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Time over Threshold electronics for an underwater neutrino telescope

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The use of Time over Threshold (ToT) digitization techniques for the treatment of the output signal of the PMTs of the KM3NeT detector is under consideration by the KM3NeT collaboration. In this technique the leading and trailing edge of the signal above a certain threshold are time stamped and the corresponding times are sent to the onshore acquisition system. More information can be obtained by applying the same scheme at multiple threshold levels. In this note we present the efficiency of such a digitization technique applied to signals provided by the Hellenic LYceum Cosmic Observatories Network (HELYCON) Extensive Air Shower detector. The hardware used has been designed by the Hellenic Open University (HOU) group and it is based on a High Precision Time to Digital Converter (HPTDC) chip developed at CERN and offering up to 32 channels with a digitization accuracy of 100ps. We describe the operation and performance of these electronics and we evaluate the reconstruction accuracy of PMT signals using data collected from Extensive Air Showers. Finally we report on our plans to use these electronics on Optical Modules proposed to be used in KM3NeT.

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