

Cosmic trigger

with RPC

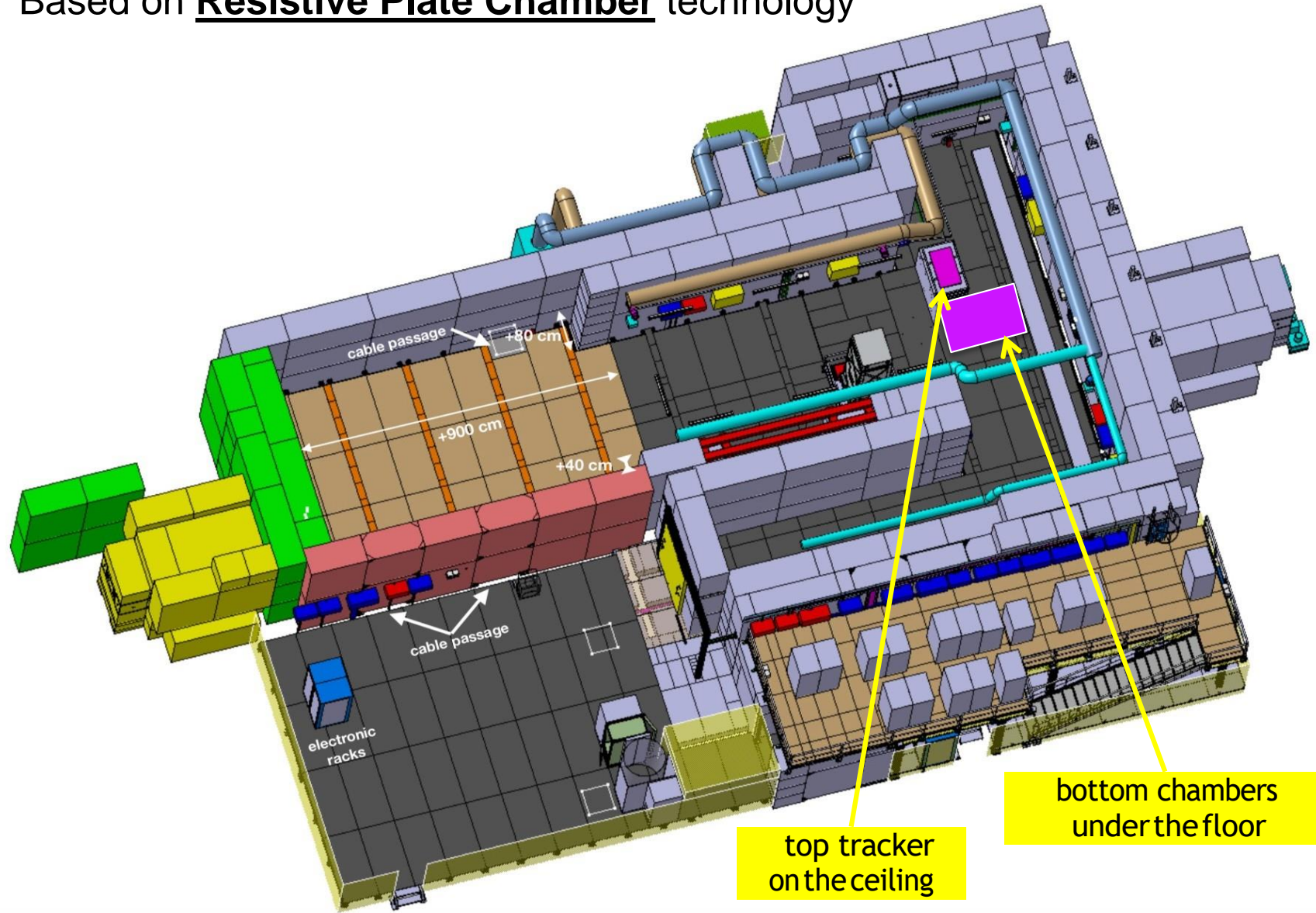
Alberghi Gian Luigi (INFN-Bologna)



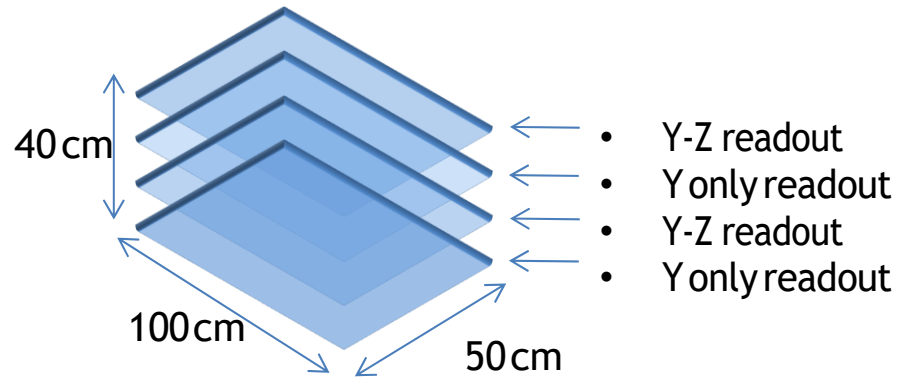
GIF++ User Annual Meeting - CERN - 2022/12/01

Cosmic tracker: setup

Based on Resistive Plate Chamber technology

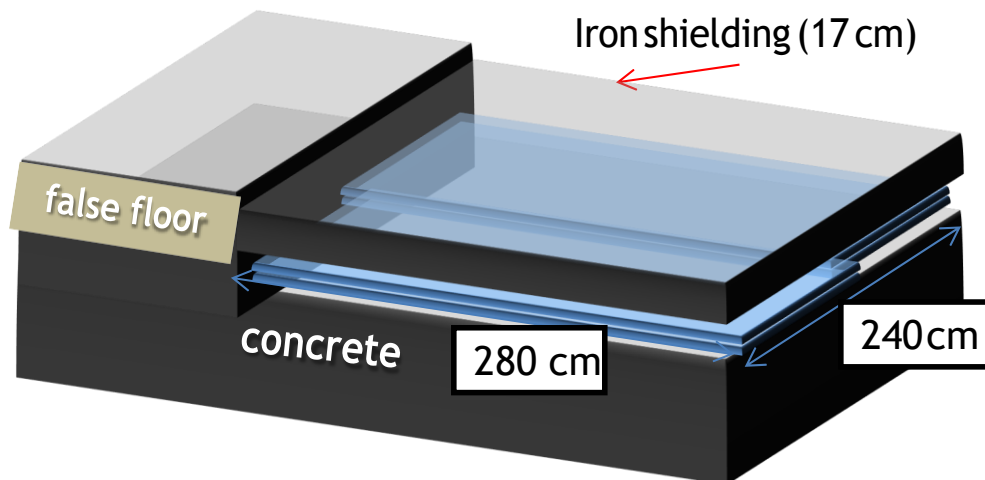


Cosmic tracker: layout



- **Top Tracker (Roof chambers)**

- RPCs with 1 mm gas gap
- 3 independent detectors with area $1.0 \times 0.5 \text{ m}^2$
- strips 2.5 cm wide
 - 1 m long strips in all 3 RPCs
 - 0.5 m long strips in 2 out of 3 chambers



- **Underground detector (Floor Chambers)**

- ATLAS-like RPCs with 2 mm gas gap
- double layer chambers: total size $2.8 \times 2.4 \text{ m}^2$
- two chambers with bi-dimensional read out with 4 cm wide strips

Cosmic tracker : bottom chambers

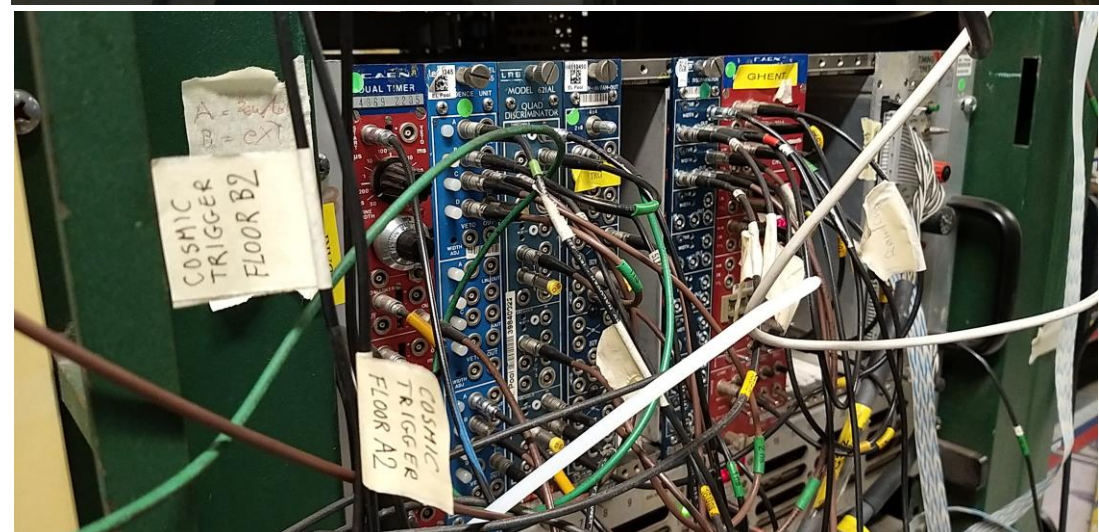
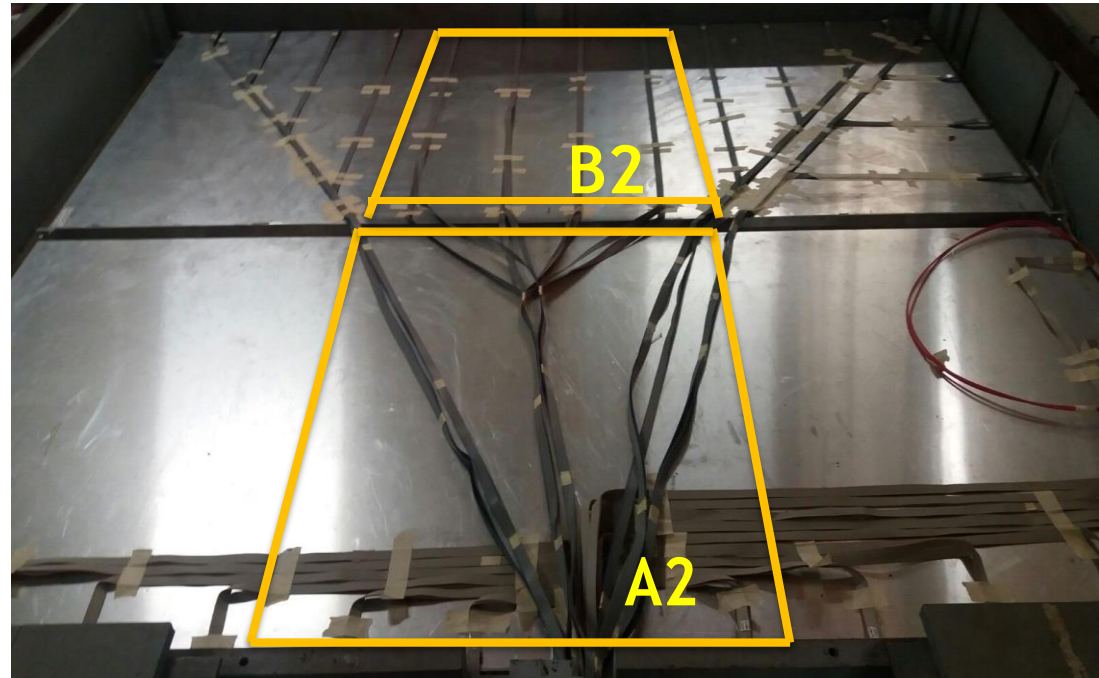
Bottom chambers

- in place for many years
- high gap currents observed
gas flow checked (ok)
further investigation
needed

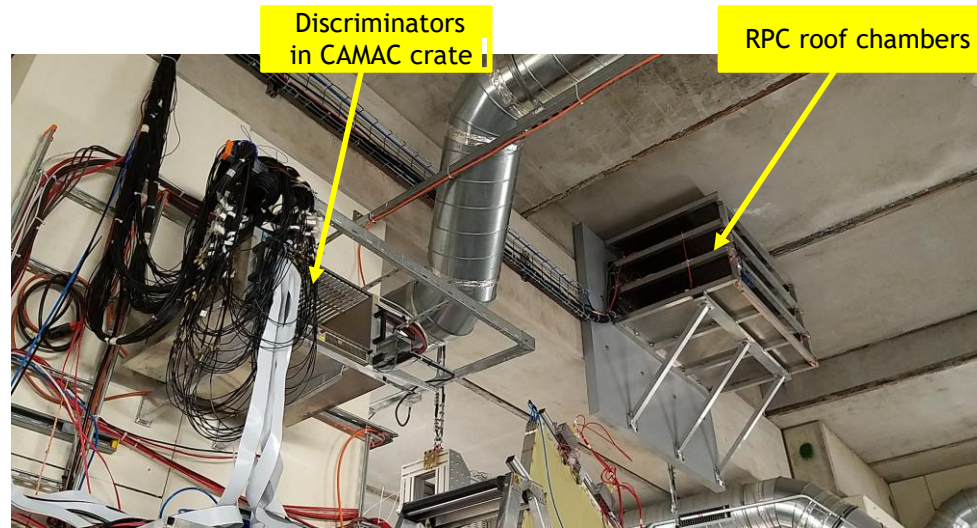
NIM crate with coincidence logic
between the two chamber layers
→ 2 LEMO cables

Two trigger signals are available
from central part of the chambers

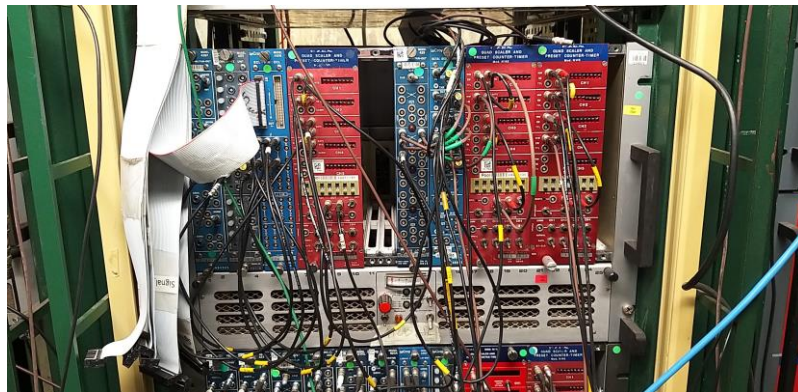
Additional crates with NIM modules
needed to provide trigger from entire
chambers



Cosmic tracker: top chambers



Signals from RPCs are discriminated in a CAMAC crate inside the bunker



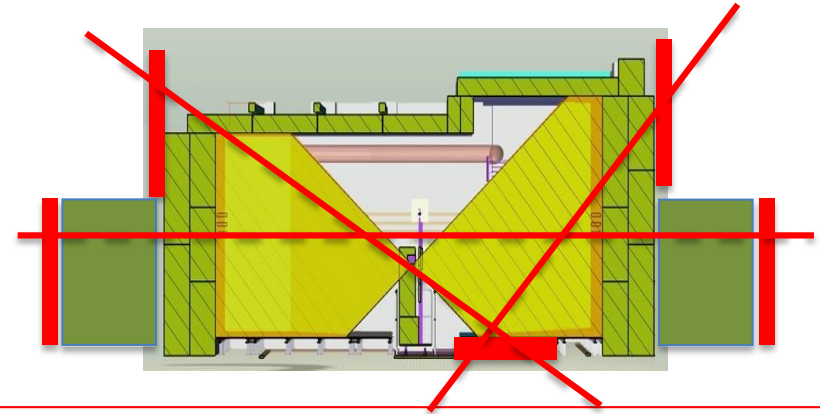
Electronics where the trigger logic is being implemented

Improvement of the GIF++ cosmic-ray tracker

Tracker coverage limited to downstream region

Proposed extension: installation of new RPC chambers on the bunker endcap walls

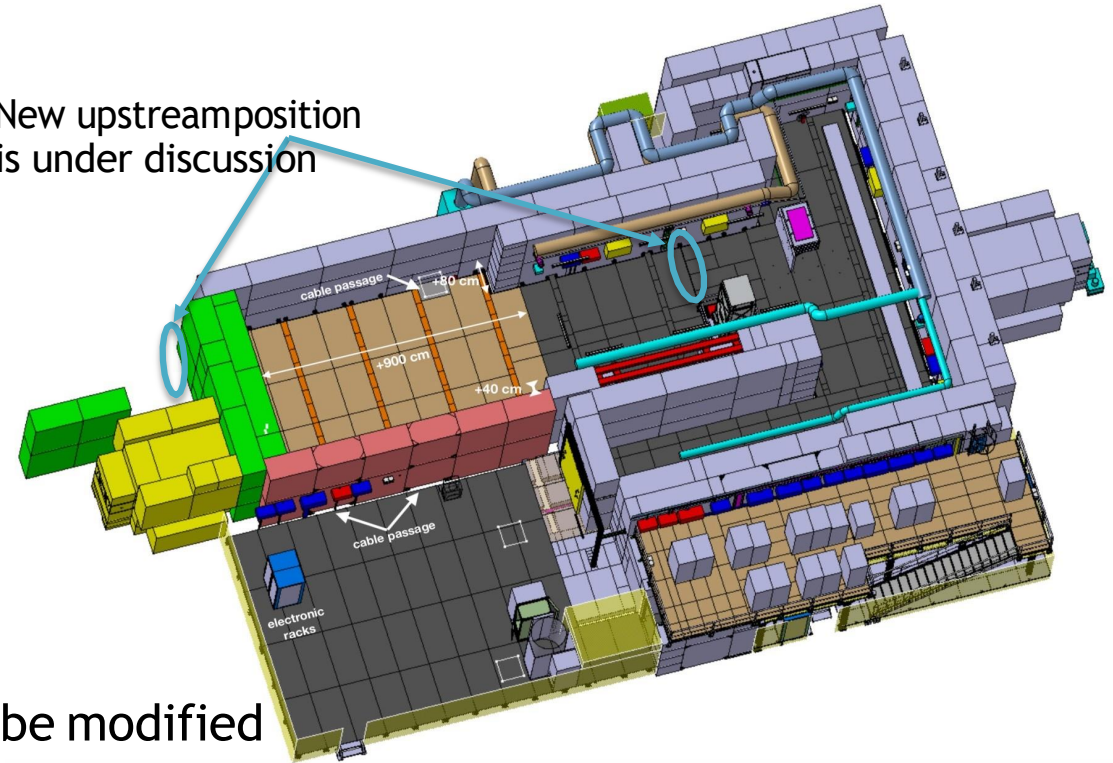
- Extend coverage
- Select harder momentum muons
- Trigger also on beam-halo muons



Downstream chamber position **set**



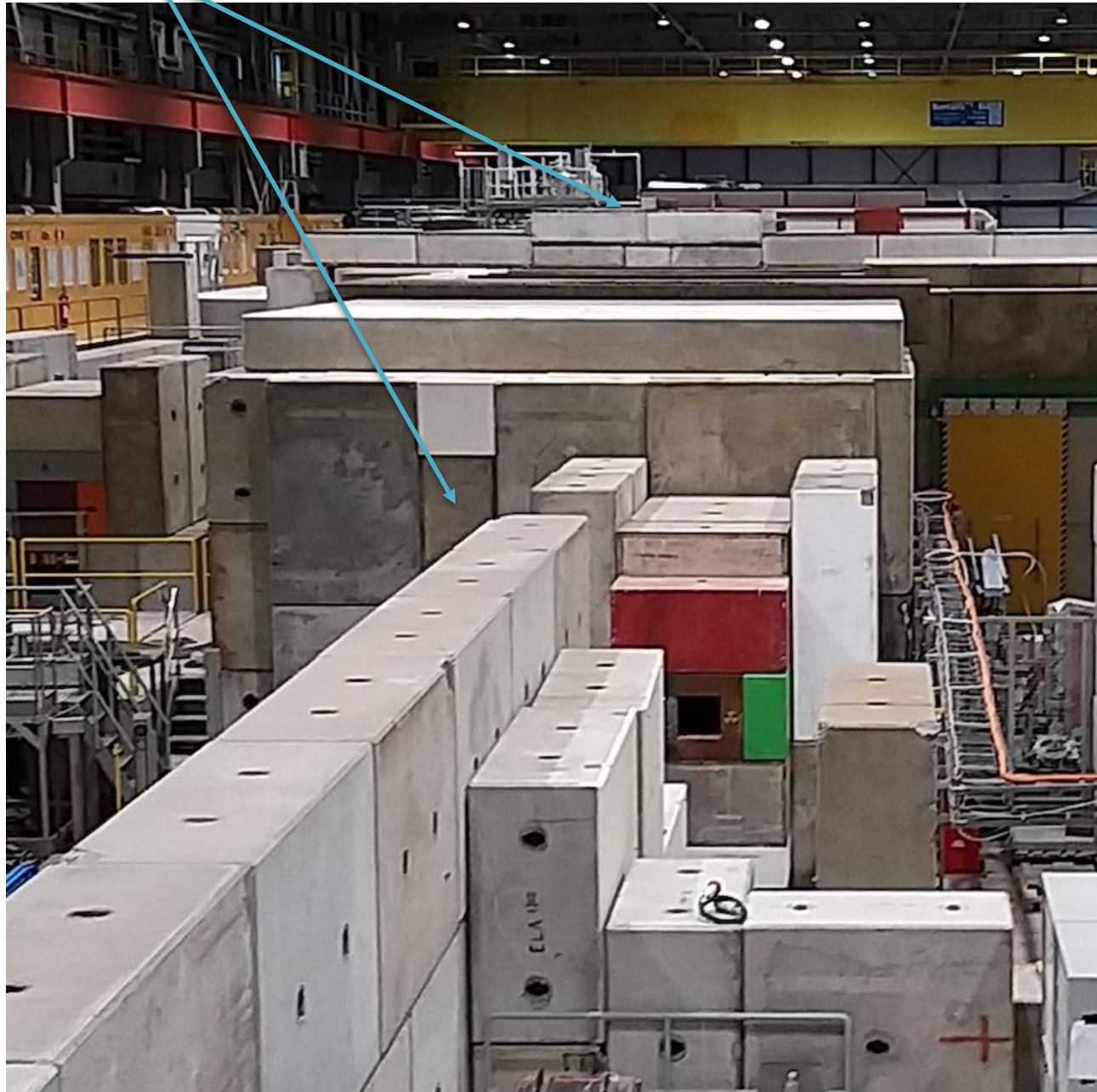
New upstream position is under discussion



Original proposal for upstream position had to be modified due to **bunker extension**

GIF++ upstream view

Possible upstream positions (under discussion)



Improvement of the GIF++ cosmic-ray tracker

Chamber status

- Chambers were checked in Rome2
- all gas volumes (16) have been refurbished (re-oiling of internal surface) at General Tecnica
- gas volumes are in Rome2 Lab, chambers are being re-assembled (one already reassembled and used for Eco-gas studies) and will be shipped back to CERN



chamber checks at Rome2



- FE electronics is in good state

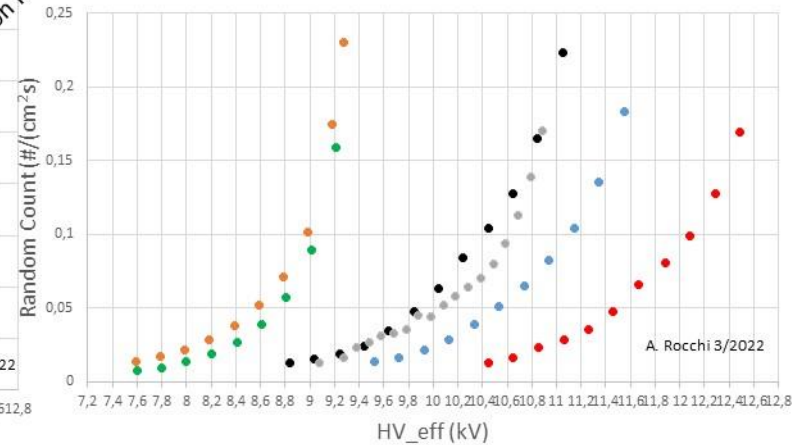
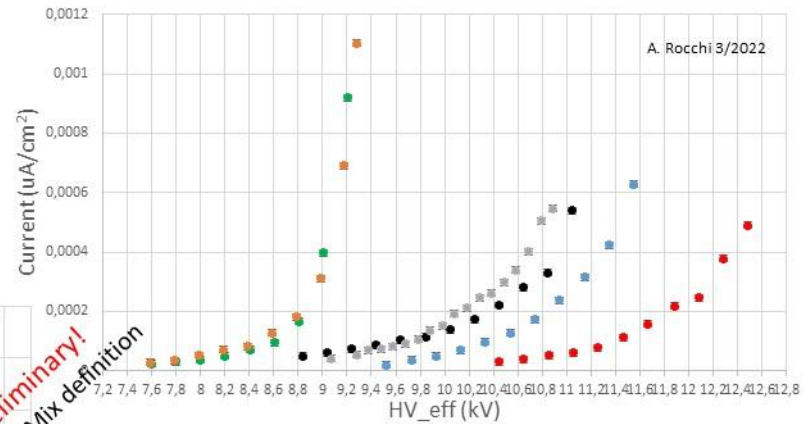
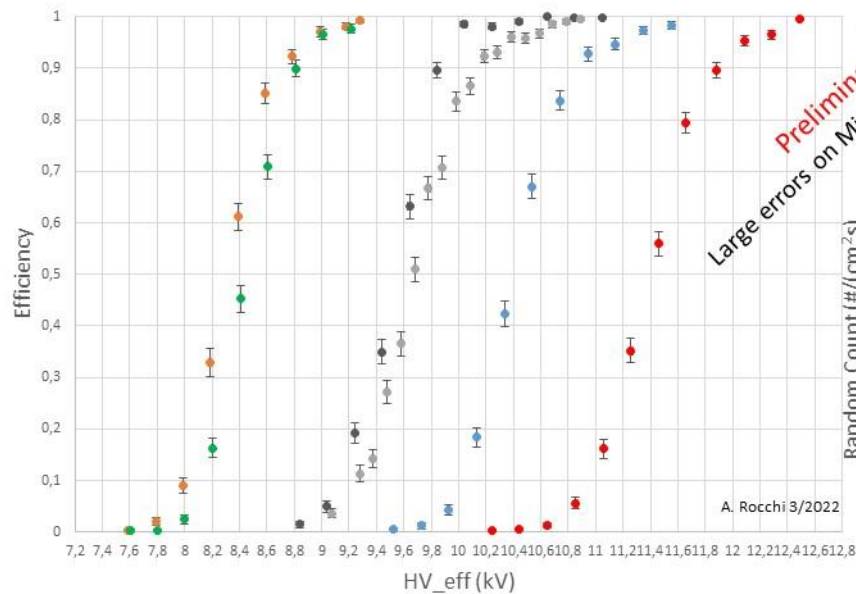
Tests with Eco Gas Mixtures

A.Rocchi et al.

COMPARISON BETWEEN ECO GAS MIXTURES

BML-D LEGACY, TOR VERGATA LABS, A. ROCCHI, B. LIBERTI, L. DI STANTE, E. PASTORI

- Mix standard 3
- HFO=35% Co2=59% IsoBut=5% SF6=1%
- TFE=29,9% CO2=62,1% IsoBut=7,5% SF6=0,5%
- TFE=32,3% CO2=62,3% IsoBut=5% SF6=0,5%
- HFO=25% Co2=69% IsoBut=5% SF6=1%
- HFO=15,72% Co2=76% IsoBut=7,28% SF6=1%



Cosmic tracker

to be done

Bottom chambers

- verify gas-volume functionality (high gap current)
- complete electronics for full trigger coverage

Top chambers

- check chamber signals in the service area
- setup the trigger logic electronics

External chambers

- define upstream position
- complete chamber assembling
- ship chambers back to CERN and proceed with installation