ESA Scylight Workshop

Laser terminals and ground stations for LEO missions – Status, way forward and feedback to ScyLight Workplan

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Sven Müncheberg / Dr. Ahmed Al-Mudhafar
ViaLight Communications GmbH
Laser Communication at ViaLight

Optical Network above the Clouds
- Data rates up to 10Gbps
- Low SWaP, <10kg Stratosphere
- Competitive price per terminal in LEO
Secure link despite:
• Poor weather conditions
• 750km/h, 7km altitude, 60km range
• Extreme shocks with afterburner
## Product Portfolio Air
Laser Terminals for Aircraft/Stratospheric Applications

<table>
<thead>
<tr>
<th></th>
<th>MLT-70 IPL Inter-Platform</th>
<th>MLT-70 ATG Air-to-Ground</th>
<th>MLT-20 Air-to-Ground</th>
<th>GS-200 Ground Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link Type</td>
<td>Bidirectional</td>
<td>Bidirectional</td>
<td>Unidirectional/asymmetric</td>
<td>Bidirectional</td>
</tr>
<tr>
<td>Link Distance</td>
<td>&gt;200km</td>
<td>&gt;50km</td>
<td>&gt;50km</td>
<td>&gt;50km</td>
</tr>
<tr>
<td>Aperture Size</td>
<td>70mm</td>
<td>70mm</td>
<td>20mm</td>
<td>200mm</td>
</tr>
<tr>
<td>Data Rate</td>
<td>10 Gbps</td>
<td>10 Gbps</td>
<td>1 Gbps – 10 Gbps</td>
<td>10 Gbps</td>
</tr>
</tbody>
</table>
## Product Portfolio Space
### Laser Terminals for Space Applications

<table>
<thead>
<tr>
<th></th>
<th>MLT-80-ISL Inter-Satellite</th>
<th>MLT-30-SGL Satellite-to-Ground</th>
<th>GS-400 Ground Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link Type</td>
<td>Bidirectional</td>
<td>Unidirectional/asymmetric</td>
<td>Unidirectional/asymmetric</td>
</tr>
<tr>
<td>Link Distance</td>
<td>&gt;4000km</td>
<td>&gt;1200km</td>
<td>&gt;1200km</td>
</tr>
<tr>
<td>Aperture Size</td>
<td>80mm</td>
<td>30mm</td>
<td>400mm</td>
</tr>
<tr>
<td>Mass</td>
<td>&lt;25kg</td>
<td>&lt;8kg</td>
<td></td>
</tr>
<tr>
<td>Data Rate</td>
<td>10 Gbps</td>
<td>10-40 Gbps</td>
<td>10 Gbps</td>
</tr>
</tbody>
</table>
**LEO Terminal Preliminary Properties**

- **Tx Power**: 1W
- **Divergence**: 12 µrad
- **Link Distance**: 4000 km
- **Data Rate**: 10 Gbps
- **Lifetime**: 5 Years
- **Max Orbit Altitude**: 1400 km
- **FoR Elevation**: +5/-25°
- **FoR Azimuth**: ±175°
- **Mass**: 25 kg

Dimensions:
- Height: 630 mm
- Width: 430 mm
- Depth: 250 mm
- Width: 400 mm
- Depth: 225 mm
ViaLight’s goals are
• Deliver ground station for LEO-ground links ➔ 2017
• Develop and qualify the 10G LEO terminal for ISL ➔ 2019
• Perform a ISL demo mission in LEO ➔ 2020
• Develop space-to-ground and QKD terminal ➔ 2021

ViaLight’s ScyLight interests are in:
• Line 1 Common System and Technologies Activities
• Line 2 Optical Communication Terminals and components
• Line 4 Quantum Cryptography Technologies
ViaLight interest in

Line 1 Common System and Technologies Activities

• ScyLight Technology Phase: Mass and cost reduction for larger series
• ScyLight Technology Phase: Next generation ISL: Multi-wavelength system for data rates up to 100 Gbps
Scylight Programme Lines

ViaLight interest in
Line 2 Optical Communication Terminals and components

• Scylight Demo Phase: Demo mission for ISL terminal in LEO
• ScyLight Technology Phase: Development of airborne laser terminal for link to GEO (EDRS – SpaceData Highway)
ViaLight interest in
Line 4 Quantum Cryptography Technologies

- Adaptation of space-to-ground terminal for use in QKD applications to allow parallel quantum and communication channels
  - Compatible telescope design
  - Interface between laser terminal and QKD system
• Most Line 1 activities address applications in GEO (e.g. VHTS, optical feeder links, improved LEO-GEO and GEO-GEO links) or for deep space
• No activity is targeted towards ISL in LEO.
• No activity is targeted towards smaller, cheaper terminals for constellation applications.