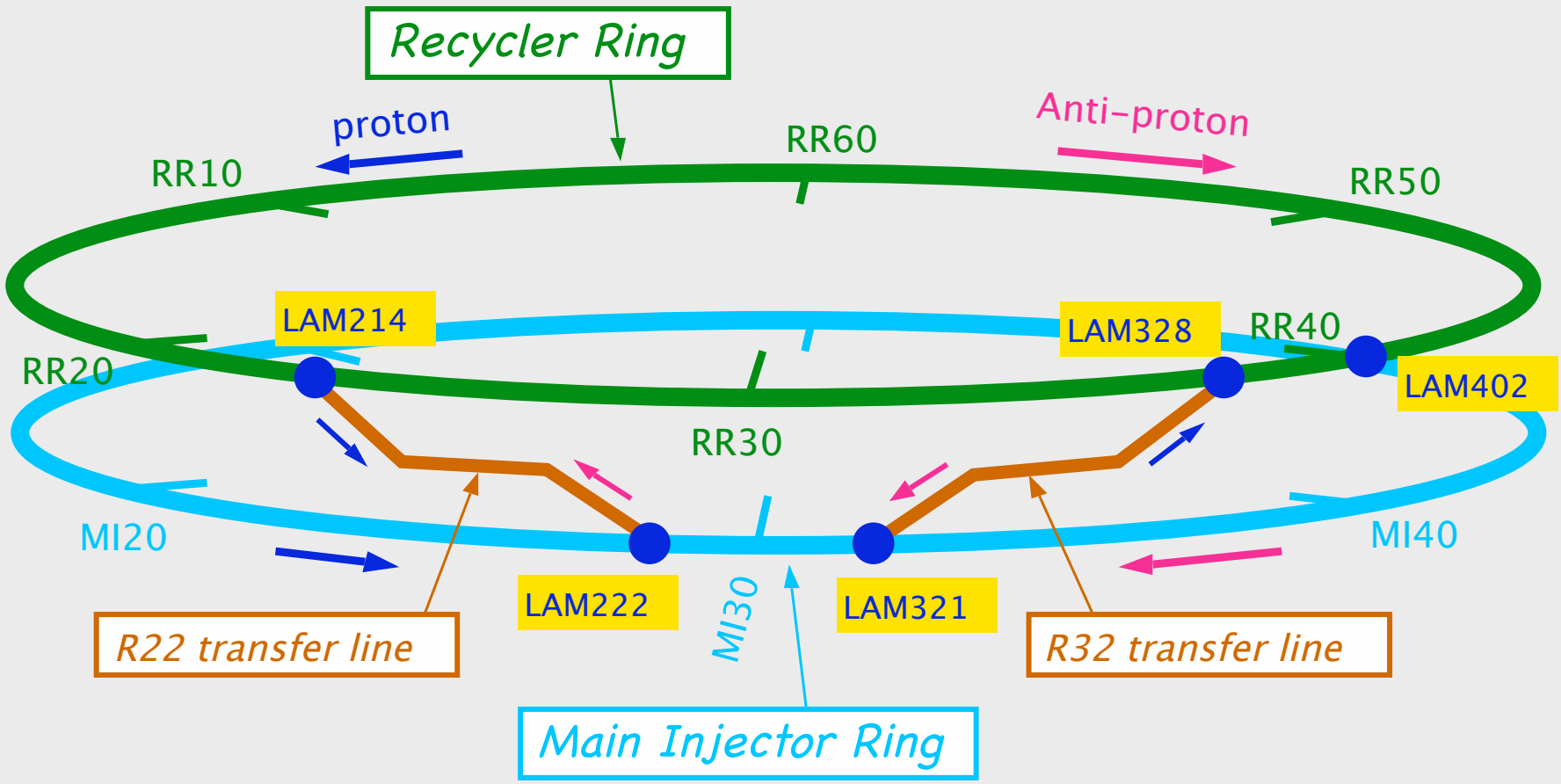
Beam transfer between MI and RR



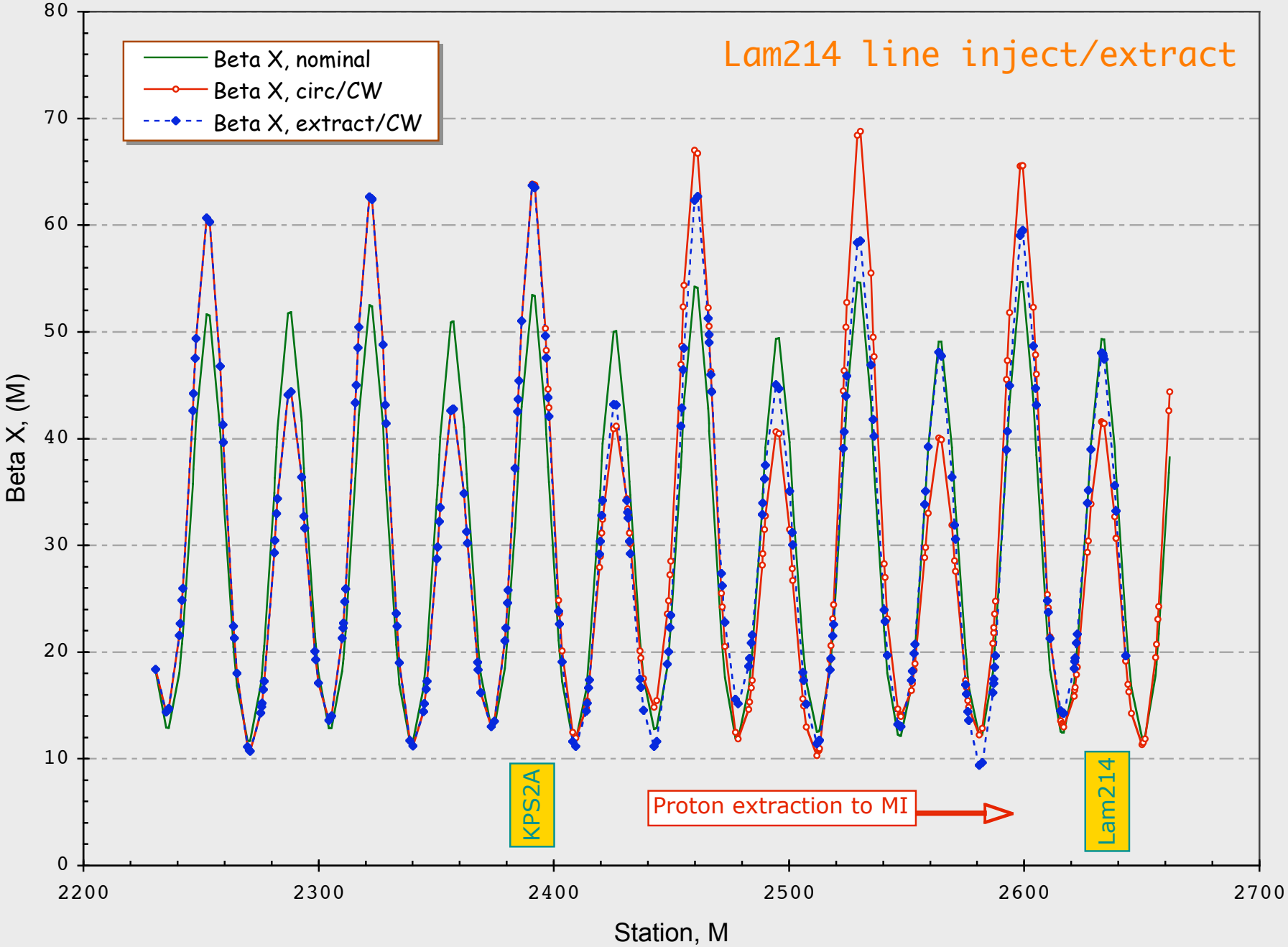
Four counter-wave segments

- Proton to RR / Pbar from RR to MI
  - MI 304 to 320.
  - RR 330 to 400.
- Pbar to RR / proton from RR to MI
  - MI 224 to 304.
  - RR 130 to 212.

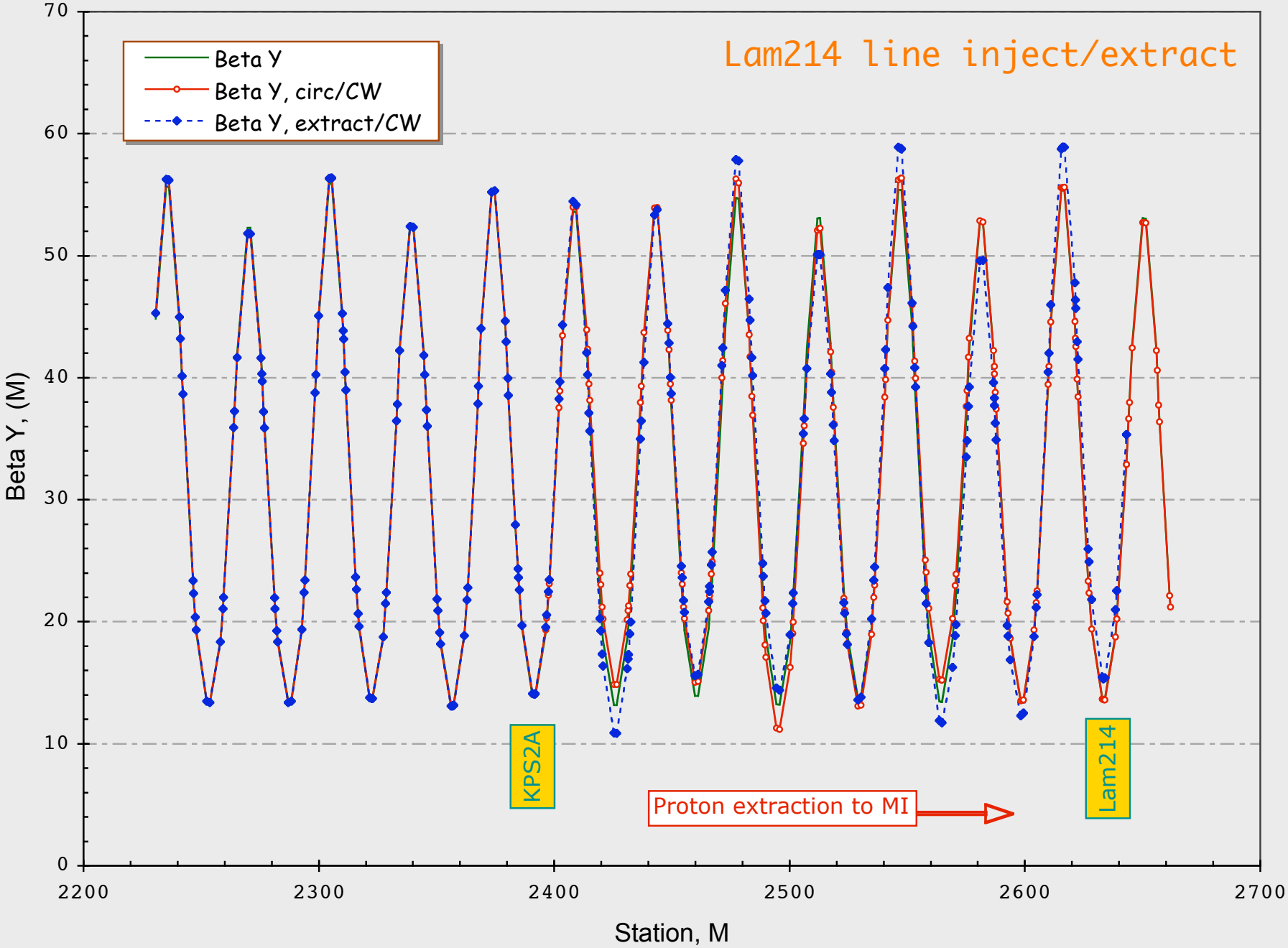
Feed-down effect from Sextuples

- Circulating orbit displacement
  - Of the order of 25 mm.
  - Feed-downs from sextupoles
    - about 6% of nominal quadrupole field.
- Injected beam orbit
  - 25 mm from central orbit, on the opposite side.
    - About 50 mm from circulating beam.
  - Effect of feed-downs is of opposite sign.
- Not all counter-waves are created equal
  - Differing overall effect.

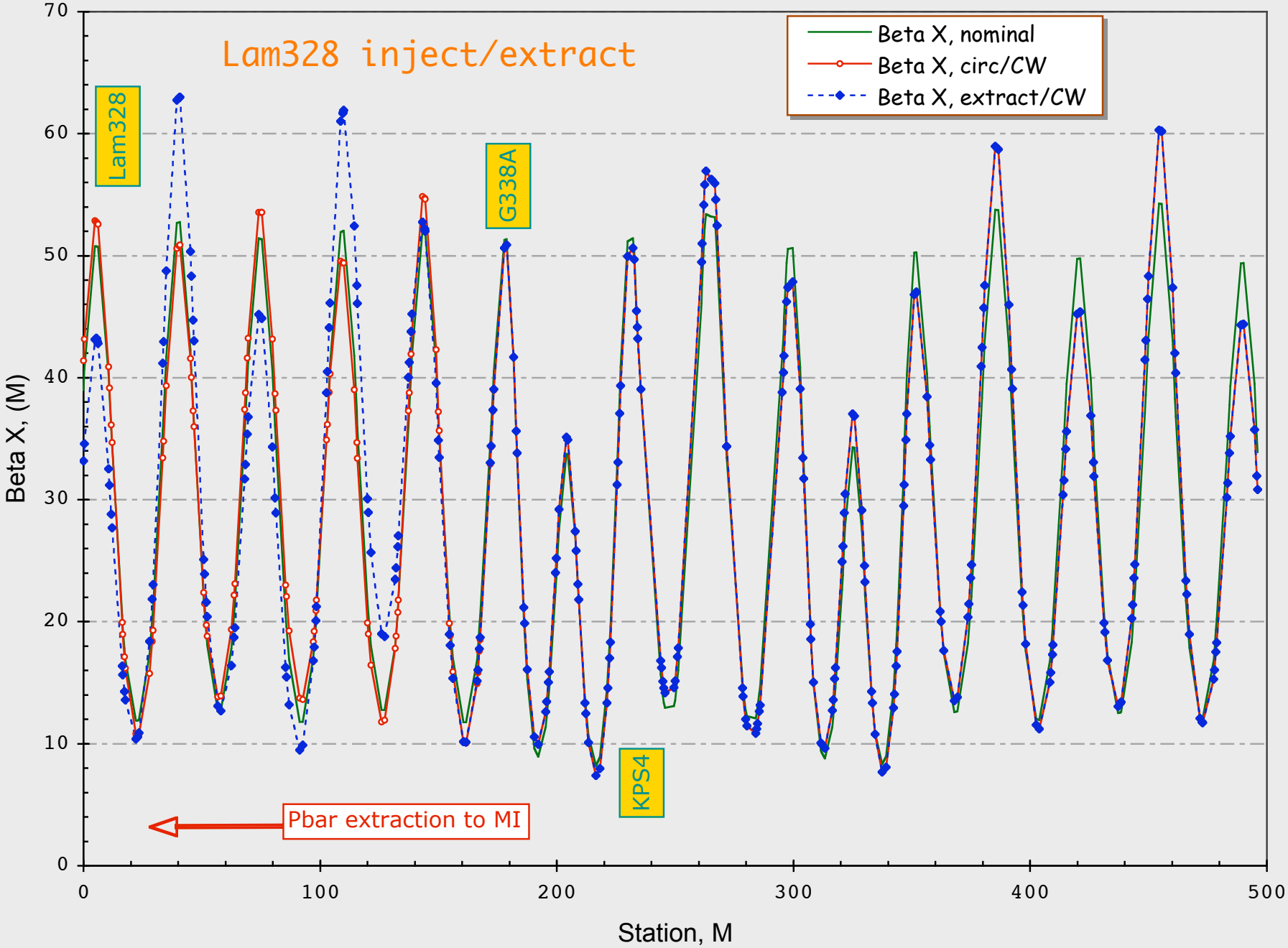
RR lattice at Lam214, horizontal plane



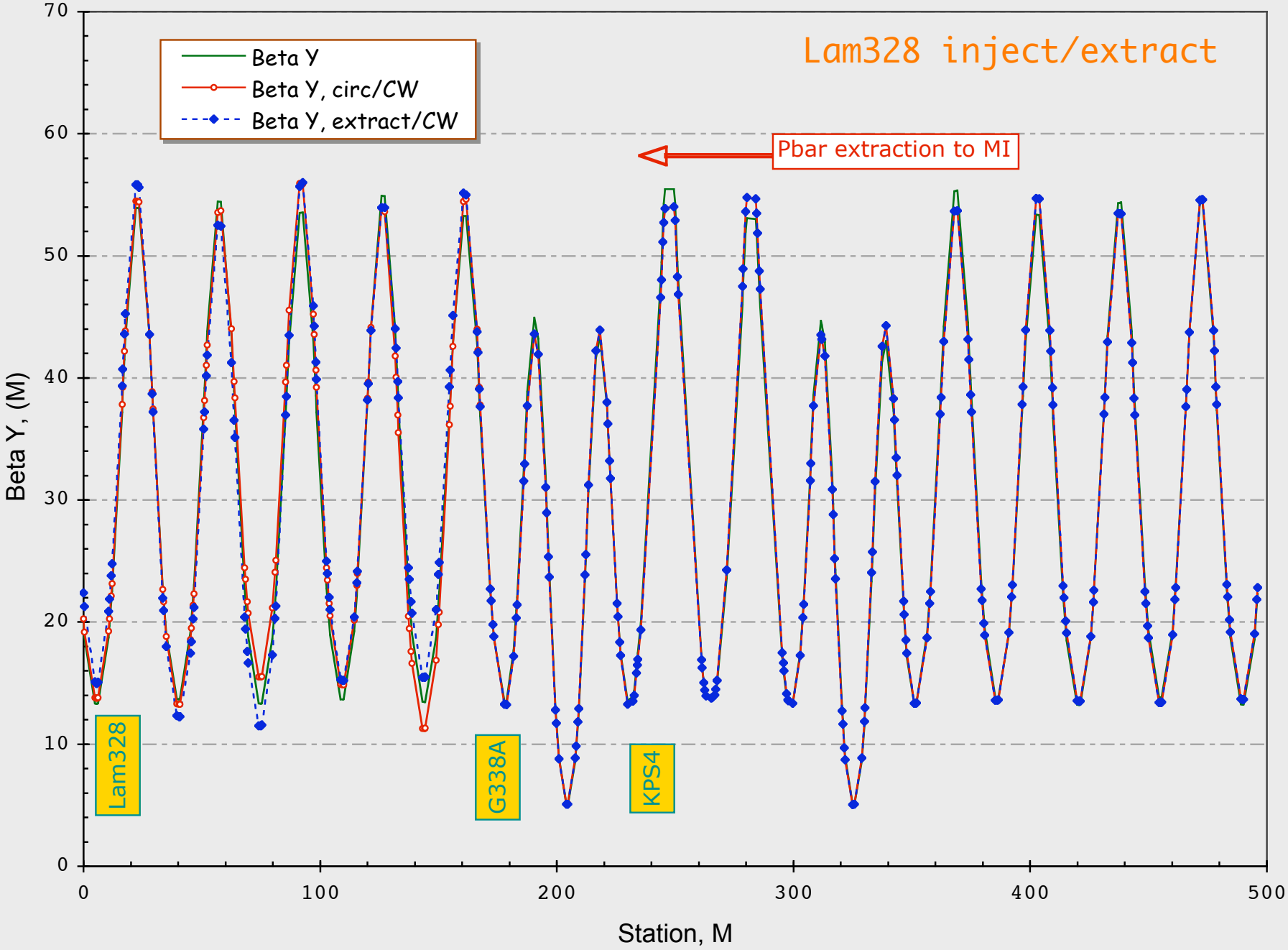
RR lattice at Lam214, vertical plane



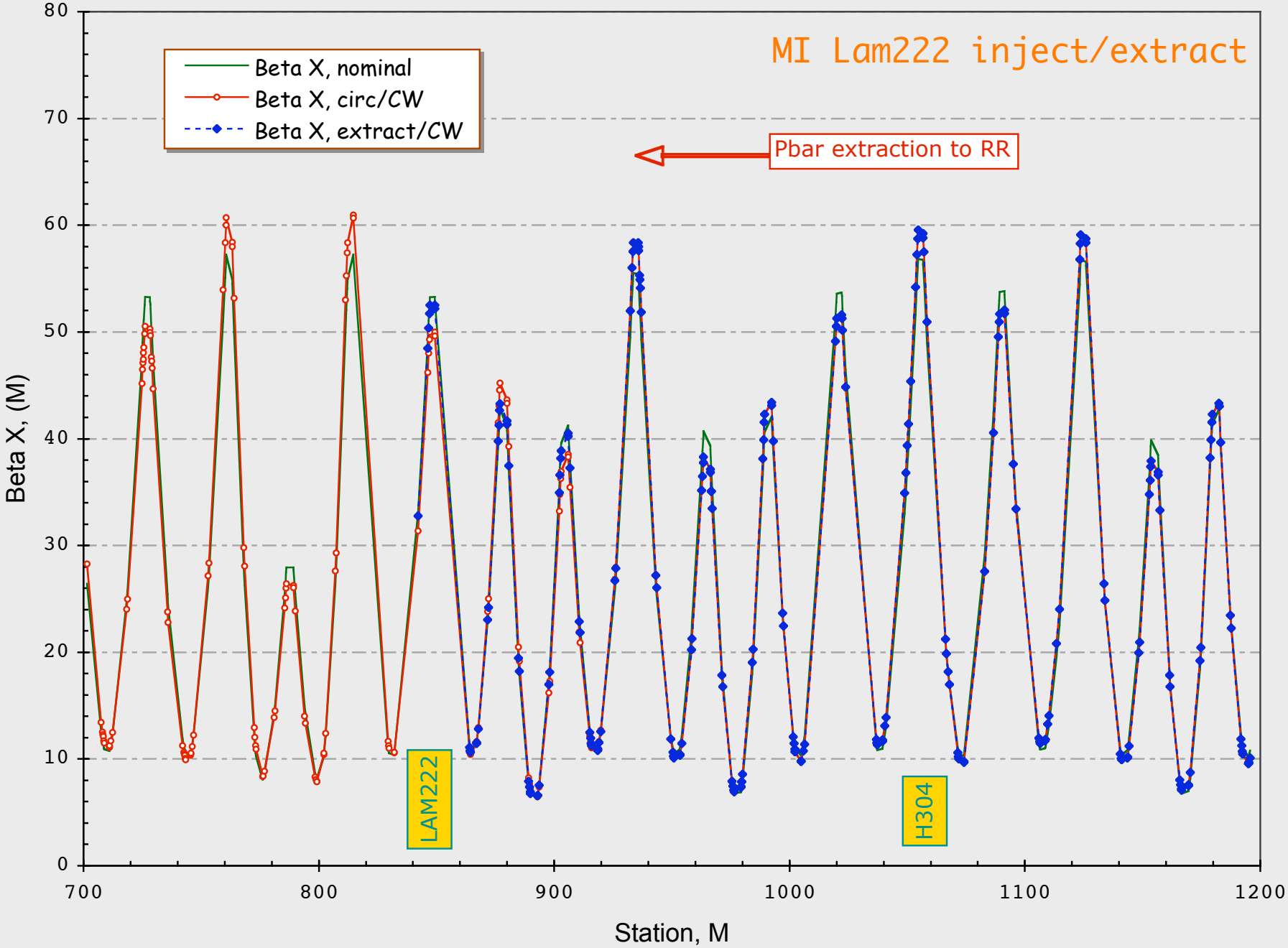
RR lattice at Lam328, horizontal plane



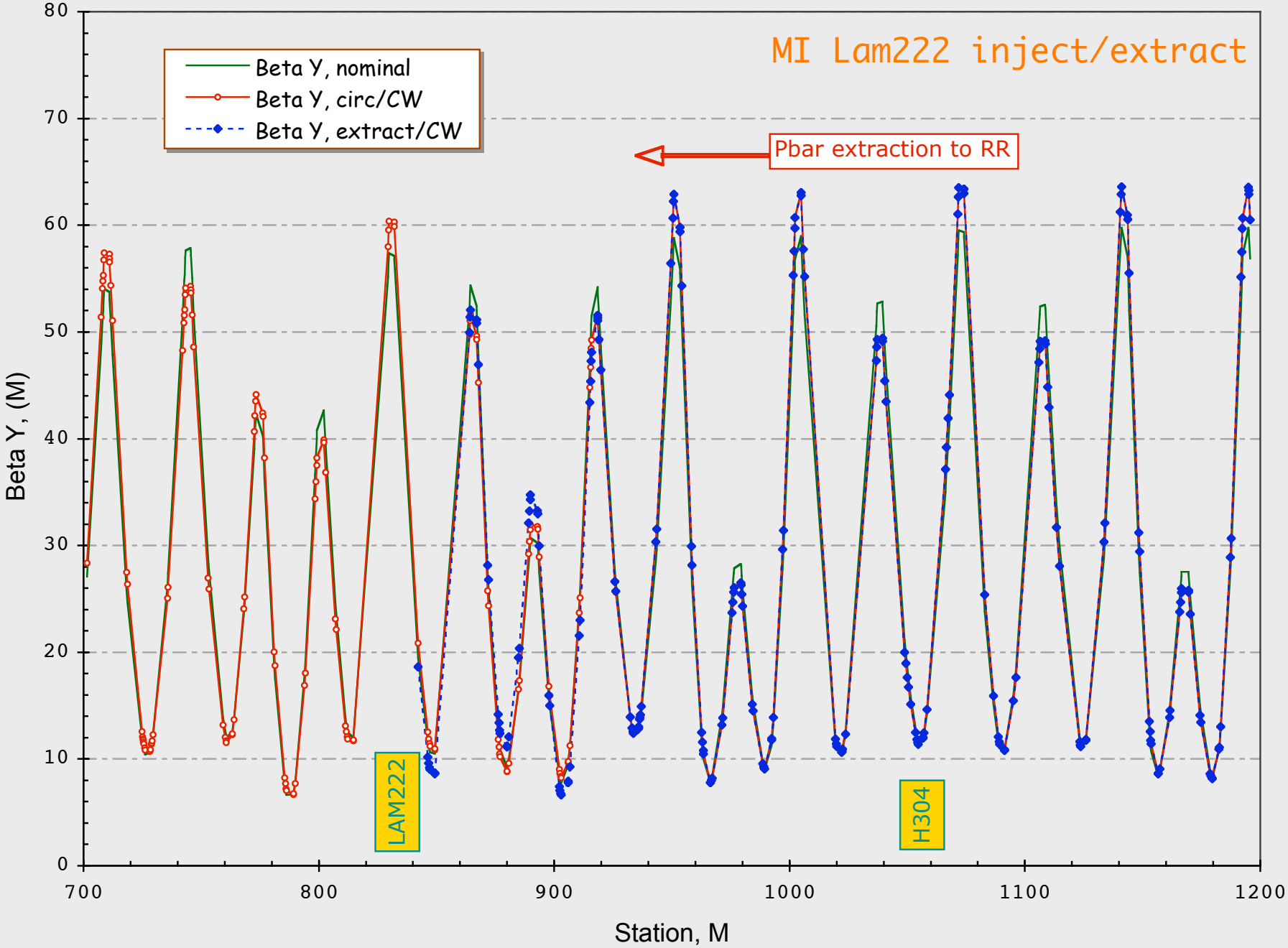
RR Lattice at Lam328, vertical plane



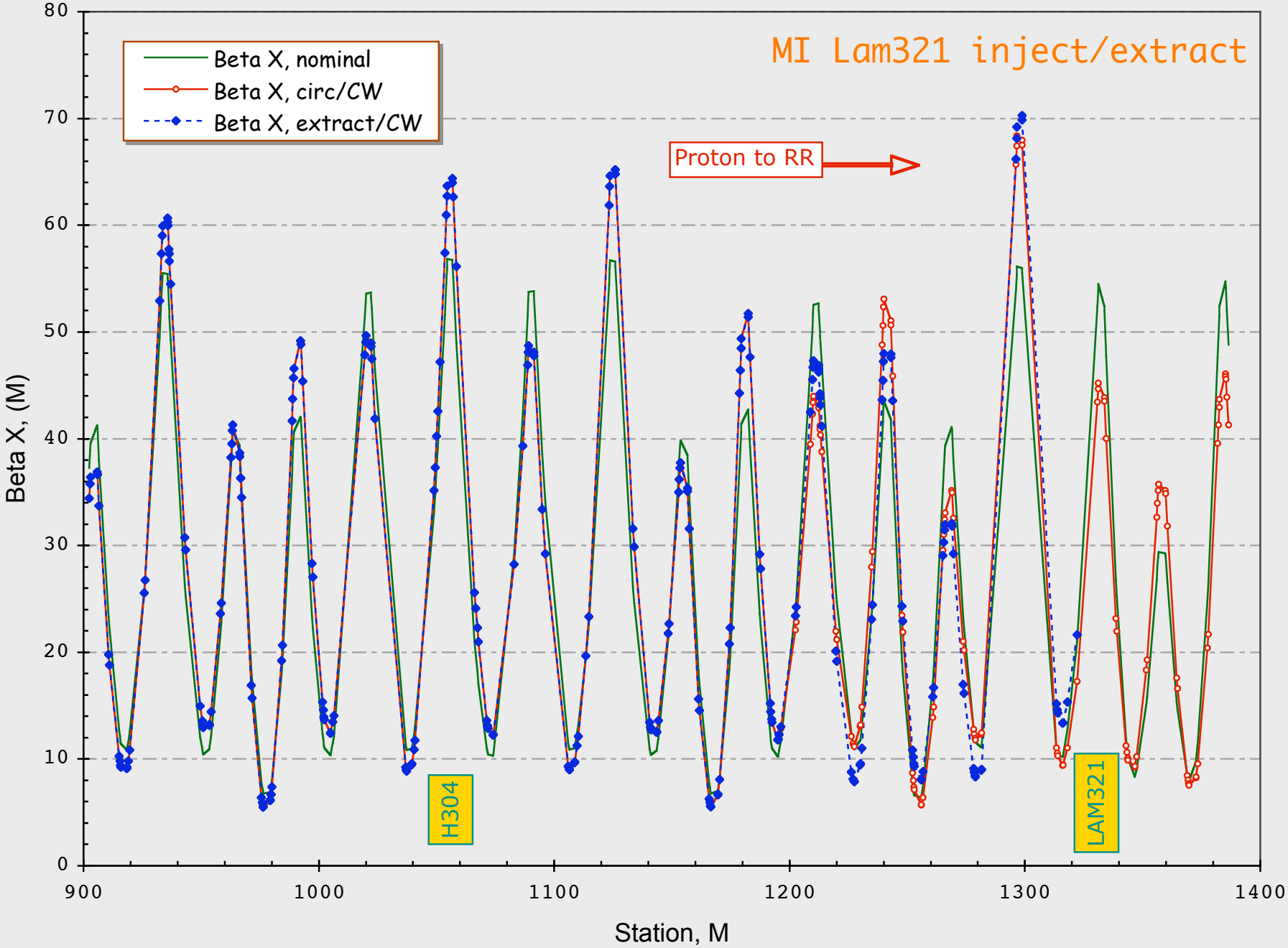
MI lattice at Lam222, horizontal plane



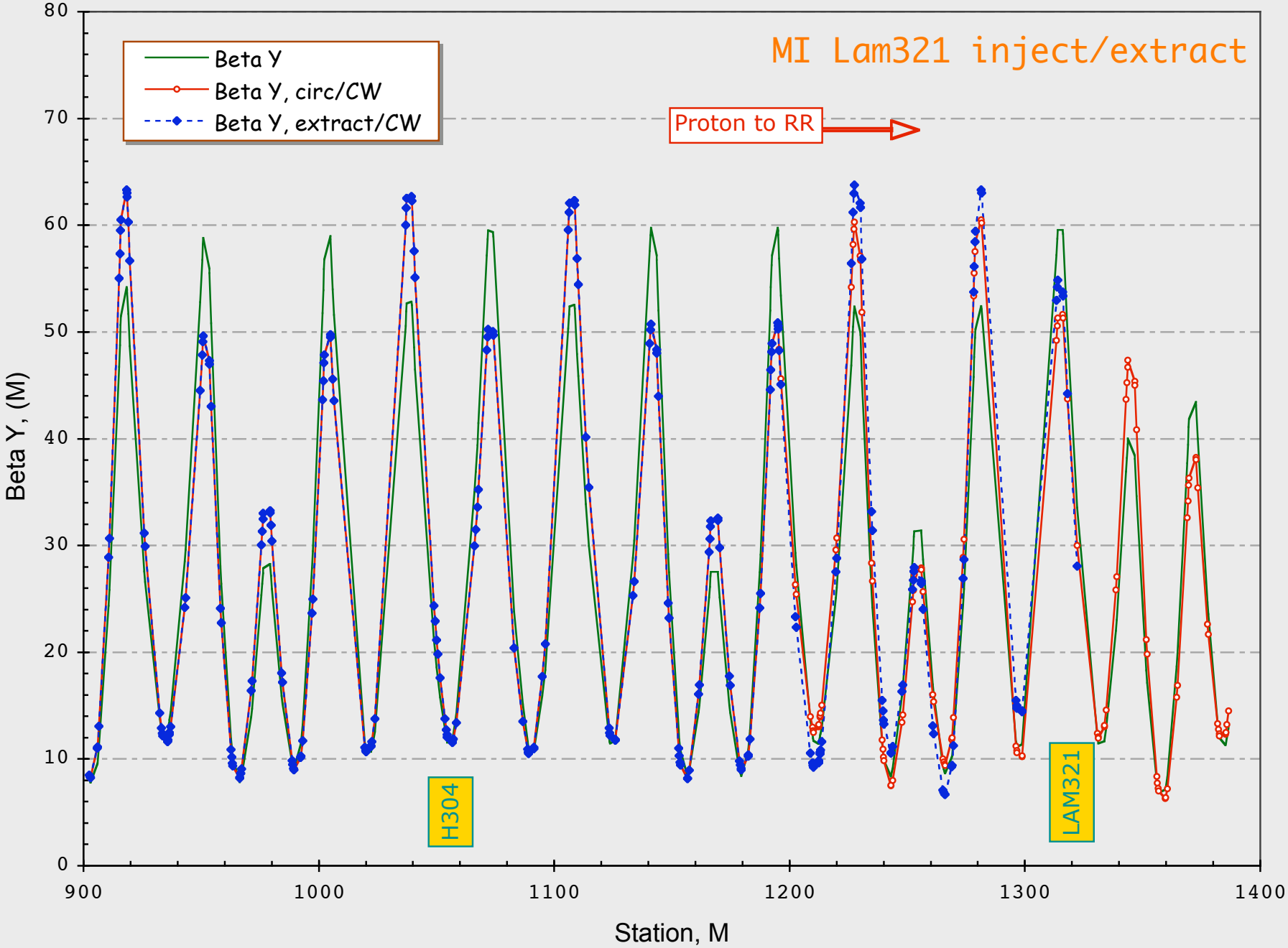
MI lattice at Lam222, vertical plane



MI lattice at Lam321, horizontal plane



MI lattice at Lam321, vertical plane



Feed-down due to R22 line counter-waves

- Lam321 at Main Injector
  - Horizontal
    - Circulating beam orbit
      - ~10 meters
    - Injection orbit
      - Similar effect as circulating beam.
  - Vertical
    - Beta errors ~10 meters
      - Same pattern for circulating and injection orbit.
- Lam328 at Recycler
  - Horizontal
    - Circulating orbit
      - Small beta errors.
    - Injection orbit
      - Beta error is > 10 meters.
  - Vertical
    - Effect minimal.

Feed-down due to R32 line counter-waves

- Lam214 in Recycler
  - Horizontal
    - Circulating beam orbit
      - Error > 10 Meters.
    - Injection beam orbit
      - ~5 meters average.
  - Vertical
    - Maximum beta error or 4 meters, at 52 meter nominal.
- Lam222 in Main Injector
  - Horizontal
    - Small perturbation, < 2 meters.
  - Vertical
    - < 2 meters.