Contribution ID: **26** Type: **Talk**

Next-generation electronics for the gaseous beam telescope of RD51

Tuesday 21 June 2022 11:00 (20 minutes)

RD51 is a CERN-based research collaboration, focusing on the development and advancement of Micro-Pattern Gaseous Detectors (MPGDs). One of the major outcomes of these activities was the development of a joint multi-purpose electronic readout system, the Scalable Readout System (SRS). It allows to read out small R&D set-ups up to mid-sized experiments with various front-end ASICs (APV25 and Timepix as most successful examples). The SRS is used for test beam campaigns and laboratory measurements since its introduction in 2009 by many RD51 teams.

In recent years the analogue and digital BNL/ATLAS VMM3a was integrated into the SRS. With its rich set of features (e.g. a multi-channel self-triggered continuous readout, a high-rate capability of 9 Mhits/s per ASIC, a 10-bit charge information and a time information with nanosecond resolution) the combination of VMM3a and SRS is particularly interesting for the readout of a beam telescope.

As part of its activities, RD51 organises up to three times per year a joint test beam campaign at the H4 beamline of CERN's Super Proton Synchrotron. For these test beam campaigns, the collaboration provides a GEM-based beam telescope with 10x10 cm² active area. During the past two RD51 test beams (July and October 2021), VMM3a/SRS was successfully tested as new electronics for its beam telescope. The telescope (detectors, FE and DAQ) aims to provide MHz rate-capability, spatial resolutions of 50 µm or better and time resolutions in the nanosecond regime. In this presentation, the first results are shown, focusing on the commissioning of the system, the tracking efficiency, spatial resolution and time resolution studies.

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Session Classification: DAQ Systems