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Diffusion Dominated RF-Response of a Coated Rb-Vapor Cell in an Inhomogenous Magnetic Field[1] MARTIN SCHADEN, KAIFENG ZHAO, ZHEN WU, Rutgers University in Newark — The magnetic resonance lineshape of Rb-vapor in a coated cylindrical cell [1] is modeled quantitatively. It is diffusion-dominated when $l^3\omega' > D$. Here l is the cell thickness, D is the diffusion constant and ω' is the local gradient of the Lamor frequency (directed perpendicular to the cell's faces). We obtain the spectrum by averaging the path-dependent transition probability over all diffusion paths in a binomial "hopping" model. The resulting line shape also depends on the characteristics of the average interactions of a Rb atom with the coated cell surface. It agrees very well with the experimentally observed lineshape. The two most prominent peaks in the diffusion-dominated regime are due to modes concentrated at either face of the cell with a gradient-dependent contribution to the half-width $c(\omega'^2\ D)^{1/3}$, where c depends on the surface interactions but is $\sim$0.5 in most cases studied. This dependence of the line width on ω' allows one to measure the local gradient of the magnetic field without moving the magnetometer and should be particularly useful for measuring time-dependent field gradients.
[1] K. Zhao and Z. Wu, to be published.

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