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**Challenges for picoTesla Magnetic-Tunnel-Junction Sensors**

WILLIAM EGELHOFF, PHILIP PONG, ROBERT MCMICHAEL, NIST, EDMUND NOWAK, University of Delaware, ALAN EDELSTEIN, JAMES BURNETT, GREG FISHER, Army Research Lab — The extension of small, inexpensive, low-power, low frequency, ultra-sensitive magnetic sensors to fields between 1 nanoTesla and 1 picoTesla, an area currently dominated by fluxgates, optically-pumped magnetometers, and SQUIDS, would be a paradigm shift for the field of magnetic sensors. The necessary elements for picoTesla MTJ sensors have been identified by modeling the noise characteristics. The results help identify the experimental challenges that exist in the integration of the necessary components of the sensor and illustrate the trade-offs that must be considered. For example, values of the TMR above 100% contribute very little, while lowering the saturation field of the free layer below 10 Oe is essential. These and other insights identify the critical issues that need attention and can guide research into productive directions.

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