



Contribution ID: 204

Type: **not specified**

R&D on quantum sensors for particle physics: the DRD5 collaboration

The detector R&D roadmap initiated by ECFA in 2020 highlighted the large number of particle physics opportunities that can be enabled by targeted and collaborative R&D in the field of quantum sensors and related technologies. Task Force 5 (TF5) of that roadmap exercise, together with the involved communities, established a list of the most promising areas for investment, and defined the R&D that would be needed to bring quantum sensors to a level that they can be incorporated into experiments. The vision outlined in the ECFA report led to the formation of DRD5 (Detector R&D 5), a global collaboration dedicated to addressing the challenges that must be overcome to realise the potential of quantum sensing for the community.

DRD5 focuses on five families of Quantum Sensors with particular suitability to particle physics, and where coordinated developments can bring about major advances in terms of sensitivity, ease of access, standardization, cost or physics reach. These are: 1) Atomic, Nuclear & Molecular Systems in Traps and Beams; 2) Quantum Materials (0-, 1- and 2-dimensional); 3) Quantum Superconducting Devices; 4) Scaled-up large ensembles of spin-oriented, hybrid or opto-mechanical elements; 5) Quantum Techniques for Sensing. These five technological domains are complemented by an overarching activity dealing with Capacity Expansion and Exchange. This document lays out the resulting high-level opportunities and common challenges that are part of pursuing the required R&D on quantum sensor technologies on a global scale.

Authors: DEMARTEAU, Marcel (Oak Ridge National Laboratory); DOSER, Michael (CERN); WORM, Steven (Deutsches Elektronen-Synchrotron (DE))