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Construction and commissioning of the Mu2e crystal and SiPM calorimeter system

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The Mu2e experiment at Fermilab searches for the neutrino-less conversion of a negative muon into an electron, with a distinctive signature of a mono-energetic electron with energy of 104.967 MeV. Mu2e aims to improve by four orders of magnitude with respect to the current best limit.

The calorimeter plays an important role to provide excellent particle identification capabilities and an online trigger filter while improving the track reconstruction capabilities, asking for 10% energy resolution and 500 ps timing resolution for 100 MeV electrons. It consists of two disks, each one made by 674 un-doped CsI crystals, read out by two large area UV-extended SiPMs.

In this talk, we present the status of construction and the QC performed on the produced crystals and photosensors, the development of the rad-hard electronics and the most important results of the irradiation tests done on the different components from crystals to SiPMs and electronics. Irradiation has been carried out with ionising doses, neutrons and protons. Production of electronics is now underway. We summarize the QC in progress on the analog electronics and on the integrated SiPM+FEE units. Construction of the mechanical parts are also well underway. Status and plans for the final assembly and commissioning are described.

A large calorimeter prototype (dubbed Module-0) has been tested with an electron beam between 60 and 120 MeV at different impact angles and the obtained results are reported. A full vertical slice test with the final electronics is in progress on Module-0 at the Frascati Cosmic Rays test setup. Stability of response and calibration results are shown.

Collaboration

Mu2e

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