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Particle Trackers Based on Thick 1~mm and 0.7~mm Scintillating Fibres Readout by a Multi-anode Photomultiplier

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This talk will describe prototype particle tracking detectors constructed at LNF with thick 1~mm and 0.7~mm plastic scintillating fibres with a 64 channel Hamamatsu H7600 flat-panel multi-anode photomultiplier readout. Cosmic ray tracks from an array of 11 gas-filled drift tubes were matched to signals in the scintillating fibres in order to measure the resolution and efficiency of tracks reconstructed in the fibre-based tracker. Resolutions better than 0.250~mm have been found for the 1~mm fibre detector and better than 0.150~mm for the 0.7~mm detector. Measurements of the number of photoelectrons detected plus cross-talk will also be shown. A GEANT4 detector simulation was also developed to compare cosmic ray data with Monte Carlo results and will be discussed. Using the parameters measured in this experimental setup, modified fibre tracker designs are suggested to improve resolution and efficiency in future prototypes to meet modern detector specifications.

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