TEST REPORT

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Report No.: CTK-2020-04545

1. Client

◦ Name : Samsung Electronics Co Ltd

◦ Address : 19 Chapin Rd, Building D. Pine Brook, New Jersey, United States

◦ Date of Receipt : 2020-10-26

2. Manufacturer

◦ Name : Samsung Electronics Co., Ltd.

◦ Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

3. Use of Report : For FCC Conformance / ISED Conformance

4. Test Sample / Model: Wi-Fi/BT Transceiver / WCA942M

5. Date of Test : 2020-11-05 to 2020-11-20

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.247
RSS-247 & RSS-Gen

7. Testing Environment: Temp.: (23 ± 1) ℃, Humidity: (49 ± 3) % R.H.

8. Test Results : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by Ji-Hye, Kim: (Signature)	Technical Manager Won-Jae, Hwang: (Signature)

2020-11-20

Republic of KOREA **CTK Co., Ltd.**

REPORT REVISION HISTORY

Date	Revision	Page No
2020-11-20	Issued (CTK-2020-04545)	all

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1. General Product Description

1.1 Client Information

Company	Samsung Electronics Co., Ltd.
Contact Point	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Contact Person	Name : Youngjoong Noh E-mail : monk.noh@samsung.com Tel : +82-277-0598 Fax : -

1.2 Product Information

FCC ID	A3LWCA942M
ISED	649E-WCA942M
Product Description	Wi-Fi/BT Transceiver
Model name	WCA942M
Variant Model name	-
Operating Frequency	2 402 MHz - 2 480 MHz
RF Output Power	1 Mbps : 12.767 dBm (18.910 mW) 2 Mbps : 12.654 dBm (18.425 mW)
Antenna Specification	Antenna type : Chip Antenna Peak Gain : -1.04 dBi (BT0), -5.11 dBi (BT1)
Number of channels	40
Channel Spacing	1 MHz
Type of Modulation	GFSK (Bluetooth 5.0 - LE)
Power Source	DC 5 V
Hardware Rev	V2.0
Software Rev	FC2

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	HP	15-bs563TU	CND7253QPR
AC/DC Adapter	HP	HSTNN-LA40	-

1.4 Model Differences

Not applicable

2. Facility and Accreditations

2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yong-in-si, Gyeonggi-do, Korea.

2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A-2
KOREA	NRRA	KR0025

2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

3. Test Specifications

3.1 Standards

FCC Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
15.247(a)	6 dB Bandwidth	C	Conducted
15.247(b)	Maximum Output Power	C	
15.247(d)	Conducted Spurious emission	C	
15.247(d)	Unwanted Emission(Conducted)	C	
15.247(e)	Transmitter Power Spectral Density	C	
15.209	Radiated Emissions	C	Radiated
15.207	AC Conducted Emissions	C	Line Conducted
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
Note 2: The data in this test report are traceable to the national or international standards.			
Note 3: The sample was tested according to the following specification: FCC Part 15.247			
Note 4: The tests were performed according to the method of measurements prescribed in KDB No.558074, ANSI C63.10-2013			

ISED Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
RSS-247 5.2(a)	6 dB Bandwidth	C	Conducted
RSS-247 5.4(d)	Maximum Output Power	C	
RSS-247 5.5	Conducted Spurious emission	C	
RSS-247 5.5	Unwanted Emission(Conducted)	C	
RSS-247 5.2(b)	Transmitter Power Spectral Density	C	
RSS-Gen 6.13	Radiated Emissions	C	Radiated
RSS-Gen 8.8	AC Conducted Emissions	C	Line Conducted
Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
Note 2: The data in this test report are traceable to the national or international standards.			
Note 3: The sample was tested according to the following specification: RSS-247, RSS-GEN			
Note 4: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013			

3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments.
During at testing, system components were manipulated within the confines of typical usage to maximize each emission. All modulation modes were tests.
The results are only attached worst cases.

Test Frequency

Lowest channel	Middle channel	Highest channel
2 402 MHz	2 440 MHz	2 480 MHz

Test mode

Mode	Duty Cycle		Duty Cycle Factor	
	BT0	BT1	BT0	BT1
1 Mbps	85.7 %	85.6 %	0.67 dB	0.68 dB
2 Mbps	58.0 %	58.1 %	2.37 dB	2.36 dB

3.3 Device Modifications

The following modifications were necessary for compliance:

Not applicable

3.4 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
Coverage factor *k* = 2, Confidence levels of 95 %

Description	Uncertainty
Conducted RF Output Power	± 1.5 dB
Power Spectral Density	± 1.5 dB
Occupied Bandwidth	± 0.1 MHz
Unwanted Emission(conducted)	± 3.0 dB
Radiated Emissions (f ≤ 1 GHz)	± 4.0 dB
Radiated Emissions (f > 1 GHz)	± 5.0 dB

3.5 Test Software

Conducted Test	Ics Pro Ver. 6.0.3
Radiated Test	TOYO EMI software EP5RE Ver. 6.0.1.0
Line Conducted Test	ESCI7, ESCI3 : EMC32 Ver. 8.50.0 ESR7 : EMC32 Ver. 8.53.0

4. Technical Characteristic Test

4.1 6dB Bandwidth

Test Procedures

KDB 558074 - Section 8.2
ANSI C63.10-2013 - Section 11.8.2
RSS-Gen – Section 6.7

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Procedures

ANSI C63.10-2013 - Section 6.9
RSS-Gen – Section 6.7

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.
Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

Test Settings :

Center frequency = the highest, middle and the lowest channels

a) RBW = 100 kHz
b) VBW ≥ 3 x RBW
c) Detector = peak
d) Trace mode = Max hold
e) Sweep = auto couple
f) Allow trace to fully stabilize
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Minimum Standard :

6 dB Bandwidth	>	500kHz

Test Data :

Test mode : 1 Mbps

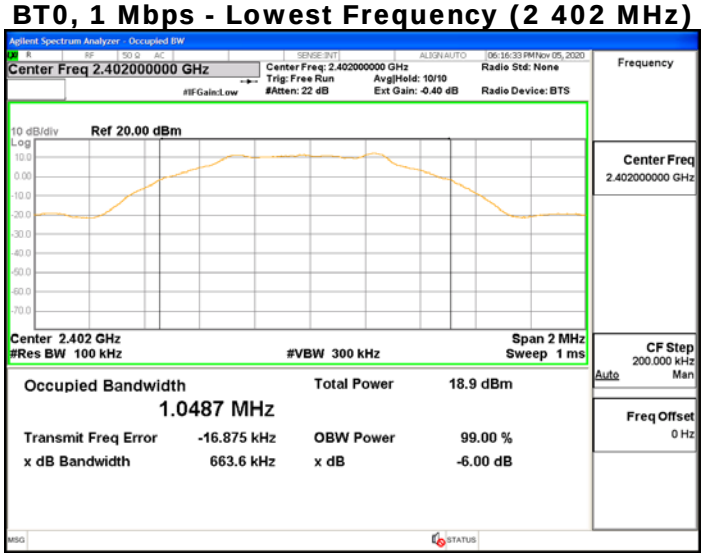
Antenna	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
BT0	2 402	0.664	1.049	Complies
	2 440	0.671	1.048	Complies
	2 480	0.668	1.048	Complies
BT1	2 402	0.665	1.050	Complies
	2 440	0.674	1.051	Complies
	2 480	0.664	1.049	Complies

Test mode : 2 Mbps

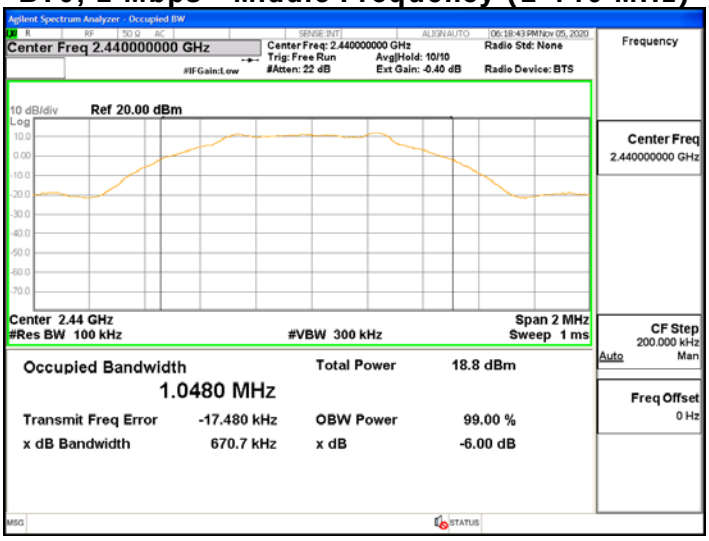
Antenna	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
BT0	2 402	1.244	2.072	Complies
	2 440	1.251	2.072	Complies
	2 480	1.246	2.072	Complies
BT1	2 402	1.201	2.068	Complies
	2 440	1.236	2.072	Complies
	2 480	1.249	2.063	Complies

See next pages for actual measured spectrum plots.

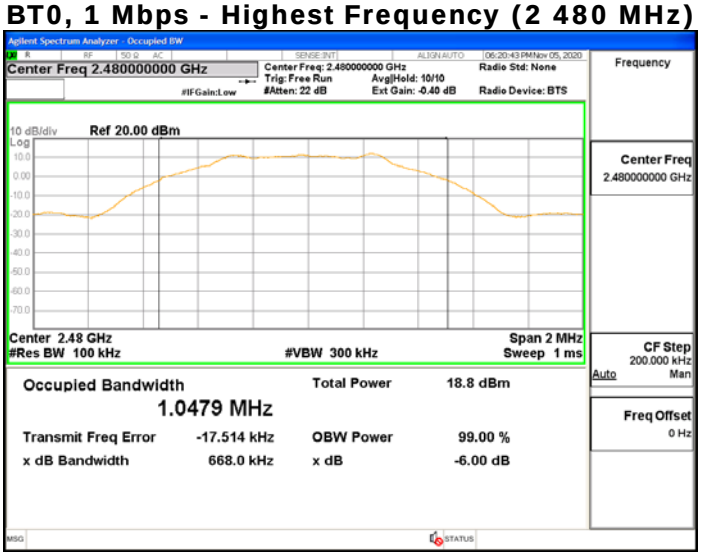
BT0, 1 Mbps - Lowest Frequency (2 402 MHz)



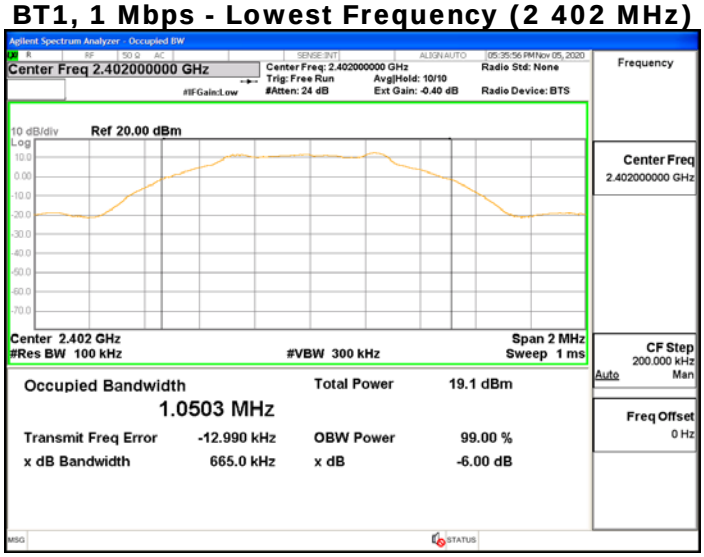
BT0, 1 Mbps - Middle Frequency (2 440 MHz)



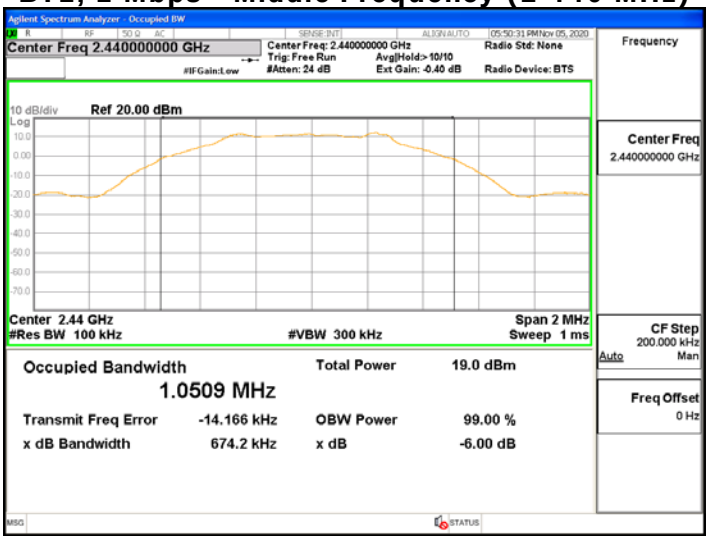
BT0, 1 Mbps - Highest Frequency (2 480 MHz)



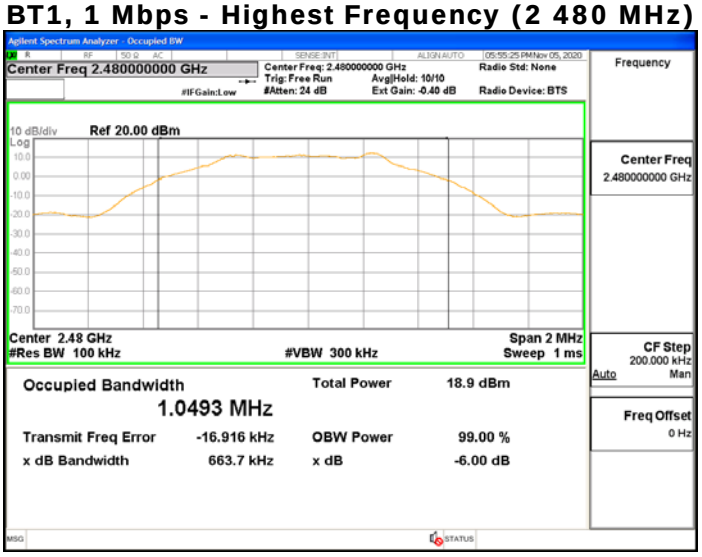
BT1, 1 Mbps - Lowest Frequency (2 402 MHz)



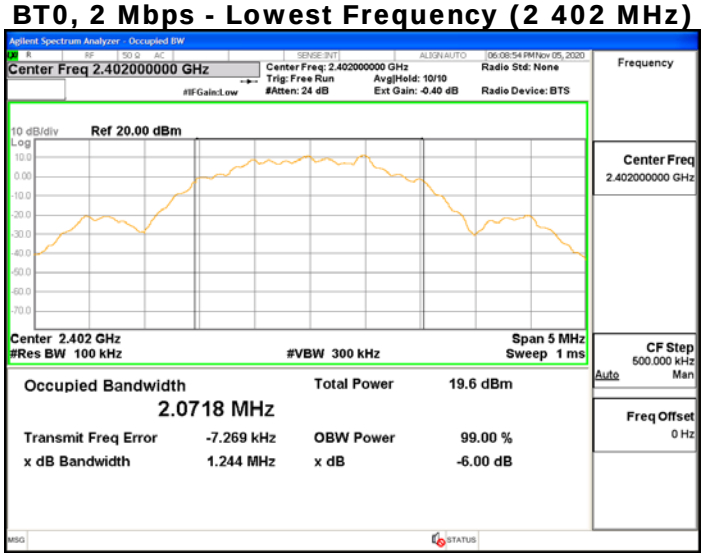
BT1, 1 Mbps - Middle Frequency (2 440 MHz)



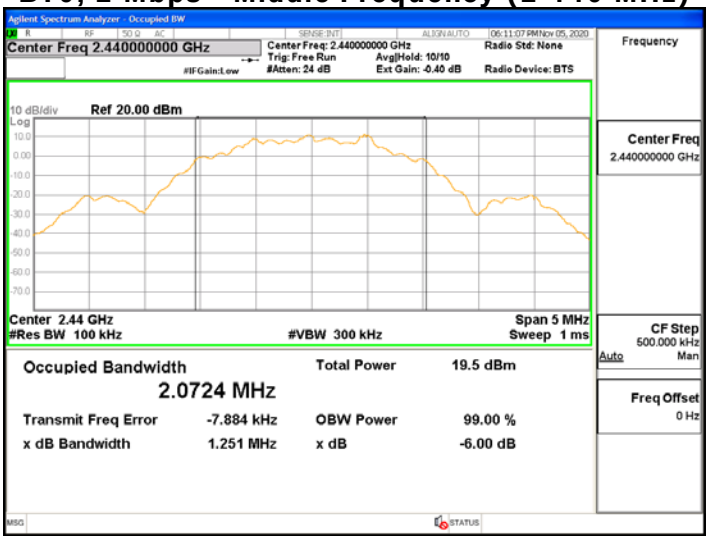
BT1, 1 Mbps - Highest Frequency (2 480 MHz)



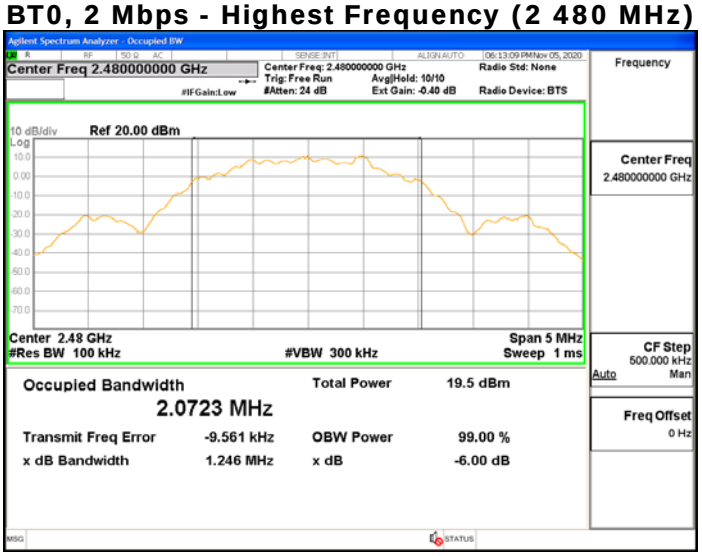
BT0, 2 Mbps - Lowest Frequency (2 402 MHz)



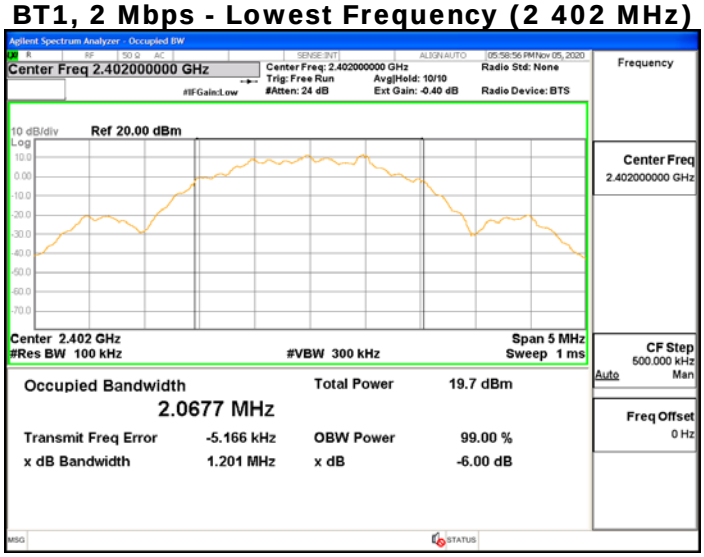
BT0, 2 Mbps - Middle Frequency (2 440 MHz)



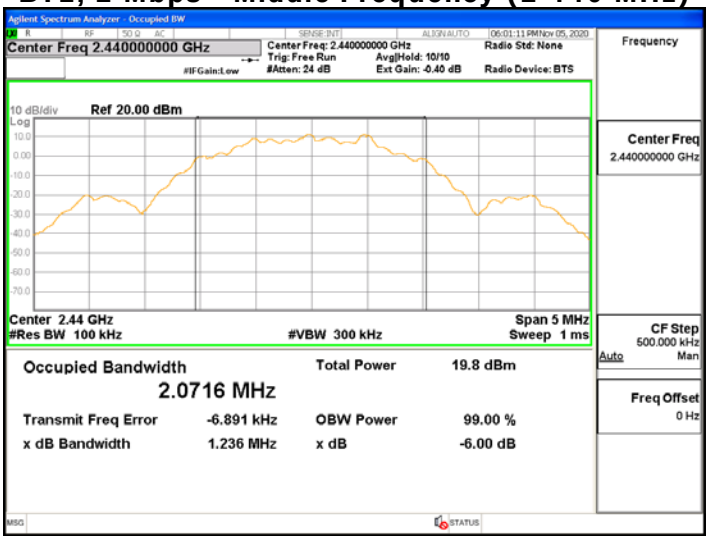
BT0, 2 Mbps - Highest Frequency (2 480 MHz)



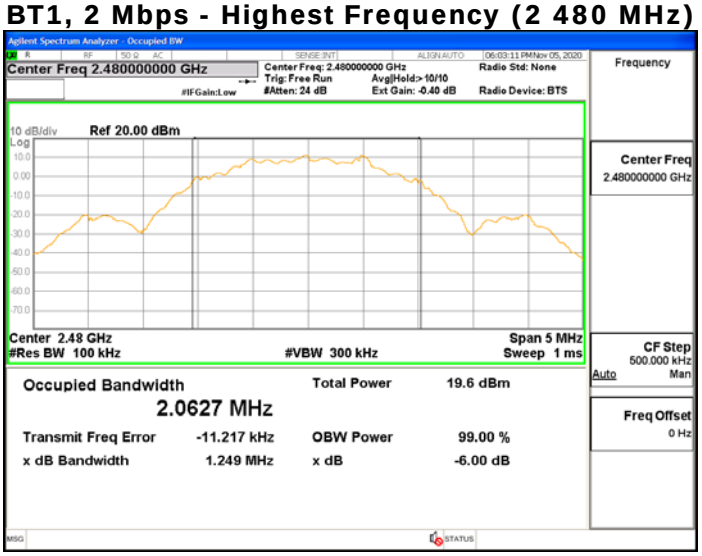
BT1, 2 Mbps - Lowest Frequency (2 402 MHz)



BT1, 2 Mbps - Middle Frequency (2 440 MHz)



BT1, 2 Mbps - Highest Frequency (2 480 MHz)



4.2 Maximum peak Conducted Output Power

Test Procedures

KDB 558074 - Section 8.3.1.1
ANSI C63.10-2013 - Section 11.9.1.1
RSS-Gen – Section 6.12

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

Test Settings:

Center frequency = the highest, middle and the lowest channels

a) RBW ≥ DTS bandwidth
b) VBW ≥ 3 x RBW
c) span ≥ 3 x RBW
d) Sweep time = auto couple
e) Detector = peak
f) Trace mode= max hold
g) Allow trace to fully stabilize
h) Use peak marker function to determine the peak amplitude level.

Limit :

Maximum Output Power	<	1 W (30 dBm)

Test Data :

Test mode : 1 Mbps

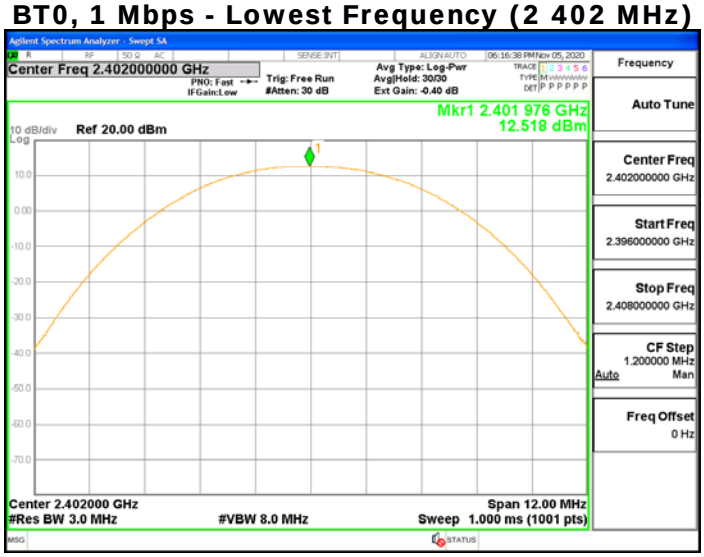
Antenna	Frequency (MHz)	Maximum peak Conducted Output Power		Result
		(dBm)	(mW)	
BT0	2 402	12.518	17.857	Complies
	2 440	12.358	17.211	Complies
	2 480	12.303	16.994	Complies
BT1	2 402	12.767	18.910	Complies
	2 440	12.432	17.507	Complies
	2 480	12.391	17.342	Complies

Test mode : 2 Mbps

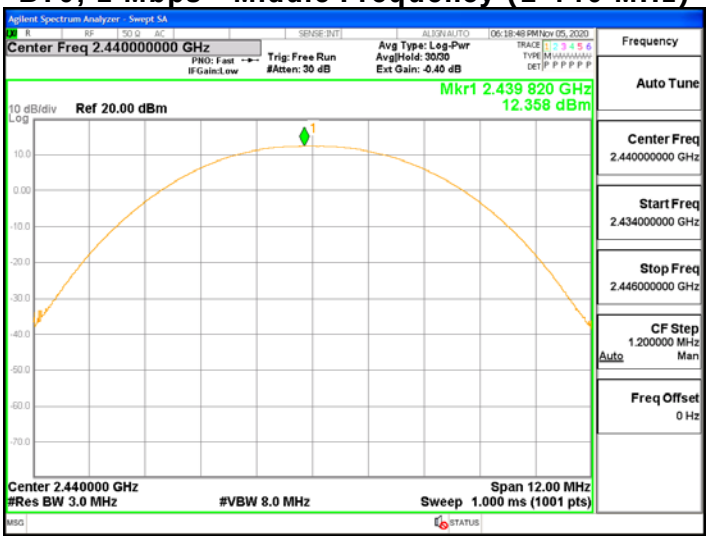
Antenna	Frequency (MHz)	Maximum peak Conducted Output Power		Result
		(dBm)	(mW)	
BT0	2 402	12.381	17.302	Complies
	2 440	12.453	17.591	Complies
	2 480	12.425	17.478	Complies
BT1	2 402	12.654	18.425	Complies
	2 440	12.617	18.268	Complies
	2 480	12.518	17.857	Complies

See next pages for actual measured spectrum plots.

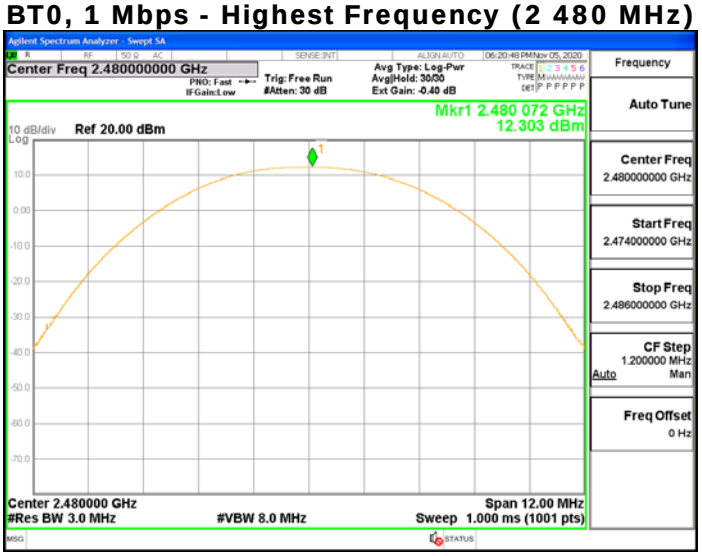
BT0, 1 Mbps - Lowest Frequency (2 402 MHz)



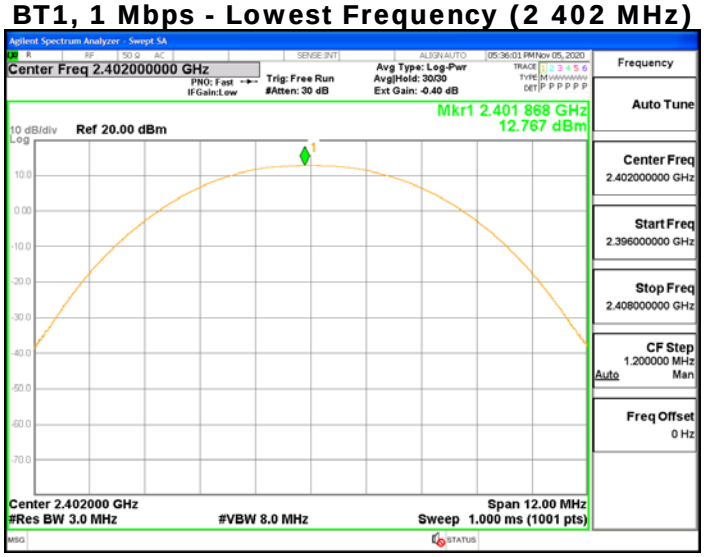
BT0, 1 Mbps - Middle Frequency (2 440 MHz)



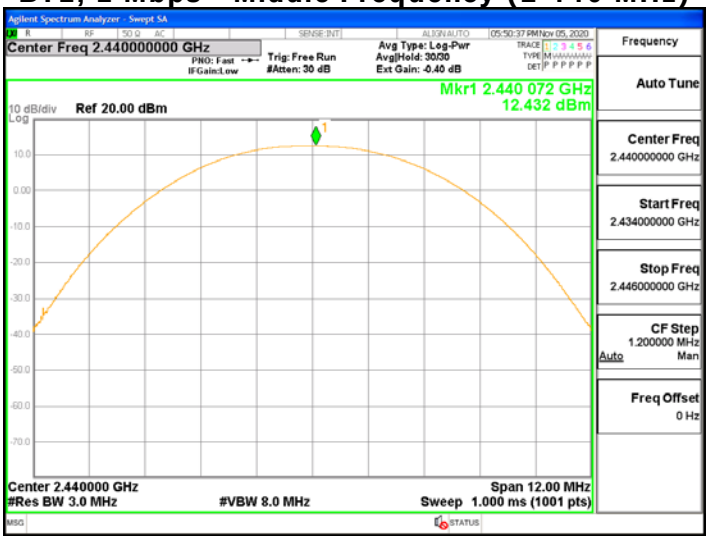
BT0, 1 Mbps - Highest Frequency (2 480 MHz)



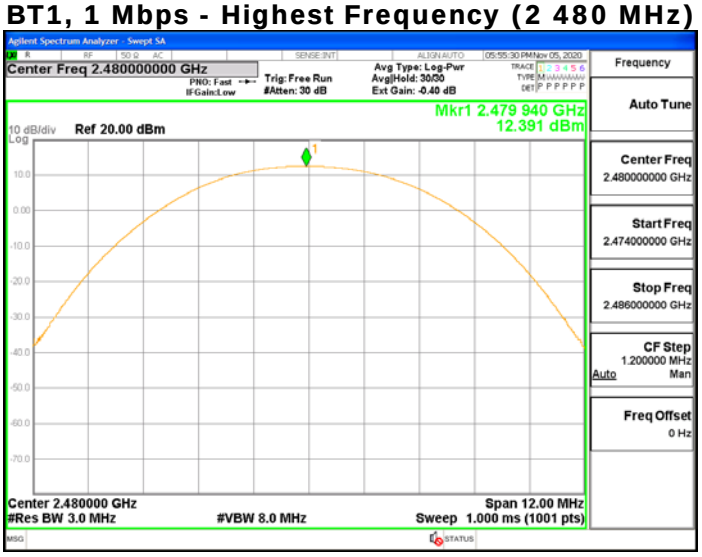
BT1, 1 Mbps - Lowest Frequency (2 402 MHz)



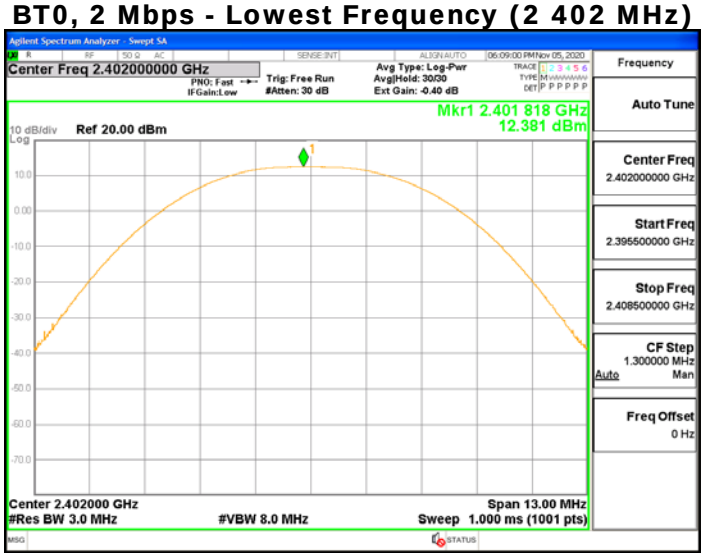
BT1, 1 Mbps - Middle Frequency (2 440 MHz)



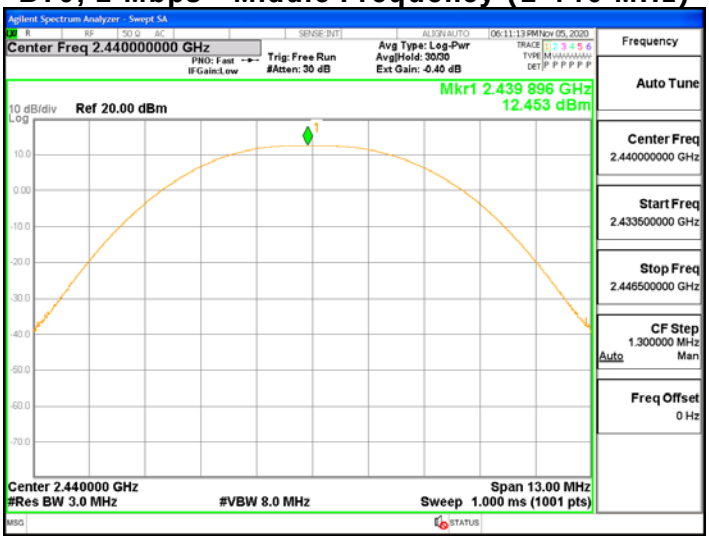
BT1, 1 Mbps - Highest Frequency (2 480 MHz)



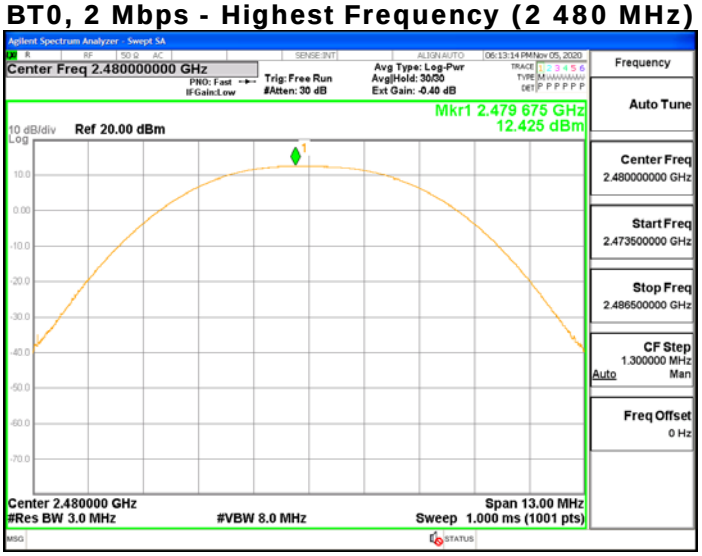
BT0, 2 Mbps - Lowest Frequency (2 402 MHz)



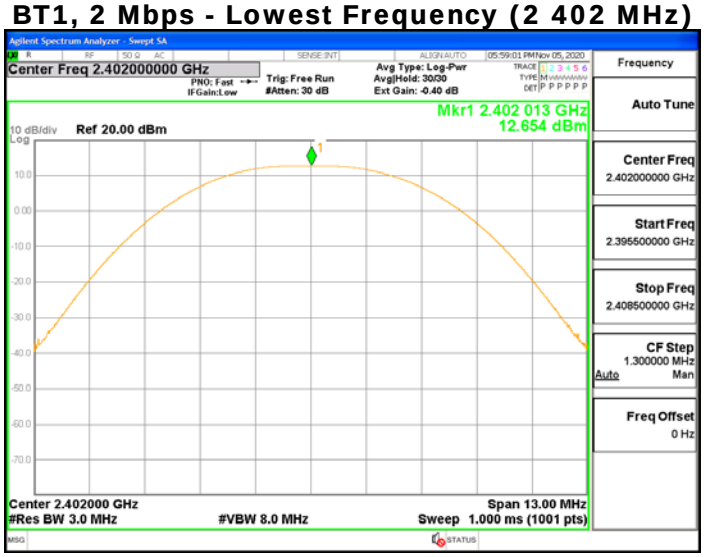
BT0, 2 Mbps - Middle Frequency (2 440 MHz)



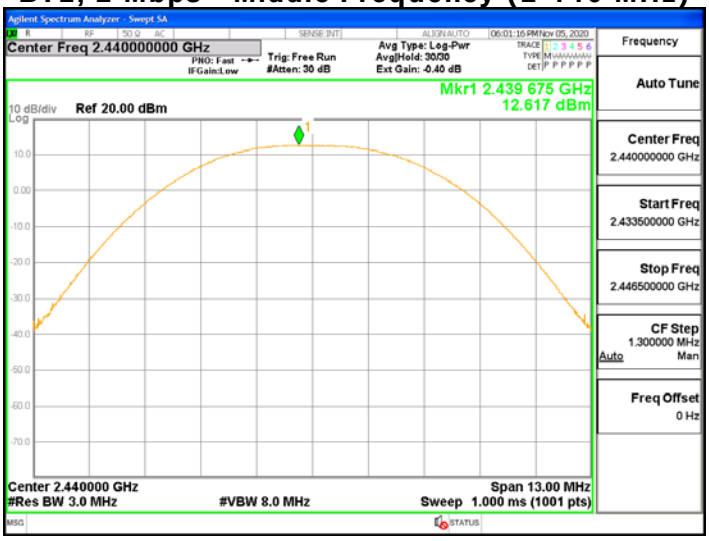
BT0, 2 Mbps - Highest Frequency (2 480 MHz)



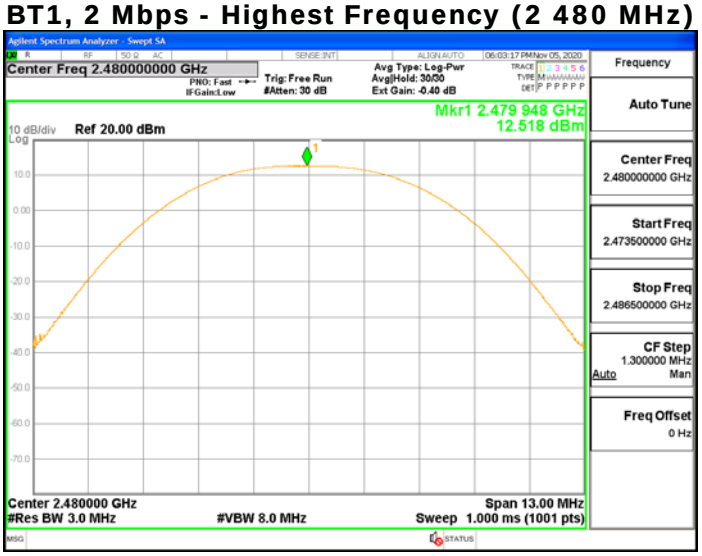
BT1, 2 Mbps - Lowest Frequency (2 402 MHz)



BT1, 2 Mbps - Middle Frequency (2 440 MHz)



BT1, 2 Mbps - Highest Frequency (2 480 MHz)



4.3 Transmitter Power Spectral Density

Test Procedures

KDB 558074 - Section 8.4
ANSI C63.10-2013 - Section 11.10.2

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance.

Test Settings:

Center frequency = the highest, middle and the lowest channels

a) RBW : 3 kHz ≤ RBW ≤ 100 kHz

b) VBW ≥ 3 x RBW

c) span ≥ 1.5 x DTS bandwidth

d) Sweep time = auto couple

e) Detector = peak

f) Trace mode= max hold

g) Allow trace to fully stabilize

h) Use the peak marker function to determine the maximum amplitude level within the RBW.

Limit :

Power Spectral Density	<	8dBm @ 3 kHz BW

Test Data :

Test mode : 1 Mbps

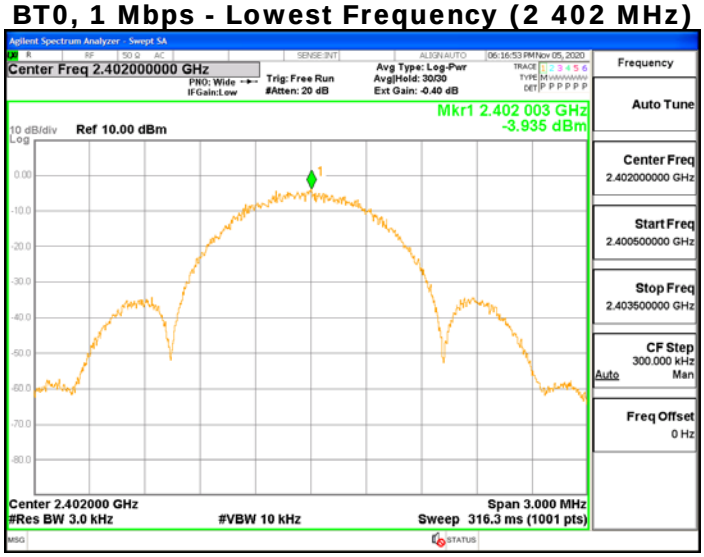
Antenna	Frequency (MHz)	Power Spectral Density (dBm)	Result
BT0	2 402	-3.935	Complies
	2 440	-4.027	Complies
	2 480	-4.339	Complies
BT1	2 402	-3.953	Complies
	2 440	-3.901	Complies
	2 480	-3.813	Complies

Test mode : 2 Mbps

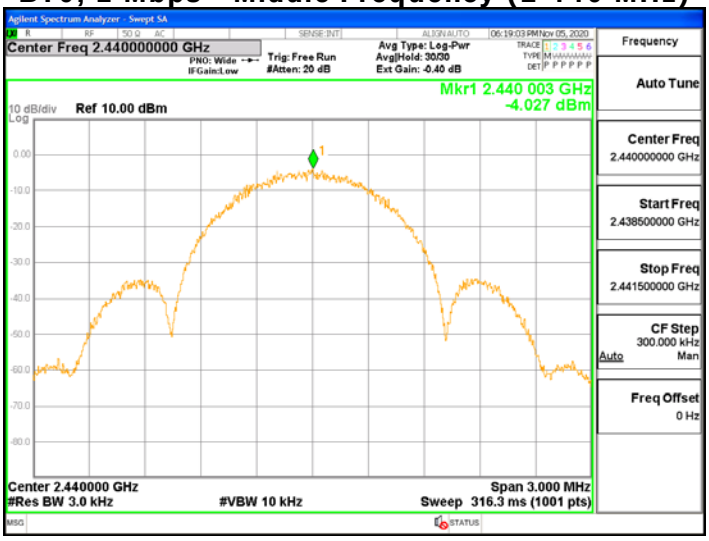
Antenna	Frequency (MHz)	Power Spectral Density (dBm)	Result
BT0	2 402	-7.026	Complies
	2 440	-6.955	Complies
	2 480	-7.159	Complies
BT1	2 402	-6.870	Complies
	2 440	-6.886	Complies
	2 480	-6.943	Complies

See next pages for actual measured spectrum plots.

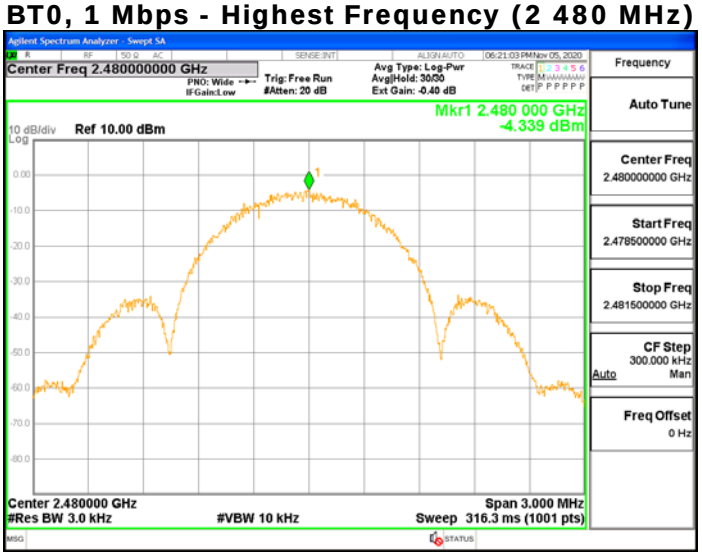
BT0, 1 Mbps - Lowest Frequency (2 402 MHz)



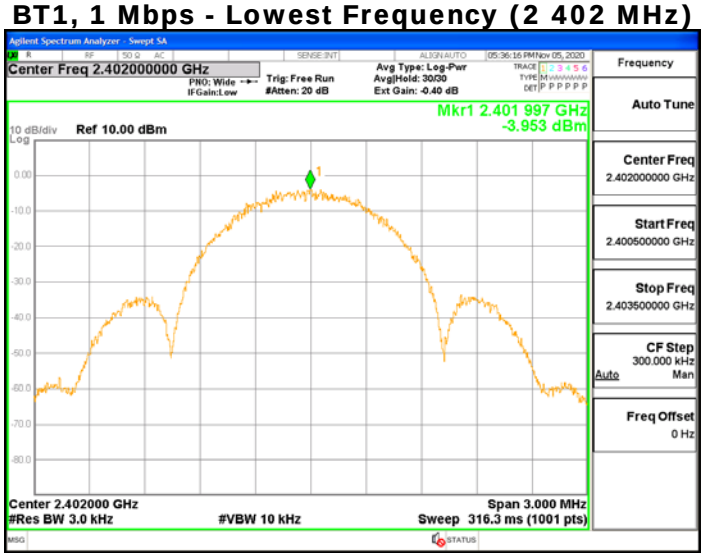
BT0, 1 Mbps - Middle Frequency (2 440 MHz)



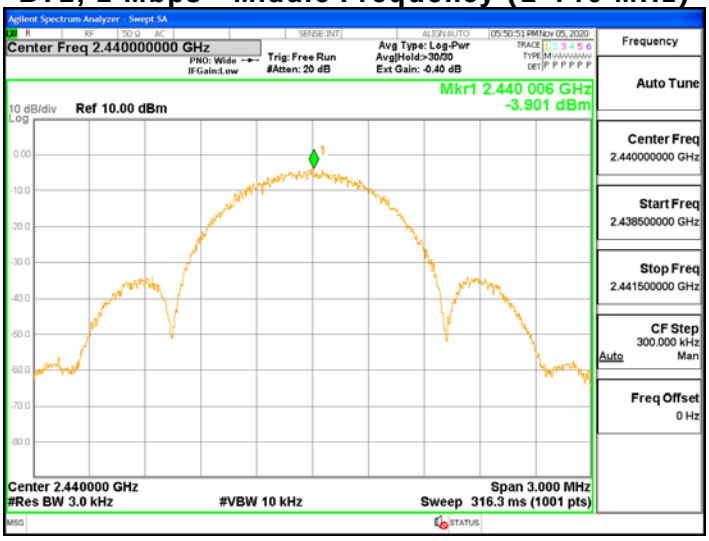
BT0, 1 Mbps - Highest Frequency (2 480 MHz)



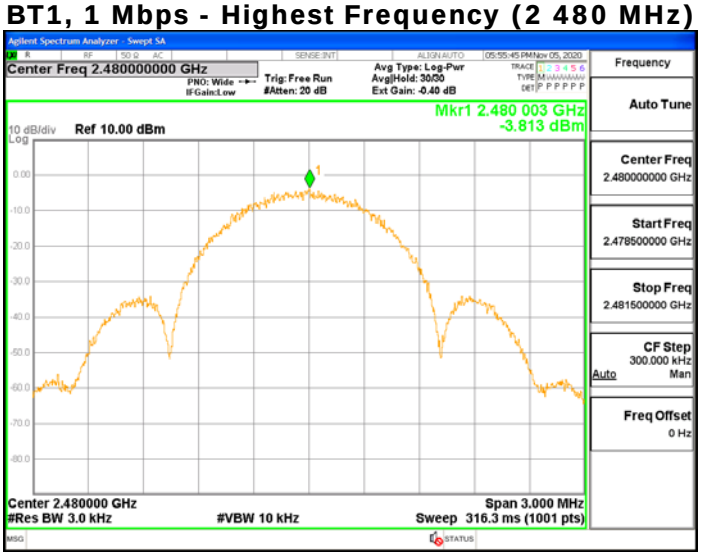
BT1, 1 Mbps - Lowest Frequency (2 402 MHz)



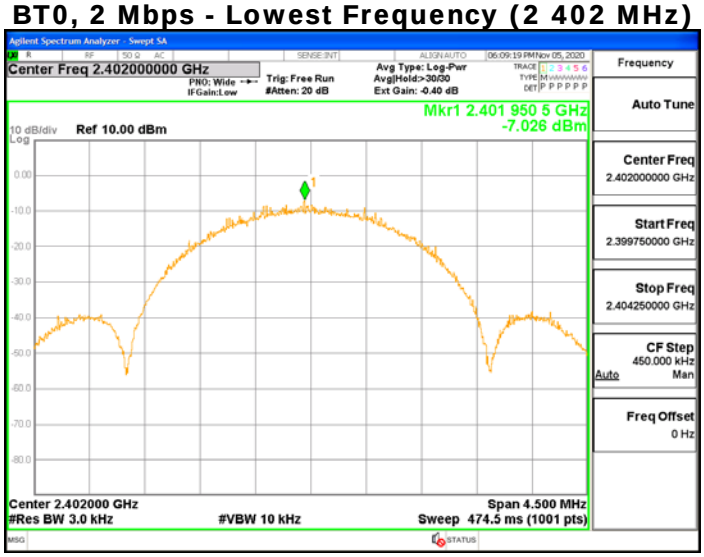
BT1, 1 Mbps - Middle Frequency (2 440 MHz)



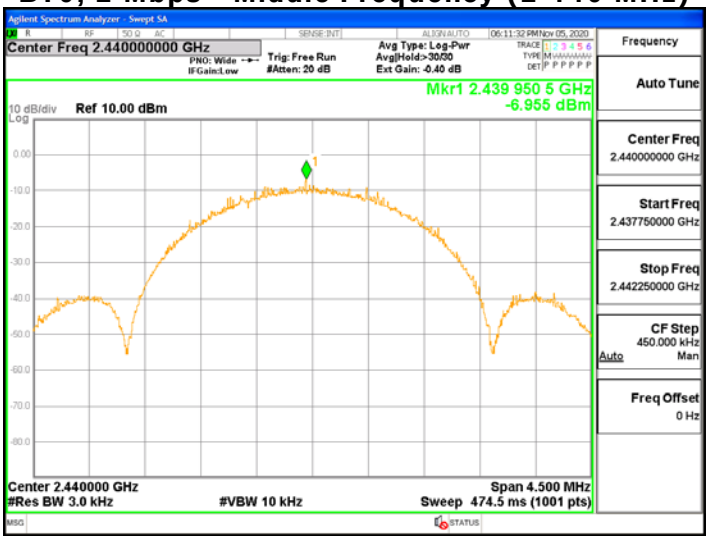
BT1, 1 Mbps - Highest Frequency (2 480 MHz)



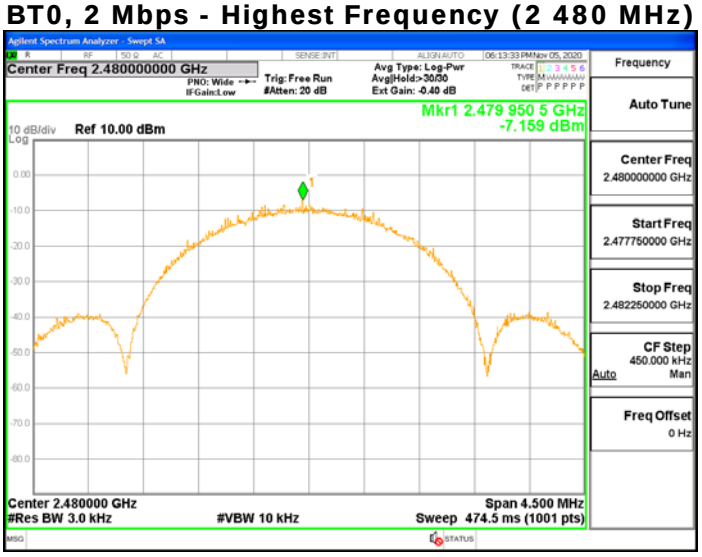
BT0, 2 Mbps - Lowest Frequency (2 402 MHz)



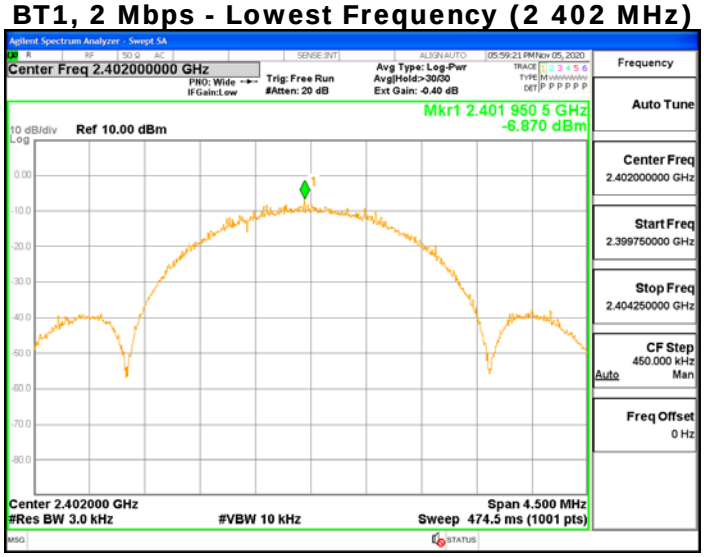
BT0, 2 Mbps - Middle Frequency (2 440 MHz)



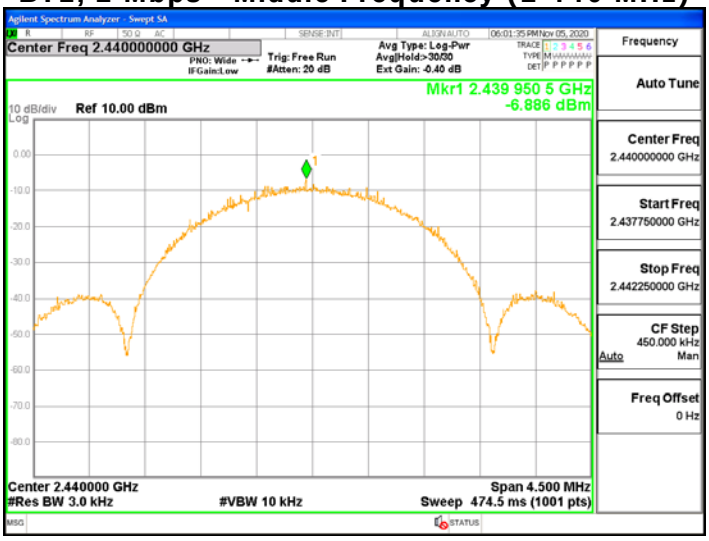
BT0, 2 Mbps - Highest Frequency (2 480 MHz)



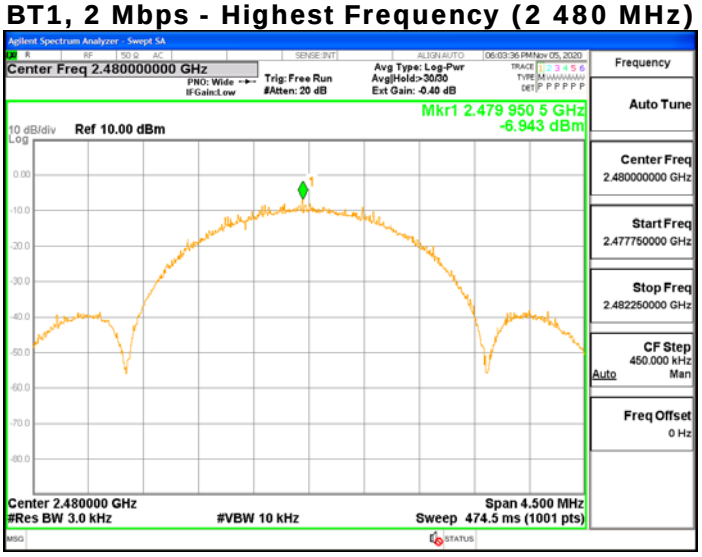
BT1, 2 Mbps - Lowest Frequency (2 402 MHz)



BT1, 2 Mbps - Middle Frequency (2 440 MHz)



BT1, 2 Mbps - Highest Frequency (2 480 MHz)



4.4 Conducted Spurious emission

Test Procedures

KDB 558074 - Section 8.5
ANSI C63.10-2013 - Section 11.11.3
RSS-Gen - Section 6.13

The Unwanted emission from the EUT were measured according to the dictates PKPSD measurement procedure in section 11.11 of ANSI C63.10-2013.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Settings:

Center frequency = the highest, middle and the lowest channels

a) RBW = 100 kHz
b) VBW ≥ 3 x RBW
c) Detector = peak
d) Sweep time = auto couple
e) Trace mode= max hold
f) Allow trace to fully stabilize
g) Use the peak marker function to determine the maximum amplitude level.

Limit :

Emission level < 20 dBc

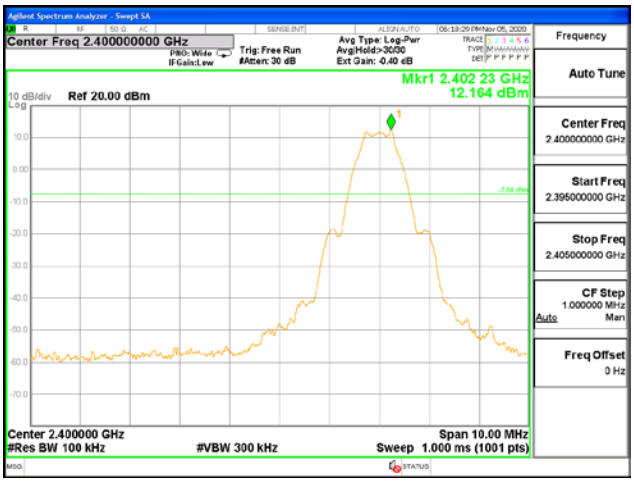
Test results: Complies

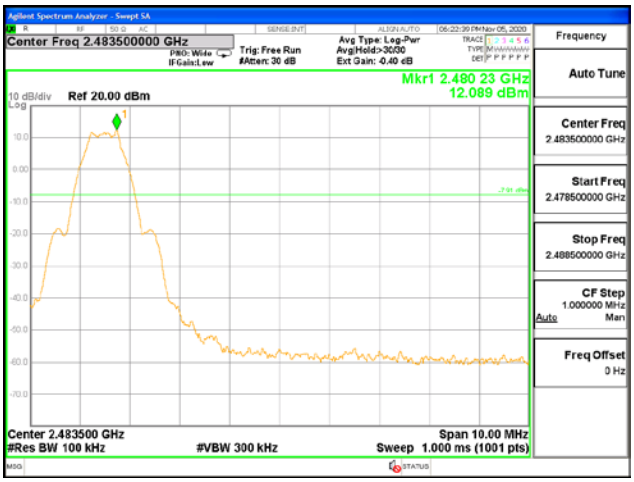
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest in-band spectral density. Therefore the applying equipment meets the requirement.

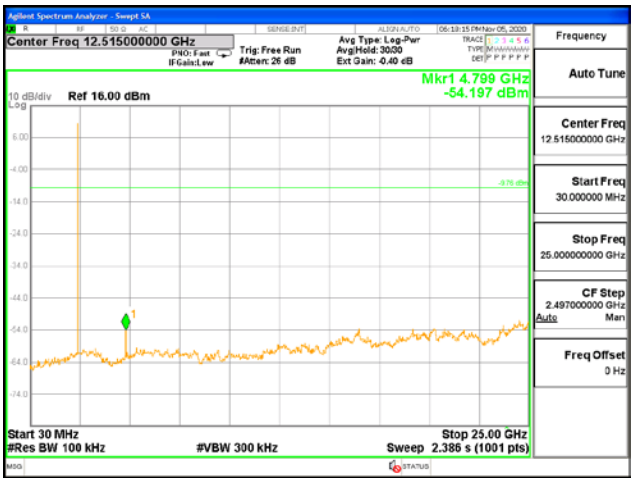
See next pages for actual measured spectrum plots.

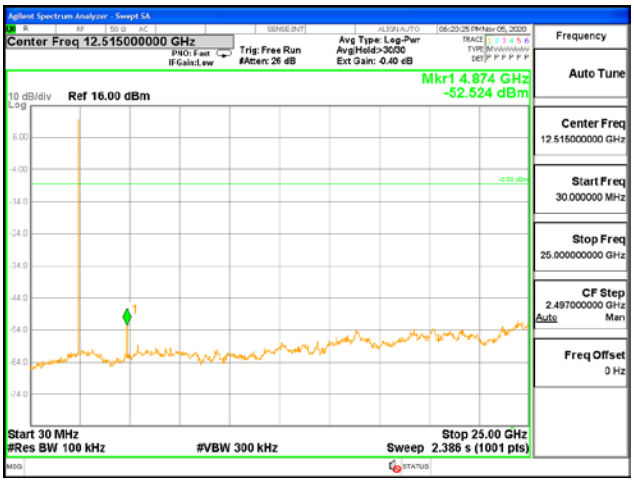
Spurious Emission

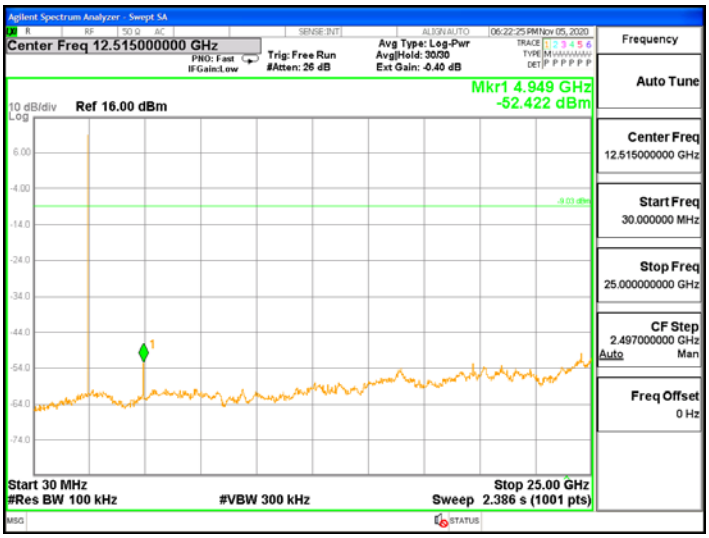
Test Mode : BT0, 1 Mbps



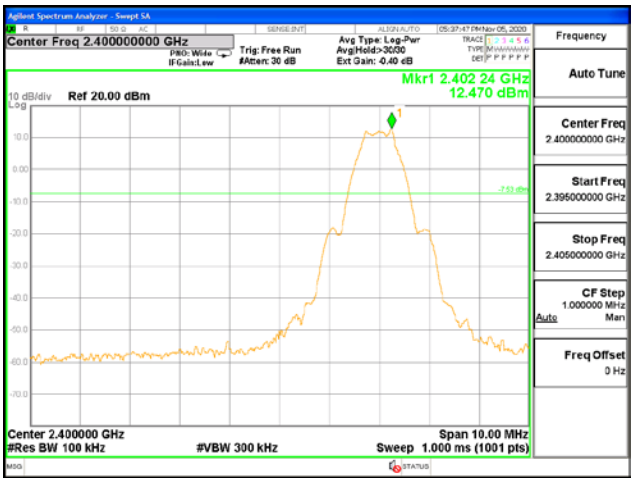


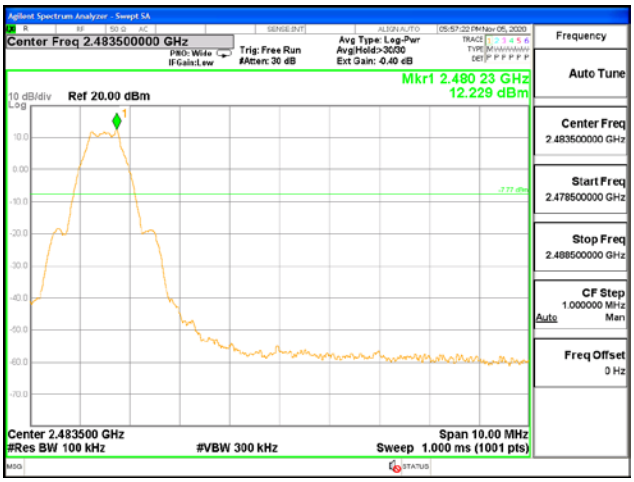


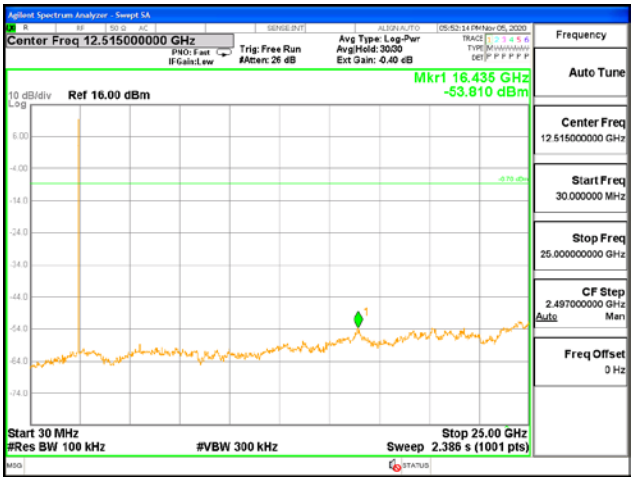


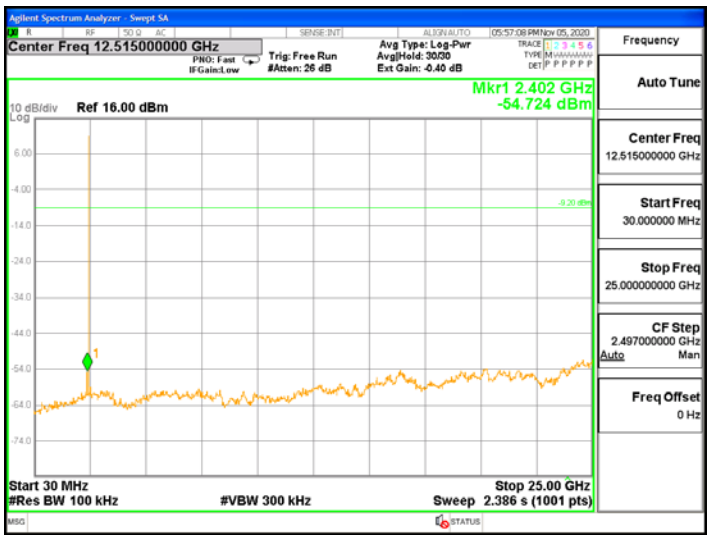


Test Mode : BT1, 1 Mbps

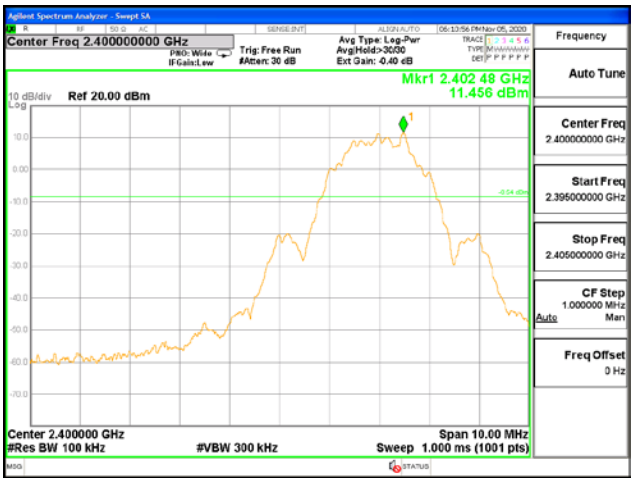


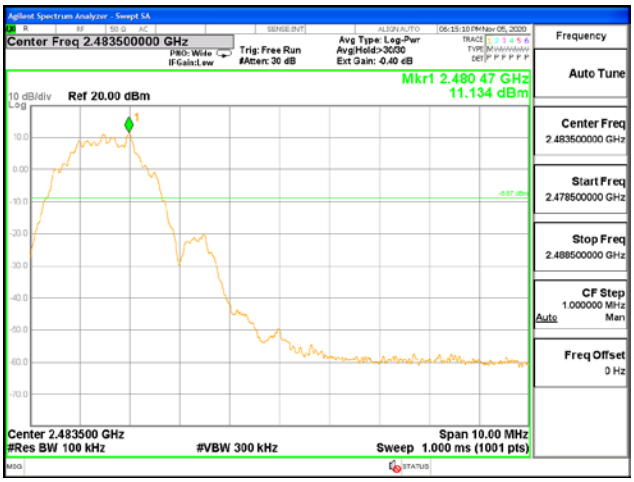


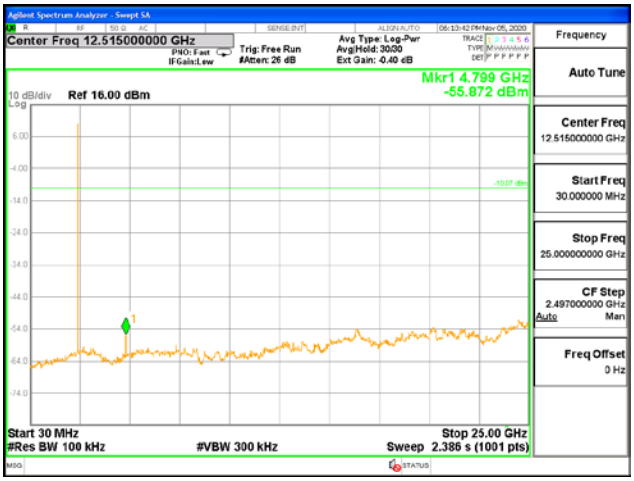


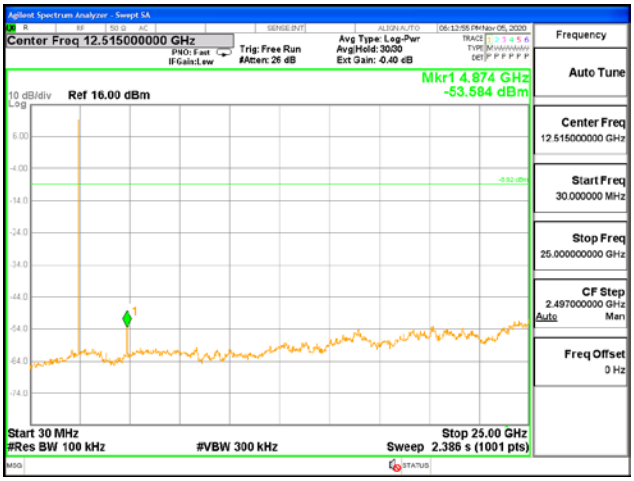


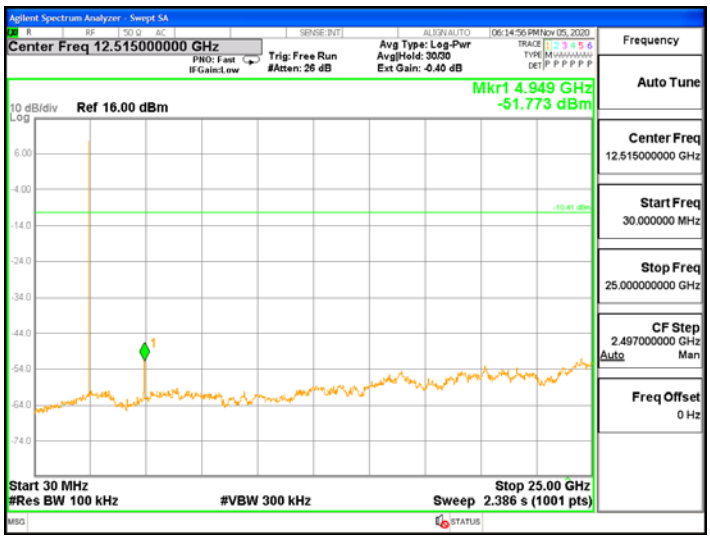
Test Mode : BT0, 2 Mbps



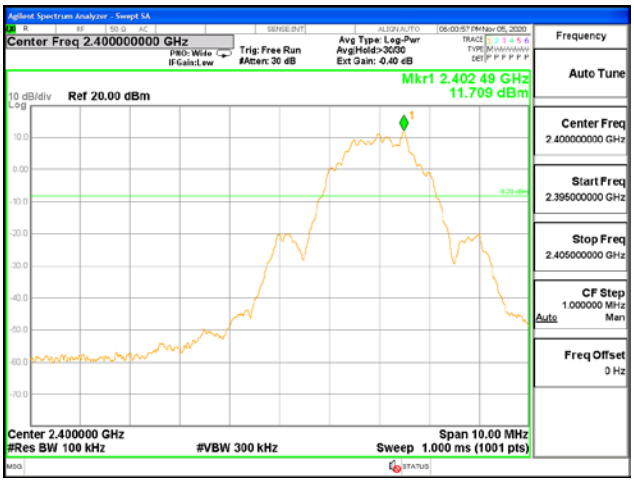


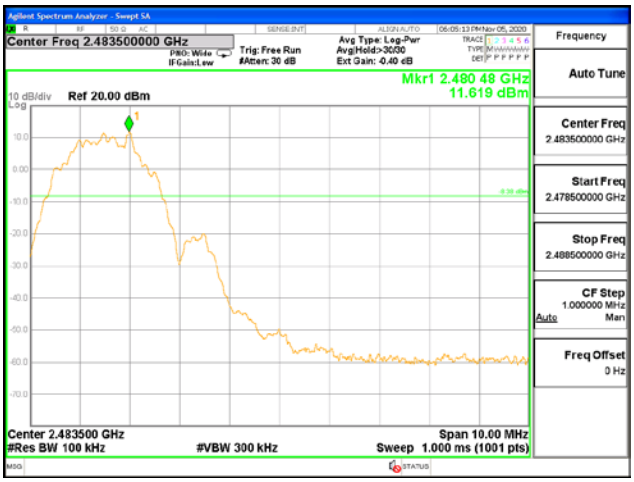


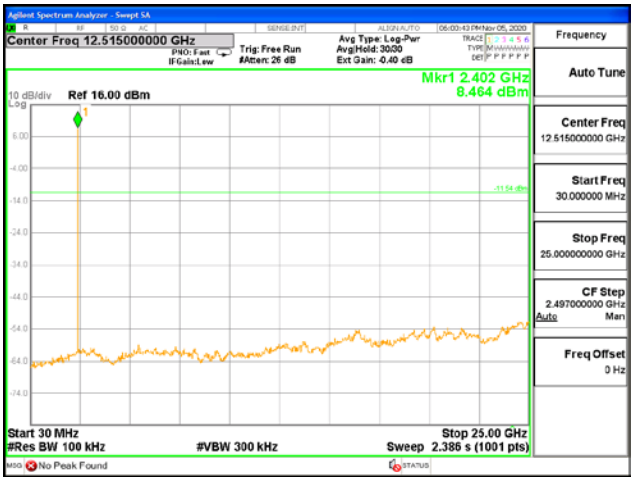


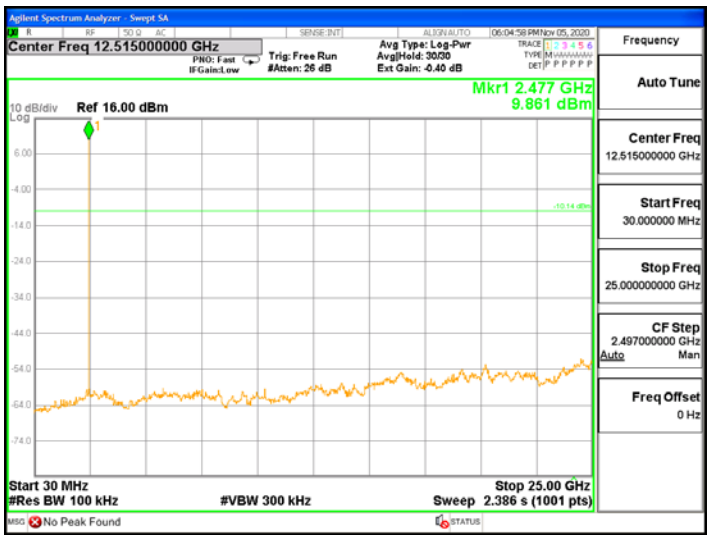


Test Mode : BT1, 2 Mbps









4.5 Radiated Emission

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

KDB 558074 - Section 8.5, 8.6
ANSI C63.10-2013 - Section 11.11, 11.12
RSS-Gen - Section 6.13

1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
2) In the frequency rage above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

Test Settings:

Frequency Range = 9 kHz ~ 1 GHz

a) RBW = 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz

b) VBW ≥ RBW

c) Detector = CISPR Quasi-peak

d) Sweep time = auto couple

- Peak

Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10th harmonic)

a) RBW = 1 MHz

b) VBW ≥ 3 x RBW

c) Detector = Peak

d) Sweep time = auto

e) Trace mode = max hold

- Average (duty cycle ≥ 98%)

Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10th harmonic)

a) RBW = 1 MHz

b) VBW ≥ 3 x RBW

c) Detector = RMS

d) Sweep time = auto

e) Averaging type = power (i.e., RMS)

f) Trace mode = average (at least 100 traces)

- Average (duty cycle < 98%, duty cycle variations are less than ±2%)

Frequency Range = 1 GHz ~ 25 GHz (2.4 GHz 10th harmonic)

a) RBW = 1 MHz

b) VBW ≥ 3 x RBW

c) Detector = RMS

d) Sweep time = auto

e) Averaging type = power (i.e., RMS)

f) Trace mode = average (at least 100 traces)

A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.
If power averaging (RMS) mode, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.

Test Mode	Duty Cycle Factor	
	BT0	BT1
1 Mbps	0.67 dB	0.68 dB
2 Mbps	2.37 dB	2.36 dB

Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
[1]0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	[2]Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

FCC Part 15 § 15.209 (a) 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 :

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 2 Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 2. General Field Strength Limits for Licence-Exempt Transmitters

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

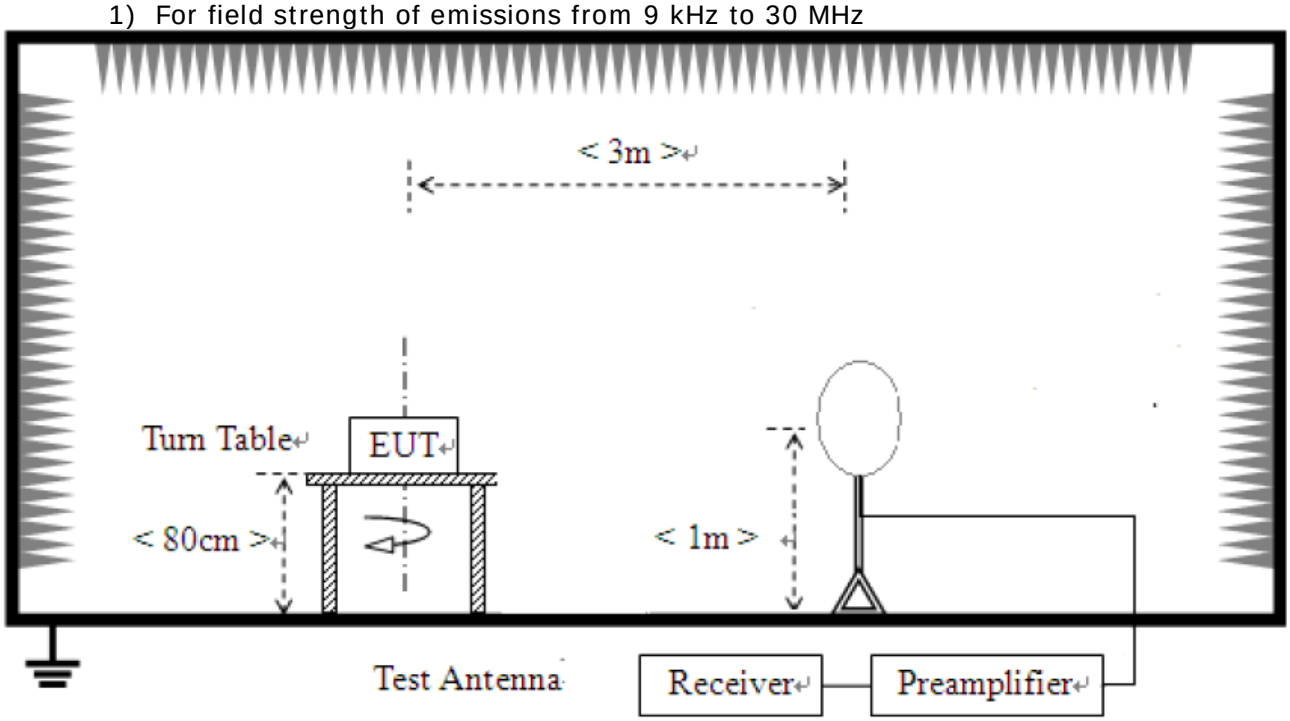
** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.

Note :

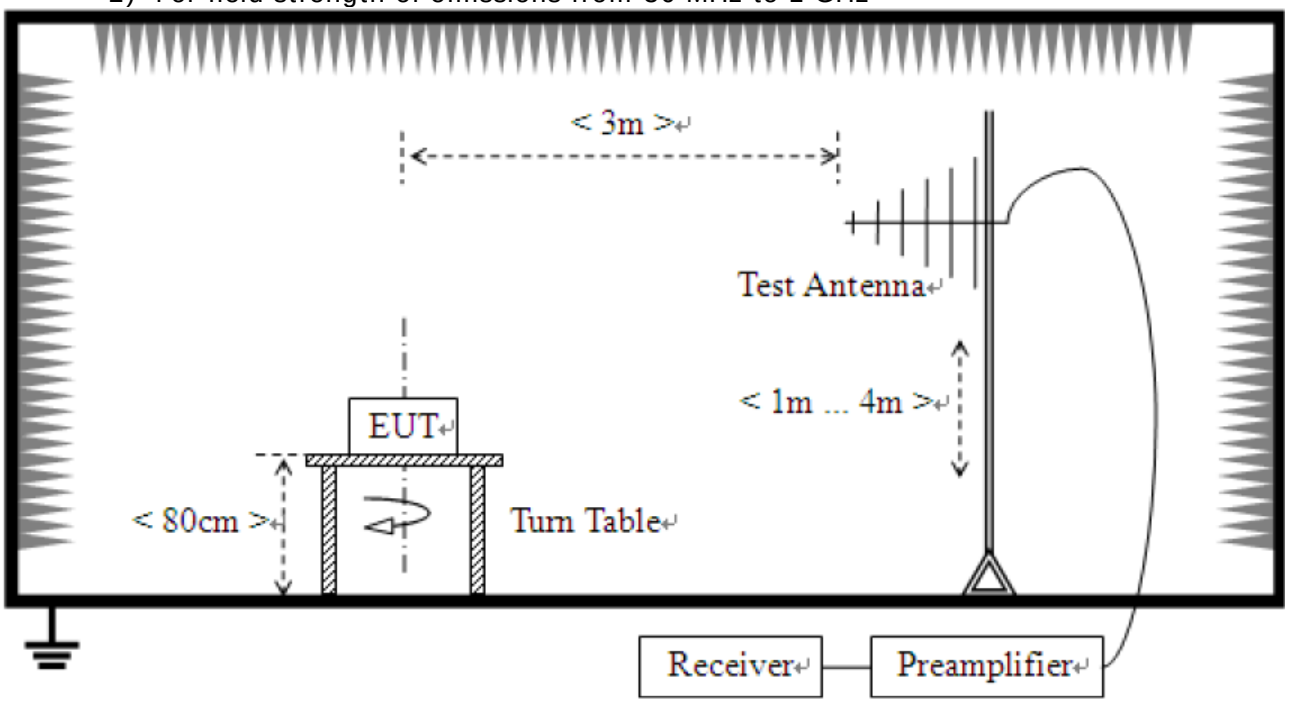
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)

Test Setup:

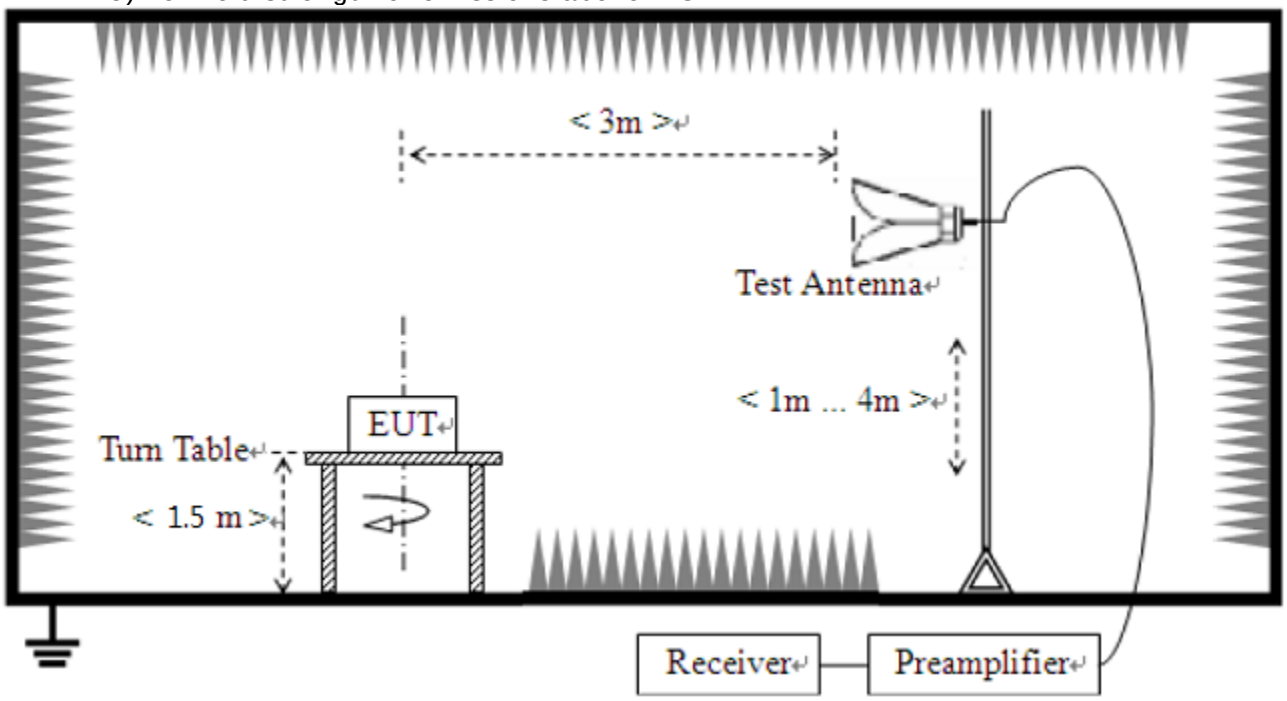
1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



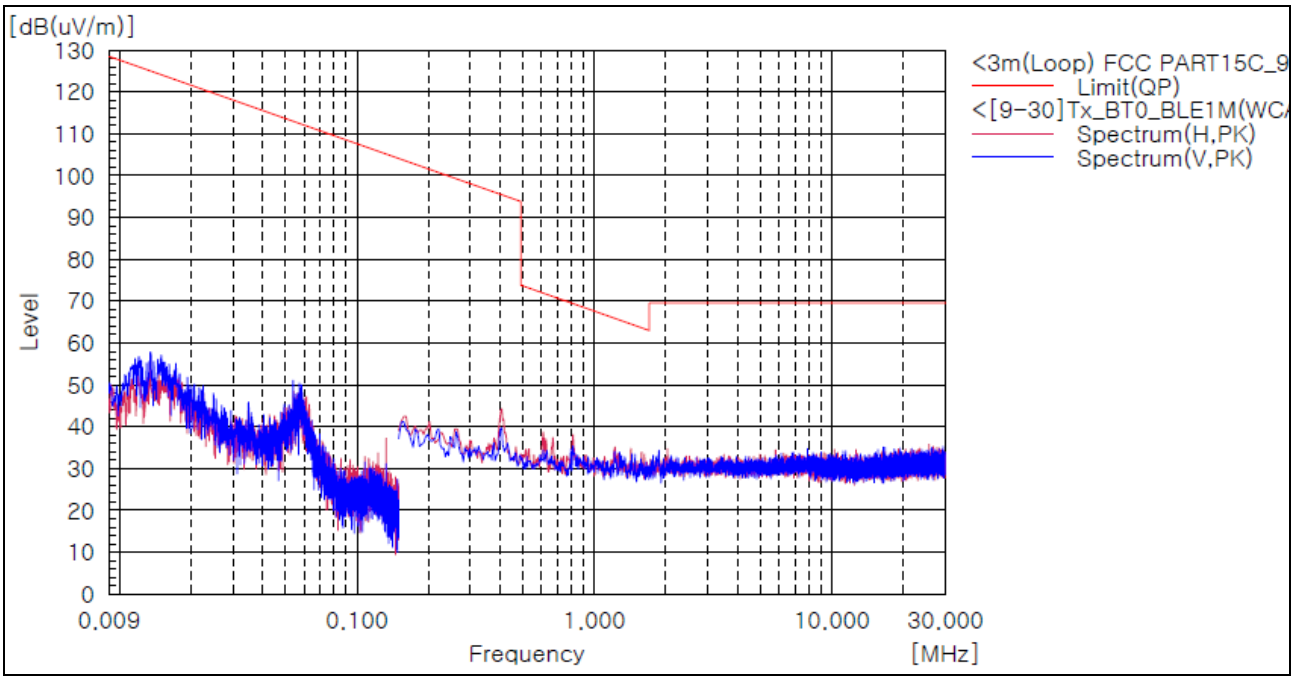
Test results

1) 9 kHz to 30 MHz

Test mode : BT0_Transmitter (Worst Case)

The requirements are:
☒ Complies

Test Data



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]

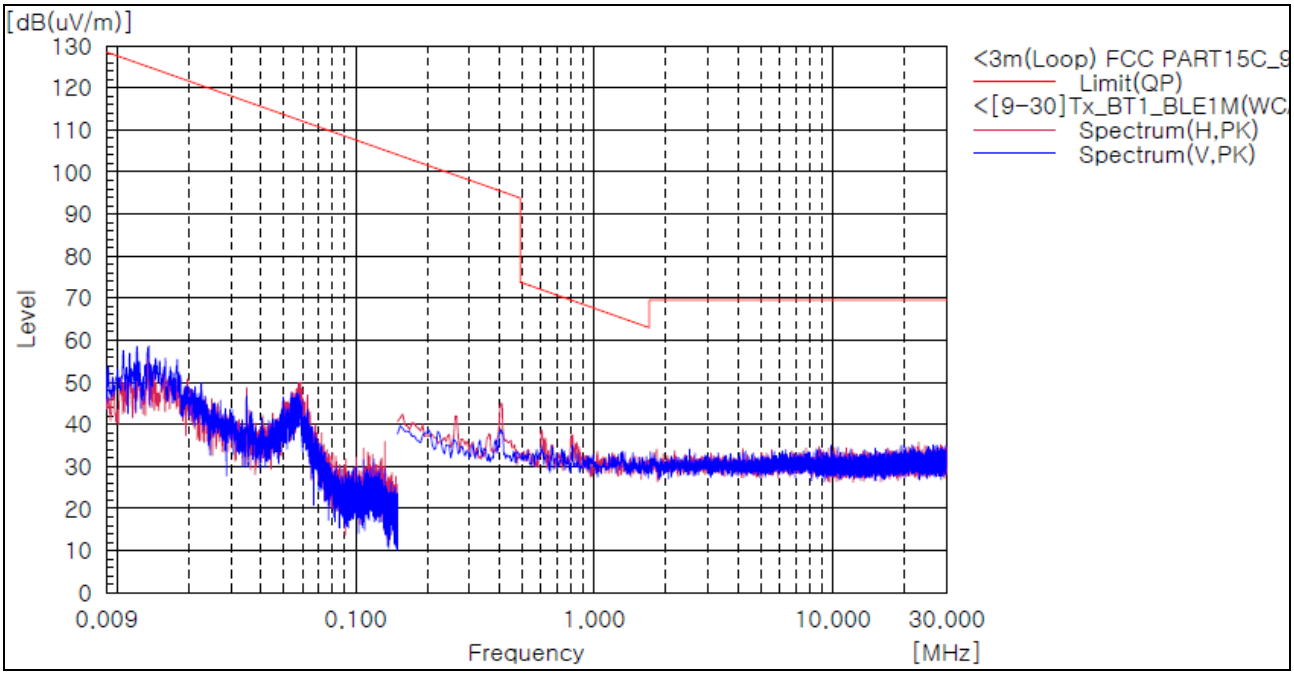
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.

Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

Test mode : BT1_Transmitter (Worst Case)

The requirements are:
☒ Complies

Test Data



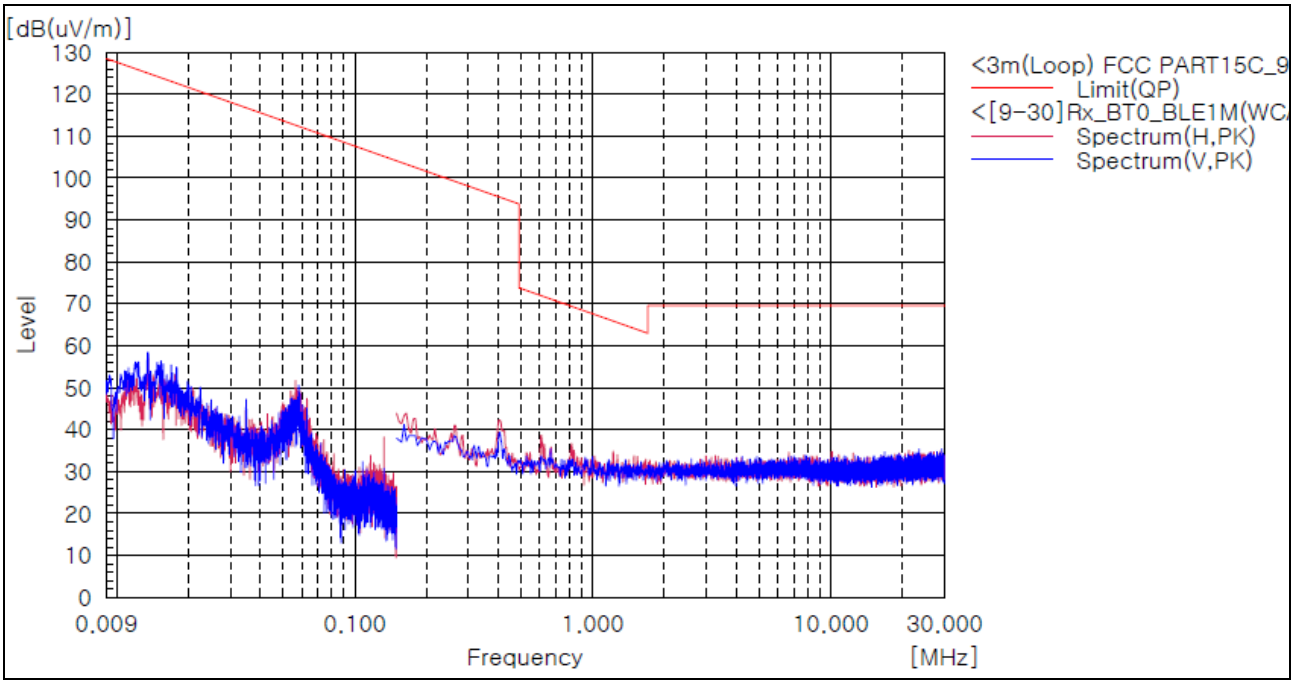
Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.						

Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

Test mode : BT0_Receiver (Worst Case)

The requirements are:
☒ Complies

Test Data



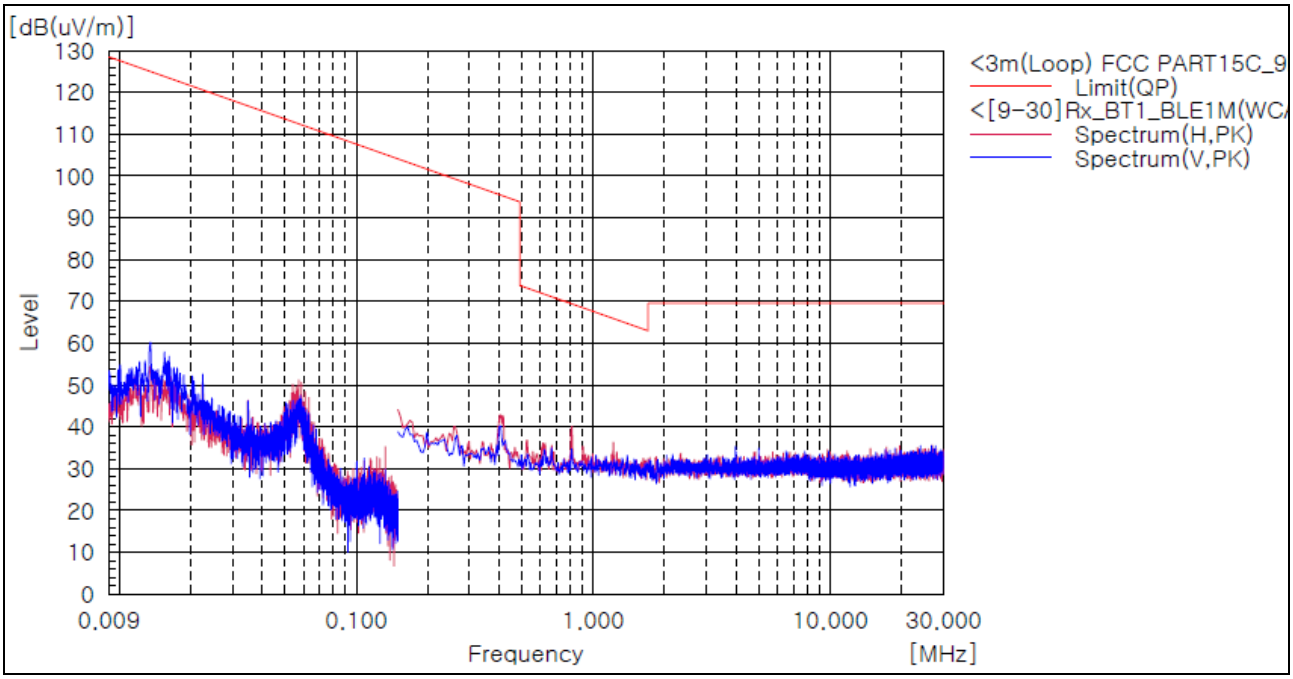
Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.						

Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

Test mode : BT1_Receiver (Worst Case)

The requirements are:
☒ Complies

Test Data



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.						

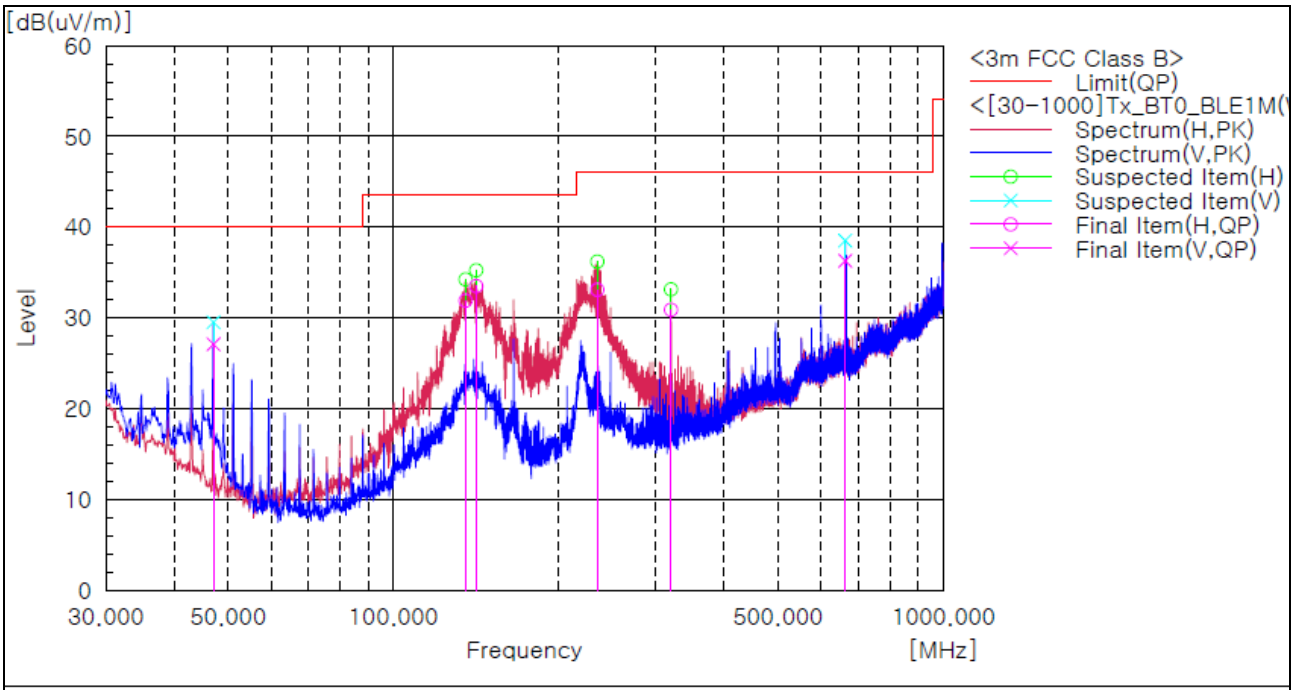
Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain
4. This data is the Peak(PK) value.

2) 30 MHz to 1 GHz

Test mode : BT0_Transmitter (Worst Case)

The requirements are:
☒ Complies

Test Data



Final Result

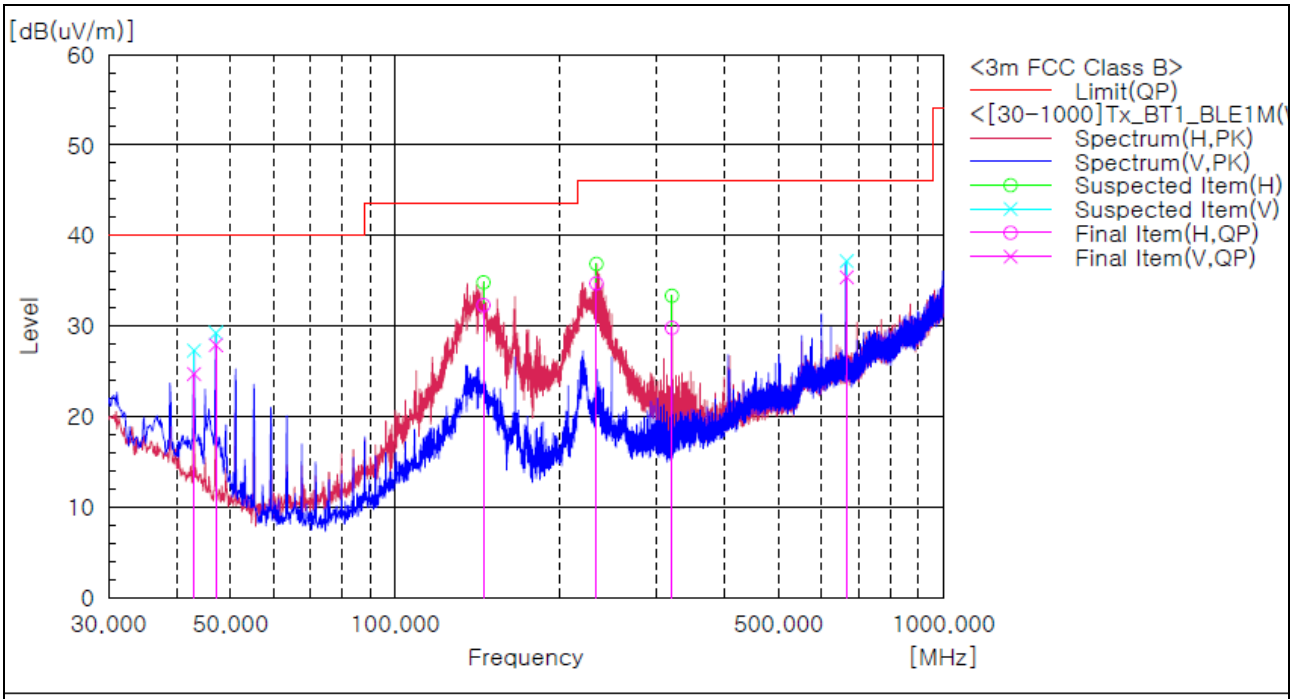
No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	47.096	V	42.2	-15.1	27.1	40.0	12.9	101.0	263.0
2	135.366	H	43.6	-11.7	31.9	43.5	11.6	209.0	216.0
3	141.550	H	45.4	-11.9	33.5	43.5	10.0	209.0	196.0
4	235.034	H	44.8	-11.7	33.1	46.0	12.9	101.0	225.0
5	320.030	H	39.0	-8.1	30.9	46.0	15.1	101.0	4.0
6	663.774	V	35.3	1.0	36.3	46.0	9.7	101.0	107.0

Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

Test mode : BT1_Transmitter (Worst Case)

The requirements are:
☒ Complies

Test Data



Final Result

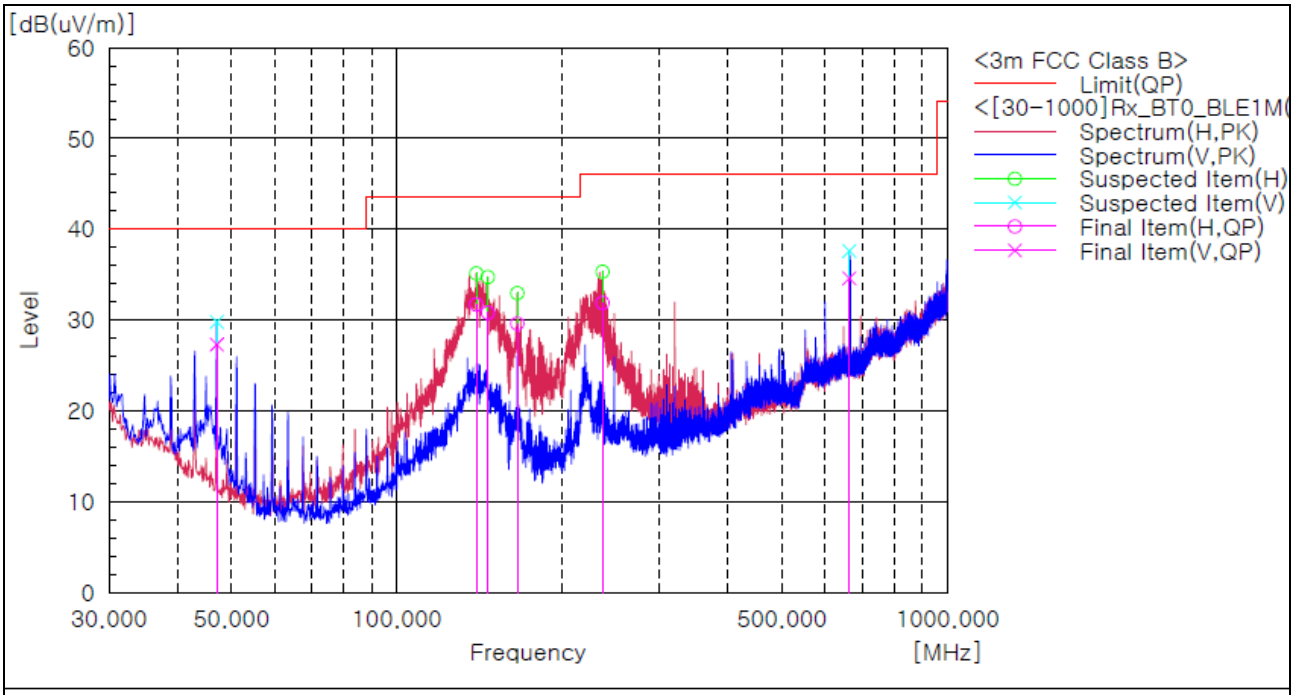
No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	42.974	V	37.5	-12.8	24.7	40.0	15.3	191.0	87.0
2	47.096	V	43.0	-15.1	27.9	40.0	12.1	100.0	283.0
3	144.945	H	44.2	-11.9	32.3	43.5	11.2	205.0	213.0
4	232.973	H	46.7	-12.0	34.7	46.0	11.3	101.0	5.0
5	320.030	H	37.9	-8.1	29.8	46.0	16.2	101.0	2.0
6	666.563	V	34.4	1.0	35.4	46.0	10.6	100.0	110.0

Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

Test mode : BT0_Receiver (Worst Case)

The requirements are:
☒ Complies

Test Data



Final Result

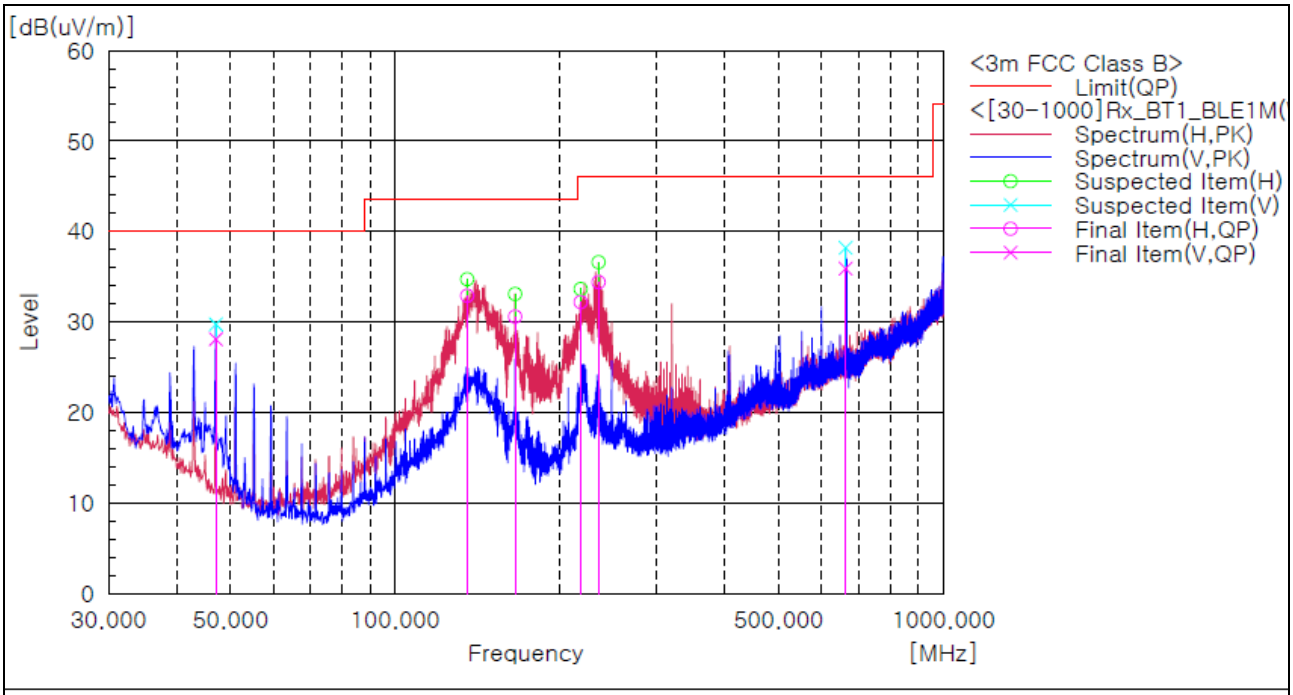
No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	47.096	V	42.4	-15.1	27.3	40.0	12.7	101.0	309.0
2	139.489	H	43.6	-11.9	31.7	43.5	11.8	209.0	223.0
3	146.400	H	42.9	-12.1	30.8	43.5	12.7	209.0	193.0
4	165.558	H	42.9	-13.3	29.6	43.5	13.9	209.0	350.0
5	236.489	H	43.4	-11.5	31.9	46.0	14.1	101.0	4.0
6	663.774	V	33.6	1.0	34.6	46.0	11.4	101.0	126.0

Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

Test mode : BT1_Receiver (Worst Case)

The requirements are:
☒ Complies

Test Data



Final Result

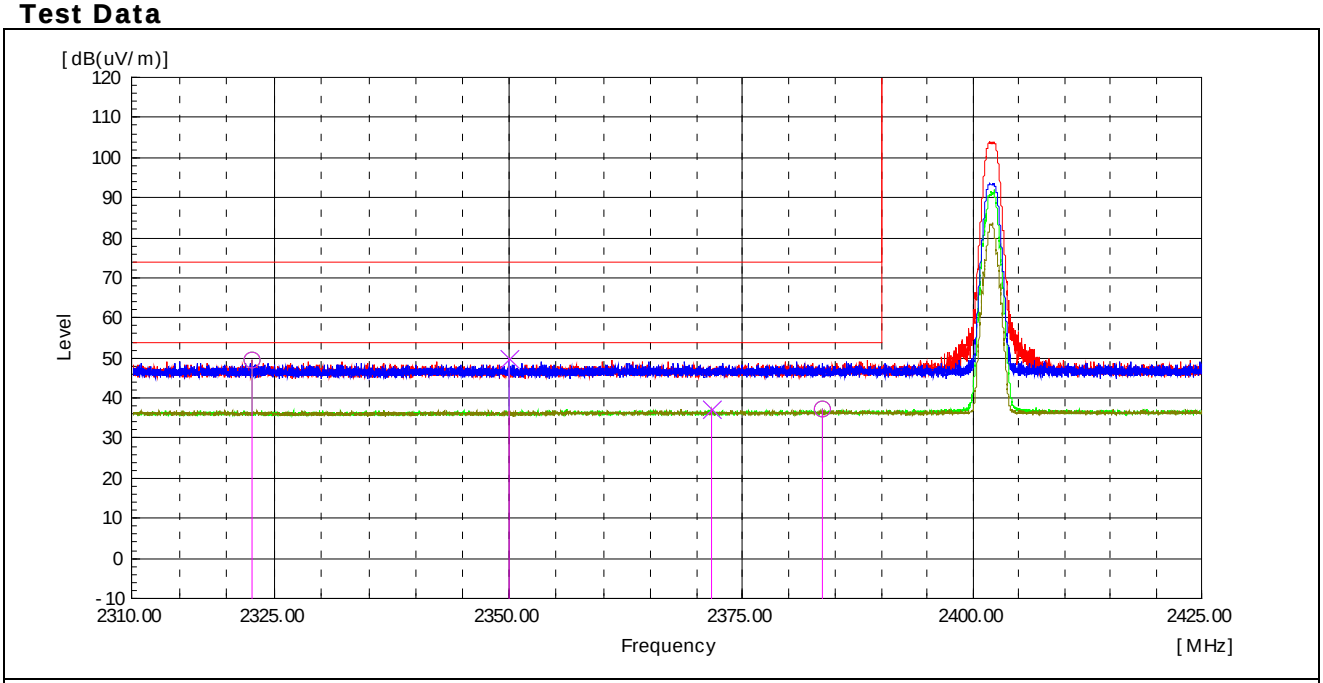
No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	47.096	V	43.2	-15.1	28.1	40.0	11.9	100.0	309.0
2	135.366	H	44.6	-11.7	32.9	43.5	10.6	209.0	213.0
3	165.558	H	43.9	-13.3	30.6	43.5	12.9	209.0	344.0
4	218.059	H	45.7	-13.5	32.2	46.0	13.8	101.0	14.0
5	235.155	H	46.1	-11.7	34.4	46.0	11.6	101.0	7.0
6	663.774	V	34.9	1.0	35.9	46.0	10.1	100.0	110.0

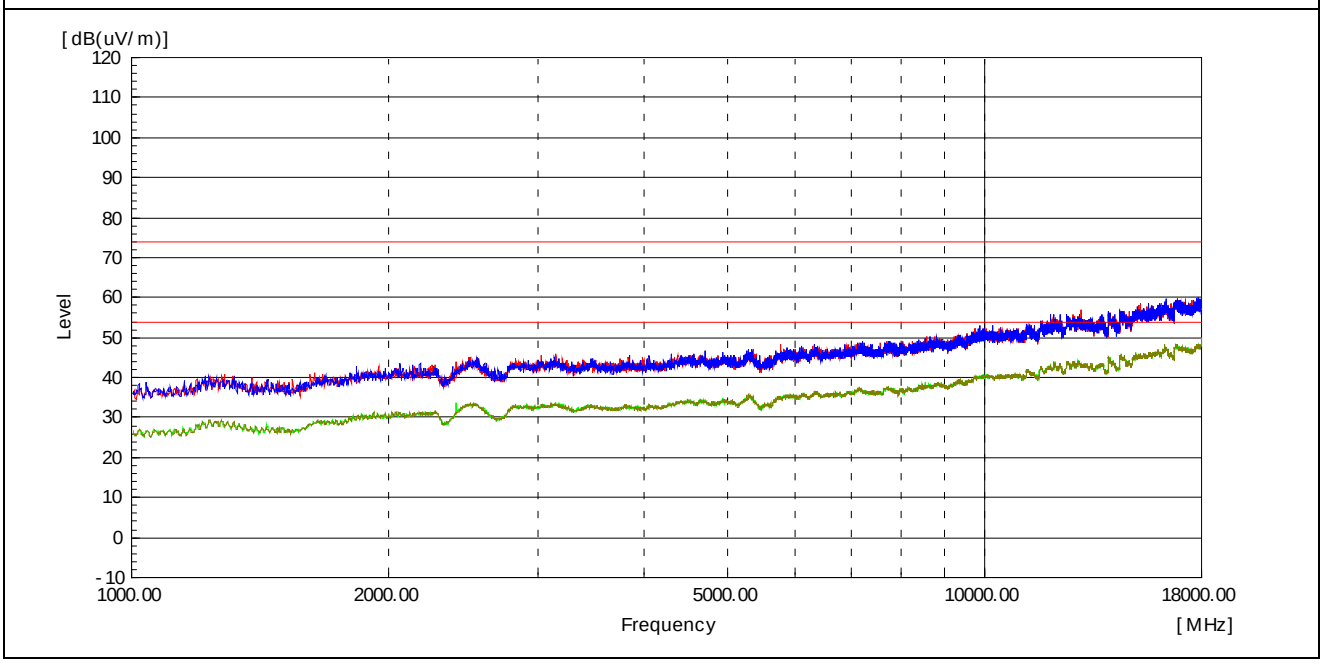
Remark :
1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

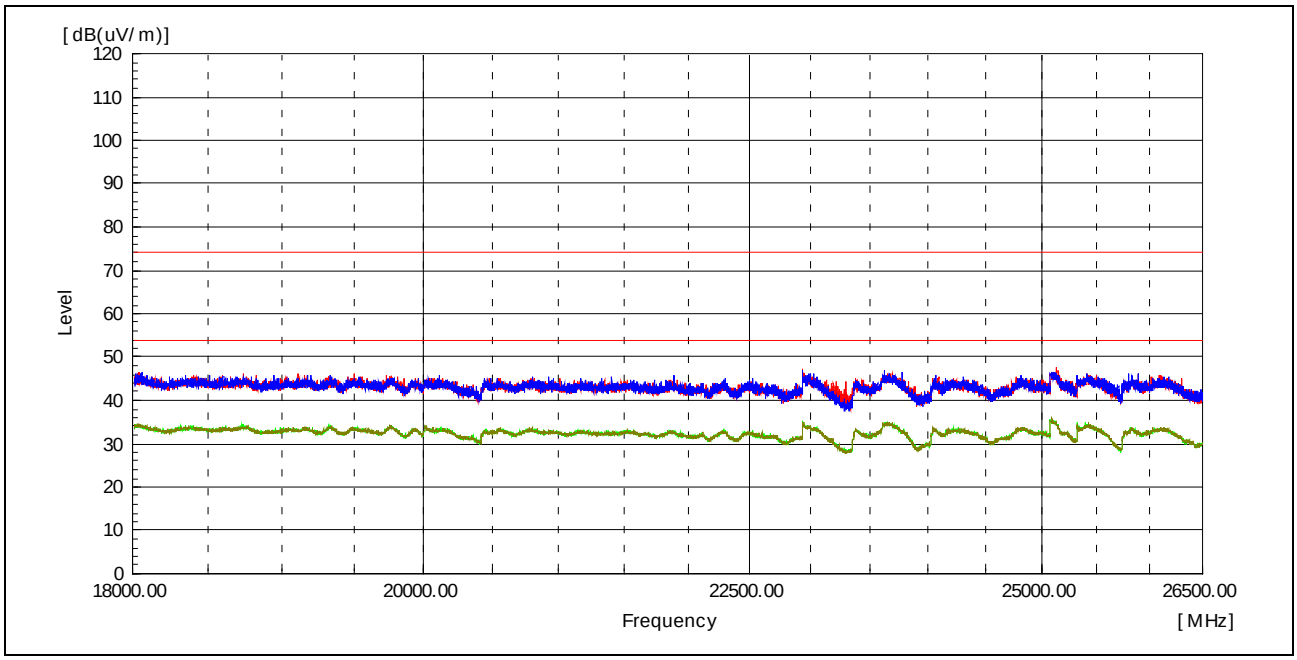
3) above 1 GHz

The requirements are:
☒ Complies

Test Data






[dB(uV/m)]
Level
120
110
100
90
80
70
60
50
40
30
20
10
0
18000.00
20000.00
22500.00
25000.00
26500.00
Frequency
[MHz]

Test mode : Transmitter (BT0, 1 Mbps)

Low (2 402 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 322.69	H	52.7	-----	-3.2	49.5	-----	-----	74.0	-----	24.5	-----
2 383.64	H	-----	40.3	-3.1	-----	37.2	0.7	-----	54.0	-----	16.1
2 350.01	V	53.0	-----	-3.2	49.8	-----	-----	74.0	-----	24.2	-----
2 371.73	V	-----	40.3	-3.1	-----	37.2	0.7	-----	54.0	-----	16.1

Mid (2 440 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
The emissions above 1 GHz were 20 dB lower than the limit.											

High (2 480 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 483.54	H	54.3	-----	-2.5	51.8	-----	-----	74.0	-----	22.2	-----
2 493.44	H	-----	40.7	-2.4	-----	38.3	0.7	-----	54.0	-----	15.0
2 491.86	V	53.6	-----	-2.5	51.1	-----	-----	74.0	-----	22.9	-----
2 498.64	V	-----	40.1	-2.4	-----	37.7	0.7	-----	54.0	-----	15.6

Remarks

1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : Transmitter (BT1, 1 Mbps)

Low (2 402 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 377.19	H	52.9	-----	-3.1	49.8	-----	-----	74.0	-----	24.2	-----
2 389.03	H	-----	40.2	-3.1	-----	37.1	0.68	-----	54.0	-----	16.2
2 323.94	V	52.9	-----	-3.2	49.7	-----	-----	74.0	-----	24.3	-----
2 311.06	V	-----	40.4	-3.1	-----	37.3	0.68	-----	54.0	-----	16.0

Mid (2 440 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
The emissions above 1 GHz were 20 dB lower than the limit.											

High (2 480 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 495.18	H	52.8	-----	-2.4	50.4	-----	-----	74.0	-----	23.6	-----
2 490.76	H	-----	40.3	-2.5	-----	37.8	0.68	-----	54.0	-----	15.5
2 488.69	V	52.2	-----	-2.5	49.7	-----	-----	74.0	-----	24.3	-----
2 496.49	V	-----	40.1	-2.4	-----	37.7	0.68	-----	54.0	-----	15.6

Remarks

4. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
5. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
6. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : Transmitter (BT0, 2 Mbps)

Low (2 402 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 357.58	H	52.5	-----	-3.1	49.4	-----	-----	74.0	-----	24.6	-----
2 387.18	H	-----	40.4	-3.1	-----	37.3	2.37	-----	54.0	-----	14.3
2 355.68	V	52.8	-----	-3.1	49.7	-----	-----	74.0	-----	24.3	-----
2 353.54	V	-----	40.2	-3.1	-----	37.1	2.37	-----	54.0	-----	14.5

Mid (2 440 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
The emissions above 1 GHz were 20 dB lower than the limit.											

High (2 480 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 483.85	H	54.9	-----	-2.5	52.4	-----	-----	74.0	-----	21.6	-----
2 483.58	H	-----	40.5	-2.5	-----	38.0	2.37	-----	54.0	-----	13.6
2 484.57	V	50.7	-----	-2.5	48.2	-----	-----	74.0	-----	25.8	-----
2 499.47	V	-----	38.7	-2.4	-----	36.3	2.37	-----	54.0	-----	15.3

Remarks

1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : Transmitter (BT1, 2 Mbps)

Low (2 402 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 375.16	H	52.6	-----	-3.1	49.5	-----	-----	74.0	-----	24.5	-----
2 365.11	H	-----	40.1	-3.1	-----	37.0	2.4	-----	54.0	-----	14.6
2 384.87	V	52.5	-----	-3.1	49.4	-----	-----	74.0	-----	24.6	-----
2 314.10	V	-----	40.4	-3.1	-----	37.3	2.4	-----	54.0	-----	14.3

Mid (2 440 MHz)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
The emissions above 1 GHz were 20 dB lower than the limit.											

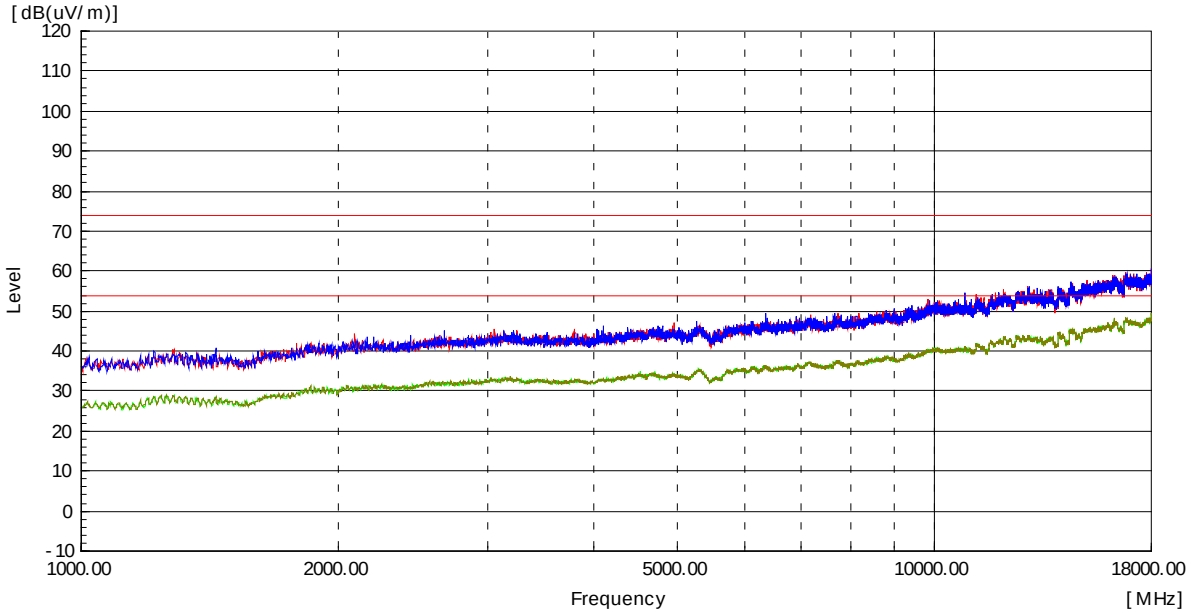
High (2 480 MHz)

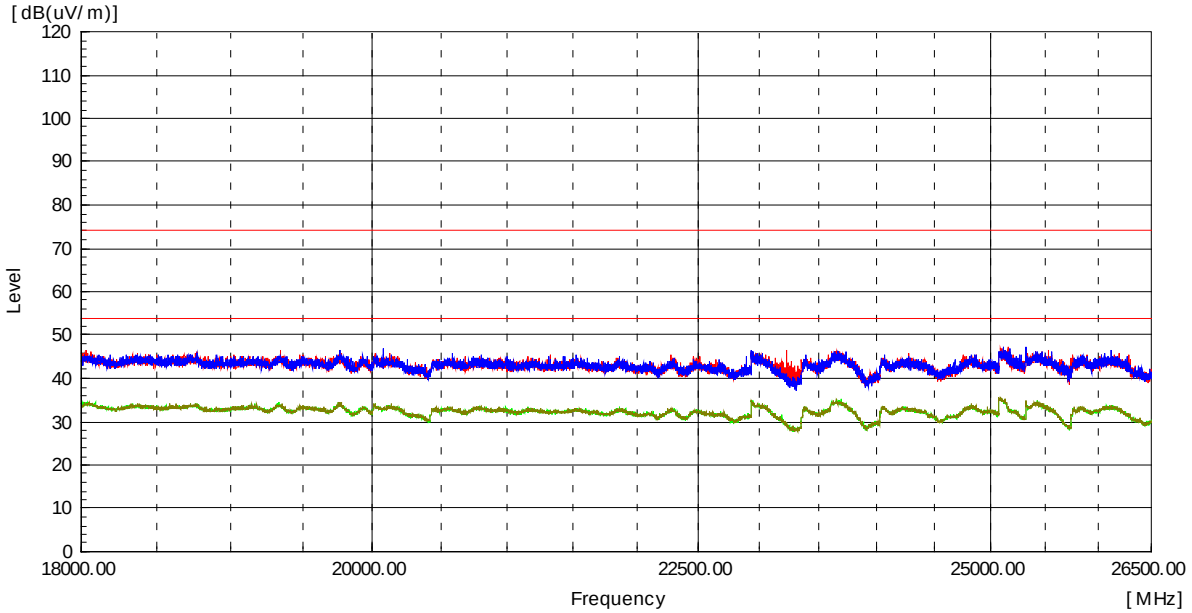
Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
2 493.23	H	52.4	-----	-2.4	50.0	-----	-----	74.0	-----	24.0	-----
2 495.03	H	-----	40.3	-2.4	-----	37.9	2.4	-----	54.0	-----	13.7
2 488.67	V	52.9	-----	-2.5	50.4	-----	-----	74.0	-----	23.6	-----
2 493.22	V	-----	40.2	-2.4	-----	37.8	2.4	-----	54.0	-----	13.8

Remarks

1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Peak Result = Reading + c.f(Correction factor)
   Average Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

Test mode : Receiver (Worst Case)





Test mode : Receiver (Worst Case)

Frequency [MHz]	(P)	Reading PK [dBuV]	Reading AV [dBuV]	c.f [dB(1/m)]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Duty Cycle Factor [dB]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]
The emissions above 1 GHz were 20 dB lower than the limit.											

Remarks

1. The unwanted emission was measured in the following position: EUT stand-up position(Z axis), lie-down positon(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.
2. Result = Reading + c.f(Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - Amp Gain

4.6 AC Conducted Emissions

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Procedures

RSS-Gen - Section 8.8

Module has been tested by mounting the End product(Printer).
The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.
Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit
- **15.207(a)**

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average**
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* The level decreases linearly with the logarithm of the frequency.
** A linear average detector is required.

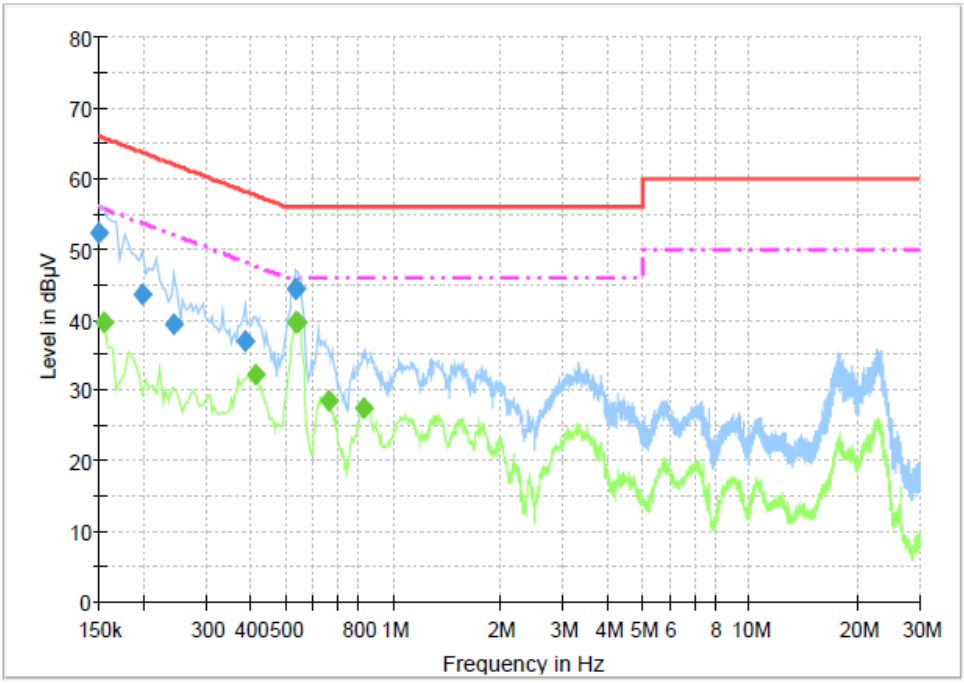
Test Results

The requirements are:
☒ Complies

Test Data

[LINE]

3CE_Class B_L1



Final Result 1

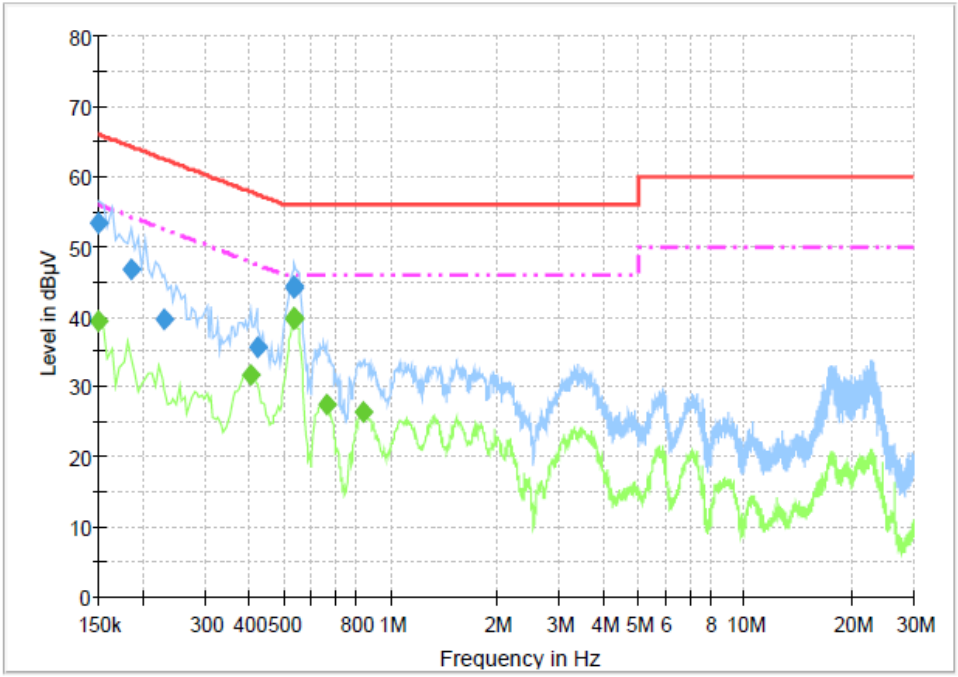
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	52.2	1000.0	9.000	On	L1	9.8	13.8	66.0
0.199500	43.7	1000.0	9.000	On	L1	9.8	20.0	63.6
0.244500	39.4	1000.0	9.000	On	L1	9.7	22.6	61.9
0.384000	36.9	1000.0	9.000	On	L1	10.0	21.3	58.2
0.532500	44.2	1000.0	9.000	On	L1	10.0	11.8	56.0
0.537000	44.4	1000.0	9.000	On	L1	10.0	11.6	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	39.6	1000.0	9.000	On	L1	9.8	16.1	55.8
0.411000	32.2	1000.0	9.000	On	L1	10.0	15.5	47.6
0.532500	39.6	1000.0	9.000	On	L1	10.0	6.4	46.0
0.541500	39.6	1000.0	9.000	On	L1	10.0	6.4	46.0
0.663000	28.4	1000.0	9.000	On	L1	9.9	17.6	46.0
0.825000	27.4	1000.0	9.000	On	L1	9.8	18.6	46.0

[NEUTRAL]

3CE_Class B_N



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	53.3	1000.0	9.000	On	N	9.8	12.7	66.0
0.186000	46.7	1000.0	9.000	On	N	9.8	17.5	64.2
0.231000	39.6	1000.0	9.000	On	N	9.8	22.8	62.4
0.420000	35.8	1000.0	9.000	On	N	10.0	21.7	57.4
0.532500	44.2	1000.0	9.000	On	N	10.0	11.8	56.0
0.537000	44.4	1000.0	9.000	On	N	10.0	11.6	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	39.4	1000.0	9.000	On	N	9.8	16.6	56.0
0.402000	31.7	1000.0	9.000	On	N	9.9	16.1	47.8
0.532500	39.7	1000.0	9.000	On	N	10.0	6.3	46.0
0.537000	39.9	1000.0	9.000	On	N	10.0	6.1	46.0
0.663000	27.4	1000.0	9.000	On	N	9.9	18.6	46.0
0.843000	26.4	1000.0	9.000	On	N	9.8	19.6	46.0

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	Signal Analyzer	Agilent	N9020A	MY50200512	2020-05-25	2021-05-25
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2020-04-28	2021-04-28
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2020-10-20	2021-10-20
4	Bilog Antenna	Schaffner	CBL6111C	2551	2020-05-26	2022-05-26
5	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2020-05-20	2022-05-20
6	6dB Attenuator	R&S	DNF	272.4110.50-2	2020-10-23	2021-10-23
7	6dB Attenuator	BIRD	5W 6dB	1744	2020-01-13	2021-01-03
8	AMPLIFIER	SONOMA	310	291721	2020-01-22	2021-01-22
9	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2020-01-17	2021-01-17
10	Preamplifier	Agilent	8449B	3008A01504	2019-12-17	2020-12-17
11	Horn Antenna	ETS-Lindgren	3117	00154525	2020-10-14	2021-10-14
12	Horn Antenna	SCHWARZBECK	BBHA9170	00967	2020-06-02	2021-06-02
13	Band Reject Filter	Micro Tronics	BRM50702	G233	2020-01-21	2021-01-21
14	Low Noise Amplifier	TESTEK	TK-PA1840H	200115-L	2020-05-29	2021-05-29
15	LISN	Rohde & Schwarz	ENV216	101235	2020-01-17	2021-01-17

	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable	Canare Corporation	L-5D2W	N/A	2020-01-19
2	RF Cable	Junkosha Inc.	MWX221	1512S127	2020-11-05
3	RF Cable	HUBER+SUHNER	SUCOFLEX 102	MY073/2	2020-05-19
4	RF Cable	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2020-05-29
5	RF Cable	HUBER+SUHNER	SUCOFLEX 104	N/A	2020-05-29
6	RF Cable	HUBER+SUHNER	SUCOFLEX 104	MY27573/4	2020-05-29
7	RF Cable	HUBER+SUHNER	SUCOFLEX 106	N/A	2020-05-29
8	RF Cable	HUBER+SUHNER	SUCOFLEX 102	803010/2	2020-10-27
9	RF Cable	HUBER+SUHNER	SUCOFLEX 102	803742/2	2020-10-27
10	RF Cable	HUBER+SUHNER	SUCOFLEX 102	MY2374/2	2020-05-07
11	RF Cable	HUBER+SUHNER	SUCOFLEX 102	MY4728/2	2020-05-07