Software Defined Multifunction LIDAR

CEOI Emerging Technologies Challenge Workshop

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Introduction: QinetiQ
Introduction: Software Defined Multifunction LIDAR (SDML)

• What is LIDAR?
  – Like radar but using light.
  – Many different types:
    – Range finding, 3D imaging.
    – Velocimetry, vibrometry, anemometry.
    – Optical comms, retro-comms.
  – Fundamentally, what discriminates them?:
    – The mod-demod scheme.
    – One or two schemes are ‘hard-wired’ into conventional LIDAR systems.

• What is SDML?
  – Mod-demod abstracted into software.
  – Switch between sensing modalities at run time.
  – Allows many modes in a single payload.
Introduction: Software Defined Multifunction LIDAR (SDML)
## SDML: Earth Observation Capability

<table>
<thead>
<tr>
<th>Sensing Mode</th>
<th>Application Examples</th>
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<tr>
<td>3D imaging/mapping.</td>
<td>Mapping, planning, biomass monitoring, precision agriculture, disaster/damage assessment.</td>
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<td>2D vis/NIR imaging</td>
<td>Conventional aerial imagery, NDVI imagery.</td>
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<td>Vibrometry.</td>
<td>Stand-off seismology.</td>
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<td>High bandwidth covert optical comms.</td>
<td>GBit+ covert, secure, bidirectional comms.</td>
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<td>Retro-comms.</td>
<td>Comms ‘tags’ for unattended ground sensors.</td>
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SDML: Earth Observation Capability
SDML for High Altitude Pseudo Satellites (HAPS)
SDML for HAPS

HAPS payload design advice and environmental testing.

2 x flight capable SDML payloads

Demo: covert, secure high bandwidth optical communications
SDML: Proof of Principle

Satellite image: Google

video
Summary

• SDML is real:
  – Funded, current development programme.
  – Flight hardware deliverables.

• Access to missions / mission enablement / science enablement:
  – SDML + HAPS offers persistent sensing (high-volume data collection).
  – Optical comms mode offers high-volume data egress.
  – HAPS a stepping stone to space-based SDML?

• Science enablement:
  – We invite the scientific community to engage!

• Commercial:
  – Optical comms for delivery of internet services into infrastructure-poor regions.
  – Commercial of 3D/2D imagery products.
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