Karlsruhe Institute of Technology

Status of Cooling Development in Karlsruhe

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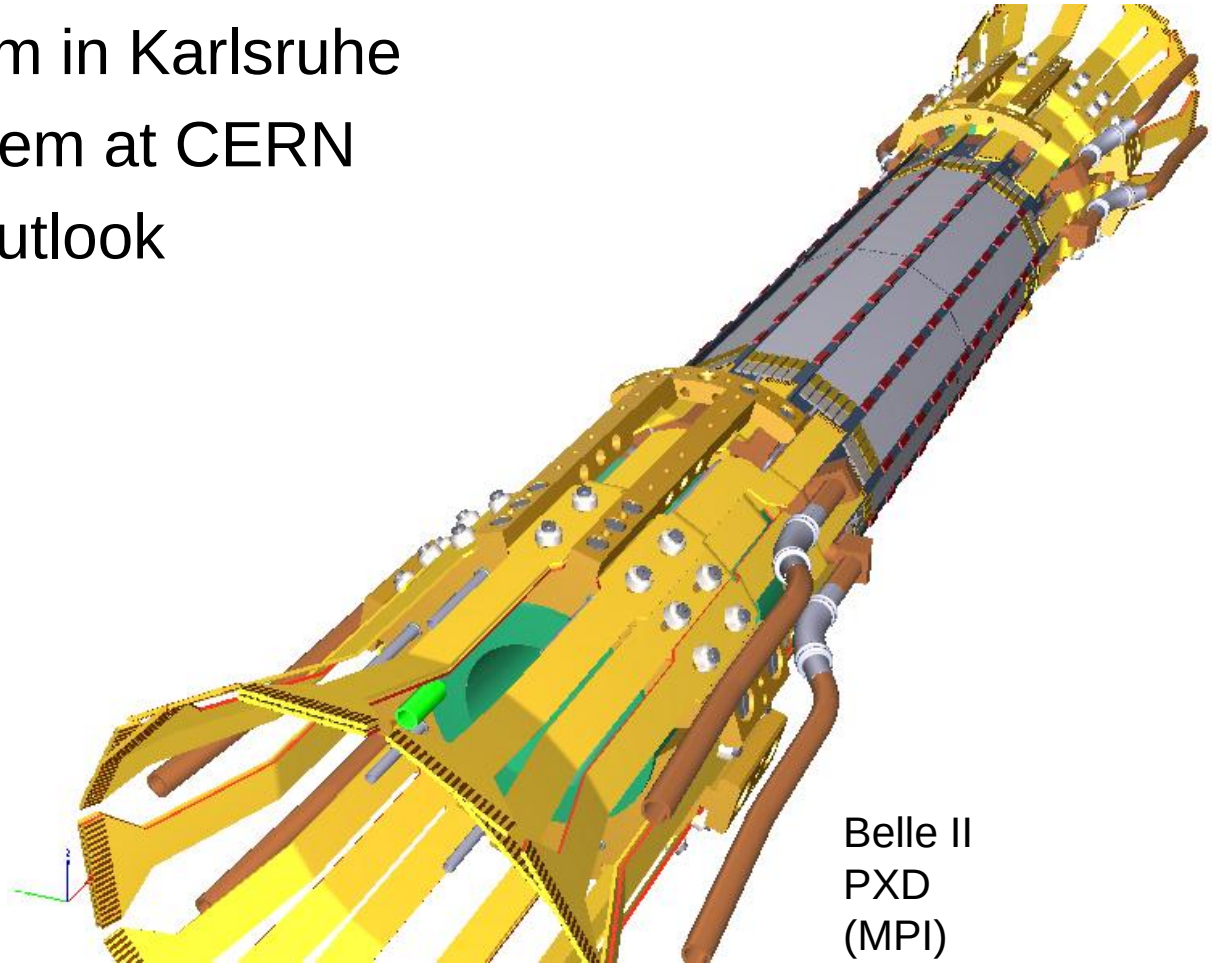
Overview

1. Cold air/nitrogen for PXD (and SVD) cooling
2. Open CO_2 system in Karlsruhe
3. Closed CO_2 system at CERN
4. Summary and Outlook



Belle II
PXD
(MPI)

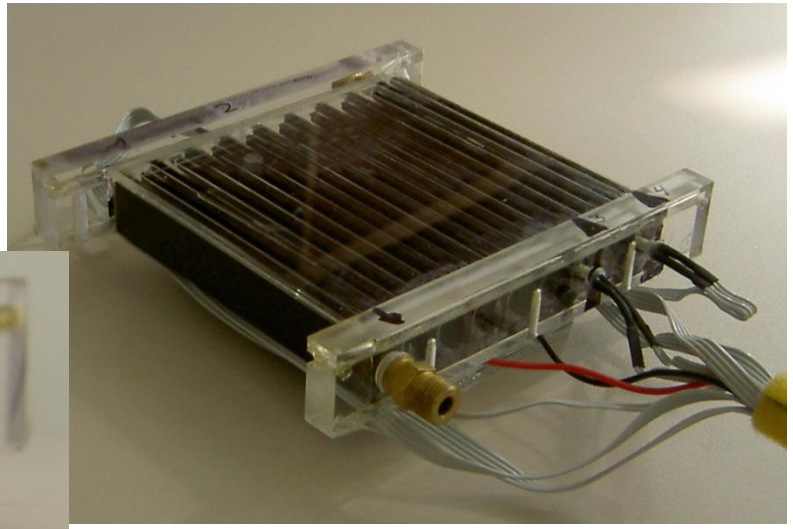
1. Cold air for PXD cooling

- Closed shared volume (~ **60l**) containing PXD and SVD to be flushed with cold air
- Inlet through dedicated channels in the PXD endflanges
- SVD only asks for „parasitic cooling“
- Continuous run time: some months (Does this exclude the use of liquid nitrogen as coolant?)

- Thermal simulations shown in Ringberg require an air temperature of **-10°C**
- Target: provide cold air with a selectable minimum temperature of **-20°C** at a rate of **10l** per minute

1. Cold air for PXD cooling

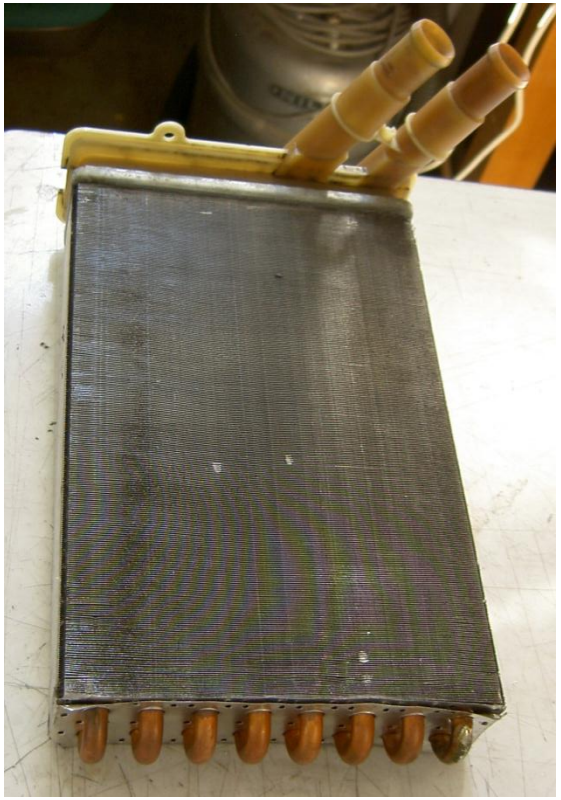
- First approach in Karlsruhe:
  boxed aluminum heat sink connected to peltier element, flush heat sink with compressed air and measure temperatures with Pt1000s



- Not successful, temperature drop per unit of channel length too small

1. Cold air for PXD cooling

- Second approach:
  heat exchanger (from *VW Golf 2*) in a box connected to water chiller, flush with compressed air and compare inlet/outlet air temperatures



- Partly successful, temperature drop is measurable
- Problems:
  - not designed to our needs (heater!)
  - box could not withstand high air pressure

1. Cold air for PXD cooling

- Third approach:
  buy a heat exchanger designed to our specifications

Technische Daten		08.09.10	Seite A	Seite B
Wärmemenge	<1 KW			
			Trockene Luft	Wasser/Gly.50%
Menge		m³/h	0,6	0,1
Einlasstemperatur		℃	20	-25
Auslasstemperatur		℃	-20	-20
Druckverlust		kPa	5	1

- Small: 300 x 120 x 50 mm³, 3 kg

- Delivered on Friday last week
- Testing will begin after Valencia meeting

Anlagenbau Böhmer

2. Open CO2 system in Karlsruhe

- Built for CMS Upgrade testing
- Manual operation → limited runtime

CO2 bottle in freezer

Endflange prototype with load resistors and Pt1000s

Manual flowmeters at outlet

Steel tube

Lab window

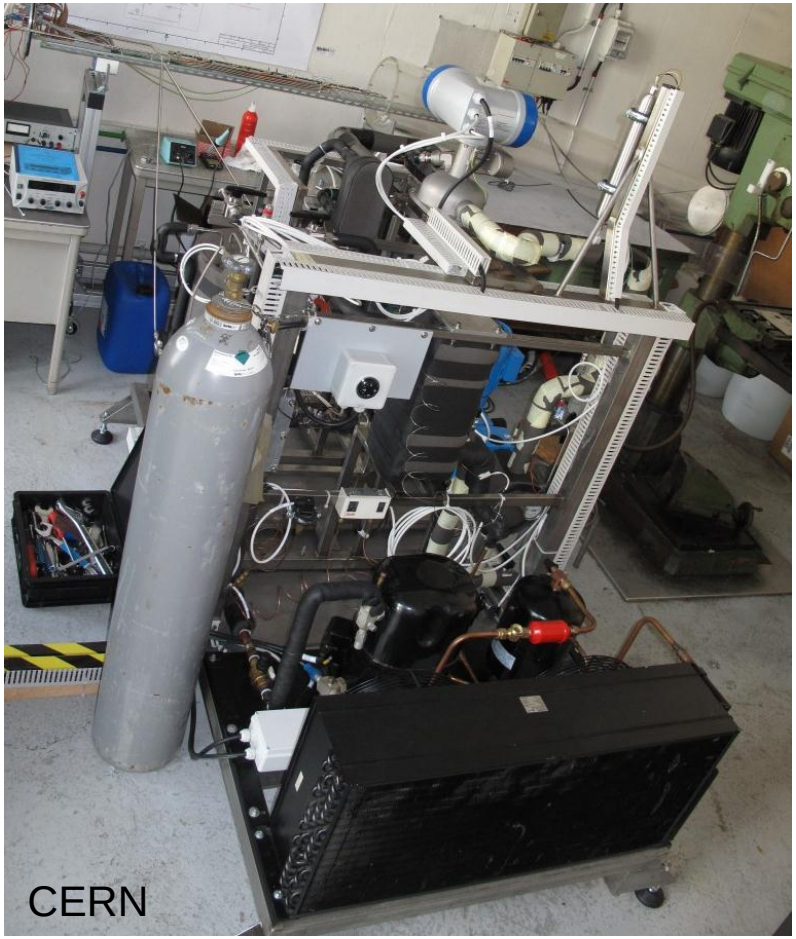
2. Open CO2 system in Karlsruhe

- To Do:
  - make system work after 1.5 years of downtime
  - replace manual flowmeters at outlet with digital one at inlet → higher mass flow and more cooling power
  - prepare heat load resistors (from old copper mockup)
  - define quantity and positions of Pt1000s

- Requirements:
  - 20 small silicon pieces (unthinned) with holes
  - screws (only if special)

3. Closed CO2 system at CERN

- Closed CO2 system built at CERN by the group of Hans Postema, also for CMS Upgrade testing
- Finished in July
- Available to IEKP Karlsruhe for tests



- Same system is supposed to be used for Belle II PXD/SVD

4. Summary and Outlook

- Providing cold air for PXD/SVD cooling for longer periods of time is not trivial
- Testing of new heat exchanger will start next week

- Preparation for CO2 cooling test of endflange prototypes has started
- First test with open system in Karlsruhe
- When successful: go to CERN and use closed system which is also foreseen for Belle II PXD/SVD

Thank you…