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Features in this issue

This edition focuses on the FEKO session at the ACES 2010 conference, as well as some important news items. News items include the release of Antenna Magus version 2.0 with exciting new features. News items also include the availability of GPU acceleration for the FEKO solver in FEKO Suite 6.0.

If you would like to comment or ask questions about the content of this issue, please send us an email, or contact your local distributor.

quarterly@emss.co.za ✉

Review of FEKO session at ACES 2010

The Applied Computational Electromagnetics Society (ACES) held its annual conference at the end of April, in Tampere, Finland. Once again FEKO enjoyed a strong presence. At this year's conference the session entitled "EM Simulations using FEKO" consisted of 11 papers of high quality, dealing with wide-ranging applications. Topics included:

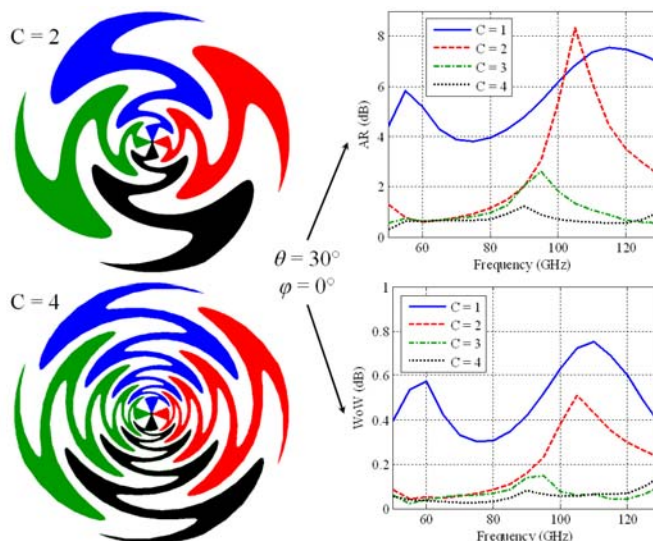
- Optimisation of printed antennas and filters using a shape preserving response prediction method or by way of tuning space mapping
- Aircraft/rocket antenna placement
- Wideband antenna modelling
- Body-worn antenna diversity study

Below we describe two of the contributions in more detail.

Modelling and Design of Frequency Independent Antennas for Millimeter Wave Electronic Warfare and UHF Platform Integration

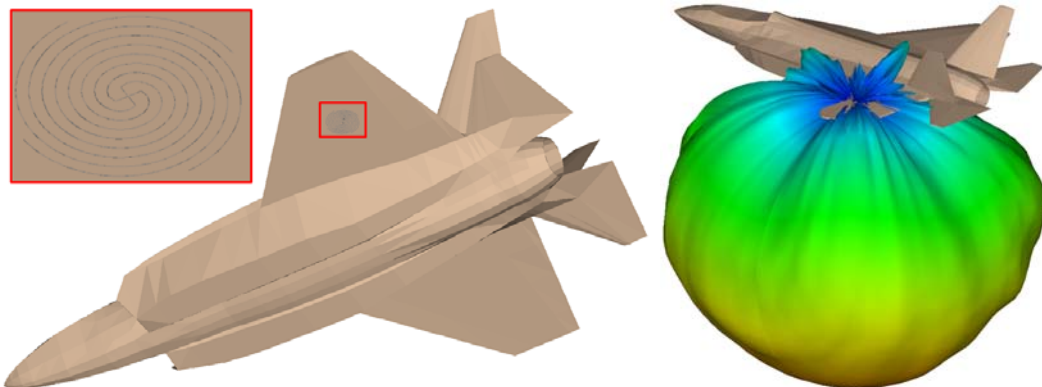
Nathan A. Sutton and Dejan S. Filipovic, Department of Electrical, Computer, and Energy Engineering, University of Colorado, Boulder, CO 80309-0425, USA.

This paper considers the analysis and design of planar dual-polarised frequency independent antennas, using the method of moments in FEKO. Specifically, fundamental properties of 4 arm sinuous and spiral antennas are investigated. Near-field and far-field antenna parameters are computed at two different frequency bands of special interest for current and future electronic warfare (EW) needs. UHF platform interaction modelling with a full-size aircraft is also conducted, which is aimed at assessing the preservation of multi-arming benefits.



Investigating sinuous antenna performance properties

“UHF platform interaction modelling with a full-size aircraft is also conducted, which is aimed at assessing the preservation of multi-arming benefits.”



Studying the integration of spiral antennas on a military aircraft platform at UHF

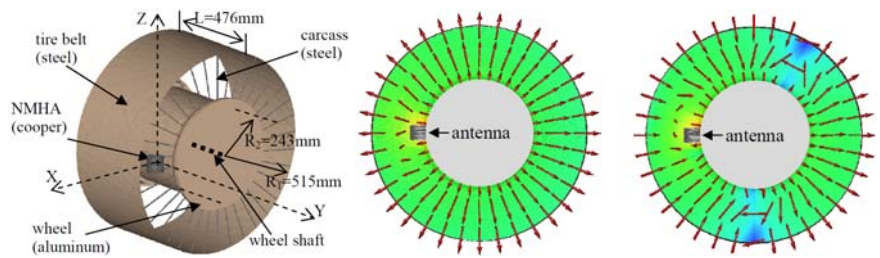
Review of FEKO session at ACES 2010... (continued)

Electromagnetic Simulation Method of a Vehicle Tyre Equipped with Carcass

Nguyen Quoc Dinh¹, Takashi Teranishi¹, Naobumi Michishita¹, Yoshihide Yamada¹, and Koji Nakatani²; ¹Department of Electrical and Electronic Engineering, National Defense Academy, 1-10-20 Hashirimizu, Yokosuka, Kanagawa, 239-8686 Japan; ²The Yokohama Rubber Co., Ltd., 2-1 Oiwake, Hiratsuka, Kanagawa, 254-8601 Japan.

A tyre pressure monitoring system, called AIRwatch has been developed by The Yokohama Rubber Co., Ltd. Pressure data is transmitted at 315 MHz by small loop antennas mounted inside the tyres. However, transmission through carcass-reinforced tyres is problematic. An approach to electromagnetic simulation of a carcass tyre with FEKO is described. For validation, electric field distributions are compared inside the tyre and inside a coaxial cylindrical resonator. For a dense carcass results correspond well. Also, modelling of attenuation due to the carcass compares favourably with theoretical values for a grid structure.

The day after the conference, an international FEKO user meeting was held, which resulted in valuable feedback from attendees.



FEKO model of the carcass and loop antenna (left); comparison of near field data obtained with a dense carcass (middle) and with a sparse one.

“One addition is the new Antenna Array Synthesis tool...”

Upgrade to Antenna Magus 2.0

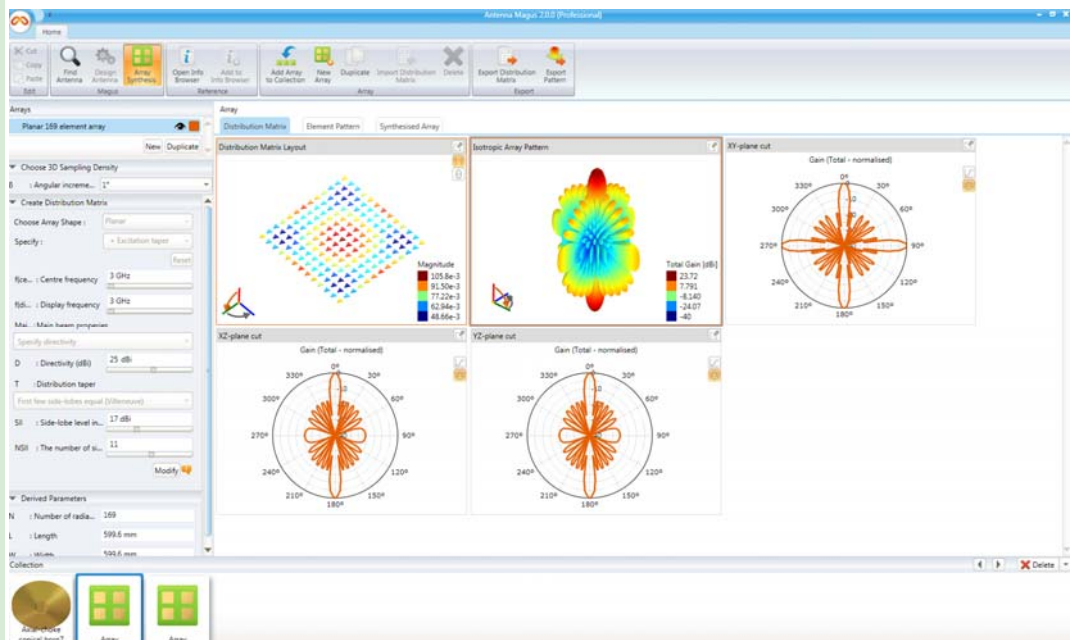
Version 2.0 of Antenna Magus has been released on April 14. The number of antenna topologies in the Antenna Magus database has almost doubled since the release of version 1.0. There are now 113 popular antennas available which can be designed according to a wide variety of objectives. Some of the more popular additions are the bi-quad, the axial choke horn, the travelling wave waveguide slot array, various patch arrays, the Vivaldi and the probe fed “Cheese” antenna.

Many other aspects of Antenna Magus have been improved with additional functionality. One addition is the new Antenna Array Synthesis tool. Array configurations can be synthesised based on performance requirements and exported afterwards. The array design can be simulated with isotropic elements or with any one of several typical element patterns.

The Antenna Magus team is confident that Antenna Magus version 2.0 will add as much value to the end-user as the original introduction of the tool did in version 1.0.

Visit <http://www.feko.info/News/upgrade-to-antenna-magus-2.0> for more information.

“...Antenna Magus version 2.0 will add as much value to the end-user as the introduction of the tool did in version 1.0.”



Antenna Magus 2.0 Array Synthesis screenshot

High-end Parallel Simulation on the SGI Cyclone system



SGI recently launched the world's first large scale on-demand cloud computing service, specifically for technical applications. EMSS - S.A. (Pty) Ltd. is proud to announce that FEKO is now available to customers with large simulation requirements via the Software as a Service (SaaS) usage model of the SGI Cyclone high performance computing system.

SGI high performance computing (HPC) systems have been market leaders in high-end computing hardware, software and networking solutions for over 20 years. The SGI Cyclone Cloud solution was

designed to serve the science and engineering communities that rely on very high-end computational hardware.

The SGI Cyclone system offers a pay-per-use usage model for FEKO users that require temporary use of a large computing platform. The system offers large scale parallelisation of FEKO simulations in an environment with sufficient memory for large problems and GPU computation acceleration (available with release of FEKO Suite 6.0, third quarter 2010).

Interested customers should contact their local FEKO distributor or SGI via the SGI Cyclone website to discuss options for usage of the Cyclone system.

http://www.sgi.com/products/hpc_cloud/cyclone

To FEKO users, this service from SGI is in addition to the already existing, similar service offered by CrunchYard.

<http://www.crunchyard.com>

Reminder:
FEKO Student Competition 2010
Win a notebook computer or a trip to an EM engineering conference of your choice
Submission deadline: September 24, 2010
For further details, please visit : www.feko.info/educational

“The SGI Cyclone system offers a pay-per-use usage model for FEKO users that require temporary use of a large computing platform.”

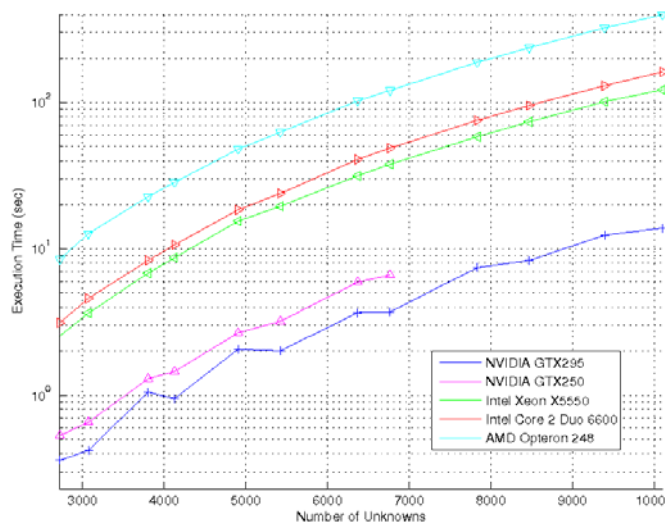
GPU acceleration of FEKO

Recently high-performance computing has seen a boost through the usage of parallel processing capabilities of multi-core GPUs (graphics processing units). Even fairly standard graphics cards found in typical engineering desktop PCs can have computing capabilities exceeding those of high-end CPUs.

Over the last year, the FEKO team has been working on integrating GPU and mixed CPU/GPU processing into FEKO for run-time critical phases of the solution process of some of the solvers available within FEKO. This functionality will be available in the next release of FEKO.

For moderate to large size Method of Moments (MoM) problems, the most run-time critical solution phase is the solution of the system of linear equations. Even though FEKO employs highly optimised libraries for the various CPUs, for this phase, the incorporation of GPU processing can increase the time performance by more than one order of magnitude.

As an example, consider calculating the backscattering from a metallic object over a frequency band with frequency dependent meshing (i.e. using between 2 700 and 10 000 unknowns) and compare the execution time for the matrix solution phase (thus not including times for matrix setup, near- and far-field evaluations, etc.). The figure shows that for an NVidia GTX295 graphics card (using one GPU only) the time is 13.9 sec, while on the three CPUs tested for comparison the times vary between 122 and 397 seconds. This is a factor of 9 to 29 faster than for the CPUs on their own.



Speedup of matrix solution phase in FEKO with GPU

“This is a factor of 9 to 29 faster than for the CPUs on their own.”

Exhibitions: FEKO will be exhibited at many conferences this quarter, including those listed below.

5 - 9 Jul '10	ANTEM/AMEREM 2010, Ottawa, Ontario, Canada
11 - 17 Jul '10	IEEE APS and CNC/USNC/URSI 2010, Toronto, Ontario, Canada
25 - 30 Jul '10	IEEE EMC 2010, Fort Lauderdale, Florida, USA
28 - 30 Sept '10	EuMW 2010, Paris, France

Resellers appointed in UK, Spain and Portugal

EMSS is pleased to announce that Aubrey Consulting has been appointed sales representative for FEKO and Antenna Magus in the United Kingdom and Dr. Jordi Soler has been appointed as sales representative for these products in Spain and Portugal.

Aubrey Consulting is an innovative product and service provider serving the commercial wireless, aerospace and public sector markets. They have more than 8 years of experience in account management, business development, participation in major proposals, procurement, supply chain solutions and project management for leading contractors in the aerospace sector.

Dr. Jordi Soler offers 10 years of experience working in engineering and business management roles within different international telecom



companies. His specialties include product and R&D project management, international business and partnership development and IPR management. Dr. Soler also has a strong technical knowledge of antennas, RF systems and communication modules. He is the author or co-author of 20 patents, has published more than 40 papers and has received several international awards. He is knowledgeable in computational electromagnetics (CEM) and commercial CEM solvers. Dr. Soler's experience and knowledge will certainly be invaluable to customers for a wide range of applications across the entire spectrum of EM simulation and design.

Contact details of these new representatives can be found at <http://www.feko.info/contacts>

APPLICATIONS

- Antenna Design
- Antenna Placement
- EMC Analysis
- Scattering Analysis
- Biomedical

SOLUTION TECHNIQUES

- Method of Moments (MoM)
- Multi-level Fast Multipole Method (MLFMM)
- Finite Element Method (FEM)
- Physical Optics (PO)
- Ray-Launching Geometrical Optics (GO)
- Uniform Theory of Diffraction (UTD)

- Planar and Periodic Green Functions
- True Hybridisation of MoM/FEM, MoM/PO, MoM/GO and MoM/UTD
- MoM for Multiple, Complex Dielectric Bodies

FAST SOLUTIONS

- Parallel Processing (Multi-Core CPUs, Clusters)
- Fast Frequency Sweep
- Out-of-Core Solving

MODEL FORMATS

- Solid Models (Parasolid, DXF, ACIS, CATIA, Pro-E, IGES, STEP, Unigraphics)
- Meshes (CADFEKO, FEMAP, NASTRAN, Auto-CAD DXF, STL, PATRAN, ANSYS CDB, ABAQUS, ASCII data format, GID)

SERVICES

- Extended Service Contract
- On-site Training (Short Course)

- CAD Preparation
- Runtime Solutions
- Engineering Consulting Services



www.feko.info

