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RPCs and readout system for the neutrino detector of the SHiP experiment

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SHiP (Search for Hidden Particles) is a proposed experiment to be installed at CERN, exploring the high intensity beam frontier, in order to study both hidden particles and tau neutrino and antineutrino physics.

The SPS proton beam interacting with the SHiP high density target is expected to produce a large neutrino flux, with about $10^{15} \nu\tau$ and $\bar{\nu}\tau$ in five years (integral p.o.t. $2 \cdot 10^{20}$). A dedicated Scattering Neutrino Detector (SND) is being designed. It consists of an emulsion target and a tracking fibres detector in magnetic field followed by a Muon identification system.

The Muon system is composed of iron filters interleaved with tracking planes (dimension $\sim 2 \times 4 \text{m}^2$), instrumented with Resistive Plate Chambers (RPCs), operated in avalanche mode. Each plane consists of three large gaps ($\sim 2 \times 1 \text{m}^2$ each) read-out by two planes of perpendicular strips (pitch $\sim 1 \text{cm}$, length $\sim 2 \text{m}$).

The RPC readout electronics is being developed in Bari. It is based on the use of front-end FPGAs connected to a concentration system, transmitting data serially at high speed via optical link to the data acquisition & control system.

A small-scale prototype of the SHiP Muon identification system, with 5 RPC planes consisting of one large gap each, has been produced and exposed at CERN H4 in a test beam.

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