

## GUIDELINES FOR THE SIMULATION ANALYSIS FOR WP4

### Important considerations:

- Distribution of the simulations scenarios among the WP4 members:

Institute	Scenario
UPC	I1N-I1S
CHUV	I2N-I2S
ENEA	PTR
IRSN	PSM
SMU	PVM

- Fill your simulation results in the file "database simulation\_14062010.xlsx" at the forum.
- The results are presented as **results for dominant or non dominant hand**, according each scenario.
- The units of doses to be used are  $\mu\text{Gy/GBq}\cdot\text{s}$  and the relative uncertainty in percentage.
- All results should be presented in excel format.
- Style of graphs (it's important to have harmony for *Report Deliverable- July*):
  - Title in bold, capital: Calibri, size: 14
  - Axis: Calibri, label size 10
- Please try to be as clear/coherent as possible (example always use the same colors for the same radionuclide or things like that).

The analysis should include at least the following tables and figures (suggestions are welcome):

- A table describing your simulation plan and status. Indicate in different colors, what has been already simulated and what is still missing. See example Table 1.

TESTS	I2S (shielding)			I2N (no shielding)		
	Tc-99m	F-18	Y-90	Tc-99m	F-18	Y-90
Displacement of the syringe along its axis				P <sub>0</sub> -1cm P <sub>0</sub> +0.5cm P <sub>0</sub> +1cm	P <sub>0</sub> -1cm P <sub>0</sub> +0.5cm P <sub>0</sub> +1cm	P <sub>0</sub> -1cm P <sub>0</sub> +0.5cm P <sub>0</sub> +1cm
Orientation of the syringe				25° : -Plane of the hand	25° : -Plane of the hand	25° : -Plane of the hand
Active volume solution				1ml 2ml	1ml 2ml	1ml 2ml
Thickness of the shield	2mm Pb 3mm Pb 1mm W 2mm W 3 mmW	2mm Pb 1mm W 2mm W 5mm W	7 mm plexi 10mm plexi 5 mm W 10mm Lead glass			
Displacement of the syringe towards the sides				-1 cm - 2cm	-1 cm - 2cm	-1 cm - 2cm

Table 1: Example: CHUV simulation plan and status.

## 2. Plots to display the data (consider only one test at the time):

### a. For Test 1: Displacement of the syringe (or vial) along its axis.

- Do one histogram for each radionuclide. Include the error bars and the figures that show the initial position ( $P_0$ ) and the other different positions. See example of Tc-99m in Figure 1

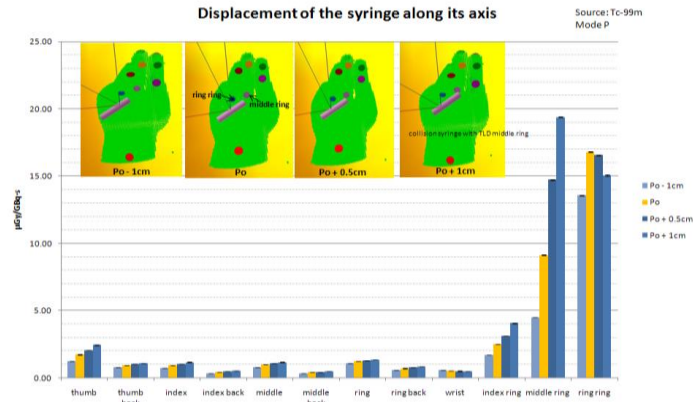


Figure 1: Example of scenario I2N. Test 1, source Tc99m.

- Calculate the ratios between the different positions and the initial position ( $P_0$ ). Do one histogram for each nuclide. See example in Figure 2. Then, with the same data, do one histogram for each "new position", comparing all nuclides. See example in Figure 3.

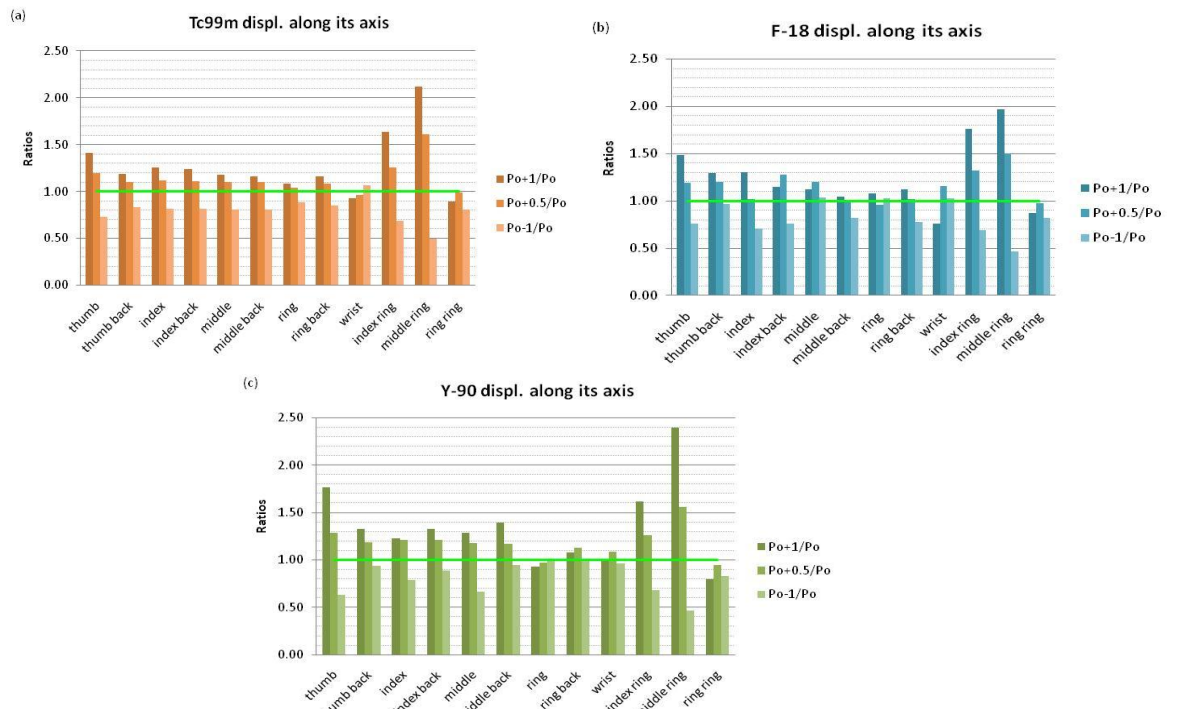


Figure 2: Example of ratios between different position and initial position. a)Tc-99m; b)F-18 and c) Y-90

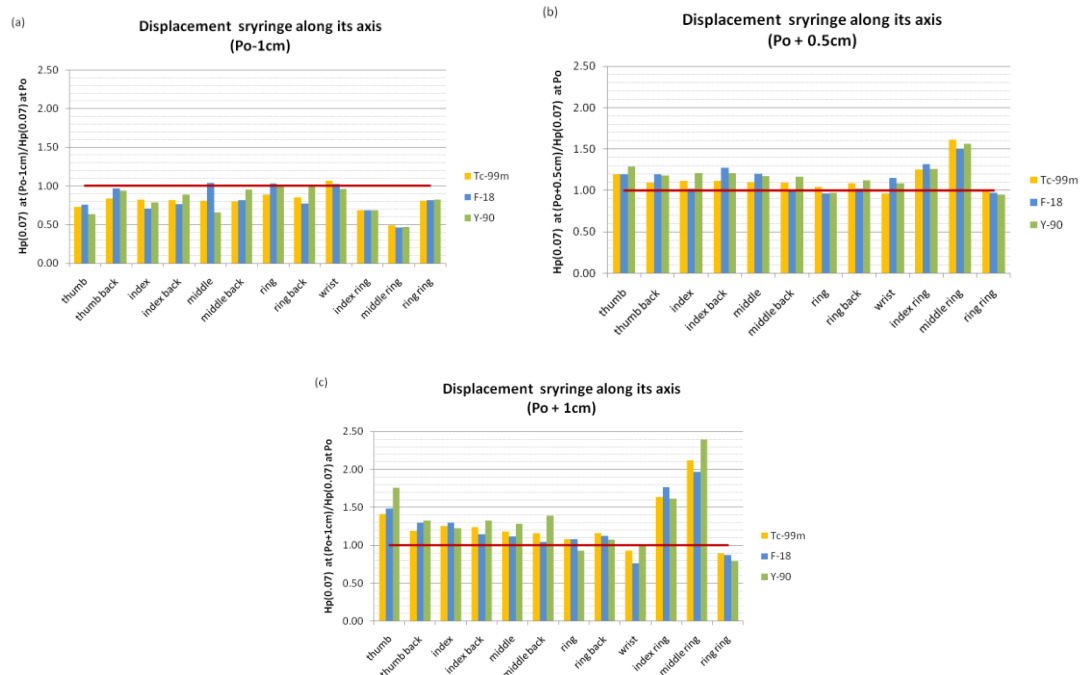


Figure 3: Example of scenario I2N. Ratios between the doses at “new position” and the doses at “initial position”, all nuclides. For this case, new positions are: a)  $P_0 - 1\text{cm}$ ; b)  $P_0 + 0.5\text{cm}$  and c)  $P_0 + 1\text{cm}$

b. For Test2: Variation in the orientation of the syringe (or vial)

- Do one histogram for each radionuclide, similar than for Test 1. See example in Figure 4.

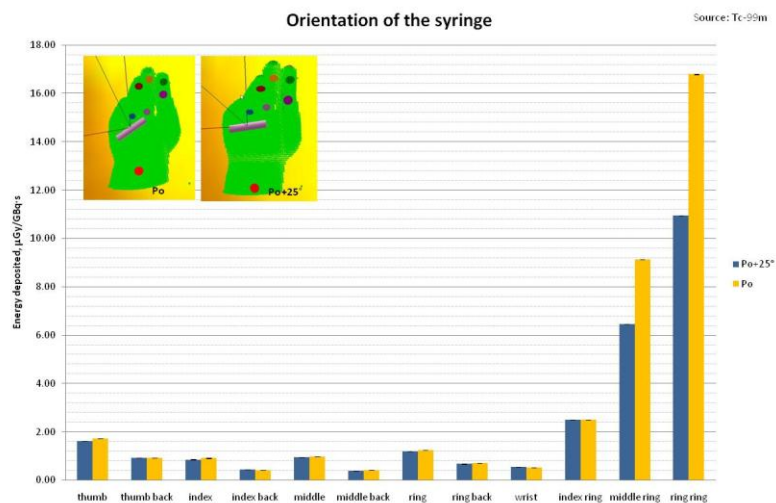


Figure 4: Example of scenario I2N. Test 2. Source Tc99m

- Calculate the ratios of different position with initial position ( $P_0$ ) and do one histogram. See example in Figure 5

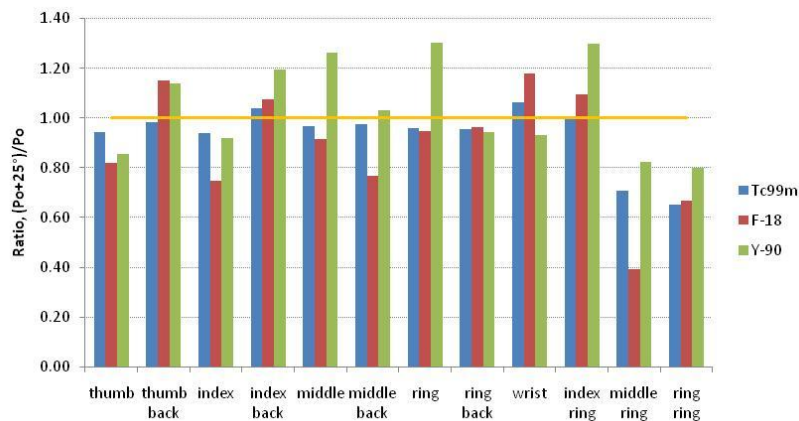


Figure 5: Example of ratios of different position with initial position. Scenario I2N.

c. For Test 3: variation of active volume

- Do one histogram for each radionuclide. Same template that previous test. See example in Figure 6
- Calculate the ratios of different volumes with initial volume and do one histogram. See example in Figure 7

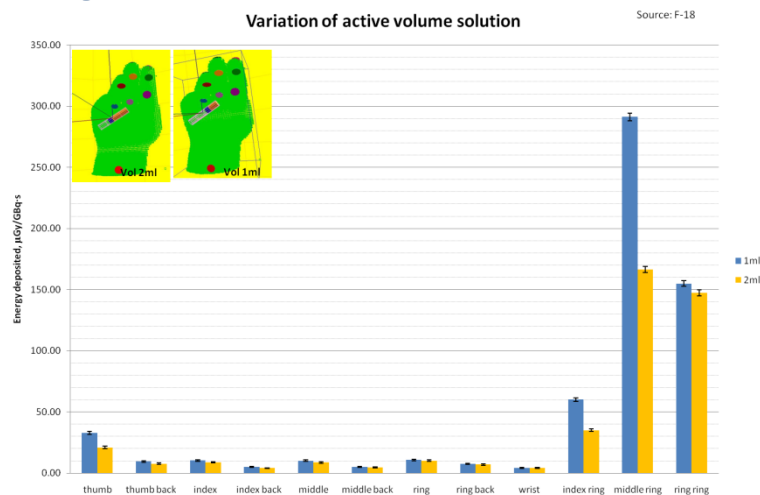


Figure 6: Example of scenario I2S. Test 3. Source F-18

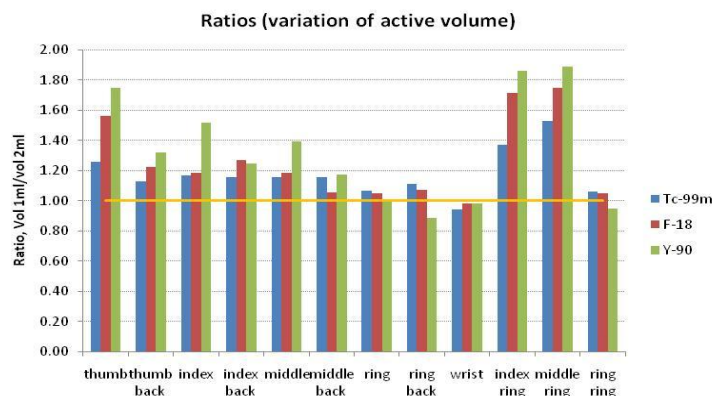


Figure 7: Example of ratios between active solution 1ml and 2ml

d. For Test 4: Variation of shield

- Do one histogram for each radionuclide. Include the error bars and the figure that show position of shielding respect to each tally. See example in Figure 8

- Calculate the ratios between different shields and without shield and do one histogram for each shield. See example in Figure 9

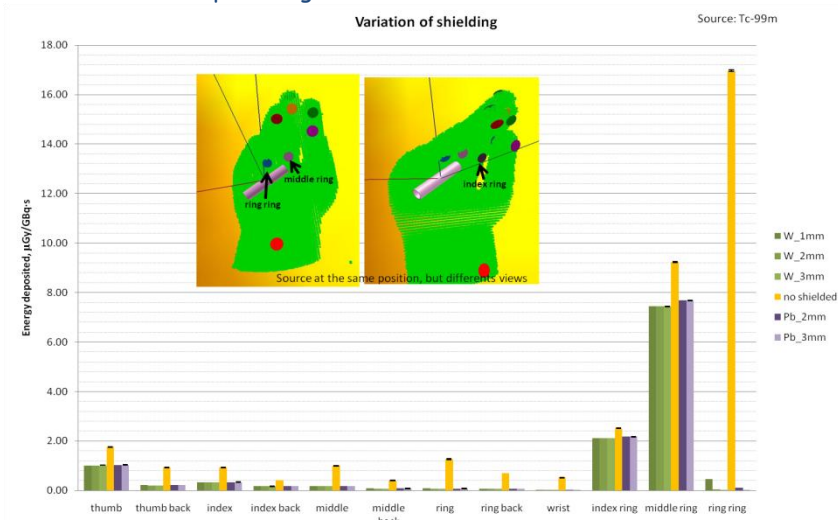


Figure 8: Example of scenario I2S. Source Tc99m

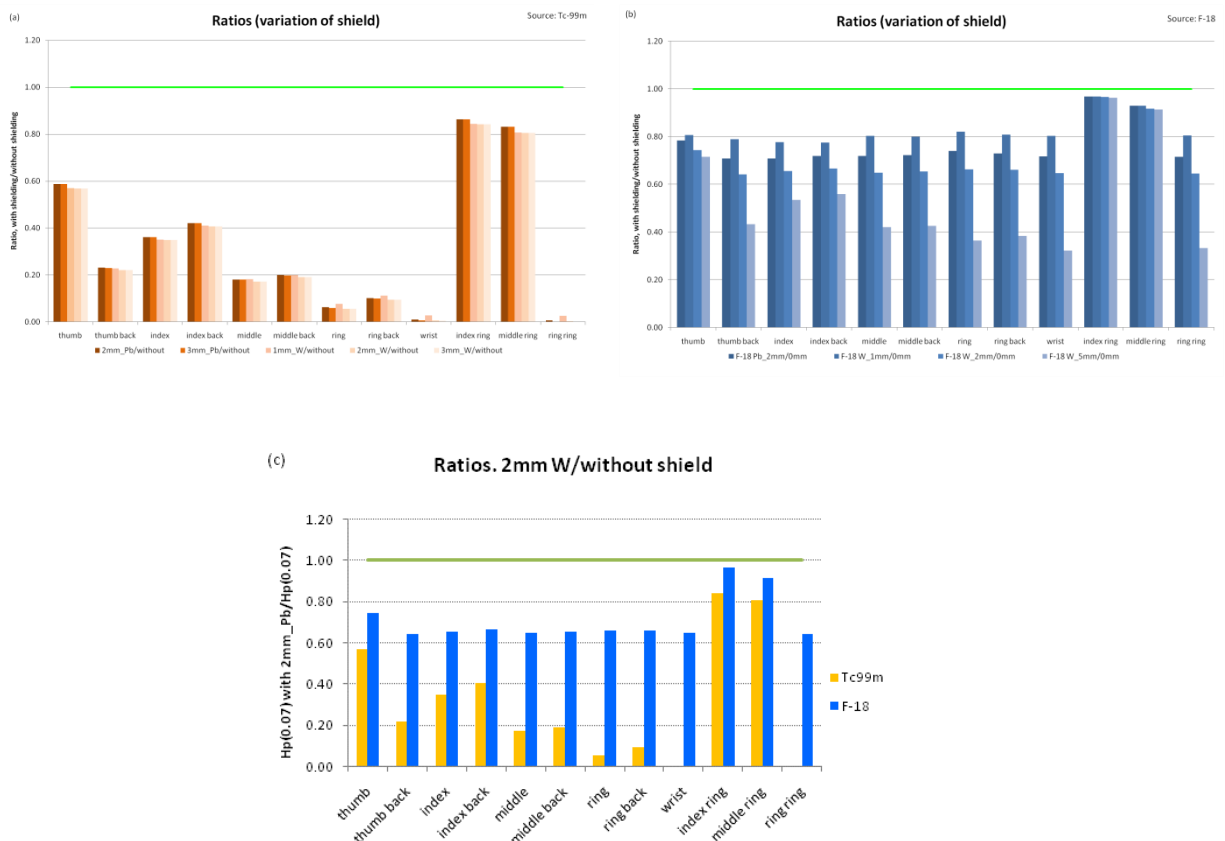


Figure 9: Examples of ratios between shield and without shield. (a) and (b) Ratios per nuclides (Tc99m and F18, respectively) for different shields. (c) Same shield for different nuclides.

e. For Test 5: displacement of syringe (or vial) towards the sides

- Do one histogram for each radionuclide. Same template as previous tests. See example in Figure 10
- Calculate the ratios between different positions and initial position and do one histogram for radionuclide, and one histogram for position, similar than previous test. See example in Figure 12.

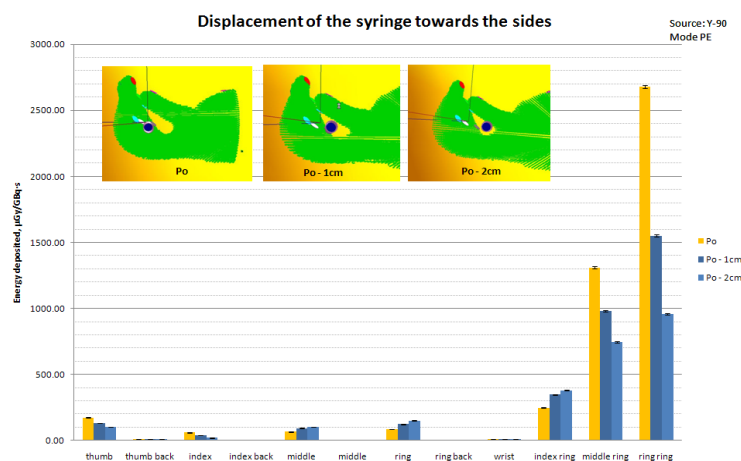


Figure 10: Example of scenario I2N. Test 5. Source Y-90

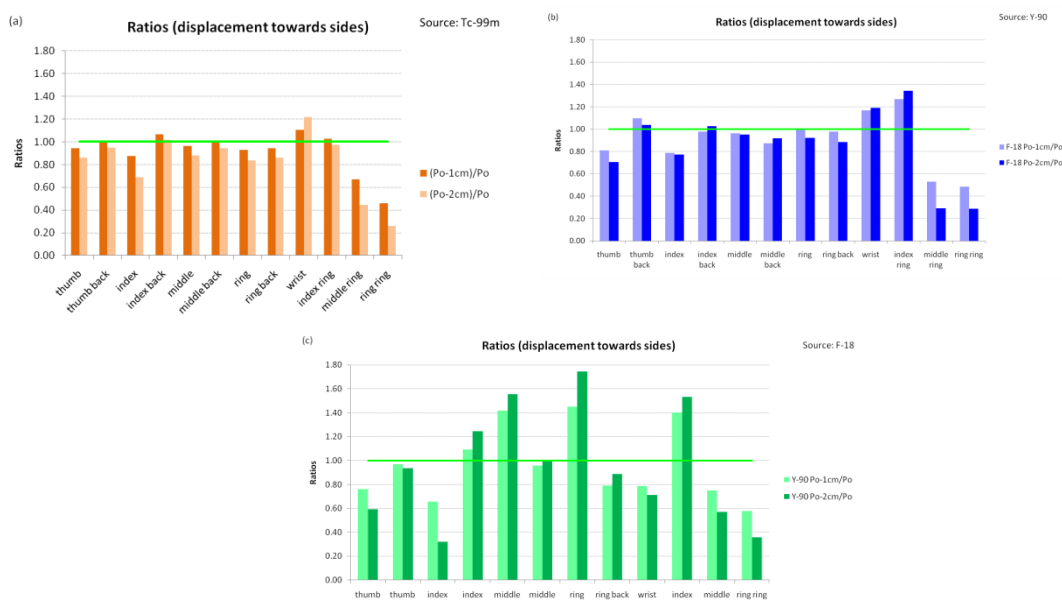


Figure 11: Example of histograms for radionuclide. Scenario I2N. a) Tc-99m; b) F-18 and c) Y-90

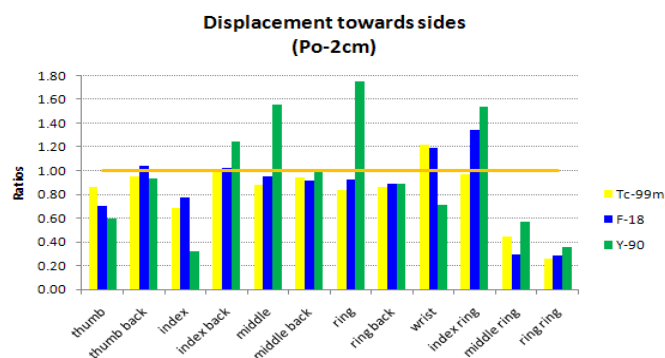


Figure 12: Example of histogram by position. Ratios between the position (Po-2cm) and initial position (Po). Scenario I2N