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Pioneers of the Mobile Phone Business in Japan



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1. Introduction

This paper summarizes information regarding the many executives and engineers of companies that launched the Japanese mobile communications business (hereinafter, manufacturers) from the 1970s to the early 1980s. In the course of my research, I had the opportunity to directly interview the manufacturers involved in launching the mobile phone business. At the beginning, each manufacturer attempting to enter the mobile communication market, not only in Japan but also in the US and Europe, had to make business decisions, and engineers and management also had to put in great effort for development to move forward. With the establishment of mobile communication services, mobile phones began to be sold out of a system called "terminal open" in the US and Japan, and exclusive telecommunication business services were opened to many telecommunications carriers. Ever since, the mobile communication industry has been expanding steadily.

In compiling this paper, I felt that it was not sufficient to simply conduct a survey, but that managers and engineers should be interviewed directly. I believe that to advance information and the telecommunications industry of the future, it is necessary to understand the judgments and actions of management and engineers in at the beginning. Thus, this paper is intended to deepen our understanding of the future mobile development and business in Japan.

Please note that I do not abbreviate titles, etc., in the text of the people who were interviewed. Many of those interviewed have already retired and the company name is given as it was known at that time.

2. Development of Phones and the Mobile Communication Environment in Japan and the US

Nippon Telegraph and Telephone Public Corporation (NTT) was responsible for all telecommunications business in Japan as a national policy. At that time, NTT was not a private enterprise, but a special corporation that was responsible for all Japanese telecommunication business services. Research and development on the large-capacity mobile telephone system, with the repetitive zone system using the 800-MHz band, was carried out and energetically advanced by Dr. Okumura et al. [1]. In the Electrical Communications Laboratory (ECL) of the NTT, I was observing opportunities for presentation based on the

situation of the High Capacity Mobile Phone System (HCMTS), which is the large-capacity mobile communication system in the US. The announcement was made in November 1971, and HCMTS in the US was announced in December of that year. In 1972, the ECL was charged with developing large-capacity cellular communication equipment in the 800-MHz band for the Nippon Electric Company, Limited (NEC), Matsushita Communication Industrial Co., Ltd (MCI), and Hitachi Kokusai Electric, Inc.

Mr. Yoshio Masuda, then the manager of Oki Electric Industry (Oki), says that "The situation was that AT&T monopolized the telecommunications business in the US. AT&T, the Western Electric Company (WeCo), and Bell Laboratories managed telecommunications business services, communications equipment business, and the research, respectively. It was very unusual that one company could monopolize the telecommunications business throughout the entire US." At that time, the telecommunications business was becoming a profitable business in the US. There was strong motivation for AT&T to want to monopolize it. Motorola, which had a robust influence on wireless business to telecommunications operator AT&T, was very dissatisfied with the AT&T monopoly project.

Against this background in the US in 1973, "the Federal Communications Commission (FCC) issued Docket 18262 and approved 75 MHz (806-881 MHz) as a business of the next-generation mobile telephone." AT&T and WeCo commercialized mobile telephone base stations and phone terminals, but Motorola mainly filed complaints against AT&T's exclusive business with the FCC. For this reason, in January 1974, the FCC prohibited WeCo from manufacturing further mobile phone terminals. AT&T then entrusted development and manufacture of mobile phone terminals to external manufacturing companies, taking the stance of "Open technology and not market monopoly." which led to the international licensing of AT&T's patents, including to foreign companies.

3. Judgment and Execution of Corporate Managers

3.1 Battle in the Early Stages

3.1.1 NEC Corporation Case

Even at that time, NEC had very high technical capability in terms of microwave communication systems, and had been developing business overseas. Among the technicians, there was a so-called eminent member group that included Mr. Morita, Mr. Kawahasi,

Mr. Itoh and others. Among them, Mr. Tomizawa, Mr. Miyawaki and others who were in charge of radio equipment of a relatively lower frequency than the microwave band, began to develop the mobile phone. They were convinced that the mobile phone would be portable in the near future, and would have great potential against all fixed telephones.

At the same time, ECL and Bell labs began to propose cellular systems. In 1972, NEC was told to develop a large capacity mobile phone from the ECL. Mr. Yoshitake Matsuo who was then in charge of development says, “Although the microcomputer was not in the world yet, C-MOS technology and some microcontrollers began to emerge, as well as various development environments, such as the D10 switching system.” The NEC put a great deal of trust in ECL, because the technical capabilities of microwave, such as non-line-of-sight communication and satellite communication were very high. As a result, microcontrollers became an essential technology. However, there was a big risk in using the microcomputer for practical use in the world. NEC held a camp with ECL to discuss the situation, and decided to adopt the microcomputer. Mr. Matsuo states, “At that time, these were scary things, because I was only a young person. After developments such as the Intel 4040/8080 could be used, radio control became relatively easy.” NEC developed not only the radio equipment for mobile phones, but also the mobile switching system. The radio and mobile switching system were developed separately.

NEC did not hesitate. Mr. Matsuo believed that if NEC and ECL worked together, there was nothing they could not do. It also created a business, so that NEC no longer needed to do business with Bell Labs in the US. NTT mobile telephone service was 2-3 years earlier than planned. After that, NEC continued development of small capacity, medium capacity, and large capacity systems. They were aiming for 1 million subscribers nationwide. Although the market did not shoot up, Mr Matsuo was able to conduct the business.

3.1.2 Matsushita Communication Institute Co., Ltd. (MCI) Case

A meeting took place to introduce Motorola in the US at the Radio Regulatory Bureau in Japan. Mr. Takakshi Kawada, former president of MCI says that Mr. Kounosuke Matsushita spoke of the founding story of MCI. “Mr. Konosuke Matsushita was listening to stories while taking notes. He also needed to start a commercial radio and consumer electronic business. The headquarters of MCI should be located in Tokyo.” MCI had been engaged in the development of a 400-MHz band mobile phone system since the 1960s at the request of ECL. Along with the increase in the number of radio channels, MCI received the research and development consignment to develop a high-capacity 800-MHz-band mobile phone. Because MCI is not an NTT family company, this contract development was a big event.

For MCI, there was great advantage in developing a mobile phone with ECL, because NTT was very powerful in its technical development capabilities, as well as in procuring the domestic market. Mr. Kawada remembers, “The request from ECL developed into a very pressured situation.” He says there was also an advanced part comparable to Bell Laboratories in the US market, so he advanced development for the US, but it did not become a big business.



Fig. 1 TZ0-801 NTT Large Capacity Mobile Phone Radio equipment (MCI) [2]

3.1.3 Oki Electric Industry Co., Ltd (Oki) Case

Oki's wireless communications business received a large number of microwave communication projects, mainly in Central and South American countries such as Costa Rica and Panama. In the domestic market, the radio business was developing a taxi radio system. Mr. Yoshida was responsible for the taxi radio business at the time. He consulted with Mr. Masuda, who cautioned, “Taxi radio requires a lot of maintenance and operating costs. I cannot imagine the radio taxi business will advance on this extension. How should we develop the wireless communication business in the future?” he continued, “From now on, public wireless communication will be important.” This endorsement would become a big motivation for Mr. Yoshida to advance the mobile phone business. In the US, social pressures from the group of companies centered on Motorola were getting stronger against the monopoly of AT&T's communication terminal business.

After the announcement of HCMTS in 1971, AT&T planned to implement open bidding for AMPS (Advanced Mobile Phone System) radio in response to social pressure. For AT&T, the exchange service using switching system was their main business. Mr. Masuda recalls that at the time, “The information that AT&T was going to implement worldwide AMPSs bidding was brought in through our overseas sales department. When the AMPS became a public market project, it would be the center of the wireless business in the future.” Mr. Masuda says “At least that was my intuition at the time.”

For the AT&T bid, Mr. Masuda and Mr. Katsuta joined forces. Mr. Masuda was itching to do new

business. “Since I had no time to go to the board of directors, I got money from three divisions and entered a bid. It was 1.5 million yen at the time. I asked the former Motorola's Mr. Ishida for a lot of bidding work.” Originally Oki was bidding all the work in Latin America and was accustomed to overseas bidding. Oki was then a family company of NTT, and it was predicted that the NTT domestic business department would rebound strongly against advancing AT&T's AMPS. Mr. Toyoo Kanai also join the work of putting together a comprehensive bid. For this effort, Mr. Masuda received strong support from the office manager class.

3.1.4 Circumstances in the United States

Bell Labs conducted a public bid on a global scale. Five well-known manufacturers from Japan participated. Dr. Reed Fisher, who was manager in Bell Labs at that time, recalls “On November 21st 1974, a briefing session on the development of a mobile phone terminal was held at Whippany (Bell Labs). Five US companies and five Japanese companies attended the briefing. Oki's proposal for a Technical Trial mobile won the highest evaluation. Oki then received a Bell Labs contract to build 120 units for the 1979 Chicago Trial.

3.2 Middle Stage

3.2.1 NEC Case

Although Motorola's dumping problem occurred, management decided that NEC had to develop a mobile phone together with ECL. Mr. Matsuo stated, “The Motorola dumping problem drove me crazy. Motorola came and spoke fluently in English, so I said “do it in Japanese as it is Japan.” But Motorola also had a variety of suggestions. I was able to study from Motorola. There was the case of an airplane accident at Mt. Osutaka that occurred in 1985. NEC was preparing a mobile radio, but using the cellular radio at that time I was able to communicate by grabbing the radio waves from the mountain to Hitachi, because it was 3 W cellular phone. At the same time, Motorola released the Dynatack 8000x. The ECL issued strong orders to NEC to focus on miniaturization equipment using all kinds of technology. Mobile phones began to sell as a result of this miniaturization. Mr. Matsuo asserted, “Everything is due to DDI (Daini Den Den) corporation, which also began mobile phone services. We started the mobile phone service together.” It became possible to fold mobile phones, and they sold like hot cakes. Sales of NCC (Non Common Carrier) Pocket bells began to gain momentum. “The pager business was opened by two operators in 1987, and this too gathered momentum. It led to the next digital cellular. NEC did various things overseas, but I did not give it to the European GSM (Global System for Mobile Communications). Too much money was needed to develop overseas.”

3.2.2 Matsushita Communication Institute Co., Ltd., (MCI) Case

MCI delivered a 400-MHz VIP car phone system in

accord with the Qatar Full Turnkey (design, equipment procurement, trial, all at once) agreement with the UAE and Qatar. Against this backdrop, the intention to develop the mobile phone business globally, including sales, was strong, and we had been working on the development of GSM (Global System for Mobile Communications) from the early stages in digital mobile communication. Although MCI was promoting development centered on mobile equipment, it began to develop mobile switching systems. Mr. Kawada recalls, “Although it was quite unreasonable, I did it at the time. Motorola's DYNATAC was sold at 200 cc, but I did my best to downsize it to 150 cc, from the perspective of device development. As a result of this, the mover was developed. At that time, the development of hardware was important, but as we can see now with the iPhone, software development will have a showdown.”

3.2.3 Oki Case

Since Oki also delivered a telephone switching system for NTT as a member of the NTT family, Oki also wanted to enter the NTT market, even with a mobile phone. Although the NTT sales department in Oki said that it was useless to do such a thing, Mr. Masuda brought it to ECL in 1974. The ECL response was severe, however. Mr. Masuda said simply, “I thought the ECL response was unreasonable.” Meanwhile, Bell Labs announced that the AMPS radio bidding would begin. I tried my best. Mr. Kanai who was in charge of offshore development said, “At that time, several important technologies were required for the bidding conditions: the first was a broadband amplifier with a dynamic range of 80 dB and a resolution of 1 dB; the second was a synthesizer; and the third was CMOS technology. Further, the synthesizer had to be prototyped as a bidding condition. Mr. Nakagawa and Mr. Onodera already had high technology: “The Bell Labs Bidders meeting was held at Whippany, New Jerseys,” Mr. Masuda said, “It was a completely open meeting.”

Bell Labs decided to visit the factories of proposing companies. Oki only succeeded in bidding at Bell Labs. Mr. Yoshida, back from the US after the bidding conference, had only a few months to prepare. Mr. Masuda was preparing to coordinate the switching transmission and semiconductors. He remembers, “In response to the factory visit by Bell Labs, I made industrial designs and mock-ups, and made it to the point just before the visit. Bell Labs had conducted extensive experiments on the operability of driving and a mobile phone. Oki also showed that he was engaged in ergonomics research on the operability of a mobile phone. The Bell Labs representatives came to visit the factory. Of course, Bell Labs also visited other companies in Japan. These companies' information was brought to Oki. Oki was familiar with overseas bidding, but many were experts in Spanish in Latin America, prepared and responded with an English expert who understood technology.

This may be the reason why Oki became the only

company in the world that was chosen for the Chicago technical trial [3].

Dr. Fisher, then one of the managers at Bell Labs, said “Oki’s technology was good”. After the successful 1979, Chicago Technical Trial, Oki, Motorola, and E. F. Johnson were contracted by Bell Labs to provide 2500 mobile phones for the 1983 Chicago Cellular Commercial Service Trial.

Oki strengthened relations with Bell Labs. At the time of Motorola’s dumping lawsuit in 1984, Oki had already switched to local production in the US and made a large investment there. There was no option but to pay a fine for Motorola’s dumping suing. Oki decided not to bid for the NTT offering [4].



Fig. 2 Chicago Trial mobile equipment (Oki) [3]

3.2.4 The Circumstances in the United States

Mr. Masuda states, “Motorola thought that mobile communication was a consumer business, and was thinking of portable phones from the beginning rather than just as a mobile phone. AT&T launched a portable phone business after its mobile phone business.” Mr. Masuda further explains Motorola’s thinking: “For Motorola, it was inevitable that Oki would be chosen, but they would stop other manufacturers from entering the US market.” The US was divided into wired carriers represented by AT&T, with wireless carriers in each region supported by Motorola. The mobile phone business is a nationwide project, and AT&T’s monopoly was unacceptable to Motorola’s business.

Furthermore, as the technical trial ended and commercial services launched, Motorola dumped problems and patent disputes on Japanese companies. In the US, Motorola conducted an open judicial struggle against AT&T for market monopoly. For three years the start of AT&T mobile phone service was delayed in 1983 from Japan’s service. At the time, I was responsible for development, and thinking that service in the US was delayed compared with Japan because of the court struggle. However, according to Dr. Fisher, the service in 1983 was as planned by AT&T, and it is said that it was during that time that the necessary legal development was completed in the country.

3.3 An Impressive Story

Mr. Matsuo of NEC says, “Why did Apple introduce

the iPhone to the world? I think that excellence is different in the world. Microsoft, Intel and Qualcomm, gather truly exceptionally good technicians and cut 10 % from the bottom. Japanese manufacturers cannot do it. Another important thing is that Nokia and Samsung are fully supported by the bank and government when going out into the world. Japan has no choice but to do so merely by the power of the manufacturer. The crucial difference is financial strength.”

As Mr. Kawada of MCI put it, “To do things that seem to be reckless, that’s when I can make great progress.”

Mr. Masuda of Oki said “The FCC did not conclude with US cellular service.” Mr. Miyake and Mr. Masuda of Oki were invited to AT&T’s headquarters in New York in 1979, where AT&T President Charles Brown, Bell Laboratory Director Ian Munro Ross and WeCo President Donald Procknow were waiting for them. The first thing he told us, “I would like to thank Mr. Masuda who developed the mobile phone in a very short time. I want to thank you”. That evening we were invited with three top AT&T senior executives to the top floor restaurant Windows on the World in the International Trade Center Building. The top executive was a joke lover, and Dr. Ian Munro Ross said, “From now on you will go to Illinois Bell, which is in Indian Hill, although I have never seen an Indian.” President Donald Procknow acknowledges, “I have been struggling since we were young, as we climbed the mast pole in WeCo.” And President Charles Brown, who had been having the hardest time with the AT&T anti-monopoly issue, said, “If I say it is a hard work, I’m having much more trouble than climbing a telegraph pole.”

4. Conclusions

I interviewed representatives of Japanese manufacturers who were there at the genesis of the mobile phone industry in the 1970s. I asked why they decided to proceed with the development of a mobile phone, and how they did so. I had the opportunity to ask them to tell their story. Those who agreed to an interview at this time were all pleasant to me. Not only did they tell us exactly what they had thought and talked about during development, but also about what their bosses, colleagues, and subordinates supported and developed. I think that there were many hints in this interview that Japan is ahead of the world in preparing to create a new era for the future. Thank you very much for the fun interviews.

5. Acknowledgements

In addition to generously giving valuable time for the interviews, I would like to thank Mr. Yoshitake Matsuo, Mr. Takashi Kawada, Mr. Yoshio Masuda, Mr. Toyoo Kanai, and Dr. Reed Fisher. I deeply appreciate their cooperation on this project.

6. History

- 1940: Study of Bell Labs large capacity cellular system
- 1971: ECL, Presentation of a large capacity mobile phone
Bell labs. announces HCMTS
- 1972: NEC, Matsushita, Kokusai Electric Contracts development of large-capacity 800 MHz mobile phone offered by ECL
- 1973: Motorola Dynatack 8000 released
- 1974: FCC Docket 18262 Issued
Holding Bell Labs Mobile Bidders Conference (10 Japanese and US companies participating in manufacturer)
- 1975: Bell Labs factory tour in Japan
- 1979: US Chicago Trial, Electric public corporation mobile phone service launched
- 1983: Cellular service launched in the US
- 1984: Motorola Dynatack 8000X Commercial, Motorola mobile phone dumping appeals [5]
- 1985: Privatization of NTT

7. References

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- [3] Chicago Trial mobile equipment (Oki).
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Research on Wireless Power and Information Transfer for Super Smart Society

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1. Introduction

Our daily lives are supported by electromagnetic waves. In particular, the microwave has been employed for wireless communication to help make our daily lives more comfortable. Recently, a vision called Society 5.0, which aims to realize a super smart society, has been declared by the Japanese government [1]. As one of the promising solutions, wireless power transfer coupled with communication has been placed in the limelight.

The Society 5.0 paper urges the acceleration of data transmission and an increase in capacity. To overcome this hurdle, next-generation communication techniques such as massive MIMO (Multiple-Input-Multiple-Output) and full duplex have been studied. Developments of RF (Radio Frequency) front-end circuits suitable for these technologies are required. These techniques can also be employed for a sustainable sensor network such as health monitoring in vehicles and environment monitoring in built infrastructures. A lot of sensor nodes with small batteries are installed in these applications and it is difficult and time consuming to replace the battery of each sensor. Therefore, a wireless power transfer (WPT) technique has been developed. However, within these spaces several scatterers are present making power transfer challenging.

Our laboratory has been investigating the solutions to the problems of the two techniques outlined above since 2014 when our laboratory was launched. This article introduces our recent activities.

2. Next-Generation Wireless RF Circuit

Full duplex communication, which is one of the next generation communication technologies, uses the same frequency to transmit and receive information on the same frequency band. This communication has a major challenge in that the received antenna receives its own transmitted radio. Furthermore, as the transmitted and received antennas are implemented on the limited area of the device, the position relation between the antennas results in a strong electromagnetic coupling. This self-interference also emerges for MIMO. To reduce this self-interference, cancellations by digital and analog circuits have been proposed. We started the integration on the analog cancellation circuit utilizing the antiphase signal to the self-interference as shown in Fig. 1. Since few works with a circuit design procedure

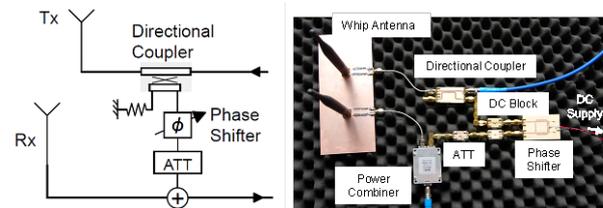


Fig. 1 Analog cancellation circuit of full duplex communication

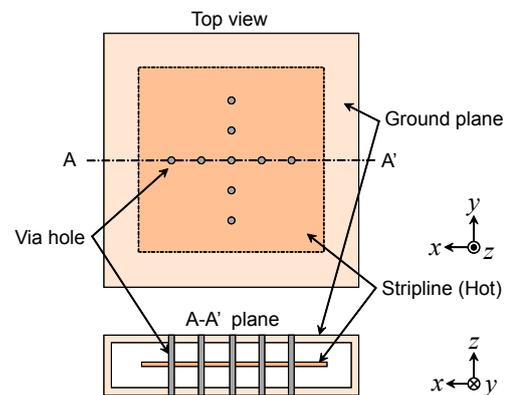


Fig. 2 multimode resonator

to meet the desired amount of reduction have been reported, we first addressed the establishment of a procedure [2]. As the cancellation amount is dependent on the insertion loss, phase shift, and group delay in the cancellation circuit, the relational expression between the self-interference amount and them were clarified. Then, the equations that determine the design specifications of each component consisting of the cancellation circuit were derived. The design specifications can be estimated from the desired cancellation amount and bandwidth. The experimental result showed that the circuit designed by our equations achieves the desired amount of cancellation. We are developing a one-chip module of a self-interference cancellation circuit that can handle both phase and

Although the cancellation circuit can mitigate self-interference, it cannot reject the spurious frequencies from the other wireless communication systems. Therefore, a band-pass filter (BPF) is one of the key components. Performance needs to be improved in next-generation communication techniques, while devices are not allowed to increase in size. The miniaturization of BPF in particular to be used in base

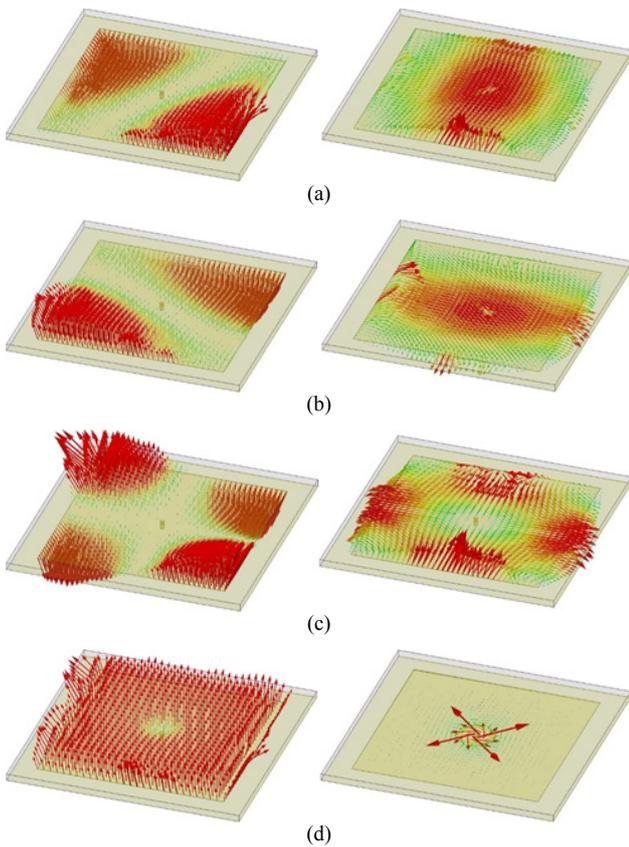


Fig. 3 Field distribution of HFSS eigenmode solution in Fig. 1 (left: electric field, right: magnetic field): (a) and (b) pair of orthogonal degenerated modes (TM_{10} and TM_{01}), (c) HS mode, (d) LC mode

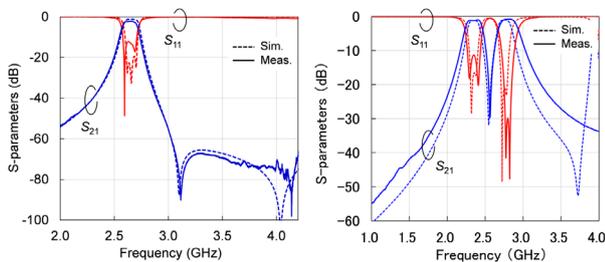


Fig. 4 Filter response: (a) Single band (b) Dual band

station is required. We've been focusing on a multimode resonator that is very attractive and interesting in terms of its miniaturization because several resonances can occur in a single resonator structure. However, it is difficult for the multimode resonators to handle several resonances that are close to each other, because cavity mode is mainly employed. Therefore, we are developing a new concept for a multimode resonator which incorporates several transmission resonance modes and one quasi-lumped component resonance mode [3,4]. The prototype to verify the operation principle is shown in Fig. 2. The transmission line modes are TM_{10} and TM_{01} which degenerated each other, and a 1st order Higher-order Stripline (HS) mode. The standing wave fields of these modes diagonally occur on the square patch as shown in Fig. 3 (a) and (b), respectively. The field distributions of the 1st HS mode is shown in Fig. 3 (c). The HS mode

for the electric field distribution (E field) always has the maximum amplitude at the four corners of the patch and zero amplitude from the center of the four sides to the center of the patch. Magnetic field distribution (H field) shows a maximum amplitude in the center of the four sides, and an amplitude of 0 at the four corners and the center of the patch. In fact, the center of the square patch represents the absence of an electromagnetic field. Thus, the field distributions are independent from the via hole at the center of the patch connected to the ground. When the via hole is placed in the center of the square patch, the in-phase maximum amplitude of E field distribution at a certain frequency appears on the perimeter of the patch as shown in Fig. 3 (d). A maximum amplitude of the H field distribution is concentrated in the vicinity of the via hole. The via hole and patch are respectively equivalent to the inductor and capacitor. Consequently, LC (quasi-Lumped Component resonance) mode can be considered. This mode cannot occur without the via hole. We have designed the single and dual-band BPFs utilizing a tri-plate stripline structure and the responses are shown in Fig 4. The operation principle can be easily demonstrated by employing the stripline structure, whereas the benefit of compactness from a perspective of practical application is small as compared to a cavity type. Based on these results, we are advancing the design and developing the cavity resonator as a next step right now.

3. Wireless Power and Information Transfer for Closed Space

Next generation communication technologies such as the 5G network are expected to combine with the Internet of Things (IoT), such as in telematics and telemetry. Communication to numerous sensors plays a crucial role for the applications. A Technique to wirelessly transfer not only data but also power to the sensors has been developed. It is WPT utilizing a resonant cavity mode. However, it is difficult to reconstruct a fully shielded space for practical applications such as in a building, greenhouse, or even plant installation and facilities which are dangerous for people to enter such as power or chemical facilities. This approach has also the restriction in that wireless communication to the sensors can only be conducted internally because of the fully closed space.

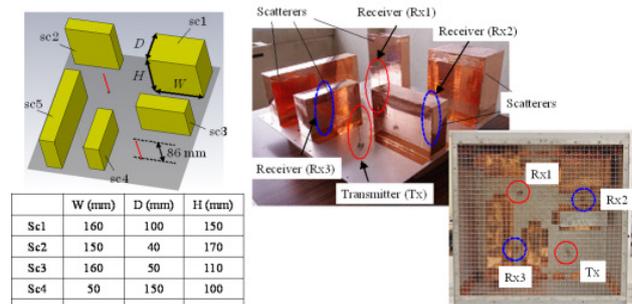


Fig. 5 Prototypes of preliminary experiment in WPIT

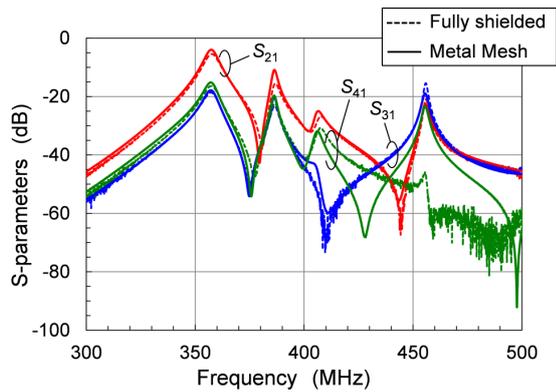


Fig. 6 Comparison results of S-parameters

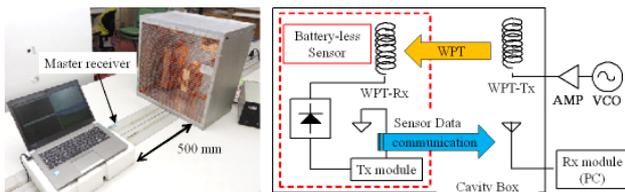


Fig. 7 Driving experiment of sensor in Fig. 5

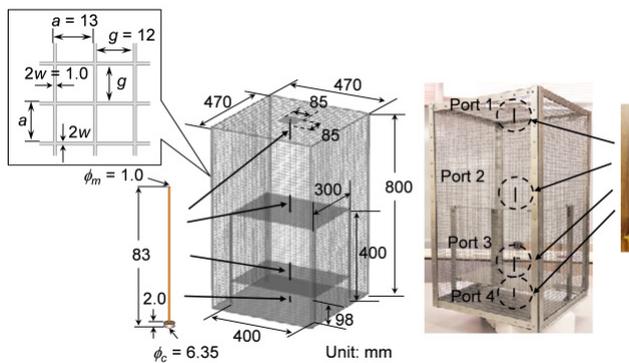


Fig. 8 Box enclosed by metal meshes with shelf

We propose a wireless power and information transfer (WPIT) in a closed space utilizing frequency selected surfaces (FSSs) [5,6]. The framework of greenhouses or plant facilities can be considered as the metal meshes which can work as an FSS. Therefore, the operation frequency of WPT can be confined in the metal mesh framework by making the mesh size smaller than the wavelength of the operation frequency. The frequency can be determined based on the dimensions of the frameworks due to the cavity mode resonance. On the other hand, the wireless communication can be transmitted and received outside by making the mesh size larger than the wavelength of the transmitting and receiving frequencies. As a preliminary experiment, the pseudo-shielded space that replaces one surface with the metal mesh was fabricated as shown in Fig. 5 and measured S-parameters are shown in Fig. 6. S-parameters were confirmed that there was almost no difference between the full shielding model and the metal mesh model. The resonant frequencies were observed in both sets of results. Then, we demonstrated the driving experiment of the battery-less sensor using the metal mesh model

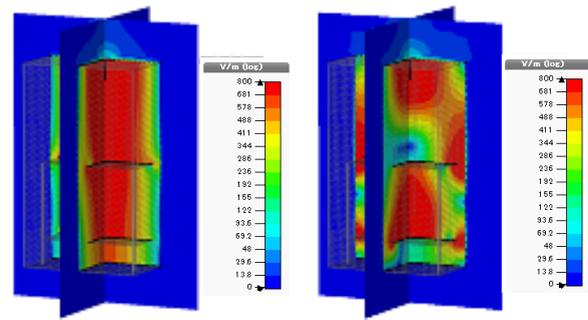


Fig. 9 Electric field distribution: (a) TE₁₀₁-like mode at 447 MHz, (b) TE₁₁₁-like mode at 494 MHz

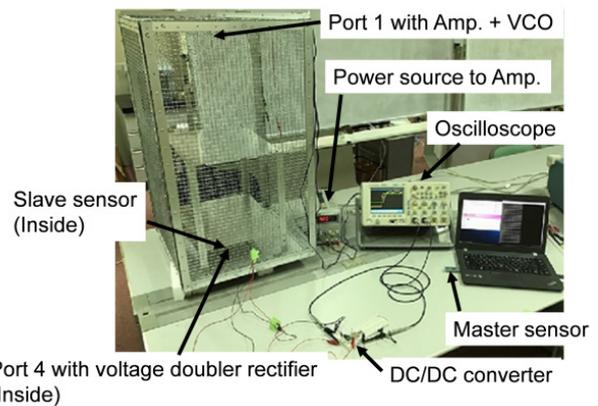


Fig. 10 Driving experiment of sensor in Fig. 8

in Fig. 7. As wireless power was transferred to the so-called line-of-sight (LOS) and non-line-of-sight (NLOS) sensors in the box, wireless communication between the inside sensors and the receiver outside the model was achieved.

As the next step, we fabricated the box enclosed by the metal meshes with the shelf in Fig. 8. S-parameters that were measured between the feeding point and the receiving points on the boards of the shelf have maximal values the same as the preliminary model because the electromagnetic wave is confined in the box at the resonant frequencies shown in Fig. 9. Note that the standing wave close to TE₁₀₁ mode at 447 MHz penetrates the shelf spacing. Thus, the power is wirelessly transferred to the LOS and NLOS sensors by using around 447 MHz. We also carried out a driving experiment of the battery-less sensors with the model shown in Fig. 10. It was observed that each slave sensor could be worked at a power of 13 dBm from port 1 at around 447 MHz and each temperature data from the sensor could be also received by the outside receiver connected to the laptop. This shows that the frequency of the power provided to the RF and sensor module is confined in the metal mesh box and the sensing data can be received outside. However, the RF-DC conversion efficiencies are dependent on the sensor installation sites in this method due to the impedance change between the feeding probe and the power receiver. We are investigating this significant challenge.

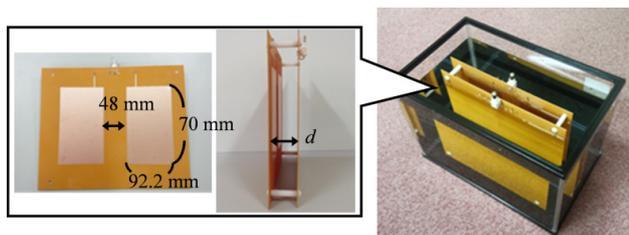


Fig. 11 Prototype of electric coupler

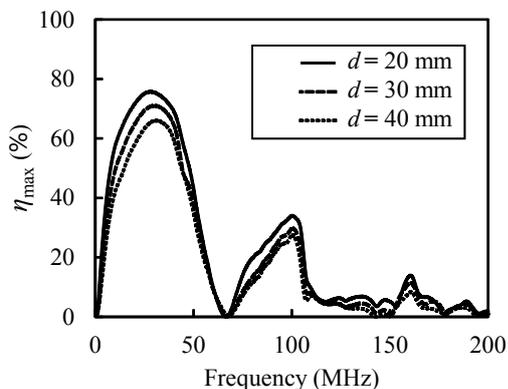


Fig. 12 Maximum power transfer efficiency in Fig. 11

4. Underwater Wireless Power and Information Transfer

We have been also developing underwater WPIT. As one of the targets, there is the autonomous underwater vehicle (AUV) for deep sea exploration. The AUV requires charging above water, which hinders improvement in the AUVs operational efficiency. This problem can be solved by the information and power that are wirelessly transferred to the AUV from the charging station set up on the submarine cables. In the case of WPT employing magnetic coupling, since a magnetic field is generated by the leakage flux through the transmitting and receiving coils, there is the challenge of electromagnetic interference (EMI). In particular, it is a deep concern that a high power magnetic field will cause serious damage to precision equipment, because U-WPT to AUV is carried out under a high power of a kW class. The capacitive coupling has the advantage of confinement of the electric field energy. However, this approach brings a reduction in efficiency because of the large dielectric loss of water. Therefore, we focused on the complex permittivity of the water. First of all, we investigated the complex permittivity of fresh water, and the relationship between the electrode size and WPT efficiency was elucidated from the frequency characteristics of the dielectric loss of water. Then, we designed the electric coupler based on the relationship in Fig. 11 and an efficiency of 75 % at around 30 MHz was achieved in Fig. 12 when the electrode size and the distance of facing electrodes were 70.0×92.2 mm and 20 mm [7]. We are moving on to the next phase in developing the optimization of the couplers under seawater.

As one of the essential technologies for underwater WPIT, there is wireless power transfer of kW power. However, since the electric properties of water/seawater under the circumstance of kW RF power are not elucidated, it is difficult to optimize the structure of the electrodes used in WPT under water. Therefore, we are also investigating the method to measure them [8].

5. Conclusion

This article introduced our laboratory's activities. These ideas that are driving force behind the activities are suggested, discussed, and investigated by twelve students (in 2017) [9]. We are striving forward to our goal to make our lives better off through our proposed techniques.

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Report on the 2nd Malaysia-Japan Workshop on Radio Technology (MJWRT2017)

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1. Introduction

The 2017 Malaysia-Japan Workshop on Radio Technology (MJWRT2017) was the second workshop on Radio Technology between Malaysia and Japan. The MJWRT2017 was sponsored and organized by the Technical Committee on Antennas and Propagation of the Institute of Electronics, Information and Communication Engineers (IEICE/AP), technically co-sponsored by the IEEE AP/MTT/EMC Malaysia Chapter, and was held in cooperation with the IEEE AP-S Tokyo Chapter. This workshop was held on January 26-27, 2017 at Malaysia-Japan International Institute of Technology (MJIT), Universiti Teknologi Malaysia Kuala Lumpur (UTMKL).



Fig. 1 Campus Director of UTMKL:
Prof. Dr. Durrishah Idrus

2. Brief History of MJWRT

The MJWRT2015, the first MJWRT, was held on June 15, 2015 at MJIT, UTMKL [1]. In this second MJWRT, MJWRT2017, Prof. Keizo Cho (Chiba Institute of Technology) and Prof. Tharek Abd. Rahman (UTM) served as general co-chairs.

The workshop is intended to provide an international forum for the exchange of information on the progress of research and development in antennas, propagation, RF/microwave and radio communication systems. It is also an important objective of this workshop to enhance the friendship between Malaysian and Japanese researchers.



Fig. 2 Prof. Keizo Cho



Fig. 3 All attendees at MJWRT2017 in Kuala Lumpur



Fig. 4 Prof. Tharek Abd. Rahman



Fig. 6 Innovation center for 5G at MJIT



Fig. 5 Dr. Tetsuro Imai

On the second day, Prof. Nishimori, Prof. Tharek (Fig. 4), and Dr. Imai (Fig. 5) gave lectures about the fifth-generation mobile communications system (5G) in tutorial workshops.

4. Social Events

At the lunch time on the first day, the technical tour was held at the innovation center for 5G at MJIT (Fig. 6). Prof. Tharek and other staffs explained the current situation of the research and development about 5G in Malaysia.

At the first night, the participants enjoyed a banquet at the D'Saji KL Titiwangsa (Fig. 7). As for the opening, we had a few words from Prof. Badrul Hisham Ahmad, Chair of the IEEE AP/MTT/EMC Joint Chapter Malaysia. After that, four students received the student paper awards at the award ceremony.

3. Technical Sessions

The technical program of the MJWRT2017 consisted of a regular session and a tutorial workshop where 31 papers in regular sessions were presented. Total number of registered participants reached 73, including 22 from Japan and 51 from Malaysia.

On the first day, Prof. Dr. Durrishah Idrus (Campus director of UTMKL, Fig. 1) and Prof. Keizo Cho (Fig. 2) gave greetings at the opening ceremony. After the technical sessions, all participants were gathered together and took a commemorative photograph as shown in Fig. 3.

5. Conclusion

The MJWRT2017 was finished with a great success (see more information and photographs at [1]). We are planning the third MJWRT in 2019. See you all in Malaysia!

6. References

[1] IEICE Technical Committee on Antennas and Propagation web site, <https://www.ieice.org/cs/ap/jpn/index.php>



Fig. 7 Banquet at the first night

Annual Report of Technical Committee on Network Systems

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 Yoshikatsu Okazaki^{††}, NTT Corp.
 Kazuya Tsukamoto^{†††}, Kyushu Institute of Technology
 Kenichi Matsui^{††††}, NTT Corp.
 Hideki Maeda^{††††}, NTT Corp.



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1. Introduction

This report covers the annual activities of the IEICE Technical Committee on Network Systems (NS). It describes activities at the monthly technical meetings, recent research topics of the committee, and the research awards for 2016.

2. Technical Meetings

The schedule from April 2016 to March 2017 consists of 10 NS technical meetings, one workshop [1], and additionally, 3 technical meetings of Network Software (NWS) sub-committee (as shown in Table 1). Several meetings are co-located with the ICN (Information-Centric Networking), OCS (Optical Communication Systems), PN (Photonic Network), RCC (Reliable Communication and Control), ASN (Ambient intelligence and Sensor Networks), RCS (Radio Communication Systems), SR (Smart Radio),

CS (Communication Systems), IN (Information Networks), NV (Network Virtualization), ICM (Information and Communication Management), or CQ (Communication Quality) committees.

Recently presented papers mainly focus on technologies that support new generation network, network virtualization, SDN, NFV/SFC, cloud computing, green ICT, wireless/ad-hoc networks, ICN/CCN, M2M/IoT, Mobile Edge Computing (MEC), machine-learning/AI, Quality of Service (QoS), and security issues. At each technical meeting, we host lectures by invited speakers who are experts in their research fields. During this fiscal year, we have had invited lectures on network operation, network design, network architecture, IoT, NFV, vehicular network, and other topics. In fiscal 2016, we had 192 presentations from academia and 93 from industry in NS technical meetings.

Since June 2003, we have fostered the work of young

Table 1: Technical meeting schedule for fiscal 2016. (Gray cells indicate technical meetings of NWS sub-committee)

Date	Location	Theme	Co-location with
April 21–22	Wakayama Univ. (Wakayama)	Traffic, Network Evaluation, Performance, Resource Management/Control, Traffic Engineering, Reliability, Resiliency	
May 19–20	Yokohama Kyoiku Bldg. (Kanagawa)	Advanced Protocol and Network Control, Network System Architecture	ICN
June 3	Shibaura Institute of Technology(Tokyo)	Network Service, Network Software, Software Technology	
June 23–24	Hokkaido Univ. (Hokkaido)	Core/Metro System, Photonic Network System, Optical Network Design, Traffic Engineering, Signaling, GMPLS, etc	OCS, PN
July 20–22	Nagoya Institute of Technology (Aichi)	Wireless Distributed Network, M2M: Machine-to-Machine, D2D: Device-to-Device, etc.	RCC, ASN, RCS, SR
September 29–30	Tohoku Univ. (Miyagi)	Post IP Networking, Next Generation Network, Contingency Plan/BCP, Network Configuration, etc.	IN, CS, NV
October 20–21	Himeji-Nishi Harima Jibasan (Hyogo)	Network Architecture (Overlay, P2P, Ubiquitous Network, Active Network, NGN, New Generation Network), Grid, etc.	
	Osaka Univ. Nakanoshima Center (Osaka)	Network Architecture, Network Software, Software Technology	IN
November 24–25	Shimonoseki Chamber of Commerce and Industry (Yamaguchi)	Network Quality, Network Measurement and Management, Network Virtualization, Network Service, General	CQ, ICM, NV
December 21–22	Kanazawa Kinrosya Plaza (Ishikawa)	Multi-hop/Relay/Collaboration, Sensor/Mesh, Mobile Ad-hoc Network, D2D/M2M, Wireless Network Coding, etc.	RCS
January 26–27	Kagoshima Sityouson Jichi Kaikan (Kagoshima)	Network Software, Network Application, SOA/SDP, NGN/IMS/API, Distributed Control/Dynamic Routing, Grid	NWS
March 2–3	Okinawa Zanpamisaki Royal Hotel (Okinawa)	General, NS/IN Workshop (March 2)	IN

researchers who have presented papers at NS technical meetings by inviting them to give a follow-up talk some months later. We call these the “encouragement talk.” We invited 18 young researchers to give such talks in the past year. We will continue this activity.

Moreover, the 2nd night session was held to provide an opportunity for an exchange of views on a given topic in January 2017. In this year, issues on the IoT network technology were discussed among all the participants enthusiastically.

3. Research Awards 2016

The Technical Committee selected recipients of the Network System Research Award from among 229 regular papers that had been presented at monthly NS technical meetings from January to December 2016. The award is given to the authors of the three or four best papers of each year. The 2016 recipients attended the award ceremony at the NS/IN Workshop (Fig. 1) held in Okinawa in March 2017. The abstracts of the four papers that won awards in 2016 are as follows.

Keiichi Nakatsugawa, Masatake Miyabe, Akiko Yamada, Shinji Yamashita, Toshio Soumiya: “A study on dynamic resource management and control for Optical Transport SDN,” [2]

With widespread use of cloud computing and smart phones, the quality and quantity of WAN traffic are becoming diversified. By realizing unified management and control for path resources across the packet and optical layers and making the transport network SDN-ready, new communication services that use the WAN on demand can be provided.

In this paper, we propose a dynamic resource management and control method that can set up the bandwidth of ODUflex paths dynamically with fine granularity and flexibility for the OTN/WDM optical core network.

To make it possible for the SDN application developer to program the optical core network as well as the packet-based OpenFlow network without being aware of the complicated device configuration and resource structure of the OTN/WDM optical core network, physical optical core resources are mapped to a simple virtual network model common to other layers. Also, in accordance with virtual network operation from the SDN application via Northbound API, route selection and bandwidth allocation of ODUflex path and configuration of the optical core nodes using OpenFlow protocol with OTN-extension can be performed dynamically and quickly.

We have implemented this method as the software of the optical core layer controller using the SDN orchestration framework “ODENOS” published as OSS by the O3 Project. (<https://o3project.github.io/>) As a result of the verification using the test bed system, ODUflex paths with requested bandwidth have been successfully set up on demand between optical core nodes by http REST request from a program on Linux PC.

Kazuki Mizuyama, Yuzo Taenaka, Kazuya Tsukamoto: “Flow bundle method performing efficient channel utilization with less control traffic in software defined wireless network -Effective evaluation in multi-channel wireless mesh network-,”[3]

Applying Software Defined Network (SDN) technology to wireless network attracts much attention but a way to reduce its control traffic should be considered. SDN mainly consists of two components, controller and switch. A controller determines transmission path of flow inside its administrative domain, while switches actually forward flows by following the decision. To dynamically switch transmission paths of flows, control traffic between the controller and switches are frequently required. In wireless network, control traffic and data traffic are inevitably transmitted together on the same network. That is, available capacity decreases as the amount of control traffic increases. Also, multi-hop networks cause consumption of extra wireless resources due to multiple transmission, thereby reducing the capacity significantly. From these points, we have to reduce control traffic to use network resources for data communication as much as possible in SDN-enabled wireless networks.

So far, we focused on efficient channel utilization to increase the network capacity in SDN-enabled wireless backbone network (WBN). We proposed a method that efficiently uses all channel resources, thereby expanding network capacity. However, the previous study did not take care of the increase in the control traffic caused by the flow control method. Especially, the amount of control messages for collecting statistical information of each flow (FlowStats) linearly increases in accordance with the number of flows, thereby being the dominant overhead. Therefore, the reduction of control traffic is necessary to indirectly increase the available capacity.

In this paper, we propose a method that prevents the increase of control traffic while maintaining network performance. Specifically, our proposed method uses statistical information of each interface (PortStats) instead of FlowStats, and handles multiple flows on the interface together. After that, we show that the proposed method can increase the network capacity while reducing the amount of control traffic.

Shun Muraoka, Go Hasegawa, Kazuhiro Matsuda, Morito Matsuoka, Yoshiki Makino, Yasuo Tan: “Power Control for Smart Home Based on Solar Power Prediction Using Machine Learning,” [4]

In recent years, the introduction of renewable energy generation facilities, especially photovoltaic power generation system increase rapidly. Due to introduction of the Feed-in Tariff System and Electricity deregulation, it is expected that smart homes that equip photovoltaic and/or fuel cell power generation systems and electric storage increase. For efficient usage of

these systems, the prediction of the photovoltaic power generation is a key issue since it is highly affected by weather conditions.

In this report, we proposed a power management algorithm based on the prediction of photovoltaic power generation by machine learning. The power generation model of solar cells was established based on a set of measured values of solar cells located at the experimental smart house in JAIST. The prediction method was then built using weather forecast. The evaluation results exhibited that the root mean square error in the estimation of total photovoltaic power generation in a day is around 2.9 [kWh], while the actual value varies from 1.3 [kWh] to 12.6 [kWh] in sunny days.

Based on the prediction, the power management system for smart homes was proposed. It controls the power-related facilities as a smart home to minimize the cost function, such as CO₂ emission, monetary cost, and the consumption of system power. The evaluation results show that the proposed method can suppress the CO₂ emissions by up to 82%, and that it can decrease the electric bill of the smart house by up to 17 %.

Shuya Abe, Go Hasegawa, Masayuki Murata: “Performance evaluation of bearer aggregation in mobile core network with C/U plane separation,” [5]

With increasing demand for cellular networks, enhancing the capacity of the mobile core networks is an urgent issue. In particular, when it comes to accommodating M2M/IoT terminals for cellular networks, the increasing load on the control plane of the mobile core network, as well as user plane, becomes a serious problem.

While applying virtualization technologies such as SDN and NFV is one possible solution, there are almost no existing works on numerical or concrete evaluation of such solutions.

In this report, on the basis of mobile core networks with virtualized nodes and C/U plane separation, we first propose a bearer aggregation method for decreasing the control plane load to accommodate massive M2M/IoT terminals.

We then show our mathematical analysis of the performance of mobile core networks based on a simple queuing theory. Specifically, we focus on the effect of the node virtualization and C/U plane separation and on the design parameters of the bearer aggregation.

The numerical evaluation results show that we can increase the capacity of the mobile core network by up to 32.8% with node virtualization and C/U plane separation, and by an additional 201.4% with bearer aggregation.

We also explain that to maintain the performance of the mobile core network, we should carefully determine where the bearer aggregation is applied and when the shared bearer for each UE is determined on the basis of

application characteristics and the number of M2M/IoT terminals to be accommodated.



Fig. 1 NS research award recipients with chair Prof. Tode

4. Future Plans

The Technical Committee will have also 10 NS technical meetings in this fiscal year. In addition, it will organize open Symposia in the IEICE Conferences, one of which will be on “Innovative Information Communication Technologies for Future Network System Supporting Information-oriented Industry” at the IEICE General Conference in March 2018.

(For more information, please see our home page.

URL: <http://www.ieice.org/cs/ns/eng/index.html>)

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Report on EMC Joint Workshop 2017 Singapore (EMCJ WS 2017, Singapore)

Takehiro Morioka

Secretary, Technical Committee of Electromagnetic Compatibility



1. Introduction

The Technical Committee on Electromagnetic Compatibility (TC-EMCJ) has held an annual workshop outside Japan as one of the international activities since 2015. The 3rd EMC Joint Workshop was held on May 18 and 19 at the Nanyang Technological University (NTU), Singapore this year. The workshop was collocated by Technical Meeting on Electromagnetic Compatibility of IEEJ (IEE-EMC) and Technical Meeting on Magnetics of IEEJ (IEE-MAG), and hosted and supported by the Electromagnetic Effects Research Lab, NTU [2] and the IEEE Singapore EMC Chapter.

2. Technical Sessions

The workshop started following the opening addresses by Professor Hideaki Sone, Committee chair of TC-EMCJ and welcome address by Dr. See Kye Yak, the Director of Electromagnetic Effects Research Laboratory (EMERL) and the local host of EMCJ WS 2017, Singapore.

The workshop had 7 regular and 4 invited talks. In addition, we had a poster session with 12 papers following a short oral presentation. The venue was filled with attendees and we had fruitful discussions on the presentation topics throughout the two-day workshop (Fig. 2). The titles of the presentation are listed below:

May 18

Regular Session 1

- 1) Far field antenna factor calibration for ridged guide horn antenna using single antenna method
- 2) Impact of LISN on EMI Filter Performance
- 3) Evaluation of Fiber Weaving of Substrate on Differential Transmission Lines

Poster Session

- 1) Fundamental Study on the Effect of Contact Condition at Gap of Transmission Line on Transmission Characteristic
- 2) A Method of Fault Detection in Encryption Device Based on Leaked EM Information from Adder Circuit
- 3) Electromagnetic Information Leakage Analysis of Cryptographic IC in Correlation Power Analysis
- 4) Continuity Condition on Single Conductor Transmission Line Model for Thin Wire Structures



Fig. 1 Prof. Sone presenting a gift to Dr. See, Director of EMERL (right)



Fig. 2 Workshop venue at NTU

- 5) Evaluation of RF Immunity of CAN-FD Transceivers during Data-frame Communication by Using DPI Method
- 6) Communication Quality of Ethernet in Relation to Parameters of Pulse Disturbance and Imbalance of Signal Transmission System
- 7) Evaluation of Secondary common-mode current Using Modal Equivalent Circuit in Four-conductor Transmission-line System
- 8) Transmission Characteristics of Band Pass Space Filter Using Metal Grid from Microwave to Millimeter Waves
- 9) A study on the equivalent circuit modeling of dual LISN for evaluating wide-band conducted emission
- 10) Study on current characteristic injected to vertical coupling plane in the ESD immunity test
- 11) Measurement of discharge current in electrode surface caused by micro gap ESD
- 12) High frequency properties of hexaferrite and its application to IC chip interposer

Invited Talk 1

- 1) Magnetic noise suppressor to facilitate compatibility between power electronic system and next generation RF IC for telecommunication

May 19

Regular Session 2

- 4) 5 MHz switching operation of a GaN-based DC-DC converter with a metal composite bulk magnetic core inductor
- 5) A Study on Design of Bent Differential-Paired Lines by Preference Set-based Design Method
- 6) Common-Mode Noise Filter Design based on Defected Ground Structure (DGS) for Multilayer PCBs
- 7) Power Distribution Network Virtual Prototyping -- A Demonstration of Pre-layout Design, Simulation & Measurement --

Invited Talk 2

- 2) EMC Simulation for Early Stage Analysis and Troubleshooting
- 3) 2.5D Method of Modeling and Simulation for Signal/Power Integrity of High Speed Electronics
- 4) Towards High Speed and Less Interference: Virtual EMC Lab

3. Attendees

As shown in Table 1, the number of attendees from both countries, Japan and Singapore in the technical sessions of the workshop is summarized. The total number of attendees is 66 for the two-day workshop. Since relevant research laboratory in Singapore has small number of students, attendees from Singapore are less than half of the total attendees. In addition to the attendees from the NTU, IEEE Singapore EMC Chapter made a contribution to the workshop and two invited talks were delivered from Institute of High Performance Computing (IHPC), Agency for Science, Technology and Research (A*STAR). Japanese attendees were professors, graduate/under-graduate students, researchers, and engineers of universities, national laboratories, and companies (Fig. 3).



Fig. 3 Workshop attendees

Table 1 Number of attendees.

	May 18	May 19
Japan	25	27
Singapore	5	9
Total	30	36

4. International Exchange

A technical visit to the Electromagnetic Effects Research Laboratory [2] located at the NTU campus was arranged in the late afternoon of the 2nd day of the workshop. Attendees of the visit were guided to an anechoic and a reverberation chamber. The reverberation chamber is large enough to contain a vehicle and all the attendees were interested in the antennas and stirrers in it. In the evening of May 18, we enjoyed a Chinese dinner at a restaurant located in the vicinity of the Raffles Marina. Attendees from Japan and Taiwan took a short walk around the marina and enjoyed the view. All attendees from both countries were on the same table and expand their friendship exchanging the technical and general experiences.



Fig. 4 WS Dinner at a restaurant

5. Conclusions

The third international EMC joint workshop, EMCJ WS 2017, Singapore was held for two days at the Nanyang Technological University in Singapore. The EMCJ WS had more than 60 total attendees and was successful. TC-EMCJ would like to express their appreciation for the great contribution of all speakers and attendees at the WS. We also would like to note that the successful WS could not been realized without the time and effort made by Dr. See Kye Yak and his friends.

The next annual international EMC joint workshop is planned to be held in Korea.

6. References

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Annual Report of Technical Committee on Communication Systems



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Web page: <http://www.ieice.org/cs/cs/>

1. Introduction

Technical Committee on Communication Systems (CS) actively organized seven technical conferences and one special workshop at various cities in Japan, in FY2016. In this report, we describe our activities which include seven technical conferences, Communication Systems Workshop (CSWS), special and general sessions on IEICE Society Conference 2016 and IEICE General Conference 2017, and CS Technical Committee's Prizes. Visit our web site (<http://www.ieice.org/cs/cs/>) to obtain the up-to-date information. Our topics of interest include (but are not limited to) the followings:

- Transport technology,
- Modulation, coding and signal processing,
- Network architecture,
- Wireless network and application,
- Network service and application.

We are welcome to make your presentations to our conferences.

2. Summary of CS Technical Committee in FY2016

In Table 1, we summarize the activities of CS Technical Committee in FY2014, FY2015 and FY2016.

The number of presented papers on technical conferences was around 100 each year in last three years. The total number of presented papers on IEICE Society and General Conferences is more than 120 in FY2016. Special sessions on those conferences were very well attended because there were latest technical topics and its trends. The number of participants of CS workshop was around 40 in average.

We had many interesting special invited talks by outstanding speakers in each conference. One of the most impressive talks was presented by Prof. Seiichi Sampei of Osaka University in CS technical conference on 19th January 2017 which was held in Kyushu Sangyo University (Fig. 1). He presented recent wireless access and optical transmission technologies for the 5th generation cellular systems. In this talk, he explained technologies on wireless access and requirements to optical fronthaul/backhaul based on Radio-on-Fiber (RoF). In September conference, Prof. Tetsuya Miki explained the history of optical access technologies and presented new systems enabled by RoF technologies (Fig. 2). Integrated optical-wireless technologies are one of the key topics in CS technical conferences.

Through the FY2016, we had many valuable special invited talks. To refer them, please visit our archive web page (<http://www.ieice.org/cs/cs/special-e.html>).

Table 1 Summary of CS Technical Committee activities

	Number of presented papers		Special session on IEICE Society Conference (Number of participants)	Special session on IEICE General Conference (Number of participants)	Number of participants of CSWS
	Technical Conferences	IEICE Society/General Conferences			
FY2014	110	52/70 (122)	Issues on convergence of mobile and optical-access networks (74)	Application of ICT to traffic field (49)	47
FY2015	97	45/77 (122)	-Mobile Optical Networks for Next Generation Mobile Communications System (5G) (61) -Recent progress of Internet of Things (IoT) and its application to cyber physical (37)	Simulation technology in information and communication fields (31)	35
FY2016	97	52/72 (124)	Cooperation of edge computing and access network for IoT (62)	-Network Technologies toward IoT (101) -Toward Future Network Innovation in IEICE Communications Society (46)	36



Fig. 1 Prof. Seiichi Sampei giving a special invited talk at CS technical conference in Kyushu Sangyo Univ. on 19th January 2017



Fig. 2 Prof. Tetsuya Miki giving an invited talk at CS technical conference in Tohoku Univ. on 29th September 2016

3. Activities of CS Technical Committee in FY2017

3.1 Technical Conferences

July's conference will be held on 27–28th July 2017, at Fukue Island, with two special invited speakers and 28 invited and general session speakers. First special invited speaker is Dr. Yoichi Maeda of the Telecommunication Technology Committee. The presentation title is “standardization topics on the future network infrastructure”. Second special invited speaker is Prof. Iwao Sasase of Keio University. The presentation title is “the proposal to role and activation of the Institute for enhancing educational and research activities”. In July conference, we plan to organize a special session for student technical presentation contest. 12 students are going to attend this special session and make presentations on their research. The winners of the student presentation award will be selected based on the quality of their research.

We are planning to have seven conferences in this year, which are shown in Table 2. We appreciate your entry to them. You can obtain detailed information at our web site (<http://www.ieice.org/cs/cs/>).

3.2 Special Sessions on IEICE Society and General Conferences

CS Technical Committee will organize a panel session of “Promotion of research and development toward future ICT” on 14th September 2017, in the IEICE Society Conference 2017 (September 12th–15th, 2017, Tokyo City Univ., Tokyo). Outstanding speakers will be invited.

For the IEICE General Conference 2018 (March 20th–23rd, 2018, Tokyo Denki Univ., Tokyo), we are now planning to have two highly motivated tutorial sessions which explain various topics on optical access technologies and Internet-of-Things (IoT) technologies, respectively.

Table 2 Technical Conferences schedule, May 2017 – April 2018

Date	Venue	Joint committee	Topics
July 27 – 28	Fukue-bunka-kaikan (Fukue Island)	–	Next Generation Networks, Access Network, Broadband Access System, Power-Line Communications, Wireless Communication Systems, Coding System, etc.
Sept. 7 – 8	Tohoku Univ.	NS, IN, NV	Post IP networking, Next Generation Network (NGN)/New Generation Network (NWGN), Contingency Plan/BCP, Network Coding/Network Algorithms, Session Management (SIP/IMS), Internetworking/Standardization, Network configuration, etc.
Nov. 15 – 17	TBA (Aso, Kumamoto)	CSWS	Broadband Access Systems, Home Networks, Network Services, Applications for Communications, etc.
Nov. 30 – Dec. 1	Nagoya Univ.	IPSJ-AVM, IE, ITE-BCT	Image Coding, Streaming, etc.
Jan. 29 – 30	Ehime Univ.	OCS	Network Core/Metro Systems, Submarine Transmission Systems, Optical Access Systems/Next Generation PON, Ethernet, Optical Transport Network (OTN), Transmission Monitoring and Supervisory Control, Optical Transmission System Design/Tools, Mobile Optical Network.
Mar. 12 – 13	Kyushu Univ.	CAS	Network Processor, Signal Processing Circuits for Communication, Wireless LAN/PAN, etc.
Apr. (TBA)	TBA	CQ	SDN (Software-Defined Networking), NFV (Network Functions. Virtualization), Network Virtualization, Cloud, Service Quality, Contents Delivery, etc.

3.3 CS Workshop

CS Workshop 2017 will be held in Kumamoto, on 15th–17th November 2017. Prof. Hiromi Ueda, General Chair of the workshop, has invited several outstanding researchers for providing talks about various categories. Please visit to the web site for more information: (<http://www.ieice.org/cs/cs/jpn/cs/ws/index.html>).

3.4 CS Prizes

CS Technical Committee provides prizes to authors or speakers who made good presentations and excellent papers every year. The detailed information on the committee's prizes is described in Table 3.

Table 3 CS committee's prizes

Chairman's prize	Summary: The aim of the chairman's prize to the superior papers is activating investigations on communication systems engineering.
	Candidates: The paper must be submitted to the IEICE committee on communication systems.
Encouraging prize	Summary: The aim of the encouraging prize to the excellent speakers is encouraging young researchers who are engaged in communication systems engineering.
	Candidates: The speaker must be less than 33 years of age at the time of the workshop in which the speaker made a presentation. His/her paper must be submitted to the IEICE committee on communication systems.

The winners of the chairman's prize in 2016 are the authors of three papers [1-3]. The speakers of the papers are Prof. Seiichi Gohshi, Prof. Daisuke Umehara and Mr. Kazutaka Hara.

The winners of the encouraging prize in 2016 are the speakers of four papers [4-7], Mr. Takahiro Suzuki, Mr. Ryota Shiina, Mr. Daisuke Hisano, and Mr. Yuki Arikawa.

Six invited talks by the speakers of CS2016-43, CS2016-75, CS2016-1, CS2016-52, CS2016-66, and CS2016-68 will be conducted and the prize ceremony will be held at the technical conference at Fukue Island on July 27th, 2017. One remaining invited talk by the speaker of CS2016-25 is planned at the CS technical conference in November 2017.

4. Conclusion

This report has summarized activities of Technical Committee on Communication Systems in FY2016. Any comments and feedbacks are appreciated to improve our activities. We welcome your submission to our conferences (<http://www.ieice.org/cs/cs/>).

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Technical Committee on Smart Radio – An Activity Report of Fiscal Year 2016 –

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IEICE Technical Committee on Smart Radio



1. Introduction

The Technical Committee on “Smart Radio” (TCSR) discusses advanced wireless communication technologies including software radio, cognitive radio, wireless distributed network, and wireless transceiver implementation. The current Chair of TCSR is Prof. Takeo Fujii. This reports overviews activities of the TCSR in FY2016.

2. Technical Conference in Fiscal Year 2016

2.1 The 1st Conference in May 2016 (SmartCom 2016)

- Date: May 15th-16th, 2016
- Venue: Hotel Lasaretti, Oulu, Finland
- Number of talks / presentations: 67
(2 opening talks, 2 keynote talks, 22 requested talks, 35 posters, and 6 technical exhibits)
- Number of participants: 128 in total (first day: 79, second day: 49)

The first technical conference in FY2016 was held as the third international technical conference of TCSR (SmartCom 2016) co-organized by TCSR and TCSRW and supported by TCRCS, TCRCC and TCMICT. This was held in Finland. Please see its detail in [1].

2.2 The 2nd Conference in July 2016

- Date: July 20th-22nd, 2016
- Venue: Nagoya Institute of Technology, Aichi
- Joint TCs: RCS, RCC, NS, ASN
- Topics: Wireless Distributed Network, M2M (Machine-to-Machine), D2D (Device-to-Device), etc.
- Number of papers: 27
(14 regular papers including 4 requested paper, 10 posters, and 3 invited talks)
- Number of participants: 72 in total (first day: 24, second day: 24, last day: 24)

This conference contains general session, poster session and invited talk for three days. This conference being held on July includes the WDN special session in every year, which has been jointly coordinated by TCs.

Poster session (WDN special session)

Topics and key words in the poster session as follows:

- ◇ Compressed sensing (3 posters)
- ◇ Robot (1 poster)
- ◇ Throughput measurements (1 poster)
- ◇ Positioning estimation (1 poster)
- ◇ ITS (1 poster)
- ◇ Pilot allocation with precoded Massive MIMO (1 poster)
- ◇ Modeling and prediction (1 poster)
- ◇ Spectrum detection method (1 poster)



Fig. 1 Poster session on WDN

General session (including WDN special session)

The WDN special session organized by TCSR has 2 papers out of 6 papers. The general session organized by TCSR contains 4 papers and 4 requested papers. The common general session has 6 papers.

The WDN special session includes the following topics:

- ◇ Full-duplex communication
- ◇ Radio in the manufacturing Files
- ◇ HEMS
- ◇ Base station cooperation for 5G
- ◇ Stochastic Geometry Analysis of Inversely Proportional Setting in WLANs

The topics of the general session is as follows:

- ◇ Spectrum sensing based on cyclostationarity detection
- ◇ Modulation classification method using deep network

- ◇ Multipath TCP
- ◇ MAC protocol for dense WLAN
- ◇ Smart radio
- ◇ 5G ultra high-density distributed antenna system
- ◇ IoT

Invited talks (Wireless Distributed Networks)

- ◇ “Deployment of smart meter communication system,” Katsumi Kobayashi, Tadashi Okabe, and Takahiro Koharagi (TEPCO PG)
- ◇ “Standardization report on NFV (Network Function Virtualization),” Ashiq Khan, Ryouzuke Kurebayashi, and Kazuaki Obana (NTT DOCOMO)
- ◇ “Research on Edge Distribution in Mobile Networks,” Takanori Iwai and Koizumi Seiichi (NEC)

2.3 The 3rd Conference in October 2016

- Date: October 27th-28th, 2016
- Venue: Osaka University Nakanoshima center
- Topics: Technical Exhibition, Product Exhibition
- Number of papers: 27 (2 invited talks, 11 regular talks, 10 technical exhibits, 4 product exhibits)
- Number of participants: 84

Invited Talks

The first talk was presented by Prof. Takahiro Matsuda (Osaka Univ.). The talk proposed novel monitoring techniques which utilizes mobile network characteristics such as geographical distribution, date/time dependency. There were many discussion about interpolation/implication of monitored data etc.

The second talk was presented by Mr. Takashi Maehata (Mitsubishi). The talk proposed structure of digital RF Front-End to realize smaller Massive-MIMO antenna focused in 5G wireless. Applicable frequency etc. were actively discussed.



Fig. 2 Invited talks (Prof. Matsuda and Mr. Maehata from left to right)

General Session

Total 11 talks were presented in two parts. Discussion mainly focused on trade-off, such as between primary user’s cost and secondary user’s benefit.

In the first part, 4 talks in wireless resource co-use were presented. Proposed techniques focused on two aspects: a) protecting non co-use user such as resource ensurement in WLAN system, b) maximize information throughput by co-use such as physical wireless parameter conversion.

In the second part, 7 talks were delivered for wireless system coexistence. As a key technology to coexist, techniques to recognize other systems such as microwave signal detection from received power were proposed. On the other hand, as a coexistence benefit, traffic offloading to maximize user throughput was also proposed.

Technical and Product Exhibition

There were 10 technical exhibits that presented research achievement for efficient use of limited wireless resource in wide area. Techniques to predict shadowing occurrence by associating communication quality with depth image, antenna configuration for antenna size reduction in OAM (Orbital Angular Momentum) multiplexing, propagation model of wooden house for traffic offloading from macro cell to indoor small cell etc. were demonstrated

4 product exhibits demonstrated research tools to prove proposed techniques. Software-defined radio platform to emulate various wireless systems, spectrum analyzer to monitor/recode/playback wireless channel etc. were introduced.



Fig. 3 Technical/Product exhibition

2.4 The 4th Conference in January 2017

- Date: January 19th-20th, 2017
- Venue: Himegin Hall (Ehime)
- Joint TCs: None
- Topics: Cognitive Radio Network, Heterogeneous Network, Cross-layer Radio Technologies, SDN (Software Defined Network), etc.
- Number of papers: 13
- Number of participants: 44 in total

The technical conference in January 2017 was held in Shikoku. Every January, we have a technical conference specifically for Smart Radio. This year, Himegin Hall in Matsuyama, Ehime, was the selected venue. The conference hall is very accessible from the airport and the city, and there are many meeting rooms with different sizes. We had a two-day conference and a total of 13 papers were presented.

On the first day of the conference, presentations included 6 regular technical papers and 1 invited talk from Prof. Hasegawa of Tokyo University of Science. The title of the invited talk was “Machine Learning and Optimization Algorithms for Cognitive Radio

Networks”. His talk was very interesting and he took many questions from the audience.

After the talk, the banquet and the evening session were held at Yamatoya-Honten, which is a famous and traditional Japanese Ryokan in Dogo-onsen. The banquet started with a Japanese Noh performance. The attendees were impressed with the unique Noh performance. The dinner included delicacies famous to the Seto Inland Sea.

The evening session included a discussion on how the technical committee can further support and facilitate research activities beyond the technical group members. The invited lecturer, Prof. Hiraguri from Nippon Institute of Technology introduced the activities carried out by the IEICE communication society, his own experience and ideas. Attendees listened and had a productive discussion.

On the second day, 6 regular technical reports were presented. Overall, this conference was very fruitful. We appreciate the time taken by the attendees to be at the conference!

2.5 The 5th Conference in March 2017

- Date: March 1st-3rd, 2017
- Venue: Tokyo Institute of Technology, Tokyo
- Joint TCs: RCS, SRW
- Topics: Mobile Communication Workshop
- Number of papers: 19
(13 regular papers, 3 invited talks, and 3 talks for panel discussion)
- Number of participants: 73 in total

This conference included general sessions, a special session which has been jointly coordinated by TCs, and a panel discussion about full-duplex wireless communication.

General session

The general sessions organized by TCSR had 13 papers. They included the following topics:

- ✧ Base station sharing in 5G
- ✧ Prefetching in 5G cellular network
- ✧ Spectrum sensing
- ✧ Dynamic resource allocation
- ✧ QoS control
- ✧ Spectrum sharing
- ✧ Vehicular-to-vehicular (V2V) communication

Invited talks (Special Session)

In the second day, a special session which was jointly coordinated by TCs about “Heterogeneous network in 5G mobile and future wireless communication systems” was held. This special session had the following invited talks:

- ✧ “DOCOMO's Activities for 5G,” Yukihiro Okumura (NTT DOCOMO)
- ✧ “M2M/IoT Network in 5th Generation Wireless Network,” Hiroshi Harada (Kyoto Univ., Chair of TCSRW)

- ✧ “Efficiency Improvement in Communication Systems by Using Device-to-Device Communication Technologies,” Koichiro Kitagawa, Yasuhiro Suegara, and Yoji Kishi (KDDI Research)

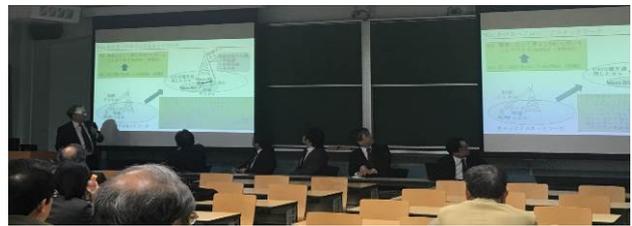


Fig. 4 Panel discussion held in March meeting

Panel Discussion

In the third day, a panel discussion about full-duplex wireless communication on single frequency was held. This session had the following talks:

- ✧ “Single Frequency Retransmission Technology in Digital Terrestrial Television Broadcasting - Practical Application of Coupling Loop Interference Canceller for On-channel Repeater in SFN -,” Koichiro Imamura (NHK)
- ✧ “Resource Management for Full-Duplex Communications,” Koji Yamamoto (Kyoto Univ.)
- ✧ “Realization of Software Full-duplex Transceiver and Its Application,” Shunsuke Saruwatari (Osaka Univ.)

In the third day, a panel session to discuss the current technology of full-duplex wireless communication and its future was held. The first talk introduced the loop interference canceller for single frequency network of ISDB-T, and the history of R&D activity on this technology. The second talk introduced how full-duplex wireless communication is interesting from the academic point of view, and then showed some analytic results of radio resource control and of transmission scheduling. The third talk reviewed the researches on full-duplex wireless communication done in worldwide, and showed the progress of the development of an SDR-based transceiver for full-duplex wireless communication. After these talks, the panelists and audience discussed the several challenges such as performance improvement, saving the hardware cost, finding killer applications to widely deploy this technology.

In this panel session, a trial to collect opinions from the audience and to share them among the attending members in the session by using an online questionnaire. We will continue this trial to make the sessions more interactive.

3. Awards for Presentations in Fiscal Year 2015

TCSR awards two awards every year. The two winners received the best paper award and the research incentive award, respectively, by being selected from the papers presented in 2015.

- Best paper award
“Investigation on Millimeter-wave Spectrum for 5G,” Tokyo Institute of Technology
- Research incentive award
“A low-complexity noise rejection method for high-accuracy energy detection on spectrum measurement,” Tokyo University of Agriculture and Technology

4. Other Remarkable Activities

4.1 Society Conference

A panel session was organized on September 23th, 2016 during Society Conference held in Hokkaido University. The title entitled “Think about Future Spectrum Utilization - Based on Case Study of Spectrum Sharing for Heterogeneous Wireless Services -” The panelists introduced the current system and status of spectrum sharing in Japan, the options of spectrum sharing in 5G mobile communication system, and R&D activity of communication system for UAV, and the trend of spectrum sharing in UAV. After the talks, the panelists and audience discussed how we should share the radio resource among different communication systems in future.

4.2 General Conference

Two symposium sessions were organized by TCSR during General Conference held in Meijo University.

The first one entitled “Applying Machine Learning into Smart Radio” was held on March 22nd. This symposium invited experts from various technical fields including wireless communication and machine learning as presenters. They introduced how machine learning can be applied to wireless communication systems, spectrum monitoring systems, and intelligent social services.

The second symposium entitled “Toward Future Network Innovation in IEICE Communications Society” was held on March 24th and co-organized by TCCQ, TCCS, TCICM, TCAP, and TCPN to discuss a vision of communication network in future from various technical aspects. They included such as antenna systems, smart management/control of wireless network, the role of photonic networks, autonomous and/or QoS/QoE-based management and operation of communication network, and from the user and application sides. The discussion including experts from wide areas in communication was fruitful and a good opportunity to think how the future communication network should be.

5. Conclusion

This paper summarized activities of the TCSR in fiscal year 2016. The TCSR is always pursuing a possibility to extend its ways by inviting new area of experts, making opportunities to provide useful

technical information, and introducing several ways to make more fruitful discussions.

6. References and Recent Articles from the TCSR

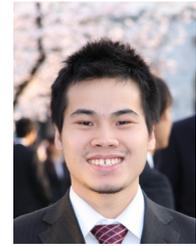
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Report on the 10th International Workshop on Evolutional Technologies & Ecosystems for 5G and Beyond (WDN-5G ICC2017)

Gia Khanh Tran
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1. Introduction

Following the successful events of the International Wireless Distributed Network (WDN) workshop on Cooperative and Heterogeneous Networks held annually since 2008, the 10th workshop focusing on 5G topics e.g. evolutional technologies and ecosystems [1] was held in conjunction with IEEE ICC 2017 on 21 May 2017 in Paris, France. The workshop was technically co-sponsored by IEICE Communications Society and 5G-MiEdge consortium [2]. This report summarizes the workshop activity, especially focusing on the current hot topic of 5G technologies and ecosystems.

2. Workshop Committee

General co-chairs:

- + Prof. Kei Sakaguchi* (Tokyo Tech., Japan)
- + Dr. Emilio Calvanese Strinati (CEA-LETI, France)
- + Dr. Thomas Haustein* (Fraunhofer HHI, Germany)

Organizing chair:

- + Dr. Gia Khanh Tran (Tokyo Tech., Japan)

Publicity chair:

- + Dr. Kentaro Ishidu (NICT, Japan)

3. Scope and Objectives

Current research efforts on 5G Radio Access Networks (RAN) strongly focus on millimeter-wave (mmWave) access for addressing a critical weakness of deployed cellular systems, i.e. the capacity to realize enhanced mobile broadband (eMBB) services, as discussed at the World Radio-communication Conference 2015. Recently, mmWave technologies have reached a significant degree of maturity and their state-of-the-art products, operated in the 60GHz unlicensed band, are already in the market. However, there are many unsolved issues for an effective deployment of mmWave 5G RAN. The most critical issue is the impossibility of providing 10 Gigabit Ethernet backhaul everywhere. Meanwhile, Network Function Virtualization (NFV) and Mobile Edge Computing (MEC) have obtained much attention in 5G networks. Especially MEC is considered as a key technology to enable mission-critical applications by allocating storage and computation resources at the edge of the network, so to circumvent the backhaul networks' limited capacity. However, in the case of mobile networks, it is not easy to reallocate computational resources on demand, while meeting the strict latency constraints foreseen in 5G networks. It

becomes a critical issue to develop evolutional technologies including a smooth combination of mmWave and MEC in future cellular architecture and the development of associated ecosystems providing new 5G vertical services. This workshop, co-located in ICC 2017, aims to offer an opportunity for academic and industrial researchers to discuss on feasible solutions including evolutional technologies and ecosystems for the realization of 5G and beyond.

4. Summary of WDN-5G ICC2017

WDN-5G was held at Palais des Congrès - Porte Maillot, Paris, France, on the first day of ICC2017, one of the flagship conferences of IEEE ComSoc. The conference venue is located in the heart of the City of Lights, where the famous Eiffel Tour is just in walking distance. This full-day workshop was separated into AM and PM sessions with two keynote speeches respectively, 13 accepted papers after rigorous review from experts of the field, and one panel discussion on the main topic of the workshop.

In the opening, the organizing chair of the workshop briefly explained the scope of WDN-5G and introduced the full-day workshop's program. After the introduction, the first keynote speech with title "SDN & NFV : new security challenges & expected transformation" was delivered by Dr. Emmanuel Dotaro, who is the head of Network & Security labs at Thales Secure Communications & Information Systems (France). He is also leading the Network of Experts in communications across the Thales group. The speaker is at the initiative, contributor or leader of various major European and national collaborative research projects and is currently involving in research on network softwarization, radio and mobile networks, cloud brokering, security as a service, security policies enforcement in 5G and IoT systems, detection and remediation related cybersecurity topics. According to the speaker, beyond "softwarization" and virtualization, 5G is coming with potentially more technical and architectural disruptions which in turn, result in resilience issues. Slicing is a promise of ultimate abstraction of the system and service complexity. The dependencies, responsibilities and control perimeter/authority impacting service level delivered at the end become important. The 5G scope cannot be wider as it combines any type of networking segments, the convergence with Information Technologies

infrastructure and technologies as well as Operational Technologies coming from vertical markets. It means that the horizontal integration (End-to-End), and the vertical one across remaining layers plus the unprecedented tenant slices is becoming a pre-requisite. The speaker pointed out a set of challenges will be introduced as the new needs in terms of regulation/certification, the new threats inherent to the 5G architectures such as slicing and underlying technologies. The emerging and promising Software Defined Security will be put in perspective covering various security aspects from protection towards remediation as well as other research directions in security impacting the development and deployment of SDN/NFV.

The second keynote speech was delivered at the beginning of PM session after the lunch break. The talk is about “Enabling determinism in converged Operational Networks”. The speaker, Dr. Pascal Thubert, has been actively involved in research, development and standards efforts on Internet mobility and wireless technologies since joining Cisco in 2000. He currently works at Cisco’s Chief Technology and Architecture office, where he focuses on products and standards in the general context of IPv6, wireless, and the Internet of Things. In parallel with his R&D missions, he has authored multiple IETF RFCs and draft standards dealing with IPv6, mobility and the Internet of Things. In this talk, the speaker explains about a novel concept called deterministic Operational Technology (OT) networks, which are purpose-built, mostly proprietary, typically using serial point-to-point wires, and operated as physically separate networks, which multiplies the complexity of the physical layout and the operational (OPEX) and capital (CAPEX) expenditures, while preventing the agile reuse of the compute and network resources. Dr. Pascal Thubert argued that bringing determinism in Information Technology (IT) networks will enable the emulation of those legacy serial wires over IT fabrics and the convergence of mission-specific OT networks onto IP. The IT/OT convergence onto Deterministic Networks will in turn enable new process optimization by introducing IT capabilities, such as the Big Data and the Network Functions Virtualization (NFV), improving OT processes while further reducing the associated OPEX. The computation of deterministic paths cannot be solved in a fully distributed fashion, and for a number of reasons, may not be fully centralized either. In conclusion, it takes Fog and Mobile Edge Computing to obtain the fundamental capability that is required to enable the IT/OT convergence.

For the general oral sessions, 13 accepted papers are categorized into 4 sessions from lower layer to upper layer respectively.

+Propagation & signal processing:

Millimeter Wave MIMO Channel Estimation Based on Adaptive Compressed Sensing (NYU, USA)

Using Predictor Antennas for the Prediction of Small-scale Fading Provides an Order-of-Magnitude Improvement of Prediction Horizons (Uppsala University, Sweden)

Noise Variance Estimation for 5G Wireless Networks under Pilot Contamination (North Carolina State University, USA)

+Fronthaul & Backhaul:

Traffic Adaptive Formation of mmWave Meshed Backhaul (Tokyo Tech., Japan)

Empirical Investigation of IEEE 802.11ad Network (NICT, Japan)

Resource Allocation for Self-Backhauled Networks with Half-duplex Small Cells (NSN, India)

Low Frequency Assist for mmWave Backhaul - The case for SDN resiliency mechanisms (Karlstad University, Sweden)

Performance Improvement for OFDM-RoF Transported 60 GHz System using Spatial Diversity and Multiplexing (University of Kent, UK)

+MEC & Networking:

Enabling effective mobile edge computing using millimeter wave links (University of Rome, Italy)

Power Efficient RACH mechanism for Dense IoT Deployment (Tata Consultancy Services, India)

Throughput Analysis of Cooperative Multi-Hop Underlay CRNs with Incremental Relaying (IIT, India)

+Control channel:

A Control method for autonomous mobility management systems toward 5G mobile networks (Osaka University, Japan)

Control Channel Enhancements for URLLC (Aalto University, Finland)



Fig. 1 Workshop attendees after the panel discussion

At the end of the workshop, a panel discussion chaired by the organizing chair on the workshop topic “evolutional technologies & ecosystems for 5G and beyond” was organized. The panelists which include the two keynote speakers and two of the general co-chairs* accepted questions from audiences on current status of 5G R&D activities and discussed about future ecosystems suitable for 5G & Beyond.

5. References

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Report on ISADS 2017

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Electronic Navigation Research Institute



1. Introduction

The Thirteenth International Symposium on Autonomous Decentralized Systems (ISADS) was held in Bangkok, Thailand, from March 22nd to 24th, 2017. The ISADS 2017 was sponsored by the Computer Society of the Institute of Electrical and Electric Engineers (IEEE) and in cooperation with the Institute of Electronics, Information and Communication Engineers (IEICE) Communications Society, IEICE Information and Systems Society, International Federation of Automatic Control (IFAC), International Federation for Information Processing (IFIP), and Object Management Group (OMG) [1]. And ISADS 2017 was also strongly supported by Chulalongkorn University, Thai-Nichi Institute of Technology, Thailand Convention and Exhibition Bureau, and The Nippon Foundation.

The Concept of Autonomous Decentralized Systems (ADS), born in Japan 40 years ago, have technologically evolved in communication networks, information, control and service systems. It has been applied in many actual systems, and it has progressed in standardization activities. ADS technology has been making tangible improvement, and innovative new research is being reported successively. In particular, it is expected that ADS technology is applied to applications to promote transformation of social infrastructures, including the smart grid, environment management, resilience of system, Internet of Things, autonomous car and train, communication among the mobiles.

The special topic of ISADS 2017 is “Autonomous Decentralized Systems Technologies and Approaches Innovation through Structure Change of Society and Life”, which bring the future technologies and global applications for the discussions. The General Chair, Prof. Jitkasem Ngamnil and the Steering Committee Chair, Prof. Kinji Mori gave opening remarks and took a picture with Local Committee members (Fig. 1).

2. Program

In ISADS 2017, Forum, one invited speech, five regular sessions, two workshops, a panel session and social events were organized.

2.1 Forum

At the Tenth Jubilee ISADS 2011, the first Forum on “Paradigm Shift of Research and Development for Information Technology under Changing and Unpredictable Market” was founded. Society, economy and life have been unpredictably changing and evolving under globalization, while a new value of sustainability has been more important as well as of growth. Technology and business are more and more rapidly and mutually related in real world, and then consistency of their research and development is crucial for sustainability in manufacturing, operation, maintenance, service and finance in all life-cycle of system. The ADS concept, technologies and applications have been highly evaluated for the paradigm shift from technology-oriented to concept-oriented research and development. And the book based on the content of the first Forum was published by Wiley in 2014 [2].



Fig. 1 General Chair, Steering Committee Chair and Local Committee members



Fig. 2 Forum introduction by Forum Organization Committee Chair Prof. Kinji Mori

The Forum Organization Committee Chair Prof. Kinji Mori gave an introduction of this Forum (Fig. 2). To achieve the sustainable development in society and economy from the viewpoint of information technology, ISADS 2017 Forum focused on the topics of “Concept-oriented Approach” that based on the analysis of past and current approaches in technology, business and life, the future approaches for innovation were discussed. During forum, eight invited speakers from Japan, USA and Europe gave their speeches:

- Farokh Bastani (University of Texas, Dallas, USA), “Control to Communication (IoT)”
- Toshiyuki Kanoh (NEC, Japan), “Concept evolution and revolution in the telecommunication, what will come next?”
- Yinong Chen (Arizona State University, USA), “Robot as a Service and its Application Development in Visual Programming”
- Atsushi Yokoyama (East Japan Railway, Japan), “Mobility Revolution by IoT, BigData and AI”
- Yutaka Saito (Hitachi Ltd., Japan), “Value Co-Creation in the Global Market - Hitachi’s Challenge to Social Innovation -”
- Radu Popescu Zeletin (ICAM GmbH, Germany), “Remarks on the Cyber Physical Systems: Challenges and R&D issues”
- Colin Harrison (IBM, USA), “Global Systems”
- Doug McDavid (ISSIP, USA), “The Role of Blockchain in Autonomous Distributed Business Services”

2.2 Technical Sessions

ISADS 2017 had five regular sessions on Autonomous Decentralized Architecture, Autonomous Decentralized Simulation, Information Privacy, Dependability and Optimization and Algorithms. In addition, the Technical Program Committee invited Prof. Jie Xu who is the leader for a Research Peak of Excellence at University of Leeds, UK to give a speech on the topic of “Massive-Scale Automation in Cyber-Physical Systems: Vision & Challenges”.

ISADS 2017 also hosted two workshops: International Workshop on Service Assurance in System Wide Information Management (SASWIM) and International Workshop on Systems and Algorithms for Distributed Embedded Intelligence (SADEI). At the workshop of SASWIM, Mr. Frederic Lecat who is a local officer of International Civil Aviation Organization (ICAO) Asia and Pacific (APAC) Office, gave an introduction and implementation plan for constructing the common information sharing platform to achieve interoperability and harmonization for global air traffic management.

2.3 Social Events

The welcome Reception of ISAD 2017 was held at Sala Thai, which is a traditional house of Thailand, on March 22nd in the Chulalongkorn University. The traditional dance show of Thailand was performed at the reception. And all participants joined the dance party at last.

The other social highlight of ISADS 2017 was the Banquet & the cultural exchange event of ADS and Flower arrangement that was held on March 23rd at the Chulalongkorn University. In this event, participants enjoyed not only the cultural exchange of technology and art but also experienced the flower arrangement of Japan, UK and Thailand (Fig. 3).



Fig. 3 ADS and Flower Arrangement Culture at Banquet

2.4 Panel Session and PC Meeting

The Panel Session of ISADS 2017 was held on the last day. Three Panelists, Prof. Kinji Mori (Waseda University, Japan), Dr. Colin Harrison (IBM, USA) and Prof. Yinong Chen (Arizona State University, USA), gave the speeches on the Future ADS and discussed the ADS applications in Internet of Things (IoT), big data analysis, and artificial intelligence.

At the end, we had an extended Program Committee (PC) meeting to decide the organizer of the next ISADS. There were four candidates, China, Mexico, Netherlands, and USA who want to organize the next ISADS. At last, through bidding the PC meeting decided to hold the next ISADS in Netherlands in 2019.

Moreover, due to the retirement of Prof. Kinji Mori as the ISADS Steering Committee Chair, Prof. Yinong Chen who was an ISADS Steering Committee member is elected as the new Steering Committee chair.

3. Conclusion

ISDAS 2017 was really successful. The organization committee thanks for the contributions to the symposium of all participants, all committee members, secretaries, and staffs for their hard work. The next ISADS will be held in 2019 in Netherlands. We hope more participants can join this event.

4. References

- [1] Proceedings of 2017 IEEE 13th International Symposium on Autonomous Decentralized Systems (ISADS 2017).
- [2] Kinji Mori, “Concept-Oriented Research and Development in Information Technology,” Wiley, ISBN 978-1-118-47891-2, 2014.

Report on International Symposium on Extremely Advanced Transmission Technologies (EXAT 2017)

Hiroataka Ono (NTT)
Assistant Secretary of EXAT



1. Introduction

The 4th International Symposium on Extremely Advanced Transmission Technologies (EXAT 2017) was held at Nara on 7–9 June 2017, organized by IEICE Technical Committee on Extremely Advanced Optical Transmission Technologies (EXAT) and National Institute of Information and Communications Technology (NICT).

2. Background

One of the most important issues to be addressed in the field of recent optical fiber communication is the capacity crunch in conventional single-mode fiber based transmission and networks. Space-division-multiplexing (SDM) technologies are expected to offer solutions for this issue. In Japan, EXAT community initiated the development of the SDM technologies in 2008 and has promoted the 3-M (multi-core, multi-mode, multi-level) technology. In particular, the launch of the IEICE EXAT Technical Committee in 2010 has made a profound contribution to accelerate “all-Japan” collaborative research activities on SDM and establish global leadership in this field, which led to the world remarkable transmission records of over Pb/s capacity and large SDM channel transmissions from NICT, KDDI and NTT. The progress of SDM development is so fast that the scope of research is being rapidly spread from transport system to large-scale optical network employing SDM nodes, subsystems to device integration and network applications. Taking account of this trend, IEICE EXAT Technical Committee has organized an international symposium to enhance interactions among researchers on SDM including 3M technology worldwide.

3. Technical Sessions

The symposium consisted of 19 invited talks including 10 from overseas, and 27 contributed poster presentations, and there were 85 participants. Day one (7 June) of the symposium started with an opening remark by Dr. Yutaka Miyamoto (NTT), the IEICE EXAT committee chair, presenting the history and background of EXAT and the motivation of the symposium (Fig. 1). After that, the technical session started with a plenary talk by Prof. Dan Marom (Hebrew University), describing the optical networking functionality for WDM-SDM networks (Fig. 2). It was followed by four invited talks by Dr. Kenya Suzuki



Fig. 1 Opening remark by Dr. Miyamoto

(NTT), Prof. Yasuo Kokubun (Yokohama National University), Dr. Scott Bickham (Corning) and Prof. Francesco Poletti (University of Southampton). They featured optical switch technology for an SDM network, mode analysis in a few-mode fiber, SDM application for short reach and a hollow core fiber.

On day two (8 June), we had seven invited talks by Dr. Roland Ryf (Bell Laboratories., Nokia), Dr. Tetsuya Hayashi (Sumitomo Electric Industries), Dr. Katsuhiro Takenaga (Fujikura), Prof. William Shieh (Merborne University), Dr. Tristan Kremp (OFS), Dr. Yong-min Jung (University of Southampton) and Dr. Yukihiro Tsuchida (Furukawa Electric). They covered the topics of a coupled multi-core fiber and a high-capacity transmission employing this kind of fiber, the high count multi-core fiber, multi-core and few-mode fiber amplifiers and sensing application using a few-mode fiber. After these invited talks, we had a poster session, whose topics ranged from SDM fibers, components, transmissions to ultrafast photonic materials, devices, and networks. The technological roadmap of the 3M technologies studied by EXAT Technical Committee was also presented in the poster session.

On day three (9 July), we welcomed another plenary speaker, Dr. René Essiambre (Bell Laboratories, Nokia) who presented prospect of SDM transport system to mitigate optical fiber nonlinear effect in core networks (Fig. 2). Before and after the plenary talk, we had six invited talks by Dr. Guillaume Labroille (CAILabs), Prof. Ryo Nagase (Chiba Institute of Technology), Prof. Masato Yoshida (Tohoku University), Dr. Alex Turukhin (TE Subcom), Dr. Daiki Soma (KDDI Research, Inc.) and Dr. Ben

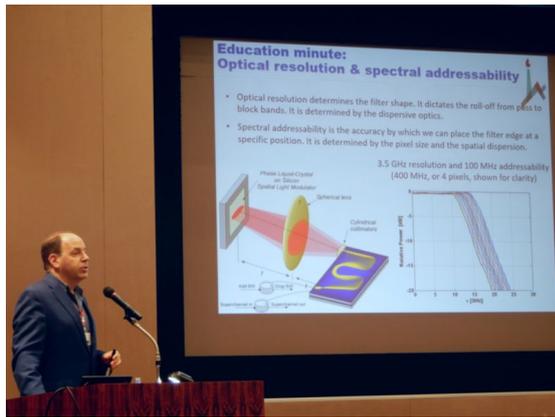


Fig. 2 Plenary talk by Prof. Marom (left) and Dr. Essiambre (right)

Puttnum (NICT). They highlighted multiplexing and connection devices for SDM, high-capacity, high spectral efficiency, and power efficient SDM transmissions. In the closing session, Dr. Naoto Kadowaki (NICT) expressed the expectation of 3M technologies for future network infrastructure supporting the progress of Internet of Things and 5G mobile network (Fig. 3). Prof. Yuichi Matsushima (Waseda Univ.) finally summarized the insights obtained through the three-day symposium. The participants had an opportunity for in-depth discussion and exchange of new ideas.

4. Conclusion

The symposium ended with great success offering an opportunity for stimulating discussion about the latest progress in SDM technologies. We would like to express our sincere thanks to all the invited speakers, especially those from overseas, as well as poster presenters and participants, for their contributions to make the symposium successful.



Fig. 3 Closing remark by Dr. Kadowaki

Report on International Workshop on Technology Trials and Proof-of-Concept Activities for 5G and Beyond (TPoC5G)

Yukitoshi Sanada
Keio University



1. Introduction

International Workshop on Technology Trials and Proof-of-Concept Activities for 5G and Beyond (TPoC5G) was organized in conjunction with IEEE Vehicular Technology Conference 2017 Spring, which was held in Sydney, Australia, on June 4th-7th, 2017. TPoC5G is technically cosponsored by IEEE VTS Japan Chapter and IEICE Communication Society. This workshop is aiming to provide the opportunity to present the latest trials and evaluation results for 5G and the proof-of-concept activities for beyond 5G.

2. Conference Program

The workshop was held from morning on June 4th for a full day. There were 18 presentations inducing a keynote presentation by Mr. T. Nakamura from NTT DoCoMo. His keynote presentation is titled “Update of NTT DoCoMo activities toward 5G deployment” and he presented the current research activities for 5G by NTT DoCoMo and collaborating companies. The large part of the research activities are about development of massive MIMO systems in low and high SFH bands.



Fig. 1 Keynote presentation by Mr. Nakamura

The workshop consists of four technical sessions; Radio Access, MU-MIMO I, MU-MIMO II, and Resource Management. There were about 45 participants and intensive discussions were held. The presenters are from Japan, China, Korea, Hong Kong, UK, and Sweden. The topics include the follows;

- Field trials of massive MIMO in low SHF and high SHF bands
- Field experiment of distributed antenna systems
- Proof-of-concept of SCMA uplink
- Trial results of 5G new air Interface technologies
- Experimental evaluation of multi-cell coordinated MU-MIMO

- Implementation of Polarization Division Multiple Access
- Field trial on opportunities for improving the unlicensed spectrum utilization of LTE
- Evaluations of coherent joint transmission for 5G networks
- System level simulation of mmWave based mobile Xhaul networks
- Performance evaluation of overloaded MIMO



Fig. 2 Technical session

3. Vivid Sydney

An event called “Vivid Sydney” had been held from the middle of May. The event was held around the harbor and it was the artistic event with music, lights, and technology. Projection mapping drew statues on water splashed from fountains.



Fig. 3 Vivid Sydney

4. Acknowledgement

The TPoC5G committee members would like to give thanks to authors, speakers, participants, and staffs.

Report on the 22th Asia-Pacific Conference on Communications (APCC2016)

Takashi Shimizu[†] and Yasunori Suzuki^{††}

[†]APCC Steering Committee, ^{††}Former Director, Planning and Member Activities, IEICE-CS.



1. Introduction

The 22th Asia-Pacific Conference on Communications (APCC2016) was held in Yogyakarta, Indonesia from August 25 to 27, 2016. With the theme “Advancement of Science, Technology and Applications in Communications for Humanity”, the conference program included 9 keynote speeches, 6 tutorials and 23 technical sessions. It was technically co-sponsored by IEEE Communications Society Indonesia Chapter, IEICE Communications Society (IEICE-CS), China Institute of Communications (CIC) and Korea Information and Communications Society (KICS). It was attended by 107 researchers and engineers mostly from Asia-Pacific region.

2. Opening Ceremony and Keynote Speeches

The conference was commenced by welcome addresses by General Chair, Wiseto Agung. After the opening, three keynote speeches addressed the variety of topics.

The first address was given by Prof. Ying-Chang Liang, University of Electronic Science and Technology of China. Entitled “Wireless Big Data: Transforming Cognitive Radios to Smart Networks”, the latest topics on cognitive radio research were discussed. Prof. Kumbesan Sandrasegaran, University of Technology in Sidney, followed with his view on “Research Collaboration in 4G/5G Mobile Networks”.

Prof. Motoharu Matsuura, University of Electro-Communications in Japan, addressed “Optically powered radio-over-fiber systems using double-clad fibers.

In the second day, 6 high-profile speakers were invited to address front line topics, including media and digital business, 5G terrestrial and satellite access, reliability for IoT, sparse code multiple access, block codes and innovation opportunities in changing air transport.

The technical program also includes 6 tutorials on hot topics, such as extrinsic information transfer analysis, indoor location estimation, IoT security and privacy, open API, wireless power transfer and systems with graphs.

3. Technical Program

The Technical Program Committee received 286 paper submissions from 23 countries and regions, and selected 126 papers for presentation by careful peer-review process. The peer-review was completed by

more than 400 professionals. Oral presentations were organized in 23 sessions for all papers. Each session was mostly well-attended and productive discussions were facilitated.



Fig. 1 Presentation at a technical session

4. Best Paper Award

Each year, Best Paper Awards were selected by the Award Committee established in APCC Steering Committee. The members of the committee made another peer-review of the top 10 high-score papers, considering not only technical aspects but also the possible impact of the paper in the relevant field. By averaging the score of the committee and the original score, following three papers were selected.

1) “On the Minimum Subspace Coding Capacity of Multiplicative Finite-Field Matrix Channels with a Given Rank Distribution”

Authors:

Chenchen Liu

Xiaolin Li

Baojian Zhou

Wai Ho Mow

(Hong Kong University of Science and Technology)



Fig. 2 Recipient of the best paper: Mr. Zhou

2) “Experimental Evaluation of a Spectrum Occupancy Rate Measurement Method Based on LSE Estimation of Gaussian Noise CDF”

Authors:

Masahiro Umehira
Shota Rachi
Shigeki Takeda (Ibaraki University)



Fig. 3 Recipient of the best paper: Prof. Umehira

3) “Performance Analysis of Low Complexity Multi-User MIMO Scheduling Schemes for Massive MIMO System”

Authors:

Jun Shikida
Naoto Ishii
Yoshikazu Kakura (NEC Corporation)



Fig. 4 Recipient of the best paper: Mr. Shikida

4) “Evaluation of Block Turbo Codes for Long-Haul Optical Networks”

Authors:

Junhee Cho
Wonyong Sung (Seoul National University)



Fig. 5 Recipient of the best paper: Mr. Cho and Sung

The certificate of the award was given to each author during the conference dinner on August 25, 2016. This award was sponsored by IEICE-CS, KICS, CIC and IEEE Communications Society Asia-Pacific Board.

5. Conclusion

Since 1993, APCC has been the forum for researchers and engineers in the Asia-Pacific region to present and discuss topics related to advanced information and communication technologies and services, while at the same time, opening the door to the world. APCC2016 successfully provided an excellent venue and facilitated the research collaboration in Asia-Pacific regions.

Next year, APCC2017 will be held in Perth, Australia on December 11-13, 2017.

Report on the 9th International Conference on Ubiquitous and Future Networks (ICUFN) 2017

*Yeong Min Jang, *Takeo Fujii, **Hwangnam Kim

*Organizing Chairs of ICUFN 2017, ** TPC Chairs of ICUFN 2017



1. Introduction

The 9th International Conference on Ubiquitous and Future Networks (ICUFN) 2017 was held at Milan, Italy, from July 4 to 7, 2017. This conference was supported by Korean Institute of Communications and Information Sciences (KICS) and technically cosponsored by the IEEE Communication Society and IEICE Communication Society.

2. Organization

The organizing committee of ICUFN 2017 was formed with the Honorary Conference Chairs, Noel Crespi (Institut Mines-Télécom, France), Ilyoung Chong (HUFS, Korea), Pascal LORENZ (Univ. of Haute Alsace, France) and Seung Ku Hwang (ETRI, Korea), and the Organizing Chairs, Yeong Min Jang (Kookmin Univ., Korea), Gianluca Reali (Univ. of Perugia, Italy), C. K. Toh (National Tsing Hua Univ., Taiwan), Zary Segall (KTH, Sweden), and Takeo Fujii (Univ. of Electro-Comms, Japan).

The technical program was organized by Technical Program Committee Chairs, Hwangnam Kim (Korea Univ., Korea), Xin WANG (Fudan Univ., China), Suguru Kameda (Tohoku Univ., Japan), and Kun Yang (Univ. of Essex, UK). More than 195 technical program committee (TPC) members were involved in the review process.

3. Conference Program

The conference consists of one opening session, two keynote speeches, and 44 technical sessions. The opening session was started with a brief introduction by Prof. Yeong Min Jang (Organizing Chair), following with two welcome addresses by Prof. You-Ze Cho (President of KICS), and Prof. Pascal LORENZ (Honorary Conference Chairs, University of Haute Alsace, France).

After that, two keynote speeches from Prof. Ramjee Prasad (Aarhus University, Denmark) and Prof. Ilyoung Chong (HUFS, Korea) were delivered. In the technical sessions, we had 228 presentations (selected from 536 submissions) with approximately 264 participants from more than 40 countries of the world, such as Korea, China, Japan, Taiwan, United Kingdom, India, Germany, Italy, USA, and so on. With regard to these technical sessions, there were 44 sessions including two poster sessions and the program covers a variety of topics on wireless and wired communication and networking technologies, including cognitive radios, wireless sensor networks, Internet of Things



Fig. 1 After Opening Session

(IoT), broadband wireless communications, future network issues, mobile multimedia networking, Big data, Cloud computing, and other important technologies.

The Welcome Reception and Banquet were held at Hotel Meliá Milano. At the banquet, Prof. Yeong Min Jang (Kookmin Univ., Korea) delivered a banquet speech on a brief history of ICUFN and emerging technologies for future wireless communications. The best and excellent paper award ceremony was held simultaneously during the banquet session.

- Best Paper Award
 - “A Mobility Link Service in NDN Face to Support Consumer Mobility Service,” Jung-Hwan Cha, Ju-Ho Choi, Ji-Yong Kim, Sung-Gi Min (Korea University, Korea), Youn-Hee Han (Korea University of Technology and Education, Korea).



Fig. 2 Best Paper Award

- Excellent Paper Awards
 - “Differentially Private Queries in Crowdsourced Databases for Net Neutrality Violations Detection,” Maria Silvia Abba Legnazzi (Politecnico di Milano, Italy),

Cristina E.M. Rottondi (University of Lugano - University of Applied Science and Arts of Southern Switzerland), Giacomo Verticale (Politecnico di Milano, Italy)

- “DL CSI Acquisition and Feedback in FDD Massive MIMO via Path Aligning,” Xiliang Luo, Xiaoyu Zhang, Penghao Cai (ShanghaiTech University, China), Cong Shen (University of Science and Technology of China, China), Die Hu (Fudan University, China), Hua Qian (Shanghai Advanced Research Institute, China)
- Best Poster Award
 - “A Compressed Sensing Technique for OFDM Channel Estimation Using Full-Band Training Symbols,” Huang-Chang Lee, Pin-Yuan Chen, Cihun-Siyong Alex Gong (Chang Gung University, Chang Gung Memorial Hospital, Taiwan).

4. Conclusion

We believe that ICUFN 2017 was a truly successful conference in the area of communication and networking. On behalf of the organizing committee, we would like to thank our sponsors, KICS, IEEE Communications Society, and IEICE-CS for their kind support to this successful event. In addition, it is our pleasure to announce that ICUFN 2018 will be held in July 2018 (for more details, please visit <http://www.icufn.org/main/>).

IEICE-CS Related Conferences Calendar

Date	Conference Name	Location	Note
28 Jul. – 2 Aug. 2019	IEEE International Geoscience and Remote Sensing Symposium 2019 (IGARSS 2019)	Yokohama, Japan	TBD
18 Dec. – 20 Dec. 2017	Japan-Africa Conference on Electronics, Communications and Computers 2017 (JAC-ECC 2017)	Alexandria, Egypt	Submission deadline: Closed
11 Dec. – 13 Dec. 2017	The 23 rd Asia-Pacific Conference on Communications (APCC2017)	Perth, Australia	Submission deadline: Closed
4 Dec. – 6 Dec. 2017	2017 IEEE International Conference on Antenna Measurements & Applications (2017 IEEE CAMA)	Tsukuba, Japan	Submission deadline: Closed
26 Nov. – 30 Nov. 2017	13 th Int. Conference on Network and Service Management (CNSM2017)	Tokyo, Japan	To be held soon
14 Nov. – 16 Nov. 2017	The fifth ENRI International Workshop on ATM/CNS (EIWAC2017)	Tokyo, Japan	To be held soon
5 Nov. – 8 Nov. 2017	International Conference on Renewable Energy Research and Applications (ICRERA2017)	San Diego, USA	To be held soon
30 Oct. – 2 Nov. 2017	2017 International Symposium on Antennas and Propagation (ISAP2017)	Phuket, Thailand	To be held soon
18 Oct. – 20 Oct. 2017	International Conference on Information and Communication Technology Convergence 2017 (ICTC2017)	Jeju Island, Korea	To be held soon
27 Sep. – 29 Sep. 2017	Asia-Pacific Network Operations and Management Symposium (APNOMS2017)	Seoul, Korea	To be held soon
22 Sep. 2017	IEEE 5G Summit Tokyo (5G Summit)	Tokyo, Japan	To be held soon
14 Sep. – 15 Sep. 2017	Special European Conference on Optical Communications 2017 Symposium (Special ECOC 2017 Symposium)	Copenhagen, Denmark	To be held soon
21 Aug. – 25 Aug. 2017	The 24 th Congress of the International Commission for Optics (ICO-24)	Tokyo, Japan	Done
24 Jul. – 28 Jul. 2017	Photonic Networks and Devices /APC 2017	New Orleans, USA	Done
4 Jul. – 7 Jul. 2017	International Conference on Ubiquitous and Future Networks 2017 (ICUFN2017)	Milan, Italy	Reported on this issue
4 Jul. – 6 Jul. 2017	2017 IEICE information and Communication Technology Forum (IEICE ICTF2017)	Poznań, Poland	Done
12 Jun. – 14 Jun. 2017	The 23 rd IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN2017)	Osaka, Japan	Done
7 Jun. – 9 Jun. 2017	International Symposium on Extremely Advanced Transmission Technology (EXAT2017)	Nara, Japan	Reported on this issue
4 Jun. 2017	Technology Trials and Proof-of-Concept Activities for 5G and Beyond (TPoC5G)	Sydney, Australia	Reported on this issue
21 May 2017	The 10 th International Workshop on Evolutional Technologies & Ecosystems for 5G and Beyond (WDN-5G ICC2017)	Paris, France	Reported on this issue
22 Mar. – 24 Mar. 2017	The 13 th International Symposium on Autonomous Decentralized Systems (ISADS2017)	Bangkok, Thailand	Reported on this issue

Please confirm with the following IEICE-CS web site for the latest information.
<http://www.ieice.org/cs/conf/calendar.html>

Special Section Calendar of IEICE Transactions on Communications

Issue	Special Section	Note
Feb. 2019	Recent Progress in Antennas and Propagation in Conjunction with Main Topics of ISAP2017	Submission due: 15 February 2018 See page 39
Oct. 2018	Wireless Distributed Networks for IoT Era	Submission due: 2 November 2017 See page 38
Sep. 2017	No special section this issue	
Aug. 2018	Autonomous Decentralized Systems Technologies and Approaches Innovation through Structure Change of Society and Life	To be issued
Jul. 2018	Communication Quality in Wireless Networks	To be issued
Jun. 2018	No special section this issue	
May 2018	No special section this issue	
Apr. 2018	Optical Access System for Social Life	To be issued
Mar. 2018	Network Resource Control and Management for IoT Services and Applications	To be issued
Feb. 2018	Recent Progress in Antennas and Propagation in Conjunction with Main Topics of ISAP2016	To be issued
Jan. 2018	Internet Technologies to Accelerate Smart Society	To be issued
Dec. 2017	No special section this issue	
Nov. 2017	Network Virtualization, Network Softwarization and Fusion Platform of Computing and Networking	To be issued soon
Oct. 2017	Opto-electronics and Communications for Future Optical Network	To be issued soon
Sep. 2017	No special section this issue	
Aug. 2017	Radio Access Technologies for 5G Mobile Communications System	Vol. E100-B, No. 8
Jul. 2017	Smart Radio and Its Applications in Conjunction with Main Topics of SmartCom	Vol. E100-B, No. 7
Jun. 2017	Visible Light Communications in Conjunction with Topics of ICEVLC 2015	Vol. E100-B, No. 6

Please confirm with the following IEICE web site for the latest CALL FOR PAPERS
<http://www.ieice.org/event/ronbun-e.php?society=cs>

Special Section on Wireless Distributed Networks for IoT Era

The IEICE Transactions on Communications announces that it will publish a special section entitled "Special Section on Wireless Distributed Networks for IoT Era" in the October 2018 issue.

A special section entitled "Special Section on Wireless Distributed Networks" was published in December 2010. Although six-years has passed since publication, research on Wireless Distributed Networks (WDN) is still being actively pursued. Recently, inter-networking of various physical devices, which is also referred to as "Internet of Things (IoT)", has been attracting much attention. WDN is growing in significance as a way of implementing the network infrastructure of IoT. In particular, advanced frequency spectrum sharing, resource control for low power consumption, wired and wireless seamless networks for flexible network topology, highly reliable and real-time wireless communication technologies for remote control, ambient intelligence systems and so on are recognized to be key technologies when integrated with WDN to realize IoT. Since the era for proactive implementation of IoT is upon us, a special section on WDN which considers core technologies for IoT will encourage WDN research and development and expand the areas of IoT applications. For these reasons, a special section is being planned (scheduled to appear in the October 2018 issue).

1. Scope

This special section aims at timely dissemination of research in these areas. Possible topics include, but are not limited to:

- (1) **Principle theories and their application to WDN** (Multi-port information theory, Array signal processing, Bayes theorem, Graph theory, Convex optimization, Game theory, Machine learning, Artificial intelligence)
- (2) **Physical layer technologies of WDN for IoT** (Distributed synchronization, Multi-hop relay, Cooperative relay, Network MIMO, Network coding, Adaptive filter and interference cancellation, Distributed coding)
- (3) **MAC layer technologies of WDN for IoT** (Spectrum sensing, Cognitive radio, Dynamic spectrum access technologies, Spectrum data based, Distributed resource control, Spectrum shaping)
- (4) **Network layer technologies of WDN for IoT** (Edge computing, SDN, NFV, Network virtualization, Traffic control, Performance evaluation for networks, Network control, Multi-hop wireless routing)
- (5) **IoT application technologies with WDN** (Location information technology, Agriculture, forestry, and fisheries support system, Healthcare system, Disaster-prevention and mitigation system, Smart space, Industrial support system, Social infrastructure system, Wide area sensing system, Wireless communications and network for reliable control, Factory Automation, Energy network, Traffic network, Distributed algorithm for multi-agent system)
- (6) **Multi-layer technologies of WDN for IoT** (Network handover, Heterogeneous networks, Self-organized networks)

A submitted paper should be related to WDN. Otherwise, the editorial committee decides it as out of scope in this special section.

2. Submission Instructions

The standard number of pages is 8. The page charges are considerably higher for extra pages. Manuscripts should be prepared according to the guideline in the "Information for Authors." The latest version is available at the web site, http://www.ieice.org/eng/shiori/mokuji_cs.html. The term for revising the manuscript after acknowledgement of conditional acceptance for this special section could be shorter than that for regular issues (60 days) because of the tight review schedule.

This special section will accept papers only by electronic submission. Submit a manuscript and electronic source files (LaTeX/Word files, figures, authors' photos and biographies) via the IEICE Web site https://review.ieice.org/regist/regist_baseinfo_e.aspx by **November 2, 2017 (JST)**. Authors should choose the Wireless Distributed Networks for IoT Era as a "Journal/Section" on the online screen. Do not choose [Regular EB].

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* At least one of the authors must be an IEICE member when the manuscript is submitted for review. Invited papers are an exception. We recommend that authors unaffiliated with IEICE apply for membership. For membership applications, please visit <http://www.ieice.org/eng/member/OM-appli.html>

Call for Papers

----- Special Section on Recent Progress in Antennas and Propagation in Conjunction with Main Topics of ISAP2017 -----

The IEICE Transactions on Communications announces "Special Section on Recent Progress in Antennas and Propagation in Conjunction with Main Topics of ISAP2017" in **February 2019**. The objective of this special section is to publish recent research results on antenna and propagation technologies related to the topics in ISAP2017 (2017 International Symposium on Antennas and Propagation). The ISAP2017 will be held in Phuket, Thailand during October 30 – November 2, 2017, which provides an international forum for exchanging recent information on progress of the researches. The special section has been planned to publish papers on progressed discussion in ISAP2017. Submissions are available particularly from, but not limited to, the authors in the symposium.

1. Scope

This special section aims at timely dissemination of progressing research fields in ISAP2017. Possible topics include antennas and propagation technologies such as antenna design techniques, 5G mobile communication systems, MIMO, millimeter-wave/THz/optical applications, and wireless power transmission. The topics also include electromagnetic wave theory and computational methods for various electromagnetic topics including metamaterial, nano-electromagnetics, image sensing and their applications. However, the field of papers submitted to this special section is not limited to the above topics.

2. Submission Instructions

The standard number of pages is 8. The page charges are considerably higher for extra pages. Submissions of "letters" are not accepted. Manuscripts should be prepared according to the guideline in the "Information for Authors". The latest version is available at the web site, http://www.ieice.org/eng/shiori/mokuji_cs.html. The period for revising the manuscript after acknowledgement of conditional acceptance for this special section could be shorter than that for regular issues (60 days) because of the tight review schedule.

This special section will accept only papers by electronic submission. Submit a manuscript and electronic source files (LaTeX/Word files, figures, authors' photos and biography) via the IEICE Web site https://review.ieice.org/regist/regist_baseinfo_e.aspx **by February 15th, 2018 (JST)**. Authors should choose the Recent Progress in Antennas and Propagation in Conjunction with Main Topics of ISAP2017 as a "Journal/Section" on the online screen. Do not choose [Regular-EB].

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3. Special Section Editorial Committee

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* At least one of the authors must be an IEICE member when the manuscript is submitted for review. Invited papers are an exception. We recommend that authors unaffiliated with IEICE apply for membership. For membership applications, please visit the web-page, <http://www.ieice.org/eng/member/OM-appli.html>.

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● IEICE Societies and Publications

Society	Transactions	Editorial Subject Indexes
A (Fundamentals of Electronics, Communications and Computer Sciences)	EA (English) A (Japanese)	Engineering Acoustics, Noise and Vibration, Speech and Hearing, Ultrasonics, Digital Signal Processing, Analog Signal Processing, Systems and Control, Nonlinear Problems, Circuit Theory, VLSI Design Technology and CAD, Numerical Analysis and Optimization, Algorithms and Data Structures, Graphs and Networks, Reliability, Maintainability and Safety Analysis, Cryptography and Information Security, Information Theory, Coding Theory, Communication Theory and Signals, Spread Spectrum Technologies and Applications, Mobile Information Network and Personal Communications, Intelligent Transport System, Image, Vision, Computer Graphics, Language, Thought, Knowledge and Intelligence, Human Communications, Neural Networks and Bioengineering, Multimedia Environment Technology, Communication Environment and Ethics, Concurrent Systems, Measurement Technology, General Fundamentals and Boundaries
B (Communications)	EB (English) B (Japanese)	Fundamental Theories for Communications, Devices/Circuits for Communications, Transmission Systems and Transmission Equipment for Communications, Optical Fiber for Communications, Fiber-Optic Transmission for Communications, Switching for Communications, Switching for Mobile Communications, Network, Network Management/Operation, Internet, Wireless Communication Technologies, Terrestrial Radio Communications, Satellite Communications, Optical Wireless Communications, Antennas and Propagation, Electromagnetic Compatibility (EMC), Sensing, Navigation, Guidance and Control Systems, Energy in Electronics Communications, Terminals for Communications, Multimedia Systems for Communications, Broadcast Systems, Integrated Systems for Communications, Space Utilization Systems for Communications
C (Electronics)	EC (English) C (Japanese)	Electromagnetic Theory, Lasers, Quantum Electronics, Optoelectronics, Microwaves, Millimeter-Waves, Ultrasonic Electronics, Electronic Circuits, Electronic Materials, Organic Molecular Electronics, Electronic Components, Electromechanical Devices and Components, Semiconductor Materials and Devices, Integrated Electronics, Electron Tubes, Vacuum and Beam Technology, Electronic Displays, Superconducting Electronics, Storage Technology, Electronic Instrumentation and Control
D (Information and Systems)	ED (English) D (Japanese)	Computation and Computational Models, Automata and Formal Language Theory, Algorithm Theory, Complexity Theory, Computer Components, VLSI Systems, Computer Systems, Fundamentals of Software and Theory of Programs, System Programs, Software Engineering, Database, Contents Technology and Web Information Systems, Data Mining, Networks, Dependable Computing, Application Information Security, Distributed Cooperation and Agents, Artificial Intelligence and Cognitive Science, Human-computer Interaction, Office Information Systems, e-Business Modeling, Educational Technology, Rehabilitation Engineering and Assistive Technology, Pattern Recognition, Speech and Hearing, Image Processing and Video Processing, Image Recognition, Computer Vision, Computer Graphics, Multimedia Pattern Processing, Natural Language Processing, Biocybernetics, Neurocomputing, Biological Engineering, Music Information Processing, Kansei Information Processing, Affective Information Processing
Journal of IEICE (written in Japanese only)		

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Service coverage for overseas members	Admission charge	Online Version		Paper Version (optional)
		Registration of the first society (includes its online version transactions)	Registration of additional societies (includes its online version transactions)	Journal (written in Japanese)
Member (overseas)	1,400	7,000	3,500 / 1society	6,000
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NOTE

1. You need to choose one Society, and you can subscribe Transactions online of your registered society.

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Asia; Guam; Midway islands	5,600 yen	3,200 yen
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Please contact the IEICE Membership Section: E-mail: member@ieice.org FAX: +81 3 3433 6659 Please fill out the application form printed on the next page.

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To foster the cooperation between the Sister Society and the IEICE Communications Society (IEICE-CS), the Sister Society agreement enables members of each institution to become members of both societies by granting special annual fees.

A 10% - 20% discount* of the annual fees will be granted to the sister society members to become the IEICE-CS overseas members. The discounted fees will be applied for the individual members when the new membership is starting or the current membership is renewing.

* The discount does not apply to the optional items and services i.e. “Additional Society”, “Additional Transactions of paper version” and “Rapid Mailing Service”.

----- Please send the following Sister Society membership information, together with membership application form in the next page. -----

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Sister Society: IEEE ComSoc KICS VDE-ITG

Membership number (Member): _____

Copy of Membership certificate or Membership card:

(Attached here)

IEICE Communications Society - GLOBAL NEWSLETTER

Submission Guideline

First version in only Japanese: May 30, 2008
Second version in only Japanese: Feb. 13, 2009
Third version in only Japanese: Jul. 22, 2010
Forth version in English and Japanese: Mar. 8, 2011
Ver 5.0 : August 10 2013

1. About GLOBAL NEWSLETTER

The Institute of Electronics, Information and Communication Engineers Communications Society (IEICE-CS) GLOBAL NEWSLETTER has been established since 2002. We quarterly publish an English newsletter every March, June, September, and December.

1.1. Goal

Our goal is to share information between overseas/foreign members and other members in IEICE-CS as a global activity, and to show IEICE presence internationally.

1.2 Category of Articles

- 1) Messages from President/Vice President
 - An inaugural message from CS President is published once per year in June. Message from CS Vice President is published properly.
 - 2) IEICE-CS Activities Now
 - IEICE General/Society Conference information/reports
 - Activities of Technical Committees
 - International activities of the society
 - 3) IEICE-CS Related Conferences Reports
 - Information/reports on IEICE-CS related conferences
 - IEICE-CS Conferences Calendar (*)
 - 4) Others
 - Essays, Laboratory activity reports, Technology reports, Messages from overseas/foreign members, etc.
 - Information from Sister Societies
 - Special topics (*)
 - 5) IEICE-CS Information
 - Call for papers
 - From editor's desk (*)
- *: planned / written by IEICE-CS Directors, Planning and Members Activities

2. Major notes for Contribution

Basically, IEICE-CS members and readers can contribute articles. IEICE-CS Directors, Planning and Members Activities may ask non-IEICE-CS members to contribute articles. The articles should be fruitful and profitable for IEICE-CS members, **NOT** for particular organization. IEICE-CS Directors, Planning and Members Activities may not accept an article for publication if it does not follow this guideline.

2.1 Template and Language

Please use template downloadable at the URL:
http://www.ieice.org/cs/pub/global_howto.html
Please use English for all articles.

2.2 Number of pages

Two to four pages are preferable. One page article is also acceptable. The maximum number of pages is eight. When you try to entry a contribution with five to eight pages, you need to negotiate with IEICE-CS Directors, Planning and Members Activities.

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<http://www.ieice.org/eng/copyright/index.html>

4. Publication fee / Manuscript fee

No publication fee and no manuscript fee for all articles.

5. Schedule

Standard editing schedule is as follows. Please note that the schedule may vary due to public holidays or other circumstances. The exact deadlines are indicated in call for newsletters.

Publication date	1 st , Mar.	1 st , Jun.	1 st , Sept.	1 st , Dec.
Call for newsletters	1 st Mon., Dec.	1 st Mon., Mar.	1 st Mon., Jun.	1 st Mon., Sept.
Contribution entry	4 th Fri., Dec.	4 th Fri., Mar.	4 th Fri., Jun.	4 th Fri., Sept.
Submission of Manuscript/Copyright	3 rd Fri., Jan.	3 rd Fri., Apr.	3 rd Fri., Jul.	3 rd Fri., Oct.

5.1 Call for Newsletters

IEICE-CS Directors, Planning and Members Activities will give you the information on call for newsletters.

5.2 Contribution Entry

You should send **information on title, summary(around 50 words or less) and number of page** to IEICE-CS Directors, Planning and Members Activities by e-mail.

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5.3 Submission of Manuscript

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Facsimile: +81-3-3433-6616, Phone: +81-3-3433-6692

6 Contact Point

IEICE-CS Directors, Planning and Members Activities in charge of IEICE-CS GLOBAL NEWSLETTER, cs-gnl@mail.ieice.org

From Editor's Desk

● IEICE Society Conference 2017

The conference is to be held in Tokyo City University Setagaya Campus, Tokyo, for September 12-15, 2017. Many researchers will participate it because it will be held after a long time in the metropolitan area. Very hot days continue every day in Tokyo. However, the temperature will fall a little and we may feel comfortable in those days. English-language sessions will be scheduled for the globalization of IEICE's academic activities. We would like you to participate in the conference. Please check out the latest information on the IEICE web site at:

http://www.toyoag.co.jp/ieice/E_S_top/e_s_top.html

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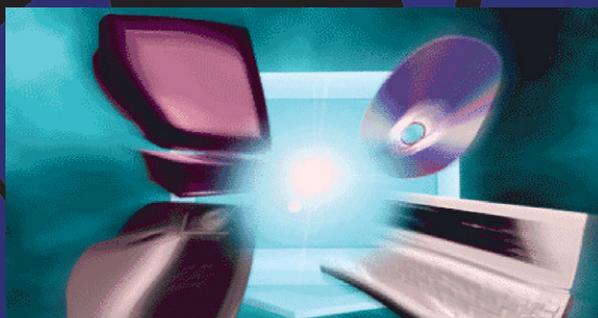
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To Probe Further and Keep Up-to-date with Communication Technologies

IEICE Communications Society



IEICE Society Conference 2017

12-15 September 2017

Tokyo City University Setagaya Campus, Tokyo

Every autumn, each Society organizes a Society Conference to provide a forum where members can present their study results and exchange views. At present, four of the Societies -- the Engineering Sciences Society, the NOLTA Society, the Communications Society, and the Electronics Society -- hold their Society Conferences as a joint event. The Communications Society Conference includes English-language sessions in addition to the Japanese-language sessions.

Please check out the latest information on the IEICE web site at:

http://www.toyoag.co.jp/ieice/E_S_top/e_s_top.html



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