

# INFN GEM Update:

6/23/21-6/29/21

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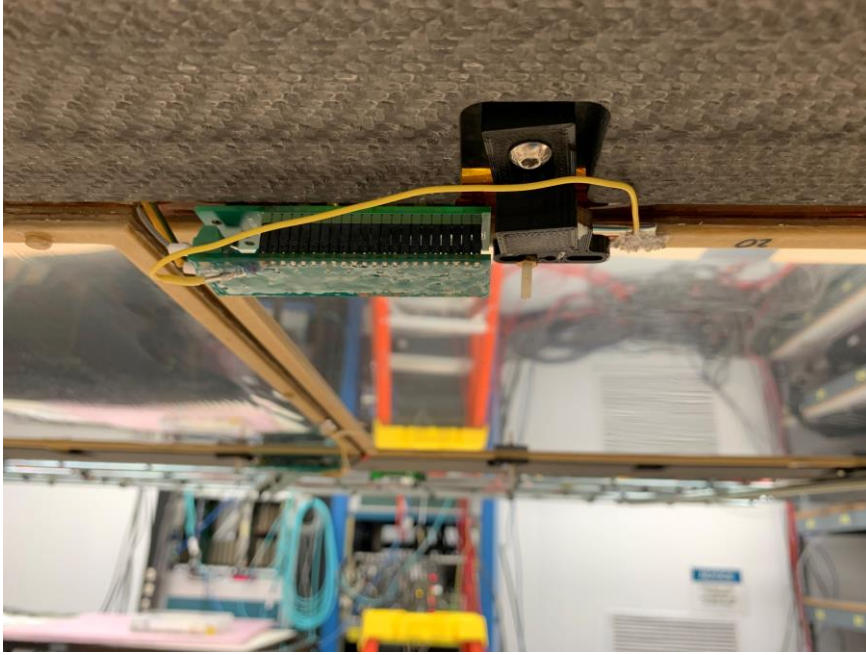
## Recent Activities:

### Test Lab Activities (June 23-29):

- Completed HV modification for layer J1.
- Removed prototype shielding on layer J3.
- Completed HV modification for layer J3.
- Had all MPDs in Test Lab resistor modification.

### Status of INFN GEMs for BigBite and SBS.

# HV Modification Layer J1, June 23-24:



Top Left: Modified HV divider on Top module

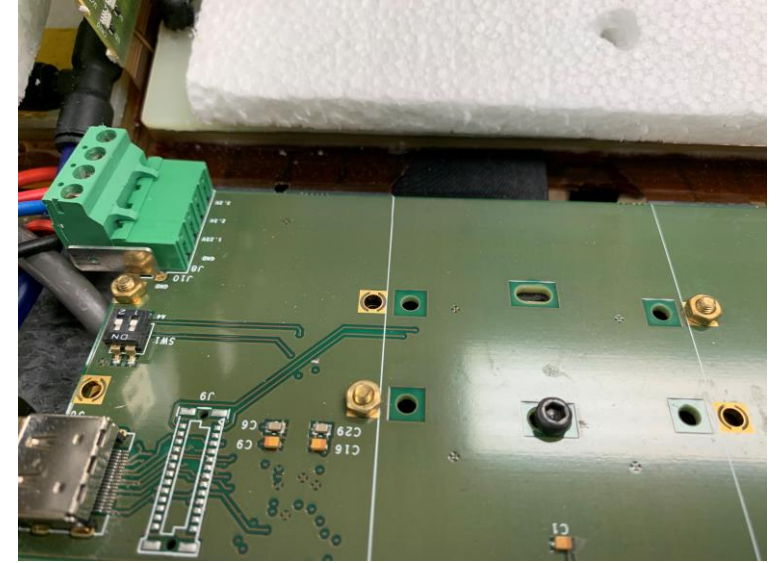
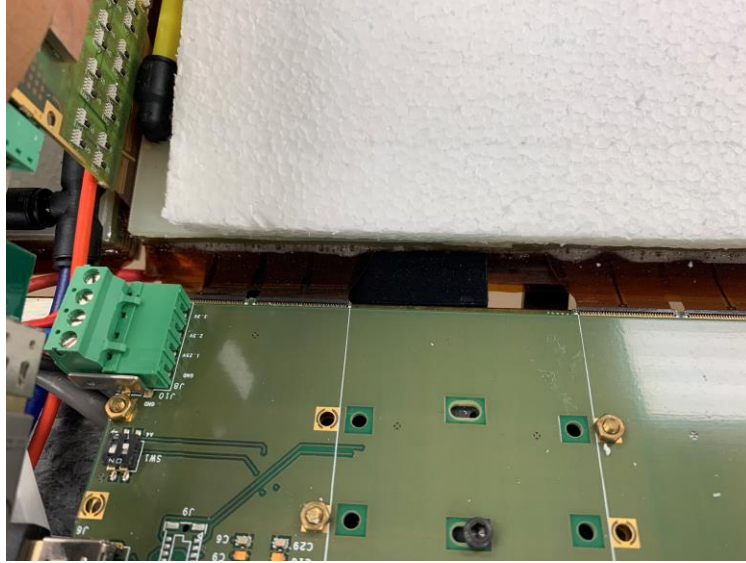
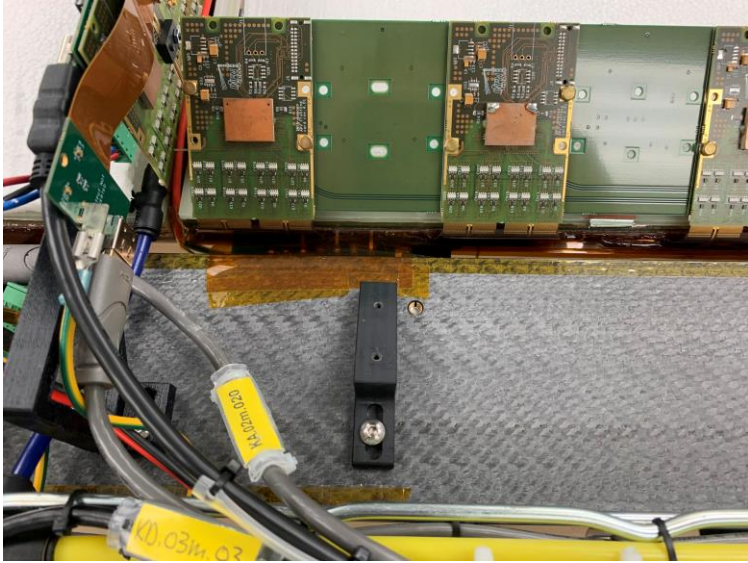
Top Right: Modified HV divider on Middle Module

Bottom Left: Modified HV divider on Bottom Module

HV modification electrical connects the exterior aluminized mylar window with the drift foil. So that way they do not become electrically attracted and deform the GEM.



# HV Modification Layer J1, June 23-24:

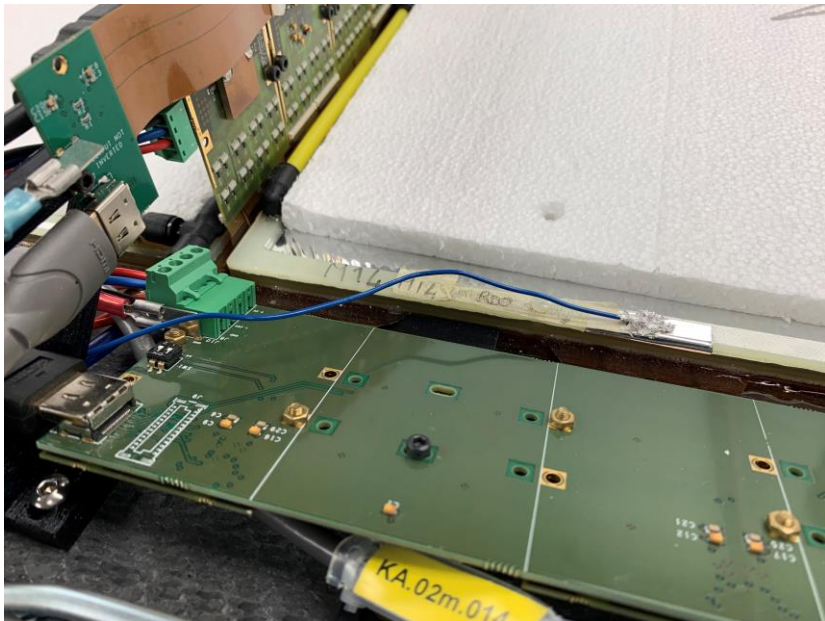
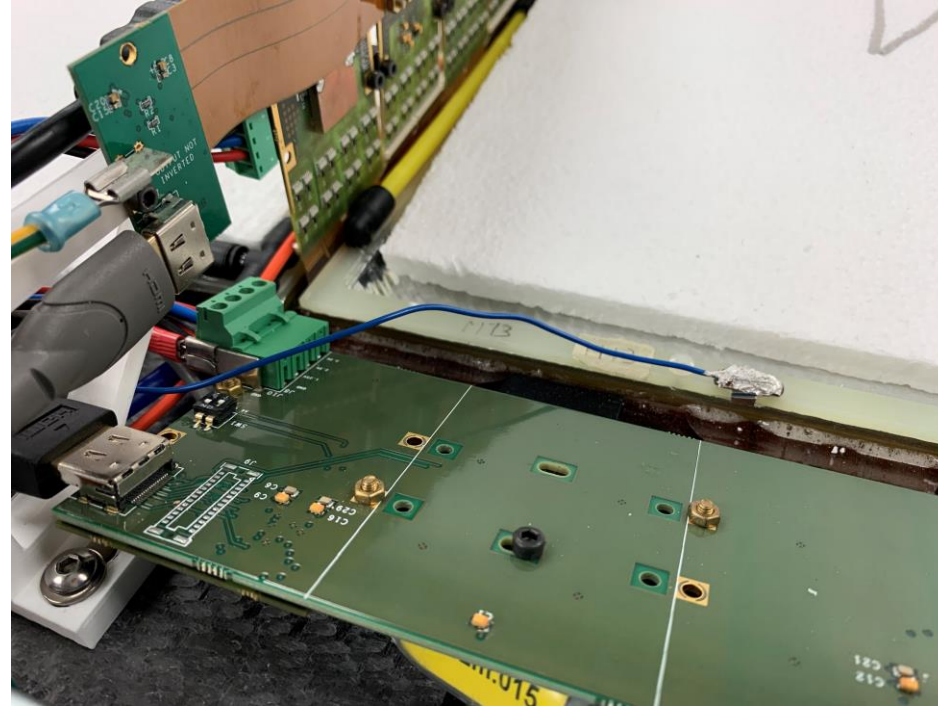
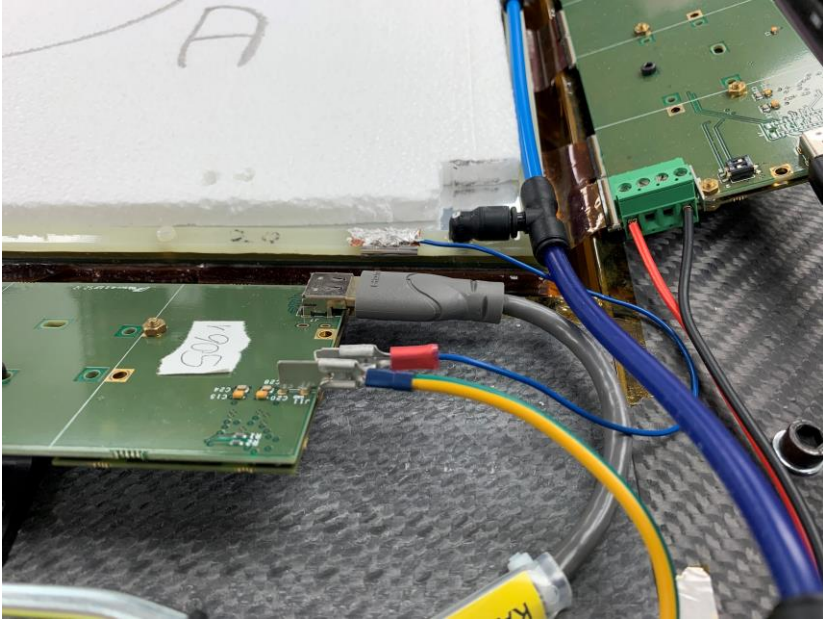


- Top Left: Kapton layer between HV divider and Backplane for Top module
- Top Middle: Plastic connector between HV divider and backplane Middle module
- Top Right: Plastic connector between HV divider and backplane Bottom module
- Bottom Left: Layer of 2 Mil Kapton connected to bottom of layer J1

HV modification electrical connects the exterior aluminized mylar window with the drift foil. So that way they do not become electrically attracted and deform the GEM.



# HV Modification Layer J1, June 23-24:

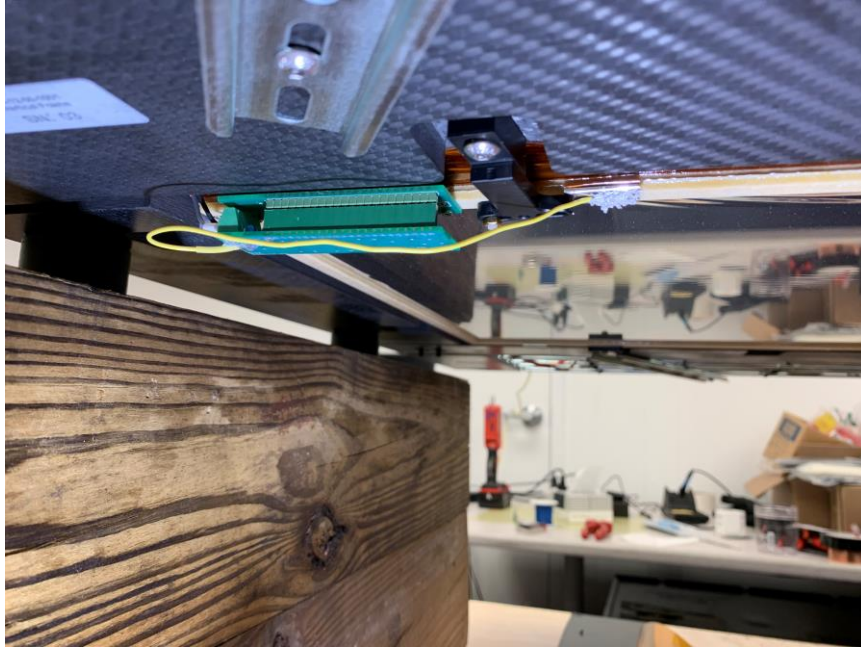


Top Left: Grounding connector readout side Top Module  
Top Right: Grounding connector readout side Middle Module  
Bottom Left: Grounding connector readout side Bottom Module

HV modification electrical connects the exterior aluminized mylar window with the drift foil. So that way they do not become electrically attracted and deform the GEM.



# HV Modification Layer J3, June 28-29:



Top Left: Modified HV divider on Top module

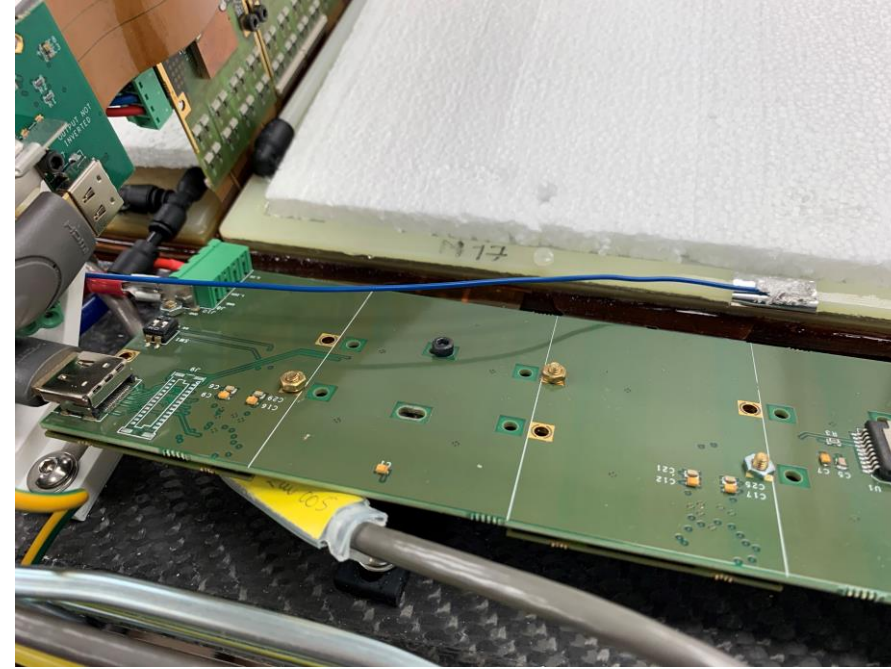
Top Right: HV divider with conformal coating on Middle Module

Bottom Left: Modified HV divider on Bottom Module

HV modification electrical connects the exterior aluminized mylar window with the drift foil. So that way they do not become electrically attracted and deform the GEM.



# HV Modification Layer J3, June 28-29:



Top Left: Grounding connector readout side Top Module

Top Right: Grounding connector readout side Bottom Module

Bottom Left: Layer of 2 Mil Kapton connected to bottom of layer J3

Note: Pieces of Kapton were placed between HV divider and Backplane for all modules on layer J3.

HV modification electrical connects the exterior aluminized mylar window with the drift foil. So that way they do not become electrically attracted and deform the GEM.

# XY Hit Map (Cosmic run 147) Nov. 6 2020

(statistics: ~ 504000 events)

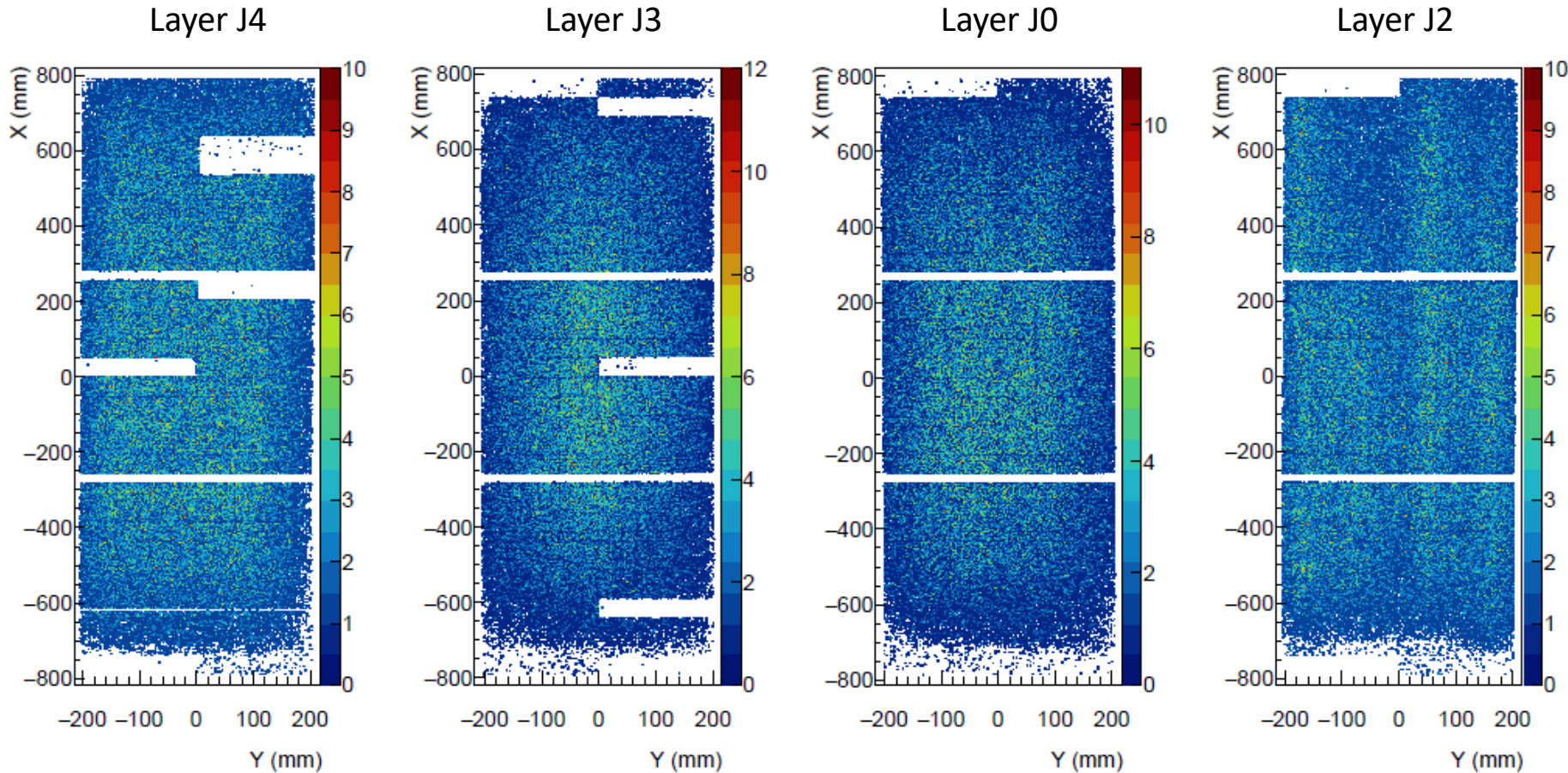
AR/CO2 gas flow ~ ½ of “nominal” values

HV = 4100V

For BigBite: chambers J0 and J2

For Recoil Polarimeter: chambers J3 and J1

Spare: J4 if repaired





# Track-based Efficiency (Cosmic run 147) Nov. 6 2020

(statistics: ~ 504000 events)

AR/CO2 gas flow ~ 1/2 of "nominal" values

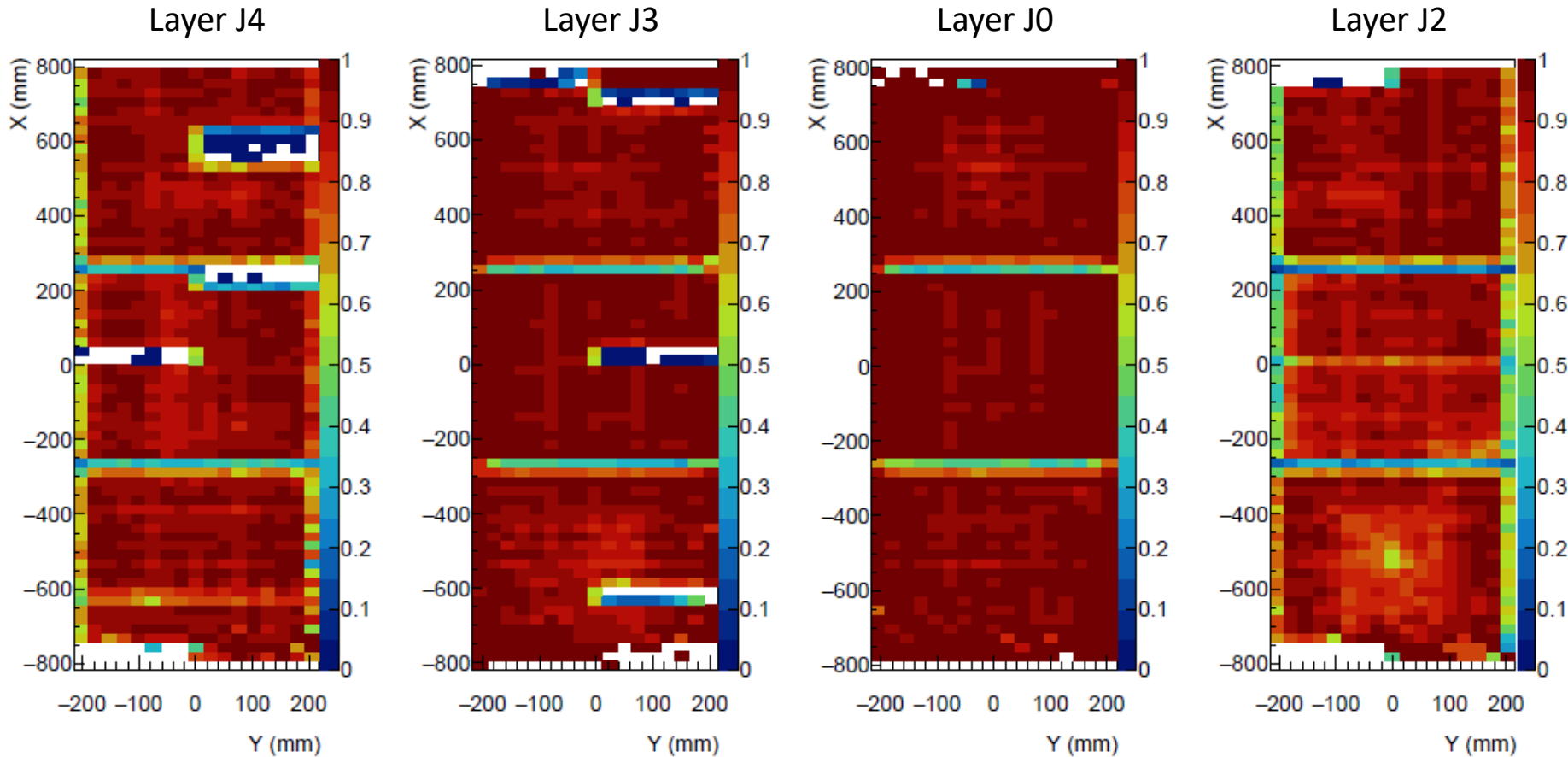
HV = 4100V

For BigBite: chambers J0 and J2

For Recoil Polarimeter: chambers J3 and J1

Spare: J4 if repaired

- Chamber J2 efficiency is lower in this plot due to incorrect latency, digital cables are 10-meters long instead of 20-meters long.
- Altered latency for J2 to proper value in Feb 2021. Verified with cosmic data.

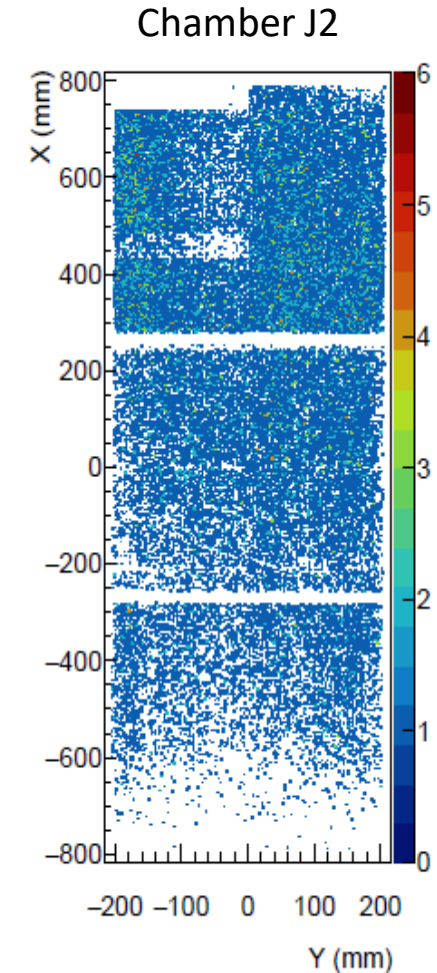
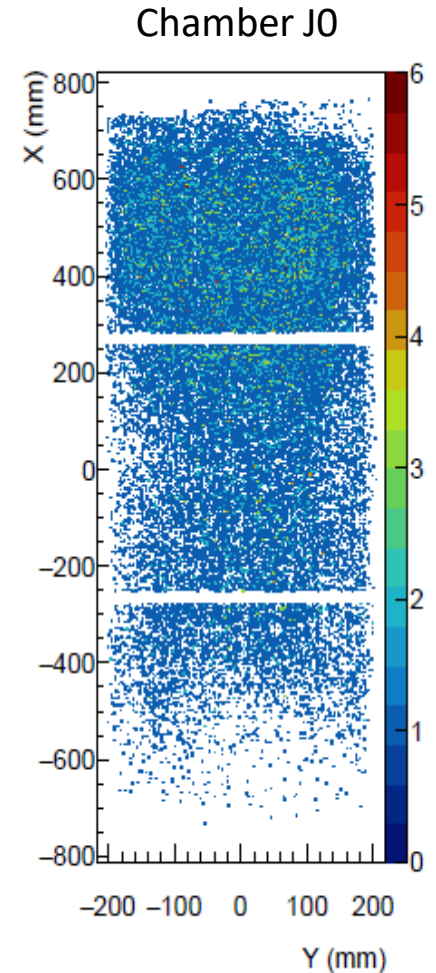
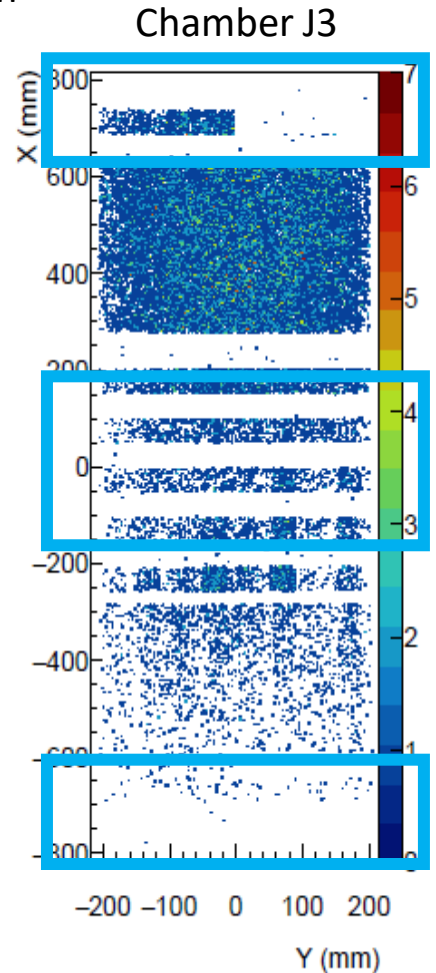
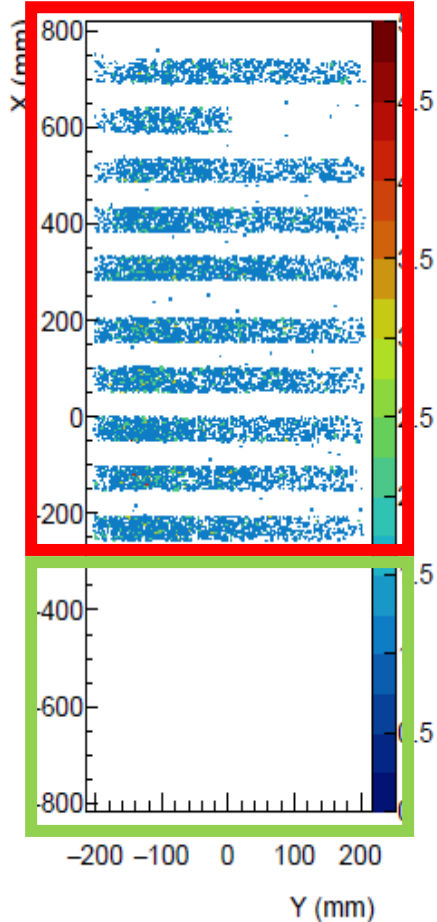


# XY Hit Map (Cosmic run 421) Feb. 8-9 2021

(statistics: ~ 503000 events)  
AR/CO2 gas flow ~ "nominal" values  
HV = 4000V  
Includes pedestal subtraction  
Chamber J4

For BigBite: chambers J0 and J2  
For Recoil Polarimeter: chambers J3 and J4  
Spare: J4 if repaired

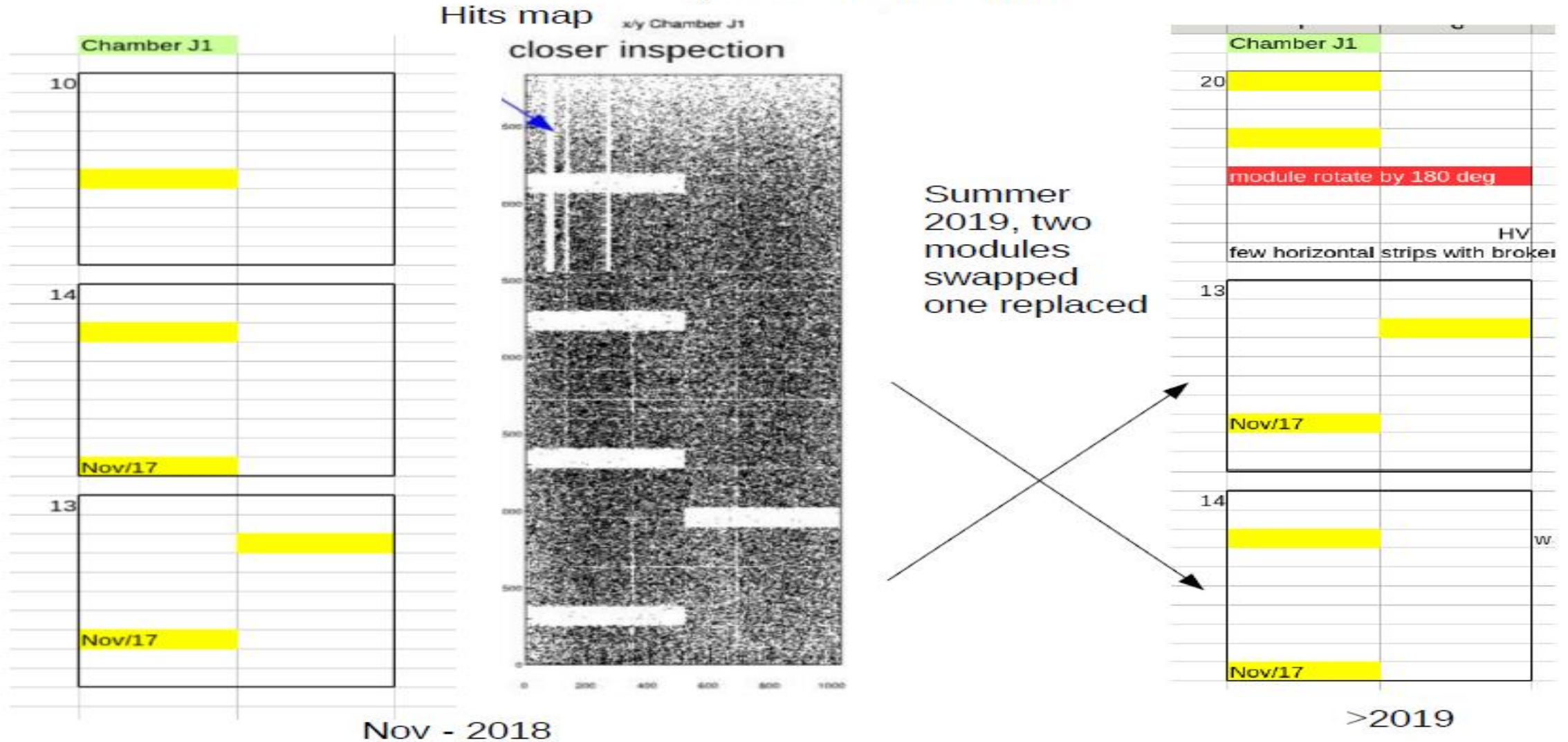
- Red on J4 is most likely due to issues with readout electronics Green is the module M23 with a shorted sector.
- Blue on J3 is most likely due to issues with readout electronics
- For red and blue, curious part is Low Level Tests, Pedestals, and DAQ do not provide errors. Present nominal response.





# XY Hit Map Layer J1

yellow: shorted sectors



## Remaining Tasks for INFN BigBite GEMs

- Reconnecting HDMI, LV, HV, and ground cables. Also reconnecting gas line. (1-2 days if material ready)
- Debugging connections and making DAQ stable (2-7 days)
- Shielding GEM layers (1-2 days per layer). Making the assumption that shielding is already prepared and BigBite GEMs are horizontal, not in BigBite Spectrometer. It will take some time to prepare the shielding materials. Also if we have to shield them vertically the time is longer.
- Test HV for bottom module of J0. That was the one that was arching. Assuming N2 has been flushed for like 1.5 week (1 day). If our change of connector does not fix problem, will take longer to do task.
- Take cosmic data for GEMs in BigBite (as much time as we can get 3-4 days gets us one good run)
- Documentation, information for shifters, online plots (Time not known to me)
- Note: Assumption for times is that one person is working on the task.



# Remaining Tasks for INFN SBS GEMs

## Before Install in SBS GEM frame:

- Reconnecting HDMI, LV, HV, and ground cables. Debugging connections and making DAQ stable. Evaluating Pedestals and possibly manipulating electronics (2-8 days)
- Test HV with modification (1-2 days)
- Take cosmic data for GEMs in SBS (3-4 days gets us one good run, preferably a week to take a few runs)
- Shielding GEM layers (1-2 days per layer). Making the assumption that shielding is already prepared. It will take some time to prepare the shielding materials. Must do horizontally before going into SBS.

## After Install in SBS GEM frame (Assuming in Hall A)

- Reconnecting HDMI, LV, HV, and ground cables. Also reconnecting gas line. (1-2 days if material ready)
- Debugging connections and making DAQ stable (2-7 days)
- Take cosmic data for GEMs in SBS (as much time as we can get 3-4 days gets us one good run)
- Documentation, information for shifters, online plots (Time not known to me)
- Note: Assumption for times is that one person is working on the task.

## Remaining Tasks for Layer J4 as a Working Spare

Assumption: Single Module Setup is restored at least for HV connection. This task may be limited if extra MPDS, HV modules, LV power supplies, and Long HDMI cables are not available.

- Remove layer J4 from cosmic stand and remove bottom module from layer J4 (1-2 days)
- Following GEM Module HV resistor scheme and using a heat camera determine where shorted sectors are (2-3 days).
- Unsolder and remove protective resistors of discovered shorted sectors (0.5-1 day)
- Do HV Test of GEM module (2-3 days).
- Integrate this GEM module back into layer J4, via electronic connections (1-2 day).
- Make DAQ stable and check Pedestals (2-5 days).
- Take cosmic data for entire layer of J4, to verify functionality (3-4 days is one good run).
- Shielding GEM layers (1-2 days per layer)
- Note: Assumption for times is that one person is working on the task.
- Also if this GEM module has more than 2 shorted sectors, we could replace it with module M20. M20 has 2 shorted sectors and a couple of bad strips.



# Questions?

