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A new generation of RPCs for next generation experiments

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Searches for new and elusive physics phenomena with present and future HEP experiments will require increasingly performant techniques, for the ability to detect high particle fluxes with high granularity and space-time resolution.
The present upgrade effort of the HL-LHC programme offers solid ground and use-cases to develop such techniques. In the case of classic large area RPCs, outstanding developments in the detector integration concept, involving at the same time the front-end electronics and the sensor itself, permitted to design a new generation of RPCs enhancing most of the detector features by about an order of magnitude, without increasing the construction cost and complexity. This represents a new de facto standard reference for future colliders experiments, and already adopted for the Phase-1 and Phase-2 ATLAS RPC upgrade projects.
New significant use cases concern recent proposals of dark matter search experiments, conceived as a smart complement of LHC detectors, such as CODEX-B (COmpact Detector for EXotics at LHCb) and ANUBIS (AN Underground Belayed In-Shaft search experiment). In both cases, these new RPCs being used for the ATLAS upgrades have been chosen as turnkey technology for the detector design, due to a very good matching between requested and offered performance at a cost per unit surface compatible to instrument large areas.
The technical features of this new generation of RPCs will be analysed for the CODEX-B and ANUBIS use cases, and how the discovery potential of this experiments critically depends on the new RPCs performance. Potential avenues for further adjustments of RPC performance and cost to the use case of CODEX-b and ANUBIS will be outlined.

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