

## Wireless Integrated Switched Oscillator Impulse Generator with Application in Wireless Passive Electric Field Sensors

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**Abstract :** Wireless electric field sensors are in high demand in the number of applications that requires measuring electric field such as investigations of high power systems and testing the high voltage apparatus. Passive wireless electric field sensors are most desired since they do not require a source of power and are interrogated wirelessly. A passive wireless electric field sensor has been designed and fabricated by our research group. In the wireless interrogation system of the sensor, a wireless radio frequency impulse generator needs to be employed. A compact wireless impulse generator composed of an integrated resonant switched oscillator (SWO) and a pulse-radiating antenna has been designed and fabricated in this research. The fundamental of Switched Oscillators was introduced by C.E.Baum. A Switched Oscillator consists of a low impedance transmission line charged by a DC source, through large impedance at desired frequencies and terminated to a high impedance antenna at one end and a fast closing switch at the other end. Once the line is charged, the switch will close and short-circuit the transmission line. Therefore, a fast transient wave will be generated and travels along the transmission line. Because of the mismatch between the antenna and the transmission line, only a part of fast transient wave will be radiated, and a portion of the fast-transient wave will reflect back. At the other end of the transmission line, there is a closed switch. Consequently, a second reflection with a reversed sign will propagate towards the antenna and the wave continues back and forth. hence, at the terminal of the antenna, there will be a series of positive and negative pulses with descending amplitude. In this research a single ended quarter wavelength Switched Oscillator has been designed and simulated at 800MHz. The simulation results show that the designed Switched Oscillator generates pulses with decreasing amplitude at the frequency of 800MHz with the maximum amplitude of 10V and bandwidth of about 10MHz at the antenna end. The switched oscillator has been fabricated using a 6cm long coaxial cable transmission line which is charged by a DC source and an 8cm monopole antenna as the pulse radiating antenna. A 90V gas discharge switch has been employed as the fast closing switch. The Switched oscillator sends a series of pulses with decreasing amplitude at the frequency of 790MHz with the maximum amplitude of 0.3V in the distance of 30 cm.

**Keywords :** electric field measurement, impulse radiating antenna, switched oscillator, wireless impulse generator

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