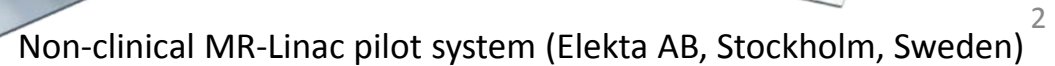


# **Investigation of Gel Dosimetry for Quality Assurance of Magnetic- Resonance Guided Radiotherapy**

Yvonne Roed

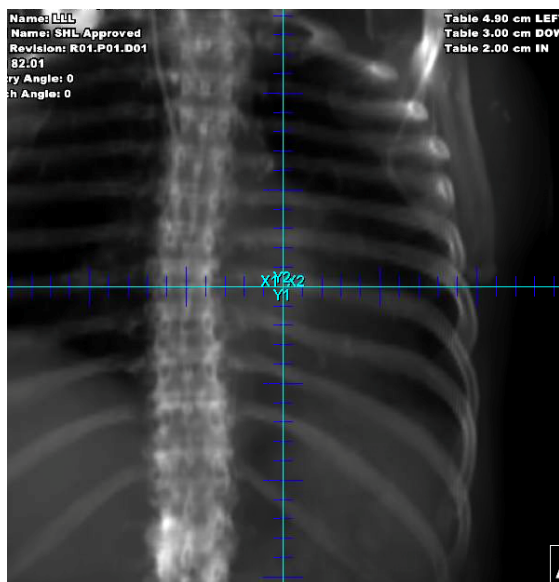
April 18, 2016

- As simple as combining a 7 MV linear accelerator with a 1.5 T MR scanner

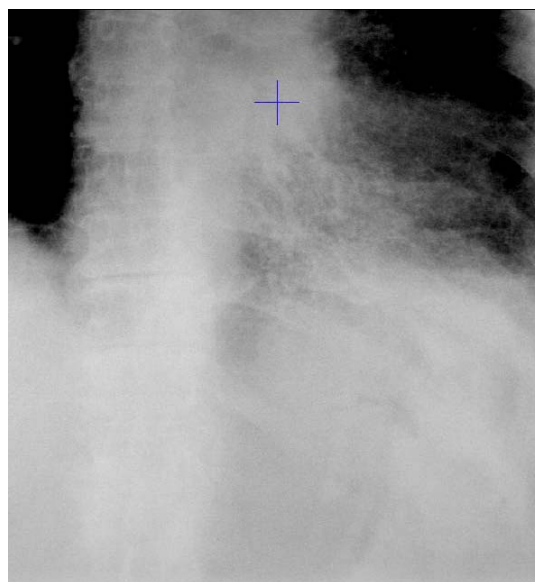


# Why MR-Linac?

- Patient positioning relies on bony anatomy
- MR shows great tissue contrast



MV image before treatment



CT image (top)  
MR image (bottom)

# QA measurements

- Need to ensure precision of prescribed radiation treatment plans with new system
- QA standards for MR-Linac are being developed
- ✗ Point measurements (1D): ion chambers, TLDs etc  
→ Concerns at interfaces between different densities
- ✗ Planar measurements (2D): film, arrays  
→ dose information might be missed in 1D and 2D  
→ MR compatibility?
- ✓ Volumetric measurements (3D): polymer gels  
→ Can address all concerns

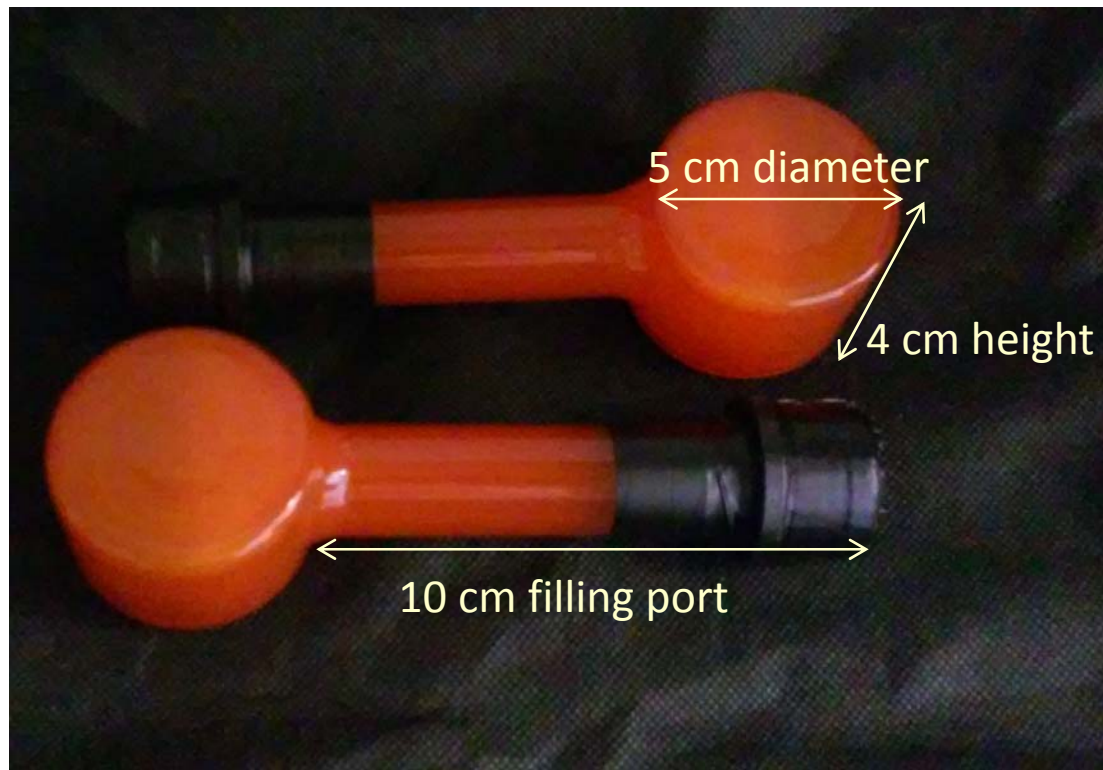
# Polymer Gels





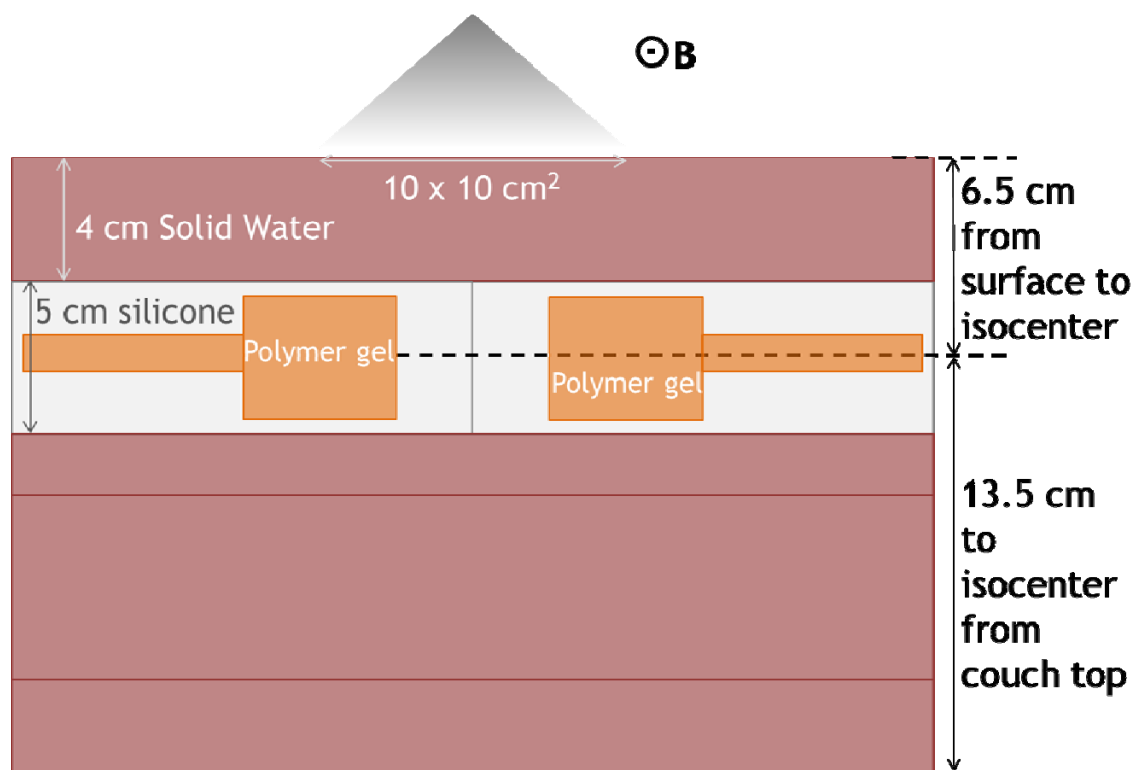
# Polymer Gels

- BANG™ polymer gels
  - Proprietary formulation prepared by manufacturer and poured into glass vessels of our design



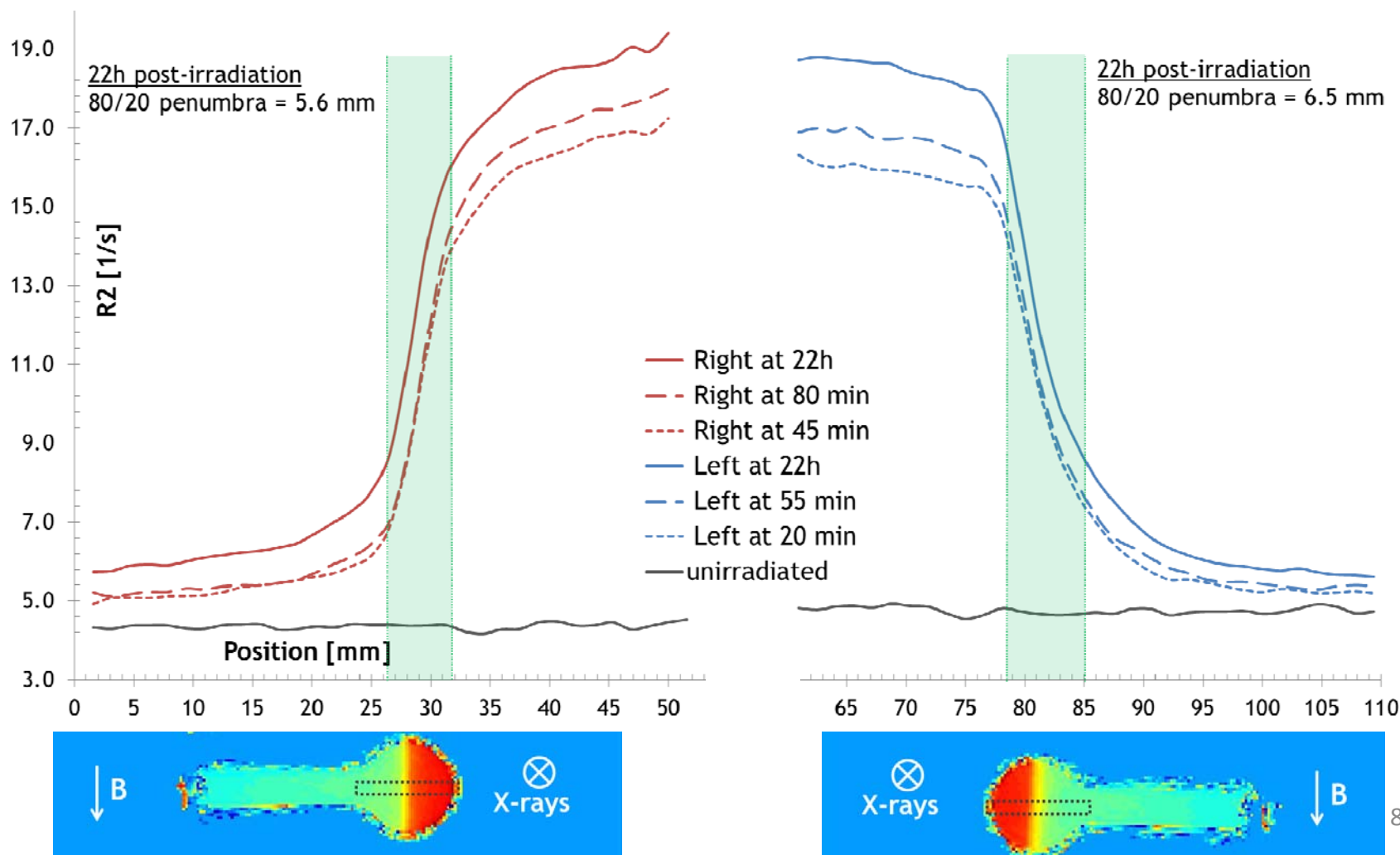
# Experimental Setup

- Penumbra measurements at isocenter in phantom
- Full scatter conditions



# Penumbra results

Field edge measured with MR-Linac at different times post-irradiation

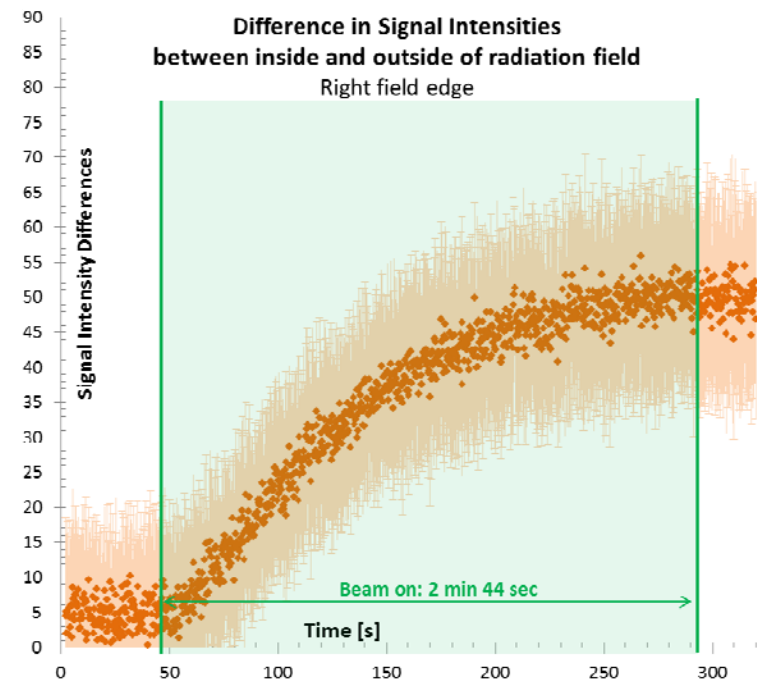
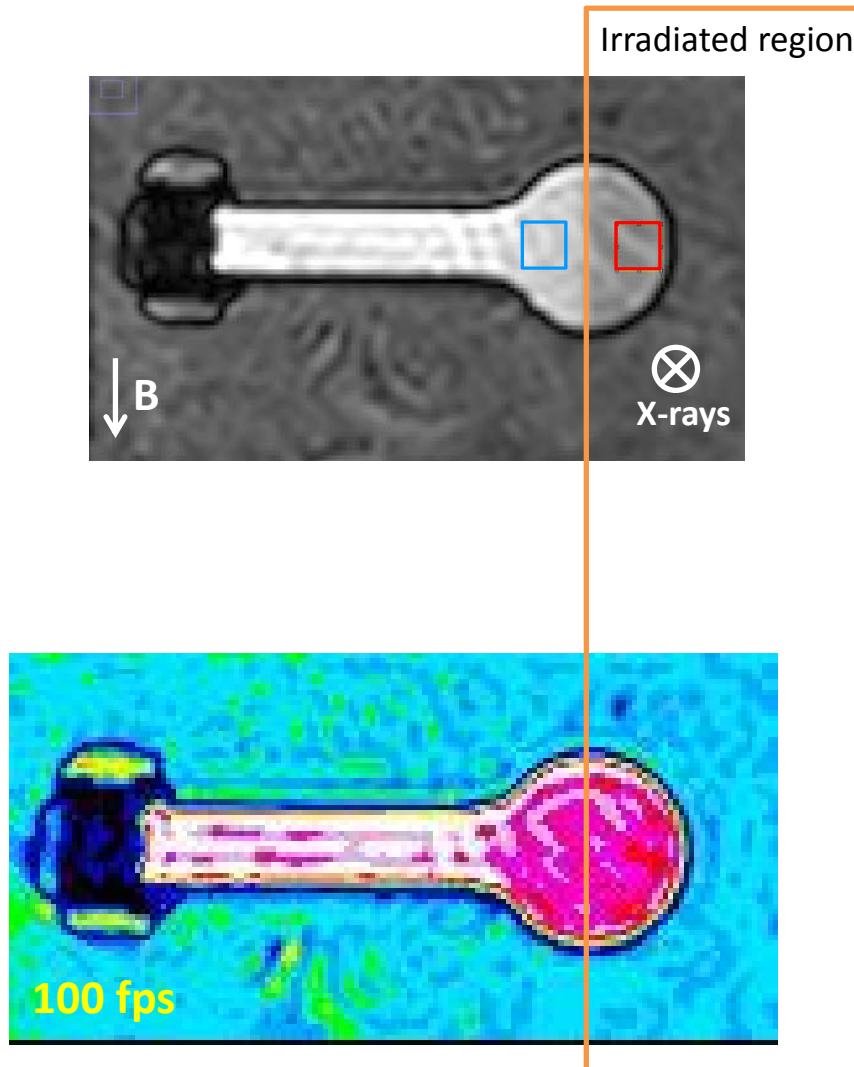




<b>Scan Time Post irr</b>	<b>Penumbra width [mm]</b>
45 min	5.2
80 min	5.4
22 h	5.6

<b>Scan Time Post irr</b>	<b>Penumbra width [mm]</b>
20 min	6.1
55 min	6.2
22 h	6.5

# Real-time data



# Conclusions

- Gel dosimetry has potential in magnetic field environment
- Valuable 3D dose information
- Can provide real-time information
- Detectors can be irradiated and analyzed without transporting

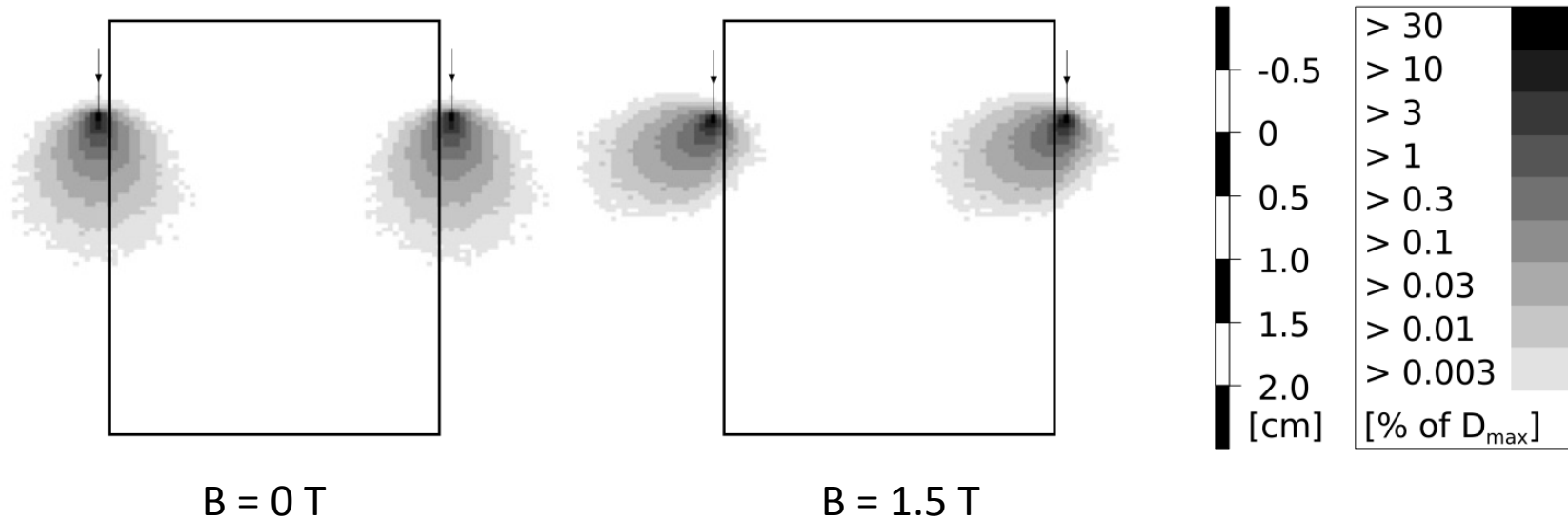
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  - Gary Bosco (Elekta)

Thank You for your  
Attention!



# Influence of Magnetic Fields: Electron Return Effect



# Electron Return Effect: B Strength and Photon Energy

Electron Energy

