

# Company, Tech & Products



**KEEQUANT**

European  
Quantum  
Security

**We secure European Infrastructure.**

# Company Facts & Figures



100% EU-27 Shareholders



Founded 2020



Fürth, Germany



8 Public-funded Projects



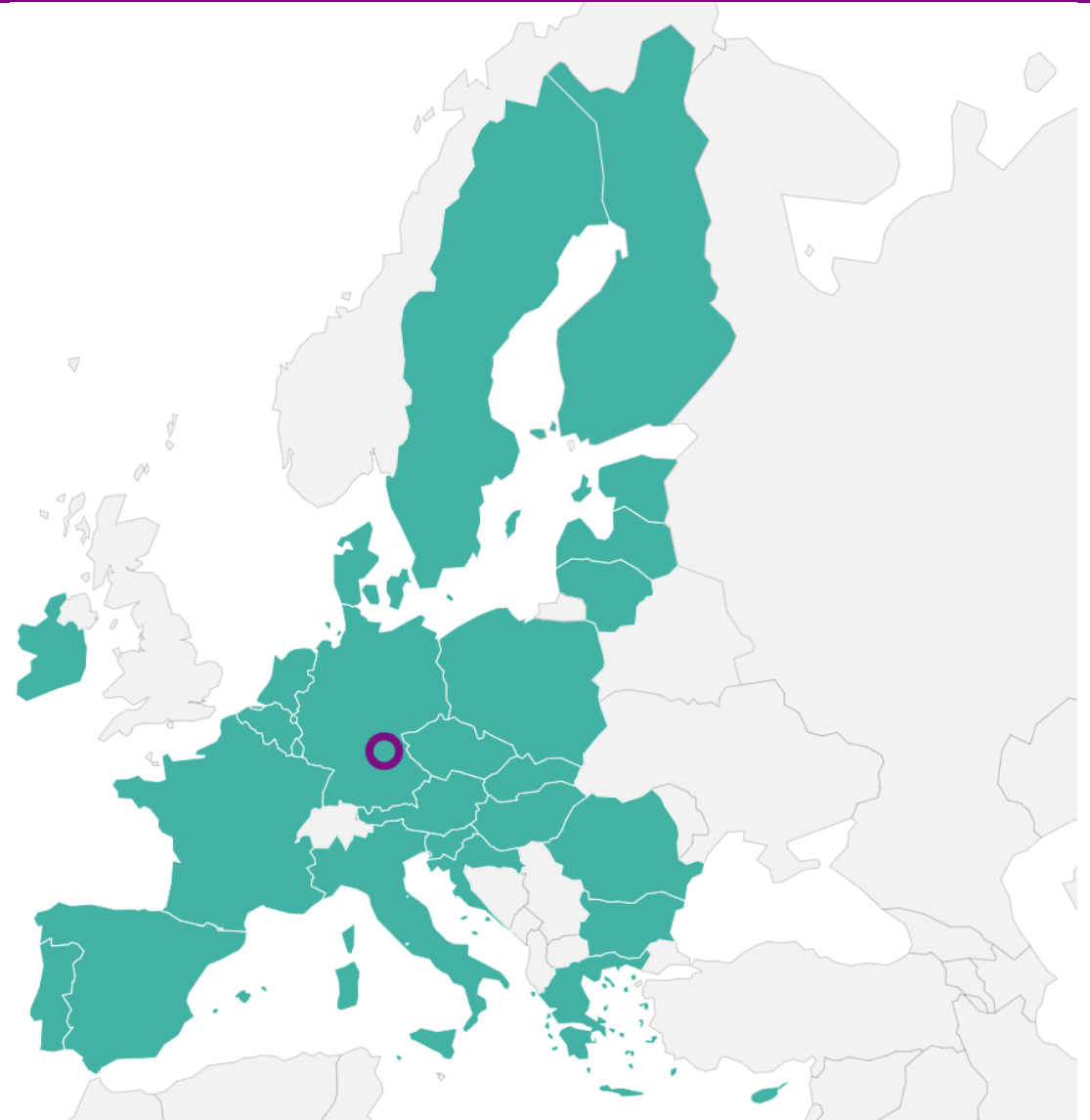
17 Employees



Novel, scalable CV-QKD Technology



2 Product Lines: QKD and KMS



# Scientific origins

## Scientific origins at the Max Planck Institute for the Science of Light in Erlangen

The founding team has...

- internationally pioneered QKD for more than 10 years
- contributed to and managed many national and international research and infrastructure projects, e.g.: *OPENQKD, CiViQ, QuNET-alpha, QCI4EU, HQS, QUBE, PASQuanS*
- set several international records for QKD



# Our network

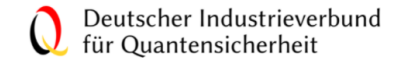
## Academia



## Industry



## Consortia & Regulation

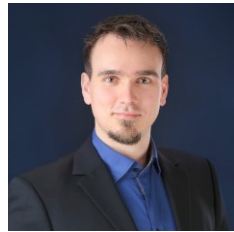


# Team: "Be excellent to each other."

## Technology



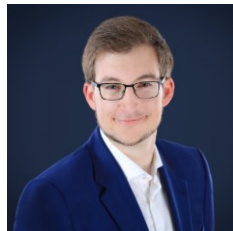
Emmeran Sollner  
Deep Tech



Emanuel Eichhammer  
Tech Lead



Imran Khan  
Managing Director



Martin Hauer  
Photonics



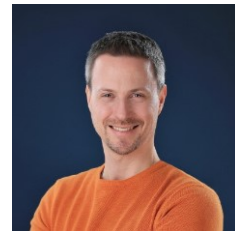
Dr. Moritz Baier  
Photonic Integration



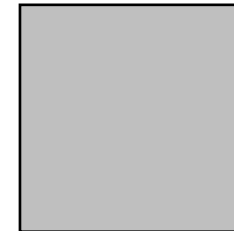
Markus Polster  
Electronics Engineer



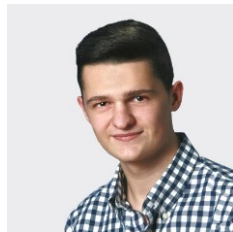
Frank Volland  
Quantum Theory



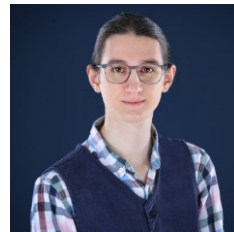
Andreas Müller  
Software & Industrialization  
Lead



Clara Porsch  
Team Assistance



Jannik Mähn  
Post-Quantum Crypto



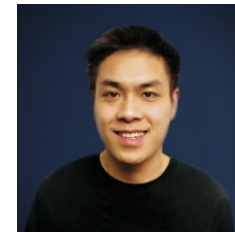
Anton Knötzinger  
SW & Electronics



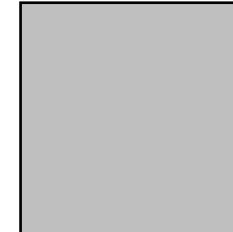
Vincent Lano  
SW & Electronics



Dr. Rafal Sopalla  
Production



Hieu Philip Hoang  
System Engineer

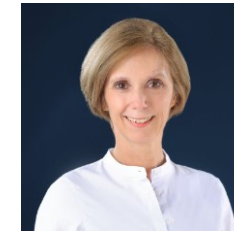


Patrick Bläcker  
Software Engineer

## Business



Dr. Ulrich Eismann  
Business Lead



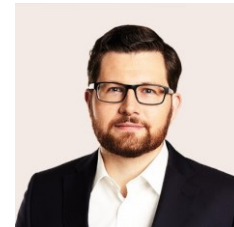
Anja Kiefer  
Operations Lead



Prof. Dr. Christoph  
Marquardt



Michael Klieber



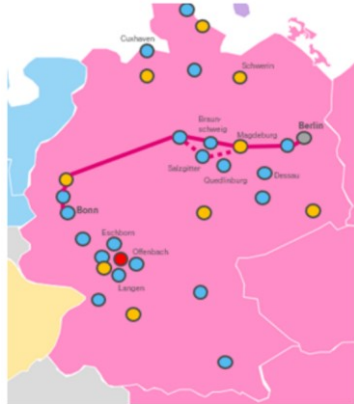
Johannes Grebhahn

non-operational

# Public projects

## KMS

### DemoQuanDT



### ISQKMS



## Politics

### SQuaD



## Space

### SpaceQRNG



## QKD

### SEQRET



Certifiable TRL 8 system

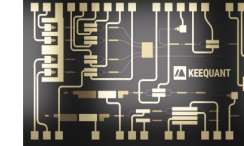


Next-gen TRL 7 system

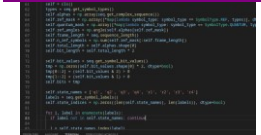
### QuINSiDa



### DECODE

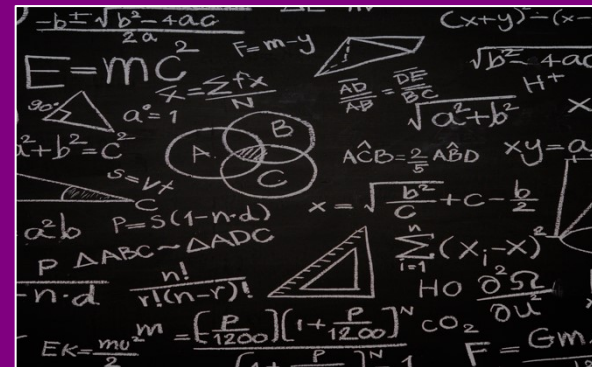
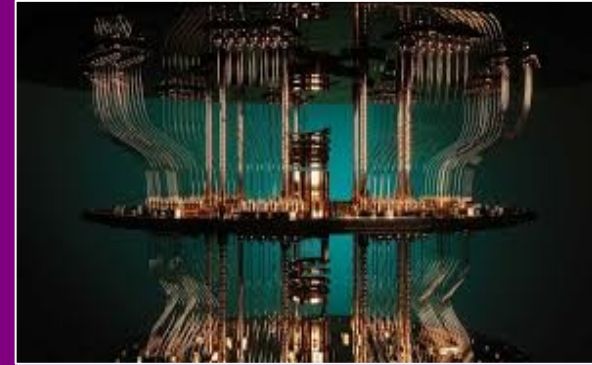


### ProQuake



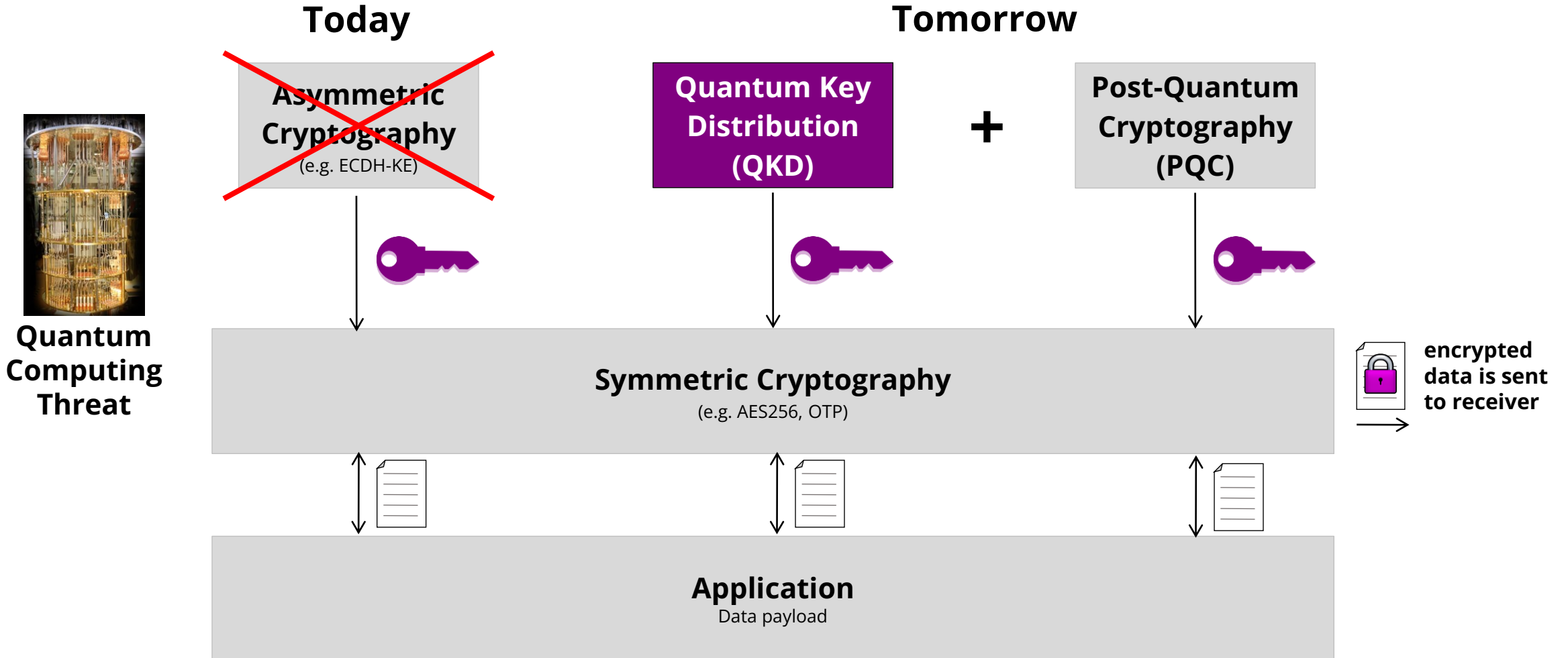
# Today's communication infrastructure, and our society, are threatened

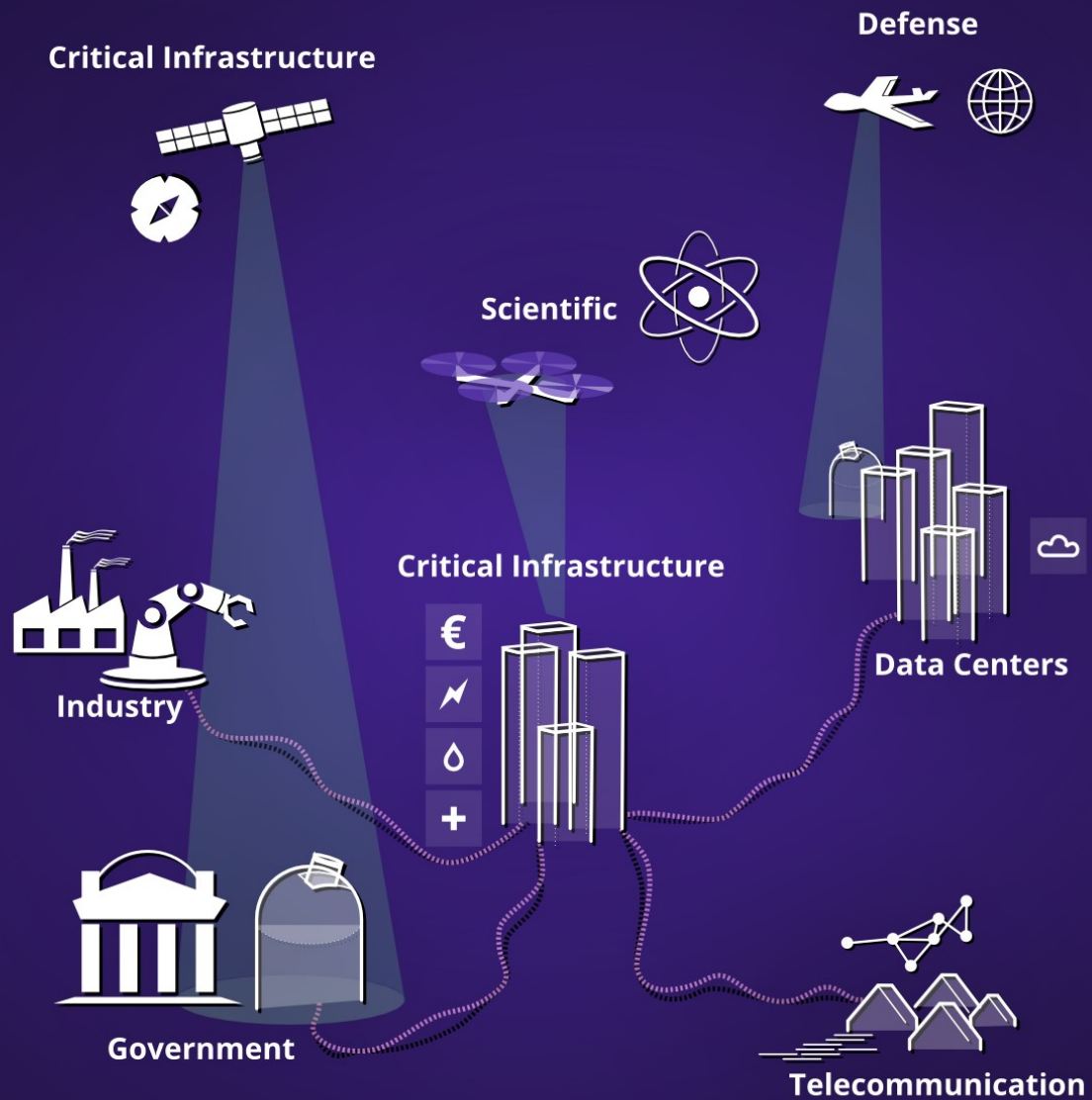
- By Quantum Computers
- Super Computers
- And Advances in Mathematics





# Cryptography today and tomorrow



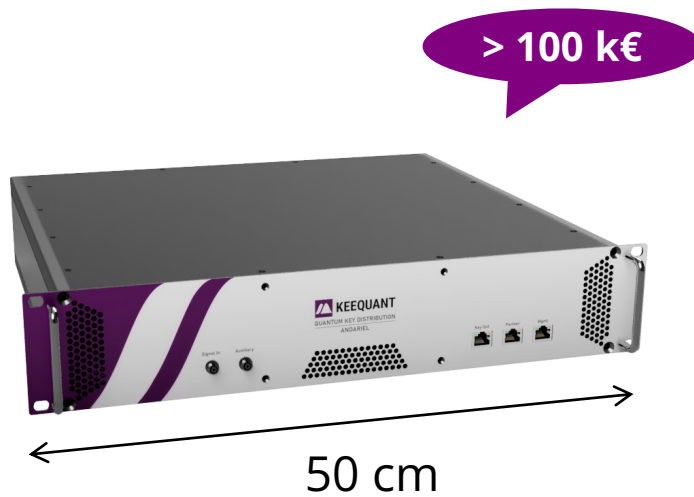


## The Solution: Quantum Cryptography

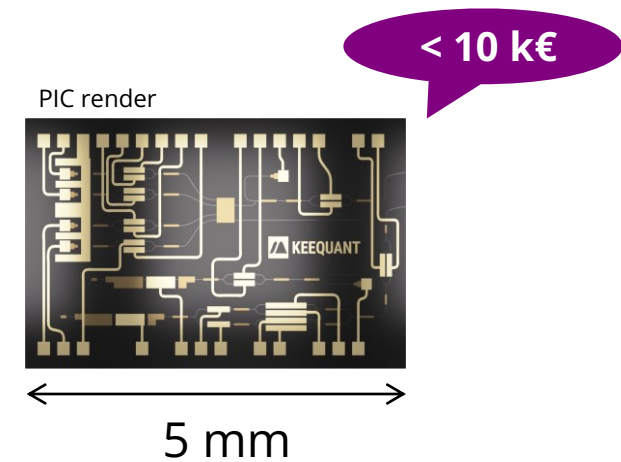
- Quantum Key Distribution (QKD) is immune against these threats
- QKD enables secure and futureproof communication

# Making Quantum Cryptography affordable

Today



Tomorrow

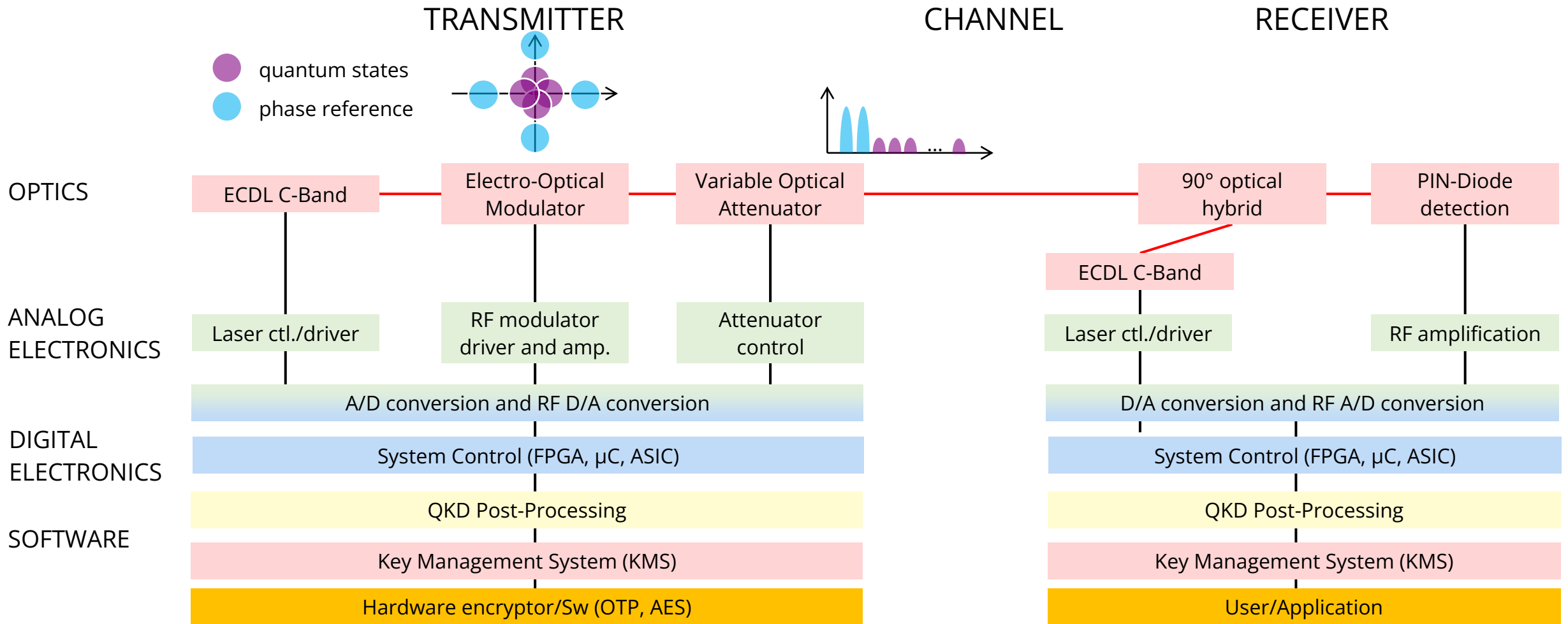


...integrated in standard telecom pluggable modules (CFP, SFP).

# KEEQuant CV-QKD Technology

	DV-QKD (Discrete-Variable QKD)	CV-QKD (Continuous-Variable QKD)	Coherent Telecom
<b>(Quantum) Information encoding</b>	Phase or polarization	Amplitude & Phase	Amplitude & Phase
<b>Receiver implementation</b>	Single Photon Detection	Coherent detection (quantum-limited)	Coherent detection
<b>Typical protocols used</b>	BB84, Decoy, Differential phase	BPSK, QPSK, QAM, Constellation Shaped QAM	BPSK, QPSK, QAM, Constellation Shaped QAM

# A typical CV-QKD System



# Development Timeline

2023

2024

2025

2026

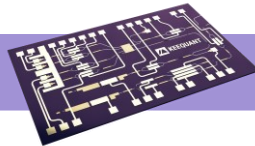


QKD

**Andariel**

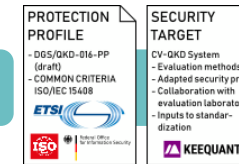
◆ Testbed operation

+ *photonic integration*



**Photonic Integrated QKD**

**Industrialization & Certification (Project SEQRET)**



+ **certification**

KMS



*Testbed Customers  
Tests with encryptors  
Additional interfaces*

*Towards real-world  
Certification  
Tamper proofing*

*Vision: As QKD Pluggable*

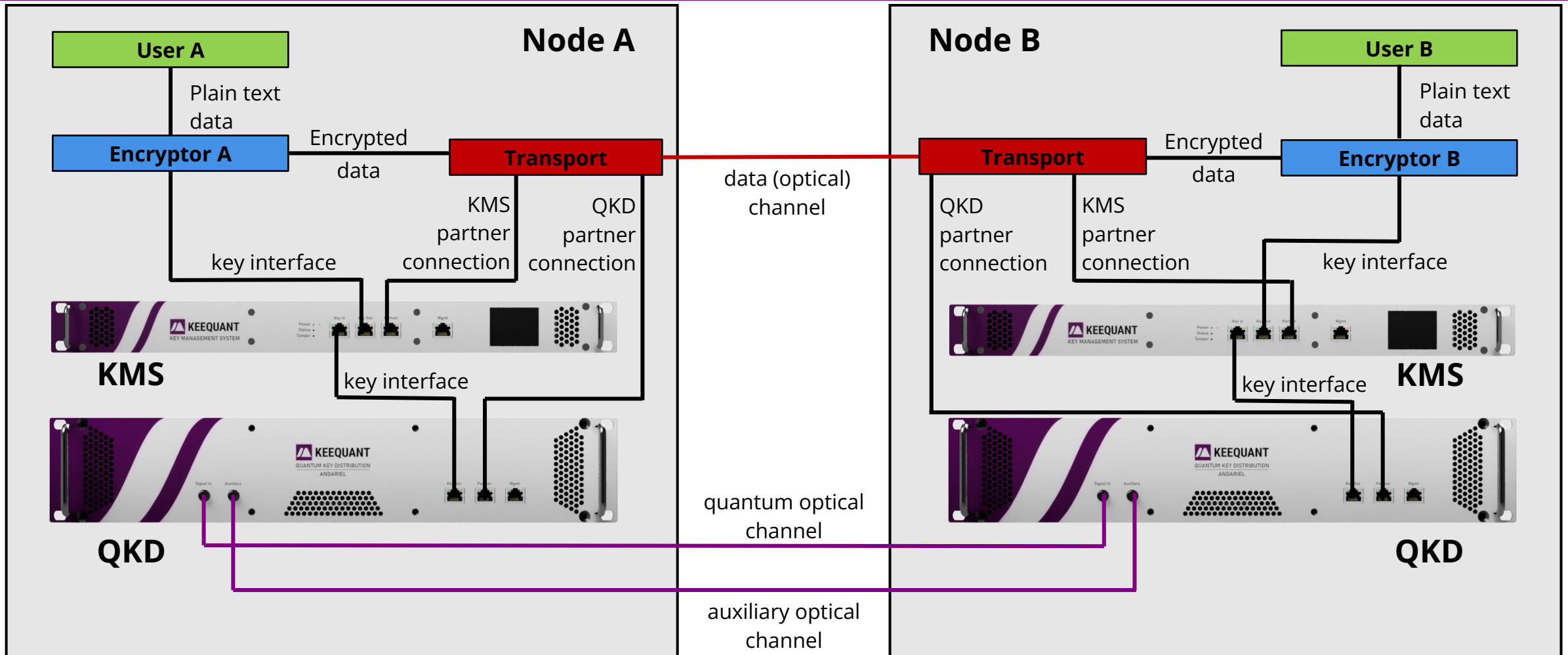


**Lilith**

QRNG for Space



# Two-node fiber QKD link



QKD System

*Andariel*



## Build your Quantum Link



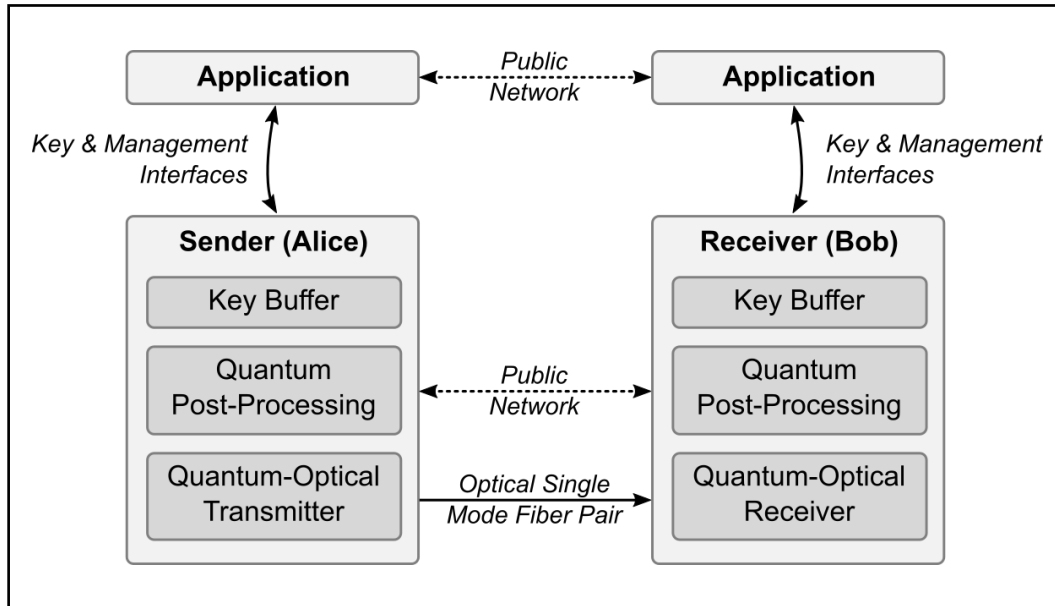
- Generate secret key material using a continuous-variables QKD protocol
- State of the art secret key rate and reach
- Easy telecom network integration

Andariel is a QKD system in the prototyping stage. All specifications are preliminary (non-binding) and are subject to change until delivery. Specifications are made with reasonable assumptions and in the best interest of both parties and the intended application.



# QKD System Andariel

## System diagram



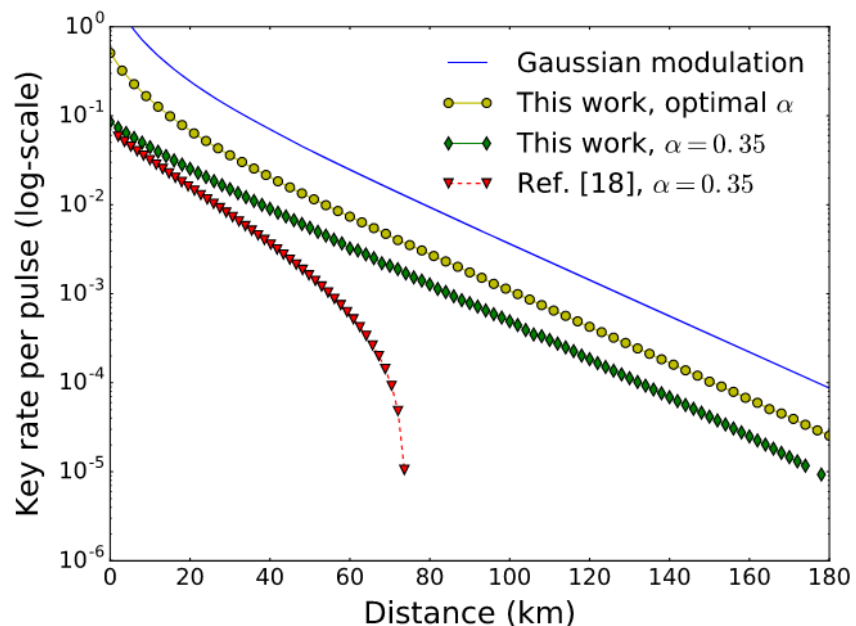
## Key features

Description	Value
QKD Protocol	CV-QKD
Detection type	Coherent
Wavelength	C-Band 1530-1560 nm, tunable to any (D)WDM channel
Required no. of fibers	Duplex (two opt. fibers)
Key delivery interface	ETSI GS QKD 014
Management interface	Browser-based GUI, possibly CLI, REST API

Andariel is a QKD system in the prototyping stage. All specifications are preliminary (non-binding) and are subject to change until delivery. Specifications are made with reasonable assumptions and in the best interest of both parties and the intended application.

# Andariel Secret Key Rate and Reach

Lütkenhaus et al., PRX 9, 041064



Target for Andariel:

- > 10 kbit/s @ 10 dB (asymptotic)
- > 16 dB reach

# Key Management System

## *KMS1*



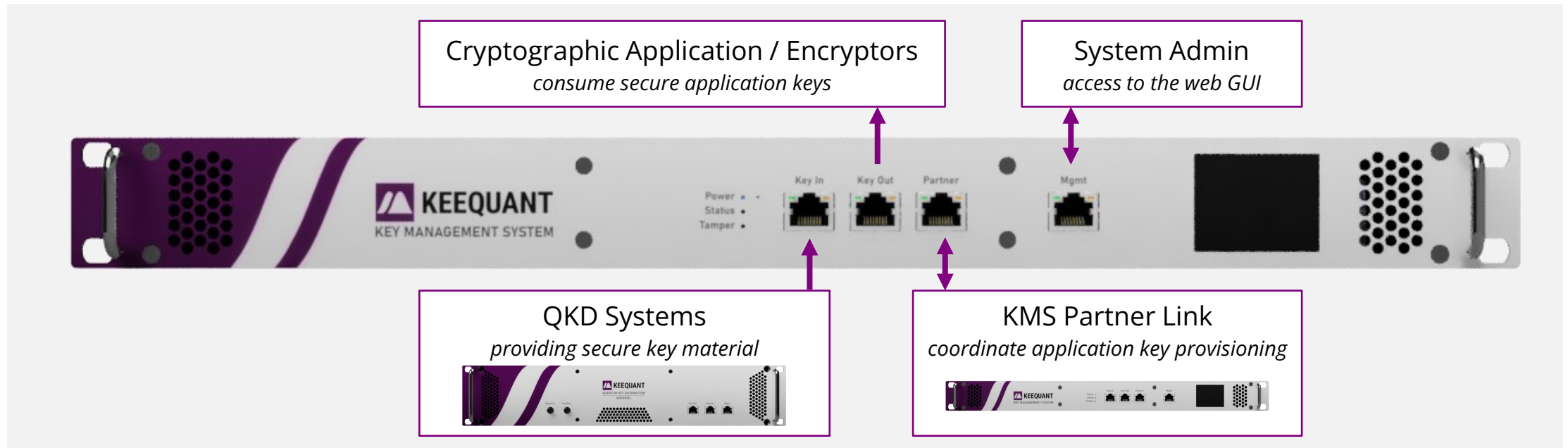
## Build your Quantum Network



- Key storage, key derivation & key auditing
- All interfaces ETSI compatible
- Easy configuration and management

# KMS1 Hardware

- Standard 19" rack appliance
- Gigabit ethernet ports
- 3 GB internal key storage



# KMS1 basic functionality and ETSI interface

## Key storage, key routing, key derivation & key auditing

- State-of-the-art key derivation along the chosen path
- Key audit provisions with detailed event logging

## All interfaces ETSI compatible

- REST API endpoints with Gigabit performance
- Full ETSI GS QKD 014 compatibility
- Vertical vendor independence (QKD and encryptor)

The screenshot displays the KEEQUANT KMS1 dashboard. The top navigation bar includes the KEEQUANT logo and the title 'KMS1 – Key Management System'. A left sidebar menu lists navigation options: DASHBOARD (selected), QUICK SETUP, NETWORK, SYSTEM, KEY AUDIT, SYSTEM LOG, and ETSI-14 CLIENT. The main dashboard area features six monitoring cards:

- Network Topology:** Shows a tree structure with green checkmarks for KMS\_4 and KMS\_2.
- Key Served:** Displays two key icons with data: 'Served: 192 Bytes (15:04:49 UTC)' and 'Served: 448 Bytes (15:03:38 UTC)'. A right-pointing arrow is next to the second icon.
- Status:** A large checkmark icon with the text 'OK' below it.
- QKD Status:** A quantum key distribution icon with a green checkmark and the text 'QKD\_KMS\_1'.
- Link Key Stored:** A key icon with data: 'Link Key Stored: KMS\_2: 17.72 KiB' and 'KMS\_4: 17.94 KiB'. A right-pointing arrow is next to the icon.
- System Temperature:** A thermometer icon with the text 'System Temperature: 37 °C'.

At the bottom of the sidebar, the following device information is displayed: KMS\_1, SN KMS1-0001, FW 01/01, HW v0.

# KMS1 configuration and versatility

The screenshot displays the KEEQUANT KMS1 configuration interface. On the left is a navigation menu with options: DASHBOARD, QUICK SETUP, NETWORK, SYSTEM, KEY AUDIT, SYSTEM LOG, and ETSI-14 CLIENT. The main area is titled 'Quick Setup' and features a network diagram with four nodes: KMS\_1 (10.1.1.2), KMS\_2 (10.1.1.3), KMS\_3 (10.1.1.4), and KMS\_4 (10.1.1.5). Each node is connected to its corresponding SAE ID (SAE\_1 to SAE\_4). Below the diagram are buttons for 'Add KMS', 'Del KMS', and 'Link'. A configuration table is shown below the buttons, and at the bottom are buttons for 'Store Configuration...', 'Show Current Configuration', and 'Reset'.

KMS ID	HOSTNAME	SAE ID 1	SAE ID 2	QKD POLL	ETSI14 SSL
KMS_1	10.1.1.2	SAE_1		1000 ms	<input type="checkbox"/> Use Northbound SSL
KMS_2	10.1.1.3	SAE_2		1000 ms	<input type="checkbox"/> Use Northbound SSL
KMS_3	10.1.1.4	SAE_3		1000 ms	<input type="checkbox"/> Use Northbound SSL
KMS_4	10.1.1.5	SAE_4		1000 ms	<input type="checkbox"/> Use Northbound SSL

## Easy configuration and management

- Arbitrary network topologies (mesh, star, linear, ...) supported
- Network configuration using graphical web interface
- Encryptorless operation of trusted node

## Versatile - Modular - Flexible

- Contact us for more functionality and integration in your QKD network

# Thank You!



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<https://www.linkedin.com/company/keequant>



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