Full Detector Systems

5 Years Work Plan

https://cds.cern.ch/record/2320882/files/LHCC-SR-007.pdf
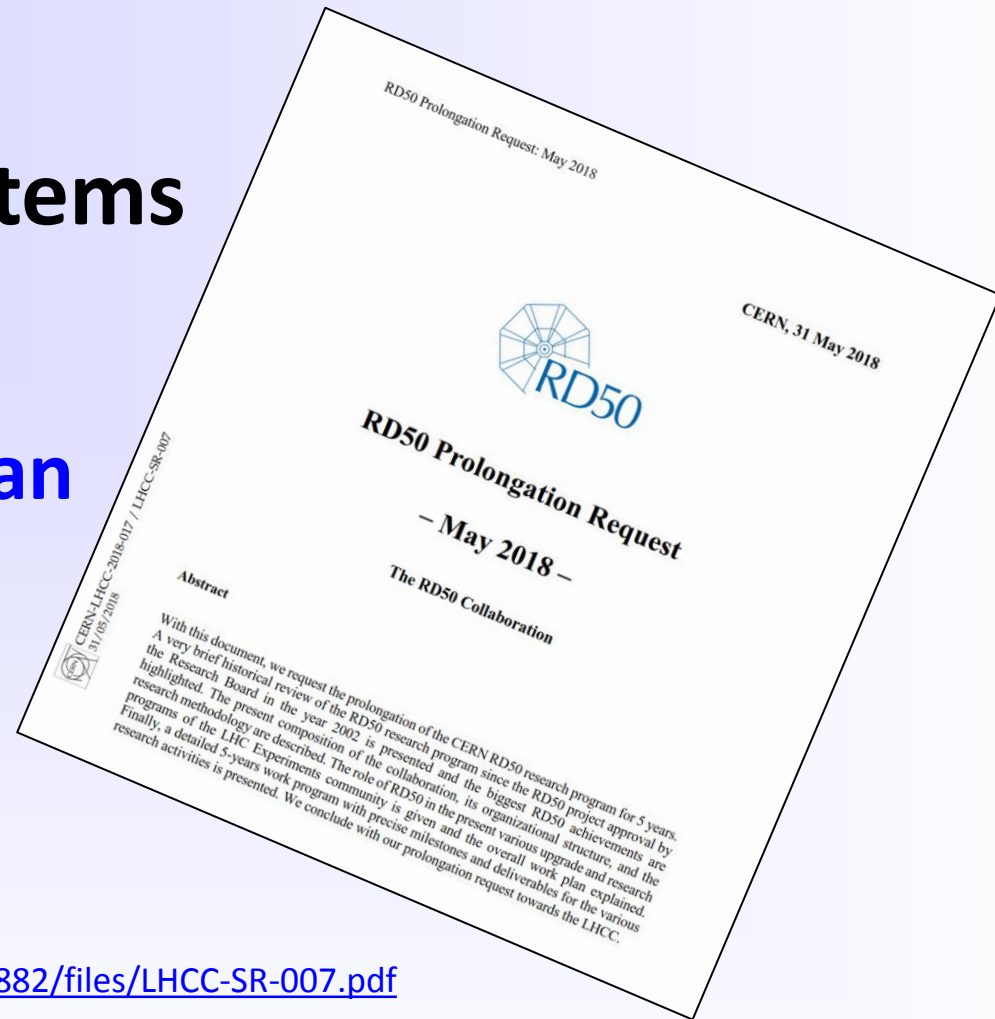
RD50: 5 years Workplan (WP 5.4.)

Extensive studies of segmented detectors are being performed within RD50 with strip and pixel readout systems especially developed by Alibava and PSI. RD50 is an ideal testing environment for the development of detection systems. RD50 methods are complementary to the ones of the large experiments and are based on mini-strip detectors and pixels.

Beyond the measurements on the segmented sensors, RD50 contributes to the analyses and understanding of data taken on the operating experiments.

• WP 5.4.1. LHC: Radiation Damage in operating tracking detectors

RD50 has a unique role in creating tools and dialogue for the modelling and monitoring of in-situ detector systems and actively collaborates with ATLAS, CMS, and LHCb.

- Identified milestones for next 5 years:

  - **M1: Hold a follow-up radiation damage workshop at the end of Run 2. Produce CERN Yellow Report documenting the status and experience gathered (Q1/2019).**

  - **M2: Develop common software that can be used for making comparisons to irradiated sensors at test beams (Q3/2019).**

  - **M3: Complete a program of irradiation and test beam campaigns with accurate thermal control to carefully study the impact of annealing with Run 2-like levels of irradiation (Q3/2019).**

  - **M4: Using the full Run 2 dataset and digitization models that incorporate radiation damage, tune TCAD radiation damage parameters to data and establish systematic uncertainties on these parameters. RD50 will maintain a database of models and parameters (Q4/2019).**

  - **M5: Using the full Run 2 dataset, lab and test beam data to develop a model that incorporates a non-uniform E-field and annealing effects (Hamburg + TCAD). The fine-tuning of this model will require further work (Q4/2020).**

  - **M 2021-2023: Repeat and extend the in-situ studies for Run 3.**

  - **M6: During LS3 we intent to perform a post-operation characterization of de-installed LHC sensors.**

• WP 5.4.2. HL-LHC

Identified milestones for next 5 years:

- M1: Understanding dependence of CCE/CM in segmented detectors on long-term bias at different annealing stages (Q4/2020).

- M2: Understanding the noise performance in CM operation mode at high voltages and modelling it for fast electronics readout (Q4/2020).

- M3: Comparative studies of mini-strip detectors from two main producers (Infineon, HPK) in terms of CCE/CM differences (Q4/2020).

• WP 5.4.3. FCC

Identified milestones for next 5 years:

- M1: Punch Through Protection (PTP) structure at high fluences, beyond that of strip sensors (Q2/2021)

- M2: CCE studies of different geometry sensors after extreme fluences of up to 5-6×1017 cm-2 (3D samples of different columns widths, mini-strips, pads). The most challenging action will be the readout of segmented devices (Q3/2022).