DRD4 Working Group 4.3

Technological Activities

Survey responses summary

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DRD4 Community Meeting
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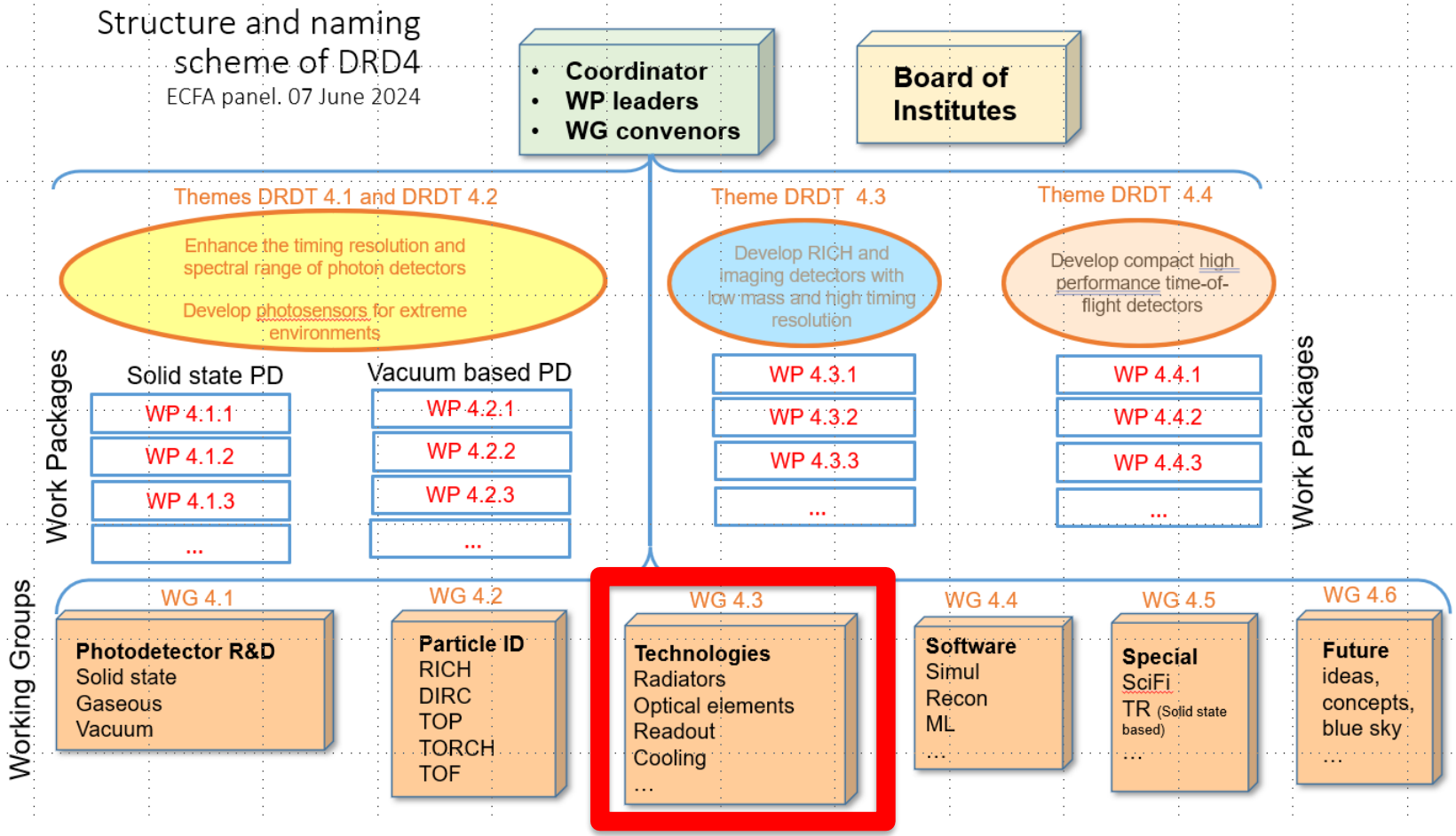
Working Group 4.3 Technological Activities



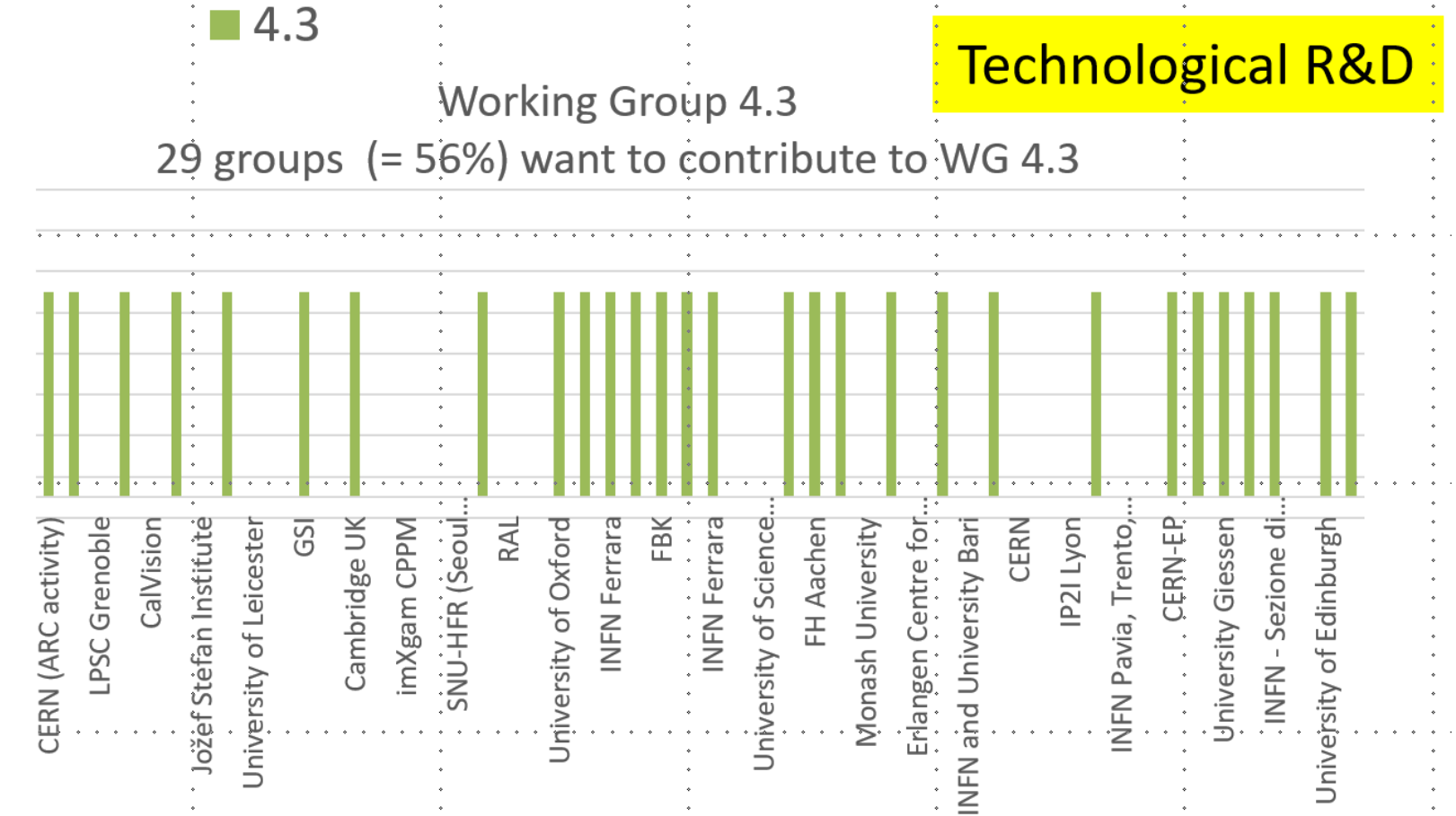
Survey n. 4: WG 4.3

WG3 focuses on the technologies of radiators, optical elements, control systems, readout and software for PID detectors.
It aims at gathering competences and contributions from all interested groups and experts in the field.

From the first survey we identified 5 areas of interest, already presented in the last meeting:

1. **RADIATORS** Gas, aerogel, liquids, solids; new materials; radiator design and characterization before/during experiment; tunable refractive index gas/aerogel; aerogel: larger modules and higher photon yield; liquid with optical purity for large volumes; dual radiators; circulation systems for fluids; properties monitoring; scintillation.
2. **OPTICAL TECHNOLOGIES** Design, construction, characterization; light-weight components; material compatibility; thermo-mechanical properties; coatings (anti-reflection, filtering, wavelength shifting); mirror/lenses and plates, standard and micro; optical glues; new concepts for optics design, aspherical surfaces, chromatic correction, segmentation/multiplexing.
3. **THERMO-MECHANICAL ENGINEERING DESIGN** Light, low radiation/interaction length design; materials; temperature monitoring, stabilization, shielding; active local cooling; annealing in situ; coolants; active optics, active alignment systems; high-pressure vessels; radiation shielding.
4. **OPTO-ELECTRONICS READOUT OF THE SENSORS** Readout, f/e, b/e, high-rate/high-bandwidth DAQ, trigger/self-trigger; low-consumption f/e; rad-hard components; design for extended temperature ranges; mitigation of radiation effects.
5. **ANCILLARY INSTRUMENTATION** Instrumentation for control of systematic uncertainties; calibration/alignment/monitoring; measurement, online/offline of: sound speed, refractive index, transparency, fluid purity, temperature/pressure of radiators, mirrors/others position/alignment/transmissivity/reflectivity, light intensity; gain, photo-detection efficieny; devices for DSS.

Survey n. 4: WG 4.3



Survey n. 4: WG 4.3

27 Institutes (1/2 of the total) confirmed interest in participating to WG4.3 activities:

Aachen, Ancona, Barcelona, Bari, Bologna, Bucharest, Cambridge, CERN (ALICE, ARC, EP),

FBK, Ferrara, Genova, Giessen, GSI, Grenoble, IC London, IHEP Beijing, Iowa, Milano Bicocca,

Oxford, Padova, Perugia, RAL, Trieste, Wuppertal, Yerevan

from: Armenia, China, France, Germany (4), Italy (10), Romania, Spain, Switzerland (CERN: 3), United Kingdom (4) , USA

+ Photonis. Other indirect expression of interest are present.

Contributions proposed in broad range of activities, facilities, tools:

know-how, tests systems, calibrations, characterizations, FEE, FPGA firmware development, …

Interests/goals cover new concepts, new materials, new readout etc.

Institute	submitter	4.3 only	Main contribution
Aachen	Karl Ziemons		Test bench for SiPM from different manufacturers
Ancona	Luigi Montalto	X	Structural/optical Characterization. Ultrasound based systems for treatment and material diagnostics. Development of mesurements and characterization methods and systems on purpose (non-destructively oriented)
Barcelona	David Gascon		FE ASIC and sensor co-design
Bari	Eugenio Nappi		Spectrophotometer/integrating sphere for aerogel tiles characterization
Bologna	Alessandro Montanari		Implementation and test of FEE for SiPM.
Bucharest	Florin Maciuc		Develop Front-End Electronics (including software and firmware) for 4D LHCb-RICH in IInd Upgrade, test radiation hardness and model annealing. Develop detection and testing systems.
Cambridge	Christopher Rob Jones		Concepts and prototypes for front-end precision time-resolved readout electronics and sensor integration. Trigger and data acquisition systems and front-end prototypes for beam tests. High rate, high bandwidth front-end data acquisition implementations
CERN-ALICE	Antonello Di Mauro		
CERN-ARC	Roger Forty		Providing feedback on technological requirements for new compact RICH concept.
CERN-EP	Carmelo D'Ambrosio		Provide know-how, whenever possible, test set-ups for all a series of activities.
FBK	Alberto Gola		Interconnection to readout electronics both for low and high-density interconnection.
Ferrara	Roberto Calabrese		Aerogel characterization stage with spectro-photomer, laser beams, remote control motors. Mirror characterization stage with Schak-Hartmann sensor and CCD camera for point-like image
Genova	Roberta Cardinale		Monitoring/Alignment/Calibration systems for future high-performance RICH detectors, finalized to control of systematic effects. Fast tools for parametric optimization of the optical layout.
Giessen	Claudia Hoehne		Test setup in lab with FLX-712/BNL-712 readout card for FPGA based (Xilinx Kintex UltraScale XCKU115) selftriggered readout; aerogel based mRICH detector for in-beam tests at GSI; shared position with Belle II for FPGA firmware developments.
GSI	Jochen Schwiening		Exchange of knowledge
Grenoble	Sara Marcantili		
IC London	Michael Andrew Mccann	X	New radiators development
IHEP Beijing	Sen Qian		The Test and Study of the Fast FPMT in ps level.
Iowa	Yasar Onel		QE Test set-up
Milano Bicocca	Claudio Gotti	X	Design of front-end ASIC in 65nm technology for photodetectors capable of timing measurements at high rate. Focus on low gain MCPs,does not exclude SiPMs and MaPMTs.
Oxford	Guy Wilkinson		
Padova	Gabriele Simi		
Perugia	Mauro Piccini		Frontend and readout electronics. Calibration and monitoring systems for photo sensors
Photonis	Emile Schyns		Hardware TBD. Find best possible technical solutions.
RAL	Antonis Papanestis		RICH Design, new radiators
Trieste	Fulvio Tessarotto		Investigation of performance limits of existing technologies (gaseous photon detectors, LAPPD). Study of gas radiator material properties: perfluorocarbons, NOVECs and RICH gas system performance.
Wuppertal	Karl-Heinz Kampert		QE test set-up, dark-room for sensor evaluation, FPGA development for time-based selection algorithms
Yerevan	Amur Margaryan		Clean room, evaporation set-up, machine shop, electronic shop.

Institute	submitter	Main interest/goal
Aachen	Karl Ziemons	TOF measurement based on optical modulation (Pockels effect)
Ancona	Luigi Montalto	Contribute to characterization and quality control of new and well established materials Development of quality control system for materials and systems
Barcelona	David Gascon	Solid state hibrid sensor (vertically integrted to the FE ASIC) with < 50 ps single photon time resolution for RICH, TORCH and ToF detector
Bari	Eugenio Nappi	Selection of most suitable aerogel tiles
Bologna	Alessandro Montanari	Stay updated on technological activities and development of front-end electronics.
Bucharest	Florin Maciuc	Develop new electronic and opto-electronics systems (DAQ, small detectors, etc). Academic (PhD students and MSc.)
Cambridge	Christopher Rob Jones	Time resolved readout for future RICH detectors. Initially in the framework of LHCb Upgrade 2 but more generally for future detectors/accelerators. Our interests here overlap with or are complementary also to some of the activities under DRD7.
CERN-ALICE	Antonello Di Mauro	
CERN-ARC	Roger Forty	Developing the new compact RICH concept.
CERN-EP	Carmelo D'Ambrosio	New high space and time precision RICHes in all their aspects.
FBK	Alberto Gola	Development of interconnection techniques to readout electronics.
Ferrara	Roberto Calabrese	Cost effective solutions for extended RICH momentum range
Genova	Roberta Cardinale	Development of an housing module with high fill factor, large area and with local active cooling for SiPMs.
Giessen	Claudia Hoehne	Usage of SiPms for single photon detection in Cherenkov counters. Make use of online pattern recignition in FPGAs to reduce backgrounc
GSI	Jochen Schwiening	Future DIRC detector applications
Grenoble	Sara Marcantili	Development of a compact TOF detector based on Cherenkov radiators.
IC London	Michael Andrew Mccann	Developing new solid radiators for wide momentum range coverage
IHEP Beijing	Sen Qian	
Iowa	Yasar Onel	Photon detector development
Milano Bicocca	Claudio Gotti	RICH detector for LHCb RICH upgrade 1b/2
Oxford	Guy Wilkinson	
Padova	Gabriele Simi	Use of metamaterials as radiators
Perugia	Mauro Piccini	Monitoring systems to evaluate periodically the time resolution and the relative efficiency of photo sensors.
Photonis	Emile Schyns	Customized photon detectors. Innovative detection technologies.
RAL	Antonis Papanestis	RICH simulation, new radiators
Trieste	Fulvio Tessarotto	Development of innovative RICH configurations: pressurized argon RICH (ePIC at EIC), Aerogel-based RICH0 (AMBER at CERN)
Wuppertal	Karl-Heinz Kampert	development of data reduction and local triggering concepts for application of SiPM based Cherenkov detectors and sensors in combination with self-triggered free streaming DAQ concepts
Yerevan	Amur Margaryan	Develop RFPMT technology.

Discussion

- Thanks to the participants we already have a good starting set of proposed contributions;
- Some clarification about vague definitions and activities common to other WGs are needed;
- *The community should identify the technological show-stoppers for future experiments and define an action plan.* We should identify missing critical items, encourage and support their study;
- The activities in WG 4.3 will maintain a good degree of freedom and flexibility;
- The main commitment is to progress towards your goals and regularly report about progress and problems;
- All types of exchanges and collaborations are encouraged;
- The WG is open to other contributors and other activities;
- The WG will promote, help and support related WP activities;
- We are also contributing to building a strong community.