Broadsky Workshop - Laser Communication in Space for Airborne Connectivity

Ka-Conference; Sorento 2019
Use Cases of Laser Communication

1. Optical Inter Satellite Links (OISL)
   (1) GEO Data Relay for Protected Backbone => Ultra low latency and not jammable service
   (2) LEO Constellation for Spacebased Internet => Gigabit connection between satellites

2. Optical Direct to Earth (DTE)
   (1) Downlinks with High data rate for Small/Cube Sats => Small size, weight and power solution
**Overview Laser Communication Portfolio**

**Data Relay Market**
1. **GEO LCT 135** “The Backbone”
2. **LEO SMART 70** “The LEO User”

**Constellation Market**
3. **ConLCT** “broadband internet in space”

**Airborne Market**
7. **Airborne and UAVs** “Beyond line of sight connectivity”

**Direct-to-Earth Market**
4. **TOSIRIS 10G** “Gigabit Downlink”
5. **CubeL 100M** “Cube Solution”
6. **Optical Ground Stations**
...each month 1,000 optical LEO to GEO links.

Total amount today 28,000 links performed.
**Payload Architecture on GEO**

Near always-on from LEO Missions or UAVs BLOS with 1,8 Gbps (or 3,6 Gbps) to GEO, bent pipe to Ka-Downlink towards the home based Groundstation and backup for Command and Control.

**GEO Hybrid RF/Optical Payload (75 kg, 329 W)**

- **Laser Communication Terminal**
  - GEO-UAV/LEO
  - Wizard Link Tx
  - FWD (ASK) 2 Mbps

- **Gigabit Modulation**
  - Flexible Modulation
  - 8/16/32 APSK
  - 1.8 Gbps

- **TWTA, Isolator**
  - Ka-Band
  - 72 W

- **Output Filter Assy**
  - Input Filter

- **Forward Data Receiver** (FDR)
  - 2 Mbps FWD

- **Input and Output Test Coupler**
  - Not Shown.

- **Ka-EESS Band Feeder Antenna**
  - Tx 26 GHz
  - Rx 28 GHz

- **Near always-on**
  - from LEO Missions or UAVs BLOS with 1,8 Gbps (or 3,6 Gbps) to GEO, bent pipe to Ka-Downlink towards the home based Groundstation and backup for Command and Control.

- **1,8 Gbps from the Airborne Sensor to the GEO Relay**
  - 2 Mbps from the Ground/GEO to the Airborne
» Tesat LCT in Space with Coherent, **Space Qualified**
1064 nm Laser Source, using **Homodyne BPSK** Modulation

» Results in the **most Efficient** („the 6 dB advantage“) Design for Long Range, High Data Rate Transmissions with Resiliency to Sunlight and Jamming (LPD/LPI)

» **Lasercom** is the perfect Media for **Quantum Key Distribution**

» **16 Flight Models** Delivered or in Production
Tesat is offering a core kit (data electronic) to connect to GEO LCT135 and is open for teaming with 3rd parties.

General Atomics ASI is one partner for Airborne Laser Terminal:

» Robust – Jamming Free Operation (LPD/LPI)

» High Performance – Gigabit Links for the Sensor

Beyond line of sight - BLOS Gigabit Laser Communication to GEO Relay

Breadboard and comms test; done Oct. 2018
Testcampaign in Spain; done June 2019
ALCOS, AirborneLaserCommSystem EM 2020/FM2021

Source: Adapted Graphics from General Atomics ASI
Laser Communication Coalition

This document does not contain technical data as defined in the ITAR, 22 CFR 120.10; or Technology as defined under the EAR (15 CFR 730-774).
Airborne LCT Aggregator and Backhaul service

Source: Adapted Graphics from General Atomics ASI
stay tuned

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