

# Changing from Image Intensifier to Flat Detector technology:

## Practical experience from the National Interventional Cardiology Centre in Luxembourg

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## Introduction

### Siemens Axiom Artis dFC

- Dedicated to interventional cardiology procedures
- Initially installed with an image intensifier and later upgraded to a dynamic flat panel detector
- Amorphous silicon solid state detector, 25cm diagonal distance, pixel size of 184µm
- Fluoro LD, ND, plus
- Acquisition LD and ND
- Integrated ionisation chamber (µGym2)
- Additional Cu filters automatically inserted: 0,1-0,9mm



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## Method

The change from Image Intensifier to a Dynamic Flat Detector in the interventional cardiology department was evaluated through a small audit on:

1. The quality assurance of the system (commissioning and constancy checking)
2. The clinical protocols used
3. The patient dosimetry (use of KAP values)

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## 1. Quality assurance of the system

- No change to Image Intensifier methods for the commissioning and control of an x-ray system:
  - Tube and generator
  - kV/mA characteristics via measurements at different dose rates, low, normal, high fluoroscopy, different field sizes and patient thicknesses
  - Image quality (spatial resolution, low contrast, distortion)
- Added to the classic test methods, the constancy checks used are those proposed in the european DIMOND protocol. The same protocol was previously used for the image intensifier

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## 2. Clinical protocols

- No innovative protocols have yet been applied because of this change from image intensifier to a flat detector. The light and compact design helps though the movements throughout the clinical procedure.

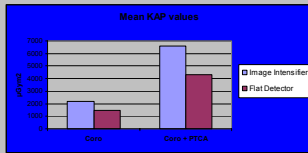
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## 3. Patient dose collection

- KAP values have been collected before and after the installation of the flat detector. Around 300 patients and two interventional cardiology procedures, CA and CA+PTCA, were taken into account.
- The mean of these KAP values was used for the comparison

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## Results and discussion(1)



- There is a reduction in the KAP values registered for the flat detector compared to those of the image intensifier

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## Results and discussion(2)

- An earlier study on the same x-ray system (Vano et al., 2005) has concluded that both technologies (II and FD) produced similar results regarding the dose rate at the entrance of PMMA phantoms, for variable thicknesses and different field sizes.

- No special clinical protocols have been applied due to the flat detector

?? What has it changed to provoke this decrease in the patient dosimetric data ??

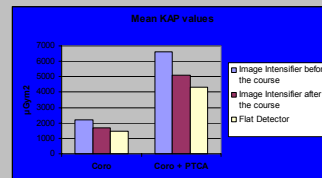
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## Results and discussion(2)

- Following a continuing education course for the interventional cardiologists, the system was optimally calibrated. For pulsed fluoroscopy, the 15pps used up to then was reduced to 6pps. The fluoroscopy mode was equally set to Fluoro LD by default. For the image acquisition mode, the same frame rate of 15per sec was reserved.
- A new collection of data has been applied for patient KAP values before and after the optimisation of the system.

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## Results and discussion(3)

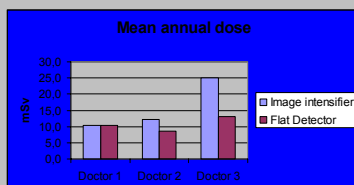


- The education of the interventional cardiologists on patient and staff radioprotection, given through the course, and the time necessary to apply it in practice can explain the further decrease of the KAP values towards the FD

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## Personal dosimetry

- The time lap from the continuing education course and the installation of the FD was very short.
- An extra evaluation was on the personal dosimetry (TLD dosimeter on the lead apron) of three interventional cardiologists



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## Conclusions(1)

Through this study it is clear that a great importance has to be given to the optimisation of the x-ray system, according to the clinical task.

The FD has shown a superior image quality for the same dose level, compared to II (Vano et al., 2005). So there is still space for amelioration.

- Application specialist
- Inform the clinical staff on the options offered by the x-ray system – new innovative protocols

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## Conclusions(2)

- New evaluation protocols are needed, specific to dynamic flat detectors, for the commissioning, initial characterisation and constancy control of the system
- Continuing education of the clinical staff help in the understanding and respect of radioprotection norms and thus in the decrease of patient and occupational doses.