Irradiation Facilities Questionnaire

Summary of answers for the Gamma Irradiation Facility

M.Capeans & C.Rembser

Background

- At the end of 2007, a Working Group for Future Irradiation Facilities was set up.
- It is interdepartmental (PH, AB, SC, TS, AT).
- Its mandate:
  - Collect requirements for future irradiation facilities at CERN (taking into account availability of facilities outside CERN).
  - Put these requirements in the context of presently available facilities/infrastructures at CERN.
  - Propose cost-effective options for future facilities, aiming for a maximum of synergy.

- http://irradiation-facilities.web.cern.ch/irradiation-facilities/

Background

- In this context, the Group launched a broad web-based survey of the requirements (Gamma, proton and mixed field, high energy high Z ions) in February 2008.

- See L.Linssen's recent report:
  http://indico.cern.ch/getFile.py/access?contribId=0&resId=0&materialId=3&confId=37331

Gamma Questionnaire

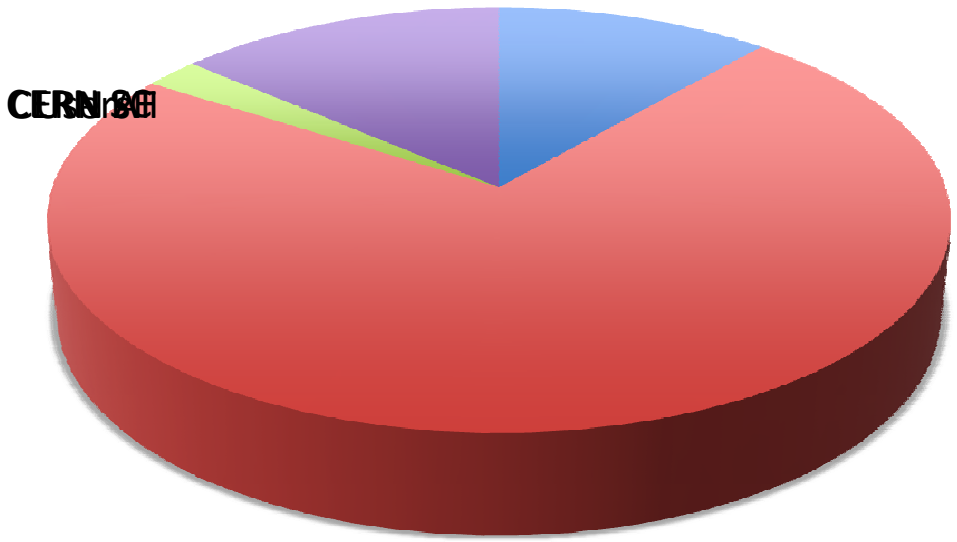
- Based on the experience and users of the ‘old’ GIF facility, the questionnaire about the gamma irradiation facility offered two options:

  - **GIF**: Strong gamma source for irradiation *(based on the existing, old GIF facility).*

  - **GIF++**: New area with a strong gamma source (SLHC compatible) for irradiation of very large areas and simultaneous particle beam.

Who answered?

- Nb of Answers to Questionnaire for Gamma irradiation: 35 out of **134** (25%)
- GIF vs GIF++: 28 / 7 (20% / 5%)
- Communities:
  - Detector performance checks (70%). *Mainly LHC muon detectors*
  - Material & Detector Component tests
  - CERN SC (Radioprotection, Safety & Environment)



Detector Groups (PH) with answers to the Questionnaire

ALICE

- Muon

ATLAS

- Muon
- Tracker (Pixel and electronics)

CMS

- Muons
- Calorimeter

LHCb

- Muons

Compass

RD-50 (Radiation hard semiconductor devices)

RD-51 (Micro-Pattern Gas Detectors Development) – *expressed interest*

CERN PH DT: Detector Technology Groups (Generic Detector R&D)

CERN PH Electronics Groups

>> Do we miss some key potential users ?

GIF vs GIF++

GIF USERS:

Radiation hardness of materials, **small prototype detectors**, electronic components and radiation monitors or dosimetry under a strong photon flux.

GIF++ USERS:

Focused on the **characterization** and understanding the long-term behavior of **large particle detectors**. Specially the large area, gas-based LHC muon detectors demand the construction of improved GIF facility with source and particle beam to continue detector optimization studies and to cope with the demanding detector R&D for **SLHC**.

Some Specs for the GIF (no particle beam)

TEST OF

- 19 (47.5%) Detector or detector component
- 1 (2.5%) Accelerator component
- 9 (22.5%) Material (generic)
- 7 (17.5%) Radiation monitor or dosimeter
- 4 (10.0%) Other (please specify details below)

  - Detectors:
    - Silicon sensors, entire silicon modules/supermodules
    - Muon detectors: MWPC, TGC, RPC
    - Crystals for calorimetry
  - Electronic components, Optoelectronic devices (laser diodes and photodiodes) and passive optical components (fibres, connectors, splitters, cable materials), power devices and power systems
  - Dosimetry: Alanine and RPL dosimeters
  - Rad Hard tests of Materials: olyinides, super-insulation , epoxies, resins, pre-preg insulation, ceramics, composites etc and metals

Some Specs for the GIF (no particle beam)

SOURCE

- **15 (53.6%) ^{60}Co source (1.17 MeV and 1.33 MeV photons)**
- 2 (7.1%) ^{137}Cs source (662 keV photons)
- 11 (39.3%) Any of the above, no preference

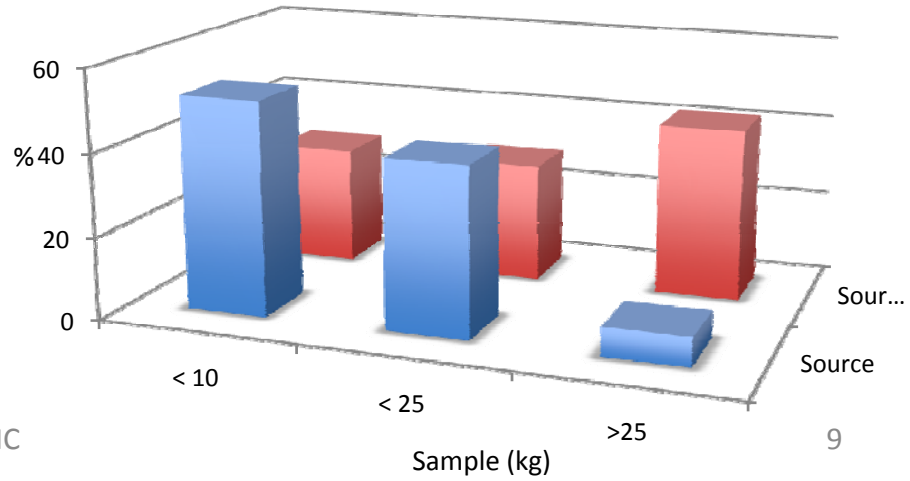
AREA

- 3 (10.7%) Very small, less than about 2 cm x 2 cm
- **10 (35.7%) Small, less than about 10 cm x 10 cm**
- 6 (21.4%) Medium, less than about 25 cm x 25 cm
- 6 (21.4%) Large, less than about 1 m x 1 m
- 3 (10.7%) Very large, more than about 1 m x 1m

} Experienced users! LHC Detector communities

RAD DOSE

- Uniform across large areas
- Similar to GIF, or 10 x larger
- Dose spreads from kGy to MGy
- Dose should be reachable in ~2 weeks



Experiments at GIF++

USERS

- **7 answers of known GIF users operating large systems in LHC, involved in detector development for SLHC (ATLAS, CMS, ALICE) and SC**
- **1 questionnaire represents many users!**

PURPOSE OF THE EXPERIMENT

- 6 (85.7%) Detector or detector component
- 0 (0.0%) Accelerator component
- 2 (28.6%) Material (generic)
- 0 (0.0%) Radiation monitor or dosimeter
- 0 (0.0%) Other (please specify details below)

Tests of very large objects (typically LHC muon detector; could be as large as 3.0 x 1.4 x 0.5 m^3)

Multiple tests of 2-3 weeks and maybe semi-permanent installations

GIF++

SOURCE

- 2 (28.6%) ^{60}Co source (1.17 MeV and 1.33 MeV photons)
- 0 (0.0%) ^{137}Cs source (662 keV photons)
- **5 (71.4%) Any of the above, no preference**
- Would one of these sources be excluded for your experiment? 0 (0.0%) yes -- **7 (100.0%) no**

DOSE: as GIF or 10 times stronger, with possibility to tune flux

BEAM

- 0 (0.0%) Particle beam from the PS (24 GeV/c)
- **5 (71.4%) Particle beam from the SPS (450 GeV/c)**
- 2 (28.6%) Any of the above, no preference

- 3 (25.0%, 42.9%) Protons
- 1 (8.3%, 14.3%) Positive pions
- 1 (8.3%, 14.3%) Negative pions
- **5 (41.7%, 71.4%) Muons**
- 2 (16.7%, 28.6%) Electrons

Expected Use of the Two Facilities

- The Facility:
  - Provides user support and services
  - Permits often access to samples/detectors during irradiation period
  - Permits to tune dose rate
  - Typical test duration: mostly 1 or 2 weeks, 1 or 2 times per year
  - Should be operational: from 2010 and for 3-5 years

Summary

- The Document ***The GIF++ Gamma Irradiation Facility at CERN*** collects the 'most popular' answers and it is available for discussion

  http://cern.ch/WP7/WP7_DOCUMENTS.htm

- See next talk (C. Rembser)