

# **Preparing for Prostate Treatments with a Scanning Proton Beam at the Proton Therapy Center in Houston**

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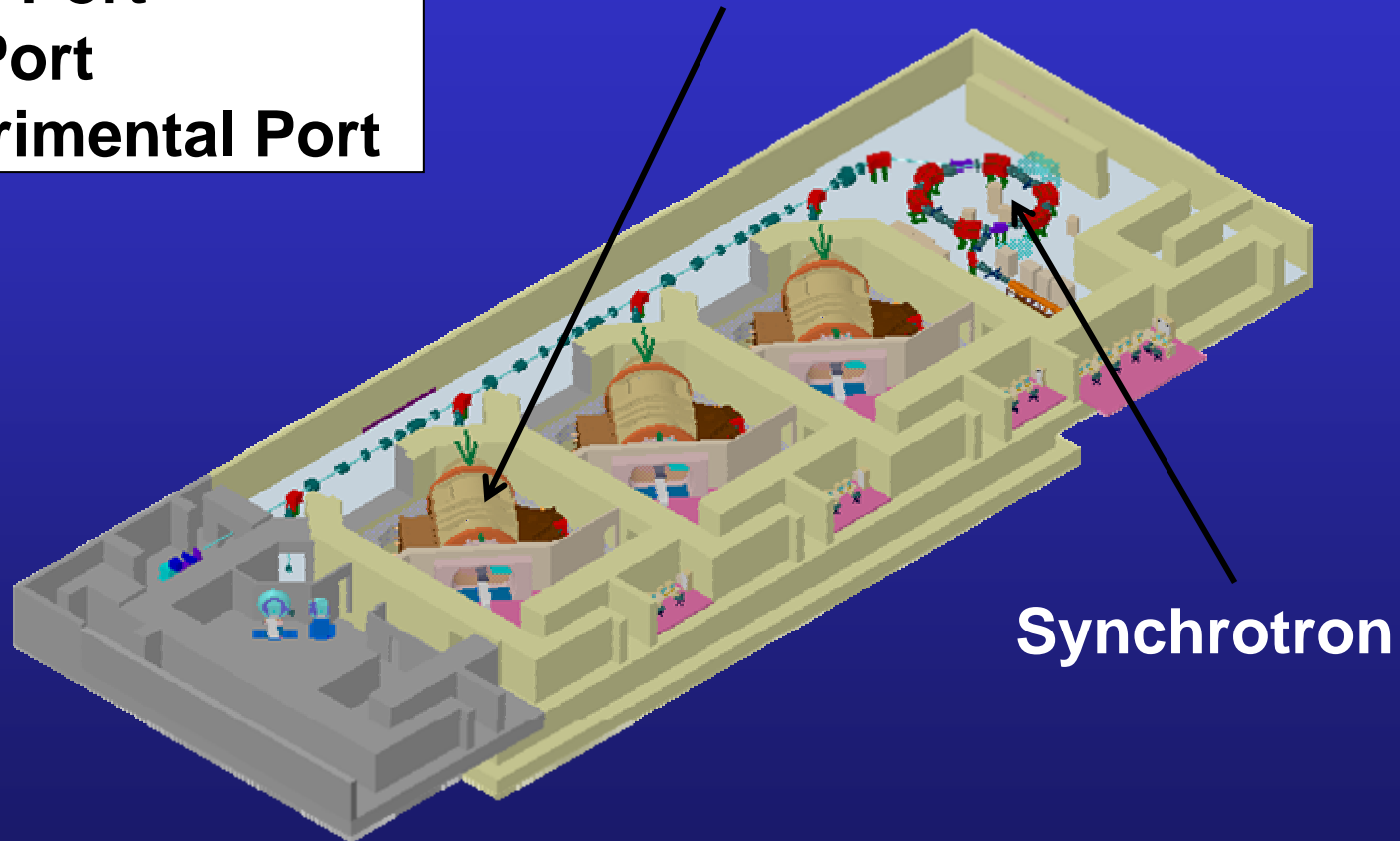
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Varian**

# Proton Therapy Center – Houston (PTC-H)

**3 Rotating Gantries**  
**1 Fixed Port**  
**1 Eye Port**  
**1 Experimental Port**

**1 Pencil Beam Scanning Port**



# Status of Pencil Beam Scanning (PBS) at PTC-H

- Contract signed, May 2003
- White paper on PBS finalized, November 2004
- PBS specifications finalized, February 2006
- First beam in gantry 3, July 2006
- Begin of PBS nozzle acceptance tests, October 2006
- Turnover of PBS nozzle to PTC-H, November 2006
- First PBS patient, early summer 2007

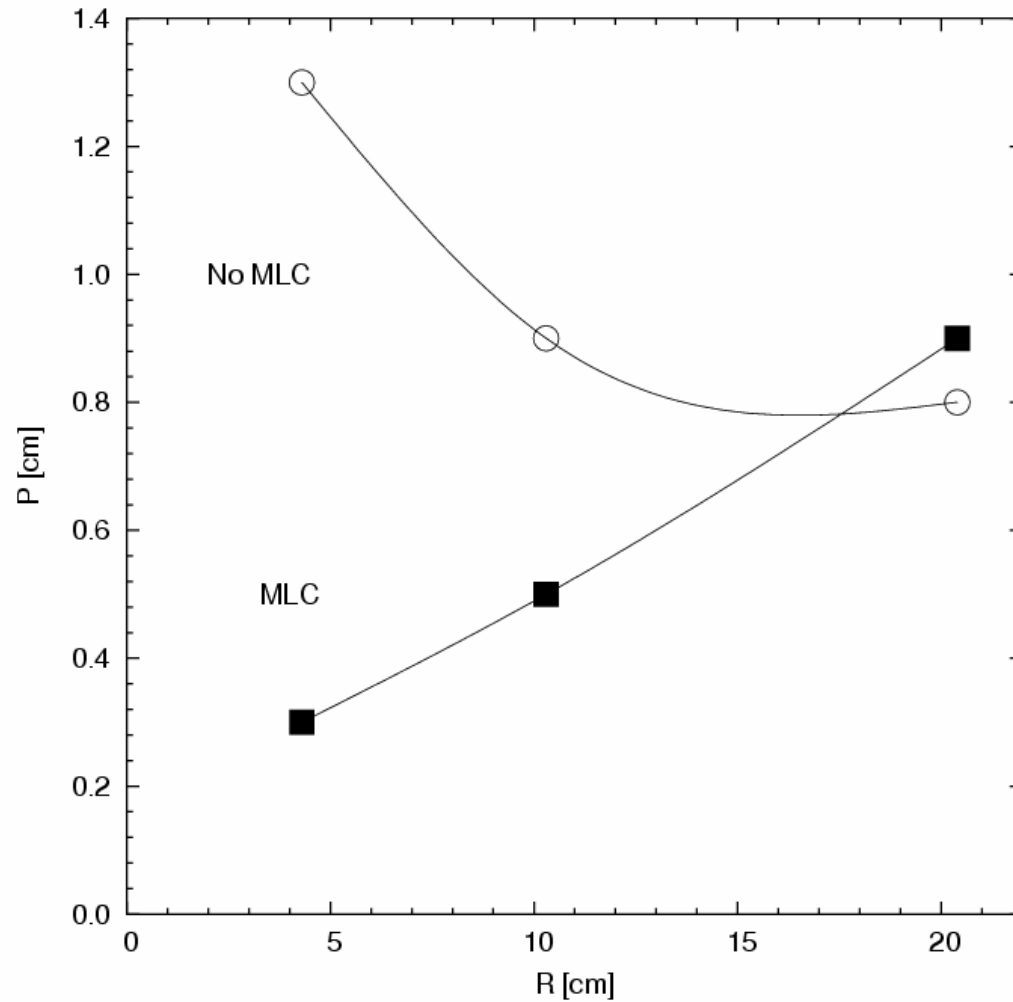
# Equipment

- Synchrotron based Hitachi ProBeat System with scanning nozzle for PBS step and shoot delivery
- Varian Eclipse Treatment Planning System with PBS capability
- IMPAC record and verify system

# Why begin with prostate?

- Experience with prostate treatments on passive scattering beam lines
  - 35 out of 68 patients treated so far a PTC-H are prostate patients
- No Interplay Effect due to lack of intra-fraction motion
- Small field size
- No need for penumbra sharpening and spot size control

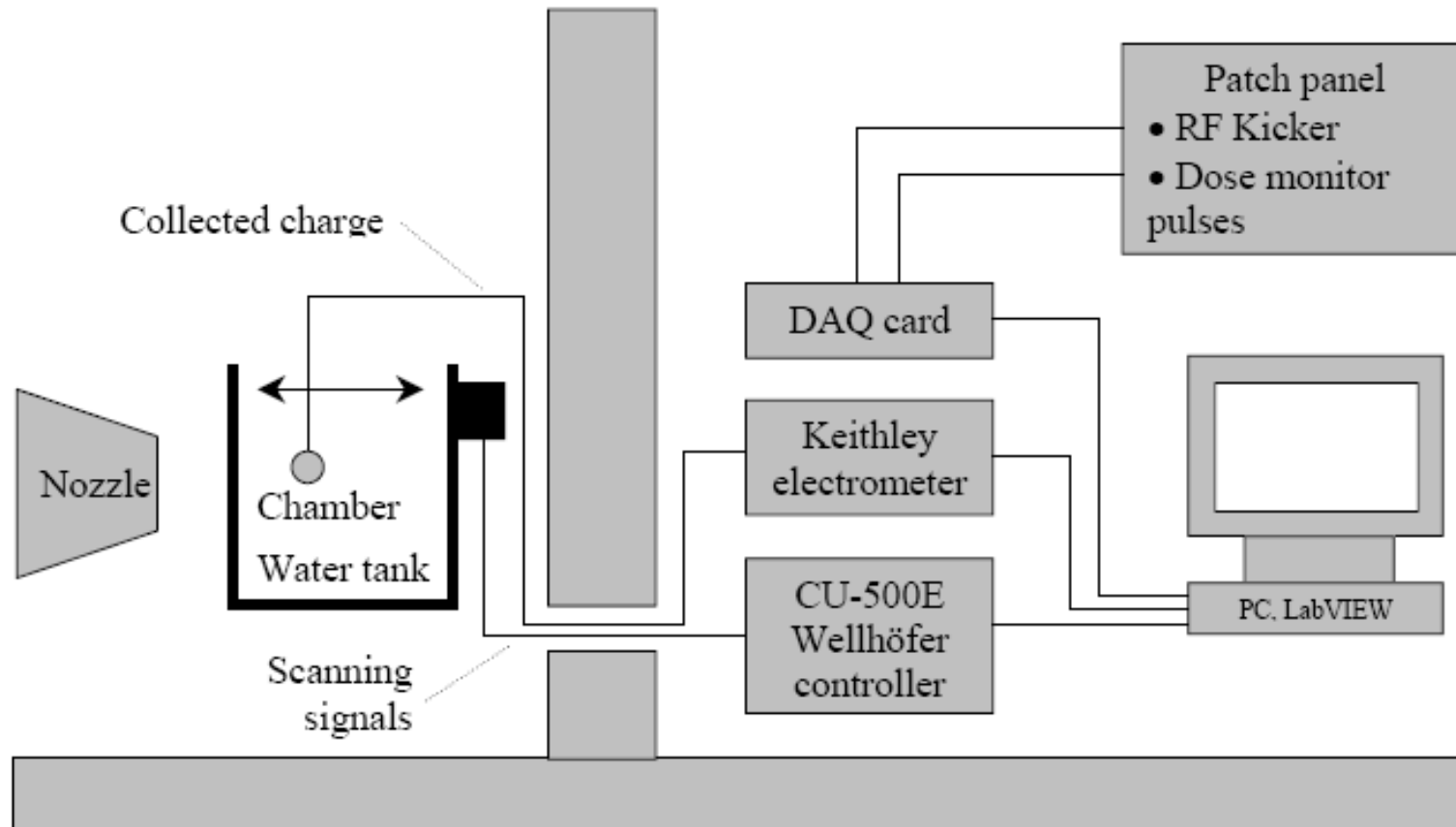
# Penumbra



# CAX Depth dose Measurements

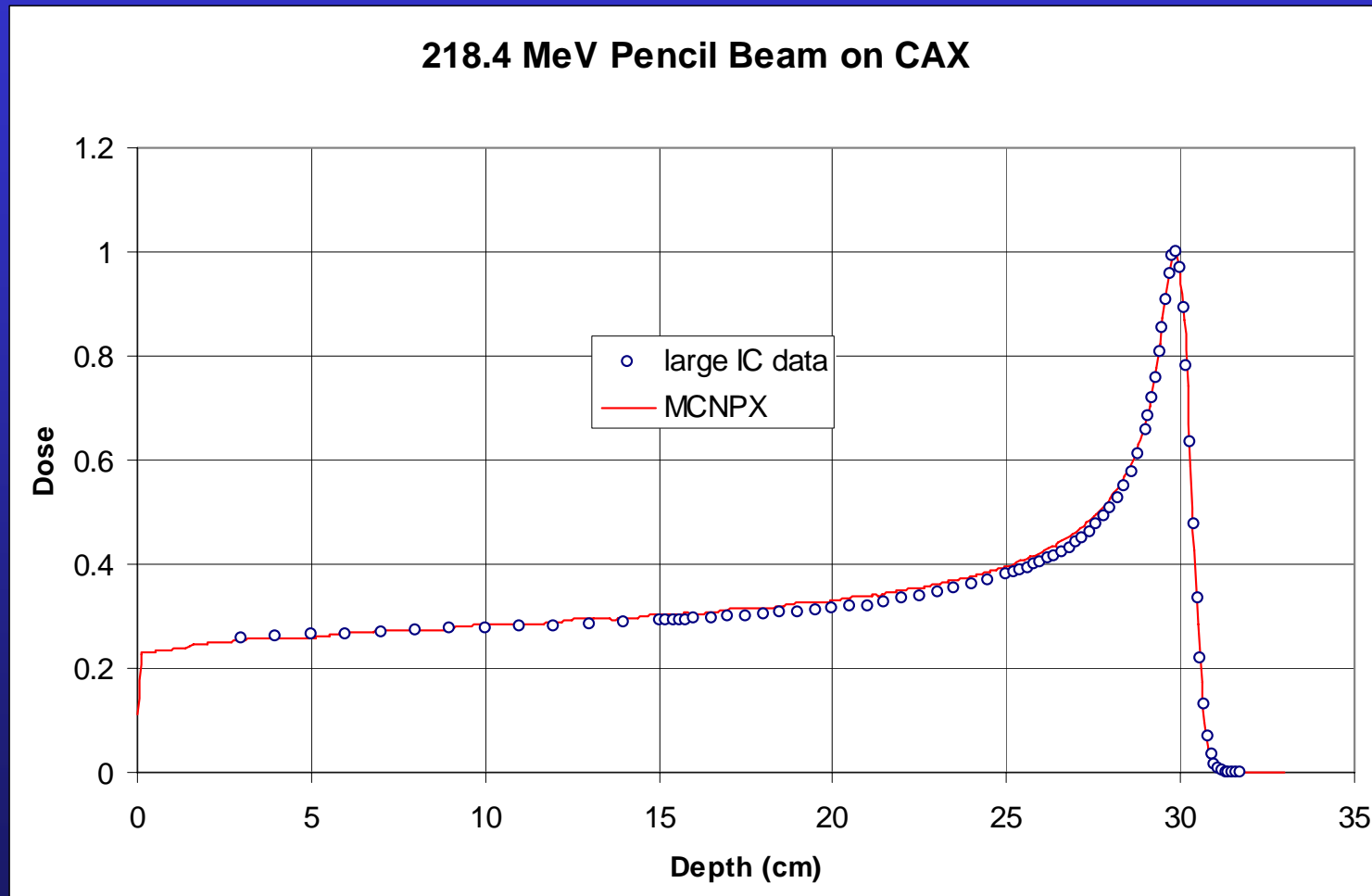
- PTW Bragg peak chamber
- Keithley Electrometer
- Wellhofer Blue Phantom
- Digital output of Hitachi MU chamber
- National Instruments DAQ card
- LabView Software

# Measurement Setup

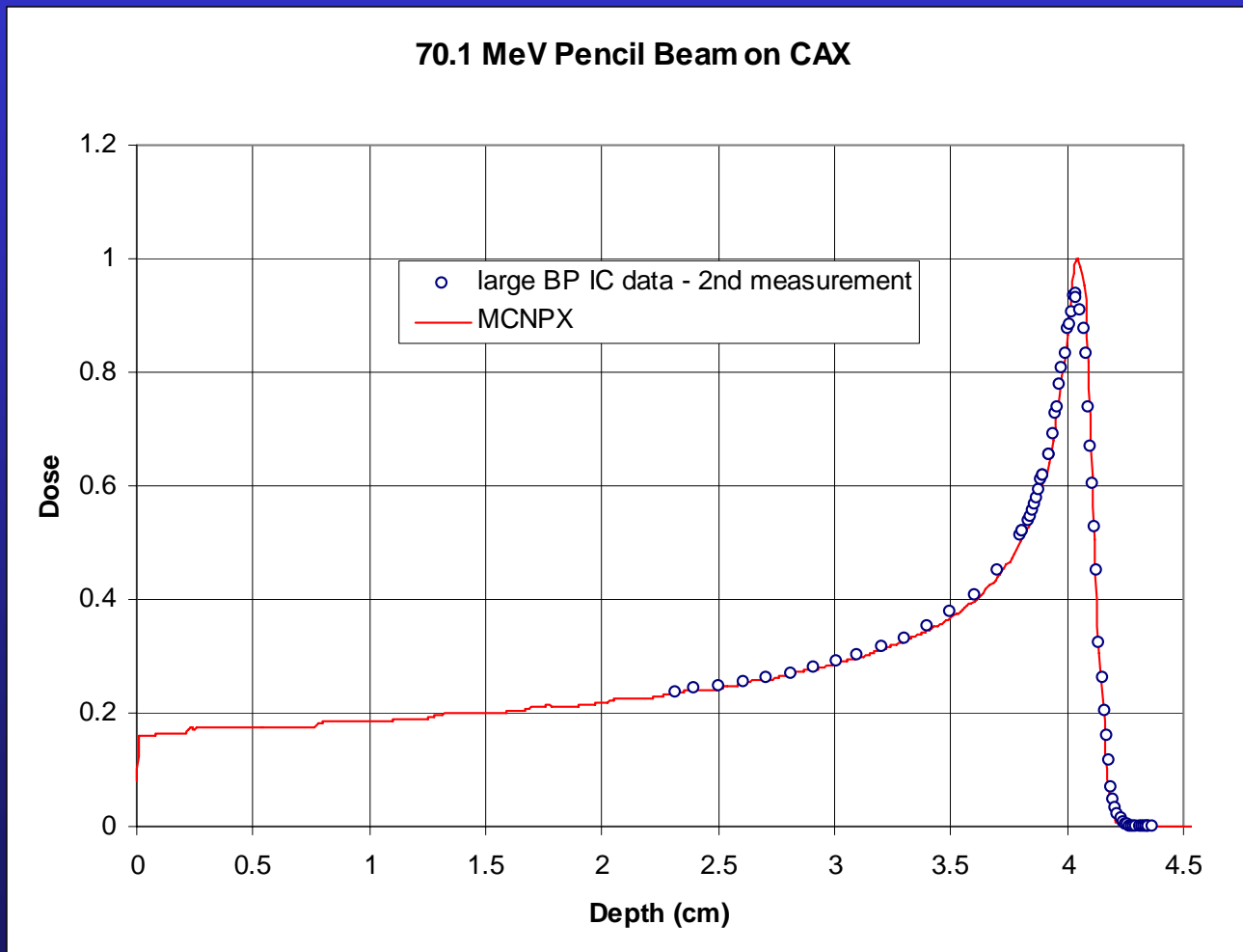




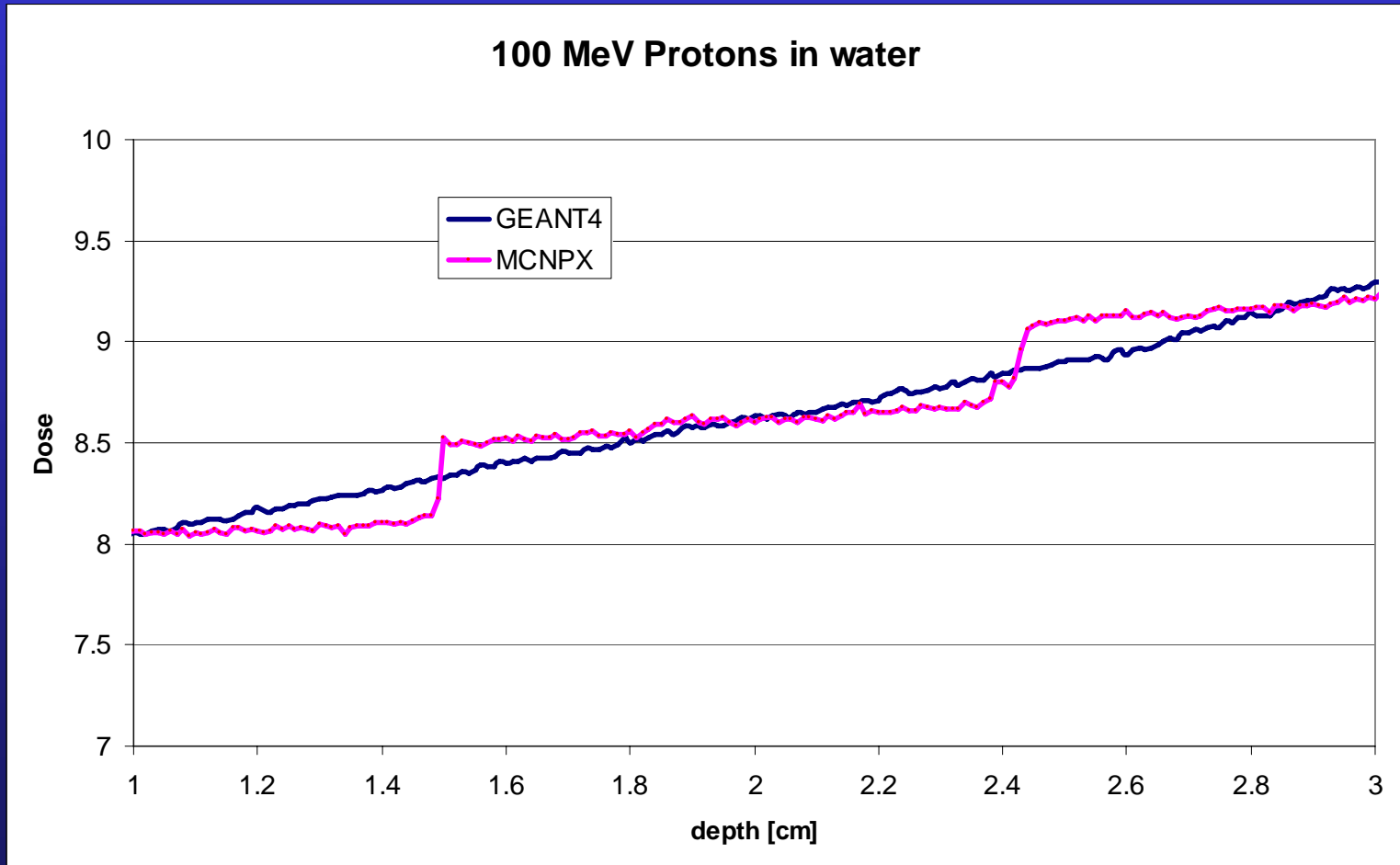
# Measurement Results (1)



# Measurement Results (2)



# “Stair steps” in MCNPX simulations



# Solution

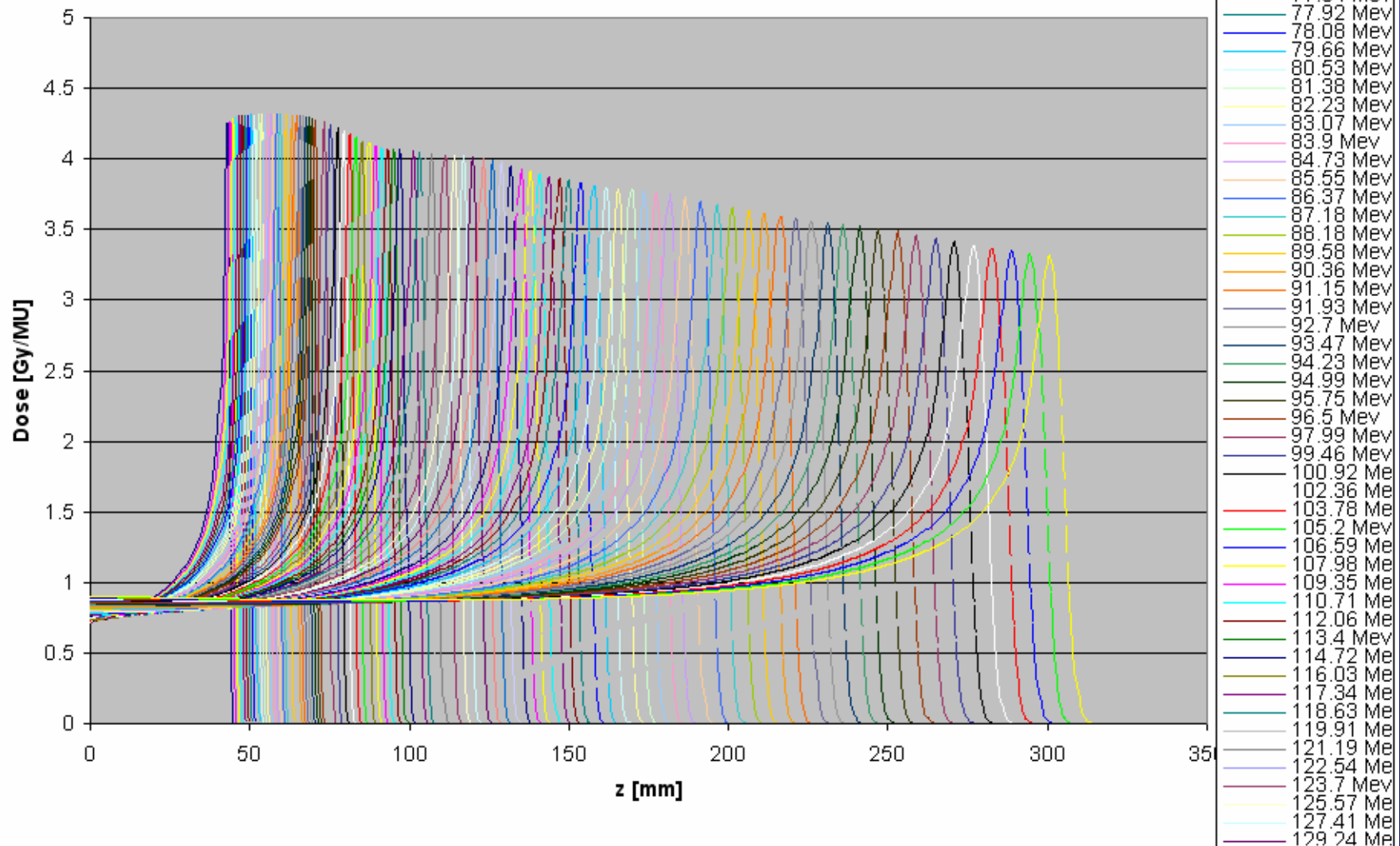
- For “Mock Commissioning” use GEANT4 data in entrance region, MCNPX at the Bragg peak

# Minimal TPS commissioning data requirements

- 93 CAX depth dose curves, in water for 93 energies ranging in penetration from 30 cm to 4 cm
- 2 x 5 x 93 lateral scans through CAX pencil beams in air, corresponding to 2 orthogonal scans at 5 distances from the isocenter plane

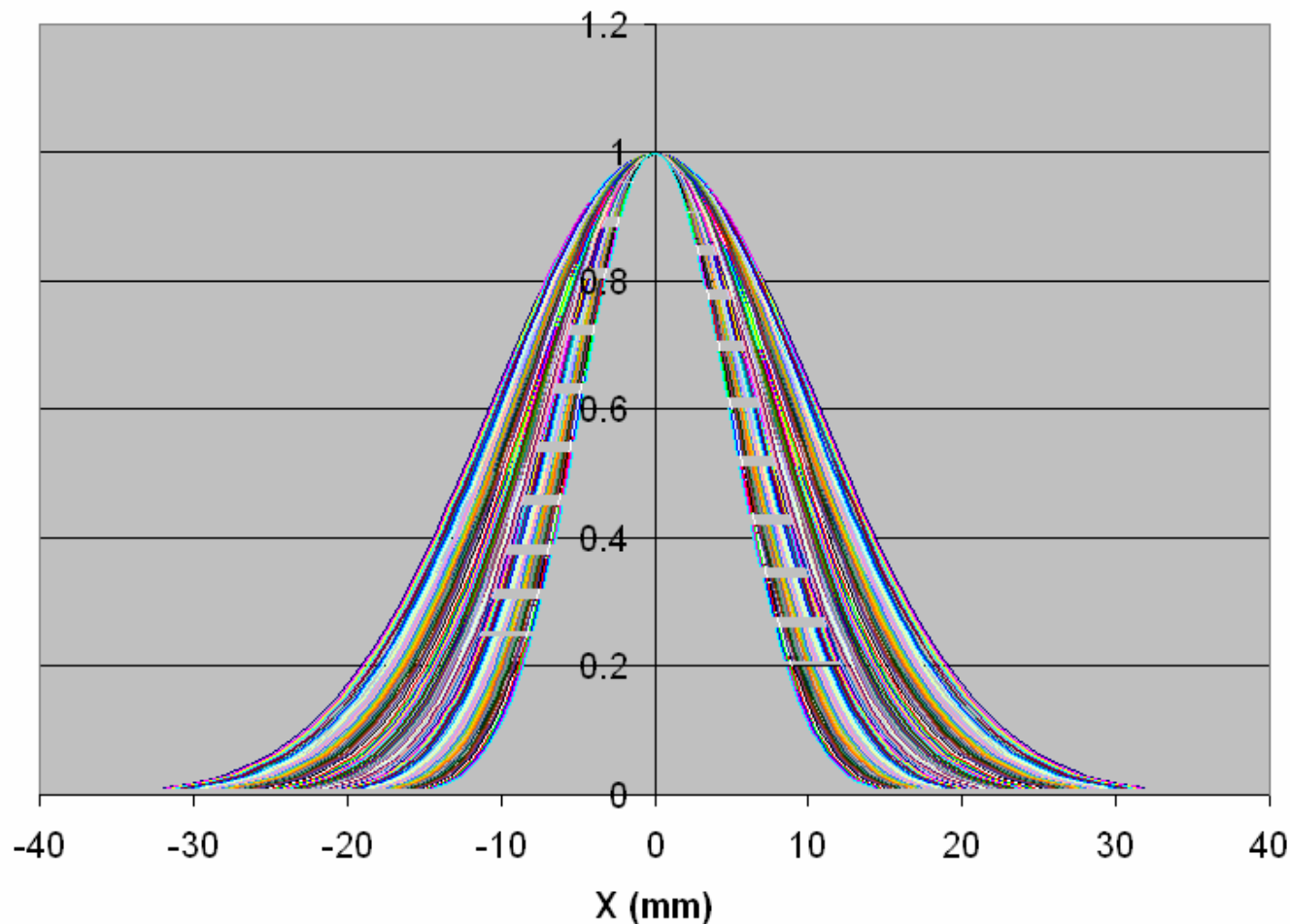
# CAX depth dose curves

Central Axis Depth Dose Curves

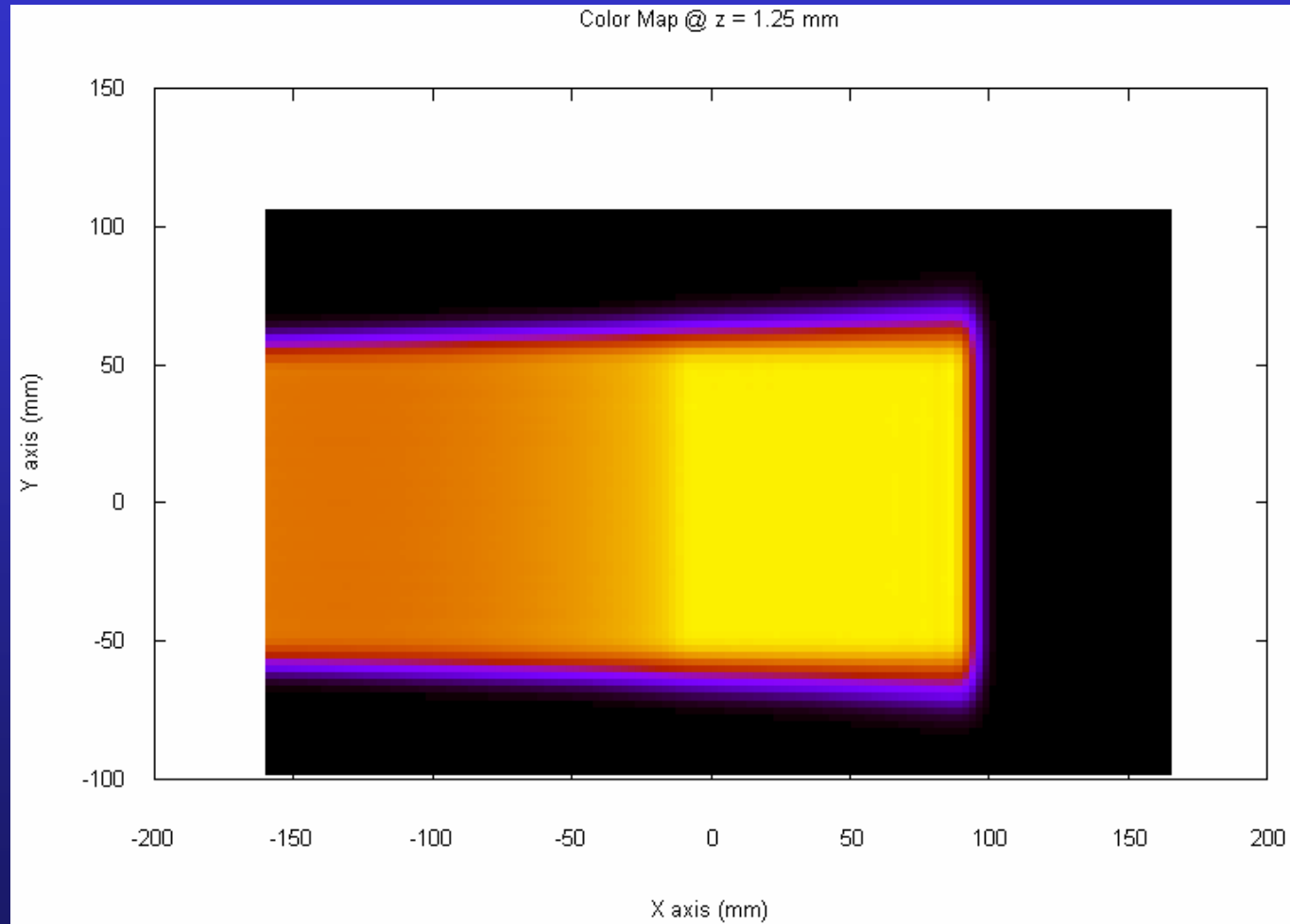


# Cross Profiles

Cross Profiles @ isocenter



# Varian Eclipse dose distribution for PTC-H PBS





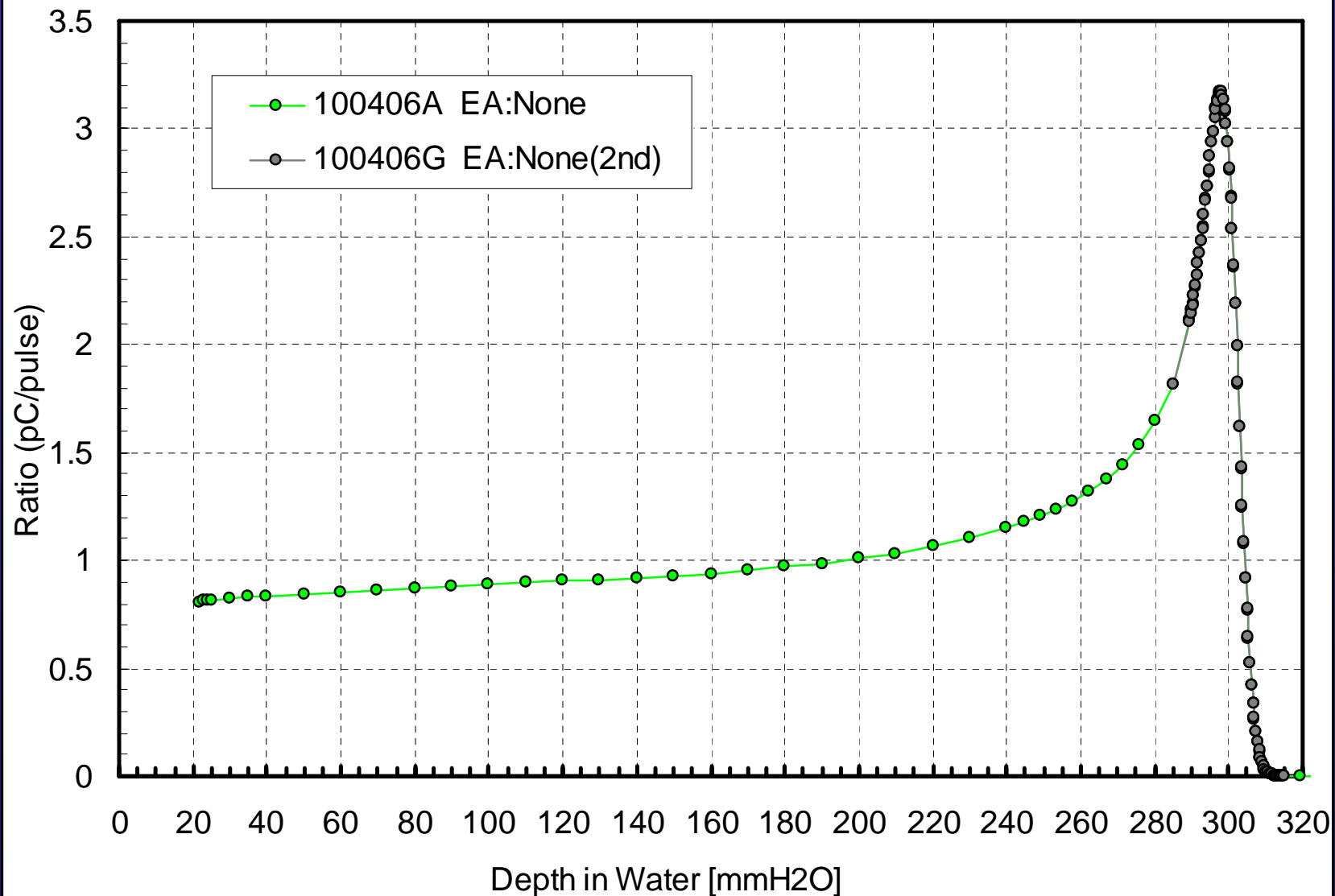
# Verification and QA tools

- CCD Lanex System
- EBT Gafchromic film
- Ionization chambers
- And more ...



Martin Bues, PhD, PTCOG 45, Houston, Scientific Session – Clinical Physics 1

# G3-NZL AT Proton Beam RangeTest(A-1)



# G3-NZL AT Proton Beam RangeTest

