



## **32<sup>nd</sup> International Conference on Lightning Protection**

# **Advance Program**

**Crowne Plaza Shanghai**  
Oct. 11-18, 2014, Shanghai, China



# **32nd International Conference on Lightning Protection**

**Crowne Plaza Shanghai  
October 12-17, 2014**

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## Message from ICLP President



Dear friends and colleagues,

On behalf of the ICLP Scientific Committee, I have the pleasure of welcoming you to this 32nd edition of the International Conference on Lightning Protection.

This is the second time that ICLP is organized in Asia, after the very successful meeting in Kanazawa, Japan in 2006. It is the first time, in the rich history of ICLP started in 1951, that our conference is organized in China. This clearly recognizes the outstanding and prolific contributions of the scientists in the Asia Pacific region.

The scientific program of the ICLP 2014 includes 2 keynote lectures given by eminent scientists in the field, about 39 technical sessions, including 9 special sessions covering a wide range of important topics from lightning return stroke modelling to lightning protection of renewable energy systems. The technical sessions will provide an in-depth coverage of lightning physics, lightning modelling, electromagnetic effects on various systems and structures, and lightning protection challenges. A technical exhibition is also offered in parallel with the technical sessions at which 15 exhibitors will present their products to the attendees. It is worth noting that the displayed products in the exhibition, including any claimed properties, are solely the responsibility of the individual exhibitors, and thus ICLP has neither endorsed these products nor does it take any responsibilities for their functioning.

ICLP 2014 will be hosted jointly by Tsinghua University and by Shanghai Jiaotong University. I wish to express my deepest gratitude and appreciation to the Chairpersons Prof. Jinliang He and Prof. Zhengcai Fu for their outstanding leadership, and to the Technical Program Committee Chairs Prof. Rong Zeng and Dr. Yijun Zhang for their remarkable job. Without their active commitment, ICLP 2014 would not have been possible at this level of quality. My deep appreciation goes to the members of the Local Organizing Committee, in particular for their dedication, efficiency and hard work to make this 32nd ICLP a success.

My sincere gratitude goes also to the members of the Scientific Committee, to Prof. V. Cooray and Dr. Fabio Fiamingo of the ICLP Executive Board, to Session Chairpersons, Reviewers, and, last but not least, to all the authors and speakers of the conference.

ICLP 2014 is supported by the IEEE (technical co-sponsor of the conference), as a result of which all the presented papers in this conference will be available in the IEEEExplore database. Note that the ICLP 2014 Awards (Berger Award, Golde Award and Scientific Committee Awards) will be announced during the Conference Banquet, while Young Scientist Awards will be presented at the Closing Ceremony.

It has been a great privilege and pleasure for me to have been serving in my capacity of ICLP President for the last 6 years. The Chairmanship of ICLP will be passed over to two remarkable individuals: Prof. Vernon Cooray (President) and Prof. Carlo Alberto Nucci (Vice President). Both are among the most respected scientists in the field and possess all the required skills to do a great job on the Executive Board of ICLP. I am fully confident they will take ICLP to greater heights.

Finally, I do hope that ICLP 2014 will be an inspiring conference for all of you. I am also confident that you will enjoy the wonderful city of Shanghai and the exciting social events prepared for you by the Local Organizing Committee.

Enjoy ICLP 2014!

**Prof. Farhad Rachidi**  
**ICLP President**

## Message from the Conference Chairpersons

*It is our great pleasure to welcome you to ICLP 2014 in Shanghai.*



*Prof. Jinliang He*



*Prof. Zhengcai Fu*

The 32nd International Conference on Lightning Protection will be hosted jointly by Tsinghua University and Shanghai Jiaotong University. The conference venue will be the Crowne Plaza Shanghai at No.400, Panyu Road, Shanghai, China.

The ICLP 2014 conference continues the tradition of the preceding ICLP conferences by offering a platform for the exchange of scientific and technical information related to lightning phenomena. Contributions are sought on all topics related to the study of lightning physics, characterization, protection of buildings, electric power systems, electronic systems as well as methods for improving protection of people, animals and property against the effects of lightning.

An attractive program of the highest standard will await you. We look forward to seeing you in the beautiful city of Shanghai, which is the biggest city in China, and an international metropolis. Shanghai is the economic, financial, trading and shipping center in Chinese mainland and in the world.

On behalf of the organizers, we extend our warm welcome to all attendees and visitors at ICLP2014, Shanghai! Your presence and contributions to the ICLP2014 in Shanghai will make it an exciting and fruitful event. You will certainly benefit from the exceptional programs we provide, and the networking and quality time you spend with your peers.

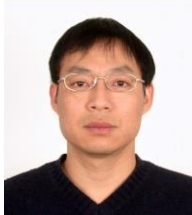
We will offer a rich scientific program of highest quality with invited speakers from all over the world and provide a broad forum of exchange for both academia and industry. The conference will cover the entire scope of atmospheric electricity, lightning physics and protection.

**Jinliang He and Zhengcai Fu**  
**Chairpersons of ICLP2014**

## Letter from the TPC Chairs



*Prof. Rong Zeng*



*Prof. Yijun Zhang*

The 32nd International Conference on Lightning Protection (ICLP2014) in Shanghai, China, is one of the most important events in the areas of lightning physics and lightning protection. In its scope and attendance, this event is the largest of its kind in the world. The Technical Program Committee (TPC), consisting of 57 prominent researchers from all over the world, has worked hard to ensure that all papers accepted for publication and presentation at this conference meet the high standards of technical quality, similar to those applied by other highly respected lightning conferences. Overall, the TPC received 544 technical paper submissions coming from 45 countries representing 6 continents. After peer reviews, during ICLP Meeting on this May in Laussane, 438 papers were accepted. Each paper was reviewed by multiple qualified reviewers. Accepted papers were assigned to 15 regular Technical Sessions, 9 Special Sessions, or to Poster Sessions. Besides traditional topics, new areas, such as lightning protection of renewable energy systems and lightning protection of smart grid, are covered. All presented papers will be published on IEEE Xplore.

The primary objective of this conference is to provide an interdisciplinary forum for the exchange of scientific knowledge and information in the fields of atmospheric electricity, lightning physics, lightning protection, and related areas. The topics receiving the most submissions were atmospheric electricity, lightning physics, lightning models and LEMP, grounding, lightning protection of power systems, lightning protection of buildings and electronic systems. Other topics that are well represented at this conference include lightning hazards and history, triggered lightning experiments, lightning protection elements and devices, lightning protection of railway systems and communication systems, lightning protection and lightning testing standards.

Whatever your lightning-related field of specialization, in either research or engineering practice, we are sure you'll find something of interest in the technical program of ICLP2014. We wish you both productive and enjoyable visit to Shanghai to attend this exciting international event!

**Rong Zeng and Yijun Zhang**  
**ICLP2014 TPC Chairs**

## ICLP Scientific Committee

### Executive Board President:

Prof. F. Rachidi, *Switzerland*

Vice President:

Prof. V. Cooray, *Sweden*

Secretariat:

Dr. Fabio Fiamingo, *Italy*

### Committee Members

Prof. I. Berta, *Hungary*

Prof. C. Bouquegneau, *Belgium*

Prof. V. Cooray, *Sweden*

Dr. G. Diendorfer, *Austria*

Prof. J. L. He, *China*

Prof. F. Heidler, *Germany*

Prof. I.R. Jandrell, *S. Africa*

Dr. M. Loboda, *Poland*

Prof. C. Mazzetti, *Italy*

Prof. C.A. Nucci, *Italy*

Prof. A. Piantini, *Brazil*

Prof. F. Rachidi, *Switzerland*

Prof. M. Rubinstein, *Switzerland*

Prof. V. Rakov, *USA*

Prof. S. Yokoyama, *Japan*

### Honorary Members of Scientific Committee

Prof. Z. Flisowski, *Poland*

Prof. W. Hadrian, *Austria*

Prof. T. Horvath, *Hungary*

Dr. J. Huse, *Norway*

Prof. T. Kawamura, *Japan*

Prof. S. Lundquist, *Sweden*

Prof. C. Menemenlis, *Greece*

Mr. E. Montandon, *Switzerland*

Prof. A.E. Pedersen, *Denmark*

Prof. J. Wiesinger, *Germany*



# ICLP2014 Committees

## Conference Chairpersons

**Jinliang He**

*Tsinghua University, China*

**Zhengcai Fu**

*Shanghai Jiaotong University, China*

## Technical Program Committee Chairs

**Rong Zeng**

*Tsinghua University, China*

**Yijun Zhang**

*CAMS, China*

## Treasurer

**Zhanqing Yu**

*Tsinghua University*

**Junting Du**

*Tsinghua University*

## Special Session

**Qing Yang**

*Chongqing University*

## Conference and Exhibition Management

**Jun Hu**

*Tsinghua University*

## Conference Secretary

**Zhihui Huang**

*GDLPC, China*

## Conference Secretariat

**Chijie Zhuang**

*Tsinghua University*

# Technical Program Committee (TPC)

## Chairs for Technical Program Committee

**Prof. Rong Zeng**, *Tsinghua University, China*

**Prof. Yijun Zhang**, *CAMS, China*

## TPC Members

Hussein B. Ahmad, *Malaysia*

**Rousseau Alain**, *France*

Akihiro Ametani, *Japan*

Soiram Ernesto Silva Artigas, *Venezuela*

Yoshihiro Baba, *Japan*

Wallace do Couto Boaventura, *Brazil*

Alberto Borghetti, *Italy*

Francisco Jose Román Campos, *Colombia*

Mingli Chen, *Hong Kong, China*

William Chisholm, *Canada*

Young-ki Chung, *Korea*

John Van Coller, *South Africa*

Camilo Andrés Cortés, *Colombia*

A.P.J. van Deursen, *Netherlands*

Patrick Du, *Hong Kong, China*

C.S. Engelbrecht, *Netherlands*

Chandima Gomes, *Malaysia*

Leonid Grcev, *Macedonia*

Stanislaw Grzybowski, *USA*

Mitchell Guthrie, *USA*

A. Manu Haddad, *UK*

Zainal Abidin Hartono, *Malaysia*

Ali Hussein, *Canada*

Masaru Ishii, *Japan*

Zen Kawasaki, *Japan*

Alexander Kern, *Germany*

E. Philip Krider, *USA*

Udaya Kumar, *India*

Bok-Hee Lee, *Korea*

Jea-Bok Lee, *Korea*

Yuei-An Liou, *Chinese Taipei*

Manuel L. B. Martinez, *Brazil*

Grzegorz Masłowski, *Poland*

C. Mata, *USA*

Pantelis N. Mikropoulos, *Greece*

Hideki Motoyama, *Japan*

Mohammed Nayel, *Egypt*

Mario Paolone, *Switzerland*

José Osvaldo S. Paulino, *Brazil*

Fabrizio Pilo, *Italy*

Osmar Pinto Jr, *Brazil*

Ed Pols, *Netherlands*

Eleftheria Pyrgioti, *Greece*

Xiushu Qie, *China*

Marcelo Saba, *Brazil*

Horacio Torres Sánchez, *Colombia*

Wenxia Sina, *China*

Masaaki Sato, *Japan*

Keyhan Sheshyekani, *Iran*

Takatoshi Shindo, *Japan*

Volodymyr Shostak, *Russia*

Wah Hoon Siew, *UK*

Héctor L. Soibelzon, *Argentina*

Rajeev Thottappillil, *Sweden*

Silvério Visacro Filho, *Brazil*

Daohong Wang, *Japan*

Peerawut Yutthagowith, *Thailand*

# Technical Programs at a Glance

## Special Sessions

ID	TopicTitle	Chairs
SS-1	Lightning Protection of Renewable Energy systems	Prof. Kazuo Yamamoto, <i>Chubu University, Japan</i>
SS-2	Lightning Protection of Railways, Automobiles and Airplanes	Prof. Kazuo Yamamoto, <i>Chubu University, Japan</i>
SS-3	Lightning Protection of Power Distribution Systems	Prof. Alexandre Piantini, <i>University of São Paulo, Brazil</i>
SS-4	Application of Advanced Optical Techniques in Lightning Research	Prof. Yijun Zhang, <i>Chinese Academy of Meteorological Sciences, China</i>
SS-5	Lightning Observations Based on Lightning Location Systems	Prof. V. Rakov, <i>University of Florida, USA,</i>
SS-6	Return Stroke Modeling and Their Applications	Prof. Vernon Cooray, <i>Uppsala University, Sweden</i>
SS-7	The Behavior of Soils in Response to the Impression of Lightning Currents and Its Impact on the Performance of Power Systems	Prof. Silvério Visacro Filho, <i>Federal University of Minas Gerais, Brazil</i>
SS-8	Recent Technology developments for Lightning Research	Prof. Zen Kawasaki, <i>Osaka University, Japan</i>
SS-9	Special Session on understanding lightning protection systems	Prof. Manu Haddad, <i>Cardiff University, UK</i>

## Technical Committees

ID	Technical Committee	Co-chairs
TC-1	Lightning physics and phenomenology	Prof. Zen Kawasaki, <i>Singapore</i> Prof. Yijun Zhang, <i>China</i>
TC-2	Lightning discharge	Prof. V. Cooray, <i>Sweden</i> Prof. Daohong Wang, <i>Japan</i>
TC-3	Lightning occurrence characteristics+SS5-7	Prof. Gerhard Diendorfer, <i>Austria</i> Prof. Ali Hussein, <i>Canada</i>
TC-4	Lightning attachment	Prof. M. Bouquegneau, <i>Belgium</i> Prof. Osmar Pinto Jr., <i>Brazil</i>
TC-5	Lightning electromagnetic impulse (LEMP) and lightning-induced effects	Prof. F. Rachidi, <i>Switzerland</i> Prof. Y. Baba, <i>Japan</i>
TC-6	Lightning deleterious effects	Prof. X. S. Qie, <i>China</i> ; Prof. M. Rubinstein, <i>Switzerland</i>
TC-7	Lightning protection of electronic systems	Prof. M. Loboda, <i>Poland</i> Prof. Ian R Jandrell, <i>South Africa</i>
TC-8	Lightning protection of power/railway systems	Prof. A. Borghetti, <i>Italy</i> Prof. Udaya Kumar, <i>India</i>
TC-9	Lightning protection of renewable energy systems	Prof. S. Yokoyama, <i>Japan</i> Dr. W. H. Siew, <i>UK</i>
TC-10	Lightning protection of buildings	Prof. F. Heidler, <i>Germany</i> Prof. Patrick Du, <i>Hong Kong, China</i>
TC-11	Practical lightning protection problems	Prof. R. Thottappillil, <i>Sweden</i> Prof. M. Paolone, <i>Switzerland</i>
TC-12	Lightning down-conductors and grounding	Prof. A. M. Haddad, <i>UK</i> Prof. S. Visacro, <i>Brazil</i>
TC-13	High-voltage/triggered lightning experiments for simulation of lightning effects	Prof. S. Grzybowski, <i>USA</i> Prof. P. N. Mikropoulos, <i>Greece</i>
TC-14	Lightning protection and lightning testing standards	Mr. Mitchell Guthrie, <i>USA</i> Prof. F. J. Roman Campos, <i>Colombia</i>
TC-15	Lightning safety, medicine and education	Prof. A. Piantini, <i>Brazil</i> Prof. Yuei-An Liou, <i>Chinese Taipei</i>

## Time Table of ICLP2014 Technical Sessions

Time		Room A	Room B	Room C	Room P
2:00-6:00PM		Registration			
6:00-8:00PM		Reception			
AM	9:30-9:45	Open Ceremony (Auditorium of Shanghai Jiaotong Univ.)			
AM	9:45-10:45	Invited Lecture 1			
AM	10:45-11:15	Coffee Break			
AM	11:15-12:15	Invited Lecture 2			
PM	2:00-3:45	SS4	TC6	SS3-1	2:00-6:00PM
PM	3:45-4:15	Coffee Break			Poster Session 1
PM	4:15-6:00	SS5-1	TC15-1	TC8-1	6:30-9:00PM TPC Dinner
AM	8:30-10:15	TC1-1	TC4	TC7	10:00AM-4:30PM Poster Session 2
AM	10:15-10:45	Coffee Break			
AM	10:45-12:30	TC3-1	TC5-1	TC10-1	
PM	2:00-3:45	SS8-1	TC12-1	SS1	
PM	3:45-4:15	Coffee Break			10:00AM-4:00PM Poster Session 3
PM	4:15-6:00	TC2	TC13	SS2	
AM	8:30-10:15	TC3-2	TC12-2	TC11	
AM	10:15-10:45	Coffee Break			
AM	10:45-12:30	TC1-2	TC14-1	TC8-2	12:00-14:00 ICLP Scientific Meeting
PM	2:00-3:30	SS8-2	SS9	SS3-2	
PM	3:30-4:00	Coffee Break			10:00AM-4:30PM Poster Session 4
PM	4:30-22:00	Banquet			
AM	8:30-10:15	TC3-3	TC5-2	TC8-3	
AM	10:15-10:45	Coffee Break			
AM	10:45-12:30	TC1-3	TC15-2	TC10-2	
PM	2:00-3:30	SS5-2	TC14-2	TC9	
PM	3:30-4:00	Coffee Break			Closing Ceremony
PM	4:00-5:30	SS6	TC12-3	SS7	
PM	5:30-6:30	Closing Ceremony			
AM 8:00 to PM 18:00		Organzied Social Tour (to Wuzhen, Zehjiang Province)			

# Invited Lectures

## Recent Advances in High Energy Atmospheric Physics



**Prof. Joseph R. Dwyer**

*Department of Physics*

*University of New Hampshire, Durham, NH USA*

Date/Time: Monday, 13 October 2014/ 9:45 – 10:45am

Venue: Meeting Hall of Shanghai Jiao Tong University

**Prof. Joseph R. Dwyer** obtained his B. S. in physics and mathematics from the University of California at Irvine, in 1986, and obtained his MS and PhD in physics from University of Chicago, in 1988 and 1994, respectively. He was a post-doc. Research Scientist in Columbia University from 1993 to 1995, a Research Associate from 1995 to 1998, a Lecturer in 1999, an Assistant Research Scientist from 1998 to 2000, in the Department of Physics, University of Maryland. He was Assistant Professor of Physics and Space Sciences, Florida Tech, during 2000 to 2003, and has been a professor since 2006. Since 2007, he is the Director of the Geospace Physics Laboratory, and he is the Department Head of Physics and Space Sciences, Florida Tech, during July 2013 to August 2014. He has been Paul Chair in Space Science and Professor of Physics, University of New Hampshire, since August 2014.

**Abstract:** Lightning and laboratory sparks were long assumed to involve only low-energy electrons and so were considered to be entirely conventional discharges. With the discovery of energetic radiation from natural and rocket-triggered lightning and from long laboratory sparks, we now know that these discharges often produce runaway electrons that may be accelerated to hundreds of keV in energy. Furthermore, thunderstorms have been observed to produce MeV gamma-ray glows, lasting seconds to minutes, and short ( $<1$  msec) but intense terrestrial gamma-ray flashes (TGFs). The TGFs also launch terrestrial electron beams (TEBs) into space where they may be observed thousands of km away. These observations show that both thunderstorms and lightning are generating very high electric fields capable of producing large numbers of energetic electrons. These energetic electrons may produce currents that influence the system, and so it is important to understand their properties. In this presentation, an overview will be given of the new field of High Energy Atmospheric Physics, which includes the x-ray and gamma-ray observations of thunderstorms and lightning, along with the physics of relativistic runaway electrons.

## Psychological Disability in Lightning Injury



### Prof. Dr. Chris Andrews

*The University of Queensland, Australia*

Date/Time: Monday, 13 October 2014/ 9:45 – 10:45am

Venue: Meeting Hall of Shanghai Jiao Tong University

**Prof. Chris. Andrews** graduated with honours in Electrical Engineering in 1973, and then Master of Engineering Science, and Diploma in Computer Science, in 1976. After this, he studied Medicine, and graduated MBBS with honours in 1982. He now practices medicine in daily life as a Family Practitioner. While practicing medicine, he completed a law qualification, and trained in the barrister stream being later registered.

In his research work Chris received the PhD degree in the area of Lightning and Electrical Injuries, with a special interest in Telephone Related Injuries. He is internationally regarded in the area of lightning and electrical injuries. Chris is a regular medico-legal expert having examined some hundreds of cases, on five continents.

He has contributed one major joint-edited text, and personal or joint authorship of 11 book chapters and updates, and 46 papers, letters, and conference presentations to the literature. He is an invited member of MT4 of IEC TC64 which examines the effects of electric current on the human body. He has been awarded the Kitagawa Medal for contributions to the area of keraunomedicine.

In private life, Chris has two sons, one cat, and tropical fish. He enjoys amateur theatre and music, amateur radio, and also holds a pilot's licence. Photography and Genealogy are also interests.

**Abstract:** When lightning and electrical injuries are considered, many concentrate on the physical aspects of the injury, such as burns, muscle, and nerve damage, among other physical features. In reality, while these are important, the major disability following the injury comes from psychological injury. The importance of this component of the injury is often not recognised, and it has major impact on work function, family function, ability to support a family, and indeed can often be the reason for the termination of relationships, and long term unemployment.

The nature of the psychological injury will be reviewed, and it will be shown that memory and cognitive loss are important and severe deficits. These are coupled with learning deficits, and in particular receptive information subscale deficits.

Receptive auditory learning deficits are particularly important. The special place of depression is discussed, with associated phobic anxiety disorders, and more general social anxiety disorders. The influence of social withdrawal on relationship function will be discussed.

The underlying pathology is presumed to be some form of brain dysfunction. This is enigmatic when electric current has not passed, or passed only in a tiny amount, near the brain. While there are behavioural reasons for a psychological reaction to grow from the insult, it is likely that areas of specific brain damage give rise to the syndrome.

Various theories of the genesis of the injury will be reviewed, and it will be shown that vascular damage and the release of vascular factors may be implicated. Further, various hormonal responses to the injury are shown to affect specific brain sites. These sites are particularly associated with the deficiencies seen, and evidence for this association is advanced, both in psychiatric terms and in terms of an electric current injury.

It is hoped that those asked to describe the injury consequences will not overlook the psychological consequences and give them their due importance.



# Technical Program

## Oral Sessions

**MONDAY**  
**OCTOBER 13, 2014**

*Note: Every session has two chairpersons with equal responsibility and they are listed in alphabetical order.*

*\*) Candidate for Young Scientist Award*

## SS4 Application of Advanced Optical Techniques in Lightning Research

Monday, 13 October 2014, Room A

Chairpersons: Weitao Lu, China, Yijun Zhang, China

2:00pm -2:15pm	<b>An Unusual Two-Stroke Negative Cloud-to-Ground Flash Showing Profuse Branching and Corona-Like Formations</b> M. D. Tran, V. A. Rakov, and S. Mallick; -University of Florida, Gainesville, FL, USA	349
2:15pm -2:30pm	<b>A Gigantic Jet Event over a Summer Storm in China</b> YANG Jing; -Chinese Academy of Sciences, Beijing, China; FENG GuiLi; -Shandong Research Institute of Meteorology, Jinan, China	309
2:30pm -2:45pm	<b>On the Occurrence of Recoil Leaders in Negative Upward Flashes in Brazil</b> Marcelo M. F. Saba, Carina Schumann, Amanda R. de Paiva, Robson Jaques, Halph M. Fraulob ELAT; -National Institute for Space Research, Brazil; Marco Antonio da Silva Ferro; -Institute of Aeronautics and Space (IAE), São Paulo, Brazil; Tom A. Warner; -ZT Research, Rapid City SD, USA	482
2:45pm -3:00pm	<b>Spectrum of Lightning Dart Leader from 400 to 1000 nm</b> Jianyong Cen, Ping Yuan; -Northwest Normal University, Lanzhou, China	97
3:00pm -3:15pm	<b>Correlation between the Channel-bottom Light Intensity and Channel-base Current of an Artificially Triggered Lightning Flash</b> M. Zhou*, J. Wang; -Wuhan University, Wuhan, China; D. Wang, N. Takagi; -Gifu University, Gifu, Japan; W. R. Gamera, M. A. Uman, D. M. Jordan, J. T. Pilkey, T. Ng; -University of Florida, Gainesville, USA	328
3:15pm -3:30pm	<b>Simultaneous Optical and Electrical Observations of a Natural Downward Bipolar Flash</b> Luwen Chen, Weitao Lu, Yijun Zhang; -Chinese Academy of Meteorological Sciences, Beijing, China; Luwen Chen; -Lightning Protection Center of Guangdong Province, Guangzhou, China; Daohong Wang; -Gifu University, Gifu, Japan	356
3:30pm -3:45pm	<b>Three-dimensional Propagation Characteristics of Leaders in a Downward Negative Lightning Flash</b> Weitao Lu, Yan Gao, Ying Ma, Yang Zhang, Yijun Zhang; -Chinese Academy of Meteorological Sciences, Beijing, China; Luwen Chen; -Lightning Protection Center of Guangdong Province, Guangzhou, China	331

## TC6 Lightning deleterious effects

Monday, 13 October 2014, Room B

Chairpersons: **Gerard Berger**, *France*, **Xiushu Qie**, *China*

2:00pm	<b>Assessing the Dangers of Lightning to Livestock, a Case Study</b>	43
-2:15pm	<b>a Lightning Event Resulting in the Deaths of 22 Sattle</b> <b>Andrew S. Dickson</b> ; <i>-University of the Witwatersrand, Johannesburg, South Africa</i>	
2:15pm	<b>Lightning: Gods and Sciences</b>	510
-2:30pm	<b>Chandima Gomes, Ashen Gomes</b> ; <i>-Universiti Putra Malaysia, Serdang, Malaysia</i>	
2:30pm	<b>Induction Lightning Current System Design</b>	470
-2:45pm	<b>Zang Pi-Cui, He Wei, Zhang Long, Wang Liu-Ling, Lu Ping, Wang Dong-Dong</b> ; <i>-Yunnan Normal University, Kunming, China</i>	
2:45pm	<b>Evaluation of Nerve Stimulation of Electromagnetic Field by</b>	443
-3:00pm	<b>Lightning Current Pulses</b> <b>Z. Á. Tamus, T. Iváncsy, I. Kiss, L. Szűcs</b> ; <i>-Budapest University of Technology and Economics, Budapest, Hungary</i>	
3:00pm	<b>Recognition of Lightning-induced Trauma to the Skeleton: a</b>	355
-3:15pm	<b>Forensic Taphonomic Study</b> <b>Nicholas Bacci*, Tanya Augustine, Patrick Randolph, Quinney, Hugh Hunt, Ken Nix</b> ; <i>-University of the Witwatersrand, Johannesburg, South Africa</i>	
3:15pm	<b>Lightning Hazard Mitigation in Uganda</b>	468
-3:30pm	<b>Ahurra Kulyaka Mary</b> ; <i>-National Meteorological Centre, Entebbe, Uganda</i> ; <b>Chandima Gomes, Ashen Gomes, Wan Fatinhamamah Wan Ahmad</b> ; <i>-Universiti Putra Malaysia, Serdang, Malaysia</i>	
3:30pm	<b>Possible Level on the Harm in Tops of Brains owing to</b>	26
-3:45pm	<b>Exposure of Lightning Return Strokes</b> <b>Hiroshi Kurita</b> ; <i>-Zaimoku-cho, Higashimatsuyama, Saitama, Japan</i>	

## SS3-1 Lightning Protection of Power Distribution

Monday, 13 October 2014, Room C

Chairpersons: **Alexandre Piantini**, *USA*, **Shozo Sekioka**, *Japan*

2:00pm -2:15pm	<b>Practical Lightning Protection Design for Overhead Power Distribution Lines</b> <b>Shigeru Yokoyama</b> ; -CRIEPI, Yokosuka-shi, Japan; <b>Tomoyuki Sato</b> ; -Tohoku Electric Power Co., Inc., Miyagi, Japan; <b>Akihisa Takahashi</b> ; -Chugoku Electric Power Co., Hiroshima, Japan	226
2:15pm -2:30pm	<b>New Test Requirements for Distribution Arresters</b> <b>Bernhard Richter</b> ; -PPHV Technology Center ABB Switzerland LTD., Wettingen, Switzerland	320
2:30pm -2:45pm	<b>Waveshapes of Lightning Induced Voltages on an Overhead Line above Lossy Ground</b> <b>José Osvaldo S. Paulino</b> , <b>Ivan José S. Lopes</b> , <b>Wallace C. Boaventura</b> , and <b>Glássio C. Miranda</b> ; -Federal University of Minas Gerais, Belo Horizonte, Brazil; <b>Celio F. Barbosa</b> ; -Fundação CPqD Campinas, Brazil	221
2:45pm -3:00pm	<b>Evaluation of Lightning-Induced Voltages over Lossy Ground with Frequency-dependent Soil Parameters</b> <b>Fernando H. Silveira</b> , <b>Alberto De Conti</b> , <b>Silverio Visacro</b> ; -Federal University of Minas Gerais, Belo Horizonte, Brazil	262
3:00pm -3:15pm	<b>Lightning-caused Transformer Failures in Distribution Systems</b> <b>Alexandre Piantini</b> , <b>de Carvalho</b> , <b>Paulo F. Obase</b> ; -University of São Paulo, São Paulo, Brazil; <b>Jorge M. Janiszewski</b> ; -Polytechnic School – PTC, São Paulo – SP, Brazil; <b>Gilnei J. G. dos Santos</b> ; -AES Sul São Leopoldo, Brazil	264
3:15pm -3:30pm	<b>Impact of Distribution Line Insulated Tower Head and Cross Arms on Lightning Surges in 10 kV Substations</b> <b>Yuwei He</b> , <b>Zhengcai Fu</b> , <b>Anfeng Jiang</b> ; -Shanghai Jiao Tong University Shanghai, China; <b>Aijun Wu</b> , <b>Guangli Wang</b> ; -Shanghai Municipal Electric Power Company, Shanghai, China	256
3:30pm -3:45pm	<b>Indirect Lightning Performance of a Distribution Network</b> <b>Alberto Borghetti</b> , <b>Fabio Napolitano</b> , <b>Carlo Alberto Nuccia</b> , <b>Fabio Tossani</b> ; -University of Bologna, Italy; <b>Gilnei J. G. Dos Santos</b> , <b>Donorvan R. Fagundes</b> ; -AES Sul, Brazil; <b>Gustavo P. Lopes</b> , <b>Manuel L. B. Martinez</b> ; -Federal University of Itajubá, Brazil	503

## SS5-1 Lightning Observations Based on Lightning Location Systems

Monday, 13 October 2014, Room A

Chairpersons: **Vladimir Rakov**, *USA*, **Marcos Rubinstein**, *Switzerland*

4:15pm -4:30pm	<b>Lightning Locating Systems: Characteristics and Validation Techniques</b> <b>Amitabh Nag*</b> , <b>Martin J. Murphy</b> ; - <i>Vaisala Inc., Louisville, Colorado, USA</i> ; <b>Wolfgang Schulz</b> ; - <i>OVE-ALDIS, Vienna, Austria</i> ; <b>Kenneth L. Cummins</b> ; - <i>University of Arizona, Tucson, Arizona, USA</i>	292
4:30pm -4:45pm	<b>Earth Networks Lightning Overview</b> <b>Stan Heckman</b> , <b>Charlie Liu</b> , <b>Chris Sloop</b> ; - <i>Earth Networks Germantown, Maryland USA</i>	494
4:45pm -5:00pm	<b>LINET Systems – 10 Years Experience, 3D Lightning Detection in the VLF/LF Regime</b> <b>Hans D. Betz</b> ; - <i>University of Munich, Munich, Germany</i> ; <b>Baptiste Meneux</b> ; - <i>Research and Development Section nowcast GmbH Sauerbruchstr. 48, Munich, Germany</i>	420
5:00pm -5:15pm	<b>Beijing Lightning NETwork (BLNET): Configuration and Preliminary Results of Lightning Location</b> <b>Yu Wang</b> , <b>Xiushu Qie</b> , <b>Dongfang Wang</b> , <b>Mingyuan Liu</b> ; - <i>Institute of Atmospheric Physics, CAS, Beijing, China</i>	183
5:15pm -5:30pm	<b>Evaluation of BrasilDAT Relative Detection Efficiency based on LIS Observations and a Numeric Model</b> <b>Kleber P. Naccarato</b> ; <b>Osmar Pinto Jr.</b> ; - <i>ELAT/ CCST / INPE São José dos Campos, Brazil</i> ; <b>Christopher D. Sloop</b> , <b>Stan Heckman</b> , <b>Charlie Liu</b> ; - <i>Earth Networks, Inc. Germantown, MD, USA</i>	479
5:30pm -5:45pm	<b>Collations of Tohoku LLS Data and Lightning Current Waveforms in Winter</b> <b>Noriyasu Honma</b> , <b>Yasuji Hongo</b> ; - <i>Tohoku Electric Power Company, Inc., Japan</i> ; <b>Takaaki Konno</b> ; - <i>CVEngineering Corporation</i>	445
5:45pm -6:00pm	<b>Negative Lightning Current Parameters and Detection Efficiency for Two Operational LLS in Catalonia (NE Spain)</b> <b>Victor March</b> ; - <i>Gamesa Innovation &amp; Technology Pamplona, SPAIN</i> <b>Joan Montanyà</b> ; - <i>Technical University of Catalonia Terrassa, SPAIN</i> <b>Nicolau Pineda</b> ; - <i>Meteorological Service of Catalonia Barcelona, SPAIN</i>	267

## TC15-1 Lightning Safety, Medicine and Education

Monday, 13 October 2014, Room B

Chairpersons: **Chris Andrews**, *Australia*, **Ron Holle**, *USA*

4:15pm	<b>Lightning Fatalities in Colombia from 2000 to 2009</b>	11
-4:30pm	<b>Norberto Navarrete</b> ; - <i>Simón Bolívar Hospital, Colombia</i> ; <b>Mary Ann Cooper</b> ; - <i>University of Illinois @ Chicago, USA</i> ; <b>Ronald Holle</b> ; - <i>Holle Meteorology &amp; Photography, United States</i>	
4:30pm	<b>Misconceptions of Lightning: Some South African Surveys</b>	483
-4:45pm	<b>Estelle Trengove</b> ; - <i>University of the Witwatersrand, Johannesburg, South Africa</i>	
4:45pm	<b>The Visual Identification of Lightning-Producing Thunderstorm Clouds</b>	15
-5:00pm	<b>Ronald L. Holle</b> ; - <i>Holle Meteorology &amp; Photography Oro Valley, Arizona, USA</i>	
5:00pm	<b>Mapping Lightning Fatality Risk</b>	65
-5:15pm	<b>William P. Roeder</b> ; - <i>Private Meteorologist, Rockledge, FL, U.S.A.</i> ; <b>Benjamin H. Cummins</b> ; - <i>Resource Systems Group, Inc., Burlington, VT, U.S.A.</i> ; <b>Walker S. Ashley</b> ; - <i>Northern Illinois University, Dekalb, IL, U.S.A.</i> ; <b>Ronald L. Holle</b> ; - <i>Holle Meteorology &amp; Photography, Oro Valley, AZ, U.S.A.</i> ; <b>Kenneth L Cummins</b> ; - <i>University of Arizona, Tucson, AZ, U.S.A.</i>	
5:15pm	<b>Lightning Warnings with NLDN Cloud and Cloud-to-ground Lightning Data</b>	93
-5:30pm	<b>Ronald L. Holle</b> ; - <i>Vaisala, Inc., Tucson, Arizona, USA</i> ; <b>Nicholas W.S. Demetriades</b> ; - <i>Arizona Vaisala, Inc., Helsinki, Finland</i> ; <b>Amitabh Nag</b> ; - <i>Vaisala, Inc., Louisville, Colorado</i>	
5:30pm	<b>Intelligent Localisation of Signals Using the Signal Waveforms: A Review</b>	135
-5:45pm	<b>Nur Farah Aziz, Velappa Ganapathy, Jeevan Ganesan, Harikrishnan Ramiah</b> ; - <i>University of Malaya, West Malaysia</i> ; <b>Paul Ratnamahilan Polycarp Hoole, H. Kunsei, K. Pirapaharan</b> ; - <i>University of Technology, Papua New Guinea</i> ; <b>Samuel Ratnajeevan Herbert Hoole</b> ; - <i>Michigan State University, USA</i>	
5:45pm	<b>The Influence of Socio Demographic Factors on Severe Weather Concern, Knowledge and Preparedness</b>	285
-6:00pm	<b>Aini, M.S., Elistina, A.B.</b> ; - <i>Universiti Putra Malaysia, UPM Serdang, Selangor, Malaysia</i> ; <b>Ab Kadir, M.Z.A, Gomez, C.</b> ; - <i>Universiti Putra Malaysia, Selangor, Malaysia</i> ; <b>Keul, A.G.</b> ; - <i>University of Technology, Vienna, Austria.</i>	

## TC8-1 Lightning protection of power/railway systems

Monday, 13 October 2014, Room C

Chairpersons: Wallace do Couto Boaventura, Brazil, Qing Yang, China

4:15pm	<b>Lightning Caused Outages in the Austrian Power Grid</b>	44
-4:30pm	<b>Transmission Line Network</b> Gerhard Diendorfer, Hannes Pichler; -Austrian Electrotechnical Association (OVE), Dept. ALDIS, Vienna, Austria; Georg Achleitner, Matthias Broneder; -Austrian Power Grid AG, Vienna, Austria	
4:30pm	<b>Effect of Corona and Non-Linear Tower Grounding System</b>	64
-4:45pm	<b>Modelling on Backflashover Simulation</b> F. M. Gatta, A. Geri, S. Lauria, M. Maccioni; -Dept. of Astronautic, Electric and Energetics Engineering (DIAEE) "Sapienza" University of Rome, Rome, Italy	
4:45pm	<b>Research on Lightning Trips and Protection Measures of Overhead Transmission Lines</b>	111
-5:00pm	Lu Yong-ling*, Liu Yang, Zhou Zhi-cheng, Tao Feng-bo; -Electric Power Research Institute, Jiangsu Province Electric Power Company, Nanjing, China	
5:00pm	<b>Requirements for and Development of Fuse-type SPD</b>	122
-5:15pm	<b>Disconnecter</b> Atsushi Sato, Nobuyuki Morii, Hidetaka Sato; -NTT Facilities, Tokyo, Japan	
5:15pm	<b>Modelling and Analysis of Different Representations for High Voltage Tower Structures, Evaluation of the Lightning Probability</b>	130
-5:30pm	J. Plesch, T. Hoehn, S. Pack; -Graz University of Technology, Graz, Austria	
5:30pm	<b>Factors Effect on Discharge Path to Scaled UHV Transmission Lines</b>	141
-5:45pm	Yu Wang, Yunzhu An, Shenglong E, Xishan Wen, Lei lan, Bao Wen; -Wuhan University, Wuhan, China; Min Dai, Zhijun Li; -EPRI, Wuhan, China	
5:45pm	<b>Experience and Long Term Performance of 132 kV Overhead Lines Gapless-Type Surge Arrester</b>	147
-6:00pm	Iryani Mohamed Rawi*; -Tenaga Nasional Berhad Kuala Lumpur, Malaysia; Mohd Pauzi Yahaya; -TNB Research, Tenaga Nasional Berhad, Kuala Lumpur, Malaysia; M. Z. A. Ab. Kadir, Norhafiz Azis; -Universiti Putra Malaysia, Selangor, Malaysia	

# Technical Program

## Oral Sessions

**TUESDAY**  
**OCTOBER 14, 2014**



## TC1-1 Lightning physics and phenomenology

Tuesday, 14 October 2014, Room A

Chairpersons: **F. J. Román Campos**, *Columbia*, **Ian R. Jandrell**, *South Africa*

8:30am	<b>Self-Initiated and Other-Triggered Positive Upward Lightning</b>	47
-8:45am	<b>Measured at the Peissenberg Tower, Germany</b> <b>F. Heidler, M. Manhardt, K. Stimper</b> ; - <i>University of the Federal Armed Forces, Munich, Germany</i>	
8:45am	<b>The Effects of Aerosol on Development of Thunderstorm</b>	52
-9:00am	<b>Electrification: A Simulation Study in Weather Research and Forecasting (WRF) Model</b> <b>Pengguo Zhao, Yan Yin, Hui Xiao</b> ; - <i>Nanjing University of Information Science &amp; Technology, Nanjing, China</i>	
9:00am	<b>A Numerical Study of Aerosol Effects on Electrification of</b>	62
-9:15am	<b>Thunderstorms</b> <b>Zheng Shi*</b> ; - <i>Nanjing University of Information Science and Technology, Nanjing, China</i> ; <b>Yong Bo Tan</b> ; - <i>Nanjing University of Information Science and Technology, Nanjing, China</i>	
9:15am	<b>High Speed Video Observation on Random Stepping and</b>	391
-9:30am	<b>Branching of Negative Leader</b> <b>Rubin Jiang*, Xiushu Qie, Mingyuan Liu, Gaopeng Lu, Zhulin Sun, Zhichao Wang, Xueke Wu, Hongbo Zhang, Kun Liu, Xun Li</b> ; - <i>Institute of Atmospheric Physics, CAS, Beijing, China</i>	
9:30am	<b>Lightning Corona Sheath Dynamics Based on a Generalized</b>	107
-9:45am	<b>Space Charge Distribution</b> <b>Caixia Cvetic J., Ignjatovic M., Pavlovic D. Djuric R., Ponjavic M., Sumarac D., Trifkovic Z., Mijajlovic N.</b> ; - <i>School of Electrical Eng, Belgrade, Serbia</i> ; <b>Heidler F.</b> ; - <i>University of the Federal Armed Forces, Munich, Germany</i>	
9:45am	<b>Lightning Activity in Typhoon Morakot(0908)</b>	353
-10:00am	<b>Ying Wen*, Yang Zhao, Xiangzhen Kong</b> ; - <i>Cold and Arid Regions Environmental and Engineering Research Institute, CAS, Beijing, China</i> ; <b>Ying Wen</b> ; - <i>University of Chinese Academy of Sciences, CAS, Beijing, China</i>	
10:00am	<b>A Huristic Approach to Obtain the Electric Fields Necessary</b>	136
-10:15am	<b>for the Initiation of Upward Lightning Flashes from Towers in the Presence of Glow Corona</b> <b>Vernon Cooray</b> ; - <i>Uppsala University, Sweden</i> ; <b>Liliana Arevalo</b> ; - <i>R&amp;D Department ABB Power System, HVDC Ludvika, Sweden</i>	

## TC4 Lightning attachment

Tuesday, 14 October 2014, Room B

Chairpersons: **Marcos Rubinstein**, *Switzerland*, **F. H. Silveira**, *Brazil*

8:30am	<b>Three-Dimensional Propagation Characteristics of the Upward</b>	323
-8:45am	<b>Connecting Leaders in Six Tall-Object Lightning Flashes Observed in Guangzhou</b> <b>Yan Gao*</b> , Weitao Lu, Ying Ma, Luwen Chen, Yang Zhang, Yijun Zhang; - <i>Chinese Academy of Meteorological Sciences, Beijing, China</i> ; <b>Luwen Chen, Xu Yan</b> ; - <i>Lightning Protection Center of Guangdong Province, Guangzhou, China</i>	
8:45am	<b>Lightning Protection for the Holy Mosque and the</b>	351
-9:00am	<b>Jamarat Bridge in Makkah</b> <b>Z. A. Hartono, I. Robiah</b> ; - <i>Lightning Research Pte. Ltd., Kuala Lumpur, Malaysia</i>	
9:00am	<b>Comparison between Numerical and Passive Integration of</b>	215
-9:15am	<b>Flat Plate Electric Field Sensor Output</b> <b>J. H. Lange, H.G.P. Hunt, K.J. Nixon</b> ; - <i>University of the Witwatersrand, Johannesburg, South Africa</i>	
9:15am	<b>An Analytical Consideration on the Striking Probability and</b>	366
-9:30am	<b>the Total Amount of Strikes to Simple Structures According to Standardized Regulations</b> <b>Martin Hannig*</b> , Volker Hinrichsen; - <i>Technische Universität Darmstadt, Darmstadt, Germany</i> ; <b>Ronald Hannig</b> ; - <i>Philips-Universität Marburg, Marburg, Germany</i> ; <b>Ralph Brocke</b> ; - <i>DEHN + SÖHNE GmbH + Co.KG., Neumarkt, Germany</i>	
9:30am	<b>Two-dimensional Simulation on the Glow to Streamer</b>	246
-9:45am	<b>Transition from Horizontal Conductors</b> <b>Lipeng Liu*</b> , Marley Becerra; - <i>Royal Institute of Technology, Stockholm, Sweden</i>	
9:45am	<b>Progress on the Development of a Measuring Instrumentation</b>	297
-10:00am	<b>for Detection of Pre-Discharges on a Lightning Rod under the Influence of a Negative Downward Leader</b> <b>Martin Hannig, Volker Hinrichsen</b> ; - <i>Technische Universität Darmstadt, Darmstadt, Germany</i> ; <b>Ralph Brocke</b> ; - <i>DEHN + SÖHNE GmbH + Co.KG., Neumarkt, Germany</i>	
10:00am	<b>Streamer to Leader Transition Criteria for Propagation of Long</b>	137
-10:15am	<b>Sparks and lightning Leaders</b> <b>Liliana Arevalo</b> ; - <i>R&amp;D Department ABB Power Systems, Ludvika, Sweden</i> ; <b>Vernon Cooray</b> ; - <i>Uppsala University, Uppsala, Sweden</i>	

## TC7 Lightning protection of electronic systems

Tuesday, 14 October 2014, Room C

Chairpersons: **Josef Birkel**, Germany, **Marek Loboda**, Poland

8:30am	<b>Lightning Incidence on Wind Turbines in Winter</b>	460
-8:45am	<b>Masaru Ishii, Mikiyoshi Saito</b> ; -The University of Tokyo, Tokyo, Japan; <b>Daisuke Natsumi</b> ; -Toyo Sekkei Co., Kanazawa, Japan; <b>Akiko Sugita</b> ; -Franklin Japan Co., Sagami, Japan	
8:45am	<b>Lightning Current among Closely-Spaced Cables</b>	121
-9:00am	<b>Hongcai Chen*, Y. Du and Mingli Chen</b> ; -The Hong Kong Polytechnic University Hung Hom, Kowloon, Hong Kong, China	
9:00am	<b>An Approach to Assess the probability of Damage When a Coordinated SPD System is Installed</b>	207
-9:15am	<b>G.B. Lo Piparo</b> ; -Univ. of Rome "La Sapienza", Rome, Italy; <b>T. Kisielewicz</b> ; -Warsaw Univ. of Technology, Warsaw, Poland; <b>C. Mazzetti</b> ; -Univ. of Rome "La Sapienza", Rome, Italy; <b>A. Rousseau</b> ; -Protection Unit SEFTIM, Paris, France	
9:15am	<b>Multiple Shots on SPDs-Additional Tests</b>	273
-9:30am	<b>Alain Rousseau</b> ; -SEFTIM, Vincennes, France; <b>Xuyun Zang</b> ; -Shanghai GrandTop Lightning Shanghai, China; <b>Ming Tao</b> ; -Eurotect Electrical, Ecully, France	
9:30am	<b>Initial Study on ZnO Based Commercial Ceramic Varistor for Low Voltage Application</b>	303
-9:45am	<b>Mahmood Anwar, Yoshishige Endo</b> ; - Hitachi Critical Facilities Protection Pte. Ltd., Loyang Crescent, Singapore	
9:45am	<b>Behavior of Low Voltage Varistors under Very Fast Oscillatory Type Current Impulse Environment</b>	426
-10:00am	<b>LA Duminda Kumara and Mahesh Edirisinghe</b> ; -University of Colombo Colombo, Sri Lanka; <b>Vernon Cooray</b> ; -Division for Electricity Uppsala University Sweden, Uppsala	
10:00am	<b>Influence of Different Impulse Waveforms on Coordination of Two Cascaded SPDs</b>	528
-10:15am	<b>Ziyu He*</b> ; -Zhejiang University, Hangzhou, China; <b>Y. Du</b> ; -The Hong Kong Polytechnic University, Hong Kong, China	

## TC3-1 Lightning occurrence characteristics

Tuesday, 14 October 2014, Room A

Chairpersons: **Gerhard Diendorfer**, *Australia*, **Wolfgang Schulz**, *Belgium*

10:45am	<b>Earth Networks Lightning Overview</b>	496
-11:00am	<b>Stan Heckman</b> , <b>Charlie Liu</b> , <b>Chris Sloop</b> ; - <i>Earth Networks, Germantown, Maryland USA</i>	
11:00am	<b>Three Direction Finding Methods of Thunder Source Using Microphone Array</b>	171
-11:15am	<b>Zhang Han</b> , <b>Gu Shanqiang</b> , <b>Feng Wanxing</b> , <b>Fang Yuhe</b> , <b>Yan Biwu</b> , <b>Guo Juntian</b> , <b>Zhou Ziqiang</b> ; - <i>State Grid Electric Power Research Institute, Wuhan, China</i>	
11:15am	<b>Lightning Detection Network Confidence Ellipses for Ground-Truth Lightning Events Occurring in Close Proximity to Each Other</b>	462
-11:30am	<b>Hugh G. P. Hunt*</b> , <b>Kenneth J. Nixon</b> ; - <i>University of the Witwatersrand, Johannesburg, South Africa</i>	
11:30am	<b>Lightning Occurrence Density in Guinea</b>	508
-11:45am	<b>Mamadou Lamine Bah</b> ; - <i>Department of Meteorology, Conakry, Guinea, France</i> ; <b>Chandima Gomes</b> ; - <i>Universiti Putra Malaysia, Serdang, Malaysia</i> ; <b>Mamadou Tounkara</b> ; - <i>Department of Meteorology, Conakry Guinea, France</i> ; <b>Ari Davdov</b> ; - <i>Earth Networks-WeatherBug, Germantown, USA</i>	
11:45am	<b>European Cloud-to-Ground Lightning Characteristics</b>	6
-12:00am	<b>D. R. Poelman*</b> ; - <i>Royal Meteorological Institute of Belgium, Brussels, Belgium</i> ; <b>W. Schulz</b> , <b>G. Diendorfer</b> ; - <i>OVE-ALDIS, Vienna, Austria</i> ; <b>M. Bernardi</b> ; - <i>SIRF &amp; Meteo Laboratory, Milan, Italy</i>	
12:00am	<b>The Characteristics of Winter Lightning in Hokkaido as Observed by the JLDN</b>	35
-12:15pm	<b>Michihiro Matsui</b> , <b>Yuji Hara</b> ; - <i>Franklin Japan Corporation Sagamihara, Kanagawa, Japan</i>	
12:15pm	<b>Number of Lightning Strikes to Tall Structures-Comparison of Calculations and Measurements Using a Modern Lightning Monitoring System</b>	55
-12:30pm	<b>Martin Wetter</b> ; - <i>Phoenix Contact GmbH &amp; Co. KG, Blomberg, Germany</i> ; <b>Alexander Kern</b> ; - <i>Aachen University of Applied Sciences, Juelich, Germany</i>	

## TC5-1 Lightning electromagnetic impulse (LEMP) and lightning-induced effects

Tuesday, 14 October 2014, Room B

Chairpersons: Yoshihiro Baba, Japan, Farhad Rachidi, Switzerland

10:45am -11:00am	<b>Propagation Effects on Radiation Fields Known as Narrow Bipolar Pulses Generated by Compact Cloud Discharges</b> Vernon Cooray; -Uppsala University, Uppsala, Sweden; M. Fernando, T.A.L.N. Gunasekara, S. Nanayakkara; -University of Colombo, Colombo, Sri Lanka	105
11:00am -11:15am	<b>Induced Voltage on a Above-Ground Natural Gas/Oil Pipeline due to Lightning Strike on a Transmission Linea</b> Georgios D. Peppas*, Marios-Panagiotis Papagiannis, Stavros Koulouridis, Eleftheria C. Pyrgioti; -University of Patras, Patras, Greece	133
11:15am -11:30am	<b>Simulation of Lightning Electromagnetic Pulses with the TLM Method in the 2D Cylindrical Coordinate System</b> Yohei Tanaka*, Yoshihiro Baba, Naoto Nagaoka, Akihiro Ametani; -Doshisha University, Kyoto, Japan;	3
11:30am -11:45am	<b>The Evaluation of Lightning Return Stroke Current Using Measured Fields</b> Mahdi Izadi; -Islamic Azad University, Firoozkooh Branch, Iran; Mohd Zainal Abidin Ab Kadir; -University Putra Malaysia, Selangor, Malaysia; Maryam Hajikhani; -Aryaphase Company, Tehran, Iran	146
11:45am -12:00am	<b>Lightning Electromagnetic Fields and Their Induced Voltages on Overhead Lines: the Effect of a Non-flat Lossy Ground</b> Javad Paknahad, Keyhan Sheshyekani, Mohsen Hamzeh; -Shahid Beheshti University Tehran, Iran; Farhad Rachidi; -Swiss Federal Institute of Technology, Lausanne, Switzerland	165
12:00am -12:15pm	<b>Analysis of the Effect on the Large Floating Roof Oil Tanks Struck by Indirect Lightning based on FDTD</b> Yakun Liu, Zhengcai Fu, Anfeng Jiang; -Shanghai Jiao Tong University, Shanghai, China; Quanzhen Liu, Baoquan Liu; -Qingdao Safety Engineering Institute, SINOPEC, Qingdao, China	252
12:15pm -12:30pm	<b>The Influence of Oblique Part on Tortuous Channel Lightning Electromagnetic Field</b> Xiaoja Wang, Yazhou Chen, Haojiang Wan, Hao Wang; -Shijiazhuang Mechanical Engineering College, Shijiazhuang, China; Lin Wang; -Troop 77108, Chongzhou, China	265

## TC10-1 Lightning protection of buildings

Tuesday, 14 October 2014, Room C

Chairpersons: **Patrick Du**, *China*, **Fridolin Heidler**, *Germany*

10:45am	<b>Surge Current Distribution in the Lightning Protection System of a Test House Equipped in Electrical and Electronic Appliances</b>	66
-11:00am	<b>G. Maslowski</b> , <i>S. Wyderka</i> , <i>R. Ziemba</i> , <i>G. Karnas</i> , <i>K. Filik</i> , <i>L. Karpinski</i> ; - <i>Rzeszow University of Technology, Rzeszow, Poland</i>	
11:00am	<b>Installation of Bulkhead Plates for Lightning Energy Diversion at FAA Communication Towers Sites</b>	68
-11:15am	<b>C. M. Chuck Graves, Jr.</b> ; - <i>Federal Aviation Administration (FAA), Oklahoma City, OK, USA</i> ; <b>Ben Wibisono</b> , <b>Enrique Tenicela</b> ; - <i>Lockheed Martin Corporation, Washington DC, USA</i>	
11:15am	<b>Surge Propagation and Characteristics in Building Wiring Systems</b>	116
-11:30am	<b>Xiang Luo</b> ; - <i>Shanghai Jiaotong University, Shanghai, China</i> ; <b>Y. Du</b> , <b>Hongcai Chen</b> ; - <i>The Hong Kong Polytechnic University, Hong Kong, China</i>	
11:30am	<b>Influence of Humidity and Pollution on the Dielectric Strength of Components Used in Isolated LPS</b>	99
-11:45am	<b>Ralph Brocke</b> ; - <i>DEHN + SÖHNE GmbH + Co. KG., Neumarkt, Germany</i> ; <b>Ottmar Beierl</b> ; - <i>Georg-Simon-Ohm University, Nuremberg, Germany</i>	
11:45am	<b>Cloud to Ground and Ground to Cloud Flashes in Lightning Protection: And Future Severe Lightning and Climate Change</b>	127
-12:00am	<b>S Thirukumaran</b> , <b>R. Harikrishnan</b> , <b>K. Jievan</b> ; - <i>University of Malaya, Malaysia</i> ; <b>P.R.P Hoole</b> , <b>S. Aiau</b> , <b>M. Kavi</b> , <b>J. Fisher</b> , <b>K. Pirapaharan</b> ; - <i>University of Technology, Papua New Guinea</i> ; <b>S.R.H. Hoole</b> ; - <i>Michigan State University, USA</i>	
12:00am	<b>Protection Against Lightning of Reinforced Concrete Buildings</b>	213
-12:15pm	<b>E. Bachelier</b> , <b>F. Issac</b> , <b>D. Prost</b> ; - <i>ONERA – DEMR/CEM, Toulouse, France</i> ; <b>C. Miry</b> , <b>E. Amador</b> , <b>P. Duquerroy</b> ; - <i>EDF R&amp;D – LME, Moret sur Loing, France</i>	
12:15pm	<b>Lightning Protection in Nuclear and Radiological Environments According to IEC/EN 62305-2:2012</b>	214
-12:30pm	<b>Alessandro Tofani</b> , <b>Davide De Carli</b> , <b>Valentina Montarese</b> ; - <i>Valentina Montarese, Medical Physics Dept., Carrara, Italy</i> ; <b>Giorgio Mosti</b> , <b>Davide De Carli</b> ; - <i>TecnoStudio Engineering, Masa, Italy</i> ; <b>Carlo Mazzetti</b> ; - <i>University of Rome “La Sapienza”, Roma, Italy</i>	

## SS8-1 Recent Technology Developments for Lightning Research

Tuesday, 14 October 2014, Room A

Chairpersons: Zen Kawasaki, Singapore, Daohong Wang, Japan

2:00pm	<b>Fast Antennas: A Plea for Continued Use</b>	490
-2:15pm	<b>Stan Heckman;</b> - <i>Earth Networks, Germantown, Maryland, USA</i>	
2:15pm	<b>Fine Spatial Structures and Associated Electric Field Changes</b>	161
-2:30pm	<b>for an M-component Observed with a VHF Broadband Interferometer System</b>	
	<b>Mingli Chen, Yanchi Shen;</b> - <i>The Hong Kong Polytechnic University, Hong Kong, China;</i> <b>Wansheng Dong;</b> - <i>Chinese Academy of Meteorological Sciences, Beijing, China;</i>	
2:30pm	<b>Multiple Baseline Lightning Interferometry - Improving the</b>	86
-2:45pm	<b>Detection of Low Amplitude VHF Sources</b>	
	<b>Michael Stock*, Paul Krehbiel;</b> - <i>New Mexico Institute of Mining and Technology, Socorro, New Mexico, USA</i>	
2:45pm	<b>Identification of Asymmetries in Bidirectional Leader</b>	272
-3:00pm	<b>Development by Means of the Lightning Mapping Array</b>	
	<b>Joan Montanyà, Oscar van der Velde;</b> - <i>Universitat Politècnica de Catalunya, Terrassa (Barcelona), Spain</i>	
3:00pm	<b>High Resolution Observation on Rocket-triggered Lightning</b>	296
-3:15pm	<b>Xiushu Qie; Rubin Jiang, Zhuling Sun, Mingyuan Liu, Zhichao Wang, Gaopeng Lu, Hongbo Zhang;</b> - <i>Chinese Academy of Sciences, Beijing, China</i>	
3:15pm	<b>Rocket-and-wire Triggered Lightning Experiments: A Review</b>	394
-3:30pm	<b>and Update</b>	
	<b>Vladimir A. Rakov;</b> - <i>University of Florida, Gainesville, Florida, USA</i>	
3:15pm	<b>Relationship between Positive Cloud-to-Ground Flash</b>	84
-3:30pm	<b>and Tilted Charge Structure of Thunderstorm</b>	
	<b>Haoliang Wang*, Fengxia Guo;</b> - <i>Nanjing University of Information Science and Technology, Nanjing, China;</i> <b>Meiou Qin;</b> - <i>Liaoning Climate Center, Shenyang, China</i>	

## TC12-1 Lightning Down-conductors and Grounding

Tuesday, 14 October 2014, Room B

Chairpersons: **Zhengcai Fu**, China, **Keyhan Sheshyekani**, Iran

2:00pm	<b>Evaluation of Grounding Grid's Effective Area</b>	119
-2:15pm	<b>F. Hanaffi</b> , W H Siew, I. Timoshkin; -University of Strathclyde, United Kingdom; <b>Hailiang LU</b> , Yu Wang, Lei Lan, Xishan Wen; Wuhan University, Wuhan, China	
2:15pm	<b>Performance of Reinforcing-steel with Joints for Down-conductors and Resistance of a Building where Rebar and Joints were connected by Connectors</b>	21
-2:30pm	<b>Kazuo Hiruma</b> ; -Obayashi Corporation, Japan; <b>Takayuki Nihei</b> ; -TOKYO TEKKO Co.,Ltd, Japan; <b>Takeo Sonehara</b> ; -SHODEN Corporation, Japan; <b>Shigeru Yokoyama</b> ; -Central Research Institute of Electric Power Industry, Japan; <b>Hideo Shimokawa</b> ; -Institute of Electrical Installation Engineers of Japan, Japan	
2:30pm	<b>A Hybrid Frequency-Time Domain Methodology for the Modeling of Grounding Systems</b>	59
-2:45pm	<b>Li Jingli</b> , Qi Ge, Qiao Zhiyuan; -Zhengzhou University, Zhengzhou, China; <b>Zhang Lingjuan</b> ; -Henan Electric Power Company, Zhengzhou, China	
2:45pm	<b>Transient Impedance of Grounding Rods Encased in Ground Enhancing Compounds</b>	100
-3:00pm	<b>Vasilios P. Androvitsaneas</b> , Ioannis F. Gonos, Ioannis A. Stathopoulos; -National Technical University of Athens, Athens, Greece	
3:00pm	<b>Steady State Performance of Improvised Ufer Grounding Practice</b>	162
-3:15pm	<b>Siow Chun Lim</b> ; -University Subang Jaya, Selangor, Malaysia; <b>Mohd Zainal Abidin Abd Kadir</b> , Chandima Gomes, Norhafiz Azis; -Universiti Putra Malaysia Serdang, Selangor, Malaysia	
3:15pm	<b>Fitting Algorithm for Power Tower Grounding Resistance with Vertical Layered Soil Model</b>	201
-3:30pm	<b>Huang Ying</b> , Tang Bo, Qu Zihang, Chen Bin; -Three Gorges University, Yichang, China	
3:30pm	<b>Grounding Impedance Calculation of Steel Monopile Foundations of Offshore Wind Turbines in Intertidal Zone</b>	261
-3:45pm	<b>Zhongnan Zheng</b> , Jincheng Wu, B.J Zhang; -Wuhan University, Wuhan, China	



## SS1 Lightning Protection of Renewable Energy Systems

Tuesday, 14 October 2014, Room C

Chairpersons: Søren Find Madsen, Denmark, Kazuo Yamamoto, Brazil

2:00pm	<b>Causes of Wind Turbine Blade Damages Due to Lightning and</b>	235
-2:15pm	<b>Future Research Target to Get Better Protection Measures</b> Shigeru Yokoyama; -CRIEPI, Japan; Nobuyuki Honjo; -Electric Power Development Co.,Ltd, Japan; Yoh Yasuda; -Kansai University, Japan; Kazuo Yamamoto; -Chubu University, Japan	
2:15pm	<b>Robust Lightning Current Measurements for Wind Turbines</b>	90
-2:30pm	<b>using Proven Technologies</b> S.F. Madsen, K. Bertelsen and T.H. Krogh; -Global Lightning Protection Services A/S, Herning, Denmark	
2:30pm	<b>EMTP models of a Wind Turbine Grounding System</b>	240
-2:45pm	Kazuo Yamamoto and Shinichi Sumi; -Chubu University, Kasugai, Japan	
2:45pm	<b>Classification of Wind Turbine Blade Incidents Regarding</b>	271
-3:00pm	<b>Lightning Risk Management</b> Yoh Yasuda; -Kansai University Suita, Osaka, Japan; Toshiaki Fujii; -Otowa Electric Corporation Amagasaki, Hyogo, Japan; Kazuo Yamamoto; -Chubu University Kasugai, Aichi, Japan; Nobuyuki Honjo; -J-Power, Tokyo, Japan; Shigeru Yokoyama; -Japan Transport Safety Board, Tokyo, Japan	
3:00pm	<b>A Simulation Tool to Assess the Lightning Induced Over-</b>	424
-3:15pm	<b>Voltages on dc Cables of Photovoltaic Installations</b> Charalambos A. Charalambous; -University of Cyprus Nicosia, Cyprus; Nikolaos Kokkinos; -Elemko Metamorphosis, Greece; Nicholas Christofides; -Frederick University Nicosia, Cyprus; Mohd Zainal Abidin Ab Kadir, Chandima Gomes; -University Putra Malaysia Selangor, Malaysia	
3:15pm	<b>Lightning Protection Zoning for Wind Turbine Blades</b>	91
-3:30pm	S.F. Madsen, K. Bertelsen and T.H. Krogh; -Global Lightning Protection Services, Herning, Denmark	
3:30pm	<b>The Effect of Overhead Ground Wires of a Lightning</b>	228
-3:45pm	<b>Protection System for a Wind Turbine Generator</b> Mitsuru Onuma; -Onuma Design Co., Ltd Yurihonjo, Akit, Japan	

## TC2 Lightning Discharge

Tuesday, 14 October 2014, Room A

Chairpersons: **Mingli Chen**, *China*, **Mohd Zainal A. Ab Kadir**, *Malaysia*

4:15pm -4:30pm	<b>An Update on the Characteristics of Positive Flashes Recorded on the Säntis Tower</b> <b>M. Azadifar*</b> , <b>F. Rachidi</b> , <b>C. Romero</b> ; <b>M. Paolone</b> ; <i>-Swiss Federal Institute of Technology, Lausanne, Switzerland</i> ; <b>D. Pavanello</b> ; <i>-University of Applied Sciences of Western Switzerland, Sion, Switzerland</i> ; <b>V.A. Rakov</b> ; <i>-University of Florida, Gainesville FL, USA</i> ; <b>M. Rubinstein</b> ; <i>-University of Applied Sciences of Western Switzerland, Yverdon, Switzerland</i>	223
4:30pm -4:45pm	<b>Estimation of Charge Distribution of Individual Lightning Discharges by VHF Broadband Interferometer</b> <b>Zen Kawasaki</b> ; <i>-Hitachi Critical Facilities Protection Pte. Ltd, Japan</i> ; <b>Manabu Akita</b> ; <i>-UEC Chofu, Tokyo, Japan</i>	89
4:45pm -5:00pm	<b>Lightning Discharges Accompanied by Initial Breakdown Pulses</b> <b>Yang Zhang</b> , <b>Yijun Zhang</b> , <b>Weitao Lu</b> , <b>Dong Zheng</b> ; <i>-Chinese Academy of Meteorological Sciences, Beijing, China</i> ; <b>Shaodong Chen</b> ; <i>-Guangzhou Field Experiment Site for Lightning Research and Testing, Guangzhou, China</i>	278
5:00pm -5:15pm	<b>Noise Reduction of Lightning Electric Field Measurements Using Local Polynomial Approximation (LPA) with ICI Rule</b> <b>Herbert E. Rojas</b> ; <i>-Universidad Distrital Francisco José de Caldas, Bogotá, Colombia</i> ; <b>Camilo A. Cortés</b> ; <i>-Universidad Nacional de Colombia, Bogotá, Colombia</i>	402
5:15pm -5:30pm	<b>Upward and Downward Lightning Observed at Tokyo Skytree</b> <b>Toru Miki*</b> , <b>Mikihisa Saito</b> , <b>Takatoshi Shindo</b> , <b>Daiki Tanaka</b> , <b>Akira Asakawa</b> , <b>Hideki Motoyama</b> ; <i>-CRIEPI, Yokosuka, Japan</i> ; <b>Masaru Ishii</b> ; <i>-The University of Tokyo, Tokyo, Japan</i> ; <b>Yusuke Suzuhigashi</b> , <b>Hiroshi Taguchi</b> ; <i>-Tobu Tower Skytree Co. Ltd, Tokyo, Japan</i>	429
5:30pm -5:45pm	<b>Continuing Currents in Cloud Flashes</b> <b>Chandana Perera</b> , <b>S.P.A. Vayanganie</b> , <b>Mahendra Fernando</b> ; <i>-University of Colombo, Colombo, Sri Lanka</i> ; <b>Vernon Cooray</b> ; <i>-University of Uppsala, Uppsala, Sweden</i>	428
5:45pm -6:00pm	<b>Modeling of Electrical Discharge with Vertical Rod Protection</b> <b>D. Khelil</b> , <b>S. Bouazabia</b> , <b>MM. Munzunzi</b> , <b>Z. Omari</b> ; <i>-University of Science and Technology, Houari Boumediene, Algiers</i>	352

## TC13 High-voltage/Triggered Lightning Experiments for Simulation of Lightning Effects

Tuesday, 14 October 2014, Room B

Chairpersons: **Manuel L. B. Martinez**, *Brazil*, **P. N. Mikropoulos**, *Greece*

4:15pm -4:30pm	<b>Influence of Ground Wire Protection Angle on Upward Leader from 110-1000 kV AC Lines</b>	305
	<b>Xi Wang*</b> , Jinliang He, Zhanqing Yu, Rong Zeng; -Tsinghua University, Beijing, China; <b>Farhad Rachidi</b> ; - Swiss Federal Institute of Technology, Lausanne, Switzerland	
4:30pm -4:45pm	<b>Investigation of the Dehydration Effects of Lightning Impulses</b>	395
	<b>D. R. Cornish</b> , Y-C. H. Lee, M. von Poser, K. J. Nixon and I. R. Jandrell; -University of the Witwatersrand, Johannesburg, South Africa	
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	<b>Oscar Diaz</b> , <b>Vernon Cooray</b> ; -Uppsala University, Uppsala, Sweden; <b>Liliana Arevalo</b> ; -Power Systems HVDC ABB AB, Ludvika, Sweden	
5:15pm -5:30pm	<b>Surge Analysis of Onshore Wind Farm Due to Multiple Lightning Strokes</b>	202
	<b>Anfeng Jiang*</b> , <b>Zhengcai Fu</b> , <b>Yuwei He</b> ; -Shanghai Jiao Tong University, Shanghai, China; <b>Bengang Wei</b> , <b>Liming Wang</b> ; - Shanghai Municipal Electric Power Company, Shanghai, China	
5:30pm -5:45pm	<b>Preliminary Investigation into the Interaction between Lightning Current and Resin</b>	449
	<b>M. von Poser</b> , <b>H. G. P. Hunt</b> , <b>K. J. Nixon</b> ; -University of the Witwatersrand, Johannesburg, South Africa	
5:45pm -6:00pm	<b>Characteristics and correlation of return stroke, M component and continuing current for triggered lightning</b>	212
	<b>Yijun Zhang</b> , <b>Yang Zhang</b> , <b>Meng Xie</b> , <b>Dong Zheng</b> , <b>Weitao Lu</b> ; - Chinese Academy of Meteorological Sciences, Beijing, China	

## SS2 Lightning Protection of Railways, Automobiles and Airplanes

Tuesday, 14 October 2014, Room C

Chairpersons: Junjia He, China, Kazuo Yamamoto, Japan

4:15pm -4:30pm	<b>Summary of Grounding System Improvement of Traction Substation around Tokyo in East Japan Railway Company</b> Hitoshi Hayashiya, Takashi Ozaki, Tomonori Fukano, Naomi Sato, Norio Koguchi; -East Japan Railway Company, Tokyo, Japan	244
4:30pm -4:45pm	<b>Accident of Automobile Due to Lightning</b> Kazuo Yamamoto; -Chubu University, Aichi, Japan; Yuta Naito, Shunichi Yanagawa; -Shoden Co., Ltd., Chiba, Japan; Naoto Takahashi; -Nissan Motor Co., Ltd., Tochigi, Japan; Michihiro Matsui; -Franklin Japan Co., Ltd., Kanagawa, Japan	239
4:45pm -5:00pm	<b>Estimation of Lightning Overvoltages According to Lightning Conditions and Effect on Decreasing Lightning Hazards Due to SPD for Railway Signalling Systems</b> Hideki Arai, Yuto Ono, Keiji Sugimoto, Youhei Hizawa; -Railway Technical Research Institute (RTRI), Tokyo, Japan	243
5:00pm -5:15pm	<b>High Voltage Impulse Experiment on Electric Automobiles and its Verification</b> Yuta Naito*; -Shoden Co., Chiba, Japan; Kazuo Yamamoto; -Chubu University, Aichi, Japan; Shunichi Yanagawa; -Shoden Co., Chiba, Japan	404
5:15pm -5:30pm	<b>An Investigation on Damages Caused by Direct Lightning Strike on Small Vessels</b> Koichi Yamabuki, Kazuyuki Nitta; -Wakayama National College of Tech., Gobo, Japan; Yoki Ikeda, Shinichiro, Kaikawa, Naoto Nagaoka; -Doshisha University, Kyo-Tanabe, Japan	408
5:30pm -5:45pm	<b>An Example of Lightning-Protection Measures in Railway Signaling Systems</b> Shunichi Yanagawa; -Shoden Corporation, Tokyo, Japan; Kazuo Yamamoto; -Chubu University, Aichi, Japan	275
5:45pm -6:00pm	<b>Visualization of Lightning Impulse Current Discharge on CFRP Laminate</b> Takeo Sonehara; -Shoden Corporation, Tokyo, Japan; Yoshiyasu Hirano; -Japan Aerospace Exploration Agency, Tokyo, Japan; H. Kusano, N. Tokuoka; -Shimadzu Corporation, Kyoto, Japan	238

# Technical Program

## Oral Sessions

**WEDNESDAY  
OCTOBER 14, 2014**

## TC3-2 Lightning Occurrence Characteristics

Wednesday, 15 October 2014, Room A

Chairpersons: Takatoshi Shindo, Japan, Rajeev Thottappillil, Sweden

8:30am	<b>Characteristics of Lightning at Tall Structures and Adjacent Areas Based on Detection Network Data</b>	397
-8:45am	<b>Volodymyr Shostak, Olexandr Bormotov; -NTUU "Kyiv Polytechnic Institute", Kyiv, Ukraine; Thomas Smatloch; -Dehn + Söhne GmbH + Co.KG., Neumarkt, Germany</b>	
8:45am	<b>The Activity of Cloud-to-Ground Flashes in a Local Thunderstorm</b>	208
-9:00am	<b>Tinglong Zhang, Changxiong Wei, Maohua Zhang, Yi Gao, Xiaoqing Lao, Hai Yu, Fangcong Zhou; -Lightning Protection Center of Hainan Province, Zhengzhou, China</b>	
9:00am	<b>Spectral Characteristics of Discharges from Artificial Charged Aerosol Cloud</b>	359
-9:15am	<b>Temnikov A.G., Chernensky L.L., Orlov A.V., Belova O.S., Zimin A.S.; -National Research University "Moscow Power Engineering Institute", Moscow, Russia</b>	
9:15am	<b>Cloud-to-ground Lightning Activity in a Hailstorm over the Central Lower Latitude Plateau of China</b>	368
-9:30am	<b>Xie Yiran, Wu Jian; -Yunnan University, Kunming, China; Zhang Tengfei, Liu Xuetao; -Meteorological Observatory of Yunnan Province, Kunming, China</b>	
9:30am	<b>Electric Field Effect of Towers with Different Types of Lightning Air Terminals: A Preliminary Observation Based on Real Field Measurement</b>	431
-9:45am	<b>Ong Lai Mun; -Hitachi Critical Facilities Protection Pte. Ltd., Singapore; Takeshi Wada; -Infrastructure Systems Company, Tsuchiura, Japan</b>	
9:45am	<b>Preliminary Analysis of Relationship Between Cloud-to-Ground Flash Activity and Radar Parameters of a Thunderstorm in Hainan Island</b>	210
-10:00am	<b>Fangcong Zhou, Yi Gao, Tinglong Zhang, Xiaoqing Lao, Changxiong Wei, Hai Yu, Mingliang Wang; -Lightning Protection Center of Hainan Province, Zhengzhou, China</b>	
10:00am	<b>Use of High Resolution Flash Density Data and GIS Analysis Methods in Power Utilities Networks</b>	336
-10:15am	<b>Gasper Lakota, Goran Milev, Vladimir Djurica, Boris Žitnik; -Milan Vidmar Electric Power Research Institute, Ljubljana, Slovenia</b>	

## TC12-2 Lightning Down-conductors and Grounding

Wednesday, 15 October 2014, Room B

Chairpersons: **Ioannis F. Gonos**, *Greece*, **Abdul Mousa**, *Canada*

8:30am	<b>Research on New Grounding Technology of Transmission</b>	314
-8:45am	<b>Line Tower in Karst Area</b> <b>Sanwei Liu, Wenxia Sima, Tao Yuan, Qing Yang;</b> <i>-Chongqing University, Chongqing, China</i>	
8:45am	<b>Lightning Protection of the Floating Roof Storage Facilities:</b>	92
-9:00am	<b>Grounding Optimization</b> <b>Drabkin Mark;</b> <i>-Hitachi Critical Facilities Protection, Pte., Ltd., Singapore</i>	
9:00am	<b>The FEM Model of Grounding System Impulse Characteristic</b>	360
-9:15am	<b>Considering Soil Frequency Dependence</b> <b>Jingli Li, Zhiyuan Qiao;</b> <i>-Zhengzhou University, Zhengzhou, China;</i> <b>Dongya Wu;</b> <i>-State Grid Henan Electric Power Company, Zhengzhou, China</i>	
9:15am	<b>Lightning-Induced Surges in Building Electrical Systems</b>	334
-9:30am	<b>Y. Du, Binghao Li, Mingli Chen;</b> <i>-The Hong Kong Polytechnic University, Hong Kong, China</i>	
9:30am	<b>Optimized Transmission Tower Earthing: Experience in</b>	430
-9:45am	<b>Design and Operation</b> <b>N. A. Abdul Rahman;</b> <i>- TNB Research Sdn Bhd, Malaysia;</i> <b>A. M. Ahmad Marican;</b> <i>- DCS Engineering Sdn Bhd;</i> <b>M. Z. A. Ab. Kadir;</b> <i>- Universiti Putra Malaysia, Malaysia</i>	
9:45am	<b>Impact of Split Factor Value on the Safe Design of</b>	219
-10:00am	<b>Distribution Substation Earth Grid</b> <b>S.D.Buba, W. F. Wan Ahmad, M. Z. A. Ab. Kadir, Chandima Gomes, J. Jasni;</b> <i>-Universiti Putra Malaysia, Selangor, Malaysia;</i> <b>M. Osman;</b> <i>-Universiti Tenaga Nasional, Selangor, Malaysia</i>	
10:00am	<b>Impulse Breakdown Characteristics of Dry Sand: Effect of</b>	263
-10:15am	<b>Sand Properties</b> <b>Zacharias G. Datsios*, Pantelis N. Mikropoulos;</b> <i>-Aristotle University of Thessaloniki, Thessaloniki, Greece</i>	

## TC11 Practical Lightning Protection Problems

Wednesday, 15 October 2014, Room C

Chairpersons: **István Berta**, Hungary, **Eleytheria Pyrgioti**, Greece

8:30am	<b>Correlation between Recorded CG Lightning Discharges and Shut-Downs of Selected HV Overhead Power Transmission Lines in Poland</b>	48
-8:45am	<b>Marek Łoboda</b> ; -Warsaw University of Technology, Warsaw, Poland; <b>Krzysztof Lenarczyk</b> ; -Polish Transmission System Maintenance Grid Department, Konstancin-Jeziorna, Poland	
8:45am	<b>Research on Circuit Breaker Lightning Failure of Openring Point in 220 kV Electromagnetic Loop Network</b>	78
-9:00am	<b>Manling Dong, Huan Ren</b> ; -State Grid Henan Electric Power Research Institute, Zhengzhou, China; <b>Shuai Yao</b> ; -Yellow River Engineering Consulting Co., Ltd, Zhengzhou, China	
9:00am	<b>Lightning Protection of Airport Traffic Control Towers (ATCT)</b>	134
-9:15am	<b>Georgios D. Peppas*</b> , <b>Dimosthenis A. Zacharakis</b> , <b>Eleftheria C. Pyrgioti</b> ; -University of Patras, Patras, Greece; <b>Vasilios P. Charalampakos</b> ; -Technological Educational Inst. of Patras, Patras, Greece	
9:15am	<b>Lightning &amp; Surge Protection Concept for a 64 Feet Yacht – A Case Study on a Hallberg Rassy HR 64</b>	375
-9:30am	<b>G. Finis, M. Sandau, H. Heckler</b> ; -Business Unit Surge Protection Trabtech Phoenix Contact GmbH & Co. KG, Blomberg, Germany	
9:30am	<b>Experimental Study of Lightning Transient and Electrical Field in UHVDC Converter Station</b>	398
-9:45am	<b>Xiao Zhang*</b> , <b>Zhanqing Yu</b> , <b>Jinliang He</b> , <b>Rong Zeng</b> , <b>Chanxiao Li</b> ; -Tsinghua University, Beijing, China; <b>Yin Huang</b> , <b>Wei Qiu</b> ; -China Southern Power Grid Co. Ltd, Guangzhou, China	
9:45am	<b>Improved Method for the Evaluation of Shielding Effect of Objects near Medium Voltage Transmission Lines</b>	471
-10:00am	<b>István Kiss</b> , <b>Bálint Németh</b> , <b>Tibor Horváth</b> , <b>István Berta</b> ; -University of Technology and Economics, Budapest, Hungary	
10:00am	<b>Applicability of Aluminium for Lightning Protection Systems under Various Environmental Conditions</b>	509
-10:15am	<b>Lasantha Chandima</b> , <b>Chandima Gomes</b> , <b>Zainal Kadir</b> , <b>Ashen Gomes</b> ; -Universiti Putra Malaysia, Serdang, Malaysia	



## TC1-2 Lightning Physics and Phenomenology

Wednesday, 15 October 2014, Room A

Chairpersons: **Chandima Gomes**, *Malaysia*, **Grzegorz Maslowski**, *Poland*

10:45am	<b>On the Initiation of Lightning Flashes in Thunderclouds</b>	102
-11:00am	<b>Vernon Cooray</b> ; <i>-Uppsala University, Sweden</i>	
11:00am	<b>Characterization of Negative Cloud-to-Ground Lightning in Florida: Revisited</b>	484
-11:15am	<b>Y. Zhu, V. A. Rakov, S. Mallick and M. D. Tran</b> ; <i>-University of Florida, USA</i>	
11:15am	<b>Positive and Negative Point Discharge Corona Currents: Influence of Thunderstorm-like Wind Velocities</b>	454
-11:30am	<b>J. Díaz, G. Ocampo, J. Huertas, F. Román</b> ; <i>-Universidad Nacional de Colombia, Colombia</i>	
11:30am	<b>Characterization of Far Electric Field Waveforms Produced by Rocket-Triggered Lightning</b>	413
-11:45am	<b>S. Mallick, V. A. Rakov</b> ; <i>-University of Florida, USA</i>	
11:45am	<b>The Influence of Meteorological Conditions on Upward Lightning Initiation at the Gaisberg Tower</b>	316
-12:00am	<b>Helin Zhou*</b> , <b>Rajeev Thottappillil</b> ; <i>-KTH Royal Institute of Technology, Sweden</i> ; <b>Helin Zhou</b> ; <i>-ABB AB HVDC, Sweden</i> ; <b>Gerhard Diendorfer, Hannes Pichler</b> ; <i>-OVE Service GmbH, Dept. ALDIS, Austria</i> ; <b>Martin Mair</b> ; <i>-Central Institute for Meteorology and Geodynamics, Austria</i>	
12:00am	<b>Time-Frequency Profile of Discharge Processes Prior to the First Return Stroke</b>	308
-12:15pm	<b>M.R.M. Esa*</b> , <b>M.R. Ahmad, V. Cooray</b> ; <i>-Uppsala University, Sweden</i> ; <b>Mona Riza Mohd Esa</b> ; <i>-Universiti Teknologi Malaysia, Malaysia</i>	
12:15pm	<b>Lightning Flash Properties Derived from Lightning Mapping Array Data</b>	269
-12:30pm	<b>Joan Montanyà, Oscar van der Velde, Glòria Solà, Feran Fabró, David Romero</b> ; <i>-Universitat Politècnica de Catalunya, Spain</i> ; <b>Nicolau Pineda, Oriol Argemí</b> ; <i>-Servei Meteorològic de Catalunya, Spain</i>	

## TC14-1 Lightning Protection and Lightning Testing Standards

Wednesday, 15 October 2014, Room B

Chairpersons: Mitchell Guthrie, USA, **Alain Rousseau, France**

10:45am	<b>Lightning Density Based on Lightning Location Systems</b>	520
-11:00am	<b>Christian Bouquegneau;</b> -University of Mons, Mons, Belgium	
11:00am	<b>A Review on the Testing Method for Low Residual Voltages in SPD</b>	80
-11:15am	<b>Young-Jun Lee;</b> -SungJin Techwin Co., Ltd, Daejeon, Korea; <b>Kihong Lee;</b> -Land & Housing Research Institute, Daejeon, Korea	
11:15am	<b>Lightning Risk Assessment Evaluation on French Nuclear Power Plants</b>	25
-11:30am	<b>P.Duquerooy, C.Miry;</b> -R&D, France; <b>P.Seltner;</b> -CIDEN–Nuclear Studies, Lyon, France	
11:30am	<b>Laboratory for the Qualification-Testing of SPDs Combining Highest Power Performance Parameters with Unique Fine Adjustment Possibilities</b>	95
-11:45am	<b>G. Finis, M. Wetter, R. Durth, C. Depping;</b> -Phoenix Contact GmbH & Co. KG, Blomberg, Germany	
11:45am	<b>Laboratory Test Experiences on Lightning Protection System for Blades with IEC 61400-24</b>	148
-12:00am	<b>Víctor March;</b> -Gamesa Innovation & Technology, Navarra, Spain	
12:00am	<b>Analysis of Additional Tests for SPD's Failure Mode in IEC61643.11</b>	293
-12:15pm	<b>Yang Guohua, Wang Chongling, Dai Dezhi, Wan Kaili;</b> -Test Center, Sichuan Zhongguang Lightning Protection Technologies Co., Ltd, Chengdu, China	
12:15pm	<b>How to Deal with Environmental Risk in IEC 62305-2</b>	149
-12:30pm	<b>Alain Rousseau;</b> -SEFTIM, Vincennes, France; <b>Alexander Kern;</b> -Aachen University of Applied Sciences, Juelich, Germany	

## Open Forum: On the Standards-Making Process of the IEEE and Related Impact on Lightning Protection Standards

Wednesday, 15 October 2014, Room B, 12:30-1:00 pm

Chairperson: **Abdul Mousa, Canada**

## TC8-2 Lightning Protection of Power/Railway Systems

Wednesday, 15 October 2014, Room C

Chairpersons: C.S. Engelbrecht, *Netherland*, Udaya Kumar, *India*

10:45am	<b>Implementation of Leader Development Models in ATP-</b>	270
-11:00am	<b>EMTP Using a Type-94 Circuit Component</b> Zacharias G. Datsios*, Pantelis N. Mikropoulos; -Aristotle University of Thessaloniki, Thessaloniki, Greece	
11:00am	<b>A Deep Insight into ZnO Nonlinear Resistor</b>	153
-11:15am	Zhang Nanfa, Xiao Jianhu, Sun Zhen, Ding Liuhua, Yue Tao; - Changzhou TT-Elec Circuitary Protection Technology Co.,Ltd, Changzhou, China	
11:15am	<b>Lightning Warning Method of Transmission Lines Based on</b>	167
-11:30am	<b>Multi-information Fusion: Analysis of Summer Thunderstorms in Jiangsu</b> Guo Juntian, Gu Shanqiang, Feng Wanxing, Chen Yue, Zhang Han; -The State Grid Electric Power Research Institute, Wuhan, China	
11:30am	<b>Measurement of V-t characteristics of Suspension Insulators to</b>	174
-11:45am	<b>Evaluate for Lightning Characteristics of Traction Power Supply System</b> Hiroaki Suzuki*, Hitoshi Hayashiya, Toshiaki Takino; -East Japan Railway Company, Tokyo, Japan; Shigeru Yokoyama, Akiko Kumada, Kunihiko Hidaka; -The University of Tokyo, Tokyo, Japan	
11:45am	<b>Assessment of Lightning Parameters Obtained by Lightning</b>	224
-12:00am	<b>Locating System for Estimation of Lightning Protection System Effectiveness</b> Bojan Franc, Božidar Filipović-Grčić, Ivo Uglešić; -University of Zagreb, Zagreb, Croatia	
12:00am	<b>Research and Application of a New Jet Stream Arc</b>	526
-12:15pm	<b>Extinguishing Gap Lightning Protection Device</b> Jufeng Wang; -Guangxi University, Nanning, China; Wei Guo, Guodong Li, Dong Wu, Xue Liang, Jinlian Liu; - Guangxi University, Nanning, China	
12:15pm	<b>Assessment of Lightning Backflash Outage Rate of Quadruple-</b>	253
-12:30pm	<b>circuit Transmission Lines Due to Subsequent Strokes</b> Bo Huang, Zhengcai Fu, Anfeng Jiang; -Shanghai Jiao Tong University, Shanghai, China; Guoli Wang, Ruihai Li; -Electric Power Research Institute of China SGC, China	

## SS8-2 Recent Technology developments for Lightning Research

Wednesday, 15 October 2014, Room A

Chairpersons: **Stan Heckman, USA, Zen Kawasaki, Singapore**

2:00pm -2:15pm	<b>LF Lightning Location System (BOLT) in Osaka Area and Its Applications</b> <b>Ting Wu*</b> , Tomoo Ushio; -Graduate School of Engineering, Osaka University, Osaka, Japan; <b>Satoru Yoshida</b> ; -Meteorological Research Institute Tsukuba, Ibaraki, Japan	23
2:15pm -2:30pm	<b>Development and Initial Observations of a Longperiod VHF Broadband Digital Interferometer</b> <b>Yoshitaka Nakamura</b> ; -Kobe City College of Technology, Kobe, Japan; <b>Ting Wu, Tomoo Ushio</b> ; -Graduate School of Engineering Osaka University, Suita, Japan; <b>Lotfy Samy Mohammed Elbaghdady</b> ; -Egypt-Japan University of Science and Technology, Borg El Arab, Egypt; <b>Zen Kawasaki</b> ; -Hitachi Critical Facilities Protection Pte. Ltd., Singapore	427
2:30pm -2:45pm	<b>Measurement of Preliminary Breakdown Pulse Trains in Cloud-to-Ground Lightning Using Lightning Locating Systems</b> <b>Amitabh Nag*</b> , <b>Martin J. Murphy</b> ; -Vaisala Inc., Louisville, USA; <b>Vladimir A. Rakov</b> ; -University of Florida, Gainesville Florida, USA	390
2:45pm -3:00pm	<b>Height-dependent Attenuation Characteristics of Lightning Return Strokes</b> <b>D. Wang, N. Takagi</b> ; -Gifu University, Gifu, Japan; <b>W. R. Gameraota, M.A. Uman, and D.M. Jordan</b> ; -University of Florida, Gainesville, USA	29
3:00pm -3:15pm	<b>Lightning Current Measurement with Fiber-Optic Sensor</b> <b>Truong X. Nguyen, Jay J. Ely, George N. Szatkowski</b> ; -NASA Langley Research Center, Hampton, USA; <b>Carlos T. Mata, Angel G. Mata</b> ; -ESC-Kennedy Space Center, FL3277, USA; <b>Gary P. Snyder</b> ; -NASA-Kennedy Space Center, FL3277, USA	387
3:15pm -3:30pm	<b>Research on Natural Cloud-to-Ground Lightning Flashes over a Chinese Inland Plateau</b> <b>Xiangzhen Kong, Yang Zhao, Huaibin Wang, Tong Zhang</b> ; - Chinese Academy of Science, Lanzhou, China	110

## SS9 Special Session on Understanding Lightning Protection Systems

Wednesday, 15 October 2014, Room B

Chairpersons: **Manu Haddad**, *UK*, **Bernhard Richter**, *Switzerland*

2:00pm	<b>New Test Standard for MO Surge Arresters</b>	324
-2:15pm	<b>Bernhard Richter</b> ; - <i>ABB Switzerland Ltd, Wettingen, Switzerland</i>	
2:15pm	<b>Lightning Performance of Grounding Systems of Overhead Lines</b>	377
-2:30pm	<b>Silverio Visacro, Fernando Henrique Silveira</b> ; - <i>UFMG, Belo Horizote, Brazil</i> ;	
2:30pm	<b>High Frequency and Impulse Earthing For Surge Arresters</b>	393
-2:45pm	<b>H. Griffiths, F. Van De Linde, N Ullah, A Haddad</b> ; - <i>Cardiff University, U.K.</i> ; <b>N. Harid</b> ; - <i>The Petroleum Institute, Abu Dhabi, UAE</i>	
2:45pm	<b>Corona Effect on Insulator Voltages for a Direct Lightning Strike to a Phase Conductor</b>	2
-3:00pm	<b>Tran Huu Thang*</b> ; - <i>Tsuruoka National College of Technology, Yamagata, Japan</i> ; <b>Yoshihiro Baba Naoto Nagaoka Akihiro Ametani</b> ; - <i>Doshisha University, Kyoto, Japan</i> ; <b>Naoki Itamoto</b> ; - <i>Hokuriku Electric Power Company, Toyama, Japan</i> ; <b>Vladimir A. Rakov</b> ; - <i>University of Florida, Gainesville, USA</i>	
3:00pm	<b>Overview of IEC Standards' Recommendations for Lightning Protection of Electrical High-voltage Power Systems Using Surge Arresters</b>	453
-3:15pm	<b>Volker Hinrichsen</b> ; - <i>Technische Universität Darmstadt, Darmstadt, Germany</i>	
3:15pm	<b>Lightning Strike Protection of Aircraft Structural Joints</b>	521
-3:30pm	<b>S. J. Evans*, I. Revel, M. S. Cole</b> ; - <i>Airbus Group Innovations, Newport, UK</i>	

## SS3-2 Lightning Protection of Power Distribution Systems

Wednesday, 15 October 2014, Room C

Chairpersons: **Alexandre Piantini**, *Brazil*, **Rong Zeng**, *China*

2:00pm -2:15pm	<b>Evaluation of Lightning Attachment and Coupling Models for the Estimation of the Lightning Performance of Overhead Distribution Lines</b> <b>Pantelis N. Mikropoulos, Thomas E. Tsovilis, Aikaterini S. Pori</b> ; - <i>Aristotle University of Thessaloniki, Thessaloniki, Greece</i>	333
2:15pm -2:30pm	<b>Multiphase Flashover Analysis in Japanese 6.6kV Medium Voltage Line</b> <b>Shozo Sekioka</b> ; - <i>Shonan Institute of Technology, Fujisawa, Japan</i>	203
2:30pm -2:45pm	<b>Analysis of Lightning Induced Voltages on a Large Distribution Network Using the YalukDraw Software</b> <b>Barrera L. F, Ocampo E., Pérez E., Salazar S., Herrera J.</b> ; - <i>Universidad Nacional de Colombia, Medellín, Colombia</i> ; <b>J. Aranguren D</b> ; - <i>Keraunos SAS, Bogotá, Colombia</i>	493
2:45pm -3:00pm	<b>Selection of MV/LV Transformers to be Protected by Surge Arresters against Indirect Lightning Overvoltages</b> <b>Alberto Borghetti, Fabio Napolitano, Carlo Alberto Nucci, Fabio Tossani</b> ; - <i>University of Bologna, Bologna, Italy</i> ; <b>Gilnei J. G. Dos Santos, Donorvan R. Fagundes</b> ; - <i>AES Sul, Brazil</i> ; <b>Gustavo P. Lopes, Manuel L. B. Martinez</b> ; - <i>Federal University of Itajubá, Brazil</i>	504
3:00pm -3:15pm	<b>Alternative Structures for Rural Distribution Networks</b> <b>Wallace C. Boaventura, José Osvaldo S. Paulino, Ivan José S. Lopes, Glássio C. Miranda</b> ; - <i>UFMG, Belo Horizonte, Brazil</i> ; <b>Inês M. F. D. Baeta, Nilton dos Santos F.</b> ; - <i>CEMIG, Belo Horizonte, Brazil</i>	414
3:15pm -3:30pm	<b>Effect of Waveform and Impulse Resistance on Lightning Performance in Distribution System</b> <b>T. Lantharthong, N. Rugthaicharoencheep</b> ; - <i>Rajamangala University of Technology Phra Nakhon, Bangkok, Thailand</i> ; <b>A. Phayomhom</b> ; - <i>Metropolitan Electricity Authority Bangkok, Bangkok, Thailand</i>	467

# Technical Program

## Oral Sessions

**THURSDAY  
OCTOBER 16, 2014**

## TC3-3 Lightning Occurrence Characteristics

Thursday, 16 October 2014, Room A

Chairpersons: **Mahendra Fernando**, Sri Lanka, **Ali Hussein**, Canada

8:30am	<b>CN Tower Lightning Return-Stroke Current Characteristics</b>	507
-8:45am	<b>A.M. Hussein, S. Kazazi, M. Anwar, M. Yusouf, and P. Liatos;</b> - <i>Ryerson University, Toronto, Ontario, Canada</i>	
8:45am	<b>Some Features of Negative Cloud-to-ground Flashes from a</b>	444
-9:00am	<b>Local Thunderstorm based on Accurate-stroke-count Study</b> <b>Zhu baoyou, Ma Ming, Xu Weiwei, Ma Dong;</b> - <i>University of</i> <i>Science and Technology of China, Hefei, China</i>	
9:00am	<b>Cloud-to-Ground Lightning Activity in Colombia and the</b>	488
-9:15am	<b>Influence of Topography</b> <b>Daniel Aranguren, Jesus López, Juan Inampué, Horacio</b> <b>Torres;</b> - <i>Keraunos S.A.S, Bogotá, Colombia;</i> <b>Hans D. Betz;</b> - <i>Nowcast</i> <i>GmbH, Munich, Germany</i>	
9:15am	<b>Research of Change Characteristics of Atmospheric Electric</b>	447
-9:30am	<b>Field before Thunderstorm</b> <b>Wang Lele;</b> - <i>Chengdu University of Information Technology,</i> <i>Chengdu, China;</i> <b>Guo Bin;</b> - <i>Weather Bureau of Hunan Province,</i> <i>Changsha, China;</i> <b>Guo Zaihua;</b> - <i>University of Information</i> <i>Technology, Chengdu, China</i>	
9:30am	<b>Characteristics of Lightning Activities in Potala Palace Region</b>	531
-9:45am	<b>of Tibet</b> <b>Gongbo Chi, Yang Zhang;</b> - <i>Beijing Jiaotong University, Beijing,</i> <i>China;</i> <b>Dong Zheng, Weitao Lu, Yijun Zhang;</b> - <i>Chinese Academy</i> <i>of Meteorological Sciences, Beijing, China</i>	
9:45am	<b>Spatio-temporal analysis of cloud-to-ground lightning activity</b>	83
-10:00am	<b>over Yangtze River Delta, China, 2009-2013</b> <b>Qiang Wang;</b> - <i>Shanghai Lightning Protection Center, Shanghai, PR</i> <i>China</i>	
10:00am	<b>On the Stochastic Modeling of Lightning Occurrences by Non-</b>	516
-10:15am	<b>Homogeneous Poisson Process, Estimation and Simulation</b> <b>Performance Evaluation and Applications: Paris-Venezuela</b> <b>Comparison</b> <b>Soiram Ernesto Silva Artigas;</b> - <i>Universidad Bolivariana de</i> <i>Venezuela (UBV), Caracas, Venezuela</i>	



## TC5-2 Lightning Electromagnetic Impulse (LEMP) and Lightning-induced Effects

Thursday, 16 October 2014, Room B

Chairpersons: Masaru Ishii, Japan, Carlo Alberto Nucci, Italy

8:30am	<b>Lightning Induced Currents in Isolated Towers</b>	450
-8:45am	<b>Udaya Kumar, Sruthi Ajay;</b> -Indian Institute of Science, Bangalore, India	
8:45am	<b>Effect of Atmospheric Refraction on VHF Lightning Location</b>	459
-9:00am	<b>Yun Li, Taichang Gao, Zhidong Jiang;</b> -PLA University of Science and Technology, Nanjing, China	
9:00am	<b>Lightning Radiated Electromagnetic Fields above</b>	475
-9:15am	<b>Inhomogeneous and Irregular Grounds</b> <b>Esteban Jiménez-Mejía, Javier Herrera-Murcia;</b> -Universidad Nacional de Colombia, Medellín, Colombia	
9:15am	<b>Developing an Approximation to the Heidler Function - With</b>	362
-9:30am	<b>an Analytical Transformation into the Frequency Domain</b> <b>Brett R. Terespolsky*, Ken J. Nixon;</b> -University of the Witwatersrand, Johannesburg, South Africa	
9:30am	<b>On Validation of FCCFs for Lightning Striking Tall Objects</b>	441
-9:45am	<b>Considering Propagation Effect of Finitely Conducting Earth</b> <b>Lixia He, Qilin Zhang, Wenhao Hou, Hongyan Xing;</b> -Nanjing University of Information Science and Technology, Nanjing, China	
9:45am	<b>Experiment Research of CFRP Destroyed by Lightning Current</b>	357
-10:00am	<b>Zhou Yinghui;</b> -Nanjing University of Aeronautics and Astronautics, Nanjing, China; <b>Zhou Yinghui, Fu Shangchen, Shi Lihua, Si Qing, Huang Zhengyu;</b> -PLA University of Science and Technology, Nanjing, China	
10:00am	<b>Induced Voltages Measured over a Non-flat Terrain on a</b>	505
-10:15am	<b>Reduced Scale Model</b> <b>Edison Soto;</b> -Departamento de Ingeniería, Eléctrica, Electrónica y Computación, Manizales, Colombia; <b>Ernesto Perez;</b> -Departamento de Ingeniería Eléctrica y Automática, Medellín, Colombia	

## TC8-3 Lightning Protection of Power/Railway Systems

Thursday, 16 October 2014, Room C

Chairpersons: Yarú Méndez Hernández, Germany, Wenxia Sima, China

8:30am	<b>Overhead Lines Lightning Protection by Multi-Chamber Arresters and Insulator-Arresters</b>	341
-8:45am	Evgeniy S. Kalakutsky, Georgij V. Podporkin, Vladimir E. Pilshikov, Alexander D. Sivaev; - <i>Streamer Electric, Russia</i>	
8:45am	<b>A Non-Contact Electro-optic Sensor for Lightning Overvoltage Measurement</b>	312
-9:00am	Rui Han, Qing Yang, Wenxia Sima, Tao Yuan, Heng Dong, Shangpeng Sun; - <i>Chongqing University, Chongqing, China</i>	
9:00am	<b>Lightning Study and Experience on the First 500kV Transmission Line Arrester in Malaysia</b>	298
-9:15am	Iryani Mohamed Rawi*; - <i>Tenaga Nasional Berhad, Kuala Lumpur, Malaysia</i> ; M. Z. A. Ab. Kadir, Norhafiz Azis; - <i>Universiti Putra Malaysia, Selangor, Malaysia</i>	
9:15am	<b>Upward Leader Inception Criterion Considering Gas Kinetic Process and Heat Conduction</b>	522
-9:30am	Xuan Zhou*, Rong Zeng, Zhizhao Li, Chijie Zhuang; - <i>Tsinghua University, Beijing, China</i>	
9:30am	<b>Shielding Failure Evaluation by Collection Surface</b>	364
-9:45am	Qizhang Xie, Stéphane Baron, Simon Fortin, Sylvie Lefebvre, and Farid P. Dawalibi; - <i>Safe Engineering Services &amp; technologies ltd., Laval, Québec, Canada</i>	
9:45am	<b>Effect of Using Two Phase Branches in the Lightning Distribution Network Performance</b>	500
-10:00am	Ocampo E., Barrera L. F, Salazar S., Pérez E.; - <i>Universidad Nacional de Colombia, Medellin, Colombia</i>	
10:00am	<b>Lightning Shielding Analysis of EHV and UHV AC Transmission Lines</b>	464
-10:15am	José Cuarán and Jhair Acosta; - <i>Universidad Nacional de Colombia, Bogotá, Colombia</i> ; Marley Becerra; - <i>Royal Institute of Technology, Stockholm, Sweden</i> ; Francisco Román; - <i>Universidad Nacional de Colombia, Bogotá, Colombia</i>	

## TC1-3 Lightning Physics and Phenomenology

Thursday, 16 October 2014, Room A

Chairpersons: **Joseph Richard Dwyer, USA, Joan Montanya, Spain**

10:45am	<b>Ultimate VHF Broadband Interferometer and Lightning Observations</b>	88
-11:00am	<b>Zen Kawasaki</b> ; -Hitachi Critical Facilities Protection Pte. Ltd.31, Singapore, Singapore; <b>Manabu Akita</b> ; -School of Informatics and Engineering, Tokyo, Japan	
11:00am	<b>On the Striking Distance of Subsequent Return Strokes</b>	106
-11:15am	<b>Vernon Cooray</b> ; -Uppsala University Uppsala, Sweden; <b>Valdimir Rakov</b> ; -University of Florida, Gainesville, USA	
11:15am	<b>3-D Fractal Analysis of Lightning by the Flashes Coaxial Unification Fractal Model(CUFM)</b>	113
-11:30am	<b>Nan Wang</b> ; -Beijing Institute of Tracking and Telecommunications Technology (BITTT), Beijing, China	
11:30am	<b>Electric Field Signatures of Narrow Negative Bipolar Pulse Activities from Lightning Observed in Sri Lanka</b>	173
-11:45am	<b>T. A. L. N. Gunasekara, U. Mendis, M. Fernando, U. Sonnadara</b> ; -University of Colombo, Colombo, Sri Lanka; <b>V. Cooray</b> ; -Uppsala University, Uppsala, Sweden	
11:45am	<b>The Effect of Ice Nucleation on Thunderstorm Charge Structure</b>	204
-12:00am	<b>Yi Yang*</b> , <b>Yongbo Tan</b> ; -Nanjing University of Information Science & Technology, Nanjing, China	
12:00am	<b>Chaotic Pulse Train in Cloud-to-Ground and Cloud Flashes of Tropical Thunderstorms</b>	232
-12:15pm	<b>M.R. Ahmad, M.R.M. Esa, D. Johari, M.M. Ismail, V. Cooray</b> ; -Uppsala University, Uppsala, Sweden; <b>M.R. Ahmad and M.M. Ismail</b> ; -Universiti Teknikal Malaysia Melaka (UTeM) Durian Tunggal, Melaka, Malaysia	
12:15pm	<b>Comprehensive Observation of Leader Characteristics Using TVLS</b>	274
-12:30pm	<b>Shi Qiu, ZhiDong Jiang, Lihua Shi, YanNa Wang</b> ; -PLA University of Science and Technology, Nanjing, China	

## TC15-2 Lightning Safety, Medicine and Education

Thursday, 16 October 2014, Room B

Chairpersons: S. E. Silva Artigas, Venezuela, Mary Ann Cooper, USA

10:45am -11:00am	<b>Variation of Minimum Safety Separation for Non-Conducting Lightning Targets</b> Ghasem Nourirad, Mahdi Izadi, Chandima Gomes, Mohd Zainal Abidin Ab Kadir; -University Putra Malaysia, Malaysia	410
11:00am -11:15am	<b>Some Aspects of Global Lightning Impacts</b> Ronald L. Holle; -Meteorologist, Vaisala Inc., Tucson, Arizona, USA	380
11:15am -11:30am	<b>Use of dielectric properties of human tissues in the analysis of lightning injuries</b> Y-C. H. Lee, D. M. Rubin and I. R. Jandrell; -University of the Witwatersrand, Johannesburg, South Africa	335
11:30am -11:45am	<b>The Need for Standardization of Tolerable Lightning Currents and Voltages for Human Beings</b> Guilherme A. D. Dias, Daniel S. Gazzana, Arturo S. Bretas; -UFRGS University, Porto Alegre-RS, Brazil; Marcos Telló -State Company of Electrical Energy CEEE-D, Porto Alegre-RS, Brazil	477
11:45am -12:00am	<b>Lightning Risk Assessment and Thunderstorm Warning Systems</b> Claudia Tovar, Horacio Torres; -National University of Colombia, Bogotá, Colombia; Claudia Tovar, Daniel Aranguren, Jesus López, Juan Inampué, Horacio Torres; -Keraunos S.A.S, Bogotá, Colombia	495
12:00am -12:15pm	<b>Data Analysis of Lightning Fatalities Occurrence by Non-Homogeneous Poisson Process with Applications on Public Health:The Case of Venezuela</b> Soiram Ernesto Silva Artigas, Yosmel Ugas Mendoza; -Universidad Central de Venezuela (UCV), Caracas, Venezuela	515
12:15pm -12:30pm	<b>A Follow-up Study of a Large Group of Children Struck by Lightning</b> Mary Ann Cooper, MD; -University of Illinois at Chicago, Chicago, U.S.A.; Ryan Blumenthal, MD; -University of Pretoria Pretoria, South Africa; Lynette M. Silva, PhD, Neil Pliskin, PhD; -University of Illinois at Chicago, Chicago, Illinois, U.S.A.	109

## TC10-2 Lightning Protection of Buildings

Thursday, 16 October 2014, Room C

Chairpersons: **Zainal Abidin Hartono**, *Malaysia*, **Alexander Kern**, *Germany*

10:45am	<b>Risk Management According to IEC 62305-2 edition 2: 2010-12</b>	339
-11:00am	<b>Alexander Kern</b> ; - <i>Aachen University of Applied Sciences, Juelich, Germany</i> ; <b>Christian Braun</b> ; - <i>DEHN + SÖHNE GMBH + CO. KG, Neumarkt OPF, Germany</i>	
11:00am	<b>Reduction of Field Intensity on Lightning Protected Installations with Ex zones to Avoid Upward Leaders</b>	250
-11:15am	<b>Michael Rock</b> , <b>Eduard Shulzhenko</b> ; - <i>Technische Universität Ilmenau, Germany</i>	
11:15am	<b>Estimation of Charge and Current Distribution Using Mathematical Modeling of Lightning Stepper Leader to Protect Buildings</b>	389
-11:30am	<b>Abhay Srivastava</b> ; - <i>Birla Institute of Technology, Ranchi, India</i>	
11:30am	<b>Statistical Distributions of Current Amplitudes and Lightning Incidence Number to Structures of Various Configurations</b>	396
-11:45am	<b>Volodymyr Shostak</b> , <b>Volodymyr Tyulyukov</b> ; - <i>NTUU Kyiv Polytechnic Institute, Kyiv, Ukraine</i>	
11:45am	<b>Lightning Selectivity for Group Buildings and Protection Against Direct Lightning</b>	469
-12:00am	<b>He Wei</b> , <b>Wang Liu-Ling</b> , <b>Lu Ping</b> , <b>Wang Dong-Dong</b> ; - <i>Yunnan Normal University, Kunming, China</i>	
12:00am	<b>Analysis and Test on Electric Field Concentration Effect of Bipolar Conventional Air Terminal</b>	416
-12:15pm	<b>Young-ki Chung</b> , <b>Kang-soo Lee</b> ; - <i>OMNI LPS Co., Ltd., Seoul, Korea</i> ; <b>Bok-hee Lee</b> ; - <i>Inha Univ., Incheon, Korea</i>	
12:15pm	<b>On the Influence of Steel Geometry on the Induced Currents in Steel Reinforced Concrete Building due to a Nearby Lightning Strike to Ground</b>	30
-12:30pm	<b>Vishwanath Hegde</b> ; - <i>Malnad College of Engineering, Hassan Karnataka, India</i> ; <b>Vinoda Shivanand</b> ; - <i>K. L. E. Institute of Technology, Hubli Karnataka, India</i>	

## SS5-2 Lightning Observations Based on Lightning Location Systems

Thursday, 16 October 2014, Room A

Chairpersons: **Xiushu Qie**, China, **Vladimir Rakov**, USA

2:00pm -2:15pm	<b>LLS Detection Efficiency of Ground Strike Points</b> <b>W. Schulz</b> ; -W. Schulz Vienna, Austria; <b>S. Pedeboy</b> ; -Meteorage, Pau, France; <b>M.M.F. Saba</b> ; -INPE, Sao Jose dos Campos, Brazil	20
2:15pm -2:30pm	<b>Regular Pulses Bursts Observation Using a Time of Arrival Lightning Mapping System with Dual channels</b> <b>Wang Yanhui</b> , Zhang Guangshu, Li Yajun, Zhang Tong, Wu Bin, Liu Yanxiu; -Chinese Academy of Sciences, Lanzhou China.; <b>Zhao Yuxiang</b> ; -Tianshui Normal University, Tianshui, China; <b>Jianru Dan</b> ; -Chinese Academy of Meteorological Sciences, Beijing, China	156
2:30pm -2:45pm	<b>Analysis of Lightning Events Preceding Upward Flashes from Gaisberg and Säntis Towers</b> <b>Alexander Smorgonskiy*</b> , Alaleh Tajalli, Farhad Rachidi; -EPFL, Lausanne, Switzerland; <b>Marcos Rubinstein</b> ; -HEIG-VD, Yverdon-les-Bains, Switzerland	376
2:45pm -3:00pm	<b>Detection of Upward Lightning by Lightning Location Systems</b> <b>Amanda R. de Paiva</b> , Marcelo M.F. Saba, Kleber P. Naccarato Carina Schumann, Robson Jaques; -National Institute for Space Research, Brazil; <b>Marco Antonio da Silva Ferro</b> ; -S.J. Campos, São Paulo, Brazil; <b>Tom A. Warner</b> ; - ZT Research, Rapid City SD USA	481
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Chairpersons: C. Bouqueneau, Belgium, José Osvaldo S. Paulino, Brazil

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## TC9 Lightning Protection of Renewable Energy Systems

Thursday, 16 October 2014, Room C

Chairpersons: **Wah Hoon Siew**, *UK*, **Shigeru Yokoyama**, *Japan*

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Chairpersons: **Vernon Cooray**, *Sweden*, **Amitabh Nag**, *USA*

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## SS7 The Behavior of Soils in Response to the Impression of Lightning Currents and Its Impact on the Performance of Power Systems

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Chairpersons: Jinliang He, China, Silvério Visacro Filho, Brazil

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## **Technical Program**

# **Poster Sessions**

## Poster Session 1-Lightning Physics and Attachment

Tuesday, 14 October 2014, Level 2 Concourse  
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## Poster Session 2-Lightning Protection of Energy System

Tuesday, 14 October 2014, Level 2 Concourse

3:00PM-5:00PM

Chairperson: **Prof. M. Nayel**, *Egypt*

- |                |  |           |
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## Poster Session 3-LEMP Effects and Protection

Wendnesday, 15 October 2014, Level 2 Concourse

10:00AM-12:00AM

Chairperson: **Prof. Qing Yang**, *China*

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10:00AM-12:00AM

Chairperson: Prof. Lihua Shi, China

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- A. Phayomhom;** -*Metropolitan Electricity Authority, Bangkok, Thailand; W. Kulwongwit;* -*The Engineering Institute of Thailand, Bangkok, Thailand; N. Rugthaicharoencheep;* -*Rajamangala University of Technology Phra Nakhon, Bangkok, Thailand*

# Other Activities During ICLP2014

## CIGRE Working Group Meetings

Time	Room	No.	Convernor	Title
Oct.11 08:30-17:30	Room D	C4.23	C.S. Engelbrecht	Guide to procedures for estimating the lightning performance of transmission lines
Oct.12 08:30-11:00	Room D	C4.410	T. Shindo	Lightning Striking Characteristics for Very High Structures
Oct. 12 11:00-12:00	Room D	IPLT meeting	M. Rubinstein	Electromagnetic Radiation from Tall Structures Steering Committee Meeting
Oct.12 13:30-15:30	Room D	C4.36	M. Ishii	Winter Lightning – Parameters and Engineering Consequences for Wind Turbines
Oct. 12 16:00-18:00	Room D	C4.37	Y. Baba	Electromagnetic Computation Methods for Lightning Surge Studies with Emphasis on the FDTD Method
Oct. 12 16:00-18:00	Room D	C4.37	Y. Baba	Electromagnetic Computation Methods for Lightning Surge Studies with Emphasis on the FDTD Method
Oct. 12 14:00-17:00	Room E	C4.33	S. Visacro	Impact of Soil-Parameter Frequency Dependence on the Response of Grounding Electrodes and on the Lightning Performance of Electrical Systems
Oct.14 18:00-21:00	Room D	C4.26	J. L. He	Evaluation of Lightning Shielding Analysis Methods for EHV and UHV DC and AC Transmission Lines

## 2014APL Scientific Committee Meeting

APL (Asia-Pacific International Conference on Lightning) Scientific Committee Meeting will be held in Room D, at 4:15pm-6:00pm, October 14<sup>th</sup>, 2014.

# General Information

[www.iclp2014](http://www.iclp2014)

## ICLP2014 Conference Venue



No.400, Panyu Road, Shanghai, China

Hotel Front Desk: 86-21-61458888 | Hotel Fax: 86-21-62803353 | email: cpsha@cpsa.com

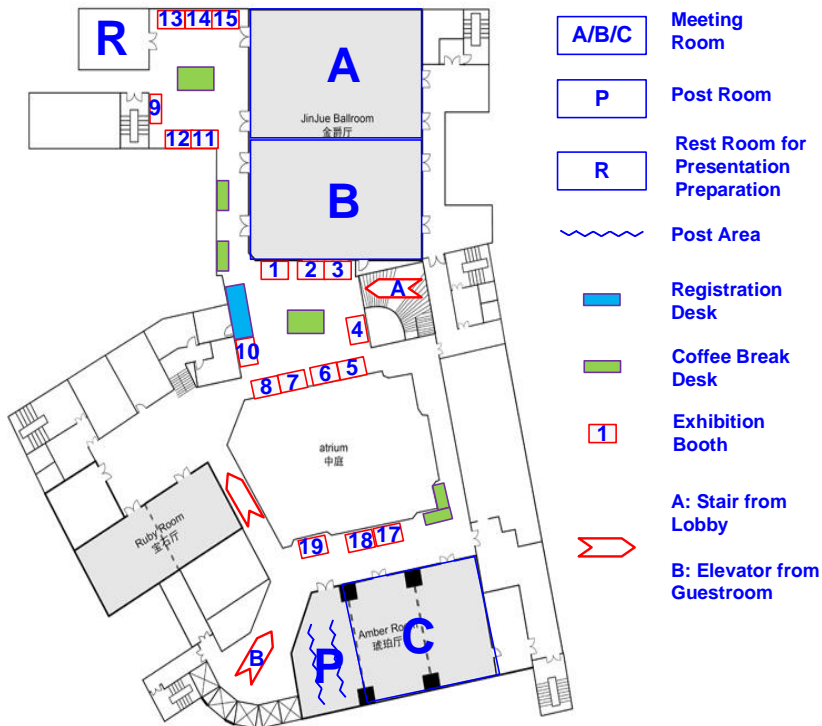


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Crowne Plaza Hotel has 588 rooms, suites and executive rooms, with first-class service and a friendly atmosphere is known. Two large ballrooms, three function rooms and eight meeting rooms fully open, can hold up to 550 people involved in the events and

banquets. The new cafe, lobby lounge, restaurant and bar also have appeared. Modern fitness center equips with an indoor heated swimming pool located, sauna / steam bath, as well as first-class gym, make you enjoy the fun.

## ICLP2014 Conferene Floor Plan



## Contacting Telephone Numbers

**Symposium Secretariat**

**Dr. Chijie Zhuang**

Tel: +86-10-62788811, Mobile: +86-13811605307, Fax: +86-10-62784709

Email: ICLP2014@tsinghua.edu.cn

## Registration Hours

**Admission to all sessions and hosted functions requires identification.  
Please wear your name badge at all times.**

- **12 October, 2014**  
From 2:00 pm to 6:00 pm
- **13, 14 October, 2014**  
From 8:00am to 5:00 pm
- **15 October, 2014**  
From 8:00 am to 3:30 pm
- **16 October, 2014**  
From 8:00 am to 5:00 pm



## Speaker Guides

### Poster Presentation

Poster sessions will be located at the Concorse of Second floor. Please register at the Registration Desk before proceeding to locate your assigned poster board. To locate your assigned poster board, look for the board marked with your Paper ID.

#### *Prepare your poster*

Each presenter is provided with a 2.4 metre high by 1 metre wide poster board.

- The presentation must cover the same material as the abstract.
- Place the title of your paper and your paper number prominently at the top of the poster to allow viewers to identify your paper easily. Indicate 1) the abstract's identification number, 2) title, and 3) authors' names.
- Highlight the authors' names, e-mail and address information in case the viewer is interested in contacting them for more information.
- You have complete freedom in displaying your information in figures, tables, text, photographs, etc in the poster.
- Include the background of your research followed by results and conclusions. A successful poster presentation depends on how well you convey information to an interested audience.

#### *Set up Your Poster*

- Please make sure that your paper number is clearly visible on your poster board.
- Tapes and other materials are available at the Information Desk, nearby the poster boards.
- For Posters on Oct.13, the presenting author(s) are required to be present by their poster at least from 3:00pm to 5:00pm. For posters on Oct. 14 and 15, and 16, the presenting author(s) are required to be present by their poster at least from 10:00am to 11:00am and from 3:30pm to 4:30pm. For posters on Oct. 16, the presenting author(s) are required to be present by their poster at least from 10:00am to 11:00am and from 3:00pm to 4:00pm.

### ***Remove Your Poster***

Posters must be removed immediately after the poster session is closed. Posters remaining after 30 minutes will be removed. Conference organizers will not be responsible for posters and materials left on poster boards after the stated hours.

### ***Information Desk***

Staff at the Information Desk will be available to assist you with location and other on-site needs. Tapes and scissors will be available for your use. If you have special needs for your poster presentation, please bring those supplies with you to the meeting.

If you have questions, please contact the Symposium Secretariat at email:  
[iclp2014@tsinghua.edu.cn](mailto:iclp2014@tsinghua.edu.cn)

## **Oral Presentation**

### ***Prepare Your Presentation***

Each oral presentation is limited to **15 minutes including questions and answers**. Therefore, each presentation should not exceed 12 minutes. You are requested to load your presentation materials before the session starts.

All speakers should come to the conference rooms **15 minutes before the session opening** and copy the presentation materials into the computers provided by conference organizers.

### ***Determine Your Audio Visual Needs***

All meeting rooms are equipped with the following audio-visual equipment:

- 1-LCD Projector
- 1-Window-based PC
- 1-Screen
- 1-Laser Pointer

The computers in the meeting rooms are being provided to Windows-based PC users. The PC will be configured with Microsoft Windows 7 as well as with Microsoft Office 2010 (Compatible with Microsoft Office XP, 2003, 2007).

### ***Create a Backup Copy of Your Presentation***

We recommend you bring at least 2 copies of your presentation to the meeting in case there is a problem with one of them. Only USB is accepted.

### ***Give Your Presentation***

- Be considerate of the other speakers and audience by staying within your allocated time. The allocated time for your presentation includes a discussion and changeover to the next speaker. Session Chairs will hold you to the allotted time. This is essential to ensure adequate time for questions and discussion as well as adherence to the schedule.
- Please discuss the same materials as reported in your paper submission. At the end of the meeting, all presentation files will be destroyed.

# Program Overview and Highlights

## Conference Hours

### 12 October – Sunday to 16 October – Thursday

The registration will be opened at 14:00 pm, 12 October, 2014, at the Registratin Desk in Crowne Plaza Shanghai.

### 11 October – Saturday

- CIGRE Working Group Meetings

### 12 October – Sunday

- CIGRE Working Group Meetings
- Delegate Arrival & Registration: the registration will be opened at 14:00 pm, 12 October, 2014, at the Registratin Desk in Crowne Plaza Shanghai.
- Evening Reception

### 13 October – Monday

- Official Opening, Invited Lectures
- Parallel oral and poster sessions
- TPC Dinner (6:30pm-9:00pm)

### 14 October – Tuesday

- Official Opening, Invited Lectures
- Parallel oral sessions and poster sessions
- APL Scientific Committee Meeting (4:15pm-6:00pm)
- CIGRE Working Group Meetings

### 15 October – Wednesday

- Parallel oral sessions and poster sessions
- ICLP Scientific Committee Meeting (12:00-am14:00pm)
- Dinner Banquet

### 16 October – Wednesday

- Parallel oral sessions and poster sessions
- Closing Ceremony

### 17 October – Friday

- Social tour to Wuzhen, Zhejiang, China (Free, organized by Travel Agency )

### 18 October – Saturday

- CIGRE Working Group Meetings

## Social Program, Lunch and Refreshments

### Sunday Welcome Reception

At Second Floor of **Crowne Plaza Shanghai**  
October 12nd, 2014, Sunday, 18:00-20:00

*Welcome to ICLP2014 Shanghai! Conference participants are invited to mingle while enjoying the light food and drinks during the opening welcome reception. Take the opportunity to interact with old friends and network new friends. The full fee has included the welcome reception.*

### Lunch

13-16 October, 2014, Monday to Thursday, 12:15-13:40  
At First Floor of Crowne Plaza Shanghai

### Refreshments

Refreshments are served outside Meeting Rooms.

### Internet

Free wireless internet is available inside the conference venue. You can use your own notebook to visit the internet.

## Wednesday Banquet Dinner & Cruise Ship Tour



15 October, 2014, Wednesday, 16: 00-22:00  
Seagull Place

Address: 2852 Binjiang Avenue, Shanghai

地址: 滨江大道 2852 号滨江花园内

Tel: 021-58797201

Banquet: 17:30 to 20:00

Cruise Ship Tour: 20:00 to 21:30

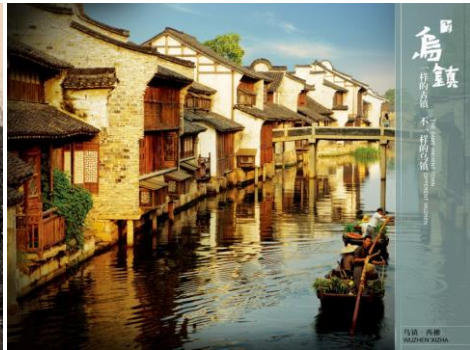
**Take the cruise ship on the pier outside the Restaurant.**

*Shuttle bus is provided from Crowne Plaza to the Restaurant at 16:00*



## Organized Social Tour

17 October, Friday: 8:00-16:00, Social Tour to WuZhen, Zhejiang Province. Wuzhen is the best traditional ancient town of rivers and lakes, which has **7000 years history**, **160 km to Shanghai**. There will be 2 hours shuttle trip.



## Travel around Shanghai

### Option 1: One Day Tour in Suzhou

One-hour drive to Suzhou, visit the famous Garden of Humble Administrator, the largest typical private garden in Suzhou. Then visit the water-land city gate—Panmen gate, on top of which, enjoy the view of the Grand Canal.

Take the cruise on the Grand Canal, opened as early as Sui Dynasty (584A.D.).

Continue to visit Silk Factory and get to know the history of silk industry and the traditional handicraft. After that, drive back to Shanghai. Lunch is included.

### Option 2: One Day Tour in Hangzhou

2 hours drive to Hangzhou. Upon arrival, walk along the bank of West Lake and visit the the Flower Harbor Park. Then take a leisurely cruise on the lake and enjoy the beautiful lake view. This afternoon, continue to the famous Lingyin Temple and Flying Peak. Drive to a famous tea plantation, Meijiawu Village, where people plant the finest green tea, Longjing. After that, drive back to Shanghai. Lunch is included.

### Option 3: One Day Tour in Shanghai

In the morning, start your tour with a visit to **Jade Buddha Temple**, a Buddhist temple in practice, famous for the Buddha statue of 6 feet high, carved out of one single piece of white jade. Continue the visit to **Yuyuan Garden**, the best example for a Chinese traditional garden in Shanghai. The tour offers a chance for a **traditional tea ceremony** in either of the two traditional stops. After lunch, drive to the former French concession and take a stop at the Chinese settlement area, now known as the bar area **Xintiandi**, which is actually a successful case for both investing business and preserving traditional architecture in Shanghai. Walking through bars and caffers in the shade of plane trees for 10 mins, the tour brings you to a narrow street with antiques and then walks to next corner with birds and flowers, to see, to experience, to meet the locals, that is how it is.

A shopping stop for silk products. Lunch is included.

The price will be found on the website: [www.iclp2014.net](http://www.iclp2014.net)

The local travel agency will provide tour service on site, according to your interest and at your own cost:

**CHINA TRAVEL SERVICE ZHEJIANG**

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