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Temperature Sensitivity of an Atomic Vapor Cell-Based Dispersion-Enhanced Optical Cavity KRISHNA MYNENI, U.S. Army AMRDEC, RDMR-WDS-WO, Redstone Arsenal, AL 35898, DAVID D. SMITH, NASA Marshall Spaceflight Center, ES31, Huntsville, AL 35812, HONGROK CHANG, Ducomm Miltec, 678 Discovery Dr., Huntsville, AL 35806, HEATHER A. LUCKAY, Jacobs, Huntsville, AL 35806 — Enhancement of the response of an optical cavity to a change in optical path length, through the use of an intracavity fast-light medium, has previously been demonstrated experimentally and described theoretically for an atomic vapor cell as the intracavity resonant absorber. This phenomenon may be used to enhance both the scale factor and sensitivity of an optical cavity mode to the change in path length, e.g. in gyroscopic applications. We study the temperature sensitivity of the on-resonant scale factor enhancement, S_0, due to the thermal sensitivity of the lower-level atom density in an atomic vapor cell, specifically for the case of the ^{87}Rb D_2 transition. A semi-empirical model of the temperature-dependence of the absorption profile, characterized by two parameters, $\alpha_0(T)$ and $\Gamma_\alpha(T)$, allows the temperature-dependence of the cavity response, $S_0(T)$ and dS_0/dT to be predicted over a range of temperature. We compare the predictions to experiment. Our model will be useful in determining the useful range for S_0, given the practical constraints on temperature stability for an atomic vapor cell.

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