

Linac Test Facility

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# Facilities for Beam Testing of Accelerator Components

Anthony Gleeson

# Who are STFC?

- The Science & Technology Facilities Council (STFC) is one of the research bodies which make up UK Research and Innovation (UKRI)
- STFC provides the 'Big Science' infrastructure which is uneconomic for individual academic or industrial parties to establish and operate
- Our facilities across the UK and overseas support fundamental research in astronomy, physics, computation and space science
- We use our facilities, technology and skills to the benefit of academia, society and industry
- We are the perfect neutral space where academia, industry partners and the national laboratories can collaborate.



**UK Research  
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Astronomy Technology Centre



Daresbury Laboratory



Chilbolton Observatory



Boulby Underground Laboratory

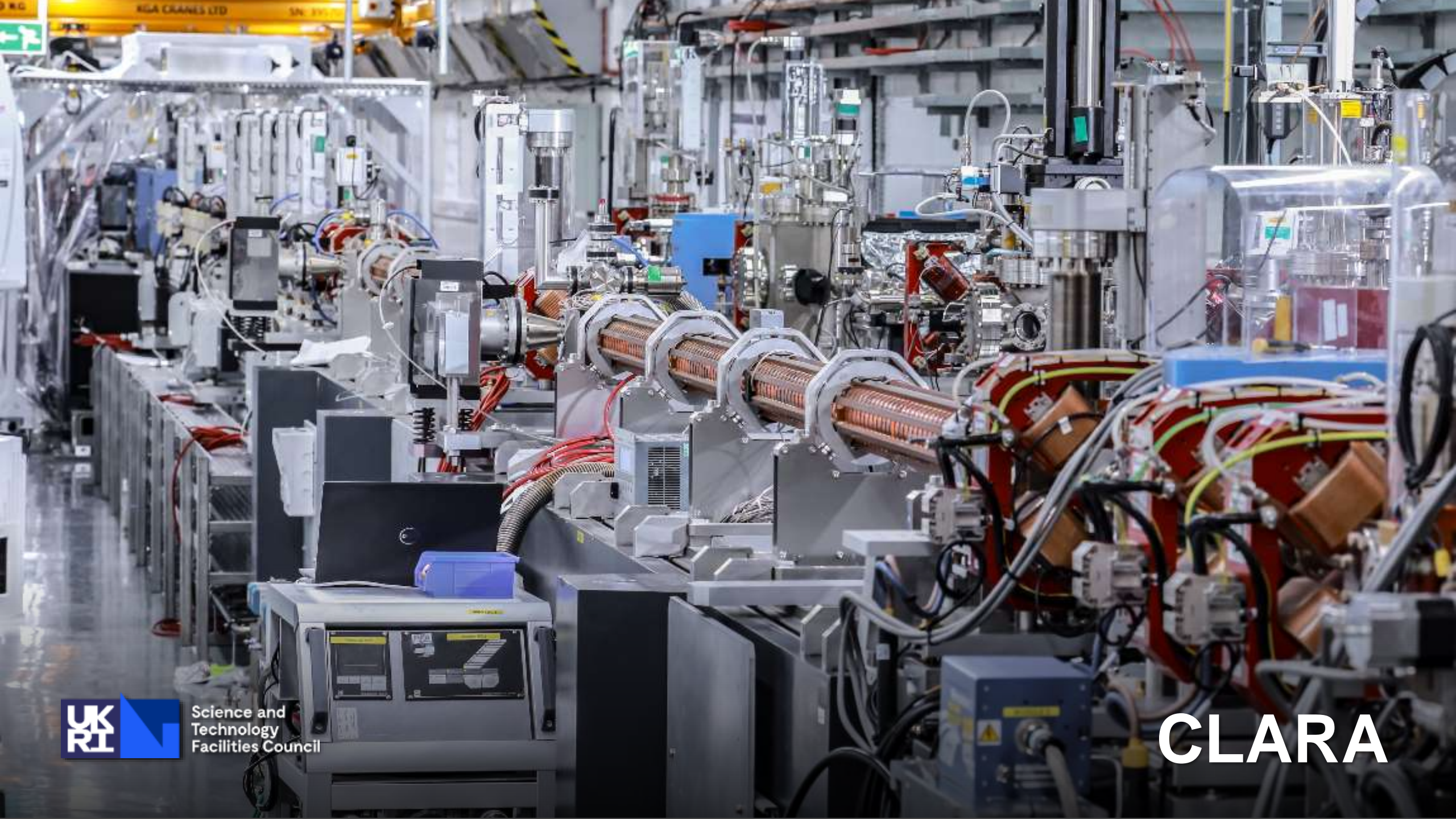


Rutherford Appleton Laboratory



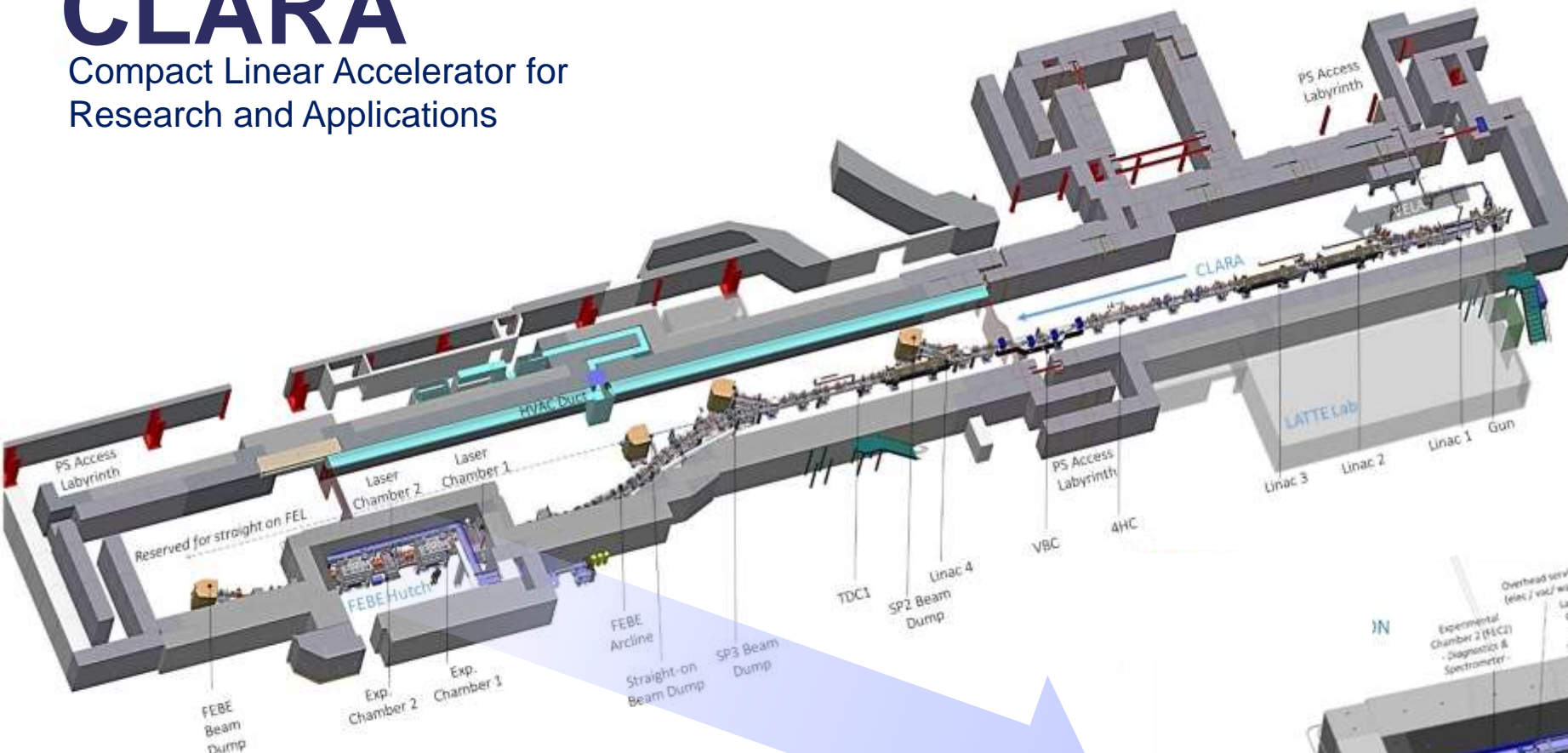
# Beam Testing of Accelerator Components

- Two STFC beam testing facilities covered by the AMICI – iFAST programme described in this presentation:
  - **CLARA**
  - **Compact Linac**
- In the case of both facilities, radiation hardness testing is not their primary purpose
- Useful tools for validating in-service, at-energy performance and lifetime (e.g. accelerated ageing)
- STFC has access to additional user facilities for further beam testing of components (outside the scope AMICI-iFAST) including the Diamond Light Source synchrotron test beamline, the ISIS neutron spallation source ChipIr and ENGIN-X beamlines and low energy EBeam industrial processing facilities



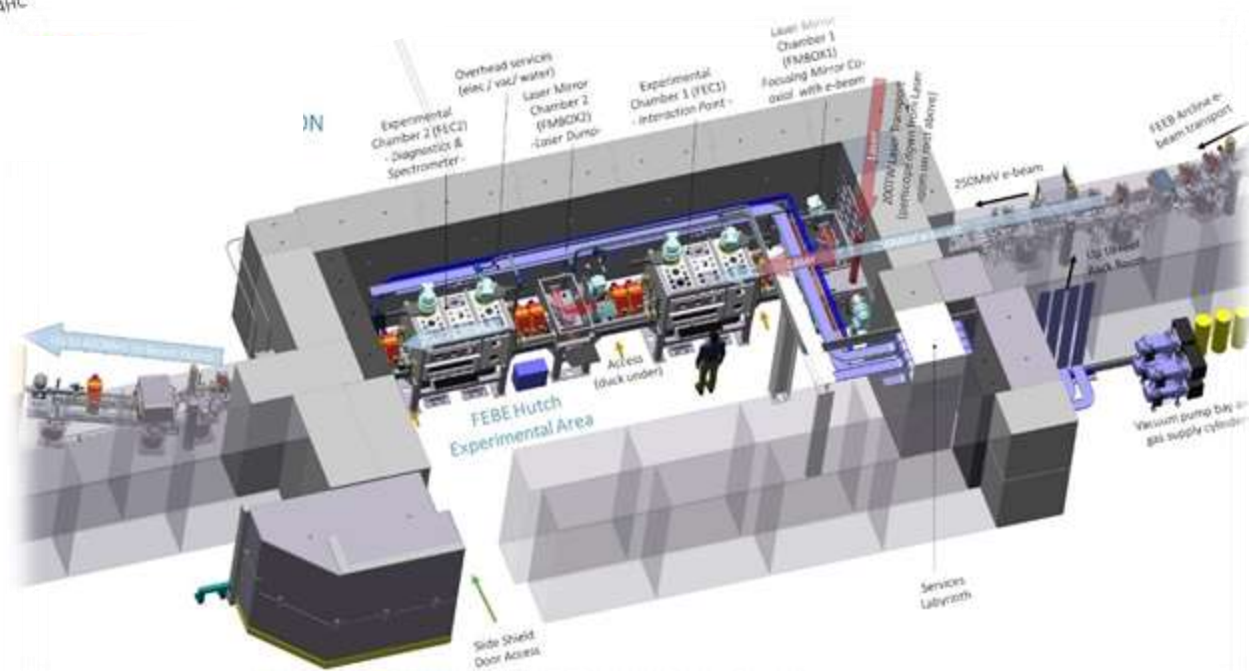
# CLARA

Compact Linear Accelerator for Research and Applications



# FEBE

Full Energy Beam Exploitation



# CLARA

- CLARA is a high brightness 250 MeV electron test facility addressing many scientific and technology challenges for future large scale facilities
- Flexible test facility to demonstrate novel concepts
- Straight-on space (Phase 3) is retained for accelerator technology R&D in support of UK XFEL
- 1.5-cell S-band 400Hz High Repetition Rate Gun (HRRG) designed by STFC/CI/INR collaboration
- Access possible to the Accelerator Hall, enabling extended parallel/ series/ substitution testing of components and sub systems (e.g. Zepto magnets)
- Also used for product testing of high-energy electron beam diagnostics



# CLARA (FEBE)

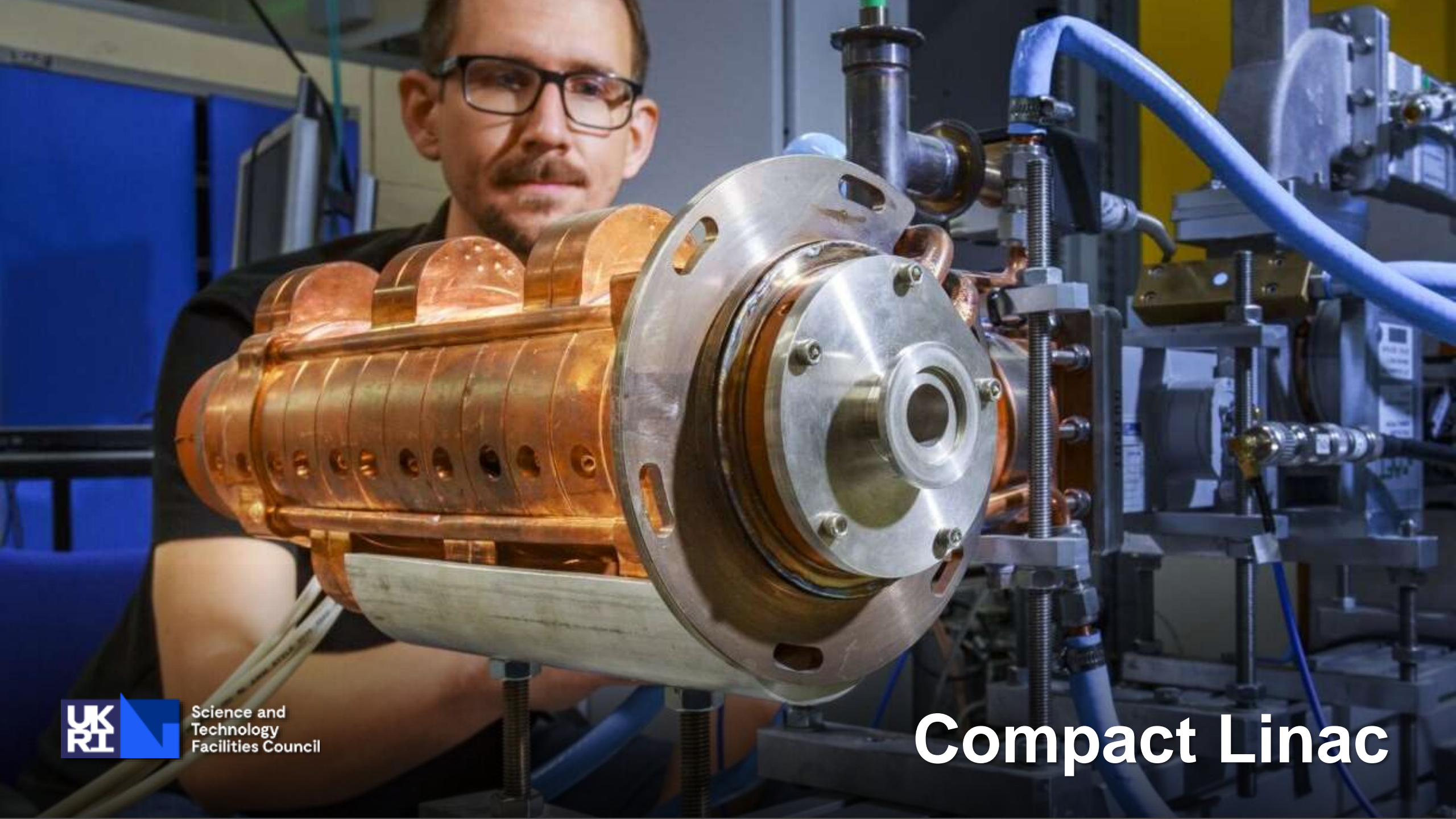
- Two identical chambers interaction chambers provide flexibility and will accommodate large components
- Full exploitation programme expected to start Q4 2024/ Q1 2025, with trans-national access enabled through EURO-LABS
- 250 MeV ideal for VHEE and FLASH oncology?

'Day 1' → Nominal → R&D

Parameter	High charge	Low charge
Energy [MeV]	250	250
Charge [pC]	250	5
RMS t [fs]	100 (50)	50 ( $\leq 50$ )
$\sigma_E/E$ [%]	<5 (1)	<1 (<1)
RMS x [ $\mu\text{m}$ ]	100 (50)	20 (1)
RMS y [ $\mu\text{m}$ ]	100 (50)	20 (1)





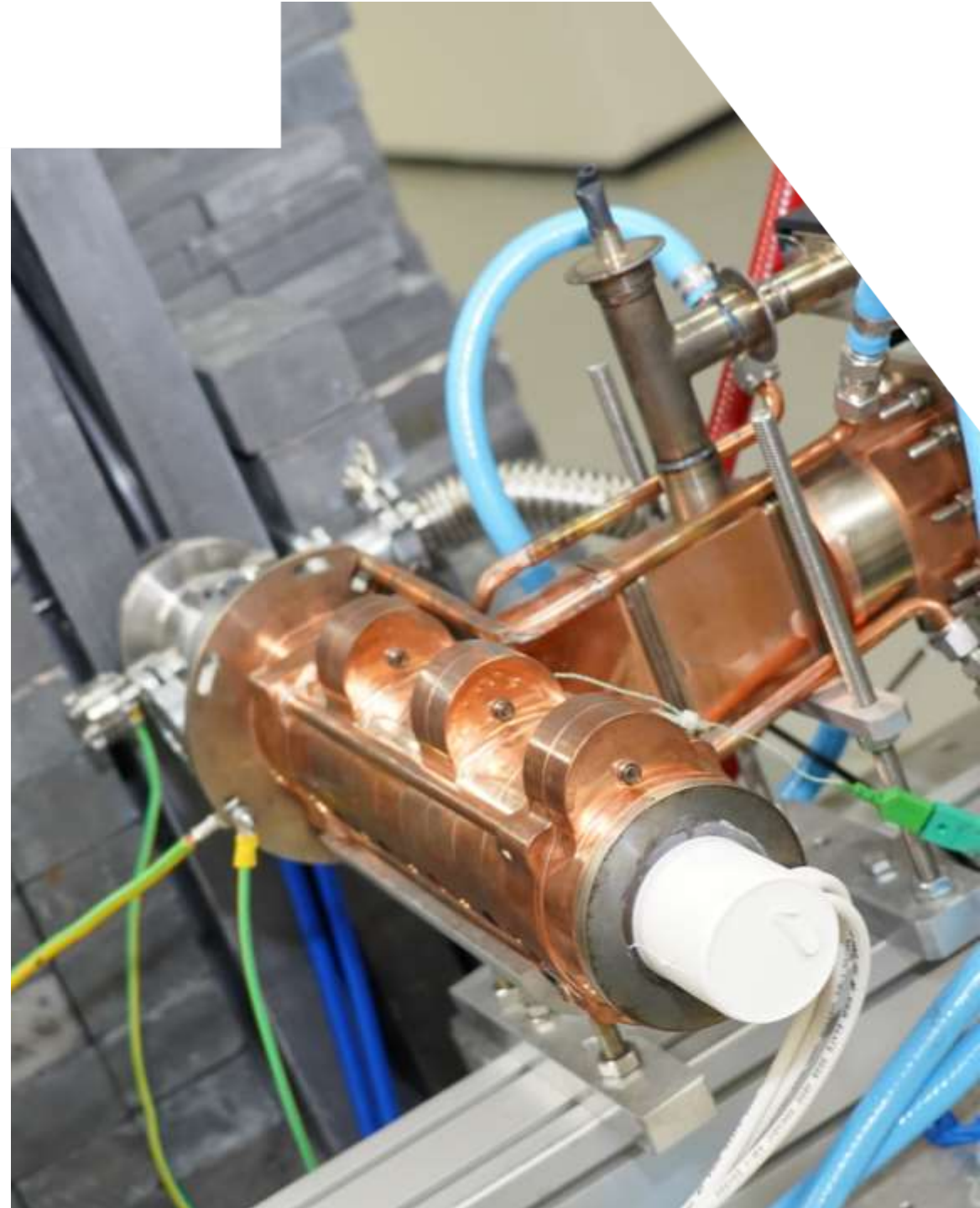


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# Compact Linac

# Compact Linac

- A highly modular, configurable 6 MeV electron linac system to support component development for societal applications (e.g. health, security, environmental)
- Up to 400 Hz repetition rate, pulse peak beam current up to 240mA
- Dosimetry and test objects/phantoms to support qualification, calibration and product acceptance testing
- Used for testing of prototype scintillator detectors, data acquisition electronics and advanced beam diagnostics in representative in-service radiation environments



iFAST

Thank you. Questions?

Anthony Gleeson

[anthony.gleeson@stfc.ac.uk](mailto:anthony.gleeson@stfc.ac.uk)

+44 (0)7590 450 356



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