

Comparison of MC and TP Dosimetry Simulations for Cancer Treatment



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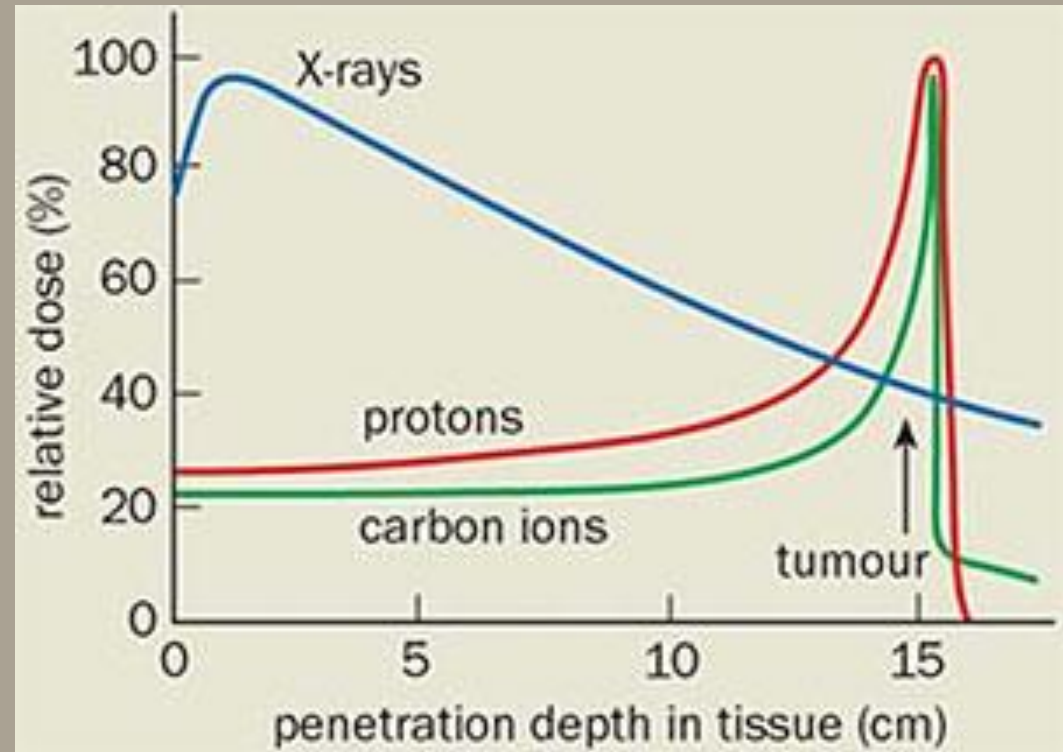
Head Supervisor: Dr. Manjit Dosanjh



- European Collaboration
- CERN, CNAO (Italy), Med-Austron (Austria), HIT (Germany)

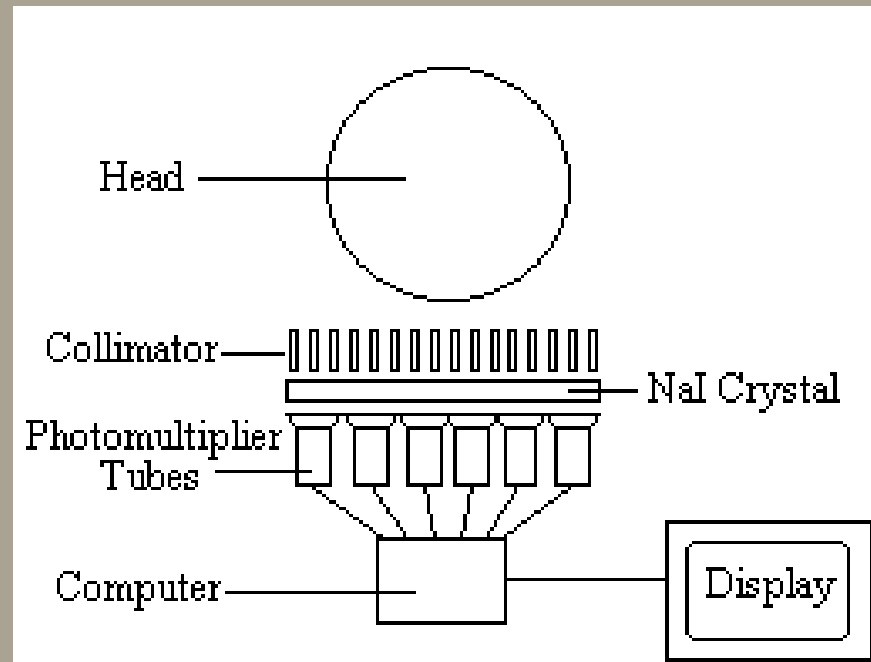
Types of Therapy

- Internal:
brachytherapy,
injection
- External: X-rays,
Protons, Light ions



Imaging

- Gamma camera
 - SPECT
 - CT
 - PET



Project Goals

- Treatment plan simulations
- Monte Carlo simulations
- FLUKA/flair
- External radiation

Current Goals

- Simple case: ^{131}I -iodine treatment of thyroid cancer
- Kinetics
- Coding and calculating dose distributions (2D \rightarrow 3D \rightarrow Monte Carlo)
- Voxels
- Patient data

CNAUpd.flair - flair

Flair Input Geometry Run Plot

Clipboard Tools Add Select Visibility Select View

Cut Copy Paste Select Orbit Info Body Zone Object Clone Wireframe Lock Layer Layout Reload

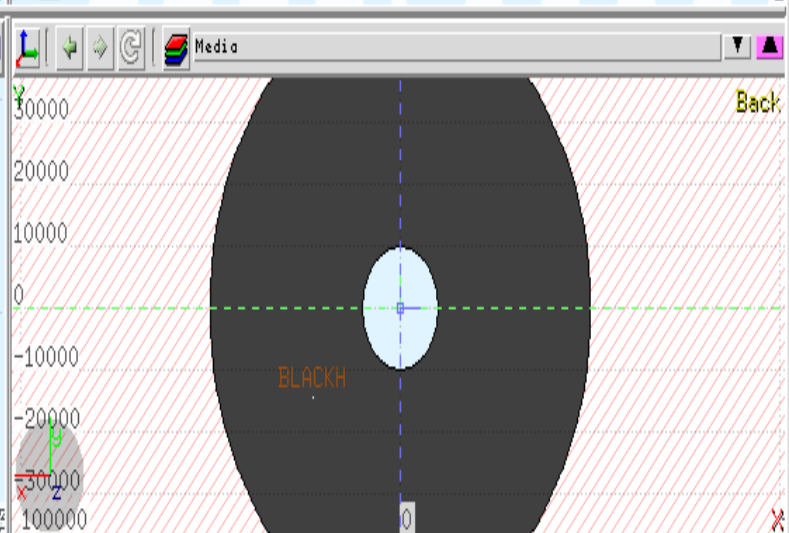
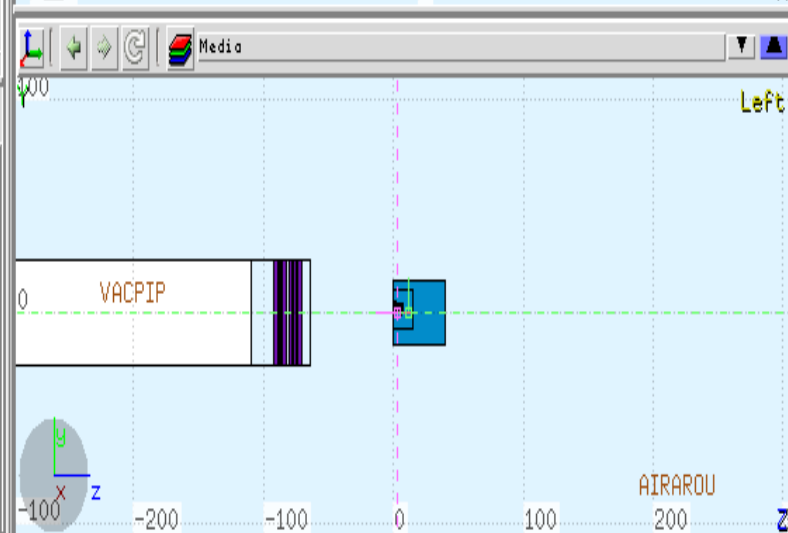
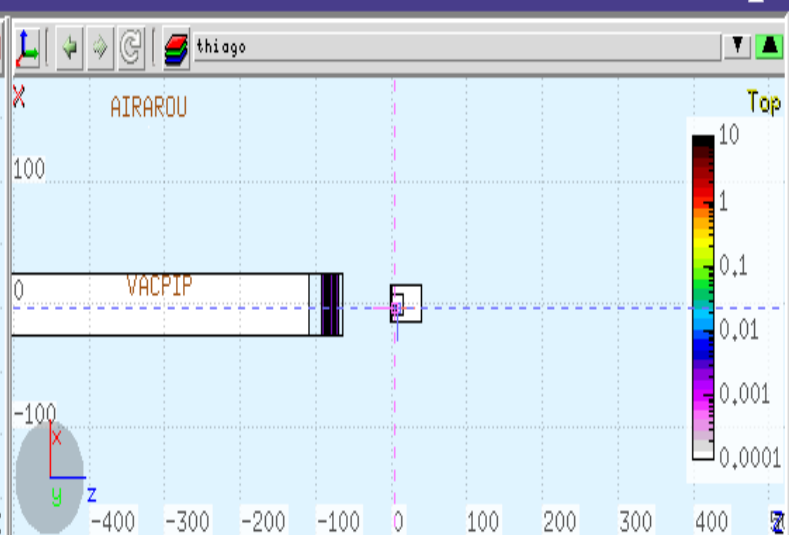
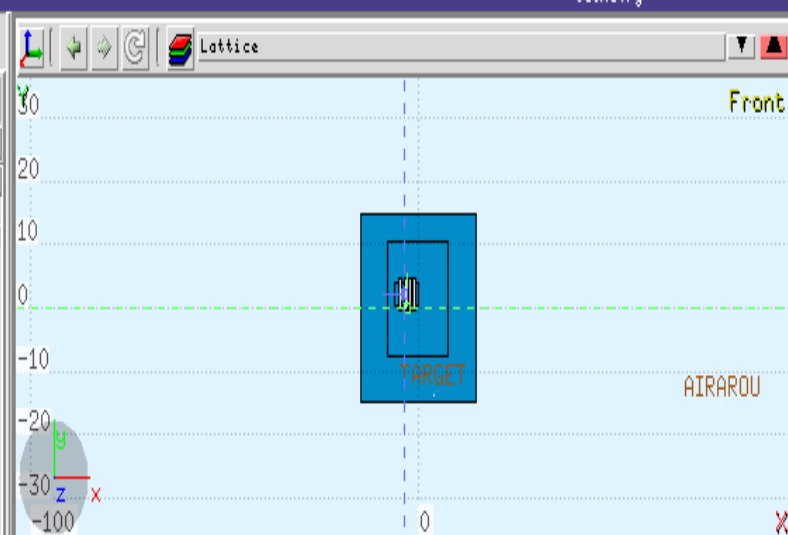
Region Delete ROT-DEFI <TL_test>

Geometry Layers Errors

Filter

Type	Name
SPH	BLK
RPP	VOID
RPP	MABD
RPP	TARG
XYP	WTEFL
XYP	WPIPD
XYP	WPIPU
RPP	BOX1
RPP	BOX2
RPP	RPPN
XYP	ELMY1
XYP	ELAL1
XYP	ELMY2
XYP	ELAL2D
XYP	ELAL2U
XYP	ELMY3
XYP	ELAL3D
XYP	ELAL3U

Properties Attributes



CNAOupd.flair - flair

Flair Input Geometry Run Plot

Clipboard Edit Card Filter View

Viewer Editor Print

Wall# Search Filter

Input	Material	Properties	Composition	Physical Properties
STERNHEI	Mat: AIR	Type: MAT-PROP Ionization: 85.7	M1: NITROGEN M3: ARGON	ρ : 1.225 dE/dx: 0.0
MATERIAL 2:	Mat: MYLAR	Type: MATERIAL	M1: CARBON M3: OXYGEN	ρ : 1.39 dE/dx: 1.3
MATERIAL 2:	Mat: KAPTON	Type: MATERIAL	M1: CARBON M3: NITROGEN M5:	ρ : 1.42 dE/dx: 4.6
MATERIAL 2: 7.0	Mat: NITROG2	Type: LOW-MAT	M1: HYDROGEN M3: OXYGEN M5:	ρ : 1.250E-03 dE/dx: 1.3
MATERIAL 2: 29.0	Mat: COPPER2	Type: LOW-MAT	M1: HYDROGEN M3: OXYGEN M5:	ρ : 8.900E+00 dE/dx: 1.5803E-3
MATERIAL 2: 9.0	Mat: FLUORINE	Type: MATERIAL	M1: CARBON M3:	ρ : 1.5803E-3 dE/dx: 2.20
MATERIAL 2:	Mat: TEFLON	Type: MATERIAL	M1: CARBON M3:	ρ : 2.20 dE/dx: 1.3
MATERIAL 2:	Mat: RW3	Type: MATERIAL	M1: HYDROGEN M3: OXYGEN M5:	ρ : 1.045 dE/dx: 4.6
MATERIAL 2:	Mat: RW3	Type: MATERIAL	M1: HYDROGEN M3: OXYGEN M5:	ρ : 1.045 dE/dx: 4.6

TO FIT EXP DATA - BRAGG RULE ~ 67 eV
 for the data with BP something like 63 eV was the best fit
 look at the data with BEAM2 we need a bit more in range 63.5 has been chosen
 to be tested!!!

Mat: RW3
 Type: MATERIAL
 Ionization: 63.5

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Dosimetry Calculations

- MIRD Method
- Cumulated activity over time in the source organ
- Energy emitted by source organ
- Fraction of energy absorbed by target organ
- 3D and Monte Carlo
- Video

