

# Electromagnetic Design and Management

EMACS Electromagnetic Airport Control and Survey

**IDS Ingegneria Dei Sistemi S.p.A.**  
Air Navigation Division, Via Flaminia 1068, 00189 Roma Italy  
Tel. +39 06 3321711 Fax +39 06 33217431  
[airnavigationsales@idscorporation.com](mailto:airnavigationsales@idscorporation.com)

**IDS Ingegneria Dei Sistemi (UK) Ltd.**  
3 Gloster Court, Whittle Avenue, Segensworth West,  
Fareham, Hampshire P015 5SH, UK  
Tel. +44 (0) 1489 885807 Fax +44 (0) 1489 584457  
[idsuk@idscorporation.com](mailto:idsuk@idscorporation.com)

**IDS Brasil Engenharia de Sistemas Ltda.**  
Av. Paulista, 2300, Andar Pilotis,  
CEP 01310-300 São Paulo – SP / Brasil  
Tel. +55 11 3060 9364 Fax +55 11 3060 9364  
[idsbr@idscorporation.com](mailto:idsbr@idscorporation.com)

**IDS North America Ltd.**  
155 Terence Matthews Cres. Ottawa, Ontario K2M 2A8 Canada  
Tel. +1 613 591-0500 Fax +1 613 591-0981  
[idsna@idscorporation.com](mailto:idsna@idscorporation.com)

**IDS North America Ltd. Montreal**  
418 Sherbrooke Street East, Montreal, Quebec H2L 1J6, Canada  
Tel. +1 514 789-0082 Fax +1 514 398-0527  
[idsna@idscorporation.com](mailto:idsna@idscorporation.com)

**IDS Australasia Pty Ltd.**  
Unit 5, 3-5 Hinkler Court, Brendale, Queensland, Australia, 4500  
Tel. +61 7 3205 5524 Fax 61 7 3205 5536  
[idsau@idscorporation.com](mailto:idsau@idscorporation.com)

**IDS Korea Ltd.**  
312-2 Migun Technoworld 1, 199 Techno 2-ro, Yuseong-gu,  
Daejeon 34025, Korea  
Tel. +82 042 932 1555 Fax +82 042 932 1557  
[idskr@idscorporation.com](mailto:idskr@idscorporation.com)





## EMACS

EMACS, ElectroMagnetic Control and Survey, applies advanced simulation techniques to assess the performance of Communication, Navigation and Surveillance (CNS) systems and can be entirely integrated and interoperable with navigation and AIS/AIM data. It helps to improve the effectiveness of CNS equipment thus improving safety, furthermore reducing the cost of flight inspections.

EMACS is composed of a modular set of validated 3D modeling and simulation tools capable of coping with ElectroMagnetic Compatibility (EMC) issues and ElectroMagnetic Interference (EMI) problems within the complex environments of airports and air navigation sites. The modeling functionality (including terrain models, obstacles, interfering systems, ground and airborne navaid equipment characteristics etc.) allows the user to model the propagation of real phenomena taking place within a complex airport scenario evaluating the electromagnetic affects where artificial or natural obstructions can interfere with navaid signals. It can be used to investigate the performance of a variety of navigation systems including: VOR, DME, ILS, ATC Radar and GPS systems.

## Electromagnetic Analysis

EMACS enables the user to calculate and simulate the same electromagnetic features of installed navaids that are typically inspected during commissioning or standard periodical flight checks. Furthermore, EMACS is capable of investigating potential changes in the environment surrounding a navigation aid (e.g. the impact of new building construction) and predicting the electromagnetic performance of any planned navigation facility.

The system is based on a layer of graphical (CAD) and geographical (GIS) functions for constructing and visualizing 3D elements on a geographic continuum using all types of datum and projections (e.g. WGS84).

EMACS allows the user to create a numerical model of the equipment under analysis and an electromagnetic model of the environment surrounding it. EMACS then performs a numerical analysis on the data provided and generates a visual representation of the computed electromagnetic field and the associated air navigation quantities (e.g. DDM, coverage limits, etc.). EMACS also has built-in parameter tools to simulate the behavior of on-board aircraft receivers.

## Basic and Multi Coverage

Basic and Multi Coverage is the core module of the EMACS system providing the following basic functions:

- Project management of the geographical and electromagnetic projects handled, workspaces and user designs
- Database connection management and interface
- User administration
- Configuration of the project data on the network and among the users
- Network and program configuration for electromagnetic analyses
- Task scheduler for electromagnetic numerical analysis execution

Basic and Multi Coverage provides numerical tools for the following tasks:

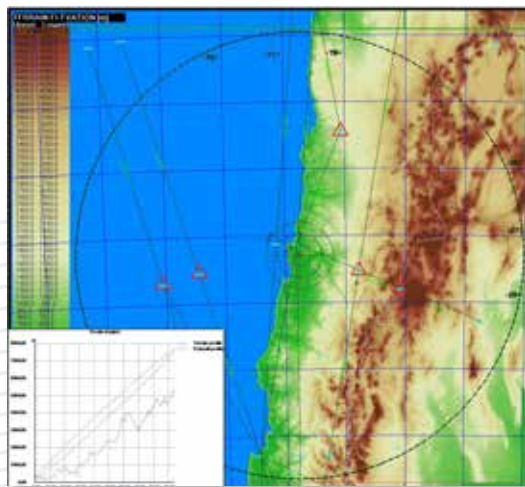
- Digital Terrain Model inspection by means of a probe function and terrain profiles extraction along polylines and/or circles
- Fresnell ellipse analysis
- CAD modeling of the environment around the TX (transmitter) antenna
- Radio coverage evaluation at a constant altitude or height and along a route segment
- Antenna pattern definition and modeling
- Electromagnetic parameters of the aerodrome/obstacle (material etc.)
- CNS equipment coverage redundancy assessment

## EMACS Modules

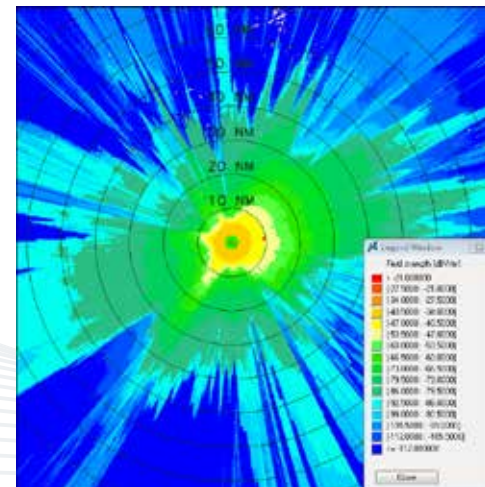
EMACS is a modular system with each module devoted to a specific type of computational analysis (e.g. Basic Coverage, EMI risk analysis, wind farm analysis, multilateration) or to a specific kind of equipment (e.g. ILS, DME, VOR, ATC).

Modules available for EMACS are:

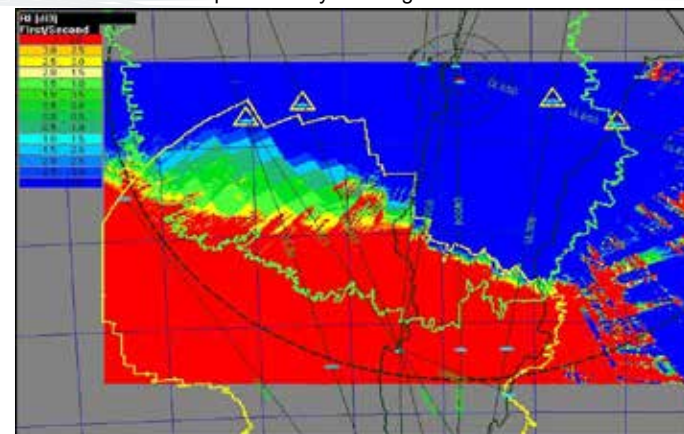
- Wind Farm - Wind Farm impact assessment
- ASUV - RNAV performance evaluation
- ILS - Instrument Landing System precision analysis
- VOR - VHF Omnidirectional Range precision analysis
- DME - Distance Measuring Equipment precision analysis
- Radar - Radar performance evaluation
- Ground-Air communications - VHF link analysis
- EMI - Electromagnetic Interference evaluation around CNS equipment
- MLAT - Airport Multilateration systems performance analysis
- WAM - Wide Area Multilateration systems performance analysis and simulation



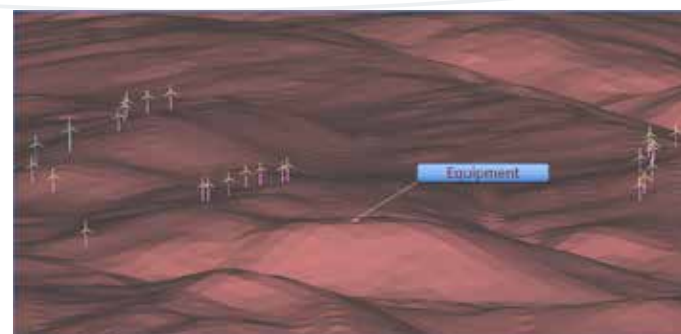
Terrain scenario and profile analysis along a radial



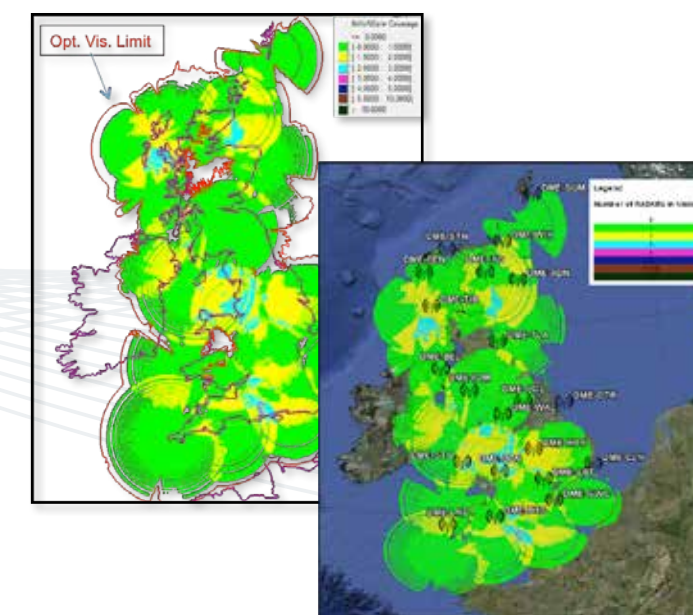
Example of radio coverage analysis of three VOR (left), and radio coverage analysis of a VOR as a function of different transmitting powers (right)



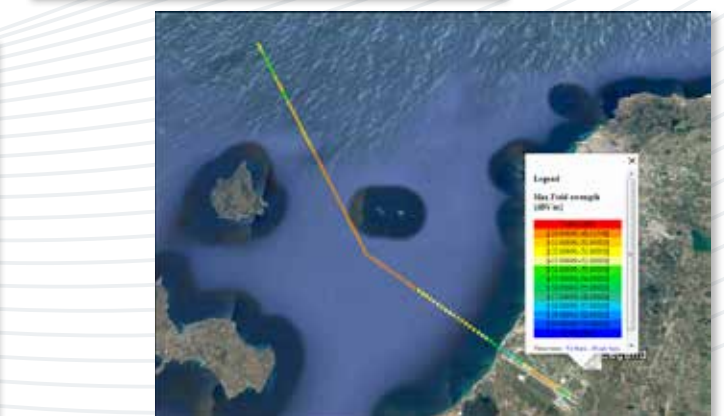
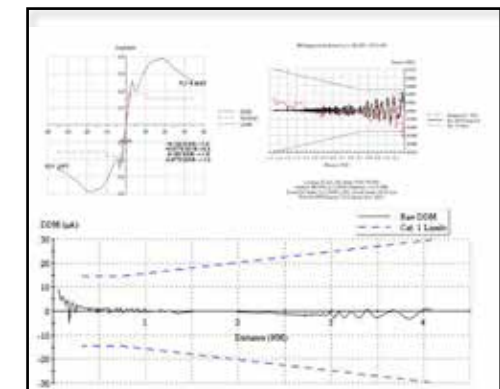
Switch point positioning along an airway segment



EMACS for site analysis and modeling, for ray tracing analysis and for ILS in time domain



EMACS navigational aid multi-coverage capability with Google export functionality



Conventional navigational aid precision analysis and RNAV performance evaluation