

Abstract Submitted  
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**Development of 0.24 THz pulsed electron paramagnetic resonance to “film” proteins in action with the UCSB free electron laser**  
SUSUMU TAKAHASHI, DAN G. ALLEN, KIYOTAKA AKABORI, MELISSA ANHOLM, HIEU NGUYEN, SANGWOO KIM, MARK S. SHERWIN, University of California Santa Barbara, JOHAN VAN TOL, LOUIS-CLAUDE BRUNEL, National High Magnetic Field Laboratory — Pulsed electron paramagnetic resonance (EPR) is extremely useful to study the fast dynamics of molecules. Currently, most high-power pulsed EPR experiments are performed near 10 GHz, with a time resolution of 100 ns. The spin dephasing times of spin labels on proteins in aqueous solution are tens of ns. Thus, conventional pulsed EPR measurements of proteins are performed on frozen samples. There exist instruments which operate at 95 GHz with time resolution shorter than 100 ns. We present the development of a 0.24 THz pulsed EPR system which is expected to have sub-ns time resolution, enabling the EPR study of proteins in solution. The system uses the UCSB free electron laser (FEL) to produce kW-level pulses at 240 GHz. A “pulse-slicer” shortens the FEL’s microsecond pulses to the ns range. Sequences of two or three pulses separated by up to 25 ns will be made using a home-made delay line. A superheterodyne detection system is being fabricated to be sensitive enough to detect 1nW signals and also protected from kW FEL inputs.

Susumu Takahashi  
University of California Santa Barbara

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