

## Work package: Frames and Infrastructure

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### Documents

#### Work Package for the Vacuum Control System for the NOVEC cooling lines of the LHCb SciFi detector

<https://edms.cern.ch/document/1974407/3>

A vacuum system for the thermal insulation of the SciFi distribution lines and manifolds

<https://edms.cern.ch/document/1887947/1> [↗](#)

#### Work Package LHCb SciFi Gas System

<https://edms.cern.ch/document/2052204/1>

#### LHCb dry air work package

<https://edms.cern.ch/document/2114223/1>

#### Work Package for DAQ system of the gas flow cells for the LHCb SciFi detector

<https://edms.cern.ch/document/2068324/1>

#### Installation of the SciFi Novec plant

<https://edms.cern.ch/document/2136253/1>

### Scope

The work package comprises the following main items and tasks

- C-frame mechanics, incl. rails, carriages.
- Novec cooling and circulation plant for cooling the SiPM arrays to -40 C.
- Water cooling system to evacuate the dissipated heat of the front-end electronics.
- A vacuum system for the insulation of the Novec distribution lines and On-detector Novec manifolds
- A dry gas flushing system to ensure a condensation and frost free environment inside the cold boxes.

## C-Frame Mechanics

The structure of the C-Frame is as follows:

1. The structural support is provided by extruded aluminium I-beams. These form the C-shape of the so-called C-Frame, with an upper and lower arm connect to a vertical beam.
2. The detector modules are mounted on an aluminium plate that is fixed to the upper and lower arms (there is an intermediate support for the novec manifold between the I-beam and mounting plate).
3. The bottom arm is supported by means of two carbon fibre strings from the top.
4. All cables, water lines, dry gas lines, and optical fibres are contained in a movable cable transport carrier which is fixed to the vertical beam. The lines are then routed over the C-Frame and connected to the detector modules.

CAD files and other documents can be found on EDMS: <https://edms.cern.ch/project/CERN-0000186229> [↗](#)

A prototype C-Frame is under development: SciFiProtoCframe It serves as an assembly prototype and test bench.

## Water Cooling

The heat dissipated by the front-end electronics will be removed by a circulation system based on demineralised water. The prel. requirements of the cooling plant are described in EDMS 1887449 [↗](#).

A row of 5 (or 6) Front-End Boxes (FEB), housing the electronics, will be cooled serially by circulated water. Each FEB will be mounted on a cooling block which ensures the thermal contact between the cooling water and the cooling plate, which constitutes the back of the FEB.

The technology chosen will be produced by AAVID from 2 part cooling blocks, to squeeze a continuous 3-meter long copper tube.

## Novec Cooling

The SiPMs require cooling to -40C in order to reduce the rate of single photoelectron equivalent "dark noise" signals that will increase over time though neutron equivalent radiation damage. A monophasic liquid, Novec, will be chilled to -50C and circulated through the detector. Vacuum insulated transfer and distribution lines have been developed to transport the liquid in a pipe that has a small enough cross section to stay within the limited envelopes of the detector.

A small version of the Novec chiller is being produced for commissioning of the production C-Frames and will be installed in the assembly hall.

### Contributing institutes

- Heidelberg
- CERN
- Clermont Ferrand
- Tomsk
- Nikhef

-- ChristianJoram - 18 Sep 2014

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