



## **2012 :15th SESSION of ESMP**

**Lecture presented in Archamps (Salève Building) by :**

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# Introduction

# PCXMC

# Radiography

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# What is it PC X MC?

- PC-based software
- X-ray imaging, static projections
- Monte Carlo calculation

# Three steps ...

- Enter geometry
  - Examination data, patient size
- Simulate exposure
  - Simulate!
- Calculate tissue/organ dose, effective dose
  - Compute doses, enter x-ray spectrum, dose area product

# Examination data

- Age (default = adult)
- Arm inside or outside the beam (checkbox)
- Focus-skin distance, field size (cm)
- Location of the field
- Projection angle
- Check preview
- OK? Save examination data (.Df2 extension)
- Back to main menu, go to: Simulate

# Simulate exposure

- Main menu → Simulate!
- Open data for MC simulation
- Choose file
- Click: Open, simulation start
- Simulation ready: result will be saved automatically (\*.en2 extension)
- Back to main menu, go to: Compute doses

# Compute doses

- Change X-ray Spectrum
- kV, anode angle, inherent and added filtration (generally Al and Cu, Z resp. 13 and 29)
- Open MC data, choose \*.en2 file
- Enter values / be carefull with the unit (!) of the input dosis
- Click on OK!

# Case: Dose assessment for the uterus (unborn child) for a pregnant patient

- Woman, 31 YOF, 1,79 m / 76 kg
- X-LumbarSpine 2 views:
  - PA prone
  - Lateral



# Case: X-LWK PA projection

- Focus-skin distance: 90 cm
- Entrance field: 18 cm x 35 cm. (W x H)
- Beam central axis: Corpus L3
- Projection: PA (= 90°)
- Save, go to Simulate
- Enter beam information (spectrum)
- 75 kV, anode angle 11°, filtration 2.7 mm. Al
- Dosis-input (from DICOM-header): 1 Gy\*cm<sup>2</sup>

# Case: X-LWK LAT projection

- Focus-skin distance: 80 cm
- Entrance field: 17 cm x 36 cm. (B x H)
- Beam central axis: Dorsal corpus L3 / L4
- Projection: Left LAT: 0°
- Save, go to Simulate
- Enter beam information (spectrum)
- 90 kV, anode angle 11°, filtration 2.7 mm. Al
- Dosis-input (from DICOM-header): 3 Gy\*cm<sup>2</sup>

# PCXMC ?

- [www.stuk.fi](http://www.stuk.fi)
- → PCXMC
- Costs: € 580,-
- Free trial (= previous version v 1.5)

# PCXMC

- **PA Chest radiograph**
- max energy 150 keV
- 20 000 photons
- PA 90 degrees
- FID 200 cm
- Width 35 cm
- Height 40 cm
- $X=Y=0, Z=50$
- 120 kV, 3 mm Al, 0.1 mm Cu
- DAP 0.1 Gy.cm<sup>2</sup>
- **PA Chest radiograph**
- 20 000 photons
- max energy 150 keV
- AP 270 degrees
- FID 150 cm
- Width 35 cm
- Height 40 cm
- $X=Y=0, Z=15$
- 80 kV, 3 mm Al, 0.1 mm Cu
- DAP 2 Gy.cm<sup>2</sup>