Field Cages Validation for the GIN Detector

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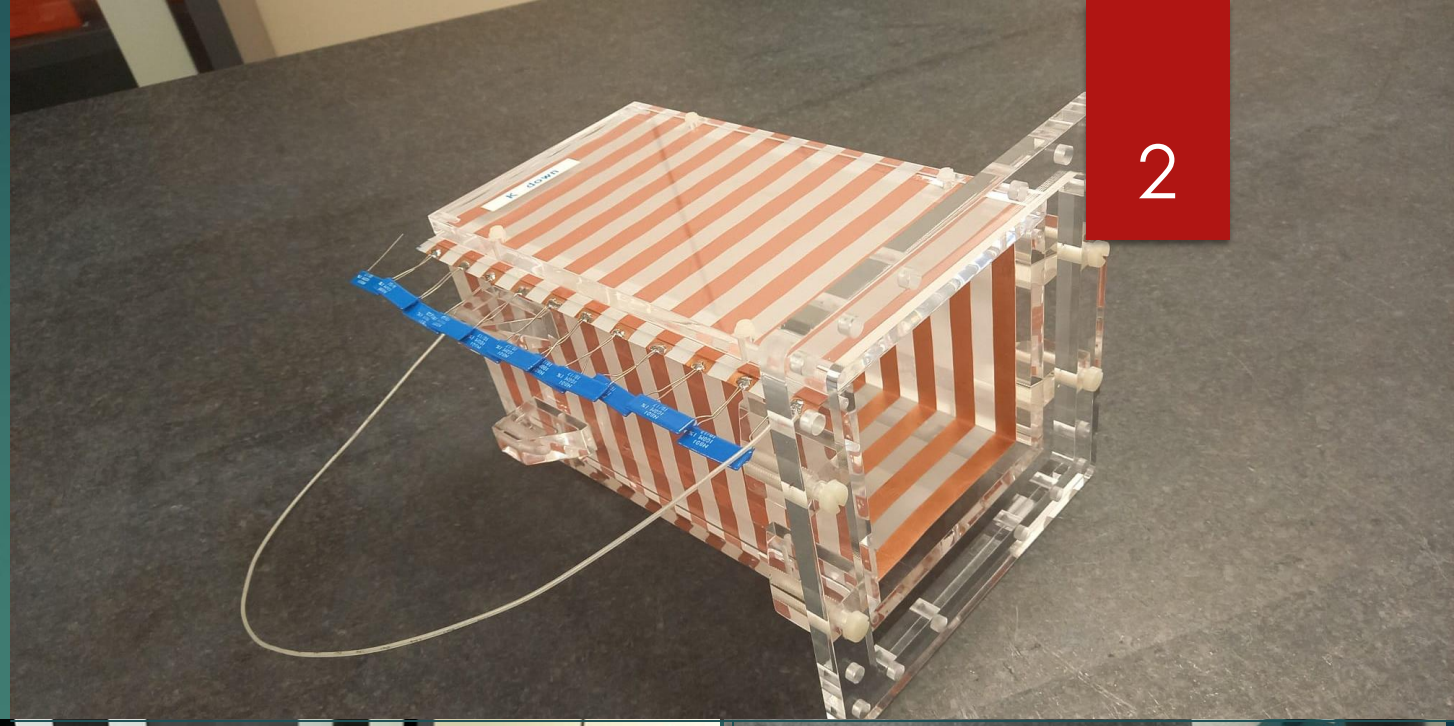
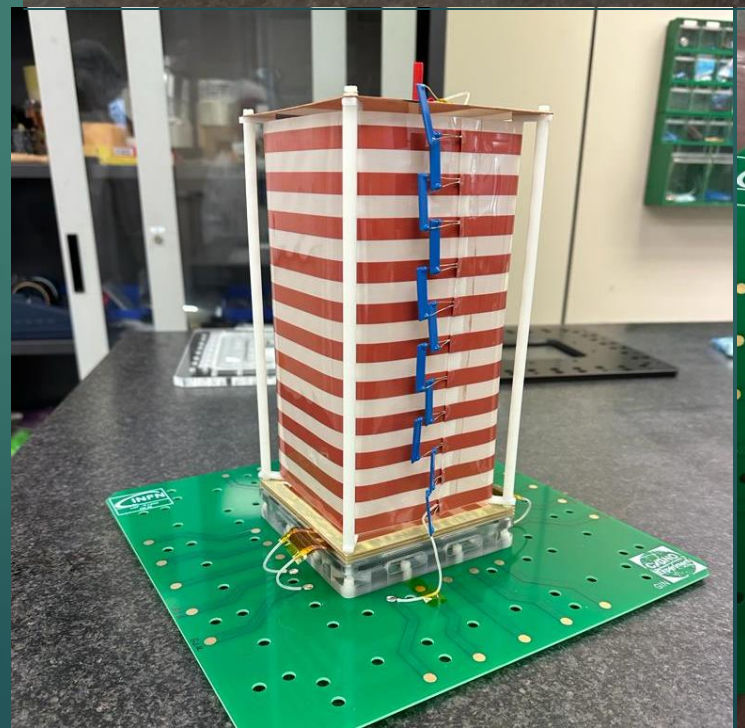
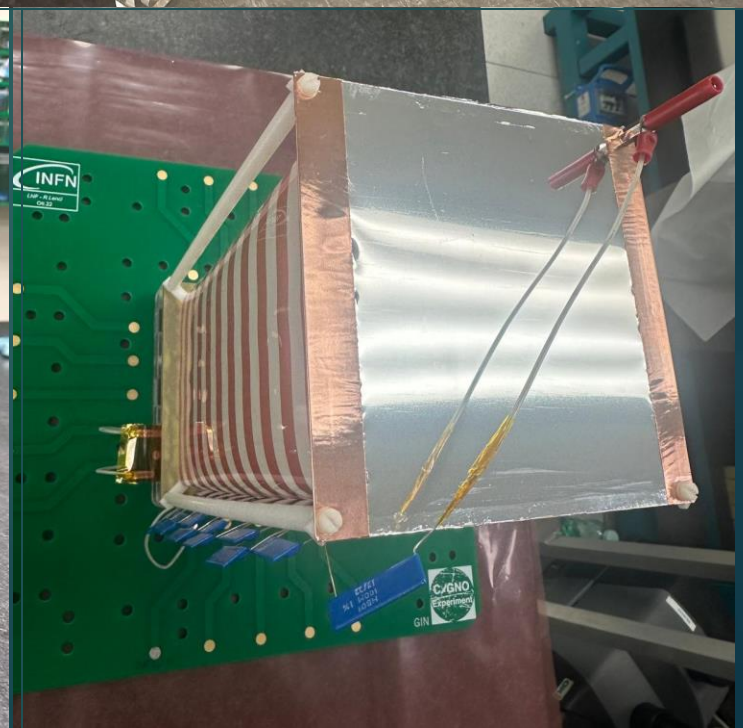
EXPERIMENTAL SETUP

- "Glued" Field Cage with Cu Cathode
- "Ethereal" Field Cage with Cu Cathode
- "Ethereal" Field Cage with Loomba's Cathode

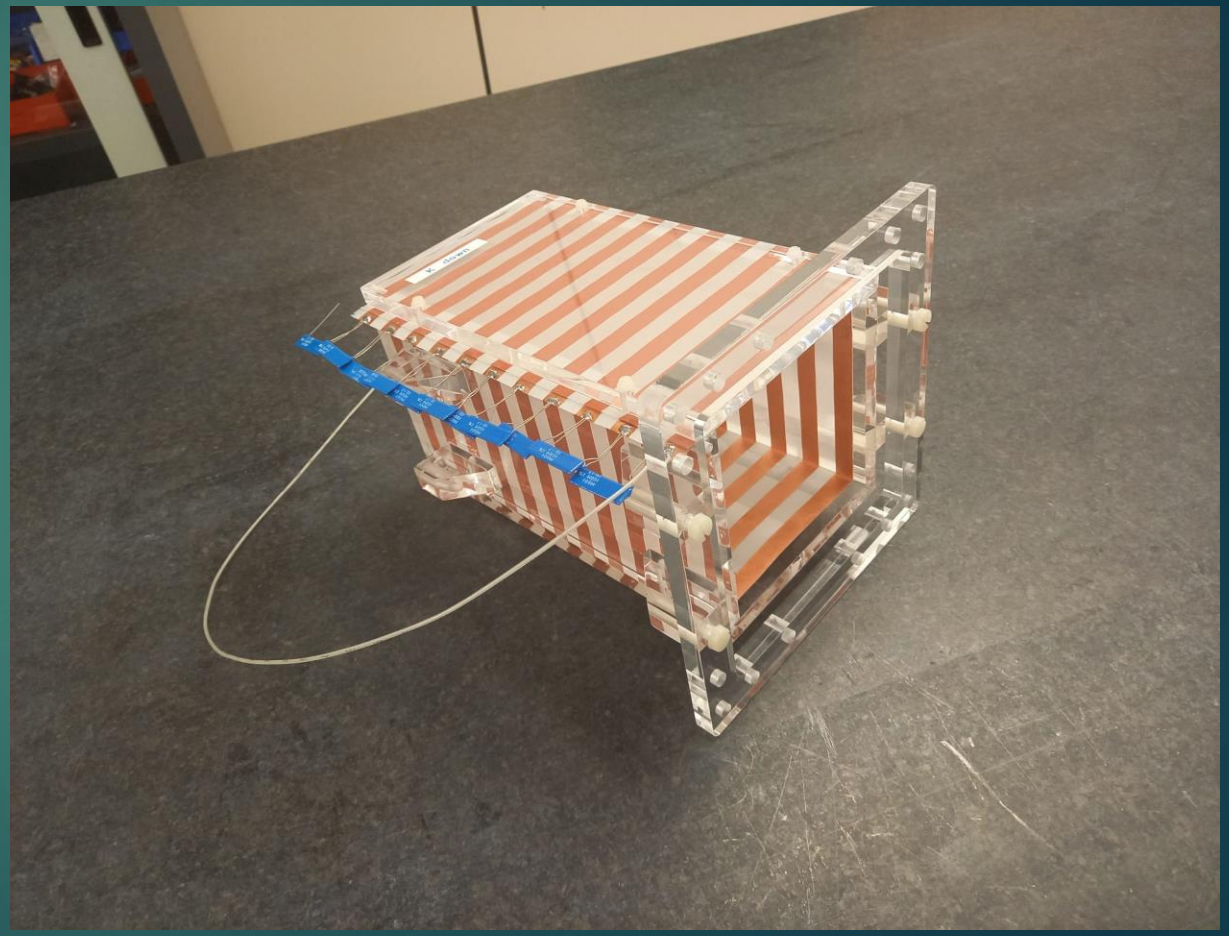






GLUED FC WITH CU CATHODE

- **FC Characteristics:**
  - Glued on PVC
  - Four indepent panels glued (one per side)
  - Electric contact when glued toghether
- **Cathode Characteristics:**
  - Made of well-levigated Copper
  - Simple construction
- **Measure Plan:**
  - Unstable, impossible to take measures in controlled conditions

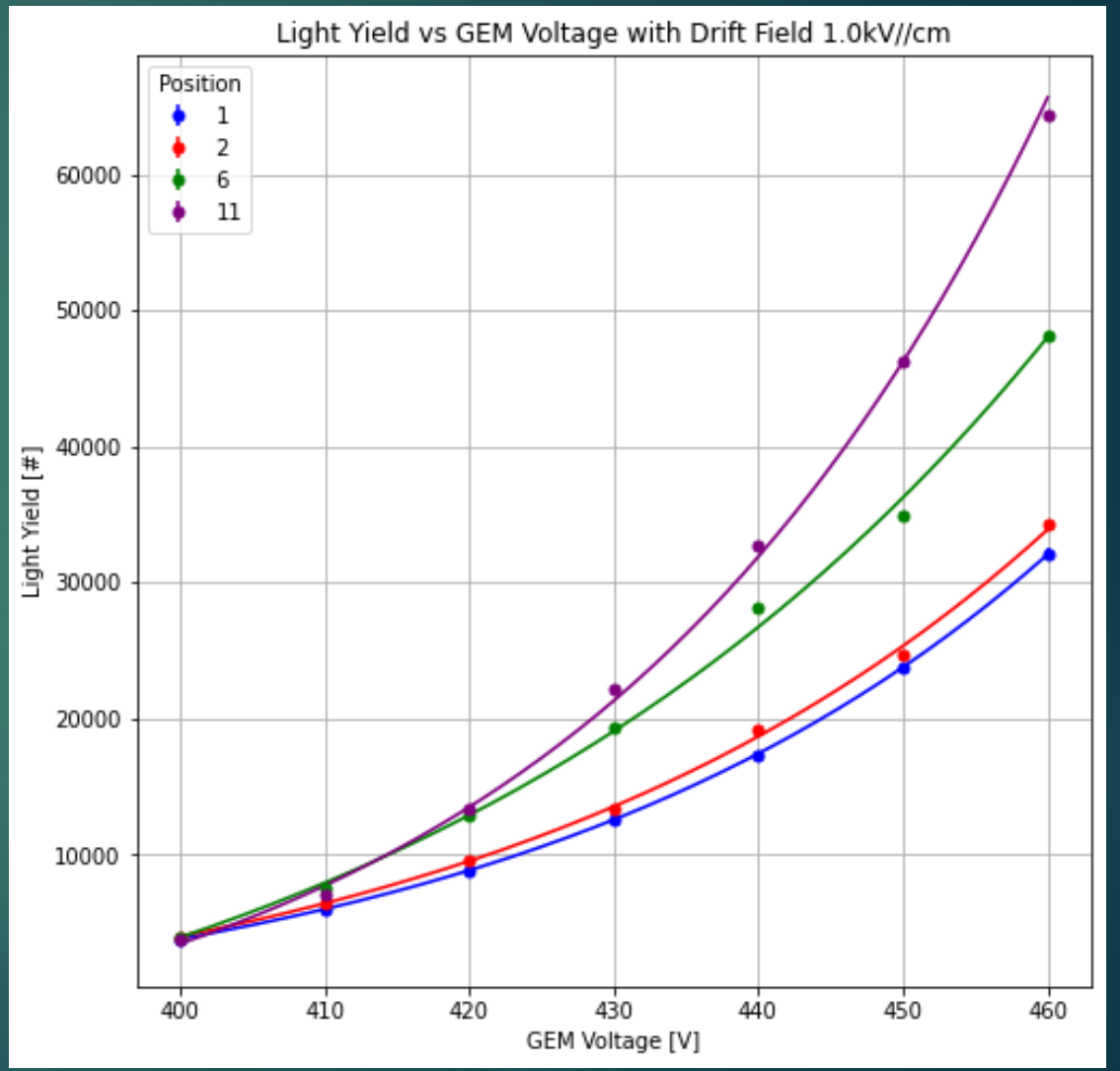


ETHEREAL FC WITH CU CATHODE

- **FC Characteristics:**
  - Rolled up on DELRIN Pillars
  - Glued to itself
  - Not connected to PVC
- **Measure Plan:**
  - Fixing Drift Field at 1 kV and scanning GEM Voltage from 400V to 460V
  - Fixing GEM at 440V and scanning Drift Field from 0.2 to 1.5 kV/cm
  - Same scan at GEM 400V
  - Scan of 7 Positions for Fe Source
  - Camera Exposure: 0.15 s

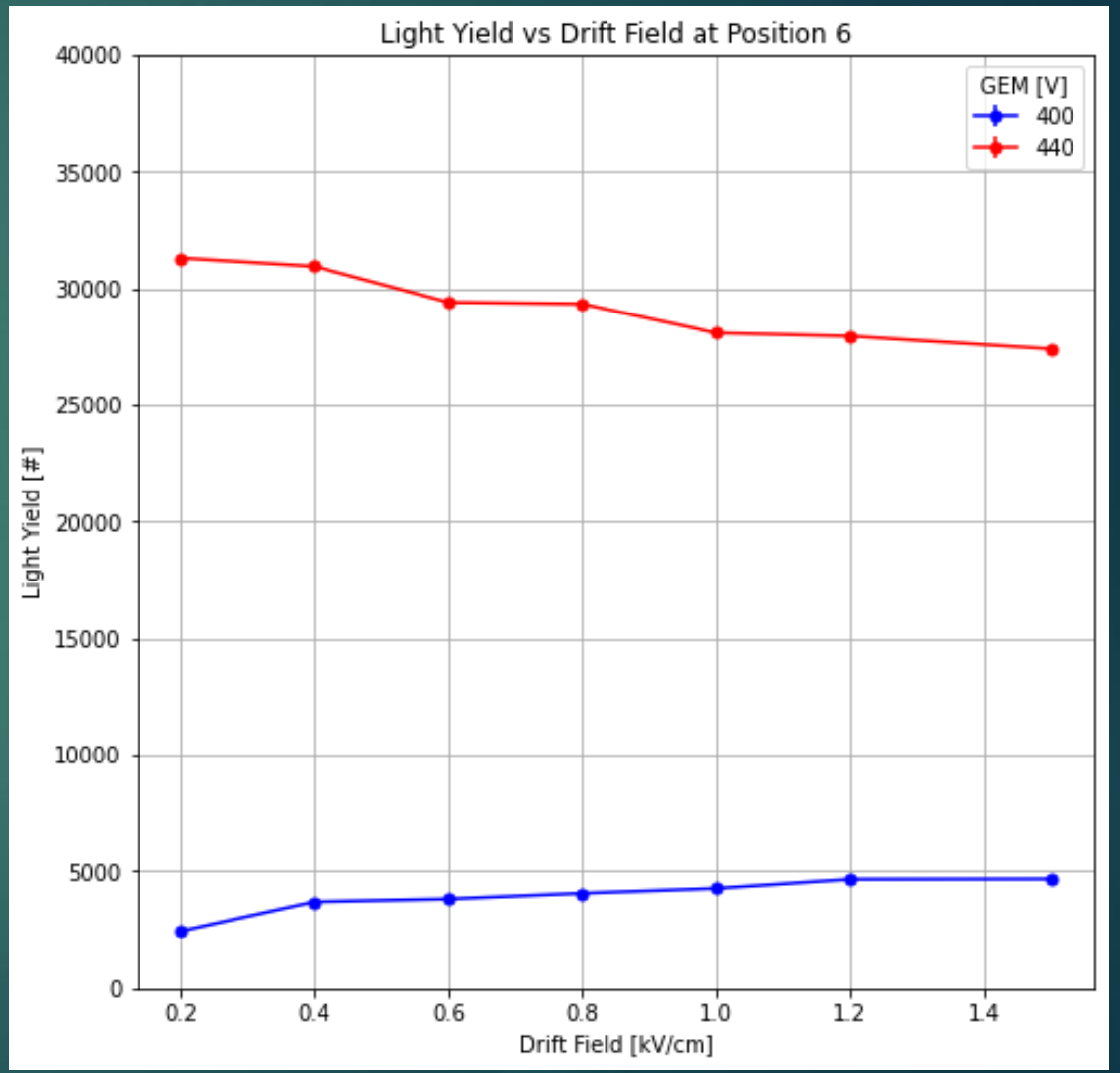
ETHEREAL FC CU – DATA ANALYSIS I

- **Light Yeld vs GEM V with Drift Field fixed at 1.0kV/cm:**
  - Position 1 is closest to GEMs while position 11 is farthest
  - Exponential behaviour in each, perfectly as expected
  - Points out of the fit line, ambiental corrections still to be made due to data lost
  - Fit parameters table upcoming in next presentation after corrections



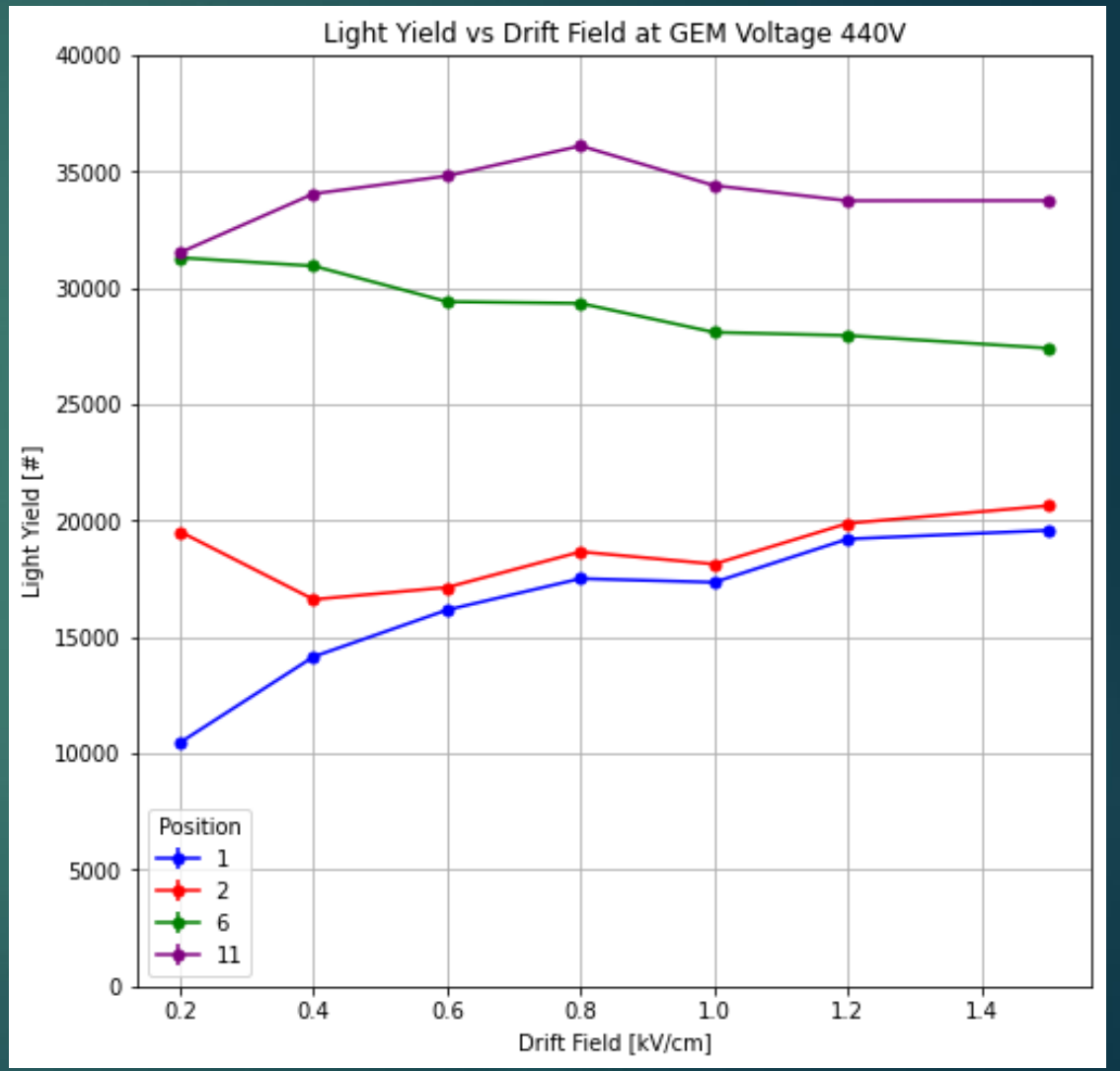
ETHEREAL FC CU – DATA ANALYSIS II

- **Light Yeld vs Drift Field fixed Position 6:**
  - With GEMs at 400V, LY seems mostly constant, decreasing at low field
  - With GEMs at 440V, LY increases at low field likely due to larger diffusion which reduces saturation



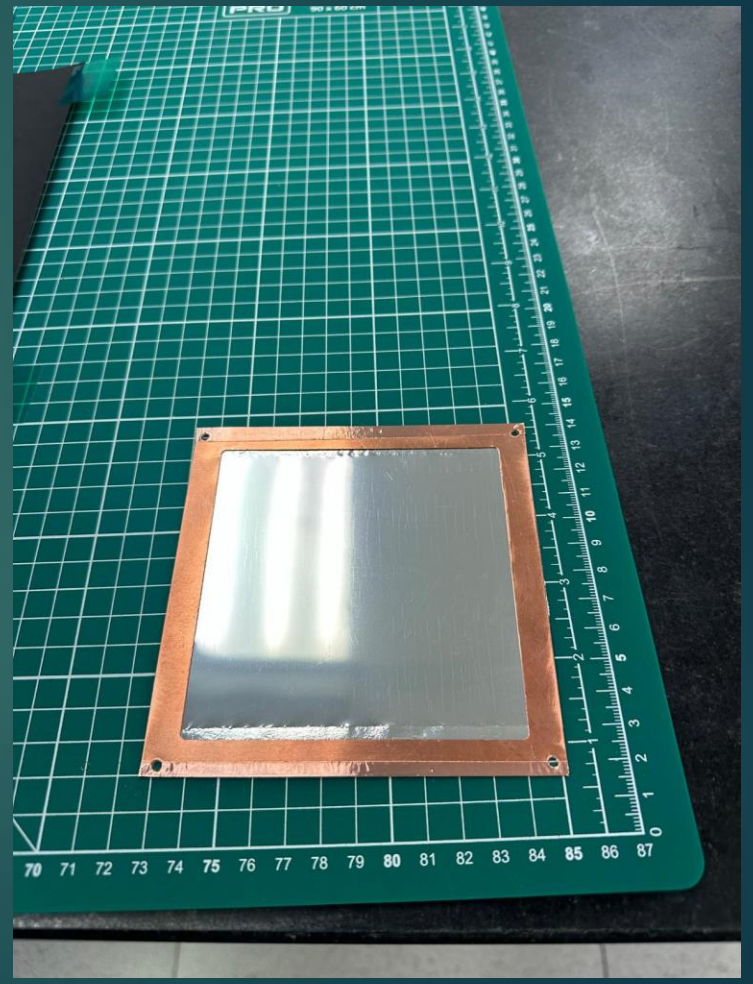
ETHEREAL FC CU – DATA ANALYSIS III

- **Light Yeld vs Drift Field with GEM Voltage fixed at 440 V:**
  - Positions farther from GEMs have more LY: saturation effects
  - LY tends to be more constant as the Drift Field increases
  - At low field the behavior depends from attanuation and diffusion



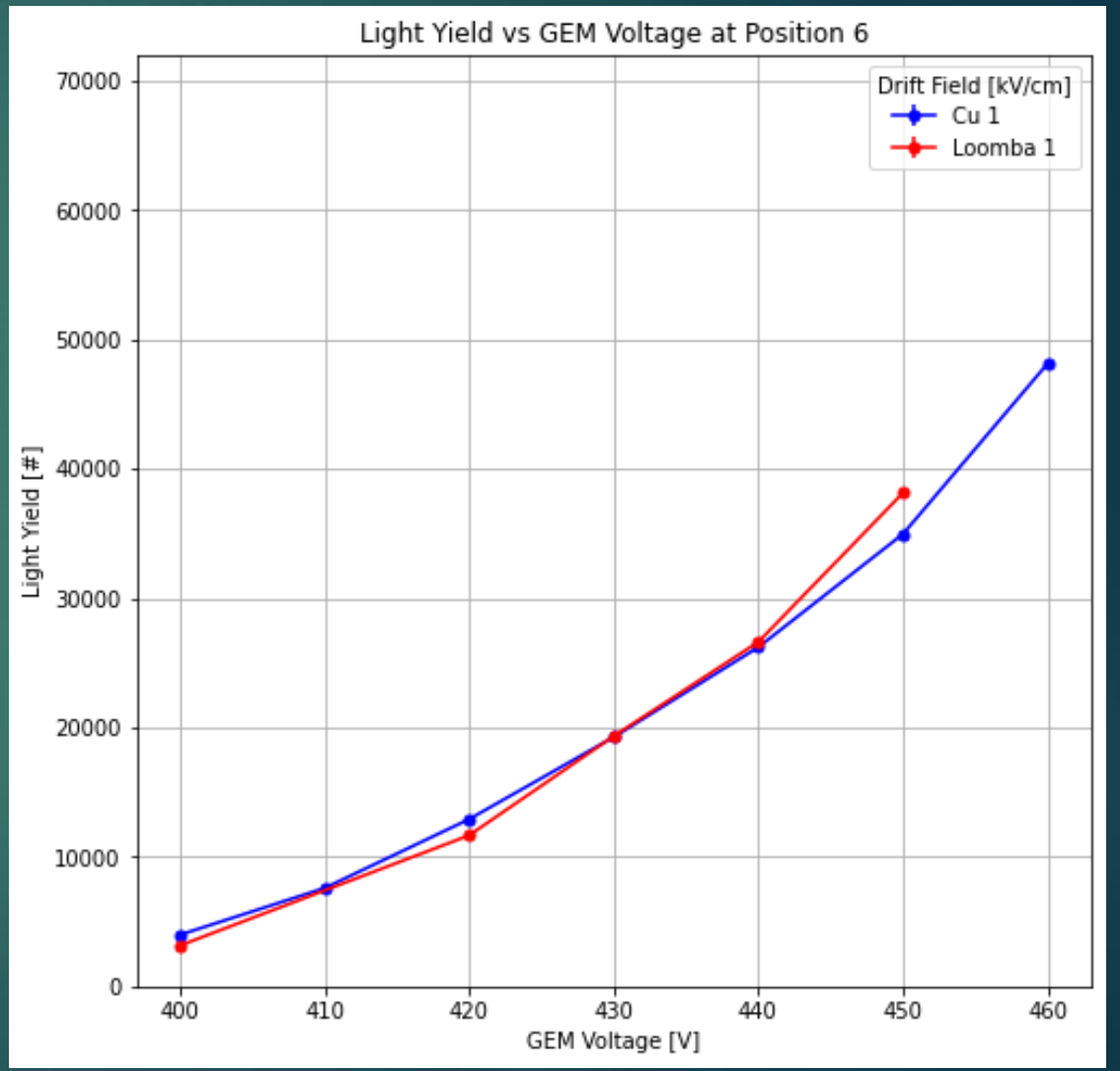
ETHEREAL FC W/ LOOMBA'S CATHODE

- **Cathode Characteristics:**
  - Thin Aluminium film over a Copper Landing strip
  - Well-streched aluminium film
  - Copper tabs for electric contacts
- **Measure Plan:**
  - Positions: 2, 6, 11
  - Field Values: 0.2, 0.6, 1 kV/cm taken at 400V and 440V
  - GEM Voltages: 400 to 450
  - Cathode capable of working up to 1.3 kV/cm, but no measures taken due to conditioning
  - Camera Exposure: 0.15 s for Short Exposures and 0.18s for Long Exposures

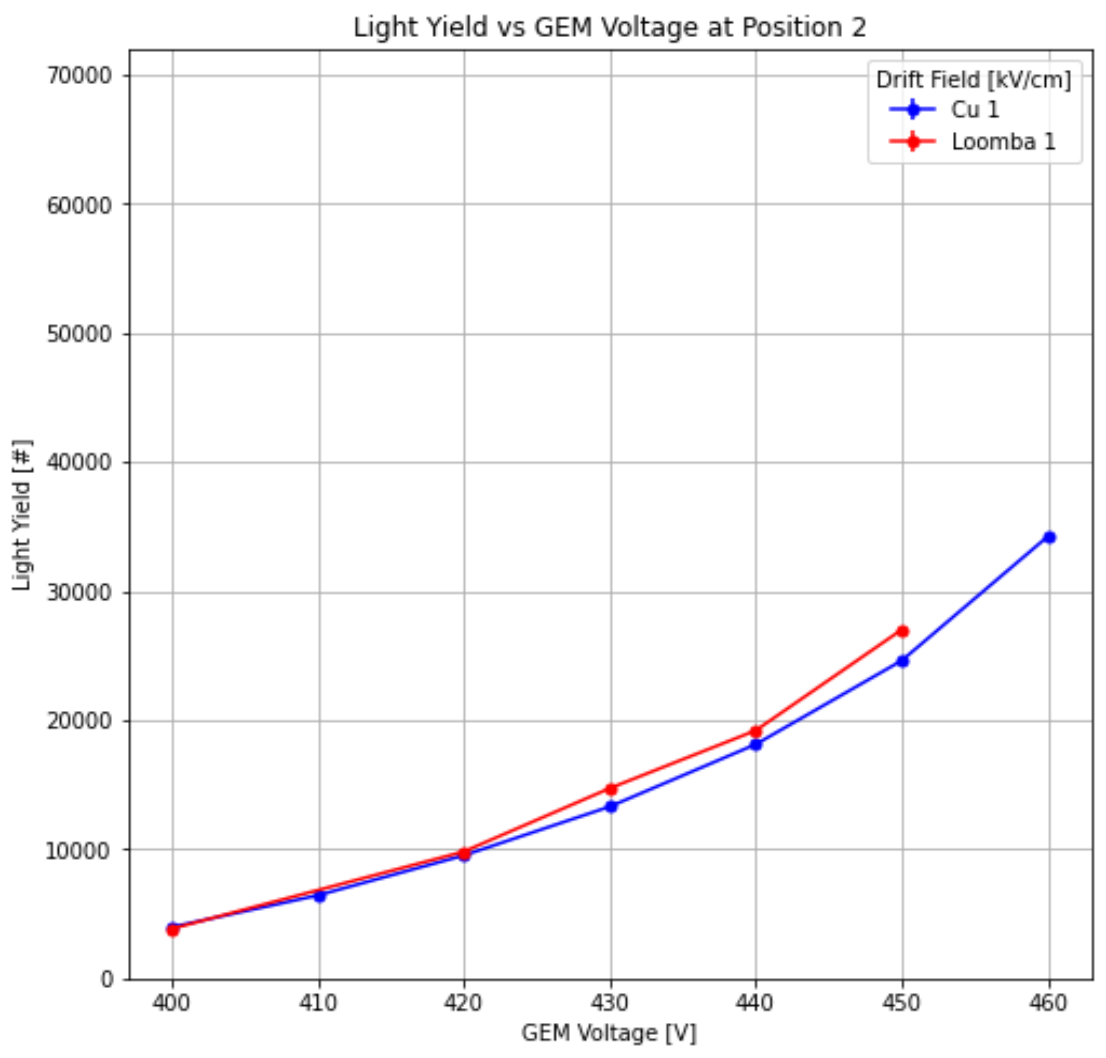


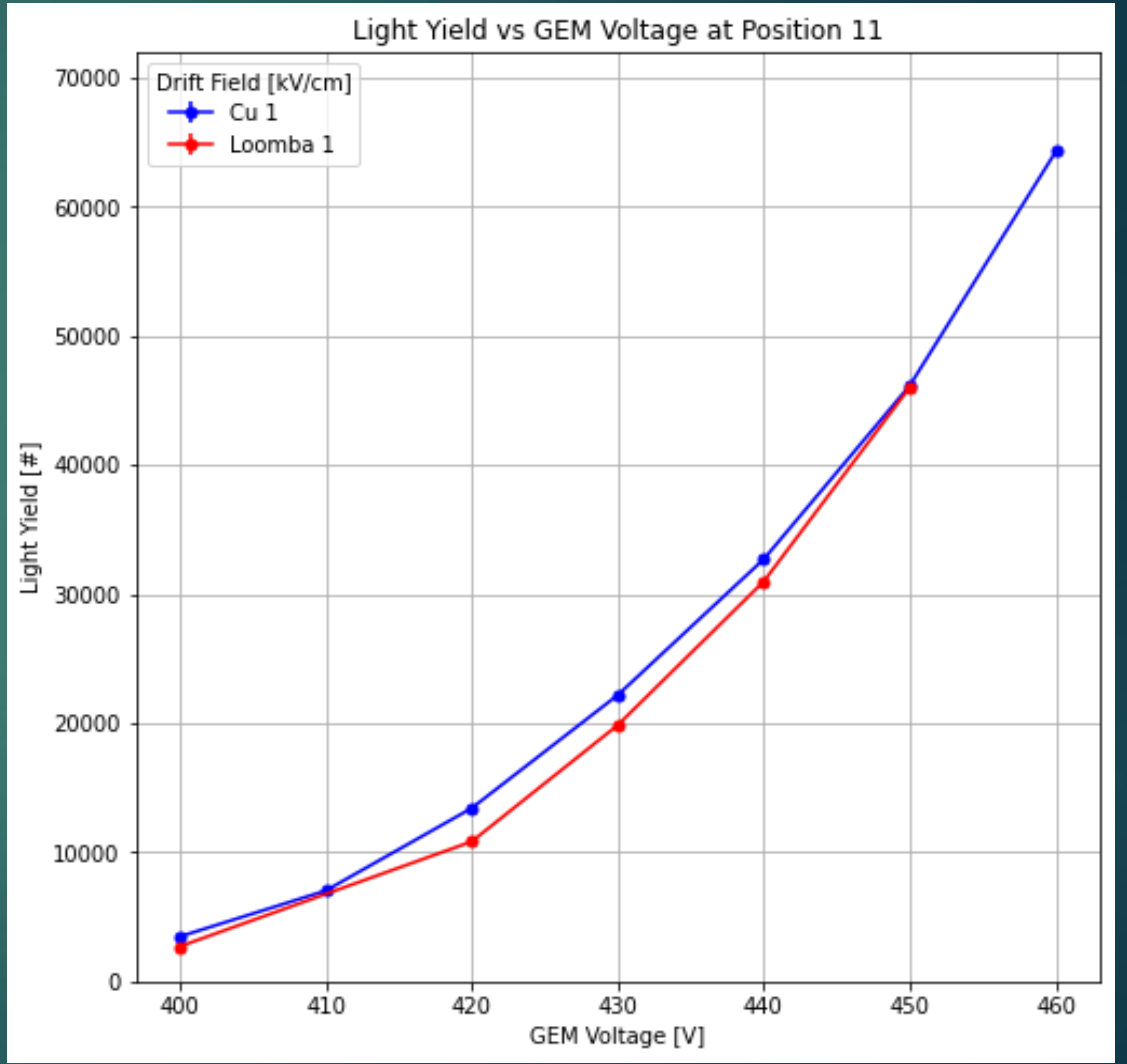
ETHEREAL FC – CATHODES COMPARISON I

- **Light Yeld vs GEM Voltage at 1 kV/cm Drift Field comparison:**
  - Data with the Loomba's Cathode are corrected for humidity and pressure/gas temperature
  - Data with Cu Cathode have mean correction for the comparison
  - Behaviour is very similar, small differences may be related to enviromental corrections



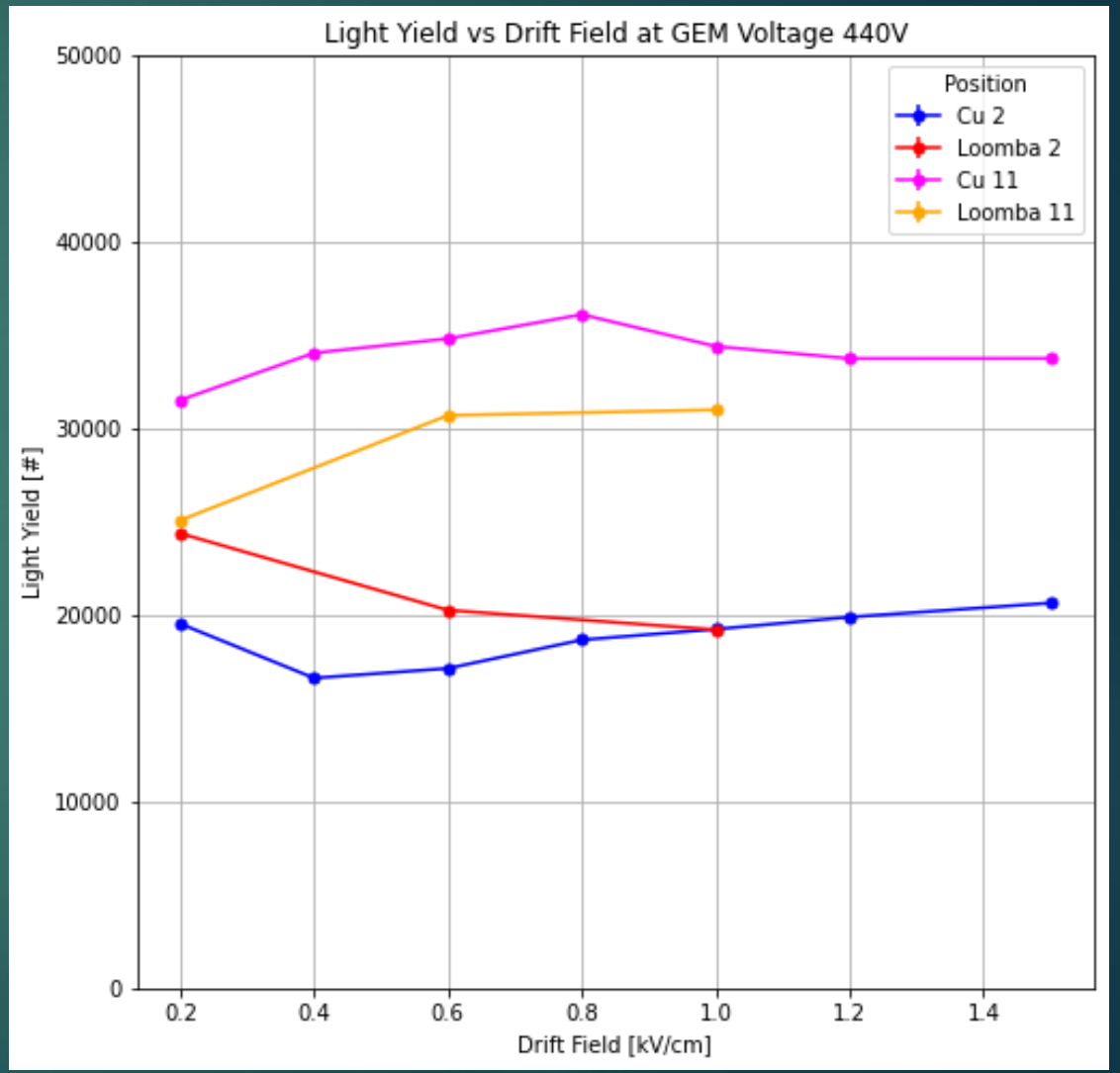
ETHEREAL FC – CATHODES COMPARISON II



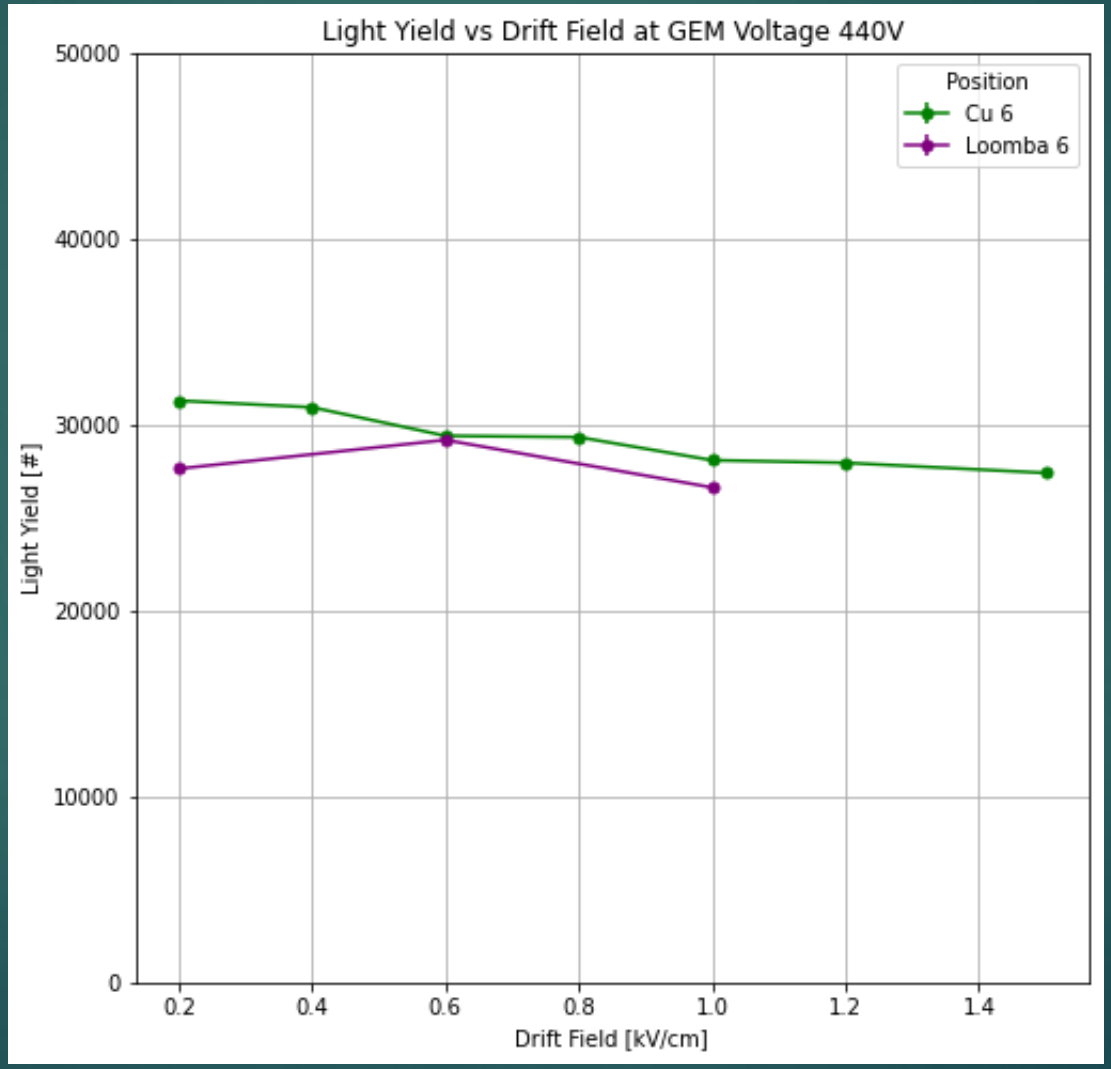


ETHEREAL FC – CATHODES COMPARISON III

- **Light Yeld vs Drift Field at GEM 440V comparison:**
  - Less points with Loomba's Cathode
  - Behaviour is similar but there is some difference in Light Yeld
  - Loomba's Cathode seems to perform better at positions close to GEMs
  - Cu Cathode seems to perform better at positions far to GEMs

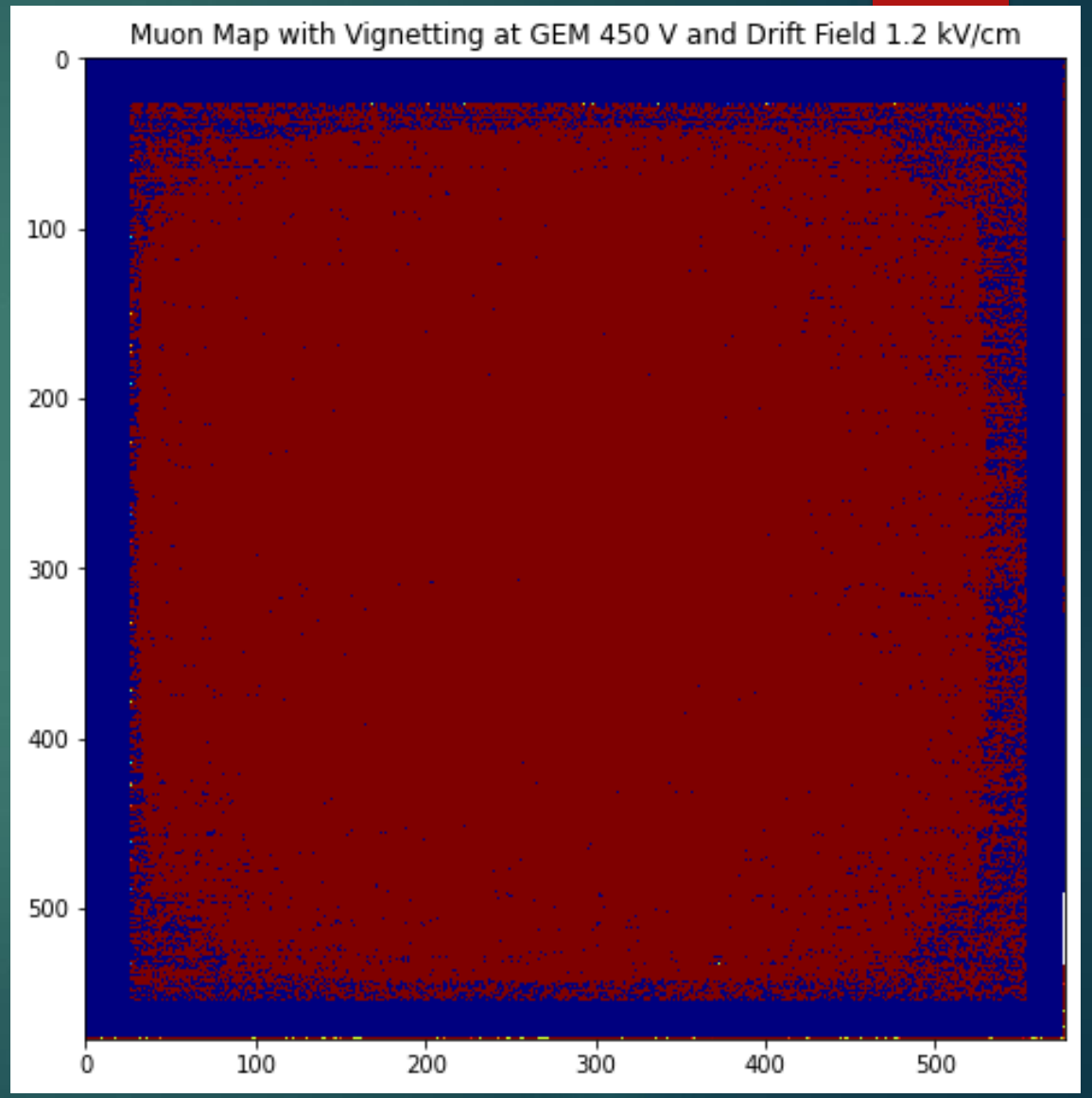


ETHEREAL FC – CATHODES COMPARISON IV

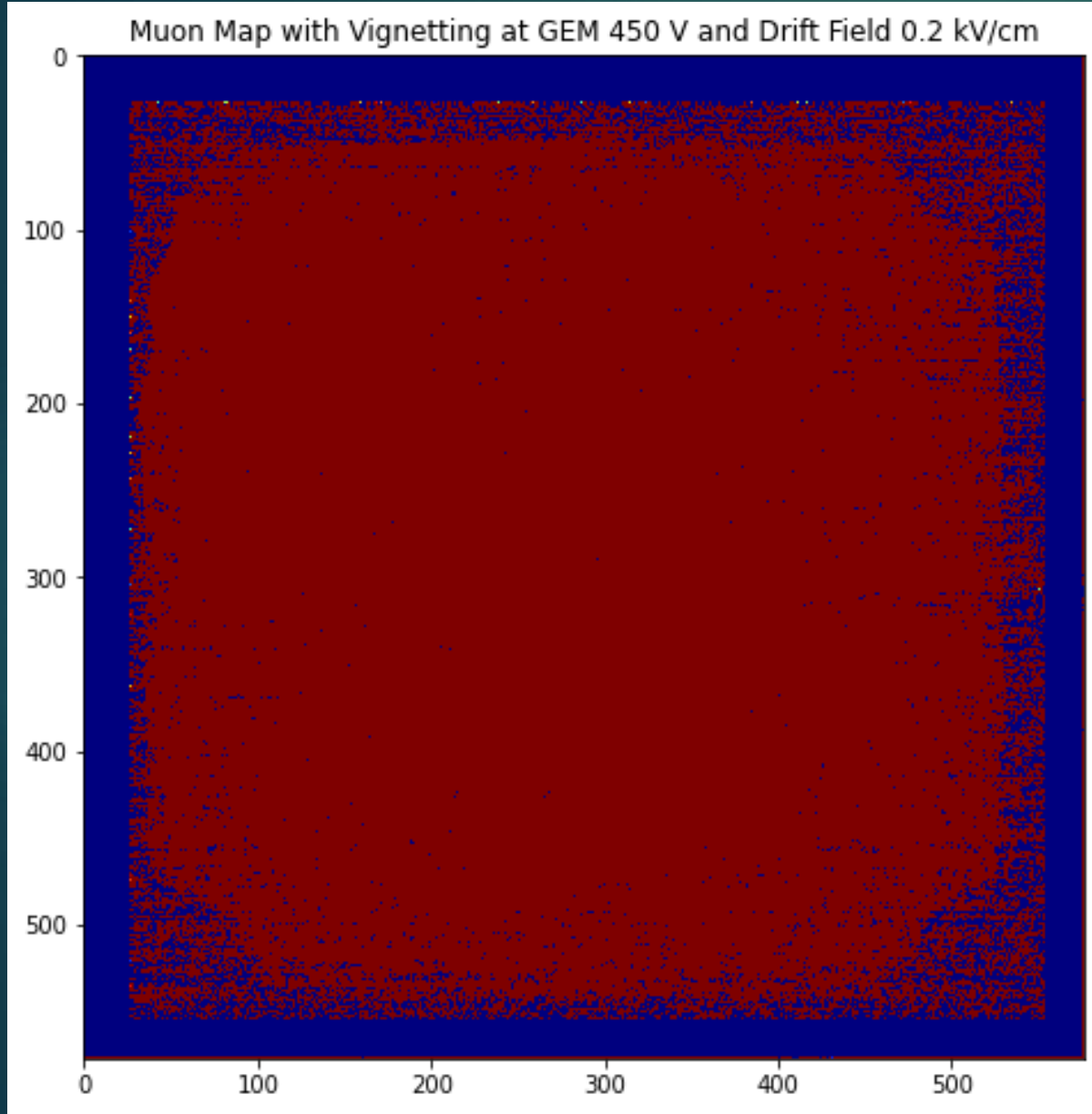


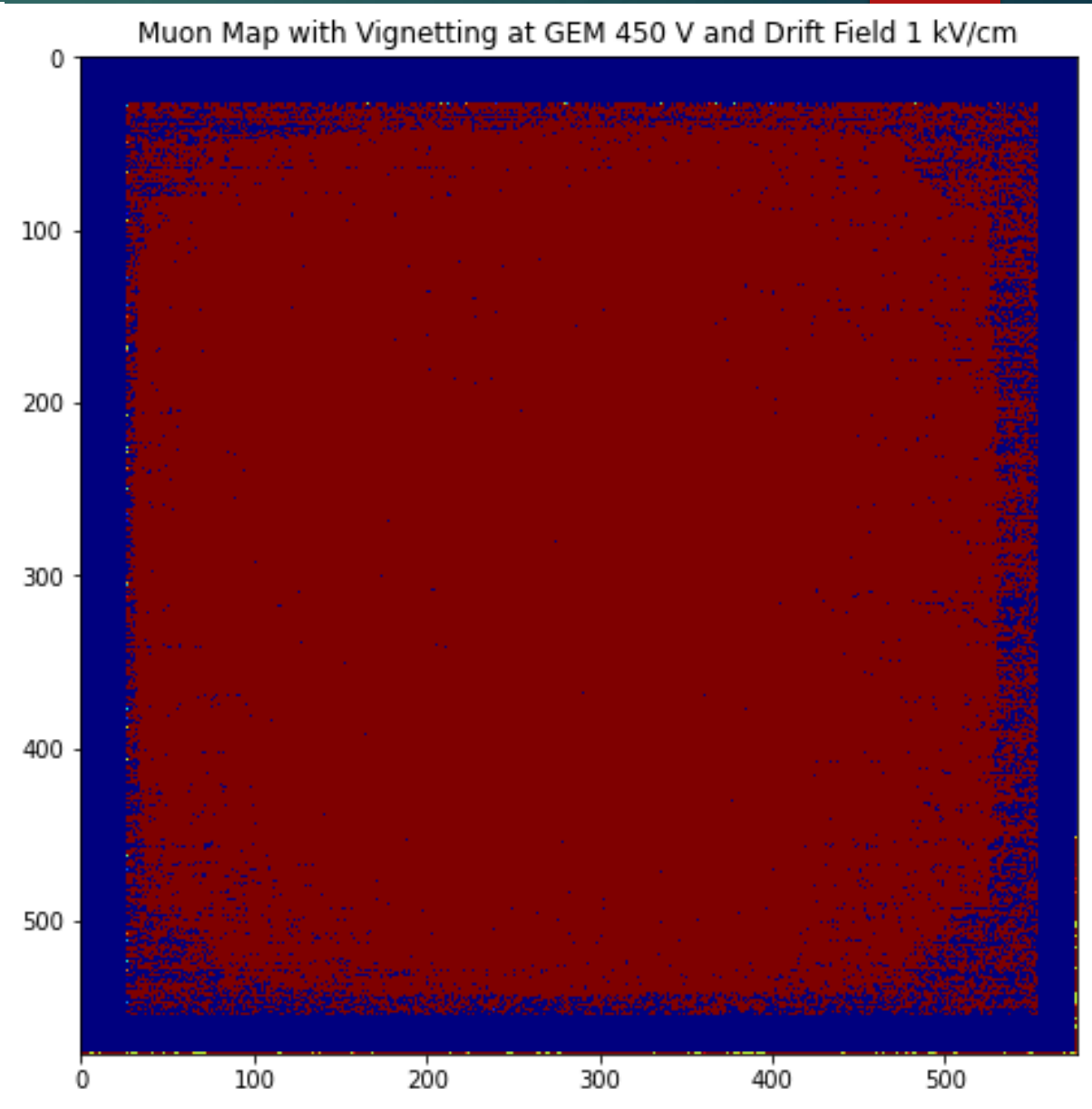
ETHEREAL FC – MUON MAPS I

- Long Exposures taken with Ethereal FC and Loomba's Cathod, not possible to take with Glued FC
- GEM 400V, 420V, 450V and Drift Field from 0.2 to 1.2kV/cm
- 450V have been used
- 420V and 400V should be better analysed
- Vignetting correction applied
- Maps are normalised in Light and events

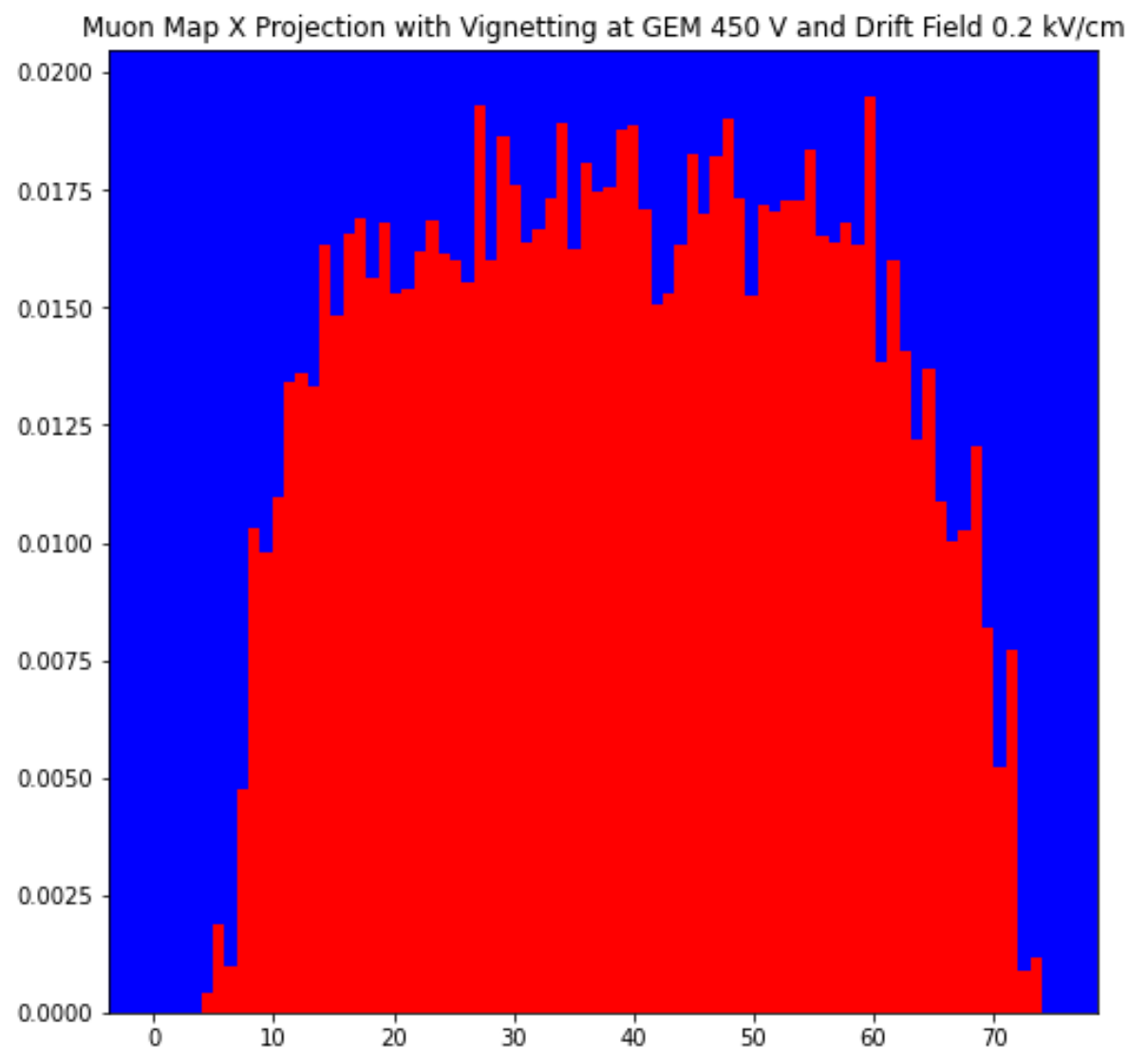


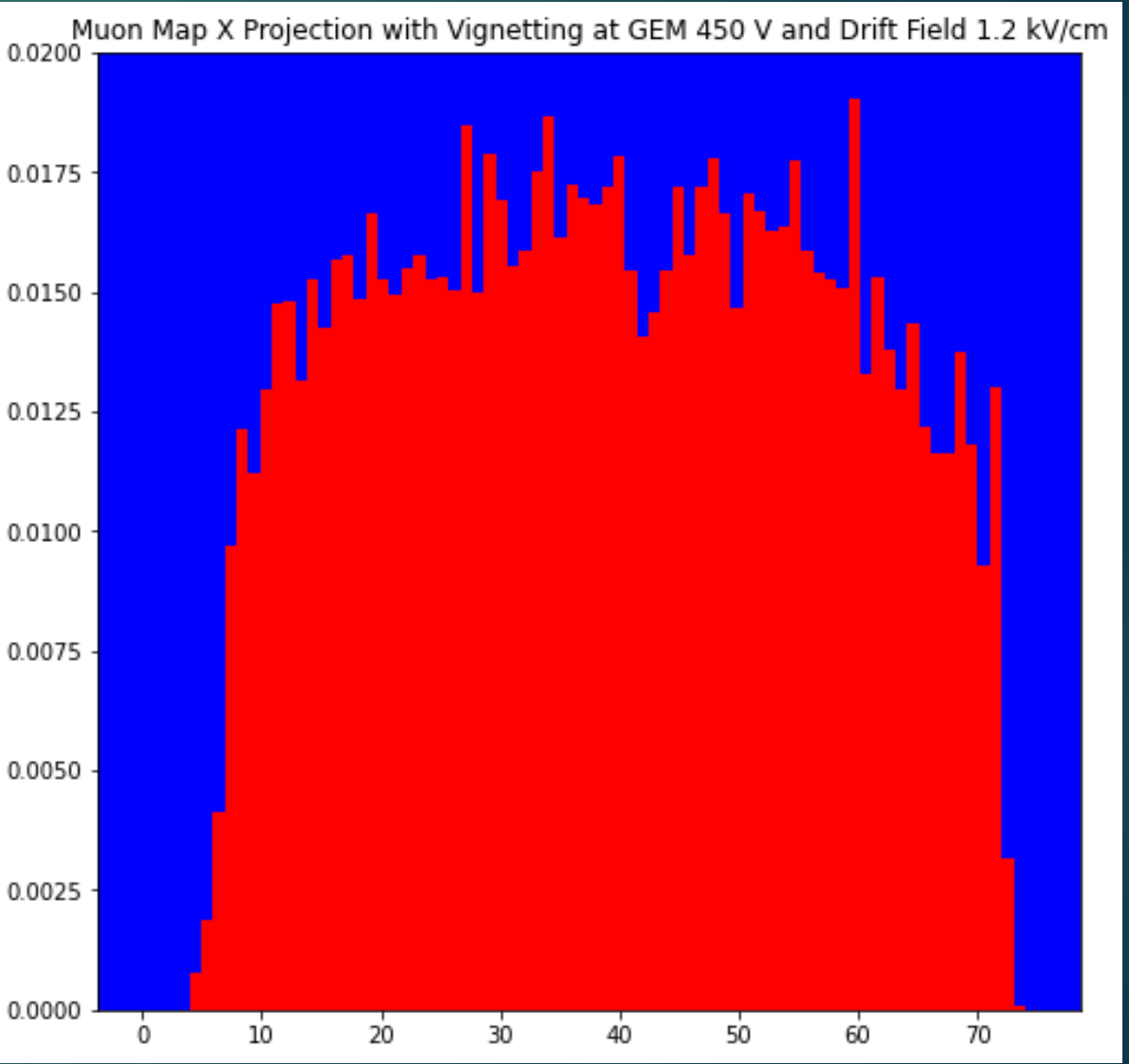
ETHEREAL FC – MUON MAPS II



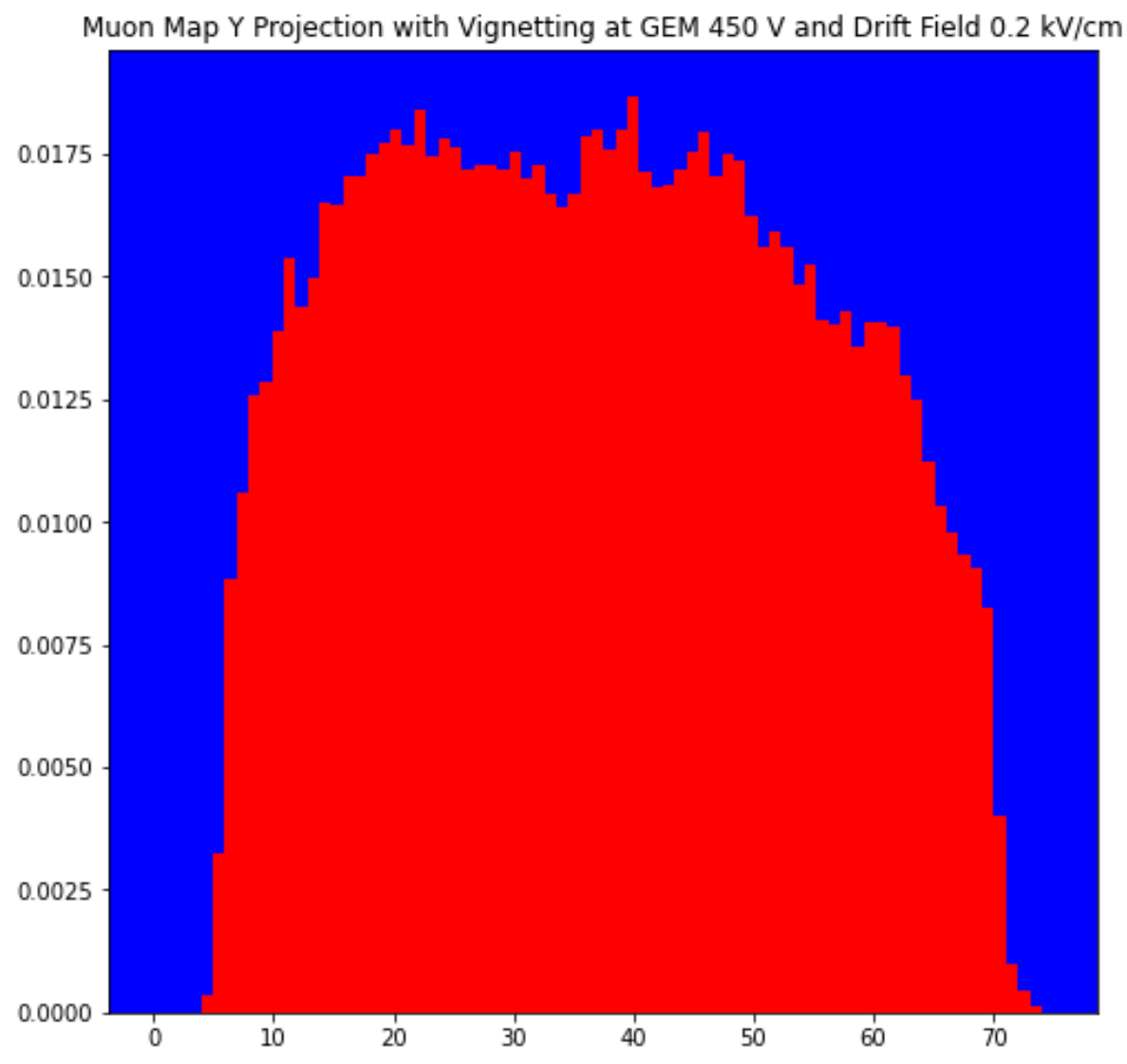


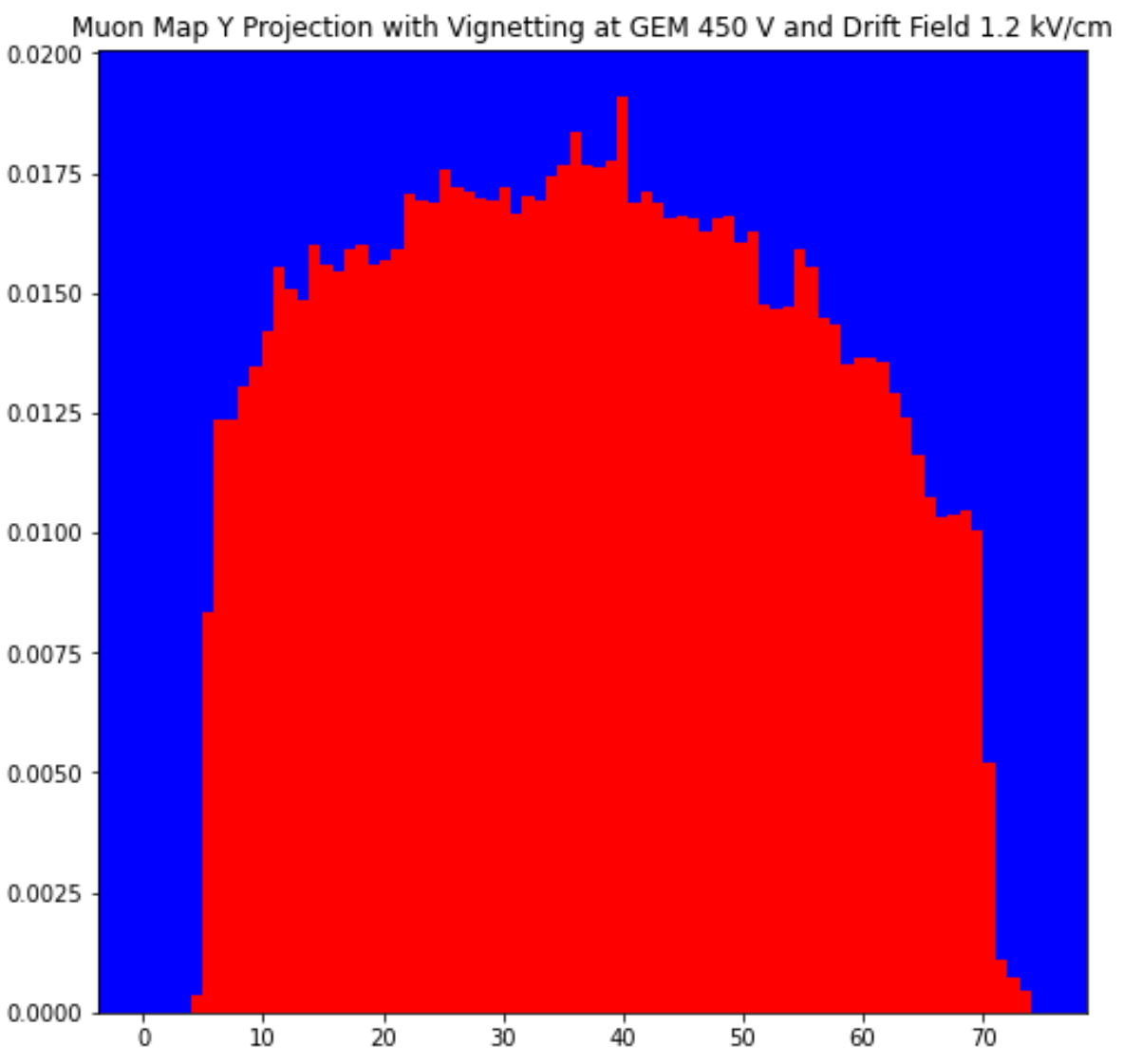
ETHEREAL FC – MUON MAPS III





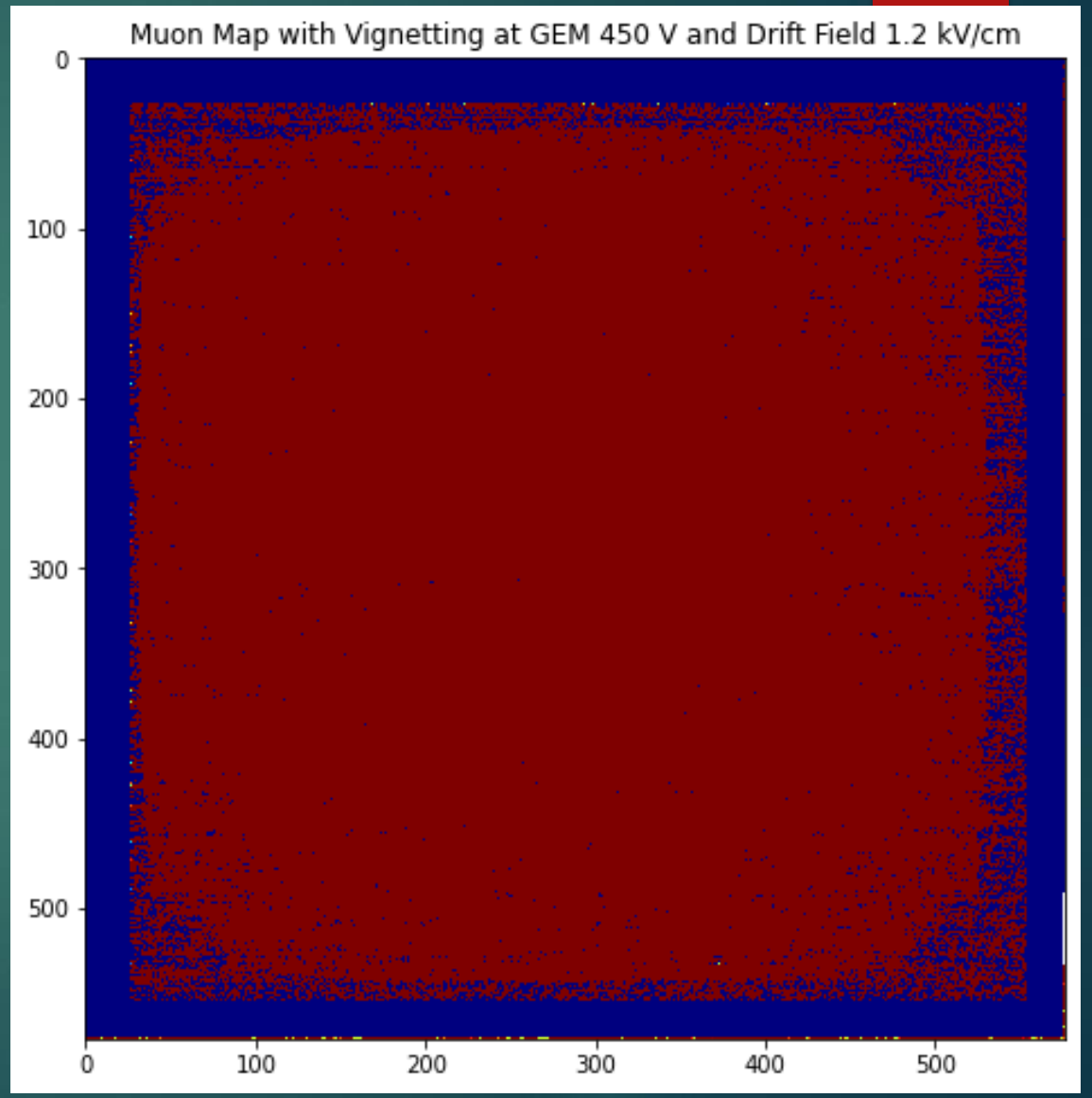
ETHEREAL FC – MUON MAPS IV





ETHEREAL FC – MUON MAPS V

- The Field is uniform enough with some problems in the corners due to Field Cages's shape
- The borders become more defined passing from 0.2 kV/cm to 1.2 kV/cm: possible to see the increasing field effect
- The Field Cage is valide for our purpose of uniformity



CONCLUSIONS AND OUTLOOKS

- **Conclusions:**
  - The Glued Field Cage is unstable and should be rejected for a future construction of CYGNO04
  - The Ethereal Field Cage can be considered as validated for future purpose as the field is uniform enough
- **Outlooks:**
  - Enviromental corrections will be applied to data with Ethereal FC and Cu Cathode when will be possible, this could help to compare more precisely the two cathodes
  - Further analysis in ongoing on dependence of LY and Energy Resolution from the system variables and the results will be presented soon