The Mu2e experiment @ Fermilab

Mu2e searches for the muon to electron conversion in the field of an Aluminum nucleus.

➔ CLFV process strongly suppressed in Standard Model: BR ≤10^{-52}

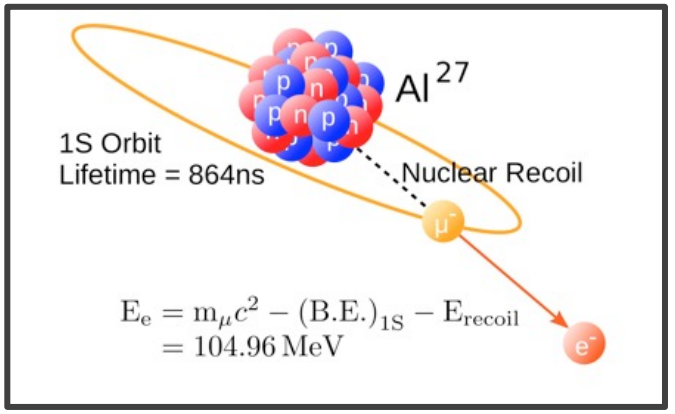
➔ Its observation is BSM physics → Goal: 10^4 improvement w.r.t. current sensitivity

With 10^{18} muon stops *μ-e* conversion in the presence of a nucleus

$$R_{\mu e} = \frac{\mu^- + N(A,Z) \rightarrow e^- + N(A,Z)}{\mu^- + N(A,Z) \rightarrow \nu_\mu + N(A,Z-1)}$$

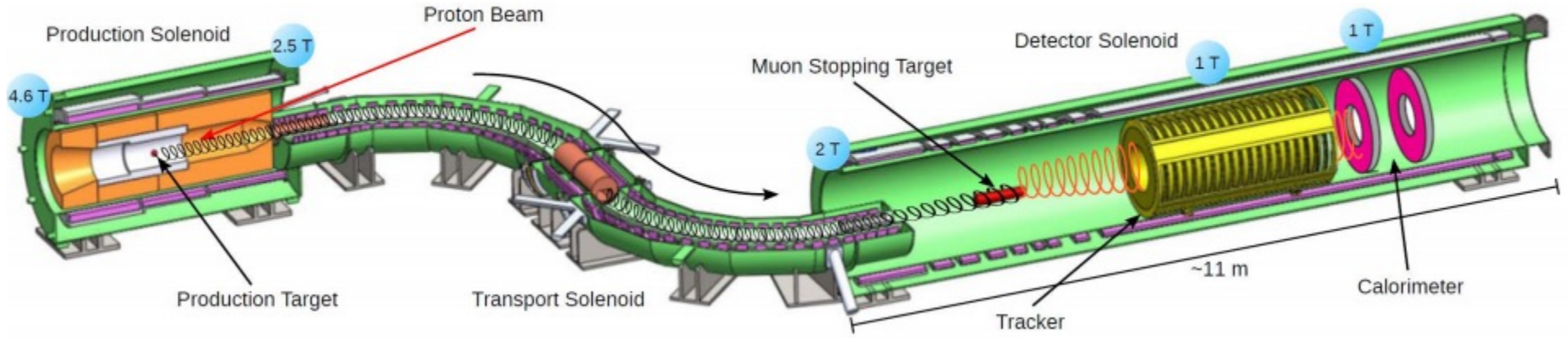
< 8.4 x 10^{-17}

Nuclear captures of muonic Al atoms



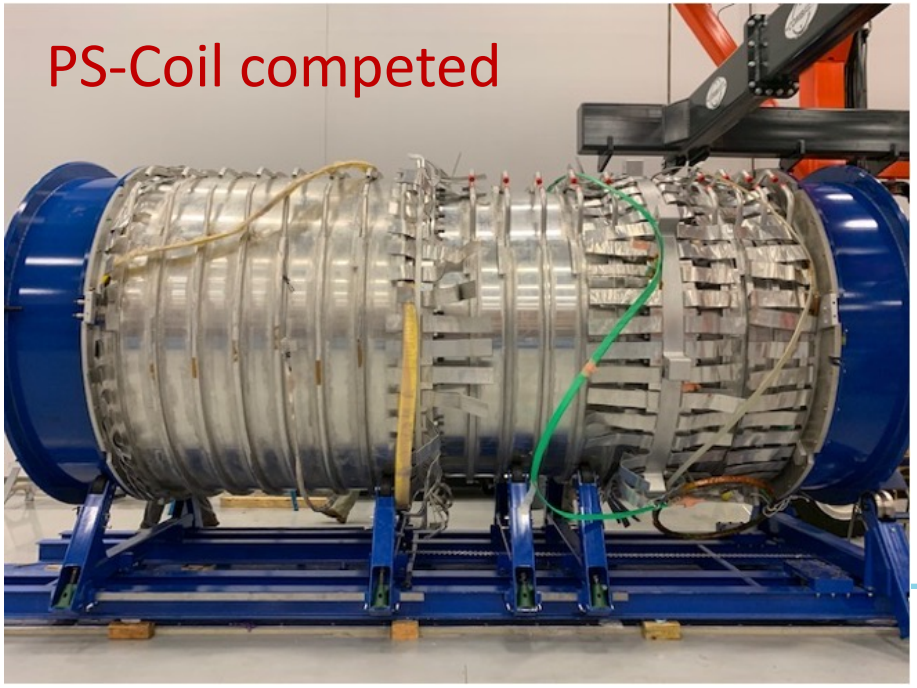
- Low momentum pulsed muon beam stopped in Al target (10 GHz)
- Muons trapped in orbit around the nucleus
- μN→*e*N signature → **mono-energetic electron @ 105 MeV**

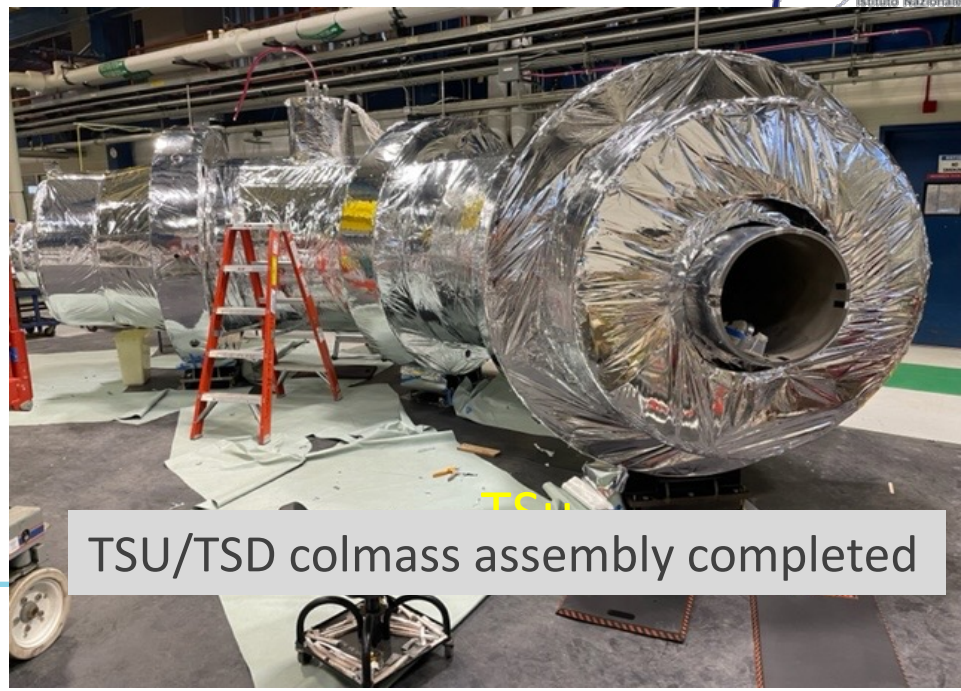
Production & Transport Solenoids

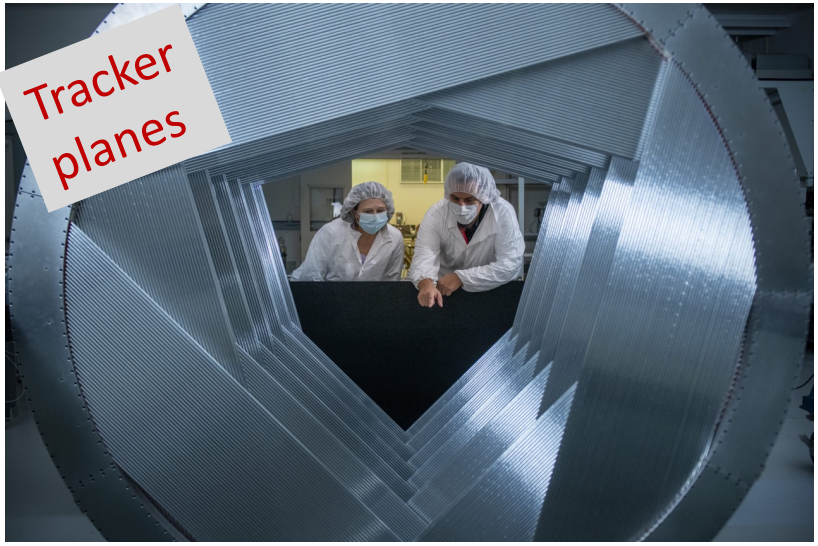


Detector Solenoid

Status of solenoids and other systems





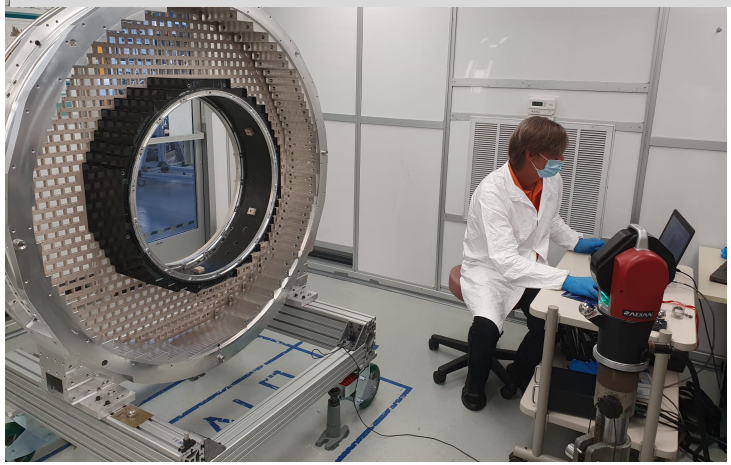


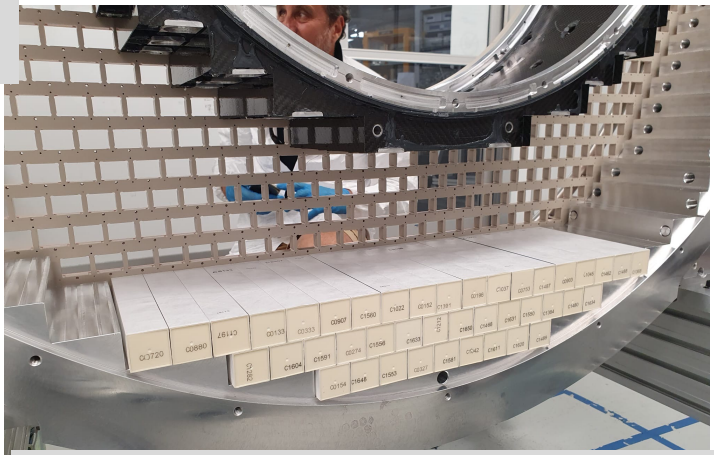
Mu2e @ 2022:

- ✓ **10 years of construction, O (300 M$) cost, 200 people**
- ✓ **Critical path driven by Solenoids + 1.5 year Covid Delay**
- ✓ **CD-4 date for project complete of Dec-2022 failed**
- ✓ **REBASELINE in progress (Sept 2022)**
- ✓ **CD-4-*new date in 2025***
- ➔ ***INFN Contributions: TS prototype, Calorimeter system, TDAQ sw, Simulation.***
- ➔ ***Proposing to contribute to accelerator test and development***

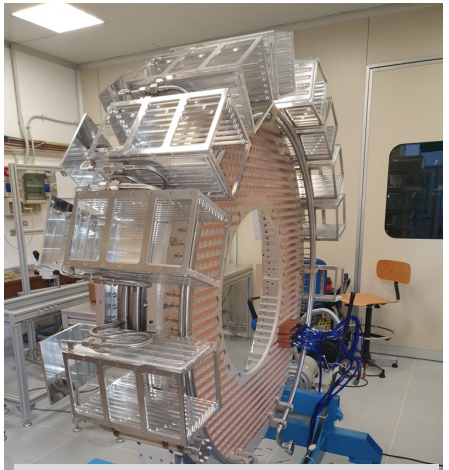
Mu2e INFN contributions 2022 for Calorimeter

Calorimeter disk Survey at FNAL



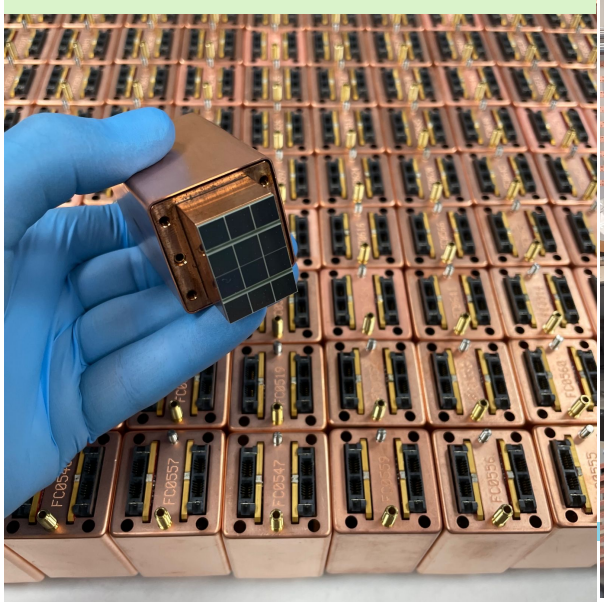


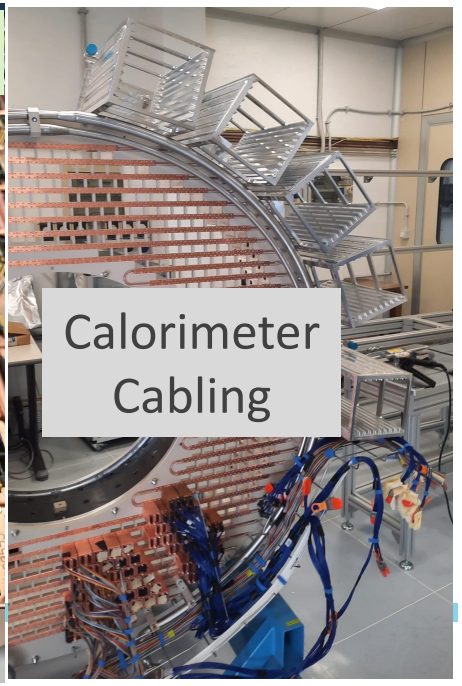
test of crystal stacking @ FNAL



Calorimeter crates

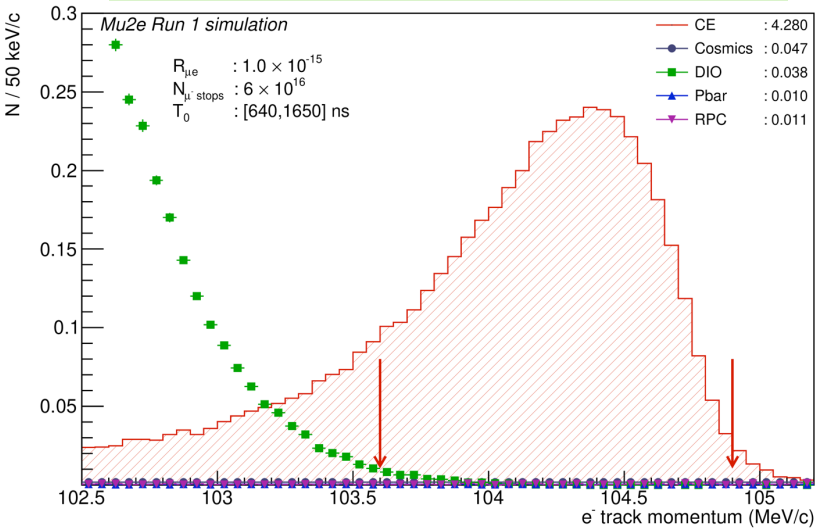
Readout Units piling up





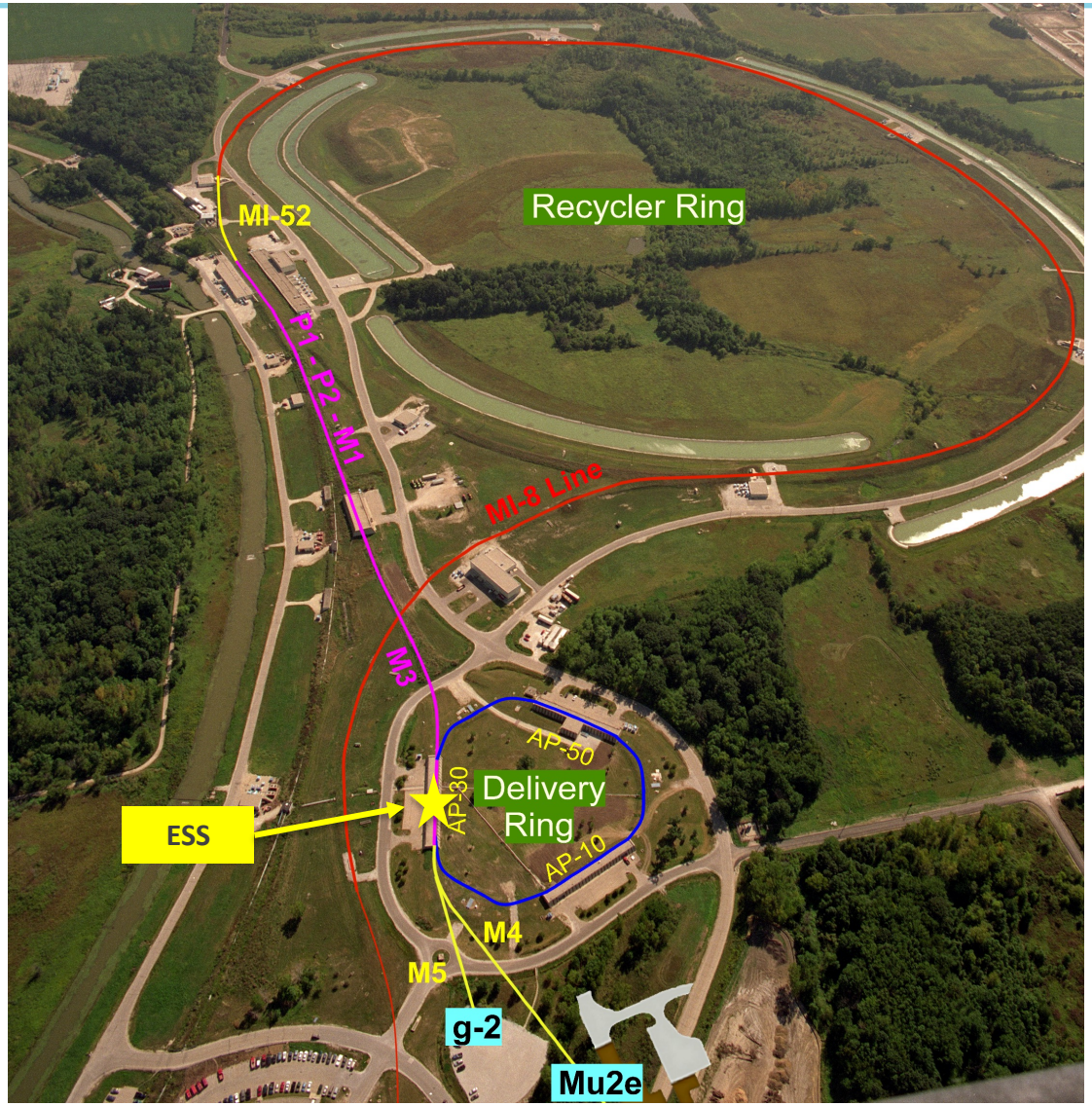
Calorimeter Cabling

Sensitivity Update 2020

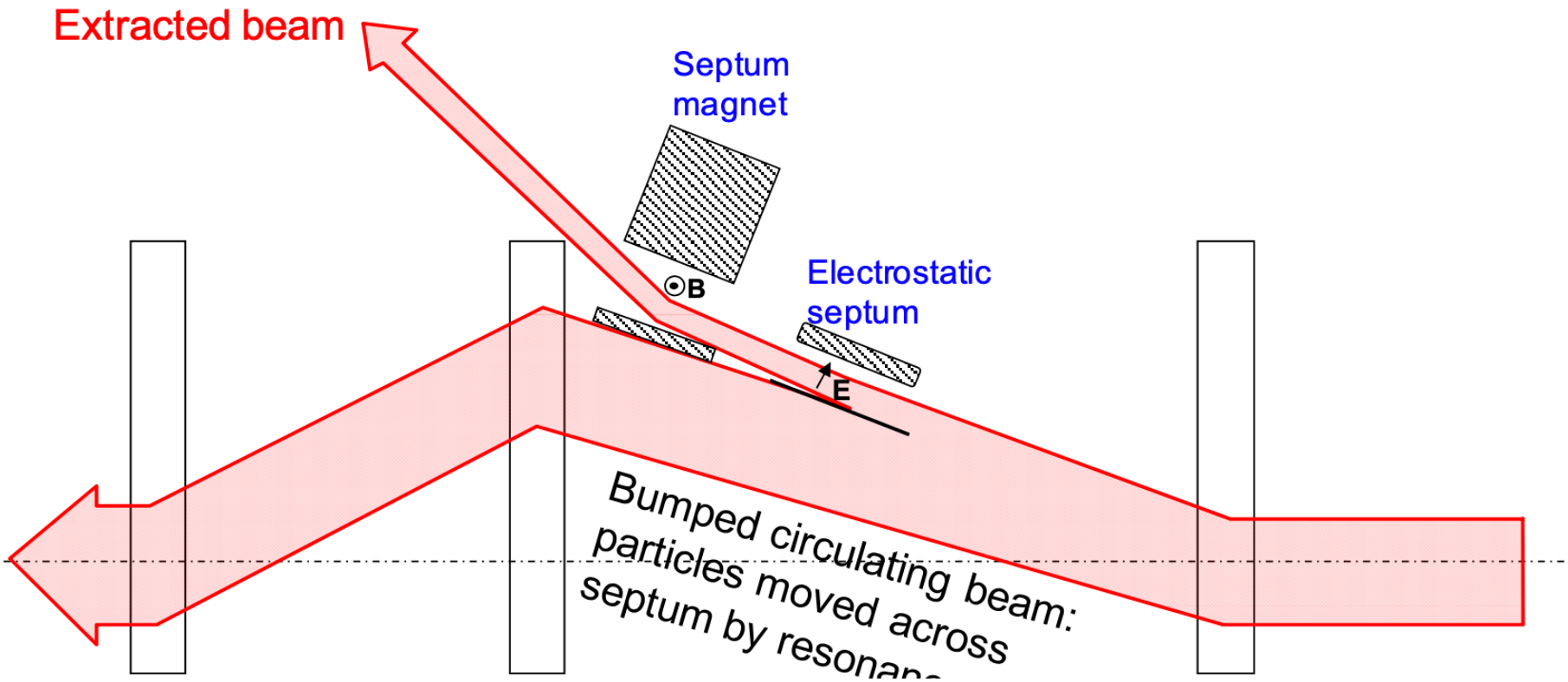


General information about the Mu2e

Aerial view to the Accelerator beam lines



Septum magnet for slow resonant extraction



Resonance is driven by sextupoles

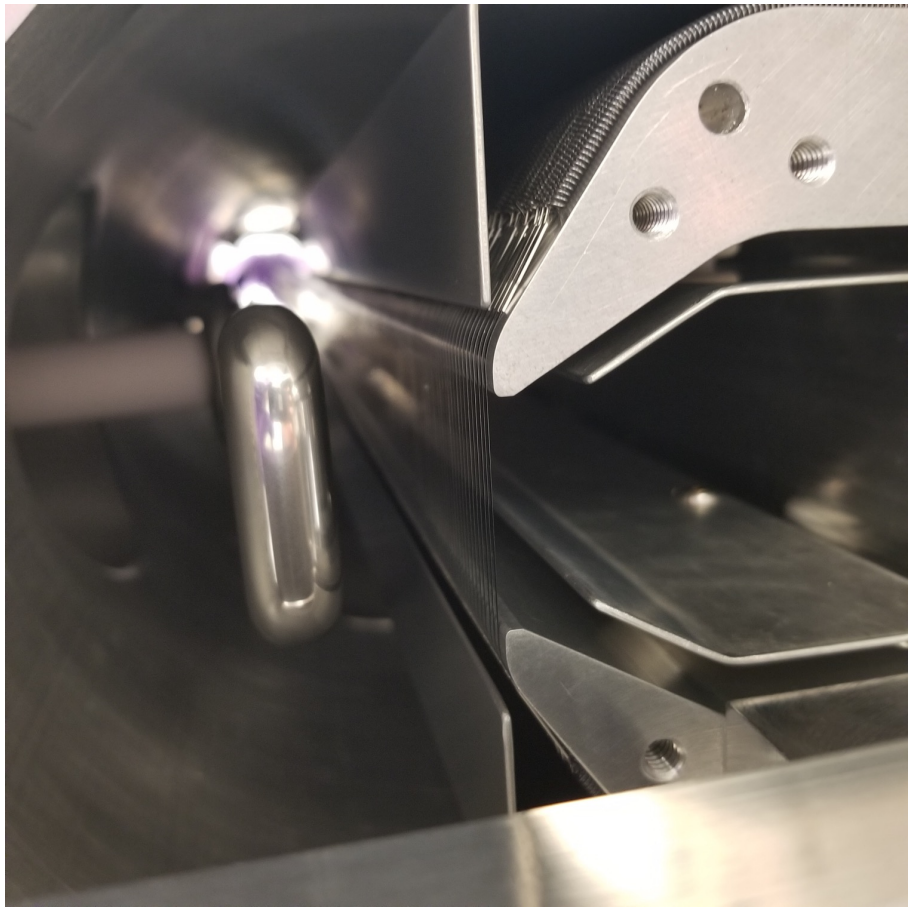
Largest oscillating particles are captured by the septum magnet yielding extraction

A fraction of the particle beam interact with the matter in the septum and generates losses

Septum

- W/Re foils 1mm/25μm
- Effective thickness 50μm

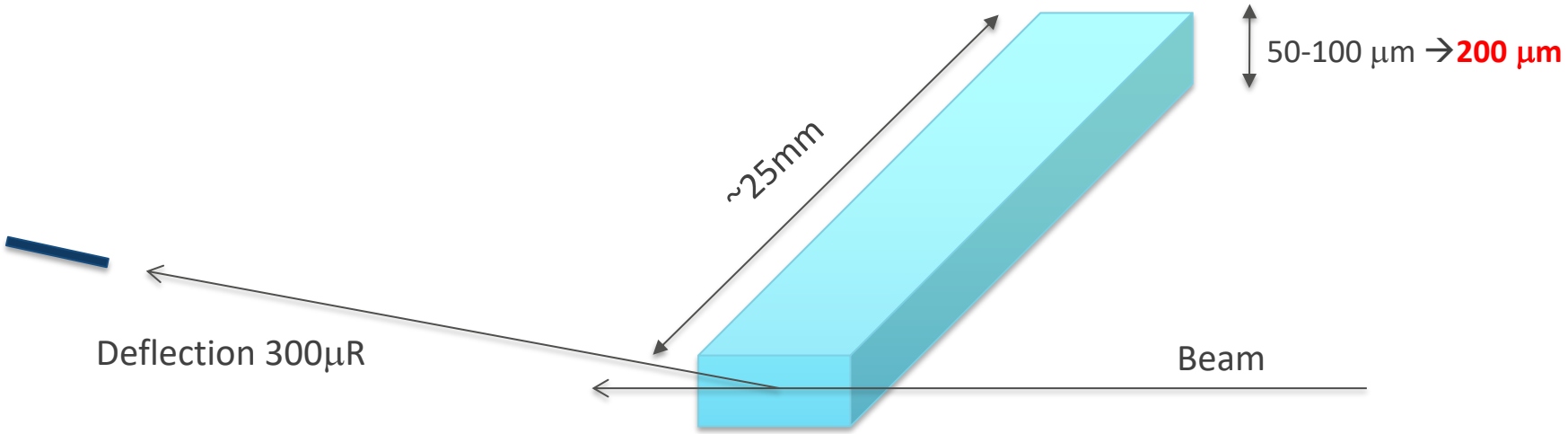
Beam losses occur due to beam passing through the thin septum plane.



Shadowing deflector location options

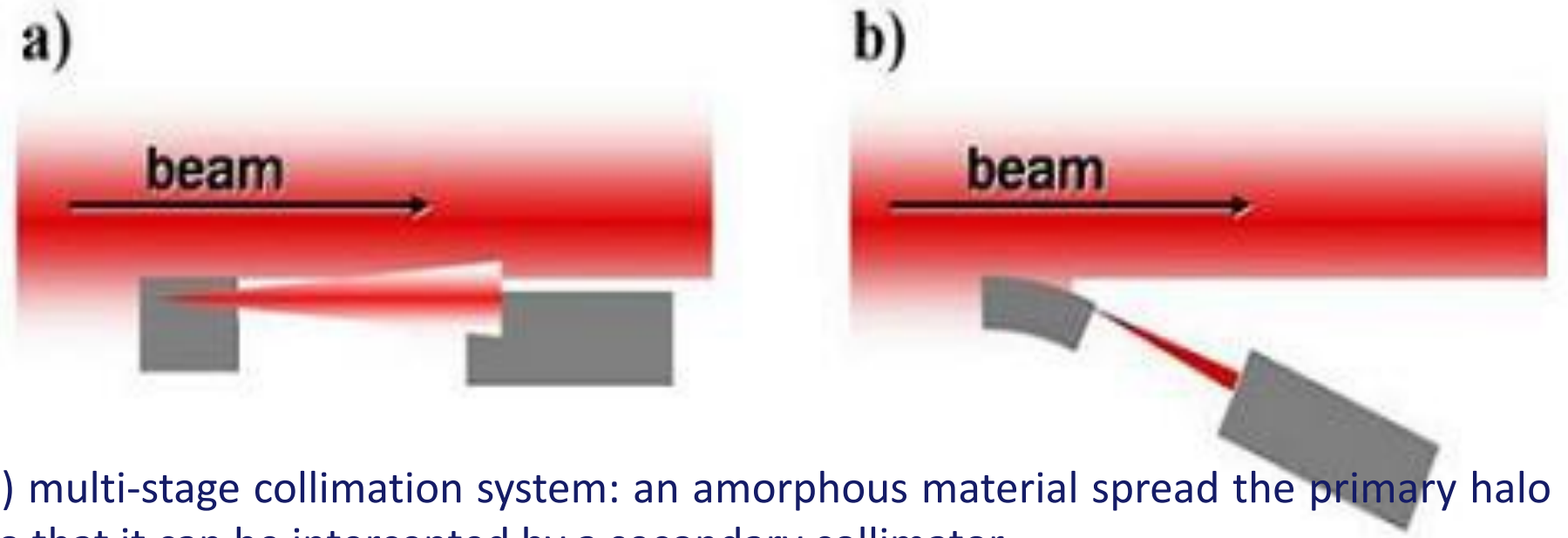
A way to reduce the beam losses at Slow Extraction:
Diffuse the beam away from the septum plane (shadow)

- Use diffuser
- Use the bending crystal



Crystal assisted beam collimation

A “smart target” which kicks all particles in only one direction



a) multi-stage collimation system: an amorphous material spread the primary halo so that it can be intercepted by a secondary collimator.

b) crystal-assisted collimation: a curved crystal deviates the halo directly to the primary absorber.

c) Essential tool for halo collimation in the LHC with 7 TeV protons

Anagrafica Ferrara 2022

	Ruolo	FTE
Laura Bandiera	Ricercatrice	10%
Vincenzo Guidi (RL)	PO	20%
Alessandro Saputi	Tecnologo	10%
Andrea Mazzolari	Tecnologo	0%

Richieste finanziarie ancora in via di definizione