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The Gigatracker: an ultra fast and low mass silicon pixel detector for the NA62 experiment

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The Gigatracker is a hybrid silicon pixel detector developed to track the highly intense NA62 hadron beam with a time resolution of 150 ps (rms). The beam spectrometer of the experiment is composed of three Gigatracker stations installed in vacuum in order to precisely measure momentum, time and direction of every traversing particle. Precise tracking demands a very low mass of the detector assembly (less than 0.5% X0 per station) in order to limit multiple scattering and beam hadronic interactions. Fluences of up to 2 x 10^14 1 MeV n eq. cm^-2 are expected during one year of operation, due to the high intensity beam (0.8-1.0 GHz in total, hence the detector name). The very low mass of the detector, the necessary operation in vacuum and the harsh radiation environment require a very efficient cooling system. The high rate and especially the high timing precision requirements are very demanding: two R&D options are ongoing and the corresponding prototype read-out chips have been recently designed and produced in 130 nm CMOS technology. One solution makes use of a constant fraction discriminator and on-pixel analogue-based time-to-digital-converter (TDC); the other comprises a digital-based TDC placed at the end of each pixel column and a time-over-threshold discriminator with time-walk correction technique. The current status of the R&D program is overviewed and preliminary results from the prototype read-out chips test are presented.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

Please find here the one page long summary:

http://mfiorini.web.cern.ch/mfiorini/abstract_vienna/abstract-long-MFiorini.pdf

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