Announcing the Final Examination of Mohammad Umar Piracha for the degree of Doctor of Philosophy

Time & Location: June 18, 2012 at 2:00 PM in CREOL 102

Title: Laser Radar Employing Linearly Chirped Pulses from a Mode-Locked Laser for Long Distance, Unambiguous, Sub-millimeter Resolution Ranging and Velocimetry

Light detection and ranging (lidar) is used for various applications such as remote sensing, altimetry and imaging. In this talk, a linearly chirped pulse source is introduced that generates wavelength-swept pulses exhibiting ~6 nm optical bandwidth with > 20 km coherence length. The chirped pulses are used in an interferometric lidar setup to perform distance measurements with sub-millimeter resolution (using pulses that are a few meters long), at target distances > 10 km, with at least 25 dB signal-to-noise ratio at the receiver. A pulse repetition rate of 20 MHz provides fast update rates, while chirped pulse amplification allows easy amplification of optical signals to high power levels that are required for long range operation. A pulse tagging scheme based on phase modulation is used to demonstrate unambiguous, long range measurements. In addition to this, simultaneous measurement of target range and Doppler velocity is performed using a target moving at a speed of over 330 km/h (205 mph) inside the laboratory. Lastly, spectral phase and amplitude modulation of the chirped pulses is implemented to achieve a two-fold increase in the lidar range resolution (300 um).

Major: Electrical Engineering

Educational Career:
Bachelor's of Engineering Sciences (Laser/Optics), BS, 2002, GIK Institute of Engg. Sciences, Pakistan
Master's of Electrical Engineering, MS, 2004, University of Southern California

Committee in Charge:
Prof. Peter Delfyett, Chair, Electrical Engineering
Dr. Guifang Li, Electrical Engineering
Dr. Partrick L LikamWa, Electrical Engineering
Dr. Linwood Jones, Electrical Engineering
Dr. Axel Schulzgen, CREOL - The College of Optics

Approved for distribution by Prof. Peter Delfyett, Committee Chair, on June 4, 2012.

The public is welcome to attend.