

## Experiences from commissioning of a linear accelerator using a novel cylindrical 3D water tank

From electrons to flattening filter free beams

Varje dag lite bättre  
– kraften hos många!

### Background

- New linear accelerator,  
True Beam (Varian)
- Cylindrical water tank,  
3DS (Sun Nuclear)



## 3DS

- Cylindrical
  - Diameter: 67.6 cm (inner), 70.1 cm (outer)
    - Measurement: 65 cm with offset, 50 cm without offset
  - Filling: ~ 6 min 30 s (6 min according to Sun Nuclear)
  - Emptying: ~ 3 min 45 s (3 min according to Sun Nuclear)
- Placement & auto-setup
  - Software version 1 vs 2
    - Water level found easily
    - Beam centre usually needed correction for software version 1
      - Less, or no, correction needed for version 2
- Total setup time: ~ 60 min (30 min according to Sun Nuclear)

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## 3DS

- Measurements
  - Setting up protocols
- High current mode
  - Measurements with diode detectors
- Post processing
- Data export
  - Export formatted for import in TPS
    - Available for Pinnacle, Eclipse, MasterPlan, Prowess Panther, XiO and Monaco
    - Requires a check/change of the header for Eclipse

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## 3DS

- Pros and cons
  - Pros:
    - One chord (+ power chord)
    - User friendly
      - Easy setup of measurement protocols
    - It's cylindrical
      - Detector turned the same way in all off axis directions
      - Only vertical shift for large field diagonal measurements
  - Cons:
    - It's cylindrical
    - Some irritating software bugs (better in version 2)

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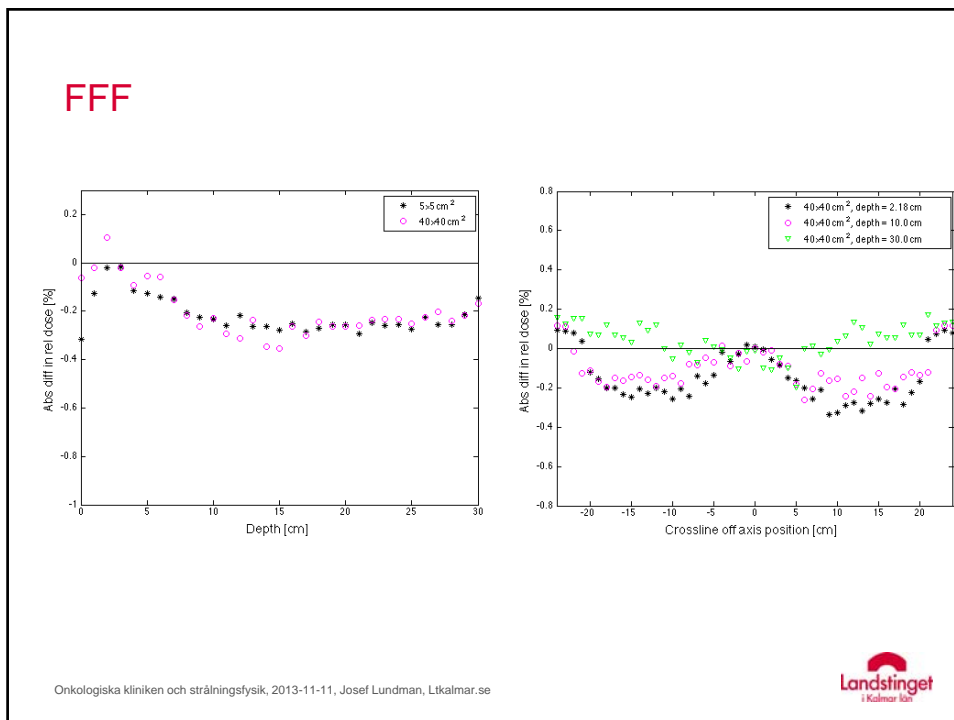
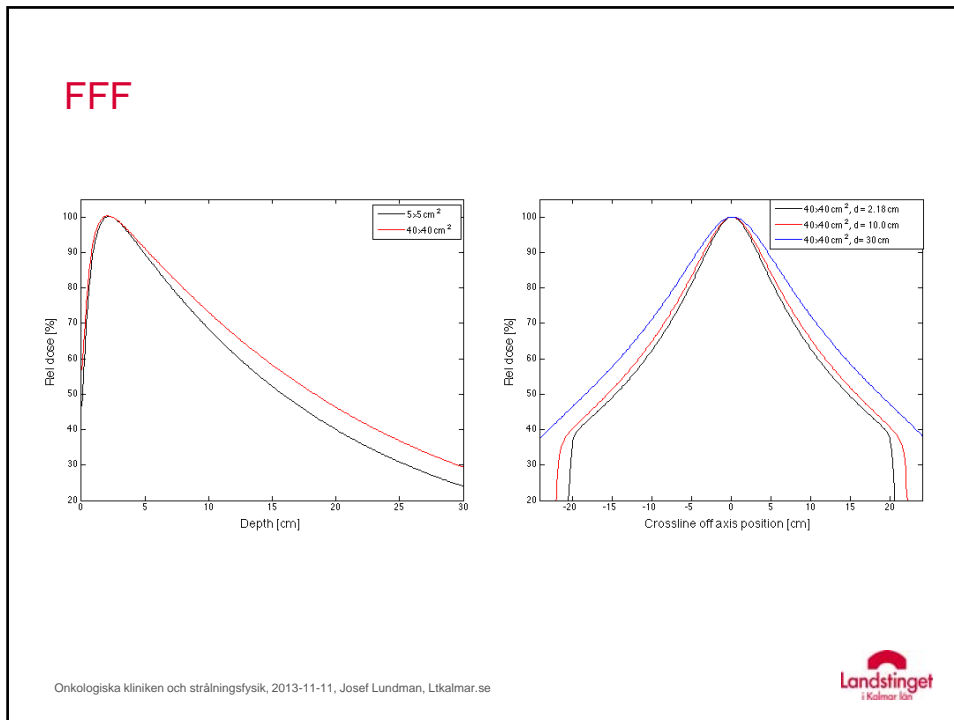
## FFF

- Collection efficiency
  - Difference at different depths and/or off axis positions
  - Should this be corrected for?
- As of now no corrections have been made in Kalmar
- Measurements at 2 different voltages
  - Detector: Ionization chamber, Semiflex, PTW, 0.125 cm<sup>3</sup>
  - Voltage: 150 V and 400 V
  - Energy: 10 MV FFF
  - Field size: 5x5 cm<sup>2</sup> (DD), 40x40 cm<sup>2</sup> (DD & DP)
  - Profile depths: 2.18 cm, 10.0 cm & 30.0 cm

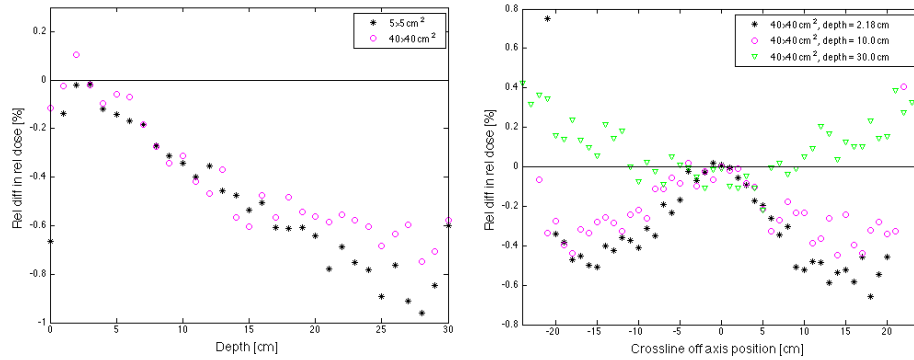
(DD = depth dose, DP = dose profile)

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## FFF



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## FFF

- Our thoughts in Kalmar are that no correction might be necessary for DDs and DPs.
- Should corrections be applied to absolute dose measurements, e.g. for  $k_{Q,Q_0}$ ?

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## Disclaimer

The results are presented as part of a reference contract with Radeq. No compensation has been paid from Sun Nuclear or Radeq for this study.

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