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Editorial

Editorial: Recent advances and applications of Resistive Plate Chambers

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This *Focus Point* concerns four different applications of a particle detector type, the Resistive Plate Chamber (RPC), conceived by V.V. Parkhomchuk *et al.* [1] in the 1970s. Owing to the steady progress made over the past decades in improving its key features, this detector is still widely used in High-Energy Physics (HEP) experiments and it has increasingly being adopted in various other fields.

The RPC is a gaseous detector featuring an excellent time resolution comparable or, in more recent designs, even sensibly better than traditional spark chambers. As a consequence of the demonstration that RPCs can be manufactured by using cheap and widely available plastic materials [2], this detector has become, since the 1980s, a very cost-effective solution for covering very large detection surfaces (above $100\,m^2$). These features, together with the capability to work in magnetic fields, have made RPCs the cutting edge choice for designing large trigger systems for HEP experiments. For instance, RPCs covering a total sensitive surface of $15000\,m^2$ have been deployed for the muon trigger arrays of the ATLAS and CMS experiments at the LHC.

The last years have seen flourishing innovative designs that considerably enlarged the application areas of RPCs. The contributions selected for this *Focus Point* represent some remarkable examples of novel applications of RPCs concerning:

- Charged particle identification by the Time-Of-Flight (TOF) technique. Multigap RPCs with floating electrodes play a key role in the design of the TOF barrel array of the ALICE experiment at the LHC. By featuring a detection efficiency above 99% and a time resolution below 80 ps, this application has paved the way to an approach that has superseded the technology based on scintillators and phototubes.
- Devices for medical imaging. A full-body Positron Emission Tomography (PET) scanner covering an axial length of 2.4 m has been designed by employing RPCs. The anticipated performance opens new directions in developing RPC-based large axial-field-of-view PET and high-resolution small-animal PET systems.
- Development of micropattern gaseous detectors with resistive electrodes. This new generation of detectors combines the key features of RPCs (spark protection and time resolution) with those of micropattern detectors (high granularity and space resolution) thus allowing applications unexpected still few years ago.
- Outreach activities and scientific communication. In the framework of the Extreme Energy Events Project [3], forty cosmic muon telescopes, made of three multi-gap RPCs each, have been built and run by high-school students and teachers from all over the Italian territory under the supervision of senior physicists. The achieved goal has been the training on challenges in particle instrumentation and in the analysis of the recorded data.

In conclusion, the collection of papers presented in this *Focus Point* shows that although RPCs have reached an excellent level of maturity, they are still benefiting of relevant advances and are employed for very peculiar applications.

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