

#### RD50 online Workshop – 18-20.11.2020



# Welcome to the 37<sup>th</sup> RD50 Workshop

Radiation hard semiconductor devices for very high luminosity colliders

**CERN/Zagreb (online) - 18-20.11.2020** 



## The RD50 Collaboration

• RD50: 64 institutes and 403 members

#### **51 European institutes**

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

4 new members since November 2019



Full member list: <a href="https://www.cern.ch/rd50">www.cern.ch/rd50</a>





#### 8 North-American institutes

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

#### 1 Middle East institute Israel (Tel Aviv)

#### 4 Asian institutes

China (Beijing-IHEP, Hefei, Jilin), India (Delhi)

## New members since November 2019



#### Number of RD50 institutes is growing

#### **Joining November 2019**

- Carleton University; NRC (National Research Council) Group, Ottawa, Canada
  - Team leader: Thomas Koffas
- University of Montenegro, Faculty of Sciences and Mathematics,
  - Team Leader: Gordana Lastovicka-Medin
- Department of Modern Physics and State Key Laboratory of Particle Detection and Electronics;
  University of Science and Technology of China (USTC); Hefei, P. R. China
  - · Team Leader: Yanwen Liu

#### **Joining June 2020**

- College of Physics, Jilin University; 2699 Qianjin, Changchun, Jilin, China
  - Team Leader: Weimin Song





National Research Council Canada





## RD50 Organizational Structure



 Organizational structure stable since many years

#### **Co-Spokespersons**

and

Gianluigi Casse (Liverpool University, UK & FBK-CMM, Trento, Italy) Michael Moll (CERN EP-DT)

## **Defect / Material Characterization**

Ioana Pintilie (NIMP Bucharest)

- Characterization of microscopic properties of standard-, defect engineered and new materials; pre- and post- irradiation
- DLTS, TSC, ....
- SIMS, SR, ...
- NIEL (calculations)
- Cluster and point defects
- · Boron related defects
- SiC based detectors

### 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 modeling (J.Schwandt)

#### **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 (Salva Hidalgo)
- HVCMOS (Eva Vilella)

#### Full Detector Systems

Gregor Kramberger (Ljubljana University)

- LHC-like tests
- Links to HEP (LHC P2, 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: M.Moll & M.Glaser (EP-DT), EXSO: R.Costanzi (EP-DT)

## RD50 – 5 Year Work Plan



- 5 year work program submitted in May 2018
  - Approved by CERN Research Board in June 2018
- Workplan [70 milestones]
  - Defect and Material Characterization [16 MS]
    - p-type silicon [7 MS]
    - Cluster defects [4 MS]
    - Theory of defects [5 MS]
  - Device Characterization & Device Simulation [21MS]
    - Silicon materials [5 MS]
    - Extreme fluences [5 MS]
    - Experimental techniques [3 MS]
    - Surface damage [1 MS]
    - TCAD simulations [7 MS]
  - New structures [21 MS]
    - 3D sensors [6 MS]; LGAD [4 MS]
    - CMOS [6 MS]; New Materials [5 MS]
  - Full Detector Systems [12 MS]
    - LHC [7 MS]; HL-LHC [3 MS]
    - FCC [2 MS]

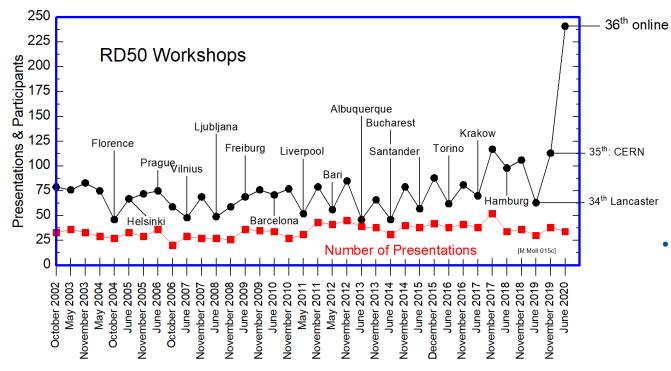


https://cds.cern.ch/record/2320882/files/LHCC-SR-007.pdf

## RD50 Workshop statistics

RD50

- RD50 holds every year two RD50 workshops
  - Average numbers for RD50 Workshops:
    <35 talks> <74 participants>



- June 2020: 36<sup>th</sup> RD50 Workshop "first online workshop"
  - COVID19: in-person Workshop in Zagreb was cancelled
  - Online Workshop: Very high number of participants
    (241 participants = 60% of collaboration); 34 talks + 4 discussions
  - · Positive experience:
    - · highest ever number of participants
    - fruitful discussions in discussion sessions
    - but we missed the social contact and the 'coffee meetings'
    - We learned for the future:
      Future workshops to be tailored as well for online participation, online discussions and online presentations.
- November 2020 .... again online
  - 37<sup>th</sup> RD50 Workshop; Zagreb cancelled again
    - >221 participants;
    - >43 talks + 6 discussions
- Let's hope: June 2021 in person in Valencia

# Program: 37th Workshop



- Wednesday 18.11.2020
  - Defect, Material and Sensor Characterization (6 talks + discussion)
  - Detector Characterization, Simulation (7 talks + discussion)
  - Collaboration Board (closed session)
- Thursday 19.11.2020 [...sorry, a very tight program]
  - TCT and IBIC techniques (6 talks and a discussion)
  - LGAD Low Gain Avalanche Detectors (14 talks + discussion)
  - 21:00-22:00 Virtual Drink (further information will be distributed)
- Friday 20.11.2020
  - R50 beta source setups/measurements (5 talks + discussion)
  - CMOS sensors (5 talks + discussion)

#### ...many thanks to

Next RD50 Workshop in person in Valencia.

Stay healthy and in good mood!

- the session chairs and discussion session leaders, in person in Valencia.
- · ... all speakers
- the local organization team
  - ... Aneliya, Esteban, ....



.. to Veronique Wedlake for doing such a great job as RD50 secretar

.. to Maurice Glaser for helping to handle the RD50 finances

while enjoying his retirement in Brazil!

# **Enjoy the Workshop!**

