



Report on Working Group # 2

The MU2E detector

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LNF INFN Frascati

MUSE Scientific Board meeting

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Calorimeter: Status



- **Statement of Work between DOE and INFN done**

- **Pre-production of crystals and SiPMs done**
 - mechanical dimensioning of crystals done
 - Optical QA in progress at LNF and Caltech
 - QA of SiPMs in progress in Pisa
 - MTTF of SiPMs in progress @ LNF
 - Irradiation planned @ NFG.
Under planning for HZDR

- **Pre-production FEE in progress for 150 chips+5 MB NIM prototype**
- **Pre-production WD in progress → first board 20 channel expected now**

- Full size Mockup of Mechanics is standing on its own feet.
CF inner disk and fake crystals arriving.
- **Module-0 construction in progress. Integration expected in January**

Calorimeter: Deliverable (end 2016)



- A first draft is available for the Final Design report of the calorimeter.
Title is: Mu2e Calorimeter FTDR (Final Tech. Des. Report)

In this FTDR we describe all changes since the all-together Mu2e TDR of 2015.

- Completion of the technology choice with CsI+SiPM as final option
- Simulation and performances
- Selection of CsI crystals and of the Mu2e custom SiPMs
- Engineering progresses
- QA

- It is a solid 120 pages report.
- It will be published as open access DOCDB for the moment in order to be visible, as version 1, from our WebSite.
- It can be a living document in view of the CRR of 2017
- If reviewed by our Publication Board can be later submitted to ArXiv and as Fermilab technical document.

Calorimeter: Deliverable (end 2016)



Mu2e Docdb
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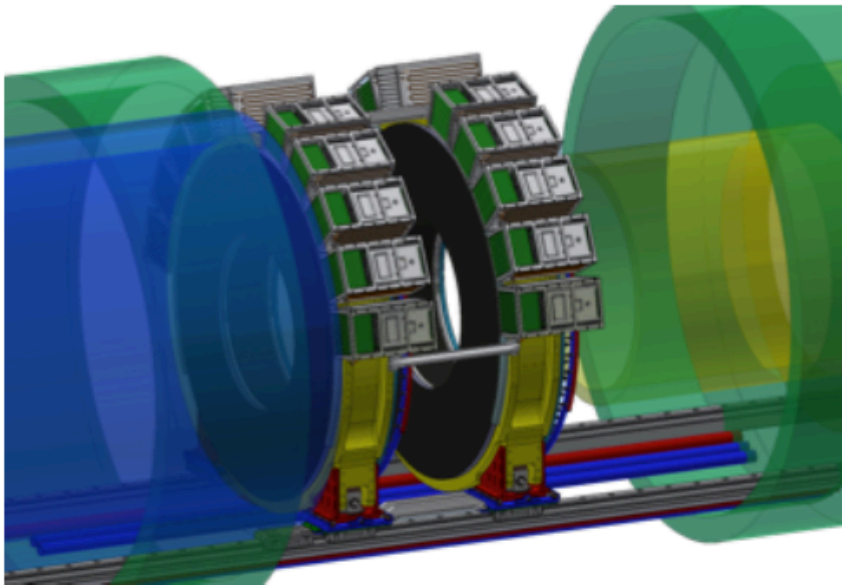
The Mu2e Calorimeter Final Technical Design Report

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Introduction and motivations

Since the writing of the Mu2e TDR, that was released at beginning of 2015 (Ref.1), the Calorimeter system had to undergo a long list of changes to arrive to its final shape. These changes were due to two different aspects: (i) on one side, during 2015 the technology choice between the TDR proposed solution of BaF₂ crystals readout with solar Blind Avalanche Photodiodes (APDs) and the backup option of CsI crystals readout with Silicon Photomultipliers (SiPM) has been completed and (ii) on the other side, the numbering of channels, the mechanical system and the readout electronics were substantially modified while proceeding with engineering towards the working solution.

The scope of this document is to update the description of the calorimeter system to make it a useful reference for future usage while adding also the most recent engineering drawings and help us proceeding towards the Construction Readiness Reviews.

After a year long discussion and a dedicated review (Ref.2), we have adopted the backup option with un-doped CsI due to two main considerations: (i) the test beam carried out on a small size prototype demonstrated that this option was viable and satisfied Mu2e calorimeter requirements and (ii) while the baseline solution was really promising, the development of the solar blind APDs was taking too much time and was start impacting the overall calorimeter preparation schedule in view of final design reviews and CD-3c. In order to take advantage of all the R&D work done in the previous years, we have maintained a development phase, both for solar blind APDs and SiPMs for the BaF₂ option in view of future upgrades of the calorimeter system for the Mu2e phase-II.

This Final Technical Design Report (FTDR) is therefore organized in 10 sections:

- (i) a summary of the calorimeter concept and its requirements;
- (ii) the calorimeter simulated performances in the Mu2e environment and its measured performances at an electron test beam;
- (iii) a description of un-doped CsI characteristics and their Mu2e specifications;
- (iv) a description of the SiPM characteristics and their Mu2e specifications;
- (v) the design and status of electronics both for the front end (FEE) and digitization (WD) systems;
- (vi) the design and status of the mechanical system;
- (vii) the design and prototyping of the calibration systems;
- (viii) risks, management and QA calorimeter program;
- (ix) the status and plans for the calorimeter Module-0 system;
- (x) plans for installation and commissioning.