FONT R&D Status

Oxford + Daresbury:

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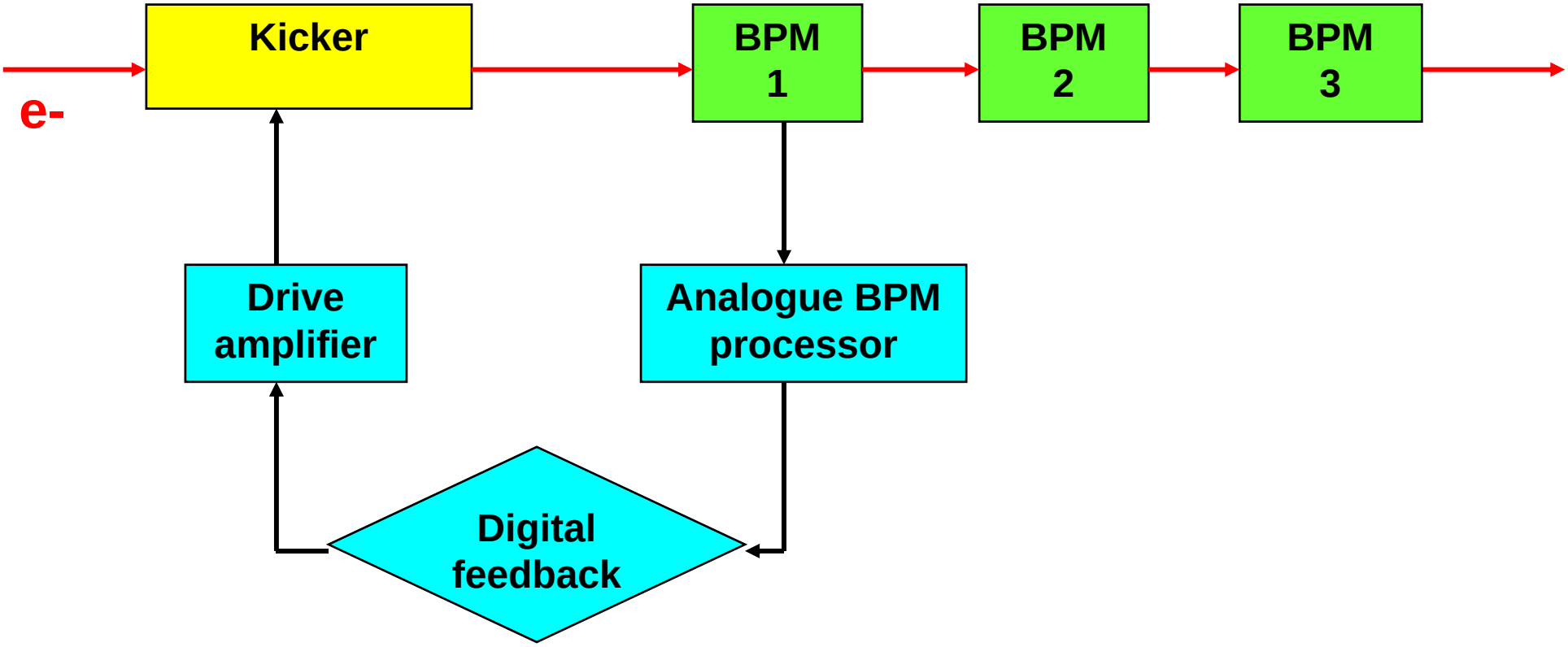
KEK, SLAC, DESY, CERN

Outline

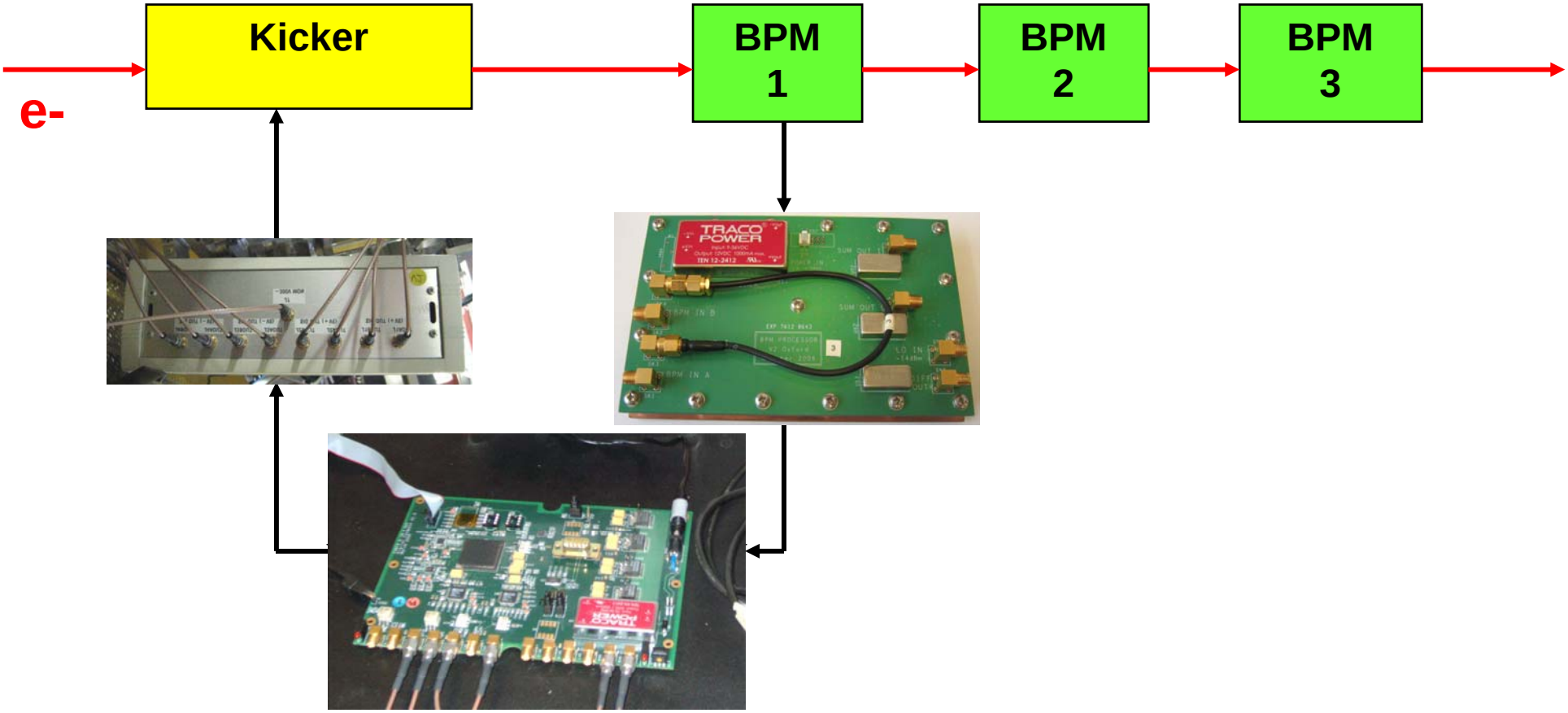
- **Summary of 2007 beam test results**
- **Plans for 2008 at ATF**
- **Plans for ATF2 deployment**

FONT4 prototype at KEK/ATF

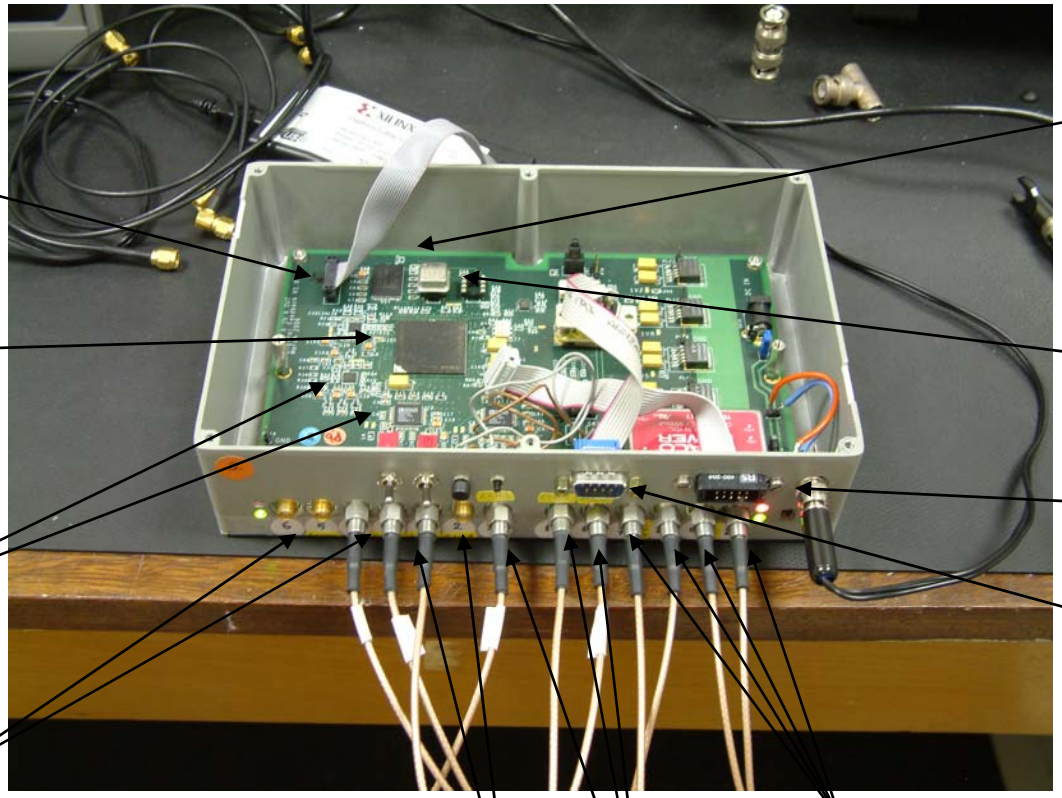
1.3 GeV beam, 3 bunches spaced at 140 - 154ns



FONT4 prototype at KEK/ATF



Digital Feedback Board



Kicker driver amplifier

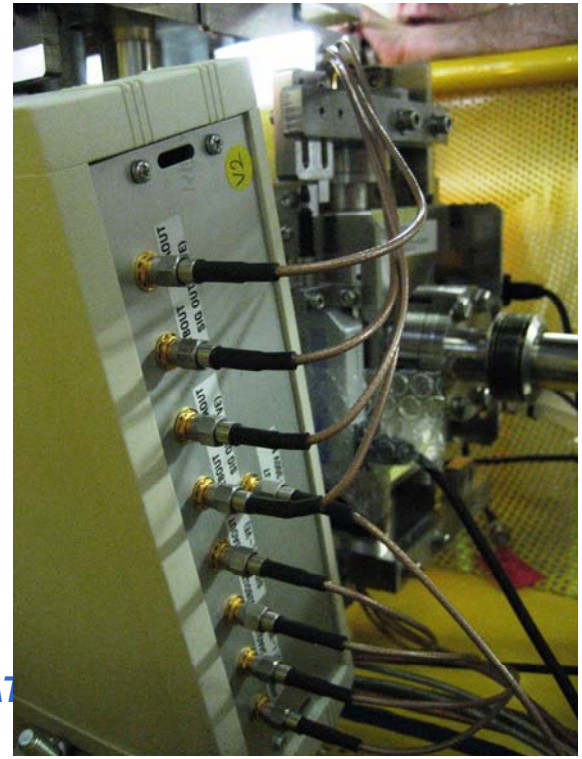
Specifications:

- **+- 15A (kicker terminated with 50 Ohm)**
- **+- 30A (kicker shorted at far end)**
- **35ns risetime (to 90%)**
- **pulse length 10 us (specified for 20-60 bunches)**
- **repetition rate 10 Hz**

Initial design by C. Perry, implemented + manufactured by TMD Technologies:

prototypes delivered December 2006

Tested with beam at ATF Dec 06, Feb + May 07



FONT4: latency estimate

- Time of flight kicker – BPM: 4ns
- Signal return time BPM – kicker: 10ns

  Irreducible latency: 14ns

- BPM processor: 7ns
- ADC/DAC (3.5 89 MHz cycles) 40ns
- Signal processing (8 357 MHz cycles) 25ns
- FPGA i/o 3ns
- Amplifier 40ns
- Kicker fill time 3ns

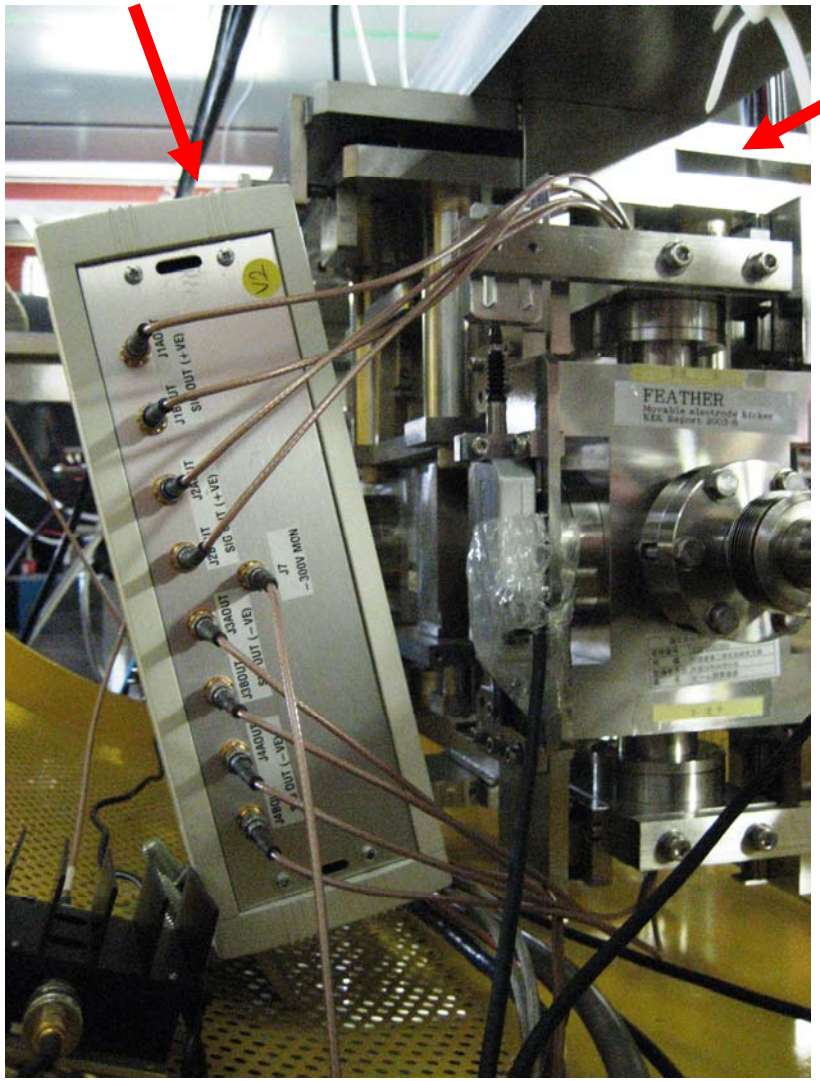
  Electronics latency: 118ns

- Total latency estimate: 132ns

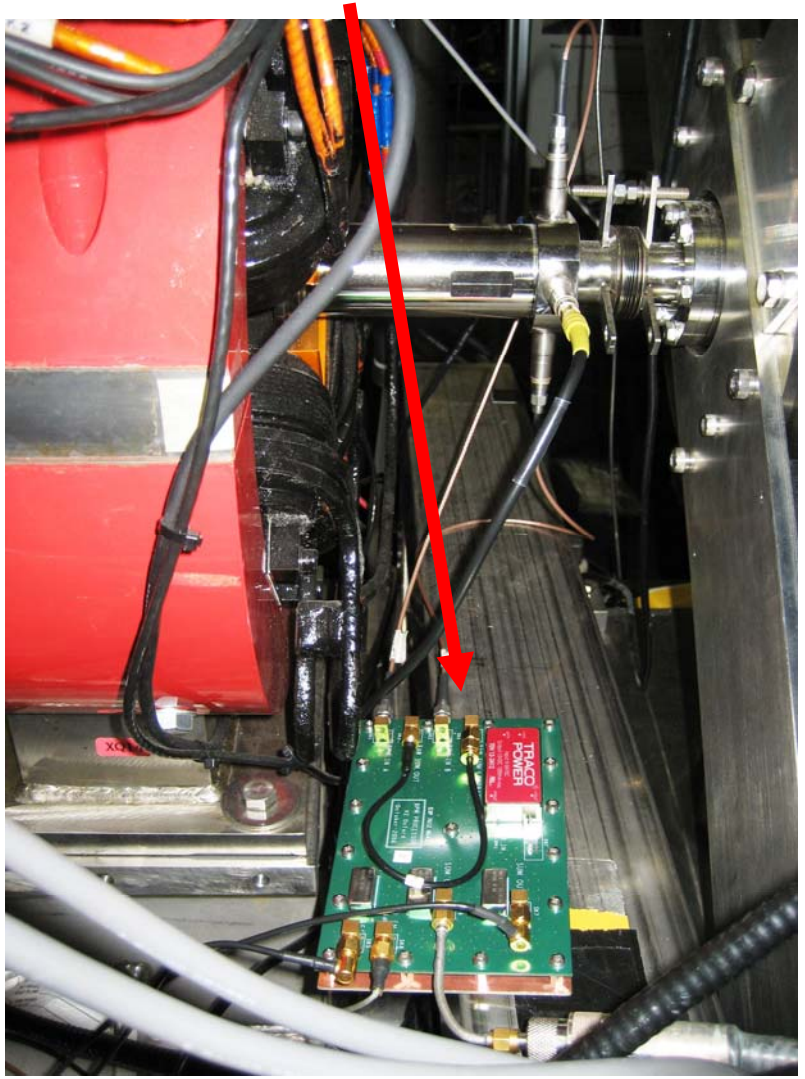
FONT4: beamline at KEK ATF (May 07)

Amplifier

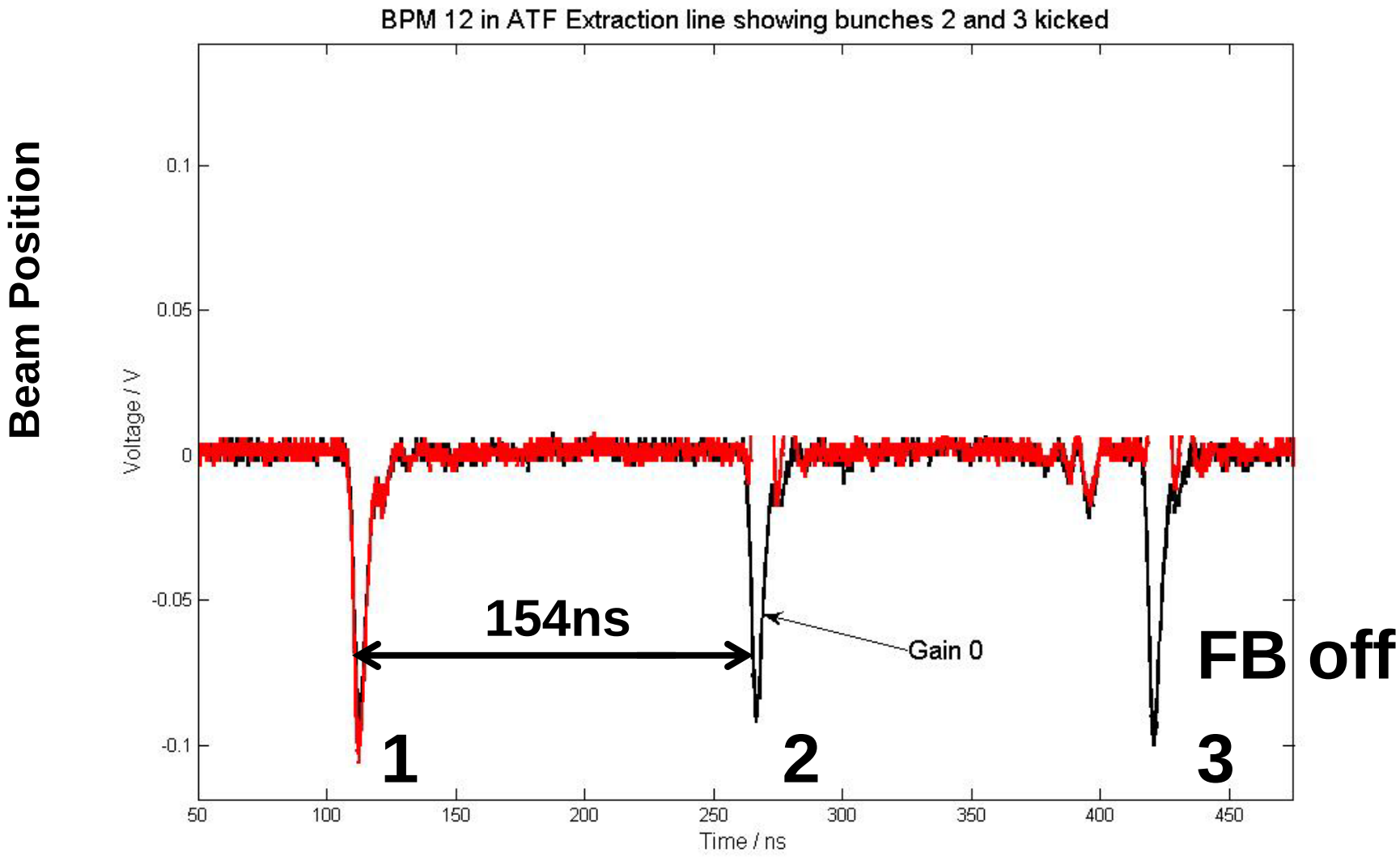
FEATHER
Kicker



BPM processor board



First closed-loop operation (Dec 06)



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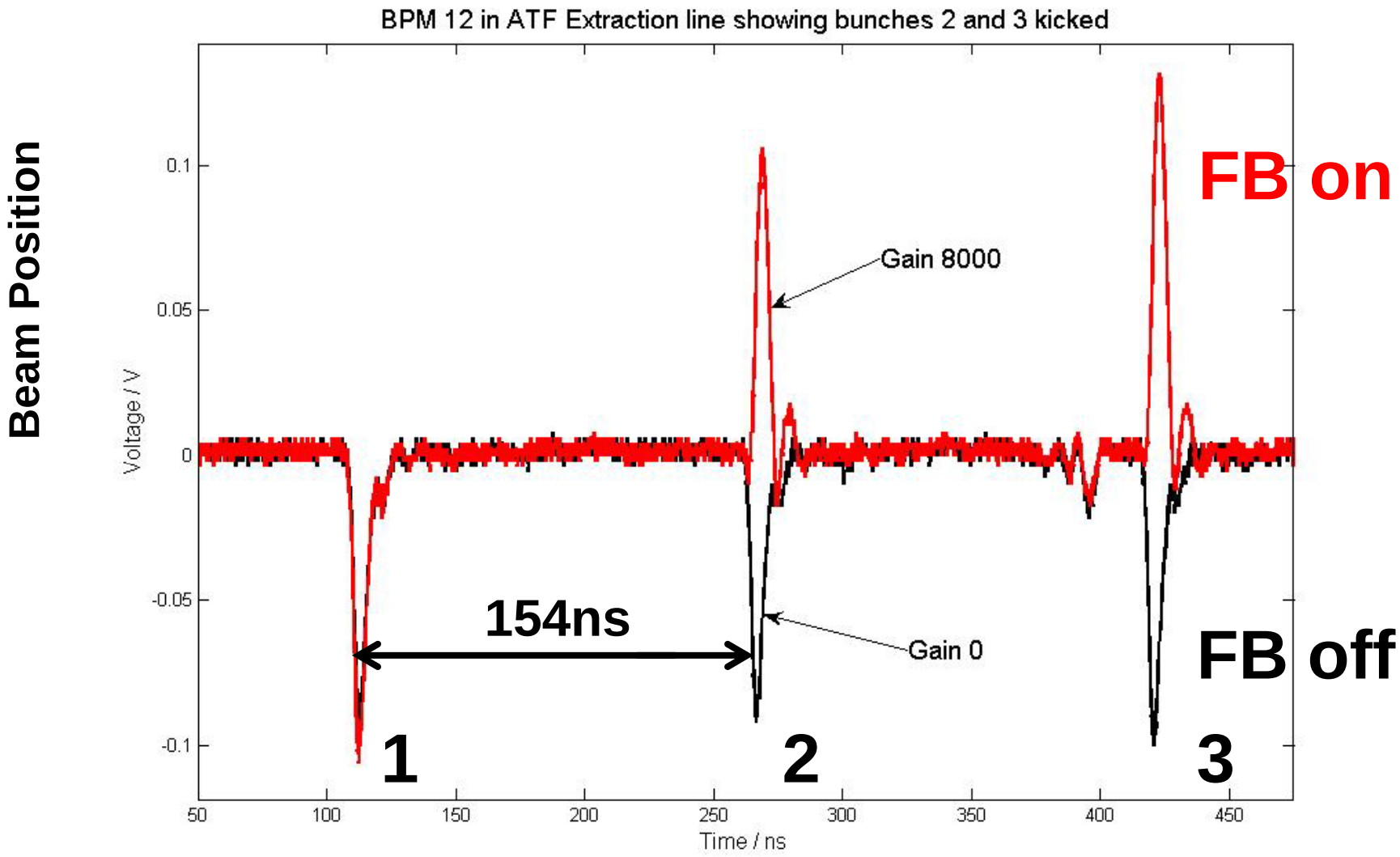
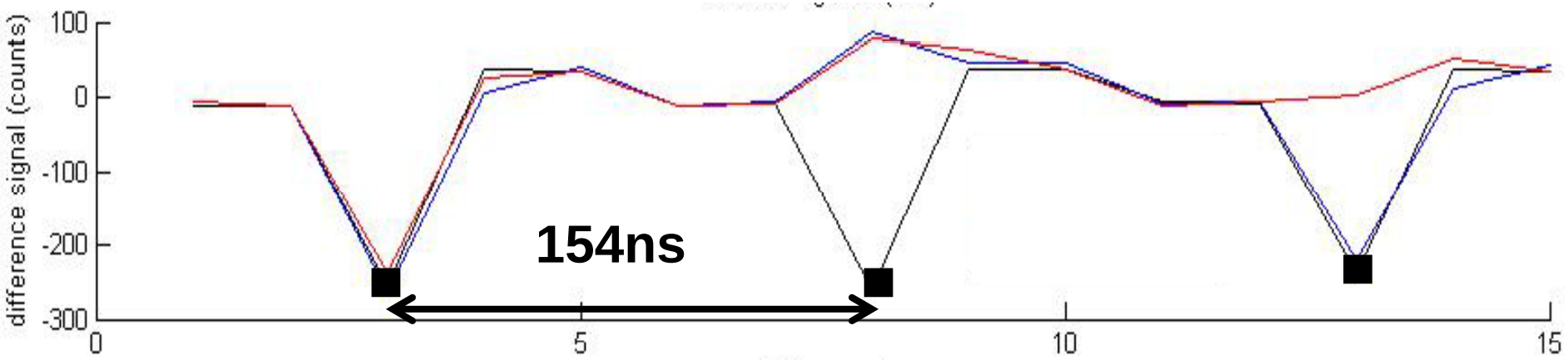


Feedback with delay-loop (Feb 07)

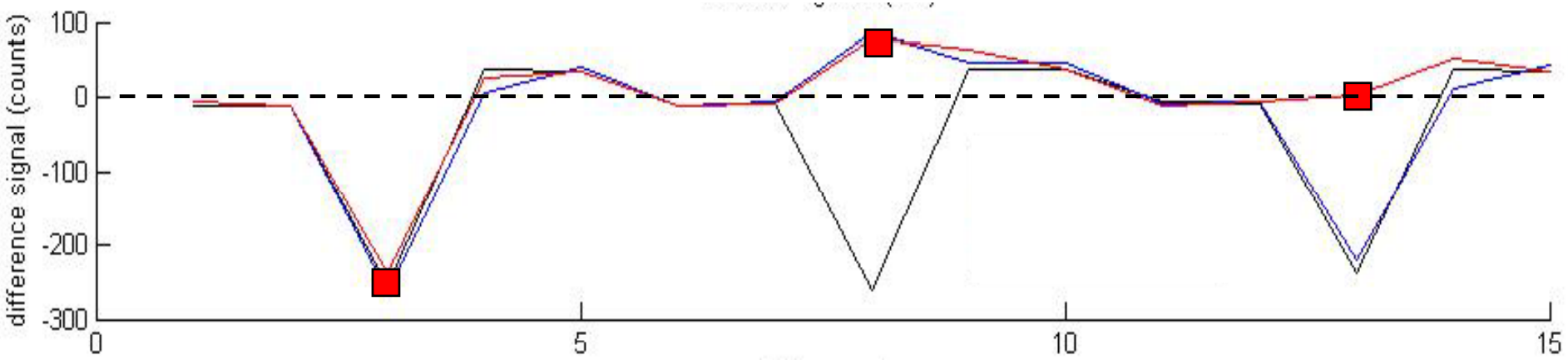
Incoming bunches



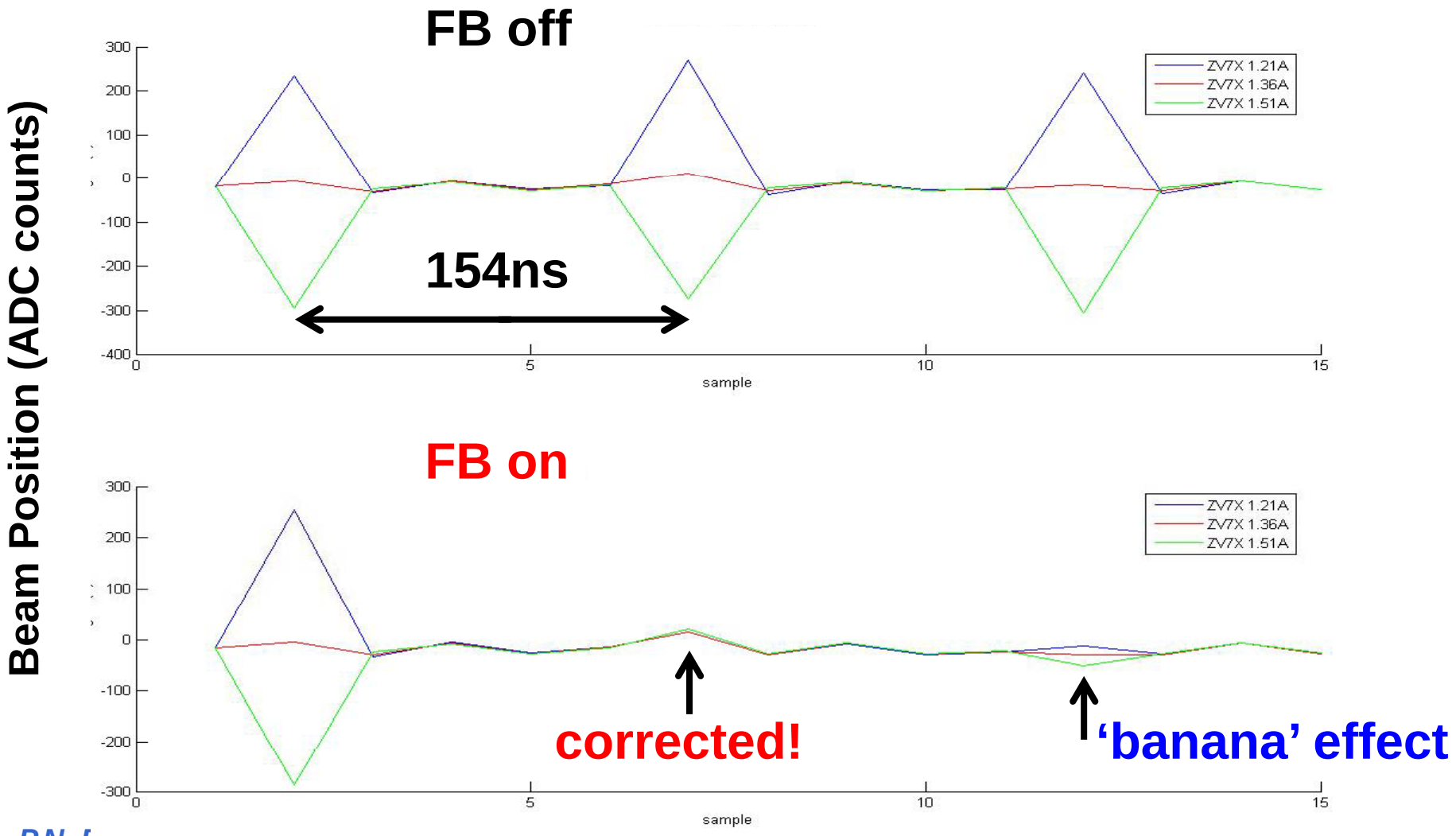
Feedback with delay-loop (Feb 07)

FB on, with delay loop

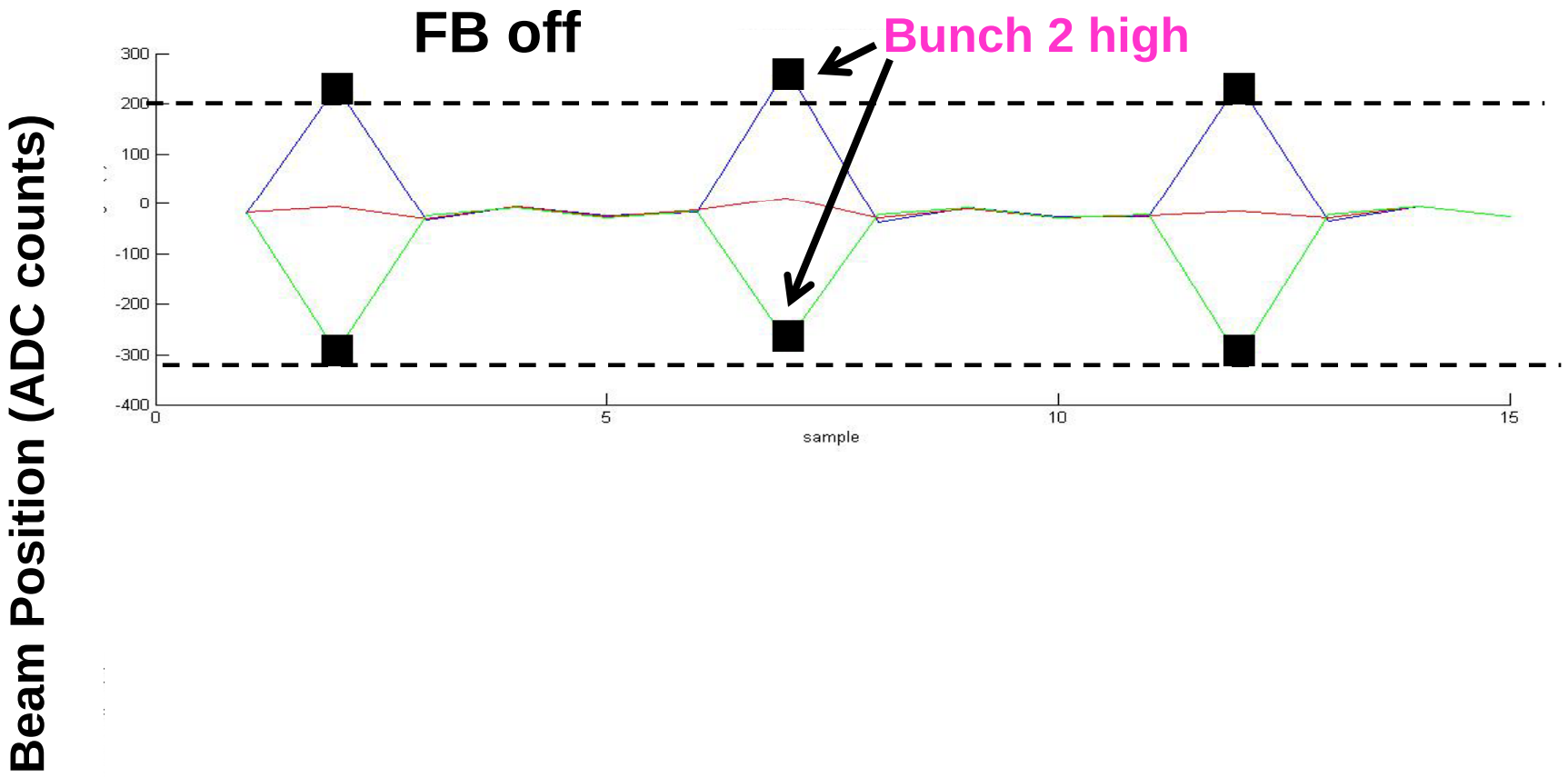
Latency ~ 135ns



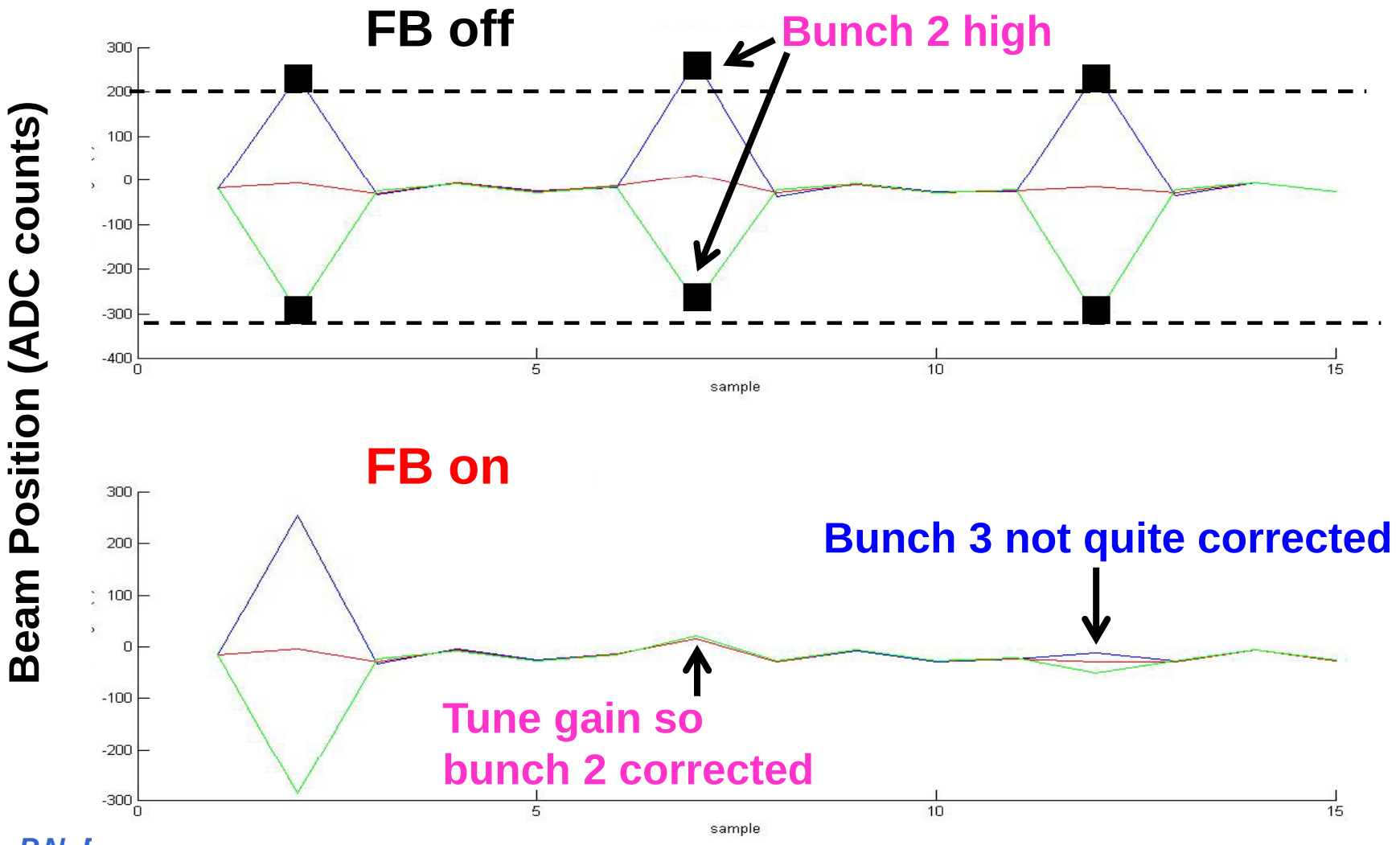
Implementation of 1/Q (May 07)



‘Banana’ effect



‘Banana’ effect



Current Status: ATF system

- **Basic functionality demonstrated:**

  closed-loop operation with latency c. 140ns
  delay loop implemented (preserves correction along train)
  normalisation of position signal by bunch charge

- **Currently studying performance + optimising parameters:**
  main gain, delay loop setting, loop gain, 'banana' effect,
  performance limitations … **plan NIM paper**

- **Studying BPM resolution + improvements:**
  LO quality, zeroing of BPM electrical offset;
  alternative BPM processor scheme (Kalinin): c. 1um resolution

Preparing for ATF2

- **Design of upstream beam feedback system to stabilise bunch in y, y' (+ x, x') at entrance to ATF2 final focus**
- **J. Resta-Lopez developed beam transport simulations**
- **Aim to agree on component locations at this meeting**
- **Define BPM + kicker specifications ASAP (spring)**
- **Install second half 2008 as ATF2 schedule permits**

Issues for discussion

- **Implementation of y, y' upstream FB**
- **Implement x, x', or leave for later?**
- **Will need operational experience with ATF2 setup:**
  x, y jitter; x-y coupling?
- **FB tests with long ILC-like bunchtrain (20 - 60 bunches)**
- **'zero crossing' DR extraction (Kalinin)**
- **DR -> extraction line FF (Kalinin)**
- **FONT-style hardware can be used for IP FB**