

Status and Plans for the Slow Control of the Luminosity Detector

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Experimental Physics and Industrial Control System (EPICS) is used for the PANDA Detector Control System (DCS)

- Set of open source software tools, libraries and applications
- Network-based client/server model
- Decentralized architecture
- Freely scalable
- Supports many platforms (Linux, Unix, Windows, RTEMS, vxWorks, ...)
- Supports many architectures (x86, x64, ARM, ...)

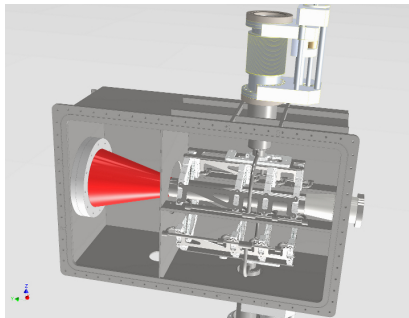
High Voltage

- HV-MAP's need high voltage power supply (~ 60 V)
 - High resolution in current measurement needed
- ⇒ Using ISEG EHS F2 05p-F
- 16 channel, 500 V, 10 mA, single channel floating-GND
 - 50 pA resolution in current measurement for $I_O \leq 20 \mu\text{A}$
 - Accuracy: $\pm(0.01\% V_O + 0.02\% V_{O,nom})$
 $I_O \leq 20 \mu\text{A}$: $\pm(0.01\% I_O + 4 \text{ nA})$
 - Sampling rates [s^{-1}]: 5, 10, 25, 50 (default), 60, 100, 500
 - Potentiometer to set hardware limits for V_{max} and I_{max} per module

Low Voltage

- HV-MAP's need low voltage power supply (1.8 V)
 - $\leq 7 \text{ mW/mm}^2$ ($\sim 400 \text{ mm}^2/\text{Sensor}$)
- ⇒ $\leq 2.8 \text{ W/Sensor}$
- No decision on concept, yet

Pressure Measurement



- Luminosity detector operates inside vacuum
 - Need coupling with vacuum inside beam pipe
- ⇒ Control of vacuum pumps and pressure measurement needed
- Details have to be discussed with engineers from HESR!

Cooling

Half planes cooled down to -20°C



Hubert Unistate
425W

Cooling power @ -20°C

1.9 kW

2.2 kW

Max pumping speed/pressure

105 l/min

45 l/min

1.5 bar

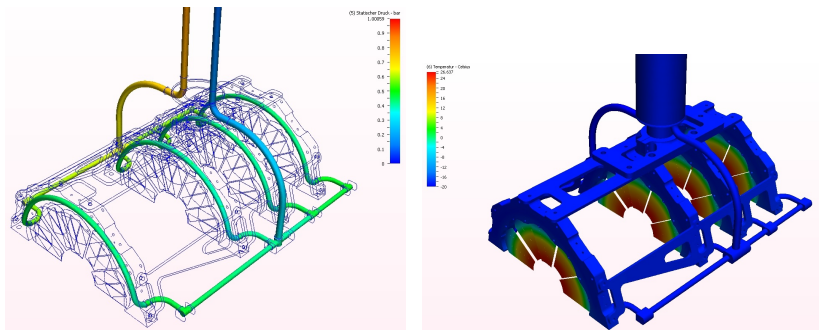
2.9 bar

Water cooled

Remote control via RS232



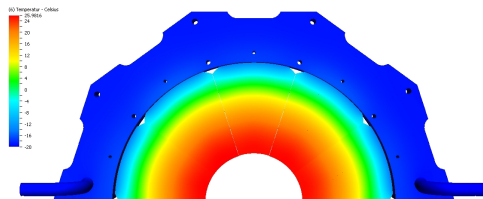
Lauda XT 550W



- Pumping cooling liquid with 1 bar overpressure
- Simulations with Glycol as cooling liquid

Temperature Measurement

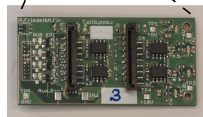
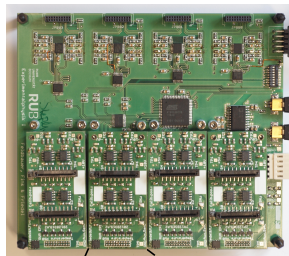
- Temperature varies along modules: $-20\text{ }^{\circ}\text{C} \leq T \leq +26\text{ }^{\circ}\text{C}$



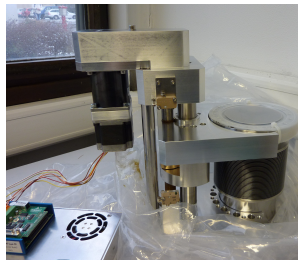
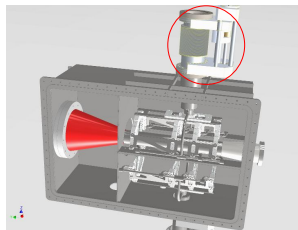
- ⇒ Temperature measurement near pixel sensors needed
- ⇒ Gluing PT100 sensors on CVD diamond
 - Need to keep material budget as low as possible
- ⇒ Sensor placed near holding structure
(maybe additional sensor on most inner part of module on last plane)

Temperature and Humidity Monitoring Board for PANDA

- Developed for PANDA EMC by F. Feldbauer and P. Friedel (Bochum)
- Modular read out system for temperature, humidity, pressure, ...
- Mainboard with 8 piggyback boards
- 8 channels per piggyback board
⇒ 64 channels per THMP
- 14 bit, 8 channel ADC
- Temperature measurement:
 - Working range: $-50^{\circ}\text{C} - +50^{\circ}\text{C}$
 - Resolution: $< 0.05^{\circ}\text{C}$



- During filling procedure of HESR luminosity detector has to be moved aside
- Using stepper motor to move half planes away from beampipe
- Precise position measurement needed (ongoing work)



Ideas for precise position measurement:

- Using IBS CPL190 Capacitive Measurement System
- ± 10 V output
- Selectable bandwidth: 100 Hz, 1 kHz, 10 kHz, 15 kHz
- Position measurement $< 10 \mu\text{m}$
- Positioning $< 200 \mu\text{m}$



What we have

- High precision high voltage power supply from ISEG used for HV-MAP's
- Using THMP \bar{P} and PT100 sensors for temperature monitoring
- Using stepper motor to move half planes away from beam during filling procedure

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What we still need

- Low voltage power supply
- Have to discuss with HESR engineers which hardware to use for vacuum inside detector (pumps/measurement)
- Decision on cooling machine has to be made
- Precise position measurement of the half planes has to be implemented