

TEST REPORT

For

144/430MHz DUAL BAND TRANSCEIVER (Bluetooth)

In conformity with

FCC Part 15C / RSS-247 Issue 2

Model Name:

FTM-300DR

FCC ID:

K6620715X40

ISED Cert No.:

511B-20715X40

Report No.:

WE190401BC1-53

Issue Date:

27 Jan. 2020

Prepared for

YAESU MUSEN CO.,LTD.

Tennozu Parkside Building 2-5-8 Higashi-Shinagawa,
Shinagawa-ku, Tokyo 140-0002 Japan

Prepared by

SGS Japan Inc.

3-5-23, Kitayamata, Tsuzuki-ku, Yokohama, 224-0021, Japan
Telephone: +81+(0)45- 550-3520
FAX: +81+(0)45- 592-7506

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History

Report No.	Date	Revisions	Issued By
WE190401BC1-51	13 Sep. 2019	Initial Issue	T. Kato
WE190401BC1-52	22 Jan. 2020	Add the setup photo of above 1GHz test	T. Kato
WE190401BC1-53	27 Jan. 2020	Replace the setup photo of above 1GHz test	T. Kato

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1 General information

1.1 Product description

Test item	: 144/430MHz DUAL BAND TRANSCEIVER (Bluetooth)
Manufacturer	: YAESU MUSEN CO., LTD.
Address	: 43 Utsuroda, Morijuku, Sukagawa-shi, Fukushima-ken 962-0001 Japan
Model	: FTM-300DR
FCC ID	: K6620715X40
ISED No.	: 511B-20715X40
Serial number	: SPP2-12 (for radiated test) SPP2-7 (for conducted test)
Hardware version	: SPP2
Software version	: Ver. 0.2 (Main), Ver. 0.3 (Sub), Ver. 7.02 (DSP)
Operating frequency	: 2402 - 2480 MHz
Modulation	: GFSK, $\pi/4$ -DQPSK, 8DPSK (Bluetooth BR/EDR)
Antenna Gain	: +2.14 dBi (Manufacturer's declare)
Receipt date of EUT	: 06 Sep. 2019
Nominal power source voltages	: DC 13.8 V

1.2 Test(s) performed/ Summary of test result

Test specification(s)	: FCC CFR 47 Part 15 Subpart C RSS-247 Issue 2, RSS-Gen Issue 5 KDB558074 D01 v05r02
Test method(s)	: ANSI C63.10: 2013
Test(s) started	: 09 Sep. 2019
Test(s) completed	: 10 Sep. 2019

Summary of test result : Complied

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty.
Accordingly, the statement below is applied to the test result.

The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.

Compliance of the EUT is more probable than non-compliance in case that the margin is less than the measurement uncertainty in the Laboratory.

Test engineer : _____
T. Kato (Testing engineer, RF/EMC Lab.)

Reviewer : _____
K. Onishi (Testing leader, RF/EMC Lab.)

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1.3 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at SGS Japan Inc., located in 472, Nippa-cho, Kohoku-ku, Yokohama, 223-0057, Japan, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948. The description of the test facilities has been filed under registration number 319924 at the Office of the Federal Communications Commission. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at <http://www.fcc.gov>.

Registered by Innovation, Science and Economic Development Canada (ISED):
The registered CAB identifier is JP0009.

Accredited by **National Voluntary Laboratory Accreditation Program (NVLAP)** for the emission tests stated in the scope of the certificate under Certificate Number 200780-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.



1.4 Measurement uncertainty

The treatment of uncertainty is based on the general matters on the definition of uncertainty in "Guide to the expression of uncertainty in measurement (GUM)" published by ISO. The Lab's uncertainty is determined by referring ETSI TR 100 028-1 V1.4.1.

The uncertainty of the measurement result in the level of confidence of approximately 95% (k=2) is as follows;

AC Conducted emission	: ± 3.3 dB (150 kHz - 30 MHz)
Radiated emission	: ± 5.0 dB (9 kHz - 30 MHz)
	: ± 5.2 dB (30 MHz - 1000 MHz)
	: ± 4.9 dB (1 GHz - 6 GHz)
	: ± 4.9 dB (6 GHz - 18 GHz)
	: ± 5.5 dB (18 GHz - 26 GHz)

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1.5 Summary of test results

Requirement	Section in FCC	Section in RSS-247	Result	Section in this report
Occupied Bandwidth (20 dB)	15.247 (a)(1)	6.7 (RSS-Gen)	Complied	2.1
Occupied Bandwidth (99 %)	-	6.7 (RSS-Gen)	Complied	2.1.1
Hopping Carrier Frequency Separation	15.247 (a)(1)	5.1 (b)	Complied	2.2
Number of Hopping Channel	15.247 (a)(1)(iii)	5.1 (d)	Complied	2.3
Average Time of Occupancy	15.247 (a)(1)(iii)	5.1 (d)	Complied	2.4
Peak Output Power	15.247 (b)(1)	5.4 (b)	Complied	2.5
Conducted Spurious Emissions	15.247(d)	5.5	Complied	2.6
Transmitter Radiated Spurious Emissions	15.205(b)/15.209	8.9/8.10 (RSS-Gen)	Complied	2.7
AC power line conducted emissions	15.207	8.8 (RSS-Gen)	N/A (*)	2.8
Radiated Emissions (Receiver)	-	7.3 (RSS-Gen)	Complied	2.9
AC power line conducted emissions (Receiver)	-	7.2 (RSS-Gen)	N/A (*)	2.10

(*) The EUT is powered by the car battery.

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1.6 Setup of equipment under test (EUT)

1.6.1 Test configuration of EUT

Equipment(s) under test

No.	Item	Manufacture	Model No.	Serial No.
1-1	144/430MHz DUAL BAND TRANSCEIVER (for Radiated test)	YAESU MUSEN	FTM-300DR	SPP2-12
1-2	144/430MHz DUAL BAND TRANSCEIVER (for Conducted test) (*)	YAESU MUSEN	FTM-300DR	SPP2-7

(*) The antenna cable loss information with this sample was applied from the manufacturer.

Support Equipment(s)

No.	Item	Manufacture	Model No.	Serial No.
2	DTMF Microphone	YAESU MUSEN	SSM-85D	SPP2
3	External Speaker	YAESU MUSEN	MLS-100	1D064

Connected cable(s)

No.	Item	From	To	Cable Shielded	Ferrite Core	Length [m]
A	Control Cable	1	1	No	No	3.0
B	Mic. Cable	1	2	No	No	0.5
C	DC Power Cable	1	DC	No	No	2.8
D	Data Cable	1	OPEN	Yes	No	1.1
E	Speaker Cable A	1	3	No	No	1.8
F	Speaker Cable B	1	OPEN	No	No	1.0
G	EXTGPS Cable	1	OPEN	Yes	No	1.0

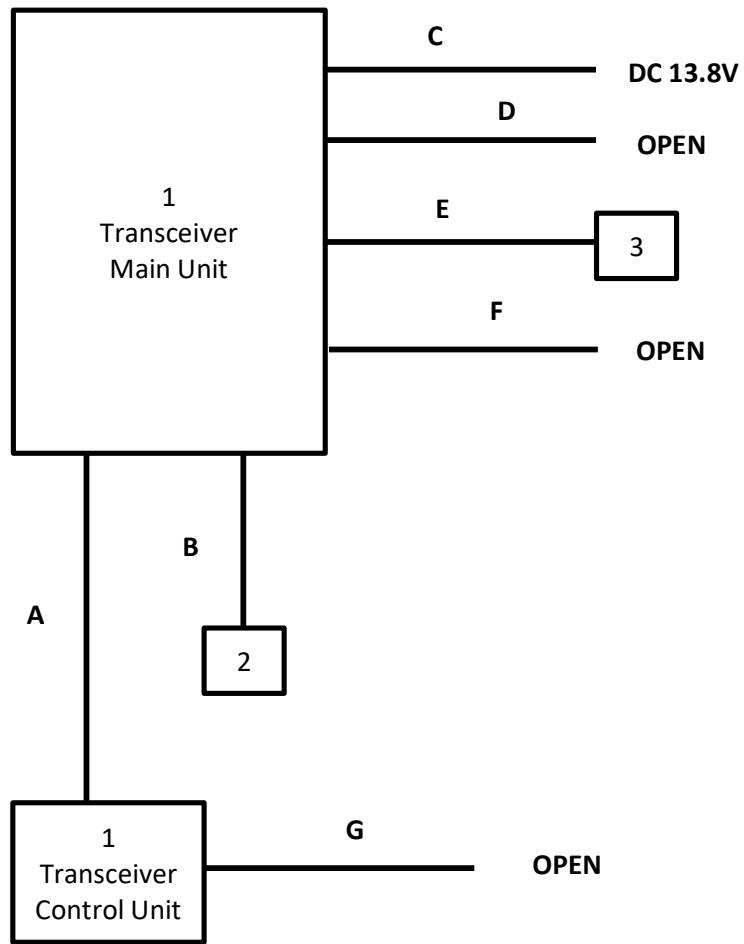
1.6.2 Operating condition:

- Tx (2402MHz): The EUT is in normal transmission mode at 2402MHz (DH5/2DH5/3DH5)
- Tx (2440MHz): The EUT is in normal transmission mode at 2440MHz (DH5/2DH5/3DH5)
- Tx (2480MHz): The EUT is in normal transmission mode at 2480MHz (DH5/2DH5/3DH5)
- Rx (2402MHz): The EUT is in normal receiving mode at 2402MHz
- Rx (2440MHz): The EUT is in normal receiving mode at 2440MHz
- Rx (2480MHz): The EUT is in normal receiving mode at 2480MHz

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1.6.3 Setup diagram of tested system



1.7 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the applicable standards described in clause 1.2.

1.8 Deviation from the standard

No deviations from the standards described in clause 1.2.

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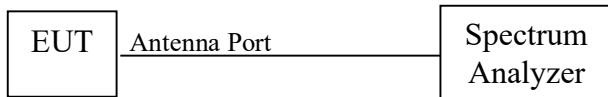
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2 Test procedure and test data

2.1 Occupied Bandwidth (20 dB)

Test setup

Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure

Spectrum analyzer is set as below according to ANSI C63.10 clause 6.9.2

- RBW : 1 to 5 % of OBW	- VBW > 3 x RBW
- Span : OBW x 2 to 5	- Trace : Max hold

Limitation

There are no limitations.

The measurement value is used for the emission designator.

Test equipment used (refer to List of utilized test equipment)

TR06	CL31	-
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Test results

Tested sample: 1-2

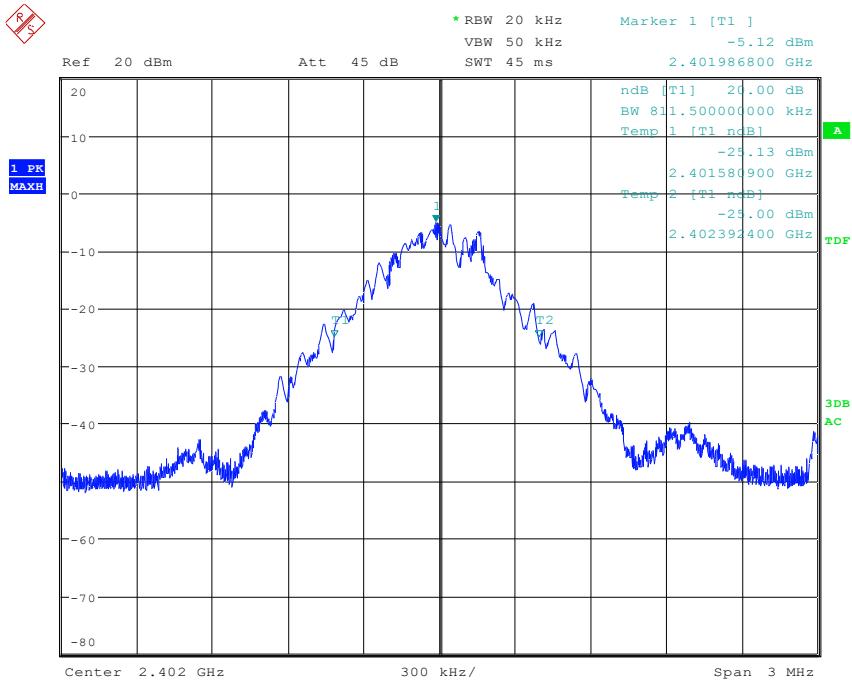
Transmission Frequency [MHz]	Occupied Bandwidth [MHz] DH5	Occupied Bandwidth [MHz] 2DH5	Occupied Bandwidth [MHz] 3DH5
2402	0.812	1.216	1.206
2440	0.808	1.211	1.206
2480	0.809	1.212	1.202

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[Chart]

Operating condition: Tx 2402 MHz DH5


Tested Date: 09 Sep. 2019
Humidity: 53 %

Temperature: 23 degC
Atmos. Press: 1006 hPa

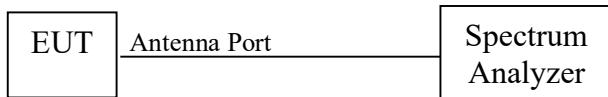
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2.1.1 Occupied Bandwidth (99 %)

Test setup

Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure

Spectrum analyzer is set as below according to ANSI C63.10 clause 6.9.3

- RBW : 1 to 5 % of OBW
- VBW > 3 x RBW
- Span : OBW x 1.5 to 5
- Trace : Max hold

Limitation

There are no limitations.

The measurement value is used for the emission designator.

Test equipment used (refer to List of utilized test equipment)

TR06	CL31	-
------	------	---

Test results

Tested sample: 1-2

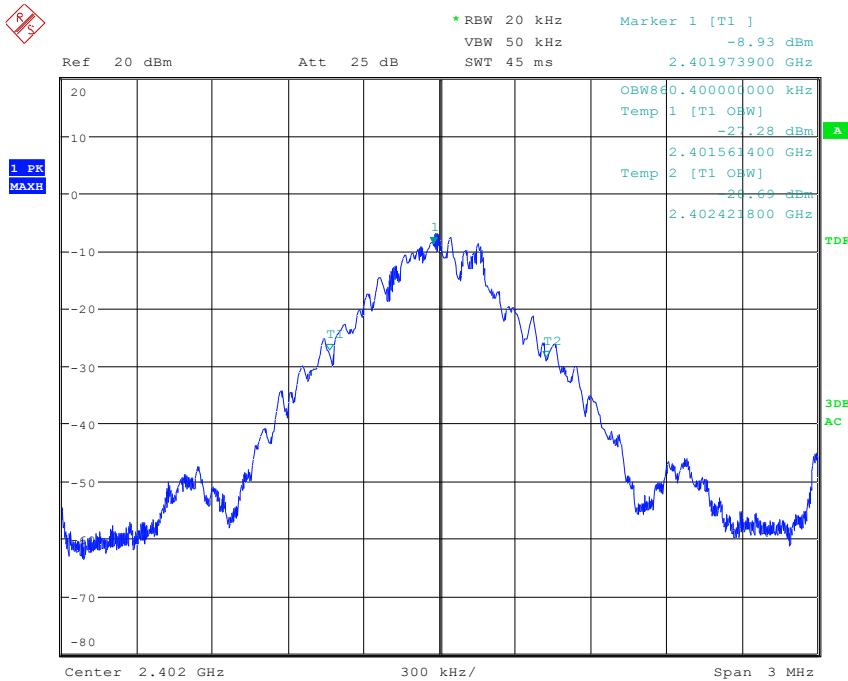
Transmission Frequency [MHz]	Occupied Bandwidth [MHz] DH5	Occupied Bandwidth [MHz] 2DH5	Occupied Bandwidth [MHz] 3DH5
2402	0.860	1.165	1.157
2440	0.854	1.167	1.158
2480	0.857	1.168	1.158

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[Chart]

Operating condition: Tx 2402 MHz DH5



Tested Date: 09 Sep. 2019
 Humidity: 53 %

Temperature: 23 degC
 Atmos. Press: 1006 hPa

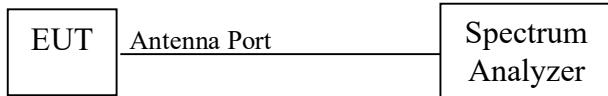
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2.2 Hopping Carrier Frequency Separation

Test setup

Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure

Spectrum analyzer is set as below according to ANSI C63.10 clause 7.8.2

- RBW: about 30% of OBW
- VBW > RBW
- Trace : Max hold

Applicable rule and limitation

FCC 15.247 (a)(1)

RSS-247 Sec. 5.1 (b)

Frequency hopping systems operating in the 2400 - 2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Limit: more than 540 kHz (2/3 of 20 dB OBW)

Test equipment used (refer to List of utilized test equipment)

TR06	CL31	
------	------	--

Test results - Complied with requirement

Test Data

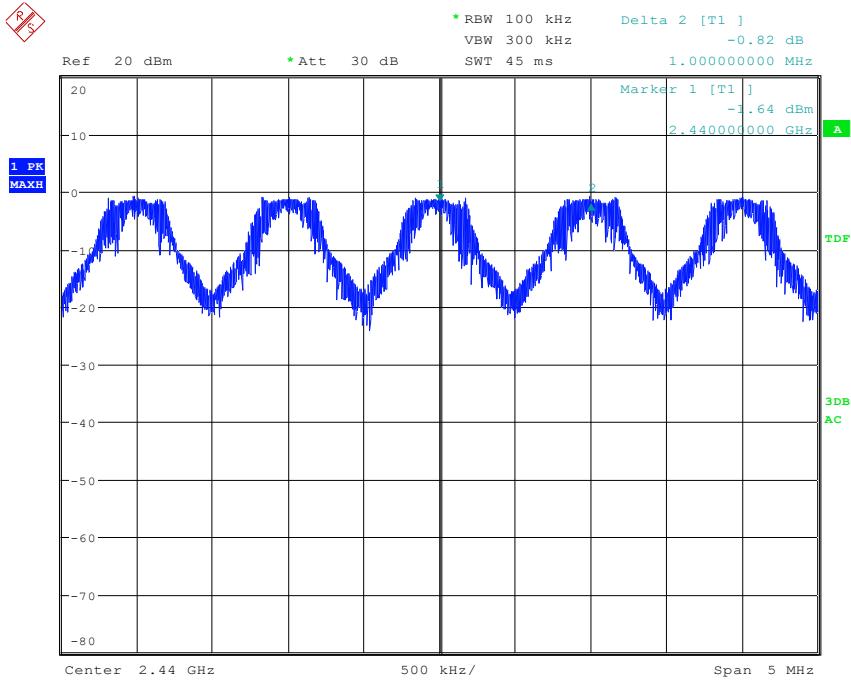
Tested sample: 1-2

Frequency Separation [kHz]	Result
1000	Pass

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[Chart]



Tested Date: 09 Sep. 2019
Humidity: 53 %

Temperature: 23 degC
Atmos. Press: 1006 hPa

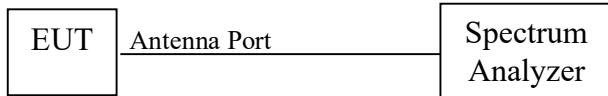
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2.3 Number of Hopping Channel

Test setup

Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure

Spectrum analyzer is set as below according to ANSI C63.10 clause 7.8.3

- RBW: about 30% of OBW
- VBW > RBW
- Trace : Max hold

Applicable rule and limitation

FCC 15.247 (a)(1)(iii)

RSS-247 Sec. 5.1 (d)

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

Test equipment used (refer to List of utilized test equipment)

TR06	CL31	
------	------	--

Test results - Complied with requirement

Test Data

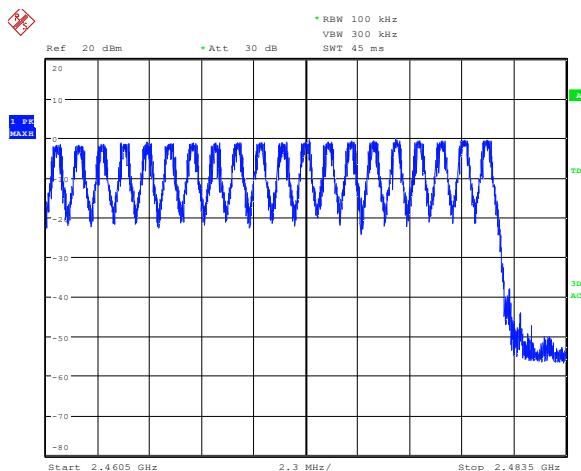
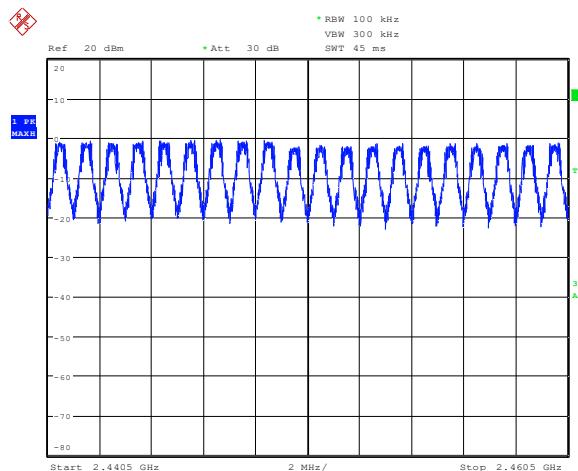
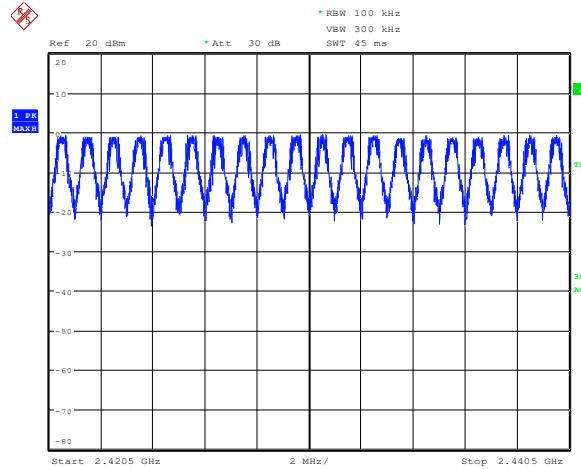
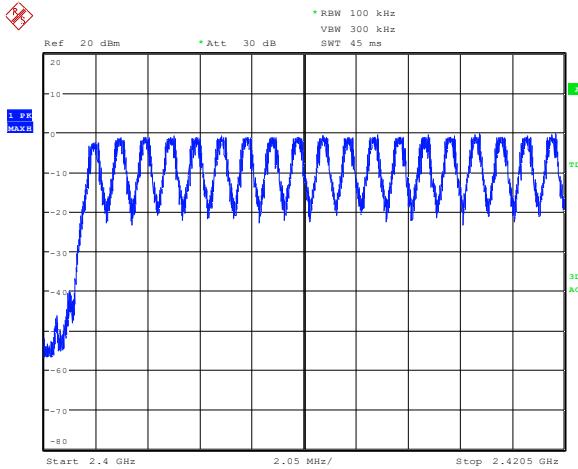
Tested sample: 1-2

Number of channel	Result
79	Pass

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[Chart]



Tested Date: 09 Sep. 2019
Humidity: 53 %

Temperature: 23 degC
Atmos. Press: 1006 hPa

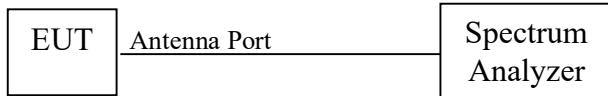
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2.4 Average Time of Occupancy

Test setup

Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure

Spectrum analyzer is set as below according to ANSI C63.10 clause 7.8.4

- RBW < Channel separation
- Trace : Max hold

Applicable rule and limitation

FCC 15.247 (a)(1)(iii)

RSS-247 Sec. 5.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test equipment used (refer to List of utilized test equipment)

TR06	CL31	
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Test results - Complied with requirement

Test Data

Tested sample: 1-2

Observed Frequency	Pulse width [ms]	Observation Time [s]	The number of pulse (*)	Time of occupancy [s]	Result
2440 MHz (DM1)	0.378	31.6	32	0.121 (*)	Pass
2440 MHz (DH3)	1.626	31.6	16	0.260 (*)	Pass
2440 MHz (DH5)	2.885	31.6	11	0.317 (*)	Pass

(*) The number of pulse was captured within a period of 10% observation time.

The test result was calculated as below

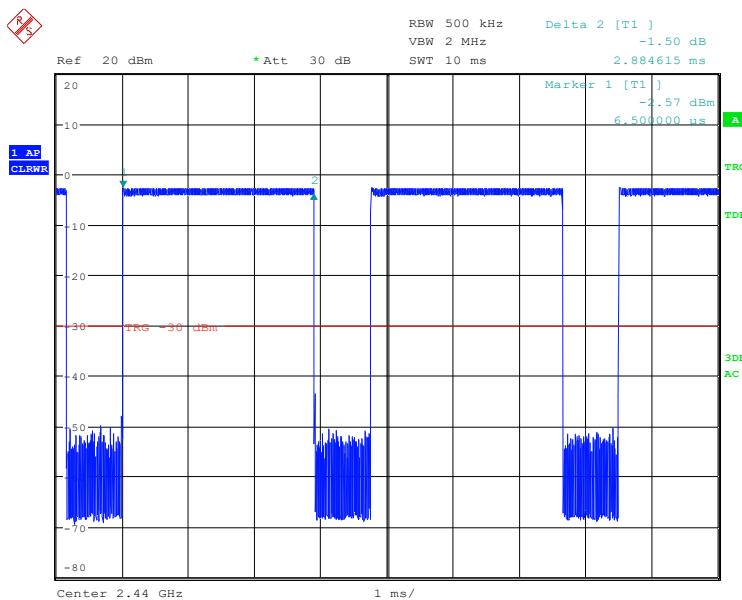
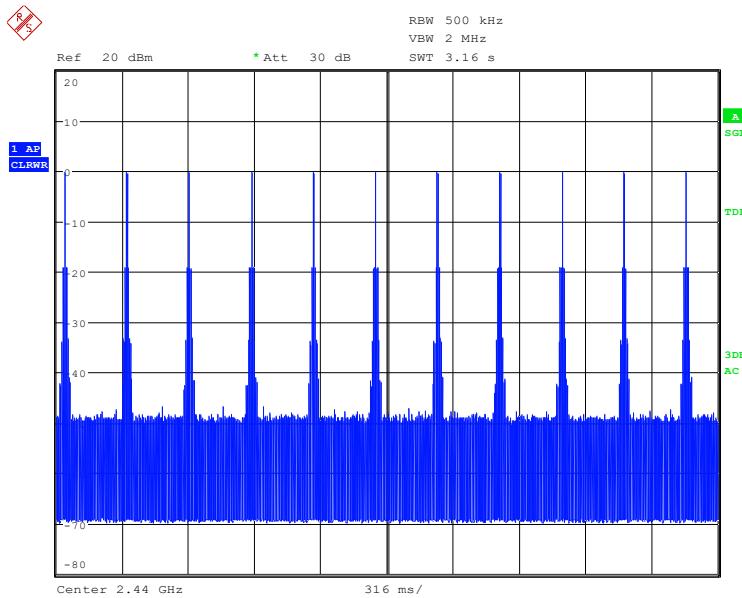
Average time of occupancy

$$= (\text{The number of captured pulse}) \times (\text{Single Pulse width}) \times (100\% / 10\%)$$

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[Chart] DH5


 Tested Date: 09 Sep. 2019
 Humidity: 53 %

 Temperature: 23 degC
 Atmos. Press: 1006 hPa

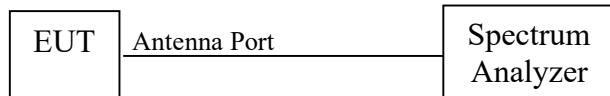
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2.5 Peak Output Power

Test setup

Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure

Spectrum analyzer is set as below according to ANSI C63.10 clause 7.8.5

- RBW > OBW
- VBW > RBW
- Span: about 5 times of OBW
- Trace : Max hold

Applicable rule and limitation

FCC 15.247(b)(1)

RSS-247 Sec. 5.4 (b)

For frequency hopping systems operating in the 2400 - 2483.5 MHz band employing at least 75 non-overlapping hopping channels : 1 w (+30 dBm)

For all other frequency hopping systems in the 2400 -2483.5 MHz band : 0.125 w (+21 dBm)

Test equipment used (refer to List of utilized test equipment)

TR06	CL31	
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Test results - Complied with requirement

Test Data

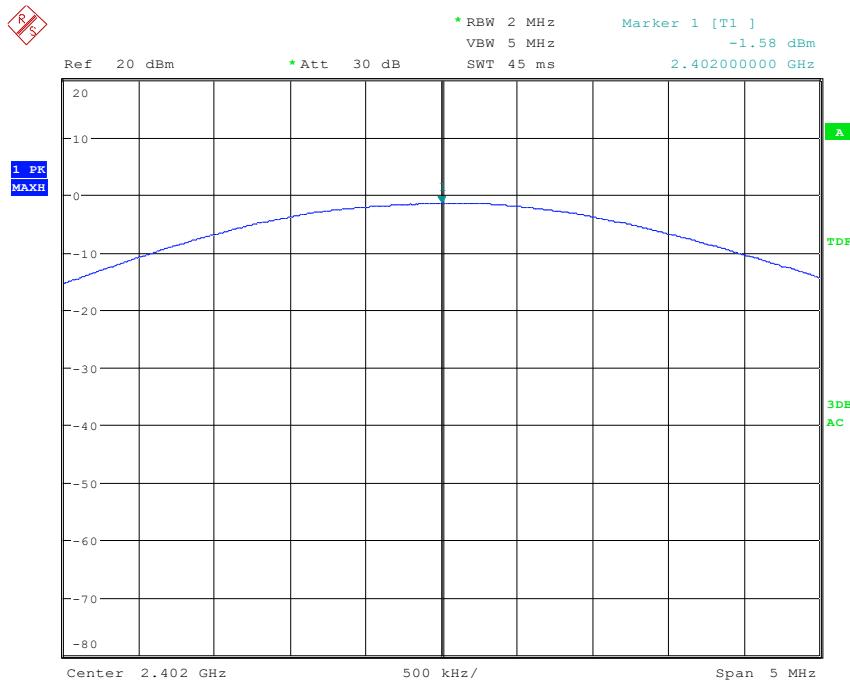
Tested sample: 1-2

Transmission Frequency [MHz]	Output Power DH5 [dBm]	Output Power 2DH5 [dBm]	Output Power 3DH5 [dBm]	Limit [dBm]	Result
2402	-1.6	-2.3	-1.8	30	Pass
2440	-2.5	-0.9	-0.4	30	Pass
2480	-1.7	-0.2	0.2	30	Pass

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[Chart]



Tested Date: 09 Sep. 2019
Humidity: 53 %

Temperature: 23 degC
Atmos. Press: 1006 hPa

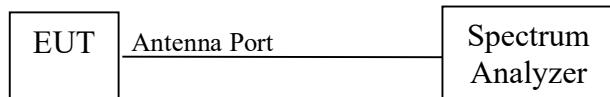
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2.6 Conducted Spurious Emissions

Test setup

Test setup is the following drawing. The antenna port of EUT was connected to the spectrum analyzer.



Test procedure

Spectrum analyzer is set as below according to ANSI C63.10 clause 7.8.8

- RBW : 100 kHz
- VBW : 300 kHz
- Detector : Peak
- Trace : Max hold

Limitation

FCC 15.247(d)

RSS-247 Sec. 5.5

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.

Test equipment used (refer to List of utilized test equipment)

TR06	CL31	
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Test results - Complied with requirement

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Test Data

Tested sample: 1-2

Operating mode: Tx 2402 MHz (DH5)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

Note: All emissions have more than 20 dB margin.

Operating mode: Tx 2402 MHz (2DH5)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

Note: All emissions have more than 20 dB margin.

Operating mode: Tx 2402 MHz (3DH5)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

Note: All emissions have more than 20 dB margin.

Operating mode: Tx 2440 MHz (DH5)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

Note: All emissions have more than 20 dB margin.

Operating mode: Tx 2440 MHz (2DH5)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

Note: All emissions have more than 20 dB margin.

Operating mode: Tx 2440 MHz (3DH5)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

Note: All emissions have more than 20 dB margin.

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Operating mode: Tx 2480 MHz (DH5)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

Note: All emissions have more than 20 dB margin.
Operating mode: Tx 2480 MHz (2DH5)

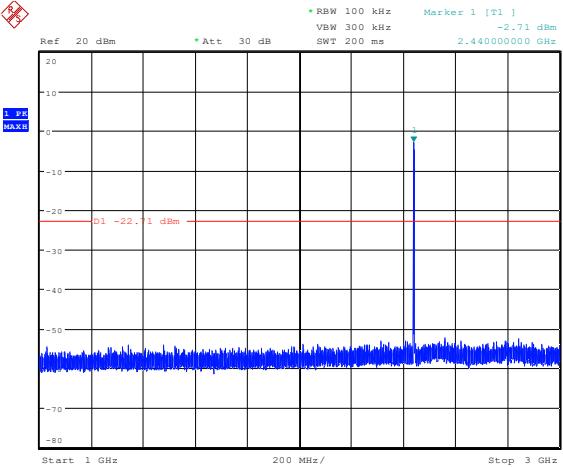
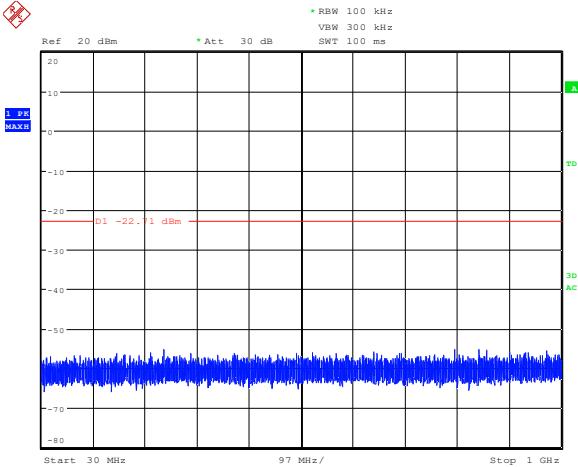
Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

Note: All emissions have more than 20 dB margin.
Operating mode: Tx 2480 MHz (3DH5)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
-	-	-	-
-	-	-	-

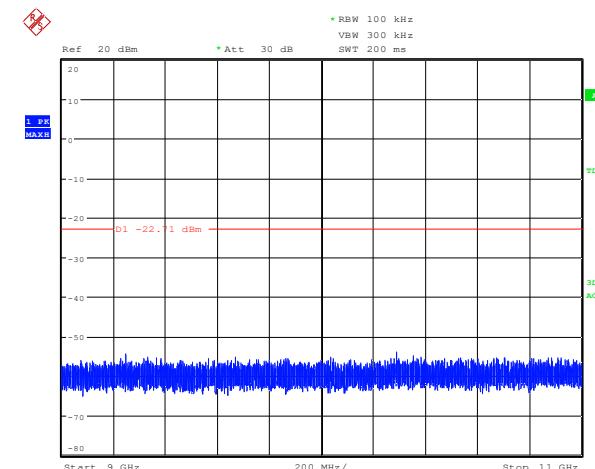
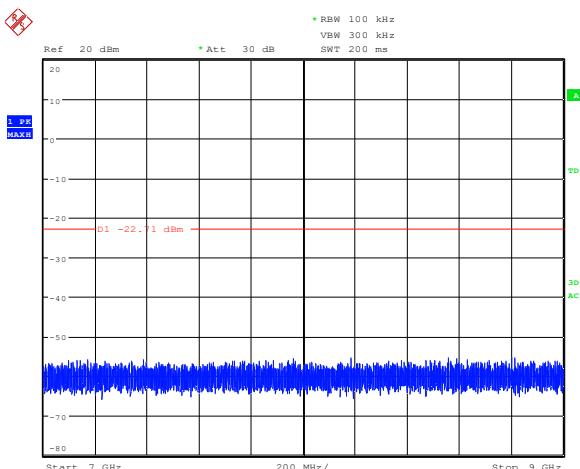
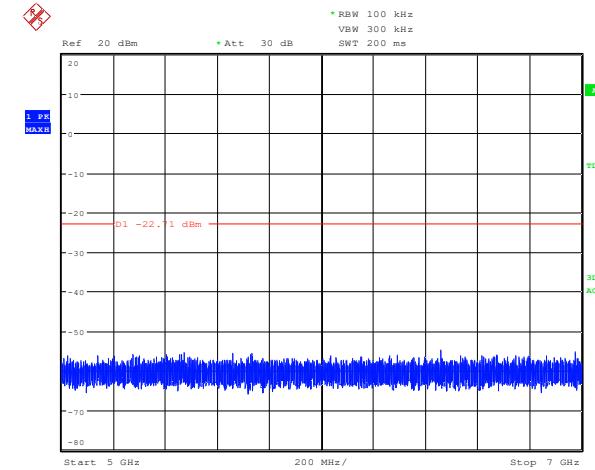
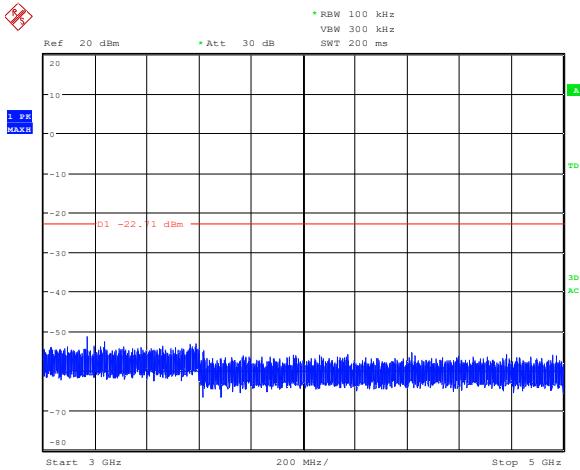
Note: All emissions have more than 20 dB margin.

[Chart] Tx 2440MHz (3DH5)



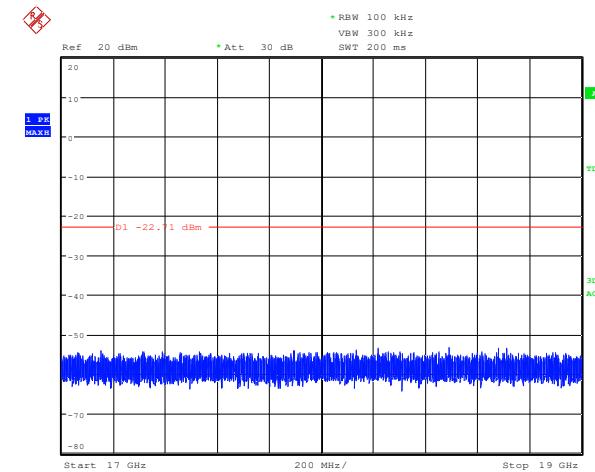
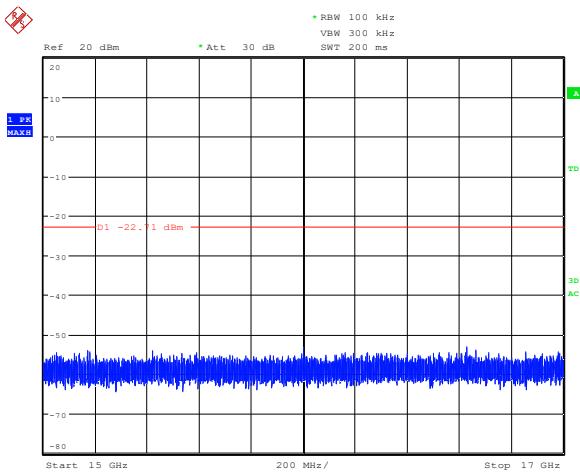
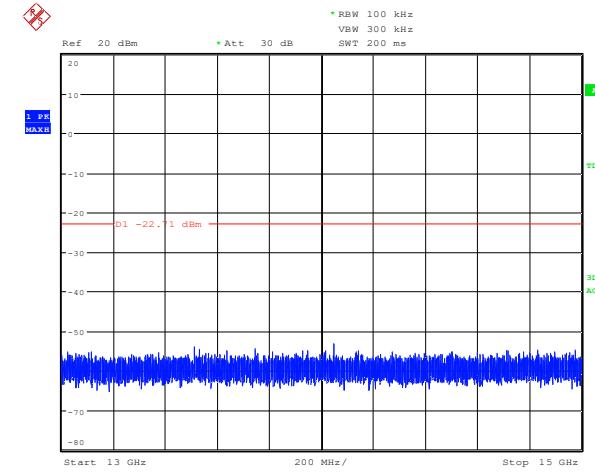
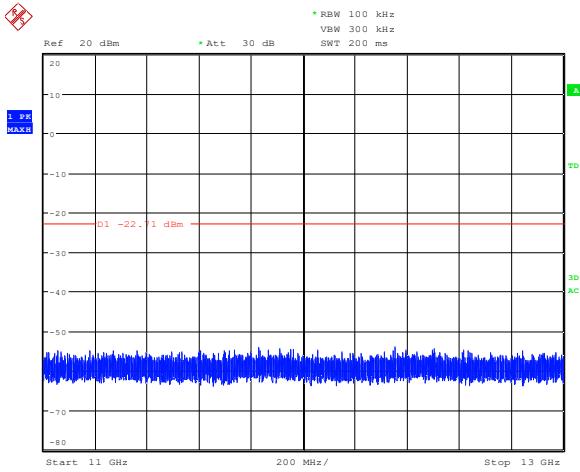
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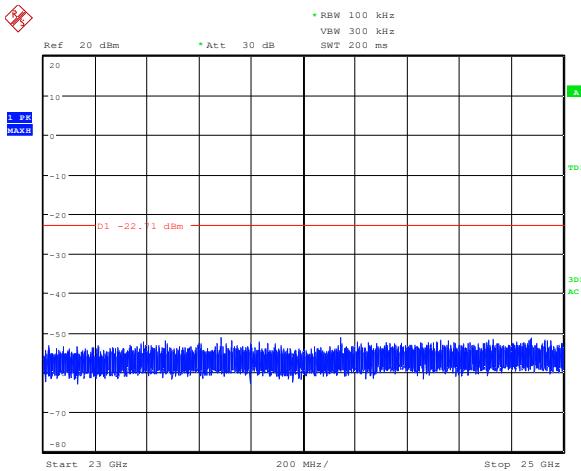
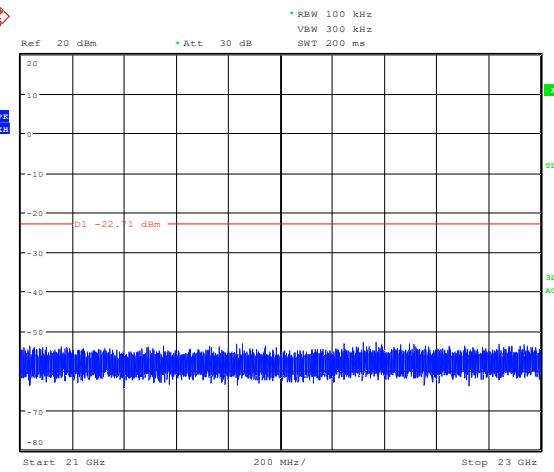
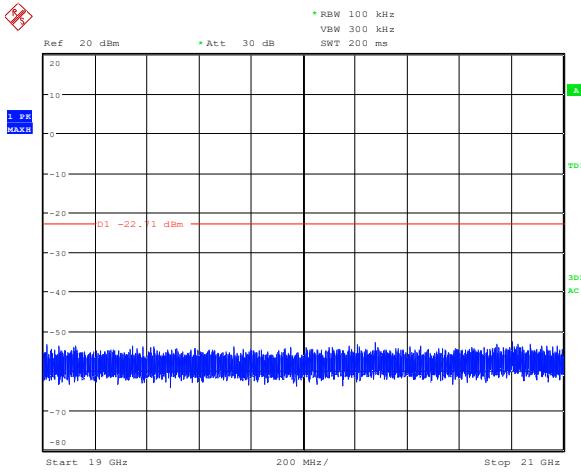
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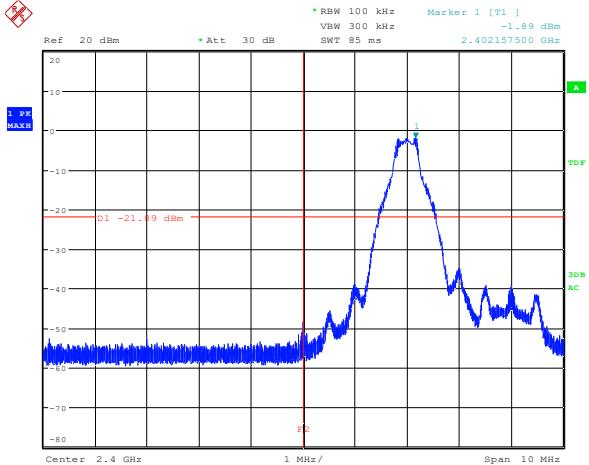


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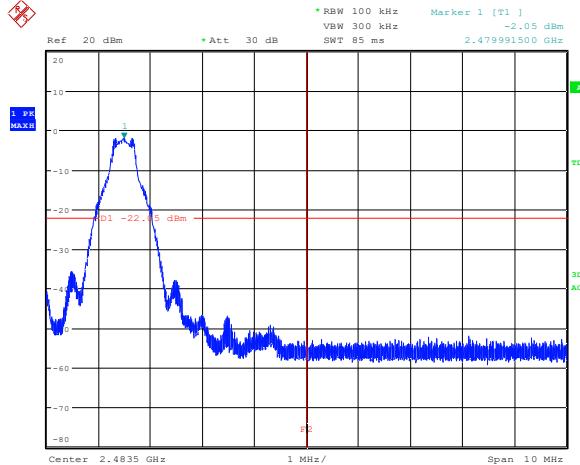
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[Band edge]

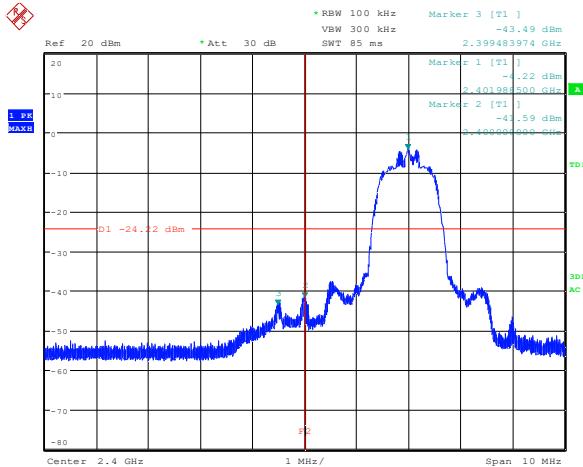
Tx 2402 MHz DH5



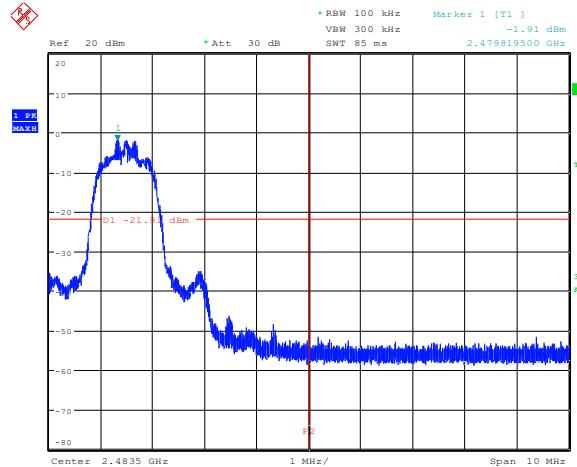
Tx 2480MHz DH5



Tx 2402 MHz 2DH5



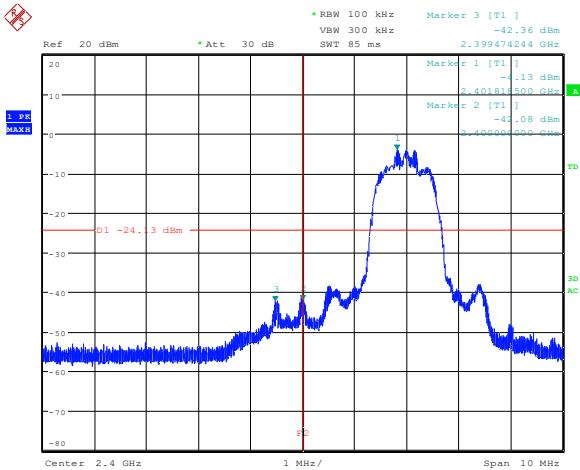
Tx 2480MHz 2DH5



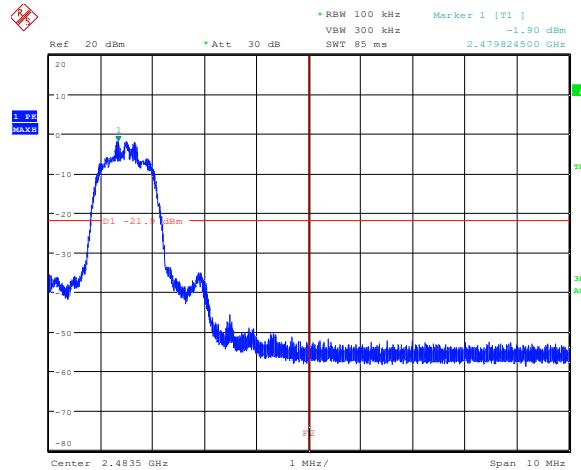
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Tx 2402 MHz 3DH5



Tx 2480MHz 3DH5



Tested Date: 09 Sep. 2019
Humidity: 53 %

Temperature: 23 degC
Atmos. Press: 1006 hPa

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2.7 Radiated emissions (for restricted frequency band)

Test setup

Test setup was implemented according to the method of ANSI C63.10 clause 6.

Test procedure

Measurement procedures were implemented according to the method of ANSI C63.10 clauses 6.
The test receiver is set as below

[9 - 150 kHz]
RBW: 200 Hz, Detector: QP

[150 kHz - 30 MHz]
RBW: 9 kHz, Detector: QP

[30 - 1000 MHz]
RBW: 120 kHz, Detector: QP

[above 1000 MHz]
RBW: 1 MHz, Detector: Ave/PK

Applicable rule and limitation

RSS-Gen Sec. 8.10

FCC 15.205 restricted bands of operation

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

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.490 - 0.510	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	38.6 -

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in FCC 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in FCC 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.

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FCC 15.209 / RSS-Gen Sec. 8.9 Field strength limits

Frequency [MHz]	Field Strength [μ V/m]	Measurement Distance [m]	Field Strength [dB μ V/m]
30 – 88	100	3	40.0
88 – 216	150	3	43.5
216 – 960	200	3	46.0
Above 960	500	3	53.9

In the emission table above, the tighter limit applies at the band edges.

The emission limits shown in the above table are based on measurements employing a quasi-peak detector.

Test results - Complied with requirement

Test equipment used (refer to List of utilized test equipment)

AC01	CL11	TR06	PR21	BA07	CL30	CL38	PR12
DH06	CH01	SH01	LP06	LPF1	HPF4	AT33	

Test software used

EMI1 Ver. 5.9

Calculation method

The Correction Factor and Result are calculated as followings.

$$\text{Correction Factor [dB/m]} = \text{Ant. Factor [dB/m]} + \text{Loss [dB]} - \text{Gain [dB]}$$

$$\text{Result [dB}\mu\text{V/m]} = \text{Reading [dB}\mu\text{V]} + \text{Correction Factor [dB/m]}$$

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Test Data (below 30MHz)

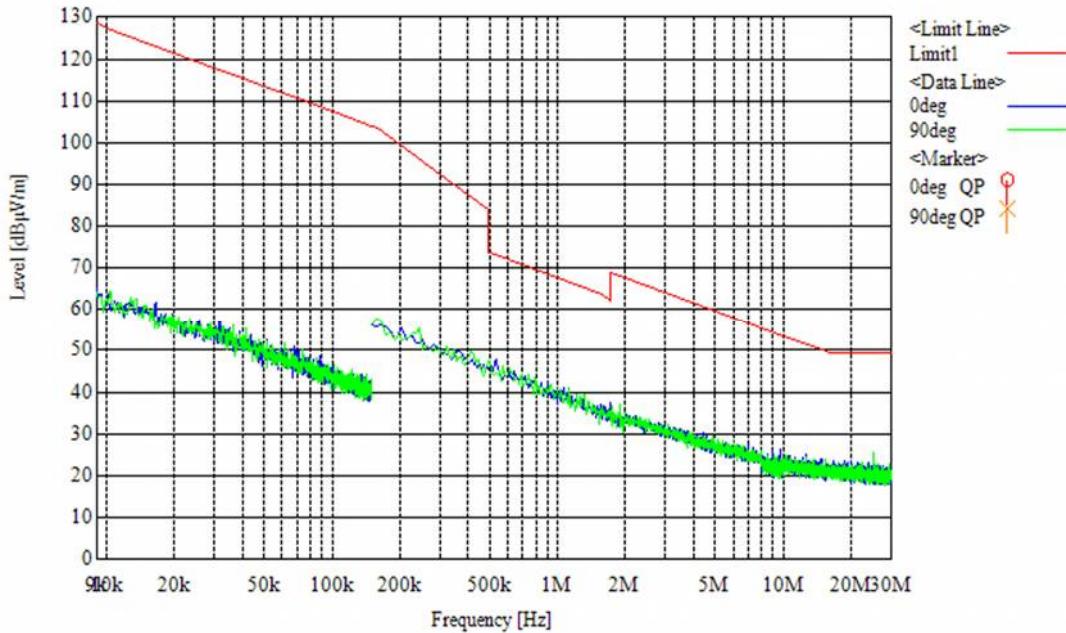
Tested sample: 1-1
 Worst operating mode: Tx 2440MHz DHS

[Emission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-

Note: All emissions were under noise floor.

[Chart]



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Test Data (30 - 1000MHz)

Tested sample: 1-1

Operating mode: Tx 2402MHz DH5

[Emission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	239.997	39.8	12.3	9.2	30.2	31.1	46.0	14.9	Hori.
2	441.950	35.5	16.8	10.8	30.2	32.9	46.0	13.1	Hori.
3	883.900	34.8	20.3	13.0	29.4	38.7	46.0	7.3	Hori.
4	225.234	40.4	12.1	9.1	30.2	31.4	46.0	14.6	Vert.
5	232.616	42.8	12.2	9.1	30.2	33.9	46.0	12.1	Vert.
6	883.901	32.0	20.3	13.0	29.4	35.9	46.0	10.1	Vert.

Operating mode: Tx 2402MHz 2DH5

[Emission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	236.300	45.3	12.3	9.2	30.2	36.6	46.0	9.4	Hori.
2	247.376	41.6	12.5	9.3	30.2	33.2	46.0	12.8	Hori.
3	441.950	35.5	16.8	10.8	30.2	32.9	46.0	13.1	Hori.
4	883.900	34.8	20.3	13.0	29.4	38.7	46.0	7.3	Hori.
5	239.999	43.3	12.3	9.2	30.2	34.6	46.0	11.4	Vert.
6	883.900	31.8	20.3	13.0	29.4	35.7	46.0	10.3	Vert.

Operating mode: Tx 2402MHz 3DH5

[Emission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	243.683	39.4	12.4	9.2	30.2	30.8	46.0	15.2	Hori.
2	247.375	41.6	12.5	9.3	30.2	33.2	46.0	12.8	Hori.
3	441.951	35.4	16.8	10.8	30.2	32.8	46.0	13.2	Hori.
4	883.900	34.8	20.3	13.0	29.4	38.7	46.0	7.3	Hori.
5	232.617	43.2	12.2	9.1	30.2	34.3	46.0	11.7	Vert.
6	239.999	43.3	12.3	9.2	30.2	34.6	46.0	11.4	Vert.
7	883.900	31.8	20.3	13.0	29.4	35.7	46.0	10.3	Vert.

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Operating mode: Tx 2440MHz DH5

[iEmission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	441.950	35.5	16.8	10.8	30.2	32.9	46.0	13.1	Hori.
2	883.900	34.6	20.3	13.0	29.4	38.5	46.0	7.5	Hori.
3	232.625	43.3	12.2	9.1	30.2	34.4	46.0	11.6	Vert.
4	236.297	48.1	12.3	9.2	30.2	39.4	46.0	6.6	Vert.
5	243.703	38.8	12.4	9.2	30.2	30.2	46.0	15.8	Vert.
6	247.387	40.8	12.5	9.3	30.2	32.4	46.0	13.6	Vert.
7	505.806	29.4	17.4	11.2	30.1	27.9	46.0	18.1	Vert.
8	883.900	31.8	20.3	13.0	29.4	35.7	46.0	10.3	Vert.

Operating mode: Tx 2440MHz 2DH5

[iEmission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	236.301	43.7	12.3	9.2	30.2	35.0	46.0	11.0	Hori.
2	332.295	32.3	14.4	10.0	30.2	26.5	46.0	19.5	Hori.
3	441.951	35.4	16.8	10.8	30.2	32.8	46.0	13.2	Hori.
4	883.901	34.6	20.3	13.0	29.4	38.5	46.0	7.5	Hori.
5	232.628	42.9	12.2	9.1	30.2	34.0	46.0	12.0	Vert.
6	883.900	31.7	20.3	13.0	29.4	35.6	46.0	10.4	Vert.

Operating mode: Tx 2440MHz 3DH5

[iEmission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	225.222	36.8	12.1	9.1	30.2	27.8	46.0	18.2	Hori.
2	247.372	41.4	12.5	9.3	30.2	33.0	46.0	13.0	Hori.
3	441.949	35.5	16.8	10.8	30.2	32.9	46.0	13.1	Hori.
4	883.899	34.5	20.3	13.0	29.4	38.4	46.0	7.6	Hori.
5	231.654	33.2	12.2	9.1	30.2	24.3	46.0	21.7	Vert.
6	883.900	31.8	20.3	13.0	29.4	35.7	46.0	10.3	Vert.

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Operating mode: Tx 2480MHz DH5

[Emission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	236.300	43.0	12.3	9.2	30.2	34.3	46.0	11.7	Hori.
2	247.376	44.4	12.5	9.3	30.2	36.0	46.0	10.0	Hori.
3	441.950	35.4	16.8	10.8	30.2	32.8	46.0	13.2	Hori.
4	883.900	34.4	20.3	13.0	29.4	38.3	46.0	7.7	Hori.
5	234.879	33.9	12.2	9.2	30.2	25.1	46.0	20.9	Vert.
6	243.676	39.7	12.4	9.2	30.2	31.1	46.0	14.9	Vert.
7	247.375	43.7	12.5	9.3	30.2	35.3	46.0	10.7	Vert.
8	883.900	31.8	20.3	13.0	29.4	35.7	46.0	10.3	Vert.

Operating mode: Tx 2480MHz 2DH5

[Emission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	236.298	42.3	12.3	9.2	30.2	33.6	46.0	12.4	Hori.
2	247.379	44.7	12.5	9.3	30.2	36.3	46.0	9.7	Hori.
3	441.950	35.4	16.8	10.8	30.2	32.8	46.0	13.2	Hori.
4	883.900	34.4	20.3	13.0	29.4	38.3	46.0	7.7	Hori.
5	236.298	46.0	12.3	9.2	30.2	37.3	46.0	8.7	Vert.
6	883.900	31.7	20.3	13.0	29.4	35.6	46.0	10.4	Vert.

Operating mode: Tx 2480MHz 3DH5

[Emission level]

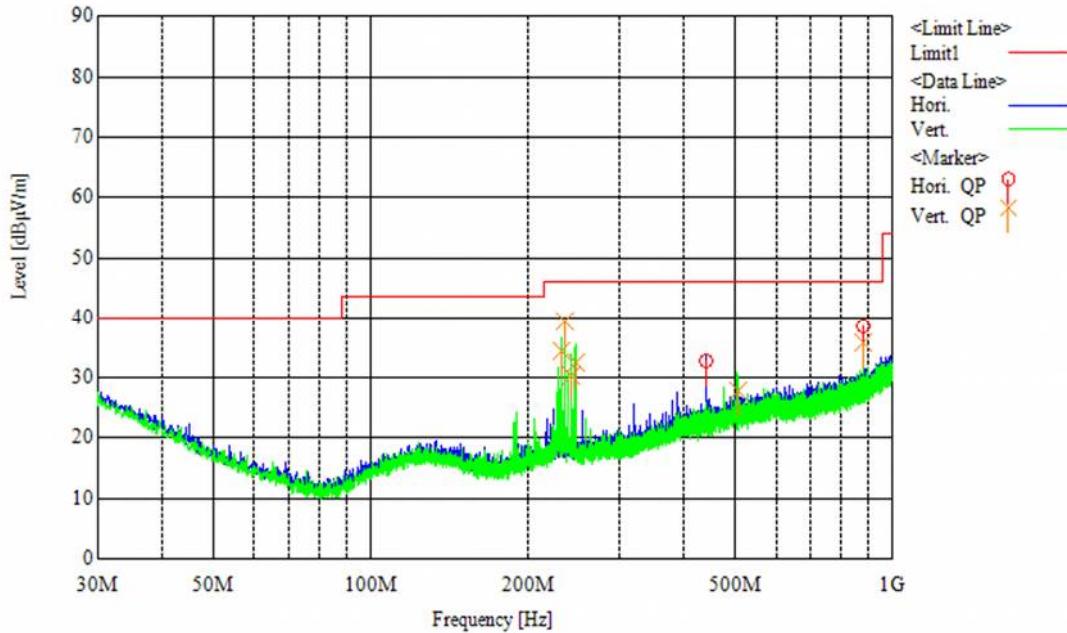
No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	247.379	44.7	12.5	9.3	30.2	36.3	46.0	9.7	Hori.
2	441.949	35.4	16.8	10.8	30.2	32.8	46.0	13.2	Hori.
3	535.998	26.6	17.8	11.4	30.1	25.7	46.0	20.3	Hori.
4	690.407	26.4	18.7	12.1	30.2	27.0	46.0	19.0	Hori.
5	738.417	27.6	19.2	12.4	30.2	29.0	46.0	17.0	Hori.
6	883.900	34.4	20.3	13.0	29.4	38.3	46.0	7.7	Hori.
7	232.613	37.9	12.2	9.1	30.2	29.0	46.0	17.0	Vert.
8	239.999	41.1	12.3	9.2	30.2	32.4	46.0	13.6	Vert.
9	247.374	44.3	12.5	9.3	30.2	35.9	46.0	10.1	Vert.
10	883.899	32.1	20.3	13.0	29.4	36.0	46.0	10.0	Vert.

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[Chart]

Tx 2440MHz DH5



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Test Data (1 - 12GHz)

Tested sample: 1-1

Operating mode: Tx 2402MHz DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.851	47.6	38.6	1.1	48.7	39.7	73.9	53.9	25.2	14.2	Hori.
2	4804.000	46.4	38.5	3.2	49.6	41.7	73.9	53.9	24.3	12.2	Hori.
3	4804.000	46.2	38.1	3.2	49.4	41.3	73.9	53.9	24.5	12.6	Vert.

Note: All other emissions are under noise floor.

Operating mode: Tx 2402MHz 2DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.850	47.5	38.6	1.1	48.6	39.7	73.9	53.9	25.3	14.2	Hori.
2	4804.000	44.1	33.2	3.2	47.3	36.4	73.9	53.9	26.6	17.5	Hori.
3	4804.000	44.4	34.1	3.2	47.6	37.3	73.9	53.9	26.3	16.6	Vert.

Note: All other emissions are under noise floor.

Operating mode: Tx 2402MHz 3DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.850	47.8	38.5	1.1	48.9	39.6	73.9	53.9	25.0	14.3	Hori.
2	4804.000	44.1	32.8	3.2	47.3	36.0	73.9	53.9	26.6	17.9	Hori.
3	4804.000	44.9	34.1	3.2	48.1	37.3	73.9	53.9	25.8	16.6	Vert.

Note: All other emissions are under noise floor.

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Operating mode: Tx 2440MHz DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.851	47.8	38.6	1.1	48.9	39.7	73.9	53.9	25.0	14.2	Hori.
2	4880.000	45.8	38.3	3.6	49.4	41.9	73.9	53.9	24.5	12.0	Hori.
3	4880.000	47.3	40.9	3.6	50.9	44.5	73.9	53.9	23.0	9.4	Vert.

Note: All other emissions are under noise floor.

Operating mode: Tx 2440MHz 2DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.850	47.3	38.5	1.1	48.4	39.6	73.9	53.9	25.5	14.3	Hori.
2	4880.000	44.9	35.0	3.6	48.5	38.6	73.9	53.9	25.4	15.3	Hori.
3	4880.000	47.2	38.1	3.6	50.8	41.7	73.9	53.9	23.1	12.2	Vert.

Note: All other emissions are under noise floor.

Operating mode: Tx 2440MHz 3DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.850	47.9	38.6	1.1	49.0	39.7	73.9	53.9	24.9	14.2	Hori.
2	4880.000	45.6	35.0	3.6	49.2	38.6	73.9	53.9	24.7	15.3	Hori.
3	4880.000	47.9	38.3	3.6	51.5	41.9	73.9	53.9	22.4	12.0	Vert.

Note: All other emissions are under noise floor.

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Operating mode: Tx 2480MHz DH5

[iEmission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.850	48.2	38.3	1.1	49.3	39.4	73.9	53.9	24.6	14.5	Hori.
2	4960.000	47.0	40.3	3.8	50.8	44.1	73.9	53.9	23.1	9.8	Hori.
3	4960.000	48.2	41.7	3.8	52.0	45.5	73.9	53.9	21.9	8.4	Vert.

Note: All other emissions are under noise floor.

Operating mode: Tx 2480MHz 2DH5

[iEmission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.850	47.5	38.5	1.1	48.6	39.6	73.9	53.9	25.3	14.3	Hori.
2	4960.000	46.7	37.4	3.8	50.5	41.2	73.9	53.9	23.4	12.7	Hori.
3	4960.000	48.5	39.4	3.8	52.3	43.2	73.9	53.9	21.6	10.7	Vert.

Note: All other emissions are under noise floor.

Operating mode: Tx 2480MHz 3DH5

[iEmission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.850	47.3	38.6	1.1	48.4	39.7	73.9	53.9	25.5	14.2	Hori.
2	4960.000	47.6	38.0	3.8	51.4	41.8	73.9	53.9	22.5	12.1	Hori.
3	4960.000	49.6	39.9	3.8	53.4	43.7	73.9	53.9	20.5	10.2	Vert.

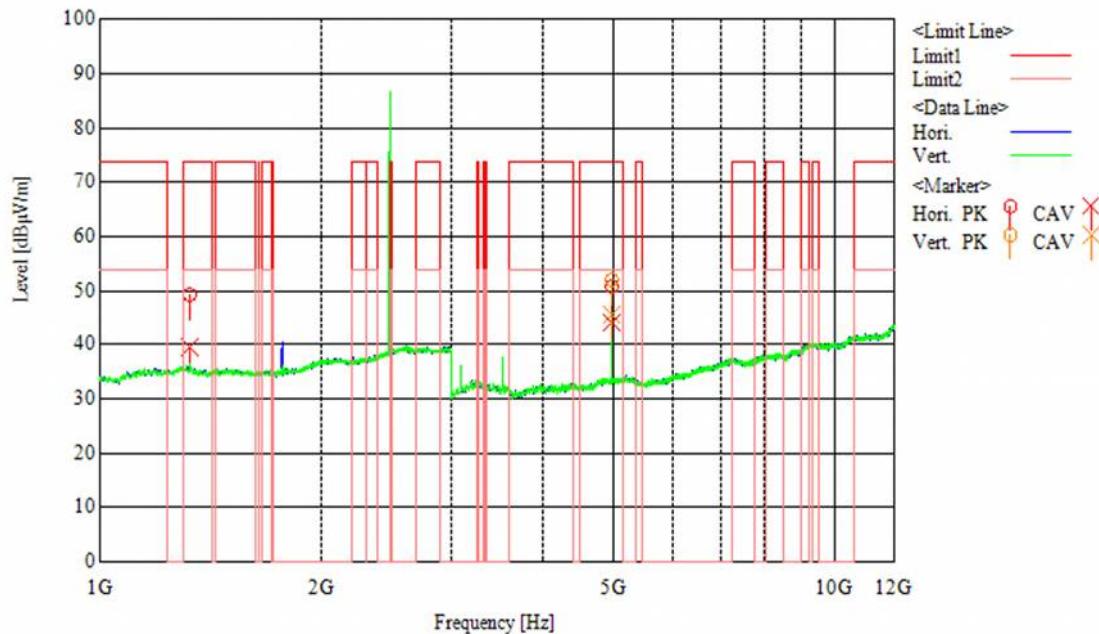
Note: All other emissions are under noise floor.

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[Chart]

TX 2480MHz DH5



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Test Data (above 12GHz)

Tested sample:

I-1

Worst operating mode:

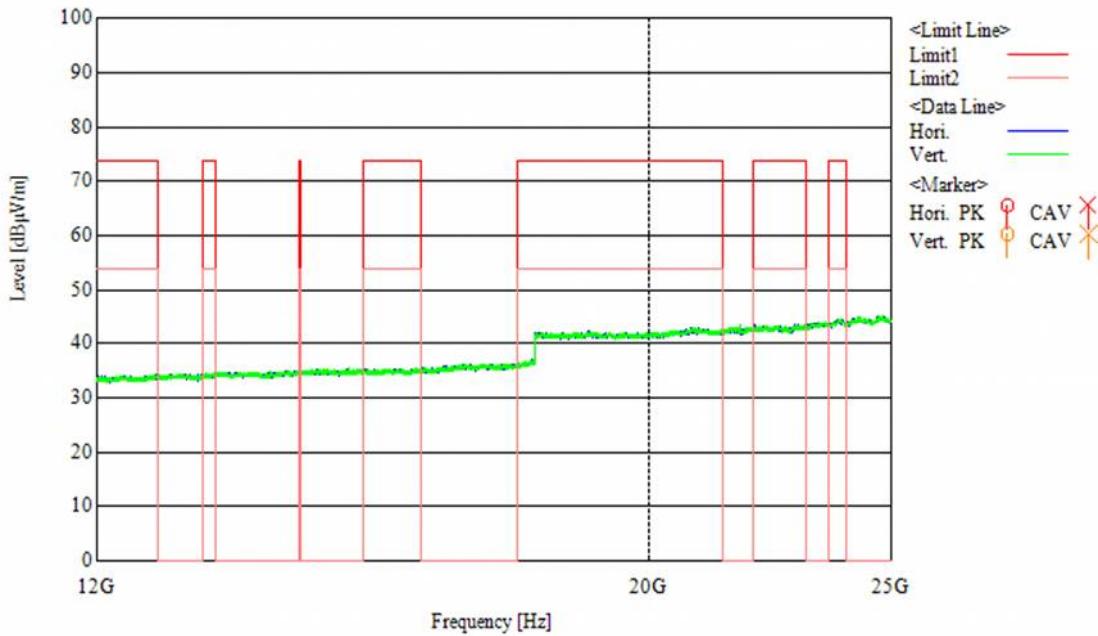
Tx 2440MHz DHS

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Note: All emissions were under noise floor.

[Chart]



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Restricted bandedge measurement

Tested sample: 1-1

Operating mode: Tx 2402MHz DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	2390.000	43.6	30.0	5.3	48.9	35.3	73.9	53.9	25.0	18.6	Hori.

Operating mode: Tx 2402MHz 2DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	2390.000	43.7	30.0	5.3	49.0	35.3	73.9	53.9	24.9	18.6	Hori.

Operating mode: Tx 2402MHz 3DH5

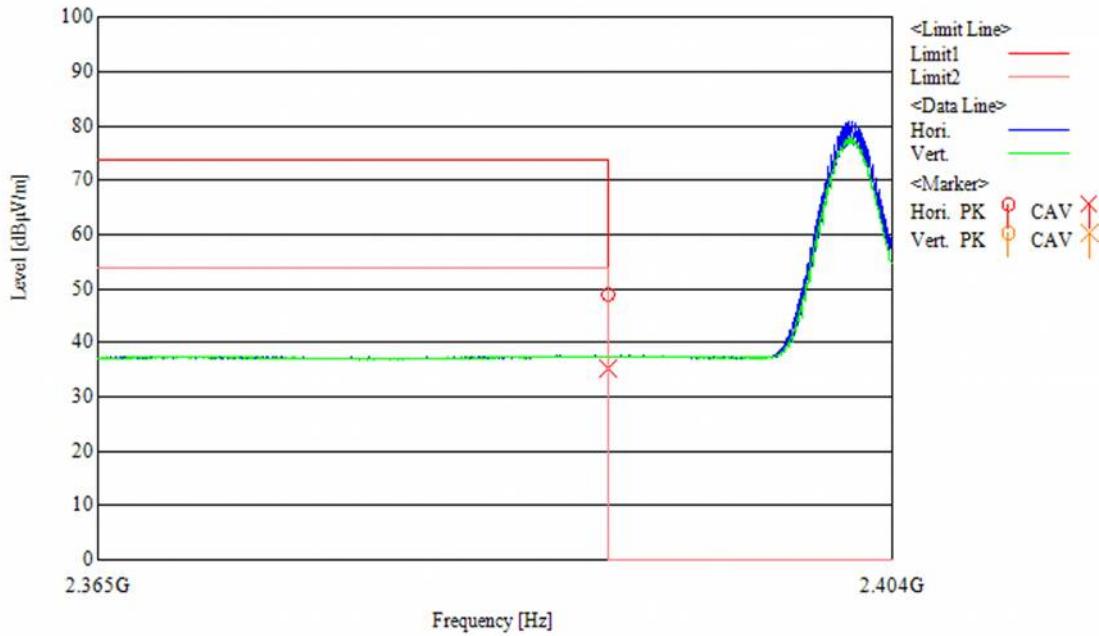
[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	2390.000	43.6	30.0	5.3	48.9	35.3	73.9	53.9	25.0	18.6	Hori.

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[Chart] Tx 2402MHz 2DH5



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Tested sample: 1-1

Operating mode: Tx 2480MHz DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	2483.500	43.4	30.0	6.0	49.4	36.0	73.9	53.9	24.5	17.9	Hori.

Operating mode: Tx 2480MHz 2DH5

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	2483.500	44.2	30.1	6.0	50.2	36.1	73.9	53.9	23.7	17.8	Hori.

Operating mode: Tx 2480MHz 3DH5

[Emission level]

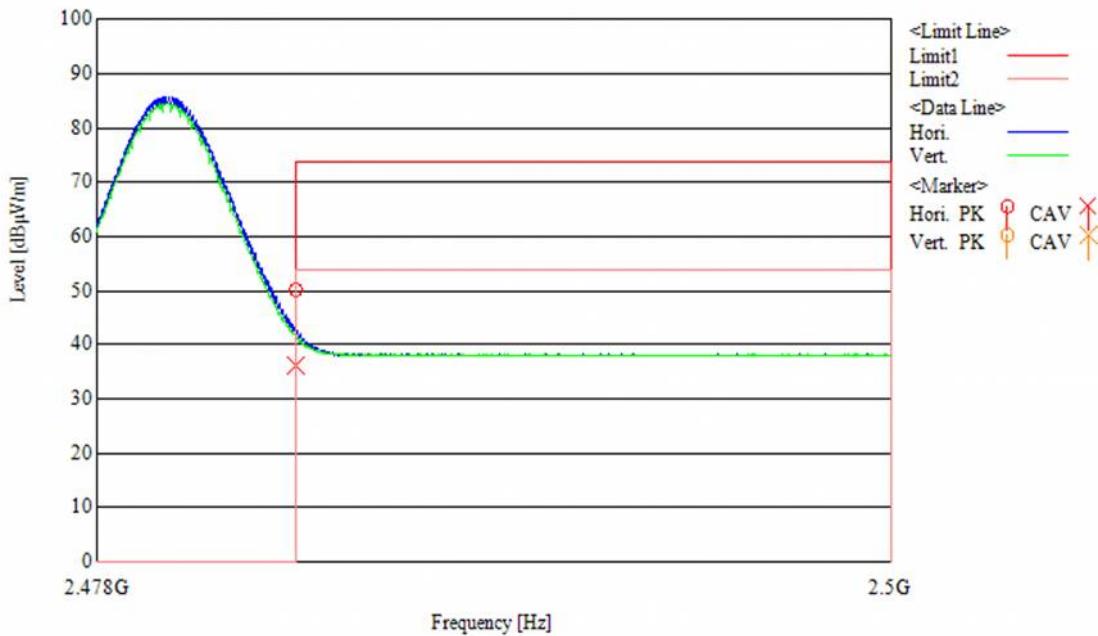
No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	2483.500	43.8	30.1	6.0	49.8	36.1	73.9	53.9	24.1	17.8	Hori.

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[Chart]

Tx 2480MHz 2DH5



[Test Day1]

Tested Date: 09 Sep. 2019 Temperature: 23 degC
Humidity: 53 % Atmos. Press: 1006 hPa

[Test Day2]

Tested Date: 10 Sep. 2019 Temperature: 22 degC
Humidity: 59 % Atmos. Press: 1013 hPa

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2.8 AC power line conducted emissions

Test setup

Test setup was implemented according to the method of ANSI C63.10 clause 6.2 .

Test procedure

Measurement procedures were implemented according to the method of ANSI C63.10 clause 6.2.

Applicable rule and limitation

FCC 15.207

RSS-Gen Sec. 8.8

AC power line conducted emissions limits

Frequency of Emission [MHz]	Conducted emissions Limit [dB μ V]	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency. The lower limit applies at the band edges.

Test equipment used (refer to List of utilized test equipment)



Test software used

EMI Ver. 5.9

Calculation method

The Correction Factor and Result are calculated as followings.

$$\text{Correction Factor [dB]} = \text{ISN Factor [dB]} + \text{Loss [dB]}$$

$$\text{Result [dB}\mu\text{V]} = \text{Reading [dB}\mu\text{V]} + \text{Correction Factor [dB]}$$

Test results - This item was not tested.

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Test Data

Tested sample: -

Operating mode: -

[Emission level]

	Freq. [MHz]	Reading QP [dB μ V]	Reading Ave [dB μ V]	Factor [dB]	Result QP [dB μ V]	Result Ave [dB μ V]	Limit QP [dB μ V]	Limit Ave [dB μ V]	Margin QP [dB]	Margin Ave [dB]	Line

[Chart]

Tested Date: -
Humidity: - %

Temperature: - degC
Atmos. Press: - hPa

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2.9 Radiated emissions (Receiver)

Test setup

Test setup was implemented according to the method of ANSI C63.4 clause 6 “General requirements for EUT equipment arrangements and operation”, clause 8.2 and Annex H.3 “Radiated emission measurements setup”.

Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4 clauses 8.2.

The EUT is place on a non-conducted table which is 0.8 m height from a ground plane and the measurement antenna to EUT distance is 3 meters. The turn table is rotated for 360 degrees to determine the maximum emission level.

The antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

The spectrum analyzer and receiver are set to the followings;

RBW=100 kHz (up to 1000 MHz) or 1 MHz (above 1000 MHz) ,

VBW= 300 kHz (up to 1000 MHz) or 3 MHz (above 1000 MHz)

Final measurement is carried out with a receiver RBW of 120 kHz (up to 1000 MHz), or 1 MHz (above 1000 MHz).

Applicable rule and limitation

RSS-Gen Sec.7.3 Radiated emissions limits

Frequency [MHz]	Field Strength [μ V/m]	Measurement Distance [m]	Field Strength [dB μ V/m]
30 – 88	100	3	40.0
88 – 216	150	3	43.5
216 – 960	200	3	46.0
Above 960	500	3	53.9

In the emission table above, the tighter limit applies at the band edges.

The emission limits shown in the above table are based on measurements employing a QP detector (up to 1000 MHz) or AVE/PEAK detector (above 1000 MHz).

Test results - Complied with requirement

Test equipment used (refer to List of utilized test equipment)

AC01	TR06	CL11	PR12	BA07	CL30	CL38	PR12
DH06							

Test software used

EMI1 Ver. 5.9

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Calculation method

The Correction Factor and Result are calculated as followings.

Correction Factor [dB/m] = Ant. Factor [dB/m] + Loss [dB] – Gain [dB]

Result [dB μ V/m] = Reading [dB μ V] + Correction Factor [dB/m]

Test Data (below 1GHz)

Tested sample: I-1

Operating mode: Rx 2402MHz

[Emission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	441.951	35.3	16.8	10.8	30.2	32.7	46.0	13.3	Hori.
2	883.900	35.0	20.3	13.0	29.4	38.9	46.0	7.1	Hori.
3	221.208	32.1	12.0	9.0	30.2	22.9	46.0	23.1	Vert.
4	236.298	45.5	12.3	9.2	30.2	36.8	46.0	9.2	Vert.
5	273.247	32.6	12.9	9.5	30.2	24.8	46.0	21.2	Vert.
6	883.899	31.9	20.3	13.0	29.4	35.8	46.0	10.2	Vert.
7	943.261	20.9	20.8	13.4	28.8	26.3	46.0	19.7	Vert.

Operating mode: Rx 2440MHz

[Emission level]

No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	236.304	43.3	12.3	9.2	30.2	34.6	46.0	11.4	Hori.
2	441.948	35.5	16.8	10.8	30.2	32.9	46.0	13.1	Hori.
3	883.899	35.0	20.3	13.0	29.4	38.9	46.0	7.1	Hori.
4	199.345	34.7	11.5	8.8	30.2	24.8	43.5	18.7	Vert.
5	228.920	39.1	12.1	9.1	30.2	30.1	46.0	15.9	Vert.
6	236.298	46.6	12.3	9.2	30.2	37.9	46.0	8.1	Vert.
7	239.984	38.4	12.3	9.2	30.2	29.7	46.0	16.3	Vert.
8	883.900	31.9	20.3	13.0	29.4	35.8	46.0	10.2	Vert.

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Operating mode: Rx 2480MHz

[Emission level]

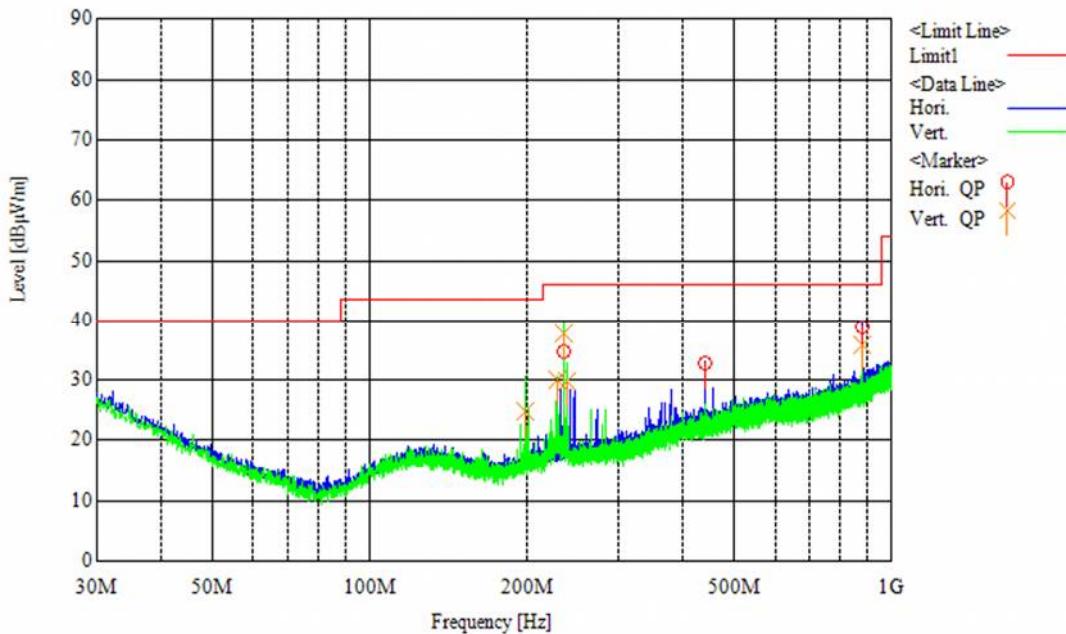
No.	Frequency [MHz]	Reading [dB μ V]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Ant.
1	225.223	37.6	12.1	9.1	30.2	28.6	46.0	17.4	Hori.
2	236.298	45.7	12.3	9.2	30.2	37.0	46.0	9.0	Hori.
3	239.998	40.5	12.3	9.2	30.2	31.8	46.0	14.2	Hori.
4	247.377	41.9	12.5	9.3	30.2	33.5	46.0	12.5	Hori.
5	391.365	31.3	16.1	10.4	30.2	27.6	46.0	18.4	Hori.
6	441.949	35.4	16.8	10.8	30.2	32.8	46.0	13.2	Hori.
7	883.900	34.8	20.3	13.0	29.4	38.7	46.0	7.3	Hori.
8	239.999	43.6	12.3	9.2	30.2	34.9	46.0	11.1	Vert.
9	883.899	31.8	20.3	13.0	29.4	35.7	46.0	10.3	Vert.

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[Chart]

Rx 2440MHz



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Test Data (Above 1000MHz)

Tested sample: 1-1

Operating mode: Rx 2402MHz

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.850	51.5	47.2	-8.8	42.7	38.4	73.9	53.9	31.2	15.5	Hori.
2	1771.400	52.2	48.6	-8.2	44.0	40.4	73.9	53.9	29.9	13.5	Hori.
3	2209.750	46.6	38.1	-5.7	40.9	32.4	73.9	53.9	33.0	21.5	Hori.
4	3099.950	47.9	39.6	-1.8	46.1	37.8	73.9	53.9	27.8	16.1	Vert.
5	3535.600	49.4	40.3	-1.1	48.3	39.2	73.9	53.9	25.6	14.7	Vert.

Operating mode: Rx 2440MHz

[Emission level]

No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.851	51.9	47.5	-8.8	43.1	38.7	73.9	53.9	30.8	15.2	Hori.
2	1771.400	52.2	48.5	-8.2	44.0	40.3	73.9	53.9	29.9	13.6	Hori.
3	2209.750	46.6	38.1	-5.7	40.9	32.4	73.9	53.9	33.0	21.5	Hori.
4	3099.950	48.0	39.6	-1.8	46.2	37.8	73.9	53.9	27.7	16.1	Vert.
5	3535.600	49.0	40.3	-1.1	47.9	39.2	73.9	53.9	26.0	14.7	Vert.

Operating mode: Rx 2480MHz

[Emission level]

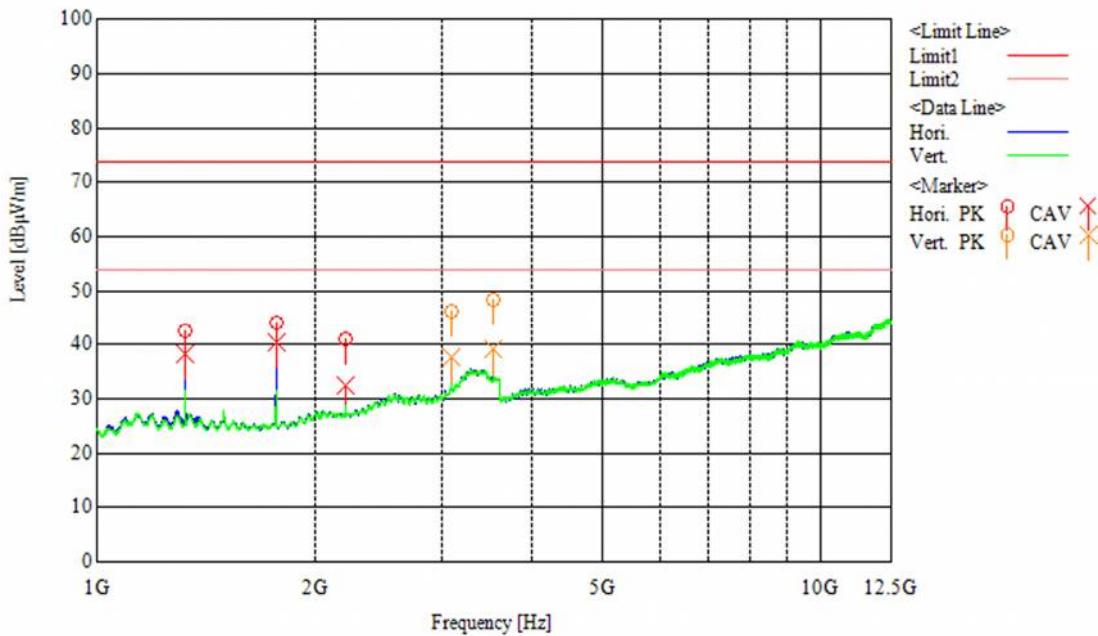
No.	Frequency [MHz]	Reading PK [dB μ V]	Reading Ave [dB μ V]	C.Factor [dB]	Result PK [dB μ V/m]	Result Ave [dB μ V/m]	Limit PK [dB μ V/m]	Limit Ave [dB μ V/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	1325.849	52.3	47.5	-8.8	43.5	38.7	73.9	53.9	30.4	15.2	Hori.
2	1771.400	52.1	48.4	-8.2	43.9	40.2	73.9	53.9	30.0	13.7	Hori.
3	2209.750	47.0	38.0	-5.7	41.3	32.3	73.9	53.9	32.6	21.6	Hori.
4	3099.950	48.4	39.7	-1.8	46.6	37.9	73.9	53.9	27.3	16.0	Vert.
5	3535.600	49.6	40.3	-1.1	48.5	39.2	73.9	53.9	25.4	14.7	Vert.

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[Chart]

Rx 2402MHz



[Test Day1]

Tested Date: 09 Sep. 2019 Temperature: 23 degC
Humidity: 53 % Atmos. Press: 1009 hPa

[Test Day2]

Tested Date: 10 Sep. 2019 Temperature: 22 degC
Humidity: 59 % Atmos. Press: 1013 hPa

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2.10 AC power line conducted emissions (Receiver)

Test setup

Test setup was implemented according to the method of ANSI C63.4 clause 6 “General requirements for EUT equipment arrangements and operation” and Annex H.1 “AC power line conducted emission measurements setup”.

Test procedure

Measurement procedures were implemented according to the method of ANSI C63.4 clauses 7, clause 13.1.3 and Annex H.2 “AC power line conducted emission measurements”.

Exploratory measurements were used the spectrum analyzer to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement.

Final ac power line conducted emission measurements were performed based on the exploratory tests.

The EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit are selected for the final measurement.

When the measurement value is grater than average limitation the average detection measurements were performed.

Applicable rule and limitation

RSS-Gen Sec.7.3 AC power line conducted emissions limits

Frequency of Emission [MHz]	Conducted emissions Limit [dB μ V]	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency. The lower limit applies at the band edges.

Test equipment used (refer to List of utilized test equipment)



Test software used

EMI Ver. 5.9

Calculation method

The Correction Factor and Result are calculated as followings.

$$\begin{aligned} \text{Correction Factor [dB]} &= \text{ISN Factor [dB]} + \text{Loss [dB]} \\ \text{Result [dB}\mu\text{V]} &= \text{Reading [dB}\mu\text{V]} + \text{Correction Factor [dB]} \end{aligned}$$

Test results - This item was not tested.

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Test Data

Tested sample: -

Operating mode: -

[Emission level]

	Freq. [MHz]	Reading QP [dB μ V]	Reading Ave [dB μ V]	Factor [dB]	Result QP [dB μ V]	Result Ave [dB μ V]	Limit QP [dB μ V]	Limit Ave [dB μ V]	Margin QP [dB]	Margin Ave [dB]	Line
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

[Chart]

Tested Date: -
Humidity: - %

Temperature: - degC
Atmos. Press: - hPa

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4 List of utilized test equipment / calibration

ID No.	Kind of Equipment	Manufacturer	Model No.	Serial Number	Cal. Date	Cal. until
AC01(EM)	Anechoic Chamber (1st test room)	JSE	203397C	-	2019/4/20	2020/4/30
AC01(EG)	Anechoic Chamber (1st test room)	JSE	203397C	-	2019/3/30	2020/3/31
BA07	Biological Antenna	TESEQ	CBL6143A	26670	2018/12/7	2019/12/31
CH01	Conical Horn Antenna (12-18GHz)	ETS-Lindgren	3163-05	00126641	2019/3/4	2021/3/31
CL11	RF Cable for RE	RFT	-	-	2019/3/19	2020/3/31
CL30	RF Cable 5 m	SUHNER	SUCOFLEX104PE	MY3599	2019/1/23	2020/1/31
CL31	RF Cable 1 m	Junkosha	MWX221	1303S118	2019/1/23	2020/1/31
CL38	RF Cable 2 m	Junkosha	MWX221	1603S626	2019/1/23	2020/1/31
DH06	DRG Horn Antenna	A.H. Systems	SAS-571	1339	2018/6/19	2020/6/30
HPF4	High Pass Filter (3000MHz)	Tokyo KEIKI	TF23LCCZGA	9001	2018/12/4	2019/12/31
LP06	Loop Antenna	ETS-Lindgren	6502	00164299	2019/4/13	2020/4/30
LPF1	Low Pass Filter (1000MHz)	M-City	LPF1000-04	RF0012-01	2019/3/20	2020/3/31
PR12	Pre. Amplifier (1-26G)	Agilent Technologies	8449B	3008A02513	2019/1/23	2020/1/31
PR21	Pre. Amplifier	Anritsu	MH648A	6200467119	2018/12/4	2019/12/31
SH01	Standard Horn Antenna (18-26G)	A.H. Systems	SAS-572	208	2018/7/12	2020/7/31
TR06	Test Receiver (F/W : 4.73 SP4)	Rohde & Schwarz	ESU26	100002	2018/10/11	2019/10/31
AT33	Attenuator 10dB 26GHz	INMET	26A-10	-	2019/7/17	2020/7/31

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

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