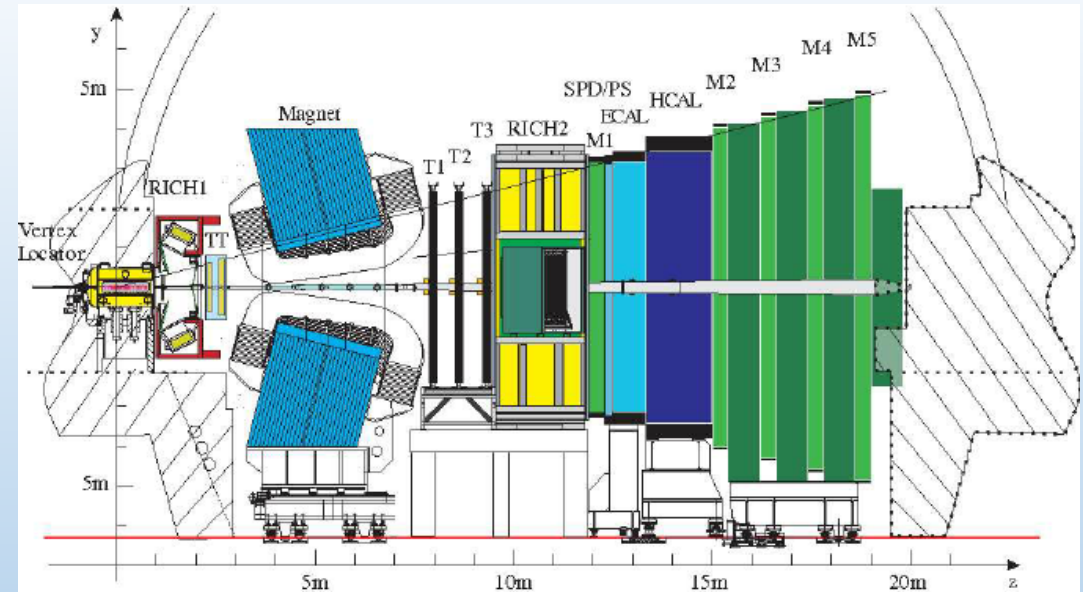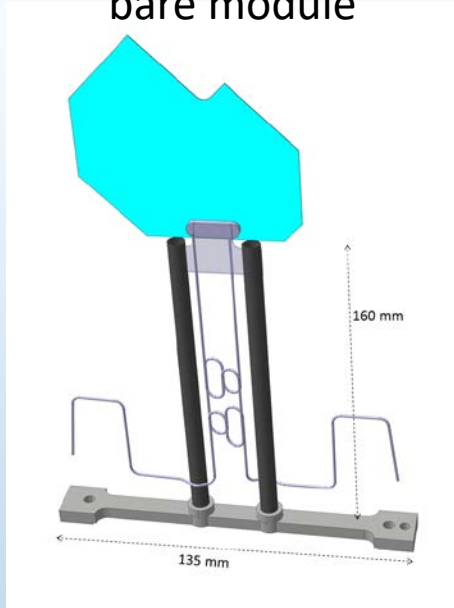# VELO Upgrade Module Test-setup

- ## <u>VE</u>rtex <u>LO</u>cator of LHCb

  - During LS2 replaced by: 52 double sided modules with 4 pixel sensors each.

  - Nikhef produces 30 modules and takes care of a functionality and readiness test setup (other 30 in Manchester)
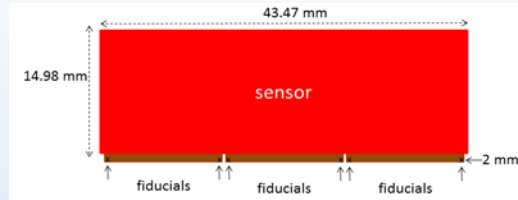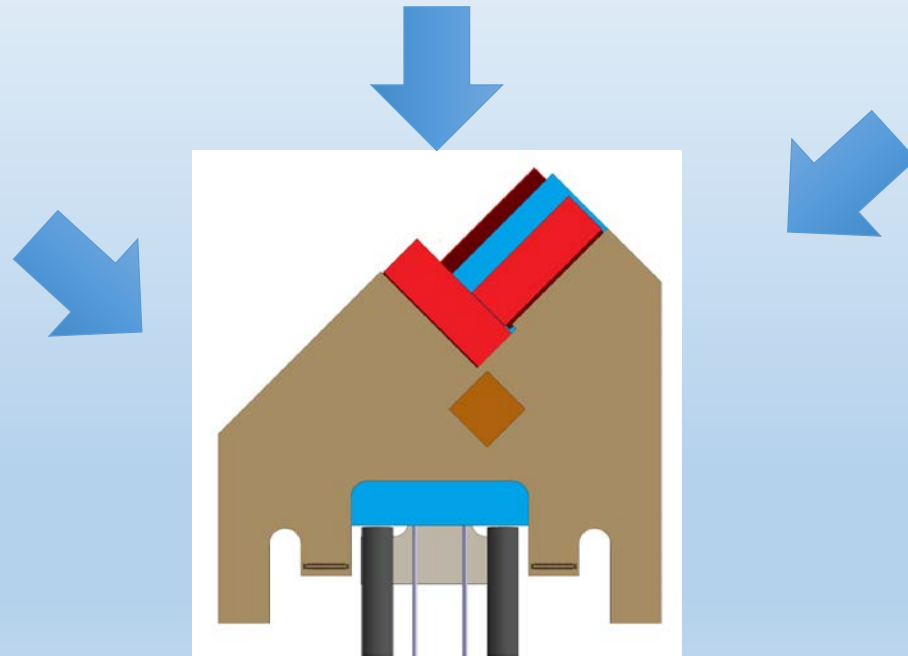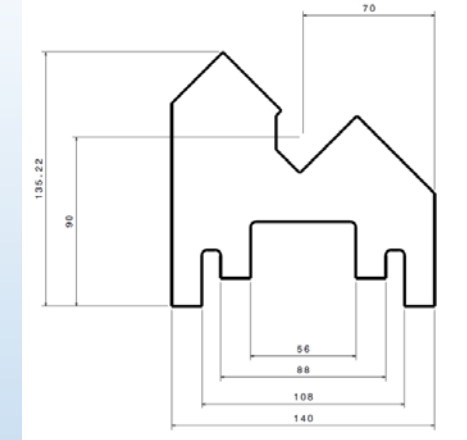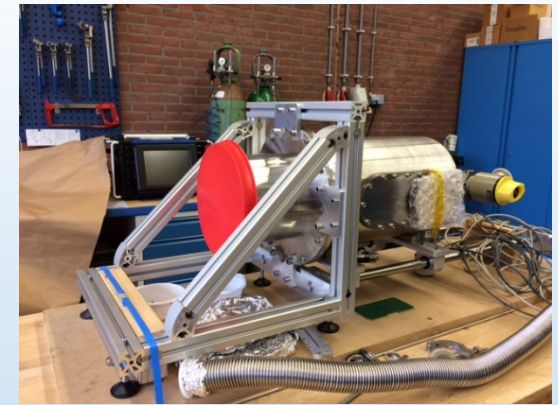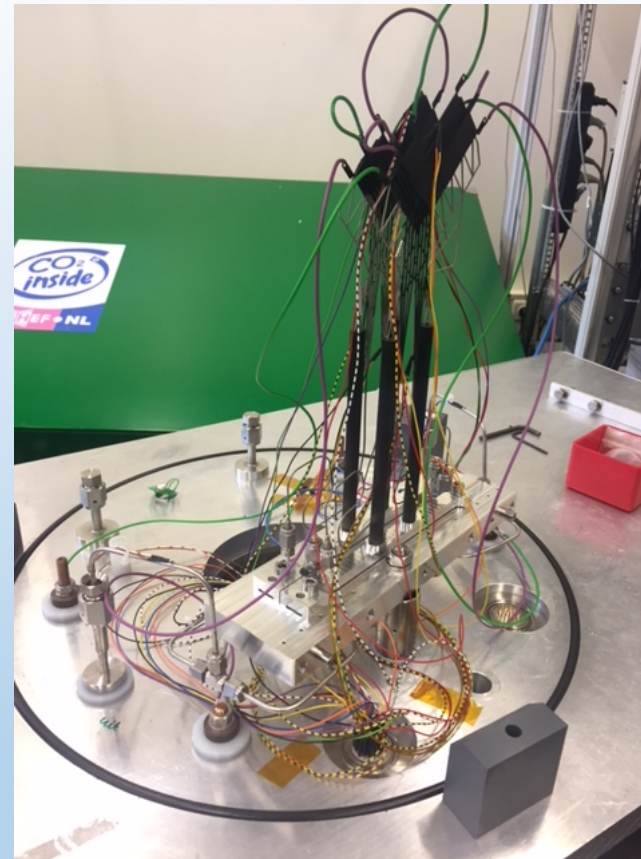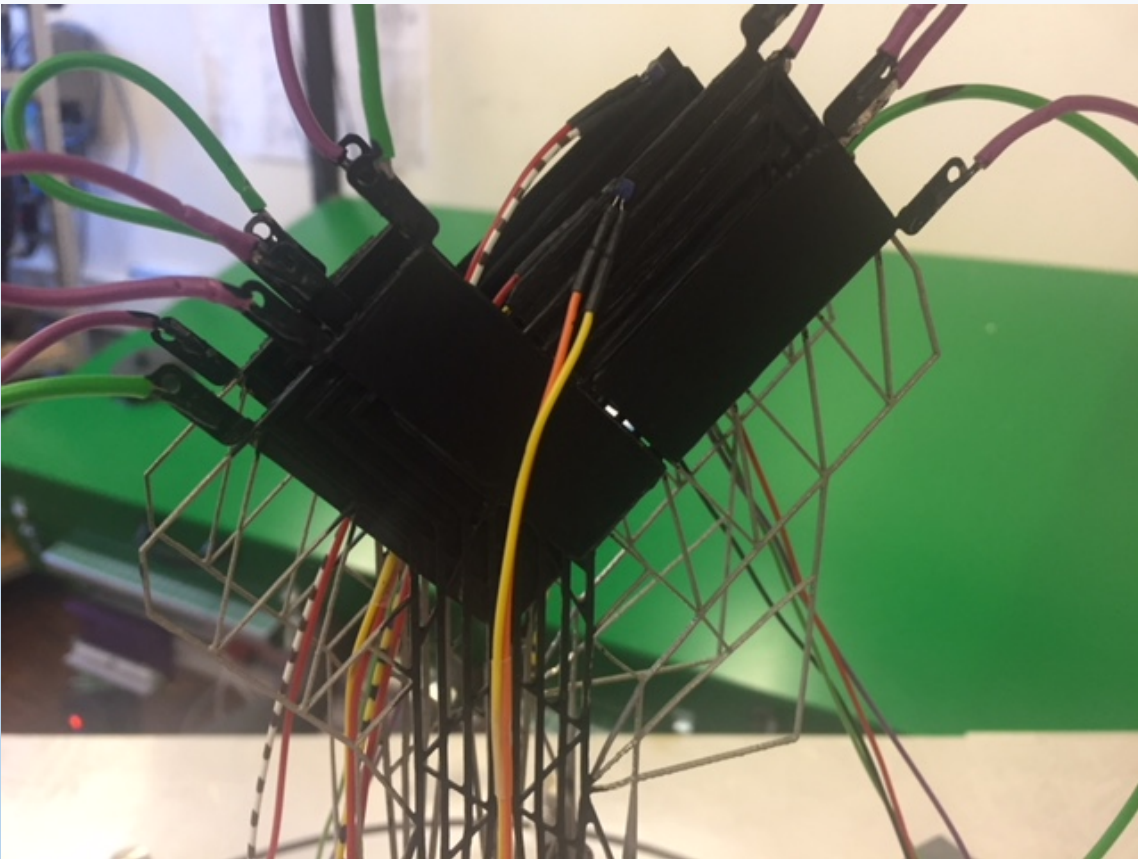
VeloPix module

"bare module"

"tile= sensor + 3 ASICs"
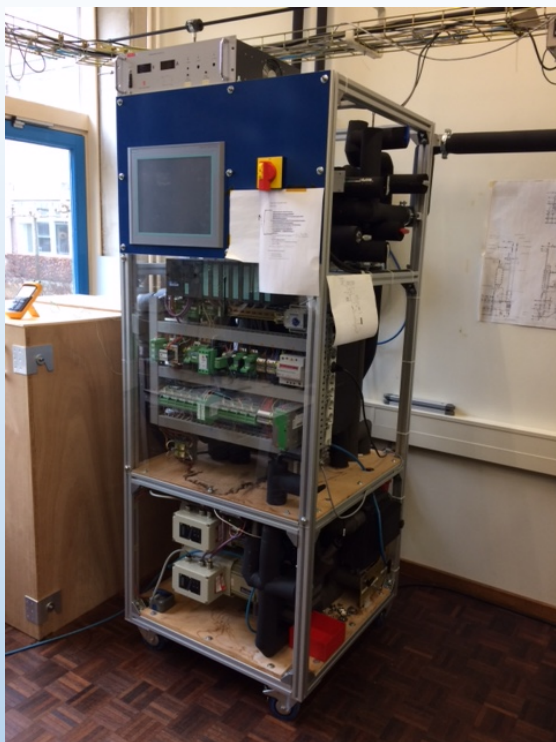
"hybrid (Cu-capton PCB)"

VeloPix Module (2)

H026

Upgrade test setup

What's needed

CONTROLS

PLC — CO$_2$ cooler

MiniDAQ2 ← optical fibers

CO$_2$

interlock ← 4 x NTC / 2 x PT100

LV — 1 channel: ± 10 V

HV — 4 channels: < 1kV

Vacuum ← pressure sensor: < 10^{-2}

OPB

Vacuum tank

OPB: optical power board
(also vacuum feedthrough)
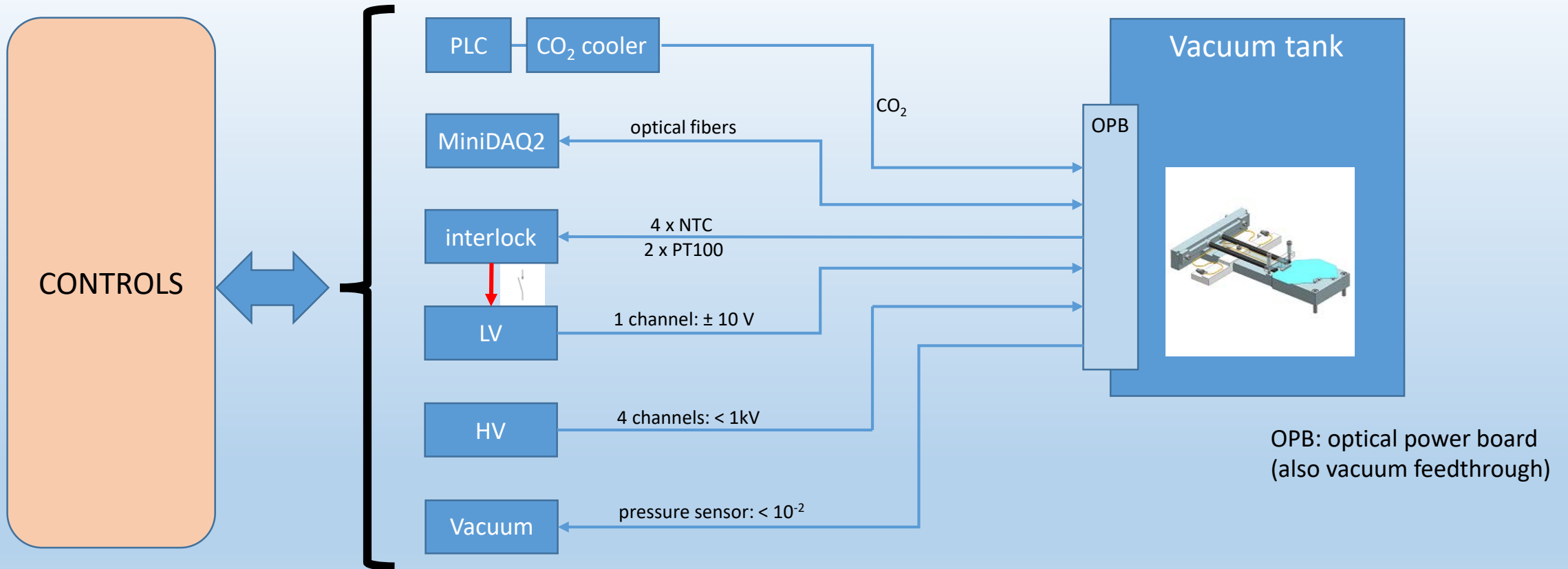
Test setup hardware

MiniDAQ2

LV: Agilent E3633A

CO2 cooler (@nikhef)
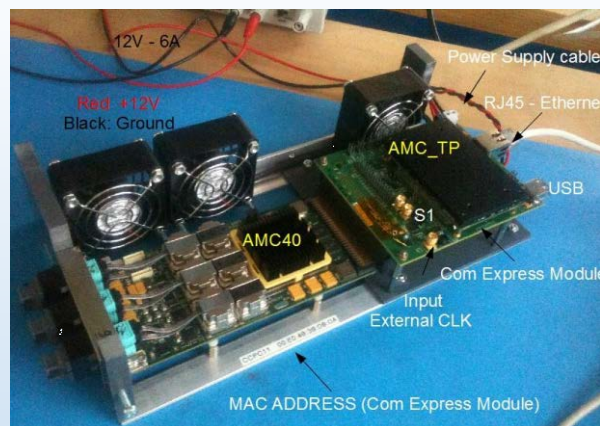
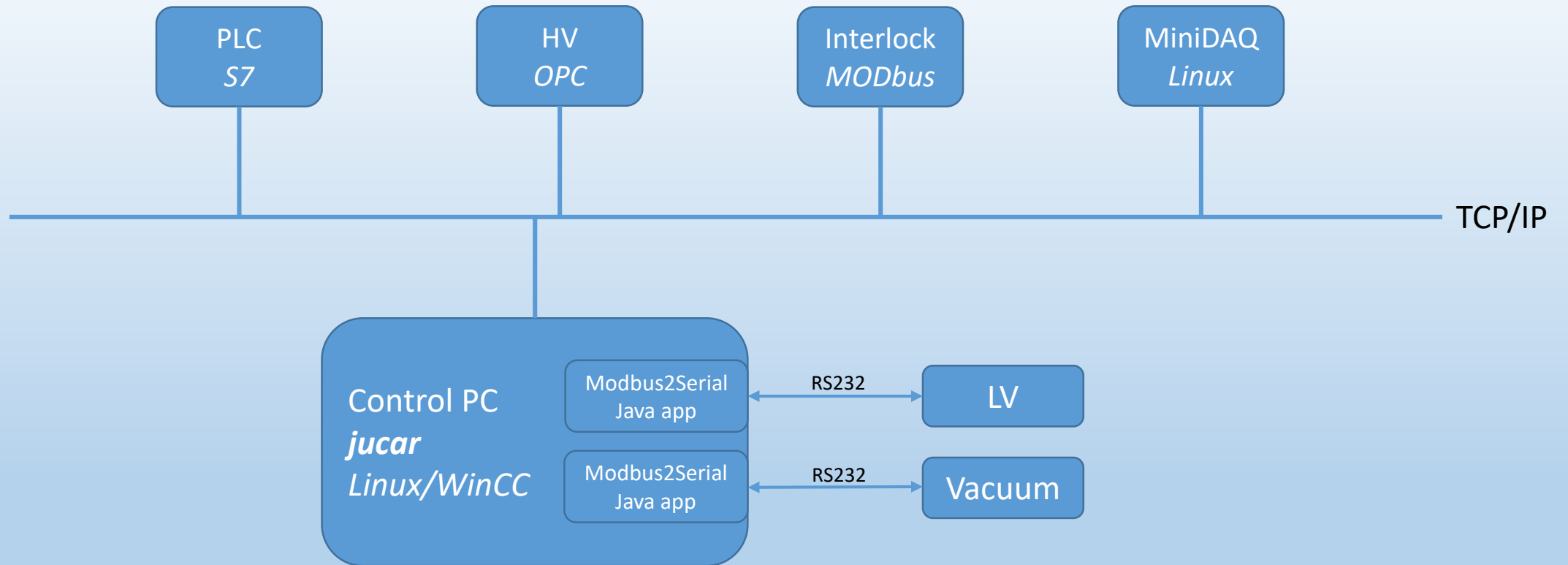HV: CAEN DT1471

Interlock: NI CompactRIO

Network connection layout

Controls

What do we need to control this heterogeneous system?

- Coherent and common Supervisory Control and Data Acquisition System (SCADA) which supports S7, OPC and MODbus
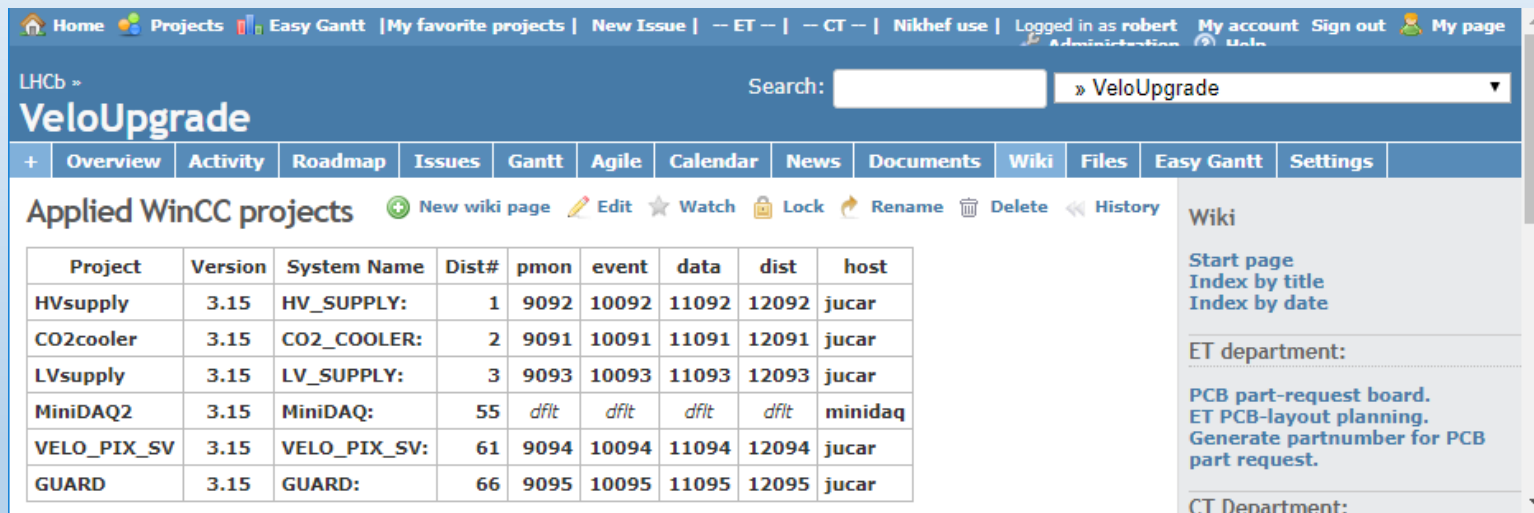
- Solution: **WinCC**

  - Founded by ETM as PVSS, taken over by Siemens (2007) and now called WinCC
  - Available on Linux and Windows
  - Provides all SCADA functionality: archiving, alarm handling, MMI, control scripts, ..
  - *Datapoint*: the basic data-container of a variable, being a simple type (*int*, *float*) or complex type (*array*, *struct* or *reference* to another datapoint). It may have *configs* like *address*, *function*, *archive* or *alert*
  - Selected by CERN (2000) for all LHC experiments
  - Available for collaborating institutes participating in a LHC experiment
  - JCOP framework: built on top of WinCC, providing common utilities and hardware support

Controls (2)

- For each sub-system (*LV, HV, Cooling, Interlock, MiniDAQ*) a WinCC Project exists, providing the basic functionality
- For a global overview, monitoring and watchdog a super-visor WinCC projects is running
- *Redmine*, a web-based project management and issue tracking tool, is applied
- All projects run on *jucar*, except the *MiniDAQ* which runs on its own machine

Expert Control panels

Super-Visor

1. Provide a coherent overview of all sub-systems
   ATLAS style applied (state, status)
2. Prevent dangerous actions
   switching on LV or HV depends on other sub-systems
3. Provide a *soft* interlock
   HV and LV are switched off in case other sub-systems transit to a status other than OKAY or WARNING

Summary

- A typical Nikhef project
  - Lack of requirements (on demand)
  - Weekly meetings with little commitment
  - Small system with lot of different protocols (Ton solved them all!)
  - PLC programming is still dependent on a retired Nikhef employee
- *Redmine*: convince others to use it
- PRR: July 2018 (postponed several times)
- Controls are ready?! Demo has been shown. Real work comes when first module will be tested.
- Usage *MiniDAQ*: uncertain, implementation by LHCb physicist
- No contact with Manchester. Are they waiting for us?