

# MODERN METHODS OF ELECTRIC POWER QUALITY SIGNALS ANALYSIS

by

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**Abstract:** Electric Power Quality (PQ) issues are again in focus of many researchers and experts from industry. The main reason behind is wide spread usage of renewable energy sources (RES) connected to the grid via power electronics interface, constant interest in energy efficiency improvement by usage of variable speed drives again through power electronics interface, application of HVDC technology and FACTS devices in the power systems, etc. They bring non-linear power converters into system, but also advanced digital control strategies which are very sensitive to PQ disturbances. There are different types of PQ disturbances, but voltage and current harmonics, voltage sags/swells, voltage flicker, voltage spikes and notches, voltage interruptions and other voltage imperfections are the most interesting ones. Each type of PQ disturbance is characterized by specific signal, which need to be adequately detected, characterized and recognized as a possible threat (or not) to normal operation. Modern methods of PQ signals treatment are based on traditional Nyquist methods and different analysis approaches are available. Recently, compressive sensing methods are introduced for signal digital treatment and transmission, while for the analysis inclusion of fuzzy logic and artificial intelligence through artificial neural networks had been proposed.

The lecture is intended to present an overview of different PQ signals analysis methods and their application in characterisation of PQ events. Special focus will be given to novel grid faults detection and analysis methods, as voltage sags/swells may have serious implications on power electronics converters operations, i.e. on RES applications, generation and their reliability.

**Keywords:** Electric Power Quality, Digital signals treatment, Harmonics, Voltage sags, Grid-connected inverters, Grid codes, Standards.