# Jet Propulsion Laboratory

California Institute of Technology

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11/27/2018

Submitted Via E-Mail

Massachusetts Institute of Technology

Office of Sponsored Programs

77 Massachusetts Avenue

Cambridge, MA 02139

Attn: To whom it may concern

The Jet Propulsion Laboratory (JPL) invites your organization to submit a written proposal in conformance with the instructions contained in this letter and its attachments for the services of Giuseppe Romano, and the acquisition of labor, materials, equipment, facilities and transportation necessary to perform the effort describe in the attached Statement of Work (SOW) entitled: “Theory of thermal transport in composite materials”.

Following are the instructions for preparation of the proposal:

1. Prepare an official-endorsed cost proposal to perform the work described in the attached Statement of Work (not to exceed project-estimated budget of $75,000).

The budget cost need to show the basis of estimate for any projected travel (number of trips, how many people, number of days, airfare, hotel, etc.) and Other Direct Costs.

1. If the U.S. Government has approved the rates cited in your proposal, please provide a copy of the latest rate agreement.

This solicitation does not commit JPL or the Government of the United States to pay any costs incurred in submitting your response, making studies or designs for preparing your response, or in procuring or subcontracting for services or supplies related to your response to JPL’s solicitation.

Please submit all requested information directly to me. Should you have any questions, please address them directly to me either by phone or e-mail.

Sincerely,

Michael DeGrey

Subcontracts Manager

**Statement of Work:**

**Theory of thermal transport in composite materials**

Work description

The Instrument Software and Science Data Systems section supports a fundamental research activity for the NASA Radioisotope Power Systems Program on optimizing composite materials for thermoelectric power conversion applications. Part of this activity is to compute the thermoelectric transport coefficients for composite materials to support laboratory tests at JPL. One component in this computation is to solve the Boltzmann Transport Equation (BTE) for phonons to obtain the thermal conductivity of the composite material. The scope of the present task is to extend an existing software package that simulates thermal transport in materials and to tailor it to JPL applications.

Scope of the work

The work covered by this sub-contract includes the following tasks:

1. Develop a method for thermal transport across interfaces between dissimilar materials.
2. Implement the model for thermal transport at interfaces into the BTE software package.
3. Compute the thermal conductivity of composite materials and explore the parameter space of inclusion composition and volume fraction.
4. Compare the results for the thermal transport calculation with those obtained with a heat diffusion model at JPL.

Deliverables

The MIT team will deliver to JPL a report that describes the new methods developed over the course of this subcontract. The software developed under this subcontract will be released on an open source platform and documentation will be provided to JPL for its use. The results of the trade space study will be published in a peer-reviewed journal coauthored by the MIT and JPL teams.

Period of performance

The period of performance of the task will start at the execution of this contract and end on August 31, 2019.