electromagnetics

get it right®

# PAM-CEM Simulation Suite

## Electromagnetic Solution for Full Virtual Testing




# PAM-CEM Simulation Suite

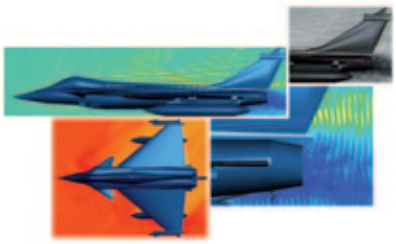
## ELECTROMAGNETIC SOLUTION FOR FULL VIRTUAL TESTING

Over the last decade, Electromagnetic Compatibility (EMC) has become a predominant design objective for all industrial sectors. Manufacturers must now guarantee their products comply with international EMC regulations and standards. With the increasing use of on-board electronic equipment, mastering EMC compliance in the early design stage is a critical technical issue and numerical EMC is appearing as a promising way to make it faster and cost-effective.

## Complete Electromagnetic Environment

### PAM-CEM/FD, 3D Maxwell Solver

The PAM-CEM/FD (Finite Difference) solver allows for fast and accurate computation of the complete electromagnetic environment. When targeting Electromagnetic Compatibility (EMC), idealized exciting waves can be easily managed while more realistic emitting or receiving devices are proposed to fit experimental conditions on the road to the Virtual Anechoic Chamber.

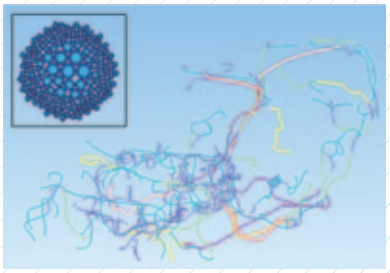


10 GHz RADAR analysis of a jet aircraft

## Conducted Phenomena on Cable Networks

### CRIPTE, MultiConductor Transmission Lines

The CRIPTE software, based on Electromagnetic Topology, enables the analysis of all conducted phenomena on Cable Networks. This includes the management of realistic bundles featuring hundreds of wires, splices, sub-networks, shielded cables, frequency dependent lossy dielectric coatings, buried wires, and many more.



Automotive Cable Network (3D running path & cross-section)

## Complex Cable Networks

### 3D/MTL Coupling

PAM-CEM Simulation Suite provides unique capabilities to handle realistic models for complex Cable Networks, which are made of bundles gathering hundred of wires integrated in realistic geometries. Starting with the geometrical model, specifying the harness path inside the vehicle as well as the related electrical architecture, all data files are automatically generated for the analysis relying on the 3D/MTL coupling procedure.

## BENEFITS

- Realistic modeling with all relevant electromagnetic features to make critical decisions in the early stage of the product design cycle
- Early identification of EMC/EMI issues at the system level avoiding extra cost and time consuming re-design iterations
- EMC testing of devices in their operating environment with a comprehensive system-level behavior
- Pre-compliance virtual testing with a high level of predictability
- Full 3D insight in the invisible world of Electromagnetics, with a better understanding of complex phenomena
- Intuitive, fast and flexible modeling process to spend more time analyzing electromagnetic results
- Automated workflow to avoid time-consuming redundant tasks for an efficient and accurate computational process

To learn more about PAM-CEM Simulation Suite, visit www.esi-group.com/electromagnetics

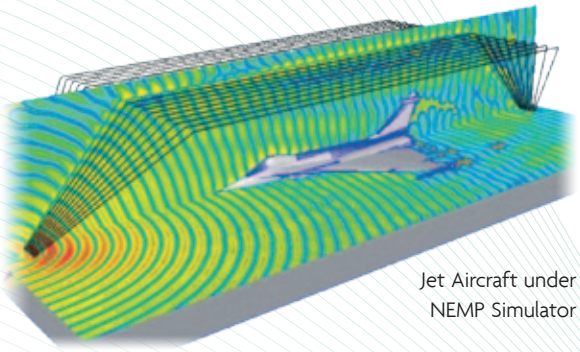
# Industries and Applications

Whether for Transportation, Aeronautics and Defense, or the Telecommunications and Electronics industries, PAM-CEM Simulation Suite is designed to address fully realistic models in their early design stage. It specifically targets electromagnetic phenomena occurring in the middle & high frequency ranges. Engineers can manage various applications by using generic and/or highly specific modeling capabilities, providing them with the ability to work with fully equipped 3D models featuring on-board complex antennas, as well as realistic cables networks.

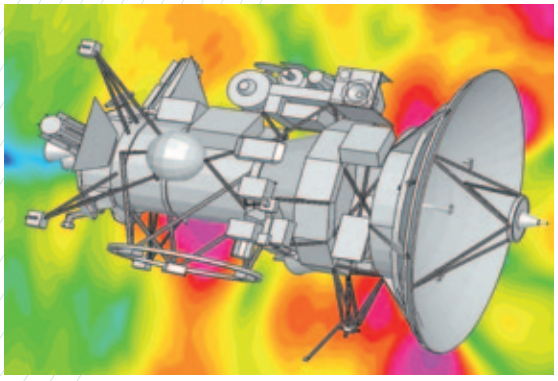
## Aeronautics and Defense

From commercial, executive or military aircraft to large naval vessels, testing in realistic conditions is usually not an option. Therefore, a solution is required which covers the complete electromagnetic spectrum, from radio frequency bands to RADAR ranges.

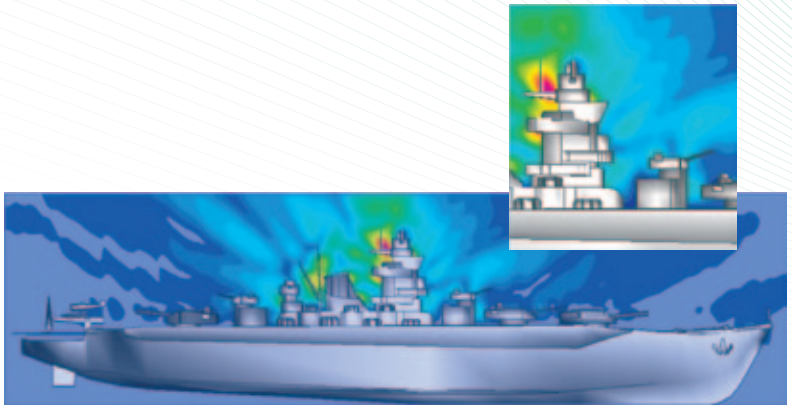
· Indirect effects of thunder lightning
· Antenna placement and cross coupling
· Radomes and Composite materials
· RADAR Cross Sections (RCS), stealth and furtivity
· EMC/EMI issues, compliance with international regulations
· Shielding, hardening to electromagnetic threats, EM pulses, etc.



Jet Aircraft under NEMP Simulator



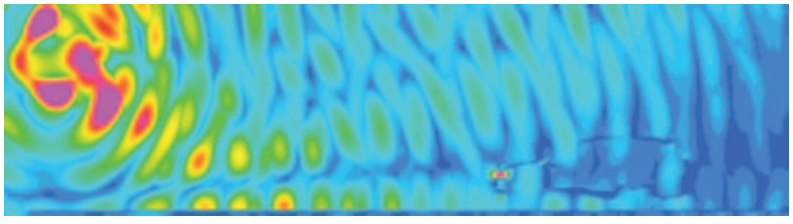
CASSINI spacecraft



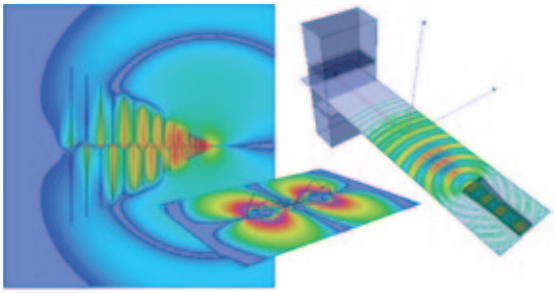
Antenna radiation

## Automotive and Railway

EMC/EMI issues are becoming more critical in the Automotive and Railway industries as sophisticated cable networks are combining their effects with various emitting and/or receiving devices. These industries are dealing with Immunity or Radiation when targeting EMC compliance, while the Virtual Anechoic Chamber is mandatory when focusing on realistic modeling and comparison with experimental measurements.



The Virtual Anechoic Chamber



Realistic modeling of wired and horn antennas

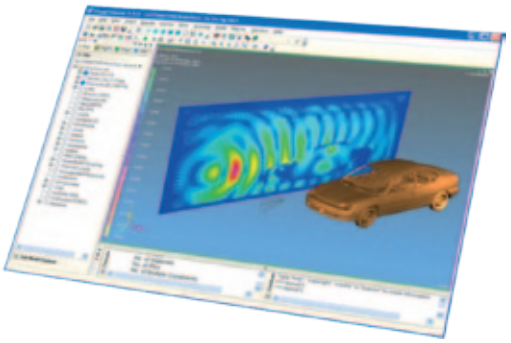
## Cable Networks and Antennas

Comparison between experimental measurements and simulated results is closely bound to a numerical model, featuring all relevant contributors to the overall electromagnetic behavior of the complete system. Specifically:

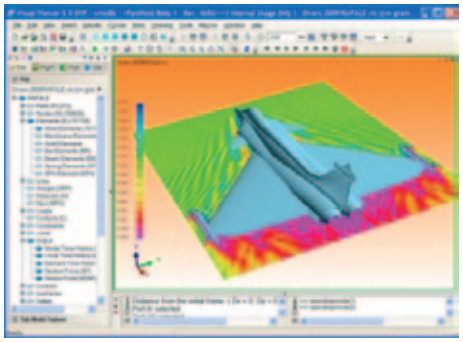
· All emitting or receiving devices, onboard antennas and radiating sources
· Internal wiring and Cable Networks with realistic loading conditions
· High fidelity modeling of major exciting and/or measurement devices, such as log-periodic, biconical or horn antennas
· Direct input of measured data when 3D modeling of highly sophisticated exciting devices remains out of reach, multilevel modeling of subsystems (3D/3D coupling procedures), etc.

# Visual-CEM

## A Dedicated Environment for Computational Electromagnetics



Users now benefit from a dedicated environment for Computational Electromagnetics within a shared platform, which allows for the automation and standardization of numerical processes while resulting in a reduction in time and resources spent on a project. Through this integration in the Visual platform users are now able to manage billions of unknowns and thus much higher operating frequencies.



Visual-CEM and Aeronautics

- Visual-CEM, a dedicated pre-processing module, proposing advanced features for the management of specialized Boundary Conditions, exciting waves or signals, 3D materials, including ideal or lossy grounds, and the specification of all targeted electromagnetic results. Also featuring wired antennas with the related loading and/or exciting conditions, in order to manage realistic emitting or receiving devices.
- Visual-Mesh allowing the management of most CAD formats, the generation of major 2D/3D meshed models and the specification of structured FD grids, with 3D refinement areas and/or staircase wired structures.
- Visual-Viewer, post-processing tool shared by all disciplines integrated in the Visual-Environment and upgraded in order to deal with typical electromagnetic data such as polar plots and antenna radiation patterns.

The Visual-CEM context can be enriched with many complementary modules of the Visual-Environment in order to avoid, for instance, long and tedious repetitive tasks (process automation and content management).

A deep insight into electromagnetic phenomena is offered by the PAM-CEM Simulation Suite for a variety of EMC/EMI applications, in many industrial sectors and wide frequency ranges, from radiated 3D effects (PAM-CEM/FD) to induced ones along Cable Networks (CRIPTE), but also from the low frequency range (SYSMAGNA) to the very high RADAR spectrum (PAM-CEM/HF relying on Physical Optics with Equivalent Edge Currents).

## ABOUT ESI GROUP

ESI is a pioneer and world-leading provider in virtual prototyping that take into account the physics of materials. ESI has developed an extensive suite of coherent, industry-oriented applications to realistically simulate a product's behavior during testing, to fine-tune manufacturing processes in accordance with desired product performance, and to evaluate the environment's impact on performance. ESI's solutions fit into a single collaborative and open environment for End-to-End Virtual Prototyping, thus eliminating the need for physical prototypes during product development. The company employs over 750 high-level specialists worldwide covering more than 30 countries. ESI Group is listed in compartment C of NYSE Euronext Paris. For further information, visit www.esi-group.com.


info@esi-group.com

EUROPE

**BENELUX & SCANDINAVIA**
**ESI Group Netherlands**
Radex Innovation Centre
room 4.57
Rotterdamseweg 183 C
2629 HD Delft
The Netherlands
T. +31 (0)15 268 2501
F. +31 (0)15 268 2514

**CZECH REPUBLIC & EASTERN EUROPE**
**MECAS ESI**
Brojova 2113/16
326 00 Pilsen
Czech Republic
T. +420 377 432 931
F. +420 377 432 930

**FRANCE**
**ESI France**
Parc d'Affaires Silic
99, rue des Solets - BP 80112
94513 Rungis cedex
France
T. +33 (0)1 49 78 28 00
F. +33 (0)1 46 87 72 02

**GERMANY**
**ESI GmbH**
Mergenthalerallee 15-21
D-65760 Eschborn
Germany
T. +49 (0)6196 9583 0
F. +49 (0)6196 9583 111

**ITALY**
**ESI Italia**
Via San Donato 191
40127 Bologna
Italy
T. +39 0516335577
T. +39 0516335578
F. +39 0516335601

**SPAIN**
**ESI Group Hispania**
Parque Empresarial Arroyo de la Vega
C/ Francisca Delgado,
11 – planta 2ª
28108 Alcobendas (Madrid)
Spain
T. +34 91 484 02 56
F. +34 91 484 02 55

**SWITZERLAND**
**Calcom ESI**
Parc Scientifique
EPFL / PSE-A
1015 Lausanne-EPFL
Switzerland
T. +41 21 693 2918
F. +41 21 693 4740

**UNITED KINGDOM**
**ESI UK**
1 Robert Robinson Av.
The Magdalen Centre
Oxford Science Park
Oxford OX 4 4GA
United Kingdom
T. +44 (0) 1865 784 830
F. +44 (0) 1865 784 826

**ESI Group**
**Headquarters**
100-102 Avenue de Suffren
75015 Paris
FRANCE
**T. +33 (0)1 53 65 14 14**
**F. +33 (0)1 53 65 14 12**

AMERICAS

**USA**
**ESI North America**
32605 W 12 Mile Road
Suite 350
Farmington Hills, MI
48334-3379
USA
T. +1 (248) 381-8040
F. +1 (248) 381-8998

**USA**
**ESI North America**
6767 Old Madison Pike
Suite 600
Huntsville, AL 35806
USA
T. +1 (256) 713-4700
F. +1 (256) 713-4799

**SOUTH AMERICA**
**ESI South America**
Av. Pedroso de Morais,
1619 cj.312
São Paulo
SP CEP 05419-001
Brazil
T./F.+55 (011) 3031-6221

ASIA

**CHINA**
**ESI China**
Room 16A,
Base F Fu Hua Mansion
No. 8 Chaoyangmen
North Avenue
Beijing 100027
China
T. +86 (10) 6554 4907
F. +86 (10) 6554 4911

**INDIA**
**ESI India**
Indrakrupa #17, 100 feet
ring road
3rd phase, 6th block,
Banashankari 3rd stage
Bangalore 560 085
India
T. +91 98809 26926
F. +91 80401 74705

**JAPAN**
**ESI Japan**
5F and 16F Shinjuku Green
Tower Bldg, 6-14-1,
Nishi-Shinjuku
Shinjuku-ku, Tokyo 160-0023
Japan
T. +81 3 6381 8490 / 8494
F. +81 3 6381 8488 / 8489

**KOREA**
**Hankook ESI**
157-033, 5F MISUNG
bldg., 660-6,
Deungchon-3Dong,
Gangseo-ku,
Seoul
South Korea
T. +82 2 3660 4500
F. +82 2 3662 0084

**SOUTH-EAST ASIA**
**ESI Group South-East Asia**
12, Jalan Dato Haji Harun,
Taman Taynton, Cheras
56000 Kuala Lumpur
Malaysia
T. +60 (12) 6181014