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**Spectroscopy with an unlocked frequency comb**[1] BACHANA LOMSADZE, H.U. JANG, C.W. FEHRENBACH, B.D. DEPAOLA, Kansas State University — We have been developing a novel approach to frequency comb spectroscopy in which the femtosecond oscillator is allowed to free run, without active stabilization of either its repetition frequency ($f_{rep}$) or its offset frequency ($f_0$). The laser light is passed through an atomic vapor target in a MOT. Excitations in the vapor are detected through the collection of ions formed synchronously with the laser pulses. The parameters of the frequency comb that produced the excitation are measured simultaneously using precision counters with GPS disciplined references. As $f_{rep}$ and $f_0$ drift with time, the ion signal will also change as comb teeth match atomic resonances. If the ion signal is plotted as a landscape versus $f_{rep}$ and $f_0$, regular structures appear that identify the comb frequencies producing the excitation. We show data for atomic transitions in Rb.

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Charles Fehrenbach
Kansas State University

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