

Monte-Carlo simulation of the TAIGA hybrid gamma-ray experiment

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for TAIGA collaboration

TAIGA detectors

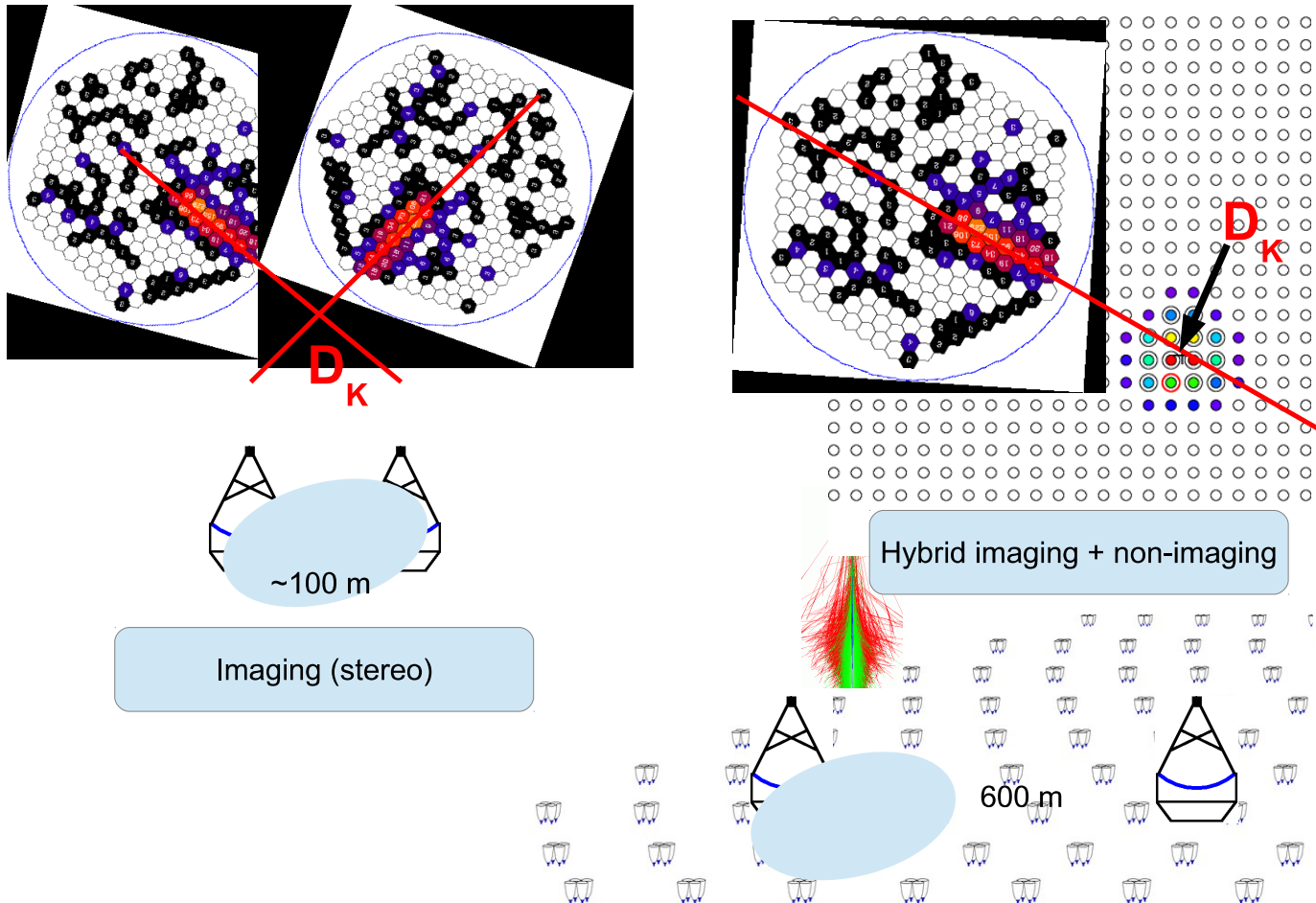


TAIGA Imaging Atmospheric Cherenkov Telescope (IACT)



HiSCORE station

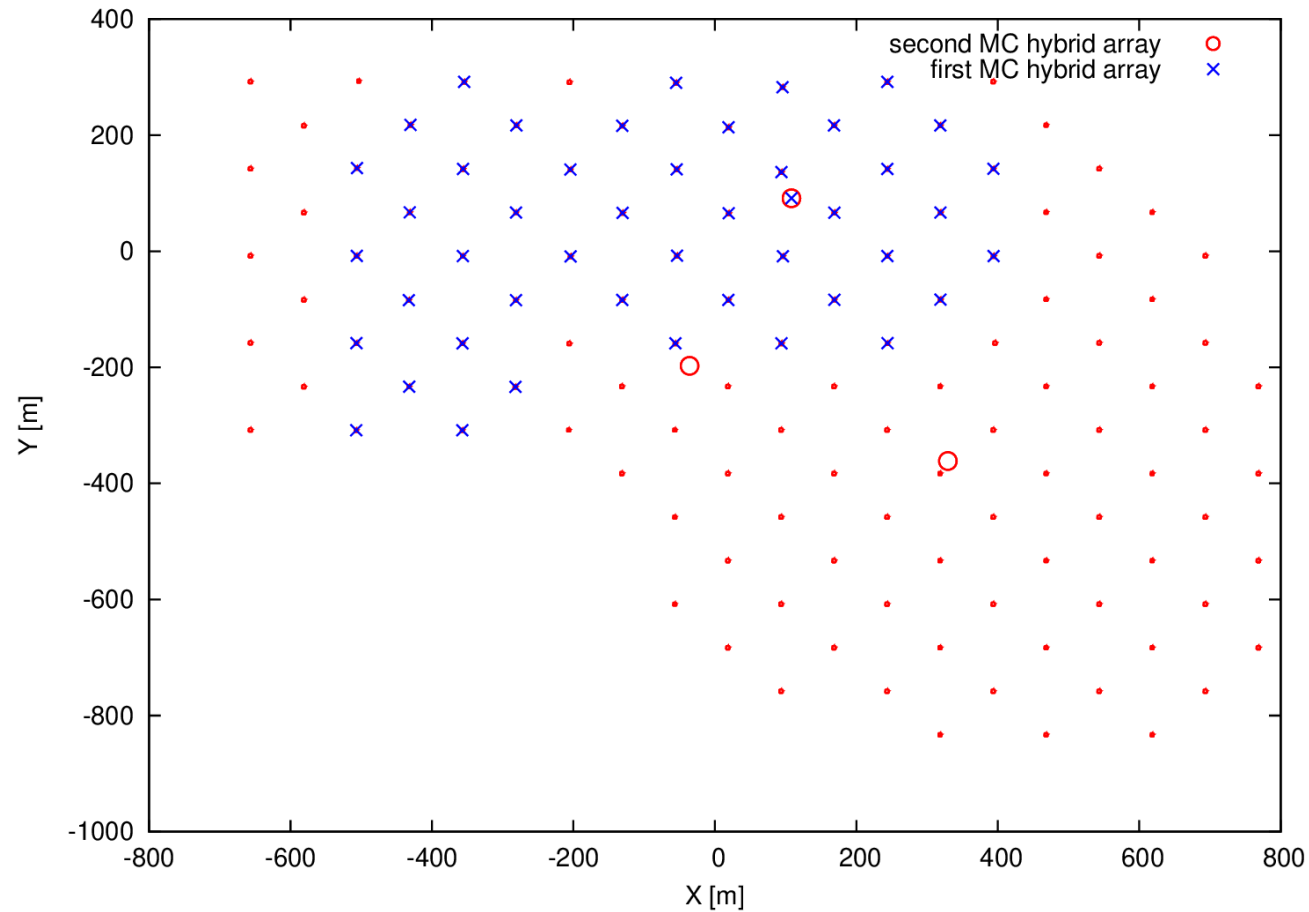
Why use hybrid detector?



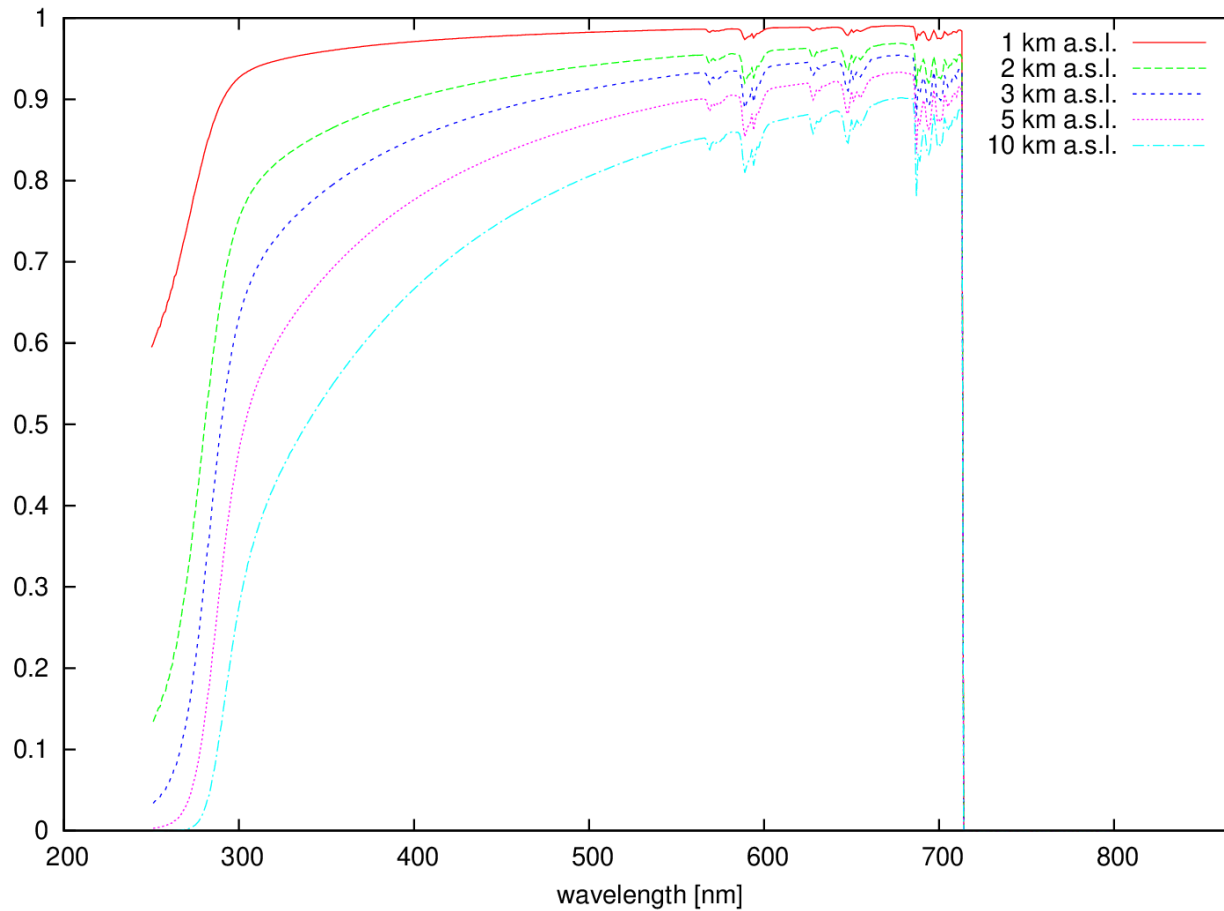
September 3, 2014

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Simulated array in CORSIKA

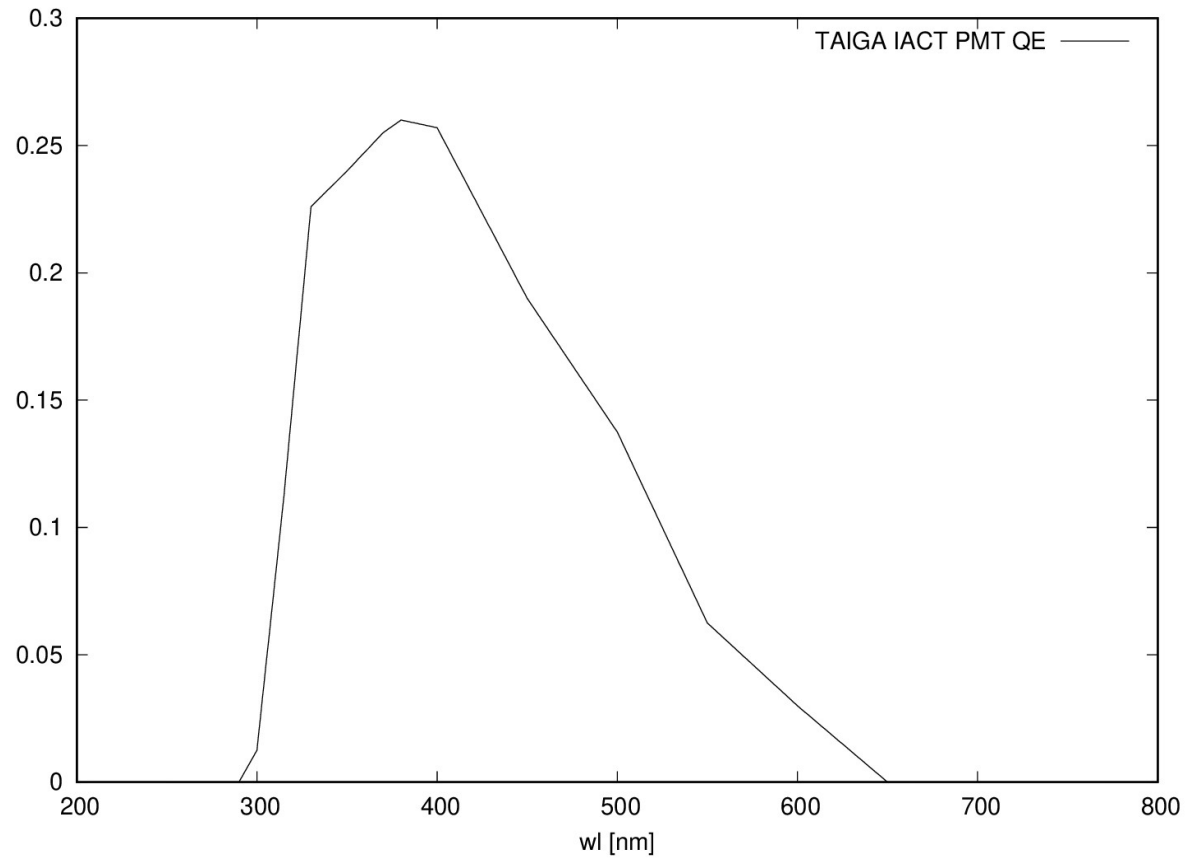


Atmospheric transparency

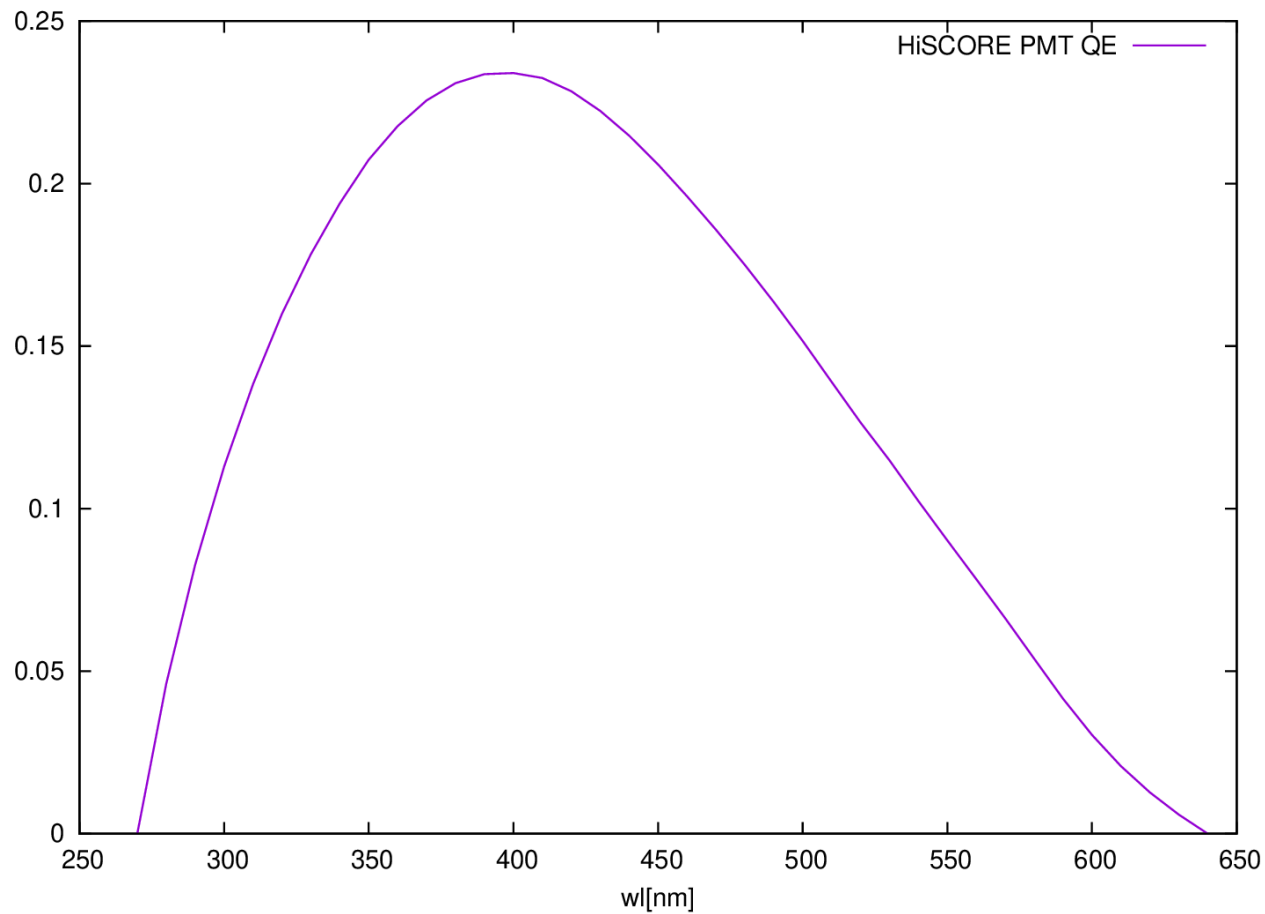


Transparency from given height to 676m at 30 degrees to zenith

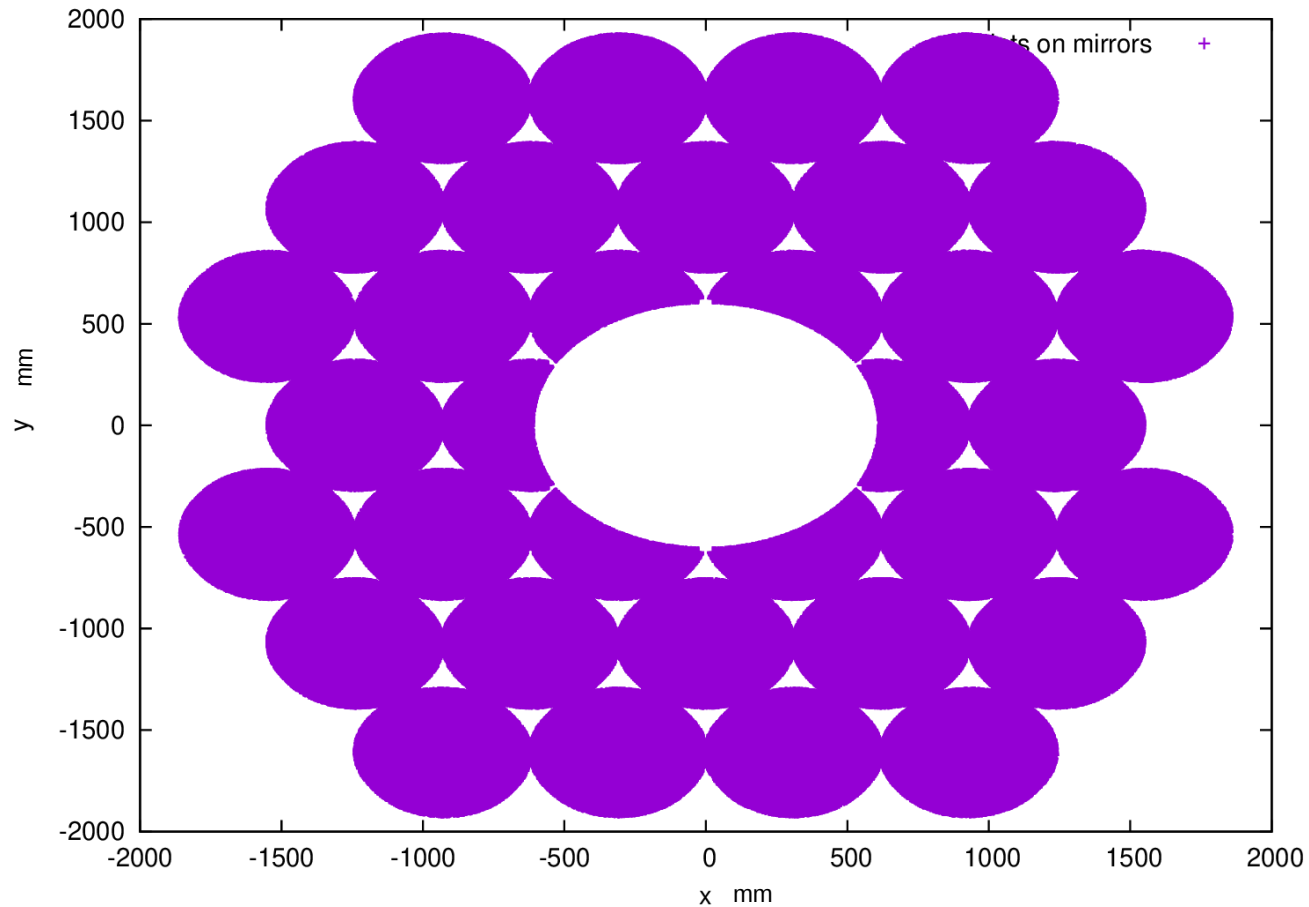
IACT PMT quantum efficiency



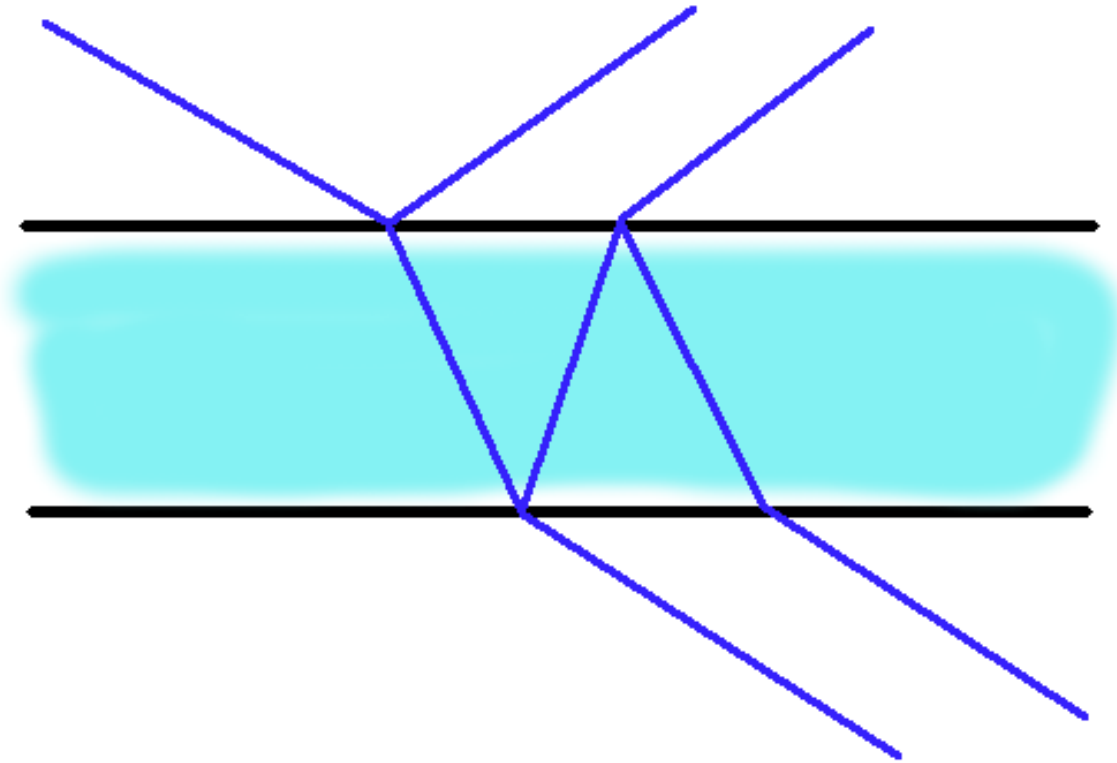
HiSCORE PMT quantum efficiency



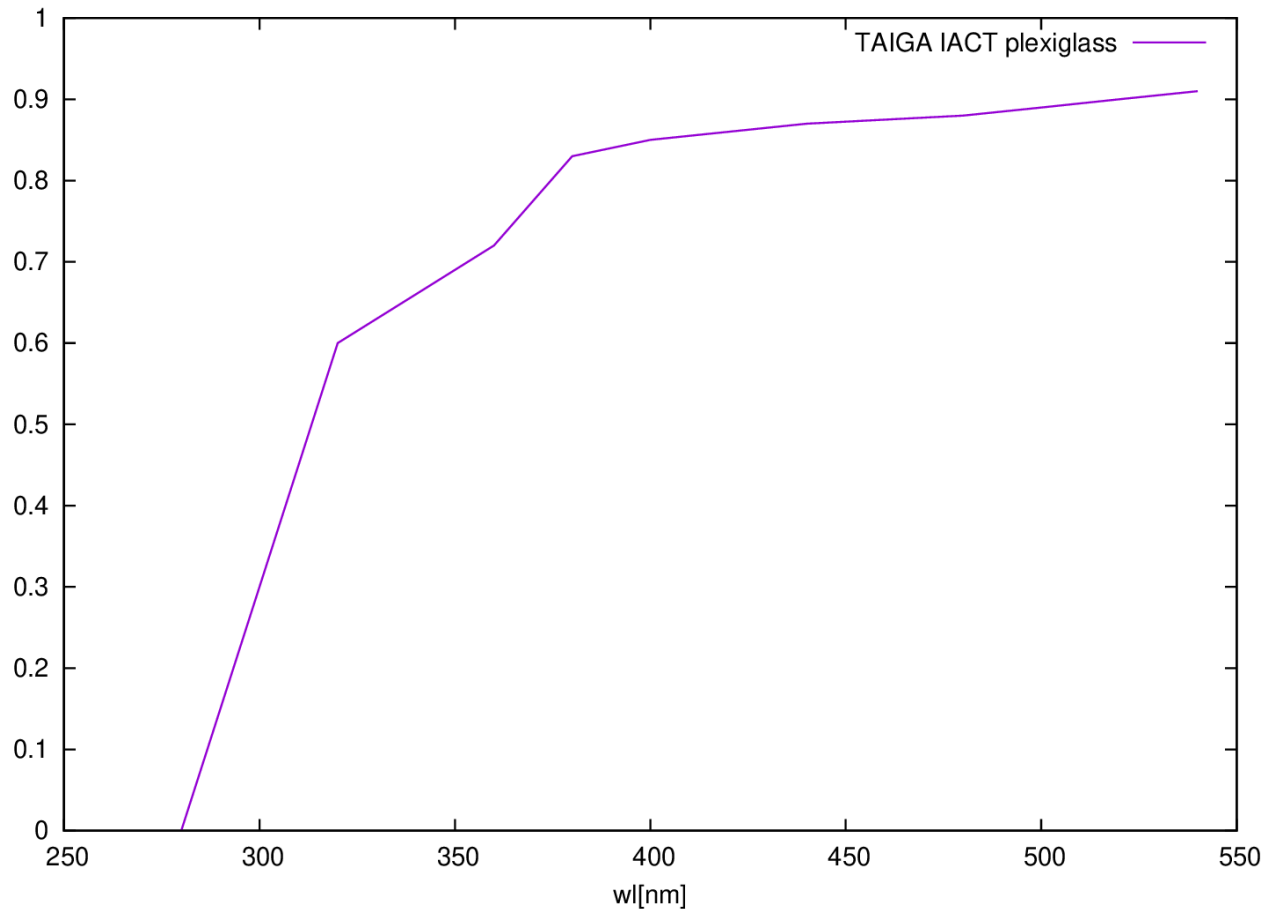
Light on IACT mirrors with shadow from the camera



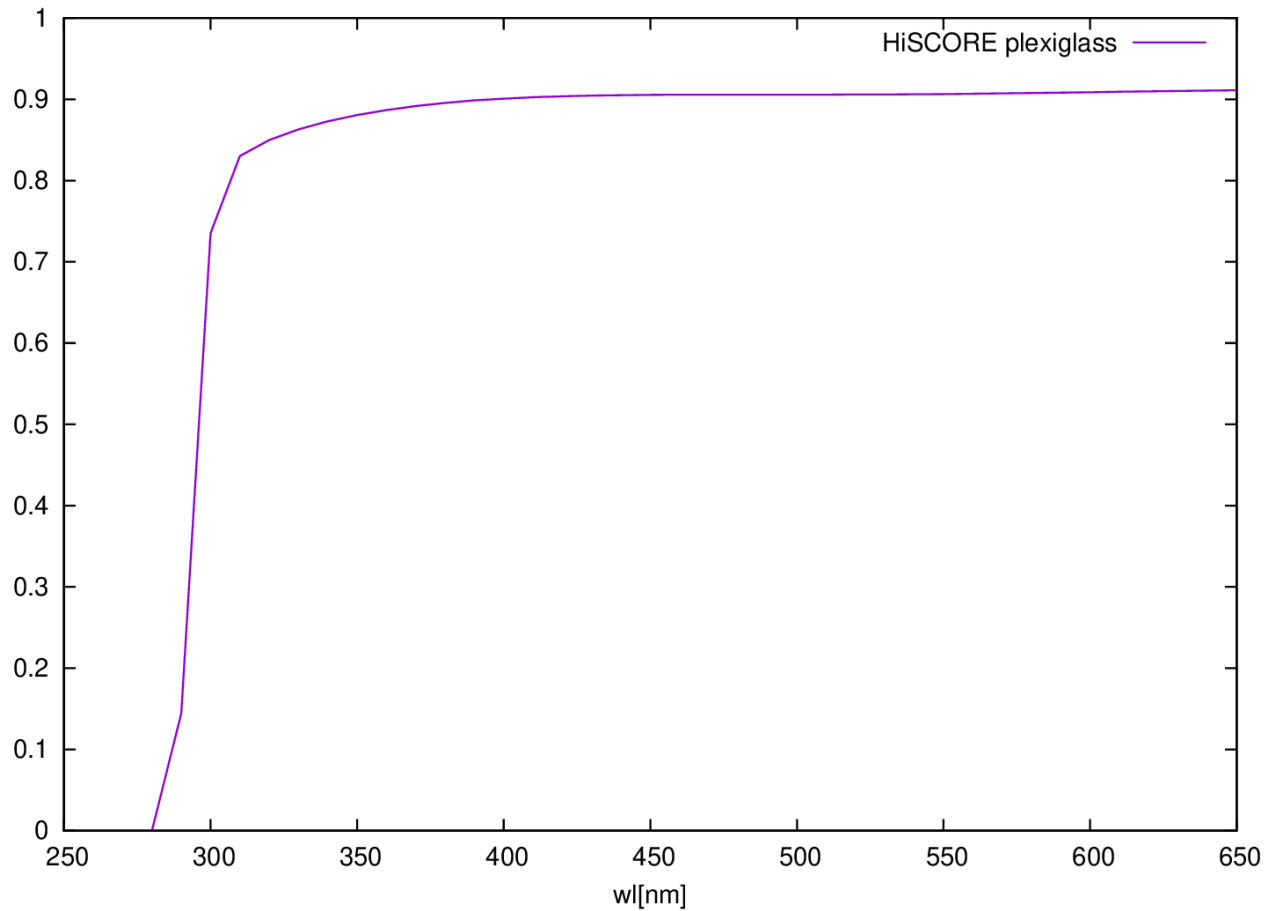
Multiple reflections and volume absorption in plexiglass window



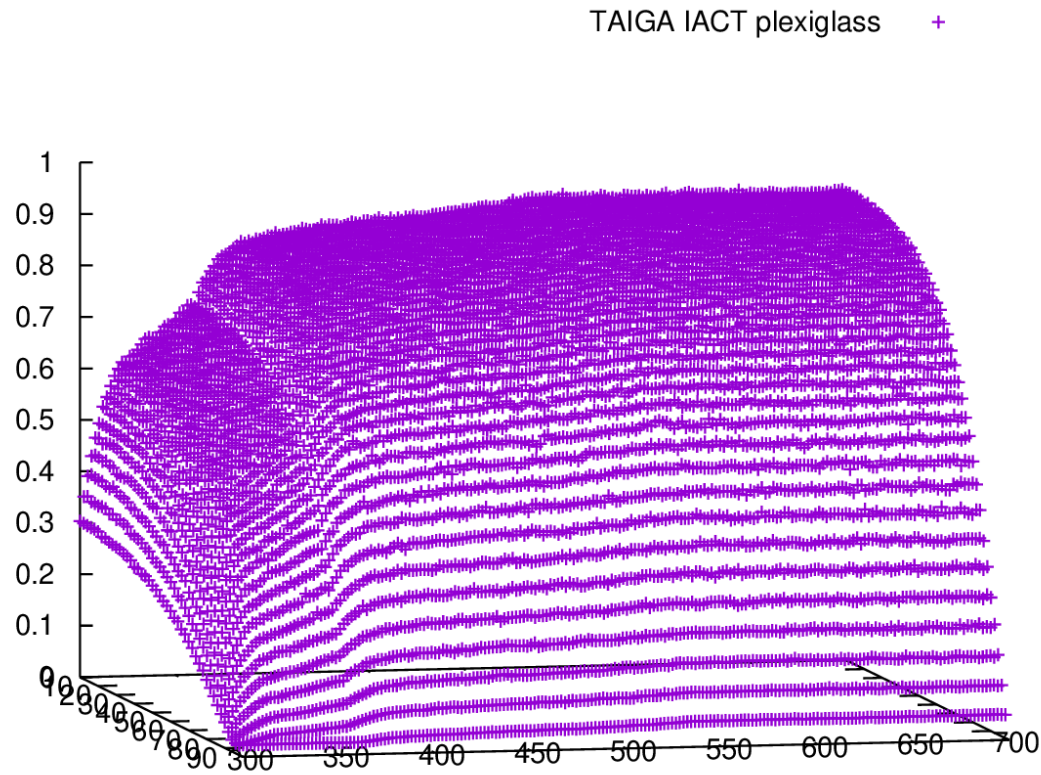
IACT plexiglass window wavelength transmissivity dependence



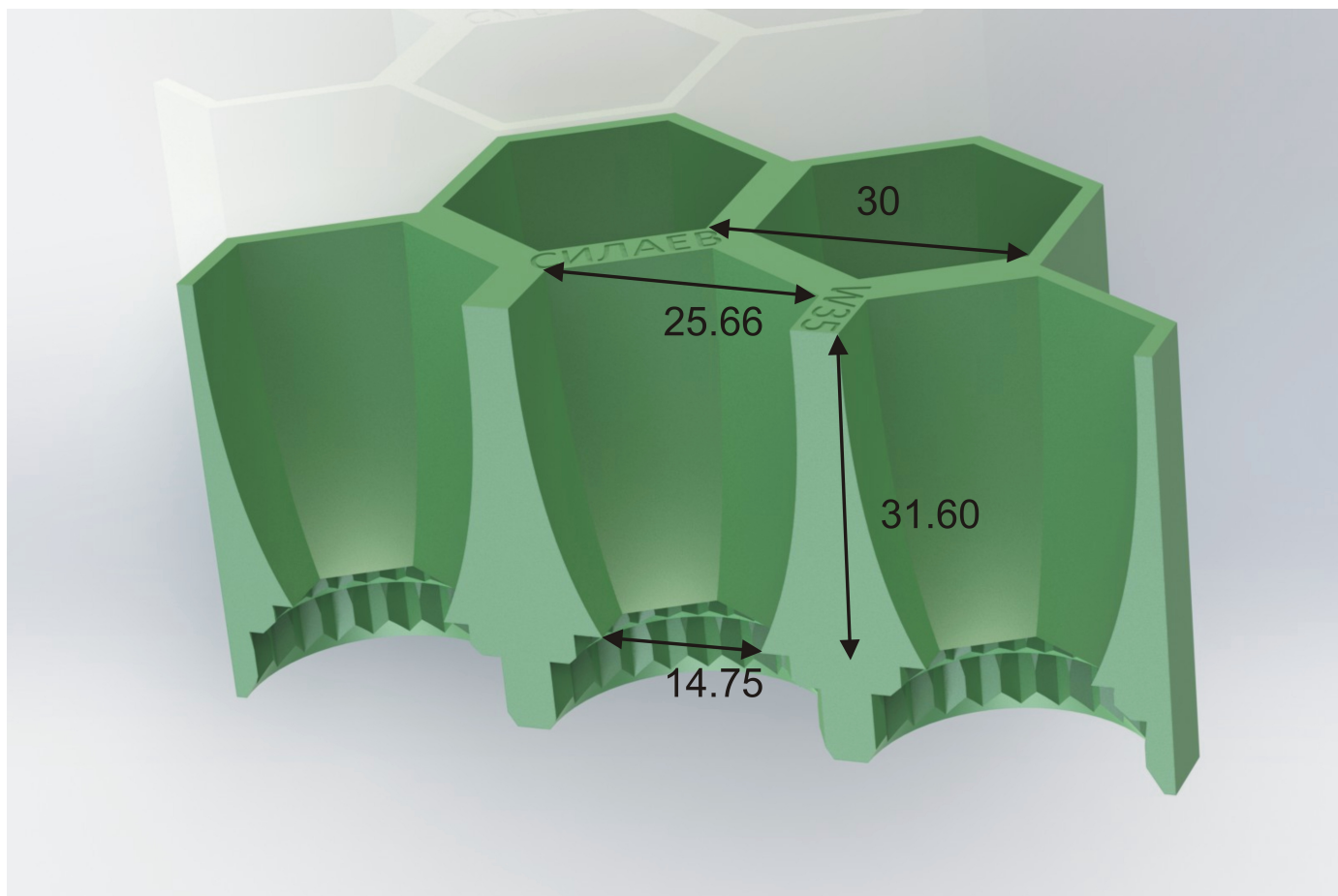
HiSCORE plexiglas window wavelength transmissivity dependence



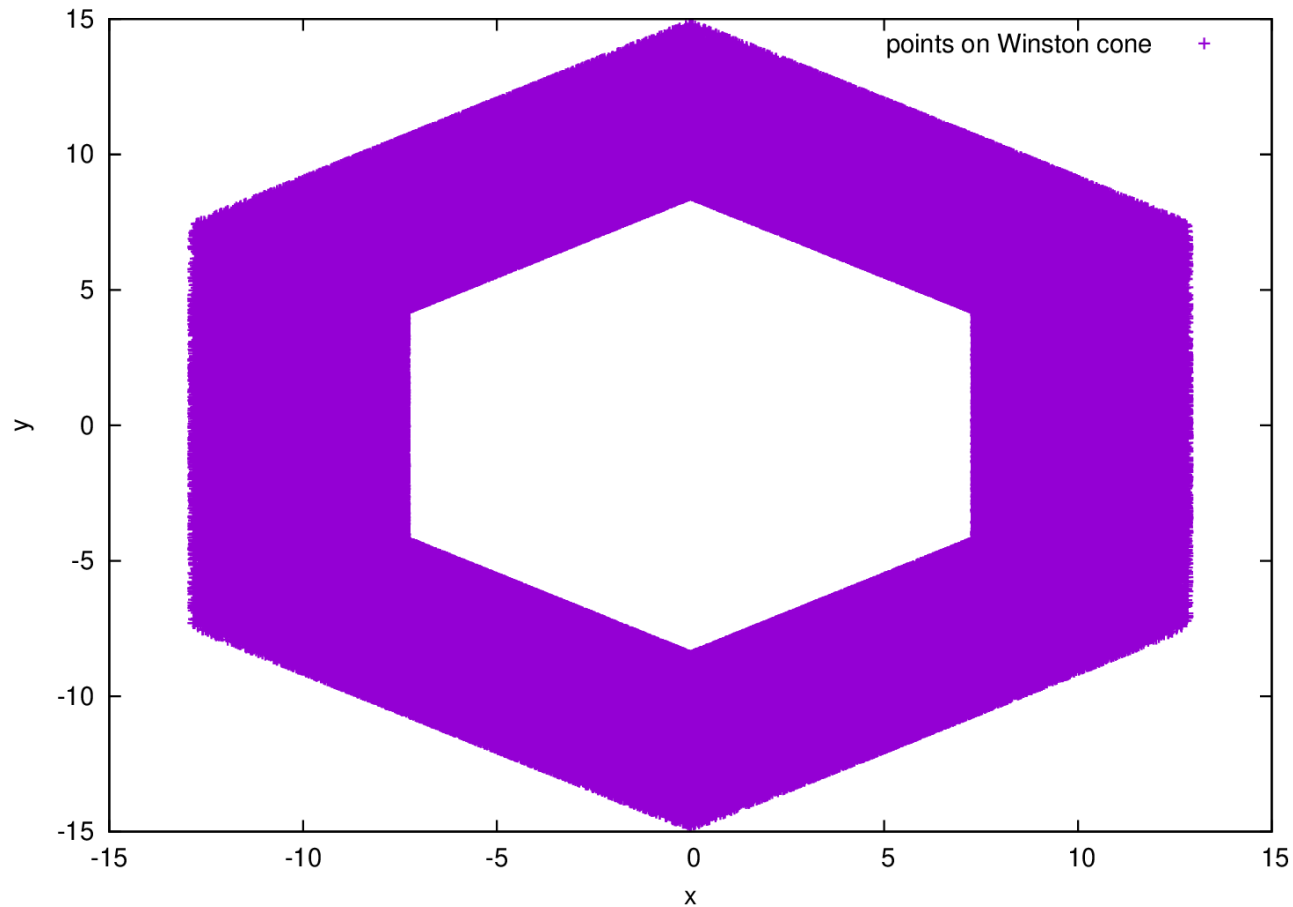
IACT plexiglas window transmissivity dependence on wavelength and incident angle



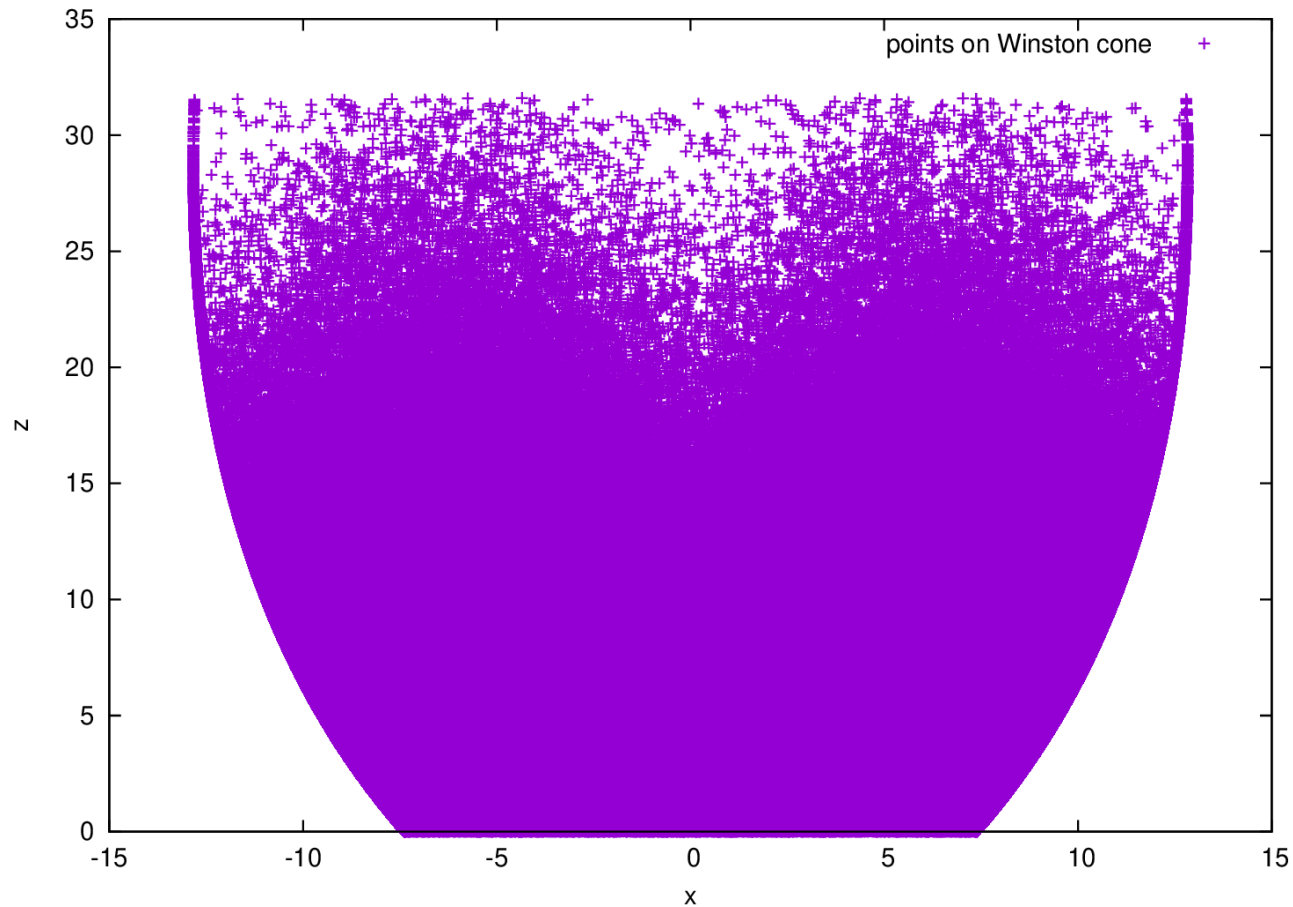
IACT Winson cones in front of PMTs



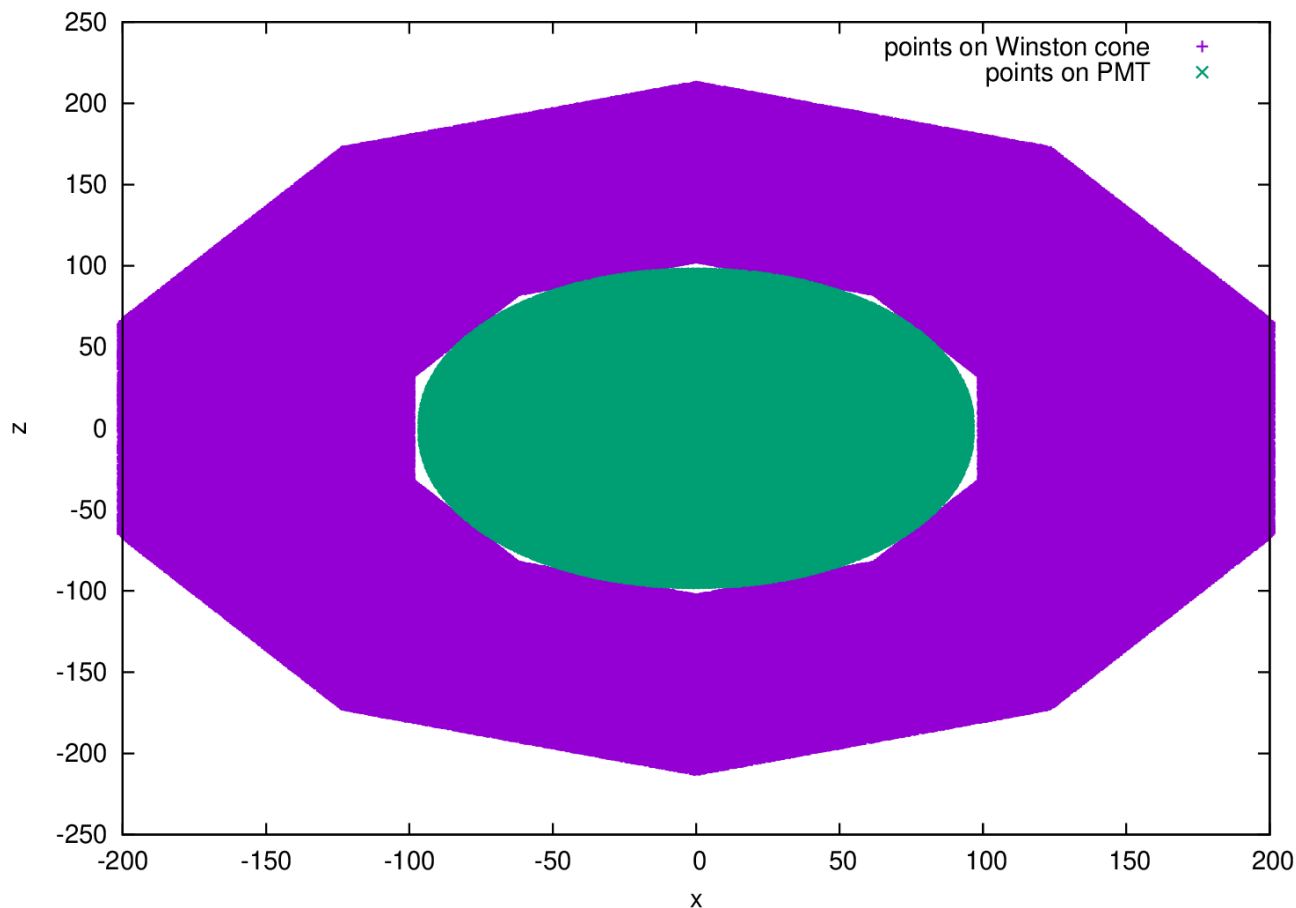
Points on simulated Winston cone of IACT



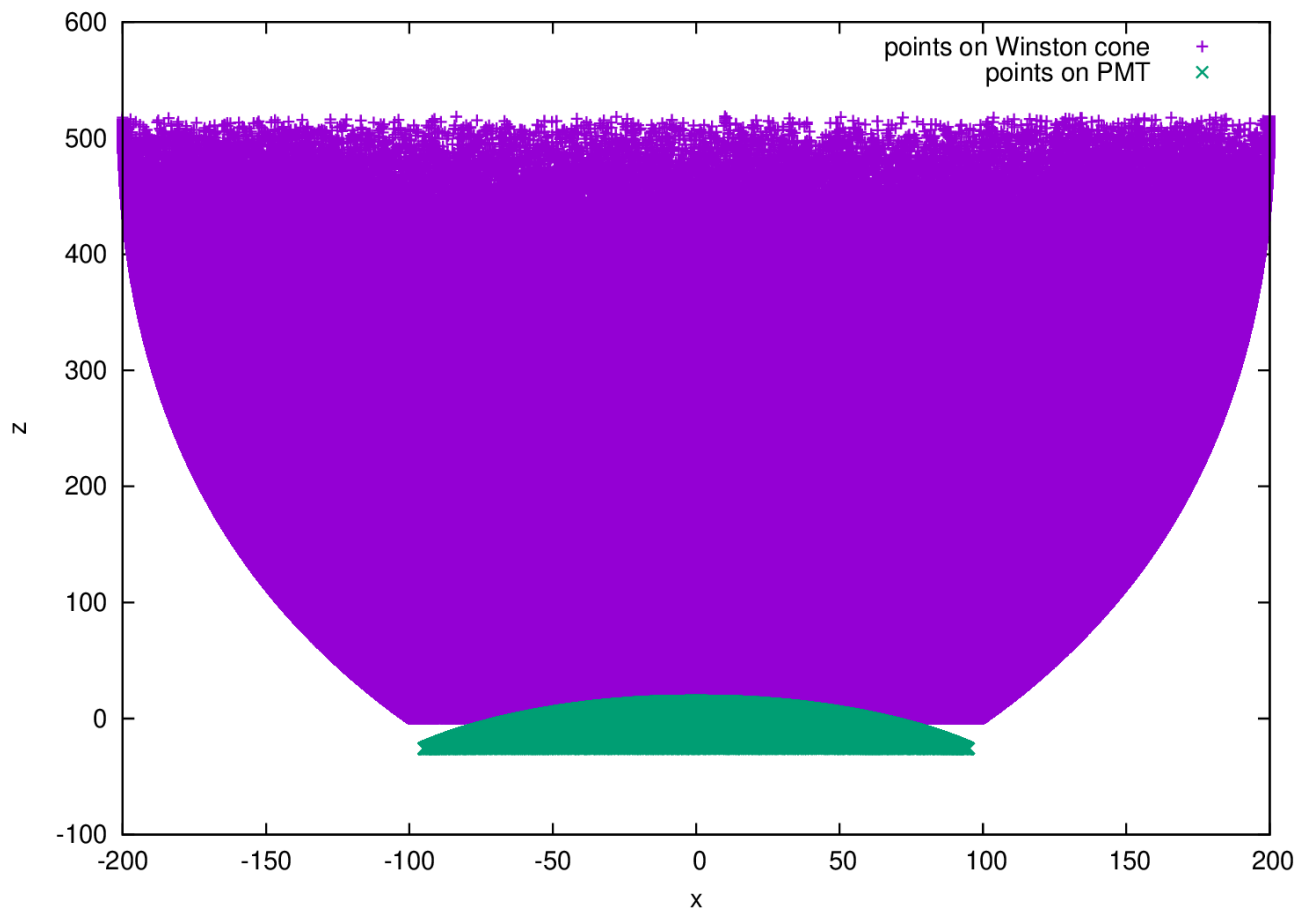
Points on simulated Winston cone of IACT



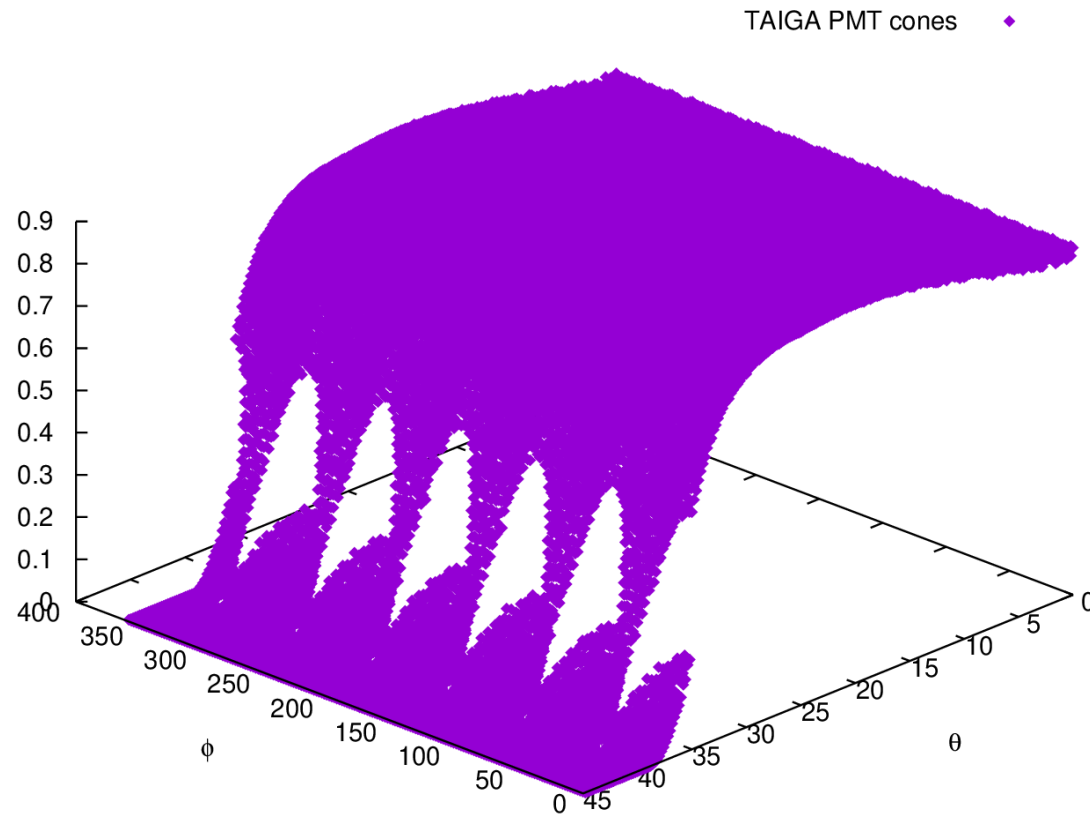
Points on simulated Winston cone of HiSCORE



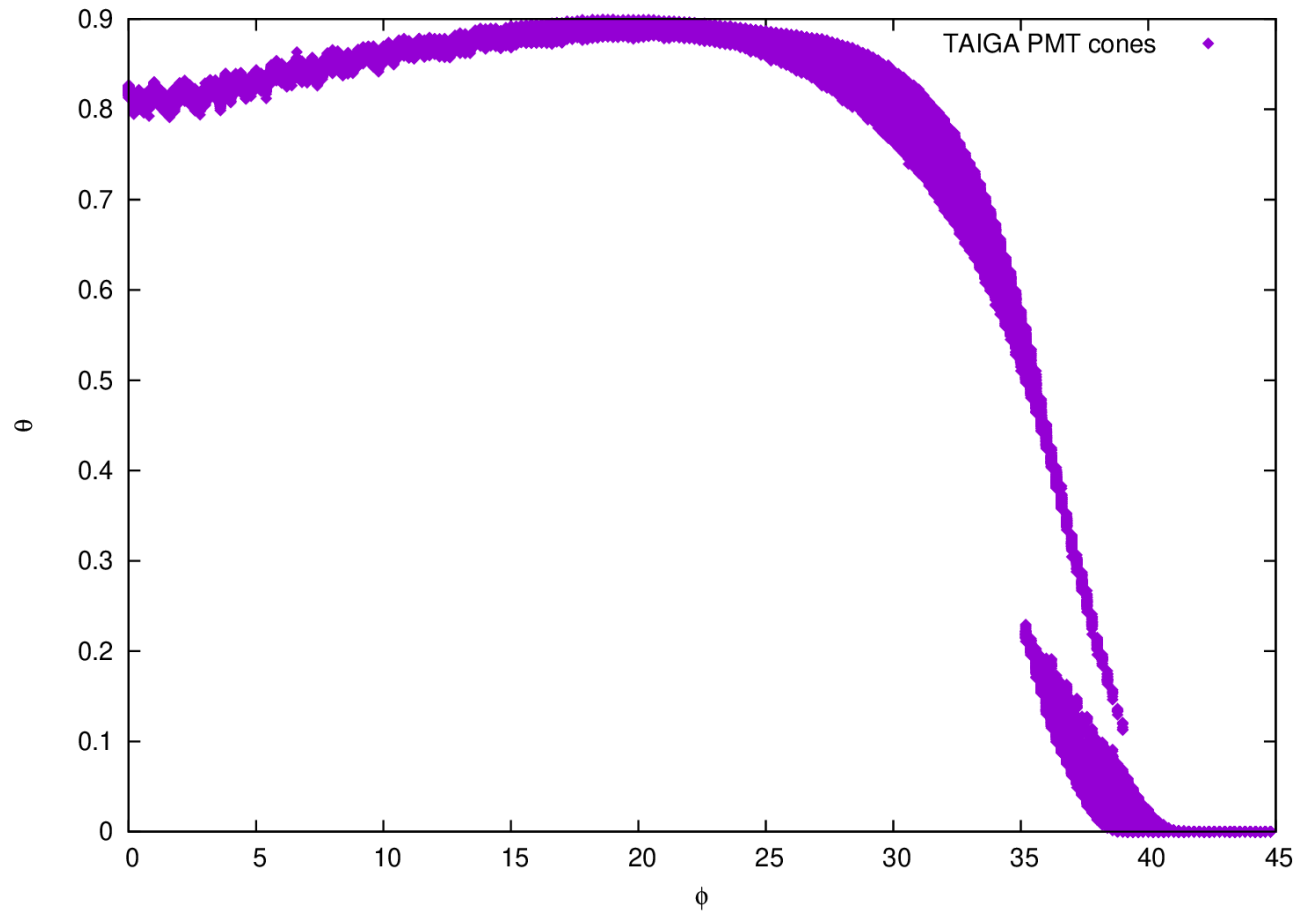
Points on simulated Winston cone of HiSCORE



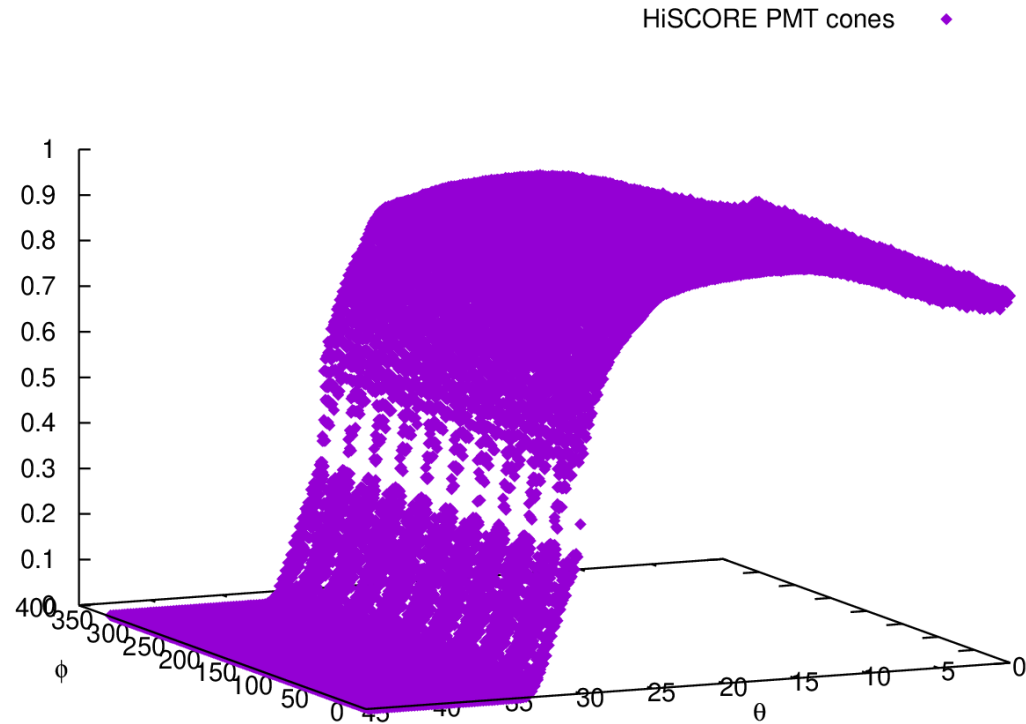
IACT cones transmissivity



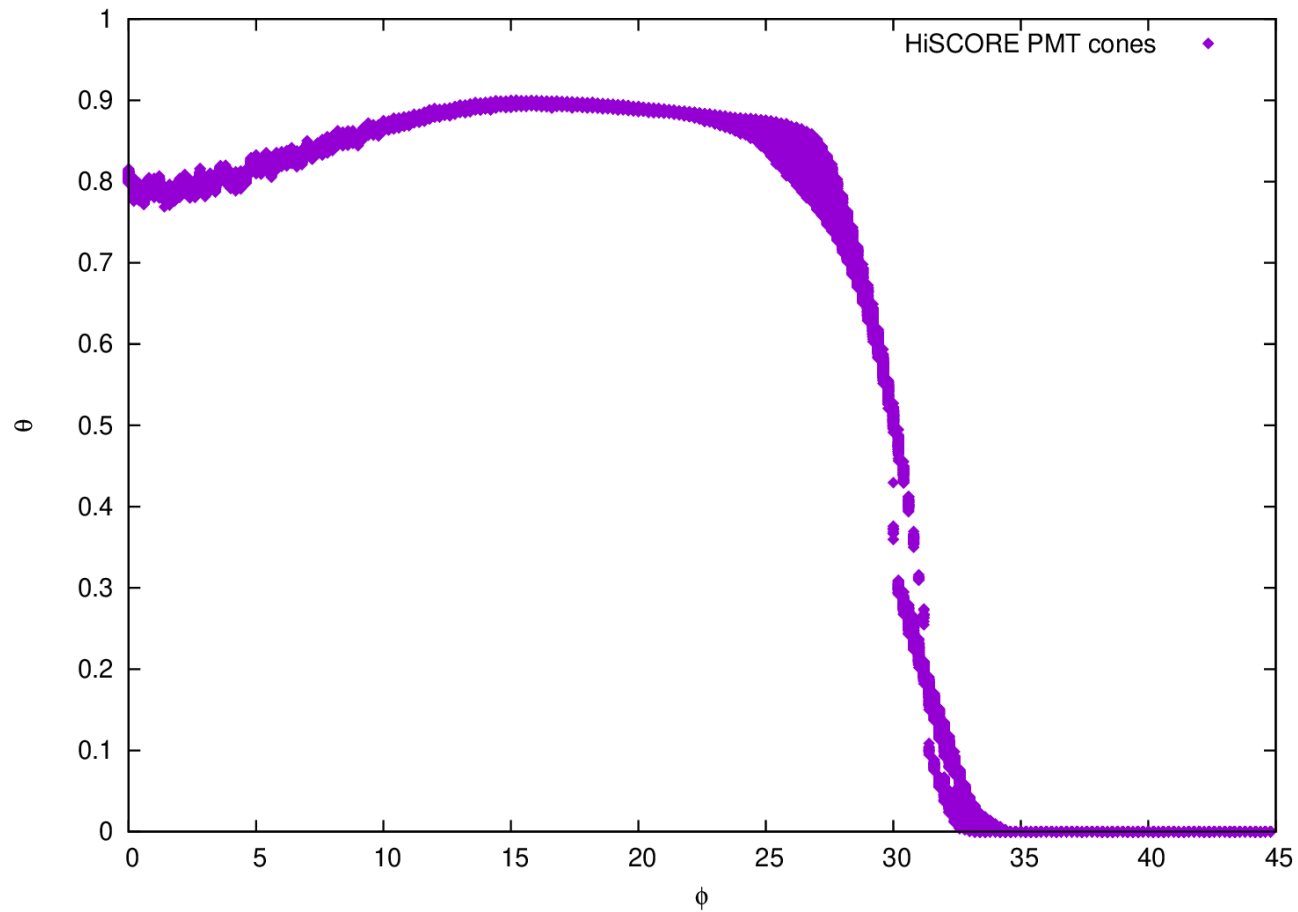
IACT cones transmissivity



HiSCORE cones transmissivity

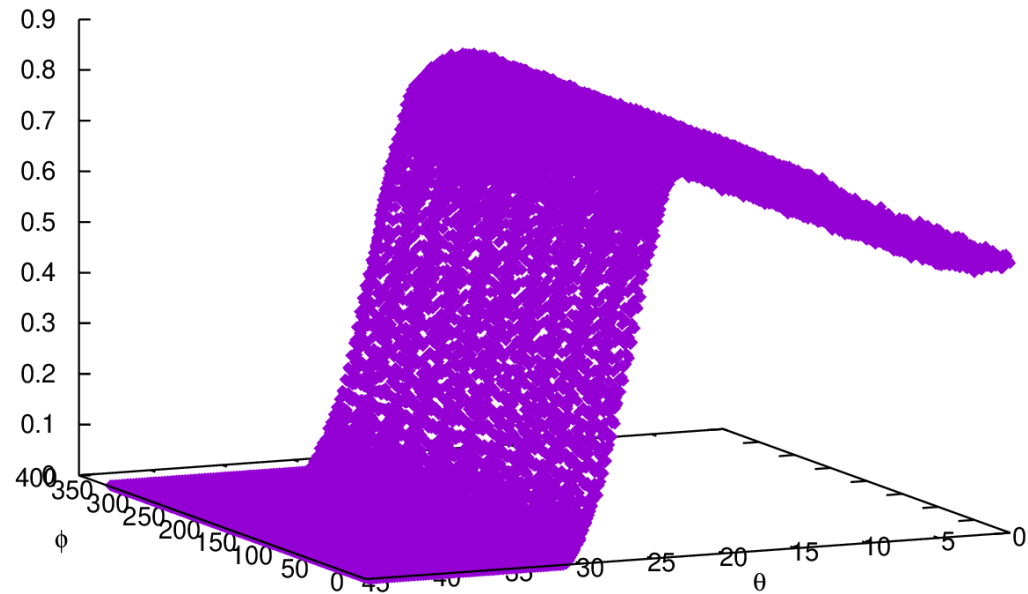


HiSCORE cones transmissivity

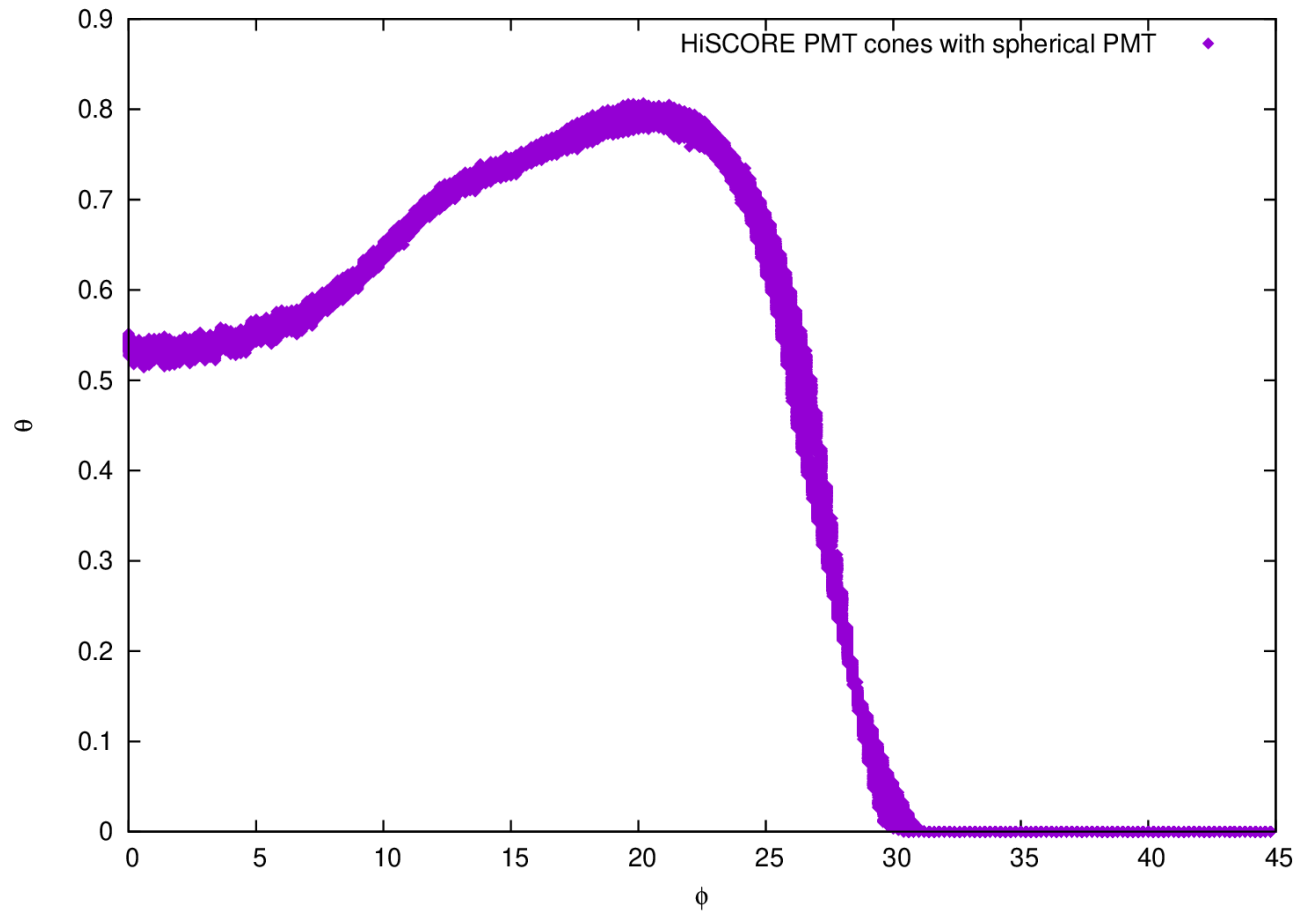


HiSCORE cones + spherical PMT transmissivity

HiSCORE PMT cones with spherical PMT ◆



HiSCORE cones + spherical PMT transmissivity



Conclusion

- A simulation code was developed for hybrid detector TAIGA.
- Reconstruction of Monte-Carlo data is necessary for comparison and interpretation of reconstruction of real data.
- For reconstruction employing this simulation listen to the next talk.

Thank you for your attention

Spare slides

Shower mapping onto the camera plane

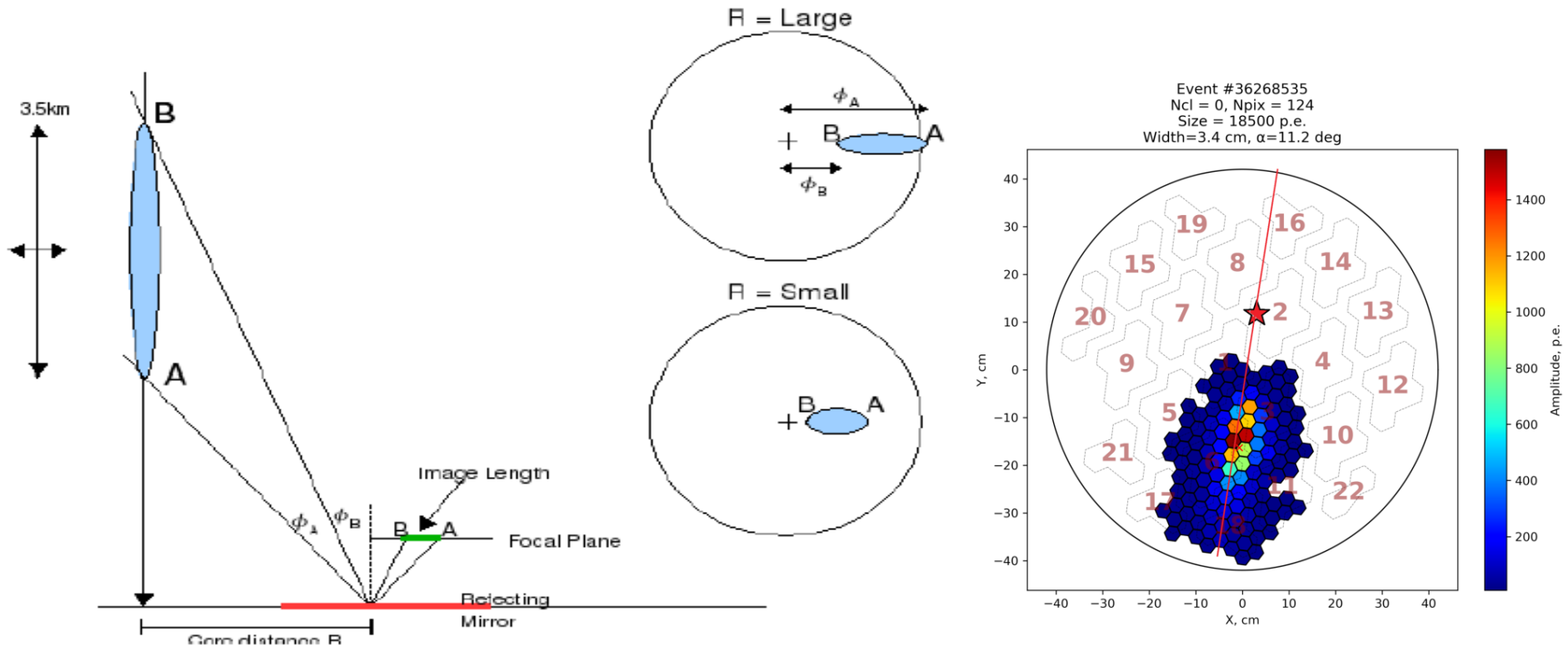
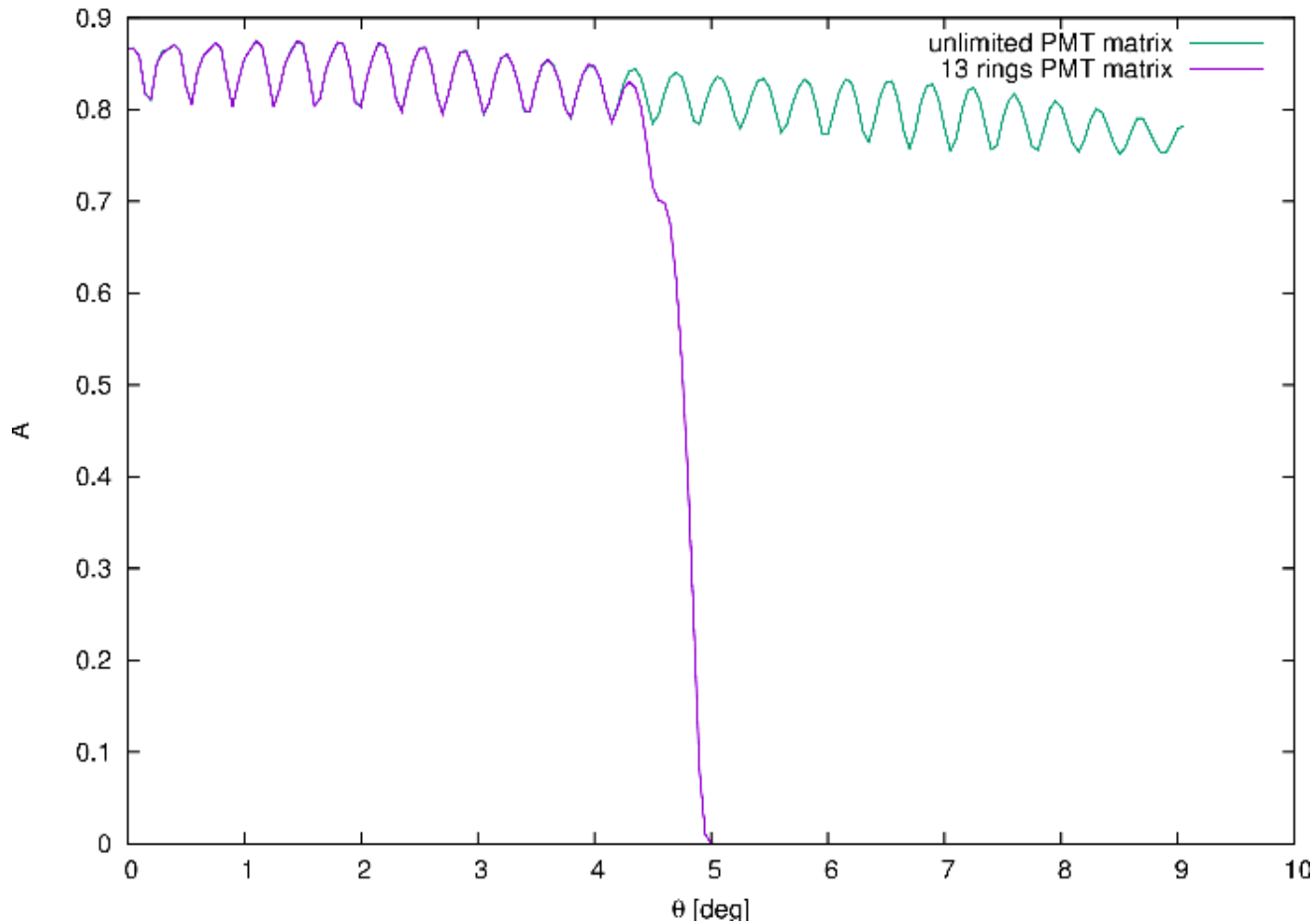


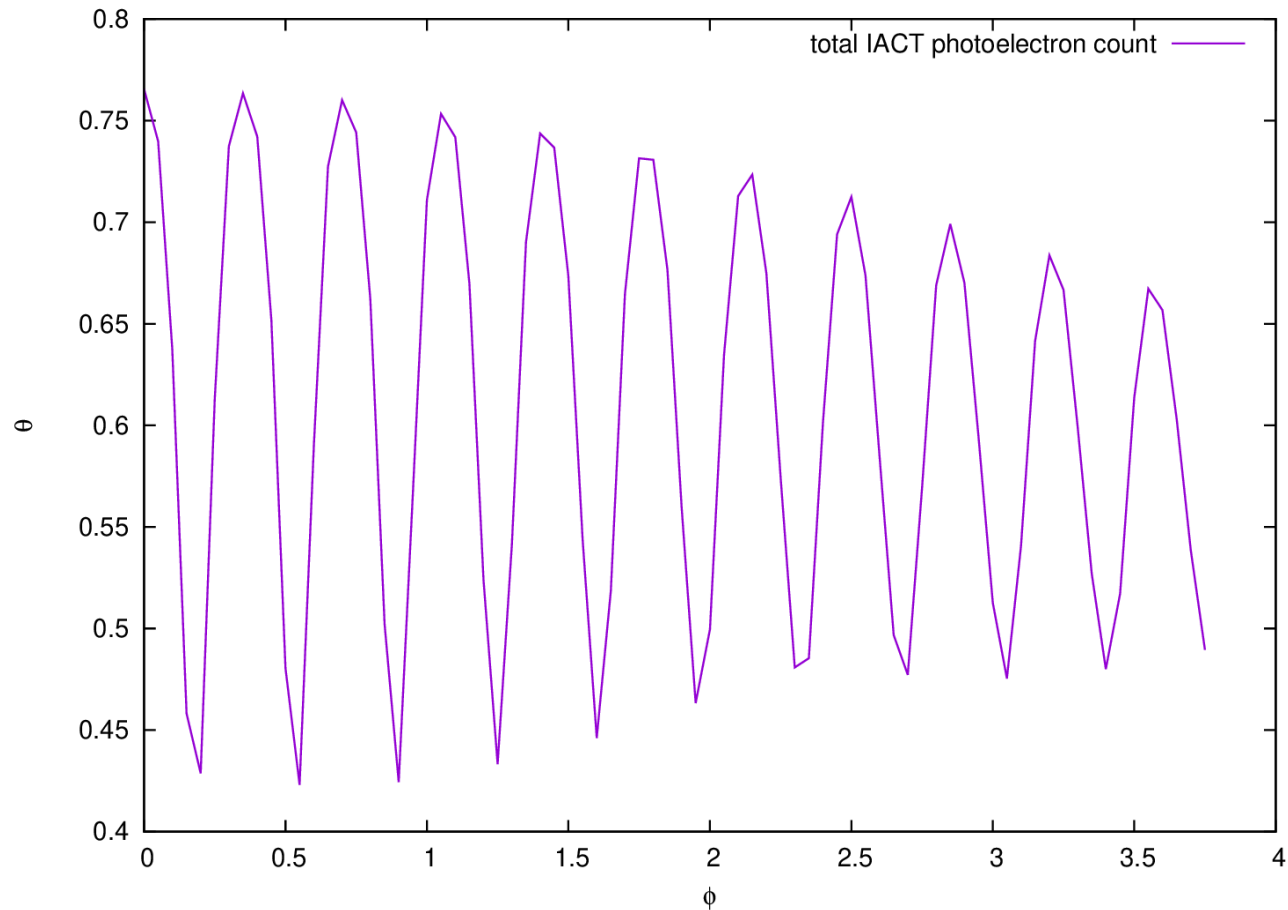
Figure 2.5: Shower mapping onto the camera plane via a reflecting mirror for an on-axis source. The angle, ϕ_B represents the angle between the light from the top of the shower, point B, and the optical axis of the reflective mirror and the angle, ϕ_A , represents the angle between the light from the bottom, point A, of the shower and the optical axis of the reflective mirror. A camera image is shown for two values of R

Total signal from all PMT dependence on angle to optical axis at fixed azimuthal angle 0



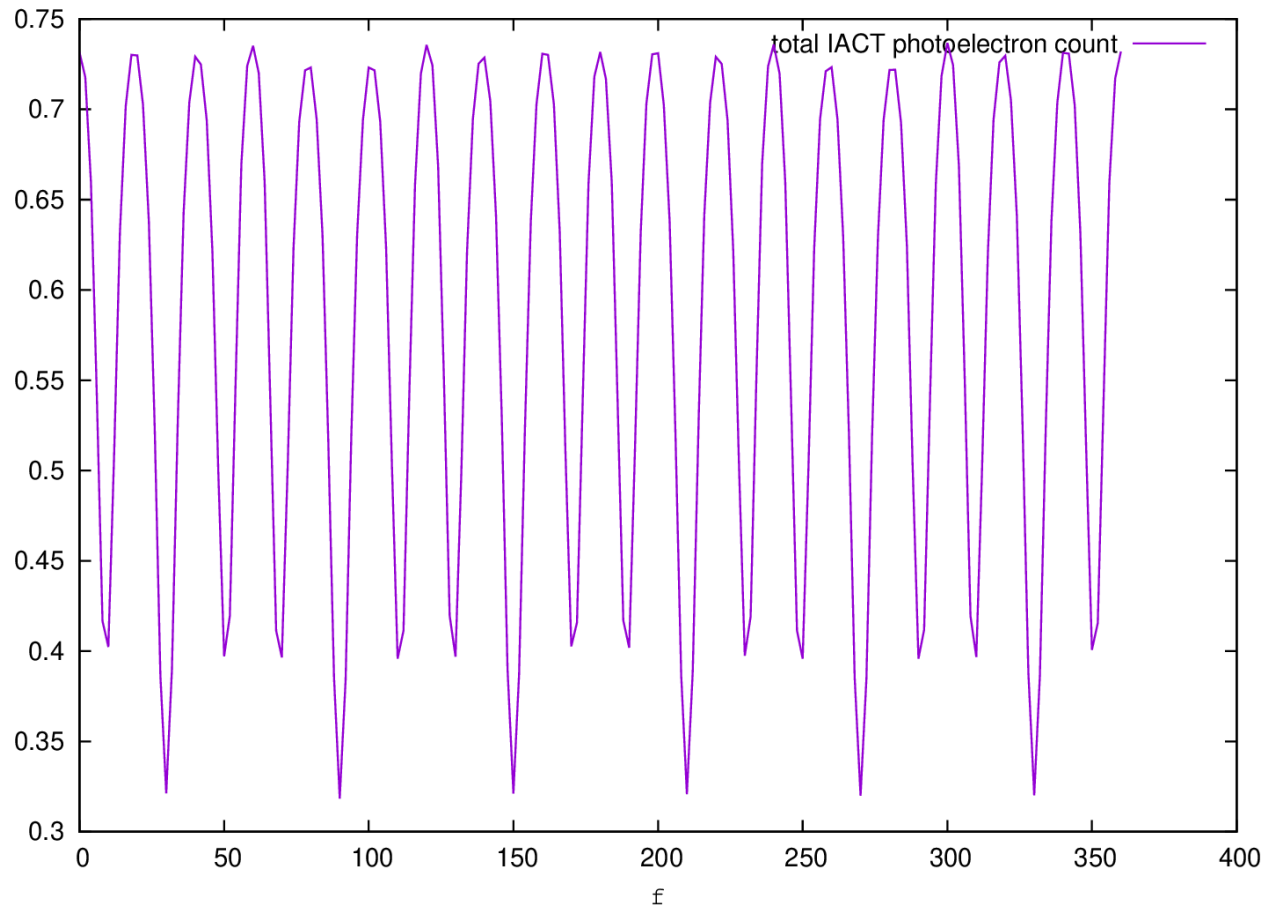
With infinitely thin inter-cone borders

Total signal from all PMT dependence on angle to optical axis at fixed azimuthal angle 0



With Winston cones as in production

Total signal from all PMT dependence on azimuthal angle at $\theta = 1^\circ$



With fully ideal optics – small focal point