Final Presentation

David Fukunaga, Dar Dahlen

August 16, 2013

High Powered Pulsed Fiber Laser

Q-Switched Pulses

Mode Locked Laser

1 High Powered Pulsed Fiber Laser

2 Q-Switched Pulses

3 Mode Locked Laser

Making a Pulsed Fiber Laser (ish)

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High Powered Pulsed Fiber Laser

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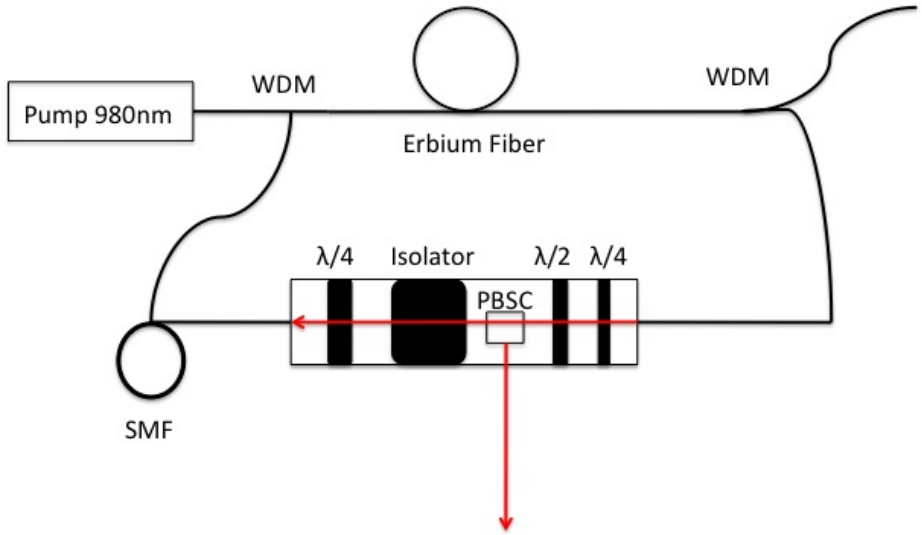
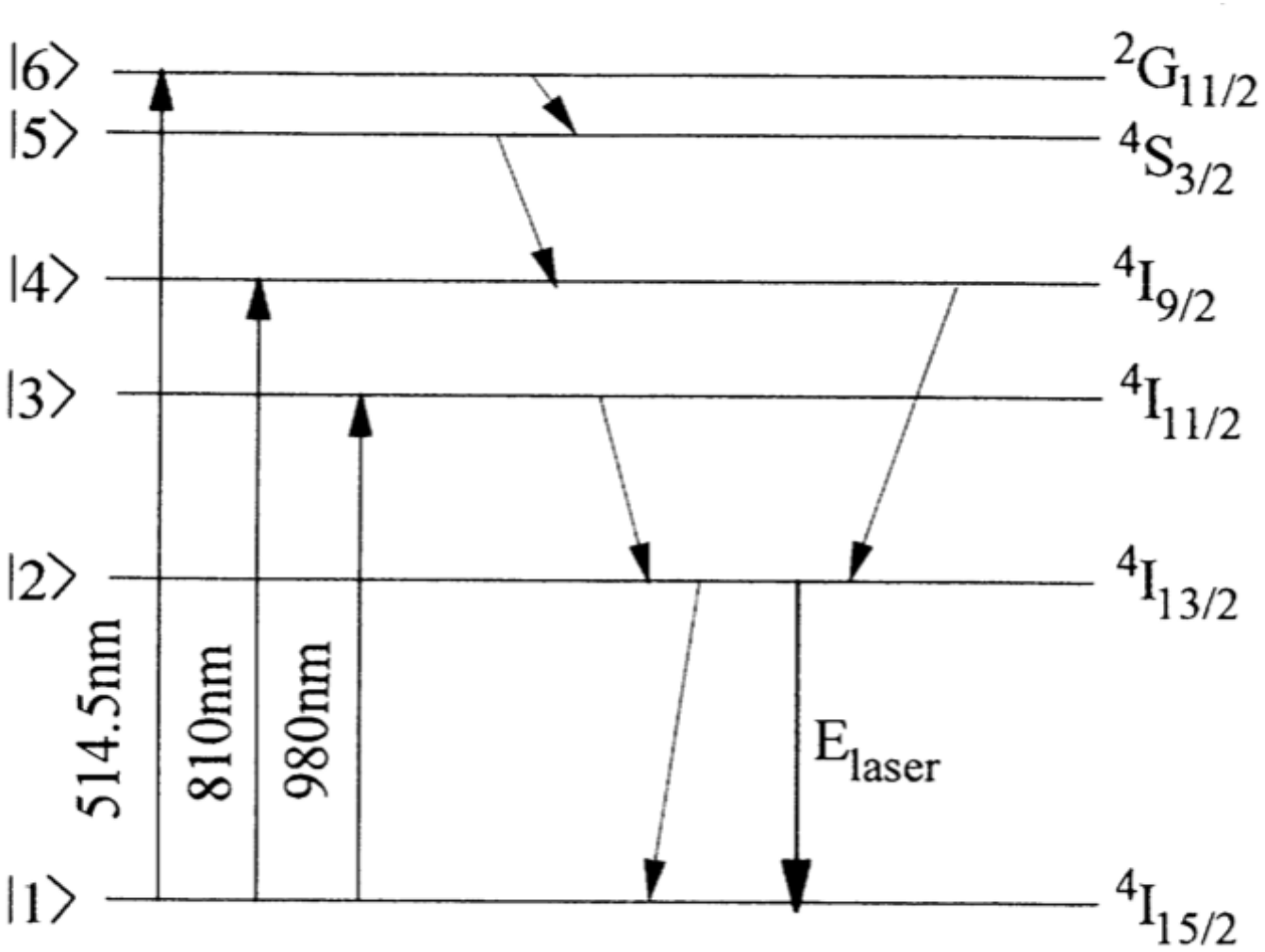
Initial Plan



Energy Levels of Erbium



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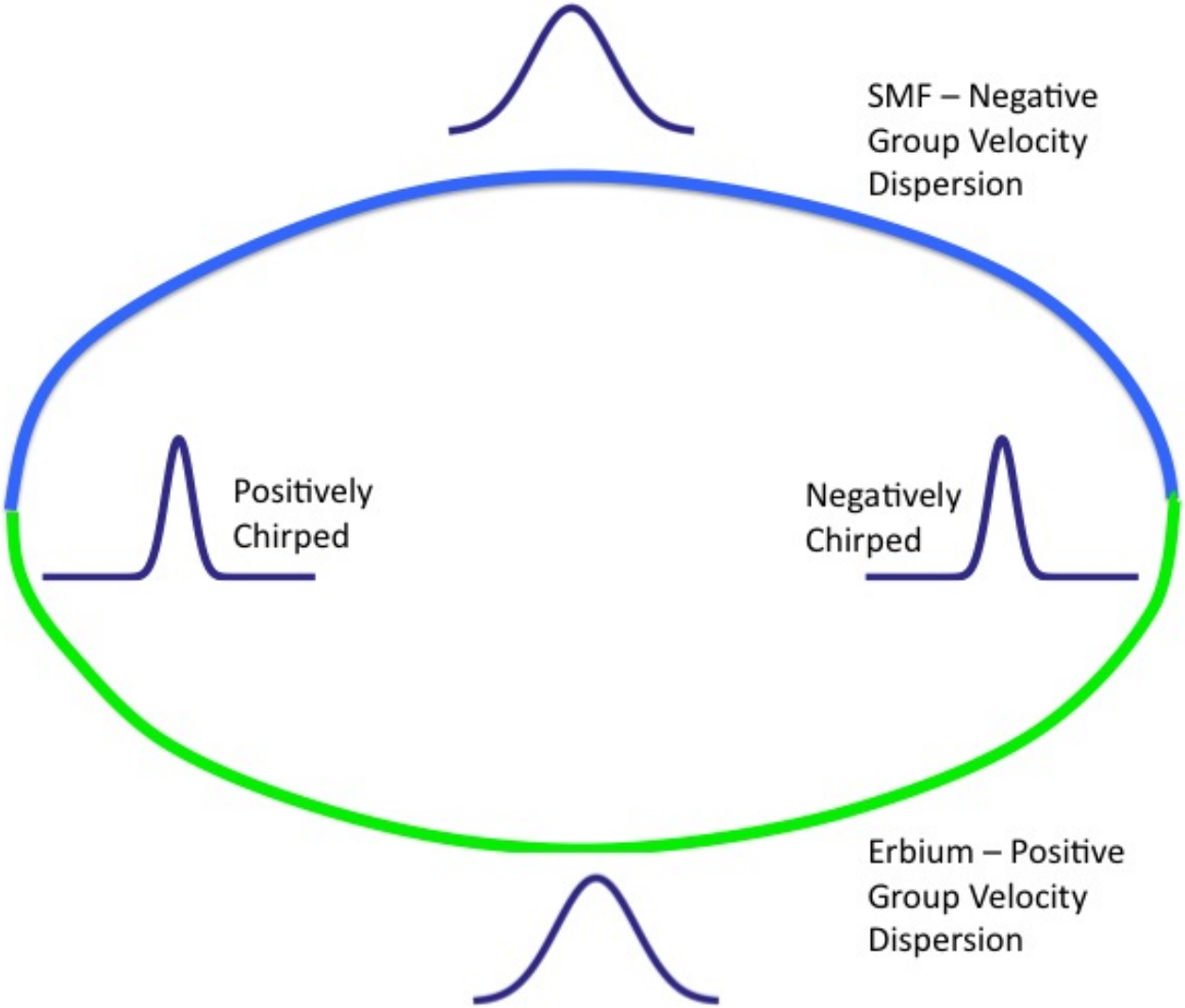
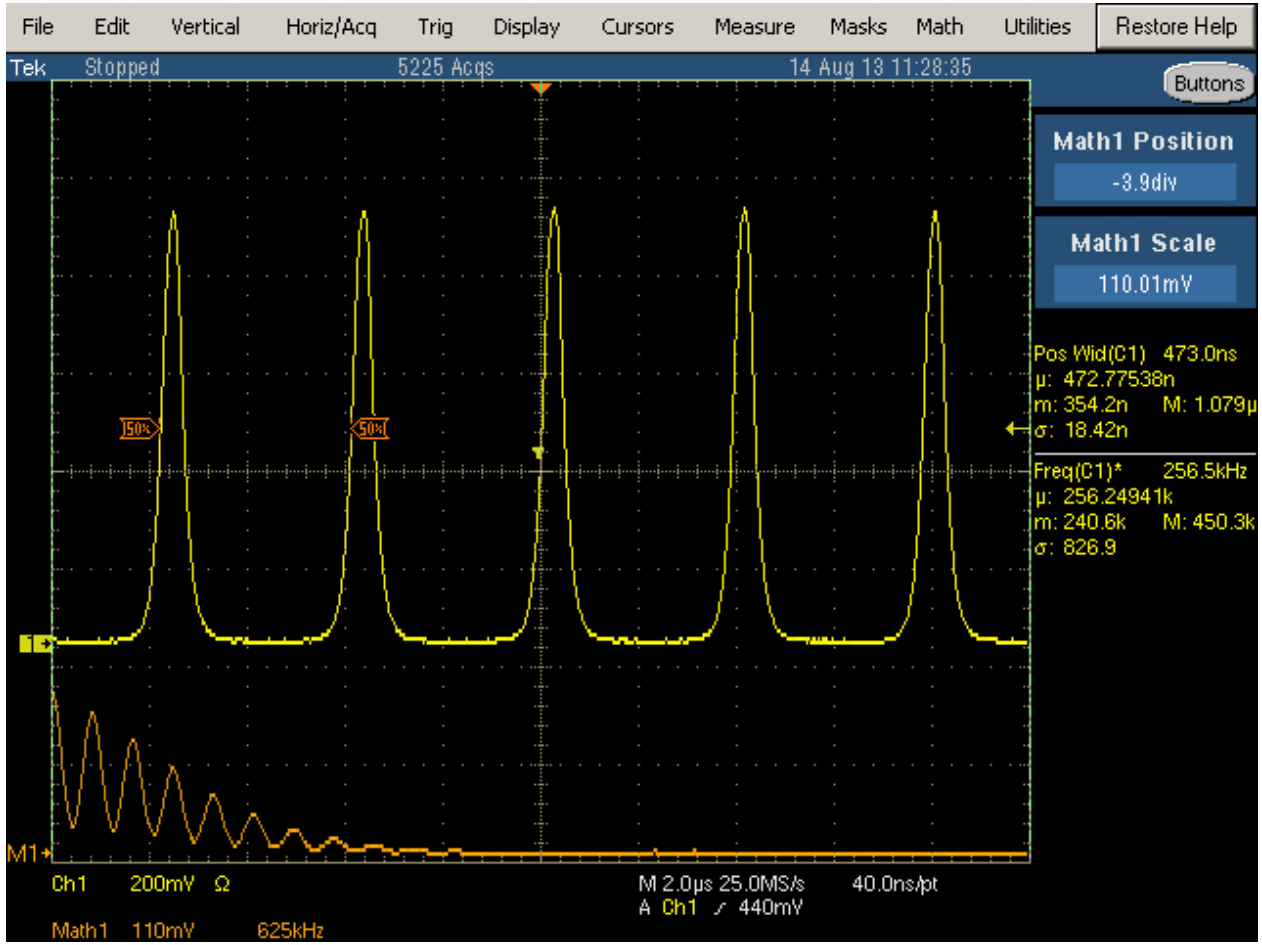
Dispersion



μs Pulses



Er 80 Length (cm)	Pulse Frequency (kHz)	Pulse Power (nJ)	Peak Power (mW)
75	223	34	71
40	154	27.4	26.6

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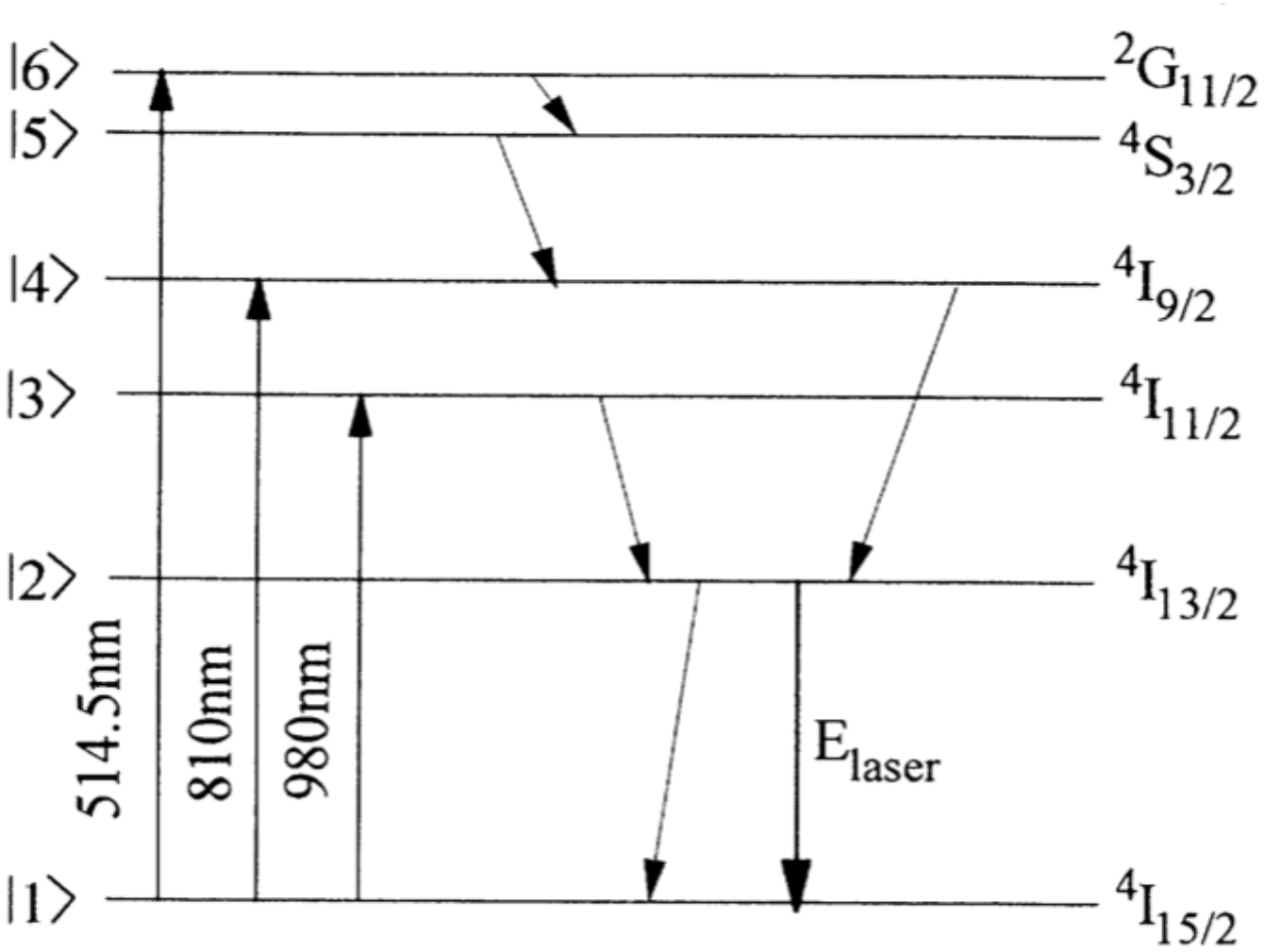
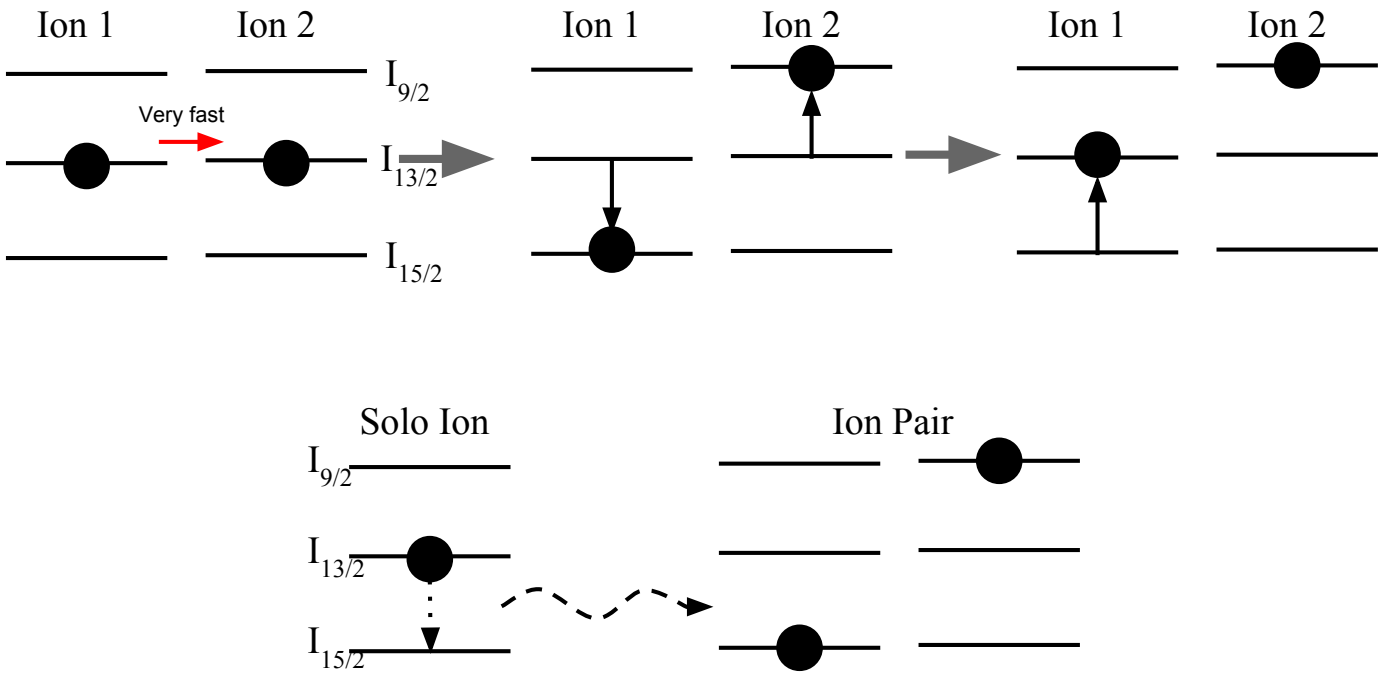
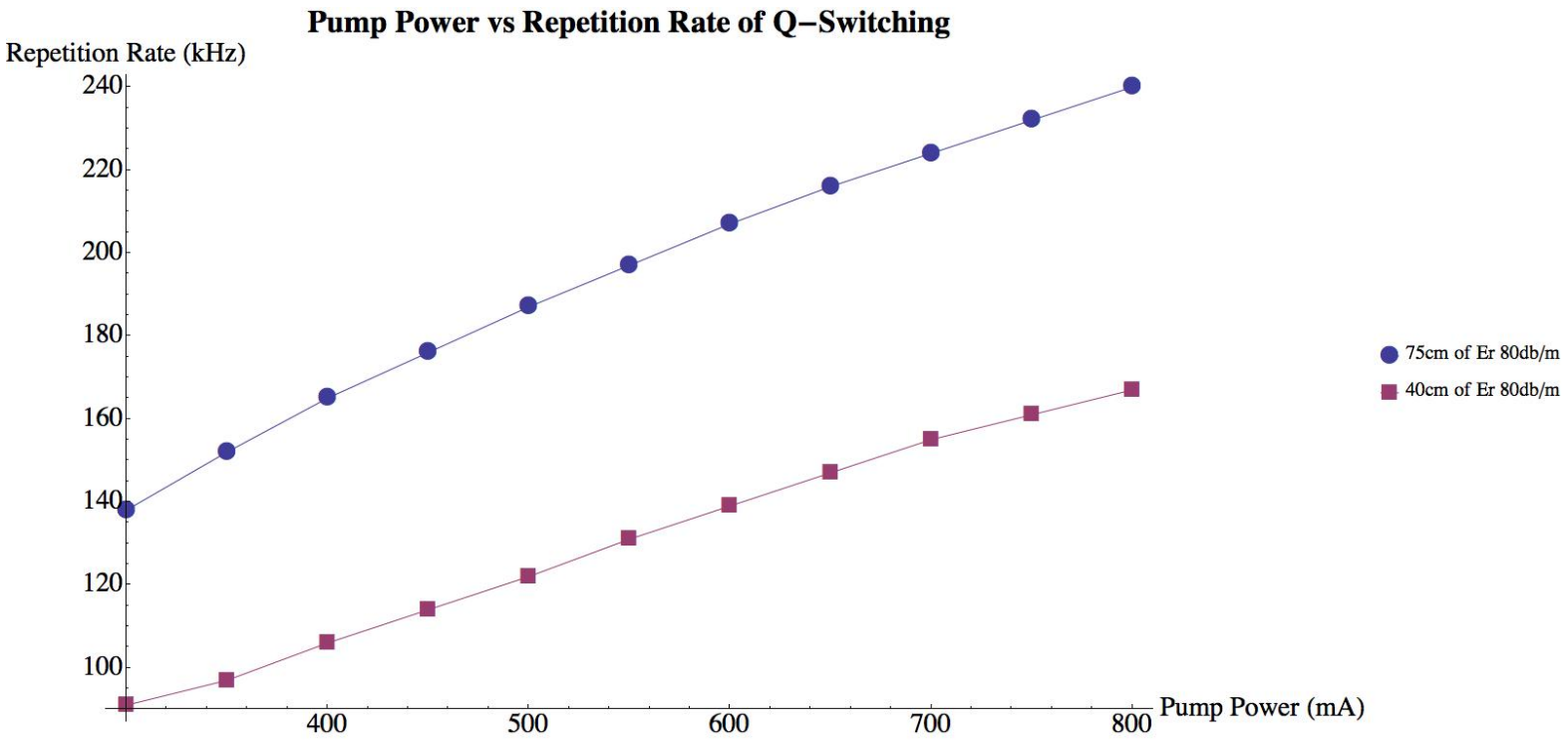


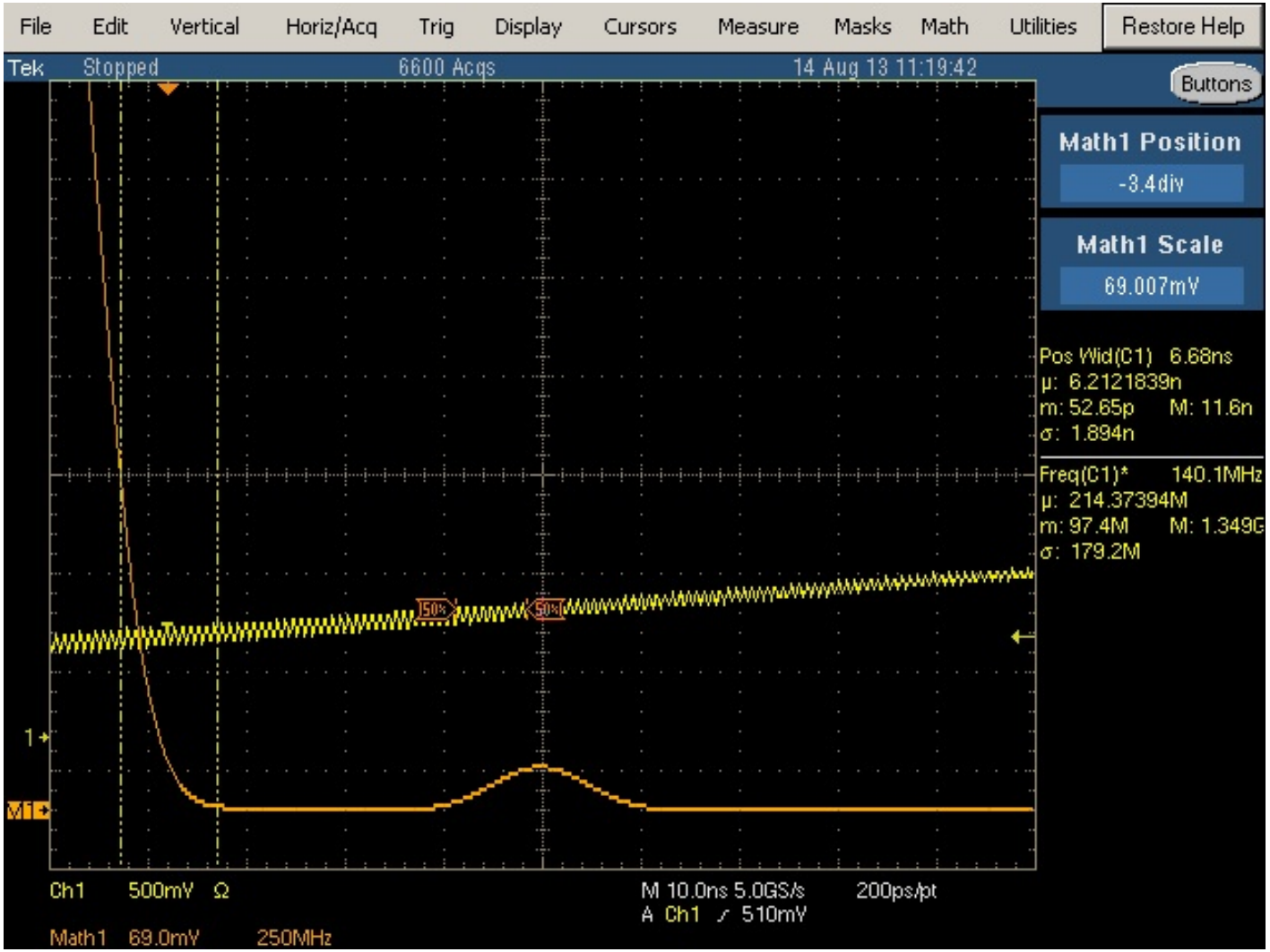
Erbium Clusters



Saturable Absorber



Mode Locking



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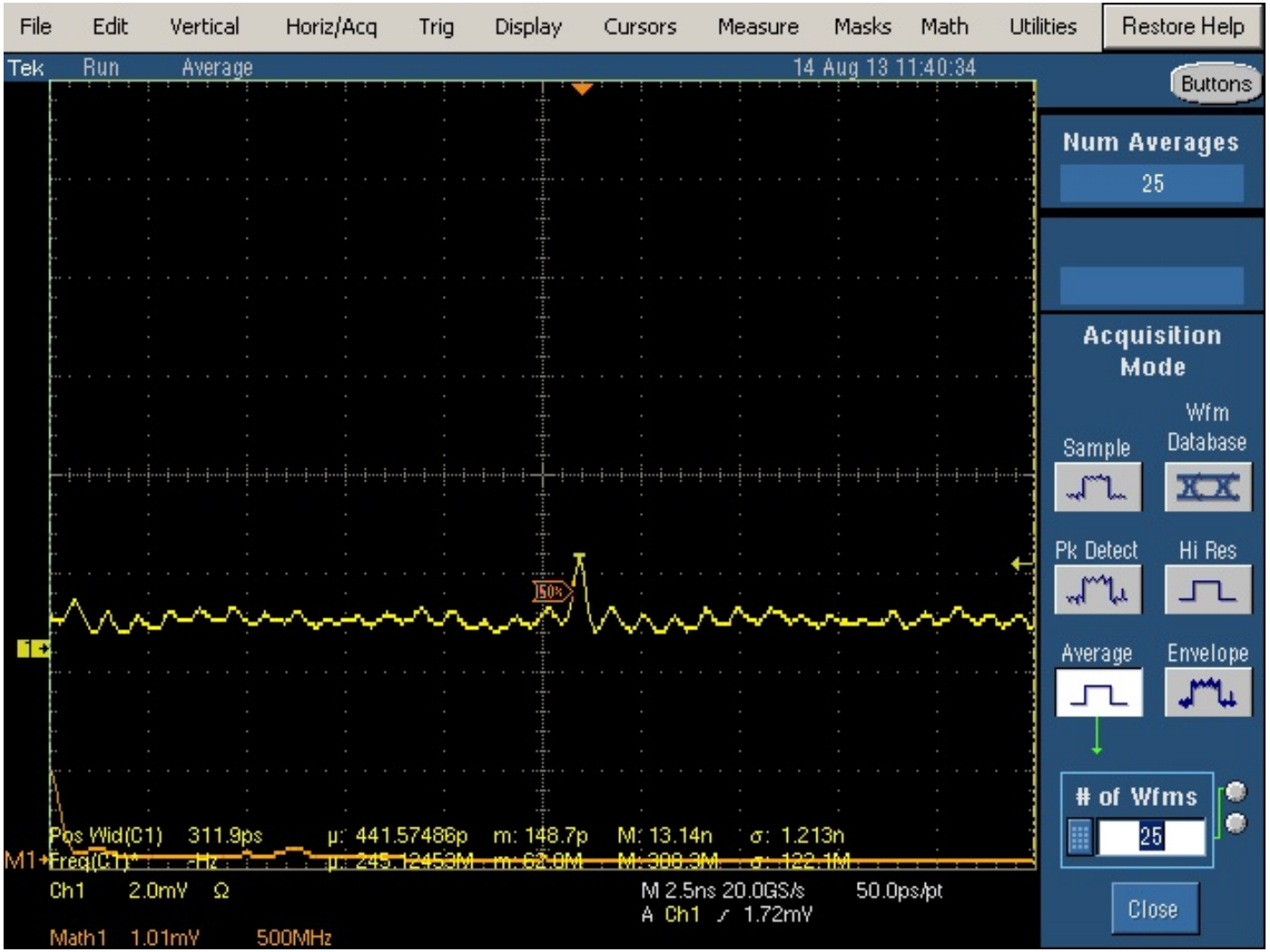

To Be Continued

- Connectors $\rightarrow$ Splices

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- More Pump Power

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- More Pump Power
- Different Fiber (AI?)

The End

Thanks for Listening

- Colin, S., E. Contesse, P. Le Boudec, G. Stephan, and F. Sanchez. "Evidence Of A Saturable-absorption Effect In Heavily Erbium-doped Fibers." *Optics Letters*21.24 (1996): 1987.
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- Tamura, K., C. R. Doerr, L. E. Nelson, H. A. Haus, and E. P. Ippen. "Technique For Obtaining High-energy Ultrashort Pulses From An Additive-pulse Mode-locked Erbium-doped Fiber Ring Laser." *Optics Letters* 19.1 (1994): 46.
- Tamura, K., C. R. Doerr, L. E. Nelson, H. A. Haus, and E. P. Ippen. "Technique For Obtaining High-energy Ultrashort Pulses From An Additive-pulse Mode-locked Erbium-doped Fiber Ring Laser." *Optics Letters* 19.1 (1994): 46

Calculating Pulse Power

- Assume Gaussian Pulse Shape

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- So $\frac{AveragePower}{RepetitionRate} = (PeakPower)\sqrt{2\pi}\frac{FWHM}{2\sqrt{2ln(2)}}$