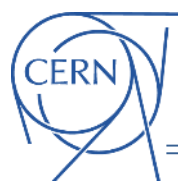


The gas systems infrastructure for the CERN Gamma Irradiation Facility

R. Guida
on behalf of the CERN Gas Service Team (EP-DT-FS)

AIDA-2020 WP15 satellite meeting during 7th BTTB Workshop



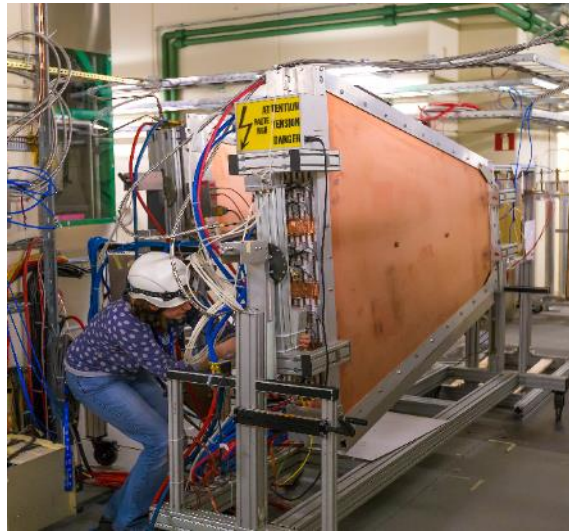
- GIF++
- Gas systems infrastructure
 - Distribution panels
 - Mixers
 - Gas recirculation units
 - Gas analysis modules
- Conclusions



GIF++ is a unique place for detector R&D tests:

- Strong gamma source
- Particle beam available
- Excellent gas and electronic infrastructures
- Unified control/monitoring system
- Setups for beam & cosmic trigger, radiation monitoring, environmental monitoring, DAQ, ...

- Detector validation up to new HL-LHC expected dose
 - Detector and electronic development
 - Performance of «recent» detector developments
 - Test on real size detectors ($\gg m^2$) and prototype
 - Studies with new environmentally friendly gases
 - New gas systems and operation for new detector upgrades
 - Large detector productions at high rate before installation
- 6 detector technologies:
- DT, MDT
 - CSC
 - RPC, iRPC, GRPC
 - MM
 - GEM
 - sTGC



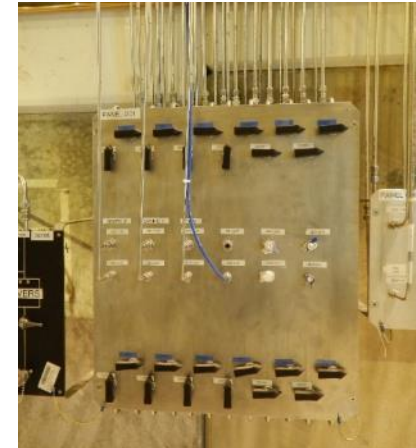
Gas mixture distribution panels

- 21 distribution panels (6 lines each)

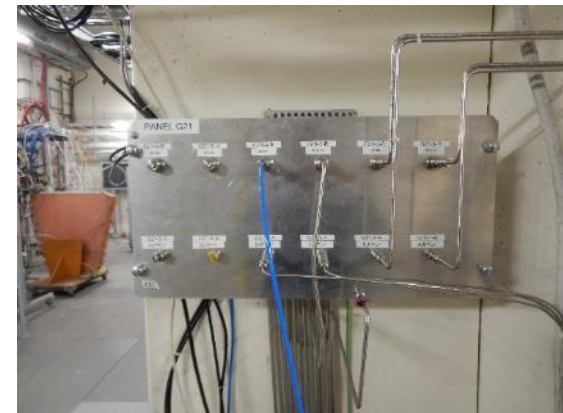
From service area to bunker and preparation area

- Two types:

From service area to bunker only



Corresponding gas panels in the GIF bunker



- Most of the gas channels already in use.

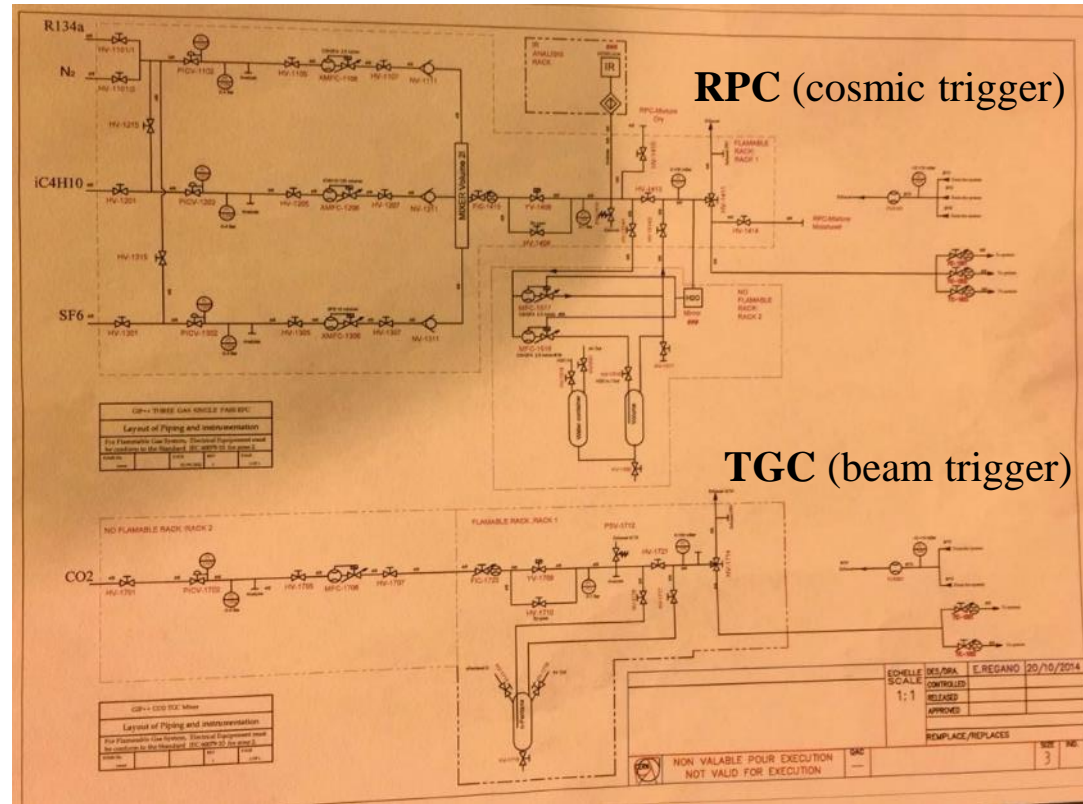
- Beam and cosmic triggers continue to be used

Beam and cosmic mixers:
ATEX components



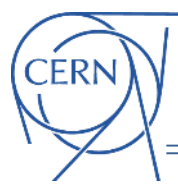
Non ATEX components

P&I diagram



RPC (cosmic trigger)

TGC (beam trigger)



Gas mixers

Many users connected. Originally foreseen only for cosmic and beam trigger. Today used by:

- Cosmic trigger
 - All RPC community (ATLAS, CMS, RPC R&D development, Glass RPC, ...)

- Beam trigger
 - ATLAS TGC (R&D and NSW)

- Two gas recirculation systems are used for
 - CMS-CSC detector ageing studies
 - Generic R&D on gas systems for GEM detectors
 - Eco-gas mixtures for RPC



Mixture distribution

Monitoring of pressure,
O₂/H₂O, temperature,
atmospheric pressure

Additional software controlled
pressure regulation for very
low flow regimes

Gas mixing unit

Gas purification cartridges



B. Mandelli et al., A new portable gas recirculation unit for gaseous detector R&D, 2017 JINST 12 T10002

Gas recirculation systems

Not really AIDA

- Second generation of new gas recirculation system
- Installation completed;
- Commissioned at GIF will start asap (**resource problem to be solved**)
- To be used by RPC community (today high R134a consumption – cost and ghg issue)

Gas recirculation module

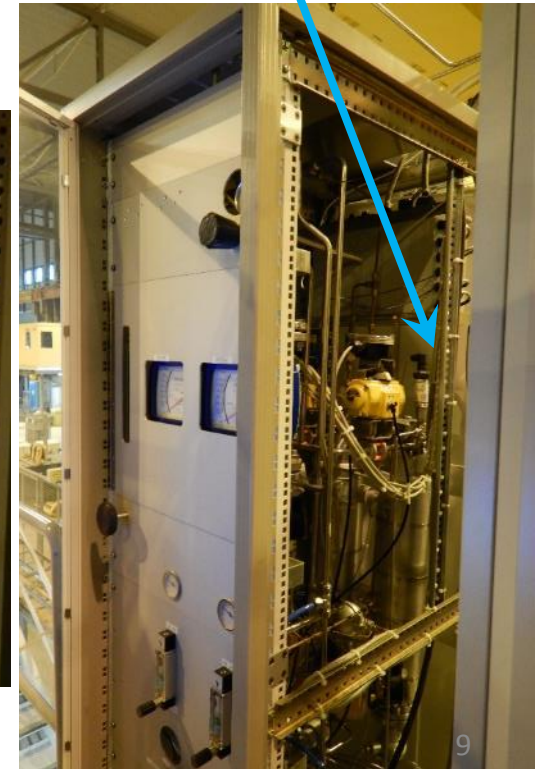


Gas mixture purification module



Monitoring and controls panel

Cartridges with cleaning agents

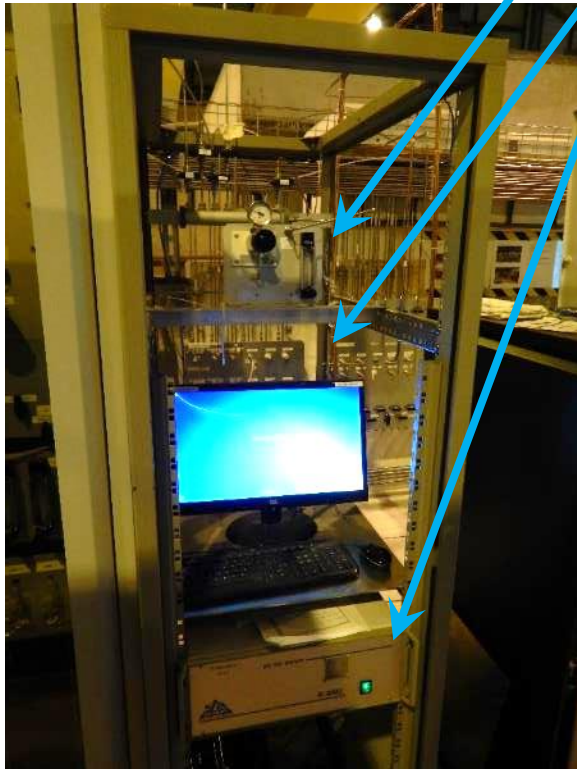


- Gas chromatographic analysis: allows monitoring gas mixture composition and presence of impurities on return from detectors under test – **used by all detectors under test**

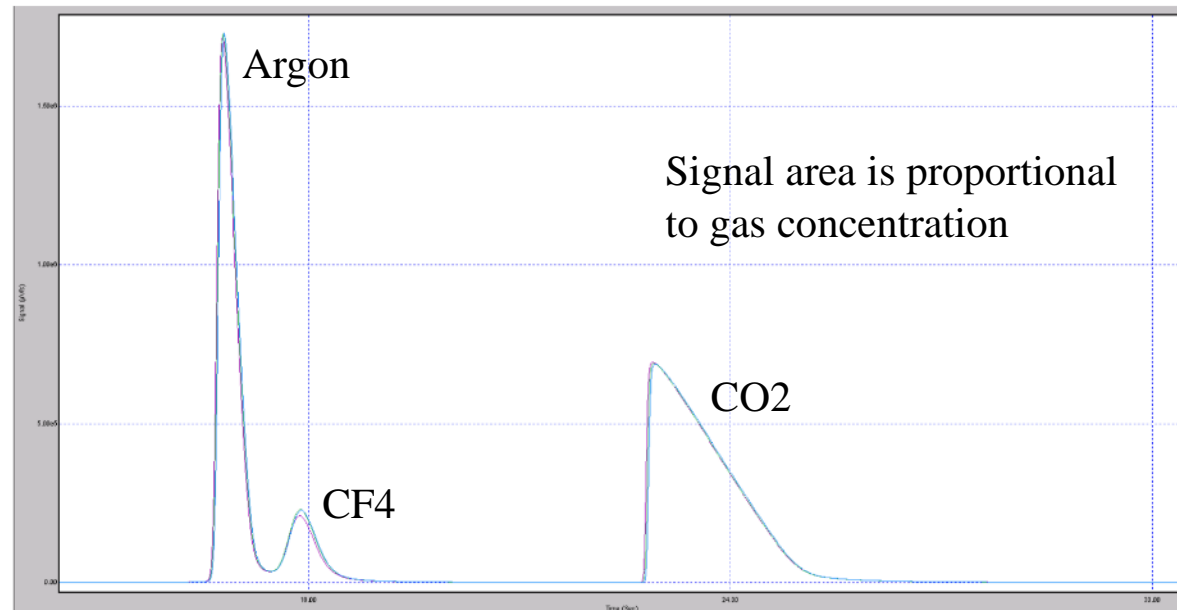
Sampling manifold

PC for GC software controls

GC analyser (3 modules for large spectra gas separation)



Gas chromatogram



- The gas systems infrastructure is a key element of the successful R&D programs performed at GIF++
 - In the Gas distribution panels most of the lines are already used
 - Mixing units (originally built for cosmic and beam triggers) are now used by many other users
 - Gas recirculation systems and gas analysis modules are used for detector R&D studies

- Gas systems infrastructure is extensively used. Some resource problem:
 - to complete commissioning of new gas recirculation unit (really not AIDA but ATL&CMS-RPC)
 - Operation rely on EP-DT gas team already fully booked for LHC gas system activities