

PBF-LB/M manufactured optical carrier structure for space operation

Large-format metal additive manufacturing enables a lightweight, stiff optical platform designed for spaceborne laser systems

Fraunhofer ILT developed and manufactured a large-format optical carrier demonstrator in AlSi10Mg using PBF-LB/M. The AM-optimized sandwich design combines low mass with the stiffness required for precise optical alignment. This further demonstrates AlSi10Mg processing on the SkalAr concept for build volumes of up to 1.0 x 0.8 x 0.4 m³.

The optical carrier structure demonstrates how design for additive manufacturing can improve large, mission-critical space hardware. The original conventionally machined carrier was redesigned for PBF-LB/M while retaining the interfaces required to mount optical components. A sandwich architecture combines solid face sheets with an internal BCCZ lattice, placing material where it contributes most to structural performance.

The result is a lightweight, stiff carrier concept for spaceborne optical systems. The final design targets a mass reduction of 16.4% compared with the conventional reference component, while preserving the specified stiffness through geometry and heat treatment. Functional surfaces are finished by machining to provide the required dimensional accuracy.

Large-format production is enabled by Fraunhofer ILT's gantry-based SkalAr system. Its movable processing head and local shielding-gas flow support scalable build areas and stable PBF-LB/M conditions beyond conventional machine envelopes. AM-specific features reduce internal support structures, facilitate depowdering and make the design suitable for low-volume, high-value aerospace applications.

The demonstrated lightweight and design-for-AM principles transfer seamlessly to other large-scale PBF-LB/M applications and materials, including steels and nickel-based alloys. Fraunhofer ILT supports industry partners in developing and implementing tailored AM solutions.

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exhibit overview