



AIDA 2020

Advanced European Infrastructures
for Detectors at Accelerators

WP9 (NA8) in AIDA-2020

Summary of the parallel session

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On behalf of the WP9 collaboration



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- **WP9 Title:** New support structures and micro-channel cooling

- **From proposal's Annex 1 (Part B), page 11:**

The **next generation** of HEP detectors have challenging requirements to the overall material budget of **trackers and pixel** detectors, including **mechanical support structures** and in particular **cooling**.

This NA will foster a new collaboration to propose a **standardisation of the production techniques** and the **sharing of best practices** in the community, integrating existing and foreseen infrastructures into a **distributed facility** that will also serve as the incubator of **higher performance testing procedures**.



- **From proposal's Annex 1 (Part B), page 25 :**

The first task of this WP will design and develop the **building blocks** of the **integration** of the cooling of the detector modules and/or the support structures (**μ-channels**). The common procedures and **protocols** for the measurements, as well as the setting up of a **new specialised measurement system** will be documented.

The second task will **build up an Advanced Mechanical facility** with systems providing controlled loads to the tested devices as well as systems to measure the mechanical and thermal characteristics and performance of the test structures. The task will also provide **standards** for characterisation as well as **procedures** for the measurements.



- **CERN**

INFN-Milano (INFN beneficiary in WP 4, 6, 7, 13, 14, 15)

UNIMAN (beneficiary in WP 3, 7)

University of Twente (**external -> might be added to the list of Collaborating Institutes**)

- **CNRS-LPNHE**

FBK (beneficiary in WP 7)

University of Goettingen (**external -> might be added to the list of Collaborating Institutes**)

CNRS-LAL Orsay (CNRS beneficiary in WP 1, 2, 3, 4, 6, 8, 9, 13, 14)

MPG-MPP Munich (MPG-MPP beneficiary in WP 4, 7, 13, 14)

INFN-Pisa (INFN beneficiary in WP 4, 6, 7, 13, 14, 15)

University of Padova (**external -> would like to access the status of Associated Partner**)

- **CSIC-IFIC**

MPG-HLL Munich (MPG-**MPP (?)** beneficiary in WP 4, 7, 13, 14)

UBONN (beneficiary in WP 4, 6)

- **UOXF:**

STFC-RAL (STFC beneficiary in WP 6)

UNIBRIS (beneficiary in WP 5)

UNILIV (beneficiary in WP 2, 6)



Task 9.1 Scientific coordination (CERN, UOXF)

- Coordinate and schedule the execution of the WP tasks
- Monitor the work progress (milestone and deliverable reports), follow-up on the WP budget and the use of resources
- Organise WP meetings

Task 9.2 Micro-channel cooling building blocks (CERN, CNRS-LPNHE, CSIC-IFIC)

- Provide access to the silicon fabrication technologies
- Development of a simulation library for micro-fluidics and bi-phase flows in distributed μ -channels
- Development of a standard for the connection of the devices
- Fabrication of prototypes to validate the models and characterise the different fabrication techniques
- Setup a specialised facility to implement the procedures and protocols established for characterisation and validation of models and fabrication techniques

Task 9.3 Low mass mechanical structures (CSIC-IFIC, UOXF)

- Setup a distributed facility to characterise advanced low-mass support structures in terms of both mechanical and thermal performance
- Define standards for characterisation and qualification of test structures
- Build test structures with and without integrated cooling systems
- Provide a library for FEA simulation models and validate them with measurements on test structures



• T 9.2 Milestones

	Milestone Description	Beneficiary	Due Date	Verification
MS 24	CFD models available (Preliminary models to be used for thermofluidics simulations implemented in the available software and ready to launch comparison with experimental results)	CERN	Jun 2016	Agenda, attendance list on Indico
MS 77	Standard connectors available (Engineered design of a family of miniaturized connectors suited for both testing and final applications. Order for procurement submitted)	CERN	Mar 2018	Purchase order submitted
MS 82	Validated CFD models ready (Advanced models, based on subsequent improvements of the preliminary definition provided in MS24 , validated for use and ready for final phase of comparison with experimental results)	CERN	Apr 2018	Report to St Com

• T 9.2 Deliverables

	Deliverable Description	Beneficiary	Due Date	Type
D 9.1	Station for tests on μ-channel test devices Fully engineered design of a test station available to partners, including detailed list of instruments and components, and manual of operation. One prototype test station built and in use for tests	CERN	Oct 2017	Other
D 9.2	μ-channel prototypes μ -channel cooling devices in Si-Si and Si-Glass available to the partners for execution of the agreed test programme, including final model validation. Specifications, geometries and features previously agreed by the partners	CSIC	Oct 2017	Demonstrator
D 9.3	Technology recommendations for μ-channel cooling Report detailing the state-of-the-art technologies selected for the production process of μ -channel cooling devices to be installed in future HEP experiments	CERN	Feb 2019	Report
D 9.4	Qualification and characterisation of μ-channel cooling Report detailing the standardized procedures endorsed to qualify and characterise μ -channel cooling devices to be installed in future HEP experiments	CNRS	Feb 2019	Report

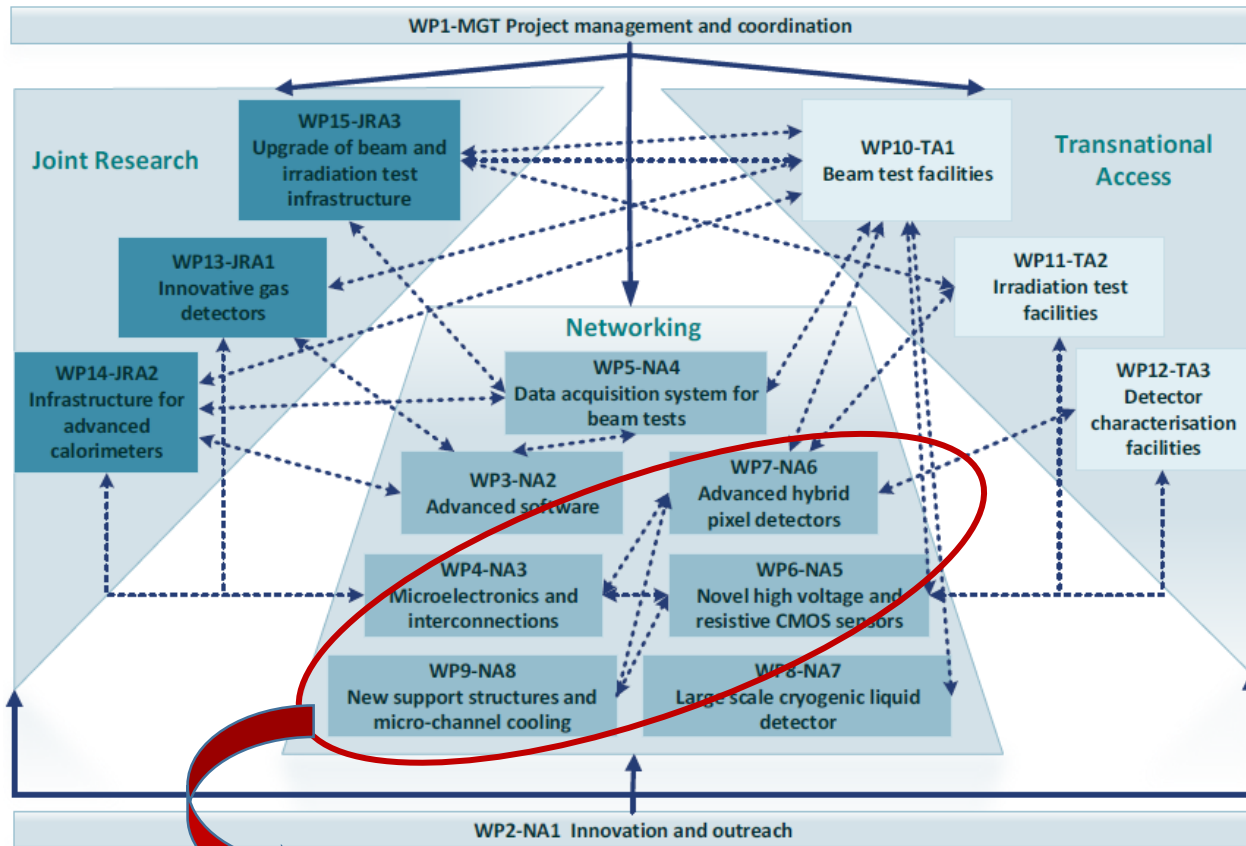


• T 9.3 Milestones

	Milestone Description	Beneficiary	Due Date	Verification
MS 8	Advanced Mechanical Distributed facility requirements (Report outlining the range of measurement setups and their capabilities to be installed within the Advanced Mechanical Distributed Facility)	UOXF	Jan 2016	Agenda, attendance list on Indico
MS 99	Advanced Mechanical Distributed facility ready (Report listing experimental setups within the Facility, and their performance as demonstrated with realistic prototypes)	UOXF	Feb 2019	Report to St Com

• T 9.3 Deliverables

	Deliverable Description	Beneficiary	Due Date	Type
D 9.5	Advanced Mechanical facility Definition of facility requirements: Identification of parameters characterizing the performance of support structures and identification of experimental techniques which make these parameters accessible, prioritization of the need by the international community for these measurements at a central facility	UOXF	Jun 2016	Other
D 9.6	Common test structures Identification of test structure designs which allow discriminating measurements of relevant structural performance parameter, prediction of performance by FEA, production of test structures and benchmarking results of these structures with the facility	CSIC	Apr 2017	Other
D 9.7	Standard procedures for qualification and characterisation Setup of measurement facilities, operation of the facility, evaluation of measurement hardware and procedures, development of definition of standard measurement procedures at the Advanced Mechanical facility	UOXF	Feb 2019	Report



- **WP9, WP7 and WP6** quite naturally linked.
- Will explore the most convenient way to keep regular links.
- However, already received a request of collaboration on a specific topic from **WP4** targeting μ -channel cooling of SALTRO chips organised on a large MCM-board for ILC detectors (U. LUND).



Parallel meeting @ Kick-off: first meeting of WP9

- Review of objectives, plan of work, **Milestones** and **Deliverables**;
- Review of different possibilities of cash flow from on Beneficiary to other institutes based on financial rules;
- T9.2: proposal of internal working structure organised around **4 Sub-tasks** with clearly identified MS and D responsibilities;
- T9.2: launched collection of personal interests for sub-tasks in order to pass **from institute identification to people identification**;
- T9.3: need to base the activity as much as possible on **user requests**;
- T9.3: launched **survey of community priority needs** based on available instrumentation and testing facilities;
- **ALL Beneficiaries**: list of competencies, infrastructures, interests, goals for beneficiary AND connected institutes;
- Invitation to widen as much as possible the **Network even outside AIDA-2020**;
- First discussion on internal communication/organization periodicity of meetings.



Next steps for WP9

- **“WP9 Kick-off” meeting: 30/6-1/7 @ CERN;**
- By WP9 kick-off meeting: internal organization, definition of working groups and of personal responsibilities endorsed;
- At WP9 kick-off meeting: detailed definition of different agendas and work plans for all working groups
- Work on all different activities will ensure **perfect continuity** with respect to the collaborations already ongoing;
- **Video meeting in September;**
- **Face-to-face meeting in December** (UOXF offers to host it) to check status of the very first WP Milestone (possibility of remote connection always granted);
- Bi-monthly cadence for Video meeting seems to be adequate for time being;
- Face-to-face meetings: certainly once per year (during plenary), possibly twice (not yet defined)