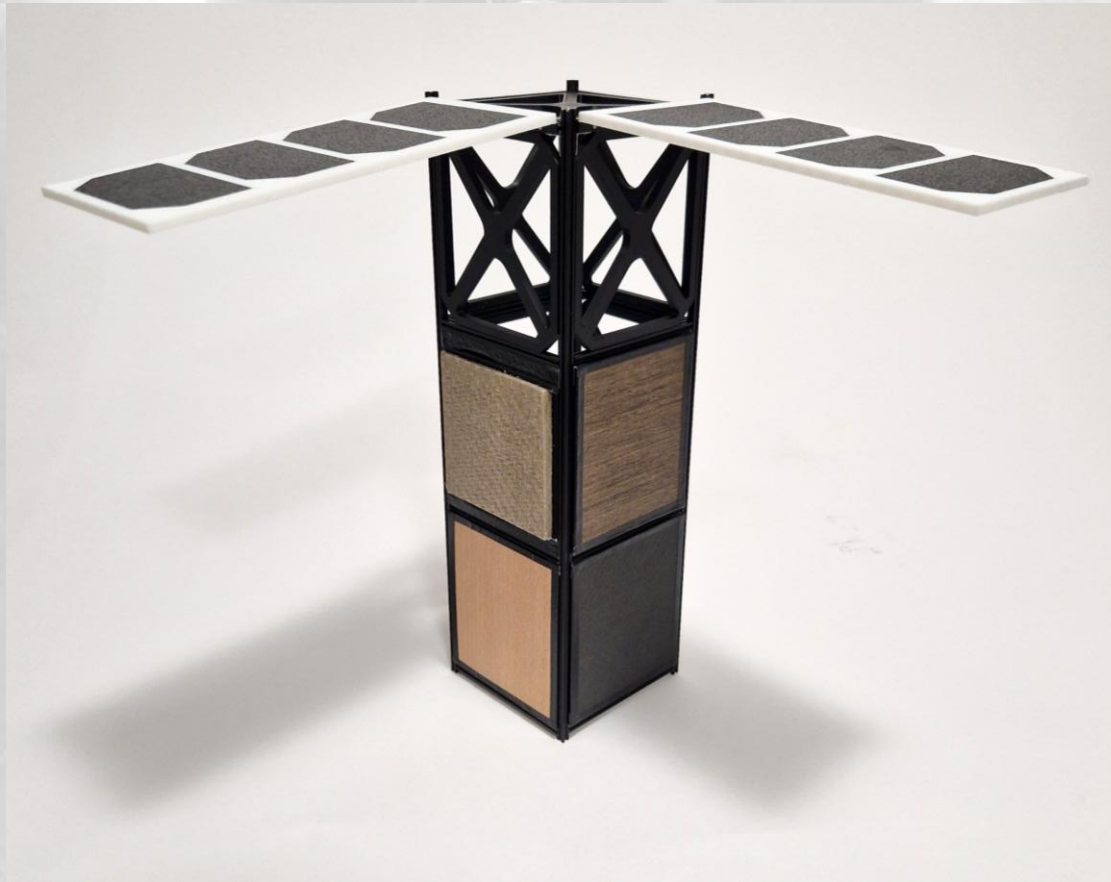


WOOD-BASED COMPOSITES AS SATELLITE STRUCTURES: MANUFACTURING AND APPLICATION OF COATINGS AGAINST ATOMIC OXYGEN EROSION

Max Preis, Dr. Isil Sakraker-Özmen, Dr. Ronja Anton, Giovanni Piazza, 30.06.2026



Bio-Based Materials

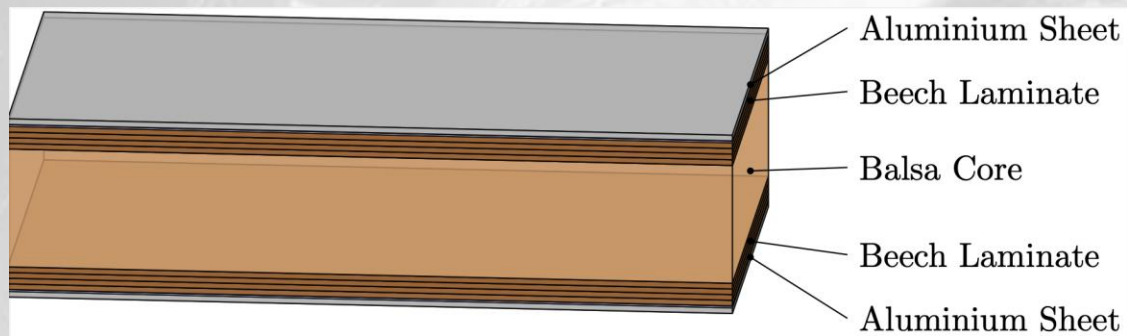


Wooden Concepts

Wooden laminate structures for CubeSats



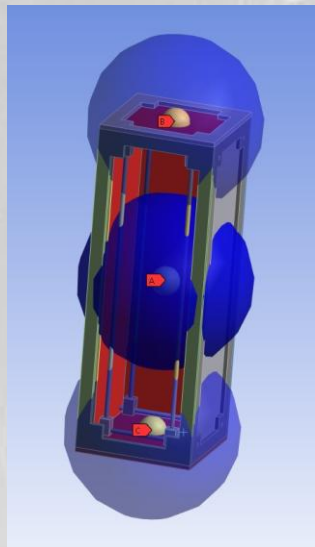
Wooden hybrid sandwich structure for satellites up to 1000 kg



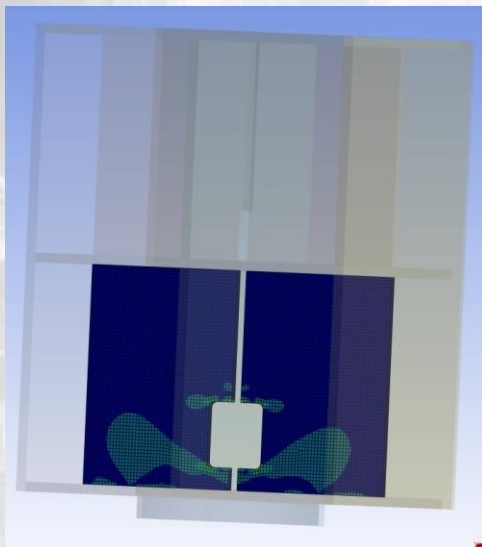
Simulation

Launch Loads: Structural, modal and random vibration analysis

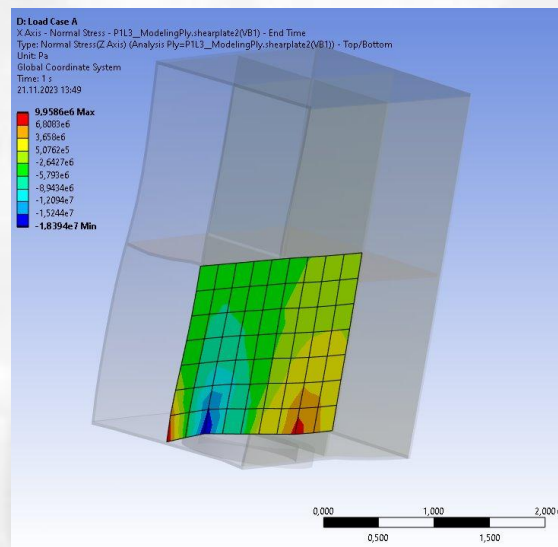
Radiation: Simulation in SPENVIS



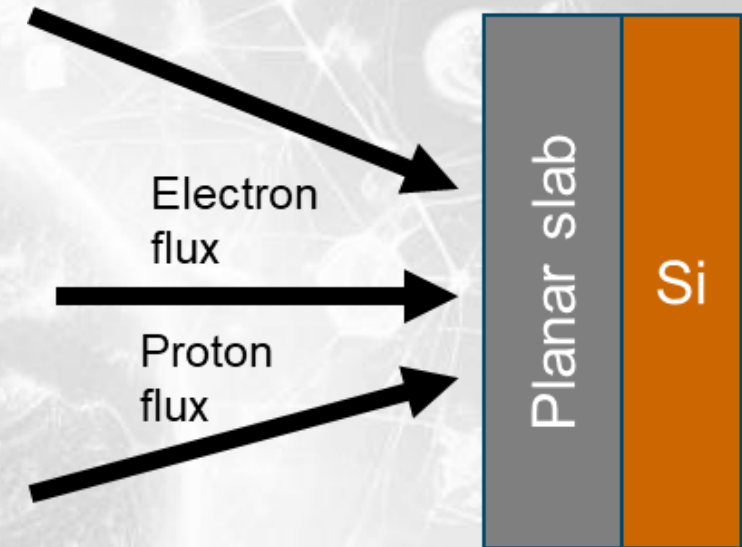
3U CubeSat



Flying Laptop



Sentinel-2



Space Qualification

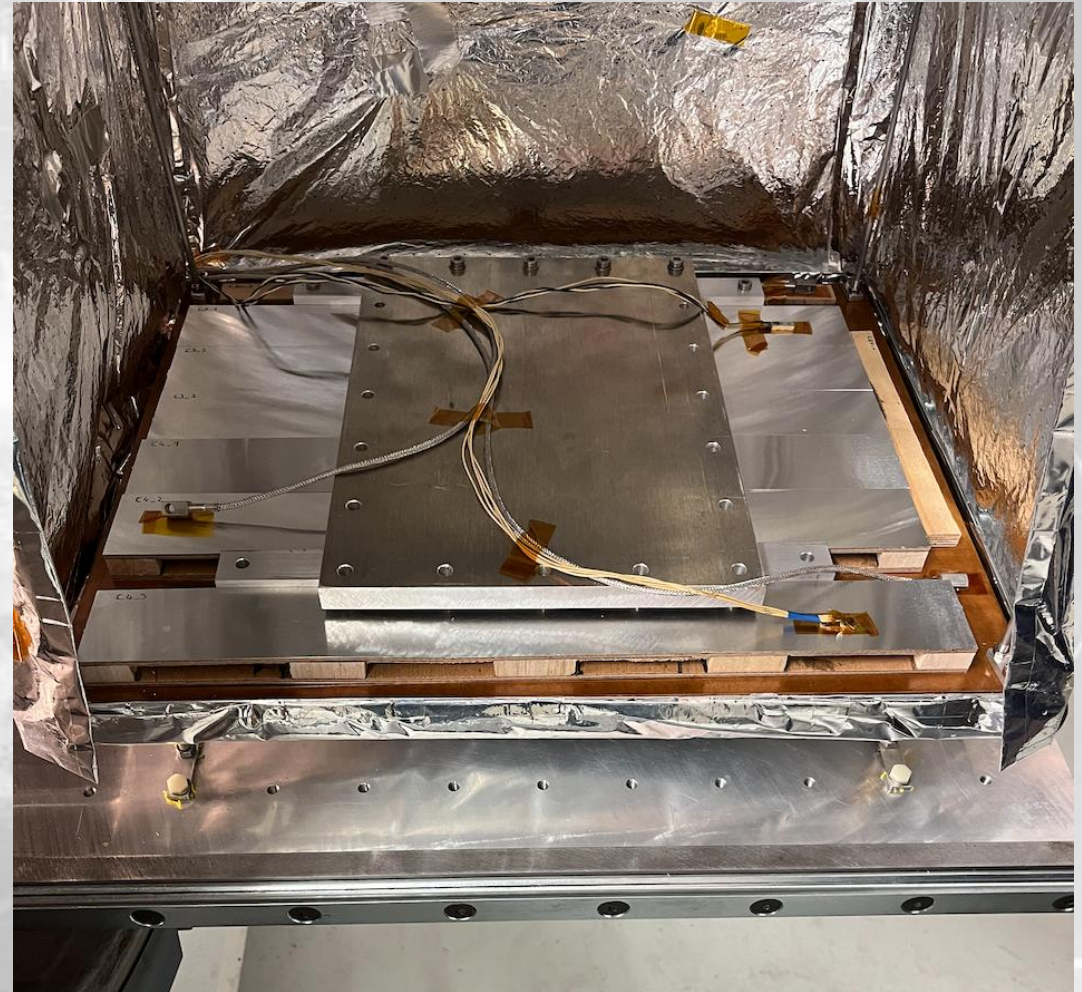
Outgassing: Micro-VCM test



Space Qualification

Outgassing: Micro-VCM test

Thermal Cycling: Thermal-Vacuum chamber

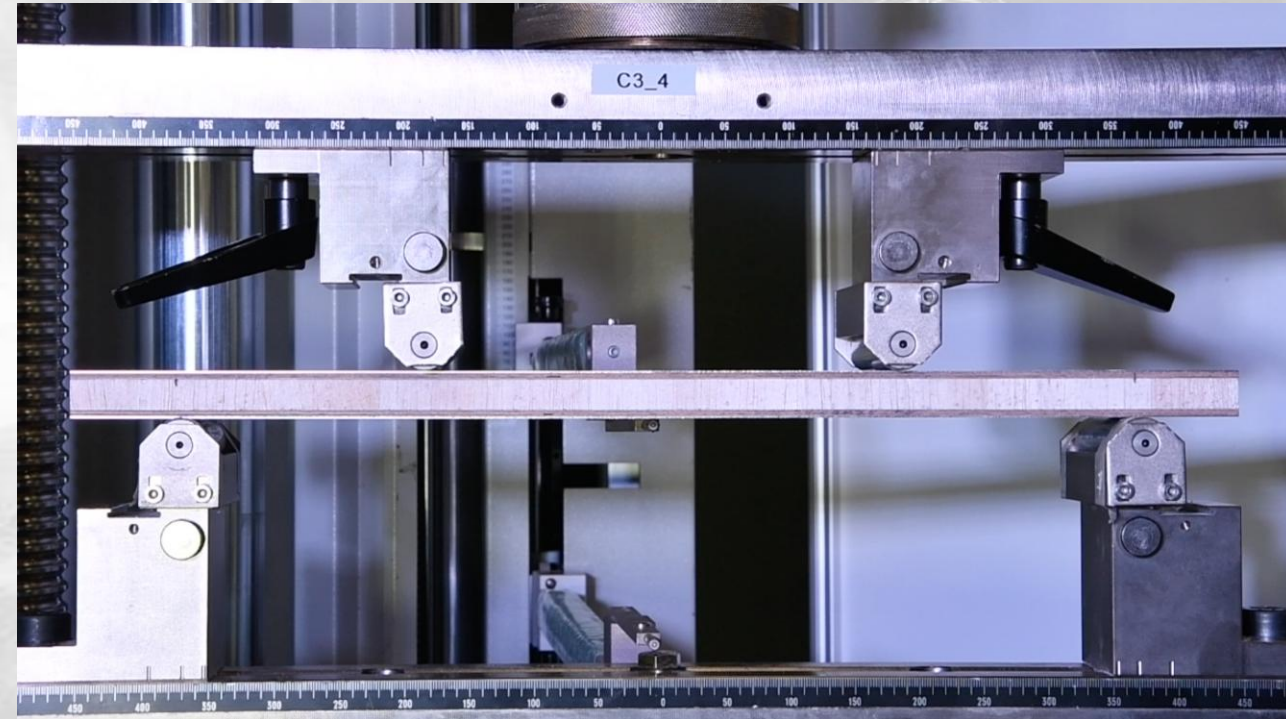


Space Qualification

Outgassing: Micro-VCM test

Thermal Cycling: Thermal-Vacuum chamber

Mechanical Tests: 4 Point Bending test



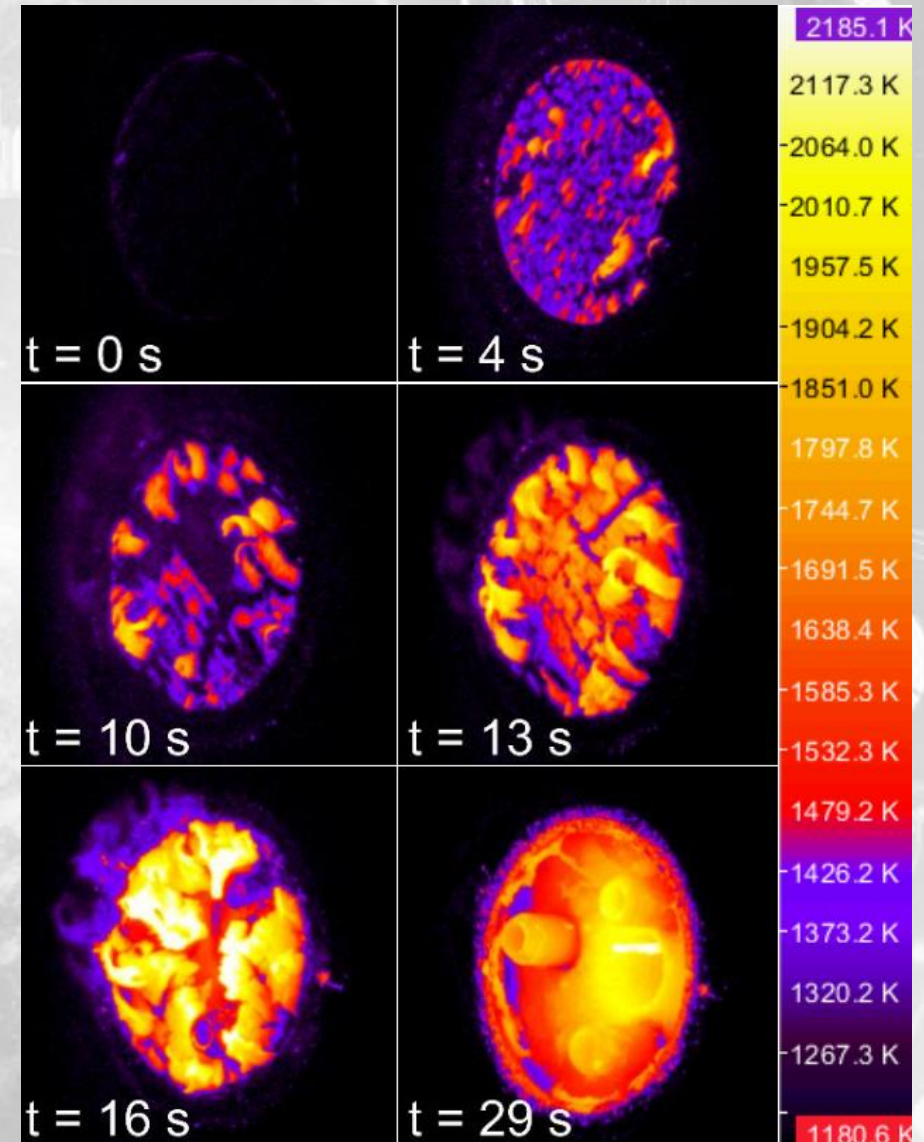
Space Qualification

Outgassing: Micro-VCM test

Thermal Cycling: Thermal-Vacuum chamber

Mechanical Tests: 4 Point Bending test

Demisability: PWT test at IRS Uni Stuttgart



Space Qualification

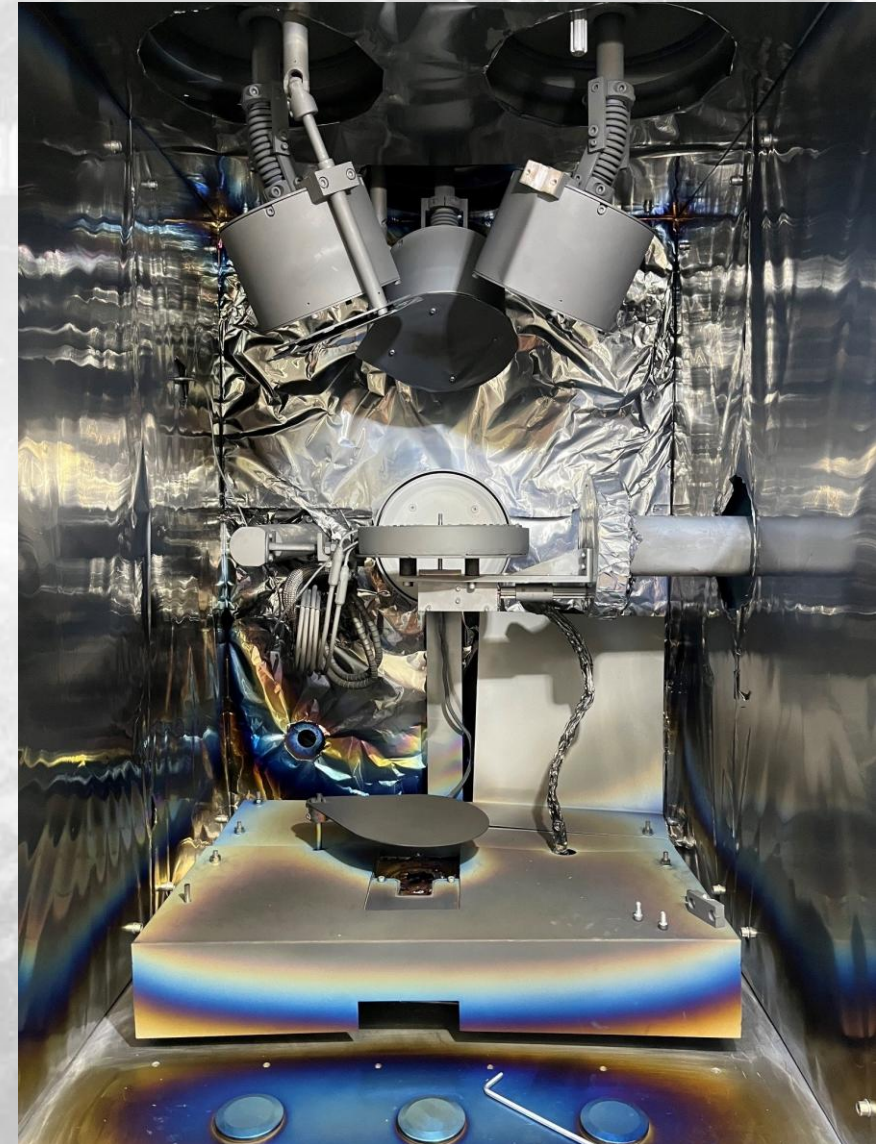
Outgassing: Micro-VCM test

Thermal Cycling: Thermal-Vacuum chamber

Mechanical Tests: 4 Point Bending test

Demisability: PWT test

Atomic Oxygen: Feasibility of coatings

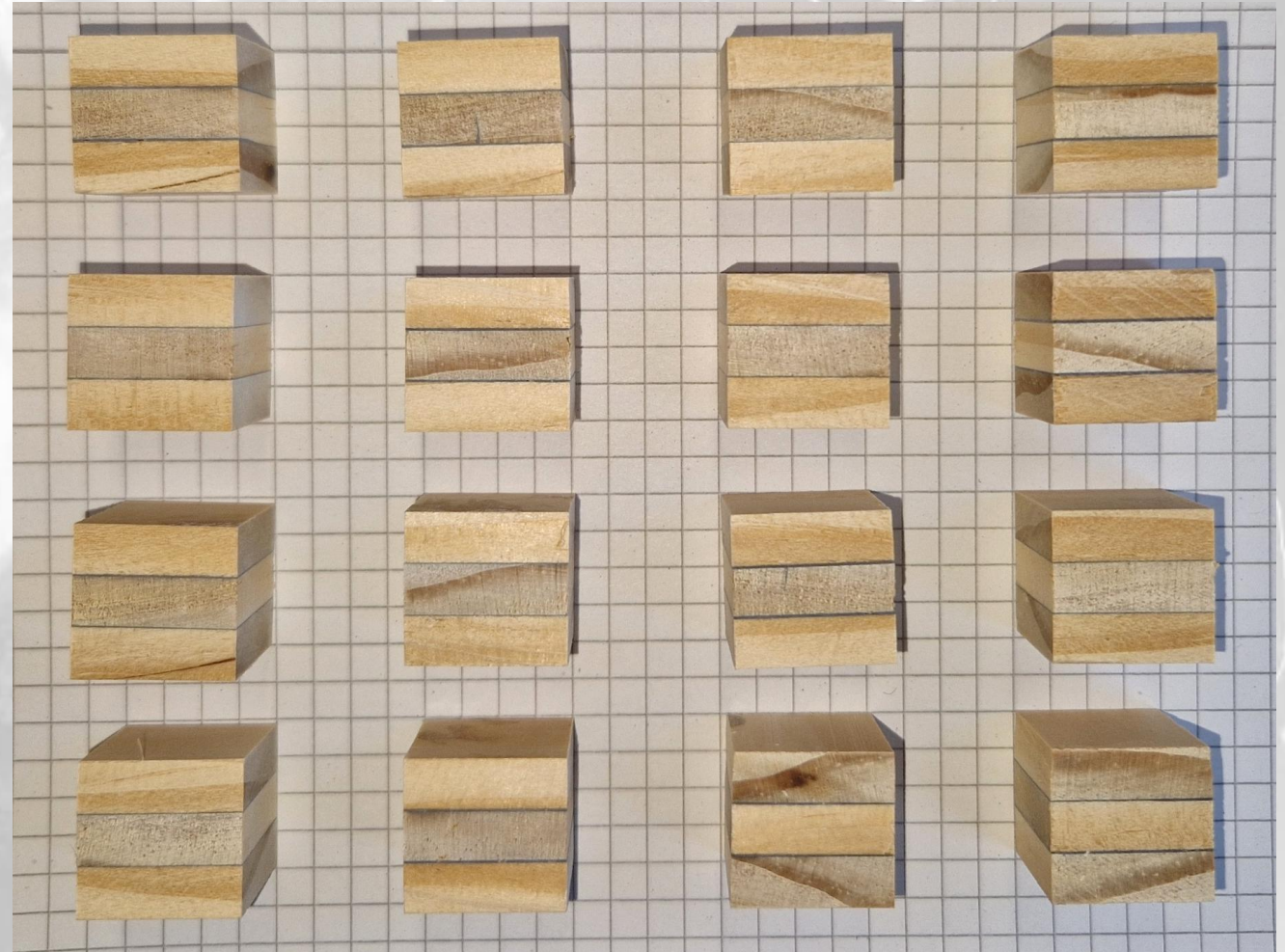


Specimen for AO Exposure Test

Acetylated radiata pine

0°/90° lay up

Bonded with 2K epoxy



Feasibility of DLR Coatings on Wood



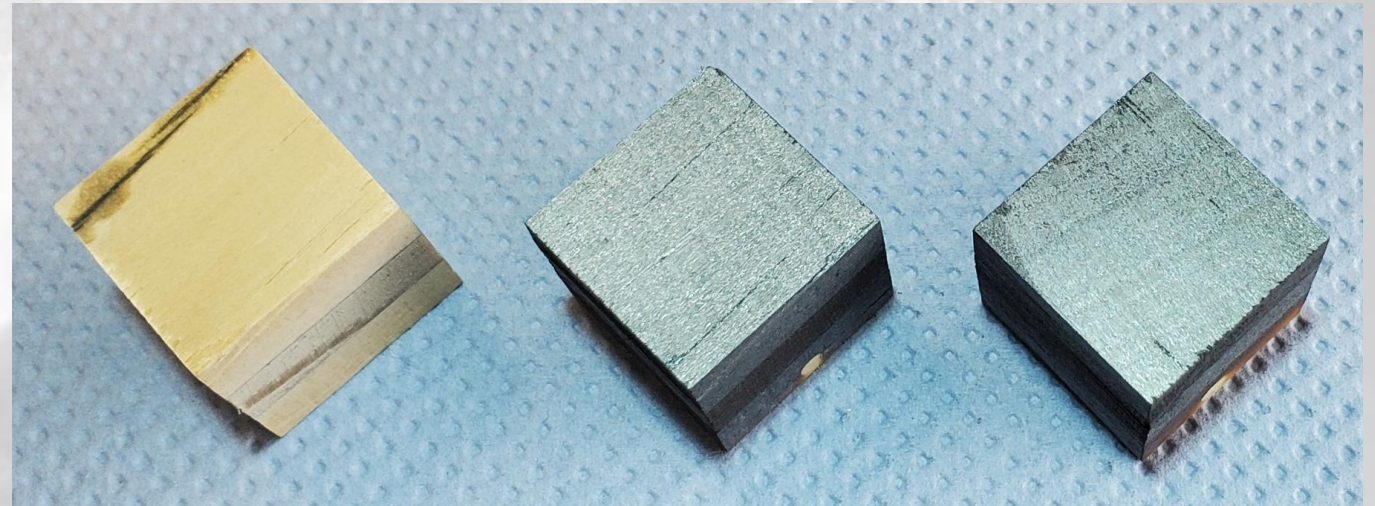
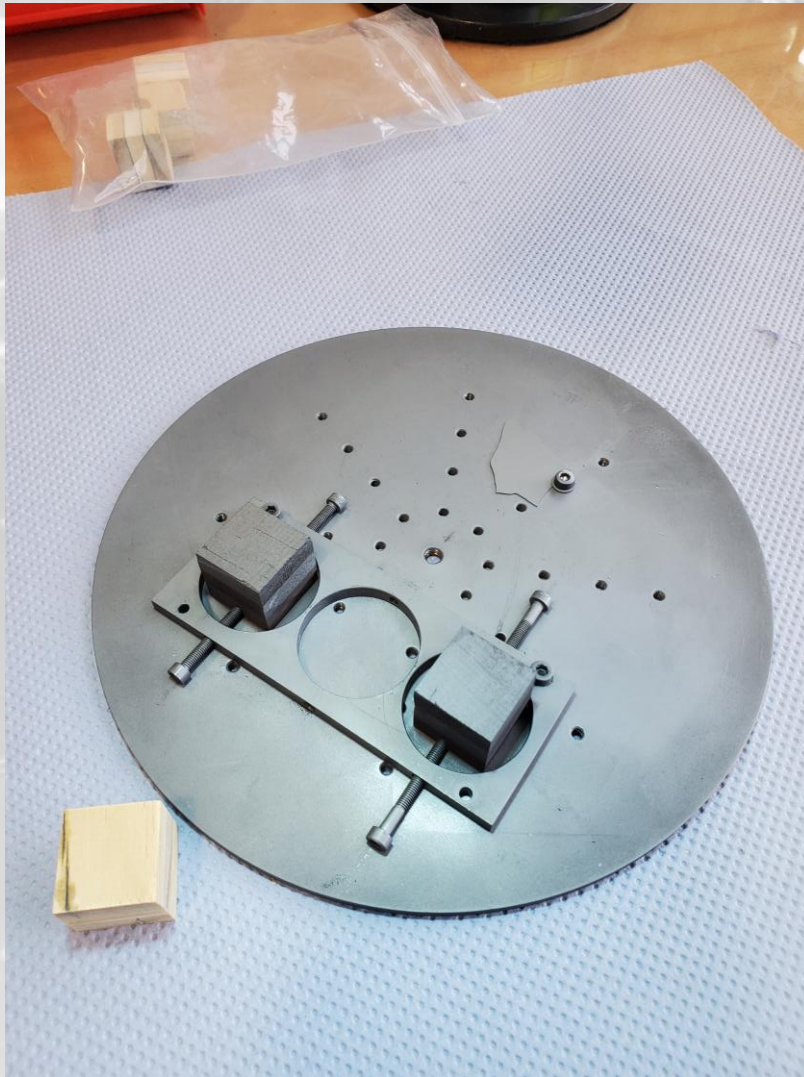
Physical Vapour Deposition

Ion etching

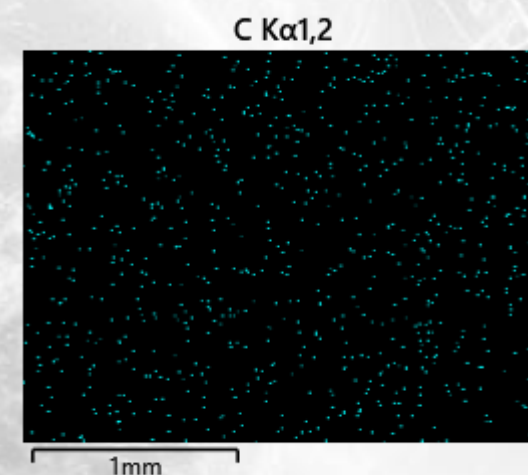
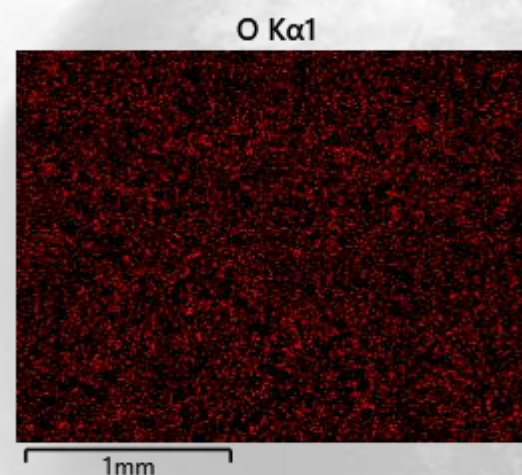
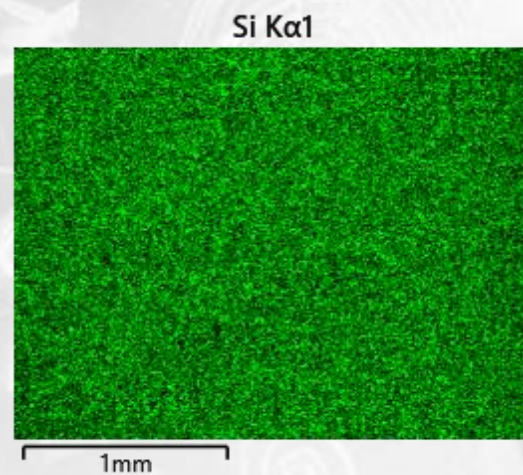
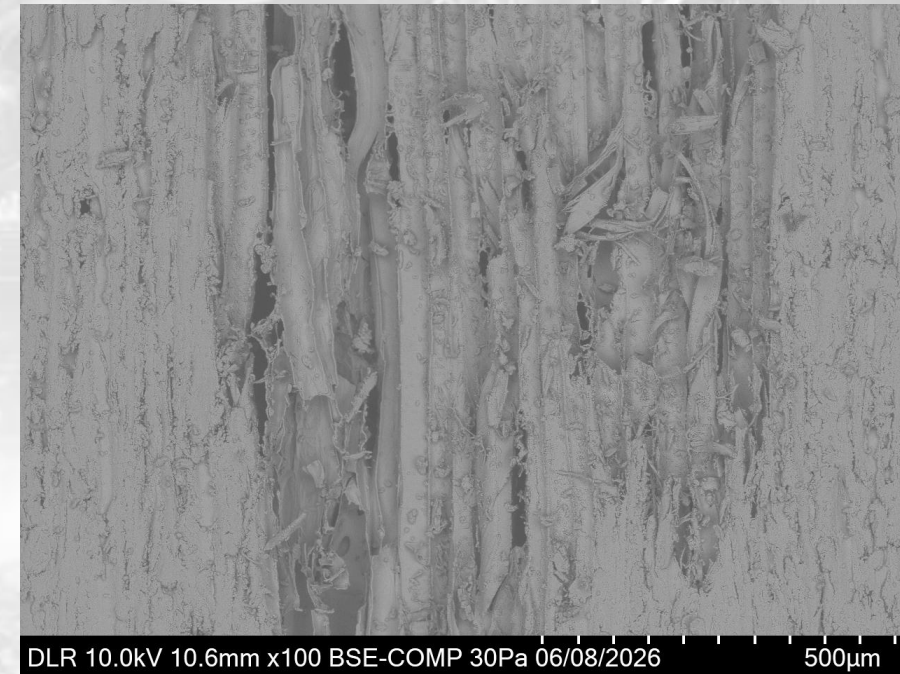
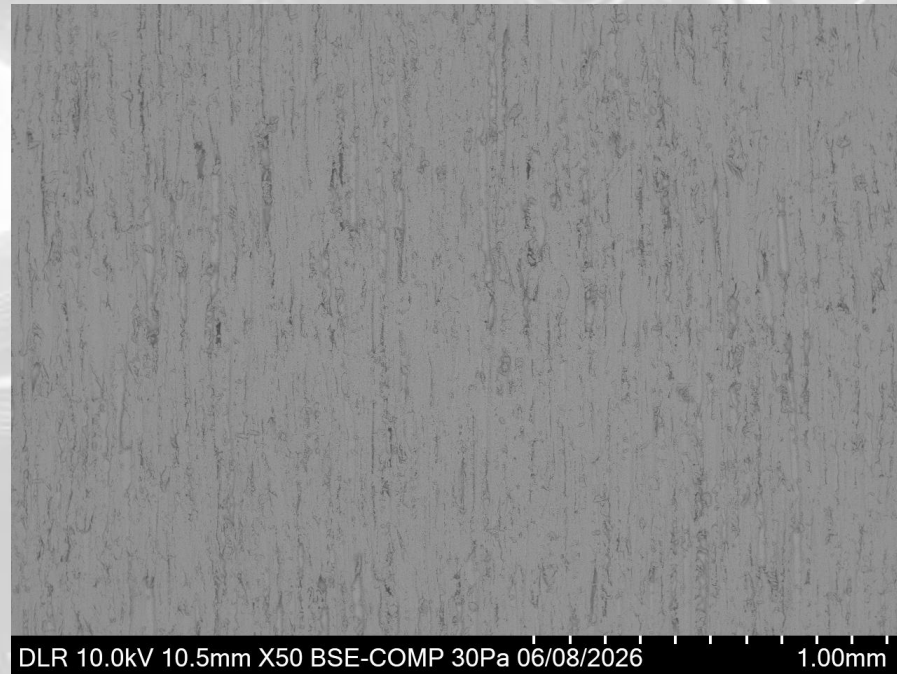
Sputter coating



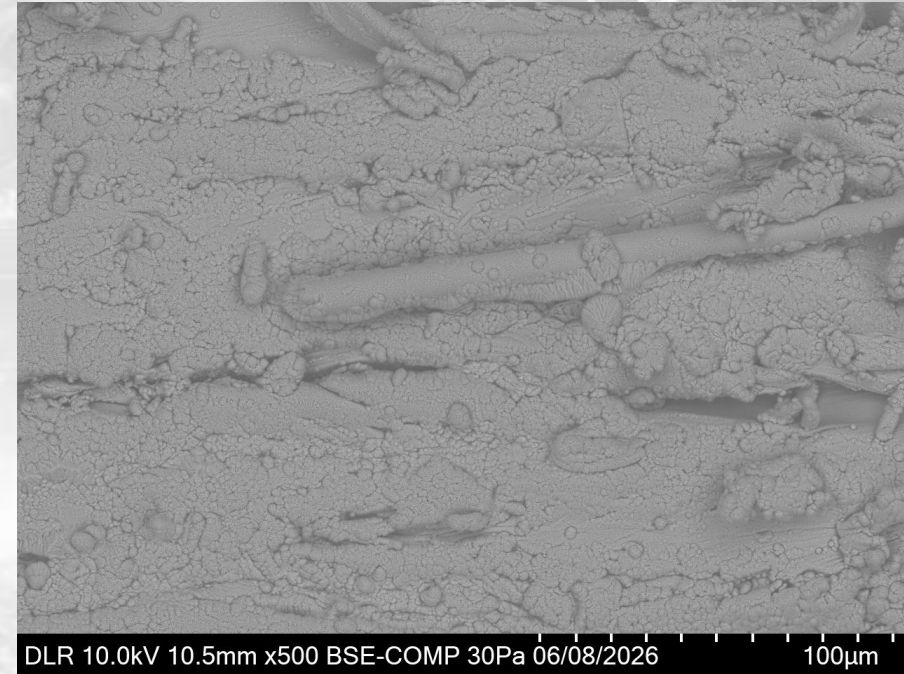
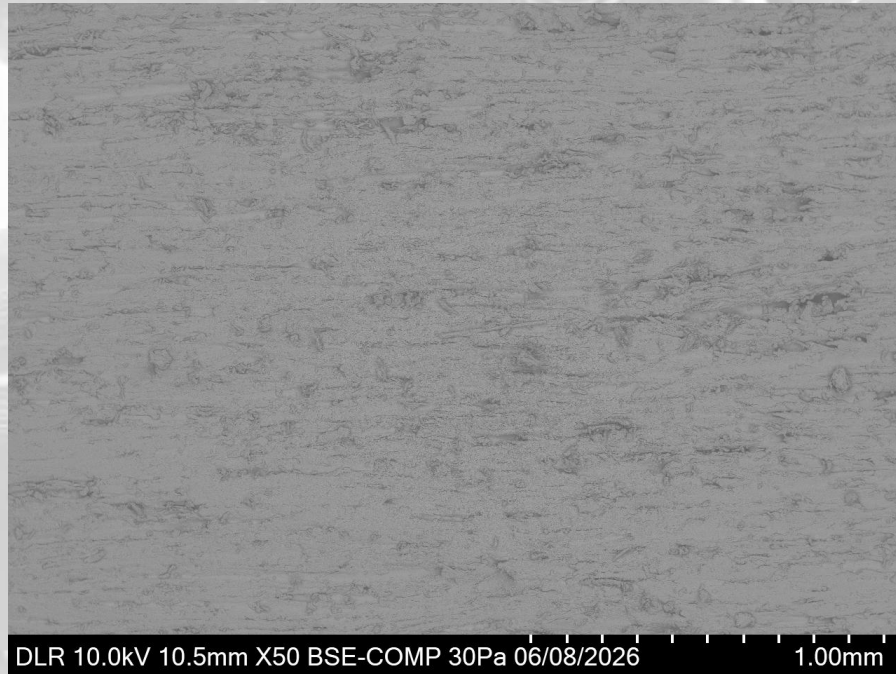
Feasibility of DLR Coatings on Wood



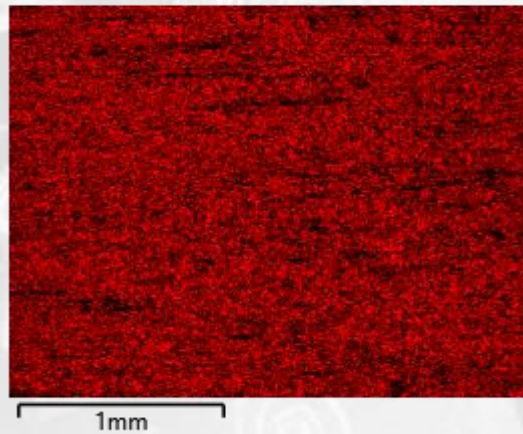
Application of Si-Coating



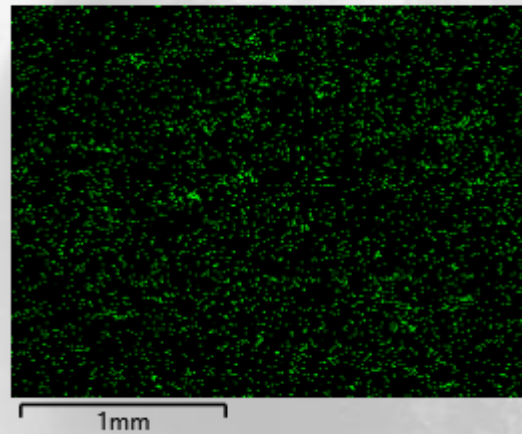
Application of Al-coating



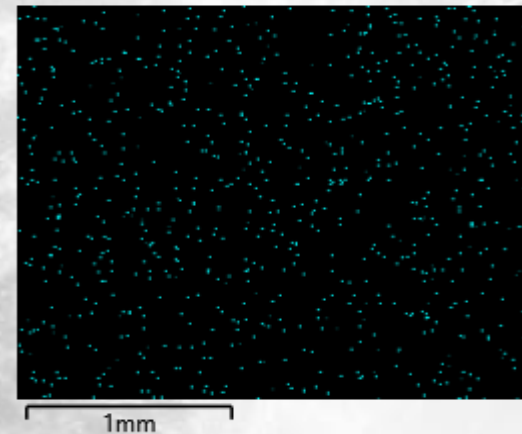
Al K α 1



O K α 1



C K α 1,2



Wooden Concepts for Satellite Structures

	Primary Structures			Secondary Structures
	3U CubeSat	Small Satellites < 1000 kg	Large Satellites > 1000 kg	
Structural Compliance	✓	✓	✗ *A new concept is needed	✓
Thermal Compliance	✓	✓	✓	✓
Outgassing	✓	✓	✓	✓
Radiation Compliance	✓	✓	✓	✓
Electrical Compliance	⌚ w. coating	⌚ w. coating	⌚ w. coating	⌚
Atomic Oxygen Effects	⌚ ✓ w. coating	⌚ ✓ w. coating	⌚ ✓ w. coating	⌚ ✓

⌚ : Work in progress

Next Steps

Improve surface finish

Apply multiple layers of coating

AO exposure test at VKI

Look into other space applications



Thank you for your attention

Contact Person

Max Preis
Max.Preis@dlr.de

Website & Social Media

