Sensitivity of the Cherenkov Telescope Array to emission from the gamma-ray counterparts of neutrino events

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The Cherenkov Telescope Array will be the next generation ground-based imaging atmospheric Cherenkov telescope (IACT) array. CTA will consist of two arrays, one in each hemisphere, with the northern array (CTA-N) consisting of 13 telescopes spread over 0.5 km^2 in La Palma, Spain, and the southern array (CTA-S) consisting of 51 telescopes spread over 4 km^2 near Paranal, Chile.

Astrophysical sources capable of hadronic acceleration to relativistic energies have long been believed to be sources of high-energy astrophysical neutrinos. The lack of a significant indication of point sources in the long-exposure neutrino sky map may point to a large population of faint,steady sources or flaring objects as the origin of the diffuse flux. The spatially and temporally correlated observations of the flaring gamma-ray blazar TXS 0506+056 and a high-energy neutrino detected by IceCube as well as the evidence for the neutrino flare of this blazar in 2014-2015 are the most compelling evidence for a high-energy neutrino point source so far.

In the *Key Science Project* proposed in the *CTA Science Book* a total of 5 hours per site, per year, has been allocated to high-energy neutrino events observations (Neutrino Target of Opportunity - *NToO*) during the first 10 years of CTA operation. We outline the ongoing work to quantify the efficiency with which CTA will observe gamma-ray emission from IceCube *Gold* υ_μ alerts and all-sky 'hot-spots' (i.e. highest significance positions).

We investigate the detection probability for the VHE gamma-ray counterparts to neutrino sources from the populations simulated by the FIRESONG software to resemble the diffuse astrophysical neutrino flux measured by IceCube. For different zenith angles and geomagnetic field configurations we scan over parameters describing the populations, luminosity and density (density rate) for steady(flaring) objects. For steady sources following both flat and star-formation-rate redshift evolution the populations with $\rho \geq 10^{-7}\,\mathrm{Mpc}^{-3}$ and $L \leq 10^{53}$ erg/yr are detected in 30 minutes of observation for the CTA Omega layout. The difference in detectability of sources between CTA-N and CTA-S for the average geomagnetic field is not substantial. We investigate the effect of higher night-sky background and the preliminary CTA Alpha layout on the detection probability. For the blazar flares resembling the neutrino flare of TXS 0506+056 in 2014-2015, CTA will detect more than 30% of the sources in 30 minutes of observation.