The Current Status of MUSE

EINN 2017 Pre-Conference

Ethan Cline

Overview

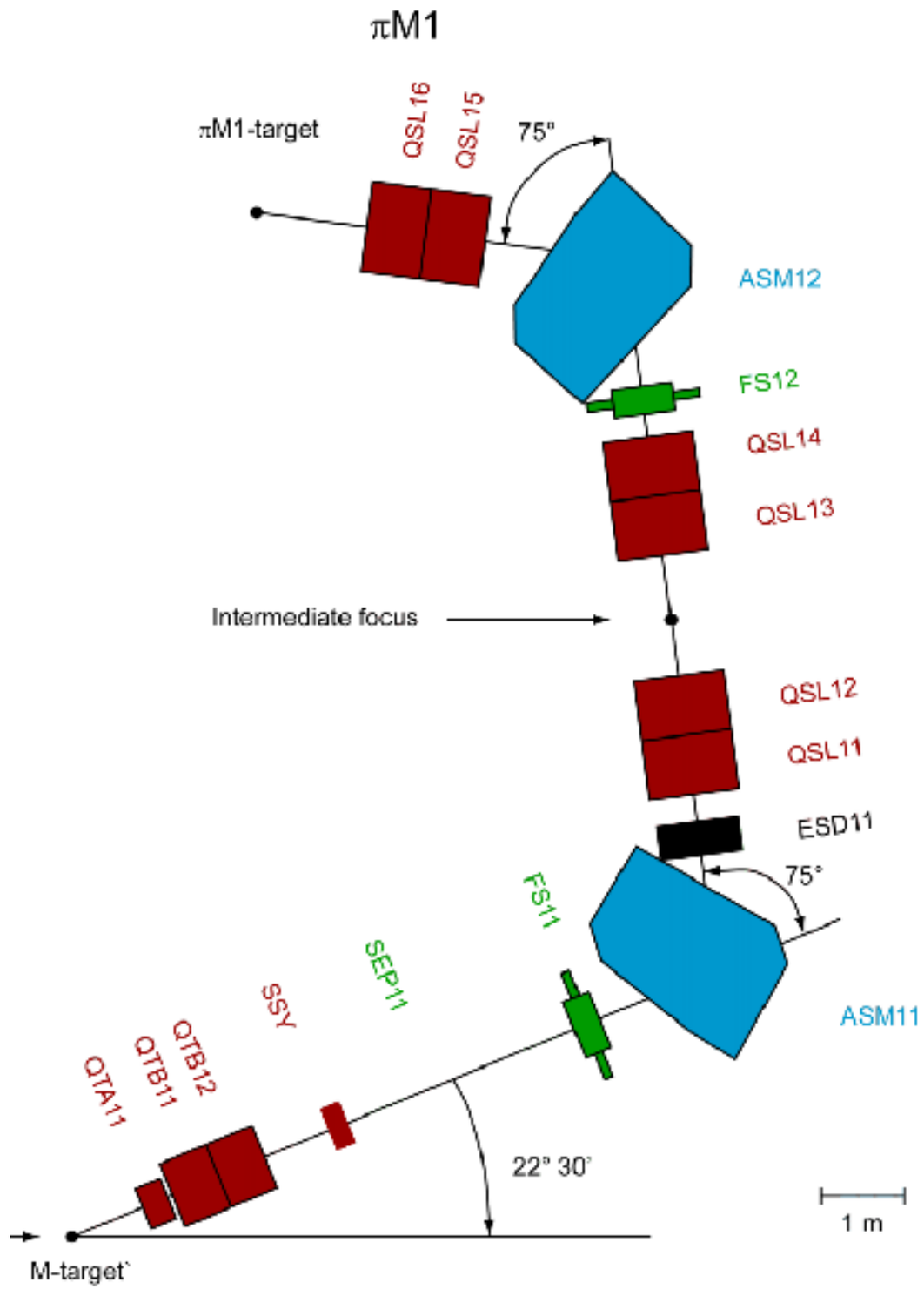
1. How we got here
2. Where we are
3. What's next

MUSE

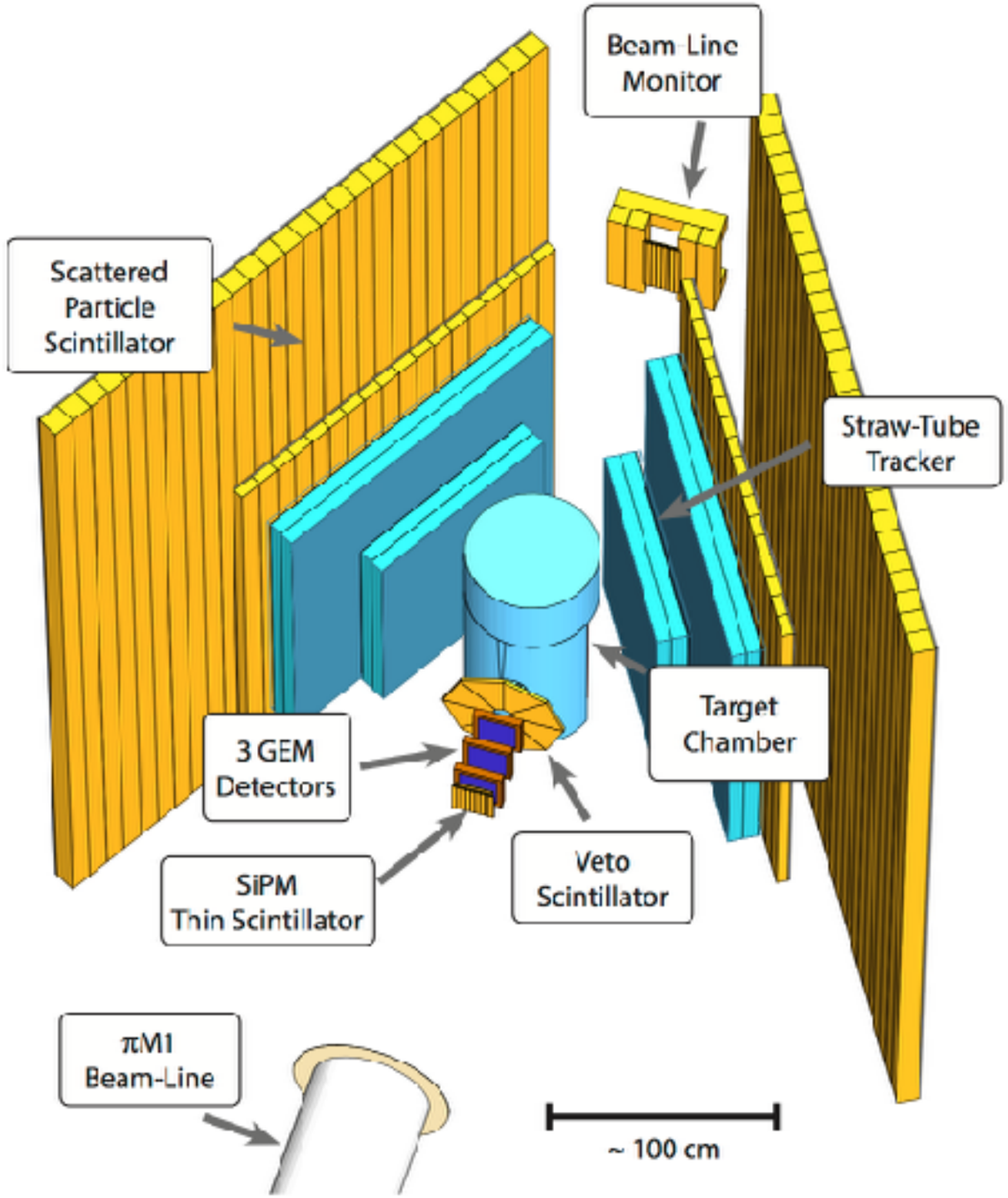
- Simultaneous elastic μP and eP scattering
- Extract radius from measured cross section
- Test lepton universality
- Measure relative cross sections
- Experiment done at Paul Scherrer Institute's HIPA, PiM1 secondary beamline

MUSE at PSI

590 MeV proton accelerator. We use the secondary beam line with a 2.2 mA current. 50.6 MHz frequency



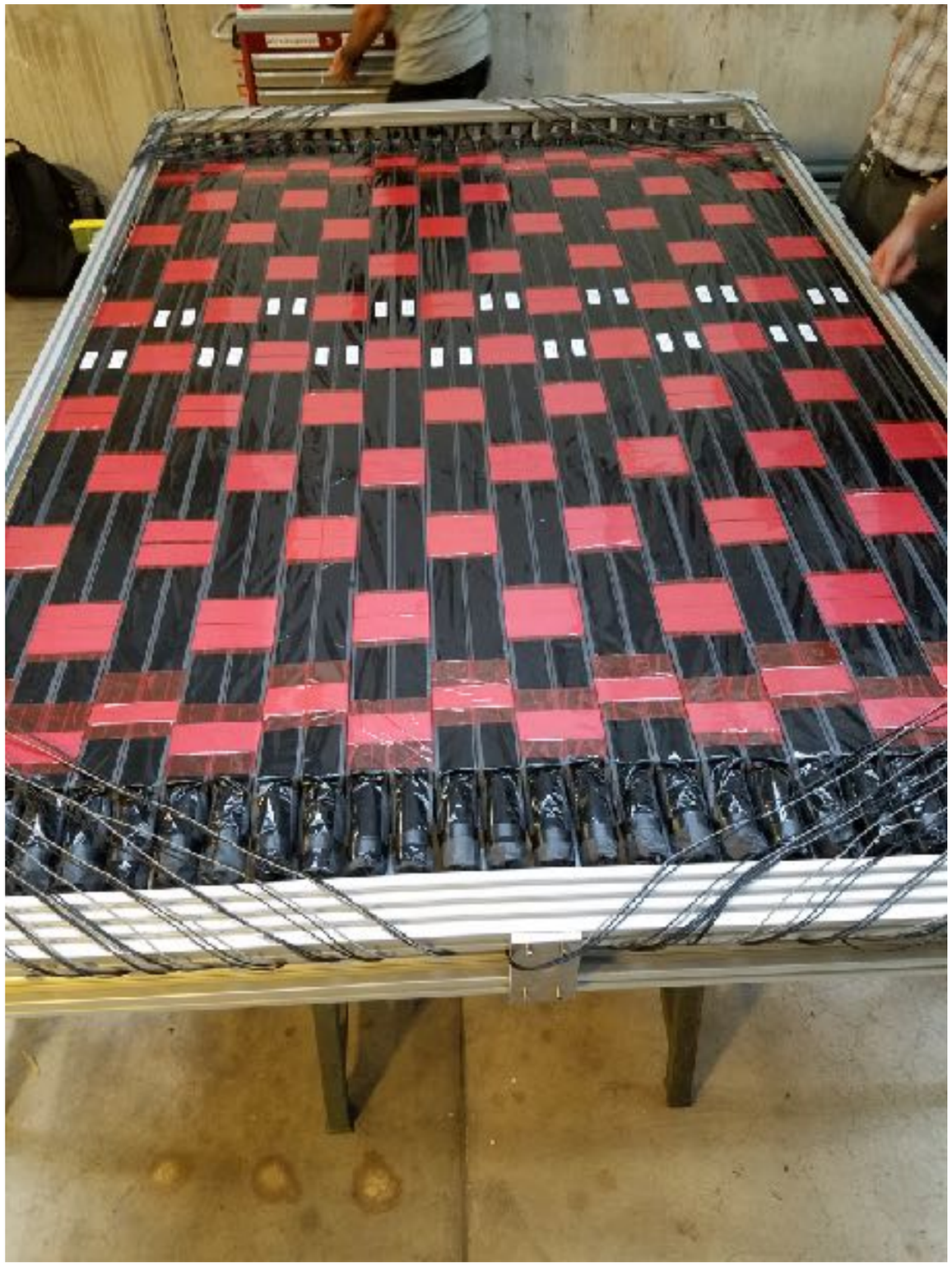
Experimental Setup



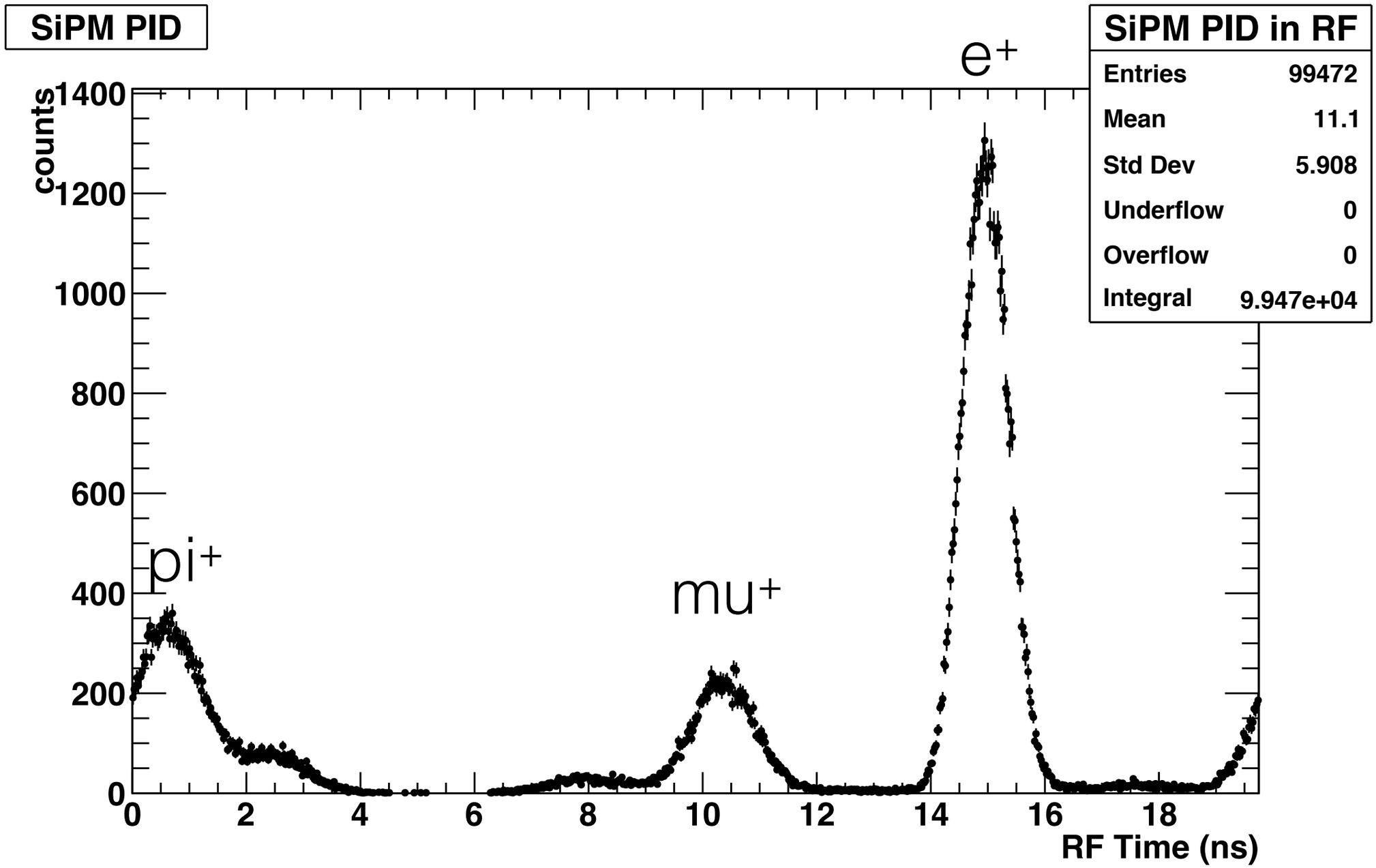
Achieved Goals

- Verified timing resolution and efficiency of Beam Hodoscope
- Scattered particle scintillator (SPS) is being commissioned
- Tracks from GEMs to Straw Tube Tracker (STT) have been visualized
- Demonstrated removal of pion events in trigger and pattern matching for scattered particles

Scattered Particle Scintillator



Trigger - 161 MeV/c



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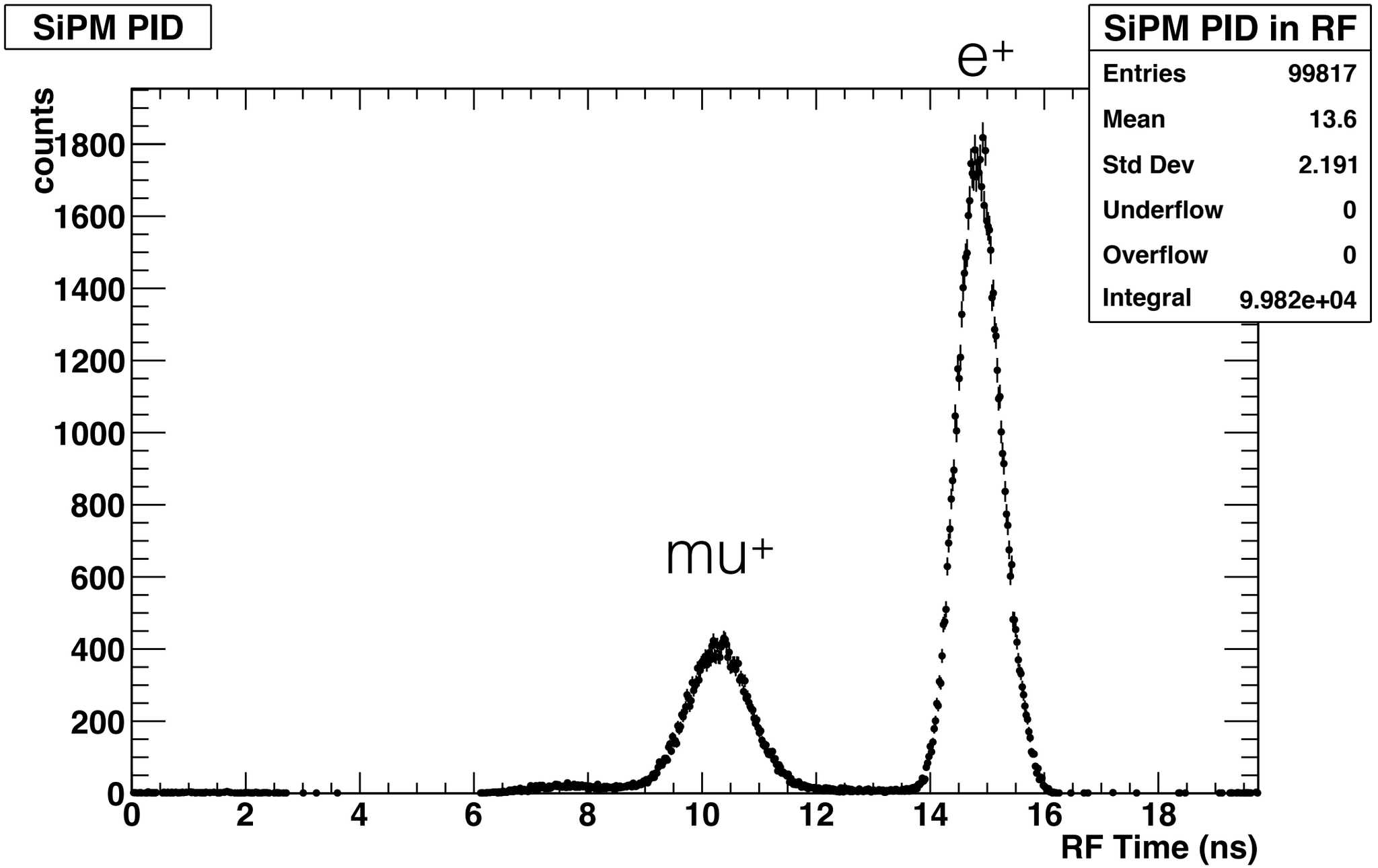
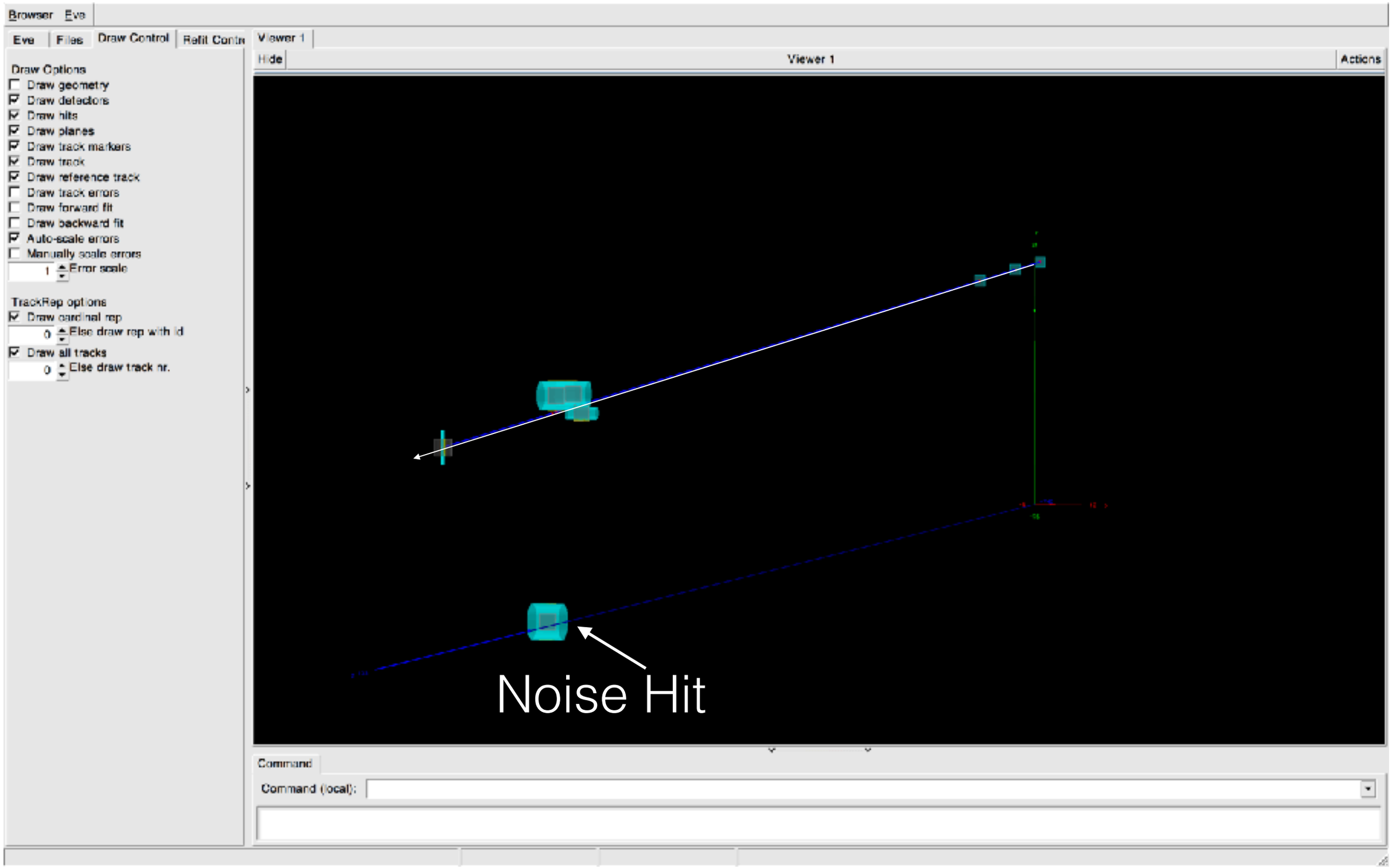


Tracks


Browser Eve
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Hide
Viewer 1
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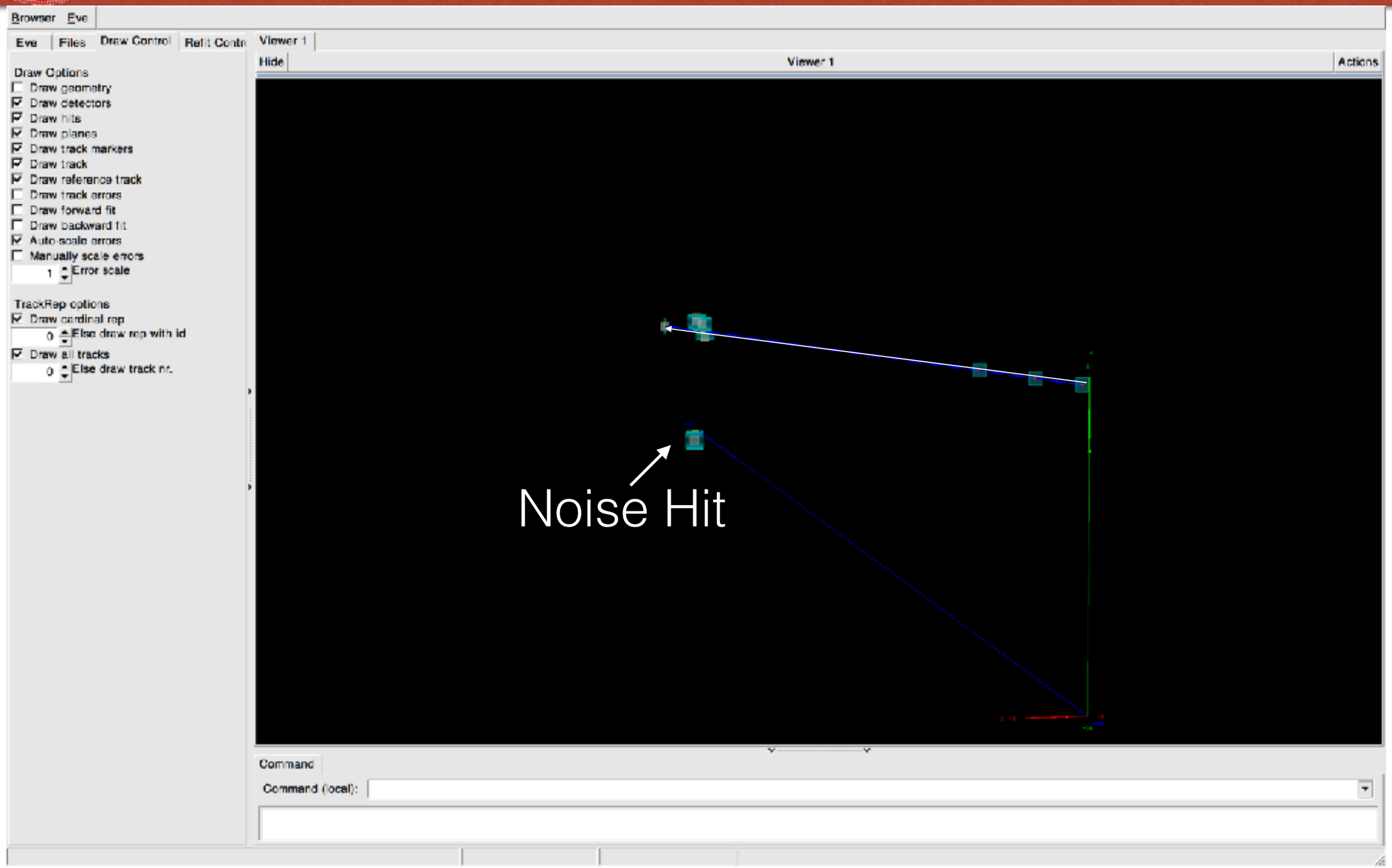
Draw Options
Draw geometry
Draw detectors
Draw hits
Draw planes
Draw track markers
Draw track
Draw reference track
Draw track errors
Draw forward fit
Draw backward fit
Auto-scale errors
Manually scale errors
1
Error scale
TrackRep options
Draw cardinal rep
0
Else draw rep with id
Draw all tracks
0
Else draw track nr.
Noise Hit
Command
Command (local):

Tracks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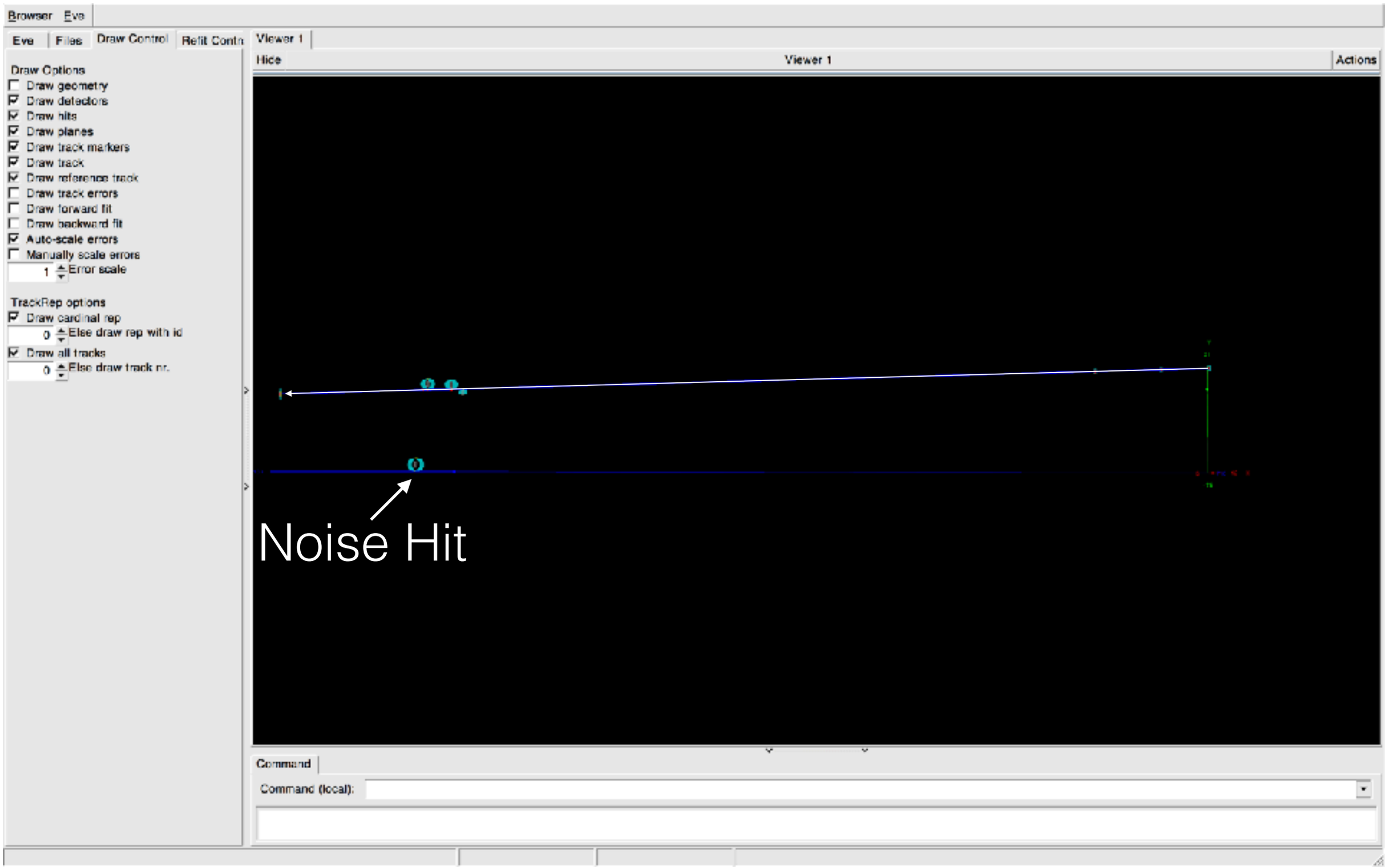
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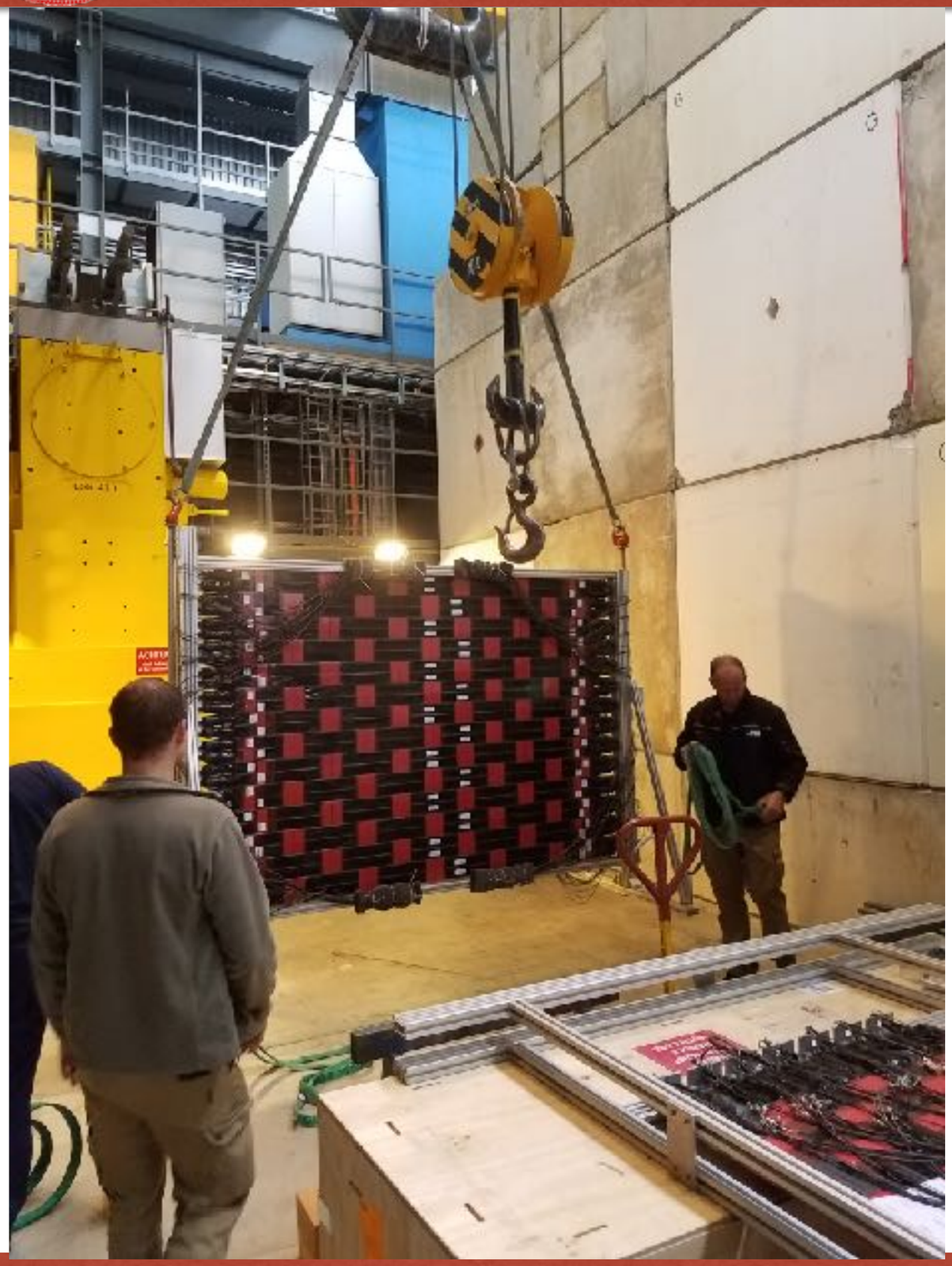
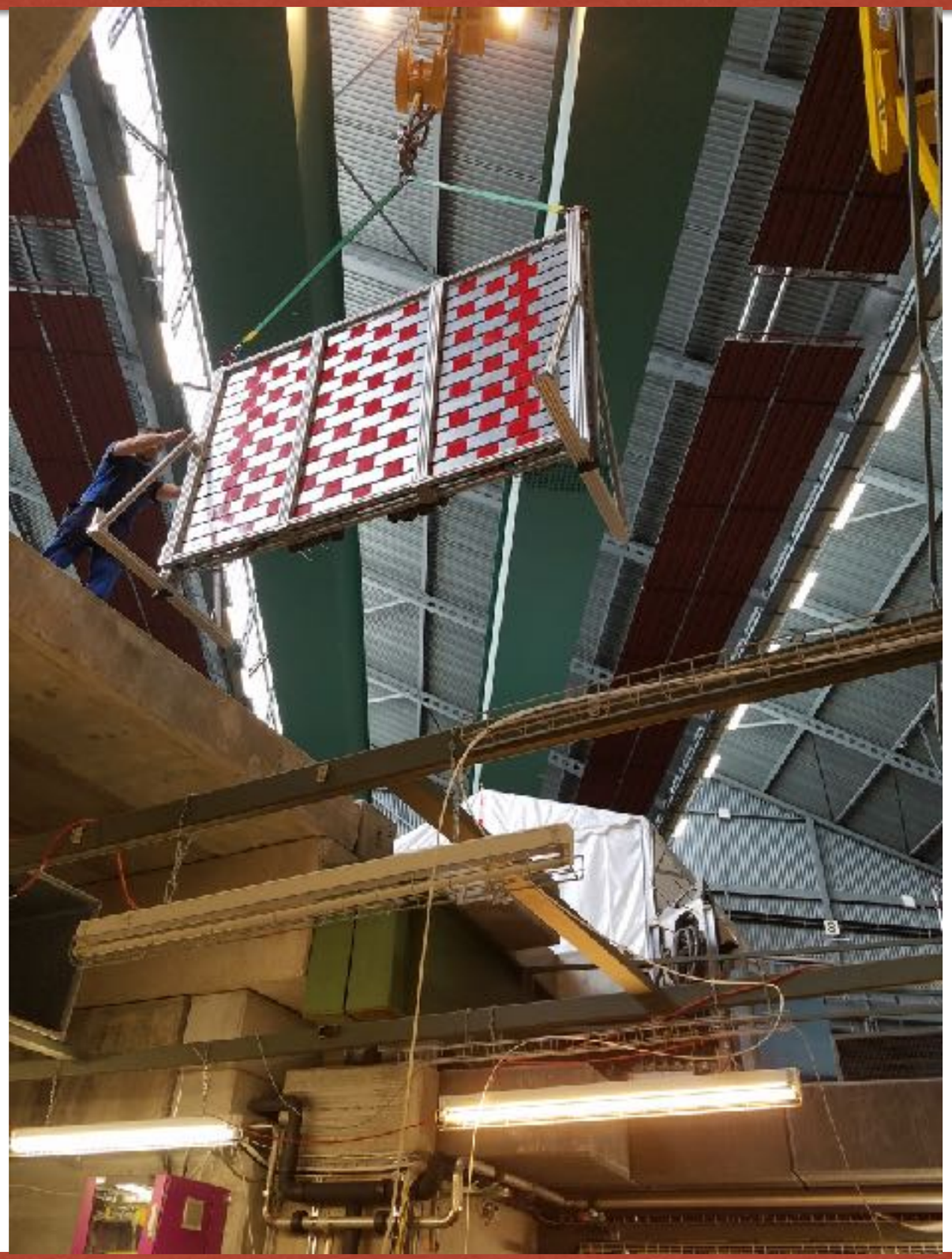
Current Work

- As we speak the SPS is being verified with cosmics
- Detailed trigger efficiency tests
- GEM readout speed increases
- Preparing for STT assembly

SPS

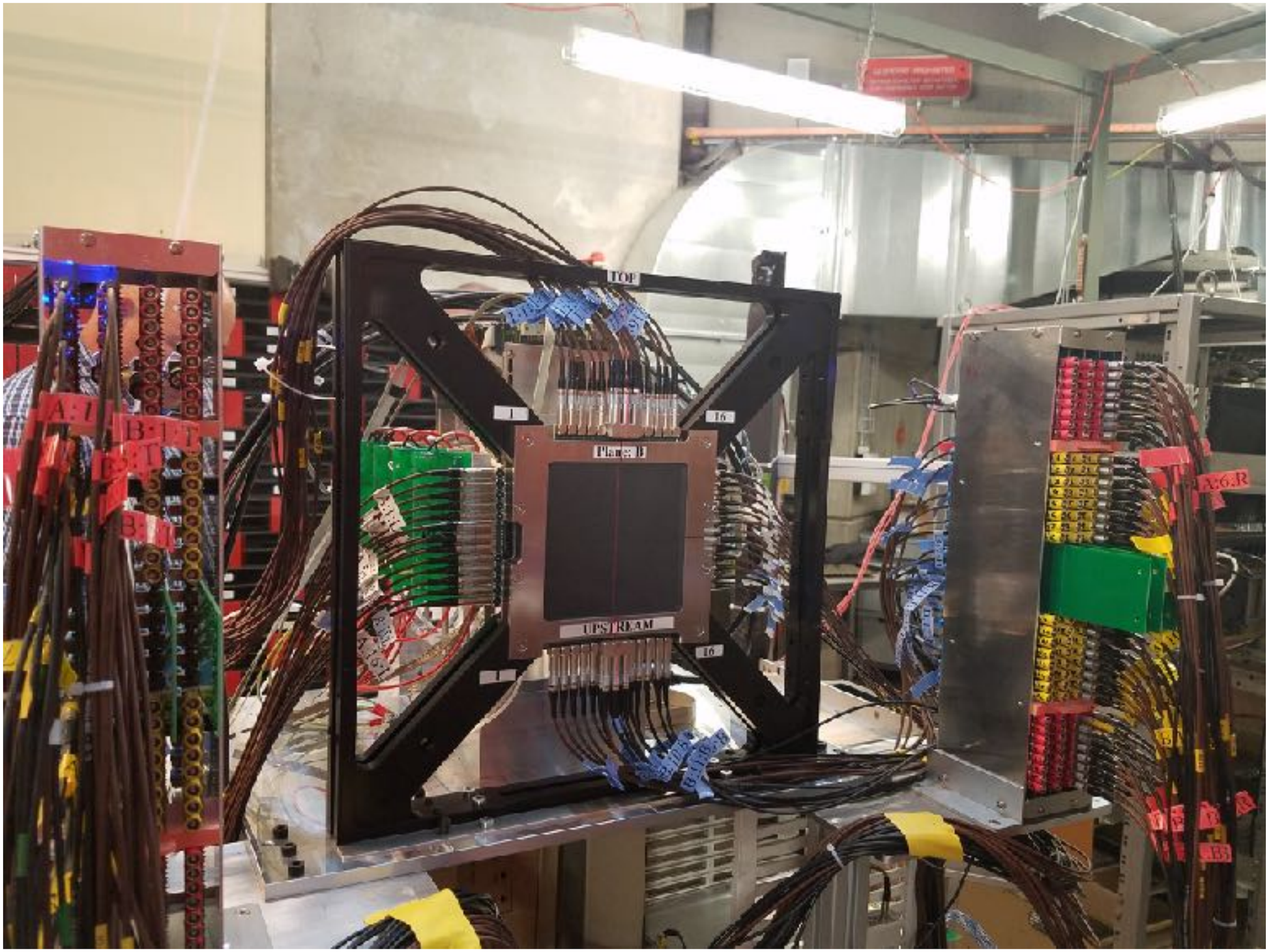


SPS



SPS

Current PiM1 Area Setup



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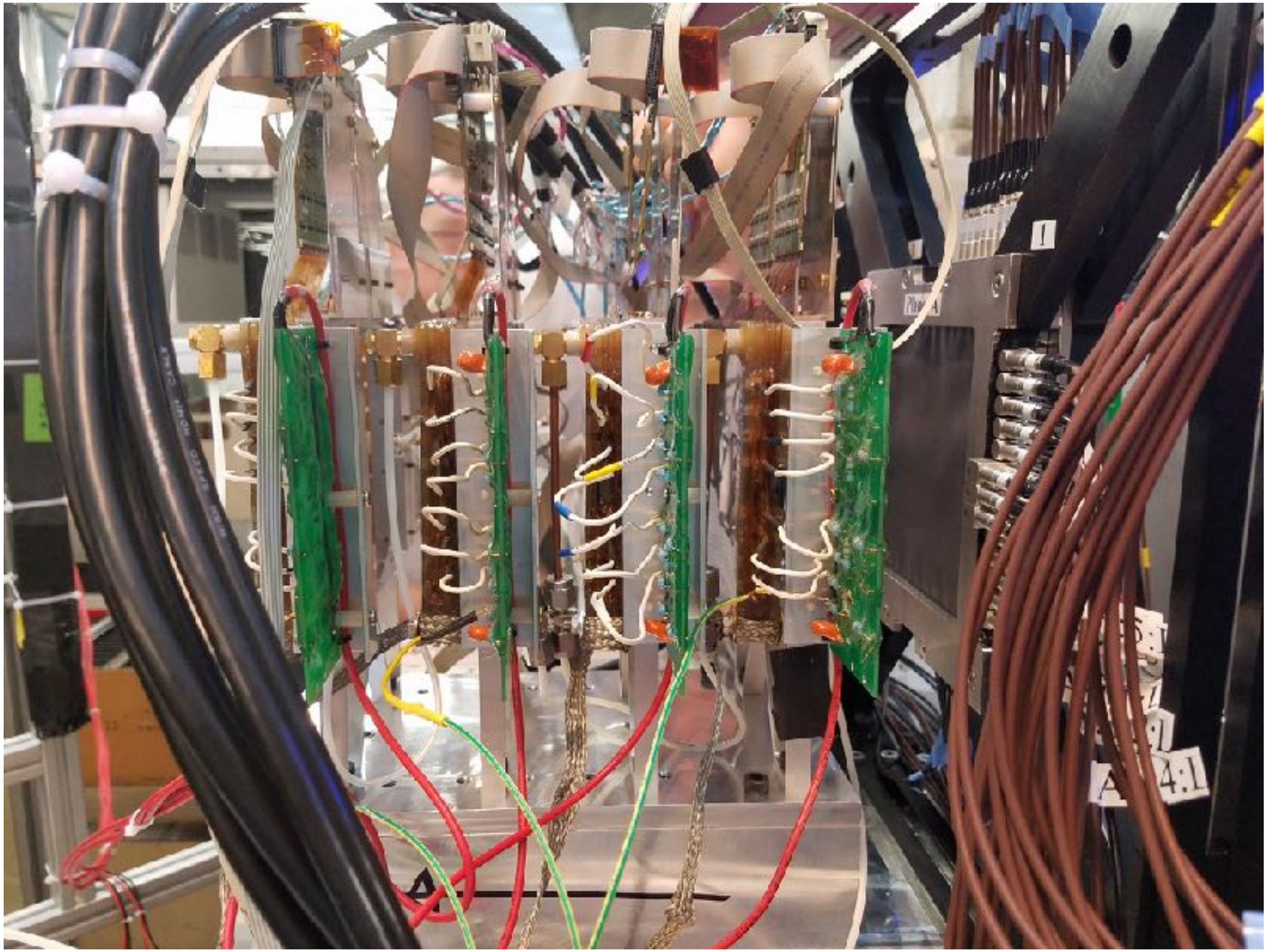


Current PiM1 Area Setup

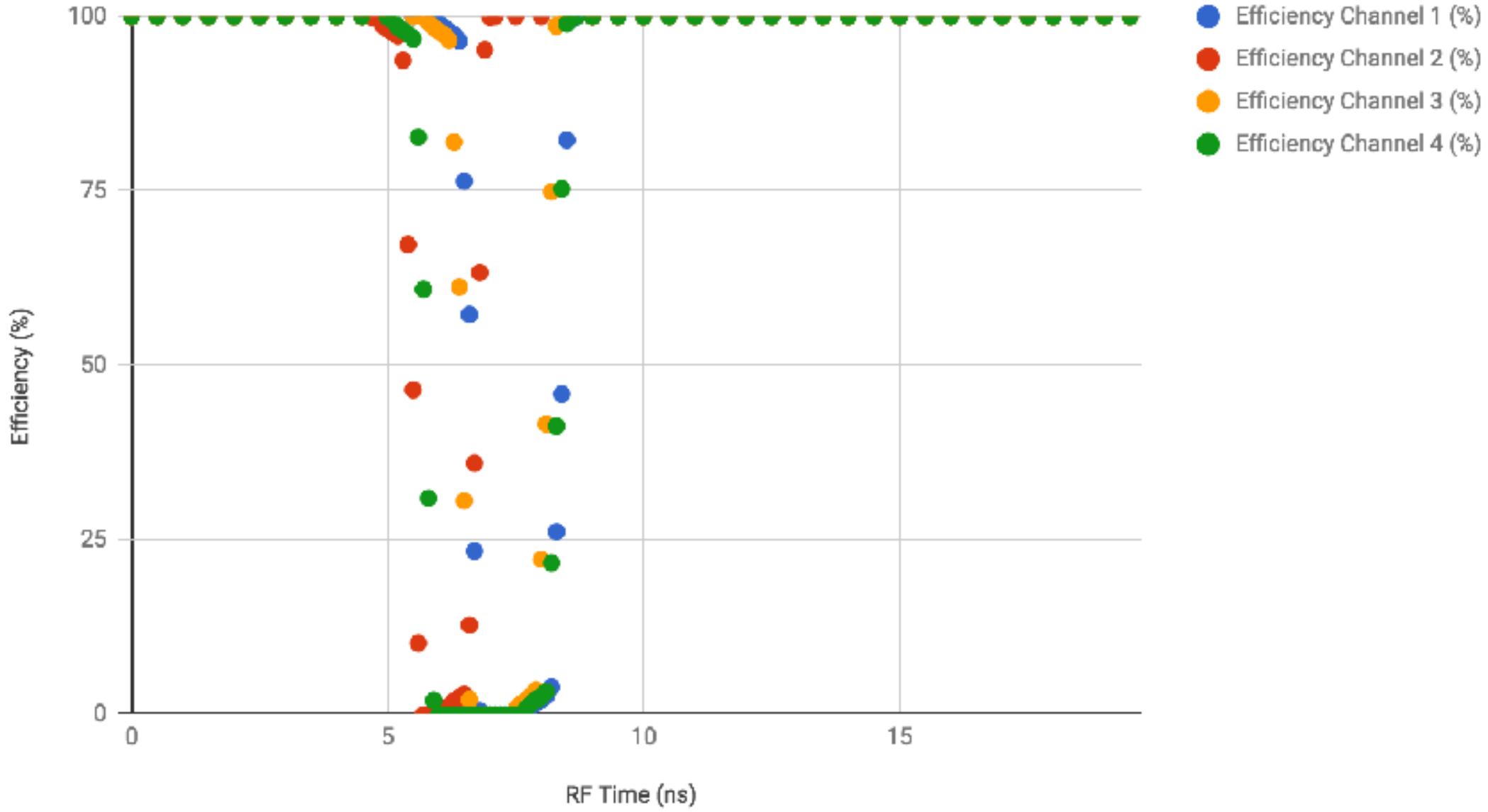
Future Work for the Installation and Dry Run

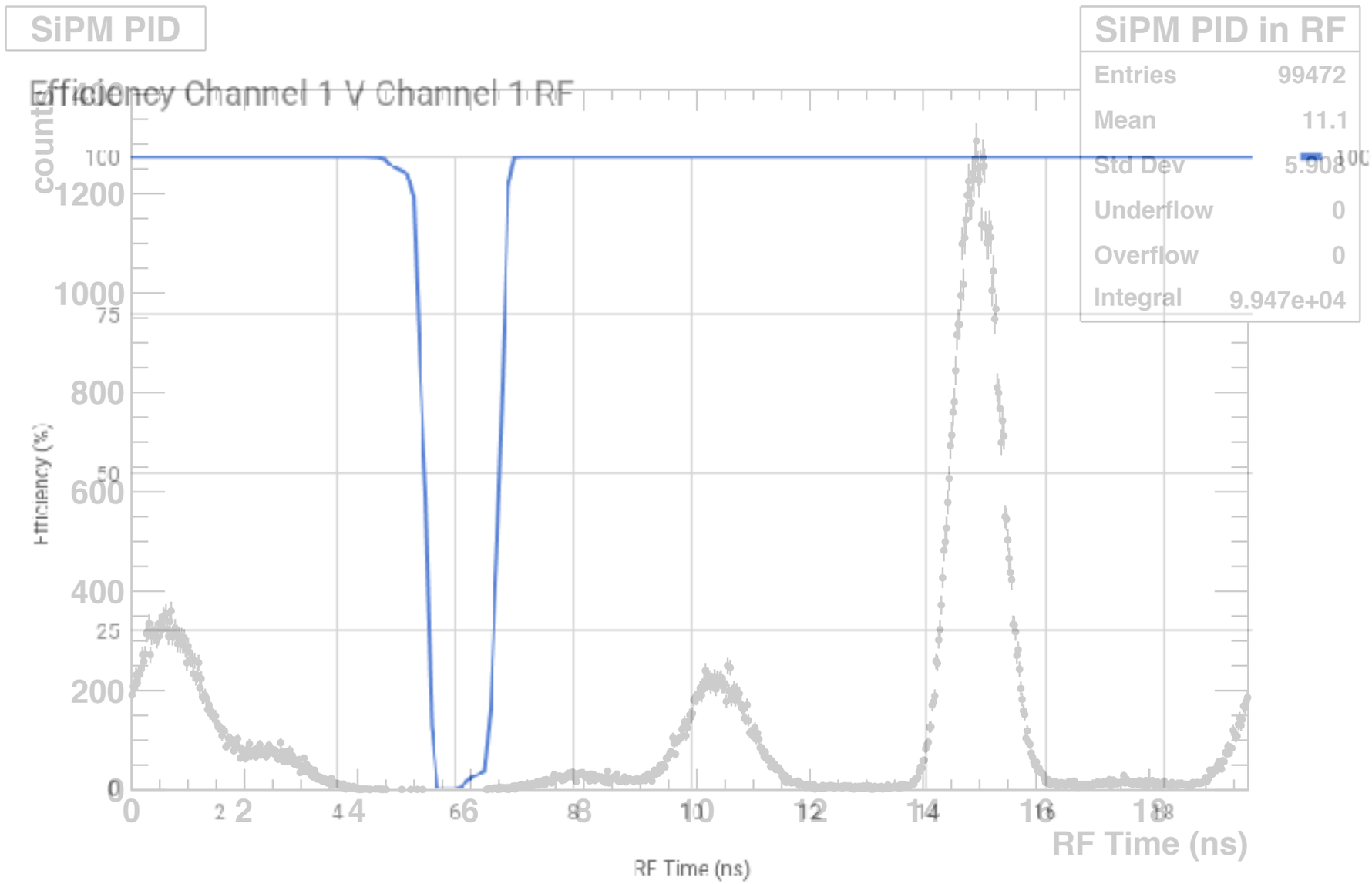
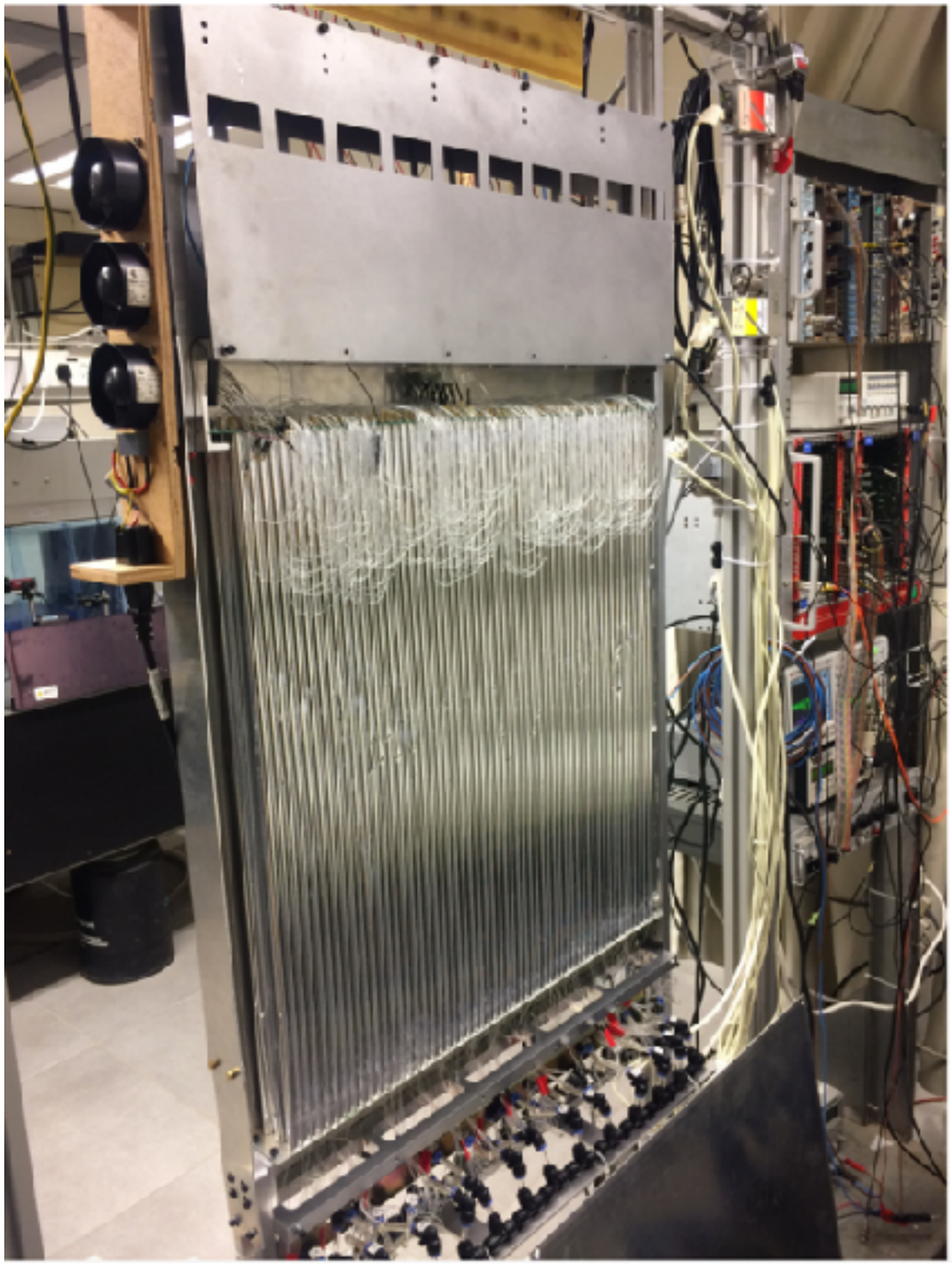
- The SPS will be verified in beam this week
  - TOF resolution will be measured
- STT assembly next week
- Calibration runs with GEMs
  - Tracks from GEMs into SPS to verify simulation
- Beam energy loss studies
- Production!

Thanks To

The MUSE collaboration,
Ed Bartz,
and John Doroshenko

Backup


Beam PID Trigger Efficiency V RF Time
100
75
50
25
0
Efficiency (%)
0
5
10
15
RF Time (ns)
Efficiency Channel 1 (%)
Efficiency Channel 2 (%)
Efficiency Channel 3 (%)
Efficiency Channel 4 (%)


SiPM PID
Efficiency Channel 1 V Channel 1 RF
SiPM PID in RF
Entries 99472
Mean 11.1
Std Dev 5.908
Underflow 0
Overflow 0
Integral 9.947e+04
counts
Efficiency (%)
RF Time (ns)
RF Time (ns)

Front	Exact Back	3	2	1	Back	1	2	3
0	2.00		0.00	1.00	2.00	3.00	4.00	5.00
1	3.35	0.00	1.00	2.00	3.00	4.00	5.00	6.00
2	4.71	2.00	3.00	4.00	5.00	6.00	7.00	8.00
3	6.06	3.00	4.00	5.00	6.00	7.00	8.00	9.00
4	7.41	4.00	5.00	6.00	7.00	8.00	9.00	10.00
5	8.76	6.00	7.00	8.00	9.00	10.00	11.00	12.00
6	10.12	7.00	8.00	9.00	10.00	11.00	12.00	13.00
7	11.47	8.00	9.00	10.00	11.00	12.00	13.00	14.00
8	12.82	10.00	11.00	12.00	13.00	14.00	15.00	16.00
9	14.18	11.00	12.00	13.00	14.00	15.00	16.00	17.00
10	15.53	13.00	14.00	15.00	16.00	17.00	18.00	19.00
11	16.88	14.00	15.00	16.00	17.00	18.00	19.00	20.00
12	18.24	15.00	16.00	17.00	18.00	19.00	20.00	21.00
13	19.59	17.00	18.00	19.00	20.00	21.00	22.00	23.00
14	20.94	18.00	19.00	20.00	21.00	22.00	23.00	24.00
15	22.29	19.00	20.00	21.00	22.00	23.00	24.00	25.00
16	23.65	21.00	22.00	23.00	24.00	25.00	26.00	27.00
17	25.00	22.00	23.00	24.00	25.00	26.00	27.00	
			3 or 4	5 or 6				
		Anything >0.2 and <0.8 is defined as in the middle