

TCBC: Temperature-Dependent SHG/THG Measurements

Proof of Concept and Temperature Documentation

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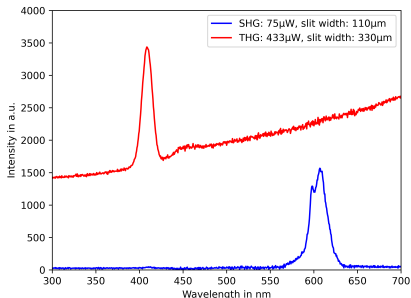
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Motivation and Objectives

- Investigation of TCBC using SHG/THG
- 1200nm and 1400nm laser light
- Proof of Concept for measurement setup and evaluation
- Temperature dependence of nonlinear optical properties

SHG and THG Measurements at 1200nm (291K)

SHG and THG Measurements of TCBC at 1200nm (291K)

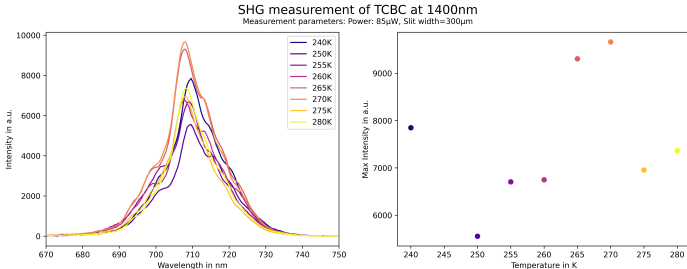


from: Adamczyk – Own Measurements and Evaluation of TCBC

SHG/THG

- Clear peaks at λ_{SHG} and λ_{THG}
- For THG we needed a much higher Laser intensity and a larger slit width
- → the noise floor of the THG signal is much higher, and the crystal does white light generation due to the high intensity

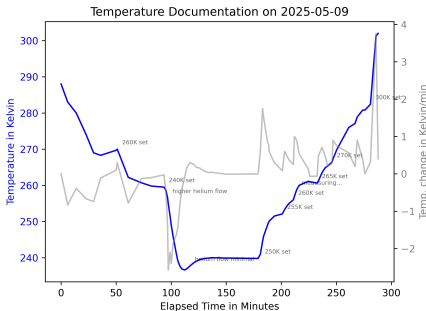
SHG Measurement at 1400nm: Temperature Dependence



from: Adamczyk – SHG Measurement with Andor Solis Spectrograph

- Signal varies a lot because of shift of Probe due to thermal expansion
- Spot is too small to find the same crystal again resulting in a different signal each time
- Not suitable for temperature series
- **Conclusion:** We need to crush the crystals to a fine powder and measure the SHG/THG of the powder

Temperature Profile during Measurement



from: Adamczyk – *Manual Documentation of Temperature*

- Documentation of temperature over time
- Annotations: Setpoints and special events
- Temperature change rate (gray, right axis)
- visible, that temperature change is always much slower than 10K/min.

Interpretation of Results

- It is very difficult to find the same spot on the crystal again
- Temperature change rate is very slow
- very few SHG spots which are very bright, mostly thg wich is only visible at very high intensities
- Crystals are too few in uncontrollable orientations
- maybe SHG is a surface effect and we need a larger surface area
- or maybe the orientation for SHG is very rare

Conclusion and Outlook

- Visible and strong SHG and THG signals at 1200nm
- Proof of Concept gave important insights
- We will crush the crystals to a fine powder and measure the SHG/THG of the powder
- that should give us a better signal because all orientations are present
- That will give a more reliable signal in variable temperature, eliminating the problem of finding the same spot on the crystal again



Adamczyk, Florian (2025a). ***Manual Documentation of Temperature***. Ed. by Prof. Dr. Sangam Chatterjee. Recorded on 09.05.2025, unpublished data. Gießen.



— (2025b). ***Own Measurements and Evaluation of TCBC SHG/THG***. Ed. by Prof. Dr. Sangam Chatterjee. Unpublished data, own experiments. Gießen.



— (2025c). ***SHG Measurement with Andor Solis Spectrograph***. Ed. by Prof. Dr. Sangam Chatterjee. Unpublished data, own experiments. Gießen.