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Readout architecture for sub-nanosecond resolution TDC

J. Marteau (1), B. Carlus (1), S. Gardien (1), C. Girerd (1), J.-C. Ianigro (1), J.-L. Montorio (1), D. Gibert (2), and F. Nicollin (3)

(1) Institut de Physique Nucléaire de Lyon (CNRS/IN2P3 5822), Lyon, France., (2) Institut de Physique du Globe de Paris (CNRS/INSU 7154), Sorbonne Paris-Cité, Paris, France., (3) Géosciences Rennes (CNRS/INSU 6118), Université Rennes 1, Rennes, France.

The DIAPHANE project is pluri-disciplinary collaboration between particle physicists and geophysicists to perform the tomography of large geological structure mainly devoted to the study of active volcanoes. The detector used for this tomography, hereafter referred to as *telescope*, uses a standard, robust, cost-effective and well-known technology based on solid plastic scintillator readout by photomultiplier(s) (either multichannel pixelized PM or silicon PM). The electronics system is built on the concept of autonomous, triggerless, smart sensor directly connected on a standard fast Ethernet network. First radiographies have been performed on the Mont-Terri underground laboratory (St-Ursanne, Switzerland) and on the active volcano of La Soufrière (Guadeloupe, Lesser Antilles, France).

We present an upgrade of the readout architecture allowing to embed a sub-nanosecond resolution TDC within the existing programmable logic to help in the background rejection (rear flux, random coincidences) and to improve the detection purity and the radiography quality. First results obtained are also presented and briefly discussed.