where ω_L is the frequency of the longitudinal phonon mode, and ω_T is the frequency of the transverse phonon mode.

IV. RESULTS AND DISCUSSION

Since there is no dynamic ME coupling, the dispersion relation for bulk polaritons can be calculated from the macroscopic electromagnetic wave equation

$$\nabla^2 \vec{H} - \nabla \left(\nabla \cdot \vec{H} \right) - \frac{\epsilon}{c^2} \vec{\mu} \cdot \partial^2 \vec{H} / \partial t^2 = 0. \tag{24}$$

For the TE modes, the constitutive connecting $\vec{B}$ with $\vec{H}$ are defined by $\vec{\mu} = 1 + 4\pi \vec{\chi}_m$. Using these relations, the solution of the wave equations for the bulk modes is of the form

$$\vec{H} \sim e^{i(k_y y + k_z z - \omega t)} \tag{25}$$

and an implicit expression for the bulk mode frequency is:

$$\mu_y k_y^2 = \epsilon_x \left(\frac{\omega}{c} \right)^2 \left(\mu_y \mu_z - {\mu_{yz}}^2 \right). \tag{26}$$

Equation (26) has two zeros, one is for $\epsilon_x = 0$ and the other for $f(\mu) = \mu_y \mu_z - \mu_{yz}^2 = 0$. It also has two resonance poles from ϵ_x and another from the condition $\mu_y = 0$. As a result, there are three bands of bulk polariton modes.

The dispersion relation for surface modes is obtained by assuming solutions in the form:

$$\vec{H} \sim e^{\beta z} e^{i(k_y y - \omega t)} \qquad \text{for } z < 0 \tag{27}$$

and

$$\vec{H} \sim e^{-\beta_o z} e^{i(k_y y - \omega t)} \qquad \text{for } z > 0 \tag{28}$$

where β and β_o are positive real attenuation constants for the sample and vacuum, respectively. An implicit relation for the attenuation factor β of the medium is derived by substituting Eq. (27) into the wave equation Eq. (24):

$$\mu_z \beta^2 = \mu_y k_y^2 - \epsilon_x \left(\frac{\omega}{c} \right)^2 \left(\mu_y \mu_z - \mu_{yz}^2 \right) \tag{29}$$

An explicit relation for the attenuation constant β_o (in vacuum) is given by

$$\beta_o^2 = k_y^2 - \left(\frac{\omega}{c} \right)^2. \tag{30}$$