WP 15.5.4 – Improved cosmic-ray tracker & demonstrator of augmented reality for GIF++

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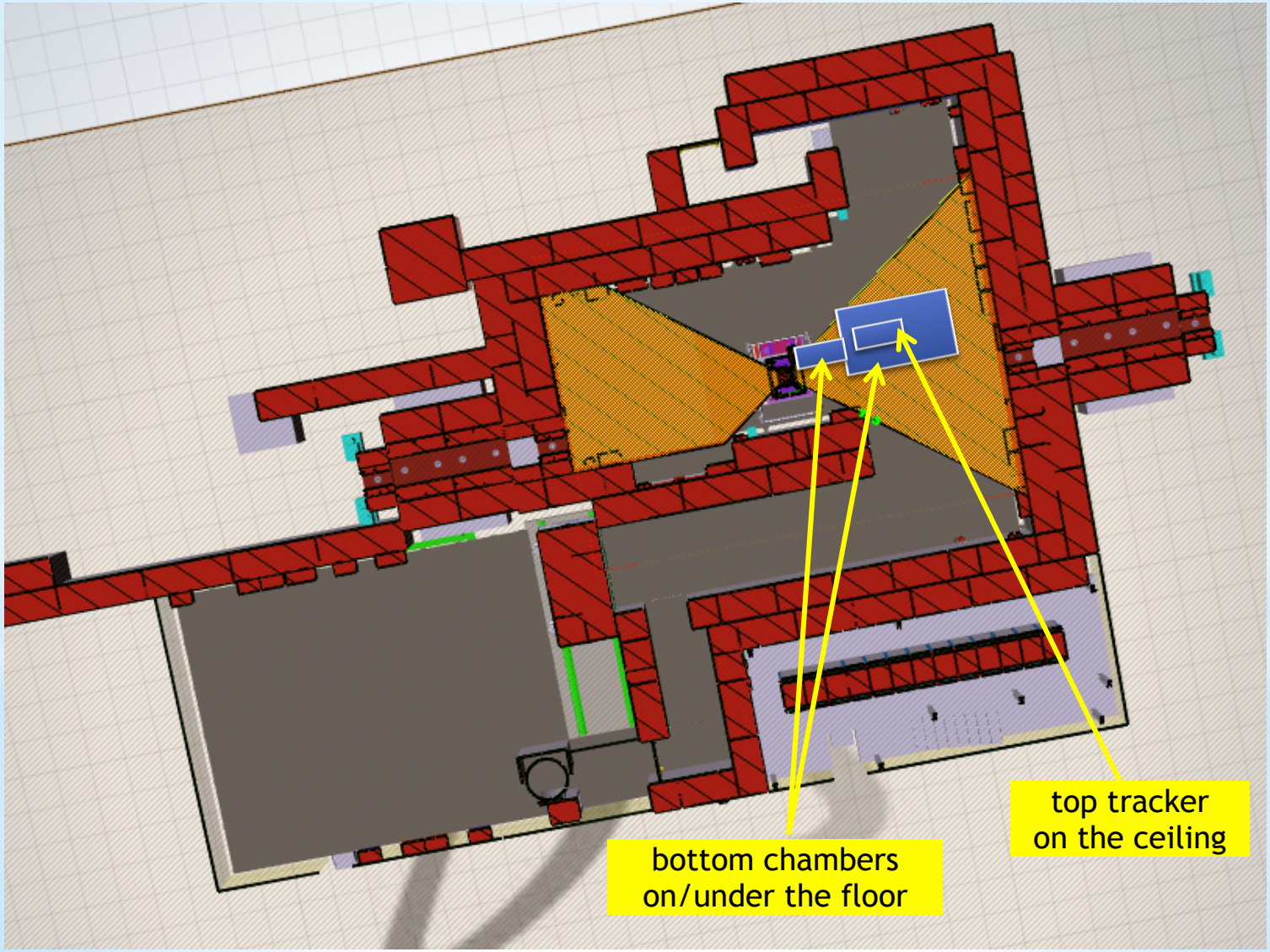
Current cosmic tracker setup

Based on **Resistive Plate Chamber** technology

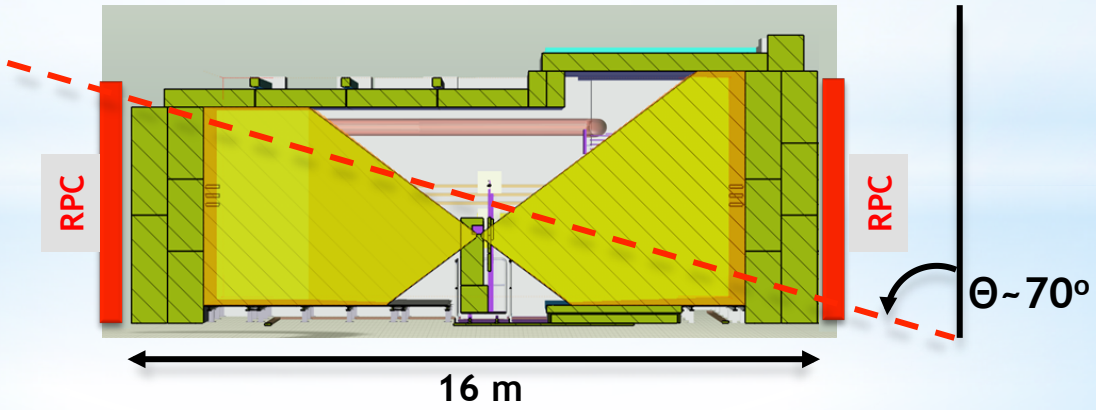


Motivations and proposal for improvement

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
… at the price of a reduced flux

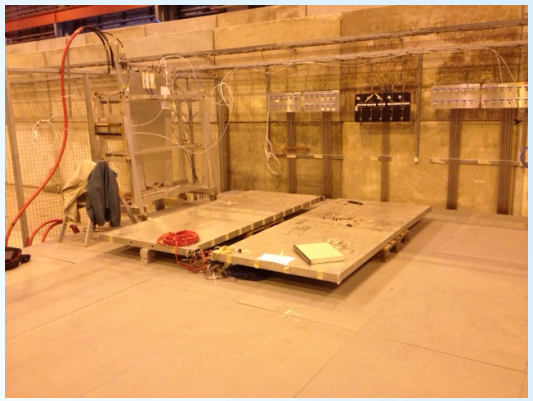


Furthermore, using large angle cosmic muons, no need to change orientation of the detectors under test wrt the setup for beam muons

Project description

Build RPC chambers to be placed at both ends of the bunker (see pictures in next slide) with a total surface of 15-20 m^2

Chamber dimensions similar to the confirm plane of the current cosmic tracker (2.8 x 1.2 m^2)



Spatial resolution ~1 cm

Exploit the already existing infrastructure of the cosmic tracker:

- gas system
- power supplies
- DCS
- DAQ
- …

Update of WP 15.5.4 (cosmic tracker)

Improved cosmic-rays tracker

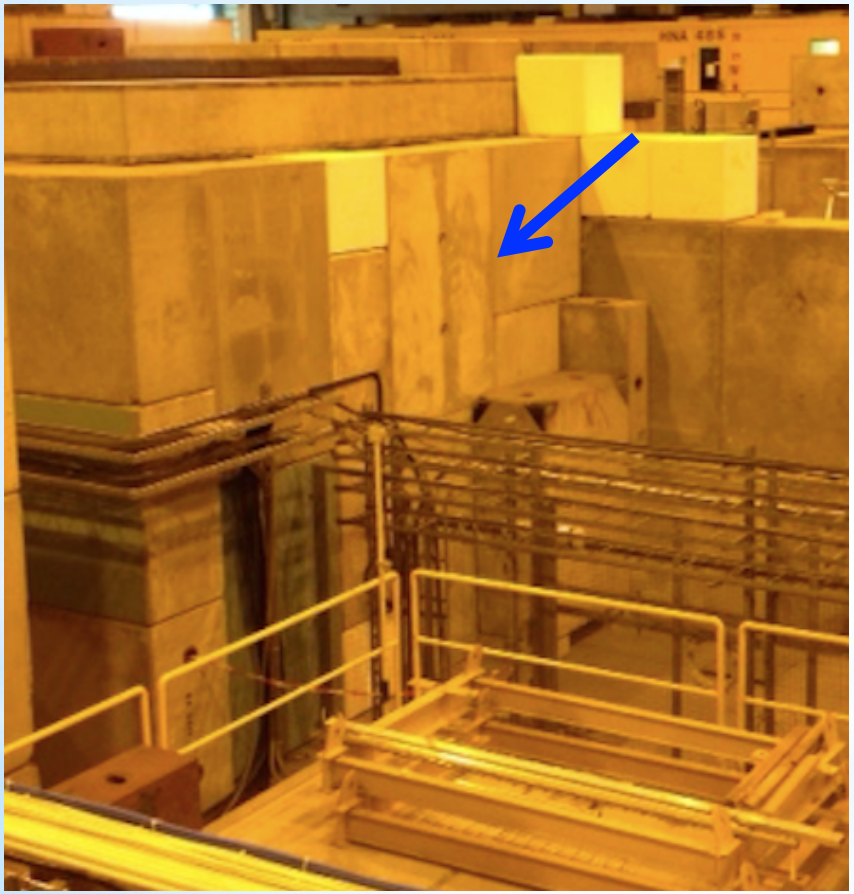
Size and position of the RPC chambers needed to instrument the vertical walls of the GIF++ bunker are under study. Large chambers like the ones used for the current GIF++ RPC confirm plane or larger size chambers (similar to BOL chambers in the ATLAS barrel muon spectrometer) are being considered.
The design will be finalized within the end of this year

Some of the mechanical parts to build large area chambers (in common with other projects) will be available in a few months

The positioning of the new large RPCs on the vertical walls in proximity of the beam line will allow to trigger muons from the beam-halo whose size is about 1 m in diameter.
A discussion on this topic with the CERN GIF++ team has just started.

View of GIF++ end-walls

Upstream view



Downstream view

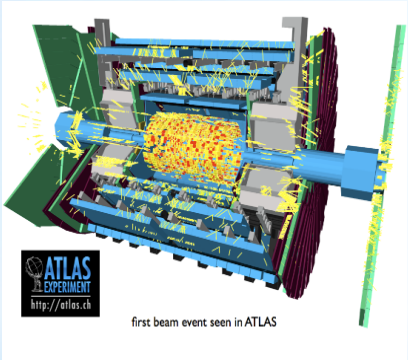
The Muon Room

Augmented Reality cosmic-rays event display

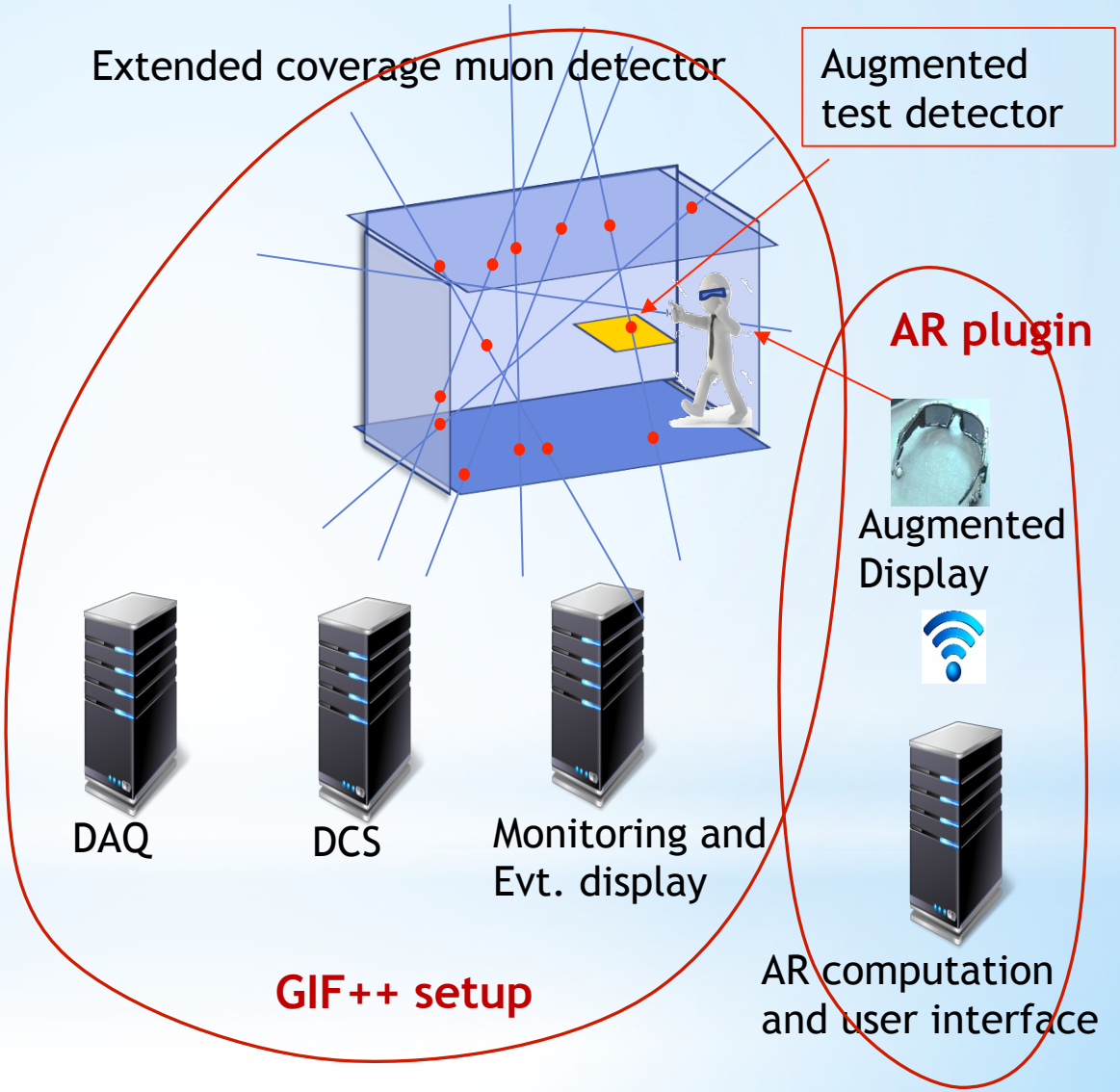
G. Aielli (University of Roma Tor Vergata)

Relation between the GIF++ and the Muon Room

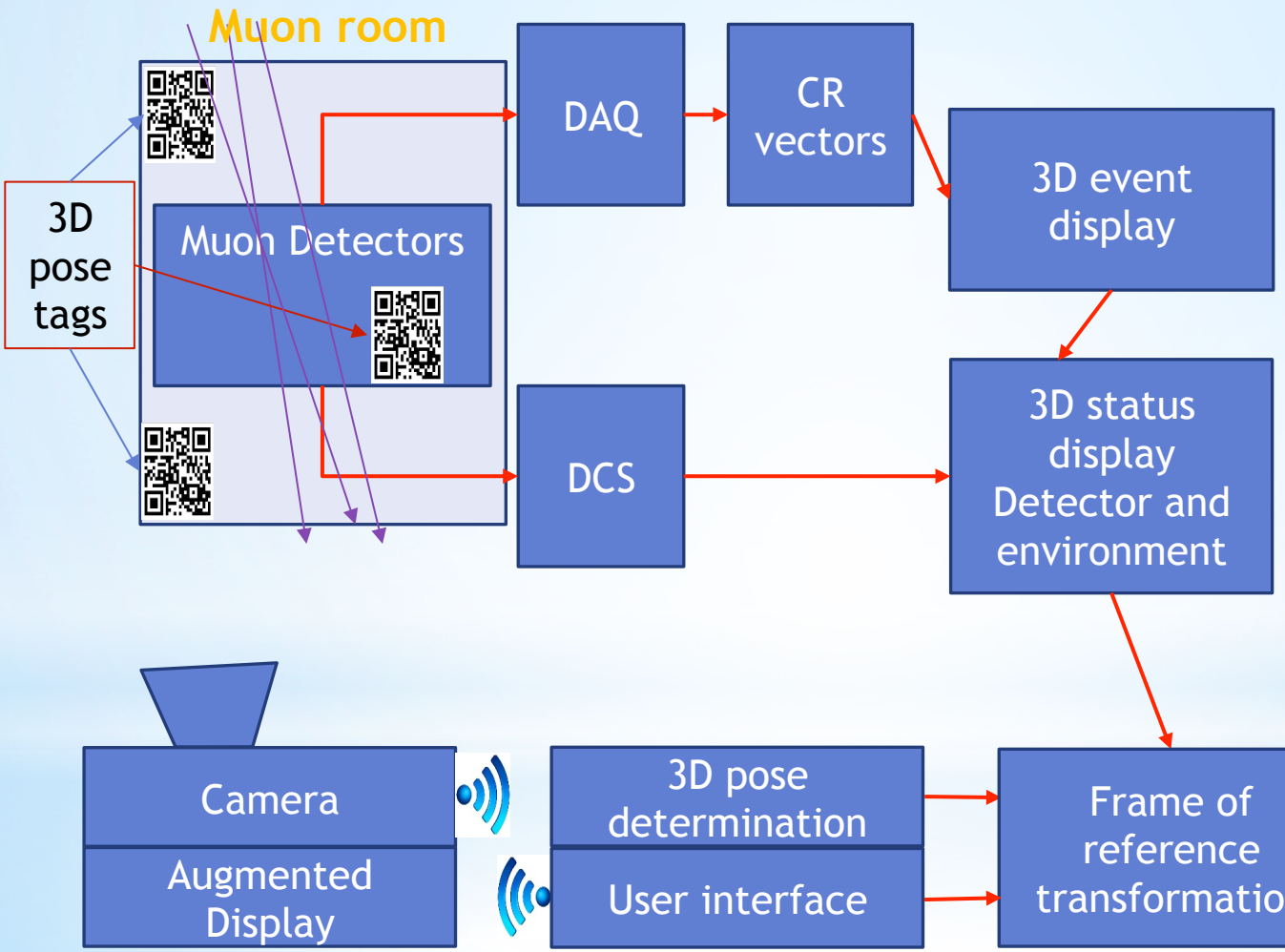
* The diagram below shows that most of the HW is already enclosed in the GIF++, especially if the CR detector coverage will be extended and we will add the 3D event display features to the online monitoring system



* 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



Functional description of the AR display in the GIF++



* Muon detectors data to construct the event display
* Camera reconstruct its pose through local tags
* The event display is transformed in the reference frame of the operator
* 3D event is sent to the augmented display through the user interface

Update of WP 15.5.4 (augmented reality)

Augmented reality demonstrator

Preparation of the DAQ system is ongoing
It will provide online monitoring data needed for the event display

In about one year, when the data will flow through the DAQ chain, the fellow in charge of the augmented reality development will be hired

The activity on the "Muon Room" task is at the moment concentrated on adapting the Trigger/DAQ system to include the new Cosmic Rays chambers foreseen in the same task, to extend the acceptance in the GIF++ area. In particular we need to optimize the geometric description of the strip system in order to reconstruct the tracks as vectors in the GIF++ reference frame. All this preparatory work is necessary to be carried out before hiring the computer vision expert (scheduled in 2017), supposed to implement the AR system basing on the acquired data.

Next deadline

Milestone at M18:

design of chambers for cosmic tracker extension