



LHCb Upgrade Electronics Radiation effects on FPGAs

Four sub-detectors will use FPGAs in their front-end electronics:
RICH, SciFi, Calo, Muons

Aim of today's discussion:

- Share information and avoid repeating measurements
- Identify important measurements to make
- Identify the most appropriate irradiation facilities

Contact with other users (CMS HCAL, LHC machine electronics)

RICH: will use Kintex7 from Xilinx (SRAM)

Probably OK to few 100s krad (to be verified)

Data logic can be triplicated to mitigate SEUs

Configuration sensitive to SEUs

have to measure probability & predict rate
then understand mitigation scheme

SciFi, Calo, Muons: will use Igloo2 from Microsemi(Flash)

Configuration insensitive to SEUs

Data logic can be triplicated to mitigate SEUs

Ok up to 10-100 krad

Typical points to investigate

SEU resistance (configuration & logic)

SEL (& others?) – learn from others (eg Space community)

Power supply current

Propagation delays

Programmability

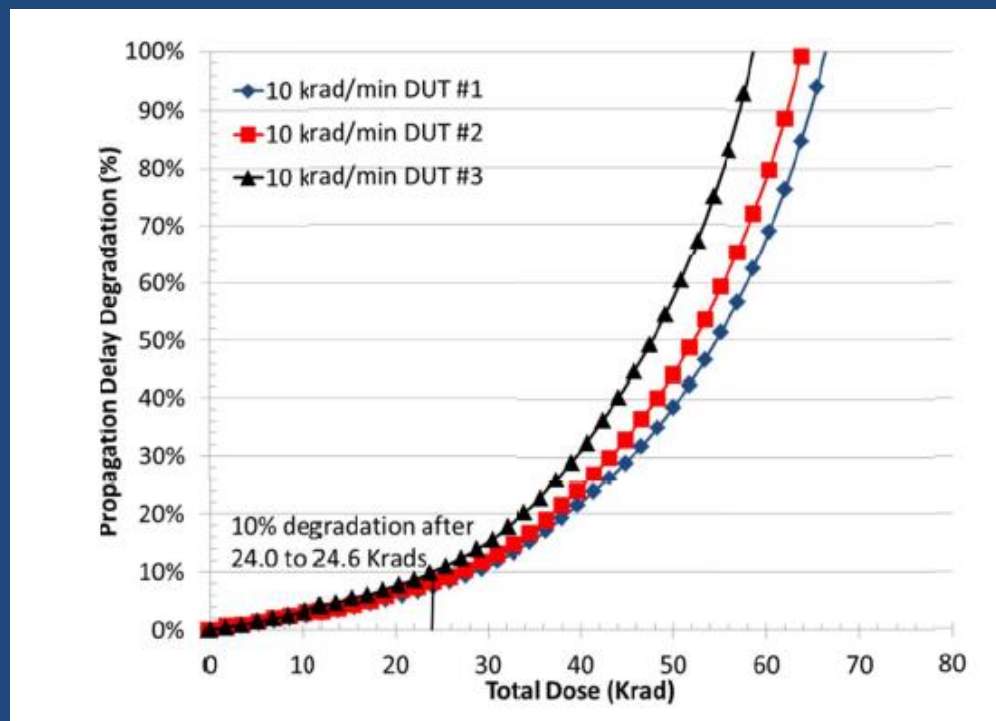
Are these a factor of:

dose-rate?

annealing?

config refreshing?

etc etc



From Rezzak et al, IEEE2014
SmartFusion2



Lots of information out there

Tullio's Twiki (started by Jorgen)

<https://twiki.cern.ch/twiki/bin/viewauth/FPGARadTol/InformationOfInterest>

There's a clear need for a remote programming interface:
New project to use JTAG from GBT-SCA,
to be studied by Joao Barbosa & Cairo Caplan

They will need info & hardware from the sub-detectors