

Title: xBSM Setup Procedures

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Initial Line Alignment [6 hours]:

1. Flatten orbit to previous bumped orbit
2. Record set, route and feedback settings
 - a. Check for shaking OFF
3. Load machine with 9 trains of 1 bunch of 1 mA each (~evenly spaced)
4. Verify all motor locations, using the last known good position
 - a. Box has been surveyed into position via approved procedure
5. Place detector into nominal slow diode position
6. Initial scans with white beam to verify light is reaching detector
 - a. TADETZ scan, if necessary bump beam to center of detector
 - b. Verify that the signal levels are consistent with established levels
 - c. Horizontal box scan sanity check
 - i. Note many previous scans required the box to be located XXX above lower edge
7. Insert pinhole optic to last known good position and width
 - a. TADETZ scan, record
 - b. TADETX scan, record
 - c. Vertically bump beam to center of detector, using TADETZ scan to monitor results
 - d. Horizontally bump beam to center of detector, using TADETX scan to monitor results
 - e. NOTE, gap might not be in the optimal position, if it is way off, revert to nominal detector position. The optimal position of the pinhole may have to be adjusted...seek guidance! The pinhole may have to be opened fully.
 - f. Iterate c and d as needed
 - g. Record set, orbit and store in route
8. Perform LET tuning cycle
 - a. Repeat step 7
9. Repeat step 6 with white beam and record
10. Pinhole optic scan (TASZ) and record
11. Optics Scans
 - a. Move box horizontally to align with optics chip
 - b. Insert optics chip and remove pinhole optic
 - c. FZP scan using TAAP, record
 - d. CA scan using TAAP, record
 - e. Whole chip scan, using TAAP, record
 - f. Proof of existence scan high energy optics chip
 - g. Record the optimal positions for all optics
 - h. Record saveset, route and orbit
12. Dump (WA) all motor positions

Pinhole Optic Width Setup [1 hour]:

Note: Historically Cline = 4.55 @ 2.1 GeV, smaller width = dec TASGAP, 0 width = 3.9 TASGAP

Note: Historically Dline = 3.35 @ 1.8 GeV, smaller width = inc TASGAP, 0 width = 4.8 TASGAP (measured at 4 GeV)

Note: Historically Dline = 3.45 @ 2.1 GeV, smaller width = inc TASGAP, 0 width = 4.8 TASGAP (measured at 4 GeV)

Note: Historically Dline = 4.59 @ 4.0 GeV, smaller width = inc TASGAP, 0 width = 4.8 TASGAP

Note: The pinhole optic width should be set low within the apparent broad minimum because the observed shape is influenced by the finite beam size at the time of calibration

1. Load machine with T1B1, 1 mA under optimized LET conditions (smallest beam possible)
2. Record set, route and feedback settings
 - a. Check for shaking off
3. Pinhole optic in and at nominal position
4. Fast readout scans

Note: TASPAP is adjusted and recorded along with beam current, image width and image height in an iterative fashion. TAAP adjustments may be necessary for large adjustments in TASPAP.

- a. Starting at nominal and decreasing pinhole width (refer to motion of TASPAP) in steps of 0.2 to find 0 width (closed). If the width does not increase as we approach 0 width, we must increase the granularity of scan and repeat.
- b. Starting at nominal and increasing the pinhole width (refer to motion of TASPAP) in steps of 0.4 with the goal of seeing the width double. The width may saturate and the intensity will continue to go up, this is also a valid end point for scan.
- c. Analyze recorded data and determine a preliminary minimum. Look at total transmission (width x height), should be linear in TASPAP.
- d. Perform a finer scan with a TASPAP window of 0.5 around recorded preliminary minimum.

DAQ Timing Setup [2 hours]:

1. Record set, route and feedback settings
2. Load machine with T1B1 1, mA in a 14 nS configuration
3. White beam on detector
4. Verify motor positions
5. Load last known good timings into daq
6. Scan each channel for gross timing (peak in 14 nS window)
7. Trim timings for all channels
8. Write timing file
9. Put second bunch in machine and scan both bunches
10. Repeat for the 4 nS setup
11. Record latest filenames and conditions

DAQ Timing Trim [30 minutes]:

1. Record set, route and feedback settings
2. Load machine with T1B1 1 mA in a 14 nS configuration
3. White beam on detector
4. Verify motor positions
5. Load last known good timings into daq
6. Trim timings for all channels
7. Review for large excursions
8. Repeat if necessary
9. Write timing files
10. Repeat for the 4 nS setup
11. Record latest filenames and conditions

DAQ Detector Calibration [10 minutes]:

1. Record set, route and feedback settings
2. Load machine with T1B1 1 mA in a 14 nS configuration
3. White beam on detector
4. Verify motor positions
5. Look at pass1 plot to see that the beam is reasonably well centered
6. Collect 1000 turns of raw data
7. Analyze raw data and generate a calibration file
8. Record latest filenames and conditions

DAQ Pedestal Collection [10 minutes]:

1. Record set and route
2. Close beam stops
3. Collect pedestal data
4. Record latest filenames and conditions.

DAQ Linearity Check [2 hours]:

1. Record set, route and feedback settings
2. Load machine with T1B1 1, mA in a 14 nS configuration
3. White beam on detector
4. Insert pinhole optic
5. Verify motor positions
6. Load last known good timings into daq
7. Collect 1000 turns and verify basic functionality
8. Collect linearity data:
 - a. Starting at 0 mA collect 1000 turns of data, incrementing the current in 0.5 mA steps.

- b. Adjust gain at each step in order to maximize signal level.
- c. Record final setting and data file
- d. Plot bunch channel 16 and look for signs of saturation
- e. Repeat 7a-d up to 10 mA

xBSM Group Verification [1.5 hours]:

1. DAQ Timing Tweak [15 min]
2. DAQ Pedestals [10 min]
3. DAQ Calibrations [10 min]
4. Coupling 8 Scan Pinhole (XR2M) [10 min]
5. Coupling 8 Scan Coded Aperture (XR2M) [10 min]
6. Coded Aperture Tune Up [35 min]
 - a. Pinhole 0
 - b. Coded Aperture 0 tadetz
 - c. Coded Aperture + 0.3 mm tadetz
 - d. Coded Aperture -0.3 mm tadetz
 - e. Coded Aperture + 0.4 mm tadetz
 - f. Coded Aperture -0.4 mm tadetz
 - g. Coded Aperture + 0.8 mm tadetz
 - h. Coded Aperture -0.8 mm tadetz
 - i. Code Aperture 0 tadetz
 - j. Box ~1mm taap
 - k. Pinhole 0

Experimenter Verification [20 minutes, 20 minutes]:

1. Coupling 8 Scan Pinhole Beginning (optics of the day) [10 min]
2. Coupling 8 Scan Coded Aperture Beginning (optics of the day) [10 min]
3. Coupling 8 Scan Pinhole Ending (optics of the day) [10 min]
4. Coupling 8 Scan Coded Aperture Ending (optics of the day) [10 min]