

CERN, 26-28 November 2018



Welcome to the 33rd RD50 Workshop

Radiation hard semiconductor devices for very high luminosity colliders





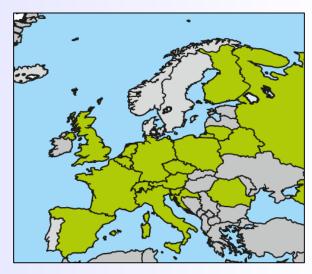
The RD50 Collaboration



• RD50: 62 institutes and 367 members

52 European institutes

Austria (HEPHY), Belarus (Minsk), Czech Republic (Prague (3x)), Finland (Helsinki, Lappeenranta), France (Paris, Orsay), Germany (Bonn, Dortmund, Erfurt, Freiburg, Goettingen, Hamburg (2x), Karlsruhe, Munich(2x)), Italy (Bari, Perugia, Pisa, Trento, Torino), Croatia (Zagreb), Lithuania (Vilnius), Netherlands (NIKHEF), Poland (Krakow, Warsaw(2x)), Romania (Bucharest (2x)), Russia (Moscow, St.Petersburg), Slovenia (Ljubljana), Spain (Barcelona(3x), Santander, Sevilla (2x), Valencia), Switzerland (CERN, PSI, Zurich), United Kingdom (Birmingham, Glasgow, Lancaster, Liverpool, Manchester, Oxford, RAL)



7 North-American institutes

USA (BNL, Brown Uni, Fermilab, LBNL, New Mexico, Santa Cruz, Syracuse)

1 Middle East institute; Israel (Tel Aviv)

2 Asian institute; China(Beijing), India (Delhi)

Detailed member list: http://cern.ch/rd50



RD50 Organizational Structure



Co-Spokespersons

Gianluigi Casse and

nd Michael Moll

(Liverpool University, UK & FBK-CMM, Trento, Italy)

(CERN EP-DT)

Defect / Material Characterization

Ioana Pintilie
(NIMP Bucharest)

- Characterization of microscopic properties of standard-, defect engineered and new materials pre- and postirradiation
- DLTS, TSC,
- SIMS, SR, ...
- NIEL (calculations)
- · Cluster and Point defects
- · Boron related defects

Detector Characterization

Eckhart Fretwurst (Hamburg University)

- Characterization of test structures (IV, CV, CCE, TCT,.)
- Development and testing of defect engineered devices
- •EPI, MCZ and other materials
- NIEL (experimental)
- Device modeling
- Operational conditions
- Common irradiations
- Wafer procurement (M.Moll)
- Acceptor removal (Kramberger)
- TCAD simulations

New Structures

Giulio Pellegrini (CNM Barcelona)

- 3D detectors
- Thin detectors
- Cost effective solutions
- Other new structures
- Detectors with internal gain
- •LGAD: Low Gain Avalanche Det.
- Deep depleted Avalanche Det.
- Slim Edges
- HVCMOS
- LGAD (S.Hidalgo)
- HVCMOS (E. Vilella)
- Slim Edges (V.Fadeyev)

Full Detector Systems

Gregor Kramberger (Ljubljana University)

- LHC-like tests
- Links to HEP(LHC upgrade, FCC)
- Links electronics R&D
- Low rho strips
- Sensor readout (Alibava)
- Comparison:
- pad-mini-full detectors
- different producers
- •Radiation Damage in HEP detectors
- Timing detectors
- •Test beams (M.Bomben & G.Casse)

Collaboration Board Chair & Deputy: G.Kramberger (Ljubljana) & J.Vaitkus (Vilnius), Conference committee: U.Parzefall (Freiburg) CERN contact: M.Moll (EP-DT), Secretary: V.Wedlake (EP-DT), Budget holder & GLIMOS: M.Moll & M.Glaser (EP-DT)



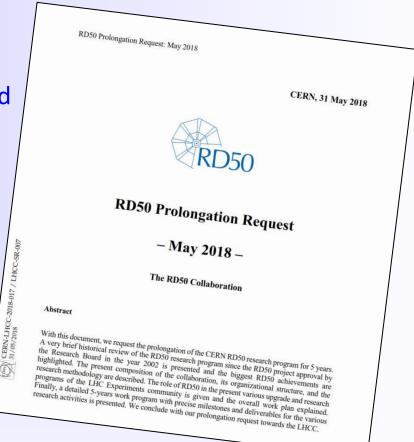
Latest News from the LHCC



- 2018: LHCC (Large Hadron Collider Committee) reviewed CERN RD experiments, i.e. also RD50
- May 2018: RD50 produced a 5 year work plan
- June 2018: Very positive feedback from LHCC
- July 2018: Research Board Minutes published

RB Minutes: RD50 (Development of Radiation Hard Semiconductor Devices for Very High Luminosity Colliders) [6] is recommended by the LHCC for the requested five-year extension, including CERN support at the level currently provided (access to facilities, human resources) which is crucial for the collaboration. Progress will be reviewed every year by the LHCC. The LHCC considers the structure of RD50, with a small but focussed core team and corresponding infrastructure at CERN, and many expert collaborators from around the world, to be an excellent setup. The Research Board extended RD50 for a further five years.

http://cds.cern.ch/record/2622164/files/M-225.pdf



Take a look!

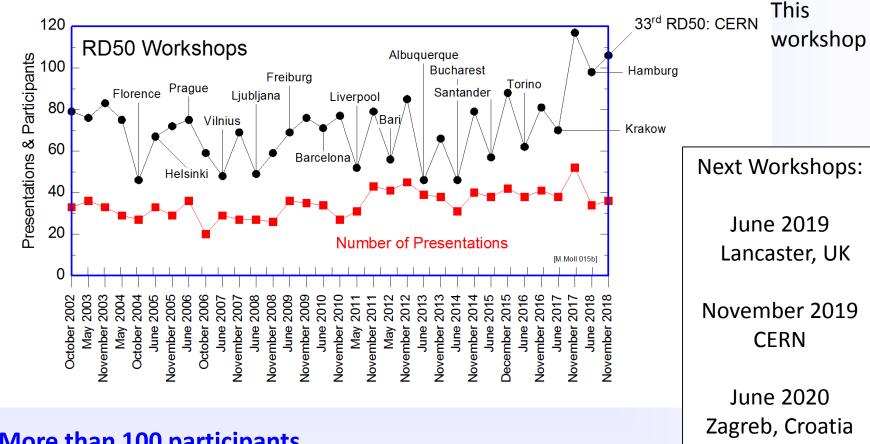
....and make this program happen!

https://cds.cern.ch/record/2320882/files/LHCC-SR-007.pdf



Workshop participation...





- More than 100 participants
 - 106 participants
 - approx. 35 presentations and 7 discussion sessions
 - these will be 3 intense days, but more relaxed than last Workshop at CERN!



Agenda



- Monday
 - Radiation Damage at the LHC & Discussion
 - Defect and Material Characterization & Discussion
 - Collaboration Board (restricted to CB members)
- Tuesday
 - Precision Timing Detectors & Discussion
 - Device Simulations & Discussion
 - Characterization Techniques & Discussion
 - Dinner (all information given in the registration package!)
- Wednesday
 - Full Detector Systems (Pixel and Strip Detectors) & Discussion
 - CMOS sensors & Discussion

This is a Workshop:

Please participate

actively in the

discussions.



Thanks for organizing this event



Veronique Wedlake

Secretary and Leader of the organization teamnothing would work without her!

- Local organization team (SSD): Matteo, Ruddy, Yana, Pedro, Esteban, William,....SSD team.
- Session Chairs and Discussion Convenors: Gregor, Gian, Eckhart, Salva, Giulio, Ivan,..... Marco, Joern
- Special greetings and thanks to Ioana, who could not comeshe became grandma.. @ ..but prepared the discussion session on defects and will try to connect on vidyo
- All speakers for their contributions and for keeping the time!
-for keeping the RD50 budget in shape while being retired in Brazil: Maurice Glaser

Enjoy the Workshop!



Radiation Damage in LHC Experiments



- Radiation Effects at LHC Experiments and Impact on Operation and Performance
 - Common Workshop: (ALICE), ATLAS, CMS, LHCb, RD50 [https://indico.cern.ch/event/695271/]
 - CERN, 11-12 February 2019
 - 4 sessions:
 - Sensor Measurements
 - Electronics/Optoelectronics
 - Radiation Background
 Simulation and Monitoring
 - Sensor Simulation
 - Last Workshop statistics:
 - 124 participants
 - 32 talks, discussion sessions

2nd workshop on radiation effects in the LHC experiments: impact on operation and performance a post run 2 review, with focus on inner detector systems 11-12 Feb 2019 at CERN: indico.cern.ch/event/769192 Sessions on: sensor measurements & simulations; radiation background simulation & benchmarking; effects on electronics/optoelectronics anising Committee: E.Butz (KIT), M.van Beuzekom (Nikhef), J.Buytaert (CERN), M.Bomben (LPNHE), P.Collins (CERN), L.Dawson (Sheff S.Mallows (KIT), M.Moli (CERN), A.Mucha (AGH UST), B.Nachman (LBNL), D.Robinson (Cambridge), A.Rozanov (CPPM-IN2P3-CNRS)

More details in first session of this Workshop