



Torbay Hi-Tech Cluster

Headquartered at:

EPIC
Whiterock Business Park
Paignton, Devon,
TQ4 7RZ, UK

Tel: +44 (0)1803 714 714

Email: epic@tda.uk.net

www.epic-centre.co.uk

TORBAY & THE SOUTH WEST

**PHOTONICS AND
MICROELECTRONICS**

A FAST GROWING - GLOBAL CLUSTER



CONTENTS

7 BACKGROUND

The legacy and history over the decades of microelectronics and photonics in our region.

11 CAPABILITY & TECHNOLOGY

Learn about the deep expertise and technical capability that exists in our area in many technologies, enabling new product design and development.

15 THE EPIC CENTRE

Provides your company with a turn-key premises solution with access to prototyping capability, microscopy & analysis and a Class 7 cleanroom. The home of the Torbay Hi-Tech Cluster.

19 TORBAY HI-TECH CLUSTER

An overview of the leading industry group in photonics and microelectronics in the Heart of the South West.

22 CASE STUDIES

See how our leading multinational photonics and microelectronics companies have invested and grown here.

25 WHY RELOCATE?

Useful information about support and finance available to establish and grow a technology business in the Heart of the South West.

27 CONNECTIVITY

Useful information demonstrating easy connectivity across the UK, Europe and beyond.

FOREWORD



Torbay and the surrounding region offers a wealth of collaboration opportunities for businesses in the microelectronics and photonics sectors. As Chair of the Cluster, my aim is to ensure that the area is renowned for technology and innovation.

A message from our Chair

The The Hi-Tech community in Torbay goes from strength-to-strength. Two years ago, in the midst of the pandemic, my company, Bay Photonics, had just moved into the Electronics & Photonics Innovation Centre (EPIC), home of the Hi-Tech Cluster, and having only been open for 1 year, the centre was at around 30% occupancy. However, it was the reliance on the type of technologies developed and manufactured right here in the Bay, such as Global Navigation Satellite System (GNSS) and telecommunications technology, that kept the globe turning. Government, business, education, health systems and logistics kept functioning and while we know that in many cases, nothing beats face-to-face interaction, we also accept

that there is now a permanent place for remote working. The environment benefits too, as we have learned that some meetings function well remotely, particularly those involving participants dispersed across the county, country, or indeed the globe.

As a result, Torbay's Hi-Tech Cluster members fared better than many companies in other sectors during the last two years and now, in the 2nd half of 2022, the occupancy of the EPIC centre stands at 85% and many EPIC tenants have grown, renting additional space. National and international companies have been attracted to Torbay because we had the foresight to create this EPIC facility, in which companies have access to world leading manufacturing

equipment in a building with excellent office, laboratory, and manufacturing space. But it is not just a case of "... build it and they will come...", the Hi-Tech heritage in Torbay runs deep and we have a highly skilled workforce with vast experience in semiconductor technology, photonics and micro-electronics.

Our ambition does not stop at attracting inward investment into the Bay - we want to grow our own talent and the Hi-Tech Cluster membership has been instrumental in developing educational modules in collaboration with South Devon College (SDC), focussed on the skills required for local Hi-Tech companies. Indeed, as Chair of the Hi-Tech Cluster, I am proud to say that our membership has been generous in providing equipment for the brand-new Kao/Hockham training suite located in the SDCs Hi-Tech & Digital Centre, course material for the various modules as well as teaching support in the delivery of the learning modules. Our membership has also been extremely active in supporting STEM activities across the Bay, and I have had the pleasure of explaining to year 7 students that we actually build lasers in the Bay (and why)!

Local promotion of our cluster has been high on the agenda over the last couple of years as for many local people the big surprise of Torbay is that it's home to a growing number of amazing tech businesses scattered across the glorious natural environment and we are participating in the "Our Torbay Story" movement, promoting "Tech by the Bay", why wouldn't you want to

check emails at ease under cloudless skies, surf by the sea not on it or meet by the marina; now that is living and working the dream! Nationally, the Hi-Tech cluster contributed evidence to the Business, Energy and Industrial Strategy (BEIS) Committee inquiry into the state of the semiconductor industry in the UK. Semiconductor materials are essential in electronics and photonics, the best-known example is the computer processor or silicon "chip" found in everything from fridge freezers to airliners. In Torbay, we specialize in producing photonic chips, responsible for cloud-based data storage and information transfer, enabling global companies such as Apple, Google, TikTok, Amazon, Netflix, and Microsoft.

With the UK investing more money into developing Quantum Technologies for advanced computing and communication, our Hi-Tech companies are looking to gear up in order to benefit and grow from this investment. We are working with our local MP, Anthony Mangnall as well as the TDA, supporting a Torbay Council "Levelling Up" bid focussed on developing the successful fishing industry in Brixham and the microelectronics and photonics industry in Paignton. This combination might seem strange to some, but I think most people would agree that Torbay is, without doubt, the perfect home for "fish & chips"!

Dr Andrew Robertson

Bay Photonics and
Chair, Torbay Hi Tech Forum

BACKGROUND

Torbay and South Devon has a rich heritage in the microelectronics sector. The region has seen continued growth and development which makes it a lucrative hub for technology businesses.

Standard Telephones & Cables (STC) moved into the Long Road, Paignton site in the mid-1950s. Always at the leading-edge of communications technology, the company, by 1999 in its NORTEL form, employed over 5,000 people. The company was a key global hub during the dot.com revolution brought about by a critical advance in photonics, namely, the change from using copper cables for communication to optical fibre technology. Today, this technology forms the backbone of the information superhighway that drives the internet, enables fast video streaming and makes sure all our smart device apps work 24/7.



The future requirements for cloud-based computing, the Internet of Things, and autonomous vehicles means that telecommunications will continue to grow. The amount of data required to ensure safe, error-free navigation to allow use of autonomous vehicles on our highways will require constant advances in technology.

The old STC Long Road site is now the location of South Devon College, where today's breed of innovators are being trained in fantastic new facilities such as the newly opened Hi-Tech and

Digital Centre. The College works with local hi-tech companies and introduces apprenticeship schemes tailored to the sector. This collaboration has been key in retaining exceptional young talent in the area.

On an adjacent site, the Electronics & Photonics Innovation Centre (EPIC) was opened in 2019. Since opening in 2019, the Electronics and Photonics Innovation Centre (EPIC) has become the home to some of the region's most successful technology businesses and is approaching full occupancy.

1950s
Standard Telephones and Cables (STC) opens three divisions in their facility in Paignton. Products included: Electron Devices, Capacitors and Film Circuits.

1977
Sir Charles Kao, employee of STC, creates ground-breaking fibre optic link.

G&H
1985
SIFAM sets up in Torquay to develop instruments and fused fibre couplers. They later became known as JDS Uniphase and to this day Gooch & Housego.

1986
STC sells its Tantalum division to AVX and become the Corporate HQ for Tantalum Capacitors.

1989
AVX & Kyocera merge.

1991
STC acquires Nortel, which later changes its name to Nortel Networks. The business employed over 5000 staff in its heyday.

spirent
1997
Nortel sells their STC Defence Systems division to Bowthorpe UK, later becoming GSS. The business is today known as Spirent.

2001
Major redundancies announced at Nortel Networks. Bookham Technologies acquires Optical Component division of Nortel and later merges with Avanex Corp, forming Oclaro.

bay photonics
2007
Alpha Contract Engineering formed. The business would later become Bay Photonics.

II-VI
2013
II-VI purchases a division of Oclaro to establish a II-VI presence in Paignton.

EFFECT
2014
EFFECT Photonics Ltd establishes in Brixham.

LUMENTUM
2018
Lumentum acquires Oclaro.

2019
South Devon Hi-Tech & Digital Centre opens.

epic
2019
£8M Electronics and Photonics Innovation Centre (EPIC) opens and becomes the home of the Torbay Hi-Tech Cluster.

queensgate
a brand of **PRIOR**
2019
Prior Scientific relocates Queensgate into EPIC becoming founding tenant.

PALOMAR
2019
Palomar Technologies opens UK demo facility in EPIC.

2020
EFFECT and Nanusens become first two foreign owned companies to join EPIC.

2021
Torbay Hi-Tech Cluster develop and launch first Photonics & Microelectronics technician training programme.

South Devon College
2022
Kao/Hockham Photonics Training Suite opens at the college. VTEC becomes 3rd foreign owned company to join EPIC.

2023
Work to commence on Photonics Production Park.

VALUE OF UK PHOTONICS SECTOR



£14.5bn
industry value to the
UK economy


Devon and Somerset

The Photonics and Microelectronics cluster in the area continues to grow quickly with investment in jobs, new product development, premises and facilities.

190
companies



76,700
people employed in the
UK across the sector



4,000
people employed

£6.5bn
Total Gross Value Added (GVA)



£85,400
GVA per employee



£725m
total turnover



5.8%
year on year growth



CAPABILITIES

Advanced photonic materials technologies including Indium Phosphide (InP), Gallium Arsenide (GaAs) and Complementary metal-oxide-semiconductor (CMOS), for Photonic Integrated Circuit (PIC) and Micro Electro-Mechanical Systems (MEMS) realisation.

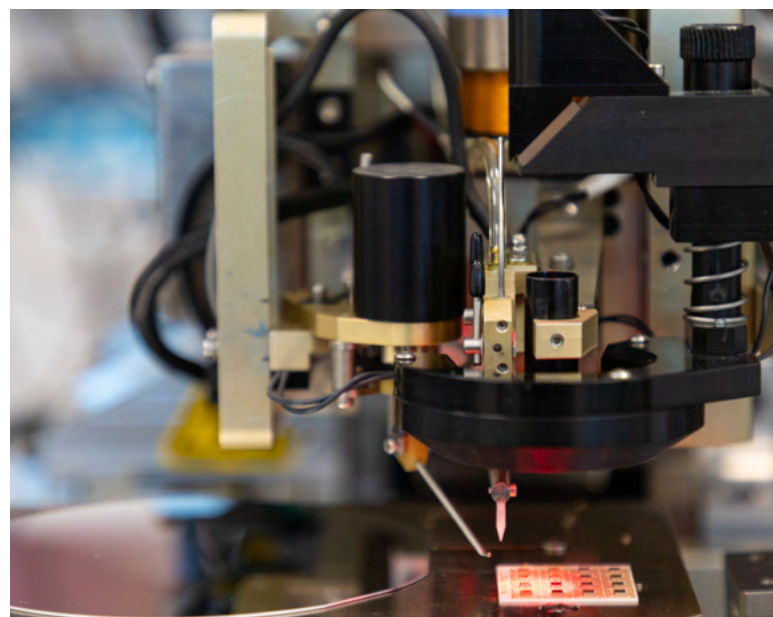
Advanced Complementary Metal-Oxide-Semiconductor (CMOS) materials technologies for micro-electronic Integrated Circuit (IC) and Micro Electro-Mechanical Systems (MEMS) realisation. Nano-positioning technologies with nano-meter resolutions and accuracies, including piezoelectric actuators for nano-positioning sensing and actuation.

Quantum Technologies, including Assembly and Packaging for secure communications, computational and positioning solutions.

Die Attach Technologies, including electronic integrated circuits and MEMS integrated circuit die attach, die bonders, thermo-sonic gold wire, epoxy and soft solder bonding processes.

Advanced Security Technologies, including hardware authentication, use behaviour analytics, data loss prevention, deep learning and cloud-based storage.

Space Communications Technologies, including free space photonic inter-satellite communications and sensing.



TECHNOLOGIES

Photonic Integrated Circuit (PIC) design, including high-speed tunable lasers, optical modulators, hi-sensitivity optical receivers, optical routing multiplexers, waveguides and add-drop filters, enabling the design and manufacture of highly integrated, high reliability Pluggable Photonic Transceivers for emerging and next-generation optical networks. Utilising lean hi-productivity photonic manufacturing capabilities for mass manufacture and global supply.

Micro Electro-Mechanical Systems (MEMS) technologies realising the amalgamation of microscopic mechanical devices with moving parts and micro-electronic circuits. MEMS design combined with MEMS engineering and manufacturing expertise realise micro-scaled systems which are now standard features in modern consumer mobile devices. MEMS accelerometers and gyros are combined with absolute positioning technologies, such as GNSS for user localisation and positioning, face recognition, and communications.

Manufacturers of precision nano-scale motion, automation, and optical measurement systems, sub-systems, and components, including microscope automation equipment with high precision motorized microscope stages. Piezo nano-positioning systems, motorised filter wheels, high-speed shutters, laser autofocus systems, custom and OEM electromechanical and optical systems, for nano-metric micro-chip inspection and surface analysis.

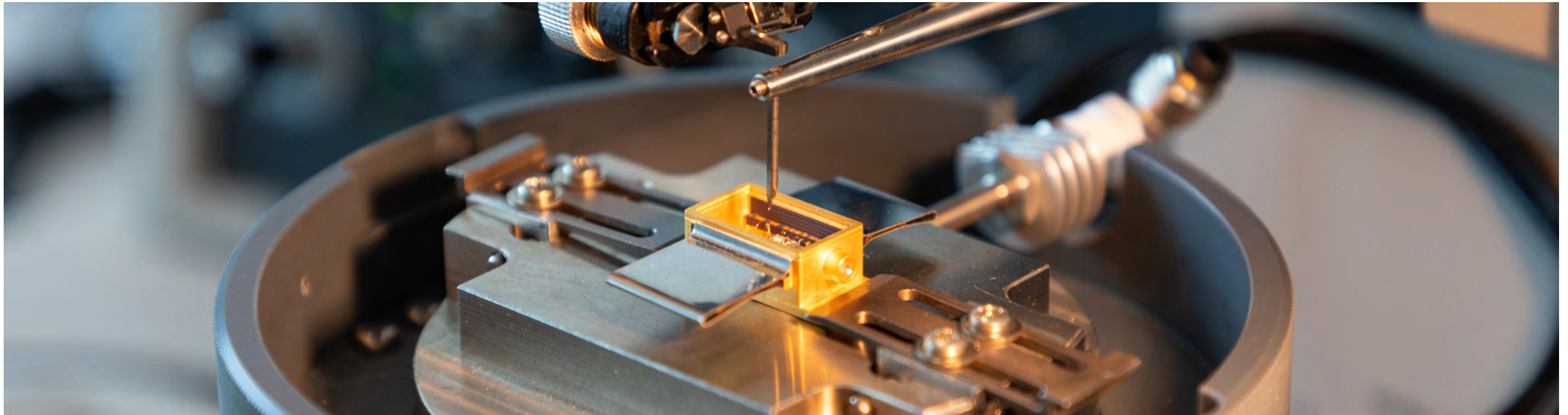
Quantum technology and packaging expertise is finding applications in secure communications, high sensitivity measurement methods including LIDAR (Light Detection and Ranging). As well as enabling enhanced computing power in navigation and timing systems, and healthcare imaging.

The advanced implementation of **micro-electronic integrated circuit die bonding** and assembly processes realises highly integrated multi-chip multi-functional systems with reduced physical size. These advanced processes are enablers in the realisation of high reliability, physically robust next-generation of portable communications devices including smart phones and GPS locations and positioning systems for terrestrial and space applications.

As society moves towards **data sharing** and cloud storage, the requirements for advanced security applications including hardware authentication, data loss prevention, user behaviour analytics becomes necessary to protect personal and corporate information.

Space and satellite instrumentation design and manufacture requires the realisation of hi-reliability, robust components and systems for Earth environment observation, astronomical exploration and inter-satellite communications in extreme operational environments.

RESEARCH & DEVELOPMENT



Research and Development (R&D) includes activities that companies undertake to innovate and introduce new products and services. It is often the first stage in the development process. R&D is therefore pertinent to businesses in microelectronics and photonics. The Torbay and the South West region is rife with technical capabilities, expertise and a vibrant supply chain to support R&D.

The cluster is involved with projects and collaboration with academia and national research centres from up and down the country. In fact, many of the region's businesses benefit from the breadth of talent that comes from two excellent universities in Exeter and Plymouth.

EXETER UNIVERSITY

Exeter University offers a number of relevant photonics graduate courses as well as PhD courses through the internationally renowned Centre for Doctoral Training (CDT) in metamaterials.



UNIVERSITY OF PLYMOUTH

The University of Plymouth offers a range of photonics and microelectronics courses and welcomes links with businesses in the region to bring them a wealth of specialist technical support and expertise - from student projects, internships, and graduate roles to collaborative research opportunities.

Its Plymouth Electron Microscopy Centre and the Wolfson Nanomaterials and Devices Laboratory are just some of their world-class facilities that are fully equipped for the exploration of leading-edge science and technology.

EPIC

Electronics & Photonics Innovation Centre

ABOUT EPIC

EPIC is the technology hub of the South West. The centre hosts some of the region's most innovative microelectronics, photonics and software companies. This encourages collaboration between these organisations and supports growth.

With 25,000 sq. ft. of lettable space, EPIC provides an array of flexible space to both start-up and established businesses. In recent years, EPIC has also seen an influx of foreign-owned companies who have chosen Torbay as their UK HQ or R&D lab.



WHAT'S ON OFFER

The centre has modern offices and laboratories to let. The flexibility of EPIC enables businesses to start small and then grow into larger or multiple units. EPIC offers tenants access to a fully classified Cleanroom and a wide variety of shared spaces including boardrooms and other conference facilities. The concept of EPIC is therefore for businesses to let the space they need but to fully utilise the services of the wider centre to improve the offer to their staff and customers.

TECHNICAL CAPABILITY

EPIC tenants have access to >£2.5M worth of prototyping equipment to increase their technical capability. This provides access to technology that smaller businesses wouldn't have ordinarily been able to purchase (or justify) in their own right.

Current capabilities include:

- Die, Wire, Ball Bonding
- Bond Testing
- Automated Visual Measuring (VMS)
- Scanning Electron Microscopy (SEM)
- Plasma Cleaning
- Environmental Simulation
- Product Storage
- Photonics Packaging
- Alignment
- Design Software and 3D Printing

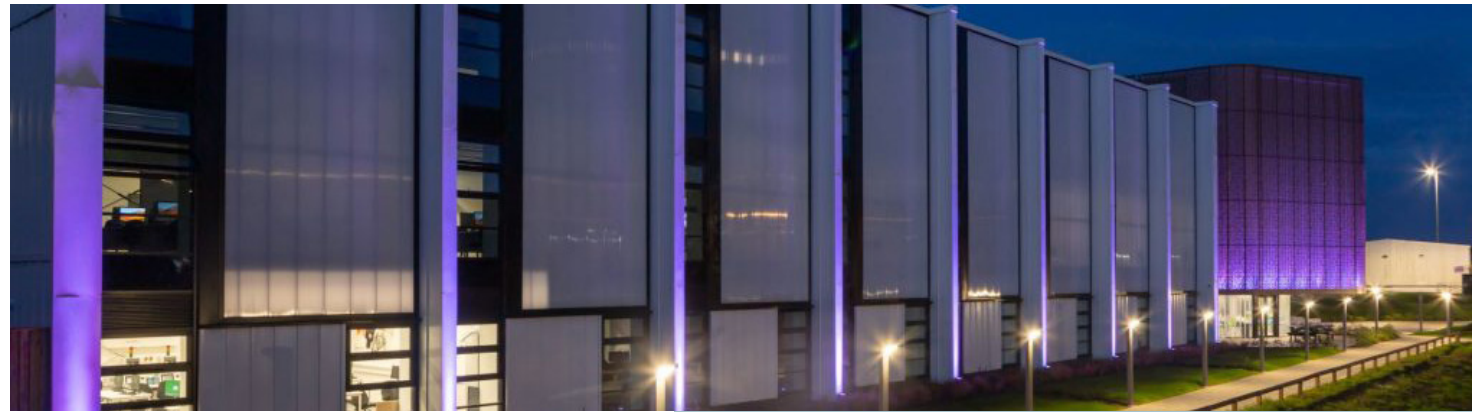
WHAT EPIC BUSINESSES SAY

"We have been looking for a facility like EPIC for 20 years. This is exactly what we needed. VTEC is very excited about collaborating with the businesses here and becoming a part of the EPIC Community."

Jan Mink – VTEC (Netherlands)



THE HI TECH & DIGITAL CENTRE



A FACILITY FOR THE FUTURE

Adjacent to EPIC lies another important asset for the local hi-tech cluster. The Hi Tech & Digital Centre is part of South Devon College and University Centre South Devon and offers training facilities that will produce the skills needed to support future growth of the cluster. The inside of the building fulfils the vision of the minds behind it, with many large and open collaborative spaces that encourage interaction across different subject areas.

A range of subjects are offered from essential entry skills to higher level skills across full-time courses apprenticeships, degree level course and employer responsive training packages. Training offers and packages are developed from Hi Tech and Digital subjects including; engineering, marine engineering and manufacturing, computing, art, interactive and graphic design illustration, film and photography, app and games development, leadership and project management and business.

PHOTONICS AND OPTICAL ELECTRONICS TRAINING

The Photonics and Optical electronics training offer is a co-designed, high quality technical and professional suite of courses aimed at meeting the current local and regional needs.

Many of the courses are delivered in the Kao/Hockham Electronic and Photonics Training suite which was opened by Anthony Mangnall MP (Co-Chair of the Photonics and Quantum All Party Parliamentary Group) on 5th May 2022.

Example courses include:

- FdSc Engineering (Photonics and Optical Electronics) degree
- Level 5 Photonics Systems Short Course
- Photonics systems design and simulation
- Die and wire bonding
- Military standard visual and destruct testing
- Lens and fibre alignment
- Fibre handling and splicing
- Lidding

OTHER FACILITIES

PARC

Located in North Devon for nearly 20 years, PARC Ltd has provided a range of environmental testing services to assess a product's reliability, and to ensure that the product survives in its working environment.



EXETER SCIENCE PARK

Exeter Science Park is the result of a vision to develop a science park in the South West of the UK to stimulate a knowledge-based economy delivering better jobs, higher productivity and economic growth.

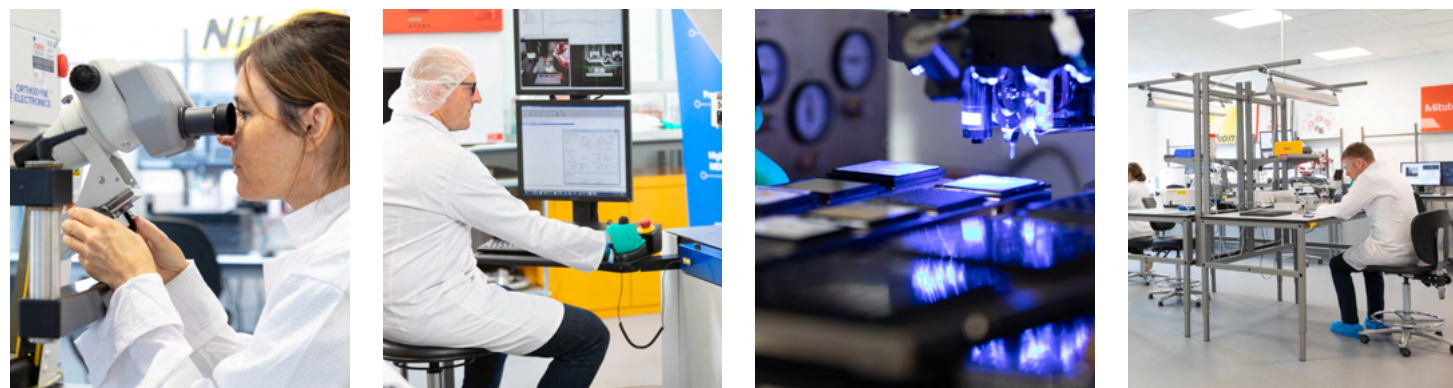


PLYMOUTH MICROSCOPY CENTRE

This facility offers a comprehensive range of light microscopes, electron microscopes, imaging processing and analysis software, providing support to a range of disciplines within Plymouth University, external research organisations and industry clients.

This equipment is integrated with sophisticated software for image analysis, image processing and x-ray characterisation of materials, with facilities for rapid report generation.

Torbay is an internationally recognised region for R&D, product design and manufacturing in hi-tech photonics & micro-electronics. It has world-leading companies, highly motivated and experienced employees and excellent access to markets.



PUTTING TORBAY ON THE MAP

Global leaders in technology like Lumentum, Gooch & Housego, Spirent, Queensgate (Prior Scientific), Effect Photonics and II-VI Photonics are all located in Torbay.

These companies are committed to major ongoing investment in the region. Alongside these are other specialised companies in photonics integrated circuits (PIC) packaging such as Bay Photonics, as well as providers of software & firmware. This has cemented our reputation as one of the UK's most vibrant microelectronics and photonics clusters.

The Cluster is also represented at various International tradeshow including Photonics West, Photonex, PIC International, ECOC and TOP Conference.

“There are multiple world leading microelectronics and photonics organisations operating within our vibrant cluster.

Dr Philip Mitchell

(Lumentum) Vice Chair, Torbay Hi-Tech Cluster



The South West, particularly Torbay, has for decades been a location of expertise in the development of robust and resilient components for telecommunications and consumer electronics. Driven by the internet of things and our demand for high speed connectivity, the global demand is huge. The future growth prospects of the South West photonics and microelectronics industry are immense and vital for growing the UK communications supply chain.

Dr John Lincoln CEO, UK PLG



CLUSTER OBJECTIVES:

With headquarters at EPIC, the Torbay Hi-Tech Cluster is very active as an organisation promoting and advocating Torbay companies and regional expertise. It is leading in pursuing opportunities for collaboration, innovation and investment. The Cluster is also a proud member of the European Photonics Industry Consortium, the industry association promoting the sustainable development of organisations working in the field of photonics across Europe.

The group has clear objectives that are regularly review. These include:

- Raise the profile of the Cluster
- Support the growth of our businesses
- Encourage inward investment
- Develop sector skills
- Identify collaborative ways of working
- Drive joint funding bids

CLUSTER MEMBERS



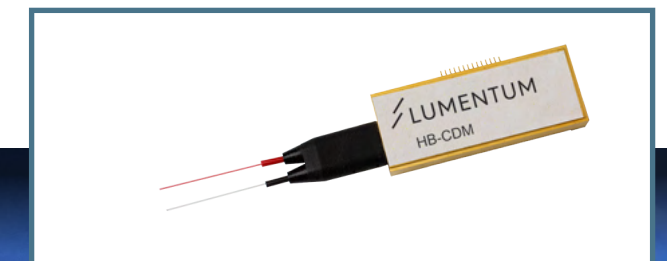
CASE STUDIES



G&H has been making photonics technology in Torbay for over 30 years. The company enables high-tech solutions for customers across telecommunications, industrial manufacturing, aerospace, defence and life sciences. G&H Torquay is home to an award-winning team, who are heavily involved in fibre optics innovation, designing and manufacturing photonics for new applications, such as space communications and lidar detection systems. Working with South Devon College, the business is developing local talent through an apprenticeship scheme.

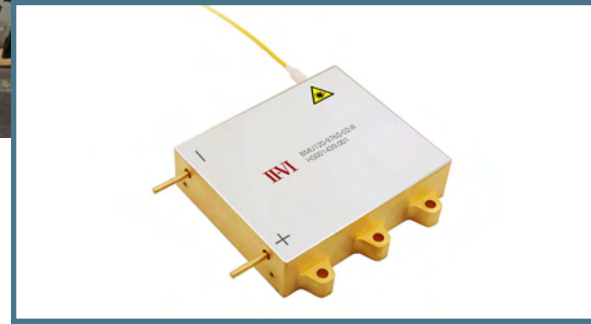


Lumentum is an advanced technology company which delivers innovative photonic technology based products to accelerate the speed and scale of next generation optical telecommunications. Lumentum also focuses on and new evolving advanced technology global market opportunities, including; cloud networking and storage, advanced material manufacturing, 3D sensing, clean renewable energy generation, autonomous automotive vehicle applications, 5G wireless evolution, and Internet of Things (IoT).





II-VI

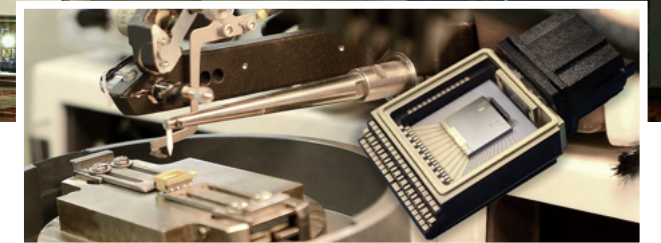


II-VI Lasers' optoelectronic components enable a broad range of applications. These include high power lasers for materials processing, optical amplifiers for terrestrial and submarine communications, high bit rate transceivers for datacentres, analytical instruments for life sciences and LiDAR for automotive and 3D sensing for consumer electronics.



QLM is revolutionising gas sensing in the oil & gas industry by developing compact, high-sensitivity, low-power Tuneable Diode Lidar (TDLidar) gas detection and imaging systems based on infrared single-photon detection.

Using technology based on research developed at the University of Bristol, QLM meets the needs of natural gas producers, distributors and service providers with fast, accurate and low-cost gas leak identification and monitoring for; oil and gas, industrial, biogas and agricultural applications.



queensgate

a brand of **PRIOR**

Queensgate offer a wide range of nanopositioning products, precision positioning devices and automation solutions. Queensgate are experts in high speed, precision applications that require single and multi-axis piezo stages, tip/tilt stages, piezo actuators and capacitive positioning sensors, with powerful control electronics.



Bay Photonics specialise in helping build prototypes that require a flexible and technically innovative approach to assembly and test. Having worked at world leading Opto-electronic suppliers, their technical team have vast experience in developing the right packaging and production solution.

WHY RELOCATE?

INCENTIVES

COMPETITIVE COSTS

Having a base within Torbay enables you to benefit from competitive property & labour costs compared to London, the South East & the Midlands.

The hi tech sector in Torbay and South West is known for its capabilities in R & D, design and new product development. The UK has the lowest corporation tax rate in the G20 and also provides up to 230% R&D tax incentives for SMEs on profits derived from technology developed here in the UK. It offers the ideal location for companies developing new technology.

FAST GROWING INTERNATIONAL CLUSTER

We have seen multi-million pound investment across our cluster including II-VI Lasers, Lumentum, Nanusens, Bay Photonics, Gooch & Housego, QLM and Spirent to name a few. All of these investments support a high proportion of research and development, new product design and manufacturing.

We have ambitious plans to grow our cluster, why not come and join us?

To support your relocation or expansion into our fast growing cluster, there are grants, incentives and commercial loans available for you to consider.

INVEST IN TORBAY SOFT LANDINGS

This is a grant of up to £10,000 available to foreign owned hi tech SMEs looking to locate or expand into Torbay and create local jobs. The grant can be used to support investment in premises fit out and purchase of equipment.

HotSW LEP ERDF INWARD INVESTMENT SUPPORT GRANT

A grant of between £25-£150,000 is available to eligible companies which must be match funded. It can be used for investment in machinery, premises and also to buy services such as IP, digital marketing and IT amongst others. Support is available to newly landed and existing, foreign owned businesses but not to support the costs of relocation.

TORBAY ECONOMIC GROWTH FUND

Torbay Council can support your company expansion into Torbay through the Torbay Economic Growth fund. A commercial loan upwards of £250,000 can be offered with competitive rates of interest over an agreed payback term. Security will be required.



CONNECTIVITY

AN EASY ROUTE INTO THE SOUTH WEST



DIRECT ACCESS TO LOCATIONS WORLDWIDE

Fly to major cities within the UK, Europe and US via Exeter and Bristol airports.

CONNECTING YOU TO CUSTOMERS AND SUPPLIERS BY ROAD...

Connecting you to the Midlands in 2.5 hours and London in 3.5 hours, via the M5.

GLOBAL SUPPLY CHAIN AND DEPLOYMENT SUPPORT

Accessible through six strategically located ports in the South West region.

... AND RAIL

Travel to London, the Midlands and beyond via fast and frequent rail links.

CONTACTS



DR. ANDREW ROBERTSON

TORBAY HI-TECH CLUSTER CHAIR

Andrew will be able to provide further information about the cluster group and its objectives.
andrew.robertson@bayphotonics.com



DR. PHILIP MITCHELL

TORBAY HI-TECH CLUSTER VICE CHAIR

Philip is a local ambassador for the Torbay Hi-Tech Cluster and is able to provide technical insights around the local supply chain.
philip.mitchell@lumentum.com



JASON BUCK

INWARD INVESTMENT MANAGER

Jason has over 12 years experience working on expansion and relocation projects for hi tech companies.
jason.buck@tda.uk.net



WAYNE LOSCHI

EPIC CENTRE DIRECTOR

Wayne can facilitate the move of technology businesses into the EPIC Centre and support them with their growth.
wayne.loschi@tda.uk.net