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Spin-Damping in an RF atomic magnetometer ORANG ALEM, George Mason University, MICHAEL V. ROMALIS, Princeton University, KAREN L. SAUER, George Mason University — Optically pumped atomic magnetometers have demonstrated an improved sensitivity over standard tuned coils for frequencies less than 50 MHz, making these radio-frequency (RF) magnetometers attractive for low-field NMR (for example, Budker and Romalis, Nature Physics 3, April 2007). Such magnetometers are often plagued by transient effects resulting in decreased sensitivity. The decay time of these transients, or ringing, can last for milliseconds, which is particularly detrimental for rapidly decaying NMR signals. We have found that actively damping the ringing of the atomic spins can significantly reduce such dead time. This spin-damping of the atomic transients is achieved through a negative feedback mechanism in which part of the optical signal during ringing is used to apply an RF field forcing the realignment of the atomic spins with the static magnetic field. We have successfully implemented spin-damping in 100 μs and recovered our femto-Tesla signal previously obscured by the ringing.

Orang Alem
George Mason University

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