

S15 Space Systems

Presentation for Deltec Conference

“Quantum Technology for Secure Communications”

5 March 2019

The Problem: Today's Communications is Not Secure

Growing need for secure communications as information moves digital and the vulnerability of existing encryption methods are exposed

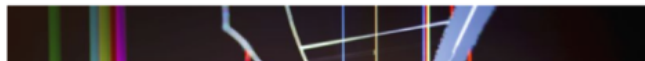
The quantum clock is ticking on encryption – and your data is under threat

WIRED

Quantum computers pose a major threat to the security of our data. So what can be done to keep it safe?



By **NICOLE KOBIE**
Tuesday 4 October 2016



Advances in quantum computing and new algorithms are set to crack existing public key encryption protocols

The quantum computing apocalypse is imminent

Shlomi Dolev 11 months ago



Comment

In the ancient world, they used cubits as an important data unit, but the new data unit of the future is the qubit — the quantum bits that will change the face of computing.

Quantum bits are the basic units of information in quantum computing, a new type of computer in which particles like electrons or photons can be utilized to process information, with both “sides” (polarizations) acting as a positive or negative (i.e. the zeros and ones of traditional computer processing) alternatively or at the same time.

According to experts, quantum computers will be able to create breakthroughs

Shlomi Dolev
Contributor

Shlomi Dolev is the Chair Professor and founder of the Computer Science department of Ben-Gurion University of the Negev. He is the author of [Self-Stabilization](#). Shlomi also is a cybersecurity entrepreneur and the co-founder and chief scientist of [Secret Double Octopus](#).

Government agencies rely on couriers to distribute encryption keys

The Solution: Quantum Communications

Ability to encode information in single particles of light, using quantum properties to ensure security

Two different flavors:

Weak Coherent Pulse

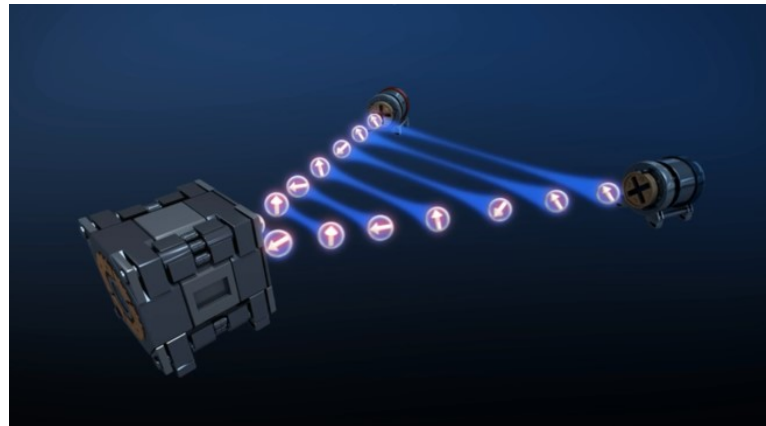
more common, but only useful for the distribution of encryption keys

Entanglement

more difficult but has more applications (quantum teleportation, quantum internet)

Tamper Proof
and
Future Proof

Quantum communications gives the unique ability to two communicating users to detect the presence of any unwanted third party



Eavesdropper revealed by laws of physics



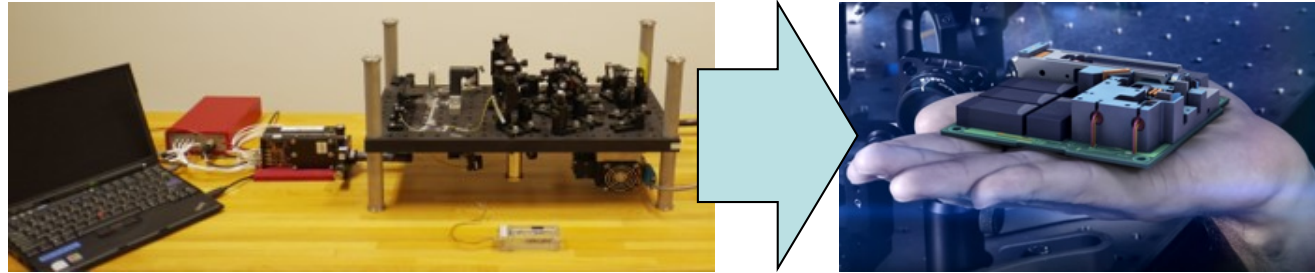
Quantum Communications over fiber optics for urban areas (~100km)



Quantum communications from satellites for intercontinental distances

S15 Space Systems

Leveraging advanced technology developed at the Centre for Quantum Technologies (CQT) in Singapore



CQT brings 15 years of experience developing space qualified small entangled photon sources that fits in a nanosatellite – the smallest source available for space

				
<p>Airborne 2012 and 2013</p>	<p>GomX-2 2014</p>	<p>Galassia 2016</p>	<p>SpooQy-1 2019</p>	<p>Qubesat 2022</p>

S15 Space Systems Team

Quantum, space, and business expertise necessary to build a successful quantum network



Chune Yang Lum
CEO, Co-Founder

10 years quantum, business development, and space experience with SES, CQT



Robert Bedington
CTO, Co-Founder

10 years space instrument development, Senior research fellow, satellite lead CQT



David Mitlyng
COO

25 years space experience with Hughes, Orbital, SSL, BridgeSat



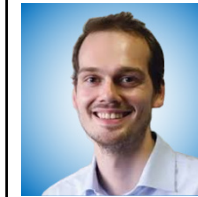
Antia Lamas-Linares
Quantum Specialist



Alexander Ling
Co-Founder, Advisor



Alex Lohrmann
Quantum Lead



Tom Vergoosen
Lead System Engineer

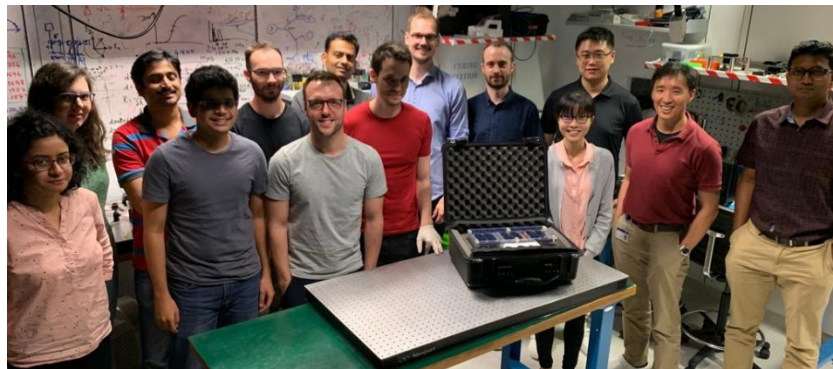


Photo Courtesy Centre for Quantum Technologies



Photo Courtesy JAXA

Addressable Market

Advanced quantum technology that can address multi-billion dollar secure communications market

Short Term

Long Term



Government & Defense

- Internal communication networks
- Embassy networks
- Defense networks and communication to forward bases overseas

Telecommunications

- Secure fiber backbone network across countries or continents
- Interconnect between multiple terrestrial quantum network
- Critical infrastructure

Enterprise Networks









- Financial sector with high-value transaction data
- Enterprises protecting internal trade secrets
- Cloud computing companies

Quantum comms market estimated* at \$1.3B in 2017, expected to reach \$6.2B by 2025, 21.6% CAGR

*Source: Marketing Insights Reports "Global Quantum Key Distribution (QKD) Market Size, Status And Forecast 2018-2025", Nov 2018, <https://www.marketinsightsreports.com/reports/11301000075/global-quantum-key-distribution-qkd-market-size-status-and-forecast-2018-2025>

The Quantum Communications Market is Heating Up

Nearly \$5B in new quantum communications investment in the past year as a response to the successful Chinese demonstration and concerns about advancements in quantum computers

 <p>China</p> <ul style="list-style-type: none">• \$100M Micius mission• \$2B quantum follow on• Three satellites for CAS Quantumnet	 <p>Europe</p> <ul style="list-style-type: none">• €1B EU Quantum Flagship initiative• Scylight and Artes• SES-led QUARTZ	 <p>USA</p> <ul style="list-style-type: none">• \$1.2B National Quantum Initiative Act bill signed into law Dec. 21, 2018	 <p>Germany</p> <ul style="list-style-type: none">• €650M German “Quantentechnologien” project• DLR QUBE mission
 <p>Japan</p> <ul style="list-style-type: none">• Air-to-ground demo for Ministry of Internal Affairs and Communications (MIC)	 <p>UK</p> <ul style="list-style-type: none">• £24M UK Quantum Network for National Quantum Technologies Programme	 <p>Singapore</p> <ul style="list-style-type: none">• S\$18M QubeSat mission in partnership with UK	 <p>Canada</p> <ul style="list-style-type: none">• CSA Quantum Encryption and Science Satellite (QEYSSat) satellite

Recent QKD Articles

- **Bloomberg:** January 14, 2019, The Super-Secure Quantum Cable Hiding in the Holland Tunnel
- **Gizmodo:** December 26, 2018, US Passes Bill to Inject \$1.2 Billion Into the Quantum Tech Race
- **MIT Technology Review:** December 19, 2018, The man turning China into a Quantum Superpower
- **Forbes:** December 17, 2018, 2019: America's Quantum Leap Year
- **NY Times:** December 3, 2018, The Race Is On to Protect Data From the Next Leap in Computers
- **Nature:** November 19, 2018, Quantum Computers put Blockchain Security at Risk
- **The Economist:** October 20, 2018, Quantum Computers will break the Encryption that Protects the Internet
- **Science Magazine:** October 19, 2018, Quantum Internet, a Vision for the Road Ahead
- **Bloomberg:** April 8, 2018, Forget the Trade War. China wants to win the Computing Arms Race
- **Gizmodo:** February 16, 2018, Quantum Hacking Could Be 'Catastrophic' If We Don't Develop Better Cryptography
- **TechCrunch:** January 5, 2018, The Quantum Computing Apocalypse is Imminent
- **Futurism:** August 17, 2017, The "Quantum Internet" Is Just a Decade Away. Here's What You Need to Know



Conclusion

Quantum Communications is Critical for the Next Generation of Secure Communications

Important Technology

Quantum communications is the only technology that exposes any attempt at eavesdropping

Space Heritage

S15 Space is the only startup with a space-qualified quantum light source designed for small satellites

Increasing Market

Growing demand for secure communications to address vulnerabilities with existing encryption protocols

