All Sciences Proceedings
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AS-ABSTRACTS
https://as-proceeding.com/index.php/as-abstracts
ISSN: 2980-1834

All Sciences Abstracts,
Volume 1, pp. 2, 1, 2023

The dynamics analysis of the two-stage chaotic Colpitts oscillator for secure communication systems

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Abstract – This abstract presents a novel study of the two-stage chaotic Colpitts oscillator which is intended to secure communication systems. This study is divided into two important parts, the first one is to solve the mathematical model of the studied chaotic oscillator under Matlab simulator using the fourth-order Runge-Kutta method, where the results show that this model goes through many different behaviors to reach the chaotic one (doubling of periods), which is obtained in the case where the value of γ is greater than 1.5. The second part of this work consists on the simulation of the oscillator circuit under Advanced Design System simulator adopting the BFG520 bipolar junction transistor, and this is for the purpose of verifying the obtained mathematical results, as well as to study the frequency properties of this circuit. Based on the results of this electrical simulation, it has been demonstrated that the two-stage Colpitts oscillator is capable to generate chaotic oscillations in the range of (0.9 to 5.6 GHz).

Keywords – Two-Stage Chaotic Colpitts Oscillator; Bifurcation Diagram; Chaotic Behavior; Secure Communication Systems; BFG520.