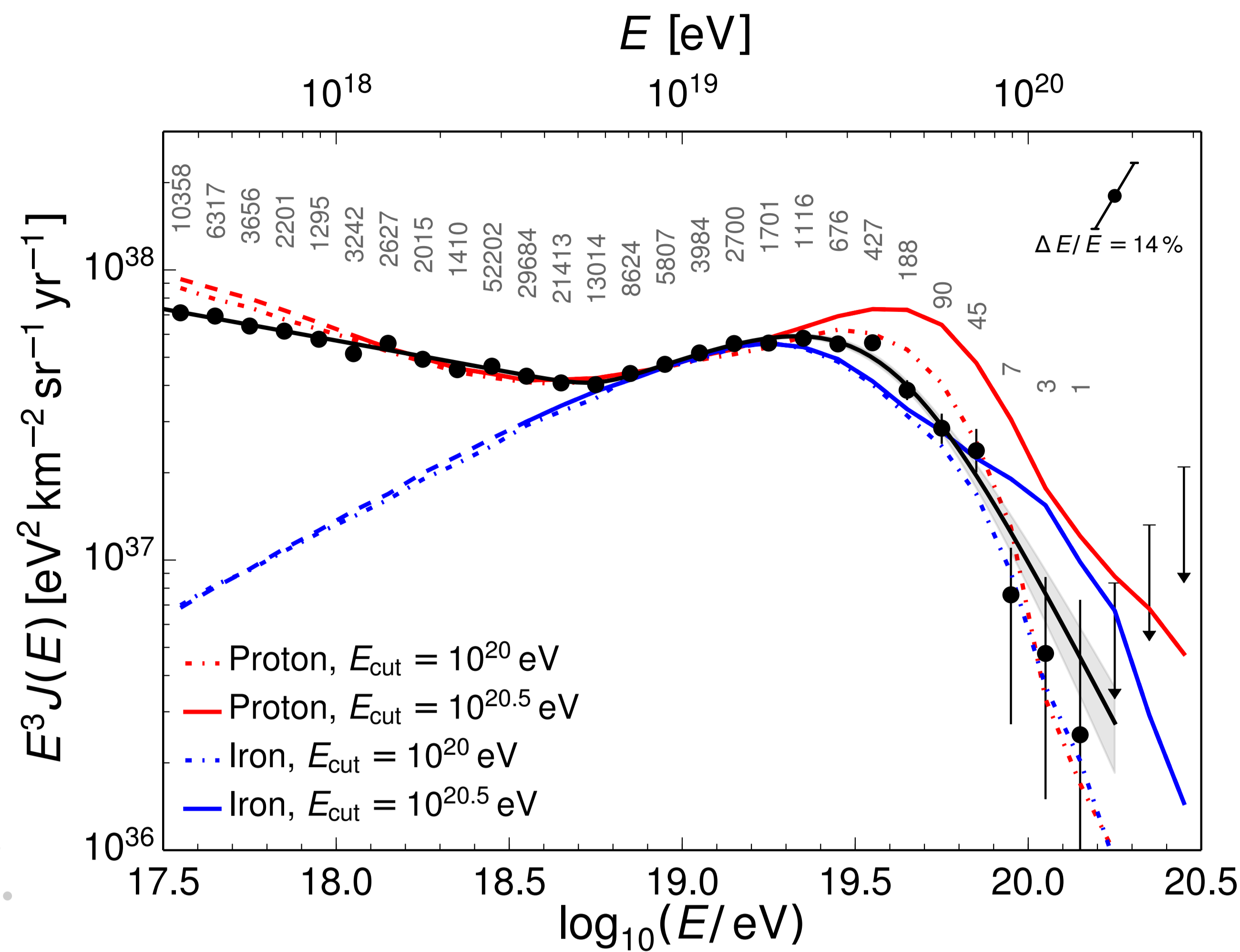
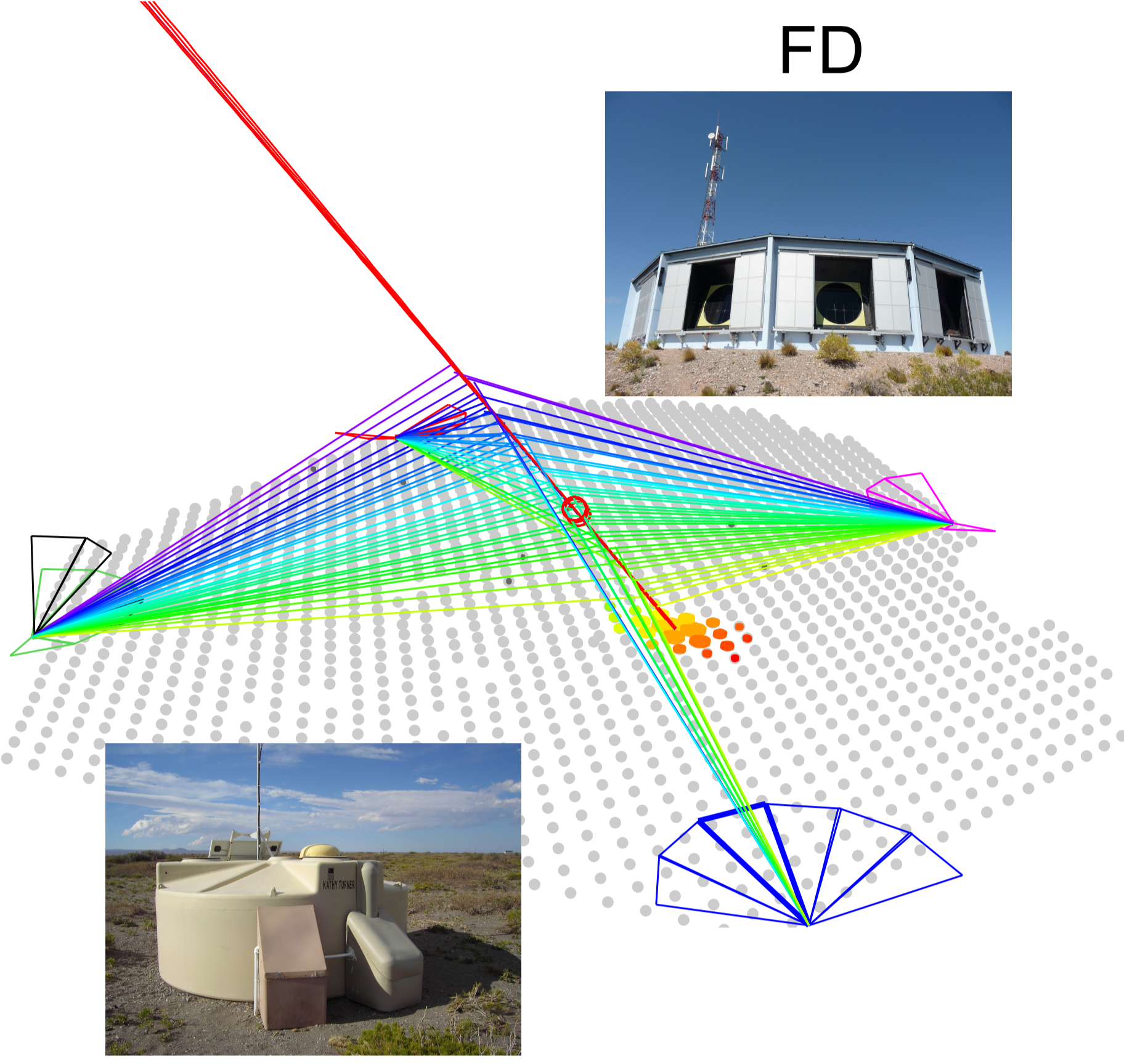


Energy Spectrum of Ultra-High Energy Cosmic Rays

Alexander Schulz and Lenka Tomankova (KIT)

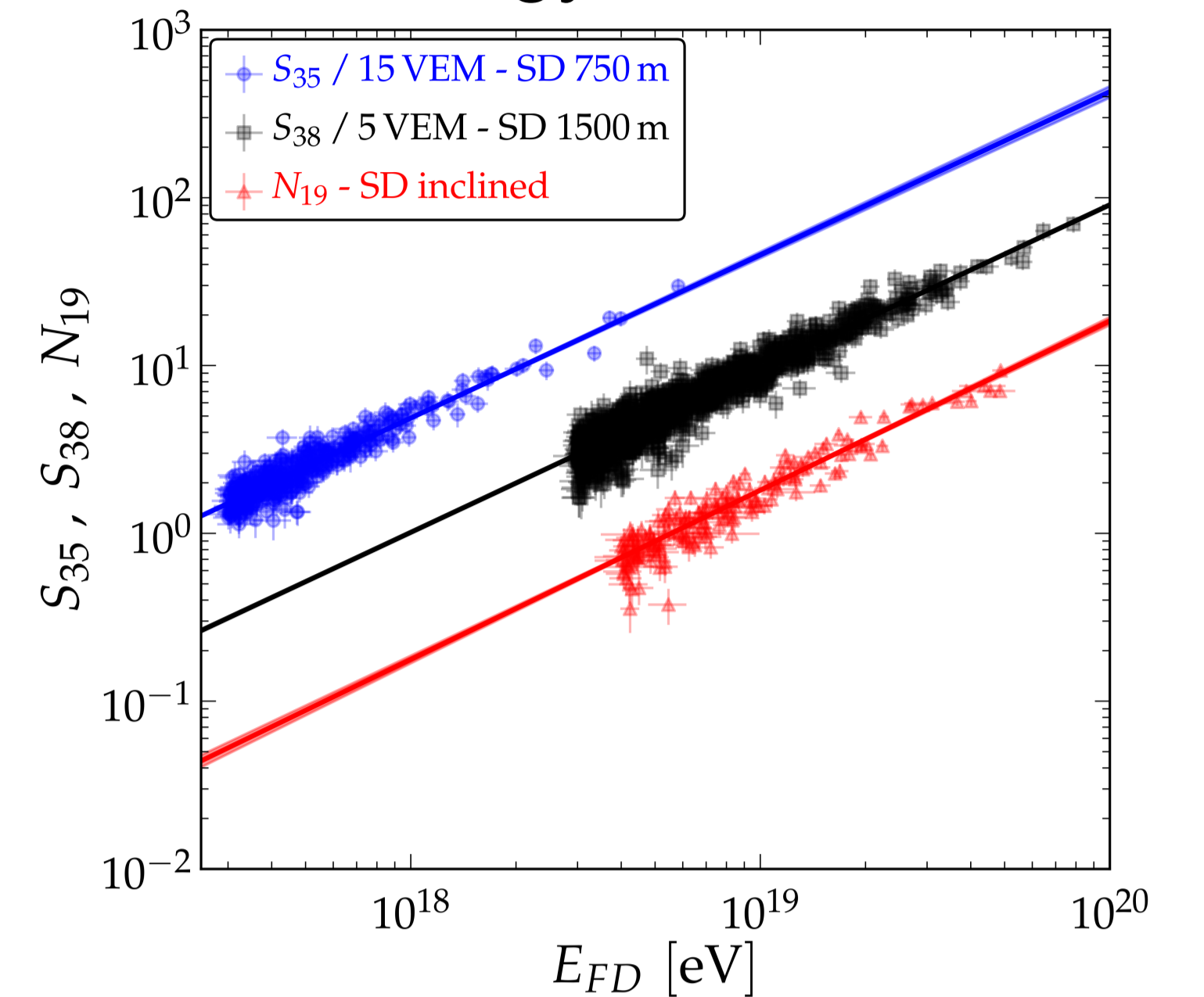
Hybrid measurement of an air shower

Primary energy 76 EeV

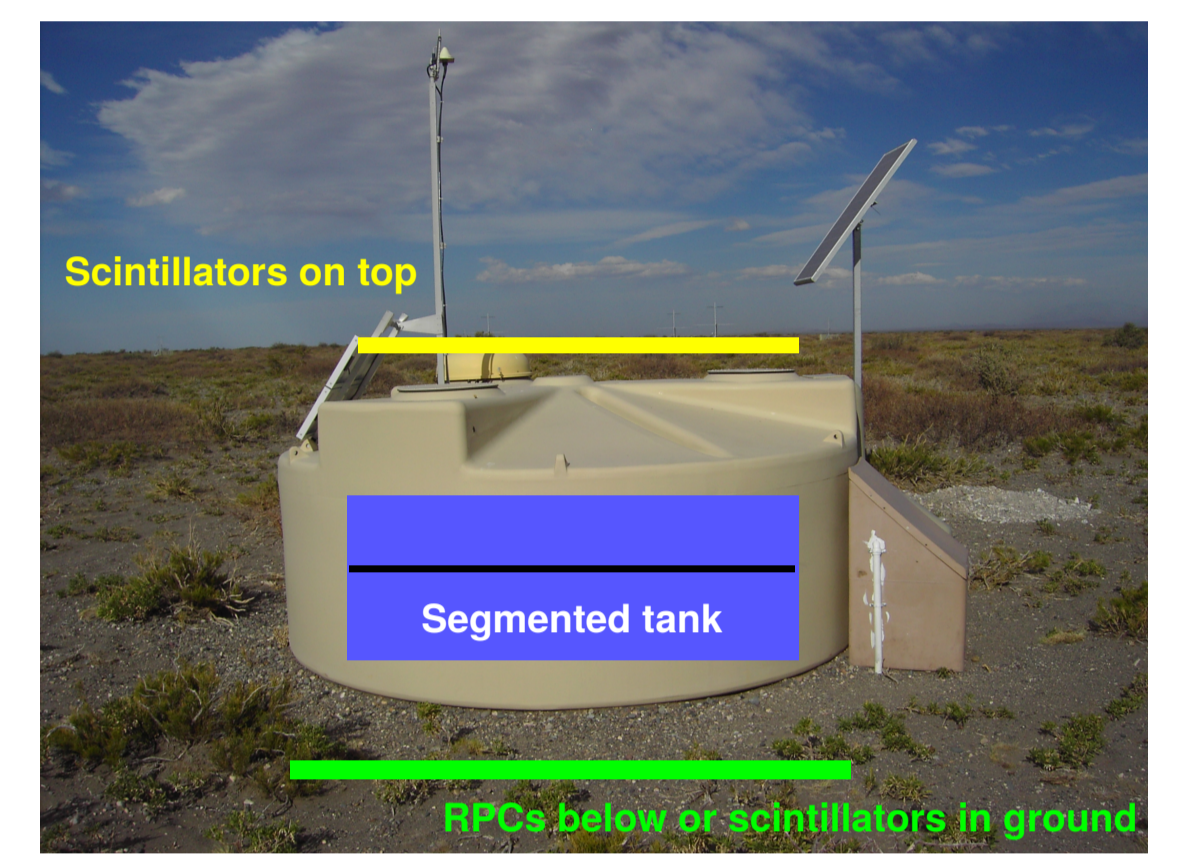


- Energy spectrum combines an FD and three SD (1500 m, 750 m, 1500 m inclined) measurements
- Total uncertainty in the energy scale of 14 %
 - Absolute FD calibration 9 %
 - Folding with the point spread function 5 %

Energy calibration



Upgrade proposals



- Event-by-event composition measurements
- Anisotropy studies with enlarged statistics

Fluorescence Detector Systematics

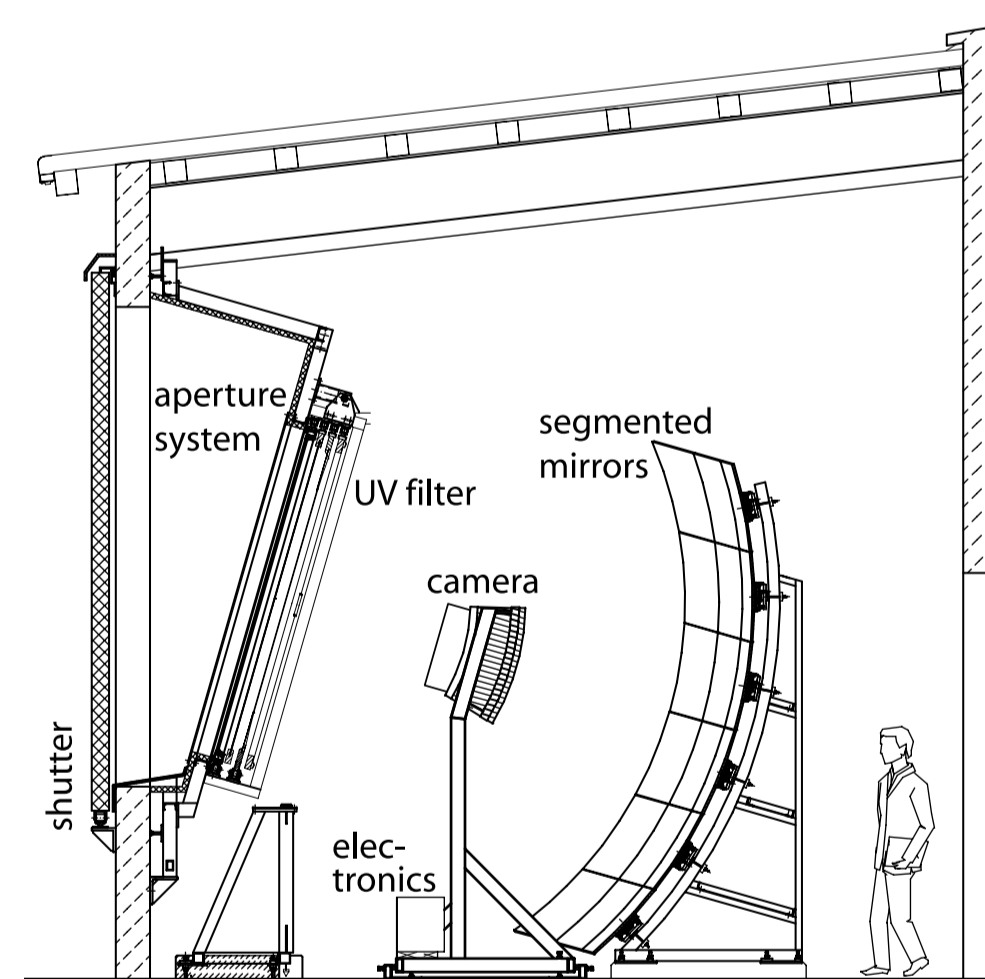
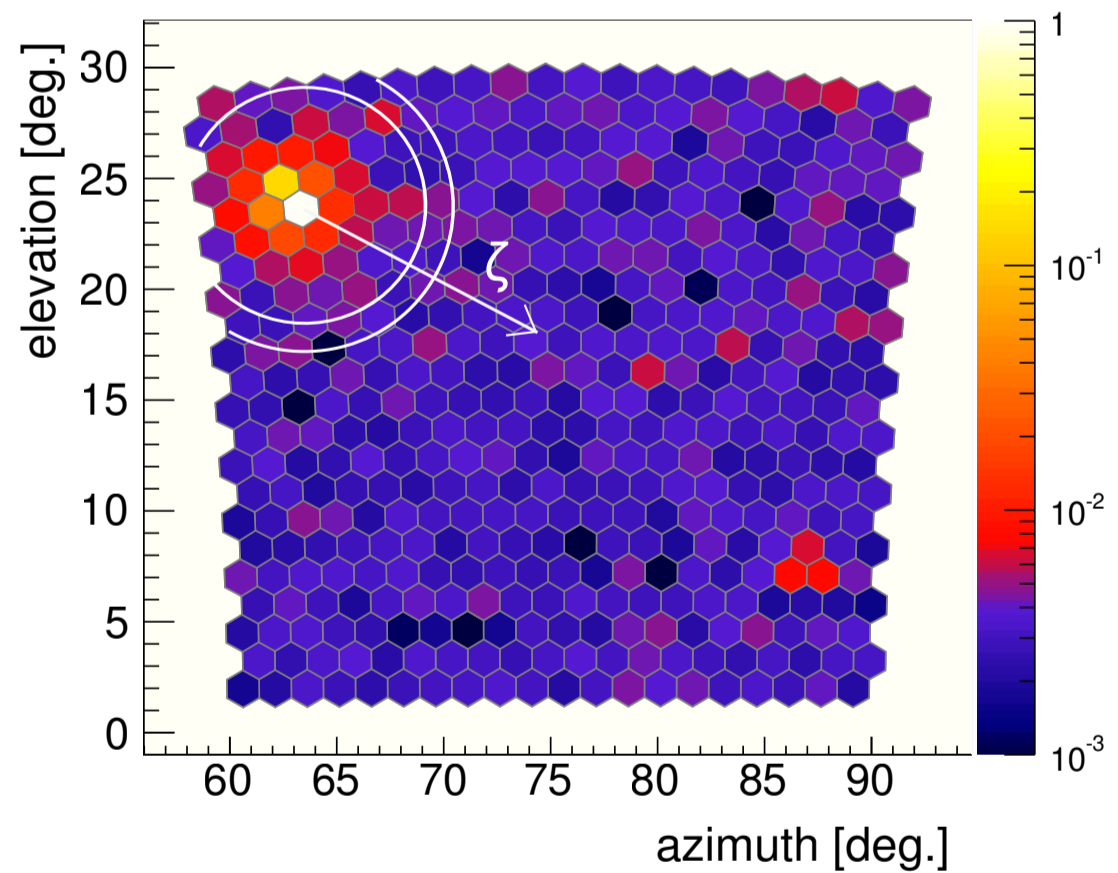
Octocopter



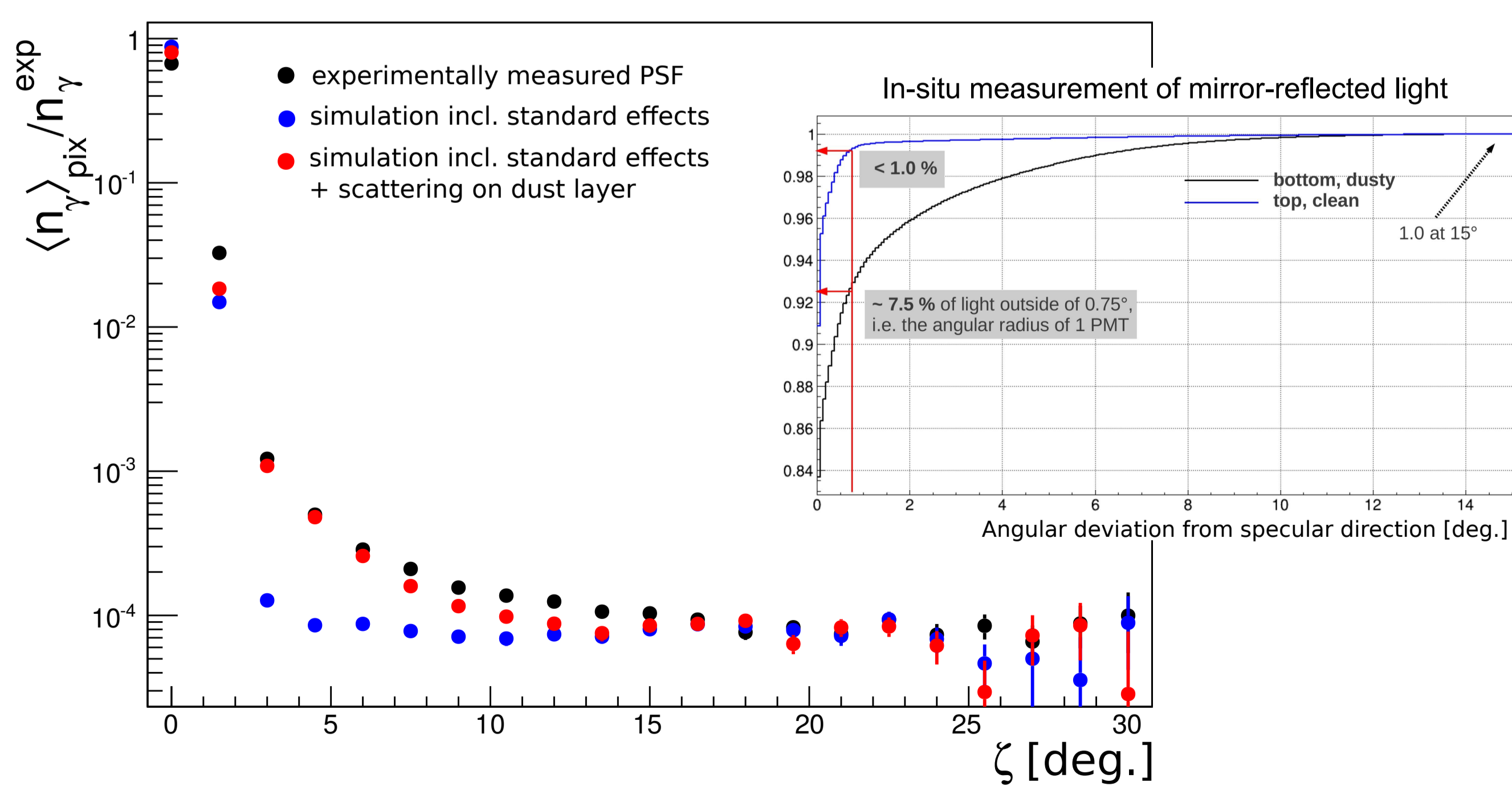
Point-like isotropic light source hovers in the FOV of a single pixel

- Experimental measurement of PSF
- Absolute calibration of single pixels
- Cross-calibration of the Auger and Telescope Array FDs (Time estimate: before 2016)

Image of octocopter pulse on the FD camera



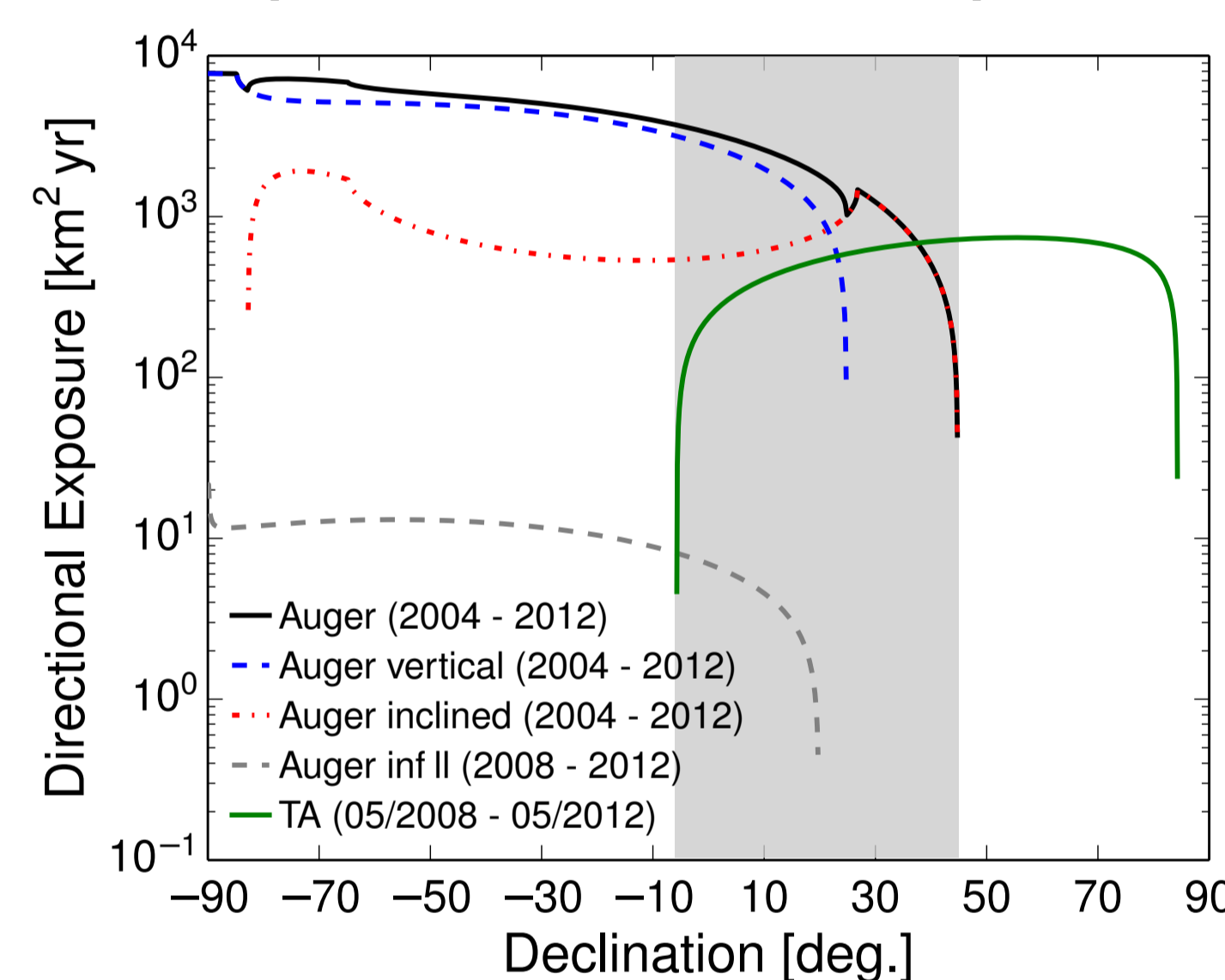
Point spread function (PSF)



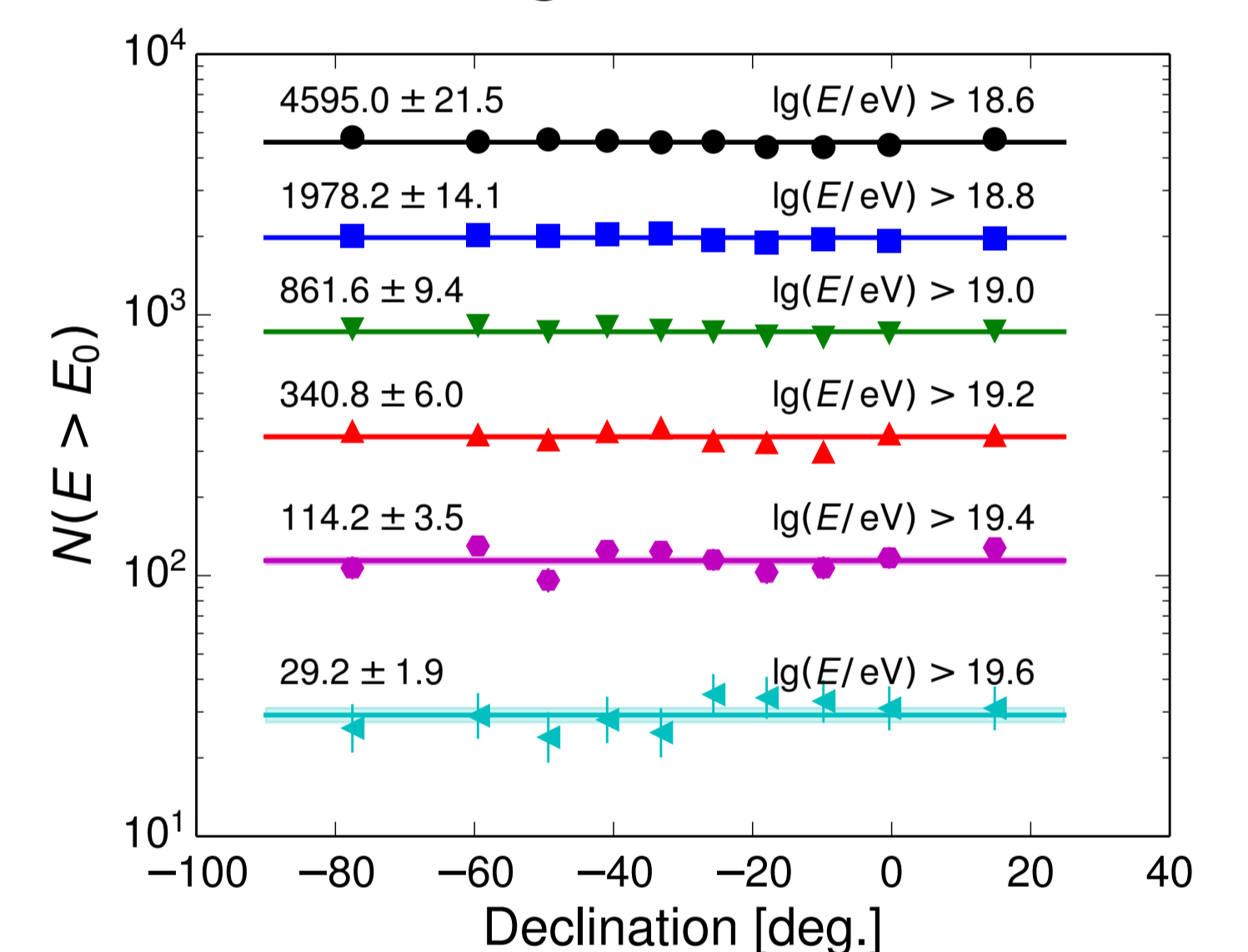
- About 18 % of light falls outside of 1.3°
- Standard effects (PMT + multiple reflections, etc.) account for ~12 %
- Scattering on dust layer important

Declination Dependence of the Flux of Cosmic Rays

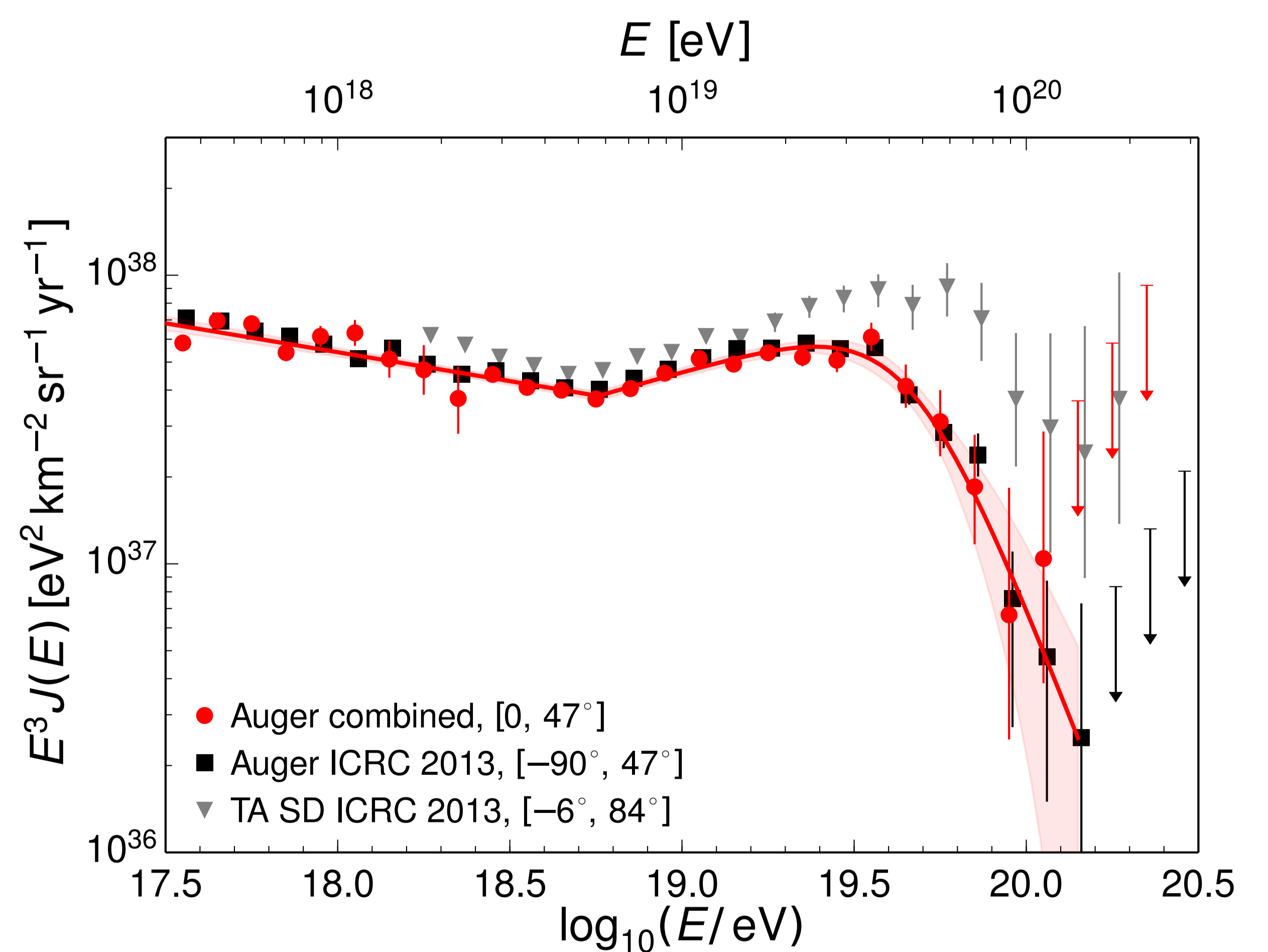
Experimental SD exposure



Looking at intensities



- Exposure of 1500 m array for zenith angles 0-60° is 31600 km² yr sr (8 years)
- Overlap with Telescope Array in declination interval from -6 to 47 degrees



- Comparison of the Auger energy spectrum in declination range from 0 to 47 degrees with TA energy spectrum
- No significant dependence of the flux on declination within Auger data
- Spectrum from TA for the same declination range would be very valuable