Strategic Plan for Broad Bandwidth FDSC Experiment (8/16 - 9/5, 2015)

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Scientific goals

Use broad bandwidth probe beam to resolve the process of pulse splitting in transparent materials in single shot.

Tasks of the last run

1. Recover and improve the supercontinuum generation process through coverslip glasses.
   We have found a regime that generates a smooth spectrum with range broader than 100 nm. However, the phase of the pulse is not linear, hence we need to intentionally chirp the pulse.

2. Perform pump-probe experiment to resolve pulse splitting in fused silica.
   We took some data last time, and found some interesting signals. However, the temporal resolution was not high enough to resolve the pulse splitting, so we will improve the resolution this time.

3. Introduce two pump beams.
   We didn't have a chance to attempt this goal.

Strategies of this run

1. Revisit supercontinuum generation through thin glasses to generate a smooth and broad spectrum. We will try thinner dispersion window to reduce the temporal chirp of the probe beam, which should improve the resolution and signal-to-noise ratio of FDSC.

2. Based on our experience, the chirp after the dispersion window is usually not linear, so we will perform a more precise measurement to determine the phase of the probe beam. We will determine the phase of the probe beam by scanning the delay of pump-induced cross phase modulation in glasses.

3. Perform pump-probe experiment through glasses by using broad bandwidth probe beams, and hopefully obtain some pulse-splitting signals.

4. Introduce two pump beams with a given temporal separation to verify the resolution of broad bandwidth FDSC.

5. Send SHG pulses through thin glasses to test the spectrum-broadening effect.

Laser requirement

1. Femtopower front end: power ~ 300 mW @ 1 kHz.
2. XPW and booster: power ~ 100 mW @ 1kHz, bandwidth > 50 nm.
3. Pre-amplifier: pulse energy ~ 50 mJ, pump laser Saga 1 only, with moderate voltage.
4. Probe line compressor is needed.