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Stress induced roughening of superclimbing dislocation in solid ^{4}He[1] DARYA ALEINIKAVA, ANATOLY KUKLOV, CSI, CUNY — We investigate numerically superclimb [1] of dislocation in solid ^{4}He biased by externally imposed chemical potential μ. The effective action takes into account quantum phase slips in the core superfluid as well as the core displacement in Peierls potential within the Granato-Lücke string model. The bias produces stress on the core and this can result in dislocation roughening. Such roughening is characterized by hysteretic behavior at temperatures (T) below some threshold $T_{\rm hyst}$. At $T > T_{\rm hyst}$ strong resonant peaks develop in the dislocation differential response. These peaks exhibit periodic behavior vs μ, with the period determined by Peierls potential and dislocation length. We explain these effects by thermally assisted tunneling of jog-antijog pairs across the barrier created by Peierls potential and the bias. Since superclimbing is controlled by core superflow, speed of sound along the superfluid core exhibits dip-like features at the peak positions. We propose that this effect is seen in the mass transport experiment [2].

[1] S. G. Söyler, et al, Phys. Rev. Lett. **103**, 175301 (2009).
[2] M. W. Ray and R. B. Hallock, Phys. Rev. Lett. **105**, 145301 (2010).

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