Study of Scintillant Fibers Microdosimeter on Different Radiation Environments using FLUKA Code

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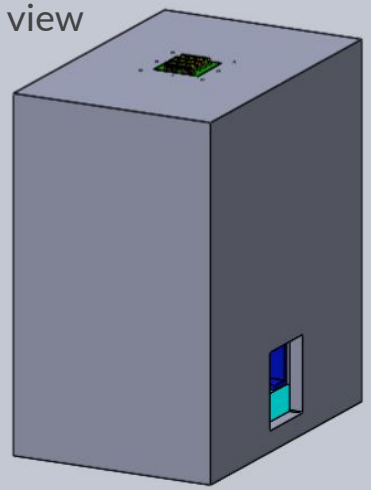
Fig. 1 Detector side view



The Project

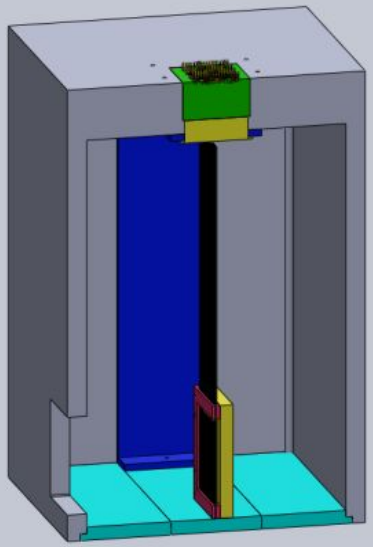


Fig. 2 Optical fiber volume side view

The Project

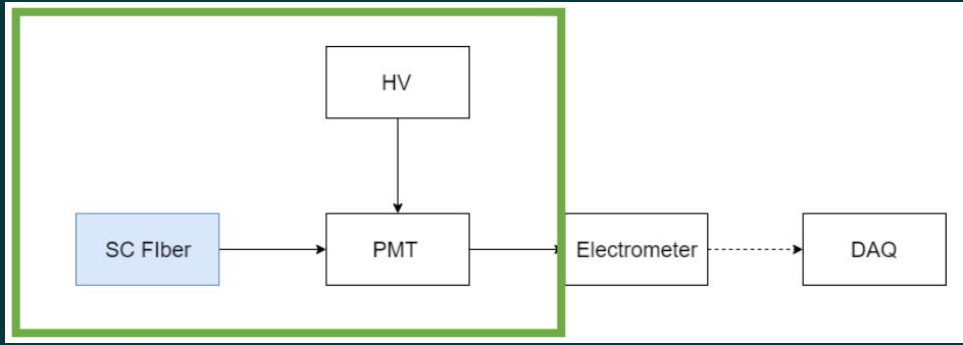


Fig. 3 Scintillation Dosimetry

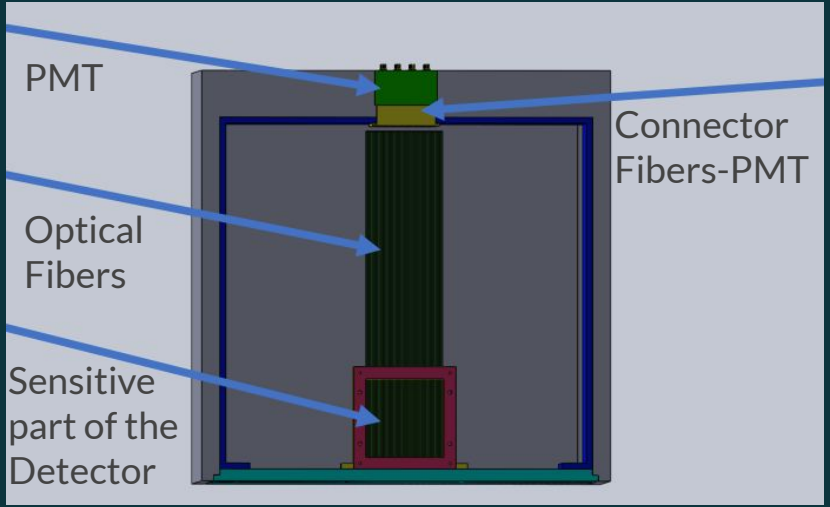


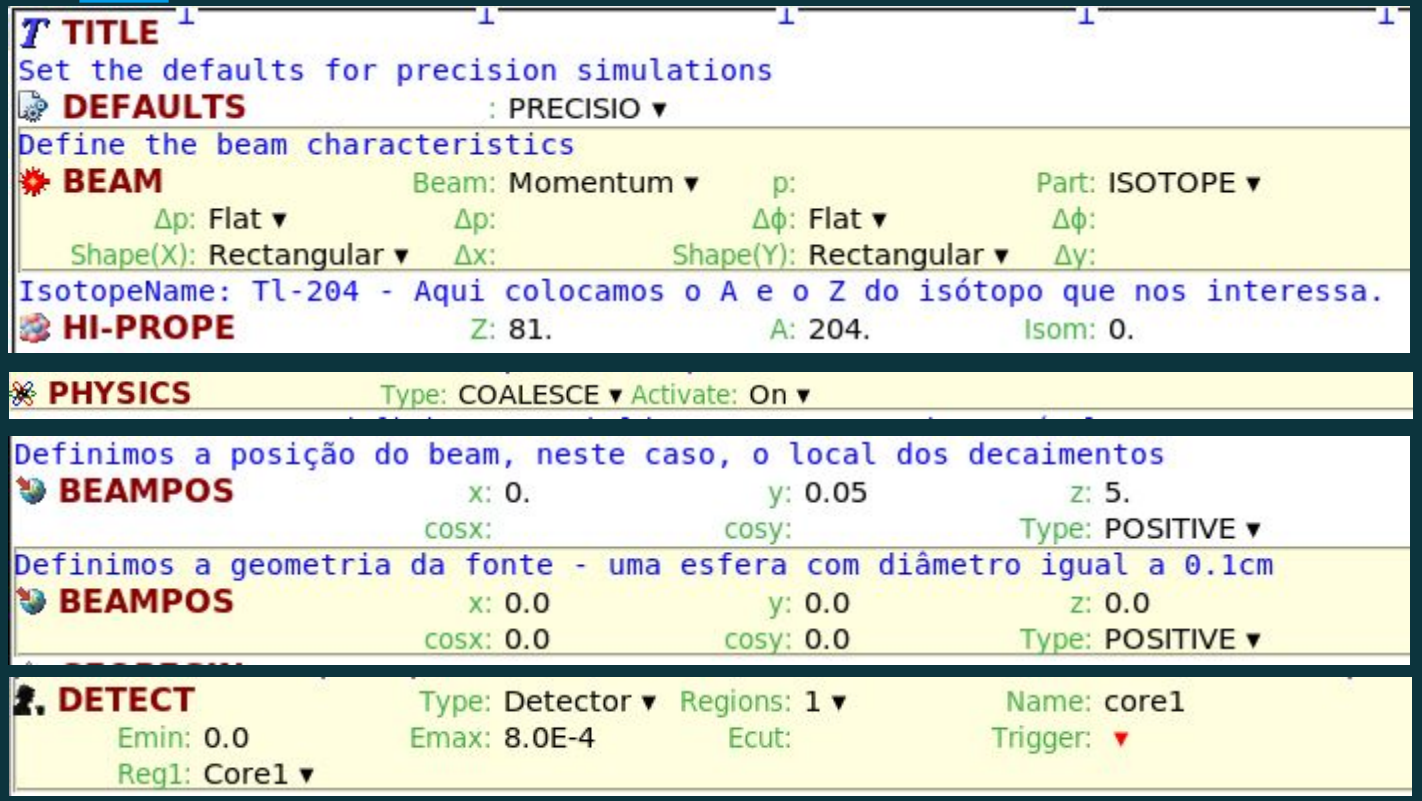
Fig. 4 Frontal view of the Fibers Volume

INTERNSHIP
PROGRAM

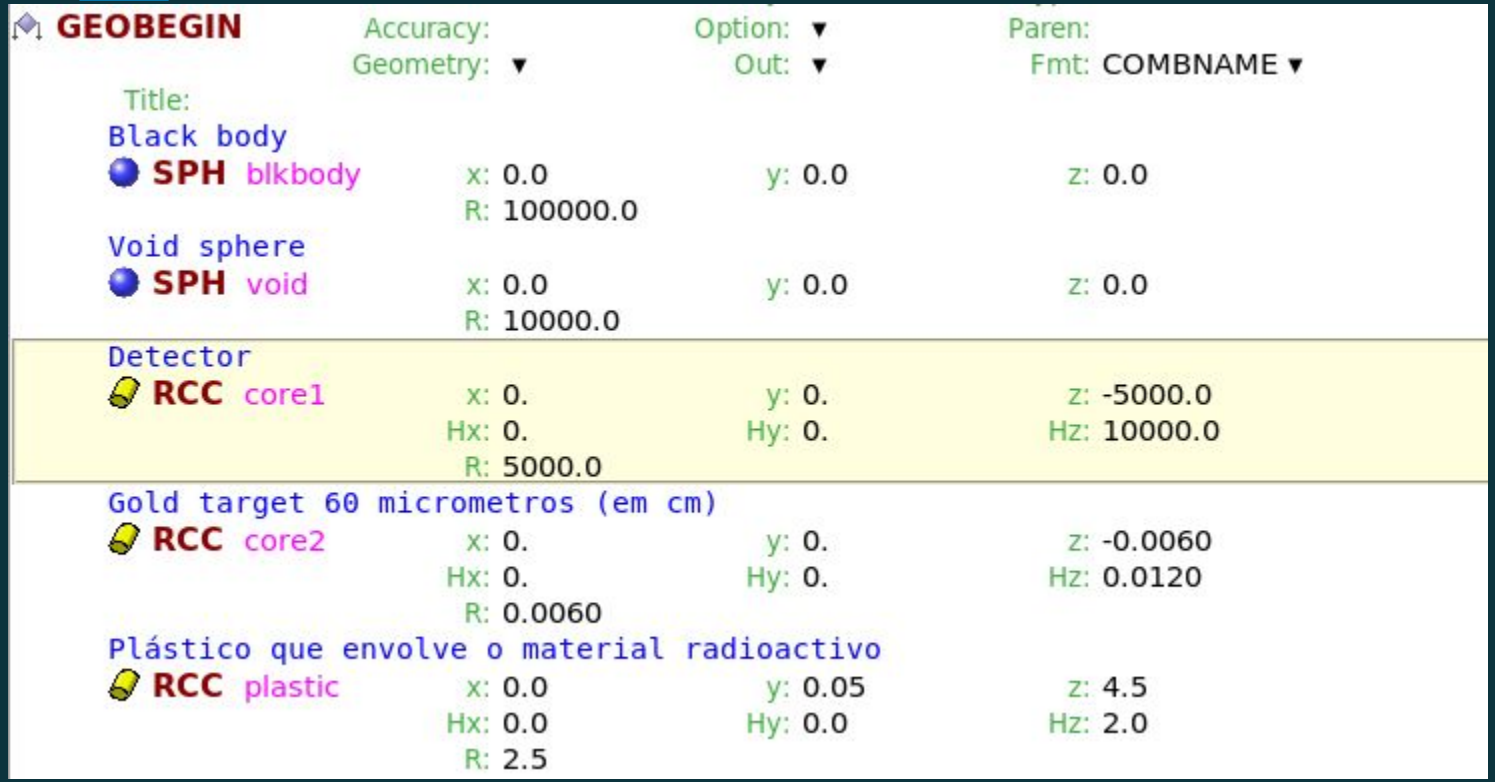
FLUKA

FLUKA

Beam, Scoring and Physics



Geometry


GEOBEGIN
Accuracy:
Option:
Paren:
Geometry:
Out:
Fmt: COMBNAME
Title:
Black body
SPH blkbody
x: 0.0
y: 0.0
z: 0.0
R: 100000.0
Void sphere
SPH void
x: 0.0
y: 0.0
z: 0.0
R: 10000.0
Detector
RCC core1
x: 0.
y: 0.
z: -5000.0
Hx: 0.
Hy: 0.
Hz: 10000.0
R: 5000.0
Gold target 60 micrometros (em cm)
RCC core2
x: 0.
y: 0.
z: -0.0060
Hx: 0.
Hy: 0.
Hz: 0.0120
R: 0.0060
Plástico que envolve o material radioactivo
RCC plastic
x: 0.0
y: 0.05
z: 4.5
Hx: 0.0
Hy: 0.0
Hz: 2.0
R: 2.5

Validation

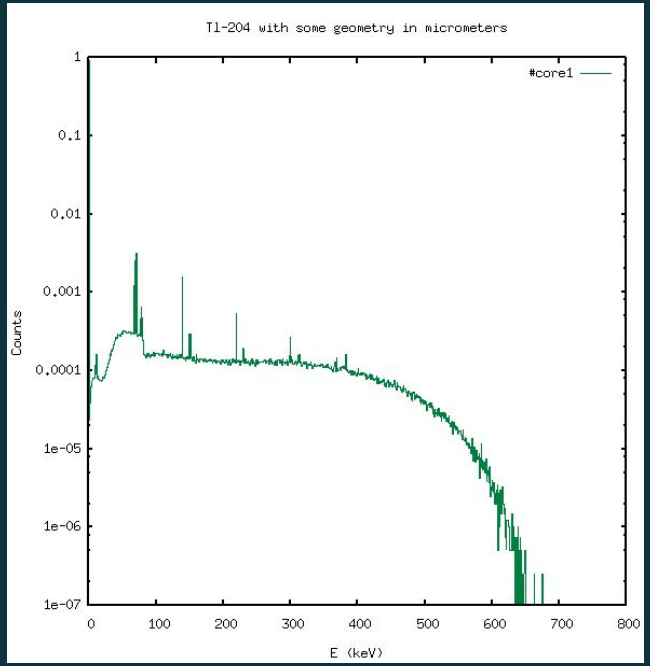


Fig. 5 The Tl-204 Spectrum with Gold detector, result of the FLUKA Simulation

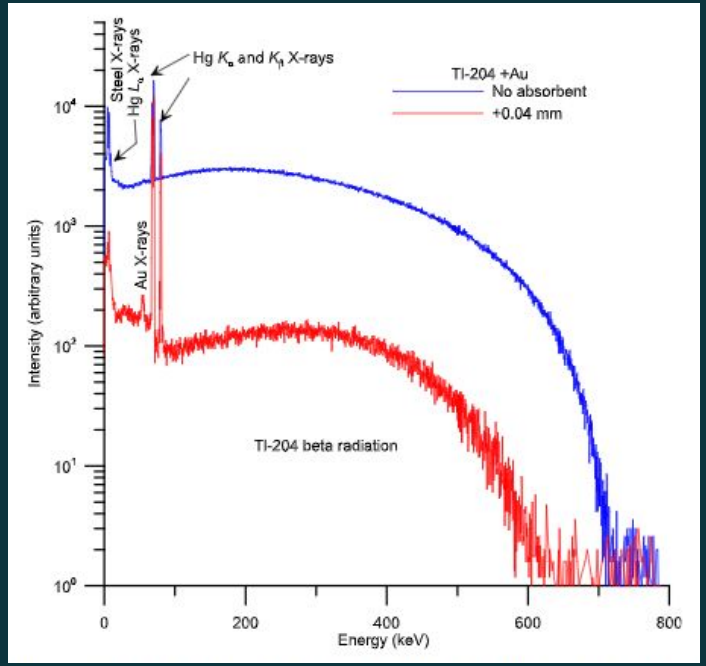


Fig. 6 Emission spectrum of Tl-204 source (blue) and experimental spectrum with a 40 μm gold absorber (red). Part of the beta radiation intensity has been absorbed by the gold. Au X-rays appear as a consequence of the radiation interaction in the thin gold layer.

Am-241 and Cs-137 with NaI detector

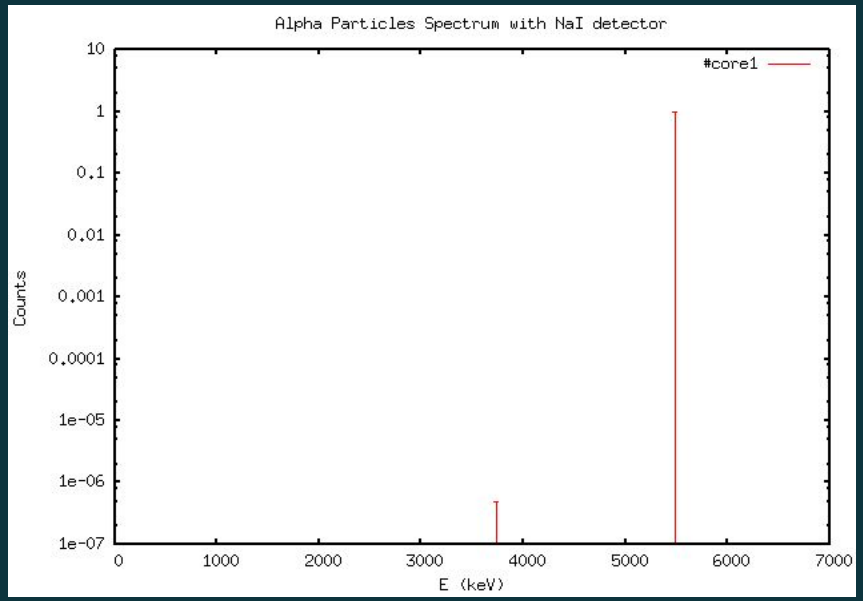


Fig. 7 The Alpha Particles from Am-241 Decay Spectrum with NaI detector

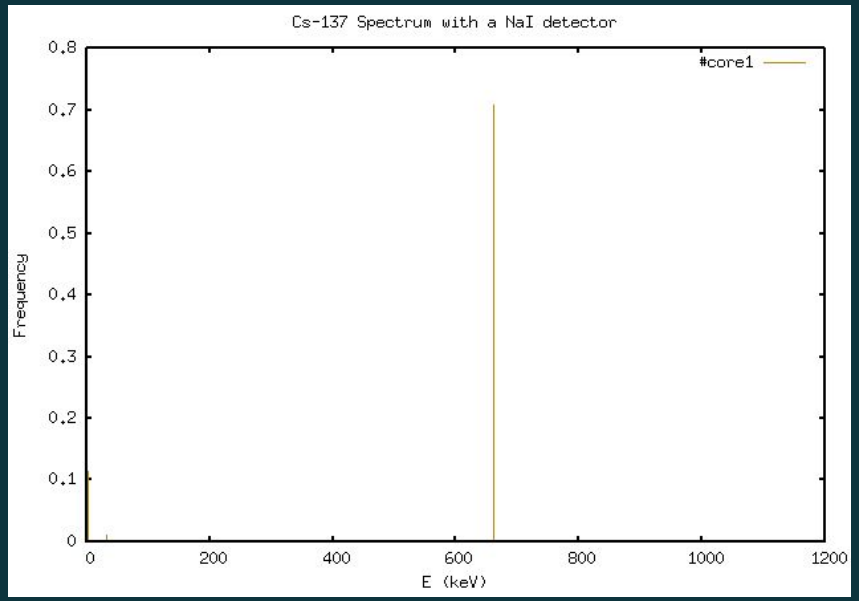


Fig. 8 The Cs-137 Spectrum with NaI detector

Am-241 and Cs-137 with Optical Fiber

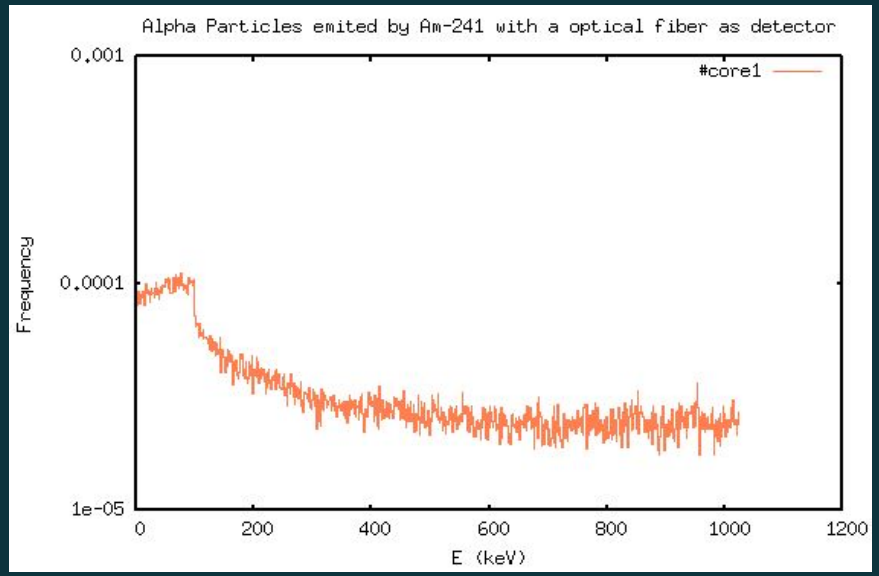


Fig. 9 The Alpha Particles from Am-241 Decay Spectrum with the optical fiber detector

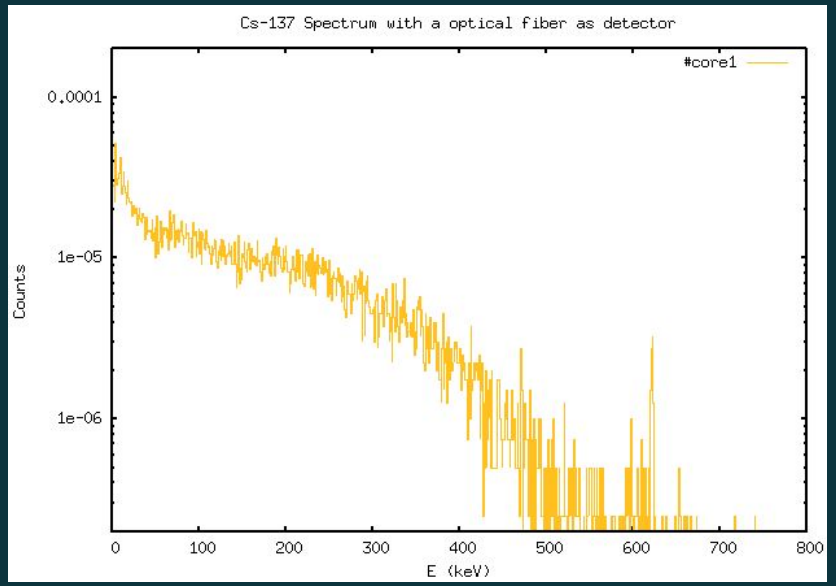


Fig. 10 The Alpha Particles from Am-241 Decay Spectrum with the optical fiber detector

Co-60 and Na-22 with Optical Fiber

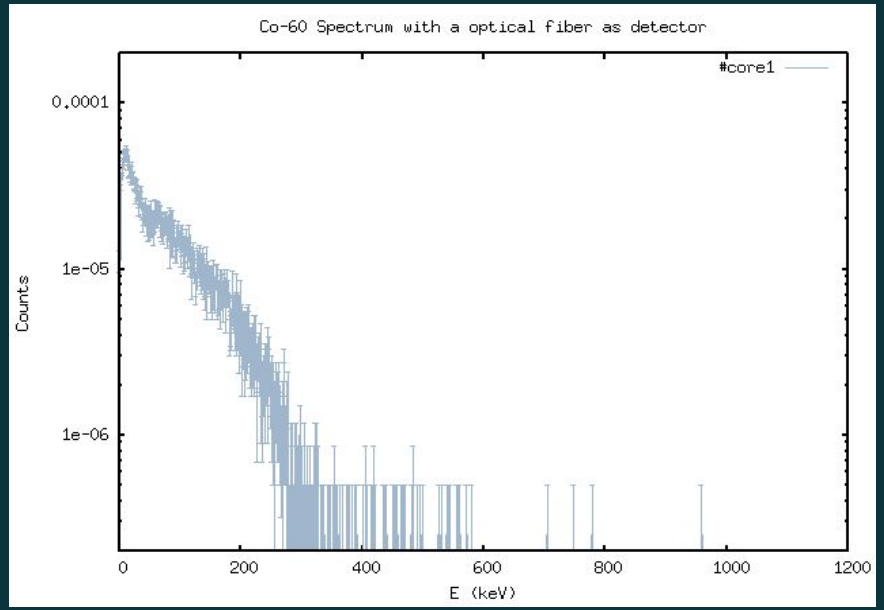


Fig. 11 Co-60 Spectrum with the optical fiber detector

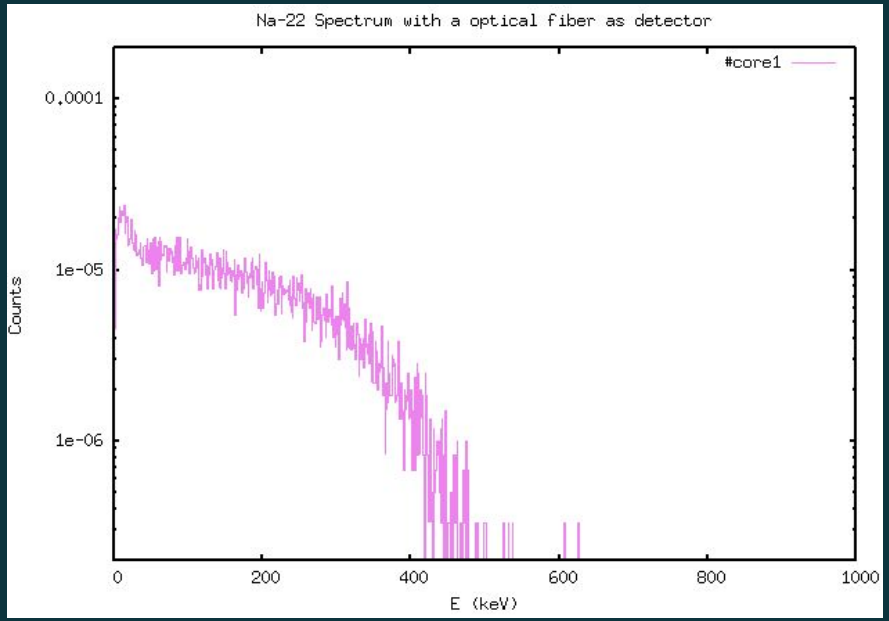


Fig. 12 Na-22 Spectrum with the optical fiber detector

Tl-204 with Optical Fiber

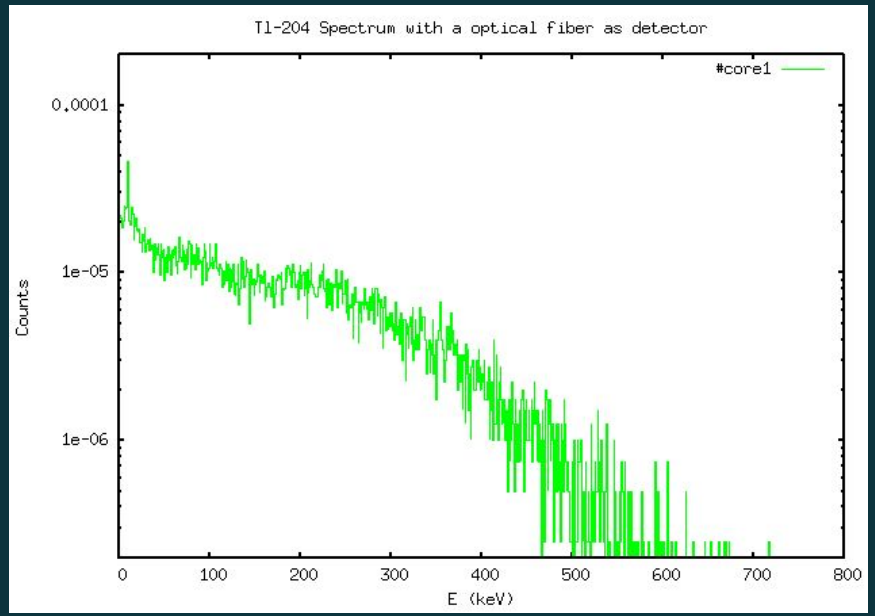


Fig. 13 Tl-204 Spectrum with the optical fiber detector

Comparison with experimental data

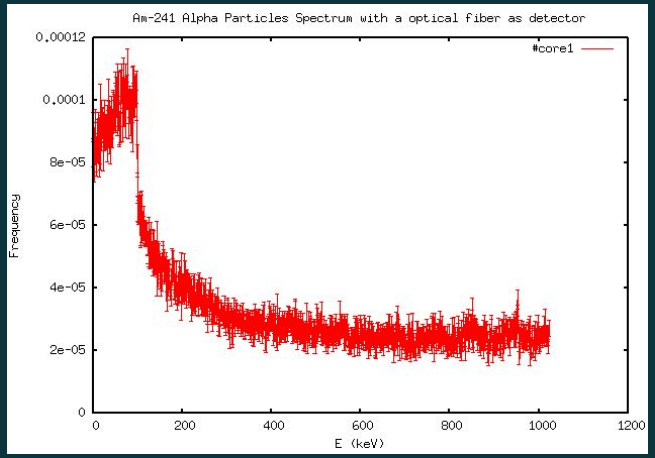


Fig. 14 Simulated Am-241 Alpha particles Spectrum with the optical fiber detector

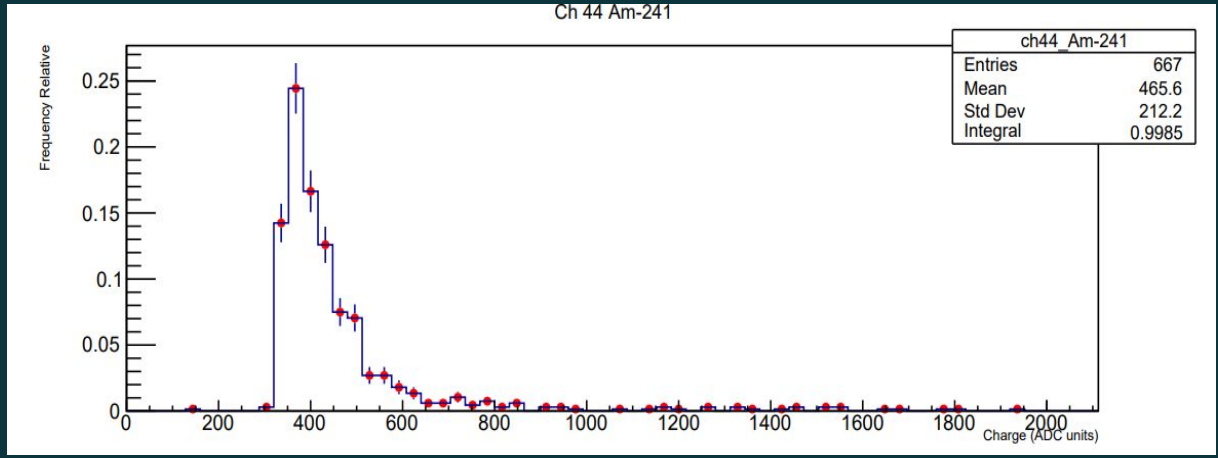


Fig. 15 Experimental Am-241 Spectrum with the optical fiber detector

The Future

References

- https://fluka.cern/about
- https://www.sciencedirect.com/science/article/abs/pii/S0168900219302748