Development of a portable fiber-optic current sensor for power systems monitoring

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References:

Abstract:
The paper presents a portable fiber-optic current sensor (FOCS) based on Faraday effect with magnetic concentrator. Both the optical sensing head and electronic processing block are illustrated. A detailed experimental study to confirm the performance of the device is also reported. According to the measured values of ac rms current up to 1 kA, a calibration procedure was performed. The paper provides the analysis of the results obtained for various conductor displacements within the concentrator. A well-known temperature dependence of the Faraday current sensor and its influence on the measurement accuracy are tested by means of a special double-layer thermal insulated chamber. The calibrated and characterized FOCS is applied for the harmonic analysis of the current. The results clearly illustrate the nature of the sensing process and demonstrate odd-order harmonics presence, as predicted by the mathematical model. The paper indicates that the device developed is suitable for the power system monitoring.

Keywords:
monitoring, power systems, Fiber-optic current sensor (FOCS), measurement, harmonics