
OUTLINE OF TECHNICAL COMMITTEES IN IEEJ

Dielectrics and Electrical Insulation (DEI)

Chairperson: Masayuki Nagao (Toyohashi University of Technology)
Secretaries: Yasuhiro Tanaka (Tokyo City University)
Yuichi Ashibe (Sumitomo Electric Co. Ltd.)
Assistant Secretaries: Toshihiro Takahashi (CRIEPI)
Takahiro Imai (Toshiba Co. Ltd.)

The Technical Committee on Dielectrics and Electrical Insulation (TC-DEI) was set up in 1979 succeeding the Permanent Committee on Electrical Insulating Materials upon the reorganization of IEEJ. The activities of the Committee have been covering mainly solid and composite dielectric materials and their technologies. The important activity of TC-DEI is the annual domestic Symposium on Electrical and Electronic Insulating Materials and Applications in Systems (SEEIMAS), formerly called Symposium on Electrical Insulating Materials. 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).

The 41st Symposium on Electrical and Electronic Insulating Materials and Applications in Systems is to be held in Akita city with the General Chair of Prof. M.Nagao on November 15-17, 2010, with technically cosponsored by IEEE DEIS Japan chapter, CIGRE Japanese national Committee and locally arranged by colleagues of Akita University. Diagnosis of electrical insulation degradation, 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.

Next year we will hold the international symposium (ISEIM) with Honorary Chair of Prof. Y.Ohki and the General Chair of Prof. M.Nagao, in September 6-10, 2011 in Doshisha University, Kyoto, followed by the Joint colloquium of CIGRE SC-A2 and D1 in Sept.11-16, 2011, in the same place. We are expecting your participation.

Furthermore, the TC-DEI runs Investigation Committees (IC's) that organize several technical meetings a year. The investigation committees are categorized into four research areas:

Macro-view of DEI technology related

> Asset Management for Electric Power Equipments Based on Insulation Diagnosis (04/2008-03/2011,

Chairperson: M. Ikeda (Nippon Petroleum Refining Co.)).

New materials including nano-materials related

> Nano-Interface Properties of Organic and Composite Thin Films and Device/Sensor Applications (10/2007 - 09/2010, Chairperson: K. Kato (Niigata University)). Next committee is now under consideration.

> Physics of Organic Dielectrics/Semiconductors and Interfacial Design (04/2007 - 03/2010, Chairperson: M. Iwamoto (Tokyo Institute of Technology)). Next committee is now under consideration.

> Advanced Polymer Nanocomposites and their Applications as Dielectrics and Electrical Insulation (04/2010 - 03/2013, Chairperson: T. Tanaka (Waseda University)).

Ageing and diagnosis of electric and electronic equipment related

> Degradation Diagnosis Technology based on Characteristics of Insulation Materials in Electric Power Apparatus (04/2007 - 03/2010, Chairperson: Y. Ehara (Tokyo City University)). Next committee is now under consideration.

> Partial Discharge Measurement under Repetitive Impulse Voltage Application (08/2007 - 07/2010, Chairperson: M. Hikita (Kyushu Institute of Technology)). The committee is cosponsored by the TC-DEI and TC of Electrical Discharge and the next one is now under consideration.

Basic dielectric and breakdown phenomena related

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

> Properties Evaluation and Improvement Technology of Polymeric Insulating Materials for Outdoor Use (04/2010 - 03/2013, Chairperson: H. Homma (CRIEPI)).

Electrical Discharges (ED)

Chairperson: Masayuki Hikita (Kyushu Institute of Technology)
 Vice-chairperson: Toshiki Nakano (National Defense Academy)
 Secretaries: Fumiyoshi Tochikubo (Tokyo Metropolitan University)
 Akiko Kumada (University of Tokyo)
 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 (A-Society) of the IEE Japan. The purposes of the TC-ED are mainly in 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..

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. The chairpersons shown in Table 1 currently run four investigation committees.

The TC-ED organizes about six domestic technical meetings on electrical discharges every year. In these meetings, about 200 full papers are presented in total from both academic and industrial sides by researchers, engineers, professors and students. The domestic technical meetings are sometimes co-organized by other Technical Committees on such as High Voltage Engineering,

Pulse Electromagnetic Energy, Plasma, and Dielectric /Electrical Insulating Materials.

In order to promote the international activities in electrical discharges, “Japan-Korea Joint Symposium on Electrical Discharge and High Voltage Engineering” has been organized by the TC-ED and has been held every two years. The last J-K Symposium was held on November 5-7 of 2009 in Busan, Korea. The special issue of this symposium will be published in the IEEJ Transactions on Fundamentals and Materials IEE Japan in October of 2010.

The TC-ED also contributes to the organization of a young researcher seminar every year in cooperation with the Institute of Engineers on Electrical Discharges in Japan to encourage the young researchers in the field of electrical discharges. About 40 young researchers and engineers participate in the seminar and discuss vigorously the topics related to electrical discharges for two days.

Table 1 Investigation Committees in TE-ED

Chairperson	Research subjects and established time
<i>M. Hikita</i> (Kyushu Institute of Technology)	Measurement of the partial discharges generated by repetitive impulse voltage (established in August 2007)
<i>E. Hotta</i> (Tokyo Institute of Technology)	Generation control and applications of vacuum and low-pressure discharges (established in October 2007)
<i>R. Hanaoka</i> (Kanazawa Institute of Technology)	Discharge phenomena in liquid dielectrics and the technologies of EHD,ER and MR applications (established in December 2007)
<i>M. Amakawa</i> (Central Research Institute of Electric Power Industry)	Technologies of arc and glow discharge applications (established in May 2008)

Plasma Science and Technology (PST)

Chairperson: Ken Yukimura (Doshisha University)
 Secretaries: Hiroshi Akatsuka (Tokyo Institute of Technology)
 Yasunori Ohtsu (Saga University)
 Assistant Secretaries: Nozomi Takeuchi (Tokyo Institute of Technology)
 Shinji Ibuka (Tokyo Institute of Technology)

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 meetings on plasma science and technology in IEE Japan since about 30 years ago. The field of activity includes researches and investigations of various plasmas over wide ranges of their density, temperature and ionization degree, and application fields as nuclear fusion, plasma processing, and plasma chemistry.

The major activity of this committee is to succeed to organize several technical meetings every year. In 2010, four technical meetings were held; in May at Hyogo Prefectural University in Himeji, in August in Honolulu and in Prefectural Culture Center Hall in Gifu, in December at Tokyo Institute of Technology in Tokyo. In 2009 also four technical meetings were held. At each symposium, about 20 or 30 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 five investigation committees as shown in Table 1. Here we introduce their activities. In the committee of economy improvement of thermonuclear fusion reactors, economic strategy of research and development as well as reactor design have been systematically

investigated by the experts of plasma physics and fusion engineering. In the committee of plasma–water applications and their reacting processes involved in liquid interfaces, various types of discharge-plasma applications have been systematically investigated to deepen the understanding of plasma–water interacting phenomena at liquid surface boundaries. In the committee of kinetic description of low-temperature plasmas with applications to modeling and simulation, development of numerical models incorporating physical and chemical phenomena play a key role. The goal of this committee is to provide recent advances in plasma kinetic theory and its potential impact on their work. In the committee of atmospheric pressure plasma source for analysis of trace-order element, physics and chemistry of atmospheric pressure plasmas as well as their appropriate diagnostic methods and applications are being investigated. In addition, innovative technologies required for the various industrial applications are widely surveyed. Finally in the committee of generation and application of metal vapor plasmas with high density and high ionization degree, upon the research outputs of the advancement of metal sputtering plasma committee held in 2006 – 2008, investigations are made over their characteristics, overview and perspectives to activate related research activities in domestic institutes.

Table 1. Investigation Committees in TC-PST

Economy Improvement of Thermonuclear Fusion Reactors	3 years from 2008, Chairperson: Y. Nagayama (National Institute of Fusion Science)
Plasma–Water Applications and their Reacting Processes Involved in Liquid Interfaces	3 years from 2008, Chairperson: K. Yasuoka (Tokyo Institute of Technology)
Kinetic Description of Low-Temperature Plasmas with Applications to Modeling and Simulation	3 years from 2008, Chairperson: S. Kambara (Gifu University)
Atmospheric Pressure Plasma Source for Analysis of Trace-Order Element	3 years from 2010, Chairperson: A. Okino (Tokyo Institute of Technology)
Generation and Application of Metal Vapor Plasmas with High Density and with High Ionization Degree	3 years from 2010, Chairperson: T. Ikehata (Ibaraki University)

Electrical Wire and Cables (EWC)

Chairperson: Yasuo Suzuoki (Nagoya University)
Secretary: Akitoshi Watanabe (VISCAS Corporation)
Assistant Secretary: Takashi Kuramochi (Fujikura Limited)
Hitoshi Nojo (J-Power Systems Corporation)

Technical Committee on Electrical Wire and Cables (TC-EWC) is a committee organized to support the IEEJ Power and Energy Society, and comprises members from universities, power utilities, JR Railway Company, Japan Electric Cable Technology Center (JECTEC) and cable manufacturers. The technical committee organizes technical meetings to promote R&D activities in this field and provides an opportunity to present technical achievements. Four technical meetings were so far held in 2010. Two technical meetings on breakdown, deterioration diagnosis and online monitoring system were held as a joint meeting with TC-DEI on January 18 and February 12 in Tokyo. A symposium on technical trends of environmental tests for insulation materials of distribution wires and cables was held on March 17 in Tokyo. A discussion meeting on trends in technologies for wires and cables in various natural conditions was held on September 2 in Kyushu. The technical committee plans to organize 5 more meetings in

FY2010.

In addition to organizing such technical meetings, the technical committee supervises investigation committee dealing with subjects relating to electrical wire and cables. During the last several years, Investigation Committee for Technology of Wires and Associated Accessories for Overhead Transmission Lines, Investigation Committee for Accessories for 66kV and Higher Voltage XLPE Power Cable, Investigation Committee for Technology of XLPE Power Cable and Associated Accessories for Underground Distribution, and Investigation Committee for Technical Trend of Environmental Tests for Insulation Materials of Distribution Wires and Cables were organized. The technical report of the last committee will be published this autumn and Investigation Committee for Recent Technological Trends in Overseas Power Transmission Cables is now in action.



Discussion meeting on trends in technologies for wires and cables in various natural conditions (September 2, 2010, Kyushu)

Pulsed Electromagnetic Energy (PEE)

Chairperson:	Eiki Hotta (Tokyo Institute of Technology)
Vice Chairperson:	Koichi Takaki (Iwate University)
Scientific Secretary:	Sunao Katsuki (Kumamoto University)
Scientific Secretary Assistance:	Shinji Ibuka (Tokyo Institute of Technology)

Using pulsed power technology, very high power electromagnetic pulses can be produced, which are used for generating high power lasers, high power electromagnetic waves, short wavelength light or high power particle beams.

The application of this technology is now extended to the following fields; new material development, thin film synthesis or ion implantation technology in industrial field; high speed imaging and intense irradiation by using pulsed x-ray sources, sterilization or medical treatment in biological and medical field; waste treatment or ozone and radical production in environmental field; nuclear fusion or particle beam accelerator technologies in energy field, and moreover the destruction of rocks or concrete blocks in the field of civil engineering and growth promotion of plant in the field of agriculture science. The pulsed power technology thus becomes to be recognized as the basis of many technologies.

Recent topics in field of PEE

Recently, pulsed power applications in industrial fields using biological effects are investigated actively. The applications are roughly categorized as decontamination of air and liquid, crop growth, food processing, and medical treatment. The intense pulsed electric fields (PEFs) with a pulse length of longer than 10 μ s are generally used for electroporation because the cell membrane acts as a capacitor and has to be charged to a sufficient voltage to cause membrane defects. Fig. 1 shows microscopic images of the grape peel tissue before (control) and after 30 minutes PEF treatment at 20 kV/cm and 20 pps. The red color is stored in anthocyanoplasts formed by a bilipid membrane inside the cells in the control sample. The red color pigments are extracted from anthocyanoplasts and the red color diffuses into the cells shown in PEF sample. As the results, the polyphenols inside anthocyanoplasts are released from the peel. The application of ns PEFs to biological cells results in intracellular effects with the intense electric field inside the cell seemingly adding a new stress to the internal biological system which will be potentially used for biotechnology, medical treatment and agricultural applications.

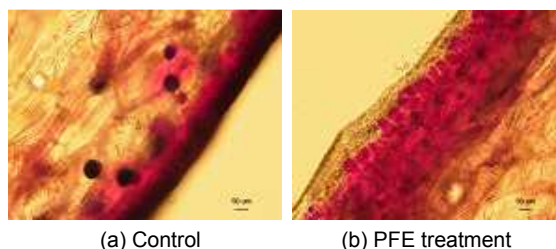


Fig. 1 Optical microscopy images of reaction inside the grape peel cell of (a) untreated samples, and (b) PEF treated samples at 20kV and 20 pps.

Recent activities of TC-PEE

The major activity of the Technical Committee on Pulsed Electromagnetic Energy (TC-PEE) is to organize several technical meetings. In 2010, five technical meetings have been held or planned to be held, including the meetings in collaboration with the Technical Committees on Electrical Discharges or Plasma Science and Technology. This year, TC-PEE held the 4th Japan-US Symposium on Pulsed Power and Plasma Applications in Honolulu, Hawaii on August 5-6 (Fig. 2). From two countries, 38 researchers and graduate students have presented 32 scientific papers on topics of pulsed power, plasma, and high-power electromagnetic radiations. This symposium started in 2002 and has been operated by both TC-PEE and TC-PST. Its purpose is to promote scientific collaboration and technical information exchange between Japanese and US scientists working in this field.



Fig. 2 4th Japan-US Symposium on Pulsed Power and Plasma Applications held in Honolulu, Hawaii.

Activity of investigation committee in TC-PEE

TC-PEE is currently running an investigation committee named “biological effects of pulsed electromagnetic energy and their industrial applications”. The investigation committee includes 18 members in various fields including electrical, chemical, mechanical engineering, biology and medical science joined from academia and industry. The activity of the committee is to hold the regular meeting and the symposium in addition to the publication of the research report. The committee covers the basic studies on the biological effects of

the extreme reactive fields produced by pulsed electromagnetic energy such as intense electric/magnetic fields, atmospheric pressure non-thermal/thermal plasmas, plasmas in fluids, shock waves, intense radiations, etc., which have been found to be novel physical stimuli or stresses to biological cells, tissues, organisms and bacteria, and their applications to biotechnology, medical, cosmetic, agricultural and food industries.

(Reported by Eiki Hotta, Koichi Takaki, Sunao Katsuki and Jiang Weihua)

Light Application and Visual Science (LAV)

Chairperson: Hiroyuki Kamei (Tokyo Institute of Technology)
Secretaries: Takeshi Kinoshita (Keio University)
Susumu Kimijima (Covalent Materials Corporation)

Activities of the technical committee on light application and visual science (TC-LAV) have been covering fields of application of optical engineering and visual science for medical science, devices for visual information processing, light sources from far infrared to extreme ultraviolet, advanced lithography, and etc. Three investigation committees: ‘Future Technology of Infrared and Terahertz Waves(IC-FTITW)’, ‘Ultimate Technology for Lithography (IC-UTL)’, and ‘Technologies for Next Generation Light Source (IC-NGLS)’, are affiliated to this TC and are surveying the technology trend of each field.

The special issue of IEEJ Transaction on Fundamentals and Materials entitled by “New trends of light sources and illuminations” is being edited by TC-LAV and IC-NGLS and will be published in May, 2011.

In the field of light sources and illuminations, novel solid-state light sources such as LED and EL have been remarkably developed and are getting rapidly popular in our lives. These light sources have higher luminous efficacy and much longer life time so that these lamps are expected to relieve the environmental problems. On the other hand, the gas discharge light sources have opened new type application like medical/bio processes for disinfection or sterilization, analysis and processing of materials and so on.

Under such situations, the special issue concerned with new type lamps and their application are arranged. The contents are as follows:

- (1) Solid-state light sources,
 - LED and Organic EL, progress of phosphors,
 - Illumination by solid-state light sources, display application, analysis and processing of materials,

medical and bio applications,

(2) Gas discharge light sources,

- Gas discharge development for light sources,
- Gas discharge illumination display, analysis and processing for material, medical and bio applications.

A recent topic of light application, “Novel lithography for helical patterning”, is introduced.

Various kinds of micro electro mechanical systems (MEMS) have been developed in these 20 years, and some of them have become indispensable for our daily lives. Lithography is widely used for fabricating various devices of MEMS in addition to the usages for fabricating highly integrated semiconductor devices.

Minimum feature size for advanced semiconductor devices has already reached to less than a half pitch of 45 nm, and devices with half pitches of 32 nm and 22 nm are vigorously researched and developed. However, feature sizes required for MEMS are much larger than these, and typical pattern sizes are in the range of 1-100 μm . On the other hand, customized technological progresses such as special applicability and flexibility for shapes and sizes of objects to be patterned, special thickness or sidewall profile conditions of resist patterns are often required.

Among these requirements, patterning onto fine shafts or pipes is one of the technologies that are strongly requested. Helical patterning is especially useful for fabricating micro-coils that are applicable to springs and inductors.

Laser-scan exposure shown in Fig.1 is one of the most prospective methods for delineating such helical patterns onto fine pipes and wires with

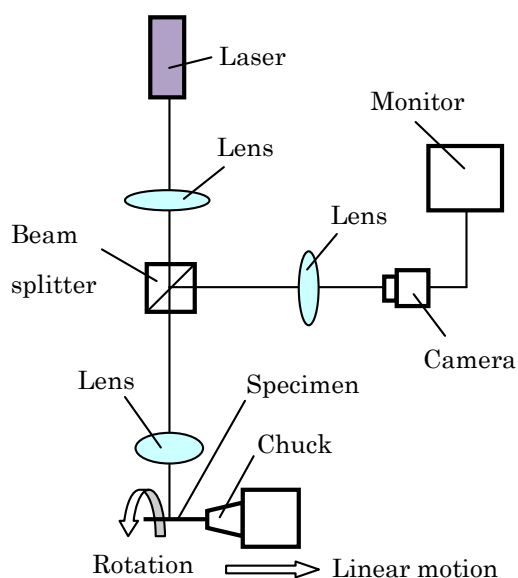


Fig.1 Exposure system for delineating patterns onto fine pipes and wires.

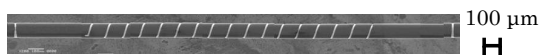


Fig. 2 Helical patterns with width of 11 μ m and pitch of 120 μ m pitch delineated on a copper pipe with a diameter of 100 μ m.



Fig.3 Micro-coil obtained by etching the specimen shown in Fig. 2. It was etched in ferric chloride solution.

diameters less than 100 μ m^{1,3}). Using this system, specimens supported by a chuck was exposed to the laser beam during they were helically moved by the stages. Violet semiconductor laser with a wavelength of 408 nm was used, and the laser beam was focused on the specimen coated with a positive resist film. The beam spot was observed by a camera monitor to check whether the beam spot was correctly scanned on the specimen surfaces or not.

An example of helical resist patterns delineated on a copper pipe with a diameter of 100 μ m is shown in Fig.2. The resist thickness was approximately 3 μ m, and the mean width of the helical space patterns was approximately 11 μ m. The pipe with the helical patterns was etched in ferric chloride solution next. As a result, a fine copper micro-coil was successfully fabricated, as shown in Fig. 3.

This novel lithography method will be much useful for developing advanced MEMS in the near future.

Reference

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Authors

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Electro-Magnetic Compatibility (EMC)

Chairperson: Tsuyoshi Funaki (Osaka University)
 Secretaries: Ken Kawamata (Hachinohe Institute of Technology),
 Tomoo Ushio (Osaka University)
 Yoshinori Taka (Nagoya Institute of Technology)

The Technical Committee on Electro-Magnetic Compatibility (EMC) has a vital role of researching following subjects;

1. Comprehensive understanding of electrical power system and EMC issue,
2. Building up 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, the situation of electromagnetic interferences, the novel measurement techniques for EMC, the protection technology 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 noise immunity for

electric and electrical appliances.

2. Investigation committee on EMC technologies for electrostatic discharge (ESD).
3. Investigation committee on technical trends in evaluation of biological protection and compatibility with electromagnetic field.
4. Investigation committee on the analysis technology of electromagnetic field including human body.

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 forth. 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. Fujiwara and Prof. Z-I. Kawasaki chaired the committee respectively from 2002 to Apr. 2005, and from May 2005 to Apr. 2008. Currently, Prof. T. Funaki succeeds the chair since May. 2008.

The committee holds some technical conferences. They were Mar. 6th(40th) , Jul 23th(41st), Nov.

27th(42th) for 2009, and Apr.,21th(43th), Jun.18th(44th) for 2010. This year, the committee co-sponsored the 2010, PPEMC (Pan-pacific EMC joint conference), which was held May 27th-28th, 2010 in Sendai.

1. Investigation Committee on Noise Immunity for Electric and Electrical Appliances.

This committee, chaired by Prof. M. Tokuda of Musashi Institute of Technology, was established in Jan. 2008. The mission of this committee is to grasp and analyze the current situation of noise immunity for electric and electronics appliances and to clarify uncertainty of the measurement in immunity test. The investigation subjects are summarized as follows.

1. Standards and regulations on noise immunity for domestic and abroad;
2. Case examples and counter measure to the interference of noise;
3. Techniques for immunity tests;
4. Design and control technology for immunity.

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

2. Investigation Committee on EMC Technologies for ElectroStatic Discharge (ESD).

This committee, chaired by Prof. S. Minegishi of Tohoku-gakuin University, was established in Apr. 2008. The mission of this committee is to study the EMC issues accompanied with electrostatic discharge phenomenon, and clarify the factor for its origination and the mechanisms of the generation of wide band noise. The committee is working on the following subjects.

1. Survey the currently recognized problems of ESD;
2. Measurement method of wide band current and electric field emitted from ESD;
3. Elucidate the mechanism in the occurrence of ESD, physically;
4. Modeling and simulation of ESD.

This committee envisions inspiring the other EMC engineers to recognize ESD problems as a sort of EMC incident.

3. Investigation committee on technical trends in evaluation of biological protection and compatibility with electromagnetic field.

This committee, chaired by Assoc. Prof. A. Hirata of Nagoya Institute of Technology, was established in Apr. 2010. The mission of this committee is to survey the formulation of guidelines of human protection against to the electromagnetic field and to investigate the trend in the standardization of product safety. Moreover, this committee aims at publicity work in clarifying the scientific basis of these guidelines and standards with applying former research work nurtured by antecedent committees. The investigation subjects are summarized as follows.

1. Trend survey in the guideline related to the human safety;
2. Trend survey in the standardization of product safety;
3. Scientific study in the guidelines and standardizations;
4. Find an issue for future work.

To this end, this committee recruited biological specialist as committee members in addition to the conventional electrical engineers.

4. Investigation committee on the analysis technology of electromagnetic field including human body.

This committee, chaired by Assoc. Prof. Y. Kamimura of Utsunomiya University, was established in Apr. 2010 to respond to the diversifying electromagnetic environment; such as popularization of wireless and radio wave sensitive appliances. The mission of this committee is to

develop and establish the fast and precise calculation and evaluation method of electromagnetic field for internal and external of human body under complex electromagnetic environment. The committee is working on the following subjects.

1. Survey the analytical and quasi-analytical calculation method of electromagnetic field inside and outside of human body;
2. Survey the numerical calculation method of electromagnetic field suitable for medium frequency band;
3. Study on the fast calculation method on the basis of surveyed calculation technology.

This committee envisions providing adequate calculation method for evaluating the exposure of human body under the complex electromagnetic environment.

Instrumentation and Measurement (IM)

Chairperson:	Kazuo Tanabe (CRIEPI)
Vice- Chairperson:	Yoshitaka Sakumoto (JEMIC) Akihito Otani (Anritsu)
Secretaries:	Terumitsu Shirai (JEMIC) Kazuaki Kodaira (JEMIC)

Activities

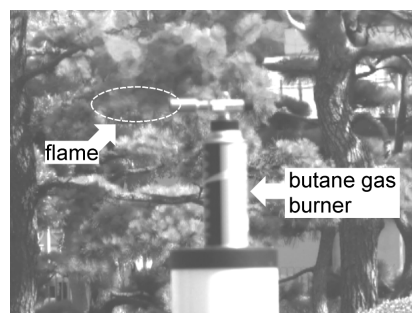
The Technical Committee of Instrumentation and Measurement of IEEJ was set up in Jan. 1980, succeeding the Committee on Electronics Instrumentation and Measurement.

Activities of the technical committee of instrumentation and measurement are as follows.

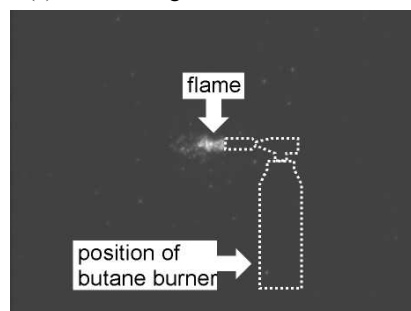
- i) The general meeting of the committee is held four times every year for discussing the various activities of the committee. Fifteen members including chairperson, two secretaries, and an assistant-secretary constitute the committee.
- ii) Workshops for the presentation and discussion of studies and researches take place almost every month in principle as a main activity of the committee.
- iii) Visit of various professional facilities is planned to carry out once or twice a year.
- iv) Special volumes on the transaction of the society A (Fundamentals and Materials) in IEEJ are planned by the committee.

The workshops mainly take place at Tokyo area, and sometimes in Kyushu, Kinki, Shikoku, and other locations. The themes of presentation in the workshop are usually focused on electromagnetic measurement, remote control instrumentation, application of optical measurement, biological

electronic measurement, time and frequency measurement, application of magnetic measurement, and so on. In several workshops, miscellaneous subjects are accepted for presentation and discussion. The annual number of presentations in



(a) Visible image of butane burner flame



(b) Image of butane burner flame in the ultraviolet region

Fig. 1. Image of butane flame.

the workshops is around 70 titles. The workshop is supported by IEEE IM and sometimes by other organizations.

The committee planed a special volume on "Measurement Technology for Safety", which included eight papers and was published in August 2009. The three contents, which were also presented in the workshops in the preparatory stage, are roughly introduced in this article.

Topics in special volume

1) Flame Imaging for Safety Surveillance⁽¹⁾

Flame detection is important for prevention of spreading of accidental fires. When combustible gas is ignited under daylight conditions, the flame is

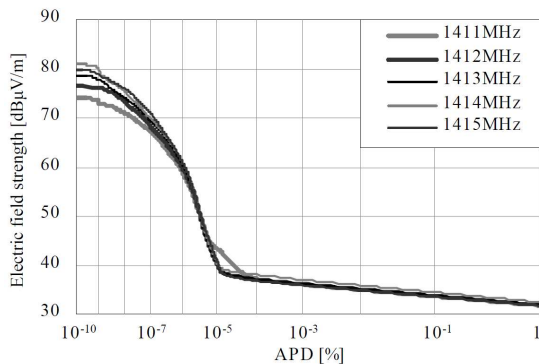
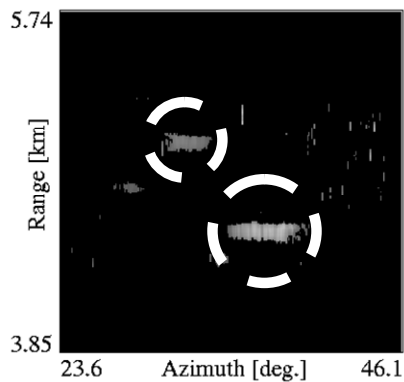
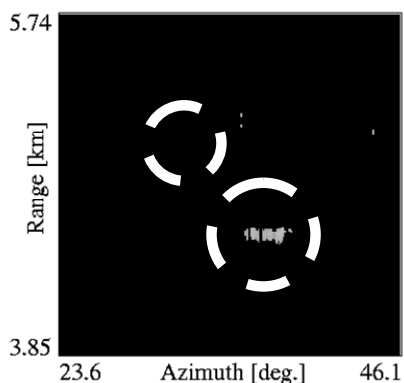


Fig. 2. Measurement results for rarely occurring pulses using APD measuring receiver.



(a) using the developed CFAR algorithm



(b) using a conventional LOG/CFAR algorithm

Fig. 3. Results using the developed CFAR and a conventional LOG/CFAR algorithm.

often difficult to detect by conventional imaging because of the high background radiation. The flame can be visualized by selectively detecting the emission of the OH radical, which is present in hydrocarbon or hydrogen flames. By detecting the OH radical emission in the solar blind region of wavelength below 290 nm, the background radiation can be effectively eliminated. In this study, an experimental device for visualization of flame at wavelength 285 nm was constructed. A combination of two narrowband interference filters was found to be sufficient to eliminate background radiation and selectively image the OH emission. Referring to Fig. 1, the device could detect butane burner flame under daylight conditions.

2) Continuous Measurement of Amplitude Probability Distribution and Applications to Pulses of Low Occurrence Frequency⁽²⁾

An Amplitude Probability Distribution (APD) measuring receiver that conforms to CISPR16-1-1 2nd edition has been developed. The receiver is installed in a general-purpose spectrum analyzer that has a field programmable gate array (FPGA) for digital signal processing. The evaluation test results for measuring continuity, the results of an examination of the accuracy on the peak measurement of pulses that occur infrequently, and the results of an APD measurement experiment on rarely occurring pulses mainly caused by electrostatic discharge, referring to Fig. 2, were reported.

3) Suppression of Weather Clutter by a New CFAR Circuit⁽³⁾

Various radar clutters obey a Weibull distribution under certain conditions. To suppress such Weibull-distributed clutter, a new adaptive method, in which the parameters of the Weibull distribution and the threshold level for an adaptive Constant False Alarm Rate (CFAR) detector are determined by calculating the variance after passing through a logarithmic amplifier, is proposed. To apply this new method to practical problems observed by an S-band radar, computer simulations were made for a finite number of samples in order to obtain the CFAR maintenance in Weibull radar clutter which included weather clutter. Finally, referring to Fig. 3, two ships (enclosed with circles), which were embedded in weather clutter, were clearly detected using the developed CFAR algorithm, as shown in (a). However, one of two ships was not detected when the conventional LOG/CFAR algorithm was used, as shown in (b). In comparing (a) and (b), the new algorithm resulted in an improvement of 30.82 dB in the target-to-clutter ratio.

WEB site and authors

Activity of our committee is also described in our website (<http://www2.iee.or.jp/~aim/>).

Written by Dr. Kazuo Tanabe (Chairman, Central Research Institute of Electric Power Industry (CRIEPI), e-mail: tanabe@criepi.denken.or.jp), T. Fukuchi, S. Arakawa, and S. Sayama.

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Metal and Ceramics (MC)

Chairperson: Ataru Ichinose (Central Research Institute of Electric Power Industry)
 Secretary: Akio Kimura (The Furukawa Electric Co., Ltd.)
 Assistant Secretary: Masanao Mimura (International Superconductivity Technology Center)

Welcome to our Technical Committee on Metal and Ceramics (TC-MC) in the Institute of Electrical Engineers of Japan (IEEJ). It is expected the TC-MC to promote the electrical materials and related technologies. Therefore, we have the pleasure to inform activities of the TC-MC and to communicate with each other.

Mission of TC-MC

The metal and ceramic materials are indispensable to electric and electronic fields and in front of advanced technologies all the time. In the twenty-first century, many advanced technologies need promising materials such as new materials or new functional materials for the diversification and renewable society. Therefore, the metal and ceramic materials are significant still more and will play an important role as a pioneer in the future.

As shown in figure 1, the activities of the TC-MC have been covering mainly electric, electronic and optical materials, and their technologies. Namely their functions are extended such as superconductivity, normal conductivity, semi-conductivity, mechanical strength, heat transfer, thermoelectric, photo-electricity, optical trans-

mission, electrochemical affinity, radio-activity, composites etc.

Furthermore, our activities have been covering data base on their processing technologies and their evaluations in order to fit any applications.

History of TC-MC

The technical committee on the electrical materials in the IEEJ, predecessor of the present the TC-MC has been already set up in 1979. With several reorganizations of the technical committees, the TC-MC under the Fundamental and Materials Society (called A-Society) has been established in 1999 with other eleven technical committees, Research and Education, Electromagnetic Theory, Plasma Science and Technology, Electromagnetic Compatibility, Pulsed Electromagnetic Energy, Electrical Discharges, Light Application and Visual Science, Insulation and Measurement, Dielectrics and Electrical Insulation, Magnetics, and History of Electrical Engineering.

Recent activities of TC-MC

The activity of the TC-MC is based on the Symposium in the National Convention of the IEEJ, the Study Meeting and the Investigation Committee under the TC-MC. The following introduces the recent Symposiums in the National Convention of the IEEJ and Study Meeting under the TC-MC as shown in Table 1 and Table 2, respectively and the third activities will be found in the next section.

Regularly, the TC-MC meetings are held four times a year. The main topics to be discussed in the regular meetings involve introduction and

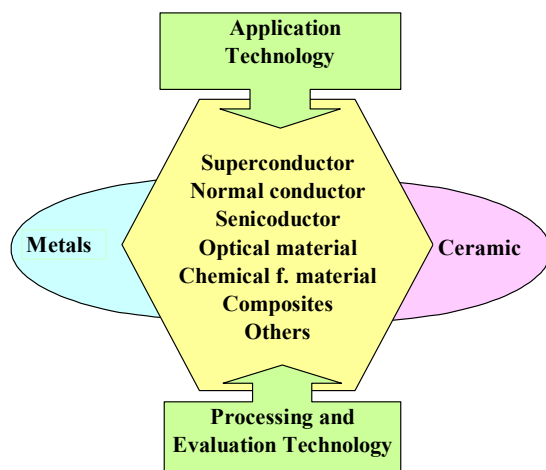


Figure 1 Activity scope of the TC-MC

understand for advanced metal and ceramics, and development of our TC-MC itself. We previously provided new three technologies and related materials such the attractive carbon nano-tube, the fuel cell and the functional diamond except the superconductors.

Recent year, much attention has been paid on an investigation on advanced superconducting materials. The electrode materials for future batteries and fuel cells to be compatible with clean, green, renewable and sustainable society have been also focused.

The investigating R&D committee whose chairperson was Dr. Kumakura issued a technical report entitled "Fabrication and superconducting

Ogino (University of Tokyo), respectively. Regularly, there are four meetings a year.

The meetings discuss fabrication technologies and evaluations on electromagnetic, thermal and mechanical properties mainly for Nb₃Al conductors, Bi-based oxide superconductors, MgB₂ conductors and Y-based oxide superconductors. Most expecting investigation results are fabrication technologies to obtain the high performance and its possibility at a viewpoint of microstructures and chemical composition for various superconducting materials such as Nb₃Al conductors, Bi-based oxide superconductors, MgB₂ conductors and Y-based oxide superconductors. And their cost performances as the practical superconductors and their applied

Table 1 Symposiums in the National Convention of the IEEJ

Theme	Date	Site
High magnetic field characteristics and indications for magnetic application of the High-Tc superconducting wires	2008.03.19	Fukuoka Institute of Technology
Development and problem of the high-efficiency solar cell	2009.03.19	Hokkaido University
Metal and ceramic materials in energy strange systems	2010.03.19	Meiji University
The 100th anniversary symposium for superconductivity discovery	2011.03.	Osaka University

Table 2 Study Meetings in TC-MC

Theme	Date	Site
Development of advanced superconducting wires and their future problems	2008.03.14	CRIEPI
Recent research progress in advanced superconducting materials	2010.10.31	University of Tokyo

Table 3 Investigation Committees under the TC-MC

Research Subject	Chairperson (Affiliation)	Period	Remarks
Fabrication technologies and characterization of advanced superconducting materials	Hiroaki Kumakura (NIMS)	2004.10-2007.09	Close
Structure, composition and characterization of advanced superconducting materials	Jyun-ichi Shimoyama (University of Tokyo)	2008.10-2011.09	Open

properties of advanced superconducting tapes and wires". This report won IEEJ outstanding technical report award in 2009. The forum using this technical report as a text book was held at CRIEPI on March 2008.

Activities of investigation committee in TC-MC

At present, there is one investigating R&D committee under TC-MC as shown in Table 3, the name of which is "Structure and composition of advanced superconducting materials". The chairperson and secretary are Prof. Jyun-ichi Shimoyama (University of Tokyo) and Dr. Hiraku

technologies to such as persistent current mode-coils, cables, transformers, fault current limiters and so on. The committee has a plan of the study meeting related with the advanced superconducting materials on October 2010. This meeting will be held to exchange information between young researchers belonging to several communities. Therefore, the new style of the presentation is adopted, which is combination of a short presentation and a poster session.

IEC and CIGRE Japanese National Committees Related to Electrical Insulating Materials

IEC TC15 Japanese National Committee

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

The task 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.

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 in 5 working groups (WGs) and 4 maintenance teams (MTs), and more than 160 standards are published. 20 work programs for standardization are in progress this year.

Japanese national committee for TC15C held meetings of three times last year. Over 30 documents for standardization have been circulated

from IEC Central Office, including CD, CDV and FDIS, all of which were studied and discussed by the specialists of the Japanese National committee.

To accomplish the tasks of the WGs in TC15, the experts from Japan are active in MT3 (plastic films), WG5 (flexible insulating sleeving), WG7 (resins and varnish) and WG9 (cellulosic materials). They are contributing to accomplish the new work item and revisions of the present standards.

Japanese national committee is participating to the standardization of new and improved insulating materials, such as PEN film and PP film of thin thickness type, in order to offer the appropriate and useful standards for the market.

TC15 meeting has been annually held. The meeting of this year was held on May in Milan. 7 members from Japan worked in MT/WG meetings and the plenary meeting.

CIGRE SC D1 Japanese National Committee (Materials and Emerging Test Techniques)

Chairperson: Naohiro Hozumi (Aichi Institute 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, while some of them are closely related to the activities of IEC Committees which publish and maintain the International Standards in the field of the Electrotechnology.

SC D1 has now following 5 Advisory Groups (AG): CSAG (Customer and Strategic related), AG D1.01 (Insulating Liquids), AG D1.02 (High Voltage Testing and Diagnostic), AG D1.03 (Insulating Gases) and AG D1.04 (Insulating

Solids). In 2010, SC D1 has started 5 new WG's: WG D1.34 (Diagnosis for OF Cables), WG.D1.37 (PD Detection), WG.D1.38 (Test Techniques for HTS Power Applications), WG.D1.40 (Data Collection and Analysis), WG.D1.41 (Radiation Ageing of Polymeric Insulation).

SC D1 now consists of 5 AG's and 17 WG's: the above new WG's as well as the 12 existed following WG's: WG D1.05 (Capacitors), WG D1.17 (HV Asset Condition Assessment Tools, Data Quality and Expert Systems), WG D1.19 (Solid Insulation Endurance under Repetitive Transient Voltages), JWG B1/D1.20 (Water Tree Detection in XLPE insulation), WG D1.23 (Diagnostics and Accelerated Life Endurance Testing of Polymeric Materials for HVDC

Application), WG D1.24 (Potential of Polymer Nanocomposites as Electrical Insulation for Highly Stressed Insulation Material in AC and DC Application), WG D1.25 (Application Guide for PD Detection in GIS using UHF or Acoustic Methods), WG D1.26 (Basic Principles to Determinate Methane Content of Cross-linked Solid Insulation of MV and HV Cables), WG D1.27 (Material Properties for New and Nonceramic Insulation), WG D1.28 (Optimized Gas-insulated Systems by Advanced Dielectric Coatings and Functionally Graded Materials), WG D1.33 (High Voltage Test and Measuring Techniques), WG D1.29 (PD in Transformers).

The preferential subjects for the 2010 SC D1 Paris group meeting were PS1: New materials for improved efficiency and sustainability of AC & DC power equipment (Nanomaterials, biodegradable materials, New gas compositions, Recyclable materials, Innovative polymers, HTSC), PS2: Challenges for testing and diagnostics (New requirements for ultra high voltage, Interpretation of diagnostic results for condition assessment, New test and monitoring methods), PS3: Endurance of materials especially in harsh electrical and physical environments (Off-shore applications, Repetitive

transients, load cycling, thermal overload, nuclear environment). From Japan, following 3 papers were accepted: "Endurance of polymeric insulating materials in nuclear power plants and needs for condition monitoring of electrical cables" by Y. Ohki, et al, "Application of new solid insulating materials and new gas compositions to future advanced gas insulated systems" by H. Hama, et al., "Experimental research on the feasibility of biodegradable polymeric insulating materials" by Y. Ohki, et al. The second paper by Hama et al. was awarded as an excellent Japanese paper for 2010 Paris meeting.

The next 2011 meeting is scheduled to be held at Doshisha University, Kyoto, Japan on September 11-16, 2011, as a Joint Colloquium of A2 (Transformers) and D1. The International Symposium on Electrical Insulation Materials will be held at Doshisha University as well prior to the CIGRE colloquium on September 6-10, 2011. All Japanese colleagues are waiting for your participation.

The Japanese National SC D1 has usually 2 or 3 meetings a year.