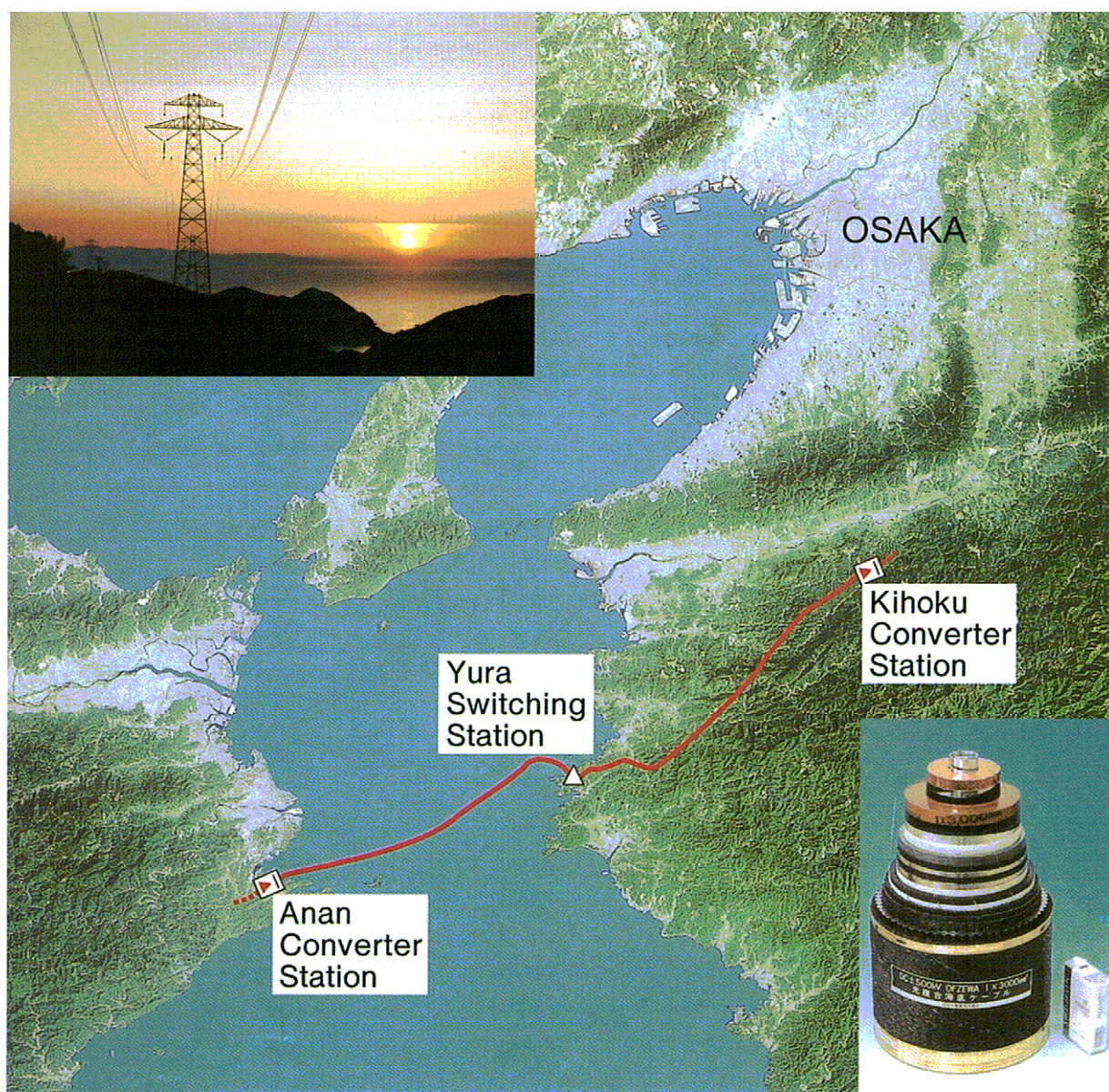


Electrical Insulation News in Asia

No.7

November 2000



IEEJ

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PREFACE

Prof. Y. Sakai

Direction of Coming Insulation Technology

In the last few years, I have had opportunities to visit Korea to exchange not only scientific knowledge at academic sides but also technological issues at an electronic industry. Main visiting places are Seoul, Chonan, Suwon, etc. There, I feel vital power by the fact that a lot of bridges, buildings, rail roads, underground tunnels for water, cables, and so on, are always under construction, which are not seen in Japan any more. My first visit to Korea was 1996. Comparing to that time, I noticed the significant change. Outside Korea as well, I experienced a big event festival sponsored by a Korea electronic company in St.Petersburg, Russia, when I visited there in this summer.



Concerning the research field as well, I recognized considerable change at the Summer Annual Conference on Electrical and Electronic Material Engineering, KIEEME, held at the Chung-Pyoung Resort. Here, the 242 papers were presented. More than 2/3 of them were the topics related to the material for micro-electronic technologies instead of the insulation material for the power technology which was the main subject at a couple of decades ago. This kind new trend of research direction to the micro-electronic material may assist the development of the following mobile technology.

A mobile telephone having Internet function recently has appeared, which is called *i-mode phone (Digital MOVA)* in Japan. This system surprises us, in general, by diversifying functions for communication, Internet, e-mail, memorandum book, calculators, clock, etc., but I am also astonished at its hardware which is highly integrated functionally and structurally. In addition, the battery lasts 3~4 days. This telephone is really a condensation of the various kind of electronic material technologies. Now, I never miss carrying it with me.

It seems to me that these kind of highly integrated devises are like the Asian people's lifestyle, since we have been gathering around high population regions. This tendency has made active and fascinating cities like Hong Kong, Tokyo, Seoul, etc. In such a socialistic point of view, I hope that Asian countries become the leading one in this field using the insulation technology developed so far.

Dr. Yosuke Sakai
(Professor, Graduate School of Engineering, Hokkaido University)

OUTLINE OF TECHNICAL COMMITTEES ON DEI AND RELATED TC IN IEEJ

Technical Committee on Dielectrics and Electrical Insulation (DEI)

Chairperson:	Y. Ohki (Waseda University)
Secretaries:	K. Kimura (Mitsubishi Electric) T. Okamoto (Central Research Institute of Electric Power Industry)
Assistant Secretaries:	M. Okashita (Showa Electric Wire and Cable) H. Nishikawa (Shibaura Institute of Technology)

This Technical Committee (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 primary activity of TC-DEI is the annual Symposium of Electrical and Electronic Insulating Materials and Applications in Systems, formerly called Symposium on Electrical Insulating Materials. In 1999, the 31st Symposium was held at the TEPCO R & D Center in Yokohama on November 16 and 17, 1999. Seventy eight papers were presented including two invited papers by Prof. M. Hanack of University of Tübingen, Germany, and by Dr. M. Leijon of ABB, Sweden.

The 32nd Symposium will be held in Nagano on November 16 and 17, 2000. Prof. L. A. Dissado of Leicester University and Prof. M. Taylor of Wales

University, both from U. K., will be invited speakers. Special sessions on "Eco-friendly insulation technologies" and "International standards" are organized. Including these topical papers, 91 papers will be heard.

The 33rd Symposium in 2001 will be held in Himeji on November 19 – 22, jointly with IEEE DEIS, Chinese Electrotechnical Society, and Korean Institute of Electrical and Electronic Material Engineers in the style of International Symposium (ISEIM 2001). The details of ISEIM 2001 can be seen on its web site: <http://www.waseda.ac.jp/conference/ISEIM2001/index.html>

The TC-DEI currently runs seven Investigating Committees (IC) which organize Technical Meetings (97 papers in 1999) and one Cooperative Research Committee (CRC) which edits and publishes this EINA.

Table 1 Investigation and Cooperative Committees in TC-DEI

Research Subject	Chairperson
Mechanism of Treeing Degradation and Influence of Polymer Morphology (3 years from Apr. 1998)	N. Shimizu (Meijo University)
Evaluation and Improvement Methods of Insulation Interfaces (3 years from Jan. 1999)	T. Tanaka (CRIEPI)
Insulation Reliability Problems of Electronic Equipment (3 years from Apr. 1999)	T. Tsukui (Tokai University)
Insulation Lifetime of Dielectric Materials and Electrical Apparatus (3 years from Apr. 1999)	T. Ito (Musashi Institute of Technology)
Development of Dielectric and Electrical Insulation Technology to Organic Molecular Device Engineering (3 years from Jan. 2000)	M. Iwamoto (Tokyo Institute of Technology)
Future Prospects of Electrical and Electronics Insulation Technologies (2 years from Apr. 2000)	T. Tanaka (CRIEPI)
EINA Magazine (2 years from Apr. 2000)	T. Tanaka (CRIEPI)
Functions of Organic Molecular Films and Organic/Inorganic Composites (3 years from July 2000)	F. Kaneko (Niigata University)

Technical Committee on Electrical Discharge (ED)

Chairperson:	K. Hidaka (The University of Tokyo)
Secretaries:	M. Yumoto (Musashi Institute of Technology) M. Nagao (Toyohashi University of Technology)
Assistant Secretaries:	T. Nakano (National Defense Academy) M. Hanai (Toshiba Corporation)

The Technical Committee on Electrical Discharge (TC-ED) has been charged with offering the opportunities for the members of IEE of Japan in the research field of electrical discharge to present their achievements, and studying and reporting on current status and future challenges in electrical discharge engineering. It was established formally in 1980, but its root goes back to the start of Expert Committee on Electrical Discharge in 1954. In order to meet the objective, a few subcommittees are organized in the TC-ED every year to survey the up-to-date subject and their activities continue for three years normally.

In the past, the following subcommittees were active and published the Technical Research Reports on a relevant subject: Discharge Simulation Methods, Surface Discharges in Diverged Fields, V-t Characteristics in SF₆, Conduction and Breakdown in Dielectric Liquids, Plasma Processing, Fundamental Processes in Non-LTE Plasma, Simulation in Non-LTE Plasma, Field Measurements in Electrical Discharges, Breakdown Mechanism and Characteristics of Gas Mixtures, Modeling of Long Sparks, Interaction between Sparks and Laser, Space Charge Effects on Electrical Breakdown in Insulating Liquids, Effects of Interface and Foreign Matters on Electrical Breakdown in Insulating Liquids, High Stress Phenomena in Cryogenic Liquids, Plasma Reactors, Plasma Display, Database on Gas Discharges, Beam and Swarm Data for Gas Discharges and Plasma; Plasma Chemistry, Electrical Breakdown in Vacuum, and so on. The total number

of the established subcommittees is 39 and the published technical reports reach 29 as of September 2000.

Now ten subcommittees are running for a survey of the listed subjects. Each subcommittee consists of 20-30 members who are the specialists in the relevant research subject or are interested in it.

The TC-ED is supporting more than ten domestic research meetings on electrical discharges every year where almost 250 full papers are reported by professors, researchers and students from universities and institutes and engineers from industries.

The "Handbook of Electrical Discharge" was revised in 1998 after an interval of twenty-five years through the active support of the TC-ED. The new handbook has a special advantage of including two discs of CD-ROM in which full text of it, database on electrical discharge and useful simulation software are stored, together with two volumes of hardcopy of total 1000 pages. The publication project of this handbook won the Authors Group Award of IEE Japan last year. The second edition of the handbook has been published.

The international and domestic conferences and annual seminar for young researchers are also promoted by the TC-ED in cooperation with the Technical Committee on Dielectrics and Electrical Insulation, IEE of Japan, the Institute of Electrostatics of Japan and the Japan Research Group on Electrical Discharge which consists of about 400 members whose backgrounds covers a wide area of electrical properties of solids, liquids and gases.

Table 1 Investigation committees in TC-ED

Research Subject	Chairperson / Secretaries / Assistant Secretaries
Technology of Material and Gas Treatment by Using Plasma Processing	M. Sugawara / M. Ouchi, S. Ono / A. Matsuoka
Control Technology of Electrical Discharge in Vacuum Relevant to Generation of High Energy Density	M. Yumoto / Y. Saito, O. Yamamoto /
Behavior of Charged Particles in Liquid and its Simulation Technique	Y. Sakai / R. Hanaoka, Y. Nakagami / S. Mori
Construction and Application of Database on Surface Discharge	M. Endo / M. Chiba, S. Matsumoto /
Ultra Long Discharge Characteristics	T. Shindo / S. Matsumoto, N. Takagi / M. Miki
Physical and Chemical Reaction of Electrons, Ions and Excited Particles in Discharge Plasma	H. Itoh / Y. Nakamura, Y. Saito / S. Suzuki
Gas Insulation Technology for Prospective Future Transmission and substation apparatus	M. Hara / T. Gouda, H. Fujii / N. Hayashi
Plasma Display Discharge and Emission	S. Mikoshiba /

Technical Committee on Electromagnetic Compatibility (EMC)

Chairperson : T. Takuma (Kyoto University)
Secretaries : Z. Kawasaki (Osaka University)
S. Yokoyama (Central Research Institute of Electric Power Industry)
Assistant Secretary : K. Miyajima (Central Research Institute of Electric Power Industry)

The Technical Committee (TC-EMC) started in April 1999 in the Fundamentals and Materials Society (A-Society), the Institute of Electrical Engineers of Japan (IEE, Japan). It followed the breaking-up of the former Technical Committee on Applied Physics of Electricity (APE) into four technical committees.

The TC-EMC is in charge of various issues related to electromagnetic compatibility in electrical engineering. Our modern life today is full of electromagnetic fields due to naturally-originated sources like lightning as well as artificial ones in almost all ranges of frequency. These sources make complex electromagnetic environments which usually give necessary benefits to and sometimes on the other hand interfere with every aspect of our life. The EMC (electromagnetic compatibility) issues are increasing their importance more and more with the recent development of the electricity-dependent life. The establishment of the TC-EMC in the IEE, Japan is based on the increasing significance of the field together with the fact that both sources and influences in the EMC issues have a close relation with electrical engineers.

The TC-EMC deals with the following items as the scope of its investigation activities.

- a) Generating sources of electromagnetic interferences, related to high voltage, static electrification, high current, electrical discharge, power electronics devices, and so on.
- b) Actual situations of electromagnetic interferences

- c) Measuring techniques in EMC
- d) Countermeasures against electromagnetic interferences
- e) Domestic and foreign standards related with EMC

The TC-EMC has started two investigation committees(ICs) in 2000. One of them, the Investigation Committee on Lightning Damages in the Highly Information-Oriented Society, began its activity in January 2000. The chairperson is Dr. S. Yokoyama in the Central Research Institute of Electric Power Industry. It intends to investigate various aspects concerning damages caused by lightning with the term of about two years until March 2002. The investigation items are to cover, for example, countermeasures in low-voltage networks for electronics and communication, related standards abroad, techniques for analyzing lightning damages, and cost estimations.

The other is the Investigation Committee on EMC Issues in the Electric Power Industry, which Associate Professor Z. Kawasaki of Osaka University chairs. Although there exist a number of EMC issues already examined by various organizations, the principal purpose of this new IC is to extract such recently noticed or important items as have been not fully elaborated in the electric power industry. The IC also intends to make mathematical simulation models of simulation models of possible EMC phenomena.

Technical Committee on High Voltage Engineering (HV)

Chairperson: M. Ishii (The University of Tokyo)
Secretaries: A. Inui (Toshiba Co.)
I. Aono (Mitsubishi Electric Co.)
Assistant Secretary: H. Motoyama (Central Research Institute of Electric Power Industry)

This technical committee (TC) belongs to Power & Energy (P&E) Society of the IEE of Japan. This committee supervises activity of investigation on technical subjects related to high voltage

engineering. Five investigation committees listed in Table 1 are active in October 2000. The last two committees in the table were newly formed in the past year. The scope of this TC resembles, but is

broader than, that of the CIGRE Study Committee 33 (Power System Insulation Coordination).

This TC jointly organizes 2nd International Workshop on High Voltage Engineering (IWHV) in November 2000 at Tottori, Japan, with two other TCs, namely on Switchgear and Protection, which also belongs to P&E Society of IEEJ, and on Electrical Discharge. This workshop, chaired by the chairperson of the TC on High Voltage Engineering, is characterized by discussion on full-length papers in English, and selected papers will constitute a special issue of Trans. IEEJ to be published in summer of 2002. The previous workshop held in

Naha, Okinawa collected 49 papers and its special issue of January 2000 comprised 15 papers from the workshop.

TC on High Voltage Engineering meets four times a year, and a technical visit to a geothermal plant, a wind power station and a diesel power plant on the Hachijo Island, 300km south of Tokyo, is planned in October 2000. The members of the committee other than the chairpersons of the investigation committees are from universities (4), a research institute (1), electric power utilities (4) and manufacturers (9).

Table 1 Investigation Committees in TC-HV

Research Subject	Chairperson
Lightning Location Systems	M. Ishii (The University of Tokyo)
Status Quo in Insulation Coordination	S. Sasaki (CRIEPI)
Insulator Contamination (Application and Evaluation of Insulators under Variety of Environments)	K. Takasu (CRIEPI)
Common Electrical Insulation Technology in Power Apparatuses of Electric Power System	H. Okubo (Nagoya University)
Estimation of Lightning Performance of Distribution Line	M. Ishii (The University of Tokyo)

Technical Committee on Electrical Wire and Cables (EWC)

Chairperson:	Yasuo Sekii (Chiba Institute of Technology)
Secretaries:	Ikuo Shigetoshi (Fujikura Ltd.) Kunio Iwasaki (The Furukawa Electric Co., Ltd.)
Assistant Secretary:	Kazuhito Mizunami (Sumitomo Electric Industries, Ltd.)

Technical Committee on Electrical Wire and Cables (TC-EWC) is the committee organized in IEEJ Power and Energy Society, with the committee members from universities, power and communication utilities, the railway company and cable manufacturers.

The technical committee holds the technical meeting to promote R&D activities in this field and provide opportunities of presenting the results of technical achievements. Three technical meetings are planned in this year. One of the meetings has been held on September 13, 2000, in Tokyo focused on the subject of High Voltage DC Cables. In addition to organizing those technical meetings, the technical committee supervises investigation committees which deal with updated subjects concerning electrical wire and cables. During these several years, investigation committees such as "The Investigation Committee on Partial Discharge Detection Technology for Power Transmission Cable Lines", "The Investigation Committee on DC

Cable Systems" and "The Investigation Committee on Examining Technical Trends in Power Cable Systems in Abroad" were organized. Those investigation committees have published technical reports such as "PD Detection Technologies Applicable to Power Cable Lines" or "Recent Technical Trends in DC Cables". The same as the previous year two investigation committees are running current year. The names and chairpersons of them are shown in Table 1.

The TC-EWC usually meets 4 times a year. Sometimes a technical visit by the committee members is planned to encourage studying most advanced science and technology. In this year, the committee is planning to visit the "Yura Switchyard" in Kansai Electric Power Co., Inc., where the cable terminations of high ampacity DC 500 kV oil-filled cable system for the "Kii Channel Link" (cable line length: 50km, conductor cross-section: 3000 mm²) have been constructed.

Table 1 Investigation Committees in TC-EWC

Name of Investigation Committee	Chairperson
Investigation Committee on Technology of Wires and Associated Accessories For Overhead Transmission lines	T. Tanaka
Investigation Committee on Computer Software and Its Application for Underground Cable Lines	M. Okada

IEC Japanese National Committees Related to Electrical Insulating Materials

IEC TC10 Japanese National Committee

Chairperson T. Ishii (Yuka Industries Co.,Ltd)
Secretary T. Takahashi (Fujikura Ltd)

IEC TC 10 deals with standards of fluids (insulating liquid and SF₆) applying to electrical equipments such as transformer, cable, condenser and switchgear. Japanese National Committee consists of 19 experts from universities, manufacturers of power apparatus, cables and insulating oils and testing companies. In 1999 two standards (IEC 61620 and IEC 60599) were published. Now 6 WGs (WG14,15,16,17,18 and 19) and a maintenance team (MT-21) are acting. Japanese National Committee contributes to the WGs and MT. Many members of the committee also belong to the committee of electrical insulating oil in Japanese Petroleum Institute and the latter committee investigates adjustment between JIS (Japanese Industrial Standard) and IEC standards.

IEC SC15C Japanese National Committee

Chairperson Tsuyoshi Kaneko (Japan Electrical Safety & Environment Technology Lab.)

SC15C that is under the influence of IEC/TC15 is responsible for standardization of insulating materials except gases and liquids at use. As insulating materials are used throughout all the fields of electrical and electronic machine and have diversity, the number of investigations results so large amounts, that involve the review of 116 standards to be taken charge and drafts for standards. Still more, two reasons cause to increase the amount of works of SC15C. One is evaluation for SC working by counting the standards made in a year, and another is a strategic policy of material manufacturer who has large share in the world. The amount of the works for SC 15C should be reduced through the discussion of all TC and SC members. Japanese national committee submitted a proposal for simplifying the

works at Frankfurt meeting in June 2000 and the proposal was adopted.

IEC SC15E Japanese National Committee

Chairperson E. Watanabe (Tokyo Metropolitan University)

The committee is a subcommittee dealing with testing methods of electrical insulating materials. It is composed of four task groups each of which manages some IEC documents concerning to its designated standards and fields. It often plays a role of the committee for enactment/ revision of JIS standards. The committee recently contributes the revision of IEC 60112 (Tracking test) and enactment of IEC 60250 (Dielectric characteristics)

IEC TC98 Japanese National Committee

Chairperson S. Kobayashi (Niigata College of Technology)
Secretaries K. Kimura (Mitsubishi Electric Corp.),
T. Okamoto (Nagoya University)

IEC TC98 was established in 1994 after disbanded TC63 to prepare IEC documents on Electrical Insulation Systems (EIS). TC98 plays an important role as Horizontal Technical Committee. The international meeting of TC98 has been held once a year since 1995. The 5th meeting was held in Tokyo and Kyoto, Japan in Oct.1999. TC98 Japanese National Committee consists of experts from MITI (Ministry of International Trade and Industry), universities, laboratories and manufacturers of power apparatus, cables and instruments. The Japanese committee has large contribution to WG activities on thermal evaluation (WG5,6) and voltage endurance of EIS under repetitive impulses from power electronics (WG4).

ACTIVITIES OF THE TECHNICAL COMMITTEE ON DEI IN IEEJ

Digest Reports of Investigation Committees in DEI

Investigating Committee on Functions of Organic Molecular Ultrathin Films, Organic/Inorganic Composite Films

Futao Kaneko (Niigata University)
Yasuo Suzuoki (Nagoya University)
Keizo Kato (Niigata University)
Kazunari Shinbo (Niigata University)

The committee was established in July 2000, with the term of three years. The investigation has focused attention on functions of organic molecular films and organic/inorganic composite films related to

1. fabrication techniques and functions of organic molecular ultra thin films,
2. composite techniques and functions of

- organic/inorganic materials,
3. evaluating techniques of ultra thin films, and
4. properties of ultra thin film interfaces and device applications.

The results of the investigation will be summarized at the end of the terms as a technical report.

Investigation Committee on Mechanism of Treeing Degradation and Influence of Polymer Morphology

N.Shimizu (Meijo University)
H.Tanaka (The Furukawa Electric Co., Ltd.)
M.Kanegami (Central Research Institute of Electric Power Industry)

The investigation of treeing phenomena is of importance concerning with reliability of electric power system. Much effort has been paid to investigate treeing phenomena, and fundamental process of initiation and propagation has been gradually clarified.

However, many detailed points are still unclear. Especially the influence of polymer morphology such as spherulite, amorphous, free volume etc is left unclarified, although it is essential factor to treeing phenomena.

From this viewpoint, the committee was established in April 1998 with the term of three years. The main subjects of investigation and survey of this

committee are

1. Initiation and propagation mechanisms of electrical tree and the influence of polymer morphology on them.
2. Initiation and propagation mechanisms of water tree and the influence of polymer morphology on them.

Since the start, we have held 15 regular meetings and 15 secretary meetings. The results of investigation and survey will be published in Technical Report of IEEJ.

Investigation Committee on Various Problems with High Reliability for Insulation of Electronic Equipment.

T.Tsukui (Tokai University)
Y.Yamano (Chiba University)
K.Shutoh (Science University of Tokyo)
S. Yoda(Hioki E.E.Co.)

This investigation committee has started in April 1999 with 27 members. The main subjects of the committee are as follows.

- (1) Survey on test methods for insulating failures due to the ionic migration.
- (2) Survey on the insulating reliability with multi-constructed printed board.
- (3) Survey on insulating strength between the conductors against surge of high voltage.

We have held 9 committee meetings and two study meetings since the start of this committee. Now, we have started the round robin test with the surge endurance of the printed wiring board. Also we are surveying on practical problems with the insulating reliability occurring in the product of electronics equipments or products. At the end of the committee, we will publish the technical report.

Investigation Committee on Life Limitation of Dielectric Insulation Materials and Electrical Apparatus

T.Ito (Musashi Institute of Technology)
M.Miyamoto (Fuji Electric Corporate Research and Development, Ltd)
K.Uchida (Chubu Electric Power Co., Inc.)
Y.Ehara (Musashi Institute of Technology)
K.Segawa (Toshiba Corporation)

The committee was established in April, 1999 with 30 members. The purpose of this committee is to survey and to discuss the relation of next keywords with electric rotating machine, power system

equipment, power cable and insulating material, 1: life limitation 2: electrical insulation diagnosis 3: insulating deterioration mechanism and process.

Investigation Committee on Future Prospect of the Research and Development of Electrical and Electronic Insulation and its Systems

T. Tanaka (Central Research Institute of Electric Power Industry)
K.Goto (Toshiba Corporation)
M. Nagao (Toyohashi University of Technology)
H. Nishikawa(Shibaura Institute of Technology)

Nearly matured technologies in electrical insulation and emerging technologies in electronics insulation are reviewed for future prospect of their R&D. Electrical insulation should be matched with social and technological requirements such as environmental

protection, transition from component technologies and system technologies, and downsizing and low cost. Electronics insulation faces with extreme downsizing and needs countermeasures against insulation degradation under the high electric stress.

Cooperative Research Committee on EINA Magazine

T. Tanaka (Central Research Institute of Electric Power Industry)

Y. Inoue (Toshiba Corporation)

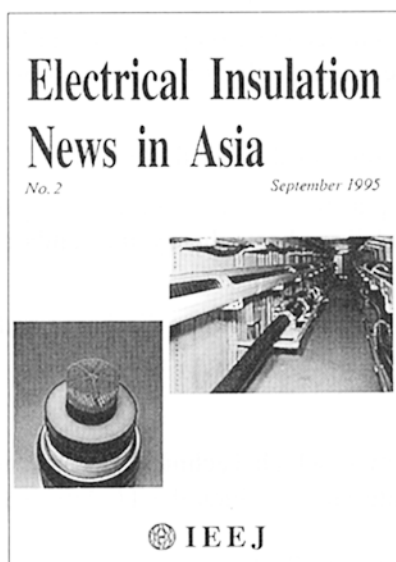
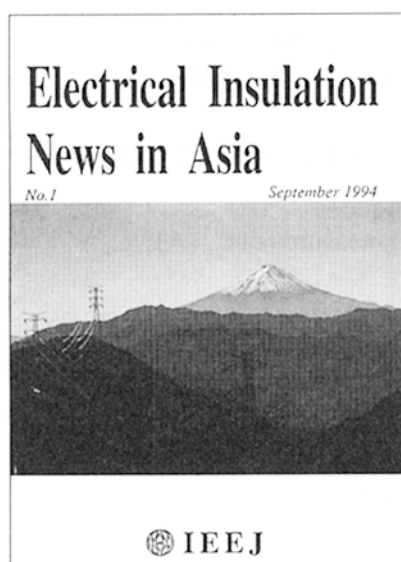
Y. Maruyama (Furukawa Electric Co., Ltd.)

Preceding committee ("Cooperative Research Committee (CRC) of Asian Interlink on Dielectrics and Electrical Insulation") worked from Jan. 1991 to Dec. 1992. The committee reviewed the present status of scientific and technical cooperation in the field of dielectrics and electrical insulation among Japan and Asian countries and sought the appropriate ways to promote it. As an important activity discussed in the committee, the "CRC of Electrical Insulation News in Asia" was established in Apr. 1994 and edited and published "Electrical Insulation News in Asia (EINA)"

No. 1 - 5 (in every September from 1994 to 1998), and No. 6 (in November, 1999) and will publish EINA No.7 in November, 2000. The EINAs have gained favorable responses by questionnaires inserted in distributed EINAs.

The Home Page of the EINA magazine is now under construction. It will be open in the end of 2000 at the URL of <http://boss.eee.tut.ac.jp/eina/>

Front covers of the back numbers are shown hereinafter.



Front covers of the back numbers of EINA

IEEJ Technical Reports Edited by TC-DEI and Related TCs

Technical reports listed here are made by investigation committees in the technical committee on DEI and related investigation committees since the publication of EINA No. 6 (1999). They are described in Japanese.

- No. 752 : “Deterioration of insulation materials for electric apparatus and cables and present state of insulation deterioration diagnosis criteria”, (A), p.136, Jan.,2000, ¥4,900.
- No. 757 : “Control of generation of charged particles and discharge in vacuum—Recent study results and technical review”, (A), p.63, Nov.,1999 ¥2,400.
- No. 765 : “Basic study, application and it’s diagnosis for generation of large scale high density and high homogenous plasma”, (A), p.60, Jan.,2000, ¥2,400.
- No. 767 : “Technical trend of the power cables in foreign countries”, (B), p.148, Mar.,2000, ¥5,100.
- No. 772 : “Life estimation of circuit printing plate under ion migration deterioration”, (A), p.48, Feb.,2000, ¥2,300.
- No. 777 : “Application technologies of high voltage capacitors”, (B), p.34, May,2000, ¥2,100.
- No. 778 : “Estimation technologies of surface electron phenomena of controlled polymer film and present state and future scope of electronic and photonic elements”, (A), p.104, Apr.,2000, ¥3,600
- No. 780 : “Technical trend of the arrestors for the distribution lines”, (B), p.50, Feb.,2000, ¥2,300.
- No. 790 : “Modeling of non-balanced plasma and fine manufacturing technique—Recent development of modeling, basic theory and fundamental measurement”, (A), p.100, May,2000, ¥2,800.
- No. 793 : “Trend of research on physics of pulsed power discharge and its high quality applications”, (A), p.48, Jun.,2000, ¥2,700.

N. B. : (A – E) after titles mean a Society in which Technical Committees work :

A : Fundamentals and Materials, in which the TC-DEI is included

B : Power and Energy

C : Electronics, Information and System

D : Industry Applications

E : Sensors and micromachines

¥ : Japanese Yen

By Mr. Yoshio Maruyama (Furukawa Electric Co., Ltd.)

TECHNOLOGIES FOR TOMORROW

Compact type transmission line arrester - An advanced solution for lightning problem

Line arrester for transmission line

Flashover by lightning is the major factor of line faults in transmission systems. Line arrester would be much more effective solution to reduce the fault on overhead transmission lines, compared with another countermeasures such as differential insulation system, implementation of multiple shielding wires or reduction of tower footing resistance.

In Japan, more than 50,000 sets of Zinc oxide line arresters, which interrupt power frequency follow current within 1/2 cycle, have been installed on the important lines in higher isoklonic areas since 1980's, and their performance has been proved.

Basic design of line arrester

For overhead transmission lines, reliability of insulation performance as well as free of maintenance is especially required. Further more, successful re-close operation must be assured if the arrester was failed by unexpected larger magnitude of lightning surge. From this point of view, external series gap type arrester has been used in Japan. As shown in Fig.1, the polymer arrester unit is mounted with the external series gap. The gap is designed to withstand switching surge and power frequency over voltage in the system. Since the arrester unit is isolated from high voltage, no deterioration of arrester unit due to continuous energizing is considered.

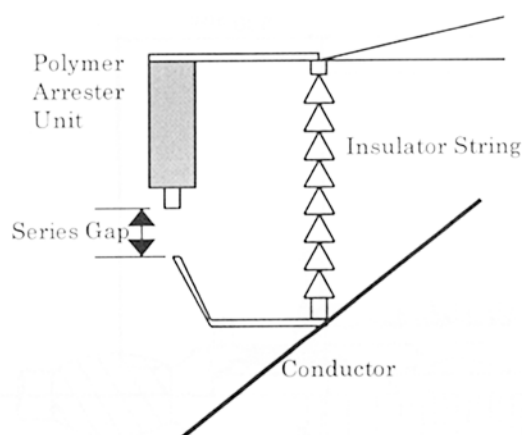


Fig.1 External series gap type line arrester

Compact type line arrester

Based on the above proven technology, more compact type of line arrester was developed. Because of compactness and lightweight, it can be installed easily like arcing horn for insulator string. Though it is designed to withstand smaller lightning impulse

current than that of the present design, it still has enough performance to prevent back flashover when used in shielded systems. That is, good cost performance is expected including installation work. Technical data of the compact type line arrester is shown in Table 1.

Using EMTP (Electro-Magnetic Transient Program) analysis, the expected frequencies of lightning fault before and after installation of line arrester were compared. As shown in the bottom column of Table 1, the compact type has enough lightning current discharge capacity.

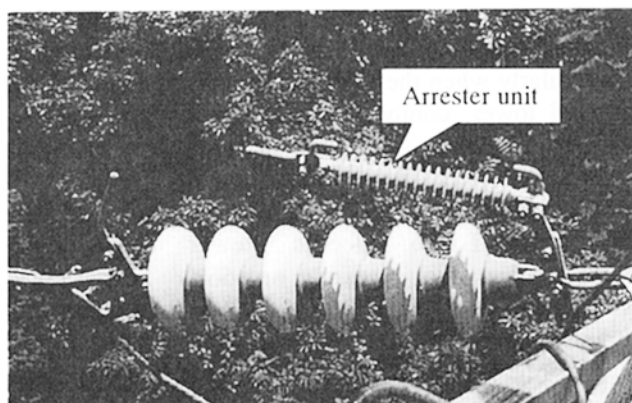


Photo 1 69kV Compact type line arrester

Table 1 Technical data

Item	Compact type	Present type
System voltage	33 to 161kV	33 to 500kV
Max. discharge current (4/10 μ s wave)	30kA	100kA
Over duty operation	Pressure relief	
Housing material	Silicon rubber	Silicon or EP rubber
Mass of arrester unit (for 69kV system)	Approx. 2kg	Approx. 10kg
Effect to prevent tripping by lightning	Approx. 95 %	> 99 %

By Engineering Department, Insulator Division
NGK INSULATORS, LTD.
1155 Tagami, Futatabi, Komaki 485-8566, Japan.
Tel:+81-568-76-7247, Fax:+81-568-76-7261
<http://www.ngk.co.jp>

Development of Composite Insulator Termination for XLPE Cable

Until today porcelain has been used as insulating materials outdoors due to the successful results obtained for many years.

During recent 20 years, with the improvement of the characteristic of the composite insulation materials including silicone rubber, the use of composite insulators, which have light weight, high mechanical strength and contamination resistant characteristics with phase-to-phase spacer and tension insulator, has become popularized. Furthermore, in recent years the application of composite insulators is advancing also in bushing.

Along with a FRP cylinder that has superior mechanical strength surrounded by silicone rubber cover and shade with excellent electric performance, a composite insulator has a structure with the metal fittings helping to mount it firmly on FRP at both sides.

In comparison with porcelain insulators, composite insulators have a number of advantages in contamination resistance, safety, workability and cost. Particularly when the termination is to be mounted on a steel tower, composite insulators have become a dominant choice for such a use due to such characteristics as safety, workability, etc.

Beginning in 1996, Furukawa Electric Co.,Ltd with the Tokyo Electric Power carried out development and research on 66kV and 154kV composite insulator terminations for tower-mounted branch line.

The 66kV composite insulator terminations were used for branching on the tower of Oihama line of Tokyo Electric Power Co. in the year, 2000. This

marked the first application of composite insulator termination in Japan.

Development of the 154kV class composite insulator termination has substantially been completed, and the composite insulator termination is at the stage where practical application is possible.

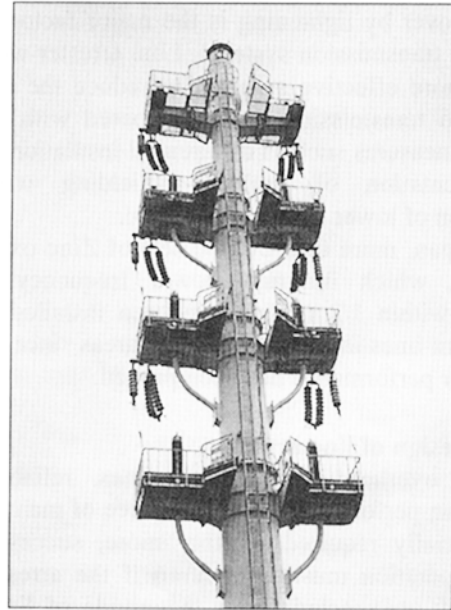


Photo.1. 66kV Oihama line No.1 tower
(Outdoor termination with composite insulator)

by Tokui Yonemura, Furukawa Electric Co.,Ltd and
Takeshi Goto, The Tokyo Electric Power Company,
Japan

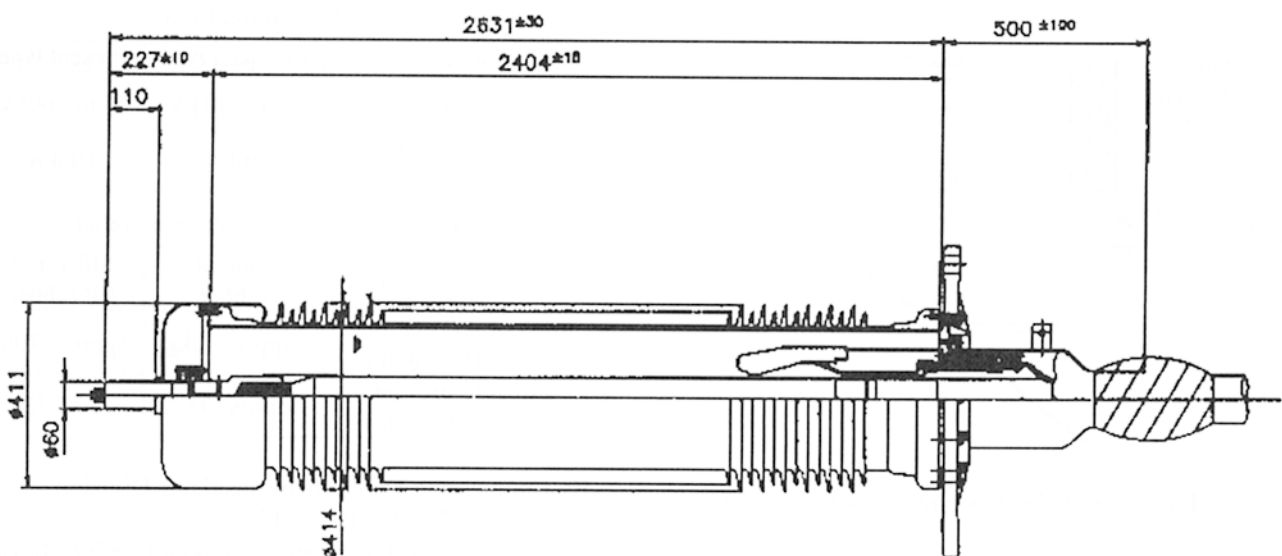


Fig.1. Structure of the 154kV composite insulator termination

TOSHIBA High Voltage and High Power Testing Laboratory

Accredited Testing Laboratory

TOSHIBA Testing Laboratory is the first accredited High Voltage and High Power Testing Laboratory in Japan. TOSHIBA quality systems have been officially accredited based on ISO/IEC guide25 by the Japan Accreditation Board for Conformity Assessment (JAB) in 1999. Moreover, TOSHIBA is a member of the Short-circuit Testing Liaison, the global forum for international collaboration between organizations.

High voltage tests and high power tests are carried out in accordance with IEC, JEC, ANSI, JEC and any national standards. After successful results of the tests, TOSHIBA will issue a Test Certificate for the tested objects.

TOSHIBA have the high voltage reference divider (rated voltage 500kV) made by HAEFELY. It is traceable to PTB (Physikalsch-Technische Bundesanstalt) in Germany. Our main measuring system is fully calibrated with its reference system according to standardized IEC60060-2.

Typical Test Products

The most products for power systems can be tested in the TOSHIBA Testing Laboratory.

Typical test products are:

Circuit breaker	Disconnecting switch
Earthing switch	Transformer
Current Transformer	Potential transformer
Reactor	Surge arrester
Bushing	Bus
Cable	load switch
Resister	Terminal
Relay	Fuse
Semi-conductor	Switchboard
DC circuit breaker	On load tap changer

Test Facilities

High voltage testing Laboratory has a 2300kV AC testing transformer made by TOSHIBA shown Photo. 1, 6000kV impulse generator and 2000kV DC generator. High power testing laboratory has 6600MVA(0.06s after short circuit) short circuit generator made by TOSHIBA shown Photo. 2 and 5.4MJ capacitor bank for synthetic breaking test. Tests in the class of 1000kV equipment are carried out. These facilities perform the maximum world level tests.

Test and Analysis Services

Not only test service of high voltage and high power for distribution system or transmission system, but also many analysis services can be provided. For example, transients analysis, arc

phenomena analysis, three dimensional electric field analysis, etc. are available.

We welcome inquiries about electrical tests and technical assistance, and can comply with your requirements.

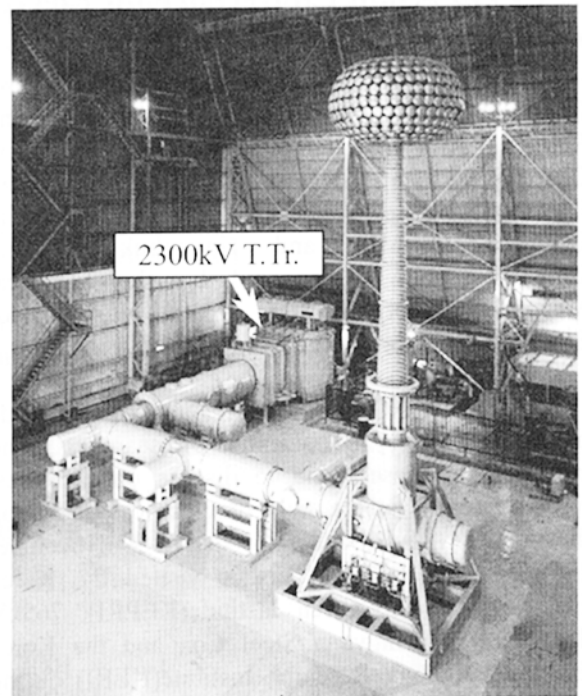


Photo. 1 2300kV AC testing transformer

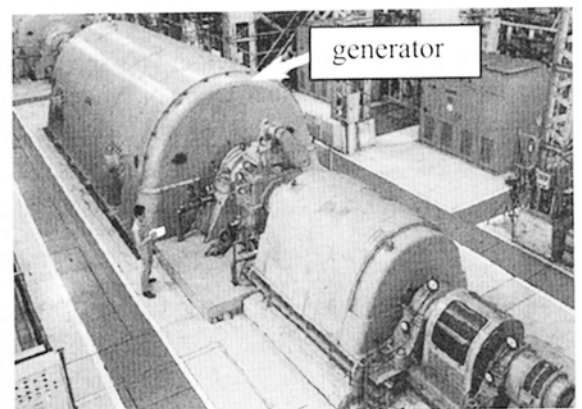


Photo. 2 6600MVA short circuit generator (0.06s after short circuit)

By High Voltage and High Power Testing Laboratory, Toshiba Corporation

2-1 ukishima-cho, kawasaki-ku, kawasaki
210-0862 JAPAN

<http://www2.toshiba.co.jp/f-ene/hvhp>

TECHNICAL EXCHANGES AND ACTIVITIES IN ASIAN COUNTRIES

Conference Records

1999 Asian Conference on Electrical Insulation Diagnosis(ACEID '99)

1999 Asian Conference on Electrical Insulation Diagnosis was held on 18 - 23 November 1999 at the Research Park of Chungbuk National University, Cheongju, Korea. It was organized by the Korean Institute of Electrical and Electronic Material Engineers(KIEEME) and Chungbuk National University and co-sponsored by the Electrical Materials Society of the Korean Institute of Electrical Engineers(KIEE) and KOSEF.

The 1999 ACEID was planned to provide opportunities for the scientists, researchers, and engineers to present and to discuss on the latest research results in the field of electrical insulation diagnosis in power apparatus on 18-19 November 1999. More than 15 persons visited the Korea Electric Power Research Institute(KEPRI), 765kV Test Yard, Kwangyang Steel Co., and the Korea Electrotechnology Research Institute(KERI) during 20-23 November as technical tour. The conference are originated from China-Japan Joint Conference on Electrical Insulation Diagnosis held at Xi'an, China on April 1990.

The three papers were invited and 96 papers from four countries (Japan, China, German, and Korea) were accepted among 115 abstracts submitted to the

program committee, and presented in seven oral sessions and two poster sessions covering the topics of High Field Effects in Solid and Liquid Dielectrics, Aging, Pre-breakdown and Breakdown Phenomena, Advanced Diagnostic Techniques, Prediction Methods of Residual Lifetime, and New Technology for Electrical Insulation. At the conference, panel discussion on the topic of Problems on PD Measurements and Interpretation in Power Apparatus was specially programmed.

During the conference, International Advisory Committee of ACEID '99 discussed on the next ACEID and was entered into an agreement to fulfill the following clauses by three representatives (Prof. Z. Yan, Prof. K. Matsuura, and Prof. Joon-Ung Lee);

- *The Conference will be held periodically in every 2 years: 2001 in Japan, 2003 in China, and 2005 in Korea.*
- *The host nation has authority to set up all the conference schedule including the exact location and the term for the Conference.*

By Prof. Kee-Joe Lim
(Chungbuk National University, Korea,
E-mail: kjlim@trut.chungbuk.ac.kr)



Announcement of International Conference to be Held in Asia

Second Asia-Pacific International Symposium on the Basic and Application of Plasma Technologies (APSPT)

APSPT devoted to basic and application of plasma technologies will be held April 18-20, 2001 in Kaohsiung, Taiwan, Republic of China. The symposium will be focused on the applications in the field of material processing and environmental treatments. Presentation emphasizing either the basic research or applied topics will be welcomed. Topics of interest will include, but not be limited to the following: Material dry processing, Pollution control technologies, Waste destruction and treatments, Miscellaneous (Plasma general)

Important Date:	Abstract (up to 200 words) due:	Oct. 30, 2000
	Acceptance Letter	Nov.15, 2000
	Pre Registration Due:	Dec.15, 2000
	Camera Ready Full Text (4-6 pages) due:	Dec.15, 2000
	Symposium:	April 18-20, 2001

Secretary: Professor S. Ono
Department of Electrical and Electronics, Engineering
Musashi Institute of Technology, Tokyo, Japan
Fax:+81-3-5707-2213
e-mail:ono@ee.musashi-tech.ac.jp

International Conference on Electrical Engineering 2001 (ICEE 2001)

ICEE 2001 will be held in Xian, China on July 22-26, 2001(to be expected). Topics cover wide areas of Electrical Engineering field.

Important Date:	Submission of abstract :	Jan. 31, 2001
	Notification of Acceptance:	March 15, 2001
	Submission of full papers:	May 1, 2001
	ICEE 2001	July 22-26, 2001 (to be expected)

Organized by: The Chinese Society for Electrical Engineering (CSEE)

Co-organized by: The Hongkong Institute of Engineers (HKIE)
The Institute of Electrical Engineers of Japan (IEEJ)
The Korean Institute of Electrical Engineers (KIEE)

The 1st International Discussion Conference on Nano Interface Controlled Electronic Devices (IDC-NICE2001)

The IDC-NICE Devices conference will be held at Kyongju Hilton Hotel in Kyongju(慶州), Korea, July 16-20, 2001.

Scope and Topics are Molecular Electronics & Devices, Nano Electronics & Devices, Nano Fabrication & Materials, Spectroscopy, Ultra-thin Films and Novel Systems, Nanotechnology.

The scientific program will consist of invited lectures, and oral presentations. The official language : English.

Important Date:	Deadline for subscription:	June 1, 2001
	Deadline for abstracts:	June 1, 2001
	Submission of proceedings:	July 1, 2001
	IDC-NICE	July 16-20, 2001

Organizing Committee: Prof. Young-Soo Kwon (Chairman, Dong-A University, Korea)
Prof. Mitsumasa Iwamoto (Co-Chairman, Tokyo Institute Technology, Japan)

Sponsored by Center for Integrated Intelligent Port Management Systems (CIIPMS), Dong-A University
Foundation of Pusan Techno-Park, Korea
The Society of Nice Devices of Japan

Supported by The 21st Century Frontier of Korea
R & D for Nano Device of Korea

In cooperation with Technical Committee on Dielectric and Electrical Insulation Materials, IEEJ
Technical Committee of Electrical Materials in KIEE, Korea
Division of Molecular Electronics & Devices (ME&D), Korea
Further information: The web site is www.donga.ac.kr/~nano/nice2001
Dr. Hoon-Kyu Shin, IDCNICE2001 Secretariat
Center for Integrated Intelligent Port Management Systems, Don-A University
840, Hadan-2dong, Saha-gu, Pusan 604-714, Korea
Phone: +82-51-200-6742, Fax: +82-51-200-5550
E-mail: nano@mail.donga.ac.kr

2001 International Symposium on Electrical Insulating Materials (ISEIM 2001) **and 2001 Asian Conference on Electrical Insulation Diagnosis (ACEID 2001)**

ISEIM 2001 and ACEID 2001 will be held at Hotel Sungarden in Himeji, Japan on November 19-22, 2001.
Main topics are 1. Conduction and Breakdown in Dielectrics, 2. Space Charge, Surface and Interfacial Phenomena, 3. Electrical Insulation for Apparatus and Cables, 4. Aging and Degradation, their Detection and Monitoring, 5. Test and Measurement Techniques, 6. Insulation Design and Reliability, 7. Eco-friendly Dielectric Materials for Electronics, 9. New and Functional Dielectric Materials, 10. Dielectric Phenomena and Their Applications.

Important Date: Submission of abstract : March 20, 2001
Submission of manuscript: July 31, 2001
Conference: November 19-22, 2001

Sponsored by: IEEJ Technical Committee on Dielectrics and Electrical Insulation
IEEE Dielectrics and Electrical Insulation Society

In Cooperation with: The Korean Institute of Electrical and Electronic Material Engineers
Chinese Electrotechnical Society
Kansai Section of IEEJ
IEEJ Investigation Committee on Insulation Lifetime of Dielectric Materials and Electrical Apparatus
Himeji Institute of Technology

More information about ISEIM 2001 is available at the following web site:
<http://www.waseda.ac.jp/conference/ISEIM2001/index.html>

7th IEEE International Conference on Properties and Applications of Dielectric Materials (ICPADM 2003)

ICPADM-2003 will be held in Nagoya, Japan, in June 2-5, 2003. This conference is sponsored by the IEEE Dielectrics and Electrical Insulation Society (DEIS) and it will be cosponsored by the IEE Japan.

The details will be in the Call for Papers which will be distributed later.

Contact person: Prof. T. Mizutani
Dept. of Electrical Eng., Nagoya University, Nagoya, Japan
Fax : +81-52-789-4441
e-mail : t.mizutani@ieee.org

Smart Measurement and Diagnostic Technology (SMDT) Lab in Hanyang University

Prof. Ja-Yoon Koo
Hanyang University, KOREA

About SMDT Lab

The Smart Measurement and Diagnostic Technology Lab.(SMDT) is an leading laboratory in Korea for the study of not only the diagnosis of power apparatus but also the insulation techniques. Main research areas include diagnostic technology for the insulation system and life estimation techniques for the power apparatus including their accessories. The SMDT is also associated with the Research Center for Electronic Materials and Components(EM&C, designated by government), Hanyang University, Korea.

Our main research activities are :

- After-laying test for underground power cable system
- Insulation degradation diagnosis and fault location of the underground power cable system
- Optical measuring system for the variation of the electric field
- Partial discharge measurement techniques and it's pattern analysis

Summary of Recent Achievements

1. A suggestion on the PD pattern analysis (published at ICPADM 2000)

The correlation between the PD patterns and the electrical tree propagation has been investigated by use of the specimen removed from the insulation of the real 154 XLPE underground power cables. Considering the results of our investigation, if the PD magnitude is only considered for the diagnosis of the cable system, it is possible to draw a wrong decision. Therefore, it is possible to propose that the evolution of PD pattern as a function of time should be taken into account for the diagnosis of the power cable system in addition to the conventional ϕ -q-n method.

2. Development of an EMI free optical prototype electric field measuring system applicable for the diagnosis of high power apparatus (to be presented at CEIDP 2000)

New PD detection technique using Pockels cell was proposed and considerable apparent chaotic characteristics were discussed. The presence of chaos of the PD signals has been investigated by examining their means of qualitative and quantitative information. The presence of strange

attractor, indicates the existence of fractal structures in it's phase space. Furthermore, several dimension values of strange attractor were verified sequentially.

3. Development of the Compact After Laying Test Set using oscillating wave voltage underground distribution for Power Cables (published at CEIDP97)

In order to suggest the optimum after laying test method, defect detection capabilities of various test methods were experimentally investigated. Based on our results, it is pointed out that with-cable-charging OW voltage test, of which test condition replacing the AC voltage test is 55kV/50shots, is the most optimum alternative method applicable to the underground distribution power cable system in Korea.

SMDT Head : Prof. Ja-Yoon Koo



- Received BS from Seoul National University, Korea (1975), MS from ENSEIHT, and Ph. D.
- Joined Research Center of the Electricity of France at Renardiere in France and then worked for the Korea Advanced Institute of Science and Technology

- Professor at the Dept. of Electrical Engineering, Hanyang University, Korea since 1988
- Regular member of SC-21 of CIGRE representing KOREA and Technical Committee member for the JICABLE (1988-1999)
- Regular member of SC-15 of CIGRE since 2000
- Director of Research Center for Electronic Materials and Components (EM&C, designated by government), Hanyang University, Korea since 1996

Contact to :

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Sa 1-dong, Ansanshi, Kyunggido, 425-791, KOREA

Tel : +82-31-400-5163 Fax : +82-31-407-9873

URL : http://emc.hanyang.ac.kr/hv_lab

E-mail : koojy@email.hanyang.ac.kr

Research Activities and Academic Exchanges in State Key Laboratory of Electrical Insulation of Power Equipment, China

Director: XIE Hengkun
Secretary: CHENG Yonghong
Xi'an Jiaotong university, Xi'an China

The electric power industry in China has already stepped into an era characterized by large power unit, huge power grid and high voltage. Under this background, State Key Laboratory of Electrical Insulation for Power Equipment (SKLEI) was established in 1991, and approved by the State Council. SKLEI, being located in Xi'an Jiaotong university, is the unique state laboratory undertaking research on power equipment in China.

The research direction of SKLEI is decided by its academic board, whose members are from famous universities, research institutes, electric power companies and power equipment manufactures. Its academic board members, such as GAO Jingde, ZHENG Jianchao, WANG Gen and Teruyoshi Mizutani, are prestigious in the field of electrical engineering. GAO is member of the Chinese Academy of Sciences, and ZHENG and WANG are members of the Chinese Academy of Engineering. Professor XIE Hengkun was appointed to the position of director for the SKLEI. More than 70 staffs, including 19 professors, and more than 60 graduates and doctoral students, work in this laboratory. It should be pointed out that new generation of young scientists are very active and play a important role in research works. The research fields of SKLEI are covering dielectric theories, high voltage engineering, electrical insulation techniques, electrical insulating and functional materials, and electrical engineering information techniques. Recently the investigation has focused mainly on the following subjects:

1. Electrical insulation measuring and on-line monitoring techniques, and insulation diagnosis for power equipments.
2. Dielectric theories and the techniques to enhance the breakdown strength of electrical insulating system.
3. Research and development of new electrical insulating and functional materials.
4. Characteristics of gaseous insulation, in particular SF₆ and its mixture gases, and electric arc theory.
5. New techniques for power equipments.

With the raise of voltage grade and the application of large capacity power equipments, the reliability in service, mostly depending on the insulation system, becomes greatly important. SKLEI pay more attention to on-line monitoring and insulation diagnosis techniques for power equipments. A number of new detecting technique, such as ultra-wideband partial discharge detecting technique, ultrasonic system for detecting the microscopic defects in insulation, ultrasonic flow-meter for measuring the flow of circulatory cooling water in turbine generator, and several kinds of on-line partial discharge monitors and dielectric parameter detectors for different power equipment such as generator, transformer, cable and ZnO arrester have been developed. In SKLEI multi-stresses aging test bases were set up, with which the aging investigations of generator winding insulation and transformer insulation have been performed under



Attendants to ICPADM 2000 held

single stress or multi-stresses such as electric, mechanical and thermal stresses simultaneously. On the basis of aging experimental results, a certain of new characteristic parameters representing the aged state of insulation were found, which have been employed for insulation diagnosis and residual lifetime estimation of power equipments. These research items are the key projects supported by National Natural Science Foundation and National Power Foundation.

So far the highest voltage of transmission in China is 500kV. In order to meet the requirements of rapid development of electric power industry, even higher voltage for transmission, for example 750kV in Northwest and 1000kV in other area, is going under planning and construction in China. SKLEI is making efforts to investigate the insulation theories of power equipments with even higher voltage grade, involving discharge characteristics of outdoor insulation, unusual discharge phenomena, optimal insulation design, and electric-magnetic effects, etc. Some of the preliminary studies for even higher voltage grade of electric power transmission are being undertaken in cooperation with relative research institutes. SKLEI has investigated the corona suppression technique and theory for the insulation systems of even higher voltage grade for many years, and made considerable headway.

The interest in SF_6 gas mixtures has been re-ignited in recent years by the issue of the greenhouse effect of the SF_6 gas. The research activity in SKLEI is now focused on SF_6/N_2 and SF_6/CO_2 gas mixtures, which is suitable for application in electrical apparatus with slightly non-uniform fields. The application of SF_6/N_2 and SF_6/CO_2 to transformer, where both highly non-uniform field problems and partial discharge in gas/film insulation are inevitable, is also investigated.

Most of research activities on dielectric theory were concerned with treeing and space charge effects. With extensive international cooperation, the installations

for measuring the space charge in solid or liquid dielectrics were set up, by using which a number of space charge effects in insulating system have been investigated in SKLEI. Also, the electric treeing phenomena was one of the important projects in this laboratory. According to the experimental results and theoretical analyses, the researchers of SKLEI put forward a low density region theory for the pre-breakdown of solid dielectrics, and proposed a series of approaches to treeing suppression and breakdown strength enhancement for XLPE cable insulation. Combining space charge effect with dielectric properties, interfacial effects in filled and reinforced polymeric composites have been studied in SKLEI, and a model for the dynamic process of interfacial space charge accumulation is put forward.

The functional materials and new insulating materials are of vital importance for developing high and new techniques. A part of researchers are engaged in the investigations on high permittivity-high voltage ceramic capacitors, linear and nonlinear ZnO resitors, power electronic device insulation, and insulation for unusual and extreme environment. These researchers developed a number of new products such as ceramic capacitors for the uniform of voltage distribution in high voltage circuit-breaker and arrester, different types of ZnO resister for power apparatus and electronics, self-regulating heating cable, fire-retardant cable insulation, etc, which are employed yet extensively in China.

Owing to the concerted efforts of staffs, SKLEI has received many awards such as national natural science awards, national science and technique progress awards and national invention awards.

SKLEI has persistently been attaching importance to international academic exchanges. In recent years, it has sponsored several international conferences including ICPADM (International Conference on Properties and Applications of Dielectric Materials),



at Xi'an Jiaotong University in June 21-26, 2000

Electrical Insulation in Vacuum), AICGD (Asian International Conference on Gaseous Discharge) and AICDEI&J-CEID (Asian International Conference on Dielectrics & Electrical Insulation and Japan-China Conference on Electrical Insulation Diagnosis), and established research cooperation with a number of universities and research institutes of Canada, UK, Germany and Japan, etc. It is worthy of special mention that SKLEI has close education and research cooperation with Nagoya University, Musashi Institute of Technology and Waseda University in Japan. SKLEI is open to the insulation researchers all over the world, and offers financial support to more

than 10 Chinese and foreign visiting scholars per annum to do research work in this laboratory.

EINA (Electrical Insulation News in Asia) has provided an opportunity for scientists and engineers in Asia to exchange research and development information, and is of great benefit to the people engaged in the field of electrical insulation. SKLEI would like to express its sincere gratitude to the editors of EINA for their great efforts, and hope that EINA will play an even more important role in creation of brilliant future of electrical insulation in Asia.

The Research on High Voltage and Insulation Technology in Tsinghua University

Guan Zhicheng
Tsinghua University, Beijing 100084, China

I am very glad to receive the E-mail from Professor Tatsuo Takada asking me to submit a manuscript to the 7th EINA for introducing the research activities on high voltage and insulation technology in Tsinghua University. It is a good opportunity for our research institute to make close links and active cooperation with other research institutes in Asia.

It is necessary to establish Future Communication Network for High Voltage, Electrical Insulation and Dielectrics in Asia based on world wide web site for scientists and engineers among Asia countries to exchange the latest information. Our research institute would like to joint the network actively.

High voltage and insulation technology research institute is one of six research institutes in the Department of electrical engineering and applied electronic technology of Tsinghua University. The other five research institutes are:

- Power Systems and its Automation
- Electrical Machines and its Control
- Power Electronic Techniques
- Theoretical Electrotechnics
- Biomedical Engineering and Instruments.

In the high voltage and insulation technology research institute there are 9 full professors, 8 associate professors, 7 lectures, 3 assistant teaches 3 technicians and 5 postdoctor research fellows. In 1999 in the high voltage and insulation research institute there are 24 doctor candidates, 67 master degree candidates and 18 part time master degree candidates. Each year 30 undergraduate students choice this research institute to do research projects for graduate theses.

In this research institute there are 6 research groups.

The name and research direction of each group is as follows:

1. Gas Discharge, Plasma and High power Pulsed Technology
 - Low temperature plasma
 - High power pulse technology
 - High temperature plasma and Z-pinch
 - Techniques and applications of photoelectronics



2. High Voltage Insulation and Composite Insulator
 - Discharge along polluted insulator
 - Composite insulators
 - Compact EHV transmission lines
 - Contaminated outdoor insulation in high altitude area
 - Application of discharge in environment engineering and biology technology
3. Insulation Detection and Diagnosis
 - Digital monitoring system for on-line partial discharge detection of power apparatus
 - Acoustic measuring system for partial discharge detection of power apparatus
 - Optical measuring technology for pressure and temperature of power apparatus
 - Signal processing methods applied to the measurements of partial discharge in power apparatus
4. High Voltage Measurement and Test
 - Dynamic performance of digital measuring system for high voltage transient signal acquisition
 - Impulse waveform recording and data processing system
 - Standard voltage divider for high voltage impulse measurement
 - Study on ozone generator and its application
5. Overvoltage in Power System and Insulation Coordination
 - Insulation coordination of gas insulated substations
 - Insulation coordination of ultra-high voltage systems and optimal design of transmission lines
 - Corona modeling for the calculation of transients on transmission lines
 - Study on substation grounding system
 - Lightning overvoltage protection

6. High Voltage Apparatus and Condition Monitoring
 - Inner fault detection of gas insulated switchgear
 - Mechano-electronic integrative detecting and diagnosing techniques for high voltage switchgear
 - DC and AC arc interruption
 - Study on switching characteristics of large capacity GTO

In 1999 there are 45 research projects are being studied and 98 papers are published in our research institute. We have received several research awards from central government. Now some international cooperation projects are being studied with overseas universities and companies. Welcome professors, scientists and engineers from foreign countries to visit our research institute to make close links and collaboration.



Guan Zhicheng

- Professor of high voltage and insulation technology research institute
 - Chairman of Academic committee for Department of Electrical Engineering and Applied Electronic technology
 - Vice President of Tsinghua University Council
 - Vice President of Chinese Society for Electrical Engineering
 - Vice President of China Electrotechnical Society
- Tel: +86-10-62771683
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 E-mail: guanzc@tsinghua.edu.cn

Stay in Xi'an Jiaotong University, China

Dr. Naohiro Hozumi

Toyohashi University of Technology, Toyohashi, Japan

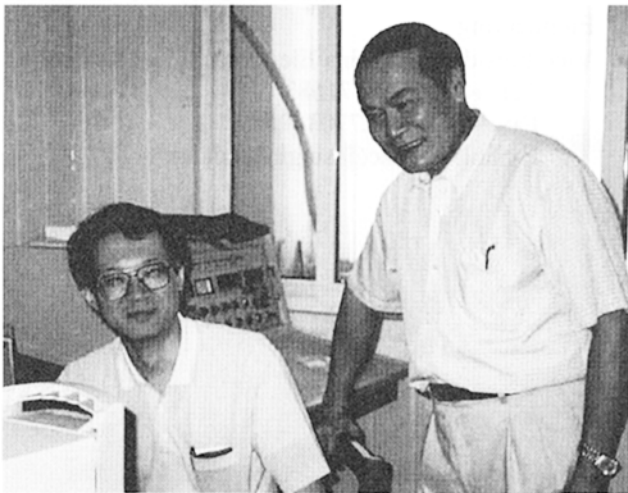
Staying in China had been my dream for a long time since I first time visited this country ten years ago. The dream has come true when Prof. Hengkun Xie kindly invited me as a visiting scholar at State Key Laboratory of Electrical Insulation Power Equipment in Xi'an Jiaotong University. I stayed there during this August and worked for partial discharge measurement of generator coils and simulation of partial discharge pattern considering discharge time-lag. Some of the achievement will be published soon.

This university, where two ICPADM meetings were held, is well known as one of the most advanced university in China on insulation field. Researches are carried out on "breakdown strength and discharge", "dielectric properties, measurement and insulation diagnostics", "insulating and functional materials" and "gaseous insulation". Most advanced facilities in the world are available at this lab. Around the campus was flooded with electronics and software shops so that students could purchase whatever component they want. Students I worked with worked very hard from early morning to late at night. It was impressive that they were so enthusiastic to learn something from me.

We often talked for a long time on measurement technique and analysis.

Although Xi'an is one of the major positions for the development of west China, there are very new and very old things at the same time. This circumstance was close to my hometown Kyoto, so I was very happy to go downtown by bicycle to enjoy both shopping for software and visiting historical places.

Chinese people were open minded and very friendly to me. It looked that they were proud of Chinese history and culture. I studied a lot about China when taking a rest at the lab. They like to teach something. In addition, I had a chance to take a lesson on Chinese language every day. Being able to speak some Chinese language is good for enjoying the life outside the campus. Some people became so friendly when they had known that I made a big effort in learning their language. Prof. Xie says he welcomes outstanding researchers from outside China. I strongly recommend young researchers to stay there and exchange technical information and friendship as well. You sure will be fun of China and Chinese people.



Prof. H.K.Xie (right) checks if the visiting scholar is working earnestly.



Doctor candidates Zh.D.Jia, X.W.Jiang and the author (center) talk about the research at the lab.

MISCELLANEOUS

Photos of Front and Rear Covers

Front cover:

The Kii Channel HVDC Link has been constructed to transmit electricity from the Tachibana Bay Coal Power Plants (3500MW) in Shikoku island to the Kansai area in the main island of Japan by the Kansai Electric Power Co., Inc, Shikoku Electric Power Co., Inc. and Electric Power Development Co., Ltd. It started operation in July 2000 and reinforced the interconnection between Shikoku and Kansai electric power systems.

From the Anan converter station to the Yura Switching Station, submarine cables (48km long) and land cables (2.7km long) were installed and from the Yura Switching Station to the Kihoku converter station, overhead lines were installed.

The upper left photo shows the beautiful sun set over Shikoku Island, seen from the Yura switching station side.

The lower right photo shows 500kV 3000mm² DC submarine cable (the largest in the world).

(The photos are offered by the Kansai Electric Power Co., Inc.)

System specification	Phase 1 (at present)	Phase 2 (in future)
Transmission capacity	1400MW	2800MW
Voltage	± 250kV	± 500kV
Current	2800A	2800A

Rear cover:

The charge distribution in degraded insulating wall of XLPE cable including water tree was measured using the pulsed electro-acoustic (PEA) method. When the dc high voltage is applied to XLPE including water tree, homo charges are observed around the tip of the water tree. The charge distribution was measured under 40kV DC voltage application. The red and blue rings stand for the induced charge by dc voltage application on the inner and outer electrodes, respectively. The blue (①~②) and red (③~⑥) regions show the existence of water trees. Comparison between the cross-section images and microscope photographs of water tree shows a good agreement between space charge formation and the water tree location.

(by Chikashi Takeya, Tatsuta Electric Wire and Cable. Co., Ltd.)

Application for Membership of IEEJ

A member of IEEJ receives a monthly journal (The Journal of The Institute of Electrical Engineers of Japan) and one transaction out of five (A: Fundamentals and Materials in which the activity of DEI is included, B: Power and Energy, C: Electronics, Information and System, D: Industry Applications, E: Sensors and Micromachines). The journal gives interesting readings about the latest science and technology in the field of Power Energy, Power Apparatus, Electronics, Information Engineering,

Materials and so on. The transaction gives review papers, research papers, letters and other information.

Total fee for joining IEEJ as a general member is ¥ 12,400 which consists of initiation fee ¥ 1,200, annual membership fee ¥ 10,000 and overseas postage of journal ¥ 1,200 (¥ : Japanese Yen).

When you need more information or an application form, you can request them from membership section of IEEJ.

Way for Purchasing Proceedings of IEEJ Technical Meetings and IEEJ Technical Reports

(1) Proceedings of Symposium on Electrical and Electronics Insulating Materials Systems
You can request it to the business and service section of IEEJ or photocopies of specified papers to the library of IEEJ. (The order form is free.)

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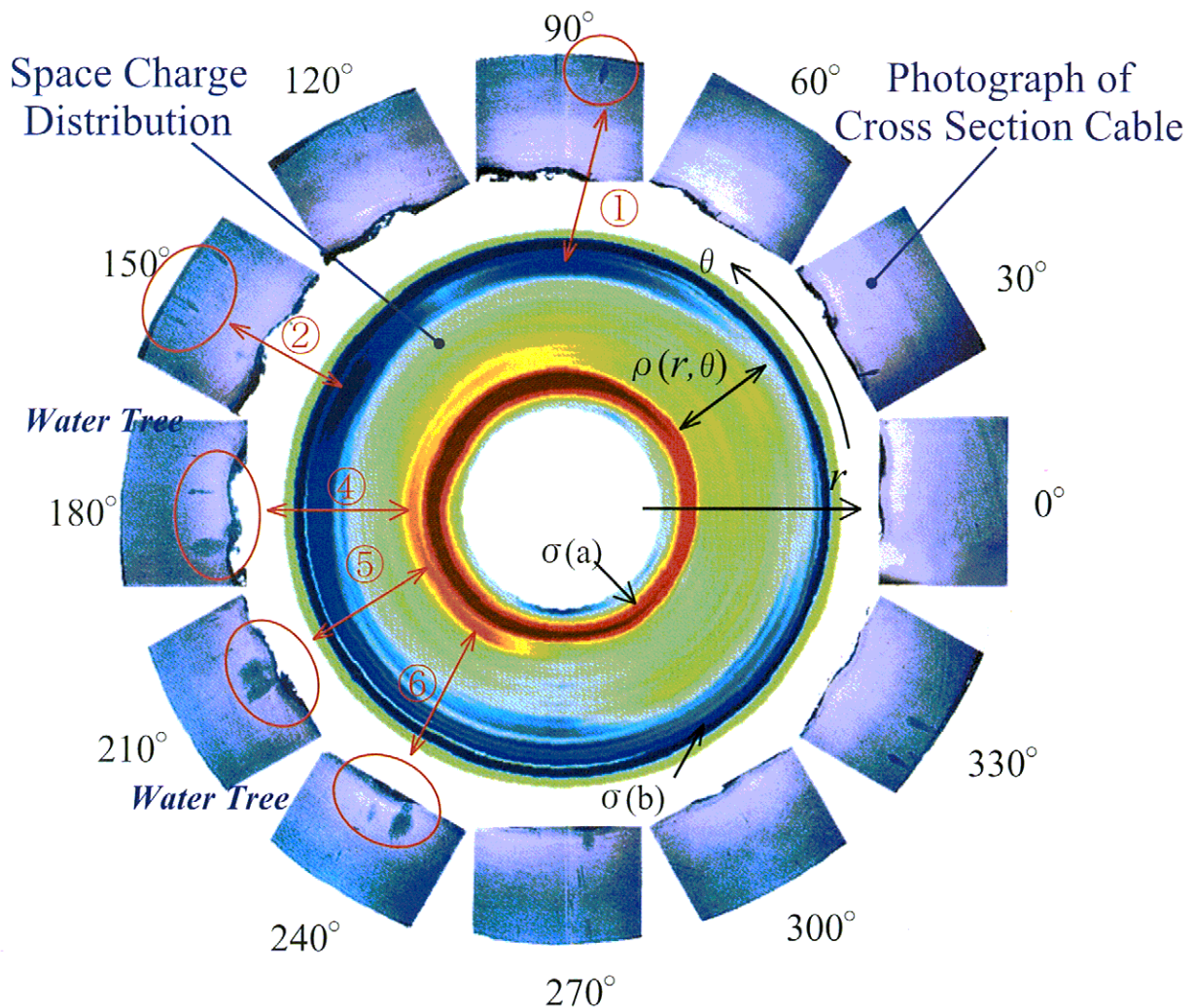
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