

Mode-Locked Nanomechanical Electron Shuttles for Phase Coherent Frequency Conversion

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We present operation of an electron shuttle realized as a nanomechanical diode for phase coherent frequency conversion. The mechanical response of the balanced resonator displays a hierarchy of frequency locked resonances [1]. We are able to achieve phase control via intrinsic frequency locking of the commensurate oscillations. By selecting the appropriate winding numbers we can apply this nanomechanical resonator for radio frequency conversion and rectification. The results also indicate that correlated electron shuttling and dividers for frequency combs can be realized with nanomechanical resonators.

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1 D.V. Scheible and R.H. Blick, *New Journal of Physics*, in press January 2010.