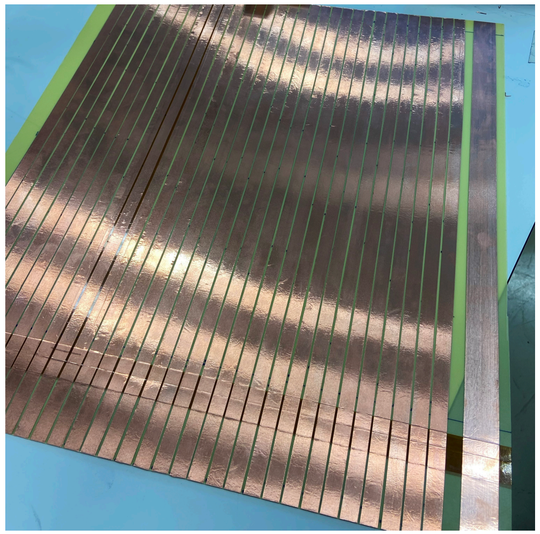
Preliminary results TB 2023 CMS Upgrade (Kodel-H)

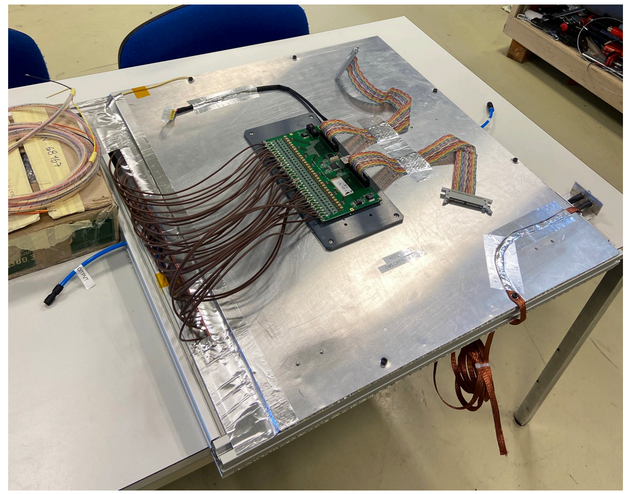
Dayron Ramos - Politecnico and INFN Bari

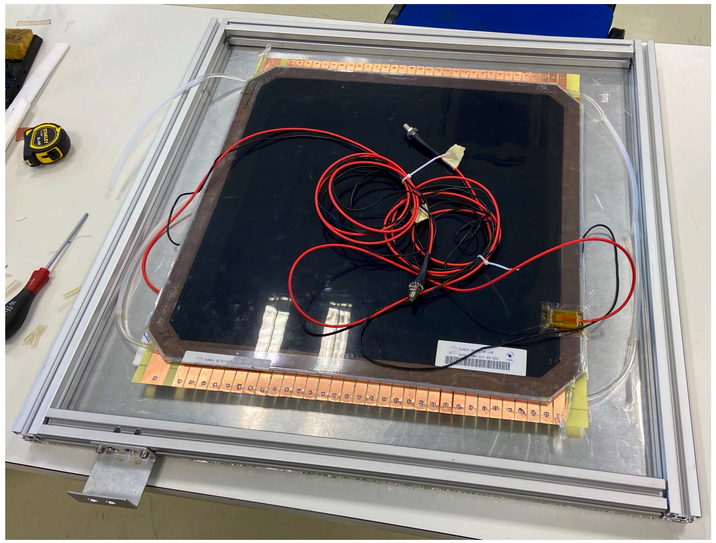
2023/09/28

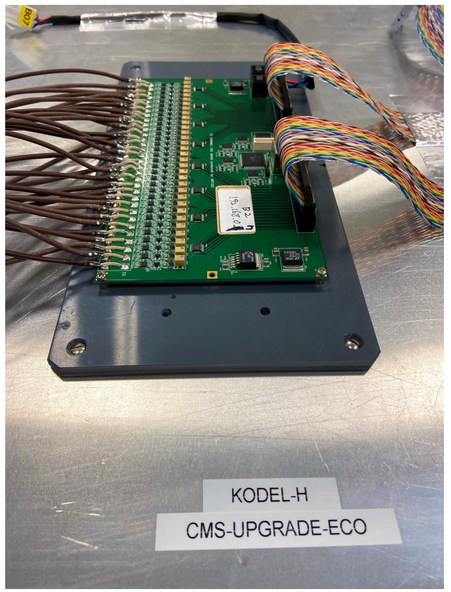
KODEL-H
Double gap layout

- **Frame:**
  - Al: 66 cm x 58 cm
- **Gaps:**
  - Area: 51 cm x 51 cm
  - Active Area: 45.5 cm x 45.5 cm
  - **Electrode thickness: 1.43 mm**
  - **Gap thickness: 1.4 mm**
- **Strips:**
  - Homemade panel
  - 32 strips - 1.27 cm width, “pitch” ~1.4 cm
  - 50 ohm termination
- **FEB:**
  - KODEL FEB
  - THR = 500 uV ≈ 60 fC
- **GIF position:**
  - Trolley 3, ~4 mts from source



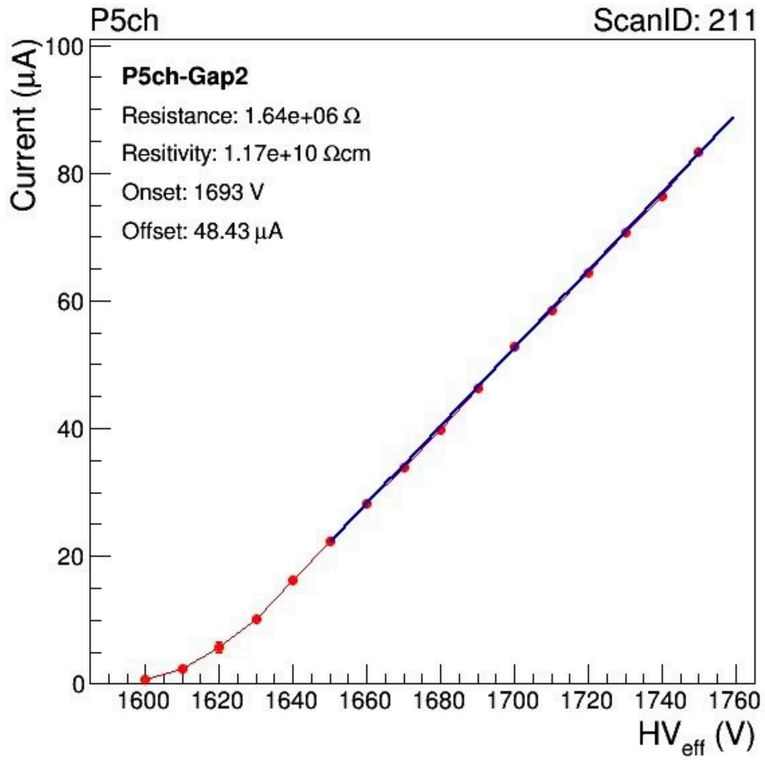


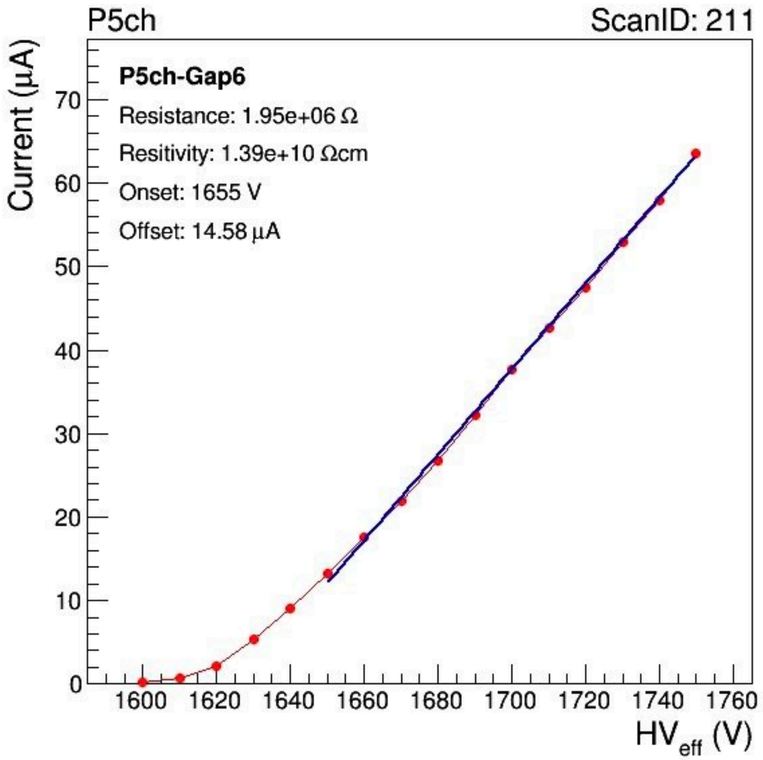




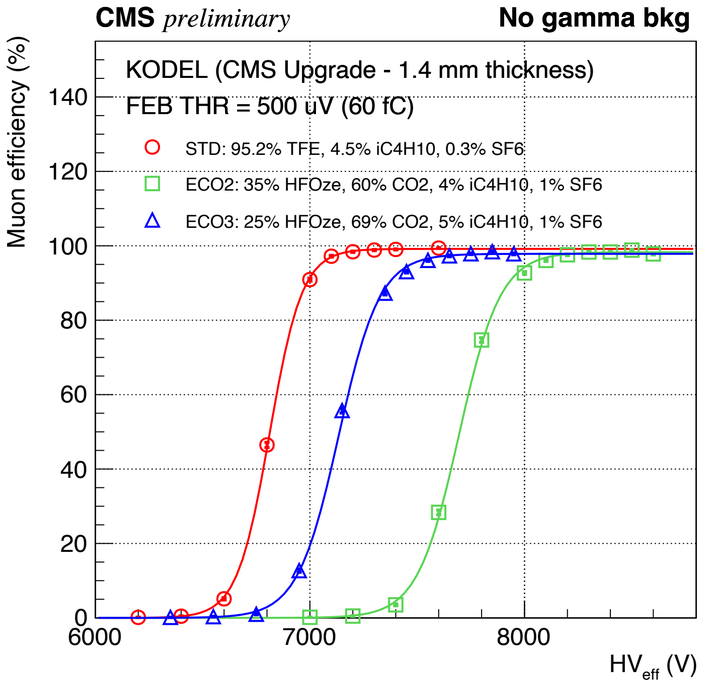
Gaps resistivity
Ar scan at 904 laboratory

KODEL-H TOP → P5ch-Gap2
KODEL-H BOT → P5ch-Gap6

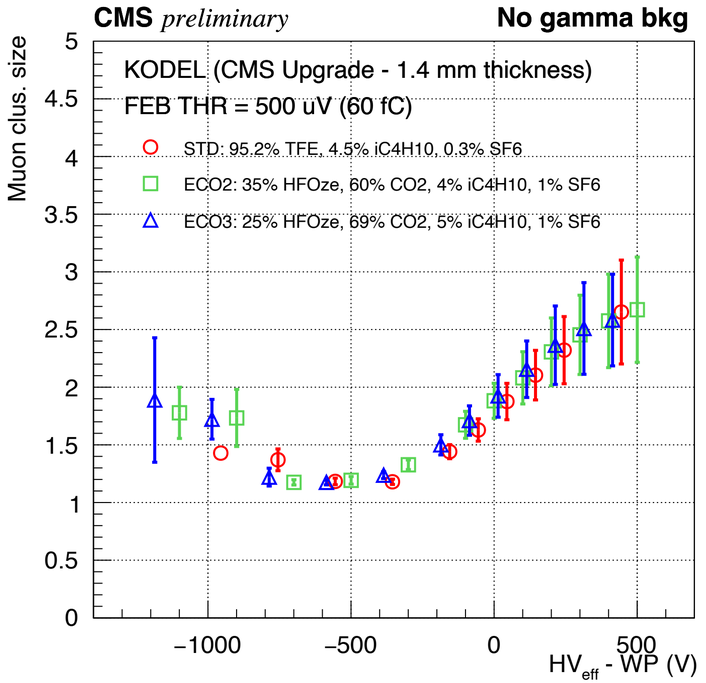


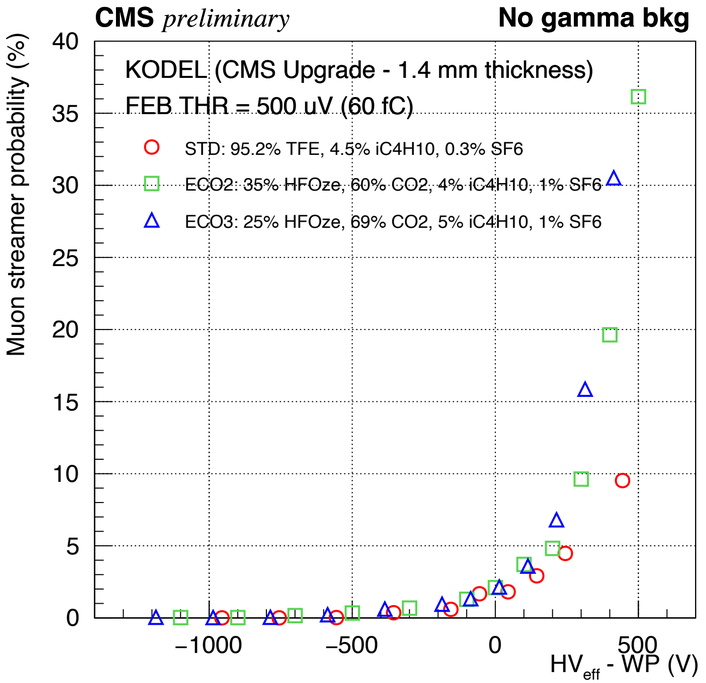


Preliminary results
Source OFF (No gamma background)



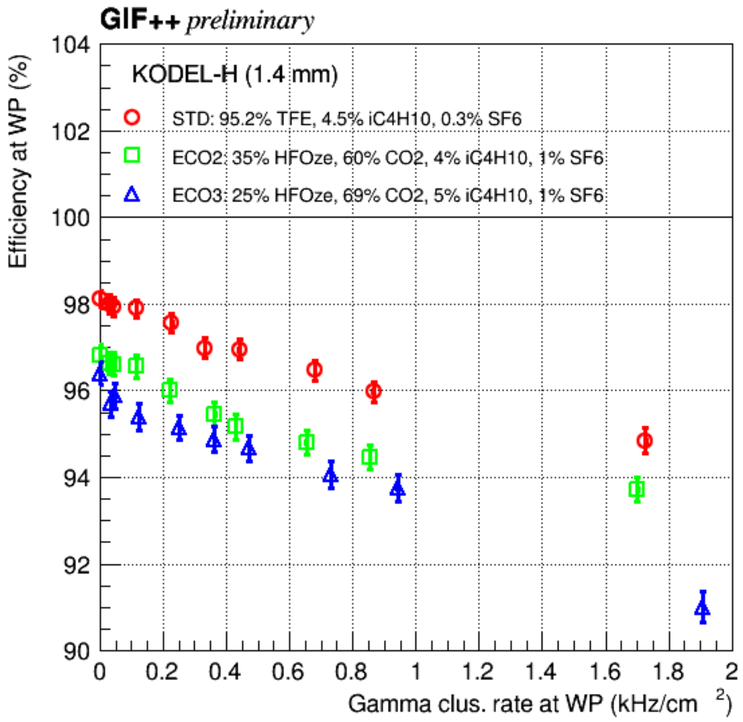
WP = 7.16 kV, ε_{WP} = 98.11 %
WP = 8.10 kV, ε_{WP} = 96.82 %
WP = 7.54 kV, ε_{WP} = 96.39 %

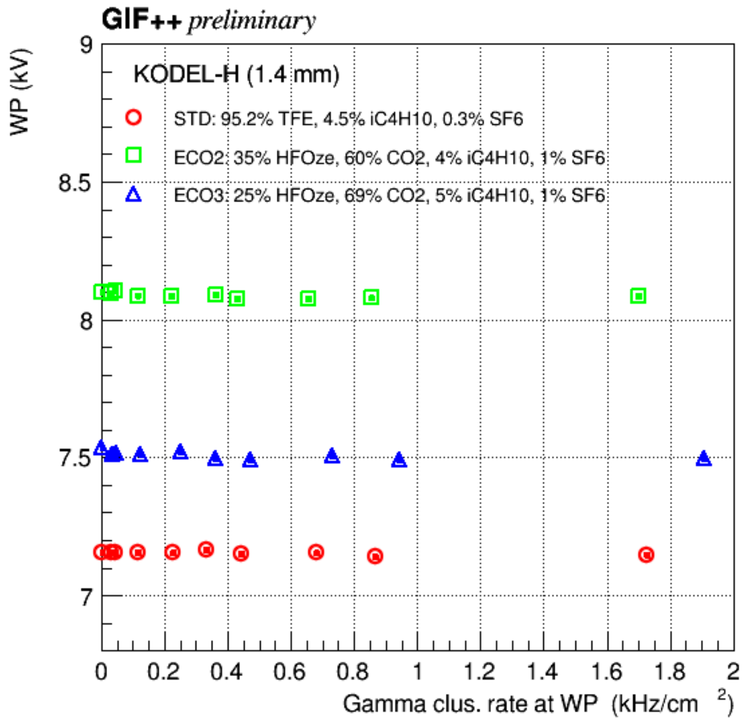




Preliminary results

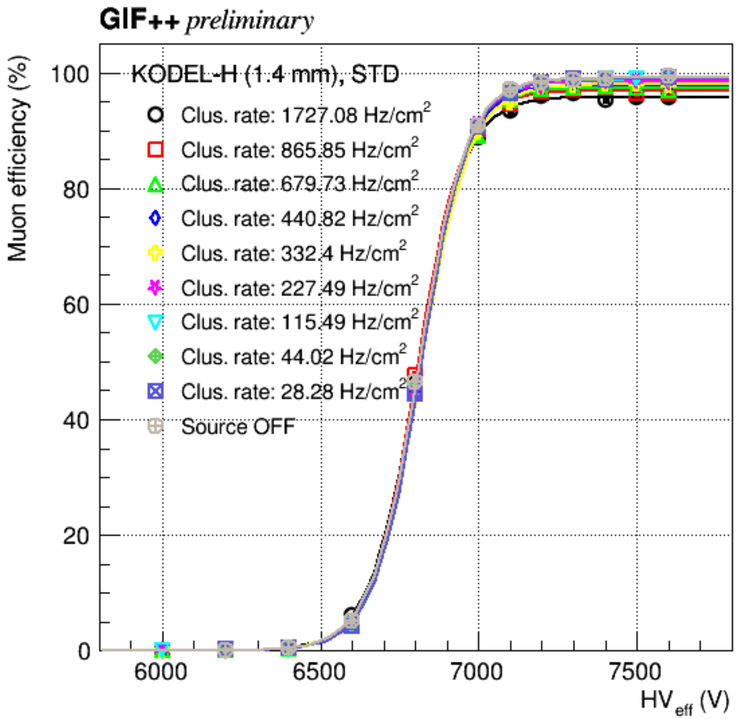
Efficiency and working point (WP)

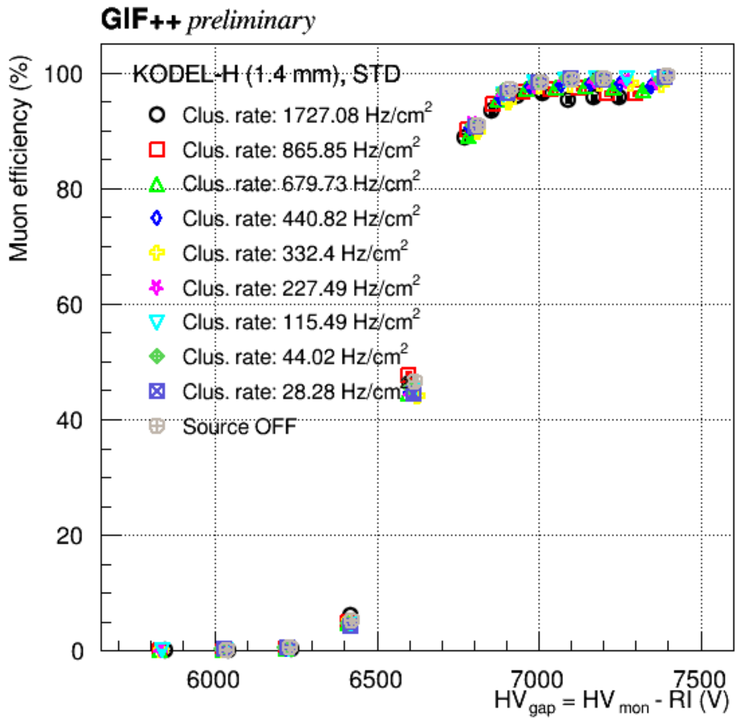




Preliminary results
RI correction

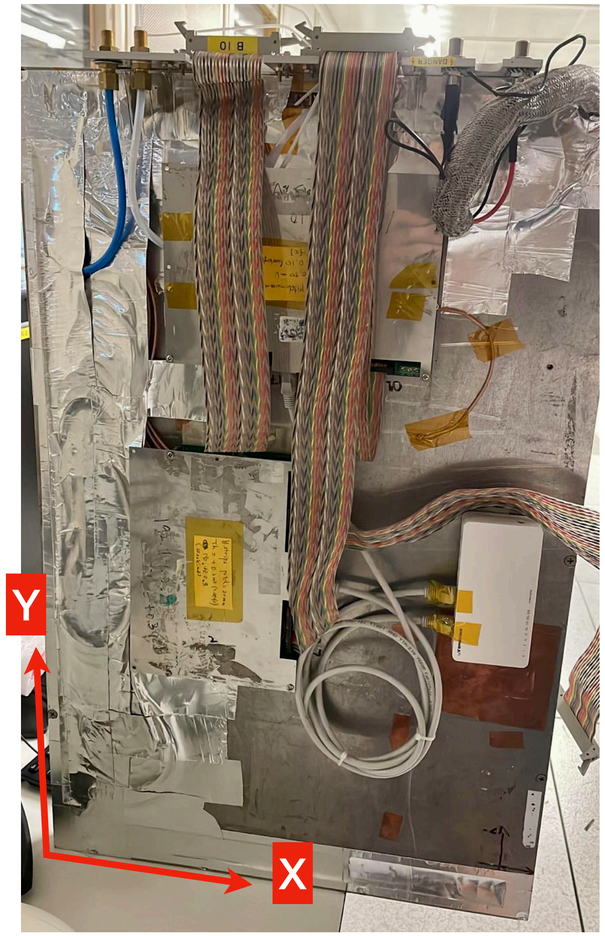
$$HV_{gap} = HV_{app} - RI$$



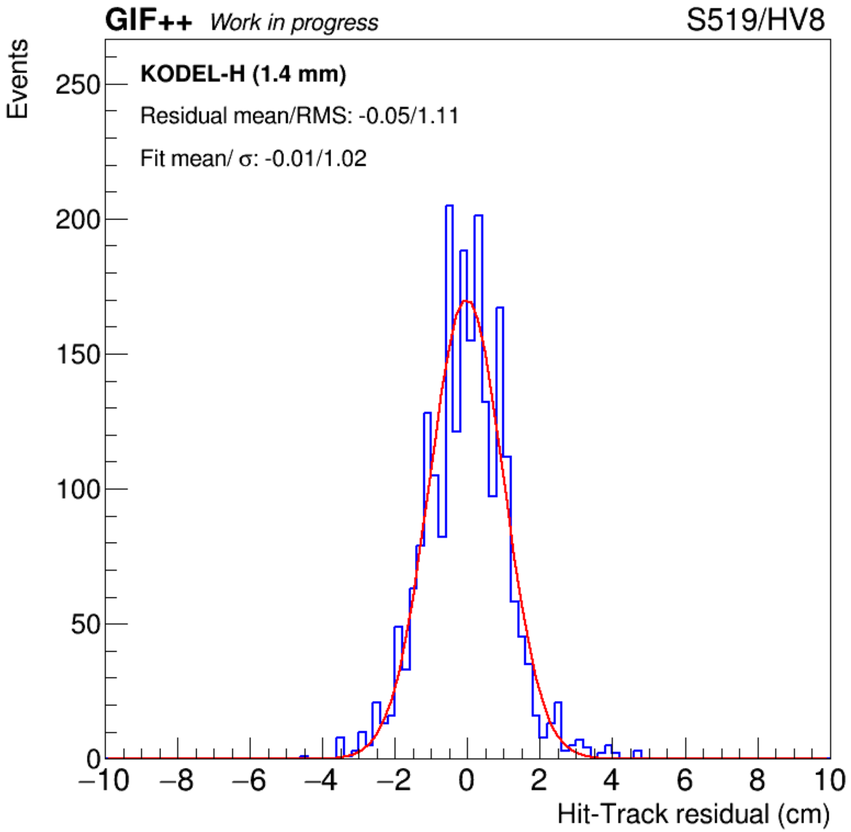


Preliminary results

Tracking using KODEL-2D

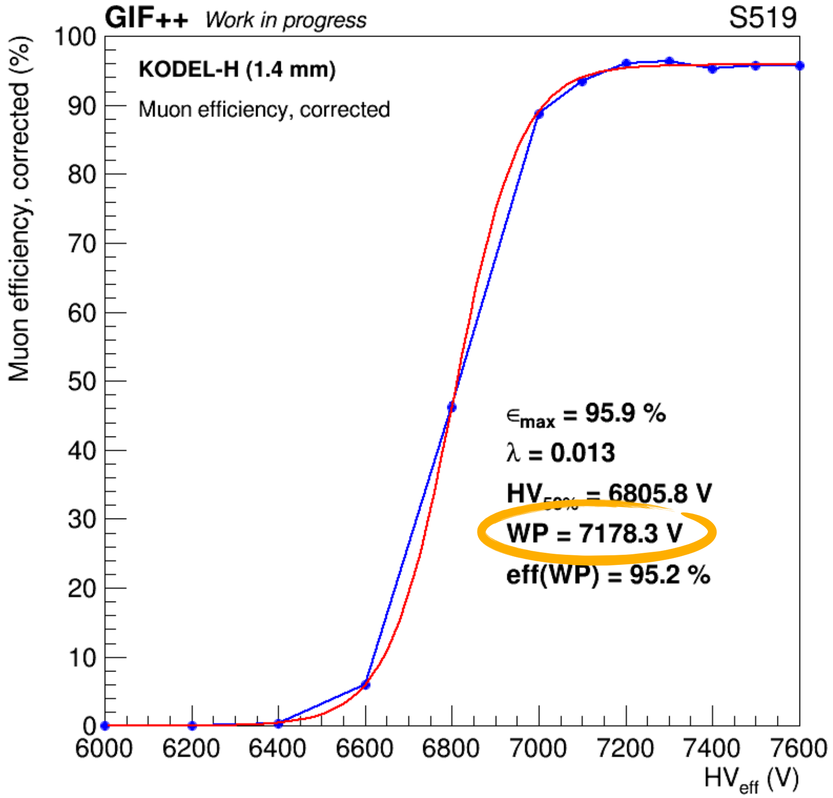


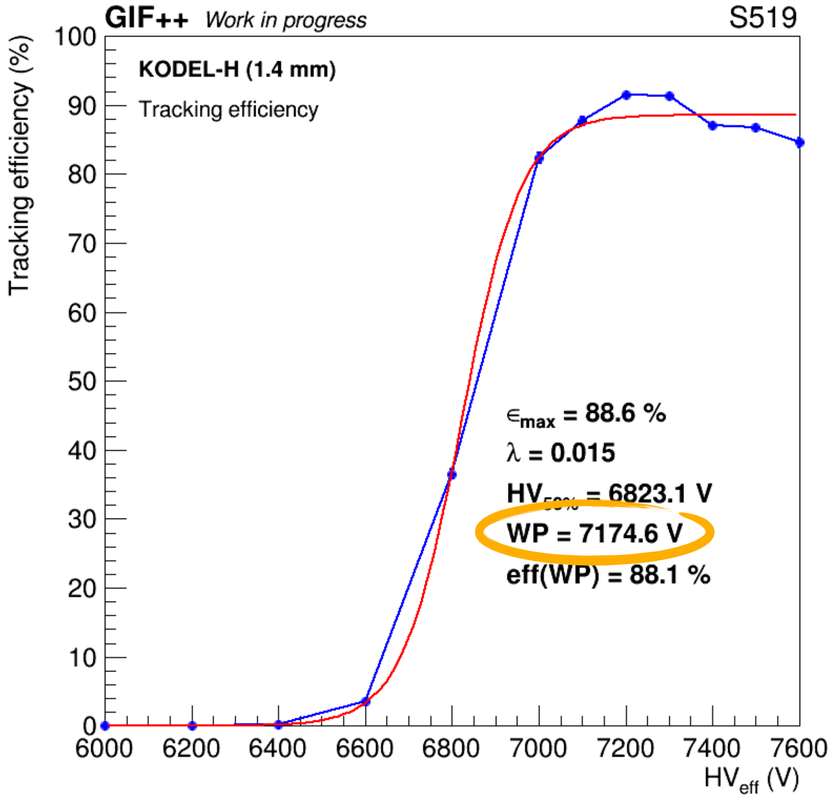
Alignment and even display (webdcs)



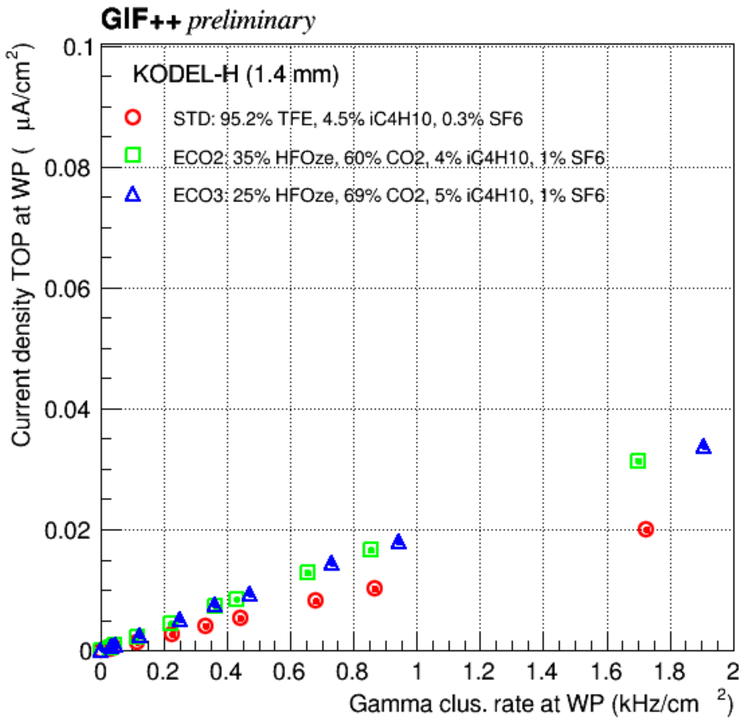
Preliminary results
Tracking using KODEL-2D

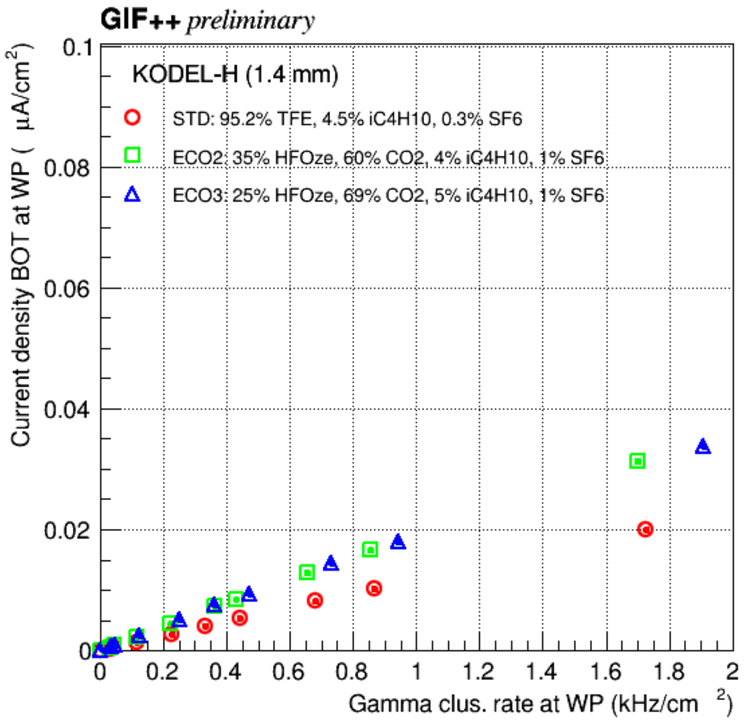
- STD mixture
- ABS = 1
- gamma clus. rate at WP = 1.7 kHz/cm2



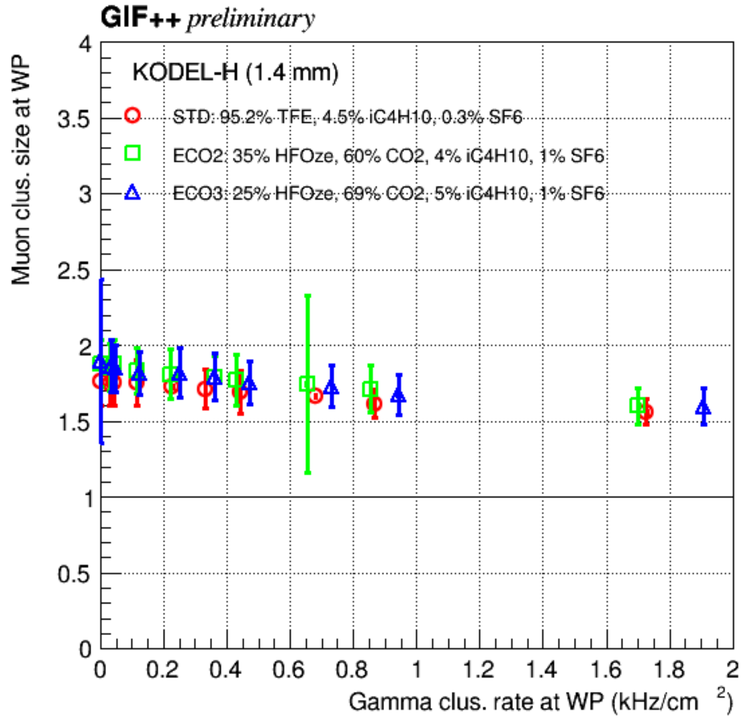


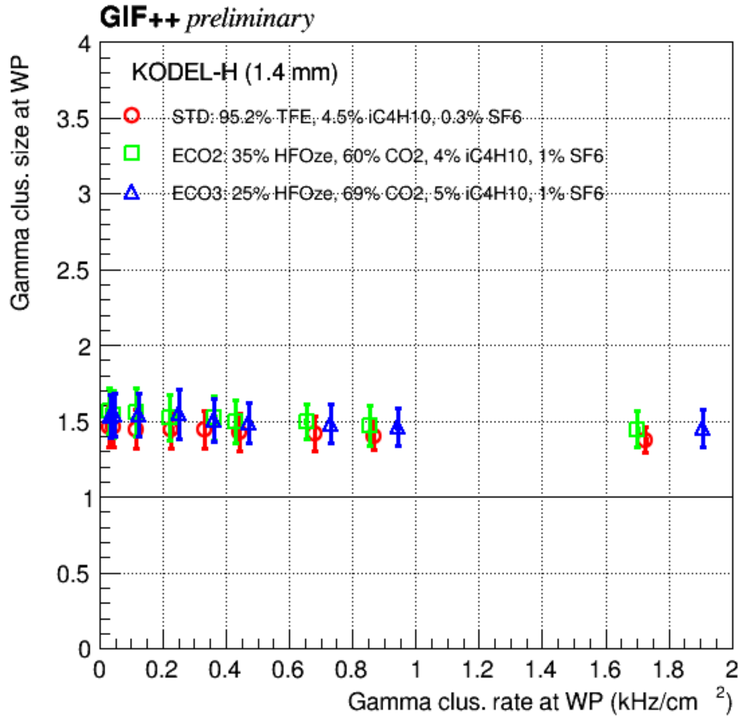
Preliminary results
Current density



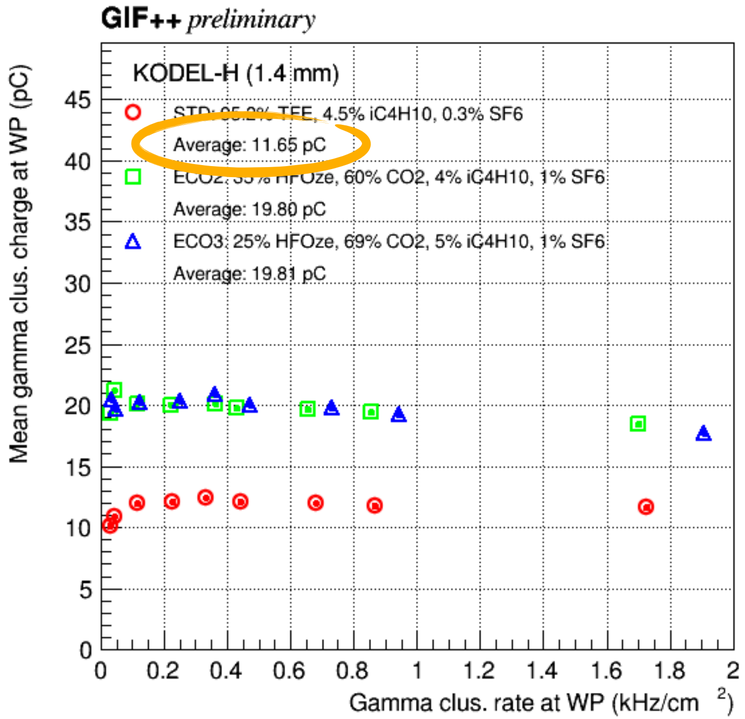


Preliminary results
Muon/Gamma clus. size





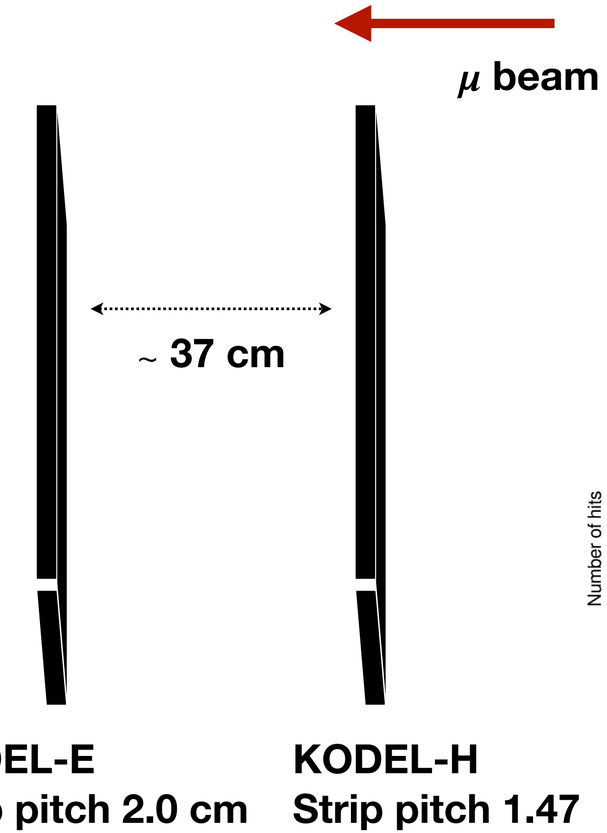
Preliminary results
Average gamma avalanche charge



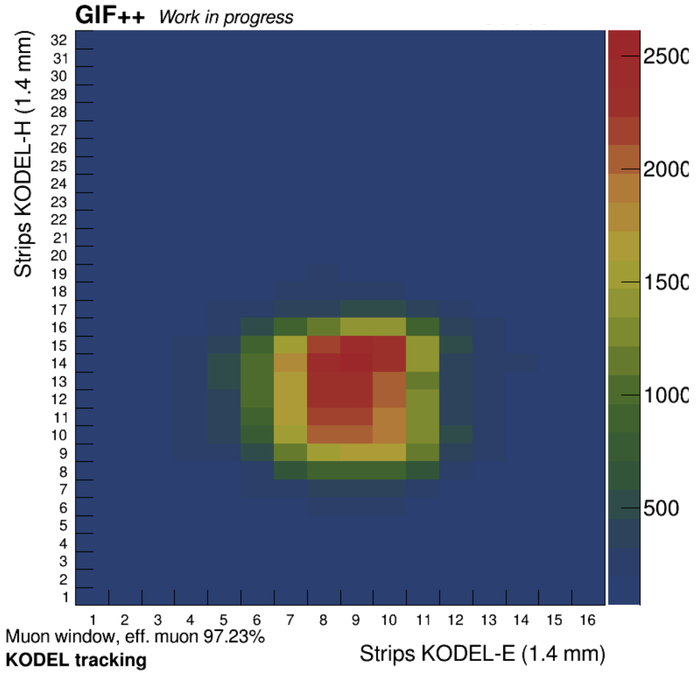
- Average charge **iRPC ≈10.9 pC** (at THR = 33 fC)
- **KODEL-H** at THR = 500 uV (≈ 60 fC) and STD mixture → average charge **= 11.65 pC**

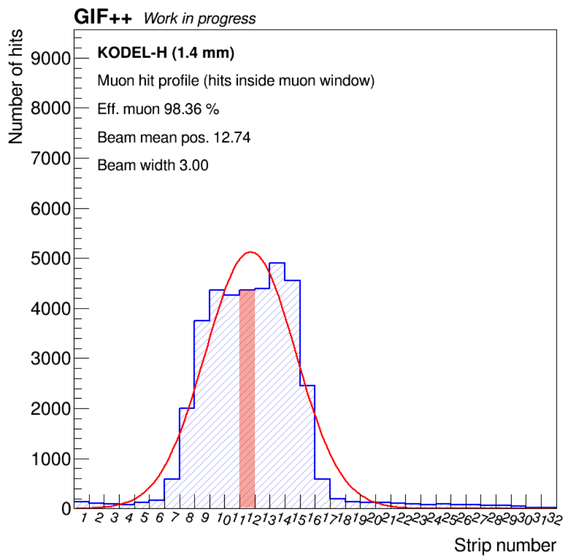
Preliminary results
Time resolution (TB Aug 2023)

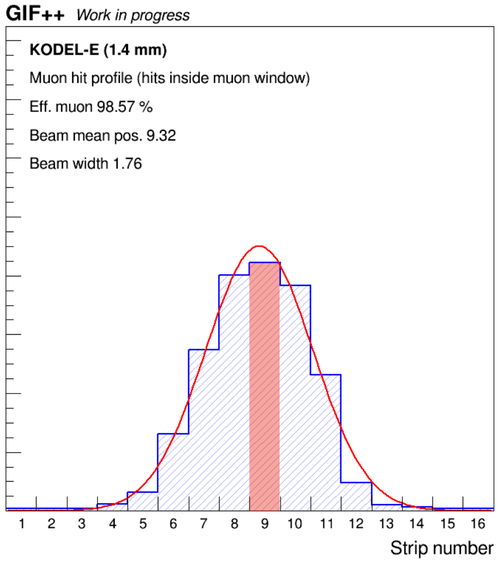
- $\sigma = \frac{\sigma_{ToF}}{\sqrt{2}}$
- **"Good events":**
  - Ensure perpendicular tracks amap
  - CLS(KODEL-H) <= 2 && CLS(KODEL-F) = 1
  - Self-tracking
    - Orthogonal strip planes
    - Filtering events by beam center strips
- **FEB:**
  - KODEL FEB
  - THR = 500 uV ≈ 60 fC
- **GIF position:**
  - Trolley 3, ~4 mts from source
- **Issues**
  - Runs with poor statistics



Orthogonal strip planes: self-tracking

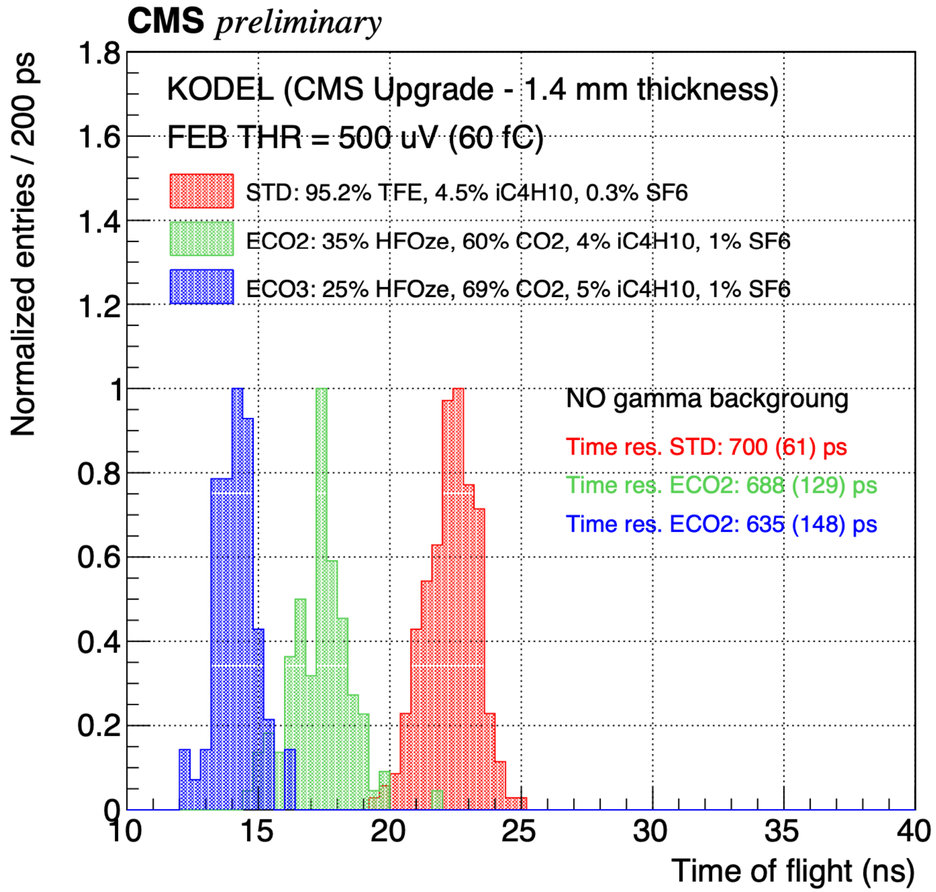






Preliminary results

Time resolution at source OFF (no gamma bkg)



Different mean values ->

single strip triggering, no channel time alignment

Time resolution:

STD 700 ps

ECO2 688 ps

ECO3 635 ps

STD/ECO2/ECO3 = 1/1.01/1.10

BACK

TB July and Aug 2023
Mixtures set tested in KODEL-H

- **STD:** 95.2% TFE + 4.5% iC4H10 + 0.3% SF6

- **HFO-CO2 based mixtures**
  - **ECO2:** 35% HFOze + 60% CO2 + 4% iC4H10 + 1% SF6
  - **ECO3:** 25% HFOze + 69% CO2 + 5% iC4H10 + 1% SF6

- **TFE-CO2 based mixtures:**
  - **MIX3005:** 65% TFE + 30% CO2 + 4.5% iC4H10 + 0.5% SF6
  - **MIX301:** 64.5% TFE + 30% CO2 + 4.5% iC4H10 + 1.0% SF6
  - **MIX401:** 54.5% TFE + 40% CO2 + 4.5% iC4H10 + 1.0% SF6