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**Nonlinear Oscillations in a Unijunction Transistor Circuit**

STEVEN CHRISTOPHER, JOHN ZIELINSKI, Rochester Institute of Technology, MARK KOEPKE, West Virginia University — Many interesting nonlinear behaviors have been studied in distributed (glow-discharge and Q-machine plasmas) and non-distributed (nonlinear electronic oscillators) nonlinear systems that can be modeled by the van der Pol equation.<sup>1,2,3</sup> This work describes an experimental, theoretical and computational investigation of two nonlinear electronic oscillators which have a unijunction transistor as a nonlinear element. The circuits that are examined in this paper are a sine wave oscillator and a relaxation oscillator. The functioning of the unijunction transistor is explained in detail. A full derivation of the differential equation describing the sine wave oscillator is made, and the results of numerical simulations based on this differential equation are compared to experimental data. Descriptions and explanations of two types of non-autonomous (driven) phenomena, entrainment and periodic pulling will be given. [1] Present affiliation: Univ. of Notre Dame, [2] Present affiliation: SUNY Oswego

<sup>1</sup>Phys. Plasmas 3, 4421 (1996).

<sup>2</sup>Geophys. Res. Lett., 21, 1011 (1994).

<sup>3</sup>Phys. Rev. A 44, 6877 (1991).

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