

AIDA 2020

WP8/NA7 Large scale cryogenic liquid detectors

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Additional items for discussion session:

- Questions from SAP
- Next AIDA program: AIDA+++

Questions from SAP

WP8: Large scale cryogenic liquid detectors

What are the statistics for WP8 regarding publications (Journal, conference/workshop, other) vs. the targets for this stage of AIDA2020? The list of publications linked to the WP8 page is clearly incomplete, in that there are references given in the Deliverables Reports that are not included in this list. Please provide a complete list of publications that result from work supported by this work package, whether or not the support of the Horizon 2020 program was acknowledged (as it should be) or not.

We will make sure that the general list of publications of WP8 is up to date with respect to the lists of publications contained in the submitted deliverables and any additional more recent publication.

Task 8.2 (Deliverable 8.1) Purification and Monitoring has developed a number of pieces of instrumentation and techniques that have application beyond the dual-phase LArTPC of WA105, most notably in the DUNE-SP design. Have any of these techniques been applied in other experiments?

These purity assessment techniques are not specific of dual-phase but rather generic. For instance the construction technique and commissioning methodology (piston purge, gas analysers, cooling down methods) of the cryostat which have been assessed for the first time with the 3x1x1 prototype, have been subsequently applied to both ProtoDUNE SP and DP, Icarus, SBND and it is also under consideration by other experiments, like future dark matter experiments. This is the case also for other monitoring items such as cryogenic cameras, the slow control system for temperatures monitoring etc ...

The Deliverable 8.2 (Task 8.3) “Charge readout and double phase,” is due in M54, about 6 months from now. Is it on track to be completed as scheduled? What is expected to be accomplished by then under AIDA2020 funding?

As discussed in 2018 this deliverable was postponed in order to include as well results from the activity and commissioning of the 6x6x6. There have been results in the past months from operating 3x3 m2 detection planes in a dedicated setup which are being included. The detector construction of the 6x6x6 has been meanwhile completed so we count also to include results from the detector commissioning. The deliverable is on track to be completed in M54. This extension of activity is performed at constant budget with respect to the original AIDA2020 funding.

The Deliverable 8.3 (Task 8.4) “Light Readout System” was due in M46 and we are now in M48. What is the status?

This deliverable was closed on schedule. There were no specific reasons to postpone it to M48. There has been some technical issue with submission. Meanwhile it has been submitted.

The transparent ITO coated cathode design that was developed under Task 8.5 and described in Deliverable Report 8.4 was used in neither the 1x1x3 nor the ProtoDUNE-DP detector. Are there plans to further develop this idea by utilizing it in a prototype detector or by performing any other sort of experimental verification? Has this work been published in any form or are there any plans to do so?

This development was done after the 3x1x1 design had been already frozen. Indeed this aspect of the R&D which is quite generic can be applied in other contexts and for instance it was applied in the ArDM dark matter experiment. There are plans to document it.

There are several references in Deliverable Report 8.5 (Task 8.6), e.g. [9], [10], [11], which appear to relate directly to the work done under WP 8.6 on the design and construction of the Baby MIND magnet but which do not include acknowledgement of AIDA2020 support nor are they included in the publication list linked to the WP8 page. Another, [13], does acknowledge AIDA2020 support but is not included in the publication list. Is there a reason that credit is not taken for these?

It was an oversight not to include the AIDA2020 acknowledgements in references [9], [10], [11]. We apologise for that. The talk in Ref. [9] was delivered by someone that was not aware of the requirement for the AIDA2020 acknowledgement and, unfortunately, it cannot be changed now since that has been published. Refs. [10] and [11] can probably be modified to include the acknowledgement, since they are arXiv submissions. We can easily add reference [13] to the publication list.

The Deliverable Report 8.5 (Task 8.6) describes a Conductor on Round Core Cable-in-Conduit that it is stated “was shown to carry a current of 48 kA at 4.2 K and 10 T.” Was this an experimental verification or purely simulation? Was the experimental result published anywhere? Was any of this work supported by AIDA2020? (There is no acknowledgement of AIDA2020 support in the thesis of Tim Mulder.) The same report describes a design for magnetizing a large LAr detector done by Alexey Dudarev. Was this work published or otherwise documented anywhere? Was it supported by AIDA2020? It is stated (or at least implied) that this design was “commissioned in the context of the CERN Neutrino Platform.” Please explain.

The Cable-in-Conduit result is an experimental result. It was published in Tim Mulder’s University of Twente PhD thesis (page 110). We do not know if it has been documented in further publications. This work was the work of a CERN Doctoral Studentship with the University of Twente and was not directly funded by AIDA2020. The two students funded directly by AIDA-2020 are Saba Parsa (University of Geneva) and Sven-Patrik Hallsjo (University of Glasgow). The study carried out by Alexey Dudarev from CERN was commissioned by Marzio Nessi under the CERN Neutrino Platform and was presented at a meeting but has not been published as far as we know.

Does the WP 8 group plan further basic R&D work on large-scale cryogenic liquid detectors, or has the focus now turned entirely to prototyping the DUNE-DP far detector?

Since the beginning, the activity of WP8 was relying on exploiting for R&D of general interest existing infrastructures in the framework of the neutrino platform such as the 3x1x1, the 6x6x6 and BabyMind. The only part specifically related to DP is contained in the Task 8.3 “Charge Readout and dual-phase technology”. This part was somehow natural since dual-phase was a quite innovative concept in the R&D. The other tasks are quite generic and can have multiple applications. Among many other examples the high voltage developments for the VHV feedthrough and generation have been commonly adopted by ProtoDUNE single-phase and ProtoDUNE dual-phase. The only task which is formally active is 8.3 for which the deliverable has been extended in order to profit of new results coming from the preparation and commissioning of ProtoDUNE-DP. Nevertheless we will try to update until the closure of the AIDA2020 program the wiki pages of the other tasks with any pertinent information of general interest coming from the running of ProtoDUNE-DP and also ProtoDUNE-SP.

➤ Next AIDA program: AIDA+++

It will be discussed at this general meeting (worth to know ideas and opinions of WPs)

Some prediscussion at last AIDA steering board

Context for WP8:

- The detector R&D developed by WP8 is a live and innovative field at it would be strange not to include it in a new AIDA program
- The main application for DUNE is however already at the level of TDR, this does not mean that the detector developments activities should stop now, further supporting R&D will be in any case beneficial for deeper understanding and for other applications
- The two protoDUNEs have proposed to operate after CERN LS2
- For AIDA2020 there was the opportunity to exploit an infrastructure from the neutrino Platform on an ideal time scale. R&D on WP8 is expensive and needs large infrastructures
- Which items should be in the new program and with which kind of infrastructure support ? (Felix: the program could be very similar to AIDA2020 with more emphasis on innovation)



- INFRA-INNOV-04-2020: Innovation pilots
 - Innovation in light source technologies
 - **Innovation in detector technologies**
 - Innovation in accelerator technologies
- Budget 30M, max **10M** per proposal
- **Deadline March 17, 2020**
- **Open community meeting early September:** propose Sept 5-6
 - Possibly second end Oct, early Nov.
- Eols before summer: sub-community discussions,...
- **Call for Eols in May, deadline end of June**
- Alignment with European Strategy Process will be challenging anyhow
- CERN likely candidate to lead, ensure support and nominate proposal coordinator



Call 5: Demonstrating the role of RIs in the translation of Open Science into Open Innovation

Large initiatives and support measures to foster the innovation potential of research infrastructures:

2. **INFRAINNOV-02-2019 - Network of research infrastructure Industrial Liaison and Contact Officers** (2019 – 1.5 M€)
3. **INFRAINNOV-03-2020 - Co-Innovation platform for research infrastructure technologies** (2020 – 35 M€)
4. **INFRAINNOV-04-2020 - Innovation pilots** (2020 – 30 M€)



INFRAINNNOV-04-2020

Innovation pilots

Objective:

- *Support RI 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, which have reached a high level of integration and can focus on joint research developments*



INFRAINNOV-04-2020

Innovation pilot

Scope:

- ***Development of roadmap/strategic agenda for the construction and upgrade of RI***
- ***Development of technologies & techniques underpinning the use of the RI***
- ***Prototyping corresponding methodologies & instrumentation***
- ***Early stage involvement of industry as supplier***
- ***Sustainability plan requested (co-funding of roadmap)***
- ***Complementarities between the two innovation actions required***

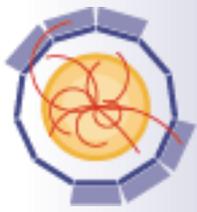


INFRAINNNOV-04-2020

Innovation pilots

Thematic coverage:

- **Innovation in light sources:** CALIPSOplus (access to light sources)
- **Innovation in detectors technologies:** AIDA-2020 (infrastructures for detectors at accelerators)
- **Innovation in accelerators technologies:** ARIES (accelerator research and innovation)



- **Separation** between call II-03 and II-04, in particular AIDA++ and ATTRACT
- II-03 aims at innovation for markets outside RI
- II-04 innovation for the delivery of services, or new services of RI

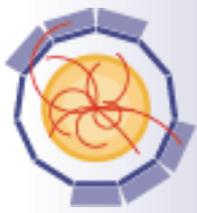
- What is **Innovation**?
- For ATTRACT: launch of a new product to market
- For us: we are invited to interpret the topic for our community
- Can be incremental
- Low and high TRLs

- Socio-economic **Impact**: as usual



Proposals should address:

- if not already done, the identification of key techniques and trends which are crucial for future construction and upgrade of the involved Research Infrastructures and the definition of roadmaps and/or strategic agendas for their development, in close partnership with the industrial partners, especially with innovative SMEs;
- the development of the identified fundamental technologies or techniques underpinning the efficient and joint use of the involved research infrastructures, taking into due account resource efficiency and environmental (including climate-related) impacts.
- the prototyping of higher performance methodologies, protocols, and instrumentation, including the testing of components, subsystems, materials, and dedicated software, needed to upgrade the involved research infrastructures or construct their next generation.



- Continue support for IA communities
- **Toolkit:**
- JRAs, NAs type of activity, no TA
- Innovation in the delivery of services of RI, or new services
- PoC is part - if it fits into this narrative
- **Outreach:** we need new ideas to leave IA mindset

- **Engagement of the communities:**
- Always an asset
- Do it with measure
 - Large-scale facilities, common technologies