



NuMI Primary:
Initial Beam Commissioning

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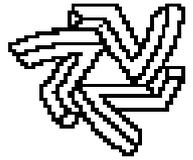
Pre (beam) commissioning



- We can – and plan to – establish readiness of systems for primary beam **PRIOR TO** first extracted beam pulses. These include:
 - Magnet function & connection polarities
 - Power supply function / ramp parameters
 - Kicker & power supply function
 - Recycler shielding from EPB fringe fields
 - Instrumentation function and readout polarities
 - Beam Permit System [establish & test 1st limits for all but NuMI BLM's]
 - Control timing
 - Main Injector beam suitable for extraction



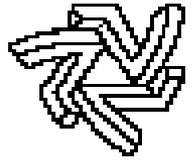
Initial NuMI Extracted Beam



- Separate NuMI cycle – each 60 – 120 seconds
 - Beam Permit System Active; Loss monitor limits set as needed for **high** intensity beam ($\sim 10^{-4}$ fractional loss)
 - $\sim 3 \times 10^{11}$ protons / pulse (2 Booster batches, each with 30 bunches)
 - Timing and NuMI batch position compatible with shared mode [NuMI + PBAR] operation
 - Manual control of NuMI beam switch. Allow new extracted NuMI pulse **only after** previous pulse data studied, and appropriate adjustments made
 - Correctors off initially. Look to establish beam to NuMI hadron absorber with target in OUT position.
 - Initial checks of beam optics & rough correction as needed



Initial Extracted Beam (cont)



- Correct beam trajectories along transport using correctors and currents predicted by AUTOTUNE
- Evaluate **any** beam loss concerns and tightest aperture clearances (downstream of carrier pipe and B2 up-bend)

NOTE: These steps are inter-connected and may be interchanged as data calls for. Goal is to establish reasonable low loss beam at this intensity to hadron absorber with a minimum number of beam pulses.

At this stage, priority shifts to alignment of horns, target & baffle



Raising Beam Intensity



- After verification of target system components alignment with low intensity beam
- Keep NuMI only cycle at low duty factor
- Increase Mi intensity per Alberto presentation
 - Additional NuMI beam transport corrections & any optics adjustments as needed
 - Beam on radiation dose measurements as intensity gives good data
 - Finer detail calibration of BLM's and BPM's
- Establish capability for up to 5 batch NuMI extraction & transport
- Establish bunch rotation as will be needed in shared mode
- Prepare for shared mode (and rapid cycle) operation.