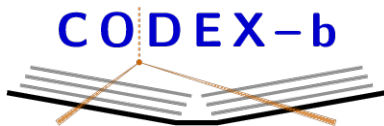


# CODEX- $\beta$ Module Testing

Jake Pfaller

University of Cincinnati

June 11, 2024

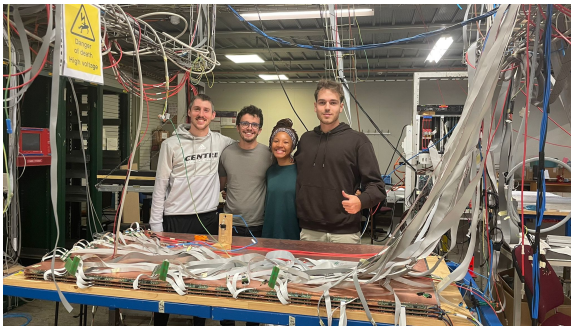


CODEX-b

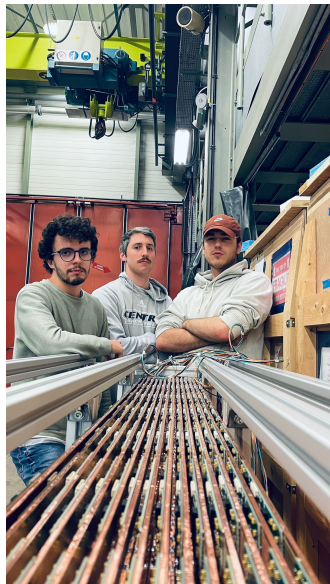


Thank you to all of our fallen soldiers:

- Nick
- Eloi
- Zarria
- Silviu
- Andras



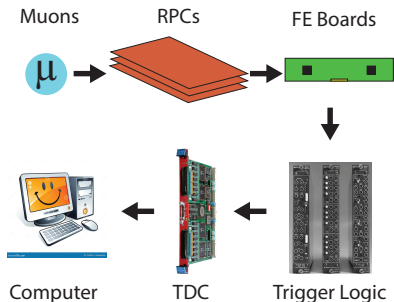
- Glue strip panels and back planes to forex
- Solder resistor network
- Solder front-end electronics
- Sandwich gas gap between two strip panels
- Solder ground connections between the two sides
- Test every step of the way



# Comissioning Tests

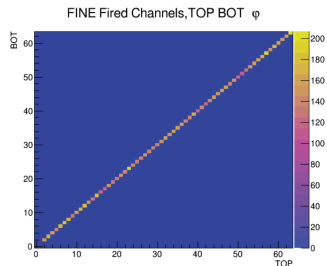
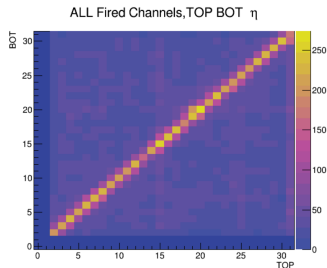
Comissioning Tests				
Name	Trigger Mode	High Voltage (V)	Number of Runs	Notes
Electronic Noise	Off	0	1	Tests for hits generated by the low voltage supplied to the front end boards. Ideally no hits are seen.
High Voltage Noise	Off	4000	1	Tests for hits generated by the high voltage supplied to the modules. Ideally no hits are seen.
Chamber Noise	Off	5800	1	Tests for the rate of noise relative to the rate of muon hits.
Correlated Electronic Noise	On	0	1	Tests to make sure the electronic noise hits are eliminated by the trigger.
Independence	On	1 @ 5800, 2 @ 0	3	Test to make sure there are no hits being recorded in the test layer, because the high voltage is turned off for the other two so they won't be able to trigger on muons.
Fake Muon	On	2 @ 5800, 1 @ 0	3	Test to make sure there are no FINE hits being recorded in the test layer, because the high voltage is turned off for the test layer so no muons should be detected.
Trigger Check	On	5800	1	Tests the module how it will be when actively taking data underground.
Efficiency Scan	On	1 @ 4800-6000, 2 @ 5800	39	Keep two layers at working point, test the other layer in 100 volt increments from 4800V to 6000V. The efficiency of the test layer should increase from ~0 to (ideally) 100%.

- Muons spark a current in the gas gap.
- This current is picked up by the strip panels and converted to an LVDS signal by the front end electronics.
- Signals are sent through trigger logic to produce a signal only for valid hits (helps filter out noise).
- Hits and trigger are sent to a time-to-digital converter (TDC).
- The TDC is interfaced with a computer for further data analysis.

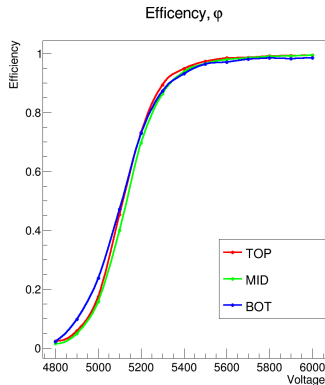
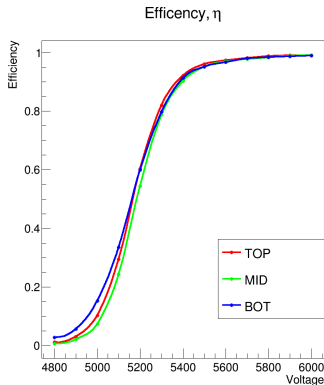


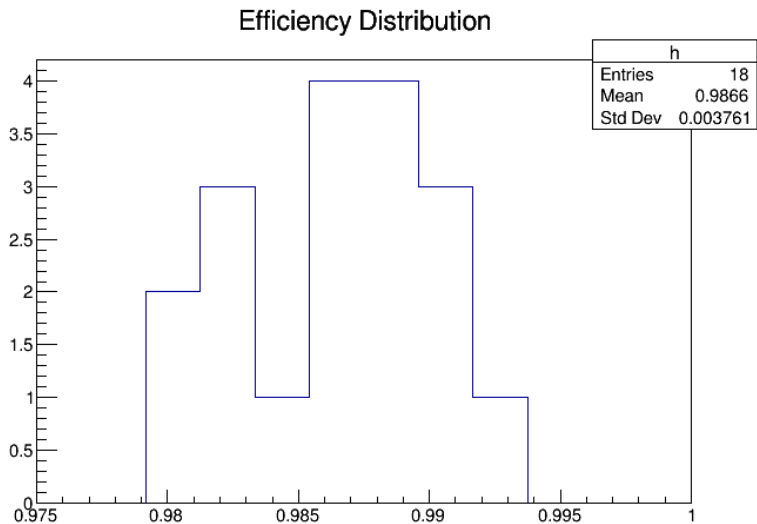
We test the overall health and performance of our detectors:

- Noise rates
- False triggers
- False muons
- Hit correlations
- RPC Efficiency

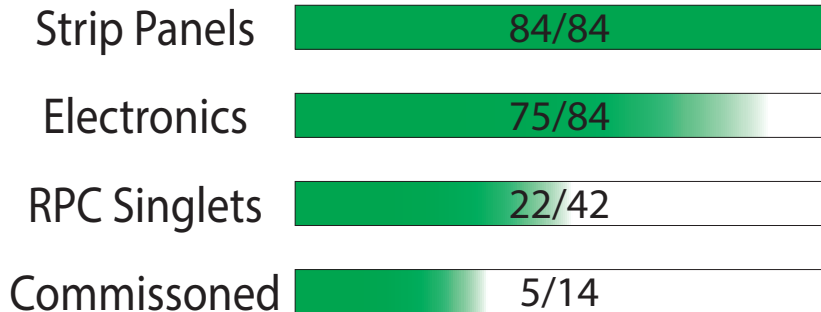


Efficiency of a given layer is calculated as the ratio of hits in the other two layers to hits in all three layers, in the same channel.









We don't currently have room to construct more RPCs:

- Need Dave's RPC cart to move modules to IP8
- Need support structure to have a place to store the modules once at IP8
- Another cart at 904 could solve this problem
- Modules take 1 day to construct, 4 days to test

Services need to be prepared for IP8:

- Patch panels
- High voltage and low voltage cables
- Power supplies / ADCs
- Low voltage distribution boards
- DCT

I leave in August :/