

Progress on Mu2e-II since last Precision Science Workshop

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At the last Prec. Sci. Workshop (April 2018)

- Dec-2017 : A Mu2e-II Workshop was held at Argonne National Lab



- 73 participants
- Identified experiment challenges
- Brainstormed technology solutions
- Summary Report available [here](#)

- Feb-2018: Submitted an Expression of Interest for the Evolution of Mu2e (Mu2e-II) to the Fermilab PAC
 - 130 signatories / 36 institutions / six countries
 - arXiv:1802.02599 / Fermilab-FN-1052

Since then...

- **June-2018** : Directorate initiated a Task Force charged with developing a conceptual design for the Mu2e-II proton beam line and target
 - Chairs: S. Werkema, R. Zwaska
 - Main challenges: beam trajectory & 100 kW-capable target
 - Final report due early 2019... but progress slow... rethink approach?
- **July-2018** : Mu2e-II presentation to Fermilab PAC. From the final report:

The PAC recognizes that the physics case of a factor of ten sensitivity improvement is compelling for all scientific outcomes of a successful (in terms of reached sensitivity) Mu2e experiment

The PAC recommends the Mu2e-II proponents to identify the most relevant and urgent R&D items for the detector. The PAC endorses the Mu2e-II request of dedicated R&D funding and encourages them to engage the Laboratory and funding agencies into identifying the required resources.

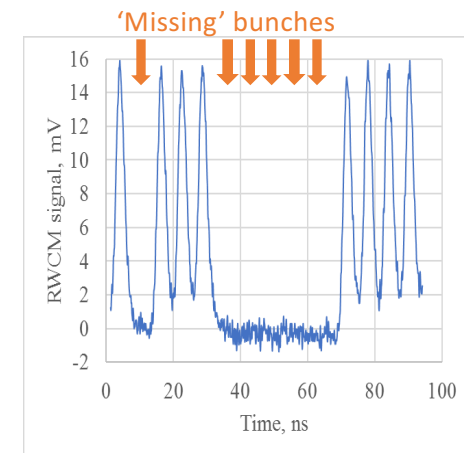
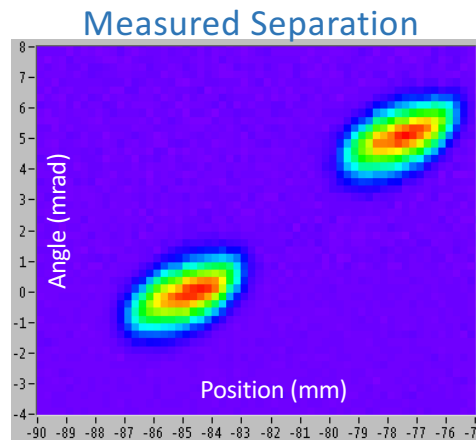
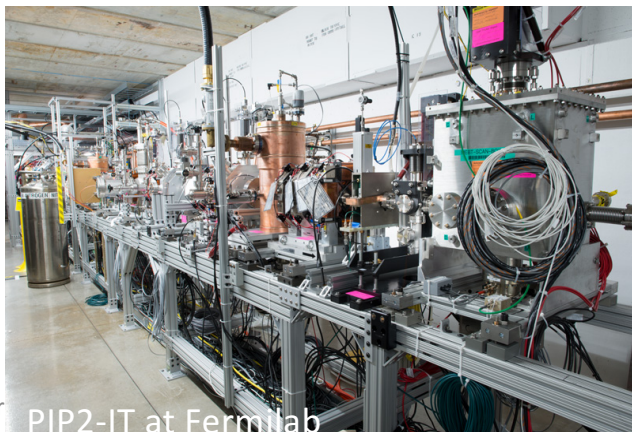
Mu2e-II Progress since April 2018

- Aug-2018 : A Mu2e-II Workshop was held at Northwestern University



- 77 participants
- Enumerated R&D tasks & objectives
- Summary Report [here](#).

- Sep-2018 : Developed proposal to measure extinction performance of the beam chopper using PIP2IT – important for Mu2e-II



Mu2e-II Progress since April 2018

- Oct-2018 : Interfaced with relevant writers of DPF ESG White Paper to ensure Mu2e-II is integrated into the final document
 - Included in “Detector R&D” and “Exploring the Unknown” sections
- Dec-2018 : Together with spokespersons of MEG, $\mu 3e$, and COMET submitted a joint White Paper for the ESG, “Charged Lepton Flavor Violation using High-Intensity Muon Beams at Future Facilities”
 - Explicitly discusses Mu2e-II using ~ 100 kW of PIP-II beam
 - arXiv:1812.06540, Fermilab-FN-1064, ESG Submission ID-25
 - Invited to make a presentation at May Workshop
- Feb-2019: Visited Germantown and briefed DOE on the progress and plans for Mu2e-II... Discussed support for Univ. groups pursuing Mu2e-II R&D
 - OHEP: ‘OK as long as not too large and dovetails with current Mu2e commitments’
- Mar-2019: AD Target Department hiring a new Associate Scientist to help develop Mu2e/Mu2e-II production target

For Discussion – Highest Priorities

- a) **Ensure progress on extinction measurement at PIP2IT**
 - Myron Campbell, Monica Tecchio, Yongyi Wu (GS) from U. Michigan are working with Paul Derwent and Dave Johnson to design this system
 - In FY19 they need to complete R&D and design
 - In FY20 they need to purchase equipment, assemble, and test
 - In FY21 PIP2IT is scheduled for decommissioning

- b) **Identify R&D required for Mu2e-II production target and work with stakeholders to secure resources to pursue this work**
 - Rethink Task Force... Streamline? Abandon and take a new approach?
 - Engage new hire in AD Target Department in helping advance this?
 - Eventually, engage RADIATE and help develop a specific proposal

For Discussion – Highest Priorities

c) Understand whether R&D is required for a new PS conductor

- We are assuming a new PS magnet will be needed
- Can we use the same conductor?
 - If so, need to identify a vendor
 - If not, need to pursue R&D to develop a new conductor

d) Reconsider realistic goal for next P5 exercise

- Next P5 exercise will begin in ~FY2021... “Snowmass” about 1y ahead of that
- Current Mu2e project scheduled for completion in FY2022
- What can we realistically accomplish given current commitments?
- Is that enough for P5?

Required progress on Highest Priorities by FY

- In FY19 we need to

Priority a)

- Find partial support for U.Michigan graduate student **[done]**
- Find lab space and some equipment for U. Michigan **[talked to PPD; submitting TSW]**
- Ensure the design for PIP2IT extinction measurement converges **[in progress]**
- Understand their needs for FY20... build that into budget **[need to revisit based on design]**

Priority b)

- Retool / Redo Task Force **[first step... work with AD & Chairs to identify way forward]**
- Begin making progress on understanding the R&D needs for Mu2e-II production target
- Consider pursuing US/Japan funds in partnership with COMET as a way to advance these studies

Priority c)

- Begin Calculations to understand whether we require PS conductor R&D **[not started...]**

Priority d)

- Understand our goals for next P5 exercise **[requires discussion...]**

Required progress on Highest Priorities by FY

- In FY20 we need to

Priority a)

- Purchase & assemble the test equipment
- Make the measurement at PIP2IT before it's decommissioned

Priority b)

- Work with RADIATE to develop a proposal for target R&D relevant for Mu2e-II
- Submit proposal for US/Japan funding to help advance R&D relevant for Mu2e-II and COMET-II

Priority c)

- Finish calculations/simulations to determine if conductor R&D is required

Priority d)

- Organize for “Snowmass”