

# Report on Participation in IEEE EMC Symposium 2006 in Portland

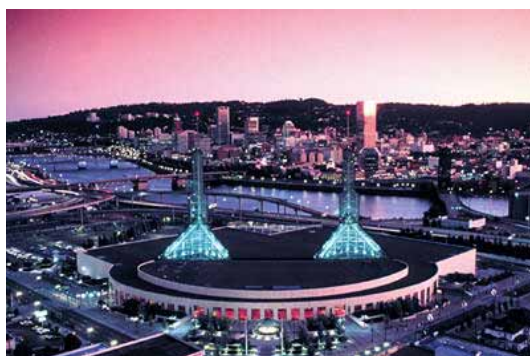
Technical Subcommittee

We participated in IEEE EMC Symposium 2006 in Portland with the following missions.

- To present a technical paper titled “Study of Site VSWR method prescribed in CISPR/A/602/CDV – Method of site evaluation for 1 - 18GHz radiated EMI measurement” prepared by the Radiated EMI Measurement Method WG under VCCI Technical Subcommittee. (This paper was selected as one of the top-10 best papers of the symposium)
- To collect information for future activities of the Technical Subcommittee on EMI measurement technology, evaluation schemes for equipment and facilities and EMC regulatory status overseas.

What follows is a report on the symposium participation.

Incidentally Mr. Osabe and Mr. Yamaguchi also attended CISPR/I/WG2, WG3 and WG4 Vancouver meetings hosted by HP company for August 7 through 11, 2006 in association with the EMC symposium.



Period of symposium: August 14 - 18, 2006

- Workshop August 14 – 18
- Paper presentations and open forum August 15, 16 and 17

Venue: Oregon Convention Center, Portland, Oregon, USA

VCCI Participants:

- OSABE, Kunihiro (Vice-Chair, VCCI Technical Subcommittee)
- YAMAGUCHI, Takashi (VCCI Technical Subcommittee, IBM-Japan)
- MIYAZAKI, Chiharu (Convener, Radiated EMI Measurement Method WG, Mitsubishi Electric)
- KAWANO, Jiroh (VCCI Technical Director)

## 1. The gist of the symposium

Paper presentations were proceeded with in seven parallel technical sessions in the morning and afternoon of August 15 through 17. Workshops were conducted in the morning and afternoon of August 14 and 18, each with five sessions to go through 20 sessions in total. Also held were six special sessions in three days of August 15 through 17. In the three preceding days of August 10 through 12, 31 open fora were also held in parallel.

Total number of papers presented in technical sessions except for special sessions was 143. Exhibitions were run collocated with the symposium in which 158 companies participated in three days starting August 15.

We participated in technical sessions of such themes as measurement of EMI from ITE, EMI measurement instruments used in regulatory context, EMI standards, management and accreditation of EMI measurement laboratories and market surveillance, among others. Some of open fora held separately were also interesting.

## 2. Summary of sessions we participated in

### 2.1 Workshops

#### **Advances in Site Validation Techniques Above 1GHz (Session # MO-AM-WS-3)**

Chair: Dr. Vince Rodriguez, ETS-Lindgren

1. Absorber Placement to Achieve “Free-Space” Test Conditions – Werner Schaefer, Cisco Systems, Inc.
2. Site Qualification Requirements Above 1 GHz – Michael J. Windler, Underwriters Laboratories Inc.
3. Introduction to Antennas Above 1 GHz – Vince Rodriguez, ETS-Lindgren
4. EMC International Standards Update - Don Heirman, Don HEIRMAN Consultants

This is one of the special sessions held in the morning of day 1. Mr. Heiman, Chairman of CISPR/A, Mr. Werner Shaefer of CISCO company and other speakers discussed deliberation status of international standards (SVSW method/CISPR/A) with regard to requirements for EMI measurement site for 1 – 18GHz, antenna characteristics, measurement methods and others. Time Domain Measurement Method (TDR) proposed within the US was also introduced in this session.

Mr. Schaefer presented measurement conditions including method of placement of floor-placed absorbing materials based on CISPR/A/648/CDV (approved for FDIS processing) for site requirements over 1GHz. He discussed TDR method good at measurement repeatability and usability by showing comparison of measurement done with antenna height changed from 1m to 2m. Mr. Schaefer further argued the necessity of floor-placed absorbing materials to reduce reflections from ground plane by demonstrating, using examples of results of measurement with time domain function of network analyzer, that even a horn antenna commonly used for measurement over 1GHz receives reflecting waves from ground plane of testing site.

Mr. Windler reported that TDR method is better than SVSWR in repeatability and measurement speed. Mr. Vince Rodriguez reported on the structure and characteristics of antenna (model 3117) used for measurement over 1GHz focusing on its peculiar directivity (existence of side lobes and main lobe coming off the axis of the antenna at 14GHz and beyond). He stressed that caution must be exercised when using this antenna in near field.

Lastly Mr. Heirman made a report on CISPR/A activities centered around status of TC77 and JTF (for work on IEC61000-4-21 reflection box and IEC61000-4-22 FAR to go shortly as CD) followed by progress status on the following standards of CISPR16.

1. Turntable, test setup table and tower: CISPR16-1-4  
Published as Amendment 2 to CISPR16-1-4
2. Antenna calibration: CISPR16-1-5  
CD released covering 3-antenna method and standard site method (SSM).

3. VSWR - Site Validation above 1GHz: CISPR16-1-4  
CDV on site VSWR method (subscribing measurement points, antenna heights and upper limits 6dB) approved to progress to International Standard (in or after September 2007).
4. Possible replacement for NSA  
Reference Site Method to replace NSA for site evaluation below 1GHz is in the phase of review/comment by product oriented committees of CISPR
5. Measurement method > 1GHz: CISPR 16-2-3  
Each NC is being questioned via product oriented committees as to the necessity of change to measurement method over 1GHz released as an amendment last year to reduce uncertainty of measurement
6. Uncertainty: CISPR 16-4-1-/2  
CD is being circulated for review which extends uncertainty of measurement instruments to uncertainty of conformity.  
This workshop was concluded with a light introduction of aforementioned TDR method as part of report on activities of ANSI ASC C63.

## 2.2 Technical sessions

Seven parallel sessions were conducted in the morning and afternoon of August 15 through 17. Themes of papers were roughly categorized either in prediction of EMI from PCB and method of control measures, development of immunity testing method based on reverberation chamber or approaches to EMC problems inside automobiles. As such, papers on new EMC themes were scarce. What follows is summaries of papers on EMI measurement over 1GHz and EMC problem solving with near field measurement which VCCI is currently interested in. The first to introduce is a paper of VCCI itself on SVSWR elaborated by the VCCI Technical Subcommittee as part of its activities.

### 2.2.1 Title: Investigation of Radiated Emissions Test Site Validation Method above 1 GHz

Author: Chiharu Miyazaki, Katsuyuki Tanakajima, Hidenori Muramatsu and Jiro Kawano/VCCI Technical Sub-committee

This is a report on technical issues involved in CISPR/A/602/CDV (revised as CISPR/A/648/CDV) on SVSWR method (equivalent to site attenuation measurement for 30MHz – 1GHz). This is the only method of site evaluation for EMI measurement over 1GHz (up to 6GHz) on which the CISPR committee has not reached a consensus. Major points of the paper found through experiments are as follows.

- (1) It is impossible for sites loaded with a great deal of testing jobs to satisfy the standard (solved in CISPR/A/648/CDV though)
- (2) Directivity of antenna affects results of site evaluation
- (3) SVSWR is underestimated if antenna with antenna elements distributed in the direction of antenna traveling like log-periodic antenna is used as receive antenna.

Because the paper was selected as one of the top 10 best papers of the symposium cameraman crews took pictures of the VCCI presenter getting nervous before the presentation. By the starting time of 9:30 the room was

almost full with audience. The presenter got into his pitch without ado following the introduction by Chairman Dave Arnett of HP in the atmosphere full of expectation. As soon as 20-minute presentation was finished 5 – 6 people raised their hands for questions and answers. Because of the time limit per session some questions were asked off the tent, which just went to show how people were interested in the presentation. We think we were able to demonstrate our activities in VCCI Technical Subcommittee.

#### 2.2.2 Title: Influence of H-plane Pattern Performance of the Omnidirectional Transmit Antenna to the Site VSWR Result

Author: Alexander Kriz / Business Unit RF-Engineering, ARC Seibersdorf research GmbH

SVSWR is about to be standardized as a method of evaluation of site for EMI measurement over 1GHz. This is a report on experiments to validate prediction of effects of differences in H-plane antenna directivity of omnidirectional antenna used as transmit antenna in the VSWR measurement of imperfect site (reflective objects intentionally placed in the side and back of the site). The experiments were carried out with an omnidirectional antenna and three antennas with their directivity intentionally changed differently on an imperfect site. The results indicated that difference in level is 1dB at most between measurement by such an antenna as with its H-plane pattern greatly distorted as to generate side lobes and measurement by antenna with directivity specified in CISPR/A/648/CDV. This result implies that SVSWR may oversight defects of sites with problems existing behind EUT. With these findings the paper concluded that there is a need for further study of specifications of antenna directivity in SVSWR.

#### 2.2.3 Title: A Study of Platform EMI from LCD Panels - Impact on Wireless, Root Causes and Mitigation Methods -

Author: Jin Shi, Al Bettner and Gordon Chinn / Mobile Platforms Group Intel Corporation

It is necessary to determine the optimized position of Wireless LAN antenna inside a laptop PC in such a way that it is separated from LCD circuit, the major noise source, as far as possible because EMI noises greatly affect transmission rate of Wireless LAN of laptop PCs. This paper argues the necessity of near field measurement of noises from LCD circuit and cables both at E field and H field to facilitate the position optimization. More concretely, by measuring near field noises from LCD driver circuit and cables inside a laptop PC both at E field and H field will help analyze their impact to Wireless LAN antenna with throughput rate of Wireless LAN as proxy values. The paper emphasizes that it is important to determine optimized placement of parts and components of a laptop PC by measuring near field electromagnetic noise distribution around each circuit, parts and cables because far field measurement of EMI commonly carried out based on CISPR standards will not do much service to EMC design of interior of equipment.

#### 2.2.4 Title: Modeling radiation sources of electronic components

Author: Yolanda Vives Gilabert, Christian Arcambal, David Baudry, Anne Louis, Belahcene Mazari,

Sylvain Alves, Michel Stanislawiak and Philippe Eudeline/IRSEEM (France) and Thales Air Defence

This paper discusses a method of modeling as a noise emission source of two electronic devices, micro controller and transmitter. It claims that near field strength of a certain frequency becomes predictable if electronic parts are modeled by an array of micro dipole antennas (with current and the angle of elements as parameters). Time to do modeling (computation) using near field strength ( $H_x$  and  $H_y$ ) around electronic parts is as short as few minutes. The measuring instrument used for verification was a robot developed by IRSEEM of France having 5 axes ( $x$ ,  $y$ ,  $z$ , horizontal rotation axis and vertical rotation axis) with positional resolution being  $10\mu\text{m}$  and rotational angle precision being  $0.009^\circ$ . Results of computation match well with results of measurement (at near field of 2mm – 5mm above electronic parts) to suggest that this is a good scheme of modeling to use. It seems, however, further study is needed in terms of application to wider range of frequency and feasibility of computation of total energy emitted from a circuit board.

### 2.2.5 An Equivalent Circuit Model for Predicting EM Radiation from a PCB Driven by a Connected Feed Cable

Author: Yoshiki Kayano, Motoshi Tanaka and Hiroshi Inoue / Akita University

This paper discusses a method to predict radiated EMI from PCB which is fed signals through a coaxial cable. Proposed method is to use an equivalent circuit model based on common mode antenna impedance and distributed constants circuit, which facilitates prediction of radiated EMI up to 18GHz. A comparison made between measurement by differential mode, measurement by common mode, output of computation by FDTD and output of computation by the proposed method indicates they all agree fairly well with each other in the frequency range of 10MHz to 18GHz. An interesting argument among others was that differential mode radiation is not negligible against common mode radiation in GHz band while common mode radiation is dominant in MHz band.

### 3. Exhibitions

EMC related exhibitions of approximately 160 companies held in the center area of the convention center attracted a lot of people passing by on the way to/from the venue of the technical sessions. One interesting thing in the exhibition was an antenna lift made of two antenna masts capable of changing antenna angles which was also exhibited last time. Another thing which drew our attention was a new model of horn antenna 3115 adjacently exhibited to red 3117 horn antenna which was referred to in the workshop on TDR measurement in 1 – 18GHz frequency range. A booth attendant explained that they would continue supply of 3115 as there still is market for it after 3117 was released which was designed to overcome directional peculiarity of 3115 (dipping at angle zero in 12 – 18GHz range).

### 4. Concluding remarks

We are honored that a paper contributed by the VCCI Technical Subcommittee was selected as one of top-10 excellent papers this time although it is a pity it was not awarded Best Paper Award. The symposium this time provided us with a good opportunity to prove that activities of the Technical Subcommittee are excellent. The fact that the VCCI presentation made the room almost full of audience who gave a big applause at the end and kept

asking questions offline even after the session indicated that people had a lot of interest in technical issues in EMI measurement over 1GHz. We believe we had a great time to demonstrate high value of the VCCI technical work. In return we were exposed to a lot of useful information in the symposium and exhibitions for the future activities of VCCI.

We left Portland feeling that we should be engaged more in outreach activities to get the presence of the VCCI Technical Subcommittee recognized on a global basis.