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# Rate capability of small-diameter Muon Drift Tube precision tracking chambers with new fast readout electronics for HL-LHC and Future Hadron Colliders

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The new small-diameter Monitored Drift Tube (sMDT) detectors with 15 mm tube diameter have proven to be excellent candidates for precision muon tracking detectors in experiments at future hadron colliders like HL-LHC and FCC-hh where unprecedentedly high background rate capabilities are required.

The rate capability of the sMDT drift tubes in terms of muon detection efficiency and spatial resolution is limited by the performance of the readout electronics. At the Max-Planck Institute in Munich, a new sMDT Amplifier-Shaper Discriminator (ASD) readout chip for use at the HL-LHC and future hadron colliders with a faster peaking time compared to the old chip has been developed, reducing the discriminator threshold crossing time jitter and thus improving the time- and spatial resolution with and without  $\gamma$ -background radiation.

Extensive tests using sMDT test chamber have been performed at the CERN Gamma Irradiation Facility (GIF++). Detector equipped with new readout chips with improved pulse shaping and discrete readout circuits with baseline restoring functionality have been tested:

→ We have shown that sMDT precision muon tracking detectors with new readout electronics are well suited to operate with the high spatial resolution and muon detection efficiencies up to the highest background rates expected at future hadron collider experiments.

→ We have demonstrated that faster signal shaping improves the spatial resolution and muon detection efficiency of sMDT drift tubes at the high  $\gamma$  background radiation.

