

Pre-production and quality assurance of the Mu2e crystals

Tuesday 19 September 2017 10:22 (1 minute)

The Mu2e calorimeter is composed by two disks of 1348 un-doped parallelepiped CsI crystals of $34 \times 34 \times 200$ mm³ dimension, each one readout by two large area SiPM arrays.

We translated the calorimeter requirements in a series of technical specifications for the crystals that are summarized by the following list:

- (i) a well defined 3D crystal shape with ± 100 μ m tolerance on the transversal dimension and 100 μ m tolerance on each plane flatness and on the parallelism and perpendicularity between faces;
- (ii) a light yield > 100 p.e./MeV when readout with a UV extended 2" PMT;
- (iii) a good longitudinal response uniformity (LRU) rms $< 5\%$ measured along the crystal axis;
- (iv) a large ratio F/T > 0.75 between the fast scintillating light component, integrated in 200 ns, and the total light emitted within 3 μ sec;
- (v) a good radiation resilience with a light output loss $< 65\%$ after a total ionization dose up to 100 krad and a neutron fluence up to 10^{12} n/cm²;
- (vi) and a small contribution to the readout noise < 0.6 MeV related to the radiation induced fluorescence in the crystals.

A pre-production of 72 Mu2e crystals has been procured by three international firms (Amcryst, St. Gobain and Siccas). A detailed quality assurance (QA) has been carried out on each crystal for the determination of its mechanical and optical parameters.

The measurement of the radiation hardness have been carried out on 2 (1) random sample for each firm for irradiation with ionization dose (neutrons). A summary of the techniques used and of the QA characterization of the crystals will be shown.

Has accepted

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Session Classification: Poster Session 1

Track Classification: P1_applications