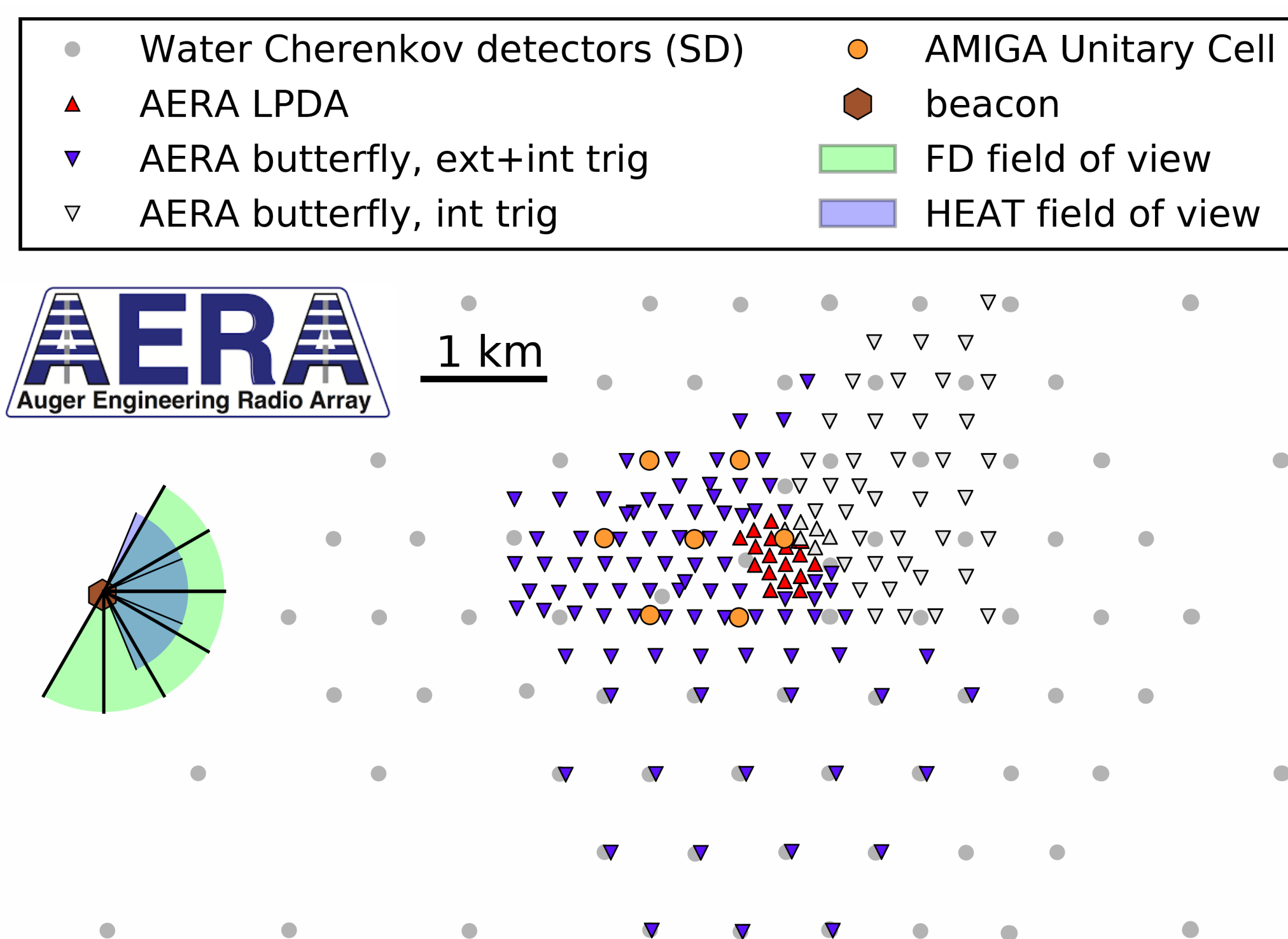


Radio detection of cosmic rays with the Auger Engineering Radio Array

Tim Huege¹, for the Pierre Auger Collaboration²

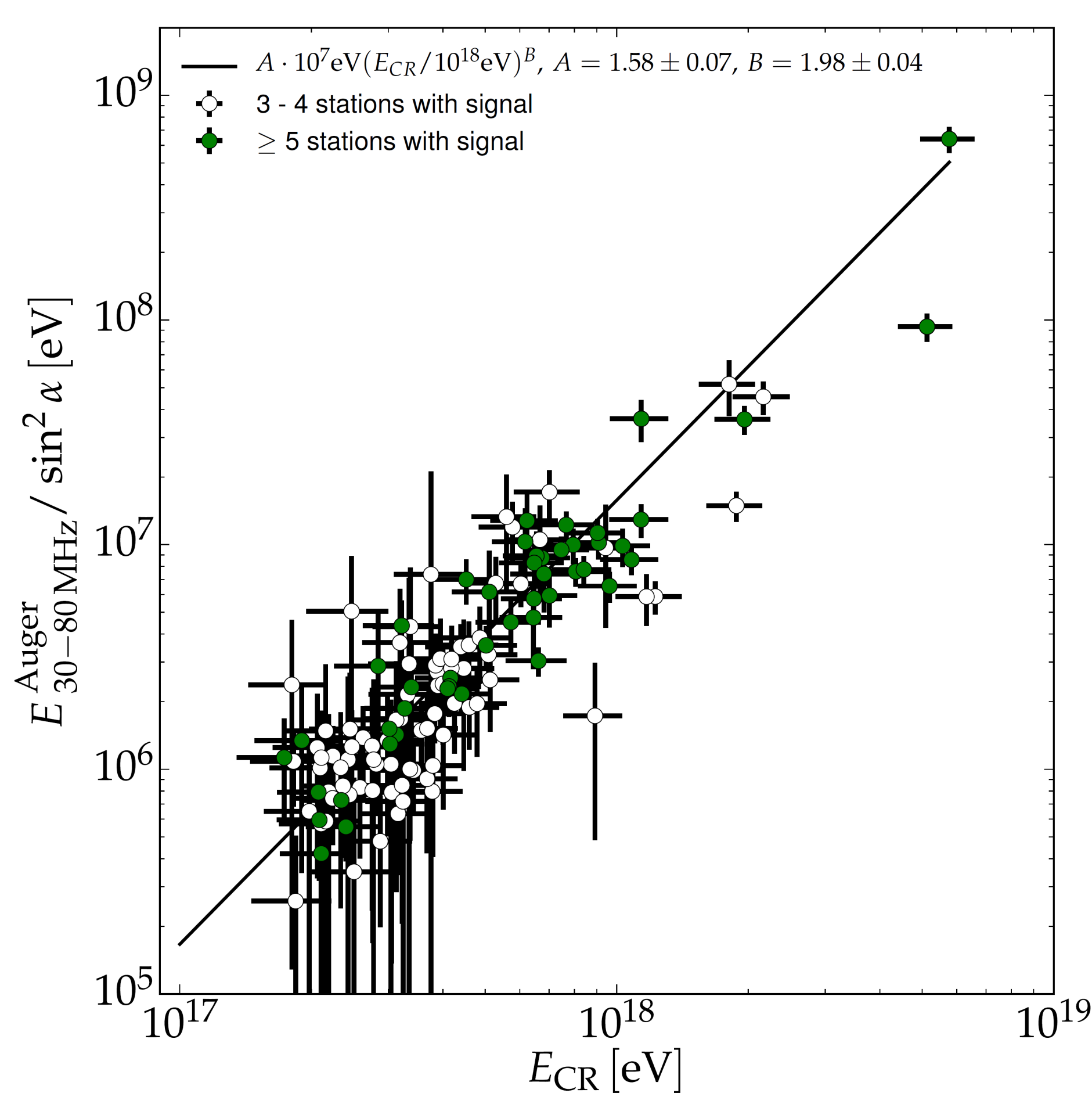
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The Auger Engineering Radio Array



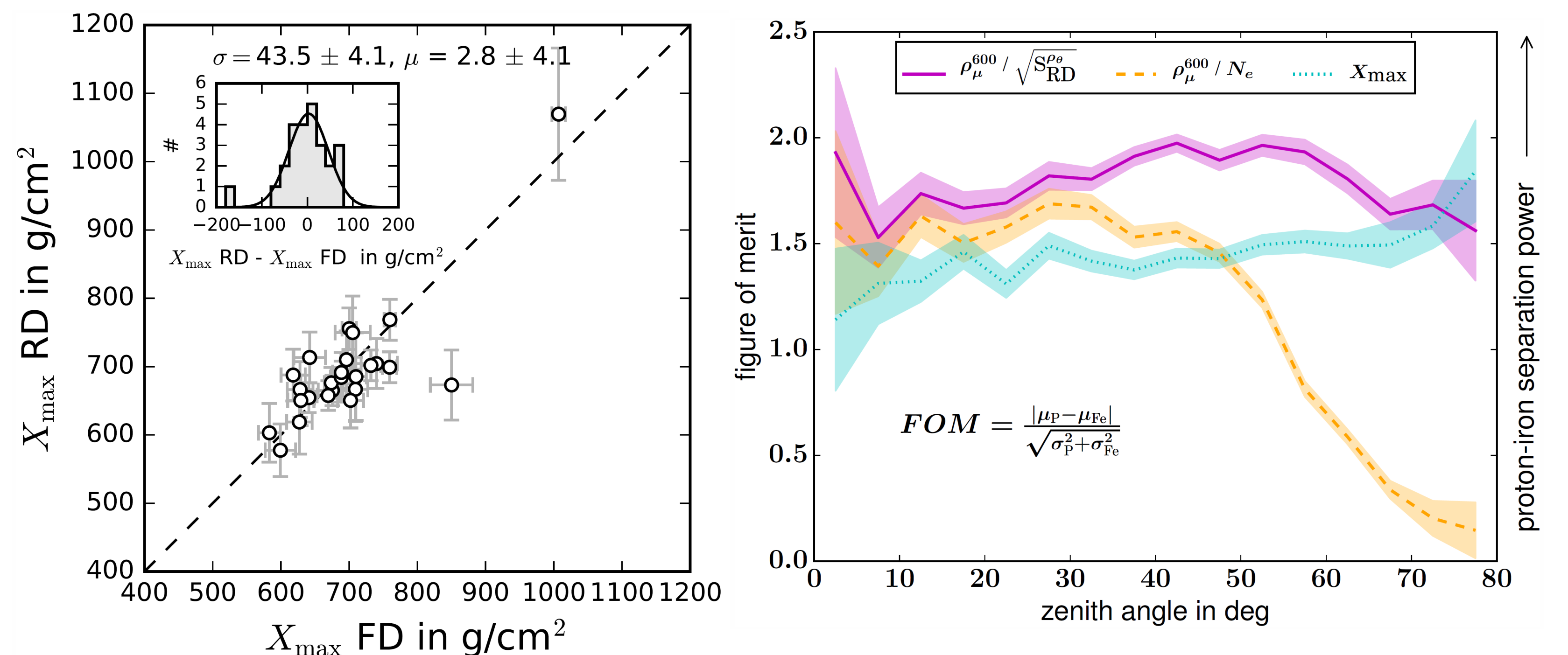
- AERA consists of 153 autonomous detector stations on an area of 17 km²
- measures in the 30-80 MHz band
- is triggered by Auger surface and fluorescence detectors, and internally

Determination of the energy scale



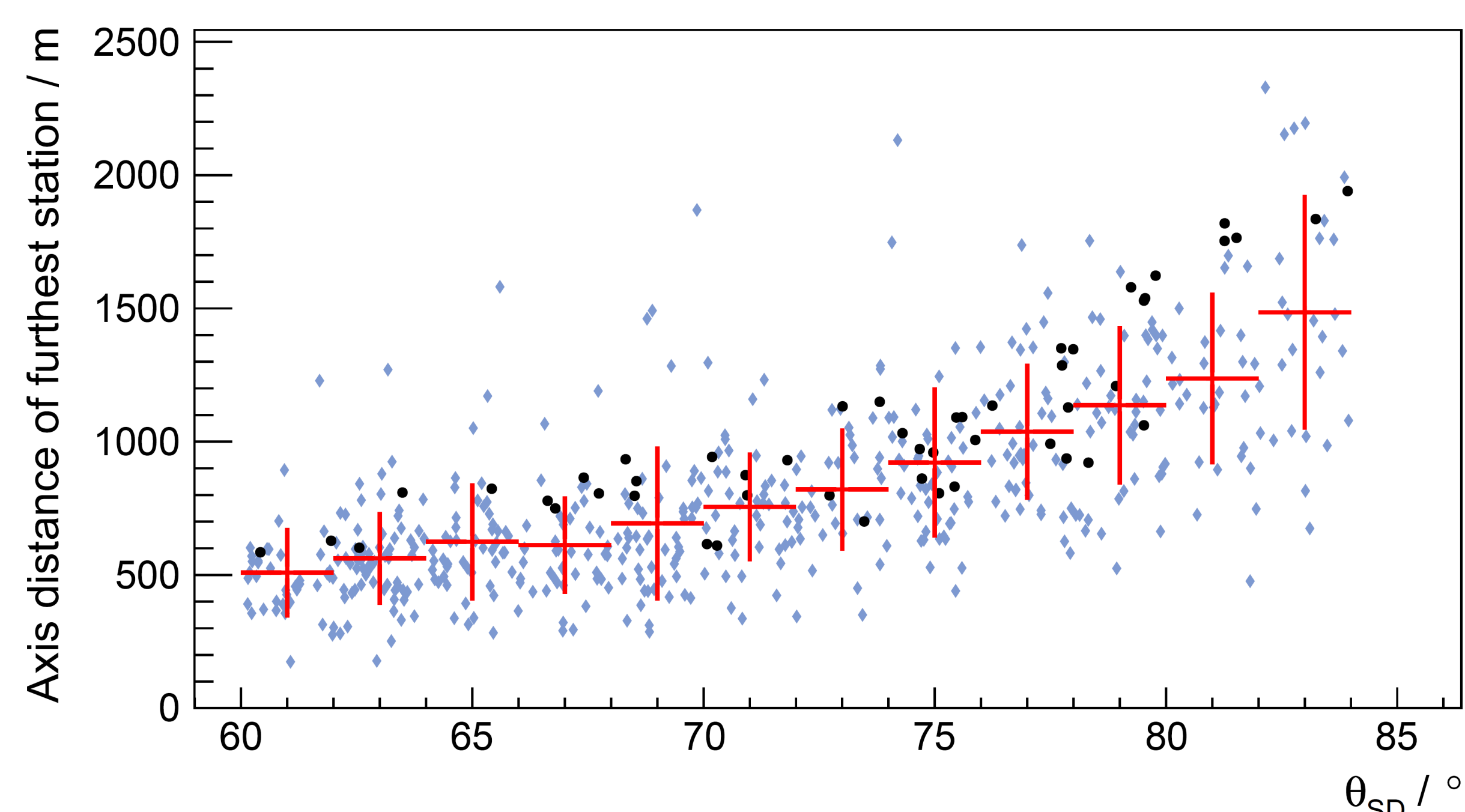
- energy deposited on the ground in the form of radio waves („radiation energy“) is a precise estimator for the energy in the electromagnetic cascade [1]
- radio emission undergoes no absorption or scattering, atmosphere is no issue
- radiation energy is usable for cross-calibration of detectors worldwide, and can be used to determine energy scale from first-principles calculations [2,3]

Mass composition sensitivity



- radio measurements allow X_{\max} determination [4]
- radio measures electromagnetic component, combination with AMIGA muon detection yields additional composition sensitivity [5]

Radio measurements of inclined air showers



- with increasing zenith angle, area illuminated by radio signals grows, covering up to 100 km² with detectable radio signals [6]
- electromagnetic component of inclined air showers measurable with radio, complementary to SD, hence Auger radio upgrade

Conclusions

- radio measurements with AERA yield complementary information on the energy and mass of cosmic rays measured with Auger
- electromagnetic component of inclined air showers can be measured with radio on large scales up to the highest energies

References

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- [6] Pierre Auger Coll., JCAP in press, arXiv:1806.05386