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New RPC readout for EAS mapping in ground based cosmic ray detectors

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Besides High Energy Physics experiments, RPCs have been successfully employed also in cosmic ray physics, as demonstrated by ARGO experiment.

The detector readout is however very different from that used for particle tracking in collider experiments, based on strips behaving as transmission lines with non-negligible signal propagation time.

Cosmic ray detection with ground-based apparatuses requires mapping extensive air showers with good accuracy. The detector requirements, based on simulations as well as on past experiments, are a modest rate capability (the cosmic rays one) coupled to good capability of measuring high hit densities (up to $10^6/\text{m}^2$ around the core region); a time resolution of the order of the ns is also required for the incident direction reconstruction. A space resolution of the order of 10 cm is sufficient, due to intrinsic fluctuations of the shower front. Given the large area to be covered, the detector must be simple, robust, reliable and economic.

To fulfill these requirements we will present a new readout, based on squared pads of area around $40 \times 40 \text{ cm}^2$, which compared to Argo, can reduce the number of read-out channels down to about an order of magnitude without losing space and time resolutions. Another innovative aspect of the new readout is the signal pick-up point that is localized not at the pad edge but at its center.

Preliminary studies about signal pick-up will also be presented.

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