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Digital processing and filtering in the PUEO experiment

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Neutrinos produced in the highest energy extragalactic phenomena propagate through space, preserving energy and direction. Detection of these ultra-high-energy neutrinos can act as a telescope and as a method to probe physics at a new energy scale. At the EeV energy scale, neutrino-induced electromagnetic showers can be observed via the Askaryan effect. As the shower traverses a dense medium, a significant excess of uncompensated negative charge builds up, leading to coherent amplification of radio Cherenkov emission and resulting in a detectable pulse. Elevating a radio payload over the continentally vast, dense and radio transparent Antarctic ice cap, gives the best chance of detection. The Payload for Ultra-high Energy Observations (PUEO) experiment, will be equipped with commercially available RFSoC technology and capable of real-time digital processing. One can utilise a digital biquad notch filter to remove known anthropogenic frequencies reducing the trigger threshold before truncating the data, reducing valuable storage consumption.

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