AIDA 2020

Advanced European Infrastructures for Detectors at Accelerators

AIDA++ *

* Working Title for the AIDA-2020 Follow-up

Iván Vila Álvarez(**)

On behalf of the AIDA++ Proposal Preparatory Team

IFCA (CSIC-UC)

Vertex 2019

Lopud, October 17, 2019

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654168.

** Most of information from Felix Sefkow introductory talk at the AIDA++ 1st open meeting

AIDA 2020

Outline

- The AIDA saga.
- A new Call in Horizon 2020.
- Expressions of Interest
- Initial WP definitions

AIDA-2020

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History

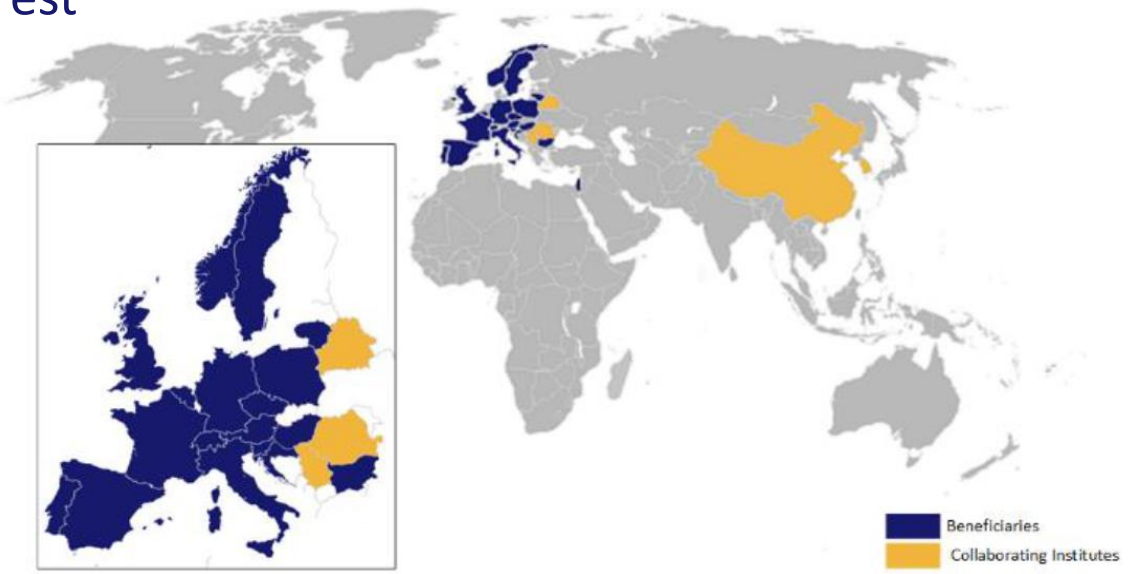
- FP6: EUDET: 2006-2010
  - Detector development for linear collider
- FP7: AIDA: 2011-2014
  - Detector development for LHC upgrades and linear colliders
  - Project-specific work packages
- FP8: AIDA-2020 2015-2020
  - Common LC and LHC work packages
  - New communities: large cryogenic neutrino experiments, new topics
  - New innovation measures, with industry
- **All projects have a strong leverage on matching funds**
- **Unique in creating coherence on European level**

Increasing level of integration

AIDA 2020 — Advanced European infrastructure for Detectors at Accelerators

- Collaborative framework
- Infrastructure: common interest

https://aida2020.web.cern.ch



- 19 countries
- 38 beneficiaries
  - + 20 collaborating institutes
- Coordinated by CERN

- Total budget 29.8 M€
- EC contribution 10.0 M€

Participants bring in complementary competences and a balanced coverage of projects.

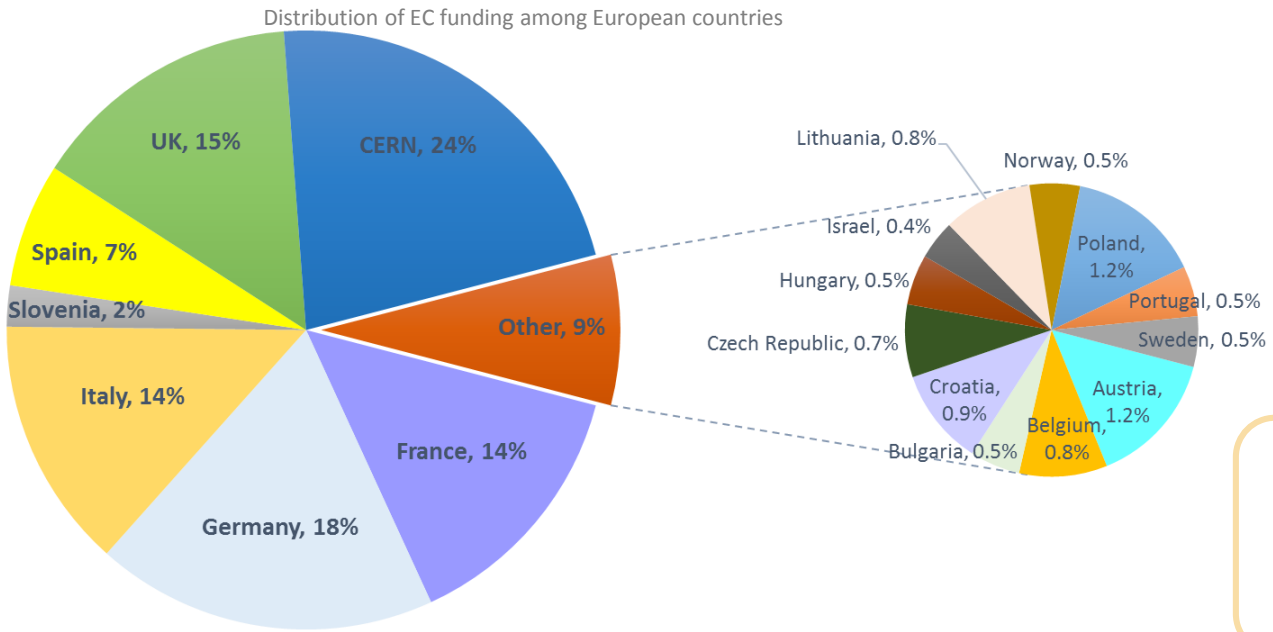
- Activities:
  - Mainly: Joint Research & Networks (85%)
  - Transnational Access (13%)

Resources

Full costs budget AIDA-2020 = **~ 29 M€**

EC contribution = **10 M€**

→ all partners contribute with a certain amount of matching funds and the funding rate for the beneficiaries varies between 29% (JRA) and 95% (TA)

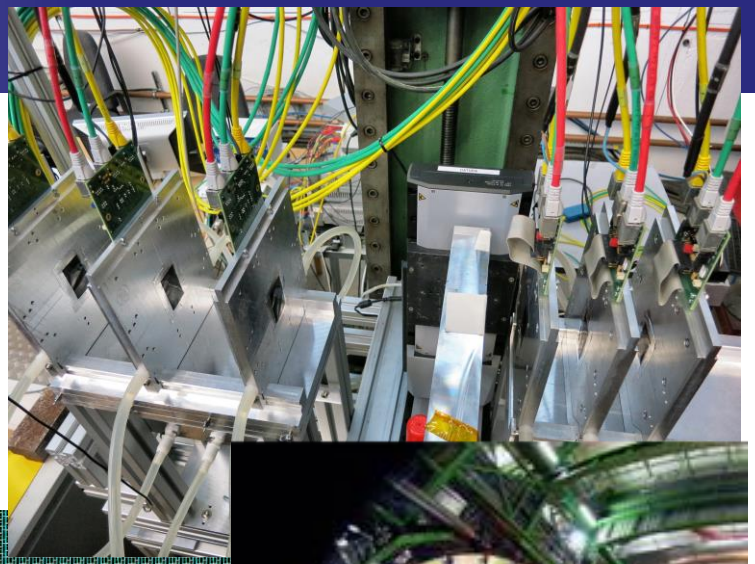


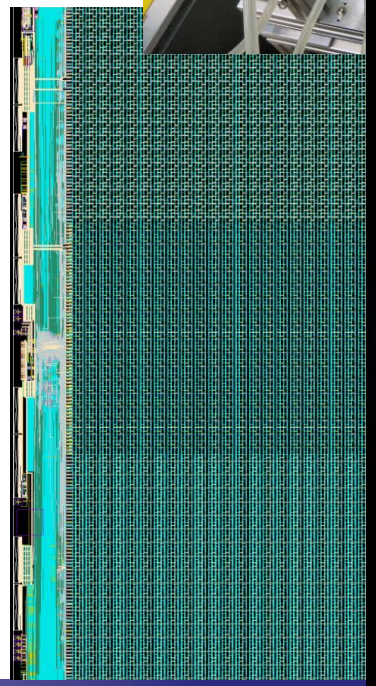
Key for involving small countries

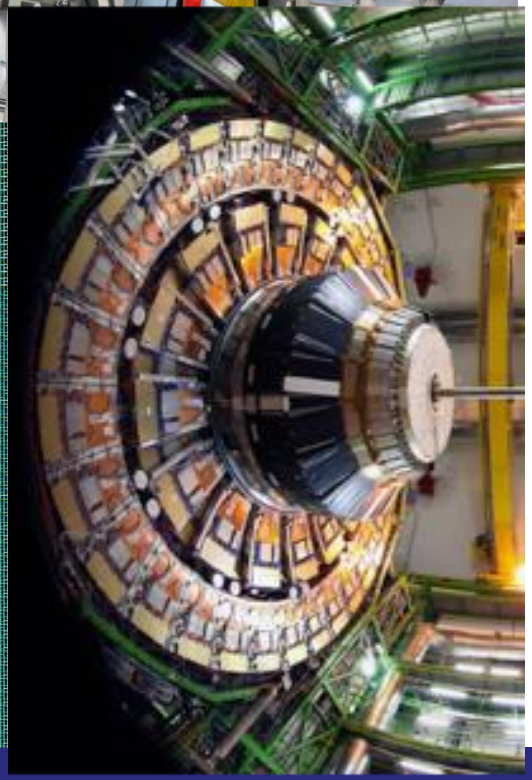
Total Person-Months = **2,525.5 PM**

Highlights

- Common micro-chip development
  - Expensive submissions
- Test beam instrumentation
  - Keep pace with increasing precision
- Common test beam DAQ
  - Easy prototype integration
- Common software frameworks
  - Parallel and vector computing
- Joining forces for novel detectors
  - LHC tracker technology and LC calorimetry -> imaging calorimeter for HL-LHC
- Test infrastructures
  - Mechanics, cooling, optical materials, electro-magnetic, irradiation, data base support….







New Call INFRAINNOV-04-2020 Innovation Pilots

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654168.

Basic information

- ***The information is based on the Work Programme for 2018-2020, 2.July 2019***
  - The actual Call for the Innovation Pilots will be published in autumn (~November)
- Topic: **Innovation for Detector Technologies for Accelerators**
- Expected EC funding: **up to 10 M€** , Proposal **Deadline March 17, 2020**

- Objective*:*
- Support **research infrastructure networks** developing and implementing a **common strategy**/roadmap including technological development required for **improving their services** through **partnership with industry;**

- Support **incremental innovation** and **cooperation with industry and academia** in areas such as scientific instrumentation

- Target : **Advanced Integrated Activities (i.e. the AIDA-2020 community)**, which have reached a high level of integration and can **focus on joint research developments**, here instrumentation for particle physics at accelerators

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Strategic guidance

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Incremental – not disruptive
Partners - not spin-offs

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Collaborative

Activities

- **Innovation for delivery of services, or new services of infrastructures**
  - Infrastructure can be interpreted as **facilities, tools and platforms** serving common interest for detector development, like in AIDA-2020
  - Innovation can be incremental
- Development of **technologies & techniques underpinning** the use of the RI
  - **Prototyping** corresponding methodologies & instrumentation
- Activities of Joint Research and Networking type (no distinction)
- But **no Transnational Access** mechanism
  - Infrastructure upgrades aiming at improving the performance or services of existing facilities can be included in the Innovation Pilots
- Main goal is **strategic R&D**
  - Activities must be related to the needs of future accelerator projects
- **Generic and Blue Sky R&D** will be addressed by a Proof-of-Concept funds distributed on a competitive basis after start of the project

Additional Points

- Involvement of **industrial partners** is strongly encouraged
  - If possible as beneficiary
- **Sustainability** and co-funding must be demonstrated
  - Relation to future projects must be clear
  - Long-term commitment of partners to be demonstrated by Matching Funds
    - As in AIDA-2020: 200% (including personnel) on average, dependent on type of activities
    - For industrial partners 100% target
- **Complementarity** with other actions (e.g. **ATTRACT**) is strictly required
  - There will be collaboration agreements to exclude double funding
- **Non-European partners** can participate
  - **no EC funds, m**ust have a **defined role** in work programme
- Awareness of **environmental aspects** may be relevant

Call for Expressions of Interest

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Expressions of Interest

- CERN takes the initiative provides support by EC office
- Nominates lead for proposal preparation
- To engage with the community at large: Call for Expressions of Interest
- Sent out on May 17, Deadline July 15, 2019, with **template**
- **Title** plus some keywords, topic
- Partner **institutes** (max 6), **Contacts** (1 per institute)
- **Description** (1 page)
  - Planned activity, envisaged outcome
  - Relevance to future accelerator-based HEP project
  - Common interest, added value for the community, Innovatiion aspects
- **Deliverables, Budget** estimate
  - Personnel (FTE years, total EC + Matching Funds 2:1 (Industry 1:1)

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- **Received 162 EoIs**
  - AIDA-2020: ~60
- Total requested funds > 30M€

Thank you!

Proposal Preparation Team

• Daniela Bortoletto (U Oxford)	AIDA-2020 Deputy Coordinator
• Giovanni Calderini (LPNHE Paris)	AIDA-2020 Governance Board Chair
• Paolo Giacomelli (Bologna)	AIDA-2020 Deputy Coordinator
• Felix Sefkow (DESY)	AIDA-2020 Scientific Coordinator
• Svetlomir Stavrev (CERN)	AIDA-2020 Administrative Coordinator
• Anne Dabrowski (CERN)	CERN representative in the PPT
• Thomas Bergauer (HEPHY Vienna)	
• Lucie Linssen (CERN)	
• Ivan Vila Alvarez (CSIC Santander)	
• Morgan Wascko (IC London)	

Topic Convenors

- Test beam Facilities & DAQ:
  - **M.Stanitzki (DESY), M.Wing (UCL), H. Wilkens(CERN)**
- Irradiation & Characterisation Facilities
  - **F.Ravotti (CERN), F.Arteche (Zaragosa), G.Kramberger (JSI)**
- Mechanics & Cooling
  - **P.Petagna (CERN), C. Gargiulo (CERN), G. *Viehhauser* (Oxford)**
- Microelectronics & Interconnections
  - ***C. De La Taille (Palaiseau), A.Rivetti (Torino), A Marchioro (CERN)***
- CMOS detectors
  - **S. Grinstein (Barcelona), M. *Caccia* (Como), P. *Riedler* (CERN), T. *Hempernek* (Bonn)**
- Hybrid silicon detectors
  - **A. Macchiolo (Zurich) G.Pellegrini (CSIC), C. Gemme (Genova)**
- Calorimeters
  - **R. Poeschl (LAL), K. Krüger (DESY), R.Ferrari (Pavia)**

Topic Convenors

- Particle ID
  - **G.Wilkinson (Oxfrd), E.Auffray (CERN)**
- MPGD & RPC
  - **S. Della Torre (Trieste),** M.Tytgat (Ghent), **B. Mandelli (CERN)**
- Large Volume Gas Detectors
  - **B. Schmidt (CERN), F. Grancagnolo (Lecce)**
- Neutrino Detectors
  - **D. Autiero (Lyon), E. Rondio (Warsaw), G. Catanesi (Bari)**
- Software
  - **F. Gaede (DESY), G.Stewart (CERN)**
- Knowledge Transfer & Outreach
  - **A. Pezous (CERN)**

Criteria

- Infrastructure spirit:
  - does it serve more than one project
  - does it fill a gap
- Strategic alignment:
  - oriented towards main future projects, near and mid-term
  - Case for advancements; is it supporting critical R&D
  - is there a sustained long-term future perspective
- Industry involvement
  - credible industry participation, ideally as beneficiary
  - built on existing cooperation or commitment
  - Check eligibility of partners like FBK (Research and Technology Organisations RTO)
- Collaborative approach:
  - is there a task sharing and pooling of expertise
  - is it even bringing communities together
- Timeliness:
  - are there tangible - and useful - deliverable on the timescale of AIDA++
- Added Value
  - AIDA++ contribution makes the difference
- Awareness of environmental aspects

WP Follow-up

- **Management WPs**
- MM Management
- MC Communication and Industry Relations
- MB Blue Sky

- **Facilities WPs:**
- FT Testbeam and DAQ
- FI Irradiation and Characterisation

- **Vertical WPs:**
- VM Monolithic Silicon Detectors
- VH Hybrid Silicon Detectors
- VG Gaseous Detectors
- VC Calorimeters and Particle ID
- VN Cryogenic Detectors

- **Horizontal WPs:**
- HM Mechanics
- HE Electronics
- HS Software

Silicon Vertexing and tracking Related EoI listed at the 1st Open Meeting

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AIDA 2020 Hybrid Sensors EoI

C. Gemme *(INFN Genova)* ,
A. Macchiolo *(University of Zurich)*,
G. Pellegrini *(IMB-CNM-CSIC)*

TIMING with 3D sensors		Participating Institutes
G. Pellegrini	3D optimized for timing	CSIC, IFAE, JSI
G. Dalla Betta	3D sensors for Tracking with Timing at High Fluence	INFN, FBK, Manchester
C. Da Via'	3D for precision tracking in future Vertex Detector	Manchester, INFN, Prague. FBK
S. Pospisil	3D in silicon and compound material for precise particle tracking	CTU Prague, Manchester, INFN, FBK

TIMING with LGADs		Participating Institutes
Macchiolo/ Cartiglia	Small pitch LGAD sensors	INFN/UZH/Uni-HH/To/Piemonte Orientale/FBK
A. Tricoli	4D silicon detector for future collider experiments	BNL
L. Serin	Timing for large pad sensors after irradiation	LAL, Bonn, CNM, JSI, IFAE, Omega,
P. Allport	Proton irradiation and characterization of fine pitch LGADs	FBK, Birmingham
M. Williams	LGADs at MICRON	Manchester, Glasgow, Krakow, MICRON, CNM
I. Vila	Inverse L-GAD sensors	CSIC, CERN, NIKHEF, USC

Simulation		Participating Institutes
D. Passeri	TCAD Radiation Damage characterization and modelling	INFN, HEPHY
G. Slmi	Radiation damage in 3D silicon sensors and electronics	INFN

Planar Pixel Sensors		Participating Institutes
G. Calderini	Thin planar sensors with small pitch and advanced trench layout	LPNHE, FBK, LAL, INFN, CERN, IZM
D. Münstermann	Passive CMOS sensors	Lancaster, Bonn, UZH, ETH, INFN, LFoundry

Radiation Hardness and Tools for generic R&D		Participating Institutes
M. Mikuz	Silicon Detectors at Fluences above 1e17 n_{eq}/cm^2	JSI, CERN, INFN, Cantabria, CSIC,
M. Moll	Radiation Hardening of p-type detectors	CERN, Hamburg, Bucharest, CIS
M. Moll	Two Photon Absorption TCT	CERN, CSIC, Fyla
O. Brandt	Systematic studies of radiation hardness	Cambridge, Birmingham CSIC

Alternative Semiconductor Materials		Participating Institutes
A. Oh	3D Diamond detectors	Manchester, CERN, Florence, INFN, CNR
G. Pellegrini	3D SiC detectors	CSIC, IFAE, PSI, ETH, DECTRIS
M. Menichelli	3D detectors on amorphous a:Si-H	INFN, EPFL

https://indico.cern.ch/event/838460/contributions/3529408/attachments/1902345/3140702/HYBRID_Sensors_V6.pdf

(D)MAPS

M. Caccia (Insubria), S. Grinstein (IFAE), T. Hemperek (Bonn), P. Riedler (CERN)

EoI no.	Title
6	CMOS pixels DMAPS
9	DMAPS Qualification and Module Assembly
45	Ultrathin CMOS pixel modules for precision tracking in high rate e+e- environment
61	Advanced Readout CMOS Architectures with Depleted Integrated sensor Arrays
80	Large-area DMAPS using photolithographic stitching
90	4D tracking with precision energy information using depleted CMOS sensors (4DCMOS)
100	Fine-pitch CMOS sensors with nanosecond timing for future Linear Collider experiments
105	A monolithic pixel vertex detector for FCCee project
112	Development of an ultra-thin, wafer-scale CMOS Monolithic Active Pixel Sensor in 65nm technology
141	Advanced Pixelated telescopes and Instruments Combining Cmos Sensors (APICCS)
32	Upgrade pilot for the EUDET beam telescopes with fully clock-less CMOS sensor planes
31	Development of LGAD sensors with small pitch for 4D tracking
53	TCAD Radiation Damage Characterization and Modelling
65	Radiation hardening and radiation damage parameterization of p-type silicon layers
66	A novel tool for 3D semiconductor sensor characterization: Two-Photon Absorption TCT
83	Development of ultra-thin hybrid pixel assemblies
89	Cost-efficient and large-scale production of passive and LGAD-based silicon particle sensors in CMOS foundries
99	Pixel-detector hybridisation with Anisotropic Conductive Films (ACF)

9 core (design, assembly and characterization) CMOS EoIs ***Part 1***

2 CMOS-TB EoIs ***Part 2***

Not fully CMOS EoIs ***Part 3***

https://indico.cern.ch/event/838460/contributions/3529406/attachments/1902125/3140871/AIDA3_OpenMeeting_CMOS_Sept2019.pdf

Microelectronics

C. De La Taille, S. Marchioro, A. Rivetti

EoI #	Title	Presenter
50	28 nm CMOS readout ASICs and high-speed data links for advanced silicon trackers and 4D detectors	Valerio Re
20	cold/timing 65/130n electronics	Christophe de la Taille
27	Optimisation of the light sensing system of a Dual Readout Calorimeter	Massimo Caccia
59	Cyber Physical Systems for Data Acquisition and Control Systems	Alberto Aloisio
110	Accelerated Neuromorphic Sensing for Wide range of detEctoR applications	Victor Coco
144	Compact readout electronics for a highly granular SiPM-on-tile calorimeter	Katja Krüger
61	Advanced Readout CMOS Architectures with Depleted Integrated sensor Arrays	M Da Rocha Rolo
106	Development of high performance readout electronics for gas detectors	Ilaria Vai
8	Wireless system of portable radiation monitors for distributed dose control	Plamen Iaydjiev
51	Development and characterisation of integrated electronics for the readout of pixelated µRWELL detectors	Paolo Giacomelli

Timeline

- After today's Open Meeting:
- Proposal Preparation Team (PPT) will define a **Work Package structure**
  - AIDA-2020 – in addition to MGT, KT&Communication, and TA – had 10
  - Formulate some guidelines on content
- PPT will also assign a **preliminary budget** per WP
- **Nominate WP contacts**
  - WP contacts will iterate with community
  - PPT stays in the loop
- **2nd Open Meeting**: Oct 23 at CERN
  - Meeting PPT with TC, Open dscussions on specific topics
  - Finalise and present Proposal Structure in terms of Work Packages
- November: INFRA-INNOV-4 Call expected to be out
- December **Final Budget**
  - Breakdown by tasks and by institutes
- **March 17, 2020 Proposal submission deadline**

This is also the deadline for intended commitments by industrial partners