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To: technicalreports@afosr.af.mil
Subject: Progress Update to Dr. Howard Schlossberg

Contract/Grant Title: High-Energy Laser for Detection, Inspection, and Non-destructive Testing: Phase II

Contract/Grant #: FA9550-08-1-0232

Reporting Period: Update – 3/21/2012

Accomplishments (200 words max):

We have completed the installation and first phase of the commissioning of the PW upgrade to the Diocles laser system. We have pumped the amplifier crystal with 8 pump beams, seeded it with the output of the 100-TW system, and amplified 4 J of input energy to 20 J. This corresponds to 400-500-TW peak power. The compressor system is also functional, and has been used to compress the amplified pulse to 36 fs. The compressed pulse has been corrected for chirp, and we have shown that the compressor does not introduce any measurable aberration. The amplified beam is now in the target chamber where it will be focused with a parabolic reflector onto a supersonic jet to produce multi-GeV energy electron beams. In the next phase, after safeguards against optical damage are implemented, the pump energy will be increased further, closer to their operational limit. The design for the upgrade to higher repetition rate has also been completed, and orders placed for almost all of the requisite components.

Archival publications (published) between 05/2010 – 03/2012:

V. Ramanathan, S. Banerjee, N. Powers, N. Cunningham, N.A. Chandler-Smith, K. Zhao, K. Brown, D.P. Umstadter, S. Clarke, S. Pozzi, J. Beene, C.R. Vane, D. Schultz, "Submillimeter-resolution radiography of shielded structures with laser-accelerated electron beams", *Phys. Rev. ST Accel. Beams* **13**, 104701 (2010).

Changes in research objectives, if any: None

Change in AFOSR program manager, if any: None

Extensions granted or milestones slipped, if any:

A 12-month no-cost extension was granted extending the final award date to May 14, 2012. The extension was requested to further upgrade our high-energy laser systems. The timeline for the project needed to be modified due to a recent opportunity to significantly enhance the project's supporting infrastructure. Funds from a recent NSF award, in conjunction with a portion of the funds from this AFOSR award, have enabled a major renovation of the laboratory space where the high-energy laser upgrade will be housed. This renovation includes installation of an independent temperature-controlled chilled water unit and air handling systems, which will greatly enhance the stability performance of the laser system.

Include any new discoveries, inventions, or patent disclosures during this reporting period (if none, report none): None