

UK Beam Delivery System Project Overview

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**Linear Collider
Accelerator + Beam Delivery Collaboration
(LC-ABD)**

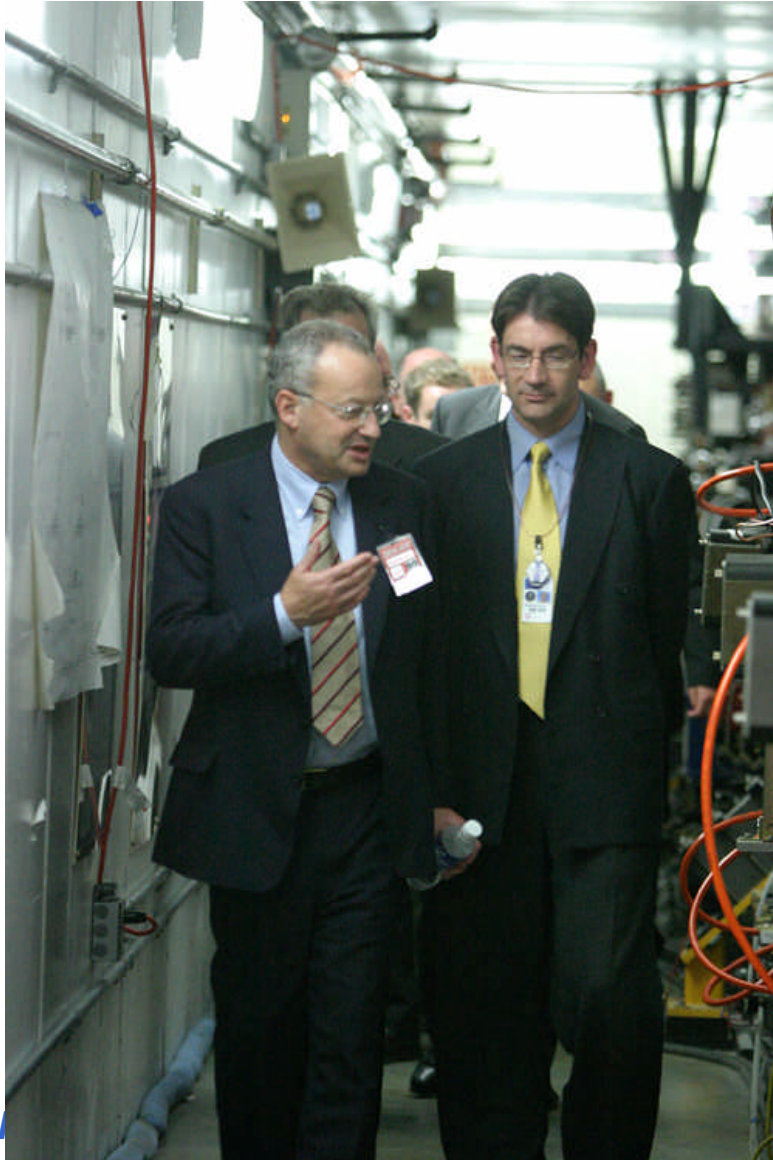
LC-ABD Collaboration

- Abertay
- Birmingham
- Durham
- Liverpool
- Oxford
- Royal Holloway
- Daresbury Lab.
- Bristol
- Cambridge
- Lancaster
- Manchester
- Queen Mary
- University College London
- Rutherford-Appleton Lab.

Grahame Blair (PI), Philip Burrows (PM)

- 41 post-doctoral physicists (faculty, staff, research associates) + technical staff + graduate students
+ 23 new posts (20 now filled)

A High Visibility Project...



**UK Science Minister,
Lord Sainsbury,
visits SLAC/NLCTA
June 8 2004.**

PPARC: 13MEuro

CCLRC: 2MEuro

1/4/04 – 31/3/07

Project Overview

1. Lattice design and beam simulations (**Angal-Kalinin**)
2. Advanced beam diagnostics (**Blair**)
3. Alignment and survey (**Reichold**)
4. Final focus luminosity stabilisation and spectrometry (**Burrows**)
5. Technology (**Poole**)

1. BDS Lattice Design and Beam Simulations

(Daresbury, Liverpool, Manchester, QMUL, RHUL, UCL)

1.1 BDS Lattice design:

Final Focus Optimisation (w. Saclay).

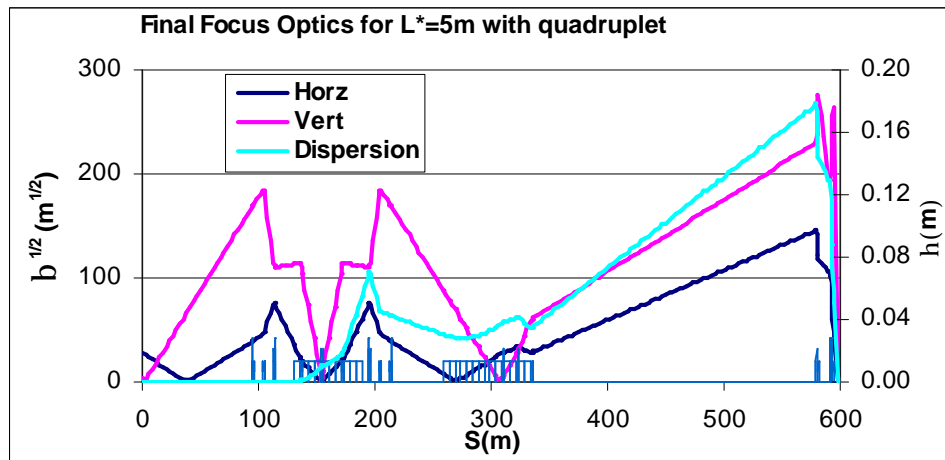
Beam Collimation (with DESY).

Beam extraction and IR issues
(with Saclay, Orsay, DESY).

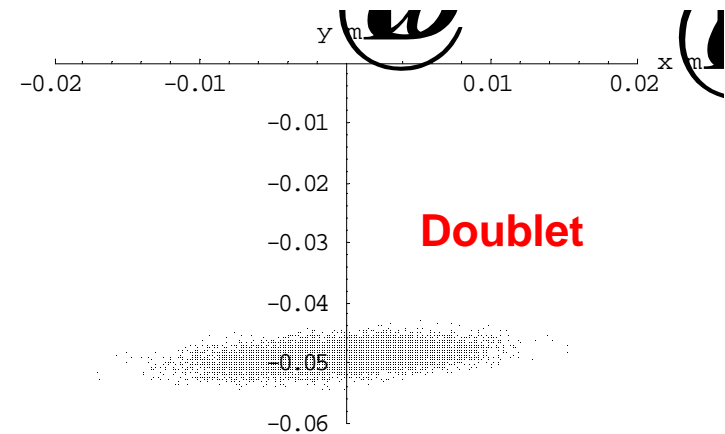
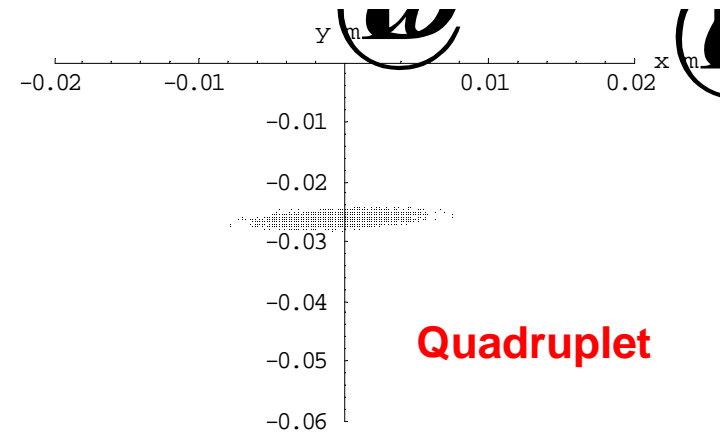
Beam-beam interactions.

Diagnostics areas.

Small vertical Xing angle:



Beam tails 50m down from IP:



1. BDS Lattice Design and Beam Simulations

(Daresbury, Liverpool, Manchester, QMUL, RHUL, UCL)

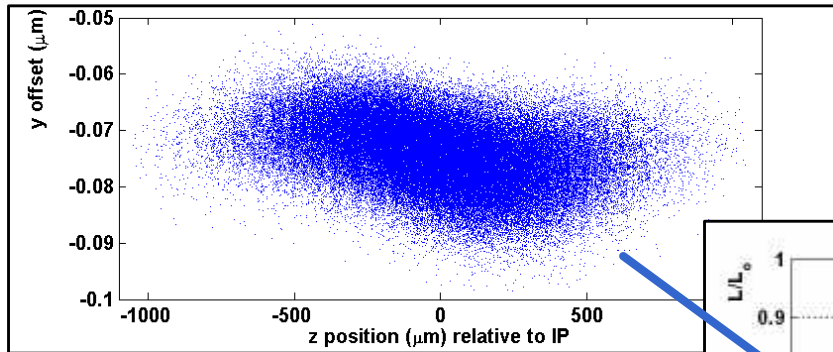
1.2 Beam transport simulations and backgrounds:

Ground motion.

Damping ring to dump beam transport.

Halo production and tracking in BDS.

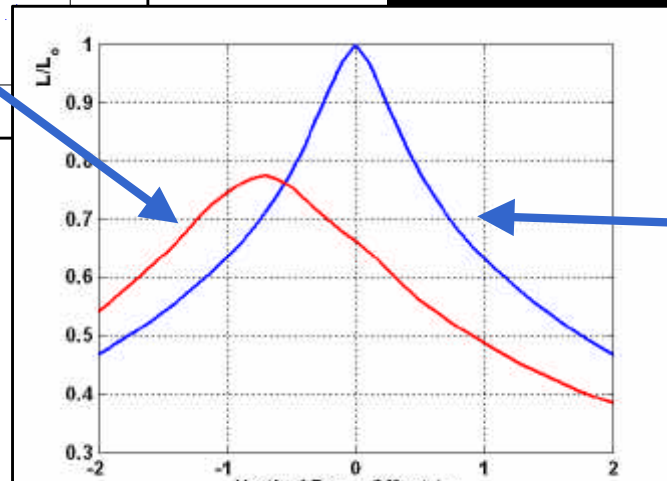
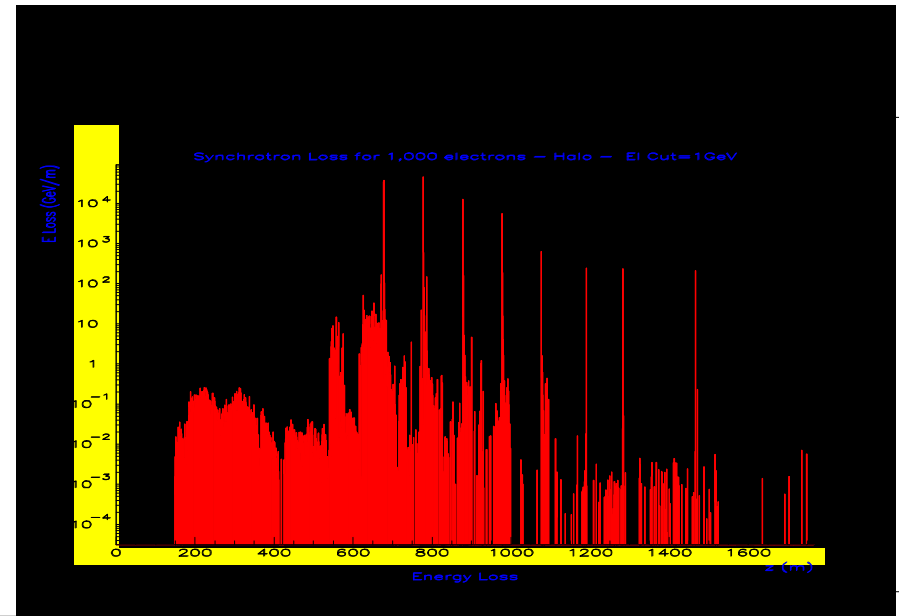
Backgrounds: e^+e^- , gammas, neutrons.



**Banana bunch
tracking and luminosity**

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Halo energy deposition in BDS:



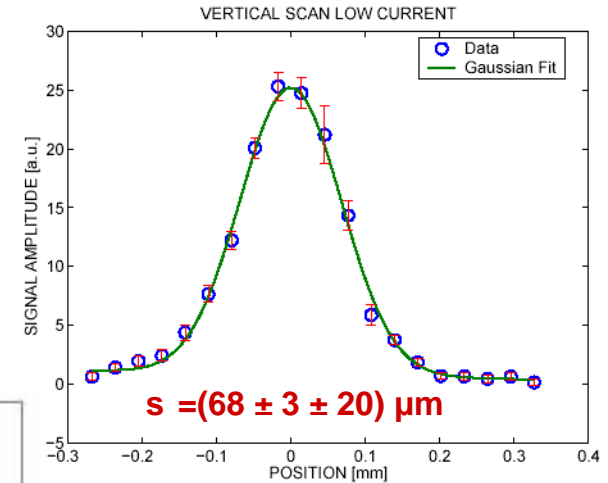
Gaussian bunch

LAN Meeting, DESY 2/11/04

2. Advanced Beam Diagnostics

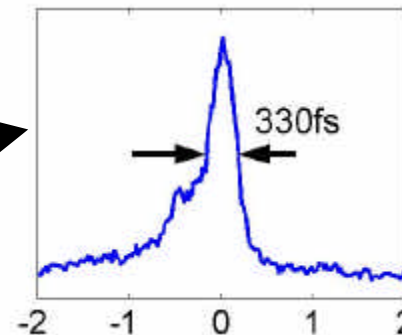
2.1 Laserwire (RHUL, Oxford, UCL):

PETRA laserwire project: UK multidirectional laser scanning system. Discussions on collaboration with KEK/ATF laserwire project.



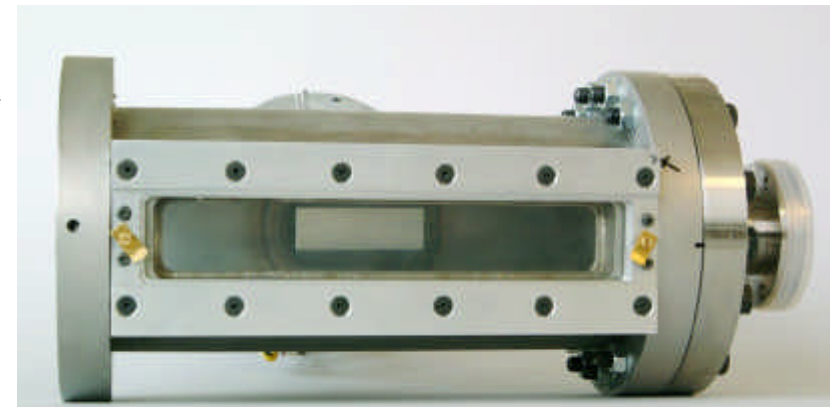
2.2 Bunch longitudinal profile (Abertay, DL, Oxford):

Electro-optic bunch length measurement (FELIX).
Smith-Purcell radiation bunch profile monitor (Frascati, FELIX).

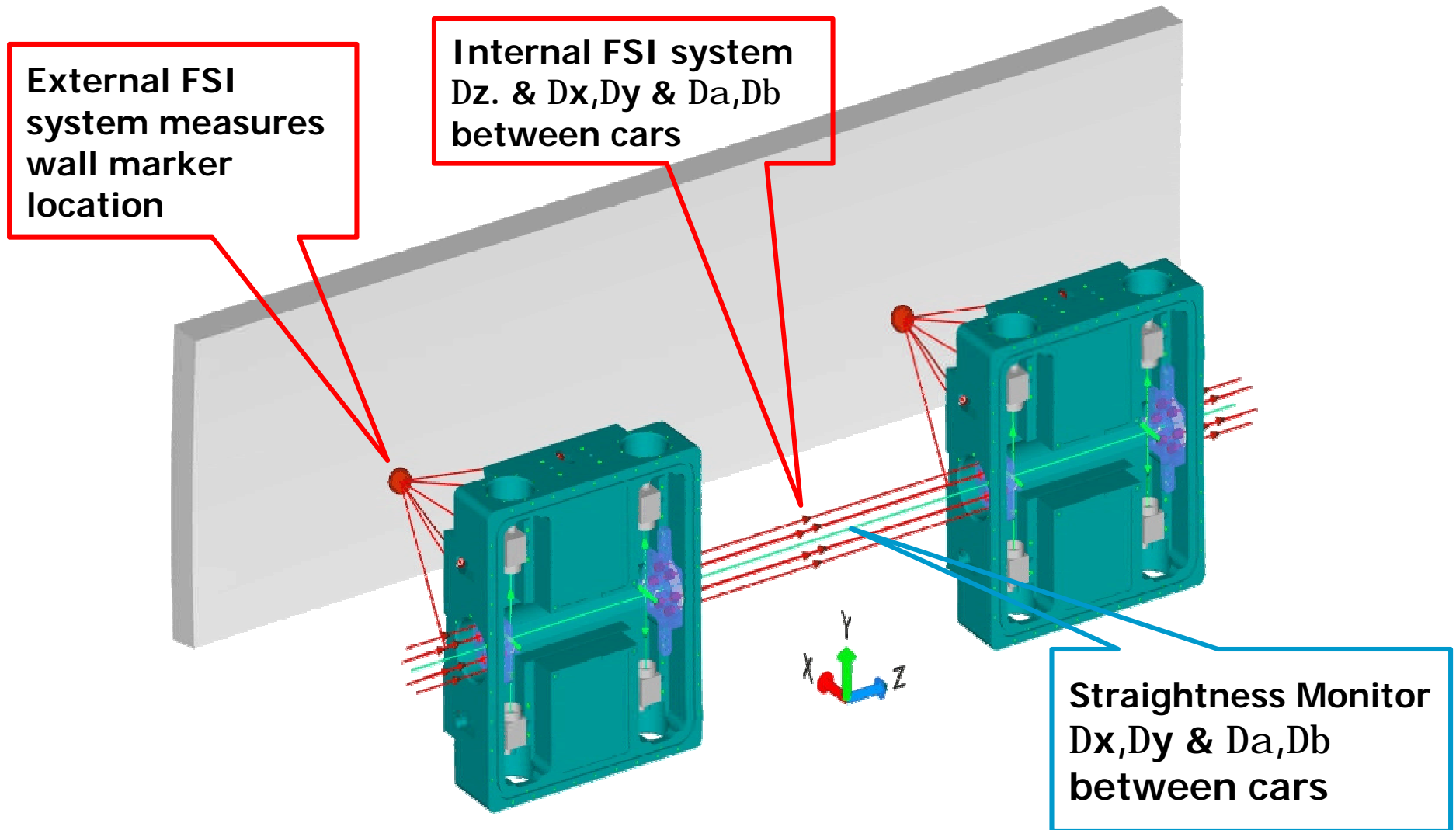


2.3 Polarisation (Durham, Liverpool)

Transport + polarimetry



3. Alignment and Survey (LiCAS) (Oxford)



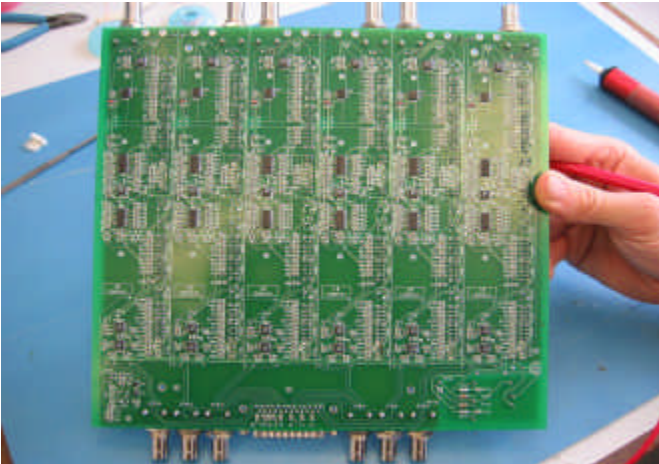
LiCAS Hardware Development

Prototype survey car:

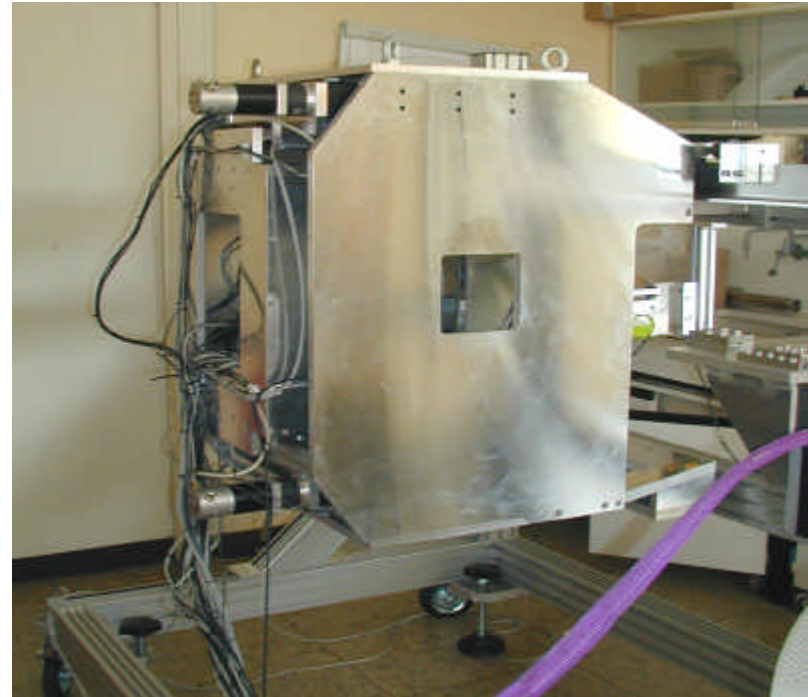
2004: Single-car sensor

2005: 3-car prototype
deployed in dedicated 70m
tunnel at DESY

2007: 5-car prototype
available for use (XFEL)



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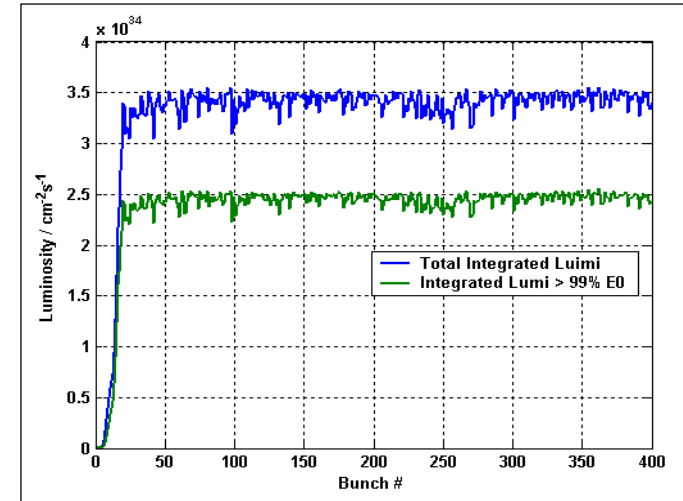
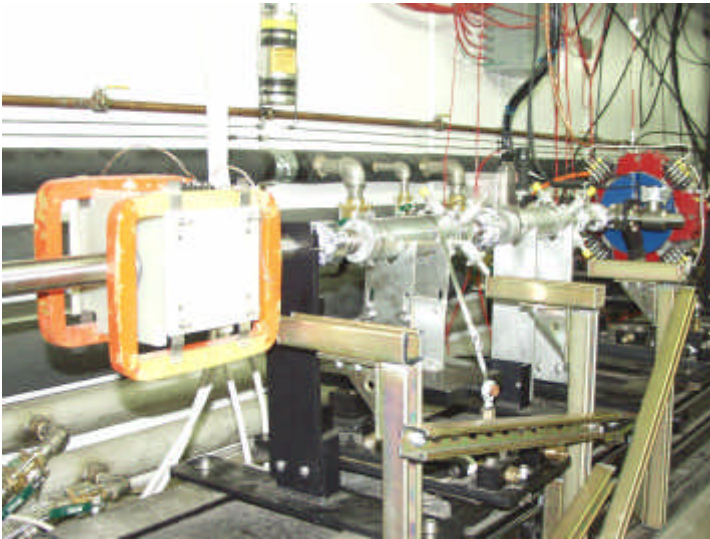


Prototype readout board

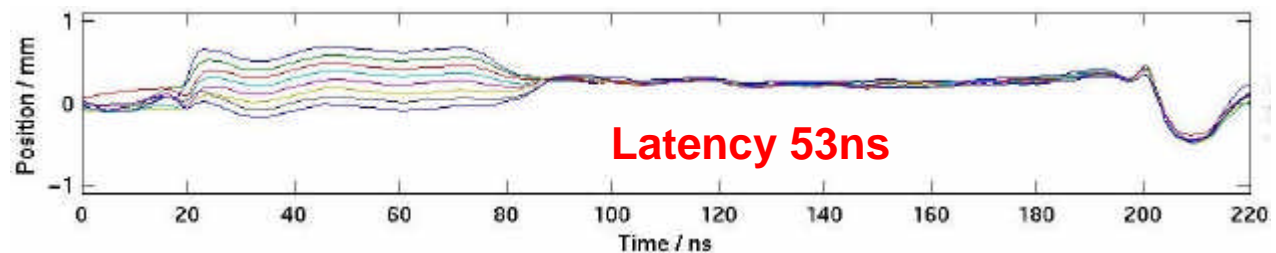
4. Luminosity Stabilisation + BPM/Spectrometry (DL, Cambridge, Oxford, QMUL, UCL)

4.1 Beam-based fast feedback (QMUL, Oxford, DL):

- Luminosity recovery simulations.
- FONT1 and FONT2 prototype intra-train FB systems tested with beam at SLAC/NLCTA.
- FONT3: beam tests at KEK/ATF summer 2005:
**micron-level stability
of 1 GeV beam**

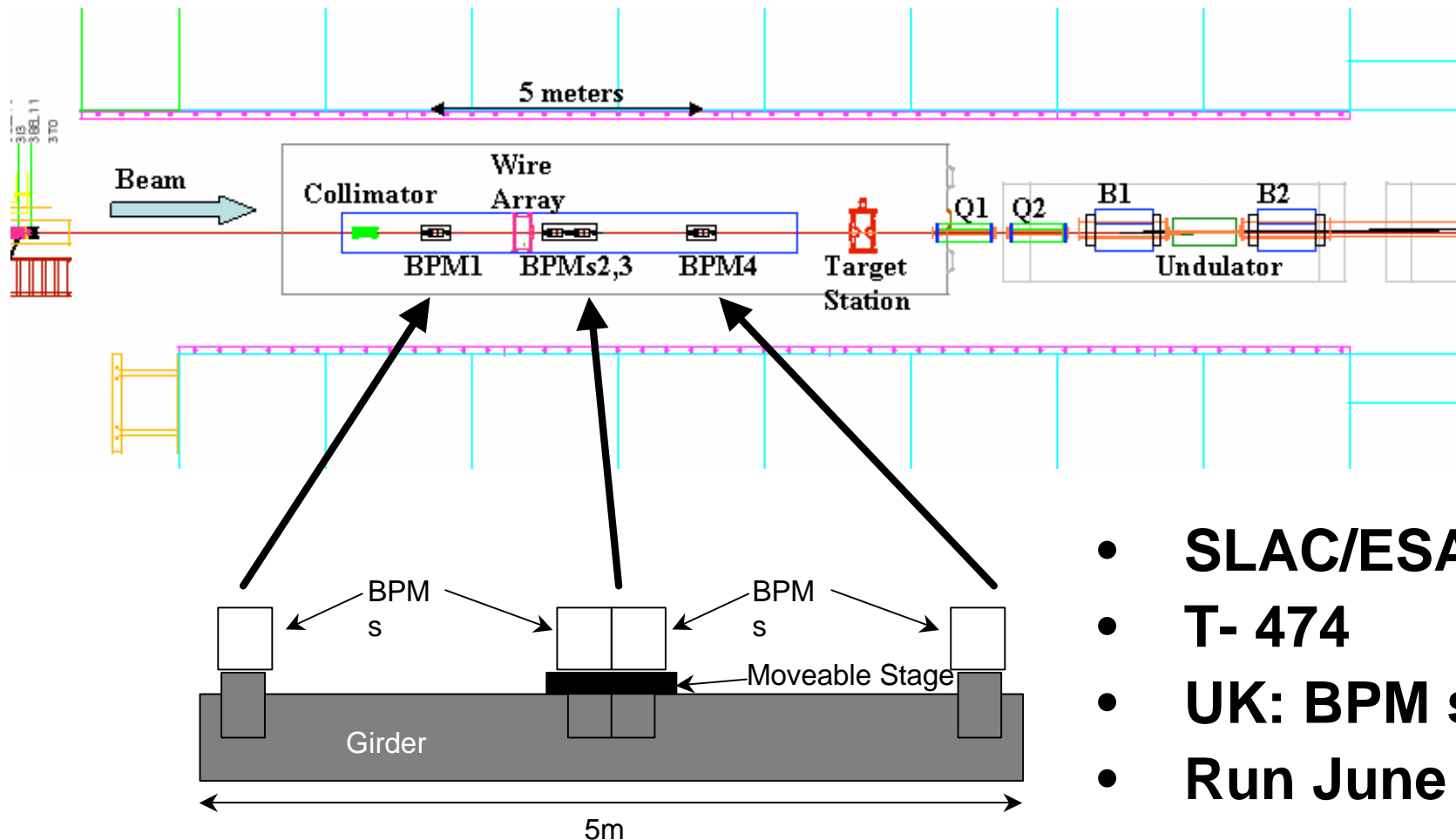


Full delay-loop feedback on:



4. Luminosity Stabilisation + BPM/Spectrometry (DL, Cambridge, Oxford, QMUL, UCL)

4.2 BPM energy spectrometry (UCL, Cambridge, DL):

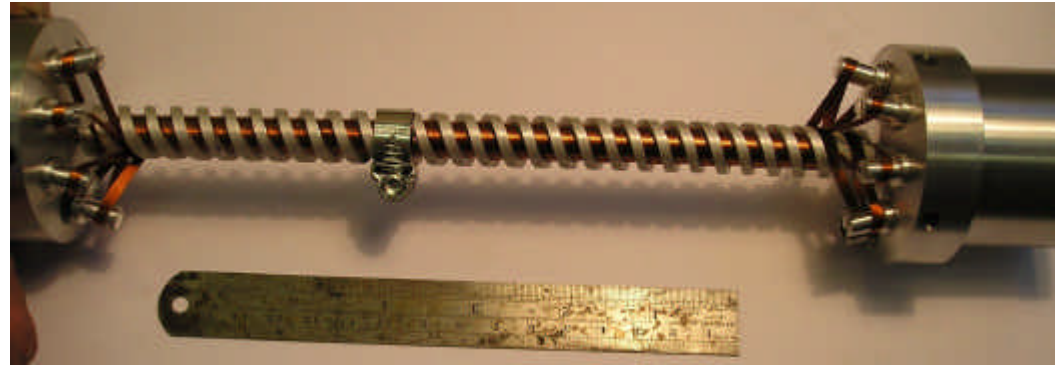


- **SLAC/ESA:**
- **T- 474**
- **UK: BPM stage**
- **Run June 2005?**

5. 'Technology'

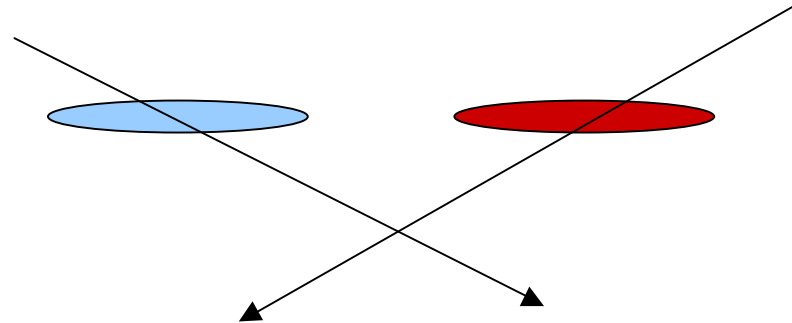
5.1 Polarised e⁺ undulator (DL, Liverpool):

Design, prototyping, testing of
NC + SC helical undulators.
Collaborating with E166 system test
(SLAC).



5.2 Crab cavity (DL, Lancaster):

Performance requirements.
Prototype cavity with power source.
Engineering design for ILC.



5.3 Collimator design (B'ham, DL, Lancaster, RAL)

Transverse wakefield simulations.
Simulate novel spoiler profiles.
Material damage simulation + tests (CERN).
Beam tests of prototypes (SLAC).

LC-ABD: Summary of Resources

	UK funding	# staff	Eurotev	Eurotev
Work package:	(kEuro) (1)	months (2)	contrib.	req.
			staff mo.	Staff mo.
Lattice design + simulation	2583	336		
Advanced beam diagnostics	3525	467		
Alignment and stabilisation	2219	330		
Lumi stabilisation/spectrometry	2703	331		
Technology	3772	354		
Miscellaneous	250	-----		
Total	15052	1818	1322	361

1) Staff (ex. faculty, students) + equipment + travel

2) All staff except graduate students