Zacta

TEST REPORT

Report number : JPD-TR-17222-0
Issue date : November 8, 2017

The device, as described herewith, was tested pursuant to applicable test procedure and complies with the requirements of;

FCC Part 24 Subpart E

The test results are traceable to the international or national standards.

Applicant	:	KYOCERA Corporation
Equipment under test (EUT)	:	Mobile Phone
Model number	:	FA37
FCC ID	:	JOYFA37

Date of test	:	September 15, 19, 21, 2017 October 23, 26, 2017 November 1, 2017
Test place	:	TÜV SÜD Zacta Ltd. Yonezawa Testing Center 5-4149-7, Hachimanpara, Yonezawa-shi, Yamagata, 992-1128 Japan Phone: +81-238-28-2881 Fax: +81-238-28-2888
Test results	:	Complied

The results in this report are applicable only to the equipment tested.
This report shall not be re-produced except in full without the written approval of TÜV SÜD Zacta Ltd.
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.

Tested by : Tadahiro Seino Chiaki Kanno
Tadahiro Seino Chiaki Kanno

Approved by : Hiroaki Suzuki
Hiroaki Suzuki
Lab Manager of RF Lab

NVLAP TESTING
NVLAP LAB CODE 200306-0

ilac-MRA

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1. Summary of Test

1.1 Purpose of test

It is the original test in order to verify conformance to FCC Part 24 Subpart E.

1.2 Standards

CFR47 FCC Part 24 Subpart E

1.2.1 Test Methods

KDB 971168 D01 Power Meas License Digital Systems v02r02
ANSI/TIA/EIA-603-D-2010

1.2.2 Deviation from standards

None

1.3 List of applied test to the EUT

Test items Section	Test items	Condition	Result
2.1046	Conducted Output Power	Conducted	PASS Note 1
24.232(c)	Effective Radiated Power 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

Note 1: Refer to RF Exposure Report (Test Report_SAR)

1.3.1 Test set up

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1.4 Modification to the EUT by laboratory

None

2. Equipment Under Test

2.1 General Description of equipment

EUT is the Mobile Phone.

2.2 EUT information

Applicant	:	KYOCERA Corporation Yokohama Office 2-1-1 Kagahara, Tsuzuki-ku Yokohama-shi, Kanagawa, Japan Phone: +81-45-943-6253 Fax: +81-45-943-6314
Equipment under test	:	Mobile Phone
Trade name	:	Kyocera
Model number	:	FA37
Serial number	:	N/A
EUT condition	:	Pre-Production
Power ratings	:	Battery: DC 3.8V
Size	:	(W) 51.3 × (D) 17.9 × (H) 113.4 mm
Environment	:	Indoor and Outdoor use
Terminal limitation	:	-20˚C to 60˚C
RF Specification		
Frequency of Operation	:	Up Link GSM1900: 1850.2-1909.8MHz Down Link GSM1900: 1930.2-1989.8MHz
Modulation type	:	GSM1900: GMSK
Emission designator	:	GSM1900: 245KGXW
Equivalent Isotropic Radiated Power (E.I.R.P)	:	GSM1900: 1.585W (32.0dBm)
Antenna type	:	Internal antenna
Antenna gain	:	GSM1900: 1.3dBi

2.3 Variation of the family model(s)

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
GSM1900	512	1850.2MHz
	661	1880.0MHz
	810	1909.8MHz

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.

3. Configuration of equipment

3.1 Equipment(s) used

No.	Equipment	Company	Model No.	Serial No.	FCC ID / DoC	Comment
1	Mobile Phone	KYOCERA	FA37	N/A	JOYFA37	EUT

3.2 System configuration

1. Mobile Phone
   (EUT)

Note1: Numbers assigned to equipment or cables on this diagram correspond to the list in “3.1 Equipment(s) used”.

4. Equivalent Isotropic Radiated Power

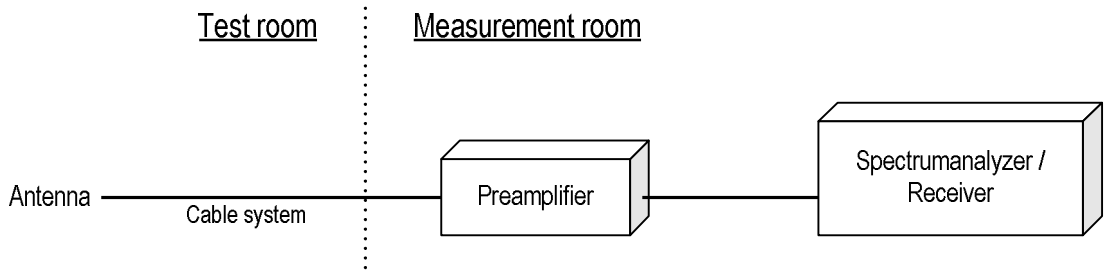
4.1 Measurement procedure
[FCC 24.232(c)]

<Step 1>
The EUT and support equipment are placed on a 1 meter x 1 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 1MHz. 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 1MHz
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 Calculation method

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

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

4.3 Limit

2 W (33dBm)

4.4 Test data

Date	:	October 23, 2017		
Temperature	:	22.1 [˚C]		
Humidity	:	54.4 [%]	Test engineer	:
Test place	:	3m Semi-anechoic chamber		Tadahiro Seino

Date	:	November 1, 2017		
Temperature	:	23.4 [˚C]		
Humidity	:	27.4 [%]	Test engineer	:
Test place	:	3m Semi-anechoic chamber		Tadahiro Seino

[GSM1900]

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1850.2	-27.2	25.1	1.1	8.1	32.0	33.0	1.0
H	1880.0	-29.2	23.7	1.1	8.0	30.6	33.0	2.4
H	1909.8	-30.0	23.4	1.2	8.0	30.2	33.0	2.8

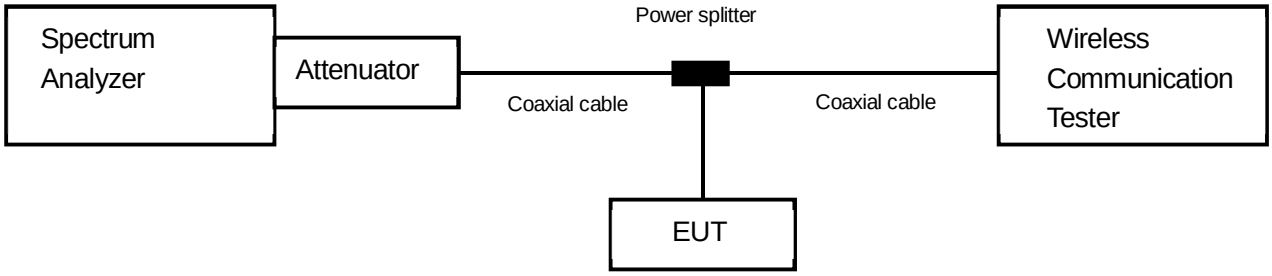
5. Peak to Average Ratio

5.1 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) Span = 5MHz
b) RBW = 1MHz
c) VBW ≥ 3 x RBW
d) Detector = Peak / Average
e) Sweep time = auto-couple
f) Trace mode=Max hold

- Test configuration



5.2 Limit

13dB or less

5.3 Measurement result

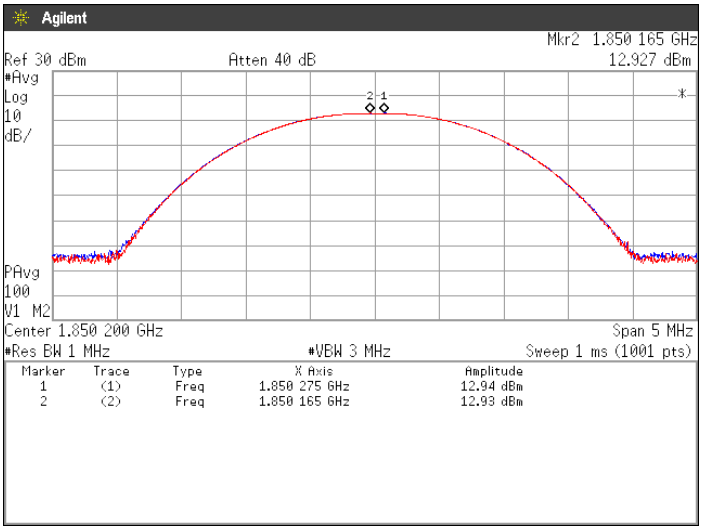
Date : September 15, 2017
Temperature : 24.4 [˚C]
Humidity : 51.4 [%]
Test place : Shielded room No.4

Test engineer : Chiaki Kanno

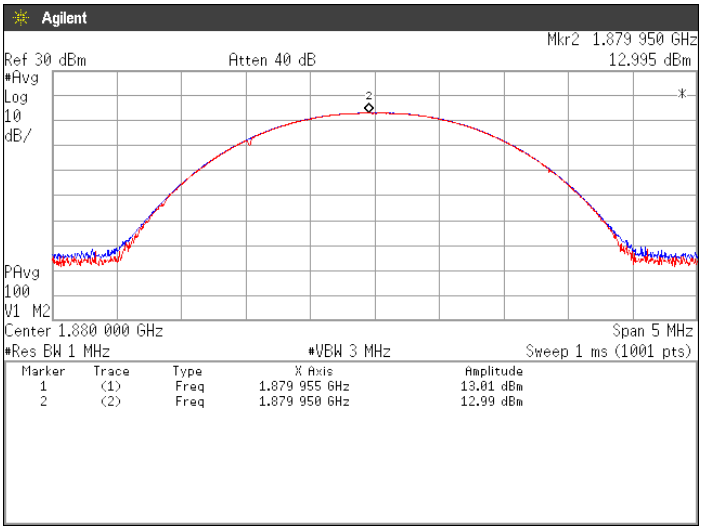
Mode	Channel	Frequency [MHz]	Peak to Average Power Ratio [dB]	Limit [dB]
GSM1900	512	1850.2	0.01	13.0
	661	1880.0	0.02	
	810	1909.8	0.02	

5.4 Trace data
[GSM1900]

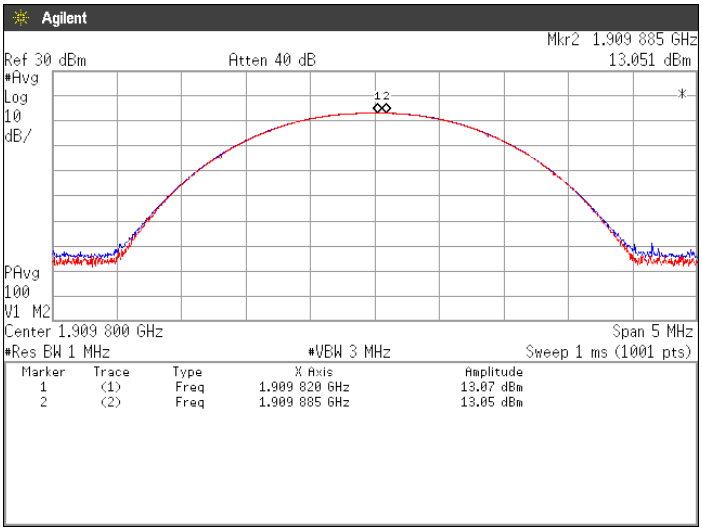
Channel: 512



Channel: 661



Channel: 810



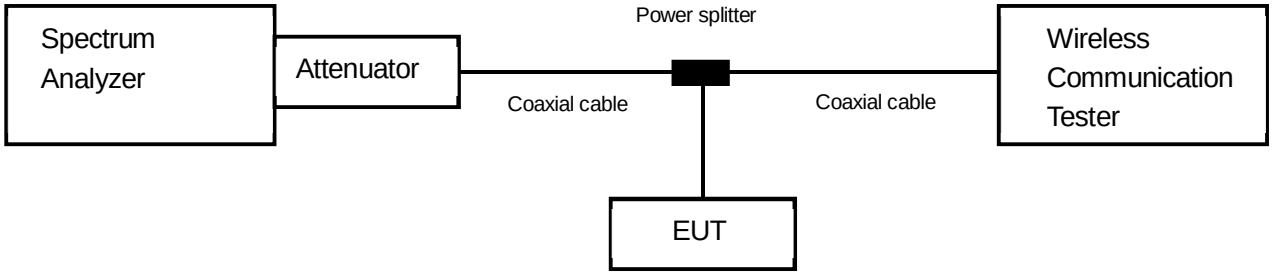
6. Occupied Bandwidth

6.1 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



6.2 Limit

None

6.3 Measurement result

Date : September 19, 2017
Temperature : 21.6 [˚C]
Humidity : 58.3 [%]
Test place : Shielded room No.4

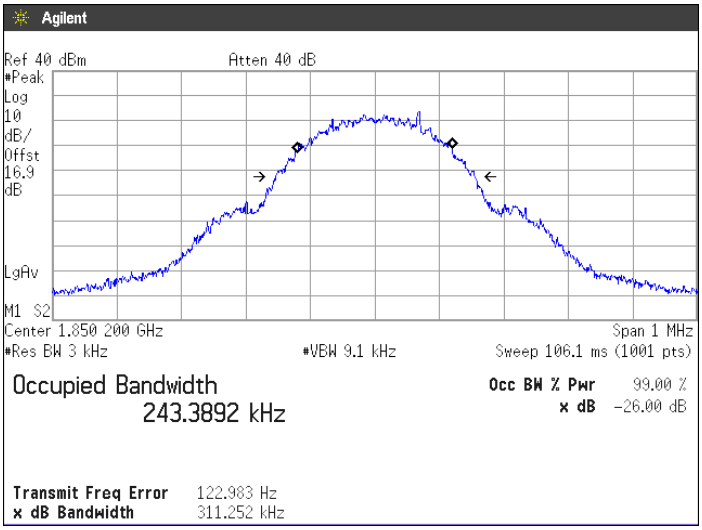
Test engineer : Chiaki Kanno

Band	Channel	Frequency (MHz)	Test Result (kHz)
GSM1900	512	1850.2	243.3892
	661	1880.0	245.3967
	810	1909.8	245.3624

6.4 Trace data

[GSM1900]

Channel: 512



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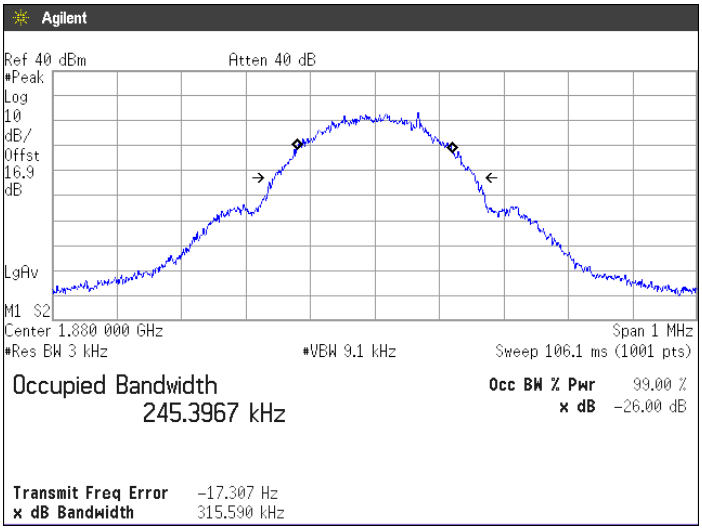
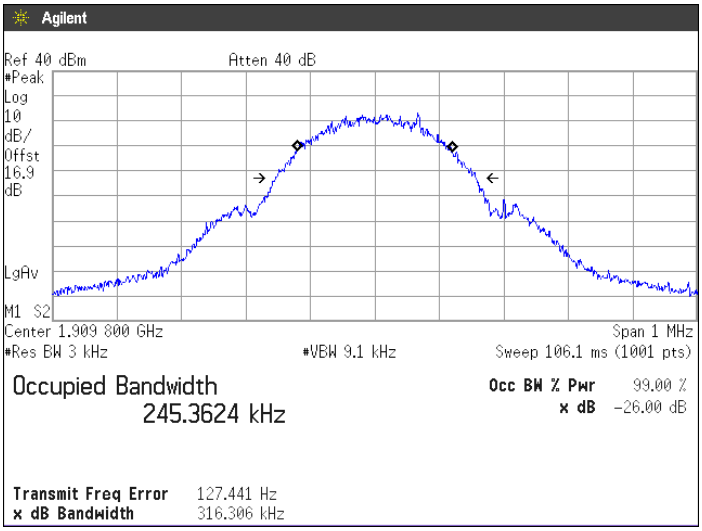


Channel: 810



7. Band Edge Spurious and Harmonic at Antenna Terminals

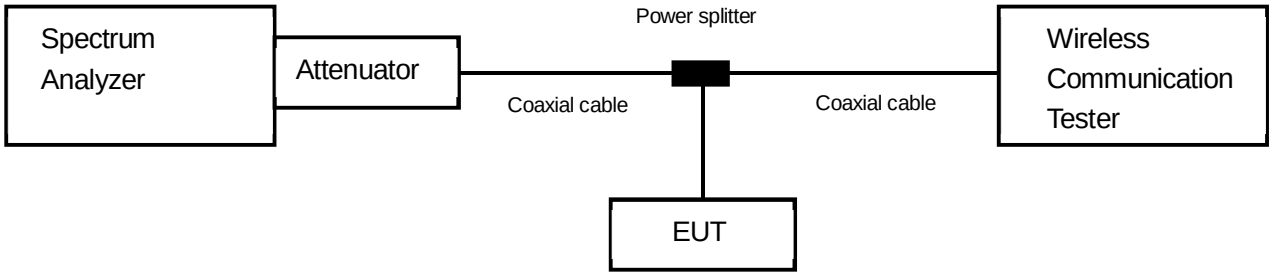
7.1 Measurement procedure [FCC 24.238(a), 2.1051]

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



7.2 Limit

-13dBm or less

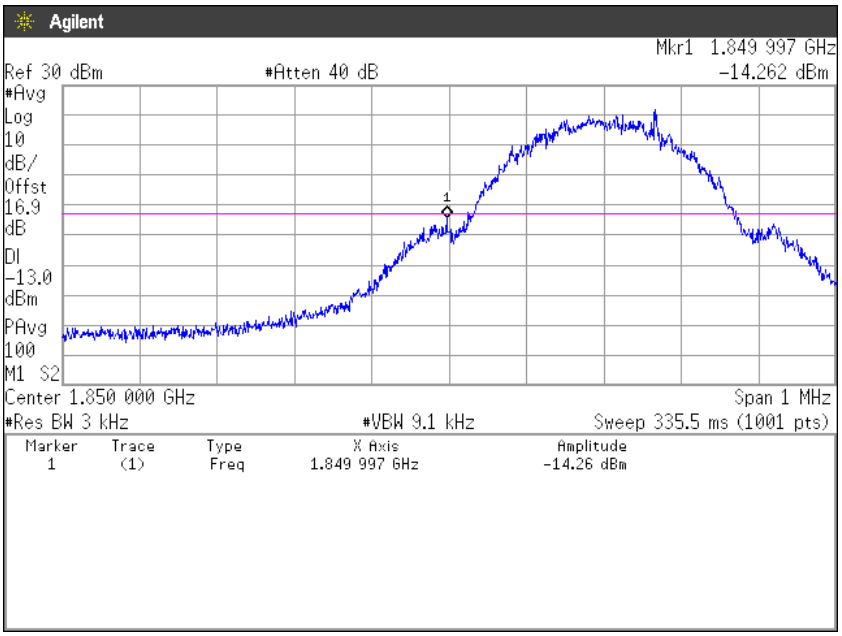
7.3 Measurement result

Date : September 19, 2017
Temperature : 21.6 [˚C]
Humidity : 58.3 [%]
Test place : Shielded room No.4
Test engineer : Chiaki Kanno

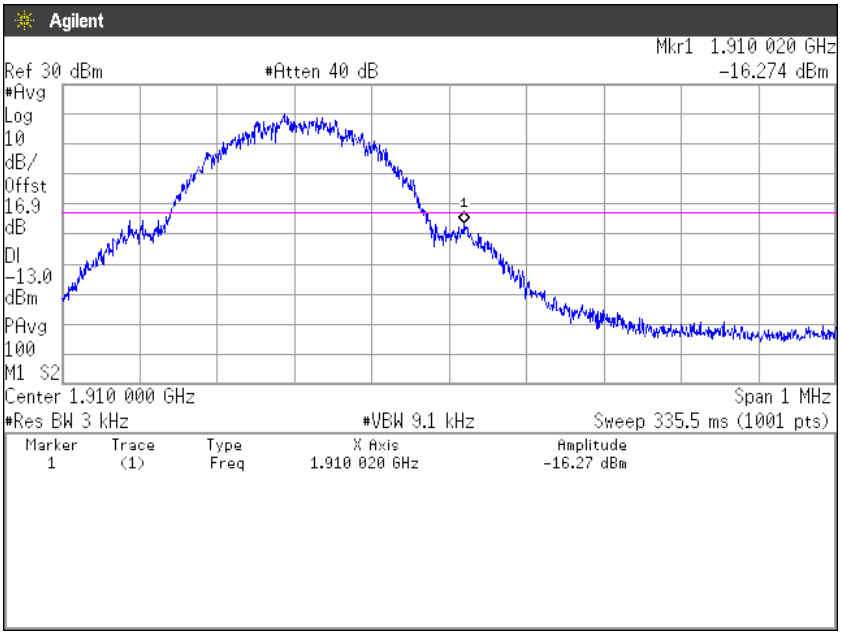
Band	Channel	Frequency [MHz]	Limit [dB]	Results	Results
GSM1900	512	1850.2	-13.0	See the trace data	PASS
	810	1909.8	-13.0	See the trace data	PASS

7.4 Trace data
[GSM1900]
(Band Edge)

Channel: 512



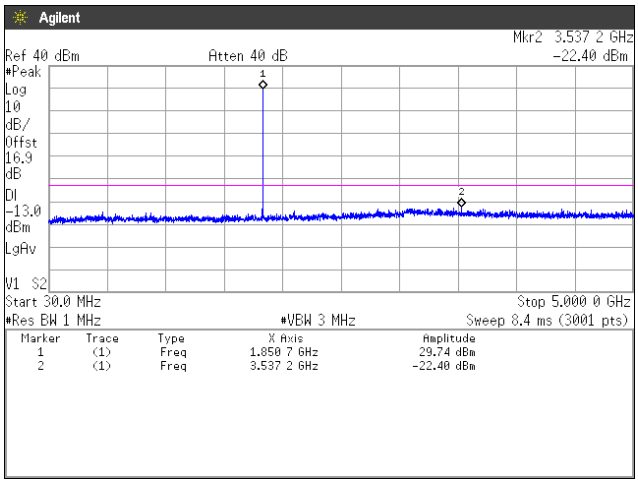
Channel: 810



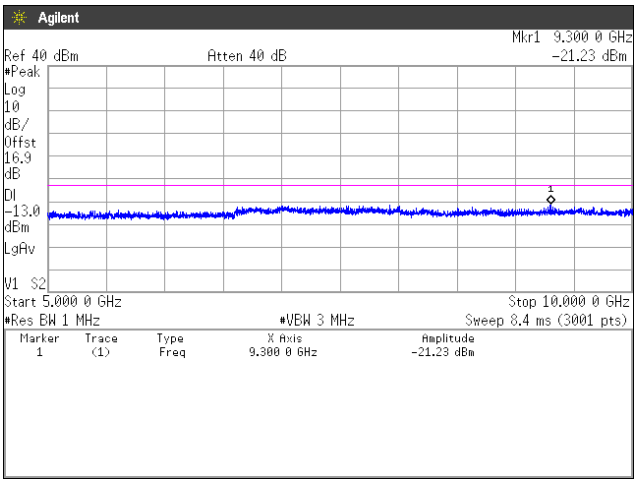
(Spurious Emissions)
Note: Conducted spurious test was measured in the worst case of conducted output power.

Channel: 512

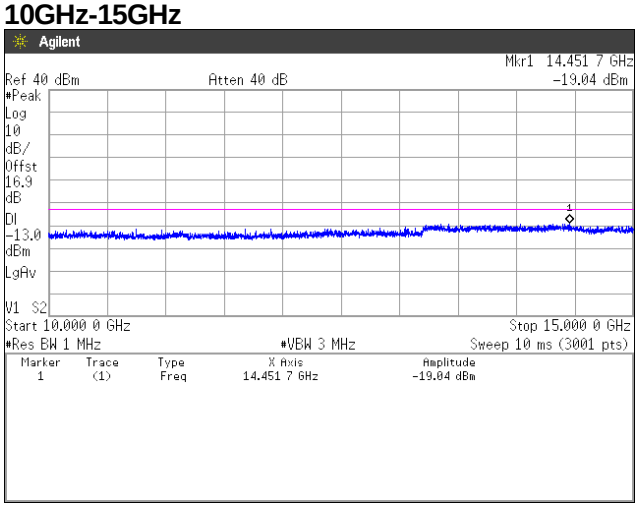
30MHz-5GHz



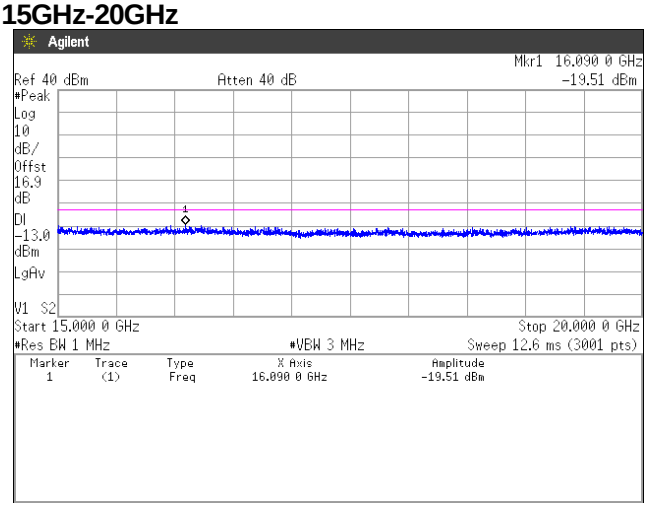
5GHz-10GHz



10GHz-15GHz

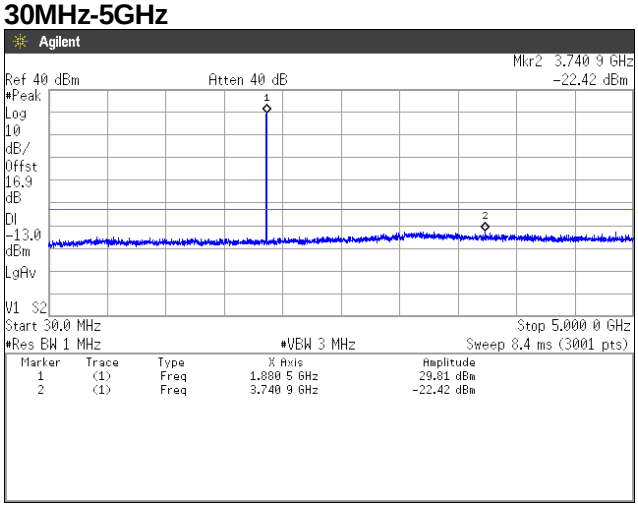


15GHz-20GHz

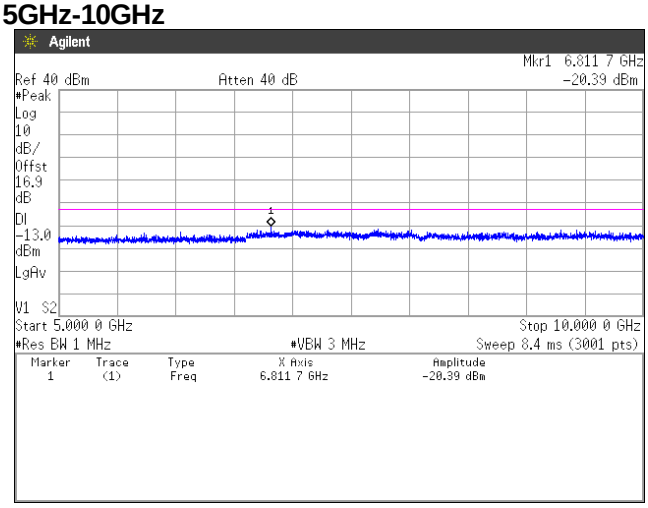


Channel: 661

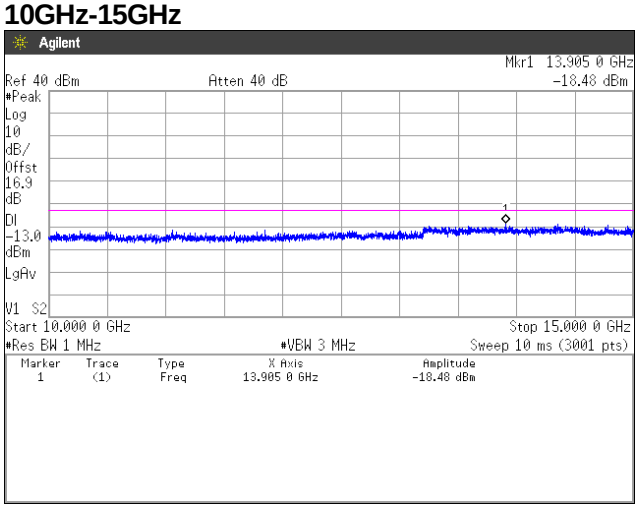
30MHz-5GHz



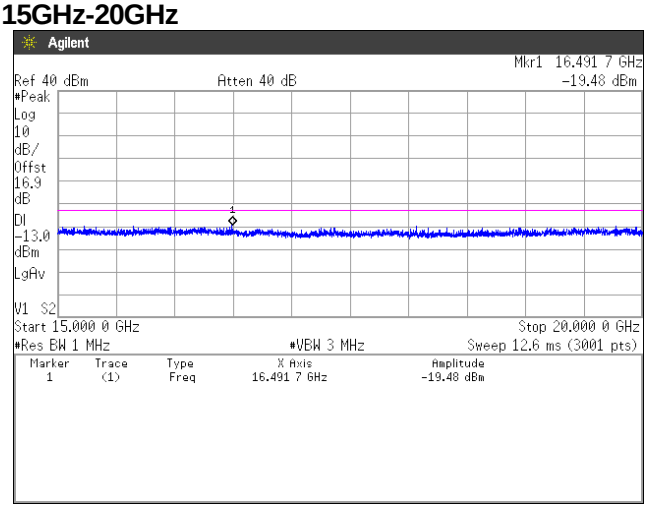
5GHz-10GHz



10GHz-15GHz

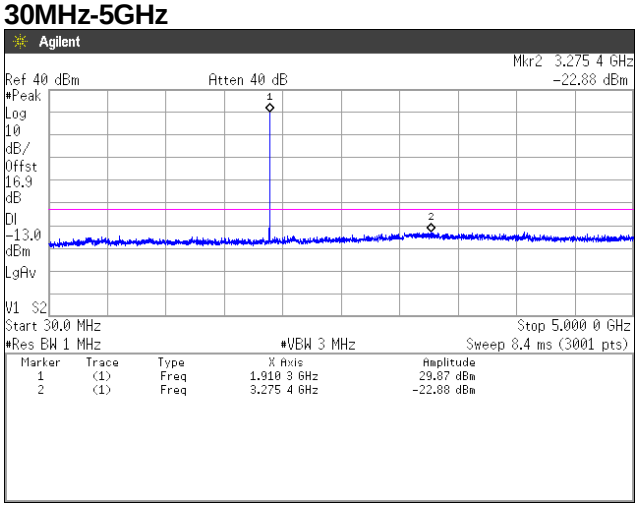


15GHz-20GHz

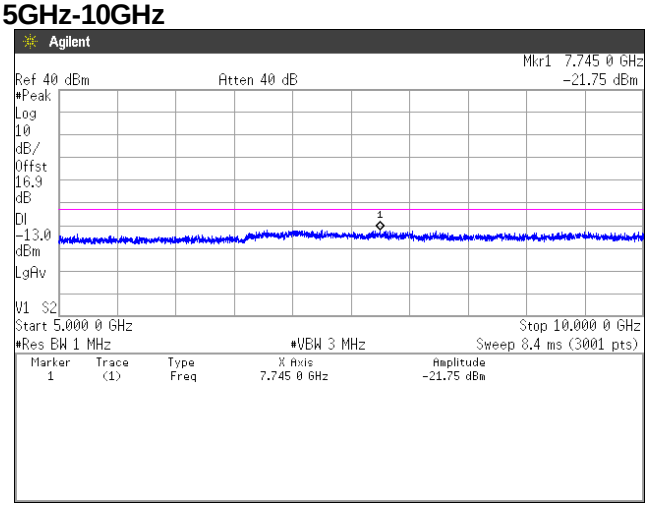


Channel: 810

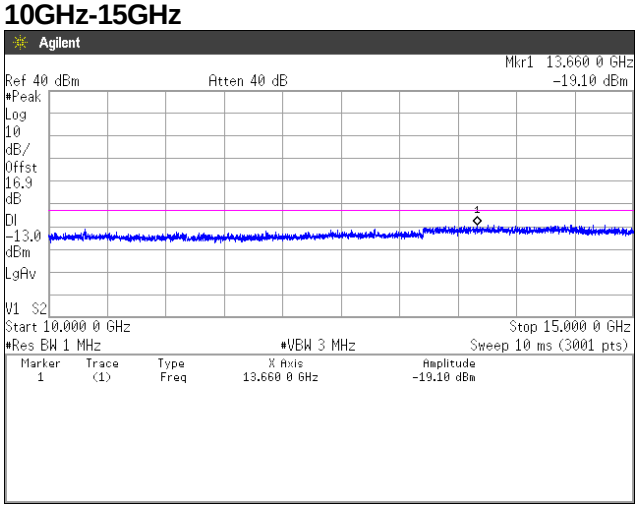
30MHz-5GHz



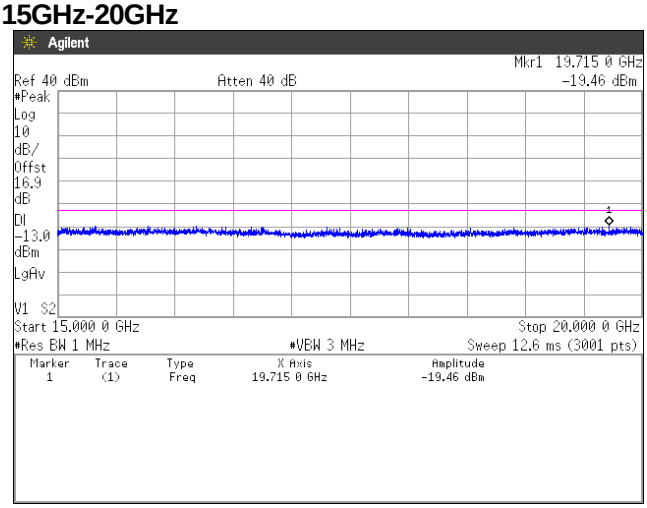
5GHz-10GHz



10GHz-15GHz



15GHz-20GHz



8. Radiated Emissions and Harmonic Emissions

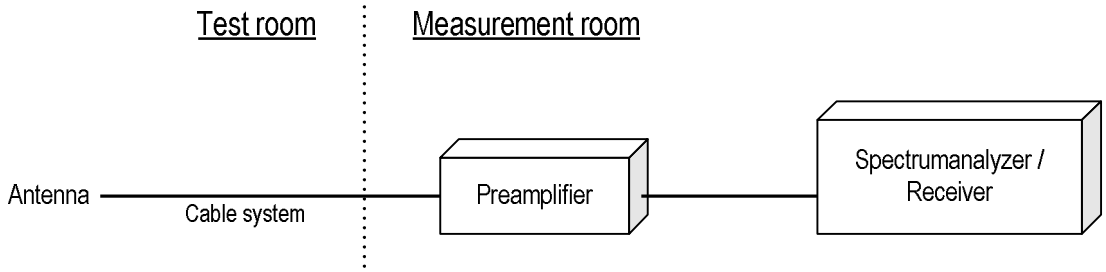
8.1 Measurement procedure
[FCC 24.238(a), 2.1053]

<Step 1>
The EUT and support equipment are placed on a 1 meter x 1 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 1MHz. The turntable is rotated by 360 degrees and stopped at azimuth of producing the maximum emission. The frequency is investigated up to 20GHz.

<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 = 100kHz for below 1GHz and 1MHz for above 1GHz / VBW ≥ 3 x RBW
b) Detector = Peak
c) Trace mode = Max hold
d) Sweep time = auto-couple

- Test configuration



8.2 Calculation method

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

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

8.3 Limit

-13dBm or less

8.4 Test data

Date	:	October 23, 2017		
Temperature	:	22.1 [˚C]		
Humidity	:	54.4 [%]	Test engineer	:
Test place	:	3m Semi-anechoic chamber		Tadahiro Seino

Date	:	October 26, 2017		
Temperature	:	21.4 [˚C]		
Humidity	:	37.4 [%]	Test engineer	:
Test place	:	3m Semi-anechoic chamber		Tadahiro Seino

Date	:	November 1, 2017		
Temperature	:	23.4 [˚C]		
Humidity	:	27.4 [%]	Test engineer	:
Test place	:	3m Semi-anechoic chamber		Tadahiro Seino

[GSM1900]
(Channel: 512)

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3700.4	-56.1	-63.6	1.6	8.8	-56.4	-13.0	43.4
V	3700.4	-56.3	-63.9	1.6	8.8	-56.7	-13.0	43.7

(Channel: 661)

H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3760.0	-56.2	-64.0	1.6	8.7	-57.0	-13.0	44.0
V	3760.0	-56.0	-63.6	1.6	8.7	-56.6	-13.0	43.6

(Channel: 810)

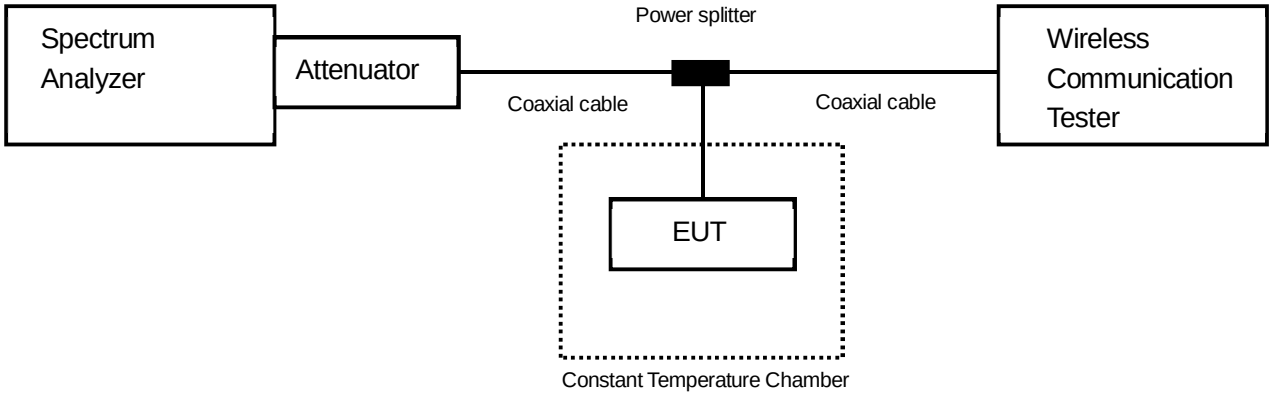
H/V	Frequency [MHz]	S.A Reading [dBm]	Ant. Input [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3819.6	-55.1	-61.4	1.7	8.7	-54.4	-13.0	41.4
V	3819.6	-55.7	-62.7	1.7	8.7	-55.7	-13.0	42.7

9. Frequency Stability

9.1 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



9.2 Limit

±2.5ppm

9.3 Measurement result

Date	:	September 21, 2017		
Temperature	:	24.0 [˚C]		
Humidity	:	46.0 [%]	Test engineer	:
Test place	:	Shielded room No.4		Chiaki Kanno

[GSM1900]
(Channel: 661)

Limit: ±0.00025% = ±2.5ppm					
Power Supply [V]	**Temperature [ºC]**	**Measurements Frequency [Hz]**	**Frequency Tolerance [ppm]**	**Limit [ppm]**	**Result**
3.80	25(Ref.)	1,880,000,017	0.00000	±2.5	Pass
	50	1,880,000,020	0.00172	±2.5	Pass
	40	1,880,000,018	0.00033	±2.5	Pass
	30	1,880,000,012	-0.00254	±2.5	Pass
	20	1,880,000,018	0.00059	±2.5	Pass
	10	1,880,000,019	0.00117	±2.5	Pass
	0	1,880,000,021	0.00203	±2.5	Pass
	-10	1,880,000,014	-0.00180	±2.5	Pass
	-20	1,880,000,023	0.00320	±2.5	Pass
	-30	1,880,000,033	0.00855	±2.5	Pass
3.42	25	1,880,000,018	0.00069	±2.5	Pass
4.18	25	1,880,000,020	0.00134	±2.5	Pass

Calculation;

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

10. Uncertainty of measurement

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 (9kHz – 150kHz)	±3.8dB
Conducted emission, AMN (150kHz – 30MHz)	±3.3dB
Radiated emission (9kHz – 30MHz)	±3.0dB
Radiated emission (30MHz – 1000MHz)	±4.7dB
Radiated emission (1GHz – 6GHz)	±4.9dB
Radiated emission (6GHz – 26GHz)	±5.2dB

11. Laboratory Information

1. Location

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

2. Accreditation and Registration

1) VLAC
Accreditation No.: VLAC-013

2) NVLAP
LAB CODE: 200306-0

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

4) Industry Canada

Site number	Facility	Expiration date
4224A-4	3m Semi-anechoic chamber	2017-12-03
4224A-5	10m Semi-anechoic chamber No.1	2017-12-03
4224A-6	10m Semi-anechoic chamber No.2	2019-12-14

5) VCCI Council

Registration number	Expiration date
A-0166	2019-07-03

Appendix A. Test equipment

Antenna port conducted test

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
Spectrum analyzer	Agilent Technologies	E4440A	US44302655	Jun. 30, 2018	Jun. 28, 2017
Attenuator	Weinschel	56-10	J4993	Nov. 30, 2017	Nov. 1, 2016
Microwave cable	HUBER+SUHNER	SUCOFLEX 104	199119/4	Feb. 28, 2018	Feb. 2, 2017
Power divider	ANRITSU	K240B	1301239	Jul. 31, 2018	Jul. 21, 2017
Wideband Radio Frequency Tester	ROHDE&SCHWARZ	CMW500	126079	Oct. 31, 2017	Oct. 7, 2016
				Oct. 31, 2018	Oct. 13, 2017
Temperature and humidity chamber	ESPEC	PL1KP	14007261	Jan. 31, 2018	Jan. 20, 2017

Radiated emission

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100765	Sep. 30, 2018	Sep. 13, 2017
Spectrum analyzer	Agilent Technologies	E4447A	MY46180188	Mar. 31, 2018	Mar. 15, 2017
Spectrum analyzer	Agilent Technologies	E4440A	US40420937	Oct. 31, 2018	Oct. 19, 2017
Preamplifier	ANRITSU	MH648A	M96057	Feb. 28, 2018	Feb. 1, 2017
Biconical antenna	Schwarzbeck	VHA9103/BBA9106	2155	Jul. 31, 2018	Jul. 18, 2017
Log periodic antenna	Schwarzbeck	UHALP9108A	0560	Jul. 31, 2018	Jul. 18, 2017
Attenuator	TME	CFA-01NPJ-6	N/A(S275)	Feb. 28, 2018	Feb. 3, 2017
Attenuator	TME	CFA-01NPJ-3	N/A(S272)	Feb. 28, 2018	Feb. 2, 2017
Preamplifier	TSJ	MLA-100M18-B02-40	1929118	Feb. 28, 2018	Feb. 3, 2017
Attenuator	AEROFLEX	26A-10	081217-08	May 31, 2018	May 24, 2017
Double ridged guide antenna	ETS LINDGREN	3117	00052315	Feb. 28, 2018	Feb. 23, 2017
Attenuator	Agilent Technologies	8491B	MY39268633	Feb. 28, 2018	Feb. 2, 2017
Double ridged guide antenna	A.H.Systems Inc.	SAS-574	469	Aug. 31, 2018	Aug. 8, 2017
Preamplifier	TSJ	MLA-1840-B03-35	1240332	Aug. 31, 2018	Aug. 8, 2017
Band rejection filter	Micro-Tronics	BRC50720	014	Nov. 30, 2017	Nov. 1, 2016
High Pass Filter	Wainwright	WHKX2.8/18G-6SS	1	Jul. 31, 2018	Jul. 20, 2017
Signal generator	ROHDE&SCHWARZ	SMB100A	177525	Jun. 30, 2018	Jun. 12, 2017
RF power amplifier	R&K	CGA020M602-2633R	B40240	May 31, 2018	May 26, 2017
Microwave cable	HUBER+SUHNER	SUCOFELX102/2m	31648	Mar. 31, 2018	Mar. 13, 2017
Dipole antenna	Schwarzbeck	VHAP	1021	Aug. 31, 2018	Aug. 2, 2017
Dipole antenna	Schwarzbeck	UHAP	993	Aug. 31, 2018	Aug. 2, 2017
Double ridged guide antenna	EMCO	3115	00058532	Dec. 31, 2017	Dec. 6, 2016
Wideband Radio Frequency Tester	ROHDE&SCHWARZ	CMW500	126079	Oct. 31, 2017	Oct. 7, 2016
				Oct. 31, 2018	Oct. 13, 2017
Microwave cable	HUBER+SUHNER	SUCOFLEX104/9m	MY30037/4	Feb. 28, 2018	Feb. 3, 2017
		SUCOFLEX104/1m	my24610/4	Feb. 28, 2018	Feb. 3, 2017
		SUCOFLEX104/8m	SN MY30031/4	Feb. 28, 2018	Feb. 2, 2017
		SUCOFLEX104	MY32976/4	Dec. 31, 2017	Dec. 2, 2016
		SUCOFLEX104/1.5m	MY19309/4	Feb. 28, 2018	Feb. 3, 2017
		SUCOFLEX104/7m	41625/6	Feb. 28, 2018	Feb. 3, 2017
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)	May 31, 2018	May 30, 2017
3m Semi an-echoic Chamber	TOKIN	N/A	N/A(9002-SVSWR)	May 31, 2018	May 31, 2017

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