FCC Part 15 Subpart B&C §15.247

Test Report

Equipment Under Test	**Bluetooth Speaker**
Model Name	**R50TE**
Variant Model Name	**-**
FCC ID	**2BE6R-R50TE**
IC Number	**-**
Applicant	**SR Lab Co., Ltd.**
Manufacturer	**SR Lab Co., Ltd.**
Date of Test(s)	**2024. 02. 16 ~ 2024. 02. 19**
Date of Issue	**2024. 04. 02**

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
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Issue to	Issue by
SR Lab Co., Ltd. 46, Jiyang-ro, Yangcheon-gu, Seoul, Korea Tel.: +82 10-6430-2253 Fax: -	**DEKRA Korea Co., Ltd.** 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Rep. of Korea Tel.: +82 31-338-8837 Fax: +82 31-338-8847

Revision history

Revision	Date of issue	Description	Revised by
--	2024.04.02	Initial	-
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1. Applicant Information

1.1. Details of applicant

Applicant	:	SR Lab Co., Ltd.
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Contact Person	:	Rin Kim
Telephone	:	+82-10-6430-2253
Fax	:	-

1.2. Manufacturer Information

Manufacturer	:	SR Lab Co., Ltd.
Address	:	46, Jiyang-ro, Yangcheon-gu, Seoul, Korea

2. Laboratory Information

Company name	:	DEKRA Korea Co., Ltd.
Test site number	:	FCC (KR0151), IC (24841)
Address	:	498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, 17030, Rep. of Korea
Web site	:	http://www.dekra.kr
Telephone	:	+82 31-338-8837
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3. Summary of test results

The EUT has been tested according to the following specifications:

FCC Rule FCC part 15	Description	Result
15.203 15.247(b)(4)	Antenna requirement	C
15.247(a)(1)	20 dB bandwidth & 99 % bandwidth	C
15.247(b)(1)	Peak output power	C
15.247(a)(1)	Carrier frequency separation	C
15.247(a)(1)(iii)	Number of hopping frequency	C
15.247(a)(1)(iii)	Time of occupancy (Dwell time)	C
15.205(a) 15.209(a) 15.247(d)	Transmitter radiated spurious emissions, Conducted spurious emission	C
15.207(a)	AC Conducted power line test	C

※ Abbreviation

C Complied
N/A Not applicable
F Fail

The sample was tested according to the following specification:
FCC Parts 15.247; ANSI C63.4:2014, ANSI C63.10:2020
FCC Public Notice KDB 558074 D01 v05r02

Approval Signatories

Test and Report Completed by :	Report Approval by :
박정렬	손홍민
Len Park Test Engineer DEKRA Korea Co., Ltd.	Kin Son Technical Manager DEKRA Korea Co., Ltd.

The above test certificate is a test report not related to the Korean Laboratory Accreditation Scheme

4. EUT Description

Kind of product	Bluetooth Speaker
Model Name	R50TE
Variant Model Name	-
FCC ID	2BE6R-R50TE
IC Number	-
Power supply	DC 3.70 V
Frequency range	2 402 MHz ~ 2 480 MHz
Modulation technique	GFSK, Pi/4DQPSK, 8DPSK
Number of channels	79 ch
Antenna gain / Type	-0.58 dBi / PCB Antenna
Test Site Registration Number	FCC (KR0151), IC (24841)
H/W version / S/W version	1.0 / 1.0
Test S/W version	1.0.2.2(FCC ASSIST)

4.1. Table for Test Modes and Frequency (Bluetooth)

Preliminary tests were performed in different data rate to find the worst radiated emission.
The data rate shown in the table below is the worst-case rate with respect to the specific test item.
Investigation has been done on all the possible configurations for searching the worst cases.
The following table is a list of the test modes shown in this test report.

Mode	Data rate (Worst case)	Frequency (Freq. MHz)
BDR	1-DH5	**Lowest** (2 402) / **Middle** (2 441) / **Highest** (2 480)
EDR	3-DH5	**Lowest** (2 402) / **Middle** (2 441) / **Highest** (2 480)

4.2. Information about the FHSS characteristics

4.2.1. Pseudorandom frequency hopping sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master. The channel is divided into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The nominal hop rate is 1600 hops/s.

4.2.2. Medium access protocol

The manufacturer declares that the device uses Bluetooth protocol.
It confirmed that Medium access protocol is implemented.

5. Measurement equipment

Equipment	Manufacturer	Model	Serial number	Calibration Interval	Calibration date	Calibration due.
Test Receiver	R&S	ESR7	101922	1 year	2023-05-16	2024-05-16
Signal Generator	R&S	SMB100A	178128	1 year	2023-05-17	2024-05-17
Spectrum Analyzer	R&S	FSVA40	101591	1 year	2023-03-16	2024-03-16
DC Power Supply	R&S	NGE100	102415	1 year	2023-05-16	2024-05-16
Power Sensor	R&S	NRP-Z85	102464	1 year	2023-05-16	2024-05-16
Horn Antenna	R&S	HF906	100236	2 year	2023-06-20	2024-06-20
Horn Antenna	AH Systems	SAS-572	269	1 year	2023-05-22	2024-05-22
Horn Antenna	AH Systems	SAS-573	164	1 year	2023-05-22	2024-05-22
Bi-Log Ant.	S/B	VULB 9161SE	4159	2 year	2026-03-21	2024-03-21
Loop Antenna	ETS LINDGREN	6502	00118166	2 year	2022-05-25	2024-05-25
Power Amplifier	TESTEK	TK-PA18H	170013-L	1 year	2023-05-16	2024-05-16
Power Amplifier	MITEQ	AFS43-01002600	2048519	1 year	2023-05-19	2024-05-19
Power Amplifier	MITEQ	AMF-6F-26004000-33-8P-HS	1511665	1 year	2023-05-19	2024-05-19
Controller	INNCO	CO2000	CO2000/064/6961003/L	N/A	N/A	N/A
Antenna Master	INNCO	MA4000	MA4000/038/6961003/L	N/A	N/A	N/A
Controller	INNCO	CO3000	CO3000/812/34240914/L	N/A	N/A	N/A
Antenna Master	INNCO	MA4640-XP-ET	None	N/A	N/A	N/A
RF Cable	SUHNER	SUCOFLEX100	84047746	3 month	2024-03-21	2024-06-21
RF Cable	SUHNER	SUCOFLEX102	801270/2	3 month	2024-03-21	2024-06-21
RF Cable	SUHNER	SUCOFLEX102	801532/2	3 month	2024-03-21	2024-06-21
Band Rejection Filter	Micro-Tonics	BRM50702	064	1 year	2023-05-16	2024-05-16
Test Receiver	R&S	ESR3	101873	1 year	2023-05-16	2024-05-16
Pulse Limiter	R&S	ESH3-Z2	100288	1 year	2023-05-17	2024-05-17
Two Line-V-Network	R&S	ESH3-Z5	100296	1 year	2023-11-24	2024-11-22
Power Divider	HP	11636B	12481	1 year	2023-05-19	2024-05-19

※Remark

Support equipment

Description	Manufacturer	Model	Serial number
Notebook computer	DELL	E5440	8HCMN12

6. Antenna Requirement

6.1. Standard applicable

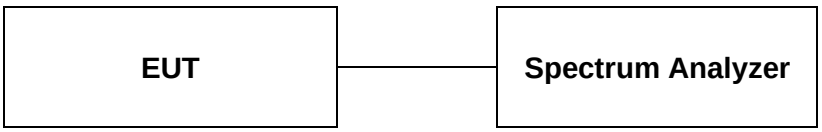
For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section §15.247 (c) if transmitting antennas of directional gain greater than 6 dBi are used.

6.2. Antenna connected construction

Antenna used in this product is PCB antenna,
Antenna gain is -0.58 dBi.

7. 20 dB bandwidth & 99% bandwidth

7.1. Test setup



7.2. Limit

Not applicable

7.3. Test procedure

Peak output power is measured using the following procedure
1. The instrument center frequency is set to the nominal EUT channel center frequency.
2. Span = Between 1.5 times and 5.0 times the OBW.
3. RBW > shall be in the range of 1% to 5% of the OBW
4. VBW ≥ 3 x RBW.
5. Sweep time = No faster than coupled(auto) time.
6. Detector = peak
7. Trace mode = max hold
8. Allow trace to fully stabilize
9. Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
10. A spectral plot of the test results and setup description shall be included in the test report.

7.4. Test results

Test mode : BDR

Frequency (MHz)	20 dB bandwidth (MHz)	99% bandwidth (MHz)
2 402	0.84	0.96
2 441	0.86	0.96
2 480	0.84	0.96

Test mode : EDR

Frequency (MHz)	20 dB bandwidth (MHz)	99% bandwidth (MHz)
2 402	1.26	1.22
2 441	1.26	1.24
2 480	1.26	1.24

※Remark

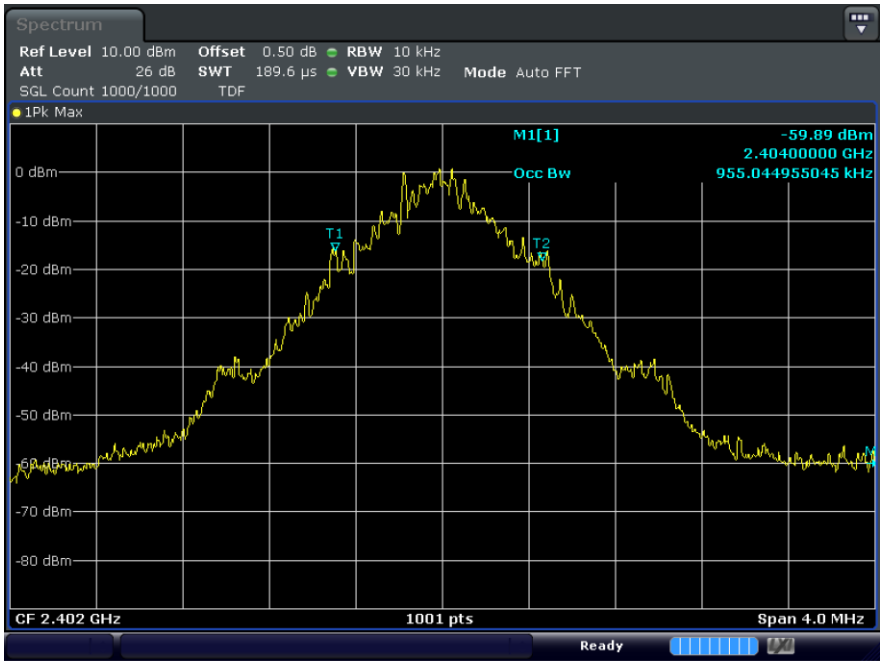
1. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

7.4.1. Test plot

Test mode : BDR

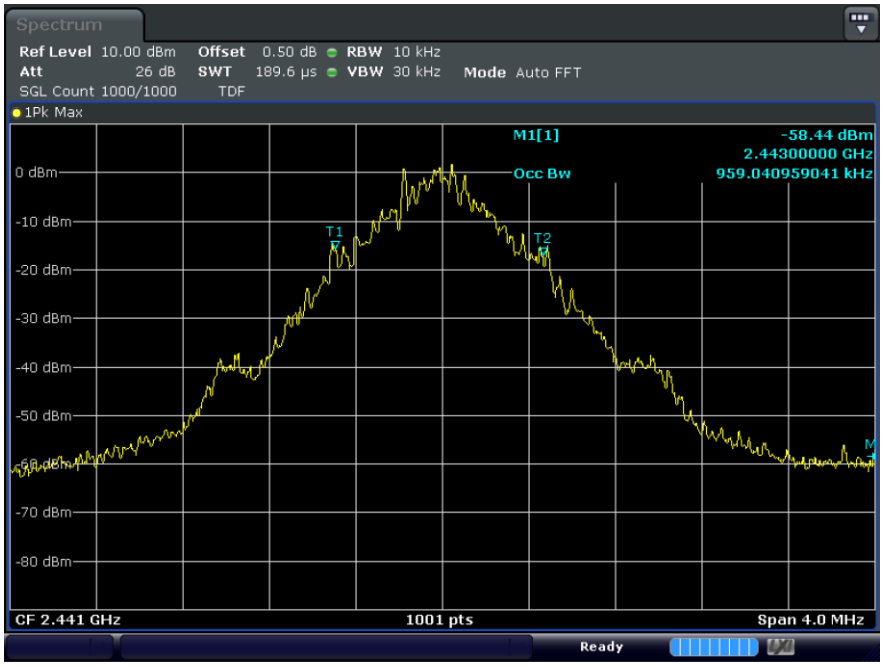
A.1. Lowest Ch. (2 402 MHz)_20 dB Bandwidth

A.2. Lowest Ch. (2 402 MHz)_99% Bandwidth



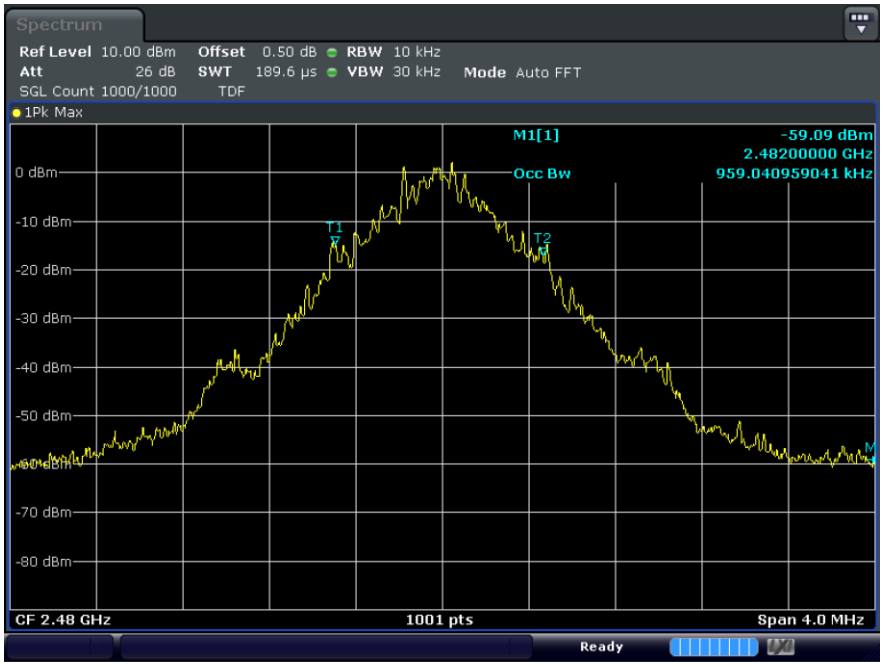
B.1. Middle Ch. (2 441 MHz)_20 dB Bandwidth

B.2. Middle Ch. (2 441 MHz)_99% Bandwidth



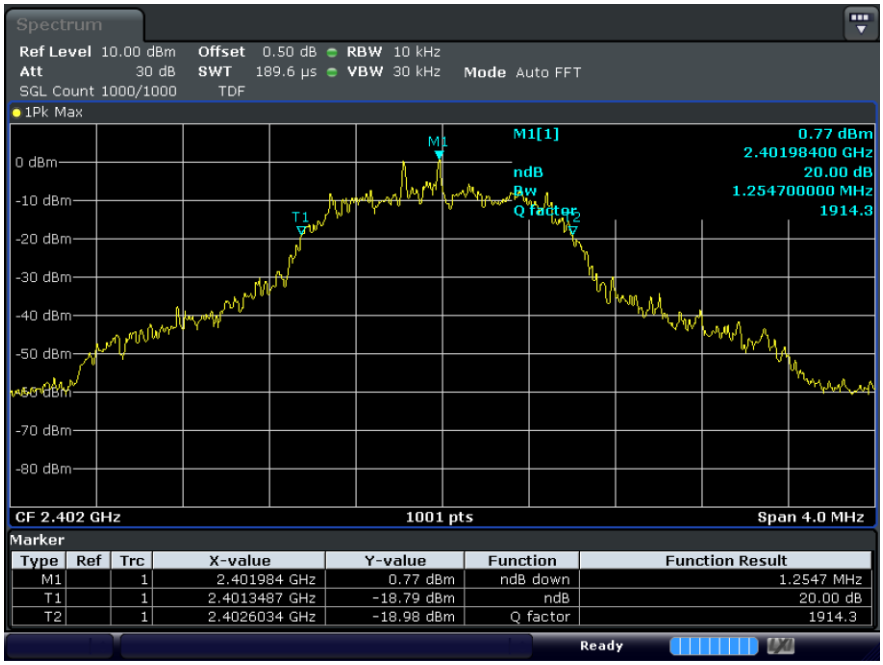
C.1. Highest Ch. (2 480 MHz)_20 dB Bandwidth

C.2. Highest Ch. (2 480 MHz)_99% Bandwidth

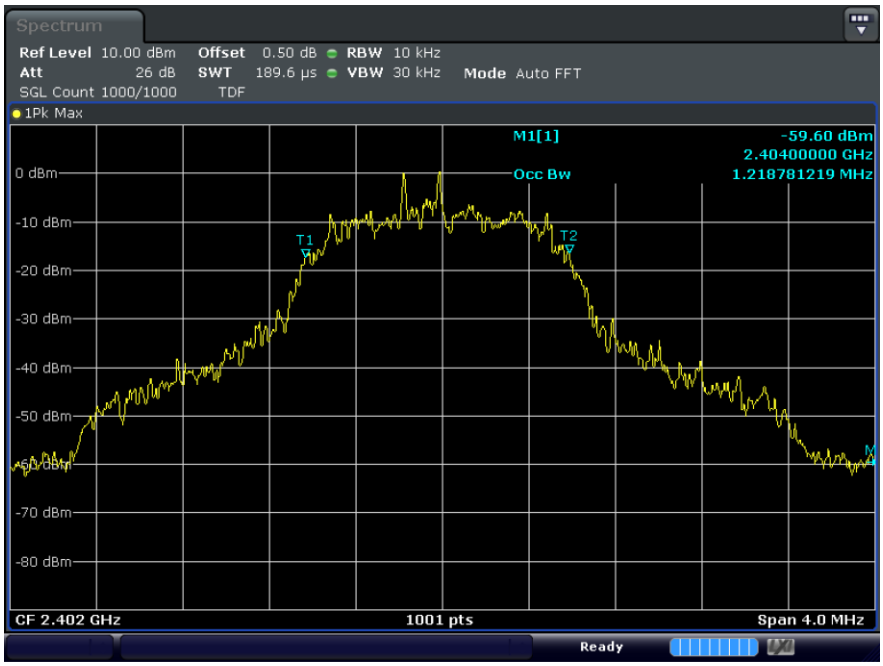


Test mode : EDR

A.1. Lowest Ch. (2 402 MHz)_20 dB Bandwidth

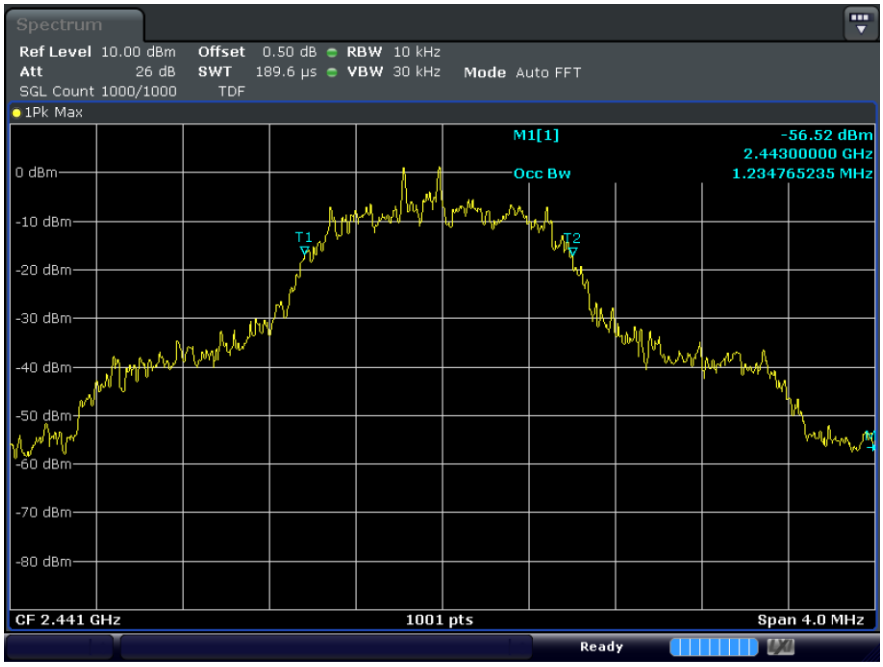


A.2. Lowest Ch. (2 402 MHz)_99% Bandwidth



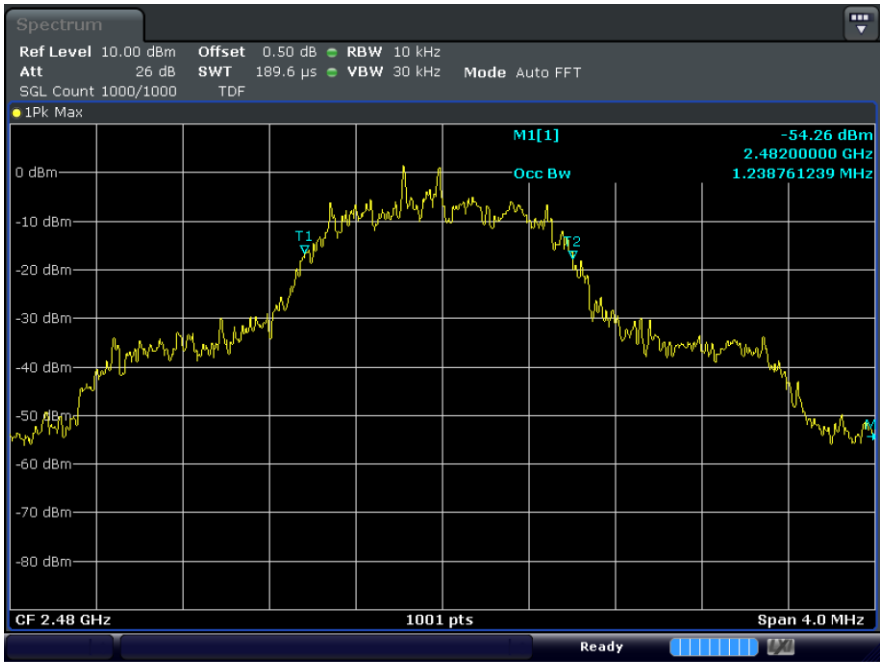
B.1. Middle Ch. (2 441 MHz)_20 dB Bandwidth

B.2. Middle Ch. (2 441 MHz)_99% Bandwidth



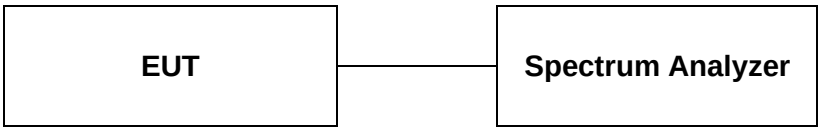
C.1. Highest Ch. (2 480 MHz)_20 dB Bandwidth

C.2. Highest Ch. (2 480 MHz)_99% Bandwidth



8. Peak output power

8.1. Test setup



8.2. Limit

The maximum peak output power of the intentional radiator shall not exceed the following:
1. §15.247(a)(1), 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, provided the systems operate with an output power no greater than 125 mW
2. §15.247(b)(1), For frequency hopping systems operating in the 2400–2483.5 MHz employing at least 75non-overlapping hopping channels, and all frequency hopping systems in the 5725–5805 MHz band: 1Watt.

8.3. Test procedure

Peak output power is measured using the following procedure
1. Frequency hopping shall be disabled for this test.
2. Span = Approximately five times the 20 dB bandwidth, centered on a hopping channel.
3. RBW > 20 dB bandwidth of the emission being measured.
4. VBW ≥ RBW.
5. Sweep time = No faster than coupled(auto) time.
6. Detector = peak
7. Trace mode = max hold
8. Allow trace to fully stabilize
9. Use the marker-to-peak function to set the marker to the peak of the emission.
10. The indicated level is the peak output power, after any corrections for external attenuators and cables.
11. A spectral plot of the test results and setup description shall be included in the test report.

8.4. Test results

Test mode : BDR

Frequency (MHz)	Peak output power (dBm)	Limit (dBm)
2 402	6.66	30
2 441	7.42	
2 480	7.70	

Test mode : EDR

Frequency (MHz)	Peak output power (dBm)	Limit (dBm)
2 402	7.11	30
2 441	7.64	
2 480	7.92	

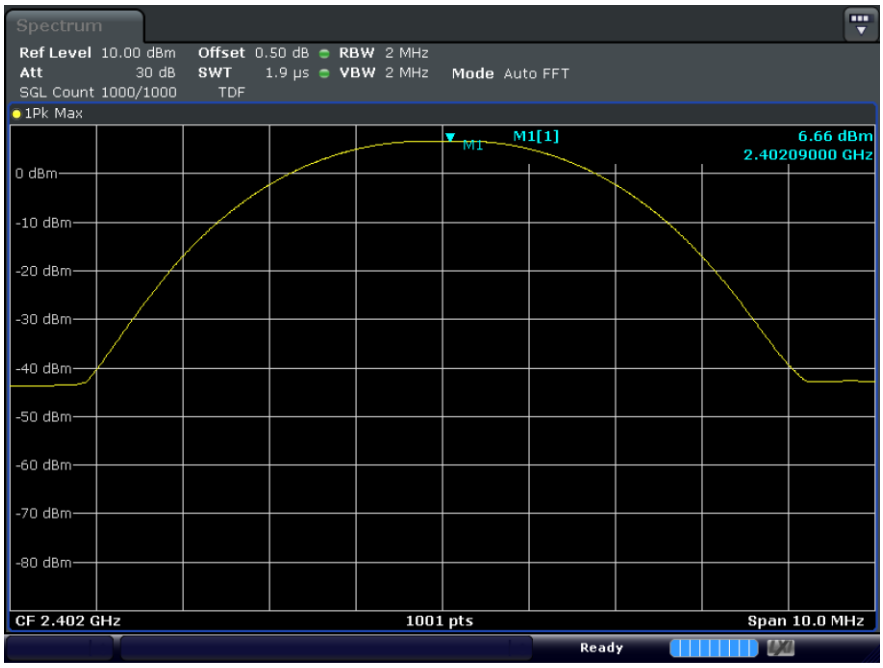
※Remark

1. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

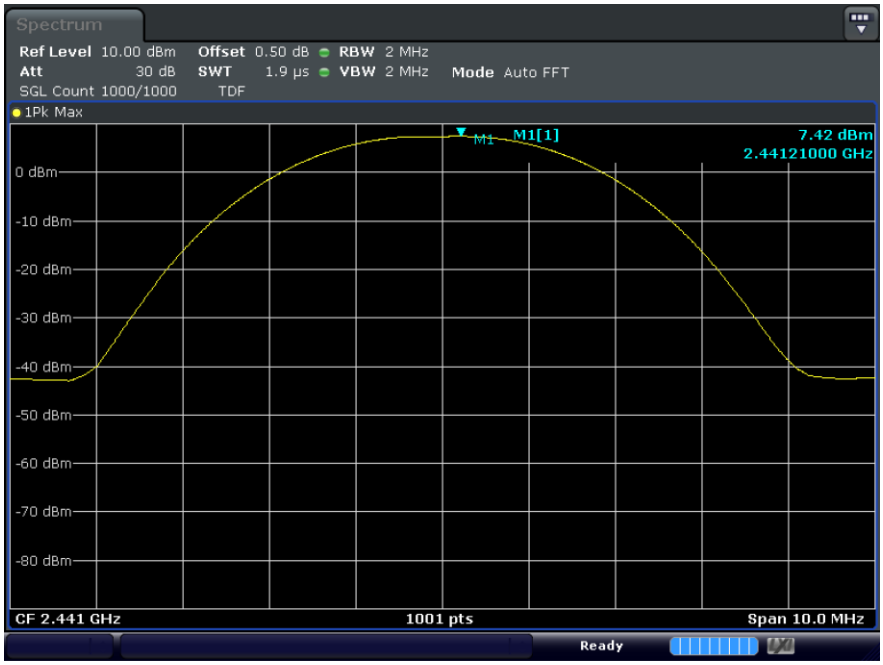
8.4.1. Test plot

Test mode : BDR

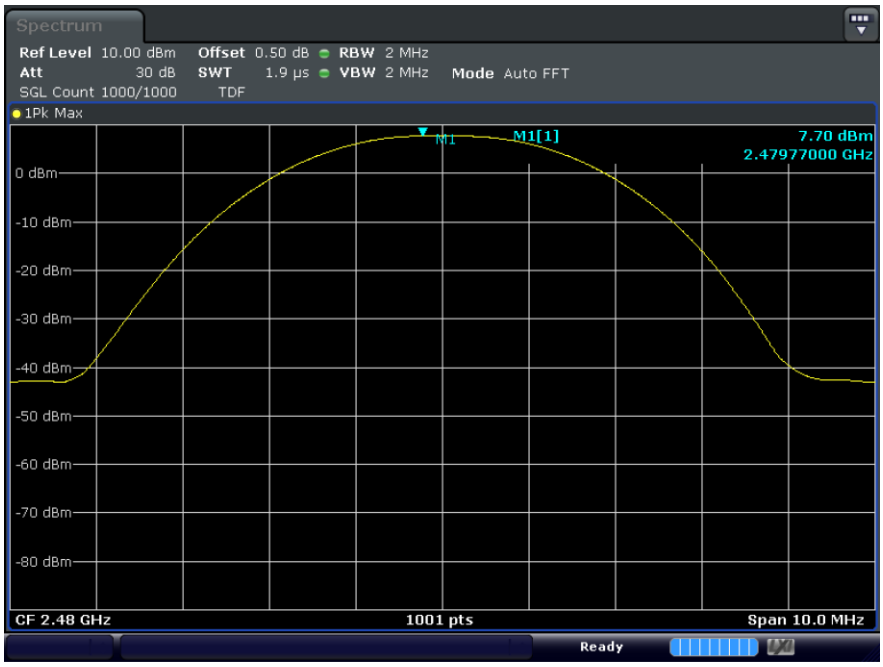
A. Lowest Ch. (2 402 MHz)



B. Middle Ch. (2 441 MHz)

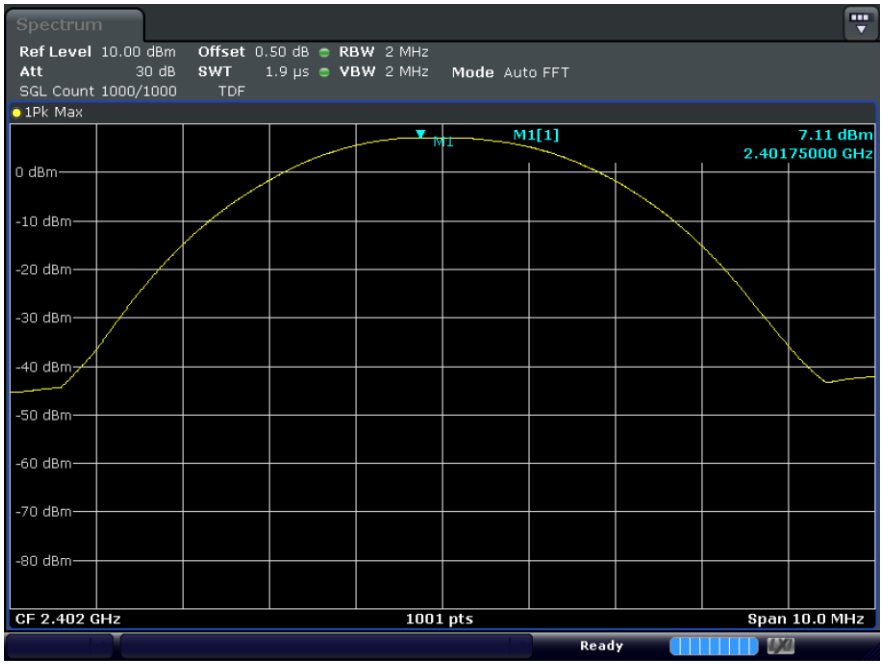


C. Highest Ch. (2 480 MHz)

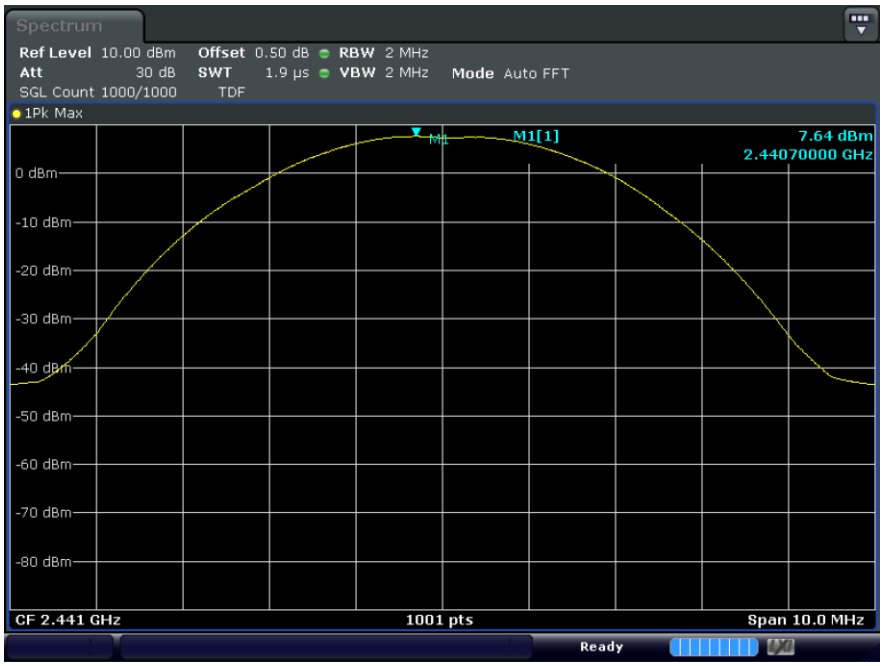


Test mode : EDR

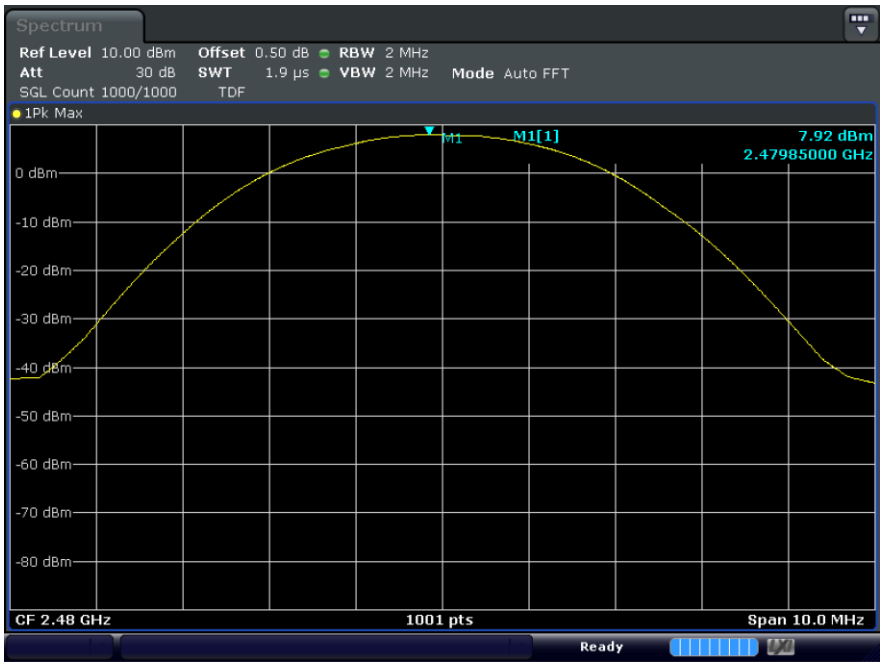
A. Lowest Ch. (2 402 MHz)



B. Middle Ch. (2 441 MHz)

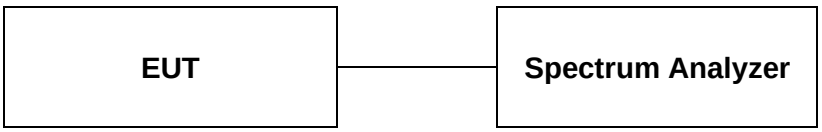


C. Highest Ch. (2 480 MHz)



9. Carrier frequency separation

9.1. Test setup



9.2. Limit

§15.247(a)(1) Frequency hopping system operating in 2 400 – 2 483.5 MHz. Band may have hopping channel carrier frequencies that are separated by 25 kHz or two-third of 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

9.3. Test procedure

Carrier frequency separation is measured using the following procedure
1. Span = Wide enough to capture the peaks of two adjacent channels.
2. RBW = Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. VBW ≥ RBW.
4. Sweep time = No faster than coupled(auto) time.
5. Detector = peak
6. Trace mode = max hold
7. Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.
Compliance of an EUT with the appropriate regulatory limit shall be determined. A spectral plot of the data shall be included in the test report.

Where the device shares the same channel plan (carrier frequencies and number of channels) across multiple data rates or modulation schemes then the carrier separation need only be measured for one of those modulation schemes or data rates.

9.4. Test results

Test mode : BDR

Frequency (MHz)	Adjacent hopping Channel separation (kHz)	Two-third of 20 dB bandwidth (kHz)	Minimum bandwidth (kHz)
2 441	1 004.00	570.00	25.00

Test mode : EDR

Frequency (MHz)	Adjacent hopping Channel separation (kHz)	Two-third of 20 dB bandwidth (kHz)	Minimum bandwidth (kHz)
2 441	1 001.00	893.33	25.00

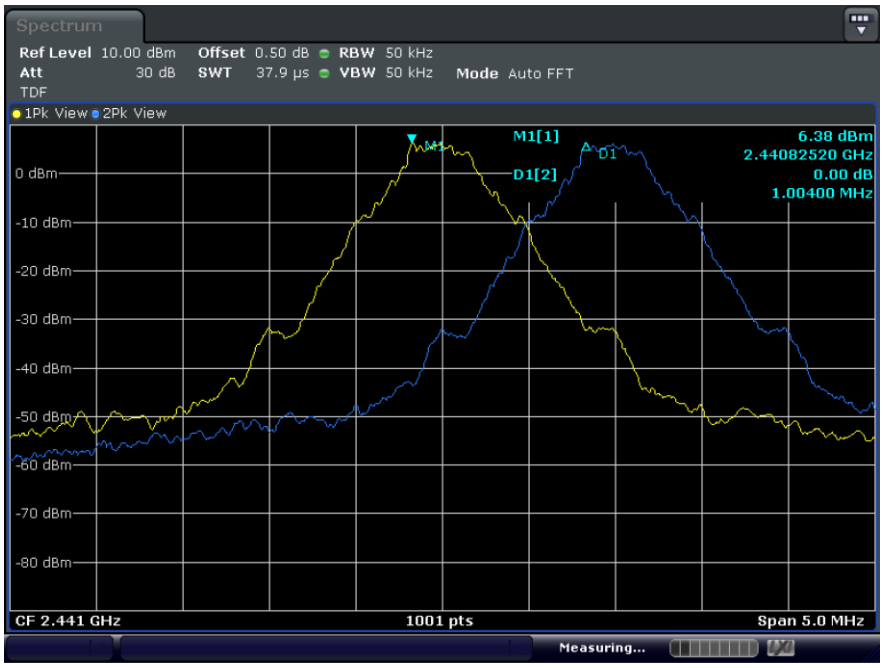
※Remark

1. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

9.4.1. Test plot

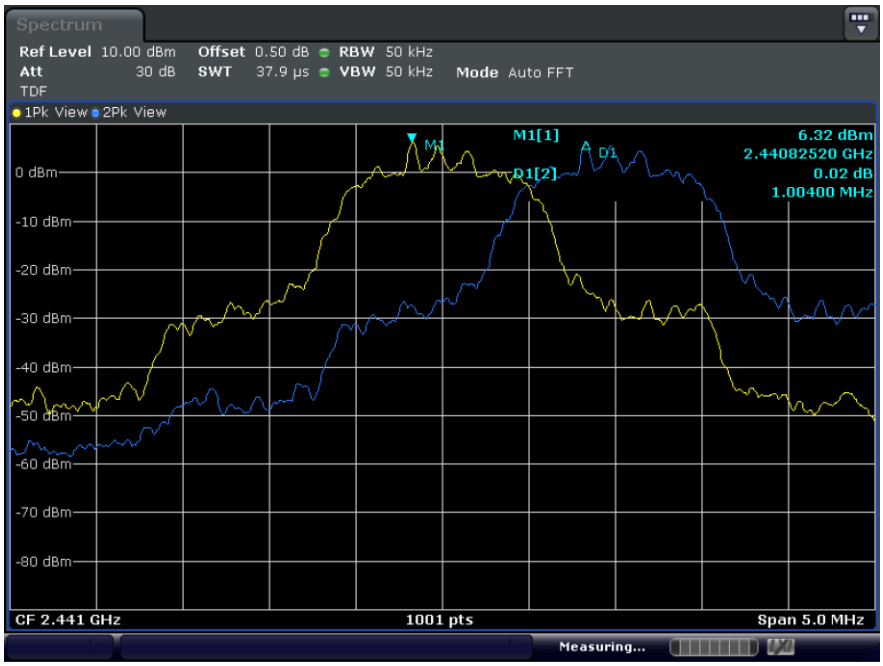
Test mode : BDR

A. Middle Ch. (2 441 MHz)



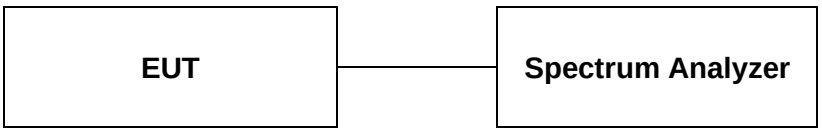
Test mode : EDR

A. Middle Ch. (2 441 MHz)



10. Number of hopping frequencies

10.1. Test setup



10.2. Limit

§15.247(a)(1)(iii) For frequency hopping system operating in the 2400-2483.5 MHz bands shall use at least15 hopping frequencies.

10.3. Test procedure

Number of hopping frequencies is measured using the following procedure
1. Span = The frequency band of operation. Depending on the number of channels the device supports, it could be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. RBW = To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW ≥ RBW.
4. Sweep time = No faster than coupled(auto) time.
5. Detector = peak
6. Trace mode = max hold
7. Allow the trace to stabilize.

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies.
Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A spectral plot of the data shall be included in the test report.

Where the device shares the same channel plan (carrier frequencies and number of channels) across multiple data rates or modulation schemes then the number of channels need only be measured for one of those modulation schemes or data rates.

10.4. Test results

Test mode : BDR

Number of Hopping Frequency	Limit
79	≥ 15

Test mode : EDR

Number of Hopping Frequency	Limit
79	≥ 15

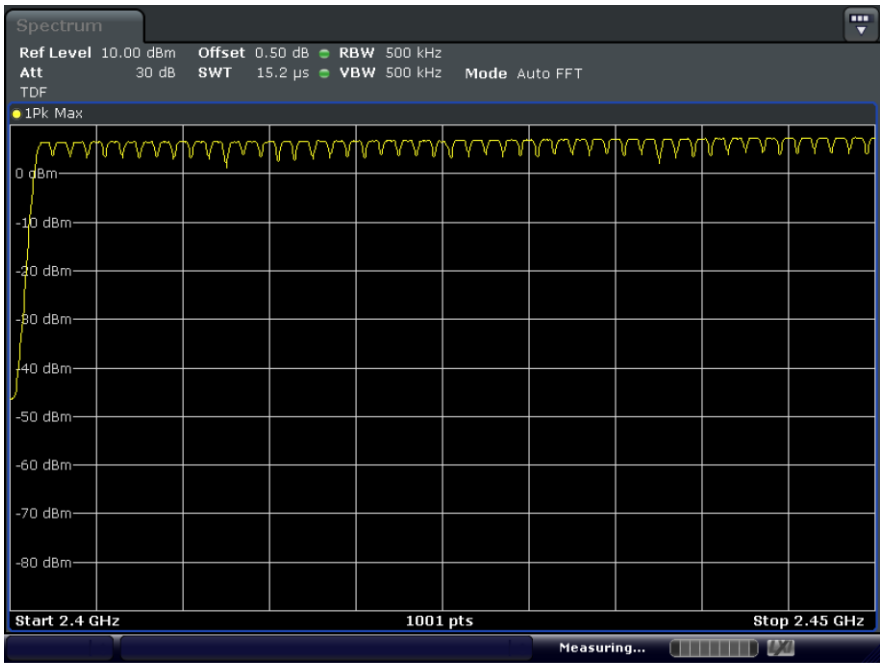
※Remark

1. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

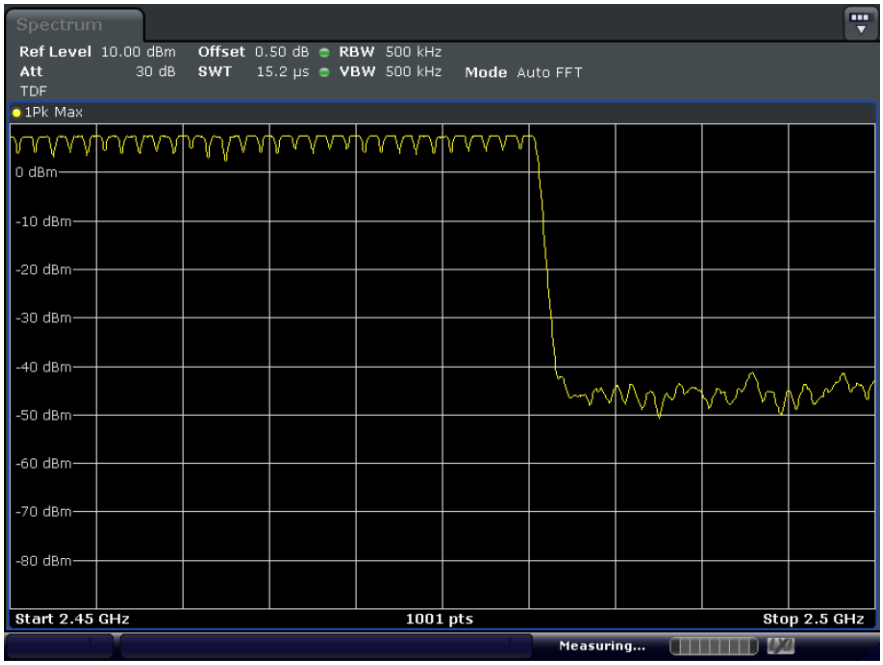
10.4.1. Test plot

Test mode : BDR

A. Lowest Band. (Hopping)

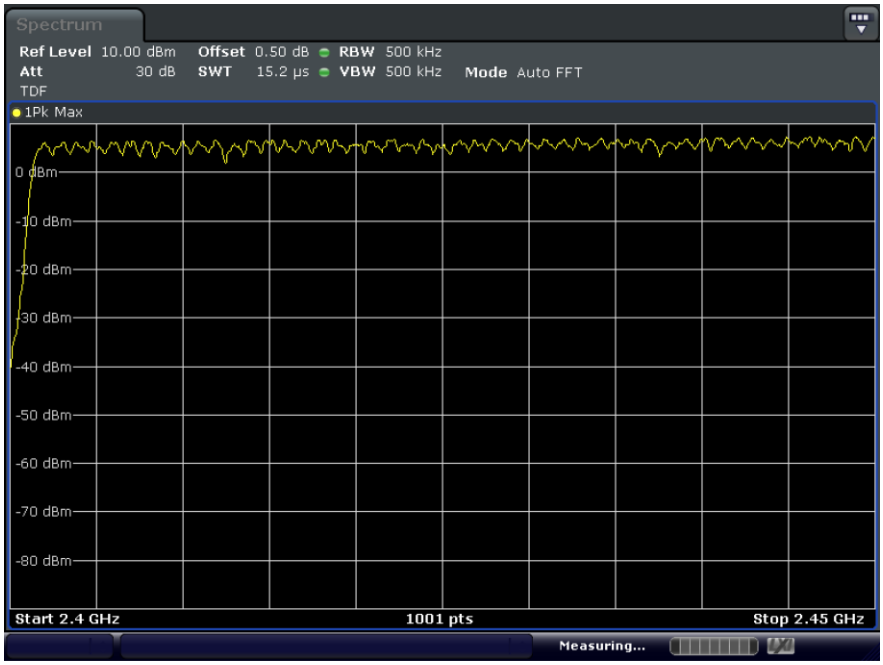


B. Highest Band. (Hopping)

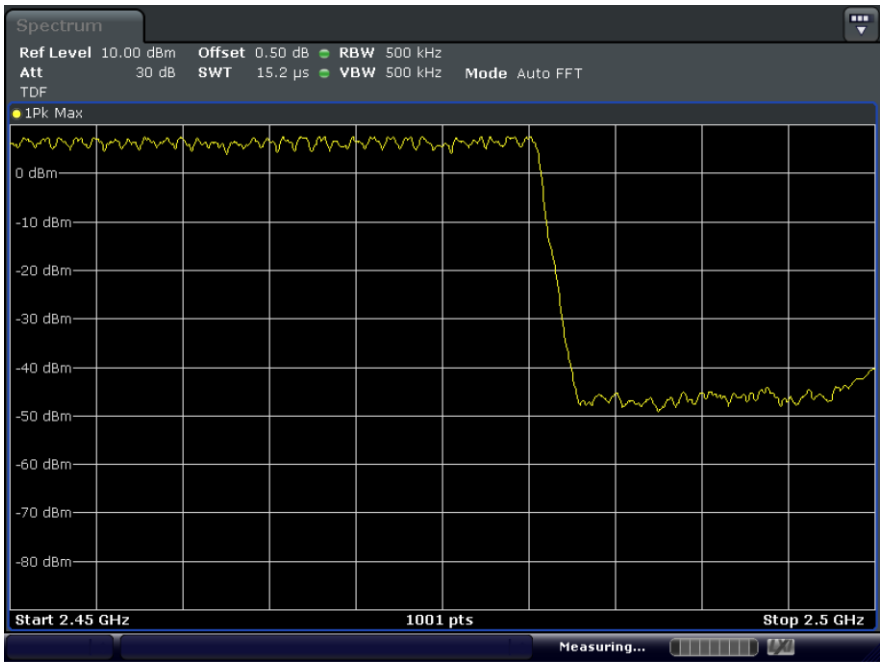


Test mode : EDR

A. Lowest Band. (Hopping)

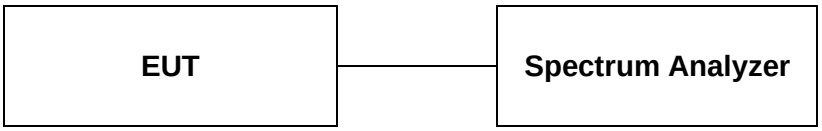


B. Highest Band. (Hopping)



11. Time of occupancy (Dwell time)

11.1. Test setup



11.2. Limit

§15.247(a)(1)(iii) For frequency hopping system operating in the 2 400 – 2 483.5 MHz band, theaverage timeof occupancy on any frequency shall not be greater than 0.4 second within a 31.6 second period.

A period time = 0.4(s) * 79 = 31.6(s)

11.3. Test procedure

Time of occupancy is measured using the following procedure
1. Span = Zero span, centered on a hopping channel.
2. RBW shall be ≤ channel spacing and where possible RBW should be set >> *1 / T, where* T is the expected transmission time per hop.
3. Sweep time = Set so that the start of the first transmission and end of the last transmission for the hop are clearly captured. Setting the sweep time to be slightly longer than the hopping period per channel (hopping period = 1 / hopping rate) should achieve this.
4. Use a video trigger, where possible with a trigger delay, so that the start of the transmission is clearly observed. The trigger level might need adjustment to reduce the chance of triggering when the system hops on an adjacent channel.
5. Detector = peak
6. Trace mode = Clear write, single sweep.
7. Place markers at the start of the first transmission on the channel and at the end of the last transmission. The dwell time per hop is the time between these two markers.
8. The hopping rate is 1 600 per second.

11.4. Test results

Test mode : BDR

On Time [ms]	Hopping Rate	Result [s]	Limit [s]
2.88	266.67	0.31	0.40

Test mode : EDR

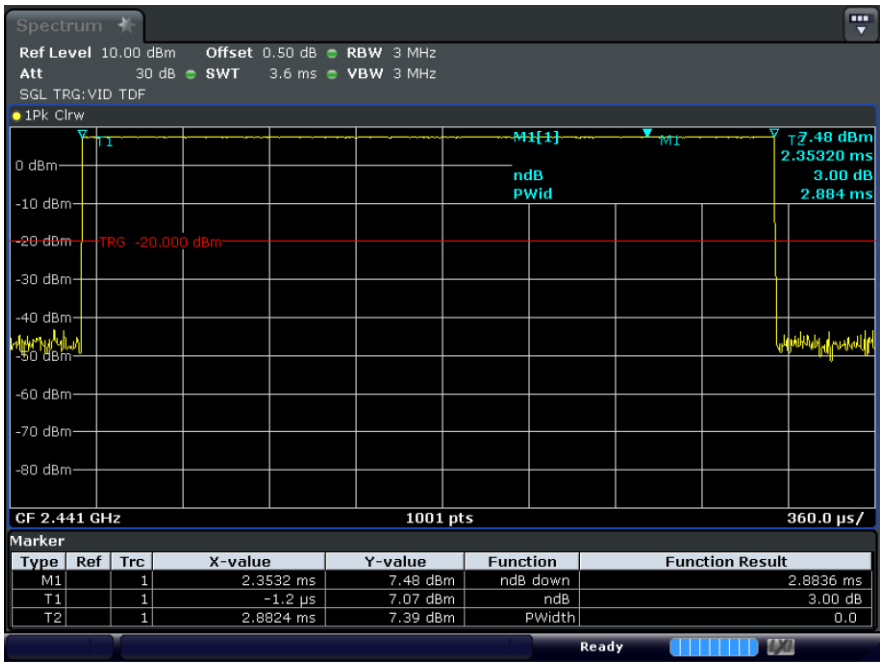
On Time [ms]	Hopping Rate	Result [s]	Limit [s]
2.89	266.67	0.31	0.40

※Remark

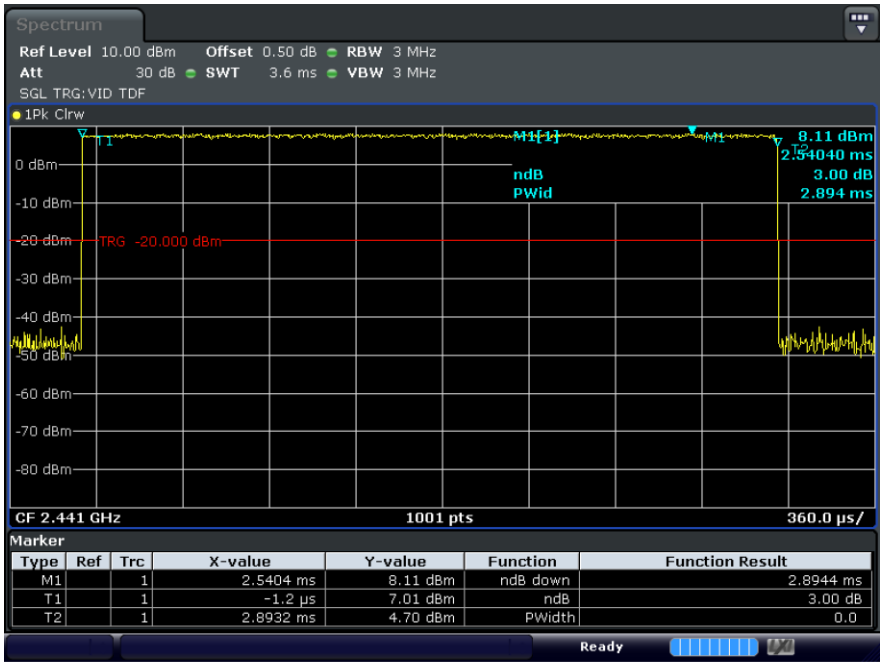
1. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

11.4.1. Test plot

Test mode : BDR



Test mode : EDR

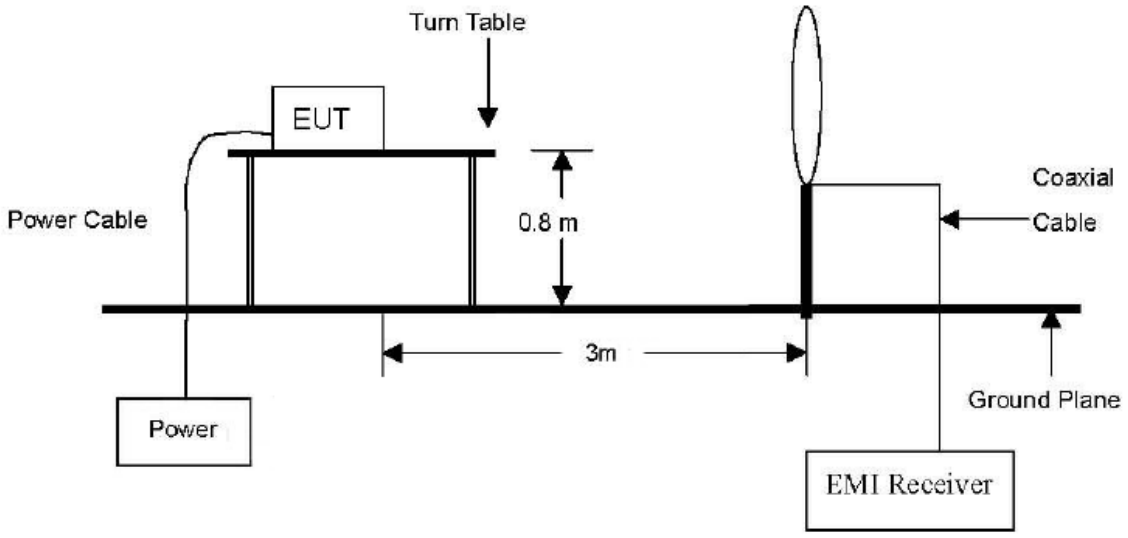


12. Transmitter radiated spurious emissions and conducted spurious emissions

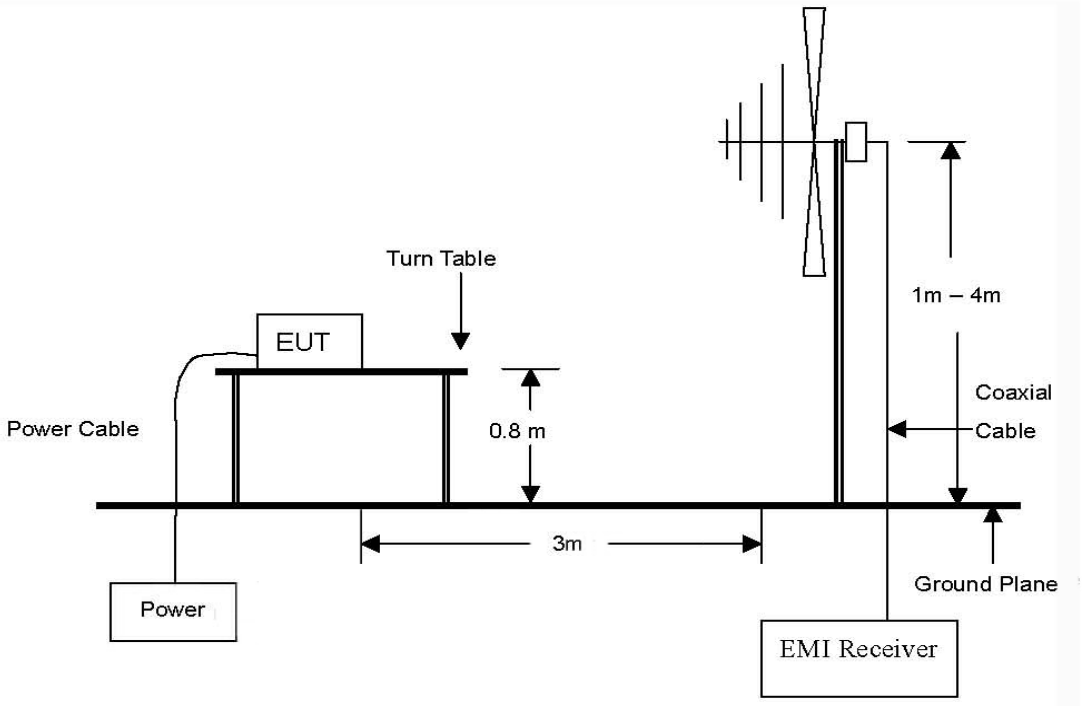
12.1. Test setup

12.1.1. Transmitter radiated spurious emissions

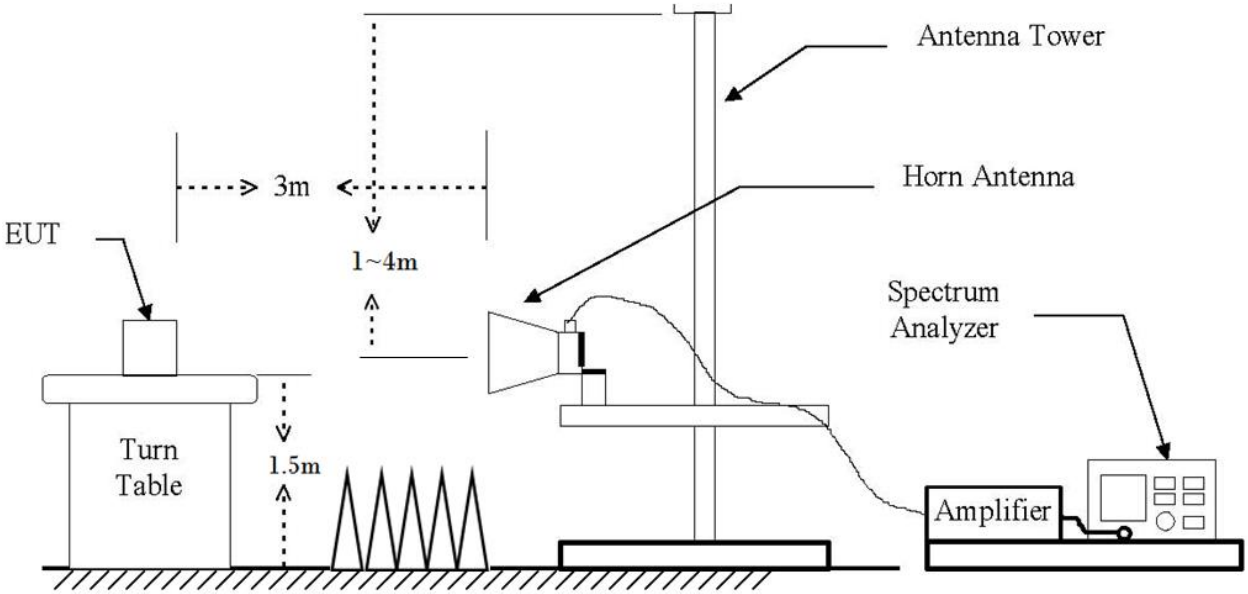
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 40 GHz emissions.



12.2. Limit

According to §15.247(d), 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 section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))
According to § 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (MHz)	Distance (Meters)	Radiated at 3M (dBuV/m)	Radiated (uV/m)
0.009–0.490	300	See the remark	2400/F(kHz)
0.490–1.705	30		24000/F(kHz)
1.705–30.0	30		30
30 - 88	3	40.0	100
88 – 216	3	43.52	150
216 – 960	3	46.02	200
Above 960	3	53.97	500

※Remark

1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Distance extrapolation factor =20log(Specific distance/ test distance)(dB)
   Limit line=Specific limits(dBuV) + distance extrapolation factor.

12.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10:2020
In case of the air temperature of the test site is out of the range is 10 to 40 °C before the testing proceeds the warm-up time of EUT maintain adequately

12.3.1. Test procedures for radiated spurious emissions

1. The EUT is placed on a turntable, which is 0.8 m (Below 1 GHz.)/ 1.5 m (Above 1GHz) above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

※Remark

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 kHz for Peak detection (PK) at frequency below 30 MHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 GHz.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.

12.3.2. Test procedures for conducted spurious emissions

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=100 kHz, VBW=100 kHz.

12.4. Test results

12.4.1. Radiated spurious emissions (9 kHz to 30 MHz)

The frequency spectrum from 9 kHz to 30 MHz was investigated. Emission levels are not reported much lower than the limits by over 20 dB. All reading values are peak values.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Test mode : EDR_2 402 MHz (Worst case)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
No other emissions were detected at a level greater than 20dB below limit.					

※Remark

1. Result = Reading + Ant. factor - Amp + CL (Cable loss)
2. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
3. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

12.4.2. Radiated spurious emissions (30 MHz to 1 000 MHz)

The frequency spectrum from 30 MHz to 1 000 MHz was investigated. Emission levels are not reported much lower than the limits by over 20 dB. All reading values are peak values.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Test mode : EDR_2 402 MHz (Worst case)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
54.80	QP	V	29.44	40.00	10.56
71.05	QP	V	23.51	40.00	16.49
156.00	QP	V	27.67	43.52	15.85
240.00	QP	V	33.17	46.02	12.85
672.00	QP	V	29.96	46.02	16.06
779.99	QP	H	34.91	46.02	11.11
Above 800 MHz Not detected					

※Remark

1. Result = Reading + Ant. factor - Amp + CL (Cable loss)
2. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
3. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

12.4.3. Radiated spurious emissions & Bandedge (Above 1 000 MHz)

The frequency spectrum above 1 000 MHz was investigated. Emission levels are not reported much lower than the limits by over 20 dB.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Test mode : BDR

A. Lowest Ch. (2 402 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2 328.87	Peak	V	35.76	74.00	38.24
*4 803.94	Peak	H	41.25	74.00	32.75
9 607.83	Peak	V	53.48	74.00	20.52
Above 10 000 MHz Not detected					

B. Middle Ch. (2 441 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*5 021.41	Peak	H	41.23	74.00	32.77
9.763.59	Peak	V	57.16	74.00	16.84
9.763.85	Average	V	15.04	54.00	38.96
Above 10 000 MHz Not detected					

※Remark

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
3. Actual = Reading + Ant. factor - Amp + CL (Cable loss) + DCCF
4. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
5. * is Restricted band.
6. DCCF(Duty Cycle Correction Factor) = 20 x Log(Worst case dwell time / 100 ms) dB
Refer to 12.4.5
7. Average measurement did not take place because the peak data did not exceed average limit
8. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

C. Highest Ch. (2 480 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2 499.43	Peak	V	34.75	74.00	39.25
*4 801.66	Peak	V	38.41	74.00	35.59
Above 5 000 MHz Not detected					

※Remark

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
3. Actual = Reading + Ant. factor - Amp + CL (Cable loss) + DCCF
4. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
5. * is Restricted band.
6. DCCF(Duty Cycle Correction Factor) = 20 x Log(Worst case dwell time / 100 ms) dB
Refer to 12.4.5
7. Average measurement did not take place because the peak data did not exceed average limit
8. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

Test mode : EDR

A. Lowest Ch. (2 402 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2 321.73	Peak	V	35.29	74.00	38.71
*4 674.80	Peak	V	37.66	74.00	36.34
Above 5 000 MHz Not detected					

B. Middle Ch. (2 441 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*4 882.19	Peak	H	38.09	74.00	35.91
*7 322.64	Peak	V	52.37	74.00	21.63
Above 8 000 MHz Not detected					

※Remark

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
3. Actual = Reading + Ant. factor - Amp + CL (Cable loss) + DCCF
4. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
5. * is Restricted band.
6. DCCF(Duty Cycle Correction Factor) = 20 x Log(Worst case dwell time / 100 ms) dB
Refer to 12.4.5
7. Average measurement did not take place because the peak data did not exceed average limit
8. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

C. Highest Ch. (2 480 MHz)

Frequency (MHz)	Detector Mode	Pol.	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
*2 493.38	Peak	H	34.41	74.00	39.59
*5 080.29	Peak	H	38.11	74.00	35.89
Above 6 000 MHz Not detected					

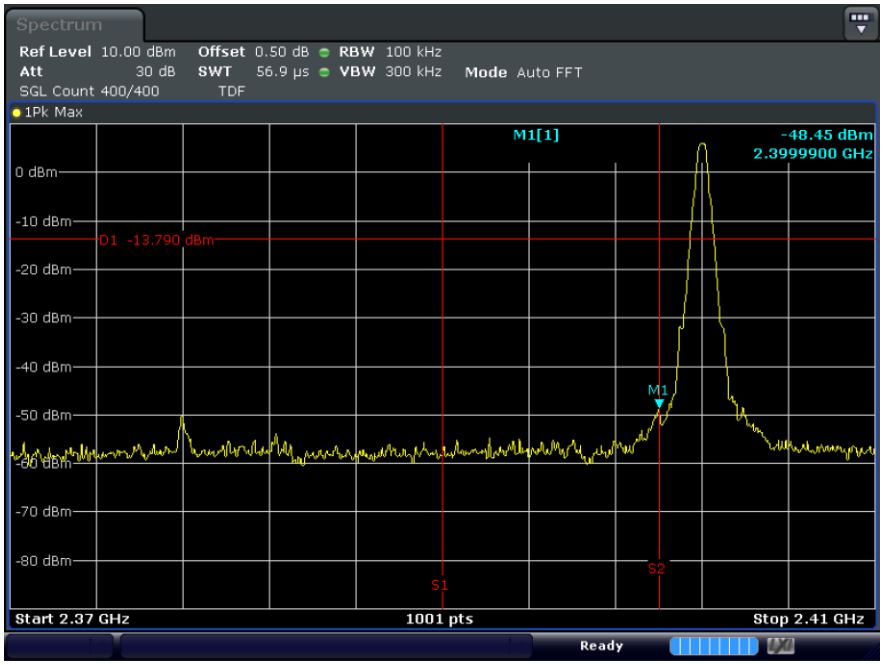
※Remark

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
2. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
3. Actual = Reading + Ant. factor - Amp + CL (Cable loss) + DCCF
4. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.
5. * is Restricted band.
6. DCCF(Duty Cycle Correction Factor) = 20 x Log(Worst case dwell time / 100 ms) dB
Refer to 12.4.5
7. Average measurement did not take place because the peak data did not exceed average limit
8. These results are satisfied in accordance with decision rules, including measurements and estimates of measurement uncertainty

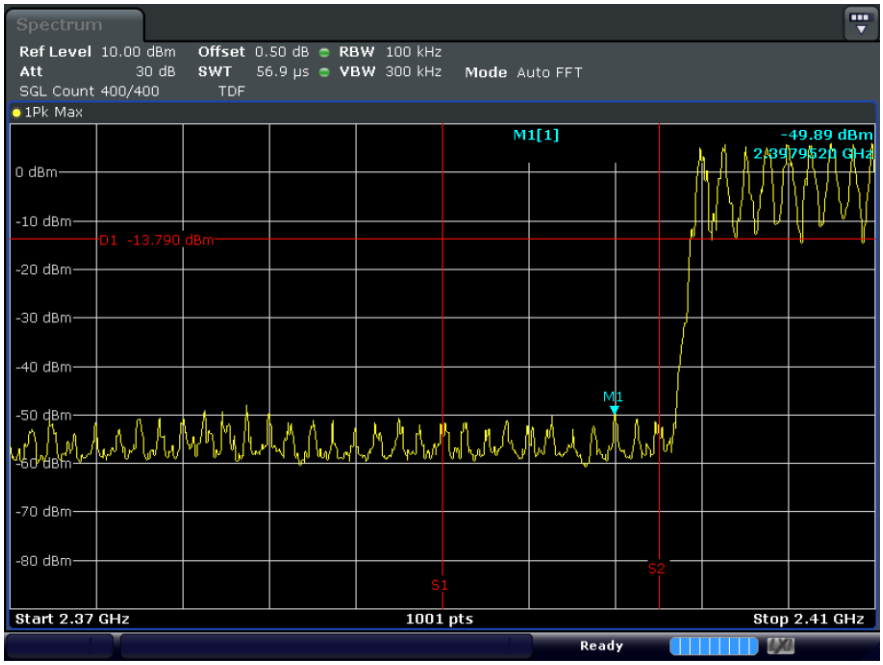
12.4.4. Test plot (Conducted spurious emissions & Bandedge)

Test mode : BDR

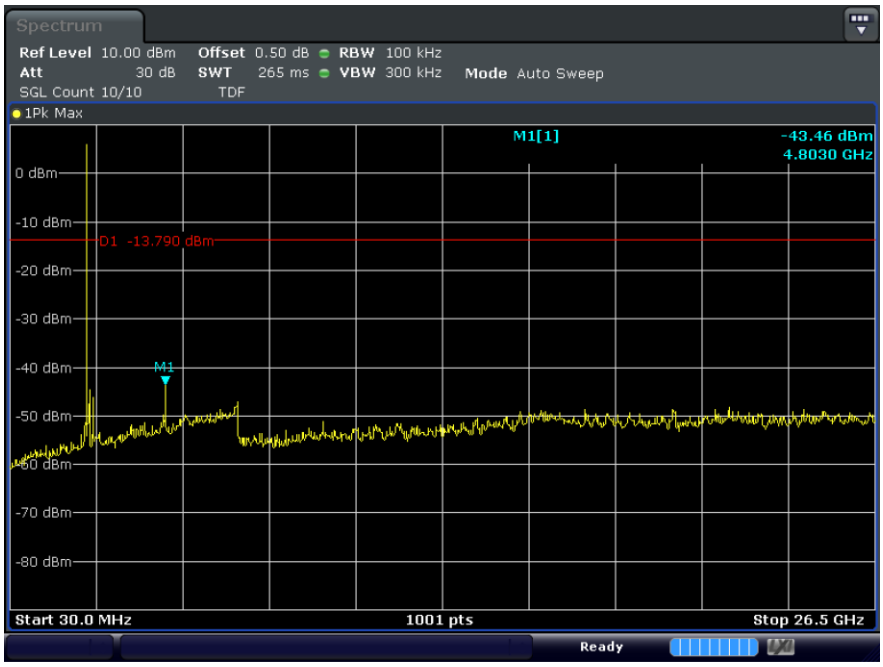
A.1. Lowest Ch. (2 402 MHz)_Band edge



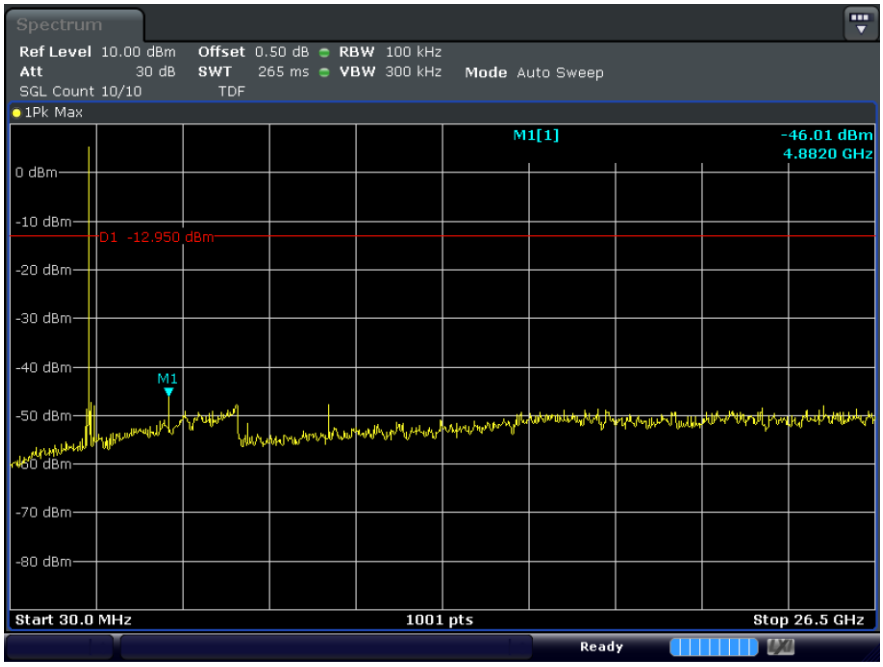
A.2. Lowest Ch. (2 402 MHz)_Band edge(Hopping)



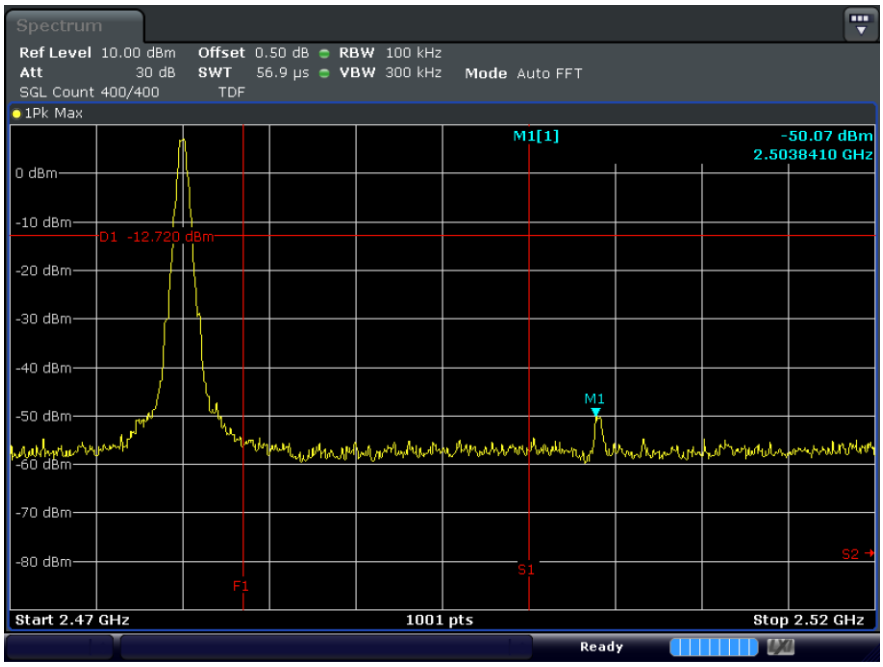
A.3. Lowest Ch. (2 402 MHz)_Spurious emissions



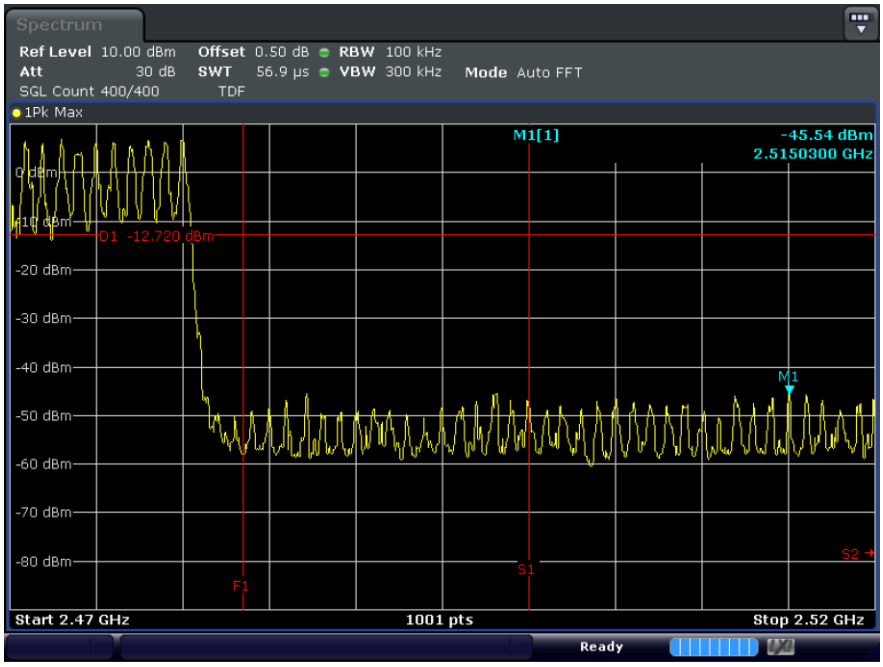
B.1. Middle Ch. (2 441 MHz)_Spurious emissions



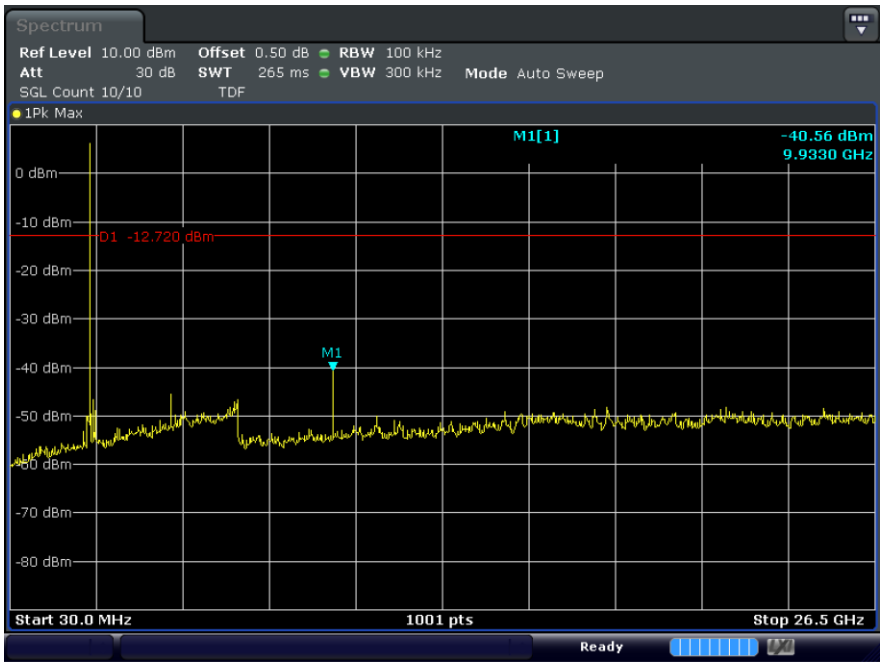
C.1. Highest Ch. (2 480 MHz)_Band edge



C.2. Highest Ch. (2 480 MHz)_Band edge(Hopping)

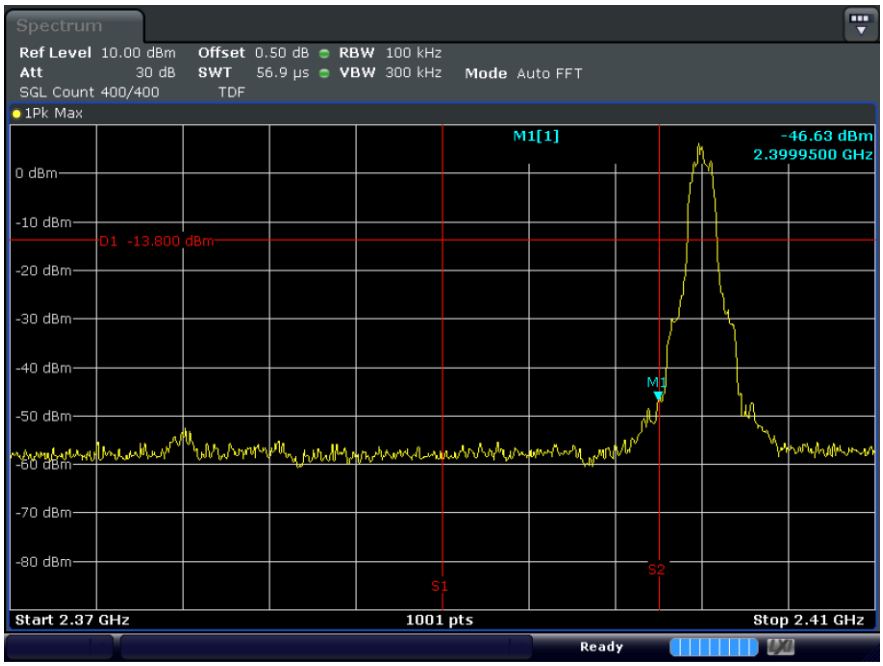


C.3. Highest Ch. (2 480 MHz)_Spurious emissions

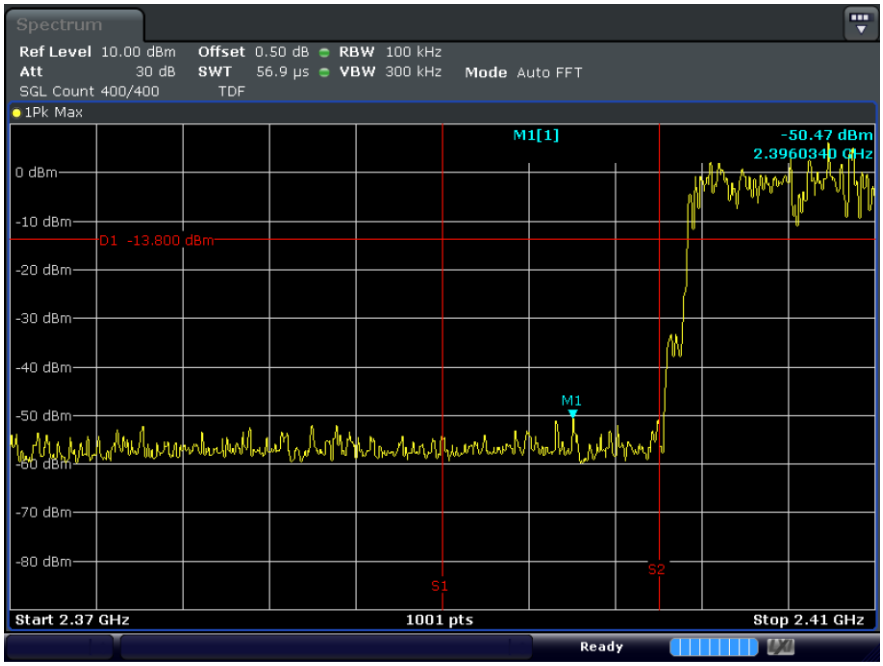


Test mode : EDR

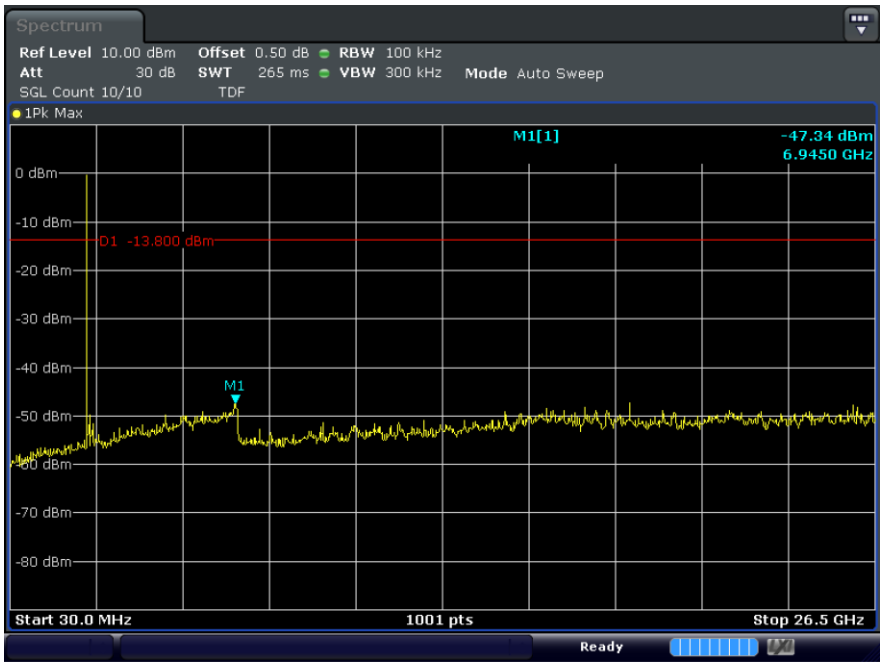
A.1. Lowest Ch. (2 402 MHz)_Band edge



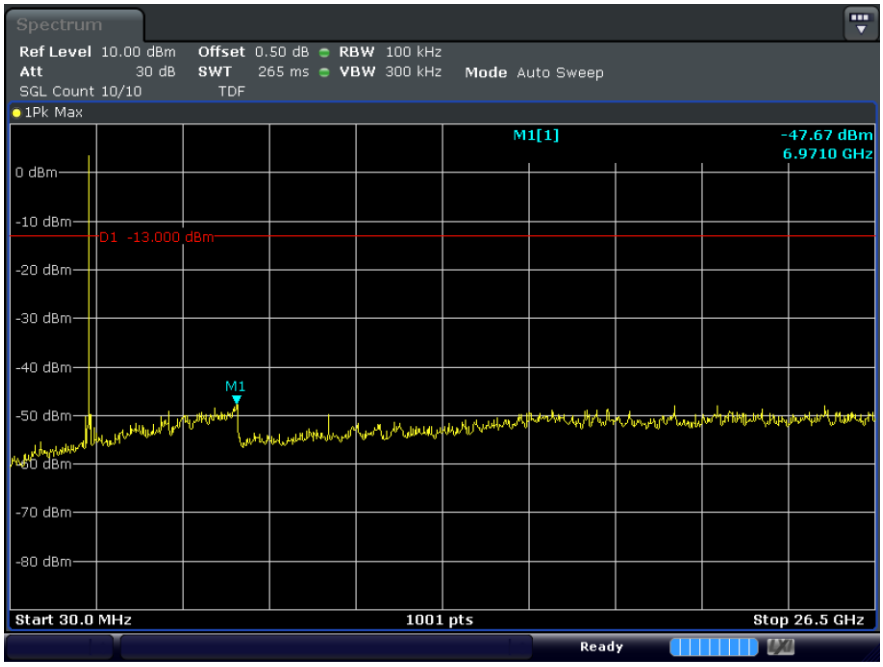
A.2. Lowest Ch. (2 402 MHz)_Band edge(Hopping)



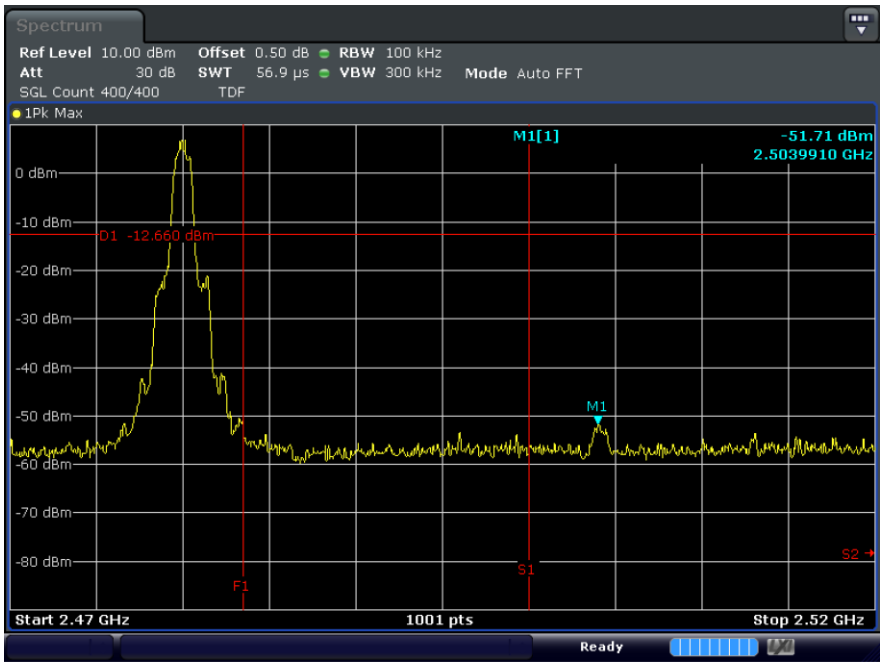
A.3. Lowest Ch. (2 402 MHz)_Spurious emissions



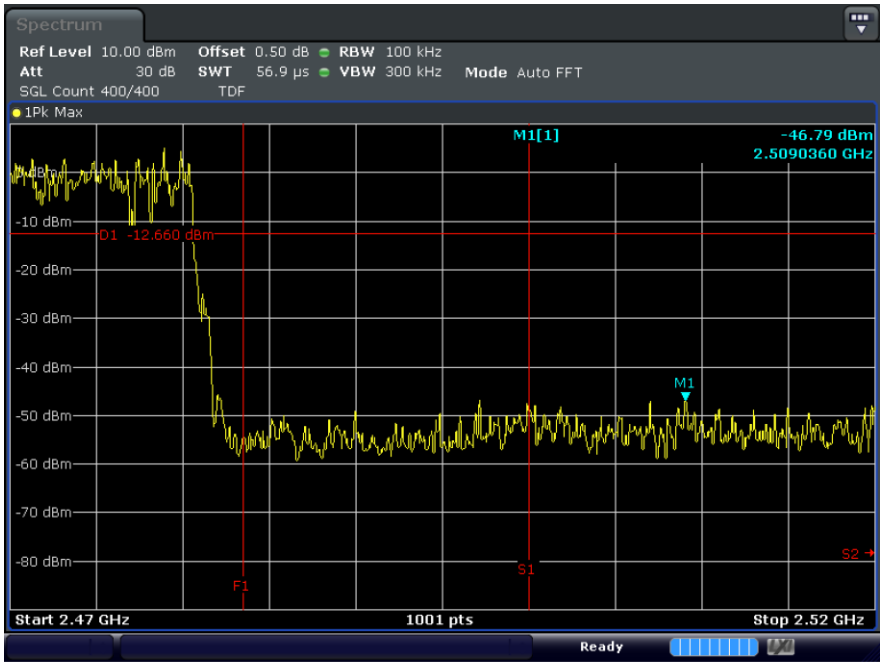
B.1. Middle Ch. (2 441 MHz)_Spurious emissions



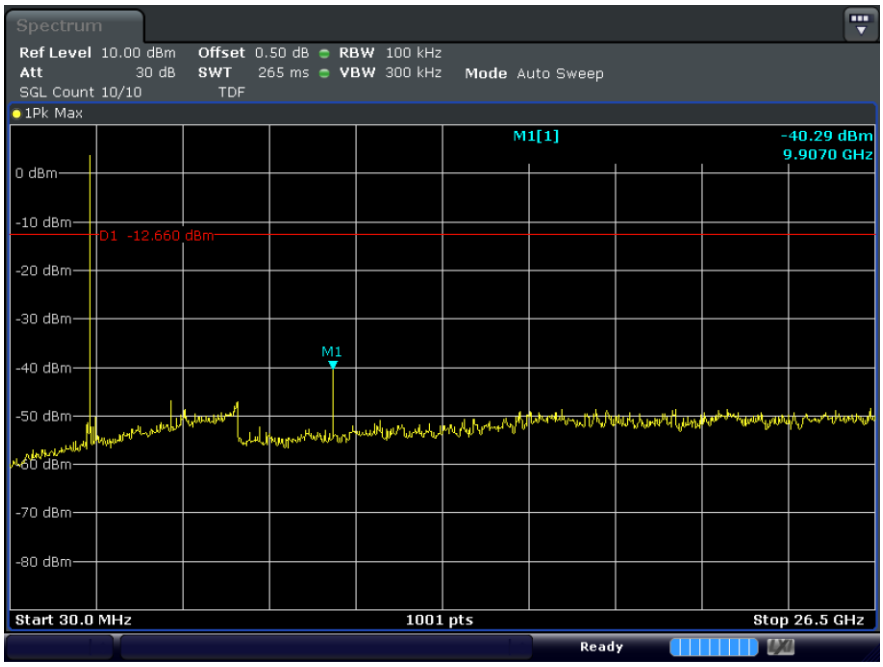
C.1. Highest Ch. (2 480 MHz)_Band edge



C.2. Highest Ch. (2 480 MHz)_Band edge(Hopping)



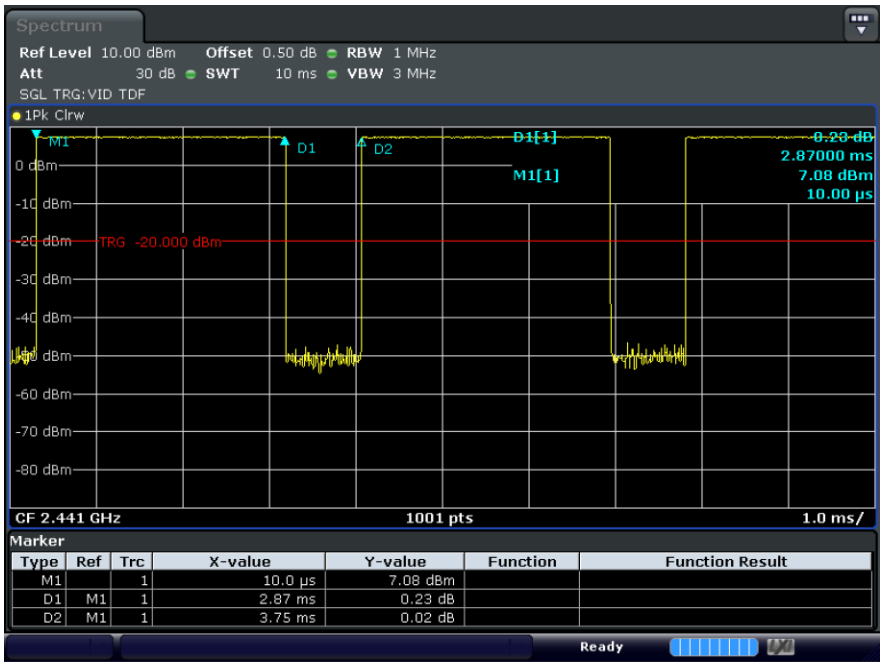
C.3. Highest Ch. (2 480 MHz)_Spurious emissions



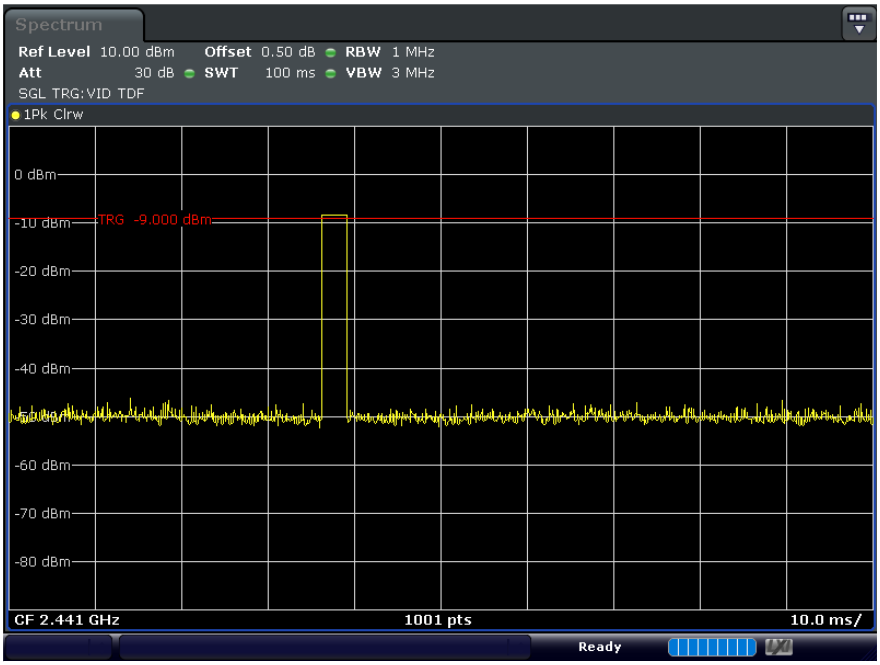
12.4.5. Test plot (Duty Cycle Correction Factor)

Test mode : BDR

A.1. Middle Ch. (2 441 MHz)_Duty Cycle



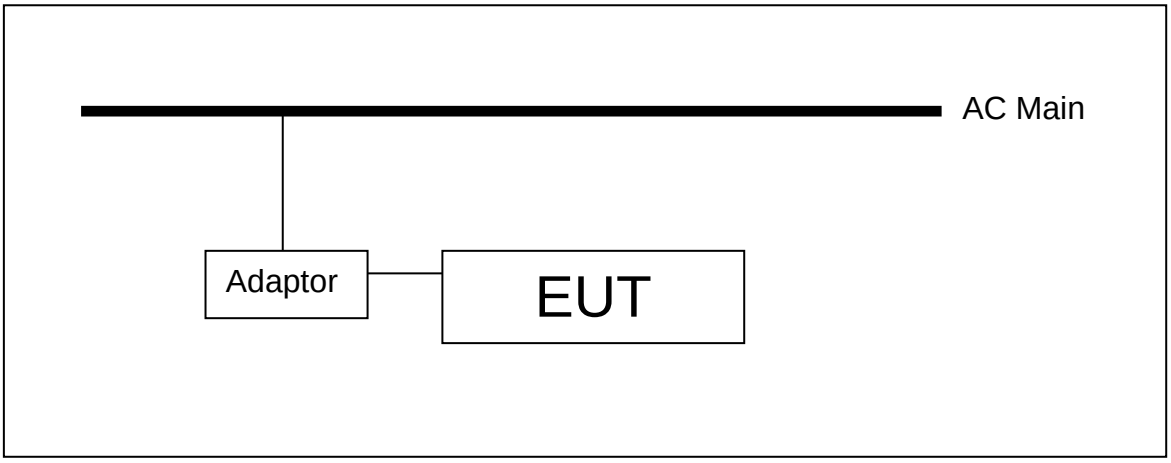
A.2. Middle Ch. (2 441 MHz)_DCCF 100 ms



Note 1 : Worst case dwell time = Burst on time * No. of hop
Note 2 : DCCF = 20 * Log(Worst case dwell time / 100 ms) = 20 * log(2.87 / 100) = -30.84

13. AC Conducted power line test

13.1. Test setup



13.2. Limit

According to §15.107(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohms line impedance stabilization network(LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted limit (dBuV/m)	
	Quasi-peak	Average
0.15 – 0.50	66-56*	56-46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

※Remark

Decreases with the logarithm of the frequency.

13.3. Test procedure

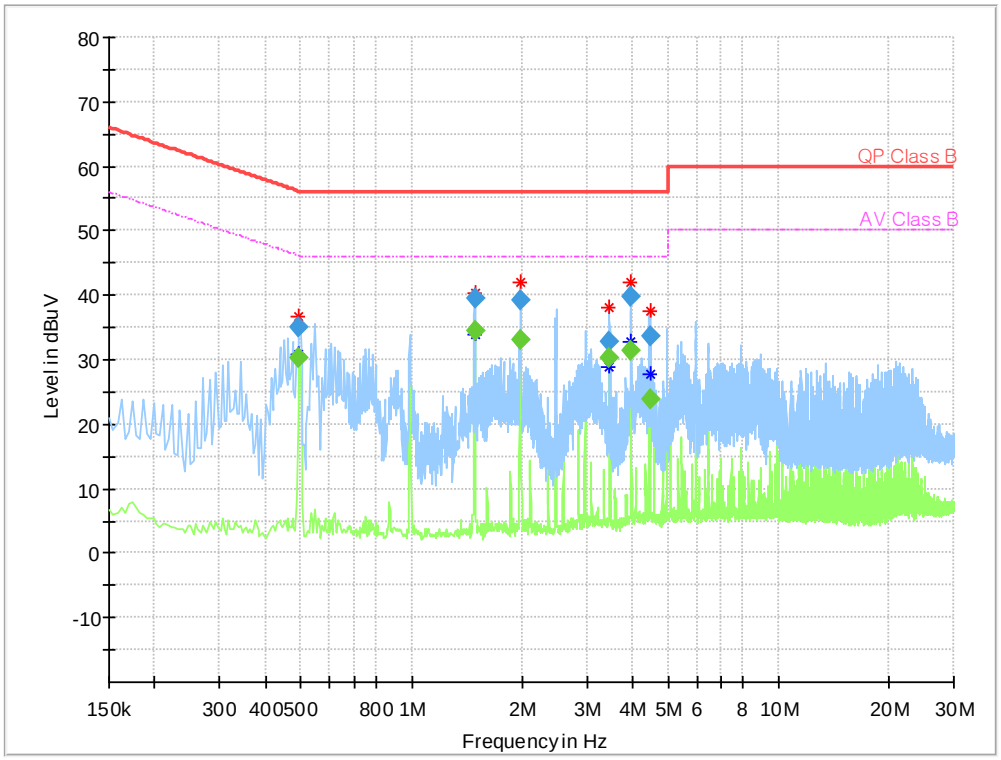
The test procedure is performed in a 6.5 m × 3.6 m × 3.6 m (L×W×H) shielded room. The EUT along with its peripherals were placed on a 1.0m(W)× 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

13.4. Test results

Frequency range: 0.15 MHz ~ 30 MHz
Measured bandwidth: 9 kHz

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.49	---	30.16	46.10	15.94	7000.0	9.00	N	GND	10.11
0.49	35.09	---	56.10	21.01	7000.0	9.00	L1	GND	10.11
1.49	---	34.60	46.00	11.40	7000.0	9.00	N	GND	10.18
1.49	39.37	---	56.00	16.63	7000.0	9.00	N	GND	10.18
1.98	---	33.13	46.00	12.87	7000.0	9.00	N	GND	10.20
1.98	39.24	---	56.00	16.76	7000.0	9.00	N	GND	10.20
3.46	32.66	---	56.00	23.34	7000.0	9.00	N	GND	10.30
3.47	---	30.36	46.00	15.64	7000.0	9.00	N	GND	10.30
3.96	39.65	---	56.00	16.35	7000.0	9.00	N	GND	10.34
3.96	---	31.40	46.00	14.60	7000.0	9.00	N	GND	10.34
4.45	33.66	---	56.00	22.34	7000.0	9.00	N	GND	10.37
4.45	---	23.83	46.00	22.17	7000.0	9.00	L1	GND	10.38

※Remark

Line(L1): Hot
Line(N): Neutral

13.4.1 Test plot