Main Beam to Main Beam Phase Error
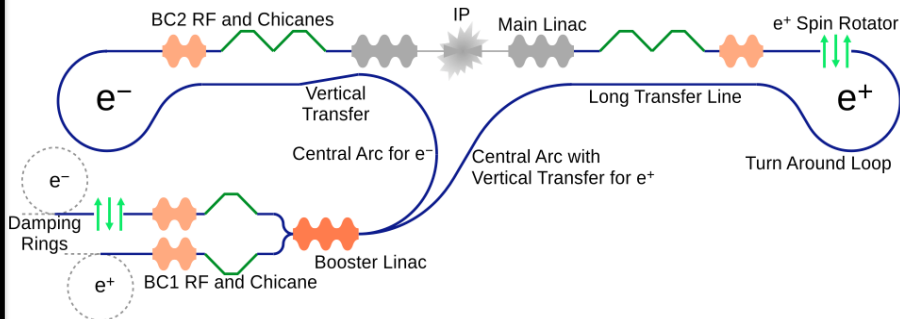

**Most important jitter source is BC2 RF ->
need phase alignment over 50km (<0.6°)**

Main Beam to Main Beam

- Absolutely need a global reference over 50 km
- 0.6 ° @ 12 GHz -> 140 fs
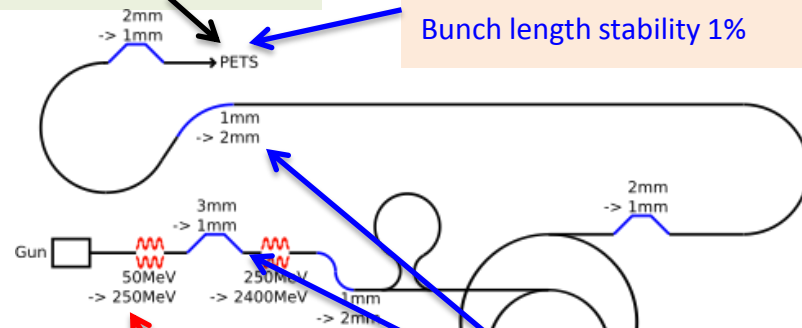- Half available to reference (roughly)
- 70 fs over 50 km

Drive Beam

- 0.2 ° @ 12 GHz -> 46 fs
- A quarter available to reference, 11.5 fs!
- 10 fs over 25 km is perhaps not feasible
- Can pick up Main Beam outgoing as an rence.

Drive Beam Requirements

Emittance $\varepsilon_{x,y} \leq 150\mu m$
Transverse jitter $\leq 0.3\sigma$

Current stability 0.75 $\cdot 10^{-3}$
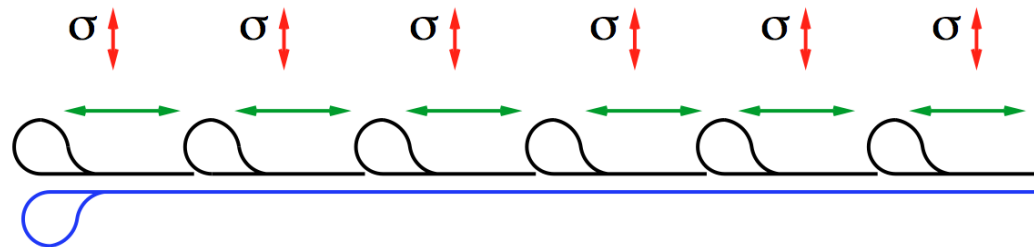Phase stability 0.2° @ 12GHz
Bunch length stability 1%

RF power stability 0.2%
RF phase stability 0.05°

Phase stability 2.5° @ 12GHz
0.2° @ 1GHz

- Some idea of requirements from Daniel Schulte for a chain-type reference system
- 3 μm = 10 fs = 70 fs/sqrt(48)
- This assumes 10 fs per segment, all inclusive, and random errors between segments.
- Stability required over several pulses, perhaps 1 to 10 Hz
- For drive beam stability requirement: 11.5 fs/sqrt(24) = 2.3 fs

Please Volunteer!

- With current approaches, 1-10 fs is achievable over a few km. From work at XFELs. Two presentations in 2009 CLIC workshop:
  - Long-distance optical stabilization with femtosecond resolution, F. Ömer İlday
  - Femtosecond Optical Synchronization System for FLASH, Matthias Felber

- Still need dedicated approach to demonstrate chaining of distributions.

- Also need to demonstrate reliability of technology to operate unattended in the tunnel.