

JPG To PDF - Unregistered

If you want to remove this text, Please register

JPG To PDF - Unregistered

If you want to remove this text, Please register

JPG To PDF - Unregistered

If you want to remove this text, Please register

JPG To PDF - Unregistered

If you want to remove this text, Please register

NONLINEAR RLC CIRCUIT IN SERIES

C.A. Emshary

Dept. of Physics, College of Education, University of Basrah, Basrah, Iraq

ABSTRACT

I have investigated the behavior of a series circuit consisted of a resistor, inductor, and a conventional diode. The diode acts as a capacitor. The circuit is driven by an external low distortion LF generator. The circuit resembles a driven nonlinear electrical resonator. The control parameter in this circuit was the frequency of the external source, under which various types of motions were seen to occur. A homoclinic Shilnikov chaotic attractor was noticed too.

1. INTRODUCTION

The study of simple nonlinear electrical resonators proved to be as important as other types of resonators⁽¹⁾. From the particular point of view these experiments are much simpler to study the universal behavior of all the nonlinear dynamical systems. It is also equally important and useful to be able to predict the behavior of nonlinear systems throughout their control parameter space that any response deemed unwanted may be avoided. The purpose of this work is to report a detailed measurements using a conventional diode to act as a capacitor in an RLC circuit. It was believed^(2,3) that nonlinear effects were noticed in circuits containing varactor diodes.

2. EXPERIMENT

The nonlinear resonator I have studied is a series circuit comprised a resistor, inductor, and capacitor (RLC) in which is a 1N4007 diode. The resonator was driven by a Philips PM 5107 low distortion LF generator (125 kHz).

Consider the circuit of Fig.1a⁽²⁾, where R and L are linear and the capacitor is characterized by Fig.1b⁽²⁾; it is two segments piecewise-linear. The voltage across each of the components were measured using Hameg dual channel oscilloscope (HM412). On the assumption that a nonlinearity exist in the diode and it is of a fixed value, there exist a number of control parameter to