Drive Beam BPMs

Feedback On Nanosecond Timescales (FONT):

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Oxford University

Opportunity

- **Need for cost-effective design for tens of thousands of drive beam BPMs**
- **Strong UK expertise on cavity (RHUL) and stripline (Oxford) BPMs**
- **Working systems (at ATF2) with excellent performance**

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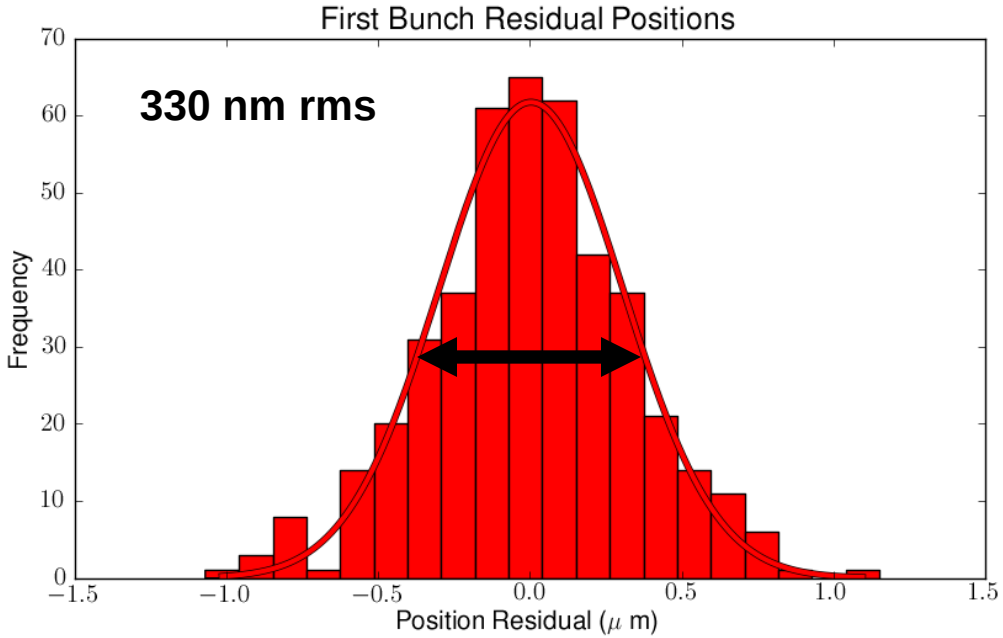
ATF2 stripline BPMs

single-pass beam

bunch Q ~ 1 nC



Opportunity

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Working systems (at ATF2) with excellent performance

Thibaut + Manfred strongly supportive:

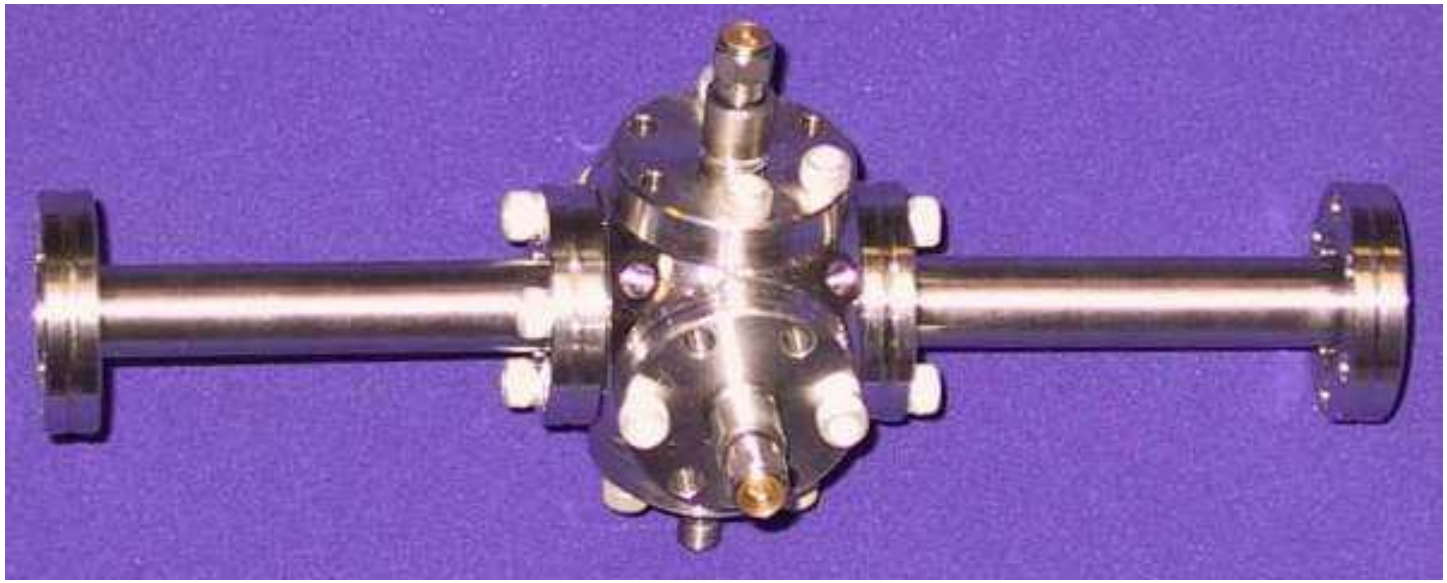
new student working on:

design of cost-effective BPM based on existing experience, exploring reasonable possibilities (striplines, buttons, coaxial …)

Future work proposal

- Study of low cost BPM pickup alternatives.
- Study of the PETS RF power EMI at the pickup location
  - Theoretical (EM simulations) and practical (CLEX beam)
- Compare different BPM types, including costs and performance
  - Stripline, button, coaxial and other “exotic” designs
- Evaluate read-out electronics for a cost/performance optimized DB BPM pickup.
- Design, prototype, and install a prototype DB BPM system in CLEX
  - Perform beam studies and demonstrate to meet the required performance, e.g. 2 μm resolution.

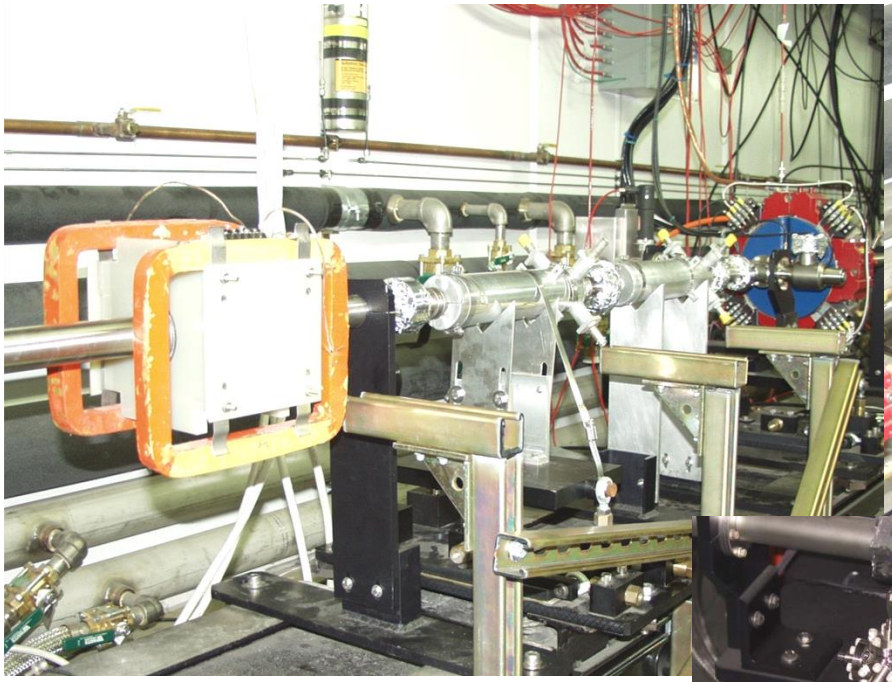
Old example (NLCTA)

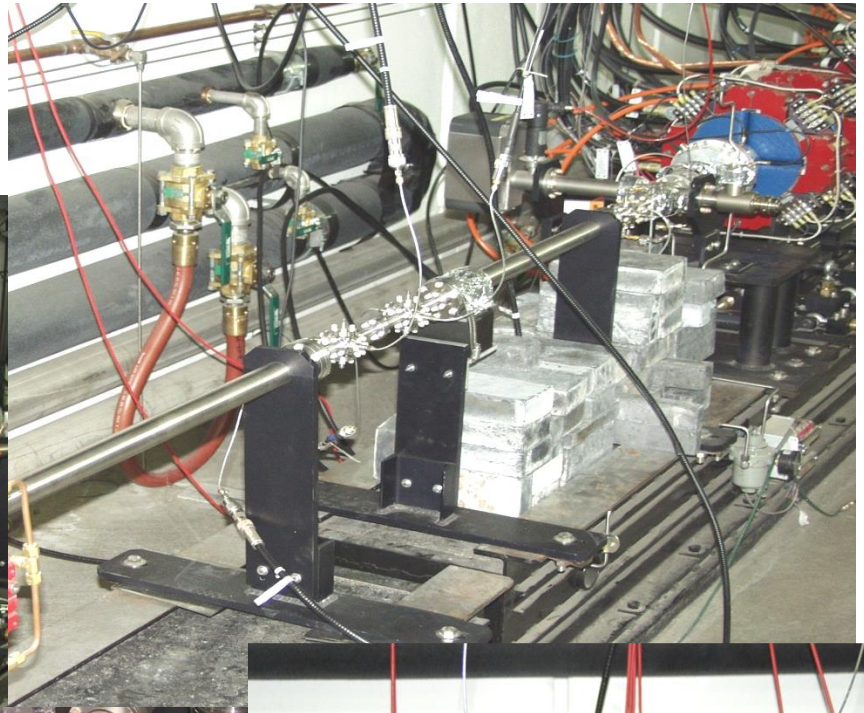


FONT2 beamline installation at SLAC NLCTA

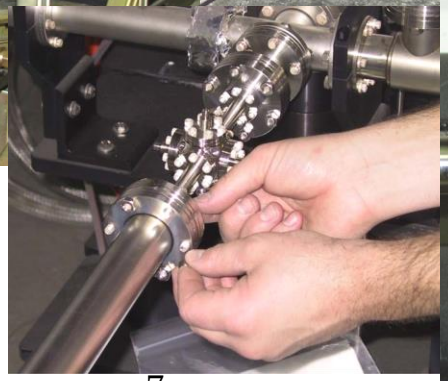
(65 MeV 170ns-long train @ 87ns spacing)

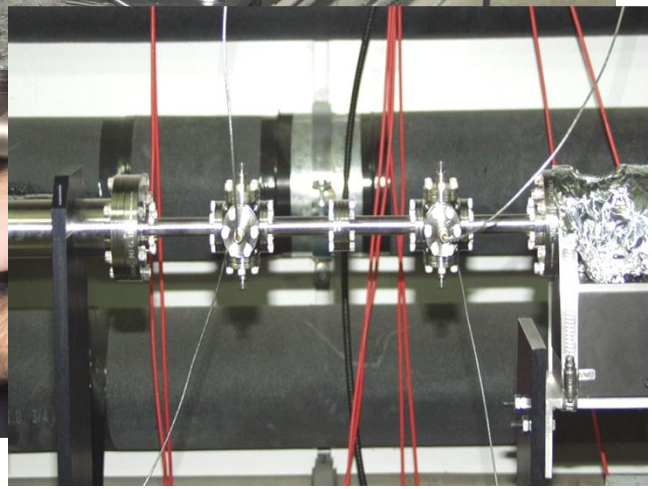
Dipole and kickers





New BPMs





Future proposed resources

Full-time PhD student (Oxford)

Supported by Oxford and RHUL:

Perry, Lyapin (electronic engineers)

Burrows, Christian, Boogert (faculty)

Deliverables and milestones

- 2014
  - Revisit the goals of the Drive Beam BPM R&D
  - Investigation of various BPM pickup types, based on simulations.
- 2015
  - Present an optimized DB BPM pickup design, including critical parts of the signal processing, i.e. rejection of unwanted 12 GHz RF power.
- 2016
  - DB BPM prototyping for CLEX
  - Stretched wire and RF bench tests of the BPM pickup
  - Read-out electronics prototyping
  - First beam studies at CLEX
- 2017
  - Finalizing beam studies at CLEX
  - Summary report on the Drive Beam BPM R&D