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TRASGO An innovative stand-alone detector with full timing and tracking capabilities

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Timing RPCs are very interesting detectors that provide outstanding timing resolution
and fast response at an affordable price to cover big surfaces. These features put together with the TimTrack reconstruction algorithm and an electronic chain composed by a FEE amplifying and digitizing electronics and an intelligent data acquisition board (opens the possibility of developing an innovative detector, or TRASGO (TRAck reconStructinG mOdule), able to work stand-alone providing full high performance timing and tracking capabilities.
The main components of a TRASGO are:
1. A High resolution timing detector: In order to provide its best performances, TRASGOs need outstanding timing detectors, like tMRPCs or fast scintillators. Sealed RPCs are being developed facing the possibility of using RPCs based TRASGOs in Astroparticle experiments without the need of cumbersome gas systems.
2. A fast and reliable reconstruction algorithm: The TimTrack algorithm (see the contribution to this Workshop) offers the best performances for the fast and smooth reconstruction of tracks. It provides a set of six parameters, or a saeta (SmAllest sEt of daTA), composed by 2 coordinates, 2 slopes, the velocity and the time of the particle at a reference plane.
3. A stand-alone FEE-DAQ chain: The DAQ structure of a TRASGO is based on the HADES DB-MB-TRB philosophy. Namely:
- A compact high bandwidth pre-amplifying and digitizing electronics codifying time
and charge in a single LVDS digital signal.
- A HPTDCs and FPGAs based intelligent acquisition board driven by an ETRAX
processor able to house the hit fitting and tracking algorithms.
This work presents some of the developments already done and those that are on
the way facing the development of the first TRASGO prototype in order to test their performances with cosmic rays.
The TRASGO concept may be of interest in several research fields, like:
- Astroparticle Physics: where its high granularity, performances and capability to work
stand-alone may facilitate the measurement of extended air showers properties.
- Particles and Nuclear Physics: either working stand-alone or as component of a spectrometer, where TRASGOs may be very useful for trigger and tracking purposes.

Primary author: Mr KORNAKOV, Georgy (University of Santiago de Compostela)

Presenter: Mr KORNAKOV, Georgy (University of Santiago de Compostela)

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