



Torbay Hi-Tech Cluster

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TORBAY & THE SOUTH WEST

**PHOTONICS AND
MICROELECTRONICS**

A FAST GROWING - GLOBAL CLUSTER



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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 year 2020 has demonstrated the strength and value of our hi-tech cluster companies to our local and national economy. Not only has our sector been able to weather the storm of unforeseen calamity, but recent events have demonstrated the essential necessity for both high capacity and highly reliable communications infrastructure to keep our education system, health system and economy running. Several companies in the wider region focus on the development and manufacture of components and systems critical to our high capacity telecommunications network.

The hi-tech sector has demonstrated a resilience to the terrible economic impact of Covid-19 that many of our colleagues have suffered in the tourism and hospitality sectors on which the South West economy is very dependent. Of course, jobs in the hi-tech sector are also unaffected by the weather, offer year round employment and are not subject to quotas, making them more critical to local coastal economy and the wider region.

One year after its opening, the Electronics & Photonics Innovation Centre (EPIC) is home to a vibrant community of varied companies, covering electronics, photonics, software and instrumentation.

The companies differ in size and maturity, and the EPIC centre is becoming known nationwide as an important photonics and micro-electronics hub. The centre has now become the home of Torbay Hi-Tech Cluster ensuring that we have the finger on the pulse of latest developments within our community.

The opening of the EPIC centre has ensured that the hi-tech industry in the region has a world class facility that demonstrates the intent of stakeholders to further invest in the hi-tech industry, with well facilitated laboratory and office space as well as cleanrooms for semiconductor fabrication processes.

Our cluster has continued to move forward, and this year continues to see considerable growth. We have welcomed two new foreign-owned companies from Spain and the US and continue to see existing cluster members, both UK and foreign owned, continue to grow and create high value employment and opportunities for younger people.

These two new companies have also made applications along with an existing cluster member company to the Heart of the South West Local Enterprise Partnership (HotSW LEP) soft landing programme to support their further growth and expansion plans. We have also been successful in securing Getting Building Fund through the HotSW LEP for additional equipment at EPIC and the Hi Tech &

Digital Centre at South Devon College.

Through Anthony Mangnall MP we are now represented at the All Party Parliamentary Group for Photonics & Quantum to help us in setting out the wider growth needs of our sector.

We have developed a new photonics & microelectronics technician training programme with South Devon College and a new sector skills co-ordinator role is currently being recruited to lead the development of the programme of training.

HotSW LEP has a special designation as a High Potential Opportunity location for Photonics. To further promote this opportunity to prospective inward investors a new film is being created.

As a cluster we are excited at the prospect of building on these activities to place ourselves at the forefront of the photonics & microelectronics community.

We welcome you to come and join us on our journey.

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. This facility offers businesses access to a classified cleanroom and state-of-the-art prototyping capability.



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, Nanusens and Trusolis become first three foreign owned companies to join EPIC.

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

VALUE OF PHOTONICS & MICROELECTRONICS SECTOR

UNITED KINGDOM



£13.5bn
industry value to the
UK economy

69,000

people employed in the
UK across the sector



4,400

people employed
in the South West

THE SOUTH WEST

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

250
companies



£5.3bn

Total Gross Value Added (GVA)



£76,400

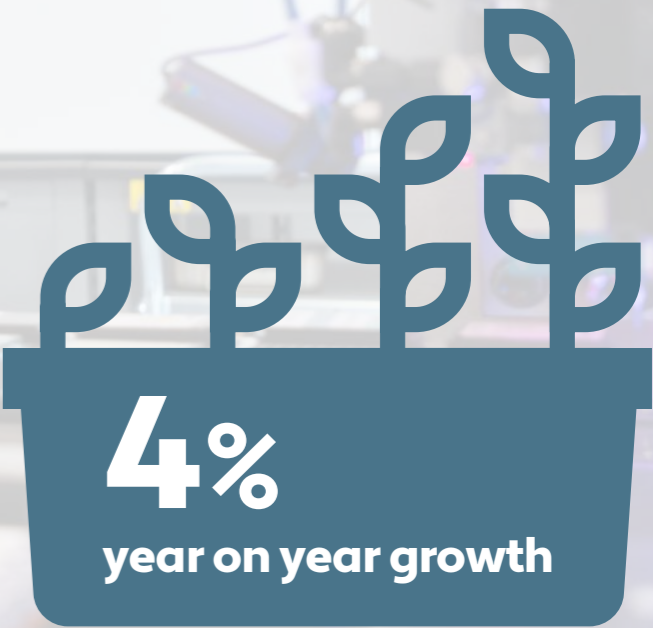
GVA per employee
(vs UK manufacturing average of £67,000)

£690m
total turnover



4%

year on year growth



8.4%

like for like growth
over 2 years (4.1 CAGR)



1

Photonics &
Microelectronics
training programme



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.

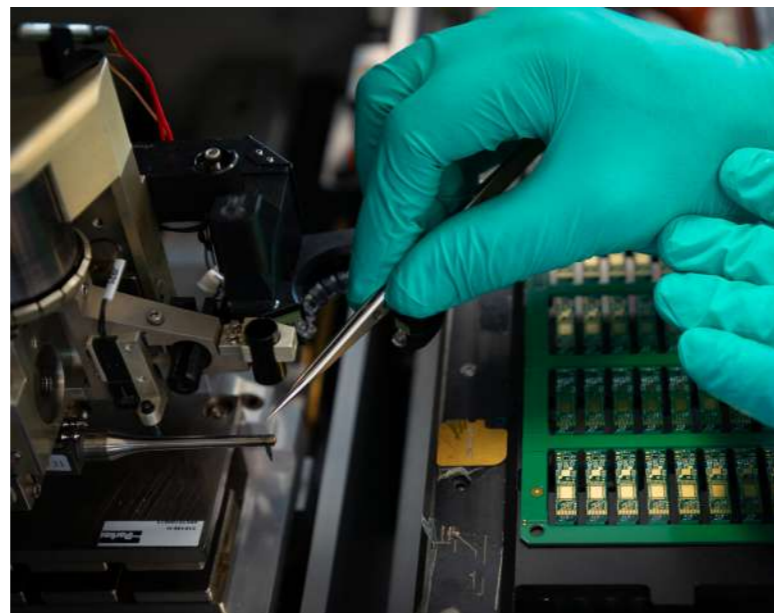
Advanced Complementary Metal-Oxide-Semiconductor (CMOS) materials technologies for micro-electronic Integrated Circuit (IC) and Micro Electro-Mechanical Systems (MEMS) realisation. Nano-positioning technologies with nano-meter resolutions and accuracies, including piezoelectric actuators for nano-positioning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

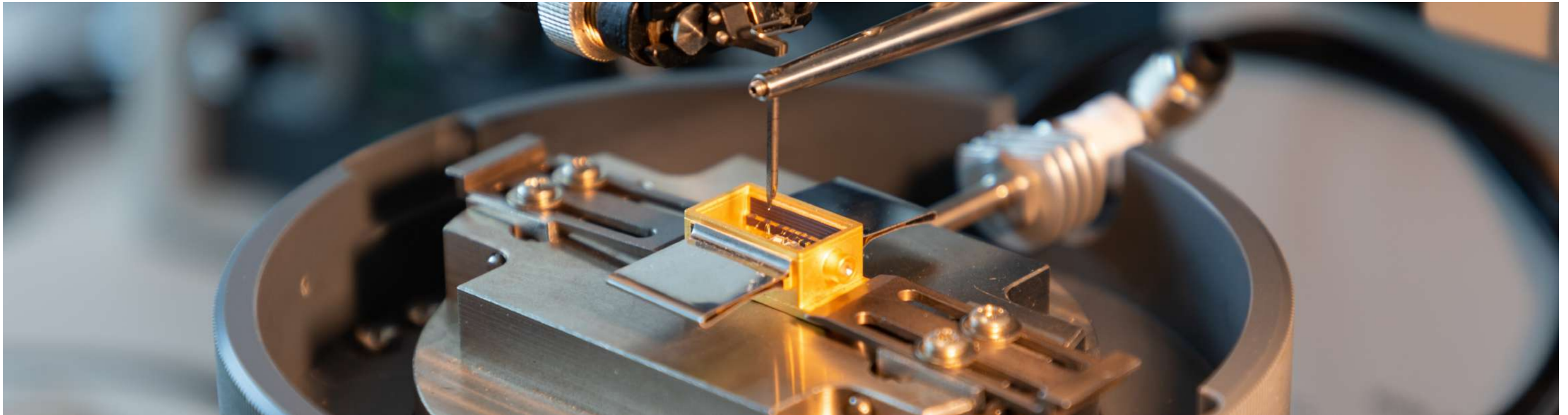
Quantum technology and packaging expertise is finding applications in secure communications, high sensitivity measurement methods including LIDAR (Light Detection and Ranging). As well as enabling enhanced computing power in navigation and timing systems, and healthcare imaging.

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.



PLYMOUTH UNIVERSITY

Plymouth University's School of Computing, Engineering and Mathematics offers photonics and microelectronic related courses. The Electron Microscopy Centre ensures students have access to expert and specialist support in the area of electron microscopy.

These facilities enable SME's in the region to offer post graduate positions and internships, hire new staff, generating a much needed stimulus to the local economy.

EPIC

Electronics & Photonics Innovation Centre

ABOUT EPIC

EPIC is the technology hub of the South West. The centre offers modern facilities to businesses in the electronics sector. With 25,000 sq. ft. of lettable space, EPIC provides an array of flexible space to both small and growth businesses. It is therefore the ideal location to locate or relocate a technology business.



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 >£1.5M 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

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 strategically located next to South Devon College 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 will encourage interaction across different subject areas.

A range of subjects are offered from essential entry skills to higher level skills across apprenticeships (level 3 & 4), degree level course (level 6) 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 law and business.

TECHNICIAN TRAINING

Technical Training packages are technical skills-based programmes that provide a training route for adults and young people, including Apprentices, by developing a clear and purposeful route, as well as Continuing Professional Development (CPD) for those employed or returning to employment

In conjunction with employer focus groups such as the Torbay Hi-Tech Cluster, EPIC and TDA, South Devon College develops sector specific training solutions to meet the demanding needs of growth sectors. Additionally, this training is developed to support wider efforts around promoting inclusive growth and community wealth building.

The Photonics, Optics and Microelectronics technician training is a co-designed, high quality technical and professional suite of courses aimed at meeting the current local and regional needs, supporting the sector to capitalise on growth opportunities. Furthermore, this training ensures the correct knowledge and skills are developed within the current and future workforce.

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.



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

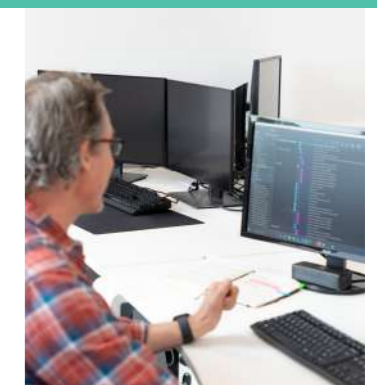
Dr Philip Mitchell

(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
- Attract new businesses to the area
- Identify collaborative ways of working
- Drive joint funding bids

CLUSTER MEMBERS

epic

queensgate
a brand of PRIOR

bp bay photonics
Specialists in Photonic and Microelectronic Packaging

spirent
Promise. Assured.

Davies &
Bell Ltd.
MICRO ELECTRONICS BONDING SPECIALISTS

EFFECT
PHOTONICS

LUMENTUM

nanusens
CREATIVE NANODEVICES

PALOMAR
TECHNOLOGIES

G&H

artemis
OPTICAL

IVI

hymid

HEEDRA

CAS antennas.

plessey

TRUSOLIS
TECHNOLOGIES

South Devon College

CASE STUDIES



G&H



G&H Torquay has a successful track record of regularly introducing new products and recently won the Queen's award for Enterprise in Innovation for their flagship FibreQ product. This technology is used in advanced laser systems for metrology and material processing applications and sold all over the world. The company has been developing and manufacturing hi-tech photonic components in Torquay for over 30 years and is part of the larger Gooch & Housego plc group.

LUMENTUM

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.



EFFECT

PHOTONICS

EFFECT Photonics delivers highly integrated optical communications products based on its Dense Wavelength Division Multiplexing (DWDM) optical System-on-Chip technology. EFFECT Photonics takes a platform approach to integration using high-yielding building blocks within the wafer.



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

Specialists in Photonic and Microelectronic Packaging

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 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, EFFECT Photonics, Bay Photonics, Gooch & Housego 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

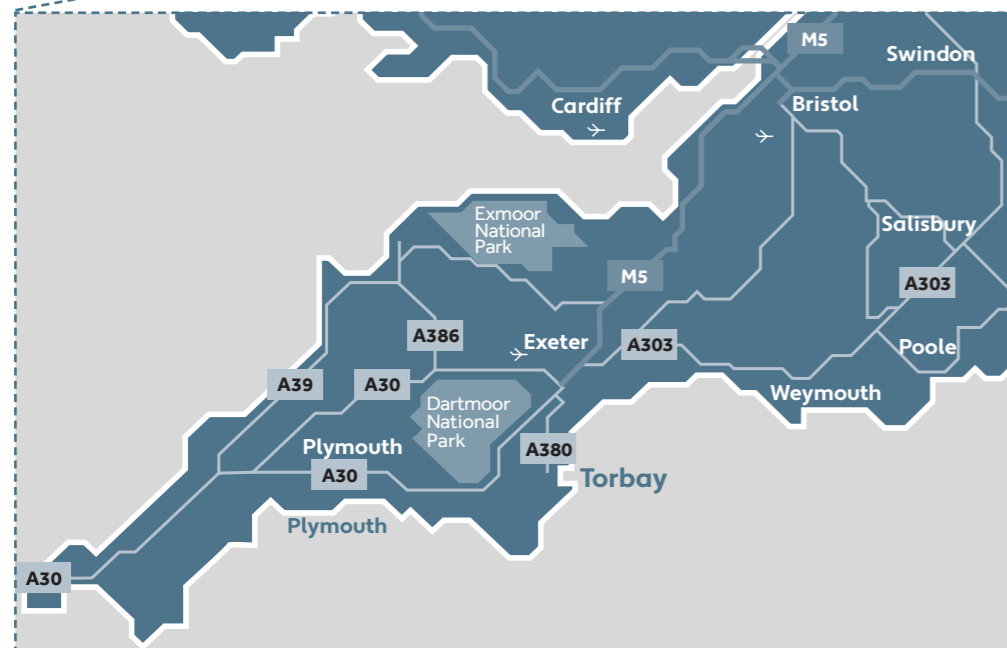
A grant of between £25-£150,000 is available to eligible companies which must be match funded. It can be used for investment in machinery, premises and also to buy services such as IP, digital marketing and IT amongst others. Support is available to newly landed and existing, foreign owned businesses 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 and Europe 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 10 years experience working on expansion and relocation projects for hi tech companies.

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WAYNE LOSCHI

EPIC CENTRE DIRECTOR

Wayne can facilitate the move of technology businesses into the EPIC Centre and support them with their growth.

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