DRAFT

10 MeV Injector Dump Setup

Document Number: Document Number—TBD

Revision Number: Rev. 2; Sept 3, 1997

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Estimated Time to Perform: 2.5 hours

Procedure Overview

This procedure describes the setup of the 10 MeV injector dump necessary for high power operation. It describes verification of raster and quadrapole operation and the steering to center the beam on the dump.

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Prerequisites

1. Beam threaded to the 10 MeV dump according to the “IR FEL Injection Line Setup Procedure”***put link here***.
2. Pulse setup at 18 MHz, 60 pC, 250 usec, 2 Hz, 0.5 uamp average.

Procedure Steps

1.0 Center beam in dump

1. Set quads MQG0G02 and MQB0G03 to zero Bdl and run through hysteresis loop.
2. Record dump current measured and Bdl’s of MDH0G01H & V correctors. If the leakage current on the dump is greater than 20% of the total measured current, increase the beam current up to a maximum of 2 microamps average.
3. Steer with the horizontal corrector MDH0G01H to positive Bdl until the intercepted beam current is 30% of the maximum value. Record the corrector Bdl.
4. Steer with the horizontal corrector to negative Bdl until the intercepted beam current is 30% of the maximum value. Record the corrector Bdl.
5. Set the horizontal corrector to $(Bdl^{+} + Bdl^{-})/2$ G-cm. This will center the beam in the dump horizontally.
6. Repeat steps 3 through 5 with corrector MDH0G01V.

2.0 Verify operation of the raster magnet

1. Energize the raster magnet to 850 G, or 3.4 amps peak (2.35 amps RMS).
2. Record dump current measured and Bdl's of MDH0G01H & V correctors.
3. Shut off the beam (close the laser shutter) and record the dump background current. Re-open the shutter.
4. Steer with the horizontal corrector MDH0G01H to the positive Bdl recorded in step 1.3. above.
5. Increase the corrector Bdl in 10 G-cm steps until the intercepted current is at the background level recorded in step 3. This gives about a 1 mm step size across the dump face. Record the corrector Bdl. Reset the corrector to the Bdl that centers the beam in the dump.
6. Steer with the horizontal corrector to the negative Bdl recorded in step 1.4 above.
7. Adjust the corrector Bdl in -10 G-cm steps until the intercepted current is at the background level recorded in step 3. This gives about a 1 mm step size across the dump face. Record the corrector Bdl. Reset the corrector to the Bdl that centers the beam in the dump.
8. The size of the rastered beam equals (9.45×10^{-5} meters)((Bdl from step 5) - (Bdl from step7)). Record the value. It should be greater than 8×10^{-2} meters.
9. Repeat steps 4 through 8 with corrector MDH0G01V.
10. If the raster is not working properly, call in AES support to determine cause.
11. Set the trip point on the FSD interface for the raster to just below the operating value. Verify that when the current in the raster is decreased, the FSD is tripped and beam is terminated.

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3.0 Verify operation of the quad expander

1. De-energize the raster magnet.
2. Set the quad MQG0G02 to 40.945 G-cm.
3. Set the quad MQB0G03 to -78.74 G-cm.
4. Shut off the beam (close the laser shutter) and record the dump background current. Re-open the shutter.
5. Steer with the horizontal corrector MDH0G01H to the positive Bdl recorded in step 1.3. above.
6. Increase the corrector Bdl in 10 G-cm steps until the intercepted current is at the background level recorded in step 3. This gives about a 1 mm step size across the dump face. Record the corrector Bdl. Reset the corrector to the Bdl that centers the beam in the dump.
7. Steer with the horizontal corrector to the negative Bdl recorded in step 1.4 above.
8. Adjust the corrector Bdl in -10 G-cm steps until the intercepted current is at the background level recorded in step 3. This gives about a 1 mm step size across the dump face. Record the corrector Bdl. Reset the corrector to the Bdl that centers the beam in the dump.

9. The size of the rastered beam equals (9.45 x 10^{-5} meters)((Bdl from step 5) - (Bdl from step7)). Record the value. It should be greater than 7 x 10^{-2} meters.
10. Repeat steps 4 through 8 with corrector MDH0G01V.
11. If the beam isn't large enough call ******* PI ********. Possible causes are quad failure, miscalculation in the design, or problems with the correctors.
12. Set the FSD trip levels for the quad currents to just below the operating points and then decrease each current and verify that the beam trips off on the FSD.

4.0 Verify the entire system

1. Set the corrector pair MDH0G01 to the Bdl's determined in section 1.0 above to center the beam in the dump.
2. Renergize the raster magnet to 3.4 amps.
3. Set the quad MQG0G02 to 40.945 G-cm.
4. Set the quad MQB0G03 to -78.74 G-cm.
5. If the intercepted current in the dump is not equal to the full beam current measured in step 1.2 above, then steer with the corrector pair in 20 G-cm steps until the full intercepted current is measured again.
6. Steer with the horizontal corrector MDH0G01H to positive Bdl until the intercepted beam current is 30% of the maximum value. Record the corrector Bdl.
7. Steer with the horizontal corrector to negative Bdl until the intercepted beam current is 30% of the maximum value. Record the corrector Bdl.
8. Set the horizontal corrector to $(Bdl^{+} + Bdl^{-})/2$ G-cm. This will center the beam in the dump horizontally.
9. Repeat steps 3 through 5 with corrector MDH0G01V.

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5.0 Setup of the 10 MeV dump is now complete.