Lightweight Graphene Radiators for Space System

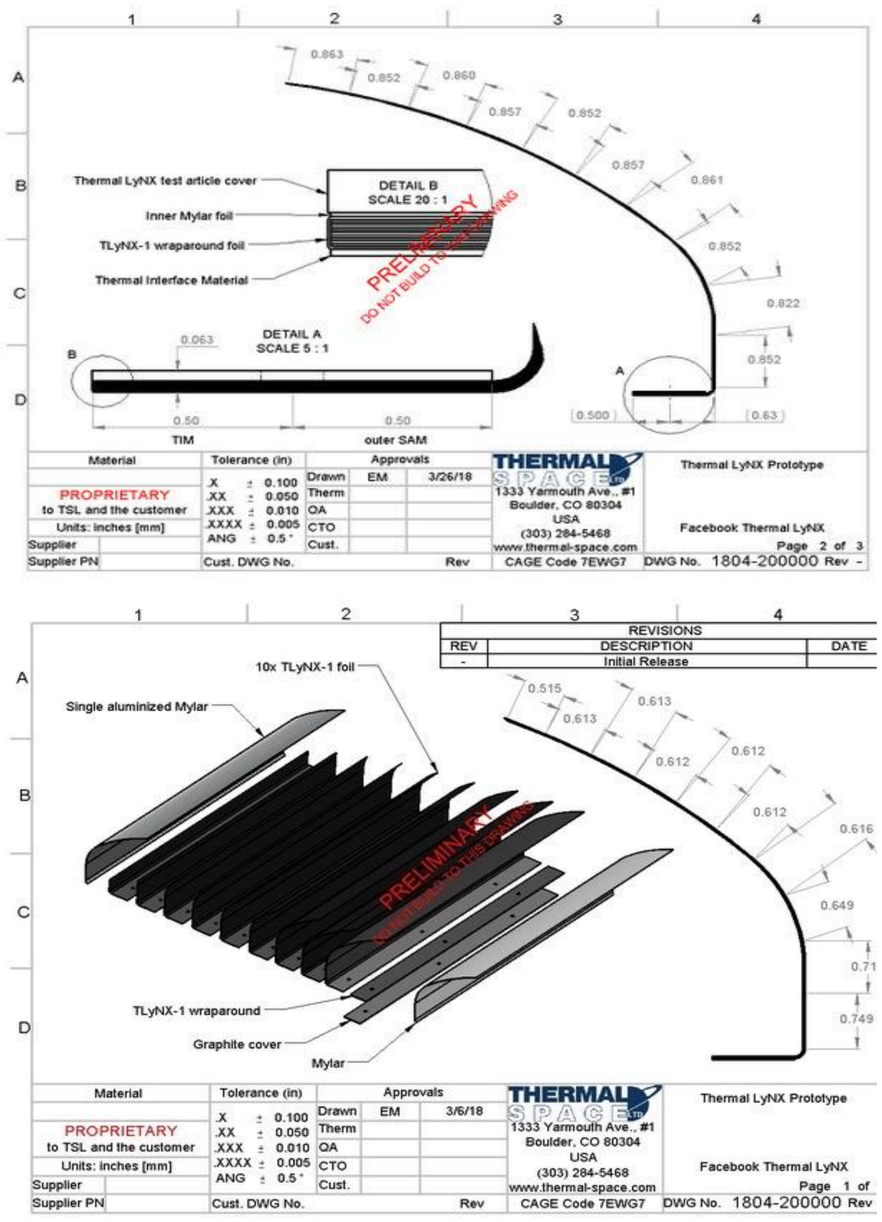
Project Description:

This semester, through market research a potential application for Thermal Space's graphene-based radiator panel technology can be identified and proposed. With an application located, CAD models can be drawn and fabricated. Thermal and mechanical performance parameters will be adjusted in CAD which will be valuable to develop a baseline radiator panel design, and can help to predict performance such as heat rejection capacity as well as temperature gradients. Once the design and fabrication process are complete, a thermal model of the product can be created. This model will help predict the radiators heat capacity and temperature gradients. Simultaneously, market research for this technology will be continued to find the most profitable potential market or specific clientele.

Design Options:

The fundamental design of the graphene-based radiator has been created by Thermal Space. Upcoming projects will be taking the design and altering the parameters so that the radiator fits properly into the clients device.

FB thermal radiator panel :



Consisting of ten layers of high-thermal conductivity graphite sheets, each capable of conducting heat at rates of up to 1700 W/m-K, these sheets absorb heat from a heat sink rail positioned at the pod's edge. Subsequently, they efficiently transfer this heat along the length of each layer and release it into the external environment. Notably, this heat dissipation is achieved not only through radiation but also through convective cooling at the panel's surface, even when operating in environments with pressures as low as 20 torr (0.026 atm).

Possible solutions-

Smallsats: Small spacecraft focus on spacecraft with a mass less than 180 kilograms and about the size of a large kitchen fridge.

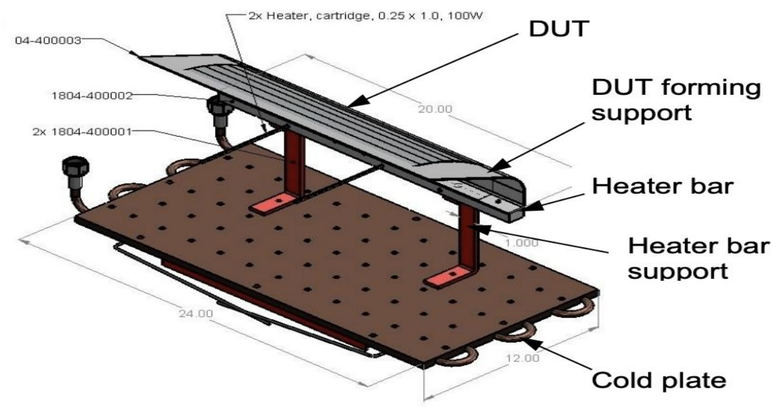
Cubesats: CubeSats are a class of nanosatellites that use a standard size and form factor of a 1:1:1 ratio

Nanosats: A small satellite that weighs less than 10kg.

Potential Clients:

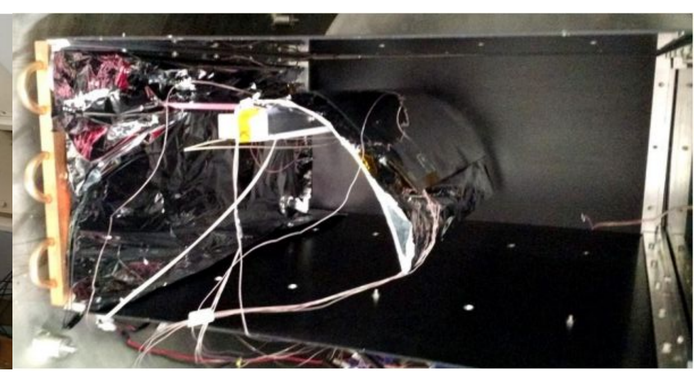
Blue Canyon Tech, Amazon- Kuiper Project, Millennium Space Systems, Inc. , Thales Alenia Space , NanoAvionics , Sidus Space , Dragonfly aerospace , York Space Systems

Graphene-Based Radiator Testing:



Illustrates the thermal test setup, which relies on temperature measurements at critical points to assess the heat dissipation capacity of the radiation panel in both hard vacuum and low-pressure environments.

Backfilling the test chamber with cold GN2



Initial test Setup without internal radiation shielding

Deliverables:

1. Market Research Report 2. Specification Document for a representative radiator panel application 3. CAD models and drawings for a radiator panel to be fabricated during the effort 4. Thermal Math Model for predicting radiator capacity and temperature gradients 5. Verification Test Plan 6. Verification Test Report 7. Design Summary, Review, and Recommendations Report

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