



U.S. DEPARTMENT OF
ENERGY

Office of
Science

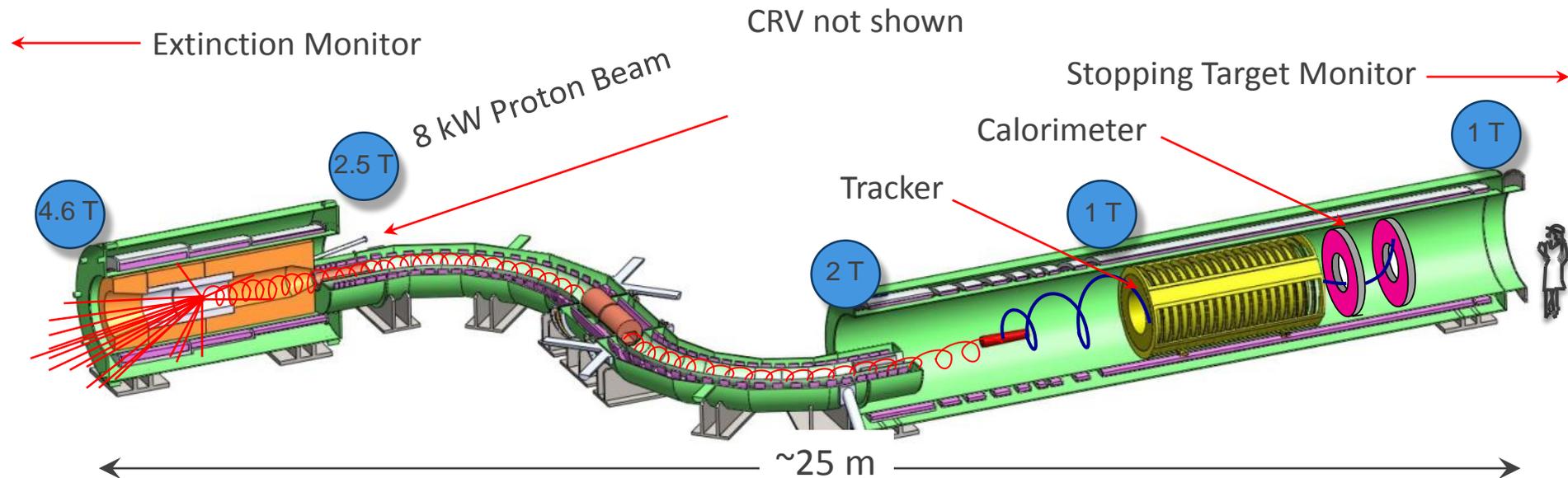
TDAQ Executive Session

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Introduction

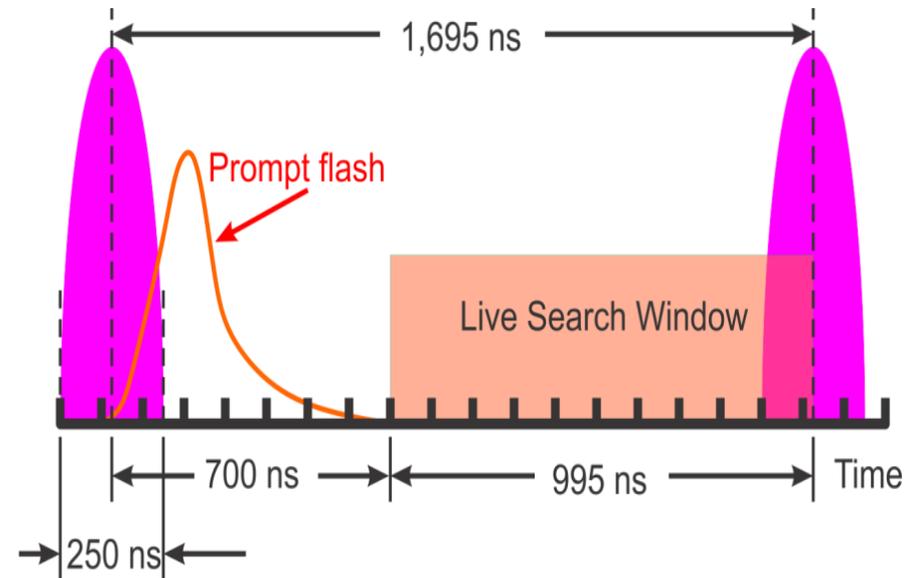
Mu2e includes several sources that pass data to the DAQ

- Tracker
- Extinction Monitor
- Calorimeter
- Stopping Target Monitor
- Cosmic Ray Veto
- Slow Controls, etc.
- The DAQ must also distribute a clock to all of these devices.



Introduction

- Strong variation of rates with time
- Beam flash persists for hundreds of ns after protons strike production target
- We wait about 700 ns before looking for conversion electrons
 - Prompt backgrounds go away
 - Lower rates in detectors
- Beam delivered for 1/3 of the 1.4 sec Main Injector supercycle.
 - Take cosmics when beam is not being delivered



Charge

- The Mu2e Trigger & Data Acquisition subsystem is constructed primarily from commercial parts but requires a substantial amount of programming. The TDAQ employs a streaming architecture with no hardware trigger. All trigger decisions are made in software/firmware.
- Mu2e is holding a series of technical design reviews for major systems. Final Design Reviews are held when designs are 80-90% complete. At this point, the design is mature enough to be reviewed but it is still possible to make adjustments based on feedback. A Final Design Review provides assurance that the completed design will meet all functional and performance specifications.

Charge

The committee is asked to address the following questions:

1. Does the TDAQ meet the requirements of the Mu2e experiment?
2. Are the interfaces between TDAQ and the detector subsystems well defined?
3. Is the TDAQ commissioning plan well defined and documented?
4. Has the technical risk of having higher data rates than expected in the experiment been properly evaluated and mitigated?
5. Is the design on track to satisfy the requirements for a DOE CD-3c review in late spring 2016?

Design Maturity

- For CD-3 approval, all designs do not have to be final, but they do need to be
 - Mature (80-90% complete)
 - There must be a plan for completing the design
 - The risks associated with the remaining design must be small
- For TDAQ
 - Hardware design is essentially complete
 - Pilot system tested
 - Lots of software left to write.
 - Need to optimize filter algorithms in firmware and software
 - Different algorithms on and off spill

Construction Readiness

- Prior to construction of any significant component, there will be a Construction Readiness Review. For this review we require
 - Final design and drawings complete
 - All recommendations from design reviews have been adequately addressed
 - Safety, QA and Labor plans in place
 - Interfaces fully defined and agreed to by all relevant parties
 - Evaluation of pre-production prototypes complete, where applicable
- This procedure has been vetted with DOE and was used to initiate construction of the Transport Solenoid Modules

Schedule

- Mu2e received CD-2 in March 2015.
- DOE CD-3c review scheduled for summer 2016
 - Timing of CD-3c is based on when the solenoids are ready, but other components have to be mature on that timescale as well.
- TDAQ needed to commission detector beginning in 2020.

Thank You

- Thank you for helping us to assure that we have a workable, robust design.
- Peer review is an important part of this process.
- A written report with your comments and recommendations within 2 weeks will be very helpful.