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Phonon Broadening of Spectral Lines in Scanning Tunneling Spectroscopy J. W. GADZUK, Electron Physics Group, NIST, Gaithersburg, MD 20899-8412 — The observation and interpretation of spectral lines associated with quasi-localized states in condensed matter systems has provided a rich source of information pertaining to the transient coupling of these states to their dynamic environment.[1] While polaron/Franck-Condon models in which a transient localized potential excites the ambient phonon system have formed the basis for phonon broadening in a wide variety of core level spectroscopies, Sunjic and Lucas have put forth an elegantly simple solution to the problem in terms of driven harmonic oscillators which easily incorporates the time scales for both the switching on and the decay of the localized potential.[2] In recent STS studies of thin NaCl films on Cu substrates, Repp et al. have observed Gaussian-broadened lines that are signatures of bound electrons at Cl vacancies (F-centers).[3] These resonance tunneling line shapes are here analyzed within the context of the SL model, properly accounting for lifetime effects due to both tip-to-vacancy and also vacancy-to-substrate tunneling, thus enabling determination of the actual electron-phonon interaction. [1]J.W.Gadzuk, PRB **44**, 13466 (1991). [2]M.Sunjic and A.A.Lucas, CPL **42**, 462 (1976). [3]J.Repp et al., PRL **95**, 225503 (2005).

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