Cantilever calibration and tuning of resonance frequencies.

Initial conditions (far):

$A_0 \gg A_1 > A_2$ $\phi_1 = \phi_2 = 90°$

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. $\phi_1 < 90°, \phi_2 < 90°$

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

Assumptions:

Far means $\approx 2\,\mu$m above the surface $\rightarrow A_0^{far}$, A_1^{far}, A_2^{far}, ϕ_1^{far}, ϕ_2^{far}

Near means $\approx 10\,$nm above the surface $\rightarrow A_1^{near}$, A_2^{near}, ϕ_1^{near}, ϕ_2^{near}

contact model

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

Calculate E'_{3D} and E''_{3D} from Eq. (S38)

Data interpretation:

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

Here: from visualisation of E'_{3D} and E''_{3D} the SLS was obtained (Fig. 2).