

FD Jitter Tolerance Studies with FFBK

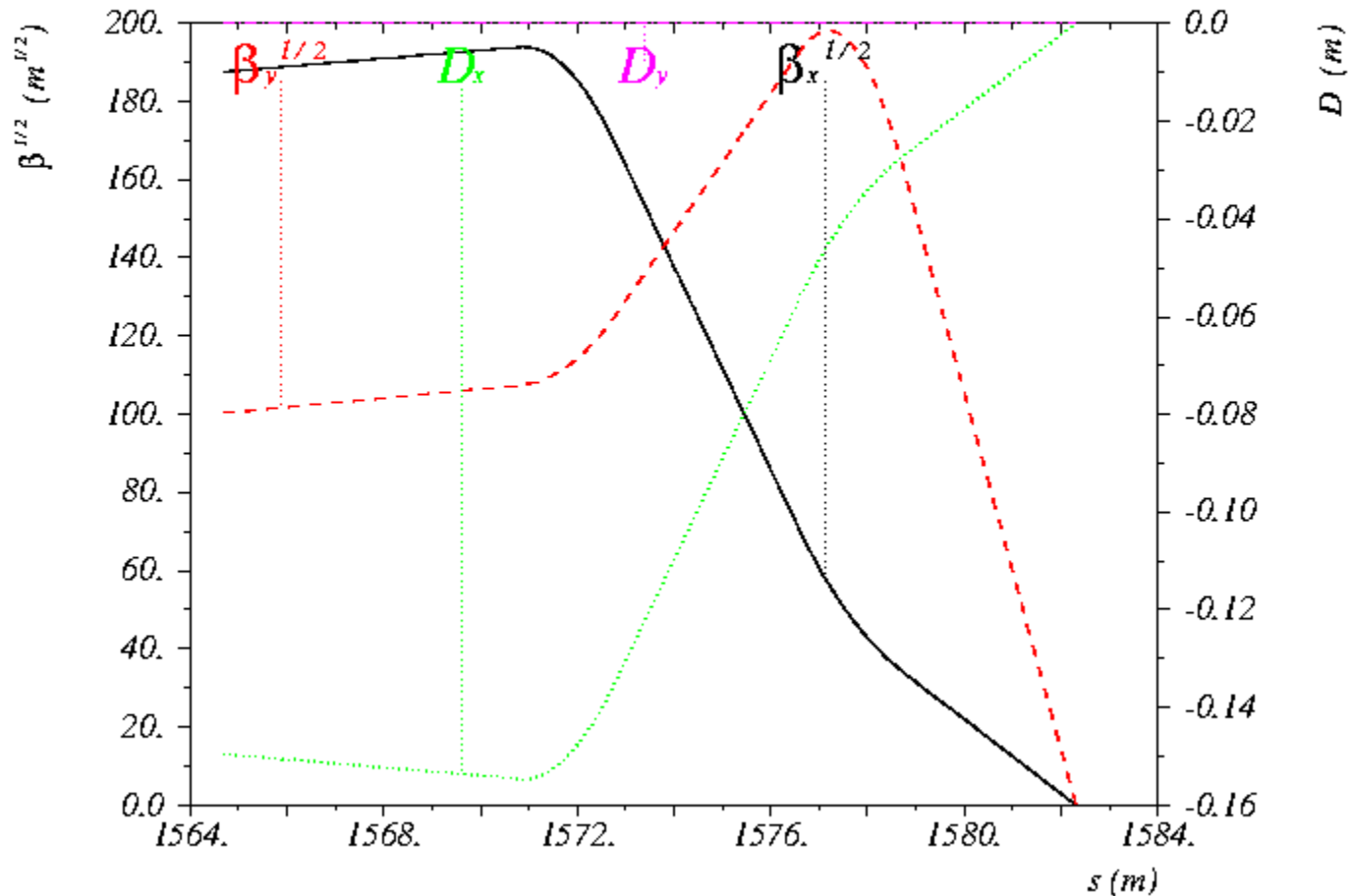
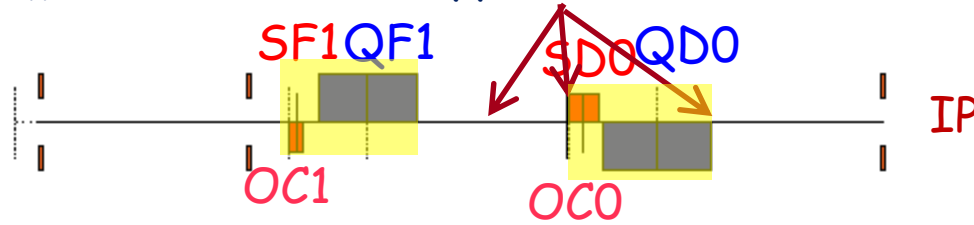
Min-Huey Wang

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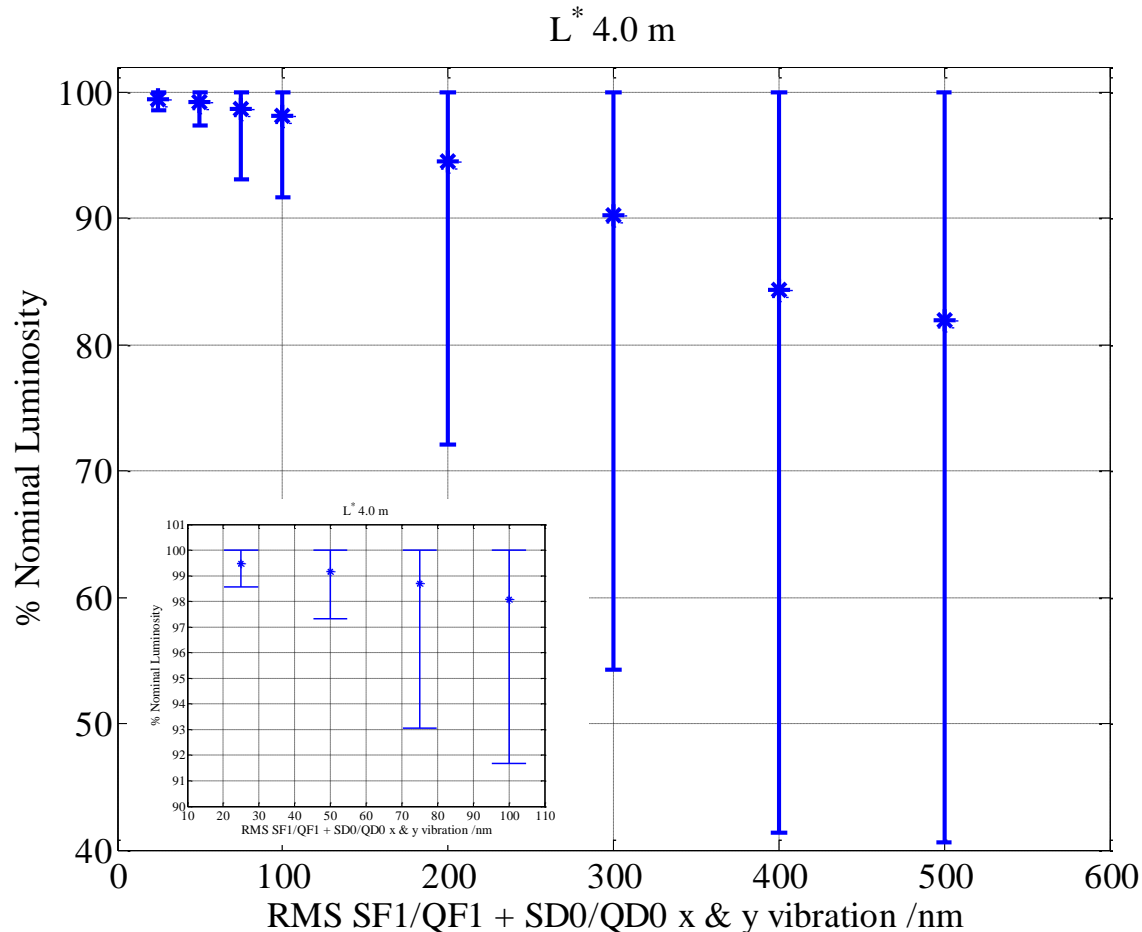
- BDS design L^* 4.0 m.
- Using 500 GeV CM baseline parameters from TDR Table 2.1 and Table 8.2.
- Using elegant + GUINEA-PIG to simulate LUMI loss criteria for QF1/SF1/OC1 and QD0/SD0/OCO offset with IP fast-feedback compensating.
- Track 80k macro particles (e^- & e^+ side) from QF1 upstream to IP with RMS vibration in horizontal and vertical planes. Total 100 consecutive pulses per RMS vibration amplitude are simulated.
- The luminosity of idea beam is $1.848E34 \text{ cm}^{-2}\text{s}^{-1}$ with y waist shift 300 μm and properly adjusting the grids in GUINEA-PIG. The same GUINEA-PIG parameters are used for the jitter studies.
- Three locations of FFB thin length kicker are simulated (beam direction).
 - At middle between QF1 and QD0
 - Before SD0
 - After QD0

IP FFB kicker position

Simulate the kicker effect at three locations

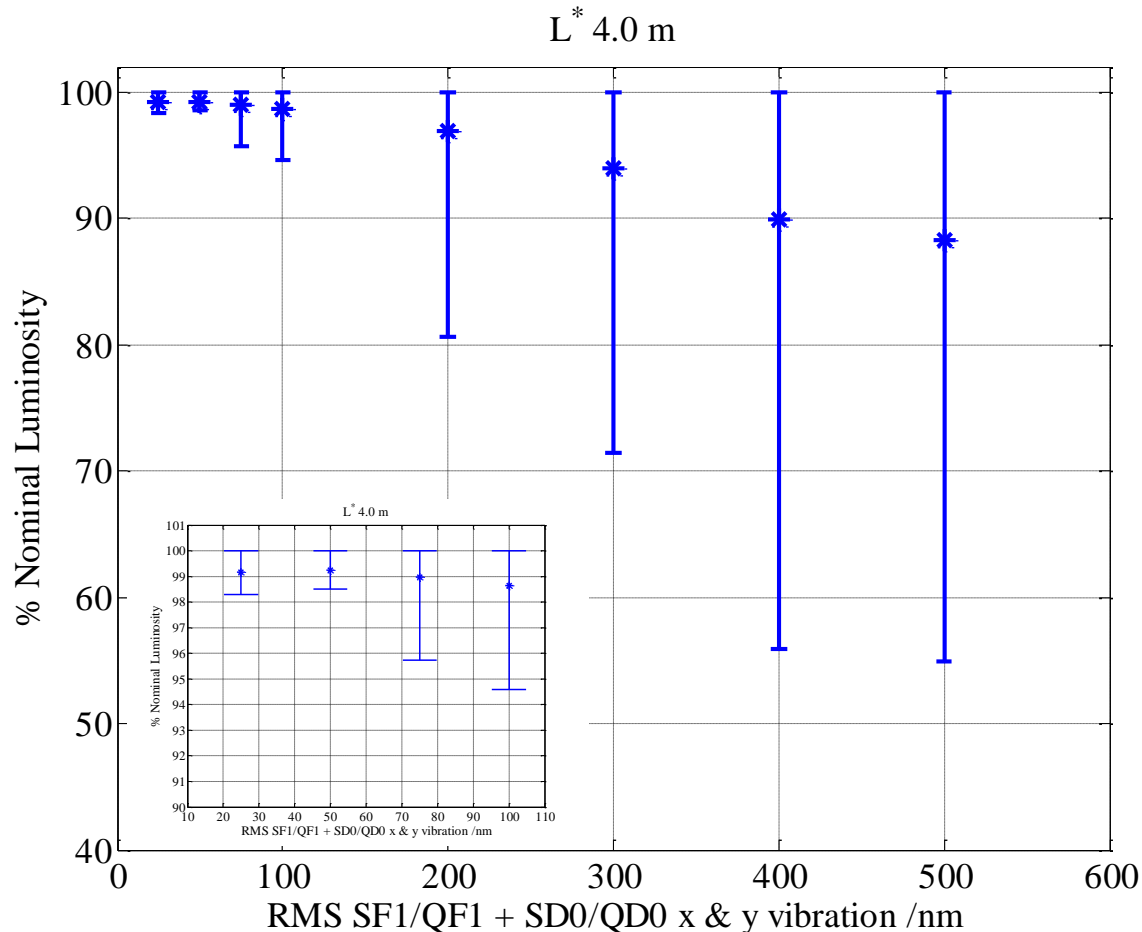


L* 4.0 m waist (FFB kicker 1.27 m upstream from SDO)



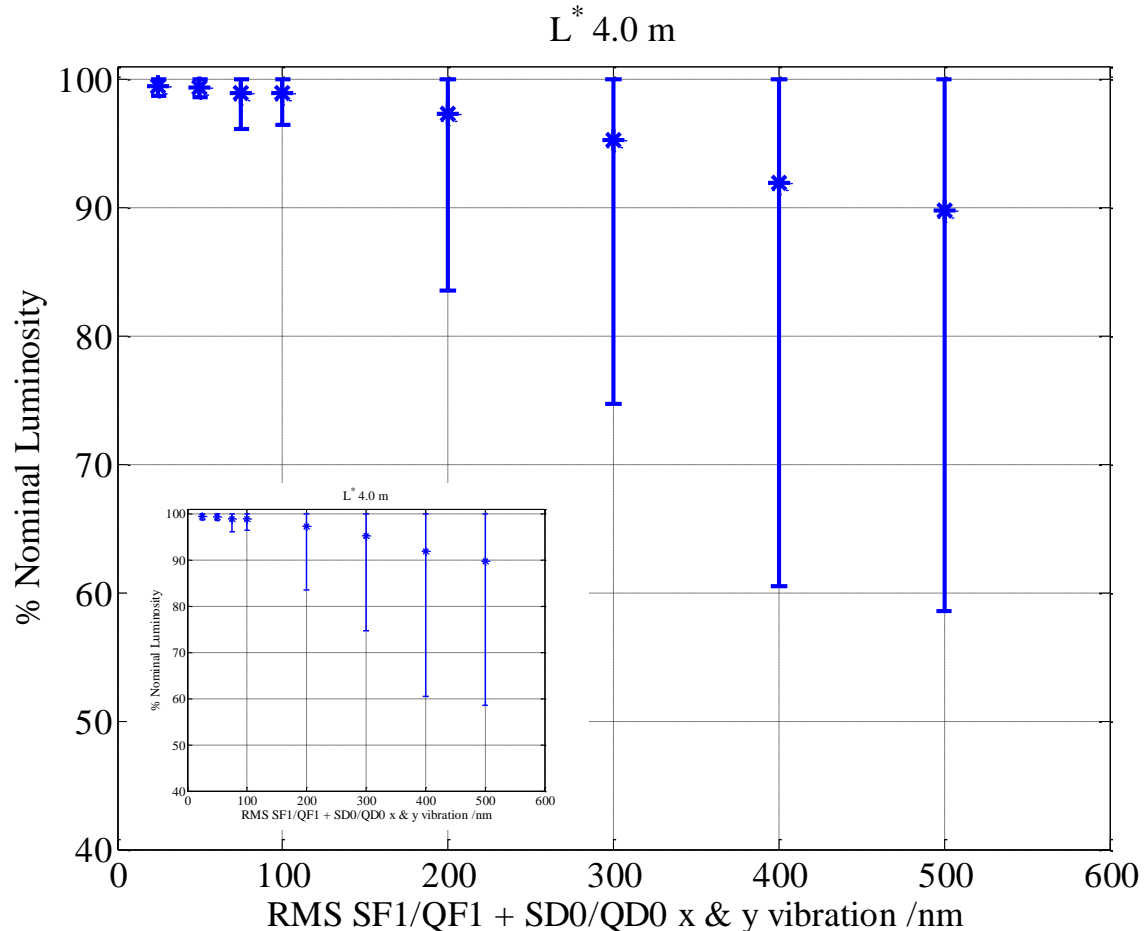
- Track 80K macro particles (e^- & e^+ side) from QF1 \rightarrow IP with RMS SF1/QF1 and SD0/QD0 vibration in horizontal and vertical planes.
- Results show mean and range of luminosities from 100 consecutive pulses.

L* 4.0 m waist (FFB kicker before QD0)



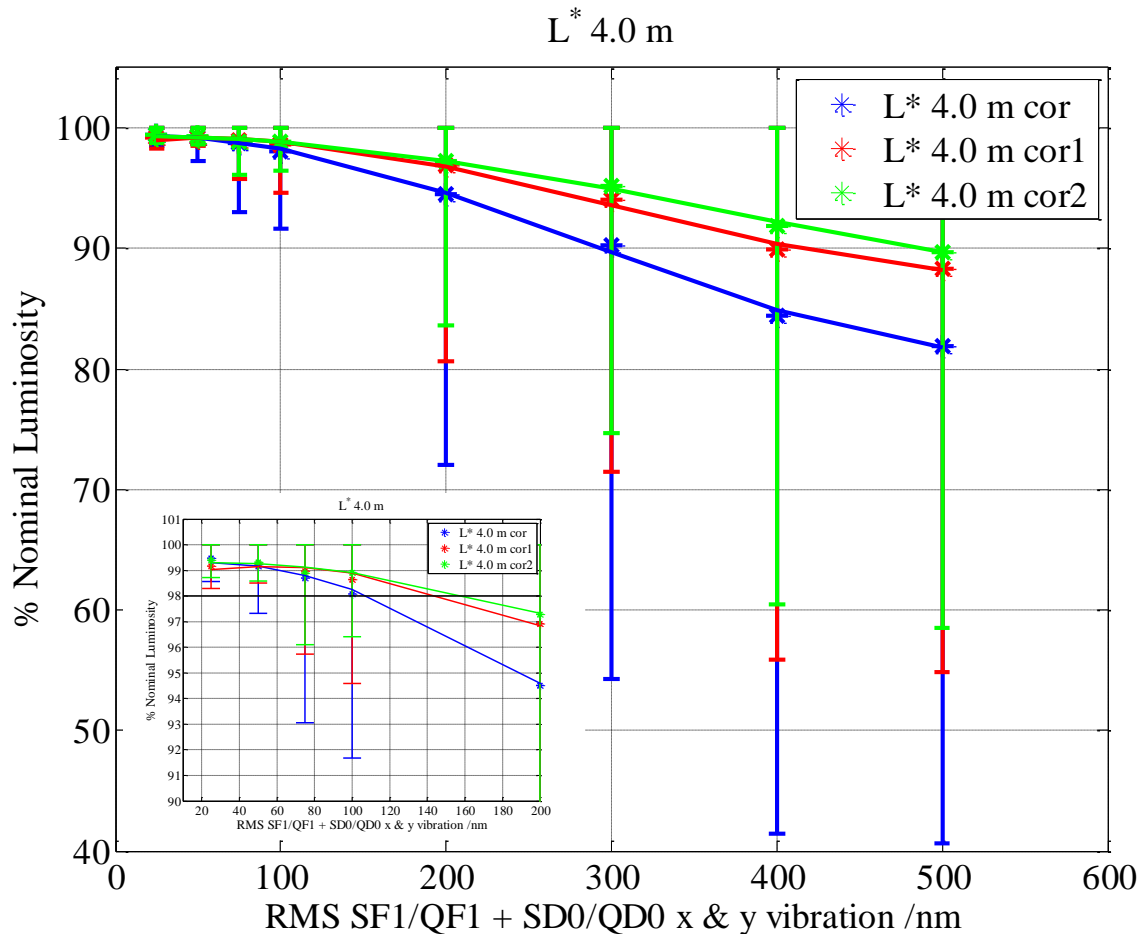
- Track 80K macro particles (e^- & e^+ side) from QF1 \rightarrow IP with RMS SF1/QF1 and SD0/QD0 vibration in horizontal and vertical planes.
- Results show mean and range of luminosities from 100 consecutive pulses.

L* 4.0 m waist (FFB kicker after QD0)



- Track 80K macro particles (e- & e+ side) from QF1 -> IP with RMS SF1/QF1 and SD0/QD0 vibration in horizontal and vertical planes.
- Results show mean and range of luminosities from 100 consecutive pulses.

Comparison of luminosity degradation of different FFB kicker positions



Cor(blue): FFB correctors 1.27 m upstream SDO

Cor1(red): FFB correctors before QD0 cryomodule

Cor2(green): FFB correctors after QD0 cryomodule

Jitter tolerance of 2% luminosity loss

L*	4.0
cor	107 nm
cor1	144 nm
cor2	157 nm

- The loss of beam luminosity due to FFB correctors decreasing as FFB correctors moved towards IP.