

The Advanced LIGO PSL Overview and Controls

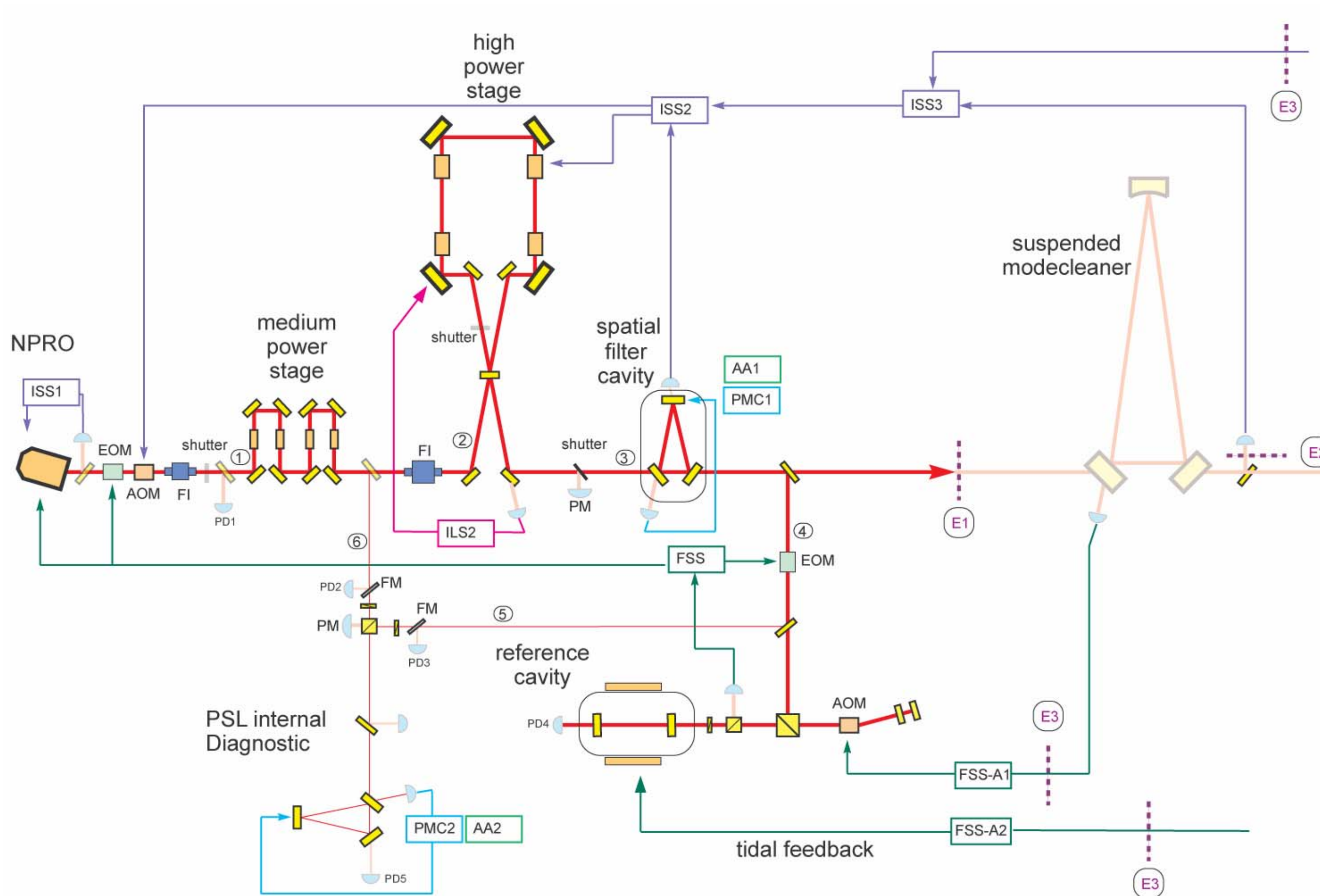
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March 12th, 2008.

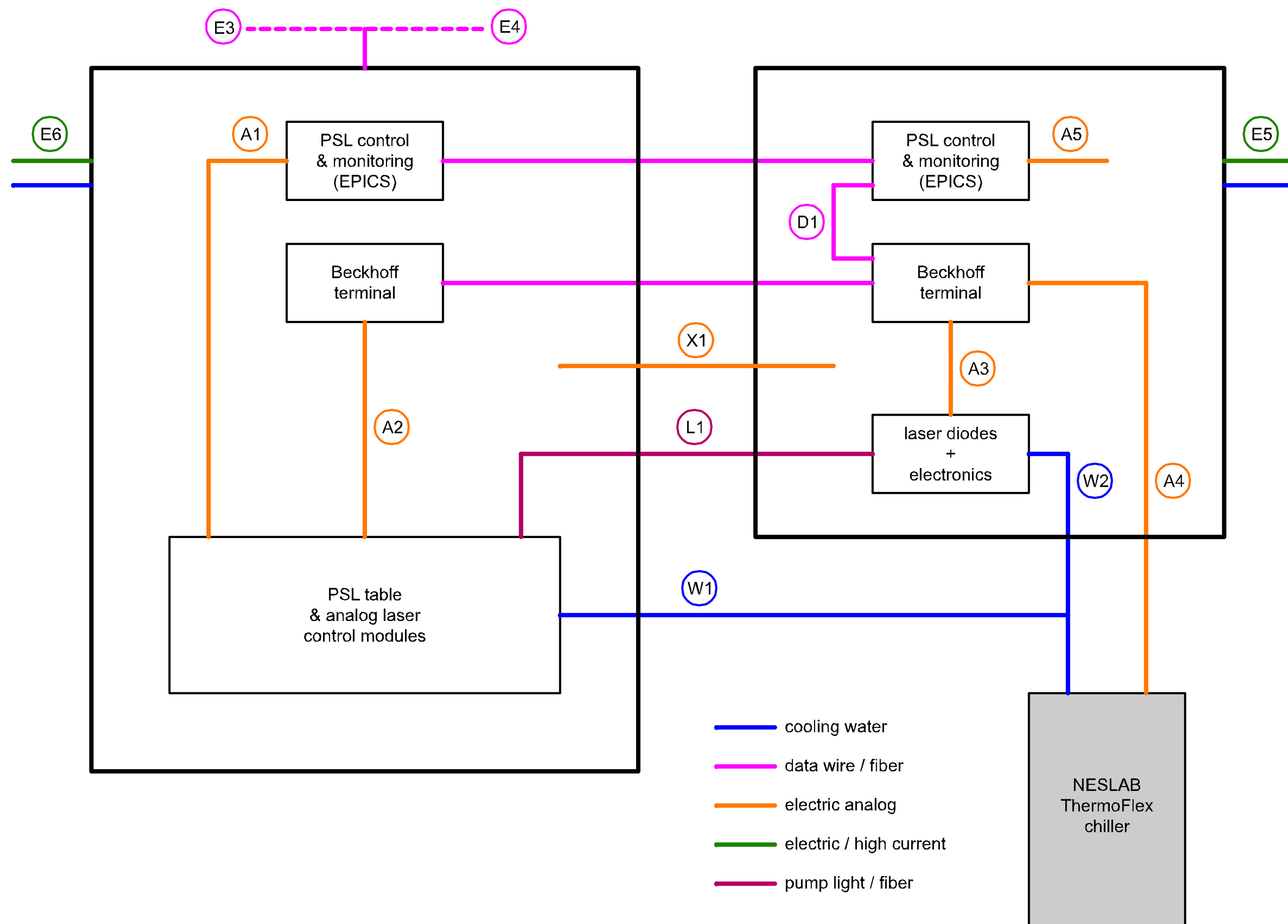
The AdL PSL

- The AdL PSL is a major contribution by one of the LSC members:
 - Albert Einstein Institute (AEI) or
 - Max-Planck-Institut für Gravitationsphysik (MPG)
- The laser is being developed by Laser Zentrum Hannover (LZH) under guidance from the AEI.
- The control electronics will be provided by the AEI.

The AdL PSL (cont.)



Interfaces to LIGO Facilities



Controls

- The laser is controlled by an industrial controls system by Beckhoff Automation known as TwinCAT. The **Windows Control** and **Automation Technology**
 - » For EnL, the controls are accessed via a touch panel PC running Windows CE.
 - » For AdL, at present, the touch panel control for the system runs Windows XP.
- The touch panel computer runs a software programmable logic controller (PLC).

Controls (cont.)

- Graphical user interface.
- No control room control will be provided except:
 - » Emergency shutdown
 - » Shutter operation (pending)
 - » NPRO slow actuator
- Modification of laser operating parameters can only be done locally.



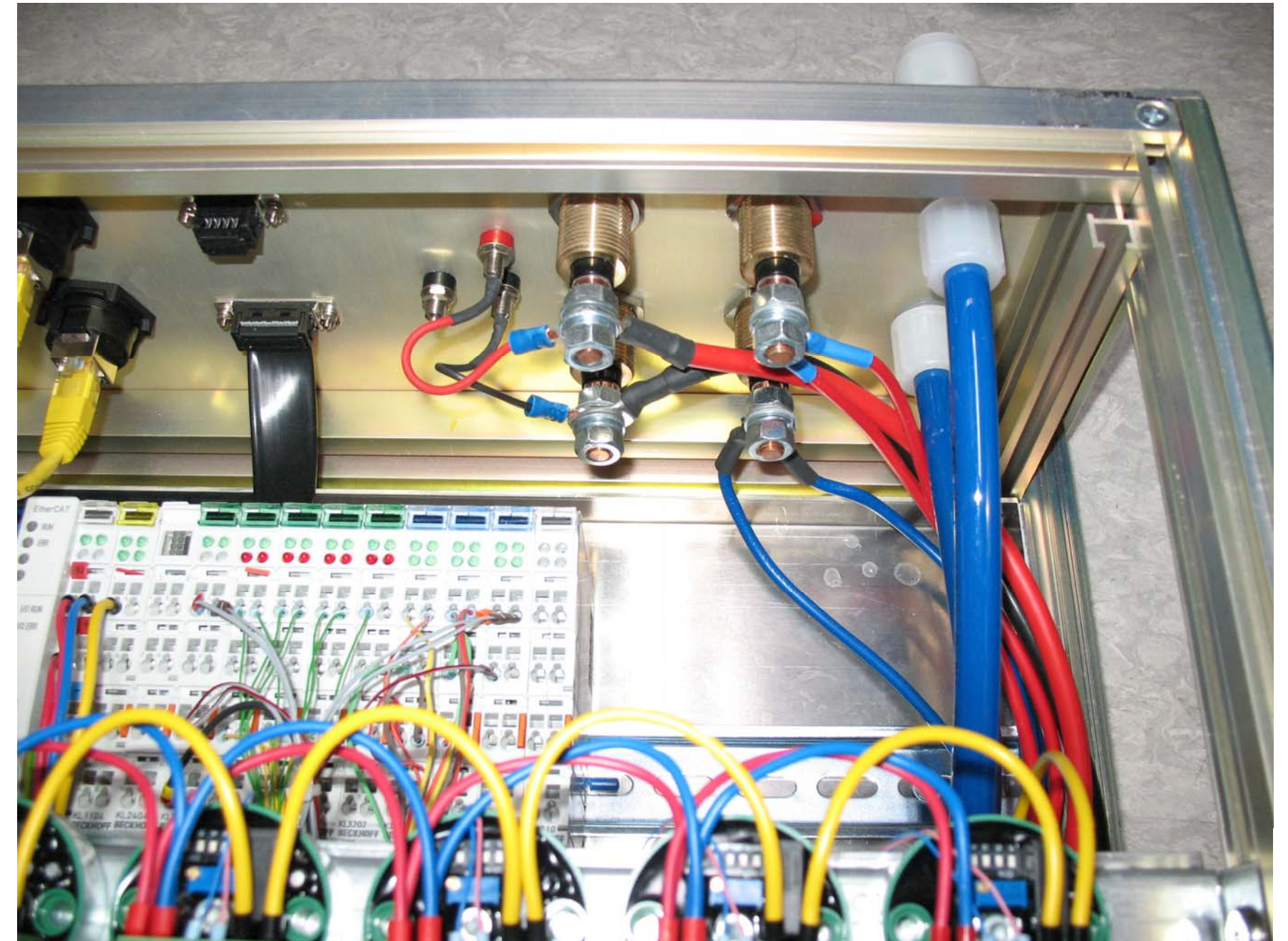
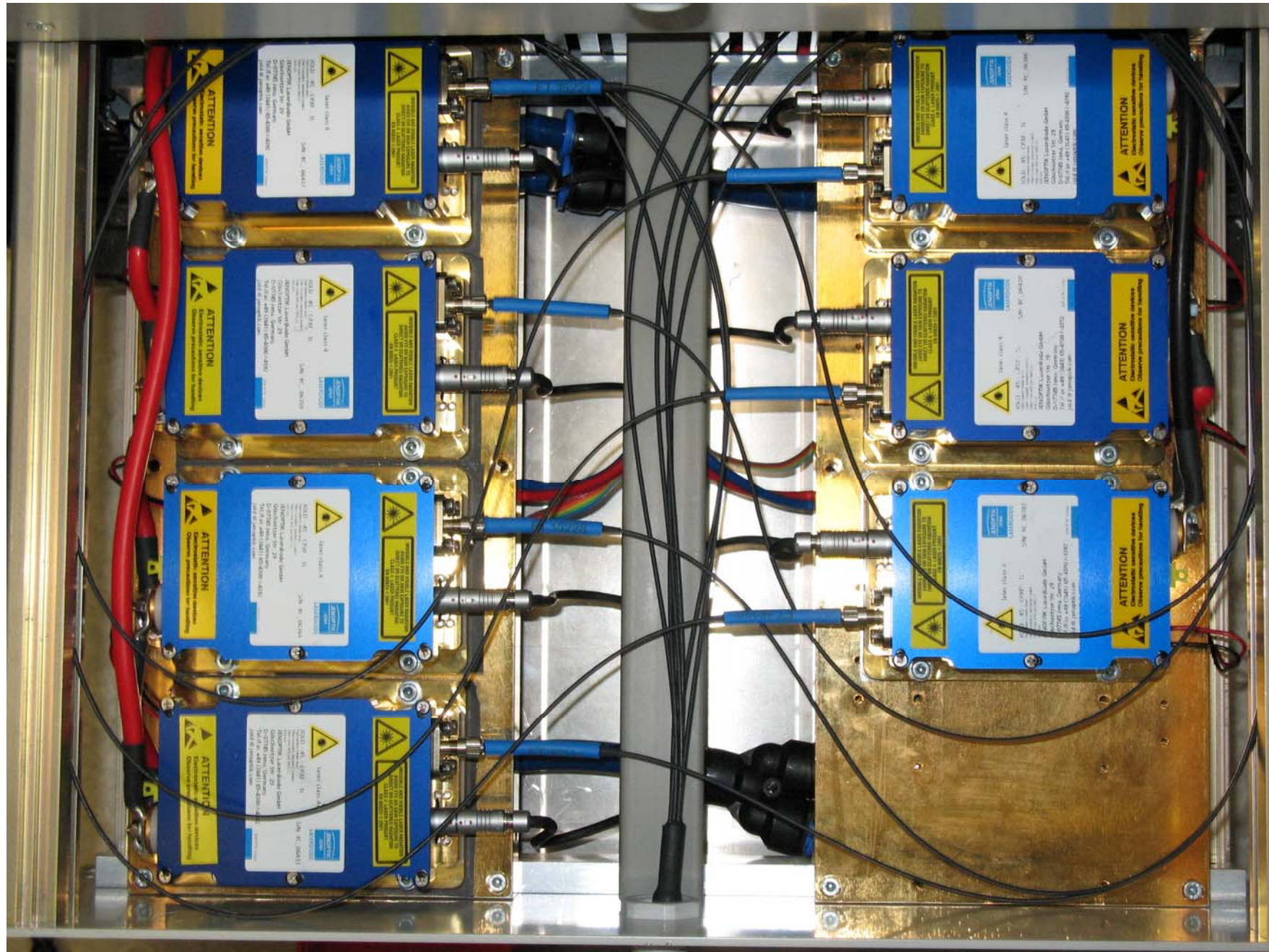
EPICS Interface

- The EPICS interface is via OPC.
 - » TwinCAT OPC server / EPICS OPC server running on a PC.
- On the EPICS side, the OPC appears just like an IOC.
 - » EPICS records reside on the OPC server.
 - » The symbol mapping between TwinCAT variables and EPICS records reside on the OPC server.
 - » Seemingly transparent, except you cannot log onto the IOC.

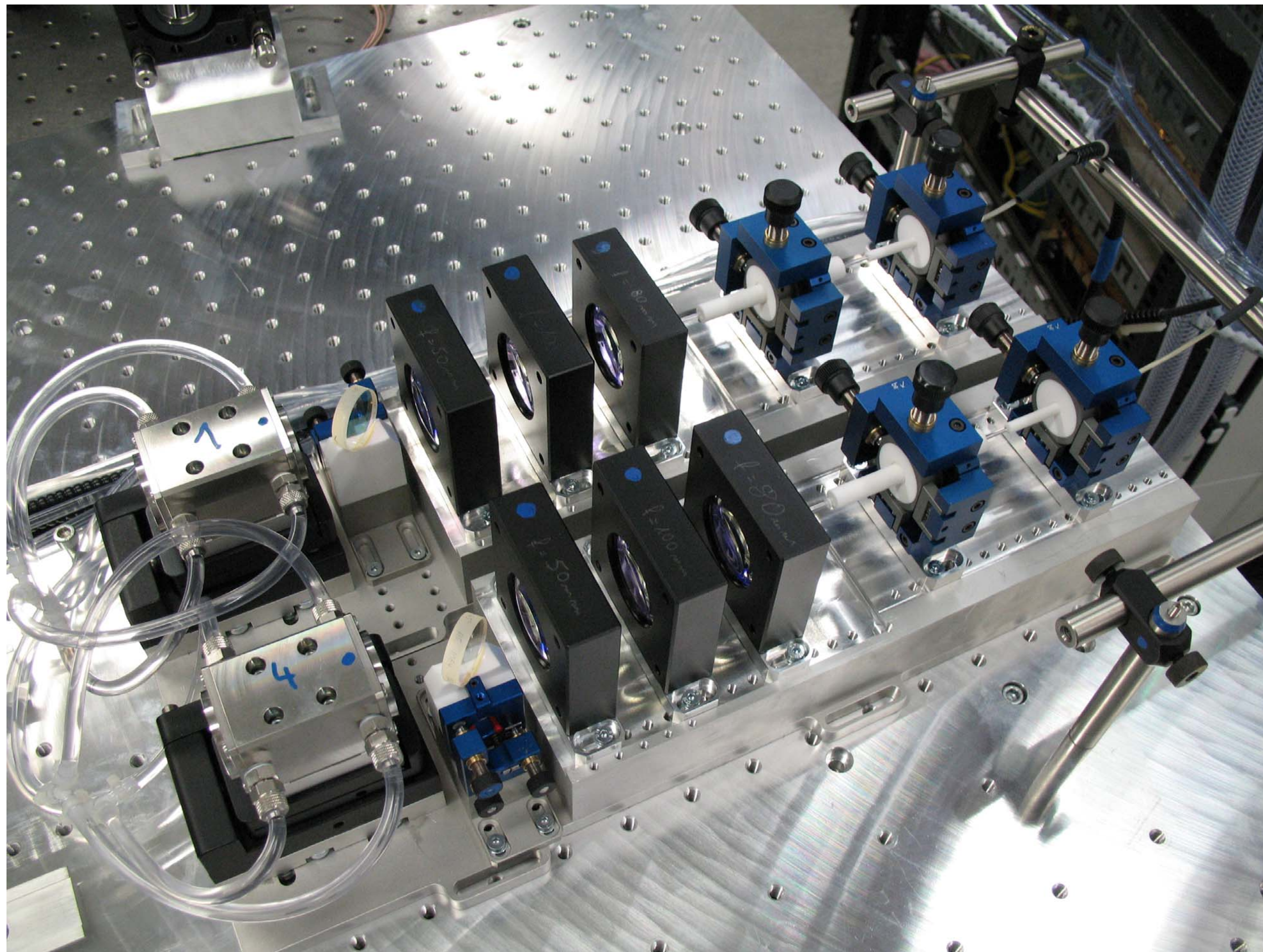
DAQ Channels & EPICS Records

- The number of signals has increased
 - » ~107 for the laser compared with 30 in InL
 - » There are, after all, 32 pump diodes per laser
- The signal count for frequency stabilisation, the pre-modecleaner, intensity stabilisation is about the same as in InL.
 - » New addition is the diagnostic breadboard, which is planned to be under full digital control.

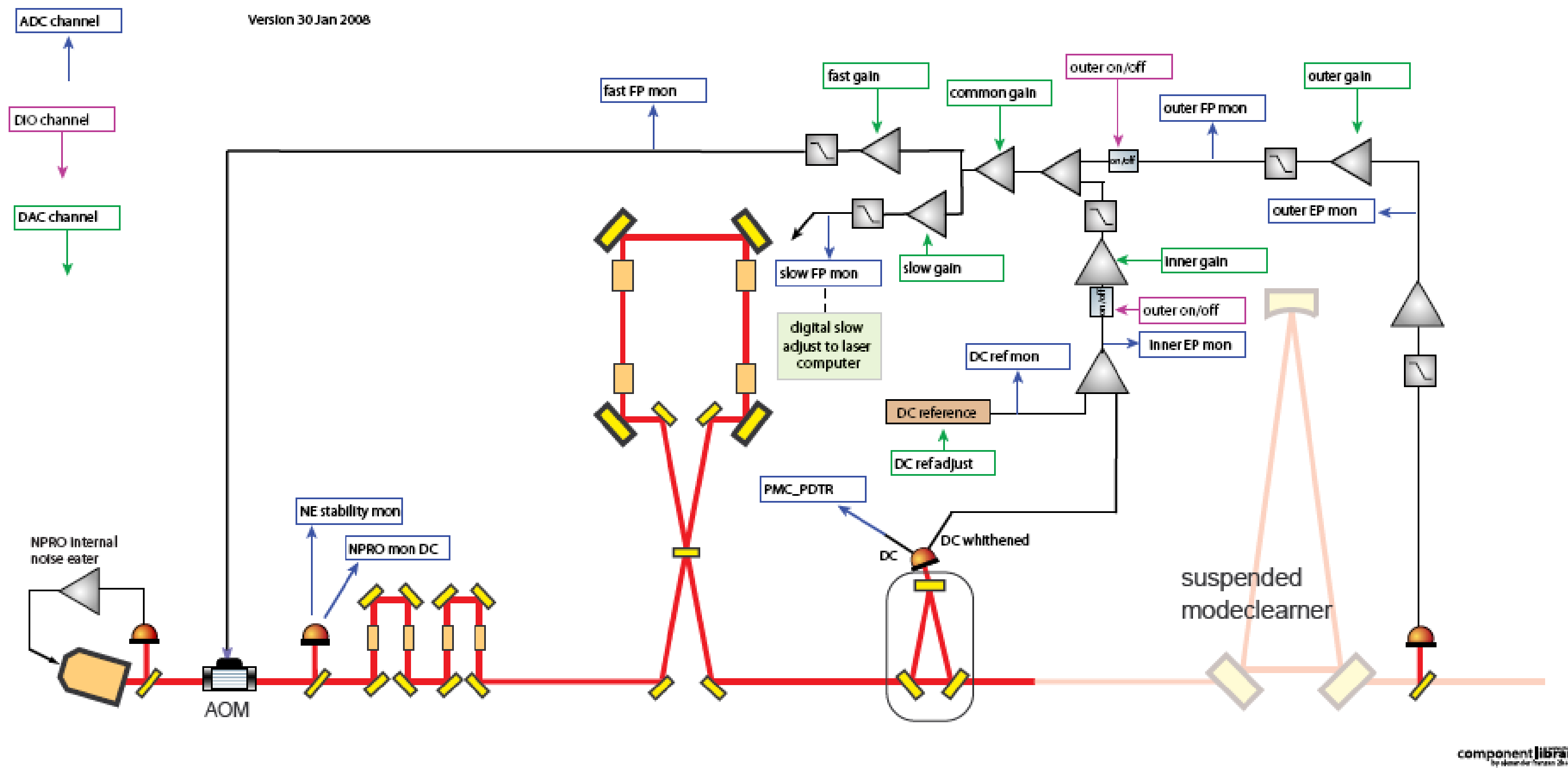
Laser Hardware



Laser Hardware (cont.)



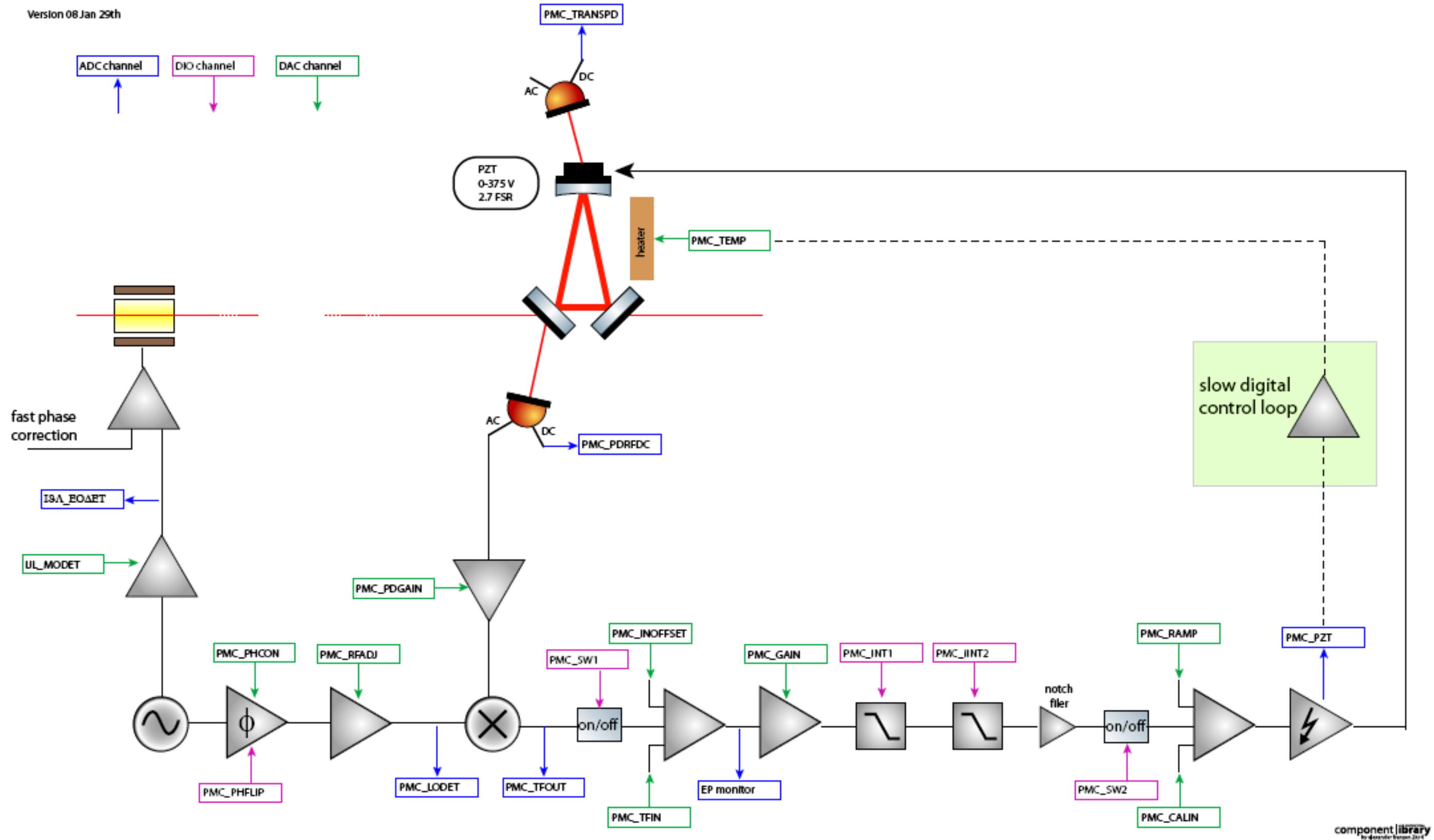
Power Stabilisation



Frequency Stabilisation

- Similar to InL electronics, if not the identical ones.
 - » Some minor changes are envisaged
 - Phase locked frequency references, for example.
- Reference cavity identical to InL.
- Pick-off for the reference cavity is taken after the pre-modecleaner.

The Pre-modecleaner



Testing

- Testing of the full up system will take place at the AEI.
 - » Integration of the servo electronics, EPICS controls and fast data acquisition.
- A complete AdL PSL reference system will reside at the AEI.

Current Status

- The 35-W EnL laser was recently locked to the reference cavity using the Initial LIGO TTFSS.
- DAQ hardware and controls being fabricated at Caltech.
- Still some teething issues with cleanliness. The cleanliness requirements will be higher than that experienced with InL.
 - » Cleanroom garb will be required when working on the PSL Table for example.
- Development of a high power, vacuum compatible, low noise photodetector is yet to be completed.
 - » We think we have the high power, low noise part optimised.