

Abstract

A subject of the thesis refers to a field of science, which is related to formation and development of electric dischargers on surfaces of cables, which the high voltage power transmission lines are made of. These lines are significant components of the power system. In cases, which may lead to the failure, a response time should be as short as possible, therefore it is necessary to apply a modern, automated protection instrumentation in electric power equipment. Currently the diagnostic techniques are most frequently used for monitoring of selected parameters, and their critical values are to inform of possibility of failure occurrence and permanent damage to the power system component being monitored.

The origin of work was a need to make a measurement and analysis of physical phenomena occurring during partial discharges (PD) on surfaces of cables which are a part of power transmission lines. The main objective of diagnostic study in that respect was an attempt to answer a question if based on optic spectra recorded, emitted by PDs, it is possible to determine a type of material on which PDs occur, so that such knowledge is used in the future for better diagnostics of the power lines.

The Ph. D. dissertation proved a thesis that: "Emission spectra, in particular in UV range, related to corona type discharges, may constitute more sensitive and precise symptom of such discharges occurrence than electric measurements used so far (U_0 and U_s). Knowledge of the PD spectra characteristic for the material, which the cables of the power line are made of, may be useful in technical terms for more effective diagnostics of power transmission lines".

The scientific objective of the thesis was to determine emission spectra of electric discharges of corona type occurring on the surface of power transmission lines made of various materials, by means of a spectrophotometer and a high sensitive UV camera. The technical objective of the dissertation was evaluation of the initial voltage of corona discharges based on emission spectra with higher sensitivity than it has been possible so far based on electric measures U_0 and U_s .

The Ph.D. dissertation has an experimental – testing character and includes lab testing of PD emission spectra for a model of a three-phase power line for line cables made of various materials. The impact of the supply voltage, distances between cables supplied from the three-phase system and material which the cables/wires of the power line are made of on measurements results has been analysed in the thesis.

In the next chapters of the Ph. D. dissertation, physics of the PD phenomenon is discussed, metrological possibilities of emission spectra detection and measurements are presented, as well as obtained results of computational measurements and studies of light emission with the use of the UV camera and the spectrophotometer, and the results obtained are summarized in a comparative manner and conclusions are formulated.