

Volume pulsation and translation

Scattered wave

$$\varphi = e^{-i\omega t} \left[a_0 h_0^{(1)}(kr) + a_1 h_1^{(1)}(kr) \cos \theta \right] \quad \psi = -e_\varepsilon e^{-i\omega t} b_1 h_1^{(1)}(k_v r) \sin \theta$$

$$v_r = -\frac{e^{-i\omega t}}{r} \left\{ a_0 k r h_1^{(1)}(kr) - \left[a_1 k r h_1^{(1)'}(kr) - 2b_1 h_1^{(1)}(k_v r) \right] \cos \theta \right\}$$

$$v_\theta = \frac{e^{-i\omega t}}{r} \left\{ b_1 \left[h_1^{(1)}(k_v r) + k_v r h_1^{(1)'}(k_v r) \right] - a_1 h_1^{(1)}(kr) \right\} \sin \theta$$

Wave inside the particle

$$\hat{\varphi} = e^{-i\omega t} \left[\hat{a}_0 j_0(\hat{kr}) + \hat{a}_1 j_1(\hat{kr}) \cos \theta \right] \quad \hat{\psi} = -e_\varepsilon e^{-i\omega t} \hat{b}_1 j_1(\hat{k}_v r) \sin \theta$$

$$\hat{v}_r = -\frac{e^{-i\omega t}}{r} \left\{ \hat{a}_0 \hat{kr} j_1(\hat{kr}) - \left[\hat{a}_1 \hat{kr} j_1'(\hat{kr}) - 2\hat{b}_1 j_1(\hat{k}_v r) \right] \cos \theta \right\}$$

$$\hat{v}_\theta = \frac{e^{-i\omega t}}{r} \left\{ \hat{b}_1 \left[j_1(\hat{k}_v r) + \hat{k}_v r j_1'(\hat{k}_v r) \right] - \hat{a}_1 j_1(\hat{kr}) \right\} \sin \theta$$

Incident acoustic wave

$$\varphi_{ac} = e^{-i\omega t} \left[A_0 j_0(kr) + A_1 j_1(kr) \cos \theta \right]$$

$$v_{acr} = -k e^{-i\omega t} \left[A_0 j_1(kr) - A_1 j_1'(kr) \cos \theta \right] \quad v_{ac\theta} = -\frac{e^{-i\omega t}}{r} A_1 j_1(kr) \sin \theta$$