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Analogue-to-Digital Converter Timing Resolution in the AIT/NEO Experiment TIMOTHY EMEIGH, TYLER ANDERSON, DOUGLAS COWEN, AARON FIENBERG, ELIZA NEIGHTS, Pennsylvania State University, WATCHMAN COLLABORATION — AIT/NEO is an upcoming experiment that will be used to demonstrate the remote monitoring of nuclear reactors via their antineutrino signature in a kiloton-scale water Cherenkov detector. The experiment's readout will consist of thousands of photomultiplier tubes (PMTs), each read out by a custom waveform digitizer whose data can be used to extract photon count and arrival time. Selection of the appropriate sampling rate for the digitizer has important implications, with higher sampling rates offering possible improvements in timing resolution, and lower sampling rates offering decreased cost. This study compares the digitizer options of 250 MSPS and 500 MSPS to determine whether the lower sample rate can achieve acceptable timing. Waveforms were collected from a Hamamatsu 10" PMT using an oscilloscope with a very high sampling rate. The waveforms were then downsampled and system timing resolution was determined through two methods: a constant fraction discriminator (CFD) and a pulse fitter. While the results demonstrate that 500 MSPS does have improved timing over 250 MSPS, the lower rate will not significantly degrade the overall timing of the system when convolved with the inherent transit time spread of the PMT.

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