RPC requests for GIF++

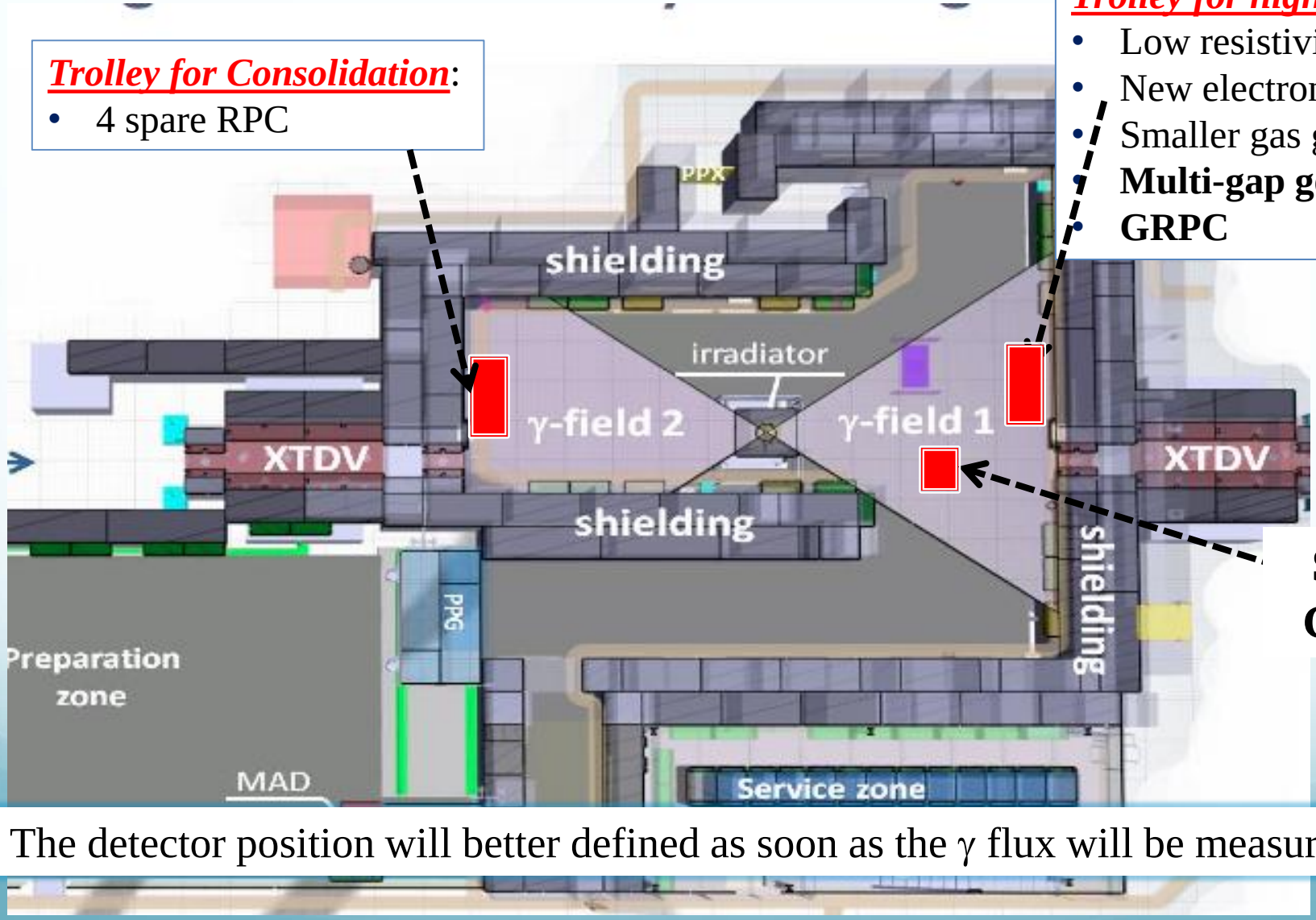
G.Pugliese, N. Zaganidis and I. Pedraza
on behalf of the RPC group

RPC set-up

G. Pugliese

Trolley for Consolidation:
- 4 spare RPC

Trolley for high eta region:
- Low resistivity HPL
- New electronics
- Smaller gas gap
- **Multi-gap geometry**
- **GRPC**



Small GRPC

The detector position will better defined as soon as the γ flux will be measured.

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Impact requests

Number	Start time	Duration	GOAL
AR 60395	Feb.15	2 years	Longevity test
AR 60396	Feb.15	2 years	Longevity test
AR 60397	June.15	2 years	Longevity test
AR 57369	July 15	14 days	Rate capability
AR 57370	Oct 15	14 days	Rate capability

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Impact requests: longevity

GOAL: certify our detectors up to an integrated charge of about 1 C/cm^2 corresponding to 3000 fb^{-1} at HL-LHC **(longevity study).**

1)

- **gamma rate needed** (gamma cm-2 s-1): about 2 10^6 gamma/cm^2 with possibility to change the flux from low flux up to **4-10 10^6 gamma/cm^2**.

- **services needed:** - network - standard RPC humidified gas mixture + Humidify Argon
- **dimension of the setup in the bunker**: 2.4 x 2 x 1.5 m^3 (consolidation trolley)
- 1 rack needed
- **dimension of the gas system**: 5-8 l/h
- **time needed** for the installation of the setup in the bunker: 1 week
- **foreseen duration** of the test: 2 years
- indicative start and end date: **Feb-March '15**

Impact requests: longevity

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2)

- **gamma rate needed:** about 4 10^6 gamma/cm^2 with possibility to change the flux from low flux up to **10 10^6 gamma/cm^2.**

-**services needed:** - network - standard RPC NOT humidified gas mixture

-**dimension of the setup** that you plan to install in the bunker:

0.5 x 0.5 x 1.6 m^3

+ electronics (inside GIF++) 1 x 0.5 x 0.5 m^3

- **dimension of the gas system** you will be installing in the gas service area (if any): 0.5 l/h

-**time needed for the installation** of the setup in the bunker: 4 days

-**foreseen duration of the test**: 1 year

-indicative start and end date: Feb-March ’15

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Impact requests: longevity

3)

-**gamma rate needed**: about 4 10^6 gamma/cm^2 with possibility to change the flux from low flux up to **10 10^6 gamma/cm^2.**

-**services needed**: - network - standard RPC humidified and not gas mixture + Humidify Argon

-**dimension of the setup** that you plan to install in the bunker: 3 x 2 x 2 m^3

-**dimension of the gas system** you will be installing in the gas service area (if any) 10-15 l/h

-time needed for the installation of the setup in the bunker: 1 week

-are you interested in gamma and/or muon beam: YES gamma and muon beam

-foreseen duration of the test: 2 years

-indicative start and end date: June ‘15

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Impact requests: beam test

Beam tests requests:

1. **AR 57369:**

Earliest Start: 29-Jun-2015 Latest End: 31-Jul-2015
Duration: 14 Days
Detector: trolley for consolidation study

2. **AR 57370:**

Earliest Start: 03-Oct-2015 Latest End: 30-Oct-2015
Duration: 14 Days
Detectors: the two trolley (consolidation and high eta region)

GOALS:

Study the detector performance with muon beam in presence of different gamma background rates.
All the tests will be done using the standard CMS mixture (closed loop) and flow rate

SPARE

Cables installation (1)

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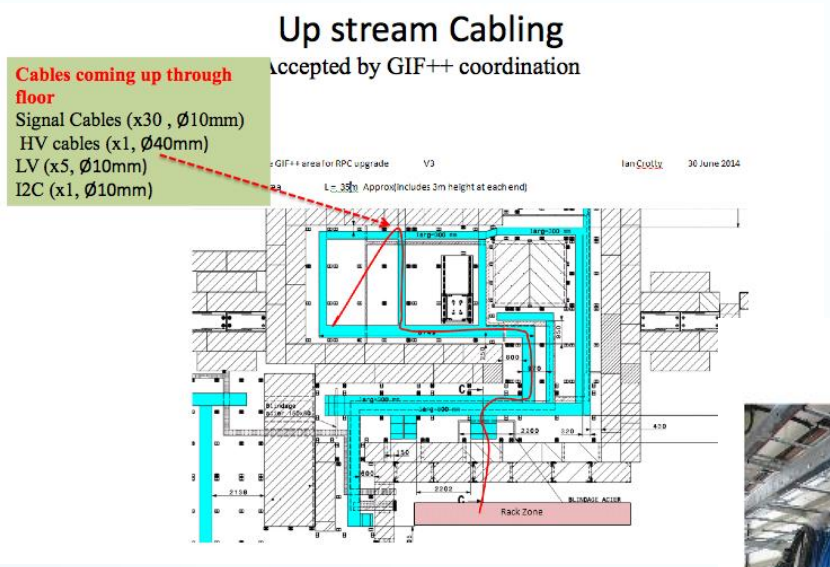
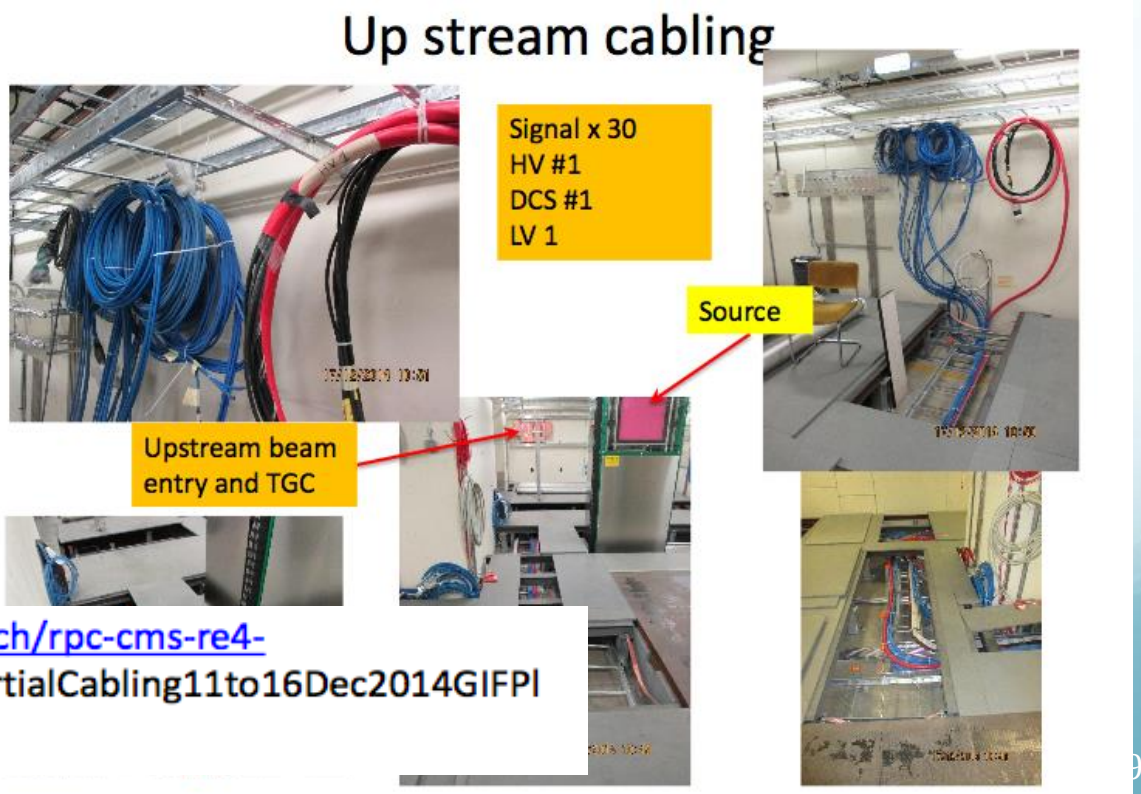


HV, LV Signal and DCS(I2C) cables installed (from Rack to inside GIF++ for Up Stream trolley position)



For more details see Ian's repository:

http://rpc-cms-re4-upscope.web.cern.ch/rpc-cms-re4-upscope/RPC/GIFPlusPlus/Services/PartialCabling11to16Dec2014GIFPlusPlus.pptx

Cables installation (2)

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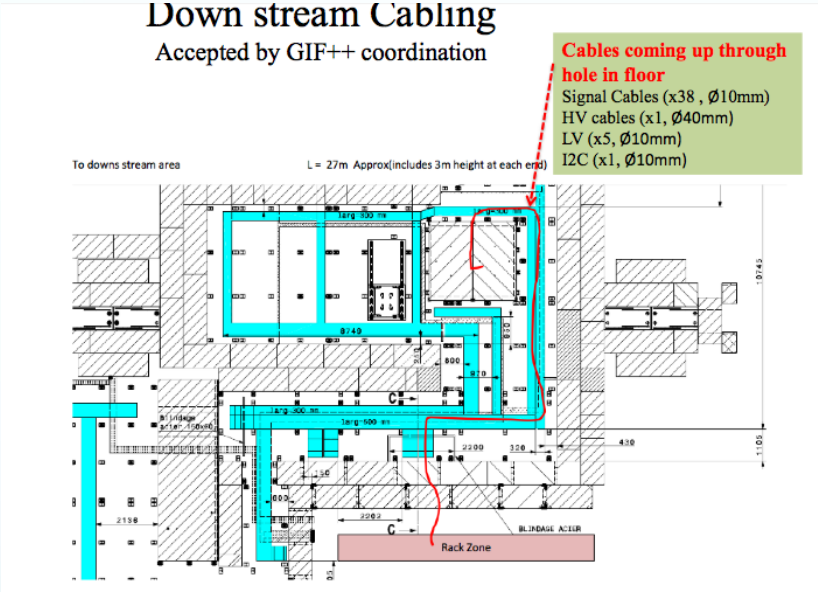
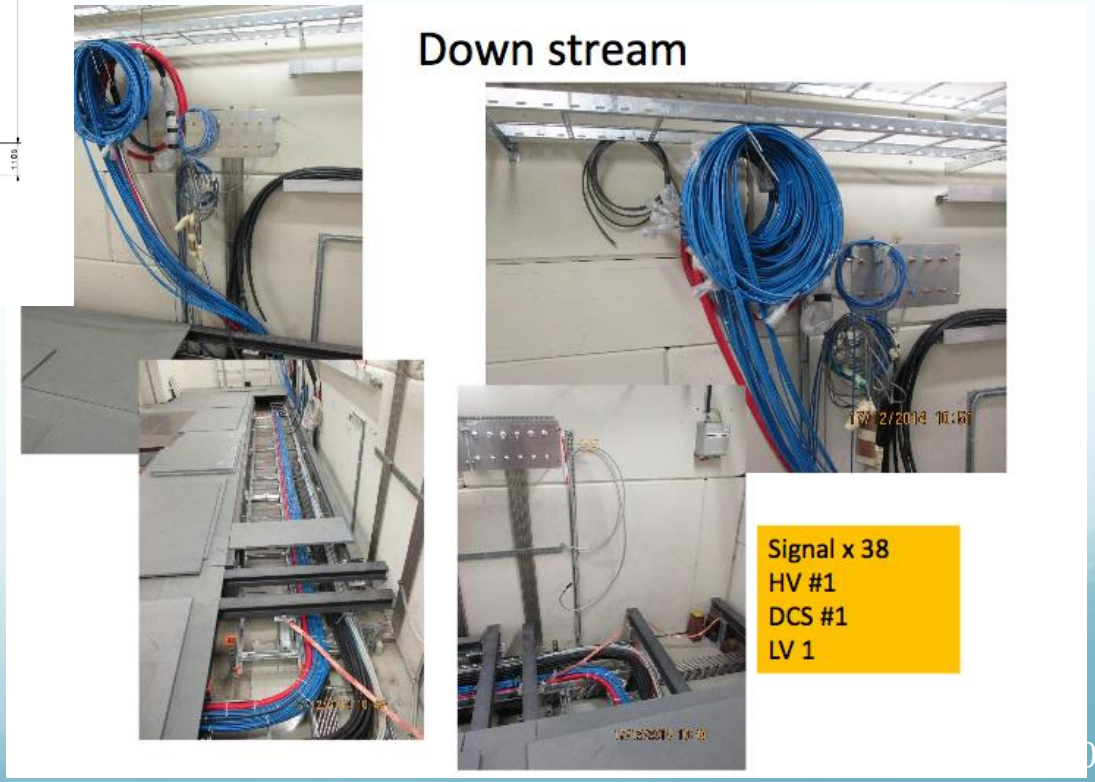


HV, LV Signal and DCS(I2C) cables installed (from Rack to inside GIF++ for Down Stream trolley position)



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Cables installation (3)

The cabling was successful and rapid with 4 Russian cabling experts from P5, M. Franco, Silveriano and Ian.

HV, Signal and 4 LV have been connectorised. The remaining LV & DCS have to be cut to length, connectors mounted and tested. LV, DCS and HV must be relabeled (done for signal cables).

The cabling to the **preparation zone** has to be done, all cables are available but all need connectors (except for the 2 signal).

Tables of cable destination are here: http://rpc-cms-re4-upscope.web.cern.ch/rpc-cms-re4-upscope/RPC/GIFPlusPlus/Services/CablesDestinationsGIFPPDec2014.xlsx

Muon chambers @ GIF++

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4. **5 RPC (barrel and endcap)**
   - **1 RB3 + (1 RE4 + 1 RE3) (now under test at GIF)**
     - Bakelite (spare production)
     - CMS electronics
   - **2 new barrel RPC**
     - Improved gas system - new mechanics & service box & Distribution Board

5. **5 RPC for High eta region**
   - **3 RE4-1**
     - Low resistivity Bakelite ($\approx 2\ 10^{10}\ \Omega$cm, or less)
     - CMS electronics - New electronics (Atlas chip)
     - new geometry (smaller gap thickness and multi-gaps)
   - **2 RE4-1 chambers**
     - Low resistivity glass
     - Double or multi-gaps

6. **2 (glass and Bakelite) RPC prototypes for gas studies**

- **common** test with ALICE, ATLAS and CMS

Aging test: duration

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When and for how long?

each sub-system is working on schedule definition.

For example, rough time estimation for RPC aging test:

$$\text{HL-LHC.Int.Charge (C/cm}^2\text{)} = \langle q \rangle \cdot T_{eff} \cdot F_{exp} \cdot SF$$

$$\text{GIF++Int.Charge (C/cm}^2\text{)} = \langle q \rangle \cdot T_{irr} \cdot F_{exp} \cdot AF$$

$$\Rightarrow \text{HL-LHC.Int.Charge} = \text{GIF++Int.Charge}$$

$$T_{irr} = \frac{SF}{AF} T_{eff} = \frac{3}{20} T_{eff} \ @4 \text{ months} \Rightarrow T_{irr} \gg 8 \text{months}$$

Assuming:

$SF = 3$ AF = 20 GIF++ efficiency » 50%

$T_{eff} = 6x10^7 s$ (corresponding to 3000 fbar^{-1} at L = 5 10^{34} / $cm^2 s$)

Infrastructure needs

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1. **GAS system:**
   - **Own gas mixer for each system:**
     - **GEM – CSC: ok**
     - **RPC to be decided (at beginning we can use the same of ALAS)**
   - **DT will use** premixed bottles
   - **Own close loop system for each system: mandatory** to reproduce irradiation under real condition. Quite expensive system: CERN GAS group is working for a cheap system (≈ 10 KEuro). Most probably, we will start with open loop then move to closed loop
   - **Gas pipe** from PP to chamber must be in Cu

2. **GAS analysers:**
   - GIF++ will be equipment with **Gas chromatograph - O2 monitor - IR analyser - H2O analysis**

3. **Cooling system:**
   - cooling to racks and chamber electronics will be provided by common **GIF++ infrastructure** (under definition users' requirements)

Infrastructure needs

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4. **Environmental sensors:**

- GIF++ will be equipped with Temperature, Pressure and Humidity **sensors** for both atmosphere and gas.

5. **Environmental conditions:**

- no general air conditioning is planned at start-up.
- Expected conditions in the hall: H = 40 ± 10 %
  T = 15 ± 5 °C
- However, we strongly request **a T and H controlled area. Mandatory for all our aging tests.**

6. **Cables:**

- GIF++ management proposes to install centrally all users' cables (from the service area to patch panel in the irradiation area). The cables must be available now **(CSC and RPC will take profit of this)**.
- own cables already available **(CSC-RPC-GEM)**