

# Status update WP1 (Physics Simulations and Design Optimization)

pCT meeting

December 22, 2016

Department of Physics and Technology,  
Bergen, Norway

# Update – Test matrix

- We are now in the process of generating data for varied detector configurations (Root + GATE v7.2)

Absorber material	Absorber thickness [mm]	Energy range [MeV]	Phantom thickness range [mm]	Energy resolution [%]	Number of layers [#]	MCS* angle [radians]
	2			?	?	?
	3			?	?	?
Al (Z=13)	4	50 – 250	0 – 260	?	?	?
	5			?	?	?
	6			?	?	?
	2			?	?	?
	3			?	?	?
C (Z=6)	4	50 – 250	0 - 260	?	?	?
	5			?	?	?
	6			?	?	?

Square detector area [270 x 270 mm<sup>2</sup>]

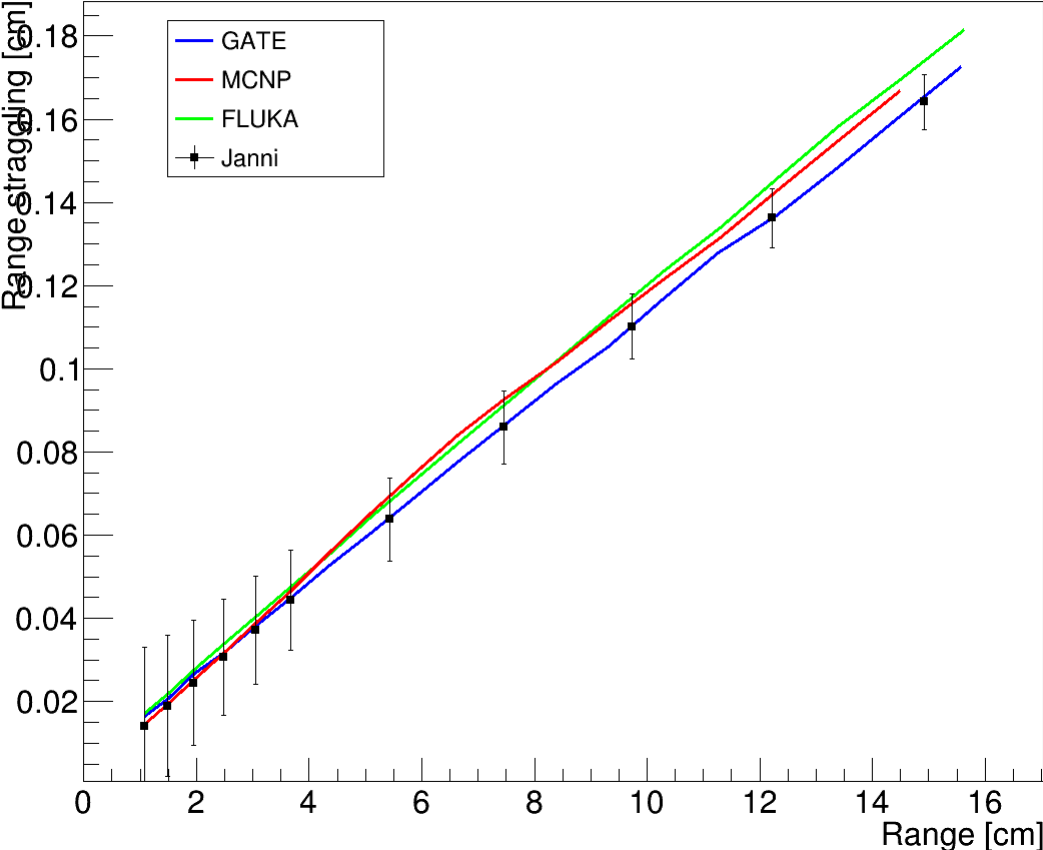
\* Multiple Coulomb Scattering

# Update – Test matrix

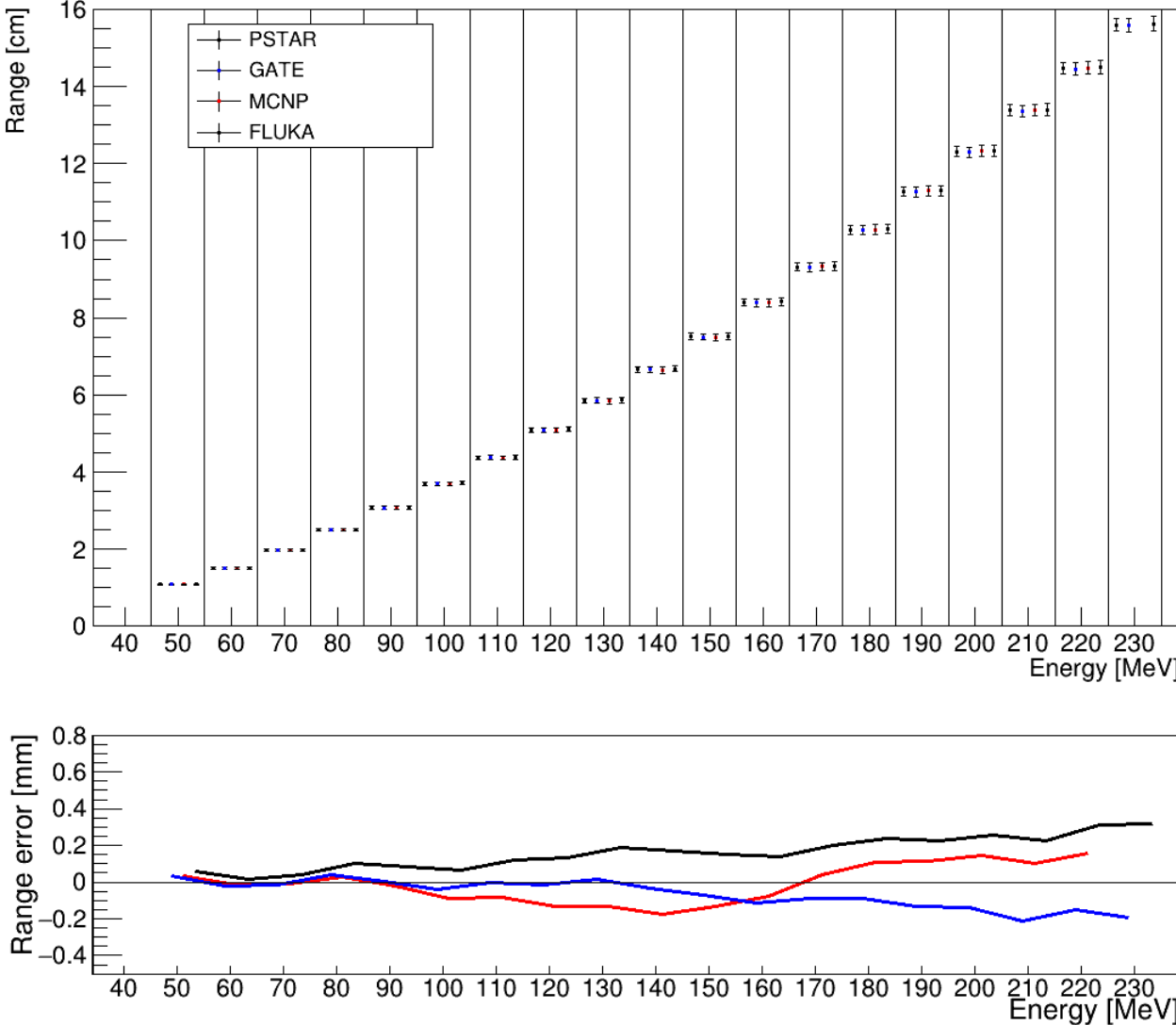
- Simulate proton pencil beams
- Also with varying water phantom thicknesses
- Do this regardless of budget / available funds
- Choose from a range of designs when a final decision has to be made based on a compromise between funds and technical requirements
  - Energy resolution better than 1% is desired
  - Smaller MCS angles (can possibly be achieved using C absorbers? Possible effects on particle tracking inside the detector?)
- Results expected by the end of January, 2017

# Update – MC code comparison

### Range straggling for different ranges



### Aluminium range comparison between different codes



# Update – MC code comparison

- Debugging of input files/physical parameters done.
- Much better agreement between MCNP6, FLUKA and GATE v7.2 for proton ranges and straggling
- Practical implications are
  1. One could use any of these codes for the MC modelling work
  2. We have a means of cross-checking our results in the absence of experimental data

# Update – MC code comparison

- An overview (?) of activities within WP1
- Overlaps with WP7 and WP3 (and possibly other WPs)
- MC simulations should be (and will be) used to provide input data to the reconstruction software → WP7
- MC simulations can be (and perhaps should be) used to provide input data to SystemC simulations (data rates) → WP3
- And possibly other interdependencies not identified yet