

HELIOS

Femtosecond Transient Absorption Spectrometer

Instrument Response Function with Astrella (Coherent)



DATA EXAMPLE

Experiment Details

This report demonstrates the temporal resolution of HELIOS with a <35 fs laser, Astrella (Coherent). The instrument response function (IRF) measurements were performed by conducting pump-probe measurements on a piece of thin cover glass (<1 mm). The pump was the second harmonic of the laser – 400 nm. The probe continuum was generated from the fundamental 800 nm beam. To obtain the IRF, the kinetic profiles at several probe wavelengths were fitted with the Gaussian function and its first and second derivatives, according to the following equation:

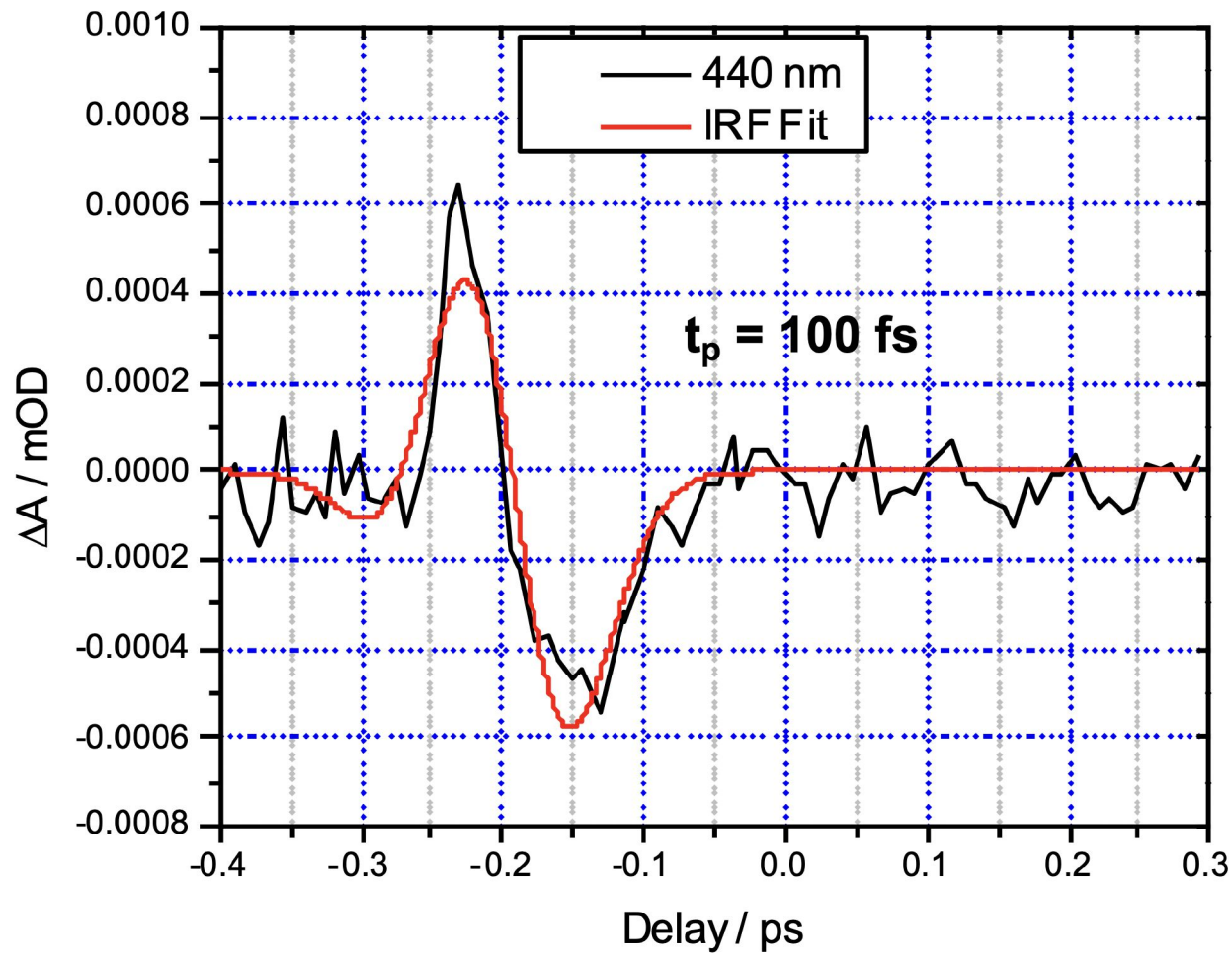
$$y(t) = \exp\left[-\left(\frac{t-t_0}{t_p/1.67}\right)^2\right] * (A + Bt + Ct^2),$$

where t_p is the IRF, which corresponds to the full width at half maximum (FWHM) of the convolution of two pulses with a Gaussian shape.

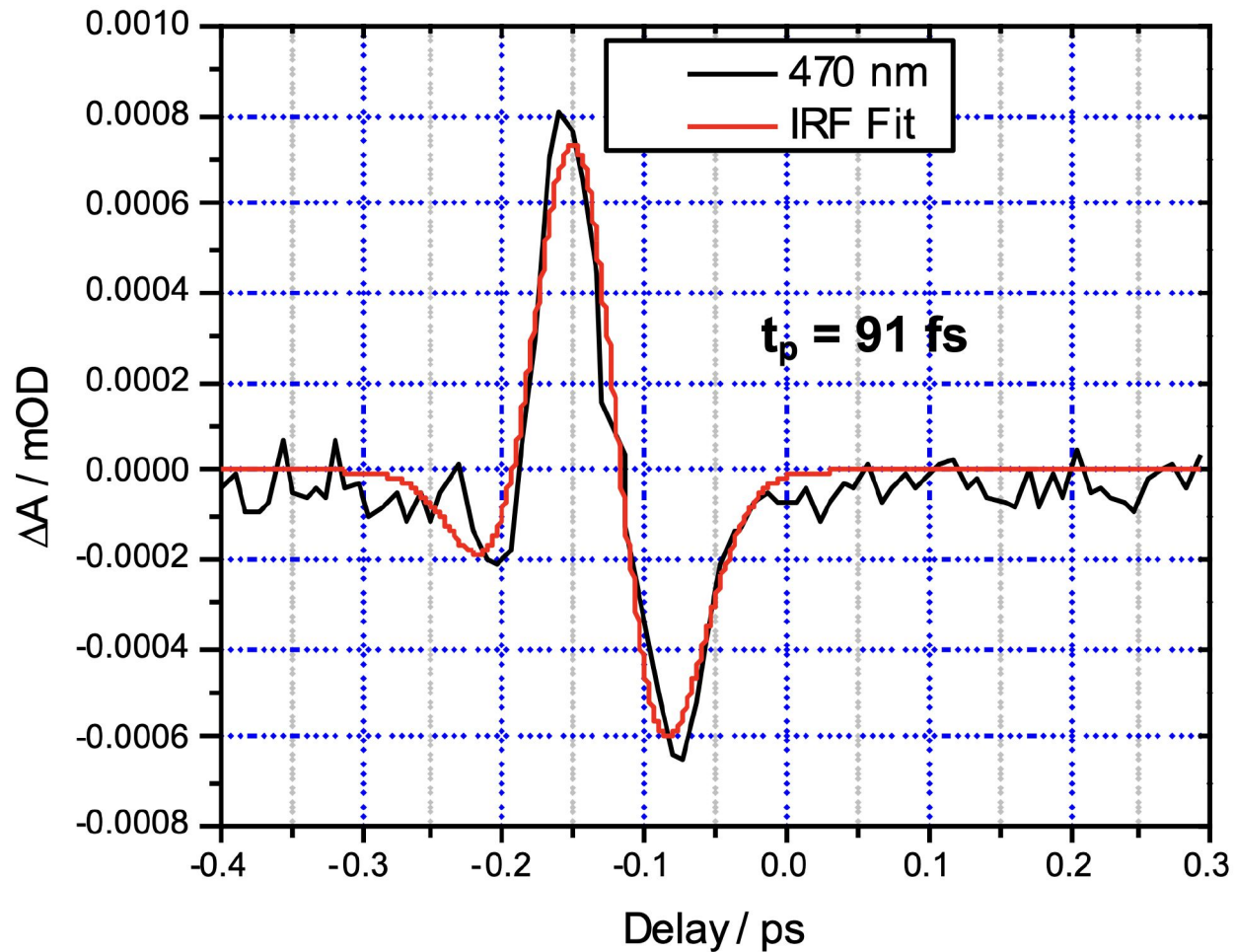
IRF vs. Wavelength

Wavelength / nm	IRF / fs
440	100
470	91
490	78
510	68
540	57
600	49
680	48

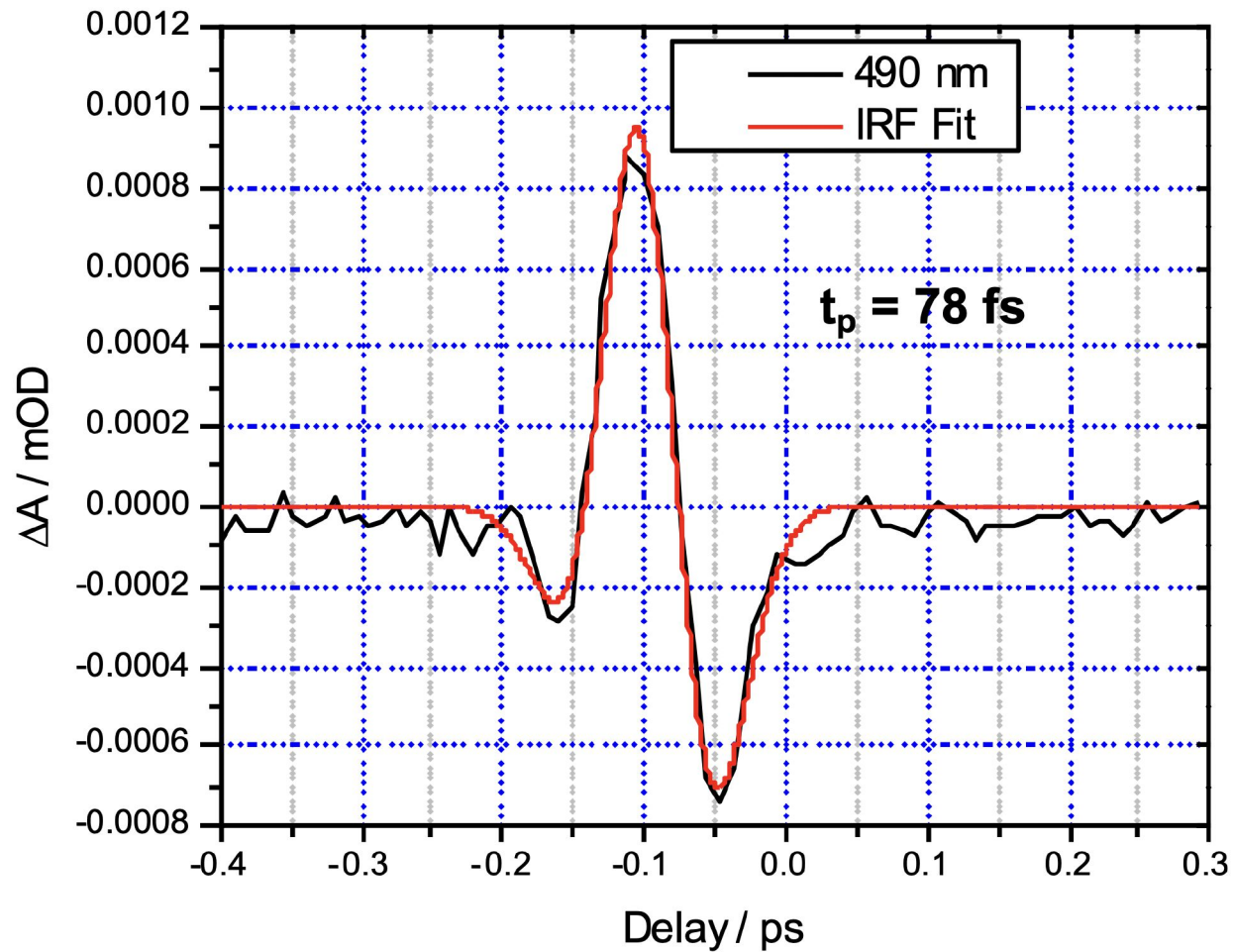
Cover glass response @ 440 nm. Pump @ 400 nm.



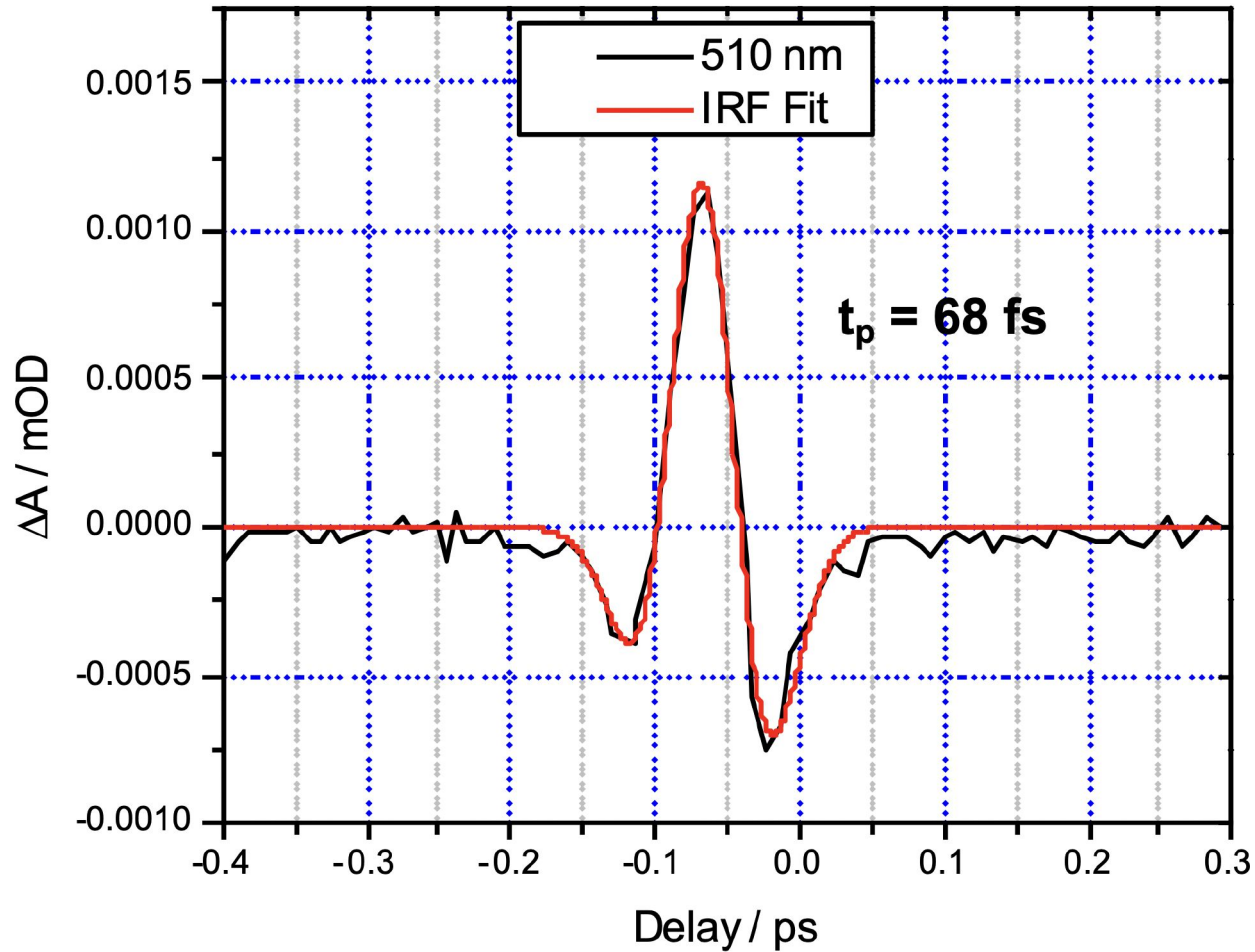
Cover glass response @ 470 nm. Pump @ 400 nm.



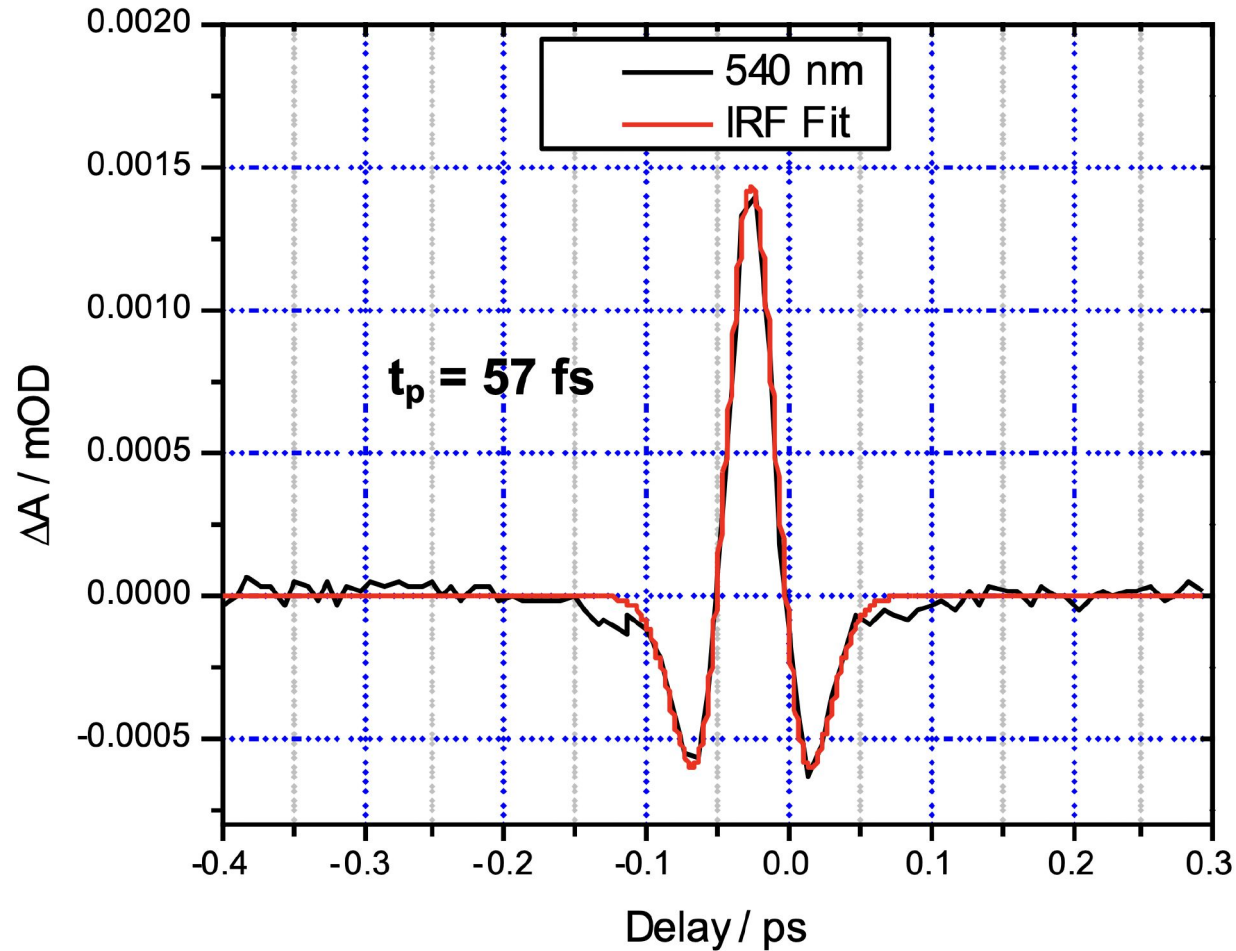
Cover glass response @ 490 nm. Pump @ 400 nm.



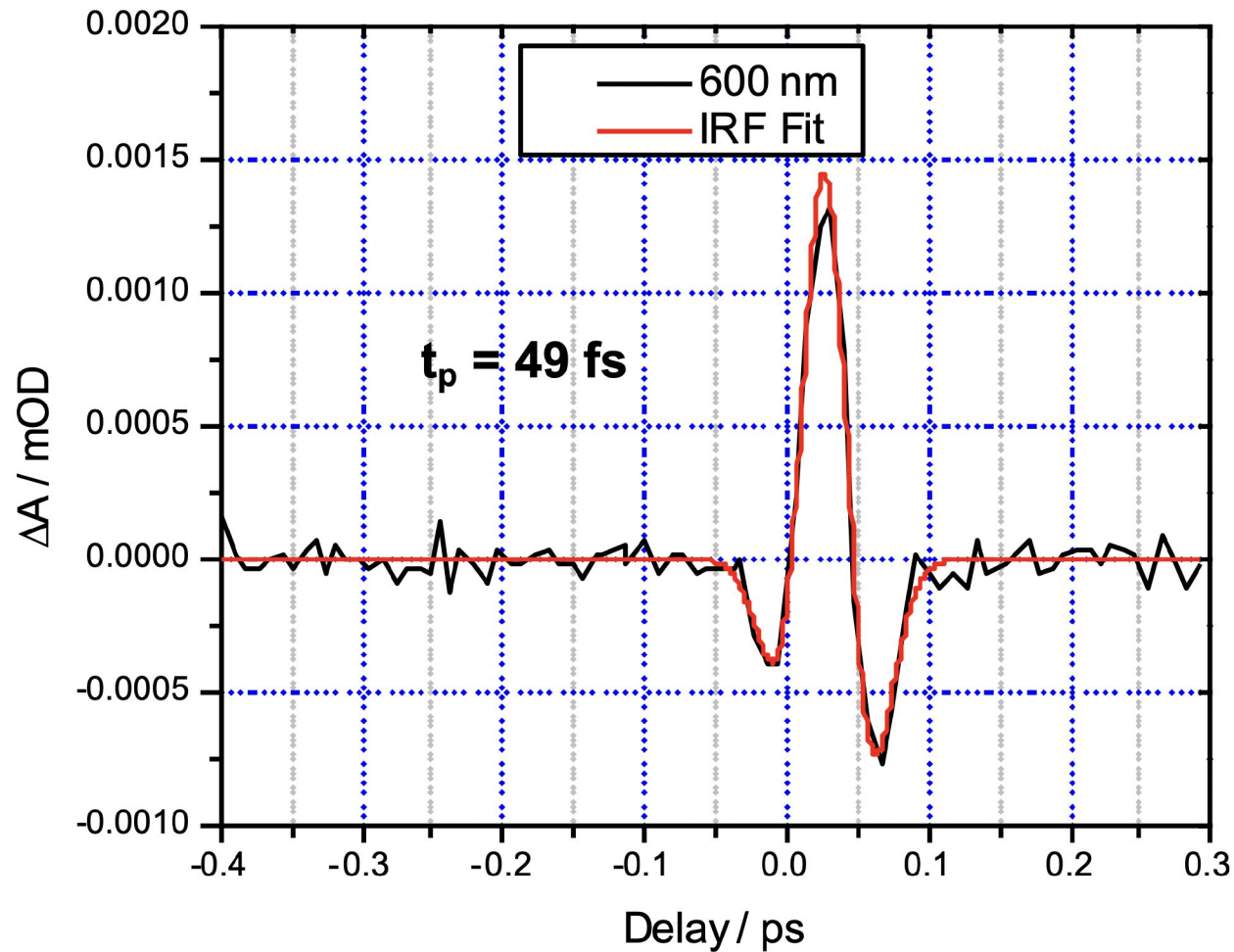
Cover glass response @ 510 nm. Pump @ 400 nm.



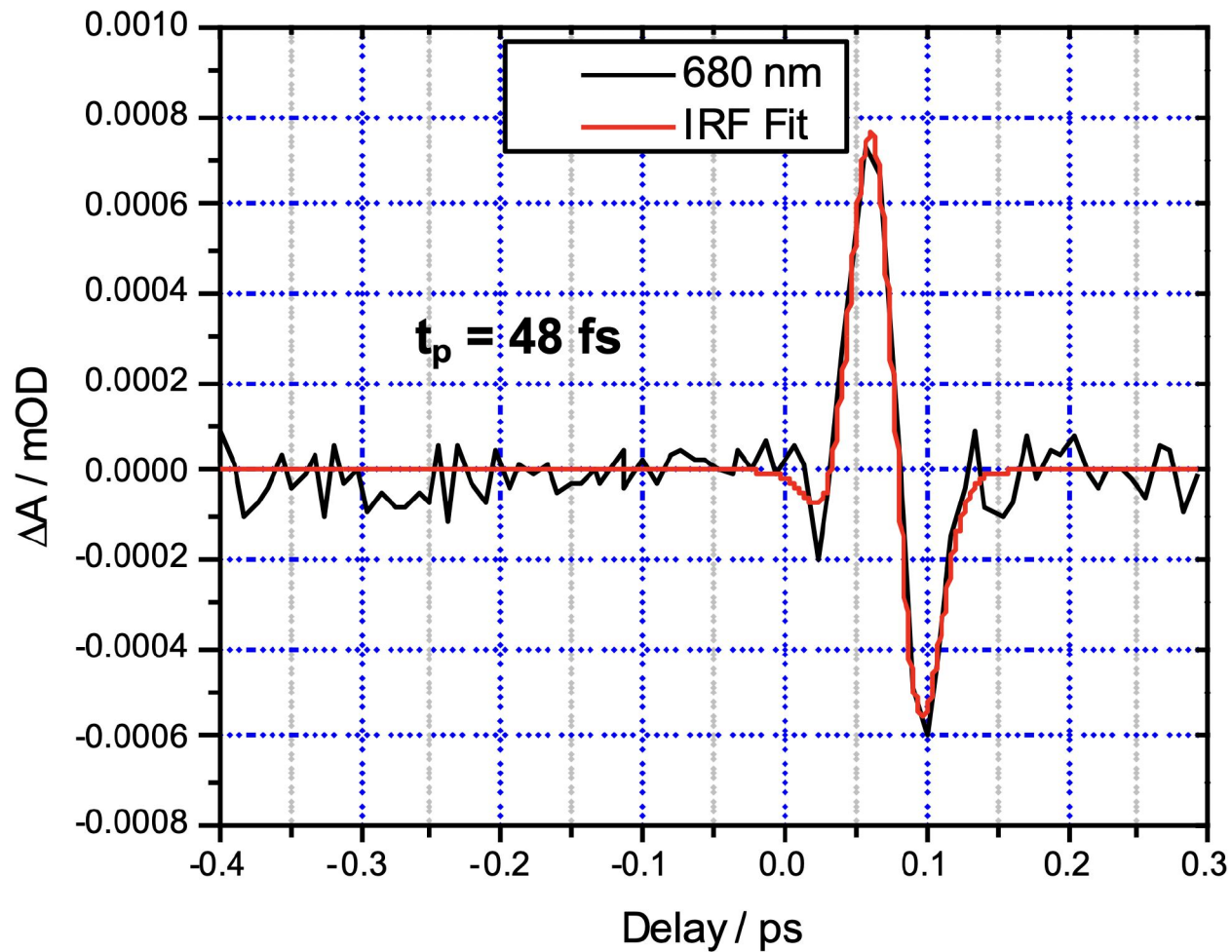
Cover glass response @ 540 nm. Pump @ 400 nm.



Cover glass response @ 600 nm. Pump @ 400 nm.



Cover glass response @ 680 nm. Pump @ 400 nm.



Laser Stability

It is important to note that the data quality (noise level, S/N, etc.) for HELIOS with Astrella was found to be the same as for HELIOS with industry standard 100 fs lasers. The stability of the Astrella output was not affected by temperature and humidity fluctuations throughout the day. A typical example can be found below.

Example of typical data with Astrella

