

# 12th Course - Challenges in Radiation Damage and Radiation Protection during Design and Operation of Accelerator Facilities and Space Missions

Contribution ID: 39

Type: **not specified**

## Challenges in the Design of Muon Colliders

*Sunday 29 October 2023 15:20 (55 minutes)*

Following the 2020 update of the Strategy for Particle Physics, the European Large National Laboratories Directors Group (LDG) initiated a new International collaboration to progress on the studies for the feasibility of a Muon Collider at 10+ TeV towards the goal of publishing a report, in time for the next European Strategy for Particle Physics Upgrade (ESPPU) at the end of this decade, providing sufficient information to decide whether there is confidence to move on to a proper Conceptual Design Report (CDR) phase. The Collaboration elaborated a detailed resource loaded R&D roadmap necessary to prove the technologies involved and is addressing the most urgent points on both the machine and detectors. The Collider aims at producing an integrated luminosity of  $10 \text{ ab}^{-1}$  at 10 TeV, with an intermediate step at 3 TeV delivering  $1 \text{ ab}^{-1}$ . The muon collider presents several challenges, starting from a production target that will have to sustain a deposited power of  $2\div 4 \text{ MW}$ , Superconducting Solenoids with large field on axis ( $5\div 40 \text{ T}$ ) and subject to heavy irradiation, RF acceleration in magnetic fields, fast acceleration to cope with the short lifetime of muons, and finally the need to keep under control the neutrino radiation on surface. In this talk I will give a brief overview of all those challenges and provide examples of how the Collaboration is addressing them.

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