



27 June 2024

Delay on:	D3.1 Common cold box delivered
Delivery Date in Annex 1:	M30 (30th September 2023)
First extension for expected Delivery Date (28-09-2023)	M39 (30th June 2024)
Revised extension for expected Delivery Date (30-06-2024)	M44 (31st December 2024)

Justification of additional delay of deliverable D3.1

Plans for finalising the AIDAInnova cold box and remaining work

As reported in the AIDAInnova P2 report, the design of the cold box has been finalised in April 2024 (M37) by University of Zurich, following a strong collaboration and experience-sharing between experts at CERN, University of Zurich and IJCLab. The procurement of the materials is well underway through CERN (M37-M39) and the construction of the cold box has begun (M39) in the mechanical workshop of the University of Zurich. It is foreseen that the construction of the cold box will be completed by the end of July 2024 (M40), only one month later than originally estimated in the first extension request.

In addition, the procurement of the auxiliary materials such as the translation stages has been concluded with delivery expected in July 2024 (M40) and the procurement of the chiller has been placed, following the pre-approval of the CERN procurement office, with delivery expected in October 2024 (M43), 4 months after the placing of the final order. The chiller was chosen after extensive considerations in terms of cooling performance and compatibility with the test beam environment and the need for portability.

Opportunistic periods in the SPS H6 beamline will be used to pre-commission the cold box during August 2024 and September 2024, in the test beam environment. The second AIDAInnova test beam is scheduled for week 42 (October 16th 2024) during which the cold box will be tested in its final environment, including the use for physics measurements with AIDAInnova detectors under test. Considering this planning, with some contingency for procurement and the need for testing, the project requests an extension of this deliverable to 31st December 2024 (M44).

While we regret taking more time than initially foreseen, we are confident that the high-quality design will perform exceptionally once built and commissioned, serving the community well for many years.

Figure A depicts the final design of the cold box with an internal view of the cooling assembly with heat exchanges and the devices under test. Figures B and C below show the mechanical

design of the cooling assembly of the cold box (B) and the experimental assembly (C), showing the internal baseplate, the space for the devices under test. The bill of materials ordered for the construction is listed in Table A.

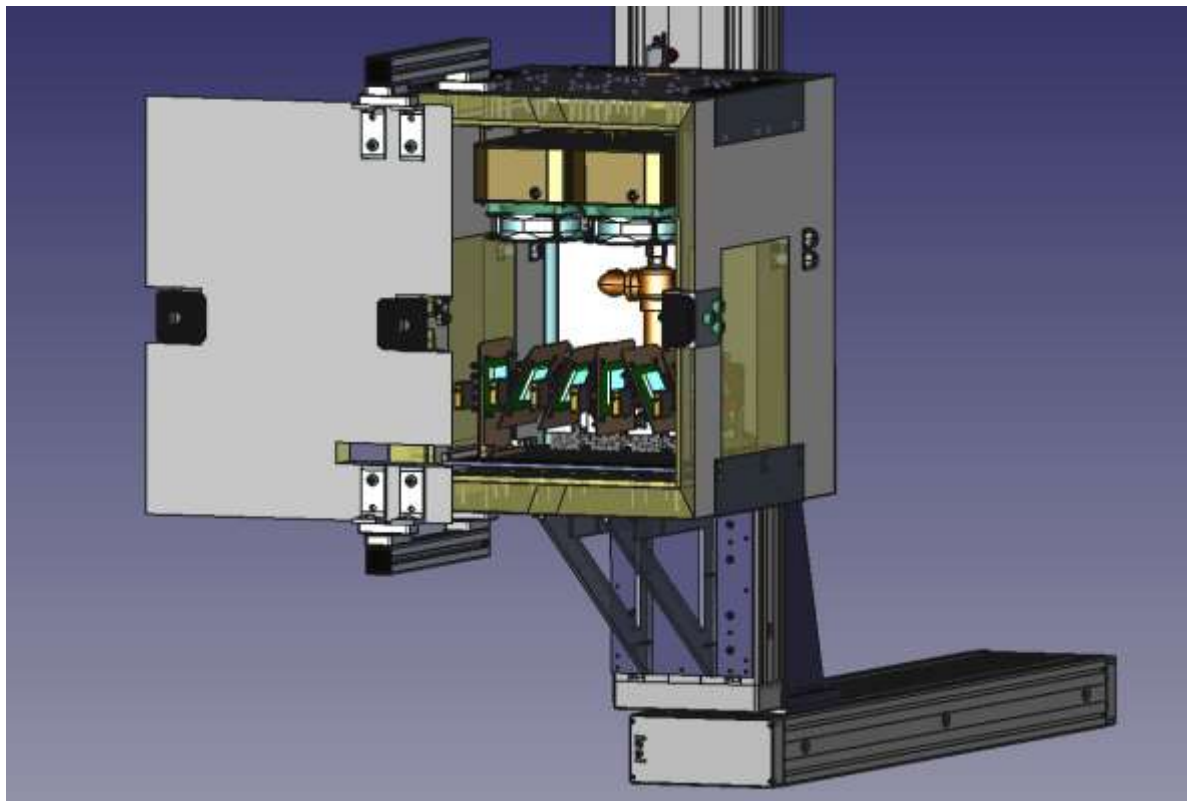


Figure A: Final version of the cold box design integrated in the test-beam environment on the X-Y stage. The cooling and experimental assemblies are visible through the parallel opening front door.

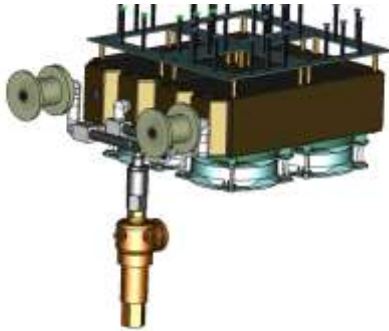


Figure B: Depiction of the cooling assembly including the distribution manifold and the safety overpressure relief valve.



Figure C: Drawer-like assembly allowing for a maximum of 5 experimental planes with individual 3-axis per plane movement.

Recall from 29 September 2023 extension justification:

Experience with existing state-of-the-art cold boxes and cold box R&D

In the last two years (M6-M30) existing cold boxes being used by CERN and other AIDAInnova collaborating institutes have been used to gain valuable experience on cold box performance and operations. In particular, the ACONITE telescope coldbox, which is installed permanently inside the SPS beam area H6A at CERN, has been extensively used, primarily by silicon sensor R&D communities working on detector designs in their final prototyping stages, for final construction by 2028; including the ATLAS Inner Tracker pixel, ATLAS Inner tracker strips, ATLAS high granularity timing detector and the CMS Phase II Tracker pixel detectors. A lot of operational experience has been gained during this time, and lessons learnt on improving the cooling capacity are being incorporated into the new AIDAInnova design.

The delay in the new state of the art AIDAInnova cold box design was primarily driven by complying with the person power test beam needs of the ATLAS Inner Tracker pixel program, which has been in a crucial final prototyping phase, requiring input to reviews to finalise the design and transition from final prototyping to now the recent successful start of the construction process. Work on the current setup for HL-LHC did not allow the investment of work into a new setup; at the same time freezing the design was difficult due to the accumulation of new knowledge regarding the possible technical solutions.

Plans for finalising the AIDAInnova cold box

In collaboration with AIDAInnova lead institute CERN, an engineer from IJCLab, experienced in cooling developments and leading a team has drafted a preliminary design based on agreed specifications and less by CERN. The finalise the design based on incorporating all lessons learnt from the existing cold box and the design should be frozen by M31. The next steps are procurement of parts (M32-M36) and the construction and commissioning (M37-M38). Procurement will be under the responsibility of CERN and construction by IJCLab, where the lead engineer who will be based at CERN from M32 as a project associate to maximise the efficiency of the collaborative work. Commissioning will be the responsibility of CERN.