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Some results of the R&D of a ToF-Wall to identify relativistic ions

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The detection setup of the R3B experiment in the FAIR facility includes time of flight (ToF) walls, dedicated to the isotopic identification of ions of any charge and mass at energies of some hundreds AMeVs. The experiments related to heavy ions require large active surfaces and a very demanding time resolution (<50 ps) for the ToF detectors in order to accomplish with their duties with reasonable flight-paths (up to 20m).
It was proposed rather early that timing-RPCs could provide an adequate solution for this detector [1]. Although the time-resolution provided by deployed tRPCs (HARP, ALICE, FOPI, HADES) can reach values well below 80 ps, they were developed and used only for MIPs. In that sense, it was clear that an important effort of R&D is needed for both, adapting the materials and geometry to heavy ions, and also to study the large dynamic-range that is expected that ions will impose to the detectors.
Only very recently it has been demonstrated [2] that typical RPC cells can perform rather well with ions up to Z=6 keeping their extreme timing properties, up to moderate rates.
In this work we show our progress in the construction of RPCs suitable to the detection of heavy ions in conditions as those of the R3B environment. We used beams at GSI of C, but also of Ni and a fragments of U. Here we show results of successful measurements in a wide range of charges, or equivalently in wide range of energy depositions, which confirm the suitable use of RPCs in what concerns efficiency, and detector and electronics stability. We also show the electronics solutions we propose after our own R&D, and perspectives to achieve an optimum time resolution adapted to R3B needs.
[1] Nuc. Phys. B 158 (2006) 186
[2] JINST 4 P11007 (2009)

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