



Composite Shielding Solutions EMI and RFI

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CASE HISTORY

Aeronautical EMC problems of electronic devices



CASE

Between 1981 and 1987, five Blackhawk army helicopters crashed and killed or injured all on board when flew too near radio broadcast transmitters.

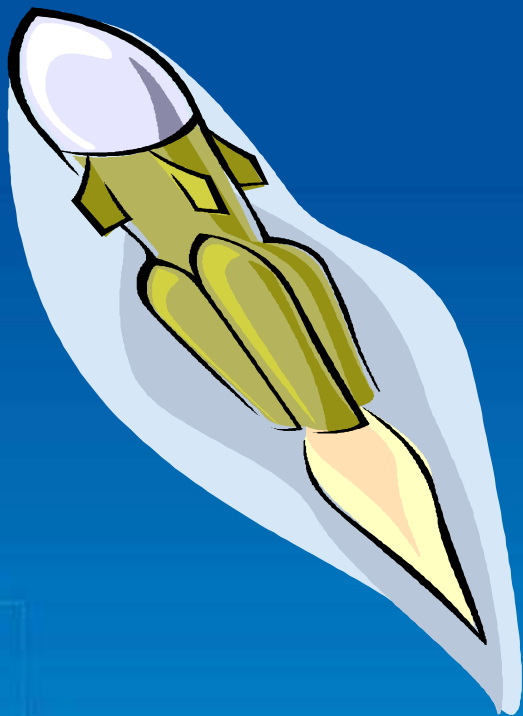
CAUSE

Insufficient immunity of flight (on-board) control electronic sub-system against high intensity radiated fields (HIRF) that produced uncommanded movements while flying past radio broadcast towers.

(Source: NASA Reference Publication 1374 July 1995)

CASE HISTORY

Missile EMC problems of electronic devices

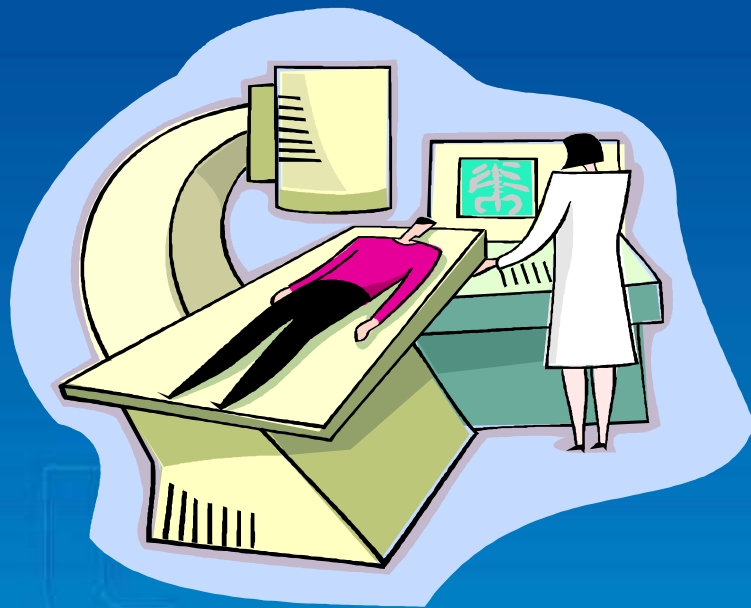


During a B-52 missile interface unit test, an uncommanded missile launch signal took place. One of the contributing factors was crosstalk in the systems wiring. The outcome was a year long redesign and test effort.

(Source: NASA Reference Publication 1374, July 1995)

CASE HISTORY

Medical equipment EMC problems of electronic devices



Modern medical equipment has experienced EMI problems. From 1979 to 1993, the FDA received over 90 reports concerning EMI problems in the field. It was pointed out that users experiencing medical equipment performance degradation might not suspect EMI as a possible cause. Thus, EMI problems are more likely to be under-reported to the FDA.

(Source: NASA Reference Publication 1374 July 1995)

CASE HISTORY

Medical equipment EMC problems of electronic devices

Publicity was given to electronic pacemakers, or aircraft and air traffic navigational control systems, but it is only a 'tip of iceberg'.

It was pointed out by many researchers that users experiencing equipment performance degradation often do not suspect EMI as a cause, and thus a number of EMI problems are never registered.

There is an unprecedented proliferation of electrical devices and electronic controls in almost every aspect of human life.

Life of individuals and functioning of the society is increasingly dependent on errorless functioning of numerous systems:

Emergency telecommunication systems

Air, maritime, land transportation systems,...

Safety systems, etc., etc, ...

Most of such critical systems are controlled by electronic sub-system hardware and/ or software.

Whilst electronic controls ("intelligence") bring many benefits, they also suffer from peculiar performance/ reliability problems

EM interference is one of major problems related to performance and reliability common to all electronic technologies .

EM SPECTRUM

ENERGIA ►

Frequenze in Hz

10^0 10^2 10^4 10^6 10^8 10^{10} 10^{12} 10^{14}

Basse frequenze

Alte frequenze

Onde lunghe, medie, corte, ultracorte, microonde

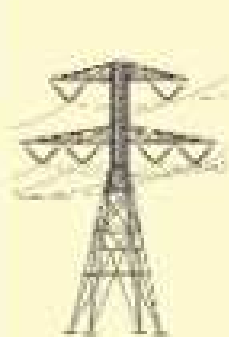
Luce infrarossa - visibile - ultravioletta

10^{16} 10^{18} 10^{20} 10^{22} 10^{24} 10^{26}

Raggi X

Raggi gamma

Radiazione
secondaria
di quota



Elettrodotti



Radio



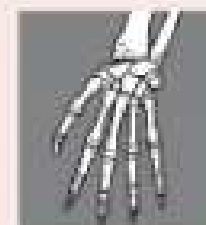
Telefono
cellulare



Calore



Luce



Radiografia



Radioattività

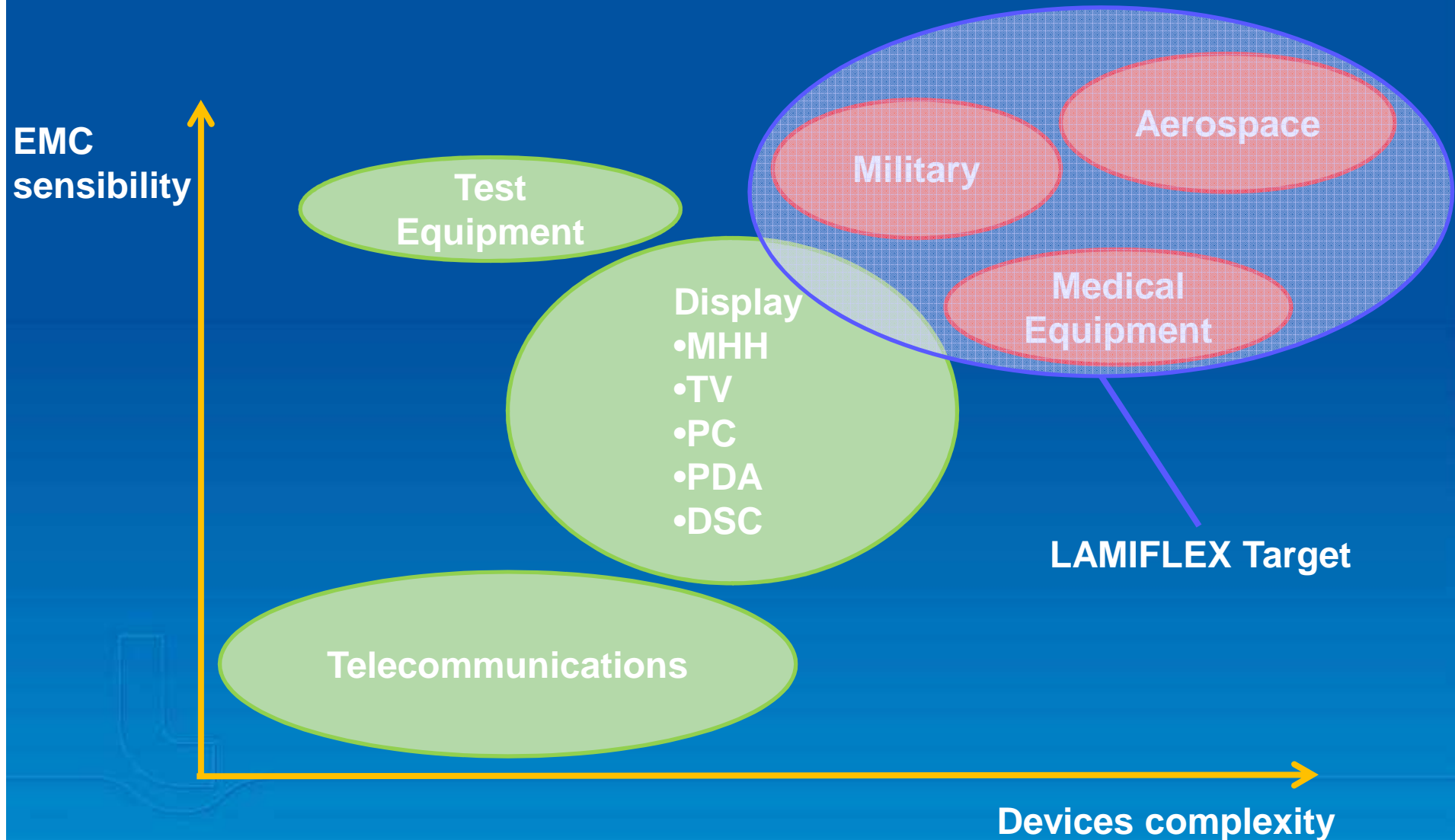
NON IONIZZANTE

IONIZZANTE

EMC SEGMENTATION

LAMIFLEX GROUP
TECHNOLOGY FOR COMPOSITES EVOLUTION

EMI and RFI Shielding Solution



MARKET AND ELECTRONICS REQUIREMENTS

The electronics devices and the cable for electrical connection don't offer in many installation a security for the range of new sources involved out side from Telecommunication and other power magnetic generation . In this condition with the new increasing transformation of structure from metal to composite, have offered more vulnerability to many devices .

The scope to use the fabric metalized in a combination of the composite are the best solution to reduce the interferences from out side or inside to out side .

The use of NICKEL as metal over the textile structure is a guaranties for the electrical surface resistivity of the composite , because the use of copper is one of the best problem for the reduced conductivity because of the rust and the salt humidity present near to the sea .

With the new metal treatment deposition with ZINC now we offer also a new way to improve the surface conductivity and more stability on strong weather condition

We can offer

- From 45dB up to 90dB attenuation level from 1 Mhz to 18 GHz

- Stability of the surface conductivity

- Flexibility in design

- Weight reduction in comparison to the metal mesh

PARTNERSHIP

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TECHNOLOGY FOR COMPOSITES EVOLUTION

Innovative EMI and RFI Shielding Solution

With the innovation of **Lamiflex**, in shaping the composite material, and the cooperation agreement signed with **Soliani EMC**, a company active in making fabrics and materials shielding / metallized, new solutions are born with EMI and RFI shielding.

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ALTA TECNOLOGIA DEI COMPOSITI



SOLIANI emc s.r.l.
Protezioni Interferenze Elettromagnetiche
EMI - RFI - ESD - TEMPEST



Patent MI2011A001417
PCT Pending
Shielding EMI RFI pre preg

Patent MI2011A001986
PCT Pending
Lightweight Pultruded Shielded EMI RFI Conduit

Patent MI2010A000593
PCT /IB2011/052220
Lightweight Shielded EMI RFI Conduit

LAMIFLEX Group

LAMIFLEX GROUP
TECHNOLOGY FOR COMPOSITES EVOLUTION

A Family Company

Lamiflex produces advanced composite materials for use in a wide range of industrial applications. The company has developed next generation EMI and RFI shielding solutions that combine high surface conductivity across broad range frequencies with the light weight, design flexibility, and cost advantages of composite materials. Lamiflex's shielding materials include a family of semi-manufactured pre-impregnated materials based on nickel, zinc, gold and silver in reinforced polyester, glass Nomex, carbon and epoxy resin. The company also produces customized, finished parts based on these composites that can be adapted to any geometric solution. Lamiflex's composites have industrial and military applications in many sectors, including aerospace, telecommunications, automotive, undersea systems, and electronics.



Lamiflex Technology:

- R&D
- Physical Chemistry Laboratory
- Clean Room
- X-Ray Chamber
- CNC

Lamiflex Capability:

- Pre-preg Machine
- Stepped Press
- Multi-Compartment Press
- Wrapping
- Pultrusion – Pullwinding
- Autoclave
- RTM Resin Transfer Molding

APPLICATIONS

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Patent Pending ©

Synergies at work

Lamiflex combines the characteristics of shielded materials and those of composite materials by creating a new components that combines the advantages from both sectors.

FEATURE of shielded materials

- High electrical conductivity on the surface
- Wide range of types of fabrics for a high coverage of the frequency spectrum

FEATURES of composite materials

- optimization of the weights
- versatility of feasible geometries

Creating a deposition of metal as Nickel or Zinc around the single filament after weaving with polyester fibers, carbon, Kevlar, Nomex

Carry a quantity of metal for various applications to improve the physical-chemical properties of the surface.

Through this synergies innovative materials and components can be realized: Pre-preg Panels, Shielded Ducts , Customized Shape...



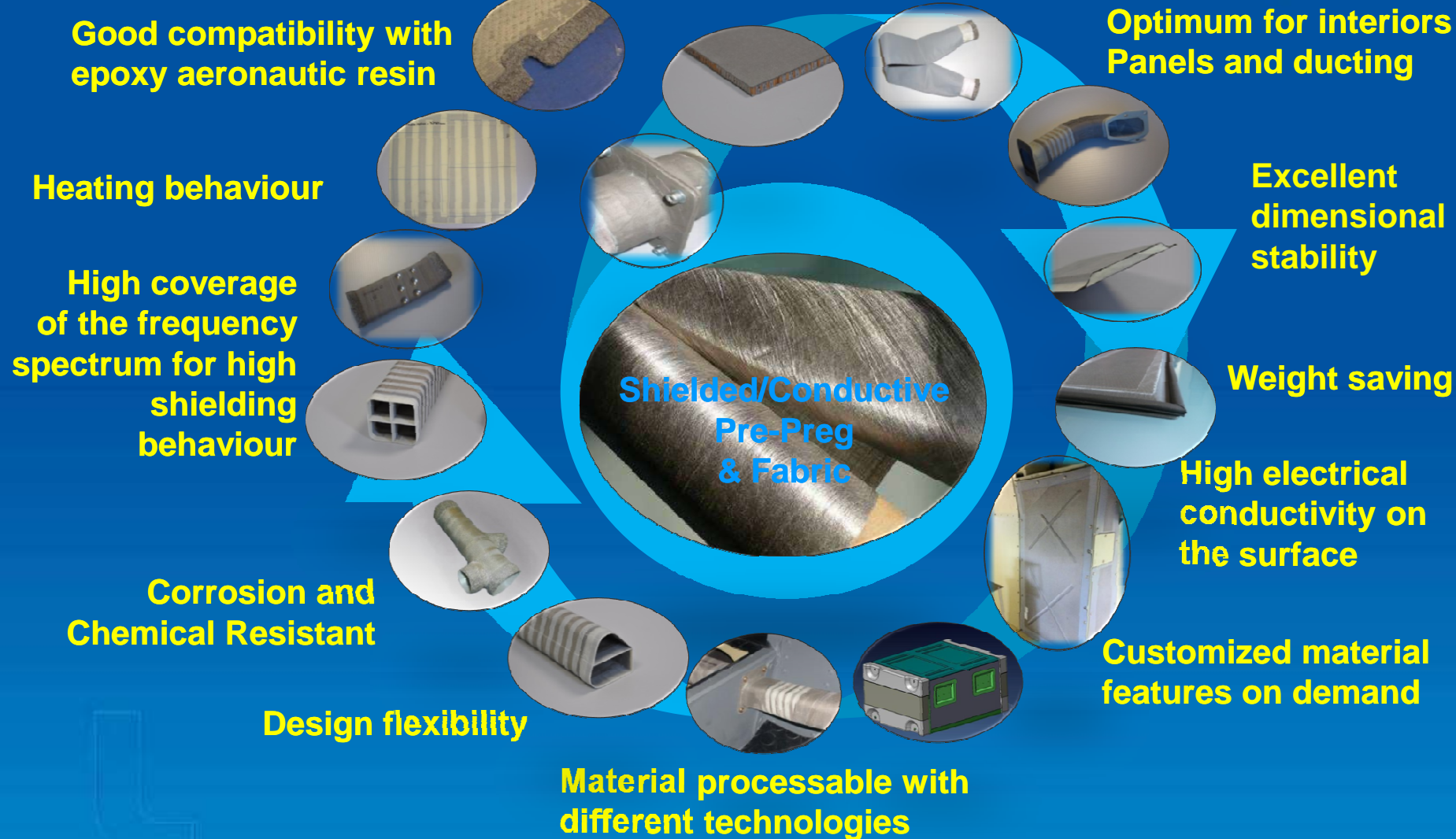
We supply components conform to the **RoHS** directive.



BENEFITS

New applications where the imagination can wander...

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Fabrics Qualification: A.I.M.S. Airbus Material Specification Individual product specification 12.0620



FARADAY Pre-pregs

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Patented ©

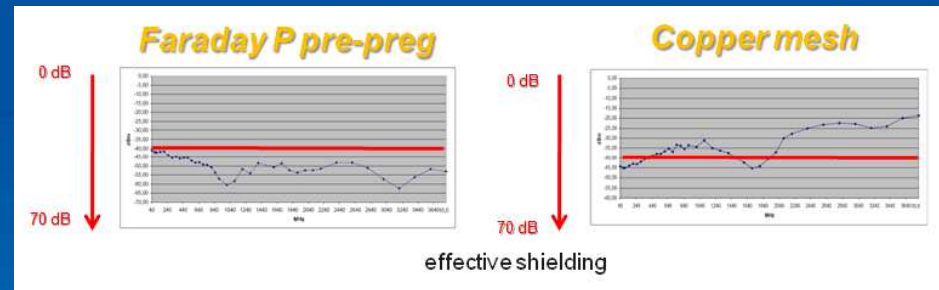
FARADAY family

Lamiflex can transform any conductive dry fabrics in pre-preg materials using:

FARADAY P	Polyester reinforcement
FARADAY N	Nomex reinforcement
FARADAY G*	Glass reinforcement
FARADAY C*	Carbon reinforcement

FARADAY[®]
CONDUCTIVE SHIELDING PRE-PREG

Color:	Grey
Metal:	Nickel - Zinc
Tack :	medium - low
Gel time at 130°C :	14 ± 3 minutes
Volatiles:	<1%
Length:	300 m max



	fabric g/m ²	pre-preg g/m ²	height mm	metal content g/m ²	Superficial Resistance mΩ/cm ²
FARADAY P_N	60	110+/-10	550	10	125-250 (*)
FARADAY HC P_N	100	200+/-10	550	40	20-30 (*)
FARADAY G	275		550	40	200-300
FARADAY N	110	270+/-10	500	30	85-150 (*)
FARADAY C	240	320+/-10	500	40	85-150 (*)



Customized grammages are available for more than 300ml.
(*) few unit of mΩ/cm² are achievable changing metal content.

MAXWELL Pre-pregs

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Maxwell family

The introduction of *metal yarn (Monel alloy) in the warp and weft* in the fabric allows a greater amount of maintaining flexibility and deformability of the fabric, keeping lightness compare with full metal structure.

This material can also be used for shielding applications at lightning

Color: Grey
Metal: Nickel - Zinc
Tack : medium - low
Gel time at 130°C : 14 ± 3 minutes
Volatiles: <1%
Length: 300 m max



	fabric g/m ²	pre-preg g/m ²	height mm	metal content g/m ²	Superficial Resistance mΩ/cm ²
MAXWELL P	200	320	550	10	125 -250

MAXWELL®
CONDUCTIVE SHIELDING PRE-PREG

Customized grammages of are available for more than 300ml

Ducts

Ducts with EMI shielding characteristics

Lamiflex produces shielding elements mainly with tubular shape

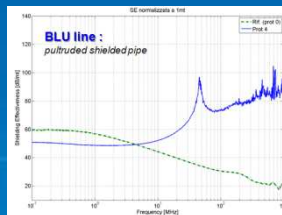
- Composite structure with internal spiral with variable stiffness
- Conductive external fabric
- Plate cut with composite rigid ring
- Realization of M/F or F/F joint type
- *Ultra light weight*
- *Better installation by flexible solution*
- *Better shielding from 1 up to 10^3 MHz*



M/F or F/F joint type



Multisection Ducts



Shielded pultruded Ducts



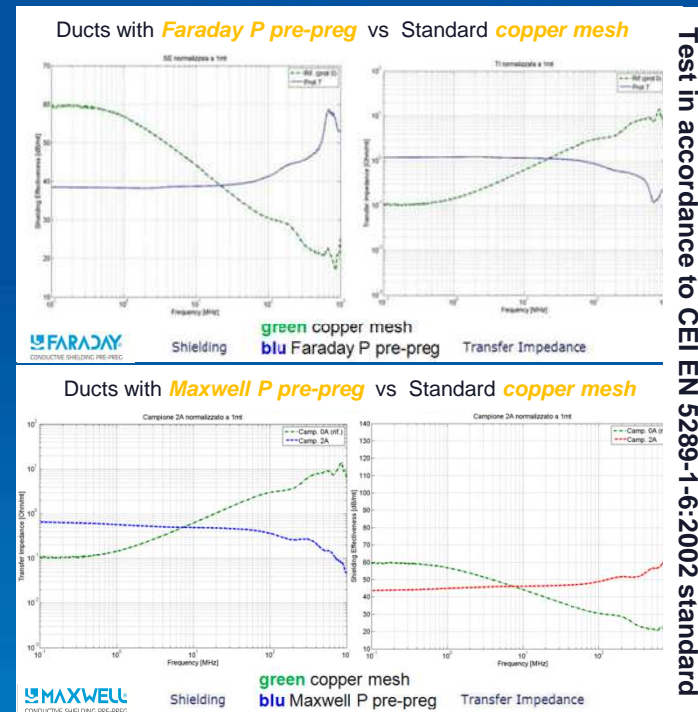
Rigid Duct

Flexible , ultra flexible and mixed ducts

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Patented ©



Better installation by flexible solution

Panels

Composite Conductive Panel VS Aluminum Panel

- Shielding between 60dB and 100dB
- 4 layers of Faraday P-N gives an high shielding behaviour in the HF range (more then 80dB)
- Maxwell pre-preg gives an high result also with only one layer



Conductive panel

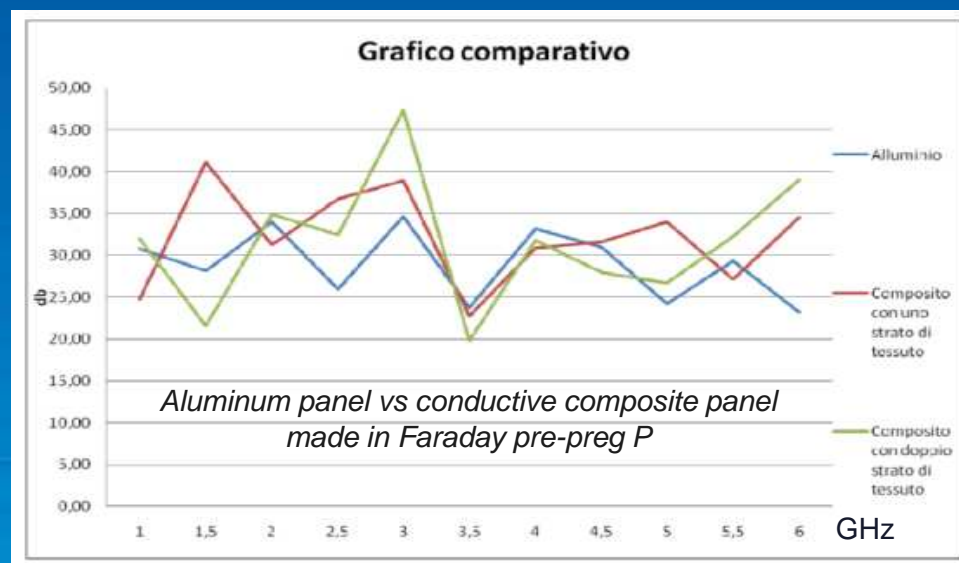


Antenna from
1 to 6 GHz

All panels materials are approved accordingly to
FAR 25.853

STRUCTURE


Glassfiber-Carbonfiber epoxy composite structure
30% lighter than metal panels



Box

Military application

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LOCK!

MILEX KOOLEX

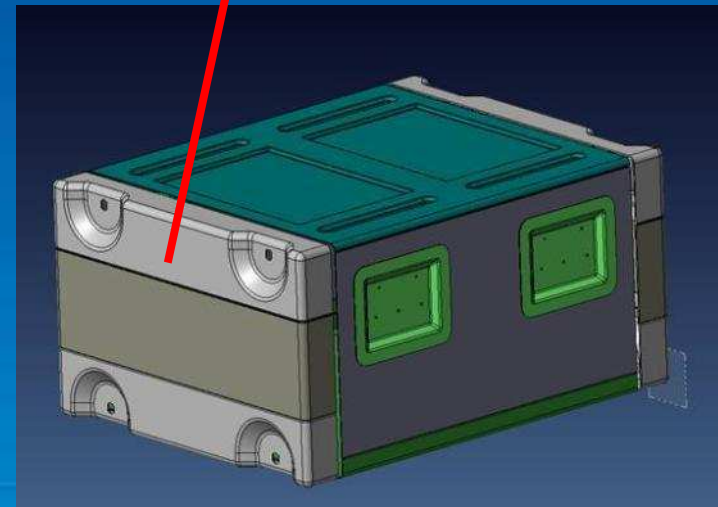
Protection in harsh environment

Defence Electronics

Expect the best in every case

EDAK

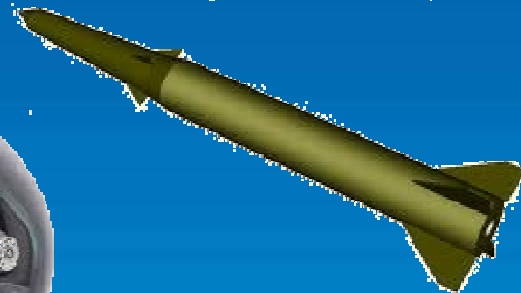
The advertisement features a large image of a white MILEX KOOLEX enclosure with a locking handle. To the right, there are smaller images showing the internal components and a stack of similar enclosures. At the bottom, there are logos for 'Defence', 'Electronics', and 'EDAK'.



APPLICATIONS

EMI RFI protection

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Test (pre-preg and composites)

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Laboratory test

SHIELDING TEST



LIGHTNING TEST



EMP

Electro-Magnetic Pulse



FAR 25.853 TEST

Flame retardant behaviour



DMA TEST

Dynamic Mechanical Analysis



PEELING TEST

DSC TEST

Differential Scanning Calorimetry



Test in anechoic chamber



Test Instruments

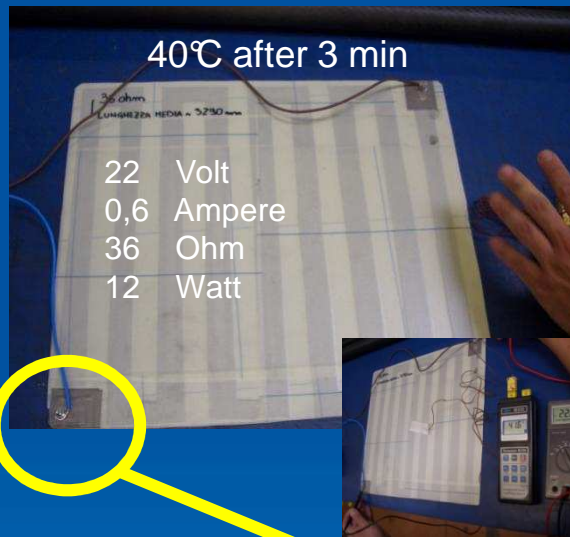


Test phase on site



Internal instruments for test

Conductive pre-preg for Heating devices

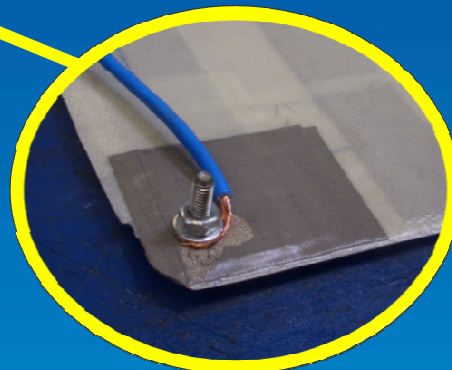


- Possibility to insert a electrical circuit with very low weight
- Possibility of heating control
- Layering on mold surface or on wing profile for de-icing application
- Energy saving
- Capability to adjust even on 3D an flexible geometries.
- Lower thicknesses
- Corrosion resistant also in saline environmental.
- Easy product customization according to specification.

Composite panel with electrical resistance.

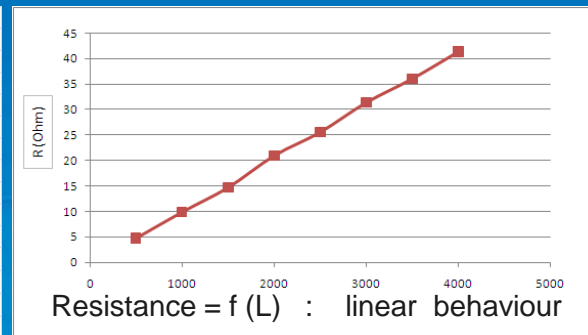
Material:
Faraday P-N
Epoxy Glass Fiber
Lenght 3,3m
Resistance 36 Ohm

Copper metal connector



$$\text{Resistance} = \frac{\text{Resistivity} * \text{Lenght (L)}}{\text{Section (B)}}$$

FARADAY PN resistività		
L (mm)	Ω	Ωm
500	4,74	1,90E-05
1000	9,9	1,98E-05
1500	14,72	1,96E-05
2000	20,97	2,10E-05
2500	25,59	2,05E-05
3000	31,41	2,09E-05
3500	36,09	2,06E-05
4000	41,4	2,07E-05
L	mm	Length
b	mm	Width
t	mm	Thickness
B=bxt	mm2	Section



KIT FOR TEST

Lamiflex can provide you samples for your internal test



BOX INCLUDE:

- CD Lamiflex with company brochure MSDS and Data Sheets
- Little box with Soliani materials and company brochure as well (shielded honeycomb, glass and gasket)
- Pre preg
 - 2m Maxwell P_Z
 - 2m Faraday P_N
 - 2m Faraday N_Z
 - 500mm Faraday G P_N
- Dry fabric (rollers around 1m):
 - FR Faraday G P_N
 - D Faraday HC P_N
 - D Faraday ST P_N
 - D Faraday TNT1 P_N
 - D Faraday P_N
- Conductive Panel size A4
- Heating Panel size A4
- Envelop bag:
 - Triaxial fabric sample : D Faraday 3D P_N
 - Sample of A Faraday TNT1 P_N
 - Sample of D Faraday G_Z
- Sample box for mobile phone test

Thanks



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R&D Responsible