Oxford contributions to ‘parameters+design’

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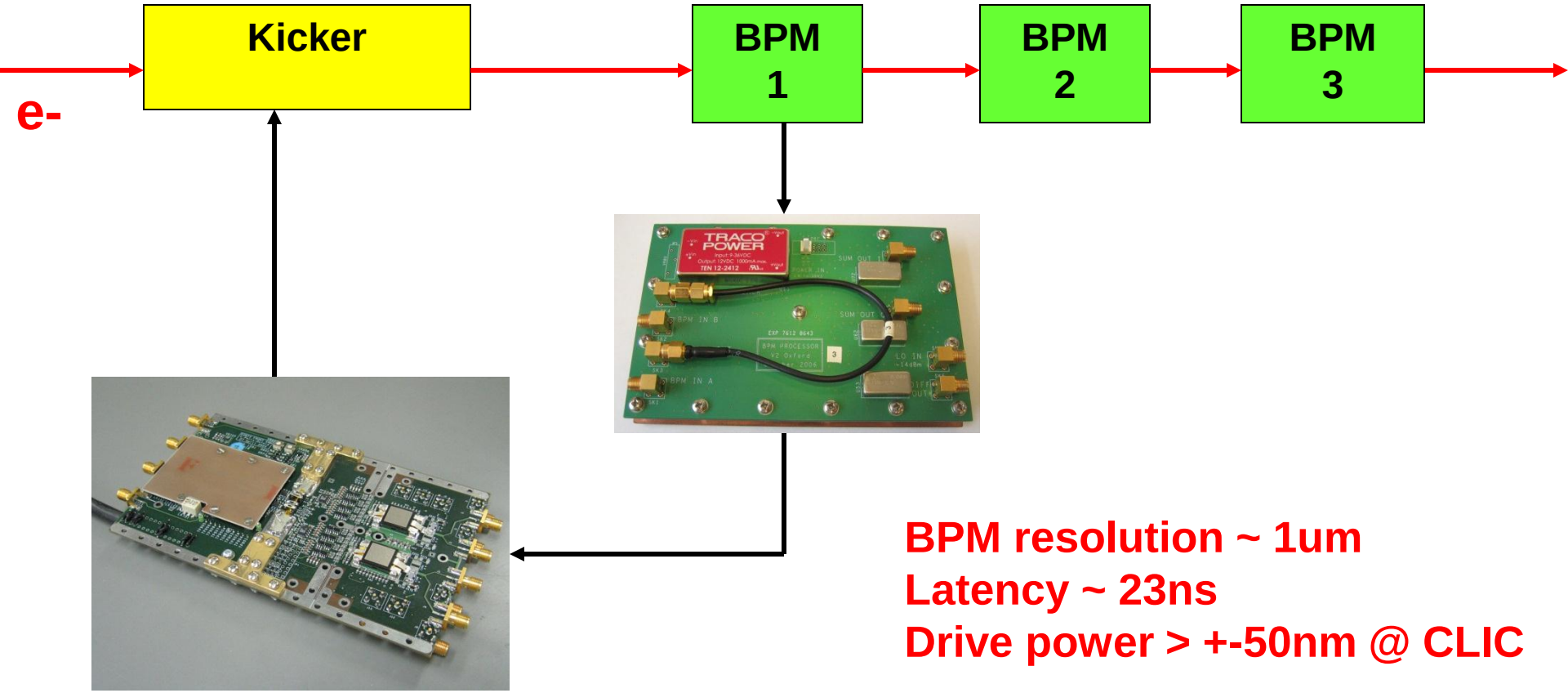
Work packages of relevance

- **Integrated modelling and performance studies**
- **Feedback design**
- **Beam delivery system**
- **Machine-detector interface**

FONT work programme

- **Design, prototyping and beam-testing of low-latency beam feedbacks operating on intra-train timescales**
  - **BPMs**
  - **feedback boards**
  - **drive amplifiers**
  - **kickers**
- **Closed-loop feedback tests of prototype hardware**

CLIC prototype: FONT3 at KEK/ATF



BPM resolution ~ 1um
Latency ~ 23ns
Drive power > +-50nm @ CLIC

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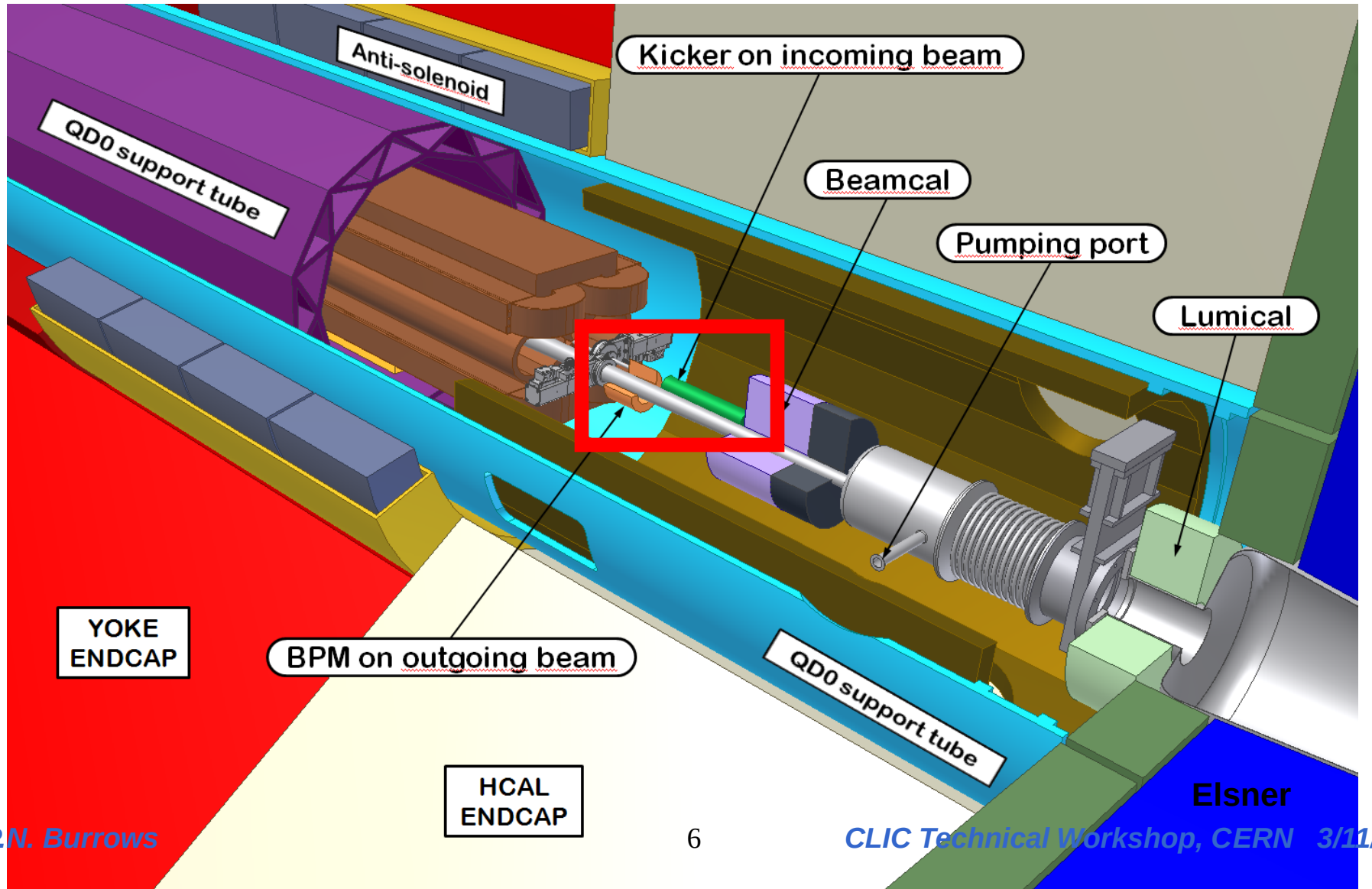
- **Design of CLIC IP collision feedback + MDI integration**

IPFB in Final Focus region



Remaining technical issues

- **Engineering of real hardware optimised for tight spatial environment: BPM, kicker, cables …**
- **Large (and spatially-varying) B-field → operation of ferrite components in kicker amplifier?!**
- **Further studies of radiation environment for FB system:**

  was studied for ILC, so far preliminary for CLIC;

  where to put electronics?

  need to be rad hard? shielded?

- **RF interference: beam ←→ FB electronics**

  kicker ←→ detector

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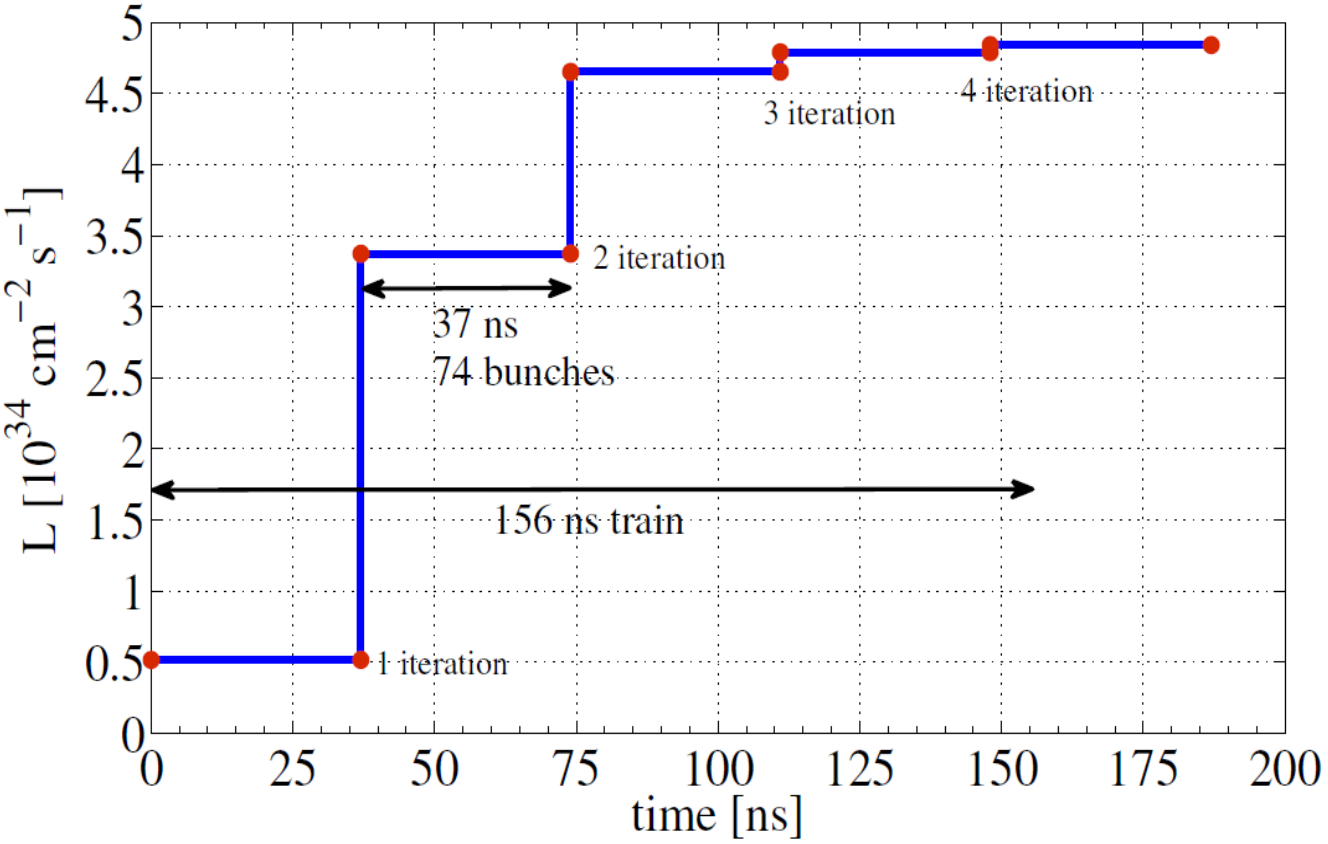
Luminosity performance with IP FB

Resta Lopez

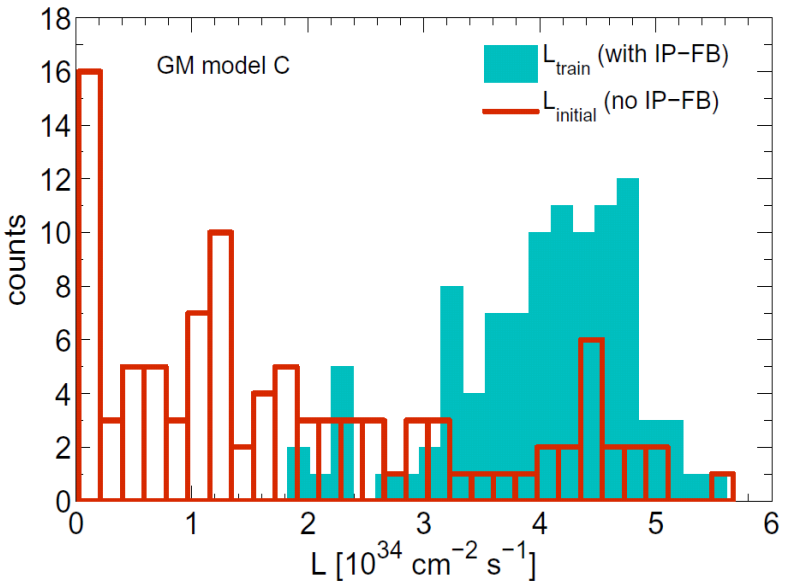
Simulation time structure:
Example applying a single random seed of GM C

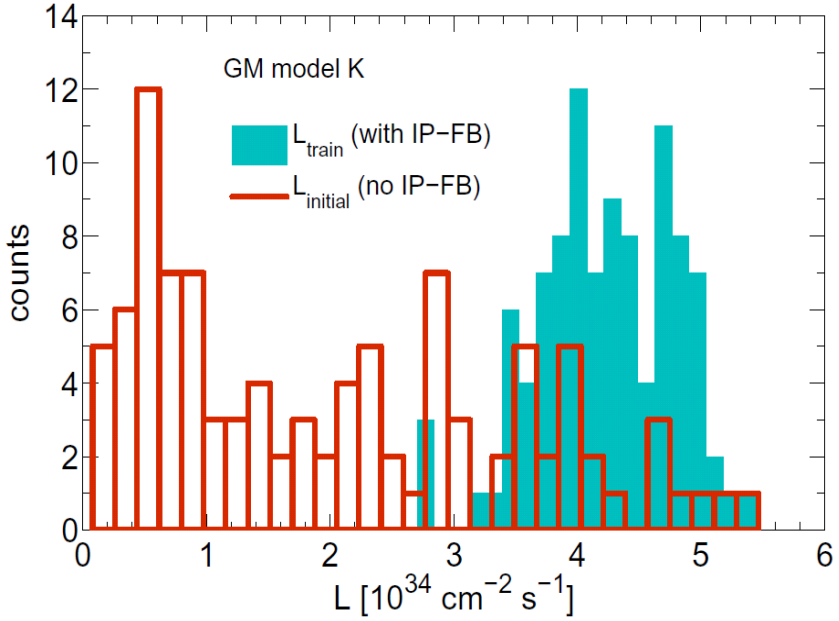


Luminosity performance with IP FB

Resta Lopez

For noisy sites:





Model C:

- Without any correction: mean $\Delta L/L_0\rangle_{train}$=30.52% & High standard deviation!
- With IP-FB: mean $\Delta L/L_0\rangle_{train}$=64.15% std reduced by a factor 2

Model K:

- Without any correction: mean $\Delta L/L_0\rangle_{train}$=32.53% & High standard deviation!
- With IP-FB: mean $\Delta L/L_0\rangle_{train}$=67.82% std reduced by a factor 3

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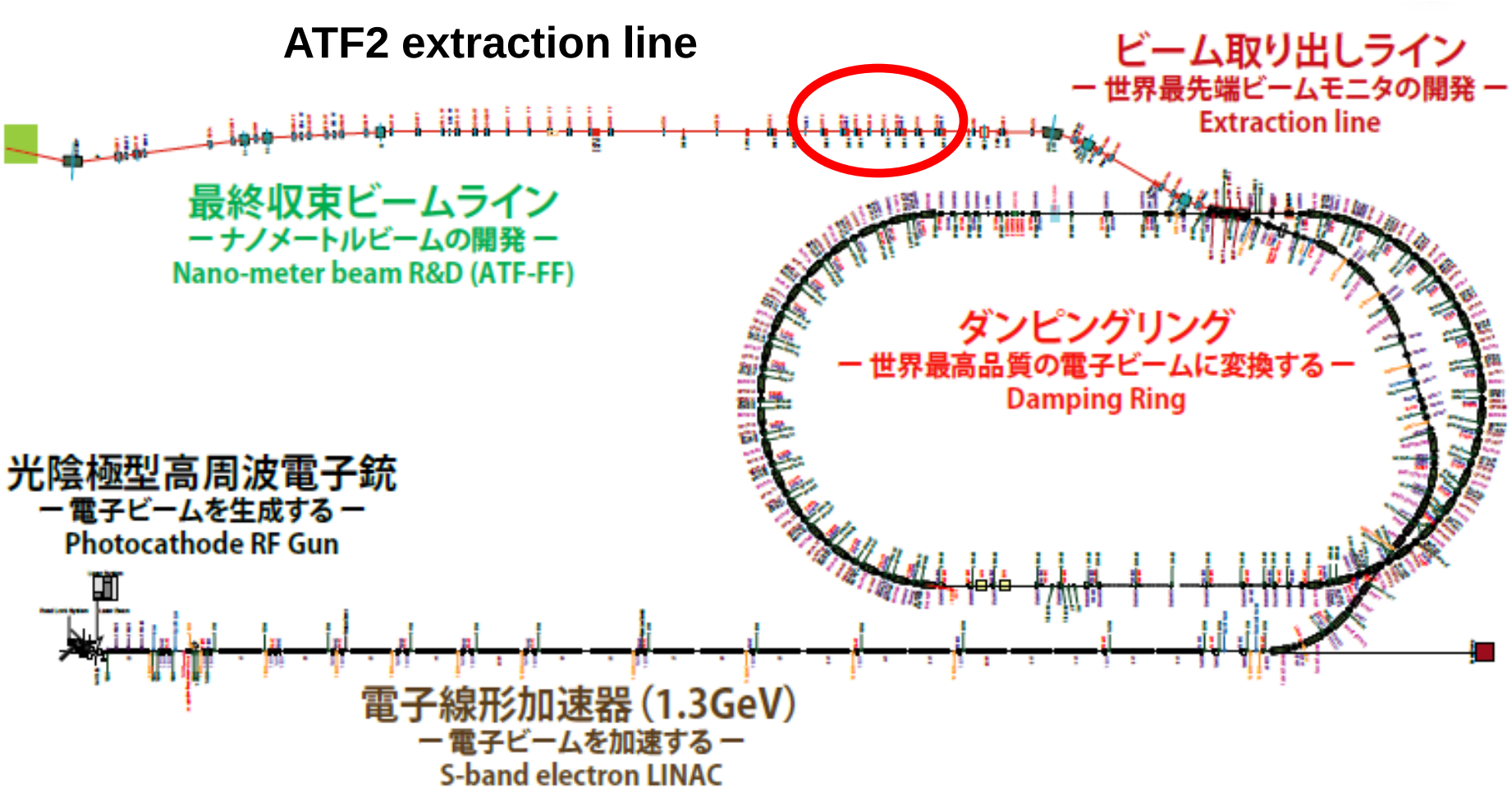
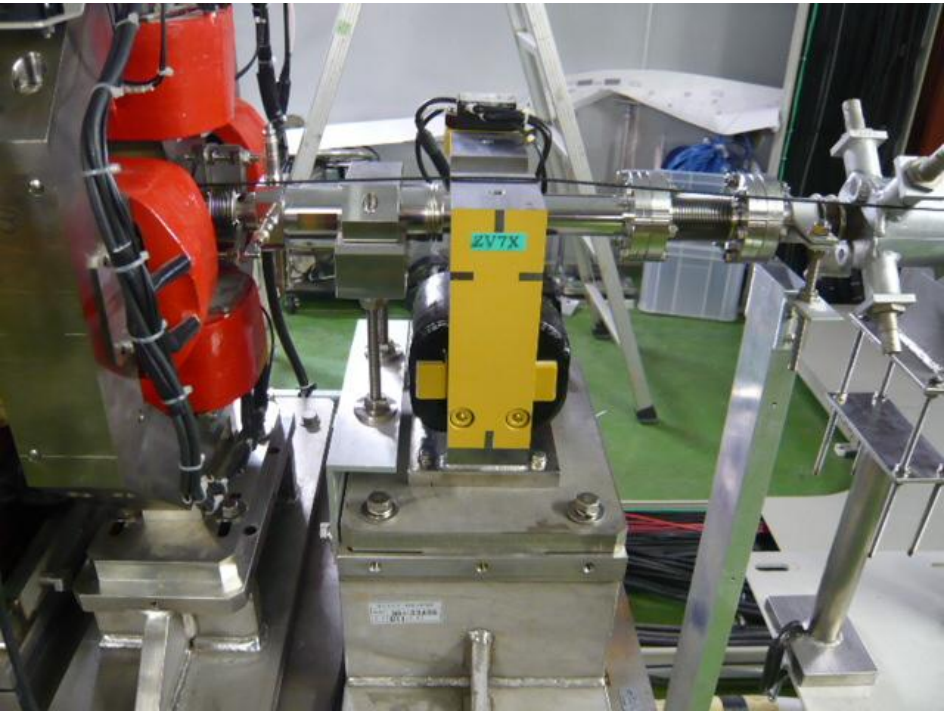
- **Design, prototyping and beam-testing of low-latency beam feedbacks operating on intra-train timescales**
  - **BPMs**
  - **feedback boards**
  - **drive amplifiers**
  - **kickers**
- **Closed-loop feedback tests of prototype hardware**
- **Design of CLIC IP collision feedback + MDI integration**
- **Beam transport / dynamics simulations**
- **Ongoing programme at KEK/ATF2: produce 37nm beam spot and stabilise at nm level**

FONT5 location

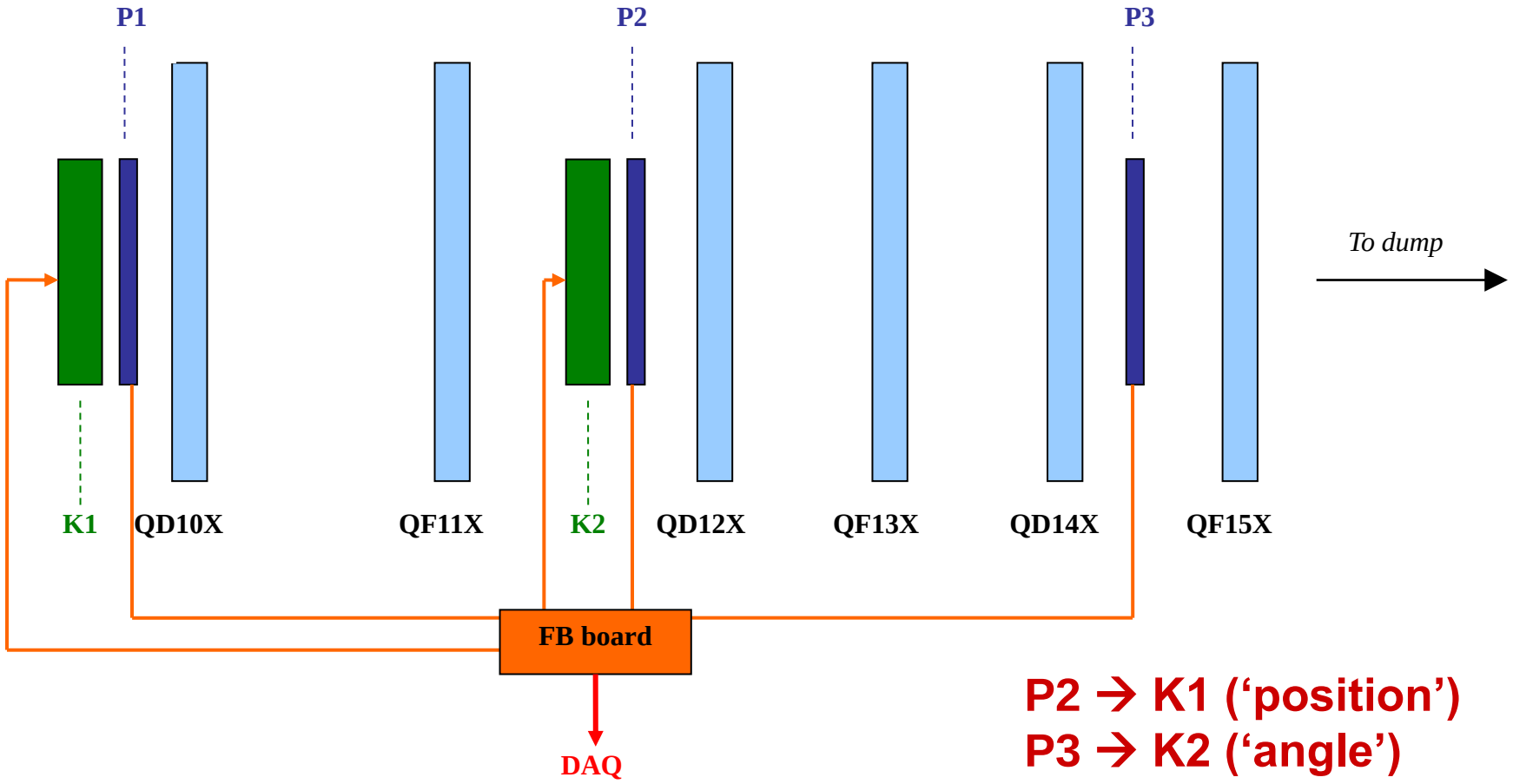


FONT5 hardware



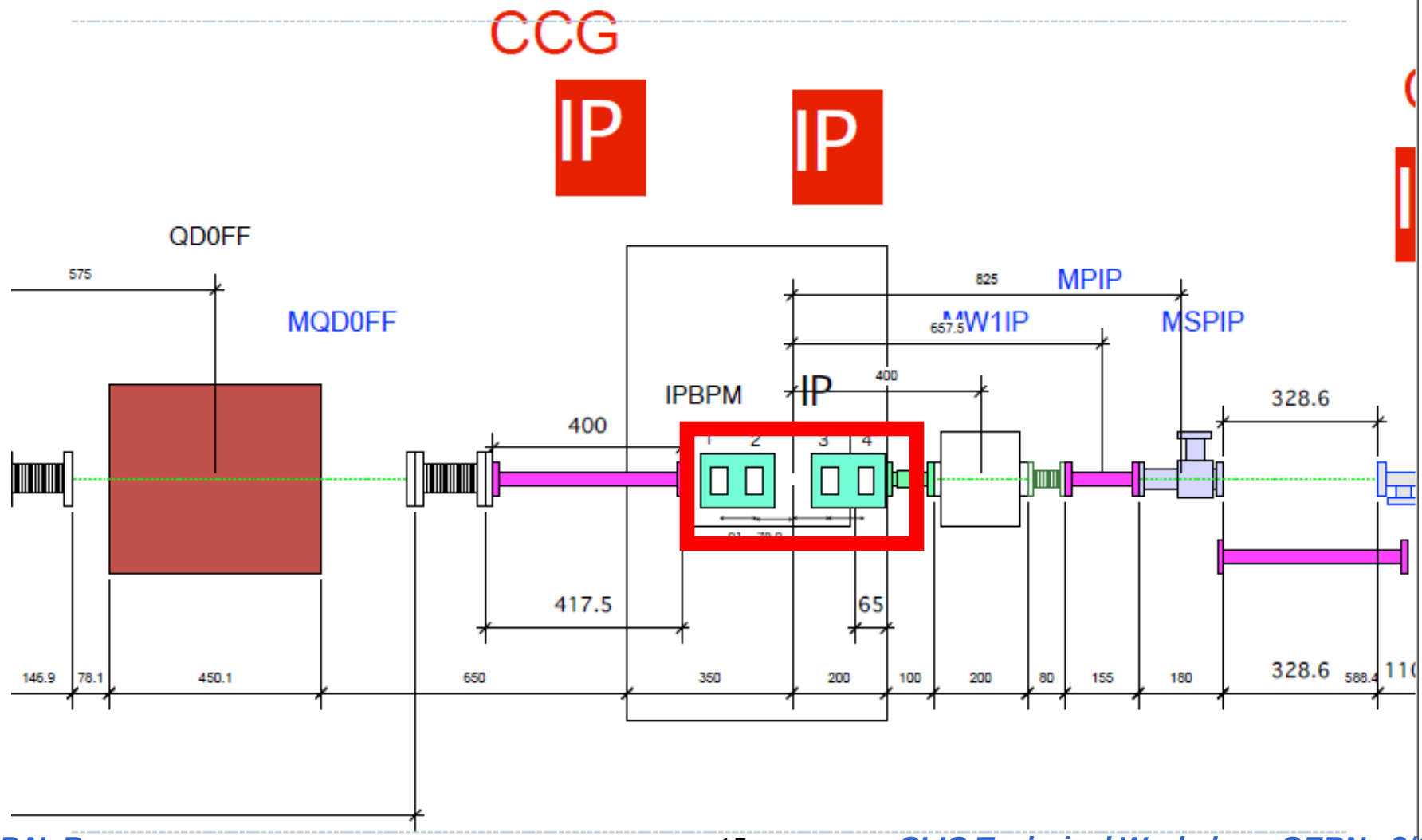
3 BPMs and 2 kickers

FONT5 setup

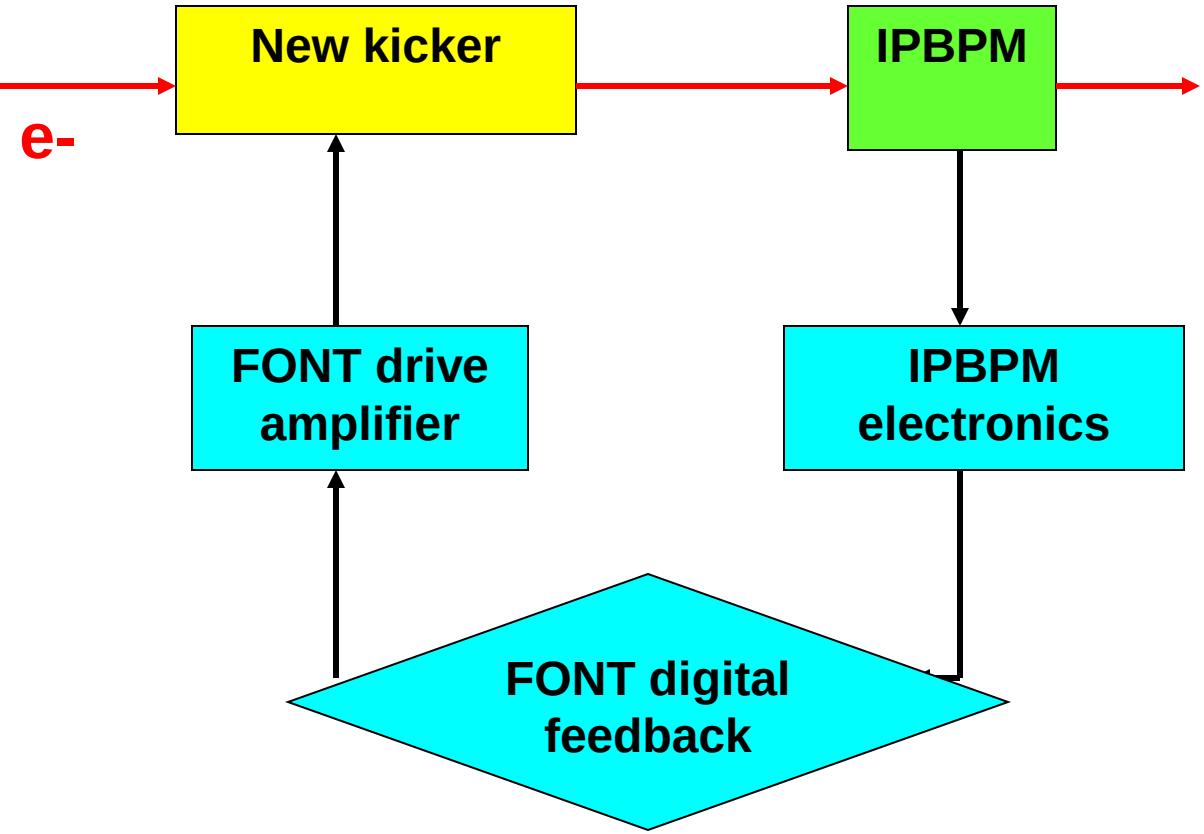


P2 → K1 ('position')
P3 → K2 ('angle')
(P3 → K1)
(P2 → K2)

ATF2 IP FB system



IP FB loop


New kicker
IPBPM
e-
FONT drive amplifier
IPBPM electronics
FONT digital feedback

Resources

- **CLIC-UK agreement: 1/4/11 – 31/3/14**
  - **1.1 FTE/year (faculty, engineer, postdoc)**
  - **88 kChF (materials + travel)**
- **Continue this activity 2014-2016**
- **Could provide additional resources from JAI/Oxford:**
  - **RA for beam dynamics 2012-13**
  - **add PhD student(s) from 2012**