FREESPACE
ELECTROMAGNETIC TECHNOLOGIES

EMPACT

A Comprehensive Service for ElectroMagnetic imPACT

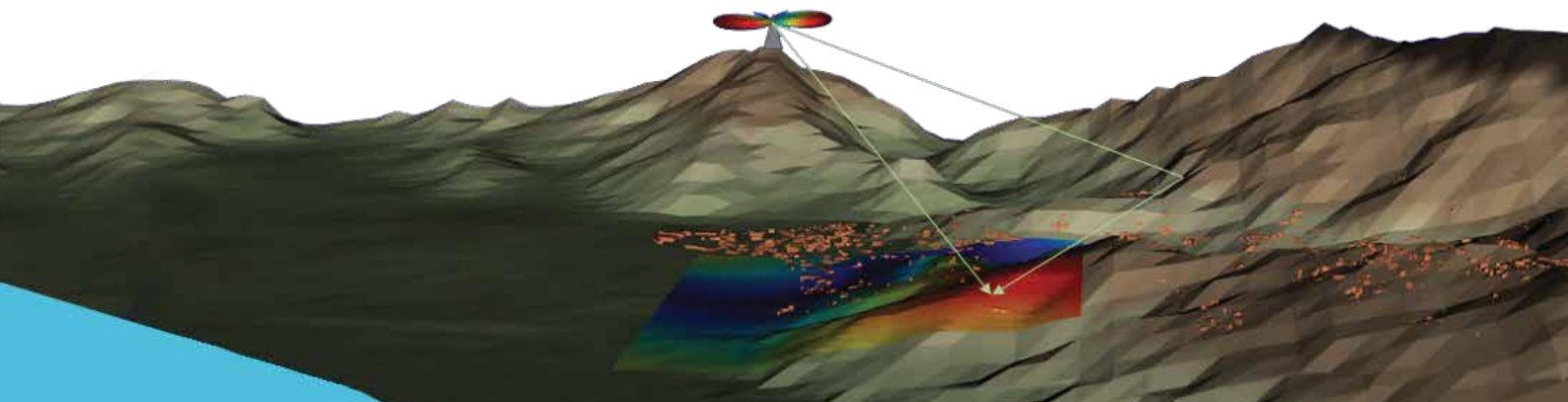
THE SERVICE INCLUDES

consultancy, design, prediction software and measurement support for robust design of complex systems in harsh electromagnetic environments

EMPACT service relies on accurate methodologies based on the high frequency theories GO (Geometrical Optics), G/UTD (Geometrical/Uniform Theory of Diffraction) and PO (Physical Optics) implemented by means of a fully 3D ray-tracing algorithm to study the EM propagation in complex scenarios.

EMPACT SERVICE IS A RESULT OF A LONG TRADITION EXPERIENCE COMING FROM THE FOLLOWING MOST IMPORTANT PROJECTS

- Base Stations Planning
  for cellular network in various cities such as **Viareggio, Lucca, Scandicci, Pisa, Pietrasanta, Forte dei Marmi, Camaiore (Tuscany, Italy)**
- EM field levels evaluation and monitoring
  in the **Poligono Interforze del Salto di Quirra (Sardinia, Italy),** study commissioned by **NATO Agency NAMSA**
- EU SANDRA Project
  in collaboration with **Institute of Communication and Navigation DLR (Germany) for network planning of future communications in airports**
- EMI analysis and prediction
  of wind farm in **Monti Albani** and in **Santa Luce (Tuscany)**



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EMPACT has several capabilities for solving different problems in the applications summarized below.

CAPABILITY	EM SOLVER	APPLICATION
Outdoor propagation in urban scenarios and in large rural areas	Ray-tracing (GO, G/UTD), Knife Edge	Cell Planning for mobile systems, Check EM levels allowed by regulations
Indoor propagation	Ray-tracing (GO, G/UTD)	Wireless Lan Coverage
Channel Analysis	Ray-tracing (GO, G/UTD)	Channel parameters estimation and short range radio links
Antenna on Platform	Ray-tracing (GO, G/UTD)	Far and Near field installed antennas performance, RADHAZ, EMC/EMI
Fixed Radio Link Assessment	ITU Recommendations, PO	Long range point-to-point radio links

ESTIMATION AND MEASUREMENTS OF THE EM FIELD LEVELS

Free Space provides a complete service related to the monitoring of EM fields both through numerical simulations and measurements (broadband and narrowband).

Free Space is able to perform measurements in **outdoor and indoor environments (both military and civilian)** of EM sources operating **from 50Hz to 18GHz** and beyond, for assessing population and workers exposure (**HERP**) as well as **RADHAZ** (**HERF, HERO, HERA, HERE**).



■ Photos of some measurement campaigns

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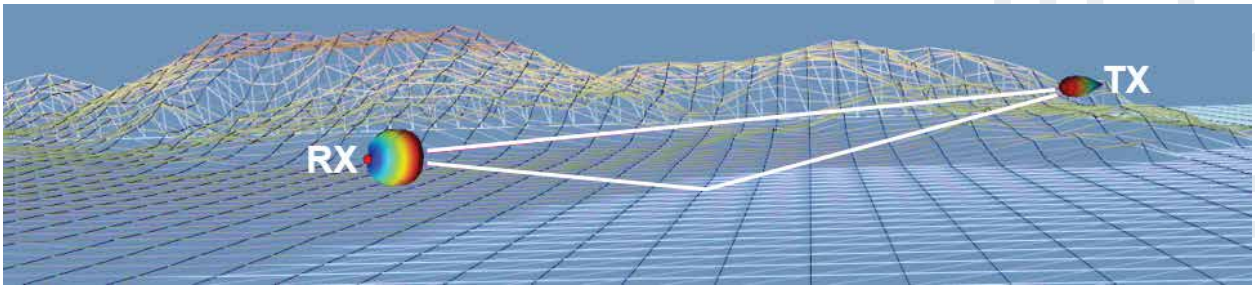
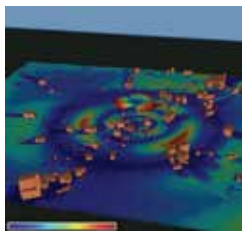
EMPACT can be used to optimize the number and position of the measuring points by identifying the most critical ones. Indeed, we are able to compute electric and magnetic fields in both far and near field regions of sources (i.e. **antennas**).

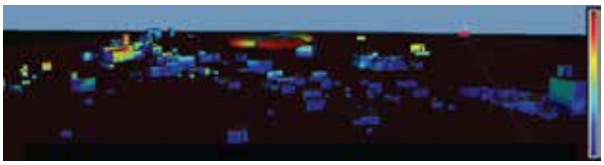
As a result of the synergy between simulations and measurements, the verification of both national and international regulations is efficient both in terms of time and cost.

■ Measurement and simulation work process

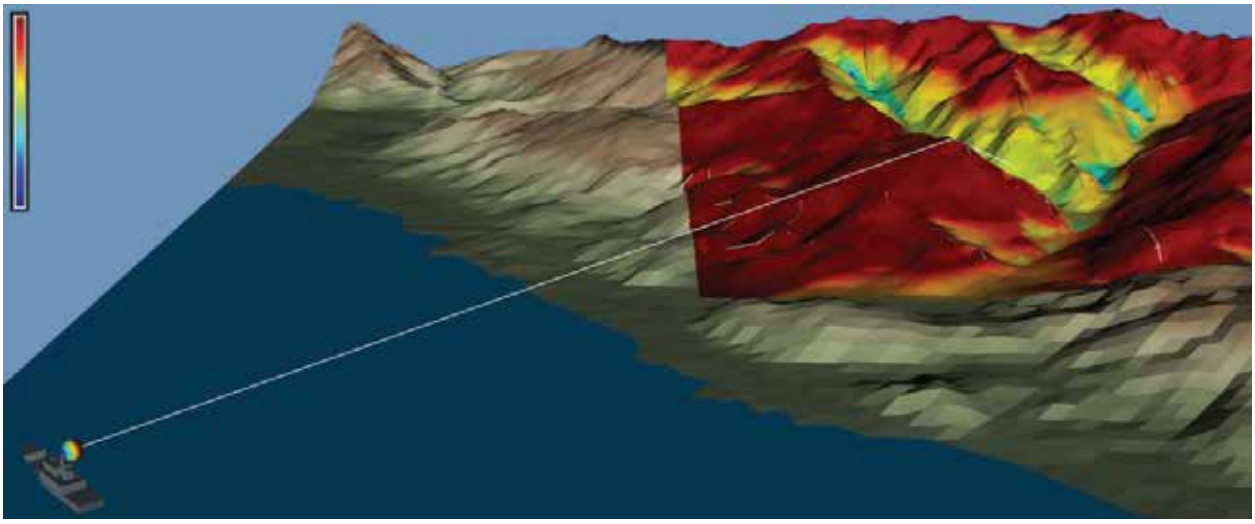




■ EMPACT: Electric field distribution in an urban scenario due to Base Stations for Mobile Communications.



■ EMPACT: Propagation over large rural area.



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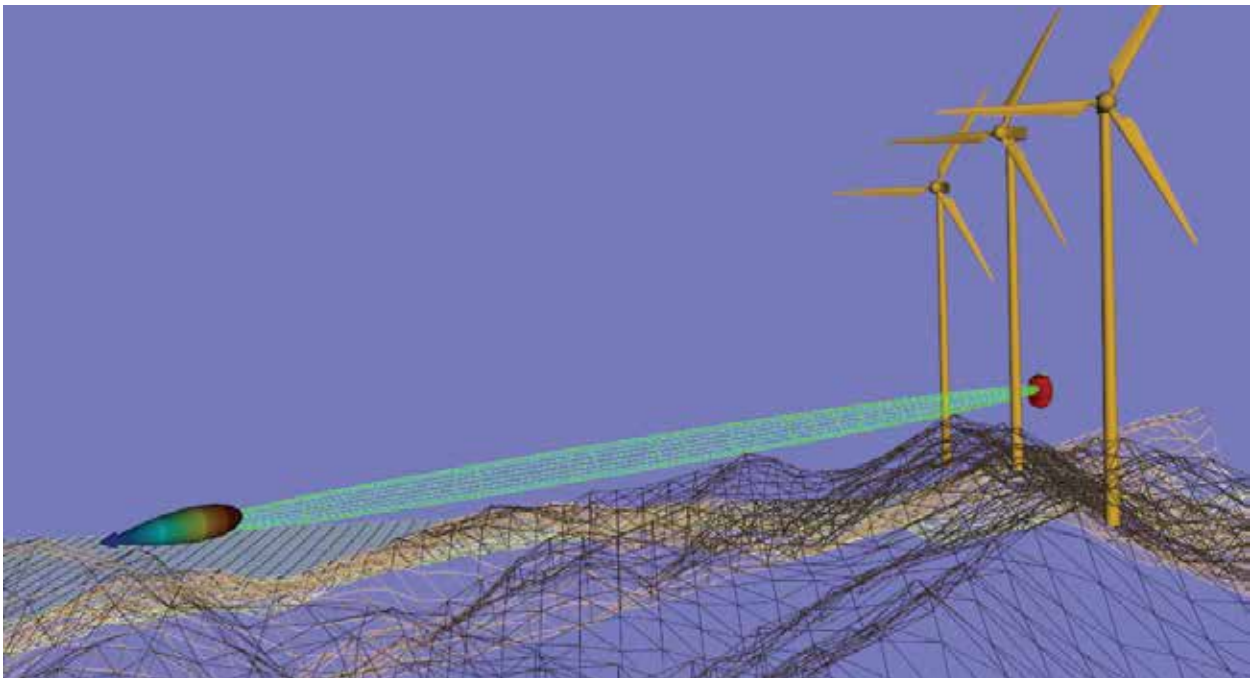
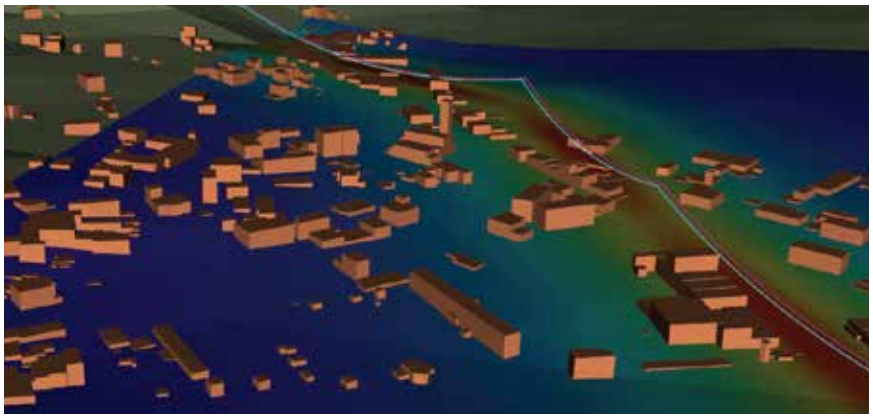


■ EMPACT: Point-to-Point Radio Link assessment

EMPACT has also a dedicated solver, based on the fully 3D Biot-Savart Law, to compute the magnetic induction due to overhead (aerial) and buried (underground) power lines at **50/60Hz**.



■ EMPACT: Magnetic Induction evaluation due to power lines at 50/60Hz.

FREE SPACE IS ABLE, UPON REQUEST, TO PROVIDE
TAILORED SOFTWARE TOOLS AND CUSTOMIZED MODELS
FOR THE DIFFERENT AFOREMENTIONED PROBLEMS