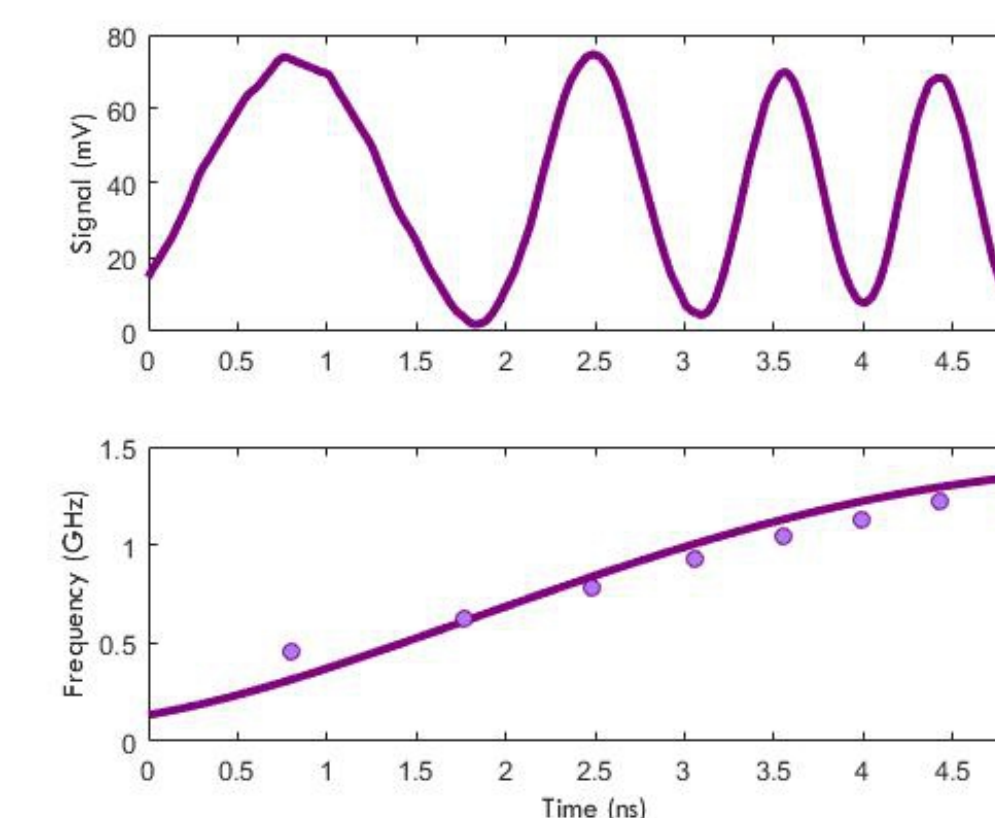


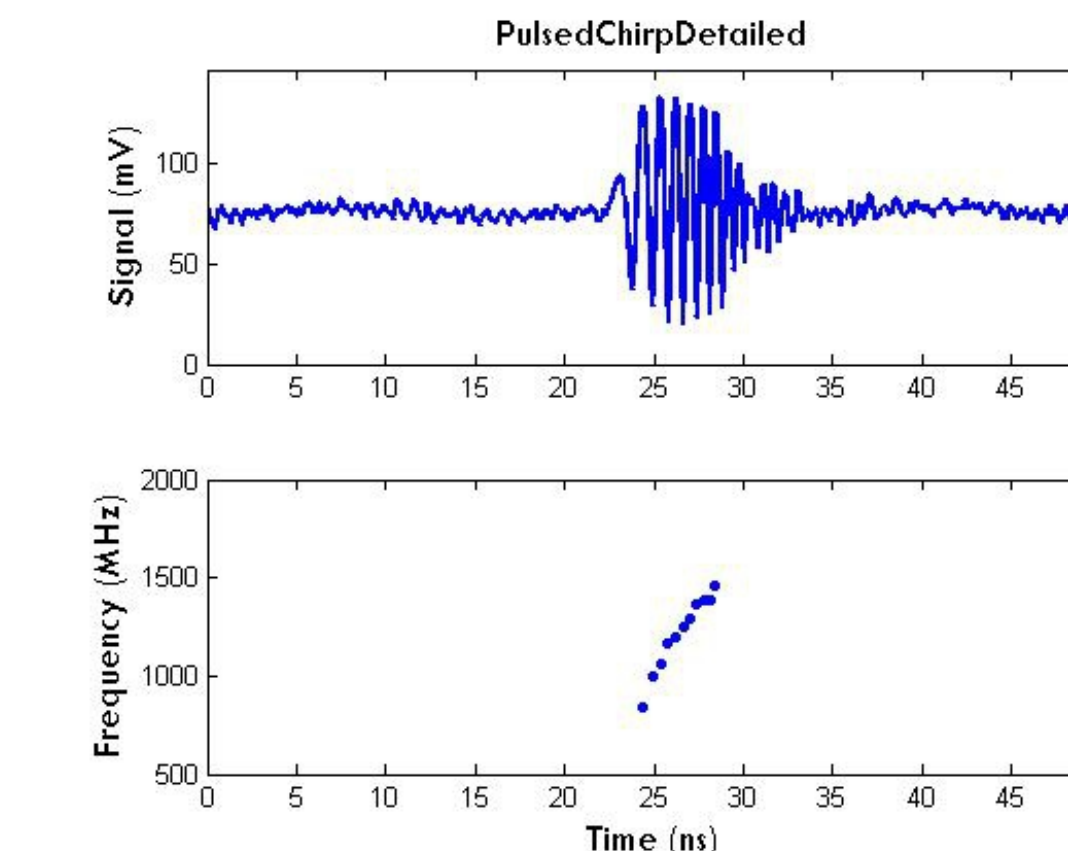
We Generate Rapid Frequency Chirped Laser Light

- We have developed a laser system which generates a frequency chirp of 1 GHz in 4 ns at a large controllable detuning
- An electro-optical phase modulator is used to generate the chirp (amplified and filtered by injection-locking in early experiment)
- The chirp can be pulsed on and off in less than 3 ns
- We have demonstrated control of the amplitude and frequency of the pulse.

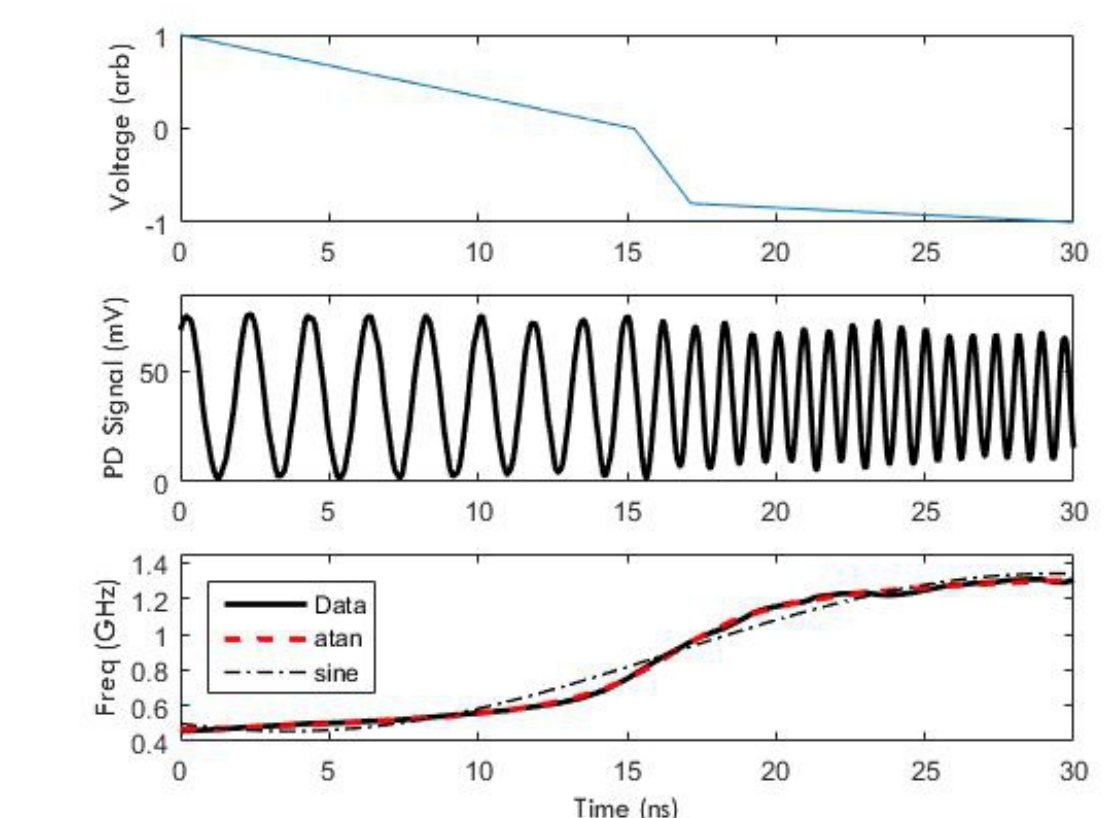
B. Kaufman *et al.*, Appl. Phys. B **123**, 58 (2017).
K. Teng *et al.*, Rev. Sci. Instrum., **86**, 043114 (2015).



1 GHz chirp in 5 ns.

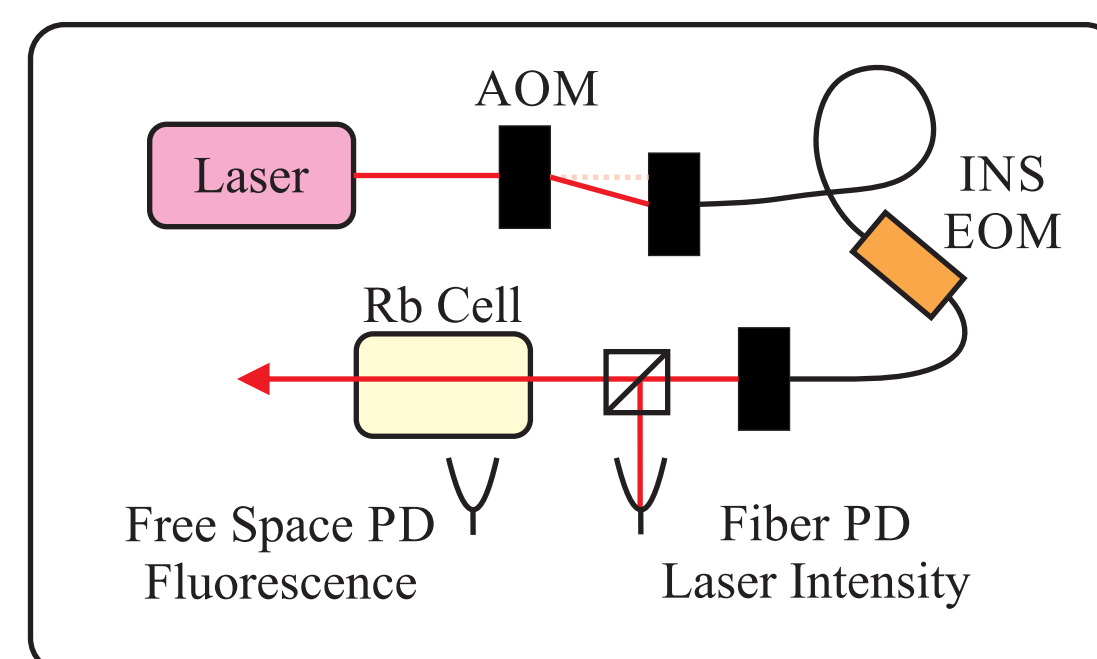


Short Pulses.



Arbitrary Shapes

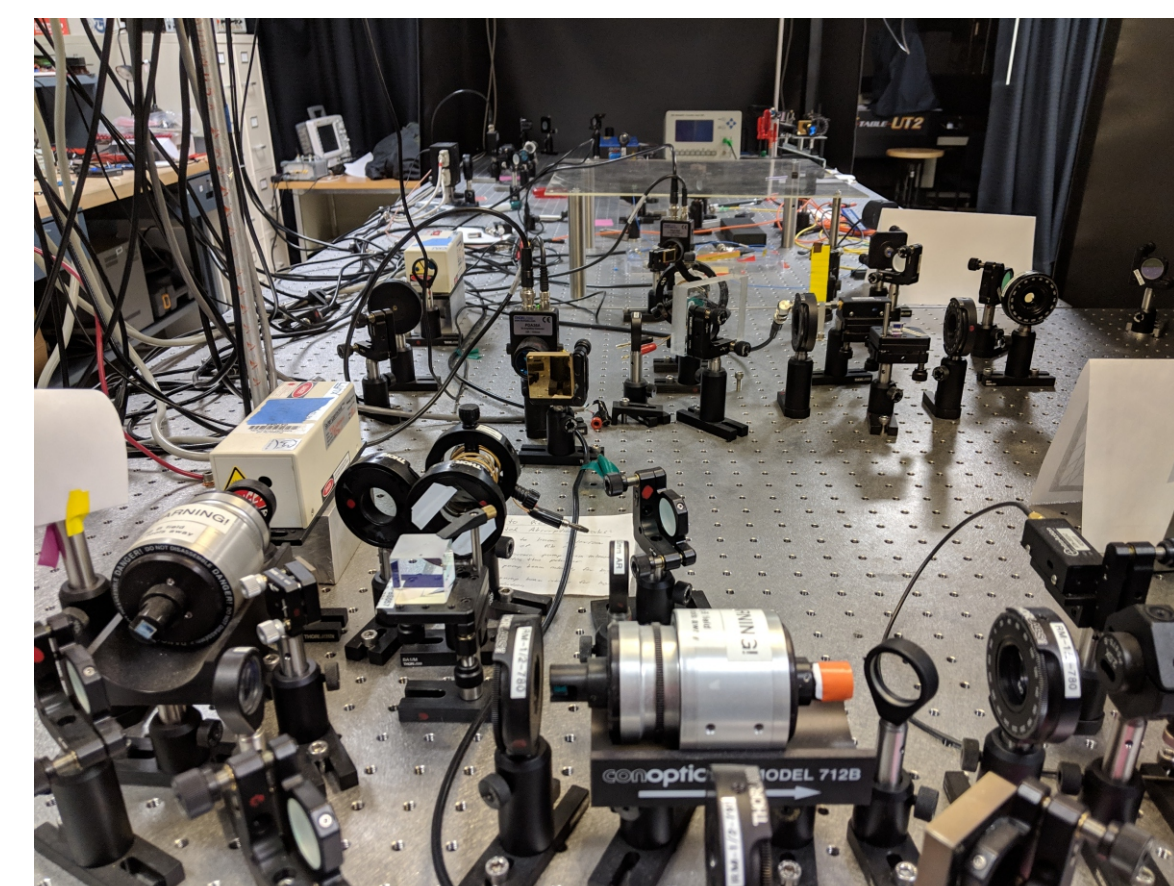
Spontaneous Emission and Quantum Beats



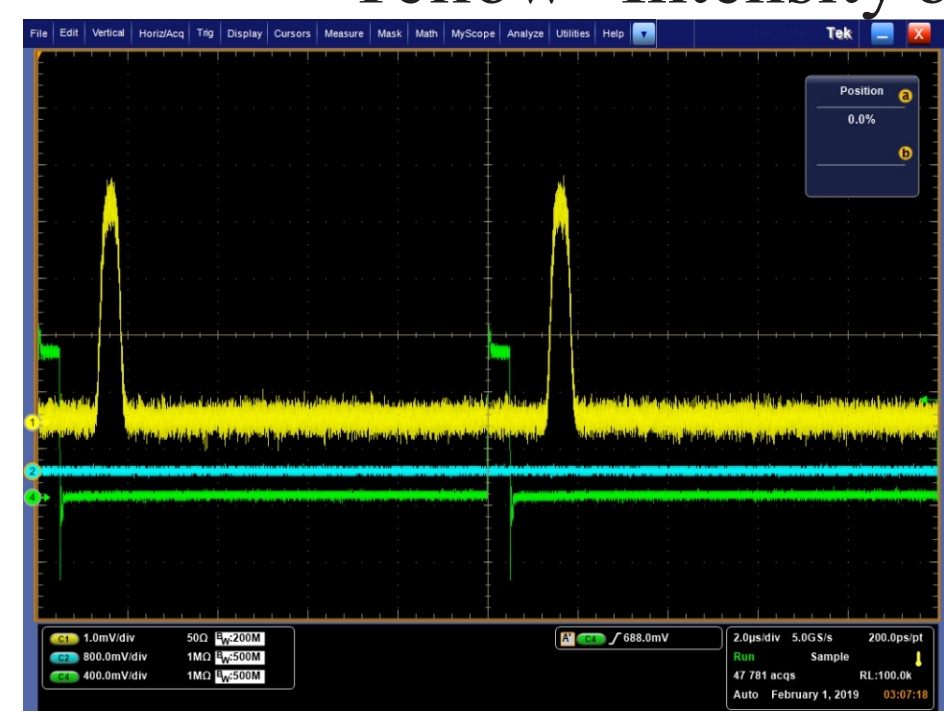
- We moved to simplify the generation of our pulsed frequency chirped light by removing the injection locked stage

- Many intensity modulators at 780 nm are limited to 5 mW CW power because of heating effects. This is circumvented by pulsing the probe laser [Gould, UConn 2019].

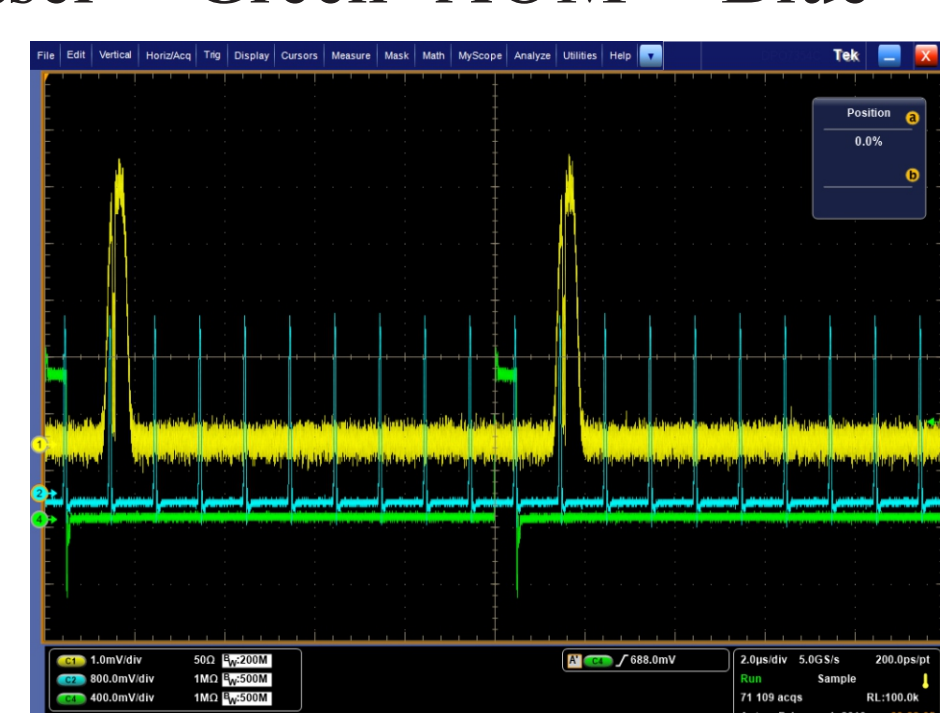
- We are able to obtain relatively high power > 15mW and short pulses ~ 1 ns.



Yellow - Intensity of laser Green - AOM Blue - Intensity Modulator



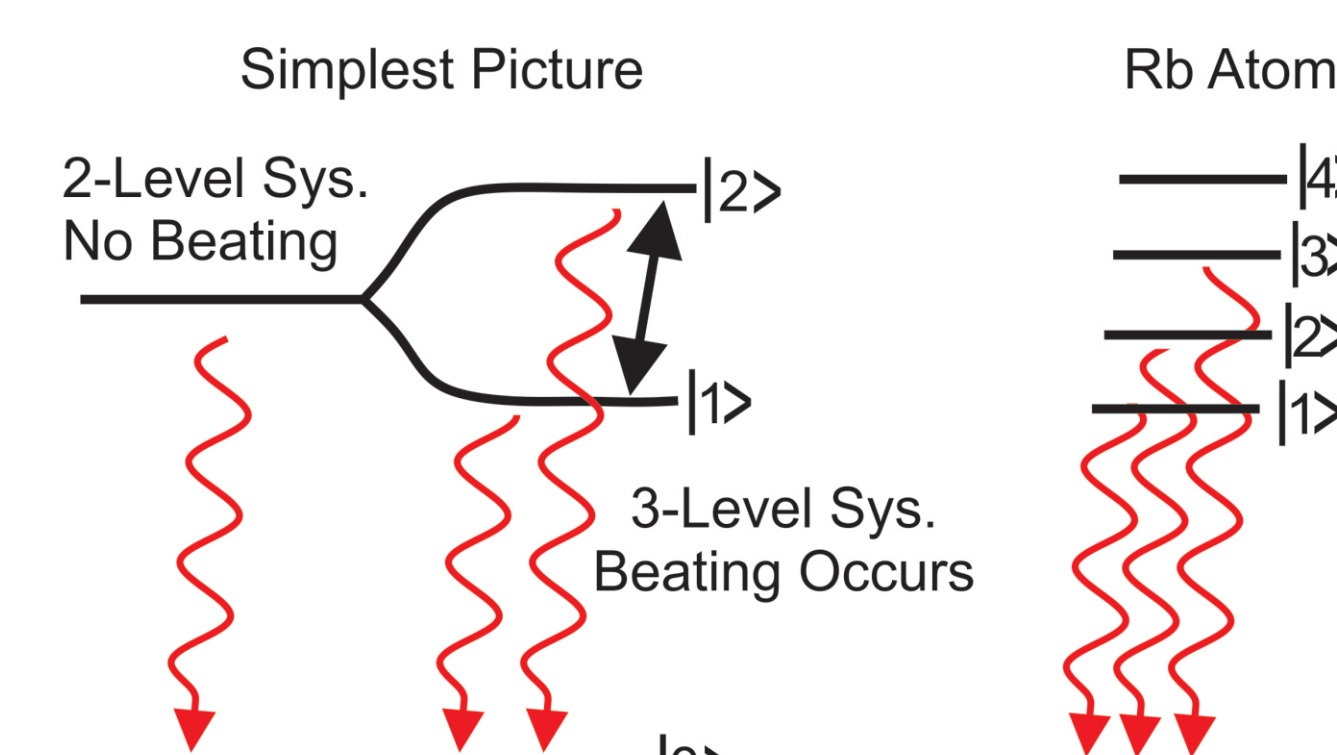
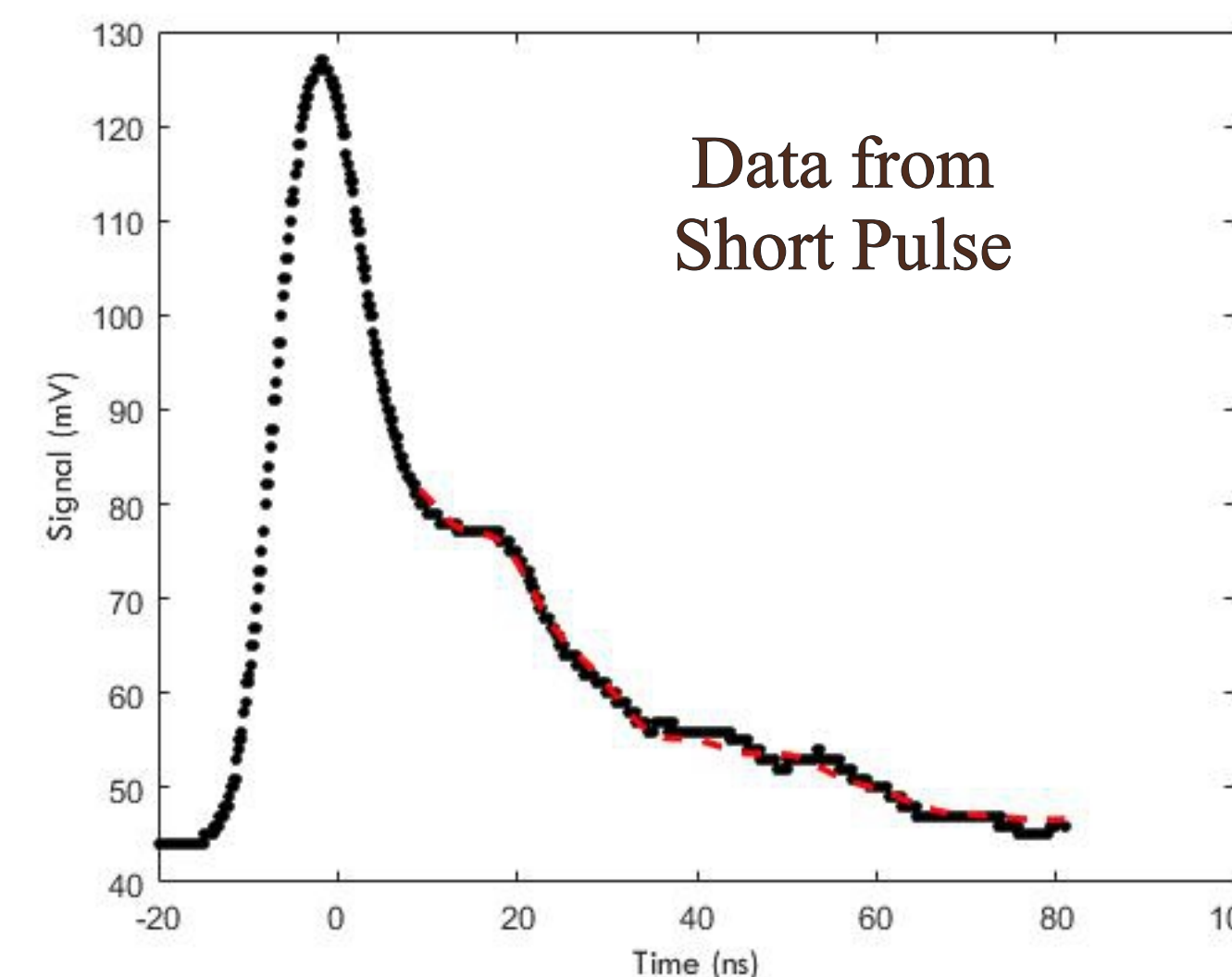
AOM is pulsed to prevent heating in intensity modulator



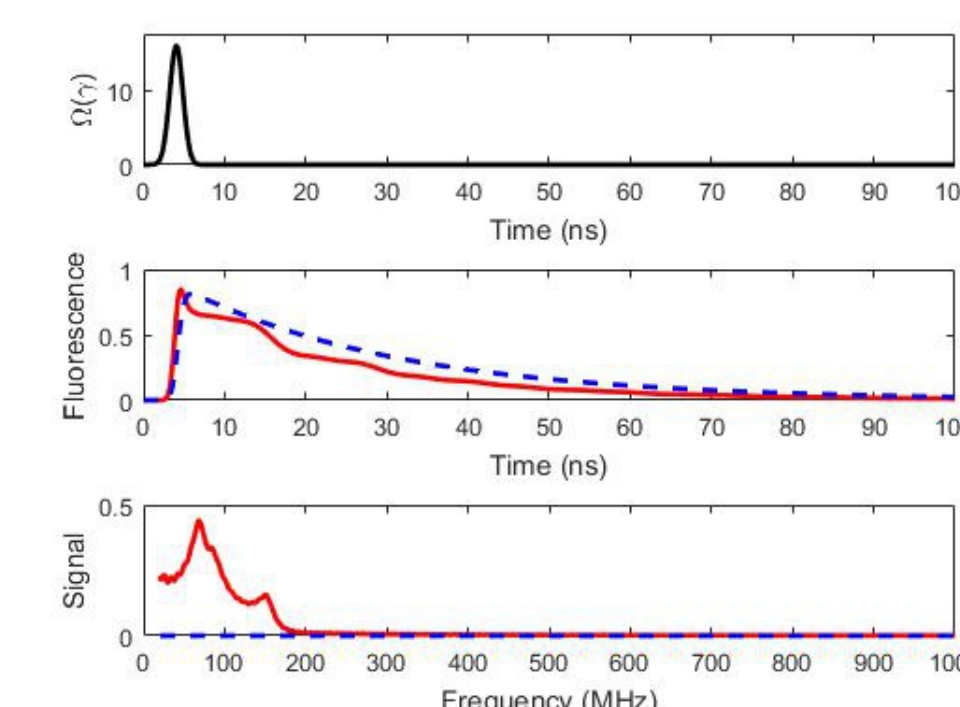
EOM is pulsed for short bursts. Phase Locked to AOM.



When phases are aligned a short pulse is achieved.



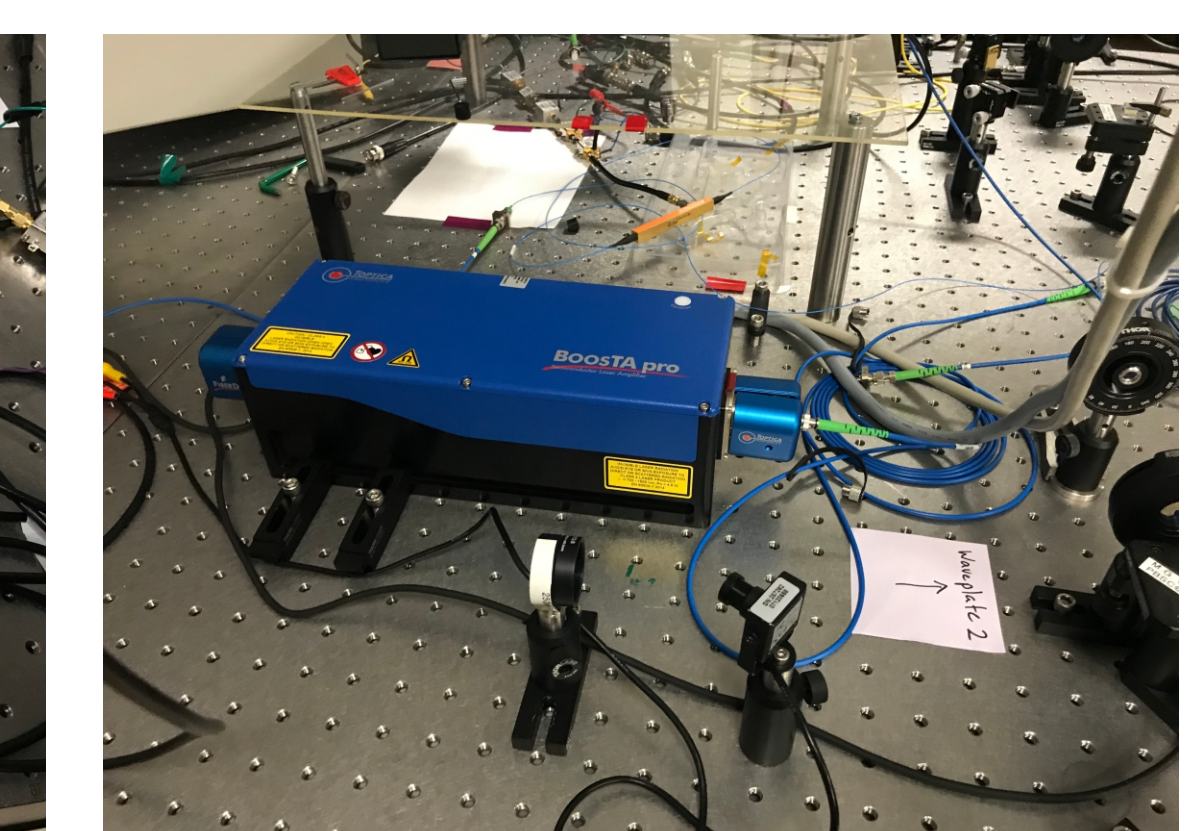
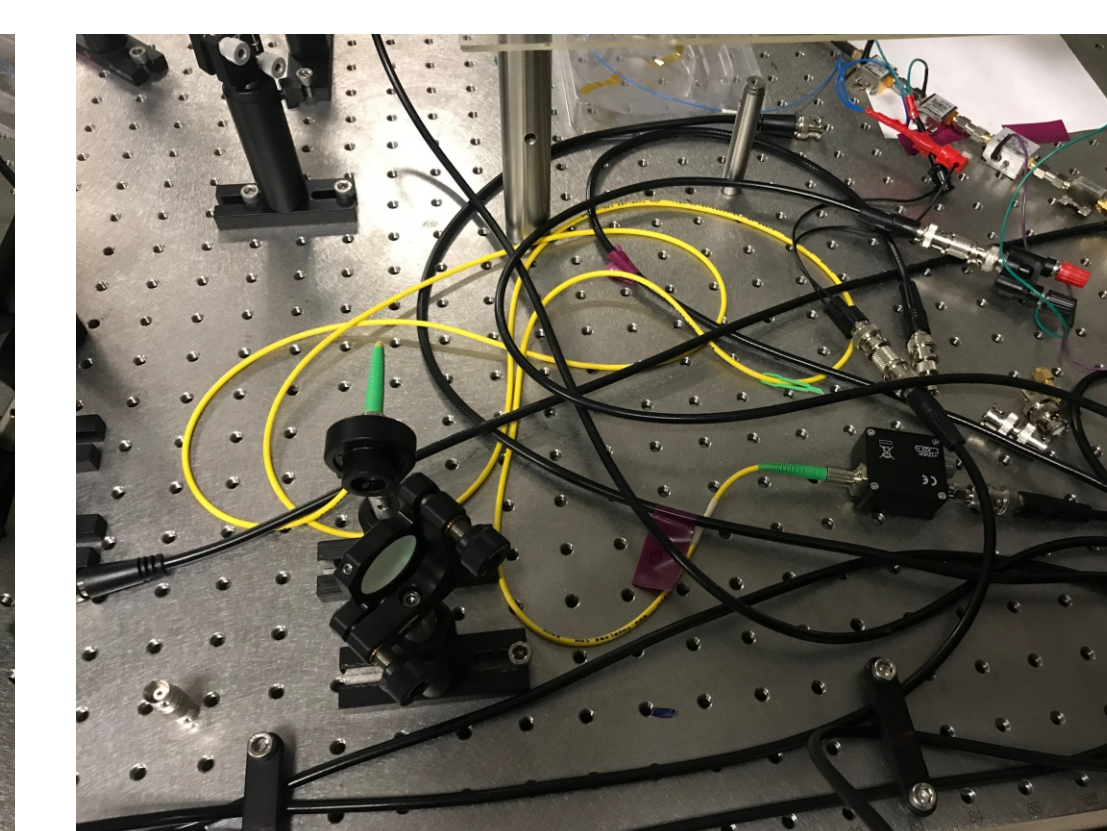
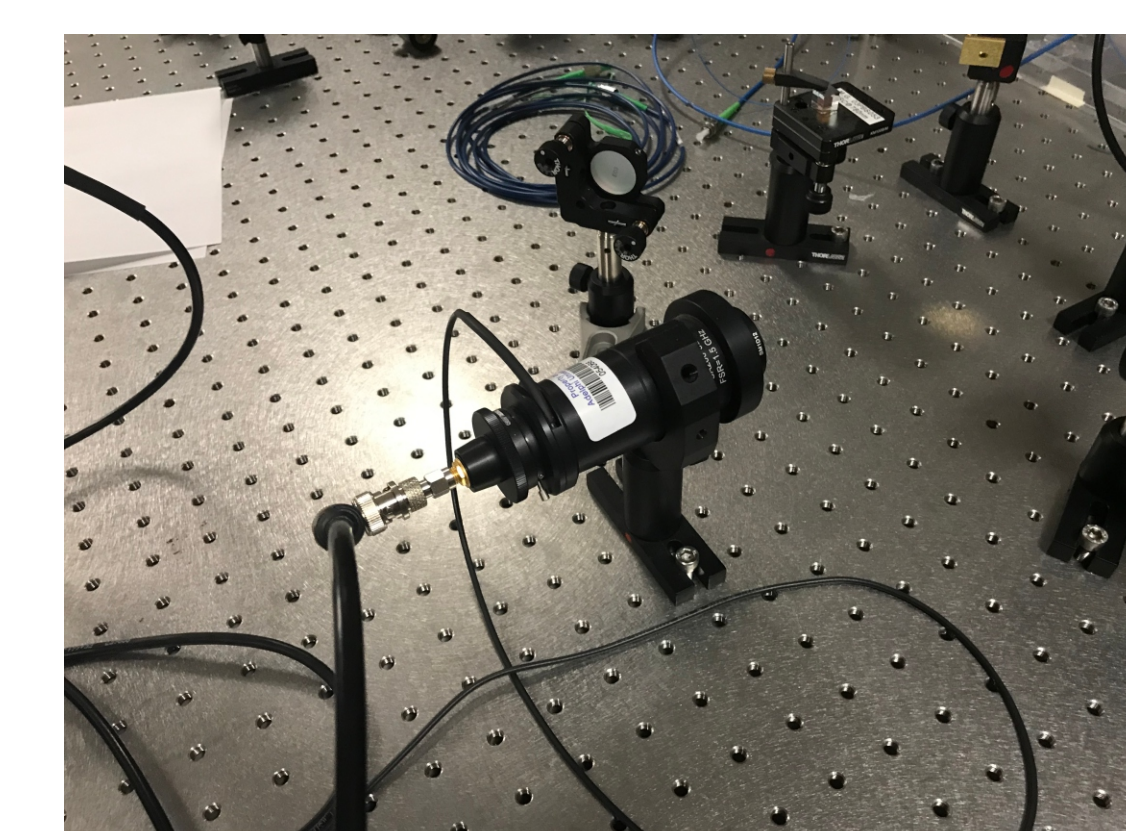
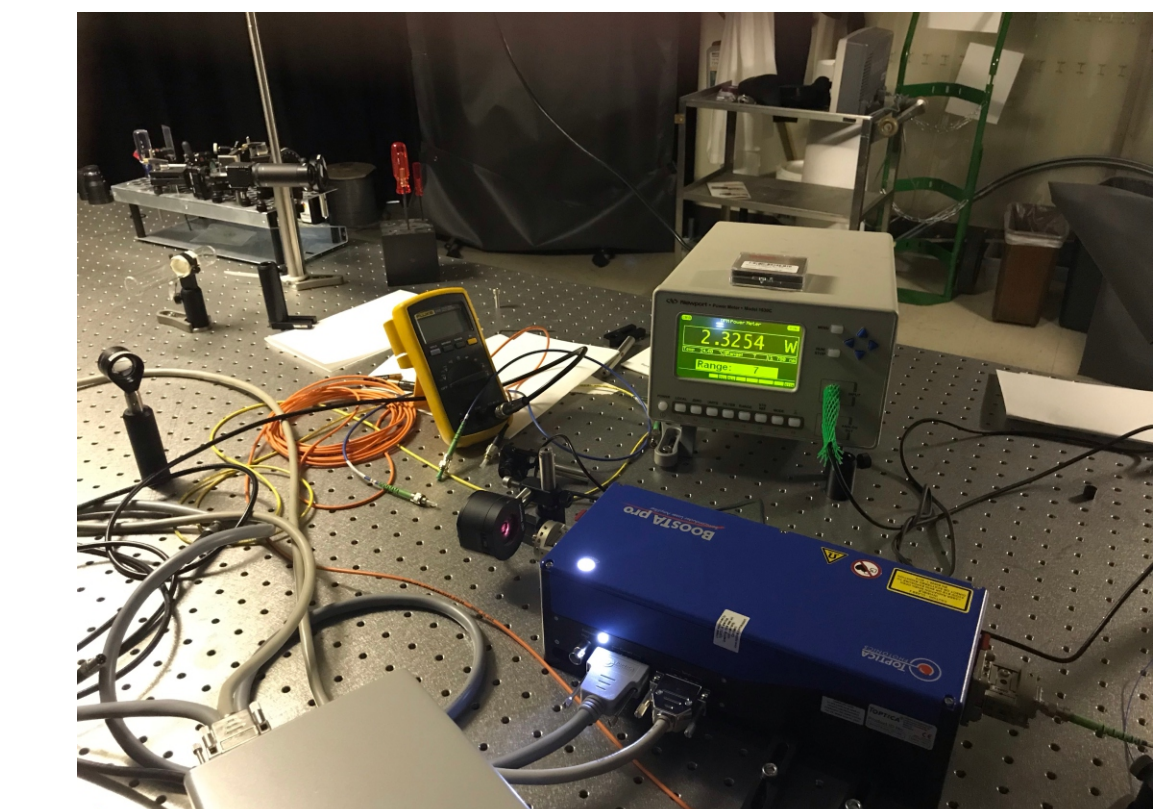
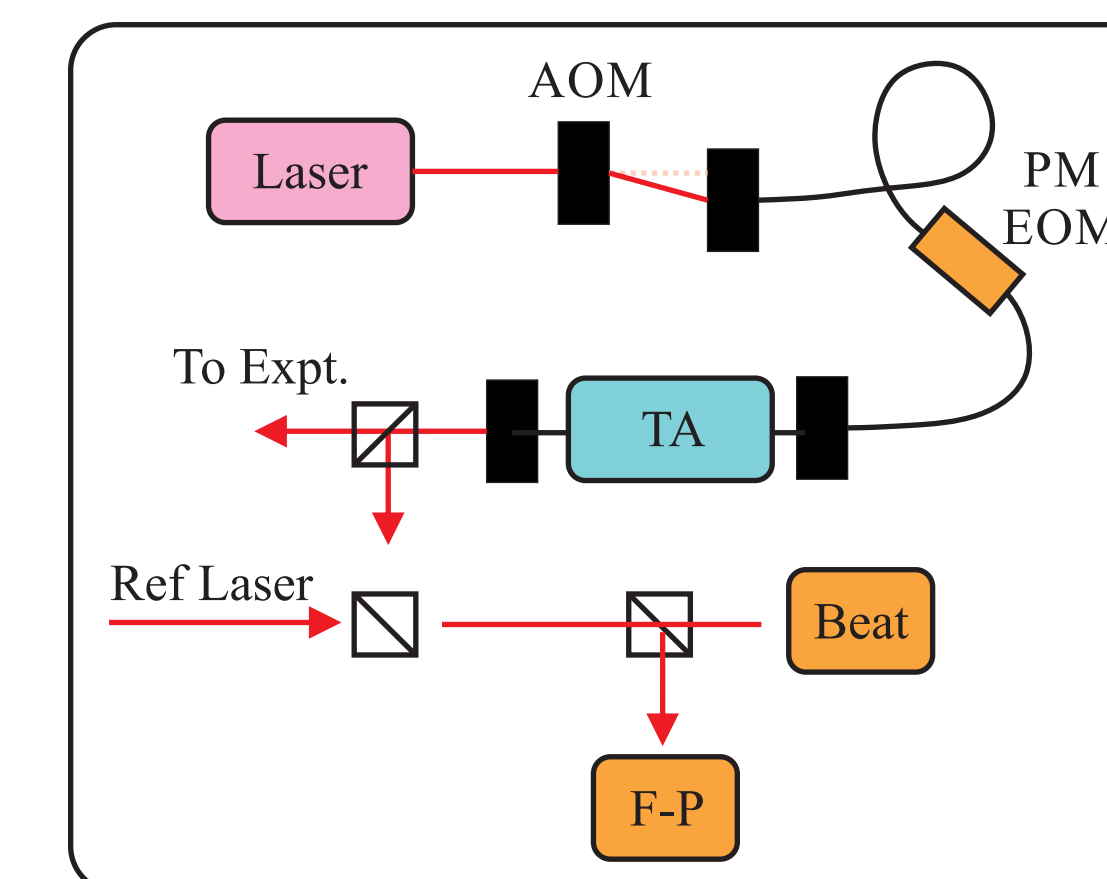
Rb Atom



We detect quantum beating in atomic decays.

Only present in 5-level simulations (red) not in the 2-level system (blue)

New System for Intense Modulated Laser Light



- We are in the process of transitioning to the new system.
- Tapered Amplifier has a high gain.
- Allows us to generate intense frequency chirped light in the side bands of the laser >> 1 GHz in 5 ns.
- We can create arbitrarily shaped pulses in frequency and intensity.
- By scrambling the phase of the light we have an usual way of generating white light

Next Steps

- Explore excitation with white light.
- Exploring ARP Force in Multilevel systems
- Coherent Control of Ultracold Collisions
- Developing time dependent tutorials in STIRAP, etc

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