

# LET Requirements on RF Stability

WG1-WG2 Joint Session on RF  
Stability

# What LET Issues Drive RF Stability?

- Mainly bunch compressor
  - Most designs use 1.3 GHz RF (TTC) at 30 to 35 MV/m
  - Phase and amplitude errors can drive
    - Energy / energy spread errors at IP (not too serious)
    - Arrival time / bunch length errors at IP (much more serious)

# BC RF

- Bunch compressor may be single stage or two stage. Examples:
  - Single stage: 48 cavities
  - Two stage:
    - 32 cavities in stage 1
    - 432 cavities in stage 2
    - 4 possible configurations depending on final bunch length etc
- Luminosity tolerances are estimated to be:
  - 5% variation in bunch length
  - Arrival time jitter = 20% of  $\beta_y^*$

Bunch length variation tolerance may be excessively tight, but in any event it is arrival time jitter tolerance that drives all RF specifications

# Tolerances on Mean Phase and Amplitude of BC RF System

Blue = BC1 drives tolerance, Red = BC2 drives tolerance, Purple = both systems about equal

Parameter	1 Stage	300 "A"	300 "B"	150 "A"	150 "B"
BC RF Amplitude	0.2%	0.1%	0.15%	0.08%	0.1%
BC RF Phase	0.07°	0.05°	0.12°	0.03°	0.06°

# Klystron Tolerances

- Single-stage BC has few klystrons (maybe 4)
  - Klystron tolerance  $\sim 2 * \text{system tolerance}$
- Two-stage BC has  $\sim 20$  klystrons in BC2
  - BC2 drives tolerances
  - klystron tolerances can be  $\sim 4.5 * \text{system tolerance}$
- In any event, need to reserve some fraction of budget for systematic phase and amplitude errors, some fraction for uncorrelated klystron jitter