X. Workshop on Resistive Plate Chambers and Related Detectors

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TimTrack A new algorithm for the tracking of particles with timing detectors

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TimTrack is a tracking algorithm to be used with timing detectors, being specially suitable to work with timing RPCs or fast scintillators. It is being developed in the framework of the Trasgo (TRAck reconstructinG mOdule) project aiming the development of a detector able to work stand-alone with full tracking and timing capabilities.

TimTrack works directly with the primary information provided by the detectors, either

coordinates or time, without any time to coordinate reduction. All the detectors must be synchronized and refered to the same zero time.

The algorithm estimates sets of six parameters of the particles: 2 coordinates, 2

slopes, the velocity and the time at a given reference plane. This set of parameters, called SAETA (SmAllest sEt of daTA), is the basic unit of the method. It provides also the complete variance-covariance matrix with 21 independent coefficients allowing a very accurate statistical analysis of the results both for track quality test and for the efficient rejection of outliers.

For most of the more common timing detector layouts TimTrack leads to linear

equations allowing to use a very simple matrix formalism providing a very fast solution. In this cases, a saeta s may be obtained directly from the measured through an equation of the type:

s = K^-1 a

where K is a 6x6 matrix (called configuration matrix) that depends only on the detector layout) and a is a 6 dimension vector that can be obtained as a linear combination of the measured data.

The matrix formalism is very easy to be implemented in some kind of electronic

components or embedded processor placed in an acquisition board offering online timing and tracking abilities.

The analytical solutions for several layouts of detectors together with their numerical results will be given.

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