

PCSEs for Quantum Applications

EPIC Techwatch

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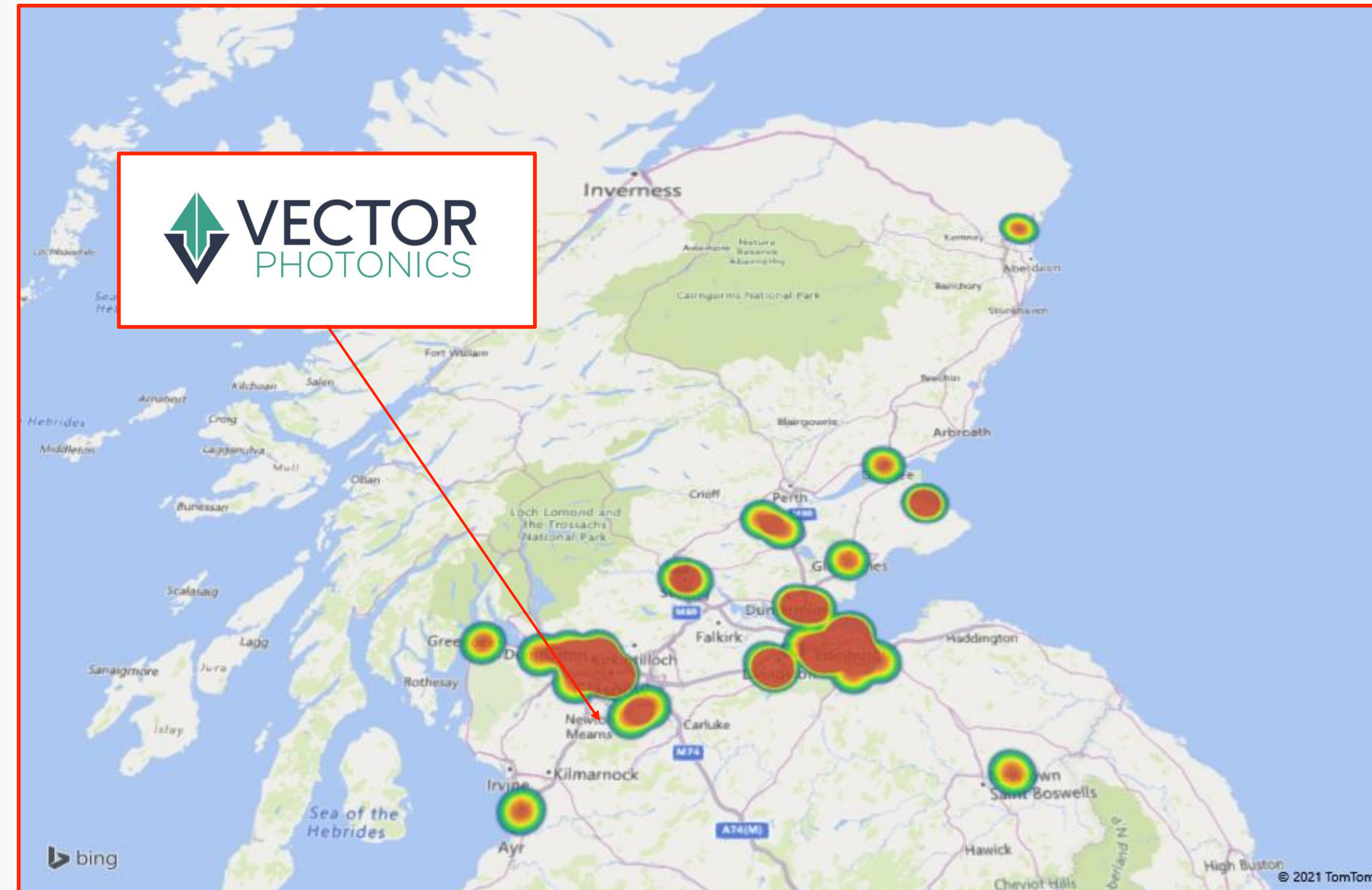
Vector Photonics Lasers for Quantum



- Vector Photonics and 2D Lasers
- 2D Differentiator
- Wavelengths
- Supply chains
- Quantum laser conundrums

Agenda for today

Vector Photonics in the Cluster



In the middle of the cluster of photonics companies offering manufacturing, systems and services

Vector Photonics – 2D Laser Commercialisation

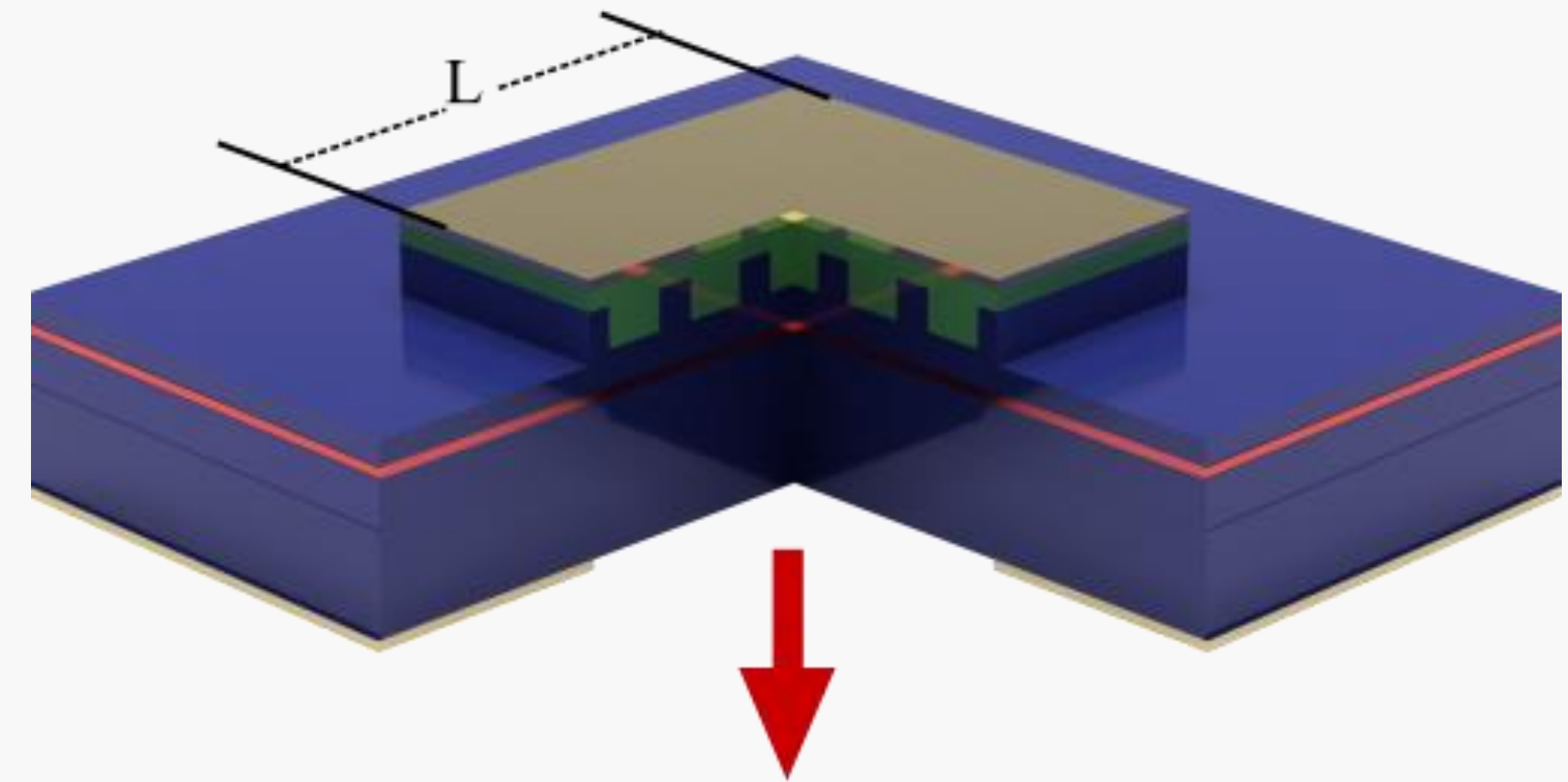
<p>Out performing all existing laser technologies in:</p> <ul style="list-style-type: none"> • Datacentres • Datacoms • Defence • Telecoms • LiDAR • Quantum • More... 	<p>0D - LED / 1960's</p>	<p>1D - EEL / DFB / 1970's</p>	<p>1D - VCSEL / 1990's</p>	<p>2D - PCSEL / 2020's</p>
	EXISTING TECHNOLOGIES			Vector Photonics
Surface Emission	Yes	No	Yes	Yes
High Power	No	Yes	No	Yes
High Speed	No	Yes	Yes	Yes
Low Cost	Yes	No	Yes	Yes

Vector is commercialising the next generation 2D laser platform

Why 2D PCSELS?

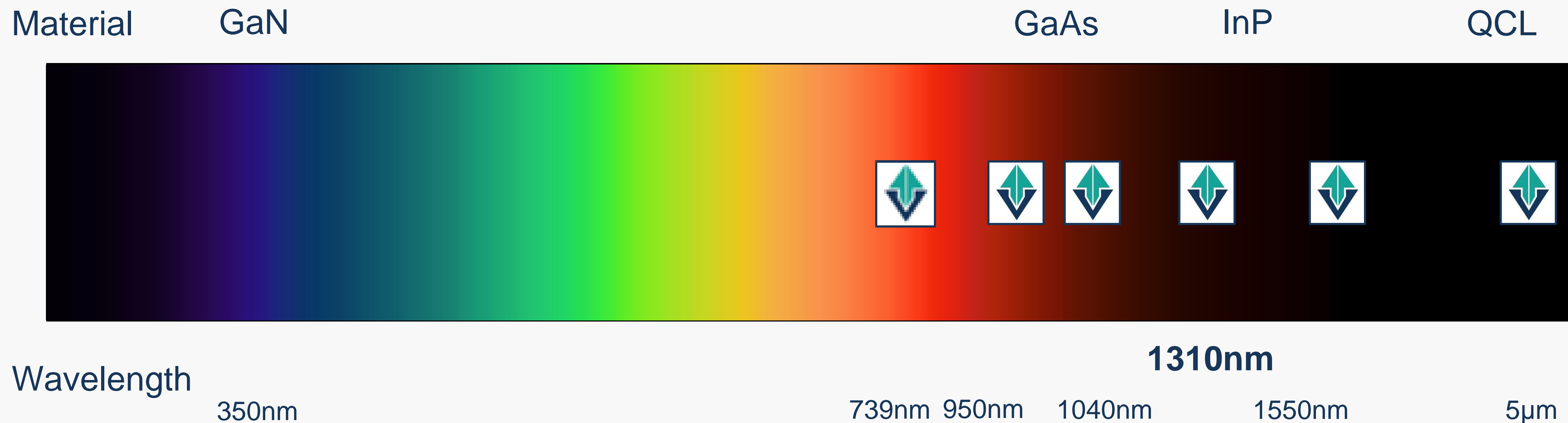
2D PCSELS have a number of advantages over traditional 1D lasers

- Surface emission
- Packaging costs
- Low divergence, symmetric beam
- Wide range of wavelengths
- Power scaling
- Coherent arrays



Next generation 2D laser platform enables enhanced laser performance

Wavelength Flexibility

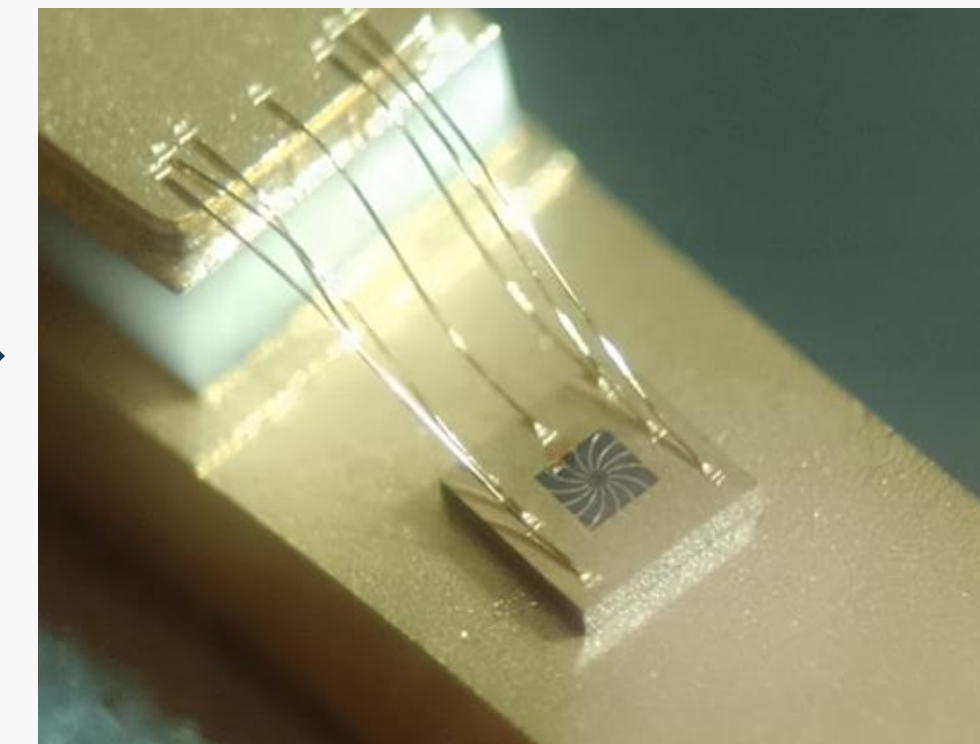


Vector Photonics has demonstrated 2D PCSELs in multiple material systems and wavelengths

Semiconductor Laser Supply Chain

Supply Chain Type	Epitaxy	Front end processing	Resist, E-Beam, Etch & Clean	Overgrowth	Post Overgrowth Processing	BEOL	Packaging
1. Prototype	 III-V Epi	 KELVIN NANOTECHNOLOGY	 KELVIN NANOTECHNOLOGY	 III-V Epi	 KELVIN NANOTECHNOLOGY	 HELIA PHOTONICS	 ALTER TECHNOLOGY

UNIQUE - everything needed to make a laser

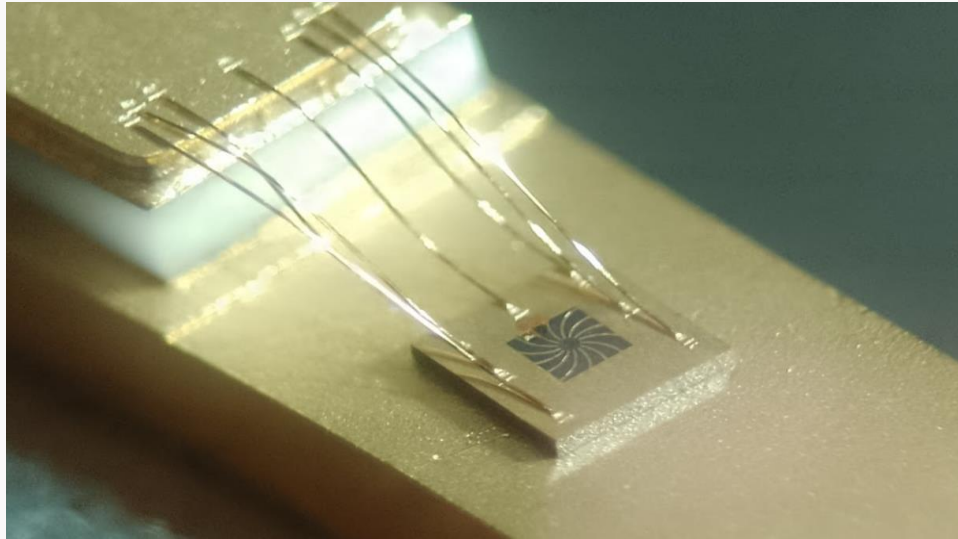


Vector Photonics has an established prototype supply chain, capable of producing thousands of lasers

Laser Supply Chain Development

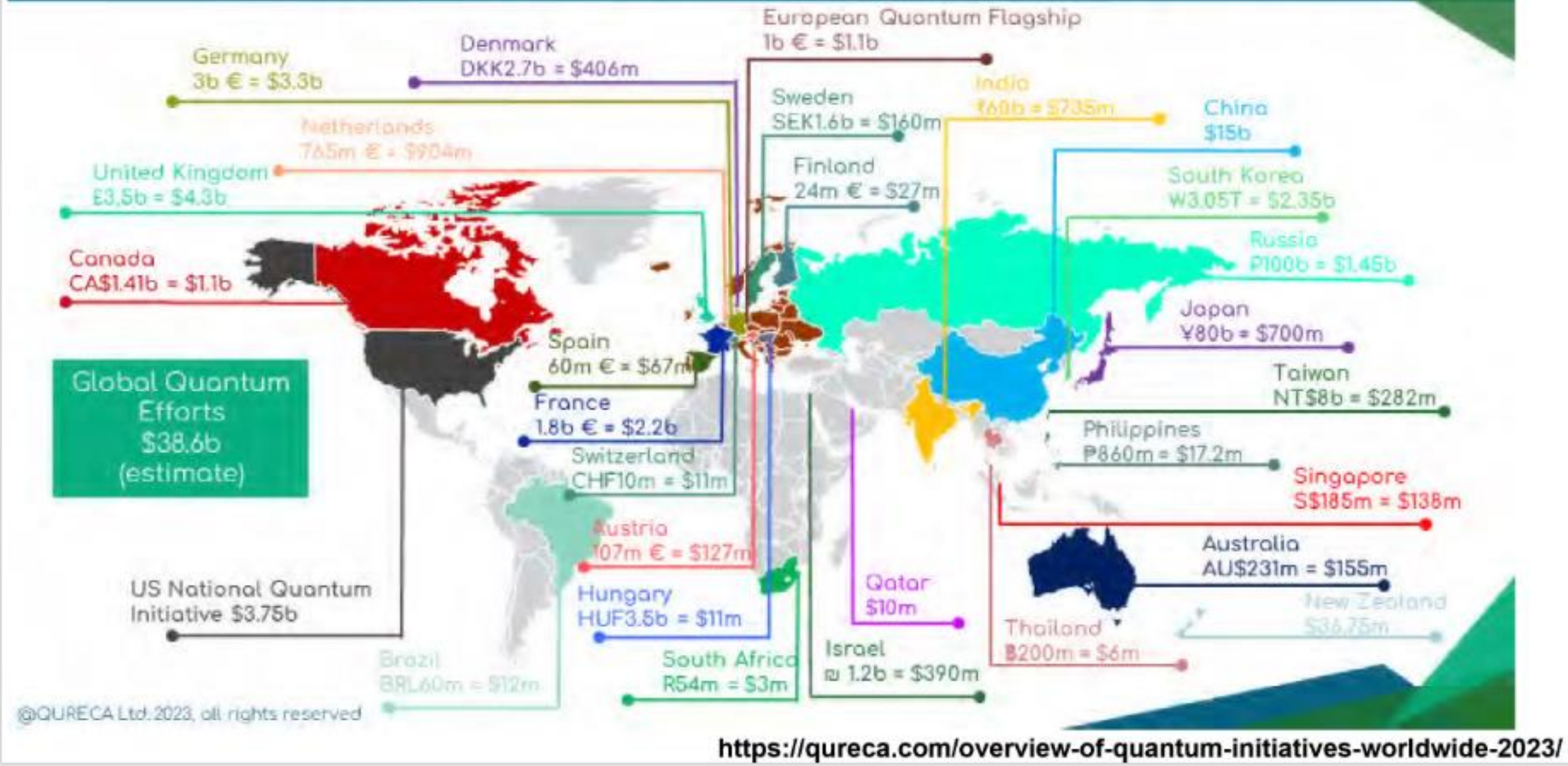


Supply Chain Type	Epitaxy	Front end processing	Resist, E-Beam, Etch & Clean	Overgrowth	Post Overgrowth Processing	BEOL	Packaging
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2. Alpha	In progress	In progress	In progress	In progress	In progress	In progress	In progress
3. Beta	Discussions	Discussions	Discussions	Discussions	Discussions	Discussions	Discussions



Diversified foundry supply chains support small scale to high volume
Continuity of supply is ensured by multiple global foundry sources

Quantum effort worldwide



Global development activities requiring lasers for atom cooling and capture

The Quantum Laser Conundrums



- Huge investments/ Long system development cycles
- Commercially good enough/ Technical perfection
- Uncertain supply chains/ Price or performance
- Fragmented architectures/ Tiny laser volumes
- Fundamental wavelengths/ Frequency doubled wavelengths
- Commercial business case/ Subsidised development

Standardisation opportunity to enable market for quantum lasers

How Vector Photonics can Contribute



- Performance enhancements available from new 2D lasers
- Surface coupling at multiple wavelengths for cooling and capture
- Arrays for system integration
- Flexible supply chain to support volume demand
- Continuity of supply supported by global foundry partners
- Partnering for commercial and grant funded projects

Vector Photonics next generation 2D lasers can mitigate many of the quantum laser conundrums

Thank You

Brief Questions Now – or Long Discussions Later?

