

# Development of High-Voltage Pulse Generator for RS105 Testing

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**Abstract**—This paper presents a high-voltage pulse generator based on magnetic-core Tesla transformer for developing MIL-STD-461-E/F/G RS105 test equipment. The proposed high-voltage pulse generator can generate double exponential pulse with magnitude from 20kV to 200kV, rise time of 2ns and FWHM of 19ns. Also the polarity of output pulse is easily reversed through polarity switching of primary coil in Tesla transformer.

**Keywords**—EMP; electromagnetic pulse ; high-voltage pulse generator ; MIL-STD-461-E/F/G RS105

## I. INTRODUCTION

MIL-STD-461-E/F/G provides RS105 test methods for determining electronic device's radiated susceptibility to electromagnetic pulse(EMP). The required electric field of double exponential waveform, within the test region, is characterized by a rise time between 1.8ns and 2.8ns, with the magnitude variability from 5kV/m to 50kV/m and reversible polarity. The full width half maximum(FWHM) is fall between  $23\text{ns} \pm 5\text{ns}$ [1]. The RS105 test equipment mainly consists of a high-voltage(HV) pulse generator and a radiation system such as a parallel plate or GTEM cell. In this paper, a HV pulse generator based on magnetic-core Tesla transformer which can easily variable the pulse voltage and polarity are presented.

## II. DEVELOPMENT AND RESULTS

The HV pulse generator consists of power supply, HV generator, pulse forming line and coaxial-to-parallel plate translator.

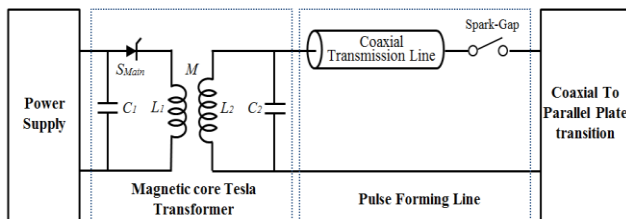


Figure 1. Block Diagram of the proposed HV pulse generator

Power supply convert from 220V AC to 80V~800V DC using inverter and DC-DC converter. It is supplied to HV generator. HV generator based on Tesla transformer consists of a primary LC circuit, a secondary LC circuit,

and the magnetic-core. The primary circuit is formed by a series of a primary winding and a capacitor. The secondary circuit is also formed by a series of the secondary winding and a coaxial-type capacitor. The magnetic-core enhance the magnetic coupling between the primary and the secondary circuits[2]. The voltage gain of the proposed Tesla transformer is 1:250. Pulse forming line designed as coaxial structure for the double exponential pulse shaping. Experiment results show that the HV pulse generator can export double exponential plus(+) and minus(-) pulse with magnitude from 20kV to 200kV, rise time of 2ns and FWHM of 19ns. The developed HV pulse generator can be applied for MIL-STD-461 RS105 test equipment.

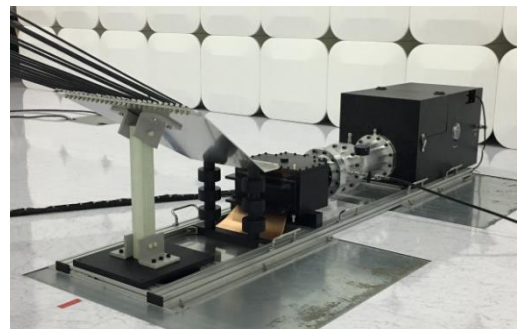


Figure 2. Photograph of the proposed HV pulse generator



Figure 3. Output pulse of the proposed HV pulse generator

## REFERENCES

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- [2] MIL-STD-461G "Requirements for the control of electromagnetic interference characteristics of subsystems and equipment", pp152~157, 2015