




Optical Stations for Telecoms in free Space





CNES Optical Ground Station Demonstrator designed and built by OGS Technologies at Calern Observatory (French Riviera).
The OGS is operating since May 2024.

OGS Technologies develops and builds Optical Ground Stations with compact designs, customized for different multi-orbit missions (LEO, MEO, GEO). Optical telescopes and optical focal plane assemblies that incorporate adaptive optics have been specifically designed to satisfy the demanding operational requirements of free-space optical (FSO) telecoms. OGS Technologies ground stations may be adapted to other missions such as Satellite Laser Ranging or Space Situation Awareness.

MAIN FEATURES

- Modular and customizable design for future evolution
- Mono or bi-static architecture, 1 or 2 telescopes with 500mm aperture on an Alt-Az mount
- Acquisition of optical GEO links (TELEO terminal): 100% success rate
- Downlink with adaptive optics and single mode fiber injection ready for coherent and tight budget link up to 200 Gbps line rate
- Robust adaptive optics pre-compensated Uplinks (GEO)
- Up to 2 WDM with 40W per WDM
- Compliant with CCSDS and SDA standards, ready to support upcoming coherent standards

TECHNICAL DATASHEET

Optical telescope(s) :

- 1 or 2 telescopes, 500 mm aperture on Alt-Az mount (5°-90°; 0°-540°; up to 10°/s)
- Full body in carbon-composite material for daytime and nighttime operations
- Linear obscuration (M2) : 32%
- Solar Exclusion Angle : 5°
- Optimized mirror coating for C and L band operations

Cassegrain FPA :

- Downlink with free-space coupling to APD (100 Mbps to 10 Gbps) with high aperture ready for LEO even at low elevation
- Downlink with adaptive optics and single mode fiber injection ready for coherent and tight budget link up to 200 Gbps line rate
- Pointing, Acquisition and Tracking (PAT)
- Downlink FPA is QKD-ready with up to 150 dB isolation of the quantum channel

Coude FPA :

- Uplink with adaptive optics pre-compensation (proven)
- Pointing ahead mechanism with automatic optimization
- Downlink with adaptive optics and single mode fiber injection ready for coherent and tight budget link up to 200 Gbps line rate
- Rx/Tx channels isolation: 90 dB
- Single polarization or 2 orthogonal polarizations; PDL: 0.15 dB
- Pointing, Acquisition and Tracking (PAT)

Adaptive optics systems :

- AO equalizer: Rx $r_0 \geq 3$ cm, Tx $\theta_0 \geq 4$ μ rad
- Fast tip/tilt mirrors
- Fine closed-loop tracking: ± 5 μ rad MAX

Tx Communication Equipment :

- 1 or 2 WDM with 40W per WDM, or multiple COTS 10 Gbps WDM

Lasercom :

- CCSDS 142.0-P-1.1 0.1 to 10 Gbps with soft bits
- SDA OCT 3.0 up to 2.5 Gbps
- B/QPSK, DP-QPSK coherent ready
- CFI transceiver on demand

OGS Control Software :

- Local or full remote control
- Automatized adaptive optics operations
- Receive and transmit data to remote mission control center

OGS Safety :

- Industrial-grade weather station with automatic OGS shutdown (rain, wind, ...)
- Laser safety
- Monitoring of flying objects in the line-of-sight (VIS & SWIR)
- Wind limits : 200 km/h (survival); up to 50 km/h (operational)
- Protection: 4.3m diameter cimier dome
- Operational temperature: -20°C to +50°C



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