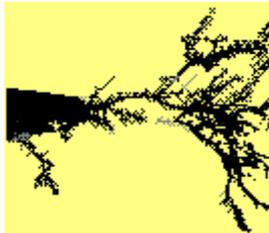


Diagnostic group

for high voltage insulation technology

[web](#)



Department of Electrical Power Engineering, Mäsiarska 74, 040 01 Košice, Slovakia

Team members

Prof. Ing. [Roman Cimbala](#), PhD. – expert in diagnostics and prophylactics of electrical power equipment aimed on acceleration ageing process of insulating material, on application dielectric spectroscopy and isothermal relaxation current analysis for determination their qualities, on design of control measuring systems in programming development environs, on applied of artificial intelligence elements for diagnostics purposes.

Prof. Ing. [Iraida Kolcunová](#), PhD. – expert on physical phenomena in electrical insulated materials as gaseous, liquidy and solid during their electrical and thermal stress, on degradation solid dielectrics in implication effect partial discharging, on diagnostics electrical insulation system of high-voltage electrical power equipment using method of partial discharge analysis.

Assoc. Prof. Ing. [Juraj Kurimský](#), PhD. – expert in measurement in electric power engineering, in high voltage technology and advanced materials for electric power engineering, in measuring and analysis electric field, inn dielectric characterization of insulating materials, in techniques examination using high voltage, in measuring of partial discharges according to IEC 60270, in measurement and analysis of overvoltages in electric network and in development software for acquisition and data analysis.

Dr. Ing. [Bystrík Dolník](#) - expert in applied physical fields (independent and combined) on insulating systems for purpose of accelerate ageing process of insulating system, on high voltage technology, on EMC field, in overvoltage (transient responses) and over-voltage protection, modelling of physical fields in purpose for application in non-destructive and destructive diagnostic methods.

Ing. [Jaroslav Petráš](#), PhD. - expert in the area of partial discharge in insulant system of high voltage equipment, in the area of partial discharge measuring primarily using acoustic method, in the area of equipment protection against overvoltage and overvoltage protection itself.

Ing. [Jaroslav Džmura](#), PhD. - expert in the area of electrical power engineering with focus on high voltage technology, in strong electric field, in electrostatics and electric separator and precipitators.

Ing. [Jozef Balogh](#), PhD. - designer of electrical equipment, installation and programming system of intelligent electrical installation, electrical engineer specialist on carrying out special inspection and specialized test restricted electric technological equipment.

Research Focus

- Diagnostic measurement of insulating system of high voltage engines and equipment using dielectric an impedance spectroscopy.
- Diagnostic measurement of insulating system of high voltage devices and equipment using method of partial discharge and partial discharge analysis in dependence on phase angle.
- DC system diagnostics of high voltage engines, generator, cable nets, terminals and joints.
- Diagnostics of high voltage transformers.
- Localization of discharge activities sources in high voltage devices using measurement of high frequency electromagnetic field.
- Engineering activities and advisory services

Research Significance and Exploits

Increasing pretensions to production in all the industrial branch project in lifetime and reliability relevant manufacturing conveniences. In case of the electric power equipment safety reliability their operations quality their insulant system is one of the main factor. Diagnostics and prophylactics present summary of preliminary actions for protection from breakdown of electric appliance and diagnostics of high and ultra high voltage equipment contribute to their failure-free operation. Therefore it is necessary to continually follow state of selected objects on the present levels of measurement techniques with utilization of the state-of-the-art method.

Praxis confirms that it is possible to save considerable values using early disclosing of developed failure in electric power equipment using properly applied diagnostic method. In the case of even primary cost for the removal disorder from electrical accident damage are not too expensive, secondarily losses following from drop-out technology reach of the order of advanced values.

Set of diagnostic methods used at the present time in our workplace makes it possible to obtain amount of valuable status information of examination equipment. Prime assumption for complete predication is in addition to correct applications of suitable diagnostic method also obligation of their periodic review and their objective evaluation. Objectiveness of valuation is directly proportional to quantities of performed measurements.

Currently Solved Topics

- Dielectric spectroscopy of insulating solid material (mica epoxide, cross-line polyethylene, biaxial oriented polypropylene foils), liquid (mineral and synthetic oils and natural esters).
- Phase analysis of partial discharge according to IEC 60 270.
- Complex analysis of magnetic liquid for industry applications.
- Accelerating lifetime test of insulating materials
- Diagnostics of low voltage networks.

Current Projects

Analysis of changes in electro-physical structure of advanced electrical engineering insulating material effected using external degradation factors, 1/0311/15, VEGA 2015-2017

Research of degradation influence of electric and thermic field on electro-physical structure of high voltage insulating material 1/0487/12, VEGA 2012-2014

Research influence of degradation factor on electro-physical structure of high voltage insulant material, VEGA 2009-2011, 1/0368/09

Reduction of energy demandingness of building using intelligent electrical installation systems, 4/2011, KEGA 2011-2012

Establishment of the EMC laboratory for electronic equipment and biological system EMKOM project ITMS 26220120055, Operational programme research and development, Centre of excellence of integrated research and progressive material utilization and technology in the area of automotive electronics

Establishment and sustainable activity of engineering and certificate place of work for mobilization and innovation creation in the area of electrical engineer and electronics ITMS 26220220182, Operational programme research and development, University scientific park TECHNICOM for innovation applications with the support of accomplishment technology

ITMS 26220220029, Operational programme research and development, Development of unique low energy static source for electrosystems

ITMS 26220220064, Operational programme research and development, Centre of research effectiveness and integration of combined system renewable energy sources

ITMS 26220220155, Operational programme research and development, Competent centre of knowledge technology for innovation productive system in industry and service

ITMS 26110230120, Operational programme research and development, Universities as drives of knowledge society drives

Cooperation with Academic Institutions and Industry

Team members were invited for lecture and educational stays on universities in Barcelona, Graz, Ilmenau, Wuppertal, Budapest, Prague, Sankt Petersburg, Czenstochowa, Brno, Moscow inter alia.

We are constituent member of Working Party “Insulation Diagnostics” with residence in Manchester and corporate member of Working Party “Electrostatics in Industry” in European Association of Chemical Engineer and we are representing Slovak Republic there.

Are we member CIGRE, IEEE, Associations Technical Diagnostics of Slovakia, TK No 43 for cable and insulator at UNMS, Slovak Electrical Engineering Society, branch office Košice, Sector Board for power engineering, gas and electricity, national project National System Profession in Slovak republic, Sector Board for power engineering, gas and electricity, national project Creation National System qualification in Slovak Republic et.

We cooperate on research project tasks with organization as:

- Institute Experimental Physics Slovak Academy of Science
- Geophysical Institute Slovak Slovak Academy of Science
- Parasitology Institute Slovak Slovak Academy of Science
- Clinic of ruminant University of Vets Medicine and Pharmacy
- Science Faculty University Pavol Jozef Šafárik of Košice
- Institute of Electrical Power Engineering and Applied Electrical Engineer Faculty of Electrical Engineer and Informatics Slovak Technical University of Bratislava
- Department of Electrical Engineering Power Systems Electrical Engineering Faculty Žilina University of Žilina

There are solved tasks for industrial partners focused on diagnostics and prophylactics of electric power equipment:

- Nuclear Power Plant Jaslovské Bohunice
- US Steel Košice
- Water Power Plant Trenčín
- Railways of Slovak Republic
- Water Power Plant Dobšiná
- ABB Switzerland
- Areva
- Embraco
- Exmont Brno
- Hesia Slovakia
- Chemko Strážske
- Engineering Buildings Košice
- Kerko Košice
- SEZ Krompachy
- Leyard Europe
- Molex Slovensko
- Perlon

- Prakoenergo
- Power System Management
- Slovak Electrization and Transmission System
- Siemens Slovakia
- Chemolak Smolenice
- SOS Electronics
- Chemosvit Svit
- Heating Plant Košice
- Telspec Stropkov
- Transgaz Nitra
- Eustream
- Třinec Ironworks
- Technical and Testing Institut of Civil Engineering
- Power Plant Vojany
- Water Power Plant Ružín
- Water Power Plant Domaša
- Power Plant Nováky
- East Slovak Electrical Engineering
- Research Institute of Nuclear Power Plants Trnava
- ZŤS Research and Development Institute Košice

The Most Significant References

Research team has published results of scientific research work in more than 1000 publications. There are several of them. Most important are scientific monographies:

- Ageing of High Voltage Insulation Systems / Roman Cimbala - 1. Iss. - Košice, TU, - 2007. - 188 s. - ISBN 978-80-8073-904-1.
- Thermal Ageing of Insulation Materials / Roman Cimbala, Ľudovít Csányi - 1. Iss. - Košice TU - 2012. - 209 s. - ISBN 978-80-553-1031-2.
- Thermal Degradation of Insulation Systems / Roman Cimbala, Vierošlava Sklenárová - 1. Iss. - Košice: TU - 2014. - 127 s. - ISBN 978-80-553-1703-8.
- Diagnostics of Electric Power Equipment Using Partial Discharge Method / Iraida Kolcunová - 1. Iss. - Košice: TU, - 2008. - 178 s. - ISBN 978-80-553-0031-3.
- Measuring of Discharge Activity in Stator Insulation of Electric Rotating Devices / Iraida Kolcunová, Milan Kvakovský - 1. Iss. - Košice TU - 2011. - 128 s.. - ISBN 978-80-553-0778-7.
- Research of Origination and Development of Discharges in Two Dielectrics Boundary / Iraida Kolcunová, Marián Hrinko - 1. Iss. - Košice: TU - 2014. - 128 s. - ISBN 978-80-553-1651-2.
- Discharges in Electric Power Transformers / Juraj Kurimský - 1. Iss. - Košice: TU - 2012. - 129 s. - ISBN 978-80-553-1044-2
- Electromagnetic Compatibility / Bystrík Dolník - 1. Iss. - Košice: elfa - 2013. - 240 s. - ISBN 978-80-8086-221-3.

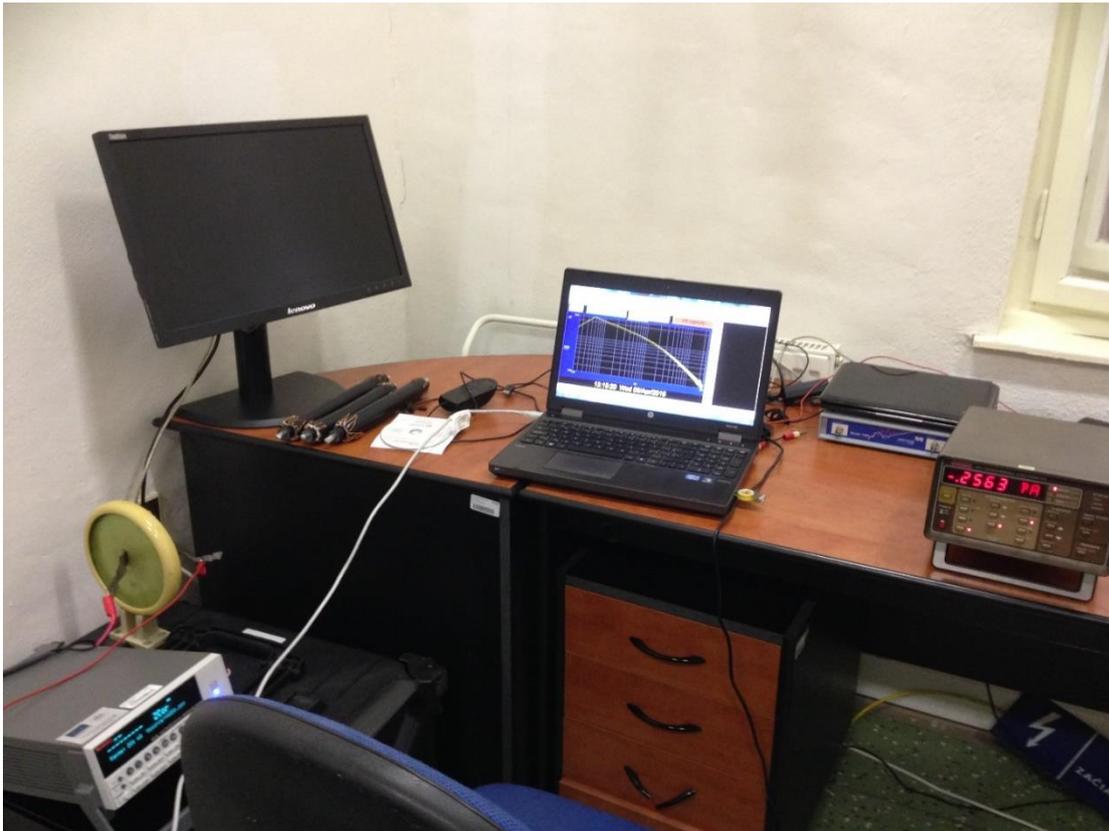
There are scientific publication in international scientific journals indexed in Current Contents Connect database:

- Understanding surface partial discharges in HV coils and the role of semi-conductive protection / J. Kurimský, I. Kolcunová, R. Cimbala - 2010.In: Electrical Engineering : Archiv fur Elektrotechnik. Vol. 92, no. 7-8 (2010), p. 283-289. - ISSN 0948-7921
- Magnetic fluid in ionizing electric field / Karol Marton ... [et al.] - 2013.In: Journal of Electrostatics. Vol. 71, no. 3 (2013), p. 467-470. - ISSN 0304-3886
- The contribution of space charge in a high non-homogenous electric field to the creation of negative differential conductivity / Karol Marton ... [et al.] - 2013.In: Journal of Electrostatics. Vol. 71, no. 3 (2013), p. 276-280. - ISSN 0304-3886
- Polarization Phenomena in Magnetic Liquids / Roman Cimbala ... [et al.] - 2015.In: Chemické listy. Vol. 109, no. 2 (2015), p. 117-124. - ISSN 0009-2770.
- Thermally Stimulated Acoustic Energy Shift in Transformer Oil / Jaroslav Petráš, Juraj Kurimský, Jozef Balogh, Roman Cimbala, Jaroslav Džmura, Bystrík Dolník, Iraida Kolcunová In: Thermally Stimulated Acoustic Energy Shift in Transformer Oil Vol. 102, no. 1(2016), p. 16-22 2016
- Unipolar characteristics of ZnO ceramics / Juraj Kurimský, Bystrík Dolník, Michal Kolcun - 2013.In: Journal of Electrostatics. Roč. 71, č. 3 (2013), s. 418-421. - ISSN 0304-3886
- Dielectric response of transformer oil based ferrofluid in low frequency range / M. Rajnak ... [et al.] - 2013.In: Journal of Applied Physics. Vol. 114, no. 3 (2013), p. 34313-1-34313-6. - ISSN 0021-8979
- The Investigation on the E-J Characteristics and the Role of Nanoparticle Concentration in Weakly Polar Magnetic Fluids / Juraj Kurimský ... [et al.] - 2014.In: Acta Physica Polonica A. Vol. 126, no. 1 (2014), p. 246-247. - ISSN 0587-4246
- Hall Effect in ZnO Extrinsic Structure / B. Dolník ... [et al.] - 2014.In: Acta Physica Polonica A. Vol. 126, no. 1 (2014), p. 76-77. - ISSN 1898-794X
- Influence of magnetic field on dielectric breakdown in transformer oil based ferrofluids / M. Rajňák ... [et al.] - 2014.In: Acta Physica Polonica A. Vol. 126, no. 1 (2014), p. 248-249. - ISSN 0587-4246
- Dielectric-spectroscopy approach to ferrofluid nanoparticle clustering induced by an external electric field / Michal Rajňák ... [et al.] - 2014.In: Physical Review E. Vol. 90, no. 3 (2014), p. 032310-1-032310-9. - ISSN 1539-3755.
- Dielectric Spectroscopy of Ferronematics Based on 6CHBT Liquid Crystal / Michal Rajňák ... [et al.] - 2015.In: Molecular Crystals and Liquid Crystals. Vol. 611, no. 1 (2015), p. 40-48. - ISSN 1563-5287

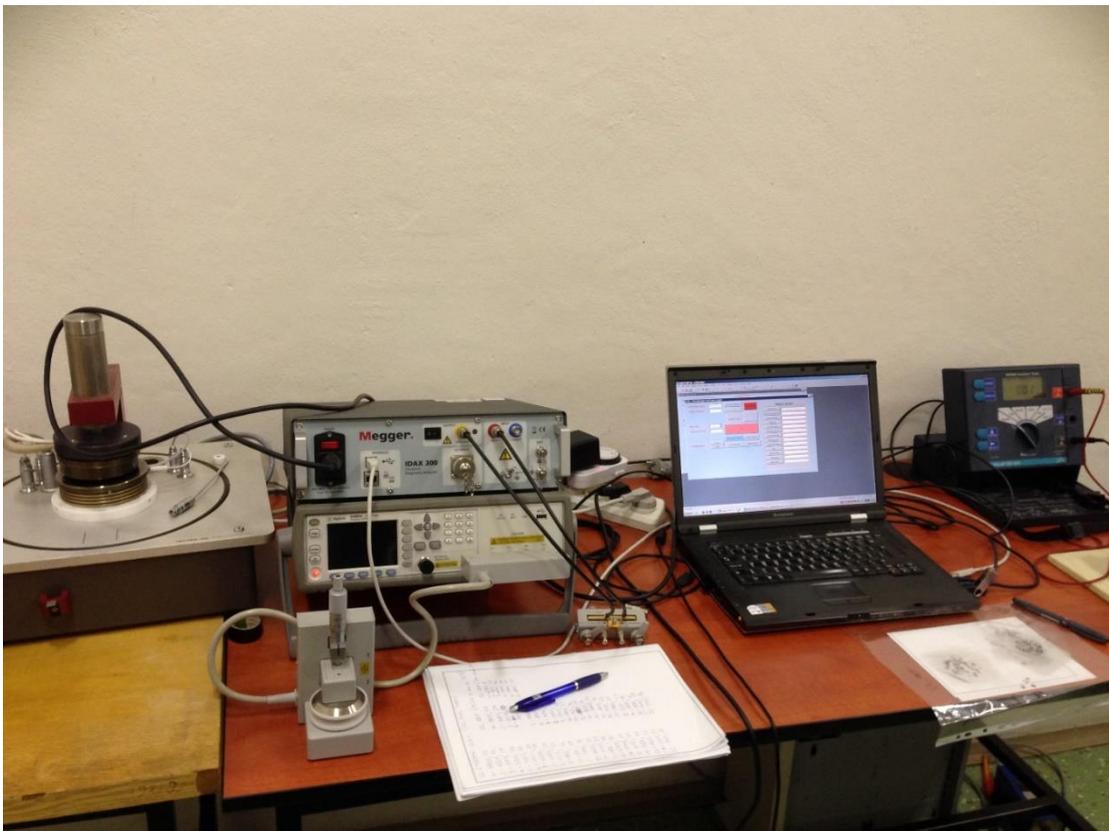
Photos



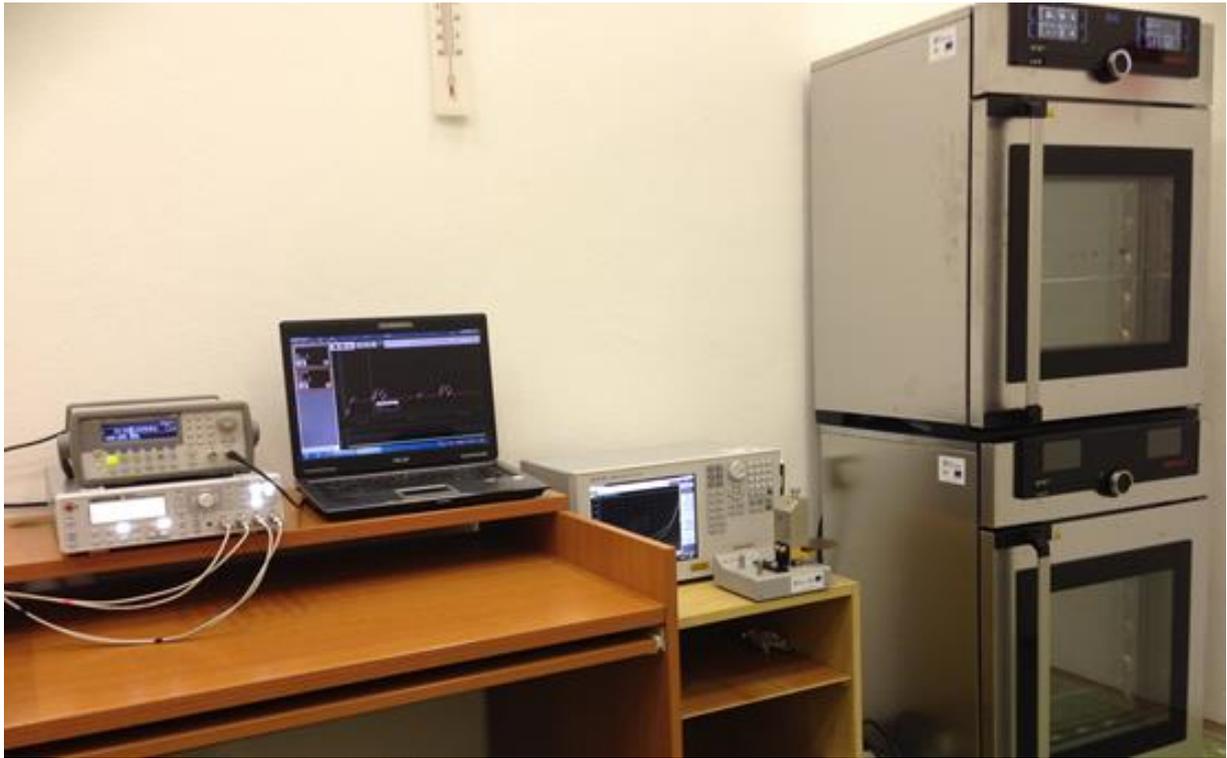
Laboratory of high voltage technologies



Measurement place for isothermal current relaxation analysis of insulation materials



Workplace for dielectric spectroscopy of insulation systems



Workplace for impedance spectroscopy upto 3GHz with temperature control