Non-linear GMI decoding in 3D printed magnetic encoded systems

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# Supplementary mATERIAL



Fig. S 1. X-ray diffraction (XRD) patterns of the as-synthesized dried samples of Co ferrite.

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Fig. S 2. Enlargement of the low magnetic field region for the room temperature hysteresis loops measured at 1.5 T for a) commercial iron oxide and b) Co ferrite particles powder. Inset: whole range hysteresis loops.

 

Fig. S 3 . Enlargement of the low magnetic field region for the room temperature hysteresis loops measured at 1.5 T for a) magnetite and b) Co ferrite filaments. Inset: whole range hysteresis loops.

 

Fig. S 4. Absolute variation of the first, V1f, and second V2f, harmonic voltage versus sensor position, . The scanned piece was formed by two magnetic strips embedded with Co ferrite MNPs separated = 3 mm.



Fig. S 5. Variation of the decoder output signal, , versus sensor position, , for extremal distances between individual magnetic strips in magnetite for the pre-magnetized state.



Fig. S 6. Evolution at different heights,, of the output decoder system, , with the scan position, , over the as printed magnetite piece. A distance of 1 mm was settled between magnetic strips.

 

Fig. S 7. Temporal evolution sequence of the scans performed for the magnetite-based piece after initial magnetization at 0.1 T.

 

Fig. S 8. Sequence of the magnetization reversal for the magnetite-based barcoded piece after addressing the central strip reversal.

 

Fig. S 9 *S*equence of the magnetization reversal for the Co ferrite barcoded piece after addressing the central strip reversal.