



Technical Note

## **WipLL 900 MHz**

Wireless IP-Based Local Loop System

# **Hopping Algorithms and Compliance with FCC 15.247 (a) (1)**

Connecting the World with Wireless Access Solutions

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## 1. Introduction

This document provides a description of the Hybrid system (HS) for WipLL 900 MHz products. The HS is for 1 Mbps, 2 Mbps, and 3 Mbps, and 1.33 Mbps and 4 Mbps.

## 2. Hybrid System Algorithms

- The hopping algorithm is defined by a table of  $n$  frequencies, where  $n$  is equal to 25 when the system is configured for 1 Mbps, 2 Mbps, and 3 Mbps, and where  $n$  is equal to 13 when the system is configured for 1.33 Mbps and 4 Mbps. The hopping sequence follows cyclically the frequencies in the table, remaining in each frequency for a constant period. The frequencies in the table are all in the 903 to 927 MHz range, with at least 1 MHz between any two frequencies in the table for systems configured for 1 Mbps, 2 Mbps, and 3 Mbps; and at least 2 MHz for systems configured for 1.33 Mbps and 4 Mbps. The order of frequencies in the table is pseudorandom.
- In Section **Error! Reference source not found.**, “**Error! Reference source not found.**”, two modes (1 MHz-channel spacing and 2 MHz-channel spacing) are described in **Error! Reference source not found.**

## 3. Hopping Time

The hopping time in a given is constant (typically WipLL uses 50 msec).

## 4. Number of Channels

The number of channels is determined by the table size  $n$  frequencies, depending on transmission speed configured for the WipLL system:

- For 1 Mbps, 2 Mbps, and 3 Mbps,  $n$  is equal to at least 25 (i.e., WipLL uses  $n = 25$ )
- For 1.33 Mbps and 4 Mbps,  $n$  is equal to 13

## 5. Resolution

The minimum difference between any two channels is:

- 1 MHz for 1 Mbps, 2 Mbps, and 3 Mbps
- 2 MHz for 1.33 Mbps and 4 Mbps

## 6. Channel Distribution

Since any used channel is included once in the table, all the channels are equally used, each channel occupying  $1/n$  of the time.

## 7. Pseudo-random Frequencies for Hybrid Mode

The following tables provide an example of pseudo-random hopping frequencies for the Hybrid mode for 4 Mbps and 3 Mbps.

**Table 1: Example of Hybrid Mode with Pseudo-Random Hopping**

4 Mbps		3 Mbps	
Frequency Assignment	Frequency (MHz)	Frequency Assignment	Frequency (MHz)
F1	921	F1	908
F2	913	F2	917
F3	919	F3	903
F4	905	F4	922
F5	903	F5	909
F6	917	F6	916
F7	909	F7	907
F8	925	F8	914
F9	915	F9	923
F10	927	F10	912
F11	907	F11	927
F12	923	F12	919
F13	911	F13	926
		F14	913
		F15	925
		F16	904
		F17	910
		F18	918
		F19	905
		F20	924
		F21	911
		F22	920
		F23	906
		F24	915
		F25	921

## 8. Receiver and Transmitter Compliance

### 8.1. Receiver Compliance with 15.247 (a) (1) / 2.1033 (a) (10)

The system receiver has an input bandwidth that matches the hopping bandwidth of the corresponding transmitters. The receiver shifts its frequency in accordance with the same frequency hopping table and pattern as the transmitters.

### 8.2. Transmitter Compliance with 15.247 (g), 15.247 (h)

■ **15.247 (g):**

The equipment fully complies with the requirements of this section. In our case, each transmission employs all available hopping channels, performed according to the requirements of 15.247.

■ **15.247 (h):**

The equipment fully complies with the requirements of this section. There is no coordination between the systems to avoid simultaneous occupancy of the hopping frequencies by multiple transmitters. Each transmitter operates independently and there is no synchronization with other transmitters.