## Cosmic-ray tracker improvements & augmented reality event-display for GIF++

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#### Improvement of the GIF++ cosmic-ray tracker

Muon beam at GIF++ available ~6-8 weeks/year as main users (+ similar time as parasitic users)

Therefore, GIF++ is (going to be) equipped with a cosmic-ray tracker covering one side (wrt the irradiation source) of the bunker



GIF++ surface is about twice the old-GIF, but already pretty crowded!

## **Motivations and proposal for improvement**

Two main requests have been raised:

- Instrument a larger area of the facility
- Select higher momentum muons

Installing large area RPCs on the vertical walls of the facility both requirements can be fulfilled (see next slide) ... at the price of a reduced flux



Furthermore, using large angle cosmic muons, no need to change orientation of the detectors under test wrt the setup for beam muons

# **Project description and status**

Build RPC chambers to be placed at both ends of the bunker with a total surface of ~20 m<sup>2</sup>, spatial resolution ~1 cm Mechanical structure being realized

Exploit the already existing infrastructure of the cosmic tracker: - gas system, power supplies, DCS, DAQ, ...

XTDV dump blocks installed last year

Currently studying how to adapt the chamber positioning to the geometrical constraints

The new chambers in proximity of the beam would also allow triggering on beam halo muons (~50 cm  $\emptyset$ )



## The Muon Room (augmented reality event display)

\* The diagram below shows that most of the HW is already enclosed in the GIF++, especially if the CR detector coverage will be extended and we will add the 3D event display features to the online monitoring system



\* The cost of this task is very limited with respect to the yield and consists in the person months equivalent for the AR software and user interface and the augmented display hardware



### **Conclusions for the augmented reality event-display**

\* Potential repercussions on the society: interfacing real time DAQ/control system (HEP field of expertise...) and AR have in general a huge potential in several applications such as future industrial control, production and safety. The special case of cosmic-rays visualization can be largely used for education and outreach, for Universities, exhibitions, museum, etc. This concept can be extended in principle to any source of invisible field of radiation by replacing the type of sensors, e.g. Radio Frequency, Infrared, UV...

#### \* Current status

software development will start as soon as the GIF++ DAQ will be ready (camera pose calculation + user interface)