



Cherenkov Telescope Ring

A Proposal for World-Wide Monitoring of the VHE Sky

Dominik Elsässer & Wolfgang Rhode M. Nöthe, K. Brügge TU Dortmund

Where we are

- Several highly successful VHE facilities (VERITAS, H.E.S.S., MAGIC, FACT, HAWC)
- CTA prototypes progressing well
- Lots of interesting sources to study and physics problems to solve

The VHE Sky in 2018: A VHE success story



Why is there even a need to act now?

- First full CTA science operations horizon still beyond typical university education timescales. Need to conserve expertise and provide continuity in education!
- Lingering hard physics questions still unanswered: Acceleration mechanisms, CR luminosity
- Multi messenger astronomy picking up tremendous speed: Gravitational waves & IceCube neutrinos
- Strong motivation for near-instantaneous observation capability

FACT: A highly successful technology & methods pioneer



FACT achievements towards future instruments

- Suitability of SiPM cameras for dense monitoring of sources even under difficult conditions
- Demonstrated reliability, robotic operations!
- Public data set: https://fact-project.org/data/

 High – performance public analysis software developed by the Dortmund group: https://github.com/fact-project/fact-tools

MAGIC: IC 310



IC 310: Rapid and continuous coverage as a physics driver



Blazar variability PDF (Fermi-LAT >100MeV)



Michael O' Riordan1, Asaf Pe'er1, and Jonathan C. McKinney2, ApJ 843, 2

TXS 0506: Potential harbinger of the neutrino point – source era





MAGIC

What can we do NOW to preserve & greatly expand VHE monitoring & follow – up capabilities worldwide?

Proposal

Three pillars:

A) Preserve, maintain and upgrade existing facilities well into the CTA era

B) Build upon the expertise gained from prototypes & precursor experiments (FACT, but also the CTA prototypes)

C) Form group of international partners to complete a ring of IACT facilities covering a wide range of longitudes and latitudes:

Cherenkov Telescope Ring

Goal

- Achieve few percent Crab flux sensitivity above ~150GeV per site
- This will open up the Universe out to z~1, including amongst others the VHE - detected FSRQ population
- Baseline telescope can be "MST like", meaning ~90sqm mirror area, modular camera with state-of-the-art readout and SiPM sensors.
 Projected price tag per site 350k – 500k Euros





Won't the CTA alone solve all this?



Michael O' Riordan1, Asaf Pe'er1, and Jonathan C. McKinney2, ApJ 843, 2

Key Point: CTR is not meant to compete with CTA, but to "bridge the gap" in a temporal sense, pertaining equally to construction timescales and observational coverage.

→ CTA will provide deep coverage and wide energy range, while CTR can complement time series

\rightarrow CTR can provide alerts to CTA





Continuous monitoring



Reliable multi - messenger follow-up



Summary

- Strong physics motivation for expanded world wide monitoring capability
- Can be achieved with realistic efforts now by building upon existing facilities & expertise from pioneering instruments (CTA, FACT, et al.)
- Additional motivation: technological and educational continuity into the CTA era
- Australian site, potentially in connection with TeV array, would add VERY SUBSTANTIALLY to the science capabilities!!