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NEON experiment: current progress and detectability for extragalactic sources

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The IceCube neutrino observatory first detected high-energy neutrinos of extraterrestrial origin in 2013, marking a significant milestone for multimessenger astronomy. However, due to its limited angular resolution and sensitivity, only a few neutrino events can be associated with known sources observed in other bands. The exact production mechanisms of celestial neutrinos remain elusive. Consequently, neutrino observatories with larger scale and high precision are critically required. To address this, we proposed the NEutrino Observatory in the Nanhai (NEON), a detection array to be deployed in the South China Sea with a volume of about 10 km^3. This project is currently under development. We have estimated the sensitivity and effective area of the proposed detector array across different energy bands. Assuming the extragalactic neutrino background originates from active galactic nuclei (AGN), and adopting specific models for neutrino production in non-jetted AGN—such as magnetically-powered corona model and the radiatively inefficient accretion flow (RIAF) model—we evaluated NEON's detectability for extragalactic sources and calculated the expected event number for different models. Furthermore, we have conducted preliminary tests on key hardware and firmware components for the NEON experiment. The reliability of the photomultiplier tubes (PMTs), front-end and readout electronics, and mechanical structures has been successfully demonstrated in these initial tests.

Authors: XIE, Caijin (Sun Yat-sen university); YANG, Lili (Sun Yat-sen university)

Co-authors: ZHANG, Huiming (Sun Yat-sen university); LIN, Sujie (Sun Yat-sen university); SHI, Yihan (Sun Yat-sen university); CUI, Yudong (Sun Yat-sen university); HUANG, Yunlei (Sun Yat-sen university); QIU, Zijian (Sun Yat-sen university)

Presenter: XIE, Caijin (Sun Yat-sen university)

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