



# Main Injector stray beam clearing options

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# Reducing beam loss at Q104

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- **Booster tuning**
  - Reduce beam outside of MI slip-stacking bucket.
  - On going.
- **Damper**
  - Need to switch mode in mid-cycler.
    - ✓ Loss is still in the machine.
- **Barricaded slip-stacking**
  - Upgrade barrier voltage.
    - ✓ Some level of D.C. beam will remain.
- **Clear out the spot**
  - Fire clearing kicker 1-turn before MI-10 kickers
  - Take the stray beam to abort dump.

# Take out the strayed protons

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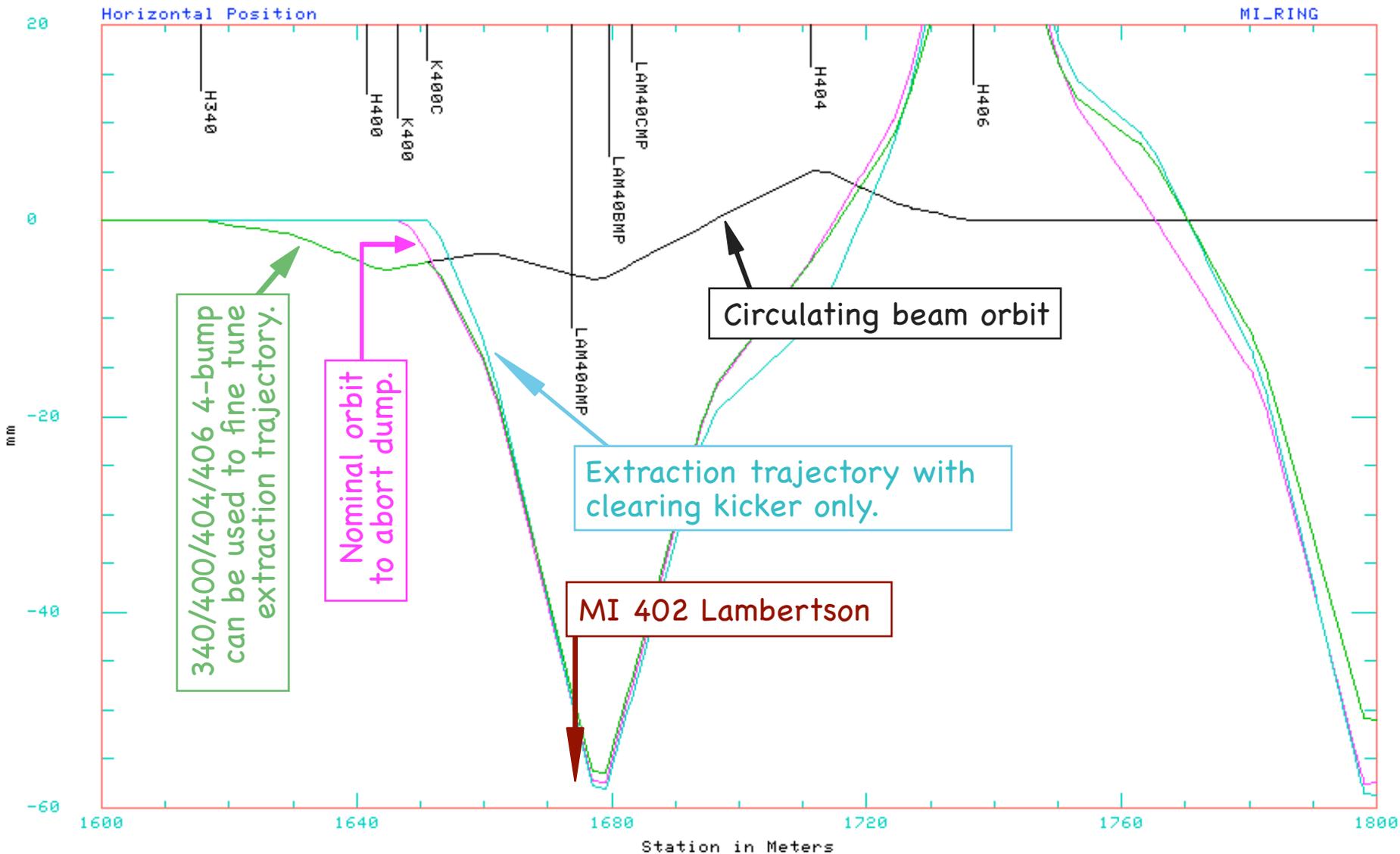
- Use RR30 extraction Lambertson
  - Recycler 30 kicker
    - ✓ Need to use counter wave.
    - ✓ Make it 15 Hz
  - Insert a switch magnet
    - ✓ Beam to RR when off.
    - ✓ A local beam dump off RR30 transfer line.
- Add a third kicker at MI40
  - Need new magnet
  - Need new power supply
    - ✓ Replicate RR 30 kicker.
    - ✓ Fires at 15 Hz.

# Extraction orbit

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- MI40 kickers (2) at 8-GeV
  - Integrated strength is 0.37 KG-M,  
✓ from MI Design Handbook
- With only the third kicker
  - Needs 0.46 KG-M.
  - Extraction angle may be a problem.
- The third kicker and a 4-bump
  - About 6 mm closed orbit displacement.
  - Need only 0.4 KG-M

# MI40 extraction orbits



# MI40 tunnel

