# Nanosecond Timescale Intra-bunch-train Feedback for the Linear Collider

# Results of the FONT2 Run


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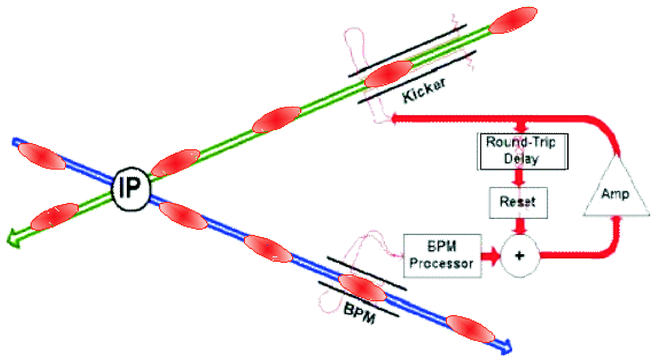
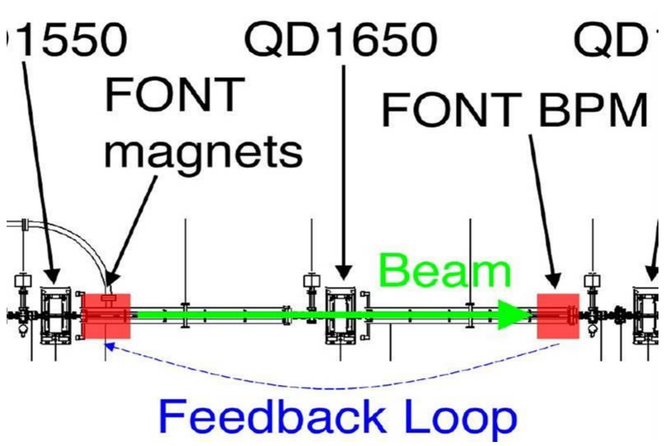
## Linear Collider intra-train feedback concept:



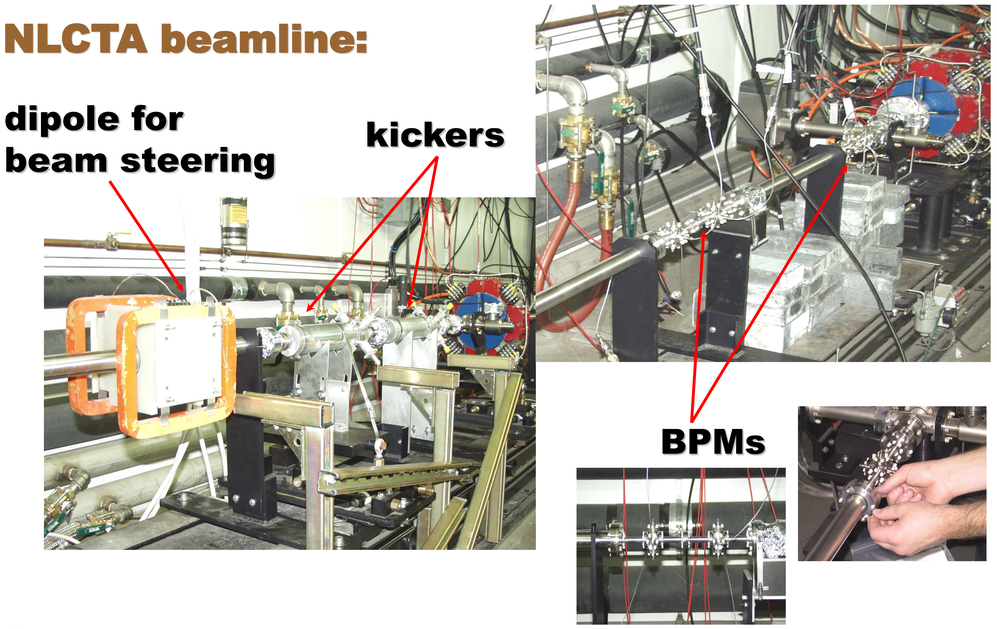

Detect position offset of incoming bunches early in train.
Calculate correction and apply with kicker to later bunches.

| | train length | # bunches |
|---|---|---|
| NLC/GLC: | 270ns | 192 |
| CLIC: | 102ns | 154 |
| TESLA: | 1 ms | 2820 |

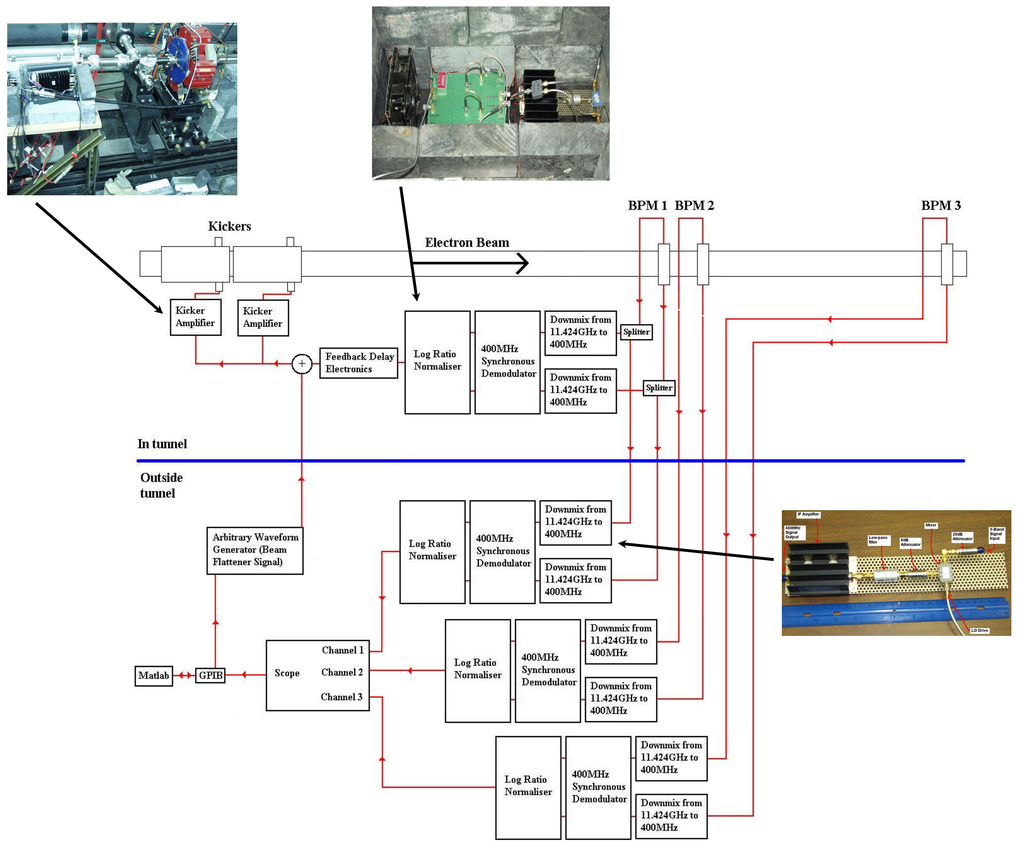
## FONT prototype at SLAC NLCTA:



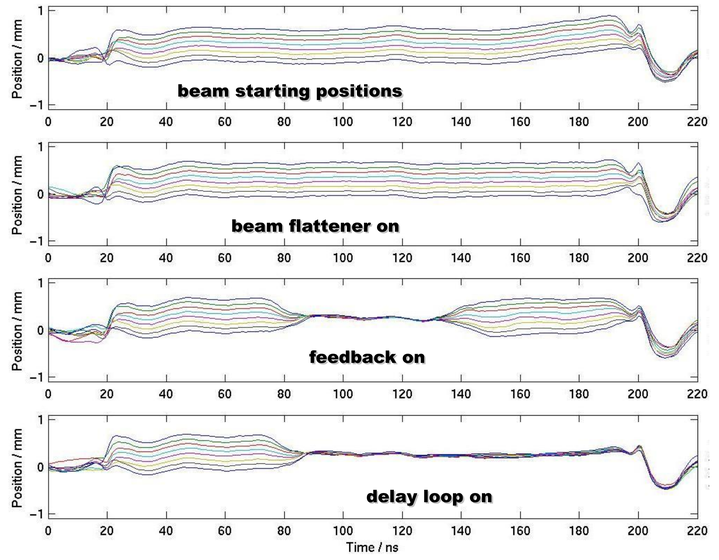

## NLCTA beamline:




## Signal processing:




## Beam test results:

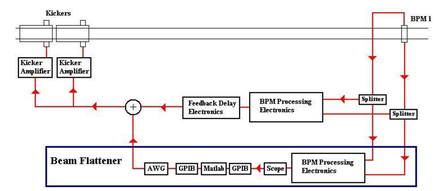


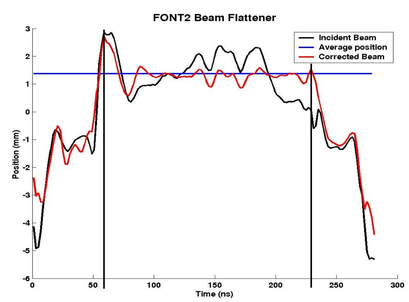

## Latency 53 ns 14:1 correction

| | |
|---|---|
| Time of flight kicker – BPM: | 6ns |
| Signal return time BPM – kicker: | 10ns |
| Irreducible latency: | 16ns |
| BPM processor: | 18ns |
| FB circuit: | 4ns |
| Amplifier: | 12ns |
| Kicker fill time: | 3ns |
| Electronics latency: | 37ns |
| Total latency expected: | 53ns |

## Beam flattener:

- take 'snapshot' of static features of position profile,
- calculate correction w.r.t. mean position
- add into feedback loop




**Technique works**

**Bandwidth limited (30 MHz) due to kicker amplifier**