Newsletter

Issued on Sept. 24, 2019 No. 26

IEEE Tokyo Section
Life Members Affinity Group

This issue reports technical tours/lectures sponsored by LMAG-Tokyo, lecture meetings sponsored by Tokyo Section (cosponsored by LMAG-Tokyo), and a future event.

1. LMAG-Tokyo Technical tour to DoCoMo R&D Center and Lecture Meeting.

LMAG-Tokyo Technical tour to DoCoMo R&D Center and Lecture Meeting were held at NTT DoCoMo R&D Center on June 10th, co-sponsored by TPC of IEEE Tokyo Section. Unfortunately it was heavy rain, but 27 people participated.

The first building and the second building were completed, in March 1998 and in March 2002, respectively. Then the ANNEX-L, R, and Laboratory building were constructed. There are oversea branches of DoCoMo R&D Center in North America, Germany, and China.

The tour started from Exhibition Room of WHARF: Wealth, Human Activities, and Revolution for the Future. We experienced the future mobile communication and smart life. For the 5th generation mobile network system, we recognized the tracking of the radio wave in the virtual space. For the natural language conversation, the translations from foreign languages to Japanese or from Japanese to foreign languages were explained. In the virtual city government, the administration plan was simulated what kind of results might arise. Anechoic chambers of radio wave and acoustic wave were experienced.

In Lecture Meeting, Mr. Seizo Onoe, the president of DOCOMO Technology Inc. talked about 5G: 5th Generation Mobile Network System – Its Technical Features and Special Impacts. Mr. Onoe played an important role of a leader for the global standardization of mobile network systems.

The investigation of mobile phones began in the late 1970th. The 1st generation mobile system was the mobile phone installed in the automobile. In 1991, the 2nd generation mobile system was available by using GSM or CDMA, and simultaneously the digital systems were on the main stream instead of the former analog systems. The i-mode and the internet were connected. In 2000, the 3rd generation started with WCDMA to enable the connection of video phones and PCs. In 2007, the 4th generation was available with WiMux and LTE for the smart phone service. Requirement from users to exchange a large volume of information seamlessly became stronger so that the expectation for the 5G has been increasing.

Recently the allocation of the frequency bands for 5G was determined, and in 2020 its service will start in Japan. In the oversea markets, Verizon in North America and KT in Korea already started the service. In the Last of his talk, he introduced the Band Wagon of 5G, and stressed not to miss boarding on this wagon.

Then, social gathering party was held by the participants, the speaker and DoCoMo people. The questions and comments about 5G were exchanged enthusiastically.

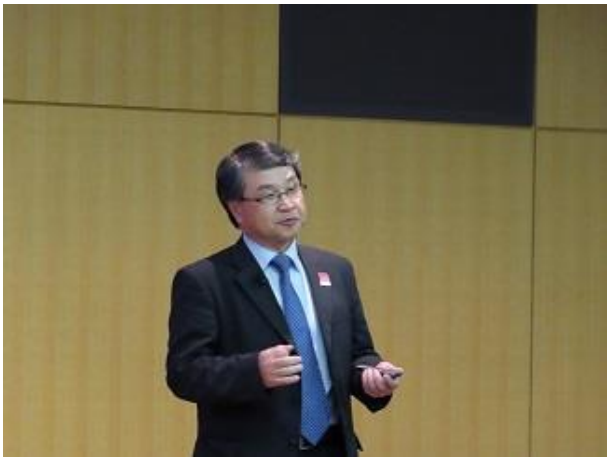

Fig. 1 Mr. Onoe giving his talk

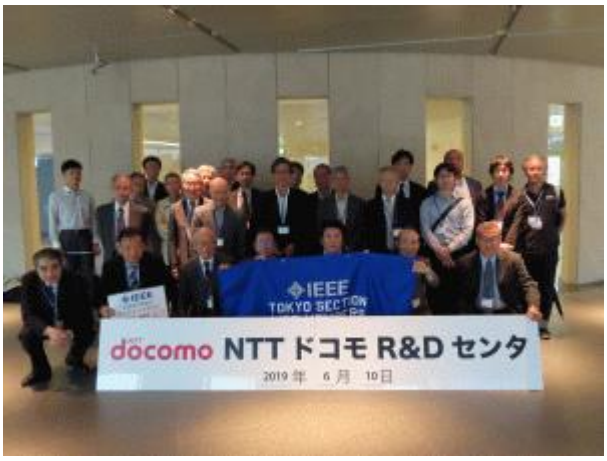

Fig. 2 Group photo of all participants

2. Lecture Meeting “ElectroMagnetic Transient Analysis for Power Systems”

A lecture meeting was held, sponsored by TPC and cosponsored by LMAG of IEEE Tokyo section, from 15:30 to 17:00 on July 23, Tuesday, at room 66 of Kikai-shinko Kaikan. The participants were 35 in number. The lecturer was Dr. Hideki Motoyama, who is now a Director of Electric Power Engineering Research Laboratory, Central Research Institute of Electric Power Industry. The topic was on “Electromagnetic Transient Analysis Technology in Power Systems,” covering a wide range of related topics from its history to the latest advances and future challenges. He was awarded an IEEE Fellow in 2019 on the related research.

First, he introduced basic matters of transient phenomena in power systems. There are two types of transient phenomena to be analyzed: 1) serge overvoltage (shorter than several hundreds micro seconds) caused by lightning, switching, and ground fault, 2) short-term AC overvoltage caused by high-frequency harmonics, resonance, and load shutdown. For designing the power system, it is useful to analyze the phenomena.

Next, he summarized advances of analysis technology using four stages in time. The first stage was till 1950, and the technologies were based on the field measurement and a theoretical method such as Heaviside transformation. The second stage (till 1980) is called “analog computer era”, and transmission line was analyzed by simulating the phenomenon with analog circuits (RLC) or analog amplifier circuits. The third generation (1970 - 2000) is called “classical digital computer era.” The phenomenon is analyzed using digital computers by representing a target system with a discrete model such as digital circuits. After 2000, digital computing method is grown and widely used with a variety of supporting tools like graphic user interface (GUI) functions and most of necessary phenomena in power systems can now be analyzed.

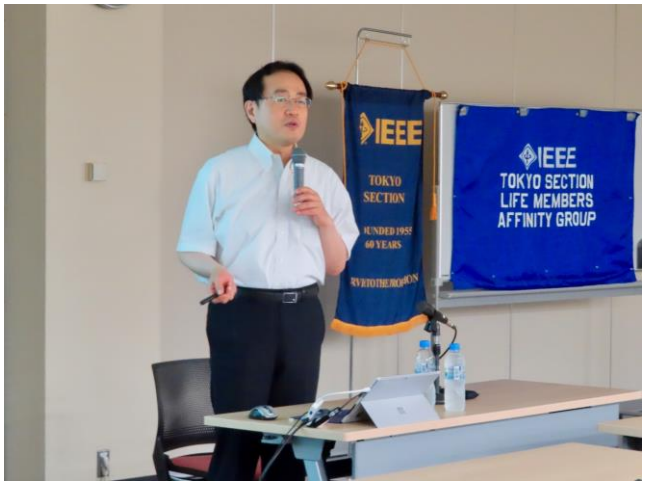

Fig. 3 Dr. Motoyama giving his lecture

As one of the advanced topics, he introduced a numerical electromagnetic analysis approach by solving Maxwell equation directly. This approach could break a limitation of conventional 2-dimensional analysis. He mentioned that the most advanced analysis tool can accept 3D structure data as an analysis target.

Finally he pointed out the importance of hybrid analyzing technologies to cope with the future complicated power systems.

After the lecture, there were several active questions on the analysis technologies and related topics. Discussion continued even after the allotted time.

3. IEEE Milestone-related Technical Tour

LMAG-Tokyo held a technical tour to Mount Fuji Radar Dome (in Fuji-Yoshida city, Yamanashi Prefecture) on August 30 (Friday) from 14:00 to 17:00 with 18 participants. The event was cosponsored by the History Committee and the TPC of IEEE Tokyo Section, and cooperated by IEICE Tokyo Section.

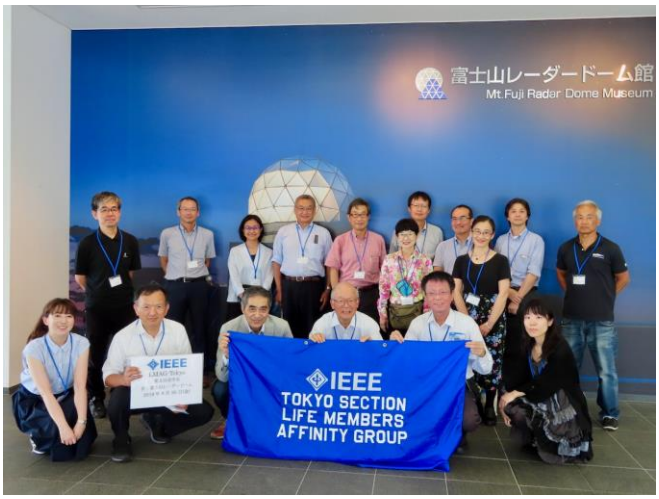

Fig. 4 Group photo of all the tour participants

Completed on the top of Mt. Fuji in 1964, Mount Fuji Radar system successfully played a role of “Typhoon Observation Fort” for 35 years. The radar system was awarded IEEE Milestone in 2000 and was moved to the current facility for opening to public.

By request from LMAG-Tokyo, Mr. Koichi Hirashima of Mitsubishi Electric Corp., an expert of weather radar, kindly participated in this tour to guide and explain the radar system.

The tour started with the nameplate of the system that shows determination of all the people who engaged in its development and construction. It was introduced that Mt. Fuji had been playing an important role in weather observation of Japan and how people in Japanese Meteorological Agency realized the project to build the weather radar system on the top of Mt. Fuji.

Next, the participants enjoyed a documentary video produced as an NHK TV program: Project-X entitled “The world-largest radar system construction ~ a drama of 9,000 people”. The video included interviews with people who actually engaged in the

system development and also included some additional content to the broadcasted program. The documentary presented how professional people in the project challenged difficulties in development and construction of the radar. An interesting story is also introduced associated with the radar-dome construction. The radar dome was necessary for protecting the antenna from Mt. Fuji's strong wind. In order to carry the dome, which was first assembled on level ground, up to the top of mountain, they decided to lift it with a helicopter. A famous legendary helicopter pilot managed to lift it up to the exact position on the top of Mt. Fuji. The signature of the pilot was displayed in the exhibition room.

Documentary novels associated with Mt. Fuji written by Jiro Nitta, Naoki Prize winner, were also displayed. As Jiro Nitta is a pen name of the person in Meteorological Agency who actually planned and promoted the Mt. Fuji radar project, some of his novels vividly describe the entire process of the project.

On the second and third floor, the actually used radar systems were displayed: an observation system operated remotely from Tokyo, S-band radar transmitter and receiver, antenna, magnetron, etc. Many technical questions were asked from the participants. Then, the participants had a chance to feel cold weather of Mt. Fuji in a special room, so that they could imagine how it was difficult to maintain the system in the actual environment. ,

After the tour, a social gathering party was held. The 14 participants exchanged additional questions and continued friendly discussions.

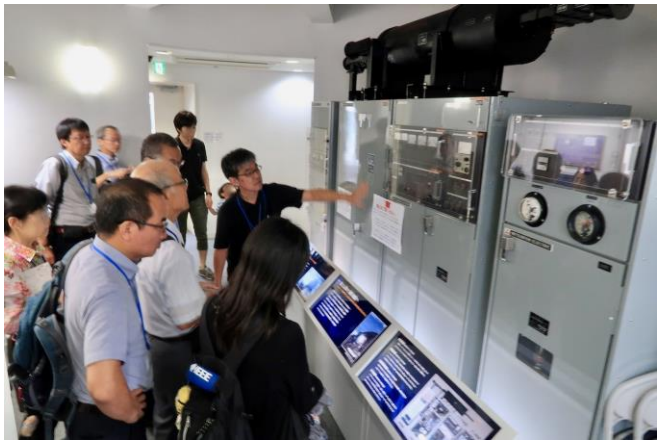

Fig. 5 Mr. Hirashima explaining Mt. Fuji radar

4. Lecture meeting "Development of wind measuring lidars and their applications"

The lecturer was Dr. Yoshihito Hirano who is now a technical advisor in the Semiconductor and Device Group of Mitsubishi Electric Corporation, and won the IEEE Fellow in 2018.

The lecture meeting was held sponsored by TPC and cosponsored by LMAG, both of IEEE Tokyo Section from 15:30 to 17:00 on September 4, Wednesday in the training room 1 of Kikai-shinko Kaikan. The participants were 38 in number.

At first, he explained LIDAR "Light Detection And Ranging" on the configuration and comparison with radio wave radars in terms of angle, range and speed resolutions. The difference between direct detection and coherent detection lidar systems was explained. The former system is simple and is not much affected by a turbulence of wave-front, and the latter has a strong sensitivity and robust against interference.

Next, using the equation of the signal to noise ratio in a lidar, he showed the peculiarities of direct detection systems with analogue reception and photon counting and a coherent detection system. Laser wavelength is selected considering eye-safety, atmospheric transparency, a source, a detector and an optical circuit. He introduced the whole history of lidars in Mitsubishi Electric Co., which covers a LD excited laser and lidars onboard an airplane and a satellite.

Then, wind measuring lidars were presented from the function principle to the measuring method of wind velocity, range and angle. He clarified the superiority of heterodyne-Doppler system through the comparison of several systems and introduced its commercialized series, DIABREZZA™. There are a large-scaled version to be used for airport surveillance, and a small scaled to be easily used to wind measurement. The experimental comparison between the remote measurement by a lidar and in-situ measurement on a pole showed excellent agreement, and enabled standardization of lidars. Nowadays, lidars are used for urban environment measurement, wind power generation support, airplane safety and wind monitoring in real time.

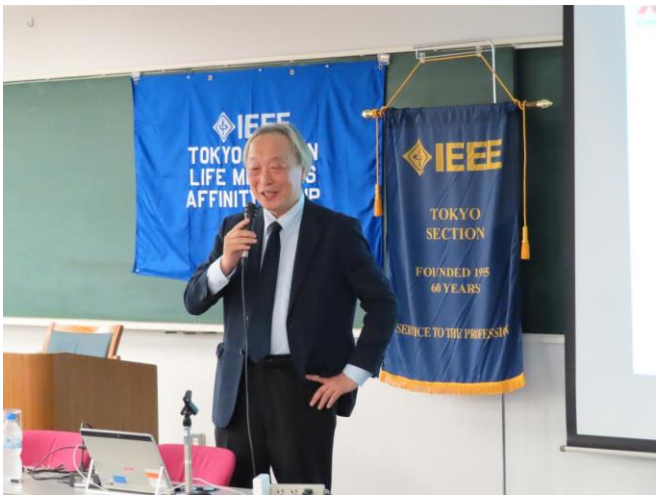

Fig. 6 Dr. Hirano in his lecture

In the technological history, there were a fiber amplifier, Er, Yb: glass Q-SW laser, and a planar laser amplifier. It is also possible to measure the moisture content through the vapor absorption. He says that a lidar expands to 3D imaging with angle measurement by a beam scan in addition to ranging.

After the lecture, 3 questions were asked, and discussion continued even after the allotted time.

5. LMAG-Tokyo Future Event

Technical Tour to KDDI Research

- Date & Time: Nov. 29, 2019 (Fri) 15:30～17:30
- Venue: KDDI Research Inc.
  2-1-15, Ohara, Fujimino-city, Saitama Prefecture

For further information, contact IEEE Tokyo Section tokyosec@ieee-jp.org.

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