Lightweight EMI-tight CFRP Electronic Housings

1. Development Activities by HPS

For ten years, HPS is developing in Germany and Portugal lightweight CFRP electronic housings for space applications under various contracts to ESA, German authorities, European industry and internal R&D funds, always in collaboration with several German and European entities. Extensive engineering work, material & process developments and equipment level tests have been performed for space and aeronautic applications. Key elements have been thermal conductivity, electro-magnetic compatibility and strength. With all that knowledge an electronic housing concept was created, which achieved comparable performance to typical bench marks with significantly less mass (20-40%). Specific applications are planetary spacecraft missions on which every 10 grams are counting, satellites with a CFRP primary structures and aircrafts with the target to reduce mass for long-term fuel saving.

On material and concept level the following items are used:

- High conductive carbon pitch fibres (for high thermal conductivity)
- Carbon nano species, CNS (for increase of electro-magnetic shielding performance)
- Specific joint techniques (for decrease of electro-magnetic leaks)
- Advanced attachment techniques (for suitable interfaces to substrates).

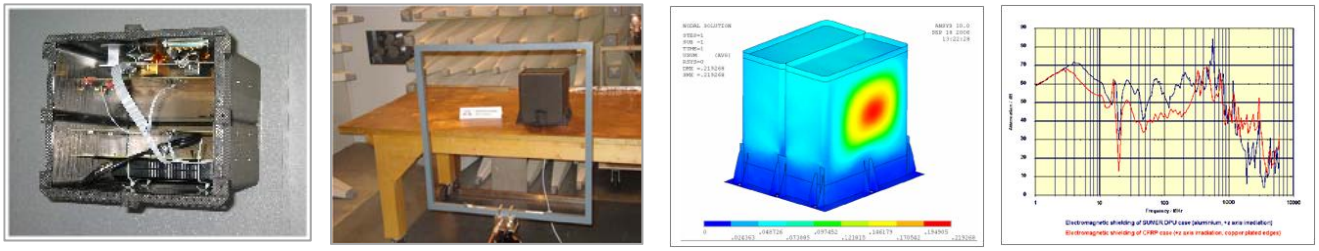
Extensive tests on sample and equipment level have been performed, including numerical model creation, test prediction and test correlation, in which a huge data base on material date could have been gathered:

- ✓ Waveguide measurements
- ✓ Common mode impedance
- ✓ EMC tests (30 MHz – 1 GHz)
- ✓ Mechanical material sample tests (fracture, stiffness, strength, NDI, REM, etc)
- ✓ Vibration tests (10 Hz – 2 kHz)
- ✓ Acoustic test
- ✓ Thermal vacuum balance and cycling tests
- ✓ Thermal conductivity tests.

So far, no particle radiation shielding tests have been performed, but tests planned in 2015 in the frame of an ESA-GSTP activity will complement the characterization of CFRP electronic housings.

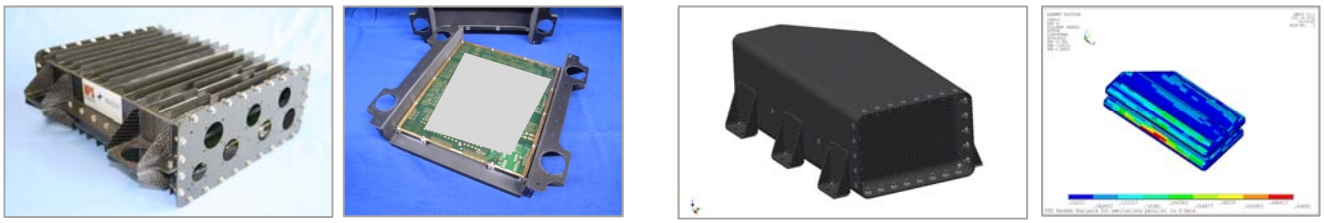
2. Realized Examples of Electronic Housings

In the following some examples of realized electronic housing developments are listed:



CFRP housing developed with focus on EMC shielding and thermal performance*

CFRP housing developed with focus on manufacturing technology (left) and carbon nanotube composite material (right)



CFRP housing for an aircraft application (left) and under development for series production for satellite equipment (right)

* Example specification: dimensions: 24cm x 28cm x 26cm; mass: 610g (excl. PCB boards); to be equipped with maximum ten boards with a total weight of 7,5 kg; dynamic limit load: 20g RMS.

3. Offer by HPS

In case of interest, HPS can provide engineering support, engineering consultancy, detailed design and analysis for specific applications up to manufacturing & testing of a complete housing.

4. Contact

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