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The role of localization in interpreting laser-grating experiments on H diffusion on Pt(111) STEFAN BADESCU, Naval Research Laboratory, Washington DC, WONE-KEUN HAN, Hong-Ik University, Korea, SEE-CHEN YING, Brown University — Recently, H diffusion on Pt(111) surfaces has been studied with laser-grating methods [1]. The puzzling fact is that the new values obtained for the diffusion barrier E_b of $\sim$160 meV at low coverage and of $\sim$105 meV at high coverage are much higher than the corresponding barrier measured through quasielastic helium atom scattering [2] ($\sim$ 68 meV). We interpret the diffusive motion observed in these experiments as evidence of quantum tunneling of the H atoms after thermally activation to higher vibrational bands [3] in the presence of surface disorder. The first excited band has an Anderson localization length small compared with the grating separation, while still larger than the characteristic length scale in the helium scattering experiment. This accounts for the apparent discrepancy of the two experiments. Numerical simulations are under way to substantiate this argument. [1] C. Z. Zheng *et al.*, Phys. Rev. B **77**, 205402 (2004) [2] A. P. Graham *et al.*, J. Chem. Phys. **111**, 1676 (1999) [3] S. C. Badescu *et al.*, Phys. Rev. Lett. **88**, 136101 (2002)

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