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A Numerical Parameter Study of Electronic Transport through a Resonant Tunneling Structure GREG RECINE, University of Virginia, BERNARD ROSEN, HONG-LIANG CUI, Stevens Institute of Technology — The standard Resonant Tunneling Structure (RTS) studied by lattice Weyl-Wigner methods is a layered active region confined in a 'simulation box'. Centered in this n-doped box is an undoped double barrier region consisting of a spacer layers (GaAs), barriers (AlGaAs) & wells (GaAs). We examine the RTS dependency on simulation box parameters by observing the emitter quantum well's (EQW) effect on I-V curve features (hysteresis & plateau) and intrinsic high frequency current oscillations. For small boxes (<70nm) the hysteresis size, oscillation strength and the I-V curve shape vary noticeably with box size. For boxes >90nm the I-V curve is insensitive to box size. Mid-size box ranges (∼70-90nm) are unstable. For small boxes the space between the boundary and the active region is small enough to be a quantum well itself. This results in large amplitude damped standing carrier density waves in the emitter region which accounts for the EQW formation (through electron depletion). As the box grows, the density wave amplitude at the boundary tends towards the background density and the EQW disappears. Only when the simulation box is bigger than the interference length of the density wave does the I-V curve becomes insensitive to the box length.

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