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# A search for neutron fluxes from Galactic candidate sources

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Neutral particles, whose arrival directions directly indicate their origin, are valuable for investigating sources of ultra-high-energy cosmic rays (UHECRs). We expect that sources emitting UHECRs also produce neutrons through nuclear interactions and photo-pion production in their vicinity. These free neutrons, which undergo $\beta$-decay, can travel a mean distance of $9.2\times(E/\mathrm{EeV})$ kpc. As a result, neutron fluxes in the EeV range could be detectable on Earth from UHECR sources within our Galaxy. We explore potential neutron fluxes from various Galactic candidate sources, focusing on objects of astrophysical interest, including pulsars, microquasars, and magnetars, as well as the Galactic center, the Crab Nebula, and a subset of gamma-ray emitters identified by LHAASO. Since air showers initiated by protons and neutrons are indistinguishable, we identify a possible neutron flux by detecting an excess of cosmic ray events near the direction of a candidate source. We compare the observed signal against the expected background to identify such excesses. Our analysis considers cosmic ray events with declinations between $-90^\circ$ and $+45^\circ$ and energies starting from 0.1 EeV.

**Primary author:** DE OLIVEIRA FRANCO, Danelise (University of Hamburg)

**Presenter:** DE OLIVEIRA FRANCO, Danelise (University of Hamburg)

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