sections of the paper. Although small, it is important to be able to account for this shift, if the technique is to be used to obtain accurate measurements of surface tension, for example.

An estimate of the effect of viscosity on the frequency of oscillation can be obtained by calculating the ratio of the magnitude of viscous stresses to surface tension forces, $f\nu\rho/(TD^{-1}) = \mathrm{Oh}[2l(l-1)(l+2)]^{1/2}/\pi$, where $D = 2a$, $f = 2\pi\omega$ and Oh is the Ohnesorge number [11]. This ratio is much smaller than unity for the droplet sizes used in these experiments. This indicates that we can neglect the influence of viscosity on the oscillation frequencies as a small effect. For example, we expect the viscosity of the water to marginally lower the frequency ω of the $l = 2$ mode of an $a = 5$ mm droplet by $(5 \pm 1) \times 10^{-4}\%$, but this is a small reduction compared to the frequency increase resulting from the trapping potential. (We obtained these estimates by solving numerically the Chandrasekhar equation for the eigenfrequencies of a viscous drop [12, 13]). The Oh number indicates that viscosity has a significant effect on the frequency of modes $l < 20$ only for water drops smaller than $a \sim 10\,\mu$m. The shape of the peaks in the power spectrum agrees well with the Lorentzian shape expected for an exponentially decaying oscillation, with half-width (HWHM) $\Delta\omega = 1/\tau \approx \nu a^{-2}(l-1)(2l+1)$ given by the Chandrasekhar equation [12, 13]. (Since the power spectrum is the square of the magnitude of the Fourier transform of the oscillations, we compare the shape of the peak with the *square* of the Lorentzian function).

IV. SPHERICAL POTENTIAL APPROXIMATION

We now consider the effect of a spherically-symmetric magnetogravitational potential well on the eigenfrequencies of the drop. We shall discuss the effects of additional harmonics in Sec. V. Our derivation follows Lamb's derivation of the Rayleigh frequencies [2] closely, with the addition of the force Γ_r on the droplet's surface due to the gradient of the magnetogravitational potential at the surface. We write the shape of the lth mode of a drop oscillating with frequency ω, for oscillations with small amplitude ϵ, as

$$r = R(\theta, t) = a + \zeta = a + \epsilon P_l(\cos\theta)\sin\omega t \tag{5}$$

where P_l is a Legendre polynomial of degree $l \geq 1$ ($l = 1$ corresponds to an oscillation of the droplet's center of mass in the potential trap).