HPS SVT Installation and Commissioning

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 vacuum chamber inside the analyzing magnet, which can take place as soon as other activities in Hall B allow it, followed by check-out and commissioning without beam. The third is the commissioning of the SVT with beam. A detailed, resource-loaded schedule is being developed to plan these activities. Figure 1 shows an overview of these three periods and their dependence on key milestones. The following sections describe the activities of these three periods, along with the resources and effort required.

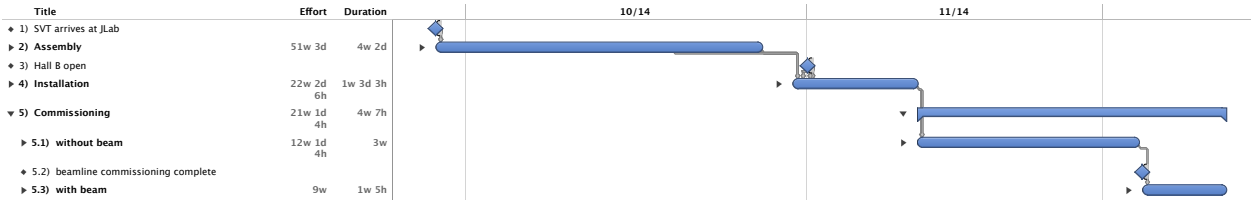

Figure 1: An overview of the work required at JLab to prepare the HPS SVT for physics running. The timing of each period depends upon an external milestone, as well as completion of the work of the previous period.

2 Assembly and Testing at JLab

Beginning when the SVT arrives at JLab, approximately four weeks are required to prepare the SVT for installation, as shown in Figure 2. During this period, two separate spaces in the EEL building at JLab must be reserved for this work. First, the cleanroom will be used to assemble and fully test the SVT. This includes mechanical assembly of the SVT, the SVT DAQ, the power supply system and controls, the cooling system and integration of all of these for a full system test. Second, space in one of the high bays will be used

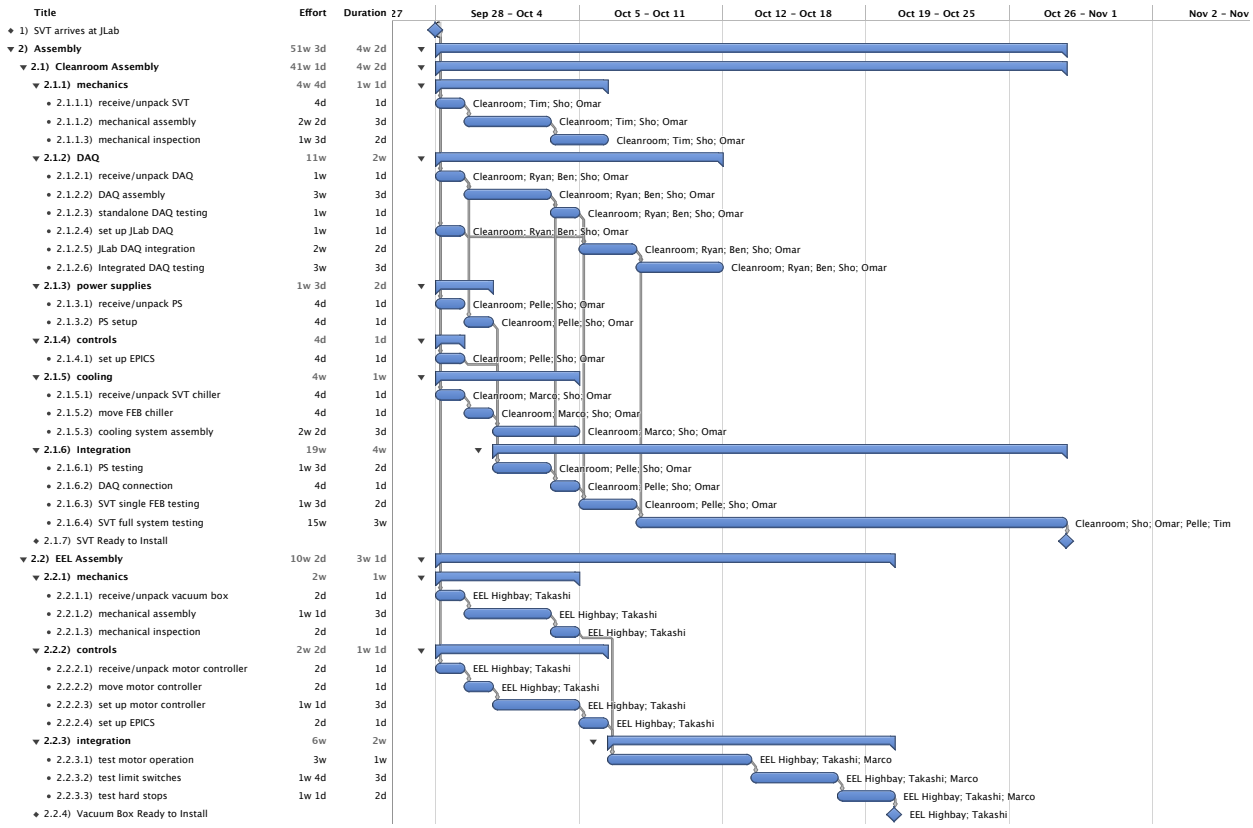

Figure 2: The schedule for assembly and testing of the SVT after receipt at JLab. Most activities take place in the EEL cleanroom area, with some additional mechanical work in an EEL high bay. After approximately three weeks of intensive work by the full installation team, a small contingent remaining at JLab continues to exercise the detector until an installation opportunity arises.

to assemble and test the vacuum box and the motion control system for the SVT and the target. During the first 2-3 weeks, a full complement of staff will be needed to undertake these tasks, including three SLAC scientists, three SLAC engineers and a pair of graduate students. Once the full system is in stable operation, a single scientist will supervise the students in exercising the system until Hall B is ready for installation of the SVT.

3 Installation in Hall B and Commissioning Without Beam

Once the system is fully tested and Hall B is ready for installation, all components will be moved to Hall B for installation, as shown in Figure 3. In addition to general access to Hall B, access to three specific areas will be needed to complete the installation; the

area upstream of the pair spectrometer (PS) magnet from which the SVT is installed and where the chillers are located, the area downstream of the PS magnet for alignment and survey, and the pie tower, where the SVT DAQ and power supplies will be installed. After preparations in Hall B, the installation itself takes approximately 4 single-shift days with the same staffing as for the SVT assembly described in the previous section in addition to Hall B technical staff. After the SVT is fully connected, but before the beamline is reassembled and pumped down, a hot checkout of all systems will be performed followed by a brief full system test. Finally, after the beamline is pumped down, work will commence in the counting room to commission the detector without beam, culminating in regular calibration running until beam is available. Once the detector is in stable operation, effort will again be reduced to a single scientist and two graduate students until the beam in Hall B is fully commissioned.

3.1 Commissioning With Beam

Once the beam in Hall B is declared ready for HPS running, a number of steps must be performed to safely commission the SVT, as shown in Figure 4. These procedures will be performed with the minimum current that allows reliable monitoring of the beam positioning, at most 5 nA, and the staff required include three SLAC scientists, two SLAC engineers, and two graduate students. After setup of the beam and protection collimator, the SVT will be brought to nominal position and voltage in a number of steps that allow verification of beam attributes and minimize the hazard to the SVT. During this time, approximately two full days of shifts, key calibration data will be taken that allows for the alignment and timing calibration of the SVT. Once complete, the SVT will be ready for taking data with the nominal beam intensity for the HPS experiment.

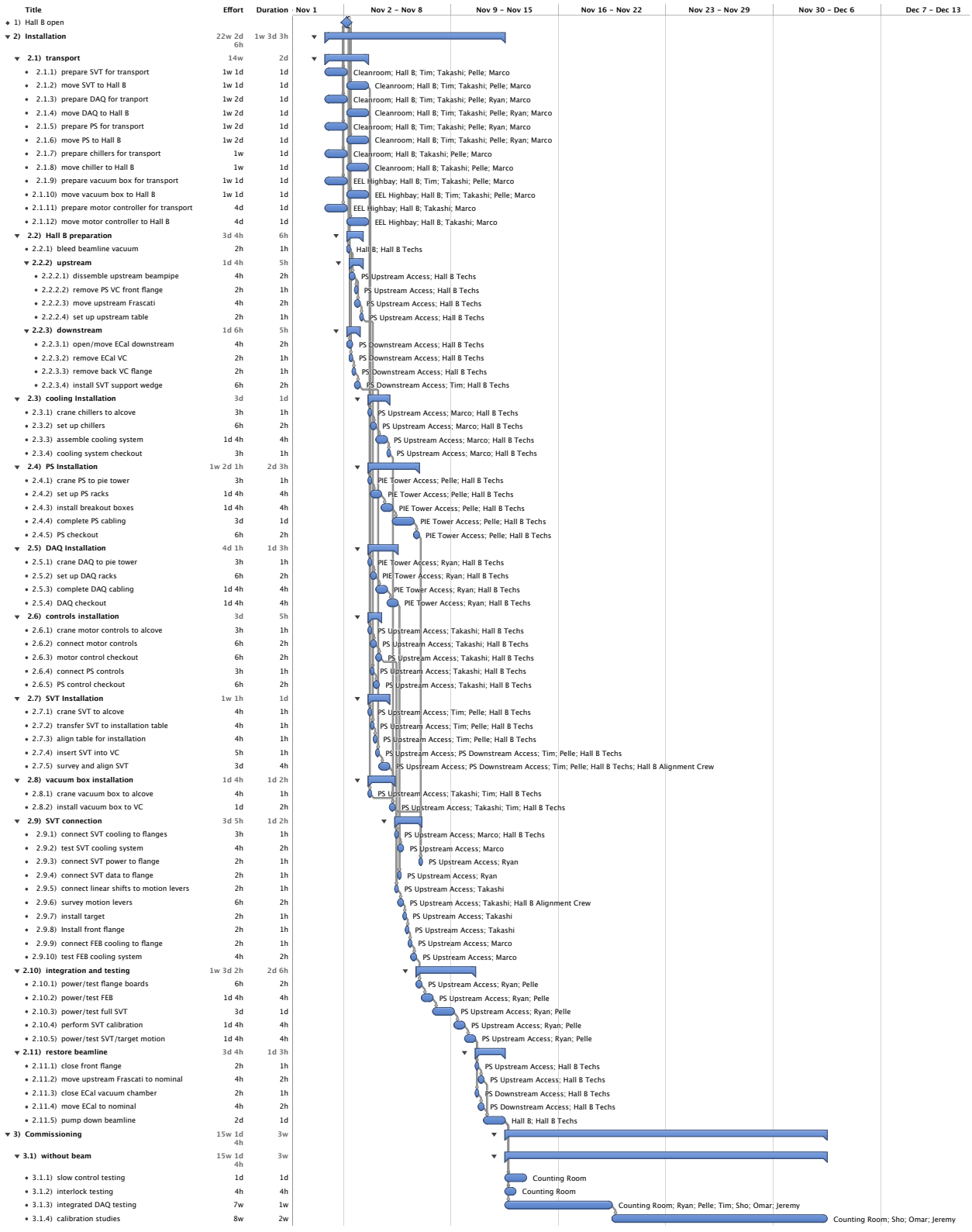

Figure 3: The schedule for installation, checkout and commissioning without beam for the SVT. After several days of intense activity, a smaller effort in the control room exercises the detector with regular calibration running until the beam is ready for HPS physics.

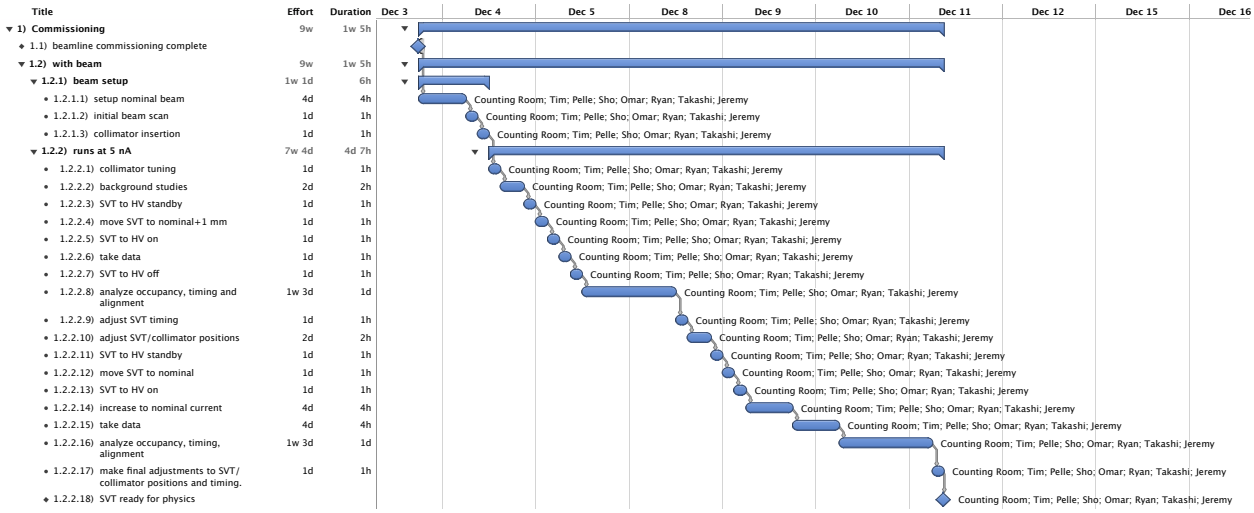

Figure 4: The schedule of procedures for safe commissioning of the SVT with electron beams. To minimize the potential for damage to the SVT, the system is brought into final position and full power in a series of carefully monitored steps. Although shown here as taking place over six 8-hour days, this procedure would likely be performed over two to three days in a series of successive shifts.