Qualification of Novel High-Damping Solar Panel Module Based on Pogo-Pin Based Holding and Release Mechanism

| Tae-Yong Park, Bong-Geon Chae & Hyun-Ung Oh (STEP Lab. Ltd.)

Specialized Company in Mechanical System Engineering for Satellites & Launch Vehicles

STEPLab.
Space Technology Exploration

- Founded in Jun. 2021 (South Korea)
- Total Business Contract : 6.5M USD (~2024)
- Series A Investment
- Our Business Areas :
  - ✓ Mechanical System Design, Analysis & Testing (Structure, Thermal, Radiation, Mechanism)
  - ✓ Development of Vibration Attenuation Technologies for Spacecraft & Launch Vehicle
  - ✓ Development of Small Satellite Core Technologies (Solar Panel Assemblies, Etc.)
    - A Novel Structural Design Methodology for Evaluating Solar Cell Safety under Launch Environment (In Research)
  - ✓ Spaceborne Deployable Mesh Antenna Technologies
  - ✓ Small Satellite System Development

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Lightweight & Safe Launch Realized by Superior Vibration Attenuation Capability

- TRL 7 (Qualified & Launched @ STEP Cube Lab-II (2022))
- Mechanical stability of HDSP to ensure safe launch of solar array against harsh vibration environment
- 2~3 times reduction of mass compared to typical CubeSat solar panels

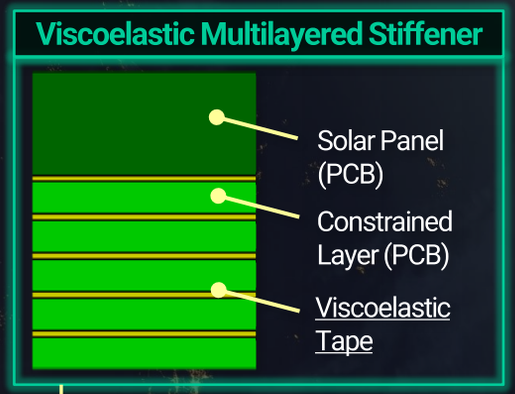
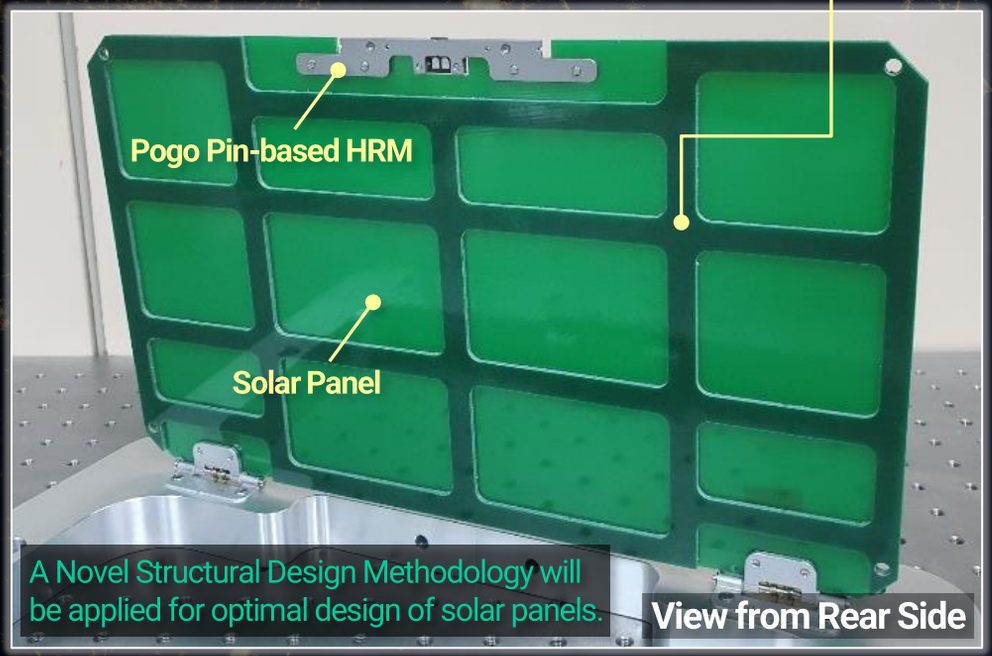
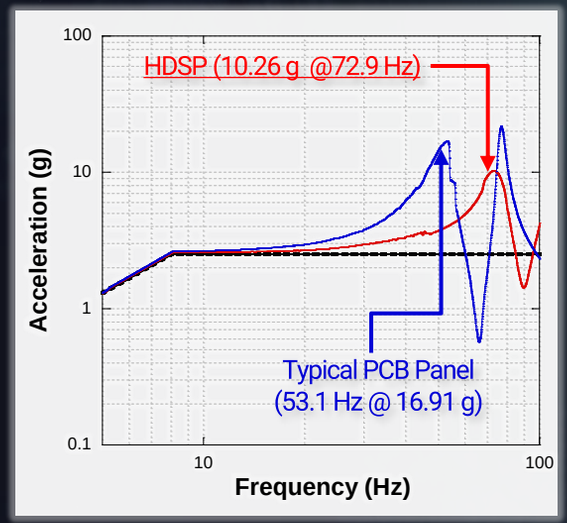


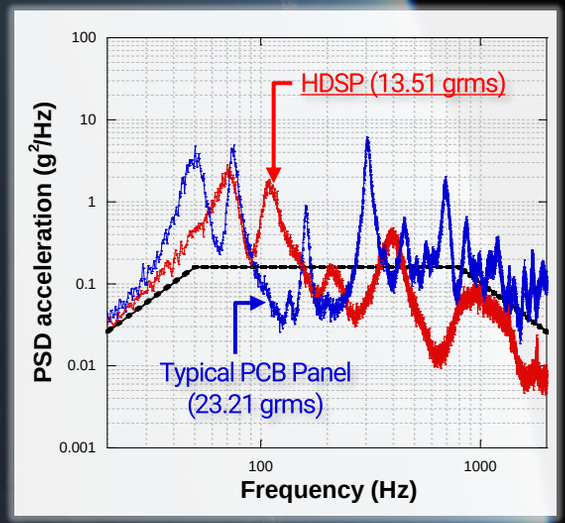
Table : Achieved Performance of HDSP

Performance Factor	Typical PCB Solar Panel	HDSP	Difference
Damping Ratio	0.036	0.141	×3.9 Enhanced
Sine Vib. Response	1.28 mm	0.37 mm	×3.45 Reduced
Random Vib. Response	1.41 mm	0.57 mm	×2.47 Reduced





Sine Vibration Test Results



Random Vibration Test Results

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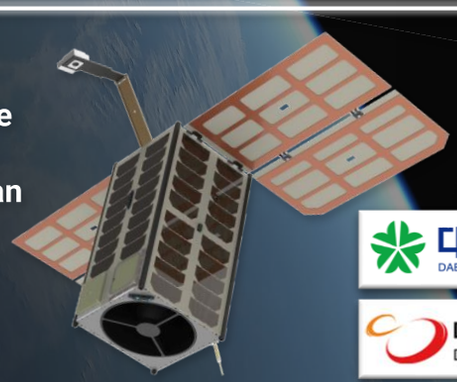
Burn Wire Triggering HRM with System Simplicity & Higher Loading Capability

- TRL 7 (Qualified & Launched @ STEP Cube Lab-II (2022))
- Pogo pin enables to implement multiple functions (Power supply connector, separation initiation spring & release status switch)
- Unique wire fastening method to ensure higher loading capability, despite based on a burn wire release method.

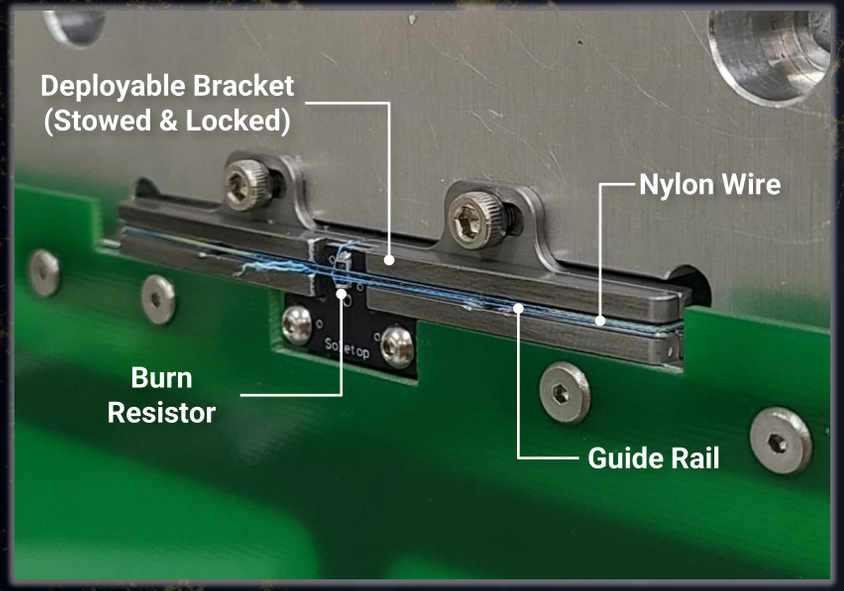
Our Next Step

HDSP module will be verified in-orbit by Daejeon metropolitan city 16U CubeSat "DaejeonSat-1" at South Korea (Launched in 2026)

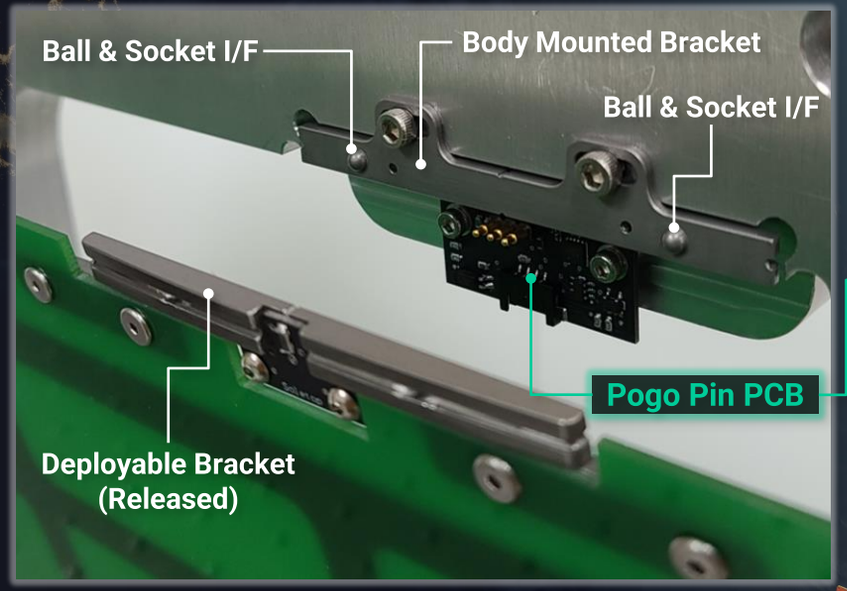


대전광역시 DAEJEON METROPOLITAN CITY

대전테크노파크 DAEJEON TECHNOPARK



Stowed Configuration



Released Configuration