

Cantilever calibration and tuning of resonance frequencies.

Initial conditions (far):

$$A_0 \gg A_1 > A_2$$

$$\phi_1 = \phi_2 = 90^\circ$$

Measurement of cantilever observables A_0, A_1, ϕ_1 and if needed higher eigenmodes, e.g. A_2 and ϕ_2 .

Assumptions:

$$A_0 > A_1 > A_2$$

Repulsive regime, i.e. $\phi_1 < 90^\circ, \phi_2 < 90^\circ$

Force volume curve to obtain observables at far and near distance to surface and the contact model, here: Sneddon.

Assumptions:

Far means $\approx 2\mu\text{m}$ above the surface $\rightarrow A_0^{\text{far}}, A_1^{\text{far}}, A_2^{\text{far}}, \phi_1^{\text{far}}, \phi_2^{\text{far}}$

Near means $\approx 10\text{nm}$ above the surface $\rightarrow A_1^{\text{near}}, A_2^{\text{near}}, \phi_1^{\text{near}}, \phi_2^{\text{near}}$

contact model

Calculate E'_{1D} and E''_{1D} from Eqs. (2)

Calculate E'_{3D} and E''_{3D} from Eq. (3)

Data interpretation:

Choice of viscoelastic model, e.g. KV, MW, SLS, generalised MW