Experimental searches for the μ-e conversion

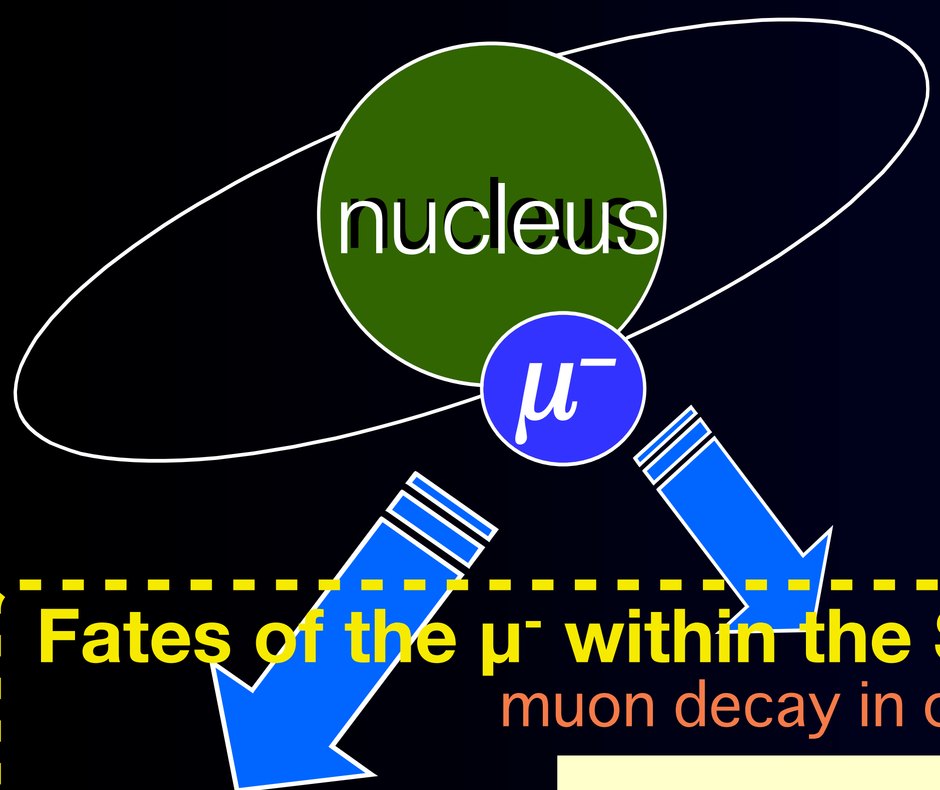
Akira Sato
Department of Physics, Osaka University

Flavor Physics & CP violation 2015 (FPCP 2015)
25-29 May 2015 @Nagoya University

μ-e Conversion Search

- Three experiments are going to start to search for the μ-e conversion process: COMET@J-PARC, Mu2e@FNAL, and DeeMe@J-PARC-MLF.
- These are stopped muon experiments. When a μ^- in stopped in a material, ...

1s state in a muonic atom



Fates of the μ^- within the SM

muon decay in orbit

$$\mu^- \rightarrow e^- \nu \bar{\nu}$$

nuclear muon capture

$$\mu^- + (A,Z) \rightarrow \nu_\mu + (A,Z-1)$$

Beyond the SM

$$\mu^- + (A,Z) \rightarrow e^- + (A,Z)$$

μ-e conversion

Forbidden by the SM, because
the lepton flavor is changed to μ-flavor to e-flavor.

Event signature :

a single mono-energetic electron of 105MeV (for Al)

in the SM + ν masses

μ-e conversion can be occur via ν-mixing, but expected rate is well below the experimentally accessible range. Rate ~$O(10^{-54})$

Discovery of the μ-e conversion is a clear evidence of new physics beyond the SM.

in the SM + new physics

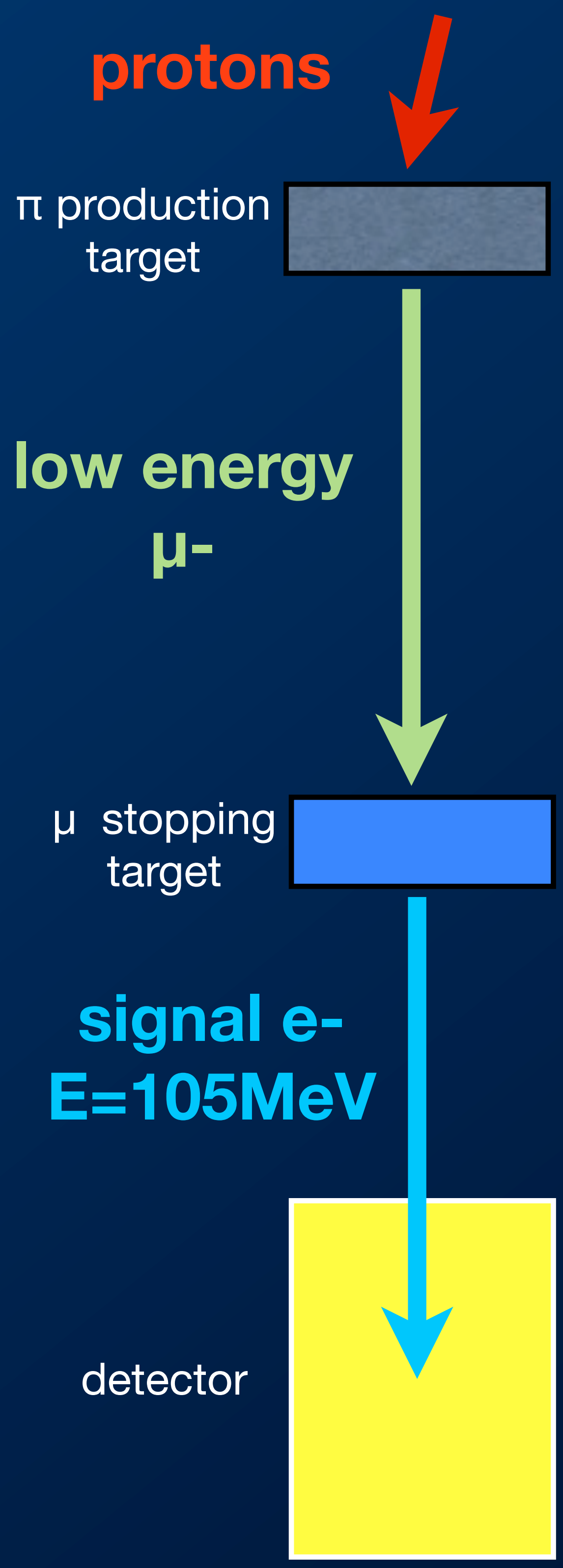
A wide variety of proposed extensions to the SM predict observable μ-e conversion rate.

Current Upper Limits and Coming Precisions

- **Current limits** (90% CL)
  - BR(μ^-Au→e^-Au) < 7x10^{-13} (SINDRUM-II@PSI)
  - BR(μ^-Ti→e^-Ti) < 4.3x10^{-12} (SINDRUM-II@PSI)
  - BR(μ^-Ti→e^-Ti) < 4.6x10^{-12} (TRIUMF)

- **Precision of coming measurements** (90% CL)
  - BR(μ^-C→e^-C) < 2.3x10^{-13} (DeeMe@J-PARC-MLF)
    - 2016~
  - BR(μ^-Al→e^-Al) < 7x10^{-15} (COMET Phase-I@J-PARC-HardonH)
    - 2017~
  - BR(μ^-Al→e^-Al) < 6x10^{-17} (COMET Phase-I@J-PARC-HadronH)
    - 2020~
  - BR(μ^-Al→e^-Al) < 6x10^{-17} (Mu2e@FNAL)
    - 2020~

How to search the μ-e conversion



- Inject proton beam to a pion production target to generate a huge amount of muons.
- Stop the muons in a stopping target.
  - Al target for COMET and Mu2e
  - Muonic atoms are produced
  - μ lifetime in Al ~ 864ns
    - 40% μ : decay in the 1S orbit (DIO)
    - 60% μ : captured to the nulear
- Look for the signal electron with E=105MeV.

Background suppression is the key point!

Backgrounds of μ-e conversion search

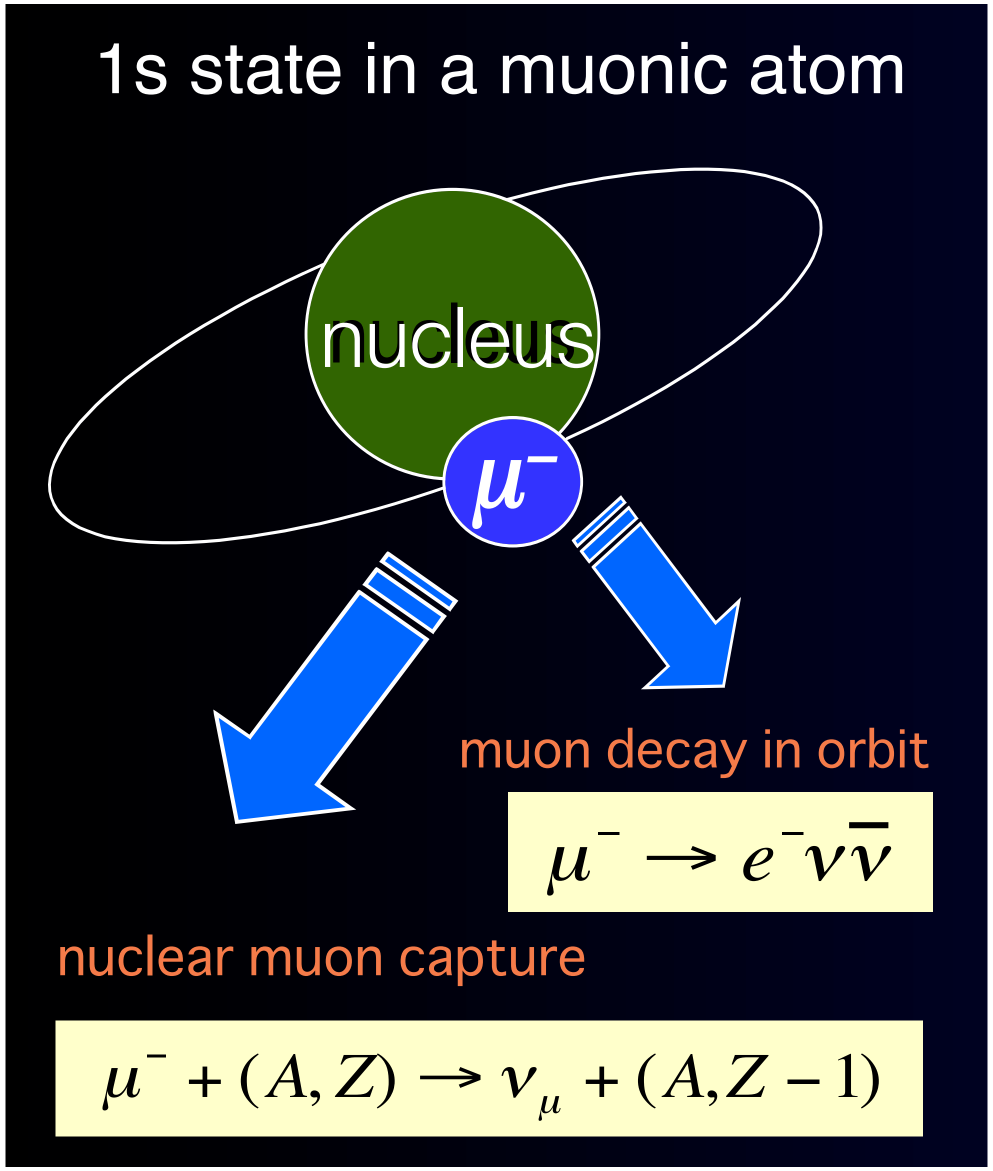
Type	Background
Physics	Muon decay in orbit
Physics	Radiative muon capture
Physics	Neutron emission after muon capture
Physics	Charged particle emission after muon capture
Prompt Beam	Beam electrons (prompt)
Prompt Beam	Muon decay in flight (prompt)
Prompt Beam	Pion decay in flight (prompt)
Prompt Beam	Other beam particles (prompt)
Prompt Beam	Radiative pion capture(prompt)
Others	Electrons from cosmic ray muons

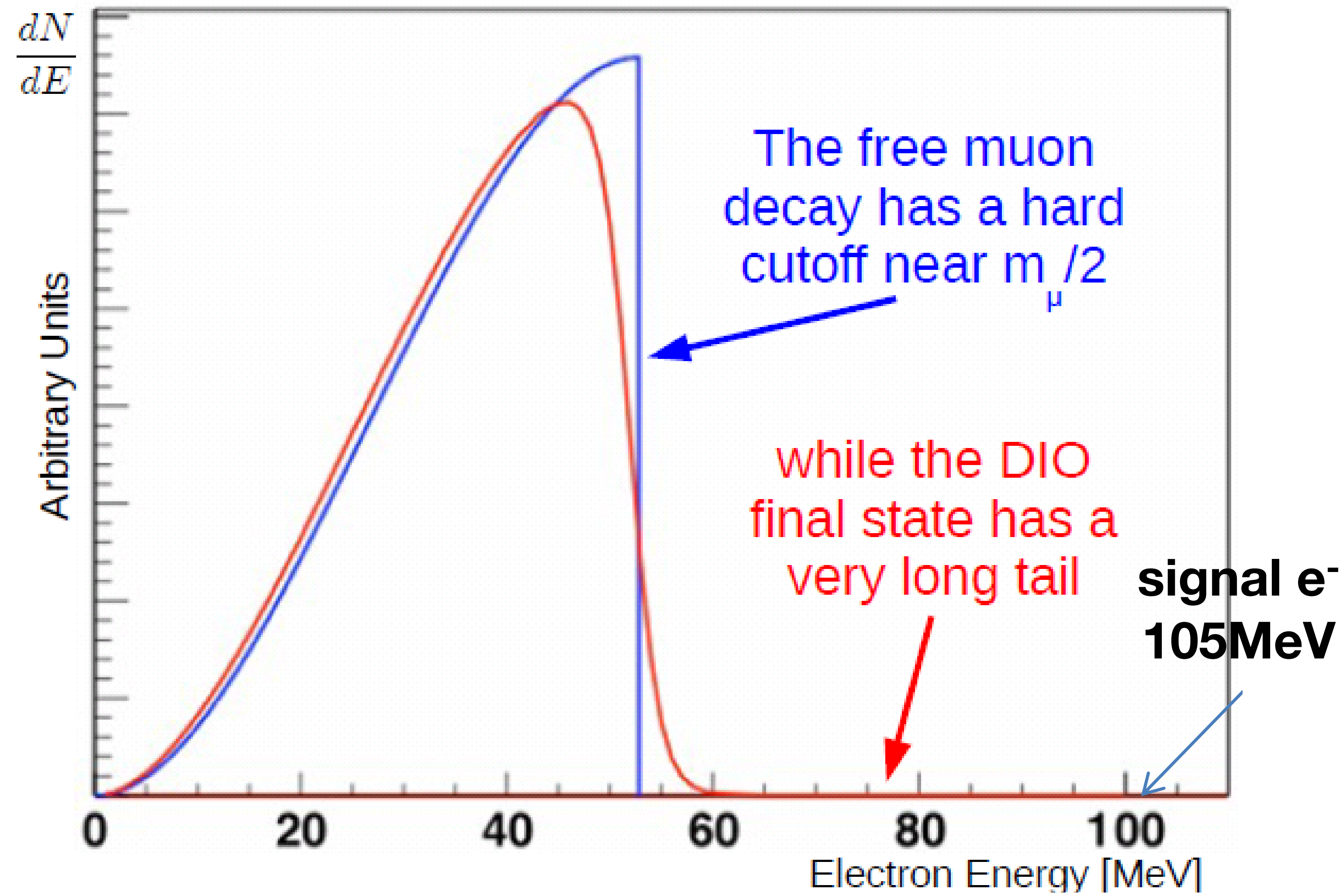
Intrinsic physics

Beam related

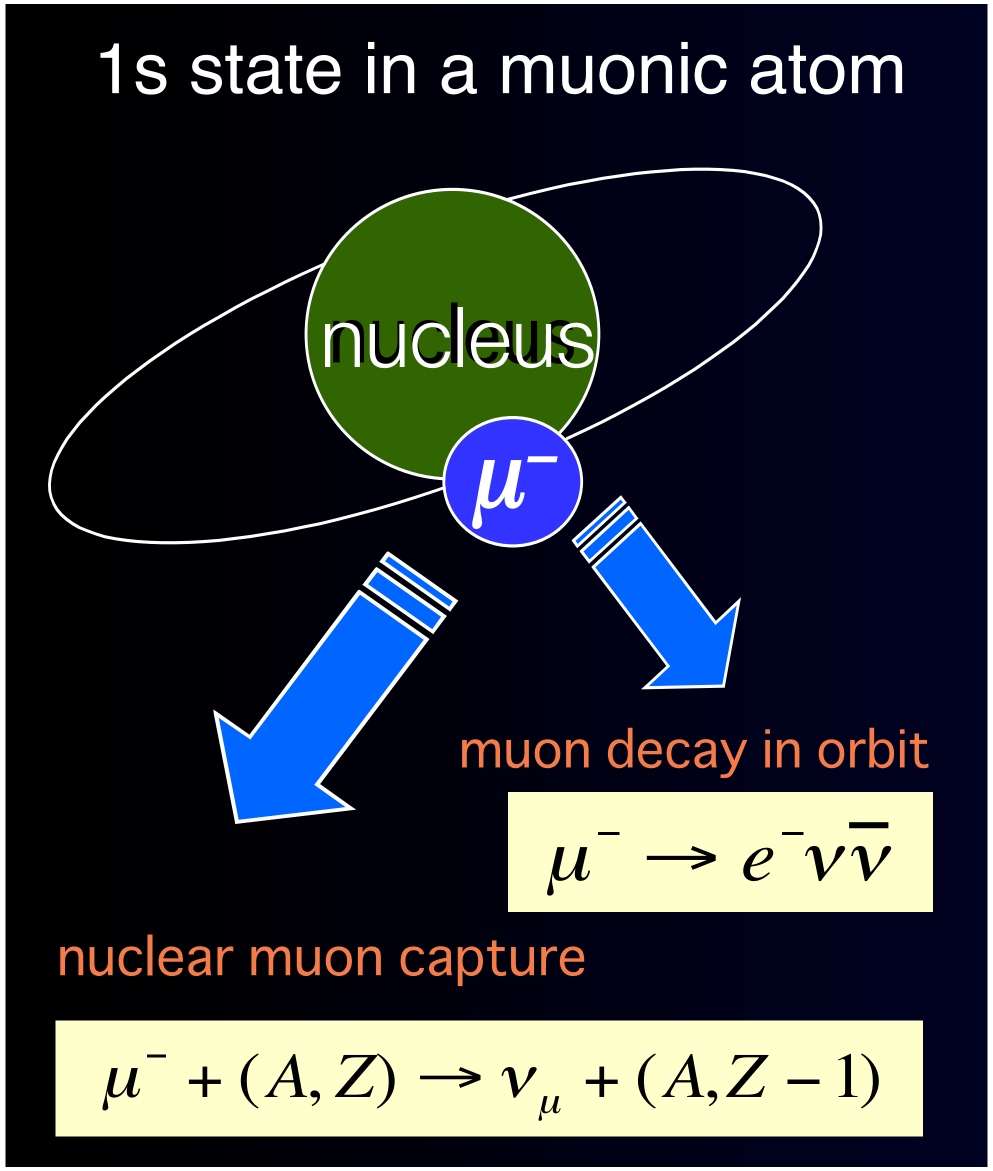
Intrinsic physics backgrounds		
1	Muon decay in orbit (DIO)	Bound muons decay in a muonic atom
2	Radiative muon capture (external)	$\mu^- + A \to \nu_\mu + A' + \gamma$, followed by $\gamma \to e^- + e^+$
3	Radiative muon capture (internal)	$\mu^- + A \to \nu_\mu + e^+ + e^- + A'$,
4	Neutron emission after muon capture	$\mu^- + A \to \nu_\mu + A' + n$, and neutrons produce e^-
5	Charged particle emission after muon capture	$\mu^- + A \to \nu_\mu + A' + p$ (or d or α), followed by charged particles produce e^-
Beam related prompt/delayed backgrounds		
6	Radiative pion capture (external)	$\pi^- + A \to \gamma + A'$, $\gamma \to e^- + e^+$
7	Radiative pion capture (internal)	$\pi^- + A \to e^+ + e^- + A'$
8	Beam electrons	e^- scattering off a muon stopping target
9	Muon decay in flight	μ^- decays in flight to produce e^-
10	Pion decay in flight	π^- decays in flight to produce e^-
11	Neutron induced backgrounds	neutrons hit material to produce e^-
12	$\bar{p}$ induced backgrounds	$\bar{p}$ hits material to produce e^-
Other backgrounds		
14	Cosmic-ray induced backgrounds	
15	Room neutron induced backgrounds	
16	False tracking	

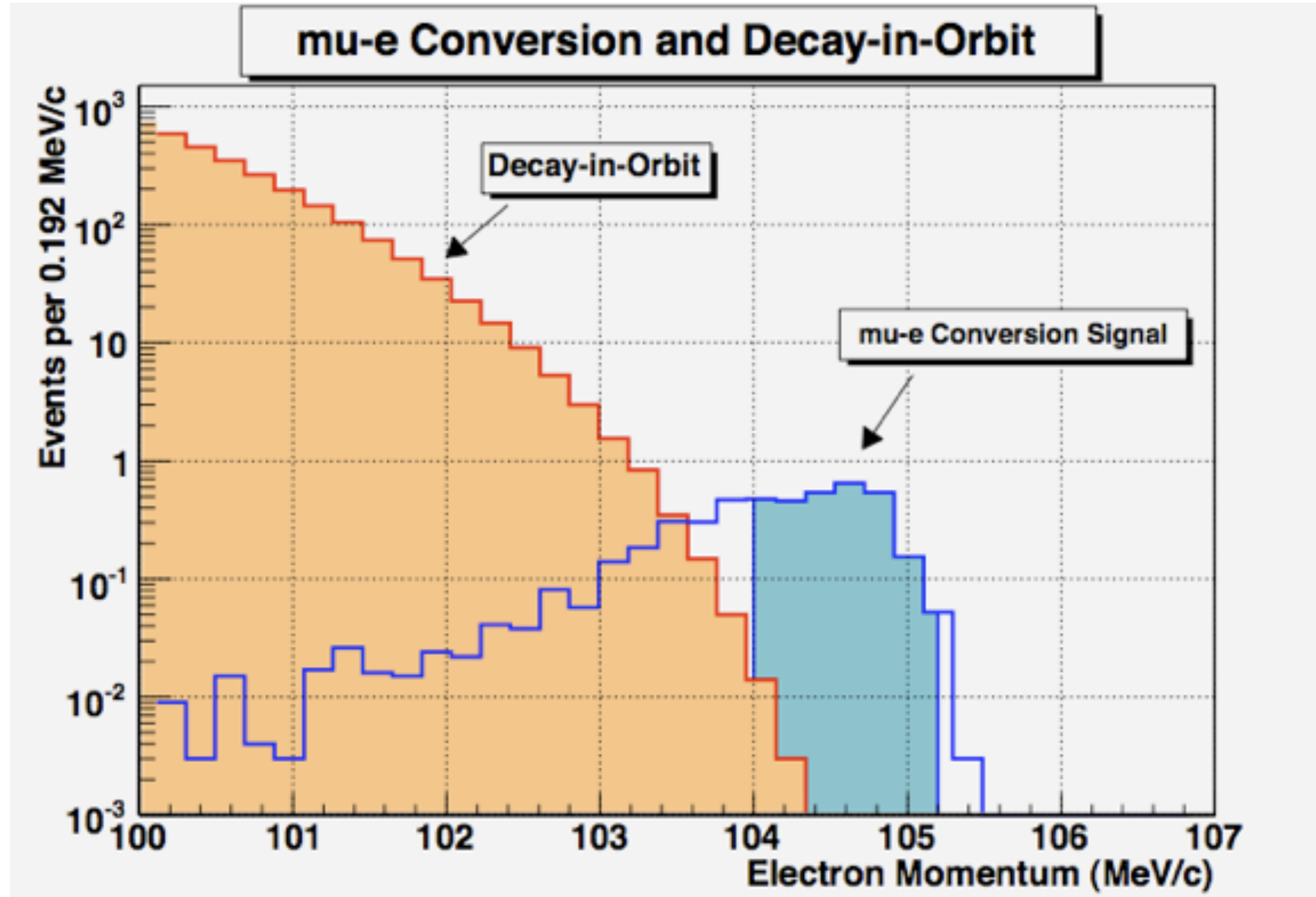
Background 1 : Decay in orbit





Background 1 : Decay in orbit



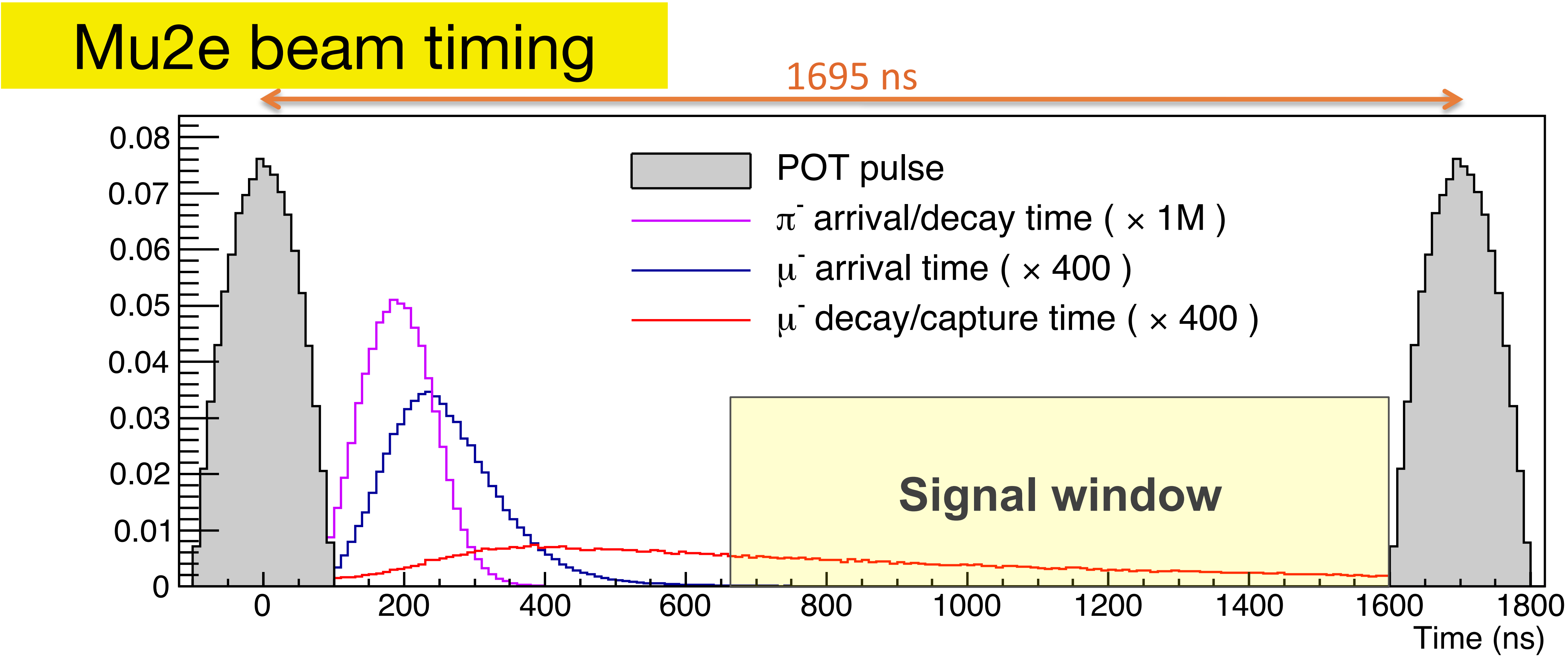


- To distinguish the signals from the DIO backgrounds, electron energy must be reconstructed with sufficient resolution. To achieve SES of 10^{-16}, σ_e < 300keV.

Background 2 : Radiative pion capture

- When π- stopped in the stopping target might emit e- with E_e<139.6MeV.
- We adopt three solutions to suppress this BG.

$$\pi^- + A \rightarrow \gamma + A', \gamma \rightarrow e^- + e^+$$



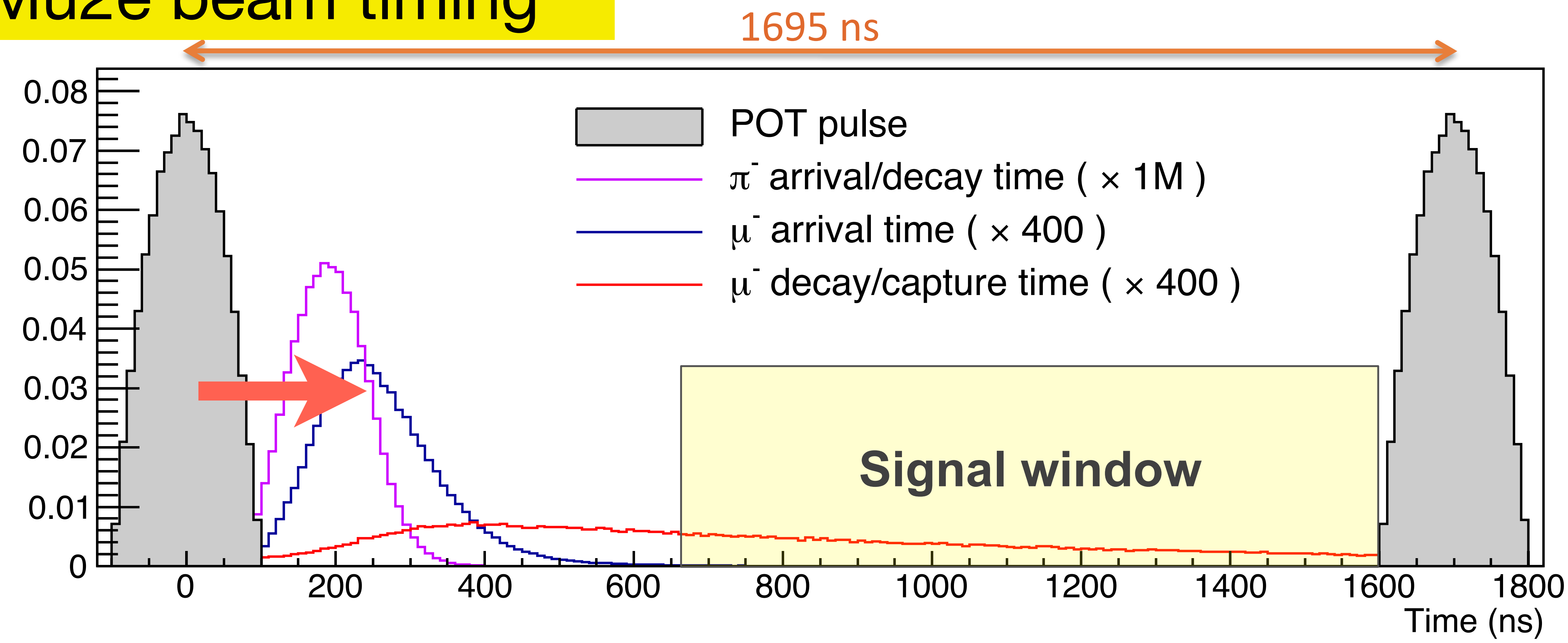
1. Put a long transfer line before the stopping target
2. Wait for ~ 700ns to open the signal window.

Background 2 : Radiative pion capture

- When π- stopped in the stopping target might emit e- with E_e<139.6MeV.
- We adopt three solutions to suppress this BG.

$$\pi^- + A \rightarrow \gamma + A', \gamma \rightarrow e^- + e^+$$

Mu2e beam timing

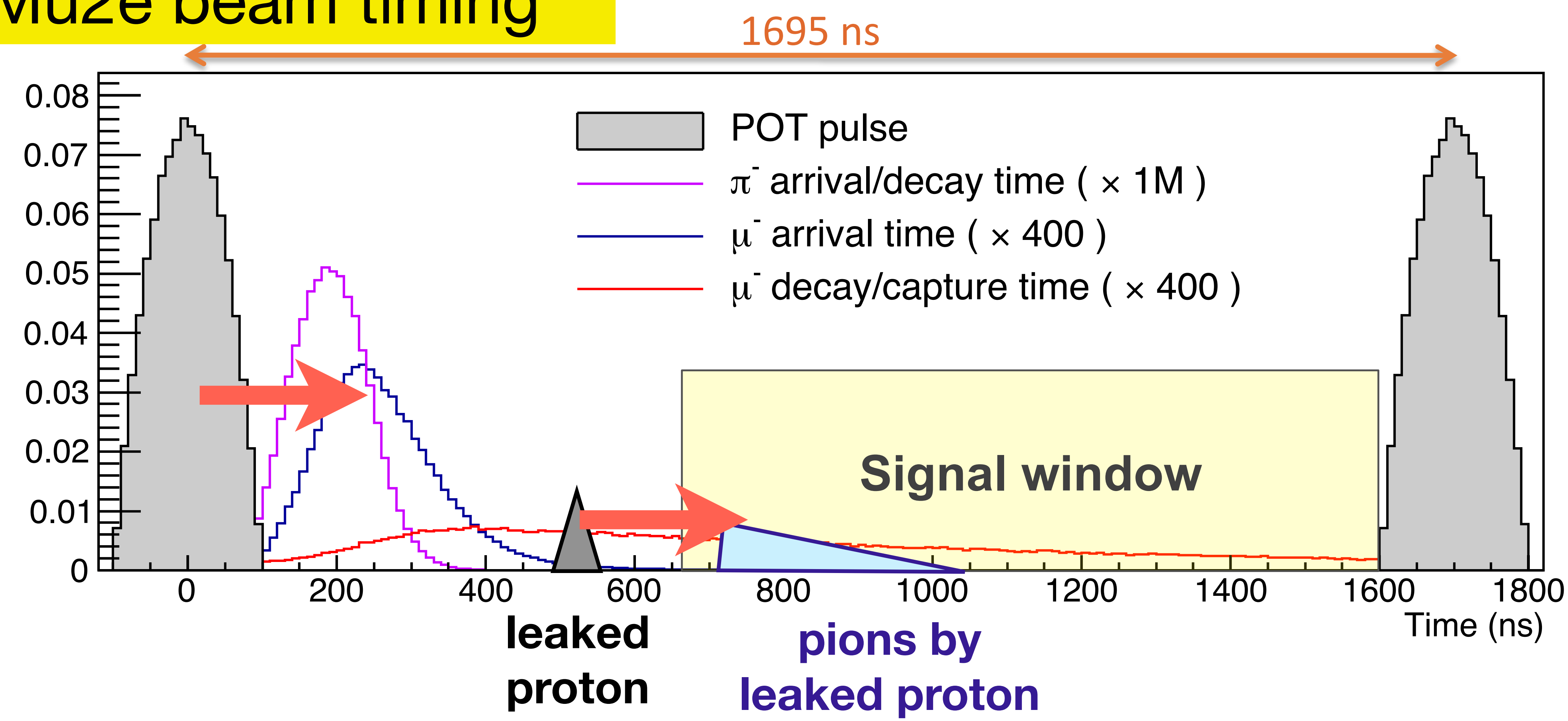


Background 2 : Radiative pion capture

- When π- stopped in the stopping target might emit e- with E_e<139.6MeV.
- We adopt three solutions to suppress this BG.

$$\pi^- + A \rightarrow \gamma + A', \gamma \rightarrow e^- + e^+$$

Mu2e beam timing



Extinction level = # of p out of the pulse width /# p in pulse width

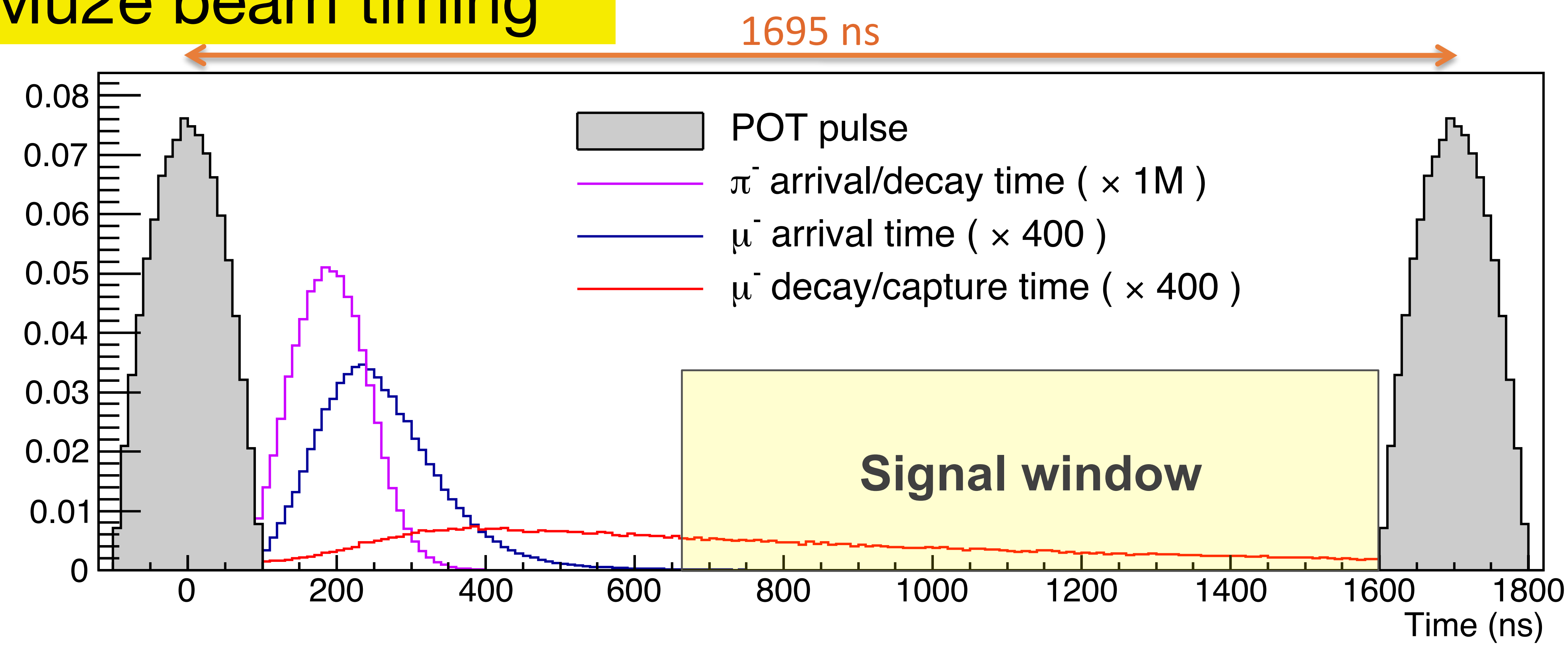
$N_{RPC} \propto N_{\pi@stopping\ target}$ **x Ext. level**

Background 2 : Radiative pion capture

- When π- stopped in the stopping target might emit e- with E_e<139.6MeV.
- We adopt three solutions to suppress this BG.

$$\pi^- + A \rightarrow \gamma + A', \gamma \rightarrow e^- + e^+$$

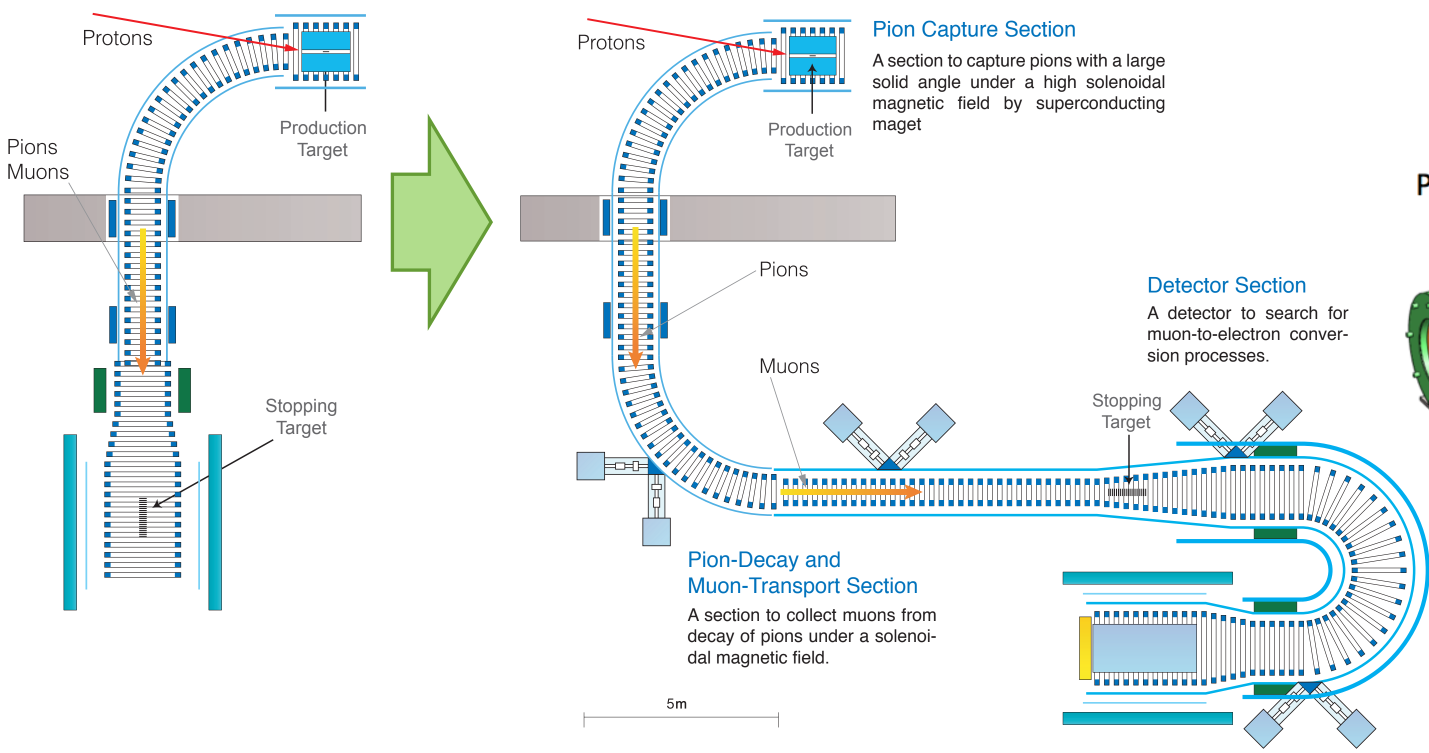
Mu2e beam timing



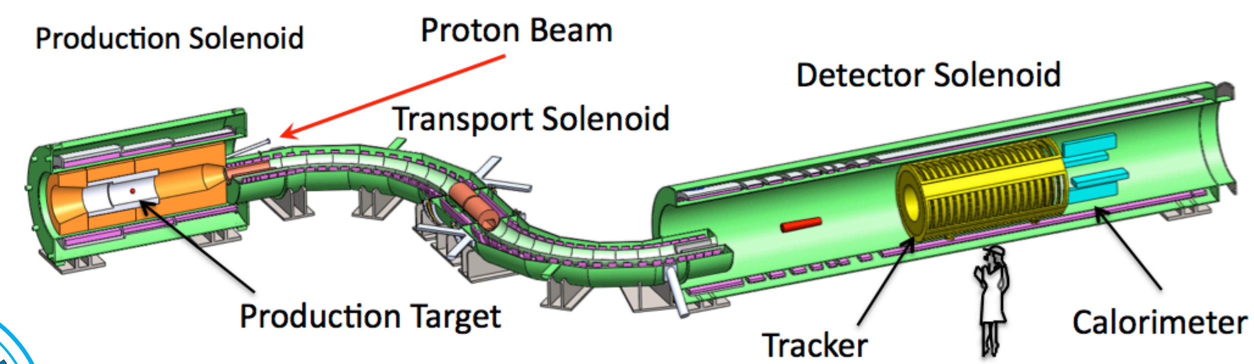
1. Put a long transfer line before the stopping target
2. Wait for ~ 700ns to open the signal window.
3. Make pulsed proton beam with extinction level < 10^{-12}~10^{-11}.

COMET and Mu2e

COMET @J-PARC



Mu2e @FNAL



COMET Phase-I :

physics run 2017-

BR(μ+Al→e+Al)<7x10^{-15} @ 90%CL

*8GeV-3.2kW proton beam, 110 days

*90deg. bend solenoid, cylindrical detector

*Background study for the phase2

COMET Phase-II :

physics run 2020-

BR(μ+Al→e+Al)<6x10^{-17} @ 90%CL

*8GeV-56kW proton beam, 2 years

*180deg. bend solenoid, bend spectrometer, transverse tracker+calorimeter

Mu2e :

physics run 2020-

BR(μ+Al→e+Al)<6x10^{-17} @ 90%CL

*8GeV-8kW proton beam, 3 years

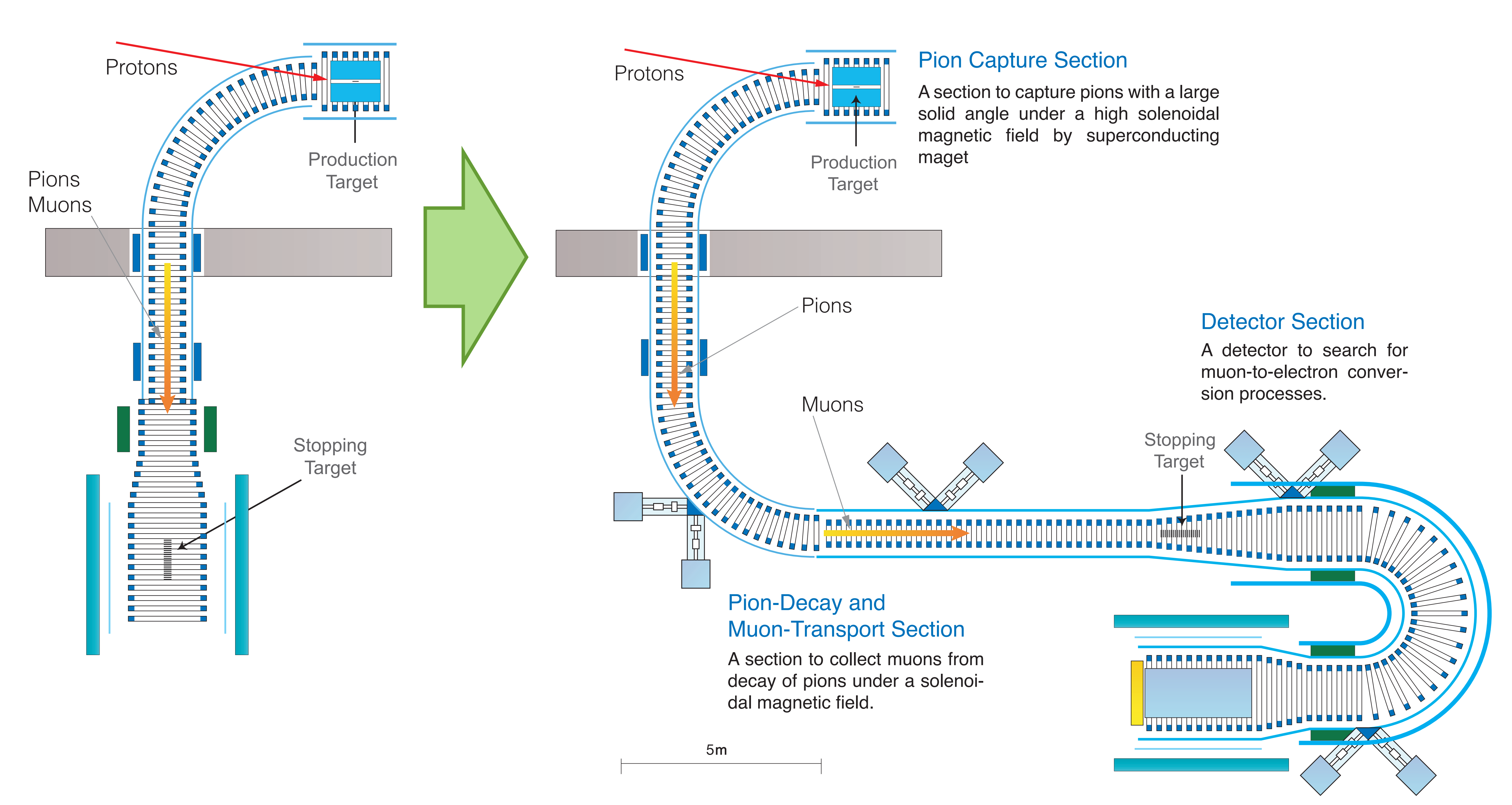
*2x90deg. S-shape bend solenoid, straw tracker+calorimeter

- Design of the both experiments are based on the MECO@BNL experiment

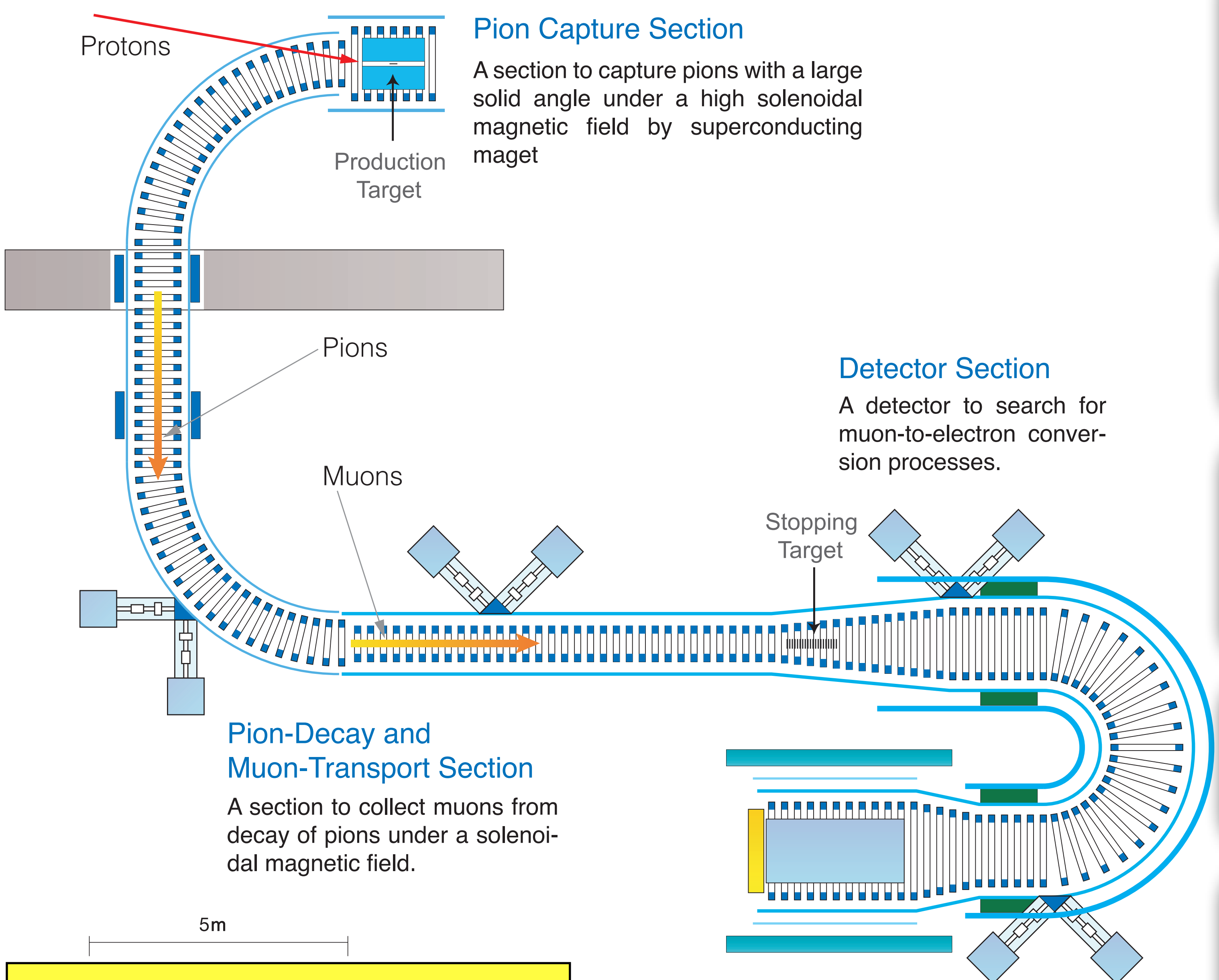
COMET

COMET Phase-I

COMET Phase-II



Key Points of COMET Phase-II (S.E.S 10^{-17})



COMET Phase-II :

physics run 2020-

BR(μ+Al→e+Al)<6x10^{-17} @ 90%CL

*8GeV-56kW proton beam, 2 years

*180deg. bend solenoid, bend spectrometer, transverse tracker+calorimeter

Intense Pulsed Proton Beam

8GeV-56kW (2x10^7 sec)
width~100ns, separation>1μs
Extinction level < 10^{-11}

reduce beam related BG

Pion Capture Solenoid

5T superconducting

10^{11} μ$^-$/sec

Long Transport Solenoid

L >10m
Curved 180deg Solenoid

eliminate energetic μ (>75 MeV/c) and pions

Thin Stopping Target

Al 200μm x 17

improve e$^-$ energy resolution

Electron Spectrometer

Curved Solenoid

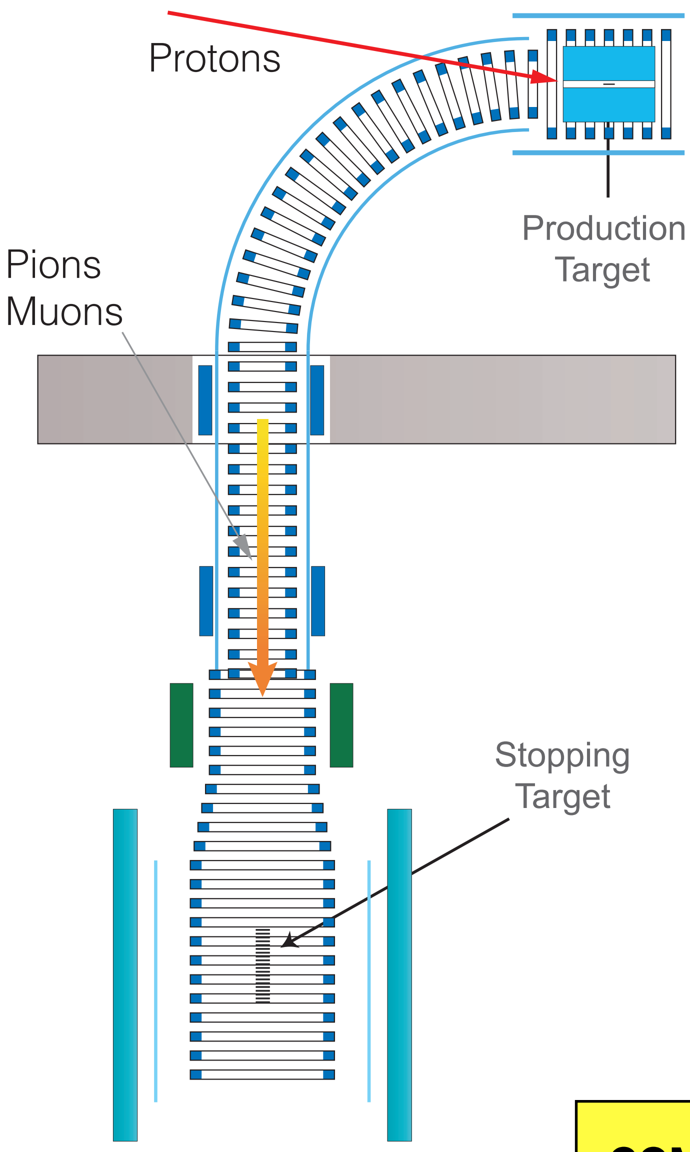
reduce detector hit rate

Low-mass Tracker

Straw chamber
in Vacuum

improve e$^-$ energy resolution

Key Points of COMET Phase-I (S.E.S 10^{-15})



COMET Phase-I :

physics run 2017-

BR(μ+Al→e+Al)<7x10^{-15} @ 90%CL

*8GeV-3.2kW proton beam, 110 days

*90deg. bend solenoid, cylindrical detector

*Background study for the phase2

Intense Pulsed Proton Beam

8GeV-3.2kW (110 days)

width~100ns, separation>1μs

Extinction level < 10^{-13} — reduce beam related BG

Pion Capture Solenoid

5T superconducting — 10^{11} μ^-/sec

Long Transport Solenoid

L >10m

Curved 90deg Solenoid

eliminate energetic μ (>75 MeV/c) and pions

Thin Stopping Target

Al 200μm x 17

improve e^- energy resolution

Electron Spectrometer

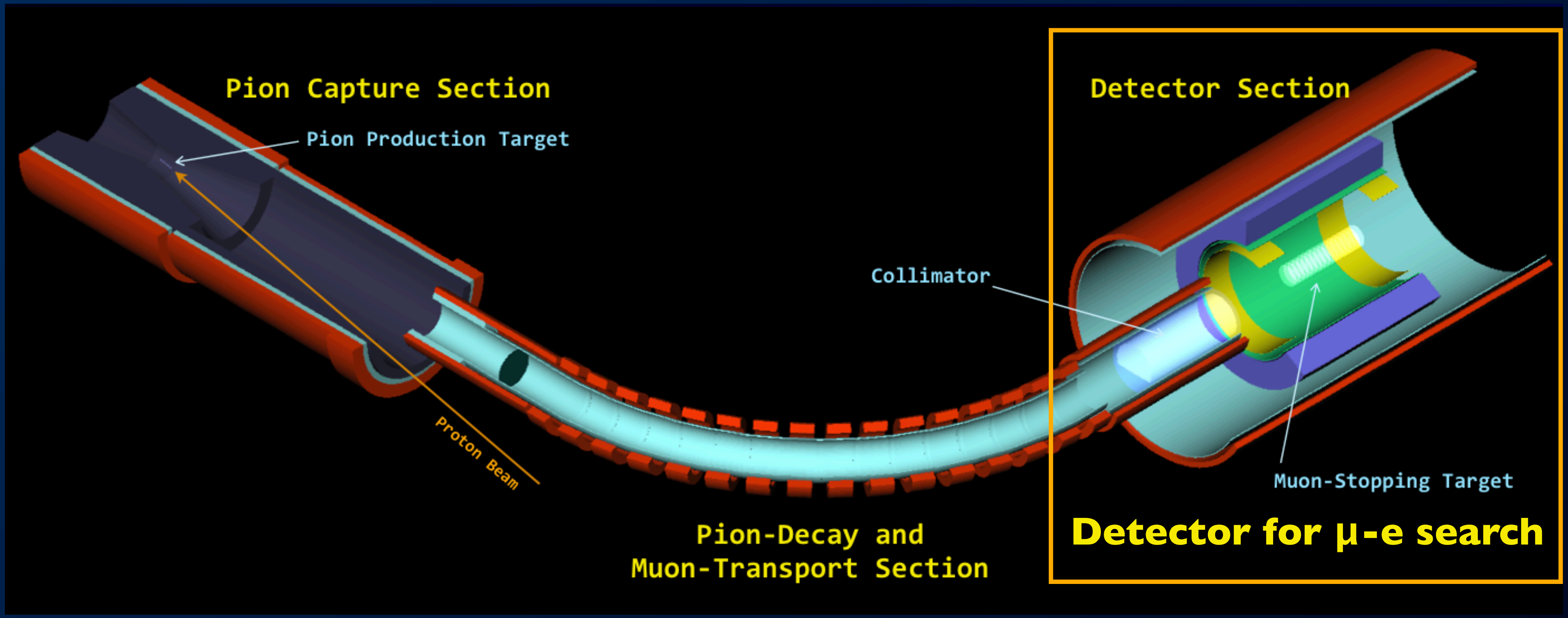
Curved Solenoid

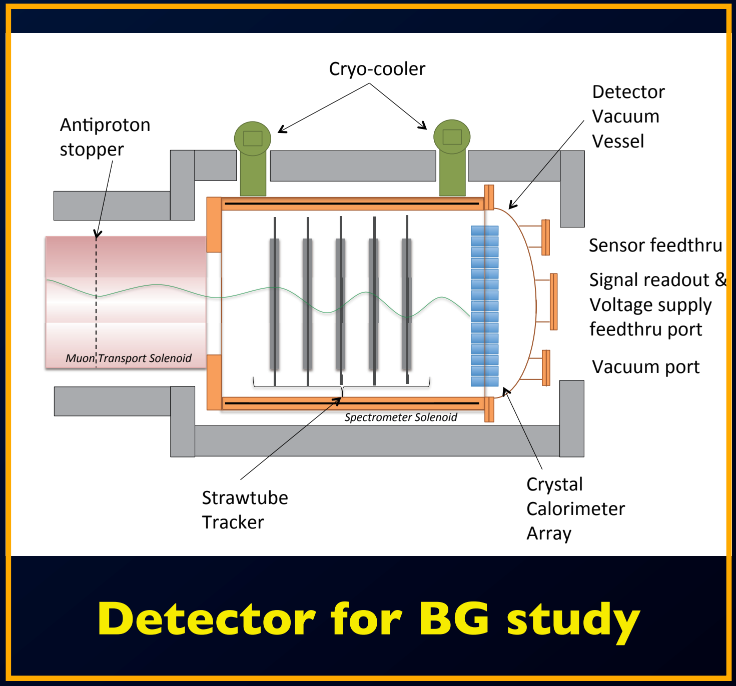
Low-mass Tracker

Cylindrical drift chamber

Goal of COMET Phase-I

- **Background Study for COMET Phase-II**
  - direct measurement of potential background sources for the full COMET experiment by using the actual COMET beamline constructed at Phase-I
- **Search for μ-e conversion**
  - a search for μ^-–e^- conversion at intermediate sensitivity which would be more than 100 times better than the SINDRUM-II limit

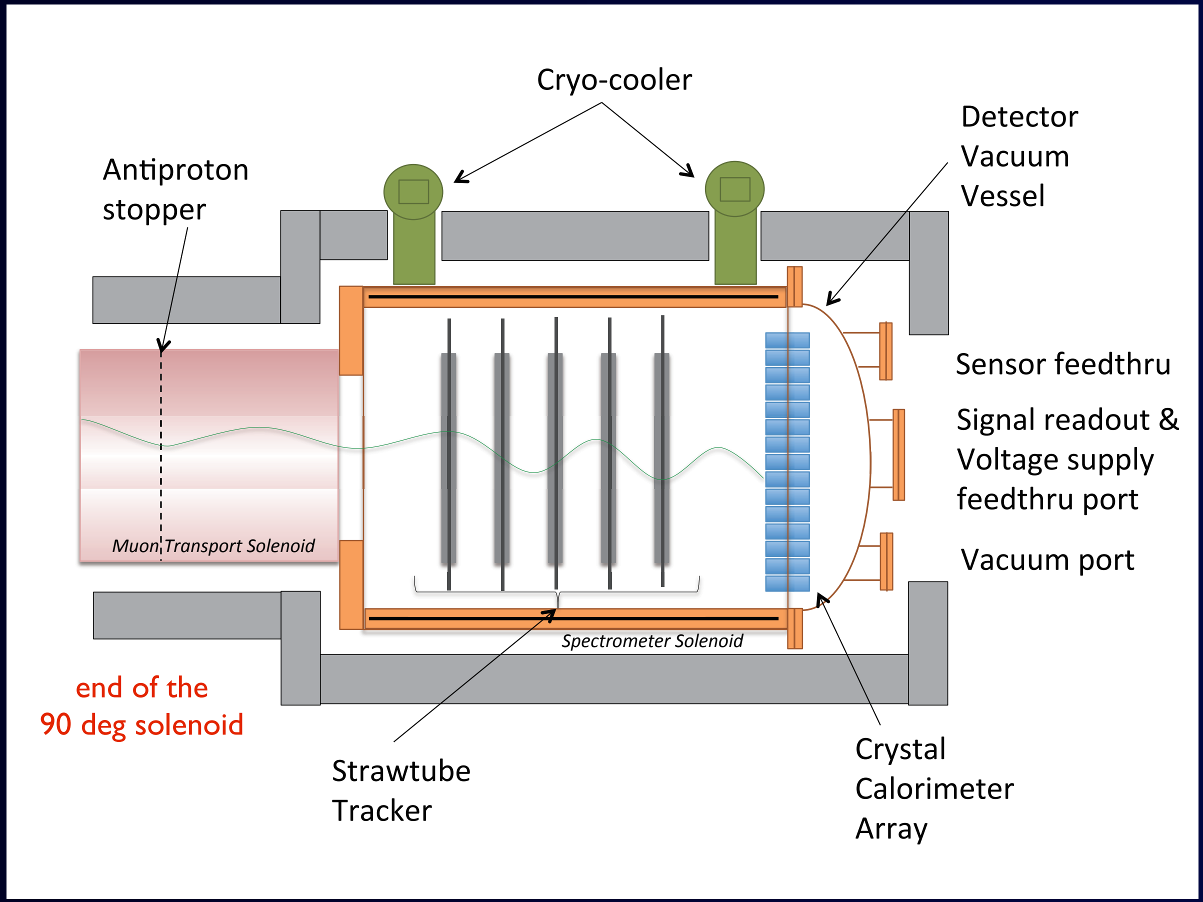




Background Study

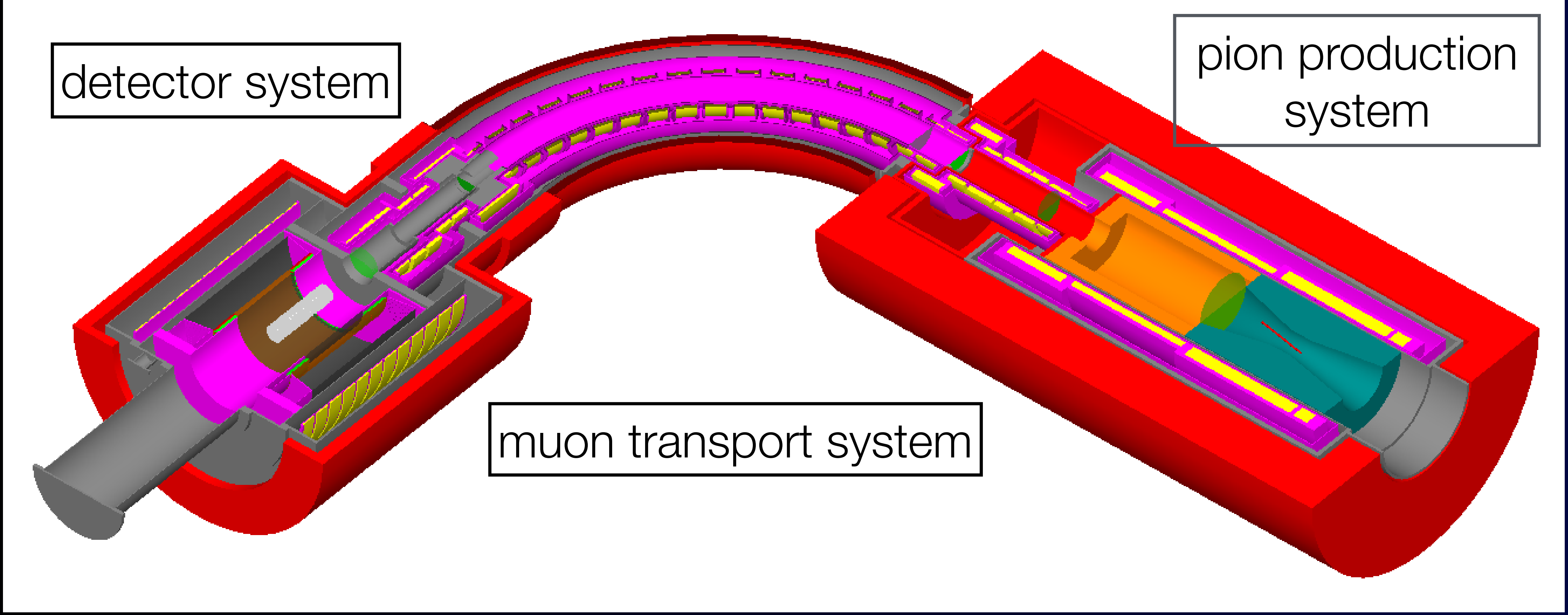
- Measure almost all background schematic layout
- Sources
  - muons, pions, electrons, neutrons, antiprotons, photons
- Same detector technology used in COMET Phase-II
  - SC spectrometer solenoid
  - straw tube transverse tracker
  - crystal calorimeter
- Particle ID with dE/dX and E/P

schematic layout



aim to know the known BG &
aim to know the unknown BG

Layout of COMET Phase-I



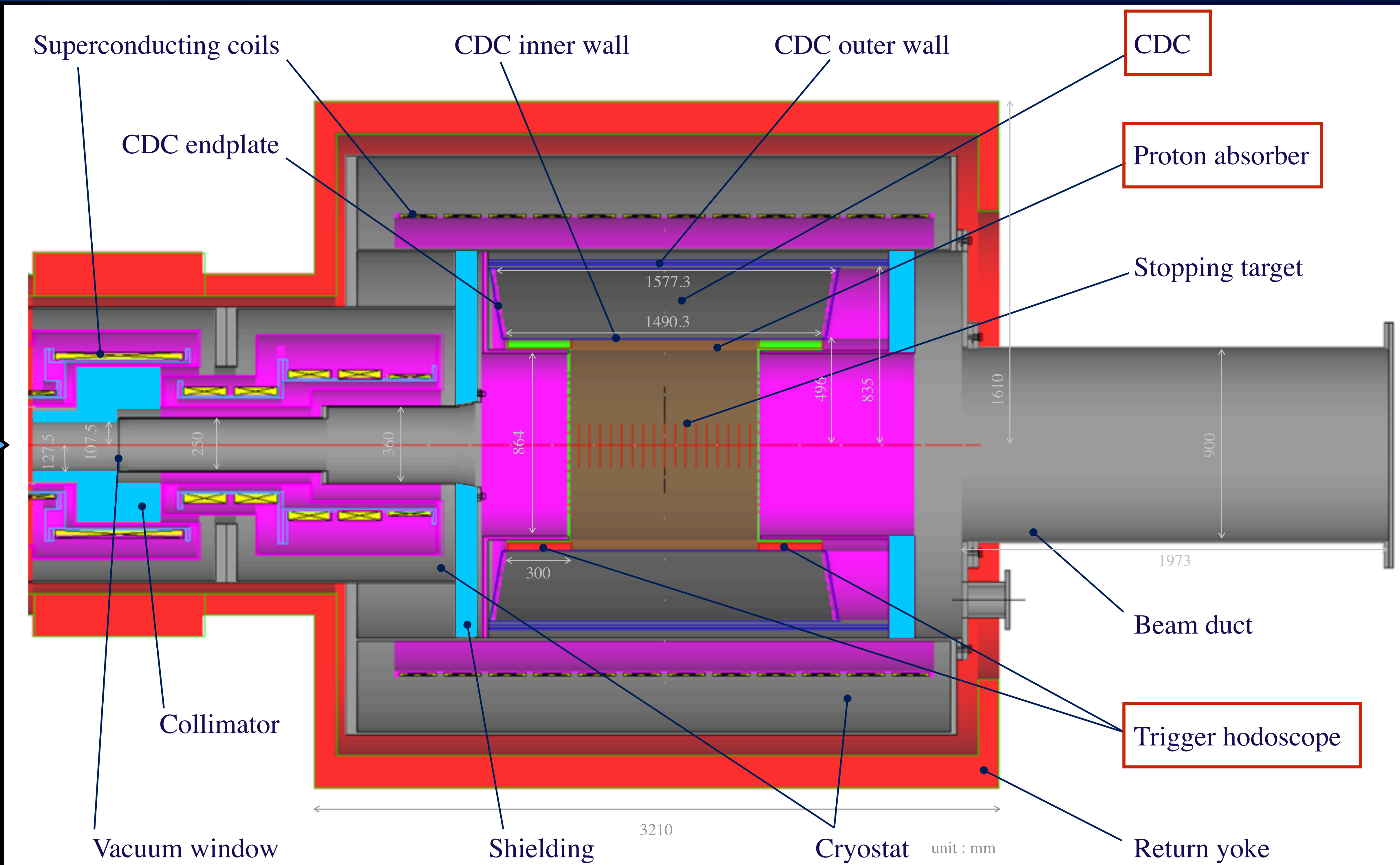
COMET Phase-I detector：

About 10^{16} muons are stopped in the target. Electron from μ-e conversion will be measured

COMET muon beam-line：

6×10^9 muon/sec with 3kW beam produced. The world highest intensity.

COMET Phase-I : Detector (CyDet)



uon

COMET Phase-I : S.E.S.

- **Single event sensitivity**

$$B(\mu^- + Al \rightarrow e^- + Al) \sim \frac{1}{N_\mu \cdot f_{cap} \cdot A_e},$$

— N_μ is a number of stopping muons in the muon stopping target. It is 1.23×10^{16} muons.

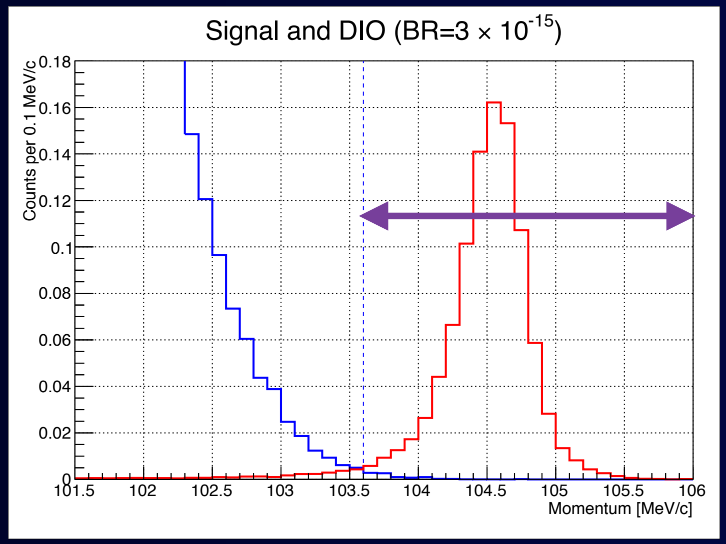
- 8GeV, 3 kW proton beam power, with 110 days running.

— f_{cap} is a fraction of muon capture, which is 0.6 for aluminum.

— A_e is the detector acceptance, which is 0.043.

Table 28: *Breakdown of the $\mu^- N \rightarrow e^- N$ conversion signal acceptance.*

Event selection	Value	Comments
Geometrical acceptance	0.37	
Track quality cuts	0.66	
Momentum selection	0.93	103.6 MeV/c < P_e <106.0 MeV/c
Timing window	0.3	700 ns < t < 1100 ns
Trigger efficiency	0.8	
DAQ efficiency	0.8	
Track reconstruction efficiency	0.8	
Total	0.043	



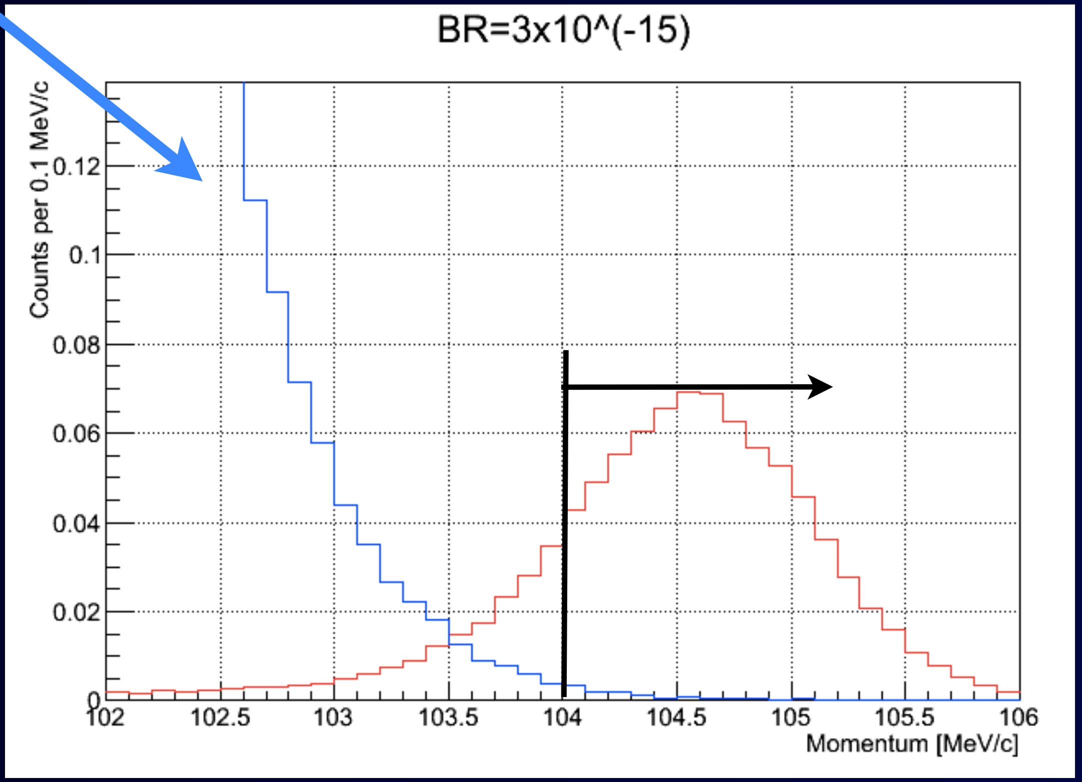
$$B(\mu^- + Al \rightarrow e^- + Al) = 3.1 \times 10^{-15}$$

$$B(\mu^- + Al \rightarrow e^- + Al) < 7 \times 10^{-15} \quad (90\% C.L.)$$

COMET Phase-I : Backgrounds

Background	estimated events
Muon decay in orbit	0.01
Radiative muon capture	< 0.001
Neutron emission after muon capture	< 0.001
Charged particle emission after muon capture	< 0.001
Radiative pion capture	0.0096*
Beam electrons Muon decay in flight Pion decay in flight	< 0.00048*
Neutron induced background	~ 0*
Delayed radiative pion capture	0.002
Anti-proton induced backgrounds	0.007
Electrons from cosmic ray muons	< 0.0002
Total	0.03

DIO



with proton extinction factor of 3×10^{-11}

Expected BG events are about 0.03 at S.E.S. of 3×10^{-15}.

COMET : Collaboration

164 collaborators, 37 institutes

COMET Collaboration meeting@KEK 26-30 Jan 2015

The COMET Collaboration

(Sep. 2014)

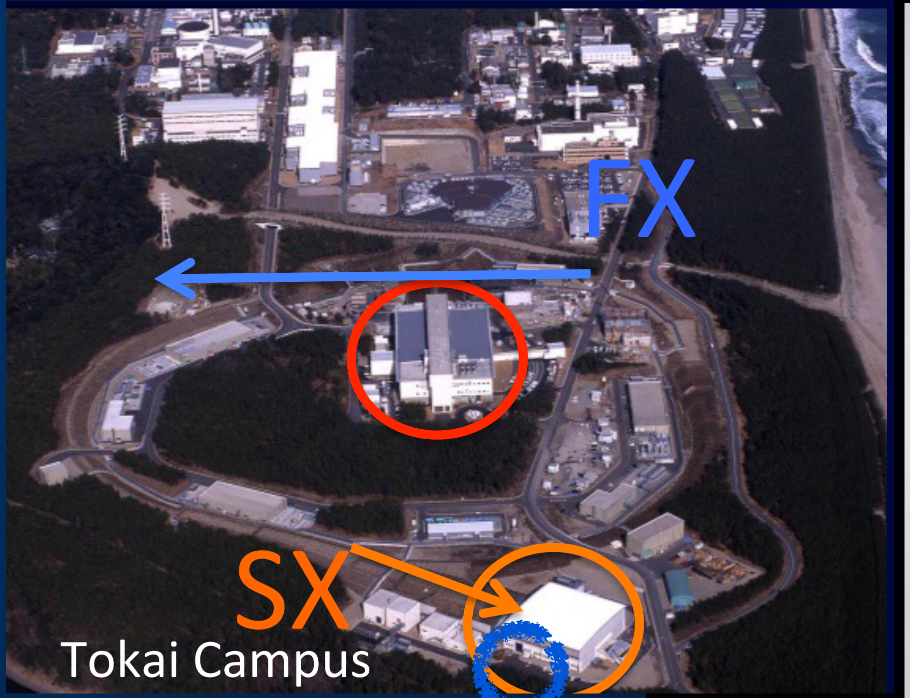
R. Akhmetshin[6,28], V. Anishchik[4], M. Aoki[29], R. B. Appleby[8,22], Y. Arimoto[15], Y. Bagaturia[33], Y. Ban[3], W. Bertsche[22], A. Bondar[6,28], S. Canfer[30], S. Chen[25], Y. E. Cheung[25], B. Chiladze[32], D. Clarke[30], M. Danilov[13,23], P. D. Dauncey[11], J. David[20], W. Da Silva[20], C. Densham[30], G. Devidze[32], P. Dornan[11], A. Drutskoy[13,23], V. Duginov[14], A. Edmonds[35], L. Epshteyn[6,27], P. Evtoukhovich[14], G. Fedotovich[6,28], M. Finger[7], M. Finger Jr[7], Y. Fujii[2], Y. Fukao[15], J-F. Genat[20], M. Gersabeck[22], E. Gillies[11], D. Grigoriev[6,27,28], K. Gritsay[14], E. Hamada[15], R. Han[1], K. Hasegawa[15], I. H. Hasim[29], O. Hayashi[29], M. I. Hossain[16], Z. A. Ibrahim[21], Y. Igarashi[15], F. Ignatov[6,28], M. Iio[15], M. Ikeno[15], K. Ishibashi[19], S. Ishimoto[15], T. Itahashi[29], S. Ito[29], T. Iwami[29], Y. Iwashita[17], X. S. Jiang[2], P. Jonsson[11], V. Kalinnikov[14], F. Kapusta[20], H. Katayama[29], K. Kawagoe[19], V. Kazanin[6,28], B. Khazin[§6,28], A. Khvedelidze[14], M. Koike[36], G. A. Kozlov[14], B. Krikler[11], A. Kulikov[14], E. Kulish[14], Y. Kuno[29], Y. Kuriyama[18], Y. Kurochkin[5], A. Kurup[11], B. Lagrange[11,18], M. Lancaster[35], H. B. Li[2], W. G. Li[2], A. Liparteliani[32], R. P. Litchfield[35], P. Loveridge[30], G. Macharashvili[14], Y. Makida[15], Y. Mao[3], O. Markin[13], Y. Matsumoto[29], T. Mibe[15], S. Mihara[15], F. Mohamad Idris[21], K. A. Mohamed Kamal Azmi[21], A. Moiseenko[14], Y. Mori[18], N. Mosulishvili[32], E. Motuk[35], Y. Nakai[19], T. Nakamoto[15], Y. Nakazawa[29], J. Nash[11], M. Nioradze[32], H. Nishiguchi[15], T. Numao[34], J. O'Dell[30], T. Ogitsu[15], K. Oishi[19], K. Okamoto[29], C. Omori[15], T. Ota[31], H. Owen[22], C. Parkes[22], J. Pasternak[11], C. Plostinar[30], V. Ponariadov[4], A. Popov[6,28], V. Rusinov[13,23], A. Ryzhenenkov[6,28], B. Sabirov[14], N. Saito[15], H. Sakamoto[29], P. Sarin[10], K. Sasaki[15], A. Sato[29], J. Sato[31], D. Shemyakin[6,28], N. Shigyo[19], D. Shoukavy[5], M. Slunecka[7], M. Sugano[15], Y. Takubo[15], M. Tanaka[15], C. V. Tao[26], E. Tarkovsky[13,23], Y. Tevzadze[32], N. D. Thong[29], V. Thuan[12], J. Tojo[19], M. Tomasek[9], M. Tomizawa[15], N. H. Tran[29], I. Trek[32], N. M. Truong[29], Z. Tsamalaidze[14], N. Tsverava[14], S. Tygier[22], T. Uchida[15], Y. Uchida[11], K. Ueno[15], S. Umasankar[10], E. Velicheva[14], A. Volkov[14], V. Vrba[9], W. A. T. Wan Abdullah[21], M. Warren[35], M. Wing[35], T. S. Wong[29], C. Wu[2,25], G. Xia[22], H. Yamaguchi[19], A. Yamamoto[15], M. Yamanaka[24], Y. Yang[19], H. Yoshida[29], M. Yoshida[15], Y. Yoshii[15], T. Yoshioka[19], Y. Yuan[2], Y. Yudin[6,28], J. Zhang[2], Y. Zhang[2]

Me

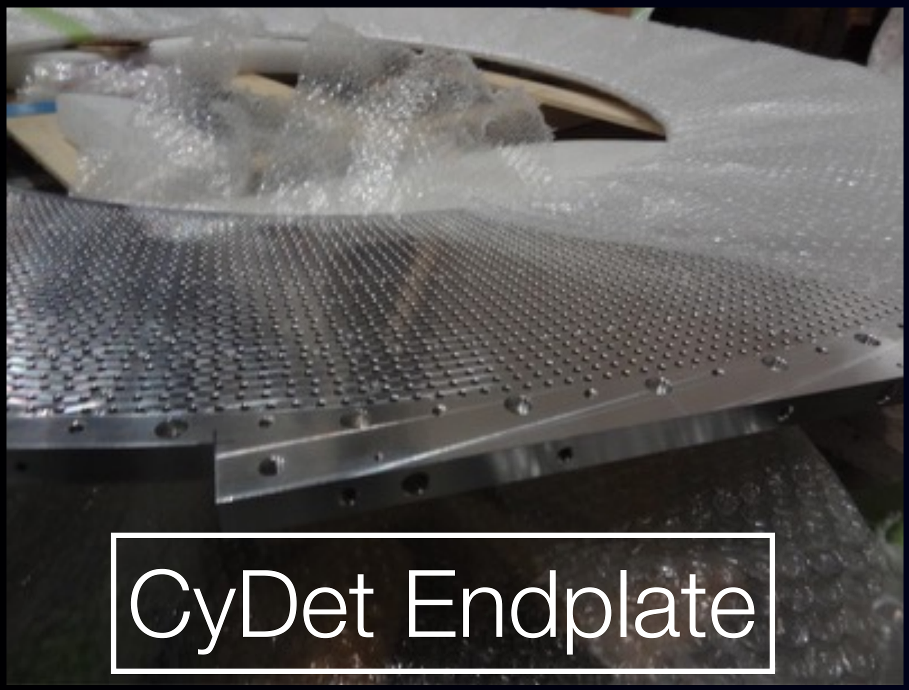
[1] *North China Electric Power University, Beijing, People's Republic of China*
[2] *Institute of High Energy Physics (IHEP), Beijing, People's Republic of China*
[3] *Peking University, Beijing, People's Republic of China*
[4] *Belarusian State University (BSU), Minsk, Belarus*
[5] *B.I. Stepanov Institute of Physics, National Academy of Sciences of Belarus, Minsk, Belarus*
[6] *Budker Institute of Nuclear Physics (BINP), Novosibirsk, Russia*
[7] *Charles University, Prague, Czech Republic*
[8] *The Cockcroft Institute, Daresbury Laboratory, Warrington, UK*
[9] *Czech Technical University, Prague, Czech Republic*
[10] *Indian Institute of Technology, Bombay, India*
[11] *Imperial College London, London, UK*
[12] *Institute for Nuclear Science and Technology, Hanoi, Vietnam*
[13] *Institute for Theoretical and Experimental Physics (ITEP), Russia*
[14] *Joint Institute for Nuclear Research (JINR), Dubna, Russia*
[15] *High Energy Accelerator Research Organization (KEK), Tsukuba, Japan*
[16] *King Abdulaziz University, Saudi Arabia*
[17] *Institute for Chemical Research, Kyoto University, Kyoto, Japan*
[18] *Research Reactor Institute, Kyoto University, Kyoto, Japan*
[19] *Kyushu University, Fukuoka, Japan*
[20] *Laboratory of Nuclear and High Energy Physics (LPNHE), CNRS-IN2P3 and University Pierre and Marie Curie (UPMC), Paris, France*
[21] *National Centre for Particle Physics, Universiti Malaya, Kuala Lumpur, Malaysia*

COMET : Status

- COMET building completed!



COMET : Status | CDC



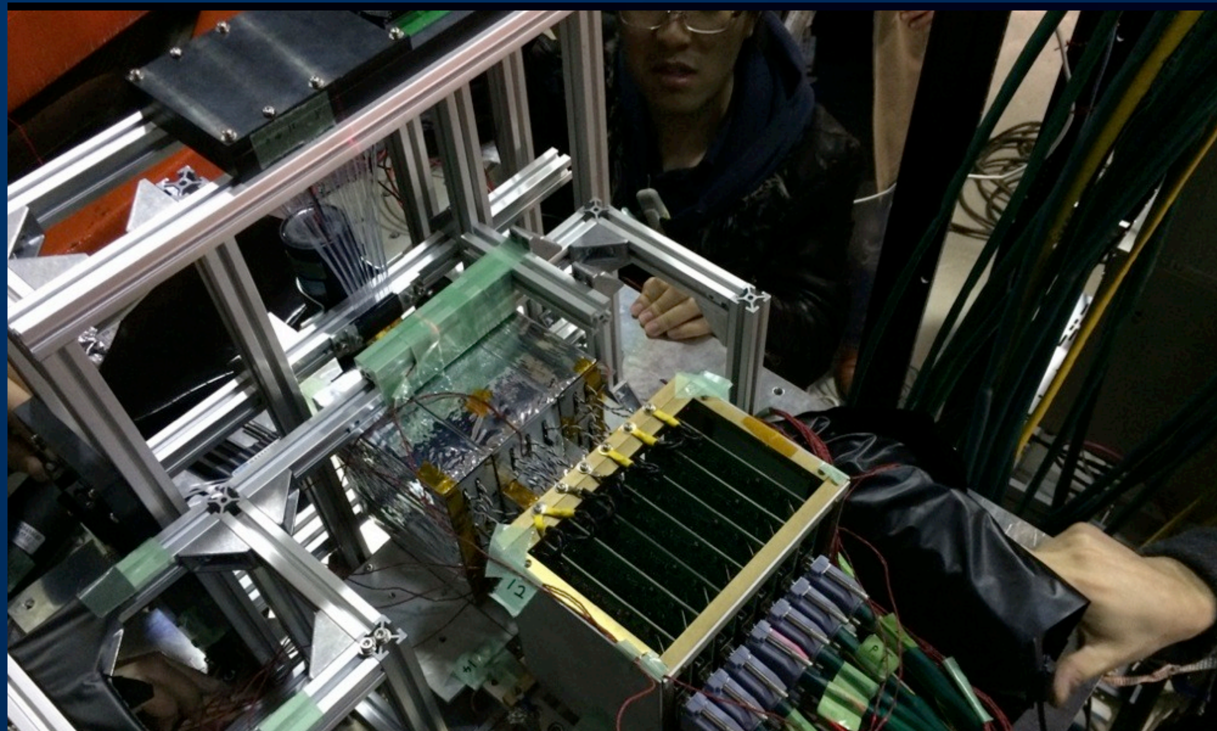
CyDet Endplate

CyDet Outer wall

CyDet assembly

CyDet on wire stringing assembly

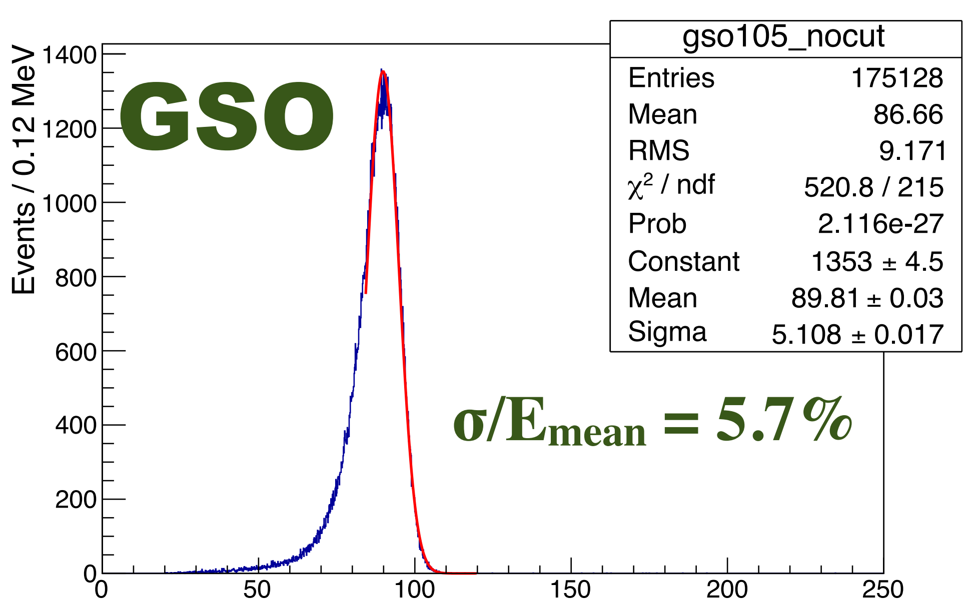
COMET : Status | Electron calorimeter

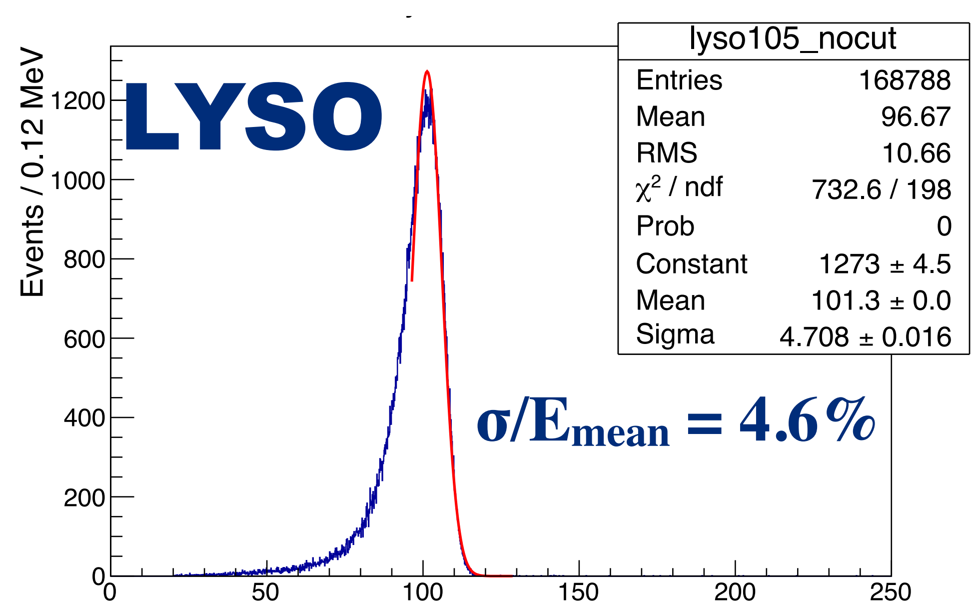


GSO and LYSO crystal test at Research Center for Electron Photon Science, Took University in March, 2014

LYSO was chosen as ECal crystal.

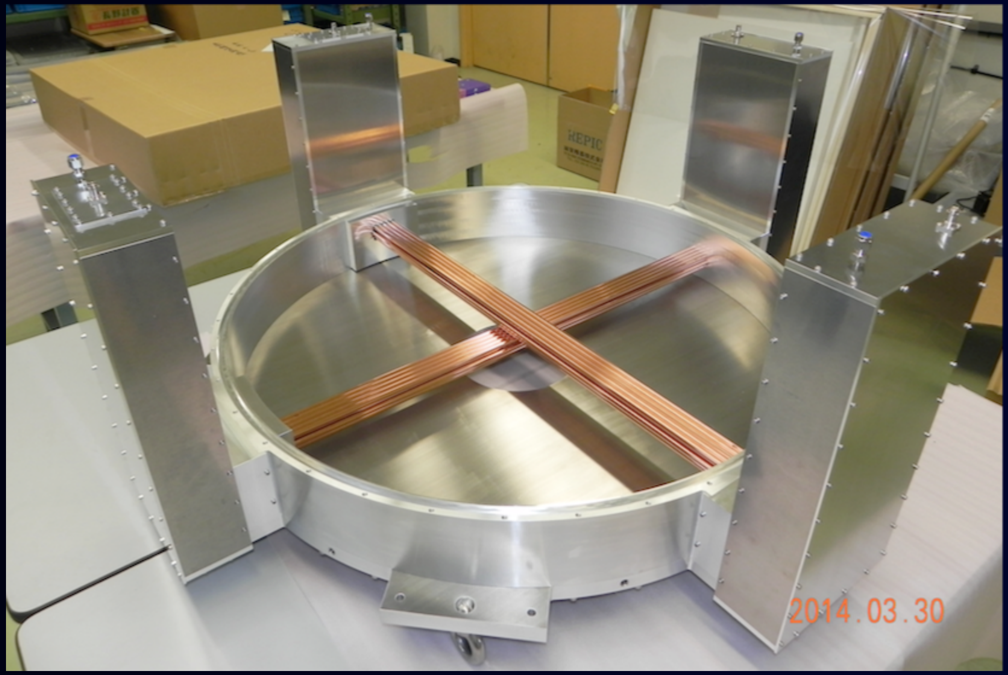
105 MeV/c runs

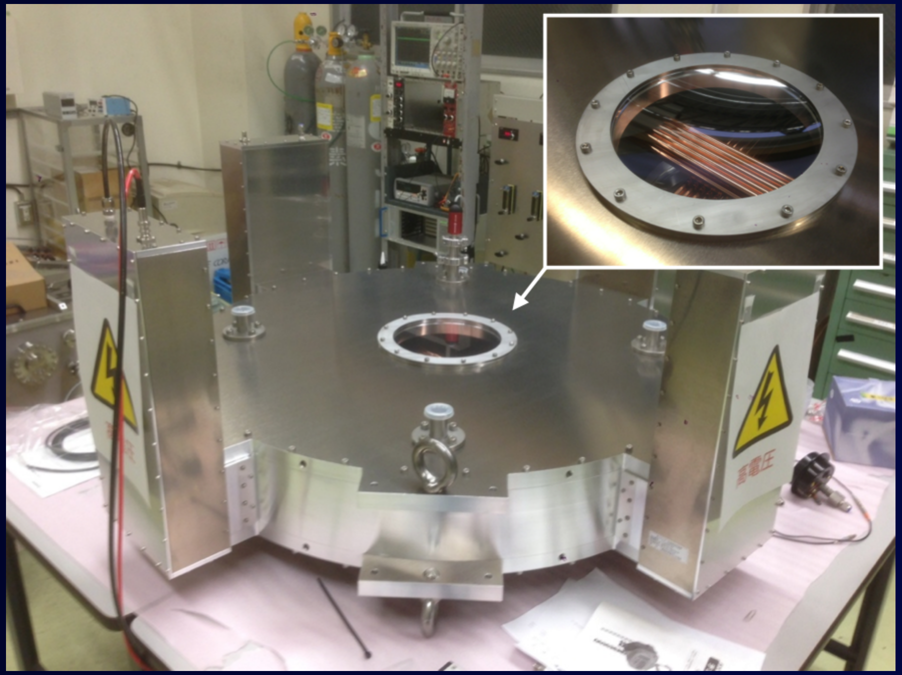




COMET : Status | Straw Tracker

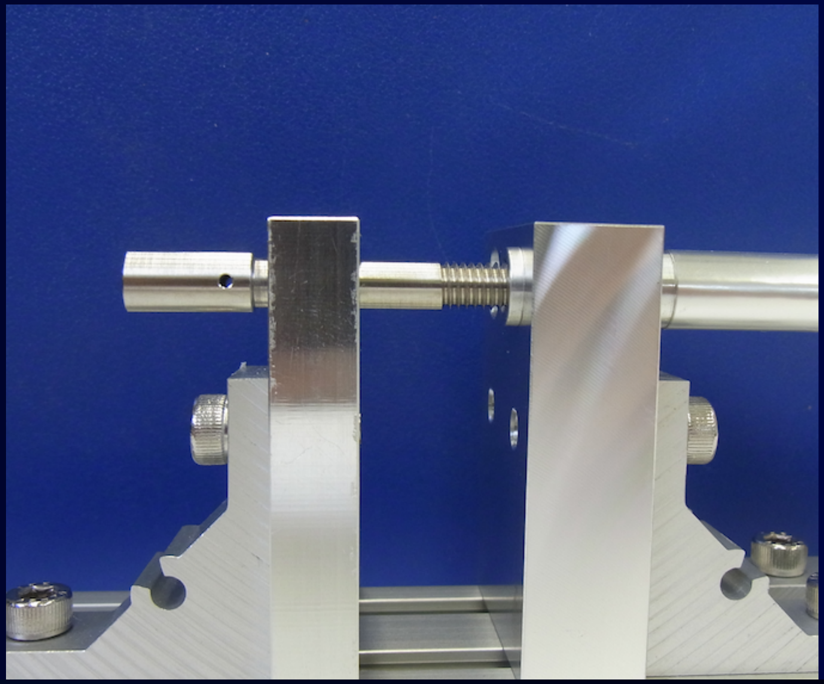
Straw Assembly Prototype with 20 micron straws





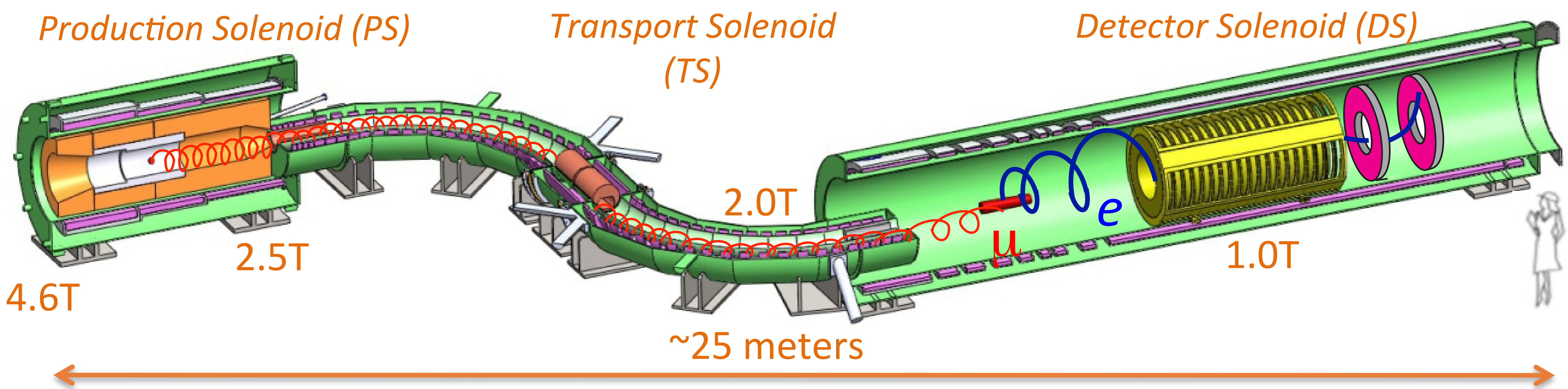
R&D at JINR for 12 micron straws

tension study and developed feedthrough

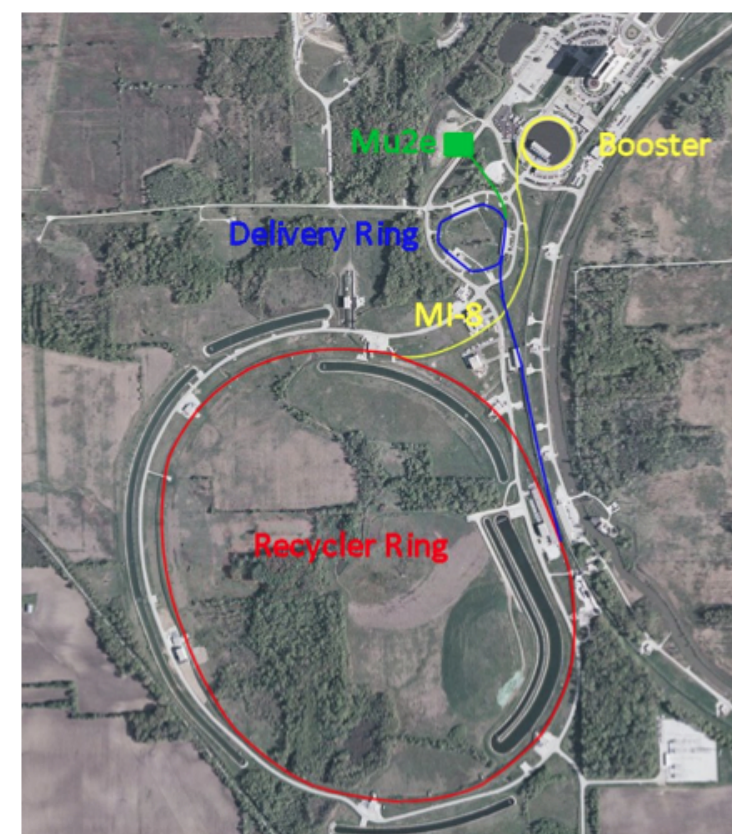


Mu2e : Overview

A System of superconducting solenoids and an intense muon beam



- Location : Muon campus in FNAL
- Expected sensitivity : 6×10^{-17}@ 90% CL
- Commissioning begins in 2020
  - Mu2e makes use of existing infrastructure at Fermilab
  - uses 8kW of protons from the Booster (8 GeV)
    - Re-bunched in the Recycler
    - Slow-spill from Delivery Ring
      - aka Accumulator/Debuncher for Tevatron anti-protons
      - Revolution period 1695 ns
  - Mu2e can (and will) run simultaneously with NOvA



Mu2e : Sensitivity

- Estimated background yields for 3.6 x 10^{20} POT

Category	Background process	Estimated yield (events)
Intrinsic	Muon decay-in-orbit (DIO)	0.199 ± 0.092
	Muon capture (RMC)	$0.000^{+0.004}_{-0.000}$
Late Arriving	Pion capture (RPC)	0.023 ± 0.006
	Muon decay-in-flight (μ-DIF)	<0.003
	Pion decay-in-flight (π-DIF)	0.001 ± <0.001
	Beam electrons	0.003 ± 0.001
Miscellaneous	Antiproton induced	0.047 ± 0.024
	Cosmic ray induced	0.082 ± 0.018
	Total background:	0.36 +/- 0.10

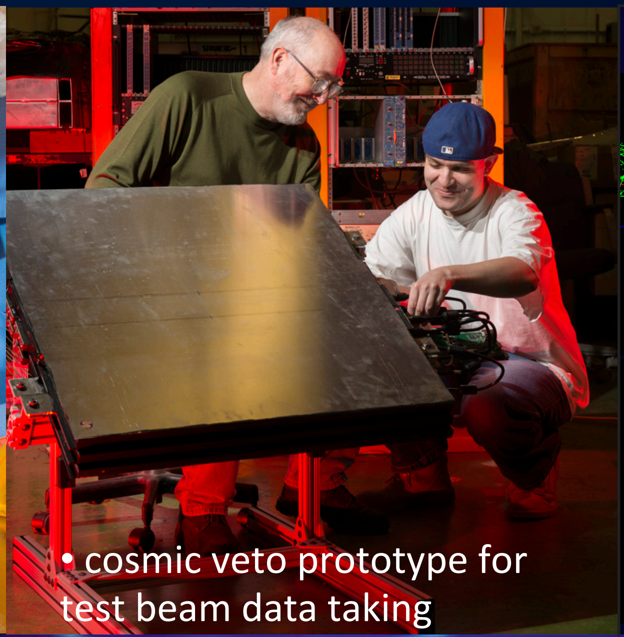
- Estimated signal sensitivity for 3.6 x 10^{20} POT

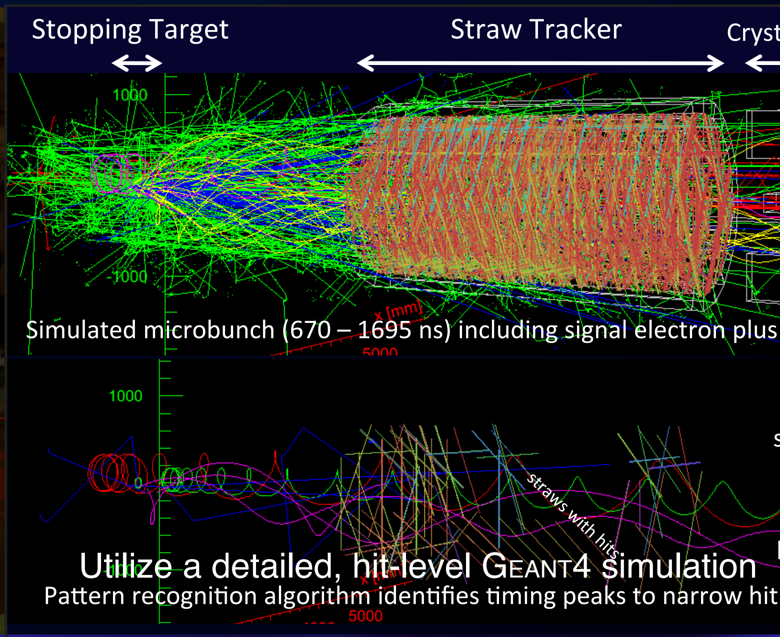
Parameter	Value
Physics run time @ 2×10^7 s/yr.	3 years
Protons on target per year	1.2 x 10^{20}
μ^- stops in stopping target per proton on target	0.0019
μ^- capture probability	0.609
Total acceptance x efficiency for the selection criteria of Section 3.5.3	$(8.5\pm^{1.1}_{0.9})\%$
Single-event sensitivity with Current Algorithms	$(2.87\pm^{0.32}_{0.27})\times10^{-17}$
Goal	2.4×10^{-17}

- **Total background yield:** (0.36 +/- 0.10) events
- **Total signal acceptance x efficiency:** (8.5 +/- 1.0) %
- **Single-event-sensitivity:** (2.9 +/- 0.3) x 10^{-17}
- **Total background yield:** (0.36 +/- 0.10) events
- **Expected Limited:** 6 x 10^{-17} @ 90% CL

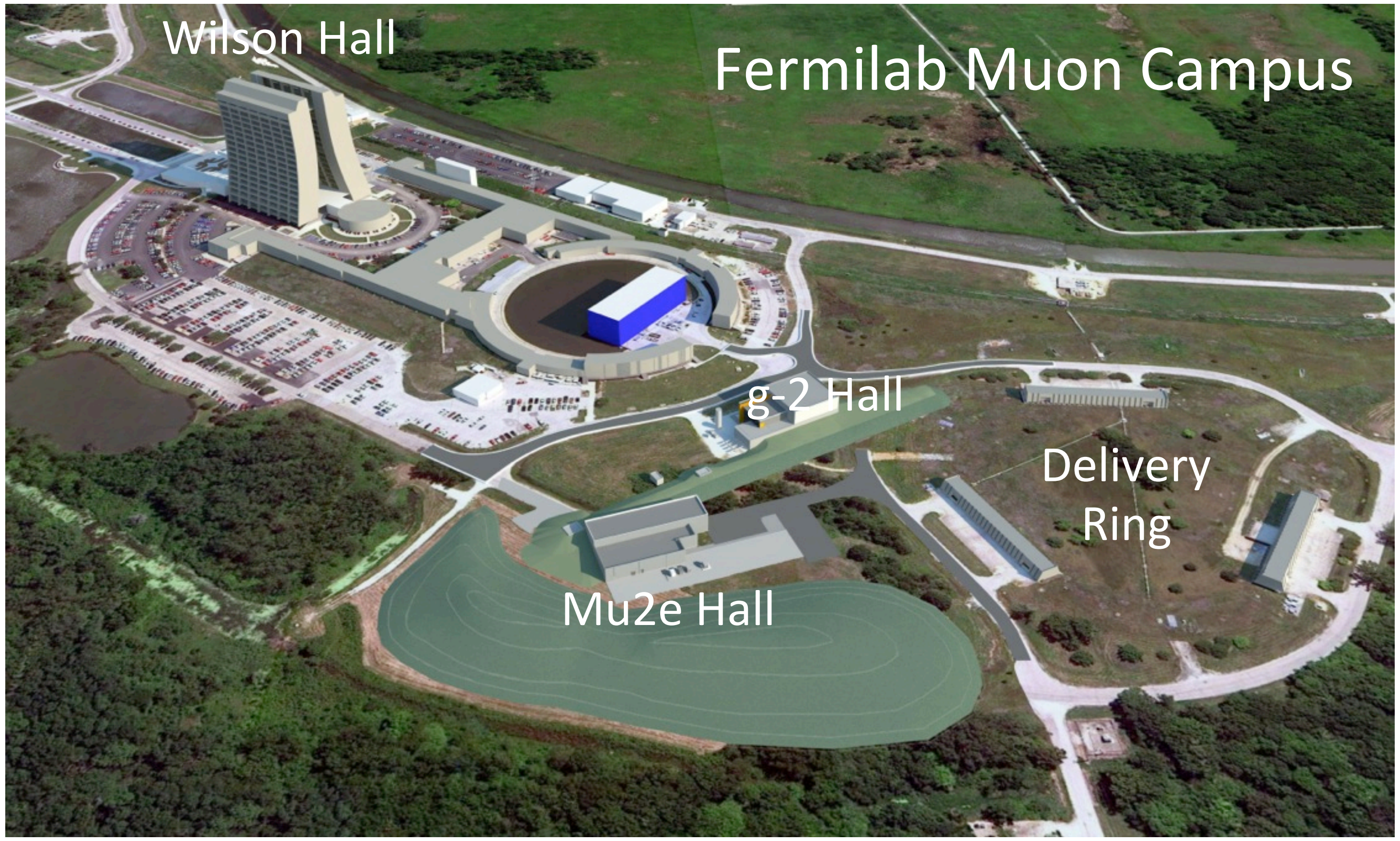
Mu2e : Status

- Technical Design Report completed (Oct. 2014)
  - arXiv:1501.05241, 888 pages, 621 figures
- Awarded CD-3a (June 2014)
  - Authorized purchase of superconductor in production lengths
- Awarded CD-2/3b (March 2015)
  - Project baseline at $273.7M
  - Authorized building start, Transport solenoid coil fabrication
- Working towards DOE CD-3c approval.





Mu2e : Muon Campus Civil Construction



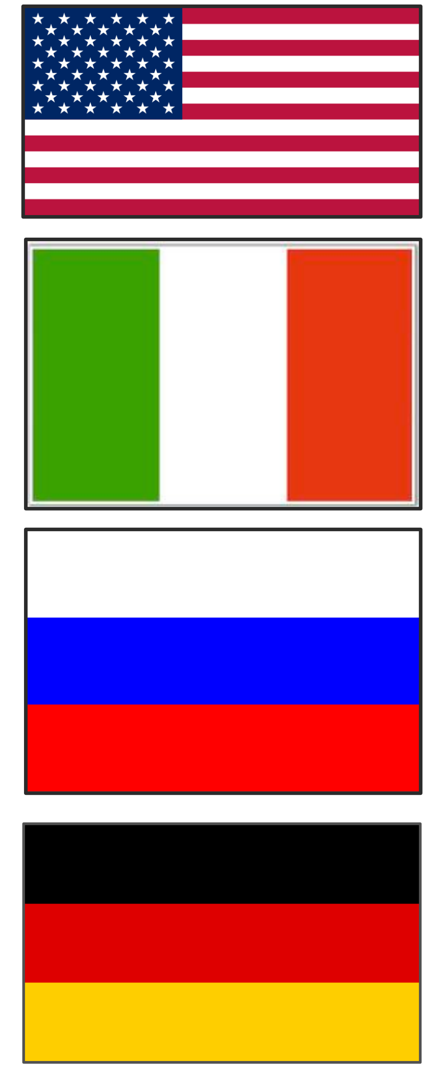
Beam line construction – April 2015

Completed g-2 experimental hall

Mu2e ground breaking April 2015

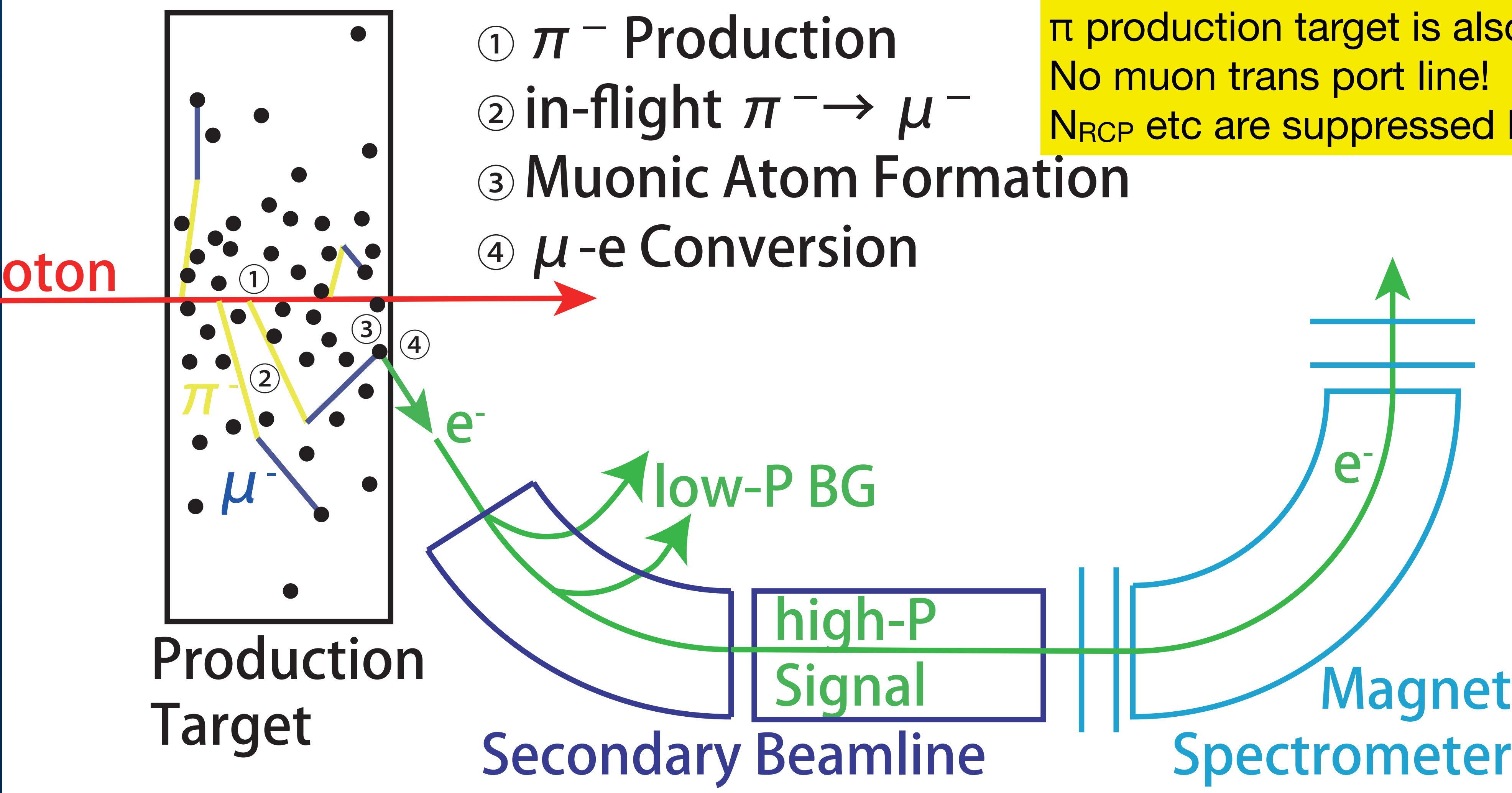
- Common Muon Campus for Muon (g-2) and Mu2e experiments –
  - common beam line, cryogenics, utilities

Mu2e : Collaboration



Argonne National Laboratory, Boston University, Brookhaven National Laboratory, University of California Berkeley, University of California Irvine, California Institute of Technology, City University of New York, Joint Institute of Nuclear Research Dubna, Duke University, Fermi National Accelerator Laboratory, Laboratori Nazionale di Frascati, University of Houston, Helmholtz-Zentrum Dresden-Rossendorf, University of Illinois, INFN Genova, Lawrence Berkeley National Laboratory, INFN Lecce, University Marconi Rome, Kansas State University, Lewis University, University of Louisville, University of Minnesota, Muons Inc., Northwestern University, Institute for Nuclear Research Moscow, Northern Illinois University, INFN Pisa, Purdue University, Novosibirsk State University/Budker Institute of Nuclear Physics, Rice University, University of South Alabama, University of Virginia, University of Washington, Yale University

DeeMe : Concept

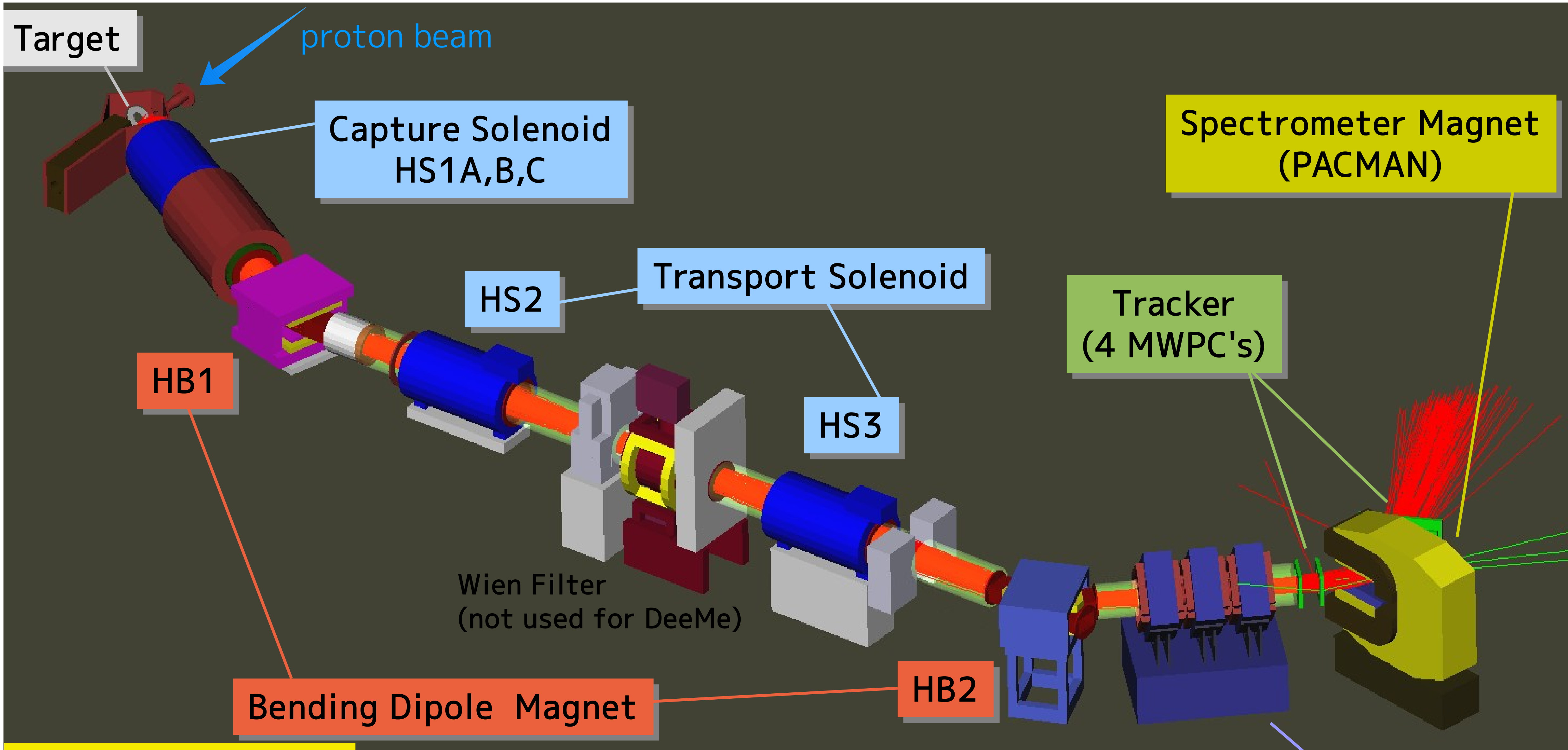


π production target is also used as a μ stopping target!
No muon trans port line!
N_{RCP} etc are suppressed by a great extinction level.

- **Backgrounds suppression**
  - Beam related prompt (PRC etc)
    - Delayed signal detection window
    - Proton extinction level : $R_{AP}<10^{-18}$
  - DIO
    - High-Performance Magnet Spectrometer

- **Single event sensitivity**
  - 1×10^{-13} with Graphite Target
  - 2×10^{-14} with SiC Target (1 year)
  - 5×10^{-15} with SiC Traget (4 years)

DeeMe : Layout and Status



- KEK-Muon PAC:Stage-2 Approval
- Detector construction will be completed in 2015
- Upstream of H-Line already exists
- Construction of the rest before 2016
- Aiming to start data taking by 2016

DeeMe : Collaboration

10 institutes, 30 collaborators

M. Aoki[1], D. Bryman[2], M. Ikegami[3], Y. Irie [3], S. Ito[1], N. Kawamura[4], M. Kinsho[5], H. Kobayashi[3], S. Makimura[4], H. Matsumoto[3], S. Meigo [5], T. Mibe[6], S. Mihara[6], Y. Miyake[4], Y. Nakatsugawa[4], H. Natori[6], H. Nishiguchi[6], T. Numao[7], C. Ohomori[3], S. Ritt[10], P.K. Saha[5], N. Saito[6], Y. Seiya[8], K. Shimizu[8], K. Shimomura[4], P. Strasser[4], N.D. Thong [1], N.M. Truong [1], K. Yamamoto[5], K. Yamamoto[8], M. Yoshii[3], K. Yoshimura[9]

(1) Osaka University, (2) UBC, (3) KEK Accelerator, (4) KEK MUSE, (5) JAEA, (6) KEK IPNS (7) TRIUMF, (8) Osaka City University, (9) Okayama University, (10) PSI

Summary

- μ-e conversion is a good probe for the new physics beyond the SM. Exciting new experimental results are coming soon!
- Three experiments are currently preparing to start data taking
  - DeeMe at J-PARC-MLF
    - for S.E.S. 1×10^{-13} (2016~)
      - then 2×10^{-14}, 5×10^{-15}
  - COMET at J-PARC-Hadron hall
    - Phase-I for S.E.S. 3×10^{-15} (2017~)
    - Phase-II for S.E.S. 3×10^{-17} (2020~)
  - Mu2e at FNAL
    - for S.E.S. 2.9×10^{-17} (2020~)

Acknowledgment for slides and informations

- Mu2e : Douglas Glenzinski, Marj Corcoran
- DeeMe : Masa Aoki