

# HPS SVT Installation and Commissioning v1.0

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## 1. Introduction

After the completion of assembly and full system testing at SLAC, the SVT will be shipped to JLab, where three distinct periods of activity are required to prepare the SVT for physics. The first of these is the re-assembly and testing of the SVT, which will commence immediately upon receipt of the SVT at JLab. The second is the installation of the SVT into the pair spectrometer vacuum chamber inside the analyzing magnet, followed by check-out and commissioning without beam. The third is the commissioning of the SVT with beam.

These periods are scheduled as follows. The SVT is expected to be shipped from SLAC before Thanksgiving. The week of December 1 will be devoted to receiving, unpacking, re-assembling and testing the full SVT and SVT DAQ. The week of December 8 will be devoted to installing the SVT in the Hall B alcove and re-commissioning and integrating the SVT DAQ with the JLab HPS DAQ. Following December 12, for the remainder of the Fall 2014 run, the SVT and the rest of the HPS apparatus will be commissioned with electron beams, and beam parameters will be established for the HPS run.

## 2. Assembly and Testing at JLab

Roughly one week will be required to receive, reassemble, test, and prepare the SVT and SVT DAQ for installation in Hall B, beginning on December 1, 2014. A high bay in the EEL will be reserved for this work, including mechanical assembly of the SVT, setting up the power supply systems and controls, the cooling systems, and the integrated SVT DAQ and JLab DAQ. In addition, the SVT vacuum box and the motion control system for the SVT and target will be assembled, interfaced with the EPICS control system, and commissioned, as will the cooling system. During this time, three SLAC physicists, two graduate students, and two electronics engineers will be employed, and JLAB experts from the slow controls system and JLab DAQ will help interface the SVT DAQ and control to JLab systems. After the full system has demonstrated successful and stable operation, it will be prepared for transport to Hall B.

## 3. Installation in Hall B

Installation is also scheduled for a one week period, beginning December 8, 2014. In preparation, Hall B mechanical technicians will begin readying the alcove on December 5. This will entail letting the vacuum in the PS vacuum chamber up to air, removing the beampipe upstream of the pair spectrometer, moving the ECal out of its normal position just downstream of the PS vacuum chamber, removing the PS vacuum chamber flange and the ECal vacuum chamber, and preparing for survey. A wedge support for the SVT will be glued on the PS downstream vacuum chamber opening. On the day of installation, one team will install the SVT cooling system, comprised of two chillers, insulated piping to carry coolant to and from

the SVT, a flow meter, and temperature sensors. A second team will install the MPOD power supplies and power and HV cables from racks outside the alcove to the vicinity of the analyzing magnet.

A third team will transport the fully assembled SVT to the alcove, insert it into the PS vacuum chamber inside the analyzing magnet, and with the help of the survey team, adjust and secure its position. Next, the SVT vacuum box will be attached to the PS vacuum chamber, and all the cooling, power, and data cables routed and attached to the SVT. Each of these items must then be tested, mechanics, cooling, and DAQ. After that, the linear shifts will be installed, connected, surveyed, calibrated and connected to EPICS. Once tests are complete, the SVT vac box is reconnected to the upstream vac pipe, the ECal vac chamber and PS flange replaced, and the ECal moved back into position. Final system tests include pumping the beamline down to vacuum, and checking the SVT cooling, DAQ, movers, and Ecal readout in this condition. Once all systems are operational, the HPS is ready for beams. All this work will be accomplished by the Hall B technicians, the JLAB DAQ and EPICS experts, and the same SLAC team who received and assembled the SVT during the prior week.

#### 4. Commissioning with Beam

Steps for the final beam commissioning of the SVT, which require SVT wire scans to determine the beam's precise position, are included in the Beamline Commissioning Document. After PS vacuum, SVT DAQ, and cooling functions are all verified, the SVT is ready for beam. Prior beamline commissioning with the ECal will insure that the beam is roughly centered in the SVT. The SVT layers 1-3 will be moved as far as possible away from the beam, and power will be off for the first commissioning. The first steps include bringing the wires to the correct beam height, performing wire scans, and moving the beam to be well-centered in the SVT coordinate system. With the beam height so determined, the next step is to set the protection collimator so the beam is centered in the vertical collimator gap. After setup of the beam and collimator, the SVT will be turned on in the out position, and backgrounds will be sampled with low current beams. The SVT will be timed in. Then occupancies will be measured as a function of beam current and the vertical position of layers 1-3. Once a safe operating distance is determined, data will be taken to get key alignment data and regular running with the Ecal trigger will be explored.