

# BB GEMs XY Layer Update

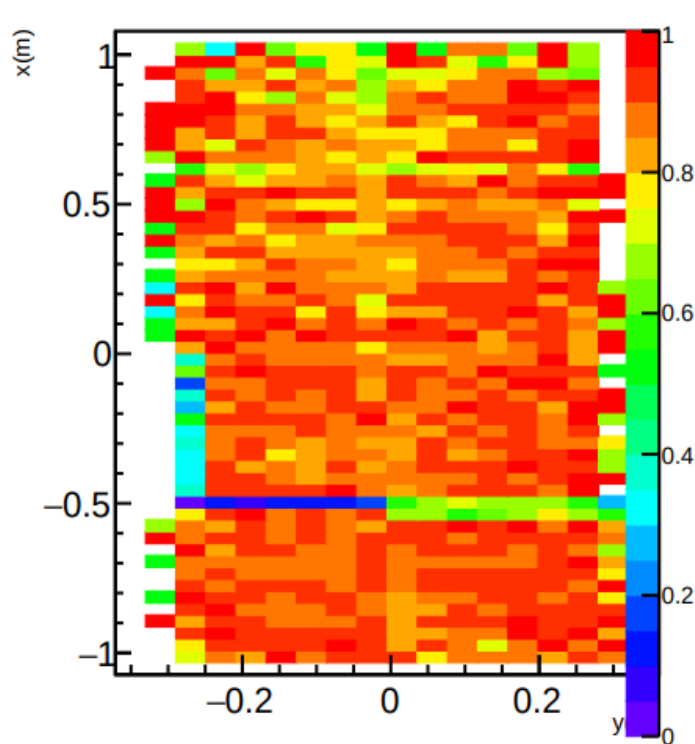
Sean Jeffas  
August 2, 2022

# Efficiency Drop

- Cosmic data first taken in July showed low efficiency for this module.
  - <https://logbooks.jlab.org/entry/4017798>
- Cosmic data from February shows no such issue

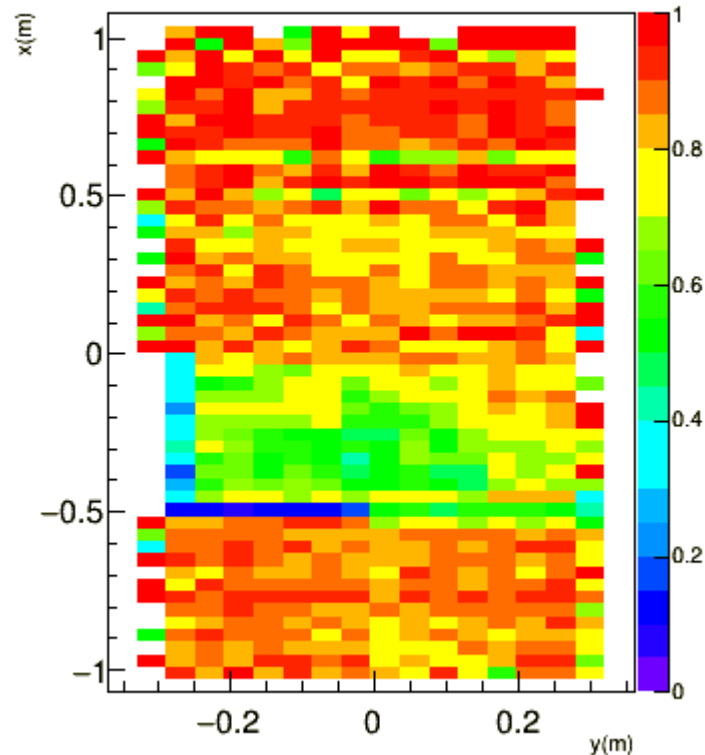
**February 4<sup>th</sup> – Run 13707**

Layer 4, Efficiency = 86.315



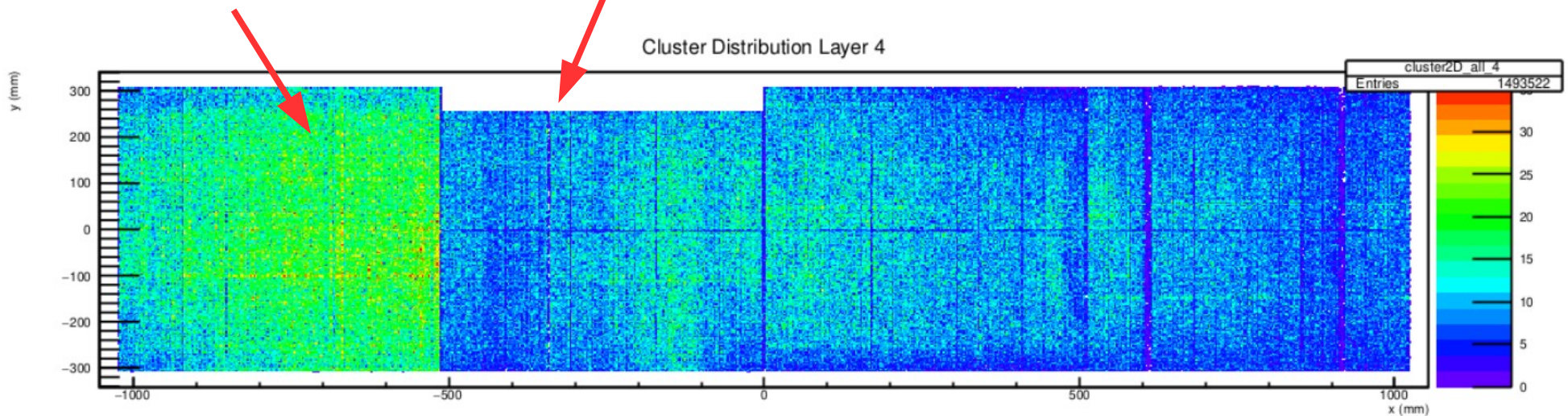
**August 1<sup>st</sup> – Run 1041**

Layer 4, Efficiency = 77.2243



# Cosmic Tests Before GMn

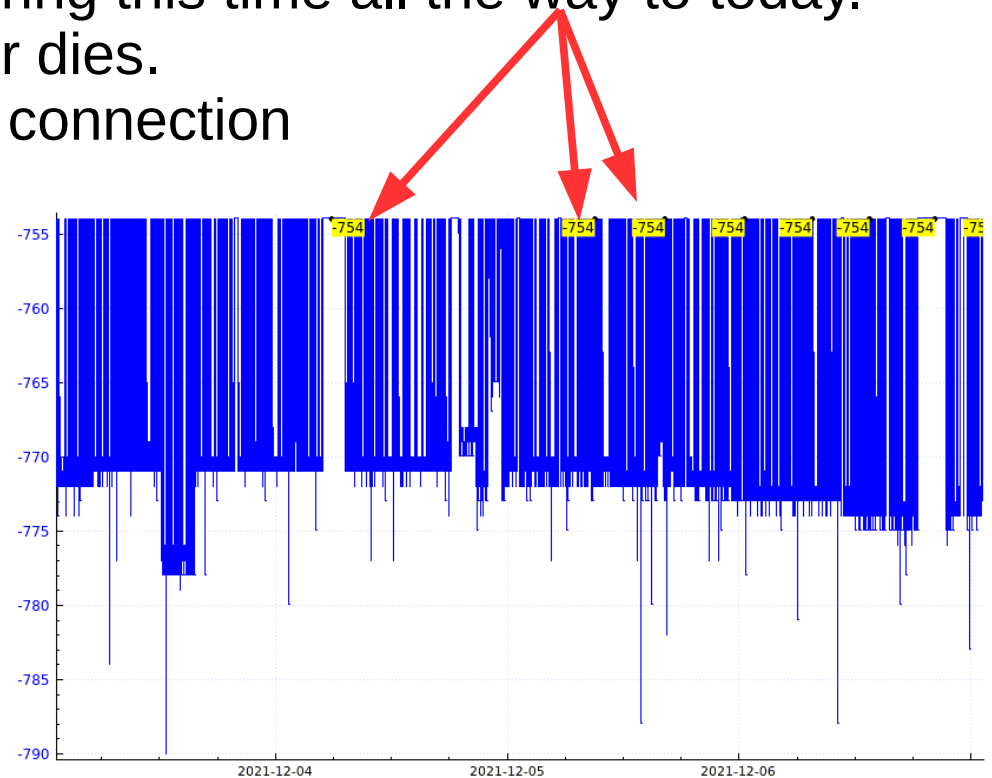
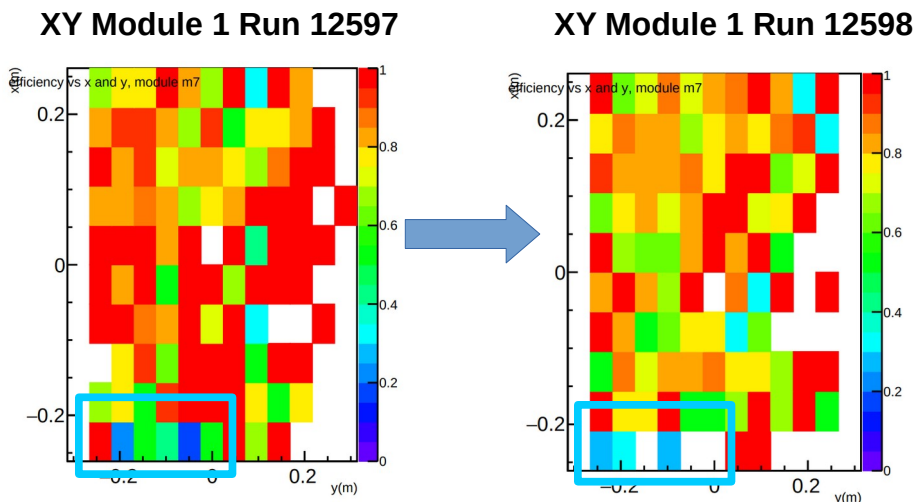
One module at higher gain      One APV not working on this module



- See old presentation:
  - [https://hallaweb.jlab.org/wiki/images/b/b4/BB\\_DAQ\\_9\\_29\\_21.pdf](https://hallaweb.jlab.org/wiki/images/b/b4/BB_DAQ_9_29_21.pdf)

# XY Module 1 – Sector Died?

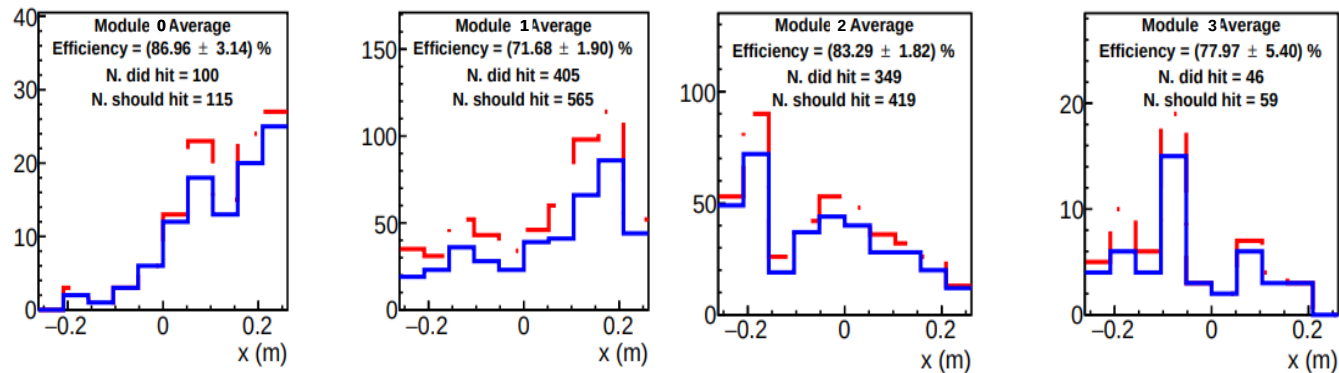
- During December 6<sup>th</sup> 2021, one sector seems to disappear from the hit map
  - Between runs 12597 and 12598
  - HV current remains constant
  - Nothing notable
- HV current remains unchanged during this time all the way to today.
- GEM should not function if a sector dies.
- Only explanation is that the sector connection became physically loose



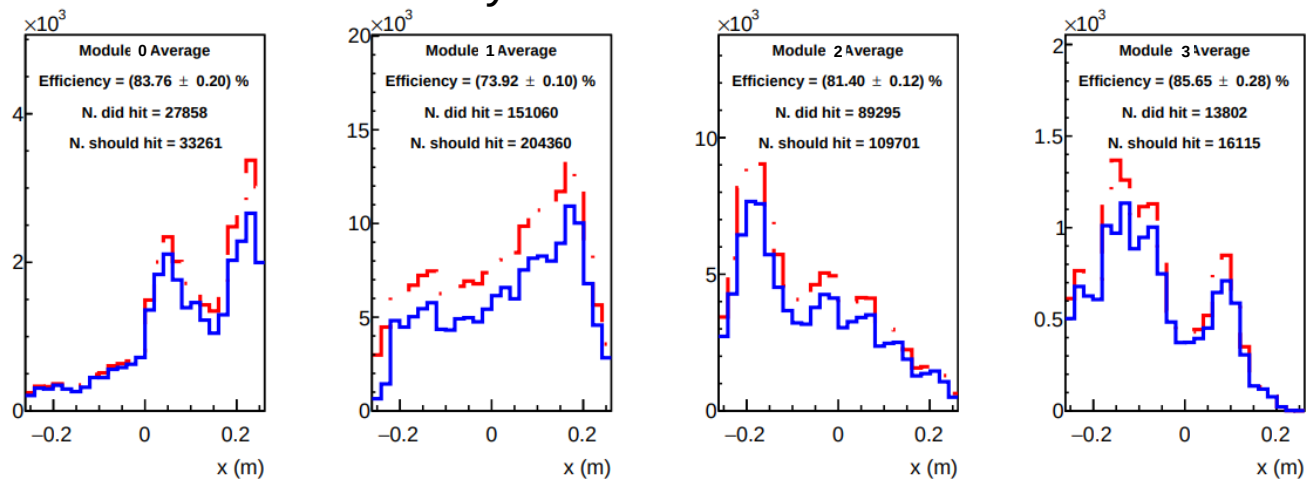
# XY Module 1 – Efficiency

- For all of GMn module 1 has been ~10% lower efficiency than the others.
- Makes sense because, ~10% of its active area is dead.

December 6<sup>th</sup> - Run 12680

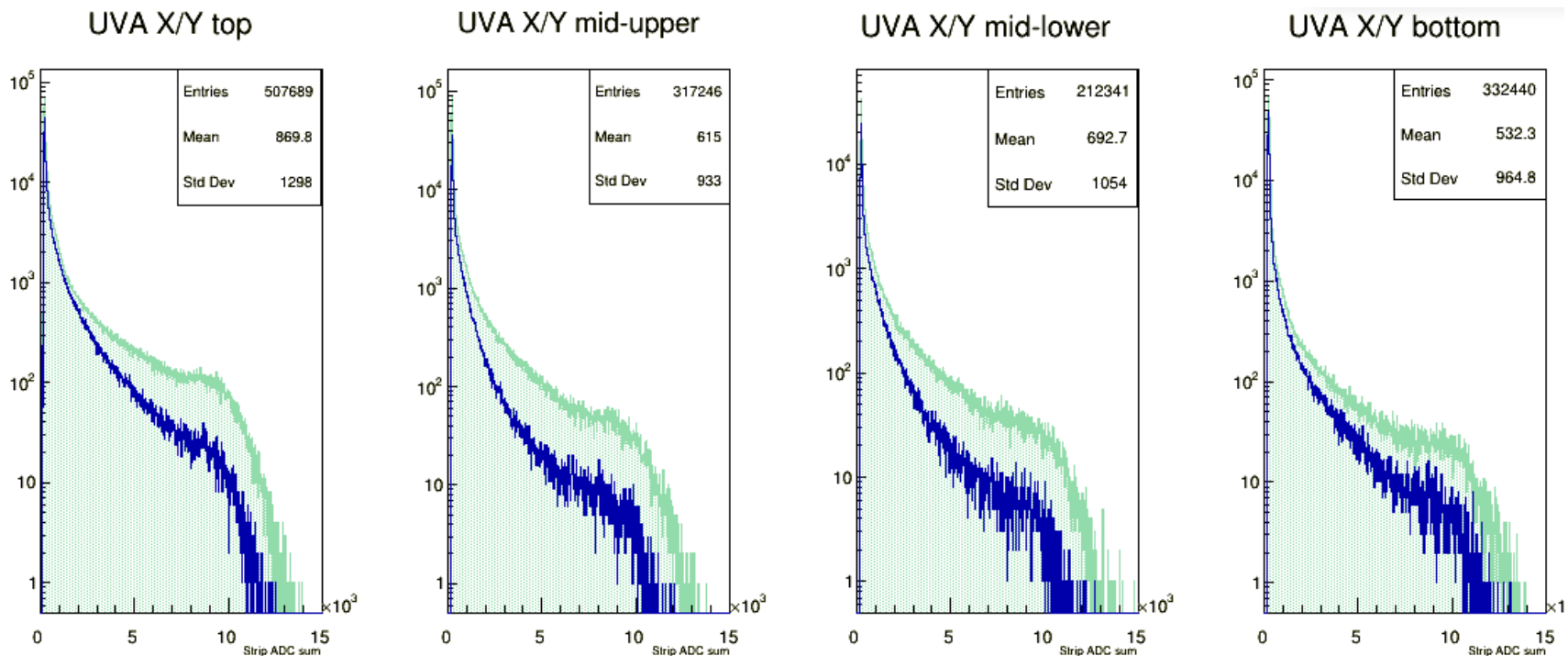


February 8<sup>th</sup> - Run 13798



# Gain Comparison

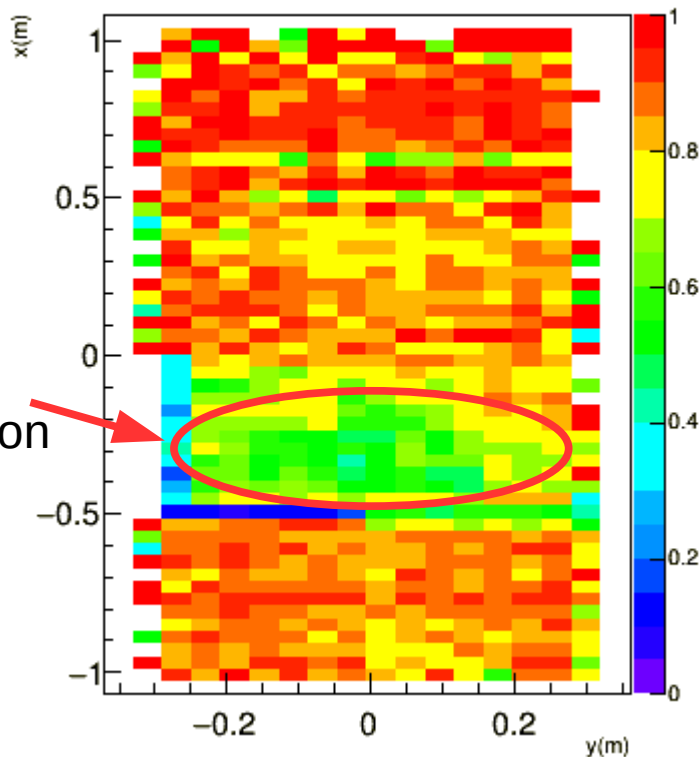
- **Green Histogram** – February Cosmic run
- **Blue Histogram** – August Cosmic run
- All ADCs are a bit lower than before
- Module 1 does not seem significantly lower than the others
  - Compare mid-upper and bottom



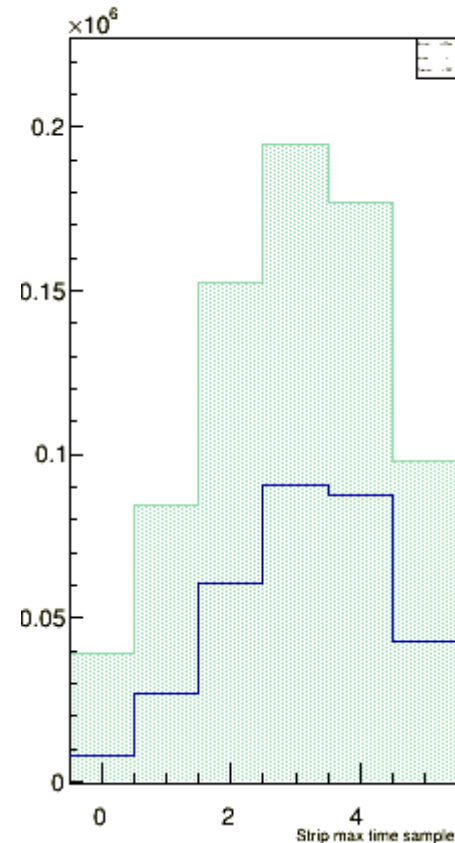
# Gas Pressure Issue?

- Uneven gas pressure causes lower efficiency in the center of the module
  - See study for UV GEMs, [https://hallaweb.jlab.org/wiki/images/3/38/BB\\_GEMs\\_1\\_19\\_22.pdf](https://hallaweb.jlab.org/wiki/images/3/38/BB_GEMs_1_19_22.pdf)
- However, time sample distribution does not seem significantly different.
- Quick inspection yesterday did not show anything obvious on the gas lines.

**August 1<sup>st</sup> – Run 1041**  
Layer 4, Efficiency = 77.2243

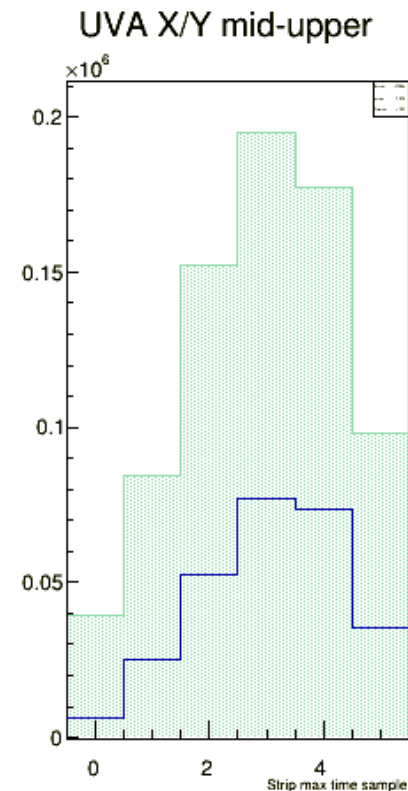
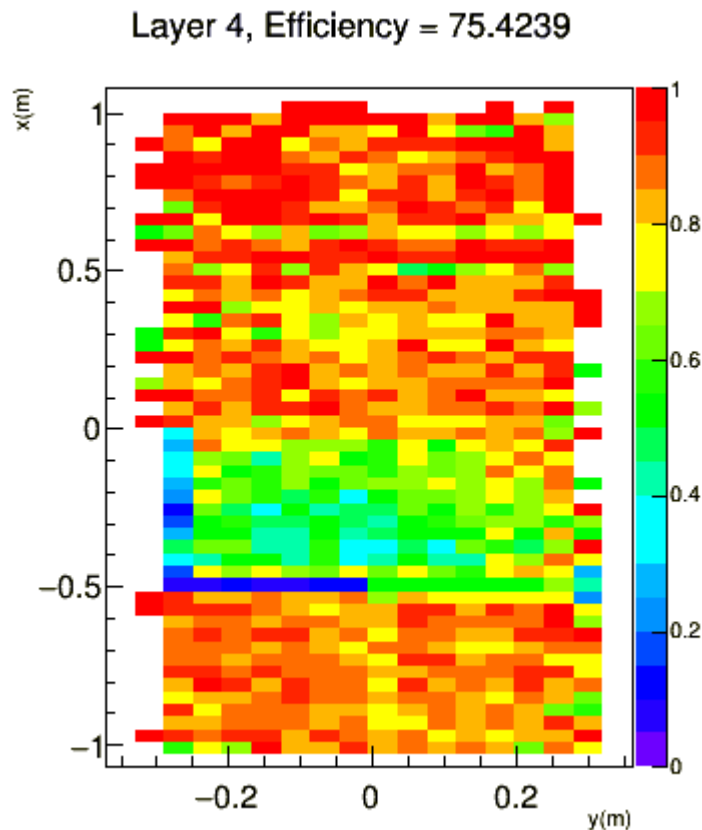


UVA X/Y mid-upper



# Gas Pressure Lowered

- Gas pressure reduced from 225 cc/min to 200.
  - This method was used to improve the UV GEM gas issue
- No improvement found, efficiency decreased
- Next I will attempt to shift the latency left by one time sample.





# Conclusion

- XY module 1 has decreased efficiency.
- Distributions is indicative of a gas issue.
- Need to investigate the gas lines more thoroughly.
- Try more gas flows and investigate time sample peaking vs hit maps.
- Currently at 3700V (4150 equivalent) and can be increased if needed.