At the centre of

future telecom networks

CATAPULT

Compound Semiconductor Applications

Digital connectivity – at the centre of society

Digital services continue to transform society. Radical changes have already been realised, in finance, in e-commerce and in logistics. In areas such as digital health provision and online working, we are only just starting to grasp their full potential. These services will play an increasingly important role in delivering economic growth – last year, the UK digital sector grew six times faster than the rest of the UK economy. Future growth will depend on access to widespread, fast and reliable digital connectivity, provided by telecom networks that link smartphones with office computers, data servers and cloud computing.

Meeting demand

Pressure on telecoms networks continues to rise – in the UK, the demand for network capacity is forecast to grow more than three times over the next five years as new services are developed. Evolving work patterns mean that these networks will need to be ever more flexible. During the COVID-19 lockdown for example, data traffic increased by 120% in UK commuter towns.

Networks also increasingly need to cope with future services – delivering virtual reality, artificial intelligence or autonomous driving for example place unique demands on network infrastructure.

Advanced electronics have revolutionised telecoms, delivering improvements in capacity, flexibility and performance unimaginable when telecoms networks were first automated in the 1940s. As demand continues to increase and patterns of demand change, network equipment will need a step-change in performance that only advanced electronics using compound semiconductors can deliver.

Given changing geopolitical priorities, it is imperative that the UK has ready access to the very latest advanced electronics technologies, to underpin digital growth and to ensure security for all.

The need for future resilience

Telecoms infrastructure is a critical national asset. A recent report by McKinsey Global Institute called ‘Risk, resilience, and rebalancing in global value chains’ showed that communications equipment supplies are more exposed to shocks such as trade disputes or pandemics than any other sector. As other countries invest heavily to secure their domestic networks, the UK must not become reliant on technologies from vendors over which we have little control.

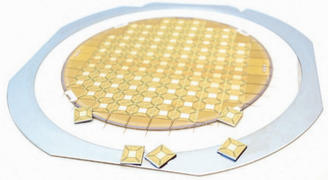
Diversifying the supply chain

Mitigating risk to the supply chain is upper-most in the minds of governments – the UK government’s Telecom Security Bill for example plans to remove ‘high risk’ vendors from UK networks and diversify the supply of telecom equipment.

Future resilience means unfettered access to the latest technologies and software. The current lack of vendor diversity is a particular issue which is being addressed in the bill through a proposal to use open standards ensuring interoperability between different vendors. Through these proposals, not only will our networks be more secure, but UK companies will benefit from a once in a generation opportunity. As the industry becomes more open, we are likely to see many small innovative companies entering the market.

The Compound Semiconductor Applications (CSA) Catapult, a not-for-profit industrial research organisation with expertise and facilities here in the UK, is working with these companies to address the opportunities.

The Catapult’s role is not just to accelerate new telecoms technologies to market but to build and manage collaborations with the major telecoms network infrastructure providers, securing UK jobs and supply chain investment.



At the centre of

telecoms network innovation

Tiny chips made using compound semiconductors will increasingly be at the heart of a new breed of advanced electronics needed to meet demand for digital services. Networks which exploit compound semiconductors will have lower latency, greater flexibility, even greater capacity and will eventually provide nearly ubiquitous affordable access.

Making a difference

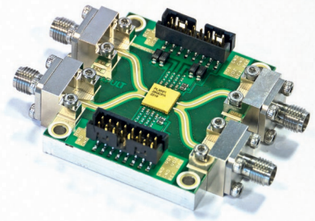
As operators move from 4G mobile to 5G and beyond, offering services with ever greater capacity and speed, high performance compound semiconductor chips are needed to handle the data traffic while minimising energy consumption. The increasing levels of data traffic require new techniques to connect 5G base stations to the network via backhaul to ensure system performance beyond the current state of the art. The UK's leading backhaul developers are using compound semiconductor transceivers to meet these requirements.

Rural coverage, for autonomous vehicle to vehicle communication for example, presents challenges to terrestrial mobile networks. Services are likely to rely on constellations of low earth orbit 'cube satellites', communicating using compound semiconductor chips.

As more users access more data, this puts increasing strain on the core optical fibre network. Innovation in compound semiconductor technology is required to deliver a step-change in network capacity.

In an inter-connected world, the security of networks is paramount. Next generation encryption combining software algorithms with digital chip encoding and quantum security is currently being developed by UK academics using compound semiconductors.

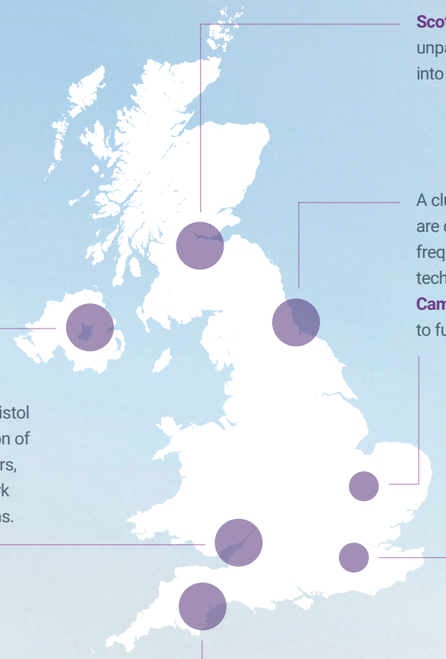
Data centres are a key part of networks – here compound semiconductors are improving their efficiency and making renewable energy sources more accessible, helping to ensure that, as capacity increases, the 1% of global energy they consume does not rise.



At the centre of

global research

UK companies pioneered innovations in telecoms, from the first transatlantic telephone call in 1926 to the first digital telephone exchange in 1969, the first transatlantic optical fibre network in 1988 and the first trial of gigabit broadband in 2013. Today, a new generation of entrepreneurs are developing critical parts of future telecoms networks. These new companies, at the forefront of research into advanced electronics, have the potential to scale-up and deploy parts of the UK network and address global export opportunities.



Scotland's reputation in photonics is unparalleled. It has recently diversified into cube-satellite manufacture.

A cluster of companies in **North East England** are developing world-leading optical, radio frequency and satellite communication technologies, complementing similar activity in **Cambridge**. These technologies are essential to future mobile networks including 5G.

Northern Ireland develops and manufactures technologies for global data centres.

The **Western Gateway**, covering Bath, Bristol and Cardiff is home to a unique collection of capabilities in compound semiconductors, cybersecurity, digital chip design, network architectures and small cell base stations.

Surrey hosts the world's largest 5G test network for research, innovation and development.

A cluster of companies in **South Devon** develop leading-edge components for high speed optical networks.

Building on regional excellence

The UK is home to a number of significant clusters of expertise. With the right support and coordination, companies within these clusters have the potential to deliver technology innovations relevant to large proportions of the network, establishing a credible export proposition.

We have a solid UK industry and research base on which we can build a resilient future. Now is the time to capitalise on UK advances in electronics to deploy a larger share of the domestic telecom network whilst securing long term resilience.

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The vision

The CSA Catapult sees a great opportunity for UK companies to develop and deploy a larger proportion of telecoms infrastructure. By harnessing innovative UK academics and companies, we can build global leadership in telecoms network technology. Through the power of compound semiconductors we can deliver the advanced electronics which will meet ever increasing and changing demand, leading to new digital services which enrich people's lives.

Our role

In only two years, the CSA Catapult has established an enviable record of helping companies translate research into commercial products. Our work accelerating new technologies based on compound semiconductors to market will become an increasingly important part of UK R&D spend in telecoms.

We have intimate knowledge of the industry, with insight into the latest developments in advanced electronics, and the challenges ahead. We are ready to co-ordinate the regional clusters to build UK leadership.

Based in South Wales, the CSA Catapult Innovation Centre incorporates a design studio, highly specified laboratories and experienced engineers to help companies accelerate prototypes to market. Our laboratories feature specialist optical and radio frequency test equipment to help companies validate telecoms systems in mobile, core network and satellite communications.

As part of the world's first compound semiconductor cluster, CS Connected, the Catapult is also developing sovereign sources of critical semiconductor materials, such as gallium nitride, to support UK telecoms companies.

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By harnessing UK innovation, we can build global leadership in telecoms network technology. Compound semiconductors can deliver the advanced electronics needed to meet ever increasing demand and realise new the digital services which will underpin future economic growth.

Get involved

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