

UK EIC Discussions

Possible UK contributions to the accelerator

Prof G Burt, Lancaster University/Cockcroft



Lancaster
University



Science & Technology
Facilities Council



UNIVERSITY OF
OXFORD

JAI
John Adams Institute
for Accelerator Science



ROYAL
HOLLOWAY
UNIVERSITY
OF LONDON



UNIVERSITY OF
LIVERPOOL

UK Collider Expertise

- Started in 2004 in LC-ABD: Linear collider beam delivery system (ILC)
 - UK expertise in crab cavities (SRF), diagnostics, LLRF synchronisation, and fast beam feedback
- 2008: Europe's first Energy recovery linac (ALICE) built and tested at Daresbury
- 2012: UK project to deliver beam delivery for CLIC (crabs, diagnostics, synchronisation and fast beam feedback)
- 2016: UK launches HL-LHC-UK to deliver key components to LHC including crabs (SRF), diagnostics (EO-BPM), including some elements of beam feedback and LLRF
- 2022 STFC starts project to deliver SRF cryomodules to PIP-II

UK expertise

- UK has expertise which is world leading and attractive to EIC in
 - Superconducting RF systems for crabs and ERLs
 - Electro-optic beam position monitors
 - LLRF synchronisation and beam feedback
 - Energy recovery linac modelling and design
- And hence we propose 4 sub-WP based on these 4 competencies
- This list also corresponds exactly with the wish list of UK contributions from BNL/JLab

SRF systems

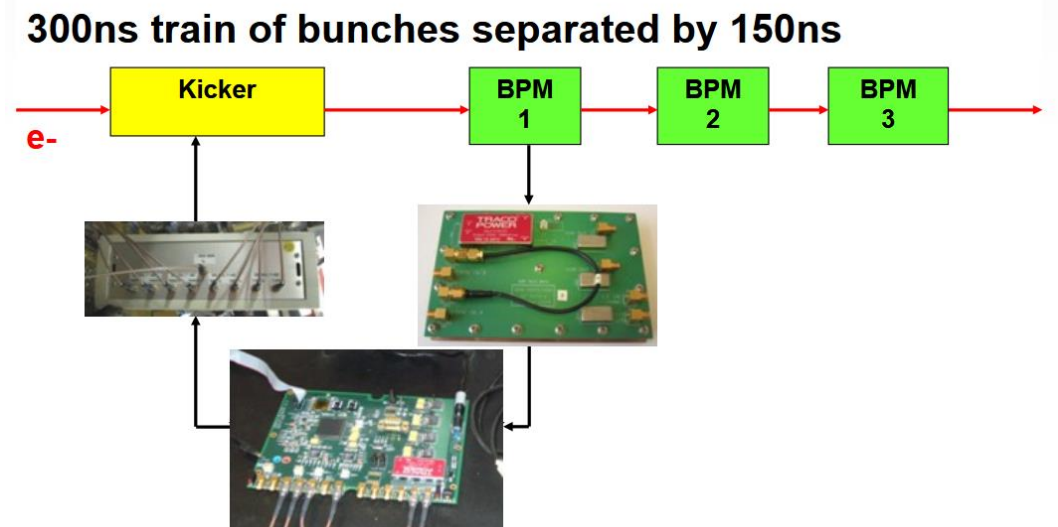
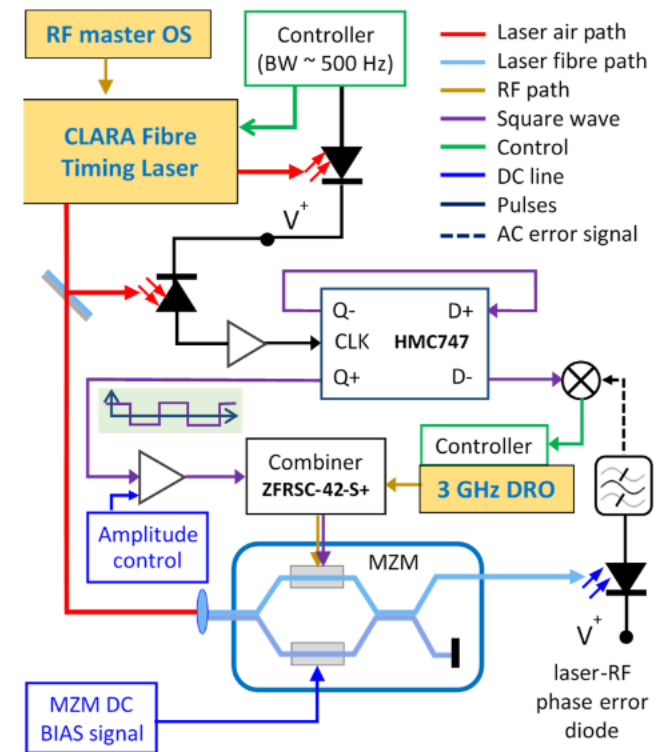
- Technology (STFC) & Lancaster University
 - with support from ASTeC (STFC)
- Building on experience from HL-LHC, ESS and PIP-II
- In discussions with US colleagues on what would be the optimal system and narrowed down to either 400 MHz crabbing system or L-band ERL SRF system
- Need to define if we deliver cavities, cryomodules or both



HL-LHC cryomodule at Daresbury

LLRF and feedback

- Oxford and Lancaster
 - Lancaster have experience in RF interferometers and Mach-Zehnder interferometers for synchronisation of RF and lasers for crabs and FELs
 - Oxford have experience in beam-based feedback for colliders based on beam offsets post-IP
 - EIC crabbing system will need both to meet specifications

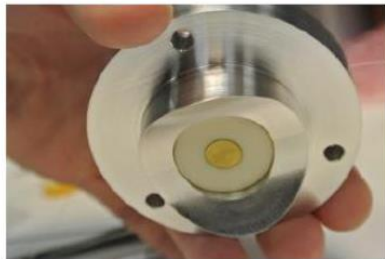


EO-BPM

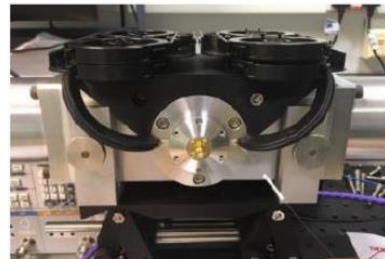
- Royal Holloway

- Building on experience from HL-LHC, these unique devices are capable of measuring crabbing angle on proton or ion beams

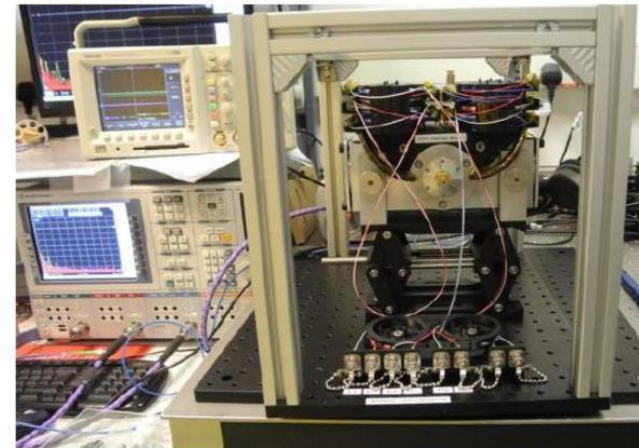
- Compact fibre-coupled waveguide pickups manufactured at RHUL



- 3D-printed supports for fibre splitter tree



- New EO-pick-ups under coaxial line test in RHUL clean room, prior to shipping



ERL

- Lancaster and Liverpool
 - Have been studying ERL filling pattern effect on RF and beam stability
 - Only study of its type most assume all bunches are identical
 - We show the differences are critical

