

# Study of the calibration method using the stars measured by the EUSO-TA telescope

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## The EUSO-TA detector parameters

Detection unit	Photo Detector Module (PDM)
PDM	36 Multi-Anode Photomultiplier Tube
MAPMT	Hamamatsu R11265-M64
Optical bandwidth	290nm-450nm
Optical system	2 Fresnel PMMA (8mm)
Gate Time Unit	2.5 $\mu$ s
Dead time	200ns

Expected signal  $N_{exp}$  for fixed observation angle can be simply described by following formula:

$$N_{exp} = C_{abs} \int_0^{\infty} T_{atm}(\lambda) \Phi_{top}(\lambda) P_{det}(\lambda) d\lambda$$

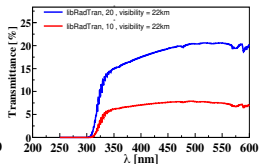
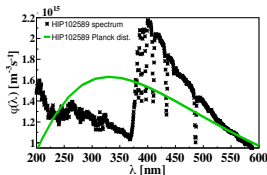
where:

$\Phi_{top}(\lambda)$  - star light flux at the top of the atmosphere

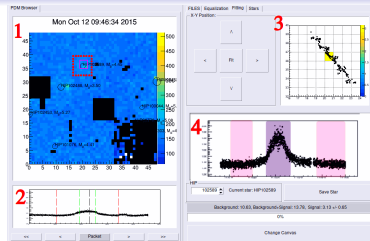
$T_{atm}(\lambda)$  - atmospheric transmittance

$P_{det}(\lambda)$  - known detector parameters

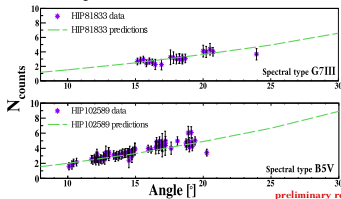
$C_{abs}$  - wavelength independent absolute calibration constant



data from: A. J. Pickles. A Stellar Spectral Flux Library: 1150-25000Å



The main panel of ROOT-based software dedicated for analysis of signals from stars in EUSO-TA data



Absolute calibration of EUSO detectors is an important step necessary to understand registered signal

The total detector efficiency for point-like signal (3x3 pixels):  
@ 300nm - 3.48% @ 365nm - 5.81% @ 400nm - 5.60%

All results obtained with the calibration constant  $C_{abs} = 0.86$