WP4: Access to Research Infrastructures for Detectors

Marko Mikuž

University of Ljubljana and Jožef Stefan Institute, Ljubljana, Slovenia

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WP4:Access to RI for Detectors in EURO-LABS

Organigramme

WP1 Management
- Task 1: Project Management
- Task 2: Information Flow
- Task 3: Contacts

Management Team

Project Office

WP2 Access to RI for Physics
- Task 1: Paul Greenlees
- Task 2: Iulian Stephan
- Task 3: Alberto Mengoni
- Task 4: Gert Aarts
- Task 5: Marco Durante

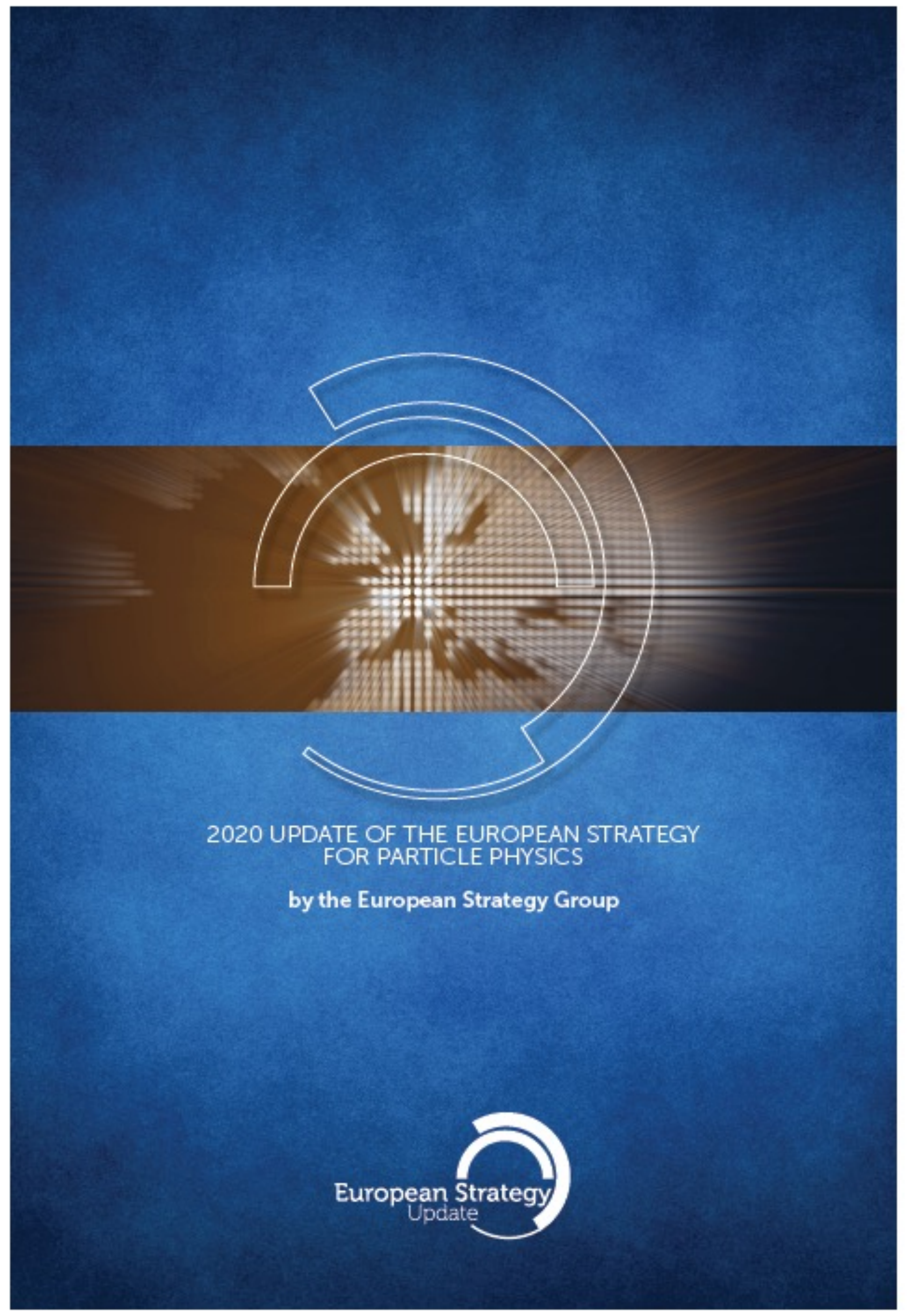
WP3 Access to RI for Accelerators
- Task 1: Nicolaos Charitonidis
- Task 2: Sylvie Leray
- Task 3: Antony Gleeson
- Task 4: Urszula Gryczka

WP4 Access to RI for Detectors
- Task 1: Eva Barbara Holzer
- Task 2: Fernando Arteche
- Task 3: Michael Moll
- Task 4: Marko Mikuz

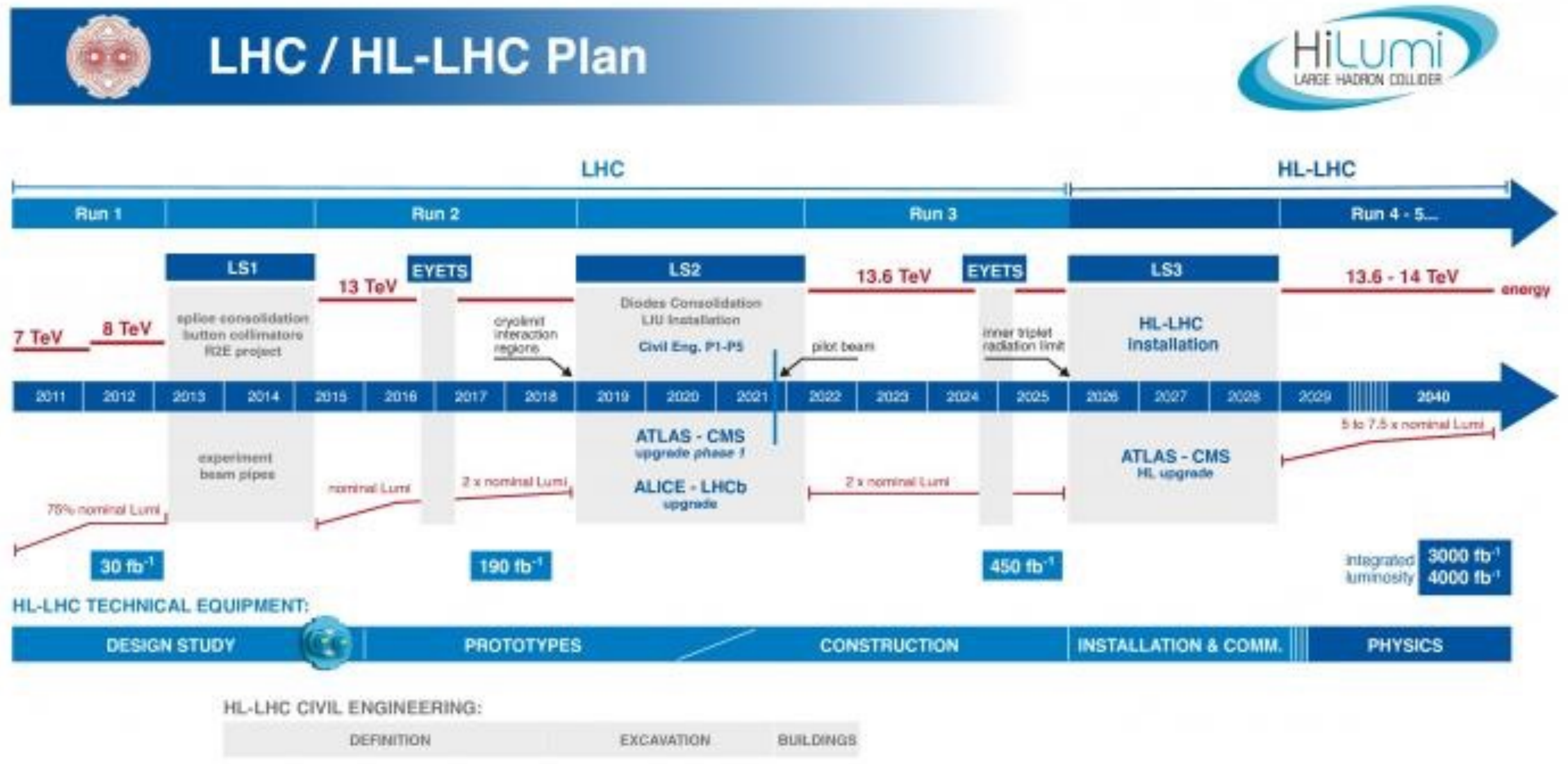
WP5 Open Diverse and Inclusive Science
- Task 1: Paolo Giacomelli
- Task 2: Antoine Lemasson
- Task 3: Sabrina Appel
- Task 4: Livius Trache

Placing of WP4 in European HEP (present)

- Core HEP Detectors endeavour today - construction of upgraded detectors for operation at the HL-LHC
  - In line with the stipulations of the 2013 European Strategy for Particle Physics (ESPP) report and their secondment in the 2020 ESPP update – "*The successful completion of the high-luminosity upgrade of the machine and detectors should remain the focal point of European particle physics, together with continued innovation in experimental techniques.*"
  - Associated detector R&D almost entirely finished, large orders placed, construction activities are well under way
  - Expected load on WP4 - few remaining parts of late R&D, like LGAD and SiPM for the timing layers
    - Main load driven by sensor QA activities to monitor production quality – not serviced by EURO-LABS
    - Production Readiness Review adopted as the dividing line – allow QA of preproduction (~5 %)



  - Exception to the grand picture - inner tracker part of ATLAS and CMS
    - No solution found to survive the entire HL-LHC lifetime
    - Replace the inner pixel detector at mid-point after ~2/ab of integrated luminosity
    - Existing detector solution could serve as a viable replacement, but R&D for technologically more advanced detectors are being pursued vigorously
  - LHCb - major upgrade in LS4
    - Radiation load to detectors - close to the inner parts of ATLAS&CMS trackers; their R&D in obvious need of EURO-LABS WP4 RI's.



Placing of WP4 in European HEP (future)

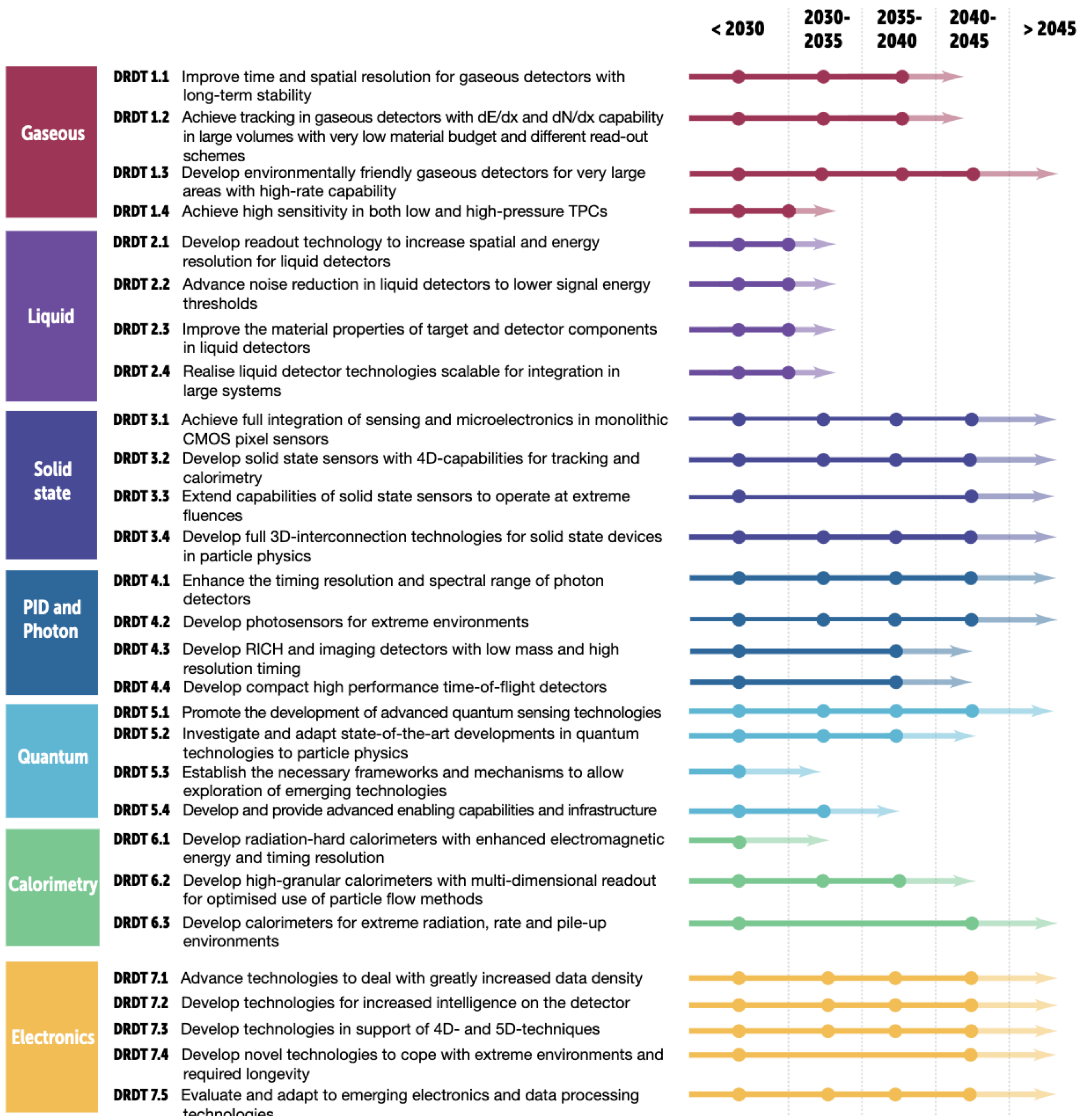
- The 2020 ESPP establishes two project initiatives as high-priority
  - "*the highest-priority next collider*": "*an electron-positron Higgs factory*"
  - for the longer term: "*a proton-proton collider at the highest achievable energy*", dubbed as the FCC-hh project.
- Detector R&D for these two goals: supported by *AIDAinnova* EC project
  - Other focal points: CERN DRD collaborations, developments within (big) experiments
- Development cycle towards the use of a new technology in detectors spans over 10 to 20 years.
  - *prospective* detector R&D ("Blue Sky" research) – TRL 1
  - *guided* detector R&D, according to known needs of future projects – TRL 2-5
  - *focussed* detector R&D of approved experiments – TRL 5-7
- These detector development phases - supplemented by providing access to the RI's of EURO-LABS WP4

Placing of WP4 in European HEP (future)

- Major support of EURO-LABS WP4 for Higgs factory detectors
  - Test Beams (WP4.1) and Detector Characterization (WP4.2) tasks
  - Radiation load is relatively small
    - Still testing at low levels of radiation & checking for single event effects
- Detector studies aimed at FCC-hh
  - Detectors at FCC-hh - highest radiation levels (after 30/ab)
    - forward calorimeters : 5000 MGy and 5×10^{18} n_{eq}/cm^2
    - innermost layer of the barrel vertex detectors ~1×10^{18} n_{eq}/cm^2
  - Need fluences in excess of at least 1×10^{17} n_{eq}/cm^2
    - benchmark for a yearly exchange of inner layers
- EURO-LABS WP4 intends to provide access to these conditions, even up to 1×10^{18} n_{eq}/cm^2
  - RI's in the Irradiations task WP4.3
- End of 2021 the *ECFA Detector R&D Roadmap* was approved by the CERN Council
  - Long term HEP Detector R&D goals defined
  - Implementation strategy approved in September 2022

ECFA Detector Roadmap Implementation

- Detector R&D Themes to be tackled by DRD Collaborations being formed now
  - DRD1 Gaseous Detectors
  - DRD2 Liquid Detectors
  - DRD3 Solid State Detectors
  - DRD4 Particle ID and Photon Detectors
  - DRD5 Quantum and Emerging Technologies
  - DRD6 Calorimetry
  - DRD7 Electronics
- Process overseen by CERN's DRD Committee
  - Evaluating submitted proposals
- Collaborations start on Jan 1st 2024



More by
DRDC Chair Thomas Bergauer
on Wednesday morning

WP4 Budget

Task name	WP label	EC + CH + UK	EC
Test Beams	WP4.1	1,033,300	855,175
Detector Characterization	WP4.2	236,420	236,420
Irradiations	WP4.3	1,074,713	908263
Service Improvements	WP4.4	740,675	606,800
Total Budget	**WP4**	**3,085,108**	**2,606,658**

- EC allocation 2.6 MEUR

  ✓ Supplemented by CH and UK contributions from their national funds

About 40 % more TA funding than in AIDA2020

WP4.1-3 Deliverables

- Each RI delivers Access Units (~beam hours) to Projects with Users
- Two access modalities: physical/remote access
  - Physical: users at RI (user support)
  - Remote: users send samples to RI (handling, shipment)

Task	WP name	Institute	Facility	Access Units	Users	Projects	User support
Test Beams	WP4.1.1	CERN	PS & SPS	8736	504	56	yes
	WP4.1.2	DESY	TESTBEAM	8640	120	30	yes
	WP4.1.3	PSI	PiM1/UCN	5376	136	32	yes
Detector Characterization	WP4.2.1	RBI	RBI-AF	504	24	12	yes
	WP4.2.2	ITAINNOVA	EMCLab	800	56	14	yes
Irradiations	WP4.3.1	CERN	IRRAD	4000	65	16	yes/remote
	WP4.3.2	CERN	GIF++	4060	74	14	yes
	WP4.3.3	JSI	TRIGA	700	150	50	remote
	WP4.3.4	IFJ-PAN	AIC-144	800	140	28	yes/remote
	WP4.3.5	UCL	HIF/LIF/NIF	100	20	10	yes
	WP4.3.6	UoB	MC40	300	36	12	remote

Dedicated talk on each of the the tasks tomorrow !

WP4.4 Service Improvements

- Aimed at improving access to RI for EURO-LABS
  - Each RI proposed improvements to maximize impact on user access
  - Improvements have to be ready in Y2 of the project
    - First three milestones delivered
    - Two more follow end October
  - EC contributions are matched by RI's own funding, typically exceeding EC
    - Budget adjustment of EC part: equipment -> consumables, manpower

Dedicated talk on Service Improvements tomorrow !

CERN TB, IRRAD & GIF++	Data base handling of beam time and irradiation requests
DESY Test Beams	Precision motion stages for large detector setups
PSI Test Beams	Beam monitor
RBI-AF	Ion beam focusing lens
ITAINNOVA	Cooling System and Graphical User Interface for EMC test station
CERN IRRAD	Beam profile monitor
JSI TRIGA	Cadmium shielding in the tangential channel
IFJ PAN AIC-144	2-D scanning table for irradiation
UCL CRC	Test chamber for the heavy ion irradiation facility
UoB MC40	Scanning system upgrade for high fluence delivery

Proccessing of WP4 Applications

- Single entry point through the EURO-LABS web page
- Generic review procedure in WP4:
  - *The scientific RI coordinator ("Facility Coordinator") checks the technical requirements and eligibility of applications. Then the EURO-LABS WP4 User Selection Panel gets notified of the application and decides on the allocation of resources*.
- USP composition: WP4 & WP4.1-3 leaders (4) & representatives of LHC experiments and DRD 1,3,7 (4), awaiting assignment from DRD6
- Some facilities require pre-approval by their Scientific Committees (CERN, PSI…)
- USP receives the proposal from the FC, any member can request discussion within two weeks, otherwise the project can go ahead

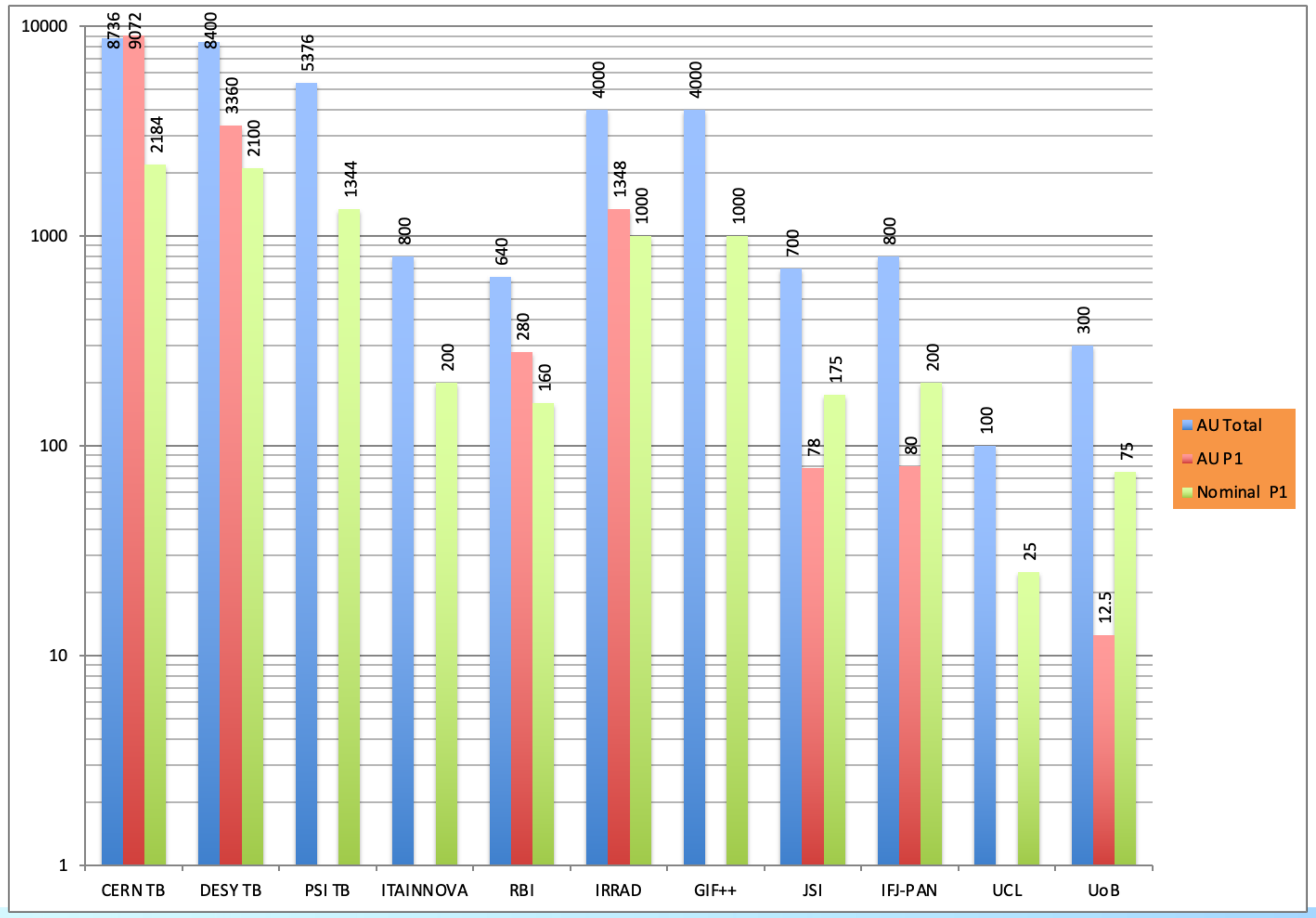
WP4 USP

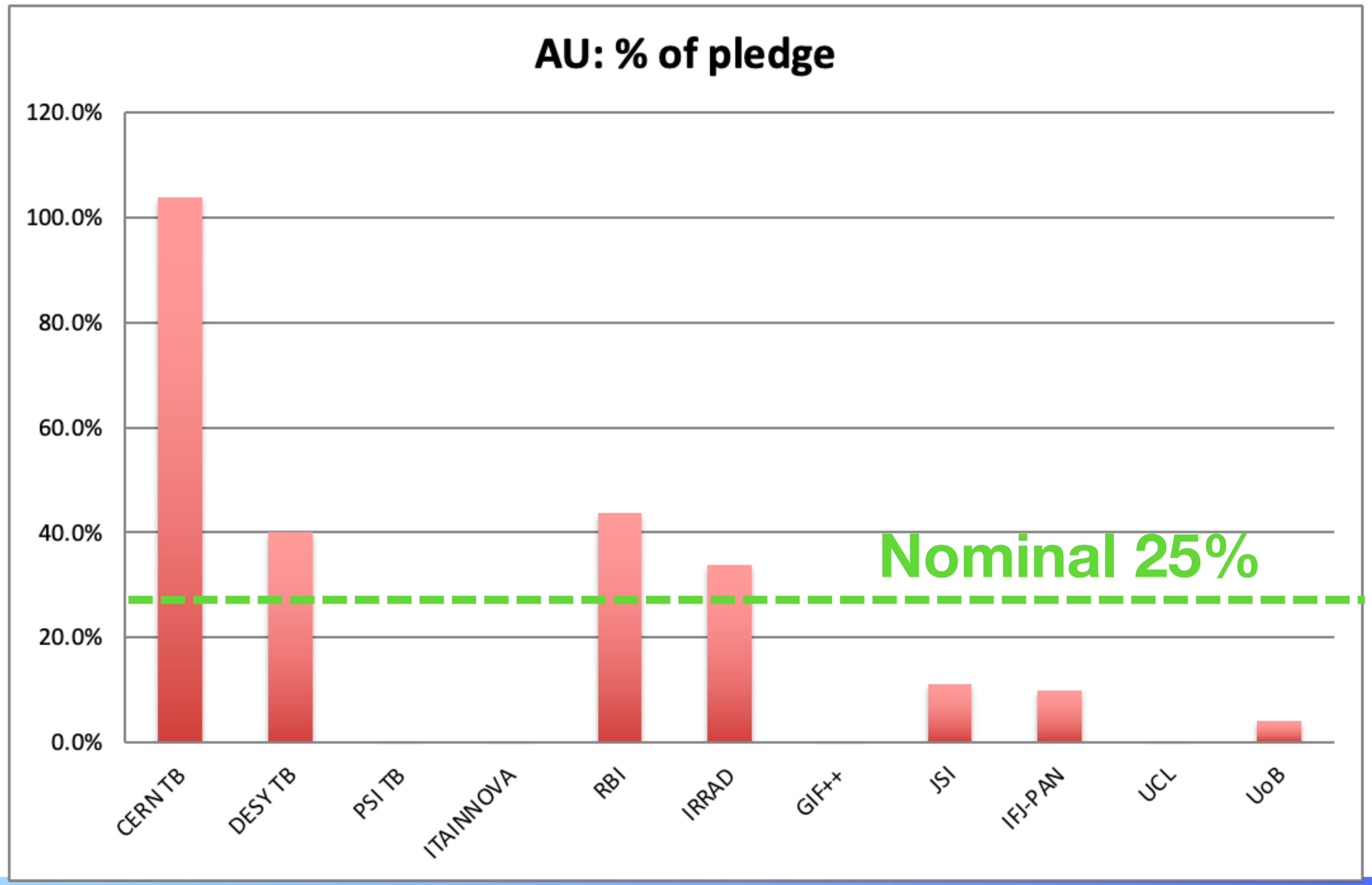
DRD1 (Gas): Eraldo Oliveri (CERN)
DRD3 (Solid): Gianluigi Casse (Univ. Liverpool)
DRD6(Calorimetry): to be nominated
DRD7 (Electronics): Mohsine MENOUNI (CPPM Marseille)
LHC experiments: Anna Macchiolo (Univ. Zurich)
WP4.1: Eva Barbara Holzer (CERN)
WP4.2: Fernando Arteche (Itainnova)
WP4.3: Michael Moll (CERN)
WP4: Marko Mikuz (Univ. Ljubljana & JSI) (Chair)

WP4 Performance in P1

- Taking overall number of AU (the only deliverable!) granted to users in P1 WP4 is doing very well with 42% of total delivered
- In fact, performance must be improved
  - Overall figure dominated by CERN (and DESY)
    - Even troublesome, if no extra resources found for user support
      - No CERN beams in 2026 though
  - Four Ris with no AU delivered at all

Facility	AU Total	AU P1	Nominal P1
CERN TB	8736	9072	2184
DESY TB	8400	3360	2100
PSI TB	5376	0	1344
ITAINNOVA	800	0	200
RBI	640	280	160
IRRAD	4000	1348	1000
GIF++	4000	0	1000
JSI	700	78	175
IFJ-PAN	800	80	200
UCL	100	0	25
UoB	300	12.5	75

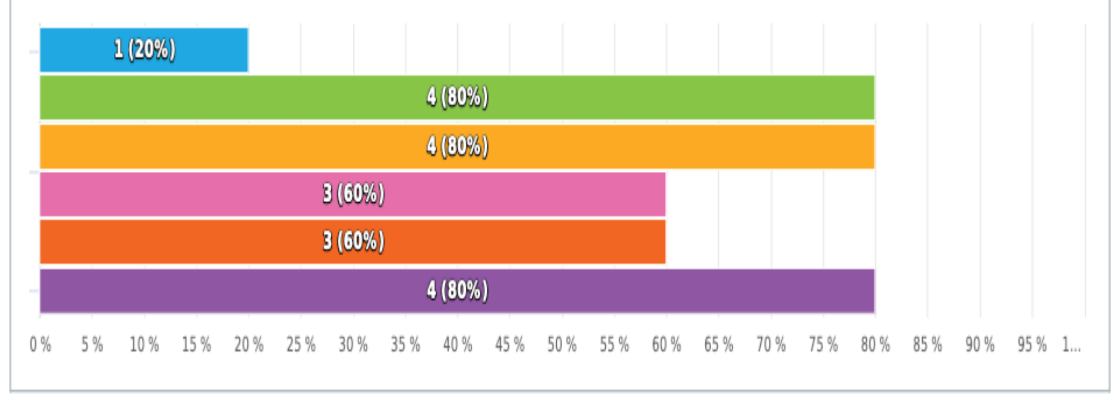




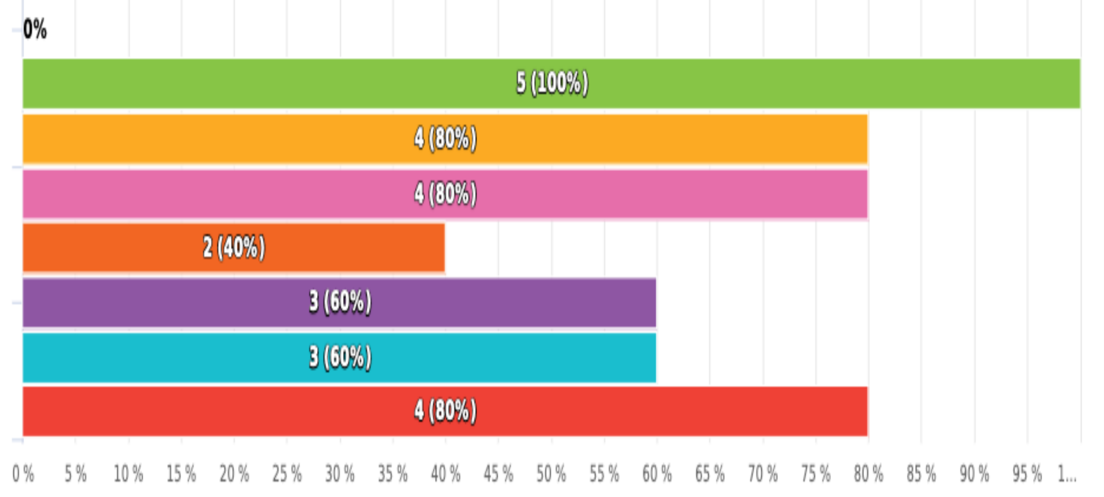
Have we miscalculated ?

- ECFA and LDG have conducted a survey among DRD collaborations of their need of resources for the coming years and beyond
- All WP4 facilities in high demand including the ones with no AU in P1
- Possible reasons for under-performance
  - Period of 12 months to short to draw (hard) conclusions
  - Formation of DRD collaborations poses heavy load on the users
  - Facilities with few expected projects – large fluctuations
  - Is excluding all HL-LHC production QA to be revised?
- Expect more comments in task leader talks tomorrow
- Certainly, development needs to be followed up closely, efforts made to actively solicit users, eventually also move resources

Answer Choices	Responses	Ratio
None	1	20.0%
CERN SPS	4	80.0%
CERN PS	4	80.0%
DESY	3	60.0%
PSI	3	60.0%
Other...	4	80.0%



Answer Choices	Responses	Ratio
None	0	0.0%
CERN IRRAD	5	100.0%
CERN GIF++	4	80.0%
JSI TRIGA Reactor	4	80.0%
IFJ PAN AIC-144	2	40.0%
UCLouvain CRC	3	60.0%
UoB MC40 Cyclotron	3	60.0%
Other...	4	80.0%



WP4 Summary

- With WP4 EURO-LABS is providing transnational access to top level European Research Infrastructures for R&D on HEP detectors
  - TA complement to AIDAinnova
- Acess to RI's free of charge
  - Tailored to detector R&D where dedicated funding is often a problem
- Covers 3 types of research infrastructures, grouped into tasks
  - Test Beams (3 facilities)
  - Detector Characterization (2 facilities)
  - Irradiations (6 facilities)
- Service Improvements at each RI to improve access
- Large fluctuations between RIs observed in P1 – to be watched
- EURO-LABS WP4 RIs in high demand for future DRD collaborations