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Integrating radio detectors of cosmic-ray air showers into the open-source NuRadio framework

NuRadio is an open-source, Python-based software package for the simulation, analysis and reconstruction of the radio emission from ultra-high-energy (UHE) neutrinos and cosmic rays. While NuRadio has so far mainly been used for in-ice radio neutrino detectors, such as ARIANNA, RNO-G and the future IceCube-Gen2 radio array, its modularity, provision of standard data processing steps for radio detectors, extensive documentation, and continuous integration system have allowed the LOFAR and SKA experiments to readily adopt NuRadio for the analysis of cosmic-ray air showers.

This contribution will provide a brief overview of NuRadio, covering its new features and improvements to performance and usability in the past several years. The main focus will be on the application to the reconstruction of UHE cosmic-ray air showers, including both radio emission as well as particle data.

We argue that using an open, collaborative framework benefits the entire radio community by reducing the software development overhead involved in duplicating, maintaining, or refactoring code, while the open review and continuous integration processes help to ensure accuracy and reliability. We therefore invite other cosmic-ray air-shower experiments to use and contribute to NuRadio.

Collaboration(s)

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