# Test Data Sheet

**EO-Mg25+**

S/N:

**Resonant electro-optic phase modulator**
- thermal crytsal mount
- hermetically sealed housing
- tunable resonance frequency

<table>
<thead>
<tr>
<th>RF properties</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resonance frequency: $f_0$&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>1.57 - 1.86</td>
<td>GHz</td>
</tr>
<tr>
<td>Preset frequency: $f_{set}$&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>1789</td>
<td>MHz</td>
</tr>
<tr>
<td>Bandwidth: $\Delta v$</td>
<td>10</td>
<td>MHz</td>
</tr>
<tr>
<td>Quality factor: $Q$</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>Required RF power for 1rad @ 313nm&lt;sup&gt;2)&lt;/sup&gt;</td>
<td>36.6</td>
<td>dBm</td>
</tr>
<tr>
<td>max. RF power: $RF_{max}$&lt;sup&gt;3)&lt;/sup&gt;</td>
<td>4</td>
<td>W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optical properties</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EO crystal</td>
<td>KDP</td>
</tr>
<tr>
<td>Aperture</td>
<td>3x3</td>
</tr>
<tr>
<td>Wavefront distortion (633nm)</td>
<td>$\lambda/6$</td>
</tr>
<tr>
<td>recommended max. optical intensity (280nm)</td>
<td>&lt;1</td>
</tr>
<tr>
<td>AR coating (R&lt;0.5%)</td>
<td>240-420</td>
</tr>
</tbody>
</table>

<sup>1</sup> at 24.3°C  
<sup>2</sup> with 50Ω termination  
<sup>3</sup> no damage with $RF_{in} < 5W$
Measured modulation

**Fig. 1: Oscilloscope trace**

- Modulation frequency [MHz]
- Modulation depth [rad]
- RF in = 1789 MHz
- \( \beta = 0.29 \) rad
- \( \lambda_{\text{test}} = 671 \) nm
- RF in = 34.3 dBm

**Table 1: Expected modulation**

<table>
<thead>
<tr>
<th>( \lambda )</th>
<th>unit</th>
<th>( \lambda_1 )</th>
<th>( \lambda_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta = 1 ) rad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \beta / U )</td>
<td>rad / V</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>P</td>
<td>dBm</td>
<td>36.6</td>
<td>45.0</td>
</tr>
<tr>
<td>P</td>
<td>W</td>
<td>4.55</td>
<td>31.42</td>
</tr>
<tr>
<td>U</td>
<td>( V_p )</td>
<td>21.3</td>
<td>56.0</td>
</tr>
<tr>
<td>Ux</td>
<td>( V_p )</td>
<td>67.0</td>
<td>176.1</td>
</tr>
</tbody>
</table>

**Fig. 2: Carrier/sideband ratio**

- Bessel Fct.
- \( |J_0|^2 \) vs. Modulation depth \( \beta \) [rad]
- \( |J_1|^2 \) vs. Modulation depth \( \beta \) [rad]
- \( |J_2|^2 \) vs. Modulation depth \( \beta \) [rad]

**Fig. 3: RF—signal amplitude vs. modulation depth**

- \( \lambda \) [nm]
- \( \lambda = 671 \) nm
- \( \lambda = 280 \) nm

**Test setup**

- Laser
- EOM
- RF
- PD
- Oscilloscope
- Spectrum analyzer

**Note:** Experimentally recorded modulation depth displayed in Fig.1 might vary from the respective values (\( \beta = 1 \) rad) provided in the table.
Resonance characteristics

Test setup

Max resonance frequency $f_{0,\text{max}} = 1860$ MHz
Min resonance frequency $f_{0,\text{min}} = 1570$ MHz
Number of turns $N_{\text{max}} = 6$
Incremental frequency shift $\Delta f \approx 48$ MHz/turn
Counter-clockwise turns $\uparrow$ higher $f_0$ $\uparrow$
Clockwise turns $\downarrow$ lower $f_0$ $\downarrow$

Attention: No upper stop!!
Handling instructions

- Housing is hermetically sealed. There are no user serviceable parts inside. None of the screws must not be loosened at any time! Crystal will be damaged otherwise.
- Input laser polarisation must be orthogonally aligned with respect to the cooling fins
- Please handle device carefully. Avoid shock. Don’t drop.
- After turn on the resonance frequency might drift slightly with applied rf power. Please compensate by tuning the rf drive frequency until steady-state (~min).

Package drawing

Note: crystal aperture is 3x3mm

Attention!! Laser polarisation (linear!) is orthogonal with respect to the cooling fins.

Attention!!! Housing is hermetically sealed. No use serviceable parts inside. Screws must not be loosened! Crystal will be damaged otherwise.