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**Electromagnetic Nondestructive Evaluation of Defects in Ferromagnetic Samples**

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There are increasing demands to detect and characterize defects in ferromagnetic materials. In the electromagnetic nondestructive evaluation (ENDE) of cracks in ferromagnetic materials, both the magnetic flux leakage effect and eddy current perturbation coexist and the signals may be a combination of the two effects: signals arise from flux leakage effects when the crack orients transversal to the flux, and signals arise from eddy current perturbation when the crack orients transversal to the eddy currents. The signals due to the two effects are different on signal width, signal phases, and etc. By the way, surface and back-side cracks can be detected and distinguished by signals of multi-frequencies. In this work, numerical simulation was carried out to analyze signals of different crack orientations and locations (surface or back-side). An array sensor probe energized by multi-frequency currents was used to detect cracks in ferromagnetic samples. A probe to detect defect on the back-side of a distant ferromagnetic sample was also proposed.