CELTIC-NEXT
Proposers Brokerage Day

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Pitch of the Project Proposal

Optolink

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Optolink Concept

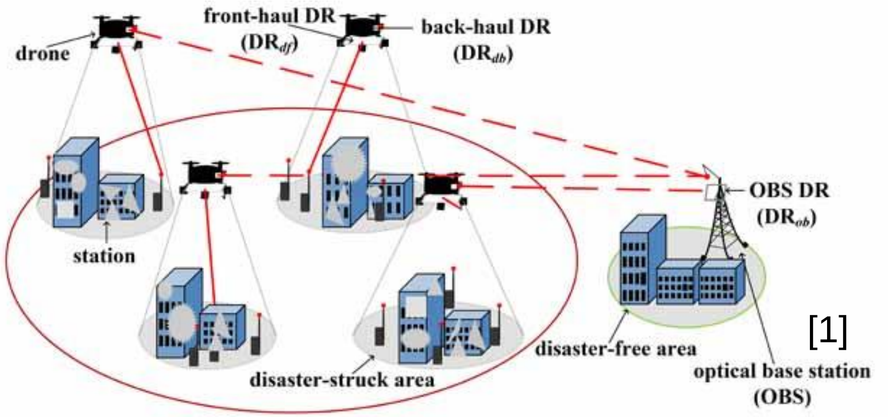
Optical comms terminals for off-grid, point-to-point communication

- High-speed comms for remote areas lacking infrastructure
- Back-up comms for disaster relief after damage to infrastructure
- Fraunhofer CAP has experience with key hardware and physical technologies for optical comms in various domains:
  - Terrestrial / Overcoming opstacles (non-line of sight)
  - Air to air / Air to ground
  - Underwater
  - Space / Space to ground

Domains and use-cases

- **Ground-** Development of land-based communications links
- **Airborne-** Optical communications systems (i.e. HAPS and Drones)
- **Underwater** environment optical links for ROVs and submarines including through water/air interface
- **Space-** optical links for space and space to ground

- **Open to discussing other topic areas**



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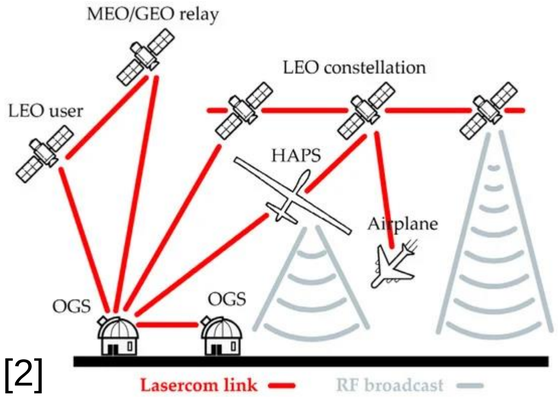

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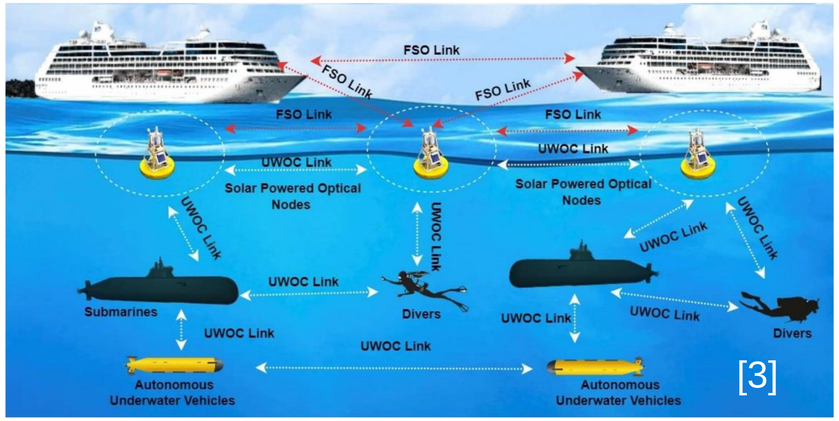


[3]

[1] P. K. Esubonteng and R. Rojas-Cessa, "RESTORE: Low-Energy Drone-Assisted NLoS-FSO Emergency Communications," in IEEE Access, vol. 10, pp. 115282-115294, 2022, doi: 10.1109/ACCESS.2022.3218014.

[2] Carrasco-Casado et al. , M. Miniaturized Multi-Platform Free-Space Laser-Communication Terminals for Beyond-5G Networks and Space Applications. *Photonics* **2024**, *11*, 545. https://doi.org/10.3390/photonics11060545

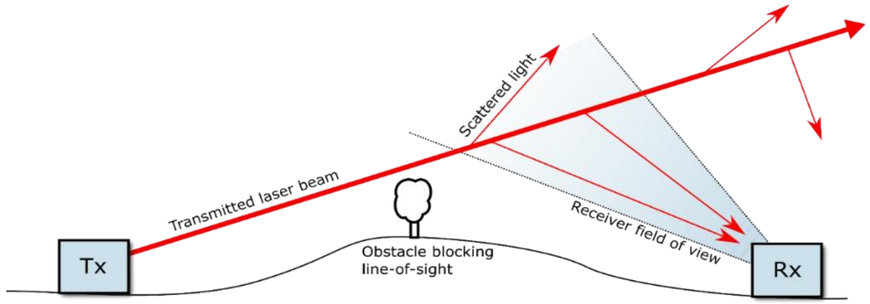
[3] Chaudhary, et al. A Salinity-Impact Analysis of Polarization Division Multiplexing-Based Underwater Optical Wireless Communication System with High-Speed Data Transmission. *J. Sens. Actuator Netw.* **2023**, *12*, 72. https://doi.org/10.3390/jsan12050072

Fraunhofer CAP

- Fraunhofer Centre for Applied Photonics provides professional R&D services for, and with, industry
- Not for Profit UK company and legally independent affiliate of Fraunhofer Gesellschaft
- Currently >80 staff and students (including 30 staff with PhDs and 28 PhD/EngD students)
- Specialising in optics and photonics technologies, including Remote sensing, Free-space optical communications and Quantum technologies
- To date:
  - >250 projects of value
  - >£120M total value of projects to all partners
  - >130 funded company partners from SMEs to multi-nationals

Land

- **Experience**
  - Developed an outdoor communications link for QKD communications.
  - Development of NIR/IR sources for turbulent environments.
  - Development of NLOS communications at various wavelengths.
- **Ideas**
  - Development of a last kilometre link for classical or quantum communications.
  - Developing optical NLOS links for overcoming obstacles say in an urban environment
  - Ground-station receivers for airborne platforms to stream secure communication data.



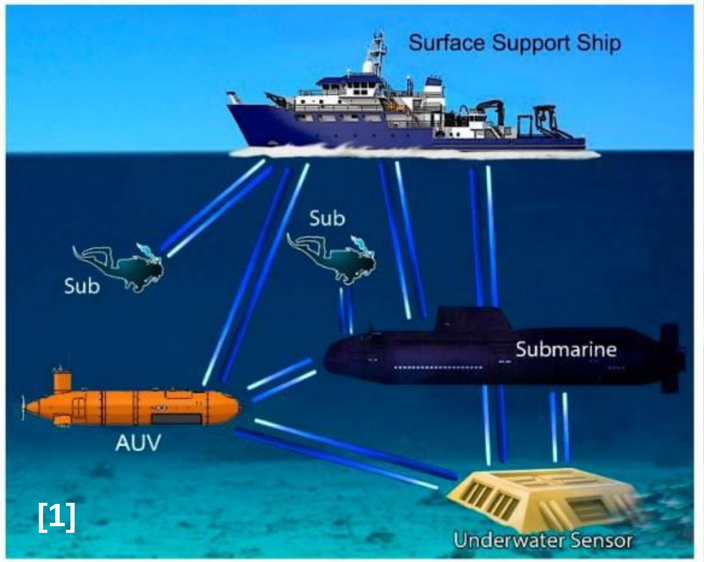
Airborne

- **Experience**
  - We have worked on projects aimed at airborne communications and sensing
  - Drone LIDAR units
  - Optical comms for HAPS

- **Ideas**
  - Communications for interconnecting drone networks used in monitoring (i.e. wildfire monitoring)
  - Air to ground systems for communication to relay information from the ground to an aerial platform (i.e. where traditional communications have been damaged)

Underwater

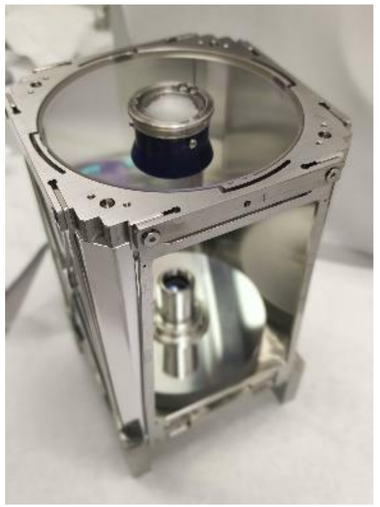
- **Experience**
  - Tested underwater links in test tanks and reservoirs
  - Tested side scattering fibres for underwater communications
- **Idea:**
  - Pointing and tracking between ROVs (Inspecting damaged undersea cables).
  - ROV to base station which could be a surface vessel or arial platform surface.
  - Monitoring station to ROV link development



[1] Schirripa Spagnolo G, Cozzella L, Leccese F. Underwater Optical Wireless Communications: Overview. Sensors (Basel). 2020 Apr 16;20(8):2261. doi: 10.3390/s20082261.

Space

- **Experience**
  - We have experience in space to ground and other forms of space-based technologies
  - CubeSat telescope (1.5U)
  - Optical ground-station receiver characterisation
  - Atmospheric turbulence modelling



- **Ideas**
  - Secure inter-satellite communications for CubeSat constellations
  - Space-to-ground communications
  - Testing units for optical ground receivers

Potential Partners

- Fraunhofer CAP works with companies across sectors, up and down supply chains, and also with universities and other Research and Technology Organisations (RTOs), use-case owners, and manufacturers and systems integrators of optical communication hardware
- Our expertise lies in the physical layer
- We are **especially interested in partners** with complimentary expertise.
- e.g. **working at data-link layer, network layer** and higher.

Contact Info

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Presentation is available via: