

Oxford contributions to 'parameters+design'

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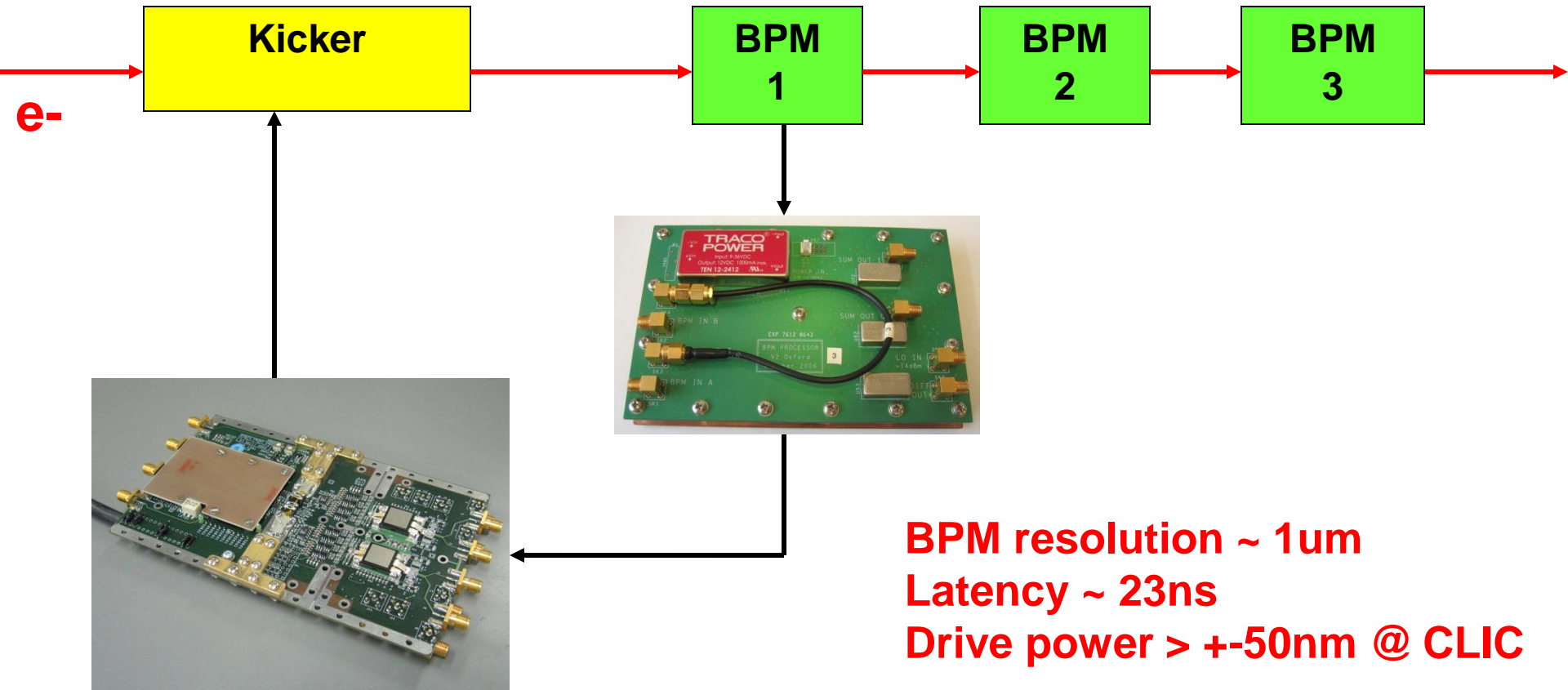
Work packages of relevance

- **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

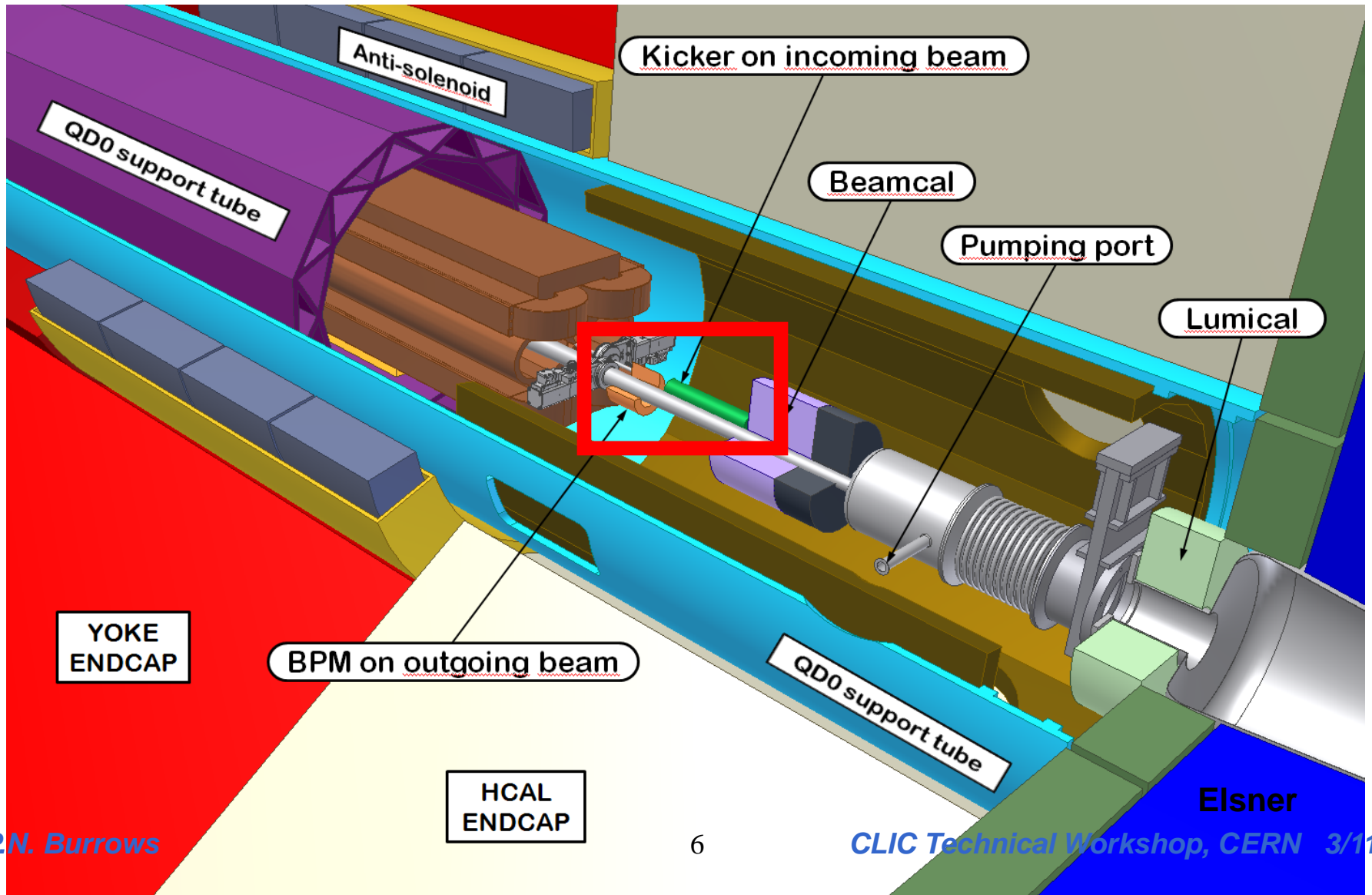


BPM resolution ~ 1 μ m
Latency ~ 23ns
Drive power > +50nm @ CLIC

FONT work programme

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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 \leftrightarrow FB electronics
 kicker \leftrightarrow detector**

FONT work programme

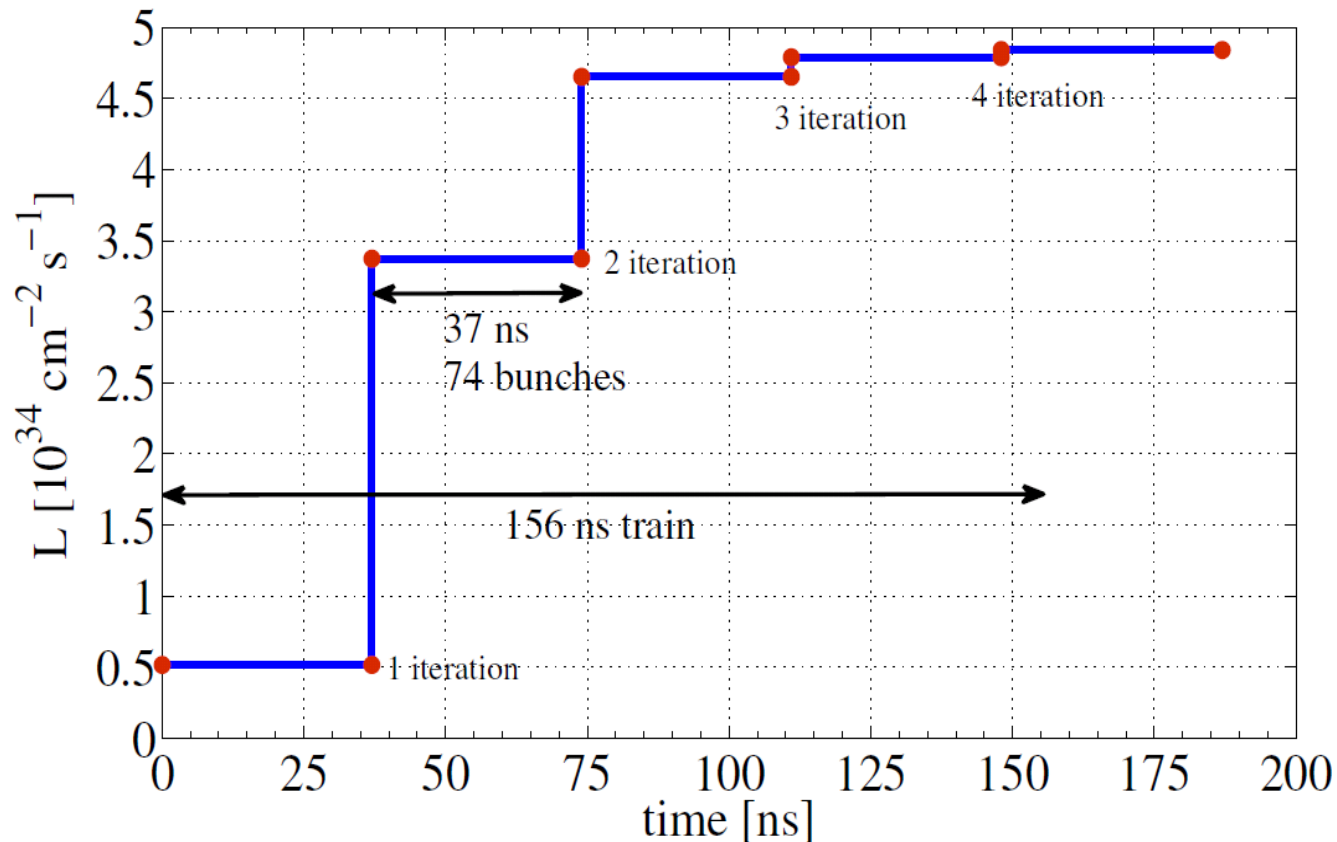
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Luminosity performance with IP FB

Resta Lopez

Simulation time structure:

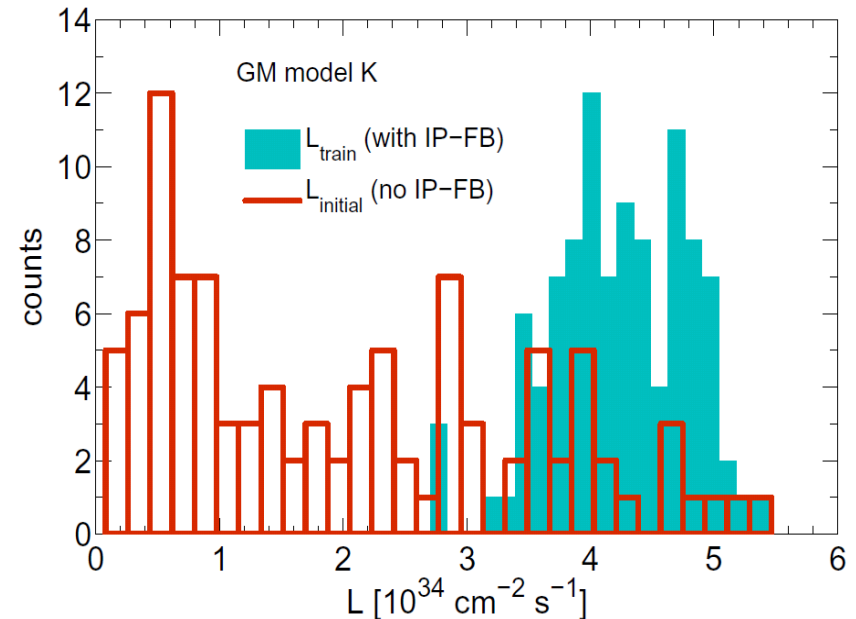
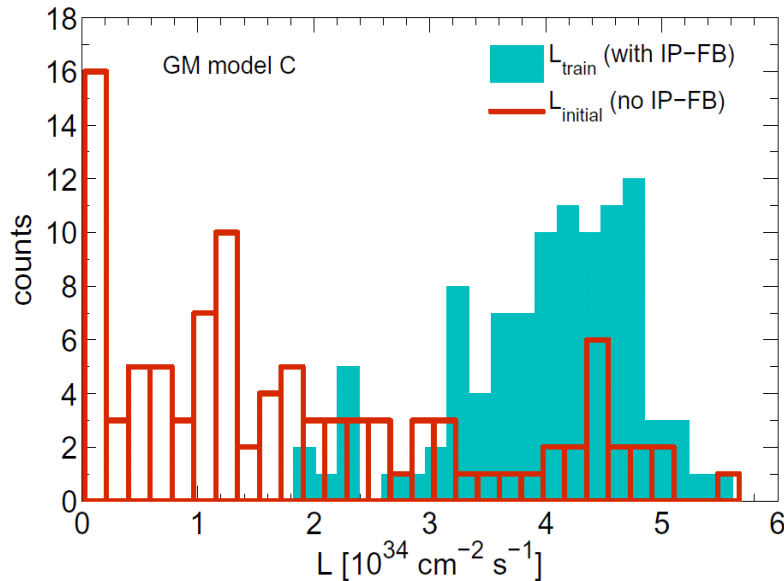
Example applying a single random seed of GM C



Luminosity performance with IP FB

Resta Lopez

For noisy sites:



Model C:

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

Model K:

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

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**
- **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

ATF2 extraction line

ビーム取り出しライン
— 世界最先端ビームモニタの開発 —
Extraction line

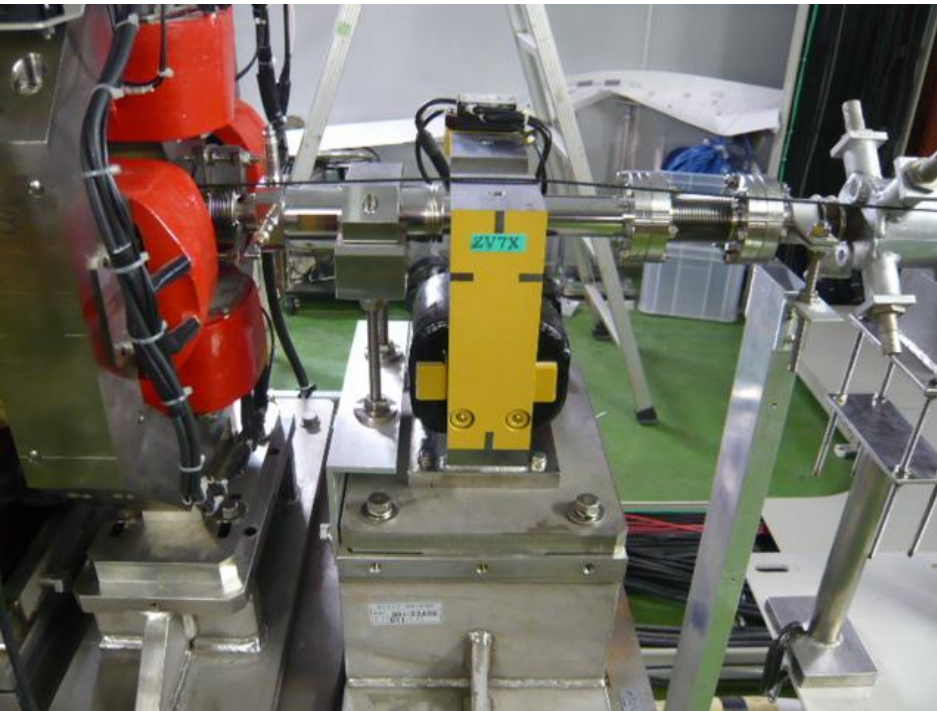
最終収束ビームライン
— ナノメートルビームの開発 —
Nano-meter beam R&D (ATF-FF)

ダンピングリング
— 世界最高品質の電子ビームに変換する —
Damping Ring

光陰極型高周波電子銃
— 電子ビームを生成する —
Photocathode RF Gun

電子線形加速器 (1.3GeV)
— 電子ビームを加速する —
S-band electron LINAC

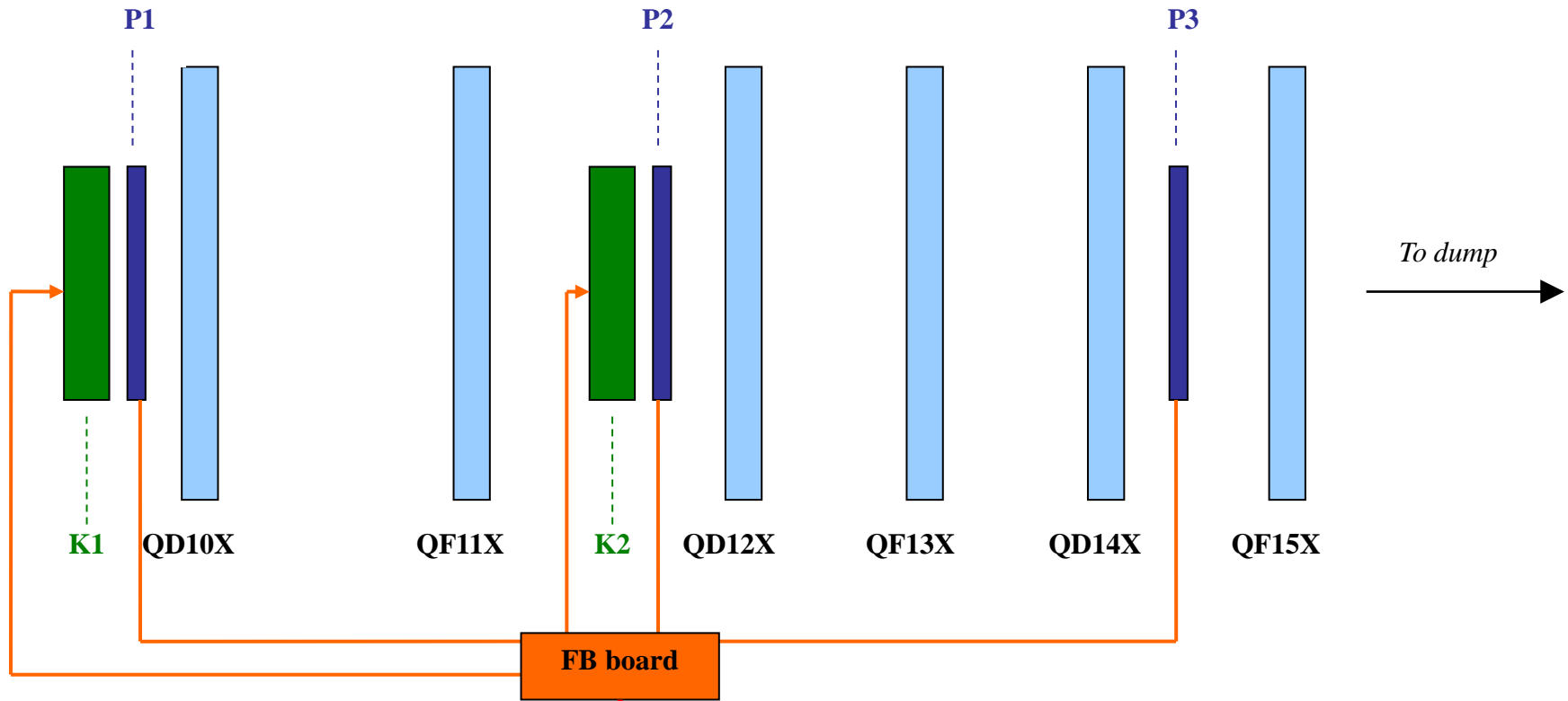
FONT5 hardware



3 BPMs and 2 kickers

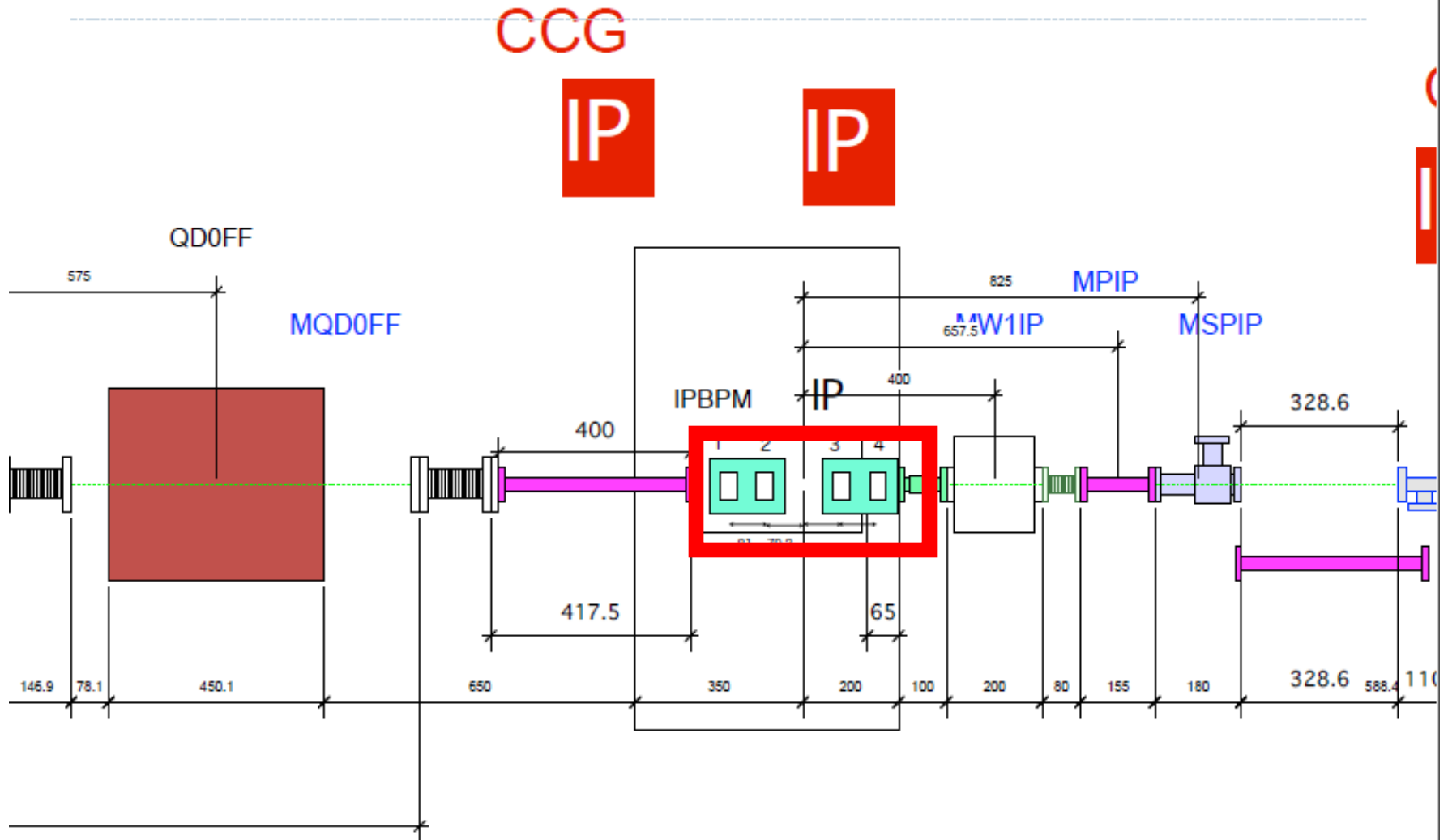


FONT5 setup

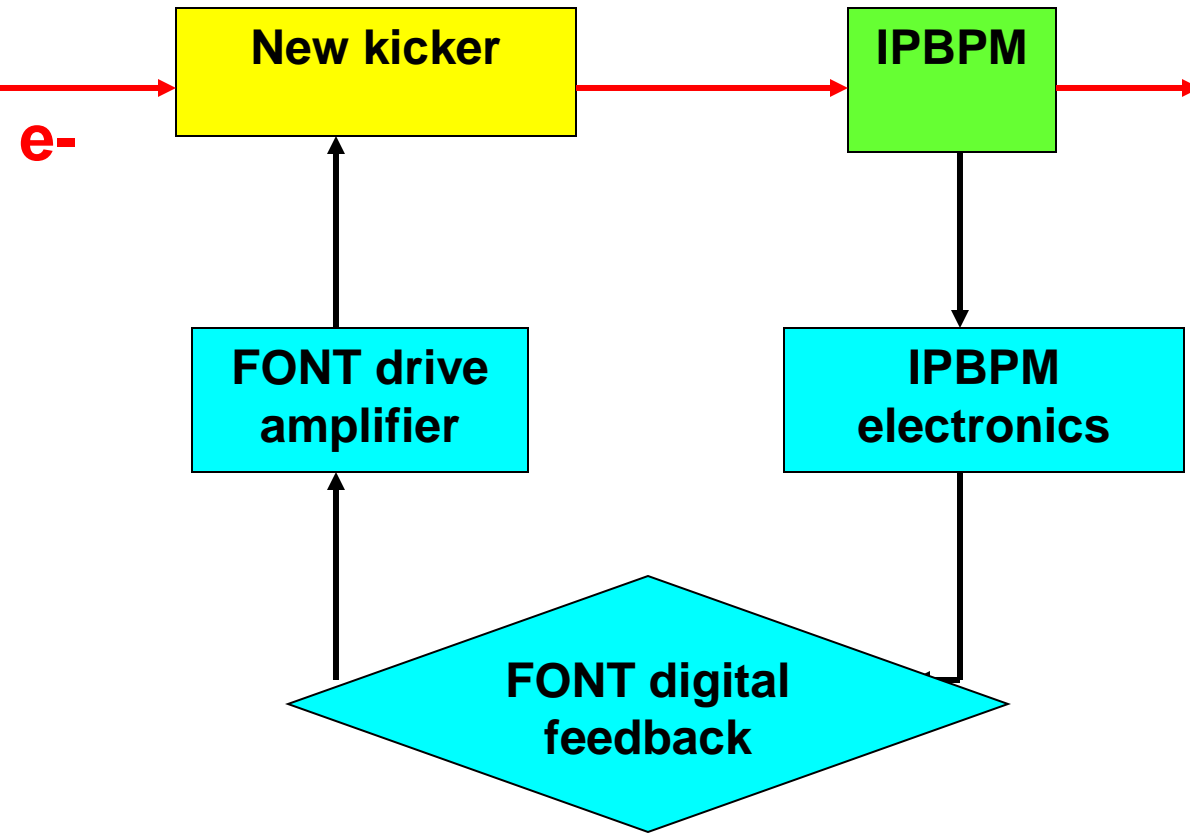


P2 → K1 ('position')
P3 → K2 ('angle')
(P3 → K1)
(P2 → K2)

ATF2 IP FB system



IP FB loop



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**