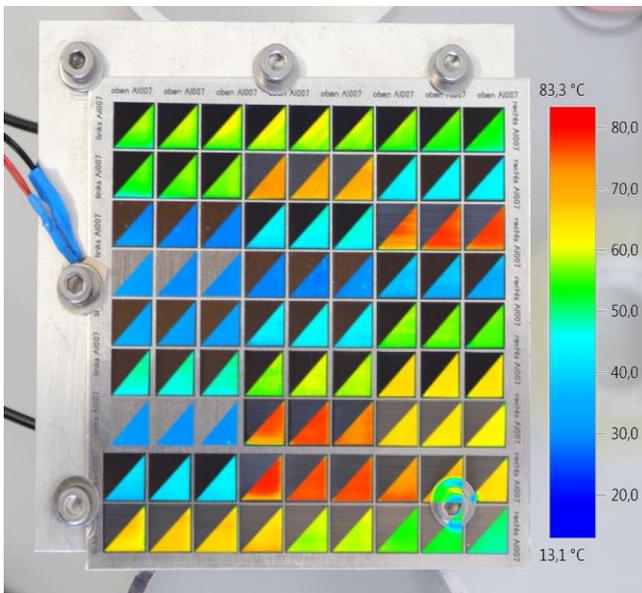


## BLAST

BLAST – Black Laser Surface Treatment is a novelty surface treatment technology developed as an alternative to high emissivity and absorptivity paints and coatings for space applications.

Relying on a femtosecond pulsed laser to uniformly alter material surfaces, the microstructures (see following pages) created on the top layer of the material enhance the thermo-optical properties of the material itself.



Laser treated surface (with false color representation)



Aluminium plate (15 x 15 cm<sup>2</sup>) laser structured with the ESA logo

### Key features and benefits

- Very high Infrared Emissivity  $\epsilon$
- Very high Solar Absorptivity  $\alpha$
- High temperature stability
- No masking required even for complex forms
- No outgassing issues
- Environmentally friendly
- No pre-treatment or primer needed

## Specifications

BLAST technology is used to change the surface properties of metals (aluminium and titanium alloys) and for better performances in space applications. This ensured that the end product and technology would be competitive in performances, as well as economically viable.

In order to do so, specific performance parameters were selected and assessed, where each value was precisely tailored with respect to the application and material.

## Performance values

#	Parameter	Material			
		Al7075*	Al6082*	Ti6Al4V*	
P01	IR Emissivity (max.)	0.96	0.95	0.69	
P02	Solar Absorptivity (max.)	0.82	0.81	0.96	
P03	Outgassing (Mean)	TML [%]	0.02	0.03	0.01
		RML [%]	0.02	0.02	0.01
		CVCM [%]	0.00	0.00	0.00

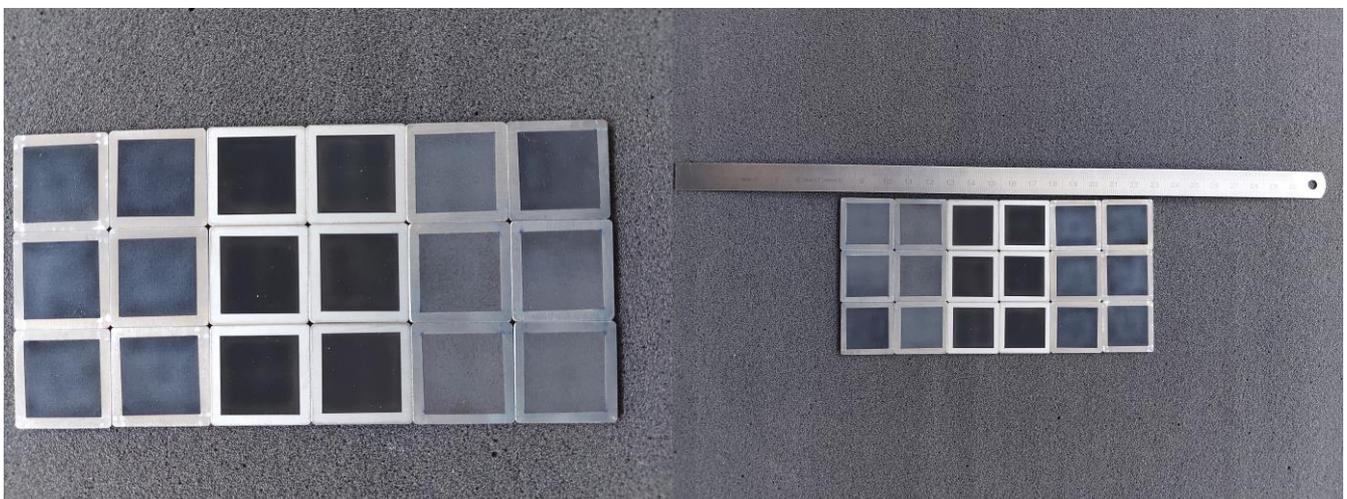
\*more details in material specifications below

## Material

The most typical materials used for the production of space structures are aluminium lightweight alloys. When the structure is required to have a higher thermal stability, usually Titanium finds usage in the application.

Our considered materials are femtosecond pulsed Laser structured metallic titanium and aluminium sheets, Ti6Al4V, Al6082, and Al7075.

They are economically viable being incredibly lightweight, and are overall ideal materials for space applications given their thermal stability and their very high strength and stiffness.



BLAST treated surface Al6082 (left); BLAST treated Ti6Al4V (middle) and Al7075 (right)

## Treatment results

Azimut Space, in cooperation with the Fraunhofer Heinrich-Hertz-Institute (Fraunhofer HHI), characterized this coating technique within the frames of an ESA GSTP funded project, supported by DLR. The joint team is set to qualify the surface treatment technology for space applications and reach TRL 9 in 2025.

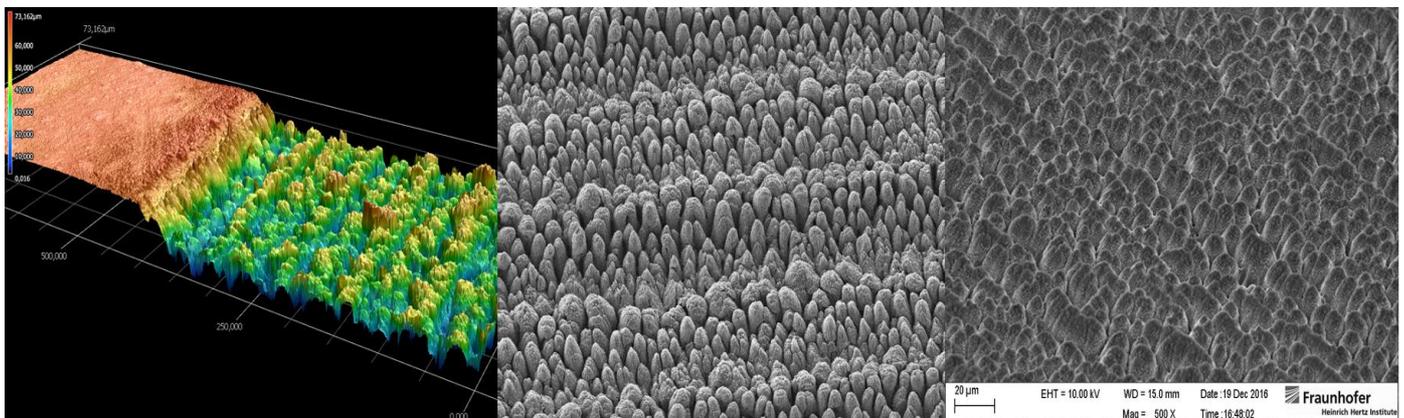
The treated surfaces resulted in an optical black layer and showed durability when tested in a relevant atmosphere (vacuum and temperature range). The results obtained through a complex testing campaign show that the laser surface treatment has considerable advantages compared to industry standard coatings.



BLAST treated aluminum (Visible spectrum)

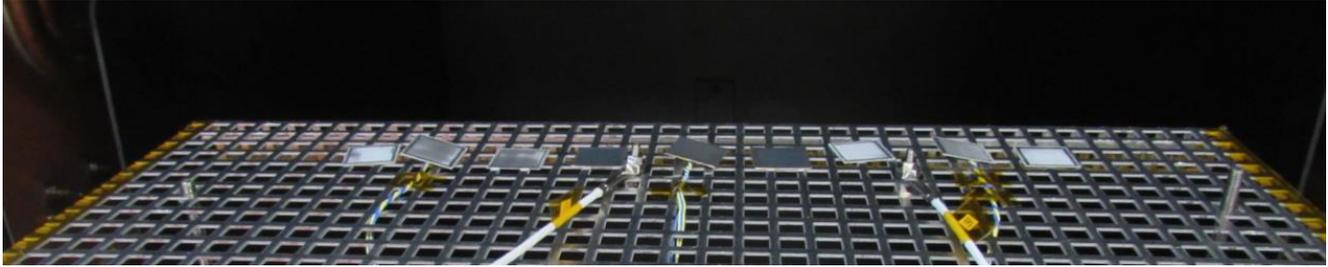


BLAST treated aluminum (infrared)

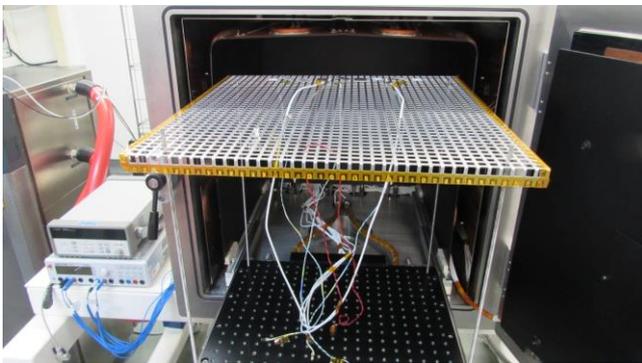


Polished and BLAST treated surface LSM (left); BLAST treated Ti6Al4V (middle) and Al7075 (right) SEM

## Testing



Samples for thermal vacuum cycling inside the vacuum chamber, before test



Coupons mounted on the cold plate for thermal vacuum cycling



Coupons for thermal vacuum cycling after thermo-optical test

## General additional options

Additional options are available on demand: assurance of required cleanliness levels for sensible hardware, grounding, and robustness.

Configurable test systems according to the user's need

- Fully autonomous test operation and remote access
- Data collection via dedicated software

### CUSTOMERS AND PARTNERS

ESA, DLR, Thales Alenia Space, AIRBUS D&S, OHB, TNO, Sonaca

### DESIGN SOFTWARE

Solid Edge, Solidworks, Nastran, Hyperworks, ESATAN

### TEST FACILITIES

Thermal Lab with thermal vacuum chamber  
Thermal cycling chamber for life cycling

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