



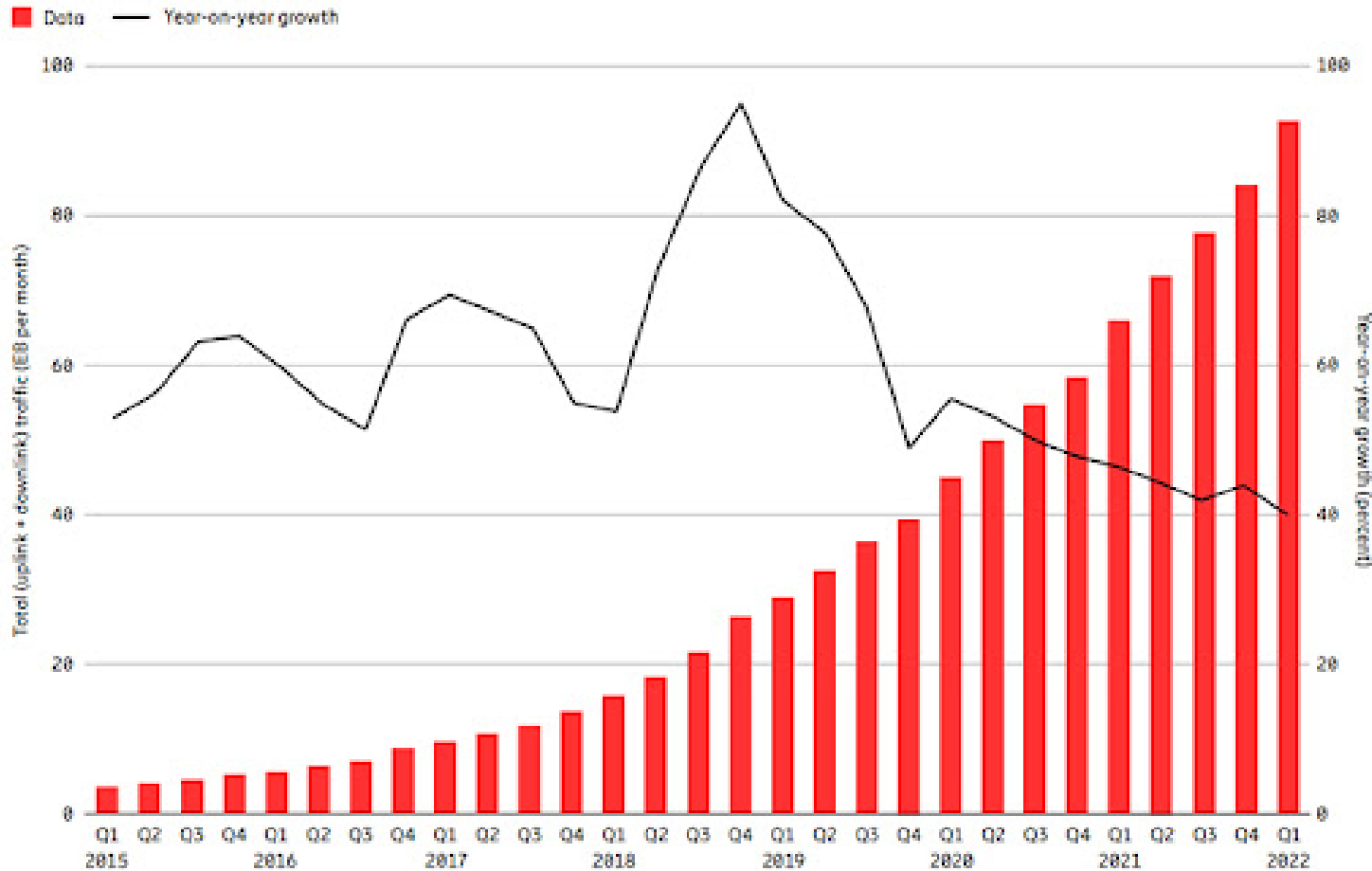
Providing world class free space optical connectivity

Will Crowcombe

Managing Director



Trends in wireless connectivity demand



Source: Ericsson traffic measurements (Q1 2022).

Note: Mobile network data traffic also includes traffic generated by fixed wireless access (FWA) services.

- Wireless mobile data is growing by 40% every year
- Over the long-term, traffic growth is driven by both the rising number of smartphone subscriptions and an increasing average data volume per subscription
- Video traffic is estimated to account for 69% of all mobile data traffic, a share that is forecast to increase to 79% in 2027
- The radio frequency spectrum is a limited natural resource



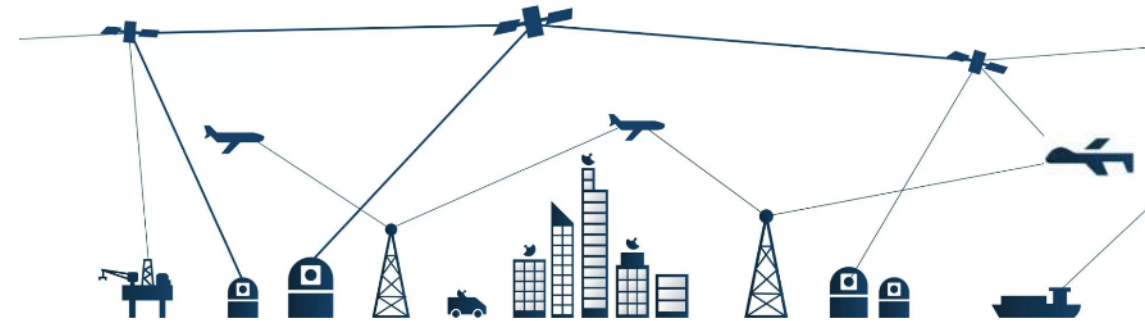
Radio RF based connectivity faces 2 serious problems

- Congestion
- Low security



FSO Instruments brings the solution to the market: optical connectivity

- Laser light combines >1000-fold more bandwidth with high security



Security issues in RF spectrum

Newsweek

U.S. World Science Health Life Rankings Opinion Entertainment Fact Check My Turn Education ...

World

Poland

GPS

US Reaper Drone in Emergency Landing Amid Russia GPS Attacks

Published Mar 19, 2024 at 5:51 AM EDT



Security issues in RF spectrum

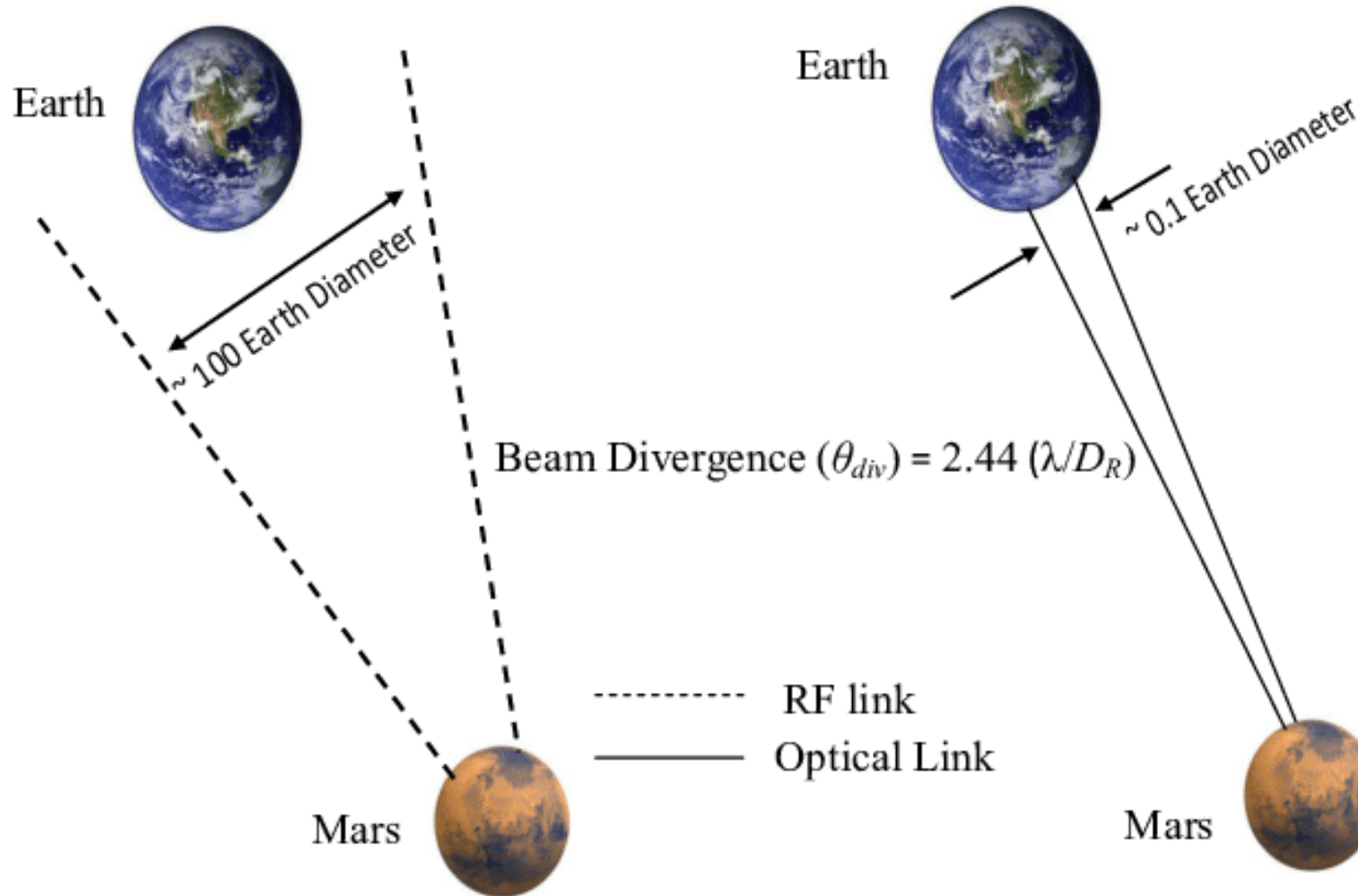
World / Europe

Ukraine relies on Starlink for its drone war. Russia appears to be bypassing sanctions to use the devices too

By Nick Paton Walsh, Alex Marquardt, Florence Davey-Attlee and Kosta Gak, CNN
6 minute read · Updated 4:17 AM EDT, Tue March 26, 2024



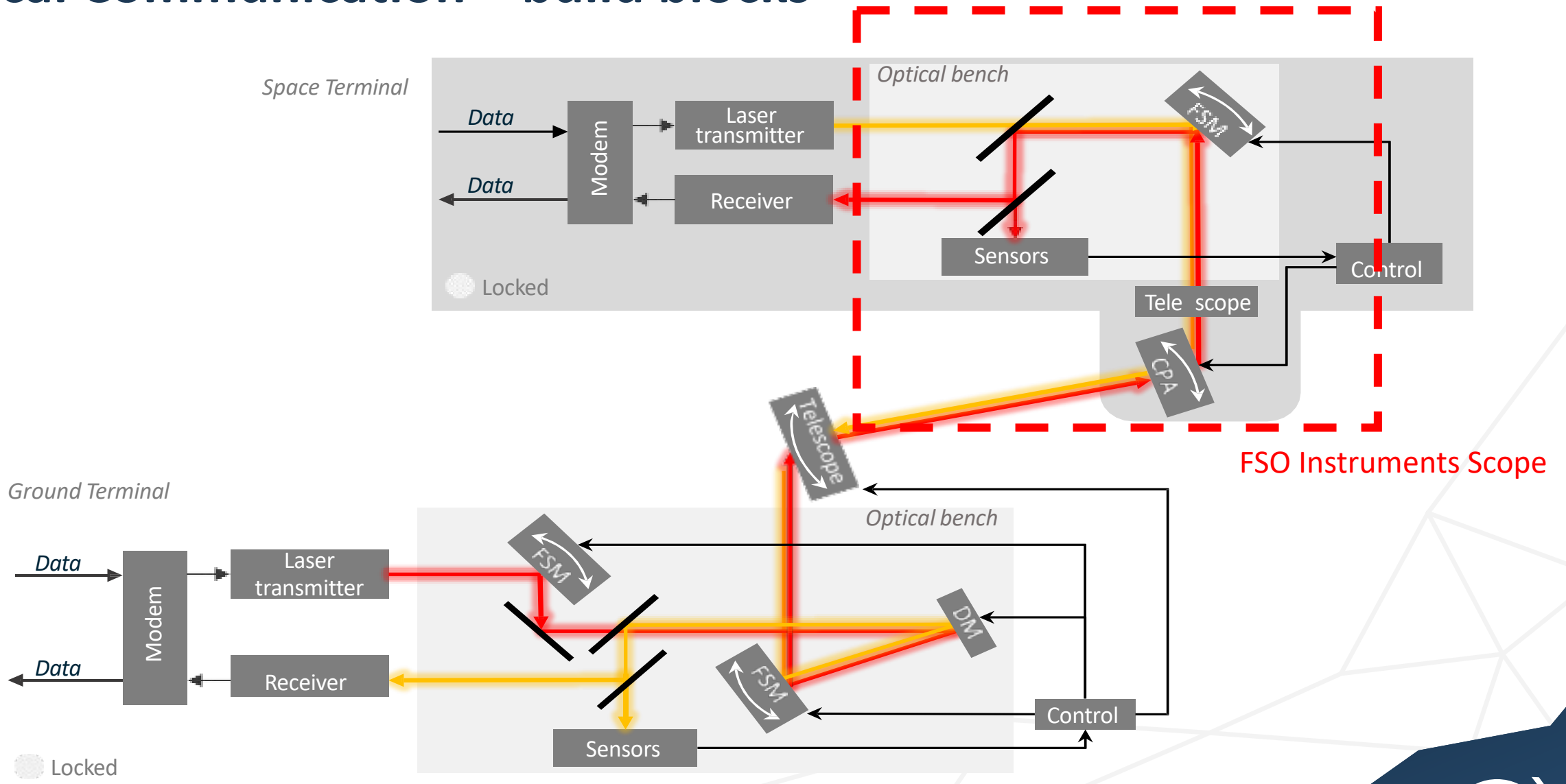
RF vs Optical Example













- For a given Tx aperture diameter the beam divergence of an optical system is significantly narrower than that of an RF system.
- Typical beam divergence in an optical system \rightarrow 1000th Deg.



Optical Communication – build blocks



RF vs Optical Communication

	<i>RF communication:</i>	<i>Optical Communication:</i>
Available bandwidth/ license regulations		
Vulnerability (Jamming/interception)		
Price/bit		
Energy/bit		
Availability (clouds)		



Introducing FSO Instruments

- FSO instruments is a joint venture between Demcon and VDL, based in Delft



High-tech contract engineering / product development



High-tech contract manufacturing / supply chain management



FSO Instruments' strategy

- Clear Product Roadmap 2023 – 2030
- Tap into TNO's unique optical communication technology base
- Tap into shareholders' vast engineering & manufacturing bases
- Tap into (inter)national funding opportunities
- Leverage Dutch Optical Connectivity Eco System



DE VERBINDING
TUSSEN TECHNOLOGIE,
MARKT EN MENS

HOME PLATFORM ▾ DISCA ▾ FLINK NIEUWS ▾ AGENDA ▾ OVER LINK ▾ CONTACT ▾

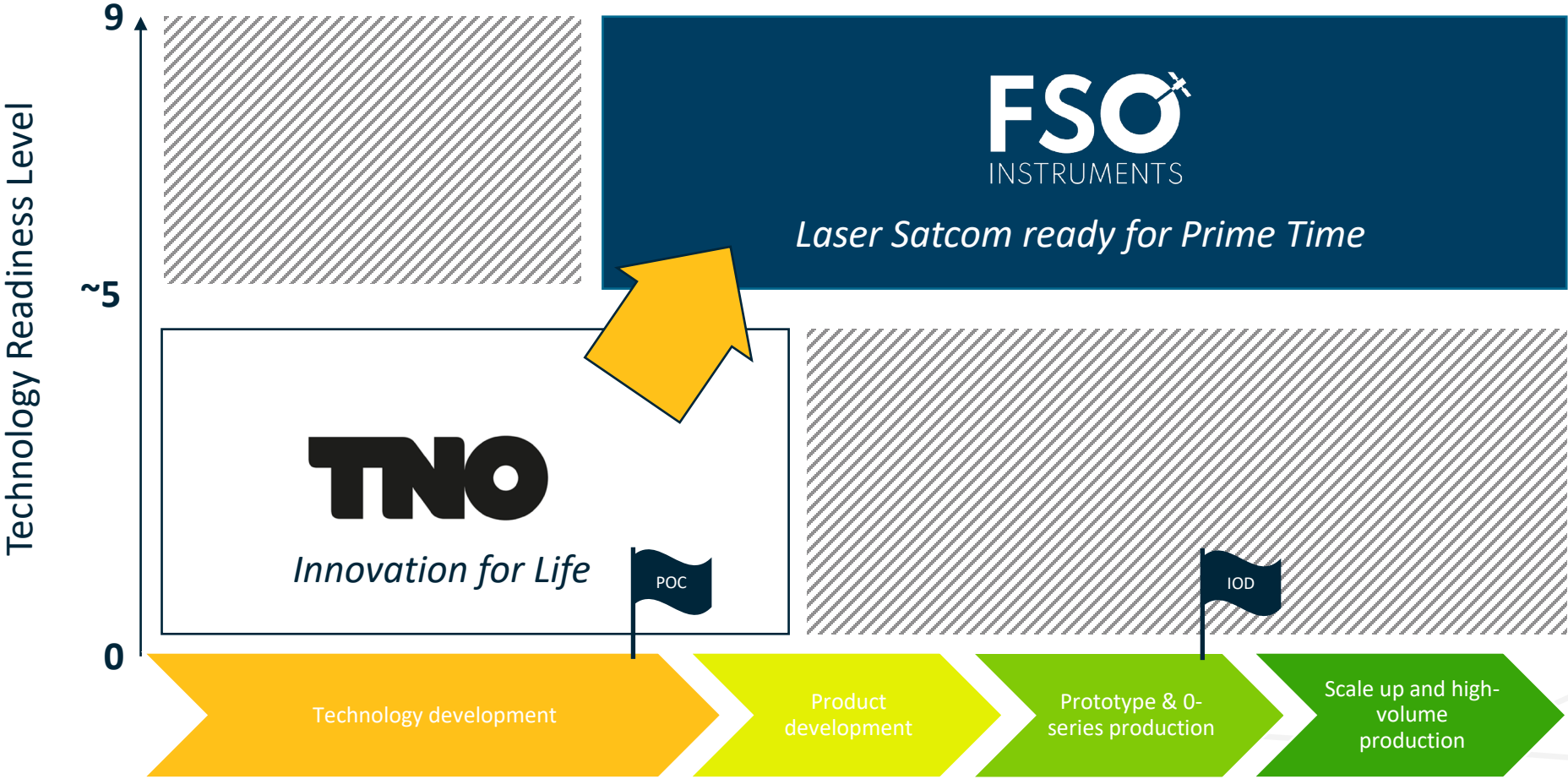
| Nieuwe samenwerking TNO en FSO Instruments om Europees ecosysteem voor laser satellietcommunicatie te vestigen in Nederland

Nationaal Groeifonds

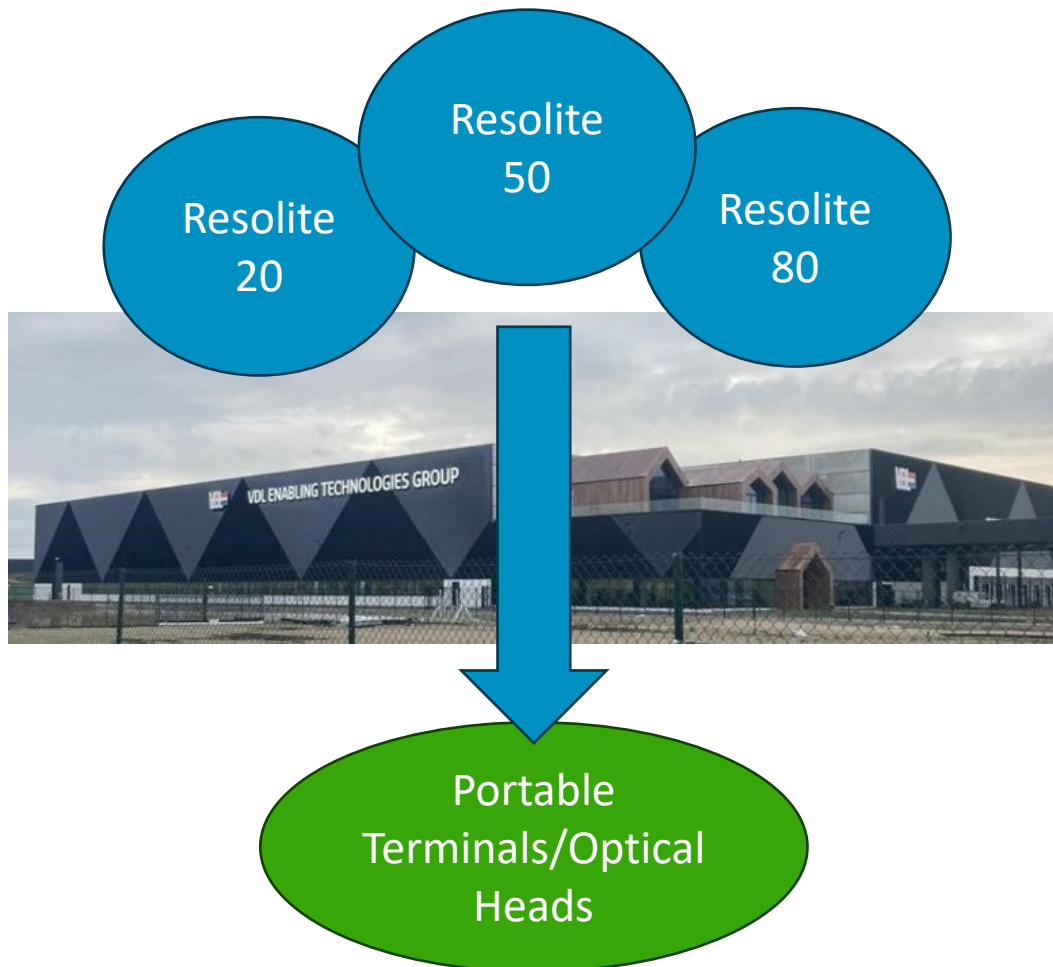


FSO Helps bring TNO technology to market

Supporting traditional OEMers with scale production



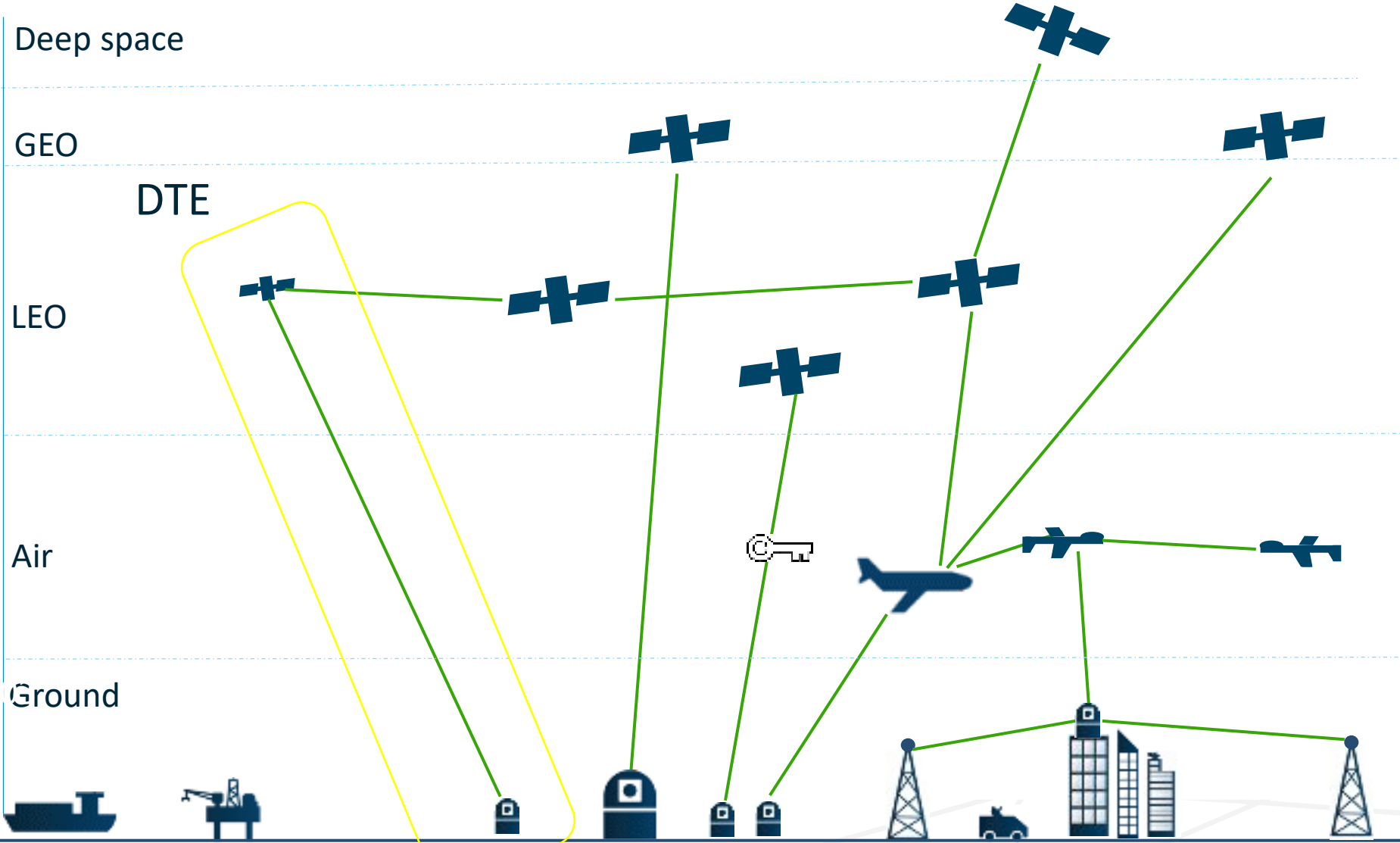
FSO Product Portfolio



- 3 main products lines
 - Varying Aperture size that cover a range of applications
 - SWaPC optimized
 - Modular building blocks
- Integrated in VDL Almelo
- Serving multiple terminal OEMs
- In multiple markets:
 - Portable terminal market (Space, Airborne, etc)
 - Spin offs markets -> eg Ground Station etc



Targetted Satcom Market overview



DTE - OGS

Project with:

TNO **AIRBUS**

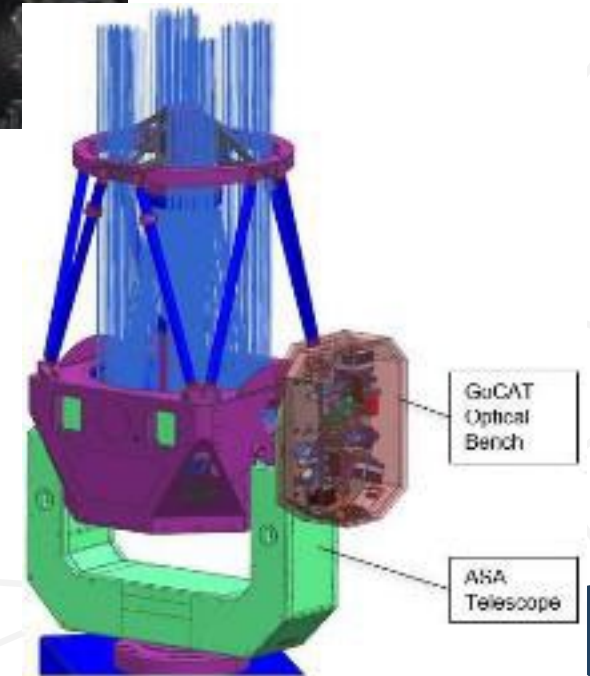
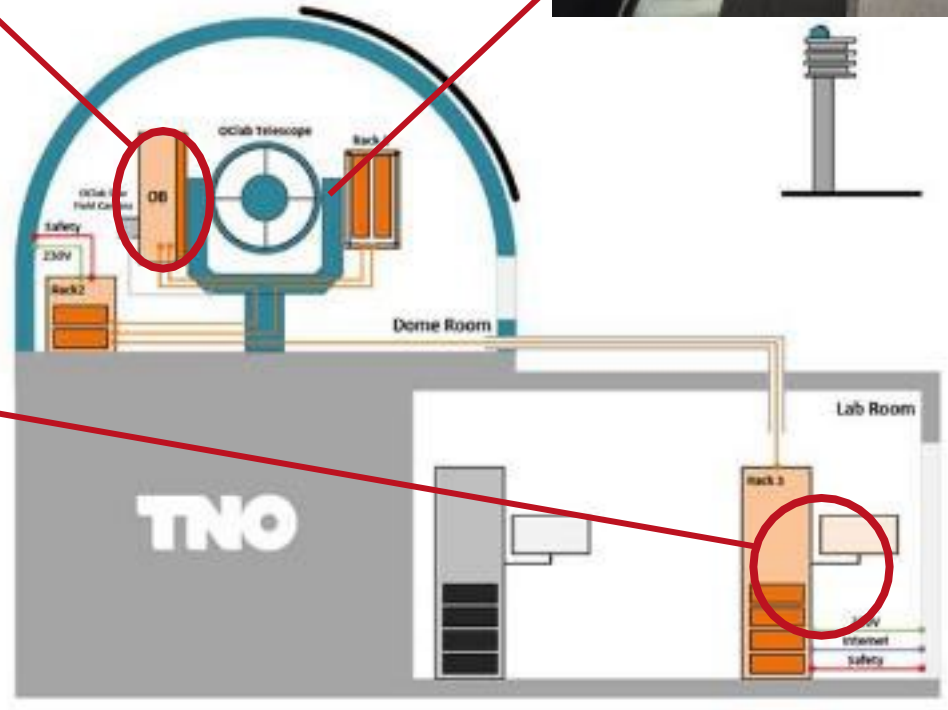
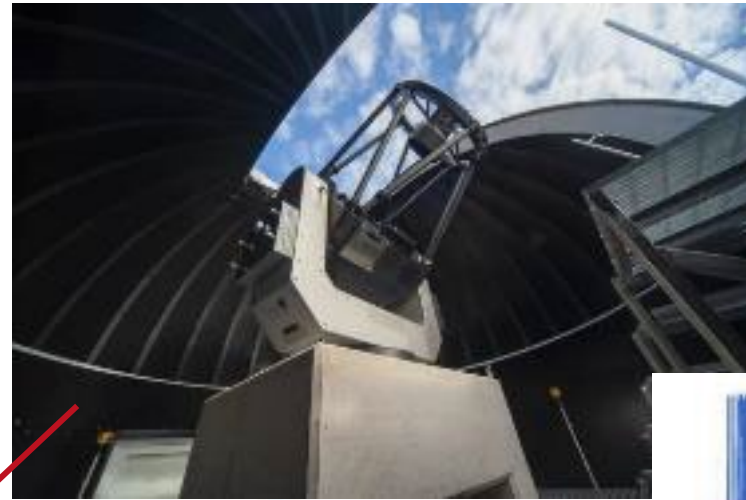


Credits: TNO



DTE - OGS

Project with:

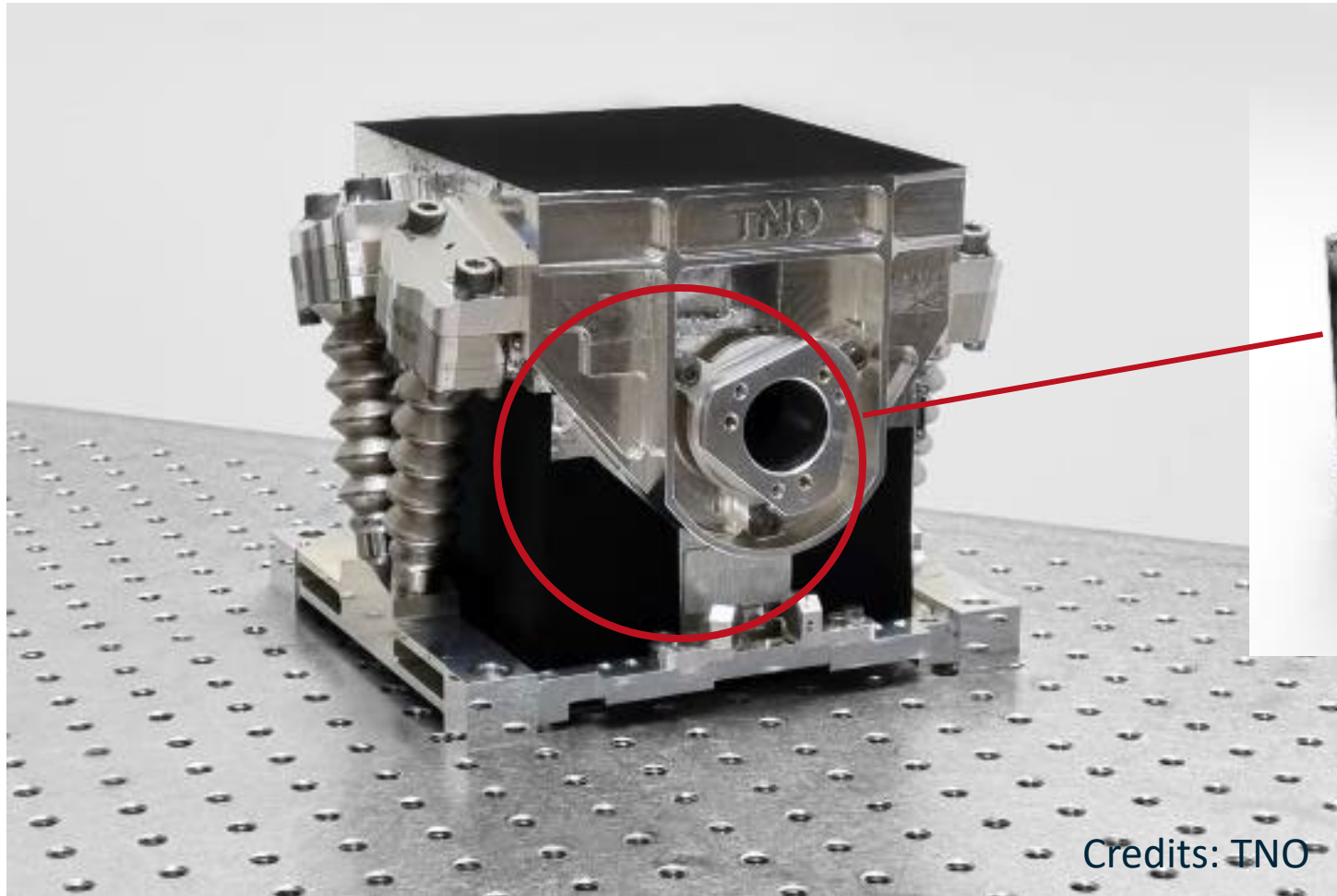


DTE – CUBECAT TERMINAL

Project with:



AAC
HYPERION



Credits: TNO

DTE – IOD SMALL ON NORRSAT-TD

Project with:



Credits: SFL-UTIAS

Launched April 2023 –
Transporter 7 mission



DTE – CubeCAT First Light

Dutch first in space technology: first data transmission via laser satellite communication

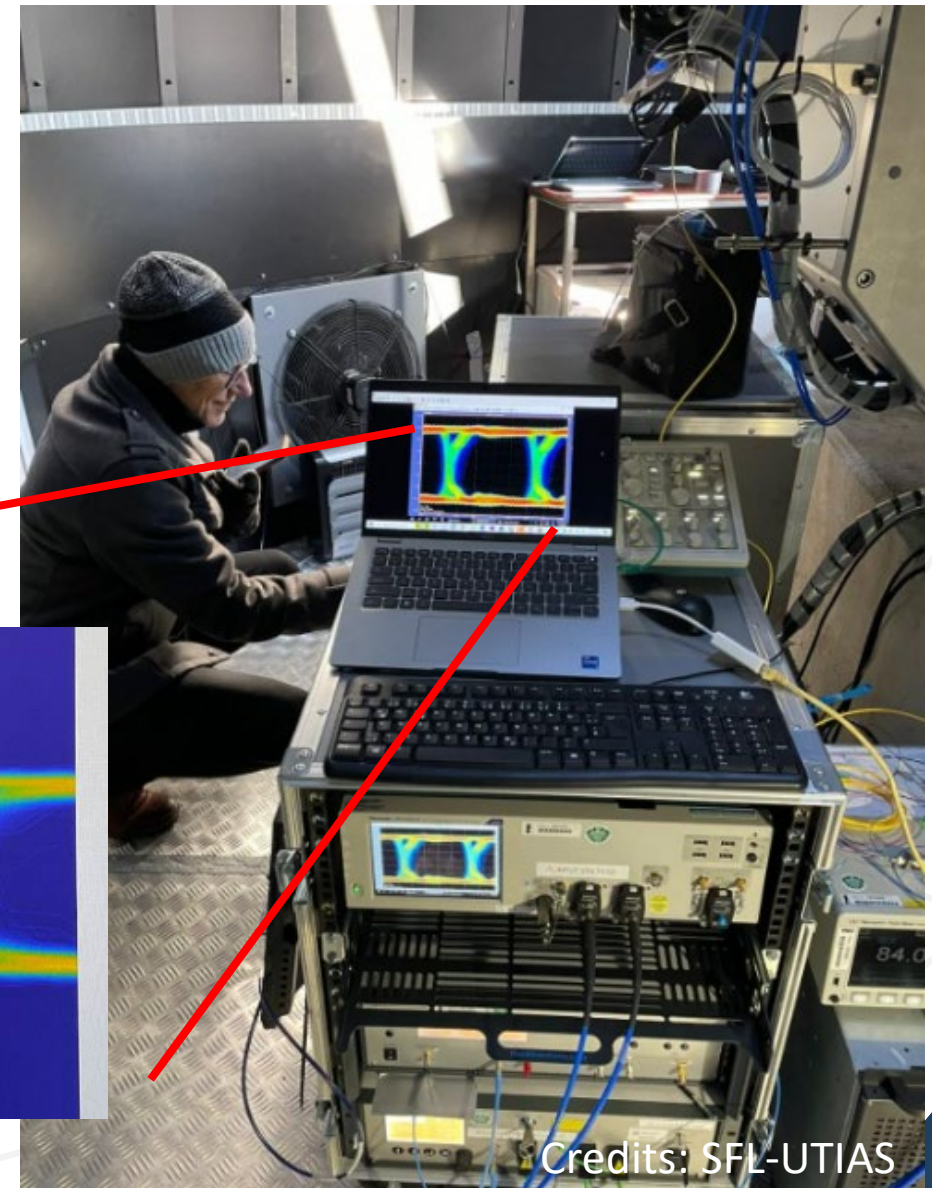
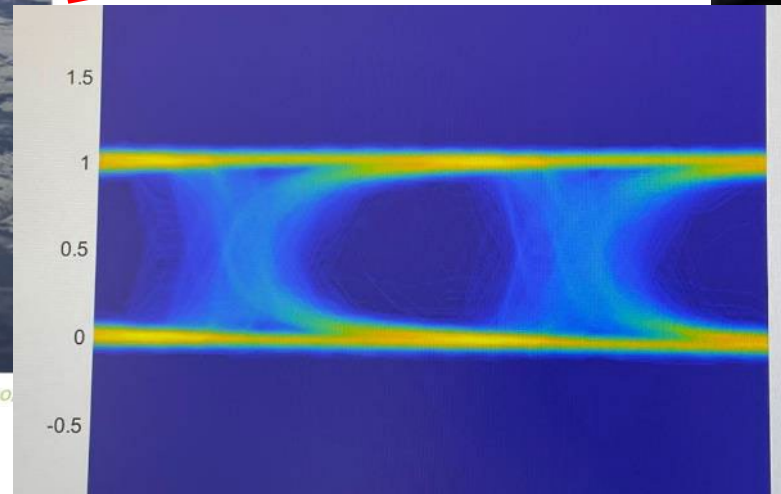
by Carmel McNamara | Jan 24, 2024 | Industry News, Satellite Communication

On 19 January, the experimental Dutch satellite instrument SmallCAT successfully connected to a ground station on Earth – via laser light. It is an important milestone for the Dutch space industry, which wants to market its laser satellite communication technology worldwide.

[View news item on the NSO website](#)



NorSat-TD carries experimental payloads including SmallCAT (credit: Norwegian Space Agency) (via NSO)



Credits: SFL-UTIAS



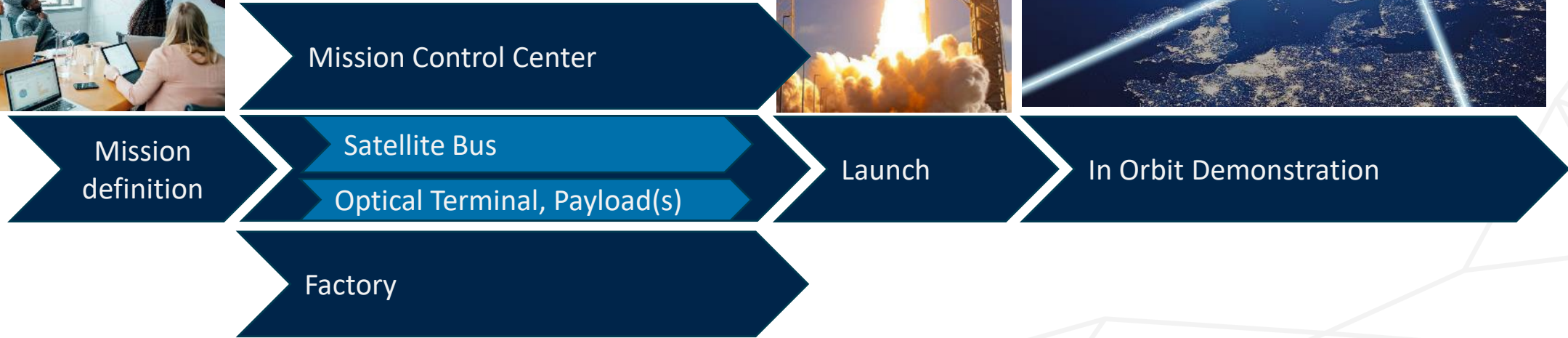
Dutch Optical Connectivity Eco System

The image features a central map of the Netherlands, colored in red and blue. Surrounding the map are logos of various companies and organizations, including:

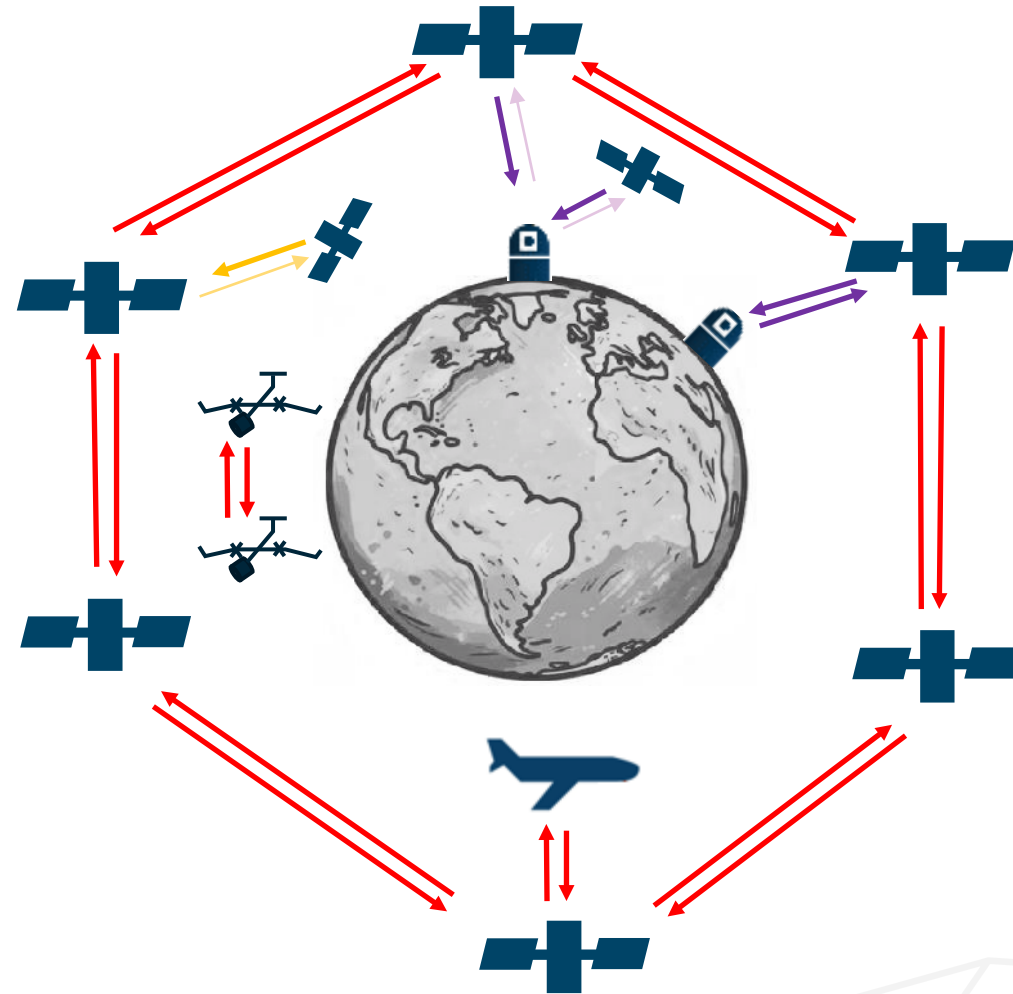
- Netherlands Space Office
- DEMCON
- AXIENT
- TNO
- Ministerie van Economische Zaken en Klimaat
- Lionix INTERNATIONAL
- AIRBUS
- nlr
- esa (European Space Agency)
- TU Delft
- AAC CLYDE SPACE
- capable (create your connection)
- FSO INSTRUMENTS
- signify
- NXT GEN HIGHTECH
- Viasat
- VDL TBP ELECTRONICS
- VTEC LASERS & SENSORS
- VDL
- SUMIPRO Optical solutions
- EFFECT PHOTONICS
- Defensie
- ROYAL NETHERLANDS AIR FORCE DEFENCE SPACE SECURITY CENTRE
- IBS Precision Engineering
- DUI Dutch United Instruments
- CSTS Satellite Test & Simulation
- AIRCISION

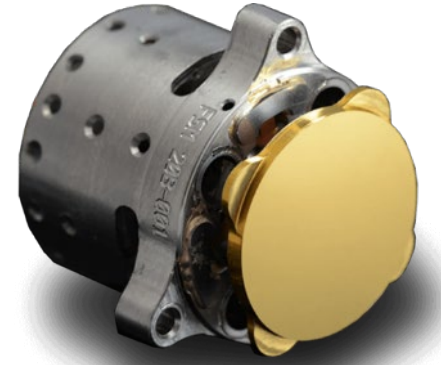
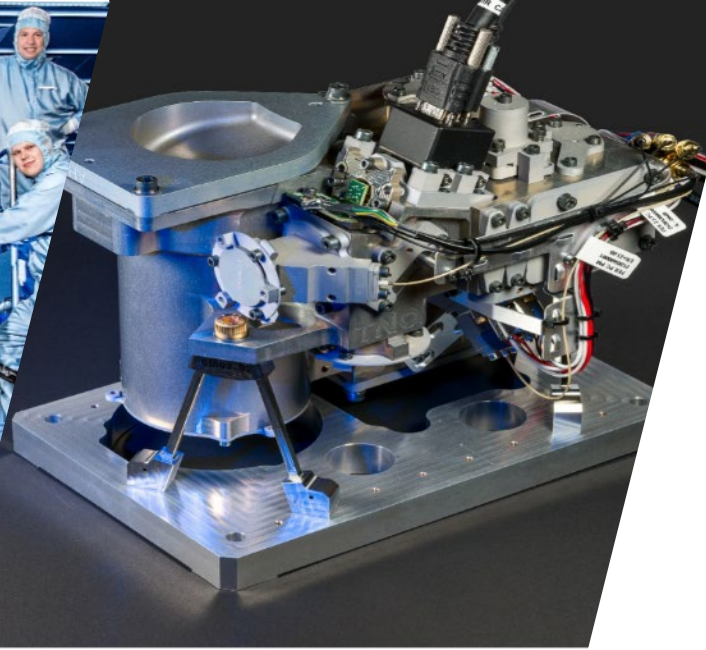
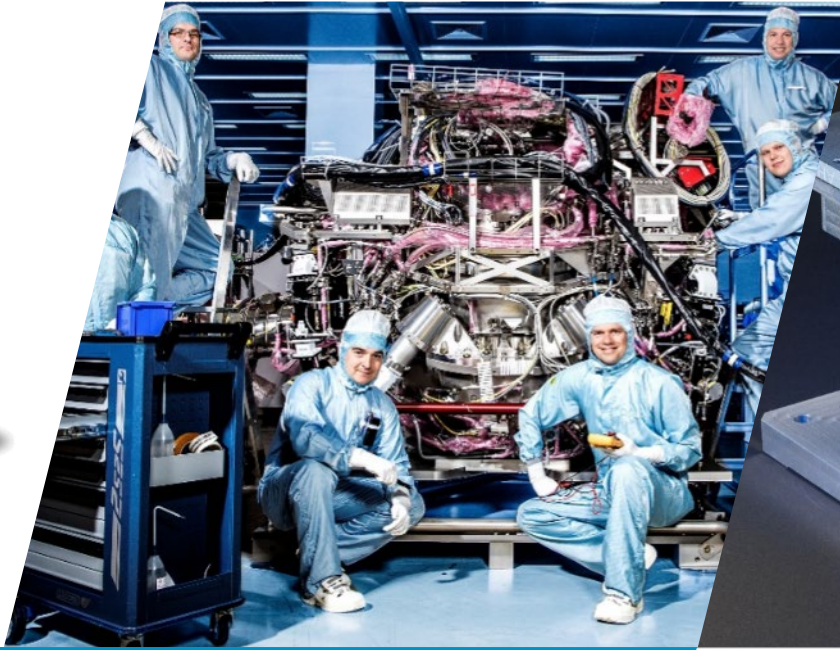


FSO Outlook - IOD Program



FSO Outlook – Moonshot -> Constellation





FSO
INSTRUMENTS

