



**Category:** Materials, Coatings & Processes

**Reference:** TD-DE-1013

### Ultra lightweight Carbon Fibre Reinforced Electronic Housing

Since 2005 the technology provider is investigating the electromagnetic influence in the presence of CFRP (e.g. under contract to ESA) in collaboration with several German and European entities. Extensive material tests using waveguide measurements and other techniques have been conducted. The materials included different carbon fibre types, CFRP/AL-honeycomb sandwich structures as well as conductive matrices achieved by Carbon Nanotubes (CNT) doping.



Analytical models of the electrical behaviour of CFRP structures have been developed. New promising insert concepts with reduced manufacturing costs and excellent bonding values have been designed. Common mode impedance measurement of different grounding rail configurations as well as numerical calculations on typical flat S/C CFRP honeycomb panels have been carried out.



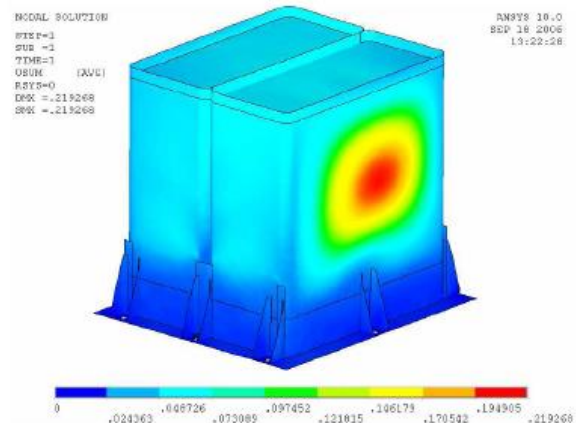
With all that knowledge on the EMI aspects of CFRP an electronic housing was created, which achieved comparable shielding performance with significantly less mass (20-30%) compared to typical bench marks, e.g. an ultra light aluminium electronic box orbiting the sun on the SOHO satellite. Beside the application for planetary spacecraft missions the „EMI-Box“ provides benefits on lightweight or long duration aircrafts.

Current Specification (for a bi-modular config.):

- dimensions: 243mm x 275mm x 255mm
- mass: 610 g (excl. electronic boards)
- possible number of boards: 10 (7,5 kg)
- loads: 20g RMSHPS

Qualification Status:

- |   |                                     |
|---|-------------------------------------|
| <ul style="list-style-type: none"> <li>▪ material (fracture, shielding, NDI, REM)</li> <li>▪ EMC testing (30 MHz –1 GHz)</li> <li>▪ thermal cycling</li> <li>▪ vibration (random vibration 10 Hz –2 kHz)</li> </ul> | sample tests<br><br><br><br>testing |
|---|-------------------------------------|



**Innovative Aspects:**

The innovative aspect of this electronic housing is its ultra-light weight which is achieved by the usage of carbon fibres and an innovative design approach. An enhancement of the electrical conductivity of the carbon fibre laminate is achieved by a carbon nano tubes modified resin system. Thus, the requirements on the electromagnetic shielding can be met without additional conductive layers like copper mesh or metallisation.

**Application Areas:**

The ultra lightweight electronic housing made of CFRP is in addition to spacecraft applications suitable for, e.g.

- aircrafts
- railways
- motor sports, e.g. formula one racing
- electric cars
- e-bikes

**Cooperation:**

The offering company is interested in joint ventures or licensing agreement.