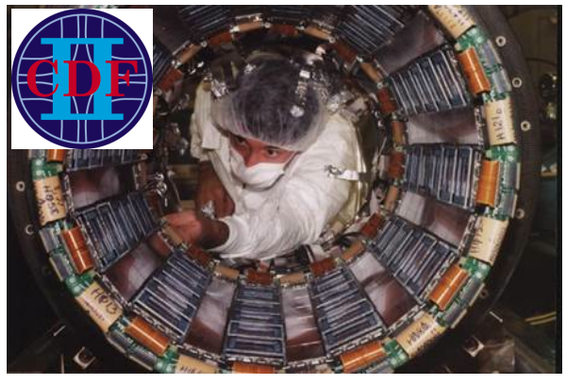
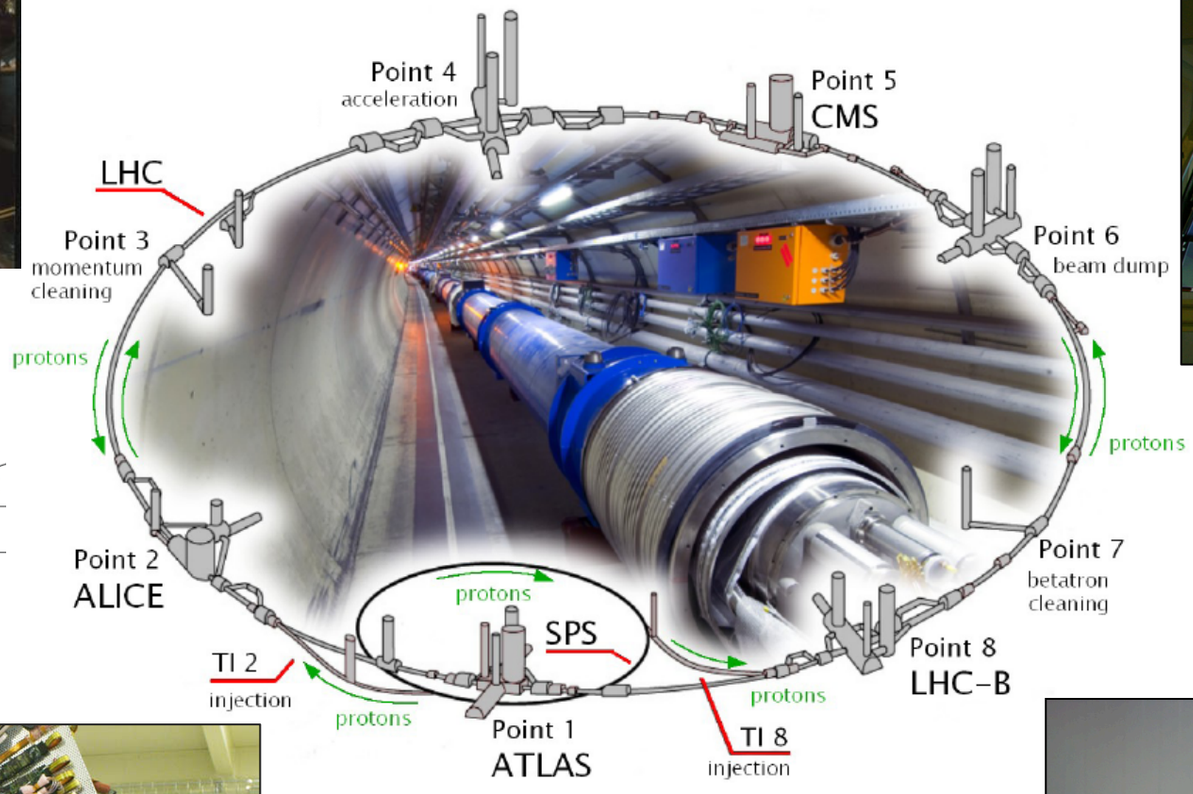
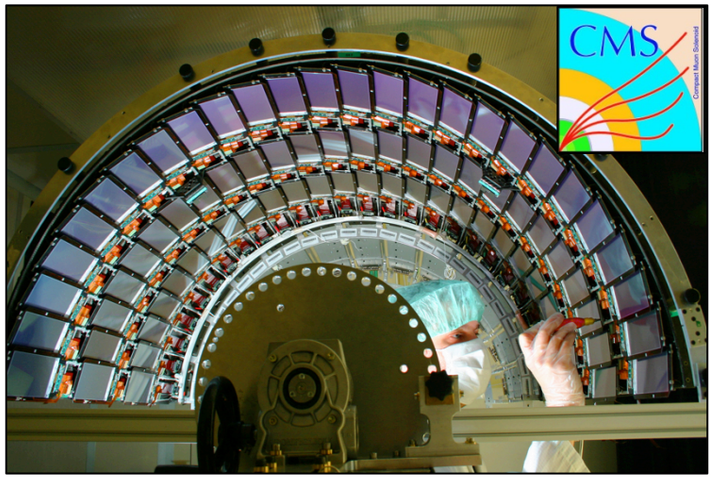
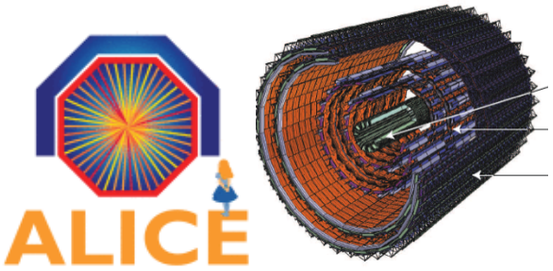
Inter-Experiment Workshop on Radiation Damage in Silicon Detectors

Bringing together the experts…

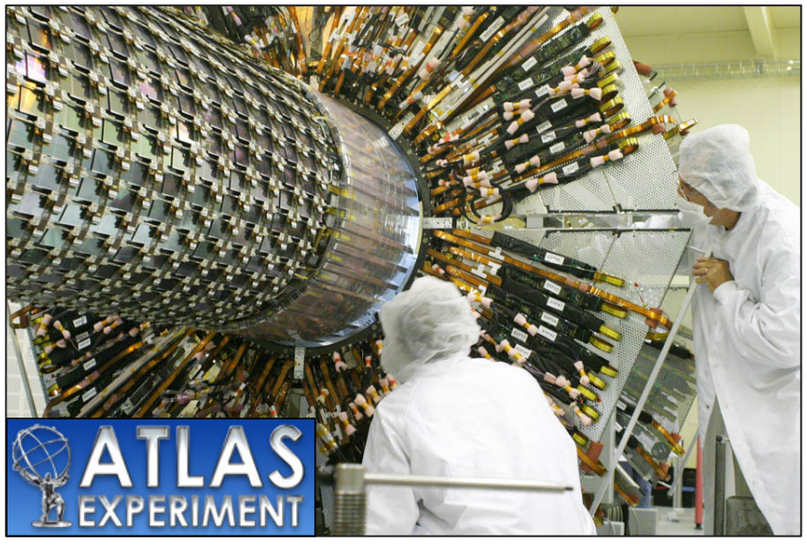








RD50 CERN

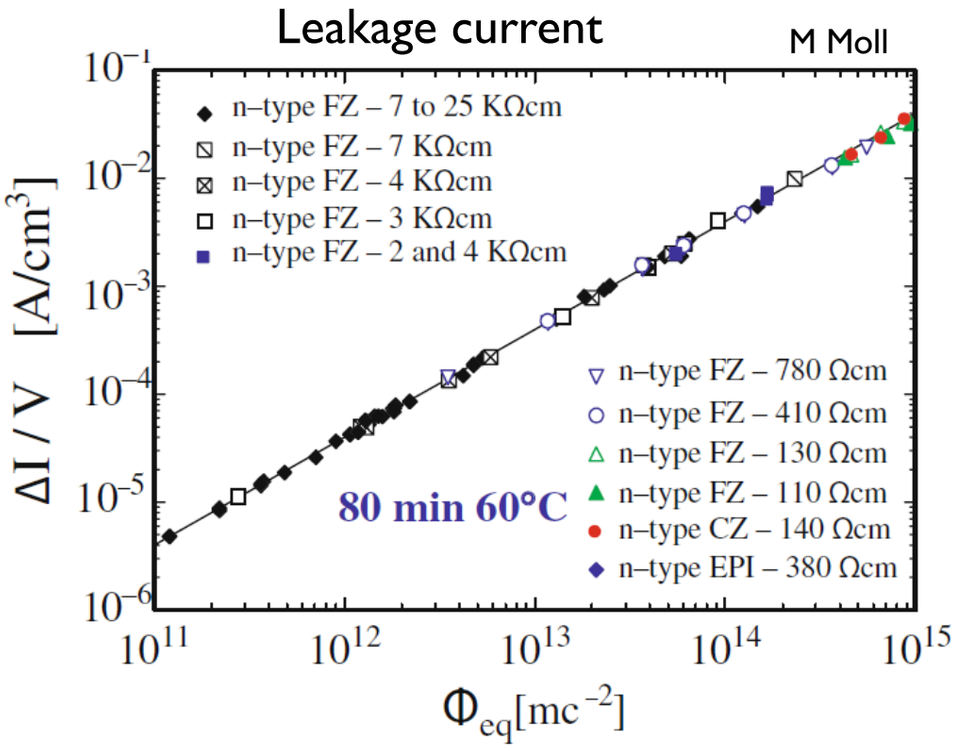


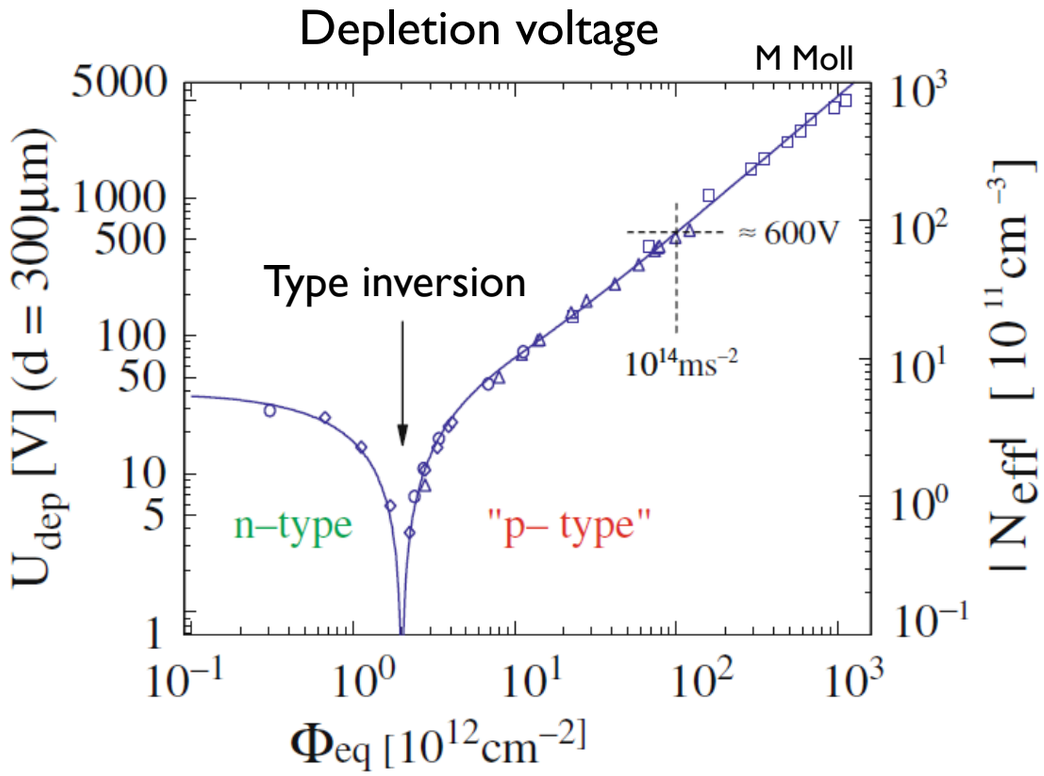
Stephen Gibson
CERN

Welcome

Outline

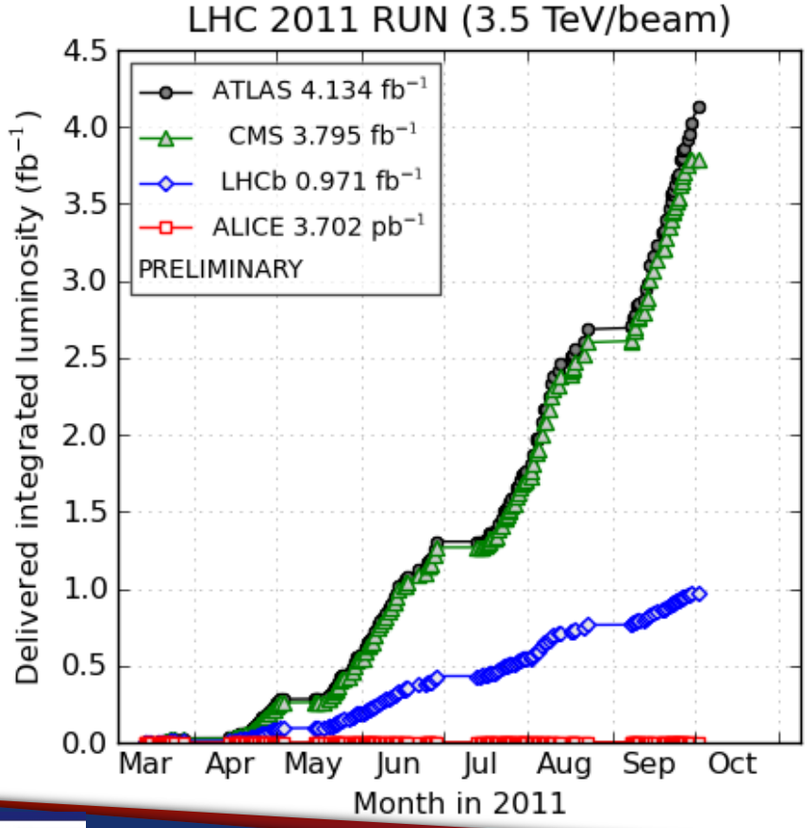
- Motivation - a common interest
- Inter-Experiment Radiation Damage Working Group
- Towards wider collaboration
- This workshop and beyond.





Motivation – a common goal

- With the rapidly increasing fluence at the LHC, initial signs of radiation damage are now clearly visible in the first few fb^{-1}.
- Our experiments all aim to quantify and understand the macroscopic effects of radiation damage in our silicon detectors, in light of recent measurements.
  - Do the new measurements match former model predictions?
  - Mitigation of reverse annealing and optimising detector performance
  - Future extrapolations: how long will our detectors last?



Expected radiation levels for Si detectors

	TID [kGy]	Fluence 1 MeV neq [cm-2]	Time [y]
ATLAS Pixel	500	1.0E+15	10
ATLAS Strips	100	2.0E+14	10
CMS Pixel	840	3.0E+15	10
CMS Strips	70	1.6E+14	10
ALICE Pixel	2.7	3.5E+12	10
LHCb VELO	50	1.3E+14	1

Working Group Announcement

- ***Radiation Damage Inter-Experiment Working Group*** was set up this summer.
- The new Inter-Experiment Working Group focuses on recent measurements and modelling of radiation damage in silicon detectors, particularly first results at the LHC.
- The aims are distinct from and complement RD50, whose main mandate is to develop super-radiation hard sensors for future upgrades (see next talk).
- ***History***: the working group was initiated following conversations at RD11 in July.
  - Over the summer, several sub-detector experts from ATLAS, LHCb and CMS have been meeting informally for discussion, together with Michael Moll for RD50.
  - This workshop aims to trigger further collaboration between the experiments and we warmly invite all interested silicon sub-detector communities to join us.
- The working group sharepoint has been set up for exchange of ideas / tools:
  - https://cern.ch/rad-damage-iewg/
  - Please join and contribute - just ask to be added to the access list, all welcome.

Towards wider collaboration

Why a Radiation Damage Inter-Experiment Working Group?

- The monitoring strategies and methods differ slightly among experiments, though with a common aim. It's clear we would mutually benefit from each other's experience.
- Rate of acquired dose and annealing is now as measured, rather than initial prediction of LHC profile: time to revive and check our models.
- Differing fluences and detector types and geometry can also help to constrain our radiation damage models.
- Would like to agree on a coherent way of preparing results for a simpler comparison.
- Let's attempt a census of tools to allow to minimize the work and converge towards the calculation of the models for predictions based on our realistic dose and dose rate.
- Benefit for operation of current detectors and planning for future upgrades.

Today's menu

Inter-Experiment Workshop on Radiation Damage in Silicon Detectors

chaired by Stephen Gibson (CERN)

Tuesday, 4 October 2011 from **09:00** to **12:30** (Europe/Zurich)
at **CERN** (**Salle Curie**)

Manage

Video Services EVO Meeting scheduled today from 08:30 to 13:30: Phone Bridge ID:4062943. More Info

Tuesday, 4 October 2011

09:00 - 09:10 **Introduction** *10'*
Speaker: Stephen Gibson (CERN)

09:10 - 09:40 **A guide to radiation damage in silicon detectors by RD50** *30'*
20mins + 10mins discussion
Speakers: Michael Moll (CERN), Jasu Haerkoenen (Helsinki Institute of Physics (FI))
Material: **Slides**

09:40 - 10:10 **Monitoring radiation damage in LHCb** *30'*
20mins + 10mins discussion
Speakers: Paula Collins (CERN), Chris Parkes (University of Glasgow (GB)), Martin Van Beuzekom (NIKHEF (NL))

10:10 - 10:40 **Monitoring radiation damage in CMS** *30'*
20mins + 10mins discussion
Speakers: Gino Bolla (Purdue University (US)), Frank Hartmann (KIT - Karlsruhe Institute of Technology (DE)), Lino Demaria (Universita e INFN (IT))

10:40 - 11:00 Coffee break

11:00 - 11:30 **Monitoring radiation damage in ATLAS** *30'*
20mins + 10mins discussion
Speakers: Carolina Deluca Silberberg (State University of New York (US)), Paul Dervan (University of Liverpool (GB))

11:30 - 12:00 **Experience from CDF** *30'*
20mins + 10 mins discussion
Speaker: Steven Worm (CERN)

12:00 - 12:30 **Common framework and discussion for future** *30'*
Speaker: Stephen Gibson (CERN)

Introduction by RD50

20mins talk +10mins discussion per experiment

Lessons from CDF

Time for discussion towards the end.

Beyond this workshop

19th RD50 Workshop, at CERN, 21-23 November 2011.

- A dedicated session is being organized on radiation damage in LHC experiments.
- Please consider to come and participate.
- We would like to aim for a common framework for simpler comparison between experiments on the timescale of the RD50 workshop: more on this in the last talk today and discussion.
- Meanwhile, we expect to hold interim meeting(s) of the Inter-Experiment Radiation Damage Working Group to help prepare for the 19th RD50 workshop.
- An inter-experiment operational workshop, which may include radiation damage effects, is envisaged for early 2012 as a follow up of one in early 2011.