Second Harmonic Generation FROG

Complete Pulse Characterization with pulseCheck and FROG Option

- Second Harmonic Generation FROG is the most popular spectrometer-less Frequency Resolved Optical Gating method. The pulseCheck autocorrelators by APE optionally integrate FROG, giving access to complete pulse characterization. The addition of a special nonlinear crystal module and dedicated software opens the door to complete spectral and temporal pulse characterization.

Crystal Module

FROG Setup:
1. Crystal Module within pulseCheck
2. Replacement Focus Mirror
3. FROG Software Upgrade

Different crystal modules for various wavelength ranges:

- VIS I: 420-550 nm
- VIS II: 550-700 nm
- NIR: 700-900 nm
- IR I: 900-1200 nm
- IR II: 1200-1600 nm
- Ext. IR I: 1800-2200 nm

- Complete pulse characterization with Second Harmonic Generation FROG
- Different crystal modules available to cover wavelengths from 420 - 2200 nm
- FROG trace data processing and visualization with included software
- Pulse width ranges from as low as 20 fs up to 6 ps
- High spectral resolution up to 0.1 nm
- Available for the pulseCheck autocorrelator series**

* See appendix for configuration details (page 34)
** Except for pulseCheck SM models; Required laser rep. rate >10 kHz
... FROG Pulse Characterization Software

FROG Trace

- The software provides the laser pulse intensity as a function of time and frequency (wavelength). This is visualized in form of the common FROG trace diagram.
- With the implemented phase matching routine from pulseCheck, it only is a matter of seconds to automatically find the required phase matching tuning angle.

Wavelength and Pulse Coverage

- The various crystals available guarantee coverage of wavelengths from 420 nm right up to 1600 nm, of pulse widths from 20 fs to 6 ps, and a spectral resolution starting as high as 0.1 nm.
- The FROG option is designed for laser repetition rates above 10 kHz and is available for the pulseCheck autocorrelator series (except for SM models).

Software interface FROG for pulseCheck
# Appendix FROG Crystals

<table>
<thead>
<tr>
<th>FROG Crystal</th>
<th>Wavelength Range</th>
<th>Pulse Width Range</th>
<th>Spectral Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIS-I-200</td>
<td>420 ... 550 nm</td>
<td>200 ... 6000 fs</td>
<td>0.1 nm</td>
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<tr>
<td>VIS-I-50</td>
<td>420 ... 550 nm</td>
<td>50 ... 200 fs</td>
<td>0.3 nm</td>
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<tr>
<td>VIS-I-20</td>
<td>420 ... 550 nm</td>
<td>20 ... 70 fs</td>
<td>1 nm</td>
</tr>
<tr>
<td>VIS-II-150</td>
<td>550 ... 700 nm</td>
<td>150 ... 2000 fs</td>
<td>0.1 nm</td>
</tr>
<tr>
<td>VIS-II-50</td>
<td>550 ... 700 nm</td>
<td>50 ... 200 fs</td>
<td>0.3 nm</td>
</tr>
<tr>
<td>VIS-II-20</td>
<td>550 ... 700 nm</td>
<td>20 ... 60 fs</td>
<td>2 nm</td>
</tr>
<tr>
<td>NIR-200</td>
<td>700 ... 900 nm</td>
<td>200 ... 5000 fs</td>
<td>0.1 nm</td>
</tr>
<tr>
<td>NIR-50</td>
<td>700 ... 900 nm</td>
<td>50 ... 500 fs</td>
<td>0.2 nm</td>
</tr>
<tr>
<td>NIR-20</td>
<td>700 ... 900 nm</td>
<td>20 ... 50 fs</td>
<td>3 nm</td>
</tr>
<tr>
<td>IR-I-150</td>
<td>900 ... 1200 nm</td>
<td>150 ... 900 fs</td>
<td>0.2 nm</td>
</tr>
<tr>
<td>IR-I-60</td>
<td>900 ... 1200 nm</td>
<td>60 ... 200 fs</td>
<td>1 nm</td>
</tr>
<tr>
<td>IR-I-30</td>
<td>900 ... 1200 nm</td>
<td>30 ... 60 fs</td>
<td>5 nm</td>
</tr>
<tr>
<td>IR-II-100</td>
<td>1200 ... 1600 nm</td>
<td>100 ... 700 fs</td>
<td>0.5 nm</td>
</tr>
<tr>
<td>IR-II-50</td>
<td>1200 ... 1600 nm</td>
<td>50 ... 100 fs</td>
<td>2 nm</td>
</tr>
<tr>
<td>IR-II-30</td>
<td>1200 ... 1600 nm</td>
<td>30 ... 50 fs</td>
<td>9 nm</td>
</tr>
<tr>
<td>Ext. IR-I-50</td>
<td>1800 ... 2200 nm</td>
<td>50 ... 200 fs</td>
<td>19 nm</td>
</tr>
</tbody>
</table>
Appendix Technical Drawings

pulseCheck

- Multitalent for any task

Manual delay (15 / 50 ps version only)

Beam distance

Beam input

Focus alignment

Input mirror

Beam height

250

220

76

190

315 (for 15/50 ps version)

350 (for 150 ps version)

575 (for SM 2000 ps version)