In this letter we present the modelling of screws in cylindrical multimodal cavity filters. The mode spectrum of each ridge circular waveguide is obtained using the Boundary Element Method (BEM) and the Contour Integration Technique (CIT). Afterwards, the complete structure composed of uniform waveguides is cascaded by a Multimodal Variational Method (MVM). This method is used with a new process to find out the number of modes. The computing time can be significantly reduced, by a factor of 3, applying this procedure.

B1.P.17 *(1108) VOLUME SINGULAR INTEGRAL EQUATION METOD IN SCATTERING THEORY*, **Alexander Samokhin**, Moscow Institute of Radiotechnics, electronics and Automatics, Applied Mathematics Russia, Moscow, 117454, Vernadsky, av, 78 117454, Moscow, Russia

We consider volume singular integral equations which describe the problems of electromagnetic scattering from three-dimensional anisotropic media characterized by permittivity and permeability. We performed a detailed analysis of these equations and corresponding scattering problems, including nonclassical ones. We consider the equivalence of the boundary value problems for the Maxwell equations and the singular integral equations and formulate the corresponding theorem. We obtain the necessary and sufficient conditions that provide the fulfillment of the Noether property of the operator and sufficient conditions for the Fredholm property. We prove the existence and uniqueness theorems for a very wide family scattering problems.

B1.P.18 *(1152) THE IMPORTANCE OF THE VELOCITY TERM IN THE ELECTROMAGNETIC FORMING PROCESS, T.E. MANEA (1), M.D. VERWEIJ (1)*, **H. BLOK (2)**, (1) Delft University of Technology, Faculty of Information Technology and Systems Laboratory of Electromagnetic Research, Mekelweg 4 2628 CD, Delft, THE NETHERLANDS

In electromagnetic forming a metal workpiece is shaped by the electromagnetic forces due to a pulsed electric current through a nearby forming coil. During the forming process, the workpiece moves with a certain velocity and the electromagnetic field should, in principle, be calculated with the use of Maxwell equations for moving media. Such equations contain additional terms as compared to those for stationary media. In this paper the motion of the workpiece is taken into account to get an insight in the order of magnitude of velocities that impose the use of Maxwell equations for moving media.

B1.P.19 *(1184) A COUPLED INTEGRAL EQUATION TECHNIQUE FOR THE ANALYSIS AND DESIGN OF COMPONENTS IN CIRCULAR WAVEGUIDE TECHNOLOGY*, **Jens Bornemann (1), Smain Amari (2)**, (1) University of Victoria, Electrical and Computer Engineering, PO Box 3055 Stn Csc Victoria, BC, V8W 3P6, Canada, (2) Royal Military College of Canada, Electrical and Computer Engineering Kingston, ON, K7K 7B4

A coupled integral equation technique is presented and applied to a variety of circular waveguide components. The algorithm is suited for both stepped and continuous profiles by engaging or disengaging edge conditions for field singu–larities. The speed of the process allows its incorporation in an optimization algorithm for fast component design and numerical fine tuning. Examples pertaining to circular waveguide transformers, standard and advanced bandpass filters, periodic structures and stepped-/continuous-profile mode converters are presented. Designs are verified by comparison with results obtained by other numerical techiques.

B1.P.20 *(1190) A RIGOROUS APPROACH TO WAVE SCATTERING BY ELLIPTIC DISKS AND RELATED PROBLEMS*, **Sergey Vinogradov, Paul Smith**, University of Dundee, Mathematics Dundee, DD1 4HN, United Kingdom

An original approach to solve rigorously a class of wave scattering problems from thin elliptic disks is developed. Applying the boundary conditions, this non-traditional formulation first establishes two-dimensional dual integral equations with trigonometric function kernels for an unknown spectral density function. A parametrisation technique transforms these equations to ``disk-like'' one-dimensional dual integral equations with Bessel function kernels, that are solved by the Method of Regularisation. Finally, each problem is reduced to the solution of an infinite system of linear equations of the second kind for unknown coefficients arising from representation of the unknown spectral density function by a Neumann's series.

B1.P.21 *(1315) FINITE ELEMENT SOLUTION FOR MAGNETOSTATICS USING VECTOR MAGNETIC POTENTIAL*, **William Davis, Kartik Sitapati**, Virginia Tech, Electrical Engineering, Bradley Department of ECE, Virginia Tech Blacksburg, 24061-0111, United States of America

This paper describes the derivation of the equations necessary to solve magnetostatics problems by the finite element method using the vector-magnetic potential with focus on the incorporation of boundary conditions. For two dimensional analysis with a normal source component, a mathematical proof is provided for the nonexistence of a linear z directed behavior in the vector-magnetic potential. The important contribution of this work is the inclusion of the boundary conditions within the functional formulation. The material presented in this paper partially forms the background required to find solutions to both static and dynamic problems in electromagnetics.

B1.P.22 *(1346) ABERRATION IN QUASI-OPTICAL FEED-SYSTEMS*, **Derek Martin (1), Robert Donnan (2), Mark Rayner (2)**, (1) Queen Mary, London University, Physics, Mile End Road London, E1 4NS, England, (2) Queen Mary, London University, Electronic Engineering, Mile End Road London, E1 4NS, England

Antenna-pattern specifications for radiometric applications of millimetre-waves are typically highly demanding. Of key concern in the design of quasi-optical feed-systems for such radiometers is the need to minimise beam aberration. Numerical/computational electromagnetic software, though ultimately useful for performance verification, is not effective in initial design and optimisation. The paper outlines the analytical approaches of Fourier and Beam-mode Optics to design and optimisation, and the development of design criteria for minimising aberrations. The presentation of the paper will include examples drawn from the design of radiometric systems for use in remote-sensing of the Earth's atmosphere

B1.P.23 *(1397) EFFICIENT ANALYSIS OF A THIN-WIRE ANTENNA ATTACHED TO A BODY*, **John Young, Chalmers Butler**, Clemson University, Dept. of Electrical and Computer Engineering 336 Fluor Daniel EIB, Clemson University Clemson, SC, 29634-0915, United States of America