

FCC LISTED, REGISTRATION
NUMBER: 905266

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IC 4621

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TEST REPORT

REFERENCE STANDARD:

USA FCC Part 15.247 and 15.109

NIE: 28057RET.201
Approved by
(name / position & signature): A. Llamas / RF Lab Manager
Elaboration date: 27/10/2008



Identification of item tested: 802.11 b/g WiFi Module
Trademark: TELIT
Model and/or type reference: WE865 – DUAL
Serial number: ---
Other identification of the product: FCC ID: RI7WE865D / IC: 5131A-WE865D
Prototypes #202 and #214
Features: Operating frequency in the 2412-2472 MHz frequency range, 3.8 V_{DC}
supplied by external power supply.
Description: 802.11 b/g WiFi module

Applicant: Telit Communication S.P.A.
Address.....: Via Stazione di Prosecco 5/B / Sgonico (Trieste), 34010 / ITALY
CIF/NIF/Passport: 03711600266
Contact person: Gian Marco Melosu
Telephone / Fax.....: +39 040 4192 111 / +39 040 4192 237
e-mail:: Gianmarco.Melosu@telit.com

Test samples supplier: Same as applicant
Address.....: ---
CIF/NIF/Passport: ---
Contact person:.....: ---
Telephone / Fax.....: ---
e-mail:: ---

Manufacturer: Same as applicant
Address.....: ---
CIF/NIF/Passport: ---
Telephone / Fax.....: ---

Test method requested	See Standard
Standard	USA FCC Part 15.247: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz: Section 15.247 Subclause (b). Maximum output power and antenna gain. Section 15.247 Subclause (d). Band-edge emissions compliance (Transmitter). Section 15.247 Subclause (d). Emissions radiated (Transmitter) inside the restricted bands. USA FCC Part 15.109: Receiver radiated emission inside the restricted bands
Test procedure	PEET034: Medidas radioeléctricas a equipos de radio de espectro ensanchado en la banda de 2,4 GHz.
Non-standardized test method	N/A
Used instrumentation	<ol style="list-style-type: none"> 1. Semianechoic Absorber Lined Chamber IR 11. BS. 2. Control Chamber IR 12.BC. 3. Rotating table EM 1084-4. ON. 4. Multi device controller ETS 2090. 5. Antenna tripod EMCO 11968C. 6. Double-ridge Guide Horn antenna 1-18 GHz HP 11966E. 7. RF pre-amplifier Miteq AFS5-04001300-15-10P-6. 8. Spectrum analyzer R&S FSU 8. 9. Spectrum analyzer Agilent PSA E4440A.
Report template No.	FDT08_09
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Competences and guarantees

Centro de Tecnología de las Comunicaciones (AT4 wireless), S.A. is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 905266.

Centro de Tecnología de las Comunicaciones (AT4 wireless), S.A. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance programme for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the AT4 wireless internal document:

PODT000: : Procedimiento para el cálculo de incertidumbres de medida

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample M/01 is composed of the following elements:

<u>Control N°</u>	<u>Description</u>	<u>Model</u>	<u>Serial N°</u>	<u>Date of reception</u>
28057/23	WiFi module	WE865 – DUAL	Prototipo #202	27/10/2008

Sample M/02 is composed of the following elements:

<u>Control N°</u>	<u>Description</u>	<u>Model</u>	<u>Serial N°</u>	<u>Date of reception</u>
28057/22	WiFi module	WE865 – DUAL	Prototipo #214	27/10/2008
28057/21	Communications board	DEV-PC-1504C	----	27/10/2008

1. Sample M/01 has undergone following test(s).
Radiated tests indicated in appendix A.
2. Sample M/02 has undergone following test(s).
All tests indicated in appendix A, except radiated tests.

Testing period

The performed test started on 2008-10-27 and finished on the same day.

The tests have been performed at AT4 wireless.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 25 °C Max. = 26 °C
Relative humidity	Min. = 64 % Max. = 65 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 k Ω
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters), the following limits were not exceeded during the test.

Temperature	Min. = 25 °C Max. = 26 °C
Relative humidity	Min. = 64 % Max. = 65 %
Air pressure	Min. = 1016 mbar Max. = 1016 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 k Ω
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ± 4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

In the chamber for conducted measurements the following limits were not exceeded during the test:

Temperature	Min. = 24 °C Max. = 25 °C
Relative humidity	Min. = 64 % Max. = 65 %
Air pressure	Min. = 1016 mbar Max. = 1016 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 k Ω
Reference resistance to earth	< 0,5 Ω

Summary

Considering the results of the performed test according to standard USA FCC Parts 15.247 and 15.109, the item under test is **IN COMPLIANCE** with the requested specifications specified in the standard.

NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".

Remarks and comments

1: Test not requested.

Testing verdicts

Not applicable: NA
 Pass.....: P
 Fail: F
 Not measured.....: NM

FCC PART 15 PARAGRAPH		VERDICT			
		NA	P	F	NM ¹
Section 15.247 Subclause (a) (2).	6 dB Bandwidth				NM ¹
Section 15.247 Subclause (b).	Maximum output power and antenna gain		P		
Section 15.247 Subclause (d).	Emission limitations conducted (Transmitter)				NM ¹
Section 15.247 Subclause (d).	Band-edge emissions compliance (Transmitter)		P		
Section 15.247 Subclause (e).	Power spectral density				NM ¹
Section 15.247 Subclause (d).	Emission limitations radiated (Transmitter) inside the restricted bands		P		
Section 15.109.	Receiver spurious radiation inside the restricted bands		P		

APPENDIX A: Test result

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TEST CONDITIONS

Power supply (V):

$$V_{\text{nominal}} = 3.8 \text{ Vdc}$$

Type of power supply = DC voltage from external power supply.

Type of antenna = Integral antenna.

Declared Gain for antenna = 3 dBi

Operating Temperature Range (°C):

$$T_n = -20^{\circ}\text{C to } +55^{\circ}\text{C}$$

TEST FREQUENCIES:

Lowest channel: 2412 MHz

Middle channel: 2437 MHz

Highest channel: 2462 MHz

The test set-up was made in accordance to the general provisions of ANSI C63.4: 2003.

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyzer using low loss RF cables with sma type connectors. The reading in the spectrum analyzer is corrected taking into account the cable loss.

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.

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.

Section 15.247 Subclause (b). Maximum output power and antenna gain

SPECIFICATION

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

RESULTS

1. DSSS modulation

MAXIMUM OUTPUT POWER (CONDUCTED). See next plots.

Preliminary tests were done with the equipment operating with DSSS modulation mode at 1 Mbps, 2 Mbps, 5.5 Mbps and 11 Mbps and the worst case was for 1 Mbps bit rate. Results shown below correspond to 1 Mbps.

	Lowest frequency	Middle frequency	Highest frequency
	2412 MHz	2437 MHz	2462 MHz
Maximum power (dBm)	18.40	17.52	17.91
Measurement uncertainty (dB)	±1.5		

The declared antenna gain for this device is 3 dBi, therefore the maximum theoretical radiated power (EIRP) in the three measurement channels for this device is 21.4 dBm or 138.04 mW.

The actual maximum radiated power (EIRP) was measured for the lowest, middle and highest frequency.

MAXIMUM OUTPUT POWER (RADIATED). See next plots.

Preliminary tests were done with the equipment operating with DSSS modulation mode at 1 Mbps, 2 Mbps, 5.5 Mbps and 11 Mbps and the worst case was for 1 Mbps bit rate. Results shown below correspond to 1 Mbps.

	Lowest frequency 2412 MHz	Middle frequency 2437 MHz	Highest frequency 2462 MHz
Maximum EIRP power (dBm)	9.23	9.94	11.32
Measurement uncertainty (dB)	±4.0		

Declared antenna gain: 3 dBi

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

2. OFDM modulation

MAXIMUM OUTPUT POWER (CONDUCTED). See next plots.

Preliminary tests were done with the equipment operating with OFDM modulation mode at 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps and 54 Mbps, and the worst case was for 6 Mbps bit rate. Results shown below correspond to 6 Mbps.

	Lowest frequency 2412 MHz	Middle frequency 2437 MHz	Highest frequency 2462 MHz
Maximum power (dBm)	21.90	21.43	21.98
Measurement uncertainty (dB)	±1.5		

The declared antenna gain for this device is 3 dBi, therefore the maximum theoretical radiated power (EIRP) in the three measurement channels for this device is 24.98 dBm or 314.77 mW.

The actual maximum radiated power (EIRP) was measured for the lowest, middle and highest frequency.

MAXIMUM OUTPUT POWER (RADIATED). See next plots.

Preliminary tests were done with the equipment operating with OFDM modulation mode at 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps and 54 Mbps, and the worst case was for 6 Mbps bit rate. Results shown below correspond to 6 Mbps.

	Lowest frequency 2412 MHz	Middle frequency 2437 MHz	Highest frequency 2462 MHz
Maximum EIRP power (dBm)	10.02	10.34	10.18
Measurement uncertainty (dB)	±4.0		

Declared antenna gain: 3 dBi

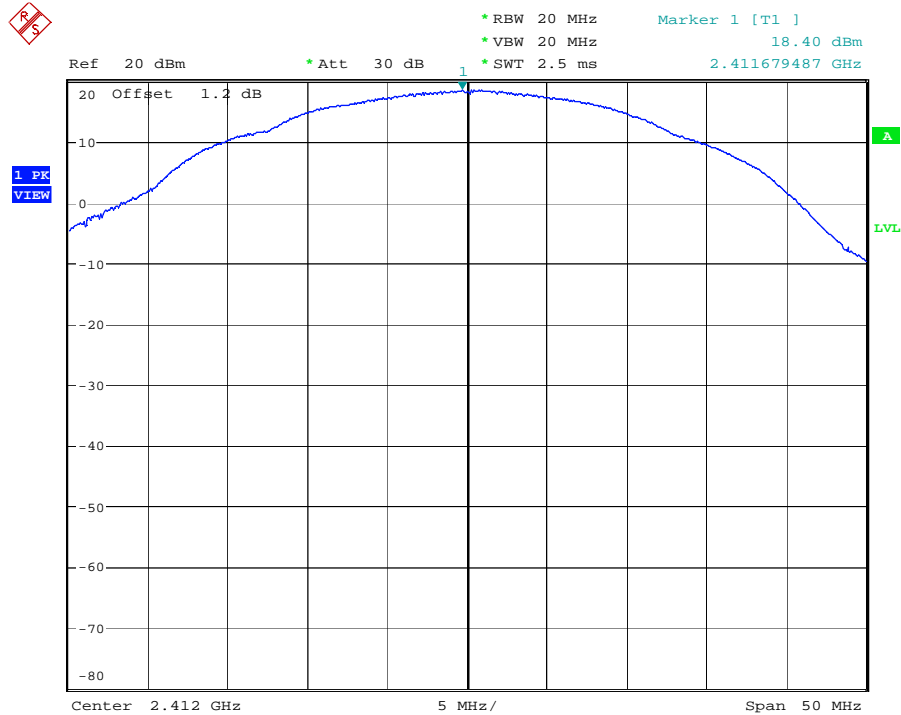
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Verdict: PASS

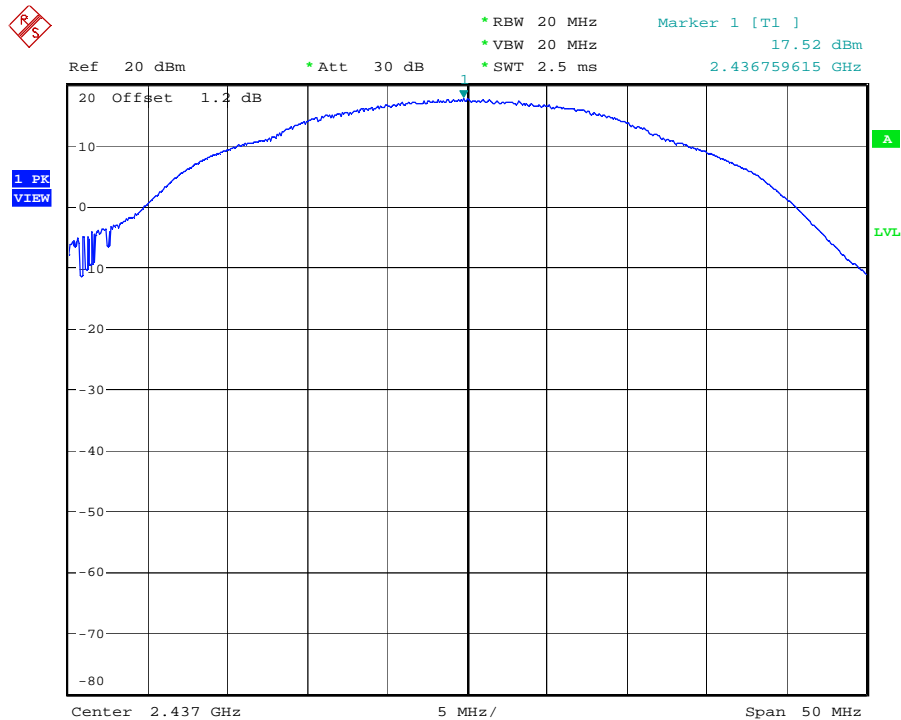
1. CONDUCTED PEAK POWER.

DSSS modulation

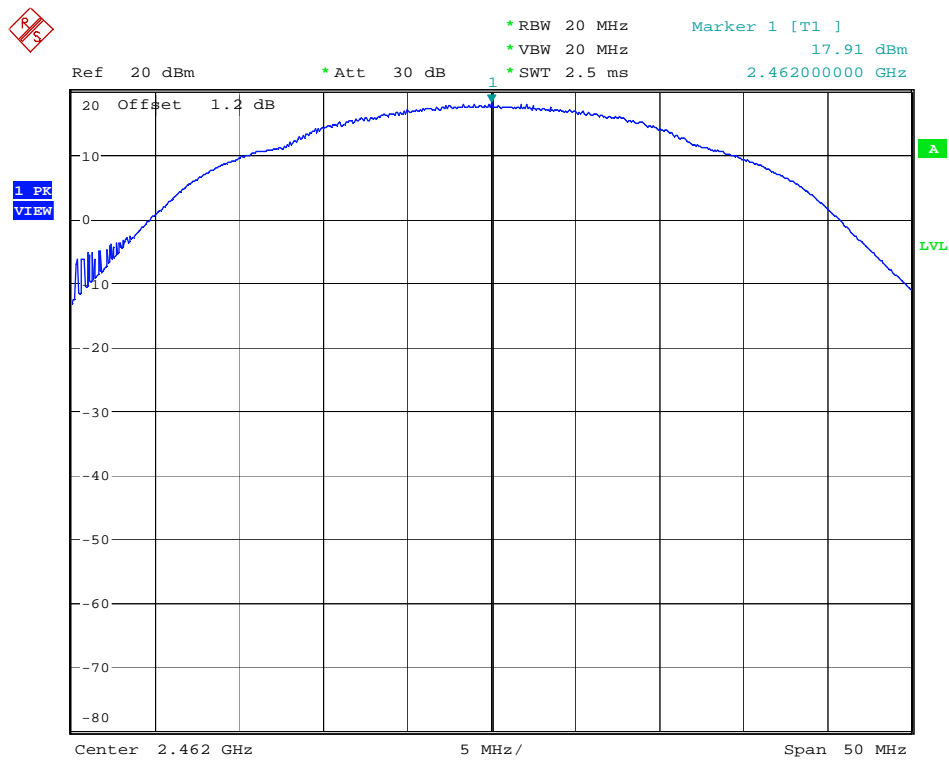
Lowest frequency 2412 MHz



Middle frequency 2437 MHz

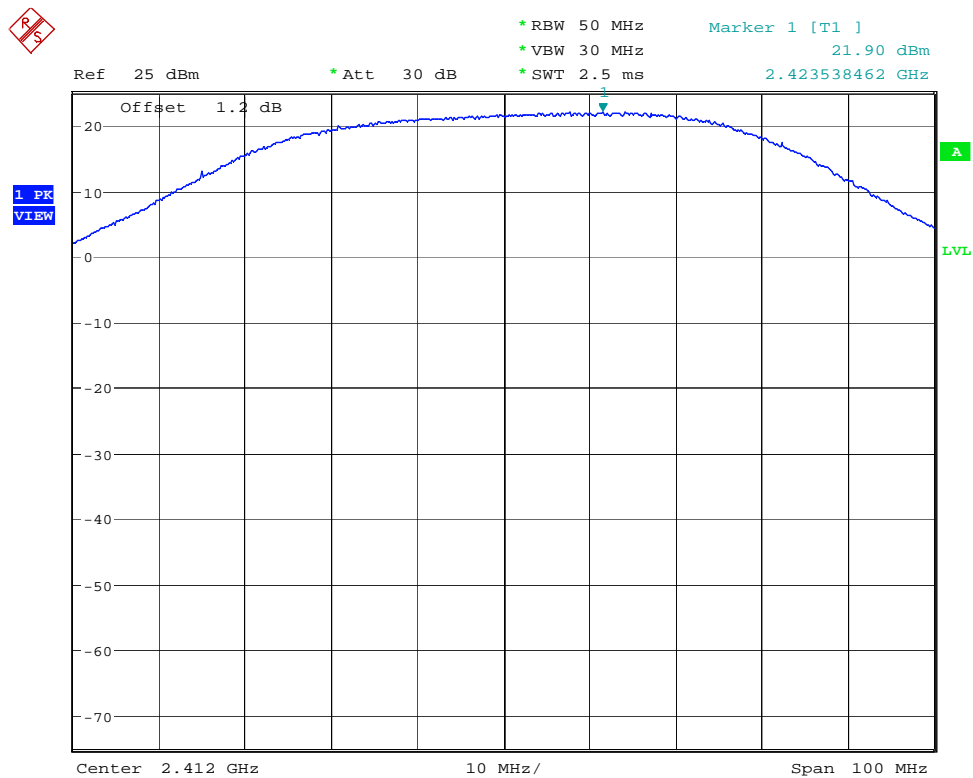


Highest frequency 2462 MHz

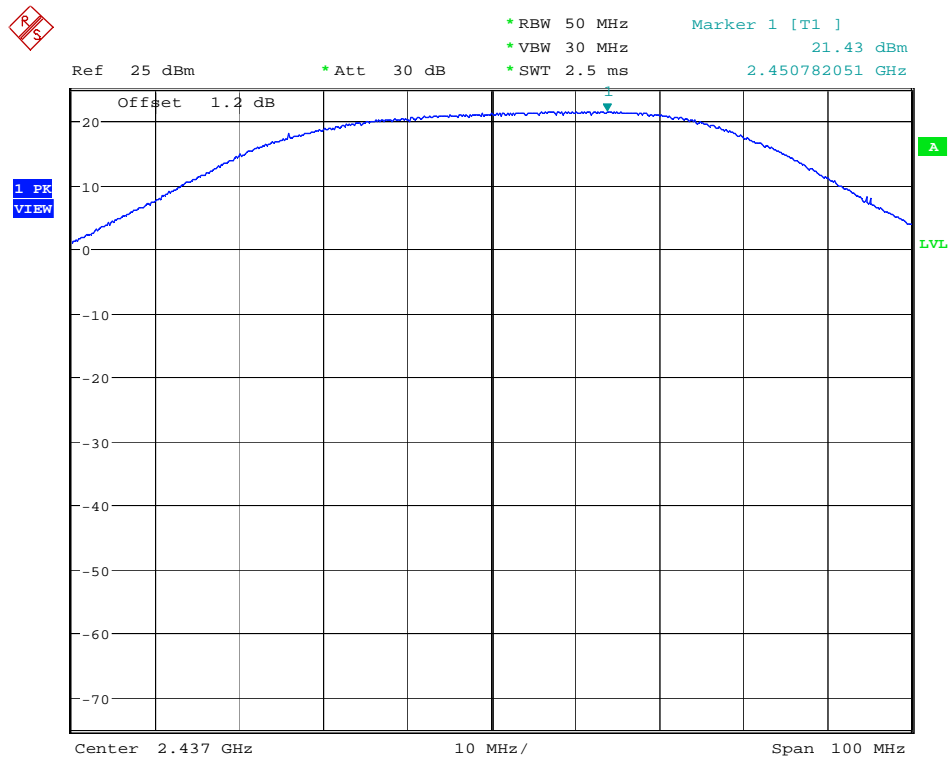


OFDM modulation

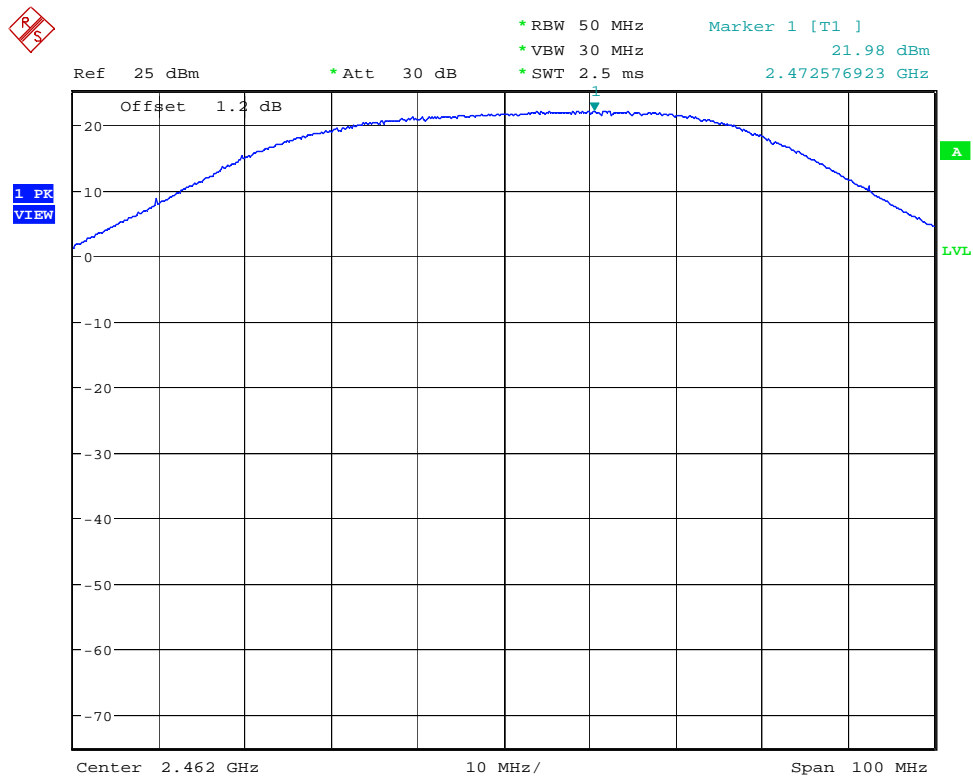
Lowest frequency 2412 MHz



Middle frequency 2437 MHz



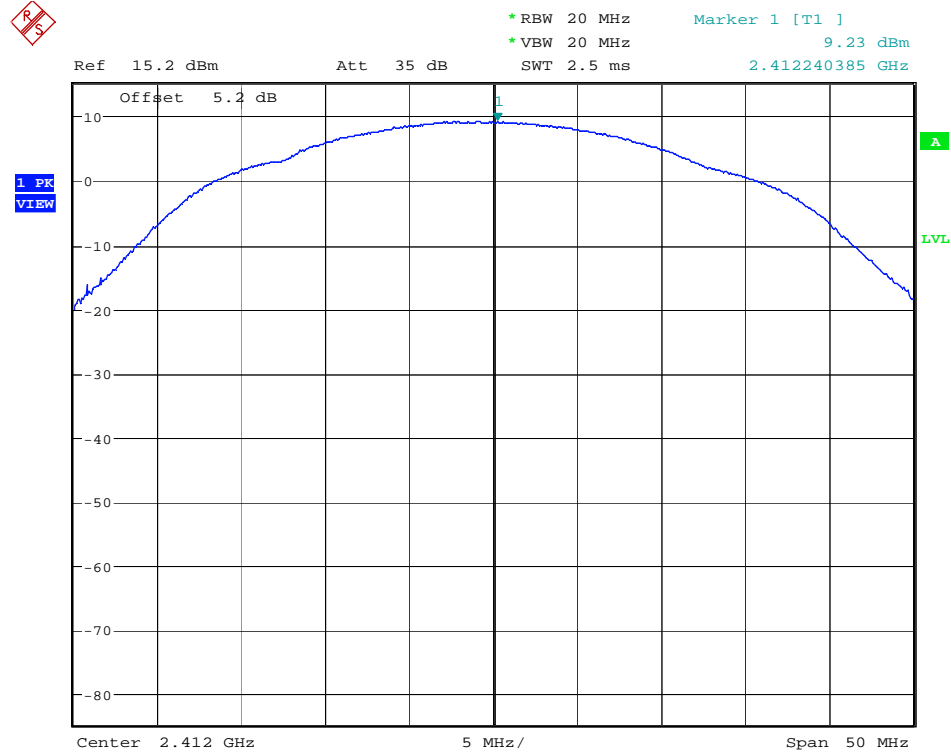
Highest frequency 2462 MHz



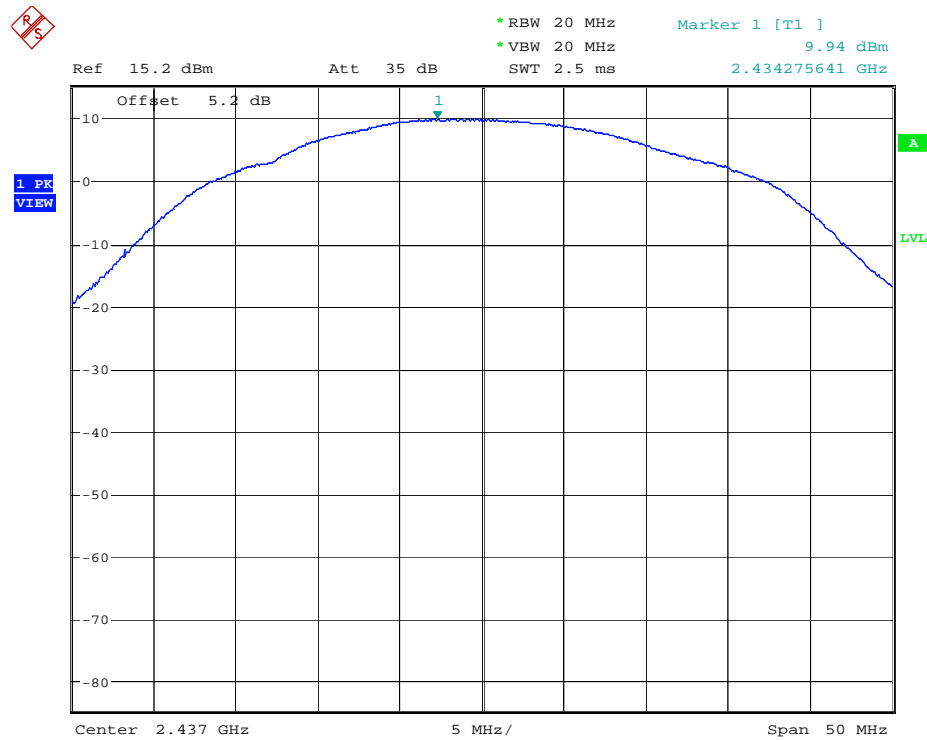
2. RADIATED PEAK POWER.

DSSS modulation

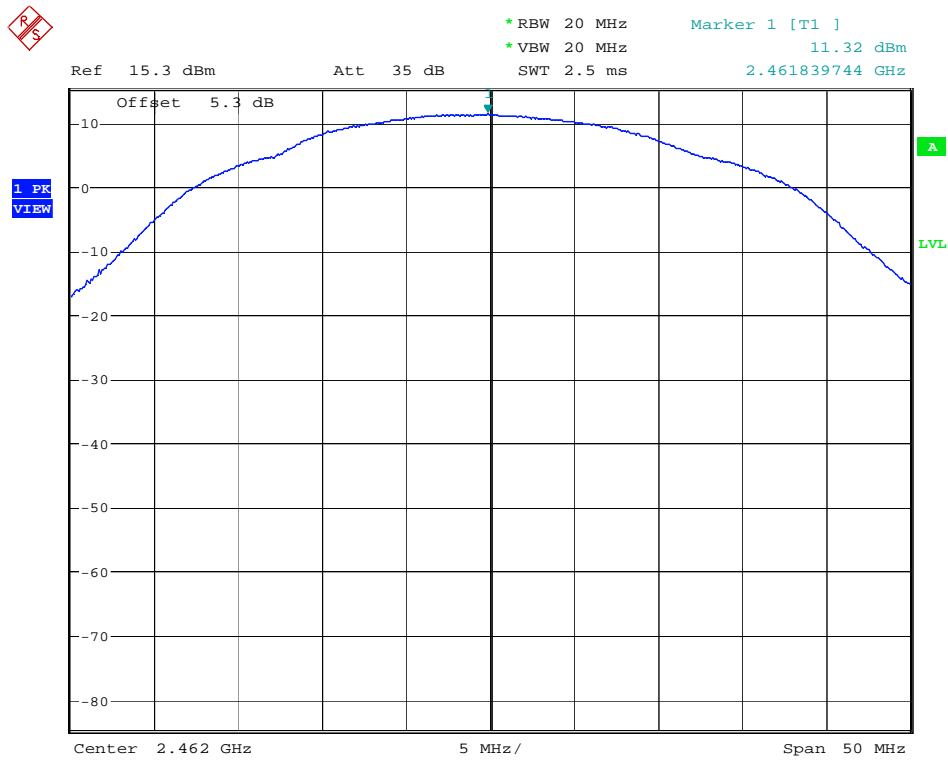
Lowest frequency 2412 MHz



Middle frequency 2437 MHz

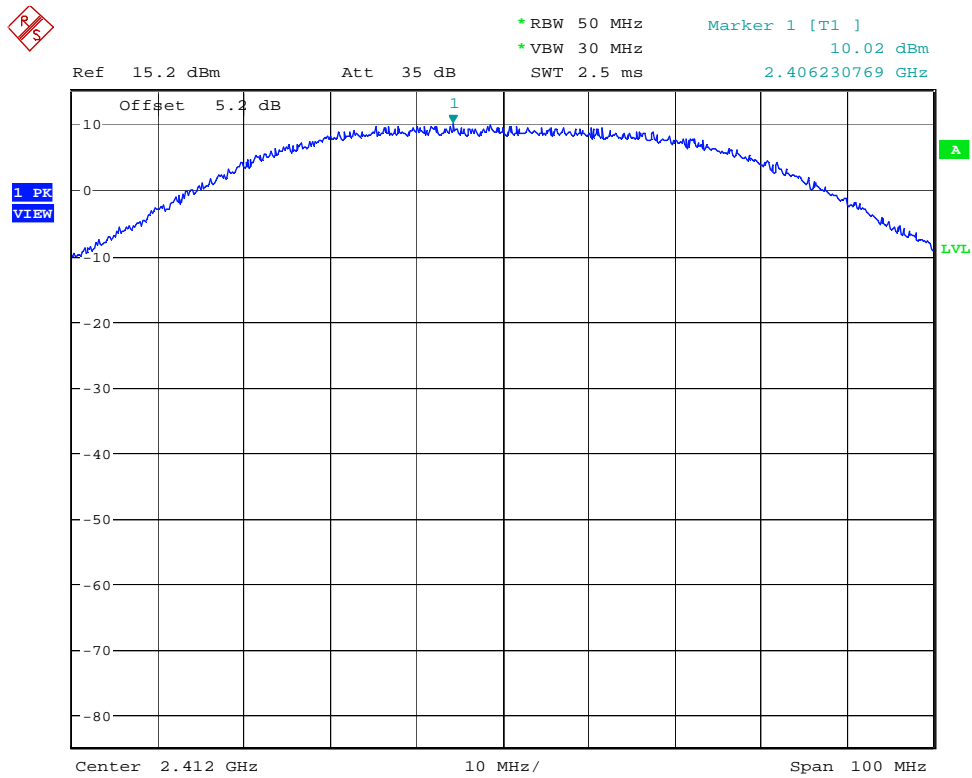


Highest frequency 2462 MHz

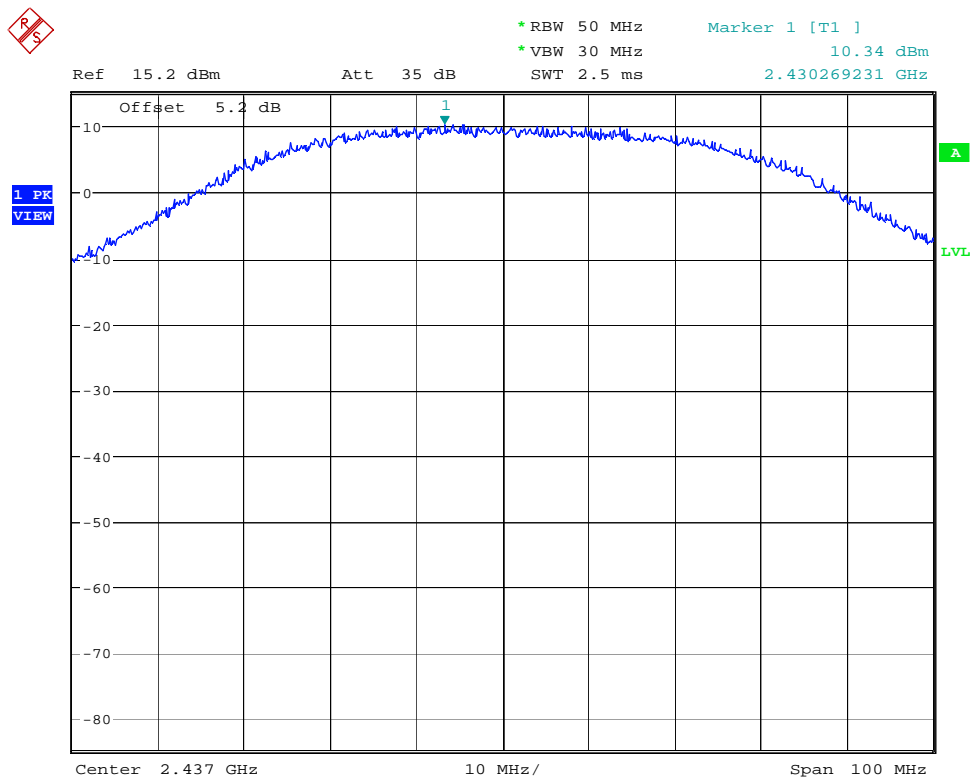


OFDM modulation

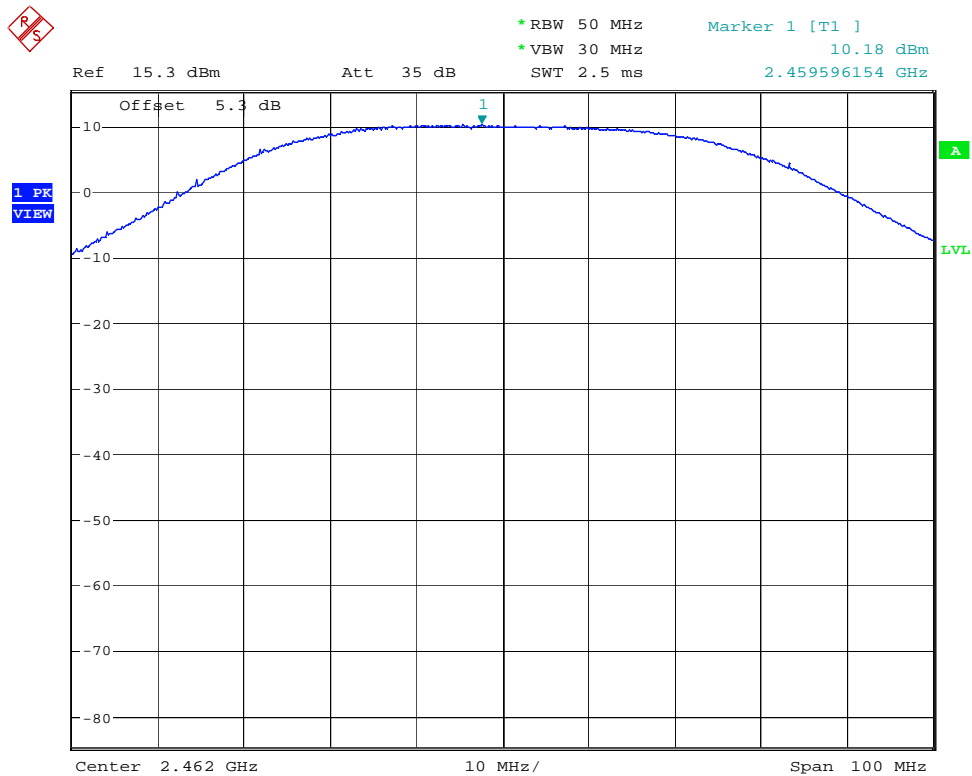
Lowest frequency 2412 MHz



Middle frequency 2437 MHz



Highest frequency 2462 MHz



Section 15.247 Subclause (d). Band-edge emissions compliance (Transmitter)

SPECIFICATION

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 30dB below the highest level of the desired power.

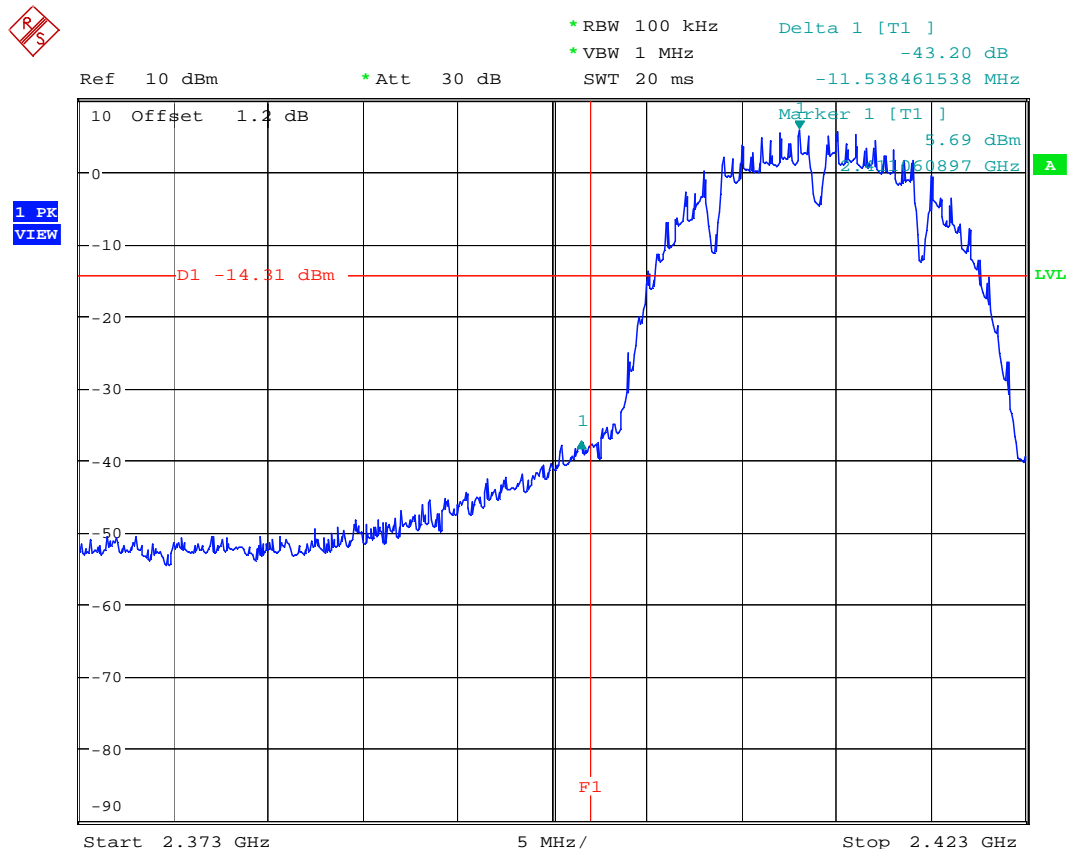
RESULTS:

1. DSSS Modulation

Preliminary tests were done with the equipment operating with DSSS modulation mode at 1 Mbps, 2 Mbps, 5.5 Mbps and 11 Mbps and the worst case was for 1 Mbps bit rate. Results shown below correspond to 1 Mbps.

1. LOW FREQUENCY SECTION 2412 MHz. CONDUCTED.

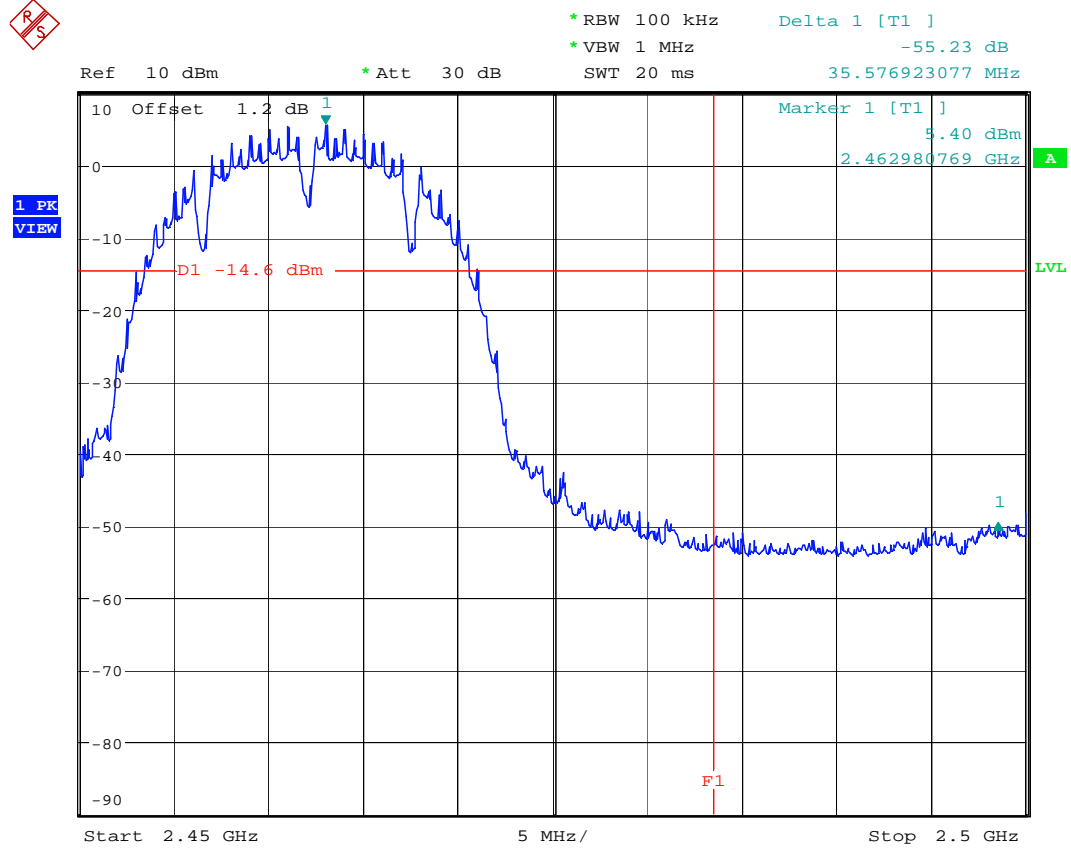
See next plot.



Verdict: PASS

2. HIGH FREQUENCY SECTION 2462 MHz. CONDUCTED.

See next plot.



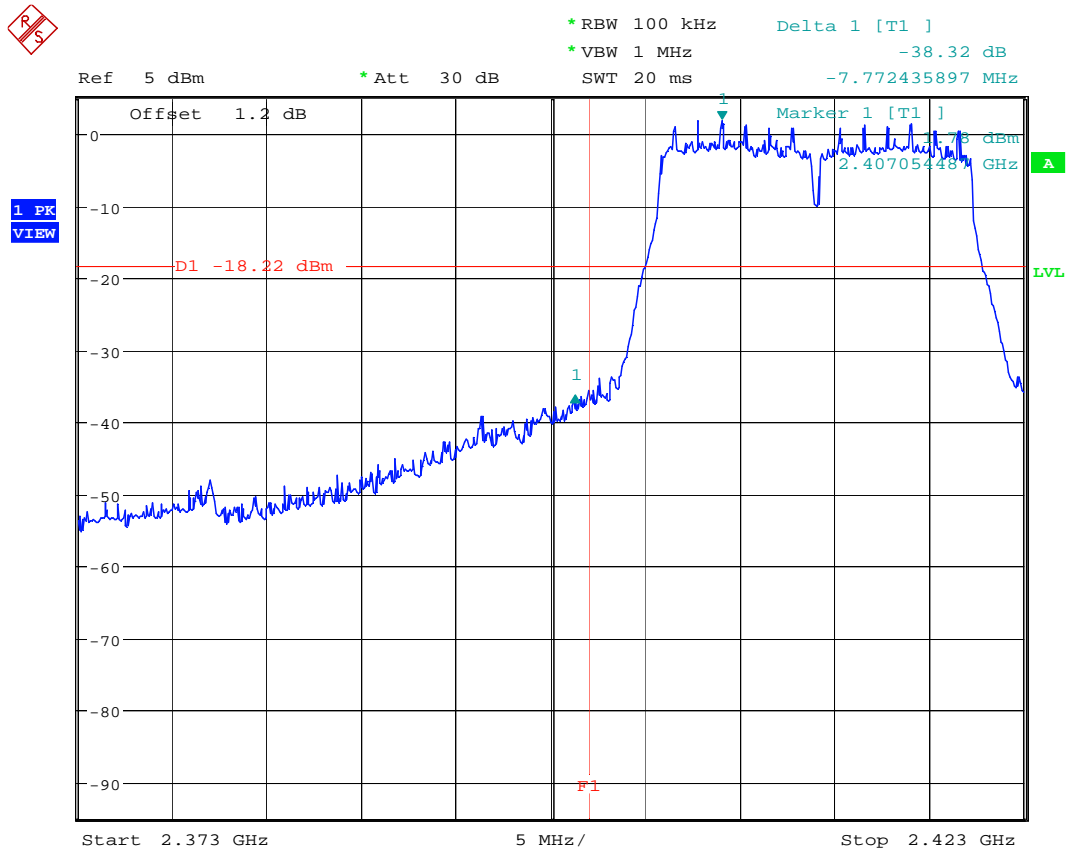
Verdict: PASS

2. OFDM Modulation

Preliminary tests were done with the equipment operating with OFDM modulation mode at 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps and 54 Mbps, and the worst case was for 6 Mbps bit rate. Results shown below correspond to 6 Mbps.

1. LOW FREQUENCY SECTION 2412 MHz. CONDUCTED.

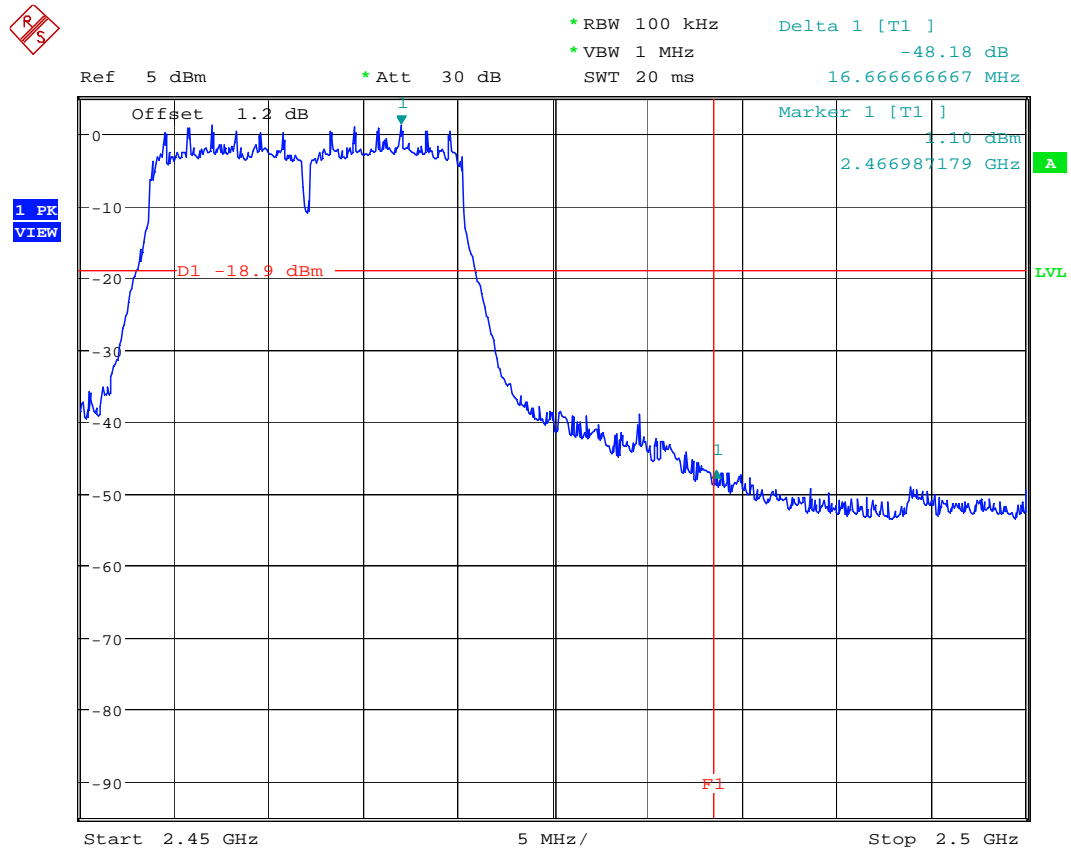
See next plot.



Verdict: PASS

2. HIGH FREQUENCY SECTION 2462 MHz. CONDUCTED.

See next plot.



Verdict: PASS

Band-edge compliance of radiated emissions

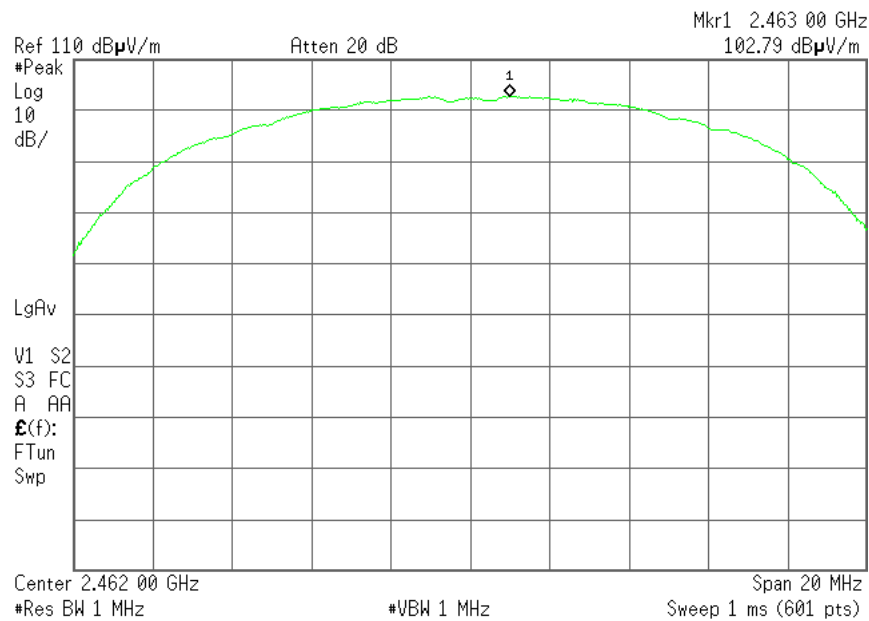
1. DSSS Modulation

Preliminary tests were done with the equipment operating with DSSS modulation mode at 1 Mbps, 2 Mbps, 5.5 Mbps and 11 Mbps and the worst case was for 1 Mbps bit rate. Results shown below correspond to 1 Mbps

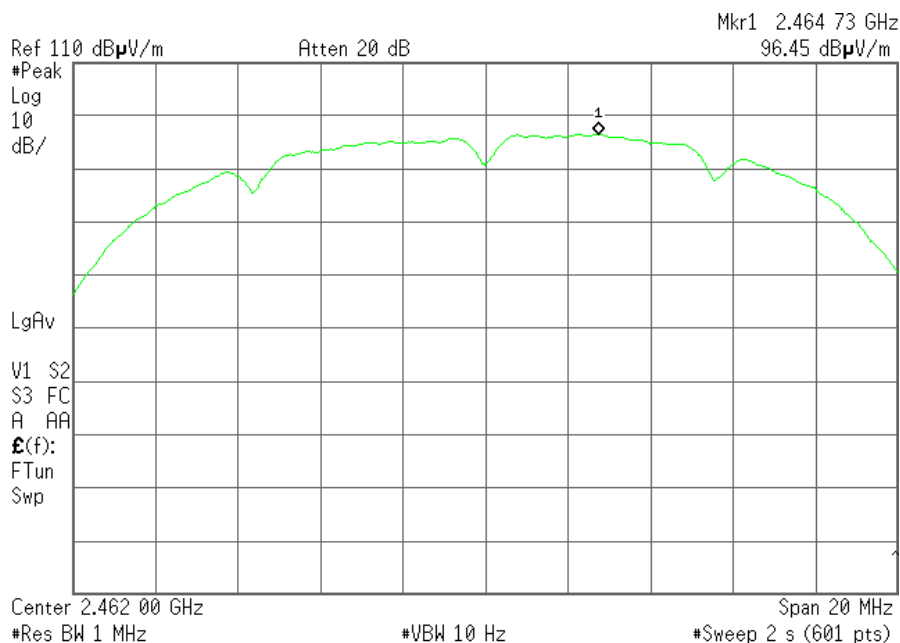
Maximum peak and average field strength of fundamental emission at 3 m distance

HIGHEST CHANNEL (2462 MHz):

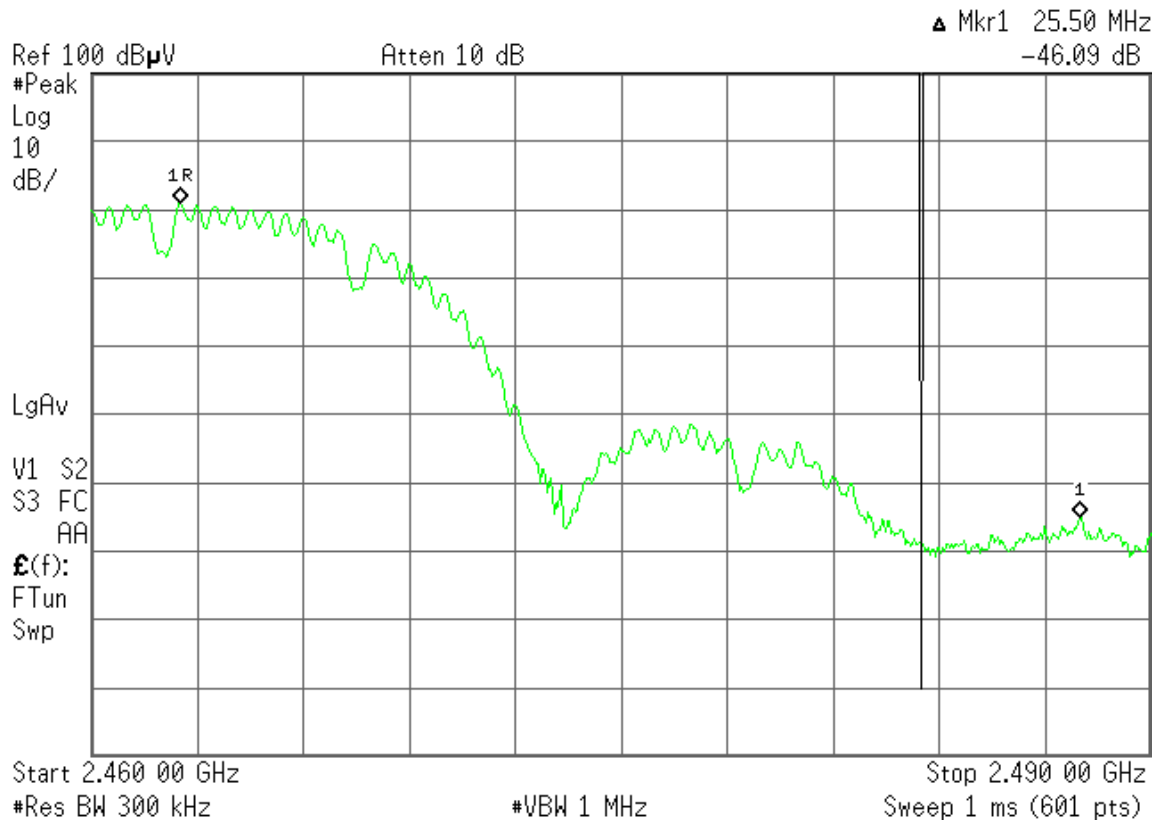
Maximum field strength at 3 m. Peak value.



Maximum field strength at 3 m. Average value.



BAND-EDGE COMPLIANCE. RADIATED. Marker-Delta Method.



Band edge compliance of radiated emissions

Fundamental max. average value 3 m	Delta value	Calculated value 3 m	Limit
96.45 dB μ V/m	46.09 dB	50.36dB μ V/m	54 dB μ V/m

Fundamental max. Peak value 3 m	Delta value	Calculated value 3 m	Limit
102.79 dB μ V/m	46.09 dB	56.70 dB μ V/m	74 dB μ V/m

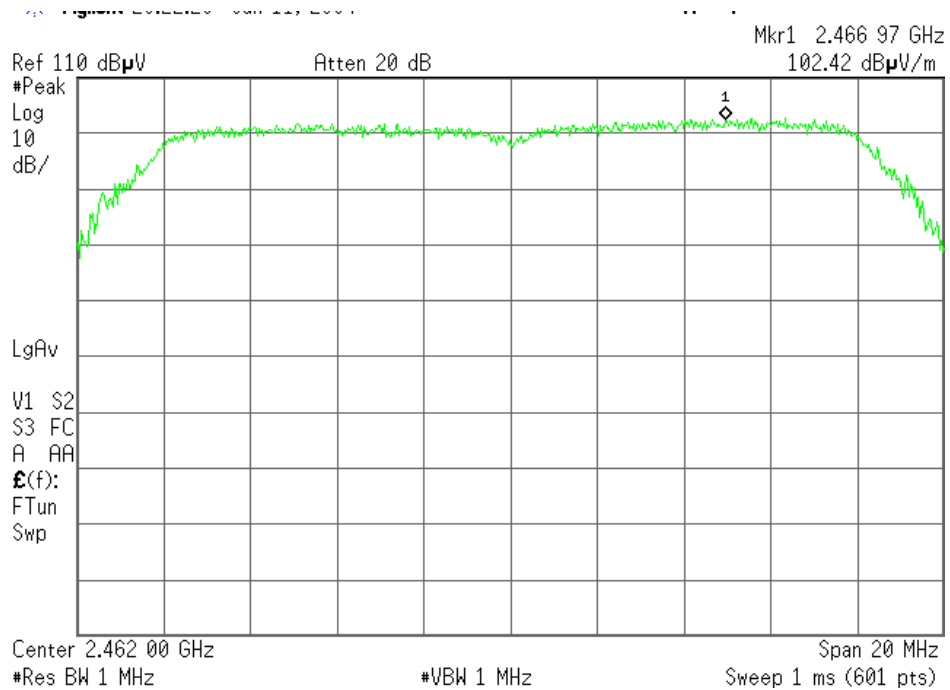
Verdict: PASS

2. OFDM Modulation

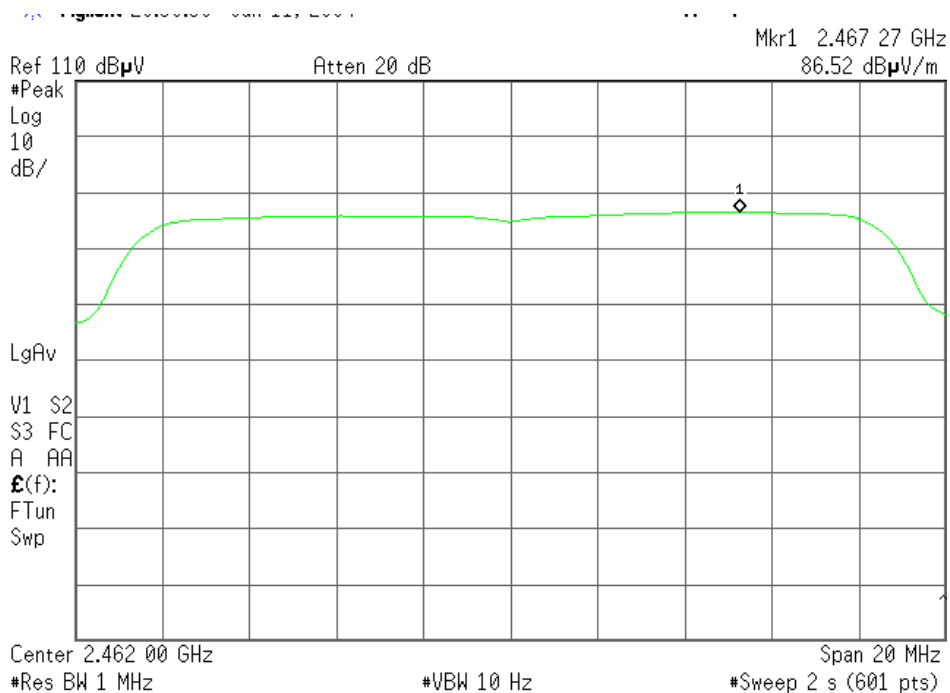
Preliminary tests were done with the equipment operating with OFDM modulation mode at 6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps and 54 Mbps, and the worst case was for 6 Mbps bit rate. Results shown below correspond to 6 Mbps.

HIGHEST CHANNEL (2462 MHz):

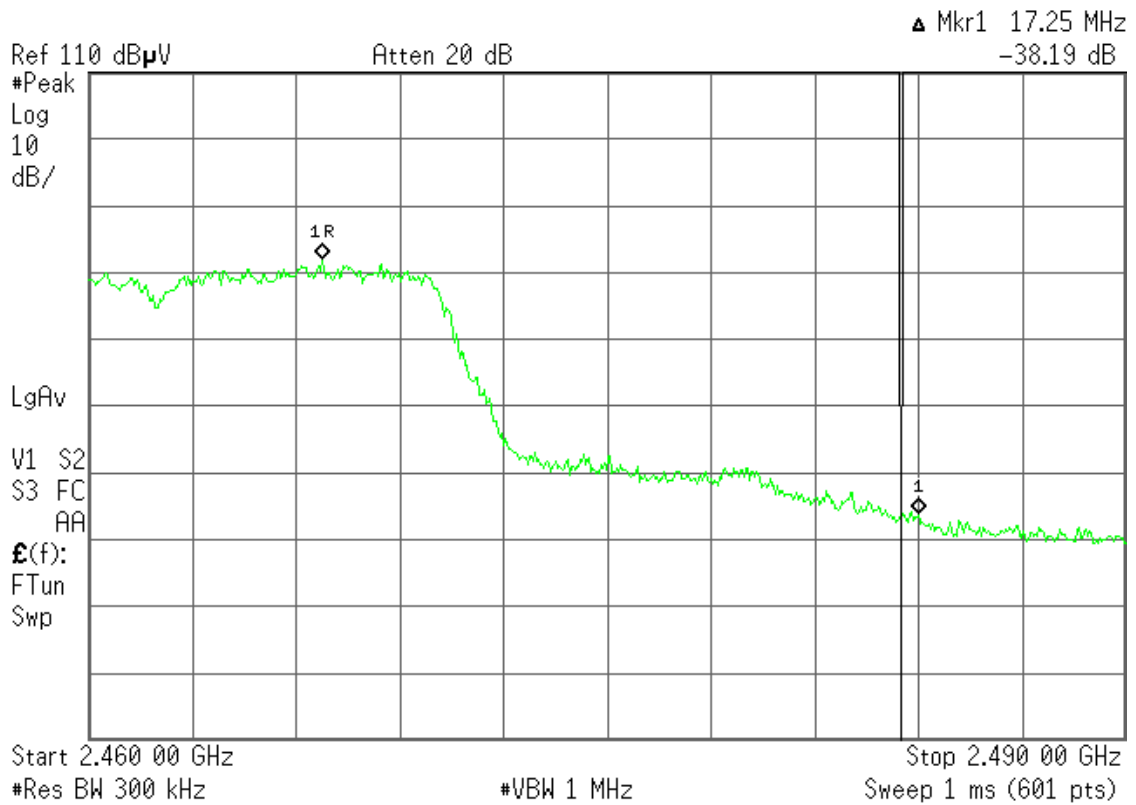
Maximum field strength at 3 m. Peak value.



Maximum field strength at 3 m. Average value.



BAND-EDGE COMPLIANCE. RADIATED. Marker-Delta Method.



Band edge compliance of radiated emissions

Fundamental max. average value 3 m	Delta value	Calculated value 3 m	Limit
86.52 dB μ V/m	38.19 dB	48.33 dB μ V/m	54 dB μ V/m

Fundamental max. Peak value 3 m	Delta value	Calculated value 3 m	Limit
102.42 dB μ V/m	38.19 dB	64.23 dB μ V/m	74 dB μ V/m

Verdict: PASS

Section 15.247 Subclause (d). Emission limitations radiated (Transmitter)

SPECIFICATION

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

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.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

The equipment transmits continuously in the selected channel so it is not necessary a duty cycle correction factor.

1. DSSS Modulation

No spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz, for the three operating channels.

2. OFDM Modulation

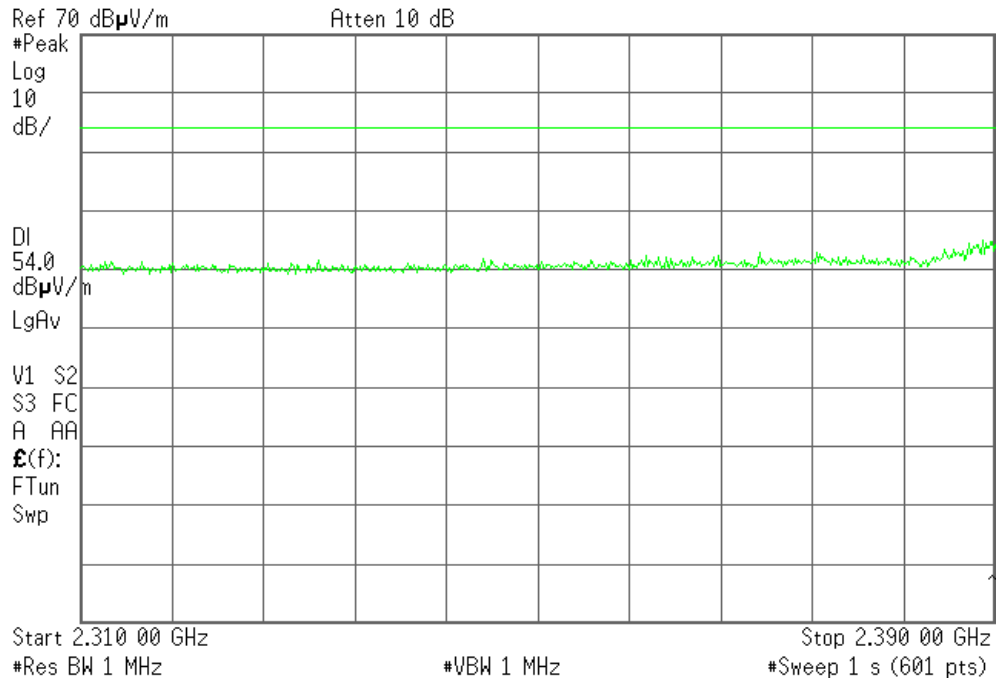
No spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz, for the three operating channels.

Verdict: PASS

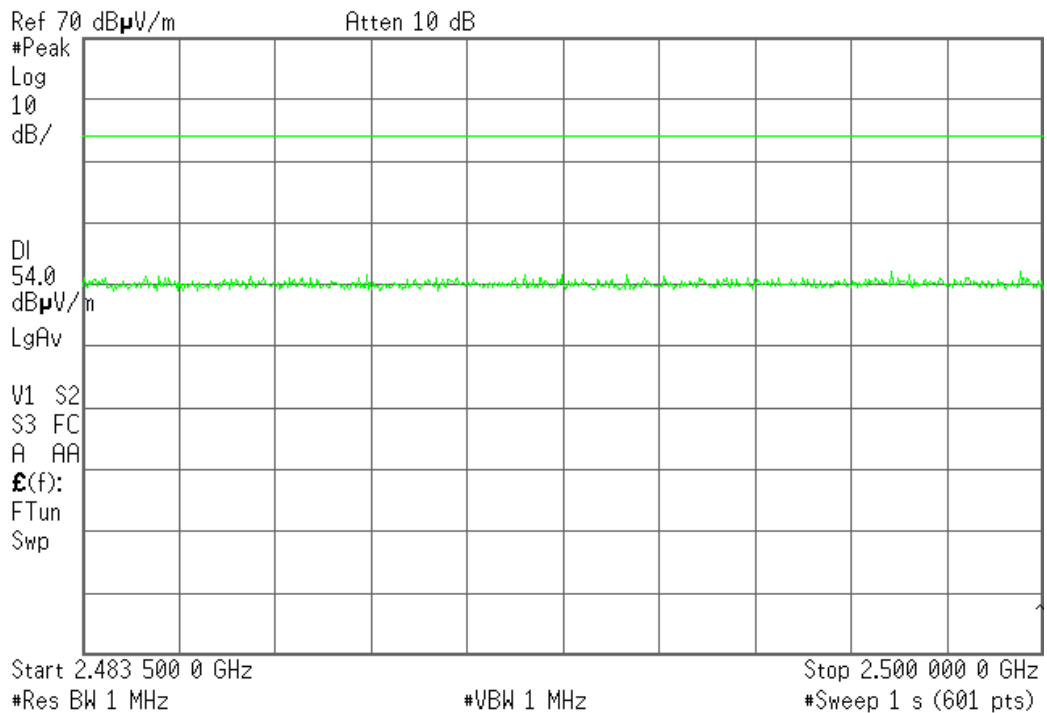
1. DSSS modulation

CHANNEL: LOWEST (2412 MHz)

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

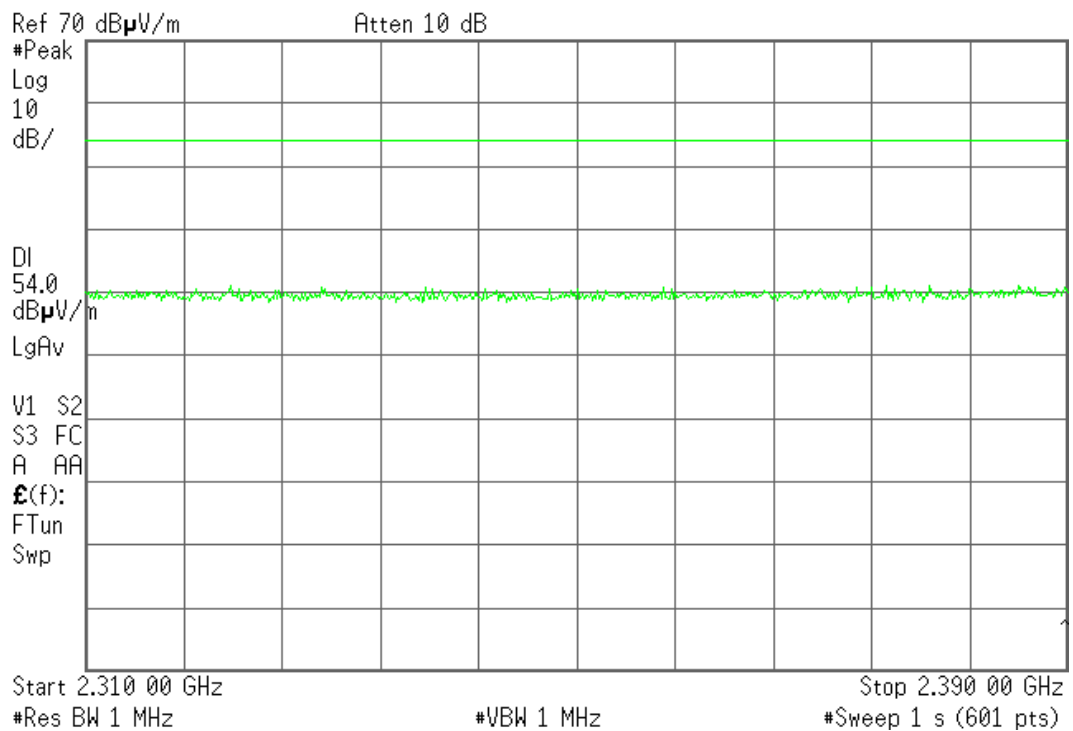


FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

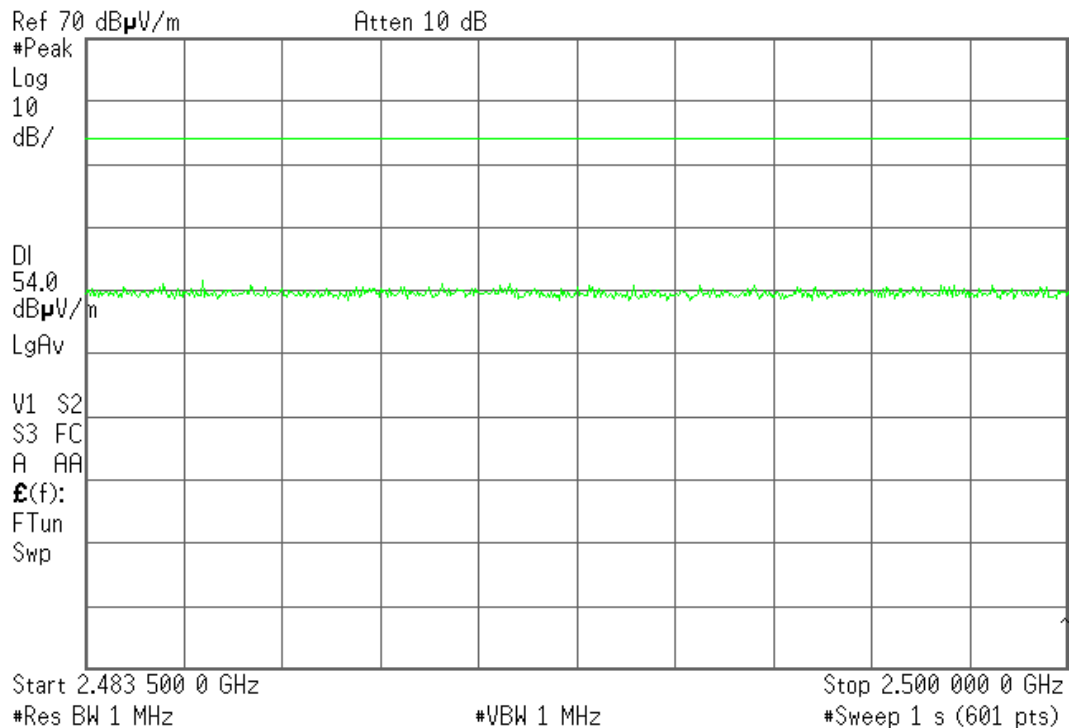


CHANNEL: MIDDLE (2437 MHz).

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

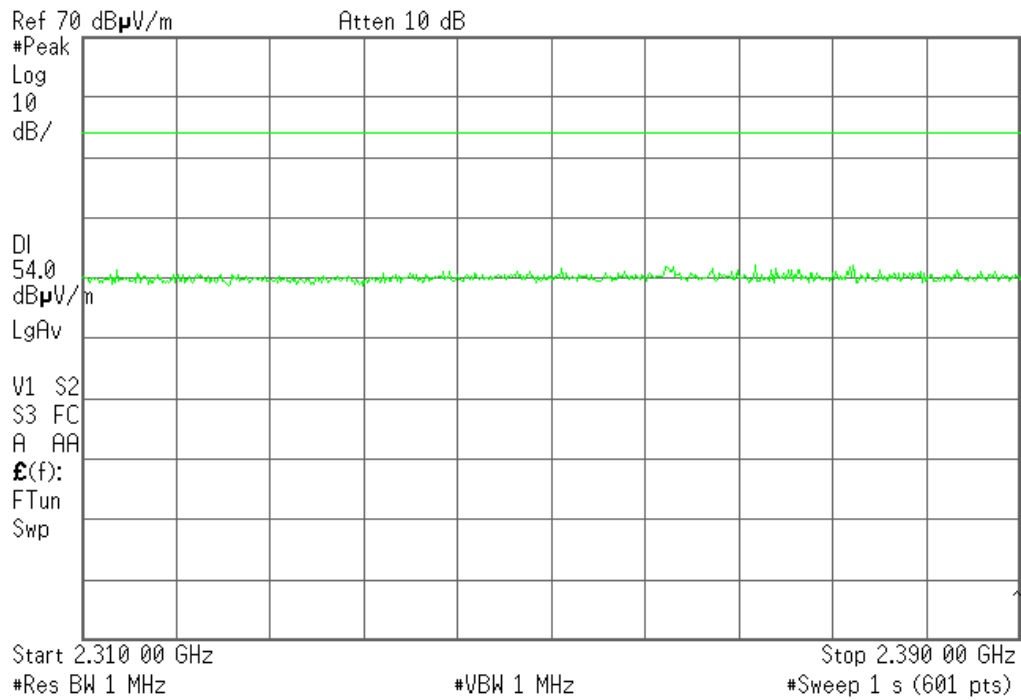


FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

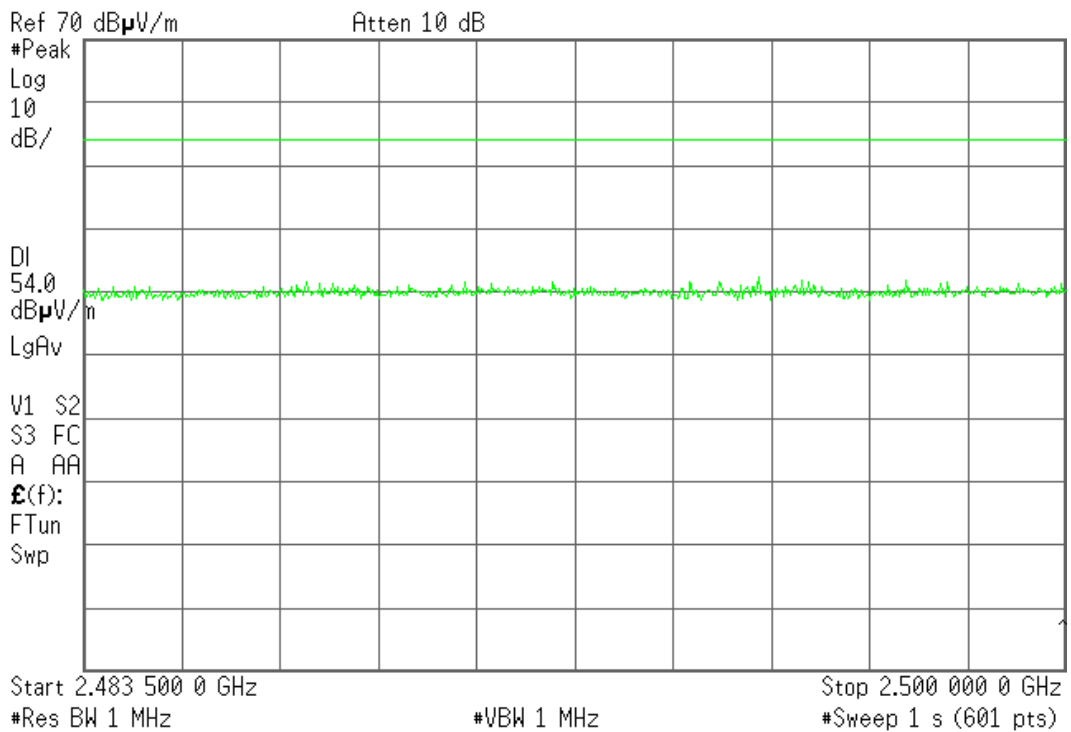


CHANNEL: HIGHEST (2462 MHz).

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)



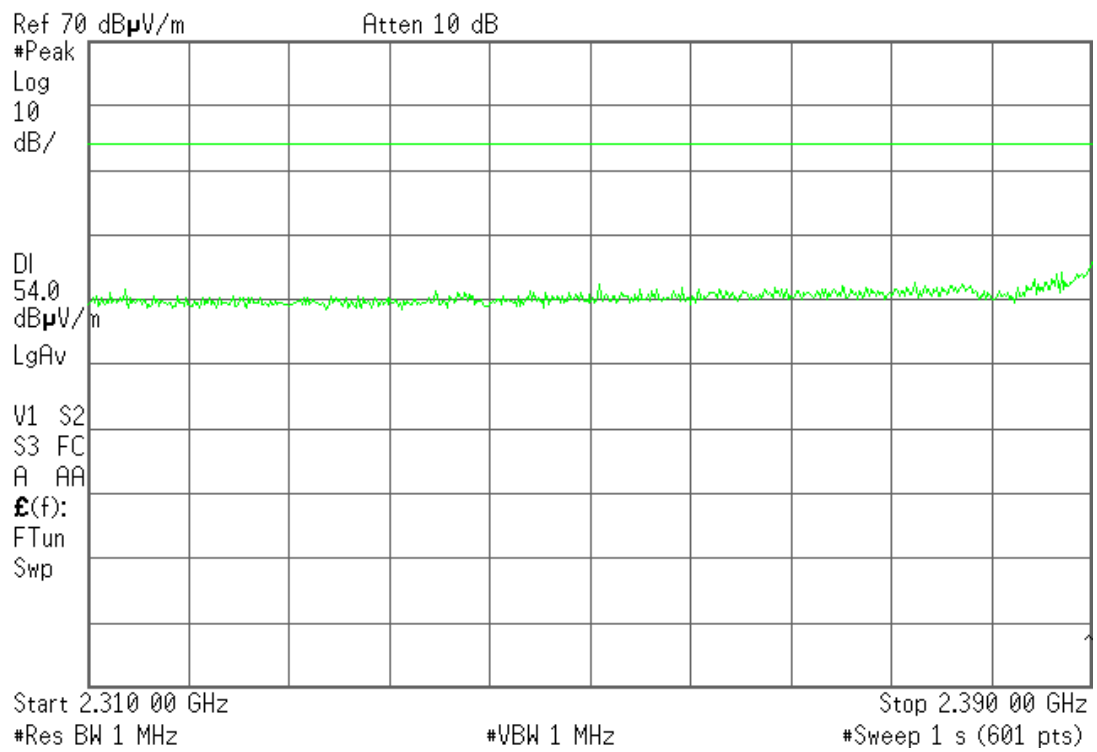
FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)



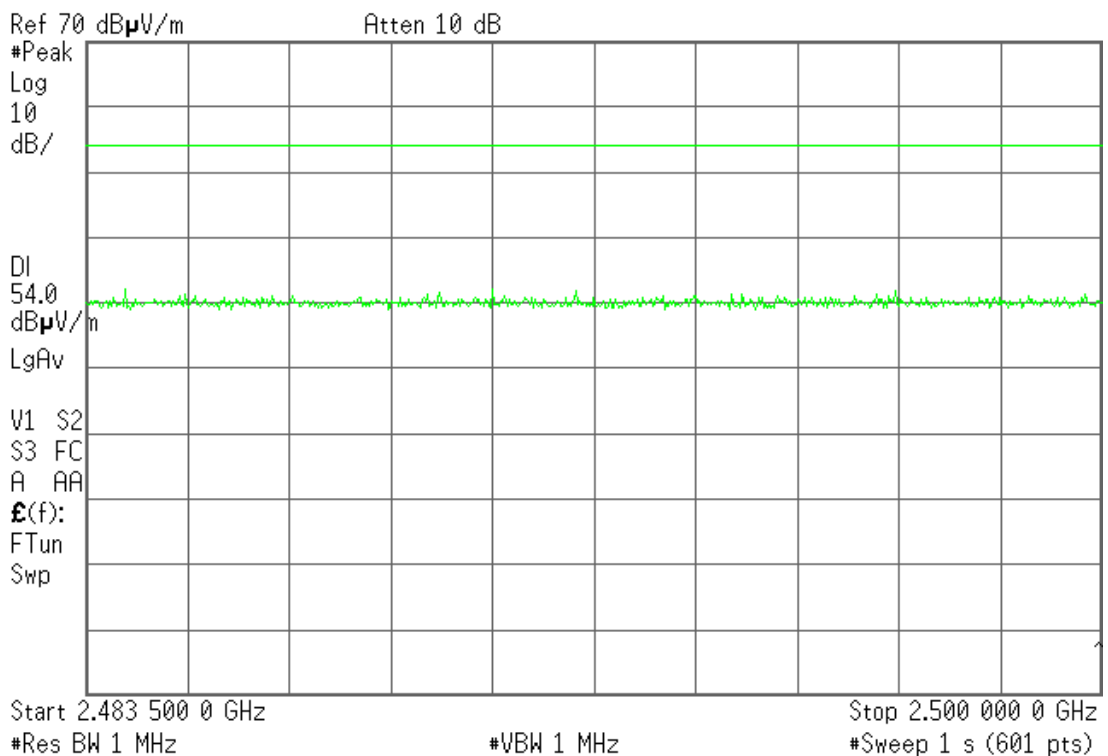
2. OFDM modulation

CHANNEL: LOWEST (2412 MHz)

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

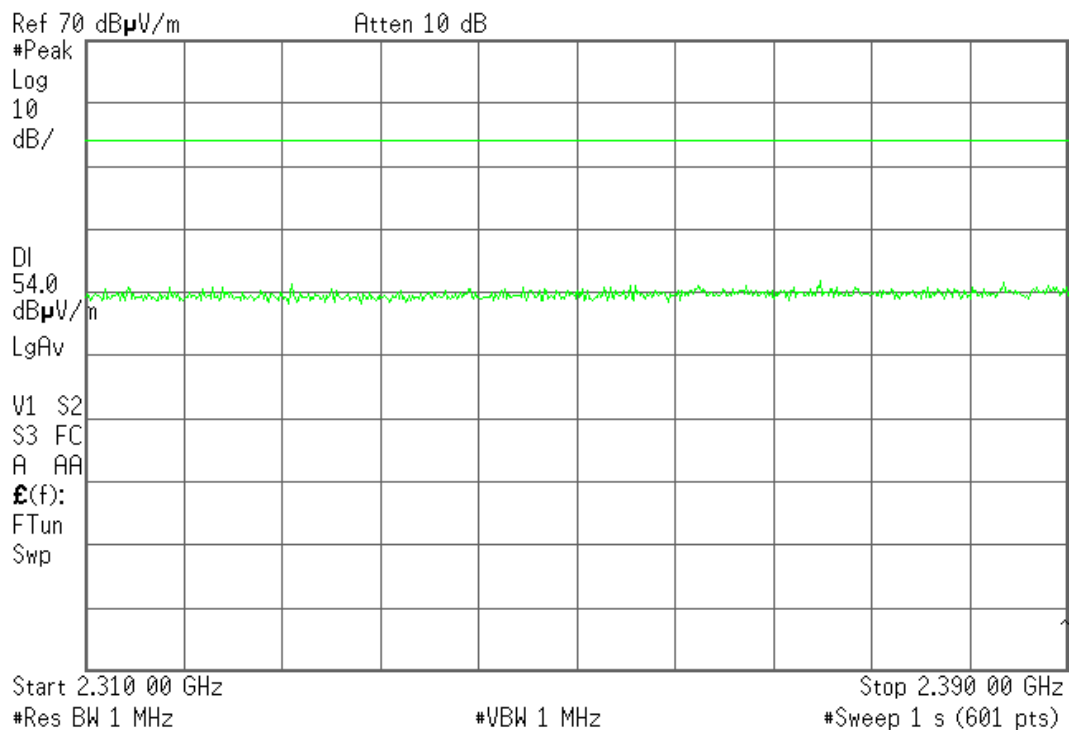


FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

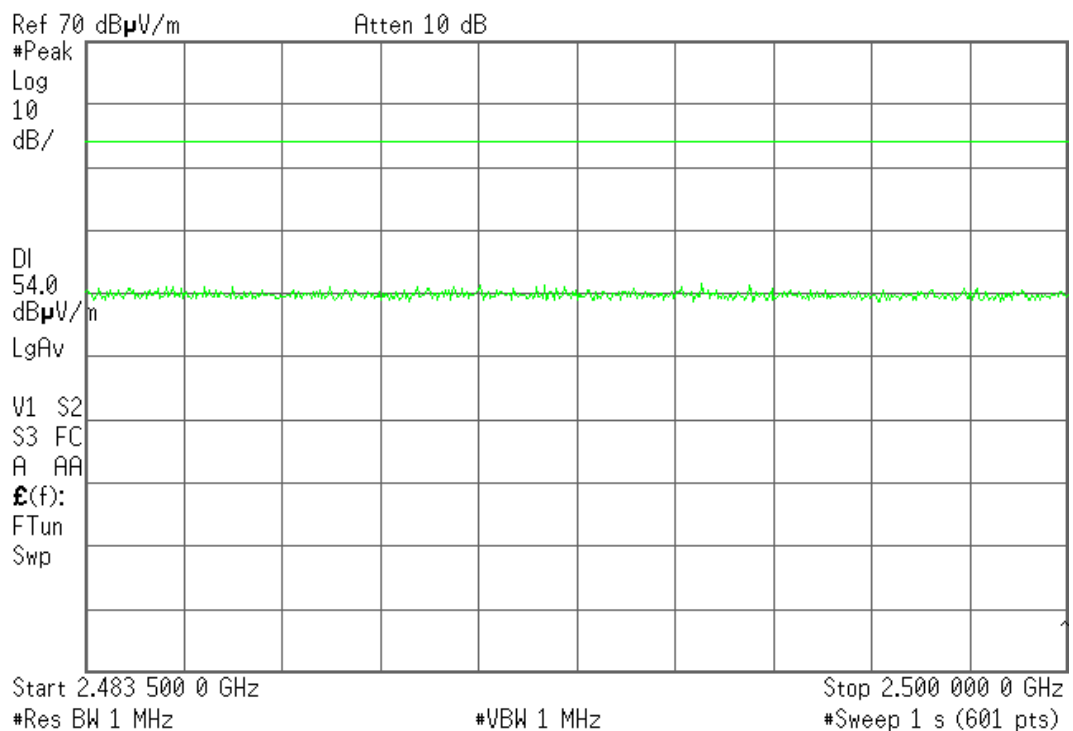


CHANNEL: MIDDLE (2437 MHz).

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

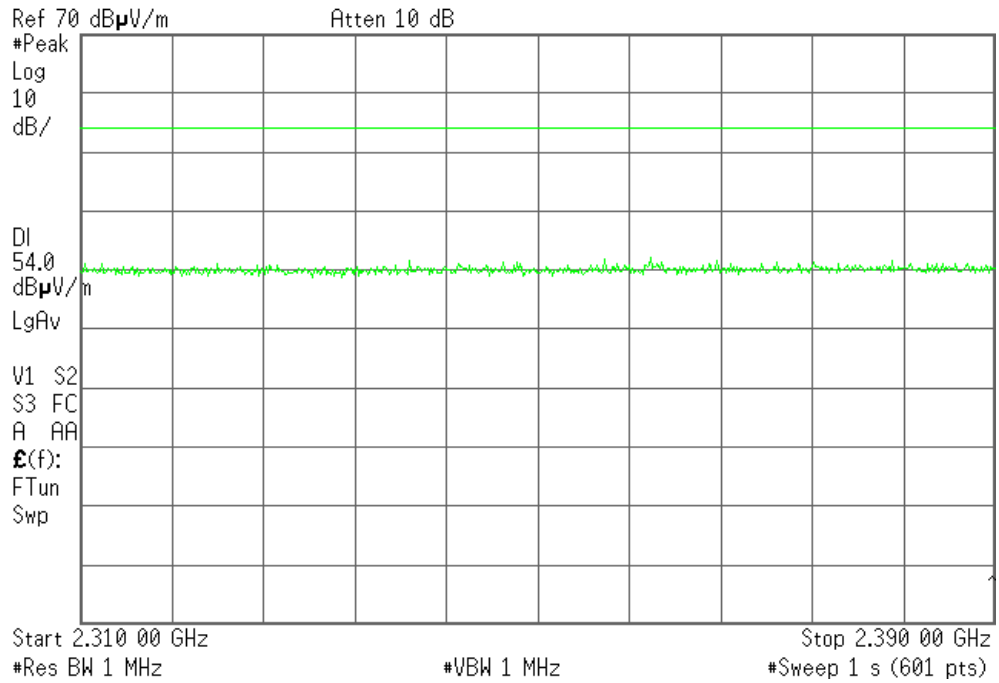


FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

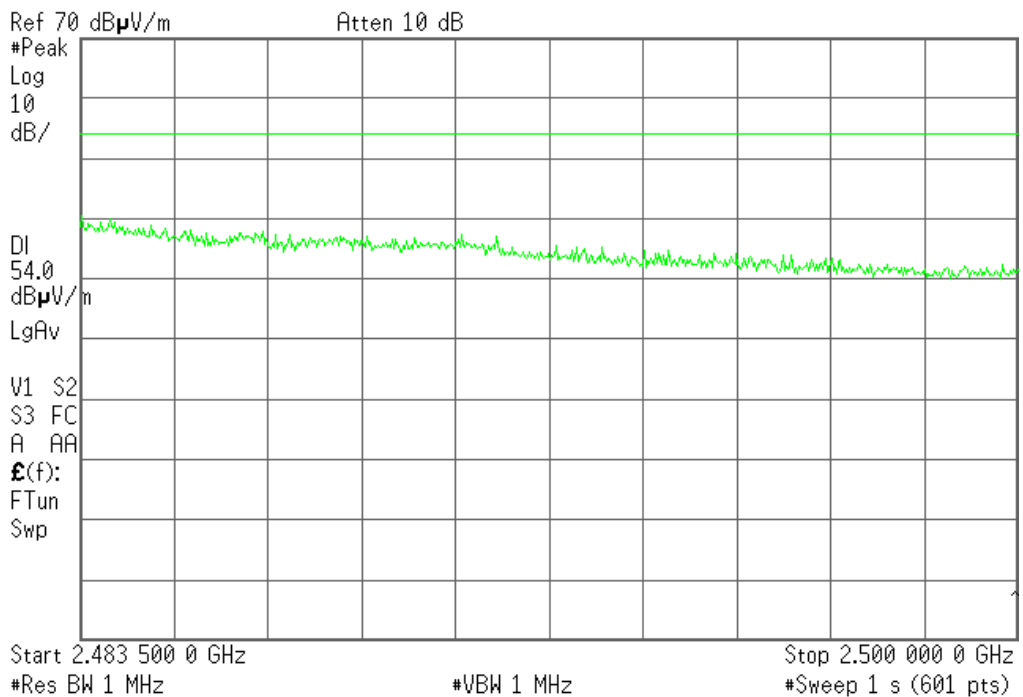


CHANNEL: HIGHEST (2462 MHz).

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)



FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)



Section 15.109. Receiver spurious radiation

SPECIFICATION

The field strength shall not exceed the following values:

Frequency Range (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

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.

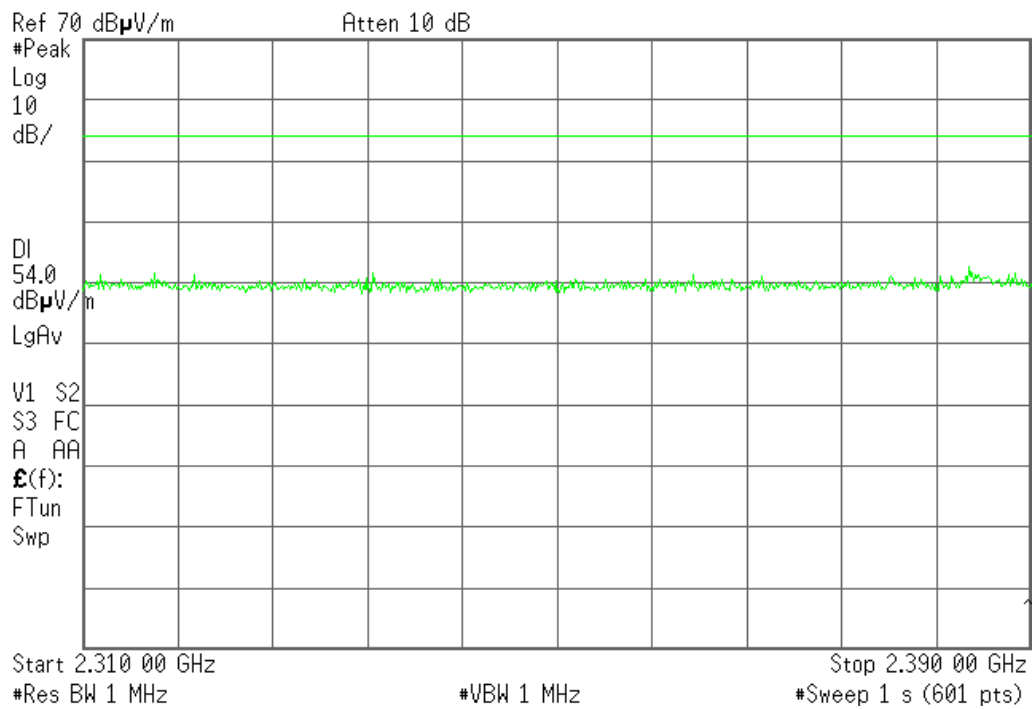
All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

No spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz, for the three receiving channels.

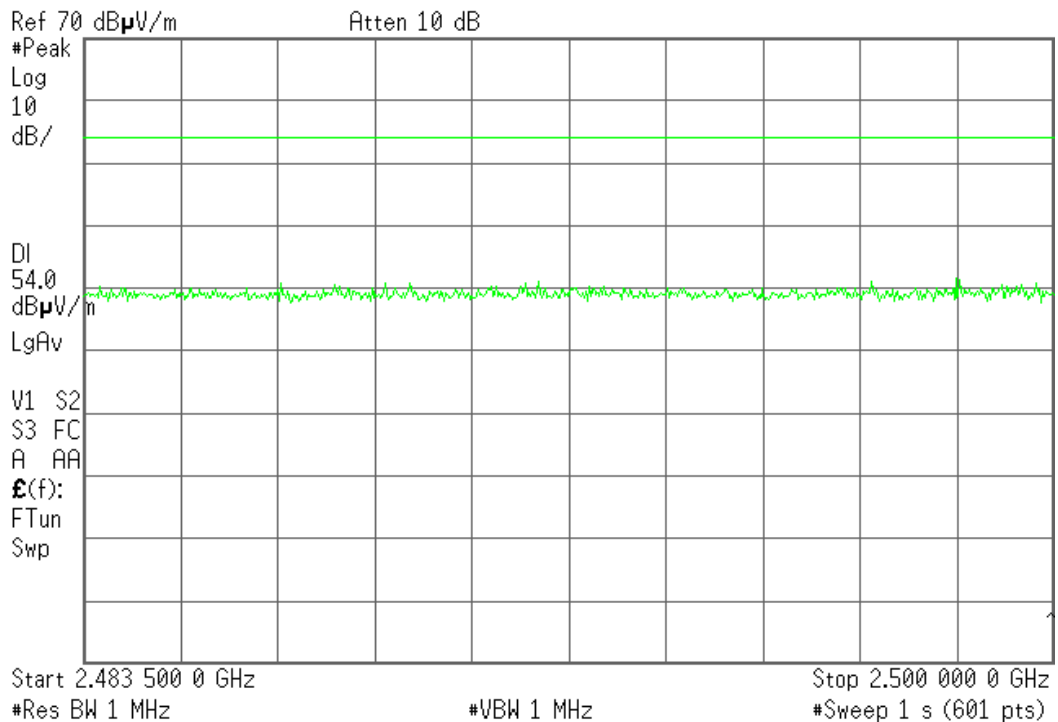
Verdict: PASS.

FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)



This plot is valid for all three channels.

FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)



This plot is valid for all three channels.