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Contributions to workshops

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Abstract

This deliverable describes the dissemination of results from the benchmark comparison and other contributions related to terminal-antenna measurements.

Keyword List

Mobile communications terminals, antenna measurements, performance evaluation

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1. INTRODUCTION

It was clearly seen from the benchmarking of facilities for measurements of the radiation efficiency of small antennas, which was performed as part of WP2.2-2, that the methods used to evaluate the terminal antennas especially for the latest communication systems are still a matter that is under development in many places around the world. There are no standard measurement procedures for measuring the performance of a mobile handset, not for the radiation efficiency, and much less when including the presence of the head or the hand of a user, or the actual radio channel. Even the diverse terminology for characterising the performance has been agreed on only recently, such as specifying the total radiated power (TRP), or the total isotropic sensitivity (TIS). But also more specific characteristics such as the mean effective gain (MEG) or the mean effective link gain (MELG) that require even more difficult evaluation methods for terminal antennas are still being introduced.

2. CONTRIBUTIONS

The goal of this work package was to map the currently used measurement procedures used for evaluating mobile terminals, and to provide an overview of the basic measurement needs for modern technologies such as GSM, UMTS and WLAN. The goal of this specific deliverable was to make this knowledge available to the antenna community through a workshop. In the course of the work it was noticed, however, that there were many suitable conferences in the field, where the knowledge could be distributed e.g. in special sessions on small-antenna measurements. Finally it was seen more useful to use these multiple opportunities for dissemination rather than holding only a single separate workshop.

Therefore, results from the benchmark comparison of measurement facilities were presented at four different conferences, usually beside other measurement related presentations, also from other ACE members:

- 14^{èmes} Journées Internationales de Nice sur les Antennes (JINA) ACE/CNRS Action Spécifique 167 Small Antennas Workshop, November 2004: [1], [2].
- Loughborough Antennas & Propagation Conference (LAPC), Session on Measurements, April 2005 [3], [4].
- IEEE Antennas & Propagation Society Symposium (AP-S), Special ACE Session, July 2005 [5], [6].
- 18th International Conference on Applied Electromagnetics and Communications (ICECom), October 2005: Special Joint Session ACE-COST 284: [7].

Furthermore a number of related contributions from ACE partners were presented at other conferences, e.g. a separate comparison of radiation efficiency measurements at several institutes [8], and a novel rapid antenna measurement system that is based on a spherical multi-probe system

[9], and also at many other international conferences, seminars and workshops [10]-[20]. Generally these presentations were all very well received at all of the occasions and produced useful input for the discussions in the community. Additionally, all these presentations provided useful publicity for the ACE network and significantly increased the visibility of this Network of Excellence.

3. REFERENCES

- [1] J. Carlsson, "Benchmarking of small terminal antennas measurement facilities", *14^{èmes} Journées Internationales de Nice sur les Antennes (JINA2004)*, Nice, France, November 2004.
- [2] K. Rosengren, P.-S. Kildal, "Simulation and measurements of capacity of a 2x2 MIMO system by using embedded element pattern of two coupled dipoles", *14^{èmes} Journées Internationales de Nice sur les Antennes (JINA2004)*, Nice, France, November 2004..
- [3] J. Carlsson, P.-S. Kildal, "Round Robin test of active and passive small terminal antennas", *Loughborough Antennas and Propagation Conference (LAPC 2005)*, Loughborough, UK, April 4-6 2005.
- [4] P.-S. Kildal, "Characterization of small antennas and active mobile terminals in Rayleigh fading by using reverberation chamber", *Loughborough Antennas and Propagation Conference (LAPC 2005)*, Loughborough, UK, April 4-6 2005.
- [5] J. Carlsson, "Benchmarking of facilities for small terminal antenna measurements", *IEEE International Symposium on Antennas and Propagation (AP-S 2005)*, Washington D.C., 3-8 July 2005.
- [6] C. Orlenius, P.-S. Kildal, G. Poilasne, "Measurements of total isotropic sensitivity and average fading sensitivity of CDMA phones in reverberation chamber", *IEEE International Symposium on Antennas and Propagation (AP-S 2005)*, Washington D.C., 3-8 July 2005.
- [7] J. Carlsson, "Benchmarking of facilities for small mobile terminals and their antennas: Results of a Round-Robin test in ACE", *18th International Conference on Applied Electromagnetics and Communications (ICECom 2005)*, Dubrovnik, Croatia, 12-14 Oct. 2005.
- [8] A. Diallo, C. Luxey, G. Kossiavas, P. Besnier, A. Chousseaud, Y. Mahe, S. Toutain, B. Derat, C. Delaveaud, L. Robert, J. Carlsson, P.-S. Kildal, C. Orlenius, O. Litschke, "Comparison of efficiency measurement methods for small antennas", *11th International*

Symposium on Antenna Technology and Applied Electromagnetics (ANTEM 2005), France, June 15-17, 2005.

- [9] J. Toivanen, T. Laitinen, C. Icheln, P. Vainikainen, "Spherical wideband measurement system for mobile terminal antennas", *2nd IASTED International Conference on Antennas, Radar and Wave Propagation*, Banff, Alberta, Canada, July 2005.
- [10] N. Hegge, C. Orlenius, P.-S. Kildal, "Development of Reverberation Chamber for Accurate Measurements of Mobile Phones and Mobile Phone Antennas", *Antenna Measurements and SAR (AMS) Technical Seminar*, Loughborough Univ., UK, 25-26 May 2004.
- [11] C. Orlenius, R. Bourhis, P.-S. Kildal, "Diversity gain of active DECT phones with two built-in antennas measured in reverberation chamber", *Joint COST 273/284 Workshop on Antennas and Related System Aspects in Wireless Communications*, Chalmers University of Technology, Göteborg, Sweden, 7-9 June 2004.
- [12] K. Rosengren, P. Bohlin, P.-S. Kildal, "Characterization of antennas for MIMO systems in reverberation chamber and by simulation", *Joint COST 273/284 Workshop on Antennas and Related System Aspects in Wireless Communications*, Chalmers University of Technology, Göteborg, Sweden, 7-9 June 2004.
- [13] P.R. Rogers, G.S. Hilton "3D Radiation Pattern Correlation of PDA-sized MIMO Antenna Arrays", *Joint COST 273/284 Workshop on Antennas and Related System Aspects in Wireless Communications*, Gothenburg (Sweden), June 2004.
- [14] K. Rosengren, P. Bohlin, P.-S. Kildal, "Multipath characterization of antennas for MIMO systems in reverberation chamber including effects of coupling and efficiency", *IEEE International Symposium on Antennas and Propagation (AP-S 2004)*, Monterey, California, June 2004.
- [15] R. Bourhis, C. Orlenius, G. Nilsson, S. Jinstrand, P.-S. Kildal, "Measurements of realized diversity gain of active DECT phones and base-stations in a reverberation chamber", *IEEE International Symposium on Antennas and Propagation (AP-S 2004)*, Monterey, California, June 2004.
- [16] J. Carlsson, P.-S. Kildal, "Characterization of Antennas and Wireless Terminals in Loaded Reverberation Chambers", *Euro Electromagnetics (EUROEM) Symposium*, Magdeburg, Germany, 12-16 July 2004.
- [17] K. Rosengren, P.-S. Kildal, "Simulation and measurements of capacity of a 2x2 MIMO system by using embedded element pattern of two coupled dipoles", *14^{èmes} Journées Internationales de Nice sur les Antennes (JINA2004)*, Nice, France, November 2004.

- [18] P. Kabacik, R. Hossa, A. Byndas, P.-S. Kildal, S. Özcan, “Measured radiation properties of a broadband terminal antenna”, *COST 284 Meeting on Innovative Antennas for Emerging Terrestrial & Space-based Applications*, Chexbres, February 2005.
- [19] C. Orlenius, P.-S. Kildal, “Characterization of mobile phones on reception by measurements of total isotropic sensitivity and average fading sensitivity in reverberation chamber”, *COST 284 Meeting on Innovative Antennas for Emerging Terrestrial & Space-based Applications*, Chexbres, February 2005.
- [20] P.-S. Kildal, C. Orlenius, “Characterization of mobile terminals in Rayleigh fading by using reverberation chamber”, *International Symposium on Antennas and Propagation (ISAP 2005)*, Seoul, South Korea, 2005.