Report on the RF Testing of:

Japan Radio Co., Ltd.
IT Controller for mini excavators,
Model: JRN-330K
FCC ID: CKEJRN-330K

In accordance with FCC Part 24 Subpart E

Japan

Add value.
Inspire trust.

Prepared for: Japan Radio Co., Ltd.
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Phone : +81-26-214-0267 Fax: +81-26-214-5779

COMMERCIAL-IN-CONFIDENCE

Document Number: JPD-TR-18184-0

SIGNATURE			
Hiro Suzuki			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Hiroaki Suzuki	Deputy Manager of RF Group	Approved Signatory	13 DEC 2018

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Japan Ltd. document control rules.

EXECUTIVE SUMMARY
A sample(s) of this product was tested and found to be compliant with FCC Part 24 Subpart E.

NVLAP TESTING
NVLAP LAB CODE 200306-0

ilac-MRA

ACCREDIATION
This test report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, ILAC-MRA, or any agency of the federal government.

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Japan

Additional signatures required by FCC 47 CFR Part 2, § 2.938 (b) (10)

Signatures of the individuals responsible for testing the product

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC Part 15 Subpart B. The sample tested was found to be compliant with the requirements defined in the applied rules.

NAME	RESPONSIBLE FOR	SIGNATURE
Taiki Watanabe	Testing	Taiki Watanabe

Japan

Contents

Japan

1 Summary of Test

1.1 Modification history of the test report

Document Number	Modification History	Issue Date
JPD-TR-18184-0	First Issue	Refer to the cover page

1.2 Standards

CFR47 FCC Part 24 Subpart E

1.3 Test methods

KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-D-2010

1.4 Deviation from standards

None

1.5 List of applied test(s) of the EUT

Test item section	Test item	Condition	Result	Remark
2.1046	Conducted Output Power	Conducted	PASS	-
24.232(c)	Equivalent Isotropic Radiated Power	Radiated	PASS	-
24.232(d)	Peak to Average Ratio	Conducted	PASS	-
24.238(a) 2.1049	Occupied Bandwidth	Conducted	PASS	-
24.238(a) 2.1051	Band Edge Spurious and Harmonic at Antenna Terminal	Conducted	PASS	-
24.238(a) 2.1053	Radiated emissions and Harmonic Emissions	Radiated	PASS	-
24.235 2.1055	Frequency Stability	Conducted	PASS	-

1.6 Test information

None

1.7 Test set up

Table-top

1.8 Test period

14- November-2018 - 29- November -2018

Japan

2 Equipment Under Test

2.1 EUT information

Applicant	Japan Radio Co., Ltd. 21-11, Mure 6-Chome, Mitaka-shi, Tokyo 181-0002, Japan Phone : +81-26-214-0267 Fax: +81-26-214-5779
Equipment Under Test (EUT)	IT Controller for mini excavators
Model number	JRN-330K
Serial number	000000000073
Trade name	JRC
Number of sample(s)	1
EUT condition	Prototype
Power rating	DC 10-32V
Size	(W) 110 × (D) 50 × (H) 25 mm (excluding the protuberance)
Environment	Indoor and Outdoor use
Terminal limitation	-30˚C to 70˚C
RF Specification	
Frequency of Operation	Up Link WCDMA Band II: 1852.4-1907.6 MHz Down Link WCDMA Band II: 1932.4-1987.6 MHz
Modulation type	WCDMA Band II: QPSK, 16QAM
Emission designator	WCDMA Band II: 4M15F9W
Equivalent Isotropic Radiated Power (E.I.R.P.)	WCDMA Band II: 0.245 W (23.9 dBm)
Antenna type	Internal antenna
Antenna gain	WCDMA Band II: -0.7 dBi

Japan

2.2 Modification to the EUT

The table below details modifications made to the EUT during the test project.

Modification State	Description of Modification	Modification fitted by	Date of Modification
Model: JRN-330K, Serial Number: 000000000073			
0	As supplied by the applicant	Not Applicable	Not Applicable

2.3 Variation of family model(s)

2.3.1 List of family model(s)

Not applicable

2.3.2 Reason for selection of EUT

Not applicable

2.4 Description of test mode

The EUT had been tested under operating condition.
There are three channels have been tested as following:

Band	Channel	Frequency [MHz]
WCDMA Band II	9262	1852.4
	9400	1880.0
	9538	1907.6

The field strength of spurious emissions was measured at each position of all three axis X, Y and Z to compare the level, and the maximum noise.
The worst emission was found in X axis and the worst case recorded.

Japan

3 Configuration of Equipment

Numbers assigned to equipment on the diagram in “3.3 System configuration” correspond to the list in “3.1 Equipment used” and “3.2 Cable(s) used”.

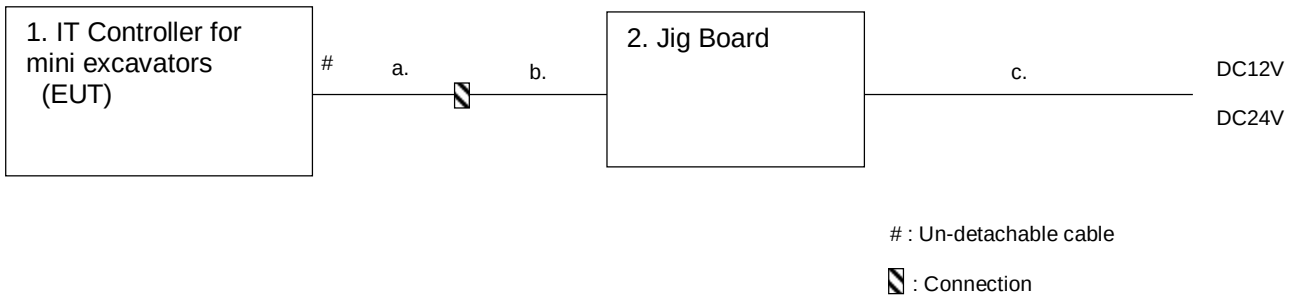
3.1 Equipment used

No.	Equipment	Company	Model No.	Serial No.	FCC ID/DoC	Comment
1	IT Controller for mini excavators	JRC	JRN-330K	000000000073	CKEJRN-330K	EUT
2	Jig Board	JRC	JRN-330K-JIG	N/A	-	-

3.2 Cable(s) used

No.	Cable	Length[m]	Shield	Comment
a	I/F Cable	0.2	No	Accessory
b	I/F Cable	2.0	No	-
c	DC cable	1.0	No	

3.3 System configuration



Japan

4 Test Result

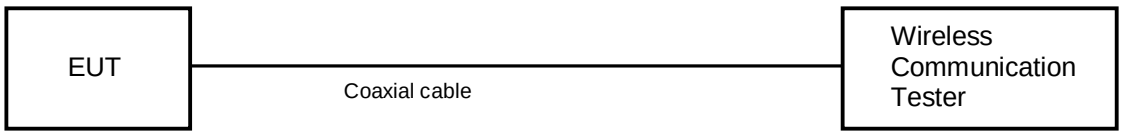
4.1 Conducted Output Power

4.1.1 Measurement procedure

[FCC 2.1046]

The conducted output power was measured with a wireless communication tester connected to the antenna terminal. The wireless communication tester parameters were set to produce the maximum power from the EUT.

- Test configuration



4.1.2 Measurement result

Date : 29-November-2018
Temperature : 21.1 [˚C]
Humidity : 44.3 [%]
Test place : Shielded room No.4

Test engineer : Taiki Watanabe

[WCDMA Band II (DC12V)]

3GPP Release Version	Mode		Sub-Test	Power [dBm]			MPR	Bc	ßd	Bc/ßd
	Channel			9262	9400	9538				
	Frequency [MHz]			1852.4	1880.0	1907.6				
99	W-CDMA	RMC	-	22.44	22.39	22.28	-	-	-	-
		AMR		-	-	-				
5	HSDPA (Cellular)		1	21.96	21.91	21.95	21.95	2/15	15/15	2/15
5			2	21.47	21.10	21.00	21.00	12/15	15/15	12/15
5			3	21.37	20.86	20.86	20.86	15/15	8/15	15/8
5			4	21.05	20.57	20.76	20.76	15/15	4/15	15/4
6	HSUPA		1	21.56	20.85	20.55	20.55	11/15	15/15	11/15
6			2	19.97	19.38	19.30	19.30	6/15	15/15	6/15
6			3	20.62	20.63	19.93	19.93	15/15	9/15	15/9
6			4	20.43	19.95	20.32	20.32	2/15	15/15	2/15
6			5	21.43	21.20	21.43	21.43	15/15	15/15	15/15

Japan

[WCDMA Band II (DC24V)]

3GPP Release Version	Mode		Sub-Test	Power [dBm]			MPR	Bc	ßd	Bc/ßd
	Channel			9262	9400	9538				
	Frequency [MHz]			1852.4	1880.0	1907.6				
99	W-CDMA	RMC	-	22.65	22.35	22.28	-	-	-	-
		AMR		-	-	-				
5	HSDPA (Cellular)		1	21.97	21.66	21.67	0	2/15	15/15	2/15
5			2	21.53	21.41	21.51	0	12/15	15/15	12/15
5			3	21.24	20.68	20.67	0.5	15/15	8/15	15/8
5			4	21.14	20.70	20.84	0.5	15/15	4/15	15/4
6	HSUPA		1	21.08	20.55	21.20	0	11/15	15/15	11/15
6			2	19.90	19.42	19.88	2	6/15	15/15	6/15
6			3	20.93	20.64	19.96	1	15/15	9/15	15/9
6			4	20.56	20.40	20.33	2	2/15	15/15	2/15
6			5	21.62	21.43	21.30	0	15/15	15/15	15/15

4.2 Equivalent Isotropic Radiated Power

4.2.1 Measurement procedure

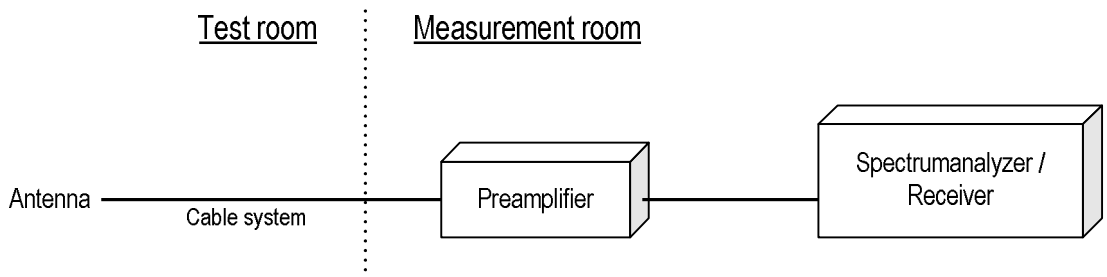
[FCC 24.232(c)]

<Step 1>
The EUT and support equipment are placed on a 0.6 meter x 0.6 meter surface, 0.8 meter height styrene foam table. Radiated emission measurements are performed at 3 meter distance with the broadband antenna (double ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1 to 4 meters and stopped at height producing the maximum emission.
The bandwidth of the spectrum analyzer is set to 1 MHz. The turntable is rotated by 360 degrees and stopped at azimuth of producing the maximum emission.

<Step 2>
The substitution antenna is replaced by the transmitter antenna (EUT).
The frequency of the signal generator is adjusted to the measurement frequency.
Level of the signal generator is adjusted to the level that is obtained from step 1, and record the emission level of signal generator.

The spectrum analyzer is set to;
a) Span = 1.5 times the OBW
b) RBW = 1-5% of the expected OBW, not to exceed 1 MHz
c) VBW ≥ 3 x RBW
d) Number of sweep points ≥ 2 x span / RBW
e) Sweep time = auto-couple
f) Detector = RMS (power averaging)
g) If the EUT can be configured to transmit continuously (i.e., burst duty cycle ≥ 98%), then set the trigger to free run.
h) If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle < 98 %), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.
i) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

- Test configuration



4.2.2 Calculation method

Result(EIRP) = Ant. Input - Cable loss + Antenna Gain
Margin = Limit – Result (EIRP)

Example:
Limit @ 1880 MHz : 33.0 dBm
Ant. Input = 19.3 dBm Cable loss = 1.1dB Ant. Gain = 8.3 dBi
Result = 19.3 - 1.1 + 8.3 = 26.5 dBm
Margin = 33.0 - 26.5 = 6.5 dB

4.2.3 Limit

2 W (33 dBm)

Japan

4.2.4 Test data

Date : 14-November-2018
Temperature : 18.8 [˚C]
Humidity : 35.3 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

Date : 15-November-2018
Temperature : 20.7 [˚C]
Humidity : 31.8 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

[WCDMA Band II (DC12V)]

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1852.4	-28.5	15.2	1.2	8.4	22.5	33.0	10.5
H	1880.0	-30.6	13.7	1.2	8.4	20.9	33.0	12.1
H	1907.6	-31.9	14.2	1.2	8.3	21.3	33.0	11.7

[WCDMA Band II (DC24V)]

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1852.4	-27.1	16.6	1.2	8.4	23.9	33.0	9.1
H	1880.0	-29.7	14.6	1.2	8.4	21.8	33.0	11.2
H	1907.6	-30.9	15.2	1.2	8.3	22.3	33.0	10.7

4.3 Peak to Average Ratio

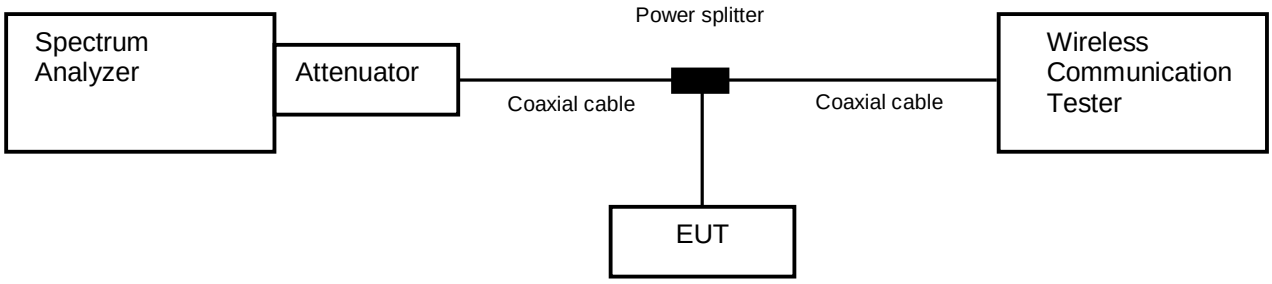
4.3.1 Measurement procedure

[FCC 24.232(d)]

The peak to average ratio was measured with a spectrum analyzer connected to the antenna terminal.

The spectrum analyzer is set to;
a) Power Stat CCDF mode
b) Set resolution / measurement bandwidth ≥ signal's occupied bandwidth.
c) Set the number of counts to a value that stabilizes the measured CCDF curve.
d) Set the measurement interval as follows:
   1) For continuous transmissions, set to 1ms.
   2) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst duration.
e) Record the maximum PAPR level associated with a probability of 0.1%.

- Test configuration



4.3.2 Limit

13 dB or less

Japan

4.3.3 Measurement result

Date : 27-November-2018
Temperature : 21.8 [˚C]
Humidity : 45.9 [%]
Test place : Shielded room No.4
Test engineer : Taiki Watanabe

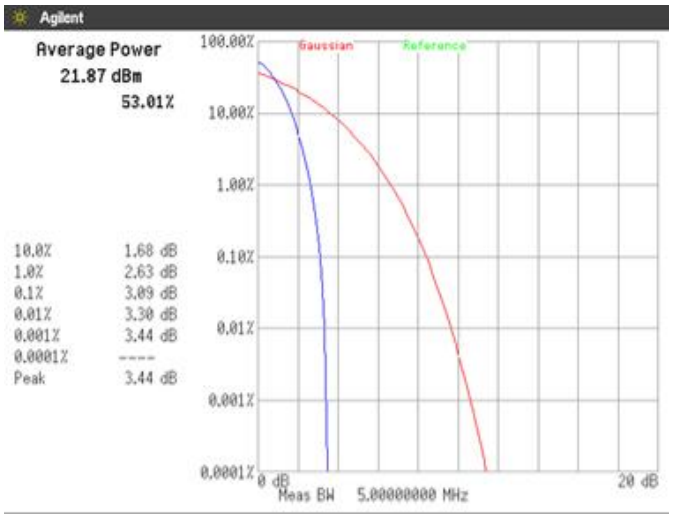
Band	Channel	Frequency [MHz]	Peak to Average Power Ratio [dB]	Limit [dB]
WCDMA Band V (DC12V)	9262	1852.4	3.09	13.0
	9400	1880.0	3.23	
	9538	1907.6	3.23	
WCDMA Band V (DC24V)	9262	1852.4	3.06	13.0
	9400	1880.0	3.24	
	9538	1907.6	3.21	

Japan

4.3.4 Trace data

[WCDMA Band II (DC12V)]

Channel: 9262



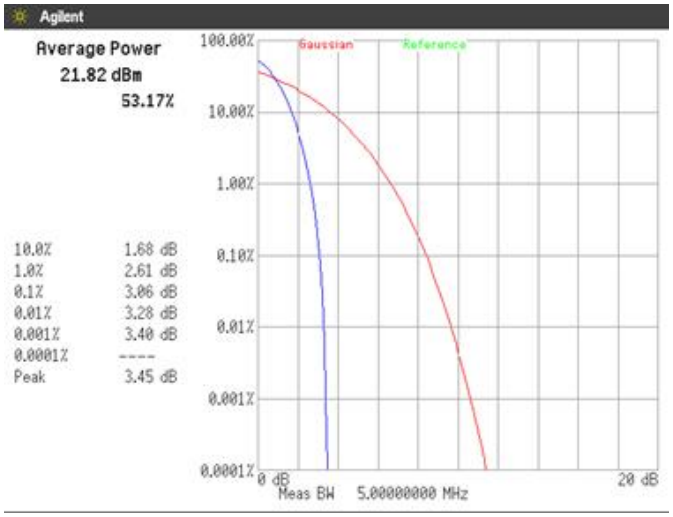
Channel: 9400

Channel: 9538

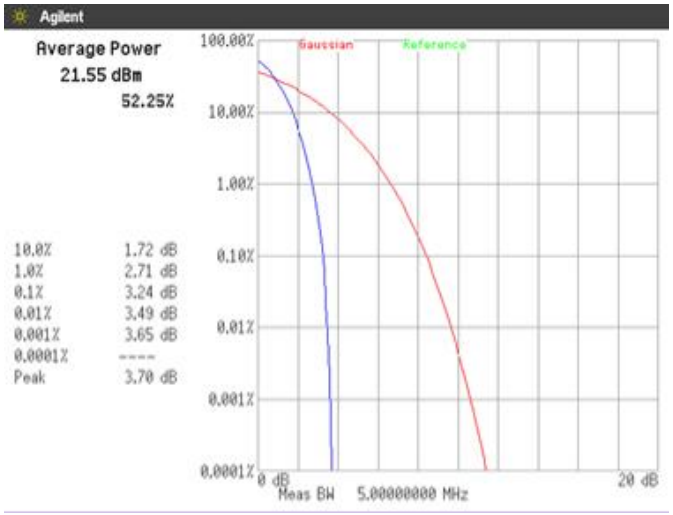
Japan

[WCDMA Band II (DC24V)]

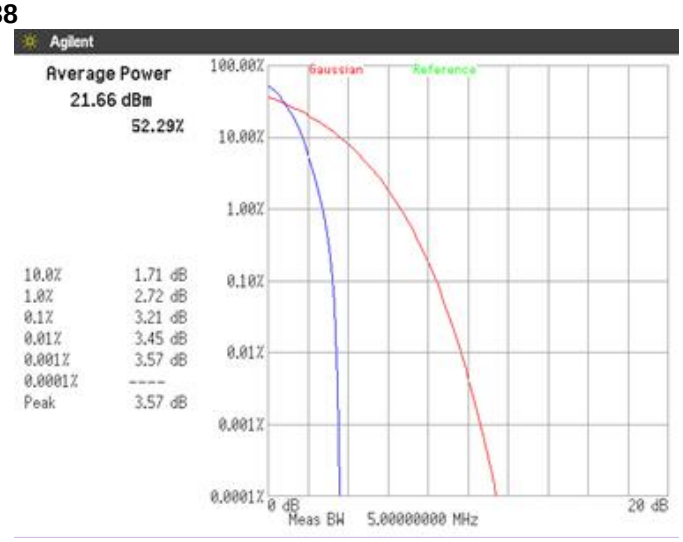
Channel: 9262



Channel: 9400



Channel: 9538



Japan

4.4 Occupied Bandwidth

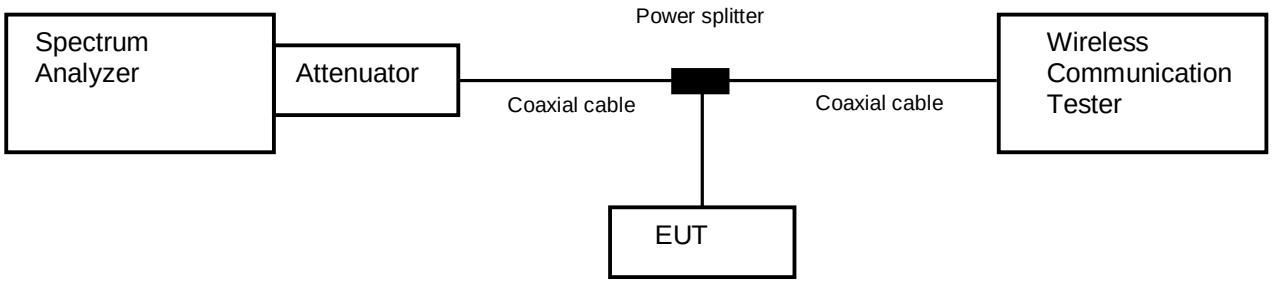
4.4.1 Measurement procedure

[FCC 24.238(a), 2.1049]

The Occupied bandwidth was measured with a spectrum analyzer connected to the antenna terminal.

The spectrum analyzer is set to;
a) RBW = 1-5% of the expected OBW & VBW ≥ 3 x RBW
b) Detector = Peak
c) Trace mode = Max hold
d) Sweep time = auto-couple

- Test configuration



4.4.2 Limit

None

Japan

4.4.3 Measurement result

Date : 27-November-2018
Temperature : 21.8 [˚C]
Humidity : 45.9 [%] Test engineer :
Test place : Shielded room No.4 Taiki Watanabe

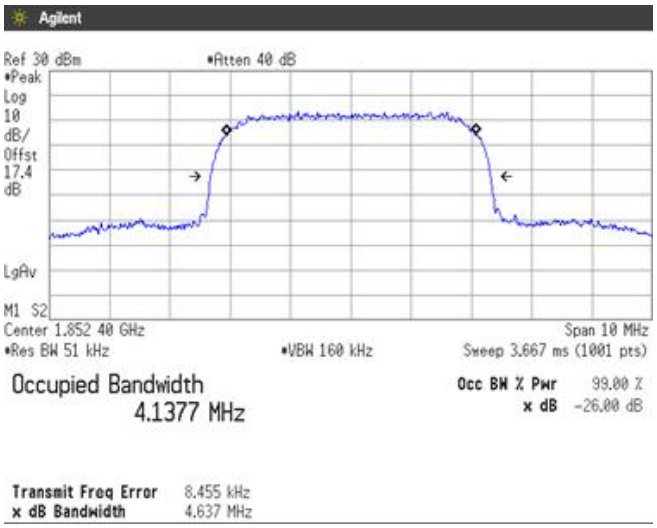
Band	Channel	Frequency [MHz]	Test Result [MHz]
WCDMA Band V (DC12V)	9262	1852.4	4.1377
	9400	1880.0	4.1429
	9538	1907.6	4.1420
WCDMA Band V (DC24V)	9262	1852.4	4.1326
	9400	1880.0	4.1368
	9538	1907.6	4.1463

Japan

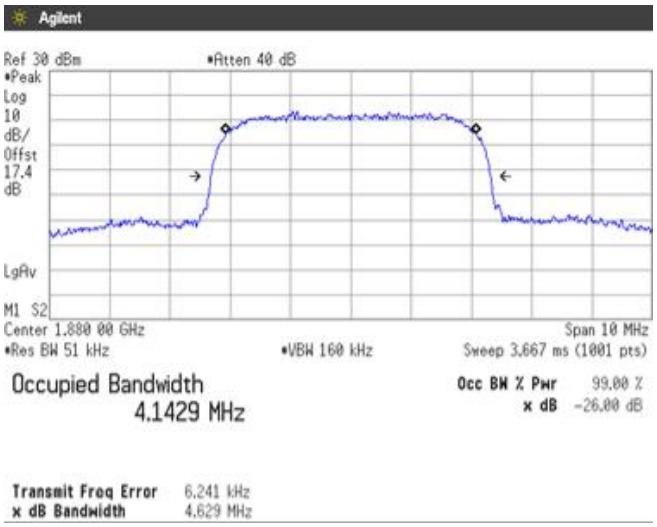
4.4.4 Trace data

[WCDMA Band II (DC12V)]

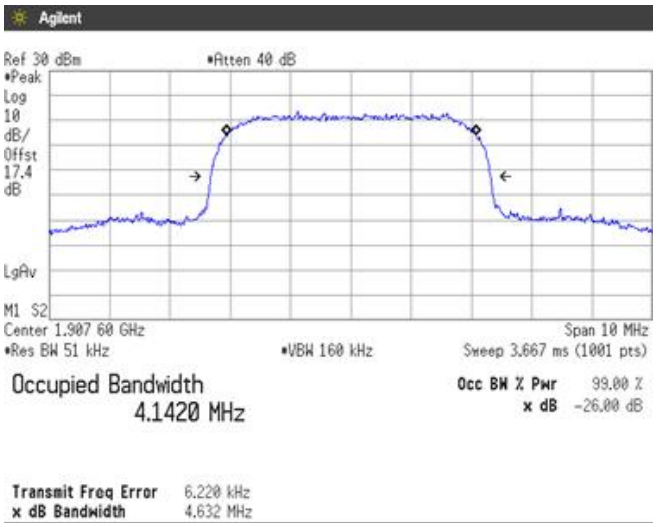
Channel: 9262



Channel: 9400

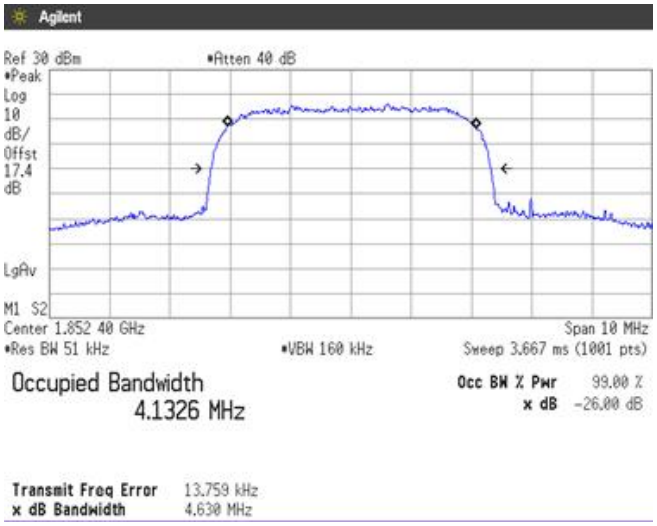


Channel: 9538



[WCDMA Band II (DC24V)]

Channel: 9262



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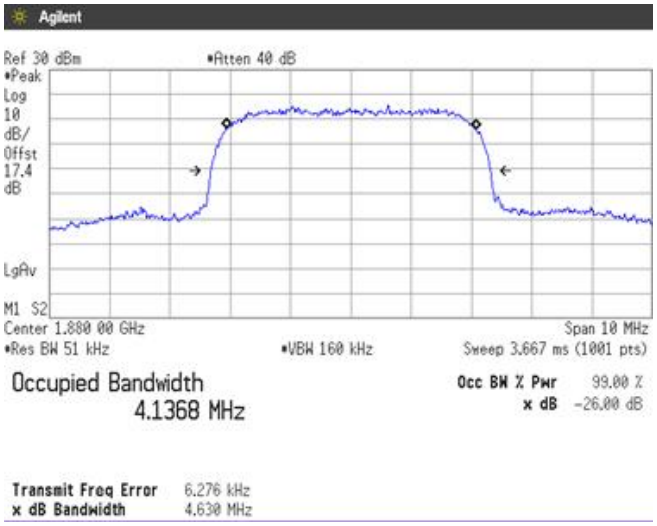
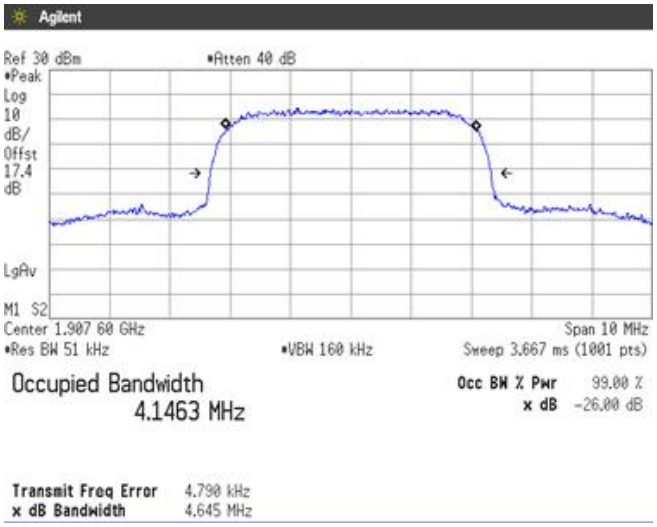


Channel: 9538



Japan

4.5 Band Edge Spurious and Harmonic at Antenna Terminals

4.5.1 Measurement procedure

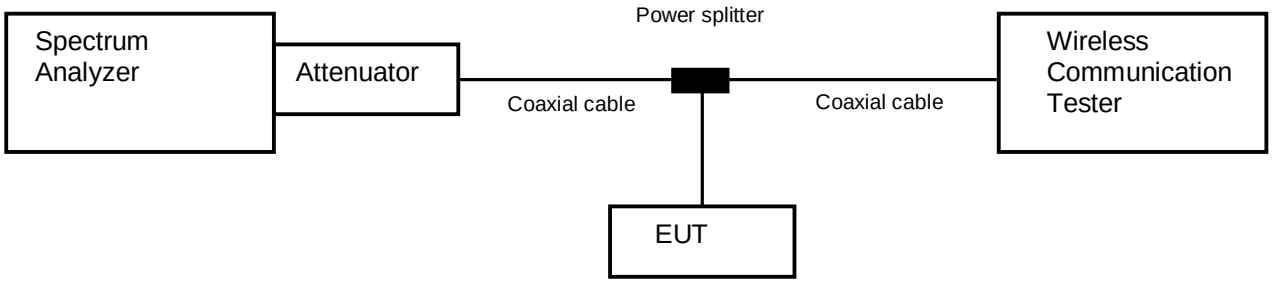
[FCC 24.238(a), 2.1051]

The band edge spurious and harmonic was measured with a spectrum analyzer connected to the antenna terminal.

The spectrum analyzer is set to;
<Band Edge>
a) Span was set large enough so as to capture all out of band emissions near the band edge
b) RBW ≥ 1% of the emission bandwidth or 2% of the emission bandwidth
c) VBW ≥ 3 x RBW
d) Detector = RMS
e) Trace mode = Max hold
f) Sweep time = auto-couple
g) Number of sweep point ≥ 2 x span / RBW

<Spurious Emissions>
a) RBW = 1MHz & VBW ≥ 3 x RBW
b) Detector = Peak
c) Trace mode = Max hold
d) Sweep time = auto-couple
e) Number of sweep point ≥ 2 x span / RBW

- Test configuration



4.5.2 Limit

-13 dBm or less

Japan

4.5.3 Measurement result

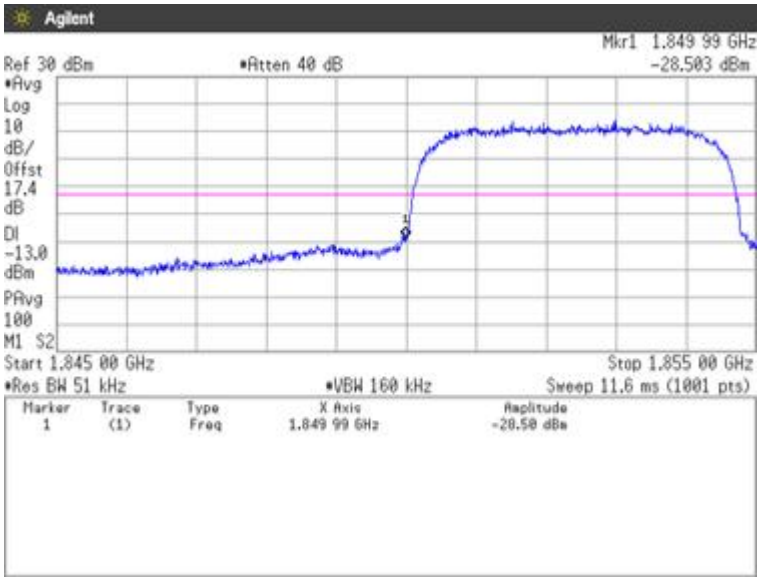
Date : 27-November-2018
Temperature : 21.8 [˚C]
Humidity : 45.9 [%] Test engineer :
Test place : Shielded room No.4 Taiki Watanabe

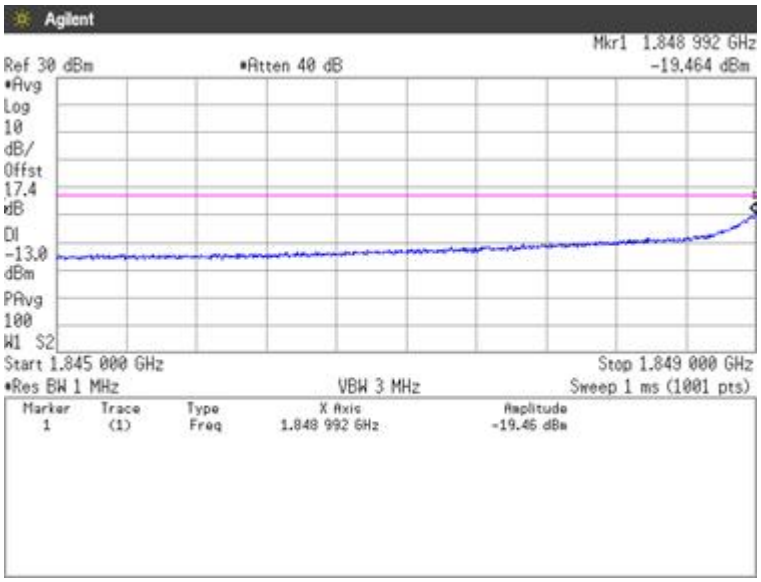
Band	Channel	Frequency [MHz]	Limit [dB]	Results	
WCDMA Band II	9262	1852.4	-13.0	See the trace data	PASS
	9400	1880.0	-13.0	See the trace data	PASS
	9538	1907.6	-13.0	See the trace data	PASS

Japan

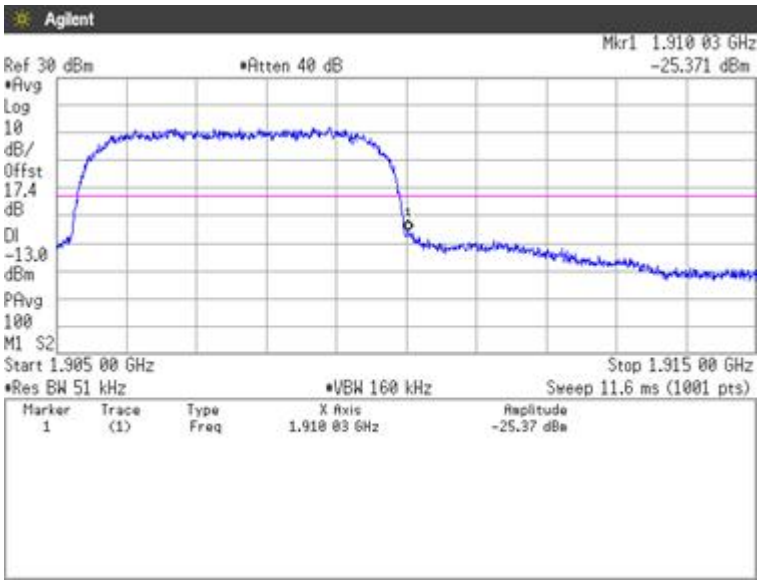
4.5.4 Trace data

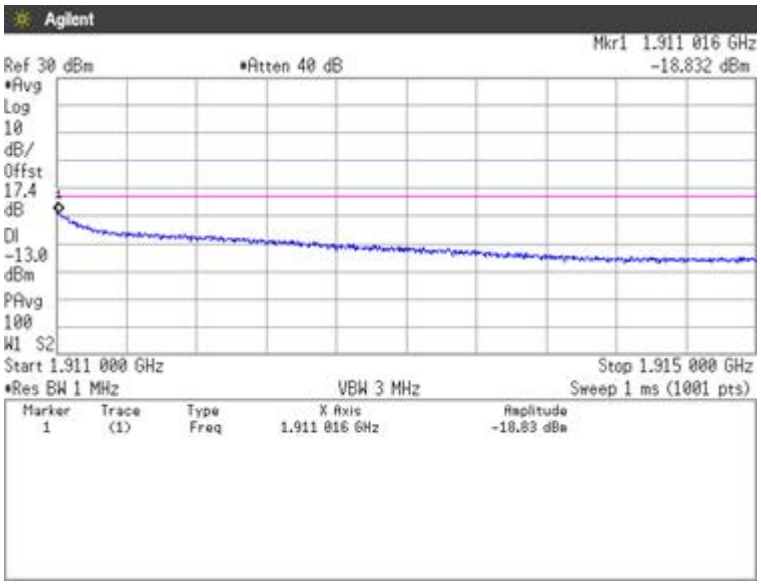
[WCDMA Band II (DC12V)]
(Band Edge)
Channel: 9262





Channel: 9538



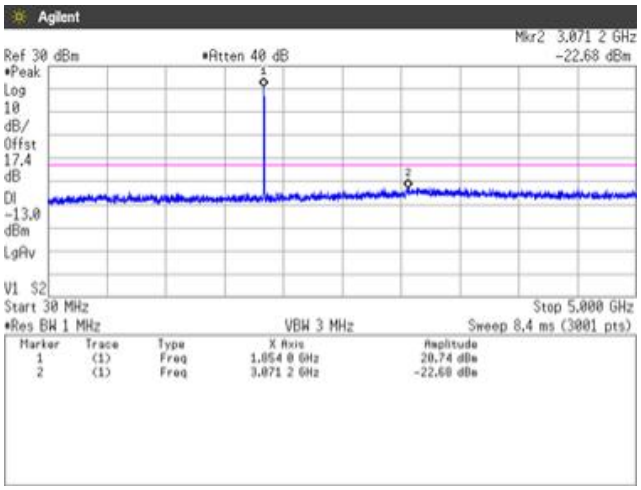


Japan

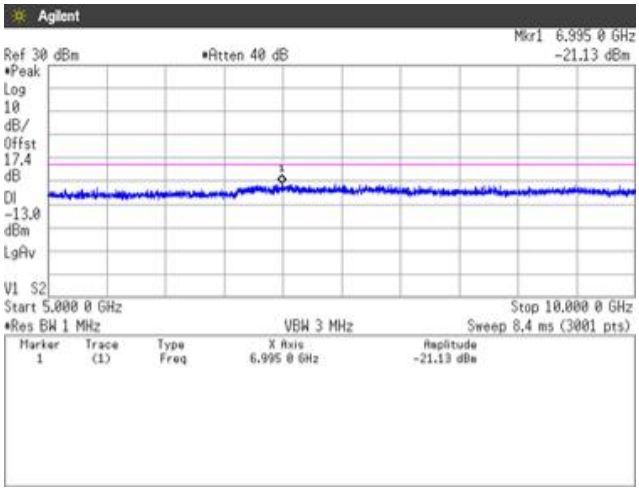
(Spurious Emissions)
Note: Conducted spurious test was measured in the worst case of conducted output power.

Channel: 9262

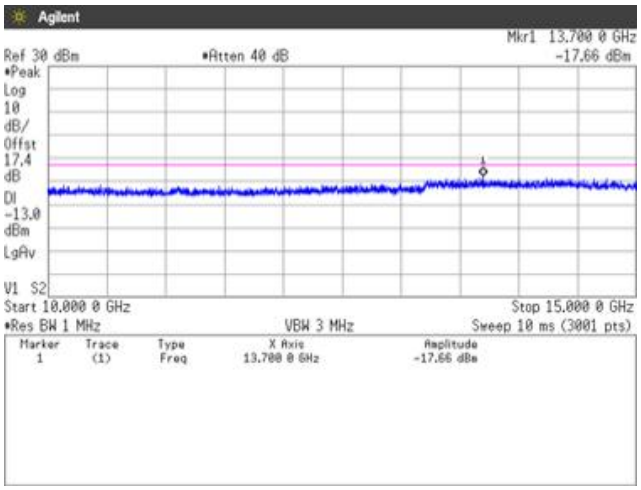
30MHz-5GHz



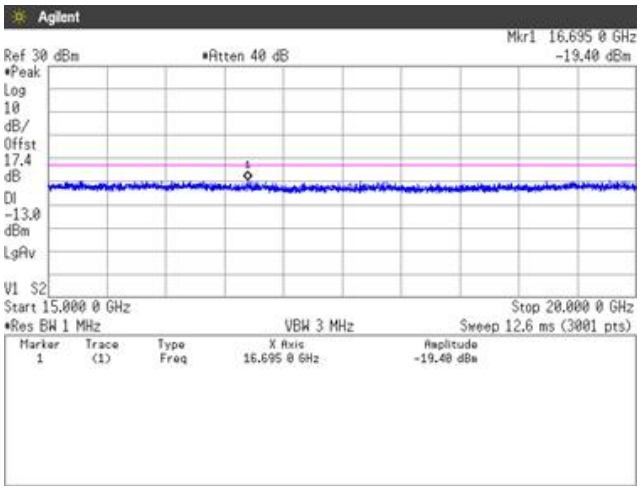
5GHz-10GHz



10GHz-15GHz

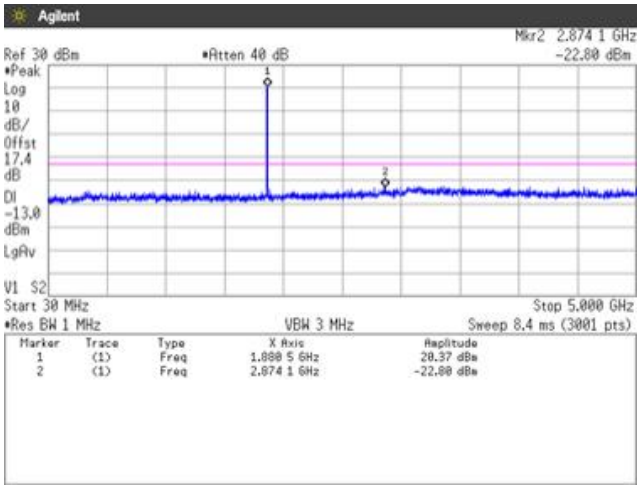


15GHz-20GHz

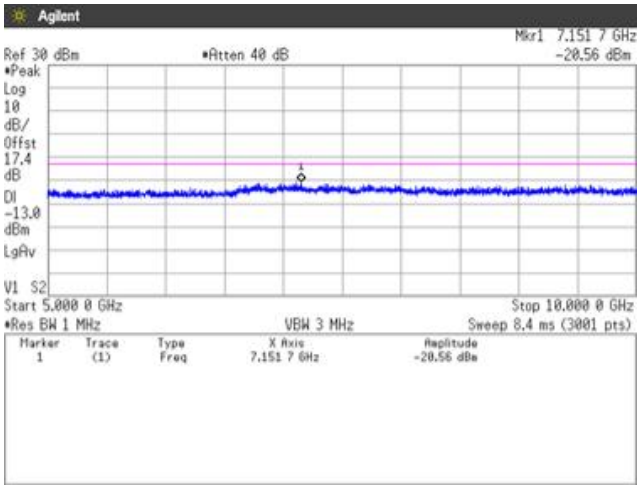


Channel: 9400

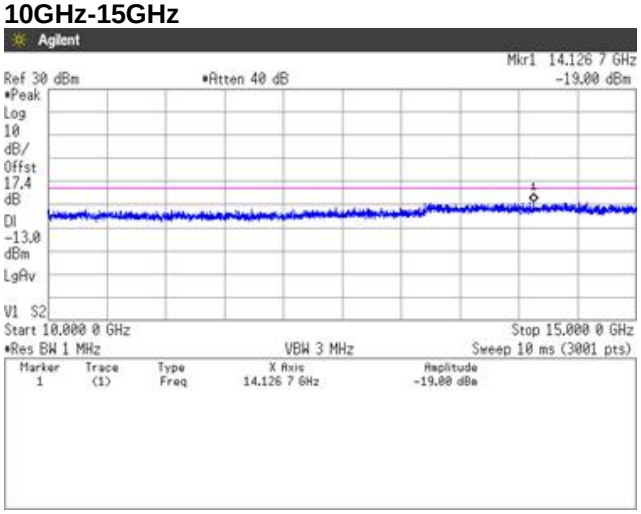
30MHz-5GHz



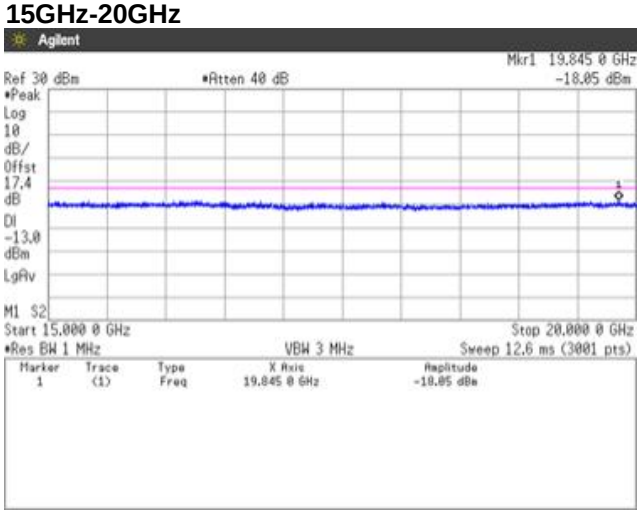
5GHz-10GHz



10GHz-15GHz

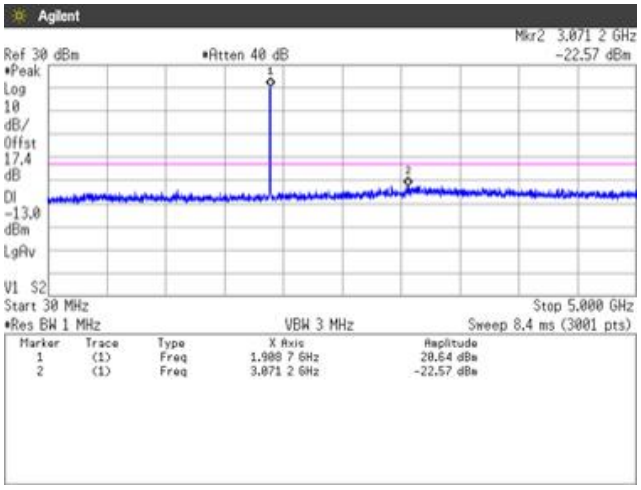


15GHz-20GHz

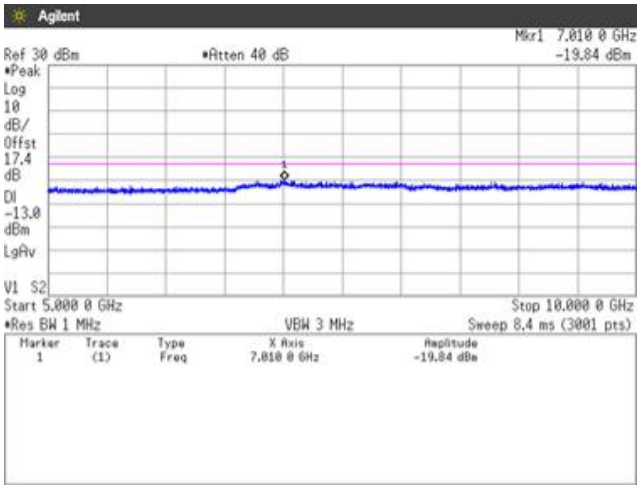


Channel: 9538

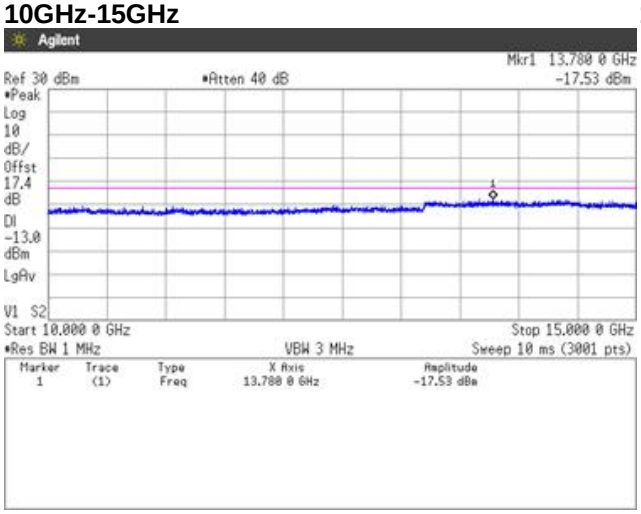
30MHz-5GHz



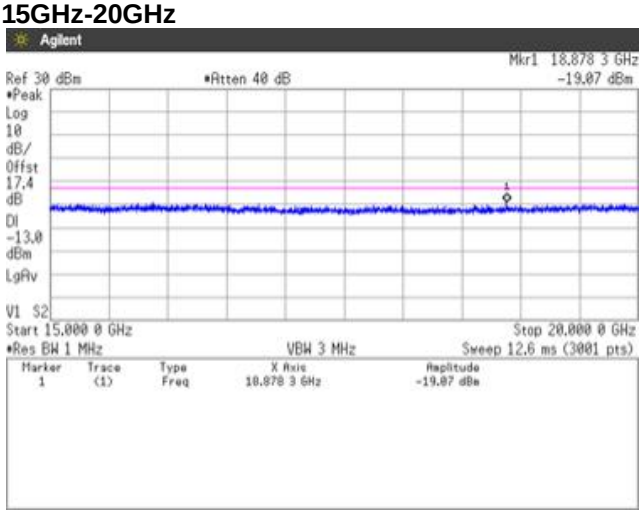
5GHz-10GHz



10GHz-15GHz

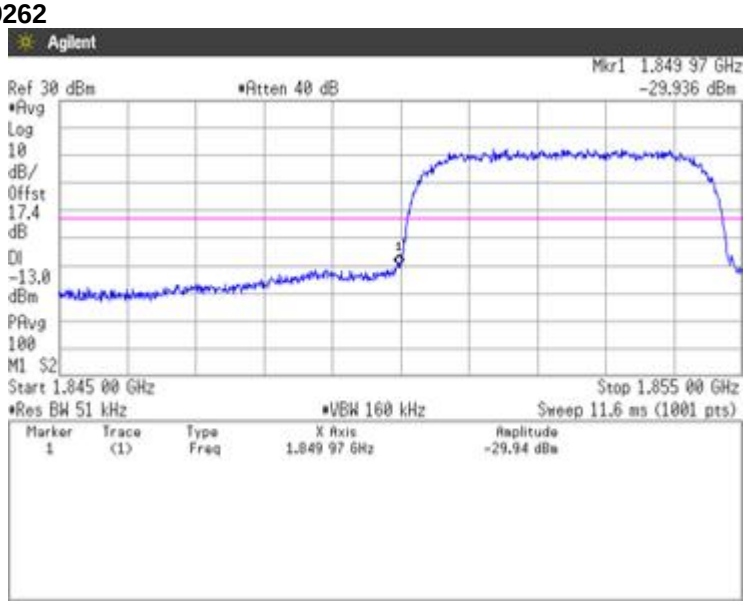


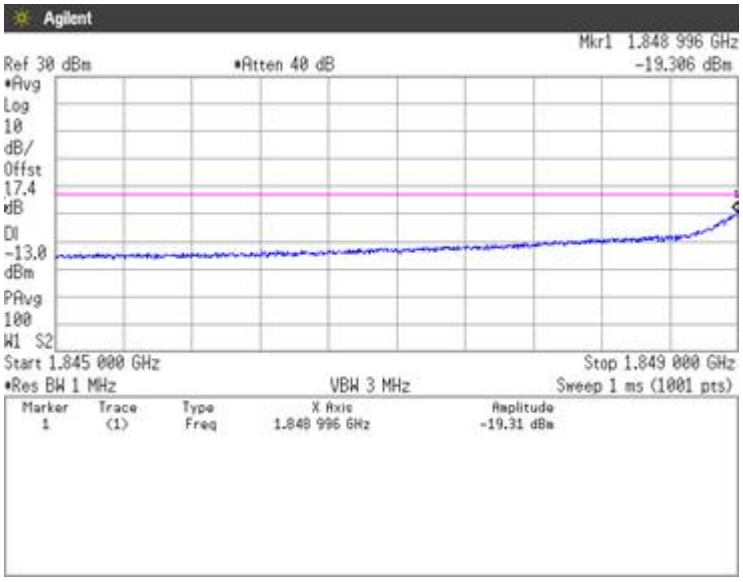
15GHz-20GHz



Japan

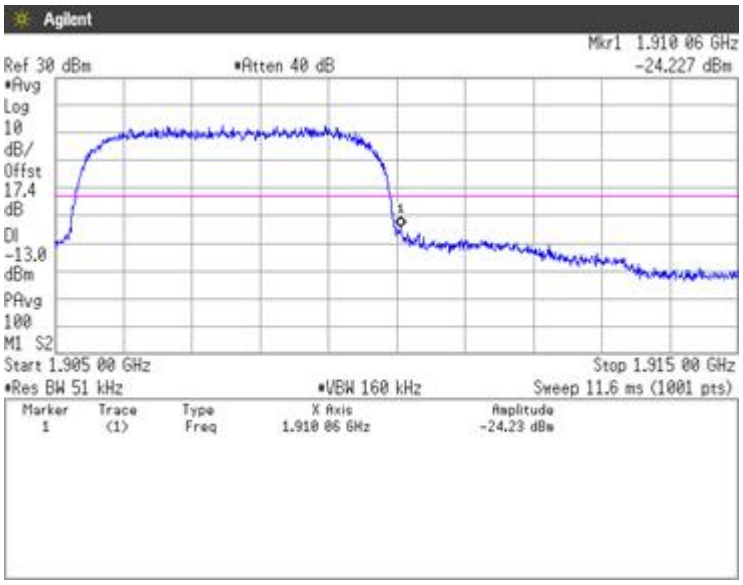
[WCDMA Band II (DC24V)]
(Band Edge)
Channel: 9262

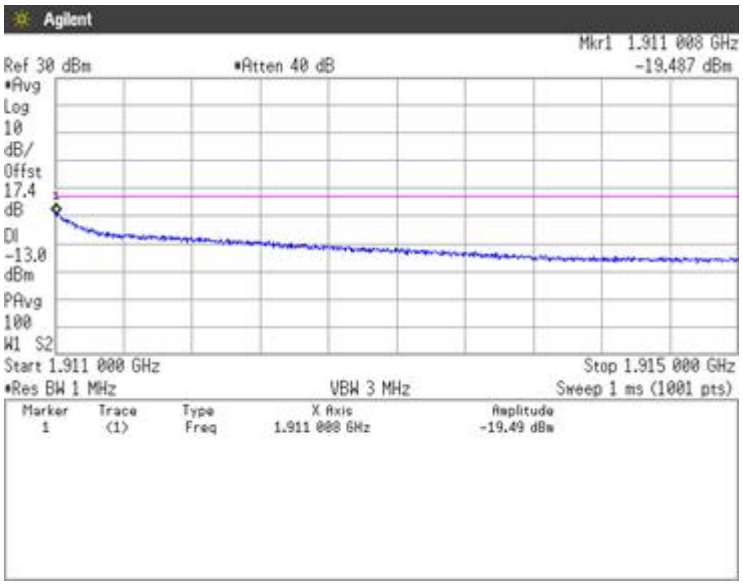




Japan

Channel: 9538



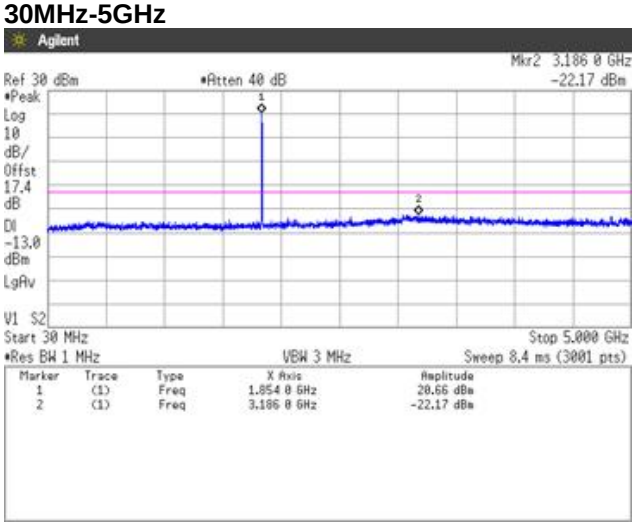


Japan

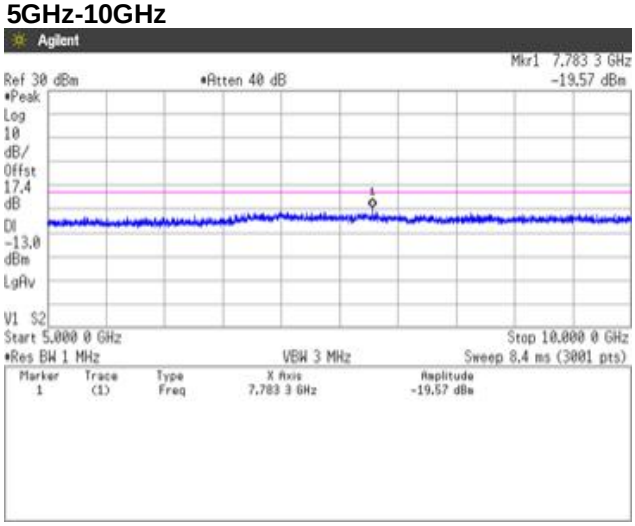
(Spurious Emissions)
Note: Conducted spurious test was measured in the worst case of conducted output power.

Channel: 9262

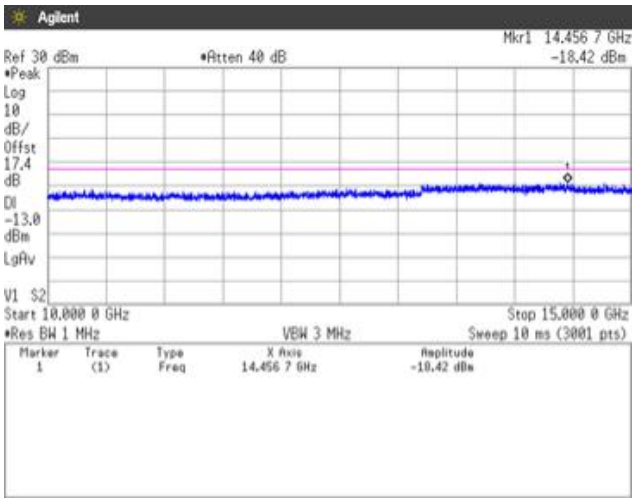
30MHz-5GHz



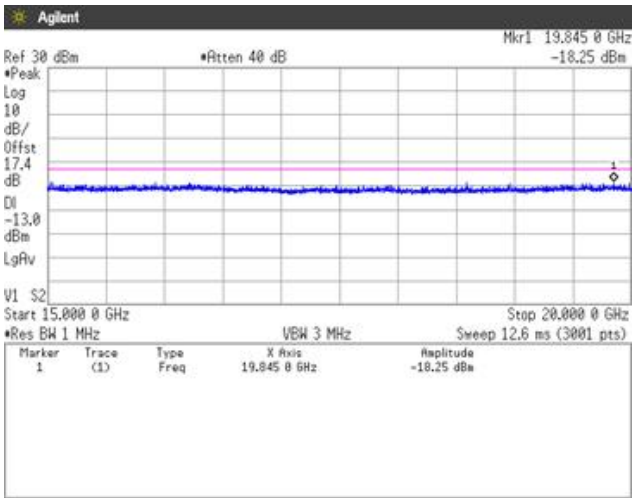
5GHz-10GHz



10GHz-15GHz

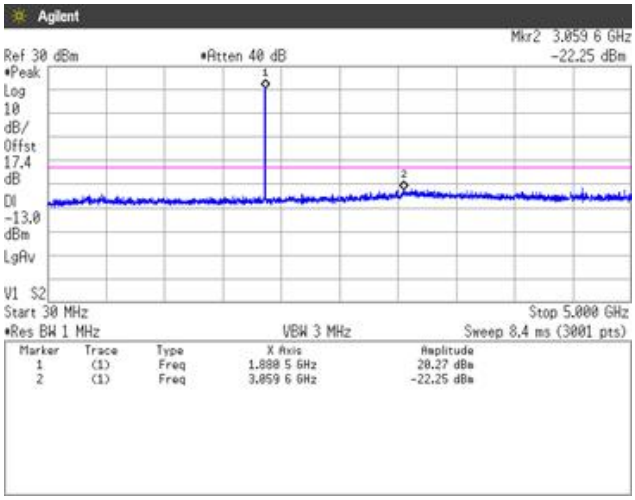


15GHz-20GHz

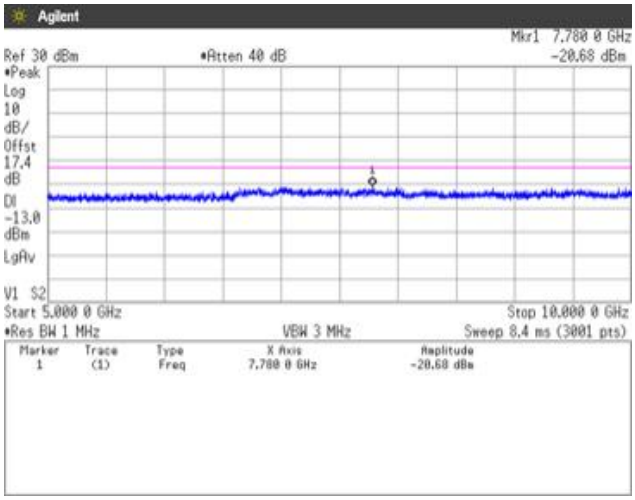


Channel: 9400

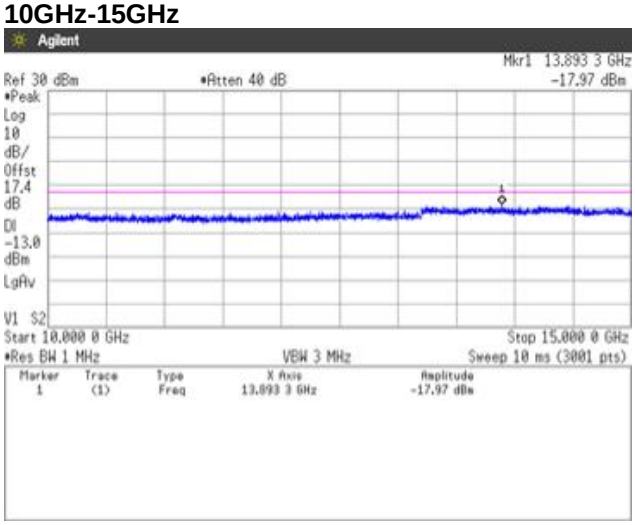
30MHz-5GHz



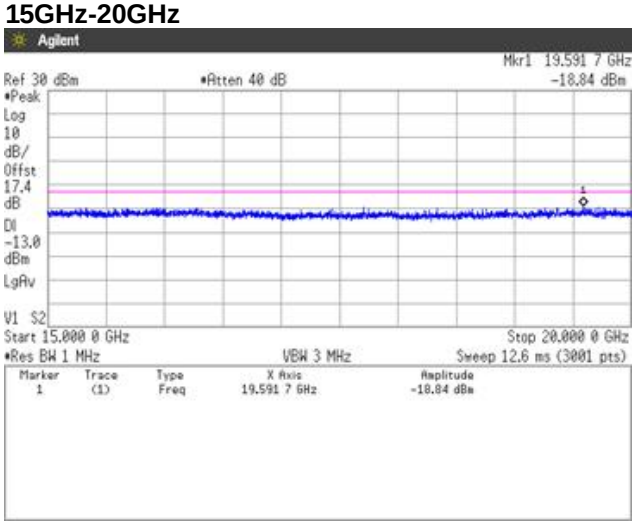
5GHz-10GHz



10GHz-15GHz

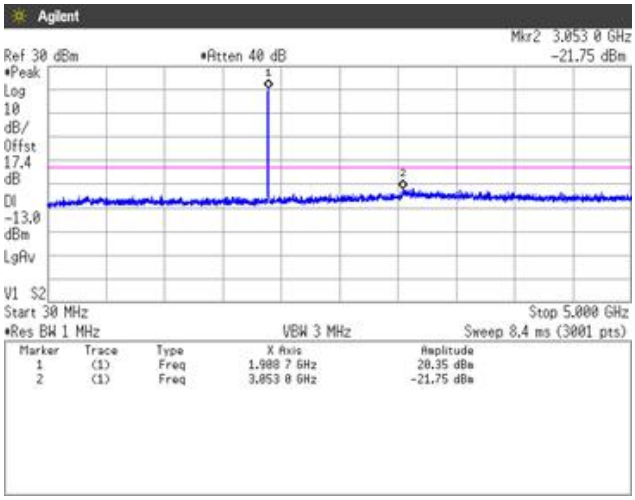


15GHz-20GHz

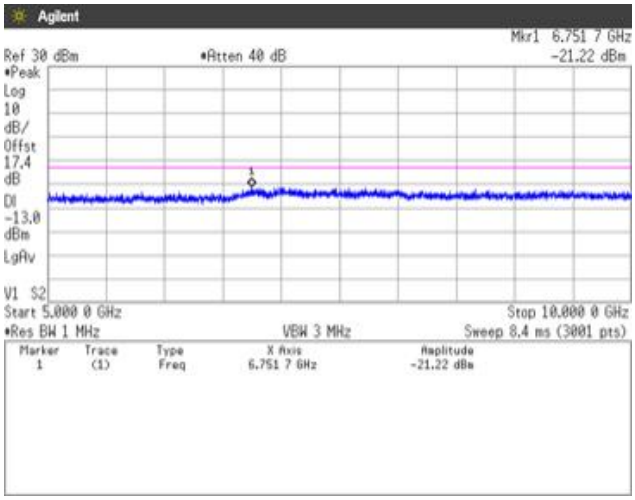


Channel: 9538

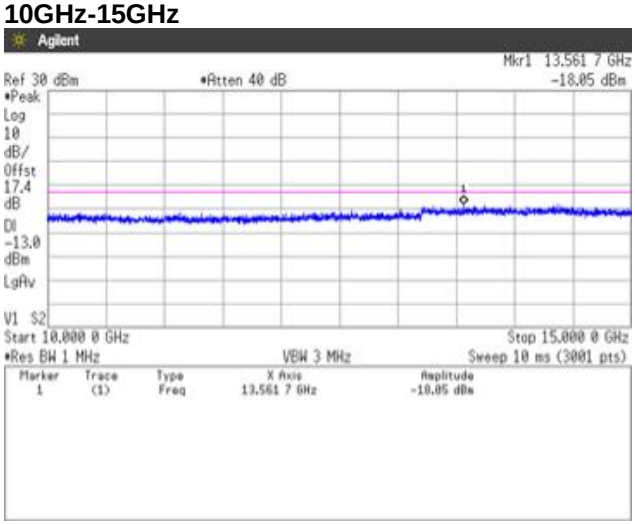
30MHz-5GHz



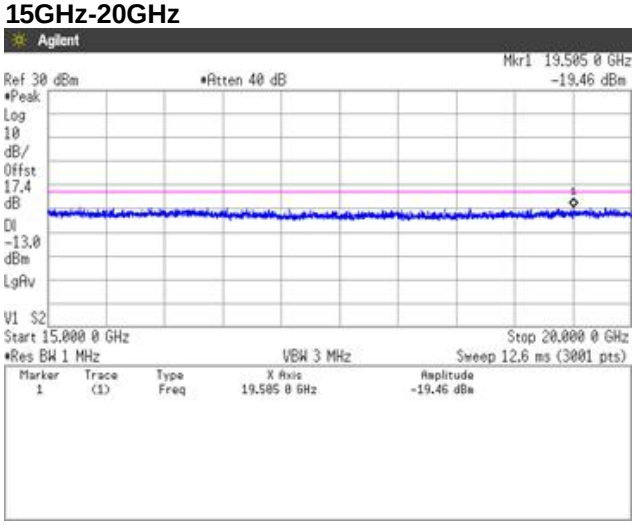
5GHz-10GHz



10GHz-15GHz



15GHz-20GHz



Japan

4.6 Radiated Emissions and Harmonic Emissions

4.6.1 Measurement procedure

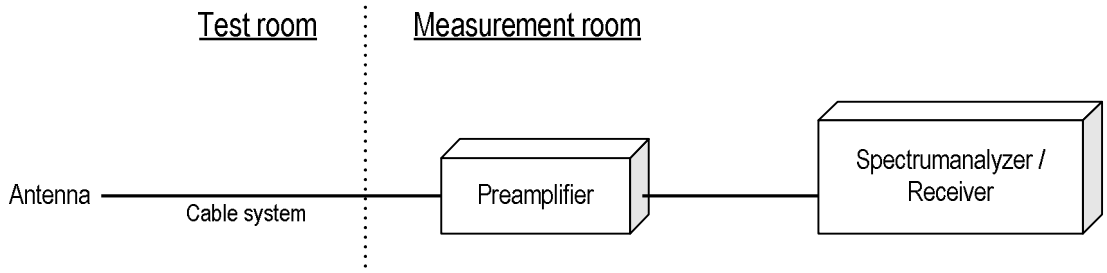
[FCC 24.238(a), 2.1053]

<Step 1>
The EUT and support equipment are placed on a 0.6 meter x 0.6 meter surface, 0.8 meter height styrene foam table. Radiated emission measurements are performed at 3 meter distance with the broadband antenna (Biconical antenna, Log periodic antenna and double ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1 to 4 meters and stopped at height producing the maximum emission.
The bandwidth of the spectrum analyzer is set to 1 MHz. The turntable is rotated by 360 degrees and stopped at azimuth of producing the maximum emission. The frequency is investigated up to 20 GHz.

<Step 2>
The substitution antenna is replaced by the transmitter antenna (EUT).
The frequency of the signal generator is adjusted to the measurement frequency.
Level of the signal generator is adjusted to the level that is obtained from step 1, and record the emission level of signal generator.

The spectrum analyzer is set to;
a) RBW = 100 kHz for below 1 GHz and 1 MHz for above 1 GHz / VBW ≥ 3 x RBW
b) Detector = Peak
c) Trace mode = Max hold
d) Sweep time = auto-couple

- Test configuration



4.6.2 Calculation method

Result = Ant. Input - Cable loss + Antenna Gain
Margin = Limit – Result (EIRP)

Example:
Limit @ 3700.4 MHz : -13.0 dBm
Ant. Input = -55.6 dBm Cable loss = 1.6 dB Ant. Gain = 9.2 dBi
Result = -55.6 - 1.6 + 9.2 = -49.3 dBm
Margin = -13.0 - (-49.3) = 36.3 dB

4.6.3 Limit

-13 dBm or less

Japan

4.6.4 Test data

Date : 14-November-2018
Temperature : 18.8 [˚C]
Humidity : 35.3 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

Date : 15-November-2018
Temperature : 20.7 [˚C]
Humidity : 31.8 [%] Test engineer :
Test place : 3m Semi-anechoic chamber Taiki Watanabe

[WCDMA Band II (DC12V)]
Channel: 9262

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	242.9	-50.9	-43.5	0.4	-7.6	-51.6	-13.0	38.6
V	3704.8	-54.4	-50.0	1.6	9.5	-42.1	-13.0	29.1

Channel: 9400

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	242.9	-50.8	-43.4	0.4	-5.4	-49.3	-13.0	36.3
V	3760.0	-55.2	-51.1	1.7	9.4	-43.3	-13.0	30.3

Channel: 9538

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	242.9	-50.7	-43.3	0.4	-7.6	-51.4	-13.0	38.4
V	3815.2	-52.8	-46.4	1.7	9.3	-38.7	-13.0	25.7

[WCDMA Band II (DC24V)]

Channel: 9262

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	242.9	-49.4	-42.0	0.4	-7.6	-50.1	-13.0	37.1
V	3704.8	-53.7	-49.3	1.6	9.5	-41.4	-13.0	28.4

Channel: 9400

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	242.9	-49.8	-42.4	0.4	-5.4	-48.3	-13.0	35.3
V	3760.0	-53.9	-49.8	1.7	9.4	-42.0	-13.0	29.0

Channel: 9538

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	242.9	-49.4	-42.0	0.4	-7.6	-50.1	-13.0	37.1
V	3815.2	-53.8	-47.4	1.7	9.3	-39.7	-13.0	26.7

Japan

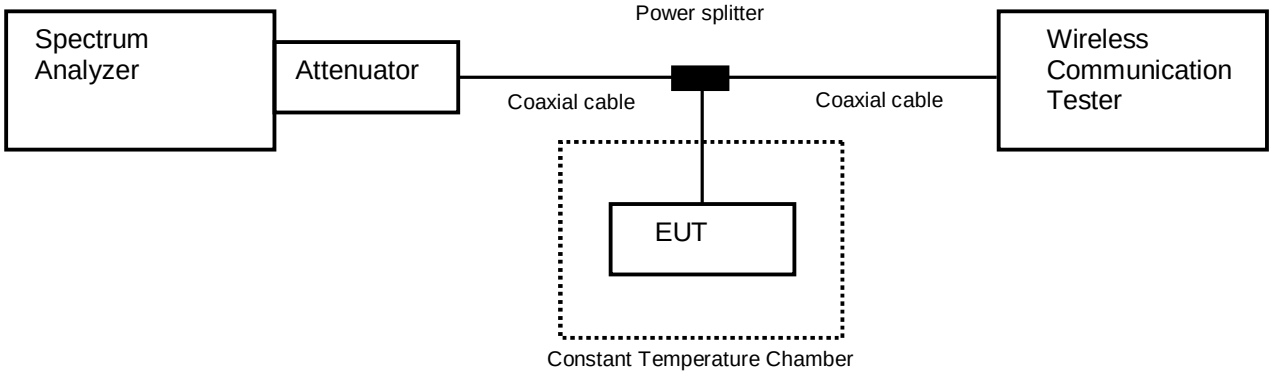
4.7 Frequency Stability

4.7.1 Measurement procedure

[FCC 24.235, 2.1055]

The EUT was placed of an inside of an constant temperature chamber as the temperature in the chamber was varied between -30˚C and +50˚C. The temperature was incremented by 10˚C intervals and the unit was allowed to stabilize at each measurement. The frequency drift was measured with the normal Temperature and voltage tolerance and it is presented as the ppm unit.

- Test configuration



4.7.2 Limit

±2.5 ppm

4.7.3 Measurement result

Date : 28-November-2018
Temperature : 20.5 [˚C]
Humidity : 43.2 [%] Test engineer :
Test place : Shielded room No.4 Taiki Watanabe

[WCDMA Band II (DC12V)]
Channel: 9400

Limit: ±0.00025% = ±2.5 ppm					
Power Supply [V]	**Temperature [ºC]**	**Measurements Frequency [Hz]**	**Frequency Tolerance [ppm]**	**Limit [ppm]**	**Result**
12.00	25 (Ref.)	1,880,000,031	0.00000	±2.5	Pass
	50	1,880,000,033	0.00065	±2.5	Pass
	40	1,880,000,037	0.00328	±2.5	Pass
	30	1,880,000,025	-0.00309	±2.5	Pass
	20	1,880,000,024	-0.00410	±2.5	Pass
	10	1,880,000,025	-0.00338	±2.5	Pass
	0	1,880,000,028	-0.00159	±2.5	Pass
	-10	1,880,000,031	0.00006	±2.5	Pass
	-20	1,880,000,024	-0.00403	±2.5	Pass
	-30	1,880,000,031	-0.00026	±2.5	Pass
10.20	25	1,880,000,024	-0.00395	±2.5	Pass
13.80	25	1,879,999,978	-0.02810	±2.5	Pass

[WCDMA Band II (DC24V)]
Channel: 9400

Limit: ±0.00025% = ±2.5 ppm					
Power Supply [V]	**Temperature [ºC]**	**Measurements Frequency [Hz]**	**Frequency Tolerance [ppm]**	**Limit [ppm]**	**Result**
24.00	25 (Ref.)	1,880,000,025	0.00000	±2.5	Pass
	50	1,880,000,030	0.00234	±2.5	Pass
	40	1,880,000,025	0.00002	±2.5	Pass
	30	1,880,000,034	0.00469	±2.5	Pass
	20	1,880,000,023	-0.00109	±2.5	Pass
	10	1,880,000,029	0.00212	±2.5	Pass
	0	1,880,000,033	0.00396	±2.5	Pass
	-10	1,880,000,026	0.00054	±2.5	Pass
	-20	1,879,999,975	-0.02705	±2.5	Pass
	-30	1,880,000,034	0.00456	±2.5	Pass
20.40	25	1,880,000,022	-0.00185	±2.5	Pass
27.60	25	1,880,000,028	0.00112	±2.5	Pass

Calculation;
Frequency Tolerance (ppm) = Measurements Frequency (Hz) – Reference Frequency (Hz) / Reference Frequency (Hz) x 1000000

Japan

5 Measurement Uncertainty

Expanded uncertainties stated are calculated with a coverage Factor k=2.
Please note that these results are not taken into account when measurement uncertainty considerations contained in ETSI TR 100 028-0011 determining compliance or non-compliance with test result.

Test item	Measurement uncertainty
Conducted emission, AMN (9 kHz – 150 kHz)	±3.8 dB
Conducted emission, AMN (150 kHz – 30 MHz)	±3.3 dB
Radiated emission (9 kHz – 30 MHz)	±3.0 dB
Radiated emission (30 MHz – 1000 MHz)	±4.7 dB
Radiated emission (1 GHz – 6 GHz)	±4.9 dB
Radiated emission (6 GHz – 18 GHz)	±5.2 dB
Radiated emission (18 GHz – 40 GHz)	±5.8 dB

Japan

6 Laboratory Information

Testing was performed and the report was issued at:

TÜV SÜD Japan Ltd. Yonezawa Testing Center

Address: 5-4149-7 Hachimanpara, Yonezawa-shi, Yamagata, 992-1128 Japan
Phone: +81-238-28-2881
Fax: +81-238-28-2888

Accreditation and Registration
NVLAP
LAB CODE: 200306-0

VLAC
Accreditation No.: VLAC-013

BSMI
Laboratory Code: SL2-IN-E-6018, SL2-A1-E-6018

Industry Canada

Site number	Facility	Expiration date
4224A-4	3 m Semi-anechoic chamber	27-November-2020
4224A-5	10 m Semi-anechoic chamber No. 1	27-November-2020
4224A-6	10 m Semi-anechoic chamber No. 2	14-December-2019

VCCI Council

Registration number	Expiration date
A-0166	03-July-2019

Japan

Appendix A. Test Equipment

Antenna port conducted test

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
Spectrum analyzer	Agilent Technologies	E4440A	US44302655	31-Jul-2019	02-Jul-2018
Attenuator	Weinschel	56-10	J4180	31-Jul-2019	12-Jul-2018
Microwave cable	HUBER+SUHNER	SUCOFLEX 104	199119/4	31-Mar-2019	01-Mar-2018
Microwave cable	HUBER+SUHNER	Sucoflex 102/2m	31648	31-Mar-2019	01-Mar-2018
Power divider	ANRITSU	K240B	020205	31-Jul-2019	12-Jul-2018
Wideband Radio Frequency Tester	ROHDE&SCHWARZ	CMW500	116338	31-Aug-2019	13-Aug-2018
Temperature and humidity chamber	ESPEC	PL1KP	14007261	17-Dec-2018	18-Dec-2017

Radiated emission

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100765	30-Sep-2019	20-Sep-2018
Spectrum analyzer	Agilent Technologies	E4440A	US40420937	31-Oct-2019	12-Oct-2018
Preamplifier	TSJ	MLA-100K01-B01-26	1310384	31-Dec-2018	16-Dec-2017
Biconical antenna	Schwarzbeck	VHA9103/BBA9106	2155	31-Aug-2019	06-Aug-2018
Log periodic antenna	Schwarzbeck	UHALP9108A	0560	31-Aug-2019	06-Aug-2018
Attenuator	TME	CFA-01NPJ-6	N/A(S275)	31-Jan-2019	18-Jan-2018
Attenuator	TME	CFA-01NPJ-3	N/A(S272)	31-Jan-2019	18-Jan-2018
Preamplifier	TSJ	MLA-100M18-B02-40	1929118	31-Jan-2019	18-Jan-2018
Attenuator	AEROFLEX	26A-10	081217-08	31-Jan-2019	18-Jan-2018
Double ridged guide antenna	ETS LINDGREN	3117	00052315	31-Mar-2019	14-Mar-2018
Attenuator	Agilent Technologies	8491B	MY39268633	31-Mar-2019	14-Mar-2018
Double ridged guide antenna	A.H.Systems Inc.	SAS-574	469	31-Aug-2019	24-Aug-2018
Preamplifier	TSJ	MLA-1840-B03-35	1240332	31-Aug-2019	24-Aug-2018
Band rejection filter	Micro-Tronics	BRC50720	014	31-Dec-2018	05-Dec-2017
High Pass Filter	Wainwright	WHKX2.8/18G-6SS	1	31-Jul-2019	12-Jul-2018
Signal generator	ROHDE&SCHWARZ	SMB100A	177525	31-Jul-2019	31-Jul-2018
RF power amplifier	R&K	CGA020M602-2633R	B40240	31-May-2019	17-May-2018
Microwave cable	HUBER+SUHNER	SUCOFELX102/2m	31648	31-Mar-2019	01-Mar-2018
Dipole antenna	Schwarzbeck	VHAP	1020	31-Aug-2019	03-Aug-2018
Dipole antenna	Schwarzbeck	UHAP	994	31-Aug-2019	03-Aug-2018
Double ridged guide antenna	EMCO	3115	00058532	31-Jan-2019	18-Jan-2018
Wideband Radio Frequency Tester	ROHDE&SCHWARZ	CMW500	126079	31-Oct-2019	12-Oct-2018
Microwave cable	HUBER+SUHNER	SUCOFLEX104/9m	MY30037/4	31-Jan-2019	18-Jan-2018
		SUCOFLEX104/1m	my24610/4	31-Jan-2019	18-Jan-2018
		SUCOFLEX104/8m	SN MY30031/4	31-Jan-2019	18-Jan-2018
		SUCOFLEX104	MY32976/4	31-Jan-2019	18-Jan-2018
		SUCOFLEX104/1.5m	MY19309/4	31-Jan-2019	19-Jan-2018
		SUCOFLEX104/7m	41625/6	31-Jan-2019	19-Jan-2018
PC	DELL	DIMENSION E521	75465BX	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V5.6.0	N/A	N/A
Absorber	RIKEN	PFP30	N/A	N/A	N/A
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(9002-NSA)	31-May-2019	21-May-2018
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(9002-SVSWR)	31-May-2019	21-May-2018

*: The calibrations of the above equipment are traceable to NIST or equivalent standards of the reference organizations.