



Contribution ID: 132

Type: Poster

High resolution timing for muon detectors at future colliders

Wednesday, 27 May 2015 09:27 (0 minutes)

Experiments at present and future hadron colliders stress timing as one of the most important detector parameters. Indeed the need to increase the collider luminosity can be achieved in principle either by decreasing the inter-bunch crossing time or by increasing the number of protons per bunch. The latter approach however can produce a dramatic event pile-up in the same bunch crossing.

We show here that high time resolution detectors can identify consecutive bunch crossings with time separation much below 1 ns. The performance of RPCs in the recent R&D development could match the requirements for future muon detectors. We discuss critically the limits and a possible upgrade of RPCs regarding the detector structure, the Front-End electronics and a new ecological gas mixture.

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Session Classification: Gas Detectors - Poster Session

Track Classification: S7 - Gas detectors