



5th IEEE International Conference on Dielectrics

Technical Program

Université Toulouse III - Paul Sabatier

Toulouse, France

June 30th - July 4th, 2024

IEEE Conference N° 59037X Website: https://ieee-icd.org/ June, 20th 2024 Sponsored by



Welcome to IEEE-ICD 2024

The 5th edition of ICD, the **International Conference of Dielectrics**, fully sponsored by the IEEE Dielectrics and Electrical Insulation Society, is taking place in Toulouse, France, **from Sunday 30th June 2024 until Thursday 4th July 2024**. Issued from the International Conference on Conduction and Breakdown in Solid Dielectrics (ICSD), ICD was initiated in Montpellier in 2016 with opening the door to liquid and gaseous dielectrics.

ICD is an interdisciplinary forum that provides a unique opportunity for researchers from industry, academia and research centers to come together to review their research activities. It covers researches in the field of insulating materials and dielectric phenomena, and on the behavior and properties of the electrical insulation in devices, under operational stresses. Topics of power devices as well as all systems involving insulations and dielectrics are covered. ICD fits into the current necessity to develop the electricity sector in the energy field and responds to the aspirations of lifestyles more respectful of our environment.

This 5th Edition of ICD comes after two Editions at the age of the Covid pandemic which made these editions tricky and stressful to organize. The 3rd Edition (Valencia, 2020) was the first conference fully online, with a format to imagine at the last minute. For the 4th edition (Palermo, 2022), a hybrid format was used due to uncertainties in the crisis. We are grateful to the organizers for having maintained a high standard to ICD under these circumstances and we hope that this edition, which is back to a fully in-presence attendance, will be the occasion to meeting again and develop friendship.

This conference series has a special relation with Toulouse, notably Laplace laboratory: it was created in Toulouse in 1983 under the name of International Conference on Conduction and Breakdown in Solid Dielectrics, and an edition returned to Toulouse in July 2004, on the occasion of its 20th anniversary. The venue to Toulouse for this 5th edition of ICD (and 16th edition combining ICD and ICSD) is on the grounds of the 40th anniversary of the series.

Toulouse is a major European City in the field of Aeronautics and Space, with Airbus headquarters. Toulouse, nicknamed 'Pink City', due to the color of the predominant bricks, also has a marked southern European feel and charm. It can be easily reached with 26 airline companies and 69 international destinations in 2023.

We hope that you will enjoy your time in Toulouse, that you will appreciate our rich program, that fruitful discussions will come and that this 5th Edition of ICD will be plainly successful.

Gilbert Teyssèdre General Chair of ICD 2024

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CONFERENCE PLACE

Conference Location

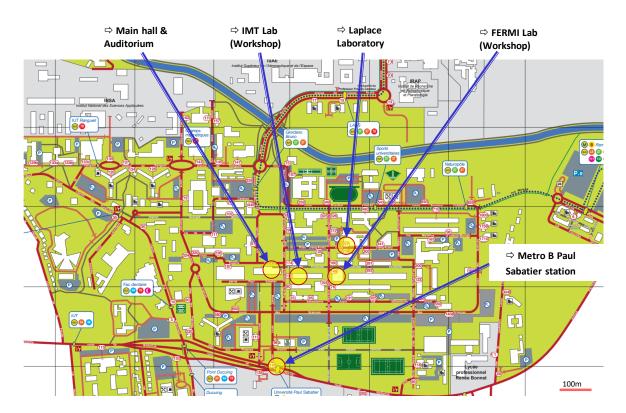
ICD 2024 is organized in the main hall of Université Toulouse III - Paul Sabatier, 118 route de Narbonne, 31400 Toulouse, France. A map of the campus is given below with reference to the Metro Station.

Plenary lectures will be given at the **Auditorium Marthe Condat**, which is situated in the main building of Université Toulouse III - Paul Sabatier. Breaks, lunches and Poster sessions are organized in spaces of the building Hall attached to the Auditorium. Workshops and Tutorial are organized on sites of the campus nearby the main Hall, respectively at IMT Lab, Fermi Lab and Laplace Lab.



Main University Hall and pictures of 500 seats - Marthe Condat Auditorium

All spaces are at walking distance from Paul Sabatier Station of metro B.



Venue and Accommodation

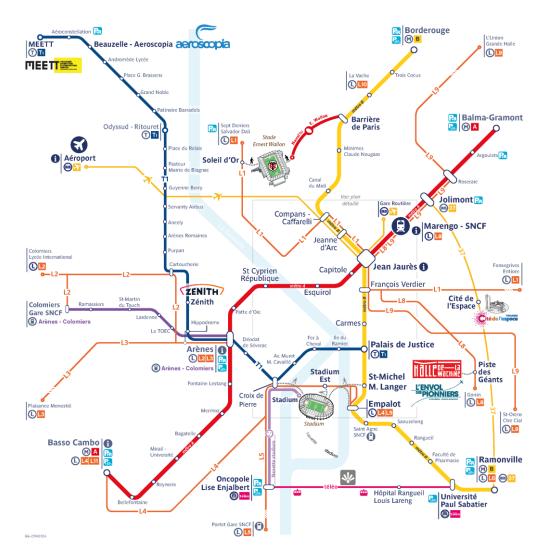
By Air: Toulouse-Blagnac Airport is situated at about 15km from the Conference Centre. It can be easily reached from abroad with 26 airline companies offering 69 international destinations in 2023. Major international hubs as Paris Charles de Gaulle, London Heathrow, Amsterdam, Munich, Frankfort... can be reached in less than 2h time.

Bus shuttles are available every 20min to reach Toulouse from the airport. It reaches metro line B - Compans Cafarelli station in about 20min.

https://www.toulouse.aeroport.fr/en/transports/public-transport

By Train: Direct trains from Lyon, Marseille, Bordeaux, Paris, etc. are available to reach Toulouse. From Paris Montparnasse 1 & 2 to Toulouse Matabiau, services depart five times a day, and operate every day. The journey takes approximately 4h20 min.

Toulouse Matabiau railway station is deserved by metro line A. Connection to metro line B is at Jean Jaures station (which is also at walking distance from the railway station)



By Metro: The Conference is organized at 300m from Paul Sabatier station of metro line B. There are two metro lines in Toulouse (Lines A and B – see map).

Hotels: Any hotel situated near metro line B is convenient to join the conference.

About Toulouse

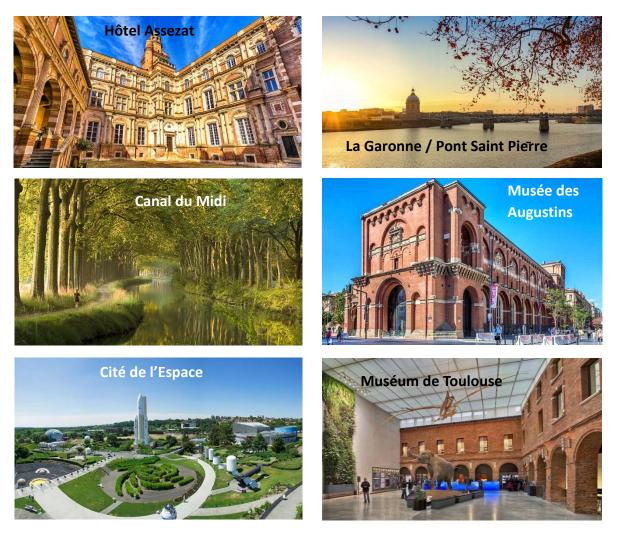
A city that combines heritage, innovation and lifestyle

Toulouse stands midway between France's Atlantic and Mediterranean coasts, not far north of the Pyrenean foothills. Capital of the Occitanie Region, the fourth largest town in France is an unmissable place.

Nicknamed *The Pink City*, due to the colour of the predominant bricks, Toulouse has a marked southern European feel and charm.

Visitors can enjoy exploring the city's historic streets on foot or by bike and discovering the place's many architectural treasures. These include: the mighty town hall, Le Capitole, overseeing a huge cafélined square marked by an Occitan cross, Saint Sernin Basilica and Les Jacobins, a profoundly significant former monastery now home to cultural events.

The Garonne's riverbanks, the Canal de Brienne and, of course, the Canal du Midi, offer visitors particularly lovely green routes through the city.



Excursions

On Wednesday, July 3rd in the afternoon, time is managed to let you discover our city. A lunchbox will be served to allow easy dispatching of the groups according to the activities chosen. Below is a short description of these activities.

Aeroscopia Museum, Blagnac

A circuit to get to know the museum and discover through the collection the roots of the history of Toulouse aeronautics. The visit is punctuated by stops around the historic fresco, the 3 emblematic planes of the museum but also under the planes, for more technical points such as the operation of the engines, flight controls...





Halle de la Machine

On the Piste des Géants, in the Montaudran district of Toulouse, the Halle de La Machine has opened its doors and presents the show machines of the Compagnie La Machine and François Delaroziere. The Halle de La Machine houses the Minotaur, created especially for Toulouse. On a daily basis, this monumental and singular machine takes the public on its back for unique journeys.

Guided visit of Toulouse downtown

Your guide-lecturer will reveal the secrets and traditions of the city, taking you from alleys to alleys, and from squares to squares, without ever neglecting the heritage, architectural and gastronomic elements: churches, remains, lines of buildings, anecdotes and culinary specialties. Outstanding places as Capitole Place, Assezat Hotel, Garonne river, etc will be presented to you.

Technical visit – EDF Bazacle

In the city centre of Toulouse, discover the EDF Bazacle spaces, this unusual 2000 m² place dedicated to the hydroelectric industry, historical heritage, local culture and also the biodiversity of the Garonne. A hydraulic power station in operation since 1888, the EDF Bazacle spaces offer you a diversified offer: a self-guided tour around energies, biodiversity, and permanent and temporary exhibitions... As highlight, the large panoramic terrace overlooking the Garonne with a breath-taking view of the city of Toulouse. Bonus: the Bazacle fish pass & its observation port to see, with a little luck, the migratory fish of the Garonne!



CONFERENCE COMMITTEES

Conference Officers

Gilbert Teyssedre — *Conference Chair* — CNRS, University of Toulouse, France
Davide Fabiani — *Vice-Chair* — University of Bologna, Italy
Kremena Makasheva — *Treasurer*— CNRS, University of Toulouse, France
Séverine Le Roy — *Technical Program Committee Chair* — CNRS, University of Toulouse, France

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Executive Committee ICD 2024

Davide Fabiani — *Executive Board Committee Chair* — University of Bologna, Italy
Gilbert Teyssedre — *Conference Chair* — CNRS, University of Toulouse, France
Kremena Makasheva — *Treasurer* — CNRS, University of Toulouse, France
Pascal Lorenz — *co-Treasurer* — IEEE France & University of Haute Alsace, France
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Laurent Boudou — *Publication Chair* — University of Toulouse, France
Laurent Berquez, Antoine Picot — *Local Arrangement Chairs* — University of Toulouse, France
Marie-Laure Locatelli — *Registration Chair* — CNRS, University of Toulouse, France
Virginie Griseri — *Publicity & Public Relation Chair* — University of Toulouse, France
Christina Villeneuve-Faure — *Exhibition/Sponsor Chair* — University of Toulouse, France
Frank Hegeler — *IEEE DEIS Meetings Committee Chair* — Naval Research Laboratory, USA

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Local organizing committee

The Executive Commitee along with: Jean-Louis Augé Christine Monnereau Christina Sara Antonella Hugo Gabriela Uribe Léo Provost

PARTICIPATION AND CONTRIBUTION TO ICD2024

Registration

Every registration opens to the participation to all the conference activities and includes lunches from Monday, July 1st to Thursday, July 4th, welcome cocktail on Sunday, June 30th evening, conference diner and excursion scheduled on Wednesday, July 3rd afternoon. Every registration includes also the presentation and submission of up to two papers having run through the reviewing procedure. Optional items concern participation to workshops and extra-page / extra-paper fees.

Companion persons can be registered, providing them access to the reception cocktail, the conference diner and the excursion on Wednesday, July 3rd afternoon. Participants are invited to choose their preferred meal for the banquet and to mention Dietary constrains at the registration step.

Registration through Conftool offers different ways of payment (Credit Card, AliPay, Bank transfer). The fees, given below, have been maintained as low as possible to permit access to the conference as broad as possible. Early bird registration is available up to June 1st, 2024.

Гуре	Early bird registration (€)	Late registration (€)
IEEE DEIS Member	480	530
IEEE Member	500	550
Non-Members	580	630
Student Attendee - IEEE Member	380	430
Student Attendee - Non-Member	430	480
IEEE Life Member	380	430
Workshop registration	80	80
Companion persons	150	150
Extra-paper fees	150	150
Extra-page	100	100

Practical aspects for participants

In an objective to limit the environmental fingerprint, we have managed to avoid transportation needs as much as possible and favored local production in our choice of meals, goods and services.

Welcome Desk and Access

The welcome desk, installed in the main building Hall, will be opened from 5:00 pm to 8:00 pm on Sunday, June 30th and from 8:00 am and on the following days (7:30 am on Monday, July 1st) for getting the conference kit and check in. Please be advised that, in order to comply with current rules, a **security check** is performed at the entrance of all buildings, mainly for bag contents.

Free transportation tickets available for all public transportation means as buses, metro and tram will be included with the conference kit and will be active up to Friday, July 5th. Thus, participants will have to reach the desk by their own means but don't need to anticipate transportation tickets for the duration of the conference.

Food and beverage

A welcome cocktail will be served from 6.00 pm to 8.00 pm in the main Hall of the Conference on Sunday, June 30th. **Lunches** will be served from Monday, July 1st to Thursday, July 4th in the main Hall of the Conference. Note that bringing food in the Auditorium is not allowed.

The **conference diner** will be held downtown Toulouse at Espaces Vanel, 1 Allées Jacques Chaban-Delmas, 31500 Toulouse, on Tuesday, July 2nd, starting at 7:00 pm. It can be accessed by walk along Allées Jean Jaurès from Metro line B, or directly from station Marengo of Metro line A.

Meetings of Sunday, June 30th

For participants to the workshops, an appointment is organized at 1:45 pm on Sunday, July 30th, at the main Hall. Please be aware that there is no lunch facility in the immediate area of the conference on Sunday. The exact addresses of the meetings held in the afternoon of Sunday, June 30th are the following:

Workshop on AFM method: (2:00 -5:00 pm) FERMI Laboratory, Building 3R4, Conference room. Contact: kremena.makasheva@laplace.univ-tlse.fr; sombel.diaham@laplace.univ-tlse.fr

Workshop on Green Materials: (2:00 -5:00 pm) Institute of Mathematics, Building 1R3, Amphitheatre Schwartz. Contact: severine.leroy@laplace.univ-tlse.fr; gilbert.teyssedre@laplace.univ-tlse.fr

DEIS AdCom meeting: (1:30 -5:00 pm) Laplace Laboratory, Building 3R2, Seminar Rooms. Contact: virginie.griseri@laplace.univ-tlse.fr

Excursions

Upon registration, participants are asked to choose among available activities proposed for the Wednesday, July 3rd in the afternoon. We have tried to meet their expectancy in the limit of available places. See section Excursion for a short description of the activities.

Activity
Aeroscopia Museum, Blagnac
La Halle de la Machine, Toulouse Montaudran
Guided visit of Toulouse downtown
Technical visit – EDF Bazacle
Not available / interested

A take away lunch is organized after the last Session on Wednesday, July 3rd in the morning. Buses will depart from the main Hall to reach the Aeroscopia Museum and Halle de la Machine. Exact meeting time will be given on-site. For the other activities which are downtown Toulouse, the meeting point for the visits will be in the City. Announcements will be achieved at the conference.

Wi-fi

The conference hall and all the facilities of the Université Toulouse III - Paul Sabatier campus are equipped with Wi-fi connection. Participants having **Eduroam credentials** can in principle connect directly. In addition, the Wi-fi of the University will be made available for participants. The codes for the Wi-fi are individualized and will be provided with the registration kit.

Practical information for Authors

Key dates

Conference Dates: Sunday, June 30th, 2:00 pm to Thursday, July 4th, 4:30 pm. The Sunday, June 30th afternoon is dedicated to Workshops. The registration will be open on Sunday, June 30th at 5:00 pm and at the desk during the conference.

Abstracts:Submission deadline:15/11/2023Acceptance notification:21/12/2023Full papers:Submission deadline:30/03/2024Acceptance notification:20/04/2024Provision of final version31/05/2024

Presentations

All presentations are with physical attendance to the conference. Registration is required and opens to the presentation of up to two papers. The publication of the paper in IEEE Xplore is committed to the effective presentation of the paper at the conference.

Oral presentations

Oral presentations for regular sessions are expected to **last 20 min, including questions** (maximum 15 min for the presentation and 5 min for the questions). Presenters can use the house style of their institution for slides and provide either a PPT or PDF file. **The file should use the format 16:9.** The format 4:3 is inacceptable, otherwise the slides will be truncated. Each speaker will be asked to upload his/her presentation by means of a USB memory stick at least 30 minutes prior to the opening of the respective Oral Session.

Poster presentations

The size of the poster should be **A0 (118.9 x 84.1 cm)**. Please arrange text and figures in vertical order (portrait). Posters fixing utensils will be provided for you to use in fixing your paper on the poster board. We don't offer service for Poster printing.

The collection of accepted papers will be published in IEEE-Xplore provided presentation has been effectively achieved at the conference. A copyright agreement has to be signed online using the Conftool account.

History of the contribution campaign

Call for papers

The call for papers was launched in August 2023. Vectors used were first the list of contributors to the 2022 Edition, to which bulk mails were sent using Conftool. A second main vector was e-notice proposed by IEEE in direction of DEIS members. The call was published in the IEEE Electrical Insulation magazine. Finally, members of the Executive and Technical Program Committees were invited to advertise about ICD in conference and in their networks.

Abstracts campaign

The campaign for abstract deposit started at the beginning of September 2023 and end-up in mid-November 2023. The reviewing step was organized by the Technical Program Committee. One page abstracts had to be submitted online using Conftool at: https://www.conftool.pro/icd2024/. The instructions and the template are available on the ICD web site https://ieee-icd.org/

Not less than 423 abstracts were received and distributed to the 17 members of the TPC. Each member had in charge to find at least two reviewers for a set of roughly 25 abstracts. Reviewers were chosen among reviews of previous edition of ICD, among new submitters having at least the title of Doctor, and among new reviewers designated on purpose by the TPCs. A pool of nearly 250 reviewers was so created. Up to 8 abstracts could be attributed to each reviewer and the vast majority of them had at least 1 paper assigned.

The abstracts were evaluated based on the soundness of the work, the originality, the English expression, etc. The abstracts having obtained low marks were discussed among the TPC members to take a decision about acceptance. In fine, 410 abstracts were accepted and the authors were informed on December, 20th, 2023. Instructions for the next steps were sent at the same time.

Paper collection campaign

Authors of accepted abstracts were asked to submit their full paper online. The template for paper submission was available at the Authors section of the ICD Website. This electronic document is a "live" template and already defines most of the components of your paper [title, text, heads, etc.] in its style sheet. The paper had to be limited to 4 pages in length, in English. The first deadline for paper submission was set to March, 15th, 2023. Relatively early deadline has been set as we wished to anticipate higher activity in Consulates for providing Visas due to Olympic Games organized in France in Summer 2024. Accordingly, we acted at optimizing the time between paper submission and final decision. The deadline was postponed once up to end-March 2024. To save time and secure information, a copy of the data provided at the abstract submission step has been done, serving as basis for the paper submission with as index ID1xxx for abstract IDxxx. The second important point is that the vast majority of reviewers already assigned to abstracts were contacted to realize the reviewing of papers. Thus, time was saved at the reviewer selection step.

Thanks to all efforts achieved by the TPC and the reviewers, formal acceptance of papers could be dispatched by 20th of April 2024 and submission of revised papers ended up by the 10th of May. This paper campaign ended up with about 320 papers accepted, some withdrawals occuring before the paper submission step. A second phase of paper management came with strict control of homogeneity of papers vis template, checking of compatibility with IEEE standard and finally gathering Copyright Agreements through the Conftool application. At the final submission stage, IEEE PDF eXpress service is used to help authors convert and check their papers.

The acceptance as oral / poster presentation was dispatched by the end of May 2024 during program construction. The proposed program listed in this document contains about 300 contributions having followed all these selection steps. We would like to point on the high efficiency and robustness of the Conftool tool to manage all the conference data (paper collection and registration management), along with the reactivity of the team providing the service.

Conference Support and Sponsors

The 5th IEEE ICD 2024 is Financially managed by **IEEE France Section**.



IEEE ICD 2024 is **DEIS** fully financially sponsored conference.



Acknowledgement to Sponsors

Several partners have supported ICD under various forms and we warmly thank them for that. These are:

-Laplace Laboratory, to which most of the Organizers belong. Laplace is a joint research unit between Centre National de la Recherche Scientifique (CNRS), Université Toulouse III - Paul Sabatier and Institut National Polytechnique de Toulouse;

-Université Toulouse III - Paul Sabatier, the hosting organization the Conference;

-Technological Research Institute (IRT) Saint-Exupery, acting for research transfer toward aeronautic and space industries;

-**Safran company**, an international high-technology group operating in the fields of aeronautics (propulsion, equipment and interiors), space and defense;

-Federation Fermat, a structure supporting interdisciplinary research between 9 laboratories having activities in Engineering within Université Fédérale de Toulouse;

-Bruker Company, a manufacturer of scientific instruments for molecular and materials research, as well as for industrial and applied analysis;

-Toulouse Convention Bureau, a local organization specialized in supporting professional events.





Information from the DEIS

DEIS Graduate Fellowship

The graduate fellowship, established by the Dielectrics and Electrical Insulation Society (DEIS), is a prestigious grant and enables its winners to further explore a research topic in the areas of electrical insulation and dielectric phenomena. The fellowship aims at students pursuing their Ph.D. degree and is awarded for a one-year research topic aside (but close to) the larger research project of the applicant. **The anticipated award for 2024 is up to FIVE fellowships of up to US\$ 5000 each.**

2024 Call

Applications for the "2024 DEIS Graduate Student Fellowship Award" are invited from graduate students in the general areas of electrical insulation and dielectric phenomena. The application is done by sending a research proposal document to the Educational Committee Chair: Prof. Christian M. FRANCK, cfranck@ethz.ch Receipt of application will be confirmed via mail. In case you don't hear back within 1 week after submission, please check back with committee chair. The document (maximum 3 pages) must contain a detailed but concise description and plan of this research topic. Please see details at the DEIS Graduate Fellowship call.

The call is open for applicants from all over the world, but the applicant must be a student member of IEEE and member of DEIS (or have applied for a student membership in IEEE at the time of application submission). Priority will be given to those applicants for who the main advisor is also a DEIS member. Previous recipients of this award are not eligible for consideration. Only one proposal per research group per year is recommended. **The deadline for submitting proposals is September 1**st, **2024**.

Awards will apply to the 2024–2025 academic year. The award notification to the successful applicants is expected to be made in late November 2024.

DEIS Graduate Fellowship at IEEE-ICD2024

One of the duties of awarded Fellowships is the presentation at one DEIS conference of the results of the research. This is a condition for getting the second installment of the grant.

For this Edition of ICD, we will have the pleasure to welcome the presentations of 3 awardees:

- Haoliang Liu (Call 2023), Tianjin University, China: Space charge measurement of polymer dielectrics in strong magnetic field based on current integral method.
- Rohith SANGINENI (Call 2022), IIT Guwahati, Guwahati, India: A Robust, cost-effective, portable and non-invasive device for condition assessment of liquid insulation.
- Duvan MENDOZA-LOPEZ (Call 2021), Université Toulouse III Paul Sabatier, France: Study of charge trapping phenomena by coupled LIMM and PSD measurements in BOPP thin films.

Young Professionals in DEIS

The DEIS Young Professionals Affinity Group is dedicated to supporting post-student members who are within 15 years of receiving their first professional degree. As the future of the Dielectric and Electrical Insulation Society (DEIS) hinges on the engagement of younger and early-career members, our primary goal is to inspire and inform DEIS-YPs on both technical and non-technical subjects, fostering their interest and active participation within the society.

There are several activities organized by DEIS-YP:

- Streaming monthly webinars;
- YP Luncheon at all DEIS-sponsored conferences, including ICD, scheduled for Monday, July 2^{nd} , 2024 at this ICD Edition;
- Launch and preparation of the CEIDP centennial celebration flip book, available at https://www.ieee.org/ns/periodicals/DEIS/eBook/index.html

These initiatives boom on the involvement of our society's members. Stay connected and follow us on **LinkedIn** at for the latest updates and event details relevant to DEIS-YPs. See also the DEIS website **DEIS-YP** for a broader description of our activities.

Contact: Mattewos TEFFERI mattewos@ieee.org

Women in Engineering

Vision



The IEEE DEIS Women in Engineering (WIE) envisions creating a diverse, inclusive, and innovative community within dielectrics and electrical insulation. Despite having a relatively small membership of around 1,800, with women

making up approximately 7%, the goal is to expand the network and support women professionals. This aims to foster an environment where women can excel and significantly contribute to technological advancements, particularly in high-voltage engineering, a field often lacking visibility and representation. The ultimate goal is to be recognized as a symbol of empowerment and excellence, driving a brighter and more inclusive future.

Mission

The mission of DEIS WIE is to advance inclusivity and innovation and the focus is on increasing female participation in DEIS activities and conferences. This includes disseminating information, engaging individuals globally through webinars, workshops, social media campaigns, and sharing success stories. By highlighting and supporting women's contributions, especially in high-voltage engineering, the mission aims to provide support, mentorship, and recognition, nurturing future leaders and promoting greater diversity and inclusion in the community.

If you're ready to be a trailblazer and leave an indelible mark on the engineering community, join us today! Send an email to us expressing your interest and briefly describing why you would be an asset to the DEIS WIE committee.

Links: Website LinkedIn Youtube Instagram

Contact: Sneha Satish HEGDE, Chair of IEEE DEIS WiE: sneha.hegde@ieee.org

3rd Thematic School on Dielectrics

After 2018 and 2021, the **3rd Thematic School on Dielectrics** is organized in **Porquerolles island**, South of France, from **September 15th – 20th, 2024**.

This Thematic School, fully in English to welcome people from everywhere, intends to train Scientists, Researchers, PhD students, Engineers and Technical staff coming from both Academia and Industry and all interested in the field of Dielectrics and Electrical Insulation from fundamental basics to applications in electrical and electronic engineering.

For this 3rd edition, the School will be focused on **Multifunctional Composite Insulating Materials for Electrical Applications** covering a broad range of sub-topics in the field of composites and nanocomposites.

We wish to maintain what made the originality and strength of the two previous editions: the intervention of renowned researchers through plenary lectures, the international openness and the articulation of courses with situational approaches through practical works / workshops. These labwork, brought specifically on-site, will cover the use of modelling tools as well as supporting experimentation for dielectric characterizations.

We are pleased to confirm some of our Distinguished Lecturers:

- Prof. Nick QUIRKE, Imperial College London, UK
- Prof. Andrea CAVALLINI, University of Bologna, Italy
- Prof. Masahiro KOZAKO, Kyushu Institute of Technology, Japan
- Assoc.-Prof. Thomas ANDRITSCH, University of Southampton, UK
- Drs. Marie-Paule BESLAND, CNRS, University of Nantes, France

Information on the program is available on the Thematic School website: https://seedsschool2024.sciencesconf.org/

Registration

The registration to the school is open, with as **deadline July**, **31**st, **2024**. Due to limited accommodation facilities, pre-registration is required. You can now pre-register by filling the form to download on the website and sending it back at: **seedsschool2024@sciencesconf.org**

Do not hesitate to advertise this event through your professional network and to come back to us for any further information at the occasion of the IEEE ICD-2024 conference.

We are looking forward to seeing you in Porquerolles Island, South of France, from 15 to 20 September 2024.

The organizing committee

Assoc-Prof. Sombel DIAHAM, University of Toulouse, LAPLACE.

Dr. Gilbert TEYSSEDRE, CNRS Toulouse, LAPLACE.

Prof. Petru NOTINGHER, University of Montpellier, IES.

PROGRAM OF ICD 2024

The timetable of the IEEE ICD 2024 Conference program is provided below and the contents of the various events are detailed in the following sections.

		Sunda 30/06/20		Monday 01/07/2024	Tuesday 02/07/2024	Wednesday 03/07/2024	Thursday 04/07/2024	Friday 05/07/2024		
8:00am – 8:15am				Registration	Registration	Registration	Registration			
8:15am – 8:30am 8:30am – 9:00am			Opening Session	-	Oral session 3 Special session	Oral session 6 Advanced and	Dakin award Lecture			
9:00am-10:00am						Eric Foster Memorial Lecture	Aeronautics	functional materials	Oral session 7 Nanodielectrics	
10:00am-10:30am				Break	Break	Break	Break	Tutorial PEA Cable		
10:30am-12:30pm				Oral session 1 Materials in insulation systems	Oral session 4 Modelling	Poster sessions 3 YR contest	Poster sessions 4 (//)	(9:00am- 01:00pm)		
12:30pm-02:00pm				Lunch	Lunch Young Professional Event	Lunch box	Lunch IAC meeting			
02:00pm-04:00pm	n (1:30 5:00pm)	DEIS AdCom (1:30 5:00pm) Workshop 1 AFM for Characterization of Dielectrics at Nanoscale Workshon 2	Workshop 2 Eco-friendly materials in electrical insulation	Oral session 2 Space charge and related effects	Oral session 5 Diagnostic methods	Excursion	Oral session 8 Ageing, degradation and breakdown			
04:00pm-04:30pm	AdCol		for Chi	-friend -friend	Break	Break	Excursion	YR Awards CLOSING SESSION		
→ 05:00pm	DEIS		Eco							
		Registrat	Registration Poster sessions 1		Poster sessions 2 (//)					
	Registration Welcome Cocktail		tion	<i>U</i> //						
→ 06:30pm			ocktail							
					GALA DINNER + WiE event					

Two Workshops will be held on the first day of the conference, dealing with application of AFM-based method to the characterization of dielectric materials and to Green materials in electrical engineering.

Two lectures will be given awarding scientists from our community for outstanding contributions: **The Eric O Forster memorial lecture** which is an award of the IEEE-ICD conference series, and the **Dakin award**, which is a DEIS award.

As traditional now with ICD, papers cover all areas of solid, liquid and gas dielectrics. There are no dedicated sessions to specific dielectric media. Instead, regular sessions are split by scientific approach: materials, development, experiments, modelling, diagnosis, etc. A special session dedicated to Dielectrics in aeronautics is organized as it is a domain in which Toulouse has substantial activity. An invited speaker from Airbus company will initiate the session. A total of 41 regular oral presentations will be given in 7 regular oral sessions plus de special one.

Regular Poster presentations are organized in 3 time windows of 2 h each with 3 sessions in each of them. This is complemented by a 4th set of sessions held on Wednesday morning fully dedicated to the young researchers' contest.

The **Young Researchers' Contest** is an innovation of this ICD Edition, with 3 prizes being distributed during the closing session. Another innovation is the distinction of one person having acting for the promotion of **Women in Engineering**. This will occur during the conference diner.

Young Professionals will communicate on their activities on Tuesday July 1st, before the afternoon session.

The Eric Forster Memorial Lecture

Eric Forster was one of the founding fathers for the ICSD/ICD conference series. The Eric O. FORSTER Memorial Lecture is a prestigious lecture given at the opening of the conference. It honors a scientist for his outstanding contribution to the field of dielectrics. For the 2024 edition, Dr Christian FRANCK from ETH Zürich, Switzerland will be awarded.

Green Developments in Gaseous Insulation Systems

Christian M. FRANCK

Abstract

Climate change, pollution, and limited material resources are some of the most pressing global problems that need to be urgently addressed and will entail a fundamental change in the way modern societies operate. Our community of dielectric and electrical insulation experts has accepted to tackle these challenges and is increasingly working on finding solution.

This Eric O. FORSTER Memorial Lecture aims to give an introduction into the challenges that we're facing with respect to gaseous insulation systems and to give an overview on current trends in research and development, as well as on achievements of the past decade. The lecture closes by highlighting future trends and making societal questions explicit that need to be debated in parallel to the technical developments.

Biography



Christian Michael FRANCK (Senior Member of IEEE) was born in Bonn, Germany in February 1973. He studied physics in Bonn, Edinburgh (Scotland) and Kiel (Germany), where he received his diploma degree from the University of Kiel in 1999. Afterwards he worked at the Max Planck-Institute for Plasma Physics and the University of Greifswald, Germany. Under the supervision of Prof. KLINGER, he performed research in the area of electromagnetic wave propagation in magnetized plasmas, receiving his Ph.D. in experimental physics in 2003.

From 2003 to 2009, he was with the ABB Swiss Corporate Research Center, Baden-Dattwil, Switzerland, as a scientist and later as a group leader for gas circuit breakers and high-voltage systems. In January 2010

he joined ETH Zurich as Assistant Professor. He was promoted to Associate Professor in June 2015 and to Full Professor in March 2020.

His current main research interests include gaseous insulation and switching arcs, with focus on SF_{6} -alternatives, and solid insulation systems, with emphasis on their resilience to HVDC and mixed electrical stresses, as well as overhead powerline corona.

He served as convenor for CIGRE JWG A3/B4.34 and WG D1.67. He is the chair of the IEEE-DEIS Education Committee since January 2023.

The Thomas W. Dakin Distinguished Technical Contribution Award Lecture

The Dakin award, which was first given in 1978, is named in honor of the late Thomas W. DAKIN, one of the most distinguished scientists in our field. Tom Dakin was a life-long employee of Westinghouse Electric and was a key figure in the development of new insulation systems for capacitors and rotating machines. Every two years, the IEEE Dielectrics and Electrical Insulation Society selects a researcher to recognize outstanding, original technical contributions, as evidenced by their sustained impact in advancing the science and technology of dielectrics and electrical insulation.

For the year 2024, the T.W. DAKIN award was attributed to Prof. Yoshimichi OHKI, from Waseda University, Japan. Prof. OHKI provided us the honor to choose ICD-2024 for giving his lecture.

Attracted to Dielectric Materials Research

Yoshimichi Онкі

Abstract

"Dielectric" literally means a substance attracted to electricity in Japanese. The title of the Dakin Award Presentation is tentatively "Attracted to Dielectric Materials Research". The presentation title and the word "dielectric" rhyme with "attracted to." The presenter will introduce some research he has been "attracted to." Although the research fields to talk about are still not fixed, they probably include surface flashover in a vacuum, radiation effects on silica optical fiber, functional inorganic materials, nanocomposites, and degradation mechanisms of polymers.

Biography



Yoshimichi OHKI (Life Fellow of IEEE and Fellow of IEE Japan) was born in Amagasaki, Japan in December 1950. He received the Dr. Eng. degree from Waseda University in 1978. He is currently a Senior Research Professor and Professor Emeritus at Waseda University. He is also an Honorary Professor at Xi'an Jiaotong University, China. He was a Visiting Scientist at MIT, USA from 1982 to 1984 and a Senior Fellow of the Japan Science and Technology Agency from 2006 to 2008.

He was the President of the Japanese Electrotechnical Committee from 2015 to 2019. He was a recipient of many awards, including the IEEE-DEIS Whitehead Memorial Lecture Award and Eric O. FORSTER Award, the

IEE-Japan Outstanding Achievement Award (two times), the Prize for Science and Technology awarded by the Minister of Education of Japan, and the Okuma Memorial Academic Award and the Research Award (six times) from Waseda University. He has written many papers; 728 listed in Scopus with 14,363 citations and an H-index of 54, as of April 2024.

Women in Engineering: Distinction

This event is scheduled during the Conference Diner, Tuesday, July 2nd, in the evening.

As an innovative action within ICD, the Executive Committee of ICD-2024 wished to put forward the involvement of Women in our research fields. Already within the Executive Committee, the gender equilibrated representation was achieved. Along with the WiE group at DEIS, the idea of rewarding a person who has significant action for promoting the involvement of Women in Engineering has emerged. It will be in the form of an event during the Conference dinner, with awarding of a recognition mark to Prof. Florence SEDES.

Prof. Florence SEDES



Professor of Computer Science at the Faculty of Sciences, University Toulouse III - Paul Sabatier, in the research area of data science, Prof. SEDES is active in database and information system research since 1987. She has published over one hundred papers, books and book chapters and has been leading international, European and national projects on personal (meta)data privacy and management, CCTV and forensic, IoT and security, geospatial and indoor/outdoor data, and social networks, with applications via deep/machine learning for alert, spam detection, social emotion and interaction. She has been heavily involved in designing data sets and

platforms in order to enable assessment of the various contributions, software and systems of our community.

Her research addresses notably gender imbalance and biases in AI.

IEEE Senior member, she is co-founder –and **IEEE President of the French Chapter of Women in Engineering**. From 2020 to 2024 she was Vice deputy chairwoman for Societal Responsibility and Sustainable Development at our University. She is a board member, in charge of Women in Informatics at the French Computer Science Society. She is a board member of Femmes & Sciences, the French Women and Science society.

Her first ambition for the WiE French Chapter is that for each event organized by IEEE France Section, people carrying a real message of inclusion, are present, visible, highlighting their skills and responsibilities and not being just a representation. Her second wish is to establish a culture of gender equality within the IEEE France Section, being internally through the recognition of the WiE stamp, and externally, why not, through the signing of a charter promoting equality between women and men, which would mark women adherence to certain values and certain operating processes. The third wish is at the generational step, the earlier the better: supporting and encouraging the development of the student branches of WiE. Her ultimate wish will be to work on these issues in France, of course, but also in the heart of Region 8 which brings together Europe, the Middle East and Africa.

We address our recognition to Prof. Florence SEDES, for her achievements for the promotion of Women in Engineering and for the encouragement and source of inspiration she represents for Women in our fields of activities. We look forward for listening about her vision and count on her incitation both for French women to be involved in the French Chapter and foreigner ones to launch actions in their country.

Special session on Insulations in Aeronautic Environment

Since the invention of the first aircraft, attributed to Clément ADER at the end of the 19th century, Toulouse has successfully set out to conquer the skies, positioning itself as a leader in aeronautics activities. Many mythical aircrafts have taken off from Toulouse, and companies have developed civil and commercial air transport. The Aeropostale story and the famous supersonic aircraft known as the Concorde participate in this heritage. Certainly one of the greatest achievements was the Airbus company who has his headquarters in Toulouse. Electrification of aircraft is constantly increasing, and this naturally provides activities in our field, the reasons why we proposed this special session. As introductory talk, an invited lecture, given by Dr Jean RIVENC, from Airbus SAS, France is scheduled.

Physical phenomena and challenges in electrical insulation for airborne applications

Jean RIVENC

Synopsis

The purpose of the talk is to give an overview of physical phenomena and challenges in electric insulation systems for airborne applications. First of all, the general context will be remembered. The embedded electric power is expected to significantly increase in future aircrafts. In order to manage this increase, while limiting the mass and volume of electric conductors, there is a need to increase the voltage. However, the transition to higher voltages in airborne applications is a real challenge.

In this lecture, concrete examples will be presented. Examples of questions, which will be discussed during the presentation, are: how to design a partial-discharge-free cable? How to test a complex equipment, like a converter, with respect to partial discharges? How to determine creepage distances at high altitude? Is there a need to take the space charge phenomenon into account in sizing of the electric insulation system, or can it be neglected? What is the aging effect on dielectric performances, and how to demonstrate that no electrical insulation failure will occur for a 30 years' application?

We will try to bring - at least partially - answers to these questions, to share our vision on how to manage the electrical insulation and to give perspectives in order to design a safe and reliable insulation system for airborne applications.



Jean RIVENC was born in Toulouse, France, in 1973. He received the Ph.D. degree in applied science from Paul Sabatier University, Toulouse, in 1998. During his Ph.D. studies, he worked on electrostatics, dielectrics, and electrical insulation, and was a Visiting Engineer at the Massachusetts Institute of Technology, Cambridge, MA, USA. From 1998 to 2013, he was an Engineer at Renault, Paris, France, where he managed a team and a laboratory in the field of electrical and electronics systems reliability. He tested various systems with respect to physicochemical environment and hazards linked to electronics failures. Since 2013, he has been with Airbus Group, Toulouse, as a Research Engineer, in the field of electromagnetic compatibility, power electronics, and composite materials. He is currently

expert in High Voltage, Partial discharges, Arc and Plasmas Technologies.

Young Researchers' Contest

The DEIS strongly supports distribution of prizes to young professionals

The Executive Committee of ICD, with support from the DEIS Educational Committee and from the DEIS Young Professionals Committee, has set up a Young Researchers Contest to encourage the participation of students and young researchers in the conference. An award of 500€ per winner will be distributed

Proven full-time engineering and science researchers and PhD students from academia as well as industry are encouraged to participate. In order to promote the involvement of the last generation of researchers into the DEIS community, and to stimulate the emergence of talented early stage researchers, candidates being within five years after their graduation are privileged. Besides the condition on seniority, candidates must be first author of their paper and commit to present it in person to participate to this contest.

Young researchers are kindly requested to "tick" a check case at the abstract/paper submission steps. Candidates whose papers are preselected based on regular reviewing will be invited to present their papers at the conference. An independent Jury, constituted of 7 members, presided by Prof. Davide FABIANI will establish a classification. Prizes will be awarded to the authors of the best contributions during the closing session of the conference.

Three prizes will be distributed, awarding

- The Best Paper
- The Best Oral Presentation
- The Best Poster Presentation

About 80 papers are finally in competition for the prizes.

The Best Paper will be selected based on the re-evaluation of the top 20 papers marked during the reviewing phase.

Jury members of the Young Researchers' Contest

Davide FABIANI, University of Bologna, Italy Sneha EDGE, Laboratoire Ampere, France Nandini GUPTA, IIT Kanpur, India Akiko KUMADA, The University of Tokyo, Japan Peter MORSHUIS, Solid Dielectric Solutions, Netherland Christina VILLENEUVE FAURE, University of Toulouse, France Yewen ZHANG, Tongji University, Shanghai, China

Regarding the competition for Best Oral prize, it will be among papers selected for an oral when building the conference program. Those papers are spread in regular sessions. 15 papers are in competition. For electing the winner, the session chairs and the jury will complete an evaluation procedure based on the oral performance.

Finally, the Poster session dedicated to the Young Researchers Contest is organized on Wednesday, July 3rd, in the morning. About 65 papers will be presented and evaluated in this session.

Workshops

Ahead of the conference, two Workshops, accessible upon registration, are organized in parallel. The following topics have been selected:

I. Atomic Force Microscopy for characterization of dielectrics at nanoscale.

This workshop is held Sunday, June 30th, 2.00 pm-5.00 pm, Conference room of FERMI Laboratory, Building 3R4.

The workshop is proposed by the IEEE DEIS Technical Committee on Nanodielectrics in coordination with the IEEE Nanotechnology Council. A presentation of the activities of the two bodies will be given in the beginning. Then the floor will be given to 3 speakers treating different aspects of the AFM:

1. 'Nanomechanical properties of polymer based nanocomposites' by Dr. Nadine LAHOUD DIGNAT, associate professor at Université de Toulouse since 2013. Nadine has a M.SC degree in polymer materials science from Université Claude Bernard Lyon1 and a Ph.D. degree in materials for electrical engineering from Université de Toulouse, France. Her research work concerns the ageing of polymer electrical insulation as well as the multiscale characterization of nanodielectrics. Her presentation will focus on the importance of a nanoscale characterization in the case of nanodielectrics. Particularly, the use of the atomic force microscopy (AFM) in order to characterize the mechanical properties of the different components within nanocomposite materials will be developed.



Contact: nadine.lahoud@laplace.univ-tlse.fr

2. **'Nanocomposite electrical probing at nanoscale'** by Dr Christina VILLENEUVE-FAURE from LAPLACE (CNRS, UTIII, University of Toulouse). Christina Villeneuve-Faure received an engineering degree in materials and nanophysics from Institut National Polytechnique de Grenoble in 2004 and the Ph.D. degree in materials physics from the University of Toulouse in 2007. After 4 years' post-doctoral position in LAAS-CNRS on MEMS reliability she is, since 2011, associate professor in LAPLACE, France. Her researches focus on AFM characterization of electrical properties of thin dielectric and semiconductor films. She developed methodologies combining AFM measurements and



Finite Element Model to simulate to determine quantitative dielectric properties, such as dielectric permittivity, at nanoscale.

Contact: christina.villeneuve@laplace.univ-tlse.fr

3. 'Newly developed AFM techniques – AFM infrared' by Mr Emmanuel PARIS from Bruker (France). Emmanuel Paris received a Master of Sciences (MSc) in electronic, energy and automatism from University Paris 6. He has acquired more than 30 years of experience in surface characterization and Atomic Force Microscopy techniques. He is currently managing the Bruker Nano Surface division in France.

Contact: Emmanuel.Paris@bruker.com

The presentations will be followed by a discussion on different architectures of nanodielectrics and a debate on the AFM application for their study, moderated by Dr Kremena MAKASHEVA and Assoc. Prof. Sombel DIAHAM.

II. Eco-friendly materials in electrical insulation

This second workshop is held Sunday, June 30th, 2:00 pm-5:00 pm, at IMT Amphitheatre, Building 1R3.

The topics of 'Green Materials' or 'Eco-friendly materials' is very broad and is currently the subject of full conferences. For this edition of ICD we propose a Workshop willing to address different aspects of dielectric materials in electrical engineering regarding their ecological impact. The questions can be from bio-sourced materials, to recyclability aspects of materials in applications ranging from cables to power modules, to life-cycle assessment. The following presenters will initiate the discussion:

1. 'Industrial needs for greener materials for insulation in electronic domain' by Dr Baptiste ARATI, from IRT St Exupery Toulouse. Baptiste was graduated from the University of Toulouse in 2023, for a work on the potentiality of application of vitrimers as self-healing materials for the insulation of power modules. His PhD was prepared in collaboration between Mitsubishi Electric Research Center and Laplace Laboratory. The presentation will be based on current needs viewed from the industry standpoint, with notably expectancies for making electronic modules more recyclable. The attached criteria will be developed, based not only on next materials but also on the possibility of dismantling the objects. Solutions for overcoming these challenges will be discussed.

Contact: baptiste.arati@irt-saintexupery.com

2. 'Sustainable Insulation Materials for Power Cables', by Detlef WALD from Eifelkabel Company. Detlef spent most of his career with Borealis company, who is a large produced of polyolefins, followed by a stay with Brugg Kabel. He has over 25 years' experience in the production of cables and performance evaluation. He is now engaged in cables for DC and HVDC energy transmission and in the way of improving the recyclability of cables. In his presentation, Detlef will review the different kinds of insulating polymers currently used from LV to HV cables. He will address the criteria to be considered to evaluate the ecological fingerprint associated with cables production. Finally, challenges and opportunities

towards greener materials for these applications, ranging from the production stage to the recycling and after cable life fate of materials, will be discussed. **Contact: d.wald@ieee.org**

3. 'Development of biobased epoxy resins for use in the electrical industry', by Prof. Jean-Pierre HABAS, from the University of Montpellier. Jean-Pierre is a physicist having moved to chemistry, specialist of polymers and composite materials. His current research span from biomass to green composite materials, contributing to the development of new class of polymeric materials with versatile physical and chemical properties. His presentation will be on the development of a large generation of bio-based epoxy resins from lipid- and sugar-chemistry. These resins present tunable properties that depend on the chemical nature of the components, their relative proportions in the reactive mixture but also their curing conditions.

The application to electrical insulation will be addressed up to the industrial qualification. **Contact: jean-pierre.habas@umontpellier.fr**

Once these presentations will be completed, the floor will be given to the audience for exchanges. Topics of interest to attendees will be discussed. We are happy to feed the discussions between participants with short presentations or questions that the participants may have prepared in advance.





Tutorial "Assembly of space charge equipment for cables"

This Tutorial is organized on Friday, June 5th, 9:00 am - 1:00 pm, at Laplace Lab, Seminars Room, Building 3R2. This tutorial, also referred to as "**PEA CE - Fourth International Workshop on Pulsed Electro-Acoustic technique for Cable Engineering**", is initiated by Prof HOZUMI and Dr MORSHUIS. It is held after the last day of the conference as a satellite event to the ICD. It comes after three successful earlier sessions in Japan and South Korea.

Purpose

Space charge measurements of full-scale HVDC insulated cables systems have reached a level where they can be used in practical tests. However, the measurement of actual insulating systems involves unique problems such as voltage application methods and acoustic propagation characteristics. It remains difficult to systematize the know-how for solving these problems, and it is also difficult to let the readers understand their importance when they are described in a paper.

The workshop aims at providing the participants with state-of-the-art information about PEA measurements on full-size cable systems. A key aspect of the workshop is the hands-on experience provided to the participants: they will each build their own cable PEA cell from the basic building blocks. At the end of the workshop, all assembled PEA cells will be tested on an HVDC cable. The PEA cells will become the participants' property and they can bring it home to be used in their company / at their research institute.

Speakers

The workshop will be given by:

- Naohiro Hozumi (Emeritus Professor Toyohashi University of Technology, Japan),
- Peter MORSHUIS (Solid Dielectric Solutions, the Netherlands)
- June-Ho LEE (Professor at Hoseo University, South Korea).

Program

1. Tutorial by Professor HOZUMI and Dr MORSHUIS on PEA measurements on HVDC cable systems. From the basics of building a PEA test set up to the latest developments on how to use the PEA technique on full-size cable systems, including joints.

- 2. A guided hands-on experience of building your own cable PEA cell.
- 3. Testing of your PEA cell by Professor HOZUMI and his team.
- 4. You will become the owner of the PEA cell you assembled during the workshop.

Access

A limited number of seats (15) is available and the Workshop is run with full attendance. Registration (fees: 400€) is achieved separately from that to the ICD.

Contact for any formation: Dr Peter MORSHUIS- peter.morshuis@dielectrics.nl

Monday 01 July 2024

E. O. Forster Memorial Lecture

Time: Monday 01 July 2024 – 9:00am - 10:00am *Session Chair:* Peter Morshuis

"Green Developments in Gaseous Insulation Systems" Christian M. Franck ETH Zürich, Switzerland

Oral Sessions 1: Materials in insulation systems

Time: Monday 01 July 2024 – 10:30am - 12:30pm *Session Chair:* Yuriy Serdyuk *Session Chair:* Marie-Laure Locatelli

- 1-1 Breakdown testing of pressure- and cure-bonded silicone rubber interfaces Harry McDonald¹, Steven Qi Li¹, <u>Simon M. Rowland¹</u>, Antonios Tzimas² ¹The University of Manchester, United Kingdom; ²Advanced Energy Industries
- 1-2 Characterization of structural and dielectric properties of silicon nitride thin films deposited by PECVD

<u>Tania Al Moussi</u>¹, Cian O'Dalaigh², Jérome Esvan³, Paul Lambkin², Ramji Lakshmanan², Baoxing Chen⁴, Sombel Diaham^{1,2}

¹LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France; ²Analog Devices International, Limerick, Ireland ; ³CIRIMAT, Université de Toulouse, École Nationale Supérieure des Ingénieurs en Arts Chimiques et Technologiques, Toulouse, France; ⁴Analog Devices Incorporation, Wilmington, MA, USA.

- 1-3 Effects of extremely cold weather on the thermal stress distribution of GIS cable termination Boxue Du¹, <u>Qi Li¹</u>, Wenbo Zhu³, PengXian Song², Longji Li², Chengyao Hou¹, XiaoXiao Kong¹, Jiaqian Zhang¹, Zhankang Gao¹, Yingting Luo¹ ¹School of Electrical and Information Engineering, Tianjin university, China; ²State Grid Tianjin Electric Power Company Electric Power Research Institute, China; ³Electric Power Research Institute of State Grid Tianjin Electric Power Company, China
- 1-4 Effect of moisture and oil-immersion on dielectric properties of paper insulation <u>Shengkang Wang</u>, Ruiqi Liu, Fuchang Lin, Hua Li

School of Electrical and Electronic Engineering, Huazhong University of Science and Technology, China

1-5 All-inorganic electrical insulation systems for high-power-density electrical machines

Zakhar R. Kudrynskyi¹, Peter H. Connor², Timothy P. Cooper¹, Matthew D. Wadge¹, James Kerfoot³, Xiang Zheng⁴, Reda M. Felfel⁵, Vladimir V. Korolkov³, Martin Kuball⁴, Christopher Gerada², David M. Grant¹

¹Advanced Materials Research Group, Faculty of Engineering, University of Nottingham, Nottingham, UK; ²Power Electronics, Machines and Control Research Group, Faculty of Engineering, University of Nottingham, Nottingham, UK; ³Park Systems UK Limited, Nottingham, UK; ⁴Centre for Device Thermography and Reliability, University of Bristol, Bristol, UK; ⁵Advanced Composites Group, University of Strathclyde, Glasgow, UK

1-6 Substitution of solid encapsulant materials by dielectric fluid in power modules: potentialities and challenges

<u>Rabih Khazaka</u>^{1,2}, Chencho Dorji², Rachelle Hanna², Olivier Lesaint², Yvan Avenas², Stephane Azzopardi¹

¹Safran, France; ²Univ. Grenoble Alpes, CNRS, Grenoble INP, G2Elab, France

Oral Sessions 2: Space charge and related effects

Time: Monday 01 July 2024 – 02:00pm - 04:00pm *Session Chair:* Kai Wu *Session Chair:* Espen Doedens

2-1 The Impact of needle electrode curvature radius on space charge distribution evolution: A combined experiment and simulation study Yuxin Liu, Penglong He, Bo Zhang, Jinliang He

State Key Laboratory of Power Systems, Department of Electrical Engineering, Tsinghua University, Beijing, China

2-2 Hindered phenolic compound grafting modification and space charge investigation of PP cable insulation

<u>Yifan Yin</u>, Zhonglei Li, Shuai Zhao, Boxue Du Tianjin University, China

- 2-3 New advancements in measuring the distribution of electric charges within liquids using PEA <u>Thierry Paillat</u>¹, Laurent Berquez², Paul Leblanc¹ ¹PPRIME, Poitiers, France; ²LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France
- 2-4 Space charge distribution measurements of thin-film insulating materials with slow sound velocity using a high-resolution PEA system
 <u>Ryota Kobayashi</u>, Kosuke Sato, Hiroaki Miyake, Yasuhiro Tanaka
 Tokyo City University, Japan
- 2-5 Fundamental study for correction technique in space charge measurements of cables under loadcycle using pulsed electro-acoustic method Shosuke Morita^{1,2}, Norikazu Fuse¹, Toshihiro Takahashi¹, Yoshinobu Murakami², Naohiro Hozumi² ¹Central Research Institute of Electric Power Industry, Japan; ²Toyohashi University of Technology, Japan
- 2-6 Ability of thermal method of measuring electric fields at metal-polymer and metal-semicon interfaces: an experimental study

Sneha Hegde¹, Jean-Charles Laurentie¹, Stéphane Holé², <u>Petru Notingher¹</u> ¹Université de Montpellier / CNRS, France; ²ESPCI / PSL / Sorbonne Université, France

Poster session 1A: Theories and Models

Time: Monday 01 July 2024 – 04:30pm - 06:30pm *Session Chair:* Anh Hoang

- 1A-01 Study on space charge accumulation allowance for DC cables using bipolar transport calculation <u>Norikazu Fuse</u>^{1,2}, George Chen² ¹Central Research Institute of Electric Power Industry, Japan; ²University of Southampton, United Kingdom
- 1A-02 Trap spectroscopy from the dielectric isothermal step response: theory and simulations

 Philippe Molinié

 Laboratoire de Génie Electrique et Electronique de Paris (GeePs), France
- 1A-03 Study on accelerated deterioration and early failure mechanism of silicone elastomers under nanosecond pulsed electric field <u>Dongxin He¹</u>, Haochen Wang¹, Teng Gao¹, Qingquan Li¹, Gilbert Teyssedre²

¹School of Electrical Engineering, Shandong University, Shandong Province, China; ²Laplace, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France

1A-04 Simulation and mechanism study of cavity discharge under pulsed electric field Zhe Zhang¹, <u>Dongxin He¹</u>, Wenjie Gong², Zhe Xu³, Haochen Wang¹, Qingquan Li¹ ¹Shandong University, China; ²State Grid Jinan power supply company, China; ³State grid Shandong electric power company ultrahigh voltage company, China

1A-05 Influencing factors and potential early warning for wind-biased transmission line discharges <u>Yufeng Guo¹</u>, Yong Liu¹, Yuepeng Xin¹, Minxin Wang¹, Qiran Li², Boxue Du¹

¹Key Laboratory of Smart Grid of Ministry of Education, School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²Tangshan Power Supply Company of State Grid Jibei Electric Power Company Limited, China

1A-06 Galloping mechanical characteristics of overhead insulated lines in 10 kV distribution network <u>Yufeng Guo</u>¹, Yong Liu¹, Zhihui Wang¹, Xiaowen Li², Boxue Du¹ ¹Key Laboratory of Smart Grid of Ministry of Education, School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²State Grid Jiangxi Electric Power Company Limited Xinfeng County Power Supply Branch Company, Ganzhou, China

1A-07 Development process of electrical arc movement on ice-covered HVDC outdoor insulator Bohan Wang¹, Yong Liu¹, Chao Li¹, <u>Minxin Wang¹</u>, Xiaowen Li², Boxue Du¹ ¹Key Laboratory of Smart Grid of Ministry of Education, School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²State Grid Jiangxi Electric Power Co., Ltd. Xinfeng Power Supply Branch, Xinfeng, China

1A-08 Effects of icing and galloping on the insulation performance of 10 kV overhead insulated conductor Hucheng Liang¹, Zekai Zhang¹, Daiyong Yang², Lixin Jiao², Jingyao Luan², Chunbo Liu², <u>Xiaoxiao Kong¹</u>, Boxue Du¹

¹School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²Electric Power Research Institute of State Grid Jilin Electric Power Co., Ltd., Changchun, China

1A-09 Dynamic characteristics of electric field and mechanical stress distribution of GIS insulation rod during operation

Chengyao Hou¹, <u>Xiaoxiao Kong</u>¹, Yun Chen^{1,2}, Jinpeng Jiang², Yifang Wang¹, Chong Zhang¹, Boxue Du¹ ¹Tianjin University, China; ²China Electric Power Research Institute, China

1A-10 Simulation of partial discharge from a railway pantograph

<u>Joanna Rzempoluch</u>¹, Jiakun Yang¹, Giulio Girelli¹, George Callender¹, Paul L Lewin¹, Paul Naylor², Richard Stainton², Matthew Atkins³

¹University of Southampton, United Kingdom; ²Network Rail, Milton Keynes, United Kingdom; ³Brecknell Willis, Chard, United Kingdom

1A-11 Behavior of water and ions within polyethylene: Insights from molecular dynamics simulations <u>Shinya Iwata¹</u>, Ryota Kitani¹, Tomoka Tsuya¹, Hiroaki Uehara², Tatsuki Okamoto², Tatsuo Takada³ ¹Osaka Research Institute of Industrial Science and Technology, Japan; ²Kanto Gakuin University, Japan; ³Tokyo City University, Japan

1A-12 The evolution of space charge and electric field in HVDC cable under polarity reversal voltage superimposed with temperature gradient

Zhong Zheng, Zhonglei Li, You Wu, Heyu Wang, Boxue Du Tianjin University, China

- 1A-13 Core loss distribution of anode saturable reactor using J-A dynamic hysteresis model Meng Xiao, Yuyan Chen, Xiangyu Dong, Boxue Du School of Electrical and Information Engineering, Tianjin University, China
- 1A-14
 Evaluation of behavior of Q(t) measurement and noise effects

 Ryota Kitani, Shinya Iwata, Tomoka Tsuya
 Osaka Research Institute of Industrial Science and Technology, Japan
- 1A-15 Numerical simulation of surface charge accumulation on epoxy insulator in DC-GIS considering temperature gradient

<u>Pinhao Huang</u>, Yu Gao, Di Lu, Shuangying Li, Boxue Du Tianjin University, China

- 1A-16
 Numerical investigation of the dynamic of electrons implanted in a polymeric material

 <u>Abdeslem Beldjilali</u>, Nadia Saidi-Amroun

 LPM Laboratory, Physics Faculty, USTHB University, Algeria
- 1A-17 New model for acetophenone ions in XLPE insulation Space charge and electric field characteristics using bipolar charge transport theory Ajith John Thomas¹, <u>Mikael Unge^{1,2}</u>, Anh Hoang³, Amirhossein Abbasi³, Claire Pitois¹ ¹NKT HV Cables AB, Technology Consulting, Västerås, Sweden; ²Department of Fibre and Polymer Technology, School of Engineering Sciences in Chemistry, Biotechnology and Health, KTH Royal Institute of Technology, Stockholm, Sweden; ³NKT HV Cables AB, R&D, Karlskrona, Sweden
- 1A-18 The role of defect aspect ratio in the partial discharge phenomenology under DC voltage and temperature gradient

<u>Giuseppe Rizzo</u>¹, Antonino Madonia¹, Roberto Candela¹, Vincenzo Li Vigni¹, Antonino Imburgia², Pietro Romano², Alessio Di Fatta², Guido Ala² ¹EOSS, Prysmian Group, Italy; ²University of Palermo, Italy

- 1A-19 Insulation state assessment of Press-pack IGBTs based on electric and temperature field simulation Yiting Zhan, <u>Feihu Zheng</u>, Yewen Zhang Tongji University, China
- 1A-20 An adaptive algorithm for electrothermal simulation of surge arrester <u>Yudong Jiang</u>, Hua Li, Fuchang Lin, Guohao Zhang Huazhong University of Science and Technology, China
- 1A-21 Simulation of insulation defects of distribution cable accessories based on harmonic current characteristics

Xu Lu¹, Kongying Guo², Weixin Sun², Ran Hu¹, Jie Tian¹, Daning Zhang³, Yanhui Wei², <u>Guochang Li²</u> ¹Shenzhen Power Supply Bureau Co, Ltd, Shenzhen, Guangdong, China; ²College of Automation and Electronic Engineering, Qingdao University of Science and Technology, Qingdao, China; ³School of Electrical Engineering, Xi'an Jiaotong University, Xi'an, China

1A-22 Quasi-2D finite volume modeling of corona discharges for ionic propulsion: comparison of reduced reaction schemes

<u>Fabio Ragazzi</u>¹, Giuseppe Caliò², Giacomo Pierotti¹, Andrea Cristofolini¹, Paolo Barbante², Arturo Popoli¹ ¹Department of Electrical, Electronic and Information Engineering "Guglielmo Marconi", University of Bologna, Bologna, Italy; ²MOX – Modelling and Scientific Computing, Department of Mathematics, Politecnico di Milano, Milan, Italy

- 1A-23 Effect of dissociation-recombination processes in a dielectric dispersion medium on the coalescence and non-coalescence of conducting droplets suspended in it Danil Saifullin, <u>Vladimir Chirkov</u>, Sergei Vasilkov St. Petersburg State University, Russian Federation
- 1A-24 Numerical modeling of non-coalescence outcomes for different-sized conducting droplets suspended in a dielectric liquid

Vladimir Chirkov, <u>Ilia Elagin</u>, Vasilii Lutsek St. Petersburg State University, Russian Federation

Poster session 1B: Space charge and related effects

Time: Monday 01 July 2024 – 04:30pm - 06:30pm *Session Chair:* Stéphane Holé

1B-01 Study on space charge properties of different nano/epoxy composites <u>Xi Pang</u>, Tianlei Xu, Zongliang Xie, Dingxin Wei, Peng Liu, Zongren Peng Xi'an Jiaotong University, China

1B-02 A Charge microscopy for high temperature use with a polymer acoustic coupler <u>Naohiro Hozumi</u>

Hozumi Measurement Lab, Japan

1B-03 Effect of semiconductive layer on space charge accumulation of polypropylene blends for DC cable insulation

Bosen Si, <u>Yu Gao</u>, Baixin Liu, Chenyi Guo, Jing Li, Boxue Du Tianjin University, China

1B-04 Effect of semiconductive layer on space charge accumulation of polypropylene blends for DC cable insulation

Bosen Si, <u>Yu Gao</u>, Baixin Liu, Chenyi Guo, Jing Li, Boxue Du Tianjin University, China

- **1B-05** Phase dependence of surface charge accumulated on epoxy insulator in C4F7N/CO2 under AC voltage Shuangying Li, <u>Yu Gao</u>, Di Lu, Pinhao Huang, Boxue Du Tianjin University, China
- 1B-06 Analysis of space charge and current characteristics of Al/LDPE interface <u>Jinyang Peng</u>¹, Zepeng Lv^{1,2}, Xuze Zhang¹, Kai Wu^{1,2}, Yonghong Cheng^{1,2} ¹Xi 'an Jiaotong University, China; ²State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, China
- **1B-07** Effect of temperature on charge mobility in oil-paper insulation

 Lu Gao, Hao Xu, Zepeng Lv, Kai Wu
 State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, China
- **1B-08** Simulation of space charge in HVDC cable under DC superimposed operation impulse voltage Yanqing Li, Jia Chu, Qiang Li, <u>Tao Han</u>, Boxue Du Tianjin University, China
- 1B-09 Effect of radial space charge distribution on electric field distribution in HVDC XLPE cables Kai Shi, Jiandong Wu, Yi Yin Shanghai Jiao Tong University, China
- 1B-10 Effect of continuous polarity reversals at different temperatures on the space charge characteristics of XLPE

<u>Xuebei Wang</u>, Jiandong Wu, Yi Yin, Qiaohua Wang, Xiang Luo Shanghai Jiao Tong University, China

- 1B-11 Space charge and conduction character of PP/POE composites under high temperature Dan Cao, Lv Zepeng, Liang Qilu, Wu Chenyu, Wu Kai, Cheng Yonghong Xi'an Jiaotong University, China
- **1B-12** Insight into 525 kV HVDC cable system performance by means of cable peeling characterizations <u>Birender Singh</u>¹, E. H. Doedens¹, M. Jarvid¹, R. Guffond² ¹Nexans Norway AS, Halden, Norway; ²Nexans France, Lyon, France
- **1B-13** Space charge deflection behavior under strong magnetic fields

 Haoliang Liu, Ke Chen, Meng Xiao, Boxue Du

 Tianjin University, China
- 1B-14 Effect of carbon black structure on charge accumulation at the interface between insulation and shielding for thermoplastic polyethylene cable Xiangyang Peng¹, Baiyuan Chang², Xin Yu¹, <u>Nuo Xu²</u>, Yinge Li¹, Hong Zhang² ¹Electric Power Research Institute of Guangdong Power Grid Co., Ltd, China.; ²State Key Laboratory of Electrical Insulation and Power Equipment, China
- 1B-15 Polarity reversal effect on space charge characteristics of double layer of natural ester oilimpregnated paper with different moisture contents Hyungjin Yoon, <u>George Chen</u>

University of Southampton, United Kingdom

- **1B-16** Influence of moisture absorption on space charge accumulation in LSR under high DC electric field <u>Chen Zhang¹</u>, Zepeng Lv¹, Zihang Xu¹, Kai Wu¹, Peter Morshuis², Aurore Claverie³ ¹Xi'an Jiaotong University, China; ²Solid Dielectric Solutions, Leiden, the Netherlands; ³Carros, France
- **1B-17** A Review on different deconvolution techniques on frequency domain for a PEA cell for HVDC cables <u>Alessio Di Fatta</u>¹, Antonino Imburgia¹, Giuseppe Rizzo², Ghulam Akbar¹, Vincenzo Li Vigni², Grazia Berardi², Marco Albertini², Pietro Romano¹, Roberto Candela², Guido Ala¹, Stefano Franchi Bononi² ¹University of Palermo, Italy; ²Prysmian Group S.p.A., Milan, Italy
- 1B-18 Electret charge stability and thermomechanical properties of polypropylene blends with ethylenemethyl acrylate copolymer

<u>Anna Guliakova^{1,2}</u>, Arthur Henderyckx^{3,4}, Nikolay Shishkin², Bart Buffel³, Frederik Desplentere³, Dmitry Rychkov¹

¹Technology Center Weissenburg, Deggendorf Institute of Technology, Richard-Stücklen-Strasse 3, Weissenburg, Germany; ²Herzen State Pedagogical University, Moika River Embankment 48, St. Petersburg, Russia; ³Research Group Propolis, Department of Materials Engineering, KU Leuven Campus Bruges, Spoorwegstraat 12, Bruges, Belgium; ⁴Beaulieu International Group, Kalkhoevestraat 16, Waregem, Belgium

- 1B-19 Hetero and homocharge in LDPE at low electric fields Balaji Sriram, <u>Nandini Gupta</u> Indian Institute of Technology Kanpur, India
- 1B-20 A novel evaluation method of the effect of space charge in passivaton materials to IGBTs blocking voltage

<u>Hirotaka Muto</u>, Atsushi Yamatake, Hiroki Shiota, Koki Kishimoto, Shuichi Kitamura Mitsubishi Electric Corporation, Japan

1B-21 Interface charge characteristics of silicone elastomer/AIN double layer dielectric using in the power module under DC voltage

Jinqiang Zhang, Xuebao Li, Zezhong Sun, Peng Sun, Zhibin Zhao North China Electric Power University, China

1B-22 Transient current and space charge in gamma irradiated PTFE: Discussion on heterocharge formation Sarah Mouaci¹, Virginie Griseri², <u>Nadia Saidi-Amroun</u>¹, Gilbert Teyssedre², Mohamed Saidi¹ ¹University of Sciences and Technology Houari Boumediène (USTHB), Algeria; ²LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France

Poster session 1C: Conduction, polarization and breakdown

Time: Monday 01 July 2024 – 04:30pm-06:30pm *Session Chair:* Hiroaki Miyake

- **1C-01** Breakdown characteristics of insulating oil in uniform to non-uniform electric field under AC voltage <u>Shigeyoshi Yoshida¹</u>, Atsushi Yamatake¹, Masahiro Kozako², Masayuki Hikita² ¹Mitsubishi Electric, Japan; ²Kyushu Institute of Technology, Fukuoka, Japan
- 1C-02 Influence of different step time and step voltage on the calculation of endurance coefficient in polypropylene ac step-stress tests

<u>Binjie Zhang</u>¹, Shuai Hou², Yunpeng Zhan², Yi Yin¹, Yalin Wang¹ ¹Department of Electrical Engineering, School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, Shanghai, China; ²Electric Power Research Institute, China Southern Power Grid, Guangzhou, China

1C-03 Effects of different diluents on dielectric property of epoxy resin based on molecular dynamics Xiaoxiao Kong¹, <u>Chengyao Hou</u>¹, Xining Li², Yun Chen^{1,2}, Jinpeng Jiang², Yifang Wang¹, Chong Zhang¹, Boxue Du¹

¹Tianjin University, China; ²China Electric Power Research Institute, China

- 1C-04 Research on charge variation of discharges in pure nitrogen and its mixture with sulfur hexafluoride <u>Wei Wang</u>, Xinyan Wang, Zhenyu Wu, Yao Qin, Yongpeng Meng, Zepeng Lv, Kai Wu Xi'an Jiaotong University, China
- 1C-05 Analysis of the test results of glass transition pressure and conductivity of polypropylene under different pressure conditions

Weizhuo Li¹, Taixiang Luan¹, <u>Yewen Zhang²</u>, Xuan Wang¹ ¹Harbin university of science and technology, China; ²Tongji University, China

- **1C-06** Study on insulation relaxation current characteristics of transformer with different operating time <u>Haotian Shen</u>, Jiandong Wu, Yi Yin, Qiaohua Wang, Xiang Luo Shanghai Jiao Tong University, China
- 1C-07 On the dielectric relaxation characteristics of epoxy resins under different aging conditions Chong Zhang¹, <u>Xiaoxiao Kong</u>¹, Qiang Fu², Chengyao Hou¹, Hangyu Mi¹, Yifang Wang¹, Boxue Du¹ ¹School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²Electric Power Research Institute of Guangdong Power Grid Co., Ltd., Guangzhou, China
- 1C-08
 Improvement of high-temperature energy storage performance of PI with non-planar structures

 Zhaoyu Ran, Li Meng, Yuhang Liu, Jun Hu, Jinliang He, Qi Li
 Tsinghua University, China
- 1C-09 Improved energy storage performance of biaxially stretched polypropylene films based on molecular semiconductor grafting

Zhaoyu Ran, Zhen Luo, Junluo Li, Li Meng, Yuhang Liu, Jun Hu, Jinliang He, Qi Li Tsinghua University, China

- 1C-10 AC breakdown voltages of PEEK insulation used in subsea cable connections <u>Danny Alexander Guana Niquinga</u>¹, Qiang Liu¹, Michael Jeschke², Daniel Walton² ¹University of Manchester, United Kingdom; ²Siemens Energy Limited, Ulverston, United Kingdom
- 1C-11
 Effect of atmospheric air pressure and electrode curvature on air breakdown voltage & surface flashover of solid dielectric with same clearance & creepage distances

 Guillaume Belijar, Mohammed El Amine Slama, Mourad Jebli, Michaël Darques

 French Institute of Technology IRT Saint Exupéry, France
- **1C-12** Constant voltage breakdown measurement of lapped insulation under cryogenic conditions <u>Luhan Zu</u>¹, Stéphane Holé¹, Christian-Éric Bruzek², Georg Gamper², Umberto Melaccio², Nicolas Lallouet³

¹ESPCI/SU/CNRS, France; ²ASG, Italy; ³NEXANS, France

1C-13 Evaluating rejuvenation effects on water-tree aged cables under diverse electric field induction using PDC method

Xurui Zhang, Kai Zhou, Yaping Wu, <u>Siyan Lin</u>, Hao Yuan, Chengyu Liu College of Electrical Engineering, Sichuan University, Chengdu, China

- 1C-14
 Effect of low temperature on energy storage performance of polypropylene film

 Ke Chen, Boxue Du, Haoliang Liu, Meng Xiao
 School of Electrical and Information Engineering, Tianjin university, China
- 1C-15 Effect of low molecular weight part of LDPE on DC conductivity of XLPE <u>Rui Sui</u>, Zibin Liu, Nuo Xu, Jinghui Gao, Lisheng Zhong State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, Xi'an, China
- **1C-16** Numerical modeling of the DC breakdown of a sphere gap due to a weakly nonuniform electric field Noorul Haque M¹, Gowrishankar Shanmugam², <u>Jineeth Joseph³</u>, Sunitha Karakkad¹ ¹National Institute of Technology Calicut, India; ²National Institute of Technology Puducherry, India; ³Independant Consultant
- **1C-17** Effect of thermal aging on the dielectric properties of polypropylene/elastomer cable insulation Meng Zhang, <u>Zhonglei Li</u>, Boxue Du Tianjin University, School of Electrical and Information Engineering, Tianjin, China

1C-18 Dielectric and molecular structural properties of biaxially stretched polypropylene under DC/AC mixed voltages

Yuhang Liu, Zhaoyu Ran, Junluo Li, Jinliang He, Qi Li Tsinghua University, China

1C-19 Correlating crystallinity and electrical conductivity in gamma-irradiated PTFE

Ali Mezouar¹, <u>Nadia Saidi-Amroun</u>¹, Virginie Griseri², Gilbert Teyssedre², Mohamed Saidi¹ ¹University of Sciences and Technology Houari Boumediène (USTHB), Algeria; ²LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France

1C-20 Radiation aging effect on electrical properties of superconductive magnet wires

Simone Vincenzo Suraci¹, Roland Piccin², Javier Osuna², Christian Scheuerlein², Davide Fabiani¹ ¹LIMES (Laboratory of Innovative Materials for Electrical Systems) – DEI University of Bologna, Bologna, Italy; ²Superconducting Magnet Technologies - Technology Department – CERN, Switzerland

1C-21 Study on the effect of pressure on breakdown and electrode loss behavior of metallized polypropylene films

<u>Guohao Zhang</u>, Hua Li, Jing Lan, Yudong Jiang, Fuchang Lin, Qin Zhang Huazhong University of Science and Technology, China

Tuesday 02 July 2024

Oral session 3 : Special session Aeronautics

Time: Tuesday 02 July 2024 – 8:15am - 10:00am *Session Chair:* Emmanuel Odic *Session Chair:* Andrea Cavallini

- INVITED "Physical phenomena and challenges in electrical insulation for airborne applications" Dr Jean Rivenc Airbus SAS, France
- 3-1 Surface discharges inception & flashover of solid insulating materials with homogeneous and inhomogeneous electrical field for aeronautical applications
 Somya Anand^{1,2}, Solomon Berihu Araya¹, Mohammed El Amine Slama², Pierre Henrard², Alain Philippe¹
 ¹Souriau-Eaton, France; ²IRT Saint-Exupéry, French Institute of Technology
- 3-2 Partial discharge inception voltage of pigtail samples with Type II insulation and sinusoidal vs switched voltage Torstein Aakre¹, Espen Eberg¹, Athanasios Mermigkas¹, Astrid Røkke²

¹SINTEF Energi AS, Norway; ²Rolls-Royce Electrical Norway AS, Norway

3-3 Effect of pressure on the electrical treeing and discharge characteristics of epoxy resin <u>Maria-Irina Oancea</u>, Qinghua Han, Lujia Chen University of Manchester, United Kingdom

Oral session 4 : Modelling

Time: Tuesday 02 July 2024 – 10:30am - 12:30pm *Session Chair:* Masahiro Sato *Session Chair:* Fulbert Baudoin

- **4-1** Evaluation of electric field in a DC model cable during superimposed impulse voltage tests <u>Anh Hoang</u>¹, Amirhossein Abbasi¹, Ajith J. Thomas², Mikael Unge², Claire Pitois² ¹NKT HV Cables AB, R&D, SE-371 23 Karlskrona, Sweden; ²NKT HV Cables AB, Technology Consulting, Västerås, Sweden
- **4-2** A Study of negative differential mobility in low-density polyethylene based on Monte Carlo analysis with percolation Ryotaro Ozaki¹, Taiki Kanamitsu¹, Akira Ohno², Hiroaki Iino², Kazunori Kadowaki¹

<u>Ryotaro Ozaki</u>¹, Taiki Kanamitsu¹, Akira Ohno², Hiroaki lino², Kazunori Kadowaki¹ ¹Ehime University, Japan; ²Tokyo Institute of Technology, Japan

4-3 About plasma-polymer interaction and treeing progression <u>Andrea Barbareschi Villa</u>¹, Giacomo Buccella¹, Luca Barbieri¹, Daniele Palladini¹, Giovanni D'Avanzo¹, Roger Schurch² ¹Ricerca Sul sistema Energetico, RSE, Milan, Italy; ²Universidad Tecnica Federico Santa Maria, Valparaiso, Chile

4-4 A Modular fractional-order circuit model for broadband impedance characterization of polymeric insulation systems

<u>Xize Dai</u>¹, Andrea Cavallini², Jian Hao³, Ruijin Liao³, Claus Leth Bak¹, Huai Wang¹ ¹Department of Energy, Aalborg University, Denmark; ²ARCES and DEI, University of Bologna, Italy; ³School of Electrical Engineering, Chongqing University, Chongqing, China

4-5 Breakdown process modeling of tri-post insulator subjected to electrical and mechanical loadings in HVAC-GIL

<u>Jianan Dong</u>¹, Boxue Du¹, Hucheng Liang¹, Zhijun Guo¹, Boyuan Cui², Yun Chen² ¹Tianjin University, China; ²China Electric Power Research Institute, Beijing, China

4-6 Usage of Physics-Informed Neural Network to Extract Physical Parameters from High Voltage Experiments

<u>Olof Hjortstam¹</u>, Carl-Johan Björnson², Felix Ågren², Thomas Hammarström², Yuriy V. Serdyuk², Christian Häger²

¹Hitachi Energy Research, Sweden; ²Chalmers University of Technology, Sweden

Oral session 5 : Diagnostic methods

Time: Tuesday 02 July 2024 – 02:00pm - 04:00pm *Session Chair:* Antonios Tzimas *Session Chair:* Thierry Paillat

5-1 Mechanoluminescence of anhydride and imidazole cured epoxies under the combined effect of thermal and cyclic mechanical stresses
Baptiste Robbiani, Jean-Louis Augé, Gilbert Teyssedre
Laplace, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France

- 5-2 Effect of electric field profile changes on partial discharge phenomenon in a loaded HVDC cable <u>Pietro Romano</u>¹, Guido Ala¹, Marco Albertini², Ghulam Akbar¹, Grazia Berardi², Roberto Candela², Alessio Di Fatta¹, Antonino Imburgia¹, Vincenzo Li Vigni², Giuseppe Rizzo², Stefano Franchi Bononi² ¹LEPRE HV Laboratory, Department of Engineering, University of Palermo, Palermo, Italy; ²Prysmian Group, Milan, Italy
- 5-3 Unveiling internal partial discharges in wiring and cable systems with novel testing method <u>Youcef Kemari</u>, Guillaume Belijar, Cédric Abadie IRT Antoine de Saint Exupéry, France

5-4 Studying the novel interaction of carbon dots with aged mineral oil through photoluminescence emission

Abdellatif Rashed^{1,2}, Mohsen Ghali^{3,4}, Abdallah Rezk³, Diaa-Eldin Mansour^{2,5}

¹Laboratoire des Sciences de l'Ingénieur Appliquées à la Mécanique et au génie Electrique – Fédération IPRA, Université de Pau et des Pays de l'Adour/E2S UPPA, Pau, France; ²Department of Electrical Power and Machines Engineering, Faculty of Engineering, Tanta University, Tanta, Egypt; ³Physics Department, Institute of Basic and Applied Science, Egypt-Japan University of Science and Technology, Alexandria, Egypt; ⁴Physics Department, Faculty of Science, Kafrelsheikh University, Kafrelsheikh, Egypt; ⁵Department of Electrical Power Engineering, Faculty of Engineering, Egypt-Japan University of Science and Technology, Alexandria, Egypt

5-5 Electric field distribution detection and surface insulation enhancement for GIS/GIL by flexible smart surface coating insulators

<u>Yuhuai Wang</u>¹, Songtao Liu², Yufan Wang², Renyong Zhao³, Hein Htet Aung¹, Boxue Du¹, Jin Li¹ ¹Tianjin University, China; ²High Voltage Company, State Grid Tianjin Electric Power Company, Tianjin, China; ³Zibo Power Supply Company, State Grid Shandong Electric Power Company, Zibo, China

5-6 Identification of the defect type in epoxy resin using the differences in reflected THz wave characteristics

<u>Rieko Mizuuchi</u>¹, Yuji Hisazato¹, Hiroaki Cho¹, Yusuke Nakamura¹, Yuichi Sumimoto¹, Kunihiko Wada¹, Hiroki Mori², Ryota Sekiya²

¹Toshiba Infrastructure Systems & Solutions Corporation, Japan; ²Toshiba Corporation, Japan

Poster session 2A: Theories and Models

Time: Tuesday 02 July 2024 – 04:30pm - 06:30pm *Session Chair:* Thomas Andritsch

- 2A-01 Dielectric performance of sustainable fluids <u>Rongsheng Liu¹</u>, Maria Lundmark¹, Lars Walfridsson¹, Jonas Hedberg¹, Dejan Vuković², Jan Hajek², Miguel Cuesto² ¹Hitachi Energy Research in Sweden; ²Hitachi Energy Transformers
- 2A-02 Preliminary characterization of dielectrics for insulated metal substrates (IMS) of power modules Paolo Seri¹, <u>David Demian</u>¹, Andrea Reolon², Andrea Cavallini¹ ¹University of Bologna, Italy; ²Serigroup, Italy
- 2A-03 Experimental evaluation of the moisture effect on the dielectric properties of thermally upgraded Kraft paper impregnated with mineral oil and natural ester
 Ismael Antolin¹, Cristina Méndez¹, Cristian Olmo¹, Félix Ortiz¹, <u>Pedro J. Quintanilla¹</u>, Diego F. García²
 ¹Universidad de Cantabria, Spain; ²Universidad del Valle
- 2A-04 Analysis of the degradation of five esters and the effect of the cellulose on their properties Cristina Méndez¹, Büsra Oezdemir², Peter Werle², Cristian Olmo¹, <u>Pedro Quintanilla¹</u>, Alfredo Ortiz¹ ¹Universidad de Cantabria, Spain; ²Institute of Electric Power Systems, Division of High-Voltage and Asset Management -Schering-Institute, Leibniz University Hannover, Germany
- 2A-05 Enhancing the piezoelectric properties of bacterial cellulose films by incorporation of ZnO nanoparticles

Meng Xiao, <u>Xiangyu Dong</u>, Zhaochen Wang, Xiaodan Du, Zening Lu, Boxue Du Tianjin University, China

2A-06 A Novel piezoelectric paper-based flexible nanogenerator composed of Rochelle salt nanoparticles and bacterial cellulose

Meng Xiao, <u>Xiangyu Dong</u>, Yuyan Chen, Zhiyuan Zhang, Liangtian Zhang, Boxue Du Tianjin University, China

2A-07 Effect of graft distribution on conductivity and breakdown strength of polypropylene film for power capacitor

Meng Xiao, <u>Xiaodan Du</u>, Zhiyuan Zhang, Xiangyu Dong, Boxue Du Tianjin University, China

2A-08 Enhanced dielectric properties of polypropylene film by multilayered structural design for power capacitor

Meng Xiao, <u>Zhiyuan Zhang</u>, Yuyan Chen, Liangtian Zhang, Boxue Du Tianjin University, China

- 2A-09 Performance enhancement of piezoelectric materials based on bacterial cellulose <u>Zhaochen Wang</u>, Meng Xiao, Xiangyu Dong, Xiaodan Du, Boxue Du Tianjin University, China
- 2A-10 Surface gradient modified basin insulator suppresses metal particle lifting and surface discharge characteristics

<u>Yuhuai Wang</u>¹, Songtao Liu², Meiyang Zuo³, Jiwei Zhang³, Hein Htet Aung¹, Jin Li¹ ¹Tianjin University, China; ²High Voltage Company, State Grid Tianjin Electric Power Company, Tianjin, China; ³Jinan Power Supply Company, State Grid Shandong Electric Power Company, Jinan, China

2A-11 Suppression of metal particle and surface flashover by dielectric functionally graded spacers Boxue Du¹, Zhouyu Jin¹, <u>Hucheng Liang</u>¹, Jinpeng Jiang² ¹Tianjin University, China; ²China Electric Power Research Institute, China 2A-12 Influence of thermal conductivity of multi-scale particles epoxy composites on high frequency electrical insulation property

<u>Yan-Hui Song</u>, Zhi-min Dang Tsinghua, China

2A-13 Significantly improving the energy storage performance of BOPP films based on the surface polymer layer

<u>Ke Chen</u>, Boxue Du, Haoliang Liu, Meng Xiao School of Electrical and Information Engineering, Tianjin University, China

2A-14 Conductivity and breakdown strength of polybutene and its copolymer insulation varying with crystal form

Zechao Yang, Zhonglei Li, Boxue Du Tianjin University, China

2A-15 Enhanced dielectric properties of recycled PLA/BaTiO3 nanocomposites: Towards sustainable capacitor applications

<u>Keerati Meeporn</u>¹, Hayri Okcu², Liam Johnston², Gwenn Morvezen¹, Benjamin Borgnic², Sebastien Flury¹, David Muñoz-Rojas², Vincent H. Mareau³, Alain Sylvestre¹ ¹University Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France; ²University Grenoble Alpes, CNRS, Grenoble INP, LMGP, Grenoble, France; ³University Grenoble Alpes, CEA, CNRS, IRIG, SyMMES, Grenoble, France

2A-16 Conductivity and permittivity of CNT-epoxy nanocomposites with filler concentrations in the neighborhood of percolation threshold

Himanshu Gupta, <u>Nandini Gupta</u> Department of Electrical Engineering, IIT Kanpur, India

2A-17 Low-frequency dielectric analysis of promising lead-free dabcoH+A- ferroelectric materials for energy applications

Gwenn Morvezen^{1,2}, Nicolas Brefuel¹, Daniel Bourgault², Hervé Guillou², <u>Alain Sylvestre¹</u> ¹University Grenoble Alpes, CNRS, Grenoble INP, G2Elab, Grenoble, France; ²University Grenoble Alpes, CNRS, Grenoble INP, Institut Néel, Grenoble, France

2A-18 Comparison of high temperature dielectric properties between epoxy resins with alicyclic and bisphenol A

<u>Keisuke Shinozaki</u>¹, Masayuki Hikita¹, Masahiro Kozako¹, Minoru Ueshima² ¹Kyusyu Institute of Technology, Japan; ²Daicel Corporation, Japan

- 2A-19 Enhancing high-temperature aeronautic cables with extruded Perfluoroalkoxy: Insights from partial discharge and polarization current analysis
 <u>Youcef Kemari</u>¹, Laurent Moisset^{1,2}, David Thomasse^{1,2}, Pierre Henrard^{1,2}
 ¹IRT Antoine de Saint Exupéry, France; ²SAFRAN Electrical & Power (SEP)
- 2A-20 Screening of suitable random copolymer polypropylene blends for HVDC cable insulation <u>Minna Niittymäki¹</u>, Kari Lahti¹, Ilkka Rytöluoto², Eetta Saarimäki², Mika Paajanen², Bassel Diban³, Paolo Seri³, Giovanni Mazzanti³, Maya Mourad⁴, Anais Leproux⁴, Rafal Anyszka⁵, Frederik Wurm⁵, Timo Rheinberger⁵

¹Tampere University, Finland; ²VTT Technical Research Centre of Finland, Finland; ³University of Bologna, Italy; ⁴SuperGrid Institute, France; ⁵University of Twente, Enschede, Netherlands

- 2A-21 Effect of elastomer blend on high temperature dielectric properties of polypropylene <u>Hana Kim</u>¹, Keisuke Shinozaki¹, Masayuki Hikita¹, Masahiro Kozako¹, Seunggun Yu² ¹Kyushu Institute of Technology, Japan; ²Korea Electrotechnology Research Institute
- 2A-22 Epoxy-glass-mica layered composites with nanoparticle fillers incorporated by air-brush technique Ondrej Musil, <u>Petr Kadlec</u>, Radek Polansky University of West Bohemia, Faculty of Electrical Engineering, Czech Republic
- 2A-23 Electrical tree resistance enhancement of polypropylene based on heterogeneous structure modulation

You Wu, Heyu Wang, Zhong Zheng, Zhonglei Li, Boxue Du Tianjin University, China

2A-24 Flashover improvement of AC-DC mixed voltages on HVDC-GIS spacer with functionally graded materials

<u>Jianan Dong</u>¹, Boxue Du¹, Zehua Wang², Hucheng Liang¹, Hang Yao¹ ¹Tianjin University, China; ²State Grid Tianjin Power Chengnan Power supply Branch, Tianjin, China

Poster session 2B: Diagnostics and experiments 1

Time: Tuesday 02 July 2024 – 04:30pm - 06:30pm *Session Chair:* Veronika Gavrilenko

- 2B-01 A cable defect location and assessment method based on the Hilbert-enveloped reflection coefficient Xingyu Zou, Haibao Mu, Renjie Wang, Ci Song, Kaixuan Fan, Ziqian Cheng, Guanjun Zhang Xi'an Jiaotong University, Xi'an, China
- 2B-02 A low-cost capacitive non-intrusive sensor for the detection, localization and identification of defects in MVAC cables

Jérémie Cicéron, <u>Pascal Rain</u>, Cornel Ioana Univ Grenoble Alpes, France

- 2B-03 Comparative analysis of partial discharge measurements for artificial defects under HVAC and HVDC voltage stresses for cable insulating materials Paolo Pieroni, <u>Giacomo Ciotti</u>, Andrea Caprara Techimp - Doble Engineering, Italy
- 2B-04 A noncalibration partial discharge magnitude measurement method based on an embedded bushing sensor

<u>Chunlin Hao</u>, Tao Han, Boxue Du¹, Jin He² Tianjin University, China, ²State Grid Tianjin Electric Power Research Institute, Tianjin, China

- 2B-05 An improved algorithm of cable fault diagnosis considering signal attenuation compensation Yan Jin¹, Yuxiao Hu¹, Chaoqun Shi¹, Guanghua He², Jinlong Qi², Yang Xu¹
 ¹State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, Xi'an, China; ²Jiangsu Wuxi Power Supply Company, State Grid Corporation of China, Wuxi, China
- 2B-06 Defect location and identification method for long-distance cable based on frequency modulated continuous wave

Shurong Li, Ao Li, Binjiang Wang, Xiaoguang Zhu, Junbo Deng, Guanjun Zhang Xi'an Jiaotong University, China

2B-07 Condition assessment of insulation systems through electric field mapping using electro-optic sensors

<u>Sneha Satish Hegde</u>^{1,3}, Gwenaël Gaborit^{2,3}, Ayyoub Zouaghi¹, Lionel Duvillaret³, Christian Vollaire¹ ¹Univ Lyon, Ecole Centrale de Lyon, INSA Lyon Université Lyon 1, CNRS, Ampère, UMR5005, Ecully, France; ²IMEP-LAHC laboratory, Université Savoie- Mont-Blanc, Le Bourget-du-Lac Cedex, France; ³Kapteos SAS, Bât. Cleanspace 354 voie Magellan, Z.A. Alpespace, Sainte-Hélène- du-Lac, France

2B-08 Holistic reliability analysis strategy for high-voltage polymeric cable assets based on field-dependent dynamic mechanisms

<u>Xize Dai</u>^{1,2}, Jian Hao², Ruijin Liao², Claus Leth Bak¹ ¹Department of Energy, Aalborg University, Denmark; ²State Key Laboratory of Power Transmission Equipment Technology, Chongging University, China

2B-09 Identification of installation defects on MV cable systems through on field PD measurements performed with the aid of NPF voltage source

<u>Antonino Madonia</u>, Giuseppe Rizzo EOSS, Prysmian Group, Italy

2B-10 Cable system setup for PD measuring systems tests and analysts' training Eduardo Arcones¹, <u>Fernando Álvarez</u>¹, Abderrahim Khamlichi^{1,2}, Fernando Garnacho¹, Ignacio Dopazo¹ ¹Universidad Politécnica de Madrid, Spain; ²LCOE-FFII, Spain

- **2B-11** Application of a reference method for the training and evaluation of PD analysts Eduardo Arcones¹, <u>Fernando Álvarez</u>¹, Javier Ortego^{1,2}, Fernando Garnacho¹, María Sanz¹ ¹Universidad Politécnica de Madrid, Spain; ²Ampacimon, Spain
- **2B-12** Evaluation of data acquisition systems for dielectric frequency response measurements <u>Daniel Svensson</u>¹, Thomas Hammarström¹, Xiangdong Xu¹, Olof Hjortstam², Yuriy Serdyuk¹ ¹Chalmers University of Technology; Gothenburg, Sweden; ²Hitachi Energy Research, Västerås, Sweden
- 2B-13 Identification of defect type in an aged 22 kV cast resin transformer from phase-resolved PD patterns <u>Mizuki Miyagawa</u>¹, Yuanhang Yao¹, Takumi Satake¹, Hideaki Kawano¹, Masayuki Hikita¹, Masahiro Kozako¹, Yoshihiro Harada², Katsutoshi Takei², Masaru Ikeda², Kazunori Miyazaki², Kazuhiro Futakawa² ¹Kyushu Institute of Technology, Japan; ²TEPCO Power Grid, Inc., Tokyo, Japan
- 2B-14 A Micro-identification method of composite insulation sheds aging based on IC-FHA-YOLOv8 and SEM images

<u>Yuepeng Xin</u>¹, Yong Liu¹, Guangming Feng², Minxin Wang¹, Yufeng Guo¹, Jingyi Jiao³, Boxue Du¹ ¹Tianjin university, China; ²Suzhou Nuclear Power Research Institute Co., Ltd., China; ³North China Electric Power University, China

- 2B-15 An aging evaluation method of composite insulators based on deep learning and decision tree model <u>Yuepeng Xin</u>¹, Yong Liu¹, Chao Li¹, Xingwang Huang², Qiran Li³, Boxue Du¹ ¹Tianjin university, China; ²State Grid Hebei Electric Power Research Institute, State Grid Hebei Electric Power Limited Corporation, China; ³Tangshan Power Supply Company of State Grid Jibei Electric Power Company Limited, China
- 2B-16 Design of a flexible UHF antenna for PD detection in inverter-fed motors Shijin Ma, <u>Peng Wang</u>, Chizhou Cheng, Wendong Huang Sichuan university, China
- 2B-17 Cable defects location method based on M-sequence with broadband impedance spectroscopy Yanqing Li, Wenhao Li, Yufei Yao, Qiang Li, <u>Tao Han</u> Tianjin University, China

2B-18 Pulsed electrical aging tests of insulation systems and components for support of HV power supplies design

Alex Pokryvailo Spellman High Voltage Electronics Corp., United States of America

2B-19 An optical measurement method for electrostatic sensing based on Fabry-Perot sensing system Yufei Wang¹, Jiawei Zhang¹, Li Wang¹, Lin Fu², Xiaobin Wang², Fouad Belhora³

¹School of Electrical Engineering, Xi'an University of Technology, Xi'an, Shaanxi, China; ²State Grid Xinjiang Electric Power Co., Ltd. Economic and Technical Research Institute Urumqi, Xinjiang, China; ³Laboratoire des Sciences de l'Ingénieur Pour l'Energie (LabSIPE), Ecole Nationale des Sciences Appliquées, El Jadida, Morocco

2B-20 New markers based on HF signals for series DC arc detection

<u>Juan M. Martínez-Tarifa</u>¹, Gabriel Barroso-de-Maria², Daniel Izquierdo², Sergio Garcia-Alfayate², Guillermo Robles¹

¹Universidad Carlos III de Madrid, Spain; ²Airbus Defence and Space

Poster session 2C: Materials and insulation systems 1

Time: Tuesday 02 July 2024 – 04:30pm - 06:30pm *Session Chair:* Yu Gao

- 2C-01 Effect of silica content and surface chemistry on the dielectric performance of silicone rubber Orestis Vryonis¹, Thomas Andritsch¹, Alun S Vaughan¹, Peter Morshuis², Aurore Claverie³
 ¹The Tony Davies High Voltage Laboratory, University of Southampton, Southampton, UK; ²Solid Dielectric Solutions, Leiden, Netherlands; ³Single Buoy Moorings Inc, Marly, Switzerland
- **2C-02** Dielectric spectra of polyurethane casting resins for electrical engineering applications <u>Josef Pihera</u>¹, Pavel Prosr¹, Petr Kadlec¹, Petr Kvasnička¹, Michal Klauber², Radek Nejdl² ¹University of West Bohemia, Czech Republic; ²Kabex a.s.

2C-03 Effect of mechanical stress on dielectric properties of epoxy resin <u>Wenjin Zhang</u>¹, Mi Xiao¹, Zehua Wang², Hucheng Liang¹, Boxue Du¹ ¹School of Electrical and Information Engineering, Tianjin University, Tianjin China; ²State Grid Tianjin Power Chengnan Power supply Branch, Tianjin, China

2C-04 Electrical tree growth characteristics of epoxy resin under combined effects of low temperature and mechanical stress

<u>Qi Li¹</u>, Boxue Du¹, Rundong Xue¹, Pengxian Song², Tiancheng Huang², Longji Li², Yifang Wang¹, Xiaoxiao Kong¹, Liping Fan¹, Yanjie Ren¹

¹School of Electrical and Information Engineering, Tianjin university, China; ²State Grid Tianjin Electric Power Company Electric Power Research Institute, China

2C-05 Lifetime investigations on insulating materials for High Voltage DC airborne applications

<u>Jean Rivenc</u>^{1,2}, Cecilien Thomas², Samuel Pin², Mourad Jebli², Guillaume Belijar², Jean-Charles Laurentie³, Serge Agnel³, Jerome Castellon³, Frederic Forget^{1,2}, Romain Magnan¹, Lea Pommier¹, Bastien Neveux^{1,3}, Emilie Fond⁴, Bastien Detilleul⁵, Florent Buttin⁴, Emmanuel Perez⁶, Christian Geertsen⁶

¹Airbus SAS, Toulouse, France; ²IRT Saint Exupéry, Toulouse, France; ³Institut d'Electronique et des Systèmes, University of Montpellier / CNRS, Montpellier, France; ⁴Radiall, Voreppe, France; ⁵Radiall, Chateau-Renault, France; ⁶ITP Interpipe, Louveciennes, France

2C-06 Effect of metal deactivator on breakdown and energy storage properties of polypropylene modified by deashing method for film capacitors

Meng Xiao, <u>Zhiyuan Zhang</u>, Xiaodan Du, Liangtian Zhang, Xiangyu Dong, Boxue Du Tianjin University, China

2C-07 Crystallization regulation of cross-linking polypropylene film for capacitors on high-temperature dielectric property

Meng Xiao, Yuyan Chen, Xiangyu Dong, Boxue Du School of Electrical and Information Engineering, Tianjin University, China

2C-08 Effect of microstructure and stretching ratio on dielectric properties of polypropylene films for HVDC capacitors

<u>Meng Xiao</u>, Xiaodan Du, Liangtian Zhang, Xiangyu Dong, Boxue Du Tianjin University, China

2C-09 Effect of stretching temperature on the breakdown performance of long-chain branched polypropylene films for HVDC capacitors

Meng Xiao, <u>Xiaodan Du</u>, Liangtian Zhang, Xiangyu Dong, Boxue Du Tianjin University, China

2C-10 Effect of graft modification on electrical tree growth in PP/POE composite insulation cables <u>Yifan Yin</u>, Zhonglei Li, Shuai Zhao, Boxue Du Tianjin University, China **2C-11** Investigation on resistance to corona erosion of different epoxy-amine combinations Ettore Fazio¹, <u>Mattia Ferraris</u>¹, Michael Loreti¹, Marco Viola¹, Angelo Croci² ¹ELANTAS Europe srl, Italy; ²ETW Consulting Sagl, Switzerland

2C-12 Cold behavior of dielectric esters <u>Fabio Scatiggio</u>, Giorgio Campi, Letizia De Florentis A&A Fratelli Parodi, Italy

2C-13 Effect of functional grafting on breakdown strength and DC conductivity of polypropylene blend insulation

<u>Shuai Zhao</u>, Zhonglei Li, Yifan Yin, Boxue Du Tianjin University, China

2C-14 Investigating the impact of grafted molecule types on frequency domain spectroscopy of polypropylene insulation

<u>Shuai Zhao</u>, Zhonglei Li, Yifan Yin, Boxue Du Tianjin University, China

2C-15 Characterization of isotactic-polypropylene-based compounds for HVDC cable insulation

<u>Bassel Diban</u>¹, Giovanni Mazzanti¹, Paolo Seri¹, Mika Paajanen², Ilkka Rytöluoto², Eetta Saarimäki², Kari Lahti³, Minna Niittymäki³, Maya Mourad⁴, Anais Leproux⁴, Rafal Anyszka⁵, Frederik Wurm⁵, Lorenzo Palmieri⁵, Timo Rheinberger⁵

¹University of Bologna, Italy; ²VTT research center, Finland; ³Tampere University, Finland; ⁴Supergrid institute, France; ⁵University of Twente, Netherland

2C-16 Ageing of aeronautical cables exposed to partial discharges: the effects of voltage frequency

<u>Vladimir Ricardo Pineda Bonilla^{1,2}, Riantsoa Rabemarolahy², Françoise Foray², Michael J. Kirkpatrick¹, Philippe Molinié¹, Emmanuel Odic¹</u>

¹Laboratoire de Génie Électrique et Électronique de Paris (GeePs -UMR8507 CNRS, Centrale Supélec, Université Paris-Saclay, Sorbonne Université) Gif-sur-Yvette, France; ²Airbus Helicopters, Marignane, France

2C-17 Analyses of RTV composite coating under DC stress for high voltage outdoor insulation

Israr Ullah¹, Urooj Shahzadi², Muhammad Mehran Bashir³, Rahmat Ullah⁴, Sajid Iqbal¹, <u>M. Tariq Nazir⁵</u> ¹Faculty of Electrical Engineering, Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi, Swabi, Pakistan; ²Institute of Chemical Sciences, University of Peshawar, Pakistan; ³Nawaz Sharif University of Engineering and Technology, Multan, Pakistan; ⁴Advanced High Voltage Engineering Research Centre, Cardiff University, UK; ⁵School of Engineering, RMIT University, Melbourne, VIC, Australia

2C-18 Electrical and morphological behavior of silicone rubber before and after accelerated thermal aging <u>El Hadi Belhiteche¹</u>, Sébastien Rondot², Madjid Meziani³, Philippe Dony², Mustapha Moudoud³, Omar Jbara²

¹University of Msila, Algeria; ²Lab. MATIM Matériaux & Ingénierie Mécanique, Reims, France; ³Lab LATAGE, University of Tizi Ouzou, Algeria

2C-19 Effect of LDPE molecular structures on the cross-linking and scorching characteristics of XLPE material for high-voltage cable

Hongjian Liu¹, Shihang Wang¹, Luwei Du¹, Jinfei Qu¹, Jiaojian Liu², <u>Shengtao Li¹</u> ¹Xi'an Jiaotong University, China; ²State Grid Shaanxi Electric Power Research Institute, China

2C-20 Performance enhancement of BNNS/NFC modified three-layer insulating paper

Xinnan Zhai¹, Daning Zhang¹, Xuan Li¹, Jiongting Jiang², Chao Li², <u>Wendong Li¹</u>, Haibao Mu¹, Guanjun Zhang¹, Lulin Xu¹

¹State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, Xi'an, China; ²State Grid Ningbo Electric Power Supply Company, Ningbo, China

Wednesday 03 July 2024

Oral session 6: Advanced and functional materials

Time: Wednesday 03 July 2024 – 8:15am - 10:00am *Session Chair*: Roman Kochetov *Session Chair*: Guillaume Belijar

6-1 Highly sensitive piezoelectric ceramic nanofibers for flexible transducers and advanced applications

Leonardo Gasperini, Giacomo Selleri, Davide Fabiani University of Bologna, Italy

6-2 Electric field regulation by surface functionally graded spacer under variable temperature gradients

Hang Yao, Hucheng Liang, Boxue Du Tianjin University, China

6-3 Insulating capacity of a sphere-plane electrode arrangement with thick dielectric coating under negative lightning impulse voltage stress in synthetic air at high pressures <u>Patrick Gambeck¹</u>, Johannes Auer¹, Myriam Koch²

¹Professorship for High Voltage Engineering and Switchgear Technology, Technical University of Munich (TUM), Germany; ²High-Voltage Laboratories, Technical University of Darmstadt, Germany

6-4 Effect of stress relaxation on insulating properties of dielectric elastomers with different pre-strain ratios

<u>Li-Juan Yin¹</u>, Hui-Yi Hu¹, Wen-Zhuo Dong¹, Yu Zhao², Zhi-Min Dang¹ ¹Department of Electrical Engineering, Tsinghua University, Beijing, China; ²School of Electrical Engineering, Zhengzhou University, Zhengzhou, China

 6-5 Electrical properties comparison: enamelled-extruded wires vs. conventional wires
 <u>Giovana Pereira dos Santos Lima</u>¹, Sonia Ait-Amar¹, Gabriel Velu¹, Philippe Frezel²
 ¹Univ. Artois, UR 4025, Laboratoire Systèmes Electrotechniques et Environnement (LSEE), Béthune, France; ²Green Isolight International, Labourse, France

Poster session Young Researcher Contest Session 3A: Conduction, polarization, space charge and related effects

Time: Wednesday 03 July 2024 – 10:30am - 12:30pm *Session Chair:* Davide Fabiani

3A-1 Study of the impact of a DC electric field on charge distribution at solid/liquid interface by acoustic method.

<u>Valentin Berry</u>¹, Paul Leblanc¹, Stéphane Hole², Thierry Paillat¹ ¹Institut Pprime, Université de Poitiers, CNRS, ENSMA, Poitiers, France; ²Laboratoire de Physique et d'Etude des Matériaux, Sorbonne Université, ESPCI Paris PSL Université, CNRS, France

3A-2 Average streamer channel field strength in pressurized synthetic air at lightning impulse voltage stress

Maximilian Millisterfer¹, Konstantin Wagner¹, Myriam Koch²

¹Professorship of High Voltage Engineering and Switchgear Technology, Technical University of Munich, Germany; ²High Voltage Laboratories, Technical University of Darmstadt, Germany

- **3A-3** Ionic liquid grafted silicone fillers for high permittivity dielectric elastomers Leo John Kershaw, Anne Ladegaard Skov Technical University of Denmark, Denmark
- 3A-4 Effect of mechanical stress on interfacial charge of double-layer cross-linked polyethylene Yao Qin, Zepeng Lv, Kai Wu Xi'an Jiaotong University, China
- 3A-5 Charge transport in a filler-free silicone rubber: exploring non-linear mechanisms and the "liquidlike" anomaly

Igor Silva^{1,2}, Pascal Rain², Lou Lacquement^{1,2}, François Gentils² ¹G2Elab, France; ²Schneider Electric, France

3A-6 The trap and dielectric characteristics of polyimide nanofiber membranes at different temperatures

Wenrui Li¹, Guanjun Zhang¹, Xiong Yang¹, Yibo Dong², Zhiliang Gao², Na Feng² ¹State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, Xi'an, China; ²Beijing Orient Institute of Measurement and Test, Beijing, China

3A-7 Electric field distribution and evolution in ±500 kV submarine cable factory joint under steady and transient voltages

Zhong Zheng, Zhonglei Li, Heyu Wang, You Wu, Boxue Du Tianjin University, China

- 3A-8 A ternary co-polyimide for high-temperature capacitive energy storage <u>Manxi Li¹, Yujie Zhu^{1,2}, Jinliang He¹, Qi Li¹</u> ¹Department of Electrical Engineering, Tsinghua University, Beijing, China; ²Department of Materials Science and Engineering, University of Wisconsin-Madison, Madison, USA
- 3A-9 Effect of insulation thickness on space charge and electric field distribution in ±500kV HVDC extruded cables

You Wu, Zhong Zheng, Heyu Wang, Zhonglei Li, Boxue Du Tianjin University, China

- 3A-10 Impact of semi-conductive layers on the DC conductivity of XLPE MVAC cables <u>Patrik Ratheiser</u>, Uwe Schichler Graz University of Technology, Austria
- 3A-11 Space charge accumulation and DC breakdown strength of epoxy nanocomposites <u>Motoshi Hirai</u>¹, Muneaki Kurimoto¹, Tomohiro Kawashima², Sunny Chaudhary³, Thomas Andritsch³ ¹Nagoya University, Japan; ²Toyohashi University of Technology, Japan; ³University of Southampton, United Kingdom
- **3A-12** Electronic transitions in biaxially oriented polypropylene accounting for photo-stimulated currents <u>Duvan Mendoza Lopez</u>, Laurent Boudou, Laurent Berquez, Christian Laurent, Gilbert Teyssedre LAPLACE, Université de Toulouse, CNRS, INPT, UPS, France
- 3A-13 Modulation of carrier injection and migration in polyethylene cable insulation based on core-shell quantum dots composite

<u>Heyu Wang</u>, Zhonglei Li, You Wu, Zhong Zheng, Zechao Yang, Boxue Du Tianjin University, China

3A-14 Fundamental analysis of interfacial signal in double-layer with different permittivity using PEA method

Yeongguk An, Hiroaki Miyake, Yasuhiro Tanaka Tokyo City University, Japan

3A-15 Study of intermediate state of Ge-rich GeSbTe phase change memories by impedance spectroscopy <u>Adrien Delpoux</u>¹, Sijia Ran², Alain Claverie², Daniel Benoit³, Jérémie Grisolia¹ ¹INSA Toulouse, France; ²CEMES, Toulouse, France; ³STMicroelectronics, Crolles, France

Poster session Young Researcher Contest Session 3B: Ageing, degradation and breakdown

Time: Wednesday 03 July 2024 – 10:30am - 12:30pm *Session Chair:* Davide Fabiani

3B-1 Breakdown characteristics and electrical life evaluation of 500 kV EHVAC cable insulation at different temperatures

<u>Tianyin Zhang</u>¹, Yuantao Zhao², Feng Xia^{1,2}, Mingyue Liu², Awais Muhammad^{1,2}, Xiangrong Chen¹ ¹College of Electrical Engineering, Zhejiang University, Hangzhou, China; ²Ningbo Orient Wires & Cables Co., Ltd., Ningbo, China

- **3B-2** Relation between chalking of HTV and decay-like aging of FRP in composite insulators <u>Yanan Peng</u>, Wendong Li, Shiyin Zeng, Yuelin Liu, Xiaochang Hua, Xinyi Yan, Guanjun Zhang Xi'an Jiaotong University, China
- 3B-3 Breakdown strength study of barium titanate ceramics for power electronics applications <u>Veronika Gavrilenko</u>¹, Paul-Etienne Vidal^{1,2}, Thomas Kohler¹, Romain Raisson^{1,2}, Sophie Guillemet- Fritsch³, Pascal Dufour³, Laurent Pecastaing¹ ¹Laboratoire des Sciences de l'Ingénieur Appliquées à la Mécanique et au génie Electrique – Fédération IPRA, Université de Pau et des Pays de l'Adour/E2S UPPA, Pau, France; ²Université de Toulouse, INP-ENIT, Tarbes, France; ³CIRIMAT, Université de Toulouse, CNRS, France
- **3B-4 PDIV and AC breakdown behavior of magnet wire in different embedded media** <u>Laureen Stahl</u>, Büsra Özdemir, Javier Torres, Peter Werle Leibniz University Hannover, Institute of Electric Power Systems, High Voltage Engineering and Asset Management, Schering-Institute, Germany
- **3B-5** Characterization of polymeric components of a cable for applications in a radiation environment <u>Federica Bortoletto</u>, Jose Gascon, Thomas Kramer, Marija Kranjcevic, Javier Riveiro Herrero, Berta Ruiz-Palenzuela, Tobias Stadlbauer CERN, Switzerland
- **3B-6** Thermal ageing of extrudable fluorinated polymer for aerospace application <u>Younnes Chikhoune</u>^{1,2}, Gilbert Teyssedre¹, Laurent Berquez¹, Philippe Collin² ¹Laplace, University of Toulouse and CNRS, France; ²Beyond Aero
- **3B-7** Experimental study on dielectric behavior of silicone gel under long-term high temperature service <u>Xinnuo Guo¹</u>, Dazhi Su¹, Fuping Zeng¹, Rirong Chen¹, Hengxin Zhong¹, Qiang Yao², Baojia Deng², Ju Tang¹

¹State Key Laboratory of Power Grid Environmental Protection, School of Electrical Engineering and Automation, Wuhan University, China; ²State Grid Chongqing Electric Power Research Institute, China

- 3B-8 Scale change approach to assess thermo-oxidative degradation in NMN insulating paper <u>Adrien Rubio</u>^{1,2}, Sombel Diaham², Nadine Lahoud Dignat², Louiza Fetouhi³, Guillaume Belijar¹, Samuel Pin¹, Zarel Valdez-Nava², Mateusz Szczepanski³ ¹IRT Saint Exupéry, Toulouse, France; ²LAPLACE, University of Toulouse, CNRS, INPT, UPS, Toulouse, France; ³Nidec - Leroy Somer, France
- **3B-9** Erosion of polymers by partial discharge at atmospheric pressure <u>Hugo Lagarrigue^{1,2}</u>, Antoine Belinger², Nicolas Naudé², Guillaume Belijar¹, Mourad Jebli¹ ¹IRT Saint Exupery, France; ²LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France
- **3B-10** Dielectric breakdown of Alumina: Effect of mechanical and electrical prestress <u>Tara Niakan</u>, Zarel Valdez-Nava, David Malec LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France

3B-11 Effects of water immersion on silicone rubber surface before and after exposure to precipitating droplets in AC electric field

<u>Karina Poluektova</u>, Sergei Vasilkov Saint Petersburg State University, Russian Federation

3B-12 Effect of cracks on the dielectric breakdown of polymers and ceramics

<u>Raul Pech-Piste</u>^{1,2}, Francis Aviles¹, Zarel Valdez-Nava², David Malec² ¹Centro de Investigación Científica de Yucatán, A.C., Unidad de Materiales, Mérida, Mexico; ²LAPLACE, Université de Toulouse, CNRS, INPT, UPS, France

- **3B-13** Breakdown and partial discharge in dry air under non-uniform electric field for MVDC applications <u>Avyoub Zouaghi</u>^{1,2}, Caterina Toigo¹, Arel Rako¹, Thanh Vu-Cong¹, Frank Jacquier¹, Alain Girodet¹ ¹SuperGrid Institute, 23 rue Cyprian, Villeurbanne, France; ²Ecole Centrale de Lyon, INSA Lyon, Universite Claude Bernard Lyon 1, CNRS, Ampère, UMR5005, Ecully, France
- 3B-14 Study on the catalytic degradation of strong greenhouse gas SF6 using a two-dimensional metal organic framework

<u>Kexin Zhu</u>¹, Langlang Lv¹, Guangzhi Chen¹, Hua Jiang¹, Xiangyu Wang¹, Liangjun Dai², Fuping Zeng¹ ¹State Key Laboratory of Power Grid Environmental Protection, School of Electrical Engineering and Automation, Wuhan University, Wuhan, China.; ²State Key Laboratory of Power Transmission Equipment & System Security and New Technology, Chongqing University, Chongqing, China

3B-15 Influence of harmonic distortion on the breakdown voltage of a composite material for the use in dry type transformers

Javier Torres, Kristin Homeier, Laureen Stahl, Peter Werle Leibniz University of Hannover, Germany

3B-16 Failure analysis of silicone rubber in corrosive environment under AC operation

<u>Guohui Pang^{1,2}</u>, Zhijin Zhang¹, Steven Qi Li^{2,1}, Xingliang Jiang¹, Hanyu Zheng¹ ¹Xuefeng Mountain Energy Equipment Safety National Observation and Research Station, Chongqing University, Chongqing, China; ²School of Engineering, The University of Manchester, Manchester, UK

Poster session Young Researcher Contest Session 3C: Experimental techniques and models

Time: Wednesday 03 July 2024 – 10:30am -12:30pm *Session Chair:* Davide Fabiani

- **3C-1** Charge transport model considering the presence of ions in an XLPE containing by-products <u>Assane Ndour</u>¹, Séverine Le Roy¹, Gilbert Teyssedre¹, Raphaël Guffond², Julien Fernandez² ¹LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France; ²Nexans France
- 3C-2 Dielectric model of polarization mechanisms in time domain field simulation including temperature dependence

Manuel Eckert^{1,2}, Josef Pihera¹

¹University of West Bohemia, Faculty of Electrical Engineering, Research and Innovation Centre of Electrical Engineering (RICE), Pilsen, Czech Republic; ²Haefely AG, Basel, Switzerland

3C-3 A novel electric field stress optimization method for high-voltage IGBT module based on AC dielectrophoresis

<u>Huanmin Yao¹</u>, Haibao Mu¹, He Li¹, Chengshan Liu², Zhiyuan Qian², Wendong Li¹, Daning Zhang¹, Guanjun Zhang¹

¹Xi'an Jiaotong University, China; ²Aerospace System Engineering Shanghai, Shanghai, China

3C-4 Equivalent circuit modelling of the dielectric response of PA6/BaTiO3 nanocomposites with different levels of absorbed moisture

<u>Keyvan Rasti</u>^{1,3}, Sathyamoorthy Dhayalan^{1,3}, Nikola Chalashkanov¹, Nick Tucker¹, Len Dissado² ¹University of Lincoln, United Kingdom; ²University of Leicester, United Kingdom; ³DPI, the Netherlands

3C-5 Numerical simulation of a transformer-based test platform

<u>Pedro Jose Quintanilla</u>¹, Eugenio Sainz¹, Ramazan Altay², Agustin Santisteban¹, Felix Ortiz¹, Alfredo Ortiz¹

¹University of Cantabria, Spain; ²BEST Transformer, Türkiye

3C-6 Simulation on tree growth under electrical and mechanical stresses

<u>Hucheng Liang</u>¹, Bei Chu¹, Zehua Wang², Wenjin Zhang¹, Yunqi Xing³, Boxue Du¹ ¹Tianjin University, China; ²State Grid Tianjin Power Chengnan Power Supply Branch, Tianjin, China; ³Hebei University of Technology, Tianjin, China

3C-7 A study towards machine learning prediction of thermal conductivity of polymers based on molecular dynamics

<u>Hiroto Yokoyama</u>, Hajime Shimakawa, Akiko Kumada, Masahiro Sato The University of Tokyo, Japan

3C-8 Generalizing numerical simulation results for droplet electrodeformation threshold under pulsed DC voltage

<u>Petr Kostin</u>, Vladimir Chirkov St. Petersburg State University, Russian Federation

3C-9 Trapping activated tautomerism of acetophenone in Polyethylene <u>Max Pierre¹</u>, Mikael Unge^{1,2}, Claire Pitois², Mikael S Hedenqvist¹ ¹Department of Fibre and Polymer Technology, Polymeric Materials Division, School of Engineering Sciences in Chemistry, Biotechnology and Health, KTH Royal Institute of Technology, Stockholm, Sweden; ²NKT HV Cables AB, Technology Consulting, Sweden

3C-10 Methodology for MD simulation and estimation of material properties of cross-linked epoxy resin <u>Pratyasha Das</u>¹, Sumit Basu², Nandini Gupta¹ ¹Department of Electrical Engineering, IIT Kanpur, India; ²Department of Mechanical Engineering, IIT Kanpur, India

3C-11 Numerical analysis of the reasons for partial coalescence of uncharged water droplet and layer

under DC electric field <u>Grigorii Yagodin</u>, Ilia Elagin, Vladimir Chirkov

Saint-Petersburg State University, Russian Federation

3C-12 Correlative calibration for space charge measurement in cables using PEA method <u>Xiaoxin Li</u>¹, Shosuke Morita², Tomohiro Kawashima¹, Yoshinobu Murakami¹, Naohiro Hozumi^{1,3} ¹Toyohashi University of Technology, Japan; ²Central Research Institute of Electric Power Industry, Japan; ³Hozumi Measuremnet Lab, Japan

3C-13 A Portable, non-invasive and non-destructive technique for condition assessment of liquid insulation

Rohith Sangineni^{1,2}, Sisir Kumar Nayak^{1,3}, Manu A Haddad²

¹School of Energy Science and Engineering, IIT Guwahati, Guwahati, India; ²Advanced High Voltage Engineering Research Centre, Cardiff University, Cardiff, United Kingdom; ³Department of Electronics and Electrical Engineering, IIT Guwahati, Guwahati, India

3C-14 Separation and recognition of partial discharge signals from multiple sources using encoderdecoder based neural network

Kotaro Matsuyama, Yasutomo Otake Mitsubishi Electric Corporation, Japan

- **3C-15** Enhanced partial discharge evaluation through integrated RF and IEC measurements <u>Rahmat Ullah</u>¹, Alistair Reid¹, Michail Michelarakis¹, Kai Zhang¹, Manu Haddad¹, Matthew Barnett², Mini Nambiar², Peter Taddei² ¹Cardiff University, United Kingdom; ²SSEN Transmission, United Kingdom
- **3C-16** Multi-point vibration monitoring of power transformer based on optical fiber sensing system <u>Sihan Wang</u>, Xiaolong Zhang, Jing Hu, Hao Liu, Wei-qi Qin, Guo-ming Ma State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University, Beijing, China

- **3C-17** Electric field mapping by electro-optical probes in known geometries under high voltage <u>Fang Liu¹</u>, Erwin Lopez¹, Andrew West¹, Veeresh Ramnarine¹, Ramy Afia¹, Vidyadhar Peesapati¹, Sinisa Djurović¹, Ian Cotton¹, Khristopher Kabbabe¹, Stephen Mbisike², Damon Stewart² ¹The University of Manchester, UK; ²National Grid, UK
- 3C-18 Simultaneous measurement of space charge distribution and partial discharge by PEA method <u>Kazuki Endo</u>¹, Kazuya Kondo¹, Junpei Kobayashi¹, Hiroaki Miyake¹, Yasuhiro Tanaka¹, Masahiro Kozako², Masayuki Hikita² ¹Tokyo City University, Japan; ²Kyushu Institute of Technology, Japan
- **3C-19** Partial discharge waveform analysis using dynamic mode decomposition <u>Tomoka Tsuya</u>¹, Shinya Iwata¹, Ryota Kitani¹, Hiroaki Uehara², Tatsuki Okamoto², Tatsuo Takada³ ¹Osaka Research Institute of Industrial Science and Technology, Japan; ²Kanto Gakuin University; ³Tokyo City University

Poster session Young Researcher Contest Session 3D: Advanced and functional materials, eco-friendly materials

Time: Wednesday 03 July 2024 – 10:30am -12:30pm *Session Chair:* Davide Fabiani

- **3D-1** An Investigation into the influence of parylene surface modification on the characteristics of cellulose insulating paper for eco-friendly fire-retardant transformers Jian Zhou, Feipeng Wang, Jie Zhang, Shi Li, Ying Zhang, Bojun Li, Sichen Yan State Key Laboratory of Power Transmission Equipment Technology, School of Electrical Engineering, Chongqing University, China
- 3D-2 Study of injection and retention of charges in silica-based nanocomposite dielectrics: impact of size of silver nanoparticles

Sariette Nowa Tatchum, Christina Villeneuve-Faure, Laurent Boudou, Kremena Makasheva LAPLACE, University of Toulouse, CNRS, UT3, INPT, Toulouse, France

3D-3 Performance evaluation of a next generation ester based dielectric for single-phase precision immersion cooling

Beau Van Vaerenbergh, Marion Kerbrat, Pieter Struelens Oleon, Belgium

3D-4 Effects of chemical grafting on the dielectric properties of aramid fiber reinforced epoxy composites

<u>Xiaoxiao Kong</u>¹, Chengyao Hou¹, Jinpeng Jiang², Yun Chen^{1,2}, Yifang Wang¹, Chong Zhang¹, Jing Mu³, Boxue Du¹

¹Tianjin University, China; ²China Electric Power Research Institute, China; ³State Grid Jibei Electric Power Company Limited Management Training Center, China

- **3D-5** Research on the recycling of EP/Al2O3 and its insulation performance after reconstitution <u>Xin Zhao¹</u>, Guanjun Zhang¹, Wendong Li¹, Wang Guo¹, Wenrui Li¹, Hongbao Zong² ¹School of electrical engineering, Xi'an jiaotong university, Xi'an; ²State Grid Tianjin Electric Power Company, Tianjin, China
- 3D-6 Electric field-assisted preparation of anisotropic BNNw/SiR composites for thermal management <u>Zikui Shen</u>¹, Yanpeng Hao¹, Meng Zhou², Zhidong Jia², Jun Wang³, Dongyuan Du¹, Fengzhen Zhang³, Wei Liang¹ ¹South China University of Technology, China; ²Tsinghua University, China; ³China National Electric Apparatus Research Institute Co., Ltd. China
- **3D-7** Effect of halloysite nanotubes on the properties of LLDPE/HNT composites for the cable industry Jan Sipla¹, Anna Vykydalová², Petr Kadlec¹, Radek Polanský¹ ¹University of West Bohemia, Faculty of Electrical Engineering. Department of Materials and Technology, Pilsen, Czech Republic; ²Slovak Academy of Sciences, Polymer Institute, Bratislava, Slovakia

3D-8 Optimizing printing parameters on dielectric properties in additive manufacturing <u>Maik Kahn</u>, Michael Kurrat

TU Braunschweig, Germany

3D-9 Dielectric and structural insight into an innovative self-healing copolymer

Daniel Haze¹, Petr Kadlec¹, Josef Pihera¹, Radek Polansky¹, Masayoshi Nishiura^{2,3}, Zhaomin Hou^{2,3} ¹University of West Bohemia, Faculty of Electrical Engineering, Department of Materials and Technology, Czech Republic; ²Advanced Catalysis Research Group, RIKEN Center for Sustainable Resource Science, Japan; ³Organometallic Chemistry Laboratory, RIKEN Cluster for Pioneering Research, Japan

3D-10 Developing novel self-healable capacitor materials with improved thermostability

<u>Neha Mulchandani</u>¹, William Greenbank², Thomas Ebel², Anne Ladegaard Skov¹, Anders Egede Daugaard¹

¹Technical University of Denmark, Denmark; ²University of Southern Denmark, Denmark

3D-11 Graded surface modification of electric vehicles motor insulating material by using plasma to tailor surface charges

<u>Shakeel Akram</u>¹, Inzamam UI Haq¹, Fang Zhi¹, Peng Wang² ¹College of Electrical Engineering and Control Sciences, Nanjing Tech University, Nanjing, China; ²College of Electrical Engineering and Control Sciences, Nanjing Tech University, Nanjing, China

3D-12 Make it stick – Influence of hydrophobicity of nano silica functionalization on dispersion and breakdown performance of BOPP nanocomposites

<u>Siegfried Werner</u>, Michael Kellner, Joachim Kaschta, Dirk W. Schubert Friedrich-Alexander University Erlangen-Nuremberg, Germany

Thursday 04 July 2024

T. W. Dakin Award Lecture

Time: Thursday 04 July 2024 – 8:15am - 9:00am *Session Chair:* Davide Fabiani

"Attracted to dielectric materials research"

Pr Yoshimichi Ohki Waseda University, Japan

Oral session 7: Nanodielectrics

Time: Thursday 04 July 2024 – 9:05am - 10:00am *Session Chair:* Jérôme Castellon *Session Chair:* Laurent Boudou

7-1 Impact of particle thermal treatment on dielectric properties of core-shell filled epoxy nanocomposites

<u>Sunny Chaudhary</u>, Orestis Vryonis, Thomas Andritsch Tony Davies High Voltage Laboratory, Department of Electronics and Computer Science, University of Southampton, Southampton, United Kingdom

- 7-2 Space charge characteristics of epoxy resin/carbon Quantum Dots nanocomposites
 <u>Daniele Mariani</u>, Simone Vincenzo Suraci, Fabrizio Palmieri, Davide Fabiani
 LIMES Laboratory of Innovative Materials for Electrical Systems Department of Electrical Engineering, University of Bologna,
 Italy
- 7-3 Electrical characteristics and surface topography of elastomeric nanocomposites based on multiwalled carbon nanotubes and poly(dimethylsiloxane)

<u>Iryna Sulym</u>^{1,2}, Konrad Terpiłowski³, Olena Goncharuk⁴, Nadine Lahoud Dignat¹, Marie-Laure Locatelli¹, Zarel Valdez-Nava¹

¹LAPLACE, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France; ²Chuiko Institute of Surface Chemistry, NASU, Ukraine; ³Maria Curie-Sklodowska University, Poland; ⁴Institute of Agrophysics, Polish Academy of Sciences, Poland

Poster session 4A: Ageing, degradation and failure

Time: Thursday 04 July 2024 – 10:30am - 12:30pm *Session Chair:* Nikola Chalashkanov

- **4A-01** A study of ageing and gelling in natural ester oils <u>Ian L Hosier</u>¹, Thomas Andritsch¹, Paul L Lewin¹, Gordon Wilson² ¹University of Southampton, United Kingdom; ²National Grid, United Kingdom
- **4A-02** Thermal fault assessment of high-voltage cable based on evolved gas analysis Hao Yuan, Kai Zhou, Yuan Li, Jiamin Kong, <u>Zerui Li</u> Sichuan University, China
- 4A-03 Increase in electrical resistance of rubber-containing epoxy resin by heat and radiation <u>Yoshimichi Ohki</u>¹, Naoshi Hirai^{1,2}, Yasuhiro Tanaka² ¹Waseda University, Japan; ²Tokyo City University, Japan

4A-04 Effect of different coating materials on partial discharge characteristics and electrical tree of printed circuit board

Jianhong Song¹, Zepeng Lv¹, Kai Wu¹, Xiangheng Zeng¹, Qixuan Wang¹, Zengbiao Huang², Qi Li³ ¹Xi'an Jiaotong University; ²SHENGYI Technology Co. Ltd; ³The University of Manchester, UK

- **4A-05** Effects of temperature gradients on breakdown of AC-GIL tri-post insulators Boxue Du¹, Zhijun Guo¹, Hucheng Liang¹, LC Hao², DP Yuan², YX Wang² ¹Tianjin University, China; ²Pinggao Group Co., Ltd, Pingdingshan, China
- 4A-06 Effects of climatic aging on the performance of EPDM used in power cables insulation
 <u>Djaffar Bouguedad</u>¹, Dahmane Mouri¹, Issouf Fofana³, Aomar Hadjadj²

 ¹Laboratoire de Génie Electrique, Université Mouloud Mammeri, Tizi-Ouzou, Algeria; ²Matériaux & Ingénierie Mécanique, Université de Reims Champagne-Ardenne, France; ³Modelling and Diagnostic of Electrical Power Network Equipment Laboratory, University of Quebec, Chicoutimi, Canada
- 4A-07 Monitoring aging of natural ester insulating fluid using supercritical fluid chromatography-mass spectrometry (SFC-MS)

Prabaharan Thiruvengetam¹, John G. Langley¹, Julie Herniman¹, <u>Ian L Hosier</u>², Thomas Andritsch², Paul L. Lewin², Gordon Wilson³, Richard C. D. Brown¹

¹School of Chemistry, University of Southampton, UK; ²Tony Davies High Voltage Laboratory, University of Southampton, UK; ³National Grid, Warwick Technology Park, Warwick, UK

- **4A-08** Effect of gamma-ray irradiation on dielectric properties of PP/Elastomer/TiO2 nanocomposite Baixin Liu, <u>Yu Gao</u>, Chenyi Guo, Di Lu, Bosen Si, Boxue Du Tianjin University, China
- **4A-09** Effect of gamma-ray irradiation on ageing of LDPE micro/nanocomposites estimated by DCIC method Chenyi Guo, <u>Yu Gao</u>, Baixin Liu, Jing Li, Bosen Si, Boxue Du Tianjin University, China
- **4A-10** Radiation resistance of PET and PEN as probed by luminescence and conductivity measurements Nassiba Belkahla¹, <u>Gilbert Teyssedre²</u>, Nadia Saidi-Amroun³, Virginie Griseri², Mohamed Saidi³ ¹UMMTO University, Tizi-Ouzou, Algeria; ²LAPLACE, University of Toulouse and CNRS; ³USTHB University, Algiers, Algeria
- 4A-11 Lifetime evaluation of photovoltaic insulating backsheets based on elongation at break considering the drop off rate

Kai Feng¹, <u>Jiawei Zhang</u>¹, Ping Wang², Lin Fu³, Li Wang¹, Rong Jia¹, Fouad Belhora⁴, Bin Zhang⁵ ¹School of Electrical Engineering, Xi'an University of Technology, Xi'an, Shaanxi, China; ²Shenzhen Power Supply Planning Design Institute Co., Ltd., Shenzhen, China; ³State Grid Xinjiang Electric Power Co., Ltd. Economic and Technical Research Institute Urumqi, Xinjiang, China; ⁴Laboratoire des Sciences de l'Ingénieur pour l'Energie (LabSIPE), Ecole Nationale des Sciences Appliquées, El Jadida, Morocco; ⁵School of Mechanical, Electrical and Information Engineering, Shandong University, Weihai, China

- **4A-12** Aging characteristics of silicone rubber composite insulators based on space charge behavior <u>Yangruisi Li</u>, Jiandong Wu, Yi Yin, Qiaohua Wang, Xiang Luo Shanghai Jiao Tong University, Shanghai, China
- 4A-13 Interfacial insulation degradation characteristics between epoxy resin and silicone rubber under different interface pressures

Zekai Zhang¹, Lanqian Yang², Qi Li¹, Pengxian Song³, Yang Yu³, Hucheng Liang¹, <u>Xiaoxiao Kong¹</u>, Boxue Du¹

¹Tianjin University, China; ²Guangdong Power Grid Co., Ltd. Guangzhou Power Supply Bureau, China; ³State Grid Tianjin Electric Power Research Institute, China

4A-14 A comparative study on thermal aging characteristics between silicone rubber and epoxy resin for dry-type transformer

<u>Xiaoxiao Kong</u>¹, Chong Zhang¹, Lidong Yan², Mingyang Wang², Hangyu Mi¹, Chengyao Hou¹, Boxue Du¹ ¹School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²State Grid Tianjin High Voltage Company, Tianjin, China 4A-15 Investigating effects of composite dielectric material components and temperature on breakdown strength

<u>Benjamin Adam Orton</u>¹, Nikola Chalashkanov², Stephen Dodd² ¹STFC ISIS, United Kingdom; ²University of Lincoln, UK

- **4A-16** Different oxygen diffusion patterns in XLPE under thermal oxidative aging <u>Nuo Xu</u>, Yueting Liu, Yang Liu, Zixuan Wang, Lisheng Zhong _{Xi'an Jiaotong University, China}
- **4A-17** Effect of antioxidant on irradiation resistance of PP composites for nuclear cable insulation Baixin Liu, <u>Yu Gao</u>, Di Lu, Chenyi Guo, Bosen Si, Boxue Du Tianjin University, China
- **4A-18** Effect of functionalized organic antioxidants on electrical treeing degradation of XLPE insulation <u>Heyu Wang</u>, Zhonglei Li, You Wu, Zhong Zheng, Yifan Yin, Shuai Zhao, Boxue Du Tianjin University, China
- 4A-19 Effect of the bending radius on the breakdown strength of rectangular PAI/PEEK insulated winding wire of electric motors

Zoltán Ádám Tamus, Richárd Cselkó Budapest University of Technology and Economics, Hungary

4A-20 Aging characteristics and lifespan prediction of composite insulator SiR under multi-haze environment in coastal area

<u>Yuepeng Xin</u>¹, Yong Liu¹, Minxin Wang¹, Bohan Wang¹, Xuejia Dong², Zhen Yin³, Boxue Du¹ ¹Tianjin university, China; ²Shijiazhuang Power Supply Branch of State Grid Hebei Electric Power Limited Corporation, China; ³State Grid Tianjin Electric Power Company High Voltage Company Branch, China

- **4A-21** Electrical tree characteristics of fiber/epoxy composites under repetitive impulse voltage <u>Lu Wang¹</u>, Boxue Du¹, Yun Chen^{1,2}, Yifang Wang¹, Chengyao Hou¹, Xiaoxiao Kong¹ ¹Tianjin University, China; ²China Electric Power Research Institute, Beijing, China
- 4A-22 Electrical tree degradation characterization of epoxy resin under thermal and temperature composite stresses based on photoelastic effect

<u>Siyuan Chen</u>¹, Htet Aung Hein¹, Ying Zhang², Renyong Zhao³, Yuhuai Wang¹, Jin Li¹ ¹Tianjin University, China; ²Skills Training Center of State Grid Jibei Electric Power Co., Ltd., Baoding, China; ³Zibo Power Supply Company, State Grid Shandong Electric Power Company, Zibo, China

4A-23 Electrical treeing degradation characteristics of glass fibre reinforced epoxy composites under compressive-tensile loads

Siyuan Chen¹, Yun Chen², <u>Yuhuai Wang</u>¹, Renyong Zhao¹, Yong Yang³, Boyuan Cui², Fang Liu³, Wenqiang Li³, Jin Li¹

¹School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²China Electric Power Research Institute, Haidian District, Beijing, China; ³Shandong Taikai Electrical Insulation Co., Ltd., Tai'an, China

4A-24 Initiation and growth characteristics of electrical trees at ultra-low frequency voltage <u>WenHao Li</u>, Tao Han, Boxue Du, Youcong Huang, Zhiwei Fu Tianjin university, China

Poster session 4B: Diagnostics and experiments 2

Time: Thursday 04 July 2024 – 10:30am - 12:30pm *Session Chair:* Juan M. Martínez-Tarifa

4B-01 Typical defect study of HVAC power cable through distortion analysis of grounding current

<u>Minxin Wang</u>¹, Yong Liu¹, Guangming Feng², Yuepeng Xin¹, Bohan Wang¹, Yufeng Guo¹, Hao Wang³, Qun Gao³, Boxue Du¹

¹School of Electrical and Information Engineering, Tianjin University, China; ²Suzhou Nuclear Power Research Institute Co., Ltd., China; ³Chengnan District Power Supply Company of State Grid Tianjin Electric Power Company, China

4B-02 Detection and diagnosis of high voltage cable water-blocking buffer layer defect based on frequency domain reflection method

Jingtao Huang¹, <u>Kai Zhou</u>¹, Qi Zhao², Hao Yuan¹

¹Sichuan University, China; ²State grid Sichuan electric power company Leshan power supply company, Leshan, Sichuan Province, China

- **4B-03** Research on transient voltage characteristics of EHV cable considering corrugated sheath structure Junyao Li, Yuxiao Hu, <u>Yan Jin</u>, Yang Xu State key laboratory of electrical insulation and power equipment, Xi'an Jiaotong University, China
- **4B-04** Research on partial discharge and self-healing characteristics for metallized film of capacitors Meng Xiao, <u>Liangtian Zhang</u>, Zhiyuan Zhang, Yuyan Cheng, Zening Lu, Boxue Du Tianjin University, China
- **4B-05** Study on partial discharge characteristics of dielectric films for metallized film capacitors Meng Xiao, <u>Liangtian Zhang</u>, zhiyuan Zhang, Xiaodan Du, Xiangyu Dong, Boxue Du Tianjin University, China
- **4B-06** Partial discharge recognition of medium voltage switchgear based on CatBoost model Chunlin Hao, Jia Chu, Tao Han, Quanwei Hu Tianjin University, China
- 4B-07 Research on transformer oil condition diagnosis technology based on multi-frequency ultrasonic detection

<u>Xiaochang Hua</u>, Haibao Mu, Yanan Peng, Chenhui Zhou, Zekai Lai, Guanjun Zhang Xi'an Jiaotong University, Shaanxi, China

4B-08 Research on typical faults of oil-impregnated paper bushing based on tanδ and capacitance measurement

Shihua Huang¹, <u>Liyun Ying</u>¹, Chao Su², Jianming Feng¹, Wei Liu¹, Da Xie¹ ¹Qingyuan Power Bureau of Guangdong Power Grid Corporation, Qingyuan, China; ²Yangshan Qingyuan Power Bureau of Guangdong Power Grid Corporation, Qingyuan, China

4B-09 Partial discharge detection beyond the frequency ranges of IEC 60270

Asawin Rajakrom¹, Chayapitch Cheechang¹, Prechapol Laochu¹, Phethai Nimsanong¹, <u>Peerawut</u> Yutthagowith²

¹Metropolitan Electricity Authority; ²King Mongkut Insitute of Technology Ladkrabang

- 4B-10 Partial discharges at boundaries of oil-pressboard immersed in mixed insulating oils
 <u>Rohith Sangineni</u>^{1,2}, Thirumurugan Chandrasekaran³, Sisir Kumar Nayak^{1,4}, Manu A Haddad²

 ¹School of Energy Science and Engineering, IIT Guwahati, Guwahati, India; ²Advanced High Voltage Engineering Research Centre, Cardiff University, Cardiff, United Kingdom; ³TIFAC CORE, Vellore Institute of Technology, Vellore, India; ⁴Department of Electronics and Electrical Engineering, IIT Guwahati, Guwahati, India
- 4B-11 Correlation method to explore corona discharge dynamics under DC harmonic voltages Kai Zhang, Alistair Reid, Michail Michelarakis, <u>Rahmat Ullah</u>, Manu Haddad Cardiff University, United Kingdom
- 4B-12 PSO and SLPSO to improve the SVM with RBF kernel for the diagnosis of power transformer oil by DGA

<u>Youcef Benmahamed</u>¹, Omar Kherif², Sofiane Chiheb³, Madjid Teguar¹ ¹Ecole Nationale Polytechnique, El Harrach, Algiers, Algeria; ²Advanced High Voltage Research Centre, Cardiff University, Cardiff, UK; ³Ecole Nationale Superieure de Technologie et d'Ingénierie, Annaba, Algeria

4B-13 Research on characteristics of typical partial discharge pattern in GIS based on SiPM

Zihan Xu¹, Lijun Zheng¹, Ruixiang Liu¹, Chuan Peng¹, Zhijie Zhang¹, Pengyue Gao¹, Liang Liang², Zhipeng Lei¹

¹Taiyuan University of Technology, Taiyuan, China; ²Urumqi Power Company of State Grid Xinjiang Electric Power Co., Urumqi, China

4B-14 Partial discharges detection using an electromagnetic antenna: a new approach based on polyimideepoxy samples

<u>Steven Coutin</u>^{1,3}, Veronika Gavrilenko¹, Roman Leduc¹, Bertrand Nogarede³, Jean-Marc Dienot^{1,2}, Robert Ruscassie¹

¹Laboratoire SIAME - Fédération IPRA, EA4581 - Université de Pau et des Pays de l'Adour/E2S UPPA, Pau, France; ²LABCEEM - Université Paul Sabatier-Toulouse III, Tarbes, France; ³NOVATEM SAS, Toulouse, France

4B-15 Measurement limitations in identifying partial discharges in turn-turn insulation of low-voltage induction motor

<u>Ondřej Šefl</u>, Raphael Färber, Christian M. Franck High Voltage Laboratory, ETH Zürich, Switzerland

- 4B-16 Effects of bending stress on the propagation of abnormally shaped electrical trees in PP Guoning Sun, Boxue Du, Zhonglei Li Tianjin university, China
- 4B-17 Inductive loop operation versus loop antenna for partial discharge detection Sana Chouaibi¹, Mohamed Hadj Said³, Antonino Imburgia², <u>Pietro Romano</u>², Sinda Kaziz², Guido Ala², Mossaad Ben Ayed¹, Denis Flandre⁴, Fares Tounsi⁴
 ¹National Engineering School of Sousse (ENISo), Sousse University, Tunisia, Tunisia; ²L.E.PR.E. H.V. Laboratory, Department of Engineering, University of Palermo, Italy; ³Center for Research in Microelectronics & Nanotechnology (CRMN), Sousse, Tunisia; ⁴SMALL Group, ICTEAM Institute, Université catholique de Louvain, Belgium
- **4B-18** Ageing assessment of submarine cables based on ultra-low frequency dielectric loss <u>WenHao Li</u>, Tao Han, Boxue Du, Youcong Huang, Zhiwei Fu Tianjin university, China
- **4B-19** Partial discharge inception and extinction voltages in motor coils for aerospace electric propulsion <u>Diego Machetti</u>, Florian Schulz, Vitik Idrizi, Andreas Reeh Rolls-Royce Deutschland, Germany

Poster session 4C: Materials and insulation systems 2

Time: Thursday 04 July 2024 – 10:30am - 12:30pm *Session Chair:* Feihu Zheng

4C-01 Thermal characterization and time-dependent-dielectric breakdown study of polyimide thin film capacitors

Marco Salina¹, Rossella Chiara¹, Francesco Guzzi¹, Gabriele Scarpiello², Dario Paci¹, <u>Donata Asnaghi</u>¹ ¹STMicroelectronics, Italy; ²Politecnico di Milano, Italy

4C-02 The homogenization effect of dielectric functionally graded materials on the electric field of insulation defects

Hao Li, Yu-Cheng Zhang, <u>Wen-Dong Li</u>, Chao Wang, Jun-Bo Deng, Guan-Jun Zhang State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, Xi'an, Shaanxi, China

4C-03 Influence of support insulators on the AC electrical strength of parallel-cylindrical conductors in liquid nitrogen

<u>André Schmid</u>, Christof Humpert TH Köln - University of Applied Sciences Cologne, Germany

4C-04 Numerical simulation of the electric field in HVDC GIL with application of surface conductivity gradient material

Hendrik Hensel, Lucas Müller, Markus Clemens University of Wuppertal, Germany

4C-05 Interaction of biaxial mechanical stress with electrical tree growth of epoxy resin

<u>Wenjin Zhang</u>¹, Mi Xiao¹, Zehua Wang², Hucheng Liang¹, Boxue Du¹

¹School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²State Grid Tianjin Power Chengnan Power supply Branch, Tianjin, China

4C-06 Improved dielectric performance of silicone rubber filled with graphene under gradient magnetic field

Hangyu Mi¹, Zekai Zhang¹, Jingang Su², Haoliang Liu¹, Xingwang Huang², Chong Zhang¹, <u>Xiaoxiao Kong¹</u>, Boxue Du¹

¹School of Electrical and Information Engineering, Tianjin University, China; ²Electric Power Research Institute of State Grid Hebei Electric Power Supply Co. Ltd., Shijiazhuang, China

- **4C-07** Humidity impact on streamer inception parameters for turn-to-turn insulation in inverter-fed motors <u>Hadi Naderiallaf</u>¹, Yatai Ji², Paolo Giangrande³, Michael Galea⁴, Michele Degano¹, Christopher Gerada¹ ¹University of Nottingham, United Kingdom; ²University of Nottingham Ningbo, Ningbo, China; ³University of Bergamo, Dalmine, Italy; ⁴University of Malta, Msida, Malta
- 4C-08 Research on semi-conductive shielding materials for high-voltage cables based on compound resins Shuai Hou¹, Lei Jia¹, Mingli Fu¹, Wen He², Yunpeng Zhan¹, Baojun Hui¹, Xiaoqiong Chen², Dehong Quan² ¹Electric Power Research Institute of China Southern Power Grid, Guangzhou, Guangdong Province, China; ²Dongguan Power Supply Bureau of Guangdong Power Grid Co. Ltd., Dongguan, China

4C-09 Suppression of metal particle lifting under polarity reversal conditions by surface functionally graded insulators

Yuhuai Wang¹, Songtao Liu², <u>Yufan Wang²</u>, Renyong Zhao³, Hein Htet Aung¹, Jin Li¹ ¹Tianjin University, China; ²High Voltage Company, State Grid Tianjin Electric Power Company, Tianjin, China; ³Zibo Power Supply Company, State Grid Shandong Electric Power Company, Zibo, China

4C-10 High Frequency dielectric properties and losses in partial discharge resistant rotating machine insulation

Hilde Marie Tollefsrud Syvertsen, Espen Eberg SINTEF Energy AS, Norway

4C-11 Study of insulation strength reduction induced by particle motion behavior under complex physical effects of GIS switching operation

Jian Wang¹, Rakhmonov Ikromjon Usmonovich², <u>Teng Zhang¹</u> ¹North China Electric Power University, China, ²Tashkent State Technical University, Tashkent, Uzbekistan

4C-12 Evaluating lifespan of corona armor tape in form-wound rotating machines

<u>Takumi Yasuda</u>¹, Takahiro Mabuchi¹, Ryuji Ikeda², Naoki Okajima², Shinsuke Kikuta³, Takayuki Sakurai², Tetsushi Okamoto³

¹Advanced Technology R&D Center, Mitsubishi Electric Corporation, Amagasaki, Japan; ²Rotating Machinery Systems Division, Toshiba Mitsubishi Electric Industrial Systems Corporation, Nagasaki, Japan; ³Rotating Machinery Systems Division, Toshiba Mitsubishi Electric Industrial Systems Corporation, Yokohama, Japan

4C-13 Structuring HVDC cable joints using smoothly field grading materials Thi Thu Nga Vu¹, <u>Gilbert Teyssedre²</u>, Séverine Le Roy² ¹Electric Power University, Hanoi, Vietnam; ²Laplace, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France

4C-14 Effect of antioxidant grafting on the dielectric properties of polypropylene insulation <u>Guoning Sun</u>, Boxue Du, Zhonglei Li Tianjin university, China

4C-15 Polymer composition and film morphology affecting polypropylene electret charge stability <u>Arthur Henderyckx</u>^{1,2}, Anna Guliakova^{3,4}, Dmitry Rychkov⁴ ¹Research Group Propolis, Department of Materials Engineering, KU Leuven, Bruges, Belgium; ²Beaulieu International Group, Kalkhoevestraat 16, Waregem, Belgium; ³Herzen State Pedagogical University, St. Petersburg, Russia; ⁴Technology Center Weissenburg, Deggendorf Institute of Technology, Weissenburg, Germany

4C-16 Partial discharge measurement during interfacial tracking degradation under 50 Hz voltage excitation <u>Pablo Donoso-Daille</u>¹, Vidyadhar Peesapati¹, Colin Smith², Koen Tavernier² ¹The University of Manchester, United Kingdom; ²IPEC Ltd, United Kingdom

- **4C-17** Dependence of self-healing arc on metal vaporization contributions for metallized film capacitor <u>Jie Zhang</u>¹, Feipeng Wang¹, Jian Zhou¹, Yushuang He², Guoqiang Du¹ ¹State Key Laboratory of Power Transmission Equipment Technology, School of Electrical Engineering, Chongqing University, China; ²College of Electrical and Information Engineering, Changsha university of science and technology, Hunan, China
- 4C-18 Comparison of properties of high-temperature vulcanized silicone rubber between natural and artificial chalking

<u>Shiyin Zeng</u>, Wendong Li, Yanan Peng, Yuelin Liu, Xinyi Yan, Guanjun Zhang Xi'an Jiaotong University, China

4C-19 Investigation of effect of nano-filler concentration on the life estimation of polyamide nanocomposites

Sathyamoorthy Dhayalan^{1,3}, <u>Keyvan Rasti</u>^{1,3}, Nikola Chalashkanov¹, Nick Tucker¹, Len Dissado² ¹University of Lincoln, United Kingdom; ²University of Leicester, United Kingdom; ³DPI, the Netherlands

4C-20 Response of polypropylene and its nanocomposite with synthetic nanoclay under electric field and temperature

Huseyin Recai Hiziroglu, Alexander Michael Bothar Kettering University, United States of America

Oral session 8: Ageing, degradation and breakdown

Time: Thursday 04 July 2024 – 02:00pm - 04:00pm *Session Chair*: Pietro Romano *Session Chair*: Nadine Lahoud Dignat

- 8-1 Effect of thermal aging on medium frequency breakdown of polyester films <u>Simone Vincenzo Suraci</u>, Lucia Cardarelli, Paolo Seri, Andrea Cavallini University of Bologna, Italy
- 8-2 Lifetime estimation of epoxy cast insulation under medium-frequency square voltage with ramp breakdown tests

<u>Xingyu Shang</u>, Lei Pang, Qinhao Bu, Qiaogen Zhang State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, China

- 8-3 Thermal aging characteristics of epoxy resin: Chemical structure and dielectric property <u>Xiaoxiao Kong</u>¹, Chong Zhang¹, Zhuoran Yang², Hangyu Mi¹, Chengyao Hou¹, Qi Li¹, Boxue Du¹ ¹School of Electrical and Information Engineering, Tianjin University, Tianjin, China; ²State Grid Nanjing Electric Power Supply Company, Nanjing, China
- 8-4 Study on breakdown of dielectric elastomer generators during energy harvesting process <u>Zihang Xu</u>¹, Zepeng Lv¹, Chen Zhang¹, Kai Wu¹, Peter Morshuis², Claverie Aurore³ ¹Xi'an Jiaotong University, China; ²Solid Dielectric Solutions, Leiden, the Netherlands; ³SBM Offshore, Carros, France
- 8-5 Effects of thermal properties on insulation breakdown behaviors of epoxy/Al2O3 composite with boron nitride doping

<u>Yuhuai Wang</u>¹, Yufan Wang², Meiyang Zuo³, Jiwei Zhang³, Songtao Liu², Hein Htet Aung¹, Jin Li¹ ¹Tianjin University, China; ²High Voltage Company, State Grid Tianjin Electric Power Company, Tianjin, China; ³Jinan Power Supply Company, State Grid Shandong Electric Power Company, Jinan, China

8-6 An engineering model for predicting probabilities of dielectric breakdown in gas-insulated systems Sophie Spencer, Edgar Engel ABB Schweiz AG, Switzerland

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