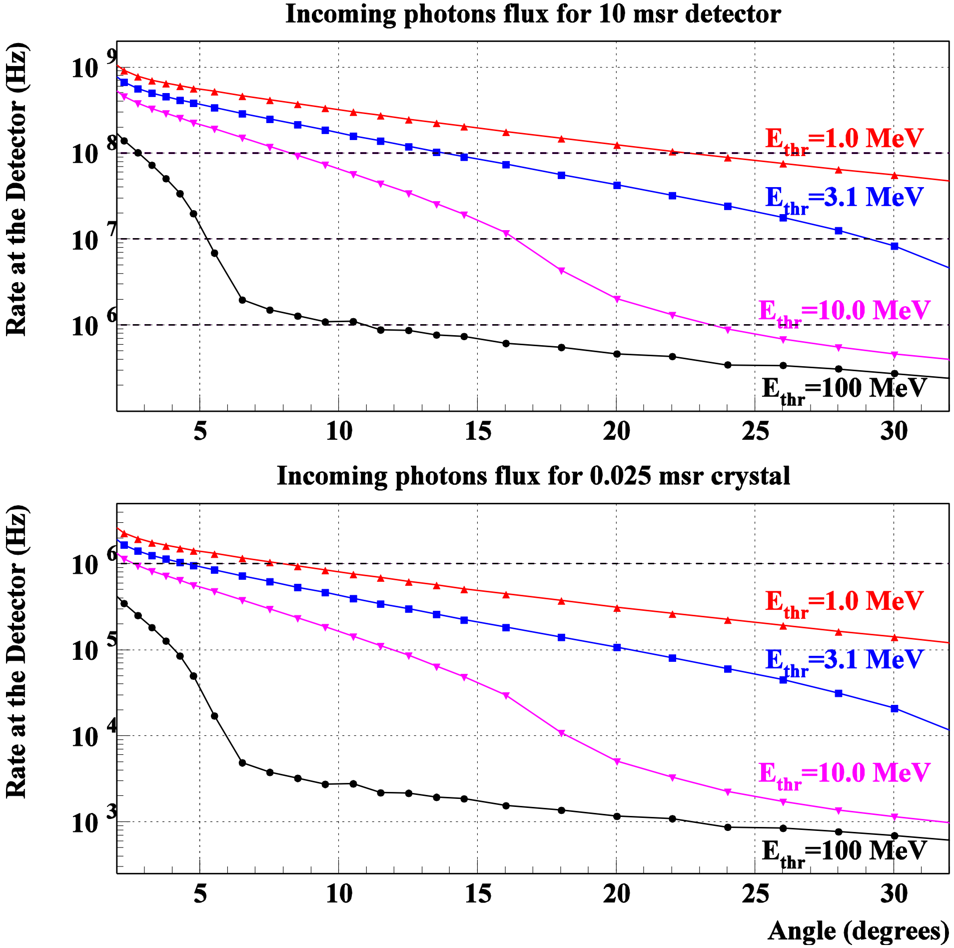
The Flux of the Low Energy Photons

The flux of the γ at the face of the π^0 detector and single module as a function of the angle at energy thresholds 1.0, 3.1, 10 and 100 MeV.

(Based on Pavel Degtiarenko simulations.)



Beam energy: 6.6 GeV
Beam current: 1.0 μA
Target: 10 cm LH2

Pi0-detector at the distance of 4.0 m from the target. The crystal sizes were taken 2.0 cm ×2.0 cm corresponding to 0.025 msr solid angle at distance 4.0 m.

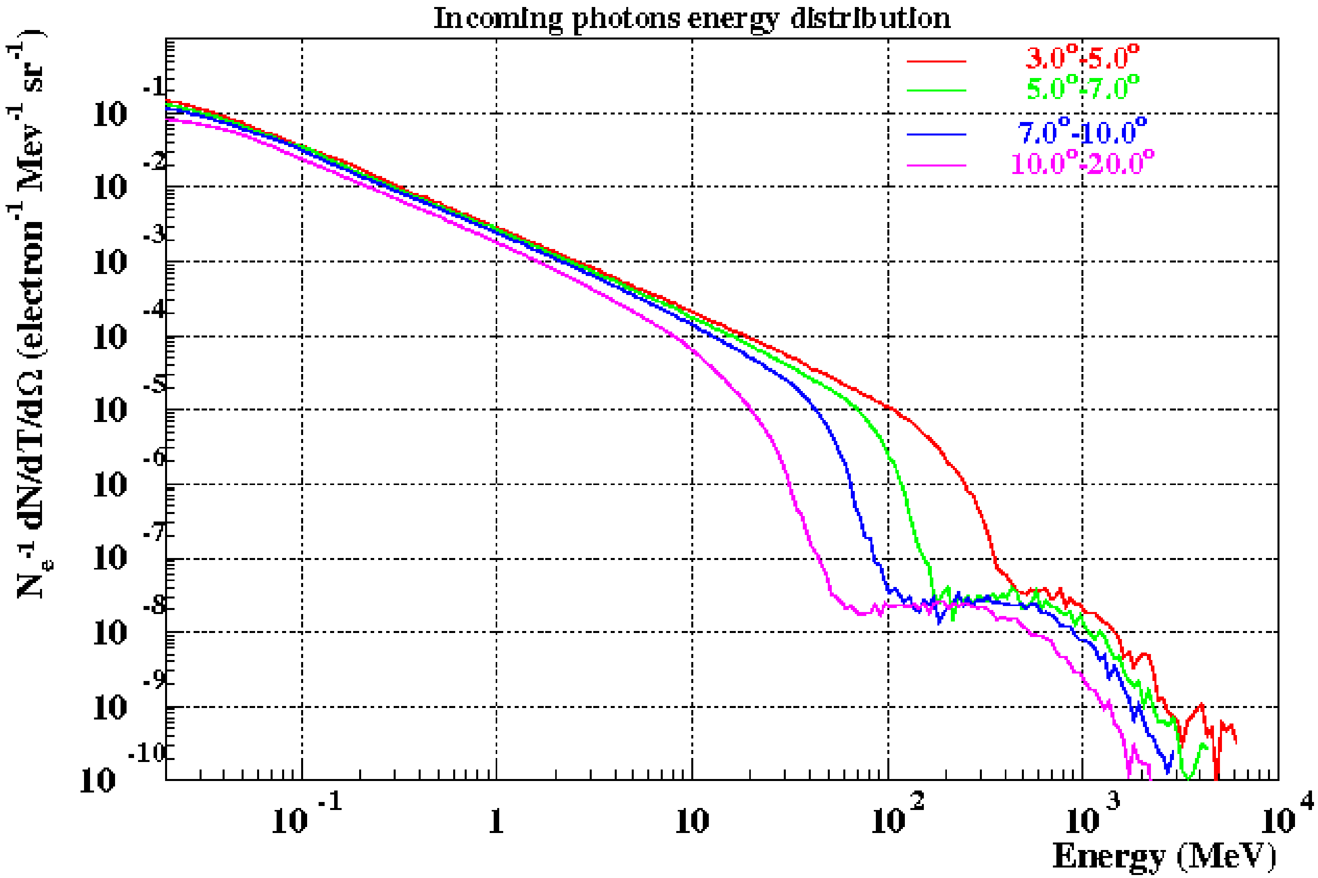
The major sources of the background:

- **the target-induced rates**
- **the beam-line components.**

For this simulation we had assumed a small-diameter beam pipe compatible with the Calorimeter at its most forward angle. We will redo this with a more optimized beam pipe.

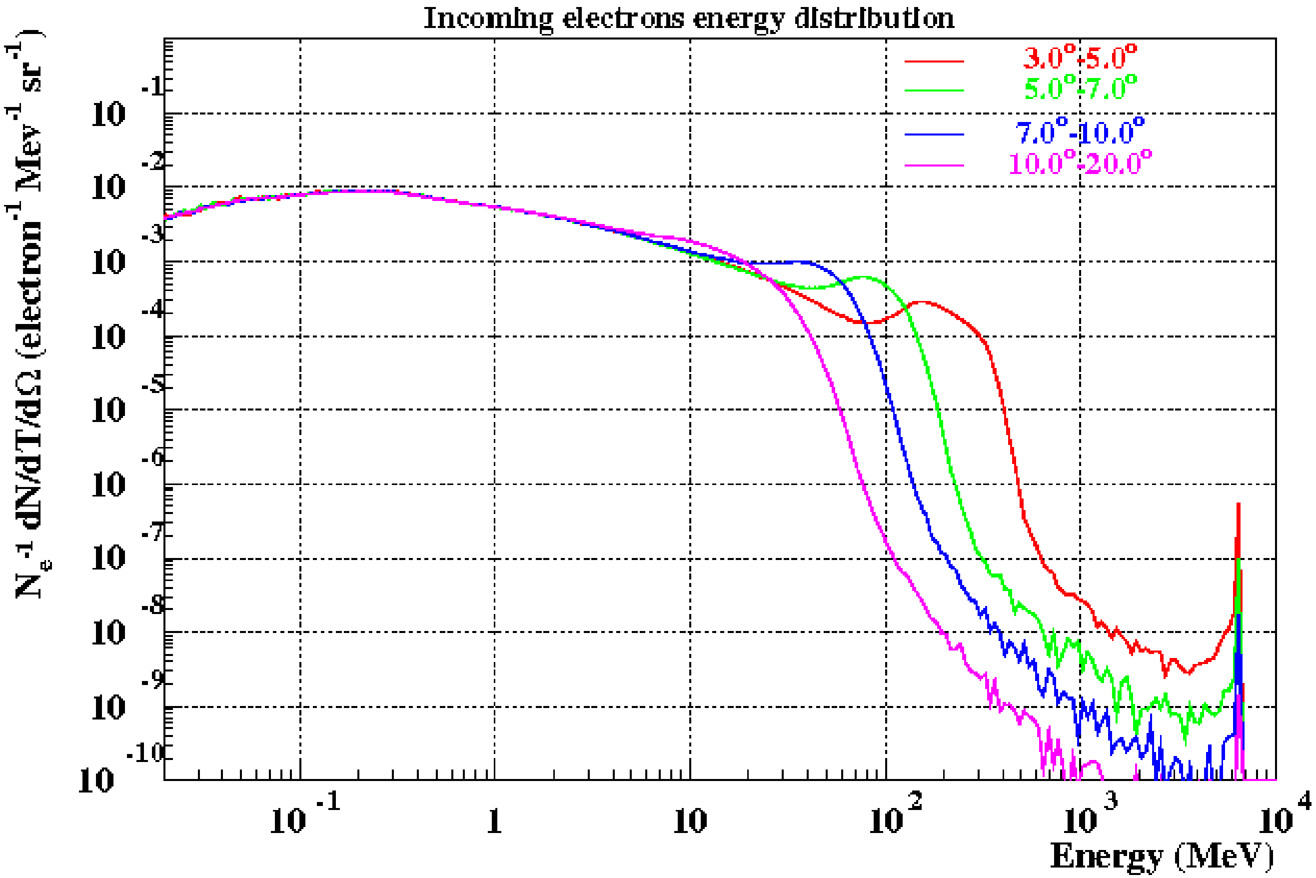
Energy Spectrum of the Photons

(Based on Pavel Degtiarenko simulations for the beam energy 6.6 GeV)



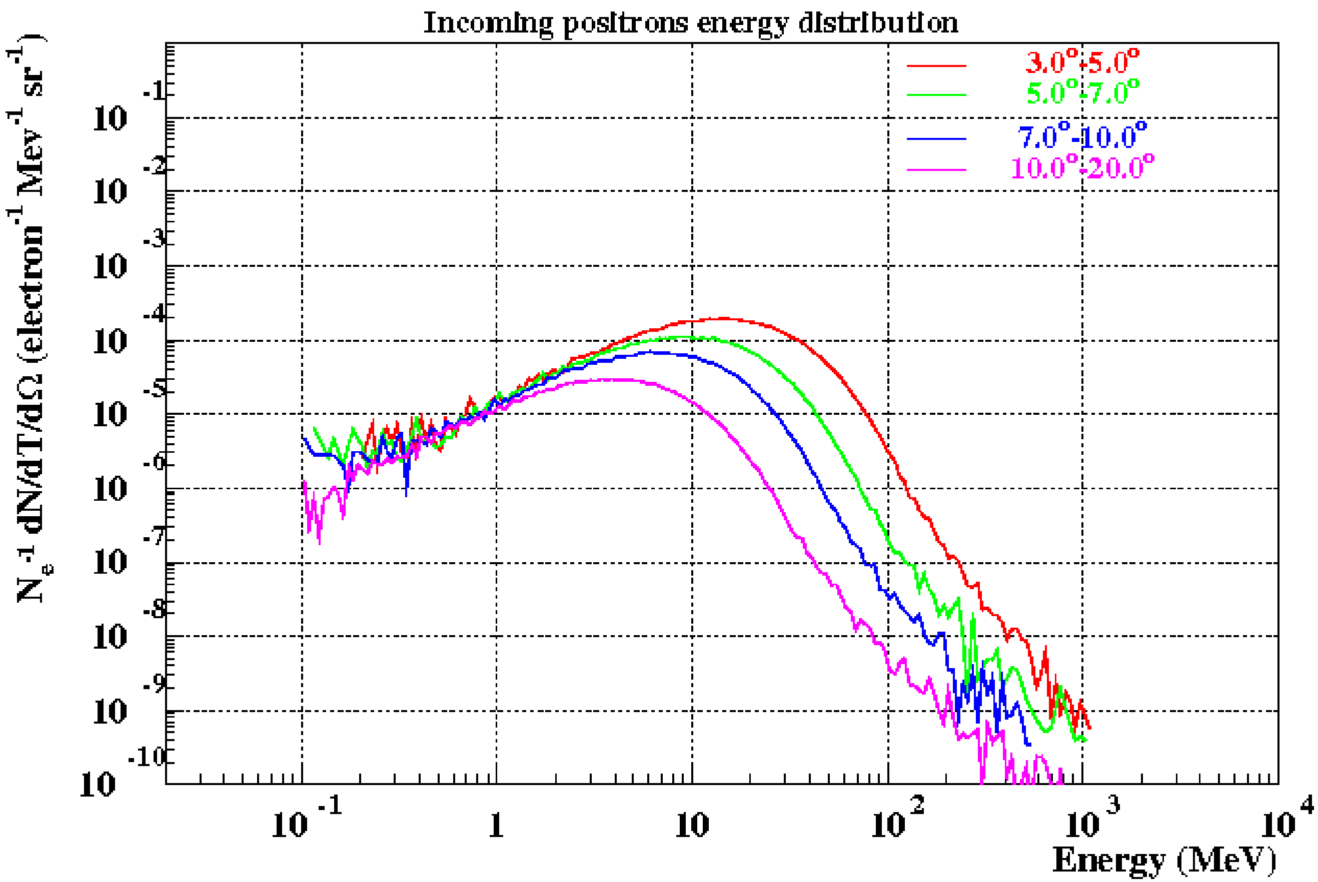
Energy Spectrum of the Electrons

(Based on Pavel Degtiarenko simulations for the beam energy 6.6 GeV)



Energy Spectrum of the Positrons

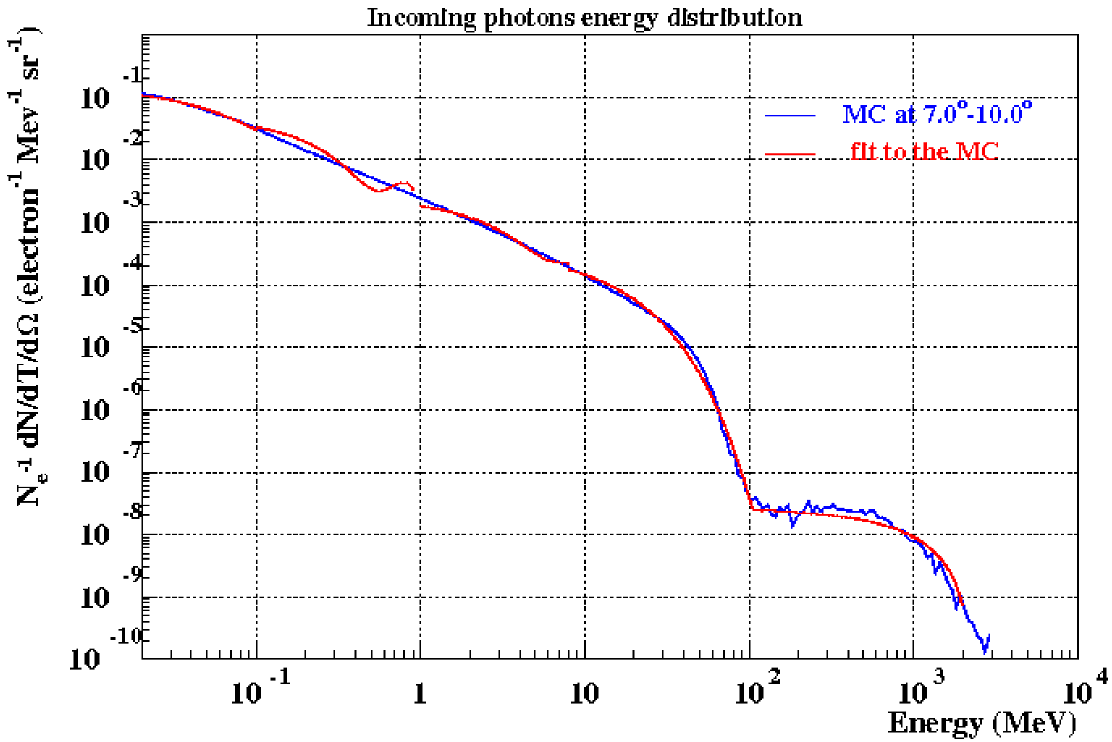
(Based on Pavel Degtiarenko simulations for the beam energy 6.6 GeV)



$f = 0.14895 - 2.3667 \cdot x + 15.415 \cdot x^2 - 2.35652 \cdot x^3 \quad \text{for} \quad 0.01 < E < 0.1 \text{MeV}$

Fit of the Photons Energy Spectrum

(Based on Pavel Degtiarenko simulations for the beam energy 6.6 GeV)



All energy range have been divided in several sections and fitted independently.
The blue line is a Pavel's MC data, the red colour lines are shown the fit functions.
For background studies one can use fit functions or data table (which can be provided).

$$f = 0.14895 - 2.3667 \cdot x + 15.415 \cdot x^2 - 35.652 \cdot x^3 \quad \text{for} \quad 0.01 < E < 0.1 \text{MeV}$$

$$f = 0.53733E-01 - 0.23643 \cdot x + 0.36084 \cdot x^2 - 0.17818 \cdot x^3 \quad \text{for} \quad 0.1 < E < 0.9 \text{MeV}$$

$$f = 0.26845E-02 - 0.99676E-03 \cdot x + 0.13550E-03 \cdot x^2 - 0.61838E-05 \cdot x^3 \quad \text{for} \quad 1.0 < E < 8.0 \text{MeV}$$

$$f = \exp(-7.9304 - 0.091089 \cdot x) \quad \text{for} \quad 8.0 < E < 105 \text{MeV}$$

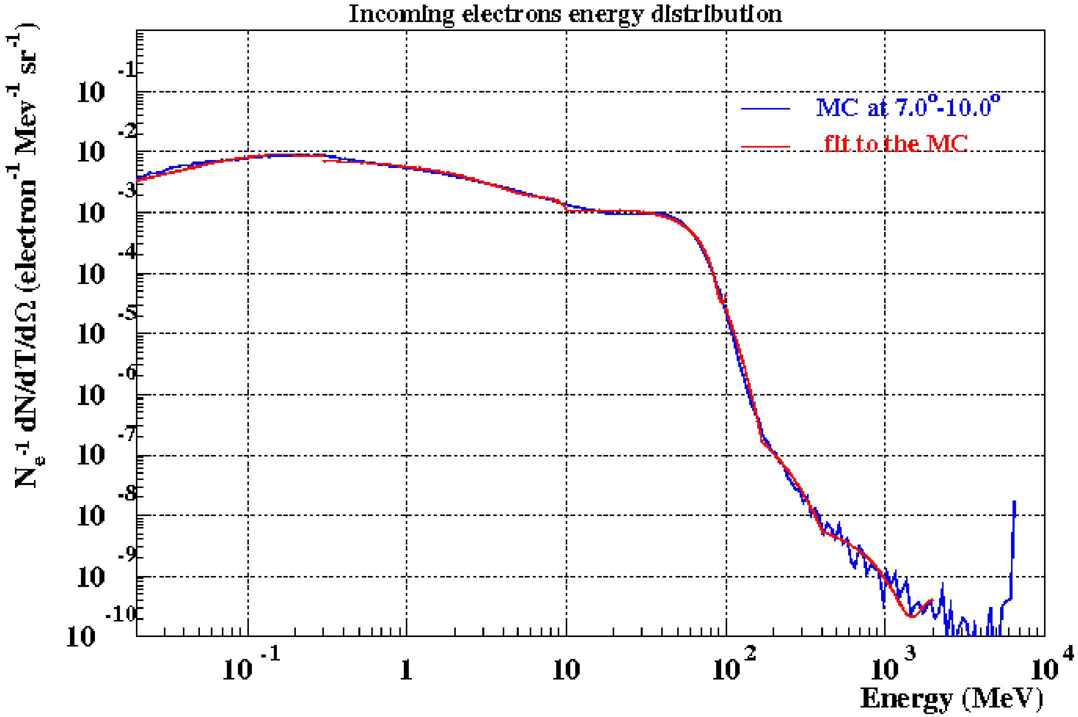
$$f = 0.26626E-07 - 0.21915E-10 \cdot x + 0.44752E-14 \cdot x^2 \quad \text{for} \quad 105 < E < 2000 \text{MeV}$$

Neglecting photons with energy below 1MeV, we may use only last three functions (for E> 1 MeV).

$f = 0.10727E-02 + 0.12552 \cdot x - 0.63569 \cdot x^2 + 1.0173 \cdot x^3 \quad \text{for} \quad 0.01 < E < 0.3\,\text{MeV}$

Fit of the Electrons Energy Spectrum

(Based on Pavel Degtiarenko simulations for the beam energy 6.6 GeV)



All energy range have been divided in several sections and fitted independently.
The blue line is a Pavel's MC data, the red colour lines are shown the fit functions.
For background studies one can use fit functions or data table (which can be provided).

$f = 0.10727E-02 + 0.12552 \cdot x - 0.63569 \cdot x^2 + 1.0173 \cdot x^3 \quad \text{for} \quad 0.01 < E < 0.3\,\text{MeV}$

$f = 0.77895E-02 - 0.23587E-02 \cdot x + 0.31988E-03 \cdot x^2 - 0.15034E-04 \cdot x^3 \quad \text{for} \quad 0.3 < E < 10\,\text{MeV}$

$f = 0.85816E-03 + 0.25322E-04 \cdot x - 0.80438E-06 \cdot x^2 + 0.46978E-08 \cdot x^3 \quad \text{for} \quad 10 < E < 100\,\text{MeV}$

$f = \exp(-3.2370 - 0.72822E-01 \cdot x) \quad \text{for} \quad 100 < E < 170\,\text{MeV}$

$f = \exp(-13.176 - 0.14409E-01 \cdot x) \quad \text{for} \quad 170 < E < 400\,\text{MeV}$

$f = 0.12215E-07 - 0.21524E-10 \cdot x + 0.12631E-13 \cdot x^2 - 0.24103E-17 \cdot x^3 \quad \text{for} \quad 400 < E < 2000\,\text{MeV}$

Assuming sweep magnet is ON, we need to take into account only last two functions for E > 170 MeV.