The miniSLR system

A standardized solution for routine SLR observations

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ILRS Technical Workshop 2019
New SLR stations are needed…

- More missions
- New tasks
- Still huge gaps in global coverage
Goals of the miniSLR project

• Routine ranging to
  • LEO satellites
  • Lageos
  • navigation satellites

…with sub-cm accuracy and stability

• Simple design
• Inexpensive hardware
• Easy maintenance
• Automated operation
• Small footprint
• Transportable
• Sealed and weather-proofed for use in harsh environments
• Inherently eye-safe to avoid need for aircraft surveillance
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A simple system for the simple tasks

miniSLR CAD drawing (April 2018, U. Nesper)
UFO legacy

- First SLR station in Stuttgart
  - UFO (Uhlandshöhe-Forschungs-Observatorium)
  - First returns in Dec 2015
  - ILRS Engineering station since 2017

- Features:
  - 100 kHz repetition rate
  - Fibre coupled transmitter (no coudé path)
  - Ranging at 1064 nm
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100 kHz laser ranging: Enabling technology for new transmitter designs
miniSLR construction

May 2018

June 2018
Transmitter and receiver
The first winter...
Tracking tests
Ready to range…

July 2019

September 2019
First returns

September 3rd, 2019
Specs of current system

- System components are not yet optimised
  - Not yet eye-safe
  - No good calibration yet
  - Some mechanical instabilities

<table>
<thead>
<tr>
<th>Repetition rate</th>
<th>27 kHz</th>
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<tbody>
<tr>
<td>Average power</td>
<td>2.2 W</td>
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<tr>
<td>Pulse duration</td>
<td>4.5 ns</td>
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<tr>
<td>Wavelength</td>
<td>1064 nm</td>
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<tr>
<td>Divergence</td>
<td>50 µrad</td>
</tr>
<tr>
<td>Accuracy</td>
<td>??</td>
</tr>
<tr>
<td>Range</td>
<td>Lageos (at least)</td>
</tr>
</tbody>
</table>
Planned upgrades

- Weather proofing / air-conditioning
- Set-up calibration target(s)
- Improve blind tracking
- Replace laser and detector (go to 1550 nm)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Repetition rate</td>
<td>200 kHz</td>
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<tr>
<td>Average power</td>
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<td>Pulse duration</td>
<td>5 ns</td>
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<tr>
<td>Wavelength</td>
<td>1550 nm</td>
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<tr>
<td>Divergence</td>
<td>&lt; 50 µrad</td>
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<tr>
<td>Accuracy</td>
<td>&lt; 1 cm (NP)</td>
</tr>
<tr>
<td>Range</td>
<td>&gt; 25 000 km</td>
</tr>
</tbody>
</table>
We invite for collaboration!

• We value comments / ideas / challenges from the community
• Let us know what you think (at the exhibition room)
• We’re happy to share ideas / plans / software