

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 | : <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
 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)

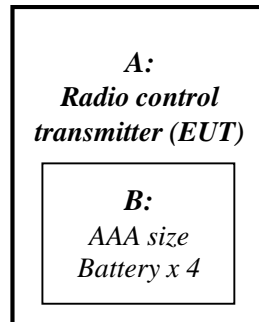
| No. | Item | Identification (Manu. etc.) | Cable Shielded | Ferrite Core | Length [m] |
|-----|------|--------------------------------|-------------------|-----------------|---------------|
| - | - | - | - | - | - |
| - | - | - | - | - | - |

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

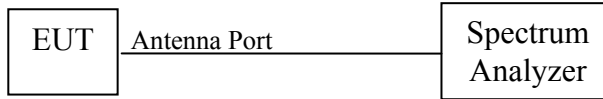
No deviations from the standards described in clause 1.2.

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

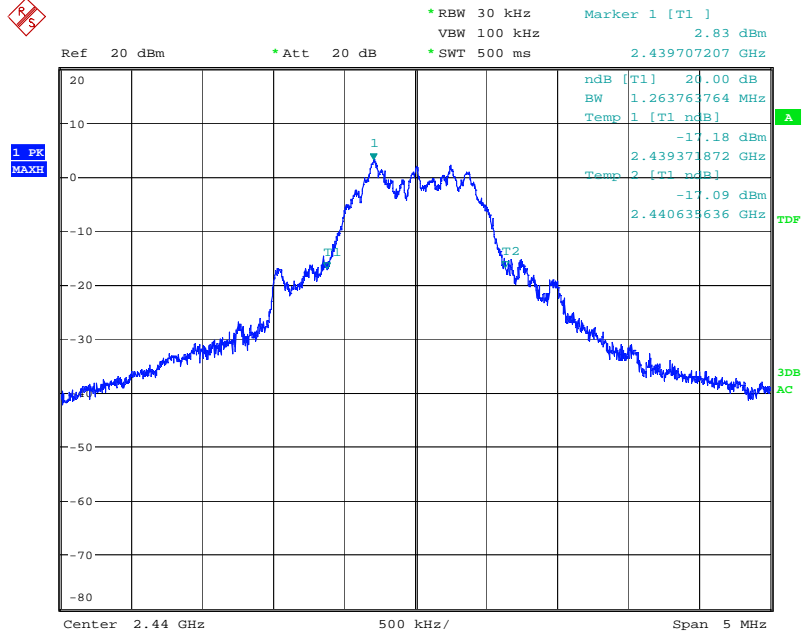
Tested sample: AI

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

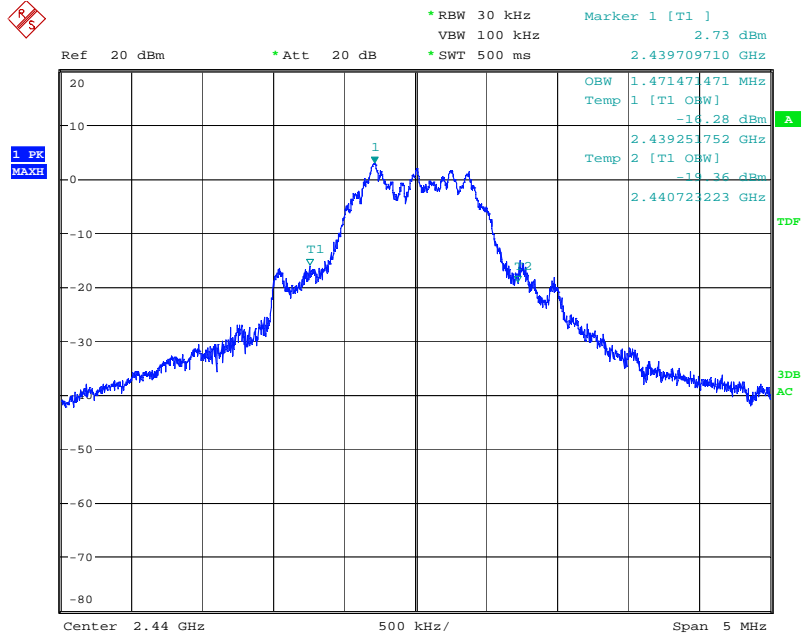
[Chart]

Tx (2440 MHz)

OBW_20dB



OBW_99%



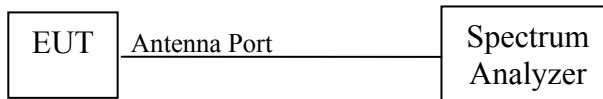
Tested Date: 19 May. 2015
 Humidity: 64 %

Temperature: 23 degC
 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 | | | | |
|------|------|--|--|--|--|

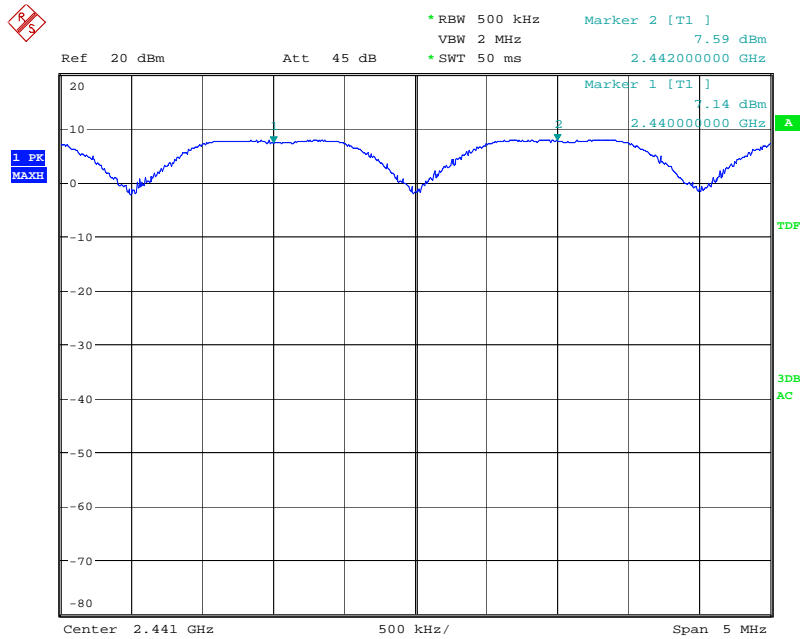
Test results - Complied with requirement

Test Data

Tested sample: A1

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

[Chart]



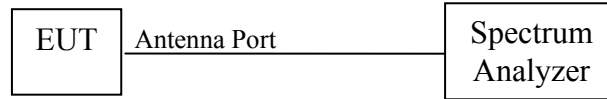
Tested Date: 22 May. 2015
 Humidity: 54 %

Temperature: 23 degC
 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 | | | | |
|------|------|--|--|--|--|

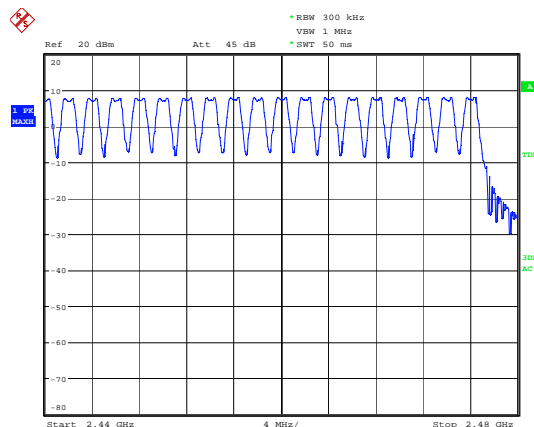
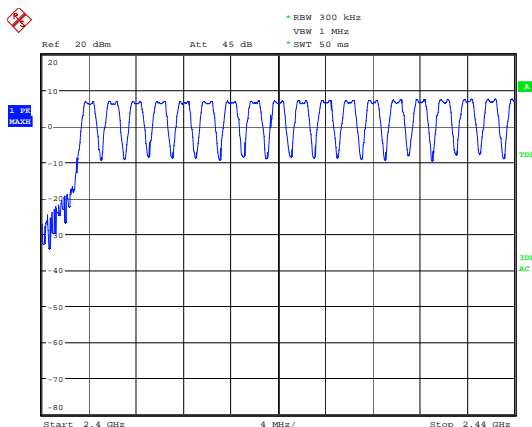
Test results - Complied with requirement

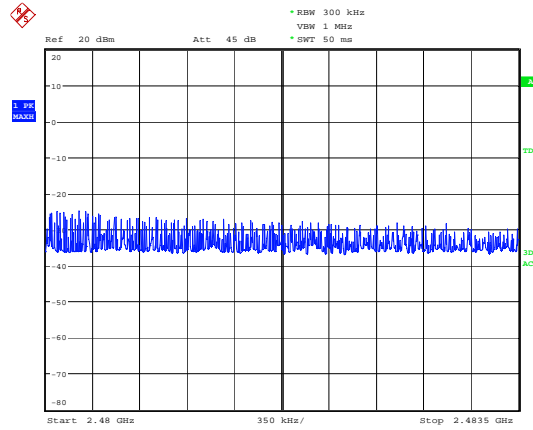
Test Data

Tested sample: A1

Hopping channel : 37

[Chart]





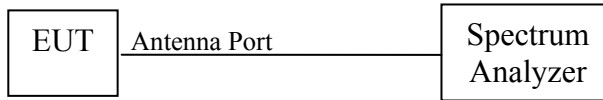
Tested Date: 22 May, 2015
 Humidity: 54 %

Temperature: 23 degC
 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

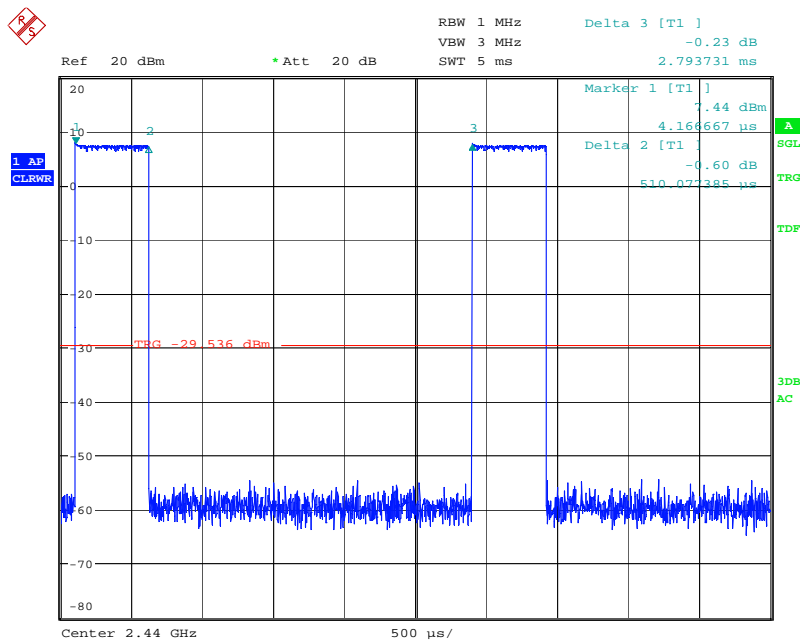
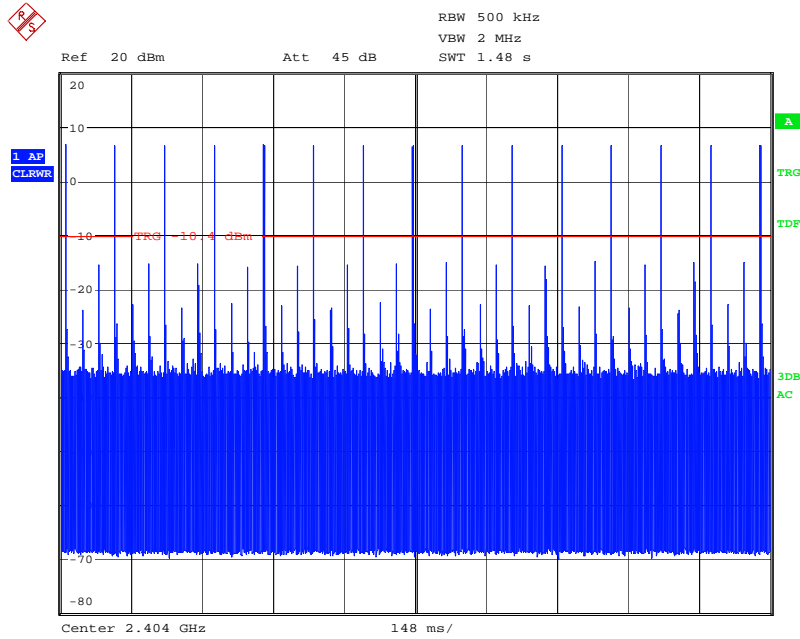
Tested sample: AI

| 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

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

[Chart]



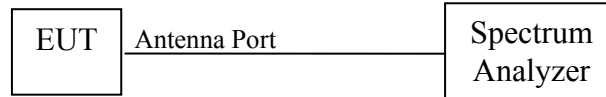
Tested Date: 22 May. 2015
 Humidity: 54 %

Temperature: 23 degC
 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
- Detector : Peak
- VBW > RBW
- 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

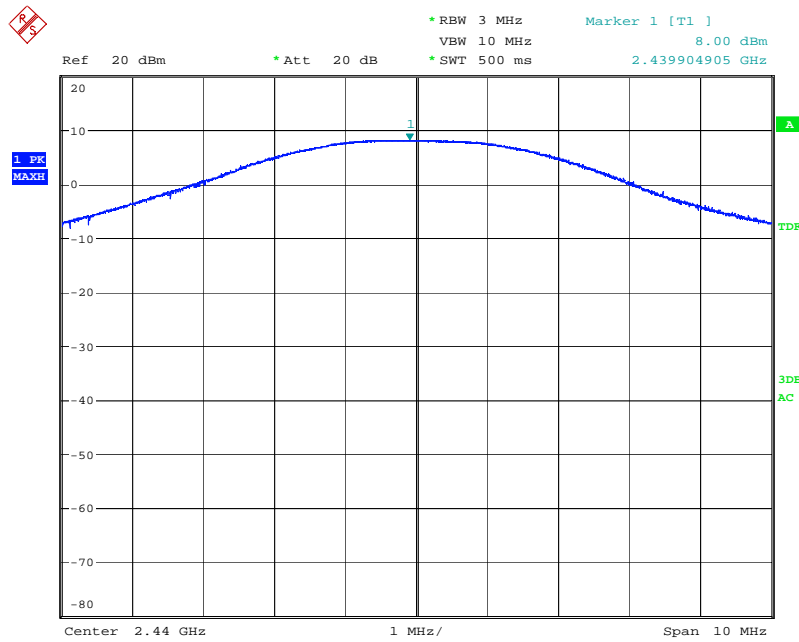
Test Data

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



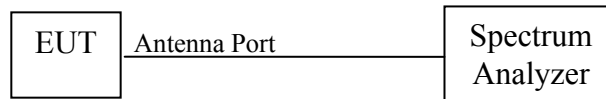
Tested Date: 19 May. 2015
 Humidity: 64 %

Temperature: 23 degC
 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)

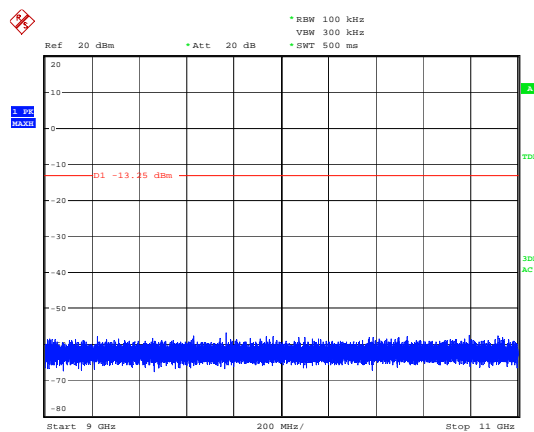
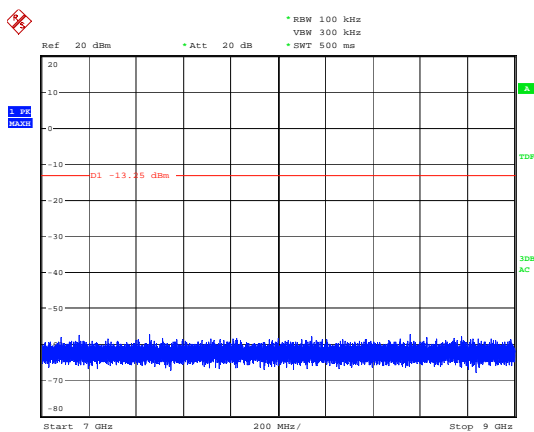
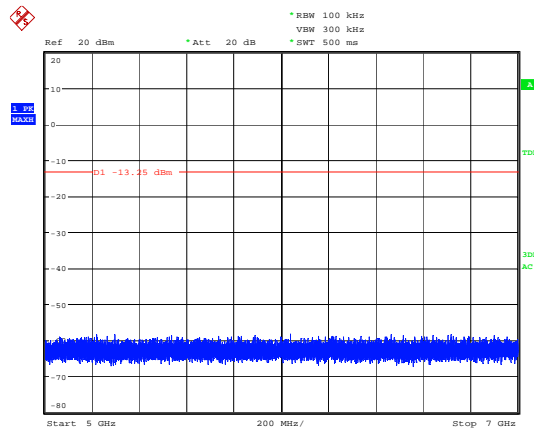
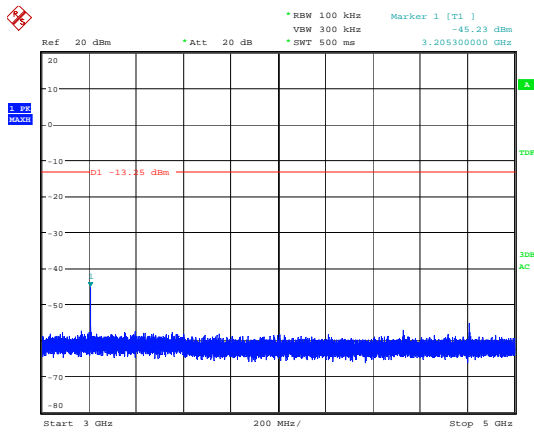
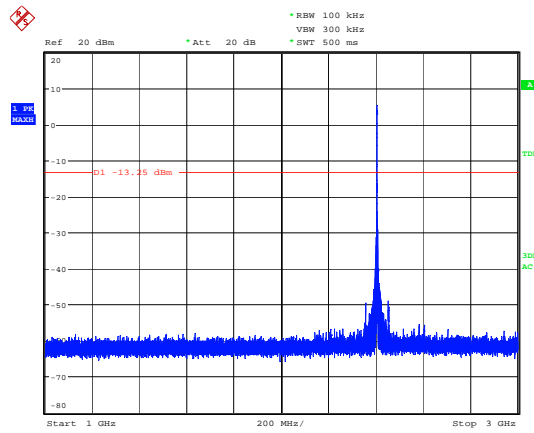
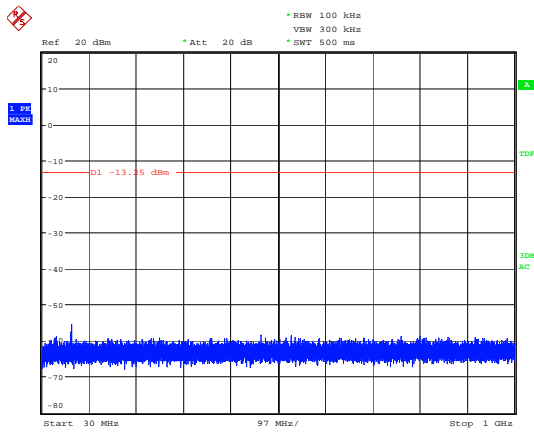
| Frequency [MHz] | Spurious level [dBm] | Carrier level [dBm] | 20dB below [dBm] |
|-----------------|----------------------|---------------------|------------------|
| 3253.300 | -46.9 | 6.88 | -13.12 |

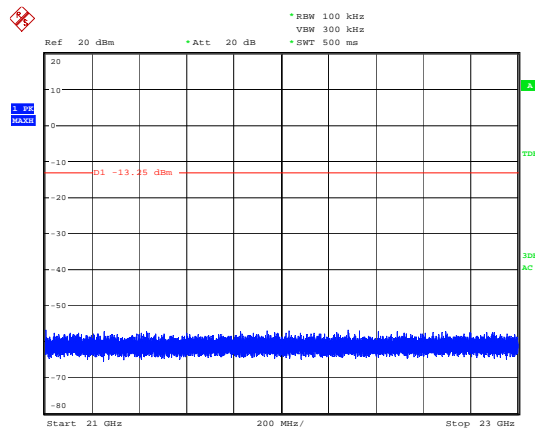
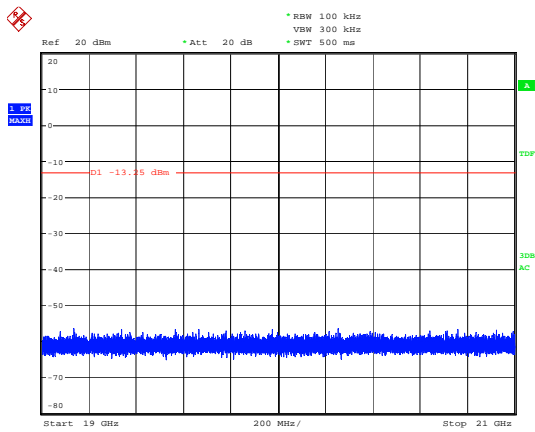
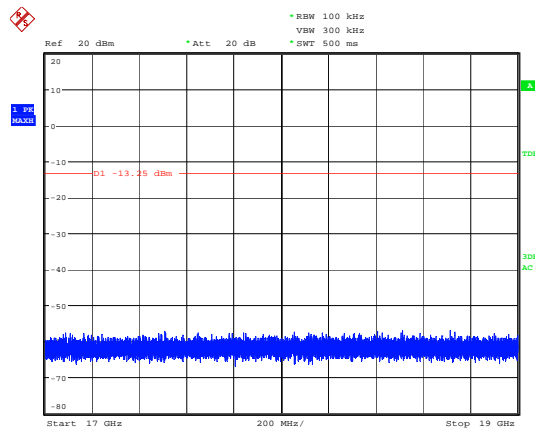
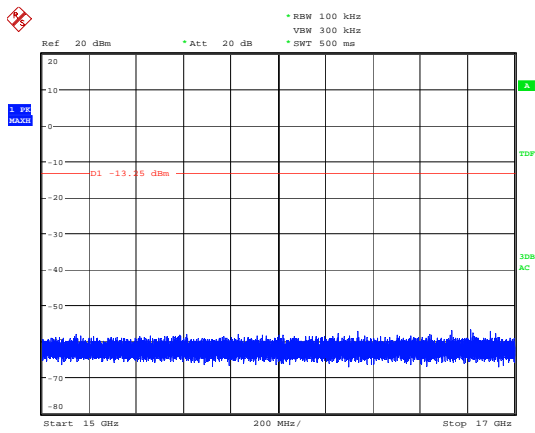
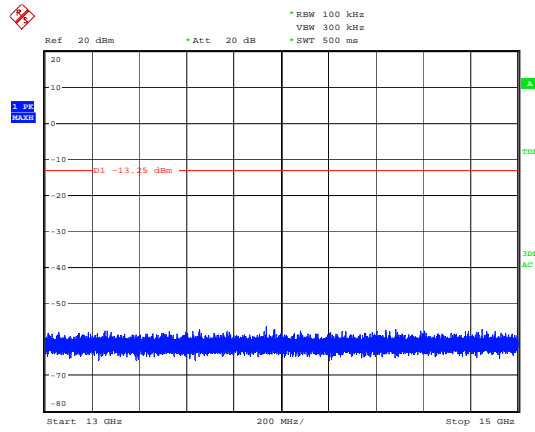
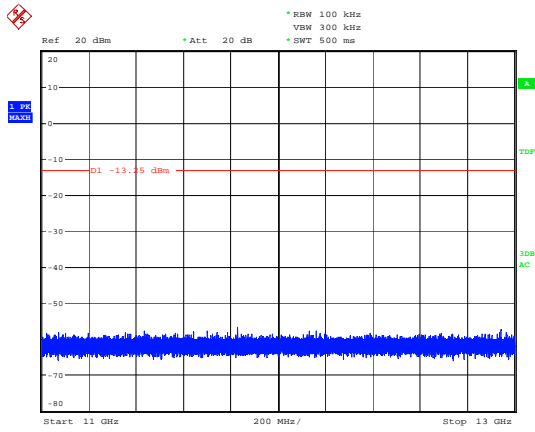
Operating mode: Tx (2476 MHz)

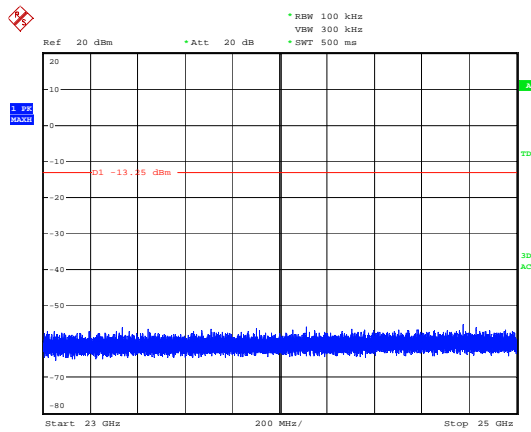
| Frequency [MHz] | Spurious level [dBm] | Carrier level [dBm] | 20dB below [dBm] |
|-----------------|----------------------|---------------------|------------------|
| 3301.300 | -48.6 | 7.48 | -12.52 |

[Chart]

Tx 2404 MHz



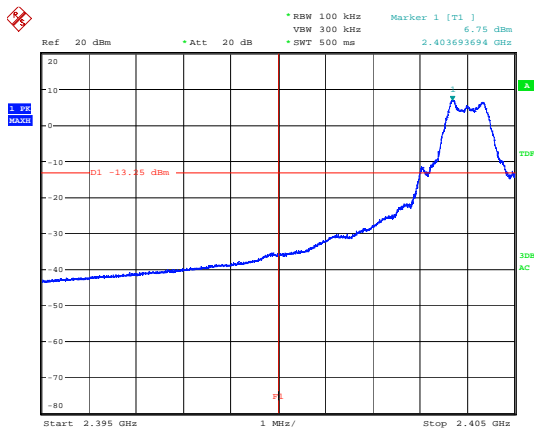




Tested Date: 19 May. 2015
 Humidity: 64 %

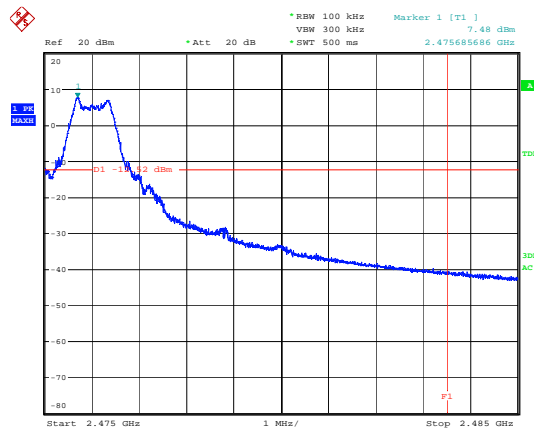
Temperature: 23 degC
 Atmos. Press: 1005 hPa

[Band edge]



Tested Date: 19 May. 2015
 Humidity: 64 %

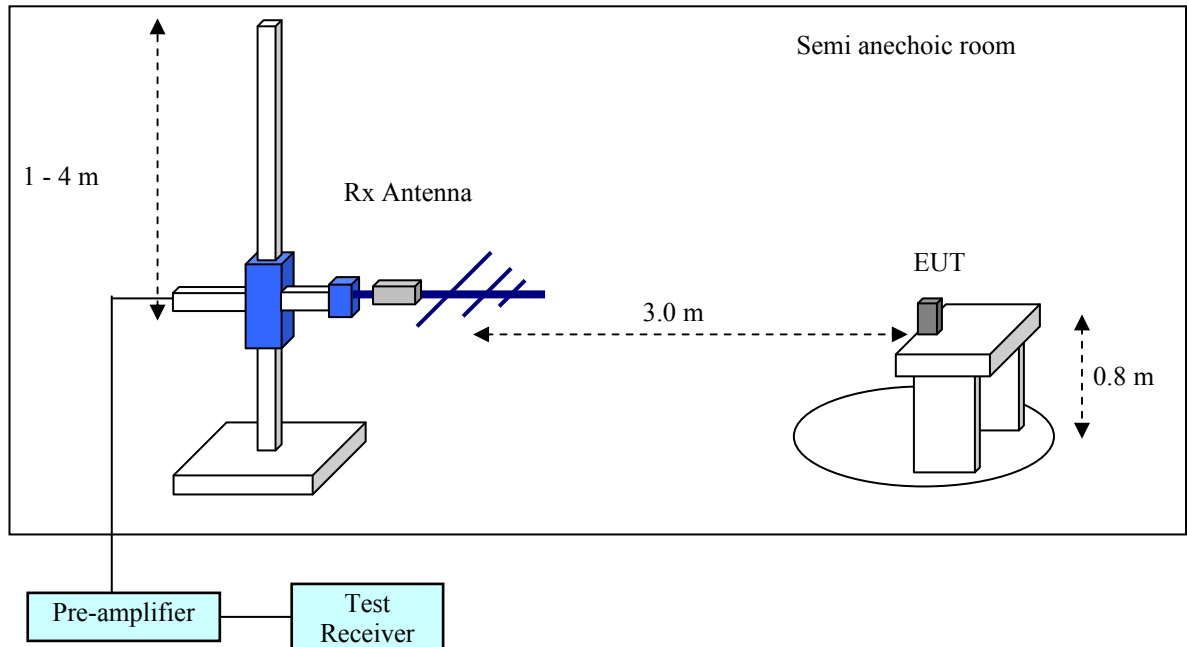
Temperature: 23 degC
 Atmos. Press: 1005 hPa



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 [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 | 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.

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

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

Test Data

Tested sample: A2

Operating mode: Tx (2404 MHz)

[Emission level] X-plane

Range: 30 - 1000 MHz

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

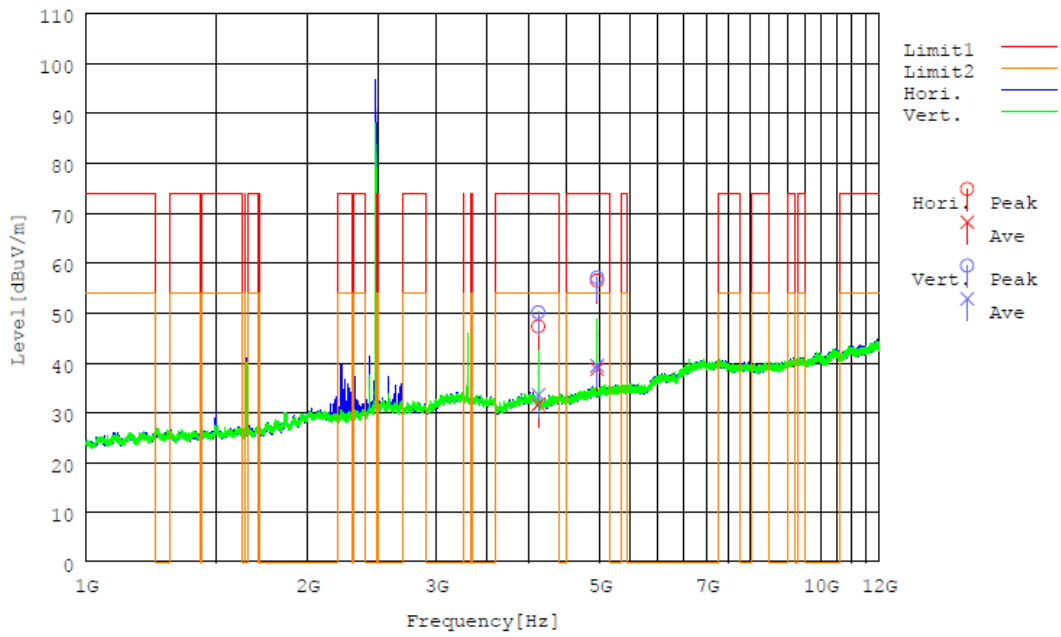
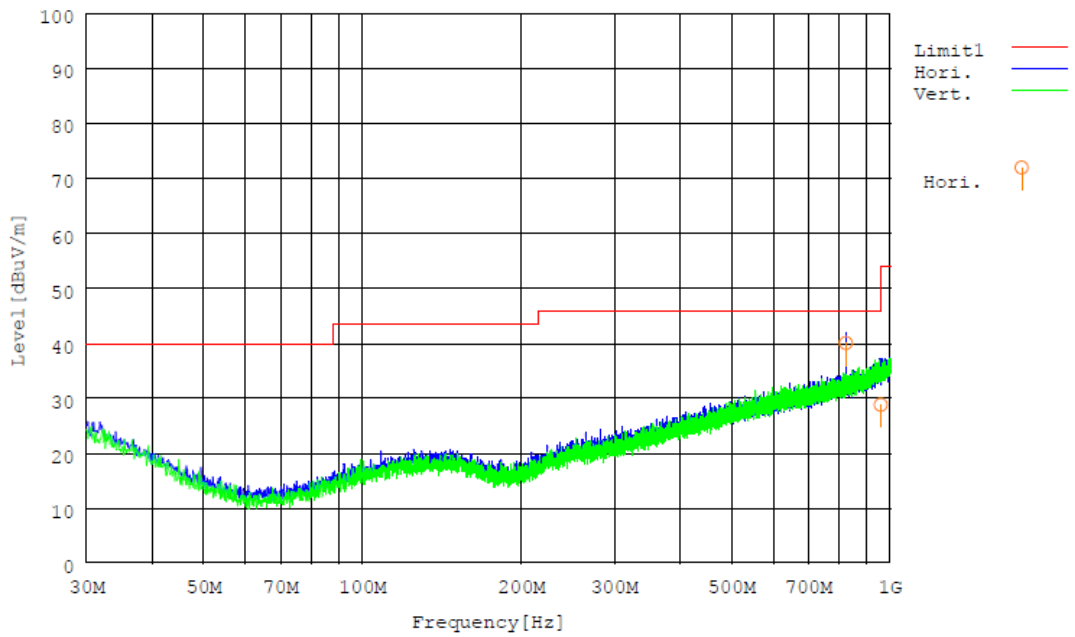
| No. | Frequency [MHz] | Reading [dB μ V] | Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dB μ V/m] | Limit [dB μ V/m] | Margin [dB] | Ant. |
|-----|-----------------|----------------------|---------------|-----------|-----------|-----------------------|----------------------|-------------|-------|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

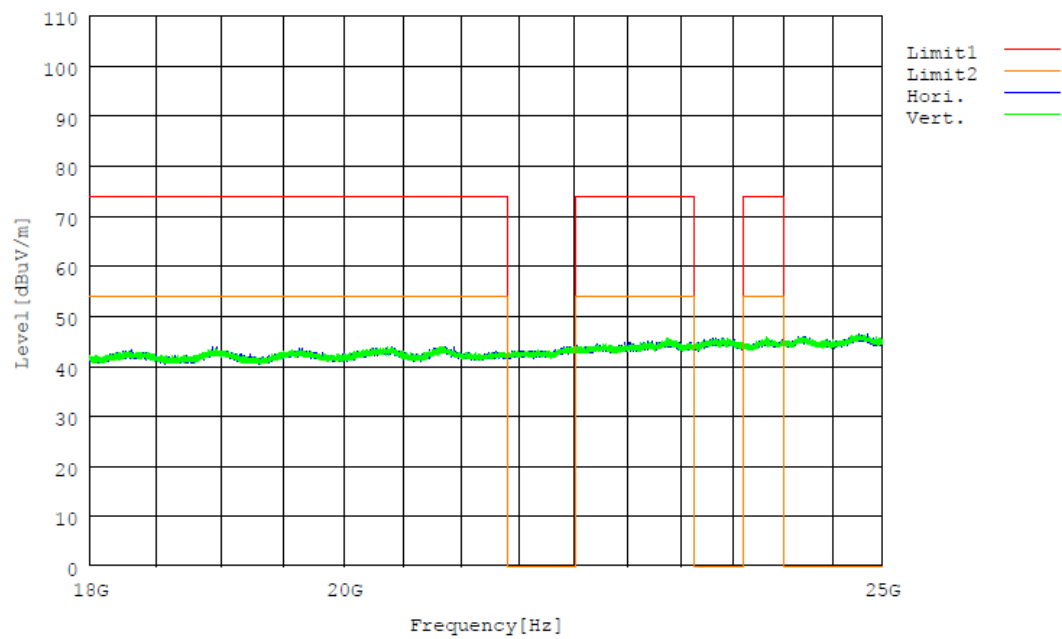
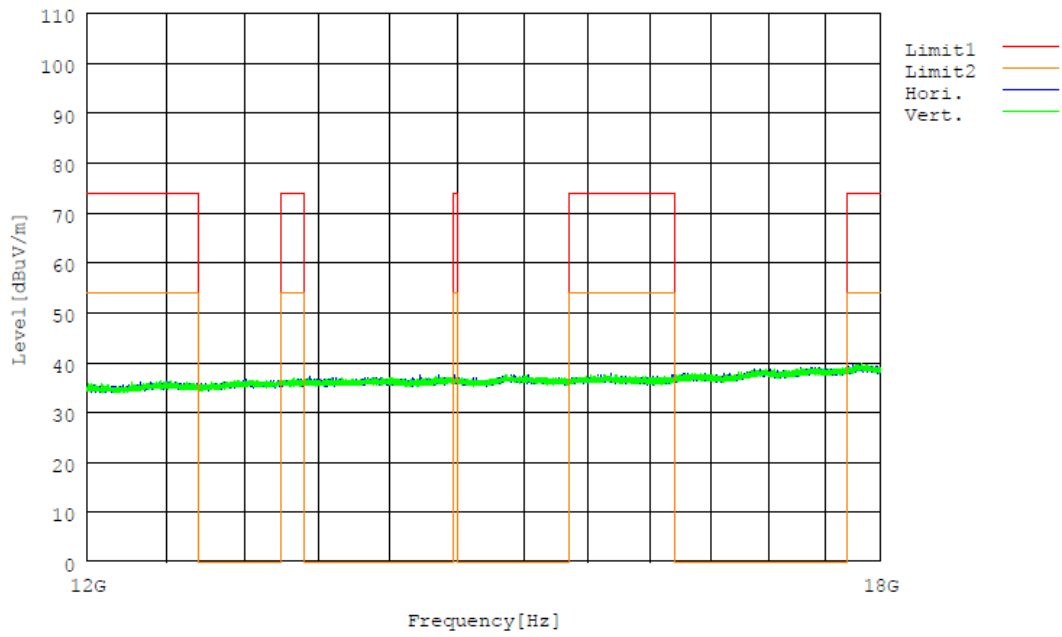
Range: 1 - 25 GHz

| No. | Frequency [MHz] | Reading PK [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] | 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)





[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. |

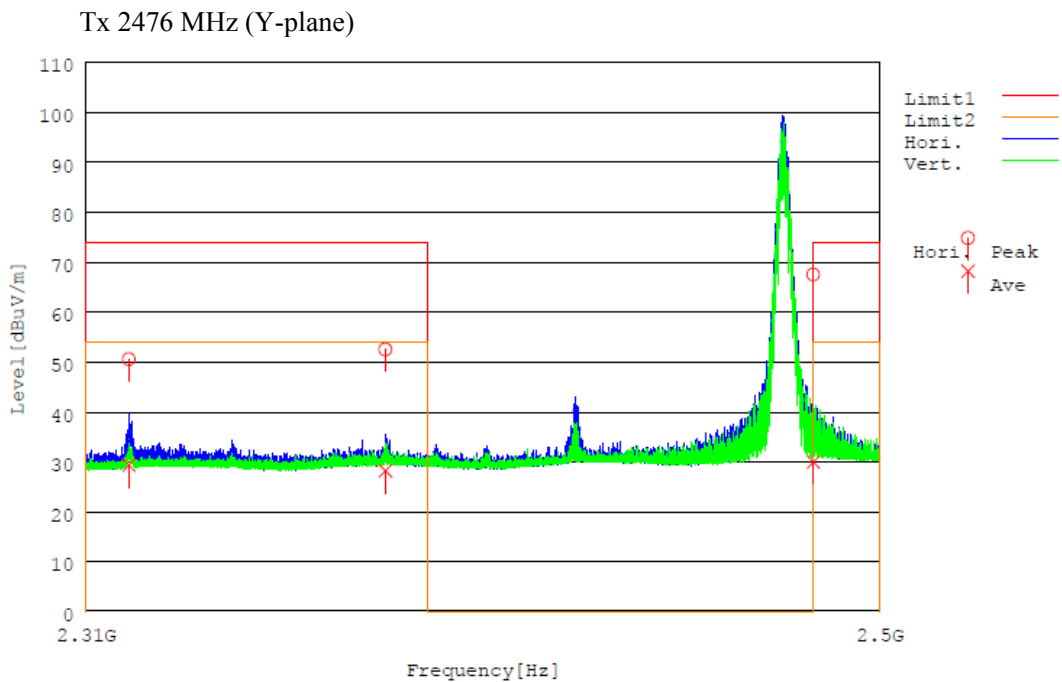
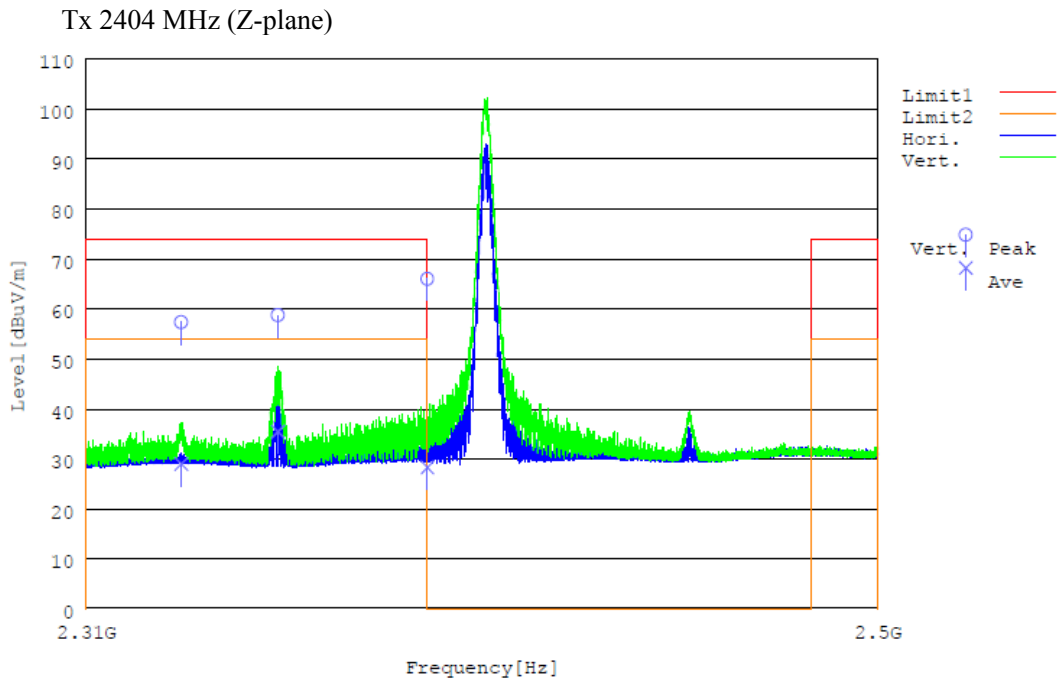
[Emission level] Y-plane

| 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]



| | | | |
|---------------|--------------|---------------|----------|
| 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 [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. 5.6

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.*

Test Data

Operating mode: -

[Emission level]

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

[Chart]

Operating mode: -

Tested Date: -
 Humidity: - %

Temperature: - degC
 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 | Biological 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 (E/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.