Dielectric function

$$\varepsilon_{\alpha\beta}(\omega) = \varepsilon_{\alpha\beta}^{\infty} + \frac{1}{v_0} \sum_j \frac{S_{\alpha\beta}^j}{\left(\Omega_{\mathbf{0}j}^{\mathrm{SCPH+B}}\right)^2 - \omega^2 - 2\Omega_{\mathbf{0}j}^{\mathrm{SCPH+B}}\Sigma^{\mathrm{B+4ph}}(\omega)}$$

SCPH → SCPH+B → Post-process

Real part of Σ

Consider Tadpole and Loop
Get SCPH frequencies ω^{SCPH}

Consider Real part of Bubble
Get SCPH+B frequencies $\Omega^{\mathrm{SCPH+B}}$

Imaginary part of Σ

Get imaginary part
of Bubble and 4ph
$$\Sigma^{\mathrm{B+4ph}}(\omega) = \mathrm{Im}\,\Sigma^{\mathrm{B}}[G^{\mathrm{SCPH+B}}, \Phi_3](\omega) + \mathrm{Im}\,\Sigma^{\mathrm{4ph}}[G^{\mathrm{SCPH+B}}, \Phi_4](\omega)$$

Mode-oscillator strength

Use Born effective charges and
SCPH+B eigenvectors to get S