

# Analysis of electromagnetic SE(shielding effectiveness) by the change in receiving and transmitting antenna position

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**Abstract**—In modern society, the threat of HPEM(high-power electromagnetic) is increasing. If the infrastructure and electronic equipments were attacked in HPEM, confusion will occur socially. From the threat of HPEM, to protect facilities that should block high-power electromagnetic and then electromagnetic shielding effectiveness evaluation of facilities is very important. But, when shielding facilities was constructed, to arrange shielding wall adjacently in the exterior concrete structures is general because of the effectiveness of space and construction cost savings. As between shielding wall and concrete structures is narrow, shielding effectiveness measurement is impossible. In this paper, analyze of the effect on shielding effectiveness by change of the receiving and transmitting antenna position. Shielding effectiveness of shielded room wall and honeycomb were measured. Experimental results, standard deviation of shielding effectiveness by changing the position of the antenna is about 3 ~ 5dB.

**Keywords**-Shielding Effectiveness; HPEM; High-Power; SE Electromagnetic

## I. INTRODUCTION

To construct HPEM shielding facility, First concrete infrastructure was constructed and then, shielded room was constructed inside the concrete buildings. But, effectiveness of space and construction cost savings in the exterior infrastructure adjacently arranging wall of shielding room is usually. For this reason, gap of between shielding facility wall and exterior concrete infrastructure is narrow. So, shielding effectiveness measurement of shielding facility is difficult. For shielding effectiveness test, as enormous construction costs are consumed, occupying gap of between shielding facility wall and exterior concrete infrastructure is difficult. So in narrow state exterior space of shielding facility, plan measuring shielding effectiveness will show impact effectiveness. If the measurement of shielding effectiveness in a small space possible, construction cost will be saved.

## II. Experiment setup

MIL-STD test method is shown Figure 1(a). Experiment is in progress to arrange transmitting antenna in the outside shielding room and exchange transmitting-receiving antenna's position.

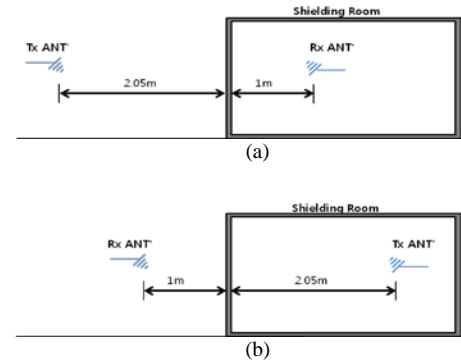


Figure 1. Shielding effectiveness experimental setup. (a)Typical SE test setup (b) Antenna position change setup

## III. Experiment result

Standard deviation of specification experimental result is presented in Table. 1. As we measure shielding effectiveness according to position of antenna, from total measurement frequency region. In the case of horizontal polarization, the standard deviation is about 3.1 dB~3.7 dB. In the case of vertical polarization, the standard deviation is about 3.8 dB~4.4 dB. The standard deviation per frequency band is 2.1dB~5.6dB in the horizontal polarization and 1.5dB~6.3dB in the vertical polarization.

TABLE I. Standard deviation According to Tx-Rx Antenna's position.

Shielding wall	Standard deviation	
	Horizontal	Vertical
Band1 (10kHz~20MHz)	2.3718	2.5799
Band2 (20MHz~100MHz)	2.7897	5.8307
Band3 (100MHz~300MHz)	4.1503	4.2312
Band4 (300MHz~1GHz)	3.7328	3.7121
Full Band (10kHz~1GHz)	3.2207	3.9104

The magnitude of standard deviation generated by changing position of antenna is almost similar to that generated by repetitive experiments.

## REFERENCES

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