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Introduction: NASA Marshall Space Flight Center's Space Environmental Effects (SEE) Team enables a wide variety of missions and projects to meet their science and exploration objectives by proving materials and systems in relevant extreme environments. The SEE Team has the capability to simulate many different space environments including lunar and planetary, LEO to HEO, and deep space. Our combined effects facilities can simultaneously expose materials to high vacuum, UV/VUV radiation, solar wind plasma (electron and proton radiation), temperature extremes, and planetary surface and regolith effects.

SEE testing allows systems and subsystems to be validated and demonstrated in relevant space environments, identifying problems earlier in development, and raising Technology Readiness Level to TRL-6. Combined testing in a single facility not only lowers cost compared to using multiple facilities, but gives truer results due to synergistic effects. The SEE Team works with customers to define the specifications of the environment where they will be operating, and designs a test that meets their specific goals and requirements. We measure and characterize properties such as optical and electrical changes in coatings, mechanical properties degradation, subsystem thermal performance, and spacecraft charging.

Recent tests that have enabled human and robotic exploration of our solar system, include:

- Europa Clipper - internal charging; electrostatic discharge/arc on cables and coatings; instrument testing in Venus fly-by environment

- Europa Lander - irradiation of solid rocket motor propellant, with our unique ability to handle energetic materials.
- Parker Solar Probe - validation of the Solar Probe Cup in the High Intensity Solar Environment Test facility
- NESC ISS RPCM Safety Assessment - ensuring astronaut safety on EVA by looking at the effects of arc-generated molten metal on spacesuit material
- E-Sail - Development of a system for making the first laboratory thrust measurements for an electric solar wind sail design, enabling unique mission profiles

With NASA's return to the lunar surface, the SEE Team is increasing the capabilities to test effects of planetary body surfaces. We intend to supplement our existing LETS (Lunar Environment Test System) to allow for testing with a wider variety of lunar and Martian regolith simulants and atmospheric gases.

