



RD50 Workshop 11/29 - 12/2 2022



Welcome to The 41st RD50 Workshop

Radiation hard semiconductor devices
for very high luminosity colliders

Sevilla Nov. 29th to Dec 2nd

Salón de Grados

2^a Planta



<https://indico.cern.ch/event/1132520/>



Escuela Técnica Superior de
INGENIERÍA DE SEVILLA

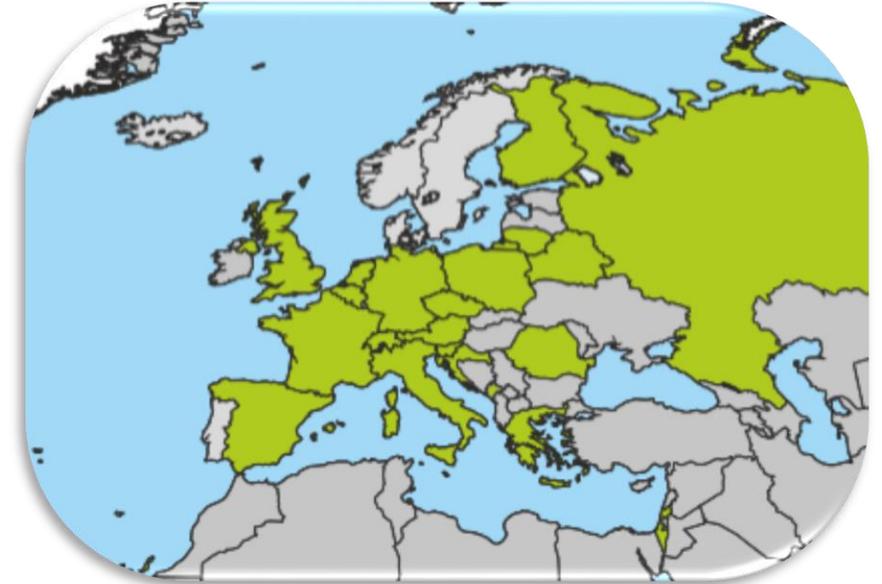
The RD50 Collaboration



- RD50: 66 institutes and 430 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 (Uni & DESY), Karlsruhe, Munich (MPI & MPG HLL)), **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)

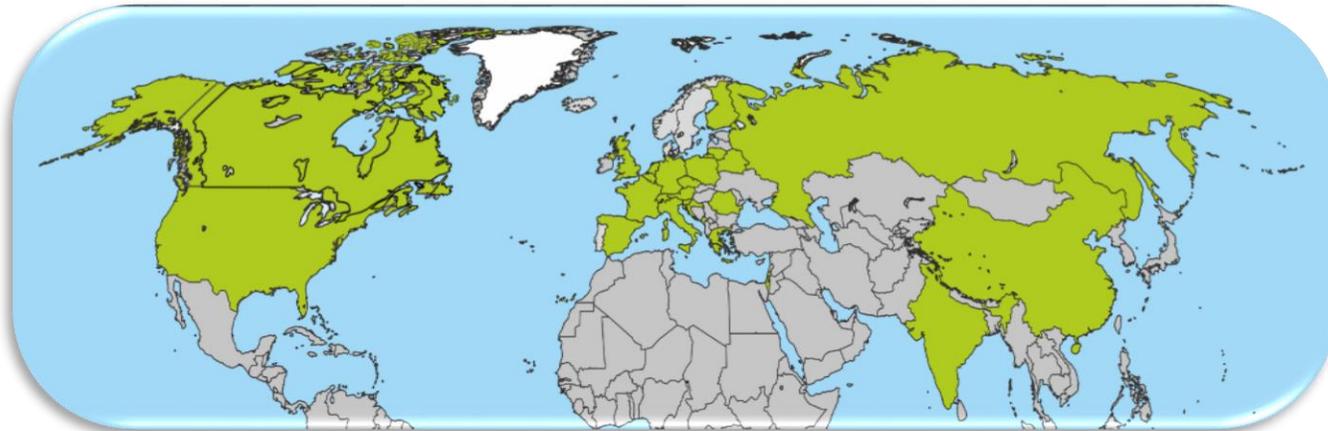


8 North-American institutes

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

7 Asian institutes

China (Beijing-IHEP, Dalian, Hefei, Jilin, Shanghai),
India (Delhi), **Israel** (Tel Aviv)



Full member list: www.cern.ch/rd50

Organizational Structure / Work Program



Covering all fields of semiconductor detectors exposed to radiation

Co-Spokespersons
Gianluigi Casse and *Michael Moll*
 (Liverpool University, UK & CNM-IMB, Barcelona, Spain)

Targeting new solid-state detector technologies including high precision 4D detectors

Spokespersons and management team were re-elected for two years in June 2021

CB chair was re-elected for 2 yrs. in December 2020

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/GaN 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
- Very high radiation fluences
- 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 (S.Hidalgo)
- HVCMOS (E. 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 (Caribou, Alibava)
- Comparison:
 - pad-mini-full detectors
 - different producers
- Radiation Damage in HEP detectors
- Timing detectors
- Test beams (M.Bomben & G.Casse)

RD50 work program and key achievements documented in a 5yrs work plan 2018-23 (70 milestones)

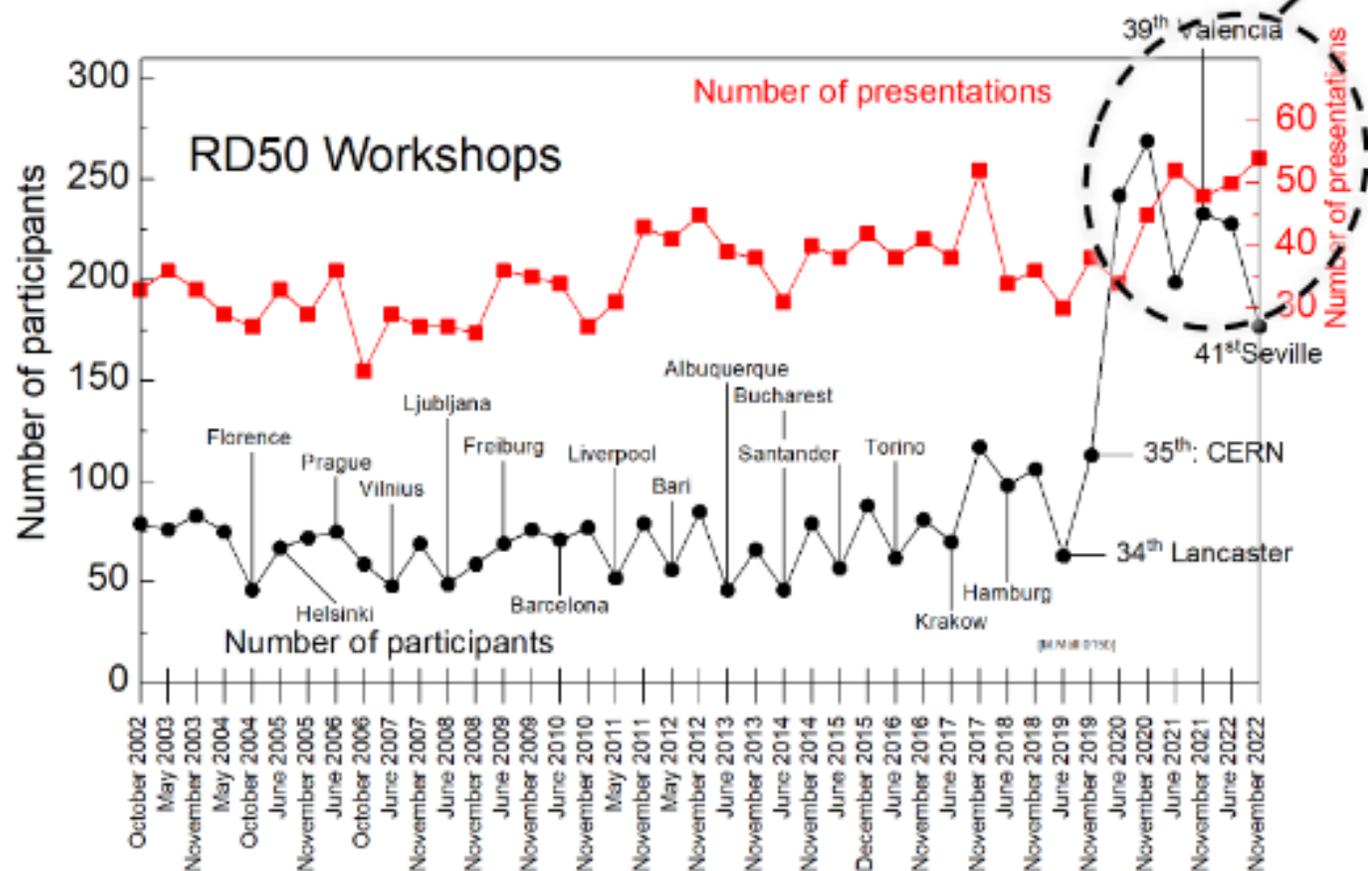
Collaboration Board Chair & Deputy: G.Kramberger (Ljubljana) & Daniel Münstermann (Lancaster), Conference committee: U.Parzefall (Freiburg)
 CERN contact: M.Moll (EP-DT), Secretary: V.Wedlake (EP-DT), Budget holder: M.Moll & M.Glaser (EP-DT), EXSO: R.Costanzi (EP-DT)

[LHCC-SR-007]

RD50 Workshop statistics

- RD50 holds every year two RD50 workshops
- Average numbers for RD50 Workshops (since 2020):
<46 talks> <234 participants>

Online/Hybrid workshops



- November 2021 : Valencia, Spain
 - First in-person workshops since November 2019
 - 233 registered participants (>50% of collaboration)
 - 48 talks and 5 discussion sessions in 3 days
- June 2022 : CERN, Geneva, CH
 - 40th RD50 Workshop
 - Hybrid Workshop (in-person/online)
 - 1st 4-day Workshop (Tuesday – Friday)
 - 228 registered participants
 - 72 in-person participants (Sunday before workshop)
 - 50 talks – 7 discussion sessions
 - Long CB meeting (ECFA Roadmap Implementation)
- November 2022 : Seville, Spain
 - 41st RD50 Workshop
 - Hybrid Workshop (in-person/online)
 - 2nd 4-day Workshop (Tuesday – Friday)
 - 54 talks + 6 discussion sessions
 - Long CB meeting (ECFA Roadmap Implementation)
 - 60 in-person participants + remote participation
- Summer 2023 not fixed
- Autumn 2023 CERN

Program: 41st Workshop [4 days]



- **DAY1** - Tuesday 29.11.2022

- 9:00-13:00: **Defect, Material and Sensor Characterization - Silicon** (10 talks)
- *Lunch*
- 14:00-15:20 **Defect, Material and Sensor Characterization - Silicon** (2 talks + discussion)
- 15:20-15:40 **Irradiation Facilities** (1 talk)
- 15:40-18:00 **Visit to the National Accelerator Center Facilities** (CNA) simultaneous with CB
- 16:10-19:10 **Collaboration Board** (closed session – RD50 institute representatives)
 - *Main topic: DRD3 Implementation & Next RD50 Workplan*

- **DAY2** - Wednesday 30.11.2022

- 9:00-11:40: **Wide Bandgap Semiconductors – SiC and GaN** (5 talks + discussion)
- 11:40-13:00: **Irradiation Facilities** (3 talks + discussion)
- *Lunch*
- 14:00-17:05 **New Structures & TPA** (7 talks + discussion)
- *Evening: Tourist Visit to the Magallanes/Elcano Historical Sites*

54 talks
&
6 discussion
sessions

Program: 41st Workshop [4 days]



- **DAY3** - Thursday 1.12.2022

- 9:00-17:00: **LGAD – Low Gain Avalanche Detectors** (10 talks)
- *Lunch*
- 13:50-17:40: **LGAD II** (8 talks + discussion)
- *Evening: Workshop Dinner*

- **DAY4** - Friday 2.12.2022

- 9:00-13:00: **MAPS and CMOS** (8 talks + discussion)
- *End of Workshop*

54 talks
&
6 discussion
sessions

Visit to the Historical Magallanes/Elcano Sites (Wednesday Evening)



Archivo de Indias
(Archive of the Indies)



Casa de la Contratación
(House of Trade)



Muelle de las Mulas
(Mules' Pier)



Torre del Oro
(Tower of Gold)



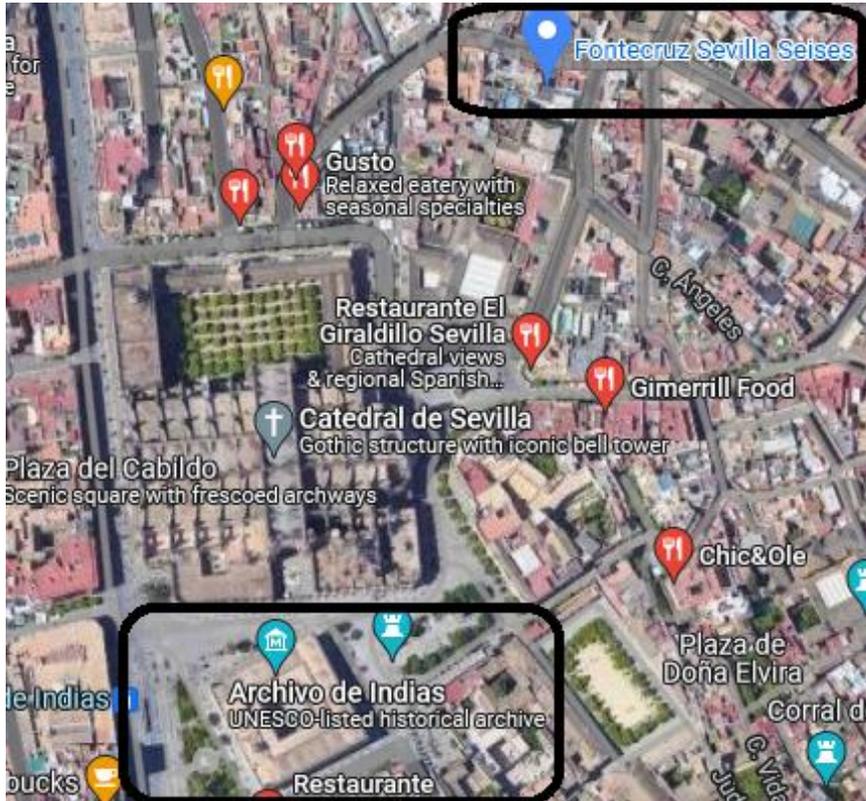
Dinner on Thursday evening

Fontecruz Sevilla Seises



• More details on Thursday

- Bus Line C1 up to Prado de San Sebastián
- Tram Line from Prado de San Sebastian to Archivo de Indias
- Walk to Calle Segovia 6



Thanks to Session and Discussion Chairs



• Tuesday

- 9:00 – 10:30 Defects & Materials: Michael Moll
- 11:00- 13:00 Defects & Materials: Ioana Pintilie/Thomas Ceponis
- 14:00-15:20 Defects & Materials: Ulrich Parzefall
- **Discussion: Defects & Materials** Ioana / Michael

- Collaboration Board: Gregor Kramberger

Wednesday

09:00-10:20 Wide Band Gap - Thomas Koffas

10:50-11:40 Wide Band Gap - Giulio Pellegrini

Discussion: Wide Band Gap Sensors: Giulio Pellegrini

11:40-12:40 Facilities: Igor Mandic

Discussion: Facilities Igor Mandic

14:00-15:40 New Structures: Gianluigi Casse

16:40-16:40 New Structures/TPA: Iván Vila

Discussion: New Structures/TPA: Gianluigi/Iván

Thursday

- 09:00-10:30 LGAD I – Salvador Hidalgo
- 10:50-12:50 LGAD II – Roberta Arcidiacono
- 13:50-15:10 LGAD III – Nicolo Cartaglia
- 15:40-17:00 LGAD IV – Esteban Currás
- **Discussion: LGAD --- Nicolo/Roberta**

Friday

- 09:00-10:20 CMOS I – Rogelio Palomo
- 10:50-12:40 CMOS II – Eva Vilella
- **Discussion: CMOS sensors - Eva**

Many thanks to ...



- ... all speakers
- the local organization team
 - ... Michael, Esteban, Daniela,
- ... and on behalf of all RD50
 - .. to **Veronique Wedlake** for doing such a great job as RD50 secretary!
 - .. to **Maurice Glaser** for helping to handle the RD50 finances while enjoying his retirement in Brazil!
- *Thanks to Gianluigi:*
 - *As Michael has to attend online, we thanks to Gianluigi for being the Sevilla local RD50 spokesperson*

Enjoy the Workshop



- **Sevilla, where the Old and the New join with Joy**



Tue 29th



18°
5°

Wed 30th



18°
9°

Thu 1st



18°
7°

Fri 2nd



18°
9°

