



Absolute and Relative Dosimetry

Practical Work at the *DosLab* Linac (Jiří Valenta, Christian Vogel)



Our plan for today.

- Introduction DosLab Facilities
- Why do we perform absolute/relative dosimetry measurements in a clinical Linac?
- Practical Work

DosLab

IBA DosLab

SSDL (Secondary Standard Dosimetry Laboratory)

Calibration of Dosimetry equipment, for IBA and external customers.

DosLab facilities include

- two ^{60}Co γ -sources for detector calibration
- kV X-Ray source
- Elekta Linac with Agility Head (e⁻ and MV X-Ray)
- Electrometers, Chambers, other Dosimetry Equipment

Today: We are going to use

- Water Phantom (Blue Phantom 2) + Controller (Movement + Electrometer)
- Ionization Chambers

Why?

Absolute/Relative Dosimetry Measurements

Basically Two Types

- *Absolute* dose at distinct points
- *Relative* beam profile scans

Purpose

- Input for the TPS' Beam Model of the Linac
 - calculated during commissioning, after repairs/upgrades, ...
- Verify Linac Operation
 - Subset of commissioning measurements repeated at intervals (daily: only dose in point, bi-yearly: profile, ...)

Beam Model Parameters

Treatment Planning System (TPS) calculates very complex beams

- Not feasible to measure full 3D dose distributions for all
- TPS needs an analytical model to calculate beams for arbitrary settings.

Beam model tuned for every single Linac installation

- Minimize difference between measurement and prediction
 - for reference fields
(e.g. 10x10cm² or special MLC patterns, Energies / “*Beam Qualities*”)
 - at certain points along distinct curves
 - *Inplane*, *Crossplane*, *Depth-Dose*, ...

Beam Model (for the Treatment Planning System)

Linac Vendor provides...

Linac Design

TPS vendor designs...

Beam Model

Linac Specific Beam Model

Medical Physicist or Technical measures...

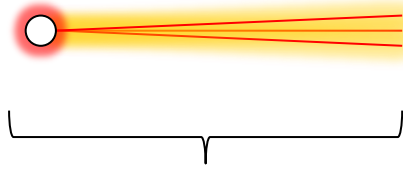
Beam Data

Us, today!

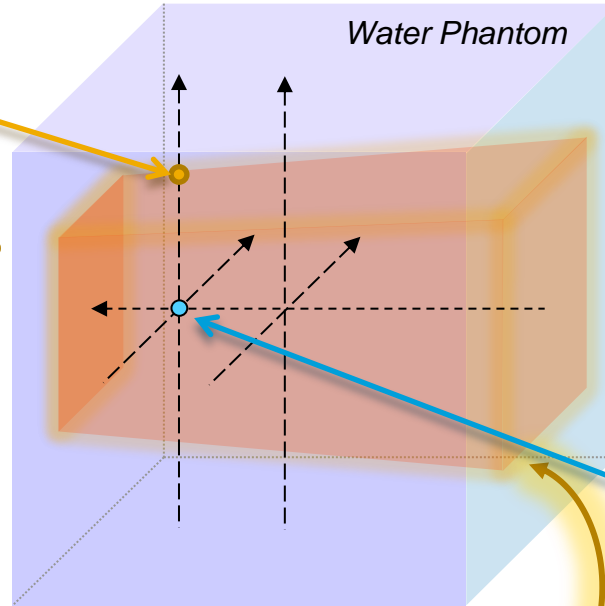
Relative Dosimetry

Field Detector

Reference Detector
(at field fringe)



Beam Source



Dose Distribution

Normalize
to D_{\max}

Practical Work

Practical Work

Relative Measurements (CCU Electrometer and Controller)

- Alignment of Phantom and Detectors
- Measurements: (CC13 Ionization Chamber)
 - Depth Dose Profiles (2 Energies)
 - Inplane (parallel to Gantry rotation axis) and Crossplane (2 depths each)

Absolute Measurements (Dose 1 Reference Electrometer)

- Photons: Output Factors (2 Energies, 2 Field Sizes each)
- Install electron collimators
- Electrons: Output Factors (2 Energies, 2 Field Sizes each)

Discussion of Results

Let's get started!