

## Thermal screening calculation

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This note details the calculation of quantum capacitance incorporating “thermal screening” effects as proposed by Andras.

$$\chi = \frac{N \exp^{-\beta E} \chi_{\text{sc}} + \chi_{\text{imp}}}{N \exp^{-\beta E} + 1} \quad (1)$$

$N$  is the effective number of levels in the SC which do not couple to the impurity. We assume that they are all at the same energy  $E$  at the gap edge of the continuum of Bogoliubov excitations (i.e., we disregard the DOS and take a “flat-band” approximation).  $E$  is calculated as the lowest excitation energy in the spin-singlet sector (optical1.dat). I take  $\chi_{\text{sc}} \equiv 0$  while  $\chi_{\text{imp}}$  is the impurity charge susceptibility, calculated as  $\partial \langle n_{\text{imp}} \rangle / \partial \epsilon$ , with the GS impurity occupancy in the singlet sector (chi1.dat).