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Low-power radio frequency amplification module with dynamic tunable notch filters for the Antarctic Impulsive Transient Antenna (ANITA)

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The Antarctic Impulsive Transient Antenna (ANITA) is a NASA long-duration balloon experiment with the primary goal of detecting ultra-high-energy ($> 10^{18}$ eV) neutrinos via the Askaryan Effect. The fourth ANITA mission, ANITA-IV, recently flew from Dec 2 to Dec 29, 2016. The most significant change in signal processing in ANITA-IV from previous flights was the inclusion of the Tunable Universal Filter Frontend (TUFF) boards. The TUFF boards had a three-fold purpose: 1) second-stage amplification by 45 dB to help boost the $\sim \mu\text{V}$ -level radio frequency (RF) signals to $\sim \text{mV}$ -level for digitization, 2) mitigation of narrow-band, anthropogenic noise with tunable, switchable RLC notch filters and 3) supplying power via bias tees to the first-stage, antenna-mounted amplifiers. In this talk, we outline the design and performance of the TUFF boards during the ANITA-IV flight.

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