

Overview of JAI activity

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oPAC Advanced School on Accelerator Optimisation
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University of Oxford



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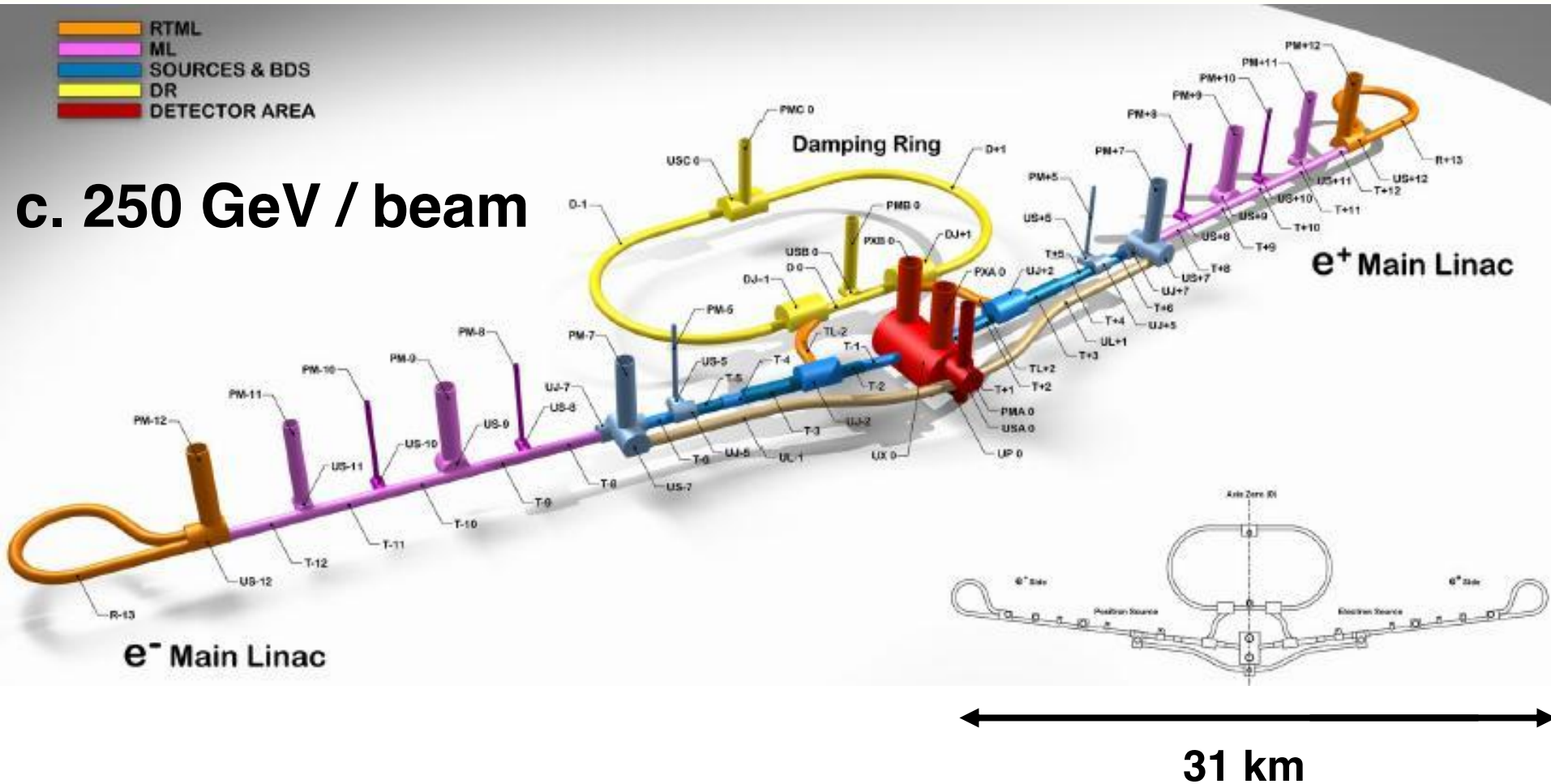
Main JAI Objectives

- **Research in Accelerator Science and Technology**
 - Generic research experience and expertise
 - Mobility and international experience
- **Training-through-research at Masters and PhD level**
 - Academic training programme at universities
 - Research projects at national and international laboratories
- **Links with Industry**
 - Direct collaboration with companies
 - Provide consultation service
- **Outreach & Dissemination**

International Linear Collider

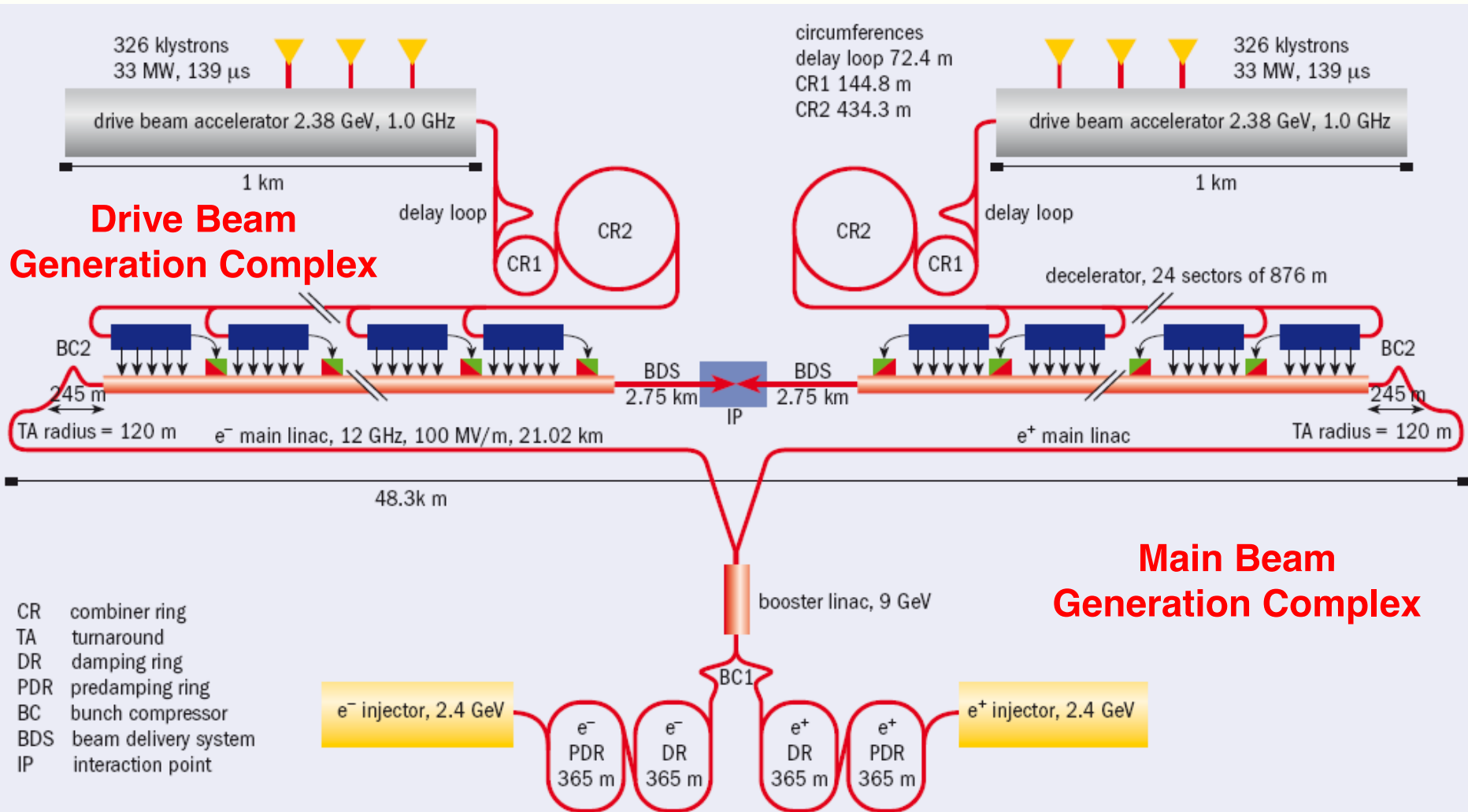
- RTML
- ML
- SOURCES & BDS
- DR
- DETECTOR AREA

c. 250 GeV / beam



Compact Linear Collider

CLIC - 3 TeV



- **Transverse beam size measurement**
 - Laserwire, OTR monitors, ODR monitors, imaging techniques and interferometers
 - Non-invasive diagnostics
- **Longitudinal beam profile measurements**
 - Coherent radiation spectrum: CDR, CTR, CSR, CSPR
 - Streak camera, RF pickup and RF deflectors
- **Beam position diagnostics**
 - Cavity BPMs, Strip line BPMs, EO BPMs, and Cherenkov Diffraction Radiation technique
- **Ultrafast Feedback and Feedforward systems**

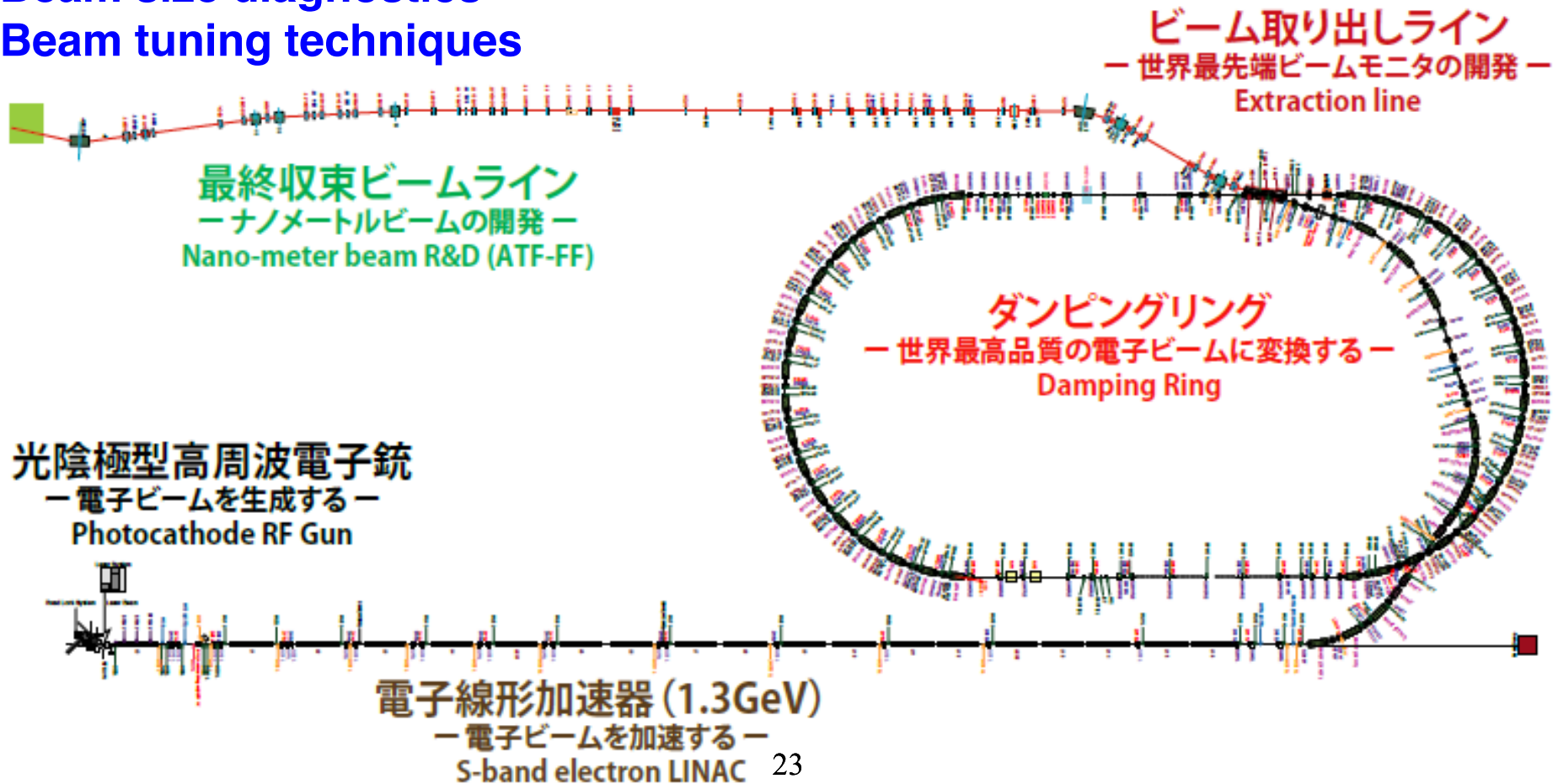
KEK-ATF2 facility in Japan

Beam feedback + feed-forward systems

Precision cavity + stripline BPMs

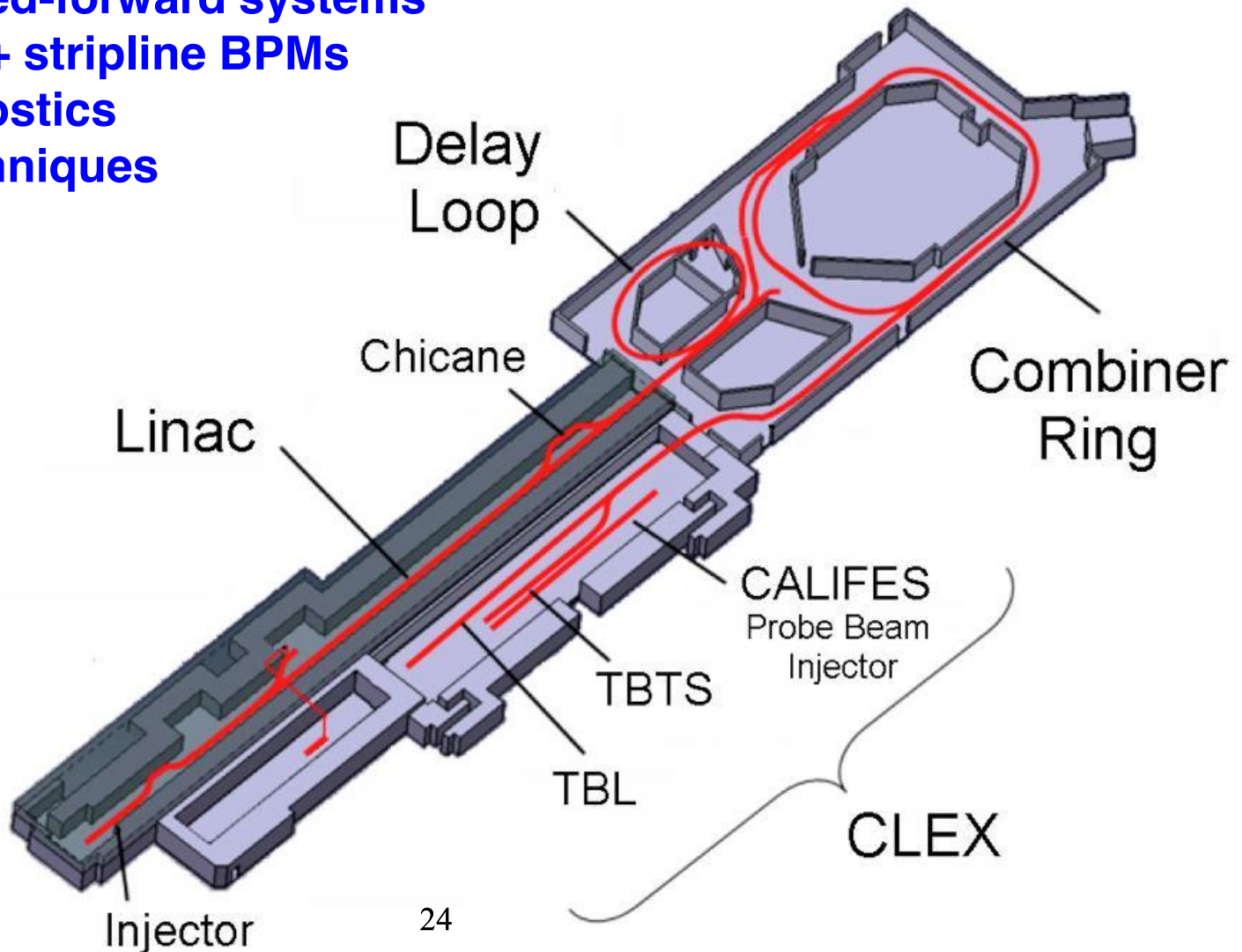
Beam size diagnostics

Beam tuning techniques

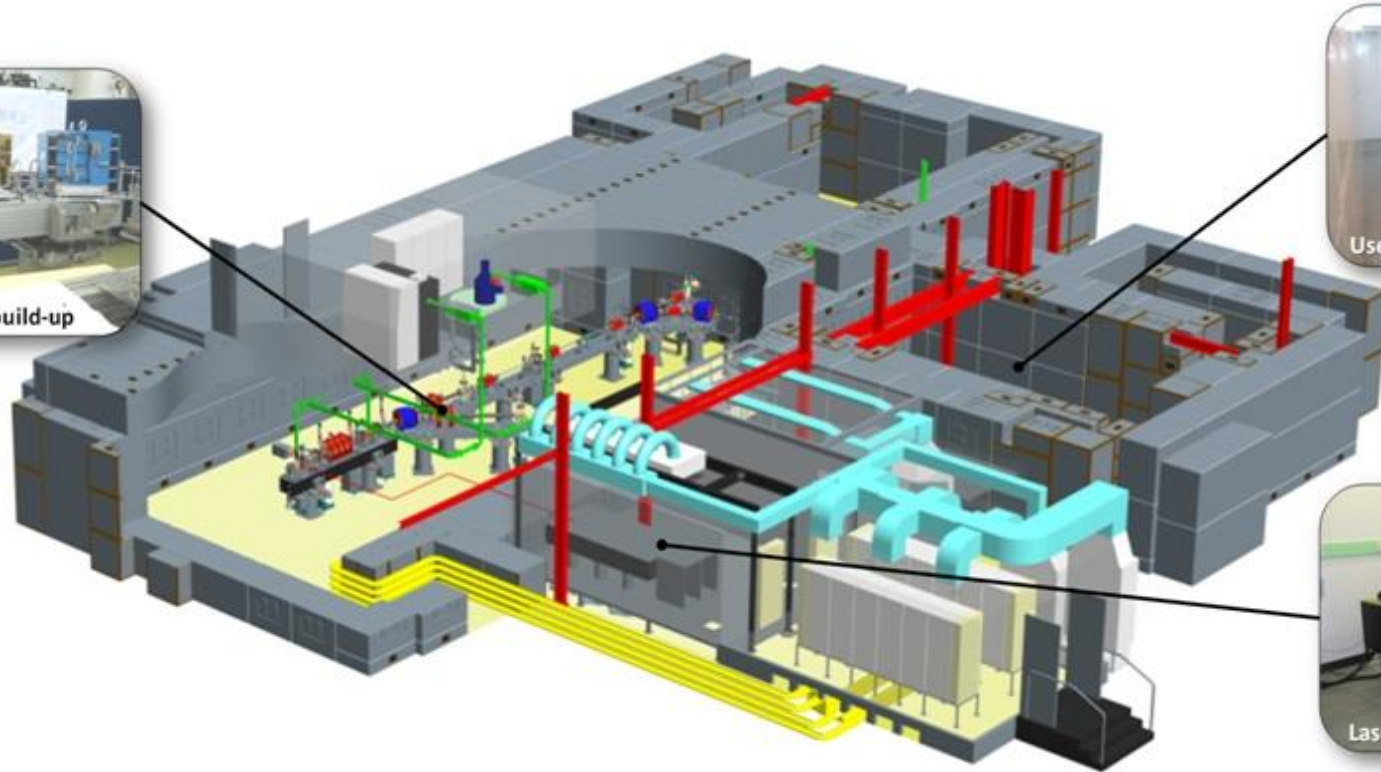


CLIC Test Facility (CTF3, CERN)

- Beam control: feed-forward systems
- Precision cavity + stripline BPMs
- Beam size diagnostics
- Beam tuning techniques



VELA facility -> CLARA



Beam energy : 4 – 5.5 MeV
Bunch charge : 10 – 250 pC
Bunch length : 3 ps

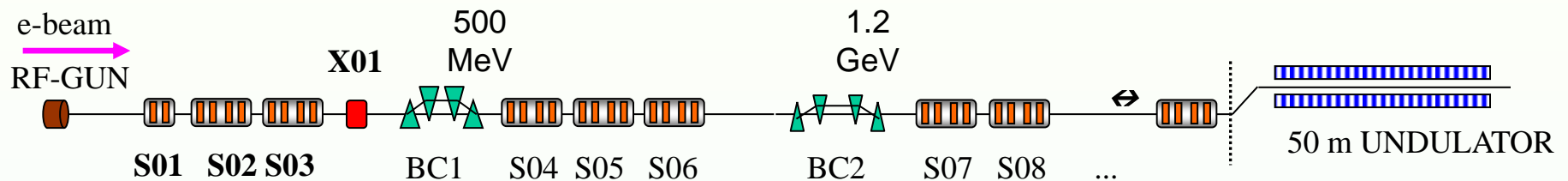
- Cavity BPMs + signal processing electronics
- Strip-line BPMs
- Amplifiers and low latency digital boards
- Ultra-fast room temperature detectors
- Novel Compact THz and X-ray sources

Light Sources in the UK

- Diamond Light Source – the largest Accelerator Facility in the UK

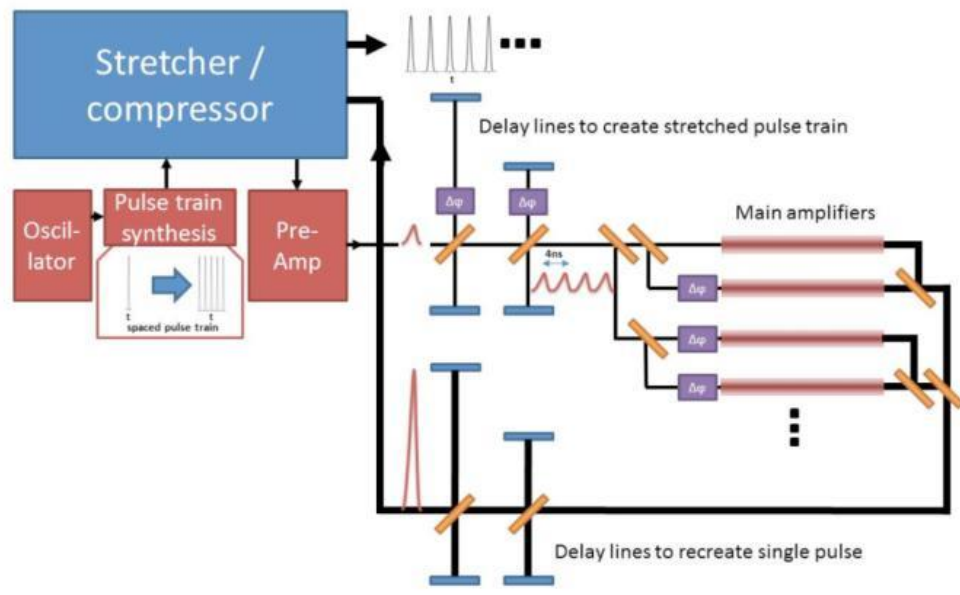
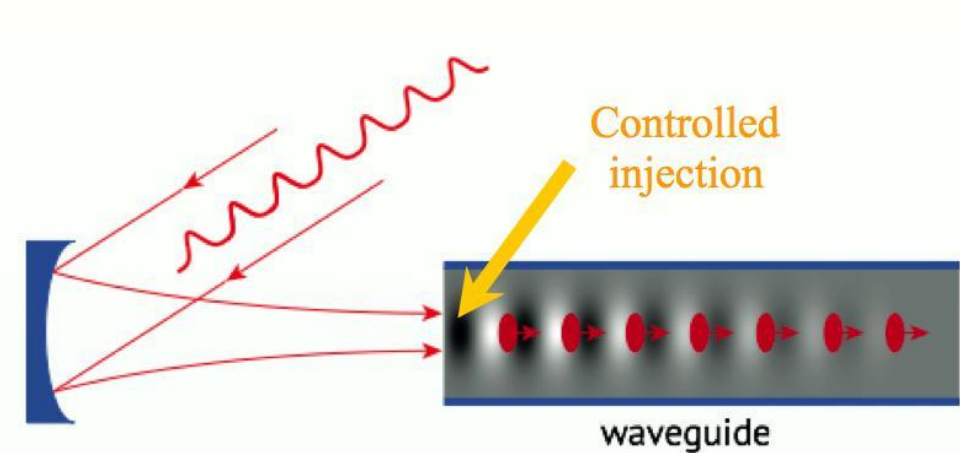


➤ Short Angstrom Pulsed Photon for Innovative Research SAPPHIRE



- Normal conducting S-band (C-band) technology
- Photon Energy 12 keV (7-8 GeV electrons in ~800 m)
- Repetition rate 100-400 Hz
- <10 - 100 fs pulses with good emittance (<1 μm) and high peak charge (few kA)
- 10 pC – 1 nC bunches (exceeding 10^{12} photon per pulse at 12 keV)

Multi-pulse Laser Wakefield Acceleration (MP - LWFA)



- Advanced experience and expertise in OU and ICL
- High power lasers are available
- Consultation on the LWFA strategy is ongoing
- Accelerator Science Laboratory is being designed at OU

Accelerator Science Laboratory

Laser areas at 2nd floor including area for R&D on promising alternatives of next gen laser technology

Dedicated experimental user areas for electron based work (gas target)

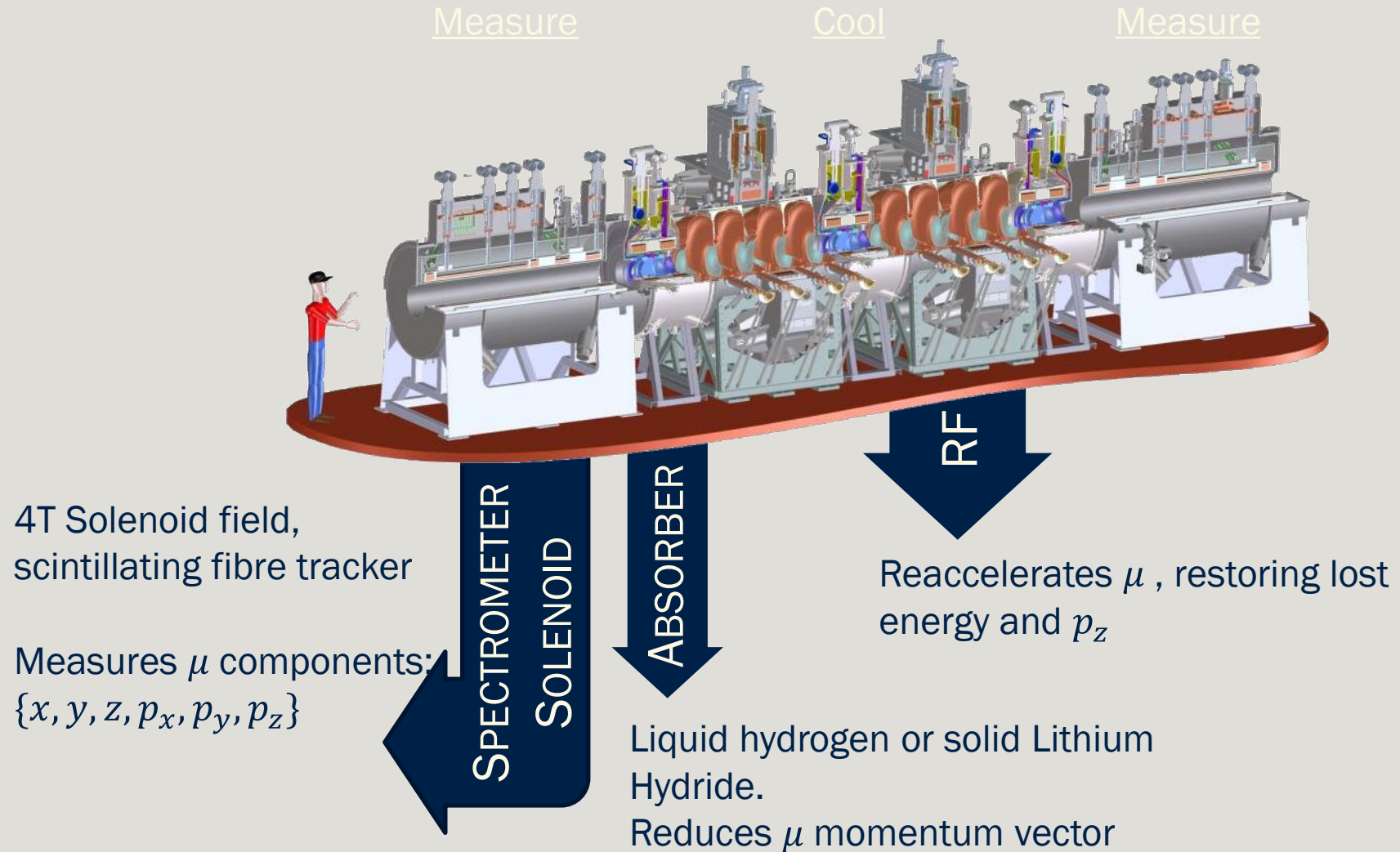
Dedicated area for innovation and campus exploitation

Dedicated experimental user area for ion / proton / neutron (solid target) work

Design and layout: CLF

Community consultations have shown that creation of this facility is strongly supported by the community

Muon Ionization Cooling Experiment (MICE)



- **High Luminosity LHC upgrade**
 - Advanced Beam Optics Studies
 - Collimation studies
 - SPS head-tail monitors
 - Electro-optic BPMs
 - Cherenkov radiation bunch length and position monitor
- **Front-End-Test-Stand (FETS) – H⁻ facility**
 - Ion source
 - RFQ
 - Beam diagnostics
- **Linac4 – injector upgrade for HL-LHC**
 - Beam position monitors
 - Laser-Wire transverse emittance scanner
- **Medical accelerators**
 - Compact accelerators for medical applications
 - Low and medium energy beam transport lines

Future plans and directions

- Future Linear Collider projects
- Engage into the FCC project
 - European strategy – CERN led efforts
 - CDR and cost by 2018
- Advance Laser Plasma acceleration technology
- MICE experiment
- Spallation sources (ISIS, ESS)
- Diamond and other light sources
- Closer collaboration with RAL, ASTEC, and Cockroft Institute