Acoustic Imaging based Covariance Matrix Fitting Algorithm for Transformer Fault Diagnosis

yue Feng[1], Yongliang Qian[1], Kunlun Wang[1], and Zhixian Jiang[1]

[1]Wenshan Power Supply Bureau of Yunnan Power Grid Co.

March 22, 2023

Abstract

With the vigorous development of power system, fault diagnosis of power transformers is very important to ensure the normal operation of the power system. However, the traditional transformer monitoring methods have blind spots, and the diagnosis results depend heavily on the experience of the managers. At present, it is urgent to develop new technologies to improve the accuracy of transformer fault diagnosis. How to diagnose transformer faults quickly, accurately, and effectively has become a difficult problem. Encouragingly, acoustic imaging, as a visual technology of sound field, promotes the development of transformer fault diagnosis. In this paper, the principles and technical status of acoustic imaging are summarized. Meanwhile, the covariance matrix fitting (CMF) beamforming algorithm is compared with the traditional beamforming algorithm, and the main factors affecting the performance of the array beamforming algorithm are simulated and analyzed. Finally, an acoustic imaging technology for transformer fault diagnosis based on CMF algorithm is proposed. This technology can accurately diagnose the transformer fault state according to the distribution of the internal sound field of the transformer, improve the efficiency of fault diagnosis, and promote the construction of smart grid. Through the analysis and processing of the acoustic test data of seven power transformers with different voltage levels and loads, including 500kV Yanshan, 220kV Tinghu and Laoshan transformers in Wenshan Power Supply Bureau, the test results prove that the acoustic imaging technology based on CMF algorithm can accurately and conveniently diagnose transformer faults.

Hosted file

`Acoustic Imaging based Covariance Matrix Fitting Algorithm for Transformer Fault Diagnosis.docx` available at https://authorea.com/users/598529/articles/631058-acoustic-imaging-based-covariance-matrix-fitting-algorithm-for-transformer-fault-diagnosis