Poster

Section: Biologické účinky a zdravotní hlediska

Simulation of cosmic rays interaction with simple human eye model by FLUKA and GEANT4 packages

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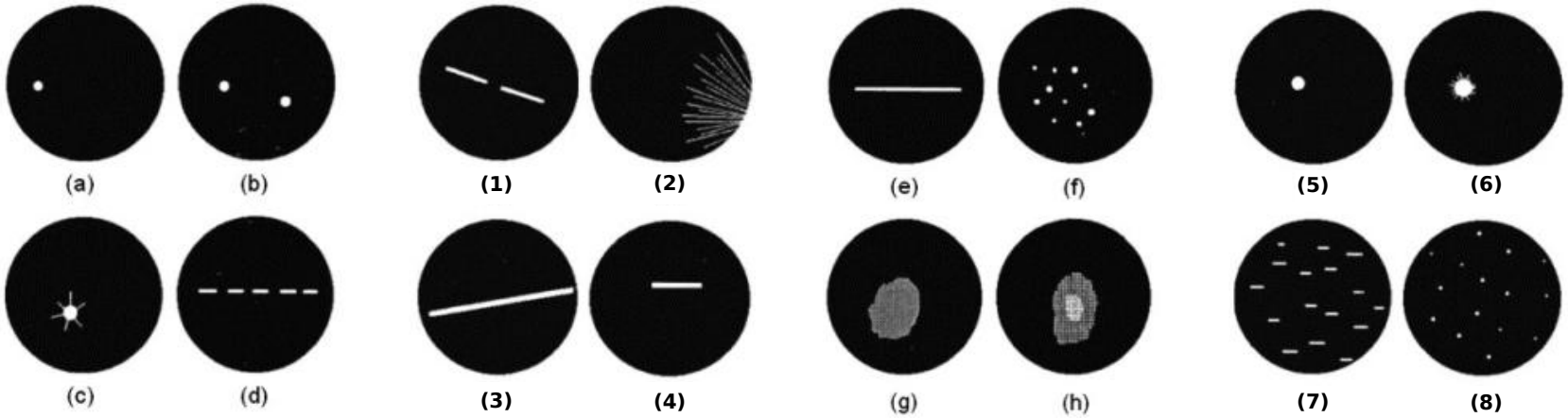
Light Flashes phenomenon

- First time observed during Apollo 11 flight
- Light flashes - caused by high-energy cosmic ray particles
- 3 main types of LF: - spot or starlike
  - strike
  - cloud
- Sileye experiment on ISS suggests 2 possible creation mechanisms:
  - Direct interaction of heavy nuclei with the retina or optic nerve
  - Proton-induced nuclear interactions in the eye



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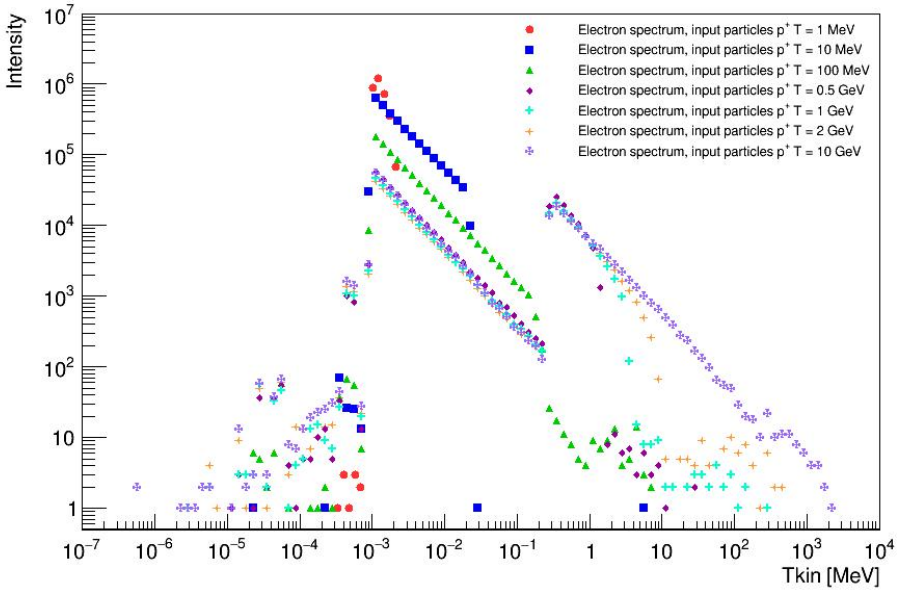
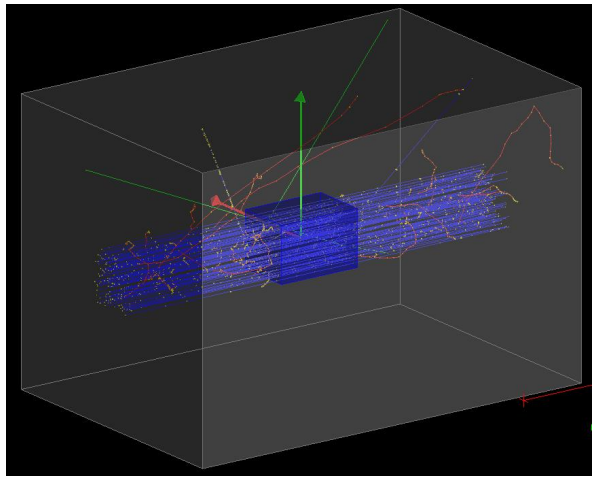
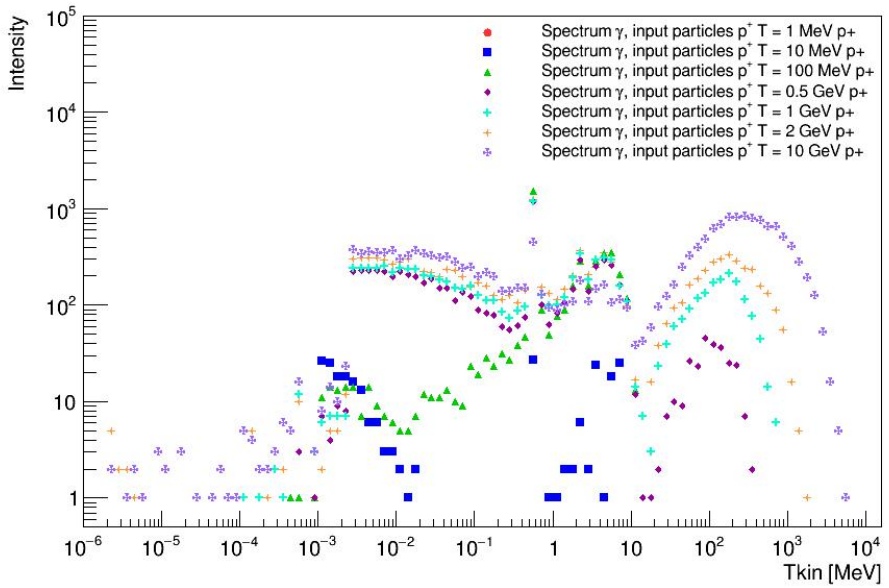
Geant4 model

- 2 x 3 x 2 cm block filled with water surrounded by a block of air 10 x 15 x 10 cm
- Input particles: 100 000 protons with various initial energies (specifically 1, 10, 100, 500 MeV and 1, 2 and 10 GeV)
- Results:



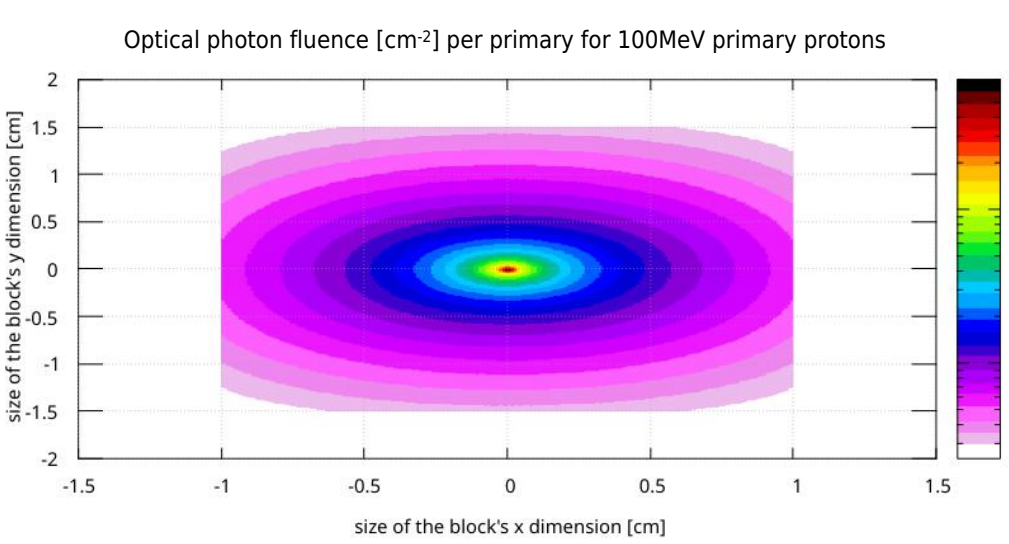


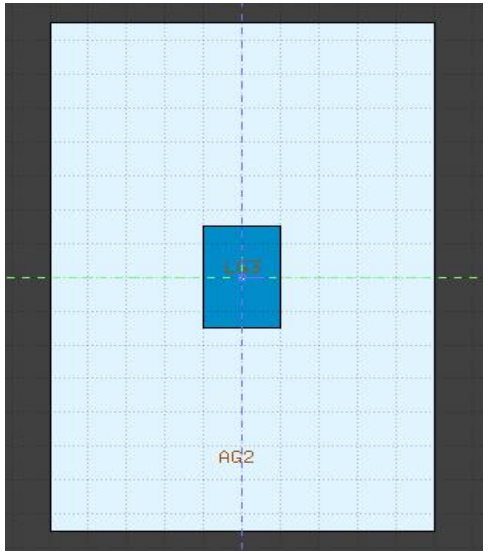


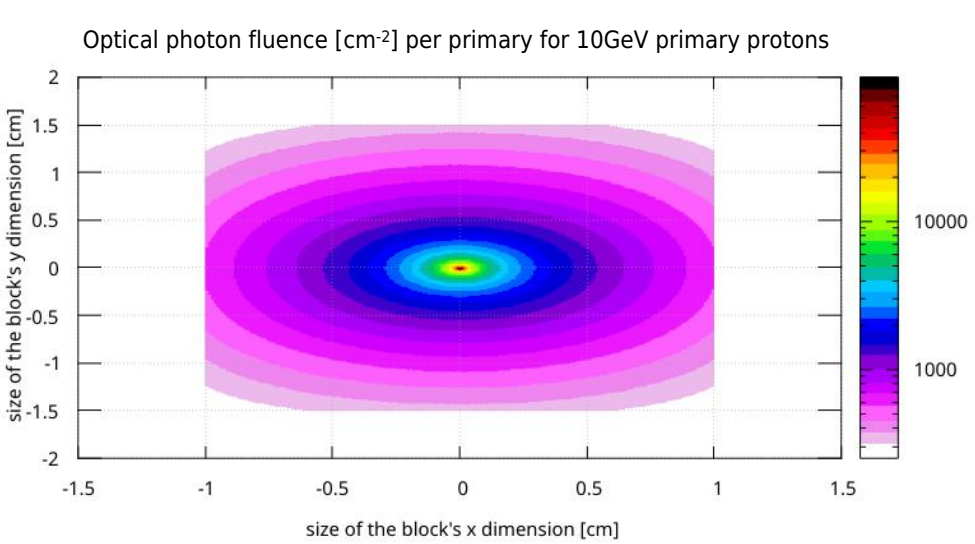
More about Geant4: https://geant4-userdoc.web.cern.ch/UsersGuides/AllGuides/html/ForApplicationDevelopers/index.html

FLUKA model

- Block od water 2 x 3 x 2 cm surrounded by a block of air 10 x 15 x 10 cm
- Input particles: 100 000 protons with various initial energies (precisely 1, 10, 100 MeV and 1, and 10 GeV)
- Results:







More about FLUKA: https://flukafiles.web.cern.ch/manual/index.html

Conclusions

- Simulations yield spectra of different secondary particles, such as: secondary protons, electrons, γ particles, and many others.
- Geant4 simulations show created γ particles in γ spectrum; however we can not distinguish visible photons.
- FLUKA simulations show a non-zero optical photons fluence maps for primary protons with energies at 100 MeV and higher
- These results can not be presently reliably compared, because of different formats of outputting data

Thank you for your attention!