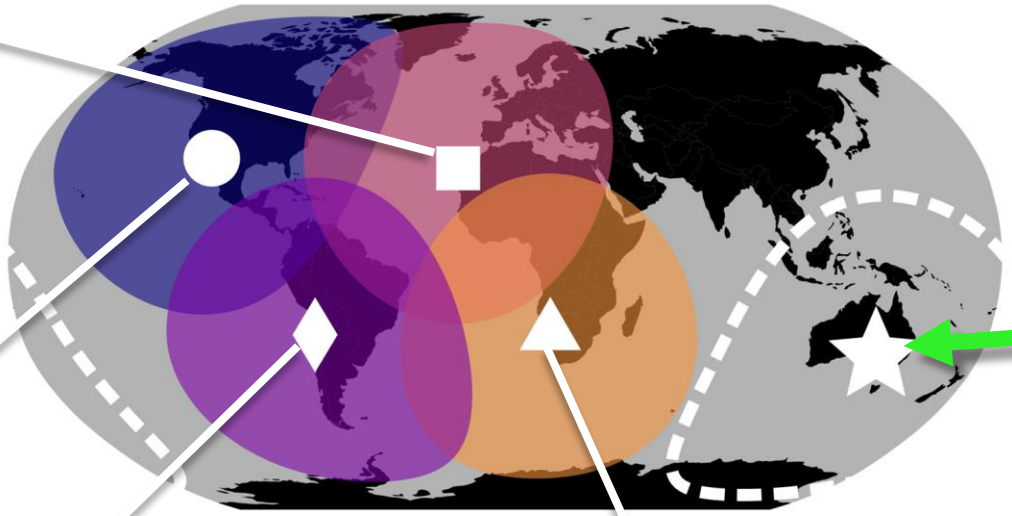
Towards a Network of Cherenkov Telescopes


[R. Wagner, MPP]


[VERITAS]

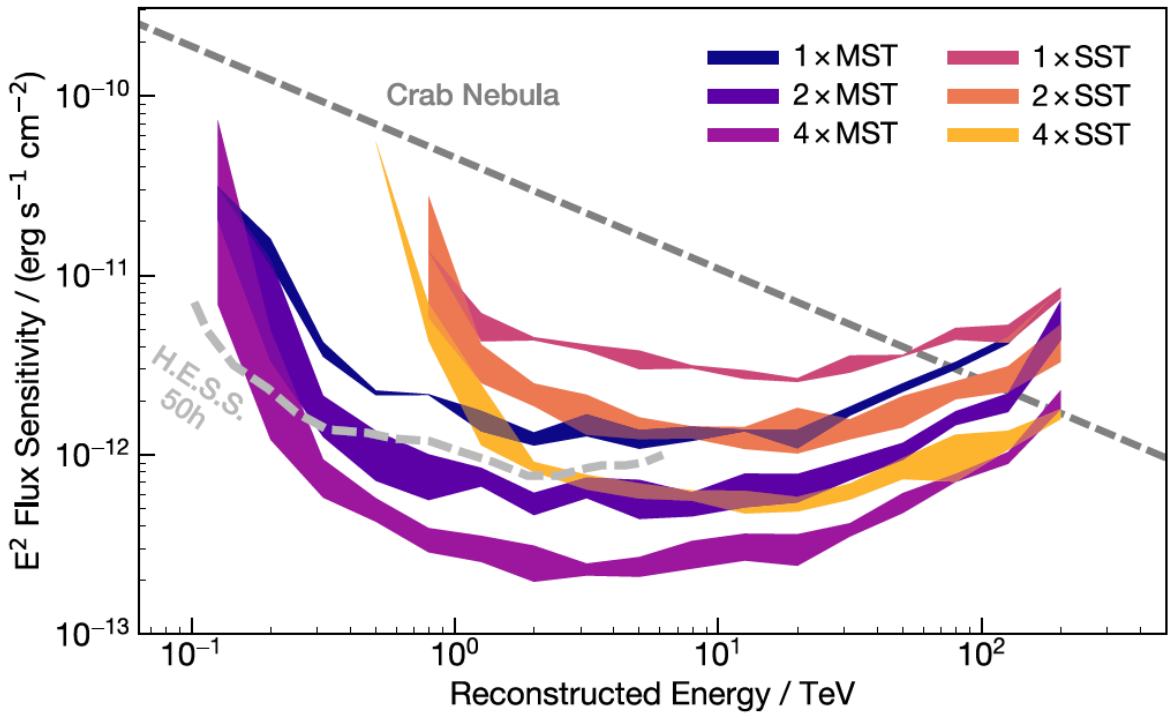



[Gabriel Pérez Diaz, IAC, Marc-André Besel, CTAO]


[Klepser, DESY, H.E.S.S. collaboration]

Simon Lee, Sabrina Einecke, Gavin Rowell (April 2022)

Number and type of telescope



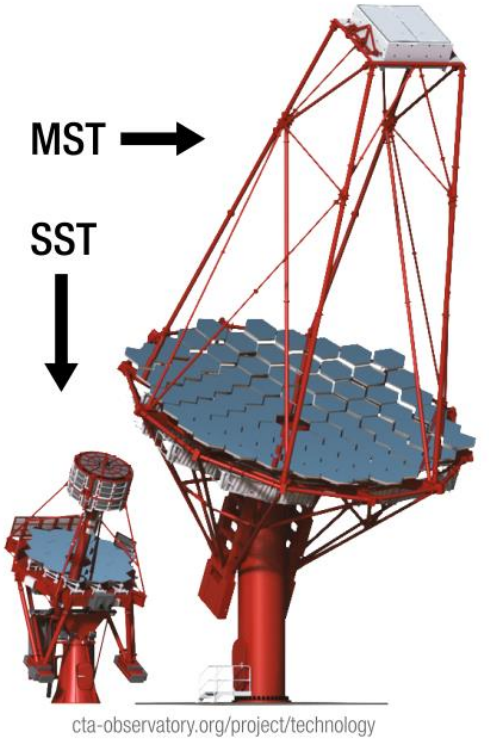


Figure 4. 50-hour differential point-source flux sensitivity for a 5σ detection as a function of reconstructed gamma-ray energy. Bands represent the range of sensitivities across the studied altitudes (0 m and 1000 m) and baseline distances (80 m to 277 m). Cuts on gamma score and θ^2 were applied for each energy bin to optimise sensitivity for each array setup. No cuts on the number of telescopes triggered were applied. The H.E.S.S. 50-hour sensitivity curve is shown for comparison (Holler et al., 2015).

Baseline distance

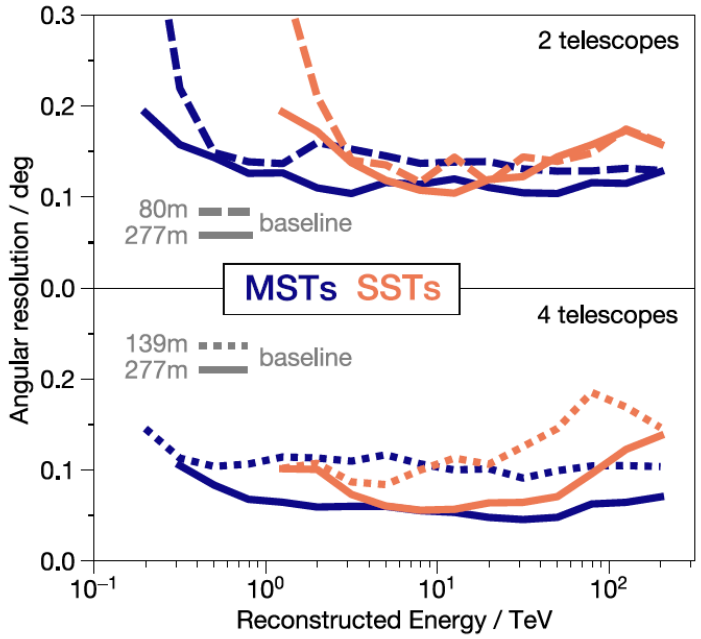
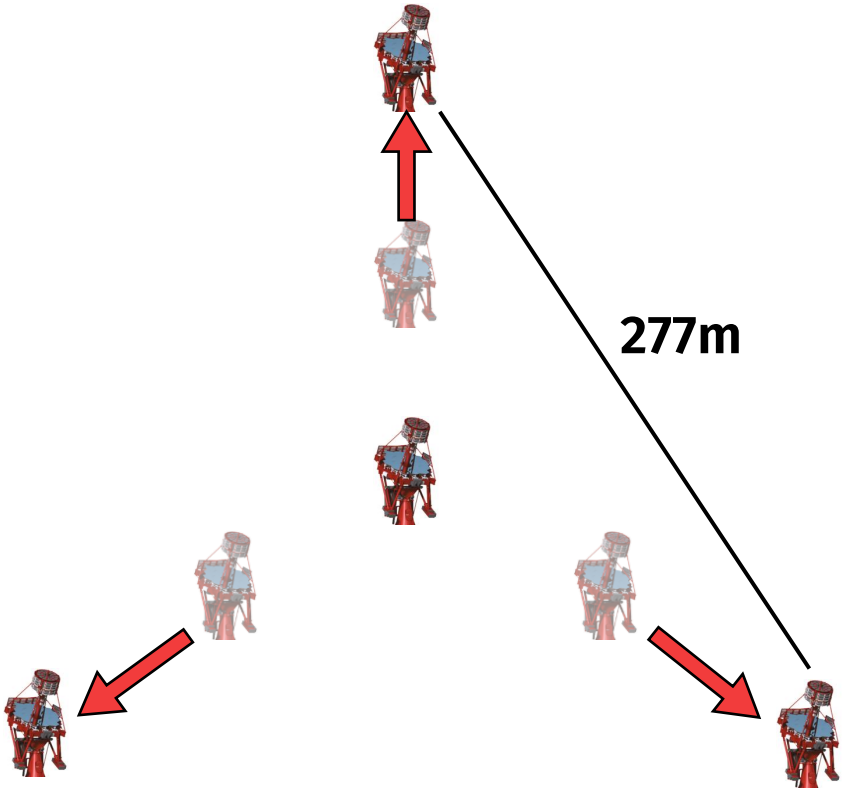


Figure 5. Angular resolution as a function of reconstructed gamma-ray energy for 0 m altitude arrays. Gamma score cuts optimised for sensitivity per energy bin were applied. Events were chosen where all telescopes triggered, otherwise monoscopic events dominated and results were similar to a single-telescope setup. The corresponding sensitivity was very similar between equivalent arrays of different baselines (see Figure B.2).



Altitude

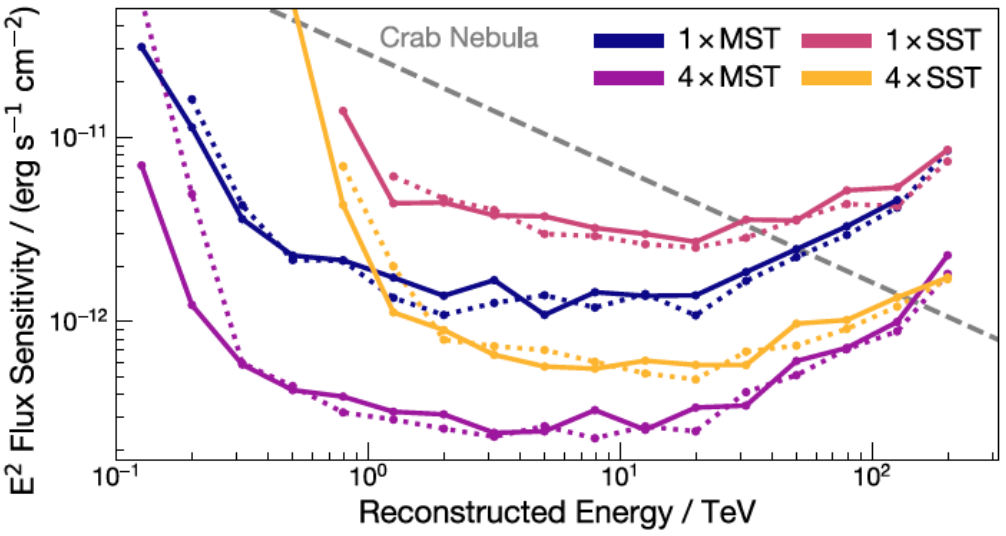
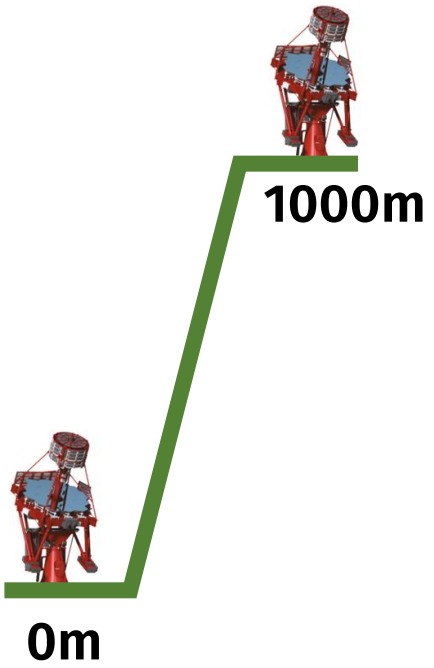


Figure B.1. Sensitivity for 0 m (dotted) and 1000 m (solid) altitude arrays showing the improvement at low energies for the 1000 m altitude arrays. 4-telescope arrays had a 139 m baseline.



Simulated observations

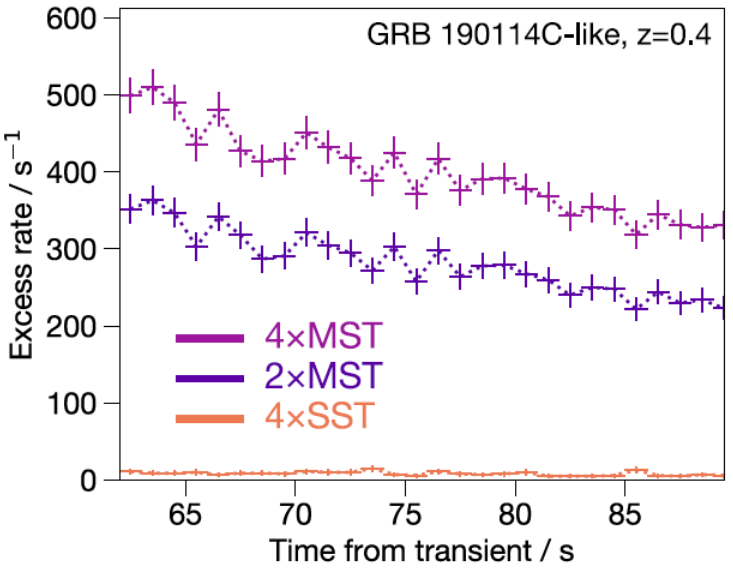


Figure 8. Estimated light curves for a GRB 190114C-like event for arrays at 0 m altitude with baselines of 277 m. The vertical bars show standard deviation, and horizontal bars show observation time per bin. Due to the 1-second binning, the mean background rate for all arrays was 0 protons per second.

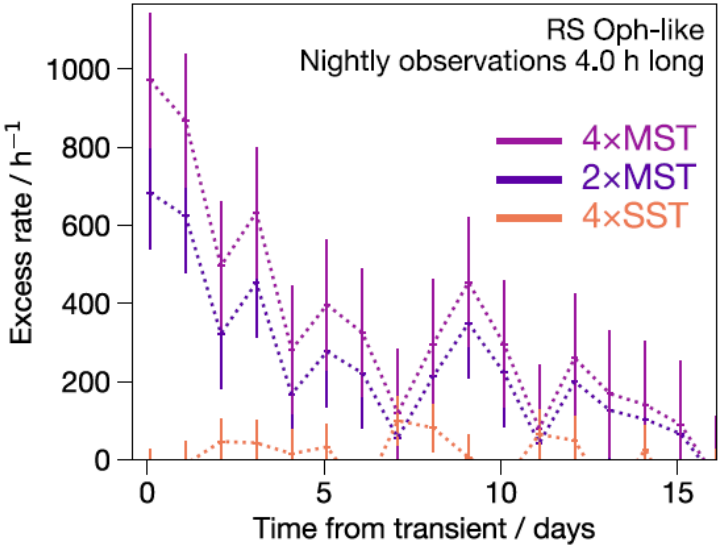
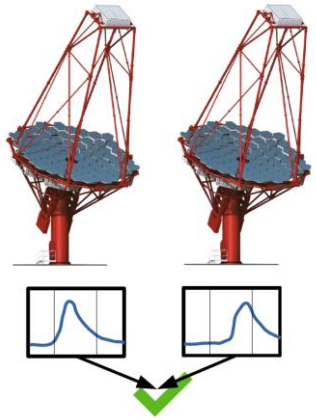
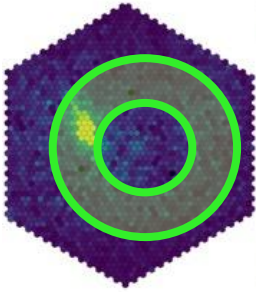


Figure 10. Estimated light curves for a flare akin to that from the recurrent nova RS Ophiuchi on the 8th of August 2021 for arrays at 0 m altitude with baselines of 277 m. The mean background rates were 336/243/45 protons per hour for 4×MST/2×MST/4×SST. The first 4 h bin represents a 5.9σ detection with four MSTs.

Current work





Requiring a **stereoscopic trigger** (multiple telescope simultaneously) or **topological trigger** (certain pixels in the camera) to reduce accidental Night Sky Background triggers

A **lower discriminator threshold** could be used while keeping a reasonable NSB trigger rate

More low-energy and high-core-distance events could be seen.

How would this effect performance? How much would the **energy threshold** improve?