

An Actively Controlled Dual Species Rb Atomic Magnetometer for Low Frequency Communication.

John Bainbridge^{1,2}, Neil Claussen¹, Joonas Iivanainen¹, and Peter Schwindt^{1,2}

¹Sandia National Laboratories, Albuquerque, New Mexico, United States.

²University of New Mexico, Albuquerque, New Mexico, United States.

We present a radiofrequency (RF) atomic magnetometer based on natural abundance rubidium vapor for communications through lossy media. By utilizing both ⁸⁵Rb and ⁸⁷Rb, we build upon the variometer concept first presented by Alexandrov et al [1] and the atomic RF magnetometers first built at Princeton [2]. We have constructed a variometer using ⁸⁷Rb to obtain the full external field vector, which allows for active stabilization of the Larmor resonance of ⁸⁵Rb at the desired frequency via an FPGA-based feedback system. We have also designed a 3D-printed miniaturized housing for our physics package. Here we report on our progress toward a highly sensitive, fieldable magnetometer for low frequency communications in lossy media that can operate outside a magnetic shield.

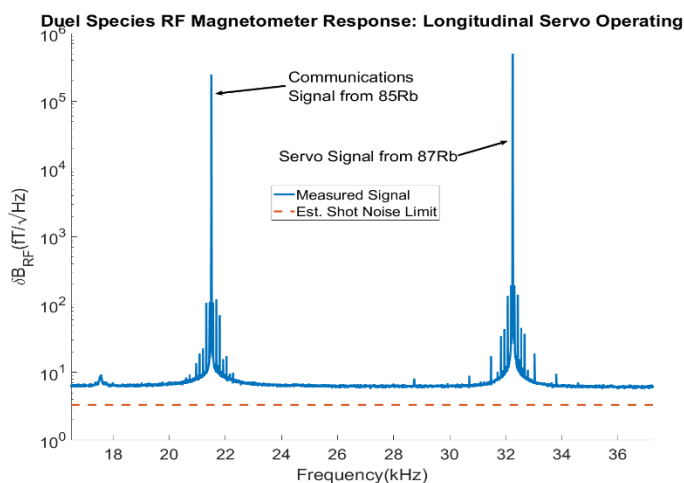


Figure 1: Preliminary data from the operation of our dual species magnetometer with longitudinal feedback engaged, demonstrating our ability to servo the magnetic field using ⁸⁷Rb whilst simultaneously detecting a communications signal from ⁸⁵Rb with good noise performance.

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References

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