LAB N° 1356 L

Applicant:	CUSTOM S.p.A Via Berettine 2/B – 43010 Fontevivo – Parma - Italy Phone: 0521 680111
Trademark:	CUSTOM®
Test item:	Printer MP RANGER USB TH FI BLACK IT
Identification / Type No.:	**MP350**
FCC ID:	**OAH-5040120**
Order content:	Full tests according to the following standard:
Test specification:	**FCC Part 15, Subpart C (15.247)**
Date of receipt:	22/02/2022
Internal storage No.:	A003216149-003
Testing period:	From 31/03/2022 to 04/04/2022
Place of testing:	TÜV Rheinland Italia S.r.l. Via E. Mattei, 3 20005 Pogliano Milanese – Milano – Italy
Testing laboratory:	TÜV Rheinland Italia S.r.l. Via E. Mattei, 3 20005 Pogliano Milanese – Milano – Italy
Test result:	**PASS**

Tested by:	Francesco Lombardi	**Authorized by:**	Roberto Radice
Date: 14/07/2022	(Laboratory technician)	**Date:** 14/07/2022	*(Reviewer)*
Position	Sachverständige(r)/Expert	**Position**	Sachverständige(r)/Expert

Condition of the test item at delivery: *Test item complete and undamaged*

The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.
As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.
Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.
Unless otherwise agreed with the customer, a conformity assessment is always carried out based on the applied standards. At the customer's request, the statement on the conformity of the product tested in this test report is carried out according to the criteria/requirements of the applied standards. Evaluation conditions deviating from these are documented separately in the respective chapters.

0. Table of Contents

1. General description of test item(s)

Description	Printer MP RANGER USB TH FI BLACK IT
Model	MP350
Serial number	ESB1026121280071
Part number	911MM010100P33
Manufacturer	CUSTOM S.p.A
Country of manufacturer	Italy
Trademark	CUSTOM®
Power supply	DC Power
Supply voltage	Internal Battery (Technology: Lithium-ion)
Battery model name	INR18650-2S1P
Battery voltage-capacity	7.2V 2.6Ah 18.72Wh
Battery cycle	750
Battery life (print)	720 minutes x 300 tickets
Manufacturer (Battery)	Shenzhen Hypercell Co.,LTD
Equipment type	Intentional radiator
Hardware version	St145-c

Software version	1.22
Dimensions	149(L) x 53(H) x 122(P) mm
Weight	475gr (with battery included)
Printing width	76.2 mm and 80 mm
Operating temperature	From -10°C to +50°C
Operating humidity (RH)	Form 10% to 95%
EUT standing	Portable
Test sample obtaining:	☒ Sampling by customer ☐ Sampling by TÜV Rheinland Group ☐ others:

2. Equipment using during test

Equipment under test

No.	Product type	Manufacturer	Model	Comments
1	Printer MP RANGER USB TH FI BLACK IT	CUSTOM S.p.A.	MP350	---

Auxiliary Equipment / Peripherals

Nr.	Product type	Manufacturer	Model	Comments
1	Laboratory PC	DELL	---	- used to enable wireless communication (Bluetooth Low Energy, Bluetooth Enhanced Data Rate & Wi-Fi) on EUT, via software Printerset. - used ESP_RF_test_tool_v1.1.0, for setting the radio module in the following radio communications: BLE, BT EDR & Wi-Fi
2	Cradle 1 Slot P-Ranger	CUSTOM S.p.A	---	- used to charge battery
3	Switching power adapter	CUSTOM S.p.A	POWER SUPPLY FOR CRADLE 4 SLOTS P-RANGER	- use to power supply cradle

Input/Output ports

No.	Name	Type	Cable length	Cable shielded	Comments
1	Enclosure port	Plastic	---	---	closed by snaps
2	AC power port	---	---	---	port not present
3	DC power port	Internal battery	---	---	Battery model: INR18650-2S1P
4	Signal control port	---			port not present
5	Wired network port	---			port not present

EUT modification

None

3. Radio module identification

Bluetooth Basic Rate / Enhanced Data Rate module & Antenna technical data	
Module manufacturer	ESPRESSIF
Radio type	Transceiver
Chip radio	ESP32-PICO-D4
Type of equipment	☐ stand-alone equipment ☒ combined equipment ☐ multi-radio equipment
ETS Category	Bluetooth - BR & EDR
Bluetooth Channel / Frequency	2402 - 2480MHz
Number of channels	79
Channel bandwidth	1MHz
Channel separation	1MHz
Modulation type	☒ Frequency hopping (FHSS) equipment (Bluetooth classic) ☐ Wideband data transmission (non-FHSS equipment) (BLE)
Sensitivity	-97 dBm
Transmit operating mode	☒ single antenna ☐ multiple antennas, no beamforming ☐ multiple antennas, with beamforming
With regard adaptivity, the type of equipment	☐ non-adaptive equipment ☐ adaptive equipment ☒ Equipment that can operate in both an adaptive and non-adaptive mode;
Spectrum access mechanism	☐ LBT (Listen Before Talk) Technique ☐ DAA (Detect And Avoid) Technique ☒ Duty cycle

Environmental equipment	☒ Test only in normal conditions ☐ Test in normal conditions and extreme conditions
Equipment that support a geo-location capability	☐ Yes ☒ No

Antenna	Description:	AMCA31-2R450G-S1F-T3
	Peak Gain:	0.5 dBi
	Type:	☐ External antenna ☒ Dedicated antenna ☐ Integral antenna
	Frequency	2450 MHz
	Impedance	50 Ω
	Manufacturer	ABRACON LLC

Antenna	Description:	Chip-Antenna WE-MCA
	Peak Gain:	0.5 dBi
	Type:	☐ External antenna ☒ Dedicated antenna ☐ Integral antenna
	Frequency	2400 - 2500 MHz
	Impedance	50 Ω
	Manufacturer	WÜRTH ELEKTRONIK

Note: Test has been performed with Antenna mod. AMCA31-2R450G-S1F-T3, manufacturer Abracon.

4. Channel list Bluetooth Basic Rate / Enhanced Data Rate

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
0	**2402**	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	**38**	**2440**	58	2460	**78**	**2480**
19	2421	39	2441	59	2461		

5. Applied reference standards

47 CFR Part 15		Radio Frequency Device - General
Title 47 Part 15 Subpart C		Radio Frequency Device – Intentional Radiators
Title 47 Part 15 Subpart C § 15.203		Radio frequency devices – Intentional Radiators Antenna requirement
Title 47 Part 15 Subpart C § 15.205		Radio frequency devices – Intentional Radiators Restricted bands of operation
Title 47 Part 15 Subpart C § 15.209		Radio frequency devices – Intentional Radiators Radiated Emissions Limits
Title 47 Part 15 Subpart C § 15.247		Radio Frequency Devices – Intentional Radiators Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
558074 D01 DTS Meas Guidance v05r02 - April 02,2019		Guidance for performing compliance measurements on digital transmission systems (DTS) operating under §15.247
ANSI C63.4	2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10	2020	American National Standard for Testing Unlicensed Wireless Devices

6. Operating modes

No.	Description
1	Continuous Bluetooth - BR & EDR Modulation RF Transmission at maximum power, at Low channel. Radio module (model ESP32-PICO-D4), set via ESP_RF_test_tool_v1.1.0, with the following parameters: ChipType: ESP32 BaudRate: 115200 Load bin: ESP32_RF_TEST_BIN_V1.4.6_20181019.bin Test Mode: BT TX Power Level: 8 Channel: 0/2402MHz Date Rate: 1M_DH1_1010; 2M_DH1_1010; 3M_DH1_1010 1M_DH3_1010; 2M_DH3_1010; 3M_DH3_1010 1M_DH5_1010; 2M_DH5_1010; 3M_DH5_1010
2	Continuous Bluetooth - BR & EDR Modulation RF Transmission at maximum power, at Middle channel. Radio module (model ESP32-PICO-D4), set via ESP_RF_test_tool_v1.1.0, with the following parameters: ChipType: ESP32 BaudRate: 115200 Load bin: ESP32_RF_TEST_BIN_V1.4.6_20181019.bin Test Mode: BT TX Power Level: 8 Channel: 38/2440MHz Date Rate: 1M_DH1_1010; 2M_DH1_1010; 3M_DH1_1010 1M_DH3_1010; 2M_DH3_1010; 3M_DH3_1010 1M_DH5_1010; 2M_DH5_1010; 3M_DH5_1010
3	Continuous Bluetooth - BR & EDR Modulation RF Transmission at maximum power, at high channel. Radio module (model ESP32-PICO-D4), set via ESP_RF_test_tool_v1.1.0, with the following parameters: ChipType: ESP32 BaudRate: 115200 Load bin: ESP32_RF_TEST_BIN_V1.4.6_20181019.bin Test Mode: BT TX Power Level: 8 Channel: 78/2480MHz Date Rate: 1M_DH1_1010; 2M_DH1_1010; 3M_DH1_1010 1M_DH3_1010; 2M_DH3_1010; 3M_DH3_1010 1M_DH5_1010; 2M_DH5_1010; 3M_DH5_1010

4	Continuous Bluetooth - BR & EDR Modulation RF Transmission at maximum power, in frequencies hopping mode. Radio module (model ESP32-PICO-D4), set via ESP_RF_test_tool_v1.1.0, with the following parameters: ChipType: ESP32; BaudRate: 115200 Load bin: ESP32_RF_TEST_BIN_V1.4.6_20181019.bin Test Mode: BT TX; Power Level: 8 Date Rate: 1M_DH1_1010; 2M_DH1_1010; 3M_DH1_1010 1M_DH3_1010; 2M_DH3_1010; 3M_DH3_1010 1M_DH5_1010; 2M_DH5_1010; 3M_DH5_1010

7. EUT configuration

The test setup was made in accordance with mentioned FF standards.

Measurements and tests were executed under ”worst case” conditions. Typical EUT arrangements or operating modes were chosen or assumed which let suspect maximum emission or susceptibility (a so called ”unfavourable configuration”).

Details of test setup or adjustments are (particularly) shown inside the photo documentation.
As far as not mentioned otherwise these statements are valid for all following tests.

8. Climatic conditions

Ambient Temperature	10 – 40 °C
Relative Humidity	10 – 90 %
Air pressure	Not specified

Note: According to ANSI C63.4

9. Statement of the measurement uncertainty

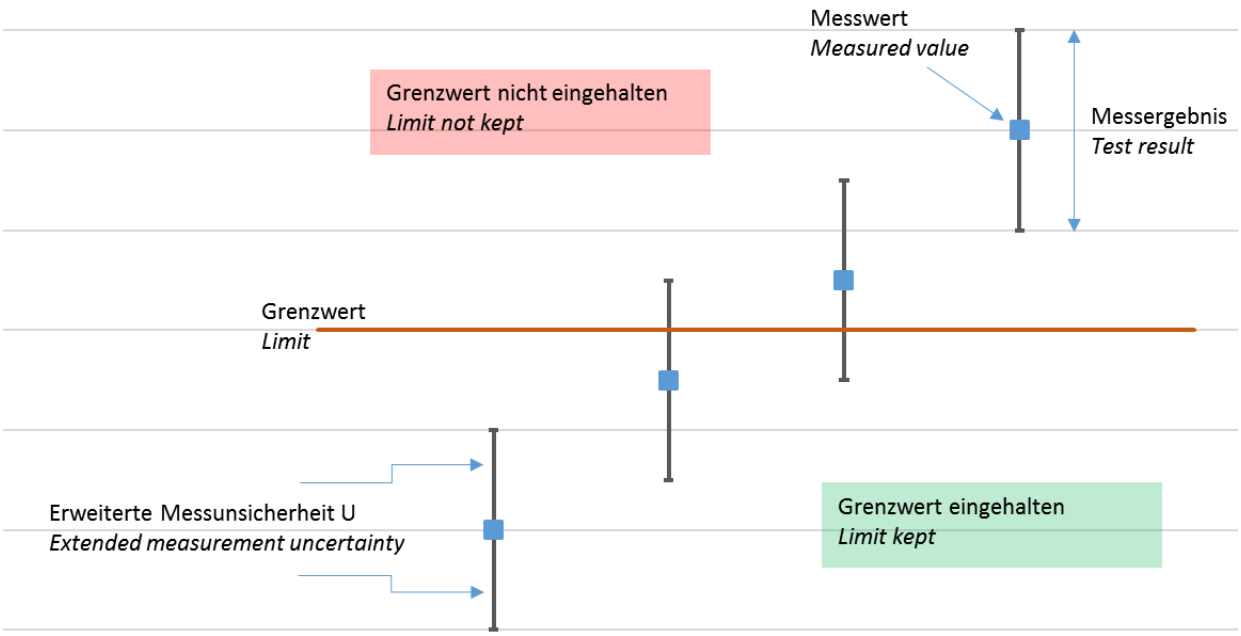
The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the quality system acc. to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation.

The manufacturer has the sole responsibility of continued compliance of the device

10. Measurement uncertainty

Test Method	Uncertainty (95%)	Coverage factor k
RF Radiated emissions – range (30 – 1000) MHz	4,9 dB	2,0
RF Radiated emissions – range (1 – 8) GHz	5,1 dB	2,0
RF Radiated emissions – range (8 – 40) GHz	5,4 dB	2,0
TX Carrier Power – Conducted (1GHz – 8GHz)	1,5 dB	2,0
Occupied Bandwidth (OBW)	514.4 x 1.00E-9	2,0
Power Spectral Density (0 – 3.6) GHz	3,7 mW	2,0
TX Conducted Spurious Emissions (9KHz – 1GHz)	0.92 dB	2,0
TX Conducted Spurious Emissions (1 – 8)	1,5 dB	2,0
TX Conducted Spurious Emissions (8 – 40) GHz	2,4 dB	2,0
Measurement of Normalised Site Attenuation and VSWR	6,0 dB	2,0

11. Example for interpretation of measuring results



Example for interpretation of measuring results

Measured value	***Limit***	***Extended measurement uncertainty* (k=2)**	***Test result***
48.9 dBµV @ 16.5 MHz	50 dBµV	2.2 dB	46.7 dBµV – 51.1 dBµV

Decision rule :	Statements of conformity (PASS or FAIL) to specifications are made in this report without taking measurement uncertainty into account. Where statements of conformity are made in this report, the following decision rules are applied: **PASS** – Results within limits/specifications **FAIL** – Results exceed limits/specifications

12. Result summary section

Requirement – Test case	Operating modes	Result
Radiated emissions (9KHz – 26GHz)[1]	1, 2, 3	**PASS**
Restricted bands of operation	1, 2, 3	**PASS**
Antenna requirements	---	**PASS**
Maximum Conducted Peak Output Power	1, 2, 3	**PASS**
20db Bandwidth	1, 2, 3	**PASS**
Out-of-band emissions	1, 2, 3	**PASS**
Band Edge	1, 3, 4	**PASS**
Carrier frequency (Hopping Channel) Separation[1]	4	**PASS**
Number of Hopping Channels Used[1]	4	**PASS**
Time of occupancy (dwell time) [1]	4	**PASS**
Additional provisions to the general radiated emission limitations	---	**PASS**

[1] *Test has been performed only worst case data rate condition.*

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

13. Change history

Test report number	List of revisions	Date
IT222QA0 001	First edition	14/07/2022

14. Emission Test

Radiated emission test (9KHz – 26GHz)	
Test date	From 30/03/2022 to 01/04/2022
Applied Standard	Title 47 Part 15 Subpart C §15.205; §15.209; §15.247
Test method	Par. 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02 (and par. 11.12.1 Radiated emission measurements of ANSI C63.10)
Temperature	23,1°
Humidity	54%
Tested by	Francesco Lombardi
Model	MP350
Internal Storage No.	1 (Storage no. A003216149-003)
Operating mode	1, 2, 3
Tested terminals	Enclosure
Result	PASS

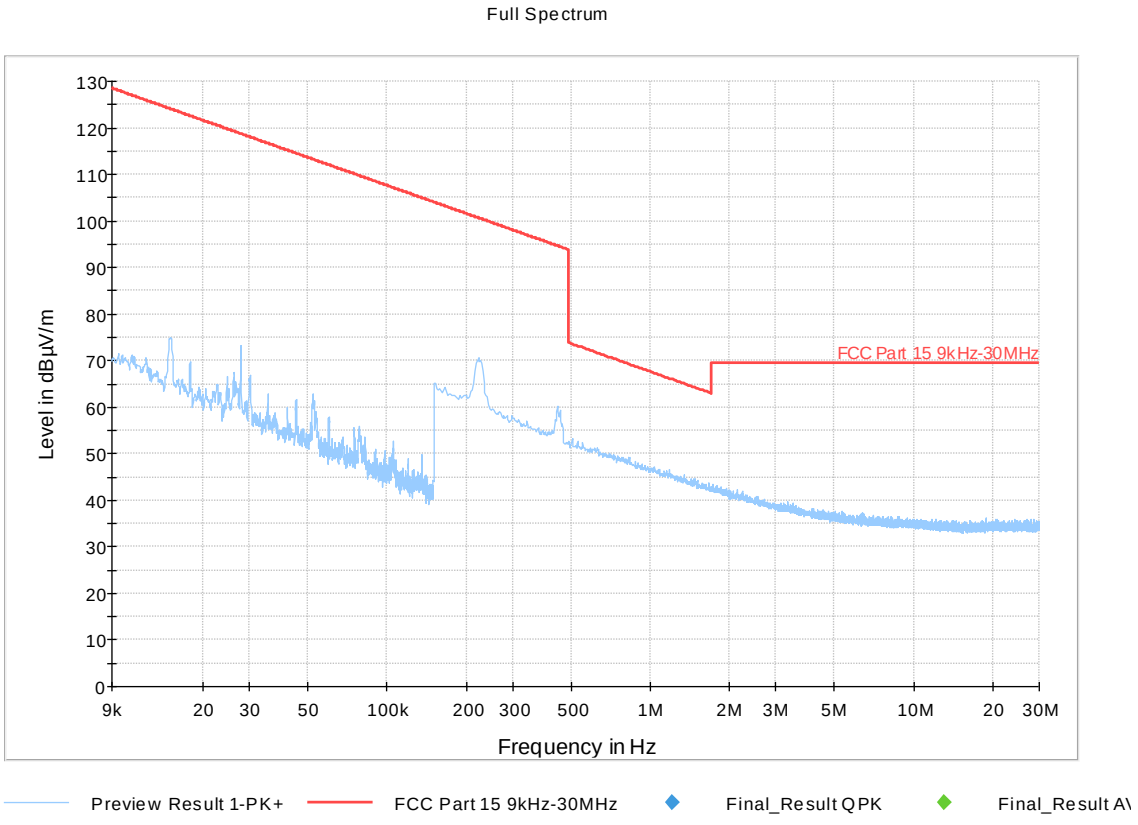
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 Db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 Db instead of 20 Db. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

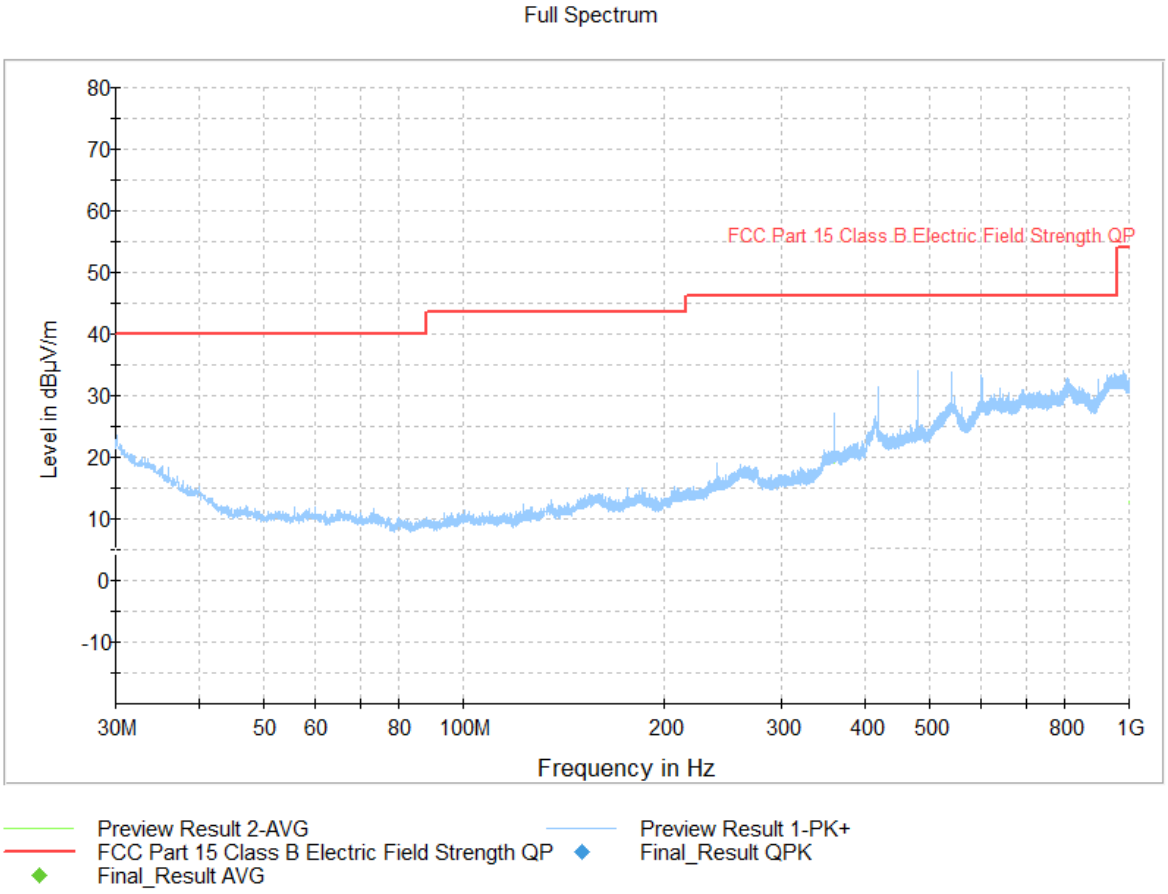
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.
Remark: In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is:
Limit 3m(dBµV/m)=Limit 300m(dBµV/m)+40Log(300m/3m) (Below 30MHz)
Limit 3m(dBµV/m)=Limit 300m(dBµV/m)+40Log(30m/3m) (Below 30MHz)

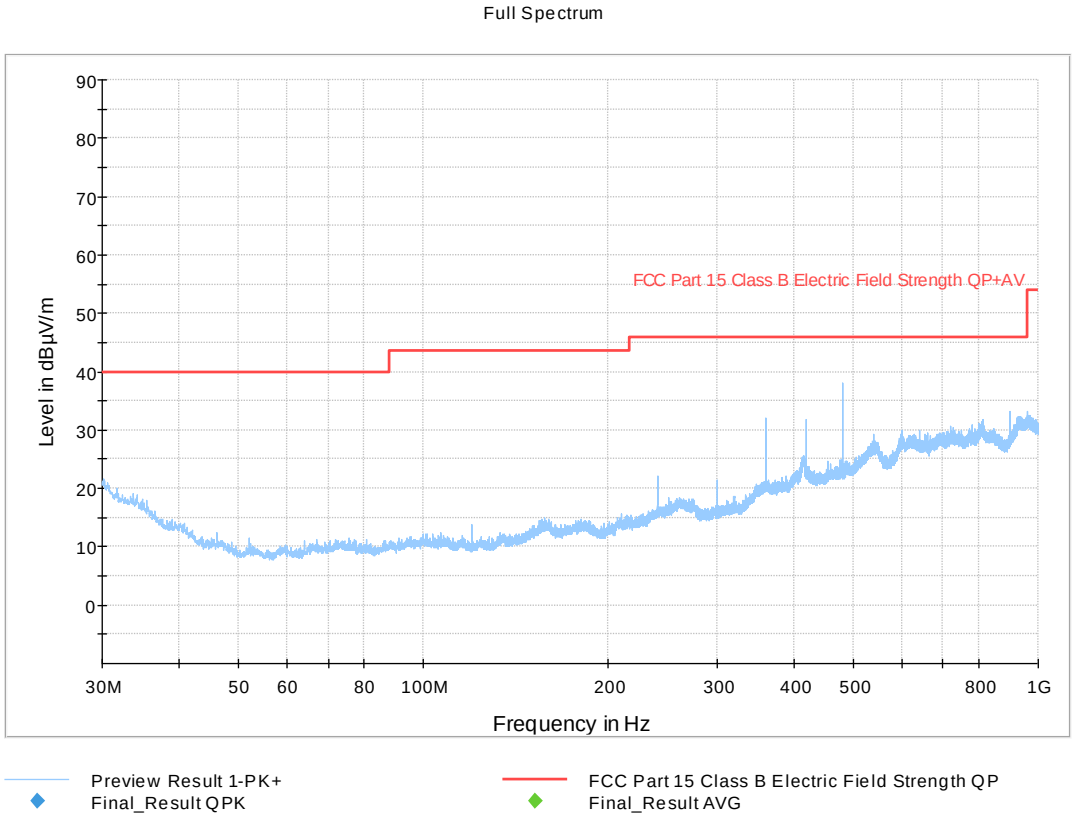
Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 9KHz – 30MHz
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



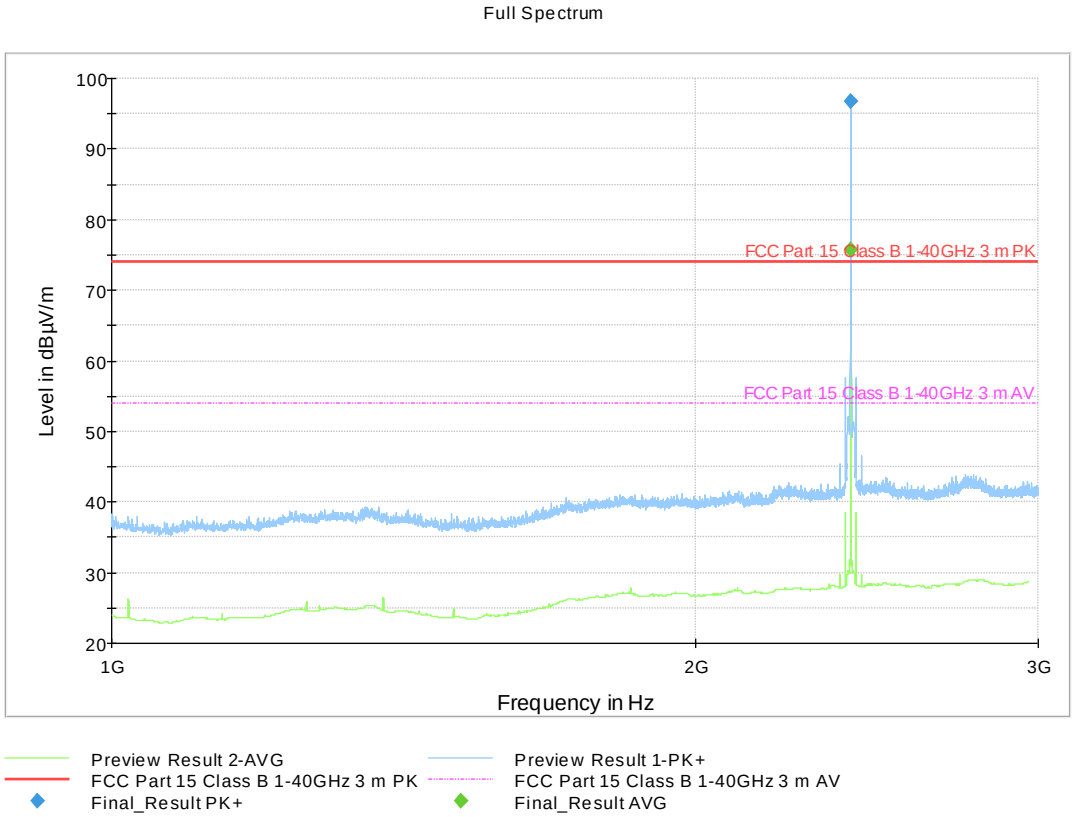
Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 30MHz – 1GHz
Antenna polarization: Vertical
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 30MHz – 1GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 1GHz – 3GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

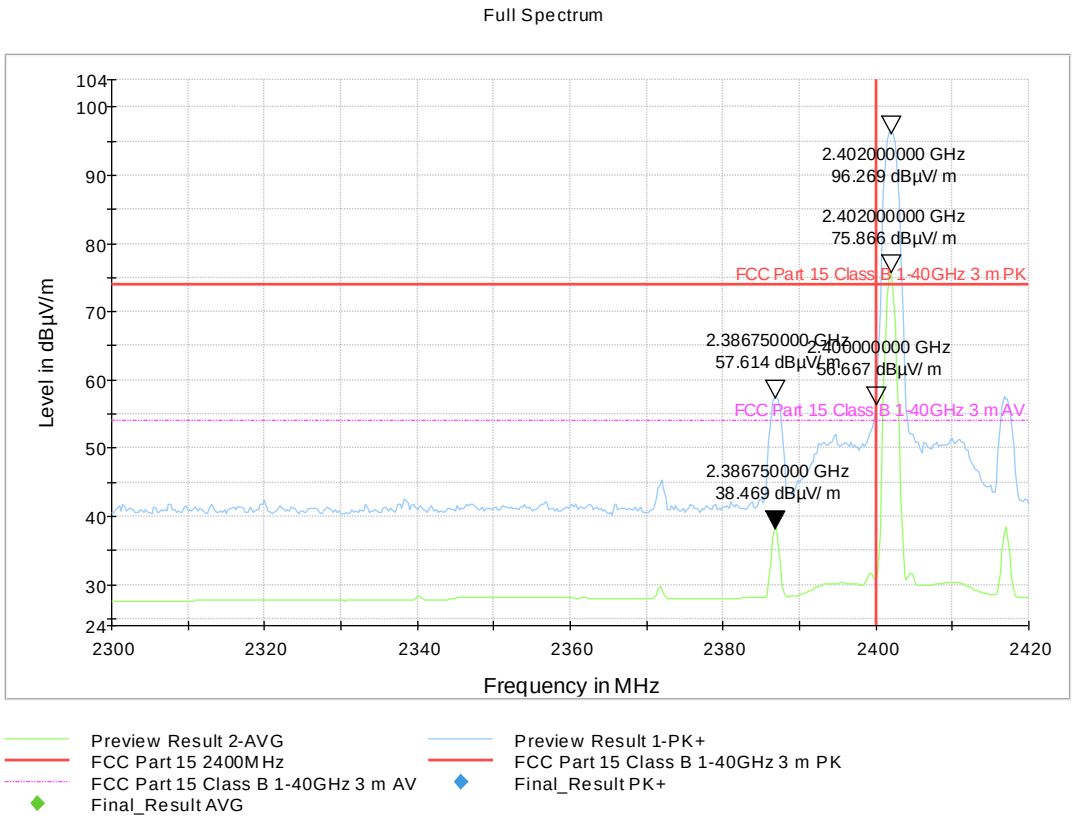


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2402.000000	**96.68**	**---**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**V**	**180.0**
2402.000000	**---**	**75.77**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**V**	**180.0**

Peaks out of limits are due to BT carrier (exclusion band).
Fundamental frequency not related to limit.

Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency: Restricted band of operations near fundamental
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Peaks out of limits are due to BLE carrier (exclusion band).
Fundamental frequency not related to limit.

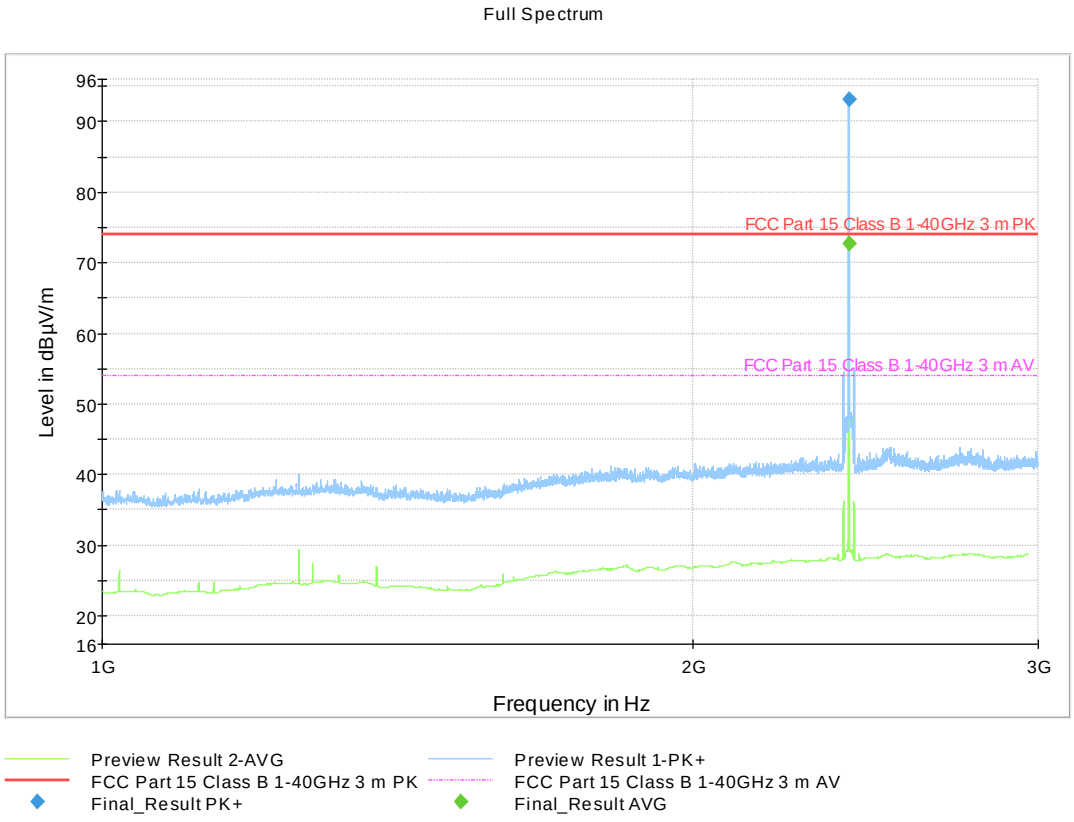
Fundamental Level

Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
2402.000000	106.22	---	-13.23	3.28	96.27
2402.000000	---	85.81	-13.23	3.28	75.86

Harmonic Level

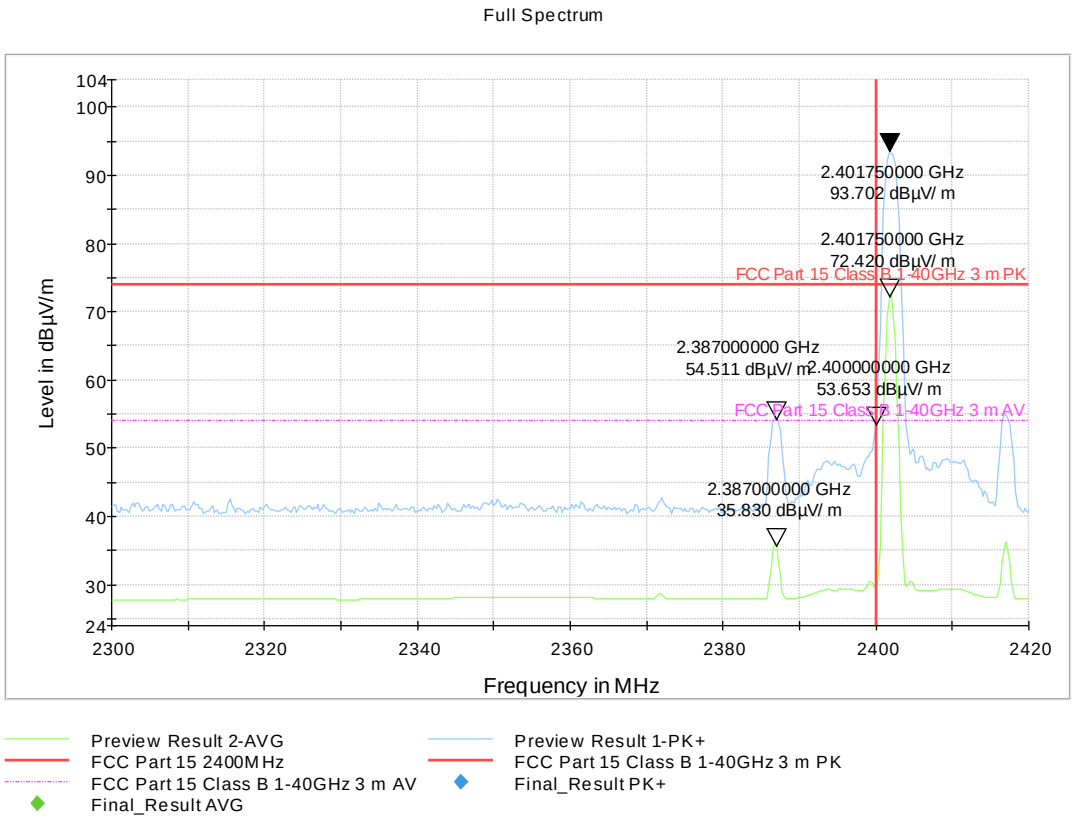
Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
2386.750000	67.61	---	-13.23	3.23	57.61
2386.750000	---	46.47	-13.23	3.23	36.47

Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 1GHz – 3GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Peaks out of limits are due to BT carrier (exclusion band).
Fundamental frequency not related to limit.

Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency: Restricted band of operations near fundamental
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Peaks out of limits are due to BT carrier (exclusion band).
Fundamental frequency not related to limit.

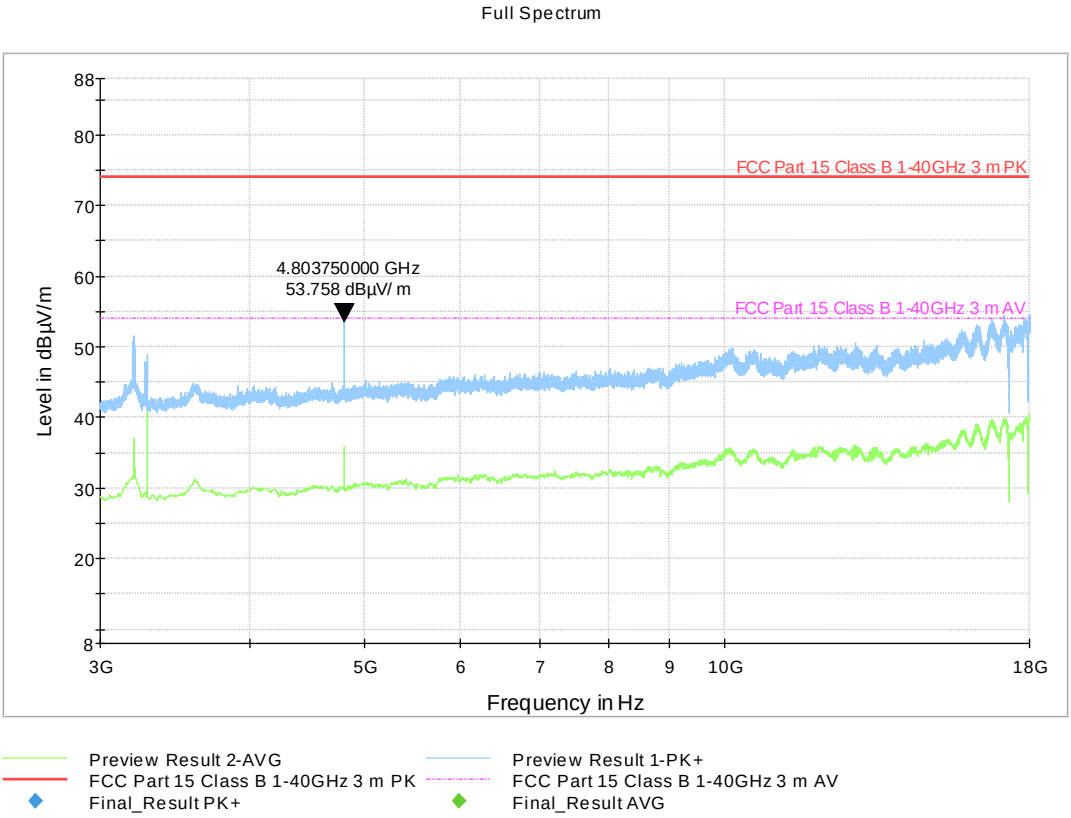
Fundamental Level

Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
2401.750000	106.93	---	-13.23	3.28	93.70
2401.750000	---	82.37	-13.23	3.28	72.42

Harmonic Level

Frequency (MHz)	Peak (dBµV/m)	Average (dBµV/m)	Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
2387.000000	64.51	---	-13.23	3.23	54.51
2387.000000	---	45.83	-13.23	3.23	35.83

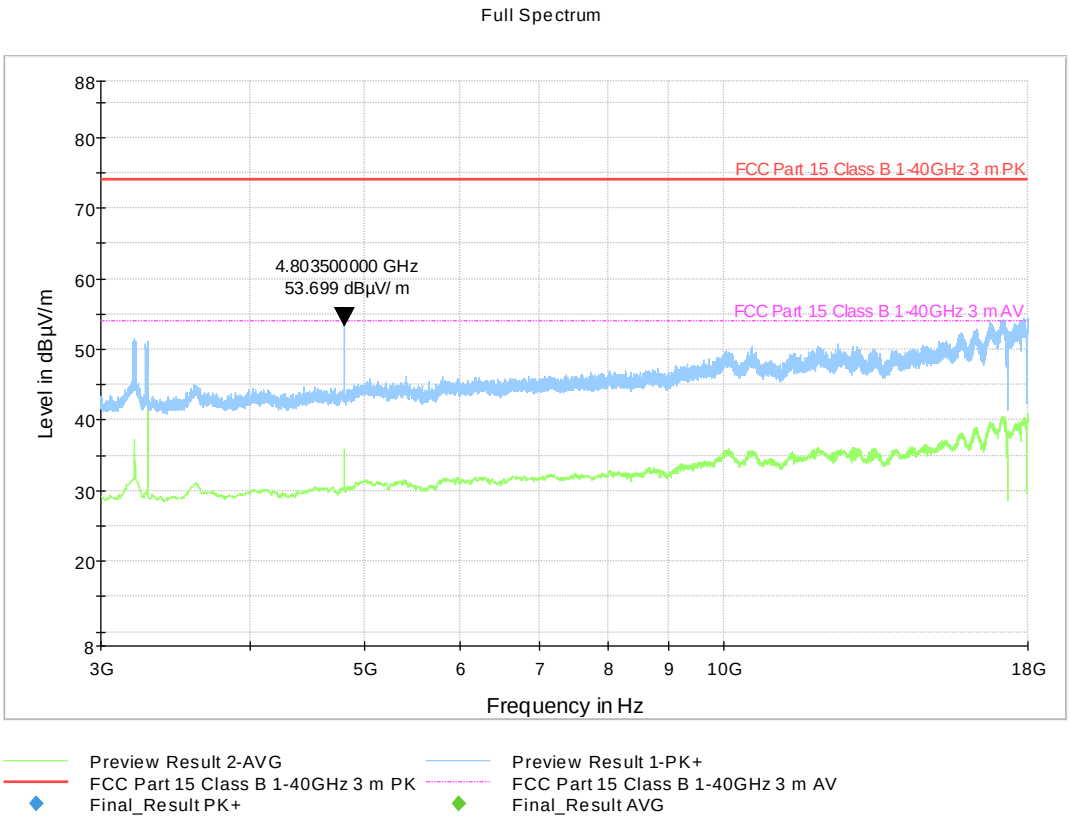
Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 3GHz -18GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4803.750000	**53.76**	**74.00**	**20.24**	**1000.0**	**1000.000**	**150.0**	**V**	**0.0**

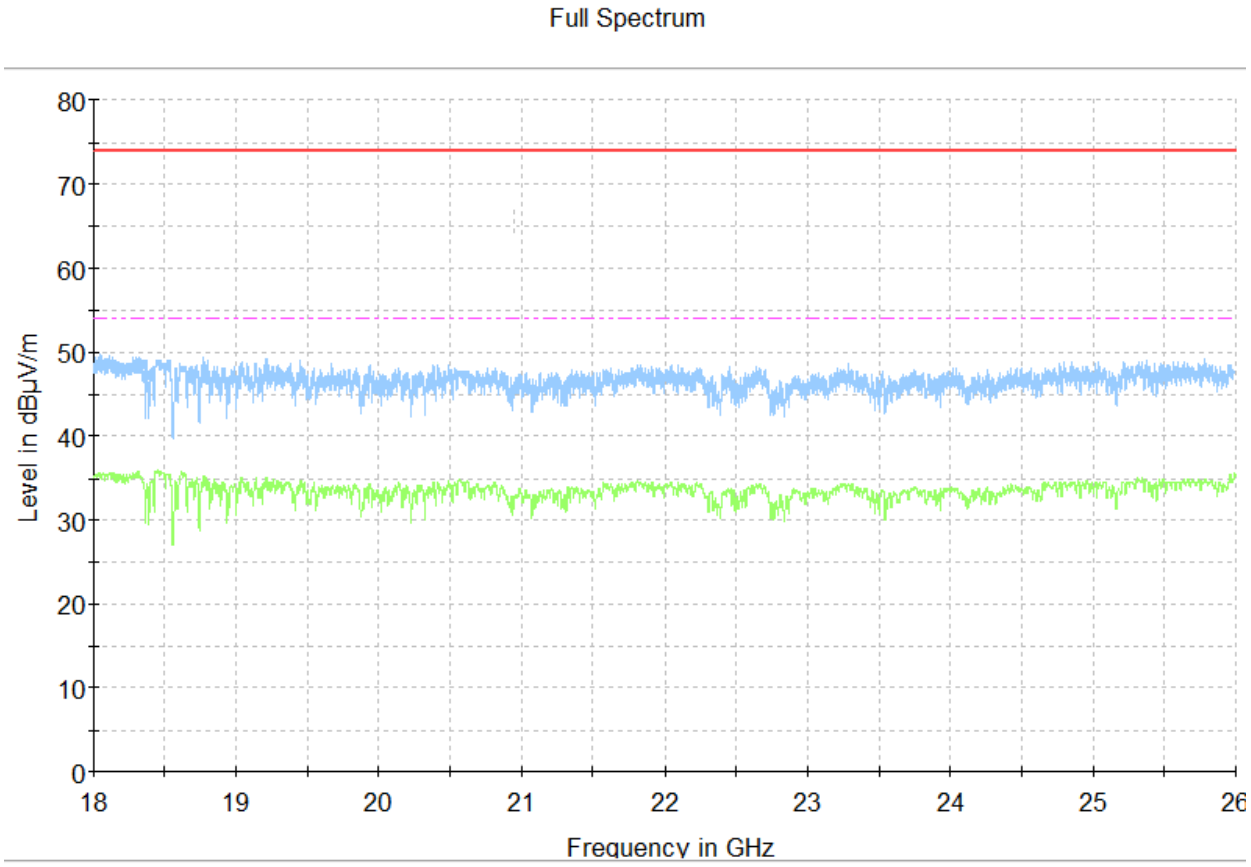
Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 3GHz -18GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



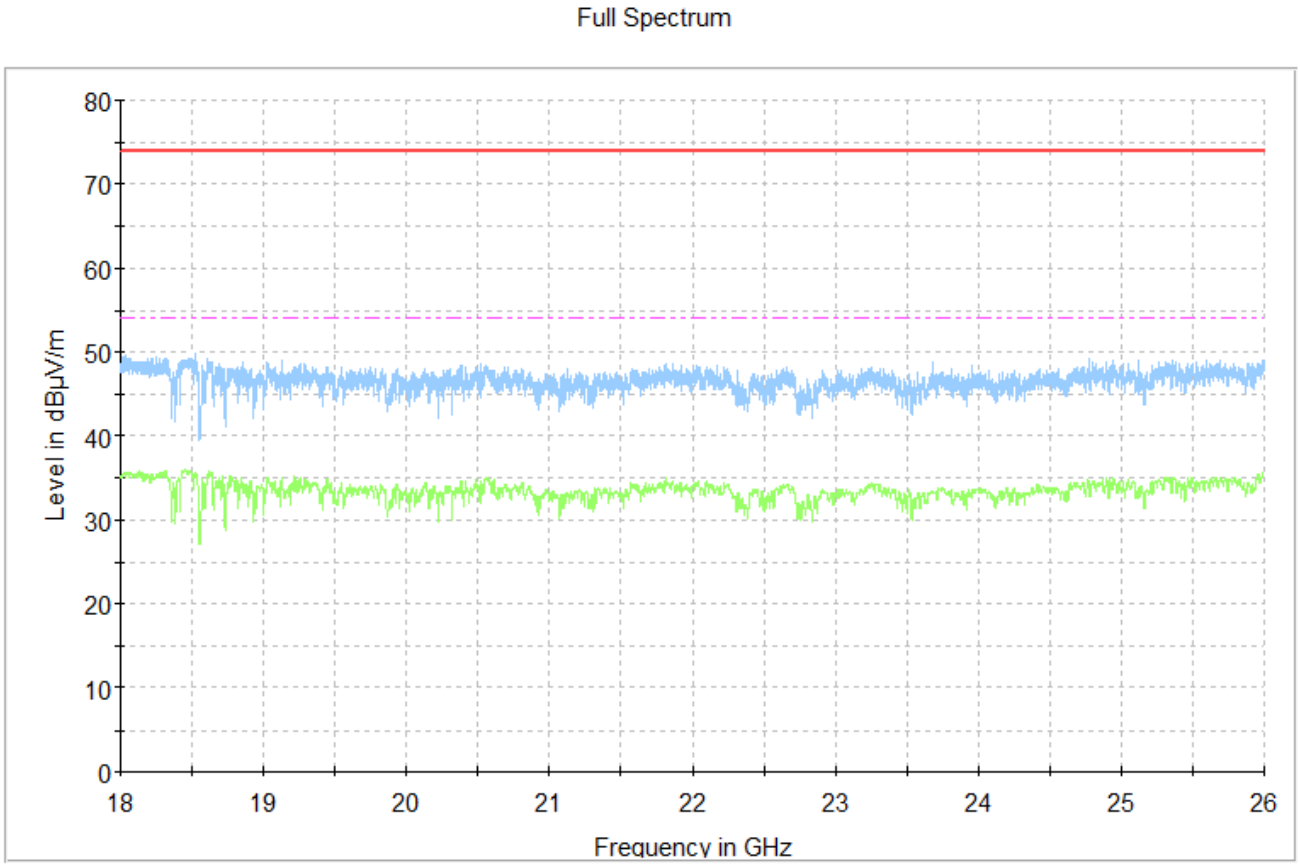
Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4803.500000	**53.70**	**74.00**	**20.3**	**1000.0**	**1000.000**	**150.0**	**H**	**0.0**

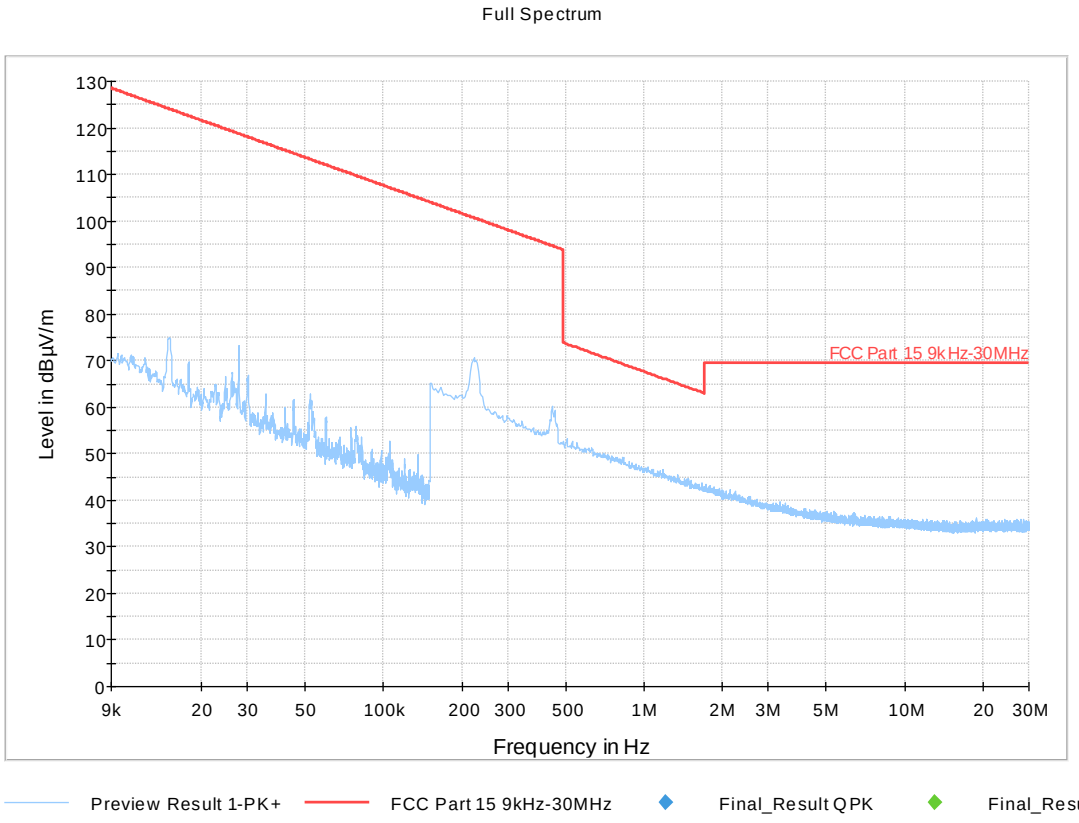
Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 18GHz – 26GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



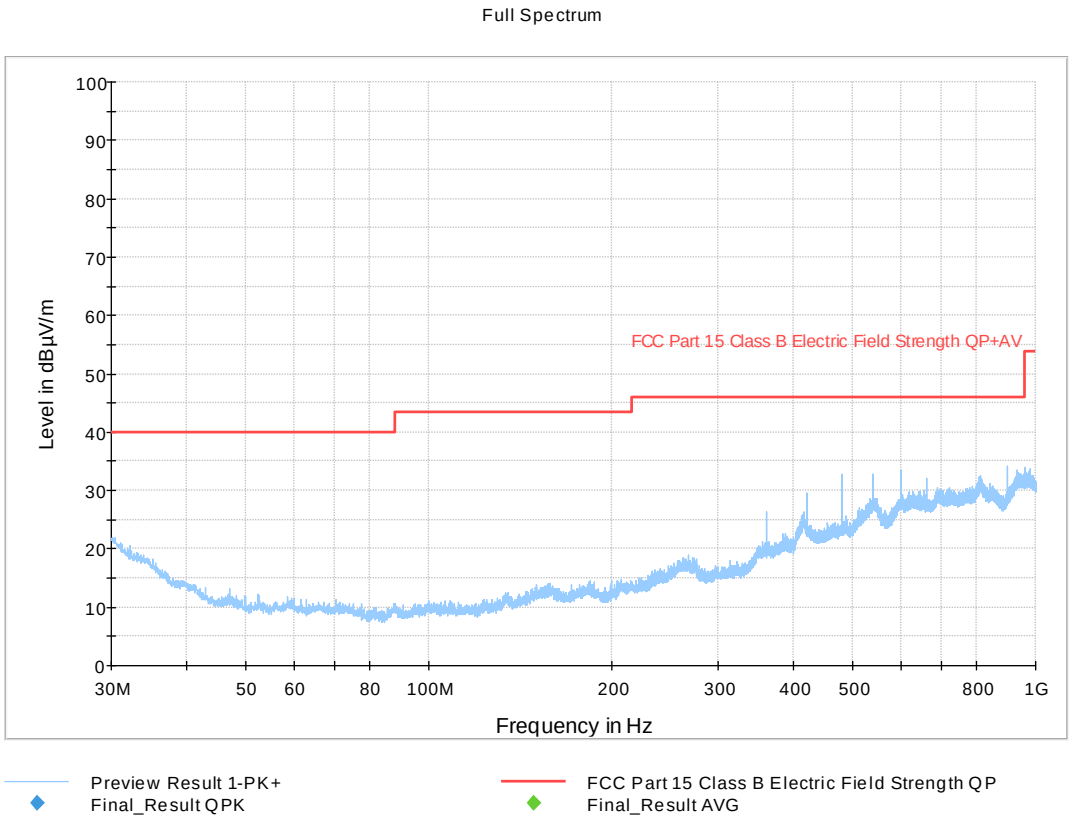
Graphical presentation of radiated emission
Operating mode: 1 (Channel 0 – Frequency 2402)
Frequency scan: 18GHz – 26GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



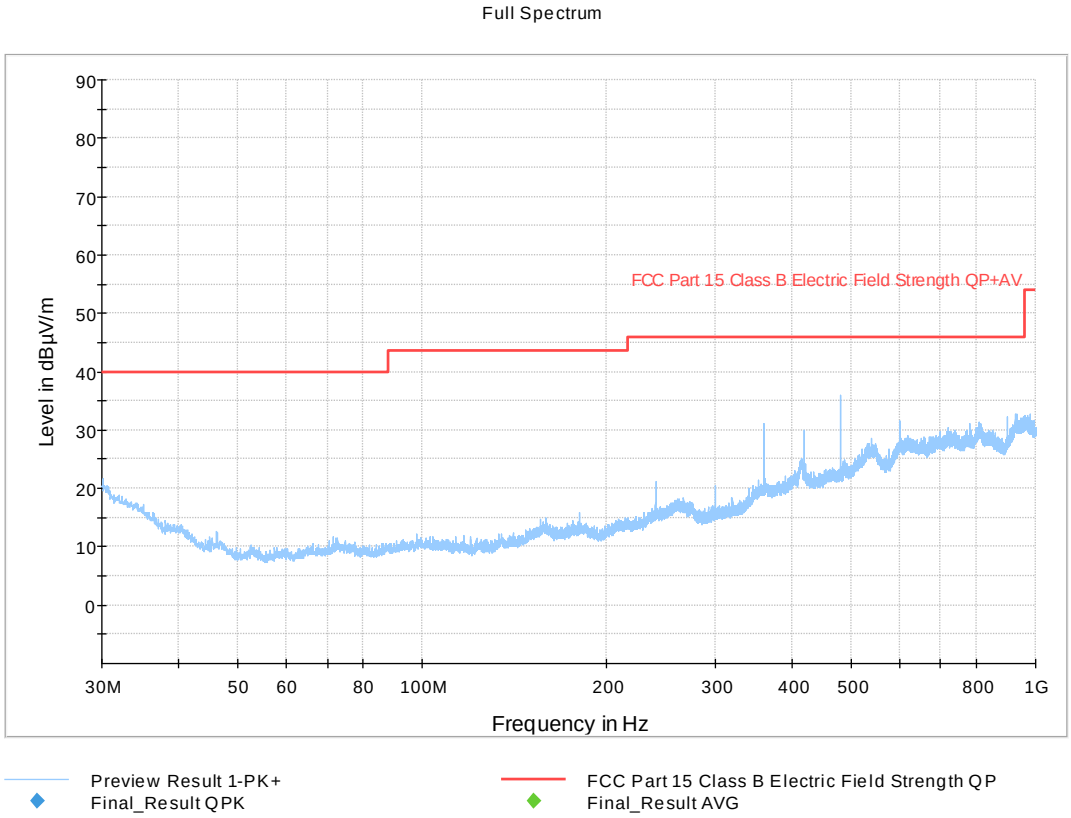
Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 9KHz – 30MHz
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



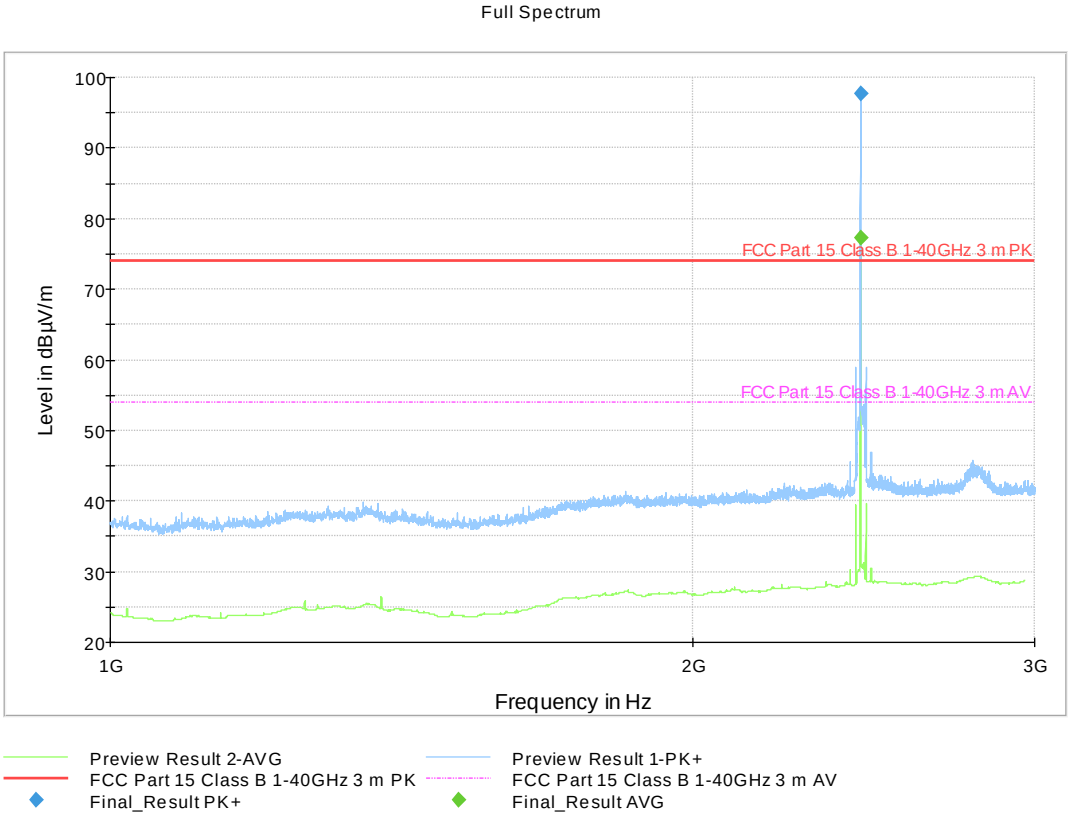
Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 30MHz – 1GHz
Antenna polarization: Vertical
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 30MHz – 1GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 1GHz – 3GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

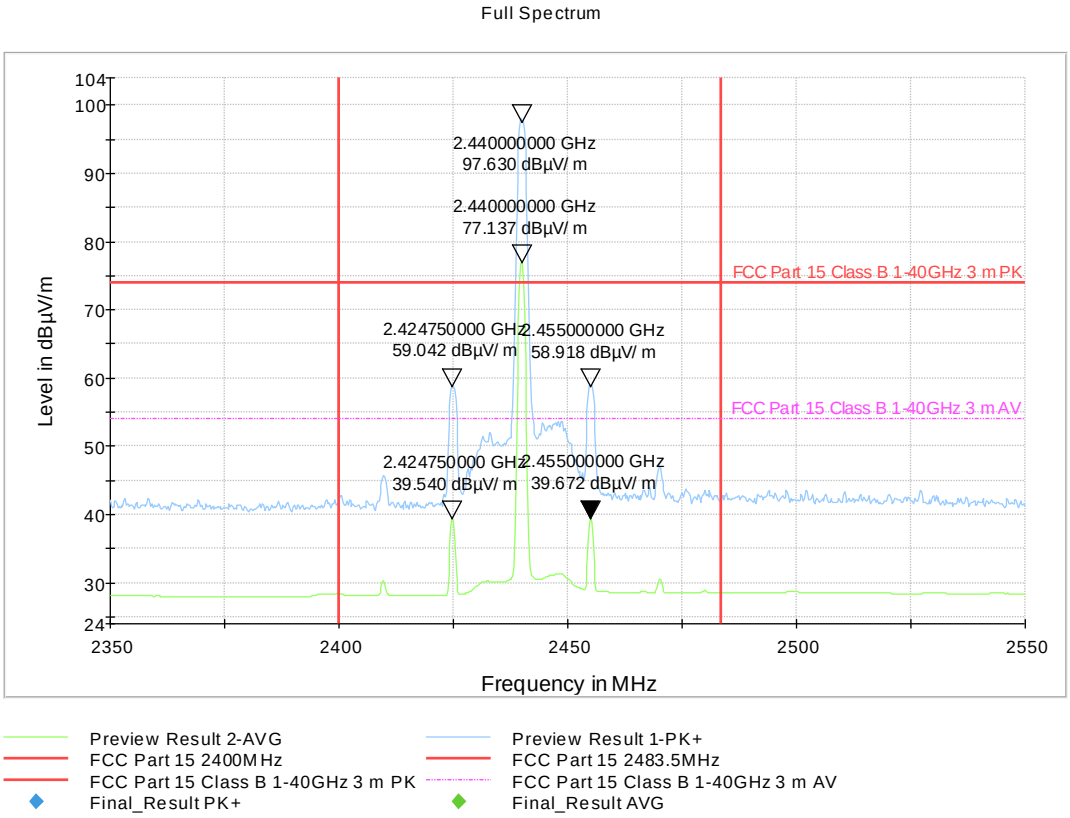


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2440.000000	**---**	**77.25**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**V**	**0.0**
2440.000000	**97.73**	**---**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**V**	**0.0**

Peaks out of limits are due to BT carrier (exclusion band).
Fundamental frequency not related to limit.

Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency: Restricted band of operations near fundamental
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Peaks out of limits are due to BLE carrier (exclusion band).
Fundamental frequency not related to limit.

Fundamental Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2440.000000	107.43	---	-13.11	3.31	97.63
2440.000000	---	86.94	-13.11	3.31	77.14

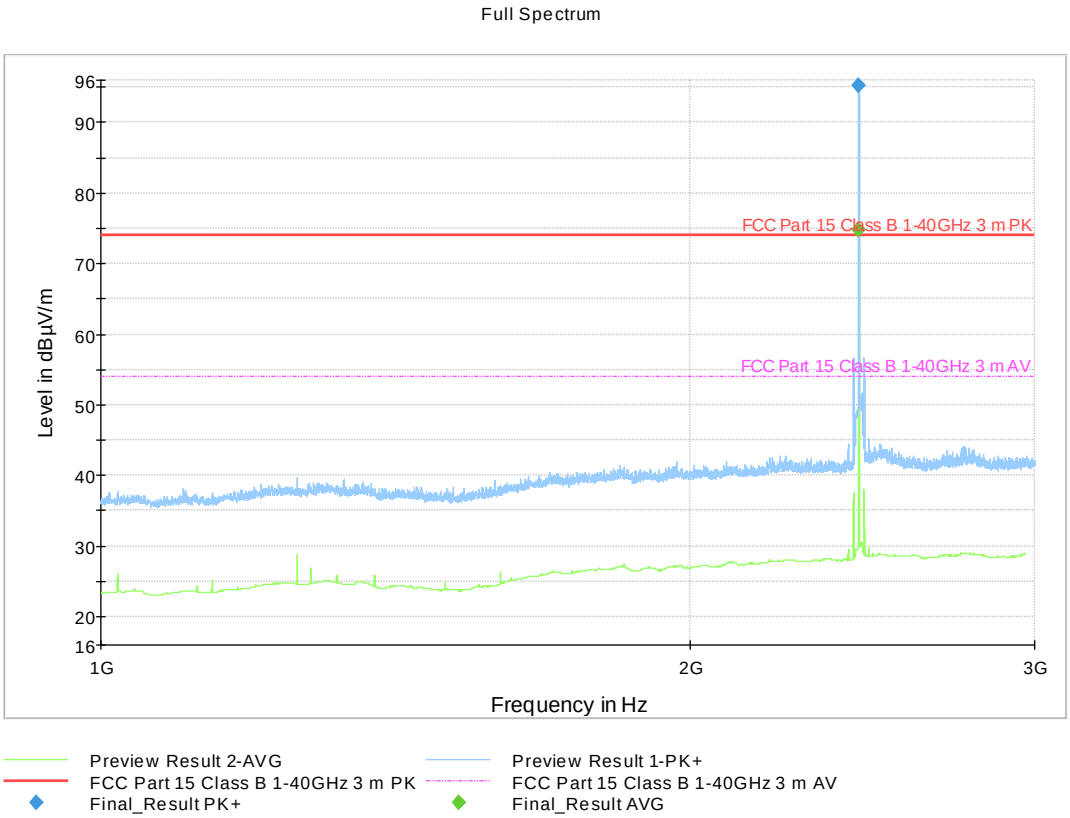
Harmonic Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2424.750000	68.83	---	-13.09	3.30	59.04
2424.750000	---	49,33	-13.09	3.30	39.54

Harmonic Level

Harmonic Level Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2455.000000	68.72	---	-13.12	3.32	58.92
2455.000000	---	49,47	-13.12	3.32	39.67

Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 1GHz – 3GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

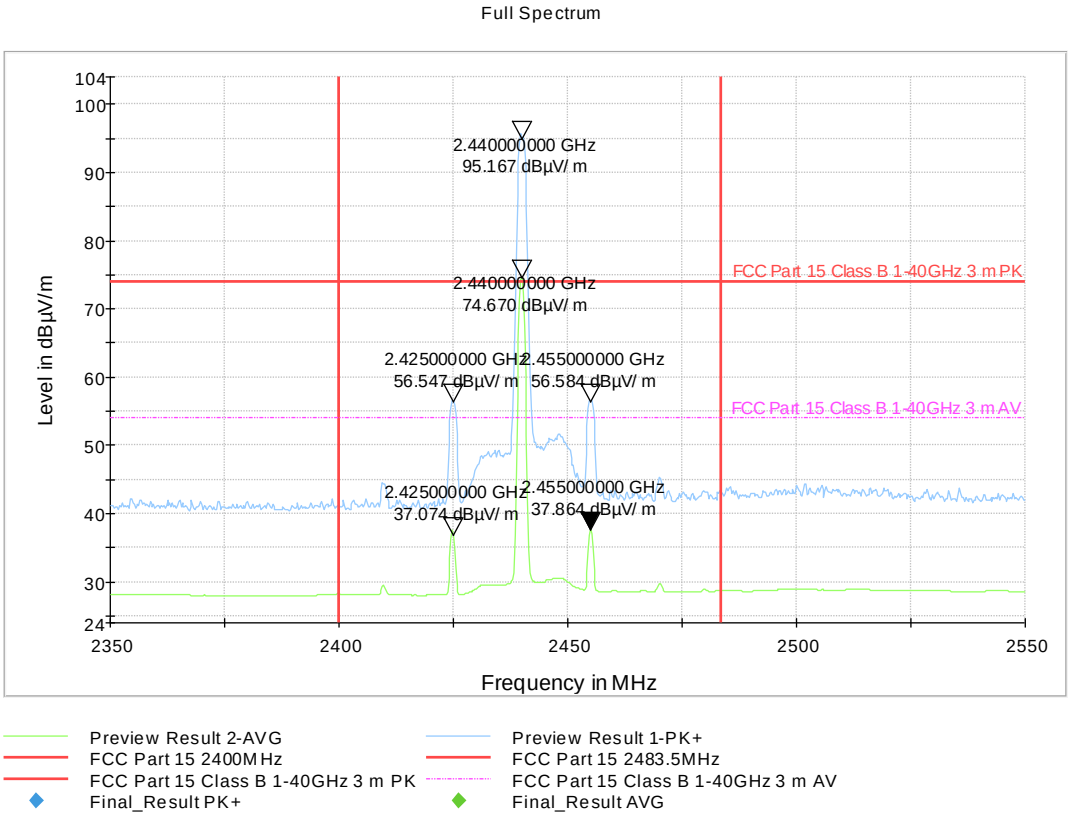


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2444.000000	**---**	**74.80**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**H**	**90.0**
2444.000000	**95.28**	**---**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**H**	**90.0**

Peaks out of limits are due to BT carrier (exclusion band).
Fundamental frequency not related to limit.

Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency: Restricted band of operations near fundamental
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Peaks out of limits are due to BLE carrier (exclusion band).
Fundamental frequency not related to limit.

Fundamental Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2440.000000	104,96	---	-13.11	3.31	95.16
2440.000000	---	84.47	-13.11	3.31	74.67

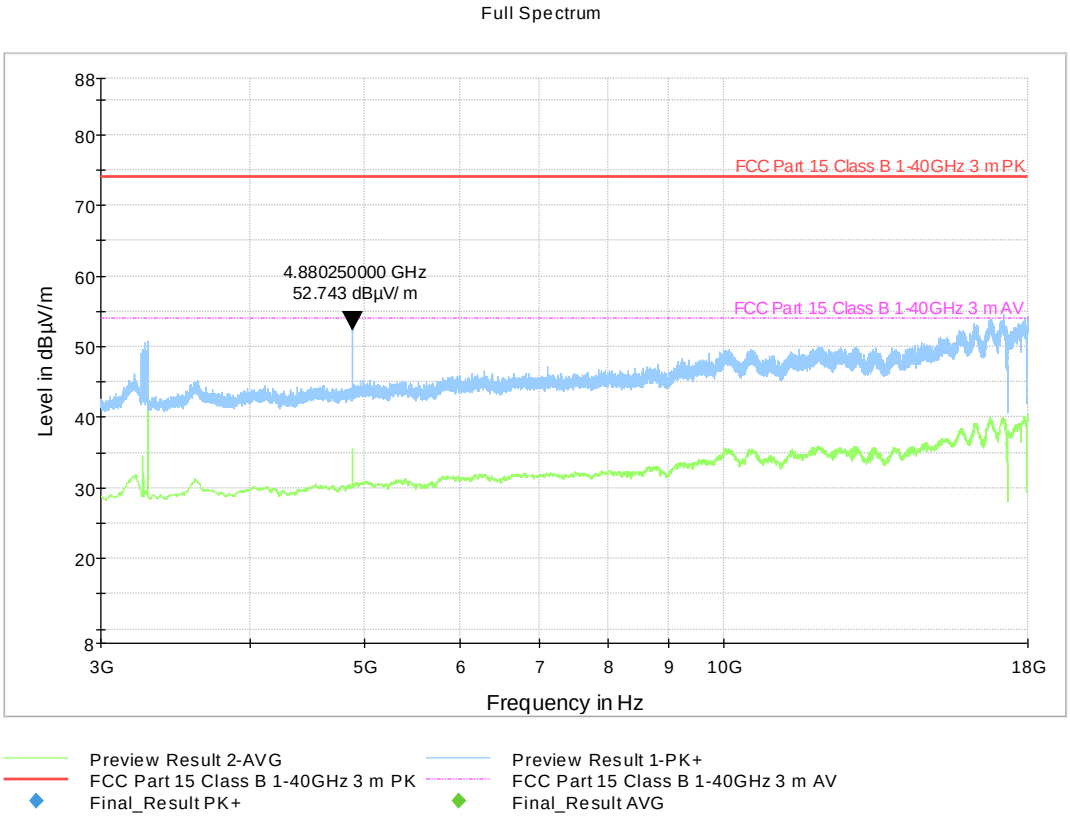
Harmonic Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2425.000000	46.86	---	-13.09	3.30	37.07
2425.000000	---	66,34	-13.09	3.30	56.55

Harmonic Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2455.000000	66.39	---	-13.12	3.32	56.59
2455.000000	---	47,66	-13.12	3.32	37.86

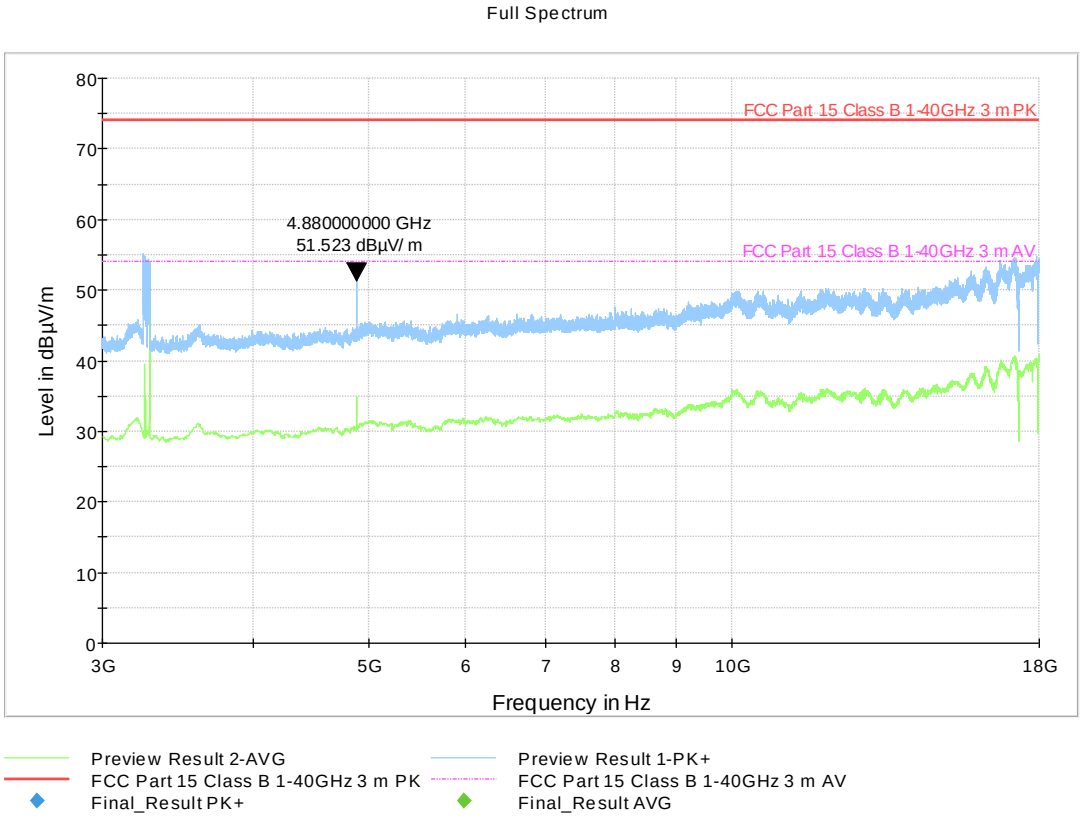
Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 3GHz -18GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4880.250000	52.74	74.00	21.26	1000.0	1000.000	150.0	V	90.0

Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 3GHz -18GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



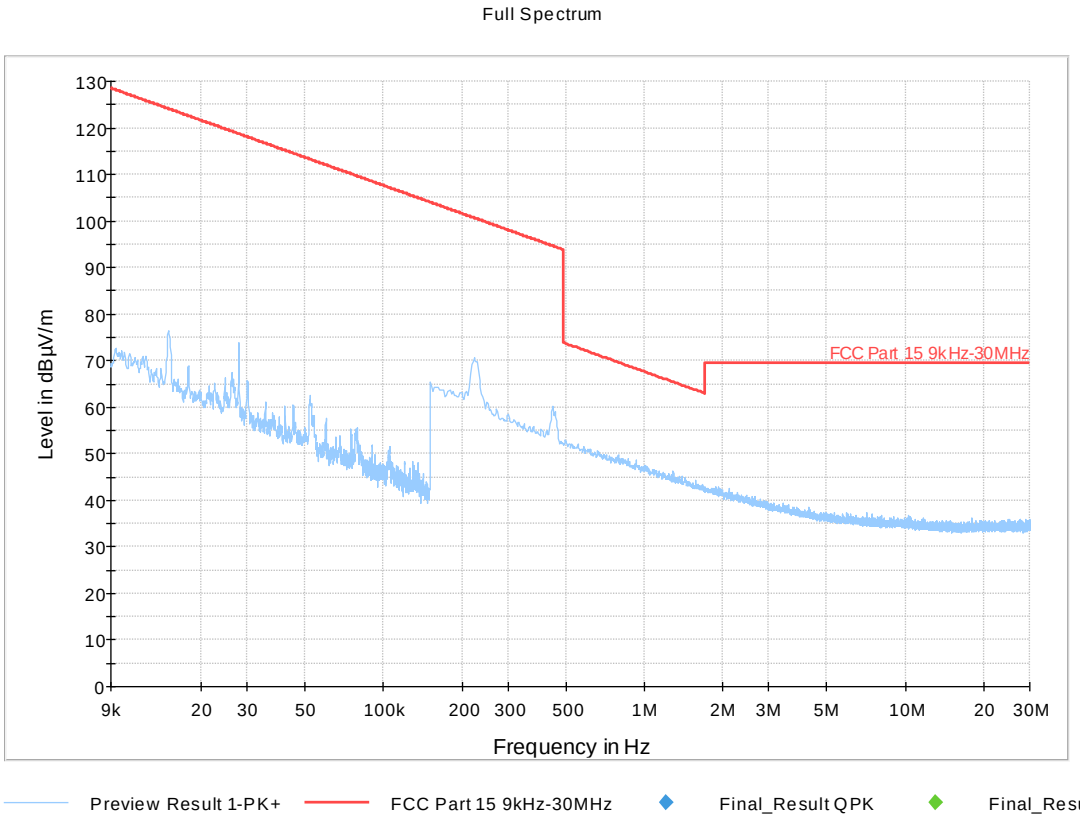
Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4880.000000	51,52	74.00	22.48	1000.0	1000.000	150.0	H	0.0

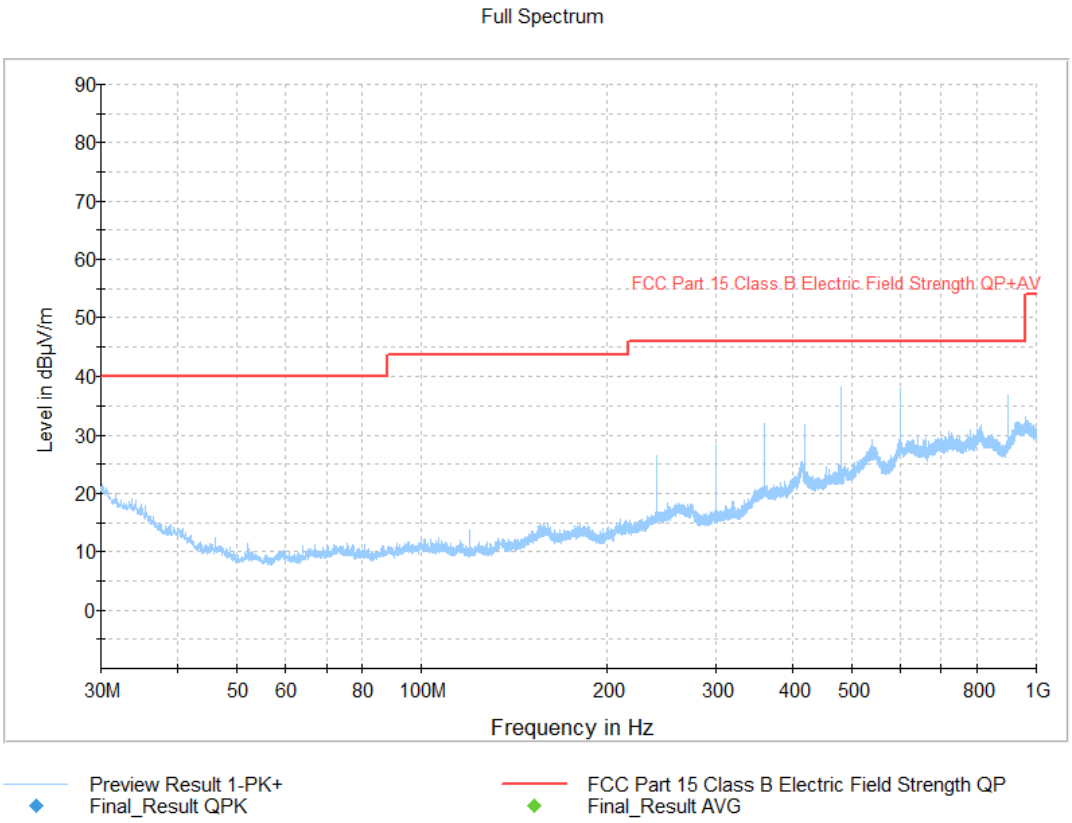
Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 18GHz – 26GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

Graphical presentation of radiated emission
Operating mode: 2 (Channel 38 – Frequency 2440)
Frequency scan: 18GHz – 26GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

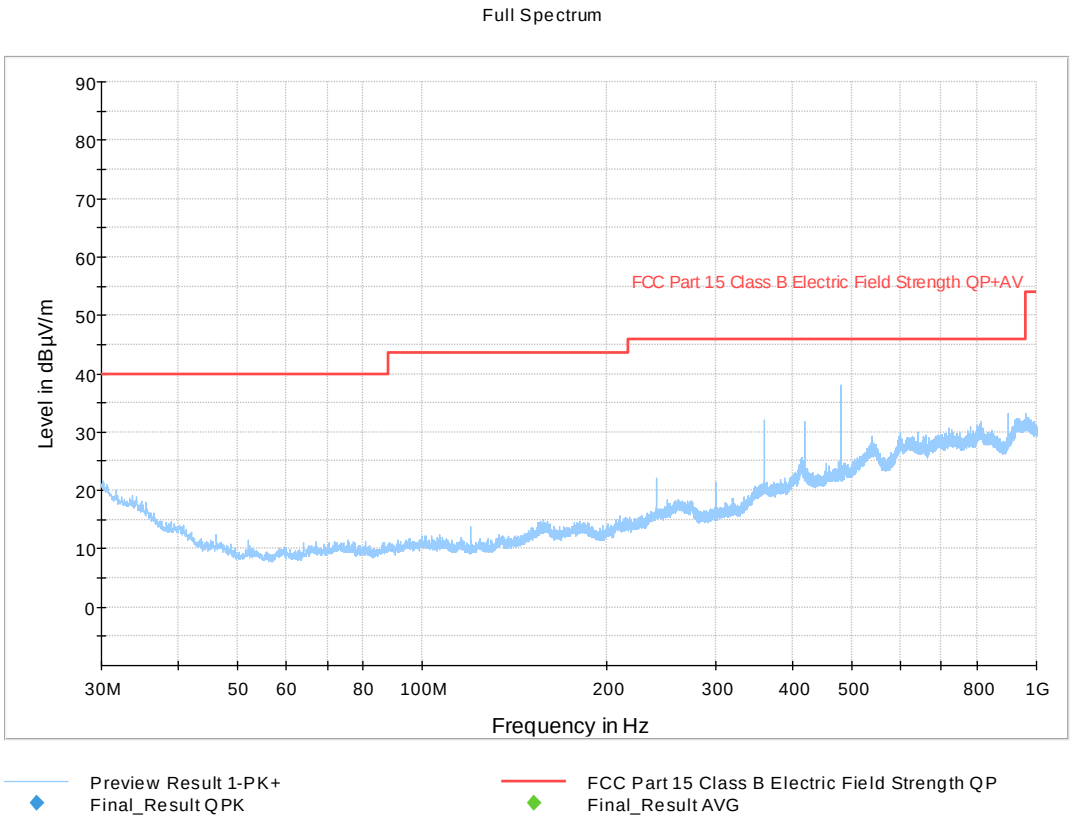
Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 9KHz – 30MHz
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



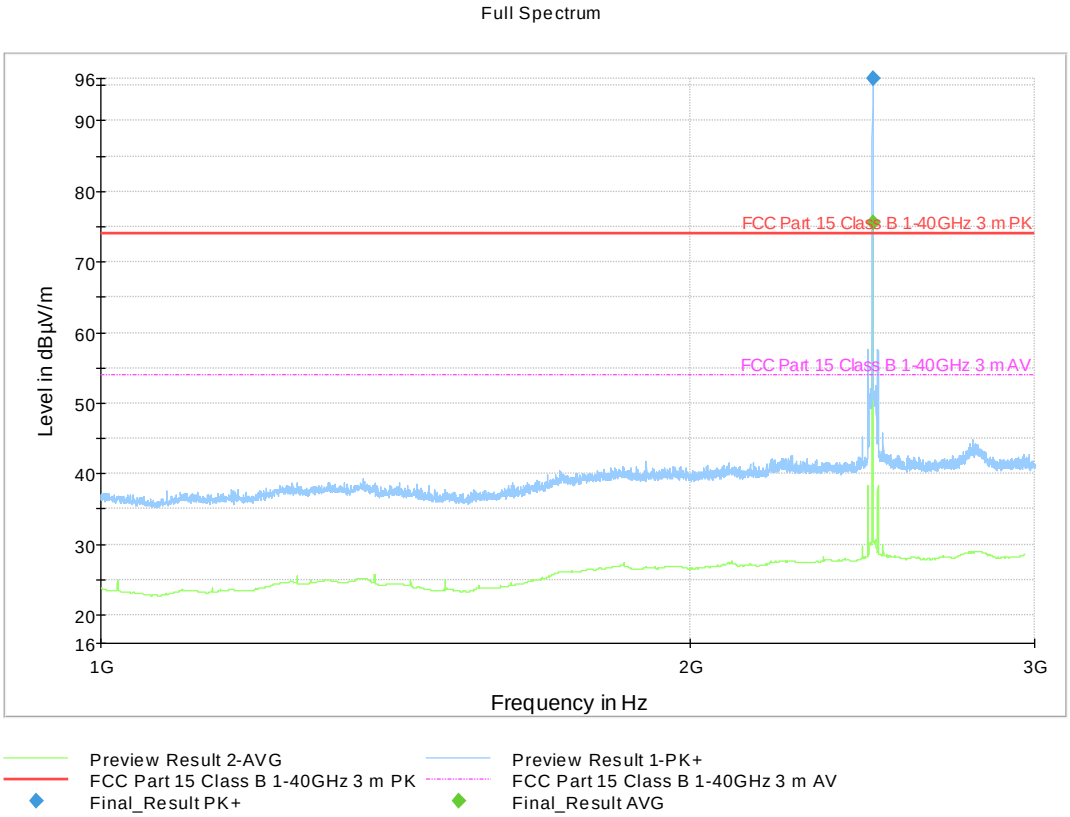
Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 30MHz – 1GHz
Antenna polarization: Vertical
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 30MHz – 1GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 1GHz – 3GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

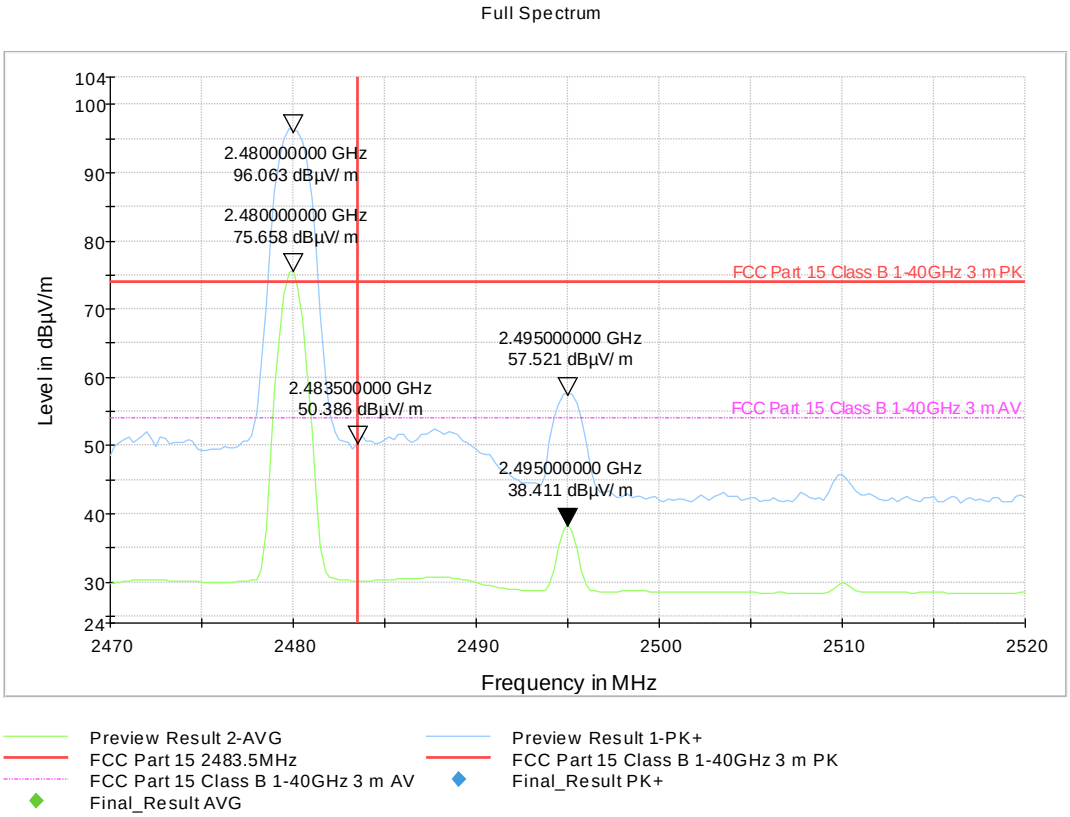


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2480.000000	**---**	**75.55**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**V**	**0.0**
2480.000000	**95.91**	**---**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**V**	**0.0**

Peaks out of limits are due to BT carrier (exclusion band).
Fundamental frequency not related to limit.

Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency: Restricted band of operations near fundamental
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Peaks out of limits are due to BT carrier (exclusion band).
Fundamental frequency not related to limit.

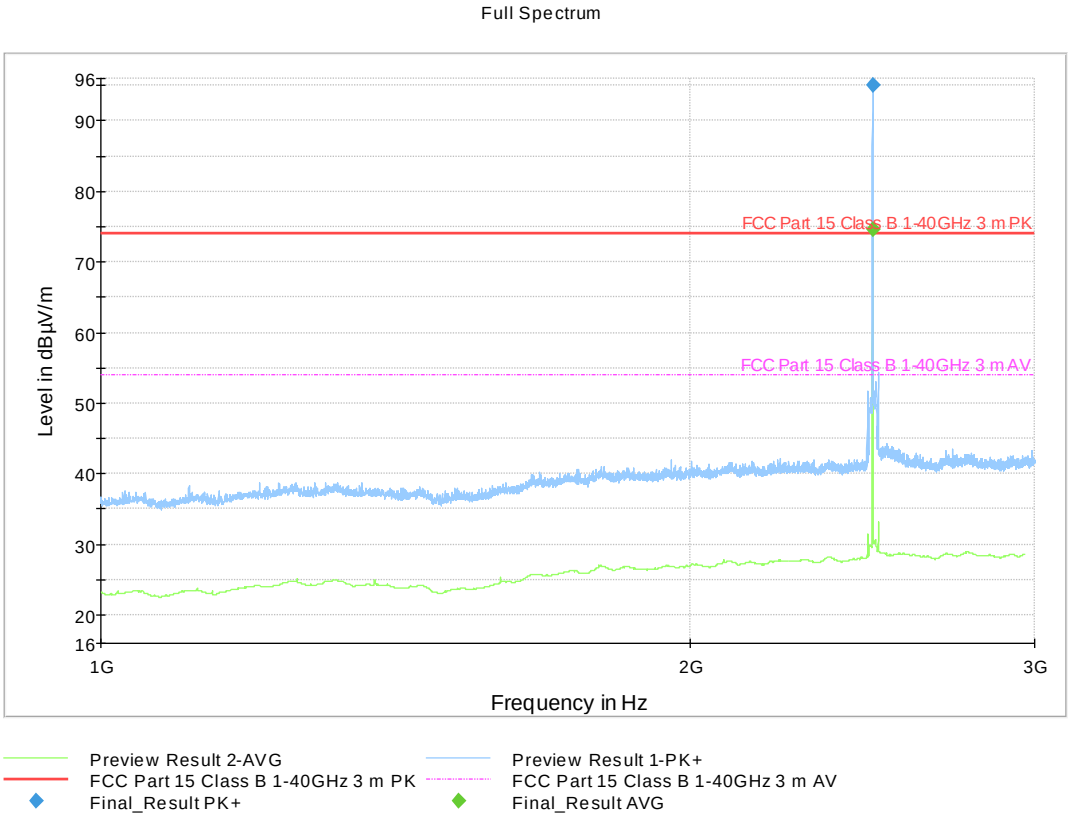
Fundamental Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2480.000000	104,83	---	-13.02	3.35	95.16
2480.000000	---	84,34	-13.02	3.35	74.67

Harmonic Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2495.000000	67.13	---	-12.98	3.37	57.52
2495.000000	---	48,02	-12.98	3.37	38.41

Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 1GHz – 3GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

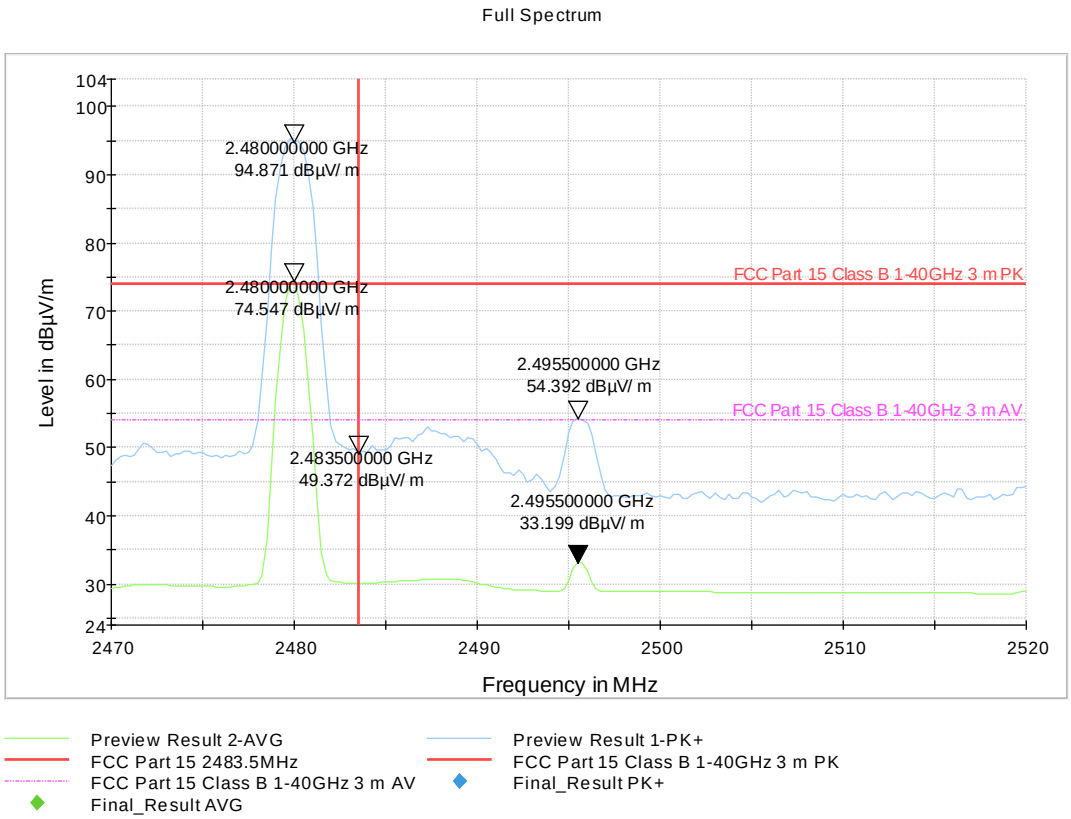


Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
2480.000000	**---**	**74.61**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**H**	**0.0**
2480.000000	**94.96**	**---**	**---**	**---**	**1000.0**	**1000.000**	**150.0**	**H**	**0.0**

Peaks out of limits are due to BT carrier (exclusion band).
Fundamental frequency not related to limit.

Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency: Restricted band of operations near fundamental
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



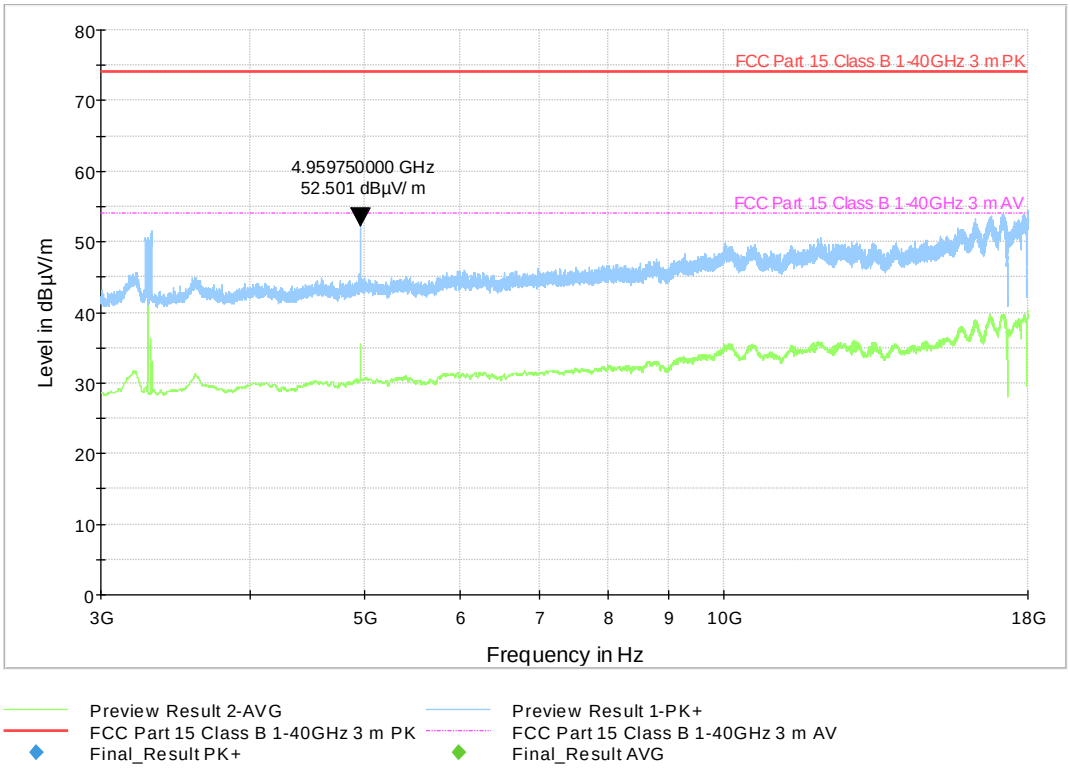
Fundamental Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2480.000000	104,54	---	-13.02	3.35	94.87
2480.000000	---	84,21	-13.02	3.35	74.54

Harmonic Level

Frequency (MHz)	Reading value (dBµV/m)		Antenna Factor with pre-Amplifier (dB3/m)	Cable Loss (dB)	Correct reading (dBµV/m)
	Peak	Average			
2495.000000	64.00	---	-12.98	3.37	54.39
2495.000000	---	42,81	-12.98	3.37	33.20

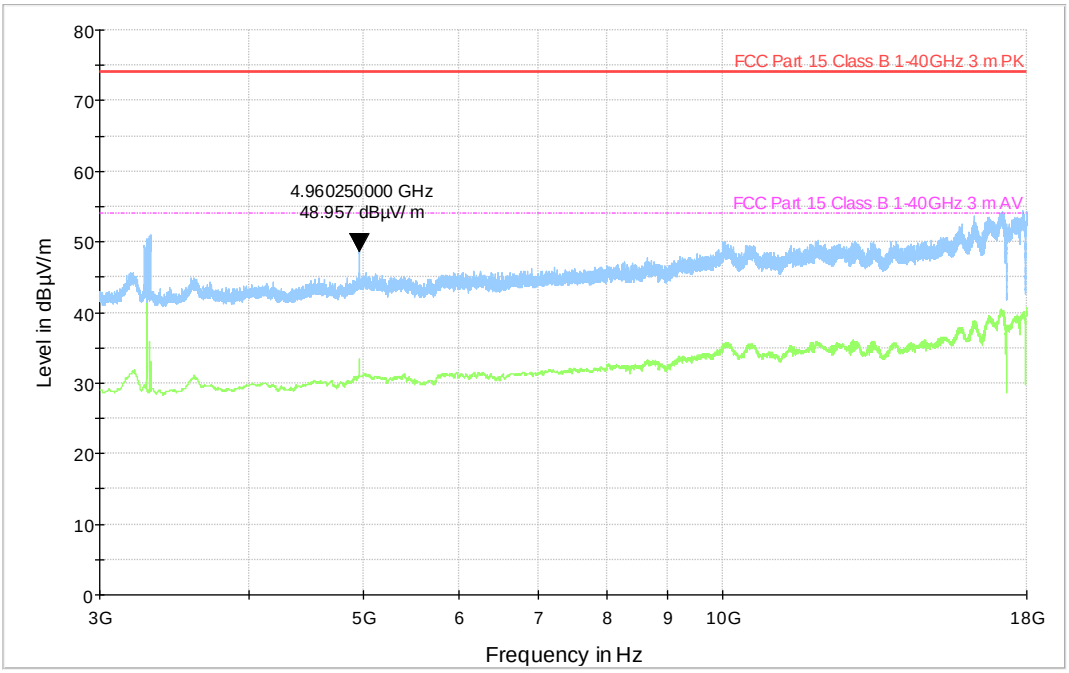
Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 3GHz -18GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4959.750000	52.50	74.00	21.50	1000.0	1000.000	150.0	V	0.0

Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 3GHz -18GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m



<<<

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
4960.250000	48.96	74.00	25.04	1000.0	1000.000	150.0	H	0.0

Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 18GHz – 26GHz
Antenna polarization: Vertical
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

Graphical presentation of radiated emission
Operating mode: 3 (Channel 78 – Frequency 2480)
Frequency scan: 18GHz – 26GHz
Antenna polarization: Horizontal
Trace: Peak (blue trace); Average (green trace)
Axis: Y (worst case)
Data rate: 2M_DH1_1010 (worst case)
Measurement distance: 3m

Antenna requirements	
Test date	31/03/2022
Applied Standard	Title 47 Part 15 Subpart C §15.203
Test method	§ 5.8 of ANSI C63.10
Temperature	23,1°
Humidity	54%
Tested by	Francesco Lombardi
Model	MP350
Internal Storage No.	1 (Storage no. A003216149-003)
Operating mode	---
Tested terminals	Antenna connector
Result	PASS

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

Antenna specifications	
N° of authorized antenna types	2
Antenna type	SMD Antenna
Maximum total gain	0.5 dBi
External power amplifiers	Not present

Maximum Conducted Peak Output Power	
Test date	31/03/2022
Applied Standard	Title 47 Part 15 Subpart C §15.247
Test method	According to Par. 8.3.2.2 of KDB 558074 D01 15.247 Meas. Guidance v05r02 (and par. 11.9.1.1 of ANSI C63.10)
Temperature	20,5°
Humidity	54%
Tested by	Francesco Lombardi
Model	MP350
Internal Storage No.	1 (Storage no. A003216149-003)
Operating mode	1, 2, 3
Tested terminals	Antenna connector
Result	PASS

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

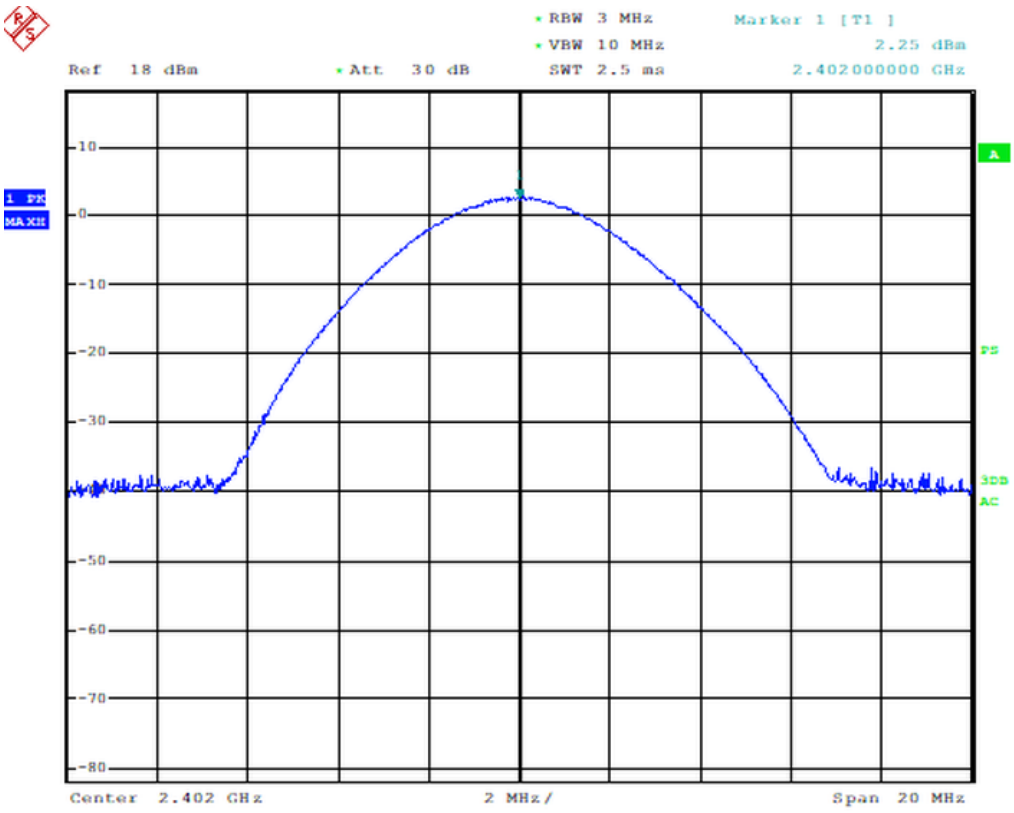
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note: since it was not possible to put in an antenna connector, test was carried out in a radiated manner According to Par. 2.3 of KDB 412172 D01 Determining ERP and EIRP v01r01

Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

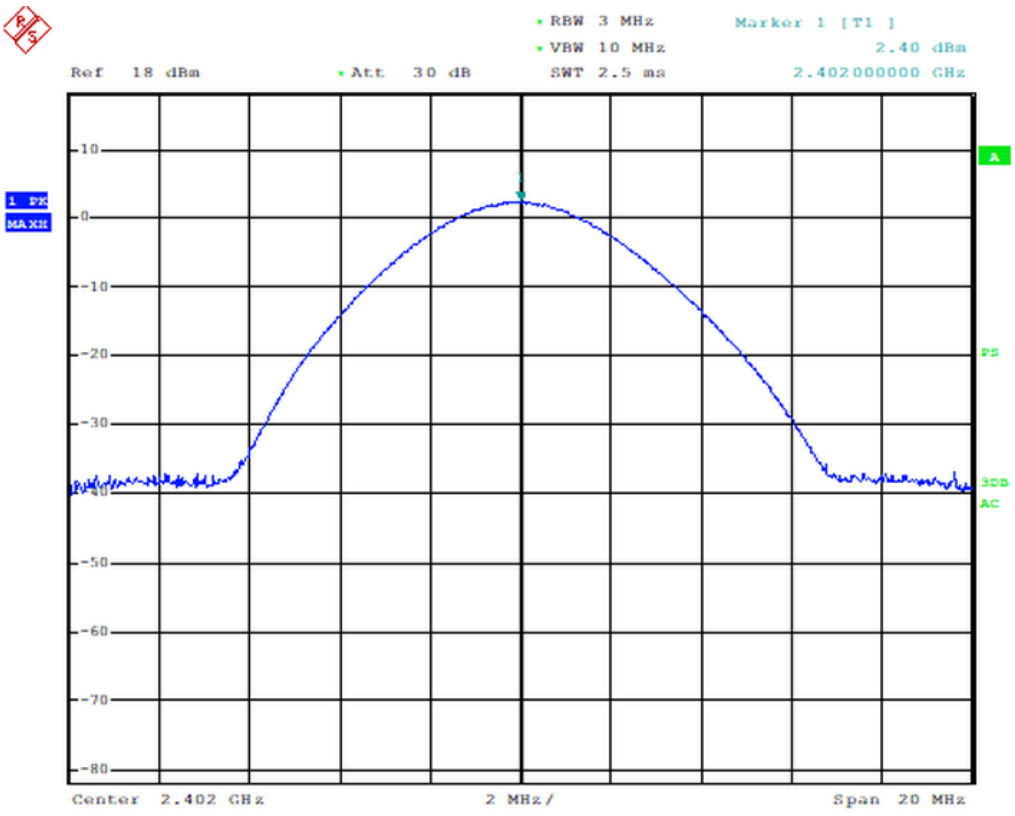
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH1_1010	2402	0	2.25	1.68	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

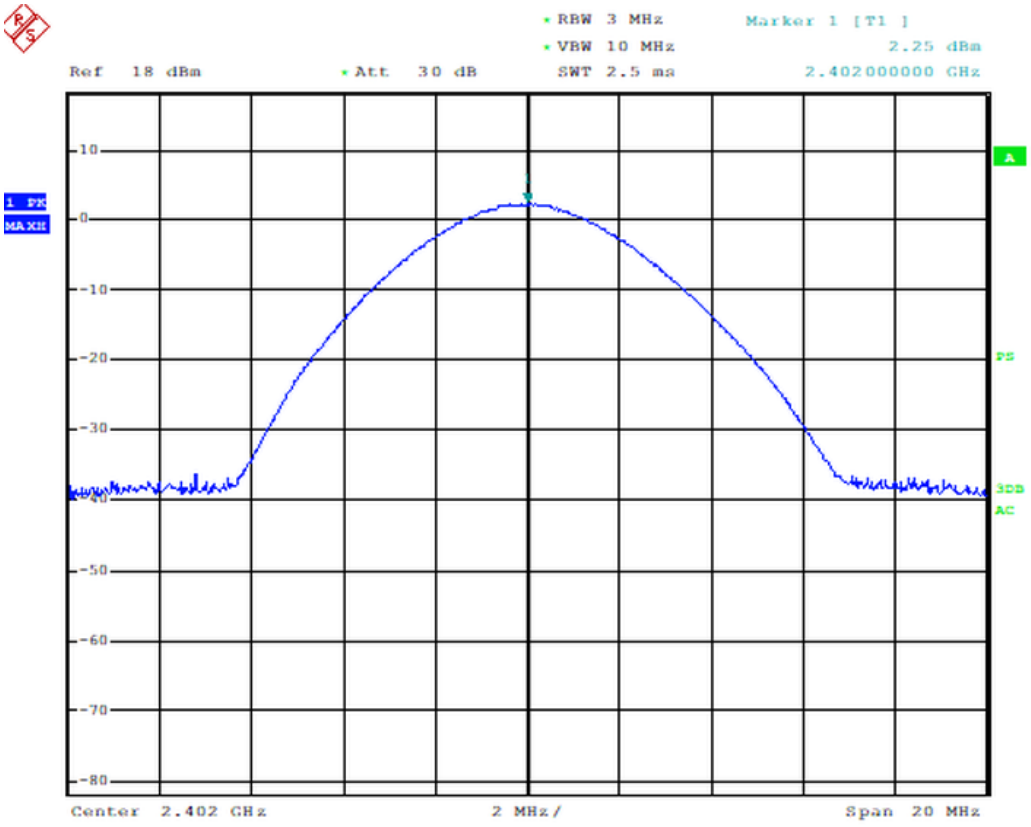
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH3_1010	2402	0	2.40	1.74	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

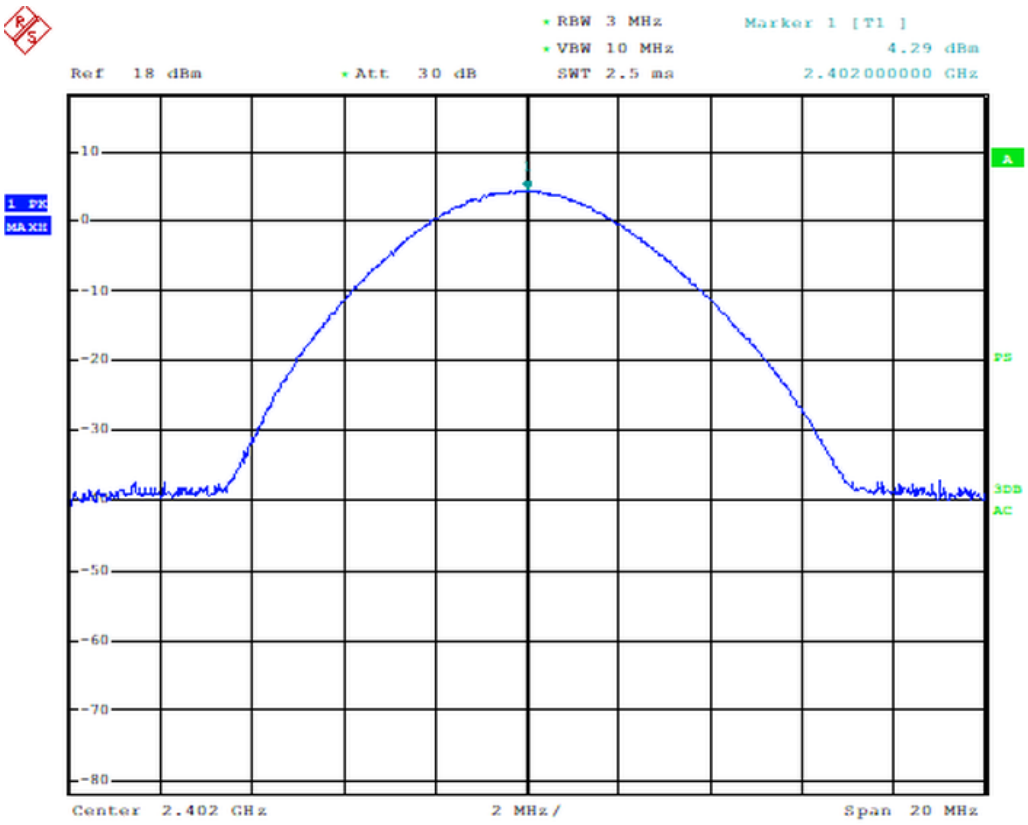
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH5_1010	2402	0	2.25	1.68	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

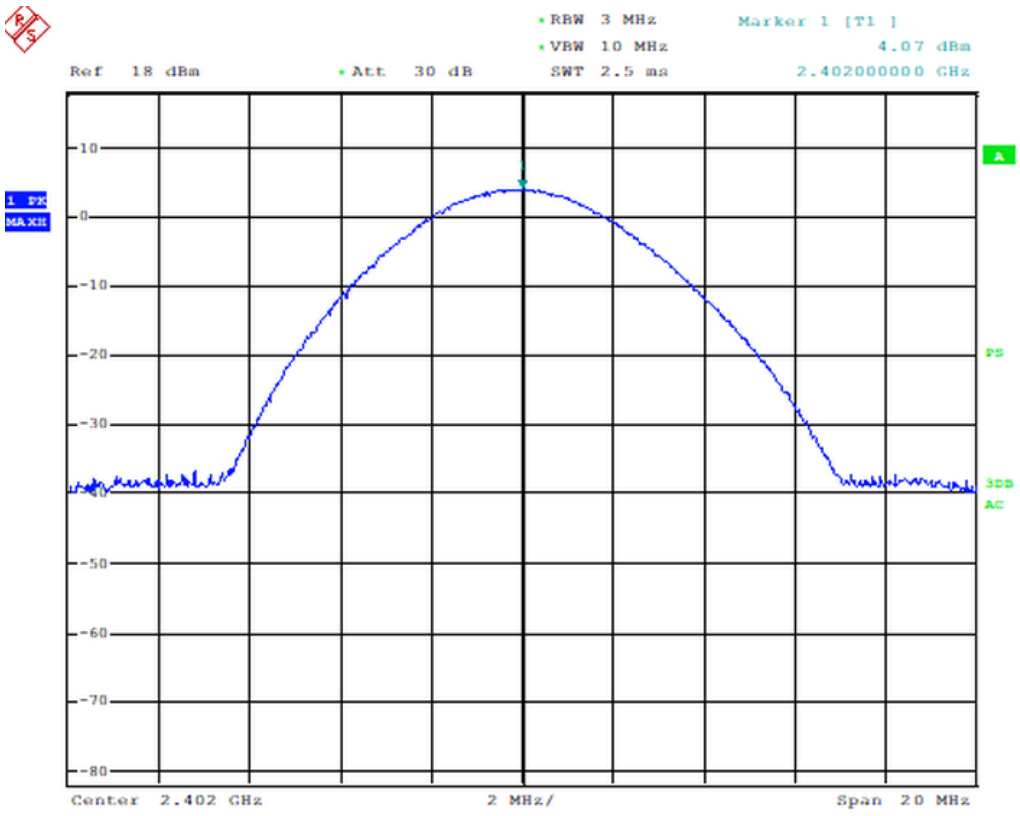
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH1_1010	2402	0	4.29	2.68	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

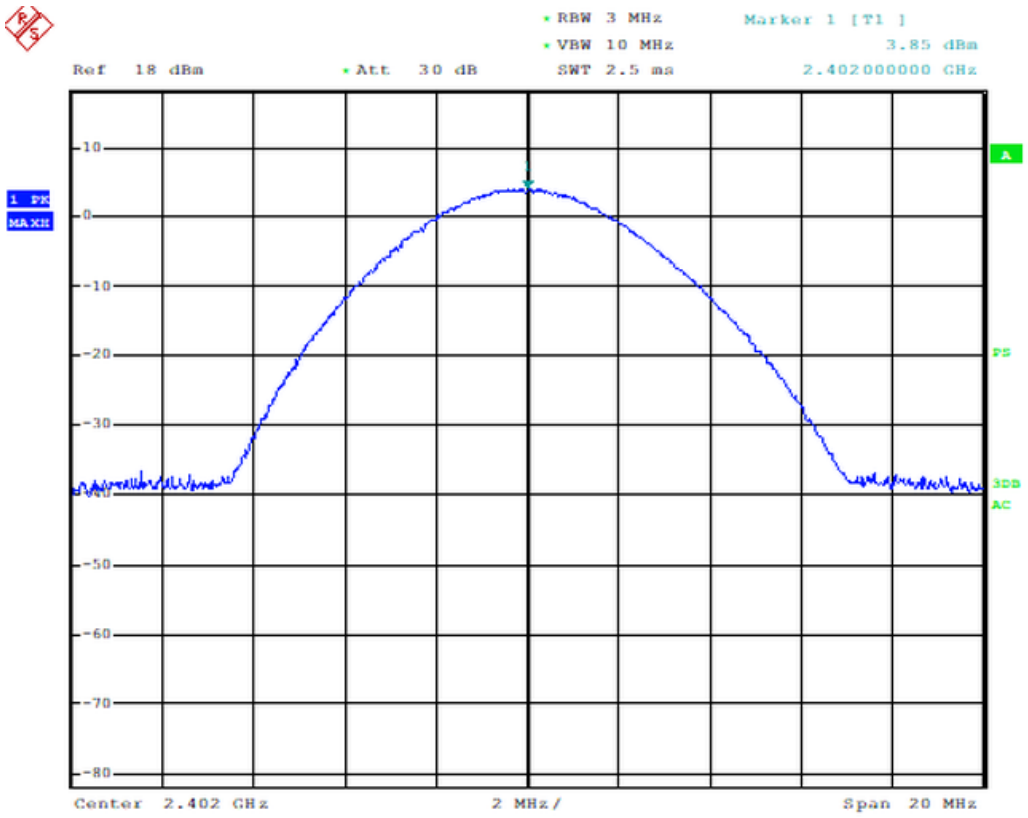
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH3_1010	2402	0	4.07	2.55	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

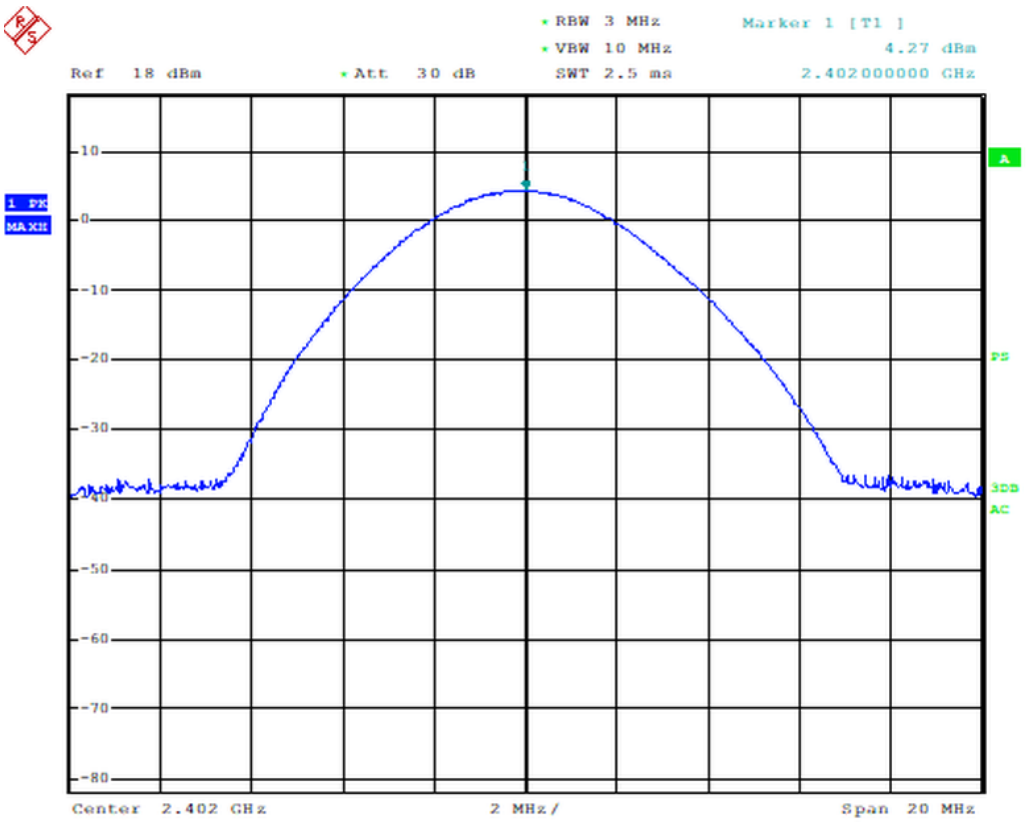
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH5_1010	2402	0	3.85	2.42	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

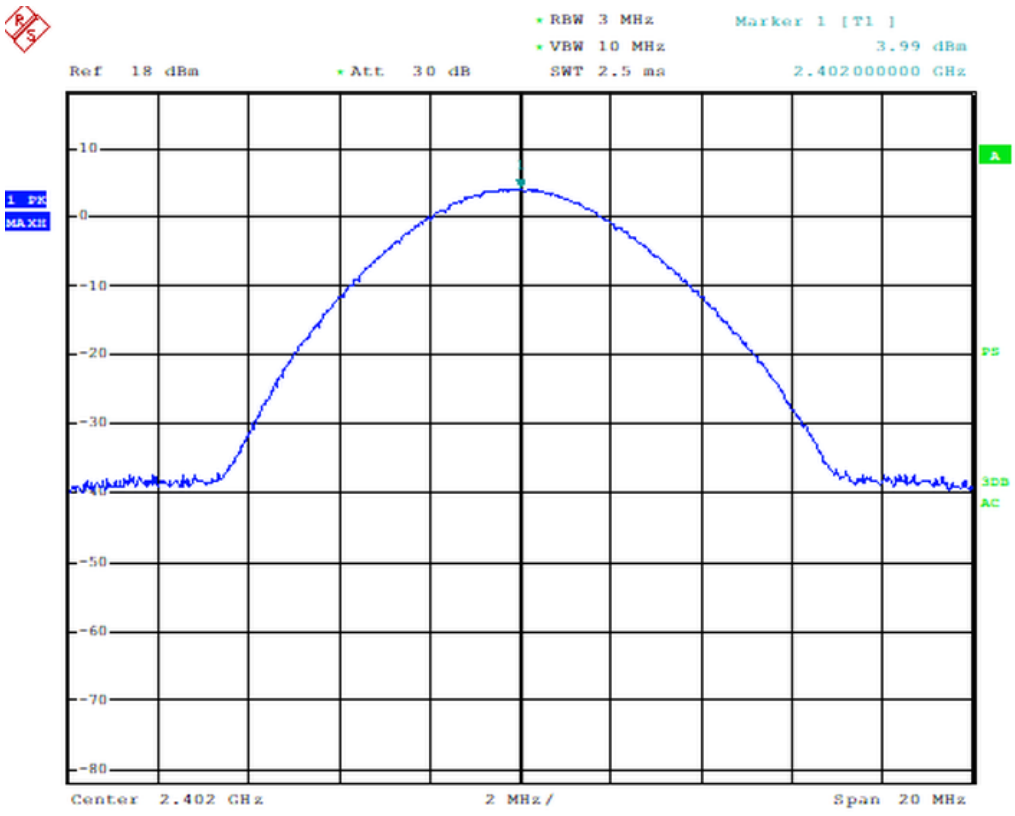
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH1_1010	2402	0	4.27	2.67	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

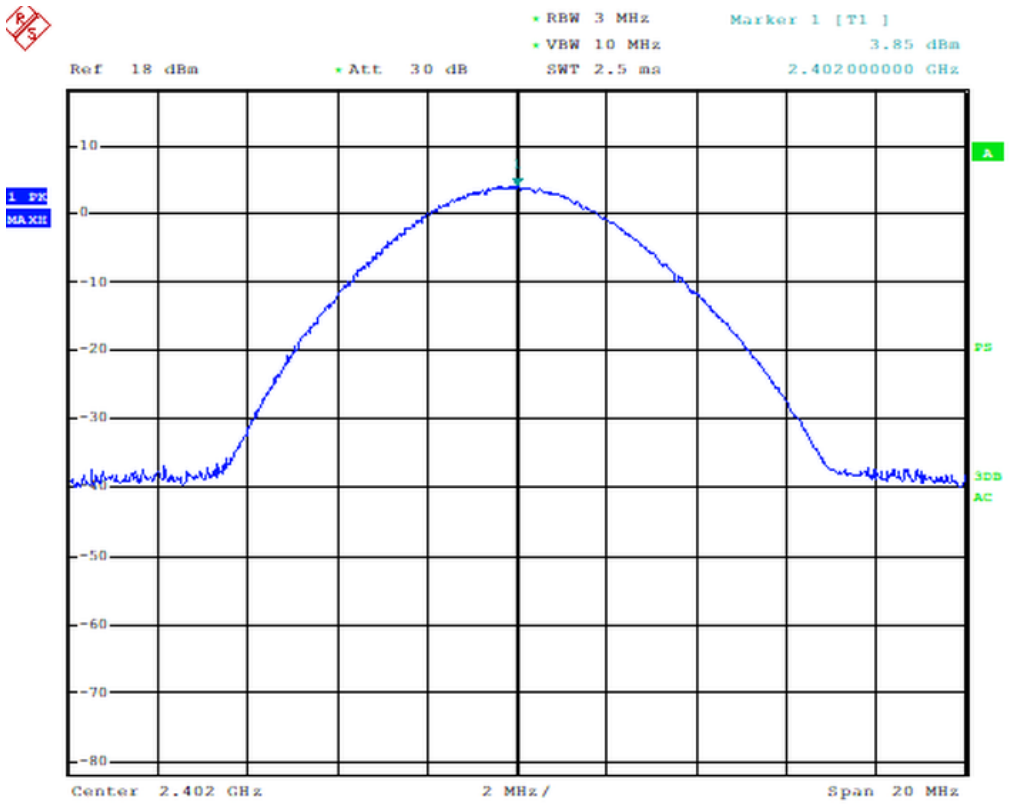
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH3_1010	2402	0	3.99	2.50	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 1 (Channel 0 – Frequency 2402)

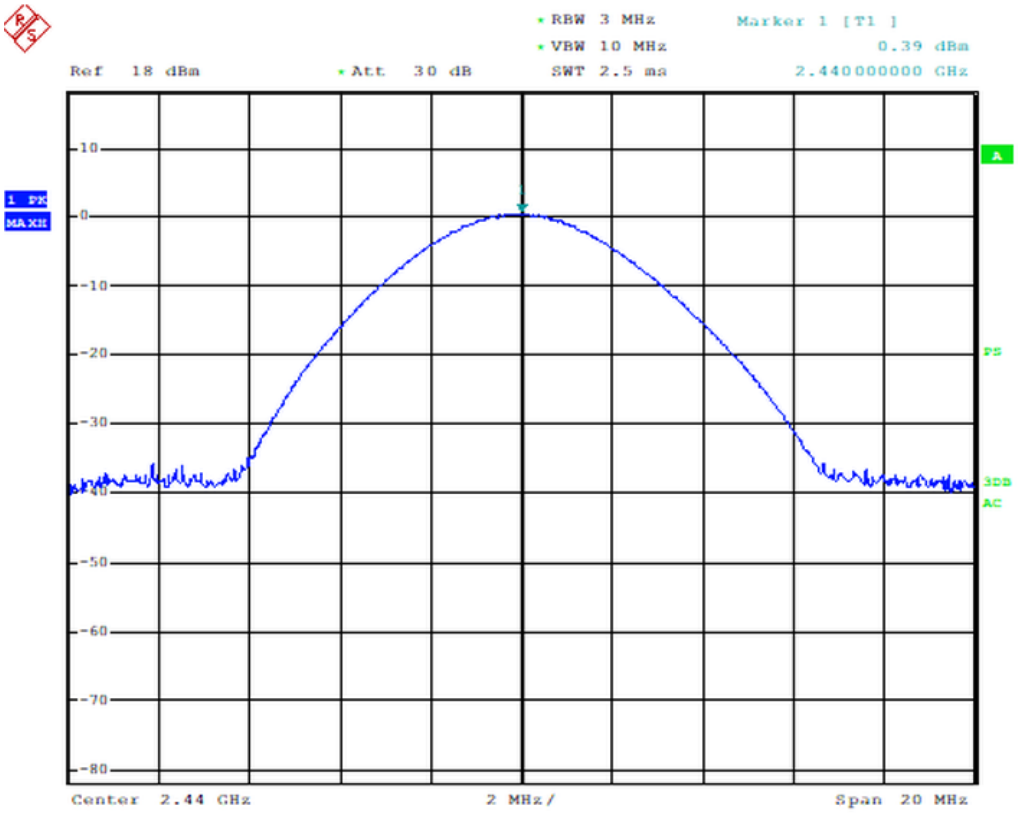
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH5_1010	2402	0	3.85	2.42	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

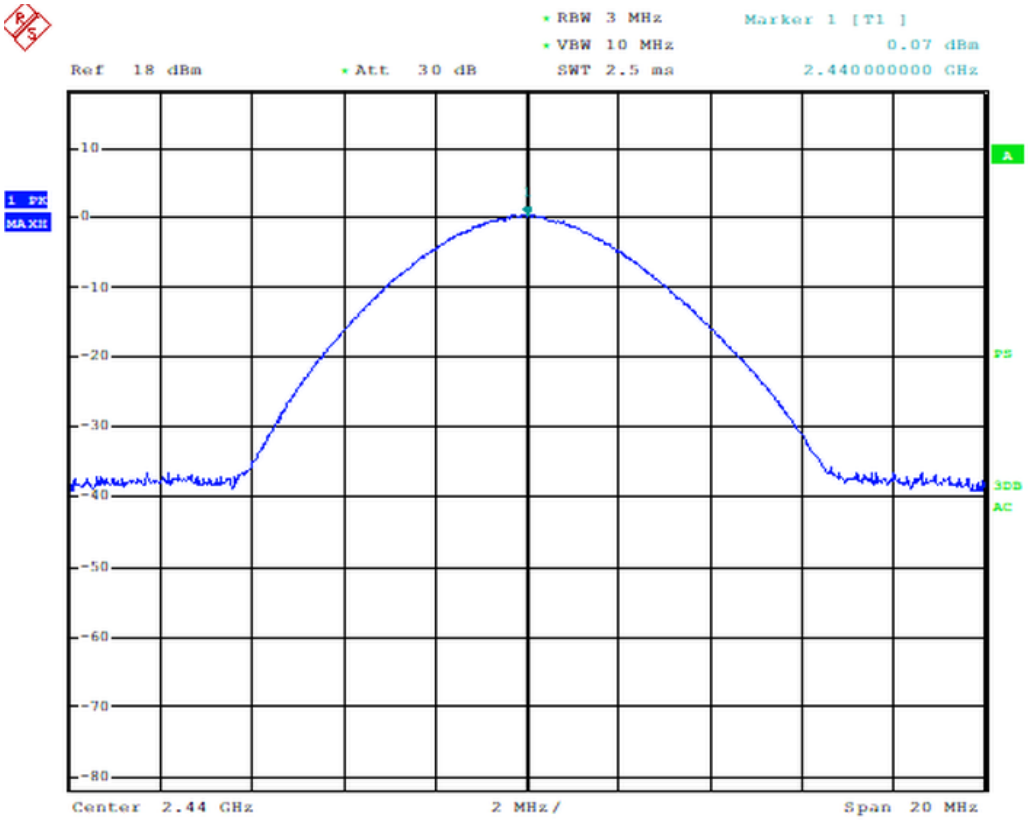
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH1_1010	2440	38	0.39	1.09	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

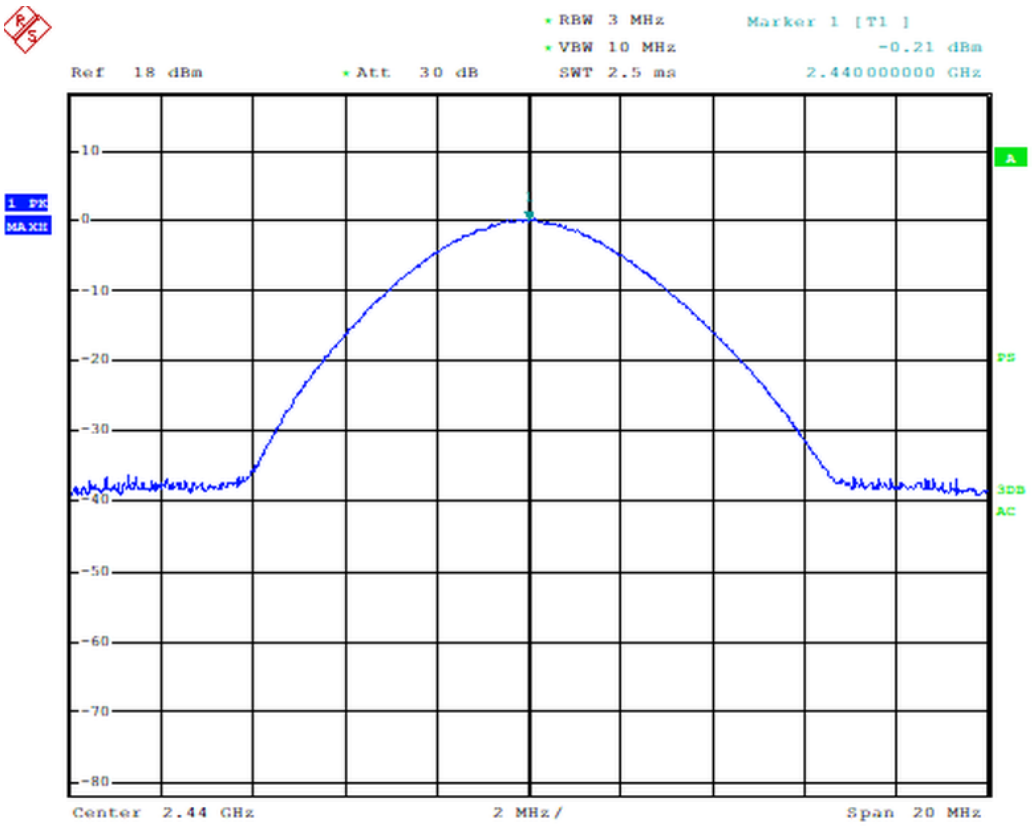
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH3_1010	2440	38	0.07	1.01	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

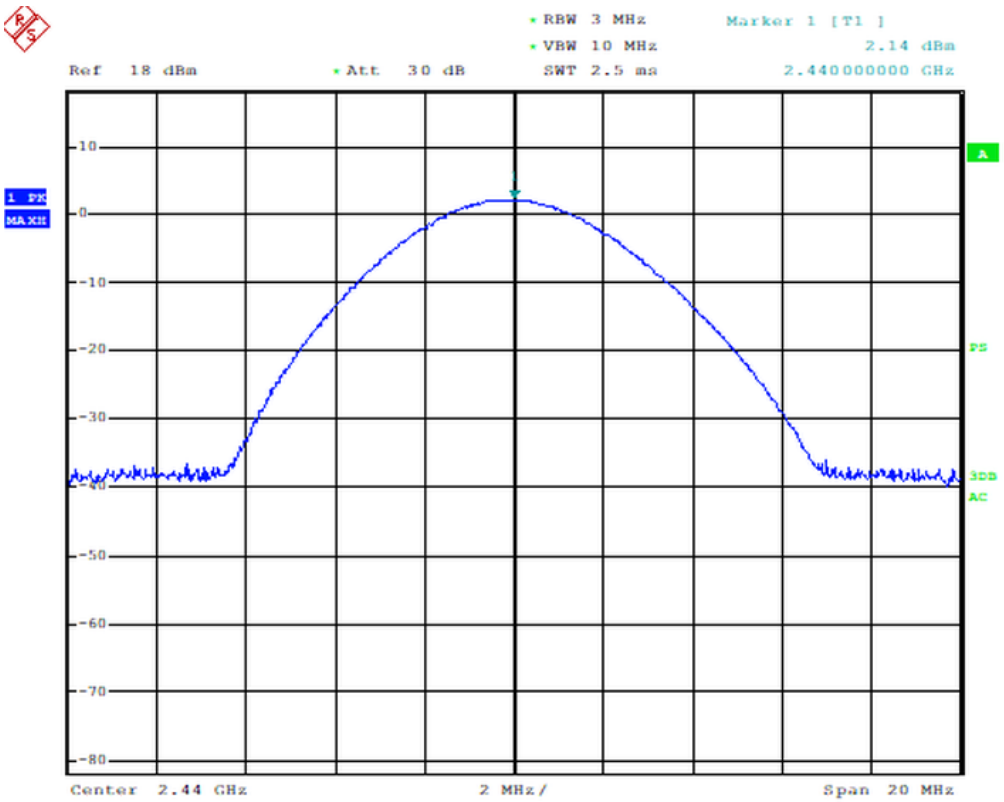
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH5_1010	2440	38	-0.21	0.95	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

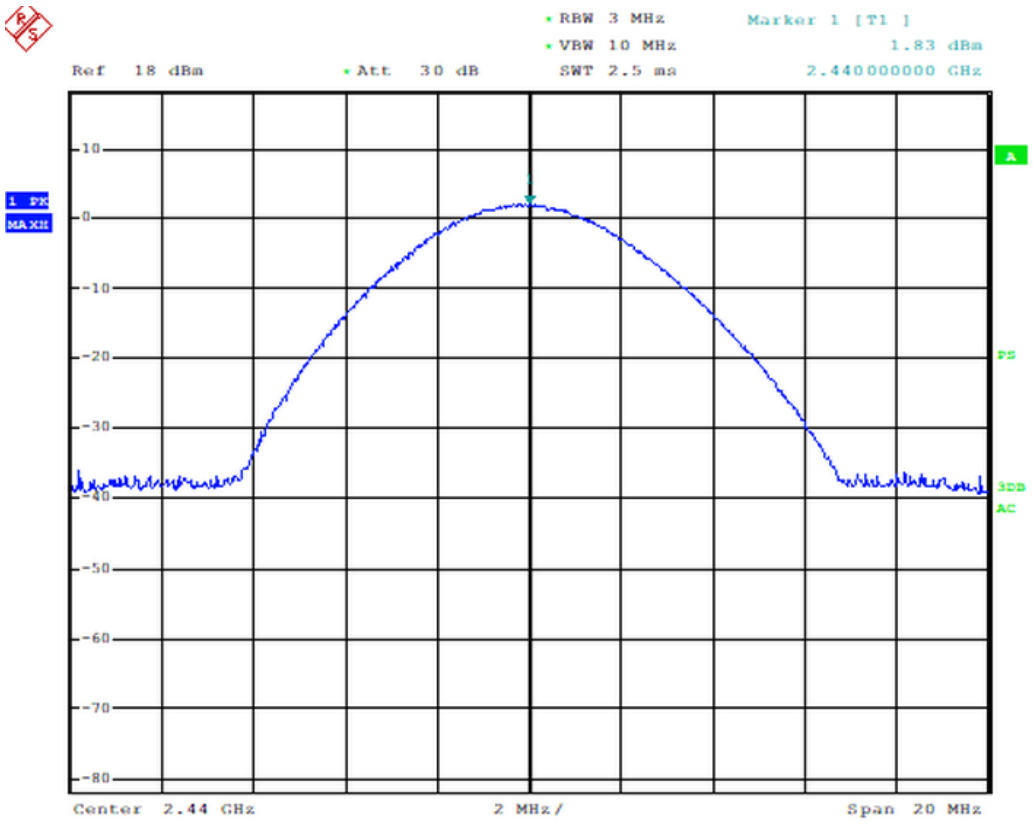
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH1_1010	2440	38	2.14	1.63	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

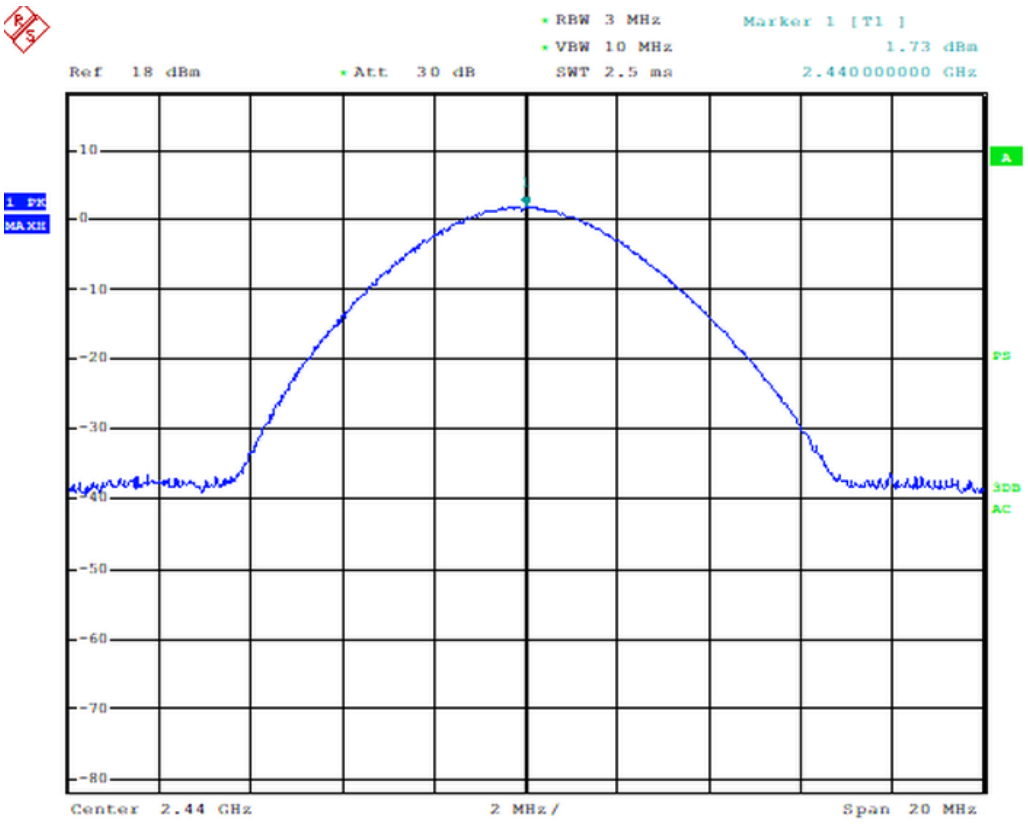
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH3_1010	2440	38	1.83	1.52	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

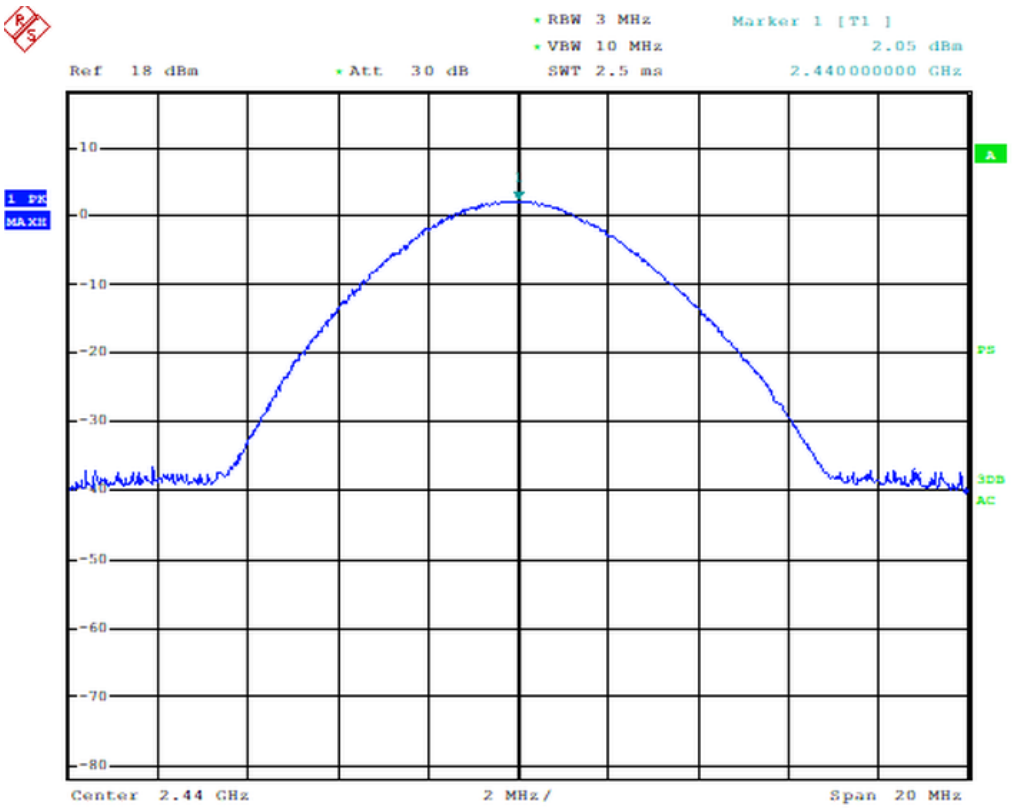
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH5_1010	2440	38	1.73	1.49	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

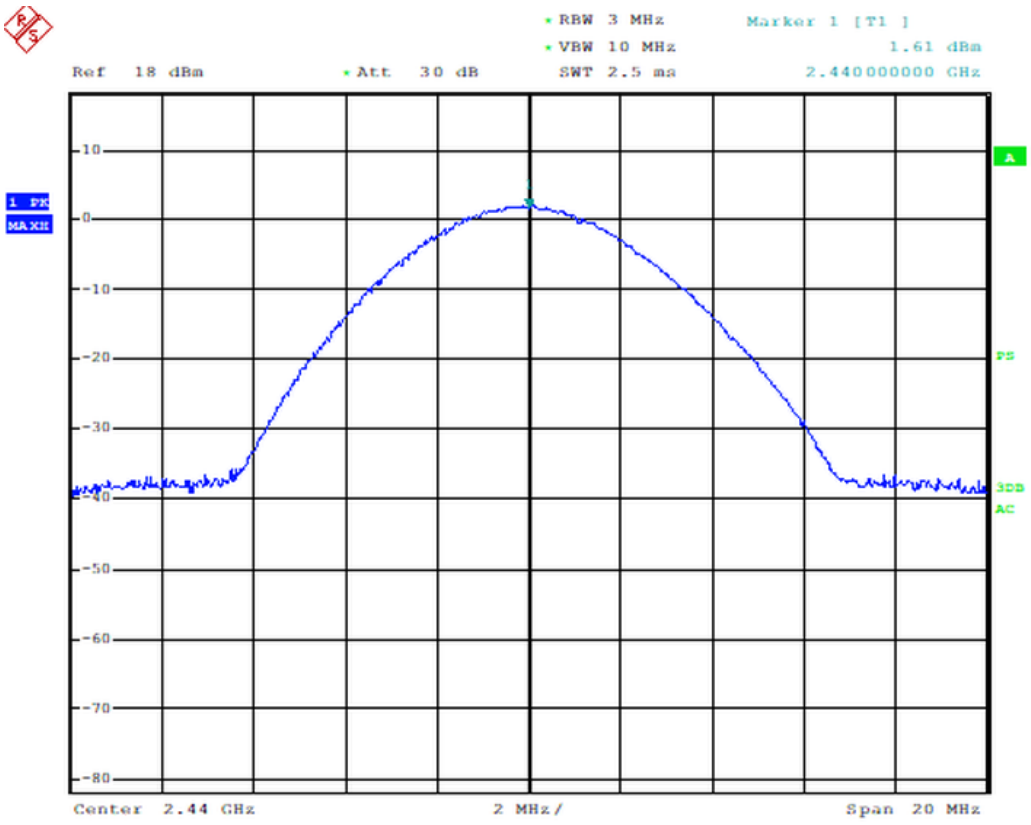
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH1_1010	2440	38	2.05	1.60	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

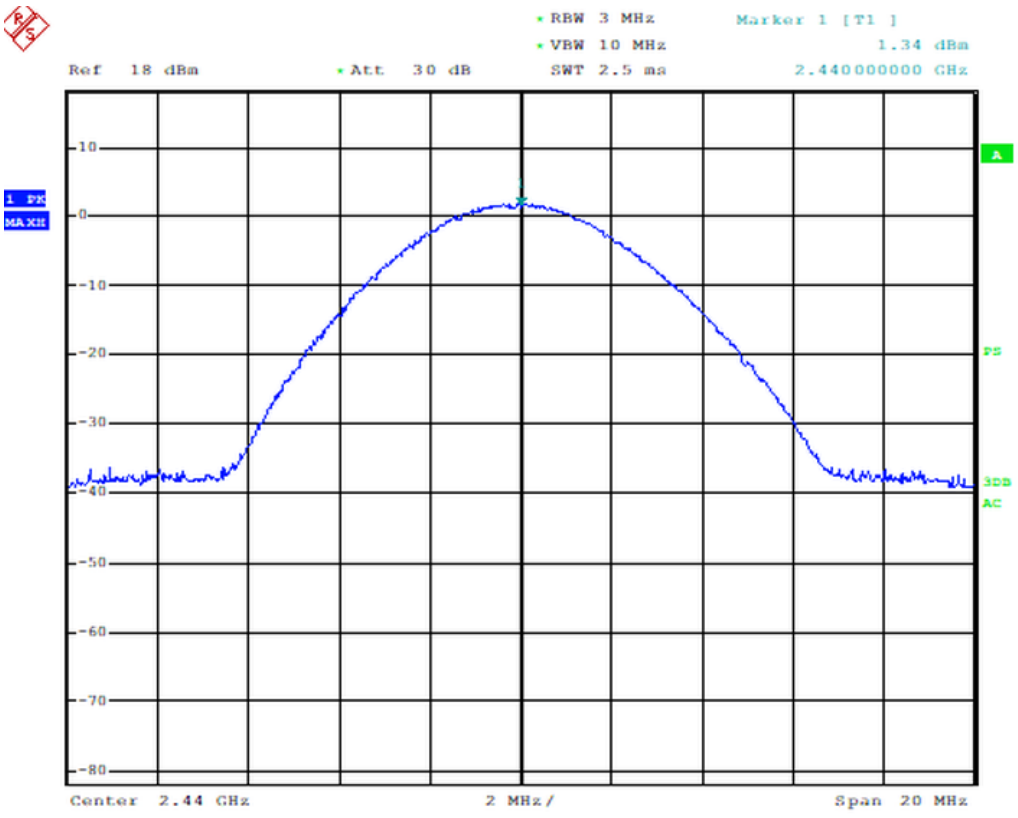
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH3_1010	2440	38	1.61	1.45	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 2 (Channel 38 – Frequency 2440)

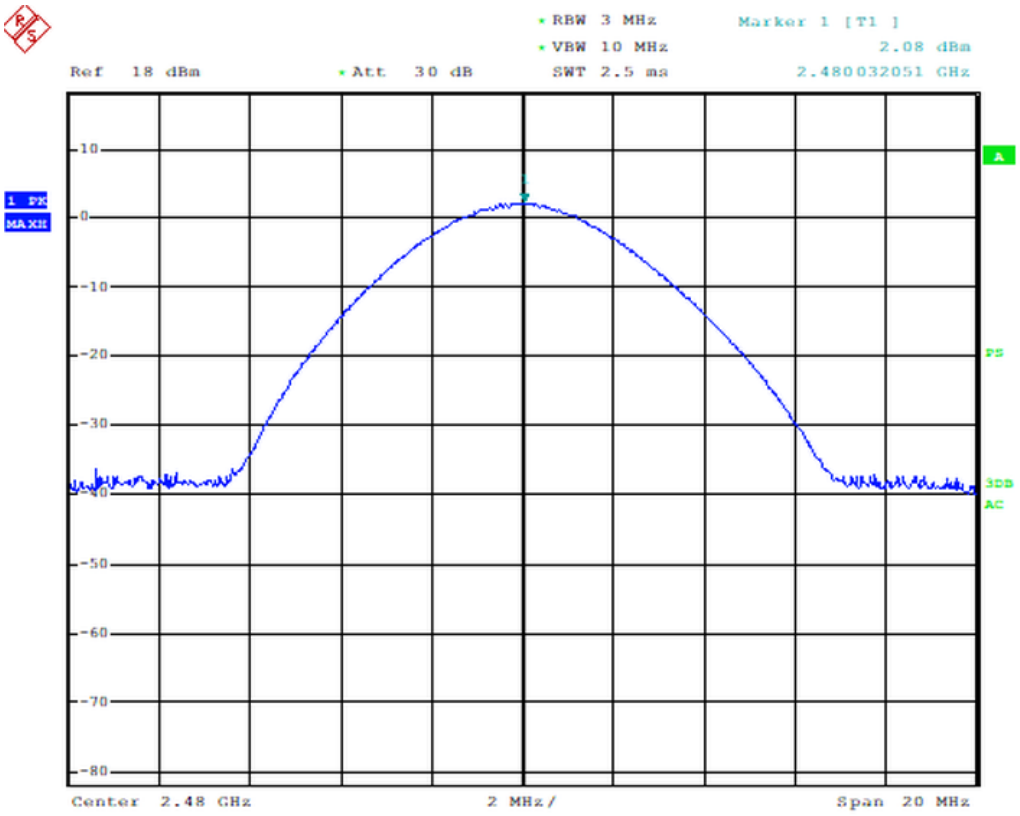
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH5_1010	2440	38	1.34	1.36	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

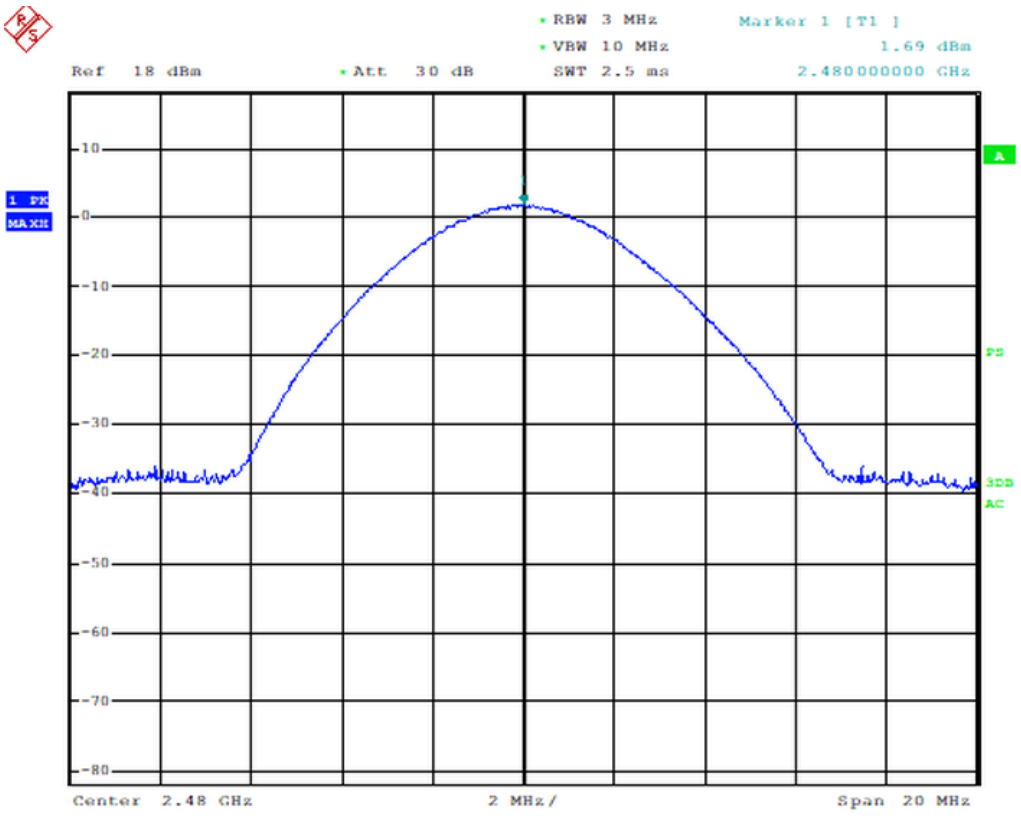
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH1_1010	2480	78	2.08	1.61	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

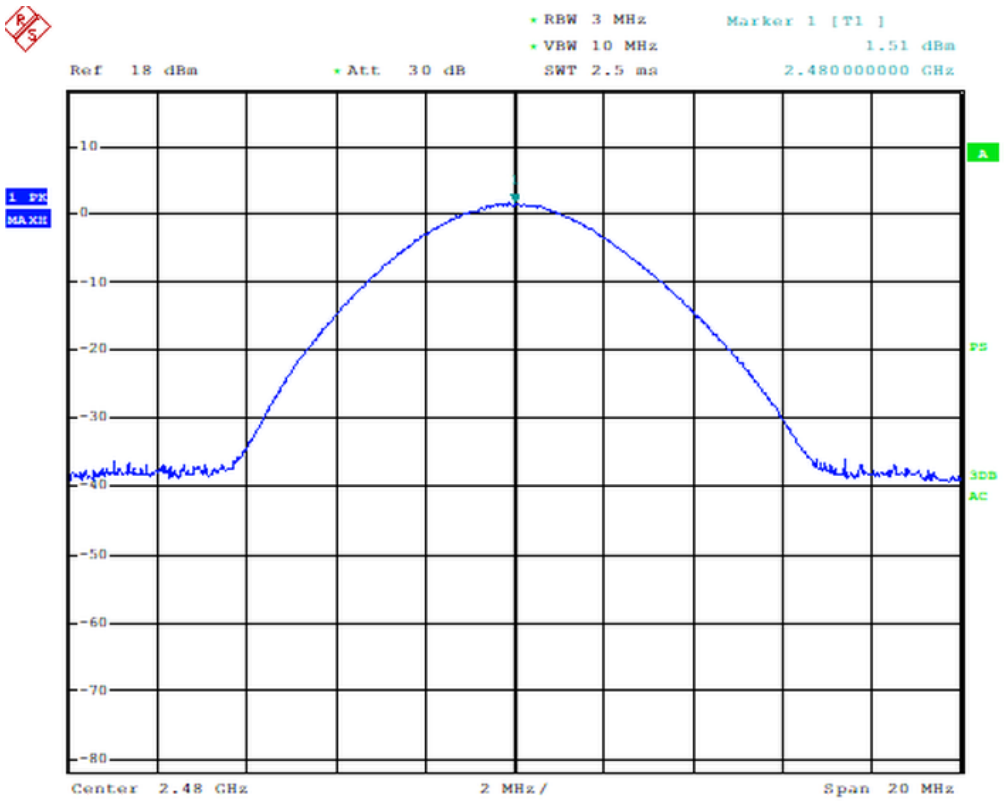
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH3_1010	2480	78	1.69	1.47	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

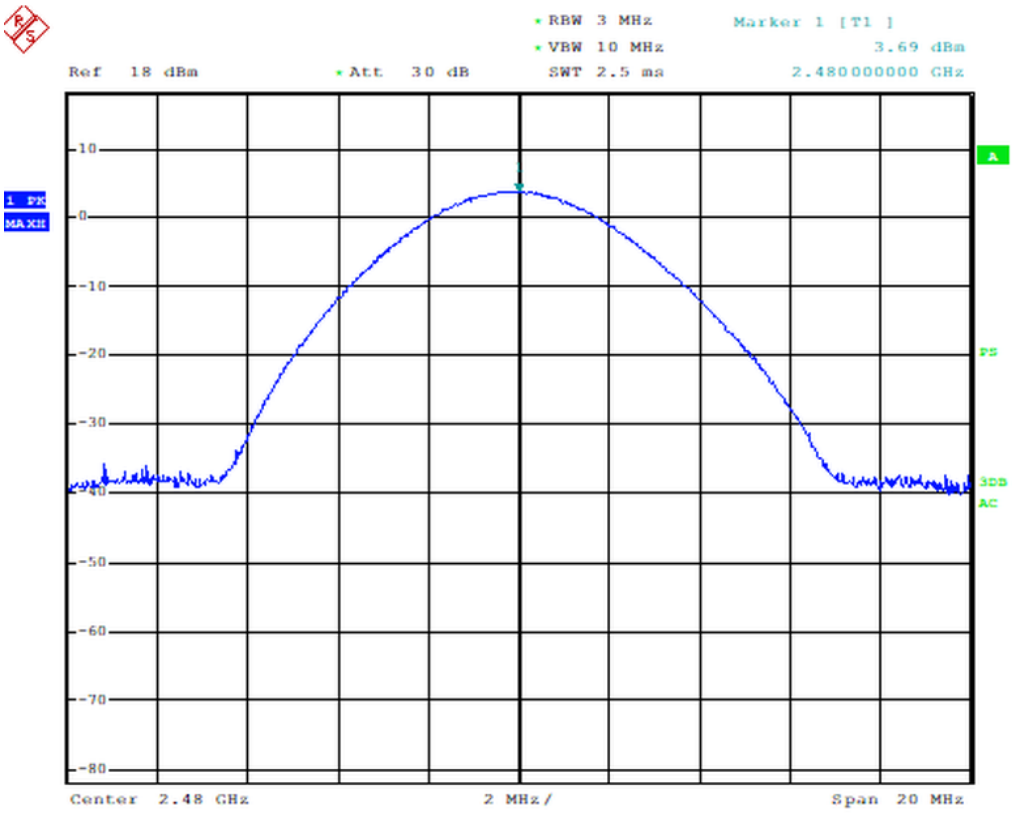
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	1M_DH5_1010	2480	78	1.51	1.41	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

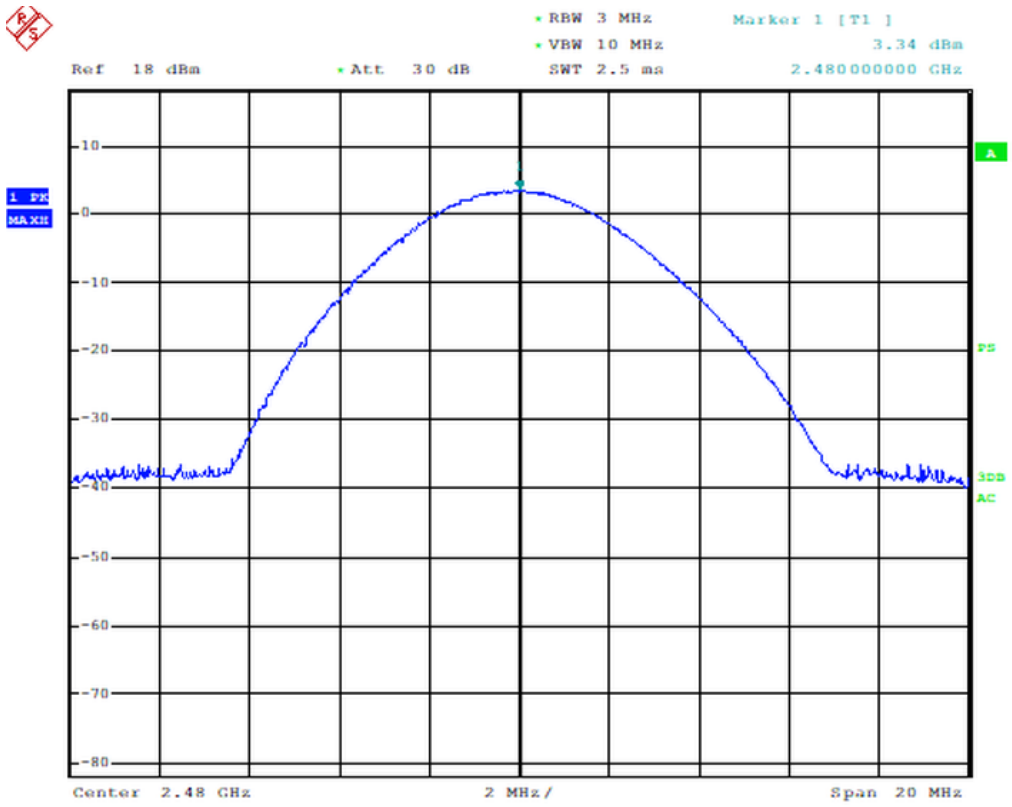
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH1_1010	2480	78	3.69	2.34	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

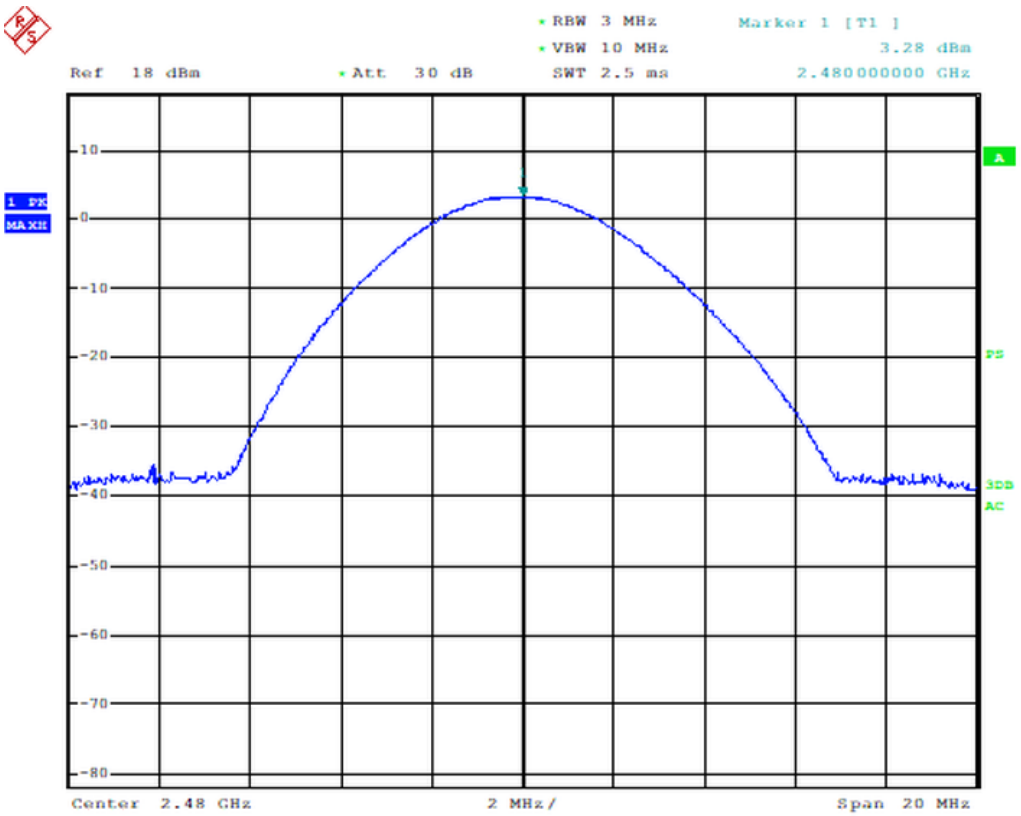
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH3_1010	2480	78	3.34	2.16	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

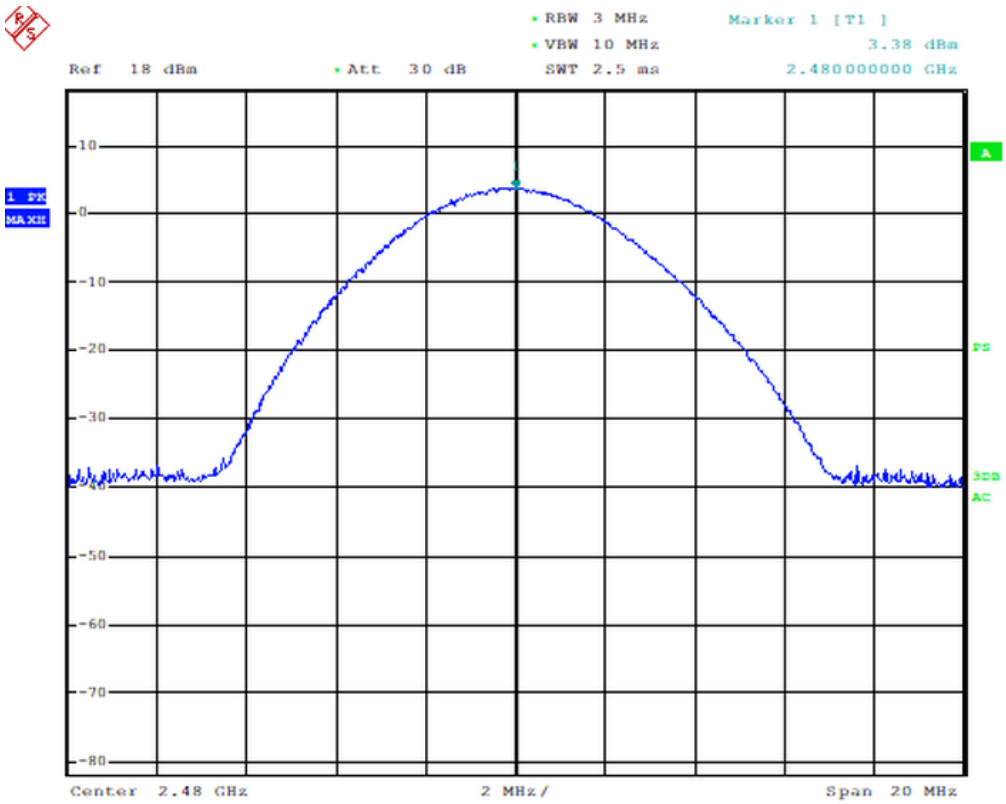
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	2M_DH5_1010	2480	78	3.28	2.13	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

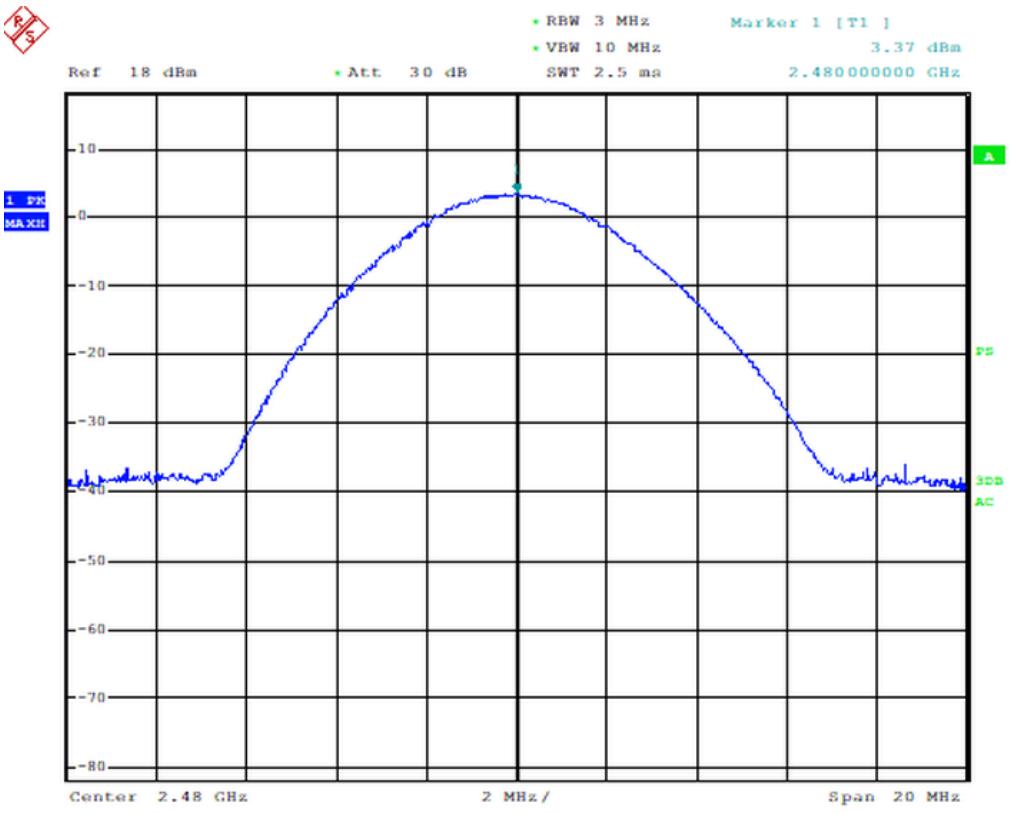
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH1_1010	2480	78	3.38	2.18	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

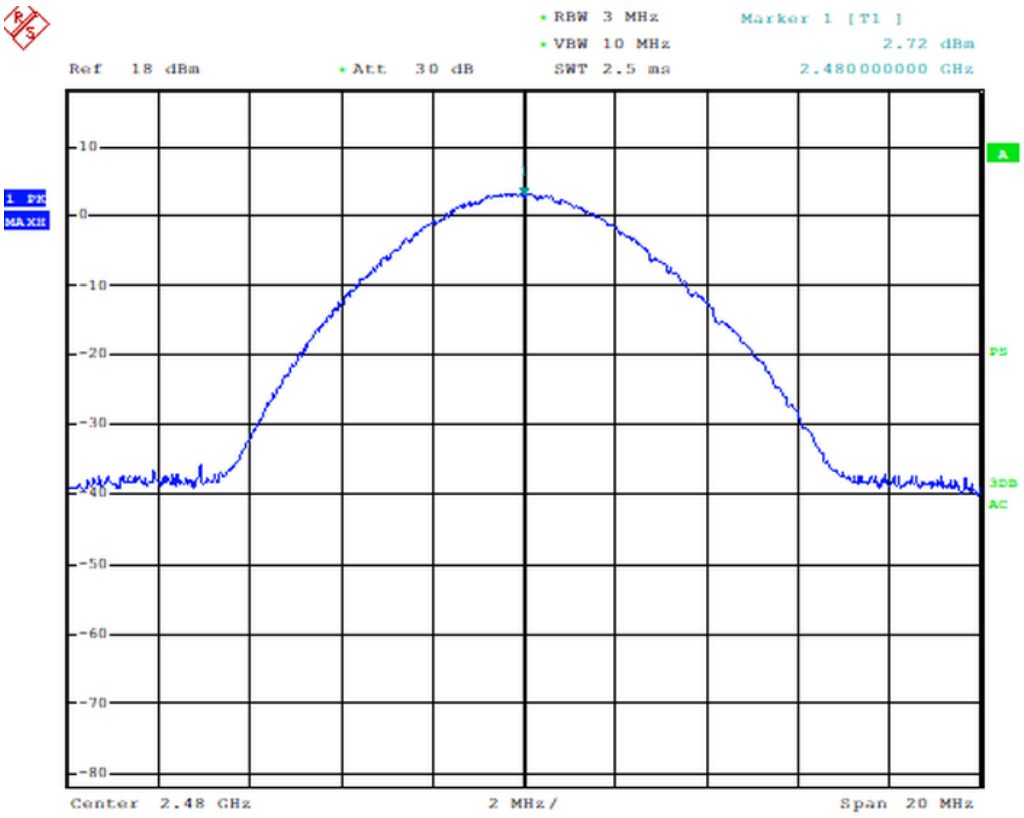
Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH3_1010	2480	78	3.37	2.17	0.5	1	4	PASS



Graphical presentation of maximum conducted peak output power

Operation mode: 3 (Channel 78 – Frequency 2480)

Test conditions			Frequency (MHz)	Channel	Conducted Output Power (Eirp)		Antenna Gain	Limits (W)		Result
Temperature	Voltage	Data Rate			dBm	mW	dBi	Conducted	Radiated	
Tnom +20.5°C	5Vdc (internal battery)	3M_DH5_1010	2480	78	2.72	1.87	0.5	1	4	PASS

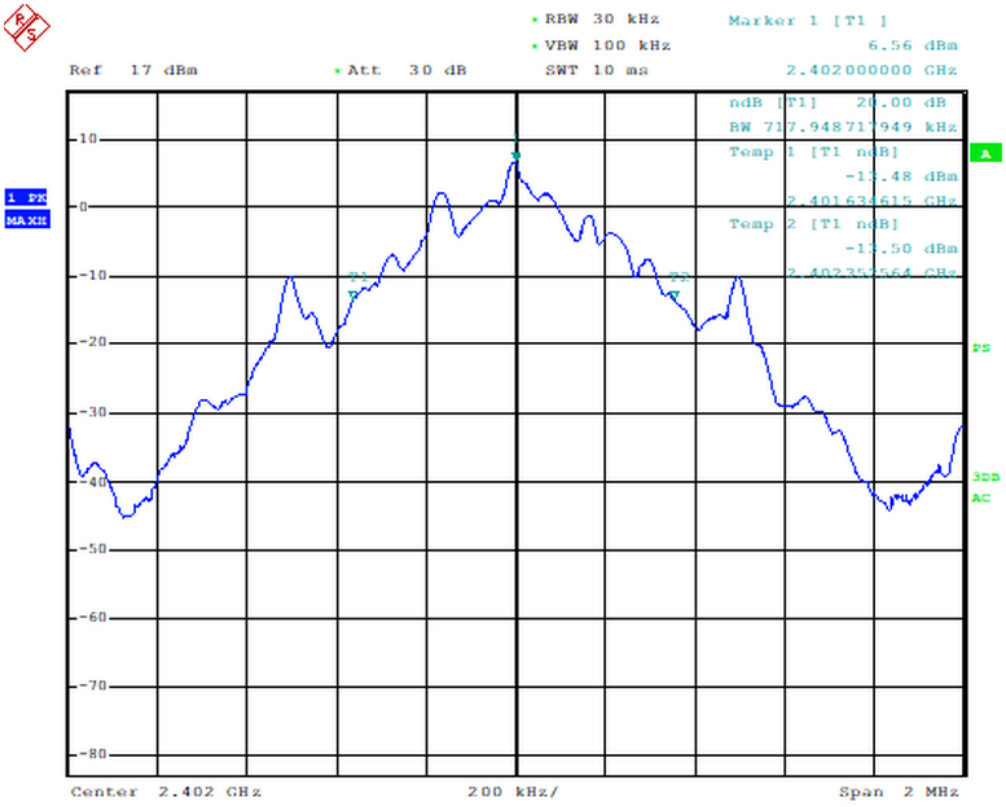


20dB Bandwidth	
Test date	31/03/2022
Applied Standard	Title 47 Part 15 Subpart C §15.247
Test method	According to Par. 8.2 of KDB 558074 D01 15.247 Meas. Guidance v05r02 (and par. 11.8.1 Option 1 of ANSI C63.10)
Temperature	20,5°
Humidity	54%
Tested by	Francesco Lombardi
Model	MP350
Internal Storage No.	1 (Storage no. A003216149-003)
Operating mode	1, 2, 3
Tested terminals	Antenna connector
Result	PASS
Frequency hopping systems 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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.	

Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

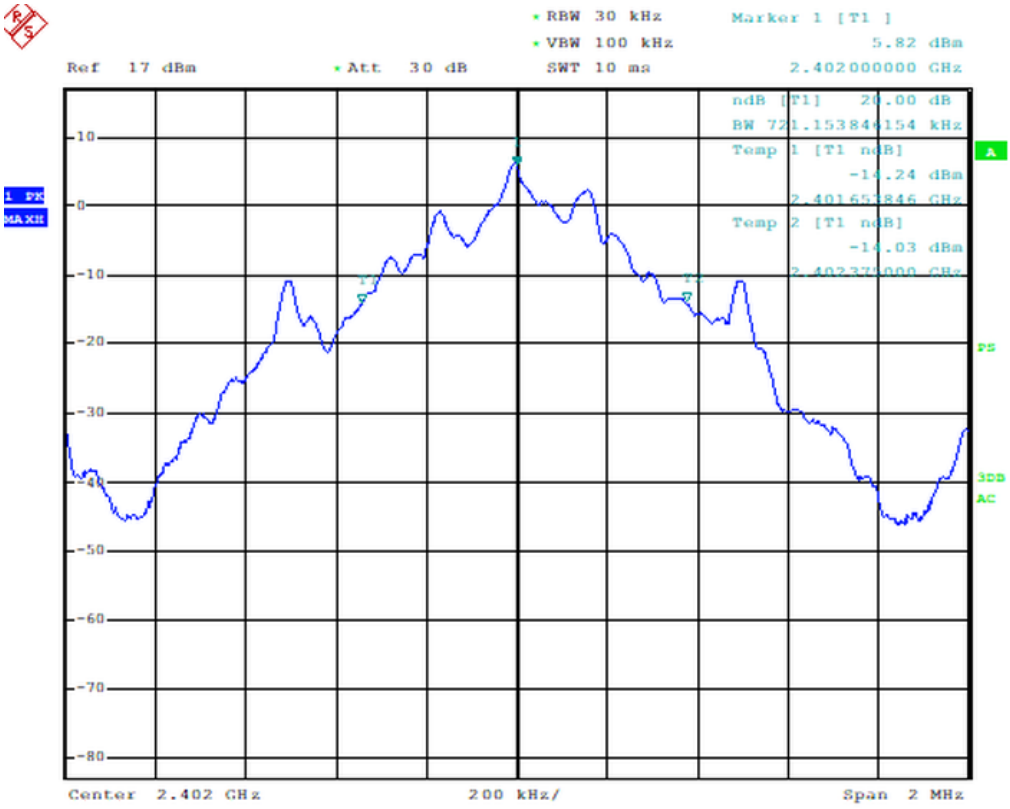
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	1M_DH1_1010	2402	0	717.95	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

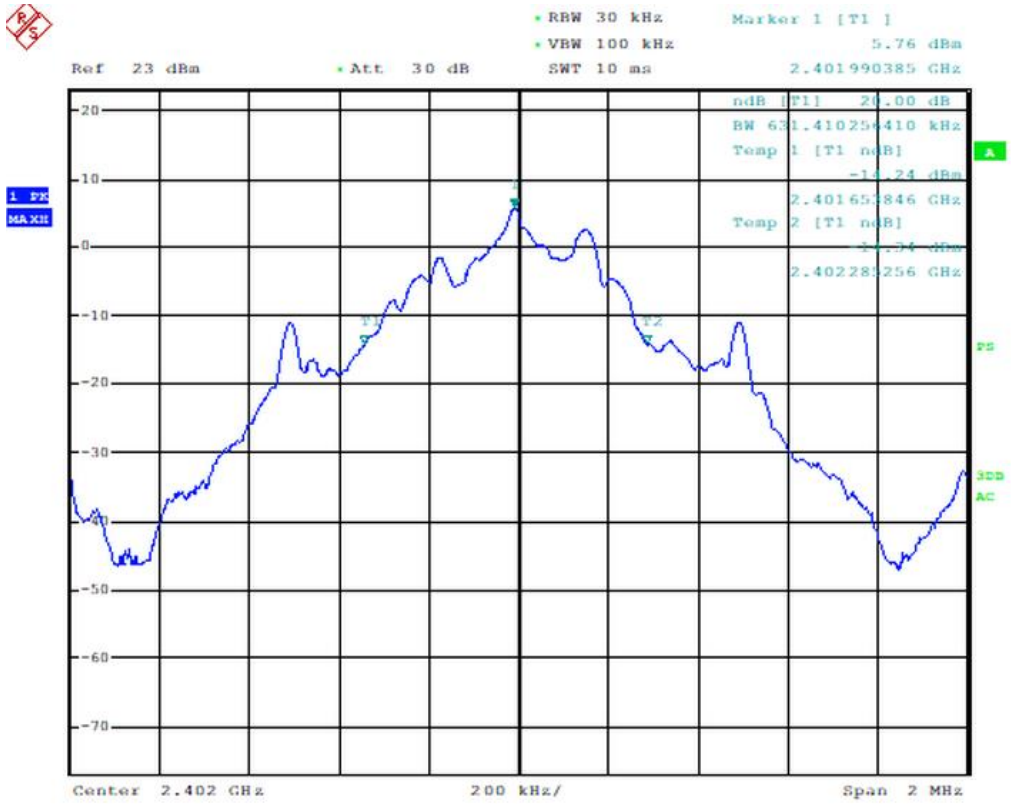
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	1M_DH3_1010	2402	0	721.15	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

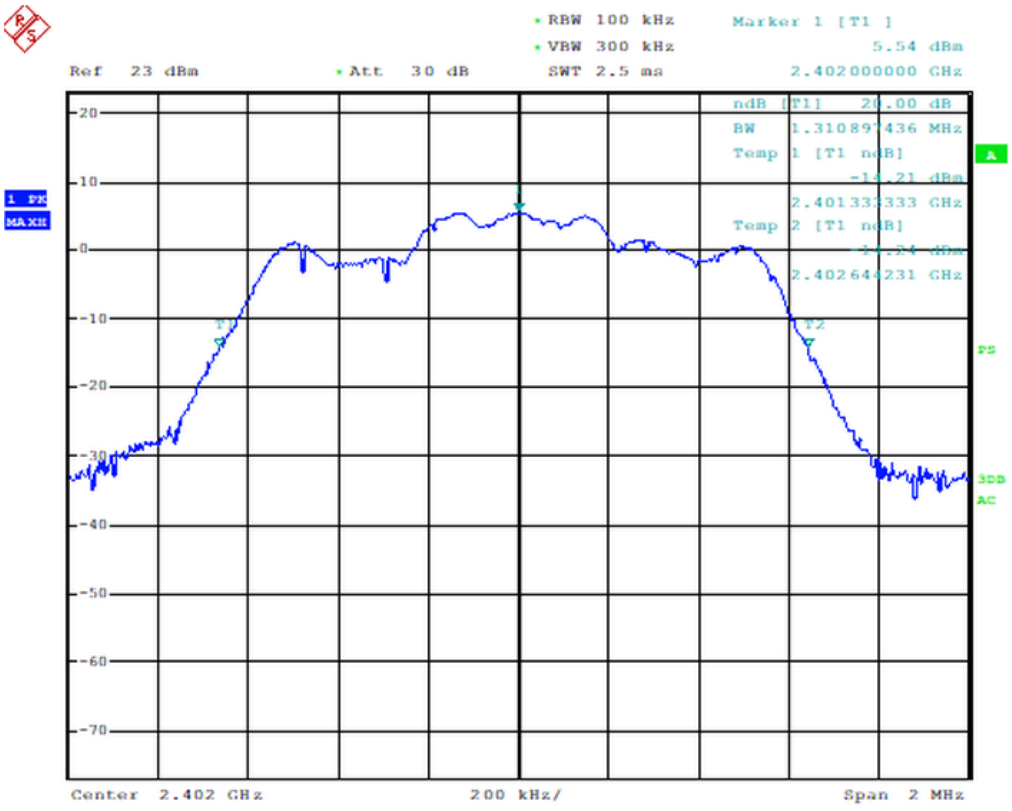
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	1M_DH5_1010	2402	0	631.41	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

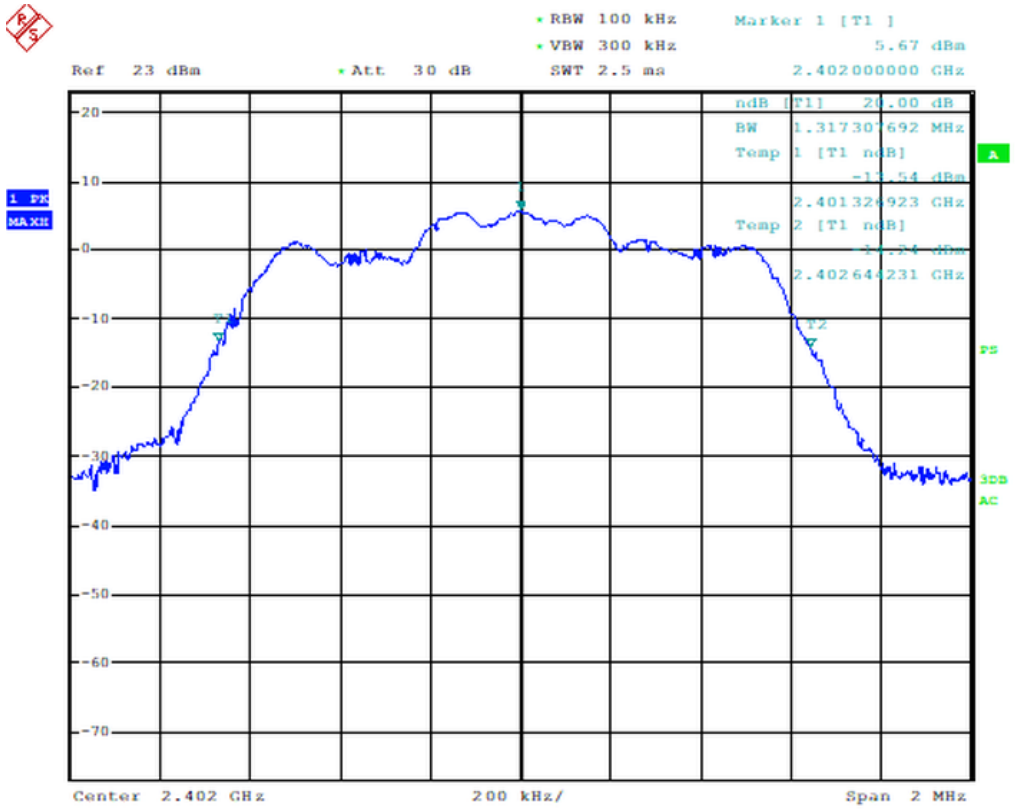
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	2M_DH1_1010	2402	0	1310.90	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

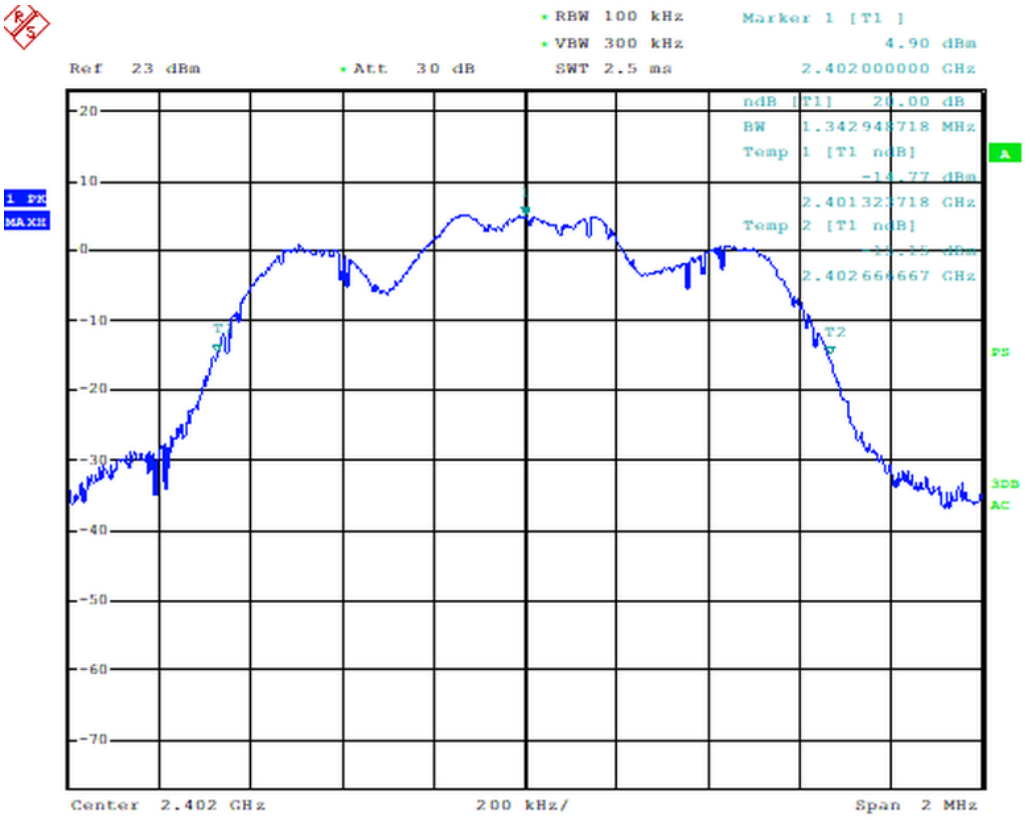
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	2M_DH3_1010	2402	0	1317.30	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

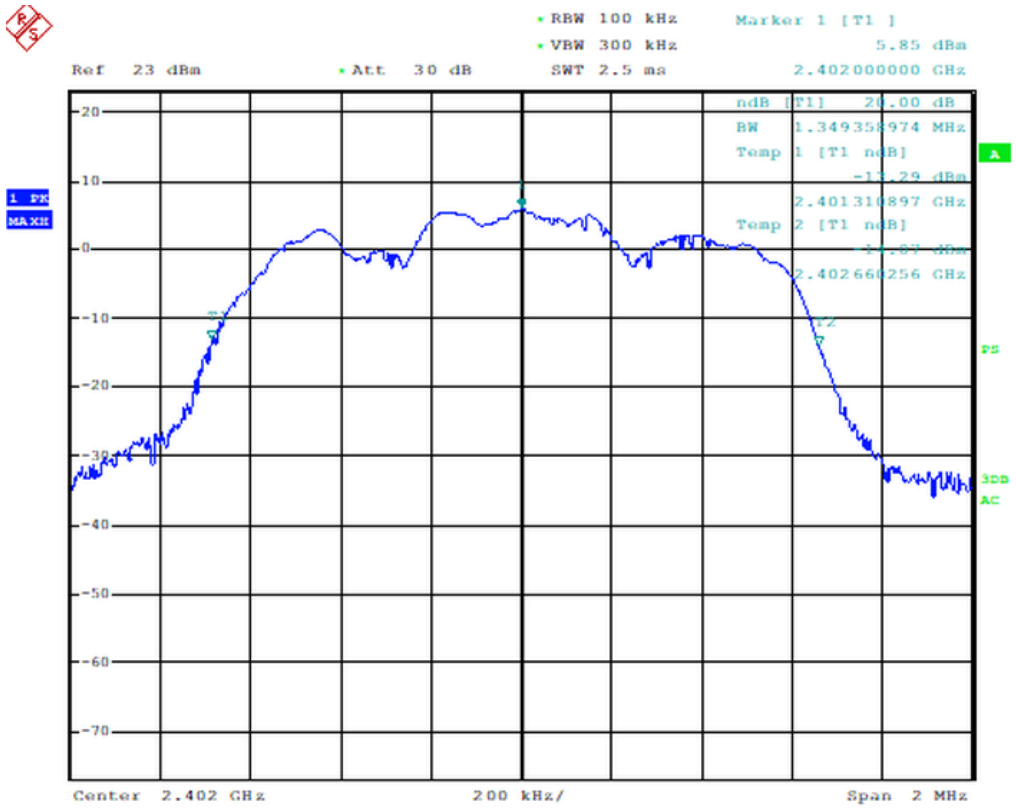
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	2M_DH5_1010	2402	0	1342.94	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

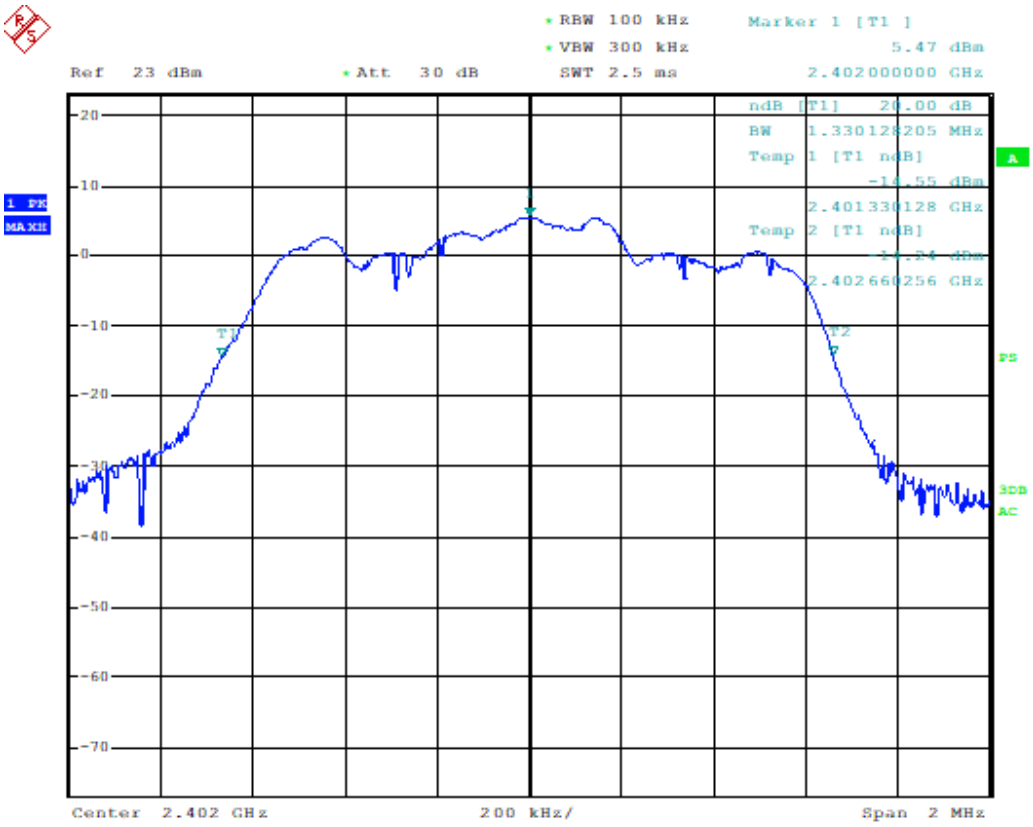
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	3M_DH1_1010	2402	0	1349.35	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

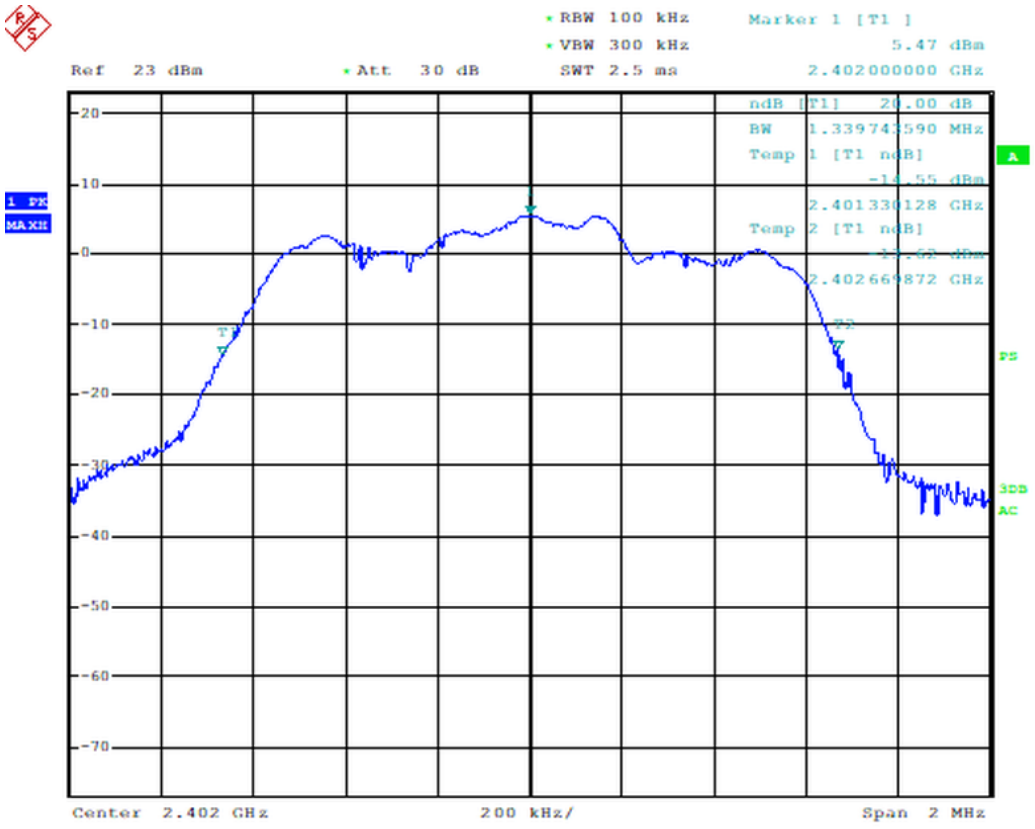
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	3M_DH3_1010	2402	0	1330.12	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 1 (Channel 0 – Frequency 2402)

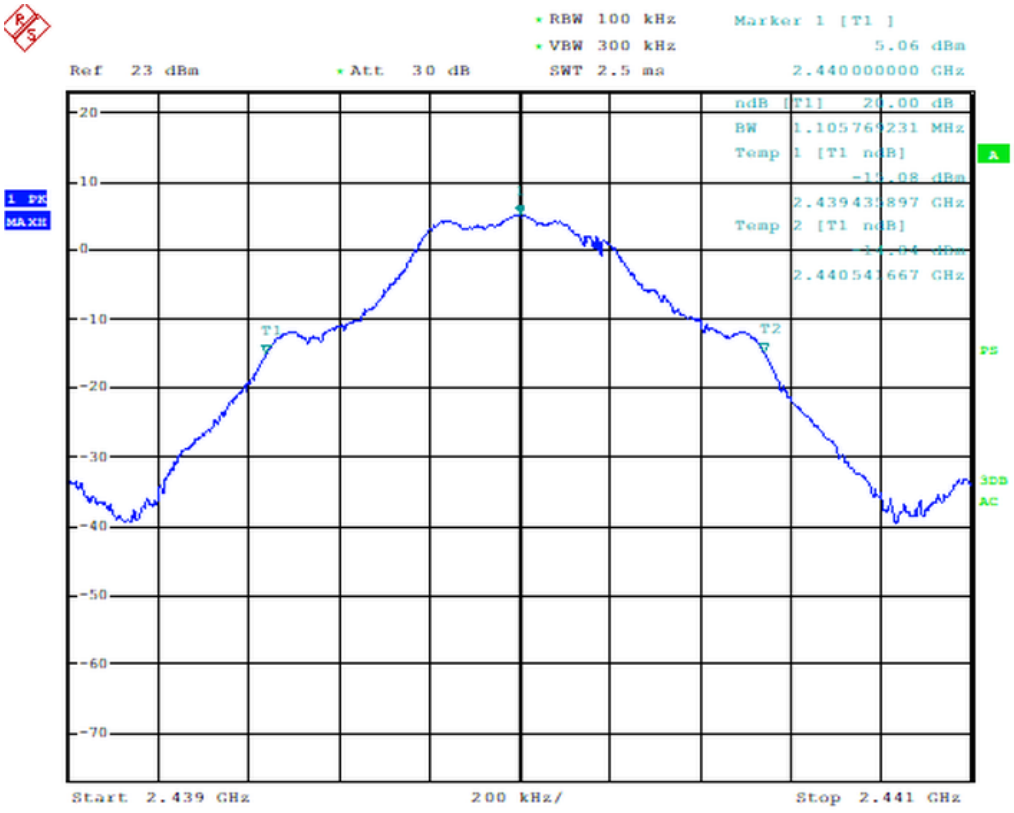
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	3M_DH5_1010	2402	0	1339.74	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

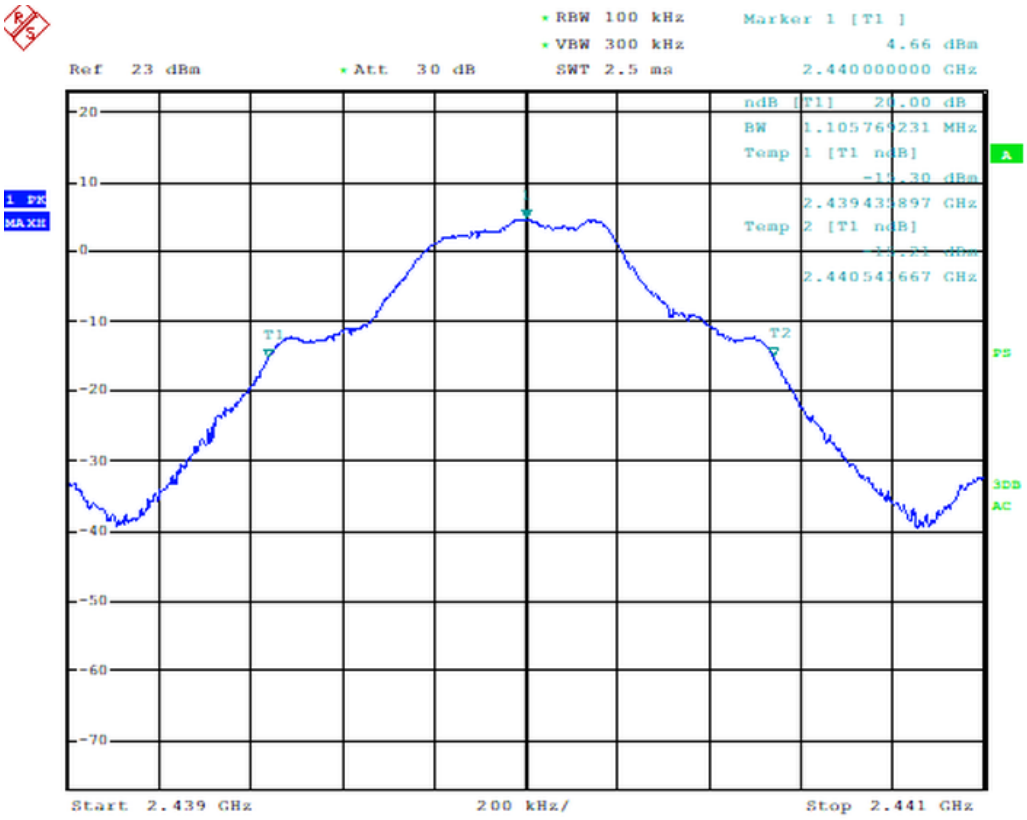
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	1M_DH1_1010	2440	38	1105.76	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

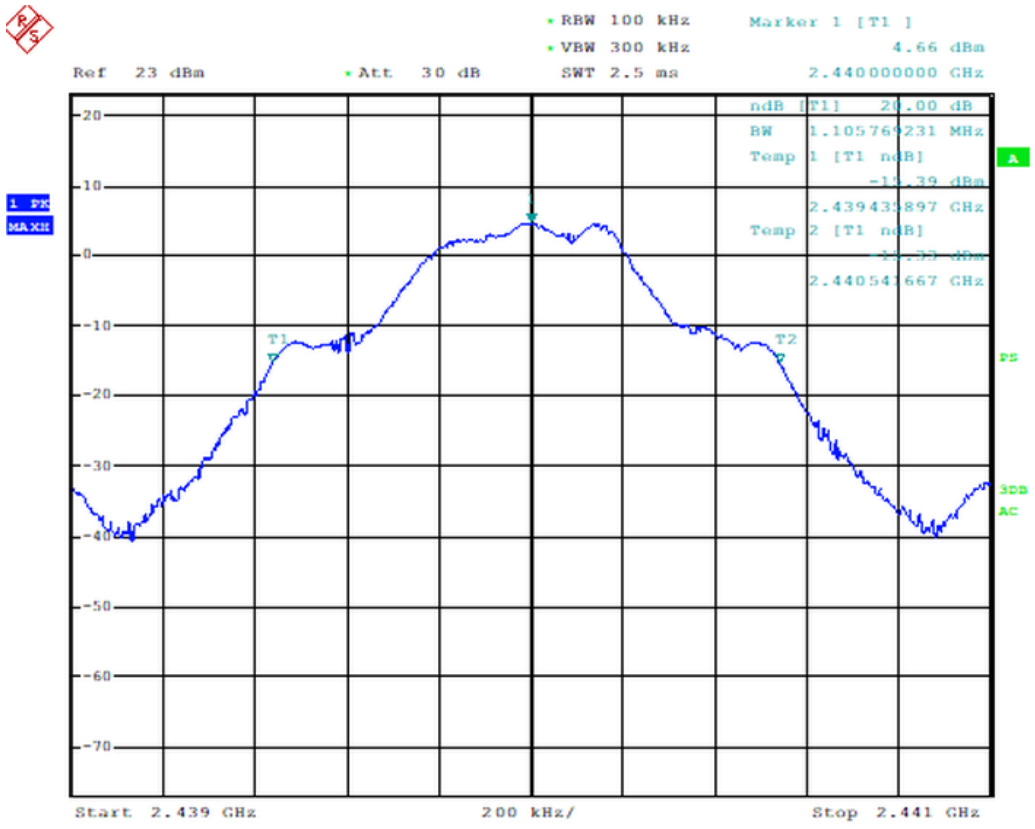
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	1M_DH3_1010	2440	38	1105.76	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

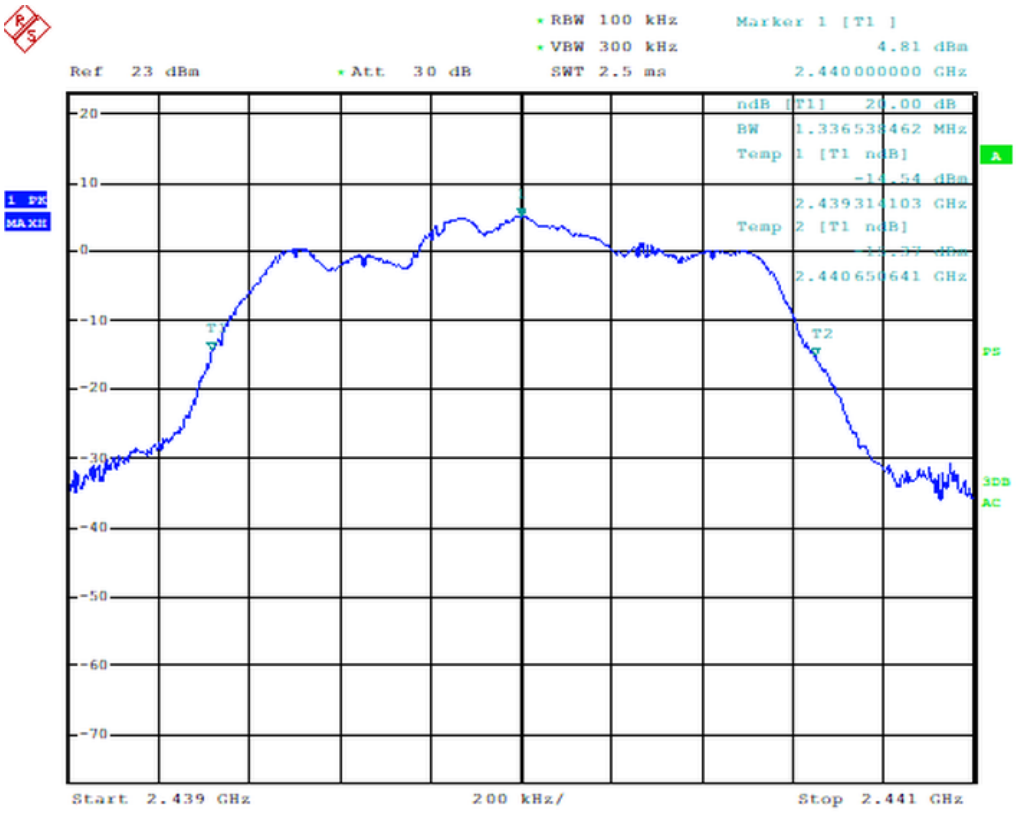
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	1M_DH5_1010	2440	38	1105.76	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

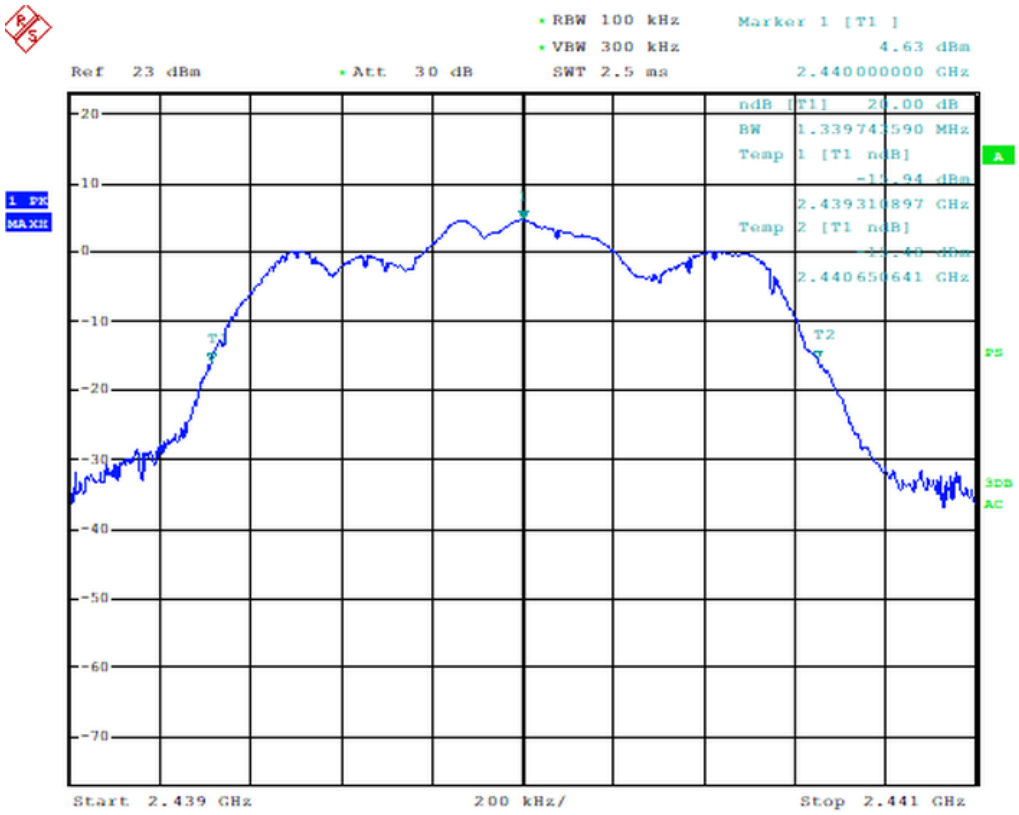
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	2M_DH1_1010	2440	38	1336.53	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

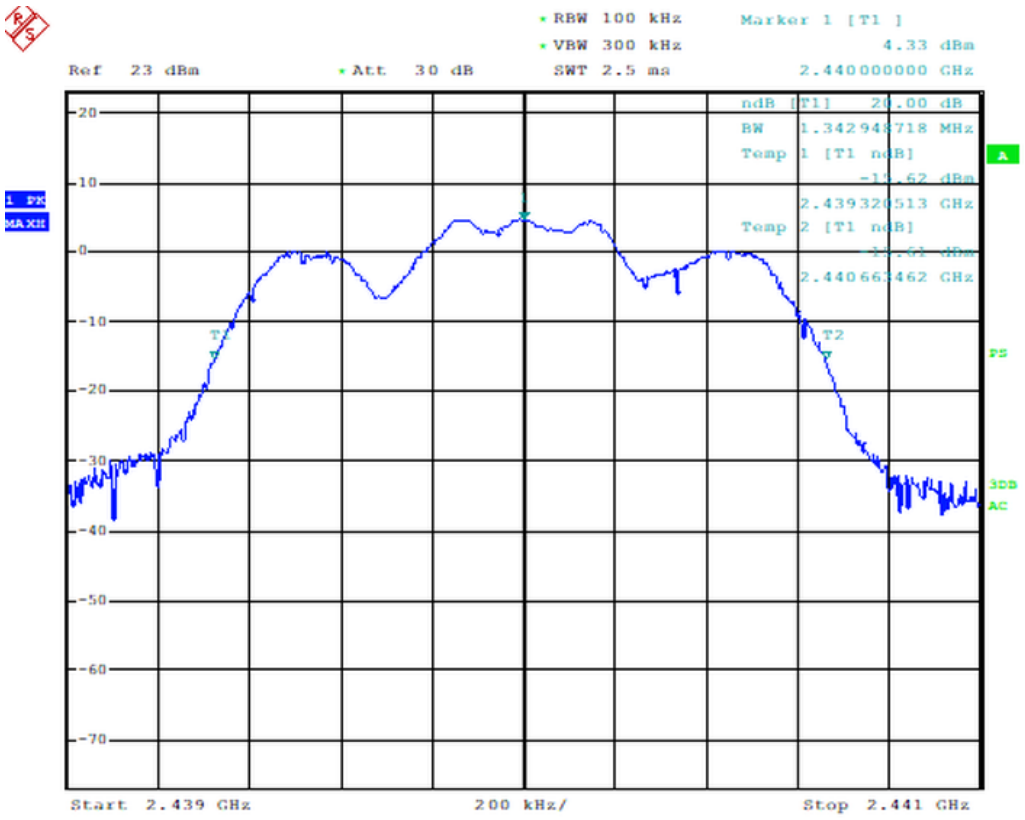
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	2M_DH3_1010	2440	38	1339.74	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

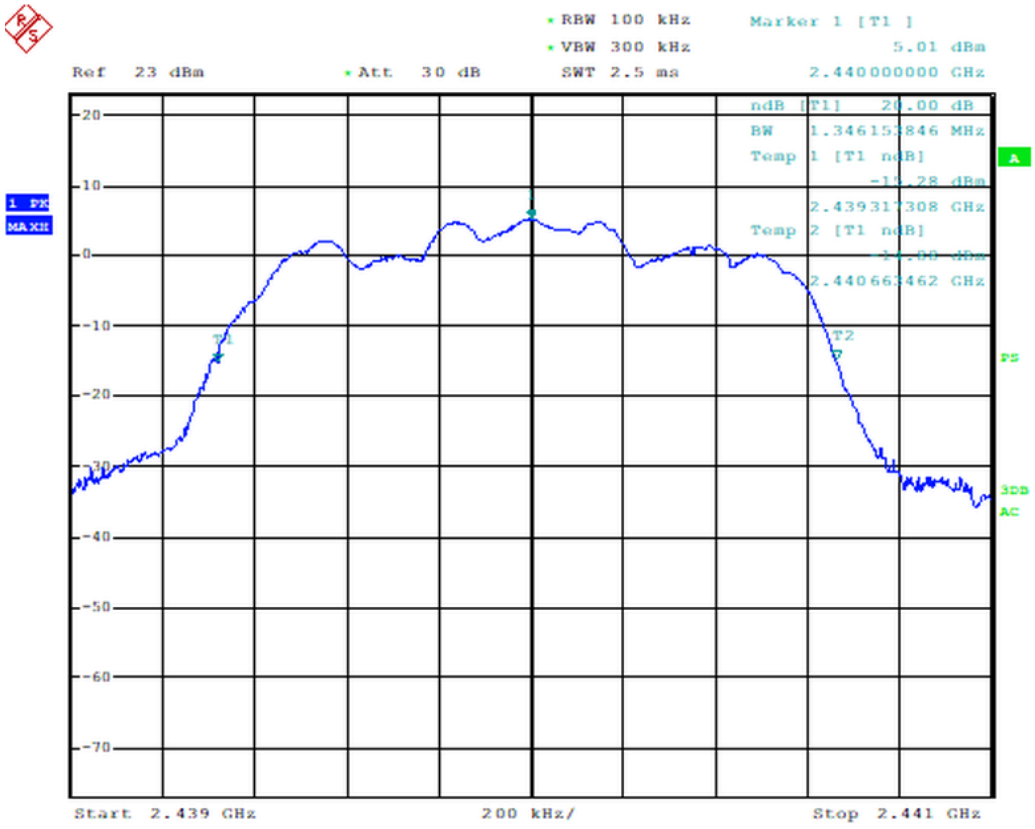
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	2M_DH5_1010	2440	38	1342.94	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

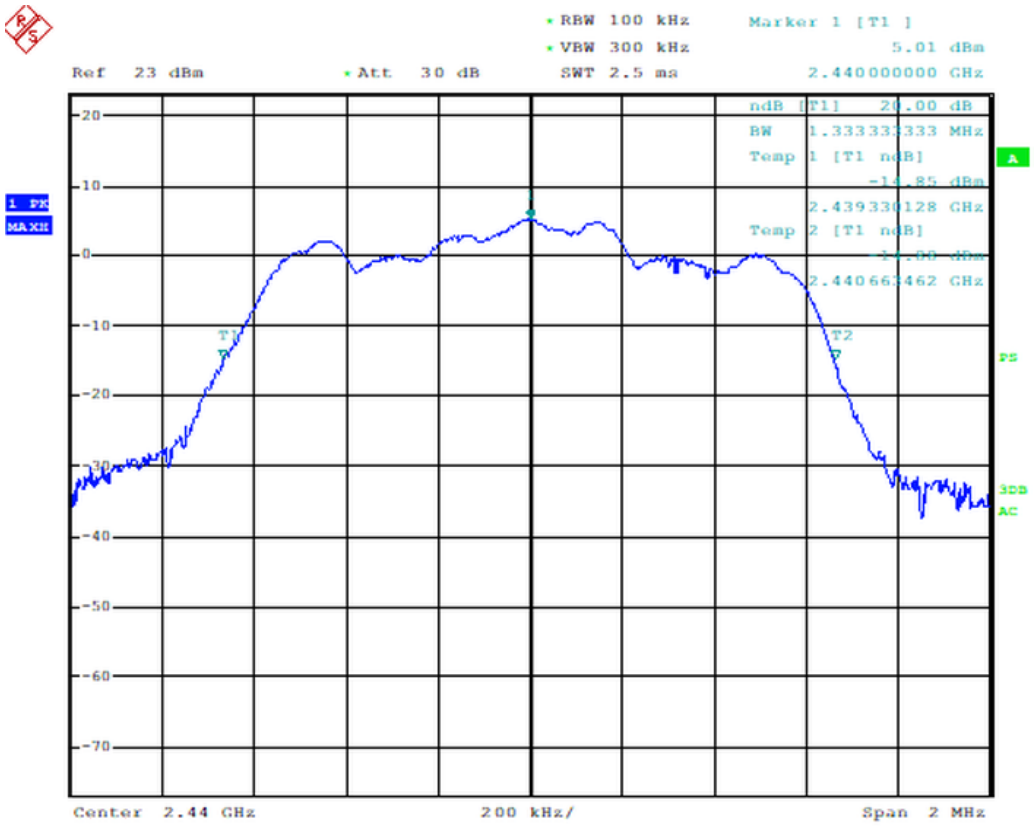
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	3M_DH1_1010	2440	38	1346.15	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

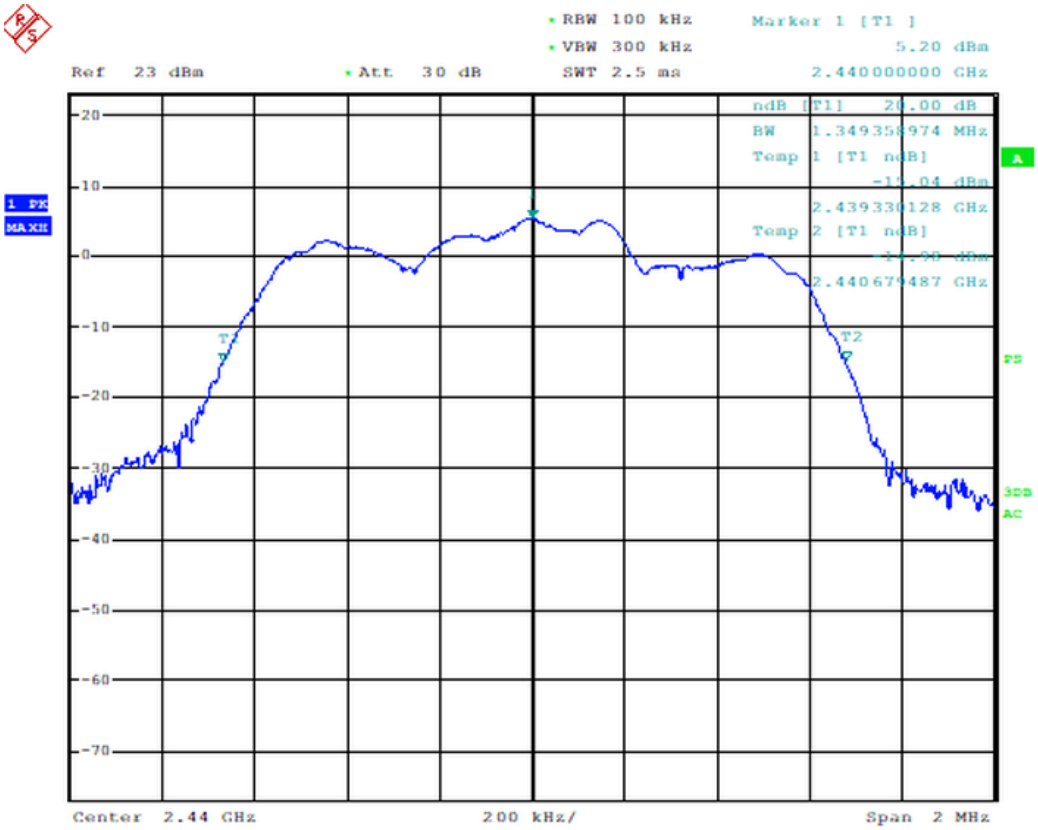
Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	3M_DH3_1010	2440	38	1333.33	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 2 (Channel 38 – Frequency 2440)

Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	3M_DH5_1010	2440	38	1349.35	PASS



Graphical presentation of 20dB Bandwidth

Operation mode: 3 (Channel 78 – Frequency 2480)

Test conditions			Frequency (MHz)	Channel	20dB Bandwidth (KHz)	Result
Temperature	Voltage	Data Rate				
Tnom +20.5°C	5Vdc (internal battery)	1M_DH1_1010	2480	78	1102.56	PASS