# Visualization of Disturbance Current and Defect Profile Inversion in Alternating Current Field Measurement based on Maxwell-Ampere Law

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In Alternating Current Field Measurement (ACFM), there is a nonlinear mapping relationship between the defect features and the spatial magnetic field features. Accurate evaluation of defect is a challenge for ACFM. Because of the skin effect, the induced current is concentrated on the surface of the structure. The induced current around the surface defect can be used to delineate the edge of the defect. The direct visualization of the disturbance current plays an important role in the accurate measurement of defect. The disturbance current visualization method can be constructed through the electromagnetic physics theory. However, there are a lot of assumptions and simplifications in the construction of disturbance current visualization method. These methods need to be re-corrected if the parameters of the system or the detected object change. Therefore, a general disturbance current visualization method is needed for accurate defect assessment in ACFM. In our work, a bidirectional gradient imaging algorithm of vertical magnetic field based on Maxwell-Ampere's law is proposed. This algorithm can directly calculate the surface induced current distribution from the vertical magnetic field of the structure surface. The surface current disturbance near the defect can be visualized through the algorithm, and the details of the surface current disturbance state can be observed. In this paper, the surface current distribution is obtained by solving the bidirectional gradient of the Bz signal of the ACFM. The disturbance current fields of crack, circular corrosion and square corrosion are inverted and calculated. The three defects morphology are reconstructed. The results show that the calculated profile is consistent with the actual defect. The sizes of the crack and square corrosion defects profile increases in the direction of current. This is because the circular defect has less current disturbance than the crack and square corrosion defect.