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A 2m x 0.5m prototype of a MRPC-based neutron detector with steel converter plates

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A 2 m long prototype detector for the detection of neutrons in an energy range from 200 MeV to 1 GeV has been successfully realized. The working principle is based on steel converter plates followed by an MRPC structure to detect charged particles produced by hadronic interactions. In order to study time resolution and efficiency, a 2m x 0.5m large module has been built which includes a 2 x 2 gap MRPC structure. An efficiency >90% and a time resolution of sigma < 100 ps have been measured for minimum ionizing electrons. This experiment has been done using the new one-electron-per-bunch mode of the superconducting electron linear accelerator ELBE, Dresden. Another test has been done using 175 MeV quasi-monochromatic neutrons at Uppsala. A test using tagged high-energy neutrons is scheduled at GSI. Extensive Monte Carlo simulations have been carried out, both for the electron-beam tests and for the final application as a neutron detector. The present approach offers a cost-effective way for the time-of-flight detection of high energy neutrons.

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