

HPS Operations Manual v0.1

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Chapter 1

Description of the HPS Experiment

1.1 The Beamline

1.2 The SVT

The SVT uses 6 layers of silicon extending from 10 cm to 90 cm downstream of the target inside of the PS vacuum chamber to measure charged particle trajectories. To accommodate the passage of the beam, the SVT is built in two halves, top and bottom, so that each layer consists of a pair of modules, one above and one below the beam plane. Each module uses silicon microstrip sensors placed back-to-back with a small stereo angle between sides to provide 3-d space points for the hits in a module. Modules for layer 1-3 have a single sensor on each side with readout at one end, while those for layers 4-6 are longer, with a pair of sensors on each side and readout at both ends.

Modules are supported in groups of three by a set of four support plates. The top and bottom support plates for the back half of the SVT (layers 4-6) are stationary. However, the supports for layers 1-3 can be opened and closed vertically around the beam, rotating around hinges behind layer 3 and moved by levers extending upstream to a pair of linear shifts outside of the magnet. The support plates are kinematically mounted inside a support box that installs into the PS vacuum chamber.

The first stage of readout electronics is located on a hybrid circuit board at the end of each sensor. Multiplexed analog signals from these boards are

digitized by a set of 10 Front End Boards (FEBs) mounted to a separate cooling plate inside the SVT support box. Each FEB can control 4 hybrid/sensor units: a single module in layers 4-6 and either one or two modules in layers 1-3. The FEBs also control the hybrids, provide regulated low-voltage power from a single input, and pass externally generated bias voltages (HV) through to the sensors. The FEBs communicate with a set of 4 Signal Flange Boards (SFB), up to three per SFB, which transmit digital signals through the vacuum penetration. The exterior side of each flange board converts digital to optical signals for communication with the RCE DAQ. Power to the FEB are routed through a pair of Power Flange Boards, one for LV and one for HV, supplied by a Wiener Mpod power supply modules in a pair of crates on the pie-tower.

Cooling for the SVT is provided by a pair of chillers; one for the hybrids and sensors that operates at -10°C and one for the FEBs that operates at room temperature. The FEBs have a single cooling loop, while the hybrids and sensors have two loops, one for the top and one for the bottom half of the SVT, where each of these loops runs first through the support structure for layers 1-3 and then through the structure for layers 4-6. There are temperature sensors on every hybrid as well as sensors in the FEBs.

The linear shifts, the cooling penetrations, and the signal/power penetrations are all located on a set of flanges on an extension vacuum box mounted to the upstream end of the PS vacuum chamber and which connects to the upstream beam line.

1.3 The ECal

1.4 The DAQ and Trigger

Chapter 2

Instructions for Shift Takers

2.1 Starting a Run

2.2 During Normal Running

2.3 Ending a Run

2.4 Between Runs

Chapter 3

Instructions for Experts

3.1 Beamline Expert Operations

3.2 SVT Expert Operations

3.3 ECal Expert Operations

3.4 DAQ and Trigger Expert Operations

Chapter 4

Instructions for Shift Leaders

4.1 Beamline Responsibilities

4.2 SVT Responsibilities

4.3 Ecal Responsibilities

4.4 DAQ and Trigger Responsibilities

Appendix A

Beamline Controls, Monitoring and Alarms

A.1 Magnets

A.2 Target

A.3 Beam Position

A.4 ???

Appendix B

SVT Controls, Monitoring and Alarms

B.1 SVT Power Supplies

B.1.1 System Description

Pelle

B.1.2 Control

Pelle, Omar

B.1.3 Monitoring, Alarms and Interlocks

Pelle, Omar

B.2 SVT Cooling

B.2.1 System Description

Marco

B.2.2 Control

Marco, Takashi

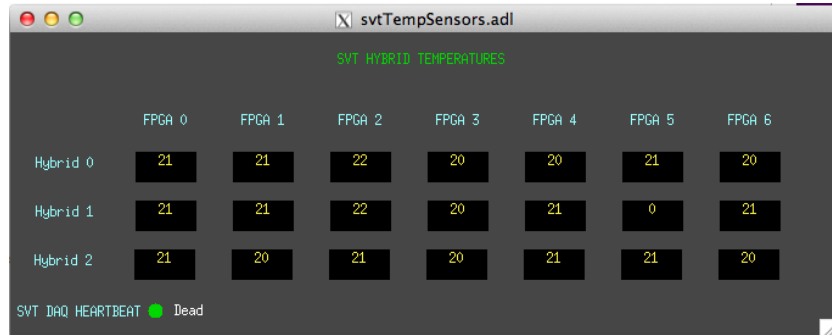


Figure B.1: SVT temperature GUI from 2012 test run. An updated GUI (work in progress) will show flow and temperature readings from the cooling loop, and chiller status.

B.2.3 Monitoring, Alarms and Interlocks

As described above, the following parameters are monitored through the EPICS slow controls system:

- Flow, inlet temperature, and outlet temperature for both cooling loops (read through Allen-Bradley PLC)
- On-board temperatures for SVT modules and front end boards (read through SVT DAQ)
- Chiller status and setpoints (read through RS-232 interfaces of chillers)

These are displayed on a monitoring GUI (Figure B.1). The SVT alarm handler has alarms defined for the temperatures: see the SVT monitoring section.

The solenoid valves are interlocked to mitigate any leaks in the cooling system. If the flow meter in either cooling loop detects low flow, the valve at that chiller's outlet closes to prevent coolant from being pumped out of a possible leak in that loop. If the vacuum gauge detects a loss of vacuum, both solenoid valves close in case the vacuum loss is due to a coolant leak inside vacuum.

Other systems use the cooling system's flow and temperature sensors as inputs to their interlocks; see the slow controls section.

B.3 SVT Position

B.3.1 System Description

Takashi

B.3.2 Control

Takashi

B.3.3 Monitoring, Alarms and Interlocks

Takashi, Sho

B.4 SVT Beam Conditions

B.4.1 System Description

Takashi

B.4.2 Monitoring, Alarms, and Interlocks

Takashi, Sho

Appendix C

ECal Controls, Monitoring and Alarms

C.1 ECal Power Supplies

C.2 ECal Cooling

C.3 ???

Appendix D

DAQ Controls, Monitoring and Alarms

D.1 The DAQ GUI

D.2 The Monitoring Application

D.3 ???

Appendix E

Contact Information

E.1 Expert Phone List