Zacta

TEST REPORT

Report number : Z101C-15085
Issue date : August 26, 2015

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

FCC Part 24 Subpart E
IC RSS-133

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

Applicant	:	KYOCERA Corporation
Equipment under test (EUT)	:	Module
Model number	:	KA36
FCC ID	:	JOYKA36
IC Certification Number	:	574B-KA36

Date of test : August 22-24, 2015
Test place : TÜV SÜD Zacta Ltd. Yonezawa Testing Center
4149-7 Hachimanpara 5-chome
Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 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, or any agency of the federal government.

Tested by : Taiki Watanabe
Taiki Watanabe

Hikaru Shibata
Hikaru Shibata

Authorized by : Hiro Suzuki
Hiroaki Suzuki
Manager of EMC Technical Department

Zacta

Table of contents

Zacta

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, IC RSS-133.

1.2 Standards

CFR47 FCC Part 24 Subpart E
IC RSS-133

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

FCC Section	IC Section	Test items	Condition	Result
2.1046	N/A	Conducted Output Power	Conducted	N/A *
24.232(c)	RSS-133 6.4	Equivalent Isotropic Radiated Power	Radiated	PASS
24.232(d)	N/A	Peak to Average Ratio	Conducted	N/A *
24.238(a) 2.1049	N/A	Occupied Bandwidth	Conducted	N/A *
24.238(a) 2.1051	RSS-133 6.5.1	Band Edge Spurious and Harmonic at Antenna Terminal	Conducted	N/A *
24.238(a) 2.1053	RSS-133 6.5.1	Radiated emissions and Harmonic Emissions	Radiated	PASS
24.235 2.1055	RSS-133 6.3	Frequency Stability	Conducted	N/A *

*: For KA36, this model is a model that changed the LTE band of J79 (FCC ID: JOYJ79). Other than the LTE band 12 and 13, the module is electrically identical. Therefore, only the Radiated test items were performed.
Refer to the following test report about other test items; J79 Test report number: Z071C-15078.

1.3.1 Test set up

Table-Top

1.4 Modification to the EUT by laboratory

None

2. Equipment Under Test

2.1 General Description of equipment

EUT is the Module.

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	:	Module
Trade name	:	Kyocera
Model number	:	KA36
Serial number	:	N/A
EUT condition	:	Pre-Production
Power ratings	:	DC 3.9V
Size	:	(W) 40.0 × (D) 40.0 × (H) 4.3 mm
Environment	:	Indoor and Outdoor use
Terminal limitation	:	-20˚C to 60˚C
RF Specification		
Frequency of Operation	:	Up Link WCDMA Band II: 1852.4-1907.6MHz LTE Band II: 1850-1910MHz Down Link WCDMA Band II: 1932.4-1987.6MHz LTE Band II: 1930-1990MHz
Modulation type	:	WCDMA Band II: QPSK, 16QAM LTE Band II: QPSK, 16QAM
Emission designator	:	WCDMA Band II: 4M16F9W LTE Band II: QPSK: 17M95G7D, 16QAM: 17M97W7D
Conducted Output power	:	WCDMA Band II: 0.258W (24.12dBm) LTE Band II: QPSK: 0.205W (23.11dBm), 16QAM: 0.163W (22.13dBm)
Antenna type	:	External antenna
Antenna gain	:	WCDMA Band II: 4.9dBi LTE Band II: 4.9dBi

Zacta

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
WCDMA Band II	9262	1852.4MHz
	9400	1880.0MHz
	9538	1907.6MHz

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 Y axis and the worst case recorded.

Band	Modulation	Bandwidth	Channel	Frequency [MHz]
LTE Band II	QPSK	1.4MHz	18607	1850.7
			18900	1880.0
			19193	1909.3
		3MHz	18615	1851.5
			18900	1880.0
			19185	1908.5
		5MHz	18625	1852.5
			18900	1880.0
			19175	1907.5
		10MHz	18650	1855.0
			18900	1880.0
			19150	1905.0
		15MHz	18675	1857.5
			18900	1880.0
			19125	1902.5
		20MHz	18700	1860.0
			18900	1880.0
			19100	1900.0
	16QAM	1.4MHz	18607	1850.7
			18900	1880.0
			19193	1909.3
		3MHz	18615	1851.5
			18900	1880.0
			19185	1908.5
		5MHz	18625	1852.5
			18900	1880.0
			19175	1907.5
		10MHz	18650	1855.0
			18900	1880.0
			19150	1905.0
		15MHz	18675	1857.5
			18900	1880.0
			19125	1902.5
		20MHz	18700	1860.0
			18900	1880.0
			19100	1900.0

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 Y axis and the worst case recorded.

3. Configuration of equipment

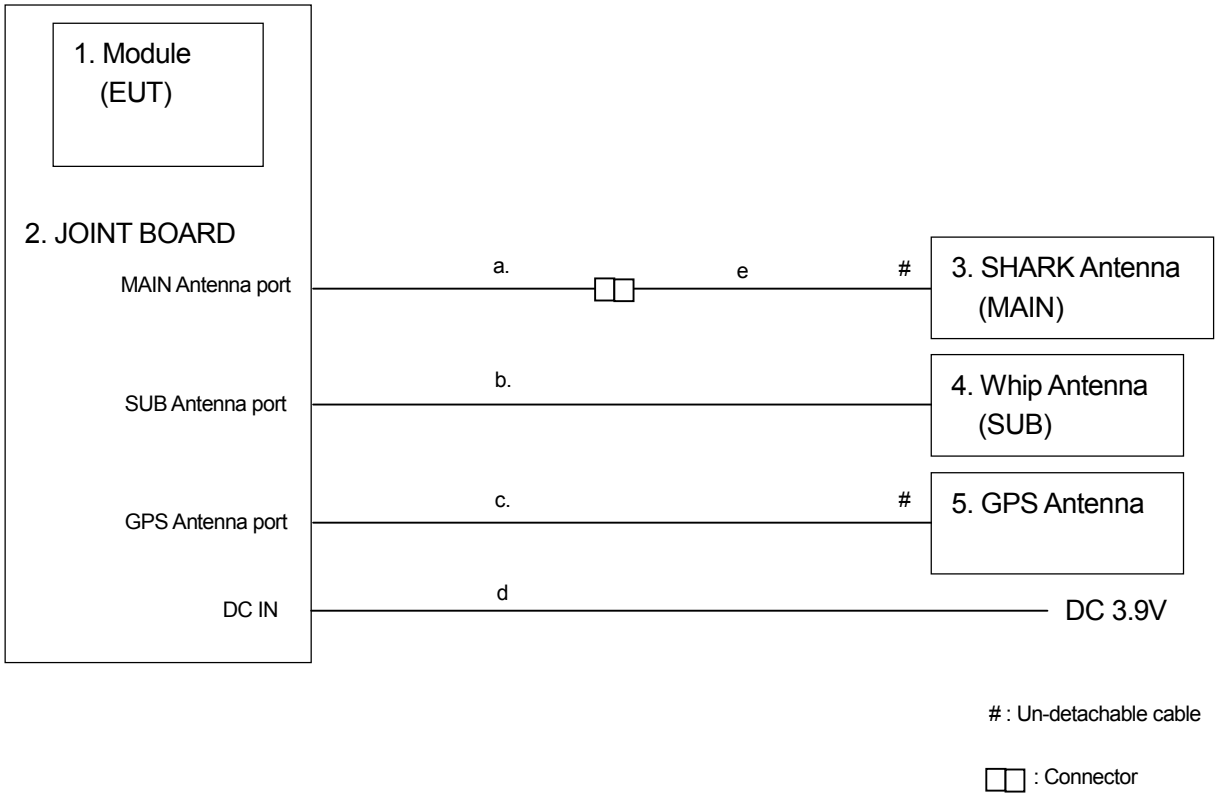
3.1 Equipment(s) used

No.	Equipment	Company	Model No.	Serial No.	FCC ID / DoC	Comment
1	Module	KYOCERA	KA36	N/A	JOYKA36	EUT
2	JOINT BOARD	KYOCERA	N/A	N/A	N/A	-
3	SHARK Antenna	YOKOWO	N/A	N/A	N/A	-
4	Whip Antenna	EAD	PTR7210	N/A	N/A	-
5	GPS Antenna	PASTERNACK	PE51066	N/A	N/A	-

3.2 Cable(s) used

No.	Cable	Length[m]	Shield	Connector	Comment
a	RF cable (MAIN)	0.3	YES	Metal	-
b	RF cable (SUB)	0.3	YES	Metal	-
c	GPS Antenna cable	5.0	YES	Metal	-
d	DC cable	1.3	NO	Plastic	-
e	RF cable	0.9	YES	Metal	-

3.3 System configuration



Note1: Numbers assigned to equipment or cables on this diagram correspond to the list in “3.1 Equipment(s) used” and “3.2 Cable(s) used”.

4. Equivalent Isotropic Radiated Power

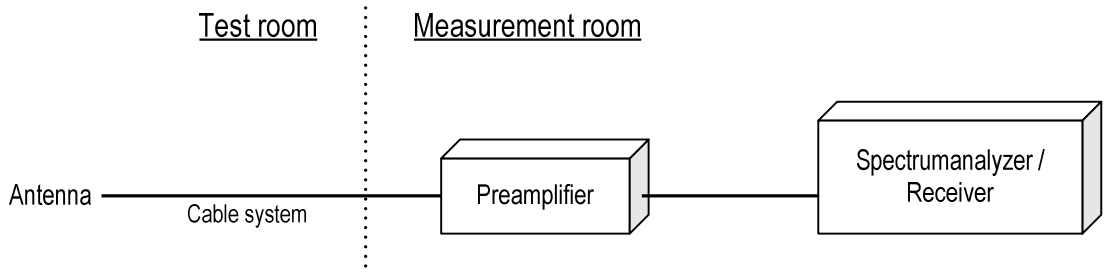
4.1 Measurement procedure
[FCC 24.232(c), IC RSS-133 6.4]

<Step 1>
The EUT and support equipment are placed on a 1 meter x 1.5 meter surface, 0.8 meter height FRP 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.

Spectrum analyzer setting
- Detector: Peak (RBW: 5MHz, VBW: 8MHz)

- Test configuration



4.2 Calculation method

Result (EIRP) = S.G Reading – Cable loss + Antenna Gain
Margin = Limit – Result (EIRP)

Example:
Limit @ 1880MHz : 33.0dBm
S.G Reading = 18.9dBm Cable loss = 1.1dB Ant. Gain = 8.3dBi
Result = 18.9 – 1.1 + 8.3 = 26.1dBm
Margin = 33.0 - 26.1 = 6.9dB

4.3 Limit

2 W (33dBm)

4.4 Test data

Date : August 22, 2015
Temperature : 22.5 [˚C]
Humidity : 65.6 [%] Test engineer : Taiki Watanabe
Test place : 3m Semi-anechoic chamber

Date : August 22, 2015
Temperature : 25.5 [˚C]
Humidity : 64.0 [%] Test engineer : Hikaru Shibata
Test place : 3m Semi-anechoic chamber

[WCDMA Band II]

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1852.4	-14.7	19.0	1.1	8.2	26.0	33.0	7.0
H	1880.0	-14.8	18.9	1.1	8.3	26.0	33.0	7.0
H	1907.6	-16.0	18.5	1.1	8.4	25.8	33.0	7.2

[LTE Band II]
QPSK, BW 1.4MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1850.7	-9.7	23.7	1.1	8.2	30.7	33.0	2.3
H	1880.0	-8.8	24.9	1.1	8.3	32.0	33.0	1.0
H	1909.3	-9.8	25.1	1.1	8.4	32.4	33.0	0.6

16QAM, BW 1.4MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1850.7	-9.5	23.9	1.1	8.2	30.9	33.0	2.1
H	1880.0	-9.5	24.2	1.1	8.3	31.3	33.0	1.7
H	1909.3	-9.9	25.0	1.1	8.4	32.3	33.0	0.7

Zacta

QPSK, BW 3MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1851.5	-9.9	23.5	1.1	8.2	30.5	33.0	2.5
H	1880.0	-9.6	24.1	1.1	8.3	31.2	33.0	1.8
H	1908.5	-10.0	24.9	1.1	8.4	32.2	33.0	0.8

16QAM, BW 3MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1851.5	-9.5	23.9	1.1	8.2	30.9	33.0	2.1
H	1880.0	-9.4	24.3	1.1	8.3	31.4	33.0	1.6
H	1908.5	-9.7	25.2	1.1	8.4	32.5	33.0	0.5

QPSK, BW 5MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1852.5	-10.0	23.7	1.1	8.2	30.7	33.0	2.3
H	1880.0	-9.8	23.9	1.1	8.3	31.0	33.0	2.0
H	1907.5	-11.4	23.1	1.1	8.4	30.4	33.0	2.6

16QAM, BW 5MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1852.5	-10.0	23.4	1.1	8.2	30.5	33.0	2.5
H	1880.0	-10.2	23.5	1.1	8.3	30.6	33.0	2.4
H	1907.5	-10.5	24.4	1.1	8.4	31.7	33.0	1.3

QPSK, BW 10MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1855.0	-10.6	23.1	1.1	8.2	30.1	33.0	2.9
H	1880.0	-10.0	23.7	1.1	8.3	30.8	33.0	2.2
H	1905.0	-10.2	24.3	1.1	8.4	31.5	33.0	1.5

16QAM, BW 10MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1855.0	-10.6	23.1	1.1	8.2	30.1	33.0	2.9
H	1880.0	-11.0	22.7	1.1	8.3	29.8	33.0	3.2
H	1905.0	-10.7	23.8	1.1	8.4	31.0	33.0	2.0

Zacta

QPSK, BW 15MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1857.5	-10.0	23.7	1.1	8.2	30.8	33.0	2.2
H	1880.0	-9.6	24.1	1.1	8.3	31.2	33.0	1.8
H	1902.5	-10.0	24.5	1.1	8.4	31.7	33.0	1.3

16QAM, BW 15MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1857.5	-10.2	23.2	1.1	8.2	30.3	33.0	2.7
H	1880.0	-10.0	23.7	1.1	8.3	30.8	33.0	2.2
H	1902.5	-10.2	24.7	1.1	8.4	31.9	33.0	1.1

QPSK, BW 20MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1860.0	-10.4	23.6	1.1	8.2	30.7	33.0	2.3
H	1880.0	-9.8	24.0	1.1	8.3	31.1	33.0	1.9
H	1900.0	-10.2	23.3	1.1	8.3	30.5	33.0	2.5

16QAM, BW 20MHz

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	1860.0	-10.5	24.1	1.1	8.2	31.2	33.0	1.8
H	1880.0	-9.4	24.4	1.1	8.3	31.5	33.0	1.5
H	1900.0	-10.0	23.4	1.1	8.3	30.6	33.0	2.4

5. Radiated Emissions and Harmonic Emissions

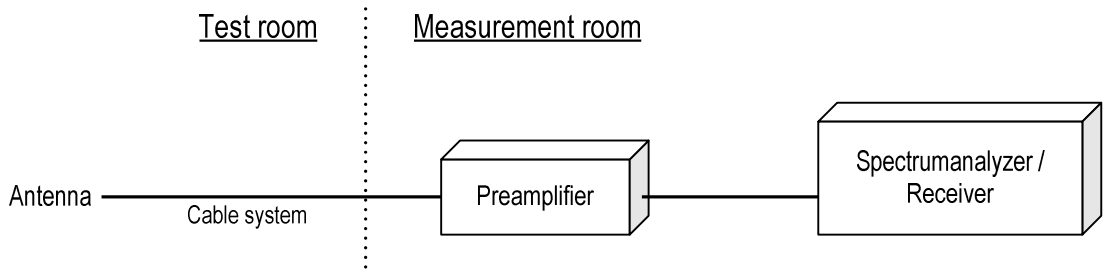
5.1 Measurement procedure
[FCC 24.238(a), 2.1053, IC RSS-133 6.5.1]

<Step 1>
The EUT and support equipment are placed on a 1 meter x 1.5 meter surface, 0.8 meter height FRP 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.

Spectrum analyzer setting
- Detector: Peak (RBW: 1MHz, VBW: 3MHz)

- Test configuration



5.2 Calculation method

Result = S.G Reading – Cable loss + Antenna Gain
Margin = Limit – Result (EIRP)

Example:
Limit @ 3757.5MHz : -13.0dBm
S.G Reading = -54.3dBm Cable loss = 1.6dB Ant. Gain = 9.2dBi
Result = -54.3 – 1.6 + 9.2 = -46.7dBm
Margin = -13.0-(-46.7) = 33.7dB

5.3 Limit

-13dBm or less

5.4 Test data

Date	:	August 22, 2015			
Temperature	:	25.5 [˚C]			
Humidity	:	64.0 [%]	Test engineer	:	
Test place	:	3m Semi-anechoic chamber			Hikaru Shibata

Date	:	August 23, 2015			
Temperature	:	25.6 [˚C]			
Humidity	:	68.4 [%]	Test engineer	:	
Test place	:	3m Semi-anechoic chamber			Taiki Watanabe

Date	:	August 24, 2015			
Temperature	:	25.0 [˚C]			
Humidity	:	59.8 [%]	Test engineer	:	
Test place	:	3m Semi-anechoic chamber			Hikaru Shibata

[WCDMA Band II]
Channel: 9262

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3707.0	-51.0	-46.5	1.6	9.4	-38.7	-13.0	25.7
V	3707.0	-55.0	-49.1	1.6	9.4	-41.3	-13.0	28.3
H	5561.0	-45.0	-38.5	2.0	11.0	-29.5	-13.0	16.5
V	5561.0	-54.8	-47.9	2.0	8.8	-41.1	-13.0	28.1

Channel: 9400

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3757.5	-59.0	-53.1	1.6	9.2	-45.5	-13.0	32.5
V	3757.5	-62.0	-55.6	1.6	9.2	-48.0	-13.0	35.0

Channel: 9538

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3813.5	-59.7	-53.8	1.6	9.3	-46.1	-13.0	33.1
V	3813.5	-62.0	-55.6	1.6	9.3	-47.9	-13.0	34.9
V	5720.0	-60.4	-52.7	2.0	11.5	-43.2	-13.0	30.2

[LTE Band II]
QPSK, BW 1.4MHz
Channel: 18607

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3702.3	-42.0	-37.5	1.6	9.4	-29.7	-13.0	16.7
V	3702.3	-45.9	-40.0	1.6	9.4	-32.2	-13.0	19.2
H	5554.0	-36.9	-29.5	2.0	11.0	-20.5	-13.0	7.5
V	5554.0	-39.5	-32.0	2.0	11.0	-23.0	-13.0	10.0

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3761.0	-38.0	-32.1	1.6	9.2	-24.5	-13.0	11.5
V	3761.0	-46.0	-39.6	1.6	9.2	-32.0	-13.0	19.0
H	5641.0	-37.8	-29.3	2.0	11.3	-20.0	-13.0	7.0
V	5641.0	-45.0	-34.9	2.0	11.3	-25.6	-13.0	12.6

Channel: 19193

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3819.6	-43.5	-37.6	1.6	9.3	-29.9	-13.0	16.9
V	3818.5	-47.0	-40.6	1.6	9.3	-32.9	-13.0	19.9
H	5729.0	-39.0	-30.3	2.0	11.5	-20.8	-13.0	7.8
V	5729.0	-51.0	-43.3	2.0	11.5	-33.8	-13.0	20.8

16QAM, BW 1.4MHz
Channel: 18607

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3702.3	-37.0	-32.5	1.6	9.4	-24.7	-13.0	11.7
V	3702.3	-47.0	-41.1	1.6	9.4	-33.3	-13.0	20.3
H	5554.0	-34.0	-26.6	2.0	11.0	-17.6	-13.0	4.6
V	5554.0	-39.9	-32.4	2.0	11.0	-23.4	-13.0	10.4

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3760.9	-36.9	-31.0	1.6	9.2	-23.4	-13.0	10.4
V	3760.9	-44.8	-38.4	1.6	9.2	-30.8	-13.0	17.8
H	5641.0	-36.8	-28.3	2.0	11.3	-19.0	-13.0	6.0
V	5642.0	-41.5	-31.4	2.0	11.3	-22.1	-13.0	9.1
H	9402.0	-55.0	-35.7	2.6	11.7	-26.6	-13.0	13.6

Zacta

Channel: 19193

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3819.5	-39.8	-33.9	1.6	9.3	-26.2	-13.0	13.2
V	3819.5	-47.0	-40.6	1.6	9.3	-32.9	-13.0	19.9
H	5729.0	-37.2	-28.5	2.0	11.5	-19.0	-13.0	6.0
V	5729.0	-44.8	-37.1	2.0	11.5	-27.6	-13.0	14.6
H	9549.0	-56.0	-36.8	2.6	12.0	-27.5	-13.0	14.5

QPSK, BW 3MHz
Channel: 18615

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3705.5	-41.4	-36.9	1.6	9.4	-29.1	-13.0	16.1
V	3705.6	-45.8	-39.9	1.6	9.4	-32.1	-13.0	19.1
H	5558.0	-35.8	-29.3	2.0	11.0	-20.3	-13.0	7.3
V	5558.0	-38.8	-31.2	2.0	11.0	-22.2	-13.0	9.2

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3762.6	-39.0	-33.1	1.6	9.2	-25.5	-13.0	12.5
V	3762.6	-43.6	-37.2	1.6	9.2	-29.6	-13.0	16.6
H	5644.0	-39.0	-30.5	2.0	11.3	-21.2	-13.0	8.2
V	5644.0	-44.8	-34.7	2.0	11.3	-25.4	-13.0	12.4

Channel: 19185

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3819.6	-38.8	-32.9	1.6	9.3	-25.2	-13.0	12.2
V	3819.6	-45.8	-39.4	1.6	9.3	-31.7	-13.0	18.7
H	5729.0	-41.0	-32.3	2.0	11.5	-22.8	-13.0	9.8
V	5729.0	-46.0	-38.6	2.0	11.5	-29.1	-13.0	16.1

Zacta

16QAM, BW 3MHz
Channel: 18615

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3705.6	-38.8	-34.3	1.6	9.4	-26.5	-13.0	13.5
V	3705.5	-41.8	-35.9	1.6	9.4	-28.1	-13.0	15.1
H	5558.0	-34.0	-29.6	2.0	11.0	-20.6	-13.0	7.6
V	5558.0	-36.1	-31.6	2.0	11.0	-22.6	-13.0	9.6

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3762.5	-38.8	-32.9	1.6	9.2	-25.3	-13.0	12.3
V	3762.5	-41.0	-34.6	1.6	9.2	-27.0	-13.0	14.0
H	5644.0	-38.0	-29.5	2.0	11.3	-20.2	-13.0	7.2
V	5644.0	-44.9	-34.8	2.0	11.3	-25.5	-13.0	12.5
H	9406.0	-53.1	-33.8	2.6	11.8	-24.7	-13.0	11.7

Channel: 19185

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3819.6	-40.4	-34.5	1.6	9.3	-26.8	-13.0	13.8
V	3819.6	-46.2	-39.8	1.6	9.3	-32.1	-13.0	19.1
H	5729.0	-39.0	-30.3	2.0	11.5	-20.8	-13.0	7.8
V	5729.0	-45.0	-37.3	2.0	11.5	-27.8	-13.0	14.8

QPSK, BW 5MHz
Channel: 18625

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3709.3	-42.0	-37.5	1.6	9.4	-29.7	-13.0	16.7
V	3709.3	-47.2	-41.3	1.6	9.4	-33.5	-13.0	20.5
H	5564.0	-35.2	-28.7	2.0	11.0	-19.7	-13.0	6.7
V	5564.0	-40.0	-33.1	2.0	11.0	-24.1	-13.0	11.1

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3764.4	-37.0	-31.1	1.6	9.2	-23.5	-13.0	10.5
V	3764.3	-45.0	-38.6	1.6	9.2	-31.0	-13.0	18.0
H	5647.0	-39.8	-31.3	2.0	11.3	-22.0	-13.0	9.0
V	5647.0	-45.0	-34.9	2.0	11.3	-25.6	-13.0	12.6

Zacta

Channel: 19175

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3819.3	-44.0	-38.1	1.6	9.3	-30.4	-13.0	17.4
V	3819.3	-48.0	-41.6	1.6	9.3	-33.9	-13.0	20.9
H	5729.0	-43.0	-34.3	2.0	11.5	-24.8	-13.0	11.8
V	5729.0	-52.0	-44.3	2.0	11.5	-34.8	-13.0	21.8

16QAM, BW 5MHz
Channel: 18625

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3705.0	-37.5	-33.0	1.6	9.4	-25.2	-13.0	12.2
V	3705.0	-44.8	-38.9	1.6	9.4	-31.1	-13.0	18.1
H	5558.0	-33.2	-26.7	2.0	11.0	-17.7	-13.0	4.7
V	5558.0	-41.9	-34.4	2.0	11.0	-25.4	-13.0	12.4

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3760.1	-37.2	-31.3	1.6	9.2	-23.7	-13.0	10.7
V	3760.1	-46.5	-40.1	1.6	9.2	-32.5	-13.0	19.5
H	5640.0	-39.0	-30.5	2.0	11.3	-21.2	-13.0	8.2
V	5640.0	-47.3	-37.2	2.0	11.3	-27.9	-13.0	14.9
H	9400.0	-54.5	-35.2	2.6	11.7	-26.1	-13.0	13.1

Channel: 19175

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3815.0	-42.0	-36.1	1.6	9.3	-28.4	-13.0	15.4
V	3815.0	-51.9	-45.5	1.6	9.3	-37.8	-13.0	24.8
H	5723.0	-41.0	-32.3	2.0	11.5	-22.8	-13.0	9.8
V	5723.0	-52.4	-44.7	2.0	11.5	-35.2	-13.0	22.2

QPSK, BW 10MHz
Channel: 18650

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3710.2	-36.6	-32.1	1.6	9.4	-24.3	-13.0	11.3
V	3710.2	-47.2	-41.3	1.6	9.4	-33.5	-13.0	20.5
H	5565.0	-32.0	-28.5	2.0	11.0	-19.5	-13.0	6.5
V	5565.0	-39.3	-32.4	2.0	11.0	-23.4	-13.0	10.4

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3760.2	-38.0	-32.1	1.6	9.2	-24.5	-13.0	11.5
V	3760.2	-49.0	-42.6	1.6	9.2	-35.0	-13.0	22.0
H	5640.0	-37.7	-29.2	2.0	11.3	-19.9	-13.0	6.9
V	5640.0	-46.5	-36.4	2.0	11.3	-27.1	-13.0	14.1

Channel: 19150

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3810.2	-37.9	-32.0	1.6	9.4	-24.3	-13.0	11.3
V	3810.1	-45.0	-38.6	1.6	9.4	-30.9	-13.0	17.9
H	5715.0	-39.0	-30.3	2.0	11.5	-20.8	-13.0	7.8
V	5715.0	-49.0	-41.3	2.0	11.5	-31.8	-13.0	18.8

16QAM, BW 10MHz
Channel: 18650

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3710.2	-36.6	-32.1	1.6	9.4	-24.3	-13.0	11.3
V	3710.2	-46.8	-40.9	1.6	9.4	-33.1	-13.0	20.1
H	5565.0	-33.7	-30.2	2.0	11.0	-21.2	-13.0	8.2
V	5565.0	-41.0	-34.1	2.0	11.0	-25.1	-13.0	12.1

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3760.2	-37.4	-31.5	1.6	9.2	-23.9	-13.0	10.9
V	3760.2	-51.0	-44.6	1.6	9.2	-37.0	-13.0	24.0
H	5640.0	-38.2	-29.7	2.0	11.3	-20.4	-13.0	7.4
V	5640.0	-45.4	-35.3	2.0	11.3	-26.0	-13.0	13.0
H	9401.0	-54.9	-36.6	2.6	11.7	-27.5	-13.0	14.5

Zacta

Channel: 19150

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3810.2	-36.0	-30.1	1.6	9.4	-22.4	-13.0	9.4
V	3810.2	-47.0	-40.6	1.6	9.4	-32.9	-13.0	19.9
H	5715.0	-42.0	-33.3	2.0	11.5	-23.8	-13.0	10.8
V	5715.0	-52.0	-44.3	2.0	11.5	-34.8	-13.0	21.8

QPSK, BW 15MHz
Channel: 18675

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3715.0	-37.0	-32.5	1.6	9.4	-24.7	-13.0	11.7
V	3715.0	-46.0	-40.1	1.6	9.4	-32.3	-13.0	19.3
H	5573.0	-38.8	-35.3	2.0	11.0	-26.2	-13.0	13.2
V	5573.0	-41.5	-34.6	2.0	11.0	-25.5	-13.0	12.5

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3760.0	-44.0	-38.1	1.6	9.2	-30.5	-13.0	17.5
V	3760.1	-45.0	-38.6	1.6	9.2	-31.0	-13.0	18.0
H	5640.0	-38.5	-30.0	2.0	11.3	-20.7	-13.0	7.7
V	5640.0	-44.8	-34.7	2.0	11.3	-25.4	-13.0	12.4

Channel: 19125

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3805.1	-39.8	-33.9	1.6	9.4	-26.2	-13.0	13.2
V	3805.1	-46.0	-39.6	1.6	9.4	-31.9	-13.0	18.9
H	5708.0	-41.5	-32.8	2.0	11.5	-23.3	-13.0	10.3
V	5708.0	-48.0	-40.3	2.0	11.5	-30.8	-13.0	17.8

Zacta

16QAM, BW 15MHz
Channel: 18675

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3701.7	-38.0	-33.5	1.6	9.4	-25.7	-13.0	12.7
V	3701.6	-44.0	-38.1	1.6	9.4	-30.3	-13.0	17.3
H	5553.0	-32.4	-27.9	2.0	11.0	-18.9	-13.0	5.9
V	5553.0	-43.6	-36.1	2.0	11.0	-27.1	-13.0	14.1

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3746.7	-36.6	-30.7	1.6	9.2	-23.1	-13.0	10.1
V	3746.7	-45.0	-38.6	1.6	9.2	-31.0	-13.0	18.0
H	5620.0	-37.0	-28.5	2.0	11.2	-19.3	-13.0	6.3
V	5620.0	-44.4	-34.3	2.0	11.2	-25.1	-13.0	12.1
H	9367.0	-54.0	-34.7	2.6	11.8	-25.5	-13.0	12.5

Channel: 19125

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3791.7	-39.7	-33.8	1.6	9.3	-26.1	-13.0	13.1
V	3791.7	-48.0	-41.6	1.6	9.3	-33.9	-13.0	20.9
H	5688.0	-41.3	-32.6	2.0	11.4	-23.2	-13.0	10.2
V	5688.0	-48.0	-40.3	2.0	11.4	-30.9	-13.0	17.9

QPSK, BW 20MHz
Channel: 18700

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3702.2	-36.6	-32.1	1.6	9.4	-24.3	-13.0	11.3
V	3702.2	-46.1	-40.2	1.6	9.4	-32.4	-13.0	19.4
H	5553.0	-32.1	-27.7	2.0	11.0	-18.7	-13.0	5.7
V	5553.0	-41.5	-32.3	2.0	11.0	-23.3	-13.0	10.3

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3742.2	-36.2	-35.0	1.6	9.2	-27.4	-13.0	14.4
V	3742.2	-47.0	-44.4	1.6	9.2	-36.8	-13.0	23.8
H	5613.0	-37.0	-29.8	2.0	11.2	-20.6	-13.0	7.6
V	5613.0	-44.3	-38.3	2.0	11.2	-29.1	-13.0	16.1

Zacta

Channel: 19100

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3782.2	-41.1	-39.4	1.6	9.3	-31.7	-13.0	18.7
V	3782.3	-50.0	-47.8	1.6	9.3	-40.1	-13.0	27.1
H	5673.0	-39.6	-32.0	2.0	11.4	-22.6	-13.0	9.6
V	5673.0	-47.9	-41.7	2.0	11.4	-32.3	-13.0	19.3

16QAM, BW 20MHz
Channel: 18700

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3697.2	-37.7	-33.2	1.6	9.5	-25.3	-13.0	12.3
V	3697.2	-46.3	-40.4	1.6	9.5	-32.5	-13.0	19.5
H	5546.0	-33.0	-28.6	2.0	10.9	-19.6	-13.0	6.6
V	5546.0	-45.0	-35.8	2.0	10.9	-26.8	-13.0	13.8

Channel: 18900

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3742.2	-35.6	-34.4	1.6	9.2	-26.8	-13.0	13.8
V	3742.2	-45.1	-42.5	1.6	9.2	-34.9	-13.0	21.9
H	5613.0	-37.4	-30.2	2.0	11.2	-21.0	-13.0	8.0
V	5613.0	-47.8	-41.8	2.0	11.2	-32.6	-13.0	19.6
H	9355.0	-54.8	-36.5	2.6	11.8	-27.3	-13.0	14.3

Channel: 19100

H/V	Frequency [MHz]	S.A Reading [dBm]	S.G Reading [dBm]	Cable loss [dB]	Ant.Gain [dBi]	Result [dBm]	Limit [dBm]	Margin [dB]
H	3782.2	-39.1	-37.4	1.6	9.3	-29.7	-13.0	16.7
V	3782.3	-49.2	-47.0	1.6	9.3	-39.3	-13.0	26.3
H	5673.0	-39.6	-32.0	2.0	11.4	-22.6	-13.0	9.6
V	5673.0	-47.0	-40.8	2.0	11.4	-31.4	-13.0	18.4

6. 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 determining compliance or non-compliance with test result.

Test item	Measurement uncertainty
Conducted emission at mains port	±3.0dB
Radiated emission (9kHz – 30MHz)	±4.4dB
Radiated emission (30MHz – 1000MHz)	±4.5dB
Radiated emission (1000MHz – 26GHz)	±3.9dB

7. Laboratory description

1. Location:

TÜV SÜD Zacta Ltd. Yonezawa Testing Center
4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 Fax: +81-238-28-2888

2. Facility filing information:

1) NVLAP accreditation: NVLAP Lab. code: 200306-0

2) VLAC accreditation: Lab. code: VLAC-013

Site name	Radiated emission	Conducted emission for mains port	Conducted emission for telecom port	Radiated emission (CMAD)	Expiry Date
3m Semi-anechoic chamber	VLAC-013			-	Jul. 3, 2017
10m Semi-anechoic chamber No.1				VLAC-013	
10m Semi-anechoic chamber No.2					
Shielded room No.1	-	VLAC-013		-	

3) FCC filing:

Site name	Registration Number	Expiry Date
Site 3	91065	Oct. 1, 2017
3m Semi-anechoic chamber	540072	Feb. 20, 2017
10m Semi-anechoic chamber No.1		
10m Semi-anechoic chamber No.2		
Shielded room No.1		

4) Industry Canada Oats site filing:

Site name	Sites on file: Oats 3m/10m	Expiry Date
Site 3	4224A-3	Dec. 3, 2017
3m Semi-anechoic chamber	4224A-4	
10m Semi-anechoic chamber No.1	4224A-5	
10m Semi-anechoic chamber No.2	4224A-6	Jan. 15, 2017

5) VCCI site filing:

Site name	Radiated emission	Conducted emission for mains port	Conducted emission for telecom port	Expiry Date
Site 3	R-138	C-134	T-1222	Nov. 16, 2017
3m Semi-anechoic chamber	A-0166			Jul. 3, 2017
10m Semi-anechoic chamber No.1				
10m Semi-anechoic chamber No.2				
Shielded room No.1	-	A-0166		

6) TÜV SÜD PS authorization:
Authorized as an EMC test laboratory

7) TÜV Rheinland authorization:
Authorized as an EMC test laboratory

Appendix A. Test equipment

Radiated emission

Equipment	Company	Model No.	Serial No.	Cal. Due	Cal. Date
EMI Receiver	ROHDE&SCHWARZ	ESCI	100451	Dec. 31, 2015	Dec. 25, 2014
Preamplifier	ANRITSU	MH648A	M96057	Jun. 30, 2016	Jun. 12, 2015
Biconical antenna	Schwarzbeck	VHA9103/BBA9106	2125	Jun. 30, 2016	Jun. 4, 2015
Log periodic antenna	Schwarzbeck	UHALP9108A	0560	Jun. 30, 2016	Jun. 4, 2015
Attenuator	TME	CFA-01NPJ-6	N/A (S275)	Jun. 30, 2016	Jun. 23, 2015
Attenuator	TME	CFA-01NPJ-3	N/A (S272)	Jun. 30, 2016	Jun. 23, 2015
Spectrum analyzer	Agilent Technologies	E4440A	US44302655	Jun. 30, 2016	Jun. 11, 2015
Preamplifier	TSJ	MLA-100M18-B02-40	1929118	May 31, 2016	May 1, 2015
Attenuator	AEROFLEX	26A-10	081217-08	Mar. 31, 2016	Mar. 12, 2015
Dipole antenna	Schwarzbeck	VHAP	1020	Sep. 30, 2015	Sep. 5, 2014
Dipole antenna	Schwarzbeck	UHAP	994	Sep. 30, 2015	Sep. 5, 2014
Double ridged guide antenna	EMCO	3115	5205	Feb. 29, 2016	Feb. 16, 2015
Attenuator	Agilent Technologies	8491B	MY39268633	Feb. 29, 2016	Feb. 1, 2015
Double ridged guide antenna	EMCO	3115	000058532	Oct. 31, 2015	Oct. 14, 2014
Signal generator	ROHDE&SCHWARZ	SMB100A	177525	Jun. 30, 2016	Jun. 19, 2015
Power amplifier	R&K	CGA020M602-2633R	B40240	Mar.31, 2016	Mar. 23, 2015
Microwave cable	SUHNER	SUCOFELX102/2m	31648/2	Mar. 28, 2016	Mar. 10, 2015
High pass filter	Micro-Tronics	HPM50115	004	Jul. 31, 2016	Jul. 12, 2015
High pass filter	Wainwright	WHKX2.8/18G-6SS	1	Jul. 31, 2016	Jul. 17, 2015
Wideband radio frequency tester	ROHDE&SCHWARZ	CMW500	126079	Aug. 31, 2015	Aug. 28, 2014
Microwave cable	SUHNER	SUCOFLEX104/9m	346316/4	Oct. 31, 2015	Oct. 31, 2014
		SUCOFLEX104/1m	322084/4	Oct. 31, 2015	Oct. 31, 2014
		SUCOFLEX104/1.5m	317226/4	Oct. 31, 2015	Oct. 31, 2014
		SUCOFLEX104/7m	41625/6	Oct. 31, 2015	Oct. 31, 2014
PC	DELL	DIMENSION E521	75465BX	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V5.3.61	N/A	N/A
3m Semi-anechoic chamber	TOKIN	N/A	N/A (9002-NSA)	Apr. 30, 2016	Apr. 27, 2015
3m Semi-anechoic chamber	TOKIN	N/A	N/A (9002-SVSWR)	Apr. 30, 2016	Apr. 27, 2015

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