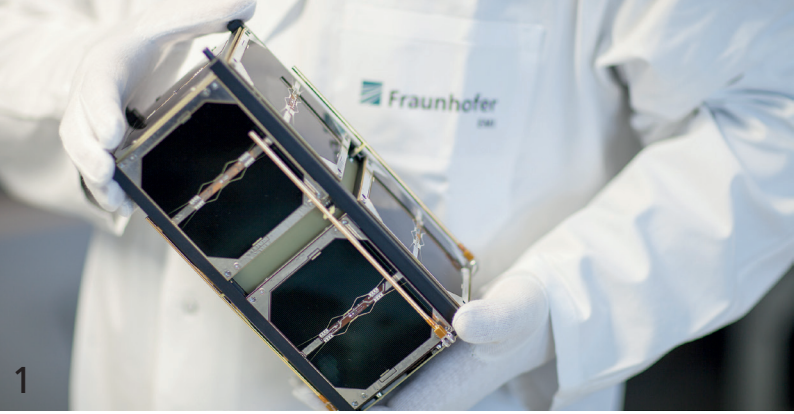
Fraunhofer
EMI

FRAUNHOFER INSTITUTE FOR HIGH-SPEED DYNAMICS,
ERNST-MACH-INSTITUT, EMI

ILA BERLIN AIR SHOW
1.–4. JUNI 2016

Berlin ExpoCenter Airport
Halle 4, Stand 202



1

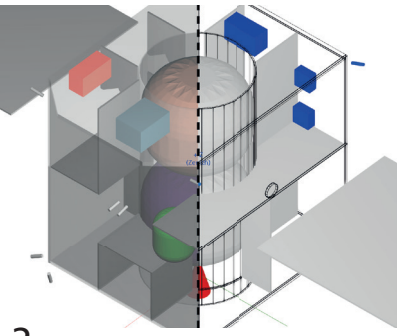
SMALL SATELLITE TECHNOLOGIES

Technology solutions for earth observation and science

Based on EMI's core competence in high-speed measurement methods and technologies as well as camera systems originally developed and applied for the analysis of high-speed processes in a laboratory environment, during the past ten years EMI has been developing scientific payloads for impact detection on-board satellites, part of which has been tested on-orbit. We offer development of hardware and software components including CCSDS based interfacing units up to complete stand-alone scientific instruments.

Image and videoprocessing for optical payloads

EMI has significantly expanded its competence in software development for optical satellite payloads and data ground stations. We offer the development of end-to-end-software for optical payloads, or whole camera subsystems, either based on our expertise in this area or together with partners. We are relying on space-qualification of commercial off-the-shelf (COTS) components, which we are doing in-house and together with R&D partners. Other technologies offered are hardware and software components for nanosatellites based on FPGA, for enhancing on-board computing power.



2

3

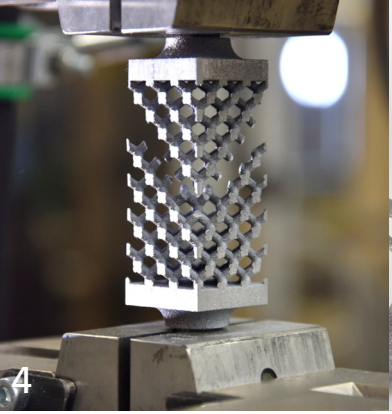
RELIABILITY AND SURVIVABILITY

Risk assessment software

The risk for operational satellites of being impacted by small particles is increasing due to the rising amount of space debris. Even collisions with small particles can have fatal consequences for satellites, if mission-critical equipment is hit. Hence, equipment reliability is reduced and functional lifetime is limited. Concerned components need to be identified in early design phases (preferably Phases 0 or A), and appropriate measures need to be taken. To this purpose, the EMI experimental software tool PIRAT (Particle Impact Risk and Vulnerability Assessment Tool) has been developed. PIRAT computes the probability of critical impact damages and the failure probability from space debris and micro-meteoroids for individual spacecraft components. This information is used to enable less vulnerable design solutions e. g. by changing the accommodation of critical components or by shielding.

Robust satellite structures

EMI combines unique experimental facilities for impact testing and material characterization at high strain rates with unique expertise in the area of satellite protection. We provide all necessary methods and technological know-how to design your high-performance, robust and low-weight shielding solution.



ADDITIVE MANUFACTURING

Material modelling and 3D design optimization for structures under dynamic loads

3D printing of metal structures and components allows for additive manufacturing with enormous freedom in designing complex geometric shapes. If adequate material models are on hand and one is able to quantify the load profile, the optimum lightweight design for the specific functional requirements can be computed with numerical optimization simulation. As a consequence high performance components can be built.

Specimens and optimized structures can be manufactured inhouse at EMI on an EOS M400 system for 3D printing of metal structures of dimensions up to 400 x 400 x 400 mm.

For additive manufactured metals reliable material models are to be established in accordance to parameters and conditions of the manufacturing process. This holds especially for dynamic strain-rate dependent material characteristics. Additionally with 3D printing the development of cellular structures is of interest for many applications. For this purpose EMI is working on meso-mechanical material models that can be more suitable.

1 *2-unit-CubeSat*
2 *Spacecraft-design optimization*
3 *Spacecraft shield*
4 *Examples for material characteriztion and design optimization*

FRAUNHOFER EMI

The Fraunhofer Institute for High-Speed Dynamics, Ernst-Mach-Institut, EMI, is specialized in impact and high-speed diagnostics, featuring testing facilities that are unique across Europe.

Fraunhofer EMI´s Business Unit Space is your competent partner for the experimental analysis, development and optimization of protective components for space systems against space debris and micrometeoroid impact. Based on risk and vulnerability analyses using own methods and tools, we optimize your satellite design against impact threats. Our know-how in material characterization and material modelling with a special focus on dynamic material behavior at high strain rates is the foundation for our expertise in numerical simulation with own and commercial hydrocodes e. g. in the field of on-orbit satellite collisions and hypervelocity impacts on geological surfaces. Technological activities comprise the design of scientific payloads such as impact detector payloads, and recently also the development of technologies for small satellite missions such as FPGA data acquisition boards, software for camera payload data handling units, ground stations for data transmission and definition and implementation of whole nanosatellite missions.

Berlin Air Show

1.–4. Juni 2016
Berlin ExpoCenter Airport
Halle 4, Stand 202
www.ila-berlin.de

CONTACT

Fraunhofer Institute for High-Speed Dynamics,
Ernst-Mach-Institut, EMI
Eckerstrasse 4
79104 Freiburg, Germany

Brigitta Soergel
Phone +49 761 2714-362
brigitta.soergel@emi.fraunhofer.de

Prof. Dr. Frank Schäfer
Phone +49 761 2714-421
frank.schaefer@emi.fraunhofer.de

www.emi.fraunhofer.de

Status 05/2016