

Second DRD3 week Introduction to the WG2 session

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Project proposals and MoU preparation

DRD3

- 12 project proposals received so far on hybrid timing sensors → see discussion session at the end of today meeting
 - Additional projects are welcome
- Three projects included so far in the draft of the MoU Annex7
 - Development of TI-LGADs
 - US-Japan Development of Ultra Fast-Time Low Mass Tracking Detectors
 - Novel silicon 3-D trench pixel detectors on 8 inch CMOS process
- Still in discussion if CERN will accept WP in the MoU with intentions and without pledges → probably we will hear more in the DRD3 CB this week

WG 2 - Hybrid Silicon Technologies

This group studies sensors with 4D capabilities for various applications including Time-of-Flight systems with only 1-2 layers of sensors with the best possible timing resolution and large 4D trackers with many layers.

Conveners:

- Alessandro Tricoli (alessandro.tricoli@cern.ch)
- Anna Macchiolo (Anna.Macchiolo@cern.ch)
- Martin van Beuzekom (martinb@nikhef.nl)

WG2 Conveners contact email: drd3-wg2-conveners@cern.ch

Documents

- Summary of Expressions of Interests: [Eols Summary](#)
- List of submitted Eols: [Eols](#)

Activities

- [Test-beam and Characterisation Facilities \(liaison to WG5\)](#)
- [Irradiation Campaigns \(liaison to WG3\)](#)
- [Interconnections \(liaison to WG7\)](#)
- [Readout Systems \(liaison to DRD7\)](#)
- [Simulation \(liaison to WG4\)](#)

Useful Links and Tools

- WG2 meetings: [indico](#)
- WG2 e-group (self subscription with admin approval): drd3-wg2-hybrid@cern.ch
- WG2 Mattermost channel: <https://mattermost.web.cern.ch/drd3/channels/wg2-general>

- [WG2 Web Page](#) linked from the [DRD3 general web page](#)
- Dedicated pages for activities relevant to the WG2 with e-mail of liaison persons:

- [Test-beam and Characterisation Facilities \(liaison to WG5\)](#)
- [Irradiation Campaigns \(liaison to WG3\)](#)
- [Interconnections \(liaison to WG7\)](#)
- [Readout Systems \(liaison to DRD7\)](#)
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- Join our [Mattermost channel](#)

→ help us to make this a useful communication channel

Liaisons to other WG

- Test-beam and Characterisation Facilities (liaison to WG5)
 - Jordi Duarte-Campderros (IFCA, Santander)
 - Ryan Heller (LBL)
- Irradiation Campaigns (liaison to WG3)
 - Leena Diehl (CERN)
 - Simone Mazza (UCSC)
 - Xuan Li (Los Alamos)
- Interconnections (liaison to WG7)
 - Mathieu Benoit (ORNL)
- Readout Systems (liaison to DRD7)
 - Abderrahmane Ghimouz (PSI)
 - Manwen Liu (IMECAS)
- Simulation (liaison to WG4)
 - Jörn Schwandt (Uni Hamburg)

Test-beams:

- Start to collect interests for TB campaigns in 2025
 - Organization and requests from WG2 at the different facilities (CERN SPS, DESY, Fermilab +??)
 - DRD3 TB request at SPS for WG2 structures submitted within the activities of WG5

Upcoming TB calls

Activity	Facility	Important dates	Comments
Call for test beam time	DESY	Deadline: November 9th 2024	Beam time for period Q1-2025 to July-2025
TCT-TPA technique school	CERN	Tentative: Feb. 04-06 2025	To be announced by WG5

Contacts:

- Ryan Heller (rheller@lbl.gov)
- Jordi Duarte (jorge.duarte.campderros@cern.ch)

List of TB facilities

Test Beam Facilities at Europe

Facility	Particle type	Particle Energy	Beam spot size	Country
CERN SPS North Area (H2)	electrons, protons, pions, muons, ions	10-400 GeV/c	mm to cm	Switzerland
CERN SPS North Area (H4)	electrons, pions, muons, ions	10-400 GeV/c	mm to cm	Switzerland
CERN SPS North Area (H8)	protons, electrons, pions, muons, ions	10-400 GeV/c	mm to cm	Switzerland
CERN SPS North Area (H6)	electrons, pions, muons	10-120 GeV/c	mm to cm	Switzerland
CERN PS East Area (T10)	hadrons, muons	up to 10 GeV/c	few cm	Switzerland
CERN PS East Area (T9)	electrons, hadrons, muons	0.5-10 GeV/c	few cm	Switzerland
DESY II Test beam facility	electrons, positrons	1-6 GeV/c	few mm	Germany
MAMI (Mainz)	electrons	0.18-1.5 GeV/c	1-2 mm	Germany
Univ. Bonn ELSA	electron	1.2-3.2 GeV/c	mm	Germany
INFN Frascati BTF	electron, positrons	25-700 MeV/c	mm to cm	Italy
PSI High Intensity	protons, pions	590 MeV/c	few mm	Switzerland
PSI μ E4	muons	10-30 MeV/c	few cm	Switzerland
PSI nM1	pions, muons, electrons	100-500 MeV/c	1-2 cm	Switzerland
RAL ISIS	protons	800 MeV/c	cm	UK
COSY (Jülich)	protons, deuterons	0.3-3.7 GeV/c	few mm	Germany
PROTO (Birmingham)	protons	up to 40 MeV/c	1-10 mm	UK

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Interconnections:

- Collect info on hybridization vendors with experience with HEP pixelated devices or methods (ACF-like) with fast turn-around time and low cost for R&D → **strong link to WG7**

WG2 - Interconnections

Our collaboration combine a large amount of knowledge and capabilities on achieving complex interconnect for hybrid detectors.

- Bump-bonding technology for pixel detectors
- Wire-bonding for ASIC interconnect to services
- Connectors and PPO type interface for pixel detector modules
- Emerging interconnect methodologies and R&D tools

Providers of these interconnect technologies are sometime industrial, sometime in the community , sometime in between. Important question often arise :

- What are the typical cost associated to it?
- What are the technological steps, is is compatible with my project?
- Who are the people to contact, what is the procedure?
- Is there collaboration opportunities with the industry ?
- What are the important procedures, how do I do this in my lab ?

This webpage intend to gather the important information to get started with interconnects for hybrid detectors and get into contact with the relevant experts able to provide solutions for your project from R&D up to production.

Contacts:

- Mathieu Benoit (benoitm@ornl.gov)

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Read-out systems:

- Are there read-out boards available already responding to our specifications and needs?
- Should we aim to a common design for WG2?

- Collect requirements for timing read-out chips under-development, **interface with DRD7**
- Advise about sensors floorplan to be compatible with chips being developed at the moment, or already available

The agenda today

DRD3

	Coffee Break & Registration		
	500/1-001 - Main Auditorium, CERN		09:30 - 10:00
10:00	Welcome: Welcome	Gregor Kramberger, Michael Moll	
	500/1-001 - Main Auditorium, CERN		10:00 - 10:20
	Introduction	Alessandro Tricoli et al.	
	500/1-001 - Main Auditorium, CERN		10:20 - 10:35
	Controlled charge multiplication in thin small-pitch 3D pixel sensors	Andrew Donald Gentry	
	500/1-001 - Main Auditorium, CERN		10:35 - 10:55
11:00	Preliminary results on 3D silicon sensors using femtosecond TCT-SPA and TPA-TCT techniques at ELI: Work in Progress		
	Gordana Lastovicka Medin		
	On the properties of signal formation in LGAD sensors	Nicolo Cartiglia	
	500/1-001 - Main Auditorium, CERN		11:15 - 11:35
	Ghosty Ti-LGAD	Ms Danijela Mrkic	
	500/1-001 - Main Auditorium, CERN		11:35 - 11:55
12:00	study of deep carbonated LGAD at IHEP	Yuan Feng	
	500/1-001 - Main Auditorium, CERN		11:55 - 12:15
	First Irradiation Studies of the novel nLGAD Concept	Veronika Kraus	
	500/1-001 - Main Auditorium, CERN		12:15 - 12:35

14:00	Performance of AC-LGADs in radiation hard environment and non-standard charge depositio	Dr Simone Michele Mazza	
	500/1-001 - Main Auditorium, CERN		13:55 - 14:15
	Impact of high deposited energy on Single Event Burnout in LGAD sensors	Dr Matthew Glenn Kurth	
	500/1-001 - Main Auditorium, CERN		14:15 - 14:35
	Research of AC-LGAD strip detector for 4D tracking	Weiyi Sun	
	500/1-001 - Main Auditorium, CERN		14:35 - 14:55
15:00	Update on the DC-coupled Resistive Silicon Detector for 4D tracking	Roberta Arcidiacono	
	500/1-001 - Main Auditorium, CERN		14:55 - 15:15
	Characterization of Low Gain Avalanche Detector Gain by Means of the Transient Current Technique	Mohamed Hijas Mohamed Farook	
	Coffee Break		
	500/1-001 - Main Auditorium, CERN		15:35 - 16:05
16:00	RD50 Common Fund Project - RD50-2023-03: Deep Junction LGAD	Dr Simone Michele Mazza	
	500/1-001 - Main Auditorium, CERN		16:05 - 16:20
	ASIC Development for Timing Measurements using LGAD Sensors	Abderrahmane Ghimouz	
	500/1-001 - Main Auditorium, CERN		16:20 - 16:35
	NEUROPIX: A neuromorphic computing framework for pixelated detector data processing	Mathieu Benoit	
	500/1-001 - Main Auditorium, CERN		16:35 - 16:50
17:00	OPTIMA, a board dedicated to Optimized Precision Timing for Multichannel Acquisition	Federico De Benedetti	
	500/1-001 - Main Auditorium, CERN		16:50 - 17:05
	LGAD and 3D technology at the IMB-CNM	Neil Moffat	
	500/1-001 - Main Auditorium, CERN		17:05 - 17:20
	Summary of Proposed Projects in WG2	Alessandro Tricoli et al.	
	500/1-001 - Main Auditorium, CERN		17:20 - 17:25
	WG2 - Discussion	Alessandro Tricoli et al.	
	500/1-001 - Main Auditorium, CERN		17:25 - 17:55