DRD5 updates

What's covered:

1. European strategy for particle physics
2. MOU status
3. WP activities ⟹ individual WP reports
4. Speaker's board / list of potential speakers
5. Enlargement of DRD5 (next group of institutes)
6. Message from next CERN Director General
7. Name for the collaboration, webmaster

1 European strategy for particle physics: update focused on HEP

DRD5 submitted a contribution (thanks to all!)

Physics Briefing book was released at https://cds.cern.ch/record/2944678

By national submissions: Quantum sensing mentioned in 25 out of 53 submissions

By labs: Quantum sensing happening in 5 out of 8 submissions

By HEPP / LEPP§: HEPP (5 of 71) / LEPP (14 of 27)

LEPP/HEPP (0 of 6)

HEPP: SNSPD's, Quantum Dots, 5D calorimetry*
LEPP: many different technologies*

§ only a small number of known low energy particle physics groups submitted a document to the ESPP update

*most topics addressed by DRD5

1 European strategy for particle physics: update

DRD5 submitted a contribution (thanks to all!)

Physics Briefing book was released at https://cds.cern.ch/record/2944678

Focus on HEP, edited by a number of people (almost exclusively HEP)

R&D on these and other quantum technologies is both developmental and exploratory. Opportunities to develop transformative quantum sensors for PP require awareness of the quantum technology landscape. It is opportunistic, identifying specific characteristics of existing quantum sensors that would potentially enhance existing particle detectors. It may permit entirely new types of measurements (e.g., helicity or polarisation of single particles). Finally, the potential to enhance sensitivity and enable novel sensing modalities for PP through the use of squeezing, back-action evasion, and entanglement will need to be studied. Challenges such as cost, scaling up or readout, must also be addressed.

DRD5 will continue fostering the exchange of expertise and ideas among disparate communities with little prior interactions towards common goals. Considering the very rapid growth in capabilities and range of quantum technologies, potential applications in neighbouring areas and synergies with, and expertise from, many domains must be explored. Dedicated resources and their efficient sharing, as well as transnational access to infrastructures, are required to evaluate the viability of new concepts quickly and coherently. R&D in QS requires a multidisciplinary workforce, familiar with quantum technologies, detectors, as well as particle, astroparticle, and nuclear physics. The shorter time scales of QS-based experiments compared to high-energy PP enable attractive combinations of R&D and physics results.

Key points: Quantum sensing devices for low-energy PP have the potential to significantly supplement and enhance existing high-energy PP detector techniques. It is crucial that dedicated R&D is carried out on a wide range of suitable sensor technologies and this is supported at national and international levels. Particular emphasis should be put on the development of pilot applications in PP experiments.

② MOU status

The MOU is identical for all DRDx's

The MOU addendum format identical for all DRDx's, but the details are specific

DRD5 submitted an addendum draft in June; iteration with CERN in September

DRD5 submitted an updated addendum draft in September

CERN: "... thanks for the draft, this looks pretty good already"

- need to update text on IP:

> The fact that foreground IP (i.e. IP developed in the execution of the R&D programme) is available to other collaboration members cannot be changed nor restricted, it is part of the General Conditions.
>
> Concerning background IP (i.e. IP that existed before the relevant work of the R&D programme started), the institutions are indeed free to say that no such IP will be made available to the whole collaboration, but only to selected collaborating institutions on a need-to-know basis; this is the way I understand the rest of your IP annex.

- need to include deliverables & involved institutes from proposal

INFN: Waiting for feedback on how INFN vs. individual institutes will be managed

3 WP activities ⇒ individual WP reports

Interface to the WP-communities
Steering of networking
Proposing of workshops / community exchange fora
Proposing / shepherding of sub-collaborations
Proposing and following through on WP-specific packages

Coordination of specific projects
Workshop organization

Work Package Leader	Name	Institution name / country	Sub-WP leader	Institution name / country
WP-1	Elina Fuchs	Hannover / Germany	Mia Au	CERN
WP-1	David Hume	NIST / USA		
WP-2	Annapaola Caricato	Bari / Italy	Anne-Mazarine Lyon	CERN
WP-2	Christophe Dujardin	Lyon / France	Yacine Haddad	Bern
WP-3	Loredana Gastaldo	KIT / Germany	Maurizio Pierrini	CERN
WP-3	Andrea Giachero	Milano / Italy	Shion Chen	Kyoto
WP-4	Sofia Qvarfort	Stockholm / Sweden	WP4a: Arne Wickenbrock	Mainz
WP-4	Gerard Higgins	Vienna / Austria	WP4b: Nicolas Fourches	French Alternative Energies and Atomic Energy Commission (CEA)
			WP4c Andrew Geraci	Northwestern
WP-5	Alberto Marino	ORNL / USA		
WP-5	Yevgeny Stadnik	Sidney / Australia		
WP-6	Georgy Kornakov	Warsaw / Poland		
WP-6	Rajdeep Chatterjee	Mumbai / India		

3 Upcoming DRD5 activities (planned)

	Exotic systems WP-1	Quantum materials WP-2	Quantum super-conducting systems WP-3	Macroscopic ensembles WP-4	Quantum techniques for sensing WP-5	Capability expansion WP-6
		Beam tests of QD's at CERN (Aug.)	Beam tests of SNSPD's at CERN (Aug.)			
			Design of a cryogenic test Beam set-up			
Oct. 2025	Collaboration meeting Oct. 30/31		Workshop #1 / CERN Oct. 29 1)			
	data repository at CERN for time-resolved clock/ quantum sensor data		-> white paper -> arXiv			
	Mini-workshop #1 Nov. 12, 2-6pm CET 2)	Radiation / light damage to quantum dots				
	Theory and experimental needs to move forward with the Th nuclear transition as a sensor of BSM physics	Workshop #1 CERN Wed 26/November 3)				
	Mini-workshop #2 Thursday, 15/01, 3:30pm-6:30pm	-> stdized test protocol	Packaging & precise device characterization		Many-to-1 entanglement Heterodox entanglement Squeezing in other syst.	
Feb. 2026	Collaboration meeting		Workshop #2 Feb. '26 / CERN			
	Bound state systems - calculations and experiments	Simulation of QD's in medium (non-continuous)			optomechanics for particle physics detection	
	Mini-workshop #3 April			Workshop #1 23rd of March 2026		Handbook on Quantum Sensors
	clock networks/ portable clocks		Heterodyne cavities (?)	Geant4 simulation of NV diamonds and of polar-ized materials	Together w/ WP-1	
	Mini-workshop #4 July			Workshop #2		

In parallel: development of devices, characterizations with sources or in beam, simulations, theory developments

DRD5 coordinates such activities, proposes directions, enables exchanges, fosters collaboration, supports initiatives and interdisciplinarity

1) https://indico.cern.ch/event/1580512/ 2) https://indico.cern.ch/event/1598214 3) https://indico.cern.ch/event/1598214

4 Speaker’s board / list of potential speakers

Need for volunteers to wave the flag

Enlargement of DRD5 (next group of institutes)

5

UK:
- Oxford University
- Univ. of Warwick
- Univ. of Birmingham
- NPL
- Imperial College
- Univ. of Southhampton
- Univ. of Sussex
- Univ. of Manchester
- Univ. of Liverpool

France:
- SYRTE / OBSPM
- CNRS - U. Sorbonne Paris Nord
- LKB
- ILM - University Lyon 1
- IRFU / CEA Saclay

Canada:
- McGill Univ.
- TRIUMF

USA:
- UCLA
- ORNL
- Northwestern Univ.
- Caltech
- MIT
- Arizona State Univ.
- Yale
- Univ. of Arizona
- NIST
- LBNL
- Univ. of Delaware
- FNAL
- SLAC

Mexico:
- U. de Aguascalientes

Spain:
- U. de Zaragoza
- U. de Cartagena
- U. de Valencia
- U. de Lleida
- IEM, CSIC

Switzerland:
- U. of Geneva
- U. of Zürich
- CERN (QTI)
- ETHZ

Netherlands:
- U. of Groningen

Norway:
- Oslo University

Germany:
- PTB
- Univ. Ulm
- Leibnitz Univ. Hannover
- KIT, Karlsruhe
- TU München
- DESY
- MPP Garching
- HU Berlin
- FBH Berlin
- Univ. Heidelberg
- Univ. Tübingen
- Univ. Düsseldorf
- Univ. Mainz
- Univ. Bremen / ZARM
- Semiconductor Lab HLL / MPG
- TU Darmstadt

Italy:
- U. of Pisa & INFN
- U. of Pavia
- U. of Firenze
- U. of Milano-Bicocca
- Fondazione Bruno Kessler, Trento
- IOM CNR, Elettra Sincrotrone, Trieste
- Univ. of Bari / INFN
- INFN Padova
- Univ. Roma 1 & 3
- Univ. Napoli
- INFN Roma Tor Vergata
- INFN LNF
- INFN Trento (TIFPA)
- INFN Torino
- INFN LNL
- INFN Lecce
- INFN Roma Tor Vergata
- U. of Camerino

Finland:
- Helsinki Inst. of Physics
- VTT

Poland:
- Warsaw TU
- Nat. Centre Nucl. Research / Warsaw
- Nat. Lab. FAMO / Torun

Czech Republic:
- Czech Tech. University
- University West Bohemia
- Charles Univ., Prague

Japan:
- QUP / KEK
- Kyoto University
- Tokyo University / ICEPP
- University of Shizuoka

Taiwan:
- Academia Sinica & NTU

Australia:
- University of Western Australia
- Swinburne University of Technology

Korea:
- Korea University

China:
- IHEP, Beijing

Iran:
- Isfahan U. of Tech.

India:
- IITTP, Tirupati
- IEM, Kolkata
- TIFR, Mumbai
- LPU, Punjab
- University SOA Bhuvaneswar
- Institute of Engineering and Management, Kolkata

Israel:
- Technion, Haifa

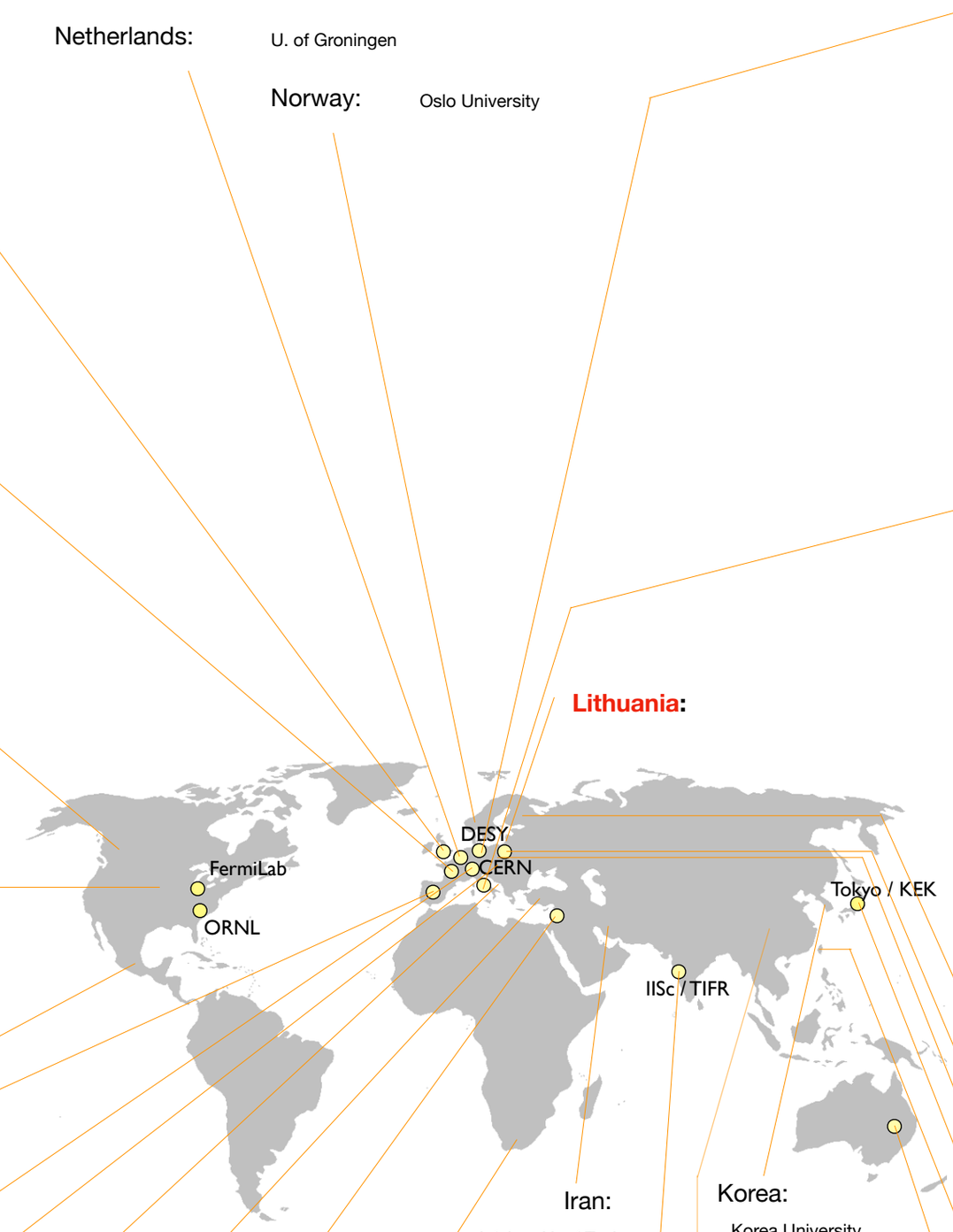
South Africa:
- U. of Cape Town

Türkiye:
- Ankara Univ.
- Duzce Univ.
- Sabanci Univ.

Austria:
- IQOQI Vienna
- TU Wien

Croatia:
- Inst. of Physics, Zagreb

Lithuania:



6 Message from next CERN Director General

Meeting on Tuesday Oct. 28, together with Steven Worm

- M.D, S.W. explained context, goals, structure of DRD5
- support for ongoing anchoring at CERN, for CERN QTI until and of QTI-2
- evaluate QTI (and indirectly, DRD5) outcomes in 2028
- strong support for non-collider activities (AD, ISOLDE, other non-collider experiments)

7 DRD5 identity and public face

- we need a web master

- we need a better name than DRD5