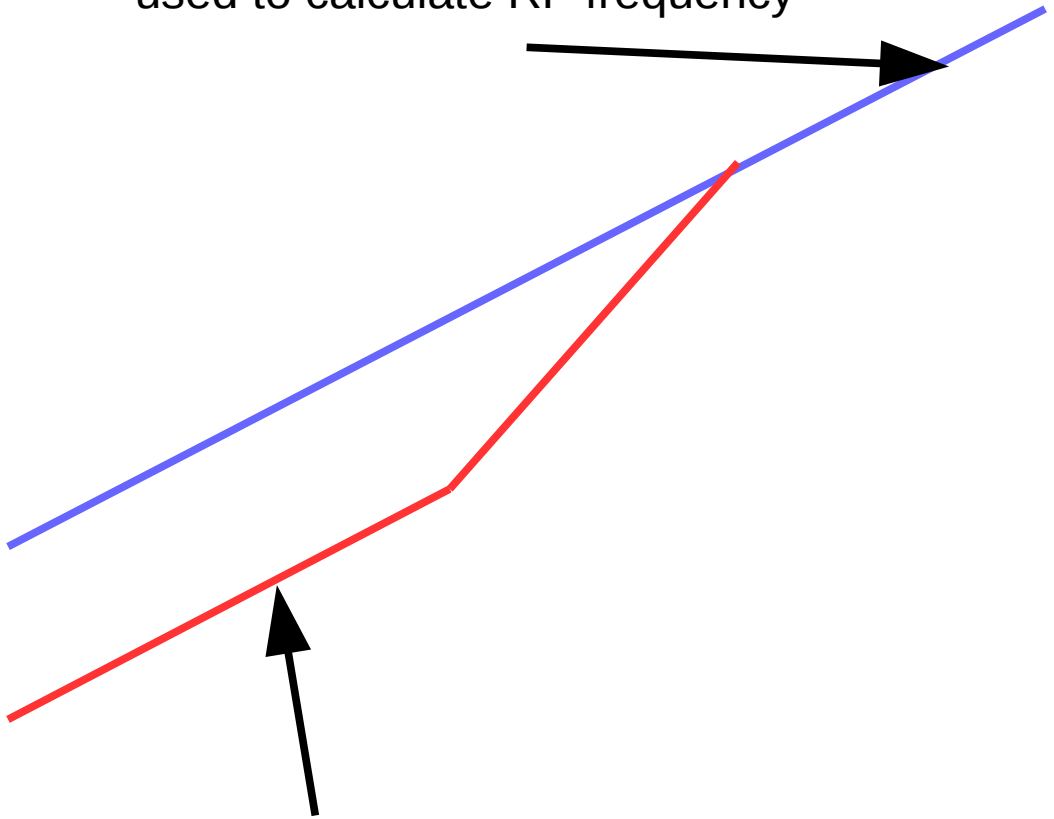
New BLonD features for PSB and LEIR (and … ?)

- Magnetic trim coils
- Fixed RF frequency (and transition to B-train)
- Δf_{RF} function

All slightly different ways of separating RF frequency from B-field, both differences and similarities

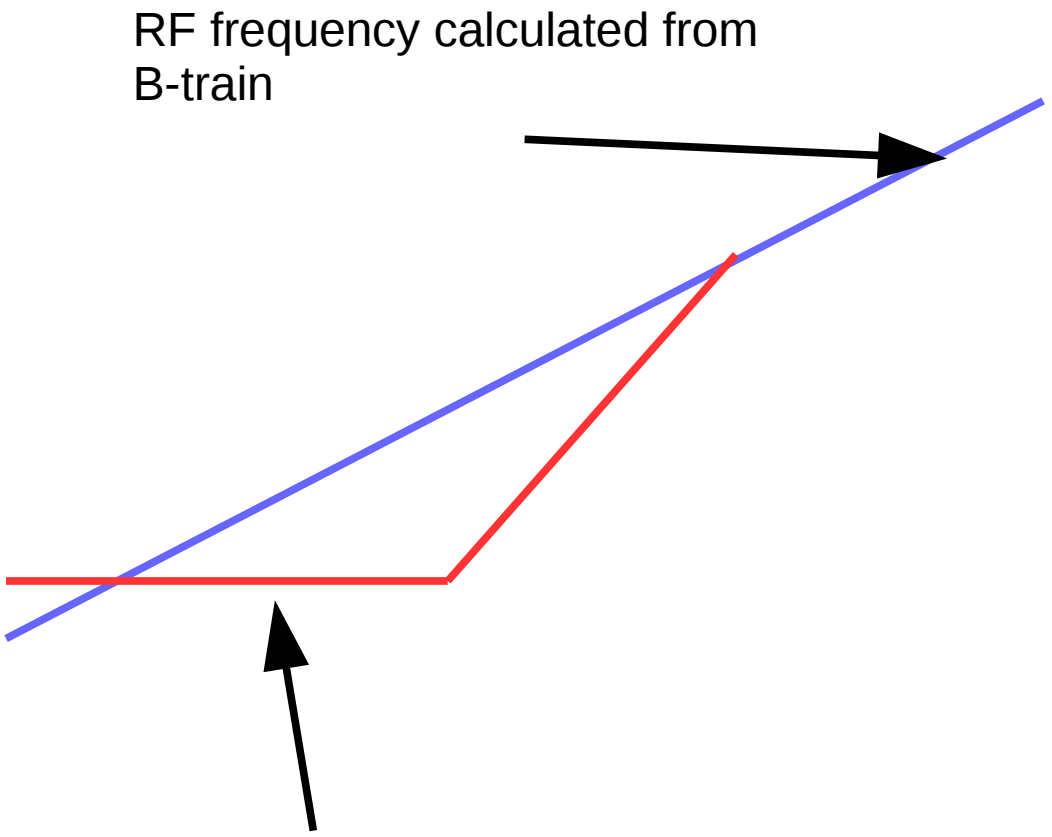
Magnetic trim coil



PSB feature ring Bdl:

- Used at extraction now, and injection after LS2
- Offset to B-field to make each ring have the same B-field for transfer to PS and later for injection
- BLonD requirement: RF frequency calculated from “design” momentum program, followed by adjustment of momentum program to account for trim
- Problems:
  - What is the synchronous particle?
  - Is it following the RF or the B-Field?
  - Is the RF frequency too high for the B-field, or is the B-field too low for the RF frequency (and does the difference matter)?

Fixed RF frequency with transition

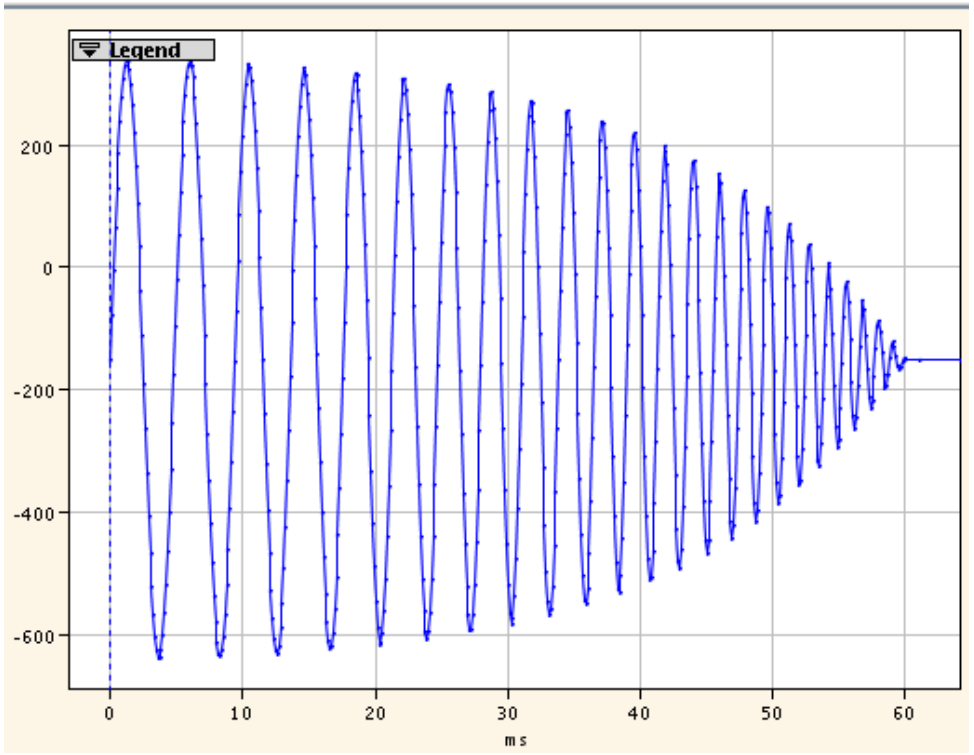


PSB feature fixed injection frequency:

- Fixed frequency for beam capture followed by a transition to frequency program
- For PSB injection creates a slightly **decelerating** bucket despite positive B-dot (0_o)
- Problems:
  - Not many, Δf_{RF}-> $\Delta\varphi$ easy
  - Requires defining functions etc but not conceptually difficult
  - Kind of like a phase loop in reverse

*N.B.: Bdl and Fixed frequency line lengths are the same here because I'm lazy, no inherent connection between the two in the machine

ΔF_{RF} function



LEIR FREVCORR function:

- Used for small addition to B-train derived RF frequency
- Problems:
  - Very similar to fixed injection frequency

3 Features similar but different

1: B-field trim: magnetic field seen by beam =/= magnetic field seen by RF

2: Fixed frequency: Exact RF frequency defined independent of B-field

3: Frequency offset: Small frequency addition on top of design frequency

2 & 3 “easy”, different user input but effectively the same result. RF frequency offset causes phase shift
1 less easy (in my head)

For PSB injection 1 & 2 simultaneous, with different duration, possibility of 3 as well.