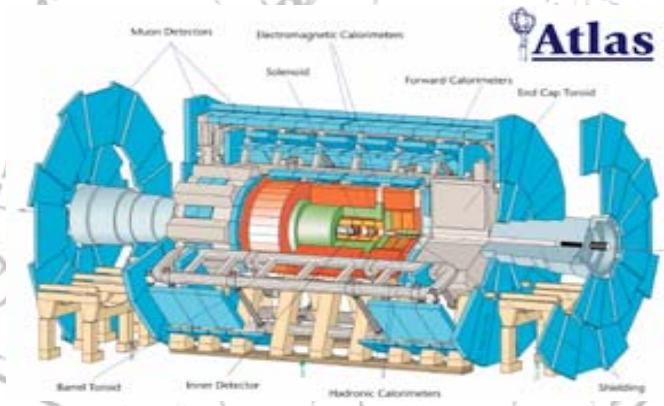
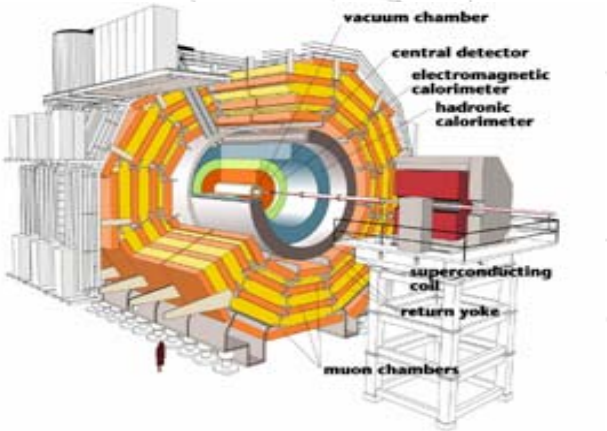
Radiation Workshop Introduction

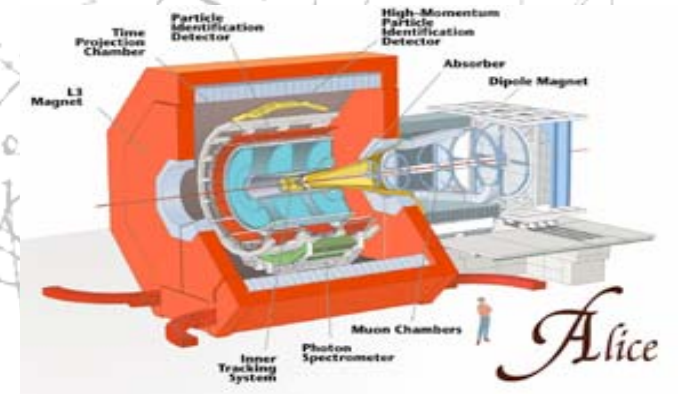
before LHC…… radiation tolerance of equipment in HEP was mainly an issue in the accelerator

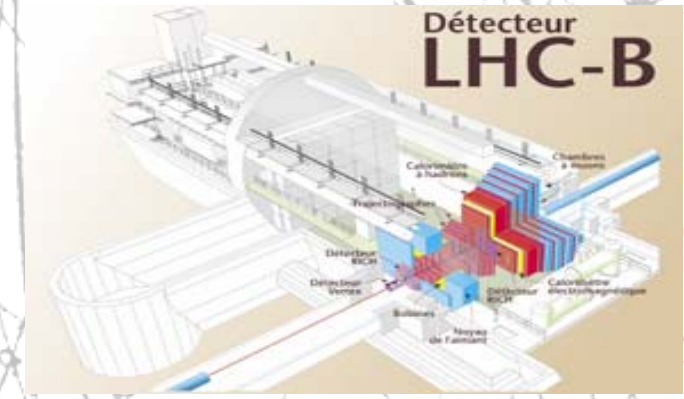
Radiation Workshop Intro

With the preparations for LHC…… radiation tolerance of equipment has also become a major issue for particle physics experiments









Radiation Workshop Intro

Radiation tolerance is now an issue of both experiments and accelerator covering many fields:

- **Activation calculations**
  - Understanding of processes ⇔ simulation tools
- **Irradiation of materials**
  - Assessing and understanding
  - Global performance degradation ⇔ SEU
- **Finding ways out to keep performance under radiation**
  - e.g. design issues of radiation-hard electronics components
  - e.g. rad-hard silicon, running/maintaining at low temperature
- **Passive protection of equipment against radiation**
  - e.g. collimation
  - e.g. neutron absorbers near calorimeters

Radiation Workshop Intro

… covering many fields, continued:

- **Measuring radiation levels**
  - Passive dosimetry
  - Active dosimetry
- **Signalling increased fluxes**
  - Beam loss monitors (accelerator)
  - Beam condition monitors (experiments)

… not forgetting:

- **Personnel protection**
  - Dosimetry
  - Radiation monitoring

Irradiation facilities

To assess the radiation hardness of equipment and their performance under radiation, irradiation facilities are used.

Several facilities were set-up within CERN

Many facilities are used outside CERN

The use of these external facilities is often coordinated by someone from our community

CERN irradiation facilities

Location	Country	Facility	Particles	Energy	Flux	Contact at PH
CERN	CH	PS-IRRAD1	p	23 GeV	$3x10^{13}$ p/hour/cm^2	M.Glaser
CERN	CH	PS-IRRAD1	mixed	Secondary particles used for SEU tests	50 mGy/hour	M.Glaser
CERN	CH	PS-IRRAD2	n	~ 1 MeV (23 GeV p+C)	10^{13} n/hour/cm^2	M.Glaser
CERN	CH	GIF	γ	^{137}Cs	740 GBq (1997)	M. Clayton
CERN	CH	Building 27	γ	^{60}Co	0.15 Gy/hour	E. Auffray Hillemans

External Facilities pi, p, n, ion

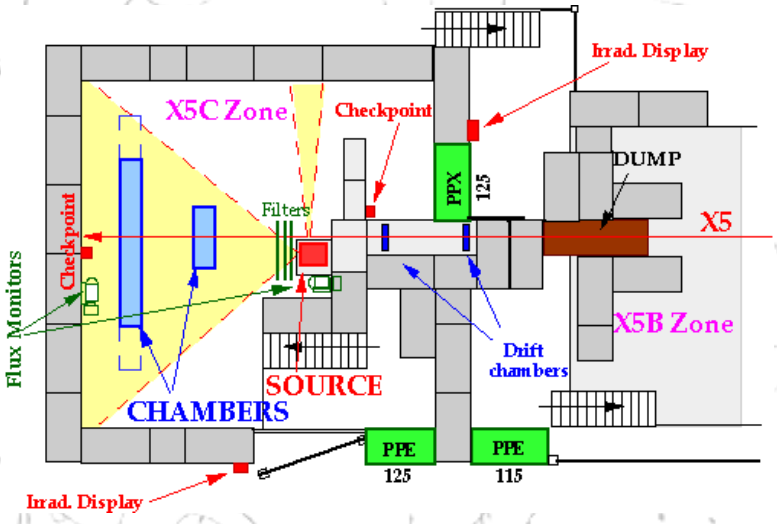
Location	Country	Facility	Particles	Energy	Flux	Contact at PH
PSI	CH	piE1	pi	191 MeV	10^{14} π/day/cm^2	M.Glaser
PSI	CH	PIF	p	up to 250 MeV (up to 5x5 cm^2)	3x10^8 p/cm^2/s	F.Faccio
Ljubljana	SI	JSI	n	~ 1 MeV (reactor)	5x10^{12} n/cm^2/s	M.Glaser
Louvain	BE	UCL-T2	n	<20.4 MeV> (d+Be)	7x10^{12} n sr^{-1} s^{-1}	K.Gill
Louvain	BE	UCL-Q	n	25 to 70 MeV (p+Li)	10^6 n/s	F. Faccio
Louvain	BE	UCL-LIF	p	10 to 75 MeV	10^9 p/s/cm^2	F. Faccio
Louvain	BE	UCL-LIF	ions	10 to 75 MeV	10^9 p/s/cm^2	F. Faccio
Uppsala	SE	TSL	n	157	6x10^7 p/s/cm^2	F.Faccio
Valduc	FR	PROSPERO	n	~ 1 MeV (reactor)	10^{14} n/hour/cm^2	-
Karlsruhe	DE	KAZ	p	20 to 42 MeV	10^{14} p/hour/cm^2	-
Jyvaskyla	FI	RADEF	p	10 to 50 MeV	10^{10} p/s/cm^2	-

External facilities, gamma

Location	Country	Facility	Particles	Energy	Flux	Contact at PH
BNL	US	SSIF	γ	^{60}Co	5x10^3 Gy/hour	-
Mol	BE	SCK-CEN BRIGITTE	γ	^{60}Co	2x10^3 Gy/hour	K. Gill
Mol	BE	SCK-CEN RITA	γ	^{60}Co	20x10^3 Gy/hour	K. Gill
Louvain	BE	UCL	γ	^{60}Co	2x10^3 Gy/hour	
Dagneux	FR	Ionisos	γ	^{60}Co	1x10^3 Gy/hour	
Geneve	CH	HUG hospital	γ	^{60}Co	320 Gy/hour	E. Auffray Hillemans

Future of GIF

- **The Gamma Irradiation Facility**
  - was set-up in West area SPS beam
  - high intensity ^{60}Co-source
  - Even after west area beam dismantling still heavily used by the experiments



- **Future of GIF**
  - Need of a new combined facility in the SPS North area?
  - Justification of needs and combination with facilities of/for other Departments?

OUTLOOK

Many departments -- SC, TS, AT, AB, PH – work on radiation issues

Due to different natures of the tasks, lots of work work is done independently, other work is performed in close collaboration

The RADIATION WORKSHOP is a unique opportunity to:

- Learn about the work done in the various CERN domains
- Identify possible areas of synergy
- Improve collaboration
- LEARN from experiences outside CERN