

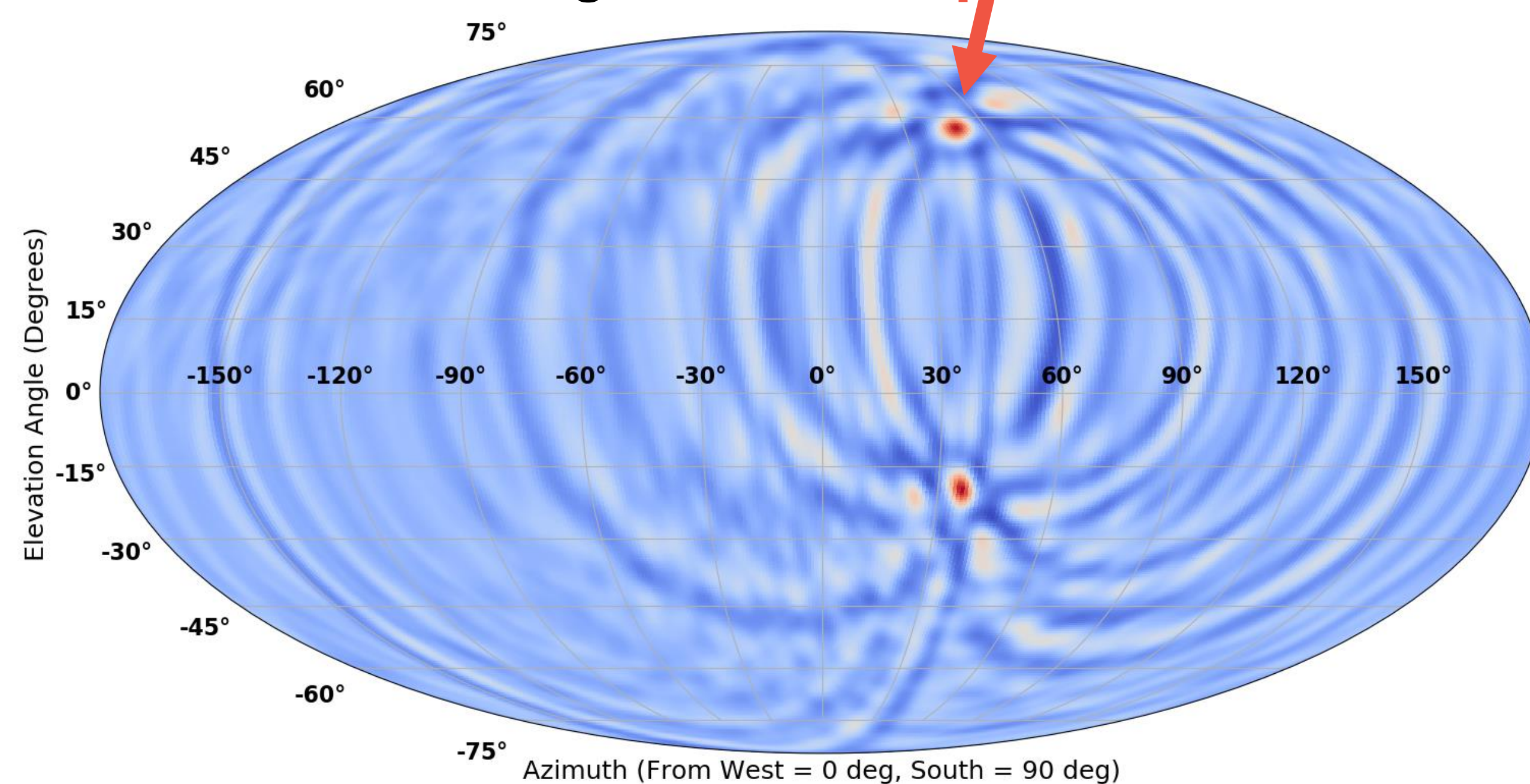
Prospects for Detecting the Highest Energy Tau Neutrinos with Elevated Beamforming Arrays

Dan Southall
on behalf of the
BEACON Collaboration
dsouthall@uchicago.edu

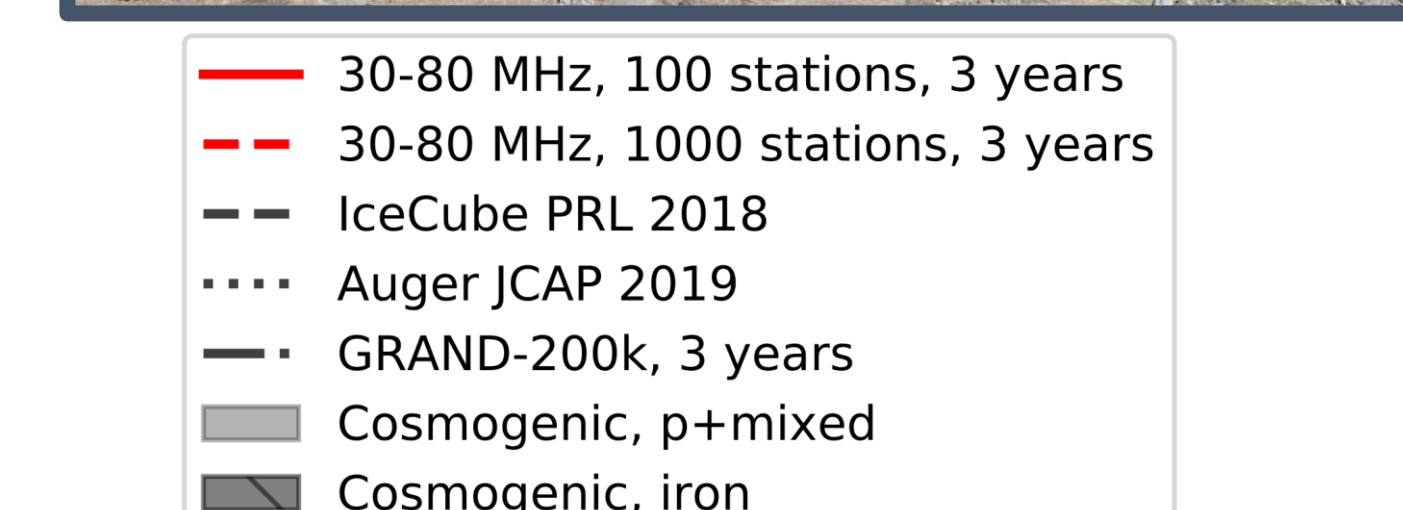
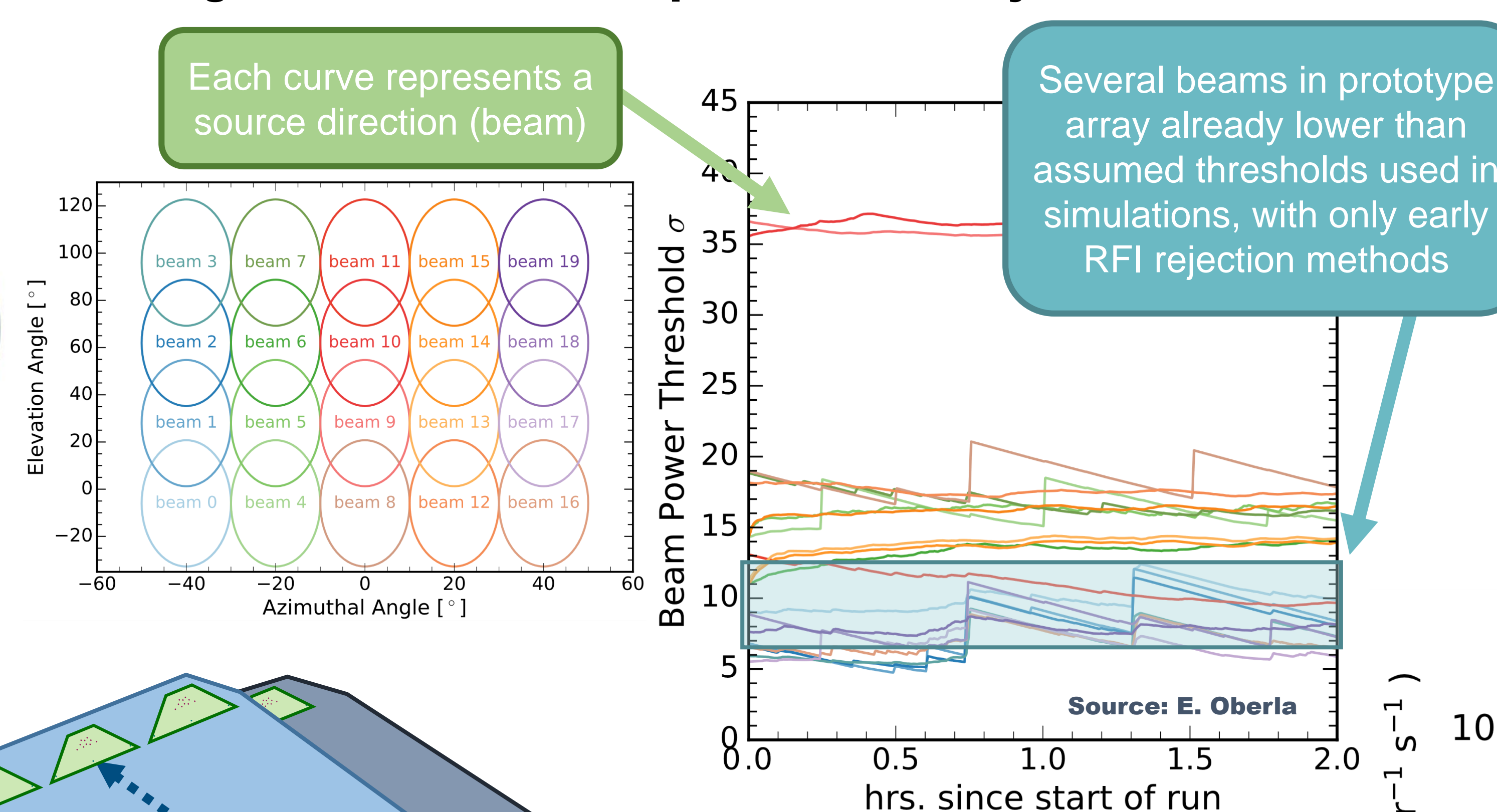


BEACON with 1000 stations is likely to observe cosmogenic tau neutrinos with trigger thresholds already achieved by existing prototype

BEACON Prototype array already has demonstrated success triggering on and pointing to impulsive transient backgrounds like airplanes



By using a 2D phased trigger, trigger thresholds can be set with directional dependence, allowing for RFI rejection from known background sources and improved sensitivity in other directions



BEACON Concept

- Mountaintop antennas measure radio signals from upward going τ decays originating from cosmic ν_τ 's
- Unambiguously measure ν_τ flux above 100 PeV, complimenting all-flavor fluxes from IceCube-Gen2, RNO-G, and other Askaryan-based experiments
- Antennas at high elevation increase sensitivity by viewing larger areas
- Stations on separate mountains with non-overlapping views increase sensitivity linearly and provide broad sky coverage
- Looking for upgoing, near horizon impulsive transients, with polarization angles correlated with Earth's magnetic field angle due to Geomagnetic emission in air showers

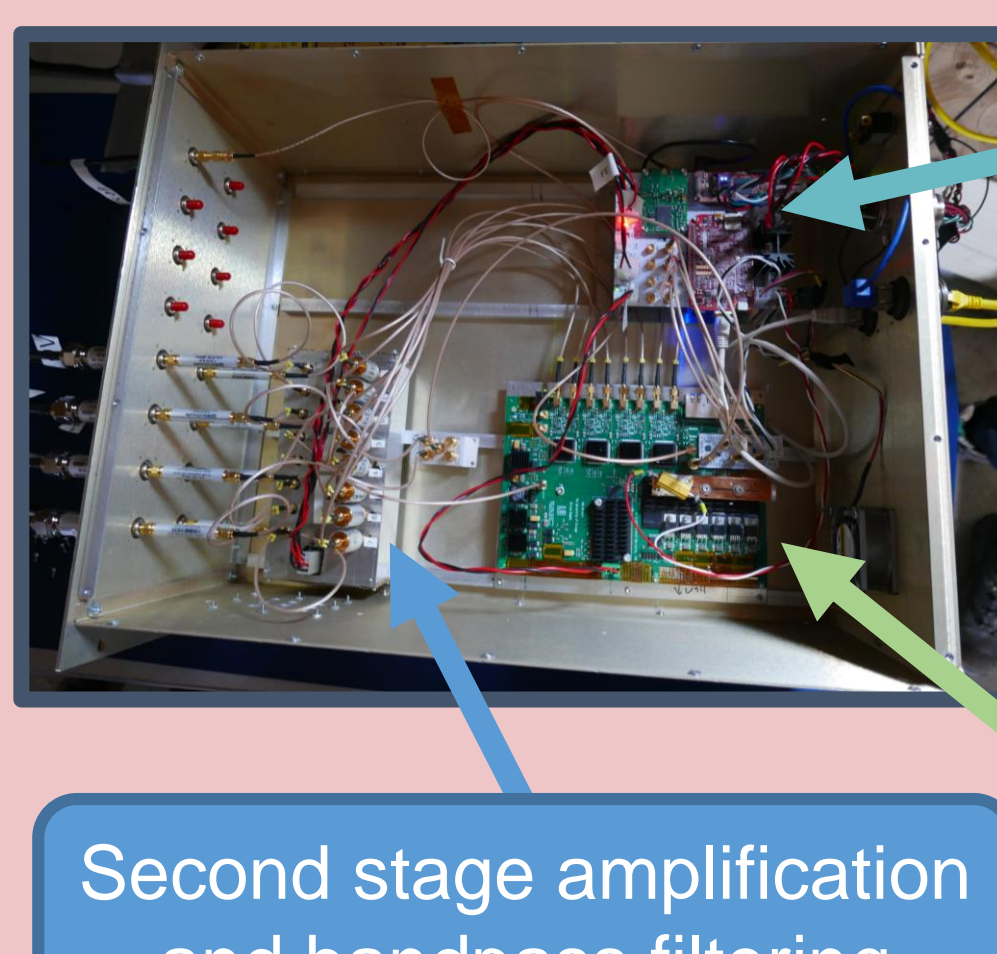
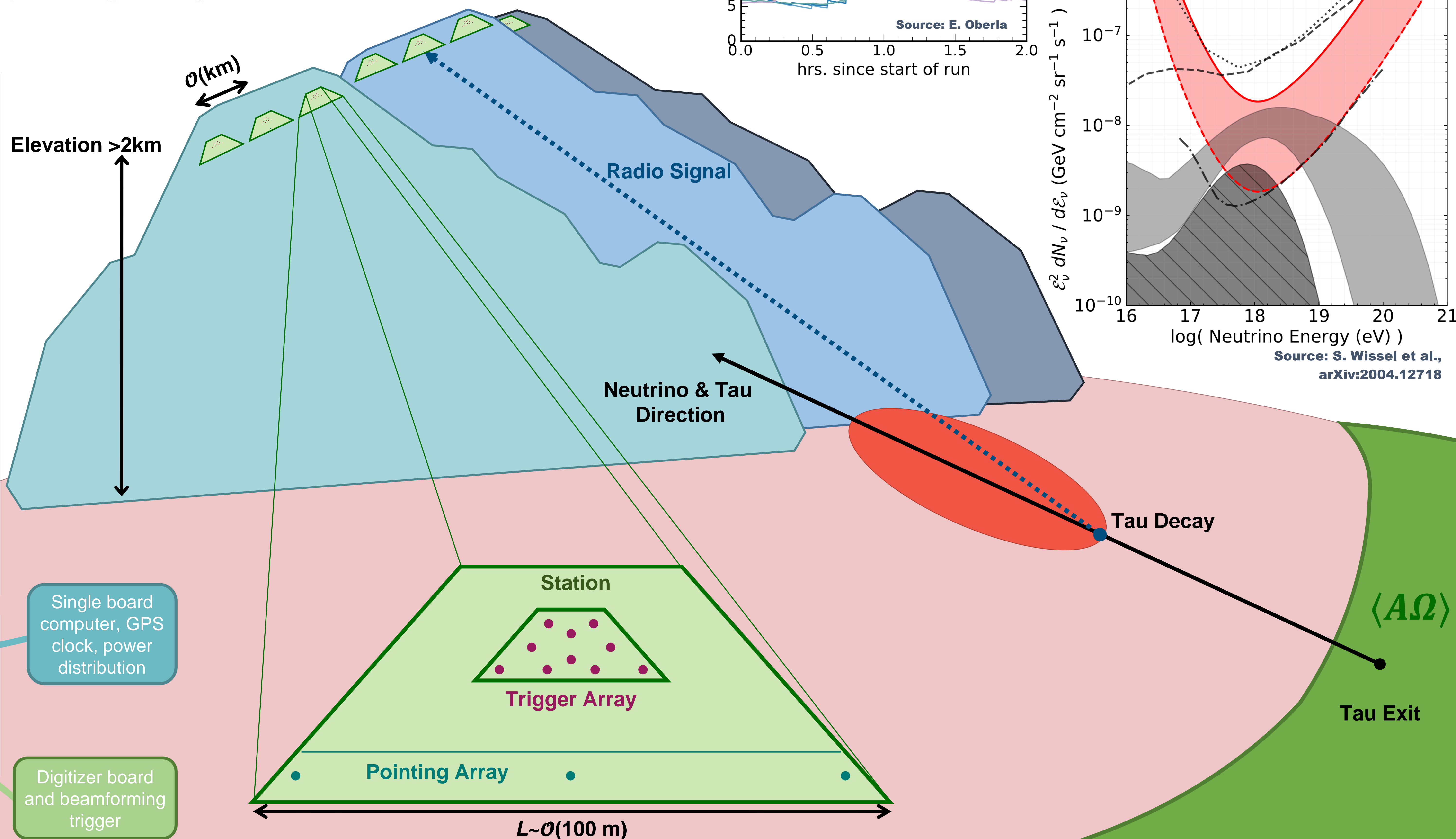
Station Design

- Optimized for scalability, ease of deployment, and science goals
- Trigger array utilizes signal phasing which provides directional RFI rejection and lower trigger thresholds

Prototype

- Currently installed at White Mountain Research Station - Barcroft Field Station, California
- 4 custom cross-polarization antennas (30-80 MHz) installed with custom DAQ
- Provides in-situ testing of hardware, while collecting real data used for characterizing RFI and developing analysis techniques
- Goals: trigger on impulsive transients, achieve efficient RF-only triggering with cosmic rays, continue lowering thresholds to match target thresholds in simulation studies over broad azimuthal angular range

Custom Crossed-Dipole Antennas on 12' Mast



- Single board computer, GPS clock, power distribution
- Digitizer board and beamforming trigger
- Second stage amplification and bandpass filtering

