Abstracts

Theory of Infrared and Optical Frequency Amplification in Metal-Barrier-Metal Diodes

D.M. Drury and T.K. Ishii. "Theory of Infrared and Optical Frequency Amplification in Metal-Barrier-Metal Diodes." 1979 Transactions on Microwave Theory and Techniques 27.6 (Jun. 1979 [T-MTT]): 598-603.

The near-infrared and optical frequency power gain of a metal-barrier-metal (MBM) point contact diode exhibiting a negative differential resistance region in its current-voltage characteristic is derived as a function of frequency. The diode is treated as a traveling-wave amplifier. The starting point for the analysis is the known electric and magnetic field distribution of the surface waves that propagate in the oxide barrier layer between the diode whisker and substrate, assuming no tunneling current is present. Then the differential tunneling conductance is introduced, and the electric and magnetic field distribution is used to find the propagation constant of the equivalent transmission line formed by the diode structure. It is shown that if the differential tunneling conductance is negative, gain can result. It is shown theoretically that the diode amplifier can provide approximately a 6-dB gain from the CO/sub 2/ laser frequency to the He-Ne laser frequency.

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