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Diamond pixel detector for beam profile monitoring in the COMET experiment at J-PARC

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We present the design and initial prototype results of a pixellized proton beam profile monitor for the COMET experiment at J-PARC. The active element of the detector is single crystal diamond grown by chemical vapor deposition (sc-cvd). The goal of the COMET experiment is to look for charged lepton flavor violation by direct μ to e conversion at a sensitivity of 10^{-18}. In the first phase, an 8 GeV proton beam pulsed at 100 ns with current corresponding to 10^{10} protons/second will be be used to create muons through pion production and decay. In the final experiment, the proton flux will be raised to 10^{14} protons/sec to increase the sensitivity with an intense muon beam. These requirements of harsh radiation tolerance and fast readout have led us into developing a sc-cvd diamond based pixel detector to profile the proton beam. The design details and first prototype readout results of the detector will be presented.

Primary author: SARIN, Pradeep (Bhabha Atomic Research Centre (IN))

Co-author: Mr JADHAV, Manoj (IIT Bombay Department of Physics)

Presenter: SARIN, Pradeep (Bhabha Atomic Research Centre (IN))

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