

Tolerance on RF frequency

From J. Uythoven, MPWG 27 February 2004:

Aperture of extraction channel allows a window of 10% on MKD extraction angle

- 8 % from the actual MKD pulse shape
- 0.9 % from the precision of the energy tracking
- of which:
 - 0.1 % DCCT resolution
 - ± 0.2 % from integrated orbit corrector field (± 1 % possible)
 - ± 0.2 % from RF frequency change (± 0.8 % possible from machine aperture ?)**

$\pm 0.2\%$ in energy $\sim \pm 259$ Hz (out of 400.8 MHz)

RF frequency interlocking

- Frequency swing between injection and top energy
 - 868 Hz for protons
 - 5500 Hz for Pb ions
- Set an allowed frequency band around the nominal frequency of, say, ± 200 Hz
- Want to measure with a precision of, say, 20 Hz
 - need to measure for $> 1/20$ second
- cf. synchrotron frequency between 61.8 Hz (injection) and 21.4 Hz (top energy)
- Fastest beam reaction time \sim half a synchrotron period
 - i.e. $\sim 1/120$ second
- So we will catch slow frequency changes but not fast jumps

Possible implementation

- Using beam energy received from Safe LHC Parameters system
- Frequency counter (instrument) connected to a VME crate containing an SLP receiver
- Software task in PowerPC periodically calculates the nominal frequency from the distributed energy and compares it with the measurement
- Generates beam abort signal to BIC if outside limits
- This relies on software and so is inherently unsafe!
- But for the moment it's the best we can propose.