Radiocommunication Study Groups

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North American Broadcasters Association

ADDITIONS TO THE WORKING DOCUMENT TOWARDS A PRELIMINARY DRAFT NEW REPORT

Impact of power line telecommunications systems on radiocommunication systems operating in the LF, MF, HF and VHF bands below 80 MHz

The North American Broadcasters Association (NABA, *www.nabanet.com*) is an association of broadcasters in Canada, Mexico, and the United States, and the NABA Technical Committee is its standing technical body. NABA is thus in a position to present the technical viewpoints of the most authoritative association of professional North American Broadcasters in television and sound programme production, post-production, and distribution for terrestrial, satellite, and cable broadcasting.

NABA is a Sector Member of ITU-R and a long-time participant in ITU-R Study Groups, Working Parties, Task Groups, Rapporteur groups, etc. NABA numbers among its members Chairmen, Vice-Chairmen and members of the above groups. NABA also participates widely in the ITU work on radio, television and multimedia services and has a strong interest in spectrum management studies including spectrum engineering techniques, spectrum management fundamentals, spectrum monitoring, and inter-service sharing, interference and compatibility.

In this context, NABA has considered Annex 6 to Document 1A/163 entitled "Working document towards a preliminary draft new Report – Impact of power line telecommunications systems on radiocommunication systems operating in the LF, MF, HF and VHF bands below 80 MHz". NABA takes note that 34 percent of the spectrum below 80 MHz is allocated in the Radio Regulations to the broadcasting service (BS). It is also noted that planning for the BS is often done on a noise-limited basis. Consequently, the BS is particularly vulnerable to interference from power line telecommunication (PLT) systems. NABA notes that Recommendation ITU-R BT.1786 provides a criterion to protect the BS from interference caused by emissions of non-broadcasting radiocommunication devices in the bands allocated to the BS. These devices such as ultra-wideband (UWB) equipment and FM modulators, and now PLT systems, are readily available to consumers. Since the BS is afforded protection from interference caused by the emission of UWB devices and short-range modulators, it is appropriate to provide similar protection to the BS from interference caused by PLT systems.

NABA continues to support the investigation of the impact of PLT on the BS. To this end, NABA presents an additional study in Annex 1 that illustrates the need for protection to the BS from PLT systems operating in the bands below 80 MHz. NABA provides this important study for inclusion in Section 5, "Analyses of potential interference," of the working document (Annex 6 of Doc. 1A/163).

Annex 1

Measurements of the radiated emissions from in-house power line telecommunications systems into the residential environment

1 Introduction

Kitagawa and Ohishi[1] recently measured the radiated electric field strength emanating from a residential house while various power line telecommunication (PLT) devices were being operated within the house. The measurements illustrate the need to provide protection to the broadcasting service through Recommendation ITU-R BT.1786. Their measurements were performed in an actual residential environment using a two-story wooden house. The measurement point was 10 metres from the outer wall of the house with a shielded small loop antenna for measuring the radiated electric field strength at a height of two metres. The antenna beam direction was fixed towards the centre of the house. The antenna output was measured by a spectrum analyser over a frequency span of 2 to 26 MHz with a resolution bandwidth of 8 kHz.

Various PLT devices were tested. Table 1 tabulates the devices by manufacturer, model, and modem standard. A pair of PLT devices was plugged into two outlets. Each device was connected to a personal computer. Data was transmitted by sending a large file from one computer to the other through the PLT devices. Measurements of the radiated electric field strength were made during the file transfer. The measurements were made during file transfers between two outlets on the second floor.

TABLE 1

PLT devices tested for radiated emissions

Manufacturer	Model	Modem standard
Hikarinetworks	CNC-1000	HomePlug 1.0 Turbo
Panasonic	BL-PA100	HD-PLC
Sharp	HN-VA10/40	HomePlug AV1.1
Netgear	PL-NTGR-300	UPA
Logitec	LPL-TX	UPA
Logitec	LPL-TXA	UPA

[1] Masahiro Kitagawa and Masatoshi Ohishi, "Measurements of the radiated electric field and the common mode current from the in-house broadband power line communications in residential environment I", IEICE Tech. Rep., vol. 107, no. 533, EMCJ2007-117, pp. 1-6, March 2008.

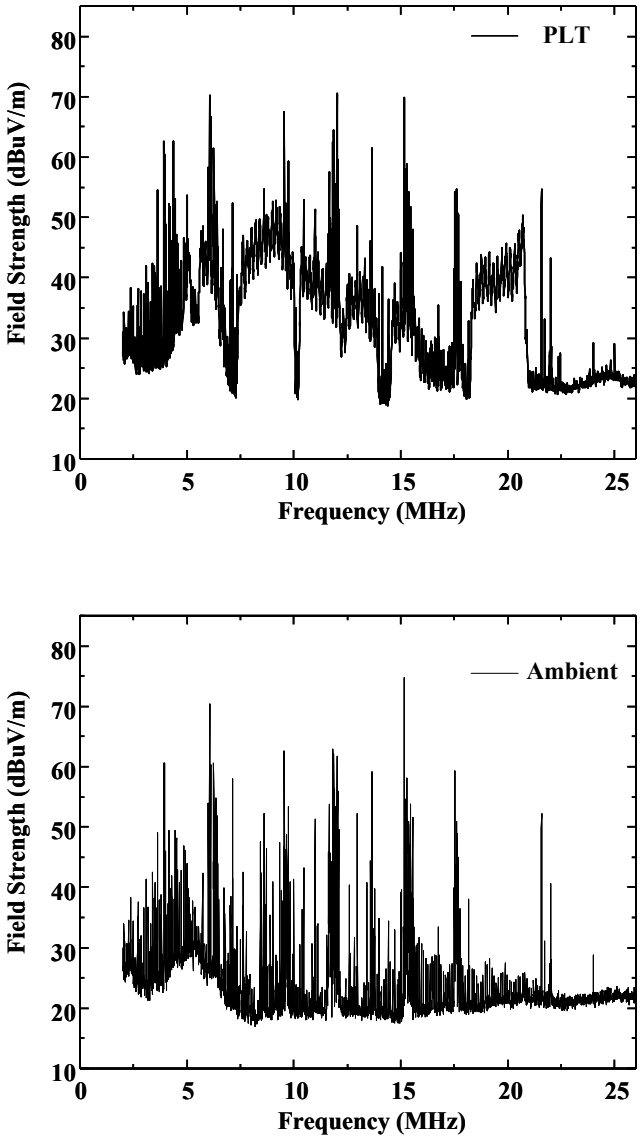
2 Measurement results

The following figures illustrate the radiated electric field strength (REF) as a function of frequency measured at a distance of 10 metres from the outer wall of the house. The upper graphs correspond to the measurement of electric field strength with the PLT device plugged in and transferring files between computers. The lower graphs correspond to the measurement of REF with the PLT devices not plugged in. These measurements correspond to the ambient noise level. Sharp spikes represent either broadcast signals or other radiocommunication signals.

Figure 1 illustrates the radiated electric field strength for a Hikarinetworks[2] CNC-1000 PLT device using the HomePlug 1.0 Turbo standard. Note that the REF reaches 50 dBµV/m at 9.4 MHz nearly 32 dB above the ambient level during a file transfer.

FIGURE 1

Radiated electric field strength (dBµV/m) as a function of frequency (MHz) for the Hikarinetworks CNC-1000 PLT device (HomePlug 1.0 Turbo standard) showing a substantial increase in the interference level above ambient across the frequency band[1]

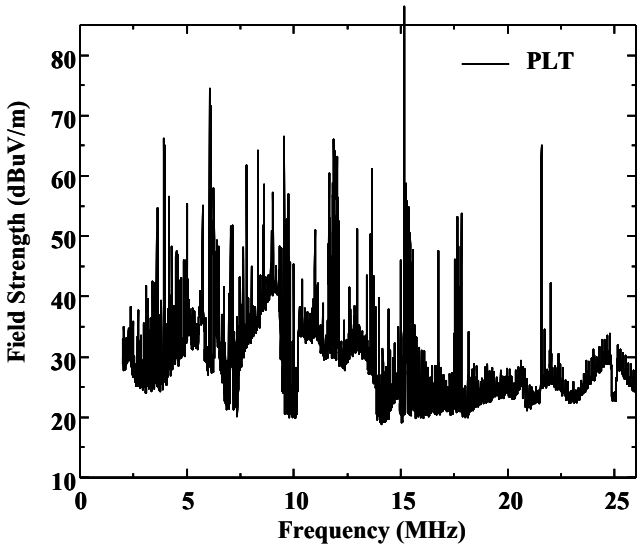


[2] The devices measured were claimed by Hirkarinetworks to be not for domestic use in Japan.

Figure 2 illustrates the radiated electric field strength for a Panasonic BL-PA100 device using the HD-PLC standard. The REF reaches 44 dBµV/m at 9.4 MHz exceeding the ambient noise level by about 26 dB during a file transfer.

FIGURE 2

Radiated electric field strength (dBµV/m) as a function of frequency (MHz) for the Panasonic BL-PA100 PLT device using the HD-PLC standard. An increased interference level above ambient is evident across the frequency band[1]



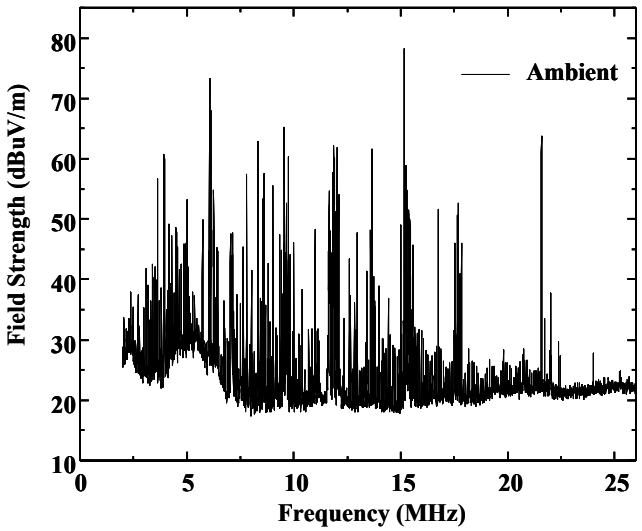
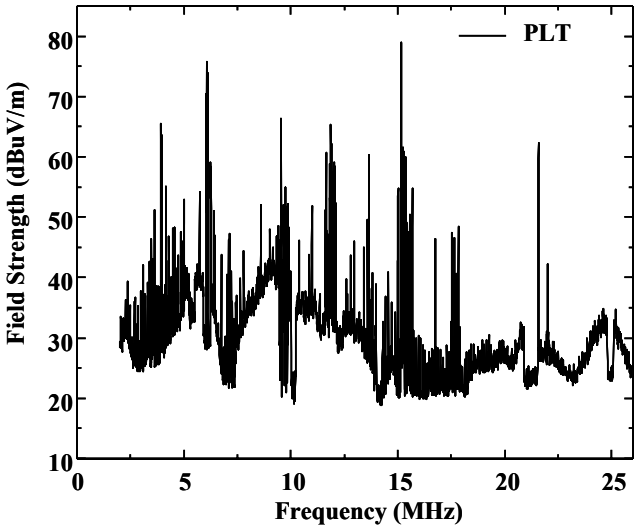


Figure 3 illustrates the radiated electric field strength for a Sharp HN-VA PLT device using the HomePlug AV 1.1 modem standard. The REF reaches 45 dBµV/m at 9.4 MHz exceeding the ambient noise level by about 27 dB during a file transfer.

FIGURE 3

Radiated electric field strength (dBµV/m) as a function of frequency (MHz) for a Sharp HN-VA PLT device using the HomePlug AV 1.1 modem standard. An increased interference level above ambient is evident across the band[1]



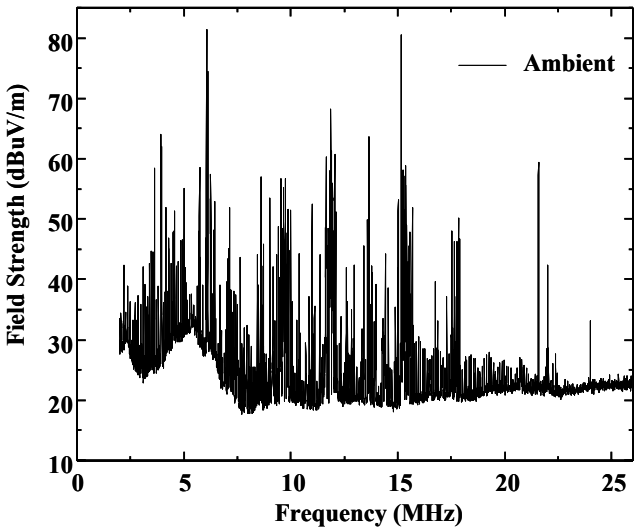
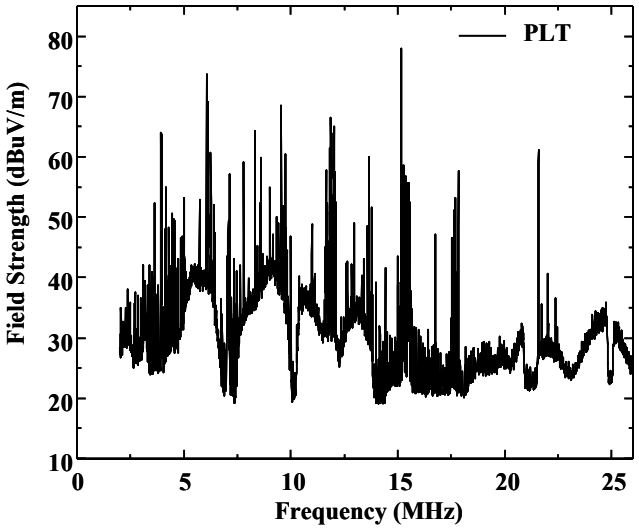


Figure 4 illustrates the radiated electric field strength for a Netgear PL-NTGR-300 PLT device using the UPA standard. The REF reaches 45 dBμV/m at 9.4 MHz exceeding the ambient noise level by about 27 dB during a file transfer.

FIGURE 4

Radiated electric field strength (dBμV/m) as a function of frequency (MHz) for a Netgear PL-NTGR-300 PLT device using the UPA standard. An increased interference level above ambient is evident across the band[1]



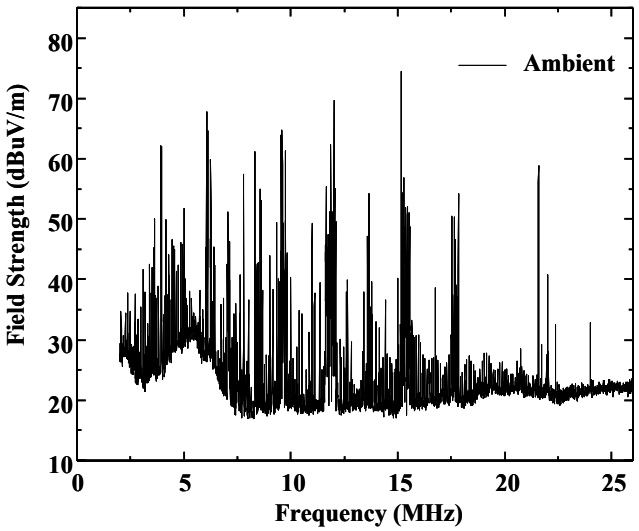
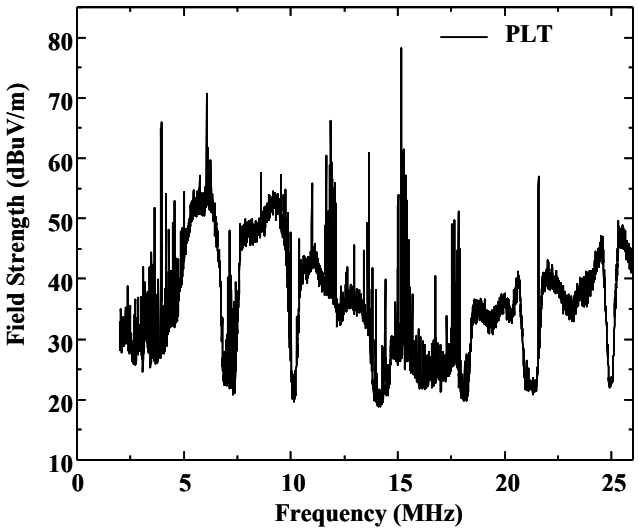


Figure 5 illustrates the radiated electric field strength for a Logitec TX PLT device using the UPA standard. The REF reaches 54 dBµV/m at 6 MHz and 9.4 MHz exceeding the ambient noise level by about 36 dB and 50 dBµV/m at 25.5 MHz exceeding the ambient noise level by about 28 dB during a file transfer.

FIGURE 5

Radiated electric field strength (dBµV/m) as a function of frequency (MHz) for a Logitec TX PLT device using the UPA standard. A significant increase in the interference level above ambient is evident across the entire band[1]



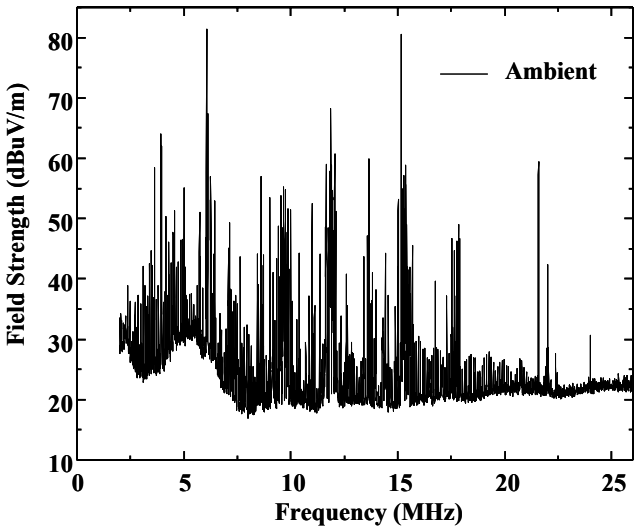
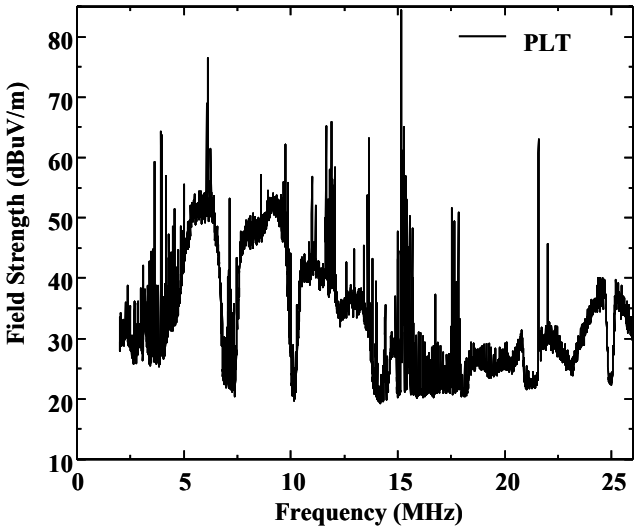


Figure 6 illustrates the radiated electric field strength for a Logitec TXA PLT device using the UPA standard. The REF is improved over the TX model by about 10 dB above 15 MHz. However, the REF of the TXA model still exceeds the ambient noise level by about 36 dB at 9.4 MHz during a file transfer.

FIGURE 6

Radiated electric field strength (dBµV/m) as a function of frequency (MHz) for a Logitec TXA PLT device using the UPA standard. A significant increase in the interference level above ambient is still evident across the entire band[1]



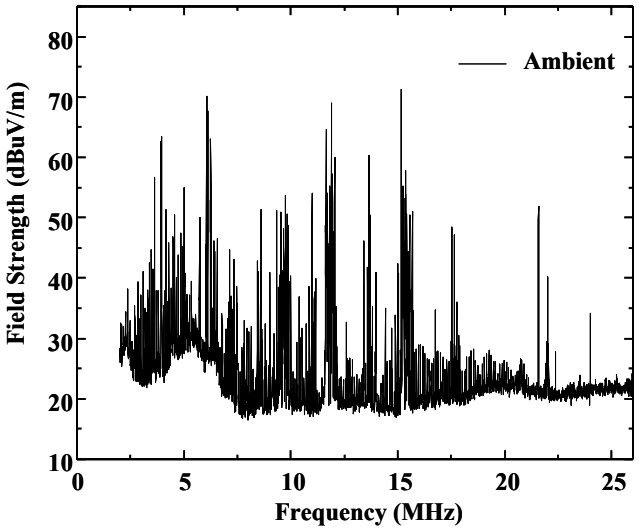
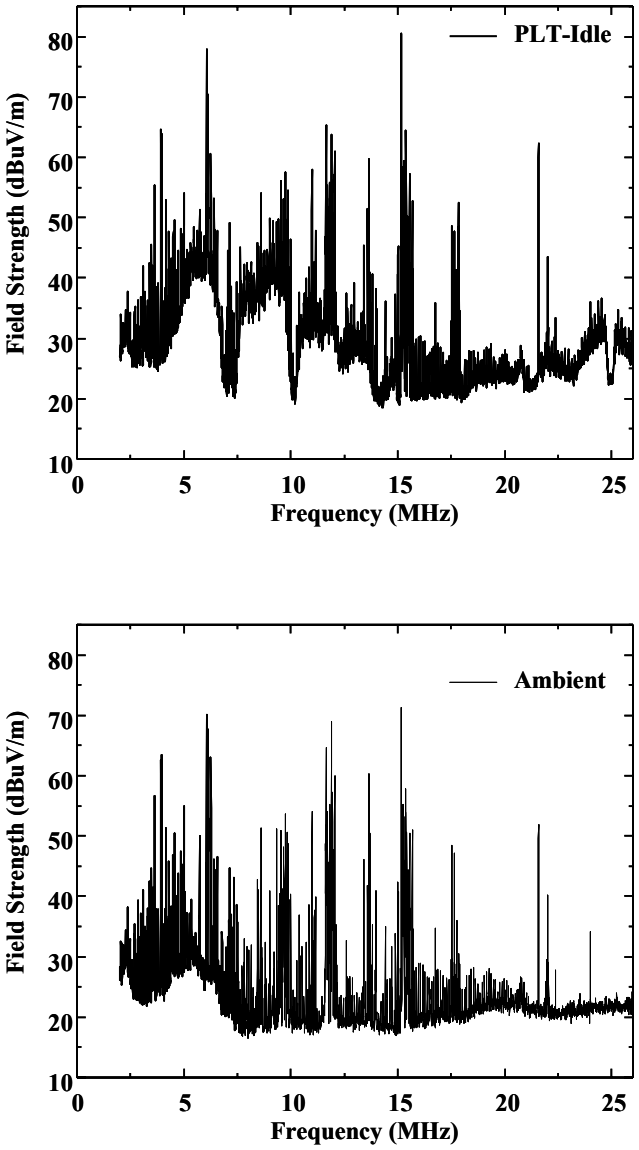


Figure 7 illustrates the radiated electric field strength for the Logitec TXA PLT device in the idle state (no file transfer). The REF still reaches 45 dBµV/m at 6 and 9.4 MHz exceeding the ambient noise level by about 17 dB.

FIGURE 7

Radiated electric field strength (dBµV/m) as a function of frequency (MHz) for an idle Logitec TXA PLT device. An increase in the interference level above ambient is evident across the entire band even though the PLT device is not transmitting information[3]



[3] Masahiro Kitagawa and Masatochi Ohishi, private communication.

3 Conclusions

The work of Kitagawa and Ohishi clearly shows that all measured radiated electric field strengths caused by individual PLT devices exceed ambient noise levels to significant degrees. It is quite evident that the antenna characteristics of in-house power lines make it difficult to control radiated emissions from PLT devices. Consequently, PLT devices for in-house use must be substantially improved in order that their interference will not exceed the protection requirement contained in Recommendation ITU-R BT.1786.