Dielectrics and Electrical Insulation (DEI)

Chairperson: Yasuhiro Tanaka  (Tokyo City University)
Secretaries: Yoitsu Sekiguchi  (Sumitomo Electric Co. Ltd.)
Hiroyuki Nishikawa (Shibaura Institute of Technology)
Assistant Secretaries: Norikazu Fuse    (CRIEPI)
Takahiro Imai     (Toshiba Corporation)

The Technical Committee on Dielectrics and Electrical Insulation (TC-DEI) has a long history from 1970, in which the former committee named as the Permanent Committee on Electrical Insulating Materials was established in IEEJ (the Institute of Electrical Engineers in Japan). The activity of the Committee has been covering mainly solid and composite dielectric materials and their technologies. From June 2013, the TC-DEI has started a new season with a new chairperson of Prof. Y. Tanaka.

Organized events by TC-DEI

The important activity of TC-DEI is the annual domestic Symposium on Electrical and Electronic Insulating Materials and Application in Systems (SEEIMAS), formerly called Symposium on Electrical Insulating Materials. Furthermore, in every 3 years, we hold SEEIMAS as an international one technically cosponsored by IEEE DEIS, namely the International Symposium on Electrical Insulating Materials (ISEIM). This year, we held the 7th international symposium (2014 ISEIM) with Honorary Chair of Prof. M. Nagao and the General Chair of Prof. Y. Tanaka, in June 1-5, 2013 at Toki Messe, Niigata, technically cosponsored by IEEE DEIS, co-sponsored by Niigata University and Waseda University, in cooperation with IEEE DEIS Japan chapter. In this symposium, the TC-DEI tried some new events. Before the symposium, a workshop of "APIANS (Analysis for Polymeric Insulating materials using Advanced Numerical Simulation)" was successfully held by inviting five speakers and many participants were discussed about this advanced technology. In the symposium, the demonstration and tutorial of PEA (Pulsed Electro-Acoustic) method to measure space charge distribution in insulating materials were also held with a new concept of “practical experience”. We are deeply grateful to all participants in the symposium for their cooperation to make the academic and the friendly atmosphere on it. The symposium was successfully closed with recording the large number of participants (162 people from 16 countries). In the symposium, the next candidate place for ISEIM was opened as Toyohashi city in 2017. We strongly hope your participation in the next symposium.

The 46th SEEIMAS is now planning to be held in Kitakyushu city in September, 2015, with technically cosponsored by IEEE DEIS Japan chapter, CIGRE Japanese national Committee. Local arrangement is expected to be supported by Kyushu Institute of Technology. New materials and the improvement of their properties, functional materials, nano-composite materials, insulation systems under inverter surges, partial discharge and space charge assessment, outdoor insulations, thin dielectric films and other topics will be discussed. Especially in the next year’s symposium, the special session featuring the diagnosis of electrical insulation degradation with demonstration using actual equipment is supposed to be carried out, and it must attract participants.

Investigation Committees run by TC-DEI

Adding to organize some events, the TC-DEI runs Investigation Committees (ICs) that organize several technical meetings a year. The investigation committees are categorized into three research areas:

New materials including nano-materials related
> Advanced Nanostructure Control for High-Performance Organic Devices and Application to Life Science (07/2014 -06/2017, Chairperson: K. Kato (Niigata University)).
> Investigating Committee on Application to the Next-Generation Electronics of Organic Dielectrics, Conductive Electrical and Electronic Materials in Asian Countries (04/2014 - 03/2017, Chairperson: M. Iwamoto (Tokyo Institute of Technology)).
> Applied Technology of Advanced Dielectric Polymer Nanocomposites (04/2010 - 03/2013, Chairperson: T. Tanaka (Waseda University)). Next committee is now under consideration.

Ageing and diagnosis of electric and electronic equipment related
> Ageing and Diagnosis of Electric and Electronic Equipment Related Investigation of Degradation Diagnosis Technology of Electric Power Apparatus for its Transfer (04/2013 - 03/2016, Chairperson: Y. Ehara (Tokyo City University)).
> Testing methods of winding insulation systems for Invertor-fed motors (05/2013 - 04/2016, Chairperson: M. Nagata (University of Hyogo)).
> Current state and future view of innovative diagnostic techniques of power apparatus (10/2012-09/2015, Chairperson: M. Ikeda (NRA)).

Basic dielectric and breakdown phenomena related
> Evaluation of Properties and Improvement of Polymeric Insulating Materials for Outdoor Use (04/2010 - 03/2013, Chairperson: H. Homma (CRIEPI)). Next committee is now under consideration.

> Standardization of Calibration and Development of Application on Space Charge Measurement using PEA Method (03/2009 - 02/2012, Chairperson: Y. Tanaka (Tokyo City University)). Next committee is now under consideration.

### Electrical Discharges (ED)

**Chairperson:** Fumiyoshi Tochikubo (Tokyo Metropolitan University)

**Secretaries:**
- Akiko Kumada (The University of Tokyo)
- Hiroshi Kojima (Nagoya University)

**Assistant Secretaries:**
- Yasushi Yamano (Saitama University)
- Naohiko Shimura (Toshiba Corporation)

The Technical Committee on Electrical Discharge (TC-ED) belongs to the Fundamentals and Materials Society of the IEE Japan. The origin of the TC-ED is the Expert Committee on Electrical Discharges, which was established in January 1954. That is, the TC-ED has supported the development of science and technologies on electrical discharges in Japan for a long time.

The purposes of the TC-ED are mainly the wide promotion of the research activities concerning to a variety of electrical discharges in vacuum, gas, liquid and on surfaces of materials and their applications to high technologies, especially aiming an environmentally sustainable technology for the next generation.

Several investigation committees, which are the affiliates of the TC-ED, are established every year to survey the up-to-date research subjects. The activities of these committees usually continue for three years. Each committee generates very useful technical report at the end of the active period. Two investigation committees shown in Table 1 are currently active.

The TC-ED organizes about six domestic technical meetings on electrical discharges every year. In these meetings, nearly 200 papers are presented from both academic and industrial sides. The technical meeting is also useful to train and encourage young researchers including students. The domestic technical meetings are sometimes co-organized by other Technical Committees such as Dielectrics and Electrical Insulation, Pulse Electromagnetic Energy, Plasma Science and Technology, High Voltage Engineering, and Switching and Protecting Engineering.

In order to promote the international activities in electrical discharges, “Japan-Korea Joint Symposium on Electrical Discharge and High Voltage Engineering” has been co-organized by the TC-ED with Research Group of High Voltage and Discharge, The Korean Institute of Electrical Engineers, since 1996. Next symposium will be held in Korea in 2015.

The TC-ED also contributes to organize an annual young researcher seminar in cooperation with the Institute of Engineers on Electrical Discharges in Japan for encouraging the young researchers in the field of electrical discharges. The seminar consists of lectures by senior researchers, poster presentation by the participants, and the visit tour to the facilities such as research institute. About 40 young researchers and engineers participate in the seminar and discuss vigorously the topics for two days.

### Table 1: Investigation Committees in TE-ED

<table>
<thead>
<tr>
<th>Chairperson</th>
<th>Research subjects and established time</th>
</tr>
</thead>
<tbody>
<tr>
<td>K. Miyagi (Kanazawa Institute of Technology)</td>
<td>Electrical/chemical behavior and application technology in dielectric liquids (established in October 2012)</td>
</tr>
<tr>
<td>H. Sugawara (Hokkaido University)</td>
<td>Gas-phase simulation technologies for analyses of electrical discharges and plasmas (established in October 2014)</td>
</tr>
</tbody>
</table>

### Plasma Science and Technology (PST)

**Chairperson:** Hiroshi Akatsuka (Tokyo Institute of Technology)

**Vice Chairperson:** Yasunori Tanaka (Kanazawa University)

**Secretaries:**
- Jaeho Kim (National Institute of Advanced Industrial Science and Technology)
- Masanori Shinohara (Nagasaki University)

**Assistant Secretaries:**
- Naoki Shirai (Tokyo Metropolitan University)
- Ryuta Ichiki (Oita University)
The Technical Committee on Plasma Science and Technology (TC-PST) was founded in April 1999. This committee has the basis on the plasma researcher’s society that had organized Technical meeting on plasma science and technology in IEE Japan several times every year since about 30 years ago. The field of activity of this committee includes researches and investigations of various plasmas over wide ranges of their density, temperature, ionization degree, and applications such as nuclear fusion, plasma processing, and plasma chemistry.

The major activity of this committee is to succeed to organize several technical meetings on plasma science and technology every year. In 2014, three technical meetings were held, in May at Ashikaga Institute of Technology in Ashikaga, in September at Osaka Prefecture University in Osaka and in October at Horutohall OITA in Oita. In 2013, also four technical meetings were held. At each symposium, about 20–60 presentations are made. Presentations by young researchers in bachelor course and master course are strongly encouraged and appreciated. Some of the technical meetings are jointly organized with TC-PPT.

TC-PST currently runs two investigation committees as shown in Table 1. Here we introduce their activities. In the committee of the standardization of experiment and simulation modeling in liquid interface plasma, upon the research outputs of the advancement of the plasma–water applications and their reacting processes committee held in 2008–2010, investigations are made over the characteristics on plasma–water interface, overview and perspectives to activate related research activities in domestic institutes. In the committee of the propulsion performance of electrical propulsive rocket engine and its internal plasma physic phenomena, the progress of the propulsion performance and the understanding of physical phenomena in plasma are investigated by researchers of electrical phenomena or plasma engineering.

Table 1. Investigation Committees in TC-PST.

<table>
<thead>
<tr>
<th>Investigation Committee</th>
<th>Term</th>
<th>Chairperson</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardization of Experiment and Simulation Modeling in Liquid Interface Plasma</td>
<td>3 years from 2011, Chairperson: K. Yasuoka (Tokyo Institute of Technology)</td>
<td></td>
</tr>
<tr>
<td>Propulsion Performance of Electrical Propulsive Rocket Engine and Its Internal Plasma Physic Phenomena</td>
<td>3 years from 2011, Chairperson: K. Tahara (Osaka Institute of Technology)</td>
<td></td>
</tr>
</tbody>
</table>

Light Application and Visual Science (LAV)

Chairperson: Yukitaka Shinoda (Nihon University)
Secretary: Mitsuhiro Kusaba (Osaka Sangyo University)

Activities of the technical committee on light application and visual science (TC-LAV) have been covering fields of visual/optical information processing and various kinds of application of optical engineering in the wavelength region from far-infrared (THz-wave) to extreme ultraviolet. In this report, two recent topics are introduced with respect to the formation of periodic grating structures on metal self-organized by double pulse irradiations, and optical lithography onto fine-diameter pipes and wires.

The first topic, "Periodic grating structures on metal self-organized by double pulse irradiations", is introduced. On metals and semiconductors under irradiation of linear polarized femtosecond laser pulses, laser induced periodic surface structures (LIPSS) were self-organized\(^{(3,12)}\) and they were oriented perpendicular to the laser polarization direction. Laser- produced LIPSS had an interspace of 0.5λ - 0.85λ, which was shorter than the laser wavelength λ and its interspaces depended on laser fluence. This phenomenon was well explained by the parametric decay model\(^{(5)}\) proposed by Sakabe et al. An assumption in this model is that, as a consequence of the ultrafast interaction with the laser beam, the solid surface is initially covered by a pre-formed surface plasma with a density much lower than the solid. Surface plasma waves are then induced at the interface between free space and the laser-produced low dense plasma by parametric decay process. Then, the LIPSS are self-organized. Therefore the pre-formed plasma is a key issue to discuss the formation mechanism of LIPSS. In this study, the double pulse irradiation experiment has been carried out to discuss the relation between the preformed plasma density and the LIPSS interspaces self-organized on the metal surface. Since the preformed plasma might be produced by rising edge of the laser pulse, the experiment result that is a variation of the surface plasma density might lead to a variation of the LIPSS interspaces will be expected. In the experiments, the T^+ laser system (λ=805 nm, τ =40 fs, 10 Hz) was used. The double pulse beam with a time delay of 160 fs was composed of a first pulse, responsible for the surface plasma formation, and a delayed pulse, responsible for the LIPSS formation. The first pulse fluence F\(_{PP}\) was varied and always kept below the formation threshold F\(_{TH}\) =60mJ/cm\(^2\) of the periodic grating structure on Ti. The delayed pulse fluence F\(_{LP}\) was kept constant above F\(_{TH}\). The double pulses were...
collimated and focused to a spot size of 45 µm with flat-topped shape on the Ti target surface with a lens \( f = 10 \) cm, at normal incidence in air. The polarization direction of the first pulse was set to be parallel to that of the delayed pulse. The target of titanium was mechanically polished and its roughness was less than 2nm. The number of irradiated double pulse beam was \( N = 25 \) in all experiments. Laser-produced LIPSS were examined by scanning electron microscopy (SEM; JSM-5560, JEOL). Figures 1 show SEM images and the power spectrum of the surface structures produced by varying the first pulse fluence \( F_{PP} \) while the delayed pulse fluence \( F_{LP} \) was kept constant \((F_{LP}= 60 \text{mJ/cm}^2)\). For the laser fluence of \( F_{PP} = 50 \text{mJ/cm}^2 \) and \( F_{LP} = 35 \text{mJ/cm}^2 \), the LIPSS oriented perpendicular to the laser polarization direction were produced. The interspace of the LIPSS was \(~604\text{nm}\) for \( F_{PP} = 50 \text{mJ/cm}^2 \) and \(~462 \text{nm}\) for \( F_{PP} = 35 \text{mJ/cm}^2 \). In Fig.2, the dependence of the LIPSS interspaces on total laser fluence of \( F_{PP} + F_{LP} \) for Ti with double pulse irradiation is shown as solid circles. The LIPSS produced by single pulse of 160fs irradiation \((4)\) are also plotted as open circles for comparison. Surprisingly the interspaces produced by double pulse irradiations are relatively good agreement with that of single pulse irradiations. Additionally, the interspaces of the periodic structure follow the parametric decay model prediction (solid line).

The experimental results suggested that the pre-formed plasma might be produced in rising edge of laser pulse duration lead to a variation of the LIPSS interspaces.

The second topic is optical lithography onto fine-diameter pipes and wires. Lithography is mainly used for fabricating highly integrated semiconductor devices. In this usage, very tiny patterns with down to less than 20 nm are required. For this reason, how to print such fine patterns stably with low costs is the main research target.

On the other hand, lithography is also often applied to fabrication of micro electro mechanical systems (MEMS) and their components, recently. In these applications, minimum pattern sizes are far larger than those for fabrications of semiconductor devices. For example, patterns with 5-200 µm are required. However, it is often required to print patterns on various objects instead of almost completely flat semiconductor wafers. Patterning onto pipes, rods, wires, and curved surfaces is a typical requirement.

To answer such needs, an effective original tool applicable to patterning onto fine straight pipes and wires was proposed, and excellent patterning results were shown\((5)\). The new method uses laser scan lithography, as shown in Fig. 3.

Patterns were delineated onto fine pipes of stainless steel (SUS304) with outer and inner diameters of 100 and 60 µm by scanning the pipes to a violet laser beam. Fig. 4 shows an example of helical space pattern delineated in a positive resist of PMER P-LA900PM coated with a thickness of approximately 3 µm. It was demonstrated that fine SUS coils were fabricated by adding electrolytic etching in an aqueous solution of sodium chloride and ammonium chloride using helical resist patterns as masks for etching, as shown in Fig. 5. Caused by under-etching phenomena, obtained coil widths became narrower than the helical resist pattern widths used as the etching mask. However, width homogeneity was very good, and the coil surface was very smooth. It is expected that the new method is applicable to fabrications of various micro-components\((6)\).

References
Electro-Magnetic Compatibility (EMC)

Chairperson: Ken Kawamata (Tohoku Gakuin University)
Secretaries: Tomoo Ushio (Osaka University), Hidenori Sekiguchi (NMRI)
Assistant Secretaries: Yu-ichi Hayashi (Tohoku University)

1. Overall of Technical Committee on EMC
   The Technical Committee on Electromagnetic Compatibility (EMC) has a vital role of researching following subjects;
   1. Comprehensive understanding of electrical power system and EMC issue,
   2. Establish the interdisciplinary cooperation among several groups and/or institutes related with EMC problem,
   3. Investigations on new and high technology for EMC,
   4. Advertisement to the public on EMC issue and key technologies,
   5. Introductory advertisement of international EMC standard to the domestic EMC researchers.

For these purposes the committee pays their attention to the causes of electromagnetic interference phenomena, the situation of electromagnetic interferences occurrence, the novel measurement techniques and method for EMC, the protection technology and counter measurement for EMC and international and domestic EMC regulations. The committee has been organizing four dedicated research sub-committees to realize the effective activity.

   1. Investigation committee on EMC problem of smart grit and city.
   2. Investigation committee on disturbance of transient electromagnetic fields to electronic equipment and wireless communications.
   3. Investigation committee on technical trends in evaluation of human exposure to electromagnetic fields.
   4. Investigation committee on the health risk analysis of electromagnetic field.

These sub-committees basically work independently, and each sub-committee meeting is held every two or three months regularly to announce their investigations and to share the obtained knowledge among sub-committee members. The practical period for the sub-committee activity is two or three years, and they are expected to publish their investigating results as a technical report of investigation committee or to have special conferences, which are related to their research theme.

Electromagnetic environment is the field, where electromagnetic phenomena exist. They are electromagnetic fields due to naturally-originated sources like lightning and earthquake, and artificial ones generated from electrical and electronic equipment as well as radiated from power lines or communication cables, and so force. EMC is the capability of electrical and electronic systems, equipment and devices to operate in the above-mentioned electromagnetic environment, without suffering or causing unacceptable degradation as a result of electromagnetic interference. In other words, a system is considered as electromagnetically compatible if it satisfies the following three criteria:

   1. It does not cause interference with other systems;
   2. It is not susceptible to emissions from other systems;
   3. It does not cause interference with itself.

The problems related to EMC had been discussed in the “Special Research Committee of EMC Engineering”, which was established in 1997 by IEICE and IEEJ joint venture. The high activity of the committee promoted the establishment of the technical committee on EMC in the Fundamentals and Materials Society of IEEJ. The committee was established to substitute the former committee in April 1999. Then Prof. T. Takuma of Kyoto University was elected as the first chair of the committee. After that, Prof. O. Fujiiwara, Prof. Z-I. Kawasaki, and Prof. T. Funaki chaired the committee respectively from May 2002 to Apr. 2005, from May 2005 to Apr. 2008, and May 2008 to Apr. 2014. Currently, Prof. K. Kawamata succeeds the chair since May 2014. The committee holds some technical conferences. They were Oct.
2. Investigation committee on EMC problem of smart grid and city

This committee, chaired by Emer. Prof. M. Tokuda in Tokyo City University, was established in Oct. 2014. The mission of this committee is that in order to clarify the issue of smart grid and city, and to organize the basic data that contribute to the EMC design of the system, it is widely investigated from the point of view of EMC. The committee is working on the following subjects.

1. Overall conditions of research and development of smart grid and city technologies over the world;
2. Trend in the standardization of smart grid;
3. EMC regulations related to smart grid and city;
4. The EMC problems in renewable energy;
5. EMC problems in generation and transformation of electricity;
6. EMC problems in transmission and distribution of electricity;
7. EMC problems in communication network for smart grid;
8. EMC problems in load and energy storage;
9. The EMC problems in wireless power transmission;

This committee envisions clarifying the EMC problems expected to occur in the smart grid and city.

3. Investigation committee on disturbance of transient electromagnetic fields to electronic equipment and wireless communications

This committee, chaired by Dr. S. Ishigami of National Institute of Information and Communications Technology, was established in Apr. 2014. The mission of this committee is to measure and figure out the characteristics associated with transient phenomena including ESD and other discharge phenomena from the viewpoint of EMC, and to clarify the mechanism in emission of electromagnetic field by the transient phenomena. The committee also investigates an impact of the phenomena on electronic equipment and wireless communications. The subjects are summarized as followings.

1. Basics and mechanisms of transient phenomena;
2. Characteristics of electromagnetic field by the transient phenomena;
3. Optimization of ESD immunity test;
4. EMC modeling and simulation of the transient phenomena;
5. Evaluation of disturbance degree to electronic equipment and wireless communications;

6. Investigation of fault injection mechanism to communications system by impulse noise.

This committee envisions to clarify the difficulties of noise immunity for electric and electronic appliances, and to offer basic data to deal with.

4. Investigation committee on technical trends in evaluation of human exposure to electromagnetic fields

This committee, chaired by Dr. K. Yamazaki of Central Research Institute of Electric Power Industry, was established in Jul. 2013. The mission of this committee is to survey the current technical trends in numerical calculation and measurement evaluation of human exposure to electromagnetic fields. Moreover, this committee aims at accumulating the knowledge of this province by inquiring the standards and evaluation methods for electrical safety of human body, and by studying the applicability of numerical analysis of electrical magnetic field. The investigation subjects are summarized as followings.

1. Surveying the research trends for the evaluation of electrical quantities in human body with numerical analysis of electromagnetic field;
2. Surveying the trends in guidelines and standards for protection of human body to the exposure to electromagnetic field;
3. Surveying the standards and evaluation method for the indirect influence of electrical magnetic field on the human body protection and the human body safety with the facilities and instruments;
4. Find issues for future work.

This committee envisions understanding comprehensively the foundation and attitude for the indirect influence of electrical magnetic fields.

5. Investigation committee on the health risk analysis of electromagnetic field

This committee, chaired by Dr. C. Ohkubo of Japan EMF Information Center, was established in Jul. 2013 as the subsequent of special committee of studying the exposure effects of electric magnetic fields on biological system, which was established on Dec. 1995 as the direct subordinate for the president of IEEJ and dissolved on Mar. 2012. The mission of this committee is to survey the trends in the research of health risk assessment with uncertainty for the exposure of electromagnetic fields and the policy in managing the risk. The committee is working on surveying the current status, trends and future tasks of following subjects.

1. Health effects due to exposure to extremely low frequency (50/60Hz) magnetic fields emitted from electrical power equipment and household electric appliances evaluated by epidemiology,
human volunteer study, animal experiment, and cellular experiment;
2. Health effects due to exposure to intermediate frequency electromagnetic fields (300Hz – 10MHz) emitted from induction heating apparatus and wireless power transmission evaluated by epidemiology, human volunteer experiment, animal experiment, and cellular experiment;
3. Health effects due to exposure to radio frequency electrical magnetic fields in human;
4. Risk management and risk communication on electromagnetic fields;
5. Others.
This committee envisions to summarize the trends in the influence of electrical magnetic field on human body and to offer back data for the sound development in utilizing the energy with the form of electrical magnetic fields.

Electromagnetic Theory (EMT)

Chairperson: Masahiro Tanaka (Gifu University)
Secretaries: Yoshio Inasawa (Mitsubishi Electric Corp.), Keiji Goto (National Defense Academy)
Assistant Secretary: Ryosuke Ozaki (Nihon University)

The Technical Committee on Electromagnetic Theory (EMT) is established, in order to maintain the qualified position of Japan in the field of the electromagnetic theory, by promoting the collaboration with foreigners, and by bringing up the young Japanese colleagues who would contribute to the global activation of the electromagnetic society.

The purposes of our technical committee are summarized as follows: (1) Systematization of the study of electromagnetic theory; (2) Promotion of collaboration in each field of electrical engineering using the electromagnetic theory; (3) Providing the members of IEEJ with the information and knowledge of our committee and enlightening activity of our technical committee; (4) Level up of our society by interaction with the domestic and foreign workers through the collaboration, and in the international conferences, etc.; (5) Education of electromagnetics to the students and growing up the young engineers in the next generation.

The scope of our technical committee includes: (1) Fundamental theory of electromagnetics (including relativistic theory, quantum electrodynamics, etc.); (2) Analysis theory of electromagnetic fields; (3) Numerical solutions and modeling of electromagnetic fields; (4) Simulation techniques of electromagnetic fields; (5) Scattering and diffraction of electromagnetic waves; (6) Interaction of electromagnetic fields with media (including laser, plasma, random media, etc.); (7) Nonlinear problems; (8) Inverse problem, inverse scattering; (9) Electromagnetic environment; (10) Electromagnetic effect on biological systems; (11) Other related fields.

Major activity of our committee is to pursue to organize several technical meetings. Currently, we have four technical meetings on electromagnetic theory every year. In 2014, technical meetings were held in Doshisha University, Kyoto (January), Akihabara Satellite Campus, Tokyo Metropolitan University, Tokyo (May), Muroran Institute of Technology, Hokkaido (July), Kusatsu Onsen Hotel & Spa Resort Nakazawa Village, Gunma (November). The all four technical meetings were co-sponsored by the technical committee on Electromagnetic Theory in The Institute of Electronics, Information and Communication Engineers (IEICE).

The current working investigating R&D committee in EMT is “Investigating R&D Committee on Observation, Prediction, and Simulation Technologies for Natural Hazard Mitigation by Electromagnetic Approaches,” chaired by Prof. Katsumi Hattori, Chiba University. The active period is from October 2012 to September 2015.

Instrumentation and Measurement (IM)

Chairperson: Tetsuo Fukuchi (CRIEPI)
Vice-chairperons: Hajime Nakajima (Mitsubishi Electric Corp.), Yoshitaka Sakumoto (JEMIC)
Secretaries: Teramitsu Shirai (JEMIC), Kazuaki Kodaira (JEMIC)

Activities
The Technical Committee of Instrumentation and Measurement (IM) hosts technical meetings on electrical and electronic measurement technology for exchange of information. It also forms R&D committees to research current and future trends in measurement technology.

The IM committee consists of 13 members, including 1 chairperson, 2 vice-chairpersons, and 2 secretaries. The
activities of the IM committee are as follows:
(1) General committee meetings, held 4 times annually.
(2) Technical meetings, held almost every month.
(3) Research activity in the "R&D committee for Metrological Traceability related to Smart Grid" (chairperson: Mr. Akio Iwasa, National Institute of Advanced Science and Technology).
(4) Technical visit, held about once a year.

Topics
Outstanding research papers presented at the technical meetings are described below.

1. Detection of latent defects in precisely polished surfaces by stress-induced light scattering method\(^{(1)}\)

   Precise polishing, such as chemical mechanical polishing, is used in manufacture of semiconductors and glass substrates, and is an important technology in the manufacturing process. Many polishing methods use mechanical processes such as friction, which may cause latent flaws (\(\mu m\) or \(nm\) order defects) on the product surface. Such flaws may degrade product reliability and cause economic loss.

   The authors proposed a new method to detect latent flaws caused by polishing using the photoelastic effect and light scattering. In this method, the sample is subjected to mechanical stress (bending stress is used in Fig. 1), and change in light scattering intensity at the flaw tip due to stress concentration is detected. This method was applied to a patterned silicon wafer (diameter 200 mm), whose insulating surface (SiO\(_2\)) was polished, and numerous latent flaws were detected (Fig. 2). The presence of flaws was confirmed by atomic force microscope (AFM) observation, after the insulation layer was removed by hydrofluoric acid solution (Fig. 3).

2. Atmospheric correction technique in surface remote sensing by satellite imaging\(^{(2)}\)

   The Normalized Difference Vegetation Index (NDVI), obtained from satellite images, is a remote sensing method for observing the earth's surface. However, the observed values differ from those on the surface because of attenuation and scattering in the atmosphere. For correcting these effects, measurement values on the ground (ground truth values) are required, but these depend on the measurement location and time.

   The authors proposed an atmospheric correction method which does not require ground truth values. This method is based on the atmospheric propagation model shown in Fig. 4 to estimate the surface reflectivity. The atmospheric transmission and scattering radiance are assumed to be separable into parameters depending on the wavelength band of the sensor and parameters depending on the atmospheric conditions. The former parameters are characteristic values, and the latter parameters can be estimated from image analysis. In this manner, correction can be applied to images at arbitrary locations and time.

   NDVI distributions before and after correction are shown in Fig. 5. The values increased after correction, and the vegetation regions are more strongly stressed. The NDVI values in Fig. 5 and ground truth values are compared in Fig. 6. Concrete and soil were considered in addition to vegetation. Atmospheric correction resulted in values closer to ground truth values, which confirmed the effect of the correction.
3. Suppression of clutter by CFAR circuit using partial Q-Q plot

Constant False Alarm Rate (CFAR) is an adaptive algorithm used in radar systems to detect target returns against a background of noise and clutter. LOG/CFAR is a type of CFAR which is currently in use, and is based on the fact that the output variance is constant when the clutter intensity obeys a Rayleigh distribution. However, improvement in radar resolution has shown that the clutter does not follow a Rayleigh distribution. The authors proposed a CFAR circuit using the partial Q-Q plot, and confirmed its effect by applying it to S-band radar measurement of an observation target in the presence of sea clutter.

Table 1 Specifications of the radar

<table>
<thead>
<tr>
<th>TOKIMEC BR-3340 MA-S314</th>
<th>Transmission frequency</th>
<th>3.05 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak transmission power</td>
<td>30 kW</td>
</tr>
<tr>
<td></td>
<td>Pulse width</td>
<td>0.5 µs</td>
</tr>
<tr>
<td></td>
<td>Antenna length</td>
<td>14 ft</td>
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<tr>
<td></td>
<td>Antenna rotation rate</td>
<td>22 r.p.m.</td>
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<td></td>
<td>Horizontal beam width</td>
<td>1.8 deg</td>
</tr>
<tr>
<td></td>
<td>Vertical antenna width</td>
<td>25 deg</td>
</tr>
</tbody>
</table>

Polarization: horizontal

Specifications of the S-band radar are shown in Table 1. Measurement results are shown in Fig. 7, in which the target vessel is indicated by a red circle. This vessel is the Daikoku Maru, length 98 m, whose information was obtained from the Electronic Chart Display and Information System (ECDIS).

The CFAR circuit using the partial Q-Q plot is shown in Fig. 8. The CFAR characteristics are obtained by using the conventional LIN/CFAR circuit, obtaining the shape parameter $c$ in the Weibull distribution by the partial Q-Q plot, and setting the corresponding threshold $T_h$. The CFAR processed result, in the case of number of samples $N=256$ and false alarm rate $P_N=10^{-3}$, is shown in Fig. 9. The clutter has been suppressed, and the target vessel has become more visible. In this case, the target-to-clutter ratio was $(T/C) = 46.76$ dB.

Fig. 7 Observation result

![Unconnected NDVI map, corrected NDVI map, and true color image](image)

Fig. 5 Distribution of NDVI

![Measurement result of NDVI](image)

Fig. 6 Measurement result of NDVI

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<td>Antenna length</td>
<td>14 ft</td>
</tr>
<tr>
<td></td>
<td>Antenna rotation rate</td>
<td>22 r.p.m.</td>
</tr>
<tr>
<td></td>
<td>Horizontal beam width</td>
<td>1.8 deg</td>
</tr>
<tr>
<td></td>
<td>Vertical antenna width</td>
<td>25 deg</td>
</tr>
</tbody>
</table>

Polarization: horizontal

Fig. 8 CFAR circuit using partial Q-Q plot

![CFAR circuit diagram](image)

Fig. 9 CFAR processing result ($N=256$, $P_N=10^{-3}$)

References


WEB site and authors

Activity of our committee is also described in our website (http://www2.iee.or.jp/~aim/). Written by T. Fukuchi (CRIEPI, e-mail: fukuchi@criepi.denken.or.jp), Y. Sakata (AIST), M. Sakai (Mitsubishi Electric), S. Sayama (National Defence Academy)
The Technical Committee on Pulsed Electromagnetic Energy (TC-PEE) was founded under the Fundamentals and Materials Society of the IEEJ in June 1999. The activity of TC-PEE covers the collection and spread of information on pulsed power technology and its applications. Using pulsed power technology, very high power electromagnetic pulses can be produced, which are used for generation of high power lasers, high power electromagnetic waves, short wavelength light or high power particle beams. In addition, while huge machines with extremely high output power released in a single shot are developed at the start of the pulsed power technology, many smaller devices equipped with a lot of modulators, which are able to control the pulse waveform accurately by using high speed semiconductor switch elements but possess only the ability of smaller output energy, are now being developed and used in series-parallel connection to attain higher average power in high repetition rate operation. Thus the pulsed power technology becomes to be widely recognized as the basis of many technologies.

Recent activities of TC-PEE

The major activity of TC-PEE is to organize technical meetings. In 2014, 3 technical meetings were held, including the joint meetings with the Technical Committees on Electrical Discharges (TC-ED) and and/or on Plasma Science and Technology (TC-PST). Also TC-PEE technically co-sponsored the 5th Euro-Asian Pulsed Power Conference. TC-PEE selects young researchers who make excellent presentations at the technical meetings, for the IEEJ excellent young researcher awards. There are two technical investigation committees on “agricultural applications using pulsed power and plasmas” and on “status and outlook of pulsed power technology in extremely high power level” running under TC-PEE. One of four steering meetings was carried out online using a web-based meeting system for the first trial, which went well. We will have more opportunities to hold such online meetings.

Investigation Committee of Agricultural Applications Using Pulsed Power and Plasmas

This investigation committee is aimed to conduct an investigation on the present status of research and development in agricultural applications using pulsed power and plasmas. 22 committee members from various fields are joined and exchange the information each other. The activities are to hold regular meetings and symposiums in addition to the publication of the research report. 3 regular meetings were held every year. In the meeting, in addition to reports from the committee member, a guest speaker was invited from industry in order to close the perspective gap between academia and industry. The attendee of meeting reached over 20 for each time. Two symposiums were held in last academic year: “Research Innovation of Plasma-Agriculture Fusion Science” for the 30th Annual Meeting of the Japan Society of Plasma Science and Nuclear Fusion, and “Application of Pulsed Electromagnetic Energy for Agriculture, Fisheries and Foods” for the 2014 Annual Meeting of the Institute of Electrical Engineers of Japan. Two special issues were promoted. The special issue of The Journal of the Japan Society of Plasma Science and Nuclear Fusion Research (Vol. 90, No. 9) was published in September 2014. The papers can be downloaded from following site; http://www.jspf.or.jp/journal/current.html. Other special issue in IEEJ Transactions on Fundamentals and Materials is scheduled to be published in June, 2015. The final report of the committee will also be published in December, 2014.

Investigation Committee on the Status and Outlook of Pulsed Power Technology in Extremely High Power Level

This investigation committee makes efforts to enhance activities in pulse power technology and high energy density physics. 3 meetings were held at Tokyo Institute of Technology (December 5, 2013), National Institute for Fusion Science (January 8, 2014) and Tokai University (March 28, 2014). In the meeting, the present status of research activities was discussed including its applications to high energy density physics, laboratory astrophysics, energetic radiation sources, material science at extreme state, radiation hydrodynamics, intense shock waves, intense particle beams, high power accelerators and fusion science. As the field has a multi-disciplinary nature, extensive discussions of related subjects are difficult in conventional societies. The committee members will continue to make efforts to provide a forum for the discussion on the field of pulse power technology. Goals of the committee are to overview the state of art of the pulse power technology, and to get an outlook on the future direction of the technology in high power level. The committee is planning to publish a Special Issue of IEEJ on “pulse power technology” in January 2015.

5th Euro-Asian Pulsed Power Conference (EAPPC2014)

EAPPC2014 was held in Kumamoto, from September 8 to 12, 2014 with the technical co-sponsorships of six scientific societies including TC-PEE, to provide a forum for the exchange of scientific and technical information between industry, academic institutions and research organizations, on the broad range of current and emerging research areas of pulsed power technology. 231 abstracts were submitted from 15 different countries all over the world. A strong technical program was assembled with 4 plenary talks by worldwide recognized
scientists, 73 oral talks (13 invited) in two parallel sessions and 154 poster presentations. 6 industrial exhibitors presented their latest technologies and products. The social program opens with a welcome reception on Monday evening at the Kumamoto Hotel Castle, followed by the conference banquet on Thursday evening at the same hotel (Fig. 1) and an excursion to the active volcanic crater of Mt. Aso on Friday. The next EAPPC will be held at Estoril, Portugal in 2016.

Electrical Wire and Cables (EWC)

Chairperson: Yasuo Suzuoki (Nagoya University)
Secretaries: Kenichi Furusawa (J-Power Systems Corporation)
Akitoshi Watanabe (VISCAS Corporation)
Kouji Miura (EXSYM Corporation)

Technical Committee on Electrical Wire and Cables (TC-EWC) is a committee organized in the IEEJ Power and Energy Society, and is comprised of members from cable manufacturers, power utilities, railway companies, universities and related research institutes such as Japan Electric Cable Technology Center (JECTEC) and Central Research Institute of Electric Power Industry (CRIEPI). The technical committee organizes technical meetings to promote R&D activities in this field and provides an opportunity to present technical achievements. One technical meeting was so far held in 2014, which was on degradation diagnosis of wires, cables and power apparatuses and was held as a joint meeting of TC-DEI and TC-EWC. The technical committee also held a forum on the status quo and problems of diagnosis and evaluation methods for distribution wire and cables. The technical committee plans to organize 3 more technical meetings, a forum and a symposium in FY2014. The technical meetings will be on (i) snow damage on transmission lines, (ii) insulation technologies of cable systems, treeing, tracking and insulating materials, and (iii) trends and problems of maintenance technologies for transmission and distribution lines, two of which will be jointly organized by TC-DEI and TC-EWC. The symposium will be on domestic and overseas technical trends in overhead transmission cables and their accessories.

In addition to organizing such meetings, forums and symposia, the technical committee supervises investigation committees dealing with subjects related to electrical wire and cables. During the last several years, investigation committees were organized on the following subjects, i.e. technology of XLPE power cables and associated accessories for underground power distribution, technical trend of environmental tests for insulation materials of distribution wires and cables, recent technological trends in overseas power transmission cables, and trend of recycling technology for wires and power cables. The technical report of the last committee is under preparation and will be published in FY2014. The Investigation Committee for Domestic and Overseas Technical Trends in Overhead Transmission Cables and Their Accessories is now in action and the Investigation Committee for the Status Quo and Problems of Diagnosis and Evaluation Methods for Distribution Wire and Cables will be launched in FY2014.
Recent rapid progresses in electrical and electronics technologies brought about a lot of new materials related to metal and ceramics materials, including carbon nano-tube materials, functional diamond materials and fuel cell materials, and also produced many new applications, such as battery applications, solar cell applications and thermolectric applications, all of which are covered in the TC-MC. Among these new materials, we especially focus on cutting-edge technologies based on superconducting materials for power and electronics applications recently.

The activities of the TC-MC are mainly composed of three parts: one is the Symposium in the National Convention of the IEEJ, where recent research results and trends are presented and discussed. The recent themes discussed in the Symposium are listed in Table 1. The second activity is the Study Meeting for Young Scientists, where the promotion and stimulation of active studies of young scientists are performed through their mutual interactions at the meeting for specific topics. A list of the recent Study Meeting for Young Scientists is shown in Table 2. Recent themes of the meeting are “advanced superconducting materials”.

The third activity is the Investigation Committee, where new research areas are intensively investigated to find out the present status and the research directions of these new topics. Typical investigation period of the committee is three years, and at the end of the investigation period, a technical report of the Investigation Committee is published. Right now, one Investigation Committee is in operation, whose research subject is “low temperature electronics based on phase engineering.” Recently a new research field based on the manipulation of the phase of superconducting materials by using magnetic materials and other disordering materials becomes a hot topic because a lot of new applications, such as high-speed integrated circuits and high-sensitive superconducting detectors are expected. The detail information of the ongoing Investigation Committee is shown in Table 3. Fig. 2 shows a microphotograph of a superconducting floating-point adder operating at 50 GHz, which is one of important applications in “the low temperature electronics based on phase engineering.”

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**Table 1**  Symposiums in the National Convention of the IEEJ arranged by the TC-MC

<table>
<thead>
<tr>
<th>Theme</th>
<th>Date</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development and problem of the high-efficiency solar cell</td>
<td>2009.03.19</td>
<td>Hokkaido University</td>
</tr>
<tr>
<td>Metal and ceramic materials in energy strange systems</td>
<td>2010.03.19</td>
<td>Meiji University</td>
</tr>
<tr>
<td>The 100th anniversary symposium for superconductivity discovery</td>
<td>2011.12.12</td>
<td>IEEJ meeting room</td>
</tr>
<tr>
<td>The latest research-and-development trend about thermoelectric material and its application</td>
<td>2013.3.19</td>
<td>Nagoya University</td>
</tr>
</tbody>
</table>

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**Fig. 1** Technologies and materials covered in the Technical Committee of Metal and Ceramics
Table 2  Study Meetings for Young Scientist in the TC-MC

<table>
<thead>
<tr>
<th>Theme</th>
<th>Date</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent research progress in advanced superconducting materials (II)</td>
<td>2011.10.23</td>
<td>University of Tokyo</td>
</tr>
<tr>
<td>Recent research progress in advanced superconducting materials (III)</td>
<td>2012.12.16</td>
<td>University of Tokyo</td>
</tr>
<tr>
<td>Recent research progress in advanced superconducting materials (IV)</td>
<td>2013.11.17</td>
<td>University of Tokyo</td>
</tr>
</tbody>
</table>

Table 3  Investigation Committee in the TC-MC

<table>
<thead>
<tr>
<th>Research Subject</th>
<th>Chairperson (Affiliation)</th>
<th>Period</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low temperature electronics based on phase engineering</td>
<td>Prof. Akira Fujimaki</td>
<td>2013.10-2016.09</td>
<td>Open</td>
</tr>
<tr>
<td></td>
<td>(University of Nagoya)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2  Microphotograph of a superconducting floating-point adder operating at 50 GHz.
IEC TC15 Japanese National Committee

Chairperson: Yoshiaki Yamano (Chiba University)
Secretaries: Yoshio Wakashima (Japan Electrical Safety & Environment Technology Lab.)
Associate Secretary: Akihiro Kawaguchi (Japan Electrical Safety & Environment Technology Lab.)

The scope for IEC TC15 is to prepare international standards including specifications for solid electrical insulating materials alone and in simple combinations. This includes coatings which are applied in the liquid state but cure to solids, such as varnishes and coatings. Although TC15 Japanese National Committee has certainly the same scope as that for IEC TC15, its mission is accomplished by consulting with Japanese industrial situations and market in the world.

IEC TC15 establishes definitions, general requirements and specification sheets for individual types of materials. The standards include test methods and guidance where these are required for the specifications. The current activities of TC15 are carried out by 5 working groups (WGs) and 4 maintenance teams (MTs). IEC TC15 has now more than 160 standards published, and 9 work programs for standardization are in progress.

Japanese national committee for TC15 held meetings of three times last year with the attendee of about 15 members. The members are from manufactures, user (customers), laboratories and universities. Over 30 documents for standardization from IEC Central Office have been circulated around specialists of the members, including drafts of CD, CDV and FDIS. They made comments on them to improve the drafts for international industrial situations and market.

To accomplish the tasks of the WGs and MTs in TC15, the experts from Japan are participating in MT 3 (plastic films), WG5 (flexible insulating sleeving), and WG 9 (cellulosic materials). They play active parts in standardization of new work item and revision of the present standards.

Especially in MT3, which deals with plastic films for electrical insulation, IEC 60674-2 (Methods of test) and IEC 60674-3-8 (PEN film specification) are now in revision works by a Japanese convener. CD was circulated in December last year. Methods for measurement of dc breakdown voltage using metal electrode was newly added to the draft for the revision. The CD was partially modified by the CC (Comment Compilation) from some countries to arrange CDV for the next stage. CDVs for these new revisions will be in a circulated stage within this year.

In WG 9, Japanese expert is proposing to include specifications of an insulating cellulose paper for coil winding include in Part 3 sheet of IEC 60554 in order to offer the appropriate and useful specifications to the market in Asia. The draft will be discussed in the next WG meeting.

IEC TC15 international meeting has been annually held. However this year, the meeting was not held by unexpected accident. Although a plenary meeting is not held this year, activities of WGs and MTs are kept continuously high as was in the past years. The meeting in the next year is scheduled to be held in Prague in early June.

IEC TC112 Japanese National Committee

Chairperson: Tatsuki Okamoto (CRIEPI)
Secretaries: Hiroya Homma (CRIEPI)
Hiroaki Uehara (Kanto Gakuin University)

IEC TC112 Committee deals with many international specifications on evaluation and qualification of electrical insulating materials and systems. TC112 deals with international standards of thermal endurance test methods of material life and related specifications. TC112 Japanese Committee was established to deal with the same standards of TC112 and related Japanese standards. TC112 Japanese Committee starts almost the end of 2005 based on the part of TC15 and TC98. TC98 and the related sub-group in TC15 were disbanded after the establishment of TC112.

TC112 international committee is including eight working groups and dealing with more than 53 standards. TC112 Japanese committee also includes eight corresponding working groups and one more WG that deals with Japanese related standards. Working group structure is shown in Table 1.

As shown in the table each WG deals with several standards. Three conveners of international WGs (WG2, WG7, WG8) are Japanese and in this reason Japanese members are very active in this standard region. Japanese committee has four meetings in a year and discusses related standards and future activities. The international committee was held in Toronto, Canada in October, 2013. Figures 1 and 2 show the some part of the international
committee and the international supper with Chinese members.

Recent standards discussed in TC112 are partly listed:

WG1: IEC/TS 60216-7 Ed.1.0 Accelerated determination of thermal endurance index (TI) and relative thermal endurance (RTE) using analytical test methods.


WG4: IEC 62631-2-1 Ed. 1.0 Determination of Permittivity and Dielectric Dissipation Factor (AC Methods) - Technical Frequencies (1 Hz to 100 MHz), IEC 62631-3-1 Ed. 1.0 Determination of Resistive Properties (DC Methods) - Volume Resistance and Volume Resistivity, IEC 62631-3-2 Ed. 1.0 Determination of Resistive Properties (DC Methods) - Surface Resistance and Surface Resistivity, IEC 62631-3-3 Ed. 1.0 Determination of Resistive Properties (DC Methods) - Insulating Resistance.

WG5: Revisions of some standards.

WG6: IEC 61858-1 Ed. 1.0 Electrical insulation systems - Thermal evaluation of modifications to an established wire-wound EIS, IEC 61858-2 Ed. 1.0 Electrical insulation systems - Thermal evaluation of modifications to an established form-wound EIS.


WG8: IEC/TR 62836 Measurement of Internal Electric Field in Insulating Materials used by Pressure Wave Propagation Method.

WG9: JIS C 2110-1(Breakdown strength—ac test), JIS C 2110-2(Breakdown strength—dc test), JIS C 2110-3 (Breakdown strength—impulse test), JIS C 2142(Condition adjustment).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>WG organization of Japanese TC112</th>
</tr>
</thead>
<tbody>
<tr>
<td>WG 1</td>
<td>Thermal endurance</td>
</tr>
<tr>
<td>WG 2</td>
<td>Radiation</td>
</tr>
<tr>
<td>WG 3</td>
<td>Dielectric/Resistive properties</td>
</tr>
<tr>
<td>WG 5</td>
<td>Tracking</td>
</tr>
<tr>
<td>WG 6</td>
<td>General methods of evaluation of electrical insulation</td>
</tr>
<tr>
<td>WG 7</td>
<td>Statistics</td>
</tr>
<tr>
<td>WG 8</td>
<td>Various material properties</td>
</tr>
<tr>
<td>WG 9</td>
<td>Japanese standards</td>
</tr>
</tbody>
</table>

Fig.1 TC112 Plenary Meeting on Oct.3, 2013

Fig.2 Supper of some Chinese and Japanese members
CIGRE SC D1 Japanese National Committee  
(Materials and Emerging Test Techniques)

Chairperson: Naohiro Hozumi (Toyohashi University of Technology)
Secretary: Toshio Shimizu (Toshiba Corporation)
Assistant Secretary: Tsuguhiro Takahashi (CRIEPI)

CIGRE (International Council on Large Electric Systems) has 16 Study Committees (SC) belonging to each of following 4 categories: A (Equipment), B (Subsystems), C (Systems) and D (Horizontal). Among them, our SC D1 has a horizontal character and contributes to other CIGRE SC’s. The activity of CIGRE SC’s is principally research oriented one.

SC D1 has now following 6 Advisory Groups (AG): Strategic AG, Customer AG, Tutorial AG, AG D1.01 (Insulating Liquids), AG D1.02 (High Voltage Testing and Diagnostic), AG D1.03 (Insulating Gases) and AG D1.04 (Insulating Solids). SC D1 consists of these AGs and following 28 WGs.

[**Liquids**]  
WG D1.29 (PD recognition), WG D1.31 (Dielectric performance of insulating liquids), JWG A2/D1.41 (HVDC transformer polarity reversal: Role of oil conductivity), JWG A2/D1.46 (Field experience with transformer solid insulating ageing markers), JWG A2/D1.47 (New frontiers of DGA interpretation for transformers and their accessories), JWG A2/D1.51 (Improvement to partial discharge measurements for factory and site acceptance tests of power transformers), WG D1.52 (Moisture measurement in insulating fluids and transformer insulator).

[**Testing & Diagnosis**]  
WG D1.53 (Ageing of upgraded cellulose and cellulose impregnated in ester liquids and other liquids), WG D1.35 (Performance of high-voltage and high-current measurement systems), WG D1.36 (Requirements for dielectric testing of UHV equipment), WG D1.37 (Maintenance and evaluation of measuring procedures for partial discharge testing), WG D1.38 (Test techniques common to high temperature superconducting power applications), WG D1.39 (Methods for diagnostic/failure data collection analysis), WG D1.44 (Testing of naturally polluted insulators), WG D1.45 (Testing of insulator performance under heavy rain), WG D1.50 (Atmospheric and altitude correction factors for air gaps and clean insulators), WG D1.54 (Basic principles and practical methods to measure the AC and DC resistance of conductors of power cables and overhead lines), WG D1.55 (Partial discharge detection under DC stress).  

[**Gases**]  

[**Solids**]  
WG D1.23 (HVDC ageing, diagnostic and accelerated life testing of polymeric material), WG D1.27 (Material properties for new and nonceramic insulation), WG D1.40 (Functional nano-materials), WG D1.42 (Radiation ageing of polymeric insulating material), WG D1.43 (Rotating machine insulation voltage endurance under fast repetitive voltage transients), WG D1.48 (Properties of insulating materials under VLF voltages), JWG D1/B1.49 (Harmonized test for the measurement of residual inflammable gases), WG D1.56 (Field grading in insulation systems), WG D1.58 (Evaluation of dynamic hydrophobicity of polymer insulating materials), WG D1.59 (Methods for dielectric characterization of polymeric insulating materials for outdoor applications).

The preferential subjects for the 2014 SC D1 Paris group meeting were PS1: Electrical insulation systems under DC voltage Material properties Space and surface charges & Potential distribution Long term performance, PS2: Emerging test techniques and diagnostic tools UHVAC and HVDC atmospheric and altitude correction, harsh conditions tools in modern asset management, and PS3: Innovative application of new materials field grading eco-friendly super conductivity.


The next meeting is scheduled to be held in Rio de Janeiro, Brazil on September 13-18, 2015, The Japanese National SC D1 will hold 2 or 3 meetings for its preparation.

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