Screening effects in FeSe/SrTiO$_3$ YUANJUN ZHOU, ANDREW MILLIS, Columbia University — Monolayer films of FeSe grown on SrTiO$_3$ substrates exhibit a significantly higher superconducting transition temperatures ($T_c$). The enhancement of $T_c$ has been proposed to arise from an interaction of electrons in the FeSe layer with SrTiO$_3$ phonons. We systematically study the electron-phonon interaction in the FeSe/SrTiO$_3$ system, investigate the SrTiO$_3$ longitudinal optical phonon mediated attractive potential, and calculate the electronic screening effect to the random phase approximation level. We find that since the longitudinal phonons live in a wide depletion region in SrTiO$_3$ substrate, they are not effectively screened by the electron fluctuations in the FeSe film. This unscreened attractive potential may induce a high $T_c$ superconductivity. The plasmon and collective mode spectrum is also calculated.

$^1$YZ is supported by National Science Foundation under grant No. DMR-1120296. AJM is supported by the Department of Energy under No. DOE-ER-046169.