RADIATION TRANSPORT

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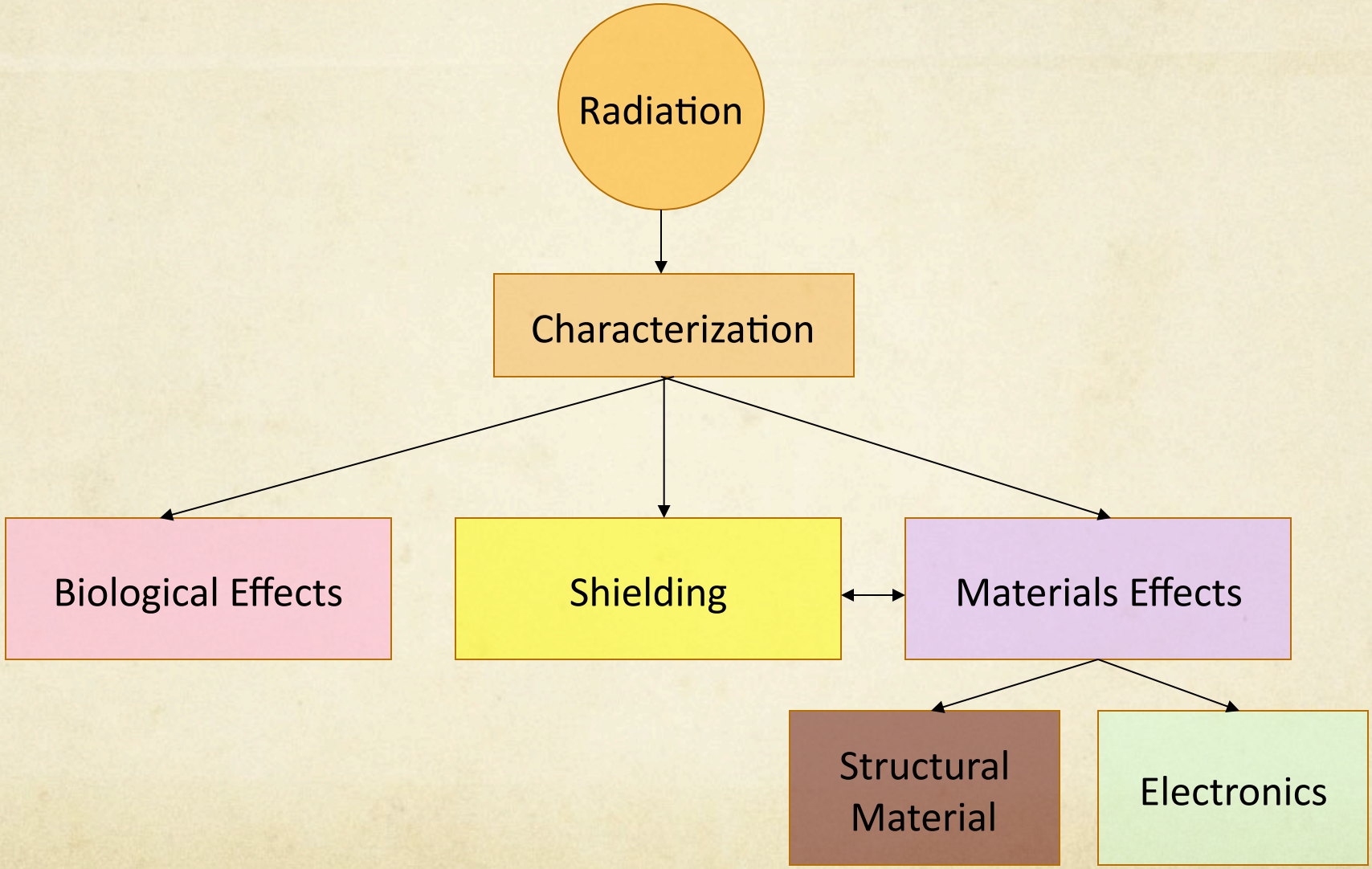
Radiation Transport Applications



Rad. Trans. Research Opportunities

- Radiation Detector modeling (solid state and gas proportional)
- Experimental Design
- Evaluation of Cross-sections and Physics Models
- Medical Physics (photoneutron dose calculations)
- Benchmark

Do we have all the Physics?

Table 1
Kinetic energy thresholds (MeV) for proton–proton (pp) reactions. Particle symbols are proton p, neutron n, deuteron d and pion π.

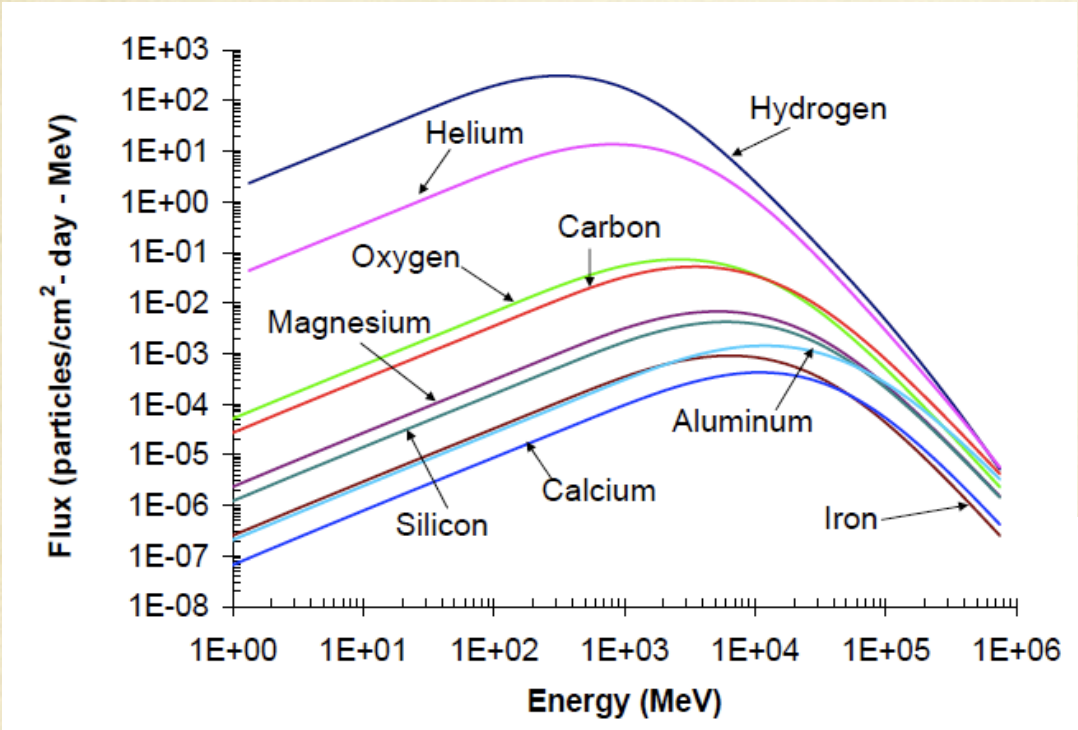
Final state	Threshold (MeV)
$pp\pi^0$	280
$d\pi^+$	288
$pn\pi^+$	292
$pn\pi^+\pi^0$	592
$pp\pi^+\pi^-$	600
$pp\pi^+\pi^-\pi^0$	920

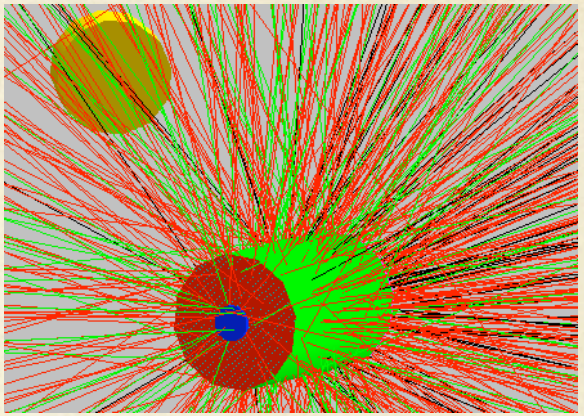
Primary decay modes [6]. The mean lifetime is given by the symbol τ and $c\tau$ is the speed of light multiplied by the mean lifetime. Particle symbols are pion π, muon μ, photon γ and neutrino ν.

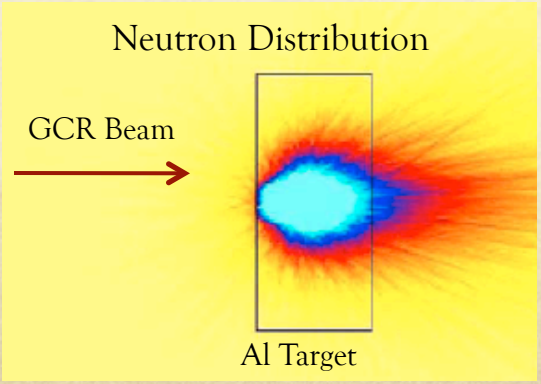
Particle	Rest mass (MeV/c^2)	Decay mode	τ (s)	$c\tau$ (m)
π^0	135	$\gamma\gamma$	8.4×10^{-17}	25×10^{-9}
π^+	140	$\mu^+\nu_\mu$	2.6×10^{-8}	7.8
π^-	140	$\mu^-\bar{\nu}_\mu$	2.6×10^{-8}	7.8
μ^+	106	$e^+\nu_e\bar{\nu}_\mu$	2.2×10^{-6}	660
μ^-	106	$e^-\bar{\nu}_e\nu_\mu$	2.2×10^{-6}	660

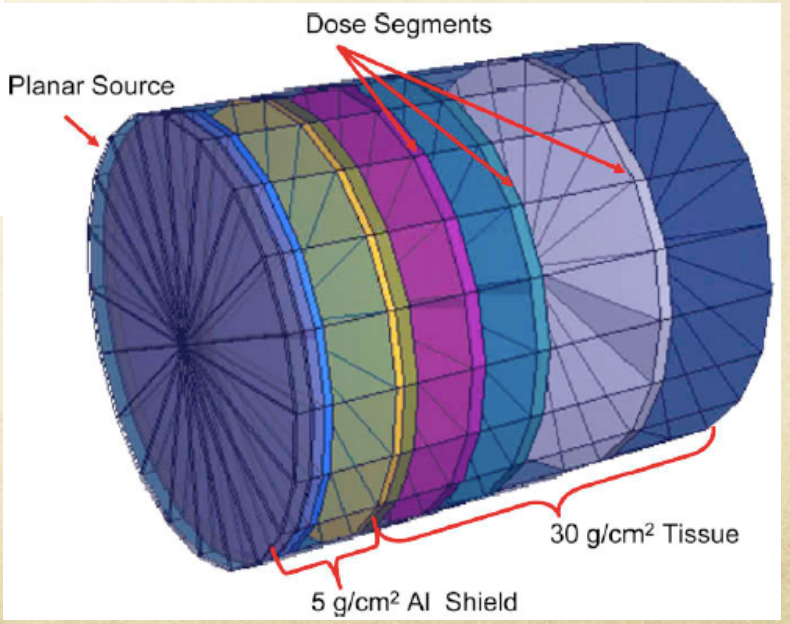
Evaluation Using MC Code

- Simulate Solar Particle Events (SPE) and Galactic Cosmic Rays (GCR) boundary conditions

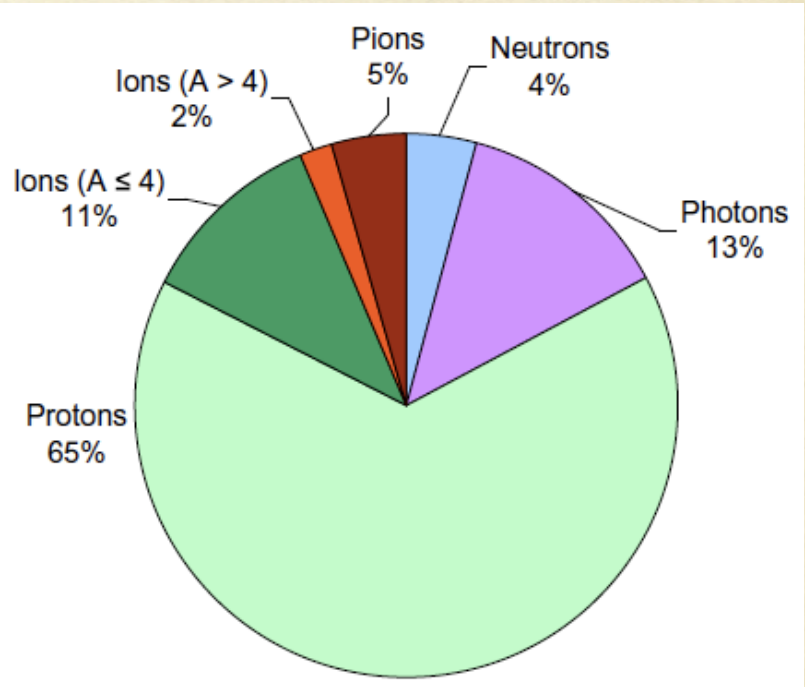








Impact?



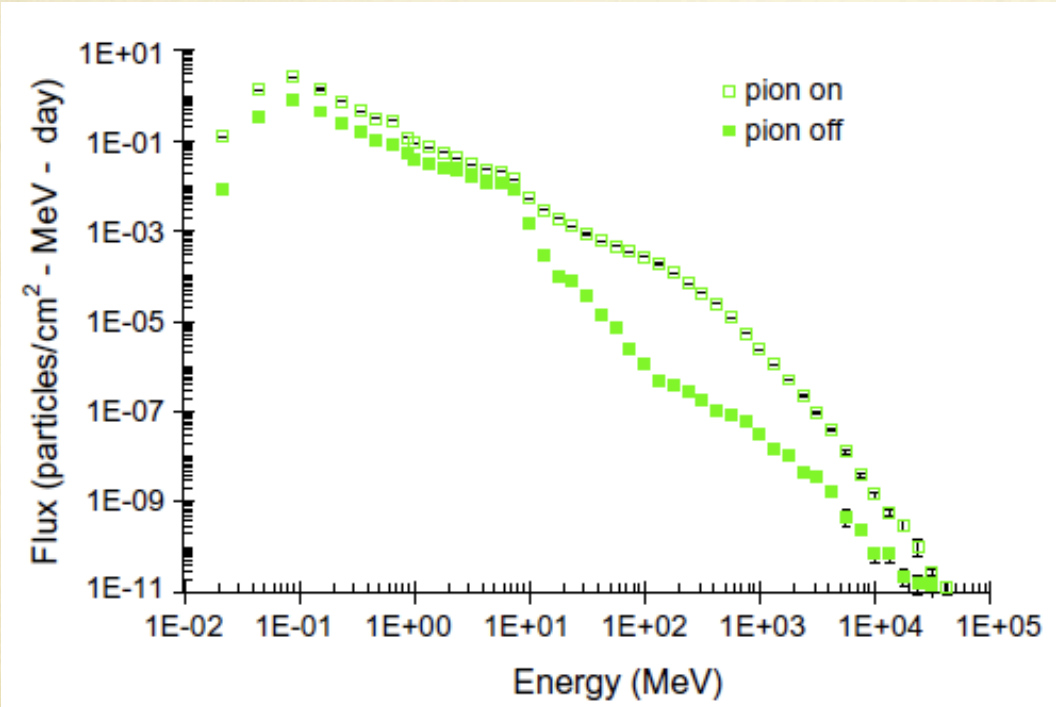
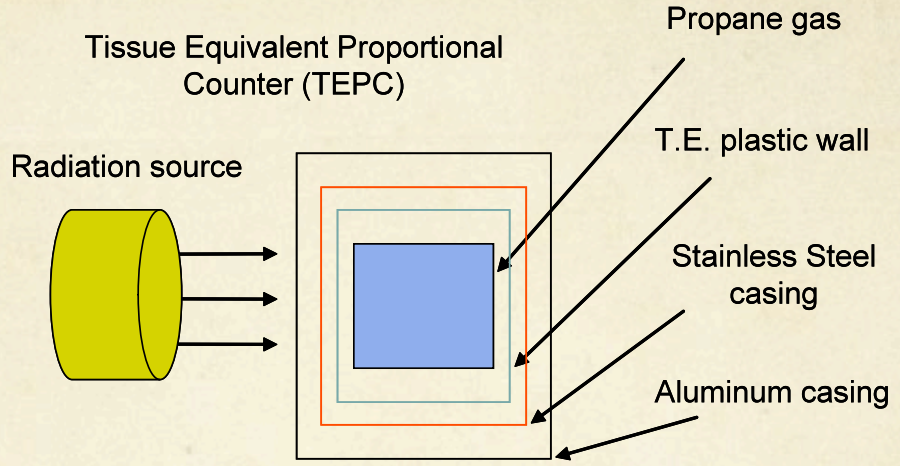
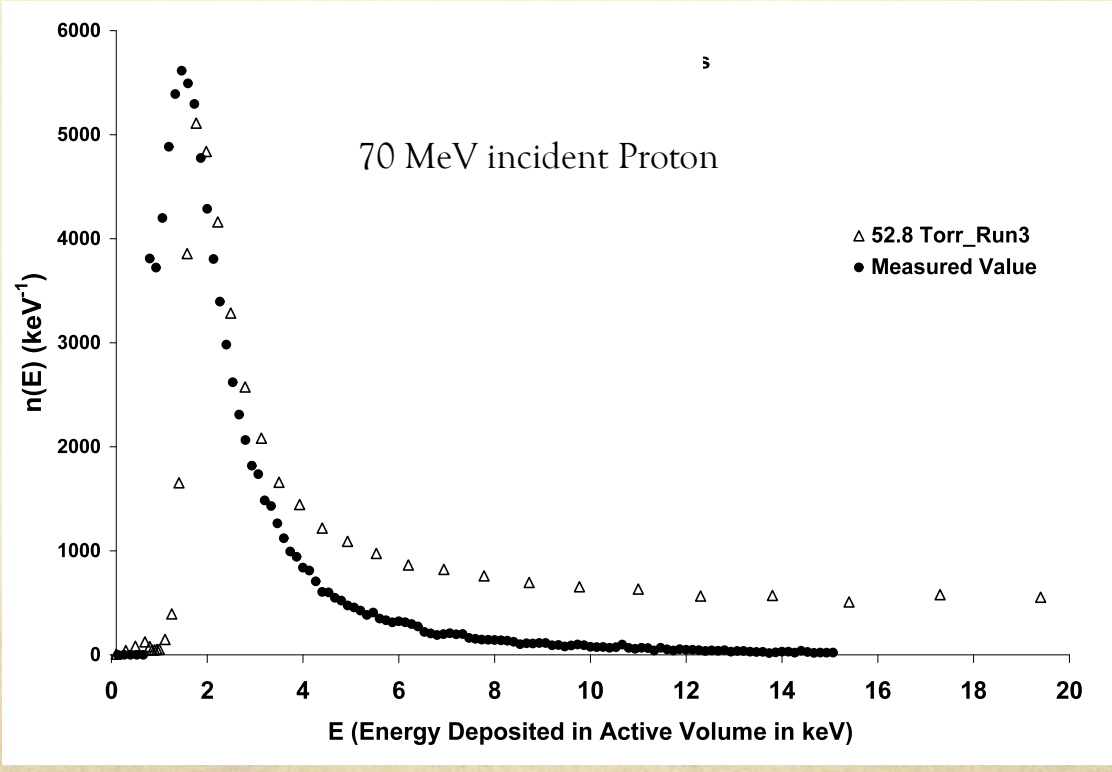


Fig. 8. Photon flux behind at 30 g/cm^2 tissue behind 20 g/cm^2 Al.

Detector Modeling (TPEC)





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