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The RPC based proposal for the ATLAS forward muon trigger upgrade in view of super-LHC

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The present ATLAS forward muon spectrometer (Small Wheel), which covers a range in rapidity $1.3 < \eta < 2.7$, is not designed to withstand the super LHC luminosity up to $5 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$. The main issues are coming from the very high background rate, up to 14 kHz/cm^2 , extrapolated from the present data, and from the necessity to drastically improve the muon momentum trigger selectivity. To fulfill this extremely challenging requirements it has been shown that a fast tracking trigger system is needed, capable of suppressing fake tracks by a factor of 10 and to measure the particle position with a precision of $300 \mu\text{m}$, needed to define a 1 mrad accurate impact angle. A major constraint is given by the available level 1 trigger latency of $1 \mu\text{s}$. An international collaboration participated by American Chinese and Italian institutes has been established to develop one of the candidate proposal, based on an enhanced RPC system. This is comparable with the former ATLAS for cost and robustness but with a much higher rate capability and timing performance. The high timing resolution of RPCs is here the key feature to suppress the background allowing a much simpler trigger scheme. A new generation front end electronics, a very fast readout circuit allowing a precise localization the particle impact point and a mean-timer based sharp coincidence system have been designed to exploit fully the detector performance matching the trigger requirements.

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