# VCCI DAYORI

## No.154　2024.10

## Contents

Contribution

# Round-robin test to assess site performance for measuring radiated disturbance from 18 to 40 GHz

National Institute of Information and Communications Technology
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1. Foreword

As a method of assessing sites for measurements from 1 GHz to 18 GHz, the site VSWR method (hereinafter, "SVSWR method") is included in the CISPR16-1-4 standards. However, the current CISPR standards have not yet stipulated a site assessment method for frequencies above 18 GHz. For measurements above 18 GHz, as for 18 GHz or less, a "free space" condition is usually required for test sites. Therefore, to use an open test site or semi-anechoic chamber as a measurement site, a radio-wave absorber must be laid on the floor, and the site must be confirmed to meet site requirements.

The SVSWR method is used to assess sites for measurements at 1 GHz or above. This method offers advantages such as excluding calibration uncertainty of the antenna in use, and the ability to more directly and easily detect site defects. However, in recent years, higher frequencies are becoming subject to measurement (in the CISPR standards, target frequencies are planned to be extended to 40 GHz), leading to more costly and time-consuming assessments. Therefore, in this report, a round-robin test was conducted to test the possibility of omitting assessment for sites above 18 GHz, and to consider the possibility of omitting site assessment itself. I'd like to share an outline of our results here.

2. SVSWR method

The SVSWR method is stipulated in CISPR16-1-4. As shown in Figure 1, this method involves measuring reception-level characteristics in horizontal and vertical polarization at five reference points in the cylindrical test space (test volume) surrounding the EUT. As shown in equation (1), $S_{VSWR}$(dB) is calculated from the maximum value $V_{max}$(dB) and minimum value $V_{min}$(dB) of the received data for each polarization.

$$S_{\mathrm{VSWR,dB}} = 20\log\left(\frac{V_{\max}}{V_{\min}}\right) = V_{\mathrm{max,dB}} - V_{\mathrm{min,dB}} \tag{1}$$

An antenna used for radiated disturbance measurement is used as the receiving antenna. For the transmitting antenna, select a dipole antenna or biconical antenna (omnidirectional in the H plane, and the so-called "figure-eight" directional in the E plane) whose radiation pattern is isotropic to simulate the EUT. Reference points are positioned at the center (C), left side (L), right side (R), front (F), and upper front (U) of the test volume (U can be omitted from assessment depending on the size of the EUT). $S_{VSWR}$ (dB) is calculated by correcting the distance from each reference point's position to the transmitting antenna. Note that according to the CISPR standards, the EUT is deemed compliant if the $S_{VSWR}$(dB) is 6 dB or less.

To measure reception-level characteristics, the transmit-antenna position is calculated from each reference point shown in Figure 1 as follows: r1 = D + 0 cm, r2 = D + 2 cm,

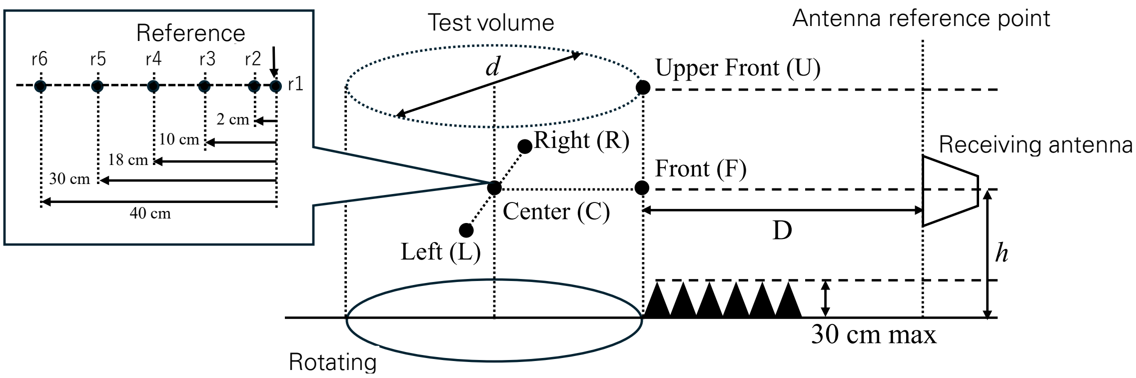


Figure 1 Positional relationship between the receiving antenna and each reference point

Here, D is the measurement distance to each reference point. For example, Figure 1 shows the distance to the front (F) reference point. To correct the distance, correct the reception value at each position from r2 to r6 to the distance for r1.

Example of calculating the correction: Corrected value = reception value + 20·log (each position's distance/reference distance). If the reception value is -20 dBm when the r6 position at reference point F = D + 40 cm (D = 3 m), the corrected value = -20 + 20·log (3.4/3.0) = -18.9 dBm.

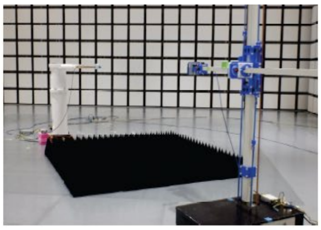
The aforementioned procedure can be used to derive $S_{VSWR}$. At this time, any measuring masts or fixed turntables are also included in the assessment, so the site assessment result is valid only for the combination of the antenna and the radio-wave absorber used in the assessment. Note that moving parts such as measurement-support platforms are excluded from assessments.

## 3. Round-robin test result

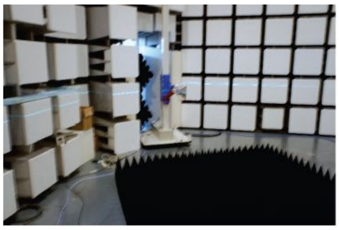
For this report, we assessed the characteristics of 1-to-18-GHz and 18-to-40-GHz sites, not only using the anechoic chamber (site A) owned by NICT as shown in Figure 2, but also at five sites across Japan co-managed with VCCI Council. Measurement instrumentation and other measurement details are as follows:

(1) Experimentation site: 10-m anechoic chamber or 3-m anechoic chamber (A to F, 6 points in total)
(2) Measurement system (such as measurement instrumentation and antennas): As shown in Figure 3

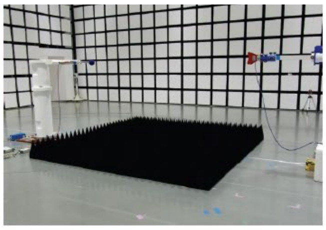
* Vector network analyzer (VNA) (ME7868A) made by Anritsu Corporation
* Transmitting antenna 1 to 6 GHz: Omnidirectional antenna (POD 16) made by Seibersdorf Laboratories
  6 to 18 GHz: Omnidirectional antenna (POD 618) made by Seibersdorf Laboratories
  18 to 40 (43.5) GHz: Omnidirectional antenna (SZ-300400/P) made by A-INFO Inc.
* Receiving antenna 1 to 18 GHz: DRGA (3117) made by ETS-Lindgren
  18 to 40 (43.5) GHz: DRGA (LB-180400-15-C) made by A-INFO Inc.
* Transmitting and receiving antenna height: 1.0 m, 1.5 m
* Transmitting and receiving coaxial cable: MWX051/2m cable made by Junkosha Inc.
* Radio-wave absorber: IS-030A2 (height: 30 cm) made by TDK Corporation
* Positioner: SVSWR positioner (DW3434AV1/O-POD) made by Device co.,Ltd.



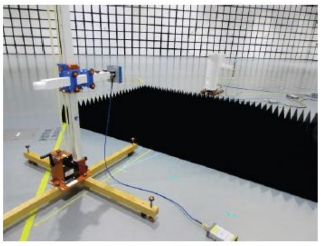
Site A (10 m)
Test volume: 2 m



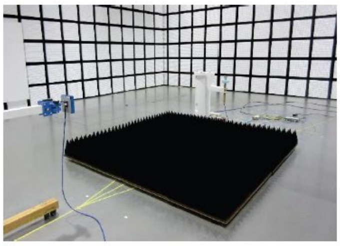
Site B (3 m)
Test volume: 1 m



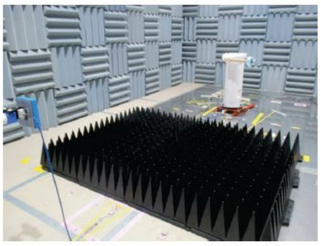
Site C (10 m)
Test volume: 2 m



Site D (10 m)
Test volume: 2 m



Site E (10 m)
Test volume: 2 m



Site F (3 m)
Test volume: 1 m

Figure 2 Each site and test volume

Note that because the VNA used in this study was divided into ports 1 and 2, we were able to shorten the cables to the transmitting and receiving antennas. Also, by moving the transmitting antenna, we were able to minimize fluctuations in the reception level. The VNA frequency was set from 800 MHz to 18 GHz and from 18 GHz to 43.5 GHz, the frequency interval was set to 50 MHz, and the IF band was set to 100 Hz. The number of measurement points for the 18-GHz-or-less and above-18-GHz bands were 345 and 511 respectively. Figure 2 shows the SVSWR measurements at each site.

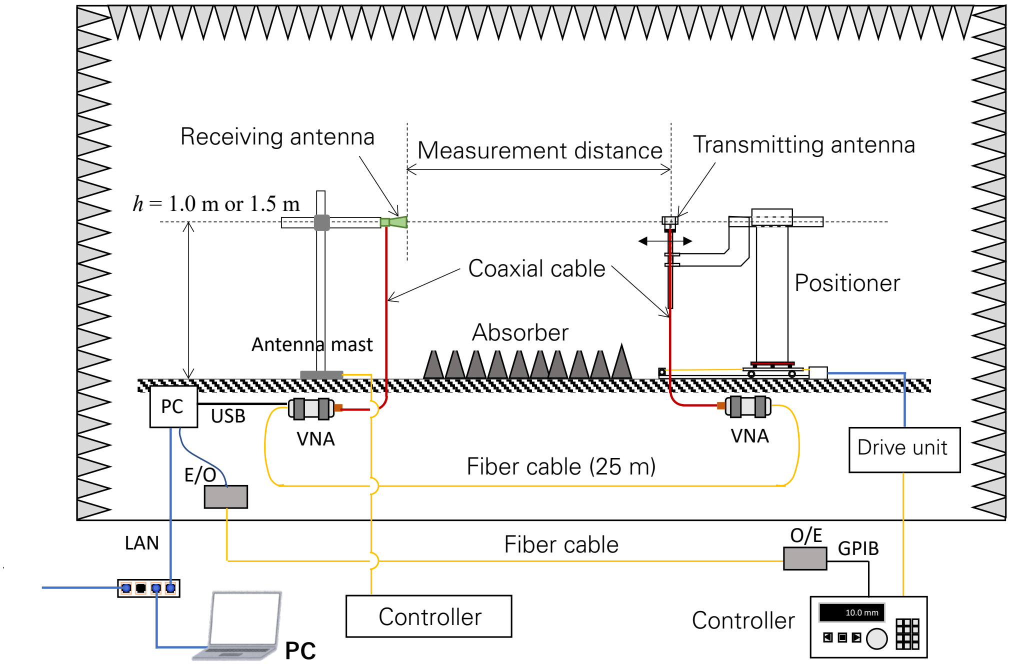



Figure 3 Measurement system of the SVSWR method

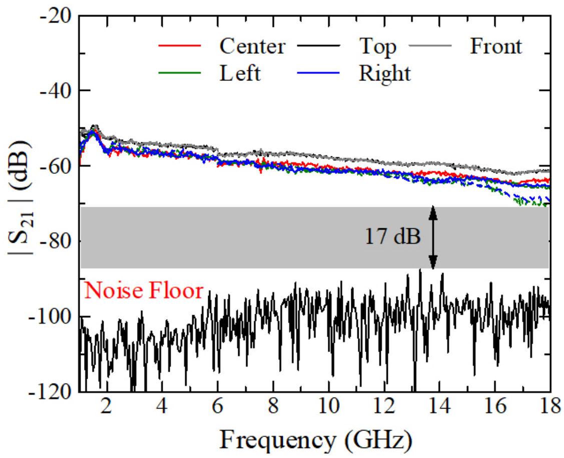



Figure 4 (a)

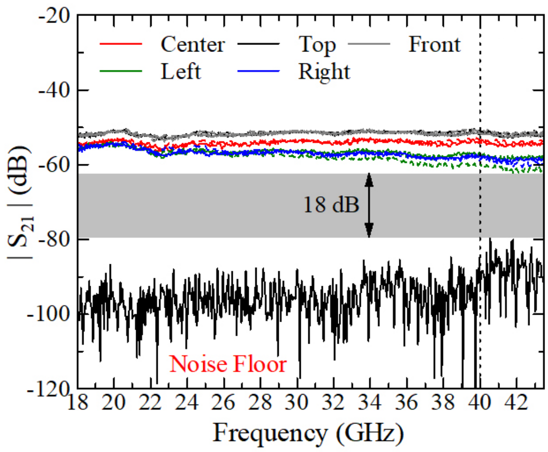



Figure 4 (b)

Figure 4 Reception-level frequency characteristics of this measurement system for 1 to 18 GHz (a) and 18 to 43.5 GHz (b)

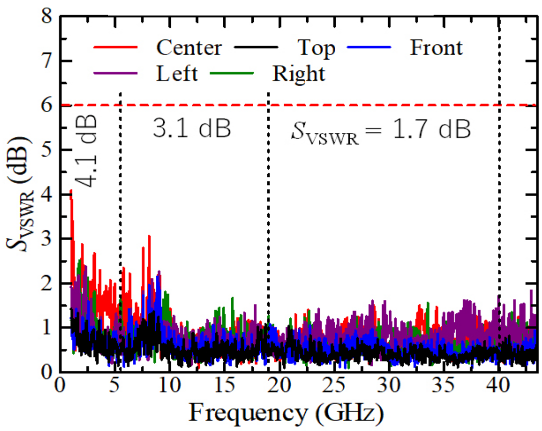



Figure 5 (a) H-Pol

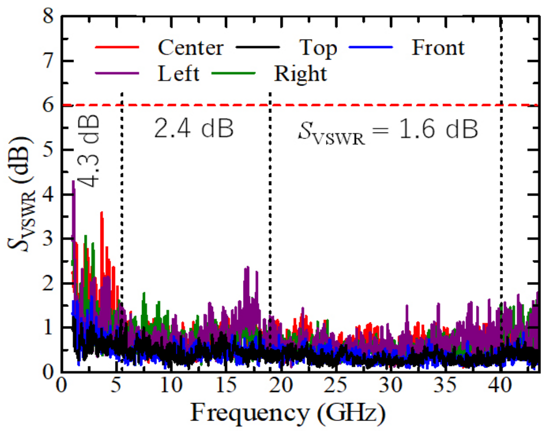



Figure 5 (b) V-Pol

Figure 5 $S_{VSWR}$ measurement results for horizontal polarization (a) and vertical polarization (b) at site A

First, Figure 4 (a) and (b) show reception-level frequency characteristics of this measurement system for 1 to 18 GHz and 18 to 43.5 GHz. Noise levels are also shown in the figure. As can be seen in Figure 4, this measurement system's noise level is about -90 dBm or less and -80 dBm or less. While about 30 dB of dynamic range is ensured for frequencies up to 1 to 10 GHz and 18 to 34 GHz, for higher frequencies, dynamic range shrinks as the frequency increases. For the maximum frequency (18 GHz and 43.5 GHz) in each frequency band, about 17 dB or more and 18 dB or more is secured.

Next, the $S_{VSWR}$ results for vertical polarization and horizontal polarization at site A are shown in Figure 5 (a) and Figure 5 (b). As can be seen in Figure 5, $S_{VSWR}$ measured for both polarizations is below CISPR's standard value of 6 dB, so the EUT can be deemed compliant. Additionally, if we compare the $S_{VSWR}$ values for 1 to 6 GHz, 6 to 18 GHz, and 18 to 40 GHz respectively, the result for horizontal polarization is $S_{\mathrm{VSWR}}^{1-6\,\mathrm{GHz}} = 4.1\ \mathrm{dB} > S_{\mathrm{VSWR}}^{6-18\,\mathrm{GHz}} = 3.1\ \mathrm{dB} > S_{\mathrm{VSWR}}^{18-40\,\mathrm{GHz}} = 1.7\ \mathrm{dB}$. Meanwhile, the result for vertical polarization is $S_{\mathrm{VSWR}}^{1-6\,\mathrm{GHz}} = 4.3\ \mathrm{dB} > S_{\mathrm{VSWR}}^{6-18\,\mathrm{GHz}} = 2.4\ \mathrm{dB} > S_{\mathrm{VSWR}}^{18-40\,\mathrm{GHz}} = 1.6\ \mathrm{dB}$. In either case, we see that the maximum value of $S_{VSWR}$ in high frequency bands is smaller than in low frequency bands. Accordingly, provided that a site is compliant at 18 GHz or less, site assessment above 18 GHz can be omitted. Similar $S_{VSWR}$ assessment results at other sites are shown in Table 1.

Table 1 $S_{VSWR}$ measurement results

| | $S_{\mathrm{VSWR}}$ (dB) | | | | | |
|---|---|---|---|---|---|---|
| | A (2 m) | B (1 m) | C (2 m) | D (2 m) | E (2 m) | F (1 m) |
| 1 to 6 GHz | 4.3 | 4.5 | 5.5 | 4.6 | 5.9 | 5.6 |
| 6 to .8 GHz | 3.1 | 2.8 | 3.1 | 3.4 | 3.5 | 2.9 |
| 18 to 40 GHz | 1.7 | 2.4 | 2.9 | 1.4 | 2.1 | 1.7 |

As can be seen in Table 1, $S_{VSWR}$ in high frequency bands was smaller than $S_{VSWR}$ in low frequency bands at all sites. This shows that site assessment above 18 GHz could potentially be omitted. These results have also been reported at the CISPR London meeting held from September 25 to 29, 2023. Until standards are defined for site assessments and measurement methods from 18 to 40 GHz, various problems will remain. However, we hope to at least encourage the possibility of omitting site assessments as requested by those in the Japanese industry.

## 4. Conclusion

We applied the SVSWR method to assess sites for measuring radiated disturbance from 1 to 18 GHz and 18 to 40 (43.5) GHz, and experimentally assessed the characteristics of six anechoic chambers across Japan. The SVSWR method is stipulated in the CISPR standards for 18 GHz or less, but there are no stipulations in particular for frequency bands above 18 GHz. Meanwhile, the raising of target frequencies for radiated disturbance measurements has raised concerns about increasing burden on testing laboratories. In this report, we showed the results of considering the possibility of omitting site assessments for 18 GHz and above. The results show that $S_{VSWR}$ in high frequency bands is smaller than $S_{VSWR}$ in low frequency bands. This suggests that if laboratories comply with the requirements of radiated disturbance measurements up to 18 GHz, site assessments for 18 GHz and above can be omitted.

Acknowledgments

The results of our SVSWR round-robin test were obtained with the help of many people. My heartfelt thanks go out to: Katsumi Fujii (NICT), Nobuyuki Mitsuzuka (Telecom Engineering Center); Hidenori Muramatsu, Toshiki Shimasaki (VCCI); Shinichi Okuyama (NEC Platforms); Masaru Yoshihara (Riken Environmental System); Hironari Tanaka (Ohtama Calibration Service); Katsunori Miura (JQA); Takeshi Yamanaka (Intertek Japan); Masashi Takabe, Kimihiro Tajima (NTT-AT).

Jerdvisanop Chakarothai

2001 Graduated from the Department of Electrical and Electronic Engineering, Faculty of Engineering and Resource Science, Akita University
2003 Graduated the Master degree from the Department of Electrical and Communication Engineering, Graduate School of Engineering, Tohoku University
2010 Graduated the Doctoral degree from the Department of Electrical and Communication Engineering, Graduate School of Engineering, Tohoku University
2011 Research Associate, Graduate School of Engineering, Nagoya Institute of Technology
2013 Research Associate, Graduate School of Systems Design, Tokyo Metropolitan University
2013 Researcher at National Institute of Information and Communications Technology
2019 Senior Researcher at National Institute of Information and Communications Technology

Major awards received

2013 Received the URSI Young Scientist Award
2019 Received the Electronics Society Invited Paper Award from the Institute of Electronics, Information and Communication Engineers
2020 Received the ISAP Best Paper Award

# Committee Activities

## ●Council

| Date | June 28, 2024 |
| --- | --- |
| Agenda items | ● Agenda item 1 FY 2023 business report<br>● Agenda item 2 FY 2023 settlement of accounts (draft)<br>● Agenda item 3 Selection of the board of councilors and director |
| Decisions and reported items | ● Agenda item 1 Approved<br>● Agenda item 2 Approved<br>● Agenda item 3 Approved<br>● Reported item 1 FY 2024 business plan<br>● Reported item 2 FY 2024 budget plan |

## ●Board

| Date | June 11, 2024 |
| --- | --- |
| Agenda items | ● Agenda item 1 FY 2023 business report (draft)<br>● Agenda item 2 FY 2023 settlement of accounts (draft)<br>● Agenda item 3 Selection of Steering Committee members<br>● Agenda item 4 Calling of the ordinary board meeting |
| Decisions and reported items | ● Agenda item 1 Approved<br>● Agenda item 2 Approved<br>● Agenda item 3 Approved<br>● Agenda item 4 Approved |

## ●Steering Committee

| Date | May 29 and June 19, 2024 |
| --- | --- |
| Agenda items | ● Agenda item 1 Topics of the 55th board meeting<br>● Agenda item 2 Guidance on calculating measurement instrumentation uncertainty (MIU) in radiated emission measurements using hybrid antennas (draft)<br>● Agenda item 3 Replacement of the Chair of the Market Sampling Test Subcommittee<br>● Agenda item 4 New members (April to May) |
| Decisions and reported items | ● Agenda item 1 Approved<br>● Agenda item 2 Approved<br>● Agenda item 3 Approved<br>● Agenda item 4 Approved<br>● Reported item 1 Activities of subcommittees (Technical, International Relations, Market Sampling Test, Public Relations, and Education) in the period from April to May<br>● Reported item 2 Secretariat work (member entry and withdrawal trends, the number of compliance verification reports, income and expenditure records, etc.)<br>● Reported item 3 Report on the VCCI International Forum 2024<br>● Reported item 4 Report on participation in EMC Japan/APEMC Okinawa 2024 (see page 28)<br>● Reported item 5 Report on the technical exchange meeting between BSMI, CTCA, and VCCI (see page 32)<br>● Reported item 6 Report on participation in COMPUTEX TAIPEI 2024 (see page 35) |

### ●Technical Subcommittee

| Date | May 15 and June 27, 2024 |
|---|---|
| Agenda items | ● Agenda item 1 On the Technical Subcommittee's planned activities for FY 2024<br>● Agenda item 2 Creation of a guidance document on calculating measurement instrumentation uncertainty (MIU) in radiated emission measurements using hybrid antennas<br>● Agenda item 3 Guidance on radiated emission measurements conducted when an EUT power cable is terminated by balanced VHF-LISN<br>● Agenda item 4 Assessment of whether EUT impedance affects the voltage/current conversion ratio relating to transformer-type AANs during conducted emissions<br>● Agenda item 5 Activities to standardize power cable termination conditions |
| Continuing agenda items | ● Agenda items 1, 3, 4 and 5 |
| Decisions and reported items | ● Decision 2 Issuing of a guidance document on calculating measurement instrumentation uncertainty (MIU) in radiated emission measurements using hybrid antennas<br>● Reported item 1 On EMC Japan/APEMC Okinawa 2024 VCCI Tutorial and presentation of two papers (see page 28) |

### ●International Relations Subcommittee

| Date | April 10, May 8, and June 21, 2024 |
|---|---|
| Agenda items | ● Agenda item 1 Survey of trends in EMC regulations<br>● Agenda item 2 Preparation to create the FY 2024 world ITE/MME-related standards survey sheet, which is updated in July of every year |
| Continuing agenda items | ● Agenda items 1 and 2 |
| Decisions and reported items | ● Reported item 1 Updates to the website’s Survey of Trends in World EMC Regulations on April 10 and June 21 |

## ●Market Sampling Test Subcommittee

| Date | April 11, May 9, and June 13, 2024 |
|---|---|
| Agenda items | ● Agenda item 1 Summary of the FY 2023 market sampling test reports<br>● Agenda item 2 Summary of the FY 2023 document inspection reports<br>● Agenda item 3 Policies on the FY 2024 market sampling test<br>● Agenda item 4 Notes on performing sampling tests for commissioned testing laboratories<br>● Agenda item 5 Status of the FY 2024 sampling test and document inspections |
| Decisions and reported items | ● Agenda item 1 A report was made summarizing the FY 2023 market sampling test results. 100 products were selected and tested. As of March 29, judgments were passed for 98 products. The judgments of 2 failing products will be carried over into FY 2024. The final number of products for which judgments were passed is 99, including 1 product that failed in FY 2023 according to the failure criteria for FY-2022 selections.<br>● Agenda item 2 A report was made summarizing the FY 2023 document inspections. 43 products were selected, and excluding cancellations, inspections were completed for 40 products.<br>● Agenda item 3 The draft policy for FY 2024 market sampling tests was deliberated on and subsequently approved.<br>● Agenda item 4 Notes on performing sampling tests were deliberated on and approved. The notes were also approved to be sent to commissioned testing laboratories.<br>● Agenda item 5 Up to 18 products have been selected for sampling tests, and selection is still ongoing. Up to 14 documents have been selected for inspections, and both preliminary screening and inspections have been completed for 6 documents. |

## ●Public Relations Subcommittee

| Date | May 15 and June 13, 2024 |
| --- | --- |
| Agenda items | ● Agenda item 1 Summary of the Vision for Regional Cities<br>● Agenda item 2 History (chronology) of VCCI panel<br>● Agenda item 3 COMPUTEX TAIPEI 2024<br>● Agenda item 4 TECHNO-FRONTIER 2024<br>● Agenda item 5 Discussion of exhibits of Asian countries other than Taiwan (such as China and South Korea) |
| Continuing agenda items | ● Agenda items 2, 4 and 5 |
| Decisions and reported items | ● Reported item 1 Comments were received on the pros and cons of showing videos throughout the year, and proposals for the future.<br>● Reported item 3 Report on participation in COMPUTEX TAIPEI 2024 (see page 35) |

## ●Education Subcommittee

| Date | April 24 and June 6, 2024 |
|---|---|
| Agenda items | ● Agenda item 1 Status of preparations for FY 2024 education and training<br>● Agenda item 2 FY 2024 textbook revisions<br>● Agenda item 3 Results of FY 2024 education and training |
| Continuing agenda items | ● Agenda items 1 and 2 |
| Decisions and reported items | ● Agenda item 1 Four lectures were established to be held in FY 2024:<br>① The basic technique of EMI measurement [planned to be held in the first and second halves of the fiscal year]<br>② The basic of electromagnetic waves, EMI measurement technique [planned to be held in the first and second halves of the fiscal year]<br>③ The level up of the EMI measurement technique [planned to be held in the second half of the fiscal year]<br>④ The EMI measurement instrumentation uncertainty (MIU) [planned to be held in the second half of the fiscal year]<br>● Agenda item 2 Feedback from the previous fiscal year's questionnaire was reflected in the textbook revisions for "The basic technique of EMI measurement" and "The basic of electromagnetic waves, EMI measurement technique".<br>● Reported item 1 – "The basic technique of EMI measurement (held on June 7)" was held in online (livestream) format with certificates of attendance given to 16 attendees.<br>– "The basic of electromagnetic waves, EMI measurement technique (classroom lectures: July 4 to 5, hands-on training: July 11 to 12)": Classroom lectures were held in online (livestream) format, and hands-on training was held at JQA. Completion certificates were given to 7 attendees. |

## ●Registration Committee for Measurement Facilities

| Date | April 15, 2024 |
|---|---|
| Agenda items | ● Reviewed the results of deliberations by the Measurement Facility Examination WG. |
| Decisions and reported items | Conformity certified (including cases certified with qualification comments after checking of supplementary papers): 22 companies<br>Radiated emission measurement facilities below 1 GHz: 11<br>AC-mains-ports-conducted emission measurement facilities: 16<br>Wired-telecommunication-port-conducted emission measurement facilities: 15<br>Radiated emission measurement facilities above 1 GHz: 10<br>Applications returned with comments: None<br>Applications carried over to the next meeting: None |
| Date | May 27, 2024 |
| Agenda items | ● Reviewed the results of deliberations by the Measurement Facility Examination WG. |
| Decisions and reported items | Conformity certified (including cases certified with qualification comments after checking of supplementary papers): 23 companies<br>Radiated emission measurement facilities below 1 GHz: 8<br>AC-mains-ports-conducted emission measurement facilities: 7<br>Wired-telecommunication-port-conducted emission measurement facilities: 13<br>Radiated emission measurement facilities above 1 GHz: 14<br>Applications returned with comments: None<br>Applications carried over to the next meeting: None |
| Date | June 24, 2024 |
| Agenda items | ● Reviewed the results of deliberations by the Measurement Facility Examination WG. |
| Decisions and reported items | Conformity certified (including cases certified with qualification comments after checking of supplementary papers): 13 companies<br>Radiated emission measurement facilities below 1 GHz: 11<br>AC-mains-ports-conducted emission measurement facilities: 10<br>Wired-telecommunication-port-conducted emission measurement facilities: 6<br>Radiated emission measurement facilities above 1 GHz: 11<br>Applications returned with comments: None<br>Applications carried over to the next meeting: None |

38th instalment

# A Brief History of the Research of Masamitsu Tokuda, Serial Contributor to VCCI Dayori (Part 3)

### My research on EMC in telecommunication equipment

Masamitsu Tokuda

## 5. My research on EMC in telecommunication equipment

(1) EMC problems in telecommunication equipment

Sometimes, metal cable laid between a telecommunication center and a subscriber's home inadvertently acts as an antenna, inducing external electromagnetic interference and causing poor reception in broadcast receiver equipment in the home. Conversely, the metal cable can radiate electromagnetic interference, causing poor reception in broadcast receiver equipment in a neighboring home. An example of such EMC problems experienced by telecommunications networks is shown in Figure 7[17), 18)]. The biggest problem with electromagnetic interference affecting telecommunication equipment is, and has always been, lightning surges. The most common case is when a lightning strike near a communication line induces current to propagate down the communication line, destroying or disrupting the operations of telecommunication equipment. Sometimes, lightning strikes

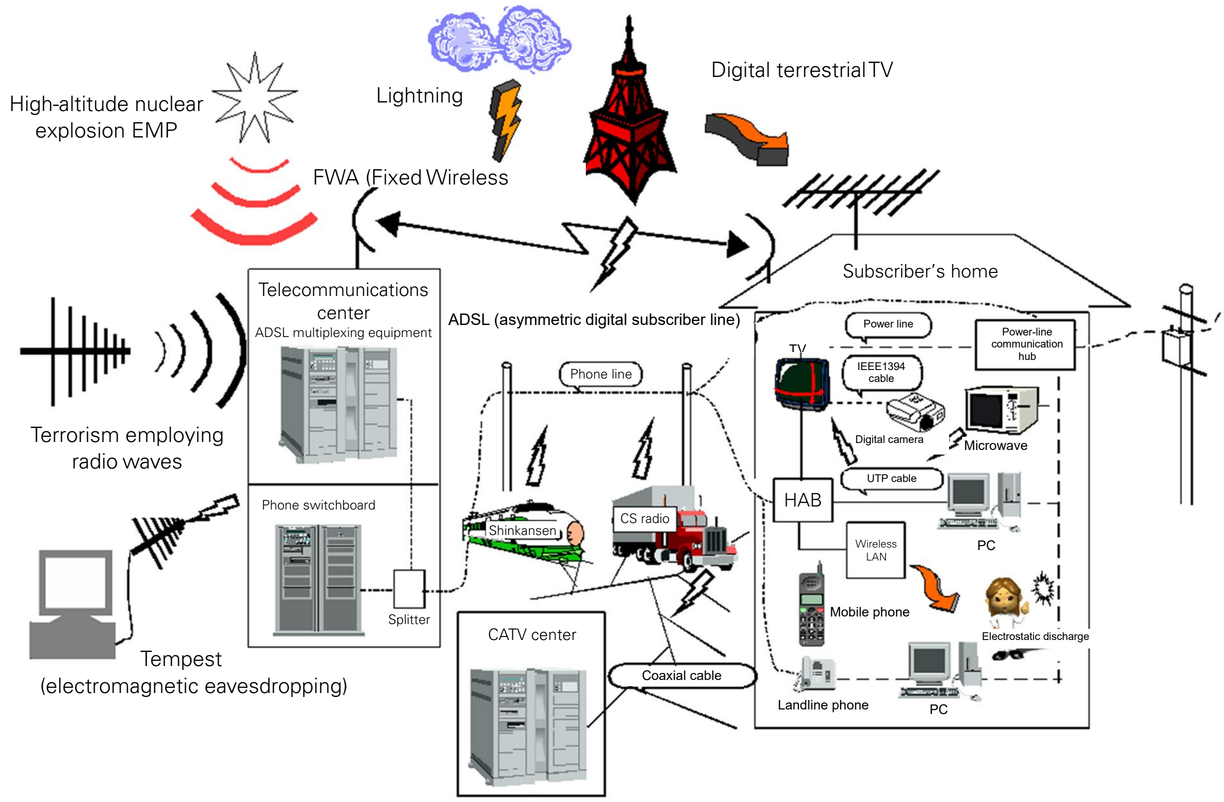



Figure 7 EMC problems in telecommunication networks[17), 18)]

communication lines or telecommunications centers directly, causing major disruptions, especially in the case of telecommunications centers. To prevent such disruptions, telecommunications centers are starting to change their entire grounding configurations, including buildings and equipment, to a new type of configuration.

The next major problem involves cases of radio waves radiated from illegal CB (citizens band), amateur radio, or broadcasting stations inducing current through communication lines, causing disturbances in telecommunication equipment. Radio waves radiated from illegal CB stations mounted on trucks are particularly strong, often activating door intercoms connected to landline phones and disrupting operations in transmission equipment installed on telephone poles, among other problems. A similar problem is high-altitude nuclear electromagnetic pulses (HEMPs)[17), 18)], powerful electromagnetic pulses caused by nuclear explosions at high altitudes, which have been a subject of experimentation in North Korea.

The aforementioned problems negatively impact telecommunication equipment through electromagnetic interference induced through communication lines. However, the opposite problem also exists; emissions radiated from telecommunication equipment causing electromagnetic interference that negatively impacts other equipment. The digitalization of telecommunication equipment in particular is leading to the emission of broadband electromagnetic interference, which is starting to cause problems. However, thanks to the VCCI standards based on the CISPR 22 standards, there have been almost no emission problems based in electromagnetic interference.

Wireless telecommunication equipment can potentially negatively impact other electronic and electrical equipment, not through the aforementioned kinds of electromagnetic interference, but through intentionally emitted electromagnetic waves. Electromagnetic waves emitted by mobile phones, which are now an indispensable part of daily life, are not particularly large. However, mobile phones are small, portable, and commonly used by people with no radio knowledge, meaning that mobile phones might be used in very close proximity to other equipment. A typical example would be when a person with cardiac pacemaker is pressed up against people holding mobile phones in a crowded train. Electromagnetic waves emitted by the mobile phones could disrupt the operation of the cardiac pacemaker, and in the worst case, could cause the heart to stop[19)]. To avoid such problems, companies such as JR have instructed passengers to turn off their mobile phones near priority seating in crowded trains. Similar instructions to turn off mobile phones have also been issued in airplanes and hospitals, where disruptions caused by such devices could have life-or-death impacts.

I have pioneered the world's first research on immunity problems, where equipment is disrupted by electromagnetic interference induced through communication lines, and emission problems, where electromagnetic interference radiated through communication lines impacts other equipment[17), 18)].

(2) EMC problems and EMC standards relating to electromagnetic interference through communication lines

Until Edition 2 of the international standards (CISPR 22) regarding emissions from information technology equipment, only electromagnetic interference from cabinet ports radiated from equipment directly into spaces, and from mains ports radiated through power lines was subject to regulation. However, it was found that connecting a long communication line to such information technology equipment also caused the problem of electromagnetic interference radiating through the communication line. Discussions on how to tackle this problem began around the time CIS/G was founded in 1985. My research group (mainly consisting of Dr. Amemiya and Dr. Kuwabara) proposed a solution on par with Germany's proposal-ISNs (impedance stabilization networks), which had already been developed for an emission testing method. Afterwards, the Netherlands and Australia participated in the task force, comparing and discussing characteristics such as degree of equilibrium and common mode impedance, until finally, the various countries' ISNs were listed side by side. Meanwhile, with regard to emission limits, there was a debate over the correlation between electromagnetic fields radiated from communication lines and common mode current values. My research group provided data that greatly contributed to the determination of emission limits. These proposals formed the basis of CISPR 22 Edition 3, which was issued in 1997 and is now followed by its successor, CISPR 32 Edition 2. CISPR 32 Edition 2 has been adopted not only in Europe and Japan, but around the world as a mandatory standard for electromagnetic interference from information technology equipment radiated through communication lines.

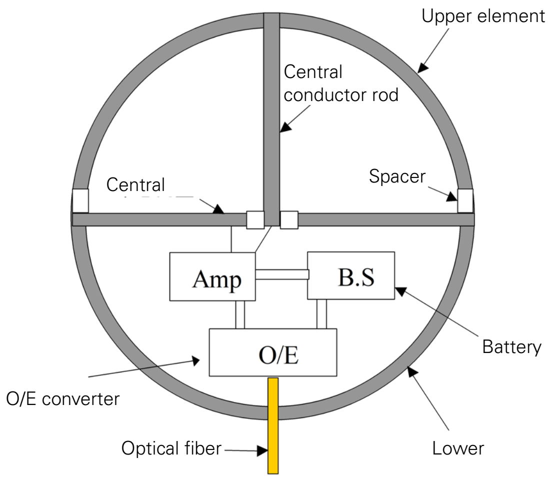


Figure 8 Spherical dipole antenna[22)]

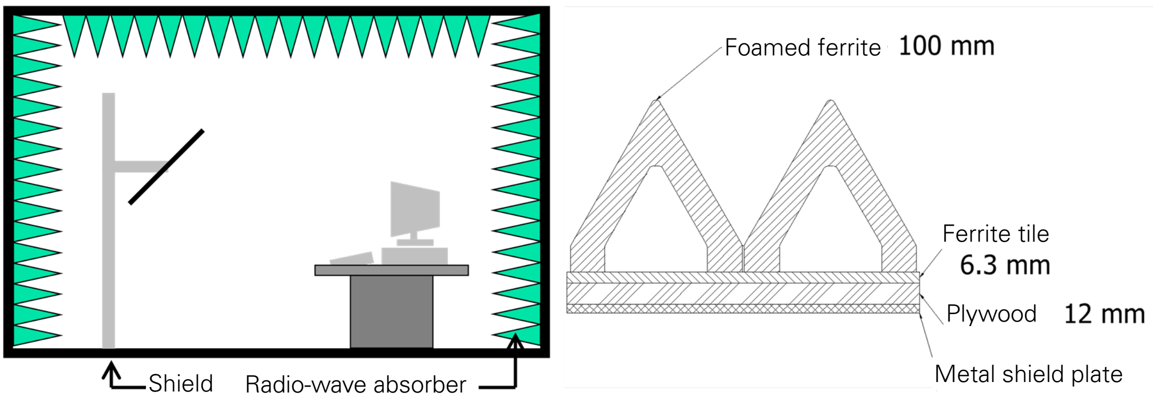
Discussion on international standards (CISPR 24) for the immunity of information technology equipment began in 1993. My group (again, mainly consisting of Dr. Amemiya and Dr. Kuwabara) drafted an immunity testing method for communication systems based on a CDN created with reference to the aforementioned ISNs. At this time, we were the first in the world to point out that if immunity-testing limits on radio waves applied to general electronic equipment were applied to audible noise in telephones, these limits would be extremely strict. Such strict limits would prevent the simulation of actual audible noise disturbances[20)]. This led to a round of immunity testing on telephones used in various countries, which found that telephones in the testers' countries faced the same circumstances as Japan's, resulting in discussions on relaxing the limits. CISPR 24 Edition 1, which reflected the results of these discussions, was issued in 1997, and in Europe, was incorporated into the conditions for acquiring the CE mark guaranteeing market compliance in information technology equipment. In the US and Japan, CISPR 24 is cited in voluntary control initiatives by industrial associations relating to information technology equipment, and CISPR 24 is similarly being applied around the world.

(3) Applications of optical-fiber technology to EMC

Before I moved into EMC research, I was engaged in R&D for optical-fiber communication, so right after starting my EMC research in 1986, I began pioneering interdisciplinary research ahead of the rest of the world. I was particularly interested in a problem with antennas for measuring electromagnetic fields. These antennas used baluns and coaxial cords, but were difficult to use with broadband baluns, and coaxial cords disturbed the electric fields being measured, making precise measurements impossible. I hypothesized that this problem could be solved by using optical fiber instead of coaxial cords, and we developed the world's first spherical dipole antenna incorporating an O/E (optical-electrical) converter, and electric-field sensors using optical modulators shown in Figure 821). The chief developer of the spherical dipole antenna was Dr. Kawamura22), and the chief developer of the electric-field sensors was Dr. Kuwabara23). The spherical dipole antenna has been adopted as a standard wave source in the IEC TS 61587-3, formulated in 1999 as an international standard for methods of measuring the effects of cabinet shields. The electric-field sensors using optical modulators are now used as electric-field-calibration sensors in the international standard IEC 61000-4-3 for testing immunity to radiated electromagnetic fields.

(4) The anechoic chamber and my doctorate at Kyushu Institute of Technology

In December 1995, I resigned from NTT Telecommunication Networks Laboratories and in January 1996, I transferred to the Electronic Engineering Course, Electric Engineering Department, Kyushu Institute of Technology. In response to my transfer, Prof. Shimomura, the head of the Electronic Engineering Course, promised to build an anechoic chamber in the department's new building planned




(a) Structure of semi-anechoic chamber　(b) Structure of radio-wave absorber

Figure 9 Structures of the anechoic chamber and radio-wave absorber at Kyushu Institute of Technology[24)] for construction in 1997, and he followed through on that promise. This authentic anechoic chamber, cutting through the fifth and sixth floors of the new building, is capable of measuring radiated disturbances using the 3-m method. Figure 9 shows the structure of the anechoic chamber and radio-wave absorber. As shown by (a), the anechoic chamber's floor has the structure of a metal semi-anechoic chamber, but this floor can be restructured into that of a fully anechoic chamber by laying out a radio-wave absorber. This anechoic chamber was constructed by Riken Eletech, led by Mr. Ishii, alumnus of Kyushu Institute of Technology, and uses foamed ferrite developed by Riken in its radio-wave absorber indicated by (b)[24]. In my laboratory, Mr. Kimura and Ms. Inokuchi led research on the ray-tracing method, and Mr. Takiguchi researched the analysis of anechoic chamber characteristics using the FDTD method.

Kyushu Institute of Technology has produced three industry PhD graduates. The first, Dr. Shimoshio, worked at the Kumamoto National College of Technology (now "National Institute of Technology (KOSEN), Kumamoto College") and received his PhD in 1999 with a paper titled "A study on the Characteristics of and Measures Against Electromagnetic Noise Occurring in Balanced Communication Lines and Power Lines"[25], on the request of Dr. Koga, who worked at the Telecommunication Line Facility Lab of NTT Ibaraki Electrical Communications Laboratory as the same as myself and after that, he moved to the Kumamoto National College of Technology. The next industry PhD graduate is Dr. Ishida, who worked at Fukuoka Industrial Technology Center's Mechanical Electronics Research Institute, and obtained his PhD in 2001 with a paper titled "A study on a Method for Detecting Radiated Disturbances in Electronic Equipment Using the CISPR Measurement System"[26]. The last industry PhD graduate is Dr. Yamamoto, who, like Dr. Shimoshio, worked at the Kumamoto National College of Technology. Dr. Yamamoto received his PhD in 2001 with a paper titled "A study on Transmission Properties and Induction Properties Considering the Structure of Twisted Pair Cables"[27].

### (5) The anechoic chamber and my doctorate at Musashi Institute of Technology

In April 2001, I transferred from Kyushu Institute of Technology to the Electronic Communication Department, Musashi Institute of Technology. Musashi Institute of Technology also had an anechoic chamber built, as this was essential to EMC research, but unlike my time at Kyushu Institute of Technology, we had to build it ourselves. The admins of Musashi Institute of Technology actively helped us search for an appropriate location, and they found us a place that had once been used as an anechoic chamber for sound. As for the construction costs, our main financial backing came from the "Grants-in-Aid for

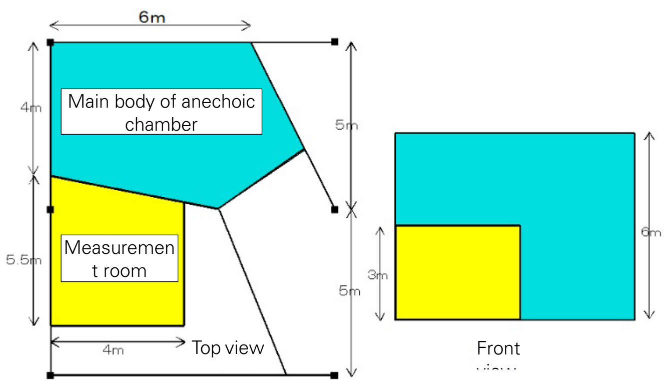



Figure 10 Arrangement of the anechoic chamber in Musashi Institute of Technology

Scientific Research", assistance from Musashi Institute of Technology, and donations from alumni of the Electronic Communication Department, Musashi Institute of Technology. The remainder, which was still more than half of the construction costs, was covered with the aid of Riken Eletech, which had helped build Kyushu Institute of Technology's anechoic chamber, and the chamber was completed in December 2005. Figure 10 shows the arrangement of Musashi Institute of Technology's anechoic chamber. The main body of the anechoic chamber is pentagonal, with a maximum floor width of about 7 m, a maximum depth of 5 m, and a height of 6 m, allowing measurement of electromagnetic interference using the 3-m method. A pentagonal, asymmetrical shape is an excellent characteristic for an anechoic chamber. The chamber could also be converted between a semi-anechoic chamber with a metal floor, and an anechoic chamber with a radio-wave absorber floor. The radio-wave absorber, like the one at Kyushu Institute of Technology, consists of pyramid ferrite and ferrite tile, though the pyramid ferrite is a different, enhanced shape. As you can see, we worked hard to build this anechoic chamber, but during the 2019 flooding of the Tama River caused by Typhoon No. 19 (a.k.a. Typhoon Hagibis), the chamber was submerged, seriously degrading the chamber's performance. The chamber has not been fully repaired since then, which is quite a shame.

At Musashi Institute of Technology, Dr. Watanabe received his PhD in 2007 with a paper titled "A study on Analysis Methods for Transmission Characteristics and Compromising Emanations of Transmission Lines for Power Line Communication"[28]. Dr. Miyazaki became an industry PhD graduate in 2006 with a paper titled "A study on Predicting Electromagnetic Interference Emitted from Digital Equipment"[29]. Dr. Ishizuka became an industry PhD graduate in 2009 with a paper titled "A study on Methods of Numerical Analysis for Radio-Wave Propagation Characteristics in Anechoic Chambers, and Methods of Engineering Radio-Wave Absorbers"[30]. Finally, Dr. Higuma became an industry PhD graduate in 2009 with a paper titled "A study on Construction and Analysis Techniques for Ubiquitous Network Systems in the Facility Equipment Field"[31].

(6) Implementation of high-speed power-line communication systems[32]

High-speed power line communication systems, which transmit shortwave (3 to 30 MHz) signals into existing power lines not only to supply energy, but to transmit 200-Mb/s high-speed signals, entered the public spotlight around 2003. However, there were already existing wireless communication systems for shortwave, so coexistence with those systems became a major problem. In response, the Ministry of Internal Affairs and Communications held a "Symposium on High-Speed Power Line Communication Equipment" in 2005. The biggest problems faced by the symposium were elucidating the mechanism of electromagnetic radiation from installed power lines, and establishing a method of calculating the radiated electromagnetic waves. The principles behind power-line communication systems are shown in Figure 11. A researcher at my laboratory, Dr. Watanabe, attempted to apply a research methodology for the radiation of electromagnetic interference developed over years in the field of communication lines, to power lines. However, there was a problem: unlike communication lines, power lines branch out to many power outlets, and as for

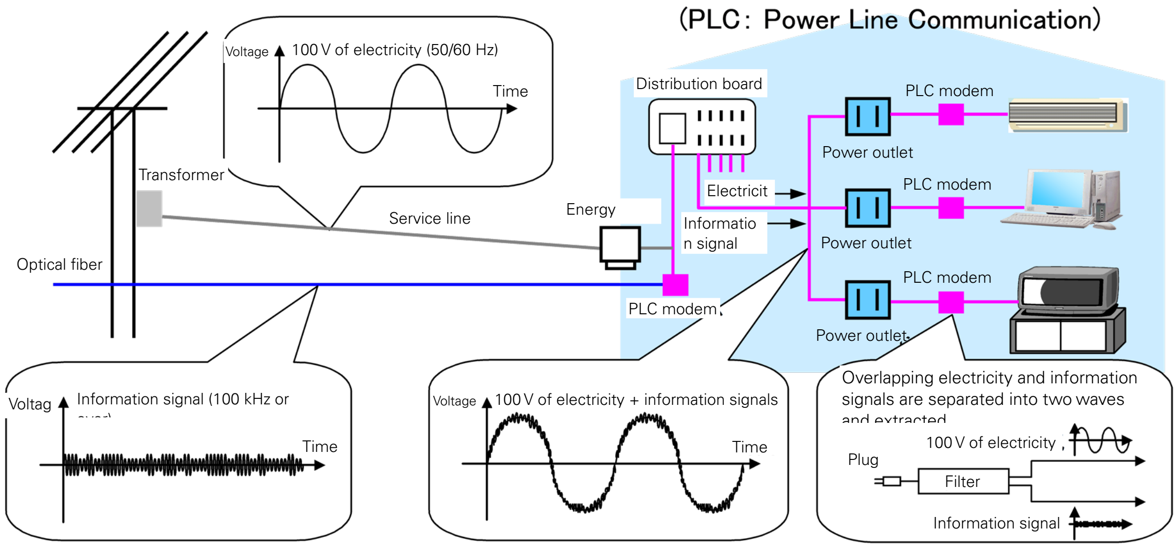



Figure 11 Principles of power line communication systems[32)]

branched switches in lighting equipment, one of the two lines is longer. In response to this problem, Dr. Watanabe first tried applying the four-terminal network theory, the established calculation method for communication lines. As a result, he found that the measured values for branches for power outlets largely matched the measured values for communication lines[33)]. However, due to the problem with branching switches where one line was longer, Dr. Watanabe considered a calculation method based on the method of moments, a general method for analyzing electromagnetic fields. He became the first in the world to establish a method of quantitatively calculating power lines, balance, common mode current, and radiated electric fields. It became clear that by mastering this method to calculate radiated electric fields near various models of power lines, we could handle power lines equivalently to communication lines, provided that the balance and common mode current were the same[34)].

Based on the aforementioned symposium's conclusion, the High-Speed Power Line Communication Facilities Subcommittee was created in February 2006 within the CISPR Committee of the Information and Communications Technology Subcommittee, Information and Communications Council (MIC), which began discussing technical standards. The Information and Communications Council finished their deliberations at the end of June 2006, deciding to tighten the regulation on common mode current from 30 dBμA to 20 dBμA in frequencies from 15 to 30 MHz. Subsequently, the Radio Regulatory Council deliberated on regulatory improvements, and in September 2006, issued an endorsement to lift the ban on high-speed PLC on the condition that equipment-installation permits were carefully examined and thorough measures were taken against interference. After that, the Ministerial Ordinance underwent a revision procedure and was published in the Official Journal (OJ) in early October 2006. As a result, companies began implementing high-speed PLC, and in early December, the first Japanese-made high-speed PLC modem was released on the market[35)]. For these initiatives, I received the PLC-J 10$^{th}$ Founding Anniversary Award from PLC-J in 2013.

(7) Radiated disturbances from solar-power generation systems[36)]

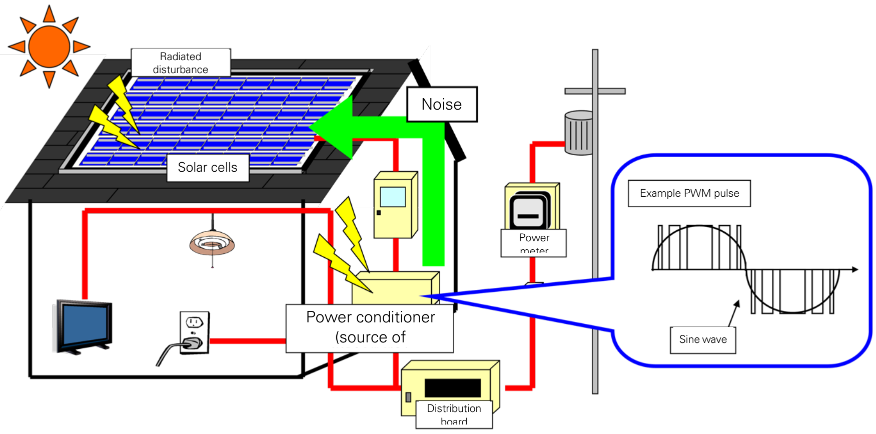



Figure 12 Radiated disturbances from a solar-power generation system[36)]

Solar-power generation systems are becoming a more widespread, familiar part of our lives; not only as a method to achieve carbon neutrality, but as essential equipment for VPPs (virtual power plants) and microgrids. However, as shown in Figure 12, solar-power generation systems produce electromagnetic interference in their power conditioners, which convert direct current generated in solar cells to alternating current. This interference can then be radiated through the solar-cell module or its surrounding wiring to the outside. All equipment that uses electricity is regulated by the CISPR standards for electromagnetic interference, and these standards are enforced in almost all countries. However, because there were no CISPR standards for radiated disturbances from solar-power generation systems, the necessity of standardizing GCPCs (grid-connected power converters) was raised at the 2005 Cape Town conference by the late Dr. Tomita. Dr. Tomita (of the Central Research Institute of Electric Power Industry) was convener of WG2 (interference from overhead power lines, high-voltage equipment, and electric railways). WG2 fell within the scope of CIS/B (interference relating to industrial, scientific and medical radio-frequency apparatus, to other (heavy) industrial equipment, to overhead power lines, to high voltage equipment and to electric traction). Afterwards, at the Osaka conference held in 2008, it was decided that an MT (Maintenance Team) for GCPCs would be established in WG1 of CIS/B and led by Japanese Mr. Inoue. In response to this decision, a project relating to emission standards for solar-power generation systems was promoted from 2008 to 2010. This project was a collaborative effort between industry (Japan Electrical Manufacturers' Association and its member companies), academia (Tokyo City University, Tokyo Metropolitan University), and government (METI, MIC, NEDO (New Energy and Industrial Technology Development Organization))[36), 37)].

In response to this, and with the assistance of NEDO, the EMC Standardization Committee for Distributed Energy Resources was established in the Japan Electrical Manufacturers' Association (JEMA) in FY 2009. Tokyo City University, where I worked, received the joint support of JEMA and NEDO. We were tasked with studying the emission mechanism of electromagnetic interference radiated from solar-power generation systems, the basic concepts behind the CISPR electromagnetic interference standards, and electromagnetic-field simulations of radiated disturbances from solar-power generation systems. These challenges were studied by students of Ms. Tomizawa, Mr. Hasegawa, and other professors, and the results were published in "The Transactions of the Institute of Electrical Engineers of Japan A"[38)].

At the MT-GCPC held in Seoul in October 2011, proposals from countries including Japan and Germany regarding limits and measurement methods for DC ports of GCPCs were deliberated on. A CD document reflecting the results was distributed in April 2012. Additionally, the CDV-document version was distributed in January 2014, and approved in June 2014. An FDIS document incorporating this CDV document into CISPR 11 Edition 6 was distributed in March 2015, and approved in May 2015. As a result, the first international standards on limits and measurement methods for DC ports of GCPCs were published in June 2015 as part of CISPR 11 Edition 6. For these initiatives, the aforementioned EMC Standardization Committee for Distributed Energy Resources received JEMA's "FY 2015 Award for Technical Excellence and Achievement in Electrical Engineering". The award was for a paper titled "Reflection of Measurement Methods and Limits for Conducted Disturbances in the DC Side of Power Conditioners During Solar-Power Generation to International Standards (CISPR 11)".

(8) Electromagnetic induction to communication lines near Linear Chuo Shinkansen

The Linear Chuo Shinkansen, a magnetic-levitation Shinkansen equipped with superconducting magnets on its train cars, is now under construction. One concern regarding this Shinkansen is that if there are communication lines nearby, the linkage of flux from the superconducting magnets with the communication lines will induce voltage. To calculate the induced voltage by using an electromagnetic-field simulation called COMSOL, I worked at Assistant Prof. Nishikata's laboratory at Tokyo Institute of Technology for one year starting April 2018, and performed the calculations myself. Figure 13 shows a photo of the exterior of a Superconducting Maglev car used in the Yamanashi Maglev Test Line. As you can see, superconducting magnets are placed at the front of the first car and on the boundaries between subsequent cars[39].

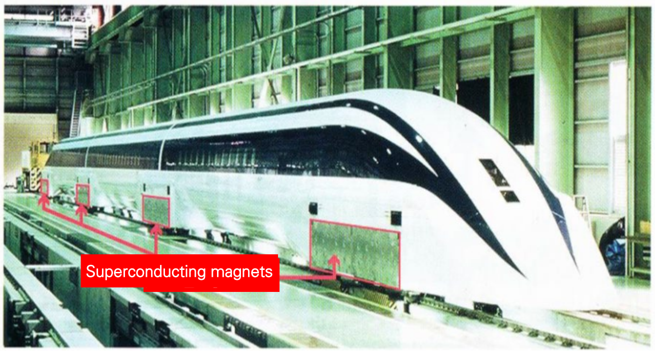


Figure 13 Exterior of a Superconducting Maglev car[39]

Flux from superconducting coils links with surrounding communication lines, and if the superconducting coils move at high speed, voltage is induced in the communication lines according to Faraday's laws of electromagnetic induction. This induced voltage is calculated by using an electromagnetic field simulation called "COMSOL Multiphysics". Even under the strictest conditions, voltage is induced in looped communication lines; that is, the common-mode induced voltage is around several volts. The differential-mode induced voltage that has an impact on actual communication is somewhere in the tens of millivolts, so it became clear that the impact on actual communication signals could be ignored[40].

(9) Overview of EMC-related standardization activities

There is an international standardization organization for electrical and electronic equipment called the IEC (International Electrotechnical Commission). The main horizontal committees in the IEC that create EMC-related standards are TC 77 and CISPR (International Special Committee on Radio Interference), which create basic standards and common standards relating to EMC. There are also product committees that create EMC-related product lines and product standards such as: TC 9 (Electrical equipment and systems for railways), TC 22 (Power electronic systems and equipment), TC 62 (Medical equipment, software, and systems), and TC 69 (Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks). Meanwhile, ACEC (Advisory Committee on Electromagnetic Compatibility) is an organization within the IEC's SMB (Standardization Management Board) that adjusts the scope of authority of TC 77 and CISPR and mediates relationships with product TCs. As for EMC-related international standardization organizations other than the IEC, there are: ISO (International Organization for Standardization), which standardizes automobiles (TC 22) and aircraft (TC 20), and ITU-T (International Telecommunication Union - Telecommunication Standardization Sector), which standardizes power equipment in telecommunication facilities. The ISO's TC 22 has created EMC standards for road vehicles such as automobiles, and with regard to immunity testing methods, there are standards relating to various electromagnetic interference application methods. ITU-T is a permanent organization of the UN organization ITU (International Telecommunication Union), and SG 5 (Environment, climate change and circular economy) creates EMC-related standards[41)].

In July 1987, I became the leader of EMC Study Group, NTT Telecommunication Networks Laboratories. At this time, I decided who would be in charge of EMC-related standardization. Because CISPR was trying to create standards for electromagnetic interference through communication lines, Dr. Amemiya, who was interested in EMC in telephones, was placed in charge of CISPR. Dr. Amemiya has served until recently as Japan's representative for CIS/I, but was succeeded a few years ago by Dr. Akiyama. Dr. Amemiya has also been active for many years as a member of the CISPR steering committee. Meanwhile, ITU-T's SG 5 had also been creating EMC standards for communication equipment, so I appointed Dr. Ideguchi, who had already been in charge of that field. However, around 1997, Dr. Ideguchi resigned from his position at NTT Telecommunication Networks Laboratories, so Dr. Hattori now serves as Dr. Ideguchi's successor. Additionally, Dr. Takaya has served as vice-chair of SG 5 since November 2016, and plans to remain in that role until 2024. Because I was active as leader of EMC Study Group, I was in charge of TC 77, which at the time (1987) was relatively less busy. Later, I expanded my activities to CISPR and ACEC among other organizations, so I'd like to elaborate on those in the following sections.

(10) My activities at TC 77[41)]

TC 77's first conference was held in September 1974, with the participation of Prof. Miyakawa of

The University of Tokyo. In October 1975, the national committee TC 77 was established in JEC under IEEJ (The Institute of Electrical Engineers of Japan). The first national-committee chair of TC 77 was Prof. Miyakawa, but after his passing in 1985, he was immediately succeeded by (then) Prof. Masada of The University of Tokyo. In 1988, I became a member of both the national committee TC 77, and TC 77's WG 6 (in charge of electromagnetic-field classification) at the same time. In 1992, I became Secretary of the national committee TC 77. In 1993, the national committee SC 77B (in charge of EMC standards for electrical and electronic equipment at high frequencies) was established, of which I became the first chair. In 1998, I became chair of the national committee TC 77, and stepped down as chair of the national committee SC 77B. In 2006, I also became international chair of TC 77, so Prof. Osaki of The University of Tokyo became chair of the national committee TC 77. Because all past international chairs of TC 77 were from Europe, I was the first non-European international chair of TC 77. In 2011, I resigned as international chair of TC 77 and nominated Prof. Osaki as my successor. Prof. Osaki was approved, and served as international chair of TC 77 until 2020.

To create the JIS standards out of the EMC standards created by TC 77, the JIS/EMC Standard Setting Committee (IEEJ) was established in 1996, of which I became Secretary. I also became chief examiner of Subcommittee 1, which created JIS for the IEC 61000-6 series stipulating parts of IEC 60050-161 (International Electrotechnical Vocabulary (IEV) relating to EMC) and IEC 61000-4 series (stipulating immunity testing methods), and common EMC standards. After that, I became chair of JIS C 61000-6-1 and JIS C 61000-6-2 Draft Revision Committee (IEEJ), established in 2006. For these activities, I received IEC-APC 10th-Anniversary Award from IEC-APC (IEC Activities Promotion Committee of Japan) in 2001, and the "Industrial standard merit award by the minister of METI" from the Ministry of Economy, Trade and Industry in 2003.

### (11) My activities at CISPR[41)]

The Japanese organization for deliberation on CISPR was the CISPR Committee of the Telecommunications Technology Council (Ministry of Posts and Telecommunications), and I became a member of Subcommittee 4 (deliberating on test sites for electromagnetic interference) in 1990. Meanwhile, CISPR established WG 1 in 1992 to discuss common standards for electromagnetic interference radiated from electrical and electronic equipment, of which I became a member. In Japan, I became Deputy chief of Subcommittee 4, which was established within the CISPR Committee in 1992 to deliberate on EMC standards for information technology equipment. I also became a member of Subcommittee 5 for deliberating on common emission standards, which was established within the CISPR Committee in 1992. Meanwhile, I became Chief of a work group for drafting Japanese standards for EMC in information technology equipment, which was established within Subcommittee 4 of the CISPR Committee in 1996.

In 1998, I became Chief of Subcommittee F for deliberating on EMC standards for household appliances and lighting equipment, which was established within the CISPR Committee. I stayed on as

Chief when Subcommittee F changed its name to "F Group" in 2001.

Later, I became a member of WG 1, a new working group established in CIS/H in 2002 to create common emission standards. Accordingly, in Japan, I became Chief of the CISPR Committee's H Group (the basis of electromagnetic interference limit values) in 2004. For these activities, I received the "Information communication merit award by MPT" (for the development and standardization of EMC techniques) from the Ministry of Posts and Telecommunications in 1997.

Regarding the harmonized safety standards stipulated by the Electrical Appliances and Materials Safety Law under the jurisdiction of METI, as a rule, JIS (created by the private sector or government) is adopted as the harmonized standards. For issues such as radio noise, private standards other than JIS (which is created by a private standardization organization) are adopted as the harmonized standards. In 2016, the CISPRJ Radio Noise Committee was established in 2016 to create these standards, and I became the first chair. During my time at this committee, I would create harmonized standards based on domestic endorsements from the Information and Communications Council, and make proposals from the Electrical Appliances and Materials Research Committee to the government. First, at the January-2017 meeting of the CISPRJ Radio Noise Committee, we decided to deliberate on the harmonized standards in CISPR 15 (standards for emissions from lighting equipment) and CISPR 32 (standards for emissions from multimedia equipment). We decided to then propose both CISPRJ 15:2017 and CISPRJ 32:2017 for "Appendix 12: Interpretation of the Technical Standards of Electrical Appliances and Materials Safety Act". In December 2017, the interpretation of the ministerial ordinance stipulating technical standards for electrical appliances was partially revised, and the preceding two standards were officially adopted as the harmonized standards[41)].

### (12) My activities at ACEC[41)]

In 1973, TC77 was established within the IEC, and ACEC was established as one of the IEC's advisory committees in 1986 to coordinate with CISPR, which had been established in 1934. In response to ACEC, the IEC Activities Promotion Committee of Japan established an ACEC Committee (Japan Standards Association) in 1992 to strengthen their approach to ACEC, and I became the subcommittee's first chair. Amidst all this, The University of Tokyo's Prof. Masada joined the ACEC Committee in 1993 after an endorsement by the IEC Board, so from then on, Prof. Masada became chair of the ACEC Committee, and I became vice-chair. Later, in 2000, I joined the ACEC Committee, succeeding Prof. Masada as IEC's SMB endorsement, and in 2001, I became chair of the ACEC Committee. In 2006, I became international chair of TC 77, so I stepped down as the SMB-endorsed ACEC Committee member. However, from 2009, the international chair of TC 77 was required to be an ex-officio ACEC Committee member, so that year, I stepped down as international chair of TC 77 and became an ACEC Committee member until 2011. However, from 2006, when I resigned as the SMB-endorsed ACEC Committee member, Prof. Noboru Shibuya of Takushoku University became chair of the ACEC Committee.

Acknowledgments

Since my article in VCCI Dayori No. 117 (issued in July 2015) titled “Organization of EMC related Standardization Committees”, I have described international EMC standardization organizations including CISPR, TC77, and ACEC, their various EMC-related international standards and Japanese regulations. I have also described automobile-related EMC international standards (not just IEC standards; also ISO standards and R10 regulations), semiconductor-device EMC standards required for automobile EMC standards, EMC product standards that do and do not have JIS standards, and ITU-T/SG5-related recommendations. This was followed by a brief history of my activities, concluding with this issue's article, the last installment of this series. I am sincerely grateful to the VCCI Dayori staff for allowing me this opportunity, and to all of you readers. Thank you very much.

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1969 Completed Electronics Engineering, Faculty of Engineering, Graduate School of Hokkaido University
Joined NTT, assigned to the Electrical Communications Laboratories
1987 Leader of EMC Study Group, NTT Telecommunication Networks Laboratories
1996 Professor of Electric Engineering Department, Kyushu Institute of Technology
2001 Professor of Electronic Communication Department, Musashi Institute of Technology
2010 Professor emeritus of Tokyo City University
Visiting co-researcher of the Graduate School of Frontier Sciences, The University of Tokyo

Major prizes received
1986 Merit award – IEICE
(on the design theory and evaluation method for optical fiber cables)
1997 Information communication merit award by MPT
(on EMC technology development)
2003 Industrial standard merit award by the minister of METI
2004 IEICE fellow
2007 Promoted to IEEE fellow

# Report on EMC Japan/APEMC Okinawa 2024 Symposium

Steering Committee/Technical Subcommittee

VCCI held a Tutorial and exhibit at this fiscal year's EMC Japan/APEMC Okinawa 2024 to report the status of VCCI Council's management of CISPR 32 Ed.2.0 and initiatives toward next term's revisions to CISPR 32. The Technical Subcommittee participated in the symposium to present its submitted papers at the regular sessions, and to gather information by participating in the Plenary Session, Tutorials and Workshops, Regular Sessions, and Poster Session.

Venue: Okinawa Convention Center, Ginowan City, Okinawa Prefecture
Event period: May 20 (Mon) to 24 (Fri), 2024
Period of participation: May 20 (Mon) to 23 (Thu), 2024
Participants: Yoshiharu Akiyama (member of the Registration Committee for Measurement Facilities),
Shinichi Okuyama (Chairman of the Technical Subcommittee),
Akira Murakami (member of the Technical Subcommittee),
Naoya Haraguchi (member of the Technical Subcommittee),
Hironari Tanaka (member of the Technical Subcommittee),
Kunihiro Osabe (member of the Technical Subcommittee),
Nozomi Miyake (member of the Technical Subcommittee),
Seijun Fukaya (Technical Adviser), Akira Oda (Executive Director),
Masahiro Hoshino (Secretary General), Minoru Hirata (Technical Counselor),
Hidenori Muramatsu (Technical Counselor), Hirohito Shigemitsu (Technical Adviser)

## Overview of the symposium

This year's program was composed of the Plenary Session, five Tutorial Sessions, six Workshop Sessions, 19 Special Sessions, 31 Regular Sessions, and the Exhibition.

There were 434 participants from 24 countries and regions. 292 papers were submitted, of which 264 were adopted.

On May 21, VCCI Council's Steering Committee held Tutorial Sessions featuring a presentation titled "Status of CISPR 32 Ed.2.0 operations in Japan and initiatives toward the next term's revisions to CISPR 32". The presentation was given at the Tutorial Sessions in the following two parts:

Part 1: "Status of the VCCI Council's CISPR 32 Ed.2.0 operations, explanation of our guidance on the "Technical Requirements" VCCI-CISPR 32:2016, market sampling test results, cautionary notes based on test report document inspections, and an explanation of the registration status of measurement facilities"

Part 2: "Report on technical considerations and details of verifications conducted for four years by the VCCI Council's Technical Subcommittee, in view of current deliberation on revisions to CISPR 32 Ed.3.0"

At the Regular Sessions on May 22, committee members Mr. Osabe and Ms. Miyake presented papers on EMC measurements submitted by VCCI Council. The VCCI exhibit was held from May 21 to 23.

1. Tutorial

Date and time: May 21, 2024 (Tue)

Attendees: 30

Part 1: The VCCI Council's activities

| No. | Themes | Presenter |
|---|---|---|
| TS1-1 | Regardi<br>ng EMI regulations on multimedia equipment in Japan<br>- Status of CISPR 32 Ed.2.0 operations<br>- Guidance for Rules for Voluntary Control Measures | The VCCI Council 1<br>Akira Oda |
| TS1-2 | Regarding the guidance on the "Technical Requirements" VCCI-CISPR 32:2016<br>- "Guidance for Measuring Radiated Emissions from EUT with Radio Functions" | The VCCI Council 2<br>Shinichi Okuyama |
| TS1-3 | Rules for market sampling tests and market sampling test results<br>- Content of the rules for market sampling tests<br>- Regarding the market sampling test results<br>- Regarding the document inspection results | The VCCI Council 3<br>Minoru Hirata |
| TS1-4 | Regarding rules for registering measurement facilities and inspection results relating to registration of measurement facilities<br>- Notes on registering measurement facilities<br>- Regarding guidance on the management of measurement facilities | The VCCI Council 4<br>Seijun Fukaya |
| TS1-5 | Introduction to the Technical Subcommittee's activities in preparation for deliberating on IS revisions | The VCCI Council 2<br>Shinichi Okuyama |

Part 2: Initiatives conducted for four years in preparation for deliberating on revisions to CISPR 32 Ed.3.0

| No. | Themes | Presenter |
|---|---|---|
| TS1-6 | Initiatives to standardize mains cable termination conditions (VHF-LISN) to the international standards CISPR 32 and CISPR 16 | The VCCI Council 5<br>Kunihiro Osabe |
| TS1-7 | Initiatives to address issues in preparation for deliberating on IS revisions relating to antenna calibration and site validation<br>- Calibrating loop antennas for measuring radiated emissions below 30 MHz and discussion of NSIL evaluation methods | The VCCI Council 6<br>Hironari Tanaka |

| | | |
|---|---|---|
| TS1-8 | Initiatives to address issues in preparation for deliberating on IS revisions relating to radiated emissions<br>- Verification of measurement distance and EUT volume when measuring emissions above 1 GHz | The VCCI Council 7<br>Akira Murakami |
| TS1-9 | Initiatives to address issues in preparation for deliberating on IS revisions relating to conducted emissions<br>- Verification results for conducted emission measurement that uses FFT-based measuring instruments | The VCCI Council 8<br>Naoya Haraguchi |

2. Papers presented by VCCI Council

(1) Presented papers relating to the VHF-LISN WG

- Paper title: "Development of VHF-LISN for 3-Phase Products"
- Presenter: Mr. Osabe (member of the Technical Subcommittee)
- Session name: EMC Measurements
- Paper overview:

There is an ongoing debate on standardizing VHF-LISNs for power cable termination to improve the reproducibility of radiated emission measurements between test sites. Though we have developed power-cable devices for 1-phase products, there is demand for the development of VHF-LISNs for 3-phase high-current products. For this reason, I spoke about the development of VHF-LISNs that meet 3-phase power cables' termination characteristics and can process up to 30 A.

(2) Presented papers relating to the Conducted Emission WG

- Paper title: "A Confirmation into How Various Types of CMAD Affects MIU in Non-Invasive Measurement"
- Presenters: Ms. Miyake (member of the Technical Subcommittee)
- Session name: EMC Measurements
- Paper overview:

To check if MIU could be improved by attaching various types of common mode absorption devices (CMAD) to the cable between the EUT and AE, we measured the wired network port's conducted emissions both with and without a CMAD attached. The result I presented here showed that MIU in these cases was not sufficiently improved despite using various types of CMADs.

3. Exhibition

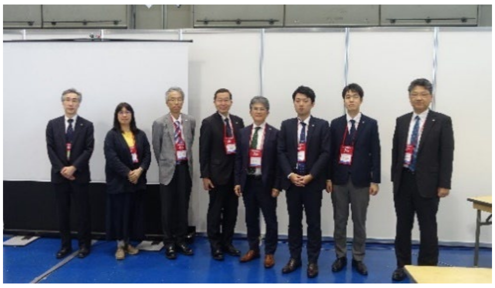
Period: May 21 (Tue) to 23 (Thu), 2024

The exhibition was held in the Exhibition Hall of the EMC Japan/APEMC Okinawa 2024 symposium venue, and 23 companies inside and outside Japan held exhibits relating to EMC. VCCI's exhibit distributed pamphlets introducing VCCI Council to symposium participants, and presented three types of VHF-LISNs (actual devices). In particular, the exhibiting of actual VHF-LISNs was our first attempt of its kind, and the VCCI booth drew about 20 visitors. We answered many questions about the specifications, structure, and so on, and gave explanations to visitors.

## 4. Impressions

At this year's VCCI Council Tutorial and paper presentations, we reported the status of our operation of CISPR 32 Ed.2.0 and verification and other initiatives toward next term's revisions to CISPR 32. This resulted in many technical questions and comments from the audience. We also exhibited actual VHF-LISNs at our booth, which also attracted many visitors.

Our next sessions are planned for May 19 to 23, 2025 at APEMC 2025, which will be held in Taipei, Taiwan. VCCI Council plans to continue considering issues in measurement methods and questions and comments received at Tutorials and paper presentations, conducting and verifying experiments, and actively submitting papers to the symposium while sharing opinions and exchanging information with experts.

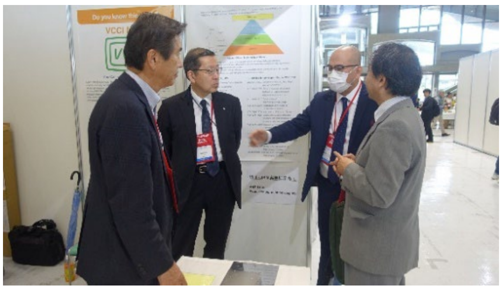


VCCI Council Tutorial presenter and Chairman

Photo 1 Tutorial presentation

Osabe, member of the Technical Subcommittee

Miyake, member of the Technical Subcommittee



VCCI Council's exhibit


VCCI credited in the program book as a sponsor

Photo 2 Paper presentations and exhibit

# Report on the BSMI/CTCA/VCCI technical exchange meeting

Date and time: May 20, 2024 (Mon) 15:30 to 17:30
Venue: Okinawa Prince Hotel Ocean View Ginowan

| | | |
|---|---|---|
| Participants: Mr. Yuan-Chun Lee | : | Technical Specialist, BSMI |
| Mr. Ming-Fong Chen | : | Associate Technical Specialist, BSMI |
| Mr. Charles Wang | : | 1. Deputy Chairperson of EMC Committee, CTCA<br>2. Deputy Director, Electric Appliance Testing, Taiwan Electric Research & Testing Center |
| Mr. David Wang | : | Deputy Director, SGS Taiwan |
| Mr. Jia Chang Chen | : | Chief, Test Technology Development Section Industrial Upgrading Service Department, Metal Industries Research and Development Centre(MIRDC) |
| Mr. Eric Chen | : | Section manager, EMC Department, Taiwan Testing and Certification Center (ETC) |
| Mr. Will Yauo | : | 1. Secretary General, CTCA<br>2. Manager, Planning and Technical Marketing Dept., ETC |
| Ms. Roxy Liu | : | 1. Secretary, CTCA<br>2. Supervisor, Planning and Technical Marketing Dept., ETC |
| VCCI Council | : | Shinichi Okuyama (Chairman of the Technical Subcommittee)<br>Akira Oda (Executive Director), Masahiro Hoshino (Secretary General), Minoru Hirata (Technical Counselor)<br>Hidenori Muramatsu (Technical Counselor), Hirohito Shigemitsu (Technical Adviser), Yoko Inagaki (Secretariat) |
| Ms. Yiwen Lin | : | Interpreter |

Description: As was the case last year, a technical exchange meeting was held between Taiwan's BSMI and CTCA affiliates and VCCI Council.
The meeting began with greetings and acknowledgments for the day's meeting from Mr. Oda, Executive Director of VCCI, and Mr. Will Yauo, Secretary General of CTCA.
Next, VCCI Council presented the following:
1. Outline of VCCI Council's activities (Mr. Oda, Executive Director)
2. Status of market sampling tests (Mr. Hirata, Technical Counselor)

3. Description of the Technical Subcommittee's activities (FY 2023 activity report and planned activities for FY 2024, presentation of the activities of working groups within the Technical Subcommittee) (Mr. Okuyama, Chairman of the Technical Subcommittee)

Next, the Taiwanese members presented the following:

4. Electric and electronic products that have become newly subject to regulations (Mr. Yuan-Chun Lee, Technical Specialist, BSMI)
5. CISPR 32 (CNS 15936) operation and status of market sampling tests in Taiwan (Mr. Ming-Fong Chen, Associate Technical Specialist, BSMI)
6. Drone EMC tests (Mr. Eric Chen, Section manager, EMC Department, ETC)

Finally, participants deliberated on the next technical exchange meeting, and concluded that they would consider scheduling the meeting for next year's APEMC Taiwan (planned for May 19 to 23, 2025) or COMPUTEX TAIPEI (planned for May 20 to 23, 2025).

NOTE　BSMI：Bureau of Standards, Metrology and Inspection
CTCA：Chinese Testing and Certification Association

Program for the technical exchange meeting

| Content | Speaker |
|---|---|
| Registration | |
| Opening Remarks | Mr. Akira Oda,<br>Director, VCCI Council<br>Mr. Will Yauo<br>Secretary General, CTCA |
| Group photo | |
| A brief Introduction of VCCI Council<br>(Introduction of Tutorial Session on 21st May) | Mr. Akira Oda,<br>Director, VCCI Council |
| Marketing Sampling Test Results | Mr. Minoru Hirata<br>VCCI Council |
| FY 2023 Activity Report and FY 2024 Activity Plan of Technical Sub Committee<br>(Introduction of Tutorial Session on 21st May) | Mr. Shinichi Okuyama<br>NEC Platforms |
| Newly Regulated Electrical and Electronic Products | Mr. Yuan-Chun Lee<br>Technical Specialist, BSMI |
| Operation of CISPR 32 (CNS 15936) and market sampling test status in Taiwan | Mr. Ming-Fong Chen<br>Associate Technical Specialist, BSMI |
| EMC Testing for Drones | Mr. Eric Chen<br>Section manager,<br>EMC Department, ETC |
| Q&A | |
| Consultation for the next meeting | |

Mr. Yuan-Chun Lee
Technical Specialist, BSMI

Mr. Ming-Fong Chen
Associate Technical Specialist, BSMI

BSMI, CTCA, and VCCI affiliates

Mr. Oda, Executive Director

Mr. Hirata, Technical Counselor

Mr. Okuyama, Chairman of the Technical Subcommittee

## Other

Prior to this year's technical exchange meeting between BSMI, CTCA, and VCCI, from the morning of the 20th, we held a joint tour of the Okinawa Institute of Science and Technology (OIST) in Onna Village, Kunigami District. Tour participants were mainly briefed on OIST's analytical instruments such as electron microscopes.


BSMI, CTCA, and VCCI affiliates (in front of the OIST auditorium)

Tour participants being briefed by the OIST representative

# Report on Participation in COMPUTEX TAIPEI 2024

Public Relations Subcommittee

| | | | |
|---|---|---|---|
| Exhibition name | : COMPUTEX TAIPEI 2024 | | |
| URL | : https://www.computextaipei.com.tw/en/index.html | | |
| Sponsor | : TAITRA: Taiwan External Trade Development Council<br>TCA: Taipei Computer Association | | |
| Exhibition period | : June 4 (Tue) to June 7 (Fri), 2024 | | |
| Venue | : Two venues: Taipei Nangang Exhibition Center Halls 1 & 2 (TaiNEX 1 & 2) | | |
| Participants | : Jiro Iizuka | Chairman of the Public Relations Subcommittee (Oki Electric Industry Co., Ltd.) | |
| | Takuya Yamasaki | Member of the Public Relations Subcommittee (Hitachi, Ltd.) | |
| | Akira Oda | Executive Director of VCCI Council | |
| | Masahiro Hoshino | Secretary General of VCCI Council | |
| | Hironari Koga | General Manager, VCCI Council | |
| Scale of exhibition | : About 1,500 participating companies from 36 countries around the world (1.5 times the previous year) with about 4,500 booths | | |
| Number of visitors | : 85,179 (from 150 countries and regions) (reference: 2023: 47,000; 2019: 42,000) | | |

## 1. Purpose of exhibiting at COMPUTEX TAIPEI

COMPUTEX TAIPEI is the largest ICT exhibition in Asia, attracting many buyers from overseas. Taiwan's ICT industry occupies a major position in the global supply chain, and is attended by numerous buyers and industry affiliates from all over the world. This exhibition was an excellent opportunity to conduct PR and raise awareness of VCCI's roles and activities. VCCI held a booth in the "InnoVEX area", largely populated by startups, to conduct PR and invite new Taiwanese ICT vendors to become VCCI members.

## 2. Exhibition

- InnoVEX area, Taipei Nangang Exhibition Center Hall 2 (TaiNEX 2)
- June 4 to 7 during COMPUTEX TAIPEI 2024

## 3. Report on the VCCI Council exhibit

Angela Lin has actively support VCCI's PR activities as an interpreter and on-site presenter. She also prepared the following materials (traditional Chinese, Japanese, English) and gave explanations at the booth, distributing the materials along with various novelty gifts:

- Introduction to the VCCI Council (triple-folded pamphlet)
- VCCI standards chart
- Japanese electromagnetic regulations
- Scope of CISPR 32

## 4. This year's activities and results

### 4.1 Overview of the COMPUTEX TAIPEI 2024 exhibition

This exhibition, the largest of its kind in Asia, was themed around the concept of "connecting AI". It was held in Taipei Nangang Exhibition Center Hall 1 (TaiNEX 1) and Hall 2 (TaiNEX 2), and consisted of the following six topics:

- AI Computing
- Advanced Connectivity
- Future Mobility
- Immersive Reality
- Sustainability
- Innovations

During the four-day period of the exhibition, 85,179 ICT buyers and industry affiliates attended from over 150 countries and regions of the world. The top ten countries and regions overseas buyers came from were Japan, the US, South Korea, China, Thailand, Hong Kong, Vietnam, India, the Philippines, and Indonesia. In the InnoVEX area (4F, Hall 2), where VCCI had its booth, 400 new startups attended, from countries including Belgium, Brazil, France, Australia, Japan, Indonesia.

A record number of CEOs attended the keynote speech and forum, and major technology companies held speeches in a relay format. A record number of CEOs and Vice-Presidents from companies such as AMD, Qualcomm, Intel, MediaTek, Supermicro, and NXP were invited to the keynote speech. Industry partners were invited from a variety of fields to share their opinions on technological progress and its impacts, including NVIDIA's CEO, who made a surprise appearance on stage with Supermicro and MediaTek.

### 4.2 CI's public relations activities

We created pamphlets in traditional Chinese, English, and Japanese, and distributed materials such as guides to VCCI and standards charts in novelty mesh pouches. We made presentations through our on-site interpreter to help Taiwan IT vendors better understand VCCI. We approached attendees, asking, "Do you know the VCCI mark?", and to those who showed interest and those who approached us themselves, we explained the details in our pamphlets and explained the VCCI mark. For ease of understanding, we indicated the VCCI mark digitally displayed on attendees' own digital cameras and smartphones during our explanations. We received business cards from those who showed active interest, so that we could follow up with them later.

We also visited about 100 companies' (largely startups') booths exhibiting hardware on all four floors of Halls 1 and 2, and actively approached attendees, distributing novelty gifts and giving explanations.

### 4.3 Response to and results of public relations activities

This year's VCCI exhibit was near the event space on the fourth floor of Hall 2. This must have been part of the reason we received many visitors, and were able to distribute many of our pamphlets and novelty gifts.

We browsed about 100 companies' booths, and found that many companies had either obtained or recognized the CE and FCC certifications. Some attendees at this year's VCCI presentations expressed interest in considering VCCI in the future, as well as some companies thinking of expanding into the Japanese market.

### 4.4 Other

One wall of the exhibit booth displayed posters advertising the role of the VCCI mark and posters explaining the VCCI mark in traditional Chinese, which provided a good opportunity to explain VCCI and the VCCI mark. Of the other booths, surprisingly few were distributing novelty gifts, so by distributing mesh pouches displaying the VCCI mark, we were able to get many attendees to listen to us. Booth visitors carried our novelty bags around the exhibition venue, which we believe further boosted the effectiveness of VCCI's PR activities.

## 5. Impressions

We saw a range of cutting-edge ICT products displayed in one place, at large booths of global enterprises such as Intel and NVIDIA as well as major Taiwanese companies such as ASUS, Acer, BenQ, and GIGABYTE. The venue was a bit far from central Taipei, but attracted an incredible number of affiliated buyers and manufacturer affiliates from inside and outside Taiwan. Participating in this sort of exhibition was a powerful and effective way to promote VCCI to more people in a short period of time. We will consider participating in other exhibitions, and hope to continuously conduct global PR activities in the future.

Taipei Nangang Exhibition Center


VCCI booth

## 6. Interview with BSMI and CTCA

We used this trip to Taipei as an opportunity to exchange information with six CTCA members including Taiwanese BSMI Acting Director General Hsieh, who participated in the technical exchange meeting:

BSMI: Bureau of Standards, Metrology and Inspection
CTCA: Chinese Testing and Certification Association

# Status on FY2024 Market Sampling Tests

Market Sampling Test Subcommittee

As of June 28, 2024

| | | |
|---|---|---|
| Planned number of market sampling tests | Purchase-based | 65 |

| Terms of sampling tests | | Selected samples | Cancelled (Not shipped, etc.) | Testable samples | Test completed (breakdown below) | Judgment | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Passed | Failed- tentative | | |
| | | | | | | | Finally passed | Finally failed | Pending |
| Grand total | | 20 | 0 | 19 | 3 | 3 | 0 | 0 | 0 |
| Loan-based testing total | | 20 | 0 | 19 | 3 | 3 | 0 | 0 | 0 |
| Term (breakdown) | 1st Quarter | 20 | – | 19 | 3 | 3 | – | – | – |
| | 2nd Quarter | – | – | – | – | – | – | – | – |
| | 3rd Quarter | – | – | – | – | – | – | – | – |
| | 4th Quarter | – | – | – | – | – | – | – | – |

| "Failed- tentative" in FY 2021 | 対象 | Passed | Failed | Pending |
|---|---|---|---|---|
| | 2 | – | – | 2 |

| 2024 年度集計（2023 年度不合格水準含む） | Passed | Failed | Pending |
|---|---|---|---|
| | 3 | – | 2 |

| Document inspection | 計画件数 | Selected samples | Cancelled (withdrawal, etc.)) | Inspectable samples | Pre-check completed | Judgment completed | Judgment | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Cleared | Problems identified |
| | 50 | 22 | – | 15 | 15 | 6 | 6 | – |

# Report from the Secretariat

## ● List of Members (April 2024 - June 2024)

New members

| Membership | Member No. | Company Name | Country |
|---|---|---|---|
| Regular | 4375 | WORLD CHEMICAL CO., LTD | JAPAN |
| Regular | 4380 | Hitachi Vantara, Ltd. | JAPAN |
| Regular | 4357 | Phison Electronics Corporation | TAIWAN |
| Regular | 4358 | BOXX Technologies, LLC | USA |
| Regular | 4362 | Barco NV | BELGIUM |
| Regular | 4365 | IBASE TECHNOLOGY INC. | TAIWAN |
| Regular | 4366 | Legrand DPC LLC dba Server Technology | USA |
| Regular | 4367 | SanDisk Technologies, Inc. | USA |
| Regular | 4368 | SECUI Corp. | KOREA |
| Regular | 4369 | MiTAC Digital Technology Corporation | TAIWAN |
| Regular | 4370 | T+A Elektroakustik GmbH & CoKG | GERMANY |
| Regular | 4372 | Harman Professional, Inc. | USA |
| Regular | 4374 | VAST Data, Inc. | USA |
| Regular | 4376 | ScaleFlux Inc. | USA |
| Regular | 4378 | DFI Inc | TAIWAN |
| Regular | 4381 | Siland(Chengdu) Technology Co., Ltd. | CHINA |
| Supporting | 4356 | eTest certification Laboratory Inc. | TAIWAN |
| Supporting | 4360 | The State Radio_monitoring_center Testing Center | CHINA |
| Supporting | 4364 | Shenzhen Global Test Service Co., Ltd. | CHINA |
| Supporting | 4371 | TÜV Rheinland (Suzhou) Co., Ltd. | CHINA |
| Supporting | 4377 | SHENZHEN ALPHA PRODUCT TESTING CO.,LTD | CHINA |
| Supporting | 4383 | Shenzhen DACE Testing Technology Co., Ltd. | CHINA |
| Supporting | 4359 | Brelyon Inc | USA |
| Supporting | 4361 | Tianjin Dongdian Testing Service Co., Ltd. | CHINA |
| Supporting | 4363 | Xingsheng Certification Service (Suzhou) Co., Ltd. | CHINA |

Company name change

| Membership | Member No. | Company Name | Country | Old company name |
|---|---|---|---|---|
| Regular | 2047 | TOPPAN DIGITAL INC. | JAPAN | Toppan Printing Co., Ltd. |
| Regular | 3296 | Meiko Electronic Development Co., Ltd. | JAPAN | Meiko Embedded Products, Ltd. |
| Regular | 4024 | RAKUS Co., Ltd. | JAPAN | RAKUS HR Tech Co., Ltd. |
| Supporting | 463 | OLYMPUS MEDICAL SYSTEMS CORPORATION | JAPAN | OLYMPUS CORPORATION |
| Supporting | 943 | Carrier Japan Engineering Corporation | JAPAN | Toshiba Carrier Engineering & Life Support Corp. |
| Supporting | 3569 | KYB Corporation | JAPAN | KYB Corporation |
| Regular | 1182 | Marvell Technology Inc. | USA | Marvell Semiconductor Inc. |
| Regular | 1627 | ARRAY NETWORKS, K.K. | USA | ARRAY NETWORKS, INC. |
| Regular | 3046 | Seagate Technology LLC | USA | Seagate Technology |
| Regular | 3447 | GN Audio Taiwan Ltd. | TAIWAN | SteelSeries ApS |
| Regular | 3720 | CAPTIVISION KOREA Inc. | KOREA | GLAAM Co., Ltd. |
| Regular | 3912 | XILINX, INC / AMD | USA | XILINX, INC |
| Regular | 3966 | Corsair GmbH | TAIWAN | Corsair Memory Inc. |
| Regular | 4367 | SanDisk Technologies, Inc. | USA | SanDisk Storage Technologies, Inc. |

Note: Please fill out and submit "Form 9 Change Notification" on the website when a company name has been changed.

## ● FY 2024 schedule of VCCI events and training seminars

| | | |
|---|---|---|
| April | May | June<br>• Release VCCI Dayori No. 153<br>• COMPUTEX TAIPEI<br>• Education and training seminar "The basic technique of EMI measurement" |
| July<br>• TECHNO-FRONTIER 2024<br>• Education and training seminar "The basic of electromagnetic waves, EMI measurement technique"<br>• Business report meeting | August<br><br>Release Annual Report | September<br><br>Release VCCI Dayori No. 154 |
| October<br><br>CEATEC 2024 | November | December<br><br>Release VCCI Dayori No. 155 |
| January | February<br><br>Technical Symposium (plan) | March<br><br>Release VCCI Dayori No. 156 |

## ● Status of Compliance Test Notifications

## April 2024—June 2024 (Product names are examples and are not limiting)

| Classification of MME (Product types are not limited to only the following examples.) | | | | Classification code | | April 2024 | | | May 2024 | | | June 2024 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Class A | Class B | Class A | Class B | Total | Class A | Class B | Total | Class A | Class B | Total |
| ITE | Computer | Large | Super computer, Server, etc. | A 2 | a 2 | 16 | 1 | 17 | 22 | 2 | 24 | 23 | 1 | 24 |
| ITE | Computer | Stationary | Workstation, Desktop PC, etc. | B 2 | b 2 | 2 | 5 | 7 | 1 | 16 | 17 | 2 | 15 | 17 |
| ITE | Computer | Portable | Laptop PC, Tablet PC, etc. | C 2 | c 2 | 2 | 22 | 24 | 1 | 39 | 40 | 0 | 17 | 17 |
| ITE | Computer | Other computers | Wearable computers, Wearable device, Smart watch, Smart glass, etc. | E 2 | e 2 | 0 | 2 | 2 | 2 | 1 | 3 | 3 | 1 | 4 |
| ITE | Peripheral / Terminal | Memory device | HDD, SSD, USB Memory, Media drive, Disk device, NAS, DAS, SAN, etc. | G 2 | g 2 | 7 | 20 | 27 | 10 | 15 | 25 | 3 | 18 | 21 |
| ITE | Peripheral / Terminal | Printer device | Printer including multifunction machine, etc. (portable) | H 2 | h 2 | 0 | 10 | 10 | 5 | 2 | 7 | 6 | 5 | 11 |
| ITE | Peripheral / Terminal | Display device | CRT display, Monitor, Projector, etc. | J 2 | j 2 | 8 | 75 | 83 | 11 | 72 | 83 | 8 | 65 | 73 |
| ITE | Peripheral / Terminal | Other I/0 devices | Image scanner, OCR, Pen tablet, Stylus pen, etc. | M 2 | m 2 | 1 | 1 | 2 | 0 | 3 | 3 | 3 | 1 | 4 |
| ITE | Peripheral / Terminal | General purpose terminal | Display controller terminal, etc. | N 2 | n 2 | 0 | 1 | 1 | 3 | 0 | 3 | 1 | 0 | 1 |
| ITE | Peripheral / Terminal | Special purpose terminal | POS, Terminal for finance, insurance etc. | Q 2 | q 2 | 3 | 1 | 4 | 0 | 2 | 2 | 8 | 0 | 8 |
| ITE | Peripheral / Terminal | Other peripheral | PCI Card, Graphics Card, Mouse, Keyboard, Cradle, etc. | R 2 | r 2 | 3 | 26 | 29 | 6 | 49 | 55 | 6 | 30 | 36 |
| ITE | Peripheral / Terminal | Copying machine / Multifunction copying machine | Copying machine, Multifunction copying machine, etc. (Stationary) | S 2 | s 2 | 0 | 2 | 2 | 2 | 1 | 3 | 2 | 0 | 2 |
| ITE | Communications equipment | Terminal equipment | Mobile phone, Smart phone, PHS phone, etc. | T 2 | t 2 | 0 | 3 | 3 | 0 | 2 | 2 | 0 | 7 | 7 |
| ITE | Communications equipment | Terminal equipment | Telephone device such as PBX, FAX, Key telephone systems, Cordless phone, etc. | U 2 | u 2 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| ITE | Communications equipment | Network-related equipment | Communication line connecting device including Modem, Digital transmission unit, DSU, TA, Media converter, etc. | V 2 | v 2 | 3 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 3 |
| ITE | Communications equipment | Network-related equipment | LAN-related device, including Router, HUB, etc. Local switch, etc. | W 2 | w 2 | 43 | 14 | 57 | 35 | 14 | 49 | 28 | 17 | 45 |
| ITE | Communications equipment | Other communication equipment | Other communication equipment | X 2 | x 2 | 9 | 9 | 18 | 6 | 6 | 12 | 10 | 3 | 13 |
| Broadcast receiver equipment | | | TV, Radio, Tuner, Video recorder, Set-top box, etc. | | k 2 | | 3 | 3 | | 0 | 0 | | 0 | 0 |
| Audio equipment | | | Speaker, Amplifier, IC recorder, Digital audio player, Headset, DTM, AI speaker, etc. | L 2 | l 2 | 1 | 2 | 3 | 4 | 6 | 10 | 0 | 6 | 6 |
| Video equip ment | | Video equipment | Digital video camera, Web camera, Network camera, Video player, Photo frame, Digital camera, Drive recorder, etc. | I 2 | i 2 | 3 | 13 | 16 | 5 | 9 | 14 | 5 | 7 | 12 |
| Video equip ment | | Other video equipment | VR goggles, Scan converter, etc. | P 2 | p 2 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | 3 |
| Entertainment lighting control equipment | | | Entertainment lighting control equipment, etc. | Z 2 | z 2 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Other MME | Entertainment / Education | Electronic stationery | Electronic dictionary, e-book reader, Translator, Calculator, etc. | D 2 | d 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| Other MME | Entertainment / Education | Electronic toy | Game console, Game pad, toy drone, etc. | Y 2 | y 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other MME | Entertainment / Education | Other Entertainment / Education equipment | Navigator, AI robot, etc. | F 2 | f 2 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other MME | Other MME | | MME other than the above | O 2 | o 2 | 9 | 1 | 10 | 3 | 1 | 4 | 4 | 4 | 8 |
| Total | | | | | | 114 | 214 | 328 | 116 | 242 | 358 | 115 | 201 | 316 |

## ●Registration Status of Measurement and Other Facilities

The following table indicates the status on registration of measuring facilities in the most recent three months.
Facilities listed here are only those made open by members of application for registration in principle. Members with those facilities whose valid period expired are kindly advised to contact VCCI to inform of the status they are in. Status to choose from are, renewal application being filed, new application being filed, waiting for the next issue to carry, or terminating the registration (all facilities are posted in the Web site).
Facilities in Japan are listed in Japanese.

### List of newly registered or renewed facilities (April 2024 – June 2024)

R: Radiated EMI measurement facilities below 1GHz　C: AC-mains-ports-conducted EMI measurement facilities
T: Telecommunication-port-conducted EMI measurement facilities　G: Radiated EMI measurement facilities above 1GHz

| Company name | Equipment name | 3 m | 10 m | 30 m | Dark 3m | Dark 10m | Registration number | Effective date | Location | Contact to: |
|---|---|---|---|---|---|---|---|---|---|---|
| Hermon Laboratories Ltd. | Hermon Laboratories shielded room | - | - | - | - | - | C-20183 | 2027/4/14 | HaTakhana road, P.O.B 23, Binyamina, Israel | +972-4628-8001 |
| Hermon Laboratories Ltd. | Hermon Laboratories shielded room | - | - | - | - | - | T-20183 | 2027/4/14 | HaTakhana road, P.O.B 23, Binyamina, Israel | +972-4628-8001 |
| DEKRA Testing and Certification Co., Ltd. | SR104 | - | - | - | - | - | C-20184 | 2027/4/14 | Room 101, 1st floor, No.7 building, Smart Science Park Phase 5, No. 8213, Fanhua Avenue, Economic and Technological Development District, Hefei, Anhui Province,230091 P.R. China | +86-512-6251-5088 |
| DEKRA Testing and Certification Co., Ltd. | AC102 | - | - | - | - | - | G-20219 | 2027/4/14 | Room 101, 1st floor, No.7 building, Smart Science Park Phase 5, No. 8213, Fanhua Avenue, Economic and Technological Development District, Hefei, Anhui Province,230091 P.R. China | +86-512-6251-5088 |
| DEKRA Testing and Certification Co., Ltd. | AC102 | - | - | - | ○ | - | R-20225 | 2027/4/14 | Room 101, 1st floor, No.7 building, Smart Science Park Phase 5, No. 8213, Fanhua Avenue, Economic and Technological Development District, Hefei, Anhui Province,230091 P.R. China | +86-512-6251-5088 |
| ソニーグローバルマニュファクチャリング＆オペレーションズ株式会社 | 幸田　有線ネットワークポート妨害波測定設備SR2 | - | - | - | - | - | T-20176 | 2027/4/14 | 愛知県額田郡幸田町坂崎雀ケ入1 | 050-3809-3510 |
| 株式会社UL Japan | 本社EMC試験所第4電波暗室 | - | - | - | - | - | C-20181 | 2027/4/14 | 三重県伊勢市朝熊町4383番326 | 0596-24-7581 |

| Company name | Equipment name | 3 m | 10 m | 30 m | Dark 3m | Dark 10m | Registration number | Effective date | Location | Contact to: |
|---|---|---|---|---|---|---|---|---|---|---|
| 株式会社UL Japan | 本社EMC試験所 第3電波暗室 | - | - | - | ○ | - | R-20224 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7581 |
| 株式会社UL Japan | 本社EMC試験所 第2電波暗室 | - | - | - | - | - | C-20182 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7483 |
| 株式会社UL Japan | 本社EMC試験所 第4電波暗室 | - | - | - | ○ | - | R-20223 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7581 |
| 株式会社UL Japan | 本社EMC試験所 第2電波暗室 (Test volume 1.5 m) | - | - | - | - | - | G-20215 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7483 |
| 株式会社UL Japan | 本社EMC試験所 第5電波暗室 | - | - | - | - | - | C-20179 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7483 |
| 株式会社UL Japan | 本社EMC試験所 第3電波暗室 | - | - | - | - | - | C-20180 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7581 |
| 株式会社UL Japan | 本社EMC試験所 第4電波暗室 | - | - | - | - | - | T-20178 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7581 |
| 株式会社UL Japan | 本社EMC試験所 第3電波暗室 (Test volume 2 m) | - | - | - | - | - | G-20216 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7581 |
| 株式会社UL Japan | 本社EMC試験所 第2電波暗室 | - | - | - | - | - | T-20180 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7483 |
| 株式会社UL Japan | 本社EMC試験所 第3電波暗室 | - | - | - | - | - | T-20181 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7581 |
| 株式会社UL Japan | 本社EMC試験所 第5電波暗室 | - | - | - | - | - | T-20179 | 2027/4/14 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7483 |
| 株式会社UL Japan | 本社EMC試験所 第4電波暗室 (Test volume 2 m) | - | - | - | - | - | G-20217 | 2027/5/26 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7581 |
| 株式会社UL Japan | 本社EMC試験所 第1電波暗室 (Test volume 4.8 m) | - | - | - | - | - | G-20220 | 2027/5/26 | 三重県伊勢市朝熊町 4383番326 | 0596-24-7483 |
| Taiwan Testing and Certification Center | Conduction Test Site 10 m | - | - | - | - | - | T-20185 | 2027/5/26 | No.8, Lane 29, Wenming road, Guishan district, Taoyuan city, Taiwan, R.O.C. | +886-3-3280026-651 |
| KSIGN TESTING CO., LTD. | KSIGN TESTING CO., LTD. | - | - | - | - | - | G-20222 | 2027/5/26 | Building 5, No. 316, Jianghong South Road, Binjiang District, Hangzhou 310052, China | +86-131-7508-8000 |
| Worldwide Testing Services (Taiwan) Co., Ltd. | 966A | - | - | - | ○ | - | R-20226 | 2027/5/26 | No. 99, Sec. 1, Balian Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.) | +886-2-2646-1508 |

| Company name | Equipment name | 3 m | 10 m | 30 m | Dark 3m | Dark 10m | Registration number | Effective date | Location | Contact to: |
|---|---|---|---|---|---|---|---|---|---|---|
| Worldwide Testing Services (Taiwan) Co., Ltd. | 966A | - | - | - | - | - | G-20221 | 2027/5/26 | No. 99, Sec. 1, Balian Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.) | +886-2-2646-1508 |
| eTest certification Laboratory Inc. | CB03 | - | - | - | ○ | - | R-20228 | 2027/6/23 | 1F., No. 91, Ln. 298, Wengong 1st Rd., Guishan Dist., Taoyuan City 333001, Taiwan (R.O.C.) | +886-3-397-1300 |
| eTest certification Laboratory Inc. | C01 | - | - | - | - | - | C-20185 | 2027/6/23 | 1F., No. 91, Ln. 298, Wengong 1st Rd., Guishan Dist., Taoyuan City 333001, Taiwan (R.O.C.) | +886-3-397-1300 |
| eTest certification Laboratory Inc. | C01 | - | - | - | - | - | T-20186 | 2027/6/23 | 1F., No. 91, Ln. 298, Wengong 1st Rd., Guishan Dist., Taoyuan City 333001, Taiwan (R.O.C.) | +886-3-397-1300 |
| eTest certification Laboratory Inc. | CB03 | - | - | - | - | - | G-20224 | 2027/6/23 | 1F., No. 91, Ln. 298, Wengong 1st Rd., Guishan Dist., Taoyuan City 333001, Taiwan (R.O.C.) | +886-3-397-1300 |
| Shenzhen Global Test Service Co., Ltd. | Conducted emissions at Wired network ports | - | - | - | - | - | T-20187 | 2027/6/23 | Building 7, 202, Creative Park, No. 98 Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, China | +86-186-8947-8364 |
| Shenzhen Global Test Service Co., Ltd. | Power terminal conduction testing system | - | - | - | - | - | C-20187 | 2027/6/23 | Building 7, 202, Creative Park, No. 98 Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, China | +86-186-8947-8364 |
| DEKRA Testing and Certification Co., Ltd. | SR104 | - | - | - | - | - | T-20184 | 2027/5/26 | Room 101, 1st floor, No.7 building, Smart Science Park Phase 5, No. 8213, Fanhua Avenue, Economic and Technological Development District, Hefei, Anhui Province,230091 P.R. China | +86-512-6251-5088 |

## Closing words

I went on a little stroll down the Kyu-Tokaido (old Tokaido) highway, a historic road linking Edo (old Tokyo) to Kyoto.

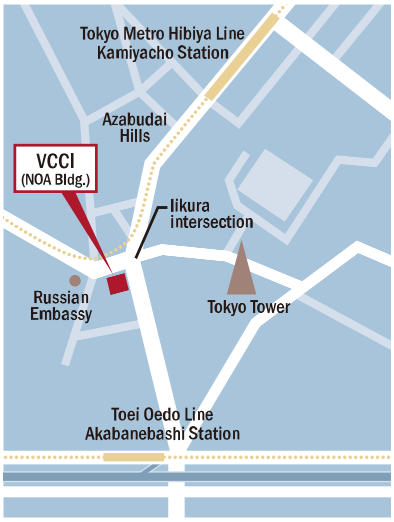
The starting point of the "Fifty-three Stations of the Tokaido" is "Oedo Nihonbashi". These days, the word "Tokaido" evokes images of railway lines such as the Tokaido Line or Shinkansen, but the old road offers other attractions. Just follow the old Tokaido between Tokyo and Yokohama from the first station, Shinagawa, to around the fourth station, Hodogaya, and you can enjoy a fascinating journey filled with memories of bygone days.

When Japan's first railway service opened in Meiji 5 (1872), the location of Shinagawa Station, which became a Shinkansen stop in October 2003, was not called "Shinagawa". Even now, the station's address is "Takanawa, Minato-ku". If you leave the Takanawa Exit with the train lines visible on your left, then cross the Yatsuyama Bridge passing over the Keikyu Line and JR lines, you will find the Kyu-Tokaido fully maintained with streetlights and a roadbed. Various shops line either side of the street, a bustling local tourist attraction. Keep walking, taking in the sights of various "Shinagawa-juku" stone monuments, pine trees, and descriptions of historic sites dotting the street, and you will see Honsenji, Shinagawa's oldest temple, on your right. This temple was founded in the Heian period (about 800 A.D.). According to one local anecdote, the temple's bell had been shipped to Europe at the end of the Edo period, and after negotiations, was finally returned in the early Showa period. Further down the street, past places called Samezu and Samehama, you'll find the Tachiai River peeking out above the ground. After crossing the river, you'll approach the ruins of the Suzugamori execution grounds, the famous site where "greengrocer Oshichi" was burned at the stake. Nowadays, the area is completely urbanized, the historic sites surrounded by tall buildings, but back in its day, it might have been quite a lonely place. From this point on, the old road is swallowed up by the "Dai-Ichi Keihin" (National Route 15), and just before Heiwajima Station, the Kyu-Tokaido becomes an old road called "Mihara Street". Crossing the Tama River between Kamata and Kawasaki is the old road "Rokugo-no-Watashi", which appears to have been near the present-day Rokugo Bridge.

For a while after entering Kanagawa Prefecture, the Keikyu Line follows the Kyu-Tokaido more closely than the Tokaido Line does. After entering Kawasaki City, the old road is bustling with activity again. Near Keikyu-Kawasaki Station is the public facility "Tokaido Kawasaki-shuku Interchange Center", and beyond that you will find historic sites such as the ruins of "honjin" inns. Near Hatchonawate Station, the old road crosses the Tsurumi River, running along the mountain side (west side) of the Keikyu Line. Keikyu-Tsurumi Station is built astride the Kyu-Tokaido, which abruptly gives way to a modern street passing by Keikyu-Tsurumi Station, featuring a crowded shopping arcade. Upon joining with Kokudo Station on the Tsurumi Line, the street blends seamlessly into a residential district. A little further on, however, you'll encounter the site of the historic "Namamugi Incident" where a British merchant was killed by samurai in 1862. It takes about ten minutes to walk from the point where the incident occurred (the first slash) to the vicinity of the Kirin Brewery Company's Yokohama Factory (the point of death), where a memorial stands.

For a while after that, the road is swallowed again by the Dai-Ichi Keihin highway. Near Keikyu Kanagawa Station, one stop before Yokohama Station, the Kyu-Tokaido reaches slightly higher ground, turning west to look down on Yokohama Station. The traditional Japanese restaurant Tanakaya, which appears in the ukiyo-e artwork of Utagawa Hiroshige, still exists today as a "Kappo-style" restaurant where Ryoma Sakamoto's wife, Oryo, once worked as a waitress. Back in those days, the area near the current Yokohama Station was mostly underwater, and the train tracks were apparently built on the embankment from Kanagawa to the current Sakuragicho. The Kyu-Tokaido passes the west side of Yokohama Station to the shopping arcade near Tennocho Station, bustling with activity yet again. Past Hodogaya Station, the road starts to run parallel to the Tokaido Line. We have now reached the end of Musashi Province. From here on, your journey will take you through Soshu. (M.H.)



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