



Advances in Intensity Modulated Proton Therapy and PT Image Guidance

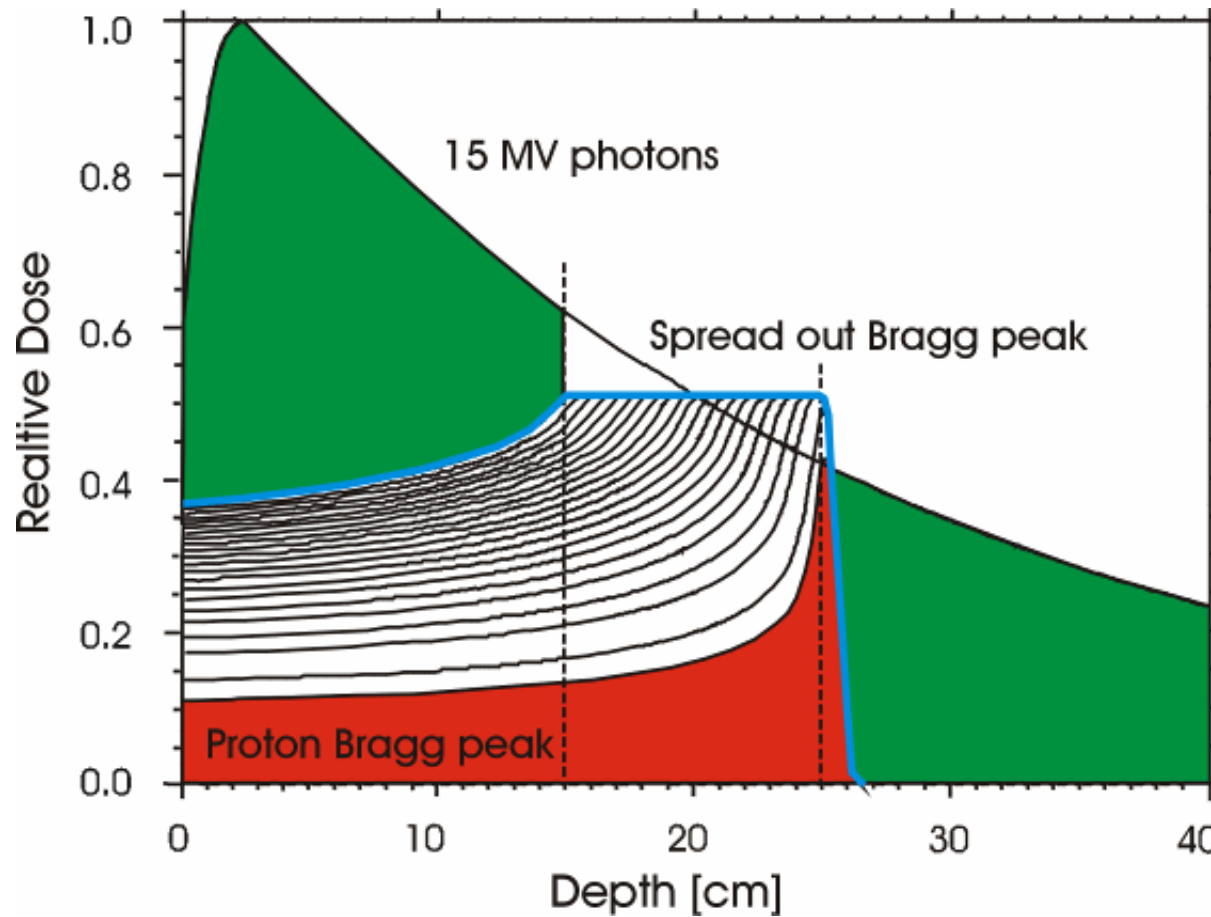
Antalya, 23th of November 2013

Agenda

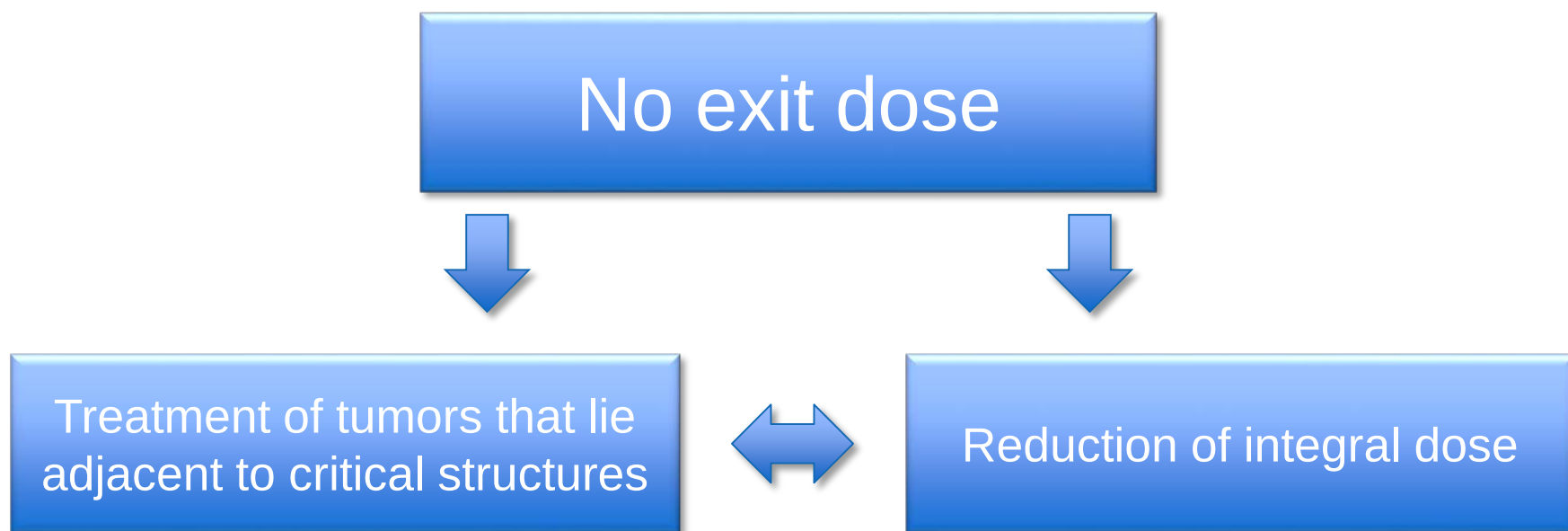
- Why Proton Therapy?
- Scanning and IMPT: Quality of Care and Workflow
- ProBeam Key Features
 - Dynamic Peak™ Scanning
 - Dynamic Peak™ Imaging
 - Dynamic Peak™ Workflow

Why Proton Therapy?

Bragg Peak



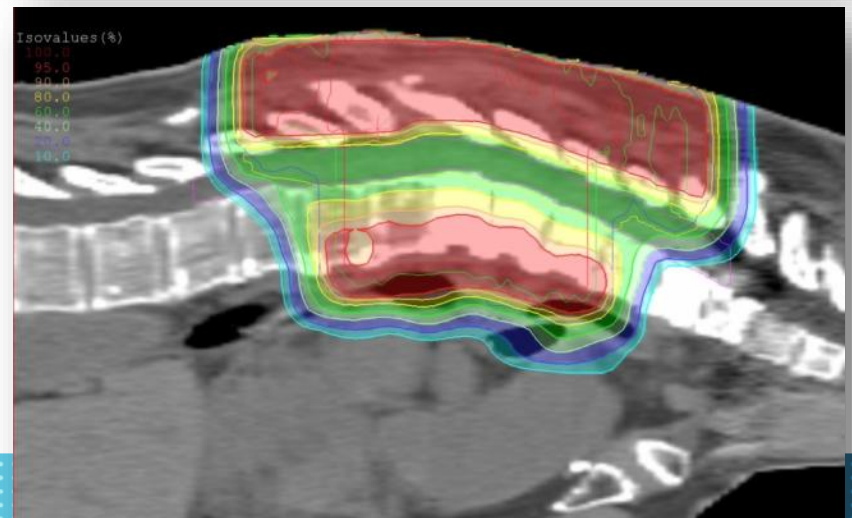
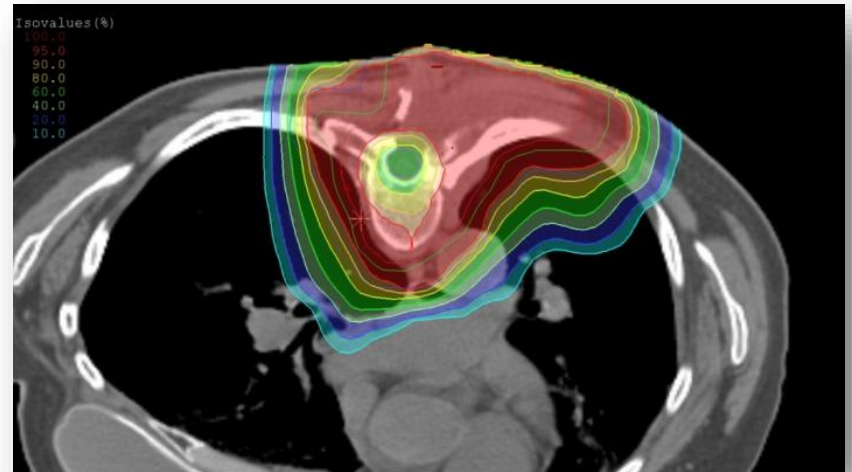
Why Proton Therapy?



Why Proton Therapy?

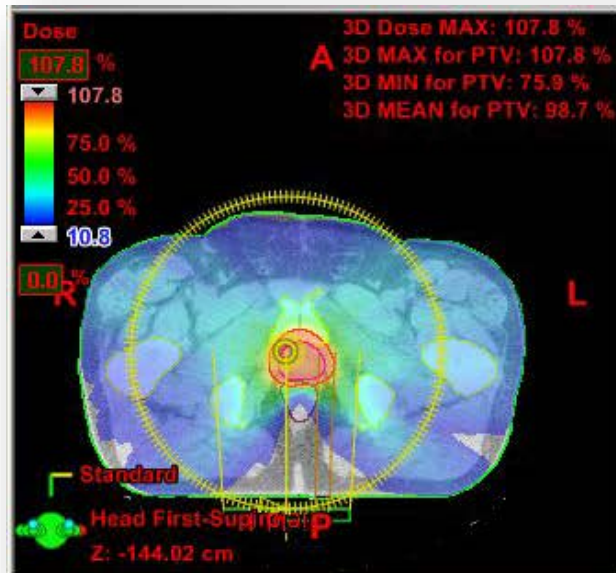
Sparing critical structures

- Ocular melanoma
 - Head & Neck
 - Central Nervous System
 - Sarcomas
-
- Lung
 - Liver
 - Breast



Why Proton Therapy?

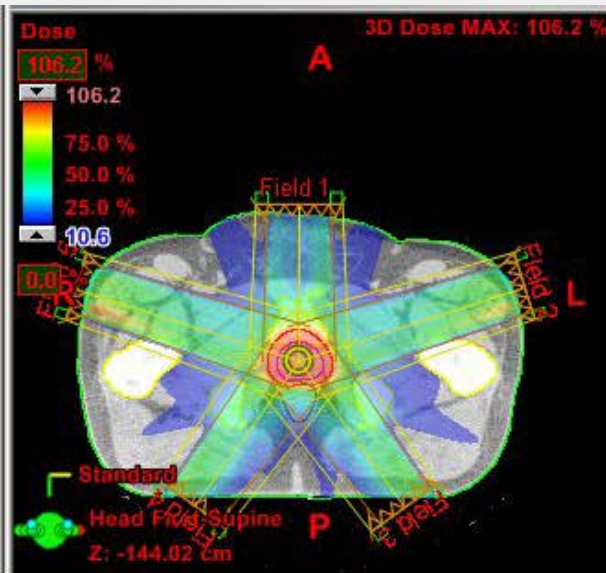
Reduction of integral dose



Rapid Arc

4.409 (Gy)

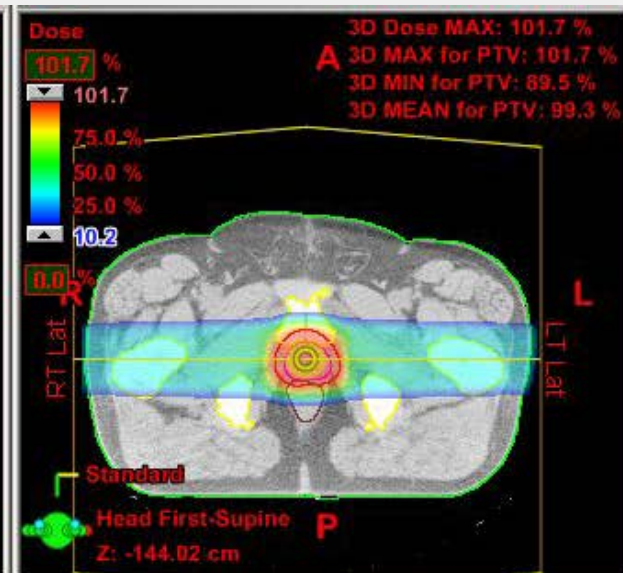
97%



IMRT

4.542

100%



Proton
Scanning

2.077

46%

Why Proton Therapy?

Reduction of margins and integral dose

- Reduction of acute morbidity
 - Reduction of long term morbidity
 - Secondary malignancies
 - Growth
 - Neurocognitive toxicity
 - Ototoxicity
- 
- Pediatric cancers
 - Hypofractionation
 - SRS

Scanning and IMPT: Quality of Care and Workflow

Why will Scanning/IMPT change Proton Therapy?



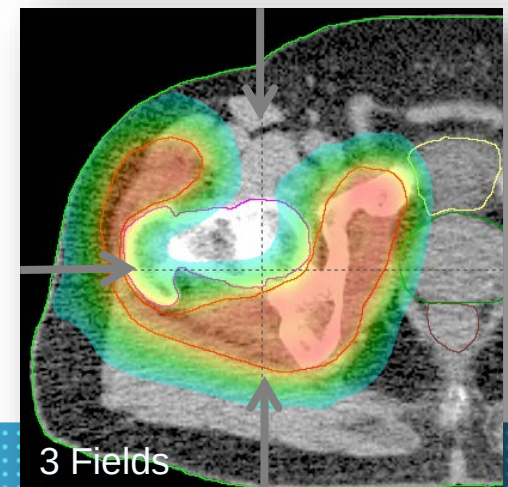
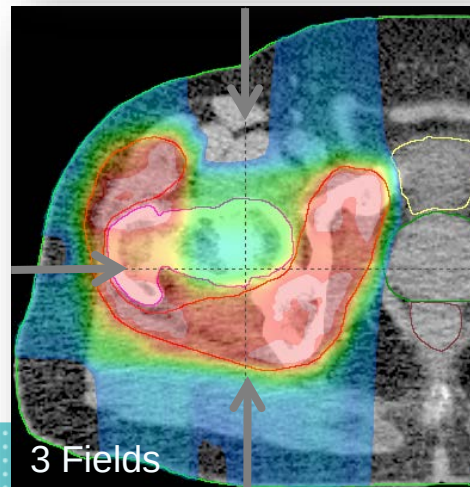
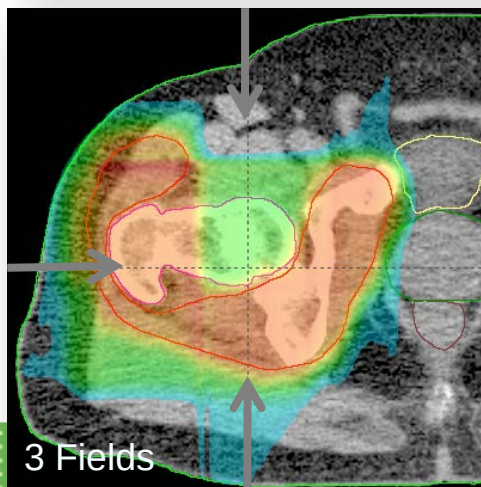
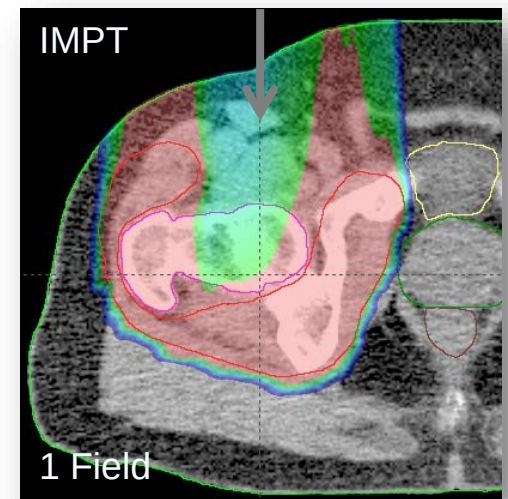
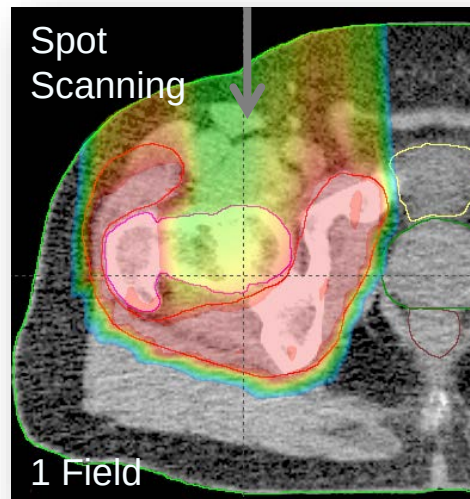
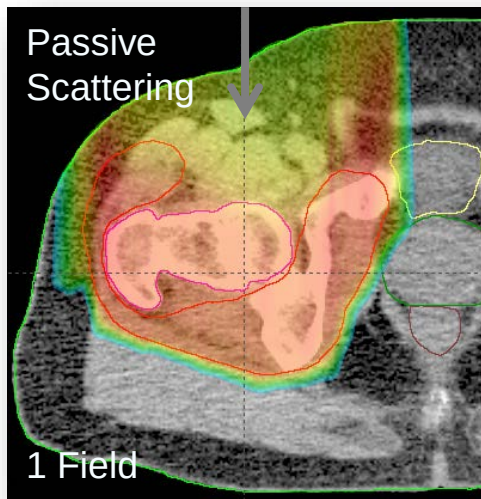
Quality of Care



Workflow



Scanning/IMPT – Quality of Care



What is IMPT?

Definition

PSI:

“IMPT is the simultaneous optimization of all Bragg peaks from all fields”

“IMPT is the pencil beam scanning equivalent of IMRT”

Varian:

SFO = Single Field Optimization.

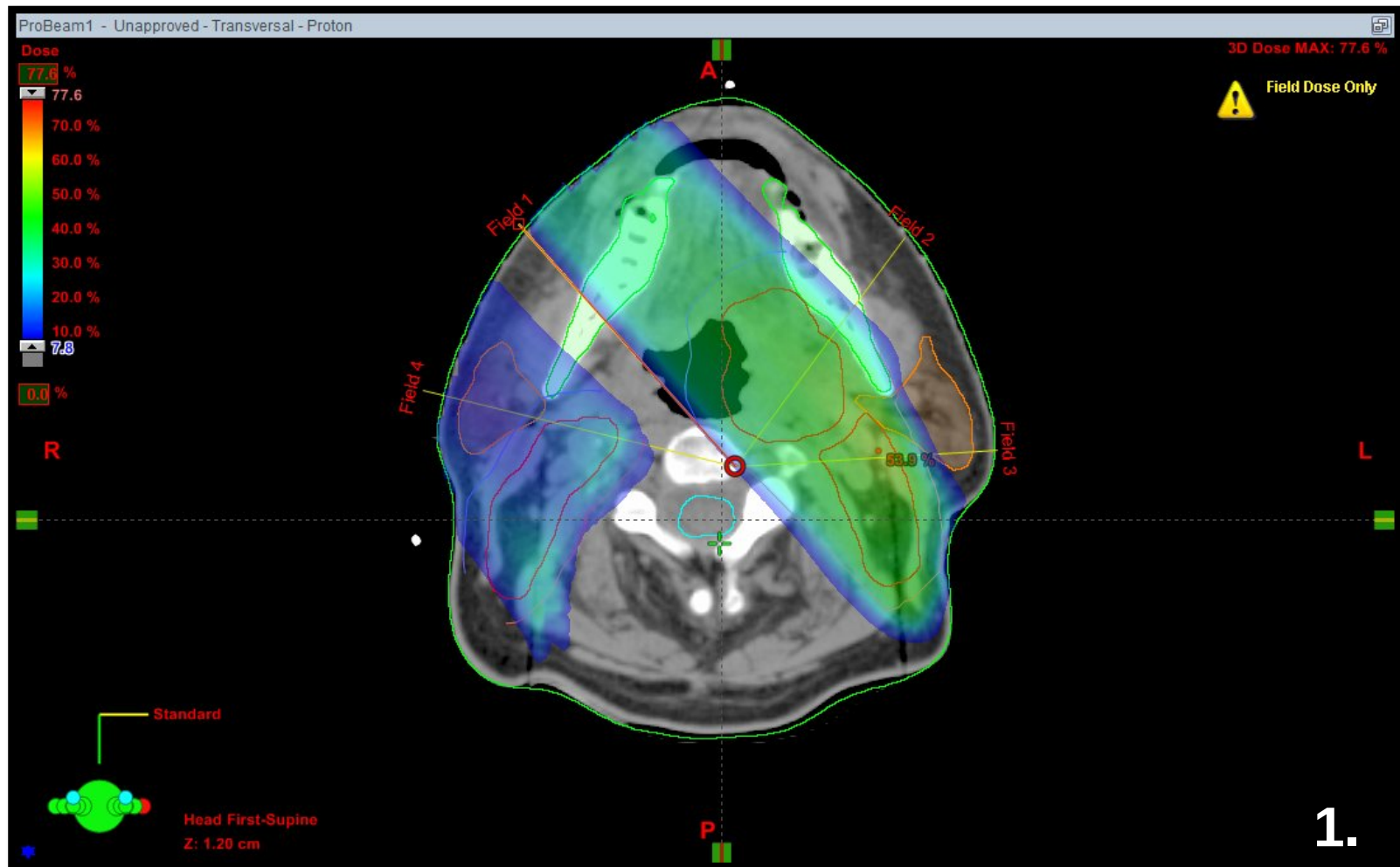
Each individual field delivers an homogeneous dose to the target volume.

MFO/IMPT = Multi Field Optimization

Each individual field delivers an optimized and inhomogeneous dose such that when combined produces a uniform target dose.

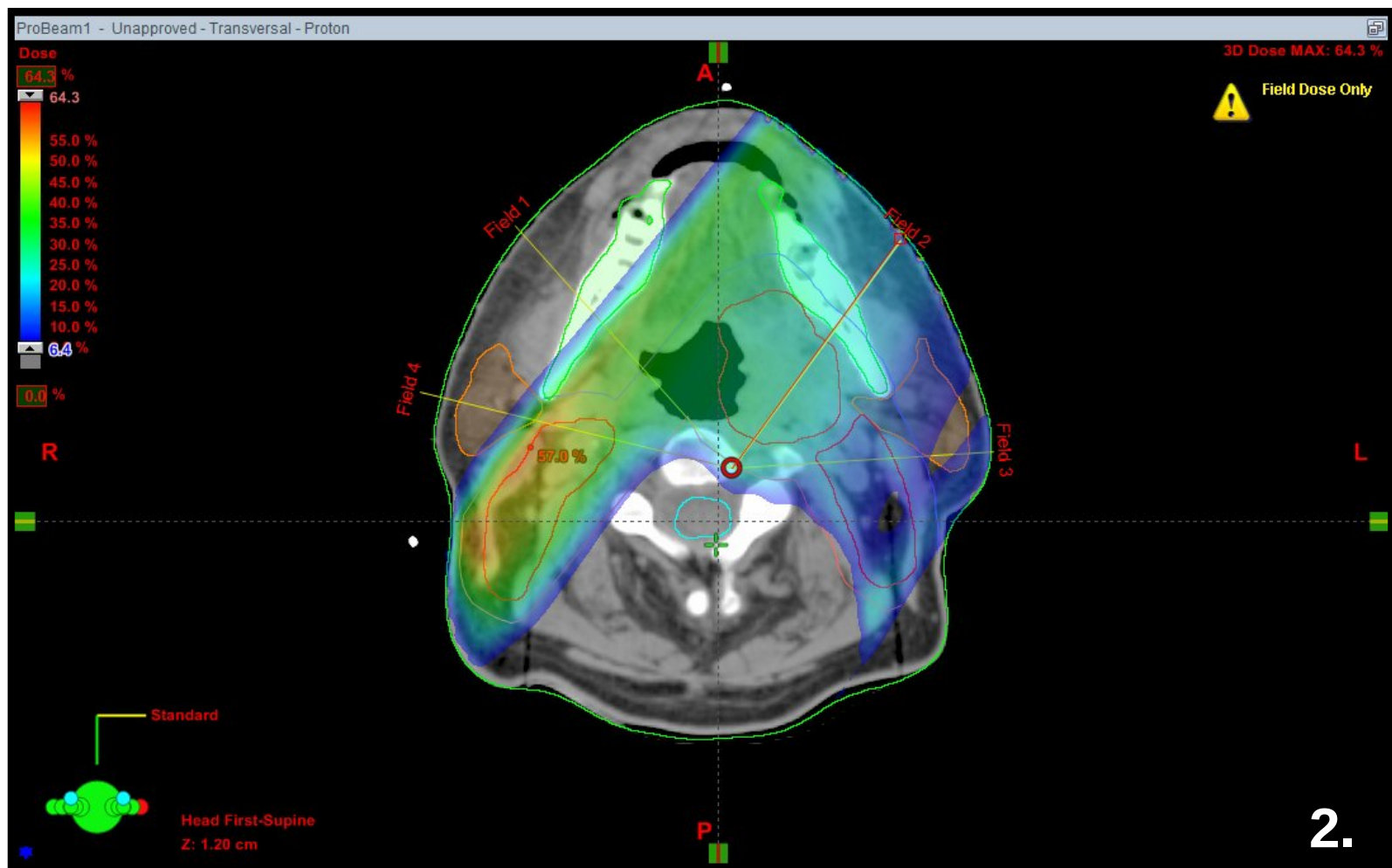
What is IMPT?

“Each individual field delivers an optimized and inhomogeneous dose”



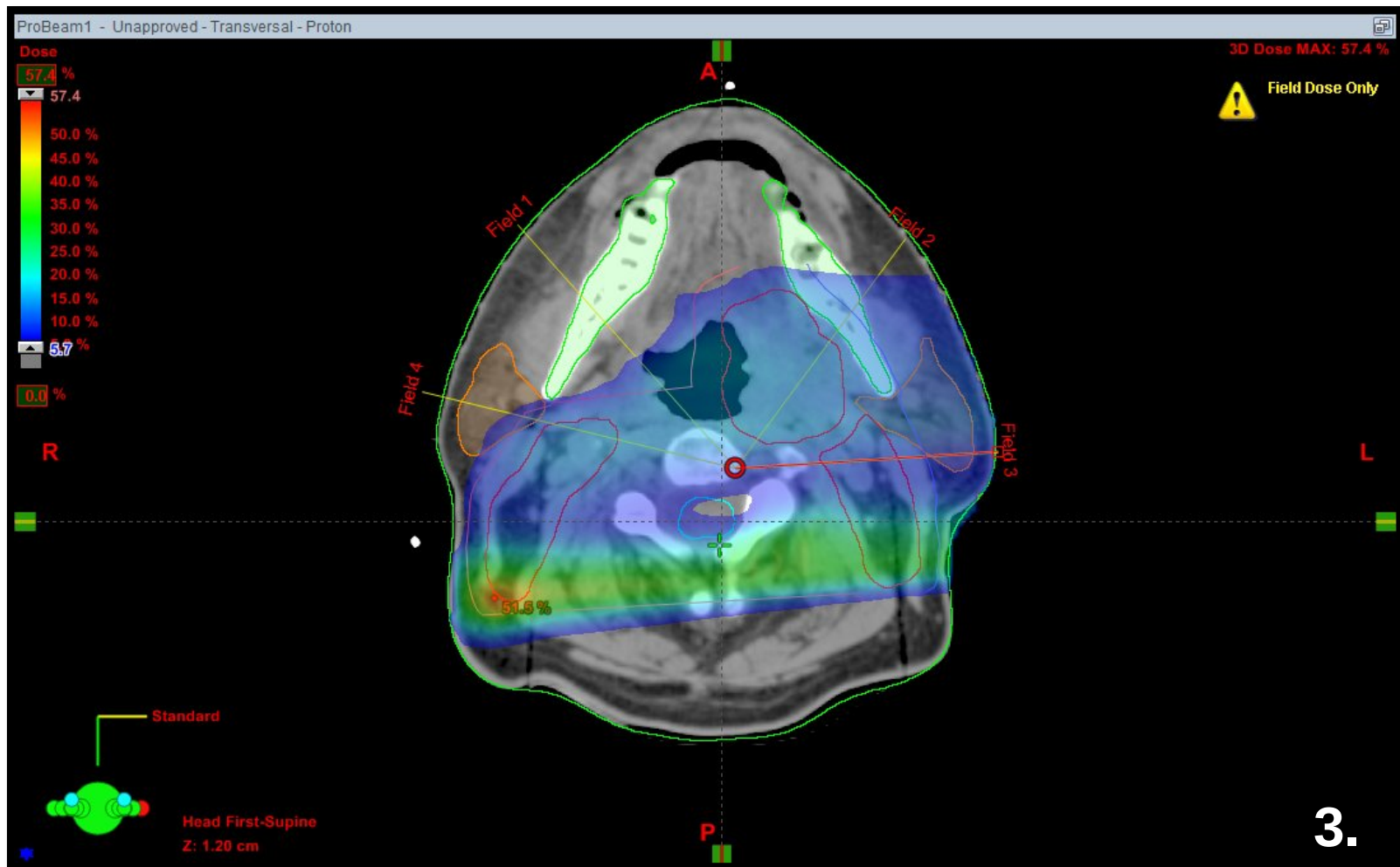
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“Each individual field delivers an optimized and inhomogeneous dose”



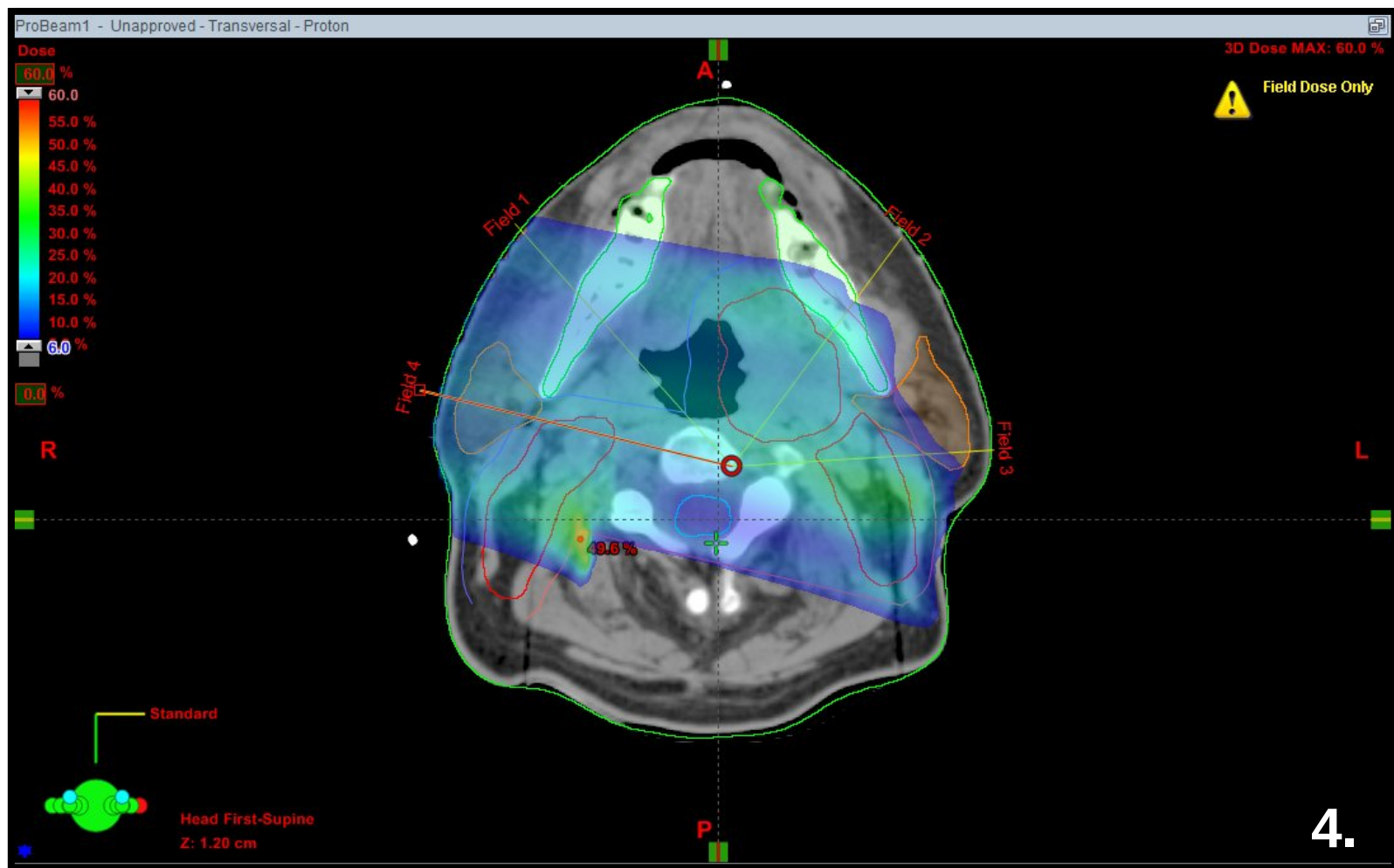
What is IMPT?

“Each individual field delivers an optimized and inhomogeneous dose”



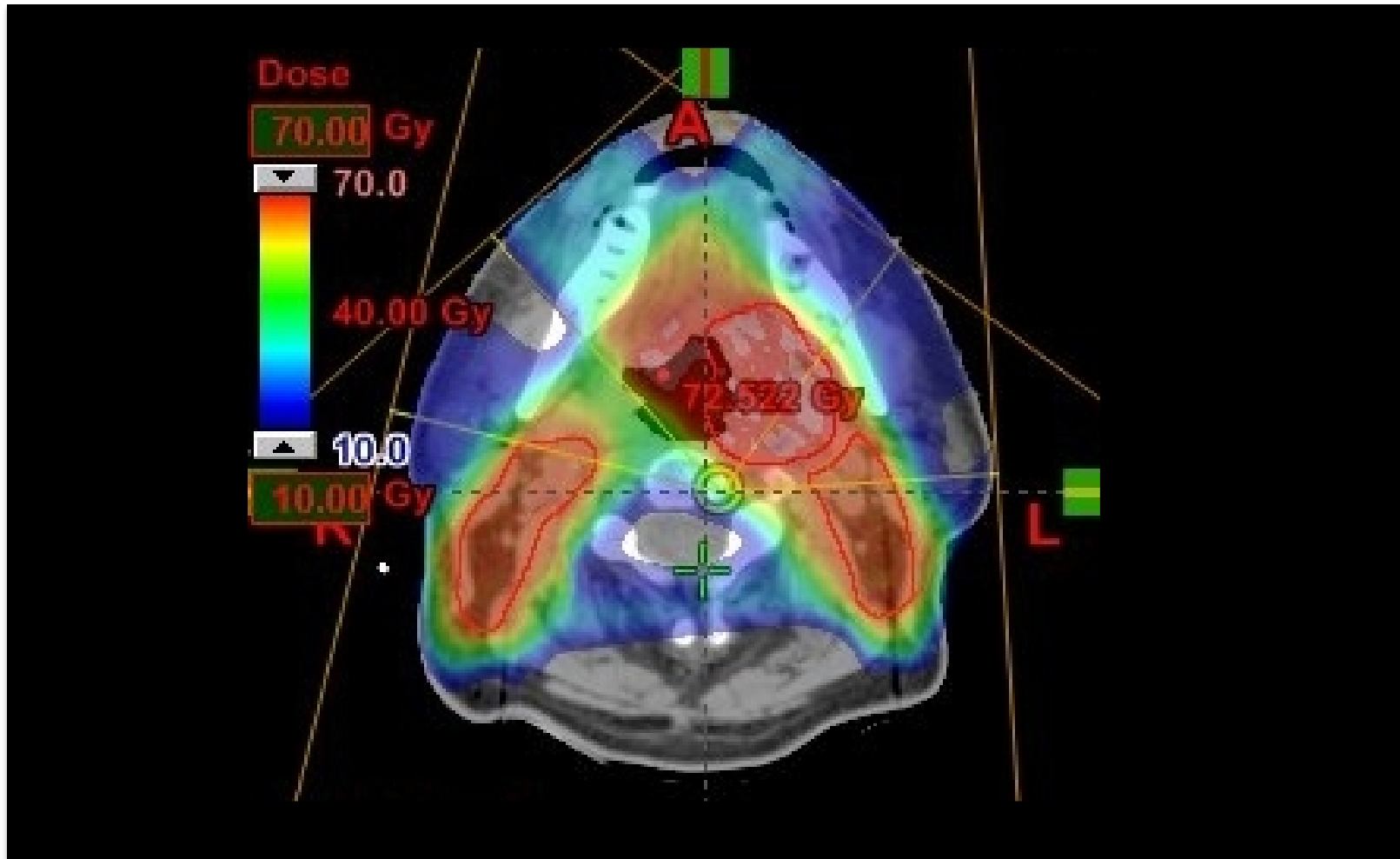
What is IMPT?

“Each individual field delivers an optimized and inhomogeneous dose”



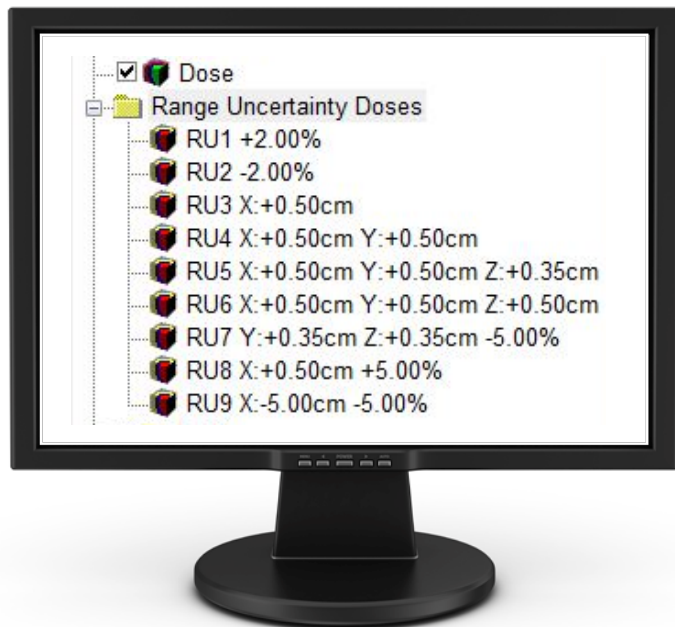
What is IMPT?

“...when combined produces a uniform target dose”



Dynamic Peak™ Scanning

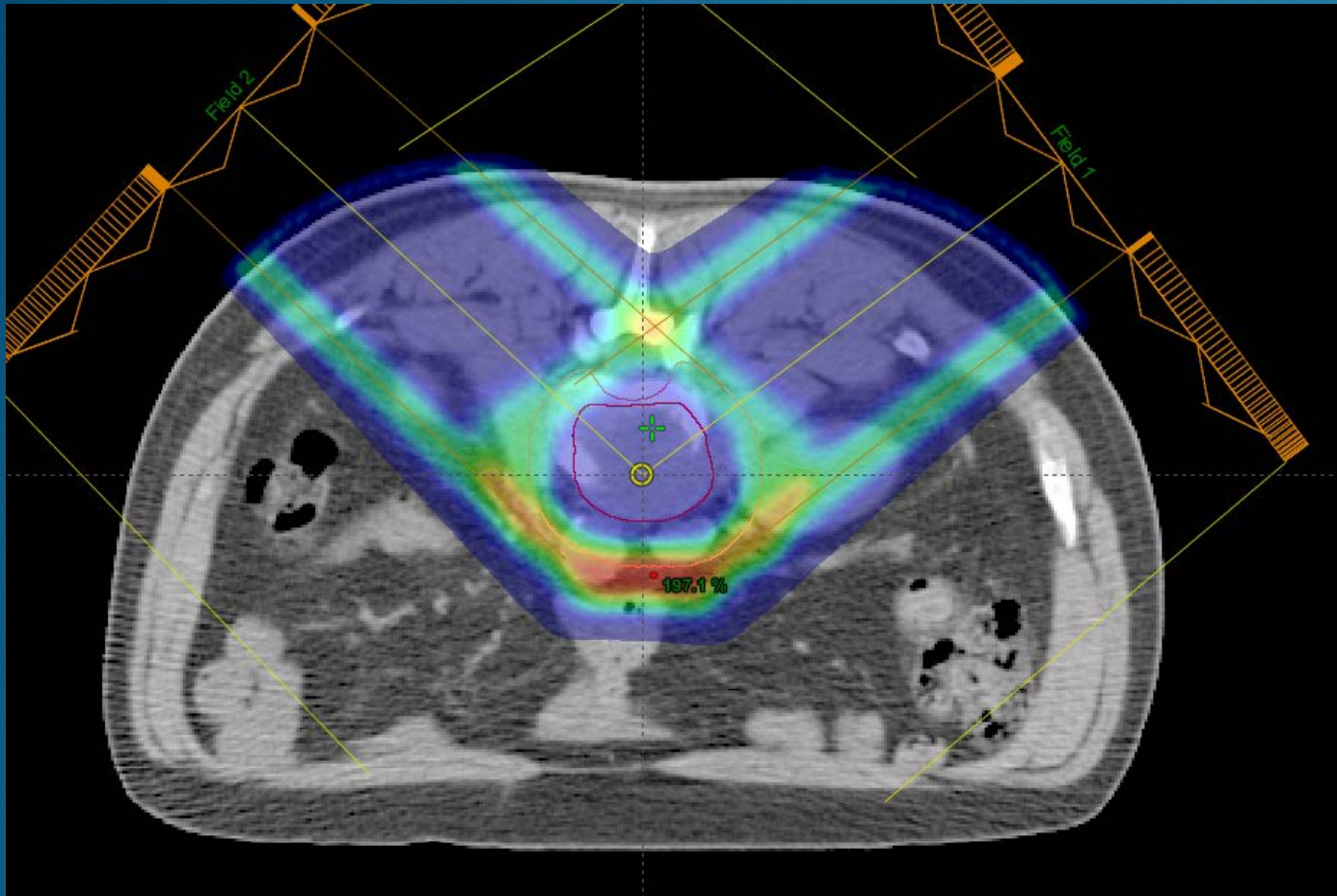
IMPT Plan Robustness in Eclipse



Plan Robustness is affected by

- Proton range uncertainty
 - Changes in tissue composition from week to week
 - Changes due to therapy
- Positional uncertainty

Plan Robustness in Eclipse—MaxMin Dose Display



Dynamic Peak™ Scanning

Scanning improves the workflow



Collimator, compensator



No patient specific devices

Bronnen: www.procure.com, www.rptc.de

IMPIMPT/Scanning Workflow

Workflow measurement at the RPTC

2.3 fields per fraction on average

22 fractions

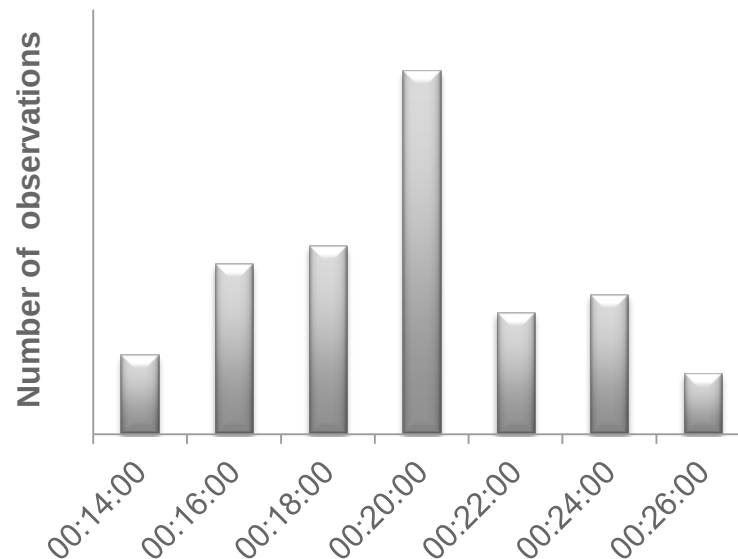
First of its kind facility competitive with top performing centers within 2 years of operation

Average 2-field treatment

■ Patient setup ■ Beam request ■ Irradiation ■ Re-mobilization

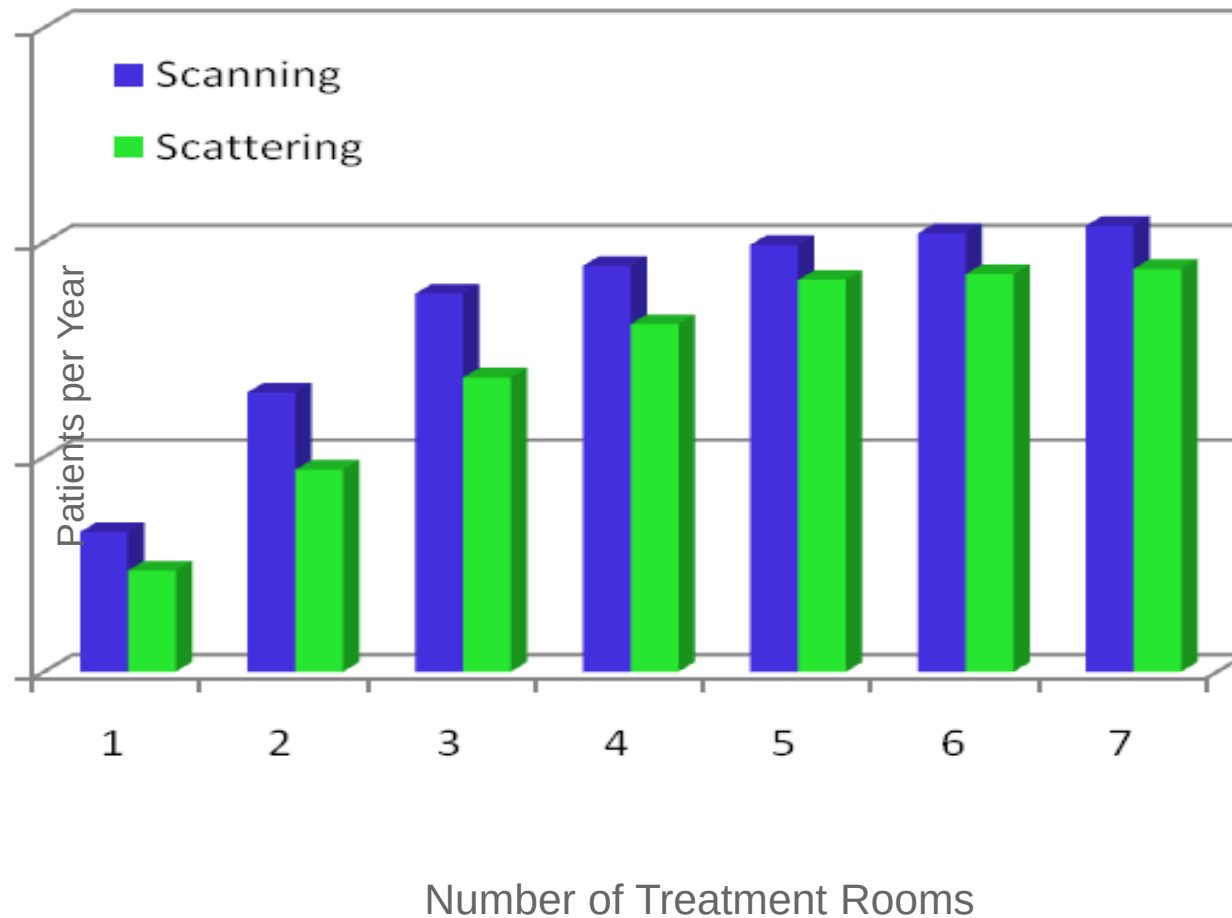


Total 18:52



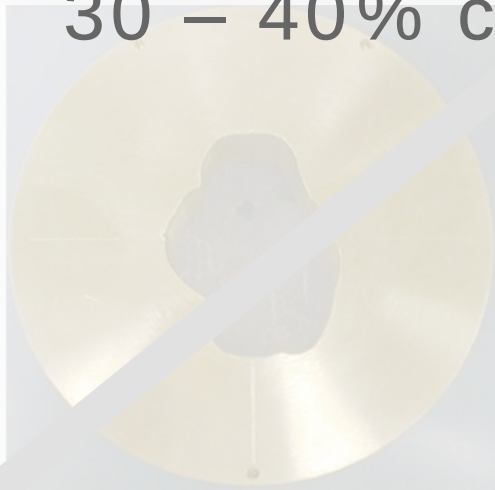
Dynamic Peak™ Scanning

Effect Delivery System on Capacity

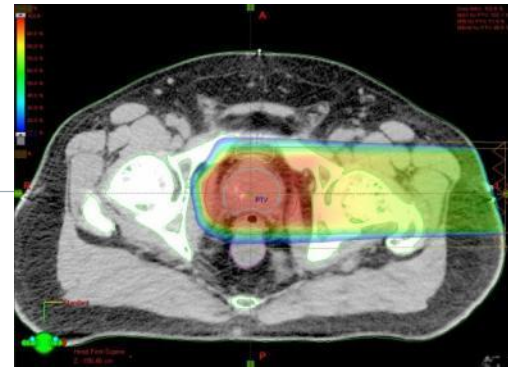




30 – 40% capacity increase



Scanning/IMPT - Summary



Quality of Care

- Optimum dose conformity
- Lowest possible neutron dose
- Allows adaptive treatments and integrated boosts

Workflow

- Improved workflow, 30-40% increased capacity
 - No dismounting/mounting of heavy devices between fields
- Shorter and more stable treatment times
- No machine shop for collimators
- Varian offers matching of rooms, 'Golden Beam Data'

Key Features

- Dynamic Peak™ *Scanning*
- Dynamic Peak™ *Imaging*
- Dynamic Peak™ *Workflow*

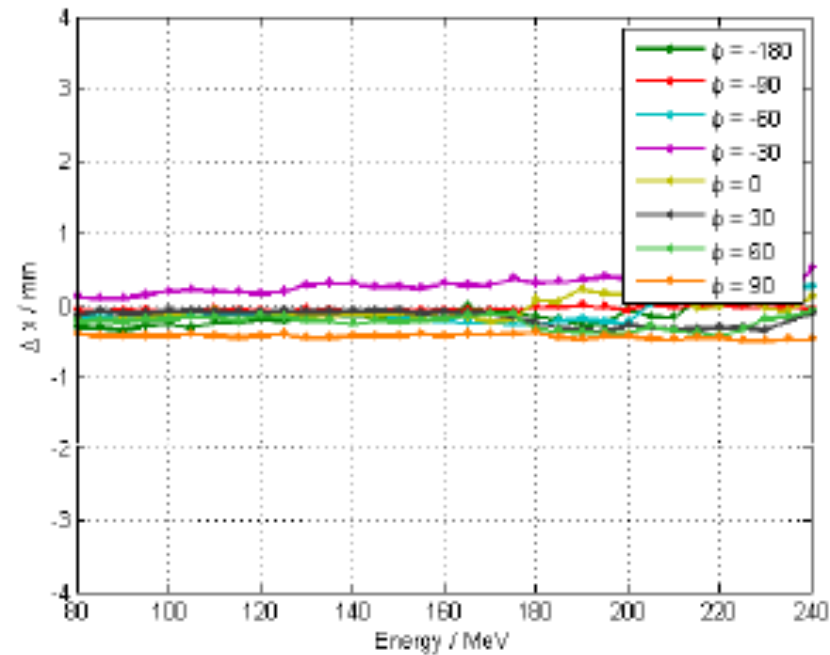
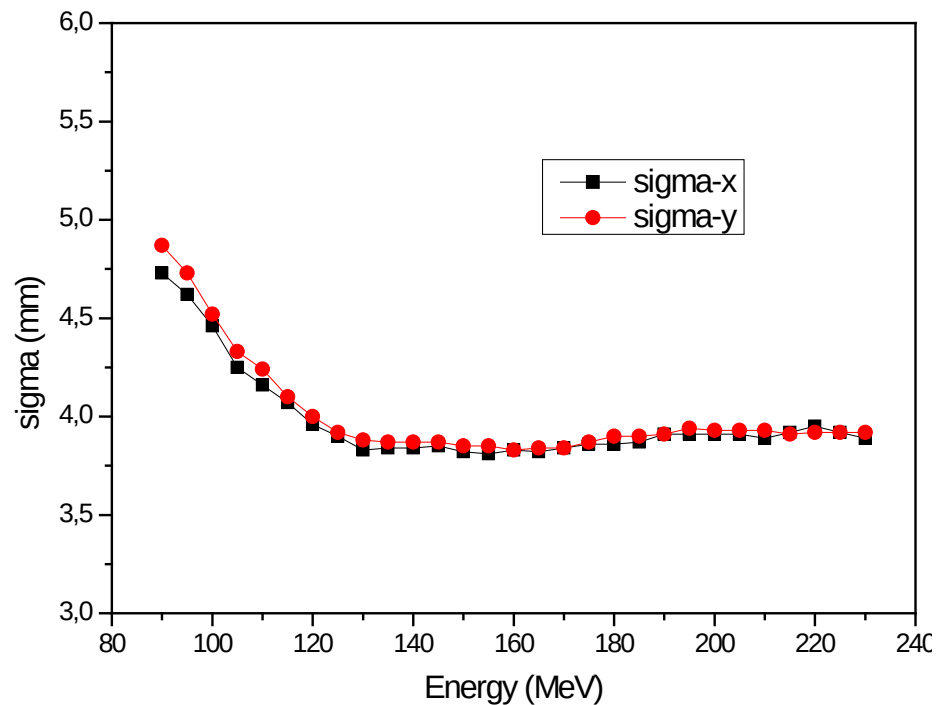
Dynamic Peak™ Scanning 2nd Generation IMPT

- 32,000 fractions delivered
- IMPT program 4 years clinical
- Focus on dedicated scanning nozzles
- Only vendor with multiple PBS on gantries clinical



Dynamic Peak™ Scanning

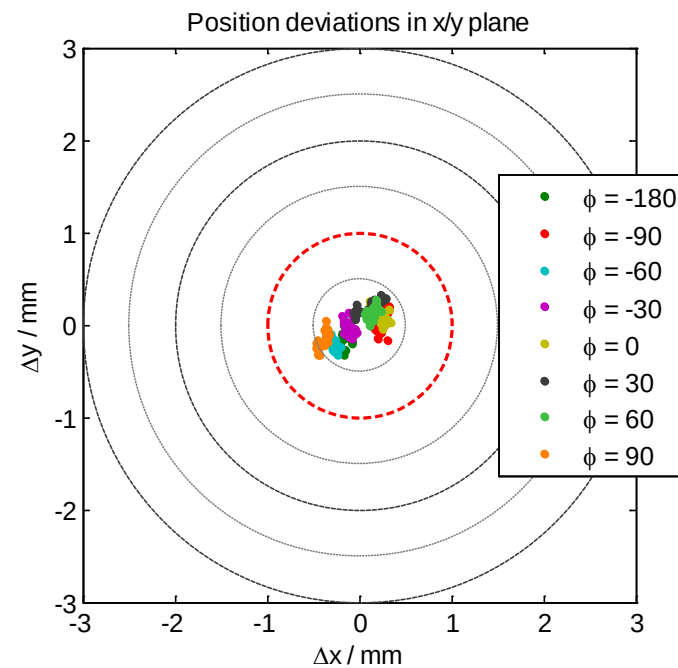
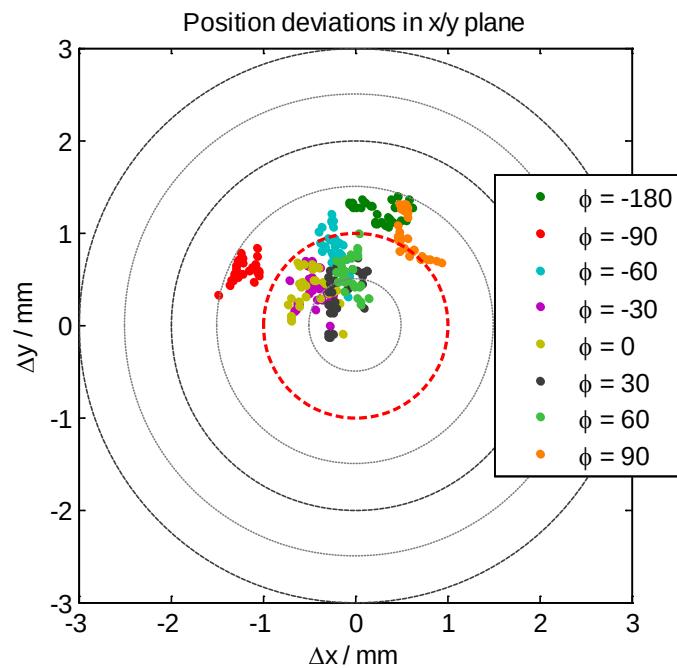
Best in Class Precision



Spot size @ 2Gy//min

Dynamic Peak™ Scanning

Best in Class Precision



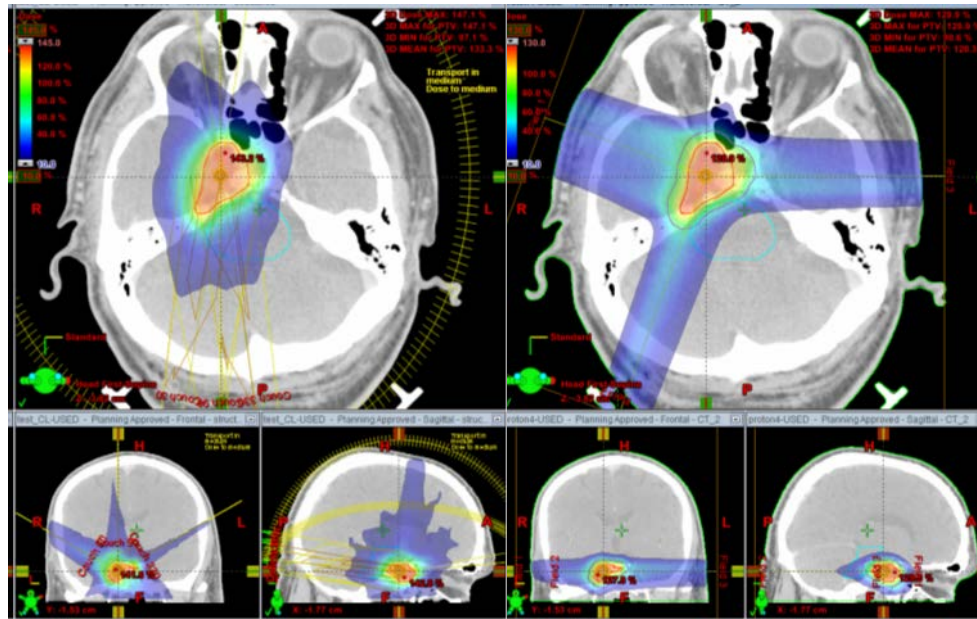
Automation of the procedure, only one night shift needed

Dynamic Peak™ Scanning

Best in Class Dose Rate

Lineac	ProBeam
~285 sec	~58 sec

- Lineac (3 arcs, non-coplanar)
 - Lineac (Eclipse A11 demo set): 6MV “flattening-filter free” with max. 1400 MU/min



- ProBeam
 - 3 fields, coplanar
 - RPTC IMPT beam data
 - Configuration in Eclipse

Lineac

ProBeam

- Small volume brain-tumor (~5 cm³)
- 1 fraction: 12.5 Gy (BED, prescribed to 80% isodose)

Dynamic Peak™ Scanning Varian



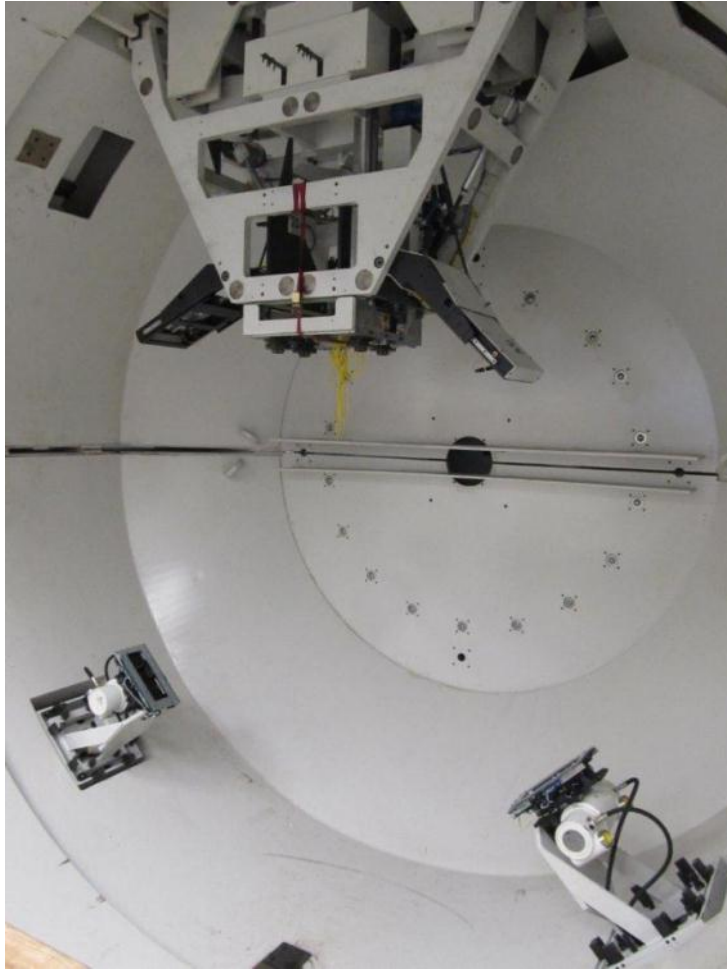
- ✓ Scanning/IMPT in clinical use for 4 years
- ✓ 4mm σ , <1 mm position accuracy
- ✓ >2 Gy/L/min dose rate, range 68–250 MeV
- ✓ Gating
- ✓ Eclipse robustness module

Dynamic Peak™ Imaging

- On-board CBCT
- Fully Integrated UI
- Imaging chain co-development in Switzerland
- Imaging roadmap aligned with TrueBeam

Dynamic Peak™ Imaging

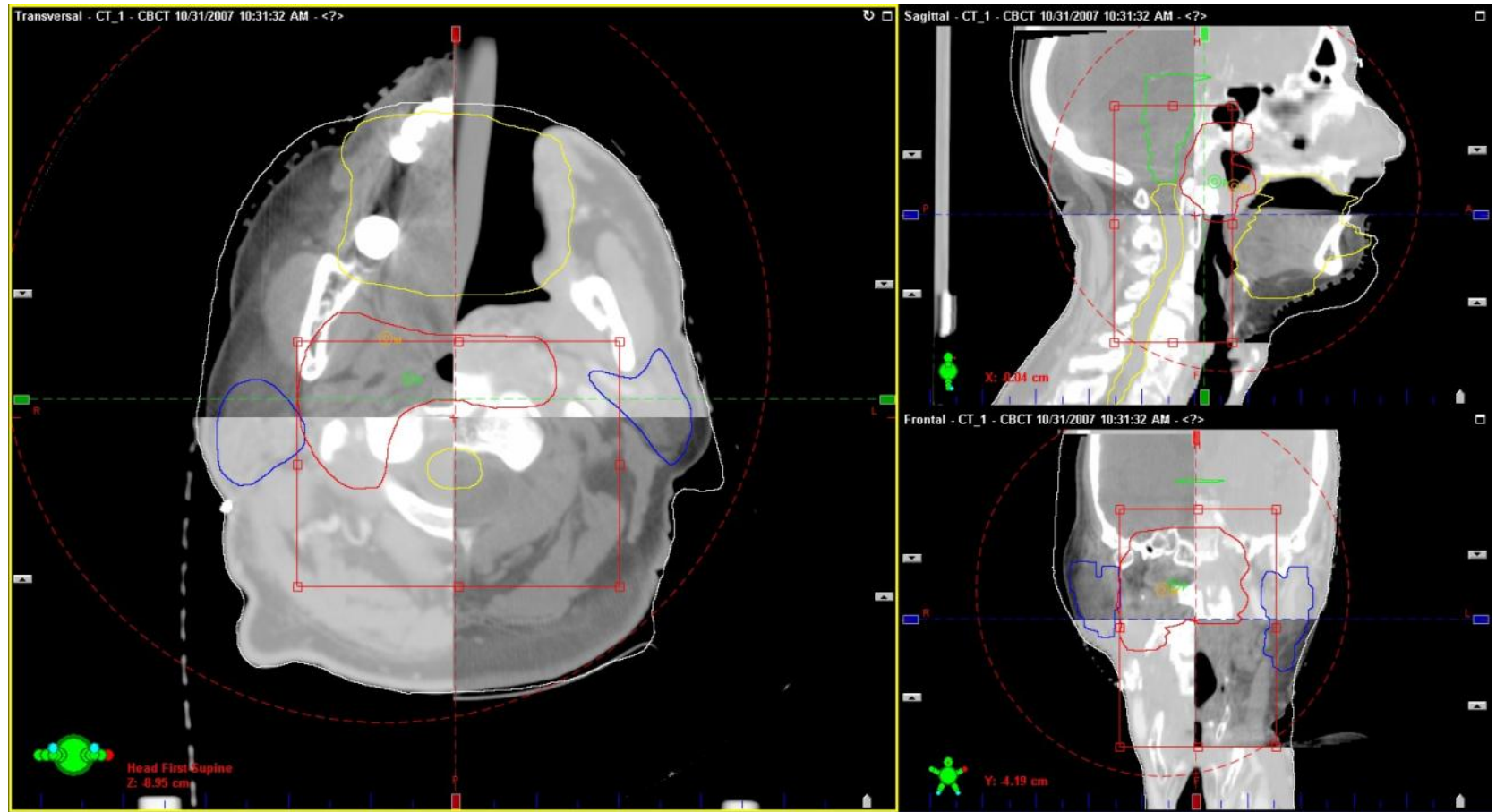
Competitive Advantages







Dynamic Peak™ Imaging



Dynamic Peak™ Imaging

Competitive Advantages

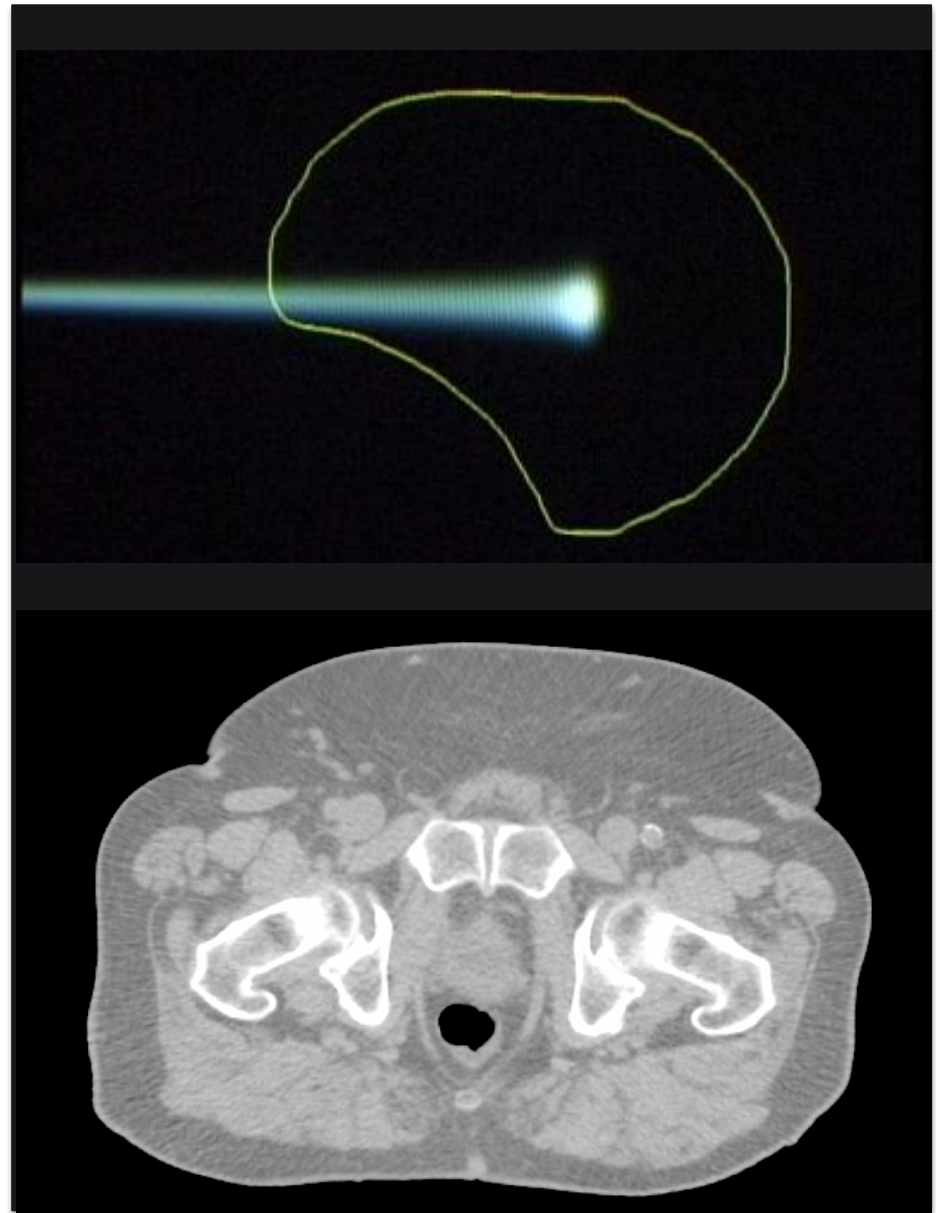
Radiographic

Fluoroscopic

Cone Beam CT

Image Analysis

Patient Alignment



Dynamic Peak™ Workflow

- Full integration of planning, OIS and imaging and delivery
- Guided workflow
- Auto-sequencing of Fields
- Room Matching

Treatment Decision

Planning

OIS

Treatment Delivery



Dynamic Peak™ Workflow

Workflow & User Interface



User Interface

- Building on TrueBeam foundation
- Increased readability
- Connecting the user to the delivery

Dynamic Peak™ Workflow

Common User Interface – Guided Workflow



Console



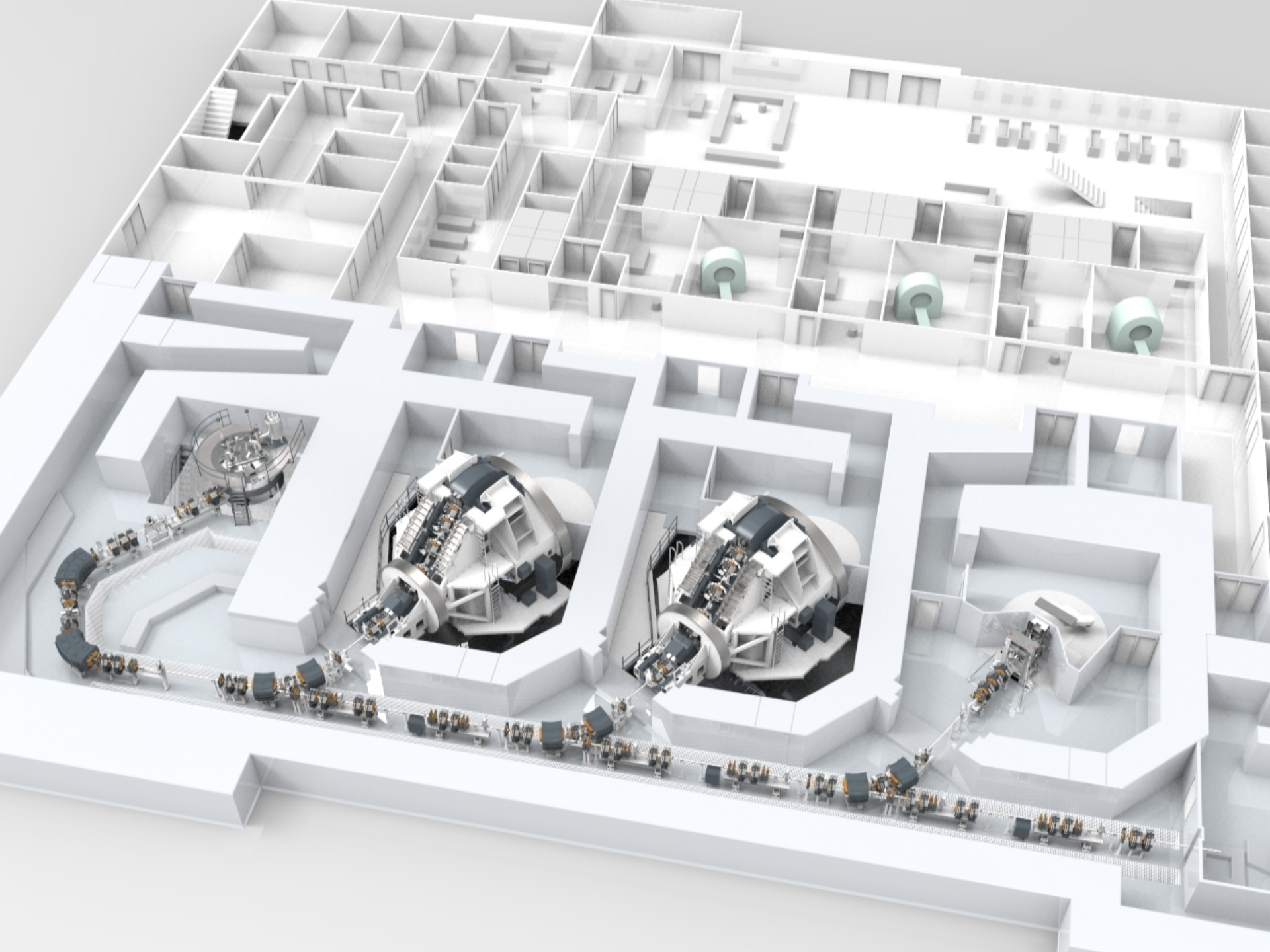
Pendant

Dynamic Peak™ Workflow

Auto-Sequencing of Fields

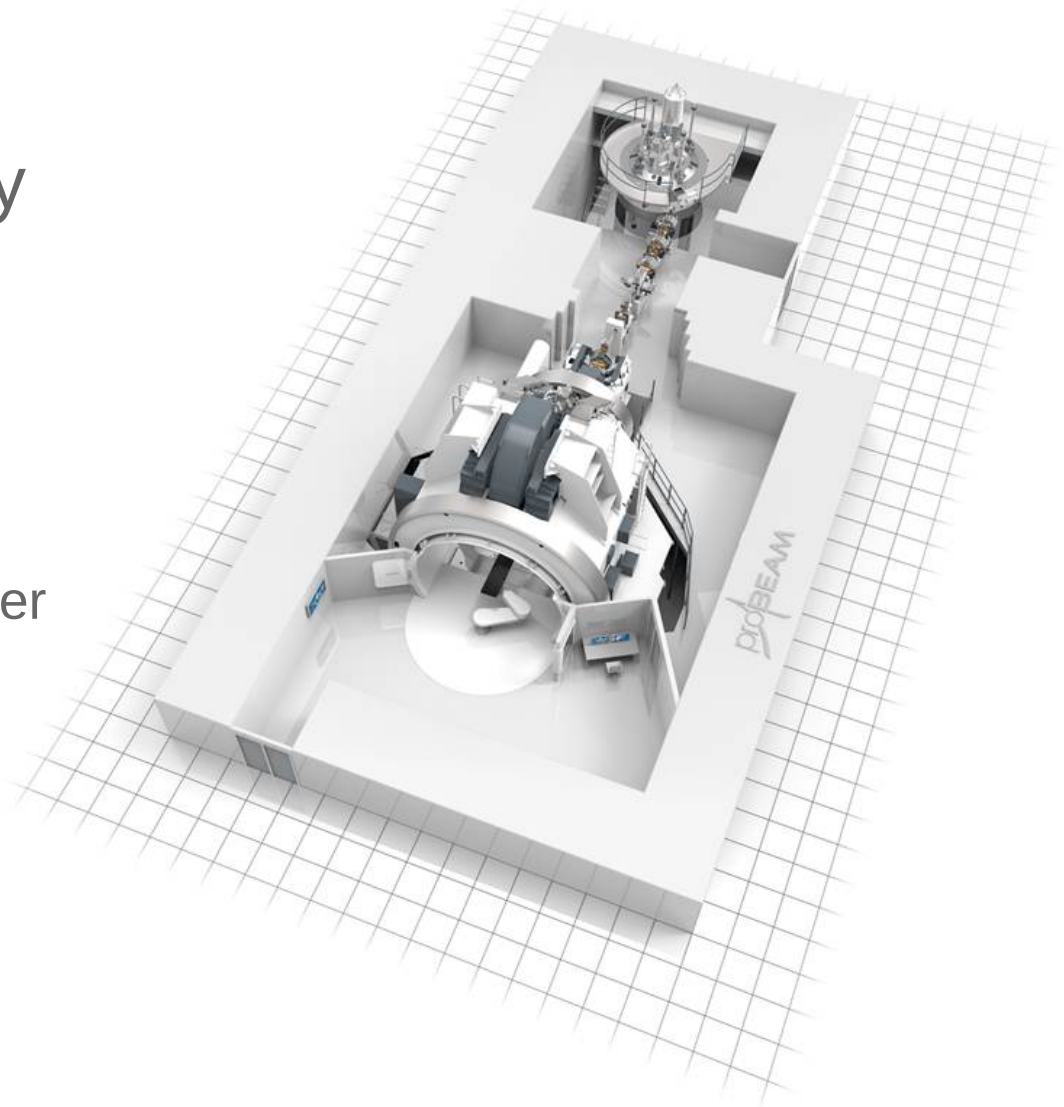
Green bar indicates
grouping fields





Close the Gap between Affordability and Innovation

- ✓ ProBeam Compact is new product line member
- ✓ Fully IMPT capable
- ✓ Reduced footprint
- ✓ 12 months to handover





Teşekkür ederim!