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Towards more eco-friendly gaseous detectors

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In the last years, the particle detector community faced a new challenge: how to convert existing and future gaseous detectors in more eco-friendly ones. Indeed, several detectors make use of greenhouse gases (GHGs) since they allow achieving excellent performance and long-term stability. With a growing concern on climate change and future restrictions, it is fundamental to look for solutions that can balance detector performance with an eco-friendly approach.

CERN was a pioneer in developing strategies to reduce the use of GHGs in particle detection. Three different strategies have been implemented: the use of gas recirculation and recuperation systems for existing and future detector systems and the search of alternative eco-friendly gas mixtures.

Thanks to the first two approaches, it is possible to recycle the gas mixture supplied to the detectors and to retrieve GHGs from the used gas mixtures, allowing a reduction of GHG emissions up to 95-100% at the LHC experiments.

By looking at the long-term operation and future particle detector applications, the search of alternative eco-friendly gas mixtures must be envisaged. A big effort is on-going for the C2H2F4 replacement for the Resistive Plate Chamber (RPC) detectors, which nowadays account for most of CERN particle detector emissions. Several eco-friendly gas mixtures have been identified and tested but finding a suitable replacement for the LHC experiments is particularly challenging. Alternatives to SF6, which is the most powerful GHG, are under studies for RPCs in term of detector performance and chemical characterization. Last point is increasingly crucial since most of the so-called eco-friendly gases belong to the PFAS family which is very likely to be subject to new regulations soon.

An overview of the CERN strategies to reduce GHGs from particle detectors will be presented, with a particular focus on the studies on eco-friendly gas mixtures.

Collaboration

Role of Submitter

I am the presenter

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