Annual Report 2005
Commission B (Fields and Waves)

Alan Robert Clark

2 May 2006

1 Active S.A. Researchers and Research Groups

Research that falls under the Commission B ambit is mainly performed at the major universities, and in associated research companies.

1.1 University of Pretoria

The University of Pretoria has an extremely active (and large) research group, and this year has provided 6 journal publications.

Much work is done on microwave antenna design and computational electromagnetics.

Main contact details are Prof. Johan Joubert (`jjoubert@postino.up.ac.za`), Prof Wimpie Odendaal (`wodendaa@postino.up.ac.za`), Prof JAG Malherbe.

1.2 University of Stellenbosch

The University of Stellenbosch, via Howard Reader, spent time at NIST (National Institute of Standards and Technology) with Mike Janezic on the use of face-calibrated probes for the measurement of dielectric material properties in the 1–3 GHz band. These results are used in the study of microwave heating of minerals for mineral liberation. Publications of the research will appear this year. Further work is conducted in the area of bore-hole radar, and they have an active interest in the characterisation of materials for wave propagation.

Main contact details are Prof J Cloete(`jhcloete@sun.ac.za`), Prof David Davidson(`davidson@sun.ac.za`), Prof Howard Reader(`hcreader@sun.ac.za`), Prof. Keith Palmer(`palmer@sun.ac.za`), Prof Petrie Meyer (`pmeyer@sun.ac.za`).

1.3 University of the Witwatersrand, Johannesburg

The Computational Electromagnetics Research Group within the School of Electrical and Information Engineering consists of Prof A.R.Clark (`a.clark@ee.wits.ac.za`), and is mainly concerned with the improvement of the theory behind the simulation package SuperNEC. At present, I have work based on MBPE (Model-Based Parameter Estimation), improvements for Ray-tracing algorithms for UTD (Uniform Theory of Diffraction), and hybridising FEM (Finite Element Method) with the MoM (Method of Moments) for the purpose of modelling Dielectric slabs. Although 2005 produced 4 M.Sc's, no publications were produced.

Annual Reports of the group are compiled in September and are all to be found on the site`www.ee.wits.ac.za/~em`, or `ytdp.ee.wits.ac.za/AnnualReport2005.html`.

South African Publications in the field of Commission B—2005

[1] J A G Malherbe. Nonradiative dielectric waveguide with a perforated dielectric strip. *IEE Electronics Letters*, 41(4):194–196, Feb 2005.

[2] J Joubert and J W Odendaal. Wideband quarter-wave patch antenna with a single-layer capacitive feed on a finite ground plane. *Microwave and Optical Technology Letters*, 45(5):225–227, May 2005.

[3] J A G Malherbe. Integrated dielectric wedge-lens antenna in a non-radiative mode. *Microwave and Optical Technology Letters*, 45(4):361–363, June 2005.

[4] G Mayhew-Ridgers, J W Odendaal, and J Joubert. Efficient full-wave modelling of patch antenna arrays with new single-layer capacitive feed probes. *IEEE Transactions on Antennas and Propagation*, 53(10):3219–3228, Oct 2005.

[5] J W Odendaal, J Joubert, and M J Prinsloo. Extended edge wave diffraction model for near-field directivity calculations of horn antennas. *IEEE Transactions on Instrumentation and Measurement*, 54(6):2469–2473, Dec 2005.

[6] J P Jacobs, J Joubert, and J W Odendaal. Effect of back plane distance on mutual coupling between cpw-fed slots on conductor-backed two-layer substrates. *IEE Electronics Letters*, 47(5):407–409, Dec 2005.