Considerations On Radiated Emission Measurements for a Laptop in a Semi-Anechoic Chamber

Abstract—This paper presents some aspects on measurements of radiated emission from a Laptop. The used Standards are presented and discussed. The measurements were carried out in a Semi-Anechoic Chamber (SAC) in accordance with EN 55022 (CISPR 22) Standard. The test arrangement was in accordance with IEC 61000-4-3 Standard and the following equipment was included: reception antenna, signal generator and emission antenna. The measurements were made at a distance of 3 meters, according to the generic Standard IEC 61000-6-3. The radiated electromagnetic interference (EMI) was assessed in the frequency domain, for the frequency range of 30 MHz – 1 GHz, in compliance with CISPR 22 Standard. The test was performed to verify if the equipment under test (EUT) is operating according to the radiated emission limits imposed by the product Standard of the class in which the equipment is framed. The results were in satisfactory agreement with the limits imposed by CISPR 22 Standard.

Keywords—electromagnetic interference (EMI); radiated emission measurements at 3 m; Laptop; semi-anechoic chamber; electromagnetic compatibility (EMC).

REFERENCES

- [1] M. M. Bait-Suwailam, D.M. Al-Abri, A.Teirab, J.Jervase, Z.Nadir, "Electromagnetic interference (EMI) radiation from airflow openings in personal computers shielded enclosures: An experimental study", GCC Conference and Exhibition(GCCCE), 2015 IEEE 8th, vol., no., pp1,4, 1-4 Feb. 2015.
- [2] P. M. Nicolae, C. M. Stoica, L. A. Dina, "Cosiderations Concernig Disturbances Generated by a Personal Computer in a Semianechoic Chamber", th.6. International Conference on Modern Power System MPS, 18-21 May 2015.
- [3] H. J. Highland, "Electromagnetic radiation revisited," Comput. Security, vol. 5, pp. 85–93 and 181–184, 1986. [4] W. van Eck, "Electromagnetic radiation from video display units: An eavesdropping risk?" Comput. Security, vol. 4, pp. 269–286, 1985.
- [5] M. G. Kuhn and R. J. Anderson, "Soft tempest: Hidden data transmission using electromagnetic emanations," Lecture Notes Comput. Sci., vol. 1525, pp. 124–142, 1998.
- [6] J.-J. Laurin, S. G. Zaky, and K. G. Balmain, "On the prediction of digital circuit susceptibility to radiated EMI," IEEE Trans. Electromagn. Compat., vol. 37, pp. 528–535, Nov. 1995.
- [7] J.-J. Laurin, S. G. Zaky, and K. G. Balmain, "Prediction of delays induced by in-band RFI in CMOS inverters," IEEE Trans. Electromagn. Compat., vol. 37, pp. 167–174, May 1995.
- [8] Federal Communications Commission Notice of Proposed Rule- Making FCC Docket No. 20780 "In the Matter of Amendment of Part 15 to redefine and clarify the rules governing restricted radiation and low-power communication devices," Adopted April 14, 1976 and published on April 23, 1976 at 41 Federal Register 17938.
- [9] Han Fang, Shi Changsheng, Lin Deyun and Li Guoding, "Measurement of radiated emission from PC computer system," IEEE 1991 International Symposium on Electromagnetic Compatibility, Cherry Hill, NJ, 1991, pp. 208-209.
- [10] P. Stenumgaard, "Radiated emission from personal computers a safety risk for TETRA systems?," 2008 International Symposium on Electromagnetic Compatibility EMC Europe, Hamburg, 2008, pp. 1-3.
- [11] IEC 61000-4-3 (VDE 0847-4-3), "Electromagnetic compatibility (EMC)-Part 4-3: Testing and measurement techniques-Radiated, radiofrequency, electromagnetic field immunity test", 2008.
- [12] I.M. Rao, "Prediction and mesurement of EMI pollution generated by the personal computers", Electromagnetic Interferences and Compatibility, Proceedings of the International Conferences on INCEMIC, vol., no., pp.11,14, 2002.
- [13] D. Hoolihan, "Radiated Emission Measurements at 1/3/5/10/30 Meters Trend shifts towards making measurements at antenna distances closer and closer to the equipment-under-test." Item MediaAntennas, Articles, EMC Directory & Design Guide, Markets, Military, Technologies, Testing, May 5, 2010.
- [14] *** https://webstore.iec.ch/publication/4246. [15] CISPR 22 Edition 6.0, "Information technology equipment Radio disturbances characteristics Limits and methods of measurement" Switzerland, 2008.