

Vulnerability Analysis of Network Device by IEMI Radiation

Chang-su Seo, Chang-Su Huh, Chan Kim, Cheon-Ho Kim
 Dept. of Electromagnetic Engineering, INHA Univ.
 Nam-gu, Incheon, South Korea
sblueriver10@naver.com , cshuh@inha.ac.kr

Abstract— This study analyzed the Vulnerability of Network Communication device when IEMI is coupled to Network System. Ultra Wide Band Generator (180 kV, 700 MHz) was used as the IEMI source. The EUTs are Switch Hub and Workstation, which are used to configure the network system. The results of this study can be applied to the basic data for equipment protection and effect analysis of intentional electromagnetic interference.

Keywords- IEMI, NNEMP, Radiation, Vulnerability Analysis

I. INTRODUCTION

Due to the development of the information age, most of the devices have evolved to construct a network and exchange large amounts of data. The dependence on the network system in the information age is increasing more and more. Such network system equipment may be damaged or broken by external transient electromagnetic waves, and may cause malfunctions in receiving undesired signals from the network connection. Therefore, in this paper, we analyze the Vulnerability of Network Communication device when IEMI is coupled to Network System. [1]

II. TEST SETUP

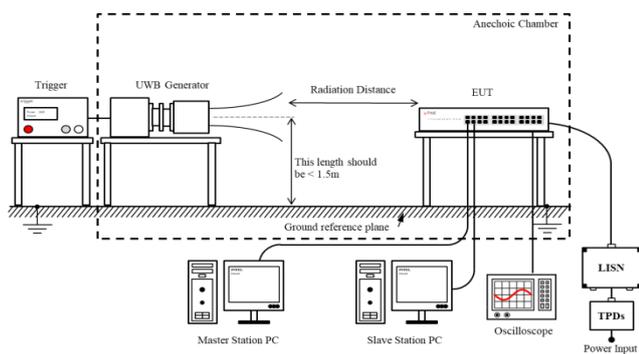


Figure 1. EUT Test setup

Figure 1 shows the test setup. It consist of an IEMI source (UWB Generator, 180 kV, Center frequency 700 MHz), a EUT (Switch Hub), and a measurement system (Oscilloscope). IEMI pulses generated by the UWB Generator are radiated through free space and coupled to the device. The malfunction of the Switch Hub was confirmed by monitoring the network connection in real time.

III. RESULTS

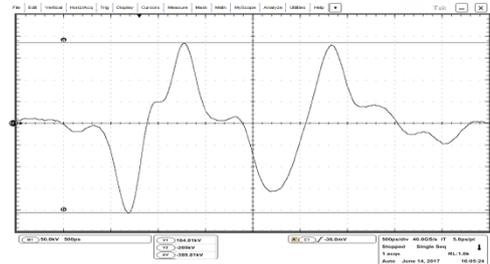


Figure 2. UWB source waveform

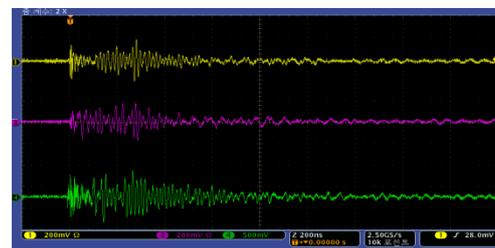


Figure 3. Coupling current waveform in case of 10 kV/m

As a result of the experiment, malfunction of network occurred as the electric field increases. The threshold electric field value was 10 kV/m for all conditions used in this experiment. To verify the electrical coupling of the EUT by IEMI, current sensors were used to measure the PCB line inside EUT and network line coupling current. Figure 3 shows the coupling current waveform in case of UWB 10 kV/m exposure.

Figure 4 shows the coupling current peak values for equipment ground line (Channel 1), power line (Channel 3) and network lines (Channel 4) by IEMI. As a result of the measurement, it can be inferred that when the coupling current due to IEMI exceeds the threshold value, it flows through the internal equipment line, causing malfunction and failure.

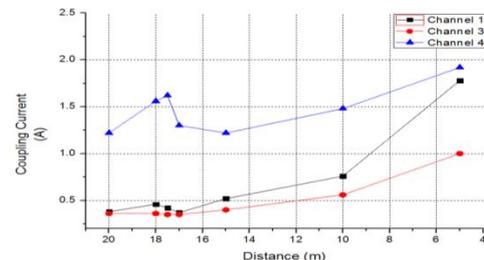


Figure 4. EUT coupling current by IEMI

REFERENCES

- [1] IEC Standard, 60050-161, "International Electrotechnical Vocabulary, Chapter 161 on EMC"
- [2] IEC 61000-1-5, Electromagnetic compatibility (EMC) –Part 1-5: General – High power electromagnetic (HPPEM) effects on civil systems