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Fast timing measurement for CMS RPC Phase II upgrade

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With the increase of the LHC luminosity foreseen in the coming years many detectors currently used in the different LHC experiments will be dramatically impacted and some need to be replaced. The new ones should be capable not only to support the high particle rate but also to provide time information to reduce the data ambiguity due to the expected high pileup.

RPC using low-resistivity Bakelite are proposed to equip the very forward region of the CMS detector. In their single-gap version they can stand rates of few kHz/cm2. New electronics equipped with excellent timing precision measurement (<150ps) are being developed to read out the RPC detectors from both side of the strips to allow good spatial resolution along them. The absolute time measurement, determined by RPC signal (around 1 ns) will also reduce the data ambiguity due to the highly expected pileup at the Level 1 trigger and help to identify Heavy Scalar Charged Particles (HSCP).

Principle of the measurement, implementation in front-end electronic boards (Petiroc front-end ASIC, wave-union TDC and PCB design) will be discussed. First results from cosmic tests and test beams at Gamma Irradiation Facility (GIF) and SPS at CERN would also be presented.

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