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Research on Switched-mode Power Supplies Influence on a Data Rate Over Home Electrical Wiring Networks

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ABSTRACT The rapid development of the Internet of Things, one of the most dynamically expanding technological domains worldwide, is the reason for ongoing search for solutions that combine high bandwidth, flexibility, scalability, and cost efficiency for the implementation of such concepts as Smart Grid, Smart Home, and Smart City. Despite the significant progress of wireless technologies and their widespread deployment in the Internet of Things sector, their application cannot always address all challenges, particularly with regard to ensuring a stable signal level in shadow coverage zones. In such cases, the application of Power Line Communication technology is considered appropriate, as it enables broadband access through home electrical wiring network. Data transmission via high-frequency signals is not considered during the design of home electrical wiring network. Therefore, it is an urgent issue to investigate both the propagation characteristics of the electrical wiring medium and the effects of various loads connected to branches on home electrical wiring network parameters. This article is devoted to researching the influence of switch-mode power supplies of different power rates on the data rate of data transmitting systems Broadband over Power Line Communication operating over home electrical wiring network. Calculations of the maximum achievable data rate for a fragment of home electrical wiring network consisting of a single branch formed by segments of ShVVP, a common domestic wire in Ukraine, with copper conductors of 1.5 mm² cross-sectional area were performed. The influence of the input filter parameters and the noise induced by the alternating magnetic field of the SMPS transformer on the maximum achievable data transmission rate in home electrical wiring network was analyzed. The research was performed within a frequency range of 0 to 30 MHz, which corresponds to the 25 MHz–PB band in accordance with ITU-T Recommendation G.9964.

KEYWORDS power line communication, broadband access, switched-mode power supply, data rate.

I. INTRODUCTION

Humanity's constant striving for automation in domestic and industrial processes stimulates the search for innovative solutions capable of ensuring the performance of routine tasks through the use of so-called "smart devices". This provides an impetus for the development of Smart Grid technology and Smart Home systems, unified under the Internet of Things (IoT) concept, which today represents one of the fastest-growing technology sectors in the world [1, 2].

Currently, the share of "smart devices" equipped with wireless interfaces predominants in the IoT device market [3, 4]. This can be explained by factors such as ease of installation and use, high flexibility and scalability, cost-effectiveness, diversity. However, despite the significant progress of wireless technologies, their application cannot always address all challenges. In particular, it applies to shadow coverage zones, where it is not possible to ensure a stable signal level to provide broadband access.

These tasks can be addressed through the application of Power Line Communication (PLC) technology. This technology uses the existing electrical network as a medium for signal transmission and offers several advantages [5, 6]: the ability to rapidly network deployment wherever electrical wiring is available, low deployment costs, simple configuration, flexibility, scalability, easy topology modification, and the capability to operate over channels with unstable and rapidly time-varying parameters. This advantages makes PLC technology attractive, primarily for use in building hybrid networks [7, 8], where both wired and wireless interfaces are used simultaneously. A variant of PLC technology, Broadband Power Line Communication (BPLC) for broadband network deployment is often employed when designing smart home systems.

However, the possibility of data transmitting using high-frequency signals is not considered when designing a home electrical wiring network (HEWN). Therefore, the transmission parameters of PLC in these frequency ranges (such as the operating attenuation and the operating transmission constant phase) need to be investigated for the effective implementation of BPLC technology. In accordance with these parameters, it is possible to determine the level of interference and, consequently, the signal-to-noise ratio (SNR), which will further be used to calculate the maximum achievable data rate over the HEWN.

Previously, the dependence of the data rate in the HEWN on the wire length used to build HEWN [9], the type of orthogonal harmonic signals applied for data transmission in BPLC [10], and the type of load impedance at HEWN branch [11] were researched. In [11] the capacitive and inductive loads, loads equal in value to the characteristic impedance of the wire, short-circuit and no-load were investigated.

Nowadays, switched-mode power supply (SMPS) are widely used. Therefor researching the influence of loads connected to HEWN branch on the data rate over HEWN built using domestic ShVVP wire is currently relevant. This problem has not been explored in the scientific literature and requires research.

The objective of this article is to research the influence of a SMPS on the data rate of BPLC data transmitting system (TS) over the HEWN.

In this article, the influence of the most common SMPSs on the data rate of a BPLC TS over HEWN is analyzed, as they are available on the market with a wide range of power ratings. The SMPSs power ratings of the investigated SMPSs and characteristics of SMPSs input filters component parameters (SMPSs IF CP) are given in Table 1.

TABLE 1. Characteristics of SMPSs.

SMPSs IF CP	SMPS power rating, W			
	5.0	18.0	33.0	150.0
C, nF	–	33.0	68.0	100.0
L, mH	–	–	4.7	5.5
R, Ohm	10580.0	2940.0	1603.0	353.0

II. INPUT DATA

The circuit diagram of typical SMPS WX-DC2416 PSU [12] with power rating of 150 W (Fig. 1) includes the following key components:

– an input filter and rectifier;

– a switching stage (pulse-width modulation (PWM) controller and metal-oxide-semiconductor field-effect transistor (MOSFET));

– transformer and secondary rectifier.

In [13] the influences of the input filter and the switching converter of the SMPS on the transmission parameters of the PLC are investigated. The input filter has been identified as the primary factor affecting of the operating attenuation and the operating transmission constant phase in HEWN. This effect is due to the presence of reactive components, such as capacitors and inductors, in the input filter's design. These reactive components can influence on transmission parameters when acting as a load on HEWN branch.

Circuit diagram of HEWN fragment with a single branch is shown on Fig. 2. It consist of segments of domestic ShVVP, a flexible PVC-insulated wire with copper conductors having a cross-sectional area of 1.5 mm² and a length of 5 m, poles (represented by large circles with serial numbers) and unnumbered branch point (represented by small circle). The load Z_{load}, such as a SMPS, is connected to pole number 2, representing the branch.

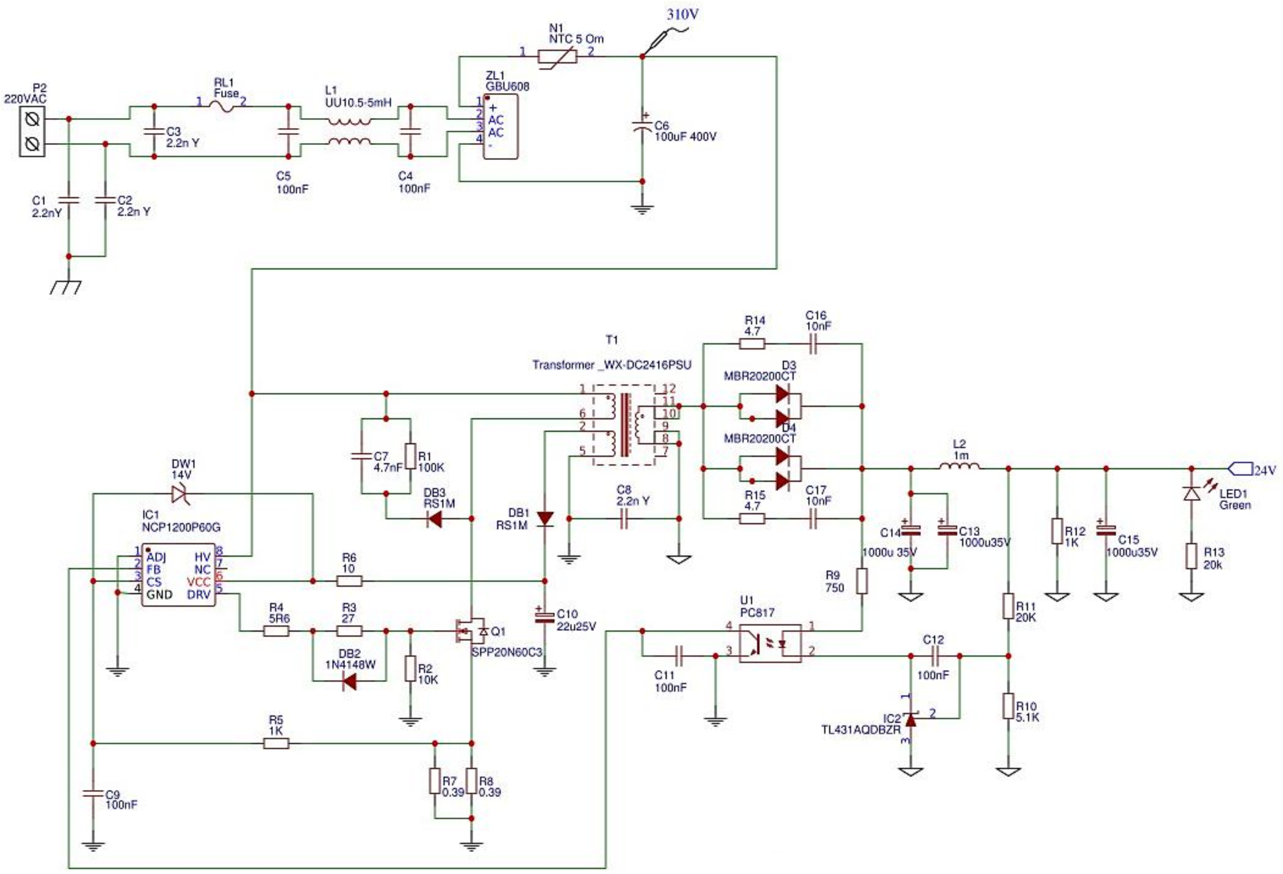

FIG. 1. Circuit diagram of SMPS WX-DC2416 PSU.

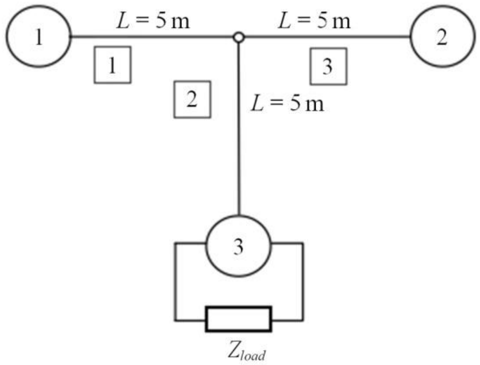

FIG. 2. Circuit diagram of HEWN fragment with a single branch.

To determine discrete impulse responses (IR) for SMPSs with different power ratings as listed in Table 1, the results of operating attenuation and the operating transmission constant phase calculations presented in [13] are used. The formula shown in [14, 15] is used to calculate IR:

$$g(n) = IFFT(h(k) \cdot \cos(\varphi(k)) + j \cdot h(k) \cdot \sin(\varphi(k))), \quad (1)$$

where n – number of samples in an orthogonality interval, $0 \le n \le N$; k – number of used subcarriers; $h(k)$ – value of HEWN operating attenuation module for sample with n-number in an orthogonality interval, dB; $\varphi(k)$ – value of HEWN operating transmission constant phase for sample with n-number in an orthogonality interval, rad.

To apply the one-sided (half) Hann [15] window to the tail part of the IR for reduce artifacts caused by artificial reflections due to finite IR length:

$$\omega(n) = 0{,}5 \cdot \left(1 + \cos\left(\frac{\pi \cdot n}{N}\right)\right), \quad (2)$$

where $N -$ number of samples in an orthogonality interval; $n -$ number of samples in an orthogonality interval, $0 \le n \le N$.

The Eq. 1 for calculating the IR takes the form:

$$g_{Hen}(n) = g(n) \cdot \omega(n). \quad (3)$$

The results of the calculation, considering the use of a one-sided Hann window, are shown on Fig. 3.

III. ANALYSIS OF THE INTERFERENCE DUE TO THE INPUT FILTER OF THE SMPS

In this article, we employ the interference calculation method presented in [10] which accounts for the influence of intersymbol and cross-channel interference BPLC TS on the achievable data rate over HEWN. The dependence of the ratio h of the effective values of the interference and the signal at the input of the BPLC TS receiver is calculated for the fragment of HEWN shown in Fig. 2, in accordance with IR shown in Fig. 3 and the BPLC TS parameters presented in [14]:

– frequency plane 25 MHz-PB;

– number of samples in an orthogonality interval, $N = 2048$;

– number of used subcarriers, $n = 942$;

– number of first used subcarrier, $m = 82$;

– number of samples in a guard interval, $L = 32$;

– limit power spectral density (PSD) mask of transmitted signal.

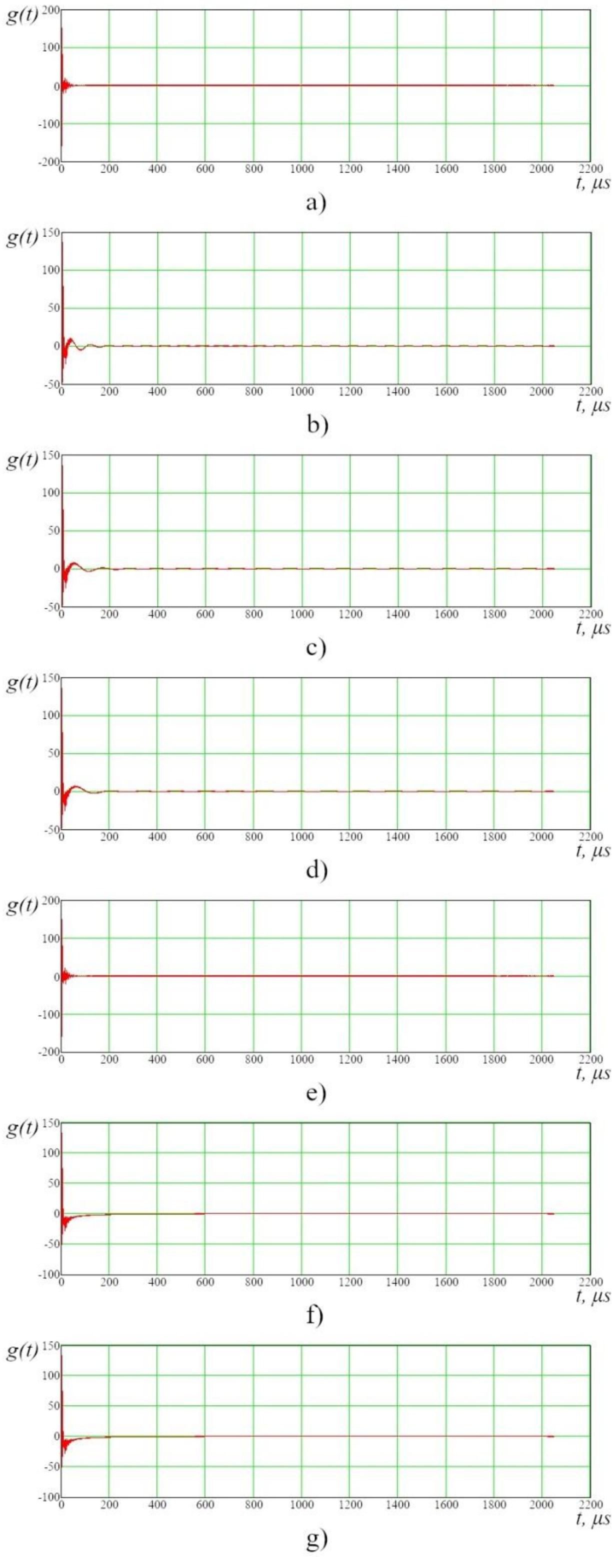

FIG. 3. Graphical representations of discrete IR $g(t)$ (the load is SMPS with a power rating of: (a) 5 W; (b) 18 W; (c) 33 W; (d) 150 W; (e) no-load; (f) short-circuit; (g) the load equal to the characteristic impedance of the ShVVP wire (Z_{chi})).

The dependences of the ratio h between the effective values of the interference and the signal at the input of the BPLC TS receiver on the subcarrier number l and the number of sample k_T, from which the signal processing in the receiver begins, are shown in Fig. 4.

As shown on Figs.4 and 5, the dependence of the ratio

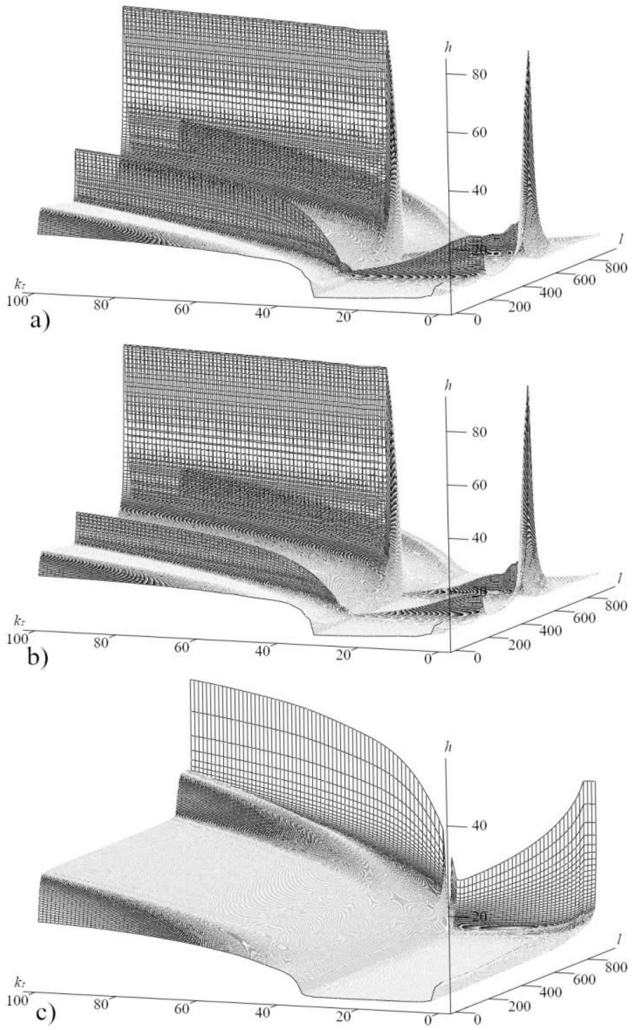

FIG. 4. Graphical representations of dependences of the ratio *h* on *l* and k_T (the load is SMPS with a power rating of: (a) no-load; (b) short-circuit; (c) the load equal to the characteristic impedance of the ShVVP wire (Z_{chi})).

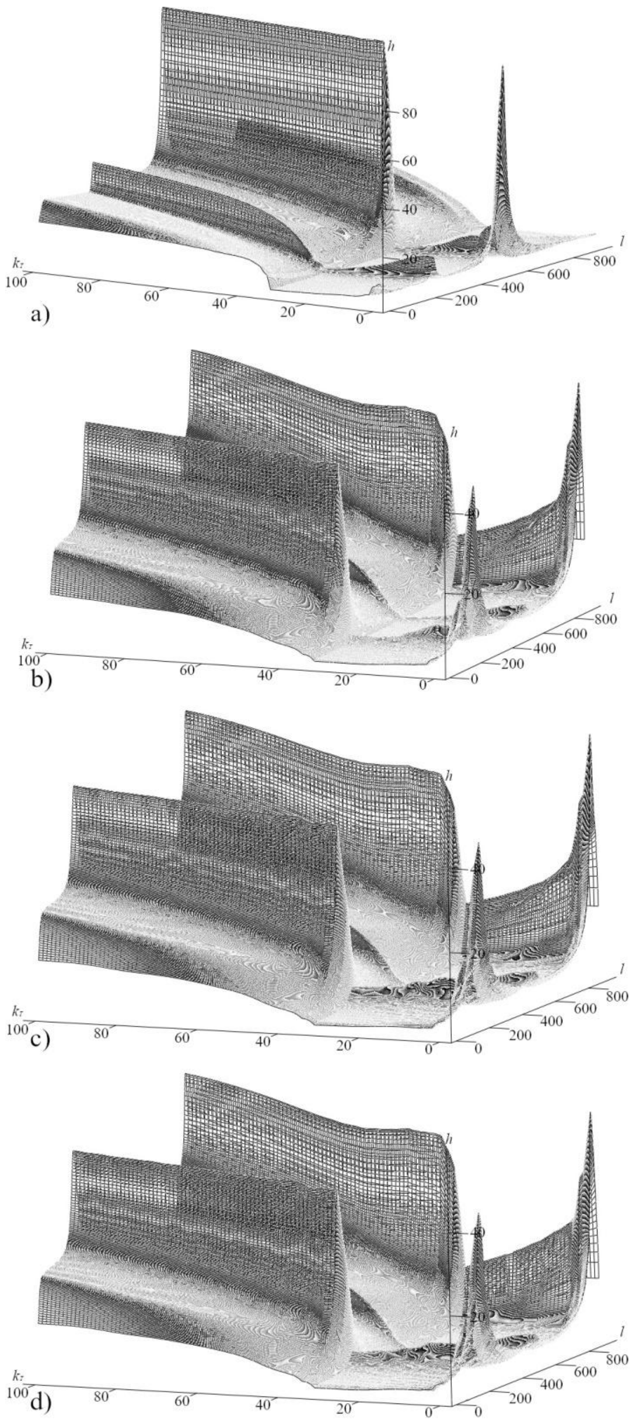

FIG. 5. Graphical representations of dependences of the ratio *h* on *l* and k_T (the load is SMPS with a power rating of: (a) 5 W; (b) 18 W; (c) 33 W; (d) 150 W).

h between the effective values of the interference and the signal at the input of the BPLC TS receiver is minimal when the load equal to the characteristic impedance of ShVVP wire is connected to the branch. When the load on HEWN branch is an SMPS with the power rating is 5 W, the value and behavior of *h* are very close to those in the case when the load is no-load.

An increased number of bursts is observed in Fig. 5b – Fig. 5d. This can be explained by distortions in the frequency characteristics of the communication channels due to difference between the load is connected to HEWN branch and the characteristic impedance of ShVVP wire.

IV. ANALYSIS OF THE NOISE GENERATED BY THE ALTERNATING MAGNETIC FIELD OF THE SMPS TRANSFORMER'S

When calculating the maximum achievable data rate over HEWN, the noise induced by the alternating magnetic field of transformer T1 must be considered. Imperfections in SMPS input filter allow this noise to enter HEWN.

The transformer-induced noise level was measured for all SMPS power ratings shown in Table 1 over the 0.15 – 30 MHz frequency range to obtain its quantitative characteristics. The measurement was carried out using a Keysight N9010B EXA spectrum analyzer and an HM 6050-2 network equivalent, connected according to the circuit diagram shown in Fig. 6.

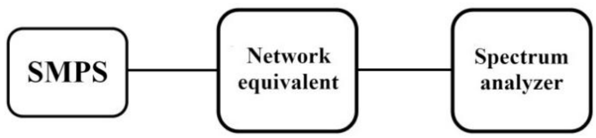

FIG. 6. Circuit diagram of the SMPS transformer-induced noise measurement setup.

As shown in Fig. 1, SMPS equipped with interface marked P2 (220VAC) that allow connect SMPS to HEWN. Through this connector, SMPS is connected to the HM 6050-2 network equivalent, which has an electrical socket-type input. The spectrum analyzer is connected to the network equivalent via a coaxial cable with a BNC connector on the network equivalent side and an N-type connector on the analyzer side.

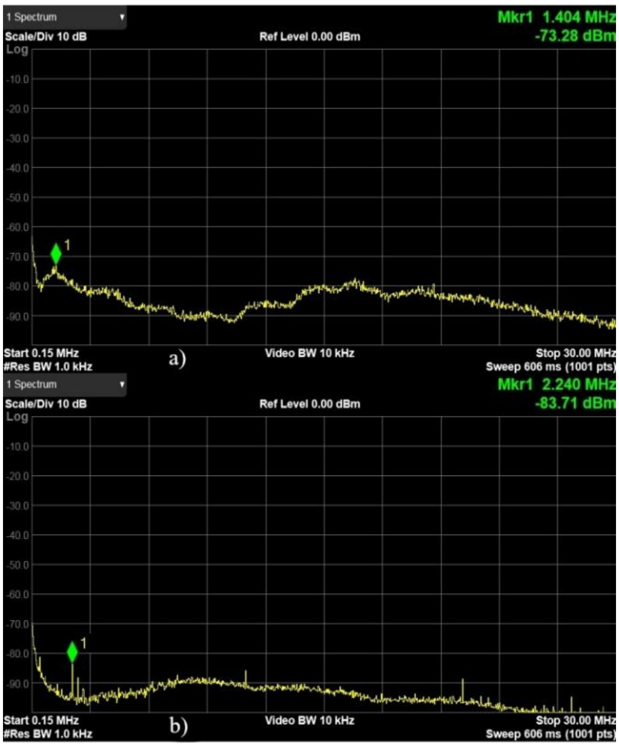

FIG. 7. PSD of noise induced by the transformer's alternating magnetic field in SMPS with a power rating of: (a) 5 W; (b) 33 W.

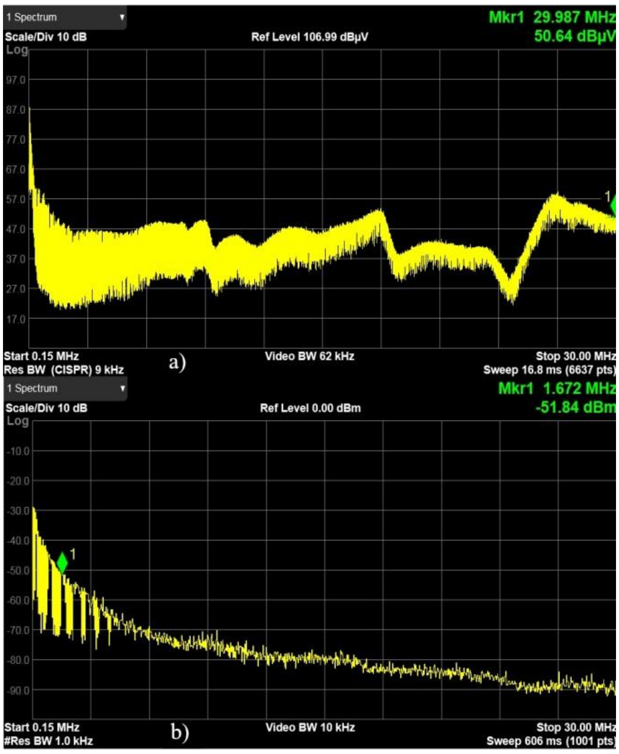

FIG. 8. PSD of noise induced by the transformer's alternating magnetic field in SMPS with a power rating of: (a) 150 W; b) 18 W.

The measurement results are shown in Fig. 7 and Fig. 8. The 10 dB insertion loss of the network equivalent was taken into account. The recalculation from dB/kHz to dB/Hz was carried out.

The power spectral density of the additive noise (PSD AN) is -140 dB/Hz when the load on HEWN branch is no-load, short-circuit, or equal i to the characteristic impedance of ShVVP wire.

As shown in Fig. 7 and Fig. 8, the maximum level of noise PSD generated by the SMPS transformer's alternating magnetic field is typical for SMPSs with 18 W and 150 W power ratings.

This is primarily due to poor manufacturing quality and imperfection in the input filter resulting from the use of low-quality components. In addition, SMPS with 18 W power rating the input filter consists of only single capacitor with capacitance of 33 nF. This input filter is unable to effectively suppress noise inducted by the transformer magnetic field.

The lowest noise PSD generated by the SMPS transformer's alternating magnetic field is observed in SMPS with a power rating of 33 W. This is due to high-quality manufacturing, high-quality components and a well-design input filter that effectively suppress noise inducted by SMPS transformer's alternating magnetic field.

V. ANALYSIS OF THE INFLUENCE OF THE SMPS ON THE DATA RATE OVER HEWN

The maximum achievable data rate in BPLC TS was calculated using the method published in [16, 17]. As shown in the formula (4) this method allows to take into account the interference and noise PSD generated by the SMPS transformer's alternating magnetic field.

$$R = f_{T\,inf} \cdot \sum_{l=m_{min}}^{m_{max}} floor\left\{log_2\left(1 + \frac{3SNR_{AN}(l)}{\left[Q^{-1}\left(\frac{p}{1,5345}\right)\right]^2 (h^2(l)SNR_{AN}(l)\cdot 10^{-4}+1)}\right)\right\}, \quad (4)$$

where:

$f_{T\,inf}$ – frequency of information frame in BPLC TS;

m_{min} – minimal number of subcarrier frequency that used in BPLC TS;

m_{max} – maximal number of subcarrier frequency that used in BPLC TS;

SNR_{AN} – ratio between the signal power at the input of the BPLC TS receiver (which is specified by the power spectral density mask according to the relevant standard) and power of the non-interference noise. This parameter allows to take into account the influence of electrical appliances that connected to the poles of HEWN;

$h(l)$ – ratio h between the effective values of the interference and the signal at the input of the BPLC TS receiver on the subcarrier number l;

p – probability of error at the output of the l-th channel of the receiver.

The results of the maximum achievable data rate in BPLC TS calculation are shown in Table 2.

TABLE 2. The calculating results of the maximum achievable data rate in BPLC TS over the HEWN.

		The load type connected to HEWN branch						
		SNPS power rating, W				No-load	Short circuit	Z_{chi}
		5.00	18.00	33.00	150.00			
Maximum achievable data rate, Mbit/s	h = 0, PSD AN = −140 dB/Hz				248.37			
	h in according to Figs. 4 and 5, PSD AN = −140 dB/Hz	219.18	210.65	184.06	187.57	210.82	218.51	245.31
	h = 0, noise PSD in according to Figs. 7 and 8	193.58	83.75	236.54	160.96	-	-	-
	h in according to Figs. 4 and 5, noise PSD in according to Figs. 7 and 8	175.17	82.76	170.99	138.01	-	-	-

VI. CONCLUSION

As a result of the research on the influence of SMPS to the maximum achievable data rate over HEWN, it was established that:

– the heterogeneity in HEWN, due to the input filter acting as a load on HEWN branch and the noise generated by the SMPS transformer's alternating magnetic field, is the cause of the reduction in the maximum achievable data rate over HEWN;

– the maximum data rate over HEWN is achieved when the load on HEWN branch equals to the characteristic impedance of ShVVP wire;

– the absence of the input filter in SMPS with power rating of 5 W allows the noise generated by the transformer's alternating magnetic field to penetrate into HEWN unhindered. As a result the maximum achievable data rate over HEWN is reduced by 22 % under interference-free conditions. The reduction of the maximum achievable data rate over HEWN is 11.75 % when the PSD AN equals -140 dB/Hz and the interference due to the heterogeneity in HEWN caused by active resistance (R = 10.58 kOhm), are take into account. A comparison of the ideal conditions (no interference and PSD AN equal to -140 dB/Hz) with the case where all influencing factors are considered (h from Fig. 5 and the noise PSD generated by the SMPS transformer's alternating magnetic field from Fig. 7) shows a 29.48 % reduction in the maximum achievable data rate over HEWN;

– the input filter composed of single capacitor with capacitance of 33 nF is unable to effectively suppress noise generated by the alternating magnetic field of the transformer in the SMPS with 18 W power rating. As a result the maximum achievable data rate over HEWN is significant reduced by 66.28 % under interference-free conditions. The reduction of the maximum achievable data rate over HEWN is 15.19 % when the PSD AN equals -140 dB/Hz and the interference due to the heterogeneity in HEWN caused by the input filter are take into account. A comparison of the ideal conditions (no interference and PSD AN equal to -140 dB/Hz) with the case where all influencing factors are considered (h from Fig. 5 and the noise PSD generated by the SMPS transformer's alternating magnetic field from Fig. 8) shows a 66.67 % reduction in the maximum achievable data rate over HEWN;

– the effect of interference remains largely unchanged whether HEWN branch is loaded with an SMPS rated at 33 W or 150 W. The reduction of the maximum achievable data rate over HEWN is 25.89 % when the PSD AN equals -140 dB/Hz. However, the influence of the noise generated by the alternating magnetic field of the SMPS transformer differs significantly. This effect accounts for a 4.76 % decrease in the maximum achievable data rate over HEWN for SMPS with 33 W power rating and 35.19 % decrease for SMPS with 150 W power rating;

– the influence of SMPSs on the maximum achievable data rate over HEWN when PSD AN is -140 dB/Hz is comparable of no-load and short-circuit loads. However, as shown in this article, the noise generated by the SMPS transformer's alternating magnetic field has significantly influence to the maximum achievable data rate over HEWN;

– the interference and the noise generated by the SMPS transformer's alternating magnetic field make a different contribution to the reduction of the maximum achievable data rate over HEWN. However, both are the integral parts of SMPS influence on the maximum achievable data rate over HEWN when SMPS acts as a load on the branch. The interference causes an average reduction of 20 % in the maximum achievable data rate over HEWN, while the noise generated by the SMPS transformer's alternating magnetic field contributes an average reduction of 32 %. Therefore, the noise contribution is more significant. Since the noise primarily results from low-quality components, poor manufacturing quality and suboptimal input filter design, its negative impact can be effectively counteracted. The use of high-quality input filters capable of effectively suppressing the noise generated by the SMPS transformer's alternating magnetic field is an effective solution for mitigating its impact on the maximum achievable data rate over HEWN.

AUTHOR CONTRIBUTIONS

O.Y – conceptualization, investigation, resources, writing-original draft preparation, supervision writing-review and editing. K.T. – investigation, writing-original draft preparation.

COMPETING INTERESTS

The authors declare no competing interests.

REFERENCES

[1] X. Zhu, K. Zhu, and M. Heggo, *Hybrid Wireless-Power Line Communication for Indoor IoT Networks*. Norwood: Artech House, 2020.

[2] L. N. Sastry Varanasi, A. R. Jonnalagadda, and S. P. K. Karri, "Smart Edge Device Utilizing Power Line Communication for Energy Management and Control of Electrical Appliances," *IEEE Access*, vol. 12, pp. 37207–37218, 2024. https://doi.org/10.1109/ACCESS.2024.3373009.

[3] "State of IoT 2024: Number of connected IoT devices growing 13% to 18.8 billion globally," [Online]. Available: https://iot-analytics.com/number-connected-iot-devices/ [Accessed: May 27, 2025].

[4] "Cellular IoT connections expected to surpass 7 billion by the end of 2030," [Online]. Available: https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/iot-connections-outlook [Accessed: May 27, 2025].

[5] S. U. Ercan, "Power line Communication: Revolutionizing data transfer over electrical distribution networks," *Engineering Science and Technology, an International Journal*, vol. 52, pp. 1–11, Apr. 2024. https://doi.org/10.1016/j.jestch.2024.101680.

[6] C. Vlachou and S. Henri, *A Practical Guide to Power Line Communications*. Cambridge: Cambridge Univ. Press, 2022.

[7] M. V. Ribeiro, M. de L. Filomeno, A. Camponogara, T. R. Oliveira, T. F. Moreira, and S. Galli, "Seamless Connectivity: The Power of Integrating Power Line and Wireless Communications," *IEEE Communications Surveys & Tutorials*, vol. 26, no. 1, pp. 1–40, First quarter 2024. https://doi.org/10.1109/COMST.2023.3327321.

[8] P. A. Janse van Rensburg, S. Alahakoon, J. Aghaei, B. P. Watkins, M. P. Sibanda, L. A. Bui, K. Emami, N. Das, and S. de Silva, "A Tutorial on Modem Coupling Circuits for Low-Voltage Power-Line Communications: Operating Principles, Trade-Offs, Design, and Safety," *IEEE Access*, vol. 12, pp. 159176–159201, 2024. https://doi.org/10.1109/ACCESS.2024.3479148.

[9] S. A. Zablotskyi, *Modeli i kharakterystyky system peredachi shyrokosmuhovoho dostupu po merezhakh elektroprovodky: candidate of technical sciences dissertation*. 05.12.02. Odesa: Odesa National O.S. Popov Academy of Telecommunications, 2014. (In Ukrainian).

[10] O. K. Yanevych, *Modeli ta metody rozrakhunku kharakterystyk system peredachi merezhamy elektroprovodky: candidate of technical sciences dissertation*. 05.12.02. Odesa: Odesa National O.S. Popov Academy of Telecommunications, 2019. (In Ukrainian).

[11] A. G. Lashko, L. M. Liakhovetskyi, and O. K. Yanevych, "Doslidzhennia vplyvu oporu navantazhennia vidhaluzhennia na shvydkist peredavannia danykh merezhamy budynkovoi elektroprovodky," *Proceedings of the O.S. Popov ONAT*, no. 1, pp. 53–60, 2018. (In Ukrainian). https://doi.org/10.33243/2518-7139-2018-1-1-53-60.

[12] "WX-DC2416 PSU," [Online]. Available: https://oshwlab.com/FrankCA/wx-dc2416-psu [Accessed: Jun 10, 2025].

[13] O. Yanevych, K. Tryfonova, and O. Kovalov, "Doslidzhennia vplyvu impulsnykh blokiv zhyvlennia na parametry peredavannia merezhi budynkovoi elektroprovodky," *Herald of Khmelnytskyi national university*, no. 4 (355), pp. 724–729, 2025. (In Ukrainian).

[14] ITU-T Recommendation G.9964 (12/2023), "Unified high-speed wireline-based home networking transceivers – Power spectral density specification," [Online]. Available: https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-G.9964-202312-I!!PDF-E&type=items [Accessed: Jun 26, 2025].

[15] A. V. Oppenheim, R. W. Schafer, and J. R. Buck, *Discrete-Time Signal Processing*. United States: Prentice-Hall, Inc., 1999.

[16] L. M. Liakhovetskyi and V. I. Oreshkov, "Vyznachennia tochnoi formuly rozrakhunku shvydkosti peredavannia informatsii na nesuchykh system peredachi ortohonalnymy harmonichnymy syhnalamy," *Proceedings of the O.S. Popov ONAT*, no. 1, pp. 138–143, 2012. (In Ukrainian).

[17] L. M. Liakhovetskyi, V. I. Oreshkov, and I. B. Barba, "Udoskonalennia metodu otsinky shvydkosti peredavannia system peredachi ortohonalnymy harmonichnymy syhnalamy," *Proceedings of the O.S. Popov ONAT*, no. 2, pp. 186–193, 2014. (In Ukrainian).

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Дослідження впливу імпульсних блоків живлення на швидкість передавання даних мережами будинкової електропроводки

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АНОТАЦІЯ Стрімкий розвиток Інтернету речей, одного з найдинамічніших технологічних секторів у світі, зумовлює постійний пошук технологічних рішень, які поєднують високу пропускну здатність, гнучкість, масштабованість та економічну ефективність для реалізації таких концепцій, як Smart Grid, Smart Home і Smart City. Попри активний розвиток безпроводових технологій та їх широке застосування в секторі Інтернету речей, вони не завжди здатні повністю задовольнити всі вимоги. Зокрема, це стосується забезпечення стабільного рівня сигналу в умовах зон тіньового покриття. У таких випадках доцільним є застосування технології Power Line Communication, що дає змогу організувати широкосмуговий доступ із використанням мереж будинкової електропроводки. Під час проєктування таких мереж, як правило, не враховується можливість передавання даних за допомогою високочастотних сигналів. Тому актуальним є дослідження параметрів середовища поширення сигналу, а також впливів, яких зазнають параметри мереж будинкової електропроводки від різних типів навантаження на відгалуженнях. У статті досліджено вплив імпульсних блоків живлення різної потужності на швидкість передавання даних у системах передавання, що функціонують мережами будинкової електропроводки. Аналіз виконано для фрагмента мережі з одним відгалуженням, утвореного відрізками вітчизняного проводу ШВВП із площею поперечного перерізу мідних струмопровідних жил 1.5 мм². Проведено розрахунок максимально досяжної швидкості передавання даних та здійснено аналіз отриманих результатів порівняно з характеристиками для випадків узгодженого навантаження на відгалуженні (хвильовий опір), холостого ходу (обриву) та короткого замикання. Також розглянуто вплив параметрів вхідного фільтра та шуму, зумовленого змінним магнітним полем трансформатора імпульсного блока живлення, на максимально досяжну швидкість передавання даних мережами будинкової електропроводки. Дослідження проведено для діапазону частот від 0 до 30 МГц, що відповідає частотному діапазону 25 MHz–PB згідно з Рекомендацією ITU-T G.9964.

КЛЮЧОВІ СЛОВА зв'язок по лінії електропередач, широкосмуговий доступ, імпульсний блок живлення, швидкість передавання даних.