

Bunch Length Measurements with Laser/SR Cross-Correlation

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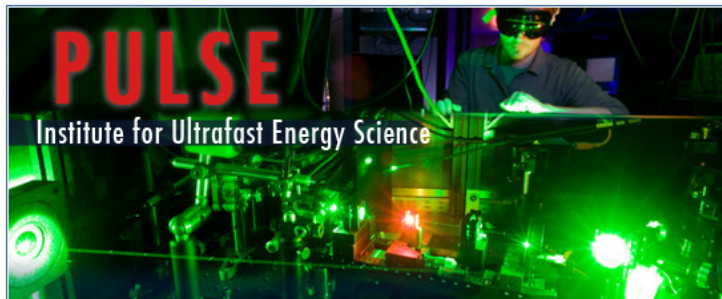
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Aaron Lindenberg



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Walter Mok

James Safranek

Xiaobiao Huang



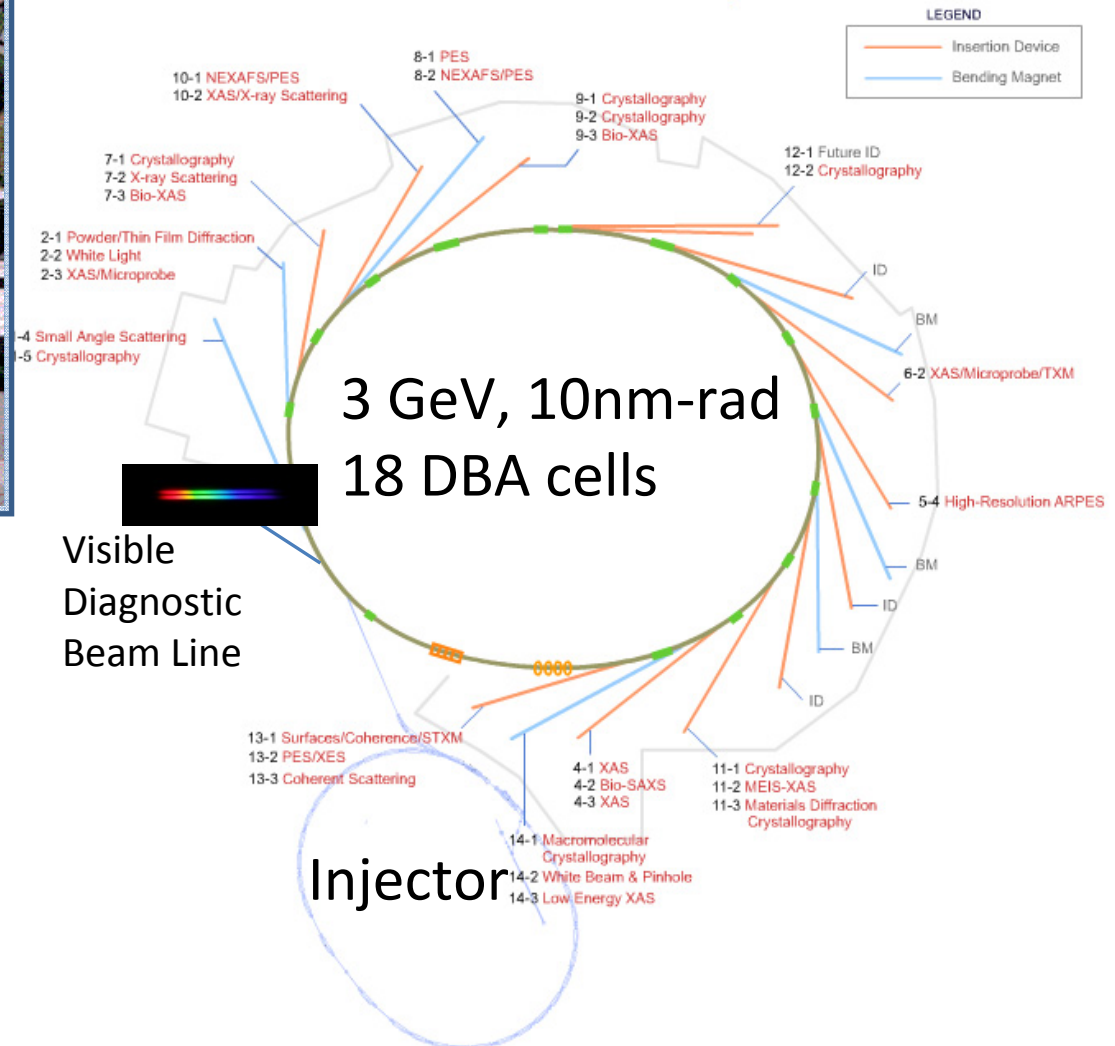
Outline

- SPEAR 3 Light Source
- Machine Optics and Low- α operation
- Laser/SR cross-correlation experiment
- Experimental Results
- Summary

SPEAR3 Light Source

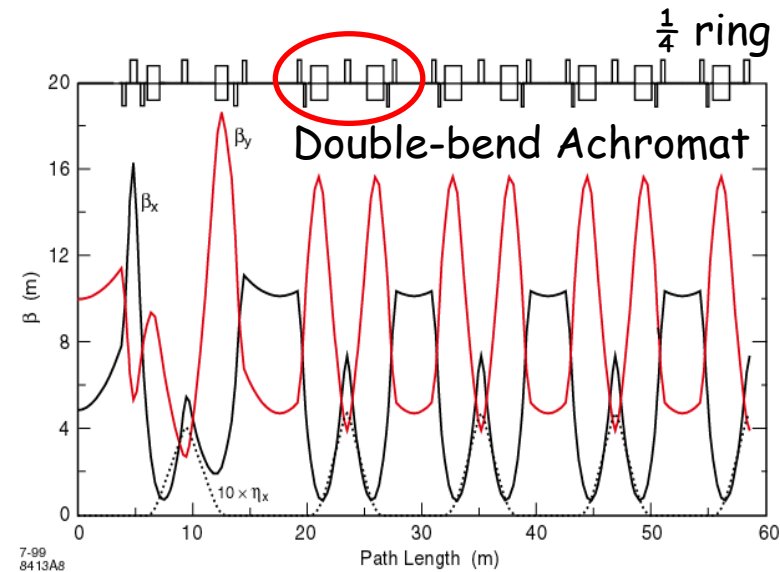
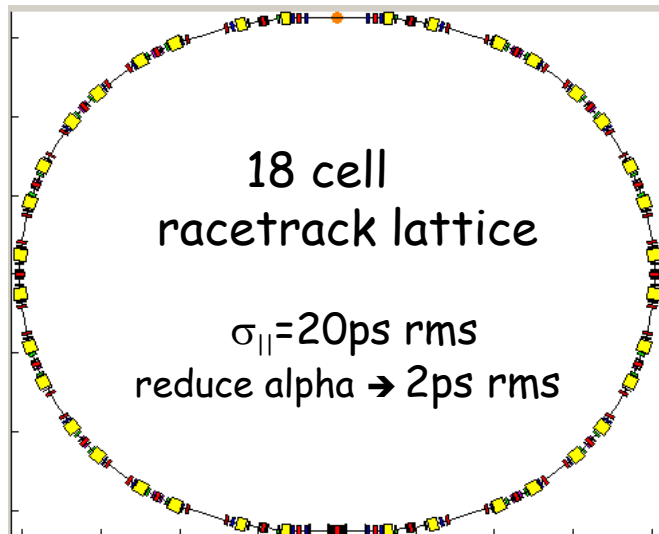


SSRL Beam Line Map

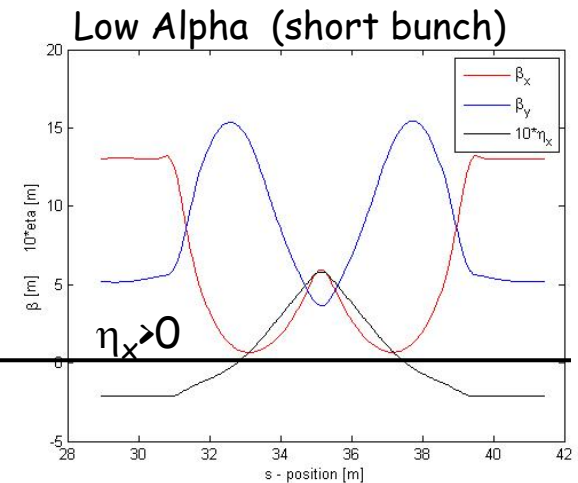
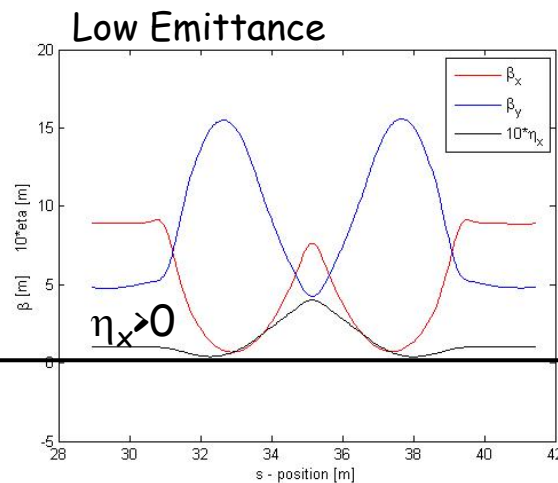
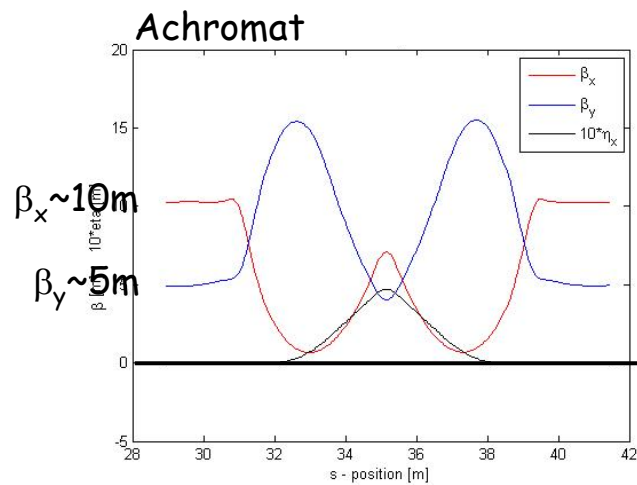


Circa 2002

SPEAR3 Accelerator Optics

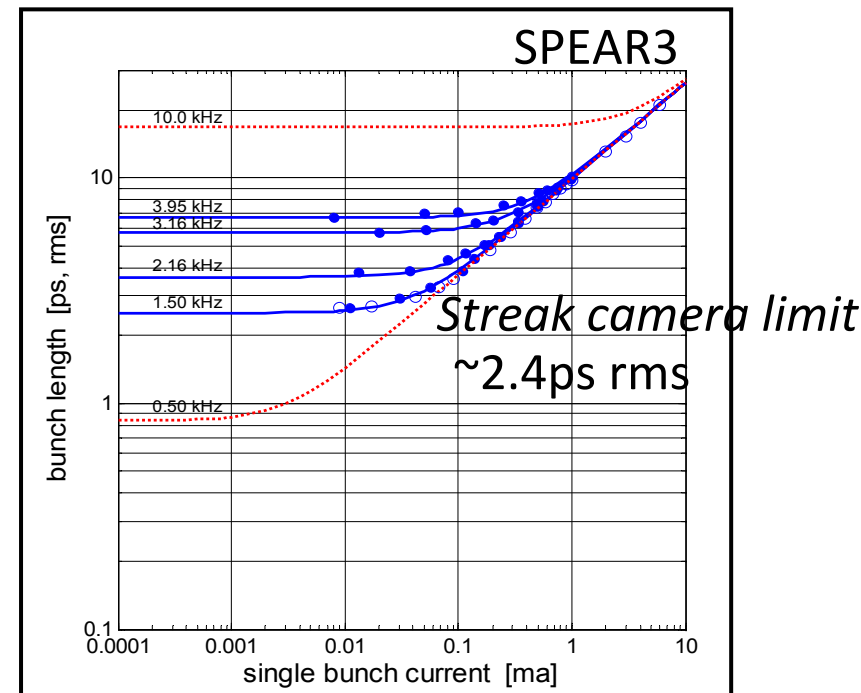
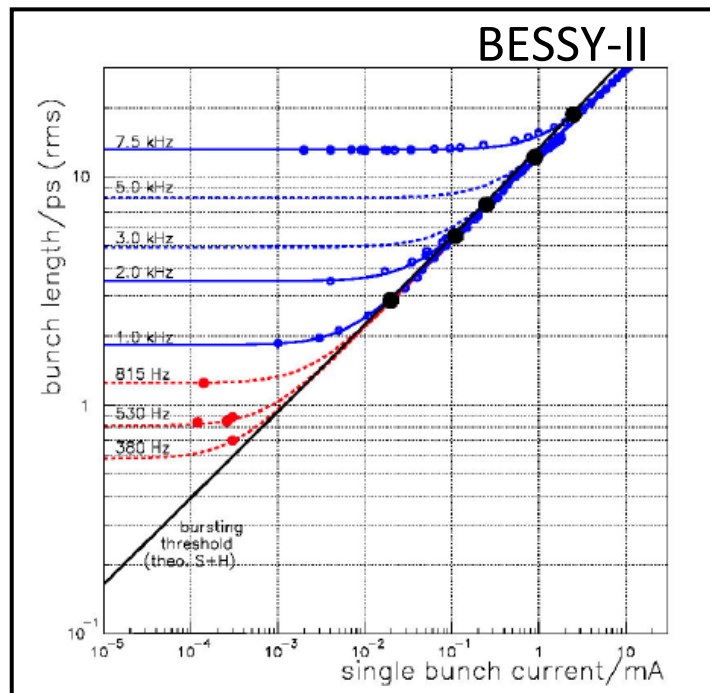
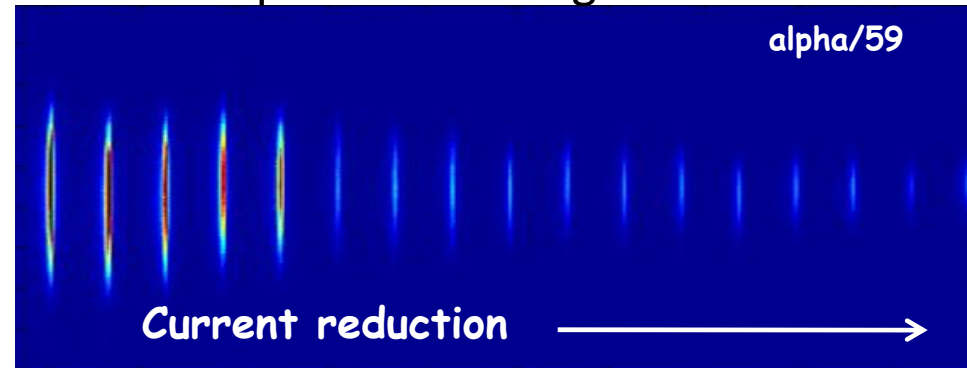


Single cell optics



Streak Camera Measurements: Low- α

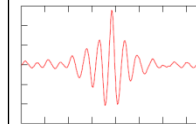
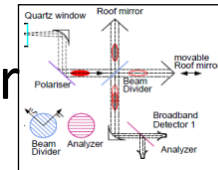
Current dependence - single-bunch



Short Bunch Measurements with SR

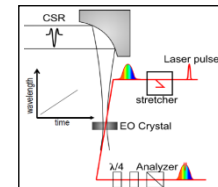
IR/THz beam line

∅ FIR interferometer/form factor



Fröhlich

∅ CSR component/electro-optic

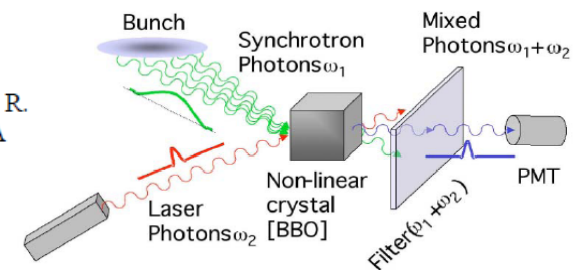


Steffen/Müller

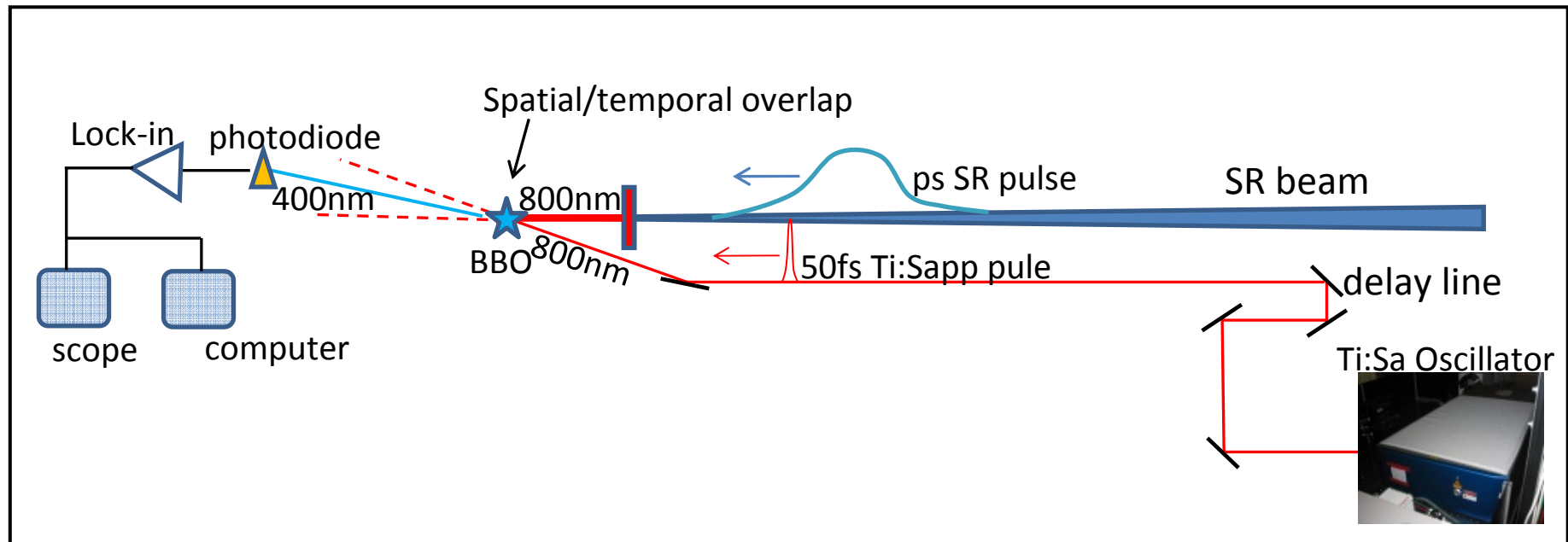
‘optical sampling’ in the visible (*Zolotarev, et al, ALS*)

DEVELOPMENT OF A LONGITUDINAL DENSITY MONITOR FOR STORAGE RINGS*

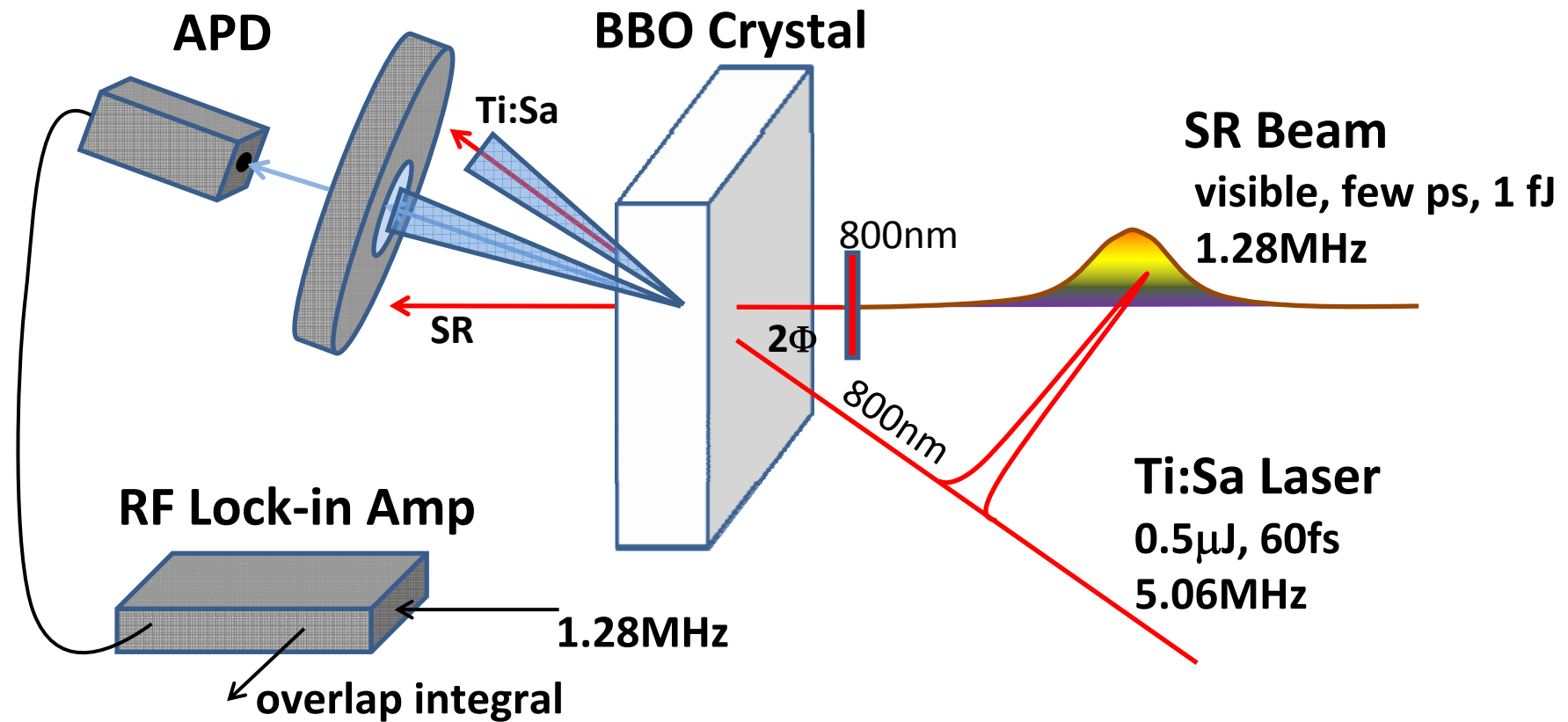
M. Zolotarev, J.-F. Beche, J. Byrd, P. Datte, S. De Santis, P. Denes, M. Placidi, A. Ratti, V. Riot, R. Schoenlein and W. Turner, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA



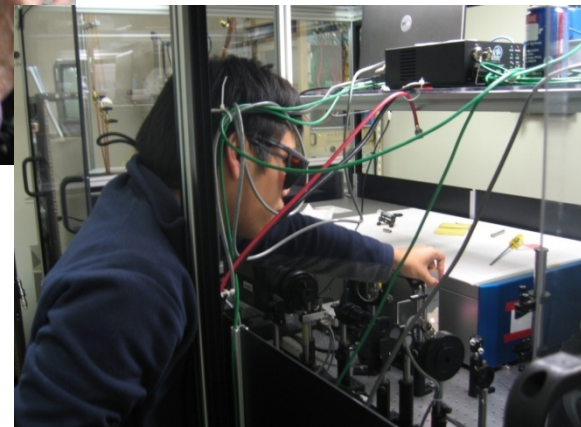
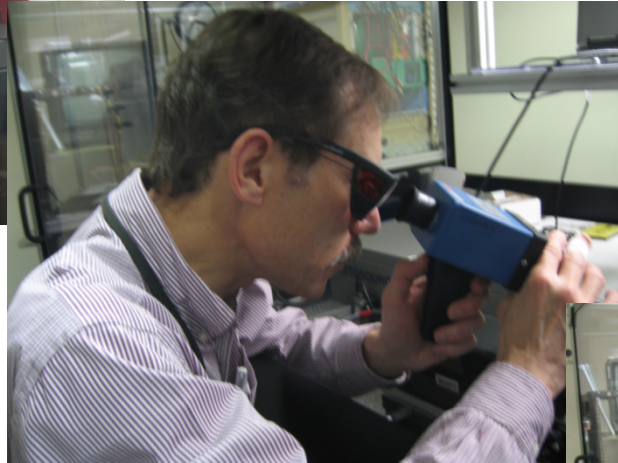
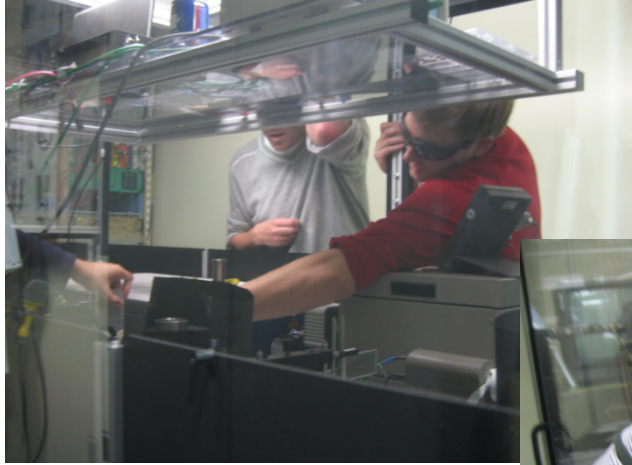
Laser/ SR Cross-correlation Geometry



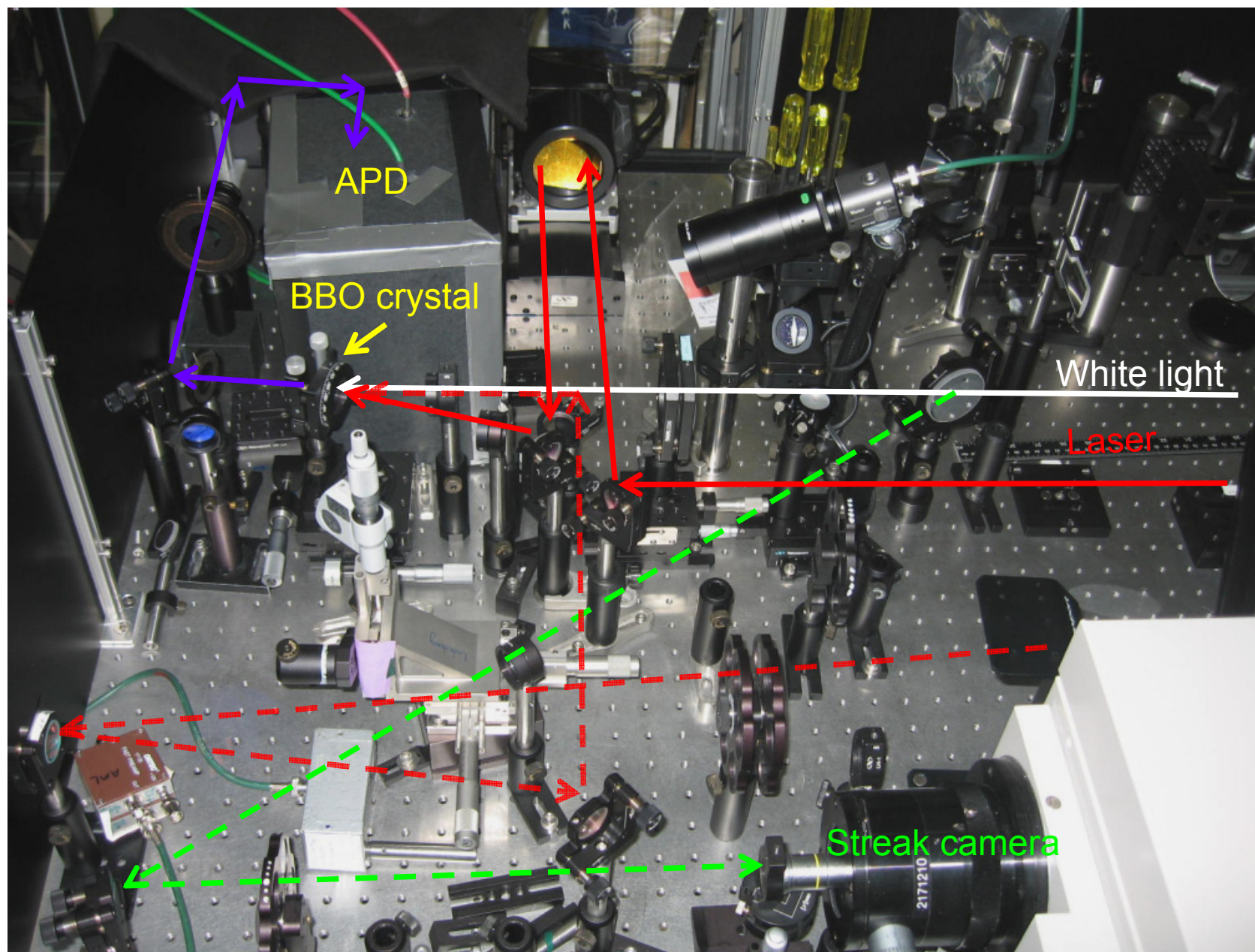
Second-Harmonic in a BBO



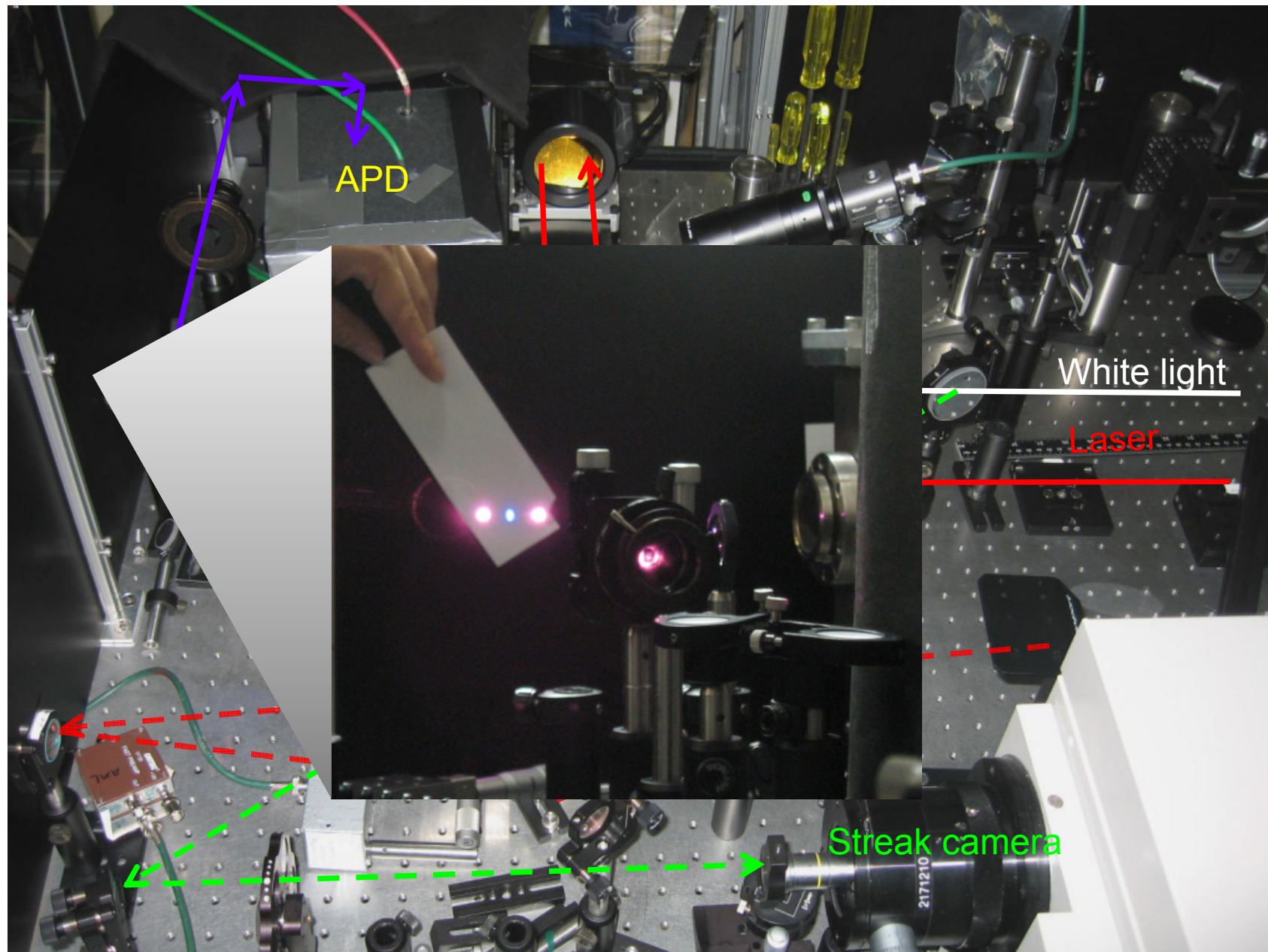
Fast at work ...



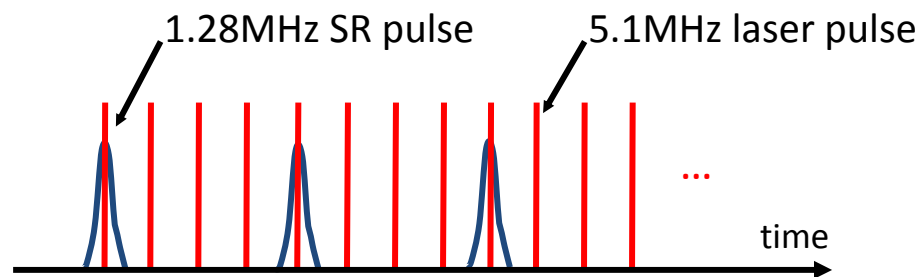
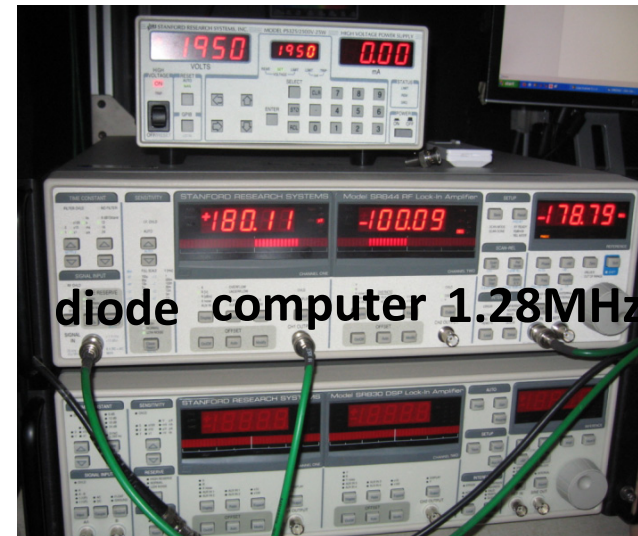
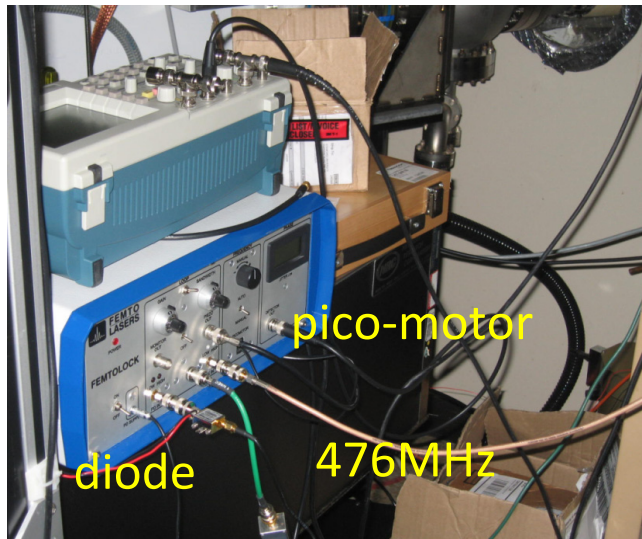
Plan View of Optical Bench



Plan View of Optical Bench

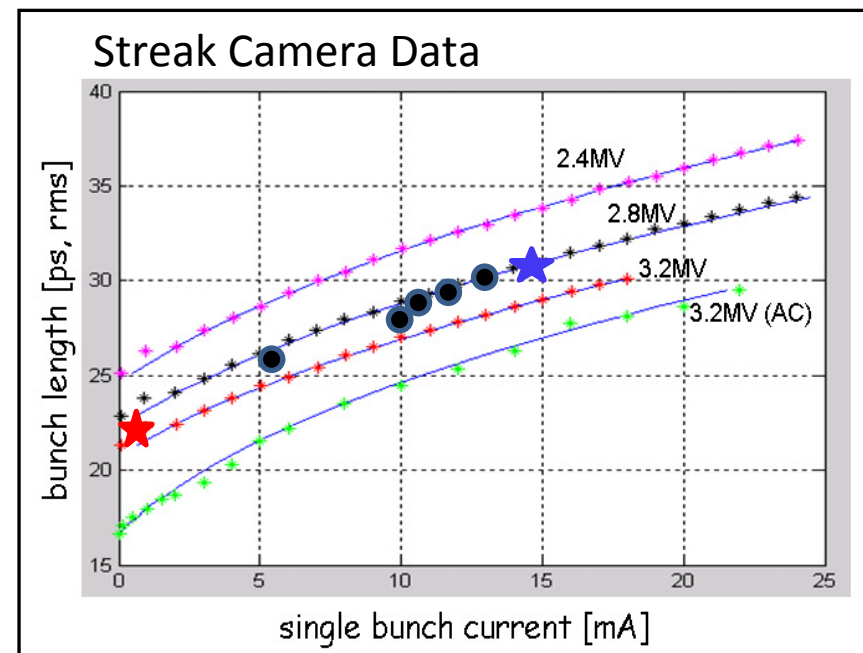
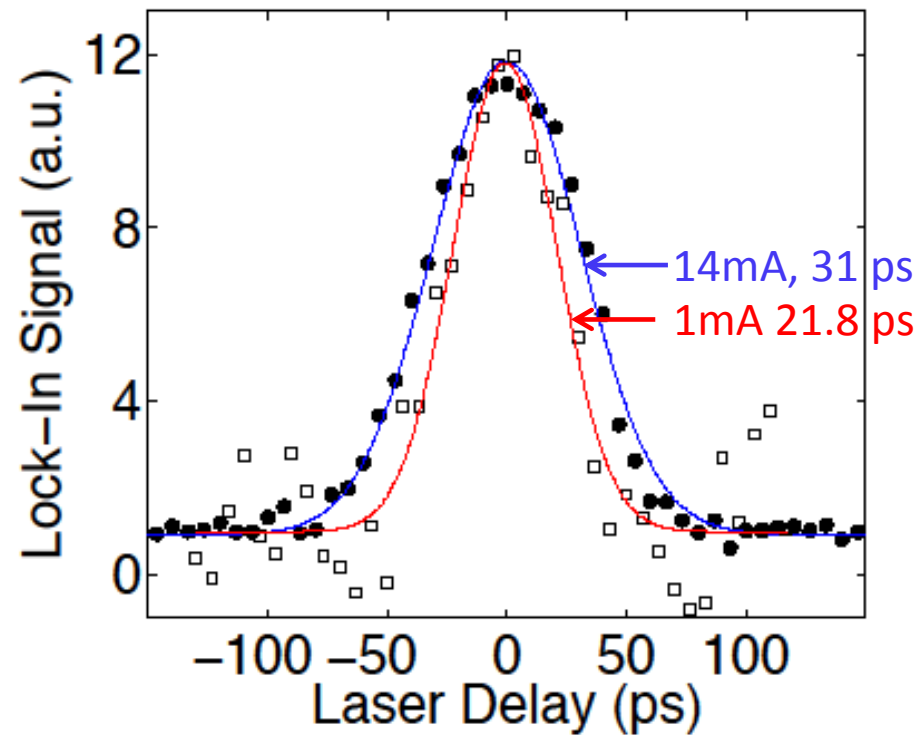


Laser timing and Lock-in Measurement

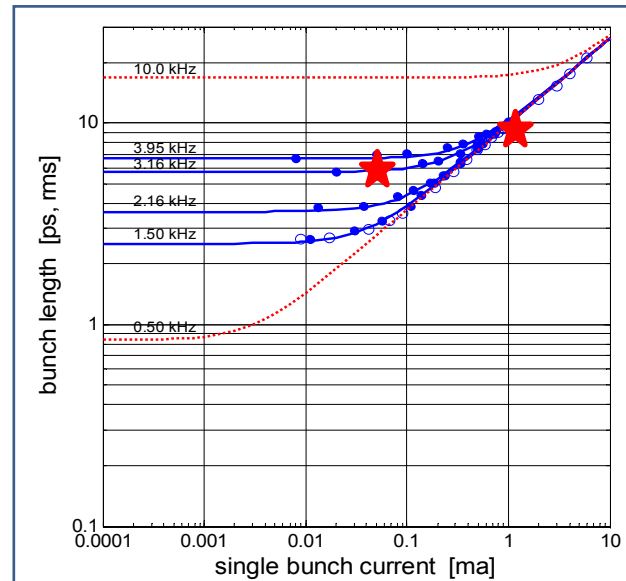
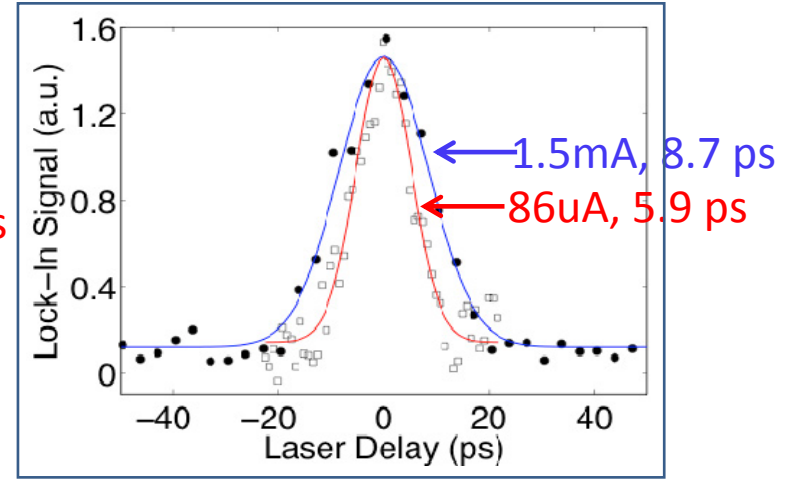
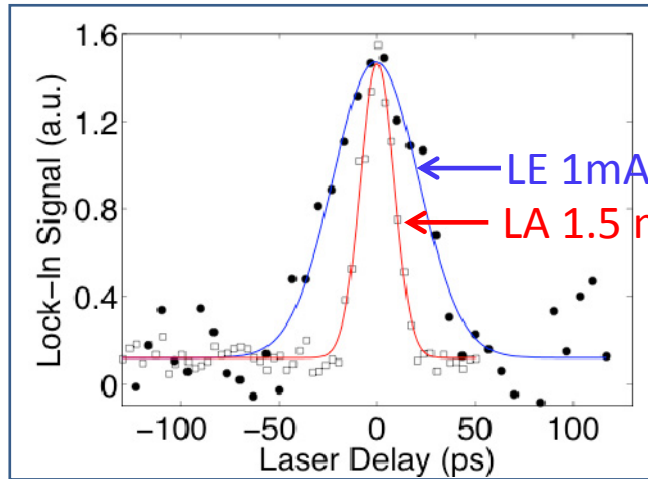


Lock-in to 1.28MHz signal
400nm component

Profile Measurements in Low-Emittance Optics



Bunch Profile in Low- α Optics



Comparison with SC data

Summary and Future Improvements

- Low- α operation for short-pulse, high rep-rate x-ray beam
- Measurements with laser/SR cross-correlation (no IR port)
- Scans in 20 ps and 6 ps optics successful - improve system
- Continue to 1-2 ps bunches
- Test new EO crystals, fiber laser
- Use visible beam to provide timing for pump/probe stations