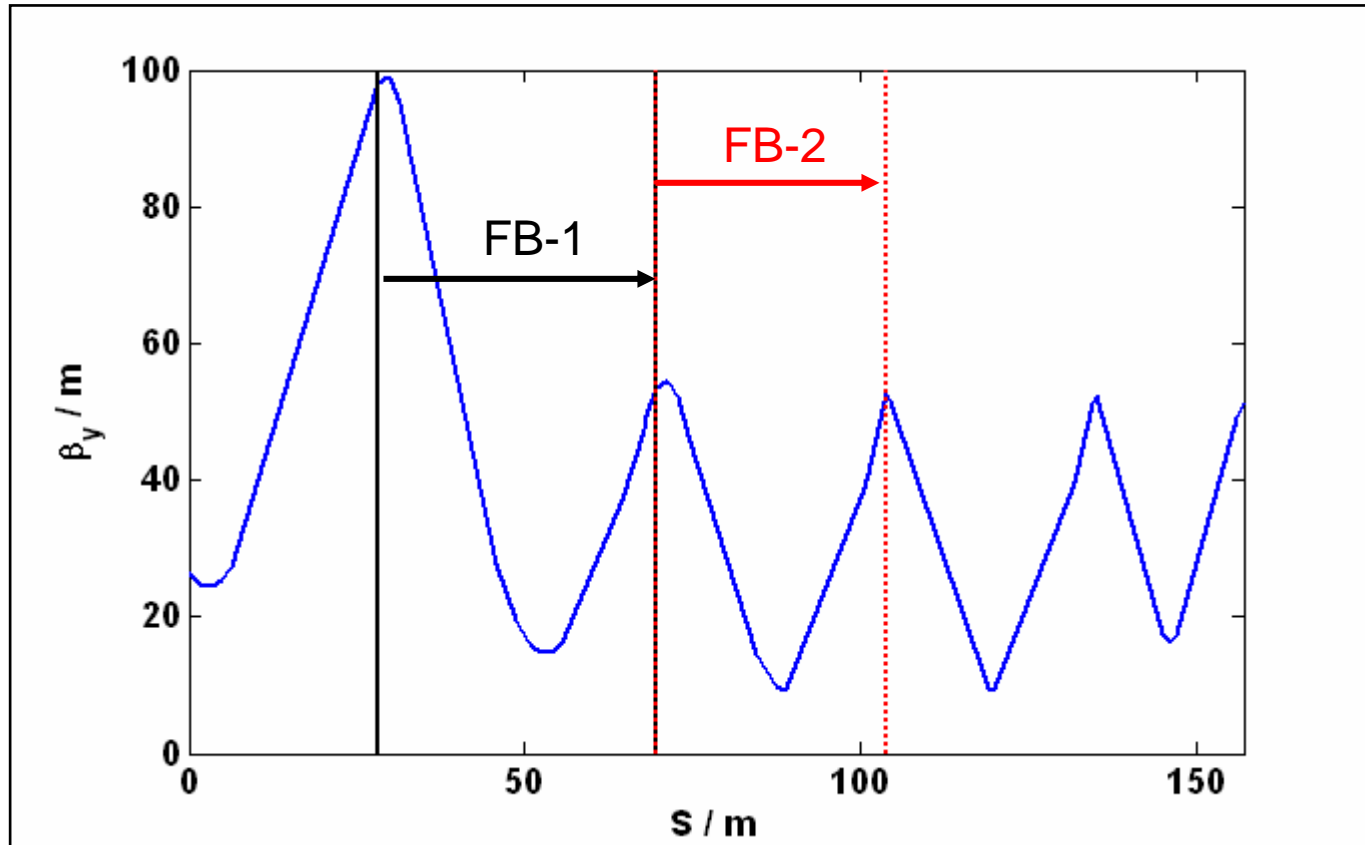


BDS Front-End FFB System

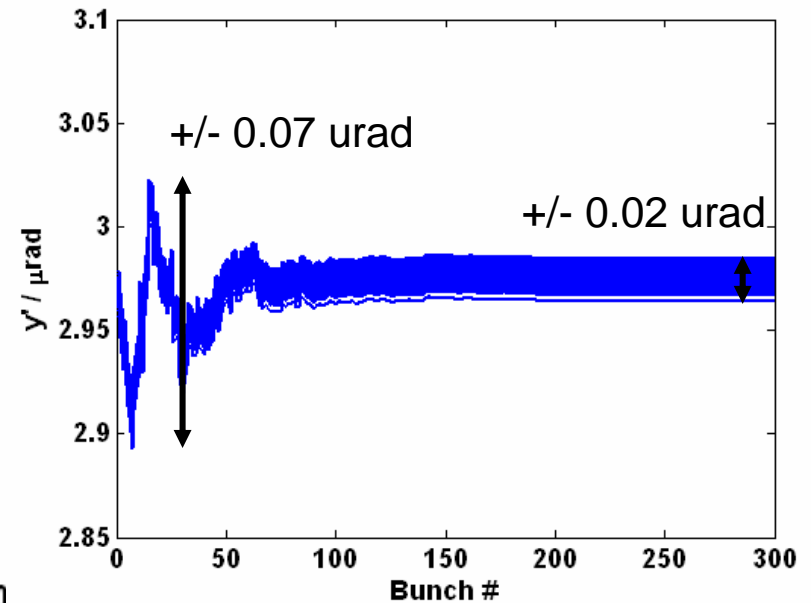
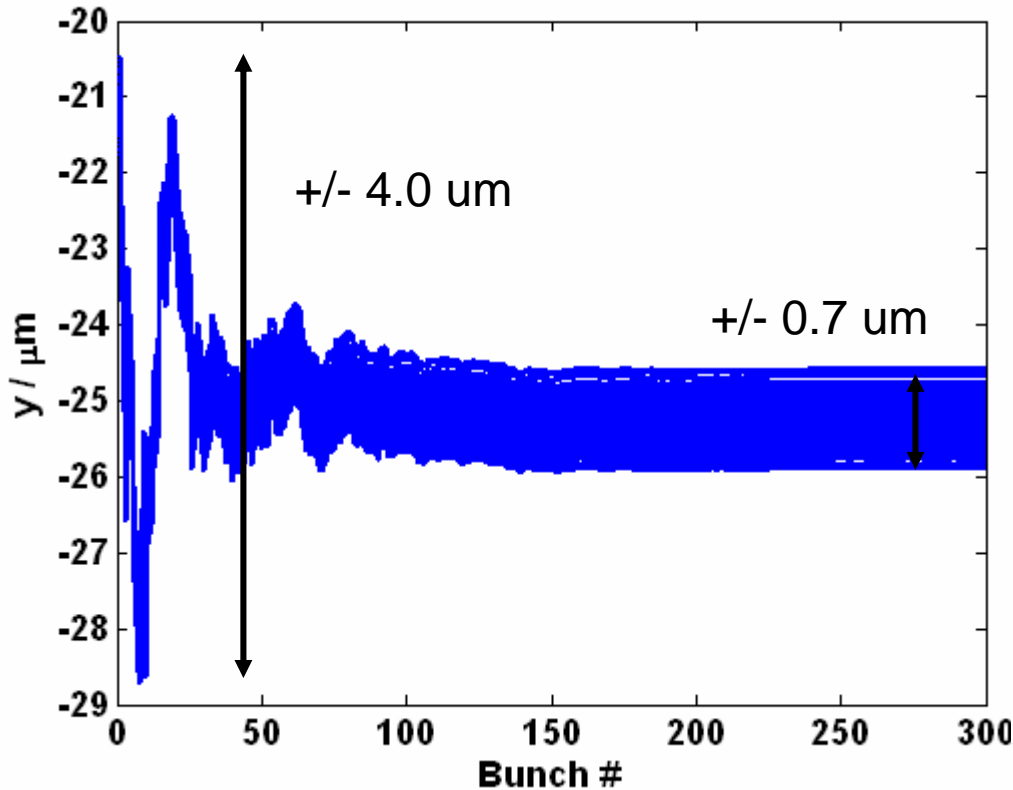
Glen White

BDS FFB Location



- 2 Kicker / BPM pairs to straighten train and remove jitter at entrance to BDS.
- FB-1:
 - Kicker: upstream QMBSY2
 - BPM: upstream QD90C
- FB-2:
 - Kicker: upstream QD90C
 - BPM: upstream QD90

Incoming Jitter from LINAC



- Vertical positions/angles of bunch train exiting LINAC (subtract mean values to get real offsets- 2 bits of beamline modeled separately in simulation).
- 200 Seeds of 0.2s model 'K' GM + 100nm Quad jitter.
- (1 sigma $y = 2.6 \mu\text{m}$ at BDS entrance)

Kicker Requirements

- Need to zero BPM readings to remove train shape and train-train jitter \sim (3.6 μm BPM1; 8.3 μm BPM2).
- Assume 1m length TESLA FFB stripline kicker design (max 0.15 μrad kick @ 250 GeV).
- With calculated R34's between BDS entrance and BPMs and between kickers and BPMs:
 - Can correct up to 9.9 μm (BPM1) and 7.5 μm (BPM2) per meter of kicker.
 - Need 0.36m of kicker for FB-1, 1.1m of kicker for FB-2.
 - Would need more kick in reality to take care of additional errors that build up over longer-timescales due to GM etc.
 - Specs to come from LINAC 5-Hz feedback studies.
- From calculated R34's between Kickers and IP:
 - 0.1 σ_{y^*} equates to \sim 3nrad kick (Kicker 1); 116nrad kick (Kicker 2)
 - 0.1 $\sigma_{y'^*}$ equates to \sim 14nrad kick (Kicker 1); 5nrad kick (Kicker 2)
 - Max required resolution: $<2\%$

BPM Requirements

- To keep jitter introduced by kickers affecting vertical IP position and angle greater than the 0.1-sigma level, BPM's require better than the following resolution:
 - BPM 1: 200 nm
 - BPM 2: 265 nm

FB Latency

- Kicker-BPM distances:
 - FB-1: 41.4m
 - FB-2: 34.3m
- ToF time + cable time (at $0.9c$) + 100ns digital processing time gives latencies:
 - FB-1: 390ns
 - FB-2: 340ns
- Feedback possible every-other bunch.
- Interleaving with ANG+IP FFB systems minimizes jitter-growth impact.