

Martian Solar Array Dust Removal Technology Development



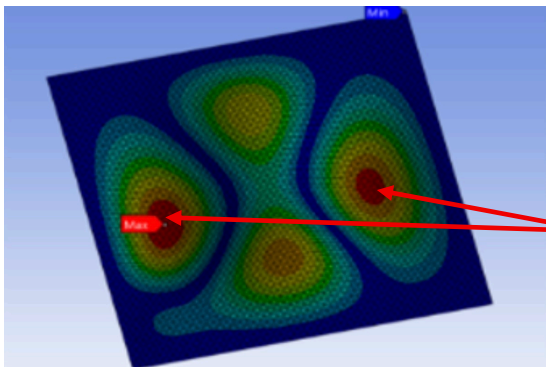
From left to right: Ryan Bercich, Juliah Moriango, James Morrison, and Philip Jensen

PROJECT BACKGROUND & DESIGN GOAL:

Solar arrays are expected to power human activities on Mars, but dust accumulation significantly reduces power generation. **The goal of this project is to investigate the use of piezoelectric actuators to remove dust by inducing vibrations on solar cells.**

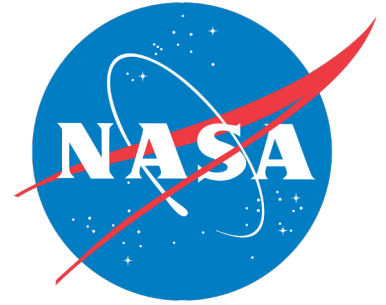
DESIGN OUTCOMES:

- Modeled a solar cell and piezoelectric actuators in ANSYS to optimize actuator placement for maximum vibrations.
- Identified the solar cell's resonant frequency to drive the piezo actuators.
- Selected actuators for experimental testing.
- Verified power recovery after each cleaning cycle by testing.



Piezoelectric Actuators

ANSYS modal analysis of the solar cell with two actuators.



National Aeronautics and Space Administration

TEAM 5

INDUSTRY REPRESENTATIVE

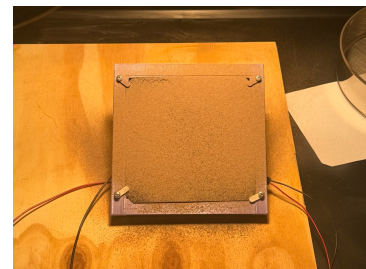
Meghan Bush
Jeremiah McNatt

FACULTY ADVISOR

Jason Petaja

DESIGN CONSTRAINTS:

- Operate in the martian environment (dry, dusty, thin CO₂ atmosphere, temperatures from 20 °C to -70 °C).
- Design shall not increase the mass of the solar cell by more than **30%**.
- Shall consume less than **0.088Wh**.
- Design shall restore approximately **70%** of solar cell output.



A dusted solar cell during testing.