



The purpose of this document is to provide the data supporting frequency stability for Digi's device: *Connect Wi-EM 9210 a/b/g*, part number 50001558.

Based on the IEEE spec, IEEE std 802.11-2007

#### **14.6.14.5 Transmit center frequency tolerance**

*The PMD transmit center frequency shall be within  $\pm 60$  kHz of the nominal center frequency.*

The data provided here was taken using Digi's test equipment consisting of:

- HP Laptop (Compaq nc6320)
- EXTECH Instruments 382213 DC regulated Power Supply
- FLUKE 79 Series Multimeter
- Agilent E4440A PSA series Spectrum Analyzer
- Tenney Benchmaster Temperature/Humidity Chamber with Watlow 922 Controller

All measurements were made according to requirements specified in ANSI C63.4-2003 standards.

Based on the ANSI C63.4-2003 Section 13.1.1., for the operating frequency of the device, we had to test 2 frequencies, 1 near the top, and 1 near the bottom. The frequencies to be tested were selected to be: 5805 MHz (Ch 161) – near top, 2412 MHz (Ch1) – 1 near bottom.

**Measurement results of frequency stability vs. temperature** were made according to ANSI C63.4-2003 Section H.5.2., see below:

*“Allow sufficient time (approximately 30 minutes) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and measure the EUT operating frequency at startup, and two, five, and ten minutes after startup. Four measurements in total are made.”*

The device was operated at 54Mbps during all tests, following Table 1 below lists test results.

Time	2412 MHz (Ch 1) @ 54 Mbps		5805 MHz (Ch 161) @ 54 Mbps	
	Temp			
	-30 °C	60 °C	-30 °C	60 °C
Start up	-13.32 kHz	-10.50 kHz	-30.72 kHz	-23.61 kHz
2 min	-13.31 kHz	-10.42 kHz	-30.82 kHz	-23.50 kHz
5 min	-13.23 kHz	-10.47 kHz	-30.71 kHz	-23.51 kHz
10 min	-13.07 kHz	-10.43 kHz	-30.65 kHz	-23.45 kHz

**Table 1**

In addition to the data above, we have ran an incremental test, where we started -30 °C and incrementally, in steps of 10 °C increased the temp until we reached 60 °C. At each temperature increment, the device was soaked for at least 30min, see Table 2.

	Channels	
	2412 MHz (Ch 1) @ 54 Mbps	5805 MHz (Ch 161) @ 54 Mbps
Temp (°C)		
-30	-13.10 kHz	-30.63 kHz
-20	-14.125 kHz	-32.71 kHz
-10	-13.55 kHz	-30.65 kHz
0	-12.35 kHz	-27.86 kHz
10	-11.97 kHz	-26.98 kHz
20	-12.10 kHz	-26.84 kHz
30	-12.28 kHz	-25.91 kHz
40	-12.20 kHz	-24.75 kHz
50	-11.67 kHz	-23.45 kHz
60	-10.50 kHz	-23.61 kHz

Table 2

**Measurements for frequency stability vs. input voltage** were made according to ANSI C63.4-2003 Section H.5.3. at the ambient temp of +20 °C, device was operated at 54Mbps during all tests.

Digi's Manual for the device states that the DC operating conditions for the input voltage is 3.3V, with min of 3.14V and max of 3.45V. Those voltage ranges were used as the reference points for this test. See the results of the test in the Table 3 below,

Channels of operation	Input Voltage range		
	3.14V	3.3V	3.45V
Ch 1 (2412 MHz) @ 54Mbps	- 12.34 kHz	-12.37 kHz	-12.31 kHz
Ch A161 (5805 MHz) @ 54Mbps	-29.44 kHz	-27.74 kHz	-27.64 kHz

Table 3

Conclusion: Based on the results of the test, Digi's device: *Connect Wi-EM 9210 a/b/g*, part number 50001558, complies with frequency stability requirements.

