



DRD4 – Detector R&D Collaboration on
Photodetectors and Particle ID

+ SciFi tracking + Transition Radiation

»Update for the DRD 4 community«

Zoom meeting

Organizers: P. Krizan and C. Joram

On behalf of DRD4 Preparation Team

Material and Links

- The Roadmap (248 p) <https://cds.cern.ch/record/2784893?ln=en>

- Implementation of the ECFA Detector R&D Roadmap

<https://indico.cern.ch/event/957057/page/27294-implementation-of-the-ecfa-detector-rd-roadmap>

DRD 4 Implementation zone. Incl. short chronological overview: <https://indico.cern.ch/event/1214407/>

Older, but still interesting

- ECFA Detector R&D Roadmap Symposium of Task Force 4 Photon Detectors and Particle Identification Detectors

Thursday 6 May 2021 <https://indico.cern.ch/event/999817/>

Detector R&D Collaborations in the context of the ECFA Roadmap

- The Roadmap has identified **detector technologies**¹⁾ that need to be developed for the next generations of particle physics experiments.
- To address those needs in a coordinated and efficient way, **Detector R&D Collaborations** are being formed.
- Some similarity to the CERN R&D collaborations before the construction of LHC (still alive RD50, RD51...)
- Collaborations shall form, define their work programme, define and organise their funding, define their management, report once per year to a DRD Committee at CERN.
- Joint R&D should increase efficiency (avoid duplication, form partnerships) and lead to synergies (share equipment, samples, know-how).
- The label **ECFA Roadmap** should enhance chances for extra funding from Funding Agencies. The participating groups (nationally clustered?) request funds from their FAs.

¹⁾ IMPORTANT: we are talking about **technological** (strategic) detector R&D in the fields photodetectors and Particle ID. This is different from **experiment-specific developments and optimisations** (adaptation of geometry, full-size prototype, industrialisation of production process, ...). The latter R&D shall remain fully under the responsibility of the experiments.

Scintillating Fibre tracking

- ECFA Roadmap panel decided to include SciFi tracking in DRD 4.
 - SciFi uses similar photodetectors than RICH, deals with similar signal levels, FE electronics, light structures
 - SciFi is also linked to Calorimetry (WP6). Use of organic scintillators
 - So far, the following institutes have expressed interest in DRD 4
 - LHCb SciFi institutes Sune Jakobsen, Pascal Perret
 - Mu3e, Geneva, ETH-Z Sandro Bravan, Rainer Wallny
 - CERN SY-BI (Beam instrumentation) Inaki Ortega Ruiz
 - GScan, Estonia (industrial) Madis Kiisk
 - We'll soon hold a separate meeting of the SciFi subteam to discuss activities and possible projects
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Transition Radiation

- TR is a well established PID method and as such fits in DRD4.
- Classic TR detectors are usually based on gaseous detectors (like straws, MWPC) and should be in DRD 1
- It was agreed to have solid state based TR R&D in DRD 4. So far, there is only 1 group.

Status

- A preparation team (volunteers) has been formed (see next slide)
- A collaboration structure has been defined and agreed on
- Program broken down in Working Groups and Work Packages (themes)
- Survey 4 clarified which group is interested in which WG and WP
- Survey 4 gave first indication on (available) resources (FTE, EUR)
- DRDC chair nominated by CERN Director of Research: Thomas Bergauer
- Common Fund question: suspended until collaboration is approved and management elected (early 2024).

DRD4 Preparation team

- Sajan Easo, RAL, UK
- Massimiliano Fiorini, Ferrara, IT
- Roger Forty, CERN, CH
- Christian Joram, CERN, CH, Coordinator
- Peter Krizan, JSI, Ljubljana, SLO, Coordinator
- Imad Laktineh, IN2P3, Lyon, FR
- Rok Pestotnik, JSI, Ljubljana, SLO
- Alessandro Petrolini, Genova, IT
- Fulvio Tessarotto, Trieste, IT

Structure and naming scheme of DRD4

ECFA panel. 07 June 2024

- **Coordinator**
- **WP leaders**
- **WG convenors**

Board of Institutes

Themes DRDT 4.1 and DRDT 4.2

Enhance the timing resolution and spectral range of photon detectors

Develop photosensors for extreme environments

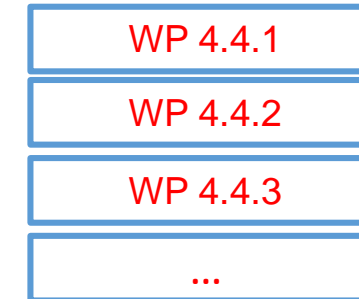
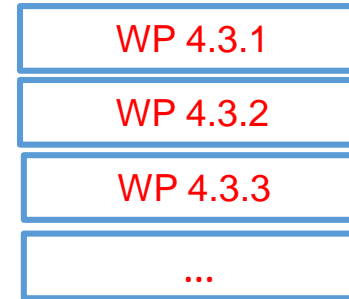
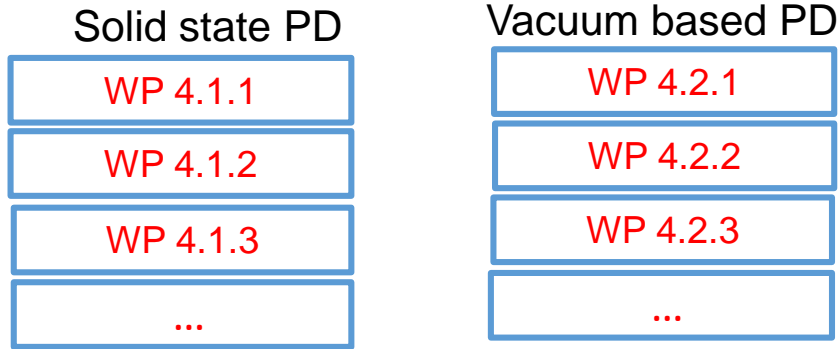
Theme DRDT 4.3

Develop RICH and imaging detectors with low mass and high timing resolution

Theme DRDT 4.4

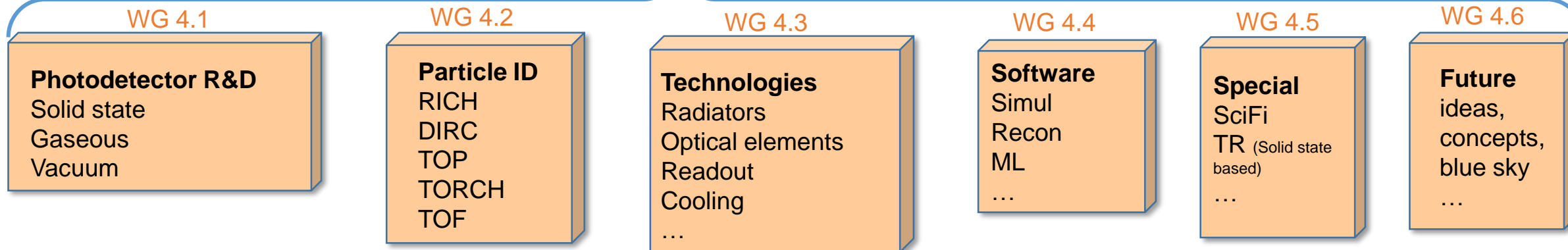
Develop compact high performance time-of-flight detectors

Work Packages



Work Packages

Working Groups

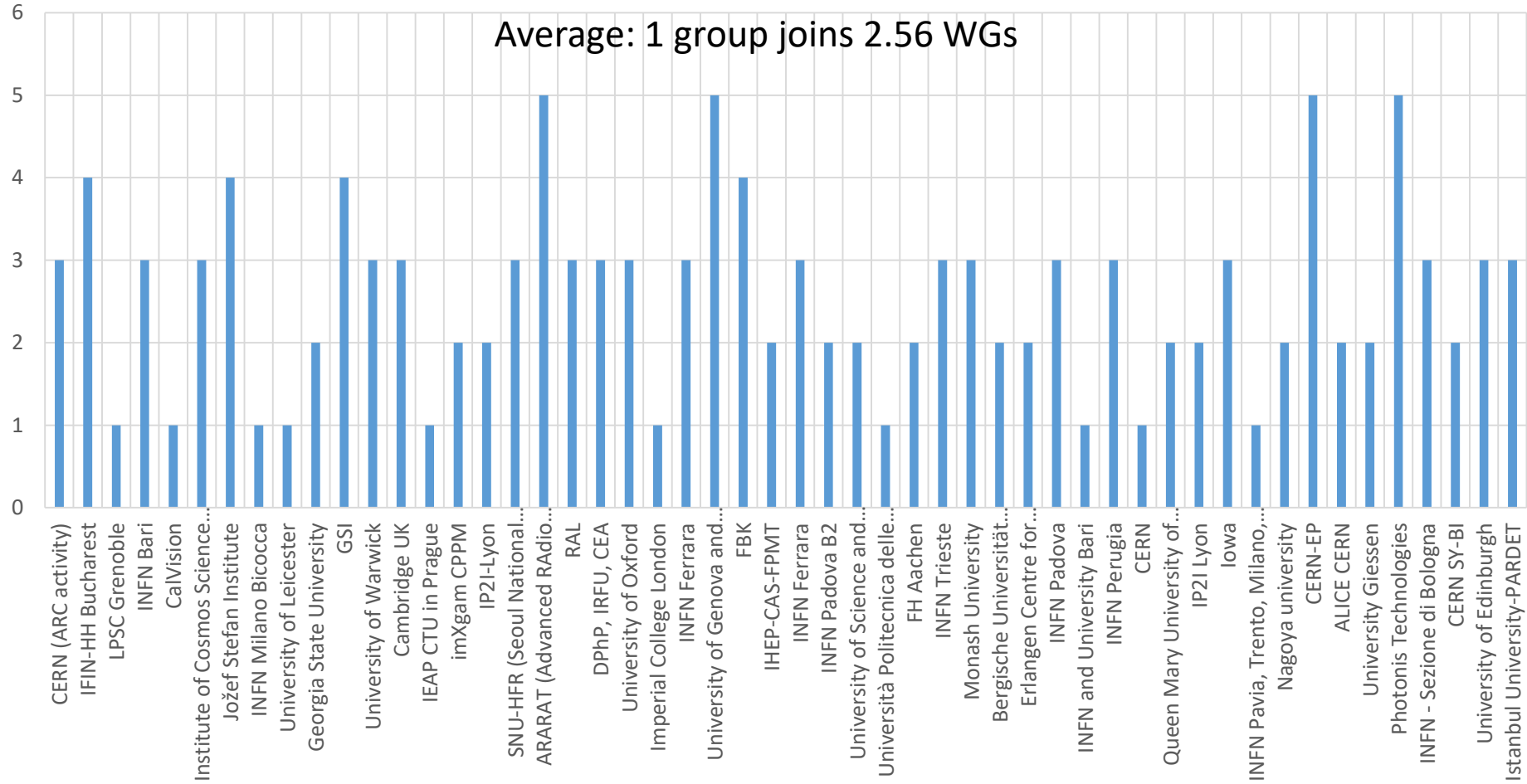


Dedicated status of (semi-)industrial partners

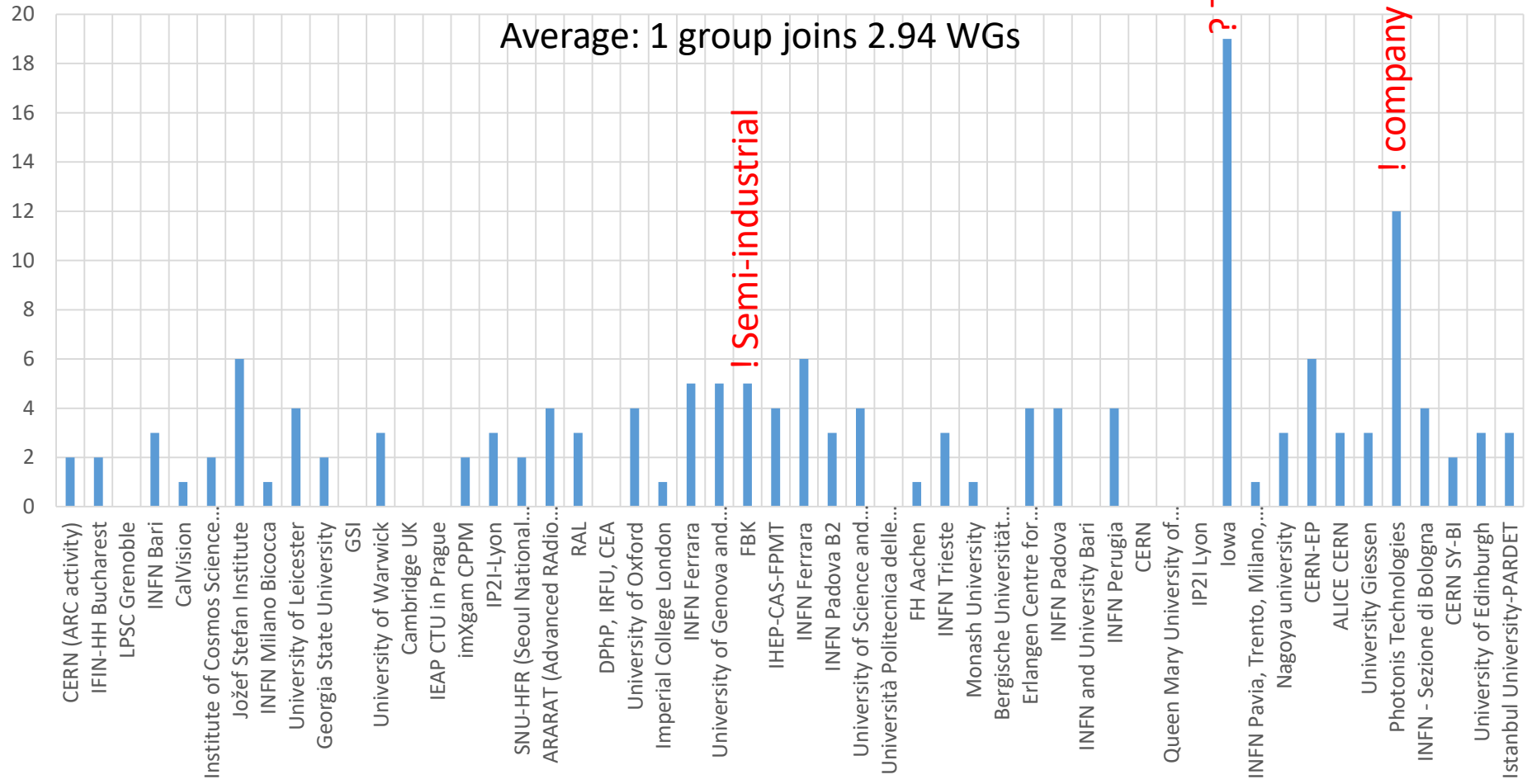
Industrial Partners (definition)

- The Board of Institutes can grant the status of “Industrial Partners” to collaborating industrial partners.
- Industrial partners are not represented in the Board of Institutes.
- Industrial partners do not contribute to a possible Common Collaboration Fund.
- Team members of industrial partners are listed as co-authors on common publications (same rules as applicable to all other collaboration members).
- Industrial partners can participate to the activities of one or several Working Groups
- Industrial partners shall not directly participate to a Work Package. Indirect participation via a collaborating institute may be possible.
- DRD 4 collaboration differentiates between industrial partners and institutions that have to finance themselves partly by commercial income. The latter can still become full members of the Collaboration (i.e. “Collaborating Institutions”).
- In cases where conflicts could arise with their commercial interests, e.g. when the collaboration is going to tender products which they are able to sell, the IB shall decide to not allow them to discuss and vote about these issues in the IB.

Groups joining WGs



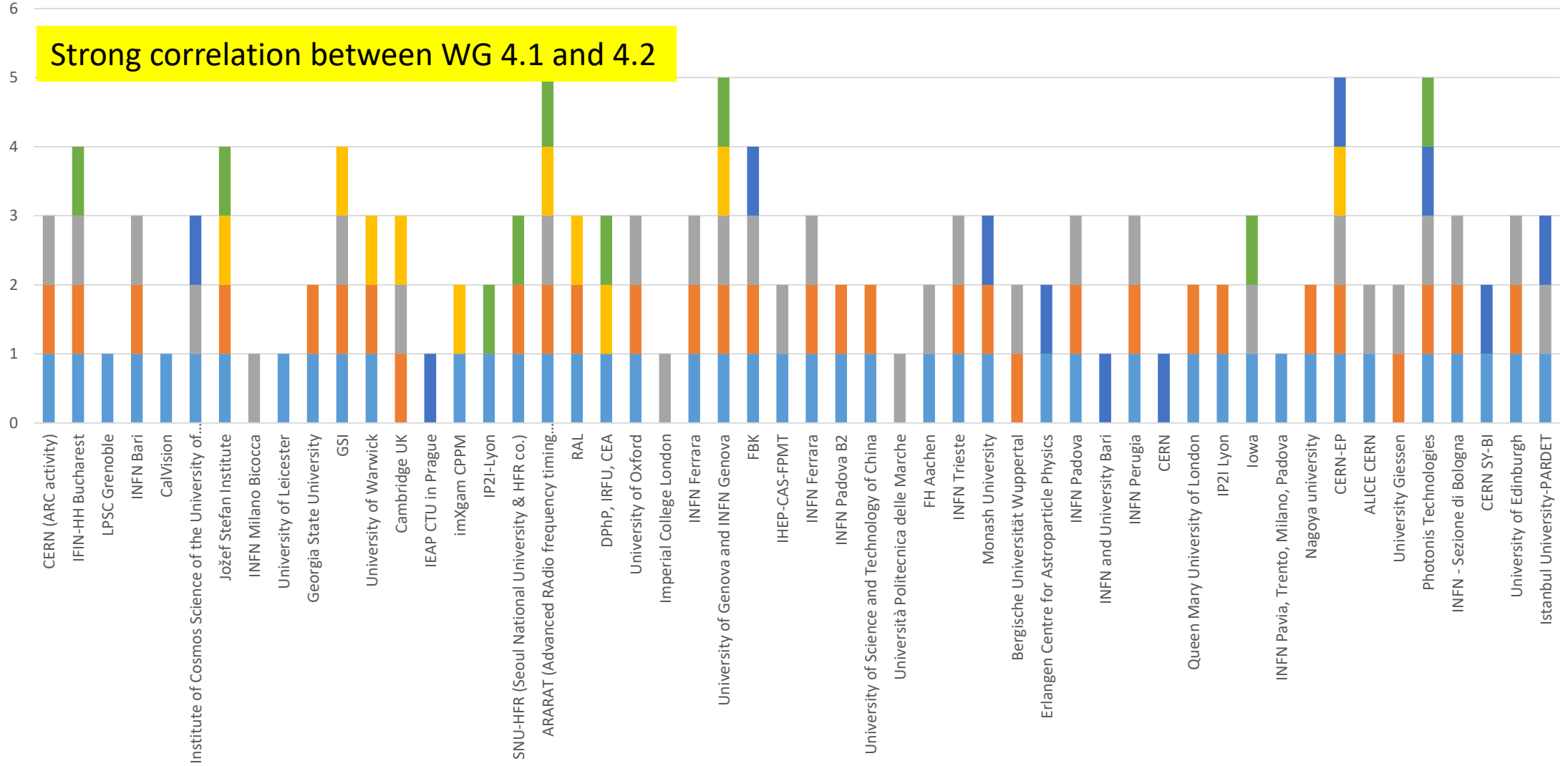
Groups joining WPs



Working Groups

4.1 4.2 4.3 4.4 4.5 4.6

Strong correlation between WG 4.1 and 4.2

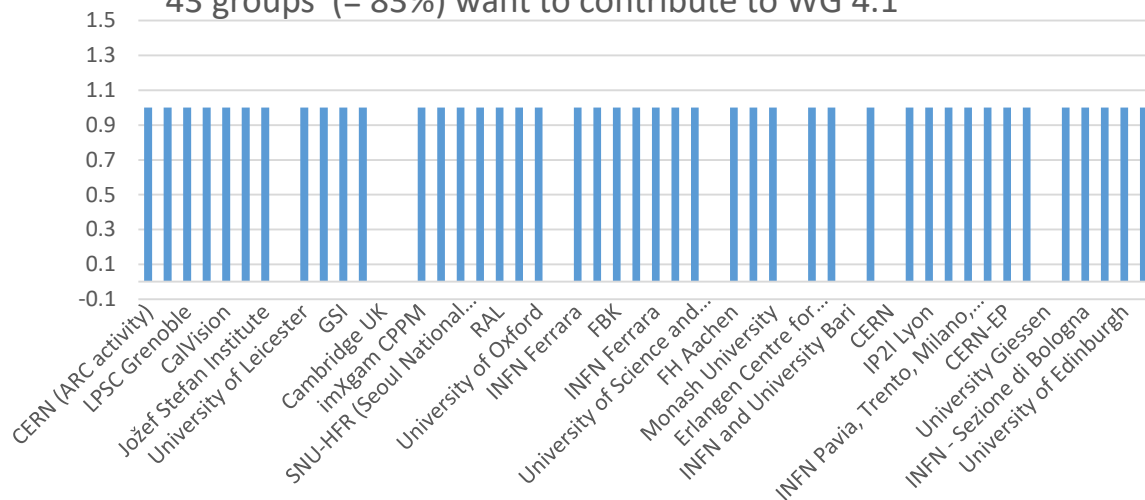


4.1

Working Group 4.1

Photodetectors

43 groups (= 83%) want to contribute to WG 4.1

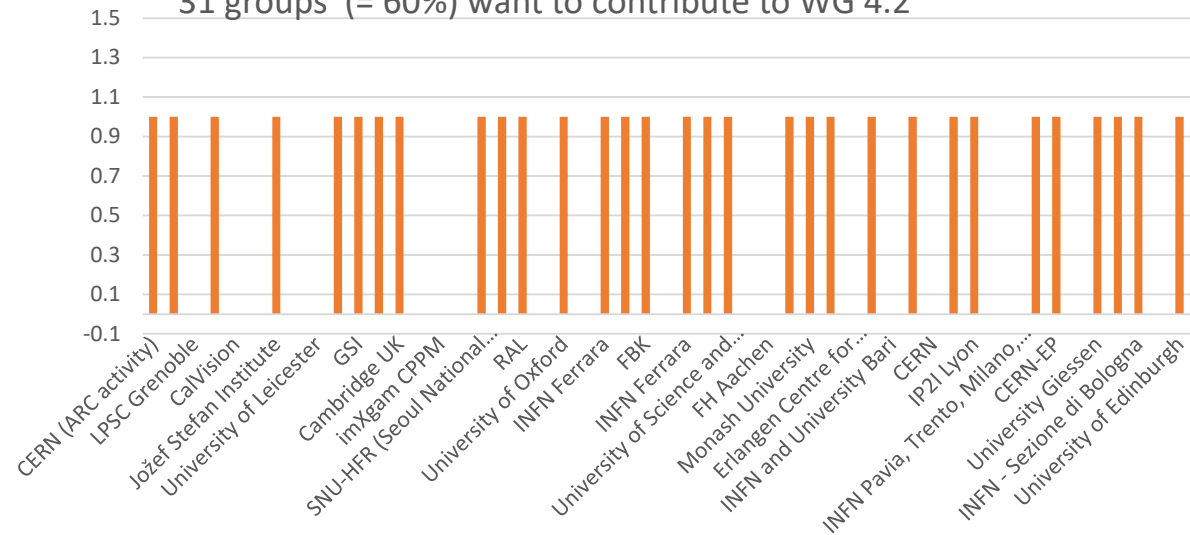


4.2

Working Group 4.2

Particle ID

31 groups (= 60%) want to contribute to WG 4.2

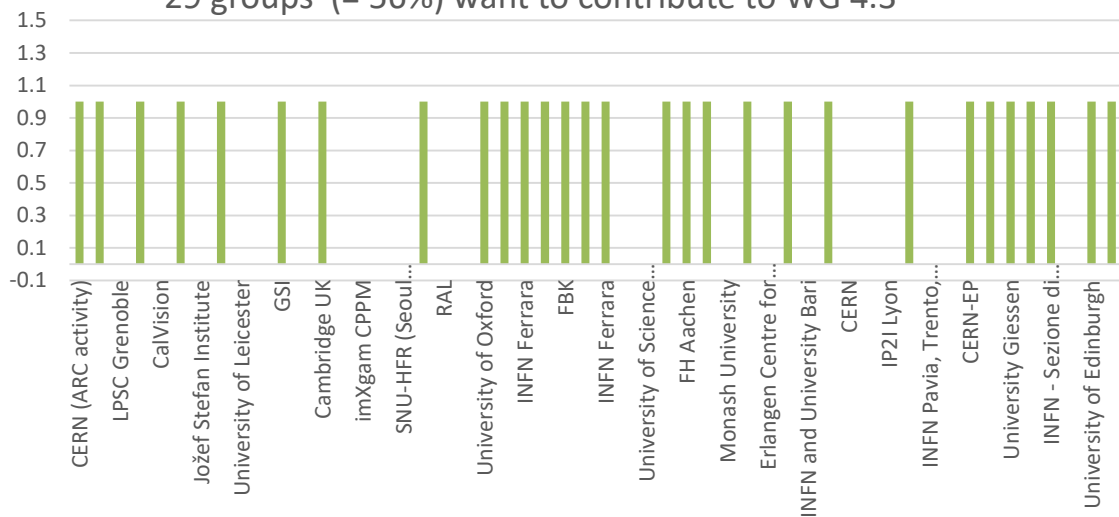


4.3

Working Group 4.3

Technological R&D

29 groups (= 56%) want to contribute to WG 4.3

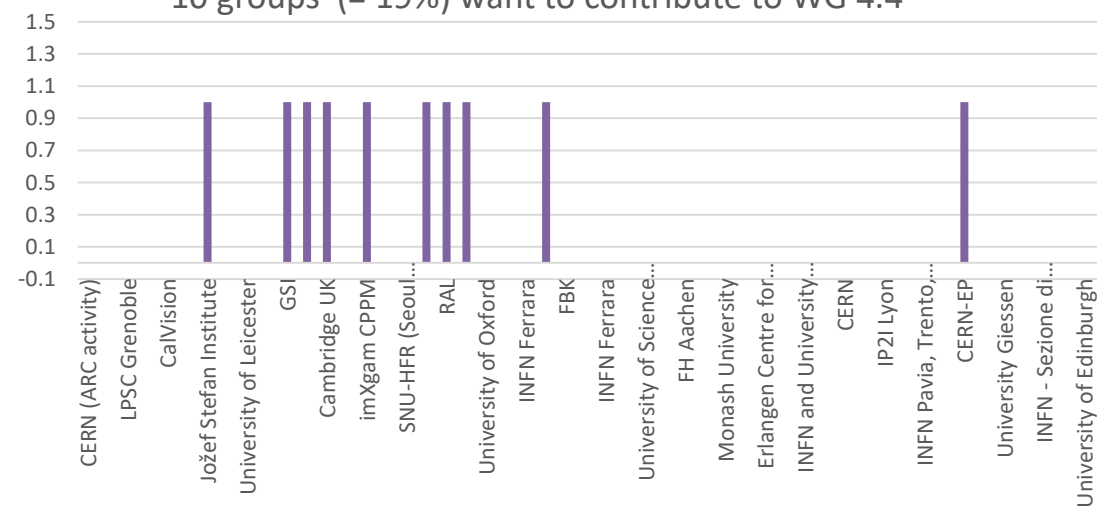


4.4

Working Group 4.4

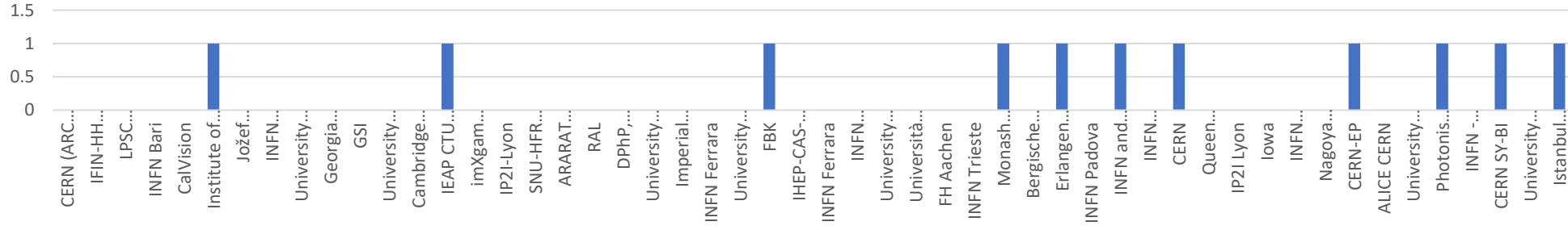
Software

10 groups (= 19%) want to contribute to WG 4.4



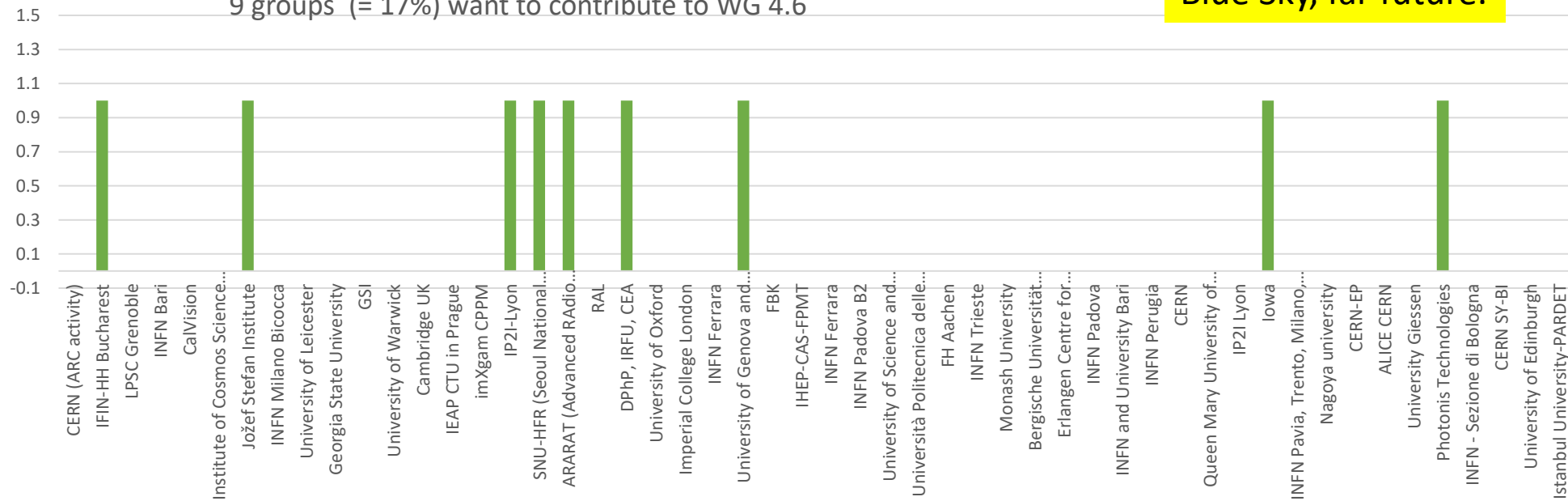
■ 4.5
 Working Group 4.5
 11 groups (= 21%) want to contribute to WG 4.5

SciFi Tracker and Transition Radiation !



■ 4.6
 Working Group 4.6
 9 groups (= 17%) want to contribute to WG 4.6

Blue Sky, far future.



Newly proposed WPs 4.1.x, 4.2.x, 4.3.x, 4.4.x (7 in total)

