

The Concept of a Switched Oscillator Box Array: 4x3 Matrix Resonant Source for HPEM Applications

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Abstract—This paper presents the concept of a resonant source for High Power Electromagnetic applications based on a Switched Oscillator (SWO) box. The single unit design will be discussed and validated. The final prototype of array was manufactured and presented in the paper.

Keywords-switched oscillator, TEM-horn antenna,

I. INTRODUCTION

In this paper, we present a 4x3 transmitter array system for high-power electromagnetic applications. This system consists of multiple resonating transmitters, tuned at different frequencies, and integrated into a single radiating rack. Each transmitter is comprised of an antenna, switched oscillator, HV-source, and pneumatic system. The system can be used to test the susceptibility and vulnerability of devices in a frequency range of 100 to 900 MHz following IEC 61000-4-36 standards.

II. SINGLE UNIT DESIGN AND VALIDATION

A single transmitter box, shown in Fig. 1, has been designed and integrated to be portable, compact, and independent of any external power source. The TEM horn “box-like” antenna has been designed [1] in which the cavity formed between the arms of the TEM horn and the ground plane has been used as housing for the SWO, the SF6 pneumatic system and the connecting elements. The HV pulsed source and the electronic control system have been installed in a small box attached to the back of the antenna. The whole system has a box-like form factor, with side dimensions of 0.44λ . The single box is expected to produce an electric field around 10 kV/m at 1 m.

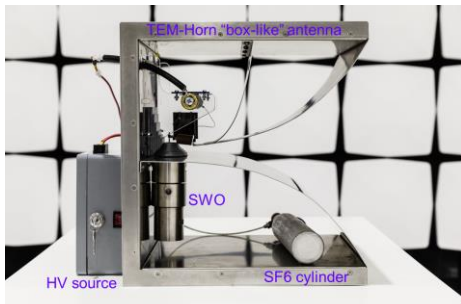


Figure 1. Single SWO box

The designed unit was tested and the electric field was measured in time domain. The reported peak amplitude was 9.51 kV/m at a charging voltage of 29kV with a central frequency of 330 MHz.

III. THE CONCEPT OF AN ARRAY

Based on the reported results of the single box, a concept of the array system has been developed combining 12 of the designed SWO boxes. The concept, shown in Fig. 2, presents the integrated system where each unit has its independent single-ended HV source, antenna, and radiating source. However, the 12 units has a single pneumatics circuit where each box is connected in series. The system is designed to have a peak electric field of 90 kV/m at 1 m. Moreover, this system has advantages over other systems with similar E-field ranges due to its low cost and easy maintenance. The manufactured final prototype is shown in Fig. 2.

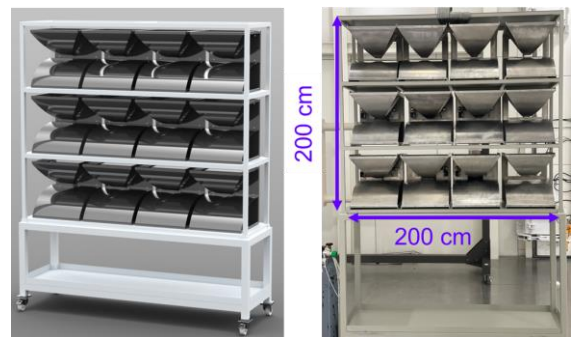


Figure 2. From left to right: 3D model, final manufactured prototype.

III. CONCLUSIONS

A design of a SWO Box array was presented based on a validated single SWO Box unit. The design is independent of any external power sources, low-cost, and easily maintained. The expected electric field is above 20 kV/m.

REFERENCES

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