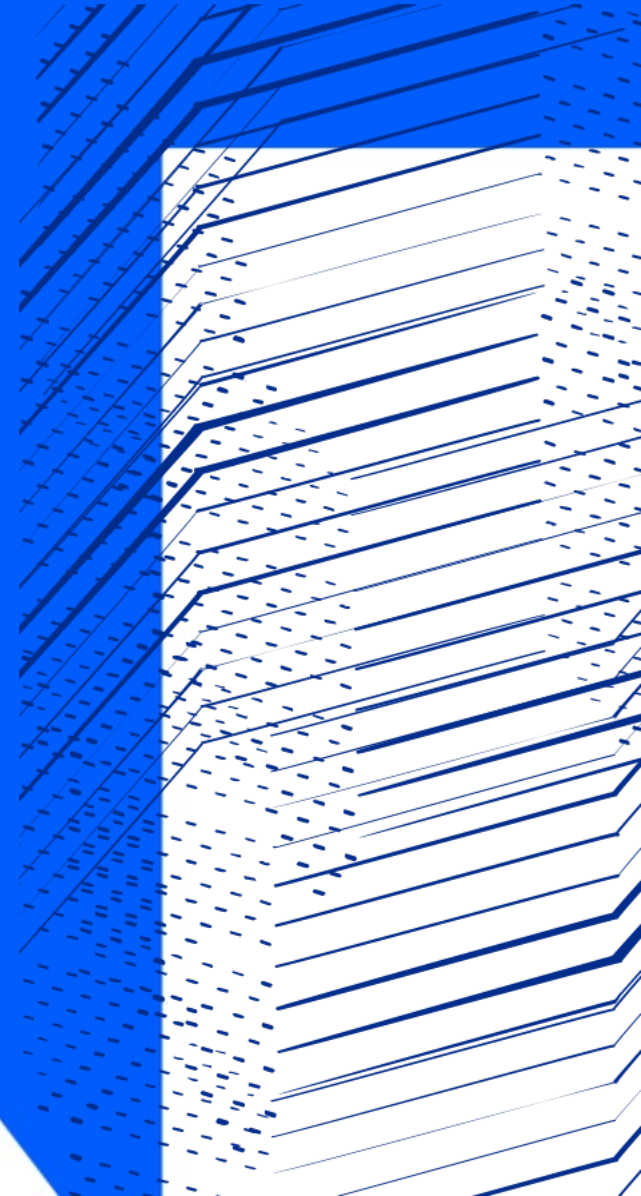




Science and
Technology
Facilities Council

CLF and the Extreme Photonics Innovation Centre (EPIC)

John Collier *for* Rajeev Pattathil



Built on a long-standing collaboration



- Built on decades of scientific collaboration
- Funded through Newton-Bhabha programme, involving UK and Indian universities since 2015
- Workshops held in India, exploring the potential of laser-driven sources for therapy, diagnosis and biomedical imaging
- A strong interest to establish a joint centre for translational research
- A *pilot programme* in 2017: UK Science minister announces a joint innovation project between CLF and Tata Institute of Fundamental Research (TIFR)
- Joint development of control systems for next-generation high power lasers



EPIC - Summary

- £4.03M over 5 years, funded by UKRI Fund for International Collaboration (FIC) programme - (£2.5M to India, £1.5M in the UK)
- £1.1M in-kind contribution from TIFR / DAE
- Establishing a Joint Innovation Centre at TIFR, Hyderabad, India. TIFR will recruit 20-25 scientists/engineers, provide lab-space, management, access to lasers
- Formally inaugurated in September 2019
- Staff hired in India will be trained in the UK



India-UK innovation centre to come up at TIFR

Centre to develop cutting edge technologies for industrial and biomedical applications

SPECIAL CORRESPONDENT
HYDERABAD

A joint India-UK innovation centre that will develop cutting edge technologies for laser-driven accelerators for industrial and biomedical applications will come up at the Tata Institute of Fundamental Research (TIFR) in Hyderabad.

Mark Thompson, who led a high-level delegation from UK Research and Innovation's (UKRI) Science and Technology Facilities Council (STFC) to TIFR, said this on Thursday.

The delegation came to TIFR to further explore ways to strengthen the links between UK and Indian academia, particularly between TIFR and STFC.

The visit is in the back-

nounced large-scale India-UK scientific partnership funded by UKRI, the Extreme Photonics Innovation Centre (EPIC) at TIFR.

Fresh technologies

Under the new innovation programme, EPIC would bring together laser scientists and engineers from both countries to develop fresh technologies that will have the potential to boost their economies.

A second delegation comprising Vice-Chancellors of 20 universities in the UK and led by Prof Steve Smith, Vice-Chancellor, University of Exeter, also visited TIFR on Thursday.

The delegates interacted with V. Chandrasekhar, Centre Director, TIFR, San-



Mark Thompson, head of the delegation from UK

Mumbai, and researchers from TIFR, IIT, University of Hyderabad and Department of Atomic Energy.

Prof. Thompson said that the innovation collaboration started with the UK Science Minister announcing a joint innovation project between Central Laser Facility (CLF),

UK, and TIFR in 2017.

He and other delegates, during their interaction with TIFR professors, stressed on how the success of previous academic collaborations between UKRI and TIFR had set the stage for further projects. A few success stories include "Mimicking star sounds in the laboratory" and studying "faster than light electrons in glasses".

Steve Smith, chair of UK delegation of Vice-Chancellors, highlighted the value of starting with an academic collaboration that has led to a "significant increase in the citation index of collaborative papers".

According to UKRI India based at the British High Commission, New Delhi, Research and innovation cooperation between UKRI and

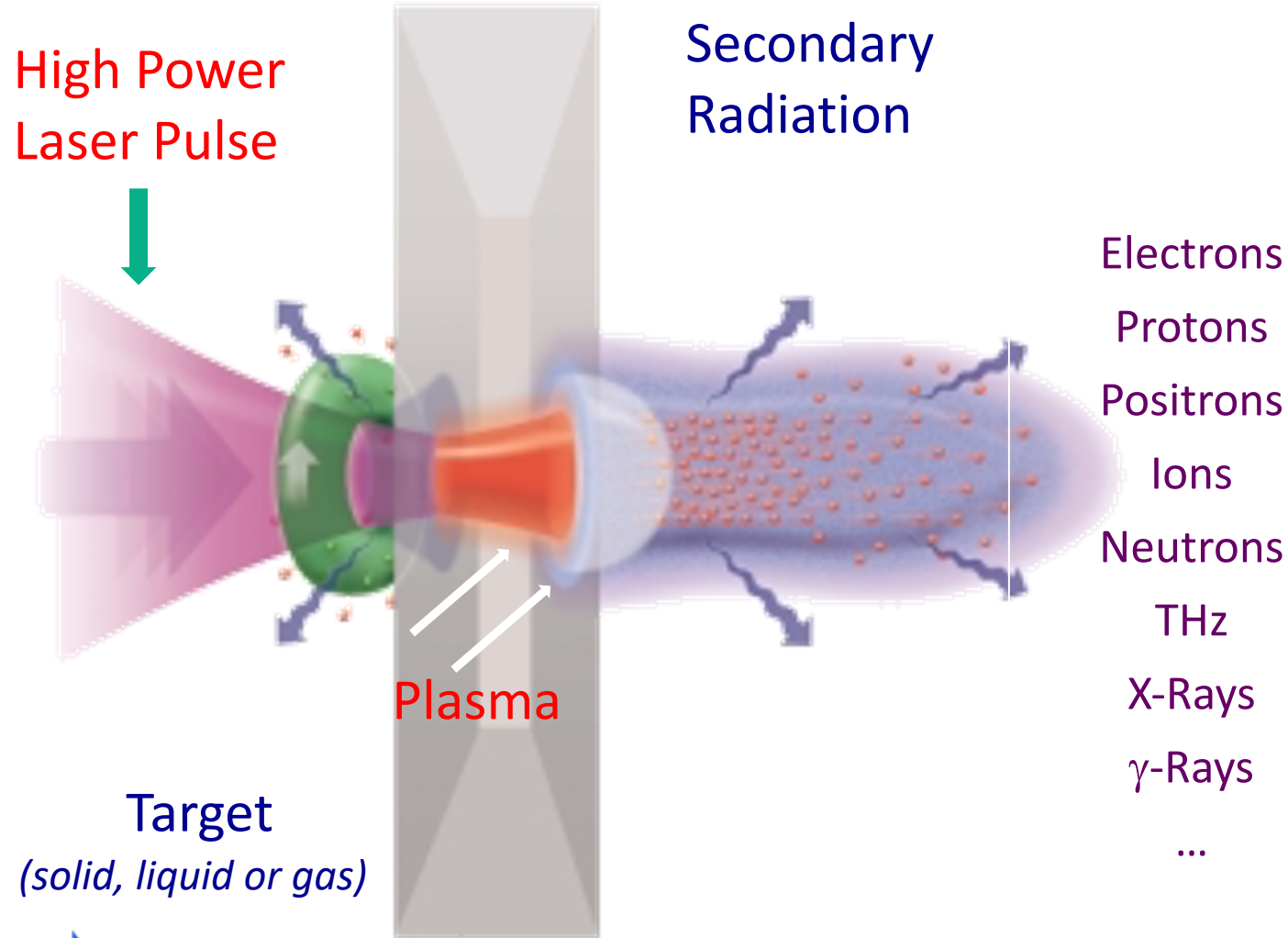
India had risen from less than £1 million to over £300 million since the UK research funders established a dedicated office in India in 2008 (then Research Councils UK).

UKRI has partnered with India with programmes spanning disciplines and cutting edge interdisciplinary research, managed through joint decision-making, and involving 200 individual projects, with over 175 different UK and Indian research institutions and more than 100 industry partners.

UKRI is by far the largest delivery partner in India for the Newton-Bhabha programme, with over £150 million worth of joint investment facilitated since the start of this fund, the visiting delegates said.

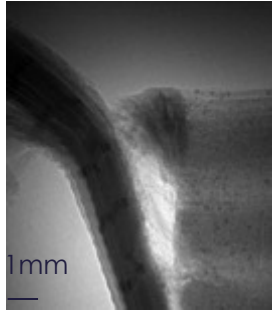


Science behind EPIC: Innovation potential of laser-driven accelerators

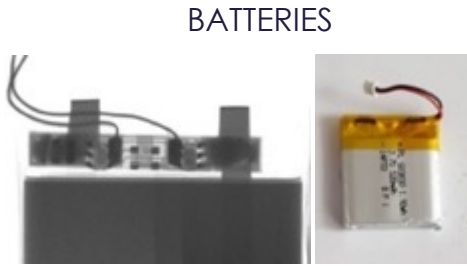


- The secondary radiation produced has unique, non-conventional properties
- Super bright, energetic & penetrating
- Point-like in space and time
- Change radiation by target type, not driver
- Switch-off safe

Proof of concept experiments show their innovation potential in biological and industrial imaging



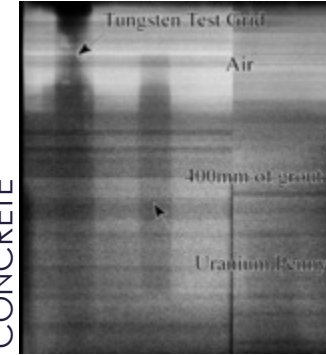
COMPOSITES



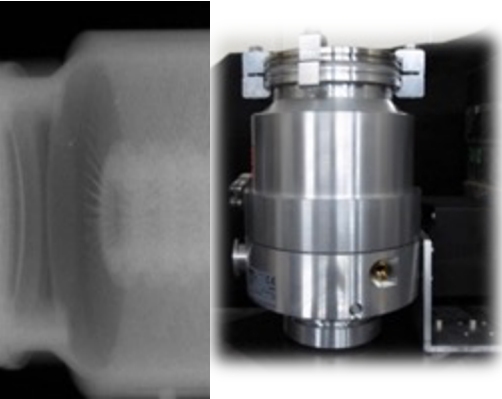
BATTERIES



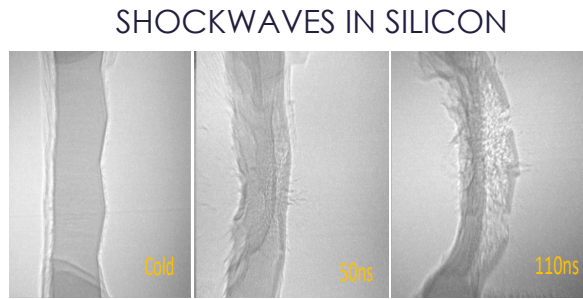
TITANIUM



URANIUM IN CONCRETE



42,000 RPM ALUMINIUM BLADES



SHOCKWAVES IN SILICON



BIOLOGICAL

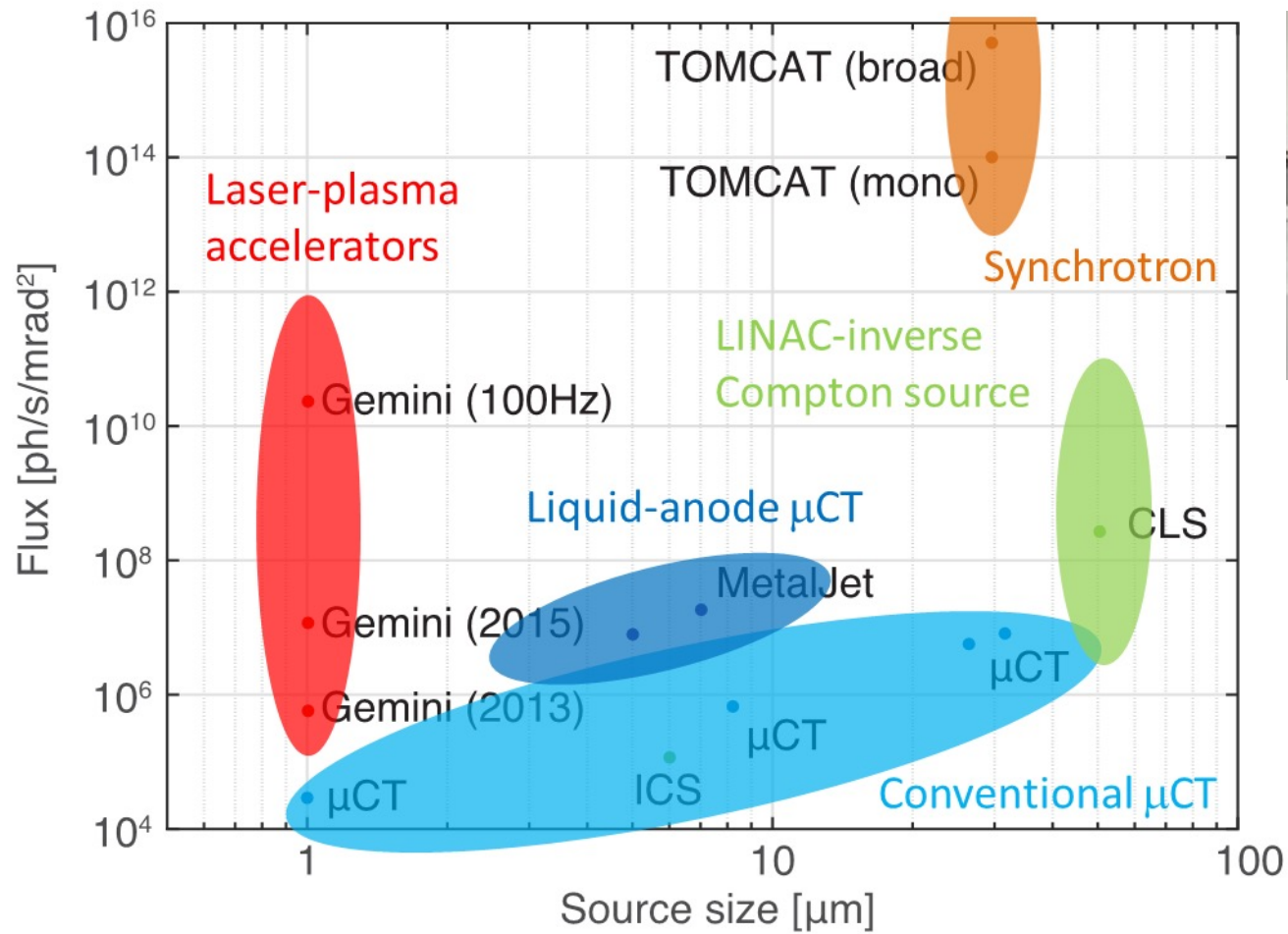


Increase in scan speed without degradation in performance

High resolution through large and dense objects

High resolution dynamic capture

Next generation laser technologies can enable μ CT scans in minutes



DiPOLE100

Laser sources maintain μ m-source size as average power is increased

New laser centres in the UK and India can exploit this

- Extreme Photonics Applications Centre (EPAC) – an £82M centre for development and applications of laser-driven accelerators and sources in academia, industry, medicine, security etc. – online 2025
- SCAPA @ Strathclyde for applications
- LWFA driven beams at 1PW, 10Hz: Up to 10GeV beams, x-rays
- TRISHUL @ TIFR Hyderabad Campus to come up in a few years time too – recently announced by the DAE Chairman

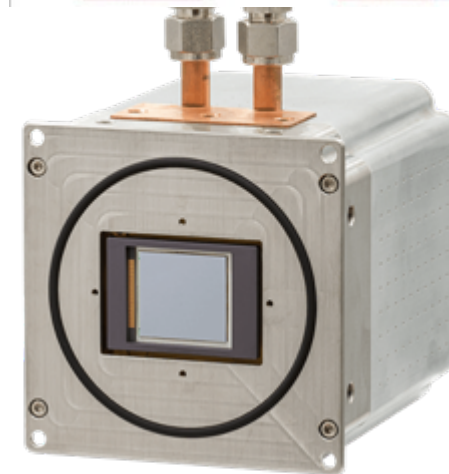
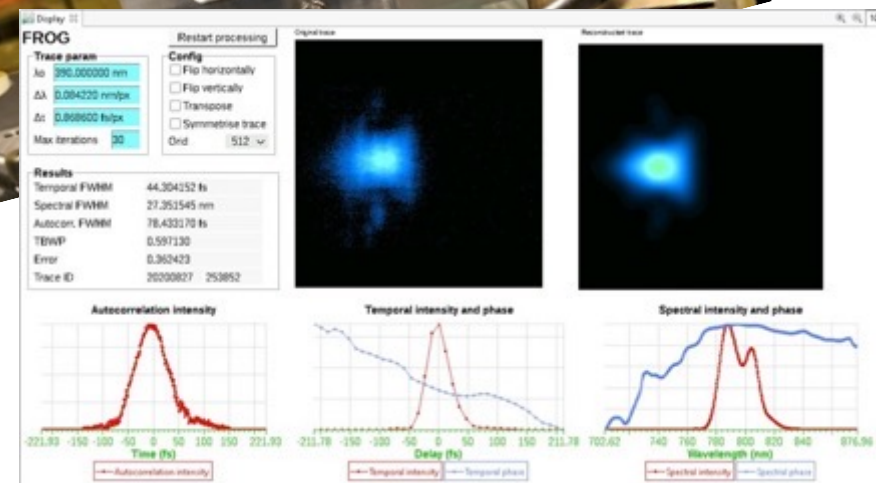
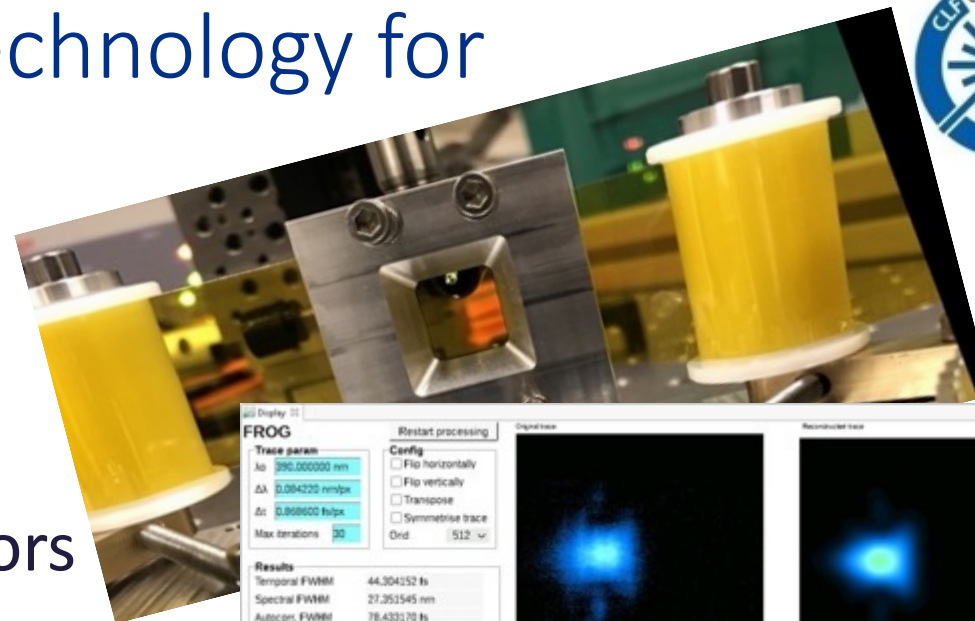


EPIC will jointly develop ancillary technology for laser-driven accelerators



Key areas

- High rep-rate targetry / plasma mirrors / target positioning systems
- High rep-rate particle and radiation detectors
- Control system solutions for laser-driven accelerators
- Design and manufacture of key opto-mechanics, vacuum systems and EMP-resistant drive systems
- High volume data analysis packages including CT



EPIC could be a model for future collaborations



- Mechanism was efficient and relatively quick to establish on both sides
- Clear bi-lateral benefit
- Collaboration is expanding beyond the initial partners
- In terms of specifics for CLF / EPIC and LIGO-India, potentially
 - Precision Optomechanics
 - Automated control
 - Vacuum infrastructures
 - Data management