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AC Current Measurements Using Rogowski Coils The Applications, Design, and Calibrations of Rogowski Coils

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Abstract – Rogowski coils have been used for a long time for measurements of high, impulse, and transient currents. They have been used for monitoring and control, protective relaying, power distribution switches, electric arc furnaces, electromagnetic launchers, core testing of large rotating electrical machines, partial-discharge measurements in high-voltage cables, power electronics, resistance welding in automotive industry, and plasma physics. Since their nonmagnetic cores do not saturate, they can operate over wide current ranges with inherent linearity. The applications entail low and high accuracy coils, measuring currents from a few amperes to tens of MA, at frequencies from a fraction of hertz to hundreds of MHz. The increased interest in Rogowski coils over the last decades has led to significant improvements in their design and performance. Their development has included innovative designs, new materials, machining techniques, and printed circuit board structures. This tutorial will cover the principles of operation, design, calibration, standards, and applications of Rogowski coils.

Branislav Djokić (IEEE M'90-SM'97) received Dipl.Ing. degrees in Power Systems Engineering in 1981, in Electronics in 1984, M.Sc. and Ph.D. in Electrical Engineering in 1988 and 1993, respectively, from the University of Belgrade, Yugoslavia. From 1982-1990, he was with R&D Institute Mihajlo Pupin, Belgrade. From 1990-1994 he was a Staff Member of the School of Electrical Engineering, Belgrade University. In 1994, he joined the Institute for National Measurement Standards, National Research Council of Canada.

Dr. Djokić is a registered Professional Engineer in the Province of Ontario. He is IEEE PES Emerging Technologies Coordinating Committee Chair and IEEE Canada Industrial Relations Committee Chair. For his papers on Rogowski coils, he received 2010 Editors' Choice Award for a paper published in the NCSLI Measure Journal, and the best paper award in the international track at National Conference of Standards Laboratories International 2008. In 2009, he was appointed a Distinguished Lecturer of IEEE I&M Society.

Target Audience – Modern Power Systems, Smart Grids, and Smart Metering cannot be imagined without impulse, transient and high AC current measurements. The same applies to automotive industry with its resistance welding, and plasma physics. The target audience for this tutorials are engineers, managers, metrologists, professionals of other profiles, manufacturers, and students with interest in AC current measurements applied to Power Systems/Smart Grids, automotive industry, and metrology. Ultimately, anyone with curiosity about this interesting and dynamic field, which does not stop fascinating researchers and practitioners all over the world, will benefit from learning about the applications, design, and calibrations of Rogowski Coils.