NRL BAA Announcement
#67-15-01

BASIC AND APPLIED RESEARCH IN HIGH TEMPERATURE PLASMAS

The Naval Research Laboratory (NRL) is interested in receiving proposals that address basic and applied experimental, theoretical and computational research to advance fundamental knowledge in high temperature plasmas.

Specific areas of interest include:

(1) Theoretical and experimental studies of krypton-fluoride laser systems, both single pulse and repetitively pulsed, includes pulsed power, optics and electron beam generation, propagation and transport. Study of laser-matter interactions and strongly-coupled plasmas for conditions relevant to direct drive laser fusion. Theory and experimental studies of laser-plasma instability at high intensity that are relevant to laser fusion

(2) High energy pulsed power systems employing capacitive and inductive energy storage. Production of pulsed plasma and intense high-power, charged particle beams including single pulse and high average (rep-rated) power systems. Modeling and simulation of pulsed power devices and applications. Pulsed-power-driven radiation and acoustic shock generation sources.

(3) Theoretical and large-scale computational modeling of ionospheric, magnetospheric, solar and space plasmas.

(4) Theoretical studies and computer simulations of nonlinear dynamic phenomena and novel nonlinear algorithms for use in applications such as nonlinear time series analysis, analysis of complex data sets, study of adaptive networks, analysis and control of coupled systems, and emergent structures in stochastic dynamics.

(5) Theoretical and experimental research in the areas of coherent radiation sources, systems, and propagation, including gyrotrons, magnicons, high energy lasers, ultrashort pulse lasers, and free-electron lasers. Theoretical and computational research in beam transport, intense laser-plasma interactions, and intense laser-electron beam interactions.

(6) Diagnostic and data handling/analysis techniques applicable to pulsed or dc measurements for remote sensing and laser-matter interactions, including real time diagnostics and post-interaction analysis.

(7) Theoretical and experimental research into the production of plasmas in neutral gas backgrounds using RF excitation, plasma discharges, beam ionization, or other techniques. Development, testing, and analysis of advanced plasma diagnostics for partially ionized gas distributions. Investigations of the interaction of plasmas with gas distributions, surfaces, or coatings on surfaces. Development or utilization of specialized diagnostics to analyze plasma effects. Analysis of experimental results and comparison with theoretical predictions.

(8) Theoretical and experimental research on microwave, millimeter-wave, or pulsed electron beam processing or synthesis of materials, including ceramics, metals, liquids, or gas mixtures.

(9) Experimental research in high-velocity electromagnetic launchers. Design of launcher barrels and armatures. Diagnostics of launcher performance. Pulsed power systems for electromagnetic launch. Novel applications of electromagnetic launchers, including laboratory studies of shock generation in materials.

(10) Theoretical and experimental research on high-energy-density plasma (HEDP) physics, including atomic processes and advanced plasma diagnostics. Physics and simulation of high-energy-density plasmas produced by electron beams, lasers, or Z-pinches. Computational tools to understand the coupling of ionization, radiation transport, and plasma dynamics in HEDP environments.

(11) Development of novel and robust detection systems suitable for high-power pulsed environments, consisting of temporally-, spatially-, and/or spectrally-resolved detectors for x-ray, high-energy gamma, or neutron (both fast and thermal) emissions and mode-differentiating data acquisition electronics.

(12) Theoretical and experimental research on the generation and diagnosis of space plasmas. Developmental research of advanced plasma diagnostics for space plasmas using ground-based simulation chambers or space-based platforms. Integration of advanced diagnostics into space platforms. Interfacing of experimental hardware with space craft. Acquisition of data, analysis, and comparison with theoretical models or other data.

Address White Papers (WP) to mailto:nrl6701@nrl.navy.mil. Allow one month before requesting confirmation of receipt of WP, if confirmation is desired. Substantive contact should not take place prior to evaluation of a WP by NRL. If necessary, NRL will initiate substantive contact.