Dispersion Compensation for Micromachining Setup

Here we show the performance of our MIKS1_S module driven by Carbide laser. A peak power increase by a factor of 4 could be achieved with an efficiency of 95%. The self-phase modulated spectrum and the pulse compression are shown in the graphs below.

On top of that we compensated the addtional dispersion introduced by the optics from the micromachining setup. This way we could achieve sub 100 fs pulse duration at the actual workpiece.

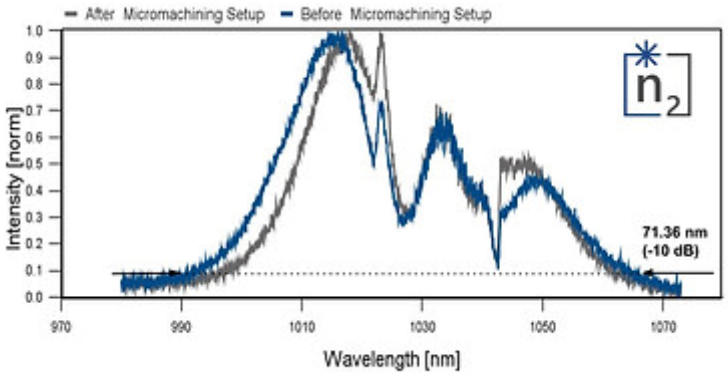
Laser pulses experience chromatic dispersion, i. e. varying group velocities for different wavelengths, while propagating through material. This effect stretches the pulses in the time domain. In general, shorter pulses with a wider spectrum are more susceptible to this effect. Commonly used micromachining setups comprise multiple such elements, for example beam expanders or f-theta lenses. It is thus necessary to account for the dispersion to benefit from ultrashort laser pulses on the workpiece.

Input Carbide: 400 mW, 40 µJ, 10 kHz, 230 fs
Output MIKS1_S: 380 mW, 38 µJ, 10 kHz, 50 fs

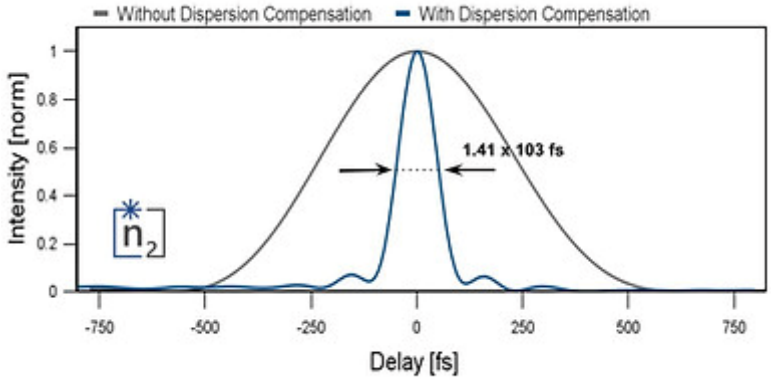
Additional micromachining setup:

- Beam expander
- Galvo-Scanner
- F-Theta-Lens

Output spectrum after micromachining setup



Output pulse duration after micromachining setup



Output beam profile after micromachining setup