TEST REPORT

For

Radio control transmitter

In conformity with

FCC CFR 47 Part15 Subpart C

Model : EX-2

FCC ID : QH9T39EX2

Report No. : ERY1506P08R3

Issue Date : 08 Jun. 2015

Prepared for

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Prepared by

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SGS RF Technologies Inc. is managed to ISO17025 and has the necessary knowledge and test facilities for testing according to the referenced standards. The test results in this report apply only to the sample(s) tested.

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History

Report No.	Date	Revisions	Issued By
ERY1505P25R3	25 May. 2015	Initial Issue	T.Kato
ERY1506P08R3	08 Jun. 2015	Add the description of operating mode (Sec 1.1 / 1.6.2)	T.Kato

1 General information

1.1 Product description

Test item	: Radio control transmitter
Manufacturer 1	: Miyuki seiki
Address 1	: 1737-1, Shiono, Shioityou, Yonezawa, Yamagata 992-0042, Japan
Manufacturer 2	: Creare
Address 2	: 3580-8, Kamikawahara, Muramatsu, Matsuyama, Kitakata, Fukushima 966-0902, Japan
Model	: EX-2
FCC ID	: QH9T39EX2
Serial number	: 0721412 (for RF conducted test) 0721411 (for RF radiated test)
Hardware version	: v1.00
Software version	: v1.00
Operating frequency	: 2404 - 2476 MHz (FHSS mode) : 2404 - 2460 MHz (MHS mode)
Modulation	: frequency hopping system (FHSS/MHS mode)
Nominal output power	: +9.0 dBm (FHSS mode) : +4.8 dBm (MHS mode)
Antenna gain	: +0.5 dBi (FHSS/MHS mode)
Receipt date of EUT	: 01 May. 2015
Nominal power source voltages	: 6.0 V DC

1.2 Test(s) performed/ Summary of test result

Test specification(s)	: FCC CFR 47 Part 15 Subpart C (01 Oct. 2014)
Test method(s)	: ANSI C63.10: 2009
Test(s) started	: 13 May. 2015
Test(s) completed	: 19 May. 2015
Purpose of test(s)	: Certification
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 is case that the margin is less than the measurement uncertainty in the Laboratory.

Test engineer : T. Kato
EMC testing Department

Reviewer : K. Onishi
Manager
EMC testing Department

1.3 Test facility

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at SGS RF Technologies 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, per October 1, 2014.
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 Industry Canada (IC): 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.

NVLAP LAB CODE 200780-0

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 UKAS Publication LAB34: 2002 “The Expression of Uncertainty in EMC Testing” and CISPR16-4-2: 2011 “Uncertainty in EMC Measurements”.
The uncertainty of the measurement result in the level of confidence of approximately 95% (k=2) is as follows;

Conducted emission: ± 3.4 dB (10 kHz - 30 MHz)
Radiated emission (9 kHz - 30 MHz): ± 3.3 dB
Radiated emission (30 MHz - 200 MHz): ± 5.0 dB
Radiated emission (200 MHz - 1000 MHz): ± 6.2 dB
Radiated emission (1 GHz - 6 GHz): ± 4.7 dB
Radiated emission (6 GHz - 18 GHz): ± 4.8 dB
Radiated emission (18 GHz - 26 GHz): ± 5.0 dB

1.5 Summary of test results

Requirement	Section in specification	Result	Section in this report
Occupied Bandwidth (20 dB/99%)	2.1049, 15.247(a)(1)	Complied	2.1
Hopping Carrier Frequency Separation	15.247(a)(1)	Complied	2.2
Number of Hopping Channel	15.247(a)(1)(iii)	Complied	2.3
Average Time of Occupancy	15.247(a)(1)(iii)	Complied	2.4
Peak Output Power	15.247(a)(1), (b)(1)	Complied	2.5
Conducted Spurious Emissions	15.247(d)	Complied	2.6
Radiated Spurious Emissions	15.205(b), 15.209	Complied	2.7
AC Power Line Conducted Emissions	15.207	N/A (*)	2.8

(*) The EUT is powered by battery.

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	Radio control transmitter (RF Conducted)	KONDO KAGAKU CO., LTD.	EX-2	0721412
A2	Radio control transmitter (RF Radiated)	KONDO KAGAKU CO., LTD.	EX-2	0721411

Support Equipment(s)

No.	Item	Manufacture	Model No.	Serial No.
B	AAA size battery	-	-	-
-	-	-	-	-

Connected cable(s)

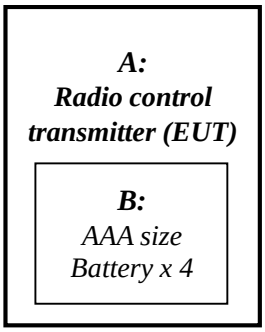
No.	Item	Identification (Manu.etc.)	Cable Shielded	Ferrite Core	Length [m]
-	-	-	-	-	-
-	-	-	-	-	-

1.6.2 Operating condition:

- Tx (2404MHz): The EUT is in FHSS normal transmission mode in 2404 MHz.
- Tx (2440MHz): The EUT is in FHSS normal transmission mode in 2440 MHz.
- Tx (2476MHz): The EUT is in FHSS normal transmission mode in 2476 MHz.

Note: The EUT have two kind of hopping mode (FHSS/MHS).
These two mode have same modulation system, but FHSS mode have a wider operating frequency range and a higher output power level.
So only FHSS mode is tested in this report.

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

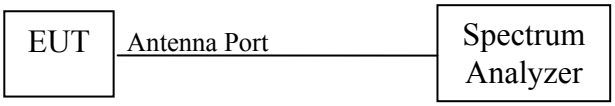
No deviations from the standards described in clause 1.2.

2 Test procedure and test data

2.1 Occupied Bandwidth (20dB / 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

- RBW: 1 to 5 % of OBW
- VBW: 3 times RBW
- Detector : Peak
- Span: 1.5 to 5.0 times OBW

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

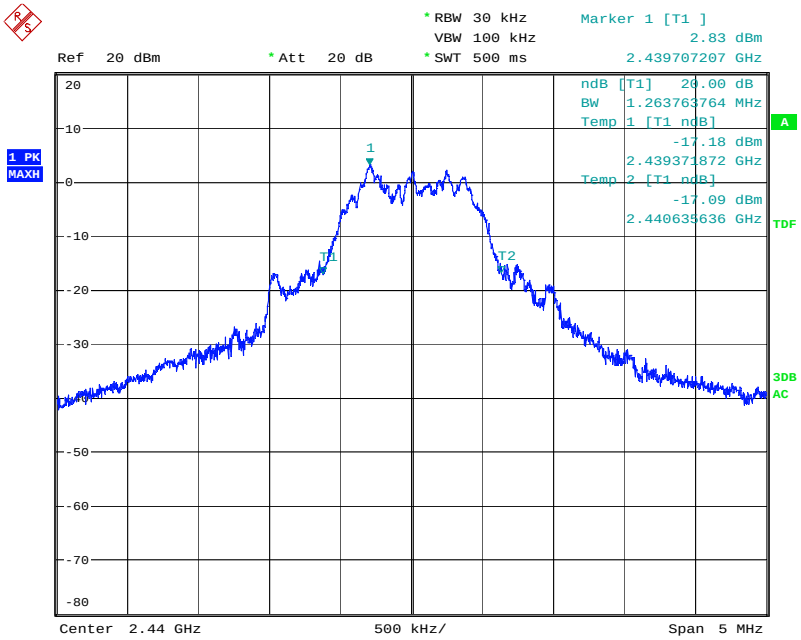
Tested sample: A1

Transmission Frequency [MHz]	OBW 20dB [MHz]	OBW 99% [MHz]
2404	1.336	1.459
2440	1.264	1.471
2476	1.279	1.451

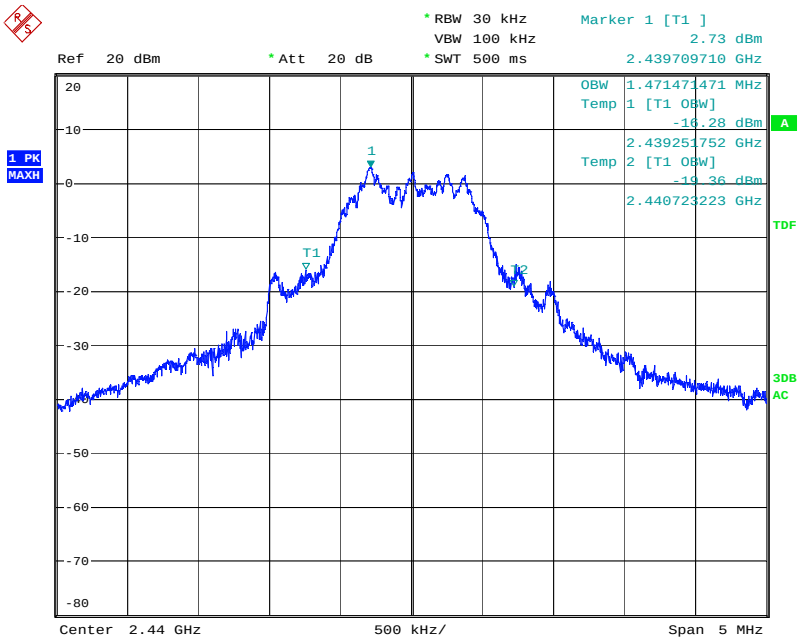
[Chart]

Tx (2440 MHz)

OBW_20dB



OBW_99%

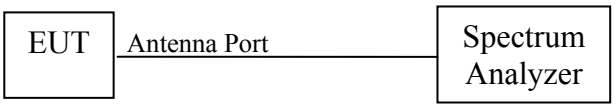


Tested Date:	19 May. 2015	Temperature:	23 degC
Humidity:	64 %	Atmos. Press:	1005 hPa

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.

- RBW : 30% of channel space
- VBW > RBW
- Detector : Peak

Applicable rule and limitation

15.247(a)(1) frequency hopping systems operating in the 2400 - 2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

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

TR06	CL31				

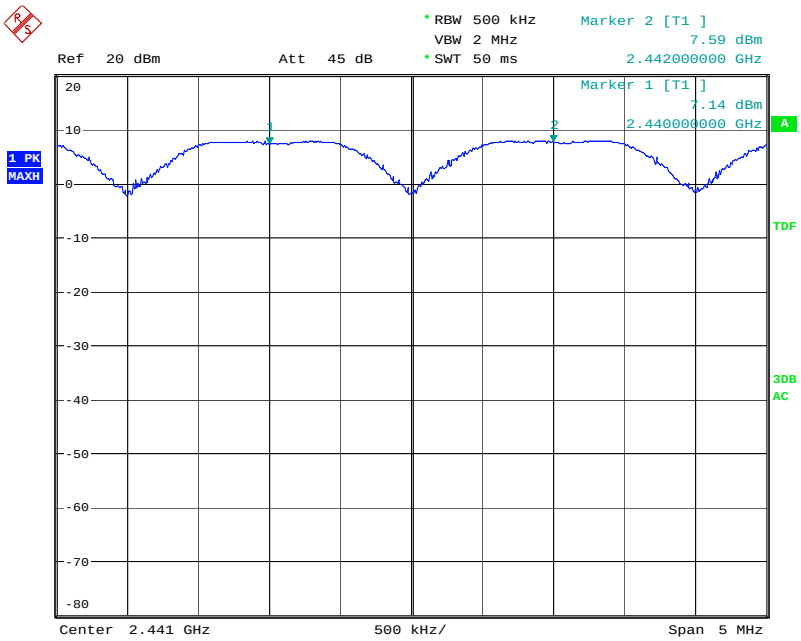
Test results - *Complied with requirement*

Test Data

Tested sample: A1

Measured Frequency	Two-third of 20dB bandwidth [MHz]	Frequency Separation [MHz]
2440 MHz	0.843	2.000

[Chart]

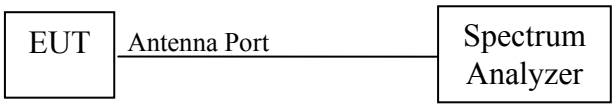


Tested Date:	22 May. 2015	Temperature:	23 degC
Humidity:	54 %	Atmos. Press:	1015 hPa

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.

- RBW : less than 30% of channel space or 20dB BW, whichever is smaller
- VBW > RBW
- Detector : Peak

Applicable rule and limitation

15.247(a) (1) (iii) (iii) 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				

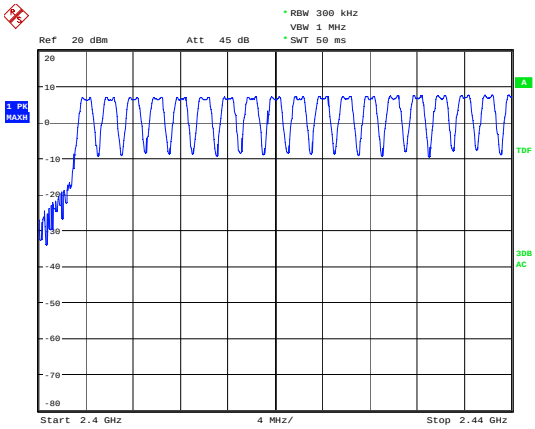
Test results - *Complied with requirement*

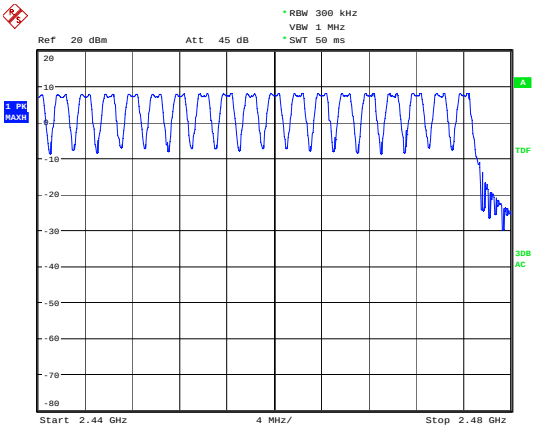
Test Data

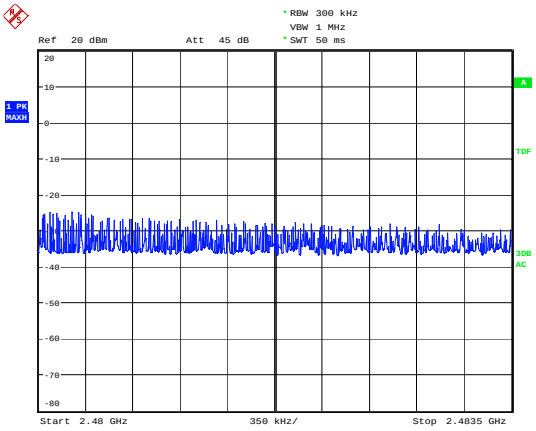
Tested sample: A1

Hopping channel : 37

[Chart]





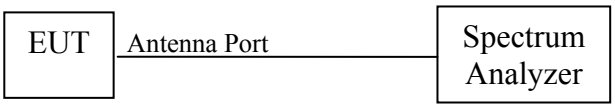


Tested Date:	22 May. 2015	Temperature:	23 degC
Humidity:	54 %	Atmos. Press:	1015 hPa

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.

- RBW < channel space
- Sweep > dwell time
- Detector : Peak

Applicable rule and limitation

15.247(a)(1)(iii) 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				

Test results - *Complied with requirement*

Test Data

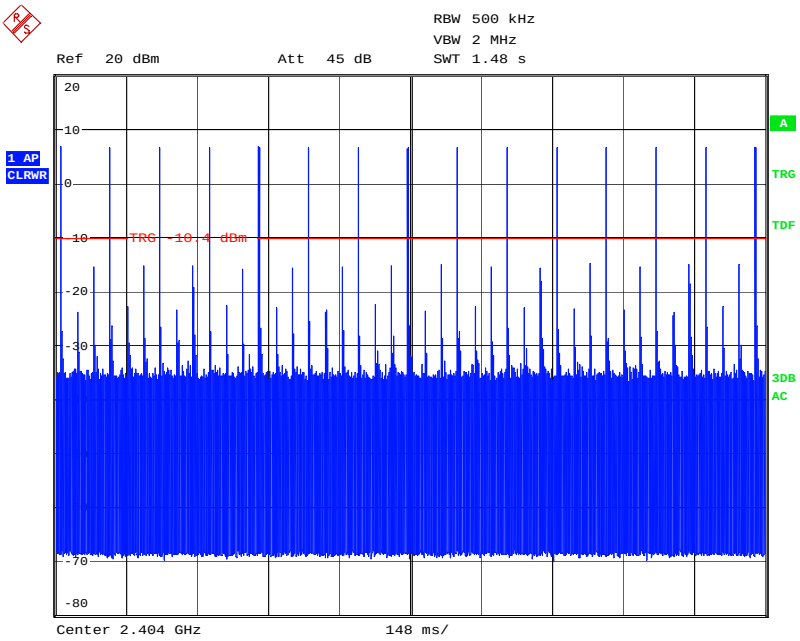
Tested sample: A1

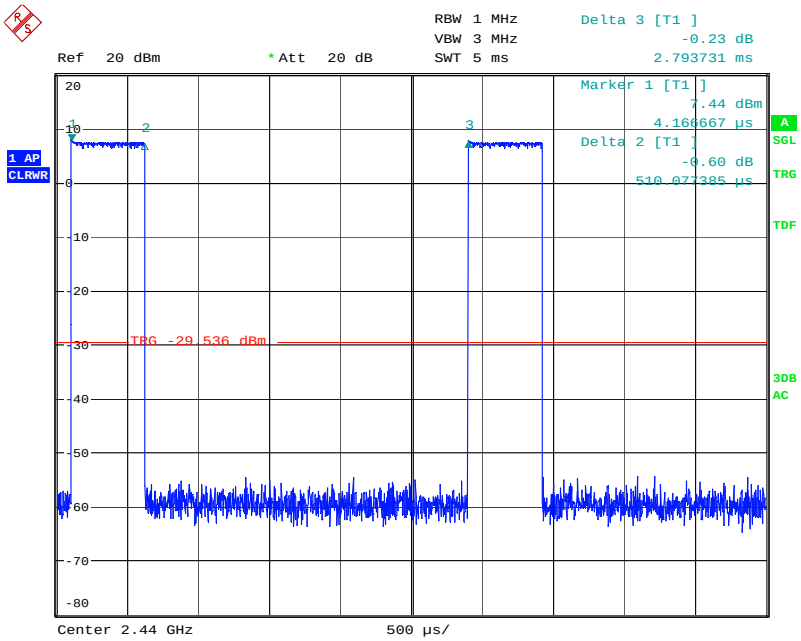
Measured Frequency	Pulse width [ms]	Observation Time [s]	Time of occupancy [ms]
2404 MHz	0.51	14.8	76.5

Note: The number of pulse was captured within a period of 10% observation time.
The test result was calculated as below

Average time of occupancy
= (The number of captured pulse) x (Single Pulse width) x (100% / 10%)

[Chart]



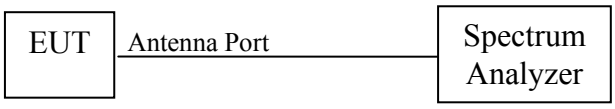


Tested Date:	22 May. 2015	Temperature:	23 degC
Humidity:	54 %	Atmos. Press:	1015 hPa

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.

- RBW : 20dB BW
- VBW > RBW
- Detector : Peak
- Span > 5 times 20dB BW

Limitation

15.247(b) (1) for frequency hopping systems operating in the 2400 - 2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725 - 5850 MHz band: 1 Watt (+30 dBm). For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watt (+21 dBm).

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

TR06	CL31				

Test results - *Complied with requirement*

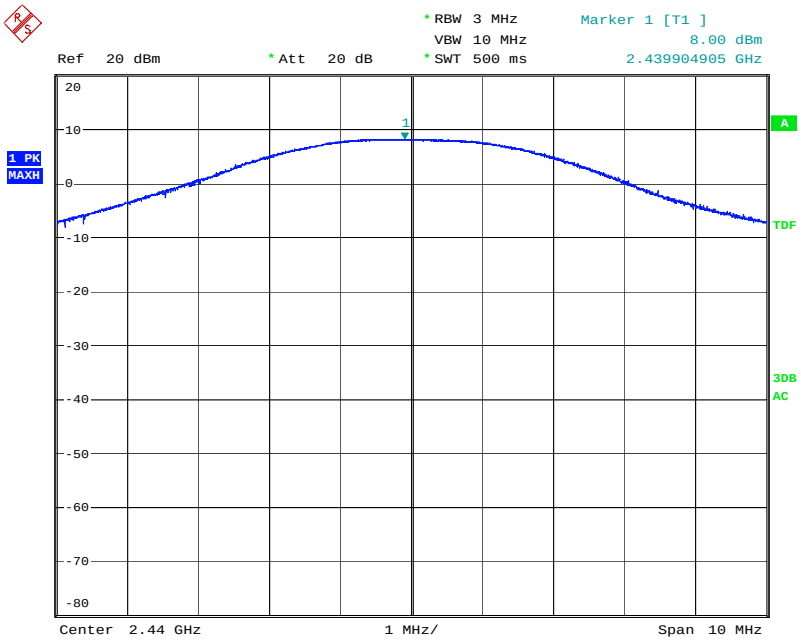
Test Data

Tested sample: A1

Transmission Frequency [MHz]	Output power [dBm]	Limit [dBm]
2404	7.61	21.0
2440	8.00	21.0
2476	8.49	21.0

[Chart]

Tx 2440 MHz

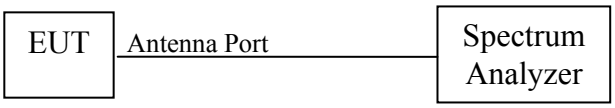


Tested Date:	19 May. 2015	Temperature:	23 degC
Humidity:	64 %	Atmos. Press:	1005 hPa

2.6 Conducted Spurious Emissions (for non-restricted frequency band)

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.

- RBW : 100 kHz - VBW > 3 times RBW
- Detector : Peak - Span > 1.5 times DTS

Limitation

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

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

TR06	CL31				

Test results - *Complied with requirement*

Test Data

Tested sample: A1

Operating mode: Tx (2404 MHz)

Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
3205.300	-45.2	6.75	-13.25

Operating mode: Tx (2440 MHz)

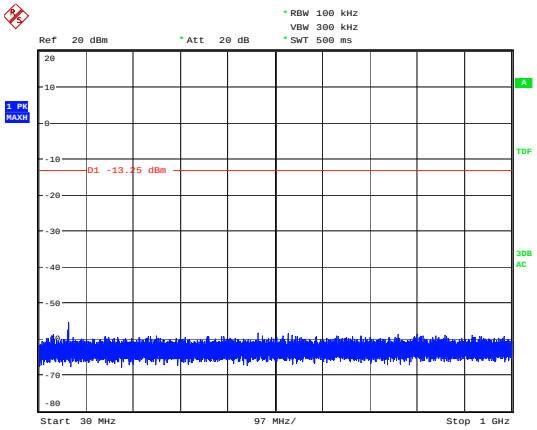
Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
3253.300	-46.9	6.88	-13.12

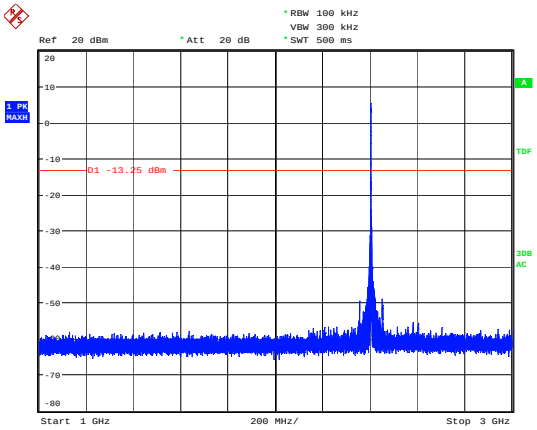
Operating mode: Tx (2476 MHz)

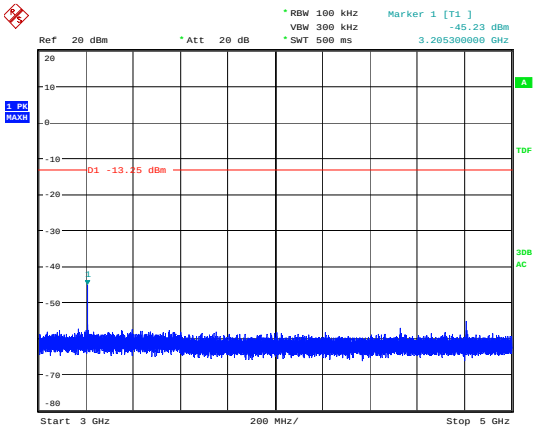
Frequency [MHz]	Spurious level [dBm]	Carrier level [dBm]	20dB below [dBm]
3301.300	-48.6	7.48	-12.52

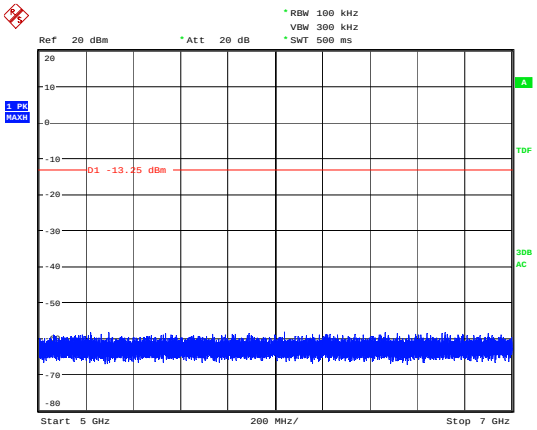
[Chart]

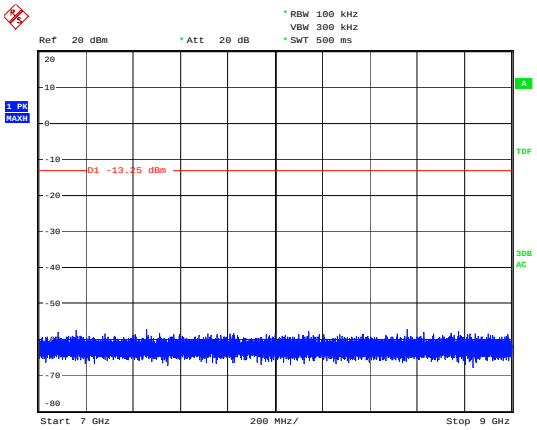
Tx 2404 MHz

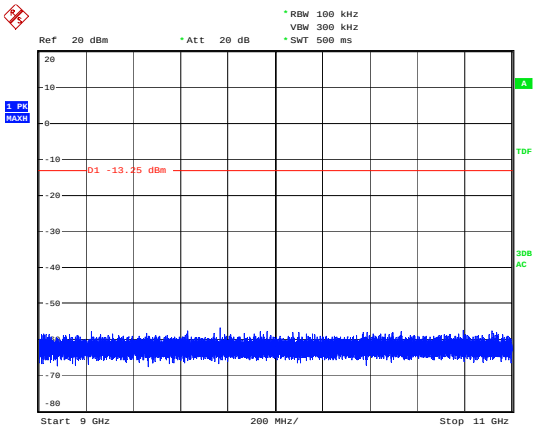


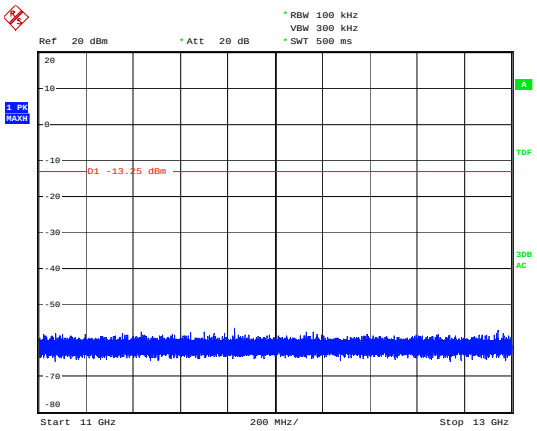


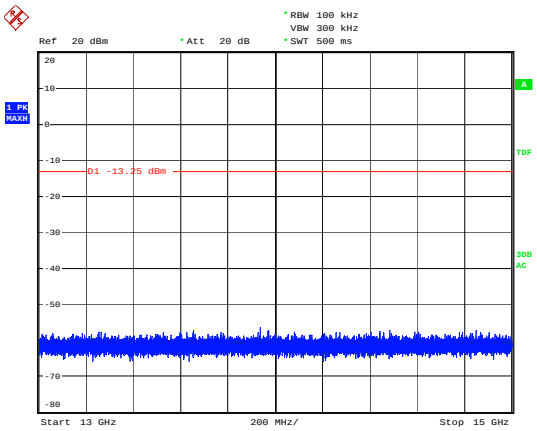


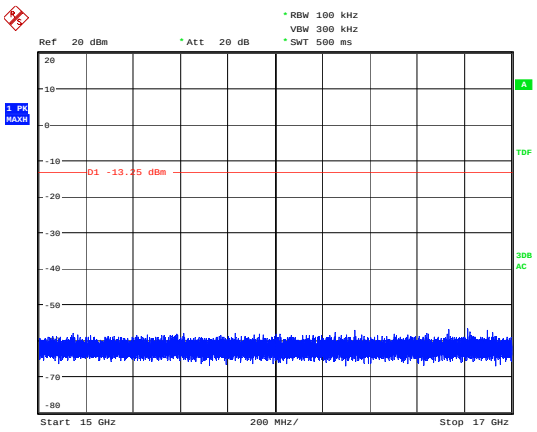


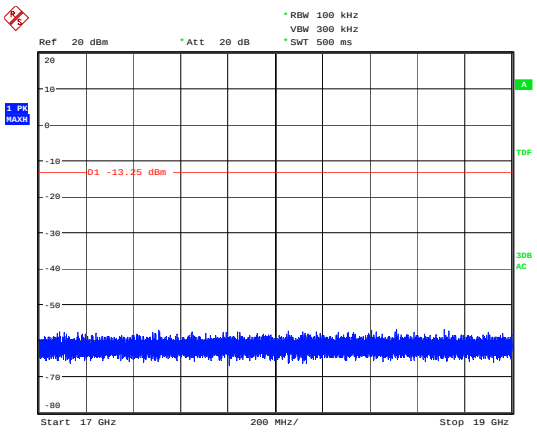


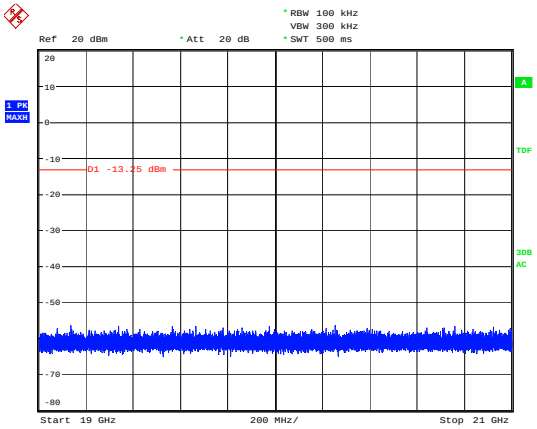


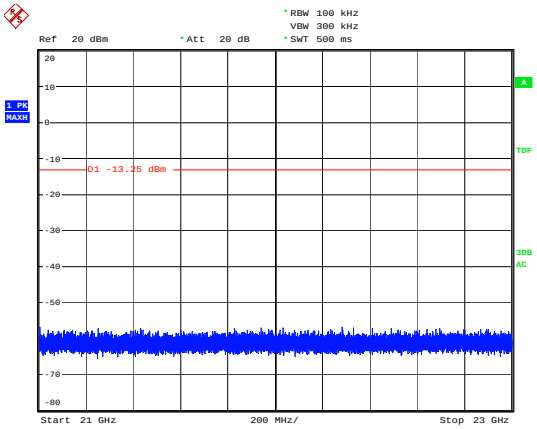

RBW 100 kHz
VBW 300 kHz
Ref 20 dBm
Att 20 dB
SWT 500 ms
D1 -13.25 dBm
Start 11 GHz
200 MHz/
Stop 13 GHz

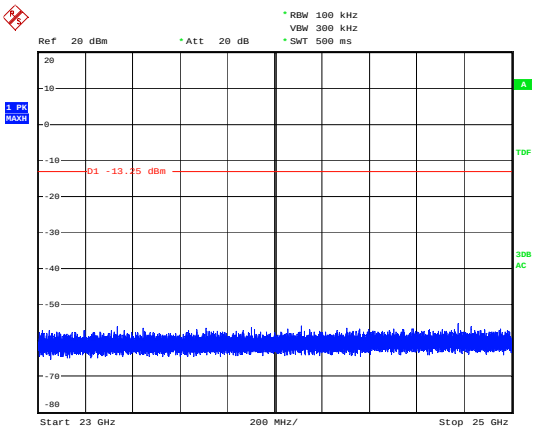

RBW 100 kHz
VBW 300 kHz
Ref 20 dBm
Att 20 dB
SWT 500 ms
D1 -13.25 dBm
Start 13 GHz
200 MHz/
Stop 15 GHz


RBW 100 kHz
VBW 300 kHz
Ref 20 dBm
Att 20 dB
SWT 500 ms
D1 -13.25 dBm
Start 15 GHz
200 MHz/
Stop 17 GHz


RBW 100 kHz
VBW 300 kHz
Ref 20 dBm
Att 20 dB
SWT 500 ms
D1 -13.25 dBm
Start 17 GHz
200 MHz/
Stop 19 GHz

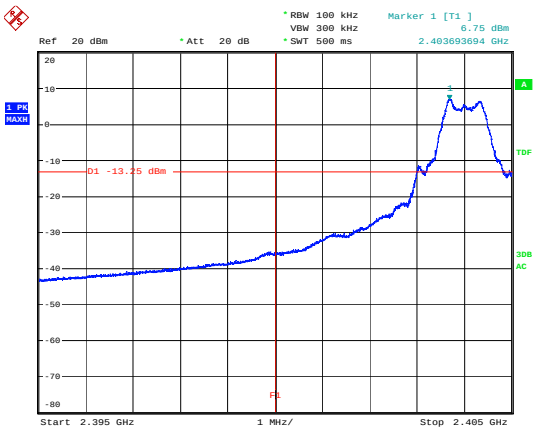

RBW 100 kHz
VBW 300 kHz
Ref 20 dBm
Att 20 dB
SWT 500 ms
D1 -13.25 dBm
Start 19 GHz
200 MHz/
Stop 21 GHz

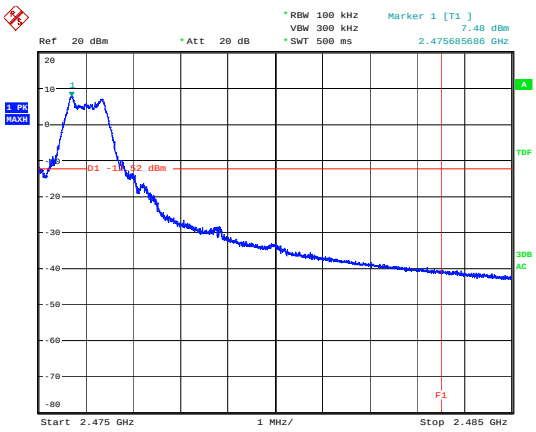

RBW 100 kHz
VBW 300 kHz
Ref 20 dBm
Att 20 dB
SWT 500 ms
D1 -13.25 dBm
Start 21 GHz
200 MHz/
Stop 23 GHz



Tested Date: 19 May. 2015 Temperature: 23 degC
Humidity: 64 % Atmos. Press: 1005 hPa

[Band edge]



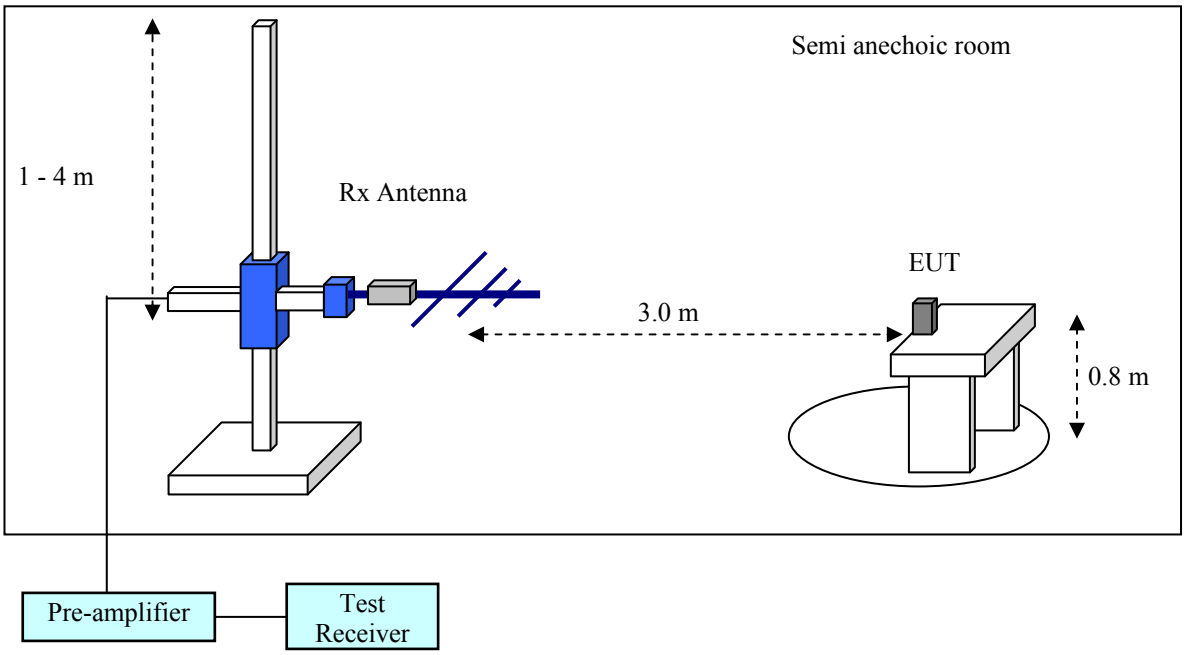


Tested Date: 19 May. 2015 Temperature: 23 degC
Humidity: 64 % Atmos. Press: 1005 hPa

2.7 Radiated emissions (for restricted frequency band)

Test setup

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



Test procedure

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

[below 1000 MHz]
RBW: 120 kHz, Detector: QP

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

Applicable rule and limitation

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.

FCC 15.209 Field strength limits

Frequency [MHz]	Field Strength [µV/m]	Measurement Distance [m]	Field Strength [dBµV/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	PR15	BA10	CL29	CL30
PR12	DH01	CH01	SH01			

Test software used

EMI Ver. 5.6

Calculation method

The Correction Factor and Result are calculated as followings.

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

Test Data

Tested sample: A2
Operating mode: Tx (2404 MHz)

[Emission level] X-plane
Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	801.140	34.2	22.1	12.0	30.3	38.0	46.0	8.0	Hori.
2	960.000	22.3	23.9	12.8	30.2	28.8	46.0	17.2	Hori.

Range: 1 - 25 GHz

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]	Ant.
1	1602.470	61.1	41.1	-8.6	52.5	32.5	73.9	53.9	Hori.
2	4006.350	48.0	32.9	0.6	48.6	33.9	73.9	53.9	Hori.
3	4807.810	58.7	39.4	2.5	61.2	41.9	73.9	53.9	Hori.
4	1602.220	54.8	37.6	-8.6	46.2	29.0	73.9	53.9	Vert.
5	4006.850	50.4	34.3	0.6	51.0	34.9	73.9	53.9	Vert.
6	4807.560	57.1	38.5	2.5	59.6	41.0	73.9	53.9	Vert.

[Emission level] Y-plane
Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	801.440	28.2	22.1	12.0	30.3	32.0	46.0	14.0	Hori.
2	960.000	22.2	23.9	12.8	30.2	28.7	46.0	17.3	Hori.
3	801.240	27.2	22.1	12.0	30.3	31.0	46.0	15.0	Vert.

Range: 1 - 25 GHz

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]	Ant.
1	1602.720	60.3	41.0	-8.6	51.7	32.4	73.9	53.9	Hori.
2	4006.350	50.0	34.3	0.6	50.6	34.9	73.9	53.9	Hori.
3	4808.060	59.8	40.8	2.5	62.3	43.3	73.9	53.9	Hori.
4	1602.470	58.4	39.0	-8.6	49.8	30.4	73.9	53.9	Vert.
5	4006.600	50.1	34.6	0.6	50.7	35.2	73.9	53.9	Vert.
6	4807.310	57.5	37.9	2.5	60.0	40.4	73.9	53.9	Vert.

[Emission level] Z-plane
Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	801.240	30.8	22.1	12.0	30.3	34.6	46.0	11.4	Hori.
2	960.000	22.2	23.9	12.8	30.2	28.7	46.0	17.3	Hori.

Range: 1 - 25 GHz

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]	Ant.
1	1602.470	58.1	39.0	-8.6	49.5	30.4	73.9	53.9	Hori.
2	4006.600	48.9	33.4	0.6	49.5	34.0	73.9	53.9	Hori.
3	4808.060	59.1	40.3	2.5	61.6	42.8	73.9	53.9	Hori.
4	1602.970	60.1	42.2	-8.6	51.5	33.6	73.9	53.9	Vert.
5	4006.600	49.9	34.6	0.6	50.5	35.2	73.9	53.9	Vert.
6	4808.560	55.1	36.5	2.5	57.6	39.0	73.9	53.9	Vert.

Tested sample: A2
Operating mode: Tx (2440 MHz)

[Emission level] X-plane
Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	813.237	34.6	22.3	12.1	30.4	38.6	46.0	7.4	Hori.
2	960.000	22.3	23.9	12.8	30.2	28.8	46.0	17.2	Hori.

Range: 1 - 25 GHz

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]	Ant.
1	1626.219	60.0	41.3	-8.6	51.4	32.7	73.9	53.9	Hori.
2	4066.597	49.5	33.6	0.7	50.2	34.3	73.9	53.9	Hori.
3	4879.806	55.0	37.0	2.6	57.6	39.6	73.9	53.9	Hori.
4	1626.469	55.7	37.1	-8.6	47.1	28.5	73.9	53.9	Vert.
5	4066.597	51.6	36.0	0.7	52.3	36.7	73.9	53.9	Vert.
6	4880.056	56.5	38.4	2.6	59.1	41.0	73.9	53.9	Vert.

[Emission level] Y-plane
Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	813.337	30.6	22.3	12.1	30.4	34.6	46.0	11.4	Hori.
2	960.000	23.9	23.9	12.8	30.2	28.7	46.0	17.3	Hori.
3	813.337	22.3	22.3	12.1	30.4	32.7	46.0	13.3	Vert.

Range: 1 - 25 GHz

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]	Ant.
1	1626.469	58.2	38.9	-8.6	49.6	30.3	73.9	53.9	Hori.
2	4066.597	50.9	35.1	0.7	51.6	35.8	73.9	53.9	Hori.
3	4880.056	56.6	38.5	2.6	59.2	41.1	73.9	53.9	Hori.
4	1626.469	58.2	38.8	-8.6	49.6	30.2	73.9	53.9	Vert.
5	4066.597	49.7	34.2	0.7	50.4	34.9	73.9	53.9	Vert.
6	4879.806	55.2	36.8	2.6	57.8	39.4	73.9	53.9	Vert.

[Emission level] Z-plane
Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	813.328	33.7	22.3	12.1	30.4	37.7	46.0	8.3	Hori.
-	-	-	-	-	-	-	-	-	-

Range: 1 - 25 GHz

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]	Ant.
1	1626.469	58.5	39.2	-8.6	49.9	30.6	73.9	53.9	Hori.
2	4066.847	52.8	36.1	0.7	53.5	36.8	73.9	53.9	Hori.
3	4880.306	57.6	39.3	2.6	60.2	41.9	73.9	53.9	Hori.
4	1626.469	59.5	39.8	-8.6	50.9	31.2	73.9	53.9	Vert.
5	4066.597	51.2	35.5	0.7	51.9	36.2	73.9	53.9	Vert.
6	4879.806	56.5	38.1	2.6	59.1	40.7	73.9	53.9	Vert.

Tested sample: A2
Operating mode: Tx (2476 MHz)

[Emission level] X-plane
Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	825.335	36.0	22.4	12.1	30.4	40.1	46.0	5.9	Hori.
2	960.000	22.3	23.9	12.8	30.2	28.8	46.0	17.2	Hori.

Range: 1 - 25 GHz

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]	Ant.
1	4126.094	46.8	31.1	0.5	47.3	31.6	73.9	53.9	Hori.
2	4952.052	53.4	35.7	3.0	56.4	38.7	73.9	53.9	Hori.
3	4126.094	49.6	33.0	0.5	50.1	33.5	73.9	53.9	Vert.
4	4952.052	54.0	36.4	3.0	57.0	39.4	73.9	53.9	Vert.

[Emission level] Y-plane
Range: 30 - 1000 MHz

No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	825.335	28.4	22.4	12.1	30.4	32.5	46.0	13.5	Hori.
2	960.000	22.3	23.9	12.8	30.2	28.8	46.0	17.2	Hori.
3	825.335	28.9	22.4	12.1	30.4	33.0	46.0	13.0	Vert.

Range: 1 - 25 GHz

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]	Ant.
1	4126.594	51.5	35.5	0.5	52.0	36.0	73.9	53.9	Hori.
2	4952.052	54.0	36.1	3.0	57.0	39.1	73.9	53.9	Hori.
3	4126.594	49.1	32.9	0.5	49.6	33.4	73.9	53.9	Vert.
4	4951.802	53.4	35.9	3.0	56.4	38.9	73.9	53.9	Vert.

[Emission level] Z-plane
Range: 30 - 1000 MHz

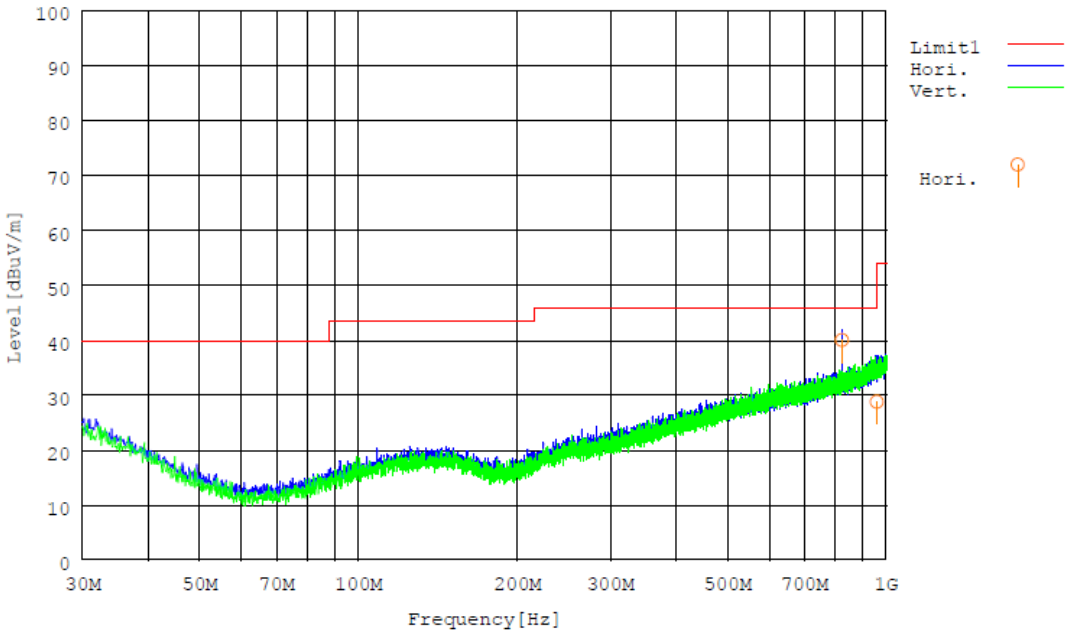
No.	Frequency [MHz]	Reading [dBμV]	Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Ant.
1	825.335	32.4	22.4	12.1	30.4	36.5	46.0	9.5	Hori.
2	960.000	22.3	23.9	12.8	30.2	28.8	46.0	17.2	Hori.

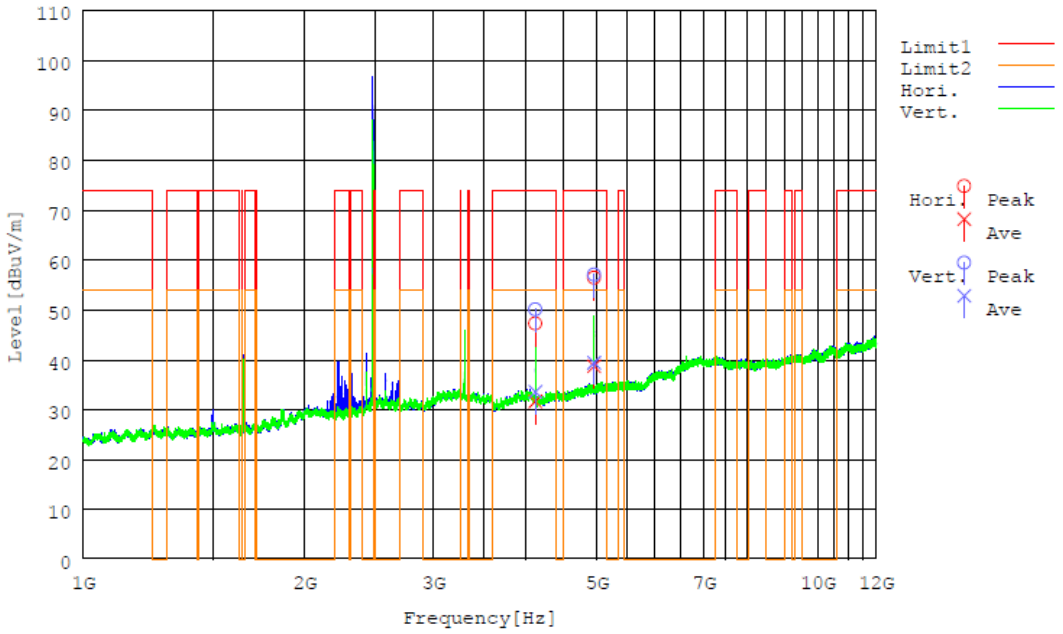
Range: 1 - 25 GHz

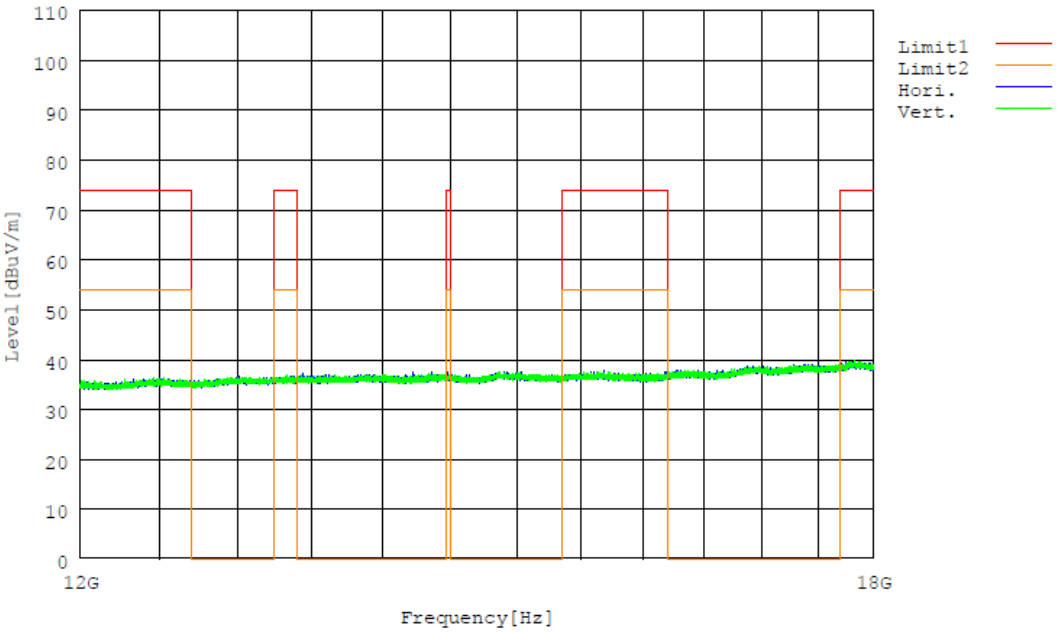
No.	Frequency [MHz]	Reading PK [dBμV]	Reading Ave [dBμV]	C.Factor [dB]	Result PK [dBμV/m]	Result Ave [dBμV/m]	Limit PK [dBμV/m]	Limit Ave [dBμV/m]	Ant.
1	4126.344	50.8	34.4	0.5	51.3	34.9	73.9	53.9	Hori.
2	4951.552	55.5	37.2	3.0	58.5	40.2	73.9	53.9	Hori.
3	4126.594	51.7	35.9	0.5	52.2	36.4	73.9	53.9	Vert.
4	4952.552	51.3	34.0	3.0	54.3	37.0	73.9	53.9	Vert.

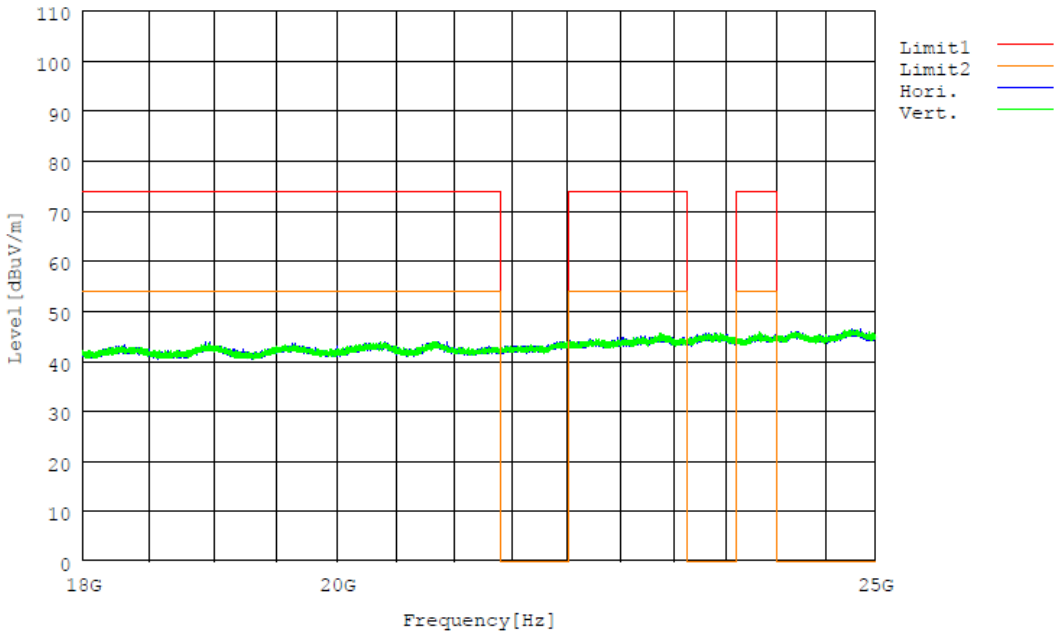
[Chart]

Tx 2476 MHz (X-plane)






110
100
90
80
70
60
50
40
30
20
10
0
Level [dBuV/m]
12G
18G
Frequency[Hz]
Limit1
Limit2
Hori.
Vert.


110
100
90
80
70
60
50
40
30
20
10
0
Level [dBuV/m]
18G
20G
25G
Frequency[Hz]
Limit1
Limit2
Hori.
Vert.

[Band-edge]

Tested sample: A2
Operating mode: Tx (2404 MHz)

[Emission level] X-plane

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]	Ant.
1	2332.029	60.7	33.4	-5.0	55.7	28.4	73.9	53.9	Hori.
2	2354.657	62.9	39.9	-4.8	58.1	35.1	73.9	53.9	Hori.
3	2390.000	69.8	32.7	-4.6	65.2	28.1	73.9	53.9	Hori.

[Emission level] Y-plane

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]	Ant.
1	2331.754	60.7	33.3	-5.0	55.7	28.3	73.9	53.9	Hori.
2	2354.524	63.5	40.4	-4.8	58.7	35.6	73.9	53.9	Hori.
3	2390.000	70.0	32.7	-4.6	65.4	28.1	73.9	53.9	Hori.

[Emission level] Z-plane

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]	Ant.
1	2331.991	62.3	34.0	-5.0	57.3	29.0	73.9	53.9	Vert.
2	2354.629	63.5	40.2	-4.8	58.7	35.4	73.9	53.9	Vert.
3	2390.000	70.6	32.9	-4.6	66.0	28.3	73.9	53.9	Vert.

Tested sample: A2
Operating mode: Tx (2476 MHz)

[Emission level] X-plane

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]	Ant.
1	2320.022	55.8	34.7	-5.1	50.7	29.6	73.9	53.9	Hori.
2	2483.500	70.9	33.5	-3.7	67.2	29.8	73.9	53.9	Hori.

[Emission level] Y-plane

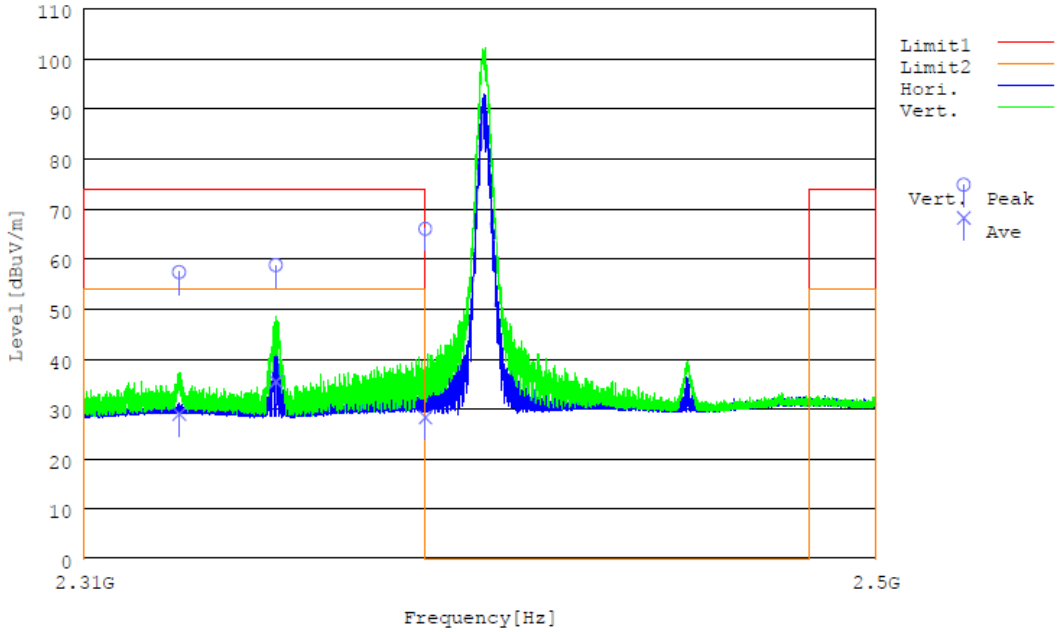
No.	Frequency [MHz]	Reading PK [dBμV]	Reading Ave [dBμV]	C.Factor [dB]	Result PK [dBμV/m]	Result Ave [dBμV/m]	Limit PK [dBμV/m]	Limit Ave [dBμV/m]	Ant.
1	2319.870	55.6	34.4	-5.1	50.5	29.3	73.9	53.9	Hori.
2	2379.907	57.2	32.9	-4.7	52.5	28.2	73.9	53.9	Hori.
3	2483.500	71.2	33.6	-3.7	67.5	29.9	73.9	53.9	Hori.

[Emission level] Z-plane

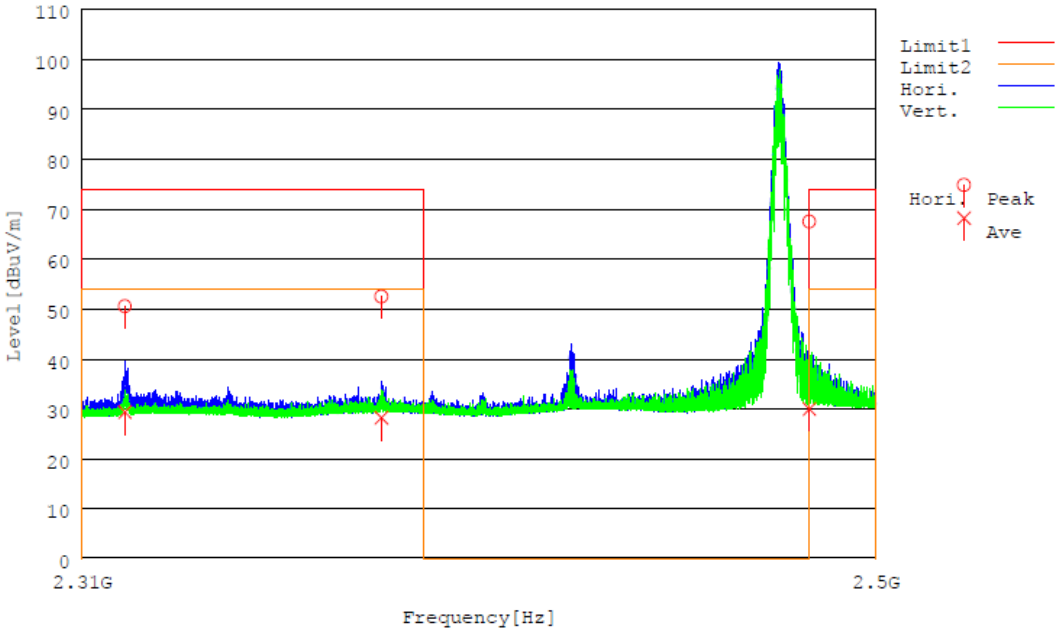
No.	Frequency [MHz]	Reading PK [dBμV]	Reading Ave [dBμV]	C.Factor [dB]	Result PK [dBμV/m]	Result Ave [dBμV/m]	Limit PK [dBμV/m]	Limit Ave [dBμV/m]	Ant.
1	2320.022	57.7	35.7	-5.1	52.6	30.6	73.9	53.9	Vert.
2	2379.888	59.0	33.3	-4.7	54.3	28.6	73.9	53.9	Vert.
3	2483.500	70.7	33.6	-3.7	67.0	29.9	73.9	53.9	Vert.

[Chart : band-edge]

Tx 2404 MHz (Z-plane)



Tx 2476 MHz (Y-plane)



Tested Date1:	13 May. 2015	Temperature:	23 degC
Humidity:	59 %	Atmos. Press:	1004 hPa
Tested Date2:	14 May. 2015	Temperature:	23 degC
Humidity:	52 %	Atmos. Press:	1012 hPa
Tested Date3:	18 May. 2015	Temperature:	23 degC
Humidity:	60 %	Atmos. Press:	1014 hPa

2.8 AC power line conducted emissions

Test setup

Test setup was implemented according to the method of ANSI C63.4: 2003 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: 2003 clauses 7, clause 13.1.3 and Annex H.2 “AC power line conducted emission measurements”.

Applicable rule and limitation

FCC 15.207 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)

Test software used

EMI Ver. 5.6

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 - *This item was not tested.*

Test Data

Operating mode: -

[Emission level]

No.	Frequency [MHz]	Reading		C.F. [dB]	Result		Limit		Phase	Pass/Fail
		QP [dBμV]	AV [dBμV]		QP [dBμV]	AV [dBμV]	QP [dBμV]	AV [dBμV]		
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

[Chart]

Operating mode: -

Tested Date: - Temperature: - degC
Humidity: - % Atmos. Press: - hPa

4 List of utilized test equipment / calibration

RFT ID No.	Kind of Equipment and Precision	Manufacturer	Model No.	Serial Number	Calibration Date	Calibrated until
AC01(EM)	Anechoic Chamber (1st test room)	JSE	203397C	-	2015/4/18	2016/4/30
AC01(EG)	Anechoic Chamber (1st test room)	JSE	203397C	-	2014/11/24	2015/11/30
BA10	Bilogical Antenna	TESEQ	CBL6111D	32342	2014/6/9	2015/6/30
CH01	Conical Horn Antenna (12-18GHz)	ETS-Lindgren	3163-05	00126641	2014/7/3	2016/7/31
CL11	RF Cable for RE	RFT	-	-	2015/3/13	2016/3/31
CL29	RF Cable 2 m	SUHNER	SUCOFLEX104PE	94709	2015/1/26	2016/1/31
CL30	RF Cable 5 m	SUHNER	SUCOFLEX104PE	MY3599	2014/8/28	2015/8/31
CL31	RF Cable 1 m	Junkosha	MWX221	1303S118	2014/10/6	2015/10/31
DH01	DRG Horn Antenna	A.H. Systems	SAS-571	785	2014/1/21	2016/1/31
LPF1	Low Pass Filter (1000MHz)	M-City	LPF1000-04	RF0012-01	2015/2/23	2016/2/29
PR12	Pre. Amplifier (1-26G)	Agilent Technologies	8449B	3008A02513	2015/1/26	2016/1/31
PR15	Pre. Amplifier	Anritsu	MH648A	6201156141	2014/6/10	2015/6/30
SH01	Standard Horn Antenna (18-26G)	A.H. Systems	SAS-572	208	2014/7/3	2016/7/31
TR06	Test Receiver (F/W : 3.93 SP2)	Rohde & Schwarz	ESU26	100002	2014/9/5	2015/9/30

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.