

# Simulation of the magnetic Barkhausen noise (P3-07)

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Non-destructive magnetic controls are increasing in the industrial field<sup>1</sup>. In this domain, the expectation for simulation tools able to anticipate the magnetic signature, improve the understanding and avoid fastidious and uncertain experimental pre-characterizations is high. Among different methods, the magnetic Barkhausen noise (MBN) control is the most popular<sup>2,3</sup>. MBN raw signal is stochastic, not reproducible and complex to exploit.  $MBN_{energy}$ , which is obtained by integrating the square of the MBN voltage signal with respect to the time axis is a much more stable indicator<sup>3</sup>. Although the so-called  $MBN_{energy}$  is not, strictly speaking, an energy, it is connected to the domain wall motion and their kinetic energy. By plotting  $MBN_{energy}$  as a function of  $H$  (the tangent surface excitation field) hysteresis cycles are observed. After rescaling  $MBN_{energy}$  on  $B$  (the induction field),  $B(H)$  and  $MBN_{energy}(H)$  hysteresis cycles look similar for high magnetocrystalline anisotropy energy material, i.e. when the domain wall contribution is large over the rotation during the magnetization process. In this study, the multiscale model<sup>4</sup> is used to simulate an anhysteretic behavior limited to the domain wall contribution. By using, this anhysteretic contribution in the Jiles-Atherton model and running an inverse procedure<sup>5,6</sup>, a MBN envelop very close to the experimental ones can be observed. By modulating the amplitude of an alternating, high frequency signal using this envelop, an accurate simulation of the raw Barkhausen noise is obtained.

## References

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