LCFI Collaboration Overview

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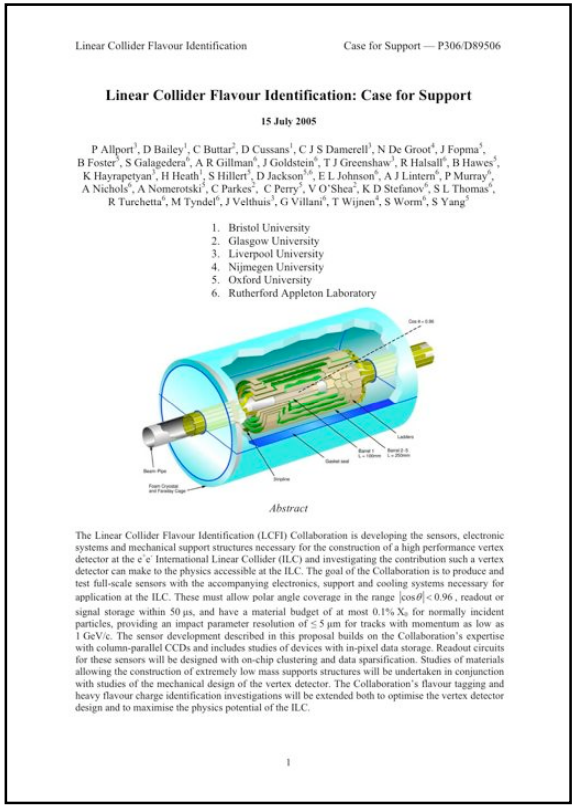
for the Linear Collider Flavour
Identification (LCFI) Collaboration

Outline

- People, capabilities, etc.
  - Proposal (at right) outlines our goals
  - 8 institutes and growing:
  - ~50 people involved
  - Permanent academic staff (~15), postdocs (~6), students! (~6), ASIC designers, engineers and techs
  - Funding from STFC, academic groups, EU, etc
- LCFI work packages
  - WP1: Vertex physics studies
  - WP2: Sensor development
  - WP3: Readout electronics
  - WP4: External electronics
  - WP5: Integrating and testing the above
  - WP6: Mechanical studies
  - WP7: Testbeams



Linear Collider Flavour Identification: Case for Support

15 July 2005

P Allport[1], D Bailey[1], C Buttar[2], D Cussans[1], C J S Damerell[3], N De Groot[4], J Fopma[5], B Foster[3], S Galagedera[6], A R Gillman[6], J Goldstein[6], T J Greenshaw[3], R Halsall[6], B Hawes[5], K Hayrapetyan[3], H Heath[1], S Hillert[3], D Jackson[3,6], E L Johnson[6], A J Lintern[6], P Murray[6], A Nichols[6], A Nomerotski[5], C Parkes[2], C Perry[5], V O'Shea[2], K D Stefanov[6], S L Thomas[6], R Turchetta[6], M Tyndel[6], J Velthuis[3], G Villani[6], T Wijnen[4], S Worm[6], S Yang[5]

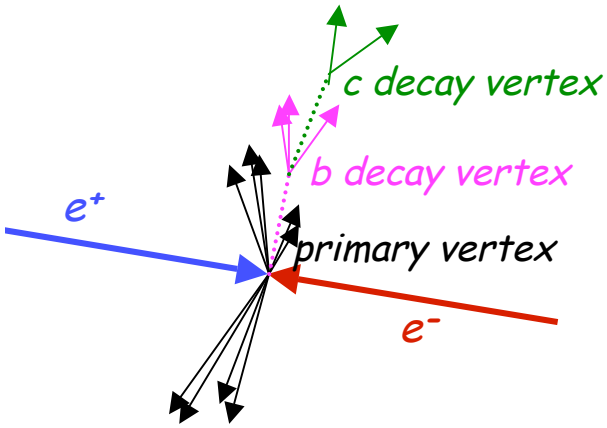
1. Bristol University
2. Glasgow University
3. Liverpool University
4. Nijmegen University
5. Oxford University
6. Rutherford Appleton Laboratory

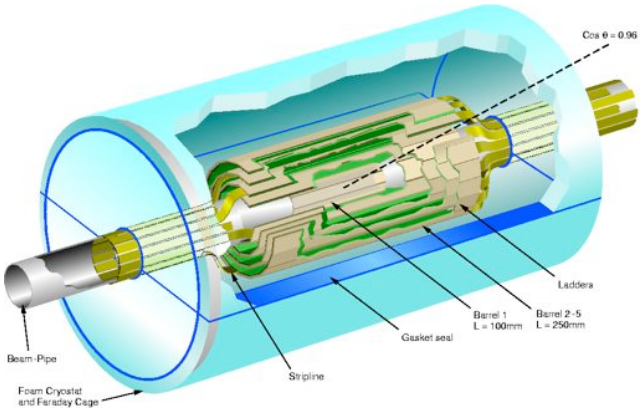
Abstract

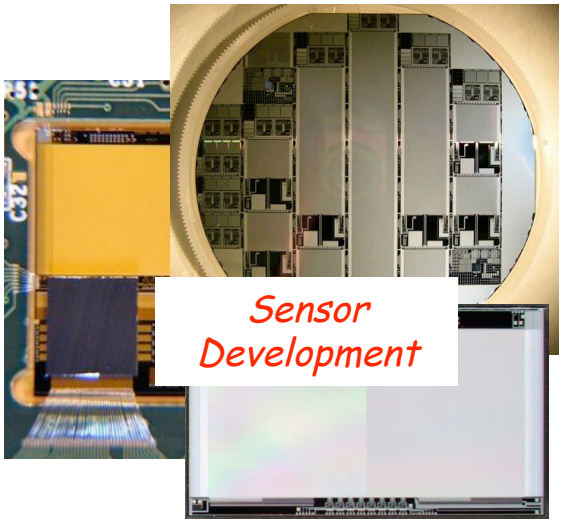
The Linear Collider Flavour Identification (LCFI) Collaboration is developing the sensors, electronic systems and mechanical support structures necessary for the construction of a high performance vertex detector at the e⁺e⁻ International Linear Collider (ILC) and investigating the contribution such a vertex detector can make to the physics accessible at the ILC. The goal of the Collaboration is to produce and test full-scale sensors with the accompanying electronics, support and cooling systems necessary for application at the ILC. These must allow polar angle coverage in the range $|\cos\theta| < 0.96$, readout or signal storage within 50 μs, and have a material budget of at most 0.1% X_0 for normally incident particles, providing an impact parameter resolution of ≤ 5 μm for tracks with momentum as low as 1 GeV/c. The sensor development described in this proposal builds on the Collaboration's expertise with column-parallel CCDs and includes studies of devices with in-pixel data storage. Readout circuits for these sensors will be designed with on-chip clustering and data sparsification. Studies of materials allowing the construction of extremely low mass supports structures will be undertaken in conjunction with studies of the mechanical design of the vertex detector. The Collaboration's flavour tagging and heavy flavour charge identification investigations will be extended both to optimise the vertex detector design and to maximise the physics potential of the ILC.

LCFI Work Package Activities

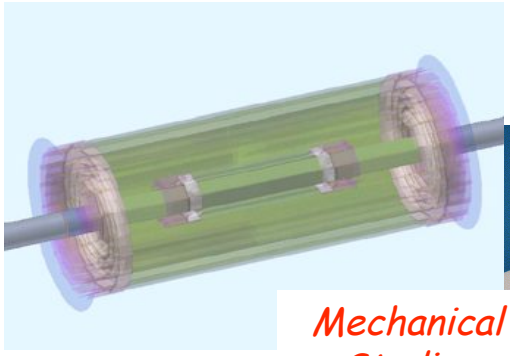
LCFI is engaged in developing the pixel sensors, readout, mechanical structures, and physics studies needed for heavy flavour vertexing in the ILC.







Sensor Development



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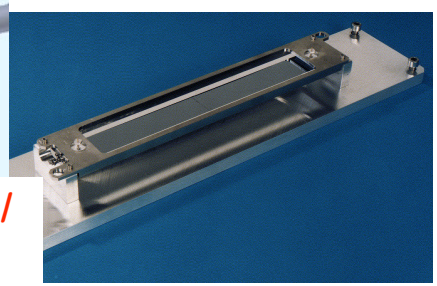
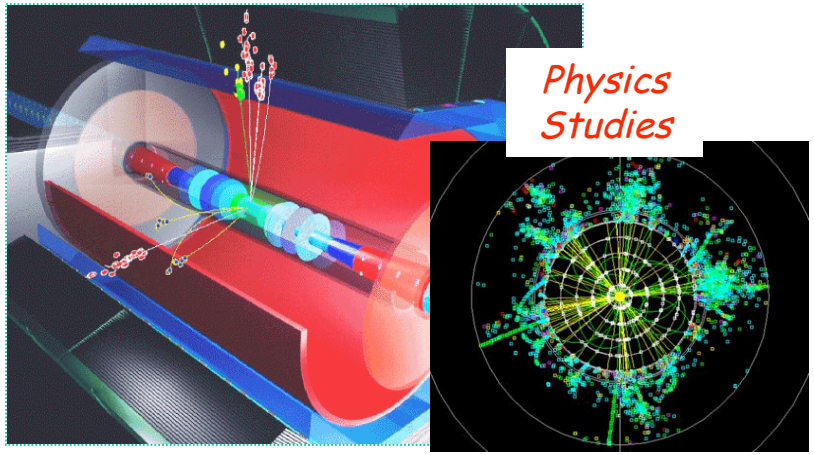


Mechanical Studies



Physics Studies

Snapshot(s) of LCFI People

Summary and Areas of Overlap

- Physics studies
  - Have invested work in vertexing package, now available
  - Want to use it for benchmark studies and to revisit vertex detector design
  - Opportunities for connection with SiD
- Sensor, readout and support electronics
  - Column-parallel CCDs and ISIS technologies under development
  - Developed in parallel, we have maturing technologies for readout and external electronics
- Mechanical and Cooling
  - Assessment of support technologies well advanced
  - Cooling bench and computer models available
  - Overall detector construction considerations being investigated
  - More opportunities for connection with SiD

LCFI active in developing all components needed for vertex detector