Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Computation of the modified magnetostriction coefficient b' corresponding to different depth ranges in ferromagnetic specimens by using a frequency dependent model for magnetic Barkhausen emissions ORFEAS KYPRIS, Department of Electrical and Computer Engineering, Iowa State University, IKENNA NLEBEDIM, DAVID JILES, 1. Department of Electrical and Computer Engineering, Iowa State University 2. Ames Laboratory, US Department of Energy, Iowa State University — We have recently shown that a linear relationship exists between the reciprocal peak voltage envelope amplitude $1/V_{peak}$ of the magnetic Barkhausen signal and elastic stress σ. By applying a frequency-dependent model [1] to determine the depth of origin of the Barkhausen emissions in a uniformly stressed steel specimen, this relationship was found to be valid for different depth ranges. The linear relationship depends on a coefficient of proportionality b'. This was found to decrease with depth, indicating that the higher part of the frequency spectrum is less sensitive to changes in stress. In this study, the model equations have been applied at various depth ranges. It was found that the variation of b' with depth can be utilized in an inversion procedure to assess the stress state in ferromagnetic specimens to give stress-depth profiles. This study is useful for non-destructive characterization of stress with depth.

[1] Kypris O, Nlebedim IC and Jiles DC. Mapping Stress as a Function of Depth at the Surface of Steel Structures Using a Frequency Dependent Magnetic Barkhausen Noise Technique. *IEEE Transactions on Magnetics* 48: 4428-4431, 2012.

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Date submitted: 03 Jan 2013 Electronic form version 1.4