

TEST REPORT

For

Bluetooth Low Energy Wireless Module

In conformity with

FCC Part 15C / RSS-247 Issue 2

Model Name: MK71351
FCC ID: 2ACIJ71351
ISED Cert No.: 20971-71351
Report No.: WE180926BC1-11
Issue Date: 15 Jan. 2019

Prepared for

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Prepared by

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History

Report No.	Date	Revisions	Issued By
WE180926BC1-11	15 Jan. 2019	Initial Issue	T.Kato

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1 General information

1.1 Product description

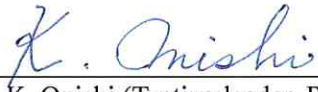
Test item	: Bluetooth Low Energy Wireless Module
Manufacturer	: LAPIS Semiconductor Co., Ltd.
Address	: 2-4-8 Shinyokohama, Kouhoku-ku, Yokohama 222-8575 Japan
Model	: MK71351
FCC ID	: 2ACIJ71351
ISED No.	: 20971-71351
Serial number	: MK71351-024 (for radiated test) MK71351-017 (for conducted test)
Hardware version	: BLE-4.2.0.0-001
Software version	: BLE-4.2.0.0-001
Operating frequency	: 2402 - 2480 MHz
Modulation	: GFSK (Bluetooth LE)
Antenna Gain	: -0.8 dBi
Receipt date of EUT	: 08 Jan. 2019
Nominal power source voltages	: DC 3.0 V

1.2 Test(s) performed/ Summary of test result

Test specification(s)	: FCC CFR 47 Part 15 Subpart C RSS-247 Issue 2
Test method(s)	: ANSI C63.10: 2013
Test(s) started	: 08 Jan. 2019
Test(s) completed	: 11 Jan. 2019
Summary of test result	: <u>Complied</u>

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 is 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 facility number is as follows;

Test site No. 1 (Semi-Anechoic chamber 3m): 6974A-1

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 Federal 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 (99 %)	2.1049	6.7 (RSS-Gen)	Complied	2.1
6 dB Bandwidth	15.247 (a) (2)	5.2 (a)	Complied	2.2
Conducted Output Power	15.247 (b) (3)	5.4 (d)	Complied	2.3
Conducted Spurious Emission	15.247 (d)	5.5	Complied	2.4
Power Spectral Density	15.247 (e)	5.2 (b)	Complied	2.5
Radiated Emissions	15.247(d) 15.205 (a)	8.10 (RSS-Gen)	Complied	2.6
AC power line conducted emissions	15.207	8.8 (RSS-Gen)	Complied	2.7
Radiated Emissions (Receiver)	-	7.3 (RSS-Gen)	Complied	2.8
AC power line conducted emissions (Receiver)	-	7.2 (RSS-Gen)	Complied	2.9

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.
A1	Bluetooth Low Energy Wireless Module (for Radiated test)	LAPIS	MK71351	MK71351-024
A2	Bluetooth Low Energy Wireless Module (for Conducted test)	LAPIS	MK71351	MK71351-017

Support Equipment(s)

No.	Item	Manufacture	Model No.	Serial No.
B	AC adapter	GO FORWARD ENTERPRISE CORP.	NP12-US0320	-
-	-	-	-	-

Connected cable(s)

No.	Item	Identification (Manu.etc.)	Cable Shielded	Ferrite Core	Length [m]
1	DC cable	-	No	No	0.1
2	DC cable	-	No	No	0.8

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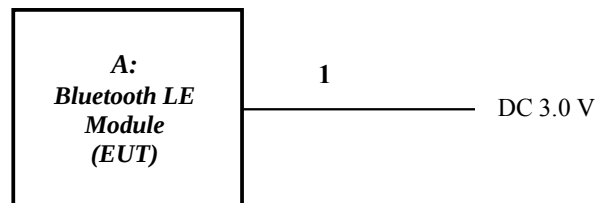
1.6.2 Operating condition:

- Tx (2402MHz): The EUT is in normal transmission mode at 2402MHz
- Tx (2440MHz): The EUT is in normal transmission mode at 2440MHz
- Tx (2480MHz): The EUT is in normal transmission mode at 2480MHz

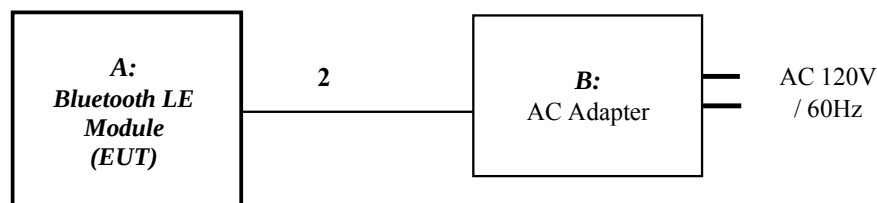
- Rx (2402MHz): The EUT is in normal receiving mode at 2402MHz
- Rx (2440MHz): The EUT is in normal receiving mode at 2440MHz
- Rx (2480MHz): The EUT is in normal receiving mode at 2480MHz

1.6.3 Setup diagram of tested system

[Configuration 1]



[Configuration 2]



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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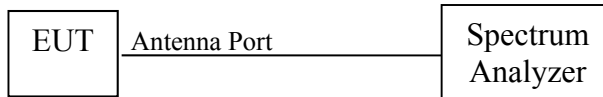
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2 Test procedure and test data

2.1 Occupied Bandwidth (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

- 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	-
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Test results

Tested sample: A2

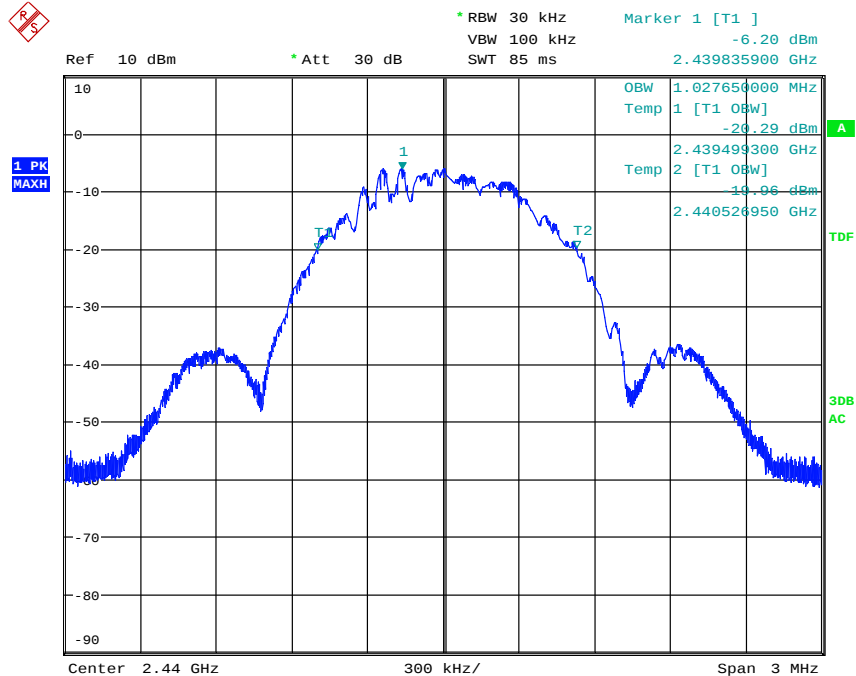
Configuration: 1

Transmission Frequency [MHz]	Occupied Bandwidth [MHz]
2402	1.028
2440	1.028
2480	1.022

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[Chart]



Tested Date: 11 Jan. 2019
Humidity: 53 %

Temperature: 20 degC
Atmos. Press: 1019 hPa

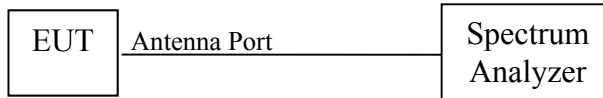
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2.2 6dB Bandwidth

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 11.8

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

Applicable rule and limitation

FCC 15.247 (a) (2)
RSS-247 Sec. 5.2(a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

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: A2

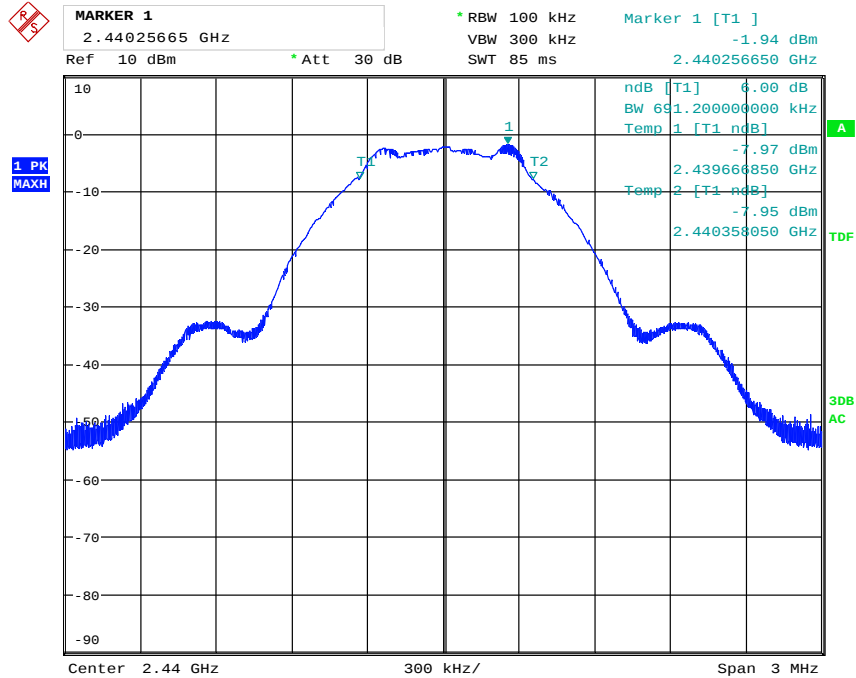
Configuration: 1

Transmission Frequency [MHz]	6 dB Bandwidth [kHz]
2402	696.8
2440	691.2
2480	689.3

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[Chart]



Tested Date: 11 Jan. 2019
Humidity: 53 %

Temperature: 20 degC
Atmos. Press: 1019 hPa

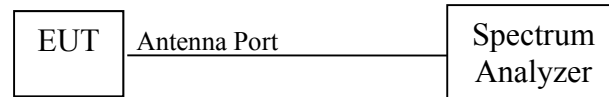
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2.3 Peak Output Power

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 11.9

- RBW > 6dB BW
- Span > 3 x RBW
- Trace : Max hold
- VBW > 3 x RBW
- Detector : Peak

Applicable rule and limitation

FCC 15.247(b) (3)
RSS-247 Sec. 5.4(d)

Output power shall be less than 1 Watt (30 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: A2

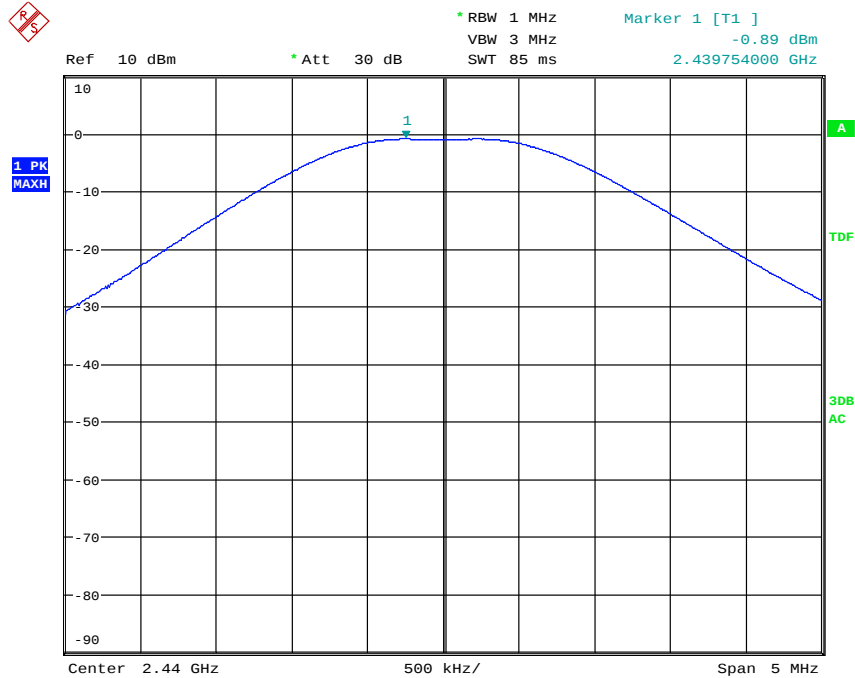
Configuration: 1

Transmission Frequency [MHz]	Output Power [dBm]
2402	-0.7
2440	-0.9
2480	-0.9

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[Chart]



Tested Date: 11 Jan. 2019
Humidity: 53 %

Temperature: 20 degC
Atmos. Press: 1019 hPa

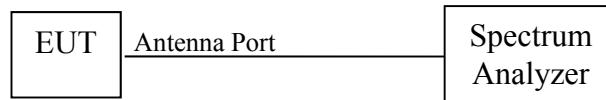
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2.4 Conducted Spurious Emissions

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	
------	------	--

Test results - Complied with requirement

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Test Data

Tested sample: A2
Configuration: 1

Operating mode: Tx 2402 MHz

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

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

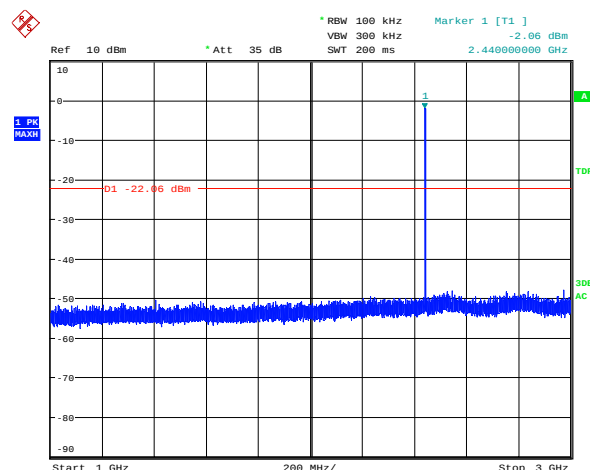
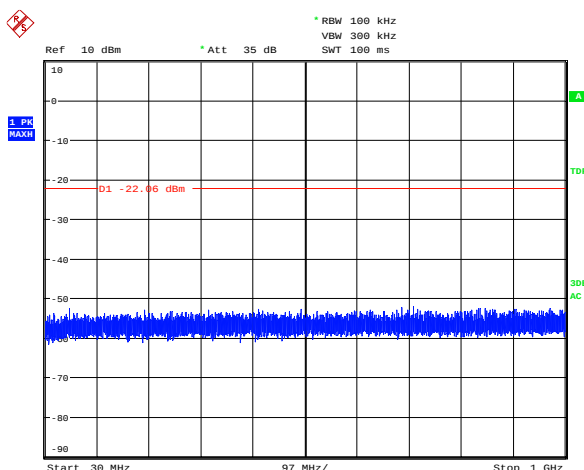
Note: All emissions have more than 20 dB margin.

Operating mode: Tx 2480 MHz

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

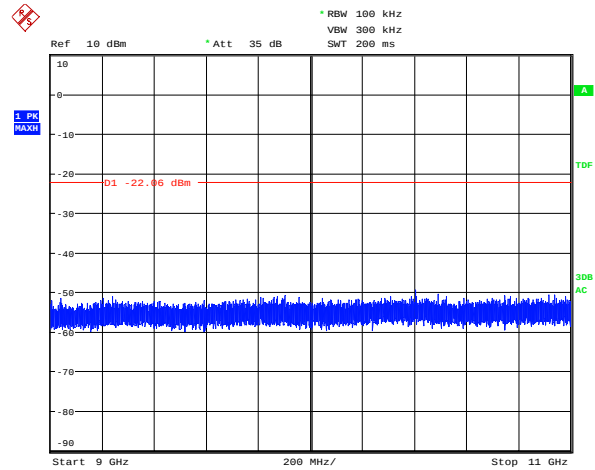
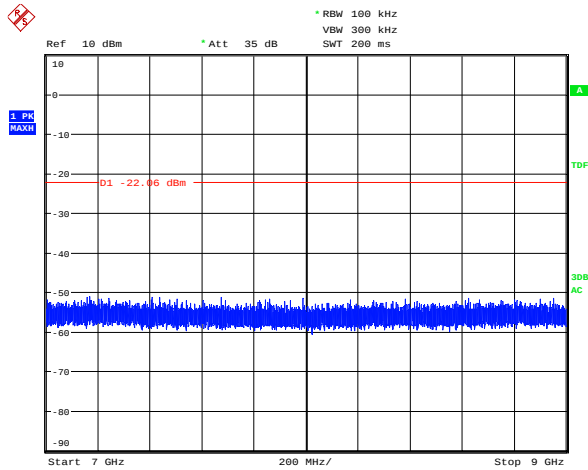
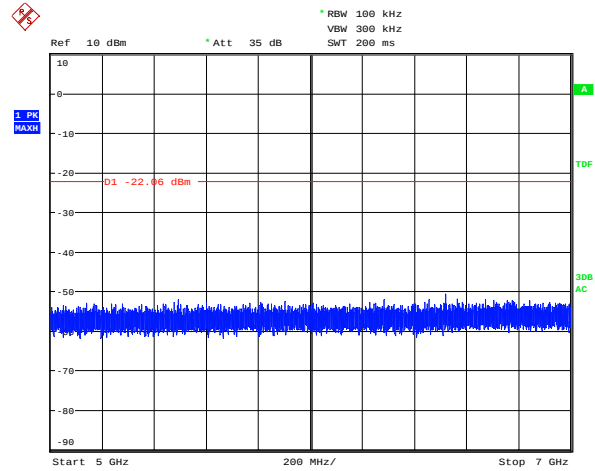
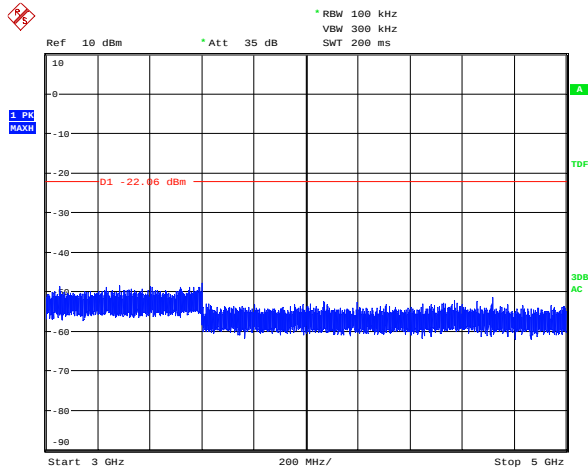
Note: All emissions have more than 20 dB margin.

[Chart]



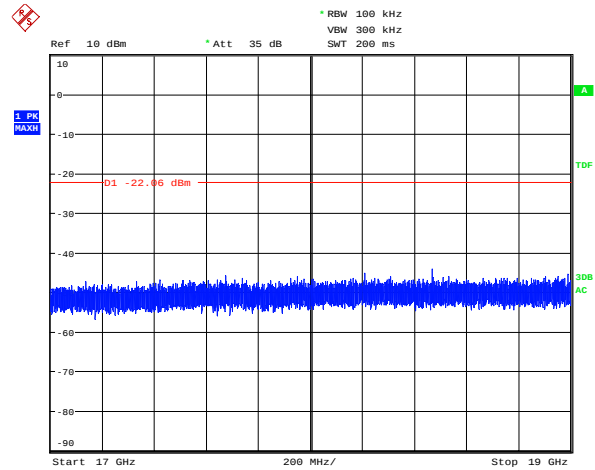
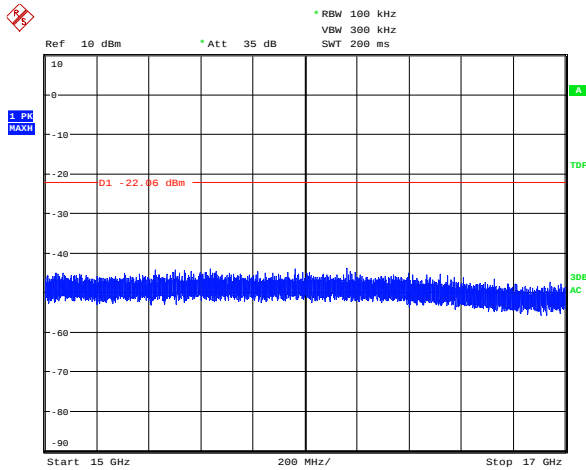
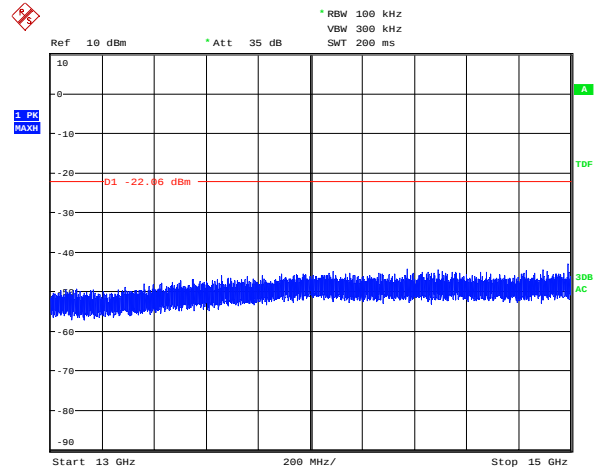
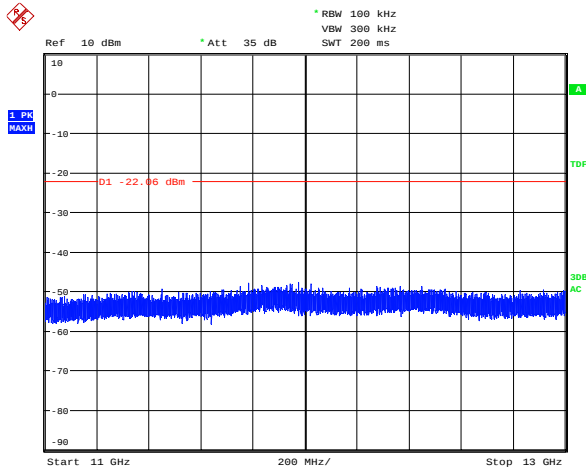
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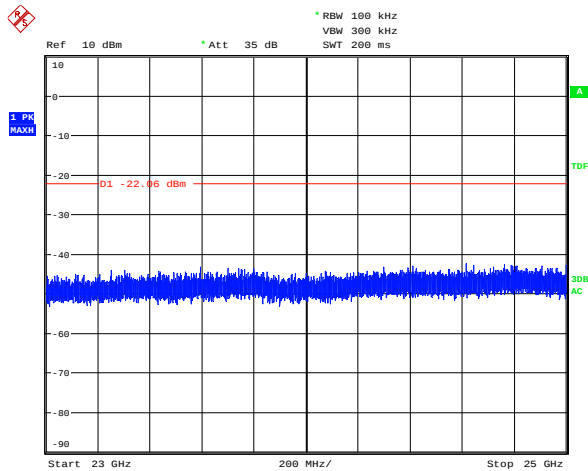
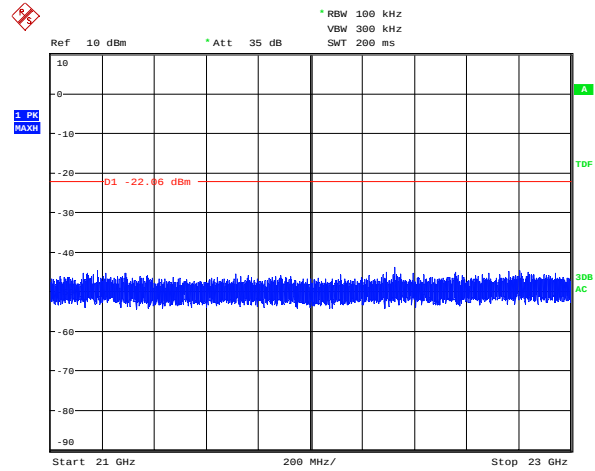
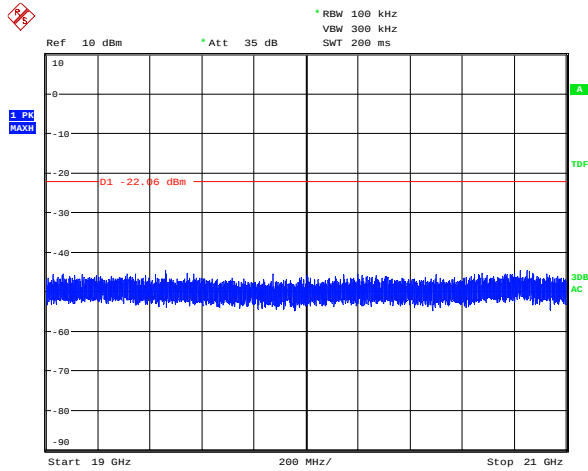
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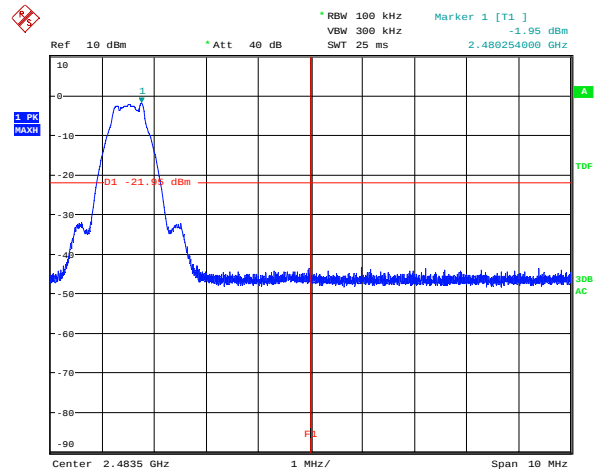
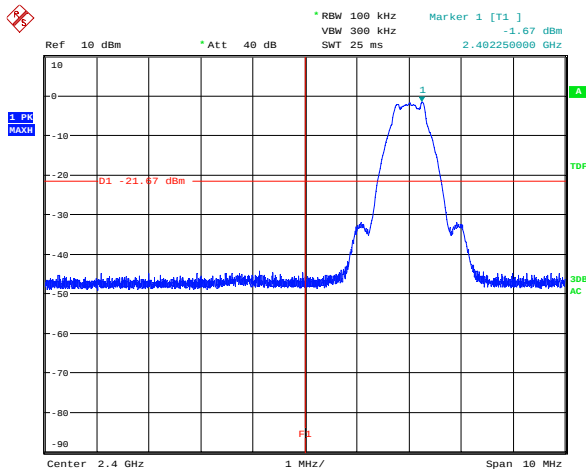
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[Band edge]



Tested Date: 11 Jan. 2019
Humidity: 53 %

Temperature: 20 degC
Atmos. Press: 1019 hPa

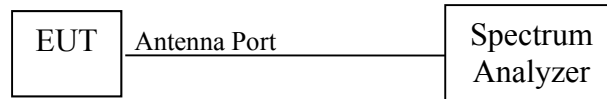
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2.5 Power Spectral density

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 11.10

- RBW : 3 kHz
- Span > 1.5 x 6dB BW
- Trace : Max hold
- VBW : 10 kHz
- Detector : Peak

Limitation

FCC 15.247(e)
RSS-247 Sec. 5.2(b)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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: A2

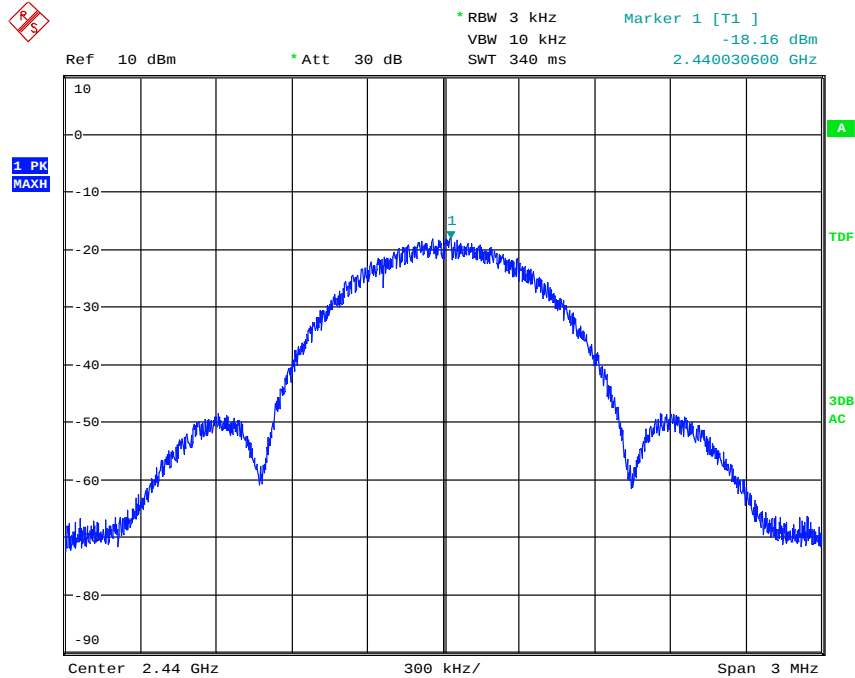
Configuration: 1

Transmission Frequency [MHz]	Spectral Density [dBm]
2402	-17.6
2440	-18.1
2480	-18.0

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[Chart]



Tested Date: 11 Jan. 2019
Humidity: 53 %

Temperature: 20 degC
Atmos. Press: 1019 hPa

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2.6 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 [$\mu\text{V/m}$]	Measurement Distance [m]	Field Strength [$\text{dB}\mu\text{V/m}$]
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		

Test software used

EMI1 Ver. 5.9

Calculation method

The Correction Factor and Result are calculated as followings.

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

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

Test Data (below 1GHz)

Tested sample: A1
Configuration: 1
Worst operating mode: Tx (2440MHz)

[Emission level] Z-plane (Worst)

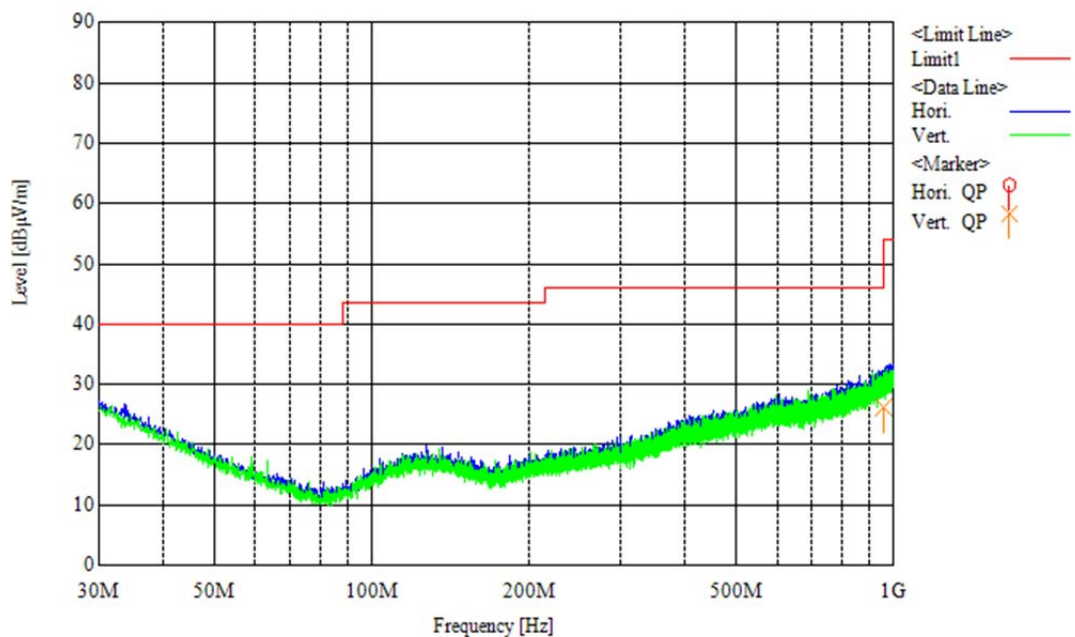
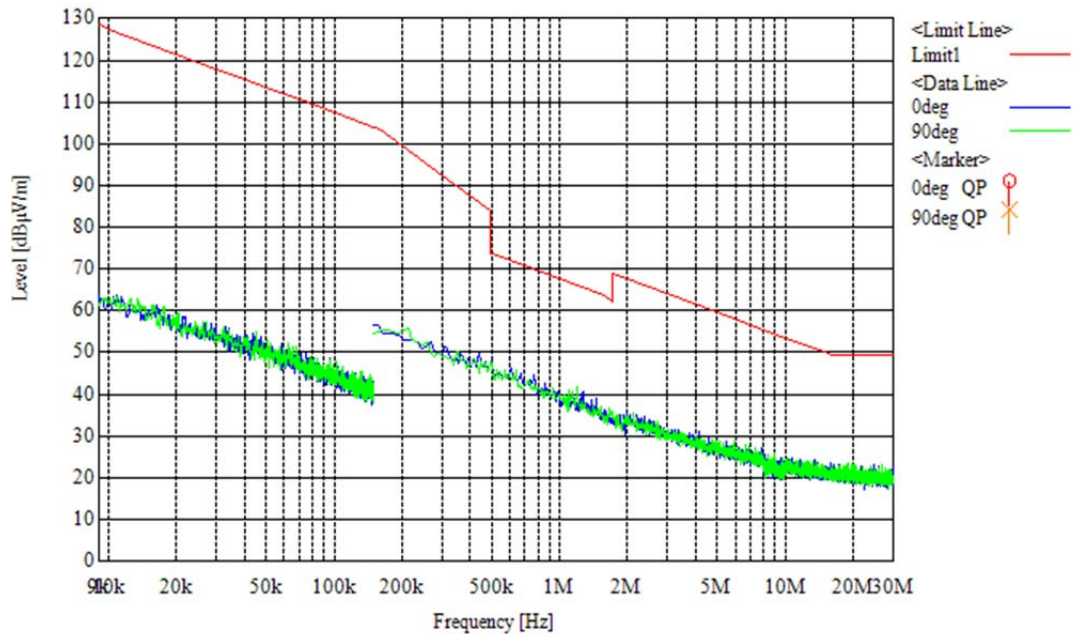
No.	Frequency [MHz]	Reading [$\text{dB}\mu\text{V}$]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [$\text{dB}\mu\text{V/m}$]	Limit [$\text{dB}\mu\text{V/m}$]	Margin [dB]	Ant.
1	960.000	20.5	20.9	13.5	28.6	26.3	46.0	19.7	Vert.

Note: All other emissions were under noise floor.

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[Chart]



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Test Data (Above 1000MHz)

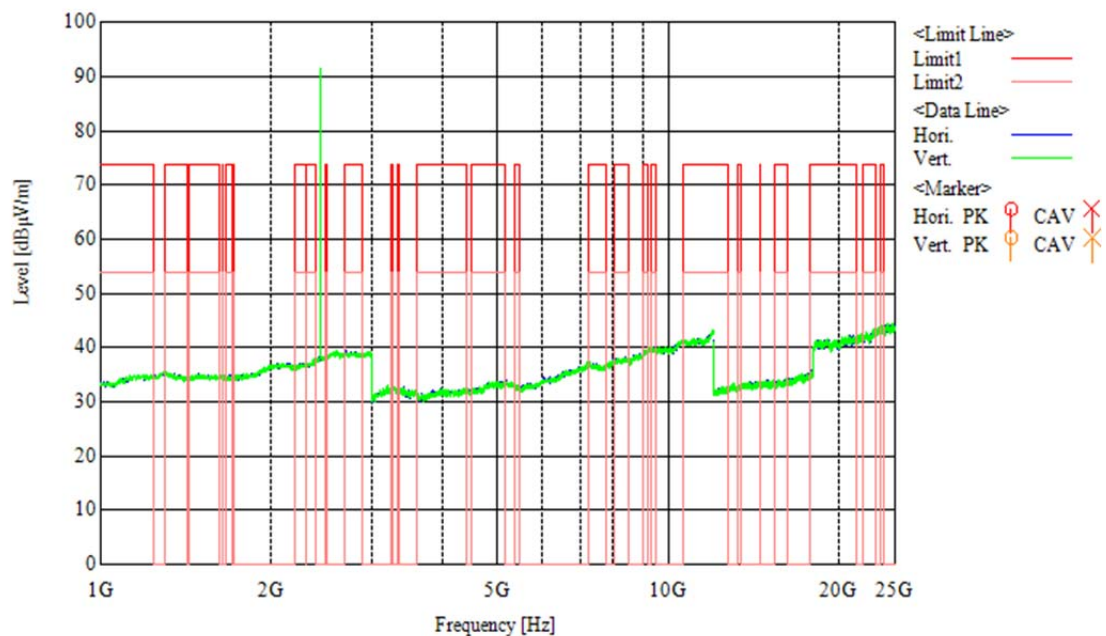
Tested sample: A1
Configuration: 1
Worst operating mode: Tx (2440MHz)

[Emission level] Z-plane (Worst)

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

Note: All emissions are under noise floor.

[Chart]



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Restricted bandedge measurement

Tested sample: A1

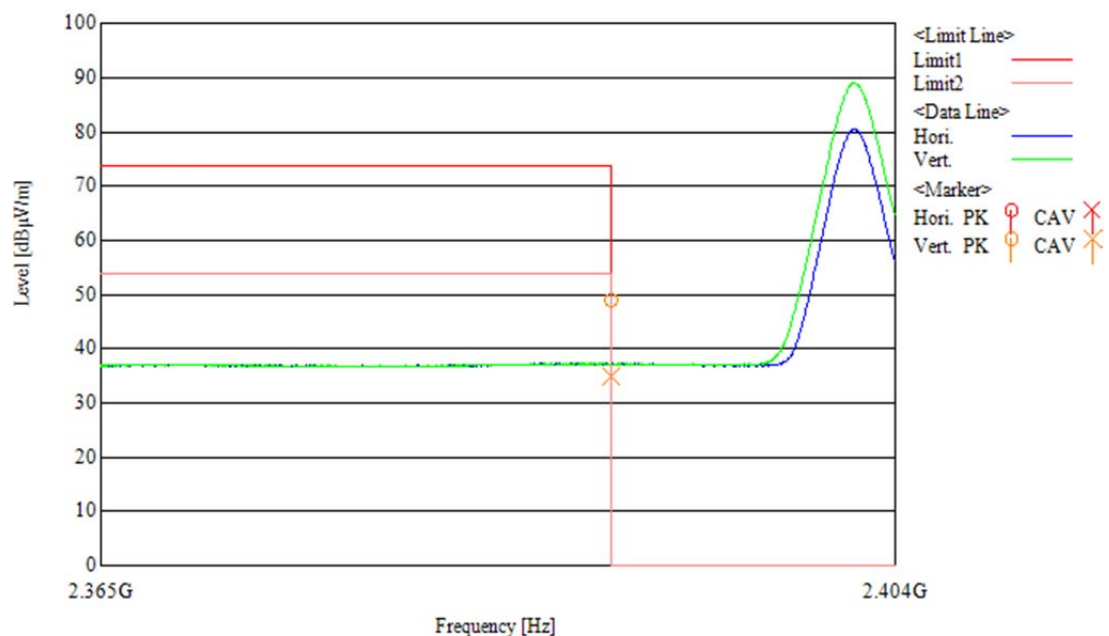
Configuration: 1

Operating mode: Tx (2402MHz)

[Emission level] Z-plane (Worst)

No.	Frequency [MHz]	Reading PK [dBμV]	Reading Ave [dBμV]	C.Factor [dB]	Result PK [dBμV/m]	Result Ave [dBμV/m]	Limit PK [dBμV/m]	Limit Ave [dBμV/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	2390.000	44.0	29.9	5.0	49.0	34.9	73.9	53.9	24.9	19.0	Vert.
-	-	-	-	-	-	-	-	-	-	-	-

[Chart (Bandedge_Low Z-plane)]



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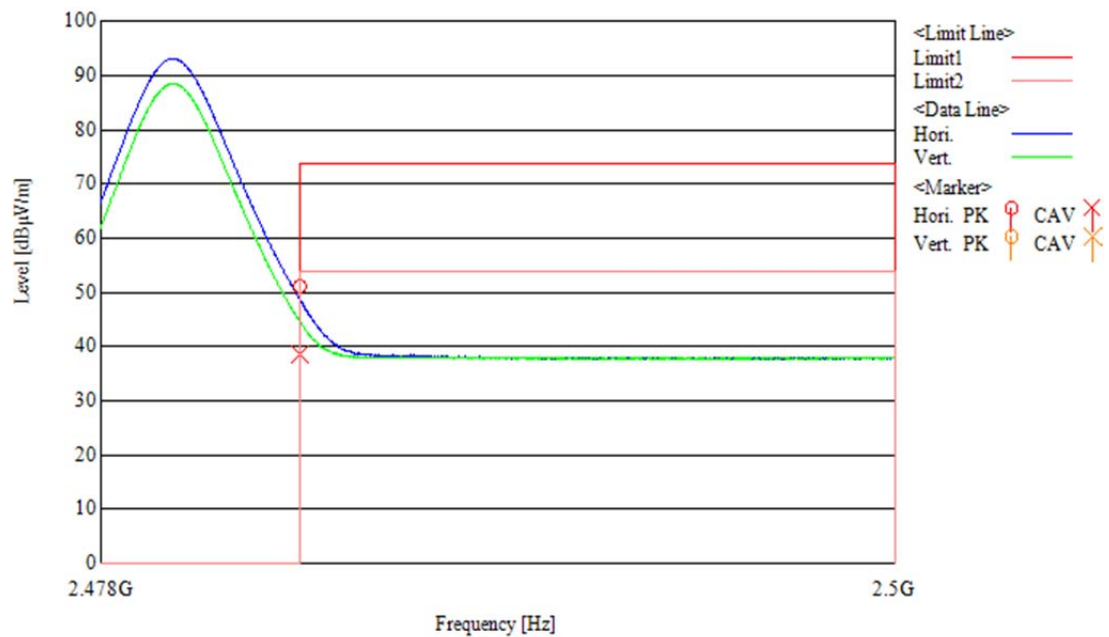
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Tested sample: A1
Configuration: 1
Operating mode: Tx (2480MHz)

[Emission level] X-plane (Worst)

No.	Frequency [MHz]	Reading PK [dBμV]	Reading Ave [dBμV]	C.Factor [dB]	Result PK [dBμV/m]	Result Ave [dBμV/m]	Limit PK [dBμV/m]	Limit Ave [dBμV/m]	Margin PK [dB]	Margin Ave [dB]	Ant.
1	2483.500	45.4	33.0	5.7	51.1	38.7	73.9	53.9	22.8	15.2	Hori.
-	-	-	-	-	-	-	-	-	-	-	-

[Chart (Bandedge_High X-plane)]



[Test Day1]

Tested Date: 08 Jan. 2019 Temperature: 16 degC
Humidity: 31 % Atmos. Press: 1020 hPa

[Test Day2]

Tested Date: 09 Jan. 2019 Temperature: 15 degC
Humidity: 33 % Atmos. Press: 1020 hPa

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2.7 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 [dBμV]	
	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)

TR06	CL18	LN05
------	------	------

Test software used

EMI Ver. 5.9

Calculation method

The Correction Factor and Result are calculated as followings.

Correction Factor [dB] = ISN Factor [dB] + Loss [dB]

Result [dBμV] = Reading [dBμV] + Correction Factor [dB]

Test results - Complied with requirement

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Test Data

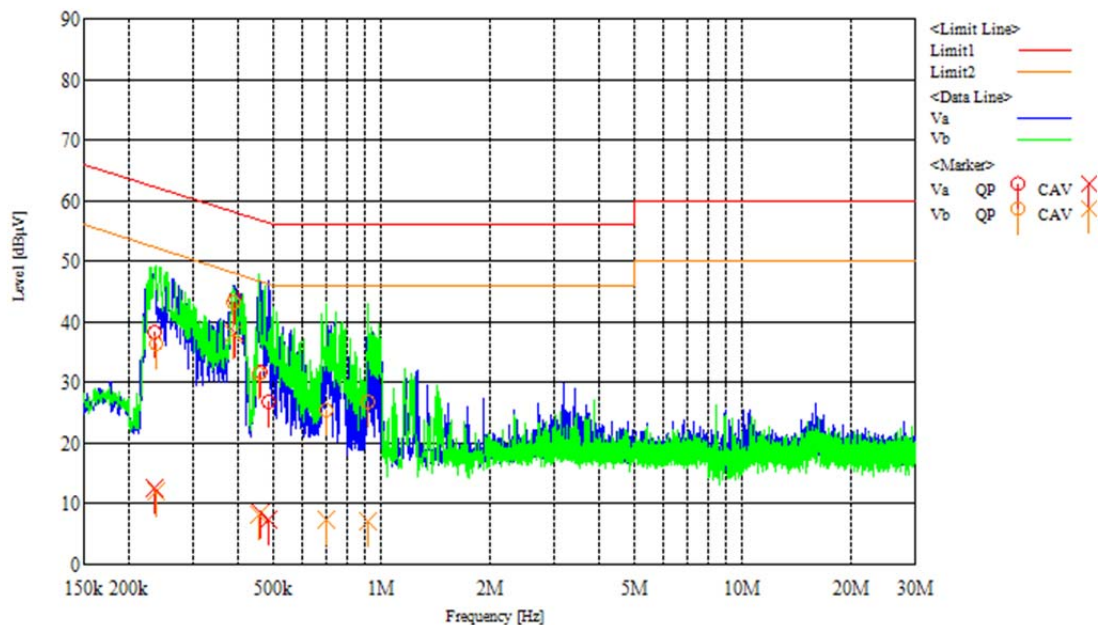
Tested sample: A1
Configuration: 2
Operating mode: Tx 2440 MHz (Worst)

[Emission level]

	Freq. [MHz]	Reading QP [dBμV]	Reading Ave [dBμV]	Factor [dB]	Result QP [dBμV]	Result Ave [dBμV]	Limit QP [dBμV]	Limit Ave [dBμV]	Margin QP [dB]	Margin Ave [dB]	Line
1	0.23515	28.2	2.5	10.1	38.3	12.6	62.3	52.3	24.0	39.7	Va
2	0.39033	33.7	28.2	10.1	43.8	38.3	58.1	48.1	14.3	9.8	Va
3	0.46291	21.7	-1.6	10.1	31.8	8.5	56.6	46.6	24.8	38.1	Va
4	0.48806	16.8	-2.6	10.1	26.9	7.5	56.2	46.2	29.3	38.7	Va
5	0.23702	26.4	1.9	10.1	36.5	12.0	62.2	52.2	25.7	40.2	Vb
6	0.38829	33.3	28.0	10.1	43.4	38.1	58.1	48.1	14.7	10.0	Vb
7	0.45849	21.3	-1.8	10.1	31.4	8.3	56.7	46.7	25.3	38.4	Vb
8	0.70086	15.4	-2.6	10.1	25.5	7.5	56.0	46.0	30.5	38.5	Vb
9	0.91383	16.7	-2.9	10.1	26.8	7.2	56.0	46.0	29.2	38.8	Vb

[Chart]

Operating mode: Tx (2440 MHz)



Tested Date: 11 Jan. 2019
Humidity: 53 %

Temperature: 20 degC
Atmos. Press: 1019 hPa

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2.8 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 placed 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.

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

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

Test Data (below 1GHz)

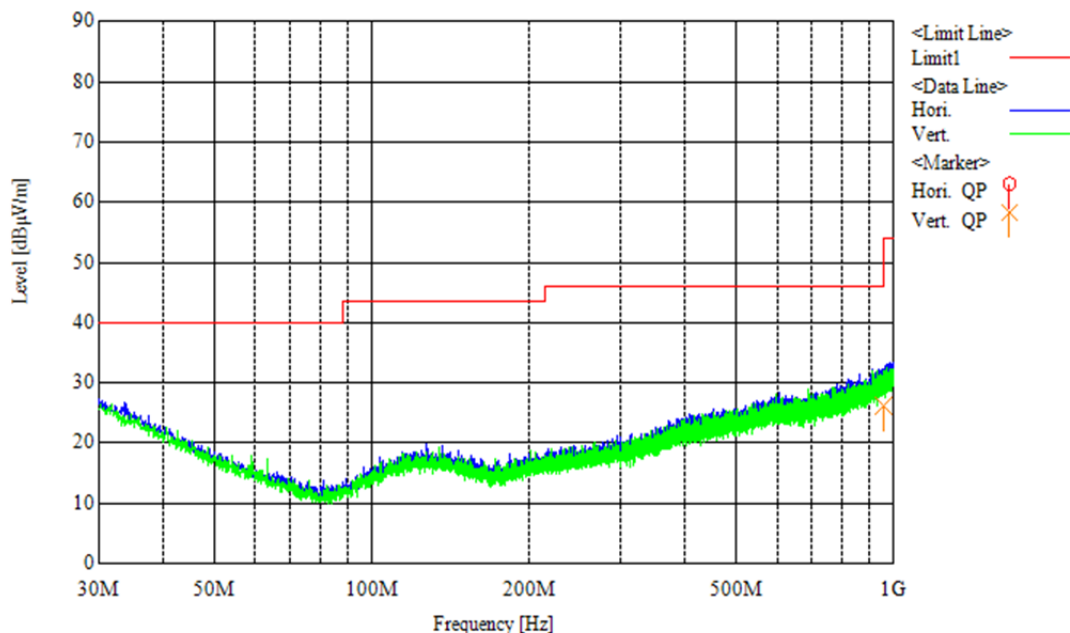
Tested sample: A1
Configuration: 1
Worst operating mode: Rx (2440MHz)

[Emission level] Z-plane (Worst)

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	960.000	20.6	20.9	12.8	28.6	25.7	46.0	20.3	Vert.

Note: All other emissions were under noise floor.

[Chart]



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Test Data (Above 1000MHz)

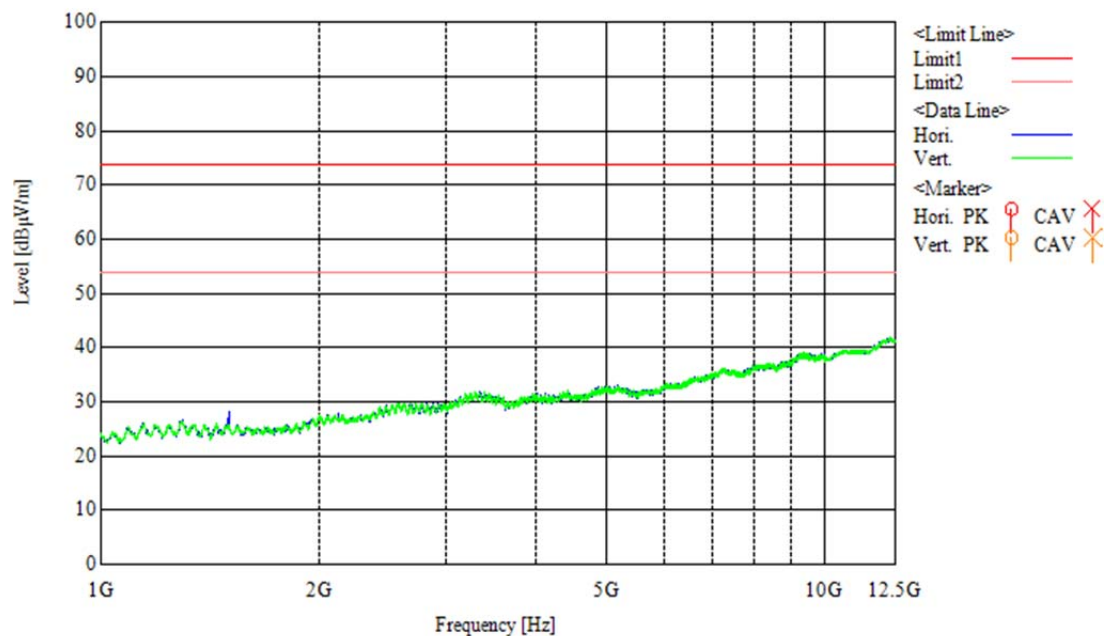
Tested sample: A1
Configuration: 1
Worst operating mode: Rx (2440MHz)

[Emission level] Z-plane (Worst)

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

Note: All emissions are under noise floor.

[Chart]



[Test Day1]

Tested Date: 08 Jan. 2019 Temperature: 16 degC
Humidity: 31 % Atmos. Press: 1020 hPa

[Test Day2]

Tested Date: 09 Jan. 2019 Temperature: 15 degC
Humidity: 33 % Atmos. Press: 1020 hPa

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2.9 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 greater 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 [dBμV]	
	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)

TR06	CL18	LN05
------	------	------

Test software used

EMI Ver. 5.9

Calculation method

The Correction Factor and Result are calculated as followings.

Correction Factor [dB] = ISN Factor [dB] + Loss [dB]

Result [dBμV] = Reading [dBμV] + Correction Factor [dB]

Test results - Complied with requirement

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Test Data

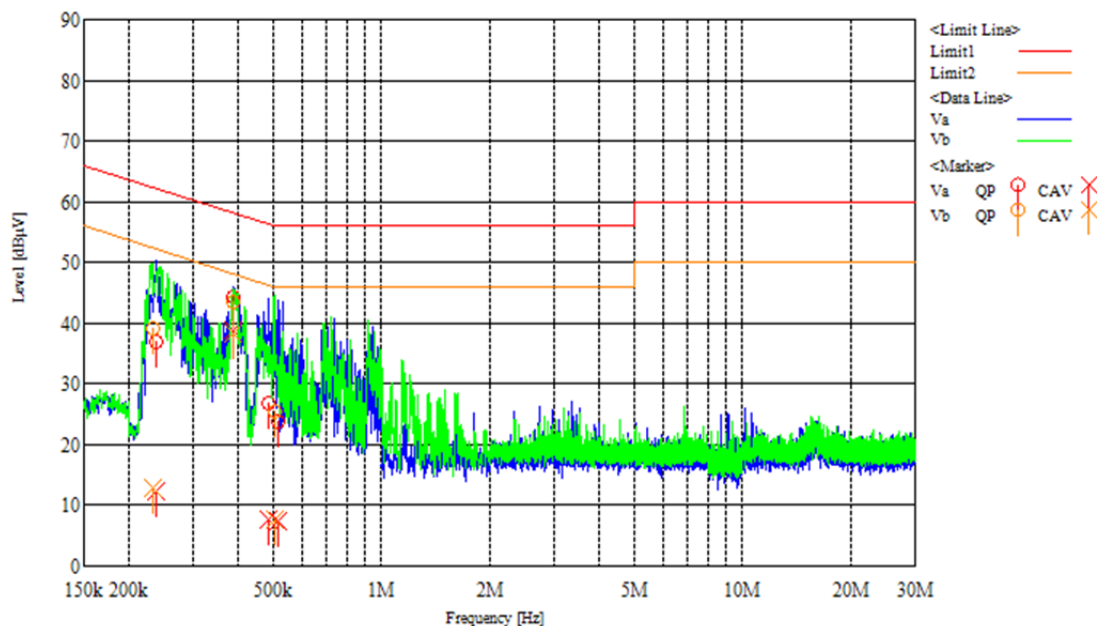
Tested sample: A1
Configuration: 2
Operating mode: Rx 2440 MHz (Worst)

[Emission level]

	Freq. [MHz]	Reading QP [dBμV]	Reading Ave [dBμV]	Factor [dB]	Result QP [dBμV]	Result Ave [dBμV]	Limit QP [dBμV]	Limit Ave [dBμV]	Margin QP [dB]	Margin Ave [dB]	Line
1	0.23770	26.9	2.3	10.1	37.0	12.4	62.2	52.2	25.2	39.8	Va
2	0.38931	34.3	28.8	10.1	44.4	38.9	58.1	48.1	13.7	9.2	Va
3	0.48772	16.8	-2.4	10.1	26.9	7.7	56.2	46.2	29.3	38.5	Va
4	0.51900	13.7	-2.8	10.1	23.8	7.3	56.0	46.0	32.2	38.7	Va
5	0.23175	28.9	2.7	10.2	39.1	12.9	62.4	52.4	23.3	39.5	Vb
6	0.38914	33.4	28.1	10.1	43.5	38.2	58.1	48.1	14.6	9.9	Vb
7	0.50404	15.4	-2.5	10.1	25.5	7.6	56.0	46.0	30.5	38.4	Vb

[Chart]

Operating mode: Rx (2440 MHz)



Tested Date: 11 Jan. 2019
Humidity: 53 %

Temperature: 20 degC
Atmos. Press: 1019 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	-	2018/4/14	2019/4/30
AC01(EG)	Anechoic Chamber (1st test room)	JSE	203397C	-	2018/3/21	2019/3/31
BA07	Biological Antenna	TESEQ	CBL6143A	26670	2018/12/7	2019/12/31
CH01	Conical Horn Antenna (12-18GHz)	ETS-Lindgren	3163-05	00126641	2017/3/29	2019/3/31
CL11	RF Cable for RE	RFT	-	-	2018/3/26	2019/3/31
CL18	RF Cable for CE	RFT	-	-	2018/3/27	2019/3/31
CL30	RF Cable 5 m	SUHNER	SUCOFLEX104PE	MY3599	2018/1/29	2019/1/31
CL31	RF Cable 1 m	Junkosha	MWX221	1303S118	2018/1/29	2019/1/31
CL38	RF Cable 2 m	Junkosha	MWX221	1603S626	2018/1/29	2019/1/31
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
LN05	LISN	Kyoritsu	KNW-407F	8-1773-2	2018/5/16	2019/5/31
LP06	Loop Antenna	ETS-Lindgren	6502	00164299	2018/4/3	2019/4/30
LPF1	Low Pass Filter (1000MHz)	M-City	LPF1000-04	RF0012-01	2018/3/26	2019/3/31
PR12	Pre. Amplifier (1-26G)	Agilent Technologies	8449B	3008A02513	2018/1/29	2019/1/31
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

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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