



UNIVERSITY OF

LIVERPOOL

UK plans/interests/capabilities

AIDA2020 WP9

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Outline

Brief overview of UK plans, interests and capabilities.

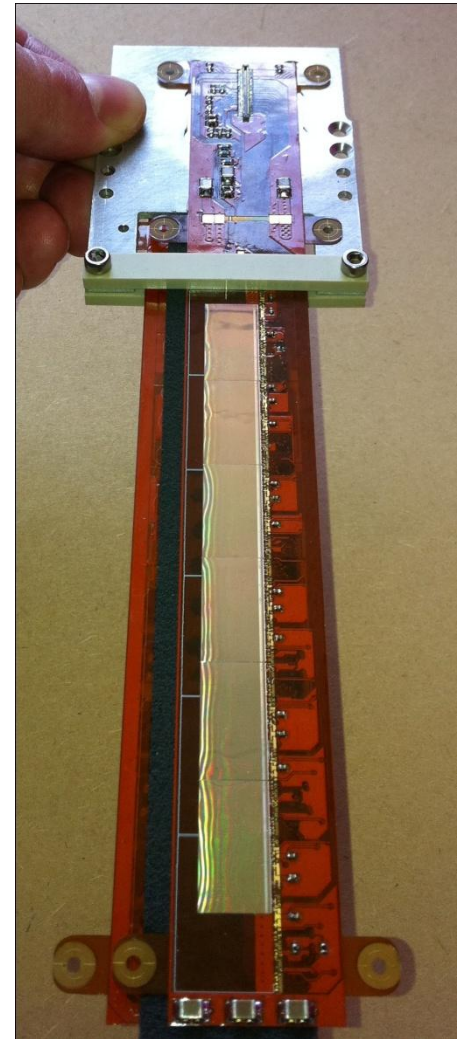
Groups: Bristol, Liverpool, Oxford

Oxford (as presented by Georg) interest is strongly focussed on building up a thermo-mechanical test facility, benefitting from the extensive facilities already in place in Oxford.

Few slides to present Bristol and Liverpool plans, interests and capabilities.

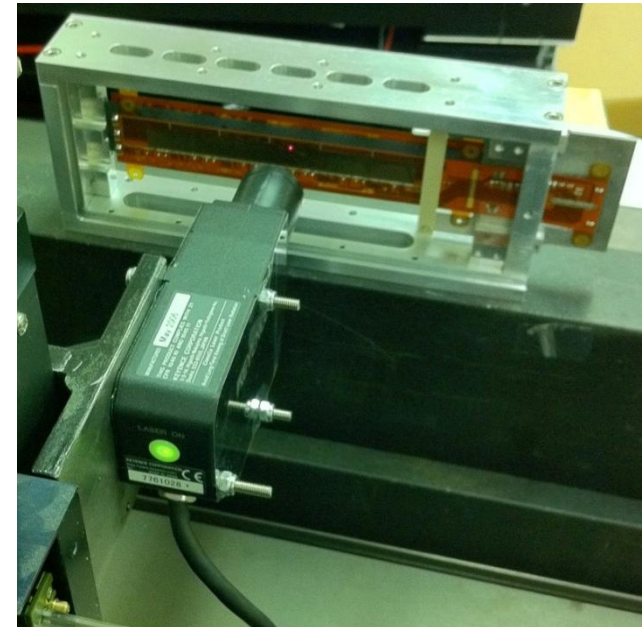
Bristol

- * Main drivers for AIDA-2020
 - * ILC vertex detector
 - * PLUME
 - * ILC silicon tracker
- * Other activities might benefit:
 - * LHCb RICH
 - * Medical and security applications



Needs

- * Mechanical testing for components from vertex (few cm) to tracker size (2-3 m)
 - * Static metrology (e.g. optical survey)
 - * Dynamic metrology (e.g. vibrations in airflow)
 - * Thermomechanical testing
 - * Deformation under temperature change
 - * Power pulsing....
- * Need
 - * Access to facilities for timescales ~hour to weeks
 - * expert technical help



Liverpool interest in WP9

To realise the physics potential of current and future experiments we need support structures with high stability and minimal mass.

Long history in construction of mechanical support structures, both low and high mass:

- CDF layer00, support wings LHC-b VeLo, ATLAS upgrade stave co-curing, CTA camera lids, R3b Si-tracker spars, T2K ND280 space-frame, g-2 tracker, ...

Outline

- Infrastructure for mechanical testing and prototype manufacture
- Possible contributions to WP9

Mechanical test facilities

Housed in dedicated construction/metrology/thermal testing area within our clean room facilities.

Metrology and mechanical testing:

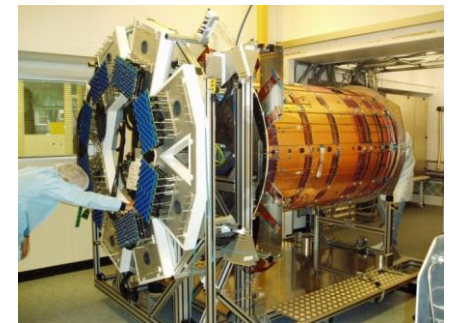
- 2 large Wenzel touch/optical-probe CMMs
- FARO Vantage Laser Tracker
- OGP SmartScope CNC624 with laser pointer and touch probe
- Lloyds and Instron Universal Materials Testers for measuring tensile, compressive and flexural properties.
- Dantec Dynamics Q400 Digital Image Correlation (DIC) test facility (non-contact time-dependent metrology)
- DataPhysics Quattro DSP/Signal ACE with impact hammer and shaker for vibration studies

Thermal testing

- Cold room, 3m x 4m x 5m, dew point -30°C, temp -25 °C
- Vacuum chamber with germanium window and x-y scanning table for imaging of sensor breakdown.
- CO2 blow off plant
- FLIR A410, SC640 and SC655 Thermal Imaging cameras

Qualification of assembly procedures:

- Automatic glue dispensers
- Netzsch Differential Scanning Calorimetry (DSC).
- DeFelsko PosiTest AC adhesion tester
- Scanning cold active plasma cleaner
- CO2 sno-cleaning gun
- PGx Contact angle measurement



Manufacturing capabilities

Composites lab:

- Prepreg (incl. co-curing) and resin infusion manufacture
- Large area laser cutter
- $L \sim 1.7\text{m}$ autoclave
- 3m x 2m x 2m curing oven ($T \sim 220\text{ }^\circ\text{C}$)
- Horizontal tube vacuum furnace ($T \sim 1100\text{ }^\circ\text{C}$)

Mechanical workshop:

- Large bed 4-axis CNC miller
- 5 axis CNC miller
- CNC lathes
- wire-spark eroder
- 3D printers, laser cutter, ...
- Faro portable Measuring Arm (in-situ metrology)



Ideas about possible contributions to WP9

- Original EoI was to develop a test facility to measure the response characteristics of system sub-components to both cyclic and impulse stimuli by extending the capability of a Digital Image Correlation. Still on our agenda.
- Generally well equipped, hence access to central facility not a strong priority.
- Cannot make firm commitment to make our infrastructure available. But keen to contribute especially on work where we are collaborating on a joint project.
- Also very interested in work developing common tools, improving protocols, sharing expertise on FEA simulation etc.
 - Keen interest in improving testing and modelling composite and/or hybrid structures.
- Useful vehicle for WP9 would be to have a set of common benchmark structures tested and simulated in different labs with a range of tools.
 - Interested to contribute to the manufacture & testing of such structures
- Keen for WP9 work to benefit mechanics work towards ILC:
 - Strong interest in developing a mechanics activity towards ILC. Therefore, for us easier to allocate effort to this WP if we can create a synergy between ILC and WP9 mechanics work.
 - Very challenging mechanical requirements (excellent benchmark)
 - Modest (but expert) resources can have big impact
- WP co-leaders WP6, with particular focus on hybridisation



Summary

Clear interest in contributing to WP9 from UK groups (Oxford, Bristol, Liverpool)

Somewhat different interest and ideas about what roles to play in this, which could complement each other well.

Common interest in development and use of tools, protocols and simulation for thermo-mechanical testing.

Also a common interest to make this work benefit work for ILC mechanics