Introduction
The German Aerospace Center (DLR) is working on the development of compact laser communication payloads for low-earth orbit (LEO) satellites.

Design and qualification of a recessed satellite cornercube retroreflector for ground-based attitude determination via satellite laser ranging

Nils Bartels¹, Paul Allenspacher¹, Sven Bauer², Daniel Hampf¹, Benjamin Rödiger³, Wolfgang Riede¹

Institute of Technical Physics

Manufacturing and testing
1. Measurement of the far-field diffraction pattern (FFDP)
2. CAD design, manufacturing, gluing, response of FFDP to heating, vibration

Challenge of accurate pointing
The attitude control system (ACS) needs to be accurate by ±1° (remaining pointing accuracy comes from active beam steering)

Attitude verification via SLR
Goal: Independent verification of the functioning of the ACS via SLR to ±1°

Future plans:
1. Smart retroreflectors + arrays
2. SLR of the CubeL retroreflector

Correlate the SLR signal to the orientation of the rotating satellite

Does the SLR signal peak when the retroreflector points towards the SLR station?

Simple retroreflector with polarimetric ID (could be passive or active as modulated retroreflector)

Table: Retardance and Diattenuation of retroreflectors

<table>
<thead>
<tr>
<th>Retroreflector</th>
<th>Retardance</th>
<th>Diattenuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCR1 0°</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CCR2 45°</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>CCRn</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A retroreflector with a 5mm circular front face needs a 14 mm recess to obtain a field of view FWHM of 5°