

# Lab Report of Laser Spectroscopy Demonstration of 200kHz System

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## 1 Questions

1. What do we mean by intracavity frequency doubling in the pump laser?

It means that a non-linear crystal, which could generate doubling frequency under SHG, is placed within the laser cavity. And a dichroic mirror in the cavity could only permit doubling frequency out while has a high reflection index to fundamental frequency.

2. What is the mode locking mechanism used in the Ti:sapphire laser?

Ti:sapphire crystal has Kerr effect, a non-linear effect of refractive index that  $n_m = n_0 + I n_2$ . When placed in the resonator, it has no(slight) focusing effect of weak light while having strong focusing effect of intense light. After travelling back and forth for many times, ultimately it would produce only a single, intense pulse. This is called *passive mode locking*.

3. Why do we need two prisms in the cavity?

The two prisms form a prism compressor system that to compensate the intra-cavity laser dispersion of Ti:sapphire laser. In detail, when laser beam goes through the first prism, different wavelengths would travel different paths. After the second prism, all wavelengths are adjusted to the same direction with different time, which would shorten the duration of laser pulse.

4. What is the function of the adjustable slit in the Ti:sapphire laser?

Adjustment of slit width changes the bandwidth of laser and inhibits secondary laser peak.

5. What is a regenerative amplifier?

In the regenerative amplifier, the input seed pulse enters the amplifier cavity and the Ti:sapphire crystal. After making multiple passes in the gain crystal, the amplified pulse exits the amplifier.

6. What type of Q-switch is used in the amplifier? What is the function of the Q-switcher?

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7. What method is used to compress the pulse in the system?

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8. Why do we need to compress the pulses?

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9. What is the range of wavelength available for the OPA(Signal and Idler)? What is the wavelength of the idler if the signal is 580nm?

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