Merge status April

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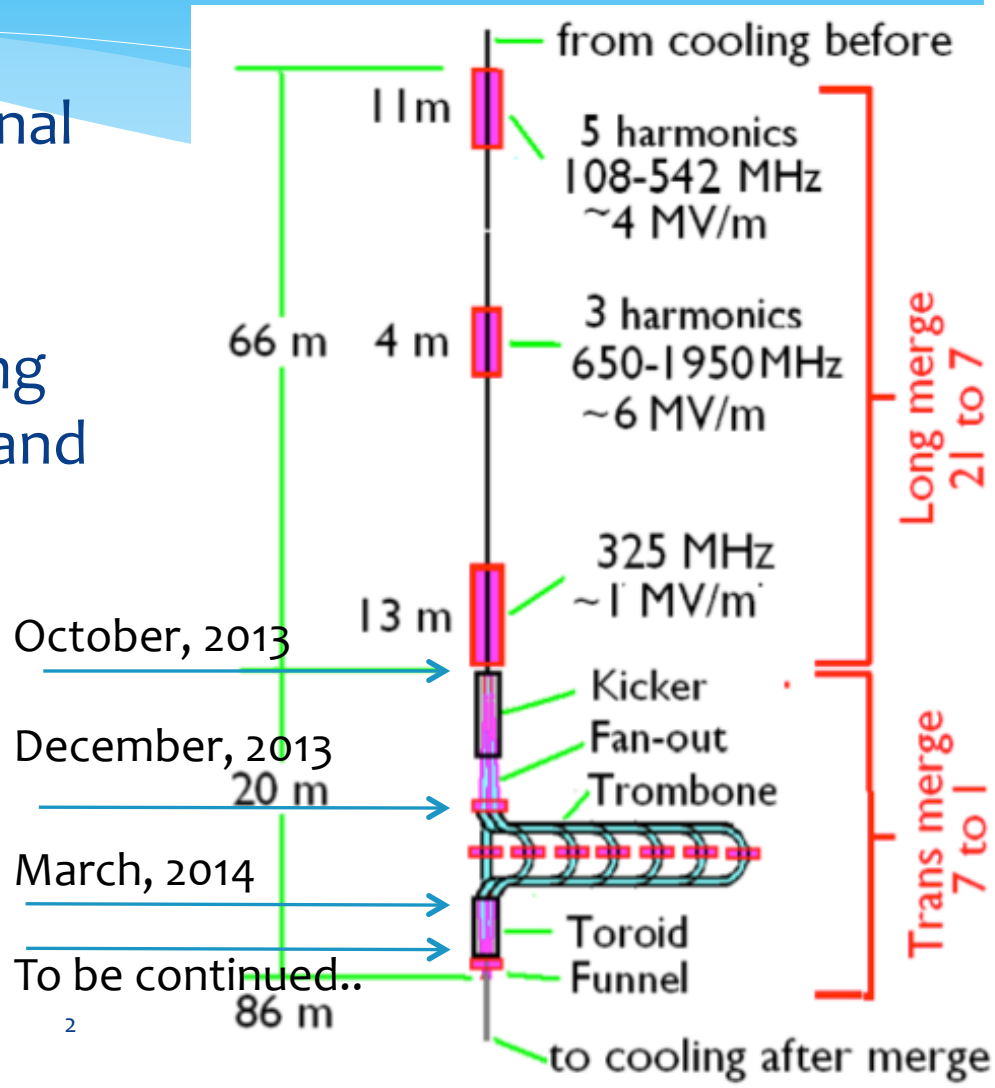
overview and timeline

- October,2013: Longitudinal merge using ideal rf field finished.
- December, 2013: Focusing channel between kicker and trombones optimized.
- March, 2014: Trombone designed, transverse emittance conserved.
- Funnel optimization in progress

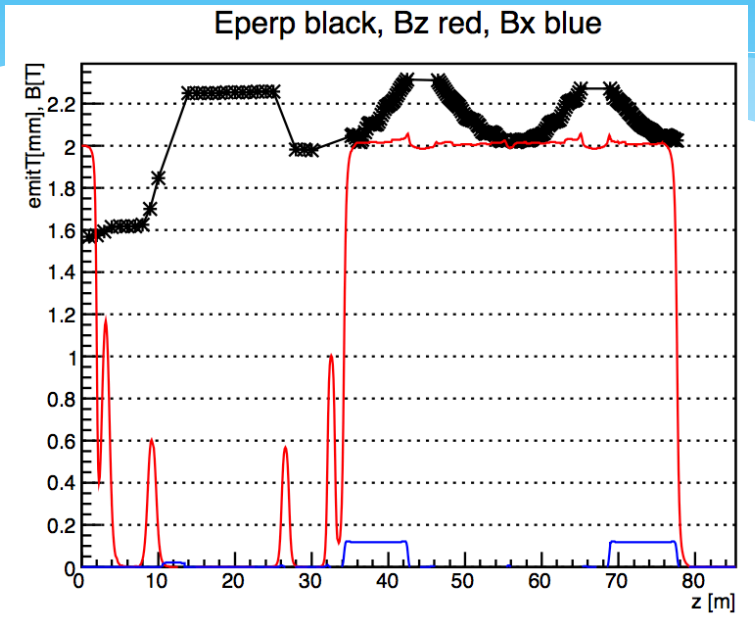


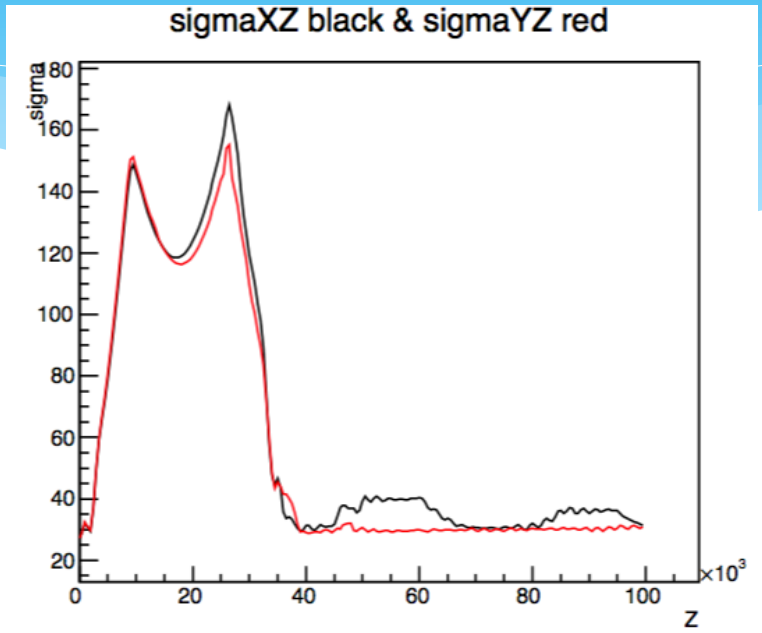
Recent progress

- Trombones: Optimized the trombones to conserve the transverse emittance.
  - Found transverse emittance oscillation in bent solenoids caused by transverse dispersion.

- Funnel: Focusing channel designed and need optimization, first test reached 2mm transverse emittance. Found the chromatic effect in the funnel field and correction in progress.

Transverse Emit in Trombone





Simulation of the trombones finished.

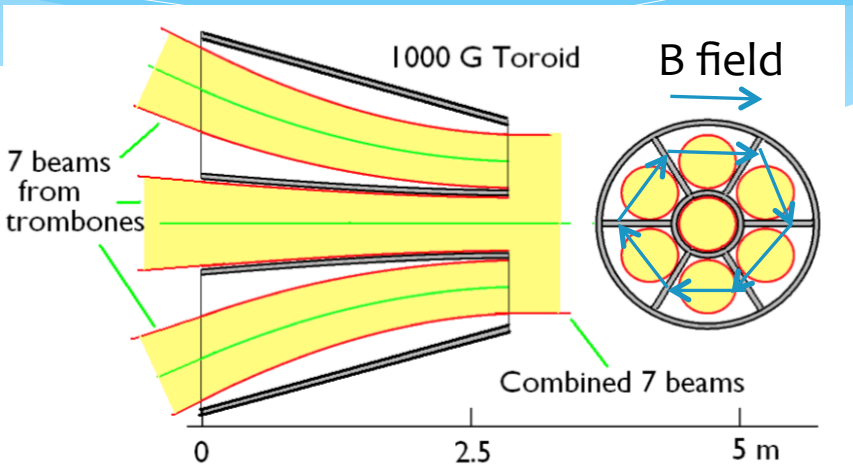
Emittance kept at 2mm after trombones despite the lengths of the straight sections.

Transverse dispersion in a bent solenoid causes the emittance growing. A reversed bent section with the same bent strength corrects the dispersion, so that the emittance comes back.

Emittance grows up in the kicker. Needs to be corrected later.

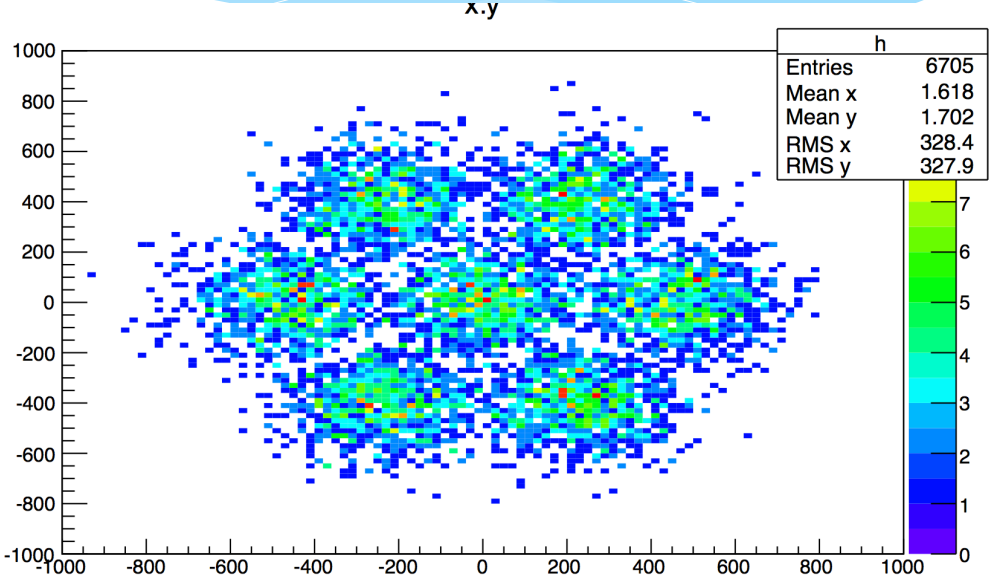
Funnel

- Limited by the physical sizes of the guiding solenoids.
- Need long funnel to have small bending angle and weak magnet.
- Need beam close to each other at the end of funnel. Chose 4 sigma from center of outer beam to funnel center.
- Need uniform dipole B field to reduce dispersion.

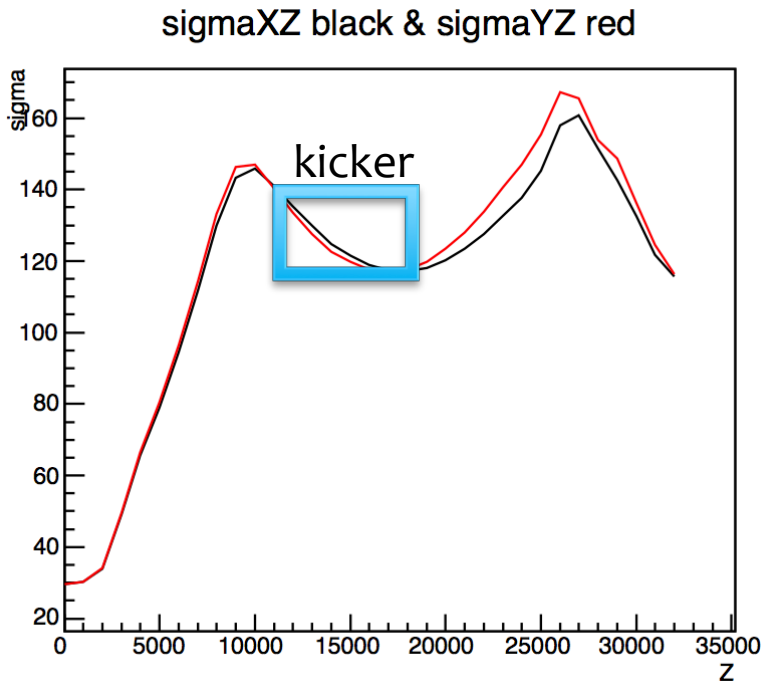


First test

- Single bunch size =11.6cm (1 sigma)
- Dipole field strength 263 G, length=7.5 m
- Wall thickness = 2 cm
- Transverse emittance reached 9 mm
- Transmission > 96%



Emittance increased by dipole



- The momentum spread is relatively big (5%) and a 15 degree dipole field has a chromatic effect
- Should be corrected by a chicane. To be continued by Bob..

To Do List

- Funnel:
  - Correct the dipole dispersion
  - Optimize the focusing before Funnel: zero alpha at output and small beta at input
- Check longitudinal emittance and put rf cavities to control the increase
- Longitudinal merge with pillbox cavities
- Make trombones shorter, to further improve the longitudinal emittance.