SONDERSEMINAR/SPECIAL SEMINAR
LMU/MPQ

am:	**Friday, November 16, 2012**
Uhrzeit:	**10 a.m. s.t.**
spricht:	**Josue Davila-Rodriguez** **Ultrafast Photonics Group** **CREOL,** **The College of Optics and Photonics** **The University of Central Florida**
Thema:	**Optical Frequency Combs with Multi-GHz Spacing from Harmonically Mode-locked Semiconductor Lasers and Applications in Multi-heterodyne Detection**
Ort:	**Audience Hall MPQ**

gez. Prof. T.W. Hänsch

Optical Frequency Combs with Multi-GHz Spacing from Harmonically Mode-locked Semiconductor Lasers and Applications in Multi-heterodyne Detection

Abstract:

Semiconductor-based, actively mode-locked lasers are used to produce 10 GHz frequency combs using a coupled cavity configurations with a long fiber cavity and a nested Fabry-Perot Etalon that serves as a high-finesse filter. The output comb is actively stabilized to the transmission peaks of the Fabry-Perot Etalon. The linewidth of individual comb components is ~1 kHz and frequency instability <300 kHz in 60 s. The optical bandwidth of the comb has been optimized through cavity dispersion control to obtain ~10 nm. The output pulse-trains have ultra-low amplitude and timing jitter, at the level of a ~2 fs (integrated from 1 Hz to 100 MHz).

These optical frequency combs are used as local oscillators for the measurement and analysis of optical waveforms with periodic time domain structures. Experimental results obtained from heterodyning pulsed and phase-modulated laser sources are presented. Finally, the analysis is extended to the heterodyning and sampling of band-limited incoherent light sources. It is shown that the correlations between photodetected white light at different times can generate RF interference that is sensitive to the optical phase.

Hybrid quantum systems can be formed by combining artificial (e.g. superconducting circuits) with elemental quantum systems. This talk introduces a hybrid setup for simulating a localization-delocalization transition. It is based on an array of superconducting flux qubits coupled to a diamond crystal containing nitrogen-vacancy centers. The underlying model is a Jaynes-Cummings(JC) -lattice. However, in contrast to well-studied "coupled cavity arrays" the interaction between lattice sites is mediated by the qubit rather than by the oscillator degrees of freedom.