ISSN: 2349-6495

Signal Modelling Using Microwave Oven

Mohamed Noufel Feresh.A[1], Balachanadar.S[2], Jaiganesh.B[3]
Department of Electronics and communication,Saveetha School of engineering,Saveetha University, Tiruvallur, Tamil Nadu, India

Abstract—*The Microwave Oven (MWO) is a usually obtainable appliance that does not send data but yet radiates signals in the unlicensed 2.4 GHz Industrial, Logical and Health (ISM) band. The MWO therefore deeds as an unintentional interferer for IEEE 802.11 Wireless Fidelity (Wi-Fi) contact signals. An analytic ideal of the MWO gesture is industrialized and learned in this paper. The model's efficacy is learned via simulation and experimental emulation.*
Keywords—Microwave Oven; Mechanism model; ISM Band; Interference.

I. INTRODUCTION

Wireless contact are the foundation culture. The Combined Contact Commission allocates countless licensed groups but the Industrial Logical and Health groups are unlicensed and hence extremely appealing for customer applications. With the blast of customer electronics that work in this frequency span, the 2.4 GHz ISM group has come to be recognized as the "wild west" of the electromagnetic spectrum. Mechanisms that work in the ISM groups, specifically the 2.4 GHz scope, contain IEEE802.11 Wi-Fi admission points, wireless laptops, Bluetooth mechanisms, cordless phones, wireless video game controllers, baby monitors, and the catalog endures to expand.

There are additionally non-data sending mechanisms working in these groups, specifically in the 2.4 GHz range. The most public of these unintentional interferers is the Microwave Oven .The residential MWO has one magnetron tuned to Approximately 2.45 GHz (the business MWO uses two magnetrons), and normally radiates across the whole Wi-Fi spectrum. This mechanism emits electromagnetic Wireless Frequency manipulation that, after working simultaneously and in proximity to Wi-Fi mechanisms, can cause data defeat and even connection termination. For this reason, the public residentialMWO is the most critical request to examine alongside the aim of interference mitigation across the use of cognitive radio. In this paper, an enhanced analytical ideal for the MWO signals counseled, simulated, and emulated. The analytical ideal is the key to fully understanding the interference process. This ideal additionally is functional in wireless web simulation studies. The emulation provides a real-world examination of the ideal, permitting for itsverification. This paper is coordinated as follows. Serving examines the MWO gesture characteristics. The MWO gesture is modeled in Serving. Simulation and emulation aftermath of the ideal are given in Serving pursued by conclusions in Serving.

II. MWO SIGNAL CHARACTERISTICS

In this serving, we furnish an overview of the experimentally ambitious gesture characteristics of the MWO that lead to the progress of the analytical MWO model. We discover its obligation series, frequency-sweeping attribute, temporal envelope, and transients. The residential MWO periodically turns ON and OFF in Synchronism alongside the 60 Hz frequency of the AC supplies line running the MWO [4]. Hence, the MWO gesture is repetitive in nature alongside an era of 16.67 ms.little residential models merely send in the negative AC line series, as others send completely in the affirmative cycle. The obligation series of all residential MWOs is therefore, at most, 50%. Power leaking from the MWO cavity reasons interference in the 2.4 GHz ISM band.

The peak-power operational frequency scope of the MWO varies alongside the producer and model. For the models tested, this scope was 2.45 - 2.465 GHz. The spectrogram of MWO is shown in Fig. 1. Note that the shading intensity is proportional to the MWO domination, i.e., the darker the picture, the higher the power. The spectrogram is extremely functional in discovering the MWO emissions because it experimentally reveals the characteristics of the frequency-sweeping and transient aspects of the MWO signal. This spectrogram was obtained experimentally in the

Wireless Interference Workshop a constituent of the Wireless Networking and Contact Scrutiny Center at Illinois Institute of Knowledge employing aComBlock receiver The Comblock varied the MWO gesture from the 2.4 GHz scope down to baseband and utilized a 40 MHz analog to digital converter to record the MWO signal.

The residential MWO gesture, in the ON mode, is comparable to a Frequency Modulated gesture alongside a frequency brush the MWO gesture exists for less than half of the 60 Hz period era, normally 5-6 ms. Across the frequency-sweeping portion of the ON series, the radiated gesture can be described as an FM gesture alongside fluctuating manipulation levels. Therefore a joined AM-FM waveform will assist as a basis for the frequency-sweeping portion of the gesture . The sinusoidal form in the FM modulating gesture can be well approximated by a sinusoid alongside a 60 Hz frequency.

SIGNAL	TRANSMISSION FREQUENCY	BW REGION
Microwave	30GHz- 300GHz	UB
Ultrasonic	40MHz	IB

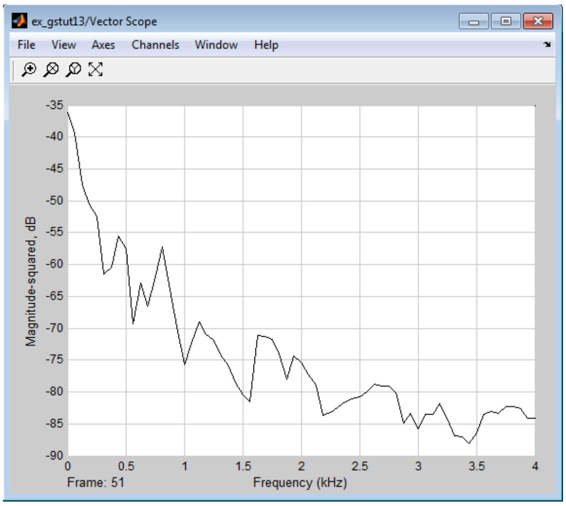

Fig. 1. Spectrogram of MWO 1 signal

Two transient signals, perceived in Fig. 1, continue in every single period; one at the commencing and one at the conclude of the ON series of the MWO. The transient signals are broadband alongside Domination Spectral Densities spreading up to 60 MHz in bandwidth. The lower manipulation broadband portion of the PSD is provoked by the transients, as the slim group, higher manipulation portion of the PSD is attributed to the frequency sweeping AM-FM signal.

III. MWO MODEL ACCURACY

The ideal delineated in the preceding serving was learned by experimentation and via simulation to scrutinize its accuracy. A precise ideal is exceedingly functional in wireless web simulation studies. For example, simulations that discover wireless web across locale and presentation have to report for RF interference from supplementary exuding sources. In this case, the MWO ideal can be utilized as one of the wireless interferers working in the simulated physical layer. Therefore cognitive wireless assesses the modeled transients alongside consented RF signals to recognize after an MWO is operating. the finished MWO bandwidth was manipulated in simulation to 1.5 MHz contrasted to the 60 MHz bandwidth of the experimental fig.2,MWOand the simulated PSD of MWO signal is shown in fig 3.

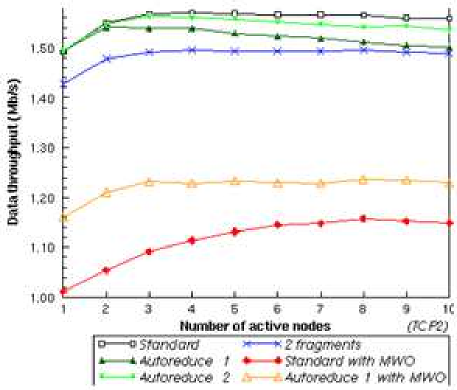

Fig2.Spectrogram of simulated MWO #1 signal

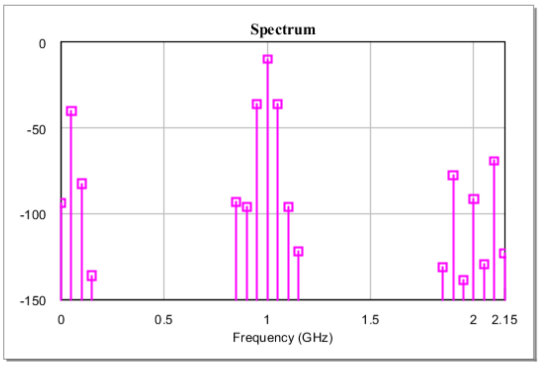

Fig. 3. Simulated PSD of MWO #1 signal

To confirm the simulation studies and to more validate the ideal, the MWO ideal was emulated experimentally for a disparate MWO. For this patriotic, a ComBlock transmitter constituent working in the 2.4 GHz scope was utilized to emulate the MWO gesture established on the ideal equations. The PSD of this emulated gesture obtained alongside a spectrum analyzer due to the experimental arbitrary gesture generator's bandwidth limitations, the emulated MWO model's bandwidth was set to 1.5 MHz

The simulation and emulation studies display that the ideal is a good approximation to the MWO signal. Furthermore, they clarify that the model's parameters are effortlessly adjustable to concerning match the characteristics of disparate MWOs.

IV. CONCLUSION

The gesture characteristics of the microwave oven were investigated and modeled in this paper. The ideal was learned experimentally and via simulation and closely matches the actual MWO signal. The aftermath of this discover are applicable to wireless web simulation studies and in cognitive wireless mechanisms for interference mitigation.

REFERENCES

[1] R.J. Bates, D.W. Gregory, Voice & Data Contact Handbook (Standards & Protocols), 4th ed. New York, NY: McGraw Hill, 2001.

[2] IEEE Average 802.11: "Wireless LAN Medium Admission Domination (MAC) and Physical Layer Specifications," IEEE Average for Data Technology (June 1997).

[3] Staff, Intersil Corporation, "Effect of Microwave Oven Interference on IEEE 802.11 WLAN Reliability", IEEE P802.11-98/240. May, 1998.

[4] A. Kamerman, N. Erkocevic, "Microwave Interference on Wireless LAN's Operating in the 2.4 GHz ISM Band," in Proc. of IEEE PIMRC, vol. 3, 1997, pp. 1221-1227.

[5] Mobile Satellite Services, URL: http://www.comblock.com/, 2006.

[6] J. Proakis, M. Salehi, Contact Arrangements Engineering, 2nd ed. Higher Saddle River, NJ: Prentice Hall, 1994.

[7] Y. Zhao, B.G. Agee, J.H. Reed, "Simulation and Measurement of Microwave Oven Leakage for 802.11 WLAN Interference Management," in Proc. IEEE Global Symposium on Microwave, Antenna, Propagation and EMC Technologies for Wireless Communications, 2005.

[8] T.M. Taher, A.Z. Al-Banna, J.L. LoCicero, and D.R. Ucci, "Characteristics of an Unintentional Wi-Fi Interference Mechanism – The Residential Microwave Oven," in Proc. IEEE Martial Contact Conference, Oct. 2006.

[9] T.M. Taher, M.J. Misurac, J.L. LoCicero, and D.R. Ucci, "Microwave Oven Gesture Interference Mitigation For Wi-Fi Contact Systems," accepted for publication at Proc. IEEE Customer Contact and Networking Conferece.

[10] Duvvury and A. Amerasekera, ESD: a pervasive reliability concern for IC technologies, Proc. IEEE, vol. 81, pp. 690-702, 1993.

[11] A. Amerasekera and C. Duvvury, ESD in Silicon Integrated Circuits, Second Edition, New York, John Wiley & Sons, 2002. ISBN 0-471-49871-8

[12] S. Dabral and T. J. Maloney, Basic ESD and I/O design, New York, John Wiley & Sons, 1998. ISBN 0-471-25359-6

[13] H.J. DeMan and R. Mertens, SITCAP--A simulator for bipolar transistors for computer-aided circuit analysis programs, International Solid-State Circuits Conference (ISSCC), Technical Digest, pp. 104-5, February, 1973.

[14] R.W. Dutton and D.A. Antoniadis, Process simulation for device design and control, International Solid-State Circuits Conference (ISSCC), Technical Digest, pp. 244-245, February, 1979

[15] R.H. Dennard, F.H. Gaensslen, H.N. Yu, V.L. Rodeout, E. Bassous and A.R. LeBlanc, Design of ion-implanted MOSFETs with very small physical dimensions, IEEE Jour. Solid-State Circuits, vol. SC-9, pp.256-268, October, 1974.

[16] R.W. Dutton and S.E. Hansen, Process modeling of integrated circuit device technology, Proceedings of the IEEE, vol. 69, no. 10, pp. 1305-1320, October, 1981.