



## **Status of IBBelle**

- Requirements and IBBelle Overview
- Commissioning at CERN (ATLAS version)
- Software Control
- Ordering of Parts
- Location of IBBelle at KEK
- Schedule and Responsibilities



Minimize material in acceptance region

#### SVD requirements:

coolant temperature for APV25 @ -20°C for SNR improvement total dissipated power ~ 700 W

#### PXD requirements:

sensor temp. < 25°C, ASICs < 50°C : cooling block @ <-20°C dissipated power ~ 360 W

- Cooling power ~ 1.6 kW at VXD (incl. ~ 540 W parasitic heat influx) have to add heat loss through 15 m of transfer lines  $\rightarrow$  ~ 2-3 kW
- Dry Volume (preferably nitrogen): dew point inside VXD volume: ~ -30 °C
- Outside of VXD: room temperature (~ 23°C) at the CDC may need a thermal enclosure towards CDC, well isolated





# Commissioning of IBBelle at CERN

![](_page_4_Picture_1.jpeg)

#### Installation at CERN (ATLAS Experiment): the "twin" of IBBelle

![](_page_4_Picture_3.jpeg)

![](_page_4_Picture_4.jpeg)

![](_page_4_Picture_5.jpeg)

Construction of IBBelle (ATLAS) is finished

Commissioning with dummy heat load is mostly done

Some problems getting down to -40°C (not important for the Belle version)

Now testing all CO2 connections to IBL

![](_page_5_Figure_0.jpeg)

![](_page_5_Picture_1.jpeg)

![](_page_5_Figure_2.jpeg)

![](_page_6_Picture_0.jpeg)

![](_page_6_Picture_1.jpeg)

Remark: This is a desired option, not a necessity

- The operation of the cooling plant is controlled by the PLC.
  - All actual control logic.
  - Hardware interfaces to the valves, compressor, gauges, etc.
  - Limits are monitored and alarms and interlocks are computed there.
- PVSS/EPICS only implement the supervision layer.
- The interface between the layers is well defined.

![](_page_6_Picture_9.jpeg)

![](_page_7_Picture_0.jpeg)

![](_page_7_Picture_1.jpeg)

#### Plant A

![](_page_7_Figure_3.jpeg)

PVSS sets operation points (T, CO2 flux) and monitors the operation

Supervising layer (+GUI) will be re-written in EPICS / CSS (Michael, Bogdan, Thorsten)

All critical control / operation functions are formulated in PLC and will not be touched

![](_page_8_Picture_0.jpeg)

![](_page_8_Picture_1.jpeg)

The CO2 system can be in anyone of three operational states: (simplified scheme)

ModeDAQ only if in "Run"ModeStates"Operation""Stop" <-> "Run" (manual, automatic, interlock, swap)"Stand-by""Stop" <-> "Run" (manual, automatic, interlock)"Maintenance""Stop" (all actuators in "safe position", all interlocks disabled, manual )

**Transitions** between states managed by sequencer ("recipes")

Alarms issued by sensors (temperature, flow, pressure)

Actuators: control point (valves, motors, mass flow controllers, etc.) for each a "safe position" is defined

![](_page_9_Picture_0.jpeg)

![](_page_9_Picture_1.jpeg)

#### **Types of Interlock** (unit or actuator)

"Full Stop Interlock" (FS): Stop unit/actuator, wait for manual acknowl.

"Temporary Stop Interlock (TS)": stop unit/actuator, resume automatically when Interlock disappears

"Start Interlock" (SI)

prevent unit / actuator from starting

**Types of Alarms** 

"Warning" message "Alarm" message, set appropriate interlock type

Depending on interlock type, hardwired signal to "interlock box" (e.g. : "FS" leads to VXD power switch off)

![](_page_10_Picture_0.jpeg)

![](_page_10_Picture_1.jpeg)

Production drawings for the **mechanics** exist, part lists as well, **but** 

- Need to go through the drawings and tables to establish part list
- MPI working on this: Sven Vogt
- Status: Swagelok part list almost done, offers have been asked for waiting for definite quotes

For the **control** side (PCLs etc), things are not too well documented:

- MPI working on this: Reinhard SedImeyer already two visits at CERN to establish status in situ
- First parts have been asked for quotes and are ordered through CERN

Process of getting quotes and do the ordering will take till the end of year

# **Construction and Commissioning**

![](_page_11_Picture_1.jpeg)

- IBBelle for VXD will be an EXACT copy of IBBelle (ATLAS)
- Variants possible in the transfer system from IBBelle to VXD (include results from Thermal Mockup)
- Up-to-date 3D CAD model and production drawings exist

Ordering of parts according to lists established at MPI (based on material from CERN/Nikhef for ATLAS IBL) by MPI

- Construction at MPI starts in 2015 (workshop is prepared), including pressure tests, control electronics, etc.
- Commissioning will be done with the help of CERN/Nikhef crew (exact dates to be organized) by the end of 2015 at MPI, including engineers from DESY, KEK and SVD (tbd)
- Certification by TÜV (process being prepared at present)

## Location of the CO2 Plant at KEK

![](_page_12_Picture_1.jpeg)

![](_page_12_Figure_2.jpeg)

# Location of the CO2 Plant at KEK

![](_page_13_Picture_1.jpeg)

![](_page_13_Figure_2.jpeg)

![](_page_14_Picture_0.jpeg)

![](_page_14_Picture_1.jpeg)

![](_page_14_Figure_2.jpeg)

Space tight, but adequate

Potential problem: Access to top of Belle II

![](_page_15_Picture_0.jpeg)

![](_page_15_Picture_1.jpeg)

![](_page_15_Picture_2.jpeg)

![](_page_16_Picture_0.jpeg)

## **Alternative Arrangement**

![](_page_16_Picture_2.jpeg)

![](_page_16_Figure_3.jpeg)

B -

![](_page_16_Figure_5.jpeg)

B-B (1:20)

![](_page_16_Picture_7.jpeg)

Advantage: unit can be assembled at MPI, no need to take it apart for transport, no reassembly

Potential problems: need water/electricity outside hall Need to air condition the container

![](_page_17_Picture_0.jpeg)

### Schedule for the CO2 Plant

![](_page_17_Picture_2.jpeg)

edule for CO2 Coo	ling System	2nd Q 14	3rd Q 14	4th Q 14	1st Q 15	2nd Q 15	3rd Q 15	4th Q 15	1st Q 16	2nd Q 16
(modified)										
IBBelle	Part list									
	Tendering Orders									
	Construction									
	Commissioning									
	Transport to KEK									
	Installation at KEK									
Junction Box	Design									
	Construction									
	Test									
	Installation									
Manifolds	Design									
	Construction									
	Test									
	Installation									
Transfer lines	Design									
	Construction								t	
	Test								†	
	Installation								IBBe	lle at KE
Cold Air / N2	Design								2016	
	Construction									
	Test									<b></b>
System Integration	at MPI									
	at KEK									

![](_page_18_Picture_0.jpeg)

![](_page_18_Picture_1.jpeg)

- Lead institute (main responsibility): MPI Munich
  Collaborating institutes: DESY + SVD (tbd)
- Installation at KEK: MPI, DESY, SVD (= "VXD")
- Commissioning: VXD + KEK

(Kimura-san, head of KEK cryo group visited IBBelle at CERN in April 2014, next meeting on October 6/7, 2014 )

- Agreement with KEK (Nov. 13 B2GM meeting):
  - KEK will operate and monitor IBBelle standard service tasks executed by KEK (e.g. filter cleaning, replacement of spare parts)
  - major failures will require action by VXD crew