



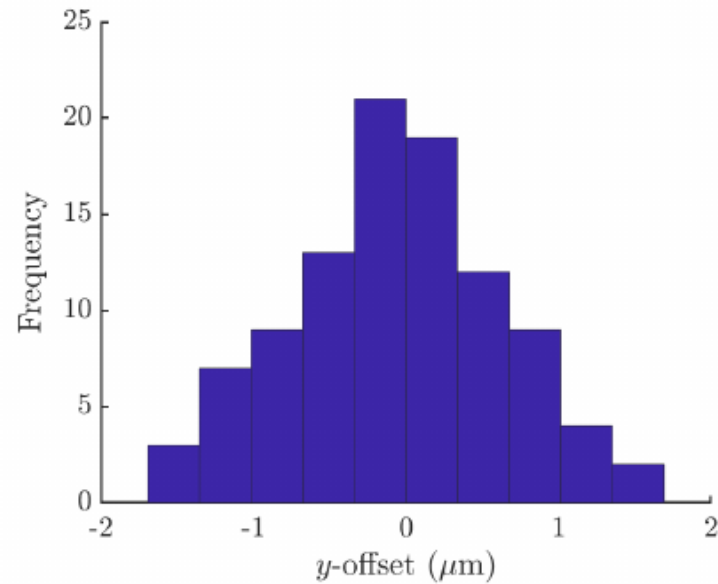
ILC Simulations

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Ground motion model K (0.2 s)

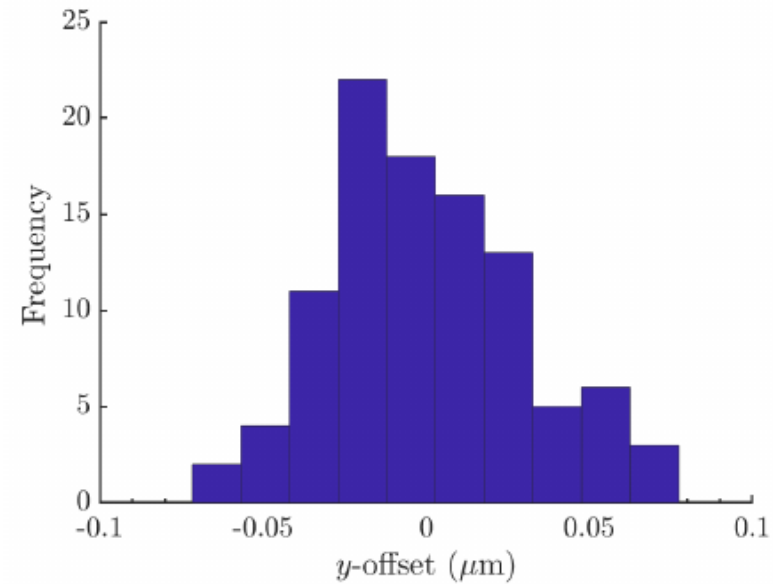
- Distribution of vertical bunch positions with 100 random seeds of ground motion model K applied for 0.2 seconds.

At the end of the ML



(a)

At the IP

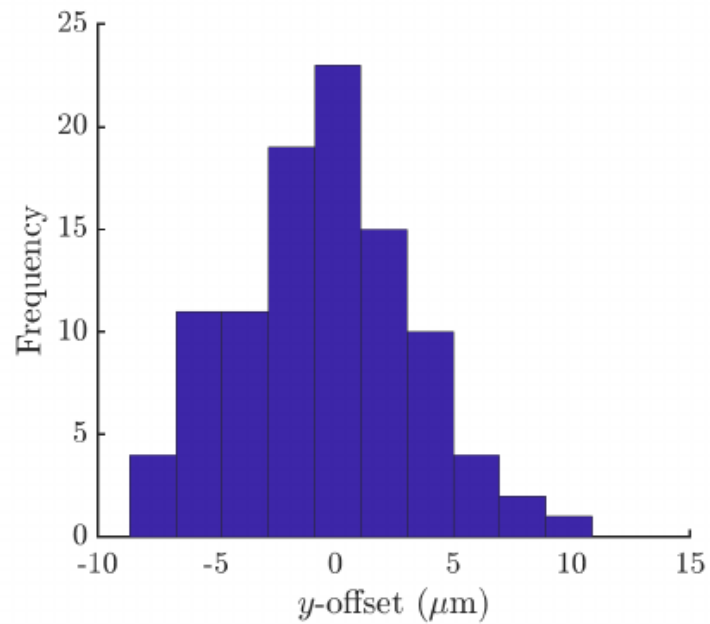


(b)

Ground motion model K (30 mins)

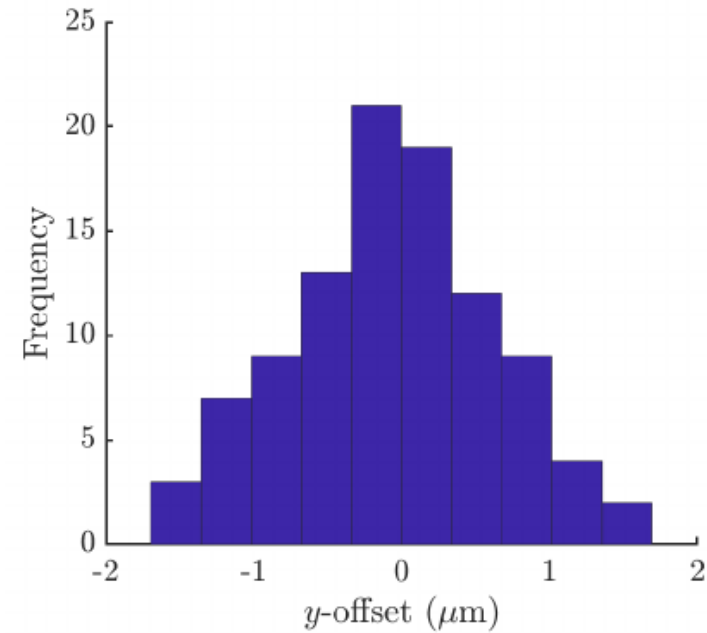
- Distribution of vertical bunch positions with 100 random seeds of ground motion model K applied for 30 minutes.

At the end of the ML



(a)

At the IP



(b)

Ground motion model comparison

IP bunch jitter and luminosity with GM applied to the ML and BDS.
Luminosities normalised by design value ($1.8 \times 10^{34} \text{cm}^{-2} \text{s}^{-2}$)

- Ground motion models A (CERN), B (Fermilab), C (DESY) and K (KEK).
- 100 random seeds of GM modelled.
- A and B are quieter regions.

Ground motion model	Time applied [s]	IP jitter (nm)	$\frac{L}{L_0}$
A	0.2	0.15	0.99
B	0.2	0.9	0.94
C	0.2	16.9	0.44
K	0.2	34.9	0.27
A	1800	31	0.30
B	1800	57	0.19
C	1800	360	0.053
K	1800	1030	0.036

Mitigation of ground motion

The cascaded FB system in the ML and BDS was modelled as a filter on the ground motion spectrum. The difference equation for the feedback modelled was

$$y[n] - y[n - 1] = x[n] - x[n - 1] - gy[n - 1]$$

Where x are the uncorrected bunch positions, y are the corrected bunch positions and n is the bunch number.

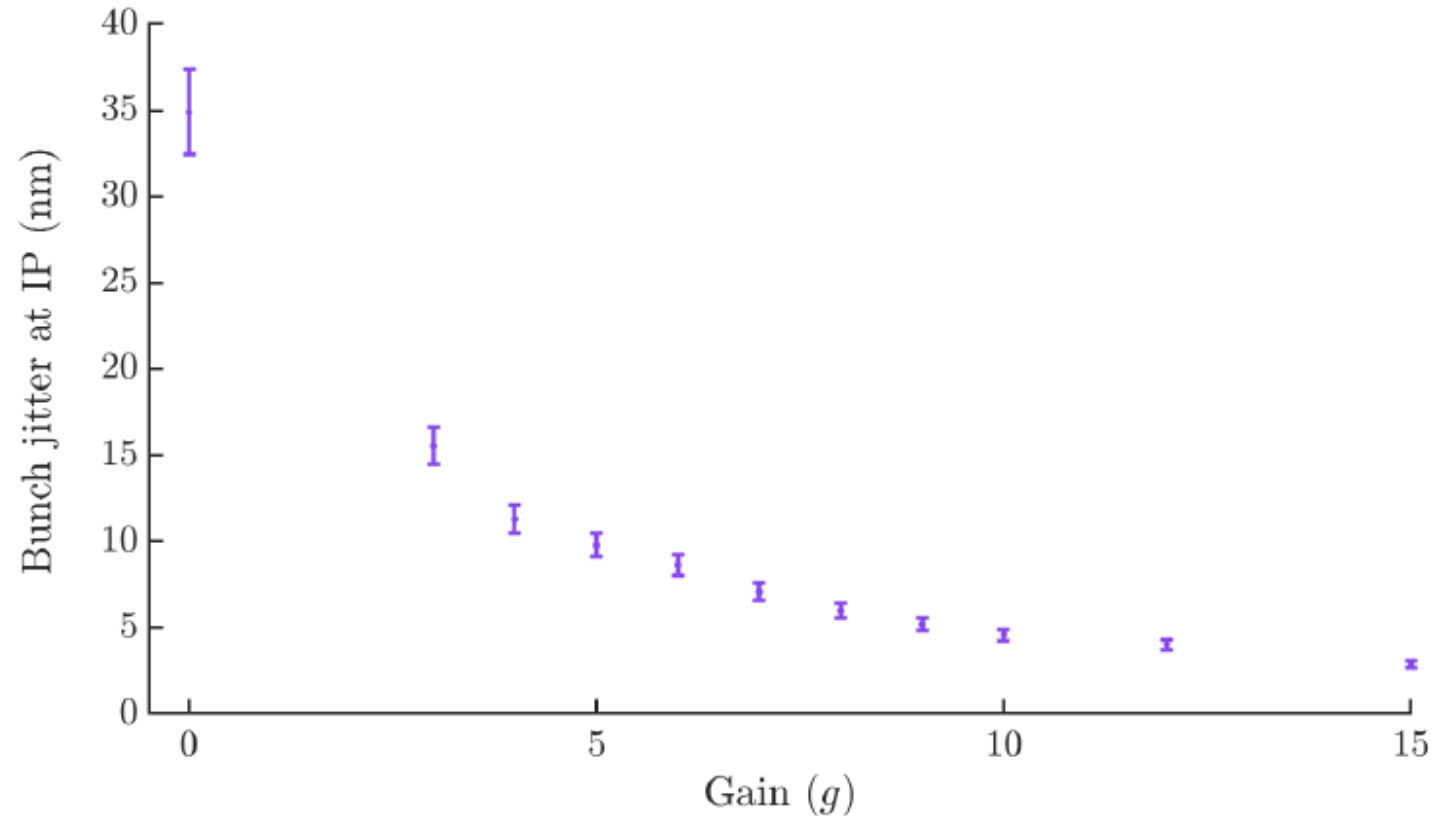
The transfer function for this feedback is used to filter the ground motion model, using PLACET function 'AddGMFilter'.

$$T(\omega) = \frac{1 - e^{\frac{-j\omega}{f_{\text{rep}}}}}{1 + (g - 1)e^{\frac{-j\omega}{f_{\text{rep}}}}}$$

Mitigation of ground motion (2)

Simulated 100 seeds of 0.2 seconds of GM model K, with a filter on the GM spectrum. For a range of gains, I calculated the jitter at the IP.

$$T(\omega) = \frac{1 - e^{\frac{-j\omega}{f_{\text{rep}}}}}{1 + (g - 1)e^{\frac{-j\omega}{f_{\text{rep}}}}}$$



Luminosity Recovery

- **Simulation:**
- 1 μ m BPM resolution
- 0.1% kicker error
- 100 nm FD jitter (<5Hz)
- DR extraction jitter corresponding to 10% of the bunch size at IP
- 0.2 s GM model K
- Short-range wakefields
- No GM filter

- IP feedback was simulated on 100 bunch trains with the above effects modelled.

