



**ORAMED: Extremity dosimetry and eye lens dosimetry in interventional radiology
/cardiology
(Work Package 1)**

**Report with the results of the measurements and simulations in the selected IR and IC
procedures**

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CONTENTS

1	INTRODUCTION	3
2	MEASUREMENTS	3
2.1	List of procedures.....	3
2.2	Measurement protocol	4
2.3	Measurements database - Methodology for the statistical analysis of the results	4
3	SIMULATIONS.....	5
3.1	Description of the input file	5
3.2	Geometry characteristics	5
3.3	Sensitivity study	5
3.4	Sensitivity study and detailed calculations	18
3.5	Uncertainty evaluation of the sensitivity study	19
3.6	Detailed simulations	21
4	REFERENCES	22
	APPENDIX 1: MEASUREMENTS' DATABASE	24
	APPENDIX 2: RESULTS - CORRECTION FACTORS (CF)	41
	APPENDIX 3: DETAILED SIMULATION RESULTS.....	63

1 Introduction

During interventional radiology (IR) and cardiology (IC) procedures the medical staff can receive relatively high doses. IR and IC procedures require the operator and assisting personnel to remain close to the patient, and close to the primary radiation beam. Despite the fact that the body area can be individually shielded by protective lead aprons, the hands, legs and the eye lenses often remain practically unshielded.

Since the state-of-the-art analysis has highlighted high extremity doses and a lack of systematic data analysis on exposures to the staff in IR and IC the objective of ORAMED's WP1 is to obtain a set of standardized data on doses for staff in the above sectors and to optimize staff protection.

A coordinated measurement program in different hospitals in Europe has been started and now it's completed. Moreover, simulations of the most representative workplaces/procedures in IC and IR have been performed to determine the main parameters that influence the extremity and eye lens doses.

More specifically, the objectives of WP1 are:

- to define a measurement protocol for the procedures to be studied
- to analyse the measured extremity doses and correlate them with other parameters (like whole body doses or DAP values)
- to perform numerical calculations using standard Monte Carlo codes on:
 - the dose distribution for various parameters such as tube voltage, filtration, beam orientations and position of the staff and catheter access
 - the dose at the level of the eyes, hands, fingers and legs
- to validate the numerical methodology experimentally

The present deliverable report contains all the relevant information about the collection of the data for the measurements and simulations. The analysis of all these results will be described in the final report.

2 Measurements

2.1 List of procedures

It has been agreed within the WP1 partners that the measurements should be performed at three hospitals per WP1 partner and ten repetitions per procedure. The procedures were selected according to their frequency in the collaborative hospitals, the KAP values, the part of the body irradiated, the position of the X-ray tube and the doses measured by the WP1 partners during some preliminary measurements. The final list of procedures includes 3 cardiac and 5 general interventional diagnostic and therapeutic examinations. More specifically, the list is composed of cardiac angiographies (CA) and angioplasties (PTCA), radiofrequency ablations (RFA), pacemaker and cardiac defibrillator implantations (PM/CD), angiographies (DSA) and angioplasties (PTA) of the lower limbs (LL), the carotids and the brain (C/B) and the reins (R), embolisations and endoscopic retrograde cholangiopancreatographies (ERCP).

The final list of the collaborative hospitals and the type of procedures examined are shown in the following Table 1.

Table 1: List of the hospitals per country and the type and number of procedures monitored

Country	Interventional Cardiology			Interventional radiology				
	CA+PTCA	RF	PM	DSA	DSA	DSA	Embolization	ERCP
				PTA LL	PTA C	PTA R		
Belgium	104	69	62	38	11	16	54	93
Greece	34	20	30	43	33	12	32	28
France	20	24	24	30	1	26	25	26
Switzerland	38	32	26	19	0	2	23	25
Poland	40	20	43	22	25	3	28	0
Slovakia	30	18	18	18	9	6	12	17
TOTAL	266	183	203	170	79	65	174	189

Total number of procedures	1329
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It should be noted that the frequency of some interventional radiology procedures was low, so the expected number for these procedures could not be reached. This was also the case for cerebral DSA procedures which are often substituted by other techniques (e.g. MR angiography).

2.2 Measurement protocol

A measurement protocol was established¹, according to which several parameters related to the angiographic system, the type and complexity of the procedure, the position of the physician, the protective equipment, the experience of the physician, some field parameters (kV values, filtration, projections, etc.) and finally the fluoroscopy time, the number of images acquired and the KAP values were recorded.

For the measurements it was decided to use TL dosimeters (LiF:Mg,Cu,P). The TLDs were sealed in small plastic bags and taped on the parts of the body to be monitored. More specifically, 8 TLDs were used, 1 on each ring finger and wrist -on the palmar side when the tube is under the table and on the dorsal side for over couch interventions- 2 on the legs about 5 cm below the lead apron, one between the eyes and one near the left/right eye depending if the tube is on the left/right side of the doctor respectively.

2.3 Measurements database - Methodology for the statistical analysis of the results

The whole series of measurements is shown in Appendix 1. The rows of the table include the various measurements performed in the hospitals. In the columns there are almost all the data that were recorded in each measurement protocol: the name of the partner who

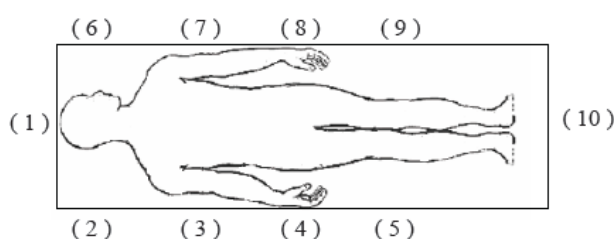


Figure 1: The possible operator's positions relatively to the patient's body

performed the respective measurements, an increasing number of the protocol per partner, the type of procedure, the name of the hospital, the code number of the protocol, worker's ID his/her experience, his/her task, the access, the position of the operator according to figure 1, the shielding equipment used (personal and other shields installed in the room), the tube configuration (tube above/below the operating table), if he/she goes out of the room during image acquisitions, the dose measurements in fingers, wrists, legs, and eyes in mSv, the KAP values in $\mu\text{Gy}\cdot\text{m}^2$, the doses normalised by the respective KAP values and finally some comments.

A first analysis of the measurements has already been performed using simple statistics. However, it was decided to use a multi variant analysis since a lot of factors seem to interact

with each other. The two-way analysis of variance (ANOVA) tests (also called two-factor analysis of variance) that measure the effects of two factors simultaneously seem to be useful for the further study of the measurements. Special statistical packages will be used for this purpose (SPSS, STATISTICA). The results will all be included in the final deliverable.

3 Simulations

3.1 Description of the input file

A simulation protocol has been created among the WP1 simulation partners in order to perform the numerical simulations for a set of combinations of the main parameters (such as tube voltage, filtration, and beam projection) as well as the various radiation protection measures that may influence the extremity and eye lens doses. The ORNL anthropomorphic phantom was used for the simulation of the patient and the operator. The “patient” phantom is at supine position, and the “operator” phantom is standing close to the patient, representing the geometry of a typical examination in interventional radiology. The original ORNL phantom was modified (by ENEA) in order to represent more realistically the irradiation scenario: eyes and hands have been added to the “operator” phantom and the forearms are bent in a more realistic position. A lead apron of 0.5 mm Pb in front of the physician’s body and a thyroid collar of 0.5 mm Pb have also been added. Finally, a cell filled with air representing the KAP chamber and an image intensifier (II) have been added to the input file. Tallies were added for the eye lenses, hands, wrists and legs corresponding respectively to the measuring points of the measurement protocol. More analytically, the tallies are described in the previous deliverable^{1,2}. The X-ray tube is simplified to a point source. Tube voltage and total filtration determine the energy photon distribution. Moreover, an ideal collimator is used. This means that the lead collimator is not simulated explicitly, but it is defined as a region where every photon is killed (not further tracked). In order to speed up the calculations we decided to start directly from photon filtered spectra, using the X-ray data of the Institute of Physics and Engineering in Medicine (IPEM), Report 78³, not simulating the bremsstrahlung radiation produced by the electrons hitting the anode. The parameters of interest within the simulation campaign are among others the tube voltage and the filtration. More specifically, the tube voltage range from 60 to 110 kVp, and the filtration from 3 to 6 mm Al and from 0 to 0.9 mm Cu. All partners used for the simulations the MCNPX code⁴.

3.2 Geometry characteristics

Simulations are performed for the following cases:

- Beam projections: Posterior Anterior (PA), Left anterior oblique (LAO) and Right anterior oblique (RAO) at angles of 30°, 60° and 90°, caudal (CAU) and cranial (CRA) projections at 20° and 40° and several realistic combinations of these projections.
- Field size at the II: diameter of 14 to 40 cm, in steps of 10 cm. The source-to-skin distance (SSD) is 60 cm and the source-to-image intensifier distance (SID) is 90 cm.
- Protective glasses for the doctor: no glasses, lead glasses equivalent to 0.5 mm Pb.
- Protective equipment for the room: combination of the three lead barriers: table curtain, patient shield and ceiling shield.
- Parts of the body irradiated: head/neck, thorax, abdomen/pelvis and lower limbs.

3.3 Sensitivity study

The goal of the simulation campaign is to investigate which of the parameters described in the previous section have significant influence on the extremity and eye lens doses. Changing these parameters one by one until all possible combinations are reached leads to an unrealistic

number of simulations which would have increased the respective computing time enormously. Therefore, it was decided to investigate the influence of 2 parameters (tube voltage and filtration) with a more simplified geometry. In this geometry the patient is simulated by a simplified phantom and no phantom for the doctor is included. For the different irradiated parts of the patient's body, different phantoms were used. For the head and neck irradiations, a head phantom is used (a cylinder with 20 cm diameter and 20 cm height, walls of PMMA with water inside); for the lower limbs, abdomen and pelvis irradiations the ISO 4037 slab phantom⁵ is used and for the thorax irradiations a lung phantom is used (a PMMA slab with external dimensions of 20x20x14 cm³ and 15x15x12 cm³ insert ICRU lung tissue). Extremity and eye lens doses are calculated on realistic positions around the "patient" phantom, using F5 tallies and the corresponding fluence to $H_p(0.07)$ and $H_p(3)$ conversion coefficients^{6,7}. The II is also included in the geometry. The tube voltage ranged from 60 to 110 kVp, filtration from 3 to 6 mm Al and from 0 to 0.9 mm Cu. The simplified phantom positions relative to the detailed input file, with the anthropomorphic phantoms are shown in figure 2. For the simplified geometry the origin is always located in the middle of the phantom. For the anthropomorphic phantom, the location of the origin is illustrated in figure 3. It is obvious that when the operator is standing at position 4 (at femur access of the patient), the distance between the X-ray beam and the operator is larger for head and neck irradiations, than for the abdomen irradiations. This was taken into account when the tallies were defined for the simplified geometries.

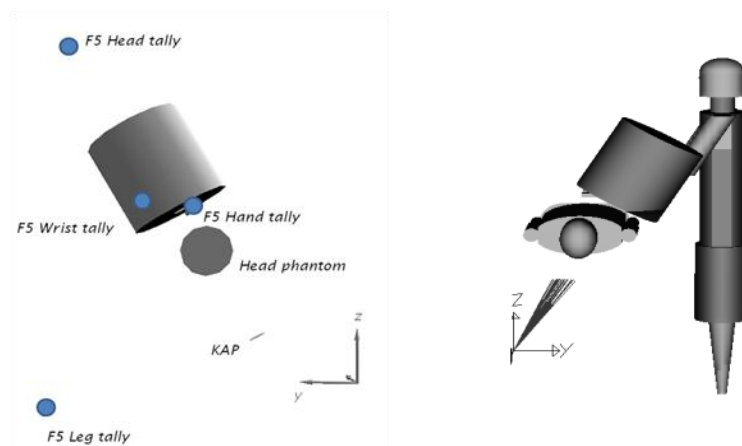


Figure 2 The MCNP-X geometry of the simplified (left) and detailed (right) simulations

In figure 3, the geometries of the simplified and detailed calculations are illustrated. Using these setups, the tally values (at eyes, wrists, hands and legs) were calculated. Additionally, doses were calculated for a specific (*reference*) position, 38 cm from the centre of the beam, in order to have a common distance and to be able to compare the results from the different phantoms. For normalization purposes every result is divided by the 'exit' dose. The exit dose is the calculated dose in air at the entrance of the II. This simplified simulation campaign, where the influence of the beam quality is investigated is referred to as the 'sensitivity study'. Table 2 shows the combinations of the beam quality spectra with the various phantoms and the projections examined in the sensitivity study. The results of the sensitivity study are included in the Appendix 2.

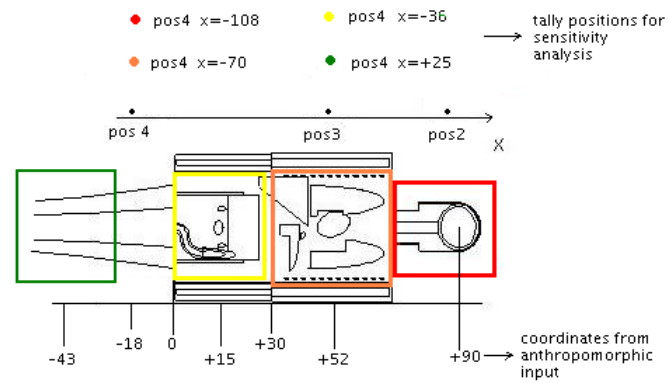


Figure 3: The detailed patient phantom and the simplified phantoms for the head (red line), thorax (orange line), abdomen (yellow line) and lower limbs (green line) irradiations.



Table 2.1: The combinations used for the sensitivity study. The *head* phantom is used. The operator is standing at the reference position (pos 3). No protective equipment is used. *The field diameter is 20 cm at the II.* The combinations marked with grey have not been performed since they are not applicable. These combinations refer to head and neck procedures.

BEAM PROJECTION															#
kVp	mm Al	mm Cu	PA	LAO			RAO			caudal		cranial		combinations	
				30°	60°	90°	30°	60°	90°	20°	40°	20°	40°	LAO30°/cau20° LAO30°/cra20° RAO30°/cau20° RAO30°/cra20°	
80	3	0													15
		0,2													15
		0,4													15
	4	0													15
		0,2													15
		0,4													15
	5	0													15
		0,2													15
		0,4													15
	6	0													15
		0,2													15
		0,4													15
90	3	0													15
		0,2													15
		0,4													15
		0,6													15
	4	0													15
		0,2													15
		0,4													15
		0,6													15
	5	0													15
		0,2													15
		0,4													15
		0,6													15
100	3	0													15
		0,2													15
		0,4													15
		0,6													15
	6	0													15
		0,2													15
		0,4													15
		0,9													15



Table 2.1: (continued)

kVp	mm Al	mm Cu	PA	BEAM PROJECTION												#			
				LAO			RAO			caudal		cranial		combinations					
				30°	60°	90°	30°	60°	90°	20°	40°	20°	40°	LAO30°/cau20°	LAO30°/cra20°	RAO30°/cau20°	RAO30°/cra20°		
100	4	0																	15
		0,2																	15
		0,4																	15
		0,6																	15
		0,9																	15
	5	0																	15
		0,2																	15
		0,4																	15
		0,6																	15
	6	0																	15
		0,2																	15
		0,4																	15
110	3	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	4	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	5	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	6	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
Total																		881	



Table 2.2: The combinations used for the sensitivity study. The *head* phantom is used. The operator is standing at the reference position (pos3). No protective equipment is used. *The field diameter is 14 cm at the II.* The combinations marked with grey have not been performed since they are not applicable. The same table combinations were used for 30 cm field diameter at the II. These combinations refer to head and neck procedures.

kVp	mm Al	mm Cu	PA	BEAM PROJECTION												#	
				30°	LAO		30°	RAO		90°	caudal		cranial		combinations		
					60°	90°		60°	90°		20°	40°	20°	40°	LAO30°/cau20°		RAO30°/cra20°
90	3	0														9	
		0,2														9	
		0,4														9	
		0,6														9	
	4	0														9	
		0,2														9	
		0,4														9	
		0,6														9	
	5	0														9	
		0,2														9	
		0,4														9	
		0,6														9	
	6	0														9	
		0,2														9	
		0,4														9	
		0,6														9	
Total																2x	135

Table 2.3: The combinations used for the sensitivity study. The *slab* phantom is used. The operator is standing at the reference position. No protective equipment is used. *The field diameter is 40 cm at the IL.* The combinations marked with grey have not been performed since they are not applicable.

kVp	mm Al	mm Cu	PA	BEAM PROJECTION						#
				30°	LAO 60°	90°	30°	RAO 60°	90°	
70	3	0	upper legs							7
		0,2								7
		0,4								7
		0,6								1
		0,9								1
		0								7
	4	0,2	upper legs							7
		0,4								7
		0,6								1
		0,9								1
		0								7
		0,2								7
	5	0,4	upper legs							7
		0,6								1
		0,9								1
		0								7
		0,2								7
		0,4								7
	6	0,6	upper legs							1
		0								7
		0,2								7
		0,4								7
		0,6								7
		0,9								7
80	3	0								7
		0,2								7
		0,4								7
		0,6								7
		0,9								7
		0								7
	4	0,2								7
		0,4								7
		0,6								7
		0,9								7
		0								7
		0,2								7
	5	0,4								7
		0,6								7
		0,9								7
		0								7
		0,2								7
		0,4								7
	6	0,6								7
		0,9								7
		0								7
		0,2								7
		0,4								7
		0,6								7



Table 2.3: (continued)

			BEAM PROJECTION							
kVp	mm Al	mm Cu	PA	LAO			RAO			#
				30°	60°	90°	30°	60°	90°	
90	3	0								7
		0,2								7
		0,4								7
		0,6								7
	4	0								7
		0,2								7
		0,4								7
		0,6								7
	5	0								7
		0,2								7
		0,4								7
		0,6								7
	6	0								7
		0,2								7
		0,4								7
		0,6								7
100	3	0								7
		0,2								7
		0,4								7
		0,6								7
	4	0,9								7
		0								7
		0,2								7
		0,4								7
	5	0,6								7
		0,9								7
		0								7
		0,2								7
	6	0,4								7
		0,6								7
		0								7
		0,2								7
		0,4							7	
Total:										397

Table 2.4: The combinations used for the sensitivity study. The *slab* phantom is used. The operator is standing at the reference position. No protective equipment is used. *The field diameter is 30 cm at the II.* The combinations marked with grey have not been performed since they are not applicable. The same table combinations were used for 20 cm field diameter at the II. These combinations refer to abdomen/pelvis and lower limbs procedures.

kVp	mm Al	mm Cu	PA	BEAM PROJECTION						#
				30°	LAO 60°	90°	30°	RAO 60°	90°	
80	3	0								7
		0,2								7
		0,4								7
		0,6								
		0,9								
	4	0								7
		0,2								7
		0,4								7
		0,6								
		0,9								
	5	0								7
		0,2								7
		0,4								7
		0,6								
		0,9								
	6	0								7
		0,2								7
		0,4								7
		0,6								
		0,9								
Total										84

Table 2.5: The combinations used for the sensitivity study. The *slab* phantom is used. The operator is standing at the reference position. No protective equipment is used. *The field diameter is 40 cm at the II.* The combinations marked with grey have not been performed since they are not applicable. These combinations refer to lower limbs procedures.

BEAM PROJECTION				
kVp	mm Al	mm Cu	PA	#
60	3	0		1
		0,2		1
		0,4		1
		0,6		1
		0,9		1
	4	0		1
		0,2		1
		0,4		1
		0,6		1
		0,9		1
	5	0		1
		0,2		1
		0,4		1
		0,6		1
		0,9		1
	6	0		1
		0,2		1
		0,4		1
		0,6		1
		0,9		1
				17

Table 2.6: The combinations used for the sensitivity study. The *lung* phantom is used. The operator is standing at the reference position. No protective equipment is used. The field diameter is 20 cm at the II. The combinations marked with grey have not been performed since they are not applicable. These combinations refer to thorax procedures.

kVp	mm Al	mm Cu	PA	BEAM PROJECTION												#		
				LAO			RAO			caudal		cranial		combinations				
				30°	60°	90°	30°	60°	90°	20°	40°	20°	40°	LAO60°/cau20°	LAO60°/cra20°		RAO30°/cau20°	RAO30°/cra20°
70	3	0																13
		0,2																13
		0,4																13
		0,6																
		0,9																
	4	0																13
		0,2																13
		0,4																13
		0,6																
		0,9																
	5	0																13
		0,2																13
		0,4																13
		0,6																
		0,9																
80	3	0																13
		0,2																13
		0,4																13
		0,6																
		0,9																
	4	0																13
		0,2																13
		0,4																13
		0,6																
		0,9																
	5	0																13
		0,2																13
		0,4																13
		0,6																
		0,9																

Table 2.6: The (continued)

			BEAM PROJECTION												#				
kVp	mm Al	mm Cu	PA	30°	LAO 60°	90°	30°	RAO 60°	90°	caudal 20°	40°	cranial 20°	40°	combinations					
														LAO60°/can20°	LAO60°/cra20°	RAO30°/can20°	RAO30°/cra20°		
90	3	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	4	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	5	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
100	3	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	4	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	5	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
110	3	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	4	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13
	5	0																	13
		0,2																	13
		0,4																	13
		0,6																	13
		0,9																	13

754

Table 2.7: The combinations used for the sensitivity study. The *lung* phantom is used. The operator is standing at the reference position. No protective equipment is used. *The field diameter is 30 cm at the IL.* The combinations marked with grey have not been performed since they are not applicable. These combinations refer to thorax procedures.

kVp	mm Al	mm Cu	PA	BEAM PROJECTION								combinations				#	
				LAO 30°	60°	90°	RAO 30°	60°	90°	caudal 20°	40°	cranial 20°	40°	LAO60°/cau20°	LAO60°/cra20°		RAO30°/cau20°
90	3	0															8
		0,2															8
		0,4															8
		0,6															8
		0,9															8
	4	0															8
		0,2															8
		0,4															8
		0,6															8
		0,9															8
	5	0															8
		0,2															8
		0,4															8
		0,6															8
		0,9															8

96

3.4 Sensitivity study and detailed calculations

On one hand the influence of beam quality and field size on extremity and eye lens doses could be determined from the sensitivity study. On the other hand, the results of the sensitivity study can be used to determine 'correction factors' in order to extrapolate results from the detailed simulations performed for one beam quality to different beam qualities.

The methodology that is used to calculate these correction factors is described in the following text as well as in figure 8: for all of the irradiations examined (the head/neck, abdomen/pelvis and lower limbs irradiations) it is necessary to perform one detailed calculation for the spectrum with the lowest HVL within one tube voltage and for each projection separately. To move from one filtration to another within the same projection and tube voltage, the "correction factors" calculated from the sensitivity study can be used. Let's take the case of the abdomen and pelvis irradiations for the PA projection and let's say that we want to move from the detailed simulation with the lowest HVL, D_{low} (70kVp, 3 mm Al, 0 mm Cu) to another one described as 70 kVp 5 mm Al and 0 mm Cu, D_{high}

- The following ratios are calculated: $D_{low}/exit_{low}$ and $D_{high}/exit_{high}$ from the detailed simulations, where $D_{low/high}$ can be the dose to the hand, wrist, leg or eyes and $exit_{low/high}$ are the exit doses at the II.

- Then the corresponding "correction factors" are calculated from the sensitivity study: $CF_i = (D_{sens,low}/exit_{sens,low})/(D_{sens,high}/exit_{sens,high})$ where the numerator and the denominator are the results of the sensitivity study for the hands, wrists, legs or eyes and the exit dose for the (70 kVp, 3 mm Al, 0 mm Cu=low) and (70kVp, 5 mm Al and 0 mm Cu=high) respectively.

- The interpolated dose, $(D/exit)_{IP}$, is calculated starting from the detailed calculation with low HVL: $D_{low}/exit_{low}$ in combination with the correction factor from the sensitivity study CF_i .

$$(D/exit)_{IP} = (D_{low}/exit_{low}) * CF_i$$

Finally, $(D/exit)_{IP}$ is compared to $(D_{high}/exit_{high})$. If the differences (interpolated values to the detailed ones) are larger than 60% the "correction factors" are not accepted and the whole series of detailed simulations should be performed.

Finally, $(D/exit)_{IP}$ is compared to $(D_{high}/exit_{high})$. If the differences (interpolated values to the detailed ones) are larger than 30% the "correction factors" are not accepted and the whole series of detailed simulations should be performed.

As it is described in the WP1 intermediate simulation report² the lung phantom that was chosen for the thorax irradiations differs a lot in its composition from the detailed case and is not appropriate to be used in the sensitivity study. This is why for the rest of the ORAMED campaign the detailed simulations were used to study the thorax irradiations. For this reason the 13 series projections that were chosen to be examined for the thorax case (table 2.5) were simulated using the detailed input for all the series of kVp using the lowest and the highest filtration (13 projections x 5 kVp x 2 filtrations HVL in each kVp- 130 cases performed by ENEA). While, for the other irradiation procedures the whole series of projections was examined for the lowest kVp and the lowest filtration but only for the 80 kVp with the lowest HVL:

- Head irradiations: 15 projections x 4 kVp using the lowest HVL – 60 cases (performed by GAEC)
15 projections for the 80 kVp for the highest HVL – 15 cases (performed by GAEC)
- Abdomen irradiation: 11 projections x 4 kVp using the lowest HVL – 44 cases (performed by SCK)
- 11 projections for the 80 kVp for the highest filtration – 11 cases (performed by SCK)

The results of the detailed simulations are included in Appendix 3.

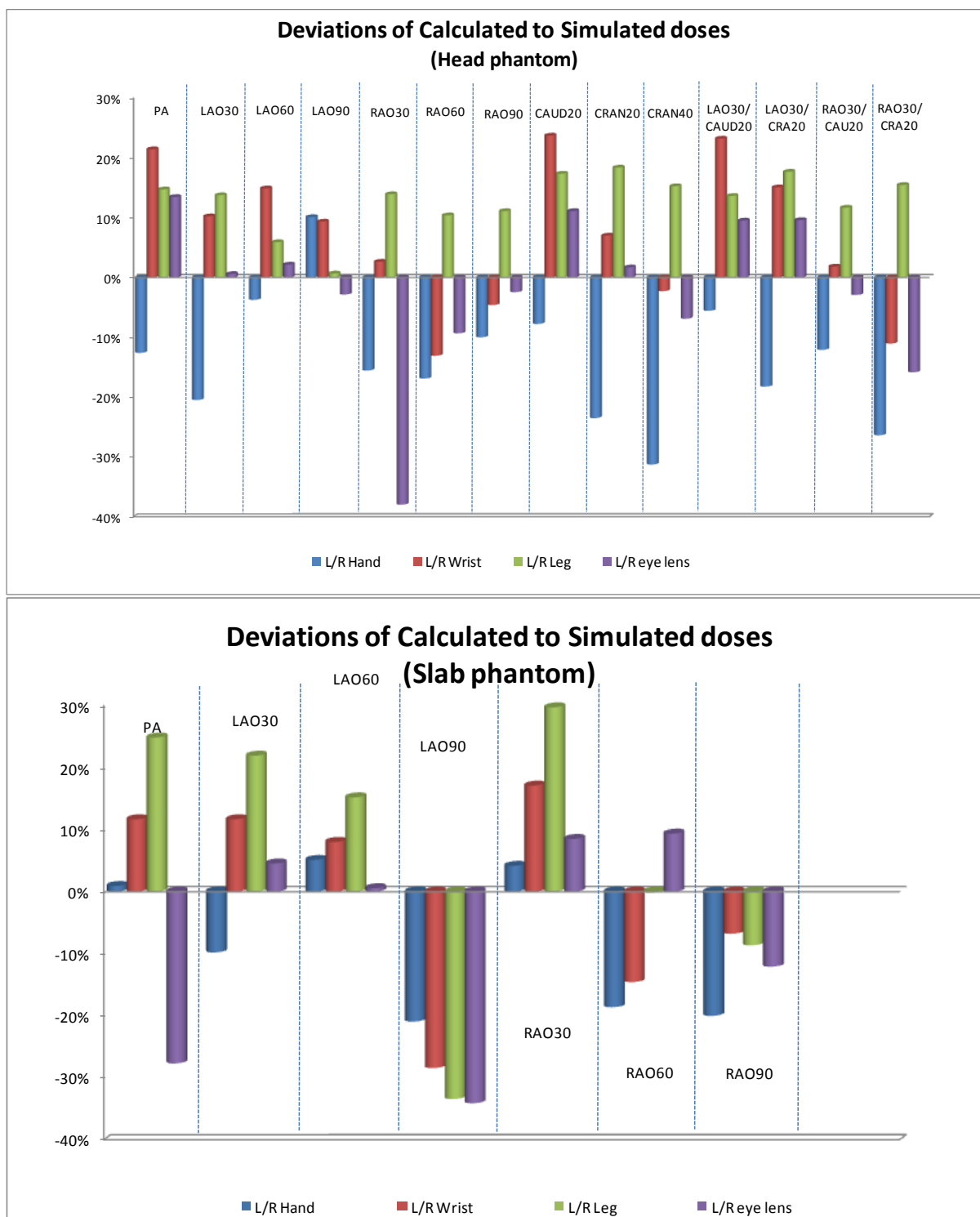
3.5 Uncertainty evaluation of the sensitivity study

Since the results of the trends of doses to the various dosimetric locations per exit dose are based on the correlation of the data obtained from detailed calculations and data from the sensitivity study, an uncertainty evaluation was needed.

In order to evaluate the uncertainty, two irradiation cases (head and neck, and abdomen) were chosen for the study. The results from the detailed simulations were in each case compared to the results obtained using the correction factors that were determined from the sensitivity study. The deviation is defined in the following formula:

$$\text{deviation\%} = [(\text{interpolated} - \text{detailed}) / \text{detailed}]$$

The deviations for the head and slab phantom are shown in the following graph 1.



Graph 1: Uncertainty evaluation for the head (a) and slab (b) phantom for all projections and dosimetric locations

The maximum deviation for the head phantom is 38% for the *RAO30* projection while all the rest are below 26% with an average deviation of 12% (in absolute values). For the slab phantom the maximum deviation is 37% for *LAO90* projection while the rest are well below 30%. In general, the deviations for these two phantoms are considered acceptable from the radiation protection point of view.

On the contrary, for the lung phantom, even though the KAP and the doses to the different locations in the scattered beam have the same trend as for the other two phantoms, there is a problem with the dose to the II (exit dose), because of the phantom's composition. This is the reason why this uncertainty evaluation could not be performed for the thorax phantom and the whole series of simulations was performed using the detailed study.

3.6 Detailed simulations

As it is mentioned in section 3.5 next to the sensitivity study, detailed simulations were performed for every projection and tube voltage, but only for the lowest filtration. Doses for the other filtrations are determined by extrapolation using the results from the sensitivity study.

Moreover, the detailed geometry has been used to study the effect of the shielding equipment (lead glasses, ceiling and table shield), the field size and the position of the operator. More specifically the following simulations have been performed:

- Use of protective shields: The shielding factor has been tested for thorax irradiations, with the operator standing at position 4 (femoral access) using
 - Ceiling shield: 2 types of ceiling shield were tested for the projections PA, LAO90, RAO60 and CRAN40. The shields are shown in figure 4.

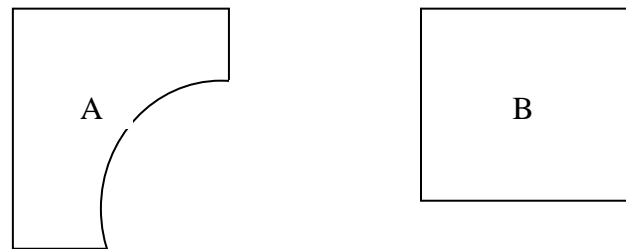


Figure 4: Schematic diagram for the ceiling shields that were tested for the simulations

For the shield A, two cases were checked: A1, when the shield is touching the patient and A2: when it is 15 cm shifted on the vertical axis. The shield was positioned at an angle ($\sim 60^\circ$) around vertical axis. Shield B was tested for 2 positions: one perpendicular to the patient and one shifted on the left side of the operator, but not above the patient, only for LA090 projection. Table shield was present at all simulations (Total=13 simulations – performed by SCK) For the table shield only the leg tallies were considered, for the ceiling shield the hands (finger + wrist) and eye tallies were considered.

- Use of lead glasses: The effect of lead glasses was examined for the 13 projections of used at the thorax irradiations, with two setups: one when lead glasses are present but without any ceiling shields present and one when lead glasses are present with ceiling shield A1 present (13+13=26 cases – performed by ENEA). Only the eyes were tallied in these cases (input with DXT spheres).
- Field size: 3 field sizes were tested, 14, 20 and 30 cm diameter at the II, only for the PA projection with the operator at position 3 for the head irradiations and 2 field sizes were studied, 20 and 30 cm at the II, for all projections for the thorax irradiations with the operator standing at position 4 (3 cases – performed by GAEC for the head irradiations and 13x2=26 cases – performed by ENEA for the thorax irradiations)
- Position of the operator: 2 positions were examined: position 3 and 4. For the head irradiations only PA projection was simulated without any shielding equipment present. For the thorax irradiations four projections were simulated PA, LA090, RA030 and CRA40. Field size was 20 cm diameter at the II for both head and thorax irradiations. (8 cases performed by ENEA for the thorax and 2 cases performed by GAEC for the head procedures)

The above simulations were performed using the spectrum: 80 kV, 3 mm Al, 0mm Cu except for the thorax irradiations where the 90 kV, 3 mm Al and 0 mm Al were used. The results of the detailed simulations are included in Appendix 3.

4 References

1. WP1 first deliverable
2. WP1 intermediate report
3. Cranley, K., Gilmore, B. J., Fogarty, G. W. A. and Desponds, L. Catalogue of diagnostic x-ray spectra and other data. IPEM Report 78 (York, UK: Institute of Physics and Engineering in Medicine) (1997).
4. Pelowitz, D.B. (Ed.) MCNPX User's manual, version 2.5.0. Report LA-CP-05-0369 (Los Alamos National Laboratory, Los Alamos, NM) (2005).



5. International Organisation for Standardisation. X and gamma reference radiations for calibrating dosimeters and dose rate meters and for determining their response as a function of photon energy—Part 1: Radiation characteristics and production methods. ISO 4037-1 (Geneva: ISO) (1997).
6. International Commission on Radiation Units and Measurements. Conversion coefficients for use in radiological protection against external radiation. ICRU Report 57 (Bethesda, MD: ICRU) (1998).
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Appendix 1: Measurements' Database

Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures			Hp(0.07) (mSv)										Hp(0.07)/KAP (mSv/Gym²)					
									room	out during cine	tube configuration	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
CHUV	CA PTCA	HUG	MRo	high	operator	femoral	4	lead apron, thyroid	table, patient	no	below	0.066	0.051	0.073	0.055	0.096	0.135	0.067	0.108	2.81E-06	2.15E-06	3.10E-06	2.33E-06	4.06E-06	5.71E-06	2.83E-06	4.60E-06
CHUV	CA PTCA	HUG	RNk	low	operator	femoral	5	lead apron, thyroid	table, patient	no	below	5.000	0.100	0.200	0.110	0.840	0.190	0.110	0.090	2.12E-04	4.24E-06	8.48E-06	4.67E-06	3.56E-05	8.06E-06	4.67E-06	3.82E-06
CHUV	CA PTCA	HUG	MRo	high	operator	femoral	4	lead apron, thyroid, eyes	table, patient	no	below	0.183	0.125	0.235	0.127	1.440	0.127	0.259	0.262	1.31E-05	9.24E-06	1.18E-05	7.25E-05	6.41E-06	1.31E-05	1.32E-05	1.32E-05
CHUV	CA PTCA	HUG	RNk	low	operator	femoral	5	lead apron, thyroid, eyes	table, patient	no	below	0.044	0.031	0.042	0.047	0.035	0.066	0.016	0.026	2.24E-06	1.55E-06	2.13E-06	2.35E-06	1.74E-06	3.31E-06	8.05E-07	1.32E-06
CHUV	CA PTCA	HUG	MRo	high	operator	radial	4	lead apron, thyroid, eyes	table, patient	no	below	0.143	0.053	0.100	0.062	0.102	0.107	0.008	0.053	1.05E-05	3.93E-06	7.37E-06	4.56E-06	7.48E-06	7.90E-06	6.17E-07	3.87E-06
CHUV	CA PTCA	HUG	AAF	low	operator	radial	5	lead apron, thyroid, eyes	table, patient	no	below	0.035	0.013	0.047	0.028	0.424	0.119	0.032	0.016	2.60E-06	9.51E-07	3.43E-06	2.06E-06	3.12E-05	8.73E-06	2.38E-06	1.16E-06
CHUV	CA PTCA	HUG	PBo	high	operator	radial	4	lead apron, thyroid, eyes	table, patient	no	below	0.229	0.176	0.217	0.116	0.332	0.034	0.038	0.045	4.43E-05	3.40E-05	4.20E-05	2.24E-05	6.42E-05	6.52E-06	7.43E-06	8.73E-06
CHUV	CA PTCA	HUG	AAF	low	operator	radial	5	lead apron, thyroid, eyes	table, patient	no	below	0.033	0.012	0.034	0.005	0.072	0.056	0.018	0.016	6.35E-06	2.27E-06	6.57E-06	9.66E-07	1.40E-05	1.09E-05	3.56E-06	3.02E-06
CHUV	CA PTCA	HUG	MRo	high	operator	femoral	5	lead apron, thyroid, eyes	table, patient	no	below	0.047	0.019	0.212	0.019	0.013	0.034	0.020	0.031	1.86E-05	7.61E-06	8.45E-05	7.52E-06	5.33E-06	1.35E-05	7.92E-06	1.23E-06
CHUV	CA PTCA	HUG	FRa	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.103	0.042	0.144	0.054	0.110	0.052	0.026	0.013	4.08E-05	1.67E-05	2.15E-05	4.39E-05	2.06E-05	1.03E-05	5.01E-06	1.78E-06
CHUV	CA PTCA	HUG	MRo	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.318	0.031	0.175	0.057	0.086	0.053	0.021	0.008	6.94E-05	6.80E-06	3.81E-05	1.25E-05	1.88E-05	1.16E-05	4.49E-06	1.78E-06
CHUV	CA PTCA	HUG	PBo	high	operator	radial	5	lead apron, thyroid, eyes	table, ceiling	no	below	0.039	0.002	0.025	0.020	0.020	0.027	0.031	0.035	8.51E-06	5.11E-07	5.38E-06	4.33E-06	5.80E-06	6.80E-06	7.54E-06	7.54E-06
CHUV	CA PTCA	HUG	MRo	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.337	0.049	0.161	0.067	0.209	0.034	0.028	0.120	7.16E-05	1.04E-05	3.41E-05	1.43E-05	4.43E-05	7.16E-06	5.87E-06	2.55E-06
CHUV	CA PTCA	CHUV	JCS	high	operator	femoral	5	lead apron, thyroid, eyes	table	no	below	0.152	0.101	0.258	0.047	0.049	0.045	0.040	0.049	2.03E-05	1.34E-05	3.44E-05	6.21E-06	6.52E-06	5.97E-06	5.29E-06	6.48E-06
CHUV	CA PTCA	CHUV	HTT	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.098	0.020	0.323	0.090	0.233	0.011	0.023	0.016	1.02E-05	2.99E-05	3.36E-05	9.34E-06	2.29E-05	1.14E-06	2.40E-06	1.66E-06
CHUV	CA PTCA	CHUV	AdE	high	operator	femoral	5	lead apron, thyroid	table	no	below	0.002	0.120	0.078	0.150	0.028	0.011	0.120	0.055	1.76E-07	1.25E-05	8.17E-06	1.57E-05	2.95E-06	1.19E-06	1.25E-05	5.78E-06
CHUV	CA PTCA	CHUV	AdE	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.041	0.032	0.057	0.059	0.056	0.120	0.041	0.049	2.15E-05	1.69E-05	2.98E-05	3.12E-05	2.96E-05	6.30E-05	2.16E-05	2.55E-05
CHUV	CA PTCA	CHUV	HTT	high	operator	femoral	5	lead apron, thyroid	table	no	below	0.021	0.015	0.012	0.120	0.001	0.003	0.010	0.120	1.10E-05	7.98E-06	6.27E-06	6.30E-05	5.05E-07	1.79E-06	5.09E-06	6.30E-06
CHUV	CA PTCA	CHUV	HTT	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.052	0.036	0.165	0.042	0.037	0.011	0.024	0.009	6.41E-06	4.35E-06	2.02E-05	5.14E-06	4.58E-06	1.37E-06	2.91E-06	1.07E-06
CHUV	CA PTCA	CHUV	AdE	high	operator	femoral	5	lead apron, thyroid	table	no	below	0.017	0.016	0.013	0.035	0.120	0.001	0.024	0.017	2.03E-06	2.01E-06	1.57E-06	4.32E-06	1.47E-05	9.00E-08	2.96E-06	2.60E-06
CHUV	CA PTCA	CHUV	Tka	high	operator	femoral	5	lead apron, thyroid, eyes	table	no	below	0.057	0.048	0.028	0.032	0.001	0.025	0.039	0.030	1.18E-05	9.97E-06	5.74E-06	6.67E-06	2.54E-07	5.11E-06	8.02E-06	6.10E-06
CHUV	CA PTCA	CHUV	CRo	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.041	0.120	0.030	0.012	0.120	0.020	0.120	0.120	7.50E-06	2.22E-05	5.84E-06	2.28E-06	2.22E-05	3.67E-06	2.22E-05	2.22E-05
CHUV	CA PTCA	CHUV	DLo	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.120	0.120	0.097	0.026	0.120	0.028	0.029	0.008	3.04E-05	6.52E-06	2.45E-05	6.52E-06	3.04E-05	7.21E-06	7.43E-06	2.05E-06
CHUV	CA PTCA	CHUV	HTT	high	operator	femoral	5	lead apron, thyroid	table	no	below	0.120	0.006	0.120	0.120	0.055	0.037	0.120	0.120	1.47E-06	3.04E-05	1.47E-06	3.04E-05	1.39E-05	9.27E-06	3.04E-05	3.04E-05
CHUV	CA PTCA	CHUV	CRo	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.019	0.001	0.006	0.006	0.120	0.120	0.009	0.120	4.29E-06	1.86E-07	1.35E-06	1.27E-06	2.74E-05	2.74E-05	2.04E-06	2.74E-06
CHUV	CA PTCA	CHUV	HTT	high	operator	femoral	5	lead apron, thyroid	table	no	below	0.015	0.063	0.016	0.062	0.068	0.020	0.004	0.020	4.89E-06	3.36E-06	1.44E-05	3.68E-06	1.42E-05	1.57E-05	4.46E-06	9.43E-06
CHUV	CA PTCA	CHUV	HTT	high	operator	radial	4	lead apron, thyroid	table	no	below	0.147	0.099	0.121	0.083	0.101	0.044	0.095	0.074	6.72E-06	4.55E-06	3.78E-06	4.62E-06	2.02E-06	4.36E-06	3.37E-06	3.37E-06
CHUV	CA PTCA	CHUV	Tka	high	operator	radial	5	lead apron, thyroid	table	no	below	0.336	0.080	0.227	0.089	0.045	0.120	0.124	0.063	1.53E-05	3.64E-06	1.04E-05	4.09E-06	2.06E-06	5.49E-06	5.68E-06	2.90E-06
CHUV	RF ablation	HUG	Hsu	high	operator	femoral	4	lead apron, thyroid	patient	no	below	0.011	0.041	0.120	0.097	0.120	0.120	0.120	0.120	4.08E-06	1.46E-05	4.31E-05	4.31E-05	3.48E-05	4.31E-05	4.31E-05	4.31E-05
CHUV	RF ablation	HUG	Hsu	high	operator	femoral	4	lead apron, thyroid	none	no	below	0.016	0.026	0.060	0.016	0.058	0.030	0.058	0.030	1.11E-05	1.87E-05	4.25E-05	1.17E-05	4.13E-05	4.13E-05	2.15E-05	2.15E-05
CHUV	RF ablation	HUG	Sha	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.120	0.019	0.034	0.011	0.044	0.006	0.044	0.006	8.65E-05	1.35E-05	2.44E-05	8.02E-06	2.79E-06	4.23E-06	4.23E-06	4.23E-06
CHUV	RF ablation	HUG	Sha	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.100	0.008	0.012	0.040	0.028	0.040	0.028	0.040	1.01E-05	8.57E-07	1.26E-06	4.08E-06	2.85E-06	2.85E-06	2.85E-06	2.85E-06
CHUV	RF ablation	HUG	Sha	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.026	0.050	0.055	0.018	0.015	0.015	0.015	0.015	4.96E-05	9.59E-05	1.06E-04	3.45E-05	2.96E-05	2.96E-05	2.96E-05	2.96E-05
CHUV	RF ablation	HUG	Sha	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.049	0.039	0.098	0.001	0.014	0.120	0.120	0.120	4.37E-06	3.52E-06	8.80E-06	7.48E-08	1.29E-06	1.07E-06	1.07E-06	1.07E-06
CHUV	RF ablation	HUG	Sha	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.062	0.025	0.155	0.015	0.015	0.015	0.015	0.015	1.83E-05	7.35E-06	4.61E-05	4.41E-06	4.41E-06	4.35E-06	1.96E-06	1.96E-06
CHUV	RF ablation	HUG	Sun	low	operator	femoral	4	lead apron, thyroid	table, ceiling	no	below	0.088	0.018	0.180	0.120	0.028	0.012	0.028	0.012	2.29E-05	4.79E-06	4.67E-05	3.12E-05	7.36E-06	3.06E-06	3.06E-06	3.06E-06
CHUV	RF ablation	HUG	Sha	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.000	0.120	0.035	0.120	0.120	0.120	0.120	0.120	2.68E-08	2.37E-05	6.88E-06	2.37E-05	2.37E-05	2.37E-05	2.37E-05	2.37E-05
CHUV	RF ablation	HUG	Sha	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.029	0.030	0.015	0.006	0.041	0.034	0.041	0.034								



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures		H _p (0.07) (mSv)										H _p (0.07) KAP (mSv/Gym²)							
									room	out during cine	tube configuration	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	
CHUV	RF ablation	CHUV	EPc	high	operator	femoral	4	lead apron, thyroid	table, ceiling	no	below	0.013	0.030	0.009	0.024	0.009	0.011	0.014	0.005	1.70E-06	4.09E-06	1.20E-06	3.22E-06	1.20E-06	1.52E-06	1.86E-06	6.61E-07	
CHUV	RF ablation	CHUV	JSc	high	operator	femoral	4	lead apron, thyroid	table, ceiling	no	below			0.003	0.045	0.025	0.120	0.020	0.004	4.50E-06	6.04E-06	6.04E-06	3.38E-06	1.62E-05	2.75E-06	4.91E-07		
CHUV	Embolisation	HUG	Dma	high	operator	radial	3	lead apron, thyroid, eyes	table	no	above	0.160	0.016	0.120	0.120	0.057	0.023	0.018	0.002	8.22E-06	8.17E-07	6.15E-06	6.15E-06	2.93E-06	1.20E-06	9.17E-07	1.21E-07	
CHUV	PM/ICD	CHUV	JSc	high	operator	shoulder	8	lead apron, thyroid	none	no	below			0.000	0.010	0.030	0.022	0.006	0.007	2.02E-07	1.32E-05	4.07E-05	3.04E-05	8.31E-06	9.84E-06	3.76E-06		
CHUV	DSA PTA LL	HUG	FBo	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.131	0.126	0.117	0.088	0.041	0.058	0.041	0.034	1.47E-05	1.41E-05	1.31E-05	9.84E-06	4.64E-06	6.53E-06	4.56E-06	3.76E-06	
CHUV	Embolisation	HUG	LPu	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	yes	below	0.329	0.051	0.393	0.111	0.006	0.120	0.012	0.038	2.93E-05	4.50E-06	3.49E-05	9.88E-06	5.24E-07	1.07E-05	1.03E-06	3.42E-06	
CHUV	Embolisation	HUG	Dma	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.035	0.026	0.166	0.049	0.006	0.017	0.019	0.009	4.83E-06	3.56E-06	2.32E-05	6.78E-06	8.69E-07	2.37E-06	2.67E-06	1.26E-06	
CHUV	ERCP	CHUV	JFr	high	operator	oral	7	apron, collar	table	no	below	0.014	0.033	0.049	0.010	0.836	0.022	0.042	0.030	7.18E-07	1.78E-06	2.61E-06	5.51E-07	4.43E-05	1.17E-06	2.24E-06	1.60E-06	
CHUV	ERCP	CHUV	JFr	high	operator	oral	7	apron, collar	table	no	below	0.008	0.010	0.120	0.026	0.062	0.015	0.007	0.015	4.51E-06	8.85E-06	6.84E-05	3.51E-05	8.47E-06	3.84E-06	8.67E-06	8.84E-06	
CHUV	ERCP	CHUV	JFr	high	operator	oral	7	apron, collar	table	no	below	0.020	0.014	0.034	0.049	0.034	0.045	0.033	0.033	6.04E-06	8.70E-06	6.04E-06	8.70E-06	6.78E-06	6.78E-06	8.03E-06	8.03E-06	
CHUV	ERCP	CHUV	JFr	high	operator	oral	7	apron, collar	table	no	below	0.120	0.120	0.022	0.036	0.014	0.006	0.005	0.026	5.05E-05	9.06E-06	1.50E-05	6.04E-06	2.36E-06	2.06E-06	1.08E-05	1.08E-05	
CHUV	PM/ICD	HUG	HSu	high	operator	shoulder	7	lead apron, thyroid	table	yes	below	0.167	0.095	0.157	0.106	0.104	0.135	0.020	0.023	3.22E-04	1.83E-04	3.03E-04	2.04E-04	2.00E-04	2.59E-04	3.93E-05	4.51E-05	
CHUV	PM/ICD	HUG	HSu	high	operator	shoulder	7	lead apron, thyroid	table	no	below	0.073	0.021	0.096	0.066	0.220	0.282	0.032	0.120	2.89E-04	8.38E-05	3.77E-04	2.61E-04	8.65E-04	1.11E-03	1.26E-04	4.71E-04	
CHUV	Embolisation	CHUV	PBi	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.060	0.028	0.129	0.069	0.159	0.051	0.040	0.016	3.06E-06	1.43E-06	6.57E-06	3.53E-06	8.14E-06	2.61E-06	2.07E-06	8.10E-07	
CHUV	CA PTCA	HLT	DBe	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.163	0.027	0.025	0.011	0.120	0.120	0.006	0.006	3.06E-05	5.11E-06	4.70E-06	2.04E-06	2.26E-05	2.26E-05	1.09E-06	1.13E-06	
CHUV	CA PTCA	HLT	DBe	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.038	0.023	0.023	0.004	0.016	0.120	0.010	0.015	9.25E-05	3.29E-05	3.54E-04	1.40E-04	1.99E-05	1.97E-05	5.30E-05	4.90E-05	
CHUV	CA PTCA	HLT	DBe	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.034	0.023	0.021	0.004	0.016	0.120	0.010	0.015	1.20E-05	8.17E-06	7.42E-06	1.44E-06	5.73E-06	4.30E-05	3.59E-06	5.23E-06	
CHUV	CA PTCA	HLT	DBe	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.524	0.201	0.093	0.157	0.027	0.024	0.047	0.053	4.18E-05	1.61E-05	7.40E-06	1.26E-05	2.12E-06	1.90E-06	3.73E-06	4.25E-06	
CHUV	CA PTCA	HLT	DBe	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.068	0.019	0.015	0.120	0.120	0.000	0.009	0.010	3.10E-05	8.61E-06	6.83E-06	5.44E-05	5.44E-05	8.95E-08	4.23E-06	5.44E-05	
CHUV	CA PTCA	HLT	DBe	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.055	0.028	0.120	0.120	0.120	0.120	0.120	0.120	1.64E-05	8.45E-06	3.60E-05	3.60E-05	3.60E-05	3.60E-05	3.60E-05	3.60E-05	
CHUV	CA PTCA	HLT	OUr	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.049	0.089	0.325	0.142	0.019	0.010	0.142	0.092	2.02E-06	7.63E-07	1.34E-05	5.88E-06	7.93E-07	4.14E-07	5.87E-06	3.81E-06	
CHUV	CA PTCA	HLT	DBe	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.207	0.031	0.033	0.023	0.024	0.003	0.031	0.020	3.94E-05	5.87E-06	6.25E-06	4.36E-06	4.57E-06	6.23E-07	5.86E-06	3.75E-06	
CHUV	PM/ICD	HUG	Bva	low	operator	shoulder	3	apron, collar	table	no	below	0.013	0.016	0.023	0.013	0.083	0.105	0.044	0.023	6.50E-06	3.15E-06	2.24E-06	5.72E-06	2.02E-05	2.55E-05	1.07E-05	5.66E-06	
CHUV	DSA PTA LL	HUG	Bva	low	operator	femoral	4	apron, collar	table, ceiling	yes	below	0.165	0.136	0.124	0.120	0.006	0.007	0.098	0.103	4.82E-06	3.96E-06	3.62E-06	3.52E-06	1.71E-07	1.94E-07	2.87E-06	3.01E-06	
CHUV	RF ablation	CHUV	ZM	high	operator	femoral	4	apron, collar	ceiling	no	below	0.046	0.120	0.235	0.046	0.854	0.196	0.022	0.050	5.17E-06	1.36E-05	2.66E-05	5.25E-06	9.69E-05	2.22E-05	2.52E-06	5.62E-06	
CHUV	RF ablation	CHUV	ZM	high	operator	femoral	4	apron, collar	ceiling	no	below	0.067	0.041	0.180	0.088	1.819	0.332	0.093	0.062	3.30E-06	2.03E-06	8.81E-06	8.91E-05	1.63E-05	4.56E-06	3.06E-06	3.06E-06	
CHUV	ERCP	CHUV	GDo	high	operator	oral	7	apron, collar	table	no	below	0.032	0.008	0.120	0.014	0.002	0.120	0.027	0.050	3.56E-05	9.03E-06	1.33E-04	1.53E-05	2.40E-06	1.33E-04	3.02E-05	5.51E-05	
CHUV	ERCP	CHUV	CNi	high	operator	oral	7	apron, collar	table	no	below	0.120	0.025	0.120	0.120	0.026	0.120	0.020	0.018	4.88E-04	1.01E-04	4.88E-04	4.88E-04	1.06E-04	4.88E-04	8.07E-05	7.50E-05	
CHUV	ERCP	CHUV	CNi	high	operator	oral	7	apron, collar	table	no	below	0.120	0.004	0.120	0.120	0.120	0.120	0.028	0.021	1.98E-04	7.10E-06	1.98E-04	1.98E-04	1.59E-05	1.98E-04	4.62E-05	3.53E-05	
CHUV	ERCP	CHUV	JSc	high	operator	oral	7	apron, collar	table	no	below	0.006	0.120	0.120	0.120	0.120	0.001	0.023	0.018	1.32E-05	2.49E-04	2.49E-04	2.49E-04	2.49E-04	1.15E-04	1.15E-04	1.15E-04	
CHUV	RF ablation	CHUV	JSc	high	operator	femoral	4	apron, collar	table, ceiling	no	below			0.020	0.120	0.120	0.025	0.120	0.120									
CHUV	RF ablation	CHUV	HLT	high	operator	femoral	4	apron, collar	ceiling	no	below	0.013	0.093	0.120	0.120	0.142	0.046	0.030	0.029	1.27E-05	8.81E-05	1.13E-04	1.13E-04	1.34E-04	4.38E-05	2.79E-05	2.74E-05	
CHUV	RF ablation	CHUV	HLT	high	operator	femoral	4	apron, collar	ceiling	no	below	0.048	0.009	0.070	0.023	0.169	0.057	0.057	0.033	4.16E-05	8.00E-06	6.07E-05	1.98E-05	1.47E-04	4.97E-05	4.91E-05	2.85E-05	
CHUV	PM/ICD	HUG	HSu	high	operator	shoulder	7	lead apron, thyroid, eyes	table, ceiling	no	below	0.243	0.123	0.027	0.047	0.290	0.319	0.120	0.017	2.00E-04	1.02E-04	2.21E-05	3.87E-05	2.39E-04	2.63E-04	9.88E-05	1.44E-05	
CHUV	DSA PTA LL	CHUV	SSA	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.739	0.299		0.210	0.026	0.092	0.089		4.82E-02	1.95E-02		1.37E-02	1.66E-03	6.02E-03	5.79E-03		
CHUV	RF ablation	CHUV	JSc	high	operator	femoral	4	apron, collar	table, ceiling	no	below	0.041	0.021	0.039	0.042	0.030	0.120	0.021	0.120	5.01E-05	2.64E-05	4.82E-05	5.22E-05	3.70E-05	1.48E-04	2.64E-05	1.48E-04	
CHUV	DSA PTA LL	CHUV	FDu	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.006	0.001	0.007	0.007	0.008	0.003	0.015	0.008	0.003	1.94E-06	4.35E-07	2.02E-06	2.47E-06	8.47E-07	4.62E-06	2.57E-06	1.00E-06
CHUV	PM/ICD	HUG	HSu	high	operator	shoulder	7	lead apron, thyroid, eyes	none	no	below	0.151	0.034	0.042	0.027	0.235	0.287	0.035	0.027	1.83E-04	4.09E-05	5.04E-05	3.22E-05	2.85E-04	3.47E-04	4.27E-05	3.32E-05	
CHUV	ERCP	CHUV	NCi	high	operator	oral	7	apron, collar	table	no	below	0.028	0.020	0.017	0.019	0.120	0.120	0.045	0.024	5.77E-05	4.08E-05	3.52E-05	3.92E-05	2.45E-04	2.45E-04	9.10E-05	4.82E-05	
CHUV	ERCP	HUG_2	JDu	high	operator	oral	7	apron, collar	table	no	below	0.005																



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures			out during cine	tube configuration	Hp(0.07)(mSv)										Hp(0.07)/KAP (mSv/Gy/cm²)									
									room					L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye				
CHUV	PM/ICD	CHUV	DGr	high	operator	shoulder	3	apron, collar	table, ceiling		no	below	0.074	0.111	0.763	0.726	0.022	0.062					9.65E-06	1.45E-05	9.94E-05	9.46E-05	2.86E-06	8.13E-06					
CHUV	PM/ICD	CHUV	DGr	high	operator	shoulder	3		table, ceiling		no	below		0.001	0.009	0.010	0.004	0.003	0.120				5.69E-06	3.58E-05	3.84E-05	1.76E-05	4.81E-04						
CHUV	PM/ICD	CHUV	PpA	high	operator	shoulder	3	lead apron, thyroid, eyes	table, ceiling		no	below		0.013	0.015	0.023	0.008	0.012	0.009				3.27E-05	3.85E-05	6.00E-05	2.18E-05	3.20E-05						
CHUV	DSA PTA Re	CHUV	QSD	high	operator	femoral	4	apron, collar, thyroid, eyes	table, ceiling		no	above	0.049	0.019	0.095	0.018	0.001	0.120	0.023	0.009			2.07E-05	7.82E-06	1.11E-05	1.72E-04	4.80E-05						
CHUV	RF ablation	HILT	ZM	high	operator	femoral	4	apron, collar	table, ceiling		no	above	0.070	0.010	0.152	0.023	0.021	0.042	0.014	0.000			7.97E-05	1.11E-05	1.72E-04	2.64E-05	1.37E-04						
CHUV	RF ablation	HILT	ZM	high	operator	femoral	4	apron, collar	table, ceiling		no	above	0.120	0.120	0.078	0.001	0.011	0.120	0.006	0.120			1.61E-04	1.61E-04	1.05E-04	8.17E-07	1.47E-05						
CHUV	RF ablation	HILT	ZM	high	operator	femoral	4	apron, collar	table, ceiling		no	above	0.061	0.023	0.052	0.000	0.120	0.120	0.005	0.003			6.10E-05	5.12E-05	3.86E-07	1.19E-04	1.19E-04						
CHUV	ERCp	CHUV	JFr	high	operator	oral	7	apron, collar	table		no	below	0.013	0.005	0.015	0.120	0.120	0.012	0.001	2.25E-06			9.51E-07	2.67E-06	2.11E-05	2.11E-05	2.07E-06						
CHUV	Embolisation	CHUV	AUs	high	operator	femoral	4	lead apron, thyroid, eyes	table		no	biplane	0.090	0.026	0.077	0.017	0.007	0.014	0.049	0.021			6.03E-06	1.74E-06	5.18E-06	1.14E-06	4.72E-07						
CHUV	Embolisation	CHUV	QSD	high	operator	femoral	4	lead apron, thyroid, eyes	table		no	biplane	0.224	0.181	0.092	0.085	0.029	0.066	0.038	0.038			8.85E-05	7.14E-05	4.81E-05	1.55E-05	1.16E-05						
CHUV	Embolisation	CHUV	PmO	low	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling		no	below	0.072	0.018	0.106	0.049	0.212	0.050	0.080	0.104			6.32E-06	1.57E-06	5.91E-06	4.28E-06	1.86E-05						
CHUV	Embolisation	CHUV	PmO	low	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling		yes	below	0.164	0.130	0.096	0.069	0.243	0.481	0.104	0.103			9.58E-07	7.61E-07	5.62E-07	4.01E-07	1.42E-06						
CHUV	Embolisation	CHUV	PBI	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling		yes	below	0.266	0.165	0.601	0.276	0.822	0.110	0.090	0.163			9.30E-06	5.74E-06	2.10E-05	9.63E-06	2.87E-05						
CHUV	DSA PTA LL	HUG	RBr	low	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling		yes	below	0.303	0.214	0.654	0.437	0.011	0.238	0.129	0.93E-06			9.53E-06	6.73E-06	2.06E-05	1.37E-05	3.47E-07						
CHUV	RF ablation	CHUV	EPi	high	operator	femoral	4	apron, collar	table, ceiling		yes	below	0.003	0.009	0.054	0.024	0.066	0.120	0.035	0.006			7.63E-07	2.40E-06	1.42E-05	6.41E-06	1.75E-05						
CHUV	PM/ICD	CHUV	JMe	high	operator	shoulder	3	lead apron, thyroid, eyes	table		no	below	5.873	3.156	4.852	1.733	1.029	0.722	0.174	0.453			6.30E-04	3.42E-04	5.25E-04	1.88E-04	1.11E-04						
CHUV	RF ablation	CHUV	JTe	low	operator	femoral	4	apron, collar	table, ceiling		no	below	0.120	0.005	0.018	0.002	0.005	0.120	0.003	0.002			6.21E-05	2.66E-06	9.19E-06	1.25E-06	2.76E-06						
CHUV	PM/ICD	CHUV	JSc	high	operator	shoulder	7	apron, collar	none		no	below	0.019	0.018	0.035	0.000	0.032	0.005	0.000	0.001			1.55E-05	1.52E-05	2.88E-05	1.70E-07	2.68E-05						
CHUV	RF ablation	CHUV	EPi	high	operator	femoral	4	apron, collar	table, ceiling		no	below	0.100	0.000	0.479	0.097	0.173	0.020	0.057	0.007			1.62E-05	4.58E-08	1.62E-05	4.58E-08	1.71E-05						
CHUV	RF ablation	CHUV	EPi	high	operator	femoral	4	apron, collar	table, ceiling		no	below	0.120	0.040	0.047	0.073	0.034	0.006	0.038	0.016			5.66E-05	1.89E-05	5.66E-05	1.89E-05	2.24E-05						
CHUV	CA PTCa	HILT	DBe	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling		no	below	0.199	0.036	0.029	0.013	0.023	0.015	0.120	0.024			6.40E-05	1.16E-05	9.25E-06	4.33E-06	7.41E-06						
CHUV	RF ablation	CHUV	ZM	high	operator	femoral	4	apron, collar	ceiling		no	above	0.131	0.052	0.485	0.069	0.576	0.054	0.127	0.061			2.70E-05	6.52E-06	1.00E-04	1.43E-05	1.19E-04						
CHUV	PM/ICD	HUG	HSu	high	operator	shoulder	7	lead apron, thyroid, eyes	none		no	below	0.172	0.267	0.019	0.295	0.313	0.370	-0.005	-0.020			6.04E-05	9.41E-05	6.86E-06	1.04E-04	1.10E-04						
CHUV	PM/ICD	HUG	ISo	high	instrumental	shoulder	4	lead apron, thyroid	none		no	below	0.145	0.050	0.039	0.099	0.739	0.423	0.108	0.117			2.24E-05	7.73E-06	6.04E-06	1.53E-05	1.14E-04						
CHUV	PM/ICD	HUG	MDo	high	nurse	shoulder	3	apron, collar	table		no	below	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120			2.86E-03	2.86E-03	2.86E-03	2.86E-03	2.86E-03						
CHUV	PM/ICD	HUG	JLy	high	nurse	shoulder	3	apron, collar	table		no	below	0.004	0.012	0.120	0.120	0.005	0.021	0.005	0.120			4.46E-06	1.50E-05	1.46E-04	1.46E-04	5.68E-06						
CHUV	PM/ICD	HILT	SAu	high	nurse	shoulder	3	apron, collar	table		no	below	0.017	0.120	0.013	0.010	0.036	0.021	0.007	0.020			2.89E-05	1.99E-04	2.10E-05	1.58E-05	6.05E-05						
CHUV	PM/ICD	HILT	SAu	high	nurse	shoulder	3	apron, collar	table		no	below	0.081	0.071	0.104	0.024	0.253	0.146	0.053	0.057			2.39E-05	2.11E-05	3.08E-05	7.22E-06	7.52E-05						
CHUV	PM/ICD	HILT	SAu	high	nurse	shoulder	3	apron, collar	table		no	below	0.134	0.086	0.186	0.075	0.226	0.124	0.144	0.097			1.63E-05	1.03E-05	2.24E-05	9.10E-06	2.73E-05						
CHUV	PM/ICD	HILT	SAu	high	nurse	shoulder	3	apron, collar	table		no	below	0.046	0.009	0.049	0.004	0.014	0.082	0.021	0.017			4.10E-05	8.51E-06	4.41E-05	3.58E-06	9.29E-05						
CHUV	PM/ICD	HILT	SAu	high	nurse	shoulder	3	apron, collar	table		no	below	0.120	0.120	0.011	0.017	0.014	0.120	0.003	0.120			2.79E-04	2.79E-04	2.53E-05	3.86E-05	3.36E-05						
CHUV	PM/ICD	HILT	SBo	high	nurse	shoulder	3	apron, collar	table, ceiling		no	below	0.066	0.123	0.060	0.075	0.008	0.120	0.073	0.069			5.93E-05	1.11E-04	5.36E-05	6.72E-05	6.97E-06						
NIOM	CA PTCa	BH	TR	Low	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling		no	below	0.450	0.258	1.072	0.376	0.023	0.073	0.033	0.021			6.27E-05	3.59E-05	1.49E-04	5.24E-05	3.19E-06						
NIOM	CA PTCa	BH	RK	Low	operator	radial	3	lead apron, thyroid	table, ceiling		no	below	0.130	0.085	0.068	0.049	0.010	0.006	0.018	0.012			8.86E-05	5.78E-05	4.65E-05	3.33E-05	6.80E-06						
NIOM	CA PTCa	BH	RK	Low	operator	radial	3	lead apron, thyroid, eyes	table, ceiling		no	below	0.059	0.173	0.198	0.101	0.021	0.065	0.024	0.011			5.90E-05	2.84E-05	3.26E-05	1.67E-05	3.40E-06						
NIOM	CA PTCa	BH	TJ	High	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling		no	below	0.013	0.015	0.051	0.018	0.009	0.006	0.013	0.006			3.63E-05	1.67E-05	5.61E-05	9.94E-06	6.66E-06						
NIOM	CA PTCa	BH	MF	High	operator	radial	3	lead apron, thyroid, eyes	table, ceiling		no	below	0.039	0.012	0.023	0.019	0.008	0.006	0.008	0.006			8.99E-05	2.73E-05	5.27E-05	4.40E-05	1.92E-05						
NIOM	CA PTCa	BH	LF	Low	operator	radial	3	lead apron, thyroid	table, ceiling		no	below	0.351	0.154	0.012	0.097	0.009	0.006	0.030	0.016			1.22E-04	5.35E-05	4.07E-06	3.36E-05	3.25E-06						
NIOM	CA PTCa	BH	MK	High	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling		no	below	0.011	0.022	0.053	0.028	0.009	0.006	0.010	0.006			4.08E-05	1.73E-05	4.27E-05	2.24E-05	7.61E-06						
NIOM	CA PTCa	BH	TR	High	operator	radial	3	lead apron, thyroid, eyes	table, ceiling		no	below	0.043	0.013	0.028	0.008	0.006	0.013	0.006	0.012			3.37E-05	3.51E-05	3.37E-05	3.51E-05	7.43E-06						
NIOM	CA PTCa	BH	TJ	High	operator	radial																											



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures			out during cine	tube configuration	Hp(0.07) (mSv)								Hp(0.07)/KAP (mSv/Gy ^{cm} ²)							
									room					L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
NIOM	CA PTCA	WAM	WG	High	operator	radial	3	lead apron	WAM	table, ceiling	no	below	0.195	0.061	0.164	0.063	0.018	0.011	0.034	0.008	3.93E-05	1.22E-05	3.29E-05	1.27E-05	3.61E-06	2.28E-06	6.93E-06	1.53E-06	
NIOM	PM/ICD	WAM2	PK	High	operator	shoulder	7	lead apron, thyroid	WAM	none	no	above	0.090	0.021	0.101	0.047	0.007	0.008	0.018	0.019	2.16E-04	4.92E-05	2.40E-04	1.13E-04	1.68E-05	2.02E-05	4.32E-05	4.47E-05	
NIOM	CA PTCA	WAM	MM	High	operator	radial	3	lead apron, eyes	WAM	table	no	below	0.145	0.041	0.106	0.045	0.013	0.015	0.024	0.006	4.33E-05	1.21E-05	3.16E-05	1.33E-05	3.89E-06	4.56E-06	7.13E-06	1.79E-06	
NIOM	PM/ICD	WAM1	AB	High	operator	shoulder	7	lead apron, thyroid, eyes	WAM1	none	no	below	0.041	0.046	0.013	0.029	0.014	0.021	0.006	0.006	2.33E-04	2.66E-04	7.75E-05	1.68E-04	8.27E-05	1.22E-04	3.45E-05	3.45E-05	
NIOM	CA PTCA	WAM	MM	High	operator	radial	3	lead apron	WAM	table	no	below	0.049	0.024	0.050	0.026	0.012	0.010	0.026	0.006	2.73E-05	1.32E-05	2.80E-05	1.48E-05	6.76E-06	5.82E-06	1.48E-05	3.37E-06	
NIOM	CA PTCA	WAM	WG	High	operator	radial	3	lead apron	WAM	table, ceiling	no	below	0.025	0.016	0.028	0.014	0.006	0.008	0.006	0.006	2.84E-05	1.82E-05	3.08E-05	1.55E-05	6.71E-06	9.22E-06	6.71E-06	6.71E-06	
NIOM	PM/ICD	WAM1	AB	High	operator	shoulder	7	lead apron, thyroid, eyes	WAM1	none	no	below	0.140	0.262	0.039	0.078	0.028	0.029	0.018	0.011	1.29E-04	2.41E-04	3.58E-05	1.71E-05	2.55E-05	2.68E-05	1.65E-05	1.02E-05	
NIOM	PM/ICD	WAM2	AB	High	operator	shoulder	7	lead apron, thyroid	WAM2	none	no	above	0.007	0.271	0.250	0.145	0.007	0.014	0.070	0.073	4.45E-06	1.66E-04	1.53E-04	8.88E-05	4.58E-06	8.50E-06	4.32E-05	4.50E-05	
NIOM	PM/ICD	WAM1	AB	High	operator	shoulder	7	lead apron, thyroid	WAM1	none	no	below	0.319	0.940	0.538	0.696	0.339	0.576	0.115	0.020	3.94E-05	1.16E-04	6.66E-05	8.60E-05	4.20E-05	7.12E-05	1.42E-05	2.52E-06	
NIOM	RF ablation	WAM1	BB	High	operator	femoral	4	lead apron, thyroid, eyes	WAM1	table, ceiling	no	below	0.035	0.023	0.038	0.023	0.020	0.014	0.012	0.006	1.46E-05	9.44E-06	1.57E-05	8.90E-06	8.41E-06	5.86E-06	5.01E-06	2.49E-06	
NIOM	PM/ICD	WAM1	AB	High	operator	shoulder	7	lead apron, thyroid, eyes	WAM1	none	no	below	0.130	0.407	0.090	0.143	0.051	0.047	0.018	0.013	5.45E-05	1.51E-04	6.10E-05	1.04E-04	4.72E-05	5.46E-05	2.10E-05	1.52E-05	
NIOM	CA PTCA	WAM	MM	High	operator	radial	3	lead apron, thyroid	WAM	table	no	below	0.026	0.018	0.016	0.015	0.017	0.009	0.006	0.006	2.71E-05	1.84E-05	1.68E-05	1.68E-05	1.77E-05	9.80E-06	6.18E-06	1.68E-06	
NIOM	CA PTCA	WAM	WG	High	operator	radial	3	lead apron, thyroid	WAM	table	no	below	0.029	0.016	0.025	0.011	0.013	0.008	0.006	0.006	4.82E-05	2.60E-05	4.13E-05	1.85E-05	2.16E-05	1.28E-05	9.83E-06	9.83E-06	
NIOM	Embolisation	BRH	X	High	operator	femoral	4	lead apron, thyroid	BRH	table	yes	below	0.015	0.013	0.012	0.012	0.009	0.008	0.043	0.054	2.13E-06	1.77E-06	1.67E-06	1.68E-06	1.20E-06	1.10E-06	6.08E-06	7.50E-06	
NIOM	RF ablation	WAM1	BB	High	operator	femoral	4	lead apron, thyroid, eyes	WAM1	table	no	below	0.028	0.020	0.023	0.017	0.007	0.007	0.006	0.006	4.56E-05	3.26E-05	3.69E-05	2.76E-05	1.06E-05	1.17E-05	9.65E-06	1.65E-06	
NIOM	RF ablation	WAM1	BB	High	operator	femoral	4	lead apron, thyroid, eyes	WAM1	table	no	below	0.031	0.026	0.041	0.018	0.021	0.014	0.008	0.006	6.59E-06	5.46E-06	8.59E-06	3.86E-06	4.46E-06	2.88E-06	1.71E-06	1.26E-06	
NIOM	RF ablation	WAM1	BB	High	operator	femoral	4	lead apron, thyroid, eyes	WAM1	table	no	below	0.044	0.031	0.051	0.035	0.018	0.013	0.006	0.006	1.39E-05	9.79E-06	1.63E-05	1.11E-05	5.60E-06	4.14E-06	1.90E-06	1.90E-06	
NIOM	CA PTCA	WAM	WG	High	operator	femoral	4	lead apron, thyroid	WAM	none	no	below	0.111	0.055	0.148	0.050	0.028	0.013	0.032	0.015	1.00E-05	4.99E-06	1.34E-05	4.48E-06	2.51E-06	1.22E-06	2.89E-06	1.34E-06	
NIOM	RF ablation	WAM1	BB	High	operator	shoulder	7	lead apron, thyroid, eyes	WAM1	table	no	below	0.033	0.019	0.015	0.018	0.014	0.006	0.006	0.006	2.97E-05	1.72E-05	1.36E-05	1.63E-05	1.22E-05	5.39E-06	5.39E-06	5.39E-06	
NIOM	RF ablation	WAM1	BB	High	operator	femoral	4	lead apron, thyroid, eyes	WAM1	table	no	below	0.071	0.068	0.195	0.074	0.038	0.015	0.006	0.008	1.81E-05	4.98E-05	1.90E-05	9.67E-06	3.93E-06	1.53E-06	2.08E-06	2.08E-06	
NIOM	PM/ICD	WAM1	BB	High	operator	shoulder	7	lead apron, thyroid	WAM1	none	no	below	0.202	0.461	0.072	0.181	0.046	0.059	0.030	0.019	1.30E-04	2.95E-04	4.62E-05	1.16E-04	2.93E-05	3.78E-05	1.92E-05	1.20E-05	
NIOM	PM/ICD	WAM2	PK	High	operator	shoulder	7	lead apron, thyroid	WAM2	none	no	above	0.191	0.178	0.091	0.074	0.007	0.007	0.039	0.011	3.12E-04	2.90E-04	1.49E-04	1.21E-04	1.07E-05	1.21E-05	6.28E-05	1.81E-05	
NIOM	PM/ICD	WAM2	PK	High	operator	shoulder	7	lead apron, thyroid	WAM2	none	no	above	0.234	0.121	0.223	0.079	0.007	0.007	0.046	0.012	2.31E-04	1.19E-04	2.20E-04	7.78E-05	7.39E-06	7.24E-06	4.54E-05	1.19E-05	
NIOM	DSA PTA Ca Ce	BRH	JCH	High	operator	femoral	4	lead apron, thyroid	BRH	table	yes	below	0.008	0.007	0.006	0.007	0.006	0.006	0.006	0.006	1.02E-06	8.78E-07	8.08E-07	8.78E-07	8.08E-07	8.08E-07	8.08E-07	8.08E-07	
NIOM	DSA PTA Ca Ce	BRH	JCH	High	operator	femoral	4	lead apron, thyroid	BRH	table	yes	below	0.008	0.009	0.007	0.007	0.006	0.006	0.006	0.006	1.47E-06	1.55E-06	1.22E-06	1.16E-06	1.04E-06	1.04E-06	1.04E-06	1.04E-06	
NIOM	PM/ICD	WAM1	AB	High	operator	shoulder	7	lead apron, thyroid, eyes	WAM1	table	yes	below	0.566	0.608	0.156	0.049	0.201	0.059	0.024	0.074	9.19E-05	9.86E-05	2.54E-05	7.98E-06	3.27E-05	9.56E-06	3.83E-06	1.21E-05	
NIOM	PM/ICD	WAM2	AB	High	operator	shoulder	7	lead apron, thyroid, eyes	WAM2	table	no	above	0.434	0.110	0.136	0.098	0.014	0.008	0.088	0.071	4.13E-04	1.04E-04	1.29E-04	9.27E-05	1.29E-05	7.90E-06	8.34E-05	6.74E-05	
NIOM	Embolisation	BRH	JCH	High	operator	femoral	4	lead apron, thyroid	BRH	table	no	below	0.488	0.459	1.187	0.488	0.053	0.075	0.759	0.300	1.60E-05	1.51E-05	3.89E-05	1.60E-05	1.74E-06	2.45E-06	2.49E-05	9.84E-06	
NIOM	DSA PTA LL	KH	MW	High	operator	femoral	4	lead apron, thyroid	BRH	table	yes	below	2.887	0.552	9.506	0.538	0.008	0.032	0.238	0.111	3.87E-05	7.41E-06	1.28E-04	7.22E-06	3.76E-07	4.28E-07	3.20E-06	1.48E-06	
NIOM	Embolisation	BRH	ZK	High	operator	femoral	4	lead apron, thyroid	BRH	table	yes	below	0.008	0.006	0.006	0.006	0.006	0.006	0.007	0.006	1.49E-06	1.16E-06	1.12E-06	1.12E-06	1.12E-06	1.12E-06	1.28E-06	1.12E-06	
NIOM	DSA PTA Ca Ce	BRH	WSZ	High	operator	femoral	4	lead apron, thyroid	BRH	table	yes	below	0.055	0.014	0.056	0.008	0.008	0.029	0.018	0.088	5.28E-07	1.35E-07	5.34E-07	1.45E-07	8.06E-08	7.59E-08	2.78E-07	1.72E-07	
NIOM	DSA PTA LL	KH	ZK	High	operator	femoral	4	lead apron, thyroid	BRH	table	yes	below	0.514	0.133	0.373	0.090	0.017	0.028	0.106	0.080	4.22E-06	1.09E-06	3.06E-06	7.79E-07	1.40E-07	2.27E-07	8.73E-07	6.55E-07	
NIOM	RF ablation	WAM1	BB	High	operator	femoral	4	lead apron, thyroid	BRH	table	no	below	0.010	0.007	0.006	0.006	0.015	0.007	0.006	0.006	1.91E-05	1.12E-05	1.12E-05	1.12E-05	2.89E-05	1.24E-05	1.12E-05	1.12E-05	
NIOM	Embolisation	BRH	ME	Low	operator	femoral	4	lead apron, thyroid, eyes	BRH	table	no	below	0.086	0.051	0.063	0.040	0.074	0.140	0.111	0.126	2.41E-07	1.42E-07	1.77E-07	1.13E-07	2.06E-07	3.92E-07	3.10E-07	3.52E-07	
NIOM	RF ablation	WAM1	BB	High	operator	femoral	4	lead apron, thyroid	BRH	table	no	below	0.011	0.011	0.007	0.006	0.016	0.018	0.006	0.007	1.12E-05	1.15E-05	7.70E-06	6.2					



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures			tube configuration	Hp(0.07) (mSv)								Hp(0.07)/KAP (mSv/Gy ^{cm} ²)							
									room	out during cine			L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
NIOM	DSA PTA Ca Ce	BRH	WSZ	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.010	0.009	0.008	0.007	0.006	0.015	0.018	0.008	8.50E-07	7.50E-07	6.38E-07	5.63E-07	4.88E-07	1.26E-06	1.51E-06	6.32E-07	
NIOM	Embolisation	KH	WSZ	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.100	0.054	0.076	0.023	0.009	0.009	0.038	0.025	1.24E-06	6.64E-07	9.40E-07	2.86E-07	1.13E-07	1.06E-07	4.71E-07	3.07E-07	
NIOM	Embolisation	KH	ZK	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.028	0.015	0.040	0.021	0.008	0.006	0.022	0.017	3.64E-07	1.93E-07	5.29E-07	2.77E-07	1.09E-07	7.94E-08	2.94E-07	2.18E-07	
NIOM	DSA PTA Ca Ce	KH	ZK	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.008	0.008	0.006	0.014	0.006	0.006	0.011	0.006	1.08E-07	8.75E-08	1.54E-07	6.55E-08	6.80E-08	6.55E-08	1.24E-07	6.86E-08	
NIOM	DSA PTA LL	KH	WSZ	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.824	0.175	0.563	0.102	0.020	0.024	0.086	0.061	7.87E-06	1.67E-06	5.58E-06	7.97E-07	1.96E-07	2.34E-07	8.20E-07	5.80E-07	
NIOM	Embolisation	KH	ZK	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.073	0.016	0.047	0.010	0.006	0.006	0.020	0.015	3.42E-07	7.43E-08	2.19E-07	4.54E-08	2.83E-08	2.83E-08	9.23E-08	7.27E-08	
NIOM	DSA PTA LL	KH	JCH	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.334	0.178	0.411	0.078	0.026	0.062	0.143	0.048	3.96E-06	2.11E-06	1.68E-06	9.28E-07	3.03E-07	7.36E-07	1.69E-06	5.74E-07	
NIOM	Embolisation	KH	ZK	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.128	0.029	0.146	0.031	0.006	0.007	0.052	0.028	6.25E-07	1.43E-07	7.13E-07	1.54E-07	2.93E-08	3.48E-08	2.55E-07	1.37E-07	
NIOM	PM/ICD	WAM2	MM	Low	operator	shoulder	7	lead apron, thyroid	none	no	above	0.006	0.009	0.007	0.014	0.006	0.006	0.006	0.006	2.24E-05	3.49E-05	2.45E-05	5.13E-05	2.24E-05	2.24E-05	2.24E-05	2.24E-05	
NIOM	DSA PTA LL	KH	ZK	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.148	0.029	0.375	0.034	0.012	0.007	0.042	0.017	3.29E-06	6.41E-07	8.33E-06	7.56E-07	2.65E-07	1.47E-07	9.31E-07	3.82E-07	
NIOM	DSA PTA LL	KH	WSZ	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.451	0.298	0.418	0.209	0.022	0.040	0.074	0.032	3.62E-05	2.39E-05	3.35E-05	1.67E-05	3.24E-06	5.90E-06	2.53E-06		
NIOM	DSA PTA Re	KH	ZK	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.014	0.007	0.029	0.012	0.006	0.006	0.014	0.013	1.58E-06	9.33E-07	2.58E-06	1.07E-06	5.32E-07	5.32E-07	1.27E-06	1.18E-06	
NIOM	DSA PTA LL	KH	WSZ	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.011	0.007	0.007	0.006	0.006	0.006	0.009	0.006	2.89E-07	1.86E-07	1.79E-07	1.53E-07	1.53E-07	1.53E-07	2.23E-07	1.53E-07	
NIOM	PM/ICD	WAM1	AB	High	operator	shoulder	7	lead apron, thyroid	none	no	below	0.009	0.009	0.006	0.006	0.006	0.007	0.006	0.006	7.39E-05	7.17E-05	4.88E-05	4.88E-05	4.88E-05	5.97E-05	4.88E-05	4.88E-05	
NIOM	DSA PTA LL	KH	ZK	High	operator	radial	3	lead apron, thyroid	table	yes	radial	0.186	0.042	0.249	0.044	0.006	0.010	0.056	0.021	1.79E-06	4.03E-07	2.41E-06	4.26E-07	5.80E-08	9.23E-08	5.37E-07	2.03E-07	
NIOM	DSA PTA Ca Ce	KH	JCH	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.007	0.007	0.006	0.006	0.006	0.006	0.007	0.006	4.06E-08	3.68E-08	3.29E-08	3.29E-08	3.29E-08	3.29E-08	3.65E-08	3.29E-08	
NIOM	DSA PTA Ca Ce	KH	JCH	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.031	0.031	0.046	0.030	0.009	0.006	0.019	0.006	7.07E-07	7.20E-07	1.06E-06	6.88E-07	2.19E-07	1.39E-07	4.50E-07	1.44E-07	
NIOM	DSA PTA LL	KH	WSZ	High	operator	femoral	4	lead apron, thyroid	table	no	below	1.186	0.265	2.178	0.255	0.021	0.031	0.148	0.135	4.63E-06	1.03E-06	8.51E-06	9.96E-07	8.22E-08	1.20E-07	5.78E-07	5.29E-07	
NIOM	DSA PTA Ca Ce	KH	WSZ	High	operator	femoral	4	lead apron, thyroid	table	yes	below	0.014	0.007	0.009	0.006	0.006	0.006	0.008	0.006	5.07E-08	4.66E-08	6.73E-08	4.66E-08	4.66E-08	6.41E-08	4.66E-08	4.66E-08	
NIOM	DSA PTA Ca Ce	KH	WSZ	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.018	0.010	0.006	0.006	0.006	0.006	0.008	0.006	1.28E-07	7.26E-08	4.31E-08	4.31E-08	4.31E-08	4.31E-08	5.61E-08	4.31E-08	
NIOM	RF ablation	SH	JR	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.109	0.024	0.211	0.037	0.283	0.062	0.048	0.021	1.74E-05	3.80E-06	3.38E-05	5.98E-06	4.54E-05	9.87E-06	7.62E-06	3.36E-06	
NIOM	RF ablation	SH	PP	low	operator	femoral	4	lead apron, thyroid	table	no	below	0.009	0.006	0.010	0.006	0.095	0.039	0.006	0.006	5.53E-06	3.71E-06	6.08E-06	3.71E-06	5.87E-05	2.44E-05	3.71E-06	3.71E-06	
NIOM	RF ablation	SH	JR	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.059	0.015	0.133	0.015	0.357	0.090	0.025	0.006	7.85E-06	1.96E-06	1.78E-05	1.94E-06	4.77E-05	1.20E-05	3.36E-06	8.03E-07	
NIOM	RF ablation	SH	JR	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.165	0.123	0.143	0.126	0.197	0.116	0.013	0.079	1.17E-05	8.80E-06	1.02E-05	8.99E-06	1.41E-05	8.28E-06	9.42E-07	5.64E-06	
NIOM	RF ablation	SH	JR	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.032	0.041	0.029	0.045	0.060	0.042	0.017	0.006	5.16E-05	6.61E-05	4.68E-05	7.26E-05	9.68E-05	6.77E-05	2.74E-05	9.68E-06	
NIOM	RF ablation	SH	KK	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.042	0.015	0.042	0.015	0.038	0.011	0.012	0.006	7.28E-06	3.76E-06	7.22E-06	6.58E-06	1.91E-06	2.08E-06	1.04E-06		
NIOM	RF ablation	SH	KK	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.015	0.010	0.011	0.008	0.018	0.025	0.009	0.006	1.45E-05	9.66E-06	1.06E-05	7.73E-06	1.74E-05	2.42E-05	8.31E-06	5.80E-06	
NIOM	RF ablation	SH	KK	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.085	0.079	0.067	0.073	0.057	0.013	0.025	0.021	7.99E-06	7.42E-06	6.29E-06	6.86E-06	5.36E-06	1.22E-06	2.35E-06	2.01E-06	
NIOM	RF ablation	SH	JR	Low	operator	femoral	4	lead apron, thyroid	table	no	below	0.008	0.006	0.013	0.006	0.009	0.006	0.007	0.006	4.08E-06	2.90E-06	6.05E-06	2.90E-06	4.54E-06	2.90E-06	3.26E-06	2.90E-06	
NIOM	RF ablation	SH	KK	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	2.59E-05	2.59E-05	2.59E-05	2.59E-05	2.59E-05	2.59E-05	2.59E-05	2.59E-05	
NIOM	PM/ICD	SH	MC	high	operator	shoulder	7	lead apron, thyroid	none	no	below	0.254	0.287	0.213	0.220	0.112	0.101	0.028	0.036	1.05E-05	1.19E-05	8.80E-06	9.11E-06	4.65E-06	4.18E-06	1.15E-06	1.50E-06	
NIOM	PM/ICD	SH	KK	high	operator	shoulder	7	lead apron, thyroid	none	no	below	0.024	0.024	0.015	0.013	0.021	0.017	0.006	0.006	5.34E-05	5.24E-05	3.43E-05	2.97E-05	4.69E-05	3.81E-05	1.33E-05	3.33E-05	
NIOM	PM/ICD	SH	KK	high	operator	shoulder	7	lead apron, thyroid	none	no	below	0.011	0.013	0.010	0.011	0.006	0.006	0.006	0.006	6.35E-05	7.31E-05	5.73E-05	6.34E-05	3.35E-05	3.35E-05	3.35E-05	3.35E-05	
NIOM	PM/ICD	SH	MO	high	operator	shoulder	7	lead apron	none	no	below	0.011	0.047	0.010	0.020	0.048	0.043	0.010	0.006	1.14E-05	5.02E-05	1.07E-05	2.12E-05	5.10E-05	4.59E-05	1.11E-05	6.38E-06	
NIOM	PM/ICD	SH	MO	high	operator	shoulder	7	lead apron	none	no	below	0.025	0.021	0.020	0.025	0.014	0.010	0.006	0.006	4.92E-05	4.15E-05	4.00E-05	4.98E-05	2.70E-05	2.05E-05	1.18E-05	1.18E-05	
NIOM	PM/ICD	SH	MO	high	operator	shoulder	7	lead apron	none	no	below	0.259	0.149	0.206	0.208	0.035	0.064	0.013	0.009	1.79E-04	1.03E-04	1.42E-04	1.43E-04	2.41E-05	4.41E-05	8.97E-06	6.21E-06	
NIOM	PM/ICD	SH	MO	high	operator	shoulder	7	lead apron	none	no	below	0.063	0.059	0.076	0.042													



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures			tube configuration	Hp(0.07) (mSv)						Hp(0.07)/KAP (mSv/Gym)								
									room	out during cine			L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye
GAEC	DSA PTA LL	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling	sometimes	below	0.045	0.018	0.070	0.034	0.022	0.021	0.018	0.018	3.45E-06	1.37E-06	5.34E-06	2.59E-06	1.67E-06	1.57E-06	1.37E-06	1.37E-06
GAEC	DSA PTA Ca Ce	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling lateral tube	no	biplane	0.033	0.065	0.077	0.090	0.034	0.023	0.242	0.167	1.36E-06	2.63E-06	3.12E-06	3.67E-06	1.37E-06	9.18E-07	9.80E-06	6.77E-06
GAEC	DSA PTA Ca Ce	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling lateral tube	sometimes	biplane	0.018	0.018	0.060	0.041	0.020	0.020	0.051	0.026	no TLD	no TLD	7.33E-06	5.04E-06	2.49E-06	2.45E-06	6.32E-06	3.24E-06
GAEC	DSA PTA Ca Ce	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling	no	below	0.131	0.043	0.082	0.075	0.053	0.022	0.085	0.043	9.83E-06	3.20E-06	1.36E-05	5.60E-06	3.98E-06	1.68E-06	6.38E-06	3.24E-06
GAEC	Embolisation	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.500	0.235	0.396	0.199	0.057	0.065	0.375	0.128	8.32E-06	3.91E-06	6.59E-06	3.31E-06	9.50E-07	1.09E-06	6.25E-06	2.14E-06
GAEC	CA PTCA	OKK	TaV	high	operator	radial	4	lead apron, thyroid	table, ceiling	no	below	0.090	0.029	0.124	0.070	0.046	0.033	0.019	0.018	6.96E-06	2.22E-06	9.60E-06	5.39E-06	3.52E-06	2.58E-06	1.47E-06	1.39E-06
GAEC	DSA PTA LL	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.356	0.199	0.571	0.265	0.325	0.105	0.664	0.354	9.88E-05	5.51E-05	1.59E-04	7.37E-05	9.02E-05	2.91E-05	1.84E-04	9.83E-05
GAEC	Embolisation	DUNANT	EA	high	operator	femoral	4	lead apron, thyroid	table	sometimes	biplane	0.018	0.018	0.033	0.171	0.107	0.305	0.097	0.492	no TLD	no TLD	3.99E-06	2.50E-06	7.12E-06	2.27E-06	1.15E-05	5.72E-06
GAEC	CA PTCA	OKK	TaV	high	operator	radial	4	lead apron, thyroid	table, ceiling	no	below	0.018	0.018	0.033	0.028	0.026	0.026	0.018	0.018	3.21E-06	3.21E-06	5.82E-06	5.05E-06	4.64E-06	4.72E-06	3.21E-06	3.21E-06
GAEC	DSA PTA LL	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.295	0.021	0.065	0.041	0.026	0.074	0.022	0.018	1.94E-05	1.40E-06	1.46E-05	4.26E-06	2.68E-06	1.74E-06	4.85E-06	1.43E-06
GAEC	DSA PTA Ca Ce	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling lateral tube	no	biplane	0.120	0.021	0.125	0.075	0.025	0.022	0.218	0.128	4.66E-06	8.16E-07	4.84E-06	2.93E-06	9.52E-07	8.62E-07	8.48E-06	4.96E-06
GAEC	Embolisation	DUNANT	EA	high	operator	femoral	4	lead apron, thyroid	table, ceiling lateral tube	no	biplane	0.097	0.061	0.169	0.065	0.377	0.230	no TLD	no TLD	2.70E-06	1.71E-06	4.72E-06	1.82E-06	1.05E-05	6.42E-06	6.42E-06	6.42E-06
GAEC	DSA PTA Ca Ce	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling	no	biplane	0.042	0.018	0.118	0.039	0.040	0.023	0.018	0.018	1.57E-06	6.78E-07	4.45E-06	1.48E-06	1.50E-06	8.81E-07	6.78E-07	6.78E-07
GAEC	Embolisation	DUNANT	EA	high	operator	femoral	4	lead apron, thyroid	table, ceiling lateral tube	no	biplane	0.489	0.143	0.814	0.611	no TLD	no TLD	1.03E-05	3.52E-06	5.52E-06	1.62E-06	1.62E-06	6.93E-06	3.68E-06	7.07E-06	5.53E-06	
GAEC	DSA PTA Ca Ce	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling lateral tube	sometimes	below	0.057	0.018	0.072	0.032	0.038	0.020	0.039	0.030	1.04E-05	3.30E-06	1.31E-05	5.80E-06	6.93E-06	3.68E-06	7.07E-06	5.53E-06
GAEC	Embolisation	DUNANT	EA	high	operator	femoral	4	lead apron, thyroid	table	yes	below	0.082	0.019	0.181	0.094	0.037	0.029	0.055	0.040	3.71E-06	8.83E-07	8.22E-06	4.28E-06	1.68E-06	1.34E-06	2.50E-06	1.87E-06
GAEC	Embolisation	DUNANT	EA	high	operator	femoral	4	lead apron, thyroid	none	no	below	0.463	0.401	1.963	0.715	0.083	0.464	0.434	0.372	6.67E-06	4.91E-06	2.41E-05	8.76E-06	1.02E-06	5.69E-06	5.31E-06	4.56E-06
GAEC	Embolisation	DUNANT	EA	high	operator	femoral	4	lead apron, thyroid	table, ceiling lateral tube	no	biplane	0.576	0.264	0.171	0.089	1.537	0.791	no TLD	no TLD	7.08E-06	3.25E-06	2.10E-06	1.09E-06	1.89E-05	9.73E-06	1.89E-05	9.73E-06
GAEC	Embolisation	DUNANT	EA	high	operator	femoral	4	lead apron, thyroid	table, ceiling lateral tube	no	biplane	0.147	0.143	0.166	0.056	0.550	0.379	no TLD	no TLD	1.69E-06	1.64E-06	1.91E-06	6.47E-07	6.32E-06	4.36E-06	4.36E-06	4.36E-06
GAEC	DSA PTA LL	DUNANT	TV	high	operator	radial	8	lead apron, thyroid	table, ceiling	sometimes	below	1.310	0.487	0.691	0.433	0.035	0.181	0.020	0.088	3.66E-05	1.36E-05	1.93E-05	1.21E-05	9.91E-07	5.07E-06	5.67E-07	2.45E-06
GAEC	Embolisation	IASOI	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling	no	below	0.371	0.243	1.093	0.295	0.049	0.042	0.375	0.082	9.23E-06	6.06E-06	2.72E-05	7.34E-06	1.22E-06	1.06E-06	9.33E-06	2.03E-06
GAEC	DSA PTA Re	DUNANT	TV	high	operator	femoral	4	lead apron, thyroid	table, ceiling	sometimes	below	0.161	0.018	0.060	0.055	0.032	0.072	0.021	0.018	1.49E-05	1.67E-06	5.58E-06	5.11E-06	3.00E-06	6.62E-06	1.92E-06	1.67E-06
GAEC	CA PTCA	OKK	SR	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.097	0.018	0.202	0.029	0.195	0.067	0.106	0.055	4.23E-05	7.83E-06	8.79E-05	1.26E-05	8.48E-05	2.91E-05	4.62E-05	2.40E-05
GAEC	CA PTCA	OKK	GP	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.025	0.023	0.040	0.044	0.033	0.043	0.018	0.018	1.01E-05	9.31E-06	1.69E-05	1.76E-05	1.34E-05	1.74E-05	7.29E-06	7.29E-06
GAEC	CA PTCA	OKK	VV	high	operator	femoral	4	lead apron, thyroid	table, ceiling	no	below	0.036	0.023	0.055	0.059	0.036	0.043	0.018	0.018	1.82E-05	1.13E-05	2.73E-05	2.96E-05	1.80E-05	2.15E-05	9.00E-06	9.00E-06
GAEC	CA PTCA	OKK	SR	high	operator	femoral	4	lead apron, thyroid	none	no	below	0.025	0.049	0.042	0.073	0.049	0.047	0.018	0.018	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP
GAEC	CA PTCA	OKK	7A	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.045	0.009	0.095	0.022	0.034	0.021	0.035	0.018	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP
GAEC	CA PTCA	OKK	SR	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.025	0.015	0.047	0.018	0.018	0.018	0.021	0.018	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP
GAEC	CA PTCA	OKK	PK	low	assistant	femoral	5	lead apron, thyroid, eyes	table, ceiling	no	below	0.037	0.026	0.028	0.062	0.037	0.026	0.055	0.018	no TLD	no TLD	9.09E-06	5.09E-06	1.13E-05	6.73E-06	1.13E-05	6.73E-06
GAEC	CA PTCA	OKK	PK	low	assistant	femoral	5	lead apron, thyroid, eyes	table, ceiling	no	below	0.036	0.029	0.060	0.038	0.029	0.060	0.038	0.018	no TLD	no TLD	1.80E-05	1.45E-05	3.00E-05	1.90E-05	no TLD	no TLD
GAEC	DSA PTA LL	EUAG1	VL	high	operator	femoral	4	lead apron, thyroid	table	yes	below	0.264	0.034	0.135	0.053	0.026	0.062	0.018	0.018	1.19E-05	1.54E-06	6.12E-06	2.39E-06	1.18E-06	2.82E-06	8.16E-07	8.16E-07
GAEC	DSA PTA Ca Ce	EUAG1	Va	low	operator	femoral	4	lead apron, thyroid	table	no	below	0.018	0.018	0.035	0.033	0.023	0.070	0.077	0.018	1.54E-06	1.54E-06	3.02E-06	2.83E-06	2.00E-06	5.98E-06	6.58E-06	1.54E-06
GAEC	DSA PTA LL	EUAG1	Va	low	operator	femoral	4	lead apron, thyroid, eyes	table	yes	below	0.194	0.019	0.167	0.064	0.036	0.030	0.047	0.029	3.32E-05	3.19E-06	2.85E-05	1.09E-05	6.10E-06	5.05E-06	8.04E-06	5.04E-06
GAEC	DSA PTA LL	EUAG1	VL	high	operator	femoral	4	lead apron, thyroid																			



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	protective measures			tube configuration	Hp(0.07) (mSv)								Hp(0.07)/KAP (mSv/Gym²)								
								personal	room	out during cine		L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	
GAEC	PM/ICD	NIMTS	Laz	high	assistant	shoulder	2	lead apron, thyroid, eyes	table	no	below				0.055	0.052	0.126	0.081	no TLD	no TLD	no TLD	no TLD	1.31E-05	1.22E-05	2.99E-05	1.92E-05		
GAEC	PM/ICD	NIMTS	Dro	low	operator	shoulder	3	lead apron, thyroid	none	no	below				0.231	0.250	0.147	0.153	no TLD	no TLD	no TLD	no TLD	5.47E-05	5.92E-05	3.48E-05	3.62E-05		
GAEC	ERCIP	NIMTS	Koul	high	operator	oral	7	lead apron, thyroid	ceiling	no	below	0.018	0.018	0.019	0.023	0.023	0.018	0.018	0.018	3.25E-06	3.25E-06	3.49E-06	4.24E-06	4.22E-06	3.33E-06	3.25E-06	3.25E-06	
GAEC	PM/ICD	IASOI	HEI	high	operator	shoulder	3	lead apron, thyroid, eyes	table	no	below	0.087	0.018		0.039	0.024	0.018	0.018	1.44E-04	3.00E-05	no TLD	no TLD	6.44E-05	3.96E-05	3.00E-05	3.00E-05		
GAEC	PM/ICD	IASOI	IT	high	assistant	shoulder	2	lead apron, thyroid	table	no	below	0.018	0.018		0.021	0.021	0.018	0.018	1.08E-05	1.08E-05	no TLD	no TLD	1.23E-05	1.25E-05	1.08E-05	1.08E-05		
GAEC	PM/ICD	DUNANT	IT	high	operator	shoulder	7	lead apron, thyroid, eyes	none	no	below	0.082	0.458		0.155	0.199	0.096	0.063	3.09E-05	1.72E-04	no TLD	no TLD	5.85E-05	7.48E-05	3.61E-05	2.39E-05		
GAEC	PM/ICD	DUNANT	EH	low	operator	shoulder	7	lead apron, thyroid	none	no	below	0.690	0.487		0.184	0.070	0.120	0.095	2.56E-04	1.81E-04	no TLD	no TLD	6.85E-05	2.61E-05	4.46E-05	3.54E-05		
GAEC	PM/ICD	NIMTS	K	low	operator	shoulder	7	lead apron, thyroid	none	no	below	0.520	0.464		0.091	0.090	0.106	0.047	2.03E-04	1.81E-04	no TLD	no TLD	3.54E-05	3.52E-05	4.16E-05	1.83E-05		
GAEC	PM/ICD	NIMTS	K	low	operator	shoulder	7	lead apron, thyroid	none	no	below	0.192	0.255		0.143	0.164	0.040	0.030	8.68E-05	1.15E-04	no TLD	no TLD	6.46E-05	7.42E-05	1.79E-05	1.34E-05		
GAEC	ERCIP	DUNANT	Scho	high	operator	oral	7	lead apron, thyroid, eyes	ceiling	yes	above	0.018	0.018	0.023	0.027	0.021	0.021	0.018	0.018	1.83E-05	2.36E-05	2.79E-05	2.13E-05	2.18E-05	1.83E-05	1.83E-05		
GAEC	PM/ICD	NIMTS	IT	high	assistant	shoulder	6	lead apron, thyroid, eyes	none	no	below	0.018	0.018	0.018	0.018	0.030	0.032	0.018	0.018	4.18E-05	4.18E-05	4.18E-05	7.03E-05	7.49E-05	4.18E-05	4.18E-05		
GAEC	PM/ICD	DUNANT	IT	high	operator	shoulder	3	lead apron, thyroid, eyes	none	no	below	0.155	0.204		0.110	0.215	0.021	0.008	1.09E-04	1.43E-04	no TLD	no TLD	7.71E-05	1.50E-04	1.50E-05	5.63E-06		
GAEC	PM/ICD	DUNANT	EH	low	operator	shoulder	7	lead apron, thyroid	none	no	below	0.486	0.251		0.268	0.100	0.099	0.075	2.56E-04	1.32E-04	no TLD	no TLD	1.41E-04	5.26E-05	5.20E-05	3.95E-05		
GAEC	ERCIP	DUNANT	Scho	high	operator	oral	7	lead apron, thyroid, eyes	ceiling	no	above	0.018	0.018	0.020	0.032	0.018	0.018	0.018	0.018	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	
GAEC	ERCIP	DUNANT	Scho	high	operator	oral	7	lead apron, thyroid, eyes	ceiling	no	above	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	
GAEC	PM/ICD	IASOI	IT	high	assistant	shoulder	2	lead apron, thyroid, eyes	table	no	below	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	1.18E-05	1.18E-05	1.18E-05	1.18E-05	1.18E-05	1.18E-05	1.18E-05	1.18E-05	
GAEC	PM/ICD	IASOI	IT	high	assistant	shoulder	2	lead apron, thyroid, eyes	table	no	below	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	3.00E-05	3.00E-05	3.00E-05	3.00E-05	3.00E-05	3.00E-05	3.00E-05	3.00E-05	
GAEC	PM/ICD	IASOI	HEI	high	operator	shoulder	3	lead apron, thyroid, eyes	none	no	below	0.276	0.185		0.340	0.035	0.037	0.030	7.45E-05	4.99E-05	no TLD	no TLD	9.17E-05	9.37E-06	9.96E-06	8.17E-06		
GAEC	PM/ICD	IASOI	HEI	high	operator	shoulder	3	lead apron, thyroid, eyes	none	no	below	0.187	0.061		0.187	0.052	0.018	0.018	8.31E-04	3.99E-05	no TLD	no TLD	1.23E-04	3.43E-05	1.18E-05	1.18E-05		
GAEC	PM/ICD	IASOI	HEI	high	operator	shoulder	7	lead apron, thyroid, eyes	none	no	below	0.152	0.618		0.309	0.302	0.070	0.053	6.37E-05	2.60E-04	no TLD	no TLD	1.30E-04	1.27E-04	2.92E-05	2.24E-05		
GAEC	PM/ICD	DUNANT	IT	low	operator	shoulder	7	lead apron, thyroid	none	no	below	0.155	1.057		0.060	0.510	0.138	0.094	3.64E-05	2.49E-04	no TLD	no TLD	1.42E-05	1.20E-04	3.26E-05	2.21E-05		
GAEC	PM/ICD	DUNANT	K	low	operator	shoulder	7	lead apron, thyroid	none	no	below	0.086	1.259		0.042	0.483	0.062	0.107	2.03E-05	2.96E-04	no TLD	no TLD	9.86E-06	1.14E-04	1.46E-05	2.51E-05		
GAEC	ERCIP	DUNANT	Scho	high	operator	oral	7	lead apron, thyroid, eyes	ceiling	no	above	0.018	0.018	0.023	0.024	0.018	0.019	0.018	0.018	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	no KAP	
GAEC	DSA PTA LL	EUGI	DF	high	operator	femoral	4	lead apron, thyroid	table	no	below	0.905	0.496		0.676	0.624	0.313	0.104	0.413	0.121	3.97E-05	2.96E-05	2.74E-05	1.37E-05	4.55E-06	1.81E-05	5.30E-06	
GAEC	DSA PTA LL	IASOI	Pap	high	operator	femoral	4	lead apron, thyroid	table	no	below				0.137	0.078	0.063	0.046	0.105	0.062	no TLD	no TLD	6.75E-06	3.86E-06	3.11E-06	2.26E-06	5.16E-06	3.05E-06
GAEC	Embolisation	IASOI	Pap	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	yes	below	0.023	0.018	0.090	0.058	0.020	0.022	0.087	0.055	1.18E-06	9.35E-07	4.68E-06	3.00E-06	1.03E-06	1.14E-06	4.51E-06	2.86E-06	
GAEC	Embolisation	IASOI	Pap	high	operator	femoral	4	lead apron, thyroid	table	no	below				0.150	0.122	0.048	0.041	0.018	0.018	no TLD	no TLD	4.56E-06	3.71E-06	1.46E-06	1.26E-06	5.48E-07	5.48E-07
GAEC	Embolisation	IASOI	Tax	low	assistant	femoral	5	lead apron, thyroid, eyes	none	no	below				0.021	0.031	0.398	0.029	0.040	0.048	no TLD	no TLD	6.52E-07	9.52E-07	8.95E-07	1.21E-06	1.46E-06	
GAEC	PM/ICD	IASOI	HEI	high	operator	shoulder	3	lead apron, thyroid, eyes	table	no	below	0.045	0.018		0.094	0.021	0.018	0.018	5.35E-05	2.14E-05	no TLD	no TLD	1.12E-04	2.49E-05	2.14E-05	2.14E-05		
GAEC	PM/ICD	DUNANT	IT	high	operator	shoulder	7	lead apron, thyroid	table	no	below	0.084	0.040		0.076	0.035	0.018	0.018	2.03E-04	9.80E-05	no TLD	no TLD	1.85E-04	8.40E-05	4.37E-05	4.37E-05		
GAEC	PM/ICD	DUNANT	Ioan	high	operator	shoulder	7	lead apron, thyroid	table	no	below	0.018	0.026	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	no TLD	no TLD	1.08E-04	1.54E-04	1.08E-04	1.08E-04		
GAEC	Embolisation	IASOI	Pap	high	operator	femoral	4	lead apron, thyroid	table, ceiling	no	below				0.041	0.035	0.032	0.024	0.024	#VALUE!	#VALUE!	1.42E-06	1.20E-06	1.29E-06	1.12E-06	8.31E-07	8.31E-07	
GAEC	Embolisation	IASOI	Tax	low	assistant	femoral	5	lead apron, thyroid, eyes	table, ceiling	no	below	0.025	0.018		0.025	0.022	0.057	0.018	0.022	#VALUE!	#VALUE!	8.69E-07	7.55E-07	9.93E-07	1.97E-06	6.20E-07	7.54E-07	
GAEC	DSA PTA Ca Ce	IASOI	CG	high	operator	femoral	4	lead apron, thyroid	table, ceiling	yes	below	0.033	0.034	0.099	0.050	0.074	0.039	0.074	0.039	5.87E-06	2.41E-06	1.07E-06	1.07E-06	3.24E-06	3.24E-06			
GAEC	PM/ICD	DUNANT	IT	high	operator	shoulder	7	lead apron, thyroid, eyes	none	no	below	0.369	1.049		0.155	0.379	0.158	0.093	8.54E-05	2.43E-04	no TLD	no TLD	3.59E-05	8.78E-05	3.65E-05	2.15E-05		
GAEC	PM/ICD	DUNANT	IT	high	operator	shoulder	7	lead apron, thyroid, eyes	none	no	below	0.125	0.389		0.129	0.169	0.040	0.018	8.30E-05	2.59E-04	no TLD	no TLD	8.60E-05	1.12E-04	2.68E-05	1.20E-05		
GAEC	Embolisation</																											



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	protective measures			tube configuration	Hp(0.07) (mSv)								Hp(0.07)/KAP (mSv/Gym²)							
								personal	room	out during cine		L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
GAEC	RF ablation	EUROCLINIC	DKat	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.018	0.018	0.019	0.030	0.018	0.018	2.33E-05	2.33E-05	2.33E-05	2.33E-05	2.49E-05	3.94E-05	2.33E-05	2.33E-05
GAEC	RF ablation	OKK	Mao	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below			0.022	0.018	0.018	0.018	0.018	0.018	1.45E-04	1.44E-04	1.44E-04	1.44E-04	1.24E-04	1.20E-04	1.20E-04	1.20E-04
GAEC	DSA PTA Ca Ce	IASOI	CG	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	yes	below	0.018	0.018	0.038	0.027	0.018	0.021	0.018	0.018	2.33E-06	2.33E-06	4.98E-06	3.53E-06	2.33E-06	2.70E-06	2.33E-06	2.33E-06
GAEC	Embolisation	IASOI	Pap	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.025	0.024	0.020	0.028	0.018	0.018	0.018	0.018	2.91E-06	2.91E-06	2.88E-06	2.32E-06	3.28E-06	2.14E-06	2.14E-06	2.14E-06
GAEC	Embolisation	IASO2	CG	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	sometimes	below	0.018	0.018	0.025	0.027	0.023	0.022	0.027	0.026	1.71E-06	1.71E-06	3.05E-06	2.52E-06	2.16E-06	2.09E-06	2.57E-06	2.47E-06
GAEC	RF ablation	EUROCLINIC	DKat	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	1.06E-04	1.06E-04	1.06E-04	1.06E-04	1.06E-04	1.06E-04	1.06E-04	1.06E-04
GAEC	ERCP	DUNANT	Soho	high	operator	oral	7	lead apron, thyroid, eyes	ceiling	no	above	0.018	0.018	0.022	0.023	0.018	0.018	0.018	0.018	no TLD	no TLD	1.21E-05	1.25E-05	9.89E-06	9.89E-06	9.89E-06	9.89E-06
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid	table, ceiling	no	above	0.023	0.024	0.019	0.019	0.018	0.018	0.018	0.018	no TLD	no TLD	9.42E-06	9.75E-06	7.59E-06	7.50E-06	7.27E-06	7.27E-06
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid	table, ceiling	no	above	0.019	0.021	0.019	0.019	0.018	0.018	0.018	0.018	no TLD	no TLD	2.45E-05	2.72E-05	2.39E-05	2.36E-05	2.29E-05	2.29E-05
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid	table, ceiling	no	above	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	4.18E-05	4.38E-05	4.33E-05	4.29E-05	4.33E-05	4.33E-05
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid	table, ceiling	no	above	0.018	0.018	0.020	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	1.15E-05	1.26E-05	1.15E-05	1.14E-05	1.15E-05	1.15E-05
GAEC	Embolisation	IASO2	CG	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.018	0.018	0.057	0.054	0.075	0.221	0.018	0.018	7.85E-07	7.85E-07	2.49E-06	2.34E-06	3.26E-06	9.65E-06	7.85E-07	7.85E-07
GAEC	Embolisation	IASO2	Tax	low	assistant	femoral	5	lead apron, thyroid, eyes	table, ceiling	no	below	0.018	0.018	0.021	0.021	0.064	0.133	0.018	0.018	7.85E-07	7.85E-07	9.12E-07	9.12E-07	2.79E-06	5.81E-06	7.85E-07	7.85E-07
GAEC	RF ablation	EUROCLINIC	DKat	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.062	0.033	0.052	0.086	0.018	0.019	2.12E-06	2.12E-06	7.25E-06	3.94E-06	6.11E-06	1.01E-05	2.12E-06	2.23E-06
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid	table, ceiling	no	above	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	2.52E-05	2.46E-05	2.52E-05	2.47E-05	2.52E-05	2.52E-05
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid	table, ceiling	no	above	0.018	0.019	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	2.71E-05	2.88E-05	2.71E-05	2.71E-05	2.71E-05	2.71E-05
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid	table, ceiling	no	above	0.018	0.019	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	4.27E-05	4.50E-05	4.25E-05	4.39E-05	4.25E-05	4.25E-05
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid	table, ceiling	no	above	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	1.91E-05	1.96E-05	1.96E-05	1.96E-05	1.96E-05	1.96E-05
GAEC	ERCP	DUNANT	Soho	high	operator	oral	7	lead apron, thyroid, eyes	table, ceiling	no	above	0.019	0.031	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	2.52E-05	4.00E-05	2.36E-05	2.33E-05	2.36E-05	2.36E-05
GAEC	ERCP	DUNANT	Soho	high	operator	oral	7	lead apron, thyroid, eyes	table, ceiling	no	above	0.018	0.020	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	3.16E-05	3.45E-05	3.16E-05	3.16E-05	3.16E-05	3.16E-05
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid, eyes	table, ceiling	no	above	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	7.87E-05	8.01E-05	7.87E-05	7.87E-05	7.87E-05	7.87E-05
GAEC	ERCP	AG.OLGA	Par	high	operator	oral	7	lead apron, thyroid, eyes	table, ceiling	no	above	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	1.20E-05	1.24E-05	1.21E-05	1.21E-05	1.21E-05	1.21E-05
GAEC	RF ablation	OKK	DKat	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.022	0.021	0.025	0.027	0.018	0.018	1.62E-05	1.62E-05	1.94E-05	1.86E-05	2.27E-05	4.23E-05	#VALUE!	1.62E-05
GAEC	RF ablation	EUROCLINIC	DKat	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.022	0.019	0.027	0.025	0.018	0.018	1.73E-05	1.73E-05	2.07E-05	1.84E-05	2.47E-05	2.37E-05	2.37E-05	2.37E-05
GAEC	RF ablation	OKK	Mao	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.022	0.019	0.019	0.028	0.018	0.018	2.28E-05	2.28E-05	2.73E-05	2.36E-05	2.36E-05	3.59E-05	2.28E-05	2.28E-05
GAEC	RF ablation	OKK	Mao	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.086	0.031	0.108	0.019	0.018	0.018	no TLD	no TLD	3.43E-05	1.26E-05	4.32E-05	7.54E-06	7.20E-06	7.20E-06
GAEC	RF ablation	EUROCLINIC	DKat	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.025	0.020	0.030	0.067	0.018	0.018	8.76E-06	8.76E-06	1.22E-05	9.82E-06	1.44E-05	3.26E-05	8.76E-06	8.76E-06
GAEC	RF ablation	EUROCLINIC	DKat	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.030	0.025	0.077	0.147	0.018	0.018	2.35E-06	2.35E-06	3.93E-06	3.20E-06	1.00E-05	1.92E-05	2.35E-06	2.35E-06
GAEC	RF ablation	EUROCLINIC	DKat	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.018	0.024	0.021	0.046	0.063	0.018	0.018	1.20E-05	1.20E-05	1.58E-05	1.38E-05	3.07E-05	4.16E-05	1.20E-05	1.20E-05
GAEC	RF ablation	OKK	Mao	high	operator	femoral	4	lead apron, thyroid, eyes, gloves	table, ceiling	no	below	0.018	0.023	0.023	0.023	0.069	0.049	0.018	0.018	no TLD	no TLD	8.62E-06	8.43E-06	2.55E-05	1.83E-05	6.67E-06	6.67E-06
GAEC	RF ablation	OKK	Mao	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	no TLD	no TLD	4.74E-05	7.47E-05	6.65E-05	1.32E-05	5.81E-06	5.81E-06
GAEC	RF ablation	OKK	Mao	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.018	0.018	0.098	0.027	0.159	0.035	0.018	0.018	no TLD	no TLD	3.77E-05	1.04E-05	6.12E-05	1.35E-05	6.92E-06	6.92E-06
GAEC	ERCP	NIMTS	Apost	high	operator	oral	7	lead apron, thyroid	ceiling	no	above	0.018	0.018	0.025	0.032	0.022	0.020	0.018	0.018	no TLD	no TLD	7.96E-06	1.02E-05	6.83E-06	6.45E-06	5.70E-06	5.70E-06
GAEC	ERCP	NIMTS	Alex	high	operator	oral	7	lead apron, thyroid	ceiling	no	above	0.018	0.018	0.026	0.028	0.023	0.019	0.018	0.018	no TLD	no TLD	8.82E-06	9.39E-06	7.70E-06	6.32E-06	6.07E-06	6.07E-06
GAEC	DSA PTA LL	IASOI	Pap	high	operator	radial	4	lead apron, thyroid	table	yes	below			0.055	0.023	0.041	0.029	0.018	0.018	no TLD	no TLD	4.97E-06	2.07E-06	3.67E-06	2.57E-06	1.61E-06	1.61E-06
GAEC	DSA PTA LL	IASOI	Pap	high	operator	radial	4	lead apron, thyroid	table	yes	below			0.057	0.022	0.072	0.026	0.018	0.018	no TLD	no TLD	9.15E-06	3.60E-06	1.17E-05	4.17E-06	2.90E-06	2.90E-06
SMU	DSA PTA Ca Ce	NUSCH	MG	high	operator	radial	4	lead apron, thyroid	table, ceiling	sometimes	below	0.020	0.024	0.046	0.026	0.162	0.050	0.030	0.020	9.23E-06	1.11E-05	2.12E-05	7.48E-05	2.31E-05	1.38E-05	1.38E-05	1.38E-05
SMU	DSA PTA Ca Ce	NUSCH	IP	high	operator	radial	4	lead apron, thyroid, eyes	table, ceiling	sometimes	below	0.026	0.020	0.045	0.020	0.226	0.370	0.020	0.020	7.97E-06	6.13E-06	1.07E-05	6.13E-06	6.93E-05	1.13E-04	6.13E-06	6.13E-06
SMU	DSA PTA LL	NUSCH	MV	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	sometimes	below	1.980	0.020	0.120	0.020	0.020	0.020	0.020	0.020	7.96E-05	8.04E-07	4.83E-06	8.04E-07	8.04E-07	8.04E-07	8.04E-07	8.04E-07
SMU	DSA PTA Ca Ce	NUSCH	TB	low	operator	femoral	4	lead apron, thyroid	table, ceiling	sometimes	below	0.039	0.020	0.025	0.020	0.020	0.020	0.027	0.021	1.76E-06	9.00E-07	1.13E-06	9.00E-07	9.00E-07	1.22E-06	9.45E-07	9.45E-07
SMU	DSA PTA Re	NUSCH	IV	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	yes	below	0.132	0.020	0.146	0.020	0.020	0.020	0.020	0.020	8.68E-06	1.31E-06	9.60E-06	1.31E-06	1.31E-06	1.31E-06	1.31E-06	1.31E-06
SMU	DSA PTA Re	NUSCH	IV	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	yes	below	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	9.66E-06	9.66E-06	9.66E-06	9.66E-06	9.66E-06	9.66E-06	9.66E-06	9.66E-06
SMU	DSA PTA LL	NUSCH	IV	high	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	yes	below	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06	1.03E-06
SMU	DSA PTA LL	NUSCH	TB	low	operator	femoral	4	lead apron, thyroid	table, ceiling	sometimes	below	0.100	0.020	0.079	0.072	0.100	0.020	0.060	0.054	6.97E-06	1.39E-06	5.51E-06	5.02E-06	6.97E-06	4.18E-06	3.76E-06	3



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures			tube configuration	Hp(0.07) (mSv)										Hp(0.07) KAP (mSvGym²)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
									room	out during cine			L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SMU	CA PTCA	NUSCH	AK	high	operator	femoral	3	lead apron, thyroid, eyes	table, ceiling	no	below	0.043	0.020	0.110	0.062	0.021	0.020	0.020	0.020	8.74E-06	4.06E-06	2.24E-05	1.26E-05	4.27E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06	4.06E-06



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	protective measures			tube configuration	Hp(0.07) (mSv)				Hp(0.07)/KAP (mSv/Gym²)											
								personal	room	out during cine		L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
SCK	CA PTCA	A	A15	low	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.150	0.054	0.244	0.105	0.066	0.075	0.096	0.097	1.22E-05	4.39E-06	1.99E-05	8.56E-06	5.42E-06	6.09E-06	7.83E-06	7.94E-06
SCK	CA PTCA	A	A2	high	operator	femoral	4	lead apron	table, ceiling	no	biplane	0.029	0.038	0.142	0.160	0.505	0.019	0.021	0.020	1.80E-06	2.39E-06	8.85E-06	9.99E-06	3.15E-06	1.18E-06	1.30E-06	1.26E-06
SCK	CA PTCA	A	A14	low	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.043	0.008	0.187	0.057	0.008	0.022	0.035	0.022	2.44E-06	6.49E-06	2.82E-05	8.55E-06	1.23E-06	3.33E-06	5.22E-06	3.34E-06
SCK	CA PTCA	A	A15	low	operator	femoral	4	lead apron	table, ceiling	no	biplane	0.019	0.011	0.392	0.010	0.010	0.019	0.011	0.019	1.82E-06	2.99E-06	9.49E-06	2.90E-05	3.77E-06	6.95E-06	4.15E-06	6.97E-06
SCK	CA PTCA	A	A14	low	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.044	0.032	0.096	0.053	0.008	0.008	0.014	0.008	9.01E-06	6.58E-06	1.96E-05	1.08E-05	1.63E-06	2.85E-06	1.63E-06	1.63E-06
SCK	CA PTCA	A	A15	low	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.108	0.063	0.591	0.141	0.809	0.089	0.057	0.075	8.18E-06	4.78E-06	4.48E-05	1.07E-05	6.13E-05	6.75E-06	4.34E-06	5.70E-06
SCK	CA PTCA	A	A11	low	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.157	0.054	0.560	0.096	1.567	0.360	0.073	0.053	2.31E-05	7.90E-06	8.20E-05	1.40E-05	2.30E-04	5.27E-05	1.08E-05	7.74E-06
SCK	CA PTCA	A	A15	low	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.029	0.027	0.055	0.029	0.152	0.008	0.033	0.023	5.99E-06	5.57E-06	1.14E-05	6.04E-06	3.12E-05	1.65E-06	6.70E-06	4.81E-06
SCK	CA PTCA	A	A19	high	operator	femoral	4	apron, collar, glasses	table, ceiling	no	biplane	0.086	0.008	0.283	0.054	0.192	0.095	0.015	0.008	1.48E-05	1.37E-06	4.86E-05	9.23E-06	3.29E-05	1.63E-05	2.58E-06	1.37E-06
SCK	CA PTCA	A	A15	low	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.041	0.020	0.115	0.008	0.008	0.020	0.032	0.008	1.91E-05	7.86E-06	7.98E-05	9.13E-06	1.54E-06	3.92E-06	6.21E-06	1.54E-06
SCK	CA PTCA	A	A19	low	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.077	0.065	0.202	0.090	0.073	0.008	0.071	0.015	5.44E-06	4.58E-06	1.43E-05	6.39E-06	5.18E-06	5.67E-07	5.00E-06	1.07E-06
SCK	CA PTCA	A	A19	high	observer	femoral	5	apron, collar, glasses	table, ceiling	no	biplane	0.008	0.030	0.008	0.008	0.024	0.008	0.008	0.017	1.18E-06	4.42E-06	1.18E-06	1.18E-06	3.55E-06	1.18E-06	1.18E-06	2.56E-06
SCK	CA PTCA	A	A14	low	operator	femoral	4	apron, collar, glasses	table, ceiling	no	biplane	0.101	0.008	0.008	0.008	0.080	0.008	0.008	0.008	1.34E-05	1.07E-06	1.07E-06	1.07E-06	1.07E-05	1.07E-06	1.07E-06	1.07E-06
SCK	CA PTCA	A	A14	low	operator	femoral	4	apron, collar, glasses	table, ceiling	no	biplane	0.288	0.083	0.252	0.172	0.386	0.075	0.054	0.008	1.90E-05	5.44E-06	1.66E-05	6.11E-05	2.55E-05	4.96E-06	3.54E-06	5.27E-07
SCK	CA PTCA	C	C1	high	operator	femoral	4	apron, collar, glasses	none	no	below	0.174	0.111	0.253	0.008	0.553	0.122	0.230	0.048	1.39E-05	8.88E-06	2.03E-05	6.41E-07	4.43E-05	9.74E-06	1.84E-05	3.83E-06
SCK	CA PTCA	C	C3	low	operator	femoral	4	apron, collar	none	no	below	0.074	0.089	0.298	0.008	0.169	0.163	0.089	0.168	8.64E-06	1.03E-05	3.48E-05	9.35E-07	1.97E-05	1.90E-05	1.04E-05	1.96E-05
SCK	CA PTCA	C	C1	high	operator	femoral	4	apron, collar, glasses	none	no	below	0.099	0.057	0.097	0.008	0.267	0.008	0.161	0.008	2.22E-05	1.28E-05	2.18E-05	1.80E-06	6.01E-05	1.80E-06	3.63E-05	1.80E-06
SCK	CA PTCA	C	C2	low	observer	femoral	5	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.058	0.008	0.008	0.008	1.80E-06	1.80E-06	1.80E-06	1.80E-06	1.30E-05	1.80E-06	1.80E-06	1.80E-06
SCK	CA PTCA	C	C1	high	operator	femoral	4	apron, collar, glasses	none	no	below	1.170	0.219	0.362	0.149	1.122	0.335	0.126	0.106	5.07E-05	9.49E-06	1.57E-05	6.45E-06	4.87E-05	1.45E-05	5.46E-06	4.60E-06
SCK	CA PTCA	C	C2	low	observer	femoral	5	apron, collar	none	no	below	0.059	0.110	0.102	0.078	0.235	0.108	0.135	0.045	2.54E-06	4.76E-06	4.44E-06	3.40E-06	1.02E-05	4.68E-06	5.86E-06	1.97E-06
SCK	CA PTCA	C	C1	high	operator	femoral	4	apron, collar	none	no	below	0.020	0.012	0.048	0.008	0.191	0.035	0.038	0.030	6.84E-06	4.09E-06	1.65E-05	2.71E-06	6.60E-05	1.21E-05	1.31E-05	1.03E-05
SCK	CA PTCA	C	C8	low	observer	femoral	5	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.007	0.013	0.008	0.008	2.76E-06	2.76E-06	2.76E-06	2.76E-06	2.25E-06	4.40E-06	2.76E-06	2.76E-06
SCK	CA PTCA	C	C8	low	operator	femoral	4	apron, collar	none	no	below	0.031	0.072	0.250	0.052	0.290	0.050	0.117	0.070	1.66E-05	7.54E-06	1.72E-05	1.24E-05	6.98E-05	1.21E-05	2.81E-05	1.69E-05
SCK	CA PTCA	C	C1	high	operator	femoral	4	apron, collar	none	no	below	0.106	0.030	0.134	0.035	0.276	0.053	0.101	0.059	2.95E-05	8.20E-06	3.72E-05	9.69E-06	7.65E-05	1.48E-05	2.81E-05	1.64E-05
SCK	CA PTCA	B	B11	high	operator	femoral	4	apron, collar	none	no	below	0.017	0.037	0.016	0.018	0.009	0.008	0.007	0.003	5.67E-06	1.27E-05	5.51E-06	6.01E-06	3.01E-06	2.73E-06	2.25E-06	1.17E-06
SCK	CA PTCA	B	B11	high	operator	femoral	4	apron, collar	none	no	below	0.461	0.136	0.317	0.164	0.049	0.025	0.036	0.026	4.29E-05	1.27E-05	2.95E-05	1.53E-05	4.53E-06	2.37E-06	3.36E-06	2.40E-06
SCK	CA PTCA	B	B13	/	nurse	femoral	5	apron, collar	none	no	below	0.035	0.019	0.012	0.019	0.012	0.009	0.009	0.016	3.25E-06	1.76E-06	1.08E-06	1.79E-06	1.14E-06	8.32E-07	8.00E-07	1.45E-06
SCK	CA PTCA	E	E3	high	operator	femoral	4	lead apron	table	no	below	0.217	0.036	0.122	0.048	0.191	0.113	0.045	0.036	4.59E-05	7.52E-06	2.58E-05	1.02E-05	4.04E-05	2.39E-05	9.51E-06	7.54E-06
SCK	CA PTCA	E	E3	high	operator	femoral	4	lead apron	table	no	below	0.039	0.032	0.068	0.028	0.170	0.013	0.037	0.015	8.07E-06	6.45E-06	1.40E-05	5.64E-06	3.49E-05	2.61E-06	7.54E-06	3.03E-06
SCK	CA PTCA	E	E3	high	operator	femoral	4	lead apron	table	no	below	0.045	0.035	0.084	0.063	0.191	0.019	0.040	0.023	8.15E-06	6.31E-06	1.51E-05	1.14E-05	3.43E-05	3.38E-06	7.14E-06	4.18E-06
SCK	CA PTCA	B	B17	high	operator	femoral	4	lead apron	table	no	below	0.025	0.029	0.079	0.064	0.331	0.011	0.116	0.075	2.50E-06	2.93E-06	7.82E-06	6.38E-06	3.29E-05	1.05E-06	1.16E-05	7.43E-06
SCK	CA PTCA	B	B17	high	operator	femoral	3	apron, collar	table	no	biplane	0.223	0.066	0.078	0.198	0.008	0.016	0.156	0.087	5.03E-05	1.49E-05	1.76E-05	4.46E-05	1.84E-06	3.59E-06	3.51E-05	1.95E-05
SCK	CA PTCA	B	B21	/	nurse	femoral	4	apron, collar	table	no	biplane	0.076	0.008	0.021	0.007	0.006	0.025	0.037	0.043	1.70E-05	1.86E-06	4.72E-06	1.67E-06	1.46E-06	5.67E-06	8.38E-06	9.76E-06
SCK	CA PTCA	B	B17	high	operator	femoral	3	apron, collar	table, ceiling	no	biplane	0.205	0.124	0.209	0.133	0.397	0.043	0.109	0.041	1.04E-05	6.33E-06	1.07E-05	6.81E-06	2.03E-05	2.22E-06	5.57E-06	2.09E-06
SCK	CA PTCA	B	B19	high	observer	femoral	4	apron, collar	table, ceiling	no	biplane	0.115	0.045	0.051	0.034	0.019	0.082	0.039	0.034	5.88E-06	2.28E-06	2.59E-06	1.73E-06	9.78E-07	4.18E-06	1.98E-06	1.27E-06
SCK	CA PTCA	B	B17	high	operator	femoral	3	apron, collar	table, ceiling	no	biplane	0.679	0.316	1.274	0.579	0.090	0.761	0.139	0.104	1.77E-05	8.24E-06	3.52E-05	1.51E-05	2.33E-06	1.98E-05	3.62E-06	2.71E-06
SCK	CA PTCA	B	B19	high	operator	femoral	3	apron, collar	ceiling	no	below	0.072	0.055	0.183	0.162	0.021	0.008	0.148	0.115</								



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	protective measures			tube configuration	Hp(0.07) (mSv)												Hp(0.07)KAP (mSvGym²)											
								personal	room	out during cine		L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye								
SCK	CA PTCA	I	I1	high	operator	radial	5	apron, collar, glasses	table, ceiling	no	below	0.069	0.045	0.025	0.039	0.008	0.008	0.008	0.008	3.39E-05	2.18E-05	1.22E-05	1.90E-05	3.92E-06	3.92E-06	3.92E-06	3.92E-06	3.92E-06	3.92E-06	3.92E-06	3.92E-06	3.92E-06	3.92E-06	3.92E-06	3.92E-06
SCK	CA PTCA	I	I1	high	operator	radial	4	apron, collar, glasses	table, ceiling	no	below	0.170	0.034	0.075	0.037	0.030	0.013	0.010	0.010	4.12E-05	8.31E-06	1.82E-05	8.89E-06	7.24E-06	3.06E-06	2.44E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06
SCK	CA PTCA	E	E10	high	operator	femoral	5	apron, collar	none	no	below	0.008	0.008	0.0043	0.018	0.155	0.020	0.086	0.008	1.45E-06	1.45E-06	7.76E-06	3.32E-06	2.45E-05	3.56E-06	1.56E-05	1.45E-06	1.45E-06	1.45E-06	1.45E-06	1.45E-06	1.45E-06	1.45E-06	1.45E-06	
SCK	CA PTCA	E	E10	high	operator	femoral	5	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.007	0.008	0.008	0.008	2.00E-06	2.00E-06	2.00E-06	2.00E-06	1.18E-05	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	2.00E-06	
SCK	CA PTCA	E	E10	high	operator	femoral	5	apron, collar	none	no	below	0.008	0.008	0.019	0.020	0.071	0.008	0.008	0.008	2.81E-06	2.81E-06	6.85E-06	7.00E-06	2.49E-05	2.81E-06	2.81E-06	2.81E-06	2.81E-06	2.81E-06	2.81E-06	2.81E-06	2.81E-06	2.81E-06	2.81E-06	
SCK	CA PTCA	E	E12	high	operator	femoral	5	lead apron	none	no	below	0.008	0.008	0.008	0.008	0.096	0.060	0.008	0.008	2.94E-06	2.94E-06	2.94E-06	2.94E-06	3.53E-05	2.21E-05	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	
SCK	CA PTCA	J	J1	high	operator	femoral	5	apron, collar	table, ceiling	no	below	0.100	0.063	0.135	0.055	-	0.152	0.030	0.026	1.96E-05	1.24E-05	2.65E-05	1.08E-05	-	2.98E-05	5.85E-06	5.20E-06	5.20E-06	5.20E-06	5.20E-06	5.20E-06	5.20E-06	5.20E-06	5.20E-06	
SCK	CA PTCA	J	J1	high	operator	femoral-radial	5	apron, collar	table, ceiling	no	below	0.168	0.093	0.166	0.134	1.296	0.466	0.062	0.046	1.15E-05	6.33E-06	1.14E-05	9.13E-06	1.07E-05	3.19E-05	4.24E-06	3.15E-06	3.15E-06	3.15E-06	3.15E-06	3.15E-06	3.15E-06	3.15E-06	3.15E-06	
SCK	CA PTCA	J	J1	high	operator	femoral	5	apron, collar	table, ceiling	no	below	0.042	0.037	0.061	0.048	0.041	0.043	0.022	0.031	7.32E-06	6.52E-06	1.07E-05	8.43E-06	7.13E-06	7.53E-06	3.87E-06	5.46E-06	5.46E-06	5.46E-06	5.46E-06	5.46E-06	5.46E-06	5.46E-06	5.46E-06	
SCK	CA PTCA	J	J1	high	operator	femoral	5	apron, collar	table, ceiling	no	below	0.178	0.071	0.232	0.076	0.297	0.192	0.059	0.057	1.28E-05	5.14E-06	1.67E-05	5.46E-06	2.13E-05	1.38E-05	4.23E-06	4.11E-06	4.11E-06	4.11E-06	4.11E-06	4.11E-06	4.11E-06	4.11E-06	4.11E-06	
SCK	CA PTCA	J	J1	high	operator	femoral	5	apron, collar	table, ceiling	no	below	0.308	0.052	0.164	0.051	0.376	0.169	0.046	0.041	5.73E-05	9.63E-06	3.05E-05	9.56E-06	7.00E-05	3.14E-05	8.48E-06	7.67E-06	7.67E-06	7.67E-06	7.67E-06	7.67E-06	7.67E-06	7.67E-06	7.67E-06	
SCK	CA PTCA	J	J1	high	operator	femoral	5	apron, collar	table, ceiling	no	below	0.027	0.028	0.031	0.032	0.061	0.057	0.022	0.019	4.19E-06	4.42E-06	4.81E-06	4.98E-06	9.59E-06	9.02E-06	3.44E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	
SCK	CA PTCA	J	J1	high	operator	radial	5	apron, collar	table, ceiling	no	below	0.027	0.031	0.043	0.016	0.026	0.030	0.021	0.015	6.03E-06	6.88E-06	9.70E-06	6.59E-06	5.97E-06	6.74E-06	4.81E-06	3.29E-06	3.29E-06	3.29E-06	3.29E-06	3.29E-06	3.29E-06	3.29E-06	3.29E-06	
SCK	CA PTCA	J	J2	high	operator	radial	5	apron, collar	table, ceiling	no	below	0.223	0.056	0.181	0.075	0.035	0.025	0.051	0.042	3.61E-05	9.14E-06	2.93E-05	1.21E-05	5.74E-06	3.98E-06	6.85E-06	6.85E-06	6.85E-06	6.85E-06	6.85E-06	6.85E-06	6.85E-06	6.85E-06	6.85E-06	
SCK	CA PTCA	J	J2	high	operator	radial	5	apron, collar	table, ceiling	no	below	0.466	0.058	0.185	0.050	0.072	0.027	0.025	0.028	9.76E-05	1.22E-05	3.88E-05	1.05E-05	1.51E-05	5.76										



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	protective measures				tube configuration	Hp(0.07) (mSv)								Hp(0.07)/KAP (mSv/Gy ^{cm} ²)							
								personal	room	out during cine			L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
SCK	RF ablation	B	B23	high	operator	femoral	4	apron, collar	table, ceiling	no	biplane	0.809	0.093	0.639	0.324	0.074	0.008	0.066	0.008	1.08E-04	1.25E-05	8.55E-05	4.34E-05	9.96E-06	1.07E-06	8.85E-06	1.07E-06	
SCK	RF ablation	B	B22	low	operator	femoral	4	apron, collar	table, patient	no	biplane	0.008	0.008	0.008	0.008	0.105	0.008	0.037	0.008	4.64E-06	4.64E-06	4.64E-06	4.64E-06	6.11E-05	4.64E-06	4.64E-06	4.64E-06	
SCK	RF ablation	E	E4	high	operator	femoral	4	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.213	0.062	0.008	0.008	3.30E-06	3.30E-06	3.30E-06	3.30E-06	8.78E-05	2.58E-05	3.30E-06	3.30E-06	
SCK	RF ablation	E	E4	high	operator	femoral	4	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.275	0.008	0.008	0.008	2.83E-06	2.83E-06	8.17E-06	0.00E-04	9.70E-05	2.83E-06	2.83E-06	2.83E-06	
SCK	RF ablation	E	E4	high	operator	femoral	4	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	6.07E-05	6.07E-05	6.07E-05	6.07E-05	6.07E-05	6.07E-05	6.07E-05	6.07E-05	
SCK	RF ablation	E	E4	high	operator	femoral	4	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.305	0.092	0.027	0.008	2.23E-06	2.23E-06	2.23E-06	2.23E-06	8.53E-05	2.56E-05	7.45E-06	2.23E-06	
SCK	RF ablation	E	E4	high	operator	femoral	4	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.079	0.008	0.008	0.008	8.36E-06	8.36E-06	8.36E-06	8.36E-06	8.25E-05	8.36E-06	8.36E-06	8.36E-06	
SCK	RF ablation	E	E4	high	operator	femoral	4	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.106	0.008	0.008	0.008	5.60E-06	5.60E-06	5.60E-06	5.60E-06	7.40E-05	5.60E-06	5.60E-06	5.60E-06	
SCK	RF ablation	C	C6	high	operator	femoral	4	apron, collar	none	no	below	0.008	0.008	0.046	0.008	0.131	0.008	0.008	0.008	3.61E-06	2.08E-05	3.61E-06	3.61E-06	5.91E-05	3.61E-06	3.61E-06	3.61E-06	
SCK	RF ablation	G	G6	high	operator	femoral	4	apron, collar, glasses	table, ceiling	no	below	0.053	0.091	0.260	0.228	0.018	0.008	0.177	0.041	1.71E-06	2.93E-06	8.34E-06	7.30E-06	5.91E-07	2.57E-07	5.69E-06	1.33E-06	
SCK	RF ablation	G	G6	high	operator	femoral	4	apron, collar, glasses	table, ceiling	no	below	0.008	0.008	0.043	0.016	0.008	0.008	0.008	0.008	2.27E-06	2.27E-06	1.23E-05	4.62E-06	2.27E-06	2.27E-06	2.27E-06	2.27E-06	
SCK	PM/ICD	A	A22	high	operator	shoulder	7	apron, collar	none	no	below	0.008	0.008	0.008	0.008	0.021	0.016	0.000	0.015	1.63E-04	1.63E-04	1.63E-04	1.63E-04	4.20E-04	3.25E-04	0.00E-00	2.99E-04	
SCK	PM/ICD	A	A27	low	observer	shoulder	8	apron, collar	none	no	below	0.013	0.013	0.008	0.008	0.015	0.013	0.008	0.025	2.71E-04	2.55E-04	1.63E-04	1.63E-04	3.01E-04	2.64E-04	1.63E-04	5.10E-04	
SCK	PM/ICD	A	A22	high	operator	shoulder	3	apron, collar	none	no	below	0.305	0.189	0.152	0.133	0.319	0.171	0.020	0.026	9.83E-05	6.09E-05	4.89E-05	4.29E-05	1.03E-04	5.52E-05	6.32E-06	8.50E-06	
SCK	PM/ICD	A	A13	low	operator	shoulder	3	apron, collar	none	no	below	0.104	0.043	0.043	0.053	0.114	0.038	0.029	0.026	1.37E-03	5.59E-04	5.64E-04	6.94E-04	1.49E-03	5.02E-04	3.84E-04	3.43E-04	
SCK	PM/ICD	A	A1	low	operator	shoulder	7	apron, collar	none	no	below	0.073	0.032	0.049	0.022	0.035	0.042	0.008	0.030	2.18E-04	9.63E-05	1.48E-04	6.53E-05	1.06E-04	1.26E-04	2.40E-05	8.84E-05	
SCK	PM/ICD	A	A20	low	operator	shoulder	7	lead apron	none	no	below	0.032	0.028	0.035	0.021	0.019	0.031	0.026	0.008	2.52E-04	2.17E-04	1.60E-04	1.48E-04	2.43E-04	2.01E-04	6.25E-05		
SCK	PM/ICD	A	A5	low	operator	shoulder	7	lead apron	none	no	below	0.072	0.075	0.071	0.074	0.075	0.063	0.035	0.008	3.00E-04	3.13E-04	2.96E-04	3.08E-04	3.13E-04	2.63E-04	1.46E-04	3.33E-05	
SCK	PM/ICD	A	A13	low	operator	shoulder	7	apron, collar	none	no	below	0.072	0.044	0.055	0.048	0.039	0.032	0.029	0.030	2.66E-04	1.62E-04	2.03E-04	1.77E-04	1.44E-04	1.18E-04	1.07E-04	1.11E-04	
SCK	PM/ICD	A	A13	low	operator	shoulder	7	apron, collar	none	no	below	0.082	0.055	0.032	0.042	0.075	0.061	0.044	0.037	4.69E-04	3.18E							



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures			tube configuration	Hp(0.07) (mSv)								Hp(0.07)/KAP (mSv/Gy ^{cm} ²)							
									room	out during cine			L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
SCK	DSA PTA LL	A	A28	low	operator	femoral	4	apron, collar	table, ceiling	no	below	0.111	0.008	0.080	0.020	0.149	0.066	0.008	0.008	3.87E-05	2.80E-06	2.80E-05	6.95E-06	5.20E-05	2.29E-05	2.80E-06	2.80E-06	
SCK	DSA PTA LL	A	A10	high	operator	femoral	4	apron, collar	table, ceiling	no	below	0.080	0.008	0.040	0.008	0.275	0.018	0.008	0.008	1.75E-05	1.74E-06	8.64E-06	1.74E-06	3.29E-05	1.38E-06	1.74E-06	1.74E-06	
SCK	DSA PTA LL	A	A29	low	operator	femoral	4	apron, collar	table, ceiling	yes	below	0.073	0.022	0.073	0.038	0.251	0.008	0.008	0.008	1.18E-05	3.51E-06	1.19E-05	6.18E-06	4.47E-05	3.07E-06	1.30E-06	1.30E-06	
SCK	DSA PTA LL	D	D1	high	operator	femoral	4	apron, collar	none	yes	above	0.074	0.008	0.018	0.008	0.008	0.008	0.008	0.008	2.76E-05	2.07E-06	2.07E-06	2.07E-06	2.07E-06	2.07E-06	2.07E-06	2.07E-06	
SCK	DSA PTA LL	D	D2	high	operator	femoral	4	apron, collar	none	yes	above	0.095	0.018	0.032	0.008	0.008	0.008	0.019	0.008	1.63E-05	3.03E-06	5.49E-06	1.37E-06	1.37E-06	1.37E-06	1.37E-06	1.37E-06	
SCK	DSA PTA LL	D	D2	high	operator	femoral	4	apron, collar	none	yes	above	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	2.85E-06	2.85E-06	2.85E-06	2.85E-06	2.85E-06	2.85E-06	2.85E-06	2.85E-06	
SCK	DSA PTA LL	D	D3	high	operator	femoral	4	apron, collar	none	yes	above	0.037	0.008	0.008	0.008	0.008	0.008	0.008	0.008	1.39E-05	3.00E-06	3.00E-06	3.00E-06	3.00E-06	3.00E-06	3.00E-06	3.00E-06	
SCK	DSA PTA LL	D	D3	high	operator	femoral	4	apron, collar	none	yes	above	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	3.44E-06	3.44E-06	3.44E-06	3.44E-06	3.44E-06	3.44E-06	3.44E-06	3.44E-06	
SCK	DSA PTA LL	D	D4	high	operator	femoral	4	apron, collar	none	yes	above	0.022	0.008	0.008	0.008	0.008	0.027	0.018	0.021	0.008	6.56E-06	2.34E-06	2.34E-06	2.34E-06	8.05E-06	5.18E-06	6.04E-06	2.34E-06
SCK	DSA PTA LL	D	D4	high	operator	femoral	4	apron, collar	none	yes	above	0.008	0.008	0.016	0.008	0.008	0.008	0.008	0.008	4.15E-06	4.15E-06	8.09E-06	4.15E-06	4.15E-06	4.15E-06	4.15E-06	4.15E-06	
SCK	Embolisation	B	B1	high	operator	femoral	4	apron, collar	none	no	above	1.095	0.040	0.702	0.045	0.008	0.008	0.368	0.176	3.98E-04	1.46E-05	2.55E-04	1.64E-05	2.91E-06	2.91E-06	1.34E-04	6.41E-05	
SCK	Embolisation	B	B1	high	operator	femoral	4	apron, collar	none	no	above	0.543	0.065	0.431	0.089	0.020	0.012	0.380	0.233	2.94E-04	3.54E-05	2.34E-04	4.80E-05	1.07E-05	6.73E-06	2.06E-04	1.26E-04	
SCK	Embolisation	B	B1	high	operator	femoral	4	apron, collar	none	no	above	0.488	0.083	0.385	0.113	0.016	0.018	0.325	0.187	2.40E-04	4.10E-05	1.89E-04	5.53E-05	7.81E-06	8.81E-06	1.60E-04	9.17E-05	
SCK	Embolisation	B	B1	high	operator	femoral	4	apron, collar	none	no	below	0.712	0.060	0.846	0.110	1.403	0.049	0.775	0.549	4.57E-06	3.60E-06	5.44E-06	7.09E-07	9.02E-06	3.12E-07	4.98E-06	3.53E-06	
SCK	Embolisation	B	B1	high	operator	femoral	4	apron, collar	none	no	below	0.559	0.033	0.966	0.154	0.441	0.008	0.242	0.150	1.18E-05	7.04E-07	2.04E-05	3.25E-06	9.29E-06	1.69E-07	5.11E-06	3.17E-06	
SCK	Embolisation	B	B1	high	operator	femoral	4	apron, collar	none	no	below	2.070	0.210	2.419	0.481	1.719	0.051	1.238	0.933	8.47E-06	8.59E-07	9.90E-06	1.97E-06	7.03E-06	2.08E-07	5.06E-06	3.82E-06	
SCK	Embolisation	B	B1	high	operator	femoral	4	apron, collar	none	no	below	0.516	0.385	1.734	0.363	1.318	0.020	0.734	0.439	7.80E-06	5.83E-06	2.62E-05	5.48E-06	1.99E-05	3.04E-07	1.11E-05	6.64E-06	
SCK	Embolisation	D	D1	high	operator	femoral	4	apron, collar	none	no	above	0.970	0.118	0.796	0.041	0.008	0.000	0.376	0.075	1.36E-04	1.65E-05	1.12E-04	5.77E-06	1.12E-06	0.00E+00	5.26E-05	1.05E-05	
SCK	Embolisation	D	D1	high	operator	femoral	4	apron, collar	none	no	above	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	1.12E-06	1.12E-06	1.12E-06	1.12E-06	1.12E-06	1.12E-06	1.12E-06	1.12E-06	
SCK	Embolisation	D	D1	high	operator	femoral	4	apron, collar	none	no	above	0.204	0.016	0.262	0.008	0.008	0.000	0.214	0.180	3								



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	protective measures				tube configuration	Hp(0.07) (mSv)								Hp(0.07)KAP (mSvGym²)							
								personal	room	out during cine	L Finger		R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	
SCK	DSA PTA Re	A	A17	low	operator	femoral	4	apron, collar, glasses	table, ceiling	yes	below	1.470	0.119	0.272	0.288	0.577	0.312	0.084	0.074	3.42E-05	2.77E-06	6.32E-06	6.69E-06	1.34E-05	7.26E-06	1.96E-06	1.71E-06	
SCK	DSA PTA Re	A	A10	low	operator	femoral	4	apron, collar, glasses	table, ceiling	yes	below	0.183	0.167	0.109	0.179	2.342	0.148	0.025	0.019	7.10E-06	6.48E-06	4.24E-06	6.95E-06	9.11E-05	5.77E-06	9.57E-07	7.25E-07	
SCK	DSA PTA Re	A	A29	low	operator	femoral	4	apron, collar	table, ceiling	yes	below	0.008	0.008	0.017	0.008	0.065	0.040	0.008	0.008	3.61E-06	3.61E-06	7.81E-06	3.61E-06	2.95E-05	1.81E-05	3.61E-06	3.61E-06	
SCK	DSA PTA Re	E	E2	high	operator	femoral	4	apron, collar	table	yes	below	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	1.09E-06	1.09E-06	2.45E-06	1.09E-06	8.37E-06	1.09E-06	1.09E-06	1.09E-06	
SCK	DSA PTA Re	B	B1	high	operator	femoral	4	apron, collar	table	no	below	0.525	0.055	0.780	0.199	0.369	0.013	0.302	0.213	1.84E-05	1.92E-06	2.74E-05	6.97E-06	1.29E-05	4.64E-07	1.06E-05	7.45E-06	
SCK	DSA PTA Re	B	B1	high	operator	femoral	4	apron, collar	none	no	below	0.855	0.096	0.257	0.715	1.458	0.059	0.271	0.226	1.58E-05	1.77E-06	4.77E-06	1.32E-05	2.70E-05	1.10E-06	5.01E-06	4.19E-06	
SCK	DSA PTA Re	A	A4	high	operator	femoral	4	apron, collar, glasses	table, ceiling	no	below	0.276	0.108	0.336	0.219	0.867	0.306	0.122	0.050	7.96E-06	3.11E-06	9.67E-06	6.32E-06	2.50E-05	8.81E-06	3.51E-06	1.43E-06	
SCK	DSA PTA Re	A	A30	low	observer	femoral	5	apron, collar	table, ceiling	no	below	0.031	0.053	0.008	0.045	0.023	0.022	0.019	0.017	8.95E-07	1.53E-06	2.30E-07	1.29E-06	6.50E-07	6.40E-07	5.34E-07	4.79E-07	
SCK	DSA PTA Re	A	A15	high	operator	femoral	4	apron, collar, glasses	table, ceiling	sometimes	below	0.166	0.064	0.333	0.098	0.721	0.040	0.090	0.017	5.71E-06	2.21E-06							



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	personal	protective measures			tube configuration	Hp(0.07) (mSv)								Hp(0.07)/KAP (mSv/Gy ²)							
									room	out during cine			L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
SCK	ERCP	D	D4	/	nurse	oral	1	apron, collar	none	no	above	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	2.14E-04	
SCK	ERCP	F	F8	high	operator	oral	7	lead apron	none	no	below	0.029	0.031	0.045	0.027	0.052	0.008	0.033	0.024	2.91E-05	3.11E-05	4.47E-05	2.68E-05	5.10E-05	7.92E-05	3.26E-05	2.38E-05	
SCK	ERCP	F	F8	high	operator	oral	7	lead apron	none	no	below	0.008	0.024	0.008	0.034	0.008	0.018	0.008	0.025	9.83E-06	2.97E-05	9.83E-06	4.14E-05	9.83E-06	2.27E-05	9.83E-06	3.07E-05	
SCK	ERCP	C	C12	high	operator	oral	7	apron, collar	none	no	above	0.008	0.008	0.008	0.008	0.008	0.008	0.043	0.026	1.90E-05	1.90E-05	1.90E-05	1.90E-05	1.90E-05	1.80E-05	1.02E-04	6.09E-05	
SCK	ERCP	C	C12	high	operator	oral	7	apron, collar	none	no	above	0.014	0.016	0.025	0.008	0.008	0.009	0.162	0.125	9.04E-06	1.06E-05	1.63E-05	5.28E-06	5.28E-06	5.95E-06	1.07E-04	8.22E-05	
SCK	ERCP	C	C17	high	operator	oral	7	apron, collar	none	no	above	0.068	0.040	0.038	0.042	0.045	0.008	0.086	0.045	5.68E-05	3.30E-05	3.19E-05	3.46E-05	3.74E-05	6.48E-06	7.17E-05	3.77E-05	
SCK	ERCP	C	C17	high	operator	oral	7	apron, collar	none	no	above	0.092	0.030	0.184	0.008	0.008	0.008	0.046	0.040	2.16E-04	7.07E-05	4.33E-04	1.88E-05	1.88E-05	1.09E-04	9.35E-05	9.35E-05	
SCK	ERCP	C	C16	/	anesthetist	oral	1	apron, collar	none	no	above	0.008	0.008	0.008	0.008	0.008	0.008	0.011	0.015	2.10E-05	2.24E-05	2.24E-05	2.24E-05	2.24E-05	2.24E-05	3.18E-05	4.07E-05	
SCK	ERCP	C	C17	high	operator	oral	8	apron, collar	none	no	above	0.015	0.008	0.064	0.008	0.008	0.008	0.035	0.025	3.32E-05	1.76E-05	1.40E-04	1.76E-05	1.76E-05	1.76E-05	1.76E-05	5.41E-05	
SCK	ERCP	C	C19	/	nurse	oral																						



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	protective measures				Hp(0.07) (mSv)								Hp(0.07)/KAP (mSv/Gym²)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
								personal	room	out during cine	tube configuration	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
IRSN	Embolisation	IRSN02	IRSN29	Low	operator	femoral	4	lead apron, thyroid, eyes	table	yes	below	0.296	0.167	0.218	0.166	0.046	0.032	0.112	0.062																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							



Partner	ID procedure	Hospital/ room	ref. worker	experience	task	access	position	protective measures				Hp(0.07) (mSv)								Hp(0.07)KAP (mSv/uGym²)							
								personal	room	out during cine	tube configuration	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye	L Finger	R Finger	L Wrist	R Wrist	L Leg	R Leg	L/R Eye	Middle Eye
IRSN	RF ablation	IRSN03	IRSN18	High	operator	femoral	4	lead apron, thyroid	table	no	below	0.012	0.012	0.067	0.012	0.012	0.012	0.012	0.013	4.49E-06	4.49E-06	2.51E-05	4.49E-06	4.49E-06	4.49E-06	4.49E-06	4.86E-06
IRSN	RF ablation	IRSN03	IRSN19	High	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.012	0.012	0.019	0.025	0.122	0.042	0.012	0.012	1.08E-06	1.08E-06		1.71E-06	2.25E-06	1.10E-05	3.78E-06	1.08E-06
IRSN	RF ablation	IRSN03	IRSN19	High	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.012	0.012	0.026	0.012	0.012		0.012	0.012	4.36E-06	4.36E-06	9.44E-06	4.36E-06	4.36E-06		4.36E-06	4.36E-06
IRSN	RF ablation	IRSN03	IRSN19	High	operator	femoral	4	lead apron, thyroid, eyes	mobile whole body shielding	no	below	0.024	0.012	0.054	0.012	0.984	0.625	0.100	0.012	1.94E-06	9.70E-07	4.36E-06	9.70E-07	7.95E-05	5.05E-05	8.08E-06	9.70E-07
IRSN	RF ablation	IRSN03	IRSN19	High	operator	femoral	4	lead apron, thyroid, eyes	none	no	below	0.012	0.012	0.026	0.012	0.076	0.033	0.027	0.012	8.40E-06	8.40E-06	1.82E-05	8.40E-06	5.32E-05	2.31E-05	1.89E-05	8.40E-06
IRSN	RF ablation	IRSN03	IRSN19	High	operator	femoral	4	lead apron, thyroid, eyes	table, ceiling	no	below	0.012	0.012	0.017	0.012	0.012	0.012	0.012	0.012	4.56E-06	4.56E-06	6.46E-06	4.56E-06	4.56E-06	4.56E-06	4.56E-06	4.56E-06
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid	none	no	below	0.113	0.115	0.573	0.311	1.633	0.145	0.427	0.047	5.19E-06	5.28E-06	2.63E-05	1.43E-05	7.49E-05	6.65E-06	1.96E-05	2.16E-06
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid	none	no	below	0.051	0.022	0.123	0.038	0.899	0.072	0.095	0.015	2.10E-06	9.05E-07	5.06E-06	1.56E-06	3.70E-05	2.96E-06	3.91E-06	6.17E-07
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid	none	no	below	0.075	0.095	0.552	0.212	0.878	0.056	0.259	0.025	3.82E-06	4.84E-06	2.81E-05	1.08E-05	4.48E-05	2.86E-06	1.32E-05	1.27E-06
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid	none	no	below	0.031	0.012	0.215	0.040	0.267	0.097	0.038	0.012	4.37E-06	1.69E-06	3.03E-05	5.63E-06	3.76E-05	1.37E-05	5.35E-06	1.69E-06
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid	none	no	below	0.025	0.032	0.172	0.078	0.649	0.027	0.096	0.012	2.10E-06	2.69E-06	1.45E-05	6.55E-06	5.45E-05	2.27E-06	8.07E-06	1.01E-06
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid, cabin	none	no	below	0.203	0.063	1.248	0.249	1.021	0.217	0.161	0.024	4.89E-06	1.52E-06	3.01E-05	6.00E-06	2.46E-05	5.23E-06	3.88E-06	5.78E-07
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid	none	yes	below	0.036	0.027	0.064	0.086	0.871	0.056	0.170	0.024	2.02E-06	1.51E-06	3.59E-06	4.82E-06	4.88E-05	3.14E-06	9.52E-06	1.34E-06
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid	none	no	below	0.054	0.043	0.085	0.055	0.443	0.083	0.139	0.052	2.40E-06	1.91E-06	3.78E-06	2.44E-06	1.97E-05	3.69E-06	6.18E-06	2.31E-06
IRSN	RF ablation	IRSN04	IRSN24	High	operator	femoral	4	lead apron, thyroid	none	no	below	0.031	0.021	0.183	0.105	1.066	0.263	0.127	0.017	1.59E-06	1.07E-06	9.36E-06	5.37E-06	5.45E-05	1.35E-05	6.50E-06	8.70E-07
IRSN	RF ablation	IRSN04	IRSN25	High	operator	femoral	4	lead apron, thyroid	none	no	below	0.039	0.017	0.059	0.013	0.538	0.251	0.038	0.012	4.24E-06	1.85E-06	6.41E-06	1.41E-06	5.85E-05	2.73E-05	4.13E-06	1.30E-06
IRSN	RF ablation	IRSN04	IRSN44	Low	operator	femoral	7	lead apron	none	no	below	0.012	0.012	0.027	0.021	0.012	0.116	0.022	0.013	2.26E-06	2.26E-06	5.09E-06	3.96E-06	2.26E-06	2.19E-05	4.15E-06	2.45E-06



Appendix 2: Results - Correction Factors (CF)

Table 2.1. : Head phantom irradiation

					PA				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	2.45E-17	0.019	0.289	0.181	0.187
		0.2	5.60	3.72E-13	3.35E-17	0.018	0.272	0.172	0.145
		0.4	6.92	3.37E-13	3.85E-17	0.017	0.261	0.166	0.128
	4	0	3.57	4.65E-13	2.66E-17	0.019	0.282	0.177	0.175
		0.2	5.83	3.65E-13	3.46E-17	0.018	0.268	0.170	0.141
		0.4	7.00	3.34E-13	3.88E-17	0.017	0.261	0.166	0.127
	5	0	4.00	4.39E-13	2.81E-17	0.019	0.280	0.176	0.167
		0.2	6.04	3.59E-13	3.52E-17	0.018	0.268	0.170	0.138
		0.4	7.18	3.32E-13	3.89E-17	0.017	0.263	0.167	0.127
	6	0	4.38	4.19E-13	2.96E-17	0.018	0.276	0.174	0.160
		0.2	6.23	3.54E-13	3.58E-17	0.017	0.267	0.170	0.136
		0.4	7.29	3.30E-13	3.94E-17	0.017	0.261	0.167	0.126
90	3	0	3.49	4.68E-13	2.87E-17	0.018	0.275	0.173	0.163
		0.2	6.27	3.57E-13	3.78E-17	0.017	0.261	0.167	0.130
		0.4	7.67	3.28E-13	4.26E-17	0.017	0.254	0.162	0.118
		0.6	8.52	3.16E-13	4.53E-17	0.016	0.251	0.161	0.112
	4	0	4.04	4.36E-13	3.05E-17	0.018	0.273	0.172	0.155
		0.2	6.51	3.51E-13	3.86E-17	0.017	0.260	0.166	0.128
		0.4	7.81	3.26E-13	4.30E-17	0.017	0.253	0.162	0.117
		0.6	8.61	3.15E-13	4.58E-17	0.016	0.249	0.160	0.110
	5	0	4.52	4.14E-13	3.21E-17	0.018	0.270	0.170	0.149
		0.2	6.73	3.46E-13	3.91E-17	0.017	0.261	0.166	0.127
		0.4	7.94	3.24E-13	4.35E-17	0.017	0.252	0.161	0.115
		0.6	8.70	3.14E-13	4.62E-17	0.016	0.249	0.159	0.110
	6	0	4.93	3.97E-13	3.35E-17	0.018	0.267	0.169	0.144
		0.2	6.94	3.42E-13	3.99E-17	0.017	0.258	0.165	0.124
		0.4	8.06	3.22E-13	4.39E-17	0.017	0.252	0.161	0.115
	100	0	3.92	4.44E-13	3.21E-17	0.018	0.266	0.169	0.148
		0.2	6.86	3.49E-13	4.13E-17	0.017	0.254	0.162	0.121
		0.4	8.30	3.25E-13	4.64E-17	0.016	0.245	0.157	0.109
		0.6	9.17	3.16E-13	4.93E-17	0.016	0.242	0.156	0.103
		0.9	10.01	3.11E-13	5.26E-17	0.016	0.237	0.153	0.098
	4	0	4.51	4.17E-13	3.41E-17	0.017	0.265	0.167	0.141
		0.2	7.11	3.44E-13	4.21E-17	0.017	0.253	0.162	0.119
		0.4	8.44	3.24E-13	4.67E-17	0.016	0.245	0.157	0.108
		0.6	9.26	3.15E-13	4.97E-17	0.016	0.241	0.155	0.103
		0.9	10.07	3.10E-13	5.30E-17	0.016	0.236	0.152	0.097
	5	0	5.02	3.98E-13	3.59E-17	0.017	0.259	0.165	0.135
		0.2	7.34	3.40E-13	4.31E-17	0.017	0.250	0.160	0.116
		0.4	8.57	3.22E-13	4.71E-17	0.016	0.246	0.158	0.108
		0.6	9.35	3.15E-13	4.98E-17	0.016	0.242	0.156	0.103
	6	0	5.46	3.83E-13	3.68E-17	0.017	0.261	0.166	0.133
		0.2	7.55	3.36E-13	4.37E-17	0.016	0.250	0.160	0.115
		0.4	8.70	3.21E-13	4.75E-17	0.016	0.245	0.157	0.107
110	3	0	4.36	4.27E-13	3.53E-17	0.017	0.259	0.165	0.136
		0.2	7.39	3.45E-13	4.46E-17	0.016	0.246	0.158	0.112
		0.4	8.85	3.26E-13	4.92E-17	0.016	0.241	0.155	0.104
		0.6	9.73	3.19E-13	5.29E-17	0.016	0.235	0.151	0.097
		0.9	10.59	3.16E-13	5.70E-17	0.015	0.228	0.147	0.091
	4	0	4.98	4.03E-13	3.73E-17	0.017	0.255	0.162	0.130
		0.2	7.65	3.41E-13	4.56E-17	0.016	0.244	0.156	0.110
		0.4	8.99	3.25E-13	5.01E-17	0.016	0.239	0.154	0.102
		0.6	9.82	3.18E-13	5.36E-17	0.015	0.233	0.150	0.096
		0.9	10.65	3.16E-13	5.73E-17	0.015	0.228	0.147	0.091
	5	0	5.50	3.87E-13	3.90E-17	0.017	0.253	0.161	0.126
		0.2	7.88	3.38E-13	4.63E-17	0.016	0.243	0.156	0.109
		0.4	9.13	3.23E-13	5.05E-17	0.016	0.238	0.154	0.101
		0.6	9.92	3.18E-13	5.37E-17	0.015	0.234	0.151	0.096
	6	0	5.96	3.75E-13	4.01E-17	0.017	0.252	0.161	0.123
		0.2	8.09	3.35E-13	4.71E-17	0.016	0.243	0.156	0.107
		0.4	9.25	3.22E-13	5.08E-17	0.016	0.239	0.154	0.101

					LAO30				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	2.43E-17	0.050	0.294	0.233	0.247
		0.2	5.60	3.72E-13	3.36E-17	0.046	0.272	0.208	0.183
		0.4	6.92	3.37E-13	3.85E-17	0.044	0.261	0.197	0.160
	4	0	3.57	4.65E-13	2.62E-17	0.049	0.289	0.227	0.231
		0.2	5.83	3.65E-13	3.42E-17	0.046	0.272	0.207	0.179
		0.4	7.00	3.34E-13	3.89E-17	0.044	0.261	0.197	0.159
	5	0	4.00	4.39E-13	2.78E-17	0.048	0.285	0.222	0.218
		0.2	6.04	3.59E-13	3.50E-17	0.045	0.270	0.205	0.175
		0.4	7.18	3.32E-13	3.96E-17	0.043	0.259	0.195	0.156
	6	0	4.38	4.19E-13	2.92E-17	0.048	0.281	0.218	0.208
		0.2	6.23	3.54E-13	3.59E-17	0.045	0.267	0.203	0.171
		0.4	7.29	3.30E-13	3.97E-17	0.043	0.260	0.195	0.155
90	3	0	3.49	4.68E-13	2.85E-17	0.047	0.278	0.217	0.212
		0.2	6.27	3.57E-13	3.79E-17	0.044	0.261	0.197	0.162
		0.4	7.67	3.28E-13	4.26E-17	0.042	0.253	0.189	0.145
		0.6	8.52	3.16E-13	4.58E-17	0.041	0.247	0.184	0.135
		0.9	10.01	3.11E-13	5.26E-17	0.039	0.236	0.173	0.120
	4	0	4.04	4.36E-13	3.05E-17	0.046	0.273	0.212	0.199
		0.2	6.51	3.51E-13	3.88E-17	0.043	0.259	0.195	0.159
		0.4	7.81	3.26E-13	4.30E-17	0.042	0.253	0.189	0.144
		0.6	8.61	3.15E-13	4.58E-17	0.041	0.249	0.185	0.135
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
	5	0	4.52	4.14E-13	3.20E-17	0.046	0.272	0.209	0.190
		0.2	6.73	3.46E-13	3.95E-17	0.043	0.258	0.194	0.156
		0.4	7.94	3.24E-13	4.38E-17	0.042	0.250	0.187	0.141
		0.6	8.70	3.14E-13	4.60E-17	0.041	0.249	0.185	0.135
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
	6	0	4.93	3.97E-13	3.36E-17	0.045	0.268	0.205	0.182
		0.2	6.94	3.42E-13	4.04E-17	0.043	0.255	0.192	0.153
		0.4	8.06	3.22E-13	4.40E-17	0.042	0.251	0.187	0.141
		0.6	8.52	3.16E-13	4.58E-17	0.041	0.247	0.184	0.135
		0.9	10.01	3.11E-13	5.26E-17	0.039	0.236	0.173	0.120
	7	0	5.02	3.98E-13	3.56E-17	0.044	0.261	0.199	0.172
		0.2	7.34	3.40E-13	4.32E-17	0.042	0.249	0.186	0.143
		0.4	8.57	3.22E-13	4.73E-17	0.041	0.244	0.180	0.131
		0.6	9.35	3.15E-13	4.99E-17	0.040	0.241	0.177	0.125
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
	8	0	5.46	3.83E-13	3.74E-17	0.043	0.257	0.195	0.164
		0.2	7.55	3.36E-13	4.43E-17	0.041	0.246	0.184	0.140
		0.4	8.70	3.21E-13	4.77E-17	0.041	0.243	0.180	0.130
		0.6	9.35	3.15E-13	4.99E-17	0.040	0.241	0.177	0.125
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
100	3	0	3.92	4.44E-13	3.24E-17	0.045	0.265	0.204	0.187
		0.2	6.86	3.49E-13	4.17E-17	0.042	0.251	0.189	0.148
		0.4	8.30	3.25E-13	4.66E-17	0.041	0.244	0.181	0.133
		0.6	9.17	3.16E-13	4.96E-17	0.040	0.240	0.177	0.125
		0.9	10.01	3.11E-13	5.26E-17	0.039	0.236	0.173	0.120
	4	0	4.51	4.17E-13	3.43E-17	0.044	0.262	0.201	0.178
		0.2	7.11	3.44E-13	4.25E-17	0.042	0.251	0.188	0.145
		0.4	8.44	3.24E-13	4.72E-17	0.040	0.242	0.180	0.131
		0.6	9.26	3.15E-13	4.97E-17	0.040	0.240	0.177	0.125
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
	5	0	5.02	3.98E-13	3.56E-17	0.044	0.261	0.199	0.172
		0.2	7.34	3.40E-13	4.32E-17	0.042	0.249	0.186	0.143
		0.4	8.57	3.22E-13	4.73E-17	0.041	0.244	0.180	0.131
		0.6	9.35	3.15E-13	4.99E-17	0.040	0.241	0.177	0.125
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
	6	0	5.46	3.83E-13	3.74E-17	0.043	0.257	0.195	0.164
		0.2	7.55	3.36E-13	4.43E-17	0.041	0.246	0.184	0.140
		0.4	8.70	3.21E-13	4.77E-17	0.041	0.243	0.180	0.130
		0.6	9.35	3.15E-13	4.99E-17	0.040	0.241	0.177	0.125
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
	7	0	5.02	3.98E-13	3.56E-17	0.044	0.261	0.199	0.172
		0.2	7.34	3.40E-13	4.32E-17	0.042	0.249	0.186	0.143
		0.4	8.57	3.22E-13	4.73E-17	0.041	0.244	0.180	0.131
		0.6	9.35	3.15E-13	4.99E-17	0.040	0.241	0.177	0.125
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
	8	0	5.46	3.83E-13	3.74E-17	0.043	0.257	0.195	0.164
		0.2	7.55	3.36E-13	4.43E-17	0.041	0.246	0.184	0.140
		0.4	8.70	3.21E-13	4.77E-17	0.041	0.243	0.180	0.130
		0.6	9.35	3.15E-13	4.99E-17	0.040	0.241	0.177	0.125
		0.9	10.07	3.10E-13	5.30E-17	0.039	0.235	0.173	0.120
110	3	0	4.36	4.27E-13	3.53E-17	0.044	0.259	0.198	0.173
		0.2	7.39	3.45E-13	4.51E-17	0.041	0.243	0.181	0.137
		0.4	8.85	3.26E-13	5.02E-17	0.039	0.236	0.174	0.124
		0.6	9.73	3.19E-13	5.32E-17	0.039	0.232	0.171	0.118
		0.9	10.59	3.16E-13	5.69E-17	0.038	0.226	0.166	0.111
	4	0	4.98	4.03E-13	3.72E-17	0.043	0.256	0.194	0.165
		0.2	7.65	3.41E-13	4.60E-17	0.040	0.241	0.180	0.135
		0.4	8.99	3.25E-13	5.08E-17	0.039	0.234	0.173	0.122
		0.6	9.82	3.18E-13	5.35E-17	0.039	0.232	0.171	0.117
		0.9	10.65	3.16E-13	5.73E-17	0.038	0.226	0.165	0.110
	5	0	5.50	3.87E-13	3.89E-17	0.043	0.253	0.191	0.158
		0.2	7.88	3.38E-13	4.68E-17	0.040	0.240	0.178	0.132
		0.4	9.13	3.23E-13	5.10E-17	0.039	0.235	0.173	0.122
		0.6	9.92	3.18E-13	5.42E-17	0.038	0.230	0.169	0.116
		0.9	10.65	3.16E-13	5.73E-17	0.038	0.226	0.165	0.110
	6	0	5.96	3.75E-13	4.03E-17	0.042	0.251	0.189	0.153
		0.2	8.09	3.35E-13	4.75E-17	0.040	0.239	0.178	0.131
		0.4	9.25	3.22E-13	5.15E-17	0.039	0.234	0.173	0.121
		0.6	9.92	3.18E-13	5.42E-17	0.038	0.230	0.169	0.116
		0.9	10.65	3.16E-13	5.73E-17	0.038	0.226	0.165	0.110

					LAO60				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	2.45E-17	0.077	0.300	0.343	0.237
		0.2	5.60	3.72E-13	3.42E-17	0.064	0.273	0.281	0.174
		0.4	6.92	3.37E-13	3.83E-17	0.060	0.267	0.266	0.157
	4	0	3.57	4.65E-13	2.64E-17	0.074	0.295	0.329	0.223
		0.2	5.83	3.65E-13	3.46E-17	0.064	0.274	0.281	0.173
		0.4	7.00	3.34E-13	3.88E-17	0.060	0.267	0.264	0.155
	5	0	4.00	4.39E-13	2.80E-17	0.071	0.290	0.317	0.210
		0.2	6.04	3.59E-13	3.52E-17	0.063	0.274	0.279	0.170
		0.4	7.18	3.32E-13	3.94E-17	0.059	0.265	0.261	0.153
	6	0	4.38	4.19E-13	2.94E-17	0.070	0.287	0.309	0.201
		0.2	6.23	3.54E-13	3.63E-17	0.062	0.270	0.273	0.165
		0.4	7.29	3.30E-13	3.95E-17	0.059	0.266	0.261	0.152
90	3	0	3.49	4.68E-13	2.87E-17	0.070	0.283	0.309	0.204
		0.2	6.27	3.57E-13	3.79E-17	0.060	0.266	0.265	0.158
		0.4	7.67	3.28E-13	4.27E-17	0.057	0.257	0.248	0.142
		0.6	8.52	3.16E-13	4.56E-17	0.055	0.252	0.239	0.133
	4	0	4.04	4.36E-13	3.06E-17	0.067	0.279	0.298	0.192
		0.2	6.51	3.51E-13	3.86E-17	0.060	0.265	0.263	0.155
		0.4	7.81	3.26E-13	4.31E-17	0.056	0.256	0.246	0.140
		0.6	8.61	3.15E-13	4.60E-17	0.054	0.251	0.238	0.132
	5	0	4.52	4.14E-13	3.22E-17	0.066	0.277	0.291	0.184
		0.2	6.73	3.46E-13	3.92E-17	0.060	0.264	0.261	0.153
		0.4	7.94	3.24E-13	4.32E-17	0.056	0.258	0.247	0.140
		0.6	8.70	3.14E-13	4.62E-17	0.054	0.252	0.238	0.131
	6	0	4.93	3.97E-13	3.35E-17	0.064	0.274	0.284	0.177
		0.2	6.94	3.42E-13	4.01E-17	0.059	0.261	0.257	0.150
		0.4	8.06	3.22E-13	4.38E-17	0.056	0.255	0.245	0.138
	100	0	3.92	4.44E-13	3.21E-17	0.065	0.274	0.289	0.184
		0.2	6.86	3.49E-13	4.11E-17	0.058	0.259	0.253	0.147
		0.4	8.30	3.25E-13	4.63E-17	0.054	0.249	0.235	0.131
		0.6	9.17	3.16E-13	4.89E-17	0.053	0.246	0.230	0.124
		0.9	10.01	3.11E-13	5.25E-17	0.050	0.239	0.219	0.116
	4	0	4.51	4.17E-13	3.38E-17	0.064	0.271	0.281	0.175
		0.2	7.11	3.44E-13	4.19E-17	0.057	0.258	0.250	0.144
		0.4	8.44	3.24E-13	4.69E-17	0.054	0.247	0.234	0.129
		0.6	9.26	3.15E-13	4.94E-17	0.052	0.245	0.228	0.123
		0.9	10.07	3.10E-13	5.26E-17	0.050	0.239	0.219	0.116
	5	0	5.02	3.98E-13	3.57E-17	0.062	0.265	0.271	0.166
		0.2	7.34	3.40E-13	4.26E-17	0.057	0.256	0.248	0.141
		0.4	8.57	3.22E-13	4.73E-17	0.053	0.247	0.232	0.128
		0.6	9.35	3.15E-13	5.00E-17	0.052	0.243	0.225	0.122
	6	0	5.46	3.83E-13	3.68E-17	0.061	0.266	0.268	0.162
		0.2	7.55	3.36E-13	4.35E-17	0.056	0.254	0.244	0.139
		0.4	8.70	3.21E-13	4.78E-17	0.053	0.246	0.231	0.127
110	3	0	4.36	4.27E-13	3.50E-17	0.062	0.266	0.274	0.169
		0.2	7.39	3.45E-13	4.49E-17	0.054	0.248	0.238	0.135
		0.4	8.85	3.26E-13	4.96E-17	0.052	0.241	0.225	0.123
		0.6	9.73	3.19E-13	5.26E-17	0.050	0.237	0.218	0.116
		0.9	10.59	3.16E-13	5.63E-17	0.048	0.231	0.209	0.109
	4	0	4.98	4.03E-13	3.72E-17	0.060	0.261	0.264	0.160
		0.2	7.65	3.41E-13	4.59E-17	0.054	0.245	0.234	0.132
		0.4	8.99	3.25E-13	5.02E-17	0.051	0.240	0.223	0.121
		0.6	9.82	3.18E-13	5.30E-17	0.050	0.236	0.217	0.115
		0.9	10.65	3.16E-13	5.65E-17	0.048	0.232	0.210	0.109
	5	0	5.50	3.87E-13	3.88E-17	0.059	0.258	0.258	0.154
		0.2	7.88	3.38E-13	4.64E-17	0.053	0.245	0.233	0.130
		0.4	9.13	3.23E-13	5.05E-17	0.051	0.240	0.223	0.121
		0.6	9.92	3.18E-13	5.34E-17	0.050	0.236	0.216	0.114
	6	0	5.96	3.75E-13	4.03E-17	0.057	0.255	0.252	0.148
		0.2	8.09	3.35E-13	4.70E-17	0.053	0.245	0.232	0.129
		0.4	9.25	3.22E-13	5.08E-17	0.051	0.240	0.222	0.120

					LAO90				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	2.44E-17	0.122	0.336	0.490	0.174
		0.2	5.60	3.72E-13	3.34E-17	0.097	0.305	0.389	0.136
		0.4	6.92	3.37E-13	3.87E-17	0.086	0.287	0.347	0.120
	4	0	3.57	4.65E-13	2.65E-17	0.115	0.325	0.460	0.163
		0.2	5.83	3.65E-13	3.46E-17	0.094	0.300	0.379	0.132
		0.4	7.00	3.34E-13	3.92E-17	0.086	0.286	0.344	0.119
	5	0	4.00	4.39E-13	2.80E-17	0.110	0.321	0.442	0.156
		0.2	6.04	3.59E-13	3.55E-17	0.092	0.296	0.370	0.129
		0.4	7.18	3.32E-13	3.94E-17	0.085	0.286	0.343	0.118
	6	0	4.38	4.19E-13	2.93E-17	0.107	0.317	0.429	0.151
		0.2	6.23	3.54E-13	3.61E-17	0.091	0.295	0.366	0.127
		0.4	7.29	3.30E-13	3.99E-17	0.085	0.285	0.340	0.117
90	3	0	3.49	4.68E-13	2.86E-17	0.107	0.314	0.432	0.152
		0.2	6.27	3.57E-13	3.77E-17	0.088	0.290	0.354	0.122
		0.4	7.67	3.28E-13	4.22E-17	0.081	0.279	0.326	0.112
		0.6	8.52	3.16E-13	4.58E-17	0.076	0.268	0.306	0.104
		0.8	9.37	3.04E-13	4.94E-17	0.071	0.257	0.284	0.096
	4	0	4.04	4.36E-13	3.06E-17	0.102	0.307	0.410	0.144
		0.2	6.51	3.51E-13	3.85E-17	0.087	0.288	0.348	0.120
		0.4	7.81	3.26E-13	4.28E-17	0.080	0.277	0.322	0.110
		0.6	8.61	3.15E-13	4.61E-17	0.075	0.267	0.304	0.104
		0.8	9.41	3.03E-13	4.97E-17	0.070	0.256	0.282	0.098
	5	0	4.52	4.14E-13	3.20E-17	0.099	0.305	0.399	0.139
		0.2	6.73	3.46E-13	3.94E-17	0.085	0.284	0.342	0.118
		0.4	7.94	3.24E-13	4.34E-17	0.079	0.275	0.318	0.109
		0.6	8.70	3.14E-13	4.61E-17	0.076	0.269	0.305	0.104
		0.8	9.50	3.02E-13	4.97E-17	0.071	0.258	0.283	0.099
	6	0	4.93	3.97E-13	3.36E-17	0.095	0.298	0.383	0.134
		0.2	6.94	3.42E-13	4.00E-17	0.084	0.283	0.339	0.117
		0.4	8.06	3.22E-13	4.39E-17	0.078	0.274	0.316	0.108
		0.6	9.06	3.09E-13	4.76E-17	0.073	0.263	0.291	0.100
		0.8	9.86	2.97E-13	5.12E-17	0.068	0.252	0.270	0.092
	3	0	3.92	4.44E-13	3.21E-17	0.098	0.299	0.395	0.138
		0.2	6.86	3.49E-13	4.14E-17	0.082	0.277	0.329	0.113
		0.4	8.30	3.25E-13	4.65E-17	0.075	0.264	0.301	0.103
		0.6	9.17	3.16E-13	4.96E-17	0.071	0.258	0.287	0.097
		0.9	10.01	3.11E-13	5.27E-17	0.068	0.252	0.275	0.093
	4	0	4.51	4.17E-13	3.42E-17	0.093	0.292	0.376	0.131
		0.2	7.11	3.44E-13	4.26E-17	0.080	0.272	0.321	0.110
		0.4	8.44	3.24E-13	4.74E-17	0.073	0.261	0.296	0.101
		0.6	9.26	3.15E-13	4.98E-17	0.071	0.258	0.287	0.097
		0.9	10.07	3.10E-13	5.31E-17	0.067	0.251	0.273	0.092
	5	0	5.02	3.98E-13	3.59E-17	0.090	0.288	0.363	0.126
		0.2	7.34	3.40E-13	4.33E-17	0.079	0.271	0.318	0.109
		0.4	8.57	3.22E-13	4.77E-17	0.073	0.261	0.295	0.100
		0.6	9.35	3.15E-13	5.04E-17	0.070	0.256	0.284	0.096
		0.9	10.16	3.09E-13	5.37E-17	0.067	0.251	0.270	0.092
	6	0	5.46	3.83E-13	3.74E-17	0.088	0.284	0.353	0.122
		0.2	7.55	3.36E-13	4.37E-17	0.078	0.272	0.316	0.108
		0.4	8.70	3.21E-13	4.81E-17	0.073	0.260	0.293	0.100
		0.6	9.60	3.08E-13	5.18E-17	0.069	0.254	0.277	0.094
		0.9	10.41	3.02E-13	5.51E-17	0.065	0.248	0.269	0.090
110	3	0	4.36	4.27E-13					
		0.2	7.39	3.45E-13					
		0.4	8.85	3.26E-13					
		0.6	9.73	3.19E-13					
		0.9	10.59	3.16E-13					
	4	0	4.98	4.03E-13					
		0.2	7.65	3.41E-13					
		0.4	8.99	3.25E-13					
		0.6	9.82	3.18E-13					
		0.9	10.65	3.16E-13					
	5	0	5.50	3.87E-13					
		0.2	7.88	3.38E-13					
		0.4	9.13	3.23E-13					
		0.6	9.92	3.18E-13					
		0.9	10.75	3.15E-13					
	6	0	5.96	3.75E-13					
		0.2	8.09	3.35E-13					
		0.4	9.25	3.22E-13					
		0.6	10.06	3.17E-13					
		0.9	10.88	3.13E-13					

					RAO30				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	2.44E-17	0.002	0.289	0.174	0.120
		0.2	5.60	3.72E-13	3.36E-17	0.001	0.271	0.166	0.098
		0.4	6.92	3.37E-13	3.83E-17	0.001	0.262	0.162	0.090
	4	0	3.57	4.65E-13	2.64E-17	0.002	0.283	0.171	0.114
		0.2	5.83	3.65E-13	3.42E-17	0.001	0.271	0.166	0.097
		0.4	7.00	3.34E-13	3.86E-17	0.001	0.262	0.162	0.090
	5	0	4.00	4.39E-13	2.79E-17	0.002	0.281	0.170	0.111
		0.2	6.04	3.59E-13	3.51E-17	0.001	0.268	0.165	0.095
		0.4	7.18	3.32E-13	3.90E-17	0.001	0.262	0.162	0.089
	6	0	4.38	4.19E-13	2.92E-17	0.001	0.279	0.170	0.107
		0.2	6.23	3.54E-13	3.57E-17	0.001	0.268	0.164	0.094
		0.4	7.29	3.30E-13	3.93E-17	0.001	0.263	0.162	0.089
90	3	0	3.49	4.68E-13	2.87E-17	0.002	0.274	0.167	0.107
		0.2	6.27	3.57E-13	3.77E-17	0.001	0.262	0.162	0.090
		0.4	7.67	3.28E-13	4.25E-17	0.001	0.254	0.159	0.084
		0.6	8.52	3.16E-13	4.56E-17	0.001	0.249	0.156	0.080
	4	0	4.04	4.36E-13	3.05E-17	0.001	0.272	0.166	0.103
		0.2	6.51	3.51E-13	3.87E-17	0.001	0.259	0.161	0.089
		0.4	7.81	3.26E-13	4.28E-17	0.001	0.254	0.159	0.084
		0.6	8.61	3.15E-13	4.58E-17	0.001	0.249	0.156	0.080
	5	0	4.52	4.14E-13	3.20E-17	0.001	0.270	0.166	0.100
		0.2	6.73	3.46E-13	3.94E-17	0.001	0.258	0.160	0.088
		0.4	7.94	3.24E-13	4.34E-17	0.001	0.253	0.158	0.083
		0.6	8.70	3.14E-13	4.61E-17	0.001	0.249	0.156	0.079
	6	0	4.93	3.97E-13	3.34E-17	0.001	0.268	0.165	0.098
		0.2	6.94	3.42E-13	4.04E-17	0.001	0.255	0.159	0.086
		0.4	8.06	3.22E-13	4.38E-17	0.001	0.252	0.158	0.082
100	3	0	3.92	4.44E-13	3.22E-17	0.001	0.265	0.163	0.099
		0.2	6.86	3.49E-13	4.15E-17	0.001	0.253	0.158	0.084
		0.4	8.30	3.25E-13	4.63E-17	0.001	0.246	0.155	0.079
		0.6	9.17	3.16E-13	4.96E				

					RAO60				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	2.46E-17	0.007	0.287	0.170	0.076
		0.2	5.60	3.72E-13	3.37E-17	0.006	0.269	0.163	0.067
		0.4	6.92	3.37E-13	3.81E-17	0.005	0.263	0.160	0.064
	4	0	3.57	4.65E-13	3.81E-17	0.005	0.263	0.160	0.064
		0.2	5.83	3.65E-13	3.44E-17	0.005	0.269	0.163	0.066
		0.4	7.00	3.34E-13	3.88E-17	0.005	0.260	0.159	0.063
	5	0	4.00	4.39E-13	2.82E-17	0.006	0.278	0.166	0.072
		0.2	6.04	3.59E-13	3.53E-17	0.005	0.267	0.161	0.066
		0.4	7.18	3.32E-13	3.92E-17	0.005	0.260	0.159	0.063
	6	0	4.38	4.19E-13	2.93E-17	0.006	0.279	0.167	0.071
		0.2	6.23	3.54E-13	3.58E-17	0.005	0.267	0.162	0.065
		0.4	7.29	3.30E-13	3.95E-17	0.005	0.260	0.159	0.063
90	3	0	3.49	4.68E-13	2.86E-17	0.006	0.275	0.165	0.071
		0.2	6.27	3.57E-13	3.80E-17	0.005	0.259	0.158	0.063
		0.4	7.67	3.28E-13	4.26E-17	0.005	0.253	0.156	0.060
		0.6	8.52	3.16E-13	4.60E-17	0.005	0.247	0.153	0.058
		0.9	10.01	3.11E-13	5.28E-17	0.004	0.236	0.149	0.055
	4	0	4.04	4.36E-13	3.05E-17	0.006	0.272	0.163	0.069
		0.2	6.51	3.51E-13	3.89E-17	0.005	0.257	0.157	0.062
		0.4	7.81	3.26E-13	4.33E-17	0.005	0.251	0.155	0.060
		0.6	8.61	3.15E-13	4.63E-17	0.005	0.246	0.153	0.058
		0.9	10.07	3.10E-13	5.32E-17	0.004	0.237	0.149	0.055
	5	0	4.52	4.14E-13	3.19E-17	0.006	0.271	0.164	0.068
		0.2	6.73	3.46E-13	3.95E-17	0.005	0.258	0.158	0.062
		0.4	7.94	3.24E-13	4.37E-17	0.005	0.251	0.155	0.059
		0.6	8.70	3.14E-13	4.65E-17	0.005	0.248	0.154	0.058
		0.9	10.07	3.10E-13	5.32E-17	0.004	0.237	0.149	0.055
	6	0	4.93	3.97E-13	3.37E-17	0.005	0.266	0.161	0.066
		0.2	6.94	3.42E-13	4.03E-17	0.005	0.256	0.157	0.061
		0.4	8.06	3.22E-13	4.40E-17	0.005	0.251	0.155	0.059
		0.6	8.06	3.22E-13	4.40E-17	0.005	0.251	0.155	0.059
		0.9	10.01	3.11E-13	5.28E-17	0.004	0.236	0.149	0.055
	100	0	3.92	4.44E-13	3.23E-17	0.006	0.264	0.160	0.066
		0.2	6.86	3.49E-13	4.14E-17	0.005	0.253	0.156	0.061
		0.4	8.30	3.25E-13	4.66E-17	0.005	0.244	0.152	0.057
		0.6	9.17	3.16E-13	4.97E-17	0.005	0.240	0.150	0.056
		0.9	10.01	3.11E-13	5.28E-17	0.004	0.236	0.149	0.055
110	3	0	4.36	4.27E-13	3.55E-17	0.005	0.257	0.157	0.063
		0.2	7.39	3.45E-13	4.51E-17	0.005	0.243	0.151	0.058
		0.4	8.85	3.26E-13	4.98E-17	0.004	0.239	0.150	0.056
		0.6	9.73	3.19E-13	5.33E-17	0.004	0.233	0.147	0.054
		0.9	10.59	3.16E-13	5.69E-17	0.004	0.228	0.145	0.052
	4	0	4.98	4.03E-13	3.74E-17	0.005	0.254	0.156	0.062
		0.2	7.65	3.41E-13	4.63E-17	0.005	0.241	0.150	0.057
		0.4	8.99	3.25E-13	5.05E-17	0.004	0.237	0.149	0.055
		0.6	9.82	3.18E-13	5.35E-17	0.004	0.233	0.148	0.054
		0.9	10.65	3.16E-13	5.72E-17	0.004	0.228	0.145	0.052
	5	0	5.50	3.87E-13	3.93E-17	0.005	0.251	0.154	0.061
		0.2	7.88	3.38E-13	4.68E-17	0.005	0.241	0.150	0.057
		0.4	9.13	3.23E-13	5.10E-17	0.005	0.236	0.148	0.055
		0.6	9.92	3.18E-13	5.38E-17	0.004	0.233	0.147	0.054
		0.9	10.65	3.16E-13	5.72E-17	0.004	0.228	0.145	0.052
	6	0	5.96	3.75E-13	4.07E-17	0.005	0.249	0.154	0.060
		0.2	8.09	3.35E-13	4.73E-17	0.005	0.241	0.150	0.057
		0.4	9.25	3.22E-13	5.16E-17	0.004	0.235	0.148	0.054
		0.6	9.25	3.22E-13	5.16E-17	0.004	0.235	0.148	0.054
		0.9	10.65	3.16E-13	5.72E-17	0.004	0.228	0.145	0.052



					RAO90				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	2.47E-17	0.044	0.290	0.172	0.048
		0.2	5.60	3.72E-13	3.42E-17	0.041	0.269	0.163	0.045
		0.4	6.92	3.37E-13	3.82E-17	0.040	0.264	0.162	0.044
	4	0	3.57	4.65E-13	2.64E-17	0.044	0.286	0.171	0.047
		0.2	5.83	3.65E-13	3.47E-17	0.041	0.268	0.164	0.045
		0.4	7.00	3.34E-13	3.87E-17	0.040	0.263	0.162	0.044
	5	0	4.00	4.39E-13	2.80E-17	0.043	0.283	0.170	0.047
		0.2	6.04	3.59E-13	3.57E-17	0.041	0.265	0.163	0.044
		0.4	7.18	3.32E-13	3.93E-17	0.040	0.261	0.161	0.044
	6	0	4.38	4.19E-13	2.91E-17	0.043	0.282	0.171	0.047
		0.2	6.23	3.54E-13	3.64E-17	0.040	0.264	0.161	0.044
		0.4	7.29	3.30E-13	3.96E-17	0.040	0.263	0.162	0.044
90	3	0	3.49	4.68E-13	2.84E-17	0.043	0.279	0.169	0.047
		0.2	6.27	3.57E-13	3.80E-17	0.040	0.260	0.161	0.044
		0.4	7.67	3.28E-13	4.25E-17	0.040	0.254	0.158	0.043
		0.6	8.52	3.16E-13	4.53E-17	0.039	0.250	0.157	0.043
		0.9	10.01	3.11E-13	5.27E-17	0.037	0.236	0.151	0.041
	4	0	4.04	4.36E-13	3.04E-17	0.042	0.275	0.167	0.046
		0.2	6.51	3.51E-13	3.87E-17	0.040	0.260	0.161	0.044
		0.4	7.81	3.26E-13	4.28E-17	0.040	0.254	0.159	0.043
		0.6	8.61	3.15E-13	4.56E-17	0.039	0.248	0.158	0.047
		0.9	10.07	3.10E-13	5.28E-17	0.037	0.236	0.151	0.041
	5	0	4.52	4.14E-13	3.20E-17	0.042	0.272	0.165	0.046
		0.2	6.73	3.46E-13	3.95E-17	0.040	0.258	0.160	0.044
		0.4	7.94	3.24E-13	4.32E-17	0.040	0.254	0.158	0.043
		0.6	8.70	3.14E-13	4.61E-17	0.039	0.248	0.156	0.043
		0.9	10.07	3.10E-13	5.28E-17	0.037	0.236	0.151	0.041
	6	0	4.93	3.97E-13	3.35E-17	0.041	0.268	0.164	0.045
		0.2	6.94	3.42E-13	4.03E-17	0.040	0.256	0.159	0.043
		0.4	8.06	3.22E-13	4.39E-17	0.039	0.252	0.157	0.043
		0.6	9.26	3.15E-13	4.96E-17	0.038	0.241	0.153	0.042
		0.9	10.07	3.10E-13	5.28E-17	0.037	0.236	0.151	0.041
	3	0	3.92	4.44E-13	3.23E-17	0.041	0.266	0.163	0.045
		0.2	6.86	3.49E-13	4.15E-17	0.040	0.252	0.157	0.043
		0.4	8.30	3.25E-13	4.60E-17	0.039	0.247	0.155	0.042
		0.6	9.17	3.16E-13	4.94E-17	0.038	0.241	0.153	0.042
		0.9	10.01	3.11E-13	5.27E-17	0.037	0.236	0.151	0.041
	4	0	4.51	4.17E-13	3.40E-17	0.041	0.264	0.162	0.045
		0.2	7.11	3.44E-13	4.24E-17	0.039	0.250	0.157	0.043
		0.4	8.44	3.24E-13	4.67E-17	0.039	0.245	0.154	0.042
		0.6	9.26	3.15E-13	4.96E-17	0.038	0.241	0.153	0.042
		0.9	10.07	3.10E-13	5.28E-17	0.037	0.236	0.151	0.041
	5	0	5.02	3.98E-13	3.57E-17	0.040	0.261	0.161	0.044
		0.2	7.34	3.40E-13	4.32E-17	0.039	0.249	0.156	0.043
		0.4	8.57	3.22E-13	4.72E-17	0.039	0.244	0.154	0.042
		0.6	9.35	3.15E-13	5.02E-17	0.038	0.242	0.154	0.042
		0.9	10.07	3.10E-13	5.28E-17	0.037	0.236	0.151	0.041
	6	0	5.46	3.83E-13	3.74E-17	0.040	0.257	0.159	0.043
		0.2	7.55	3.36E-13	4.37E-17	0.039	0.249	0.156	0.043
		0.4	8.70	3.21E-13	4.78E-17	0.038	0.243	0.153	0.042
		0.6	9.26	3.15E-13	4.96E-17	0.038	0.241	0.153	0.042
		0.9	10.07	3.10E-13	5.28E-17	0.037	0.236	0.151	0.041
110	3	0	4.36	4.27E-13					
		0.2	7.39	3.45E-13					
		0.4	8.85	3.26E-13					
		0.6	9.73	3.19E-13					
		0.9	10.59	3.16E-13					
	4	0	4.98	4.03E-13					
		0.2	7.65	3.41E-13					
		0.4	8.99	3.25E-13					
		0.6	9.82	3.18E-13					
		0.9	10.65	3.16E-13					
	5	0	5.50	3.87E-13					
		0.2	7.88	3.38E-13					
		0.4	9.13	3.23E-13					
		0.6	9.92	3.18E-13					
		0.9	10.65	3.16E-13					
	6	0	5.96	3.75E-13					
		0.2	8.09	3.35E-13					
		0.4	9.25	3.22E-13					
		0.6	9.92	3.18E-13					
		0.9	10.65	3.16E-13					



					CAUD20				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	1.97E-17	0.006	0.294	0.190	0.213
		0.2	5.60	3.72E-13	2.73E-17	0.004	0.280	0.181	0.164
		0.4	6.92	3.37E-13	3.10E-17	0.004	0.276	0.179	0.148
	4	0	3.57	4.65E-13	2.12E-17	0.006	0.290	0.187	0.202
		0.2	5.83	3.65E-13	2.80E-17	0.004	0.279	0.180	0.161
		0.4	7.00	3.34E-13	3.16E-17	0.004	0.274	0.177	0.146
	5	0	4.00	4.39E-13	2.26E-17	0.005	0.287	0.186	0.192
		0.2	6.04	3.59E-13	2.87E-17	0.004	0.277	0.179	0.158
		0.4	7.18	3.32E-13	3.20E-17	0.004	0.273	0.177	0.144
	6	0	4.38	4.19E-13	2.35E-17	0.005	0.288	0.186	0.186
		0.2	6.23	3.54E-13	2.91E-17	0.004	0.278	0.180	0.156
		0.4	7.29	3.30E-13	3.24E-17	0.004	0.272	0.177	0.143
90	3	0	3.49	4.68E-13	2.31E-17	0.005	0.283	0.183	0.186
		0.2	6.27	3.57E-13	3.10E-17	0.004	0.271	0.176	0.147
		0.4	7.67	3.28E-13	3.46E-17	0.004	0.270	0.175	0.135
		0.6	8.52	3.16E-13	3.74E-17	0.003	0.265	0.172	0.127
	4	0	4.04	4.36E-13	2.47E-17	0.005	0.280	0.181	0.176
		0.2	6.51	3.51E-13	3.15E-17	0.004	0.272	0.176	0.145
		0.4	7.81	3.26E-13	3.51E-17	0.004	0.269	0.174	0.134
		0.6	8.61	3.15E-13	3.78E-17	0.003	0.264	0.171	0.125
	5	0	4.52	4.14E-13	2.61E-17	0.005	0.279	0.180	0.169
		0.2	6.73	3.46E-13	3.21E-17	0.004	0.272	0.176	0.143
		0.4	7.94	3.24E-13	3.53E-17	0.004	0.270	0.175	0.133
		0.6	8.70	3.14E-13	3.79E-17	0.003	0.264	0.172	0.125
	6	0	4.93	3.97E-13	2.74E-17	0.004	0.275	0.178	0.163
		0.2	6.94	3.42E-13	3.29E-17	0.004	0.269	0.174	0.140
		0.4	8.06	3.22E-13	3.55E-17	0.004	0.270	0.175	0.132
	100	0	3.92	4.44E-13	2.63E-17	0.005	0.274	0.177	0.167
		0.2	6.86	3.49E-13	3.39E-17	0.004	0.267	0.173	0.137
		0.4	8.30	3.25E-13	3.82E-17	0.003	0.261	0.169	0.124
		0.6	9.17	3.16E-13	4.03E-17	0.003	0.261	0.169	0.119
		0.9	10.01	3.11E-13	4.33E-17	0.003	0.256	0.166	0.112
	4	0	4.51	4.17E-13	2.77E-17	0.004	0.274	0.177	0.160
		0.2	7.11	3.44E-13	3.48E-17	0.004	0.265	0.172	0.134
		0.4	8.44	3.24E-13	3.85E-17	0.003	0.261	0.169	0.123
		0.6	9.26	3.15E-13	4.04E-17	0.003	0.262	0.170	0.119
		0.9	10.07	3.10E-13	4.37E-17	0.003	0.255	0.165	0.111
	5	0	5.02	3.98E-13	2.91E-17	0.004	0.272	0.176	0.154
		0.2	7.34	3.40E-13	3.54E-17	0.004	0.264	0.171	0.132
		0.4	8.57	3.22E-13	3.91E-17	0.003	0.259	0.168	0.122
		0.6	9.35	3.15E-13	4.11E-17	0.003	0.260	0.168	0.117
	6	0	5.46	3.83E-13	3.00E-17	0.004	0.273	0.177	0.151
		0.2	7.55	3.36E-13	3.59E-17	0.004	0.264	0.171	0.130
		0.4	8.70	3.21E-13	3.95E-17	0.003	0.259	0.168	0.121
110	3	0	4.36	4.27E-13	2.91E-17	0.004	0.268	0.173	0.153
		0.2	7.39	3.45E-13	3.71E-17	0.003	0.258	0.168	0.126
		0.4	8.85	3.26E-13	4.08E-17	0.003	0.257	0.167	0.118
		0.6	9.73	3.19E-13	4.38E-17	0.003	0.253	0.164	0.111
		0.9	10.59	3.16E-13	4.70E-17	0.003	0.248	0.161	0.104
	4	0	4.98	4.03E-13	3.06E-17	0.004	0.267	0.173	0.147
		0.2	7.65	3.41E-13	3.76E-17	0.003	0.259	0.168	0.125
		0.4	8.99	3.25E-13	4.14E-17	0.003	0.256	0.166	0.116
		0.6	9.82	3.18E-13	4.40E-17	0.003	0.253	0.164	0.110
		0.9	10.65	3.16E-13	4.73E-17	0.003	0.248	0.161	0.104
	5	0	5.50	3.87E-13	3.19E-17	0.004	0.265	0.172	0.143
		0.2	7.88	3.38E-13	3.84E-17	0.003	0.258	0.167	0.123
		0.4	9.13	3.23E-13	4.16E-17	0.003	0.257	0.166	0.116
		0.6	9.92	3.18E-13	4.44E-17	0.003	0.252	0.164	0.109
	6	0	5.96	3.75E-13	3.30E-17	0.004	0.265	0.172	0.139
		0.2	8.09	3.35E-13	3.86E-17	0.003	0.260	0.168	0.123
		0.4	9.25	3.22E-13	4.20E-17	0.003	0.256	0.166	0.114



					CAUD40				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	1.10E-17	0.019	0.006	0.120	0.321
		0.2	5.60	3.72E-13	1.55E-17	0.015	0.005	0.106	0.248
		0.4	6.92	3.37E-13	1.82E-17	0.014	0.004	0.100	0.219
	4	0	3.57	4.65E-13	1.17E-17	0.018	0.006	0.118	0.308
		0.2	5.83	3.65E-13	1.63E-17	0.014	0.004	0.103	0.237
		0.4	7.00	3.34E-13	1.85E-17	0.013	0.004	0.099	0.215
	5	0	4.00	4.39E-13	1.26E-17	0.017	0.005	0.115	0.290
		0.2	6.04	3.59E-13	1.66E-17	0.014	0.004	0.103	0.234
		0.4	7.18	3.32E-13	1.87E-17	0.013	0.004	0.099	0.214
	6	0	4.38	4.19E-13	1.34E-17	0.016	0.005	0.112	0.278
		0.2	6.23	3.54E-13	1.69E-17	0.014	0.004	0.102	0.231
		0.4	7.29	3.30E-13	1.89E-17	0.013	0.004	0.100	0.215
90	3	0	3.49	4.68E-13	1.31E-17	0.017	0.005	0.112	0.279
		0.2	6.27	3.57E-13	1.83E-17	0.013	0.004	0.254	0.215
		0.4	7.67	3.28E-13	2.04E-17	0.013	0.004	0.096	0.200
		0.6	8.52	3.16E-13	2.20E-17	0.012	0.003	0.094	0.188
		0.9	10.01	3.11E-13	2.64E-17	0.011	0.003	0.087	0.163
	4	0	4.04	4.36E-13	1.43E-17	0.016	0.005	0.107	0.261
		0.2	6.51	3.51E-13	1.84E-17	0.013	0.004	0.099	0.215
		0.4	7.81	3.26E-13	2.09E-17	0.013	0.004	0.095	0.195
		0.6	8.61	3.15E-13	2.24E-17	0.012	0.003	0.093	0.185
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
	5	0	4.52	4.14E-13	1.51E-17	0.015	0.005	0.105	0.250
		0.2	6.73	3.46E-13	1.88E-17	0.013	0.004	0.098	0.212
		0.4	7.94	3.24E-13	2.11E-17	0.013	0.004	0.095	0.194
		0.6	8.70	3.14E-13	2.25E-17	0.012	0.003	0.093	0.185
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
	6	0	4.93	3.97E-13	1.58E-17	0.015	0.004	0.105	0.242
		0.2	6.94	3.42E-13	1.94E-17	0.013	0.004	0.097	0.207
		0.4	8.06	3.22E-13	2.12E-17	0.013	0.004	0.095	0.194
		0.6	9.26	3.15E-13	2.45E-17	0.011	0.003	0.090	0.172
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
	7	0	5.02	3.98E-13	1.72E-17	0.014	0.004	0.100	0.224
		0.2	7.34	3.40E-13	2.08E-17	0.013	0.004	0.095	0.196
		0.4	8.57	3.22E-13	2.27E-17	0.012	0.003	0.093	0.183
		0.6	9.35	3.15E-13	2.47E-17	0.011	0.003	0.090	0.172
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
	8	0	5.46	3.83E-13	1.80E-17	0.013	0.004	0.098	0.217
		0.2	7.55	3.36E-13	2.12E-17	0.012	0.004	0.094	0.193
		0.4	8.70	3.21E-13	2.33E-17	0.012	0.003	0.092	0.179
		0.6	9.26	3.15E-13	2.45E-17	0.011	0.003	0.090	0.172
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
100	3	0	3.92	4.44E-13	1.52E-17	0.015	0.005	0.105	0.246
		0.2	6.86	3.49E-13	2.00E-17	0.013	0.004	0.096	0.202
		0.4	8.30	3.25E-13	2.26E-17	0.012	0.003	0.092	0.184
		0.6	9.17	3.16E-13	2.44E-17	0.011	0.003	0.090	0.173
		0.9	10.01	3.11E-13	2.64E-17	0.011	0.003	0.087	0.163
	4	0	4.51	4.17E-13	1.62E-17	0.014	0.004	0.103	0.235
		0.2	7.11	3.44E-13	2.05E-17	0.013	0.004	0.095	0.198
		0.4	8.44	3.24E-13	2.26E-17	0.012	0.003	0.093	0.184
		0.6	9.26	3.15E-13	2.45E-17	0.011	0.003	0.090	0.172
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
	5	0	5.02	3.98E-13	1.72E-17	0.014	0.004	0.100	0.224
		0.2	7.34	3.40E-13	2.08E-17	0.013	0.004	0.095	0.196
		0.4	8.57	3.22E-13	2.27E-17	0.012	0.003	0.093	0.183
		0.6	9.35	3.15E-13	2.47E-17	0.011	0.003	0.090	0.172
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
	6	0	5.46	3.83E-13	1.80E-17	0.013	0.004	0.098	0.217
		0.2	7.55	3.36E-13	2.12E-17	0.012	0.004	0.094	0.193
		0.4	8.70	3.21E-13	2.33E-17	0.012	0.003	0.092	0.179
		0.6	9.26	3.15E-13	2.45E-17	0.011	0.003	0.090	0.172
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
	7	0	5.46	3.83E-13	1.80E-17	0.013	0.004	0.098	0.217
		0.2	7.55	3.36E-13	2.12E-17	0.012	0.004	0.094	0.193
		0.4	8.70	3.21E-13	2.33E-17	0.012	0.003	0.092	0.179
		0.6	9.26	3.15E-13	2.45E-17	0.011	0.003	0.090	0.172
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
	8	0	5.46	3.83E-13	1.80E-17	0.013	0.004	0.098	0.217
		0.2	7.55	3.36E-13	2.12E-17	0.012	0.004	0.094	0.193
		0.4	8.70	3.21E-13	2.33E-17	0.012	0.003	0.092	0.179
		0.6	9.26	3.15E-13	2.45E-17	0.011	0.003	0.090	0.172
		0.9	10.07	3.10E-13	2.67E-17	0.011	0.003	0.087	0.161
110	3	0	4.36	4.27E-13	1.70E-17	0.014	0.004	0.100	0.225
		0.2	7.39	3.45E-13	2.18E-17	0.012	0.003	0.093	0.188
		0.4	8.85	3.26E-13	2.45E-17	0.011	0.003	0.090	0.172
		0.6	9.73	3.19E-13	2.65E-17	0.011	0.003	0.087	0.162
		0.9	10.59	3.16E-13	2.85E-17	0.011	0.003	0.085	0.153
	4	0	4.98	4.03E-13	1.82E-17	0.013	0.004	0.097	0.213
		0.2	7.65	3.41E-13	2.23E-17	0.012	0.003	0.092	0.185
		0.4	8.99	3.25E-13	2.49E-17	0.011	0.003	0.089	0.170
		0.6	9.82	3.18E-13	2.68E-17	0.011	0.003	0.086	0.160
		0.9	10.65	3.16E-13	2.87E-17	0.010	0.003	0.084	0.152
	5	0	5.50	3.87E-13	1.91E-17	0.013	0.004	0.095	0.206
		0.2	7.88	3.38E-13	2.27E-17	0.012	0.003	0.092	0.183
		0.4	9.13	3.23E-13	2.51E-17	0.011	0.003	0.089	0.169
		0.6	9.92	3.18E-13	2.68E-17	0.011	0.003	0.087	0.160
		0.9	10.65	3.16E-13	2.87E-17	0.010	0.003	0.084	0.152
	6	0	5.96	3.75E-13	1.96E-17	0.013	0.004	0.095	0.203
		0.2	8.09	3.35E-13	2.31E-17	0.012	0.003	0.091	0.180
		0.4	9.25	3.22E-13	2.54E-17	0.011	0.003	0.090	0.167
		0.6	9.25	3.22E-13	2.54E-17	0.011	0.003	0.090	0.167
		0.9	10.65	3.16E-13	2.87E-17	0.010	0.003	0.084	0.152

					CRAN20				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	1.94E-17	0.050	0.535	0.327	0.265
		0.2	5.60	3.72E-13	2.74E-17	0.045	0.450	0.280	0.196
		0.4	6.92	3.37E-13	3.10E-17	0.044	0.427	0.267	0.176
	4	0	3.57	4.65E-13	2.12E-17	0.048	0.508	0.312	0.245
		0.2	5.83	3.65E-13	2.80E-17	0.220	0.044	0.278	0.192
		0.4	7.00	3.34E-13	3.13E-17	0.043	0.424	0.266	0.174
	5	0	4.00	4.39E-13	2.26E-17	0.047	0.491	0.303	0.231
		0.2	6.04	3.59E-13	2.88E-17	0.044	0.438	0.273	0.187
		0.4	7.18	3.32E-13	3.18E-17	0.043	0.421	0.264	0.172
	6	0	4.38	4.19E-13	2.37E-17	0.046	0.482	0.298	0.223
		0.2	6.23	3.54E-13	2.93E-17	0.044	0.436	0.272	0.184
		0.4	7.29	3.30E-13	3.21E-17	0.043	0.419	0.263	0.170
90	3	0	3.49	4.68E-13	2.32E-17	0.046	0.477	0.295	0.224
		0.2	6.27	3.57E-13	3.11E-17	0.043	0.420	0.263	0.174
		0.4	7.67	3.28E-13	3.46E-17	0.042	0.401	0.252	0.158
		0.6	8.52	3.16E-13	3.73E-17	0.041	0.386	0.244	0.148
	4	0	4.04	4.36E-13	2.48E-17	0.045	0.465	0.288	0.212
		0.2	6.51	3.51E-13	3.16E-17	0.043	0.418	0.262	0.172
		0.4	7.81	3.26E-13	3.54E-17	0.042	0.394	0.249	0.155
		0.6	8.61	3.15E-13	3.78E-17	0.041	0.382	0.242	0.146
	5	0	4.52	4.14E-13	2.60E-17	0.046	0.458	0.284	0.204
		0.2	6.73	3.46E-13	3.22E-17	0.043	0.413	0.259	0.169
		0.4	7.94	3.24E-13	3.56E-17	0.042	0.395	0.249	0.154
		0.6	8.70	3.14E-13	3.81E-17	0.041	0.380	0.241	0.145
	6	0	4.93	3.97E-13	2.72E-17	0.045	0.448	0.279	0.196
		0.2	6.94	3.42E-13	3.27E-17	0.043	0.411	0.258	0.167
		0.4	8.06	3.22E-13	3.60E-17	0.042	0.392	0.247	0.153
	100	0	3.92	4.44E-13	2.65E-17	0.044	0.441	0.275	0.199
		0.2	6.86	3.49E-13	3.38E-17	0.042	0.402	0.252	0.161
		0.4	8.30	3.25E-13	3.78E-17	0.041	0.381	0.241	0.146
		0.6	9.17	3.16E-13	4.09E-17	0.040	0.364	0.231	0.136
		0.9	10.01	3.11E-13	4.32E-17	0.040	0.356	0.227	0.130
	4	0	4.51	4.17E-13	2.76E-17	0.044	0.439	0.274	0.193
		0.2	7.11	3.44E-13	3.45E-17	0.042	0.397	0.250	0.158
		0.4	8.44	3.24E-13	3.83E-17	0.041	0.378	0.239	0.144
		0.6	9.26	3.15E-13	4.11E-17	0.040	0.364	0.231	0.136
		0.9	10.07	3.10E-13	4.34E-17	0.040	0.355	0.227	0.129
	5	0	5.02	3.98E-13	2.87E-17	0.044	0.434	0.271	0.186
		0.2	7.34	3.40E-13	3.52E-17	0.042	0.392	0.247	0.155
		0.4	8.57	3.22E-13	3.86E-17	0.041	0.377	0.239	0.144
		0.6	9.35	3.15E-13	4.11E-17	0.040	0.364	0.232	0.135
	6	0	5.46	3.83E-13	3.00E-17	0.043	0.425	0.266	0.179
		0.2	7.55	3.36E-13	3.59E-17	0.042	0.396	0.250	0.156
		0.4	8.70	3.21E-13	3.90E-17	0.041	0.375	0.238	0.142
110	3	0	4.36	4.27E-13	2.86E-17	0.044	0.427	0.267	0.186
		0.2	7.39	3.45E-13	3.68E-17	0.041	0.381	0.241	0.149
		0.4	8.85	3.26E-13	4.06E-17	0.040	0.364	0.232	0.137
		0.6	9.73	3.19E-13	4.36E-17	0.039	0.351	0.224	0.128
		0.9	10.59	3.16E-13	4.67E-17	0.038	0.338	0.216	0.121
	4	0	4.98	4.03E-13	3.02E-17	0.043	0.419	0.262	0.178
		0.2	7.65	3.41E-13	3.75E-17	0.041	0.378	0.239	0.147
		0.4	8.99	3.25E-13	4.14E-17	0.040	0.360	0.229	0.135
		0.6	9.82	3.18E-13	4.39E-17	0.039	0.351	0.223	0.128
		0.9	10.65	3.16E-13	4.70E-17	0.038	0.337	0.216	0.120
	5	0	5.50	3.87E-13	3.15E-17	0.043	0.411	0.258	0.172
		0.2	7.88	3.38E-13	3.81E-17	0.041	0.376	0.238	0.145
		0.4	9.13	3.23E-13	4.15E-17	0.040	0.361	0.229	0.134
		0.6	9.92	3.18E-13	4.43E-17	0.039	0.348	0.222	0.127
	6	0	5.96	3.75E-13	3.27E-17	0.042	0.404	0.254	0.166
		0.2	8.09	3.35E-13	3.87E-17	0.040	0.372	0.236	0.143
		0.4	9.25	3.22E-13	4.22E-17	0.039	0.357	0.227	0.132

					CRAN40				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	1.11E-17	0.133	1.586	0.954	0.486
		0.2	5.60	3.72E-13	1.52E-17	0.113	1.267	0.770	0.367
		0.4	6.92	3.37E-13	1.81E-17	0.101	1.098	0.671	0.311
	4	0	3.57	4.65E-13	1.20E-17	0.126	1.494	0.899	0.451
		0.2	5.83	3.65E-13	1.59E-17	0.109	1.220	0.742	0.351
		0.4	7.00	3.34E-13	1.81E-17	0.101	1.101	0.673	0.311
	5	0	4.00	4.39E-13	1.23E-17	0.127	1.483	0.895	0.443
		0.2	6.04	3.59E-13	1.64E-17	0.107	1.191	0.725	0.342
		0.4	7.18	3.32E-13	1.84E-17	0.100	1.087	0.665	0.306
	6	0	4.38	4.19E-13	1.33E-17	0.121	1.397	0.844	0.414
		0.2	6.23	3.54E-13	1.69E-17	0.105	1.157	0.705	0.332
		0.4	7.29	3.30E-13	1.86E-17	0.100	1.080	0.661	0.303
90	3	0	3.49	4.68E-13	1.29E-17	0.122	1.409	0.851	0.422
		0.2	6.27	3.57E-13	1.80E-17	0.101	1.099	0.671	0.312
		0.4	7.67	3.28E-13	2.03E-17	0.095	1.006	0.618	0.279
		0.6	8.52	3.16E-13	2.22E-17	0.090	0.933	0.576	0.256
		0.9	10.01	3.11E-13	2.58E-17	0.084	0.832	0.517	0.223
	4	0	4.04	4.36E-13	1.41E-17	0.115	1.320	0.799	0.390
		0.2	6.51	3.51E-13	1.84E-17	0.100	1.083	0.663	0.306
		0.4	7.81	3.26E-13	2.06E-17	0.095	0.995	0.612	0.276
		0.6	8.61	3.15E-13	2.22E-17	0.090	0.935	0.578	0.256
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
	5	0	4.52	4.14E-13	1.50E-17	0.111	1.259	0.764	0.369
		0.2	6.73	3.46E-13	1.89E-17	0.098	1.058	0.648	0.298
		0.4	7.94	3.24E-13	2.08E-17	0.094	0.988	0.608	0.273
		0.6	8.70	3.14E-13	2.22E-17	0.091	0.941	0.581	0.257
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
	6	0	4.93	3.97E-13	1.57E-17	0.109	1.219	0.741	0.354
		0.2	6.94	3.42E-13	1.92E-17	0.097	1.048	0.642	0.294
		0.4	8.06	3.22E-13	2.12E-17	0.093	0.970	0.597	0.268
		0.6	9.26	3.15E-13	2.42E-17	0.087	0.876	0.543	0.237
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
	7	0	5.02	3.98E-13	1.69E-17	0.104	1.146	0.699	0.330
		0.2	7.34	3.40E-13	2.08E-17	0.093	0.983	0.603	0.273
		0.4	8.57	3.22E-13	2.29E-17	0.089	0.910	0.563	0.249
		0.6	9.35	3.15E-13	2.44E-17	0.086	0.870	0.539	0.235
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
	8	0	5.46	3.83E-13	1.72E-17	0.104	1.133	0.691	0.324
		0.2	7.55	3.36E-13	2.10E-17	0.093	0.976	0.600	0.270
		0.4	8.70	3.21E-13	2.33E-17	0.088	0.899	0.556	0.245
		0.6	9.35	3.15E-13	2.44E-17	0.086	0.870	0.539	0.235
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
100	3	0	3.92	4.44E-13	1.53E-17	0.109	1.224	0.743	0.360
		0.2	6.86	3.49E-13	1.99E-17	0.096	1.015	0.624	0.284
		0.4	8.30	3.25E-13	2.25E-17	0.090	0.924	0.571	0.253
		0.6	9.17	3.16E-13	2.40E-17	0.087	0.879	0.544	0.238
		0.9	10.01	3.11E-13	2.58E-17	0.084	0.832	0.517	0.223
	4	0	4.51	4.17E-13	1.62E-17	0.105	1.173	0.714	0.341
		0.2	7.11	3.44E-13	2.04E-17	0.094	0.996	0.612	0.278
		0.4	8.44	3.24E-13	2.28E-17	0.089	0.915	0.566	0.251
		0.6	9.26	3.15E-13	2.42E-17	0.087	0.876	0.543	0.237
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
	5	0	5.02	3.98E-13	1.69E-17	0.104	1.146	0.699	0.330
		0.2	7.34	3.40E-13	2.08E-17	0.093	0.983	0.603	0.273
		0.4	8.57	3.22E-13	2.29E-17	0.089	0.910	0.563	0.249
		0.6	9.35	3.15E-13	2.44E-17	0.086	0.870	0.539	0.235
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
	6	0	5.46	3.83E-13	1.72E-17	0.104	1.133	0.691	0.324
		0.2	7.55	3.36E-13	2.10E-17	0.093	0.976	0.600	0.270
		0.4	8.70	3.21E-13	2.33E-17	0.088	0.899	0.556	0.245
		0.6	9.35	3.15E-13	2.44E-17	0.086	0.870	0.539	0.235
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
	7	0	5.02	3.98E-13	1.69E-17	0.104	1.146	0.699	0.330
		0.2	7.34	3.40E-13	2.08E-17	0.093	0.983	0.603	0.273
		0.4	8.57	3.22E-13	2.29E-17	0.089	0.910	0.563	0.249
		0.6	9.35	3.15E-13	2.44E-17	0.086	0.870	0.539	0.235
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
	8	0	5.46	3.83E-13	1.72E-17	0.104	1.133	0.691	0.324
		0.2	7.55	3.36E-13	2.10E-17	0.093	0.976	0.600	0.270
		0.4	8.70	3.21E-13	2.33E-17	0.088	0.899	0.556	0.245
		0.6	9.35	3.15E-13	2.44E-17	0.086	0.870	0.539	0.235
		0.9	10.07	3.10E-13	2.60E-17	0.083	0.827	0.514	0.221
110	3	0	4.36	4.27E-13	1.68E-17	0.104	1.141	0.696	0.331
		0.2	7.39	3.45E-13	2.17E-17	0.091	0.947	0.583	0.262
		0.4	8.85	3.26E-13	2.46E-17	0.085	0.857	0.531	0.233
		0.6	9.73	3.19E-13	2.65E-17	0.081	0.809	0.502	0.217
		0.9	10.59	3.16E-13	2.80E-17	0.080	0.778	0.485	0.207
	4	0	4.98	4.03E-13	1.77E-17	0.101	1.099	0.672	0.316
		0.2	7.65	3.41E-13	2.22E-17	0.090	0.928	0.572	0.256
		0.4	8.99	3.25E-13	2.48E-17	0.085	0.853	0.528	0.231
		0.6	9.82	3.18E-13	2.66E-17	0.081	0.807	0.501	0.216
		0.9	10.65	3.16E-13	2.83E-17	0.079	0.771	0.481	0.205
	5	0	5.50	3.87E-13	1.86E-17	0.098	1.062	0.649	0.302
		0.2	7.88	3.38E-13	2.25E-17	0.089	0.919	0.567	0.253
		0.4	9.13	3.23E-13	2.50E-17	0.084	0.849	0.526	0.230
		0.6	9.92	3.18E-13	2.68E-17	0.081	0.803	0.499	0.215
		0.9	10.65	3.16E-13	2.83E-17	0.079	0.771	0.481	0.205
	6	0	5.96	3.75E-13	1.90E-17	0.098	1.045	0.641	0.295
		0.2	8.09	3.35E-13	2.29E-17	0.088	0.909	0.561	0.249
		0.4	9.25	3.22E-13	2.53E-17	0.084	0.840	0.520	0.227
		0.6	9.92	3.18E-13	2.68E-17	0.081	0.803	0.499	0.215
		0.9	10.65	3.16E-13	2.83E-17	0.079	0.771	0.481	0.205

					LAO30/CAU20				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	1.93E-17	0.063	0.296	0.259	0.271
		0.2	5.60	3.72E-13	2.70E-17	0.056	0.279	0.231	0.202
		0.4	6.92	3.37E-13	3.12E-17	0.053	0.270	0.219	0.177
	4	0	3.57	4.65E-13	2.09E-17	0.061	0.292	0.253	0.254
		0.2	5.83	3.65E-13	2.77E-17	0.056	0.278	0.229	0.197
		0.4	7.00	3.34E-13	3.16E-17	0.053	0.270	0.218	0.175
	5	0	4.00	4.39E-13	2.27E-17	0.062	0.507	0.367	0.307
		0.2	6.04	3.59E-13	2.84E-17	0.055	0.276	0.227	0.193
		0.4	7.18	3.32E-13	3.18E-17	0.053	0.270	0.218	0.174
	6	0	4.38	4.19E-13	2.36E-17	0.058	0.283	0.240	0.228
		0.2	6.23	3.54E-13	2.92E-17	0.054	0.273	0.223	0.188
		0.4	7.29	3.30E-13	3.22E-17	0.053	0.270	0.218	0.172
90	3	0	3.49	4.68E-13	2.30E-17	0.058	0.282	0.240	0.231
		0.2	6.27	3.57E-13	3.08E-17	0.053	0.270	0.218	0.179
		0.4	7.67	3.28E-13	3.49E-17	0.051	0.263	0.210	0.160
		0.6	8.52	3.16E-13	3.76E-17	0.050	0.259	0.204	0.149
	4	0	4.04	4.36E-13	2.47E-17	0.057	0.278	0.234	0.217
		0.2	6.51	3.51E-13	3.17E-17	0.053	0.267	0.216	0.174
		0.4	7.81	3.26E-13	3.54E-17	0.051	0.262	0.208	0.158
		0.6	8.61	3.15E-13	3.80E-17	0.050	0.258	0.203	0.148
	5	0	4.52	4.14E-13	2.58E-17	0.057	0.278	0.232	0.210
		0.2	6.73	3.46E-13	3.25E-17	0.052	0.265	0.213	0.170
		0.4	7.94	3.24E-13	3.57E-17	0.051	0.262	0.208	0.157
		0.6	8.70	3.14E-13	3.81E-17	0.050	0.258	0.203	0.147
	6	0	4.93	3.97E-13	2.71E-17	0.055	0.275	0.228	0.201
		0.2	6.94	3.42E-13	3.29E-17	0.052	0.266	0.213	0.168
		0.4	8.06	3.22E-13	3.61E-17	0.051	0.262	0.208	0.155
	100	0	3.92	4.44E-13	2.61E-17	0.055	0.273	0.227	0.205
		0.2	6.86	3.49E-13	3.41E-17	0.051	0.262	0.209	0.163
		0.4	8.30	3.25E-13	3.85E-17	0.049	0.254	0.200	0.146
		0.6	9.17	3.16E-13	4.10E-17	0.048	0.252	0.196	0.138
		0.9	10.01	3.11E-13	4.35E-17	0.047	0.250	0.193	0.131
	4	0	4.51	4.17E-13	2.78E-17	0.054	0.269	0.222	0.195
		0.2	7.11	3.44E-13	3.47E-17	0.051	0.262	0.209	0.160
		0.4	8.44	3.24E-13	3.88E-17	0.049	0.254	0.200	0.145
		0.6	9.26	3.15E-13	4.12E-17	0.048	0.252	0.196	0.137
		0.9	10.07	3.10E-13	4.39E-17	0.047	0.249	0.192	0.129
	5	0	5.02	3.98E-13	2.92E-17	0.053	0.267	0.219	0.186
		0.2	7.34	3.40E-13	3.52E-17	0.051	0.261	0.208	0.158
		0.4	8.57	3.22E-13	3.91E-17	0.049	0.255	0.200	0.144
		0.6	9.35	3.15E-13	4.14E-17	0.048	0.252	0.196	0.137
	6	0	5.46	3.83E-13	3.06E-17	0.052	0.264	0.215	0.179
		0.2	7.55	3.36E-13	3.59E-17	0.050	0.260	0.206	0.156
		0.4	8.70	3.21E-13	3.95E-17	0.049	0.254	0.199	0.142
110	3	0	4.36	4.27E-13	2.90E-17	0.053	0.265	0.217	0.187
		0.2	7.39	3.45E-13	3.70E-17	0.049	0.255	0.202	0.151
		0.4	8.85	3.26E-13	4.11E-17	0.048	0.250	0.196	0.137
		0.6	9.73	3.19E-13	4.40E-17	0.047	0.247	0.190	0.129
		0.9	10.59	3.16E-13	4.75E-17	0.045	0.240	0.184	0.120
	4	0	4.98	4.03E-13	3.06E-17	0.052	0.262	0.214	0.178
		0.2	7.65	3.41E-13	3.78E-17	0.049	0.254	0.201	0.148
		0.4	8.99	3.25E-13	4.16E-17	0.048	0.250	0.194	0.136
		0.6	9.82	3.18E-13	4.45E-17	0.046	0.245	0.189	0.128
		0.9	10.65	3.16E-13	4.78E-17	0.045	0.240	0.183	0.120
	5	0	5.50	3.87E-13	3.23E-17	0.051	0.258	0.209	0.170
		0.2	7.88	3.38E-13	3.86E-17	0.049	0.252	0.199	0.145
		0.4	9.13	3.23E-13	4.22E-17	0.047	0.248	0.193	0.134
		0.6	9.92	3.18E-13	4.49E-17	0.046	0.244	0.188	0.127
	6	0	5.96	3.75E-13	3.34E-17	0.051	0.258	0.207	0.165
		0.2	8.09	3.35E-13	3.90E-17	0.049	0.252	0.199	0.144
		0.4	9.25	3.22E-13	4.24E-17	0.047	0.249	0.193	0.133



					LAO30/CRA20				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	1.97E-17	0.066	0.542	0.396	0.352
		0.2	5.60	3.72E-13	2.74E-17	0.058	0.462	0.333	0.254
		0.4	6.92	3.37E-13	3.10E-17	0.056	0.437	0.314	0.225
	4	0	3.57	4.65E-13	2.12E-17	0.065	0.526	0.382	0.328
		0.2	5.83	3.65E-13	2.79E-17	0.058	0.462	0.332	0.250
		0.4	7.00	3.34E-13	3.15E-17	0.056	0.433	0.311	0.221
	5	0	4.00	4.39E-13	2.27E-17	0.062	0.507	0.367	0.307
		0.2	6.04	3.59E-13	2.85E-17	0.058	0.457	0.329	0.245
		0.4	7.18	3.32E-13	3.18E-17	0.056	0.432	0.310	0.219
	6	0	4.38	4.19E-13	2.39E-17	0.061	0.494	0.358	1.289
		0.2	6.23	3.54E-13	2.92E-17	0.057	0.449	0.323	0.239
		0.4	7.29	3.30E-13	3.23E-17	0.055	0.426	0.306	0.215
90	3	0	3.49	4.68E-13	2.32E-17	0.061	0.493	0.357	0.299
		0.2	6.27	3.57E-13	3.08E-17	0.056	0.433	0.312	0.226
		0.4	7.67	3.28E-13	3.49E-17	0.053	0.407	0.292	0.199
		0.6	8.52	3.16E-13	3.75E-17	0.051	0.392	0.280	0.185
	4	0	4.04	4.36E-13	2.49E-17	0.060	0.477	0.345	0.279
		0.2	6.51	3.51E-13	3.16E-17	0.055	0.428	0.307	0.220
		0.4	7.81	3.26E-13	3.54E-17	0.053	0.404	0.289	0.196
		0.6	8.61	3.15E-13	3.76E-17	0.052	0.392	0.280	0.184
	5	0	4.52	4.14E-13	2.60E-17	0.059	0.471	0.340	0.268
		0.2	6.73	3.46E-13	3.20E-17	0.055	0.426	0.306	0.217
		0.4	7.94	3.24E-13	3.56E-17	0.053	0.403	0.288	0.195
		0.6	8.70	3.14E-13	3.77E-17	0.052	0.392	0.280	0.184
	6	0	4.93	3.97E-13	2.72E-17	0.058	0.459	0.331	0.255
		0.2	6.94	3.42E-13	3.25E-17	0.055	0.423	0.304	0.214
		0.4	8.06	3.22E-13	3.61E-17	0.052	0.399	0.285	0.192
	100	0	3.92	4.44E-13	2.62E-17	0.058	0.464	0.333	0.265
		0.2	6.86	3.49E-13	3.43E-17	0.053	0.405	0.291	0.202
		0.4	8.30	3.25E-13	3.80E-17	0.051	0.387	0.277	0.183
		0.6	9.17	3.16E-13	4.05E-17	0.050	0.375	0.267	0.171
		0.9	10.01	3.11E-13	4.33E-17	0.048	0.361	0.257	0.160
	4	0	4.51	4.17E-13	2.79E-17	0.057	0.446	0.322	0.248
		0.2	7.11	3.44E-13	3.54E-17	0.052	0.397	0.285	0.196
		0.4	8.44	3.24E-13	3.84E-17	0.051	0.385	0.275	0.181
		0.6	9.26	3.15E-13	4.09E-17	0.050	0.372	0.266	0.170
		0.9	10.07	3.10E-13	4.36E-17	0.048	0.360	0.256	0.159
	5	0	5.02	3.98E-13	2.91E-17	0.056	0.439	0.317	0.239
		0.2	7.34	3.40E-13	3.56E-17	0.052	0.398	0.285	0.195
		0.4	8.57	3.22E-13	3.89E-17	0.051	0.382	0.273	0.178
		0.6	9.35	3.15E-13	4.11E-17	0.050	0.372	0.265	0.169
	6	0	5.46	3.83E-13	3.00E-17	0.056	0.435	0.313	0.232
		0.2	7.55	3.36E-13	3.62E-17	0.052	0.394	0.282	0.192
		0.4	8.70	3.21E-13	3.92E-17	0.050	0.381	0.272	0.177
110	3	0	4.36	4.27E-13	2.88E-17	0.056	0.437	0.315	0.241
		0.2	7.39	3.45E-13	3.67E-17	0.051	0.390	0.279	0.189
		0.4	8.85	3.26E-13	4.08E-17	0.049	0.370	0.264	0.170
		0.6	9.73	3.19E-13	4.38E-17	0.048	0.356	0.253	0.158
		0.9	10.59	3.16E-13	4.71E-17	0.046	0.342	0.242	0.147
	4	0	4.98	4.03E-13	3.04E-17	0.055	0.426	0.307	0.229
		0.2	7.65	3.41E-13	3.77E-17	0.051	0.384	0.275	0.184
		0.4	8.99	3.25E-13	4.14E-17	0.049	0.367	0.262	0.168
		0.6	9.82	3.18E-13	4.42E-17	0.048	0.355	0.252	0.157
		0.9	10.65	3.16E-13	4.74E-17	0.046	0.341	0.242	0.146
	5	0	5.50	3.87E-13	3.16E-17	0.054	0.420	0.302	0.220
		0.2	7.88	3.38E-13	3.80E-17	0.051	0.384	0.274	0.183
		0.4	9.13	3.23E-13	4.19E-17	0.049	0.365	0.260	0.166
		0.6	9.92	3.18E-13	4.45E-17	0.047	0.353	0.251	0.156
	6	0	5.96	3.75E-13	3.28E-17	0.054	0.413	0.296	0.212
		0.2	8.09	3.35E-13	3.83E-17	0.051	0.384	0.274	0.181
		0.4	9.25	3.22E-13	4.24E-17	0.048	0.362	0.258	0.164



					RAO30/CAU20				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	1.93E-17	0.0007	0.293	0.050	0.149
		0.2	5.60	3.72E-13	2.69E-17	0.0006	0.278	0.043	0.120
		0.4	6.92	3.37E-13	3.07E-17	0.0006	0.273	0.041	0.110
	4	0	3.57	4.65E-13	2.09E-17	0.0007	0.288	0.048	0.141
		0.2	5.83	3.65E-13	2.76E-17	0.0006	0.277	0.043	0.118
		0.4	7.00	3.34E-13	3.14E-17	0.0006	0.270	0.040	0.108
	5	0	4.00	4.39E-13	2.22E-17	0.0007	0.286	0.047	0.136
		0.2	6.04	3.59E-13	2.84E-17	0.0006	0.274	0.042	0.115
		0.4	7.18	3.32E-13	3.14E-17	0.0006	0.272	0.041	0.108
	6	0	4.38	4.19E-13	2.34E-17	0.0007	0.282	0.045	0.131
		0.2	6.23	3.54E-13	2.86E-17	0.0006	0.276	0.042	0.115
		0.4	7.29	3.30E-13	3.19E-17	0.0006	0.270	0.040	0.107
90	3	0	3.49	4.68E-13	2.26E-17	0.0007	0.284	0.046	0.133
		0.2	6.27	3.57E-13	3.07E-17	0.0006	0.269	0.041	0.109
		0.4	7.67	3.28E-13	3.48E-17	0.0005	0.262	0.038	0.100
		0.6	8.52	3.16E-13	3.77E-17	0.0005	0.256	0.037	0.095
		0.9	10.01	3.11E-13	4.39E-17	0.0004	0.248	0.035	0.085
	4	0	4.04	4.36E-13	2.43E-17	0.0006	0.280	0.045	0.127
		0.2	6.51	3.51E-13	3.13E-17	0.0005	0.268	0.040	0.107
		0.4	7.81	3.26E-13	3.51E-17	0.0005	0.262	0.038	0.100
		0.6	8.61	3.15E-13	3.79E-17	0.0005	0.257	0.037	0.095
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
	5	0	4.52	4.14E-13	2.58E-17	0.0006	0.275	0.043	0.121
		0.2	6.73	3.46E-13	3.18E-17	0.0005	0.269	0.040	0.107
		0.4	7.94	3.24E-13	3.55E-17	0.0005	0.262	0.038	0.099
		0.6	8.70	3.14E-13	3.81E-17	0.0005	0.257	0.037	0.094
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
	6	0	4.93	3.97E-13	2.69E-17	0.0006	0.275	0.043	0.119
		0.2	6.94	3.42E-13	3.23E-17	0.0005	0.268	0.040	0.105
		0.4	8.06	3.22E-13	3.57E-17	0.0005	0.262	0.038	0.099
		0.6	9.17	3.16E-13	4.10E-17	0.0005	0.251	0.036	0.089
		0.9	10.01	3.11E-13	4.39E-17	0.0004	0.248	0.035	0.085
	7	0	5.46	3.83E-13	3.00E-17	0.0006	0.267	0.041	0.110
		0.2	7.55	3.36E-13	3.58E-17	0.0005	0.259	0.038	0.098
		0.4	8.70	3.21E-13	3.94E-17	0.0005	0.253	0.036	0.092
		0.6	9.35	3.15E-13	4.15E-17	0.0005	0.251	0.036	0.089
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
	8	0	5.02	3.98E-13	2.88E-17	0.0006	0.269	0.041	0.112
		0.2	7.34	3.40E-13	3.53E-17	0.0005	0.259	0.038	0.099
		0.4	8.57	3.22E-13	3.90E-17	0.0005	0.254	0.037	0.093
		0.6	9.35	3.15E-13	4.15E-17	0.0005	0.251	0.036	0.089
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
100	3	0	3.92	4.44E-13	2.58E-17	0.0006	0.275	0.043	0.121
		0.2	6.86	3.49E-13	3.38E-17	0.0005	0.262	0.039	0.102
		0.4	8.30	3.25E-13	3.83E-17	0.0005	0.254	0.037	0.093
		0.6	9.17	3.16E-13	4.10E-17	0.0005	0.251	0.036	0.089
		0.9	10.01	3.11E-13	4.39E-17	0.0004	0.248	0.035	0.085
	4	0	4.51	4.17E-13	2.76E-17	0.0006	0.270	0.042	0.115
		0.2	7.11	3.44E-13	3.46E-17	0.0005	0.260	0.038	0.100
		0.4	8.44	3.24E-13	3.86E-17	0.0005	0.254	0.037	0.093
		0.6	9.26	3.15E-13	4.12E-17	0.0005	0.251	0.036	0.089
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
	5	0	5.02	3.98E-13	2.88E-17	0.0006	0.269	0.041	0.112
		0.2	7.34	3.40E-13	3.53E-17	0.0005	0.259	0.038	0.099
		0.4	8.57	3.22E-13	3.90E-17	0.0005	0.254	0.037	0.093
		0.6	9.35	3.15E-13	4.15E-17	0.0005	0.251	0.036	0.089
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
	6	0	5.46	3.83E-13	3.00E-17	0.0006	0.267	0.041	0.110
		0.2	7.55	3.36E-13	3.58E-17	0.0005	0.259	0.038	0.098
		0.4	8.70	3.21E-13	3.94E-17	0.0005	0.253	0.036	0.092
		0.6	9.35	3.15E-13	4.15E-17	0.0005	0.251	0.036	0.089
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
	7	0	5.02	3.98E-13	2.88E-17	0.0006	0.269	0.041	0.112
		0.2	7.34	3.40E-13	3.53E-17	0.0005	0.259	0.038	0.099
		0.4	8.57	3.22E-13	3.90E-17	0.0005	0.254	0.037	0.093
		0.6	9.35	3.15E-13	4.15E-17	0.0005	0.251	0.036	0.089
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
	8	0	5.46	3.83E-13	3.00E-17	0.0006	0.267	0.041	0.110
		0.2	7.55	3.36E-13	3.58E-17	0.0005	0.259	0.038	0.098
		0.4	8.70	3.21E-13	3.94E-17	0.0005	0.253	0.036	0.092
		0.6	9.35	3.15E-13	4.15E-17	0.0005	0.251	0.036	0.089
		0.9	10.07	3.10E-13	4.41E-17	0.0004	0.247	0.035	0.085
110	3	0	4.36	4.27E-13	2.88E-17	0.001	0.265	0.041	0.111
		0.2	7.39	3.45E-13	3.69E-17	0.000	0.255	0.037	0.095
		0.4	8.85	3.26E-13	4.12E-17	0.000	0.249	0.036	0.089
		0.6	9.73	3.19E-13	4.39E-17	0.000	0.247	0.035	0.085
		0.9	10.59	3.16E-13	4.72E-17	0.000	0.242	0.034	0.081
	4	0	4.98	4.03E-13	3.03E-17	0.001	0.264	0.040	0.108
		0.2	7.65	3.41E-13	3.77E-17	0.000	0.253	0.037	0.094
		0.4	8.99	3.25E-13	4.16E-17	0.000	0.249	0.035	0.088
		0.6	9.82	3.18E-13	4.43E-17	0.000	0.246	0.035	0.085
		0.9	10.65	3.16E-13	4.74E-17	0.000	0.242	0.034	0.081
	5	0	5.50	3.87E-13	3.15E-17	0.001	0.263	0.039	0.106
		0.2	7.88	3.38E-13	3.86E-17	0.000	0.251	0.036	0.092
		0.4	9.13	3.23E-13	4.44E-17	0.000	0.247	0.035	0.085
		0.6	9.92	3.18E-13	3.26E-17	0.001	0.262	0.039	0.103
		0.9	10.65	3.16E-13	4.74E-17	0.000	0.242	0.034	0.081
	6	0	5.96	3.75E-13	3.90E-17	0.000	0.251	0.036	0.092
		0.2	8.09	3.35E-13	4.23E-17	0.000	0.248	0.035	0.087
		0.4	9.25	3.22E-13	4.23E-17	0.000	0.248	0.035	0.087
		0.6	9.92	3.18E-13	3.26E-17	0.001	0.262	0.039	0.103
		0.9	10.65	3.16E-13	4.74E-17	0.000	0.242	0.034	0.081

					RAO30/CRA20				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
80	3	0	3.06	5.02E-13	1.93E-17	0.033	0.529	0.315	0.165
		0.2	5.60	3.72E-13	2.68E-17	0.029	0.456	0.276	0.132
		0.4	6.92	3.37E-13	3.06E-17	0.027	0.428	0.261	0.121
	4	0	3.57	4.65E-13	2.11E-17	0.032	0.506	0.303	0.156
		0.2	5.83	3.65E-13	2.75E-17	0.028	0.449	0.272	0.130
		0.4	7.00	3.34E-13	3.13E-17	0.027	0.421	0.258	0.118
	5	0	4.00	4.39E-13	2.23E-17	0.031	0.493	0.296	0.149
		0.2	6.04	3.59E-13	2.80E-17	0.028	0.447	0.271	0.128
		0.4	7.18	3.32E-13	3.17E-17	0.027	0.419	0.256	0.117
	6	0	4.38	4.19E-13	2.36E-17	0.030	0.480	0.288	0.144
		0.2	6.23	3.54E-13	2.86E-17	0.028	0.443	0.269	0.126
		0.4	7.29	3.30E-13	3.19E-17	0.027	0.418	0.256	0.117
90	3	0	3.49	4.68E-13	2.29E-17	0.030	0.481	0.289	0.146
		0.2	6.27	3.57E-13	3.05E-17	0.027	0.424	0.259	0.120
		0.4	7.67	3.28E-13	3.44E-17	0.026	0.401	0.247	0.110
		0.6	8.52	3.16E-13	3.70E-17	0.026	0.386	0.239	0.105
	4	0	4.04	4.36E-13	2.44E-17	0.030	0.469	0.282	0.139
		0.2	6.51	3.51E-13	3.12E-17	0.027	0.419	0.257	0.118
		0.4	7.81	3.26E-13	3.50E-17	0.026	0.396	0.244	0.109
		0.6	8.61	3.15E-13	3.72E-17	0.026	0.385	0.239	0.104
	5	0	4.52	4.14E-13	2.59E-17	0.029	0.455	0.275	0.134
		0.2	6.73	3.46E-13	3.21E-17	0.027	0.412	0.252	0.115
		0.4	7.94	3.24E-13	3.54E-17	0.026	0.393	0.243	0.108
		0.6	8.70	3.14E-13	3.74E-17	0.025	0.384	0.238	0.104
	6	0	4.93	3.97E-13	2.71E-17	0.028	0.446	0.270	0.130
		0.2	6.94	3.42E-13	3.27E-17	0.026	0.408	0.250	0.114
		0.4	8.06	3.22E-13	3.57E-17	0.026	0.391	0.242	0.107
100	3	0	3.92	4.44E-13	2.58E-17	0.029	0.450	0.273	0.133
		0.2	6.86	3.49E-13	3.39E-17	0.026	0.398	0.245	0.110
		0.4	8.30	3.25E-13	3.79E-17	0.025	0.377	0.234	0.102
		0.6	9.17	3.16E-13	4.05E-17	0.025	0.365	0.228	0.098
		0.9	10.01	3.11E-13	4.35E-17	0.024	0.351	0.220	0.092
	4	0	4.51	4.17E-13	2.75E-17	0.028	0.438	0.266	0.127
		0.2	7.11	3.44E-13	3.47E-17	0.026	0.392	0.242	0.109
		0.4	8.44	3.24E-13	3.81E-17	0.025	0.377	0.234	0.102
		0.6	9.26	3.15E-13	4.09E-17	0.024	0.363	0.227	0.097
		0.9	10.07	3.10E-13	4.38E-17	0.024	0.349	0.219	0.092
	5	0	5.02	3.98E-13	2.88E-17	0.028	0.428	0.261	0.123
		0.2	7.34	3.40E-13	3.51E-17	0.026	0.392	0.242	0.108
		0.4	8.57	3.22E-13	3.86E-17	0.025	0.374	0.233	0.101
		0.6	9.35	3.15E-13	4.12E-17	0.024	0.362	0.226	0.096
	6	0	5.46	3.83E-13	2.99E-17	0.027	0.422	0.258	0.120
		0.2	7.55	3.36E-13	3.56E-17	0.026	0.389	0.241	0.107
		0.4	8.70	3.21E-13	3.90E-17	0.025	0.372	0.231	0.100
110	3	0	4.36	4.27E-13	2.86E-17	0.028	0.425	0.259	0.123
		0.2	7.39	3.45E-13	3.65E-17	0.025	0.381	0.236	0.104
		0.4	8.85	3.26E-13	4.08E-17	0.024	0.360	0.225	0.096
		0.6	9.73	3.19E-13	4.35E-17	0.024	0.350	0.219	0.092
		0.9	10.59	3.16E-13	4.71E-17	0.023	0.334	0.211	0.087
	4	0	4.98	4.03E-13	3.02E-17	0.027	0.415	0.254	0.118
		0.2	7.65	3.41E-13	3.74E-17	0.025	0.376	0.233	0.102
		0.4	8.99	3.25E-13	4.10E-17	0.024	0.361	0.225	0.096
		0.6	9.82	3.18E-13	4.42E-17	0.024	0.345	0.217	0.091
		0.9	10.65	3.16E-13	4.74E-17	0.023	0.332	0.210	0.086
	5	0	5.50	3.87E-13	3.15E-17	0.027	0.408	0.250	0.115
		0.2	7.88	3.38E-13	3.82E-17	0.025	0.372	0.231	0.101
		0.4	9.13	3.23E-13	4.16E-17	0.024	0.357	0.223	0.095
		0.6	9.92	3.18E-13	4.43E-17	0.024	0.346	0.217	0.091
	6	0	5.96	3.75E-13	3.30E-17	0.026	0.397	0.244	0.112
		0.2	8.09	3.35E-13	3.86E-17	0.025	0.370	0.230	0.100
		0.4	9.25	3.22E-13	4.22E-17	0.024	0.354	0.222	0.094

Table 2.2. : Slab phantom irradiation

					PA				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
70	3	0	2.66	5.59E-13	2.06E-17	0.029	0.305	0.175	0.219
		0.2	4.88	4.04E-13	2.82E-17	0.028	0.284	0.165	0.167
		0.4	6.04	3.62E-13	3.12E-17	0.028	0.282	0.165	0.153
		0.6	6.77	3.42E-13	3.37E-17	0.028	0.275	0.162	0.143
		0.9	7.50	3.26E-13	3.52E-17	0.028	0.277	0.164	0.138
	4	0	3.10	5.15E-13	2.23E-17	0.028	0.297	0.171	0.204
		0.2	5.08	3.96E-13	2.86E-17	0.028	0.285	0.166	0.165
		0.4	6.16	3.59E-13	3.18E-17	0.028	0.280	0.164	0.151
		0.6	6.85	3.40E-13	3.38E-17	0.028	0.276	0.162	0.143
		0.9	7.55	3.25E-13	3.53E-17	0.028	0.278	0.164	0.138
	5	0	3.48	4.84E-13	2.35E-17	0.028	0.296	0.170	0.195
		0.2	5.26	3.89E-13	2.92E-17	0.028	0.284	0.165	0.163
		0.4	6.27	3.55E-13	3.21E-17	0.028	0.280	0.164	0.149
		0.6	6.93	3.38E-13	3.36E-17	0.028	0.280	0.164	0.144
	6	0	3.82	4.61E-13	2.48E-17	0.028	0.291	0.168	0.187
		0.2	5.43	3.82E-13	3.00E-17	0.027	0.279	0.163	0.158
		0.4	6.37	3.52E-13	3.23E-17	0.028	0.280	0.164	0.149
80	3	0	3.06	5.11E-13	2.40E-17	0.029	0.295	0.170	0.191
		0.2	5.60	3.78E-13	3.16E-17	0.028	0.280	0.164	0.151
		0.4	6.92	3.44E-13	3.51E-17	0.028	0.275	0.162	0.138
	4	0	3.57	4.73E-13	2.55E-17	0.028	0.292	0.169	0.181
		0.2	5.83	3.71E-13	3.24E-17	0.028	0.277	0.163	0.148
		0.4	7.00	3.41E-13	3.57E-17	0.028	0.272	0.162	0.136
	5	0	4.00	4.47E-13	2.71E-17	0.028	0.287	0.167	0.172
		0.2	6.04	3.65E-13	3.27E-17	0.028	0.279	0.163	0.146
		0.4	7.18	3.38E-13	3.59E-17	0.028	0.273	0.161	0.135
	6	0	4.38	4.27E-13	2.78E-17	0.028	0.289	0.168	0.169
		0.2	6.23	3.60E-13	3.33E-17	0.028	0.277	0.163	0.144
		0.4	7.29	3.36E-13	3.62E-17	0.028	0.273	0.161	0.134
90	3	0	3.49	4.75E-13	2.69E-17	0.028	0.289	0.168	0.173
		0.2	6.27	3.62E-13	3.47E-17	0.028	0.274	0.162	0.139
		0.4	7.67	3.33E-13	3.77E-17	0.028	0.273	0.162	0.130
		0.6	8.52	3.22E-13	4.00E-17	0.031	0.270	0.160	0.124
	4	0	4.04	4.43E-13	2.87E-17	0.028	0.284	0.166	0.163
		0.2	6.51	3.56E-13	3.51E-17	0.028	0.275	0.162	0.138
		0.4	7.81	3.31E-13	3.81E-17	0.028	0.273	0.161	0.129
		0.6	8.61	3.20E-13	4.01E-17	0.028	0.269	0.160	0.123
	5	0	4.52	4.21E-13	2.98E-17	0.028	0.284	0.166	0.159
		0.2	6.73	3.52E-13	3.58E-17	0.028	0.273	0.162	0.135
		0.4	7.94	3.30E-13	3.82E-17	0.028	0.272	0.162	0.128
		0.6	8.70	3.19E-13	4.04E-17	0.028	0.270	0.160	0.123
	6	0	4.93	4.03E-13	3.14E-17	0.028	0.277	0.162	0.151
		0.2	6.94	3.47E-13	3.63E-17	0.028	0.272	0.161	0.134
		0.4	8.06	3.27E-13	3.86E-17	0.028	0.272	0.162	0.127
100	3	0	3.92	4.51E-13	3.01E-17	0.028	0.278	0.163	0.157
		0.2	6.86	3.55E-13	3.70E-17	0.028	0.272	0.161	0.132
		0.4	8.30	3.31E-13	4.03E-17	0.028	0.268	0.159	0.123
		0.6	9.17	3.22E-13	4.25E-17	0.028	0.265	0.158	0.117
		0.9	10.01	3.16E-13	4.50E-17	0.028	0.261	0.157	0.111
	4	0	4.51	4.24E-13	3.15E-17	0.028	0.277	0.162	0.151
		0.2	7.11	3.50E-13	3.77E-17	0.028	0.270	0.160	0.129
		0.4	8.44	3.30E-13	4.08E-17	0.028	0.267	0.159	0.121
		0.6	9.26	3.21E-13	4.28E-17	0.028	0.265	0.158	0.116
		0.9	10.07	3.16E-13	4.51E-17	0.028	0.261	0.157	0.111
	5	0	5.02	4.05E-13	3.27E-17	0.028	0.276	0.162	0.146
		0.2	7.34	3.46E-13	3.80E-17	0.028	0.271	0.160	0.129
		0.4	8.57	3.28E-13	4.11E-17	0.028	0.267	0.159	0.121
		0.6	9.35	3.20E-13	4.32E-17	0.028	0.263	0.157	0.115
	6	0	5.46	3.90E-13	3.40E-17	0.028	0.273	0.161	0.142
		0.2	7.55	3.42E-13	3.86E-17	0.028	0.269	0.160	0.127
		0.4	8.70	3.27E-13	4.15E-17	0.028	0.266	0.158	0.119



					LAO30				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
70	3	0	2.66	5.59E-13	1.33E-17	0.083	0.429	0.329	0.440
		0.2	4.88	4.04E-13	1.89E-17	0.072	0.387	0.281	0.312
		0.4	6.04	3.62E-13	2.11E-17	0.071	0.383	0.273	0.281
		0.6	6.77	3.42E-13					
		0.9	7.50	3.26E-13					
	4	0	3.10	5.15E-13	1.45E-17	0.080	0.417	0.315	0.404
		0.2	5.08	3.96E-13	1.94E-17	0.071	0.383	0.277	0.304
		0.4	6.16	3.59E-13	2.12E-17	0.071	0.385	0.274	0.279
		0.6	6.85	3.40E-13					
		0.9	7.55	3.25E-13					
	5	0	3.48	4.84E-13	1.56E-17	0.077	0.406	0.304	0.376
		0.2	5.26	3.89E-13	1.99E-17	0.071	0.382	0.275	0.298
		0.4	6.27	3.55E-13	2.18E-17	0.070	0.378	0.268	0.272
		0.6	6.93	3.38E-13					
	6	0	3.82	4.61E-13	1.63E-17	0.076	0.403	0.299	0.361
		0.2	5.43	3.82E-13	2.02E-17	0.071	0.380	0.274	0.293
		0.4	6.37	3.52E-13	2.19E-17	0.070	0.378	0.268	0.270
80	3	0	3.06	5.11E-13	1.62E-17	0.076	0.399	0.298	0.361
		0.2	5.60	3.78E-13	2.15E-17	0.071	0.378	0.269	0.275
		0.4	6.92	3.44E-13	2.39E-17	0.069	0.370	0.260	0.248
	4	0	3.57	4.73E-13	1.71E-17	0.076	0.400	0.295	0.344
		0.2	5.83	3.71E-13	2.20E-17	0.070	0.375	0.266	0.269
		0.4	7.00	3.41E-13	2.40E-17	0.069	0.372	0.261	0.247
	5	0	4.00	4.47E-13	1.82E-17	0.074	0.390	0.285	0.323
		0.2	6.04	3.65E-13	2.25E-17	0.069	0.372	0.264	0.263
		0.4	7.18	3.38E-13	2.44E-17	0.068	0.368	0.258	0.242
	6	0	4.38	4.27E-13	1.90E-17	0.073	0.387	0.281	0.310
		0.2	6.23	3.60E-13	2.28E-17	0.069	0.371	0.263	0.259
		0.4	7.29	3.36E-13	2.47E-17	0.068	0.367	0.257	0.240
90	3	0	3.49	4.75E-13	1.93E-17	0.076	0.372	0.290	0.307
		0.2	6.27	3.62E-13	2.52E-17	0.070	0.352	0.260	0.238
		0.4	7.67	3.33E-13	2.78E-17	0.068	0.346	0.253	0.216
		0.6	8.52	3.22E-13	2.94E-17	0.067	0.340	0.247	0.204
	4	0	4.04	4.43E-13	2.07E-17	0.074	0.364	0.280	0.288
		0.2	6.51	3.56E-13	2.60E-17	0.068	0.346	0.255	0.231
		0.4	7.81	3.31E-13	2.83E-17	0.067	0.341	0.249	0.212
		0.6	8.61	3.20E-13	2.95E-17	0.067	0.339	0.247	0.203
	5	0	4.52	4.21E-13	2.15E-17	0.073	0.363	0.277	0.278
		0.2	6.73	3.52E-13	2.65E-17	0.068	0.343	0.253	0.226
		0.4	7.94	3.30E-13	2.83E-17	0.068	0.344	0.250	0.212
		0.6	8.70	3.19E-13	2.98E-17	0.066	0.339	0.245	0.201
	6	0	4.93	4.03E-13	2.26E-17	0.071	0.358	0.271	0.264
		0.2	6.94	3.47E-13	2.67E-17	0.068	0.345	0.254	0.225
		0.4	8.06	3.27E-13	2.84E-17	0.068	0.344	0.250	0.211
100	3	0	3.92	4.51E-13	2.01E-17	0.072	0.381	0.276	0.293
		0.2	6.86	3.55E-13	2.52E-17	0.068	0.365	0.256	0.235
		0.4	8.30	3.31E-13	2.85E-17	0.065	0.349	0.241	0.209
		0.6	9.17	3.22E-13	2.98E-17	0.065	0.348	0.239	0.199
		0.9	10.01	3.16E-13	3.15E-17	0.065	0.344	0.236	0.189
	4	0	4.51	4.24E-13	2.13E-17	0.071	0.375	0.269	0.278
		0.2	7.11	3.50E-13	2.60E-17	0.067	0.359	0.250	0.228
		0.4	8.44	3.30E-13	2.87E-17	0.065	0.349	0.241	0.207
		0.6	9.26	3.21E-13	2.99E-17	0.065	0.349	0.239	0.199
		0.9	10.07	3.16E-13	3.17E-17	0.065	0.343	0.235	0.188
	5	0	5.02	4.05E-13	2.21E-17	0.070	0.375	0.266	0.267
		0.2	7.34	3.46E-13	2.65E-17	0.067	0.357	0.248	0.224
		0.4	8.57	3.28E-13	2.88E-17	0.066	0.350	0.241	0.206
		0.6	9.35	3.20E-13	3.02E-17	0.065	0.347	0.238	0.197
	6	0	5.46	3.90E-13	2.29E-17	0.070	0.372	0.263	0.259
		0.2	7.55	3.42E-13	2.68E-17	0.067	0.356	0.248	0.221
		0.4	8.70	3.27E-13	2.92E-17	0.065	0.347	0.239	0.203



					LAO60				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
70	3	0	2.66	5.59E-13	5.58E-18	0.296	0.908	1.187	1.096
		0.2	4.88	4.04E-13	7.32E-18	0.255	0.886	1.010	0.834
		0.4	6.04	3.62E-13	7.97E-18	0.245	0.895	0.970	0.764
		0.6	6.77	3.42E-13					
		0.9	7.50	3.26E-13					
	4	0	3.10	5.15E-13	5.73E-18	0.296	0.936	1.184	1.068
		0.2	5.08	3.96E-13	7.26E-18	0.259	0.909	1.027	0.842
		0.4	6.16	3.59E-13	8.24E-18	0.239	0.875	0.943	0.739
		0.6	6.85	3.40E-13					
		0.9	7.55	3.25E-13					
	5	0	3.48	4.84E-13	6.13E-18	0.284	0.916	1.131	0.997
		0.2	5.26	3.89E-13	7.54E-18	0.252	0.890	0.995	0.809
		0.4	6.27	3.55E-13	8.18E-18	0.241	0.888	0.954	0.744
		0.6	6.93	3.38E-13					
	6	0	3.82	4.61E-13	6.30E-18	0.281	0.924	1.119	0.971
		0.2	5.43	3.82E-13	7.71E-18	0.248	0.882	0.980	0.791
		0.4	6.37	3.52E-13	8.26E-18	0.240	0.885	0.949	0.736
80	3	0	3.06	5.11E-13	6.18E-18	0.283	0.927	1.130	0.988
		0.2	5.60	3.78E-13	8.34E-18	0.235	0.860	0.930	0.730
		0.4	6.92	3.44E-13	9.35E-18	0.220	0.836	0.866	0.648
	4	0	3.57	4.73E-13	6.91E-18	0.260	0.874	1.034	0.883
		0.2	5.83	3.71E-13	8.64E-18	0.229	0.842	0.905	0.704
		0.4	7.00	3.41E-13	9.43E-18	0.220	0.837	0.863	0.644
	5	0	4.00	4.47E-13	7.13E-18	0.257	0.882	1.022	0.856
		0.2	6.04	3.65E-13	8.61E-18	0.232	0.858	0.914	0.706
		0.4	7.18	3.38E-13	9.49E-18	0.219	0.838	0.862	0.640
	6	0	4.38	4.27E-13	7.48E-18	0.250	0.869	0.993	0.815
		0.2	6.23	3.60E-13	8.69E-18	0.231	0.861	0.911	0.699
		0.4	7.29	3.36E-13	9.46E-18	0.220	0.847	0.868	0.643
90	3	0	3.49	4.75E-13	7.48E-18	0.231	0.819	0.928	0.806
		0.2	6.27	3.62E-13	9.47E-18	0.206	0.792	0.812	0.635
		0.4	7.67	3.33E-13	1.04E-17	0.198	0.789	0.776	0.579
		0.6	8.52	3.22E-13	1.10E-17	0.192	0.777	0.751	0.545
	4	0	4.04	4.43E-13	7.80E-18	0.228	0.825	0.913	0.779
		0.2	6.51	3.56E-13	9.63E-18	0.205	0.790	0.812	0.623
		0.4	7.81	3.31E-13	1.05E-17	0.196	0.782	0.768	0.570
		0.6	8.61	3.20E-13	1.11E-17	0.191	0.775	0.747	0.541
	5	0	4.52	4.21E-13	8.16E-18	0.223	0.816	0.888	0.739
		0.2	6.73	3.52E-13	9.88E-18	0.201	0.782	0.793	0.607
		0.4	7.94	3.30E-13	1.06E-17	0.196	0.781	0.766	0.567
		0.6	8.70	3.19E-13	1.12E-17	0.189	0.769	0.740	0.527
	6	0	4.93	4.03E-13	8.37E-18	0.221	0.822	0.880	0.720
		0.2	6.94	3.47E-13	9.77E-18	0.205	0.800	0.807	0.614
		0.4	8.06	3.27E-13	1.08E-17	0.192	0.768	0.751	0.553
100	3	0	3.92	4.51E-13	7.91E-18	0.241	0.855	0.955	0.769
		0.2	6.86	3.55E-13	1.00E-17	0.210	0.808	0.827	0.605
		0.4	8.30	3.31E-13	1.08E-17	0.203	0.807	0.797	0.559
		0.6	9.17	3.22E-13	1.15E-17	0.197	0.792	0.767	0.525
		0.9	10.01	3.16E-13	1.24E-17	0.187	0.767	0.728	0.488
	4	0	4.51	4.24E-13	8.48E-18	0.230	0.832	0.908	0.718
		0.2	7.11	3.50E-13	1.00E-17	0.212	0.820	0.834	0.605
		0.4	8.44	3.30E-13	1.08E-17	0.204	0.811	0.798	0.558
		0.6	9.26	3.21E-13	1.17E-17	0.195	0.786	0.759	0.519
		0.9	10.07	3.16E-13	1.25E-17	0.186	0.763	0.725	0.484
	5	0	5.02	4.05E-13	8.79E-18	0.226	0.829	0.890	0.693
		0.2	7.34	3.46E-13	1.01E-17	0.212	0.825	0.833	0.602
		0.4	8.57	3.28E-13	1.09E-17	0.203	0.810	0.795	0.554
		0.6	9.35	3.20E-13	1.17E-17	0.194	0.785	0.756	0.515
	6	0	5.46	3.90E-13	9.23E-18	0.218	0.811	0.860	0.660
		0.2	7.55	3.42E-13	1.03E-17	0.210	0.820	0.825	0.591
		0.4	8.70	3.27E-13	1.11E-17	0.201	0.802	0.786	0.545



					LAO90				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
70	3	0	2.66	5.59E-13	1.42E-18	1.663	3.792	6.158	2.463
		0.2	4.88	4.04E-13	2.11E-18	1.210	3.143	4.438	1.741
		0.4	6.04	3.62E-13	2.45E-18	1.073	2.945	3.933	1.529
		0.6	6.77	3.42E-13					
		0.9	7.50	3.26E-13					
	4	0	3.10	5.15E-13	1.44E-18	1.673	3.923	6.162	2.458
		0.2	5.08	3.96E-13	2.16E-18	1.191	3.128	4.369	1.710
		0.4	6.16	3.59E-13	2.45E-18	1.075	2.962	3.940	1.530
		0.6	6.85	3.40E-13					
		0.9	7.55	3.25E-13					
	5	0	3.48	4.84E-13	1.58E-18	1.548	3.721	5.693	2.265
		0.2	5.26	3.89E-13	2.18E-18	1.181	3.128	4.330	1.693
		0.4	6.27	3.55E-13	2.32E-18	1.118	2.979	4.099	1.602
		0.6	6.93	3.38E-13					
	6	0	3.82	4.61E-13	1.75E-18	1.413	3.468	5.197	2.060
		0.2	5.43	3.82E-13	2.32E-18	1.118	2.979	4.099	1.602
		0.4	6.37	3.52E-13	2.39E-18	1.109	3.086	4.063	1.578
80	3	0	3.06	5.11E-13	1.81E-18	1.345	3.292	4.975	1.973
		0.2	5.60	3.78E-13	2.56E-18	1.024	2.822	3.764	1.461
		0.4	6.92	3.44E-13	2.83E-18	0.950	2.752	3.492	1.344
	4	0	3.57	4.73E-13	2.10E-18	1.183	2.970	4.363	1.725
		0.2	5.83	3.71E-13	2.60E-18	1.012	2.817	3.721	1.441
		0.4	7.00	3.41E-13	2.88E-18	0.938	2.733	3.449	1.326
	5	0	4.00	4.47E-13	2.16E-18	1.169	2.990	4.308	1.692
		0.2	6.04	3.65E-13	2.62E-18	1.011	2.835	3.712	1.435
		0.4	7.18	3.38E-13	2.98E-18	0.908	2.655	3.336	1.282
	6	0	4.38	4.27E-13	2.24E-18	1.136	2.969	4.184	1.641
		0.2	6.23	3.60E-13	2.66E-18	1.001	2.828	3.674	1.420
		0.4	7.29	3.36E-13	3.03E-18	0.895	2.633	3.294	1.264
90	3	0	3.49	4.75E-13	2.33E-18	1.075	2.764	3.972	1.560
		0.2	6.27	3.62E-13	3.12E-18	0.860	2.462	3.159	1.217
		0.4	7.67	3.33E-13	3.88E-18	0.707	2.132	2.605	0.993
		0.6	8.52	3.22E-13	4.14E-18	0.672	2.072	2.491	0.943
	4	0	4.04	4.43E-13	2.53E-18	1.004	2.656	3.707	1.450
		0.2	6.51	3.56E-13	3.28E-18	0.820	2.373	3.020	1.159
		0.4	7.81	3.31E-13	3.86E-18	0.712	2.146	2.614	0.999
		0.6	8.61	3.20E-13	4.20E-18	0.661	2.046	2.450	0.928
	5	0	4.52	4.21E-13	2.58E-18	0.994	2.681	3.671	1.431
		0.2	6.73	3.52E-13	3.46E-18	0.781	2.286	2.877	1.103
		0.4	7.94	3.30E-13	3.88E-18	0.712	2.155	2.631	0.998
		0.6	8.70	3.19E-13	4.22E-18	0.662	2.049	2.442	0.927
	6	0	4.93	4.03E-13	2.88E-18	0.901	2.465	3.318	1.290
		0.2	6.94	3.47E-13	3.40E-18	0.797	2.349	2.937	1.123
		0.4	8.06	3.27E-13	3.92E-18	0.704	2.141	2.603	0.988
100	3	0	3.92	4.51E-13	2.49E-18	1.026	2.750	3.786	1.477
		0.2	6.86	3.55E-13	3.36E-18	0.811	2.407	2.984	1.142
		0.4	8.30	3.31E-13	3.88E-18	0.720	2.223	2.652	1.006
		0.6	9.17	3.22E-13	4.00E-18	0.708	2.240	2.609	0.985
		0.9	10.01	3.16E-13	4.60E-18	0.625	2.015	2.302	0.865
	4	0	4.51	4.24E-13	2.70E-18	0.963	2.643	3.546	1.378
		0.2	7.11	3.50E-13	3.40E-18	0.804	2.402	2.958	1.131
		0.4	8.44	3.30E-13	3.81E-18	0.734	2.272	2.701	1.024
		0.6	9.26	3.21E-13	4.12E-18	0.688	2.180	2.537	0.957
		0.9	10.07	3.16E-13	4.69E-18	0.613	1.981	2.259	0.849
	5	0	5.02	4.05E-13	2.79E-18	0.942	2.627	3.462	1.342
		0.2	7.34	3.46E-13	3.47E-18	0.791	2.381	2.910	1.112
		0.4	8.57	3.28E-13	3.82E-18	0.734	2.282	2.703	1.024
		0.6	9.35	3.20E-13	4.12E-18	0.689	2.188	2.539	0.957
	6	0	5.46	3.90E-13	2.92E-18	0.907	2.573	3.341	1.291
		0.2	7.55	3.42E-13	3.51E-18	0.784	2.373	2.888	1.102
		0.4	8.70	3.27E-13	3.90E-18	0.720	2.249	2.655	1.005



					RAO30				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
70	3	0	2.66	5.59E-13	1.34E-17	0.011	0.437	0.265	0.296
		0.2	4.88	4.04E-13	1.86E-17	0.010	0.404	0.247	0.225
		0.4	6.04	3.62E-13	2.15E-17	0.009	0.387	0.237	0.200
		0.6	6.77	3.42E-13					
		0.9	7.50	3.26E-13					
	4	0	3.10	5.15E-13	1.43E-17	0.011	0.436	0.265	0.282
		0.2	5.08	3.96E-13	1.92E-17	0.010	0.398	0.244	0.219
		0.4	6.16	3.59E-13	2.16E-17	0.009	0.387	0.238	0.199
		0.6	6.85	3.40E-13					
		0.9	7.55	3.25E-13					
	5	0	3.48	4.84E-13	1.52E-17	0.011	0.428	0.261	0.267
		0.2	5.26	3.89E-13	1.98E-17	0.009	0.395	0.242	0.214
		0.4	6.27	3.55E-13	2.18E-17	0.009	0.388	0.238	0.198
		0.6	6.93	3.38E-13					
	6	0	3.82	4.61E-13	1.61E-17	0.010	0.420	0.256	0.255
		0.2	5.43	3.82E-13	2.01E-17	0.009	0.393	0.241	0.211
		0.4	6.37	3.52E-13	2.22E-17	0.009	0.384	0.236	0.195
80	3	0	3.06	5.11E-13	1.58E-17	0.010	0.421	0.258	0.257
		0.2	5.60	3.78E-13	2.13E-17	0.009	0.393	0.242	0.202
		0.4	6.92	3.44E-13	2.42E-17	0.009	0.377	0.233	0.181
	4	0	3.57	4.73E-13	1.67E-17	0.010	0.420	0.257	0.247
		0.2	5.83	3.71E-13	2.18E-17	0.009	0.390	0.240	0.198
		0.4	7.00	3.41E-13	2.42E-17	0.009	0.381	0.235	0.182
	5	0	4.00	4.47E-13	1.77E-17	0.010	0.412	0.253	0.235
		0.2	6.04	3.65E-13	2.25E-17	0.009	0.383	0.236	0.192
		0.4	7.18	3.38E-13	2.48E-17	0.008	0.374	0.231	0.178
	6	0	4.38	4.27E-13	1.88E-17	0.010	0.403	0.247	0.223
		0.2	6.23	3.60E-13	2.27E-17	0.009	0.386	0.237	0.192
		0.4	7.29	3.36E-13	2.48E-17	0.008	0.377	0.233	0.178
90	3	0	3.49	4.75E-13	1.92E-17	0.008	0.382	0.234	0.217
		0.2	6.27	3.62E-13	2.50E-17	0.007	0.360	0.222	0.175
		0.4	7.67	3.33E-13	2.77E-17	0.007	0.351	0.218	0.161
		0.6	8.52	3.22E-13	2.94E-17	0.006	0.347	0.216	0.154
	4	0	4.04	4.43E-13	2.08E-17	0.007	0.369	0.227	0.202
		0.2	6.51	3.56E-13	2.56E-17	0.007	0.357	0.221	0.172
		0.4	7.81	3.31E-13	2.82E-17	0.006	0.349	0.217	0.158
		0.6	8.61	3.20E-13	2.96E-17	0.006	0.344	0.216	0.152
	5	0	4.52	4.21E-13	2.18E-17	0.007	0.367	0.226	0.195
		0.2	6.73	3.52E-13	2.57E-17	0.007	0.359	0.223	0.172
		0.4	7.94	3.30E-13	2.83E-17	0.006	0.350	0.217	0.158
		0.6	8.70	3.19E-13	2.98E-17	0.006	0.346	0.216	0.152
	6	0	4.93	4.03E-13	2.20E-17	0.007	0.373	0.230	0.194
		0.2	6.94	3.47E-13	2.64E-17	0.007	0.355	0.220	0.168
		0.4	8.06	3.27E-13	2.87E-17	0.006	0.347	0.216	0.156
100	3	0	3.92	4.51E-13	1.99E-17	0.009	0.396	0.245	0.213
		0.2	6.86	3.55E-13	2.54E-17	0.008	0.374	0.232	0.174
		0.4	8.30	3.31E-13	2.81E-17	0.008	0.366	0.228	0.161
		0.6	9.17	3.22E-13	2.99E-17	0.008	0.359	0.224	0.153
		0.9	10.01	3.16E-13	3.19E-17	0.007	0.351	0.220	0.145
	4	0	4.51	4.24E-13	2.13E-17	0.009	0.386	0.239	0.201
		0.2	7.11	3.50E-13	2.60E-17	0.008	0.372	0.231	0.171
		0.4	8.44	3.30E-13	2.85E-17	0.008	0.363	0.226	0.159
		0.6	9.26	3.21E-13	3.01E-17	0.007	0.358	0.224	0.152
		0.9	10.07	3.16E-13	3.21E-17	0.007	0.350	0.220	0.144
	5	0	5.02	4.05E-13	2.16E-17	0.009	0.394	0.244	0.199
		0.2	7.34	3.46E-13	2.64E-17	0.008	0.370	0.230	0.169
		0.4	8.57	3.28E-13	2.88E-17	0.008	0.362	0.226	0.158
		0.6	9.35	3.20E-13	3.02E-17	0.007	0.358	0.224	0.152
	6	0	5.46	3.90E-13	2.29E-17	0.009	0.382	0.237	0.189
		0.2	7.55	3.42E-13	2.66E-17	0.008	0.372	0.231	0.168
		0.4	8.70	3.27E-13	2.90E-17	0.008	0.361	0.225	0.156



					RAO60				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
70	3	0	2.66	5.59E-13	5.80E-18	0.110	0.796	0.477	0.586
		0.2	4.88	4.04E-13	7.34E-18	0.107	0.812	0.486	0.487
		0.4	6.04	3.62E-13	8.36E-18	0.101	0.788	0.470	0.435
		0.6	6.77	3.42E-13					
		0.9	7.50	3.26E-13					
	4	0	3.10	5.15E-13	5.85E-18	0.115	0.839	0.503	0.588
		0.2	5.08	3.96E-13	7.51E-18	0.105	0.807	0.481	0.477
		0.4	6.16	3.59E-13	8.48E-18	0.100	0.783	0.469	0.430
		0.6	6.85	3.40E-13					
		0.9	7.55	3.25E-13					
	5	0	3.48	4.84E-13	6.16E-18	0.113	0.834	0.499	0.564
		0.2	5.26	3.89E-13	7.82E-18	0.103	0.788	0.470	0.460
		0.4	6.27	3.55E-13	8.53E-18	0.101	0.786	0.470	0.429
		0.6	6.93	3.38E-13					
	6	0	3.82	4.61E-13	6.50E-18	0.111	0.820	0.491	0.538
		0.2	5.43	3.82E-13	8.04E-18	0.101	0.778	0.464	0.448
		0.4	6.37	3.52E-13	8.63E-18	0.100	0.782	0.468	0.424
80	3	0	3.06	5.11E-13	6.66E-18	0.106	0.790	0.472	0.523
		0.2	5.60	3.78E-13	8.49E-18	0.100	0.780	0.467	0.430
		0.4	6.92	3.44E-13	9.66E-18	0.095	0.751	0.450	0.386
	4	0	3.57	4.73E-13	7.05E-18	0.105	0.786	0.471	0.500
		0.2	5.83	3.71E-13	8.70E-18	0.099	0.774	0.465	0.422
		0.4	7.00	3.41E-13	9.69E-18	0.095	0.755	0.453	0.386
	5	0	4.00	4.47E-13	7.35E-18	0.104	0.789	0.475	0.483
		0.2	6.04	3.65E-13	8.71E-18	0.100	0.784	0.470	0.423
		0.4	7.18	3.38E-13	9.83E-18	0.094	0.751	0.450	0.381
	6	0	4.38	4.27E-13	7.66E-18	0.103	0.783	0.472	0.467
		0.2	6.23	3.60E-13	9.10E-18	0.097	0.763	0.457	0.406
		0.4	7.29	3.36E-13	9.82E-18	0.095	0.757	0.455	0.382
90	3	0	3.49	4.75E-13	7.62E-18	0.096	0.762	0.457	0.467
		0.2	6.27	3.62E-13	9.53E-18	0.091	0.752	0.450	0.391
		0.4	7.67	3.33E-13	1.07E-17	0.086	0.738	0.437	0.356
		0.6	8.52	3.22E-13	1.12E-17	0.086	0.733	0.439	0.345
	4	0	4.04	4.43E-13	7.87E-18	0.097	0.775	0.464	0.457
		0.2	6.51	3.56E-13	9.63E-18	0.091	0.756	0.452	0.388
		0.4	7.81	3.31E-13	1.05E-17	0.088	0.746	0.446	0.361
		0.6	8.61	3.20E-13	1.13E-17	0.085	0.726	0.436	0.340
	5	0	4.52	4.21E-13	8.35E-18	0.094	0.758	0.454	0.434
		0.2	6.73	3.52E-13	9.70E-18	0.091	0.761	0.455	0.387
		0.4	7.94	3.30E-13	1.06E-17	0.088	0.750	0.448	0.361
		0.6	8.70	3.19E-13	1.14E-17	0.085	0.727	0.436	0.340
	6	0	4.93	4.03E-13	8.38E-18	0.096	0.782	0.467	0.434
		0.2	6.94	3.47E-13	1.00E-17	0.089	0.746	0.447	0.376
		0.4	8.06	3.27E-13	1.06E-17	0.089	0.755	0.452	0.362
100	3	0	3.92	4.51E-13	8.16E-18	0.100	0.769	0.464	0.444
		0.2	6.86	3.55E-13	1.03E-17	0.093	0.740	0.447	0.369
		0.4	8.30	3.31E-13	1.10E-17	0.092	0.746	0.452	0.352
		0.6	9.17	3.22E-13	1.14E-17	0.093	0.752	0.456	0.343
		0.9	10.01	3.16E-13	1.24E-17	0.089	0.726	0.441	0.322
	4	0	4.51	4.24E-13	8.51E-18	0.100	0.770	0.466	0.430
		0.2	7.11	3.50E-13	1.03E-17	0.093	0.747	0.451	0.369
		0.4	8.44	3.30E-13	1.11E-17	0.092	0.745	0.451	0.350
		0.6	9.26	3.21E-13	1.15E-17	0.092	0.749	0.455	0.341
		0.9	10.07	3.16E-13	1.25E-17	0.089	0.725	0.440	0.321
	5	0	5.02	4.05E-13	8.81E-18	0.099	0.771	0.464	0.418
		0.2	7.34	3.46E-13	1.03E-17	0.094	0.757	0.457	0.370
		0.4	8.57	3.28E-13	1.11E-17	0.093	0.748	0.453	0.349
		0.6	9.35	3.20E-13	1.16E-17	0.092	0.747	0.453	0.339
	6	0	5.46	3.90E-13	9.26E-18	0.096	0.754	0.455	0.401
		0.2	7.55	3.42E-13	1.05E-17	0.093	0.751	0.454	0.364
		0.4	8.70	3.27E-13	1.12E-17	0.092	0.747	0.453	0.347

					RAO90				
SPECTRA			HVL (mmAl)	KAP (Gy.cm ²)	EXIT DOSE	eye/exit dose	hand/exit dose	wrist/exit dose	leg/exit dose
kV	mm Al	mm Cu							
70	3	0	2.66	5.59E-13	1.36E-18	0.826	3.176	1.604	0.969
		0.2	4.88	4.04E-13	1.96E-18	0.690	2.766	1.406	0.798
		0.4	6.04	3.62E-13	2.33E-18	0.622	2.540	1.300	0.714
		0.6	6.77	3.42E-13					
		0.9	7.50	3.26E-13					
	4	0	3.10	5.15E-13	1.44E-18	0.818	3.181	1.604	0.956
		0.2	5.08	3.96E-13	2.13E-18	0.641	2.580	1.312	0.738
		0.4	6.16	3.59E-13	2.42E-18	0.603	2.470	1.264	0.694
		0.6	6.85	3.40E-13					
		0.9	7.55	3.25E-13					
	5	0	3.48	4.84E-13	1.63E-18	0.744	2.916	1.468	0.865
		0.2	5.26	3.89E-13	2.10E-18	0.660	2.662	1.355	0.760
		0.4	6.27	3.55E-13	2.45E-18	0.598	2.448	1.255	0.686
		0.6	6.93	3.38E-13					
	6	0	3.82	4.61E-13	1.75E-18	0.714	2.807	1.420	0.827
		0.2	5.43	3.82E-13	2.18E-18	0.642	2.597	1.324	0.738
		0.4	6.37	3.52E-13	2.51E-18	0.589	2.418	1.245	0.676
80	3	0	3.06	5.11E-13	1.77E-18	0.694	2.734	1.394	0.808
		0.2	5.60	3.78E-13	2.42E-18	0.604	2.466	1.273	0.696
		0.4	6.92	3.44E-13	2.84E-18	0.550	2.284	1.182	0.629
	4	0	3.57	4.73E-13	2.01E-18	0.637	2.529	1.289	0.739
		0.2	5.83	3.71E-13	2.58E-18	0.572	2.345	1.208	0.657
		0.4	7.00	3.41E-13	2.83E-18	0.553	2.300	1.194	0.633
	5	0	4.00	4.47E-13	2.07E-18	0.639	2.561	1.306	0.739
		0.2	6.04	3.65E-13	2.62E-18	0.569	2.340	1.208	0.653
		0.4	7.18	3.38E-13	2.98E-18	0.530	2.207	1.146	0.606
	6	0	4.38	4.27E-13	2.09E-18	0.648	2.614	1.335	0.748
		0.2	6.23	3.60E-13	2.64E-18	0.569	2.347	1.214	0.654
		0.4	7.29	3.36E-13	3.01E-18	0.527	2.196	1.142	0.602
90	3	0	3.49	4.75E-13	2.49E-18	0.526	2.130	1.093	0.615
		0.2	6.27	3.62E-13	3.24E-18	0.476	1.974	1.023	0.547
		0.4	7.67	3.33E-13	3.90E-18	0.420	1.770	0.922	0.482
		0.6	8.52	3.22E-13	4.26E-18	0.399	1.694	0.888	0.456
	4	0	4.04	4.43E-13	2.84E-18	0.478	1.946	0.999	0.556
		0.2	6.51	3.56E-13	3.47E-18	0.450	1.869	0.969	0.513
		0.4	7.81	3.31E-13	3.86E-18	0.427	1.797	0.942	0.487
		0.6	8.61	3.20E-13	4.37E-18	0.392	1.661	0.873	0.447
	5	0	4.52	4.21E-13	2.88E-18	0.489	1.984	1.023	0.569
		0.2	6.73	3.52E-13	3.44E-18	0.459	1.907	0.991	0.523
		0.4	7.94	3.30E-13	4.09E-18	0.406	1.705	0.892	0.464
		0.6	8.70	3.19E-13	4.49E-18	0.383	1.622	0.853	0.437
	6	0	4.93	4.03E-13	2.91E-18	0.495	2.024	1.045	0.570
		0.2	6.94	3.47E-13	3.56E-18	0.446	1.863	0.971	0.511
		0.4	8.06	3.27E-13	4.09E-18	0.408	1.717	0.899	0.464
100	3	0	3.92	4.51E-13	2.53E-18	0.555	2.250	1.172	0.641
		0.2	6.86	3.55E-13	3.43E-18	0.472	1.966	1.033	0.541
		0.4	8.30	3.31E-13	3.87E-18	0.444	1.870	0.989	0.508
		0.6	9.17	3.22E-13	4.14E-18	0.431	1.828	0.972	0.492
		0.9	10.01	3.16E-13	4.51E-18	0.410	1.749	0.937	0.469
	4	0	4.51	4.24E-13	2.55E-18	0.569	2.315	1.206	0.657
		0.2	7.11	3.50E-13	3.36E-18	0.487	2.029	1.068	0.558
		0.4	8.44	3.30E-13	3.95E-18	0.438	1.848	0.978	0.501
		0.6	9.26	3.21E-13	4.24E-18	0.422	1.790	0.952	0.482
		0.9	10.07	3.16E-13	4.51E-18	0.412	1.756	0.940	0.470
	5	0	5.02	4.05E-13	2.72E-18	0.547	2.244	1.169	0.631
		0.2	7.34	3.46E-13	3.47E-18	0.476	1.987	1.048	0.544
		0.4	8.57	3.28E-13	3.93E-18	0.443	1.868	0.990	0.506
		0.6	9.35	3.20E-13	4.22E-18	0.426	1.808	0.964	0.487
	6	0	5.46	3.90E-13	2.89E-18	0.525	2.157	1.126	0.603
		0.2	7.55	3.42E-13	3.43E-18	0.486	2.031	1.070	0.555
		0.4	8.70	3.27E-13	3.92E-18	0.446	1.884	0.998	0.510

Appendix 3: Detailed Simulation Results

Table 3.1: kVp dependence

Table 3.1.1. Head irradiation												
Irradiated body part		head	x=90		* Hand, wrist and leg doses are expressed in Hp(0.07) (Sv)							
Protective equipment		none			** Eye lens doses are expressed in Hp(3) (Sv)							
Field diameter (cm)		20										
Operator's position		3 (x=52)	radial access									
38cm from centre of primary beam												
				Exit dose (Gy/nps)	* L Hand / exit dose	* R Hand / exit dose	* L Wrist / exit dose	* R Wrist / exit dose	* L Leg / exit dose	* R Leg / exit dose	** L eye lens / exit dose	** R eye lens / exit dose
80kV	3 mmAl	0 mmCu	Projections									
HVL (mmAl)	3,06		AP	1,18E-17	0,547	0,094	0,599	0,086	0,033	0,009	0,192	0,147
KAP (Gy·cm²/nps)	5,01893E-13		PA	1,17E-17	0,097	0,010	0,369	0,025	0,260	0,167	0,033	0,027
			LAO30	1,49E-17	0,109	0,012	0,454	0,043	0,270	0,144	0,059	0,044
			LAO60	2,18E-17	0,112	0,009	0,427	0,044	0,135	0,059	0,051	0,038
			LAO90	2,76E-17	0,150	0,016	0,458	0,051	0,067	0,023	0,056	0,041
			RAO30	1,49E-17	0,074	0,007	0,118	0,010	0,114	0,081	0,001	0,001
			RAO60	2,18E-17	0,061	0,005	0,018	0,007	0,046	0,033	0,007	0,007
			RAO90	2,75E-17	0,063	0,006	0,021	0,006	0,025	0,018	0,018	0,015
			CAUD20	9,87E-18	0,119	0,012	0,420	0,034	0,235	0,148	0,009	0,006
			CRAN20	1,06E-17	0,109	0,013	0,437	0,027	0,366	0,252	0,049	0,038
			CRAN40	8,19E-18	0,190	0,023	0,725	0,040	0,533	0,386	0,073	0,058
			LAO30/CAU20	1,26E-17	0,136	0,013	0,488	0,050	0,229	0,118	0,070	0,051
			LAO30/CRA20	1,33E-17	0,138	0,015	0,601	0,048	0,380	0,223	0,068	0,051
			RAO30/CAU20	1,25E-17	0,086	0,008	0,019	0,011	0,118	0,080	0,001	0,001
			RAO30/CRA20	1,34E-17	0,077	0,008	0,170	0,011	0,155	0,114	0,013	0,013
80kV	6 mmAl	0.4 mmCu	Projections	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	7,29		PA	2,16E-17	0,101	0,010	0,277	0,021	0,153	0,097	0,025	0,021
KAP (Gy·cm²/nps)	6,87797E-14		LAO30	2,72E-17	0,108	0,011	0,311	0,030	0,146	0,080	0,045	0,035
			LAO60	3,85E-17	0,102	0,009	0,282	0,030	0,082	0,036	0,038	0,029
			LAO90	4,82E-17	0,116	0,012	0,289	0,034	0,044	0,017	0,040	0,030
			RAO30	2,71E-17	0,079	0,008	0,106	0,011	0,075	0,052	0,001	0,001
			RAO60	3,85E-17	0,066	0,006	0,020	0,008	0,036	0,024	0,006	0,006
			RAO90	4,81E-17	0,063	0,006	0,020	0,006	0,021	0,014	0,017	0,014
			CAUD20	1,88E-17	0,121	0,011	0,316	0,026	0,136	0,082	0,005	0,003
			CRAN20	1,95E-17	0,113	0,013	0,327	0,022	0,201	0,134	0,041	0,033
			CRAN40	1,51E-17	0,189	0,022	0,511	0,032	0,291	0,207	0,058	0,048
			LAO30/CAU20	2,35E-17	0,131	0,012	0,332	0,035	0,128	0,066	0,053	0,040
			LAO30/CRA20	2,42E-17	0,133	0,014	0,401	0,035	0,199	0,114	0,051	0,040
			RAO30/CAU20	2,34E-17	0,090	0,008	0,014	0,010	0,078	0,050	0,001	0,001
			RAO30/CRA20	2,43E-17	0,083	0,008	0,154	0,012	0,095	0,070	0,012	0,013
90kV	3 mmAl	0 mmCu	Projections	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,49		AP	1,47E-17	0,471	0,079	0,515	0,074	0,030	0,009	0,159	0,122
KAP (Gy·cm²/nps)	4,67614E-13		PA	1,46E-17	0,100	0,011	0,326	0,023	0,211	0,135	0,030	0,024
			LAO30	1,85E-17	0,110	0,011	0,389	0,036	0,214	0,117	0,053	0,040
			LAO60	2,66E-17	0,108	0,009	0,368	0,038	0,114	0,049	0,046	0,034
			LAO90	3,34E-17	0,136	0,015	0,389	0,043	0,058	0,020	0,049	0,036
			RAO30	1,85E-17	0,077	0,007	0,115	0,010	0,098	0,067	0,001	0,001
			RAO60	2,66E-17	0,065	0,005	0,019	0,008	0,042	0,029	0,007	0,008
			RAO90	3,33E-17	0,063	0,006	0,021	0,006	0,023	0,016	0,018	0,015
			CAUD20	1,26E-17	0,121	0,012	0,368	0,029	0,192	0,120	0,007	0,005
			CRAN20	1,32E-17	0,111	0,013	0,387	0,023	0,290	0,197	0,046	0,036
			CRAN40	1,03E-17	0,188	0,023	0,627	0,037	0,428	0,306	0,066	0,053
			LAO30/CAU20	1,59E-17	0,134	0,013	0,419	0,043	0,183	0,095	0,062	0,046
			LAO30/CRA20	1,65E-17	0,135	0,015	0,514	0,042	0,301	0,176	0,061	0,046
			RAO30/CAU20	1,58E-17	0,089	0,008	0,017	0,009	0,100	0,067	0,001	0,001
			RAO30/CRA20	1,66E-17	0,081	0,008	0,162	0,012	0,128	0,096	0,013	0,013
100kV	3 mmAl	0 mmCu	Projections	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,92		AP	1,75E-17	0,422	0,069	0,457	0,064	0,028	0,009	0,139	0,107
KAP (Gy·cm²/nps)	4,43598E-13		PA	1,74E-17	0,102	0,011	0,298	0,022	0,181	0,116	0,027	0,023
			LAO30	2,18E-17	0,109	0,012	0,346	0,033	0,181	0,100	0,049	0,037
			LAO60	3,10E-17	0,106	0,009	0,329	0,034	0,099	0,043	0,042	0,032
			LAO90	3,86E-17	0,128	0,013	0,343	0,038	0,052	0,019	0,045	0,033
			RAO30	2,18E-17	0,080	0,008	0,109	0,011	0,085	0,060	0,001	0,001
			RAO60	3,09E-17	0,066	0,006	0,020	0,008	0,040	0,025	0,007	0,007
			RAO90	3,86E-17	0,065	0,006	0,021	0,007	0,022	0,015	0,018	0,014
			CAUD20	1,52E-17	0,122	0,011	0,336	0,028	0,161	0,099	0,006	0,004
			CRAN20	1,57E-17	0,114	0,013	0,351	0,024	0,248	0,165	0,043	0,034
			CRAN40	1,22E-17	0,187	0,023	0,557	0,034	0,361	0,253	0,061	0,050
			LAO30/CAU20	1,89E-17	0,132	0,012	0,369	0,038	0,154	0,080	0,056	0,043
			LAO30/CRA20	1,95E-17	0,135	0,015	0,458	0,039	0,255	0,148	0,055	0,043
			RAO30/CAU20	1,89E-17	0,091	0,009	0,016	0,010	0,085	0,058	0,001	0,001
			RAO30/CRA20	1,95E-17	0,082	0,009	0,158	0,012	0,111	0,084	0,012	0,013

Abdomen irradiation		
Irradiated body part	Abdomen	x=25
Protective equipment	none	
Field diameter (cm)	40	
Operator's position	3 (x=13)	reference
38cm from centre of primary beam		

* Hand, wrist and leg doses are expressed in Hp(0.07) (Sv)

** Eye lens doses are expressed in Hp(3) (Sv)

**It was moved to the side for RAO90 and LAO 90 to keep
38 cm dist for Doctor AND II**

80kV	3 mmAl	0 mmCu	Projections	Exit dose (Gy/nps)	* L Hand / exit dose	* R Hand / exit dose	* L Wrist / exit dose	* R Wrist / exit dose	* L Leg / exit dose	* R Leg / exit dose	** L eye lens / exit dose	** R eye lens / exit dose
HVL (mmAl)	3,06		AP	8,87E-18	0,942	0,159	0,932	0,097	0,023	0,012	0,391	0,302
KAP (Gy·cm ² /nps)	5,11E-13		PA	1,06E-17	0,157	0,022	0,255	0,034	0,306	0,191	0,032	0,023
			LAO30	6,50E-18	0,261	0,034	0,865	0,103	0,614	0,297	0,143	0,095
			LAO60	1,49E-18	1,215	0,205	5,628	0,658	1,955	0,860	0,763	0,474
			LAO90	3,46E-19	14,304	2,310	52,059	6,120	3,053	0,946	6,276	3,905
			RAO30	8,04E-18	0,108	0,019	0,064	0,010	0,254	0,194	0,038	0,010
			RAO60	2,01E-18	0,262	0,064	0,167	0,032	0,621	0,523	0,317	0,239
			RAO90	3,15E-19	4,719	1,100	3,809	0,347	4,371	3,685	4,737	3,880

80kV	6 mmAl	0.4 mmCu	Projections	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	7,29		PA	1,93E-17	0,144	0,020	0,220	0,025	0,174	0,107	0,042	0,032
KAP (Gy·cm ² /nps)	3,35E-13		LAO30	1,16E-17	0,267	0,034	0,672	0,076	0,332	0,165	0,122	0,083
			LAO60	2,76E-18	1,093	0,150	3,998	0,467	1,090	0,497	0,575	0,390
			LAO90	4,29E-19	14,619	2,193	46,234	5,653	2,869	0,841	6,132	4,154
			RAO30	1,89E-17	0,127	0,023	0,070	0,009	0,161	0,123	0,040	0,010
			RAO60	3,37E-18	0,315	0,069	0,197	0,027	0,464	0,374	0,251	0,204
			RAO90	3,73E-19	4,860	0,986	3,328	0,324	3,581	2,996	3,963	3,472

90kV	3 mmAl	0 mmCu	Projections	Exit dose (Gy/nps)	* L Hand / exit dose	* R Hand / exit dose	* L Wrist / exit dose	* R Wrist / exit dose	* L Leg / exit dose	* R Leg / exit dose	** L eye lens / exit dose	** R eye lens / exit dose
HVL (mmAl)	3,49		PA	1,30E-17	0,162	0,022	0,243	0,031	0,254	0,156	0,030	0,021
KAP (Gy·cm ² /nps)	4,75E-13		LAO30	7,87E-18	0,268	0,035	0,774	0,088	0,497	0,260	0,135	0,089
			LAO60	1,90E-18	1,157	0,177	4,768	0,557	1,569	0,666	0,666	0,429
			LAO90	3,91E-19	14,277	2,285	47,081	5,667	2,796	0,860	6,168	3,926
			RAO30	8,04E-18	0,091	0,016	0,070	0,009	0,216	0,165	0,032	0,008
			RAO60	2,46E-18	0,315	0,074	0,196	0,035	0,597	0,495	0,319	0,244
			RAO90	3,48E-19	4,398	0,963	3,373	0,316	3,650	3,107	4,072	3,514

100kV	3 mmAl	0 mmCu	Projections	Exit dose (Gy/nps)	* L Hand / exit dose	* R Hand / exit dose	* L Wrist / exit dose	* R Wrist / exit dose	* L Leg / exit dose	* R Leg / exit dose	** L eye lens / exit dose	** R eye lens / exit dose
HVL (mmAl)	3,92		PA	1,52E-17	0,163	0,023	0,229	0,028	0,218	0,137	0,028	0,016
KAP (Gy·cm ² /nps)	4,50323E-13		LAO30	9,20E-18	0,274	0,036	0,719	0,082	0,425	0,218	0,125	0,087
			LAO60	2,29E-18	1,092	0,163	4,193	0,492	1,302	0,571	0,596	0,390
			LAO90	4,06E-19	13,778	2,148	46,421	5,486	2,764	0,909	5,832	3,766
			RAO30	1,12E-17	0,128	0,026	0,070	0,010	0,191	0,149	0,041	0,010
			RAO60	2,01E-18	0,317	0,071	0,200	0,032	0,521	0,440	0,284	0,223
			RAO90	3,40E-19	4,491	0,954	3,245	0,324	3,480	2,918	3,812	3,156



Thorax irradiation	
Irradiated body part	thorax
Protective equipment	none
Operator's position	4
Field diameter (cm)	20

70kV 3 mmAl 0 mmCu			Projections	Exit dose	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,002	0,002	0,010	0,004	0,128	0,092	0,012	0,008
KAP (Gy·cm ²)	1,37E-14		LAO30	1,96E-17	0,003	0,002	0,014	0,004	0,120	0,069	0,019	0,010
			LAO60	8,38E-18	0,010	0,007	0,068	0,015	0,259	0,026	0,078	0,037
			LAO90	7,75E-19	0,259	0,148	1,677	0,368	2,649	0,234	1,388	0,470
			RAO30	6,07E-17	0,001	0,000	0,004	0,001	0,032	0,020	0,001	0,000
			CAUD20	1,02E-17	0,003	0,002	0,013	0,005	0,172	0,117	0,007	0,004
			CAUD40	2,38E-18	0,005	0,005	0,027	0,011	0,600	0,457	0,026	0,012
			CRAN20	1,15E-17	0,003	0,002	0,014	0,007	0,211	0,141	0,016	0,009
			CRAN40	2,41E-18	0,016	0,012	0,087	0,034	1,424	1,034	0,052	0,033
			LAO60/CAU20	3,86E-18	0,006	0,005	0,043	0,016	0,593	0,351	0,055	0,024
			LAO60/CRA20	6,08E-18	0,004	0,005	0,036	0,016	0,581	0,345	0,021	0,012
			RAO30/CAU20	2,31E-17	0,001	0,001	0,002	0,001	0,081	0,055	0,000	0,000
			RAO30/CRA20	1,20E-17	0,003	0,002	0,008	0,003	0,148	0,116	0,011	0,007

80kV 3 mmAl 0.4 mmCu			Projections	Exit dose	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	3,1		PA	1,83E-17	0,002	0,001	0,010	0,003	0,100	0,072	0,012	0,007
KAP (Gy·cm ²)	1,25E-14		LAO30	2,46E-17	0,003	0,002	0,014	0,004	0,094	0,056	0,019	0,011
			LAO60	1,08E-17	0,009	0,007	0,060	0,015	0,195	0,021	0,073	0,035
			LAO90	9,98E-19	0,191	0,102	1,277	0,296	1,697	0,182	1,041	0,414
			RAO30	7,09E-17	0,001	0,001	0,005	0,001	0,028	0,018	0,001	0,001
			CAUD20	1,31E-17	0,003	0,002	0,013	0,003	0,121	0,089	0,007	0,004
			CAUD40	3,28E-18	0,006	0,004	0,025	0,017	0,464	0,359	0,025	0,011
			CRAN20	1,50E-17	0,004	0,002	0,014	0,005	0,174	0,114	0,016	0,010
			CRAN40	3,47E-18	0,015	0,010	0,062	0,020	1,005	0,707	0,052	0,034
			LAO60/CAU20	5,38E-18	0,006	0,004	0,034	0,012	0,433	0,256	0,048	0,022
			LAO60/CRA20	8,25E-18	0,004	0,004	0,026	0,012	0,431	0,263	0,021	0,011
			RAO30/CAU20	2,83E-17	0,001	0,001	0,002	0,001	0,067	0,046	0,000	0,000
			RAO30/CRA20	1,56E-17	0,002	0,002	0,010	0,002	0,116	0,091	0,012	0,008
data for pos.4 near patient leg			AP	2,28E-17	0,020	0,009	0,043	0,005	0,009	0,003	0,083	0,046
data for ref. pos. near patient arm			AP	2,28E-17	0,212	0,042	0,247	0,022	0,009	0,002	0,131	0,095

90kV 3 mmAl 0 mmCu			Projections	Exit dose	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	3,5		PA	2,20E-17	0,002	0,001	0,010	0,003	0,089	0,064	0,012	0,007
KAP (Gy·cm ²)	1,168E-14		LAO30	2,89E-17	0,003	0,002	0,014	0,003	0,081	0,049	0,019	0,010
			LAO60	1,29E-17	0,008	0,005	0,058	0,015	0,172	0,019	0,071	0,036
			LAO90	1,33E-18	0,153	0,076	0,994	0,232	1,435	0,169	0,839	0,333
			RAO30	7,88E-17	0,001	0,001	0,005	0,001	0,027	0,016	0,001	0,001
			CAUD20	1,61E-17	0,003	0,002	0,011	0,004	0,108	0,072	0,007	0,004
			CAUD40	4,31E-18	0,005	0,004	0,026	0,009	0,357	0,260	0,024	0,013
			CRAN20	1,83E-17	0,003	0,002	0,013	0,005	0,143	0,090	0,016	0,010
			CRAN40	4,45E-18	0,015	0,010	0,059	0,017	0,799	0,545	0,050	0,033
			LAO60/CAU20	6,87E-18	0,005	0,004	0,028	0,011	0,354	0,216	0,044	0,022
			LAO60/CRA20	1,02E-17	0,004	0,004	0,023	0,008	0,370	0,223	0,020	0,012
			RAO30/CAU20	3,30E-17	0,001	0,001	0,002	0,001	0,063	0,040	0,000	0,000
			RAO30/CRA20	1,88E-17	0,002	0,002	0,008	0,002	0,100	0,079	0,012	0,008

100kV 3 mmAl 0 mmCu			Projections	Exit dose	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	3,9		PA	2,54E-17	0,002	0,001	0,009	0,003	0,079	0,055	0,012	0,007
KAP (Gy·cm ²)	1,108E-14		LAO30	3,30E-17	0,003	0,001	0,013	0,003	0,072	0,040	0,019	0,011
			LAO60	1,49E-17	0,008	0,007	0,053	0,013	0,149	0,017	0,067	0,033
			LAO90	1,65E-18	0,132	0,065	0,844	0,179	1,176	0,219	0,725	0,298
			RAO30	8,63E-17	0,001	0,001	0,005	0,001	0,025	0,015	0,001	0,001
			CAUD20	1,88E-17	0,003	0,002	0,012	0,003	0,100	0,066	0,007	0,004
			CAUD40	5,12E-18	0,004	0,004	0,025	0,007	0,331	0,229	0,023	0,010
			CRAN20	2,12E-17	0,004	0,002	0,013	0,004	0,122	0,085	0,016	0,010
			CRAN40	5,44E-18	0,016	0,008	0,059	0,020	0,704	0,455	0,050	0,032
			LAO60/CAU20	8,25E-18	0,005	0,004	0,026	0,010	0,301	0,182	0,043	0,022
			LAO60/CRA20	1,21E-17	0,004	0,003	0,023	0,007	0,296	0,184	0,020	0,011
			RAO30/CAU20	3,72E-17	0,001	0,001	0,003	0,001	0,055	0,036	0,000	0,000
			RAO30/CRA20	2,17E-17	0,003	0,001	0,009	0,002	0,089	0,065	0,012	0,009

110kV 3 mmAl 0 mmCu			Projections	Exit dose	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	4,2		PA	2,84E-17	0,002	0,001	0,010	0,003	0,069	0,053	0,012	0,007
KAP (Gy·cm ²)	1,0652E-14		LAO30	3,65E-17	0,003	0,001	0,013	0,003	0,069	0,037	0,018	0,010
			LAO60	1,68E-17	0,008	0,005	0,055	0,013	0,153	0,014	0,065	0,034
			LAO90	1,95E-18	0,111	0,055	0,722	0,174	1,007	0,153	0,631	0,280
			RAO30	9,32E-17	0,001	0,001	0,005	0,001	0,024	0,014	0,001	0,001
			CAUD20	2,12E-17	0,003	0,002	0,013	0,002	0,088	0,060	0,007	0,004
			CAUD40	5,95E-18	0,005	0,004	0,024	0,006	0,273	0,210	0,022	0,010
			CRAN20	2,37E-17	0,004	0,002	0,012	0,005	0,112	0,076	0,016	0,010
			CRAN40	6,31E-18	0,015	0,008	0,052	0,017	0,574	0,420	0,050	0,032
			LAO60/CAU20	9,55E-18	0,005	0,003	0,024	0,008	0,264	0,166	0,040	0,022
			LAO60/CRA20	1,39E-17	0,003	0,003	0,018	0,007	0,253	0,161	0,019	0,011
			RAO30/CAU20	4,12E-17	0,001	0,001	0,002	0,001	0,049	0,034	0,000	0,000
			RAO30/CRA20	2,44E-17	0,003	0,002	0,009	0,002	0,080	0,063	0,012	0,009

Table 3.2: Field size dependence for the thorax case, no protective equipment used, operator stands at position 4 (femoral access)

Field diameter (cm)			30									
80kV	3 mmAl	0 mmCu	Projection	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,06		PA	1,60E-17	0,004	0,002	0,014	0,004	0,123	0,079	0,017	0,010
KAP (Gy-cm ² /nps)	5,05177E-13											

Field diameter (cm)			20									
80kV	3 mmAl	0 mmCu	Projection	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,06		PA	1,69E-17	0,003	0,001	0,011	0,004	0,117	0,081	0,012	0,008
KAP (Gy-cm ² /nps)	5,01998E-13											

Field diameter (cm)			14									
80kV	3 mmAl	0 mmCu	Projection	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,06		PA	1,87E-17	0,002	0,001	0,008	0,003	0,103	0,072	0,009	0,005
KAP (Gy-cm ² /nps)	5,00583E-13											

Field diameter (cm)			20									
90kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	3,5		PA	2,20E-17	0,002	0,001	0,010	0,003	0,089	0,064	0,012	0,007
KAP (Gy-cm ²)	1,168E-14		LAO30	2,89E-17	0,003	0,002	0,014	0,003	0,081	0,049	0,019	0,010
			LAO60	1,29E-17	0,008	0,005	0,058	0,015	0,172	0,019	0,071	0,036
			LAO90	1,33E-18	0,153	0,076	0,994	0,232	1,435	0,169	0,839	0,333
			RAO30	7,88E-17	0,001	0,001	0,005	0,001	0,027	0,016	0,001	0,001
			CAUD20	1,61E-17	0,003	0,002	0,011	0,004	0,108	0,072	0,007	0,004
			CAUD40	4,31E-18	0,005	0,004	0,026	0,009	0,357	0,260	0,024	0,013
			CRAN20	1,83E-17	0,003	0,002	0,013	0,005	0,143	0,090	0,016	0,010
			CRAN40	4,45E-18	0,015	0,010	0,059	0,017	0,799	0,545	0,050	0,033
			LAO60/CAU20	6,87E-18	0,005	0,004	0,028	0,011	0,354	0,216	0,044	0,022
			LAO60/CRA20	1,02E-17	0,004	0,004	0,023	0,008	0,370	0,223	0,020	0,012
			RAO30/CAU20	3,30E-17	0,001	0,001	0,002	0,001	0,063	0,040	0,000	0,000
			RAO30/CRA20	1,88E-17	0,002	0,002	0,008	0,002	0,100	0,079	0,012	0,008

Field diameter (cm)			30									
90kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand /	R Hand /	L Wrist /	R wrist /	L Leg /	R Leg /	L eye	R eye
HVL (mmAl)	3,5		PA	2,02E-17	0,003	0,002	0,013	0,003	0,097	0,063	0,016	0,009
KAP (Gy-cm ²)	6,0202E-15		LAO30	2,14E-17	0,005	0,002	0,020	0,005	0,114	0,058	0,024	0,013
			LAO60	7,65E-18	0,016	0,010	0,117	0,026	0,286	0,045	0,125	0,058
			LAO90	9,18E-19	0,362	0,144	1,816	0,472	1,878	0,399	1,327	0,550
			RAO30	3,69E-17	0,002	0,001	0,007	0,002	0,052	0,033	0,002	0,001
			CAUD20	1,58E-17	0,004	0,002	0,018	0,004	0,116	0,072	0,010	0,006
			CAUD40	4,91E-18	0,007	0,005	0,042	0,012	0,321	0,234	0,029	0,014
			CRAN20	1,66E-17	0,005	0,002	0,019	0,005	0,156	0,098	0,021	0,013
			CRAN40	4,50E-18	0,021	0,009	0,070	0,018	0,805	0,540	0,059	0,037
			LAO60/CAU20	4,81E-18	0,009	0,005	0,044	0,014	0,473	0,277	0,062	0,032
			LAO60/CRA20	6,38E-18	0,008	0,006	0,040	0,014	0,493	0,281	0,038	0,022
			RAO30/CAU20	2,30E-17	0,002	0,001	0,005	0,002	0,087	0,055	0,001	0,001
			RAO30/CRA20	1,64E-17	0,004	0,002	0,013	0,003	0,115	0,083	0,015	0,010

Table 3.3: Position dependence

Head irradiation

Irradiated body part	Head
Protective equipment	none
Field diameter (cm)	20

Operator's position	3 (x=52)	radial access
38cm from centre of primary beam		

80kV	3 mmAl	0 mmCu	Projection	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,06		PA	1,17E-17	0,097	0,010	0,369	0,025	0,260	0,167	0,033	0,027
KAP (Gy·cm ² /nps)	5,01893E-13											

Operator's position	(x=25)	
65cm from centre of primary beam		

80kV	3 mmAl	0 mmCu	Projection	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,06		PA	1,16E-17	0,005	0,002	0,038	0,005	0,178	0,110	0,028	0,017
KAP (Gy·cm ² /nps)	5,01893E-13											

Operator's position	4 (x=20)	femoral access
110cm from centre of primary beam		

80kV	3 mmAl	0 mmCu	Projection	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,06		PA	1,16E-17	0,001	0,001	0,003	0,002	0,078	0,060	0,013	0,006
KAP (Gy·cm ² /nps)	5,01893E-13											

Thorax irradiation

Irradiated body part	Thorax
Protective equipment	none
Field diameter (cm)	30

Operator's position *	(x=25)	
26cm from centre of primary beam		

* Hands just outside the primary beam

80kV	3 mmAl	0 mmCu	Projection	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,06		PA	1,61E-17	0,477	0,034	0,269	0,026	0,221	0,162	0,020	0,017
KAP (Gy·cm ² /nps)	5,05177E-13											

Operator's position	4	femoral access
71cm from centre of primary beam		

80kV	3 mmAl	0 mmCu	Projection	Exit dose (Gy/nps)	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R Wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens / exit dose	R eye lens / exit dose
HVL (mmAl)	3,06		PA	1,60E-17	0,004	0,002	0,014	0,004	0,123	0,079	0,017	0,010
KAP (Gy·cm ² /nps)	5,05177E-13											

Operator's position	4	femoral access
Field diameter (cm)	20	

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,002	0,002	0,010	0,004	0,128	0,092	0,012	0,008
KAP (Gy·cm ²)	1,37E-14		LAO90	7,75E-19	0,259	0,148	1,677	0,368	2,649	0,234	1,388	0,470
			RAO30	6,07E-17	0,001	0,000	0,004	0,001	0,032	0,020	0,001	0,000
			CRAN40	2,41E-18	0,016	0,012	0,087	0,034	1,424	1,034	0,052	0,033

Operator's position	3	radial access
Field diameter (cm)	20	

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand / exit dose	R Hand / exit dose	L Wrist / exit dose	R wrist / exit dose	L Leg / exit dose	R Leg / exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,043	0,005	0,083	0,009	0,219	0,151	0,014	0,013
KAP (Gy·cm ²)	1,37E-14		LAO90	7,75E-19	1,833	0,560	12,659	1,433	1,280	0,254	1,792	0,935
			RAO30	6,07E-17	0,013	0,002	0,013	0,004	0,049	0,033	0,000	0,000
			CRAN40	2,41E-18	0,831	0,069	0,396	0,060	1,880	1,499	0,100	0,066

Table 3.4: Use of protective equipment: eye glasses

Irradiated body part	thorax
Protective equipment	none
Operator's position	4
Field diameter (cm)	30

90kV	3 mmAl	0 mmCu	Projections	Exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	3,5		PA	2,02E-17	0,016	0,009
KAP (Gy·cm ²)	1,168E-14		LAO90	9,18E-19	1,351	0,560
			RAO30	3,69E-17	0,002	0,002
			CRAN40	4,50E-18	0,060	0,037

Protective equipment	WHITH GLASSES
Field diameter (cm)	30

90kV	3 mmAl	0 mmCu	Projections	Exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	3,5		PA	2,02E-17	0,002	0,008
KAP (Gy·cm ²)	6,0202E-15		LAO90	9,18E-19	0,173	0,536
			RAO30	3,69E-17	0,000	0,001
			CRAN40	4,50E-18	0,008	0,033

Table 3.5: Use of protective equipment: ceiling shield

Irradiated body part		thorax
Protective equipment		none
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,012	0,008
KAP (Gy·cm ²)	1,37E-14		LAO90	7,75E-19	1,388	0,470
			RAO30	6,07E-17	0,001	0,000
			CRAN40	2,41E-18	0,052	0,033

Irradiated body part		thorax
Protective equipment		A1
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,003	0,001
KAP (Gy·cm ²)	1,37E-14		LAO90	7,75E-19	1,085	0,355
			RAO30	6,07E-17	0,000	0,000
			CRAN40	2,41E-18	0,009	0,006

Irradiated body part		thorax
Protective equipment		A2
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,003	0,002
KAP (Gy·cm ²)	1,37E-14		LAO90	7,75E-19	1,089	0,380
			RAO30	6,07E-17	0,000	0,000
			CRAN40	2,41E-18	0,030	0,021

Irradiated body part		thorax
Protective equipment		B1
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,001	0,001
KAP (Gy·cm ²)	1,37E-14		LAO90	7,75E-19	0,754	0,169
			RAO30	6,07E-17	0,000	0,000
			CRAN40	2,41E-18	0,006	0,005

Irradiated body part		thorax
Protective equipment		B2
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L eye lens, Hp(3) / exit dose	R eye lens, Hp(3) / exit dose
HVL (mmAl)	2,7		LAO90	7,75E-19	0,118	0,081
KAP (Gy·cm ²)	1,37E-14					

Table 3.6: Use of protective equipment: ceiling shield (hand tallies)

Irradiated body part		thorax
Protective equipment		none
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand / exit dose	R Hand / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,002	0,002
KAP (Gy-cm ²)	1,37E-14		LAO90	7,75E-19	0,259	0,148
			RAO30	6,07E-17	0,001	0,000
			CRAN40	2,41E-18	0,016	0,012

Irradiated body part		thorax
Protective equipment		A1
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand / exit dose	R Hand / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,002	0,001
KAP (Gy-cm ²)	1,37E-14		LAO90	7,75E-19	0,216	0,119
			RAO30	6,07E-17	0,001	0,000
			CRAN40	2,41E-18	0,013	0,007

Irradiated body part		thorax
Protective equipment		A2
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand / exit dose	R Hand / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,002	0,001
KAP (Gy-cm ²)	1,37E-14		LAO90	7,75E-19	0,217	0,120
			RAO30	6,07E-17	0,001	0,000
			CRAN40	2,41E-18	0,013	0,008

Irradiated body part		thorax
Protective equipment		B1
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand / exit dose	R Hand / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,001	0,001
KAP (Gy-cm ²)	1,37E-14		LAO90	7,75E-19	0,208	0,109
			RAO30	6,07E-17	0,000	0,000
			CRAN40	2,41E-18	0,011	0,006

Irradiated body part		thorax
Protective equipment		B2
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Hand / exit dose	R Hand / exit dose
HVL (mmAl)	2,7		LAO90	7,75E-19	0,229	0,123
KAP (Gy-cm ²)	1,37E-14					

Table 3.7: Use of protective equipment: ceiling shield (wrist tallies)

Irradiated body part	thorax
Protective equipment	none
Operator's position	4
Field diameter (cm)	20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Wrist / exit dose	R wrist / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,010	0,004
KAP (Gy-cm ²)	1,37E-14		LAO90	7,75E-19	1,677	0,368
			RAO30	6,07E-17	0,004	0,001
			CRAN40	2,41E-18	0,087	0,034

Irradiated body part	thorax
Protective equipment	A1
Operator's position	4
Field diameter (cm)	20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Wrist / exit dose	R wrist / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,004	0,003
KAP (Gy-cm ²)	1,37E-14		LAO90	7,75E-19	1,029	0,278
			RAO30	6,07E-17	0,001	0,000
			CRAN40	2,41E-18	0,049	0,029

Irradiated body part	thorax
Protective equipment	A2
Operator's position	4
Field diameter (cm)	20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Wrist / exit dose	R wrist / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,010	0,004
KAP (Gy-cm ²)	1,37E-14		LAO90	7,75E-19	1,435	0,333
			RAO30	6,07E-17	0,004	0,001
			CRAN40	2,41E-18	0,062	0,030

Irradiated body part	thorax
Protective equipment	B1
Operator's position	4
Field diameter (cm)	20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Wrist / exit dose	R wrist / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,005	0,003
KAP (Gy-cm ²)	1,37E-14		LAO90	7,75E-19	1,311	0,324
			RAO30	6,07E-17	0,002	0,001
			CRAN40	2,41E-18	0,049	0,029

Irradiated body part	thorax
Protective equipment	B2
Operator's position	4
Field diameter (cm)	20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Wrist / exit dose	R wrist / exit dose
HVL (mmAl)	2,7		LAO90	7,75E-19	1,447	0,329
KAP (Gy-cm ²)	1,37E-14					

Table 3.7: Use of protective equipment: table shield (leg tallies)

Irradiated body part		thorax
Protective equipment		none
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Leg / exit dose	R Leg / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,128	0,092
KAP (Gy·cm ²)	1,37E-14		LAO90	7,75E-19	2,649	0,234
			RAO30	6,07E-17	0,032	0,020
			CRAN40	2,41E-18	1,424	1,034

Irradiated body part		thorax
Protective equipment		tableshield
Operator's position		4
Field diameter (cm)		20

70kV	3 mmAl	0 mmCu	Projections	Exit dose	L Leg / exit dose	R Leg / exit dose
HVL (mmAl)	2,7		PA	1,43E-17	0,002	0,002
KAP (Gy·cm ²)	1,37E-14		LAO90	7,75E-19	0,047	0,022
			RAO30	6,07E-17	0,000	0,001
			CRAN40	2,41E-18	0,043	0,181

Irradiated body part		abdomen
Protective equipment		none
Operator's position		4
Field diameter (cm)		40

80kV	3 mmAl	0 mmCu	Projections	Exit dose	L Leg / exit dose	R Leg / exit dose
HVL (mmAl)	3,06		PA	8,60E-18	0,227	0,144
KAP (Gy·cm ² /nps)	5,11E-13		LAO90	3,92E-19	3,039	0,617
			RAO30	6,54E-18	0,137	0,104
			CRAN40	4,01E-18	0,804	0,516

Irradiated body part		
Protective equipment		tableshield
Operator's position		
Field diameter (cm)		40

80kV	3 mmAl	0 mmCu	Projections	Exit dose	L Leg / exit dose	R Leg / exit dose
HVL (mmAl)	3,06		PA	8,60E-18	0,003	0,004
KAP (Gy·cm ² /nps)	5,11E-13		LAO90	3,92E-19	0,061	0,064
			RAO30	6,54E-18	0,004	0,008
			CRAN40	4,01E-18	0,028	0,100