Comprehensive Electromagnetic Solutions

FEKO

QUARTERLY: September 2010

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This edition focuses on the release of FEKO Suite 6.0. This major release is packed with new features, and comes with a completely revised version of POSTFEKO. Other news items include an exciting special offer as well as the appointment of a new FEKO and Antenna Magus reseller in South America.

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

New features in FEKO Suite 6.0

FEKO Suite 6.0, released in September 2010, comes packed with new and improved features. Here follows an introduction to some of the highlights. For a complete list, please consult the release notes which can be found in the FEKO installation directory.

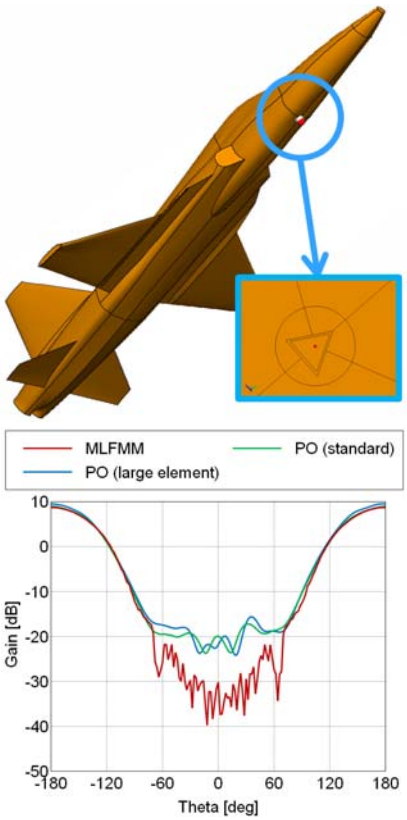
Large element physical optics (LE-PO): The physical optics solver has been extended to support electrically large elements with plane-wave based basis functions. This leads to dramatic reductions in computational cost, in cases where these elements are applicable, as the element can be very large in terms of wavelengths (2λ or even more). Typical applications are RCS, antenna placement and reflector antenna analysis where the first reflection is dominant.

Shared memory parallelisation: Distributed memory parallelisation has been available for all phases of the FEKO solver, allowing the efficient use of cluster, multi-core and multi-CPU computers. FEKO Suite 6.0 introduces pure or hybrid shared memory parallelisation based on multithreading for the MoM and MLFMM solvers. This leads to memory (MLFMM) and runtime (large MoM) savings on multi-core CPUs and multi-CPU systems.

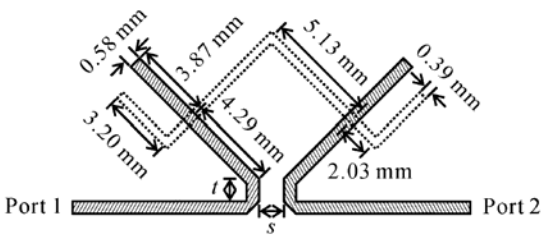
"...shared memory parallelisation based on threads is now also available for the MoM and MLFMM solvers"

Aperture modelling with planar media: FEKO has a dedicated planar multilayer MoM solver to simulate microstrip geometries very efficiently. In Suite 6.0, the capability to model slots in infinite metal surfaces inbetween dielectric layers was added. Only the slot aperture needs to be meshed, resulting in large savings of runtime and memory requirement.

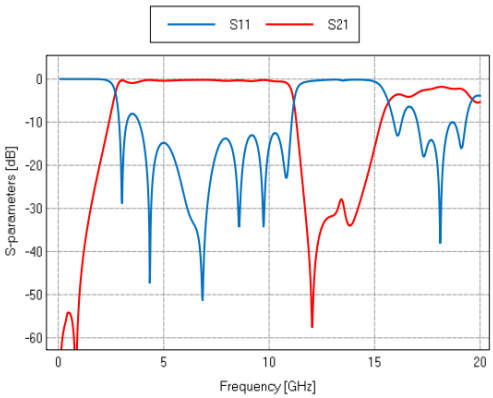
GPU acceleration of the MoM solver: Modern GPUs (Graphical Processing Unit) are now capable of complex parallel computations and can be used for general-purpose



Patch antenna placement at 4.3 GHz: Standard PO requires 560 Mbyte RAM, while LE-PO only requires 27 MByte.



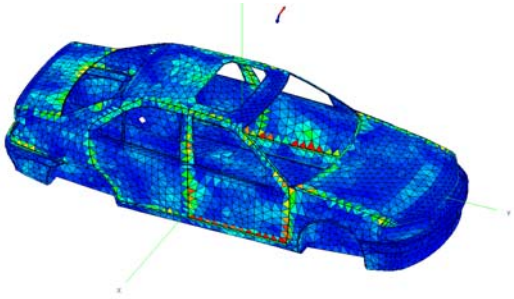
Microstrip band-pass filter making use of slots in a ground plane. This structure can now be very efficiently analysed in FEKO, by meshing only the microstrip lines and slot apertures.



New features in FEKO Suite 6.0... (continued)

computing. FEKO can now utilise NVIDIA CUDA enabled GPUs for the runtime critical solution phases of MoM matrix setup and solution. Other solution phases will be included in future releases.

Frequency dependent material modelling: In the past, a loop construct in EDITFEKO had to be used to realise a frequency sweep of a model with frequency dependent material properties. Models for variable dielectric properties (e.g. Cole-Cole, Debye) can now be used to define material parameters.



Estimated error distribution in the MoM solution of surface currents on an automobile. Note how the largest errors occur near small gaps.

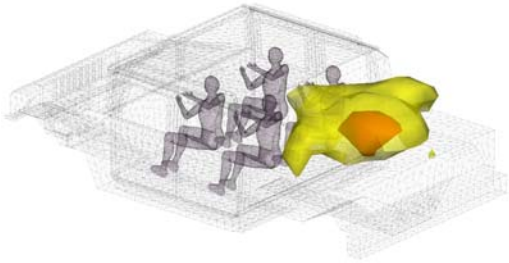
"The FEM can now be used together with the MLFMM."

Integrated SPICE circuit solver: SPICE circuit model files can now be incorporated into FEKO simulations. For example, a complex matching network may be attached to the feed port of an antenna and simulated together with the antenna. FEKO supports the Berkeley SPICE3f5 syntax.

Extended cable coupling capabilities: FEKO now natively supports a number of cable types and bundle configurations, for EMC cable coupling analysis (cable irradation only). The cable types supported are single conductors, coaxial lines, widely spaced multiple conductors, multiple conductors with a shield and ribbon cables. For shields, the Kley formulas have been implemented, as well as the Schelkunoff model.

Error estimation: The estimated error distribution in a numerical result can now be viewed in FEKO, to assist the user in refining the discretisation where it is most needed, minimising computational cost.

FEM-MLFMM hybrid solver: The FEM can now be used together with the MLFMM. This is an ideal solution for bio-EM analysis of bodies in close proximity to large metallic objects, e.g. a human phantom inside a vehicle.



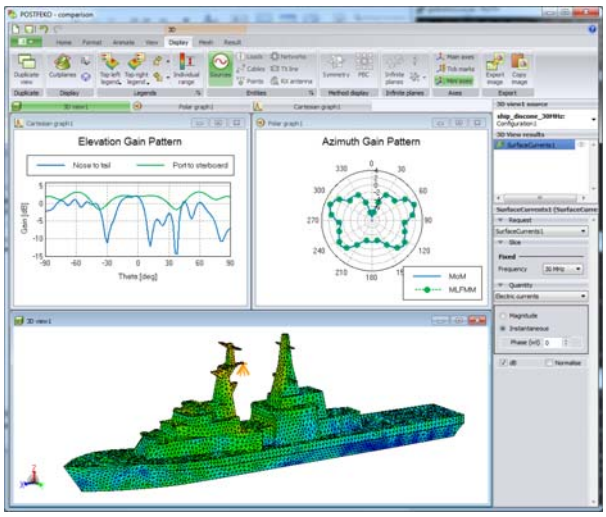
Dramatic reduction in computation cost of bio-EM analysis: standard FEM-MoM required 32.8 GByte while FEM-MLFMM only required 13.9 GByte. Runtime improved by 57%.

Accelerated mono-static RCS calculation with the MLFMM: FEKO now uses a phase corrected version of the previous angle's solution to speed up the iterative process. This can result in dramatic runtime savings.

Adaptive Cross Approximation (ACA) acceleration of the MoM solver is an exciting alternative to the MLFMM, dramatically improving the computational efficiency of the MoM. ACA is particularly well-suited to areas where the MLFMM is not applicable, e.g. planar MoM and electrically small but complex structures.

Brand new POSTFEKO in Suite 6.0

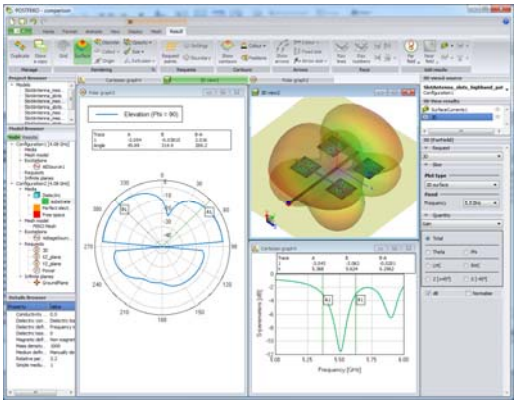
"POSTFEKO has been made easy to learn for new users as well as more intuitive and generally faster to use."



POSTFEKO is an important component of the FEKO Suite. It is used for displaying FEKO mesh models and the solution setup (excitations, field requests, etc.) before the kernel is run. Once the FEKO solution kernel has been run, POSTFEKO is used for the result extraction, visualisation, and exporting/printing. Supported 2-D graphs include polar plots for far-field results, Smith charts and Cartesian graphs. POSTFEKO also supports a rich set of features for 3-D visualisation of surface currents, near-fields, iso-surfaces, SAR values, UTD rays and 3-D far-field patterns in the same view as the meshed model.

With the release of FEKO Suite 6.0, POSTFEKO has undergone a major upgrade. One of the main motivations to redesign POSTFEKO was the improvement of usability. It has

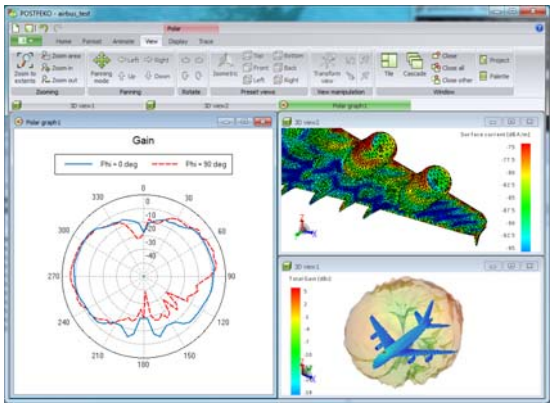
Brand new POSTFEKO in Suite 6.0... (continued)



been made easy to learn for new users as well as more intuitive and generally faster to use. This was accomplished through many internal UCD (User Centred Design) sessions with video recordings of users interacting with POSTFEKO prototypes. Amongst other things, these sessions resulted in the use of a ribbon (a menu structure also used by applications such as Microsoft Office 2007 / 2010).

Of course, everything that could be done in the old POSTFEKO is still supported in the redesigned POSTFEKO, it is just more intuitive to use. Apart from the improvements to the user experience, new features were also added and many more will follow in future releases. Some of the major new POSTFEKO features in Suite 6.0 include animating versus frequency, extended animation export options, improved distance measurement, the ability to set cursors on 2-D plots, zooming into Smith charts and polar plots, user defined legend positions, preview of optimisation masks, duplication of views (keeping all existing view settings), improved math series (i.e., post processing of data with mathematical operations) and many more (consult the complete release notes).

"...everything that could be done in the old POSTFEKO is still supported in the redesigned POSTFEKO..."



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

Intel Cluster Ready Hardware Partners

The Intel Cluster Ready program promotes the standardisation of high performance cluster computers through its network of OEM providers. EMSS, as a member of the ICR program, is working with Intel to foster closer ties with such hardware providers in a bid to improve advice and services offered to buyers of cluster computers. The OEM providers that are involved in this initiative will be able to advise prospective customers on the merits of different cluster sizes, dependent on the type of FEKO problems that the customers are interested in solving.

Launch partners of this close cooperation between EMSS and hardware providers are: **Transtec, www.transtec.de** (Europe), **Atipa Technologies, www.atipa.com** and **Aspen Systems, www.aspsys.com** (USA). Please contact your local FEKO distributor or these partners directly for information on how Intel clusters can enhance your simulation performance with FEKO.

"OEM providers that are involved in this initiative will be able to advise prospective customers on the merits of different cluster sizes"

Limited time, parallel licence upgrade discount

FEKO is well known for efficient parallel processing and maximum exploitation of available computer resources. The development of FEKO Suite 6.0 prioritised the enhancement of these features with the hybridisation of shared and distributed memory allocation for parallel processes. This hybridisation makes better use of memory on FEKO's host computer, regardless of whether CPUs are located on the same motherboard, or spread across a cluster or server computer hardware architecture.

It is with these improvements of FEKO Suite 6.0 and the initiatives of the Intel Cluster Ready program in mind that EMSS is offering a special, time limited, 30% discount to existing customers who want to upgrade from sequential to parallel licences of FEKO or add more CPUs to current parallel licences. This special offer is valid until 31 January 2011.

Please contact your local FEKO distributor for more information on this special offer.

"...EMSS is offering a special, time limited, 30% discount..."

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

8 - 10 Sept '10	EMCSA Symposium, Melbourne, Australia
28 - 30 Sept '10	European Microwave Week 2010, Paris, France
10 - 15 Oct '10	AMTA 2010, Atlanta, Georgia, USA
19 - 20 Oct '10	Antenna Systems 2010, Dallas, Texas, USA
23 - 26 Nov '10	ISAP 2010, Macau
7 - 10 Dec '10	Asia-Pacific Microwave Conference (APMC) 2010, Yokohama, Japan

Microwave Journal interviews FEKO product manager

Microwave Journal publishes regular executive interviews. The intent of these interviews is to provide insight into niche markets by industry visionaries. It is with this goal in mind that the FEKO product manager, Dr. Ulrich Jakobus, was recently interviewed by Microwave Journal. In the interview Dr. Jakobus outlines how his involvement with EMSS/FEKO has taken him from Germany to South Africa, his approach to software development and the company's strategy for achieving a global presence. He also extols the virtues of collaboration, service and customer support.

Dr. Jakobus

The full transcript of the interview can be accessed via the Microwave Journal website (mwjournal.com) or via a link from the corresponding news article on the FEKO website.

New Reseller in South America

EMSS is pleased to announce that AllOpticDesigns has been appointed as sales representative for FEKO and Antenna Magus in South America.

Aldo Peruggia Horjales is the driving force behind AllOpticDesign, an innovative product and service provider that is active in the fields of telecommunication system design, optical networking and photonic solutions. Mr. Horjales's enthusiasm for his work ensures that existing and prospective FEKO customers in South America will get the best possible solutions out of their software and will enjoy the highest standard of local service.

Contact details of this new representative can be found on the FEKO website.

AllOpticDesigns®
Photonics and Communications Solutions

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

SOLUTION TECHNIQUES
- Method of Moments (MoM)
- Adaptive Cross-Approximation (ACA)
- 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, MLFMM/FEM MoM/PO, MoM/GO and MoM/UTD
- MoM for Multiple, Complex Dielectric Bodies

FAST SOLUTIONS
- Multi-Core CPUs, Clusters, GPU
- 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

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