OS EXPERIMENTOS protoMIRAX e MIRAX

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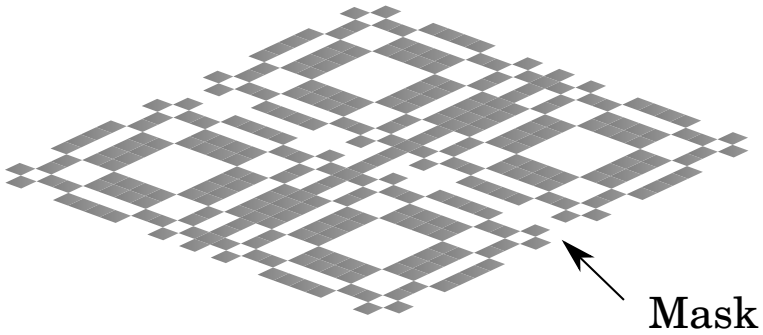
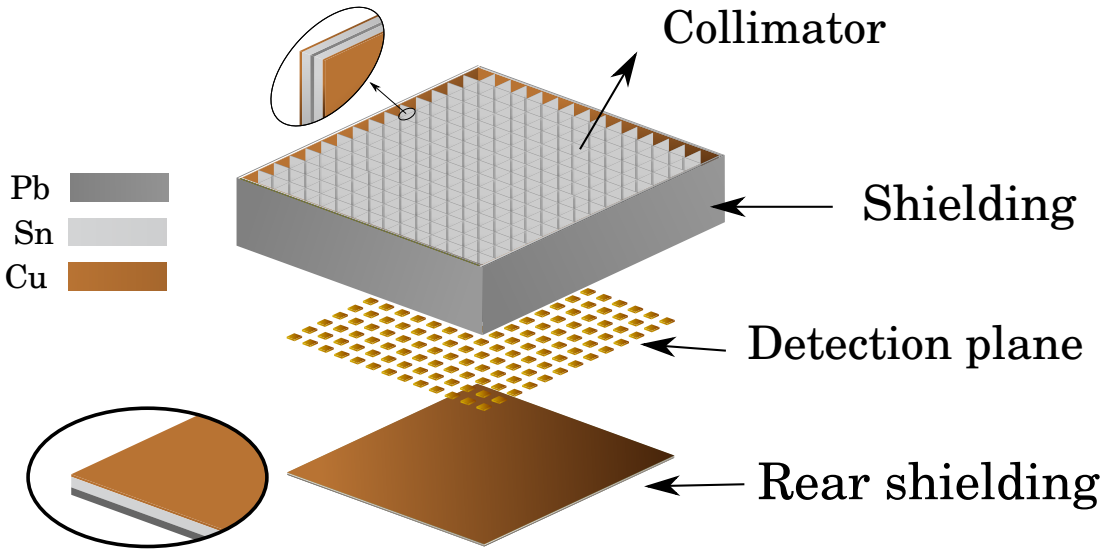
Workshop da Divisão de Astrofísica

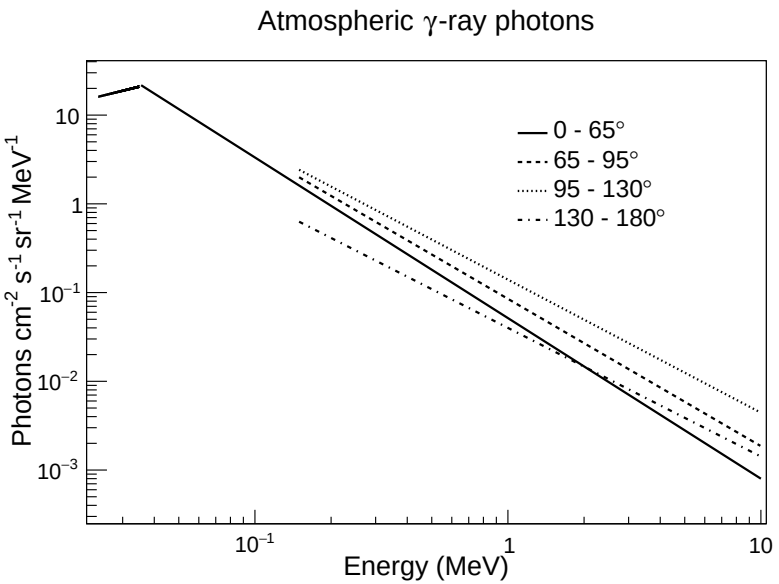
3 - 4 de maio de 2016

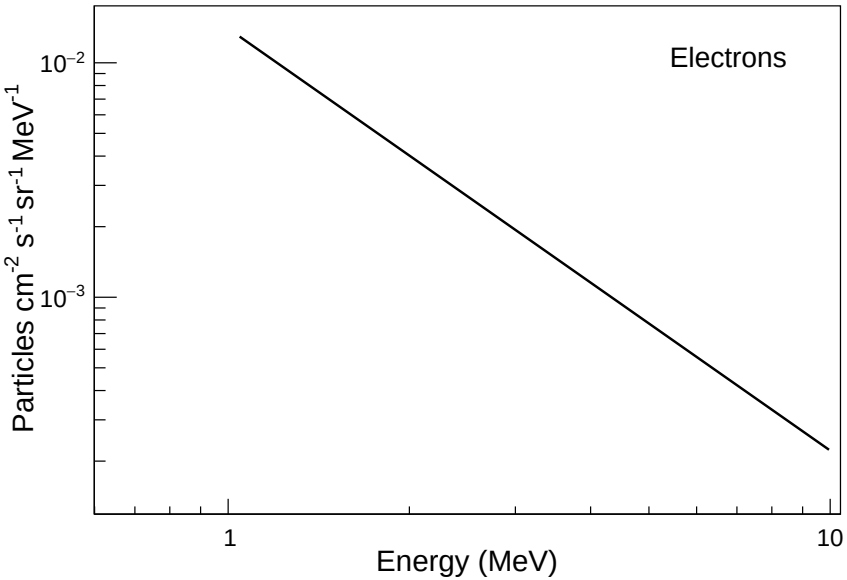
O protoMIRAX/MIRAX

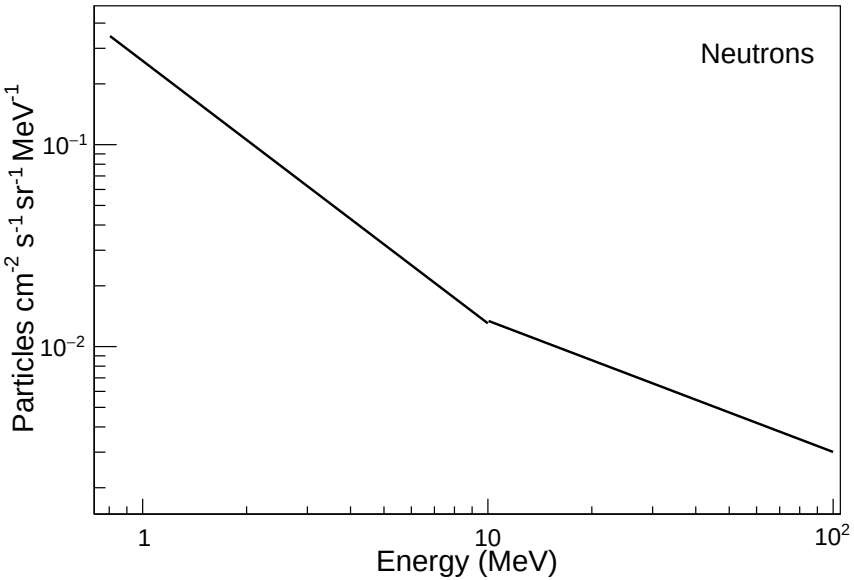


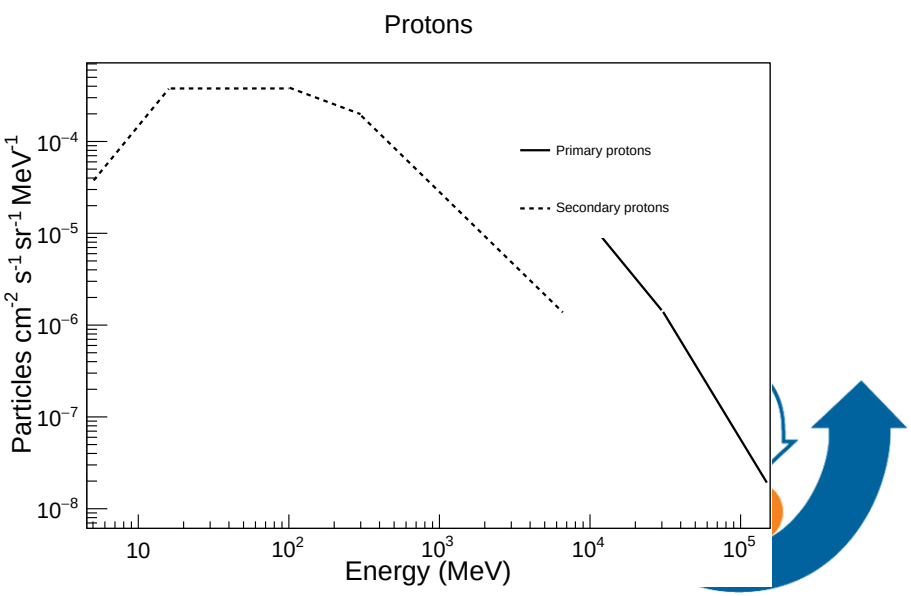


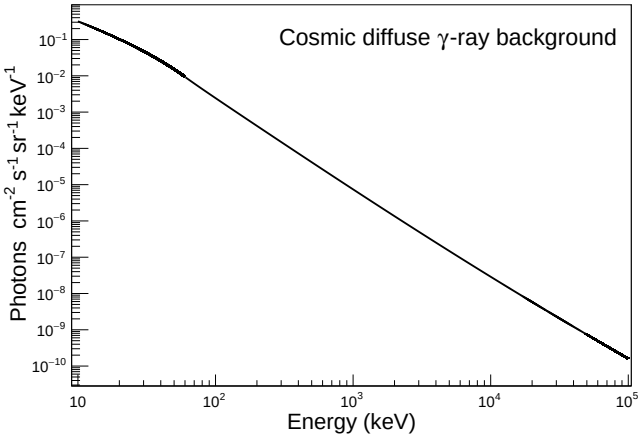
Componentes do ruído

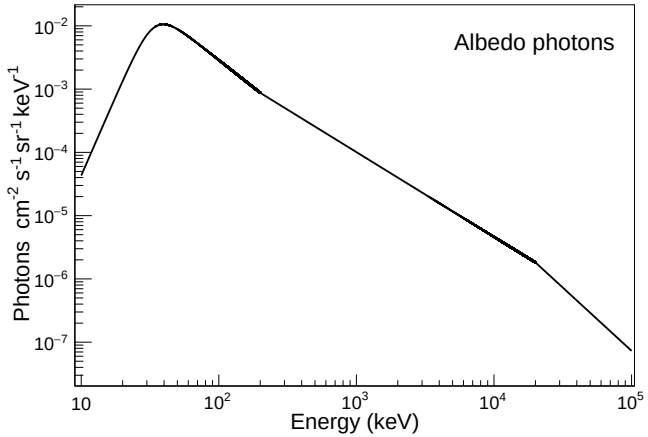


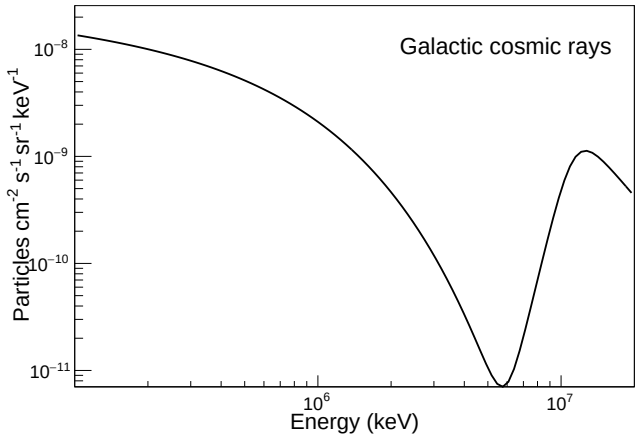


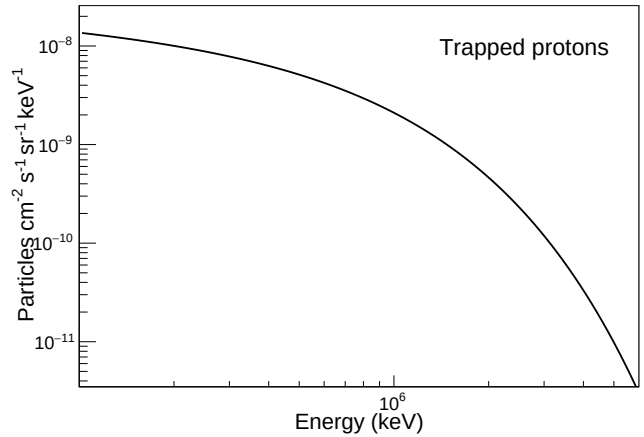


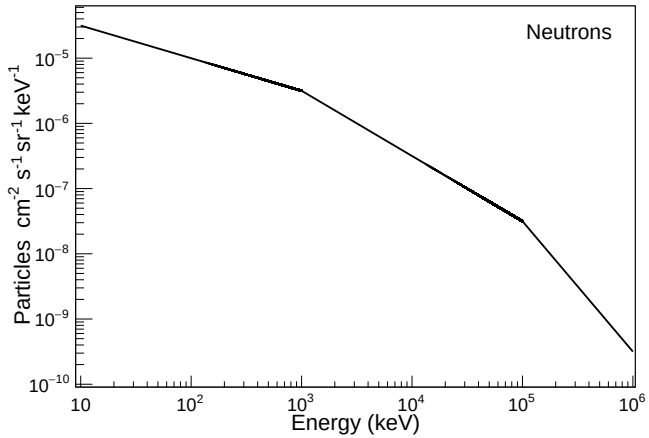



Cosmic diffuse γ-ray background
Photons cm^{-2} s^{-1} sr^{-1} keV^{-1}
Energy (keV)

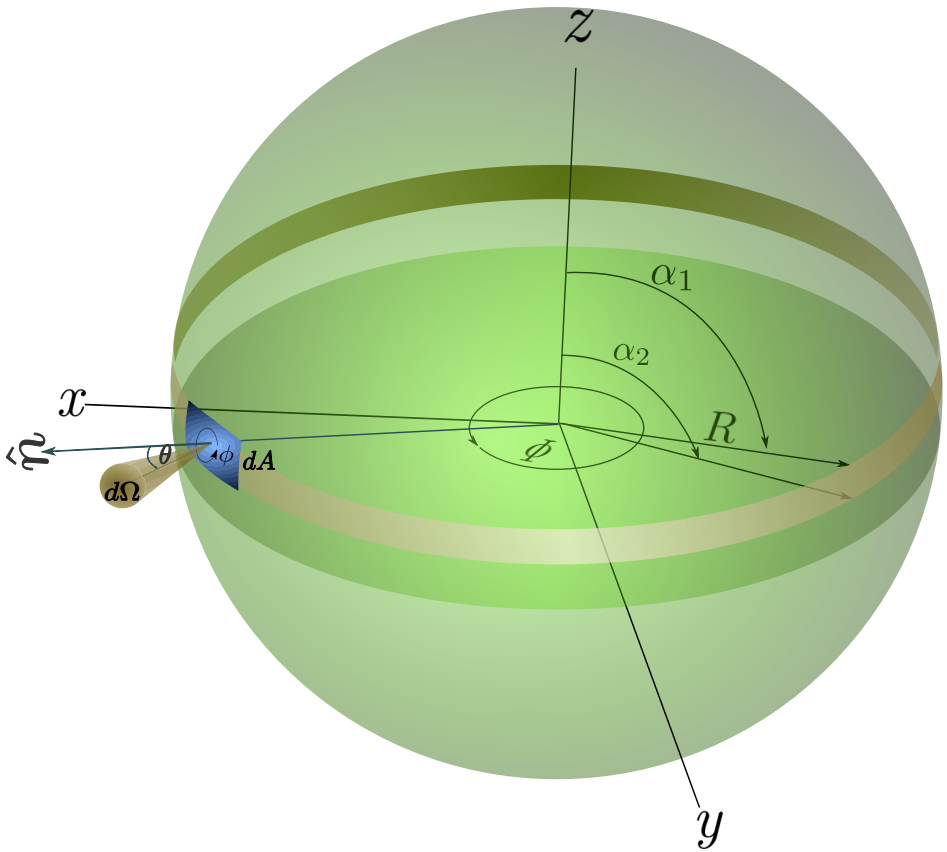

Albedo photons
Photons cm^{-2} s^{-1} sr^{-1} keV^{-1}
Energy (keV)


Galactic cosmic rays
Particles cm^{-2} s^{-1} sr^{-1} keV^{-1}
Energy (keV)


Trapped protons
Particles cm^{-2} s^{-1} sr^{-1} keV^{-1}
Energy (keV)


Neutrons
Particles cm^{-2} s^{-1} sr^{-1} keV^{-1}
Energy (keV)

Normalização

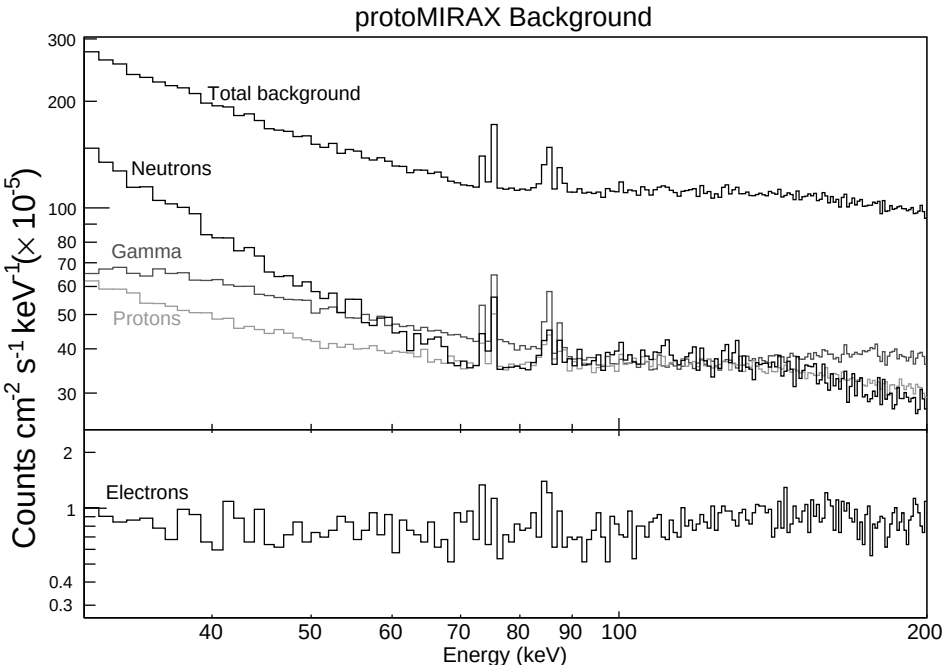


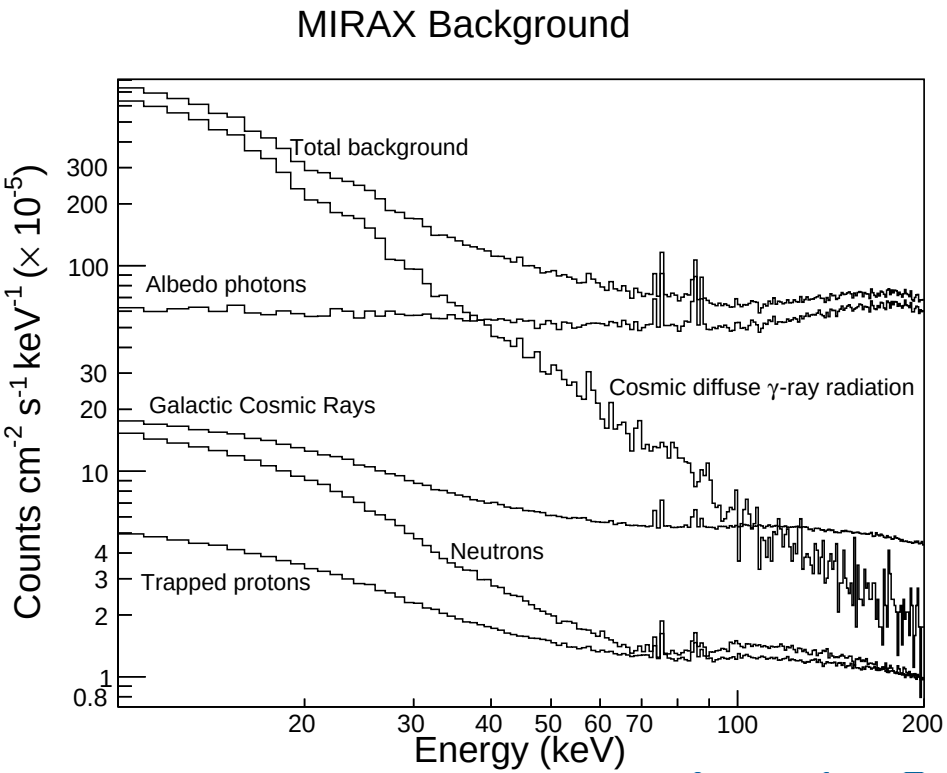
$$N = \int I_N \cos\theta \, d\Omega \, dA \, dt \, dE,$$

$$N = \pi \, A \, T \int I_N \, dE,$$

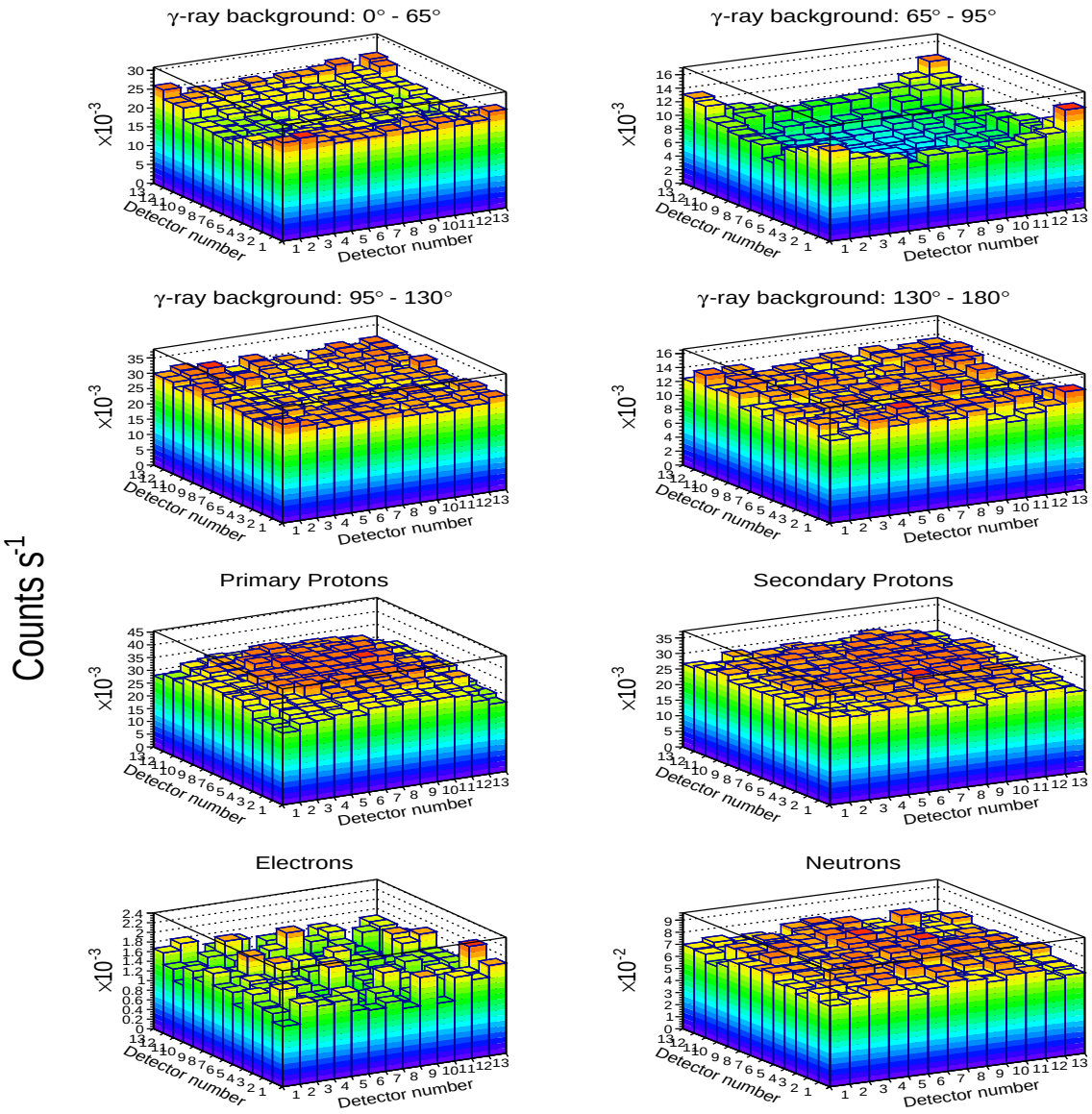
$$d\Omega = d\phi \, \sin\theta d\theta$$
$$dA = R^2 \sin\alpha d\alpha d\Phi$$

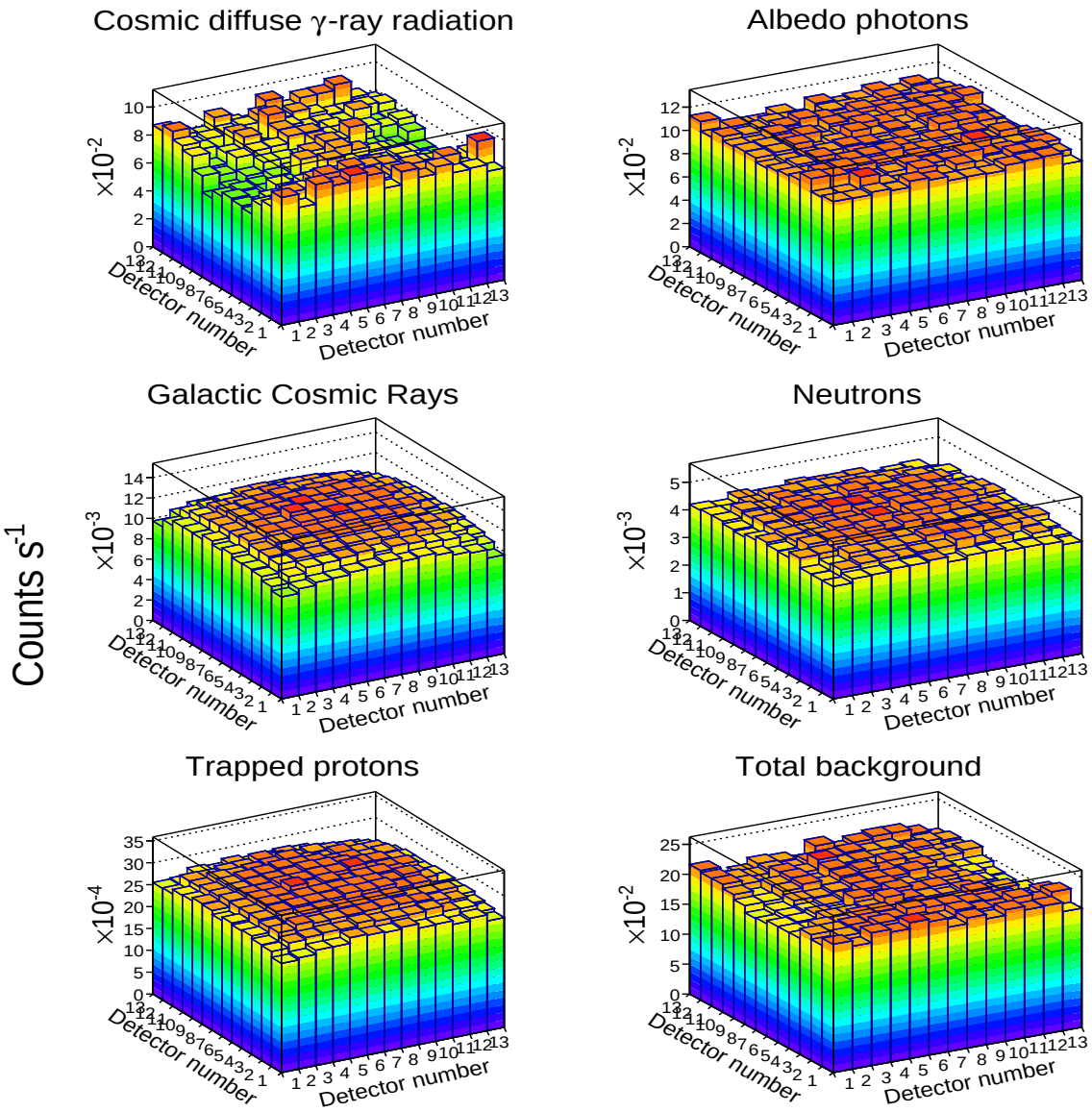
Contribuição do ruído



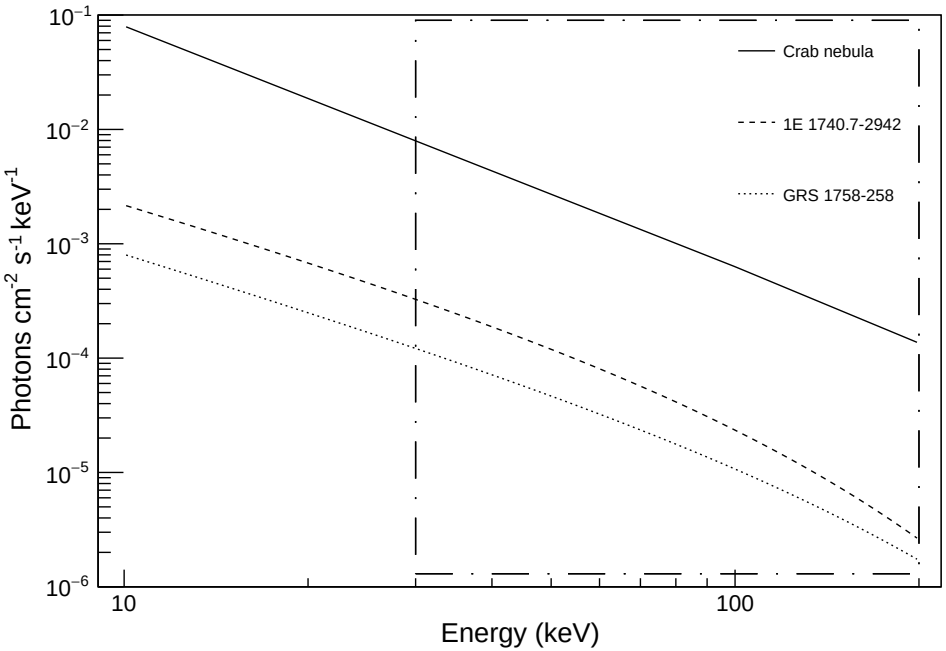


Distribuição espacial




Cosmic diffuse γ-ray radiation
Albedo photons
Galactic Cosmic Rays
Neutrons
Trapped protons
Total background
Counts s-1
Detector number
Detector number

Reconstrução de imagens



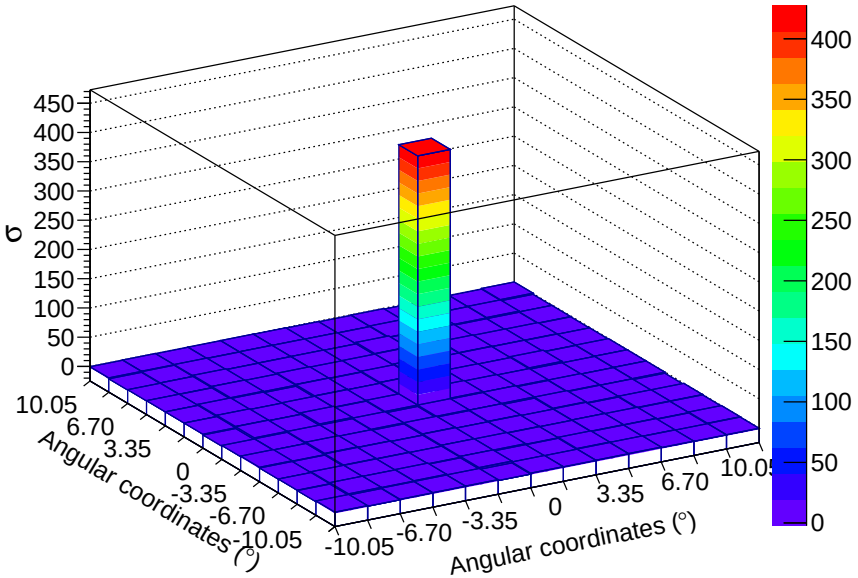
para o protoMIRAX

$$F(E) = F_0(E)\ e^{-\frac{\mu}{\rho}(E)\ x\ \sec(z)}$$

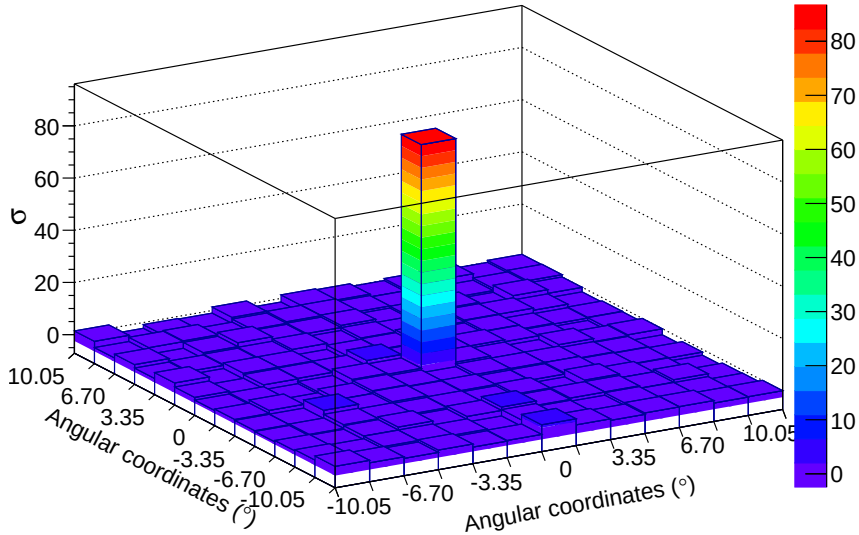
$$\cos z(t) = \sin\varphi \sin\delta + \cos\varphi \cos\delta \cos(t - \alpha)$$

$$N = \int_S \int_{E_{\min}}^{E_{\max}} \int_0^T F_0(E)\ e^{-\frac{\mu}{\rho}(E)\ x\ \sec(z(t))}\, dt\, dE\, dS$$

Imagem reconstruída



Crab - MIRAX - 4h



Crab - protoMIRAX - 4h

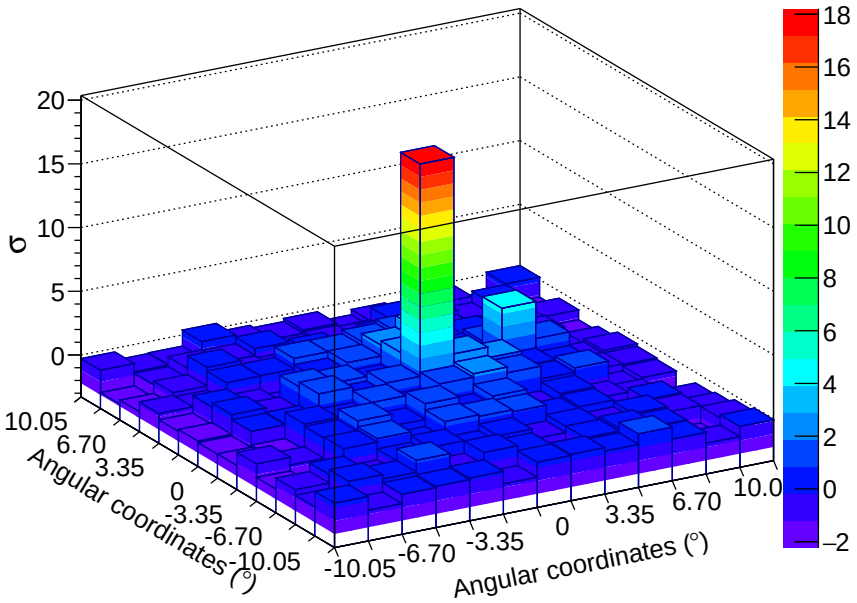


Figura: 1E 1740.7−2942 e GRS 1758−258

Background and Imaging Simulations for the Hard X-Ray Camera of the *MIRAX* Mission

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ABSTRACT

We report the results of detailed Monte Carlo simulations of the performance expected both at balloon altitudes and at the probable satellite orbit of a hard X-ray coded-aperture camera being developed for the *MIRAX* mission. Based on a thorough mass model of the instrument and detailed specifications of the spectra and angular dependence of the various relevant radiation fields at both the stratospheric and orbital environments, we have used the well-known package GEANT4 to simulate the instrumental background of the camera. We also show simulated images of source fields to be observed and calculated the detailed sensitivity of the instrument in both situations. The results reported here are especially important to researchers in this field considering that we provide important information, not easily found in the literature, on how to prepare input files and calculate crucial instrumental parameters to perform GEANT4 simulations for high-energy astrophysics space experiments.

Key words: instrumentation: detectors – methods: numerical – atmospheric effects – balloons - space vehicles: instruments – techniques: image processing