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Protection of Medical Staff

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12:15-12:30 Auditorium
Friday 21 January 2011



OCCUPATIONAL DOSIMETRY IN REAL TIME. BENEFITS FOR INTERVENTIONAL RADIOLOGY

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Introduction

- **High occupational radiation doses in fluoroscopy-guided interventional procedures.**
- **PRESENT SITUATION:**
 - **Protection tools not always used.**
 - **Good operational measures not always applied.**
 - **More complex procedures are performed daily.**
- **CONSEQUENCE: radiation-induced lesions of the eye may occur after several years of work.**

The problems ...

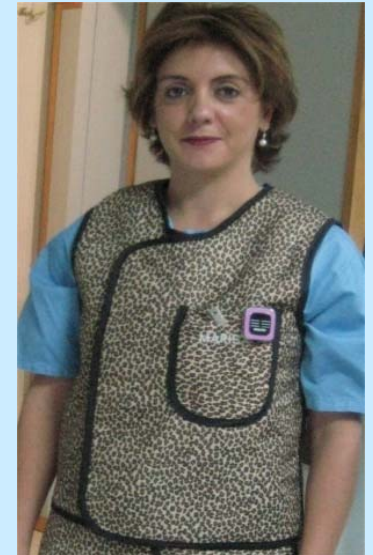
- **Personal dosimeters are not regularly used by many professionals.**
- **Most of the used dosimeters are worn under the lead apron and it is difficult to estimate radiation doses to the non protected organ and tissues.**
- **Lack of training in radiation protection.**

Objective

- This work present the methodology and initial results obtained in a university hospital during the evaluation of a new system of **electronic occupational dosimetry in real time**, used in interventional radiology and interventional cardiology catheterization laboratories.

Materials and Methods (I)

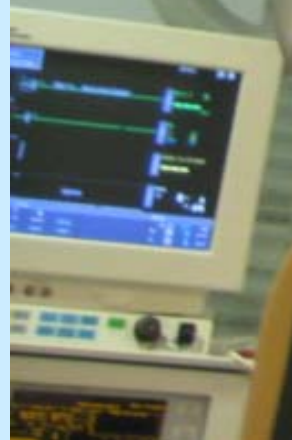
- **A new electronic system for occupational dosimetry (DoseAware ©) allowing to show the doses to health professionals **in real time during the procedures.****
- **The system uses solid-state detectors with a wireless connection sending scatter dose rate and cumulative scatter dose readings to a base station.**





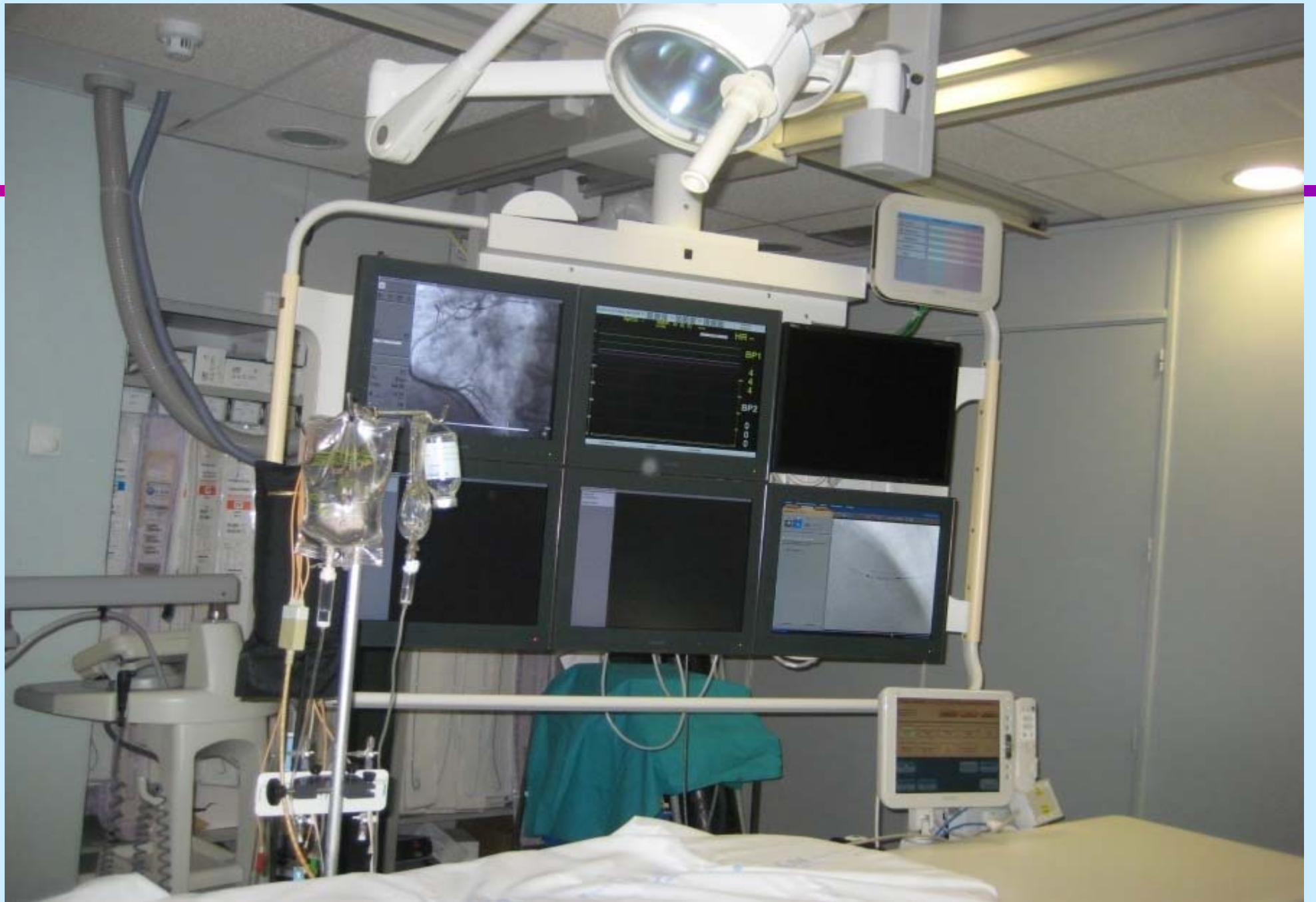
ID	Alert Level	Value
10000033		Acc. Dose 959.5 µSv
10000196		Acc. Dose 325.2 µSv
10000198		Acc. Dose 33.6 µSv
10000214		Acc. Dose 8.2 µSv
10000221		Acc. Dose 2.6 µSv

PHILIPS



Materials and Methods (II)

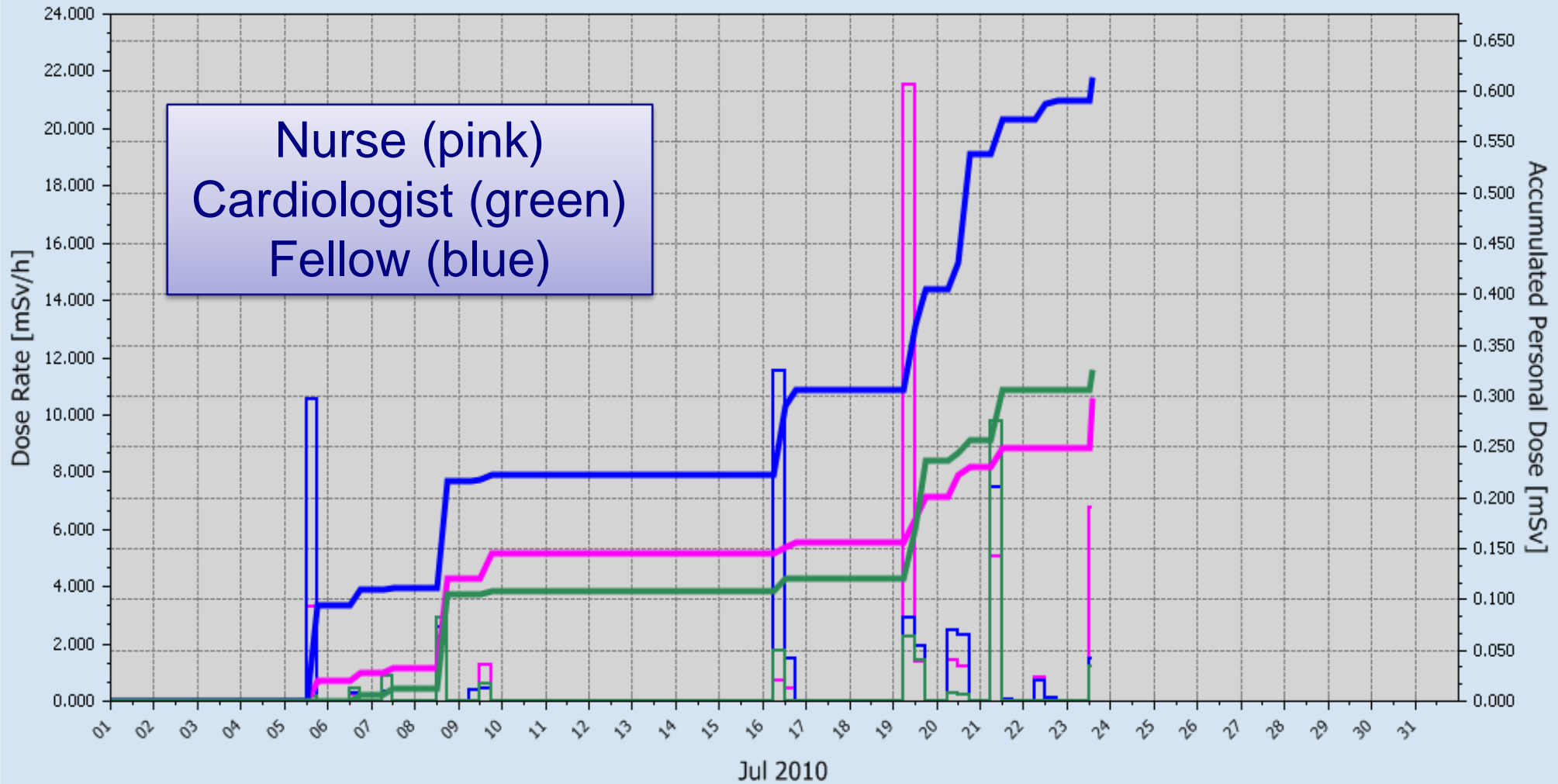
- **Physicians and other paramedical personnel can see the personal dose equivalent $H_p(10)$ and the dose rate on the screen mounted in the catheterization laboratories next to the diagnostic monitors and therefore be alerted on high scatter dose rates during the procedures.**



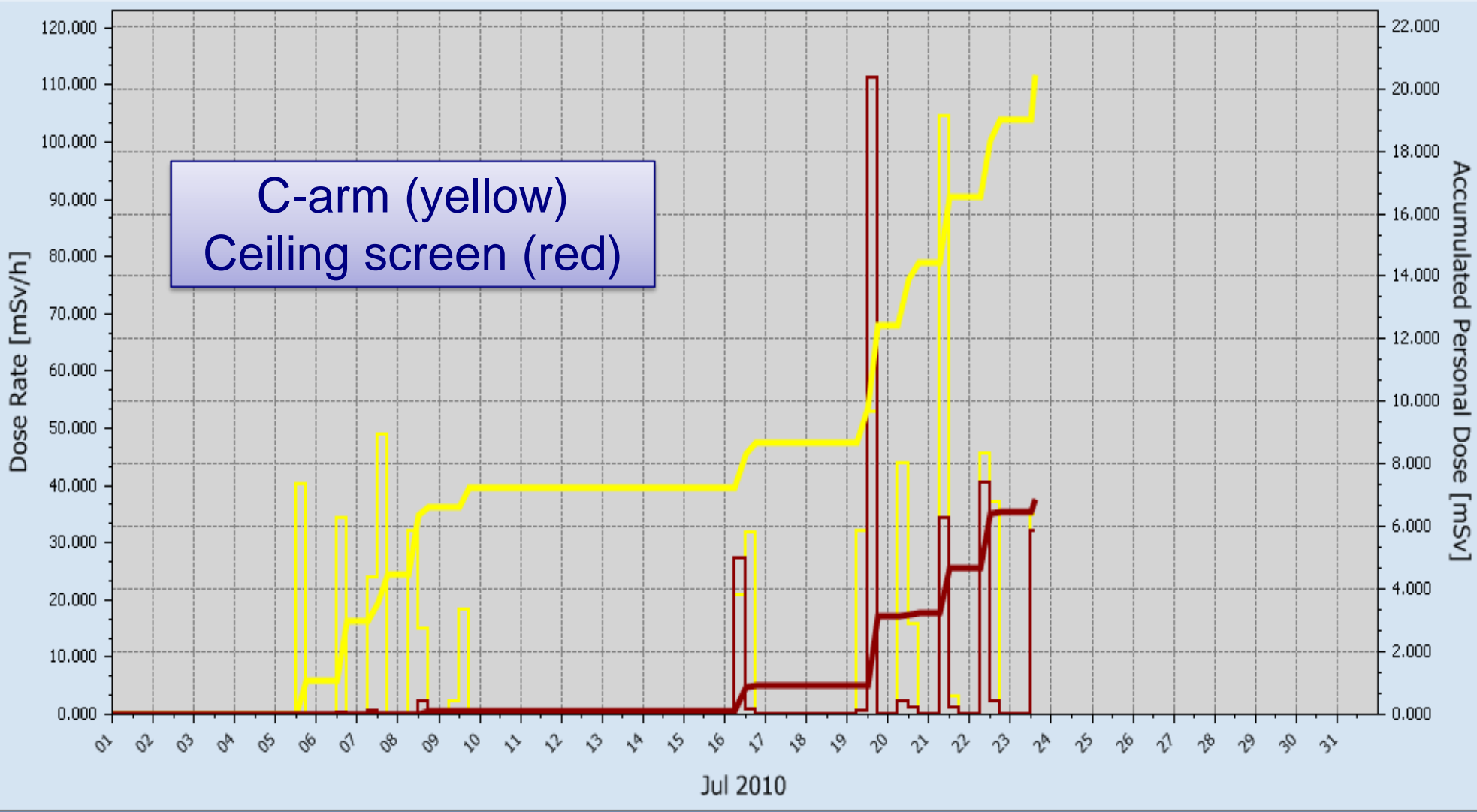
Materials and Methods (III)

- **The initial test was carried out during 4 months on 60 complex interventional procedures in two catheterization laboratories (one for cardiology and a second dedicated to general interventional procedures).**
- **The dosimeters have a potential of storing instantaneous dose rate and cumulative dose values for up to 3600 values (one value every second).**

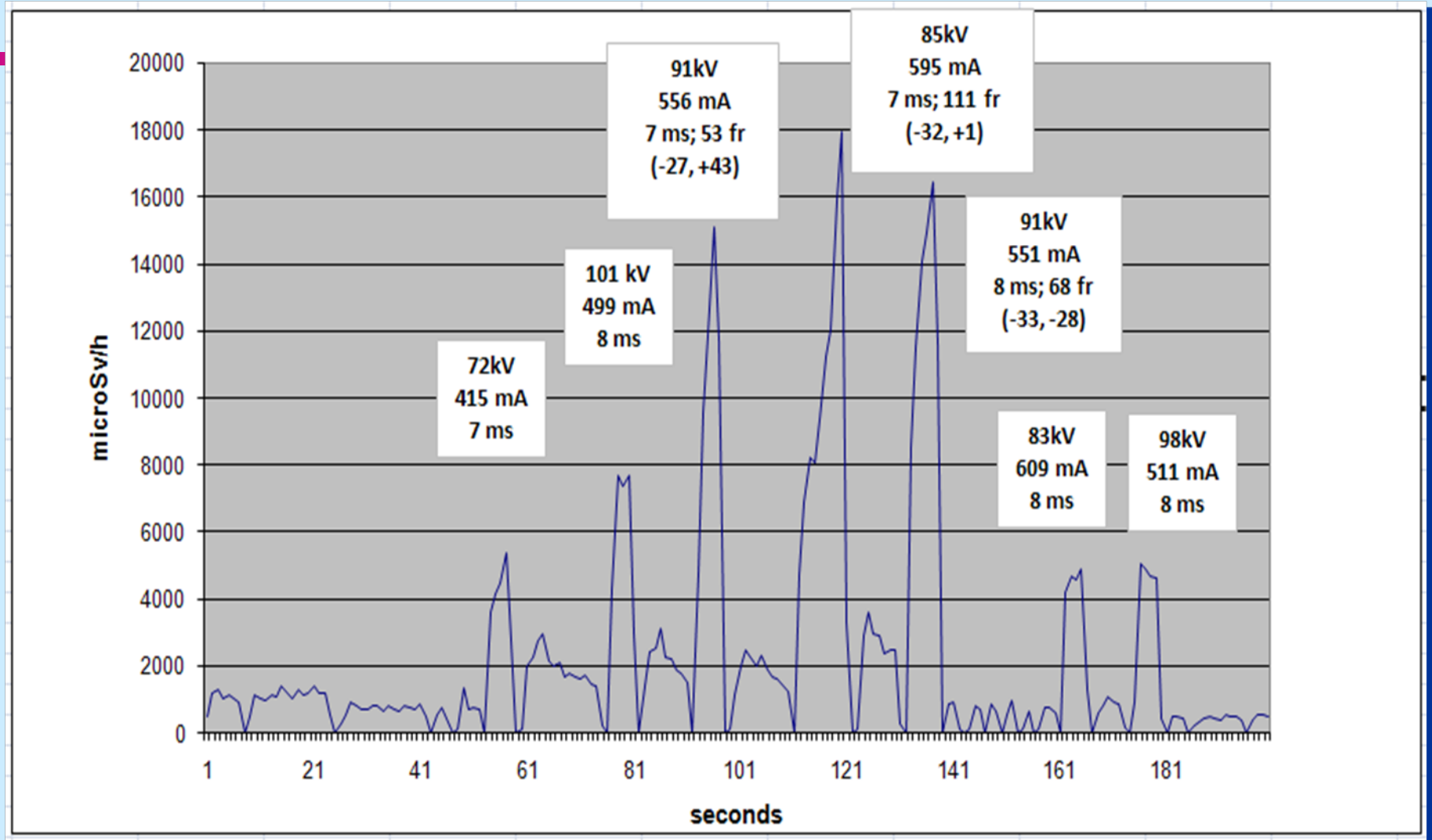
Overview July 2010. Cardio results (nurse pink, cardiologist green and fellow blue). Low cumulative doses but some high dose rates.



Overview July 2010. Cardio results (yellow C-arm; red in protective screen)



Cardiology procedure: analysis of scatter dose



Results

- **Values of cumulative occupational doses and charts of scatter dose values for different professionals (cardiologists, radiologists, anaesthetists, nurses, technicians, etc) and different procedures, have been obtained together with a correlation with patient doses and the complexity of the procedures.**

Benefits of the system (I)

- 1. Real time information on occupational doses (dose rate and cumulative doses).**
- 2. Detailed retrospective information on cumulative dose and dose rates during the procedure.**
- 3. Individual occupational doses per procedure.**

Benefits of the system (II)

4. Comparison **between different staff** in room at the same time, during the procedures.
5. Comparison with **dose values at the C-arm** and with patient doses ($\mu\text{Sv}/\text{Gy}\cdot\text{cm}^2$).
6. Correlation with **geometry and radiographic factors** used during the procedures.

Benefits of the system (III)

7. Evaluation of maximum dose rates
8. Global occupational dose analysis per month, per week or per day and identify the most high risky procedures.
9. Obtain criteria for optimization occupational radiation protection together with RP of patients.