

**TEST CONDITIONS**

Power supply (V):

$$V_{\text{nominal}} = 3.3 \text{ Vdc}$$

Type of power supply = DC Voltage from main board

Type of antenna = Integral antenna

Maximum Declared Gain for antenna= 0 dBi

Operating Temperature Range (°C):

$$T_n = -15 \text{ to } +55$$

**TEST FREQUENCIES:**

Lowest channel: 2402 MHz

Middle channel: 2441 MHz

Highest channel: 2480 MHz

The test set-up was made in accordance to the general provisions of ANSI C63.4-1992.

**CONDUCTED MEASUREMENTS**

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser via the antenna connector (sma type) provided with the test sample. A coaxial low-loss connecting cable was necessary for such connection so the cable attenuation correction was made.

**RADIATED MEASUREMENTS**

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

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Annex A

**Section 15.247 Subclause (a) (1). 20 dB Bandwidth and Carrier frequency separation**SPECIFICATION

Frequency hopping system shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

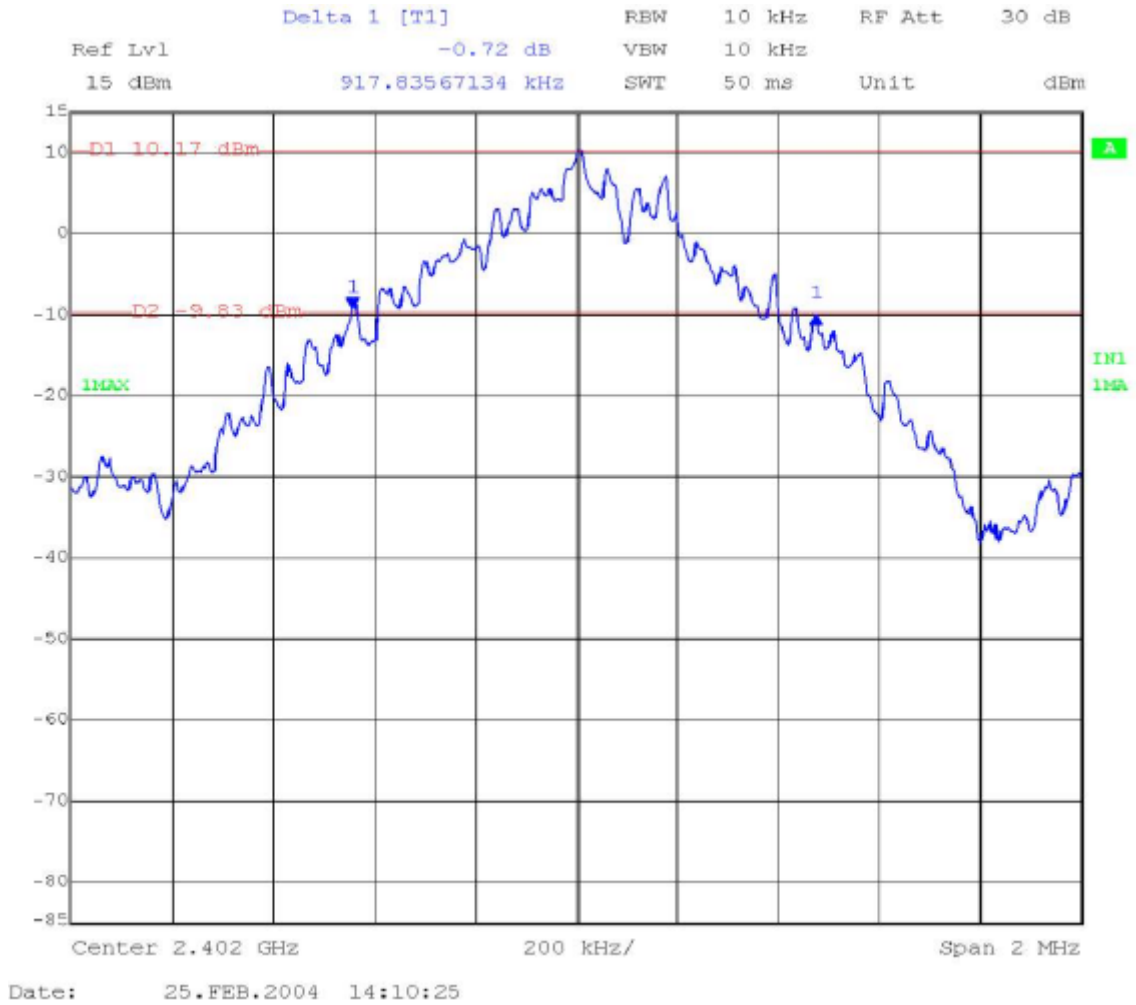
RESULTS

20 dB Bandwidth (see next 3 plots).

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	917.84	917.84	953.91
Measurement uncertainty (kHz)	±11		

20 dB BANDWIDTH.

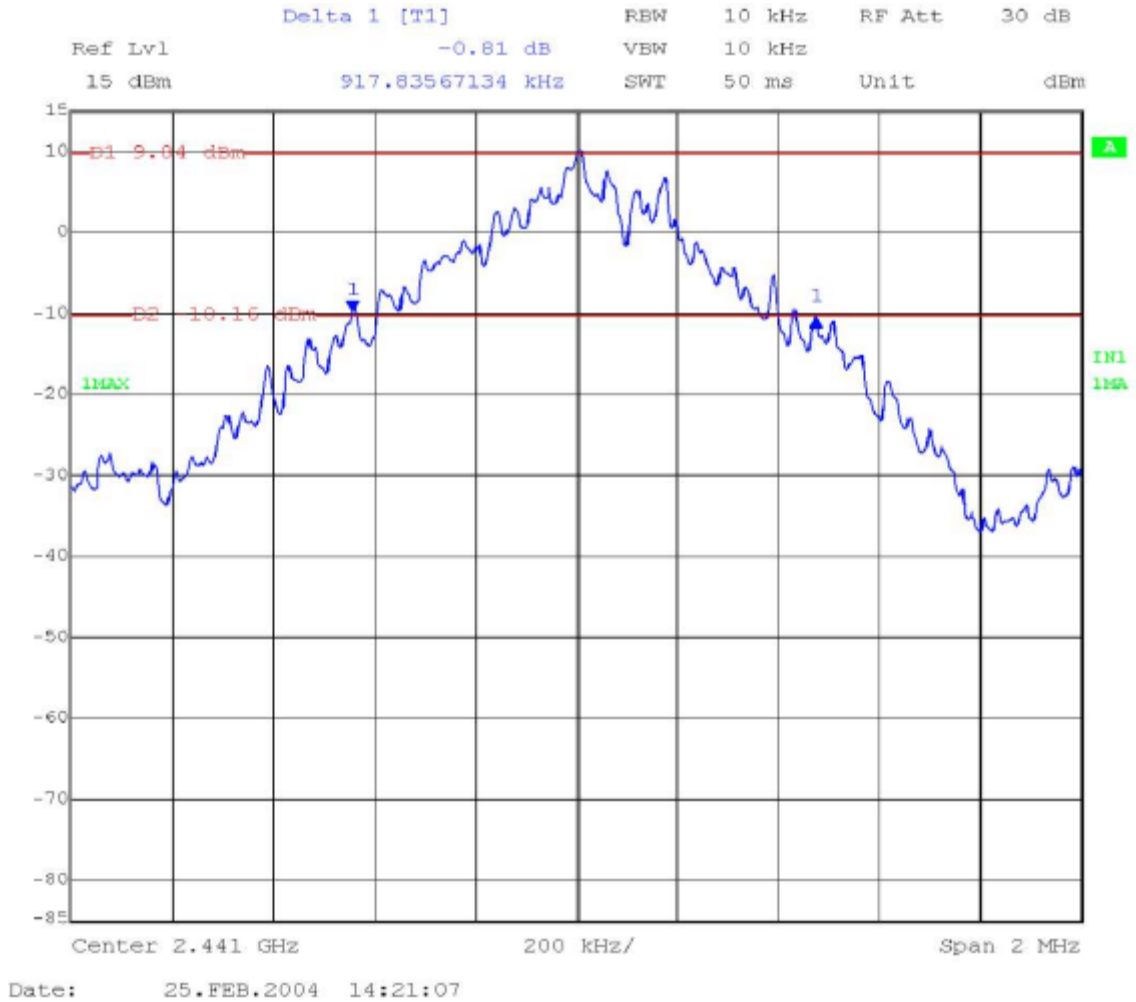
Lowest Channel: 2402 MHz.



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20 dB BANDWIDTH.

Middle Channel: 2441 MHz.



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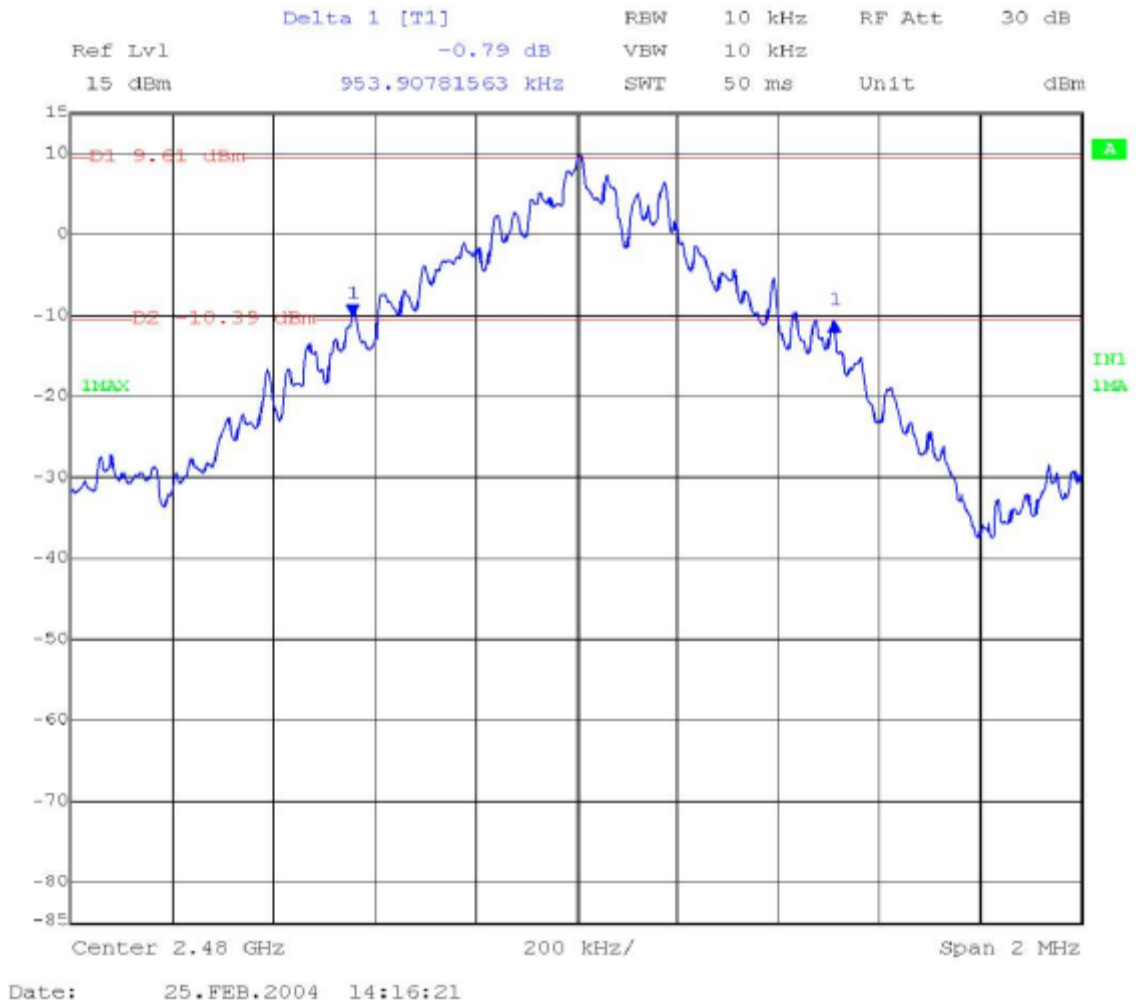
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20 dB BANDWIDTH.

Highest Channel: 2480 MHz.



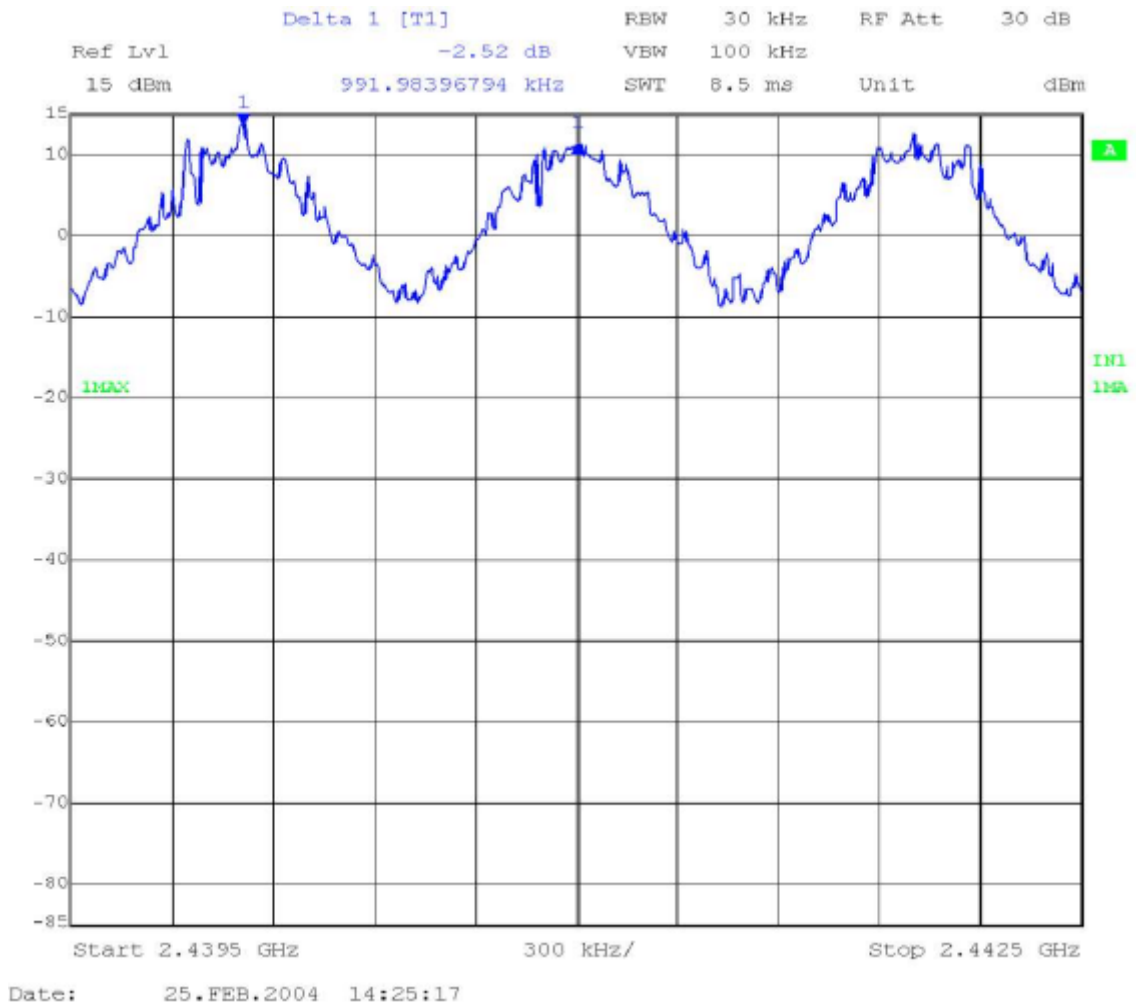
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Carrier frequency separation (see next plot).



The hopping channel carrier frequencies are separated by a minimum of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

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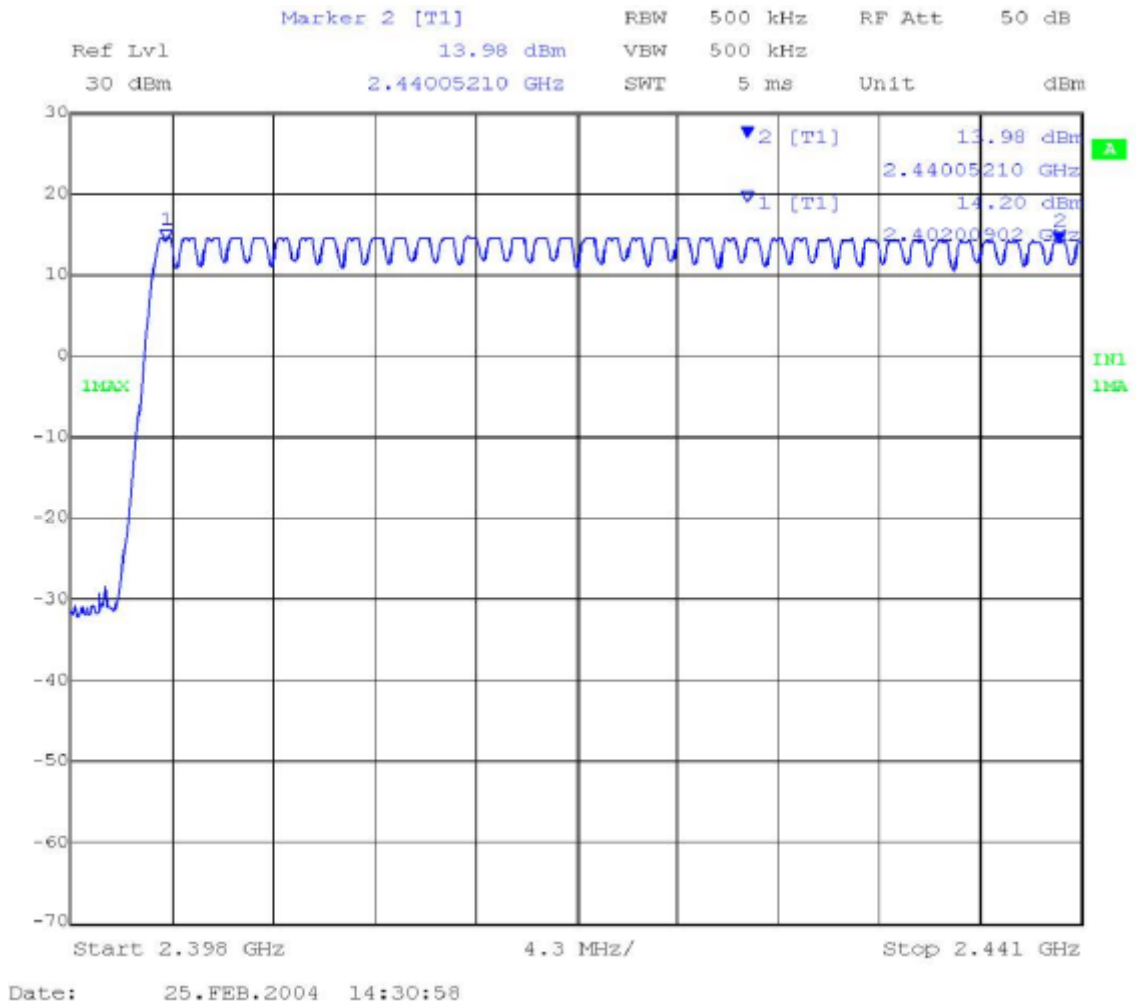
**Section 15.247 Subclause (a) (1) (iii). Number of hopping channels**

SPECIFICATION

Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels.

RESULTS

The number of hopping channels is 79 (see next two plots).



Number of hopping frequencies: 39

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Number of hopping frequencies: 40

Total number of hopping frequencies: 79

Verdict: PASS

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**Section 15.247 Subclause (a) (1) (iii). Time of occupancy (Dwell Time)**

SPECIFICATION

The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed =  $0.4 \times 79 = 31.6$  seconds.

RESULTS

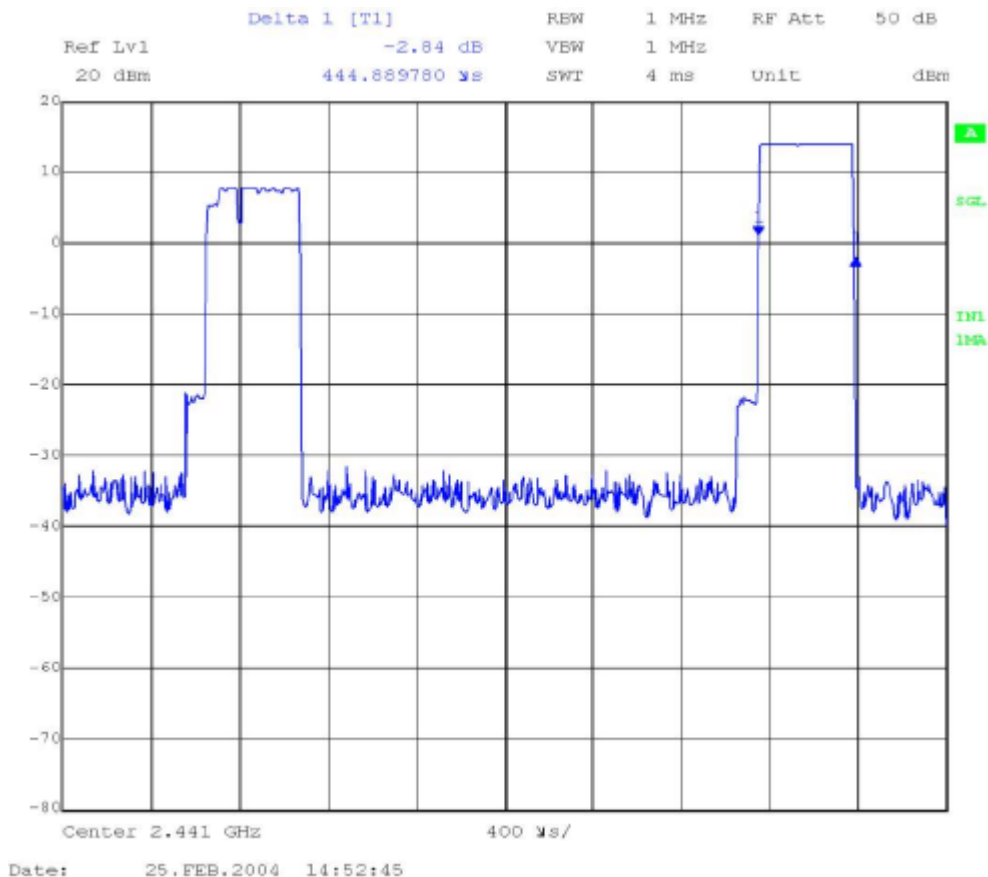
The equipment only supports 1 slot packet (DH1).

1. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH1.

The system makes worst case 1600 hops per second or 1 time slot has a length of  $625\mu s$  with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case  $1600/2 = 800$  hops per second with 79 channels. So you have each channel  $800/79 = 10.13$  times per second and so for a period of  $0.4 \times 79 = 31.6$  seconds you have  $10.13 \times 31.6 = 320.11$  times of appearance .

Each Tx-time per appearance is  $444.9 \mu s$  (see next plot).

So we have  $320.11 \times 444.9 \mu s = 142.42$  ms per 31.6 seconds.



Verdict: PASS

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