Status of the GIF++ Project Proposal

Mar Capeans, Richard Fortin, Lucie Linssen, Christoph Rembser

On behalf of the GIF and GIF++ User Communities

LEAF Meeting, 20/11/09

I.E. (EN Dept.) presents the technical aspects of the project

GIF, GIF++, Users Community

- **GIF++ project consists of the implementation of a new gamma irradiation facility combined with a high-energy particle beam in the SPS H4 beam line in hall EHN1.**
  - GIF++ is motivated by strong needs from the LHC and sLHC detector and accelerator communities.
  - GIF++ follows up on the very successful GIF facility in the SPS west area, which lost its access to a particle beam in 2004 and which currently suffers from a lack of sufficient source intensity and aged infrastructure.
  - The GIF++ facility presented takes into account the requirements from the users and has been discussed extensively with them.

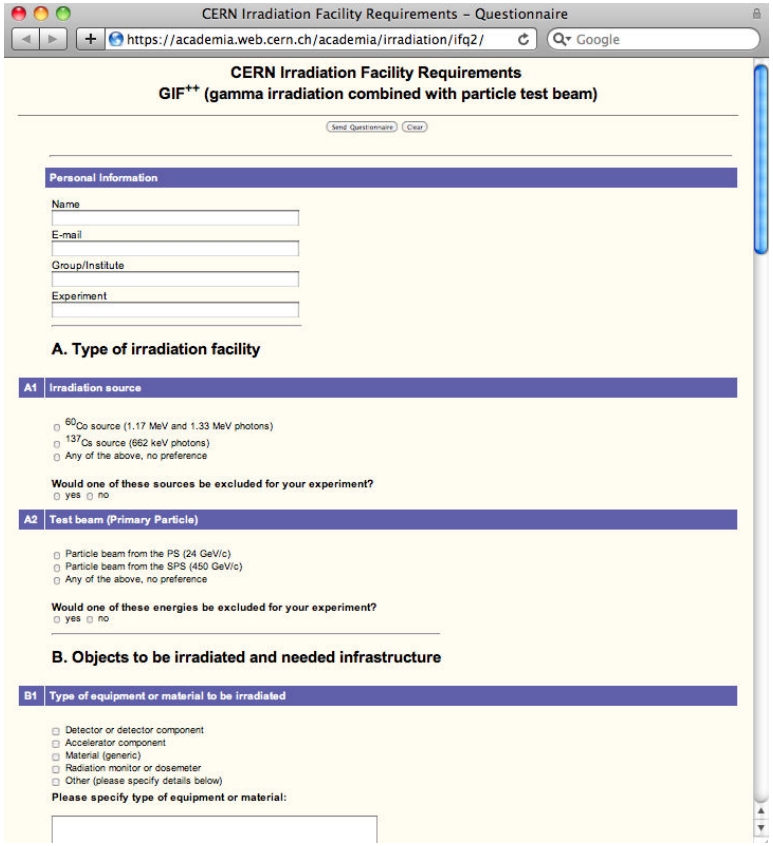
- Communities well known but there is **no formal organisation** beyond a mailing list and meetings related to the GIF/GIF++ usage/planning.
  - ALICE, ATLAS, CMS, LHCb, COMPASS, NA62 experiments
  - LHC Beam loss monitors
  - RD-50 and RD-51 Collaborations
  - CERN PH-DT, CERN PH-ESE
  - CERN DG-SCI, CERN DG-SCR
  - CERN EN-STI
  - CERN TE-CRG
  - CERN TE-MSC
  - CERN BE-BI

M.Capeans, R.Fortin and C.Rembser have been collecting requirements and linking with EN to propose the new GIF++ facility

Collection of GIF++ Specifications

Web-Questionnaires sent to users communities in particle physics.

Questions on the required radiation field, facility infrastructure, type of irradiation experiments, annual required beam time and test time scale.



Options for Gamma Field:

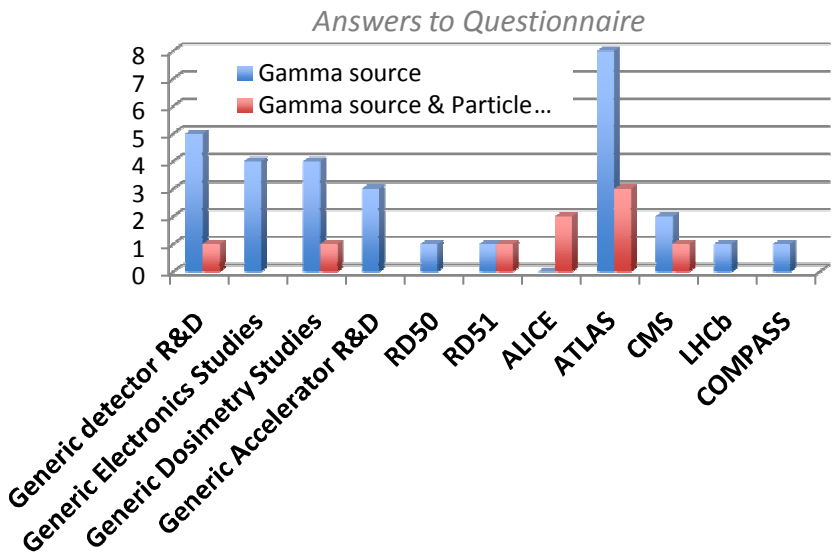
a) Exposure of objects to the radiation field of a high intensity gamma source

Answers: 29

b) Large-area gamma irradiation facility combined with a particle test beam of low intensity.

Answers: 9

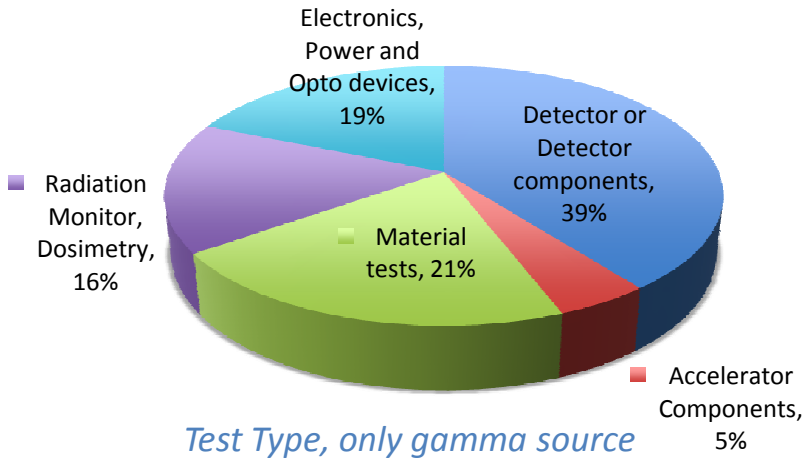
> In-depth discussions with the LHC upgrade program team (3 dedicated users meetings, open meetings)



Collection of GIF++ Specifications

Two distinct communities:

1. There is a set of groups concerned by radiation hardness of materials, **small** prototype detectors, electronic components and radiation monitors or dosimetry under a **strong photon flux**.

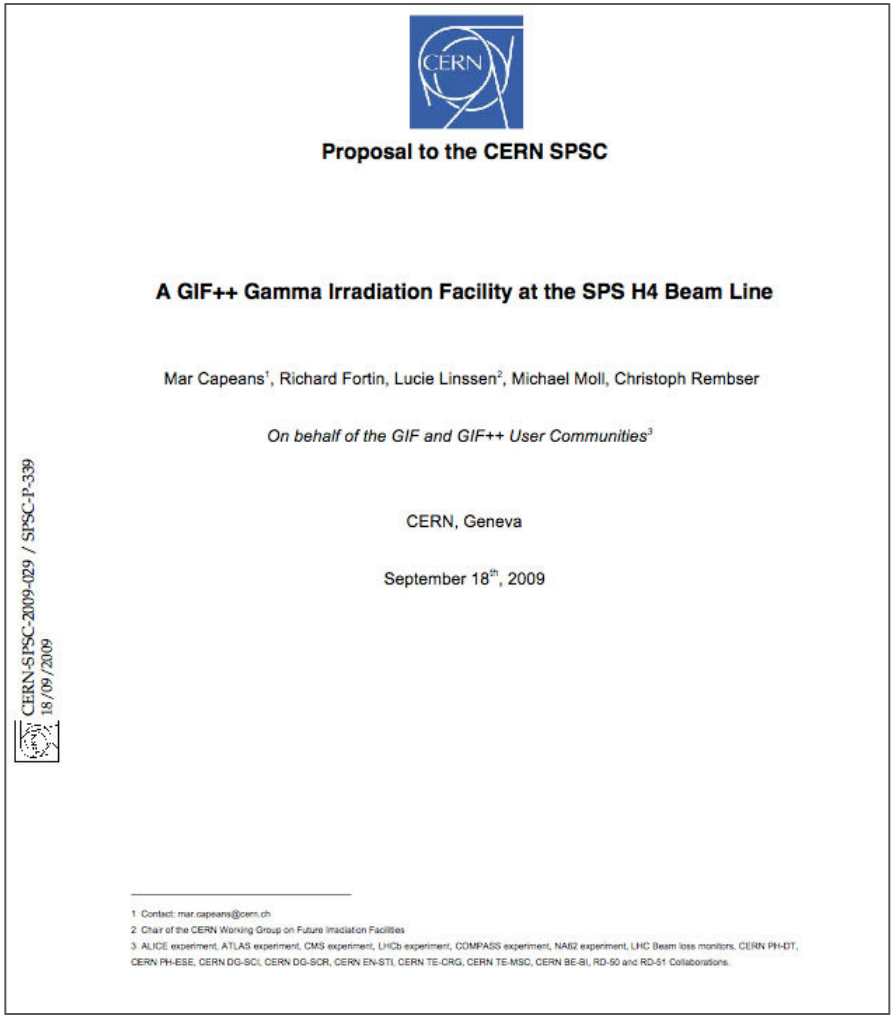


Test Type, only gamma source

2. The second set of users represent the **muon detector systems** of the LHC experiments. Their focus is the characterization and understanding of the long-term behavior of **large particle detectors** and therefore they need, in addition to the high-rate, large-area photon background, the availability of a high energy (SPS), low rate and narrow muon beam.

- A common point made by all users is the need of well equipped facility providing an excellent general infrastructure and a variety of common services to minimize administrative and setting up procedures.
- The new facility is planned to be able to serve simultaneously the needs of these two communities.

GIF++ Proposal



CERN

Proposal to the CERN SPSC

A GIF++ Gamma Irradiation Facility at the SPS H4 Beam Line

Mar Capeans[1], Richard Fortin, Lucie Linssen[2], Michael Moll, Christoph Rembser

On behalf of the GIF and GIF++ User Communities[3]

CERN, Geneva

September 18th, 2009

CERN-SPSC-2009-029 / SPSC-P-339
18/09/2009

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2 Chair of the CERN Working Group on Future Irradiation Facilities
3 ALICE experiment, ATLAS experiment, CMS experiment, LHCb experiment, COMPASS experiment, NA62 experiment, LHC Beam loss monitors, CERN PH-DT, CERN PH-ESE, CERN DG-SCI, CERN DG-SCR, CERN EN-STI, CERN TE-CRG, CERN TE-MSC, CERN BE-BI, RD-50 and RD-51 Collaborations.

GIF++ Project Overall Timeline

Defined by:

- Availability of White Paper funds (2008-2011)
- GIF lifetime (source radiator is already 2 years over nominal 10 y lifetime)
- Agreed to liberate the West hall at the beginning of 2011

- **Nov 07:** White Paper R&D WP7 established, with GIF Upgrade as one of the tasks
- **Feb 08:** budget allocation, start of activities. Launched Questionnaire
- **Aug 08**: Presented outcome of questionnaire and first implementation plan to users
- **Sept 08**: formal announcement of GIF++ project to SPSC
- ……. Several proposals worked out by EN and discussed
- **April 09:** New implementation plan at H4 presented to users
- **June 09:** Improved implementation plan presented to users > optimization > current proposal
- **Sept 09:** Request SPCS to endorse the scientific case and ask it to support the implementation of the facility in the H4 location
- **NEXT STEPS:**
  - ✓ **BUDGET ALLOCATION to start implementation (**expecting OK from SPSC 25/11, submission to RB 2/12)
  - ✓ **Start IMPLEMENTATION in Jan 2010** to reach facility **'Ready for Users' in early Spring 2011**

Budget

Reviewed 19/11/09
All in kCHF

#		Item	Responsible		Total
1.0	**Source & irradiator**		PH		**342.0**
2.0	**Users infrastructure**		PH		**200.0**
	2.1	*Environment control sensors*	*Users (AIDA)*	*0.0*	
	2.2	*Radiation filters for irradiator*	*Users (AIDA)*	*0.0*	
	2.3	*DCS (materials)*	*Users (AIDA)*	*0.0*	
	2.4	*Trigger systems*	*Users (AIDA)*	*0.0*	
	2.5	Gas racks + controls		150.0	
	2.6	DAQ racks		50.0	
3.0	**Area installation**				**485.0**
	3.1	removal existing material	EN/MEF	30.0	
	3.2	cabling	EN/EL	10.0	
	3.3	counting rooms (incl. cabling + ventilation)	EN/MEF, EN/EL	80.0	
	3.4	networking	IT	5.0	
	3.5	gas infrastructure and piping	EN/MEF	50.0	
	3.6	gas safety	EN/MEF	100.0	
	3.7	gas building modifications	EN/MEF	20.0	
	3.8	motorized beam dumps	EN/MEF	60.0	
	3.9	beam dump control	EN/STI	30.0	
	4.0	crane modification	EN/HE	75.0	
	4.1	area infrastructure for detectors	EN/MEF	25.0	
4.0	**Access system**		GS/ASE		**50.0**
	4.1	access to PPE164/CMS area		10.0	
	4.2	access to GIF++		30.0	
	4.3	irradiator interlocks		10.0	
5.0	**Shielding**				**115.0**
	5.1	transport of blocks from Meyrin	EN/HE	40.0	
	5.2	installation in EHN1	EN/HE	25.0	
	5.3	special roof shielding blocks	GS/SEM	50.0	
6.0	**Auxiliary works/systems**				**5.0**
	6.1	radiation protection monitors	DG/SCR	???	
	6.2	beam vacuum pipes	EN/MEF	5.0	
	6.3	beam instrumentation	BE/BI	???	
				total :	**1197.0**

GIF++ Total (kCHF)	**1200**
Contributions	
PH White Paper funds 2009	300
PH White Paper funds 2010	200
EN Dept (I.E.)	100
Balance to cover	**600**

Users' contribution:

- No commitments till now
- AIDA proposal (FP7) allocates EU funds for 400 kE to INFN (Roma2, Roma3, Naples), Weizmann, INRNE and NTUA to provide and commission sub-systems of the infrastructure necessary to operate and test detectors in GIF++.
- Successful rate of AIDA ~ 50%, project starts in 2011

This estimate does not include dismantling old GIF

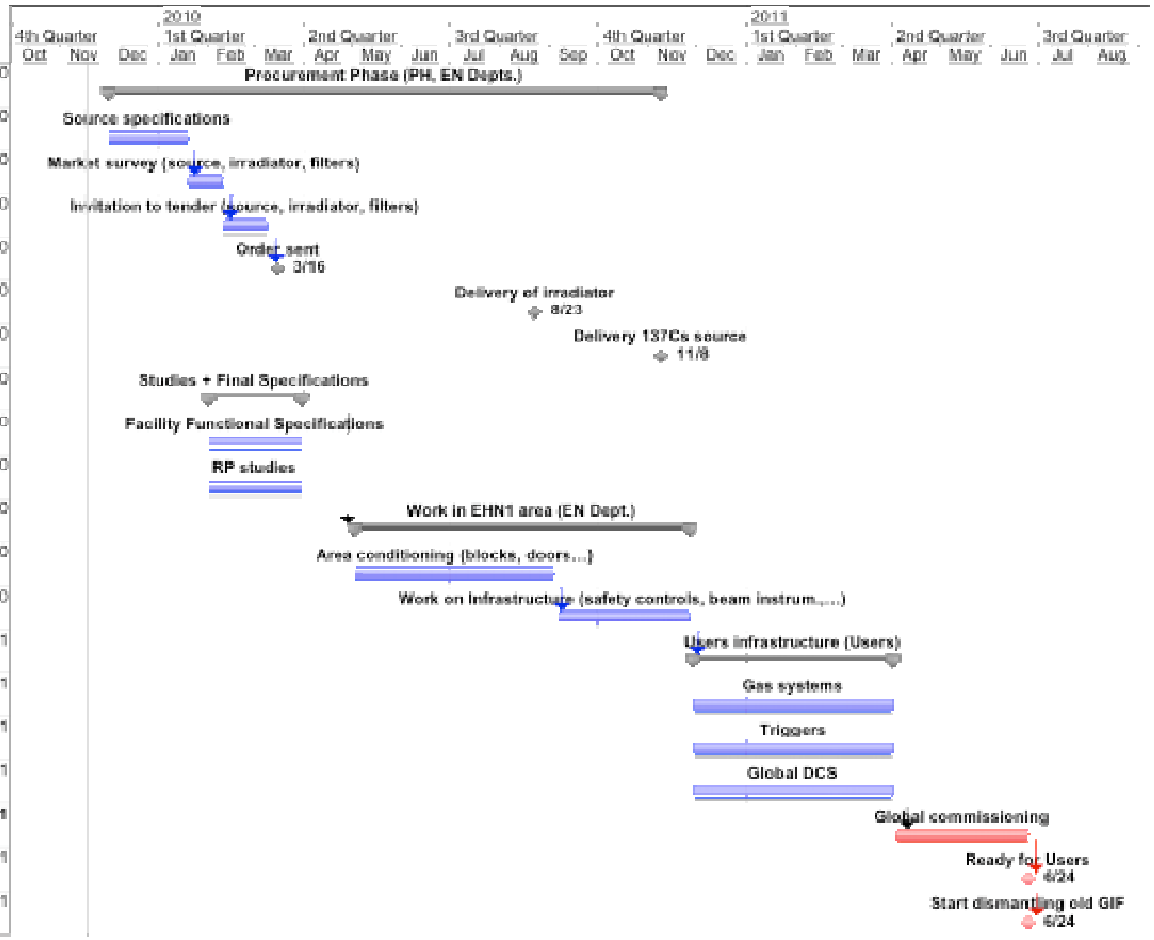
Decisions needed now

- Ok to **Budget** and to **Budget Share** between stakeholders (PH, EN, Users, Experiments….)
- Ok to Share of **Responsibilities** (GIF++ spokesperson from the PH/Users side to follow up construction + commissioning of Users' infrastructure + operation)
- Ok to **Schedule**

Extra

GIF++ Implementation Schedule

ID	Task Name	Duration	Start	Finish
1	**Procurement Phase (PH, EN Depts.)**	235 days?	Tue 12/1/09	Mon 11/8/10
2	Source specifications	25 days	Tue 12/1/09	Mon 1/18/10
3	Market survey (source, irradiator, filters)	16 days?	Tue 1/19/10	Tue 2/9/10
4	Invitation to tender (source, irradiator, filters)	4 wks	Wed 2/10/10	Tue 3/9/10
5	Order sent	0 days	Tue 3/16/10	Tue 3/16/10
6	Delivery of irradiator	0 days	Mon 8/23/10	Mon 8/23/10
7	Delivery 137Cs source	0 days	Mon 11/8/10	Mon 11/8/10
8	**Studies + Final Specifications**	42 days	Mon 2/1/10	Tue 3/30/10
9	Facility Functional Specifications	42 days	Mon 2/1/10	Tue 3/30/10
10	RP studies	42 days	Mon 2/1/10	Tue 3/30/10
11	**Work in EHN1 area (EN Dept.)**	150 days	Mon 5/3/10	Fri 11/26/10
12	Area conditioning (blocks, doors...)	90 days	Mon 5/3/10	Fri 9/3/10
13	Work on infrastructure (safety controls, beam instrum.....)	60 days	Mon 9/6/10	Fri 11/26/10
14	**Users infrastructure (Users)**	90 days?	Mon 11/29/10	Fri 4/1/11
15	Gas systems	90 days?	Mon 11/29/10	Fri 4/1/11
16	Triggers	90 days?	Mon 11/29/10	Fri 4/1/11
17	Global DCS	90 days?	Mon 11/29/10	Fri 4/1/11
18	**Global commissioning**	**60 days**	**Mon 4/4/11**	**Fri 6/24/11**
19	Ready for Users	0 days	Fri 6/24/11	Fri 6/24/11
20	Start dismantling old GIF	0 days	Fri 6/24/11	Fri 6/24/11

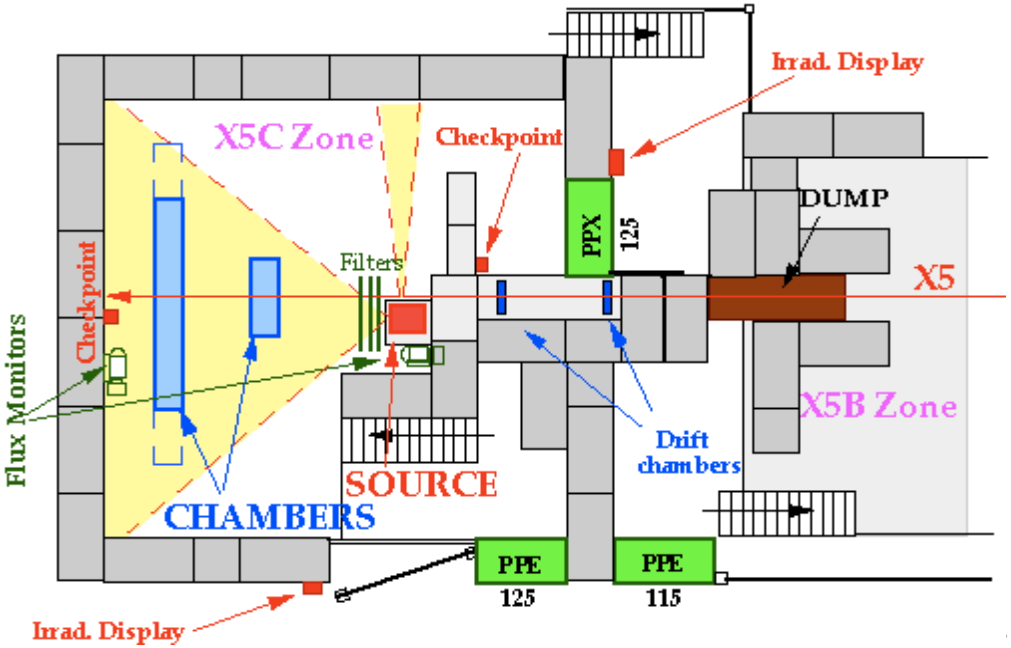


Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline

Gamma Irradiation Facility (GIF)

1997 - 2010

Irradiation Field	740 GBq ^{137}Cs source irradiation *(15 rad/h at a distance of 50 cm)*, over large surfaces (~m^2), combined with SPS West area X5 beam (until 2004)
Occupation	Fully booked all year round, even nowadays (50 w/y)
Major Clients	Detector community *For instance, most LHC gas detector technologies have been validated at the GIF:* • ***CMS**: RPC, CSC; **ATLAS**: MDT, RPC, TGC, CSC; **ALICE** TOF, AMS; CPC, RPC; **LHCb**: MWPC; **COMPASS** detectors*
Tests	Pure gamma irradiations, Long-term irradiation of detectors and performance studies under harsh background conditions (photon source= background; particle beam= signal)



Shortfalls:

- Beam not available since 2004
- Aged facility (source and infrastructure)
- Need more photon intensity (x10)
- Need more space