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FCC RADIO TEST REPORT

Applicant's company	**LANCOM Systems GmbH**
Applicant Address	Adenauerstrasse 20/B2 52146, Wuerselen Germany
FCC ID	**U4Y-ESLREVC2**
Manufacturer's company	**LANCOM Systems GmbH**
Manufacturer Address	Adenauerstrasse 20/B2 52146, Wuerselen Germany

Product Name	Dual RF Transceiver
Brand Name	LANCOM
Model Name	ESL Rev. C2
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.249
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Aug. 18, 2016
Final Test Date	Nov. 01, 2016
Submission Type	Original Equipment

Statement

The test result in this report refers exclusively to the presented test model / sample.
Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013** and **47 CFR FCC Part 15 Subpart C**.
The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR681137AB	Rev. 01	Initial issue of report	Nov. 10, 2016

1. VERIFICATION OF COMPLIANCE

Product Name	:	Dual RF Transceiver
Brand Name	:	LANCOM
Model Name	:	ESL Rev. C2
Applicant	:	LANCOM Systems GmbH
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart C § 15.249

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Aug. 18, 2016 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Reviewed By:
Cliff Chang
SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C			
Part	**Rule Section**	**Description of Test**	**Result**
4.1	15.207	AC Power Line Conducted Emissions	Complies
4.2	15.249(a)	Field Strength of Fundamental Emissions	Complies
4.3	15.215(c)	20dB Spectrum Bandwidth	Complies
4.4	15.249(a)/(d)	Radiated Emissions	Complies
4.5	15.249(d)	Band Edge Emissions	Complies
4.6	15.203	Antenna Requirements	Complies

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Power Type	From host system
Modulation	MSK
Frequency Range	2400 ~ 2483.5MHz
Operation Frequency Range	2404 ~ 2480MHz
Channel Number	10
Operating Frequency	2404 MHz / 2410 MHz / 2422 MHz / 2425 MHz / 2442 MHz / 2450 MHz / 2462 MHz / 2470 MHz / 2477 MHz / 2479.4 MHz
Channel Bandwidth (99%)	0.968 MHz
Max. Field Strength	109.04 dBuV/m at 3m (Peak)
Carrier Frequencies	Please refer to section 3.3
Antenna	Please refer to section 3.4

3.2. Accessories

N/A

3.3. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency
2400 ~ 2483.5MHz	1	2404 MHz
	2	2410 MHz
	3	2422 MHz
	4	2425 MHz
	5	2442 MHz
	6	2450 MHz
	7	2462 MHz
	8	2470 MHz
	9	2477 MHz
	10	2479.4 MHz

3.4. Table for Filed Antenna

Ant.	Antenna board	Brand Holder	P/N	Antenna Type	Connector	Gain (dBi)
1	3	Tyco Electronics Corporation	1513164-1	Dipole Antenna	U.FL	4
2	4	Tyco Electronics Corporation	1513164-1	Dipole Antenna	U.FL	4

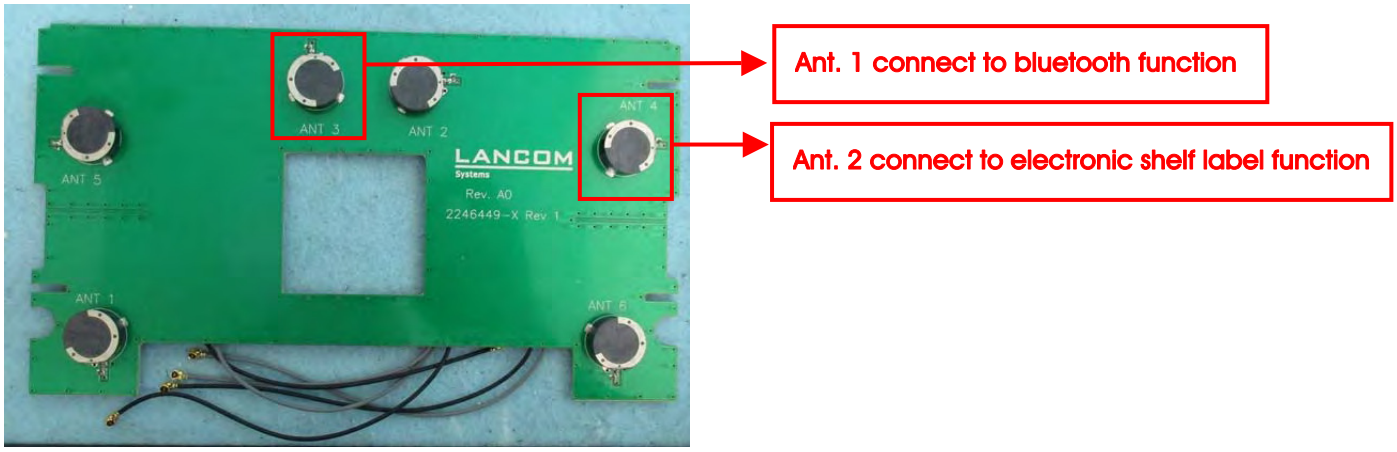
Note: The EUT has two antennas.

For IEEE bluetooth function (1TX/1RX):

Only Ant. 1 can be used as transmitting/receiving antenna.

For IEEE electronic shelf label function (1TX/1RX):

Only Ant. 2 can be used as transmitting/receiving antenna.



3.5. Table for Test Modes

The following table is a list of the test modes shown in this test report.

Test Items	Mode	Channel	Antenna
AC Power Line Conducted Emissions	CTX	-	-
Field Strength of Fundamental Emissions 20dB Spectrum Bandwidth	CTX	1/5/10	2
Radiated Emissions 30MHz ~ 1GHz	CTX	-	-
Radiated Emissions 1GHz~10th Harmonic	CTX	1/5/10	2
Band Edge Emissions	CTX	1/5/10	2

Note: CTX=continuously transmitting

For Co-location MPE:

The EUT could be applied with bluetooth function and electronic shelf label function; therefore Co-location Maximum Permissible Exposure (Please refer to FA681137) is added for simultaneously transmit between bluetooth function and electronic shelf label function.

3.6. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	**Site Category**	**Location**	**FCC Designation No.**	**IC File No.**	**VCCI Reg. No**
03CH01-CB	SAC	Hsin Chu	TW0006	IC 4086D	-
CO02-CB	Conduction	Hsin Chu	TW0006	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

3.7. Table for Supporting Units

For Test Site No: CO02-CB

Support Unit	Brand	Model	FCC ID
LCD Monitor	DELL	1704FPTt	DoC
Keyboard	iCooky	SK068	DoC
Mouse	Logitech	M-U0026	DoC
Raspberry Pi	Teleconformity	Raspb212	DoC
AP	LANCOM	LN-830E	DoC
Test Fixture	LANCOM	400340781800002	N/A

For Test Site No: 03CH01-CB and TH01-CB

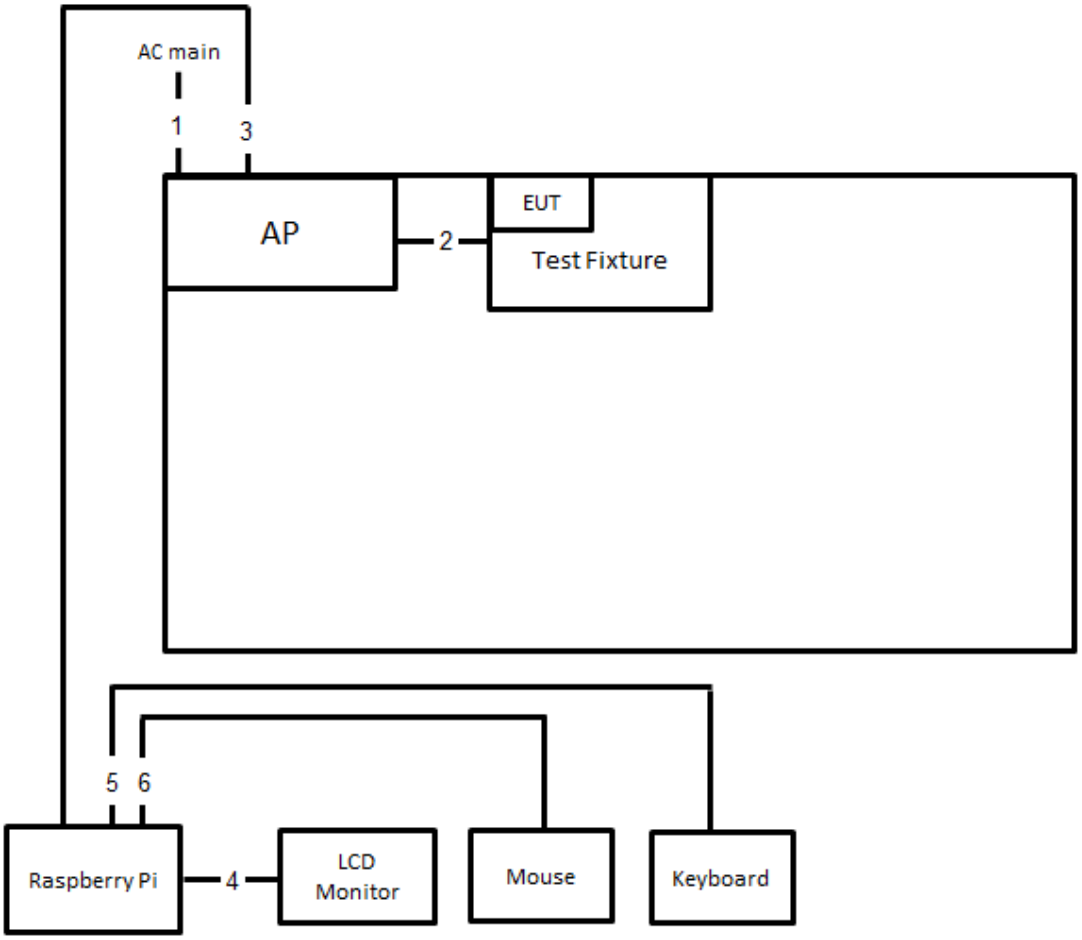
Support Unit	Brand	Model	FCC ID
LCD TV	SONY	KLV-32U300A	DoC
Mouse	Logitech	M-U0026	DoC
Keyboard	iCooky	SK068	DoC
AP	LANCOM	L-151E	DoC
Raspberry Pi	LANCOM	N/A	DoC
Test Fixture	LANCOM	400340781800002	N/A

3.8. Duty Cycle

On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
1.000	1.000	100	0.00	0.01

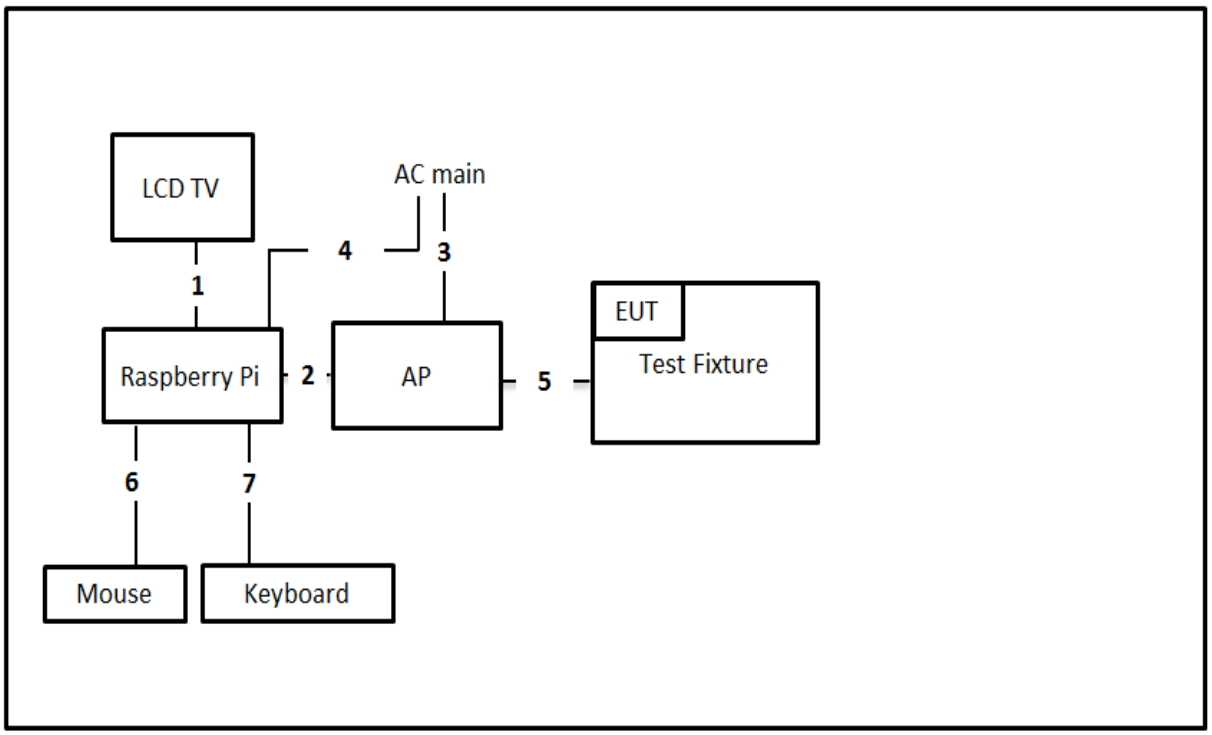
3.9. Test Configurations

3.9.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shield	Length
1	Power cable	No	2m
2	Bus cable	No	0.1m
3	RJ-45 cable	No	10m
4	HDMI cable	Yes	1.8m
5	USB cable	Yes	1.8m
6	USB cable	Yes	1.8m

3.9.2. Radiation Emissions Test Configuration



Item	Connection	Shield	Length
1	HDMI cable	Yes	1.82m
2	RJ45 cable	No	3m
3	Power cable	No	1.5m
4	Power cable	No	2m
5	Bus cable	No	0.1m
6	USB cable	Yes	1.8m
7	USB cable	Yes	1.8m

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

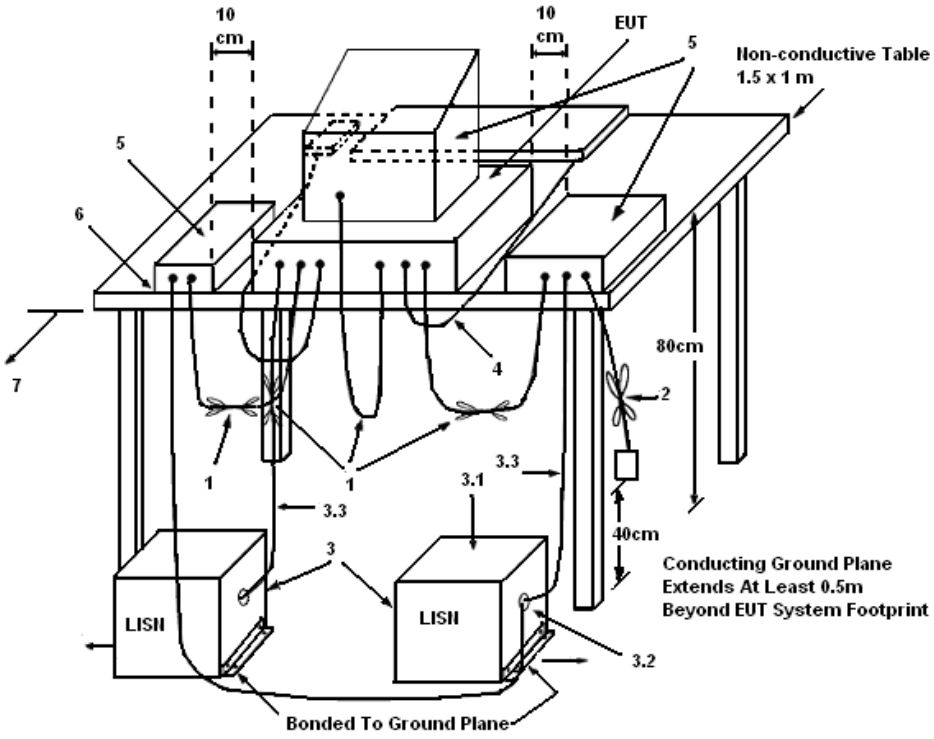
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



LEGEND:

(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5. Test Deviation

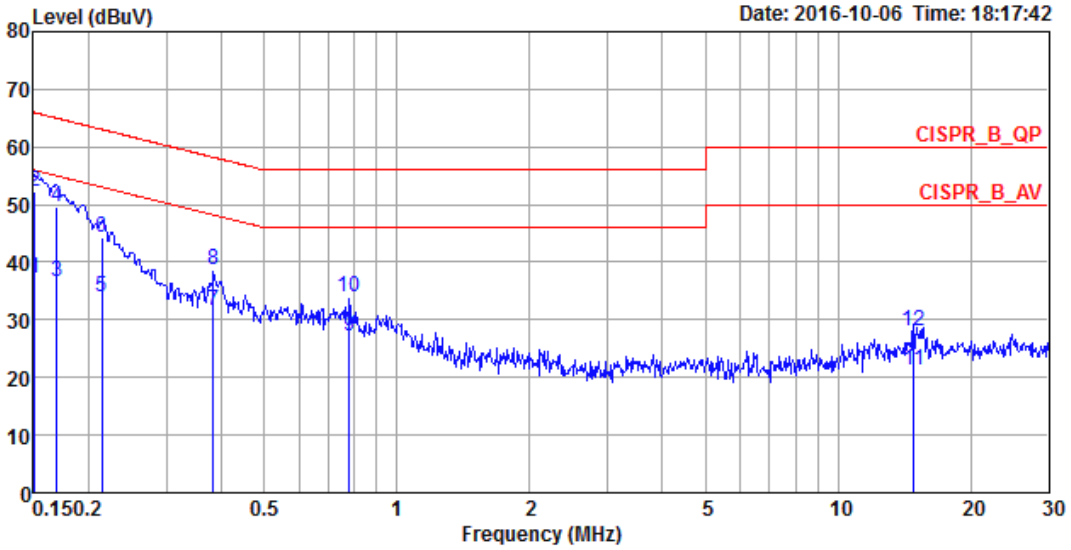
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

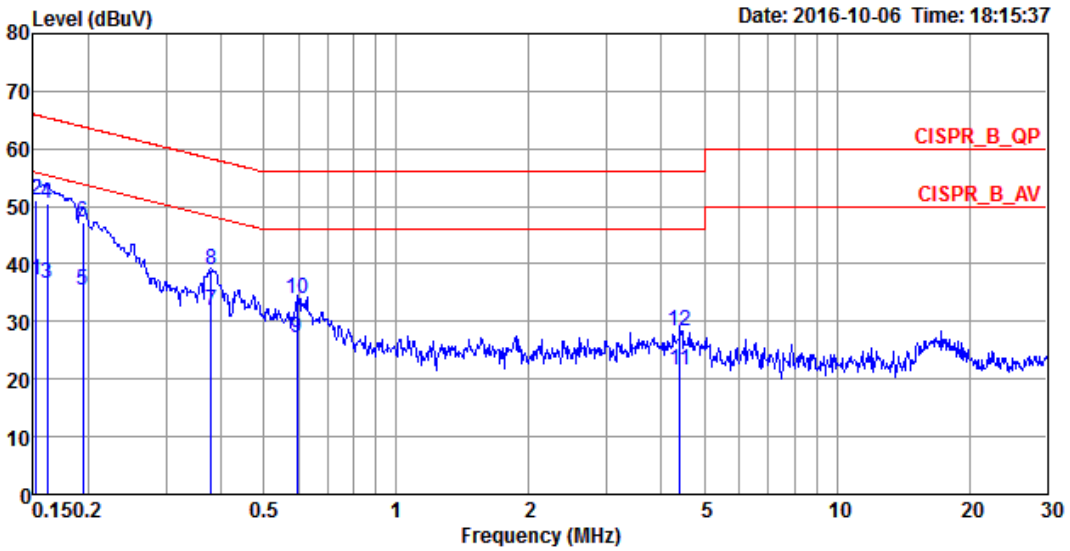
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	23°C	Humidity	59%
Test Engineer	GN Hou	Phase	Line
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1508	37.30	-18.66	55.96	27.18	9.96	0.16	Average	LINE
2	0.1508	52.12	-13.84	65.96	42.00	9.96	0.16	QP	LINE
3	0.1694	36.58	-18.41	54.99	26.46	9.96	0.16	Average	LINE
4	0.1694	49.50	-15.49	64.99	39.38	9.96	0.16	QP	LINE
5	0.2139	34.04	-19.01	53.05	23.90	9.96	0.18	Average	LINE
6	0.2139	44.15	-18.90	63.05	34.01	9.96	0.18	QP	LINE
7	0.3832	31.64	-16.57	48.21	21.43	10.01	0.20	Average	LINE
8	0.3832	38.64	-19.57	58.21	28.43	10.01	0.20	QP	LINE
9	0.7793	27.19	-18.81	46.00	16.96	10.04	0.19	Average	LINE
10	0.7793	33.84	-22.16	56.00	23.61	10.04	0.19	QP	LINE
11	14.8281	21.23	-28.77	50.00	10.57	10.22	0.44	Average	LINE
12	14.8281	27.96	-32.04	60.00	17.30	10.22	0.44	QP	LINE

Temperature	23℃	Humidity	59%
Test Engineer	GN Hou	Phase	Neutral
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.1524	37.08	-18.79	55.87	26.96	9.96	0.16	Average	NEUTRAL
2	0.1524	51.14	-14.73	65.87	41.02	9.96	0.16	QP	NEUTRAL
3	0.1616	36.65	-18.73	55.38	26.53	9.96	0.16	Average	NEUTRAL
4	0.1616	50.60	-14.78	65.38	40.48	9.96	0.16	QP	NEUTRAL
5	0.1945	35.43	-18.41	53.84	25.29	9.96	0.18	Average	NEUTRAL
6	0.1945	47.25	-16.59	63.84	37.11	9.96	0.18	QP	NEUTRAL
7	0.3791	31.89	-16.41	48.30	21.72	9.97	0.20	Average	NEUTRAL
8	0.3791	39.05	-19.25	58.30	28.88	9.97	0.20	QP	NEUTRAL
9	0.5948	27.10	-18.90	46.00	16.93	9.97	0.20	Average	NEUTRAL
10	0.5948	33.87	-22.13	56.00	23.70	9.97	0.20	QP	NEUTRAL
11	4.4071	21.62	-24.38	46.00	11.26	10.03	0.33	Average	NEUTRAL
12	4.4071	28.39	-27.61	56.00	18.03	10.03	0.33	QP	NEUTRAL

Note:

Level = Read Level + LISN Factor + Cable Loss

4.2. Field Strength of Fundamental Emissions Measurement

4.2.1. Limit

The field strength of fundamental emissions within these bands specified at a distance of 3 meters (measurement instrumentation employing an average detector) shall comply with the following table.

Frequency Band (MHz)	Fundamental Emissions Limit (dBuV/m) at 3m
2400-2483.5	94 (Average)
	114 (Peak)

4.2.2. Measuring Instruments and Setting

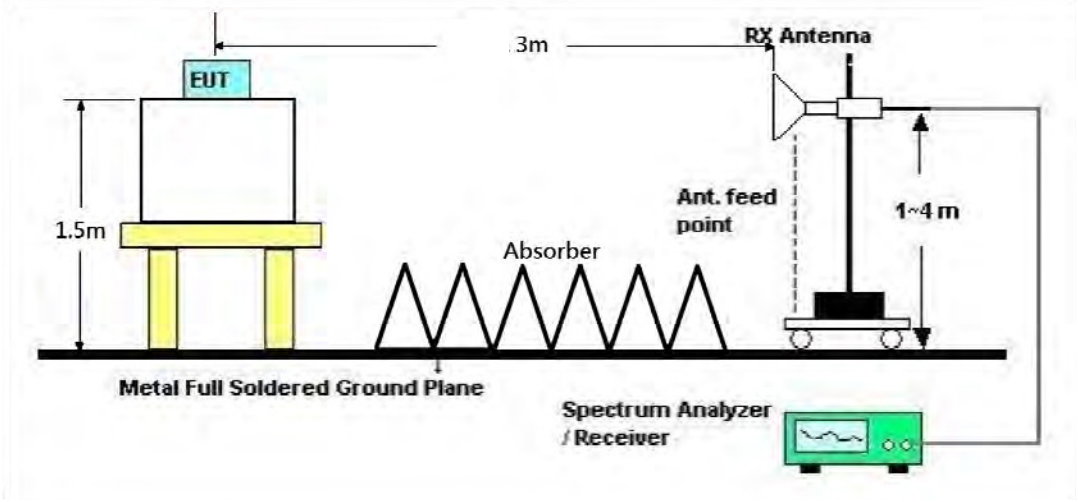
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Power Meter Parameter	Setting
RBW	1 MHz Peak / 3MHz Peak
VBW	1 MHz Peak / 1/T Average
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.2.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. For Fundamental emissions, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

4.2.4. Test Setup Layout



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of Field Strength of Fundamental Emissions

Temperature	22°C	Humidity	54%
Test Engineer	Zero Chen & Mason Chen	Configurations	Channel 1, 5, 10
Test Date	Oct. 27, 2016		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2404.00	76.19	94.00	-17.81	43.15	5.15	27.89	0.00	262	312	Average	HORIZONTAL
2	2404.00	107.50	114.00	-6.50	74.46	5.15	27.89	0.00	262	312	Peak	HORIZONTAL

Channel 5

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2442.00	75.85	94.00	-18.15	42.80	5.20	27.85	0.00	297	58	Average	HORIZONTAL
2	2442.00	107.16	114.00	-6.84	74.11	5.20	27.85	0.00	297	58	Peak	HORIZONTAL

Channel 10

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2479.40	77.73	94.00	-16.27	44.65	5.26	27.82	0.00	255	38	Average	HORIZONTAL
2 @	2479.40	109.04	114.00	-4.96	75.96	5.26	27.82	0.00	255	38	Peak	HORIZONTAL

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

4.3. 20dB Spectrum Bandwidth Measurement

4.3.1. Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (2400 ~ 2483.5MHz).

4.3.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RBW	100 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.

4.3.4. Test Setup Layout

4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

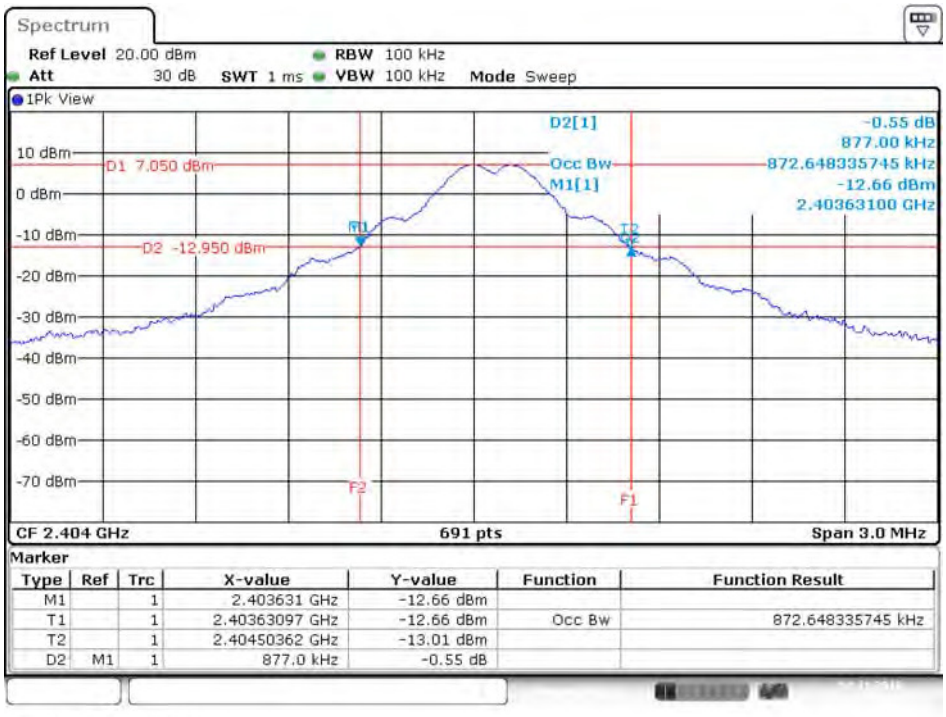
The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of 20dB Spectrum Bandwidth

Temperature	22℃	Humidity	54%
Test Engineer	Wen Chao	Configurations	Channel 1/5/10

Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 2400MHz	Frequency range (MHz) f_H < 2483.5MHz	Test Result
2404 MHz	0.877	0.873	2403.6310	-	Complies
2442 MHz	0.864	0.847	-	-	Complies
2479.4 MHz	0.903	0.968	-	2479.7438	Complies

20 dB & 99% Bandwidth Plot on 2404 MHz



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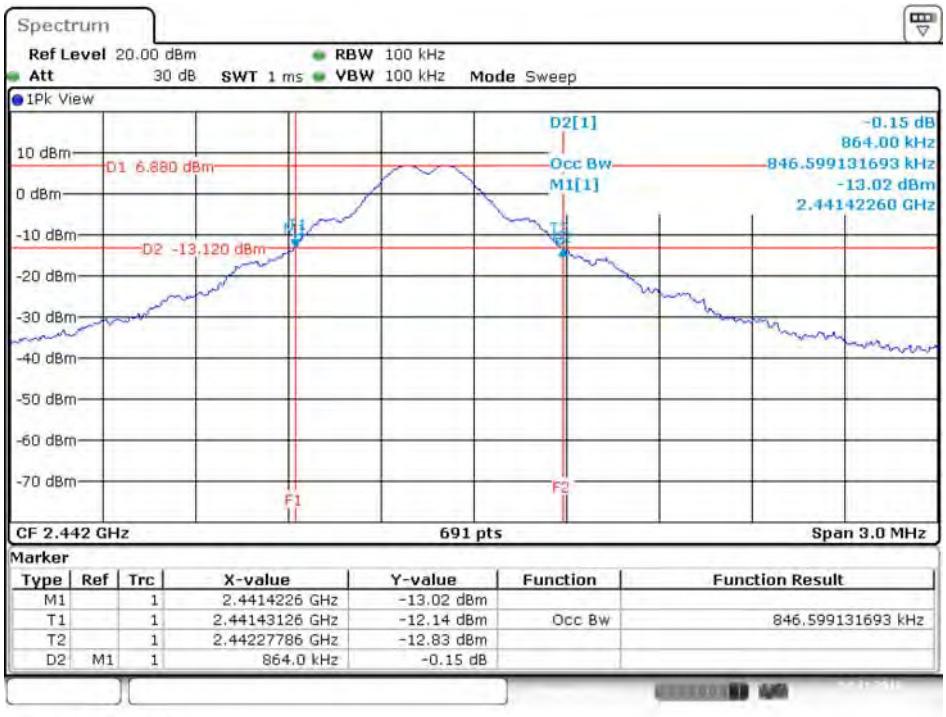
20 dB & 99% Bandwidth Plot on 2442 MHz



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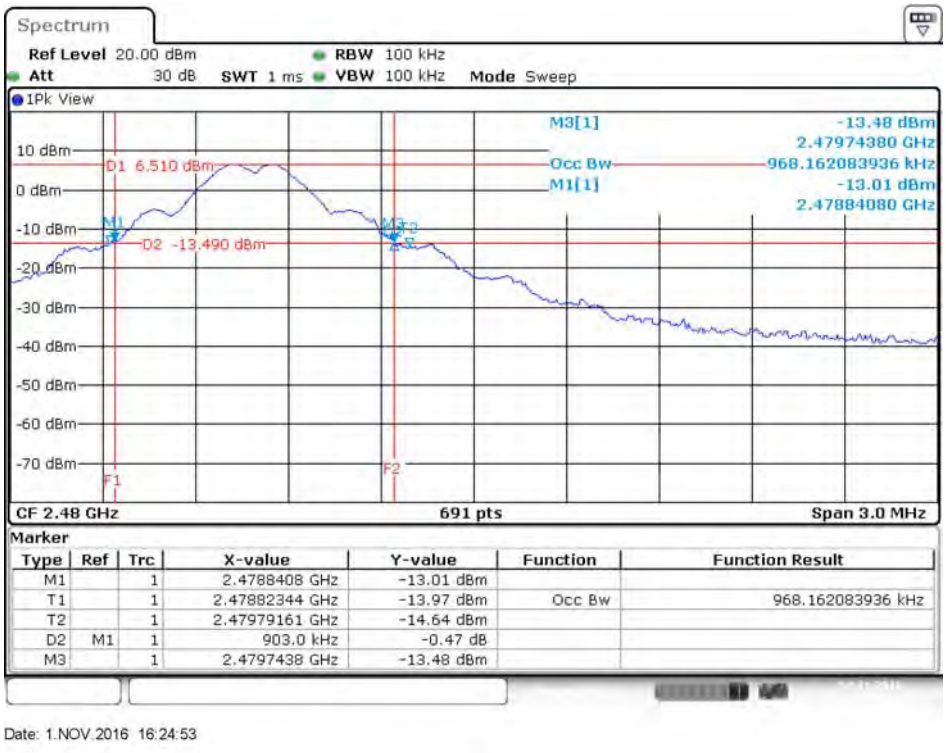
20 dB & 99% Bandwidth Plot on 2479.4 MHz



4.4. Radiated Emissions Measurement

4.4.1. Limit

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.4.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	100kHz/300kHz for Peak

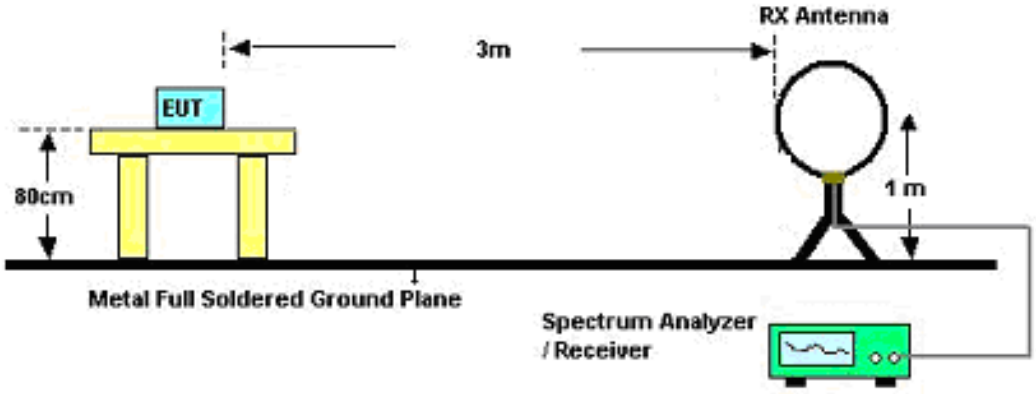
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.4.3. Test Procedures

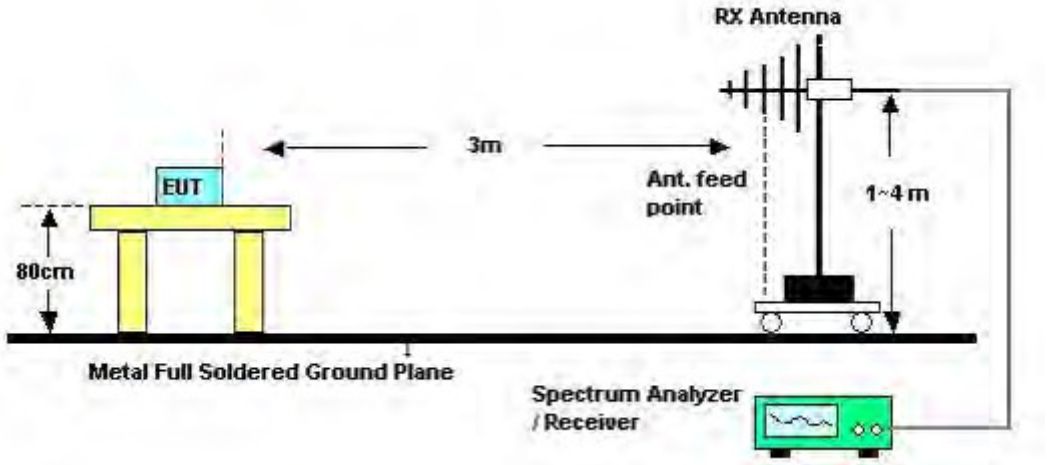
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.4.4. Test Setup Layout

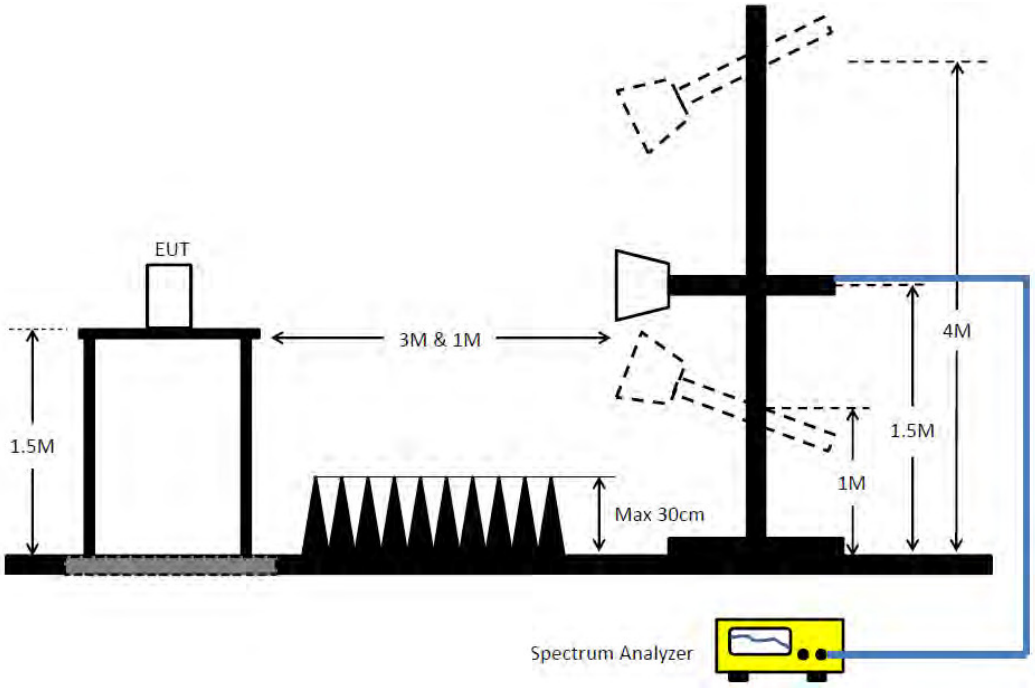
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	22°C	Humidity	54%
Test Engineer	Zero Chen & Mason Chen	Configurations	CTX
Test Date	Oct. 29, 2016		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

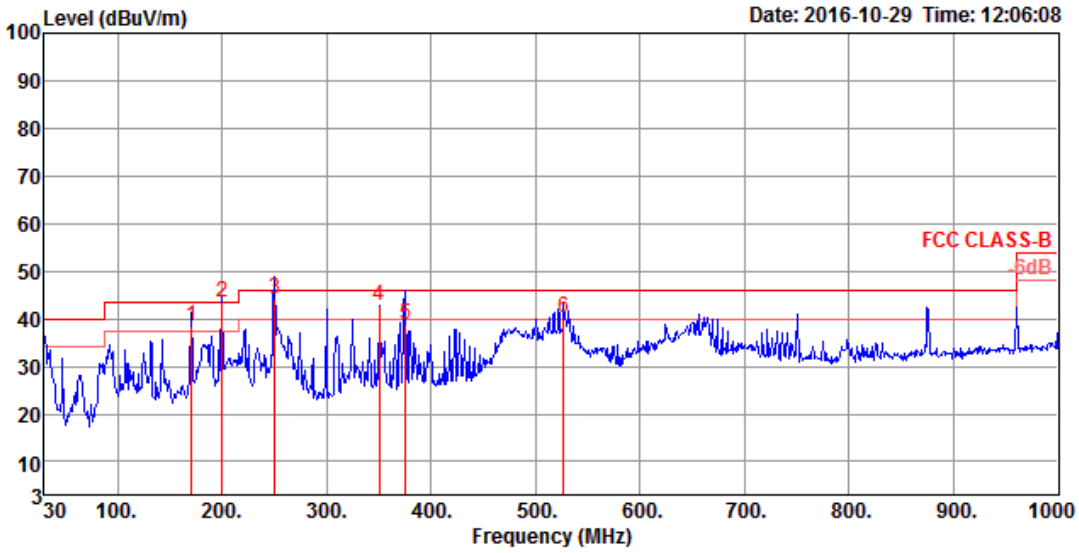
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

4.4.8. Results of Radiated Emissions (30MHz~1GHz)

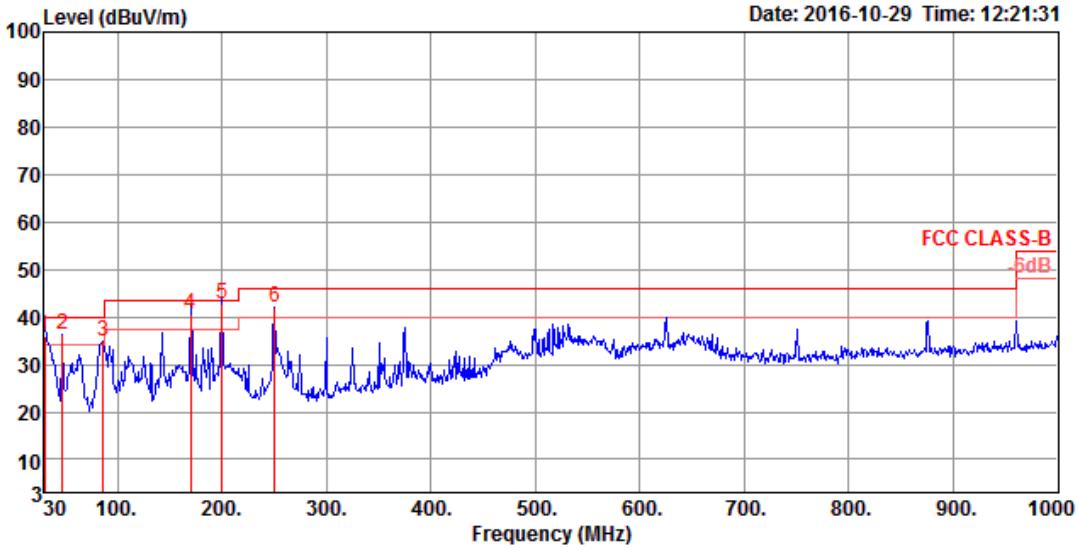
Temperature	22°C	Humidity	54%
Test Engineer	Zero Chen & Mason Chen	Configurations	CTX

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	170.65	38.47	43.50	-5.03	53.01	1.25	16.57	32.36	150	294	QP	HORIZONTAL
2	199.75	43.32	43.50	-0.18	57.59	1.36	16.70	32.33	150	117	QP	HORIZONTAL
3	250.19	44.27	46.00	-1.73	56.00	1.50	19.10	32.33	100	175	QP	HORIZONTAL
4	350.10	42.73	46.00	-3.27	51.83	1.81	21.40	32.31	100	126	Peak	HORIZONTAL
5	375.32	38.96	46.00	-7.04	47.30	1.89	22.08	32.31	100	312	QP	HORIZONTAL
6	526.64	40.23	46.00	-5.77	45.90	2.23	24.43	32.33	150	192	QP	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	30.00	35.88	40.00	-4.12	42.80	0.50	25.60	33.02	200	113	QP	VERTICAL
2	47.46	36.38	40.00	-3.62	52.17	0.65	16.00	32.44	200	2	Peak	VERTICAL
3	86.26	34.87	40.00	-5.13	51.59	0.91	14.81	32.44	100	248	Peak	VERTICAL
4	169.68	40.41	43.50	-3.09	54.90	1.25	16.62	32.36	100	166	QP	VERTICAL
5	199.75	42.82	43.50	-0.68	57.09	1.36	16.70	32.33	100	166	QP	VERTICAL
6	250.19	42.01	46.00	-3.99	53.74	1.50	19.10	32.33	100	118	Peak	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.4.9. Results for Radiated Emissions (1GHz~10th Harmonic)

Temperature	22°C	Humidity	54%
Test Engineer	Zero Chen & Mason Chen	Configurations	Channel 1
Test Date	Oct. 28, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4808.18	29.71	54.00	-24.29	25.95	7.85	32.56	36.65	151	110	Average	HORIZONTAL
2	4808.18	61.02	74.00	-12.98	57.26	7.85	32.56	36.65	151	110	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4808.40	33.91	54.00	-20.09	30.15	7.85	32.56	36.65	293	335	Average	VERTICAL
2	4808.40	65.22	74.00	-8.78	61.46	7.85	32.56	36.65	293	335	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Zero Chen & Mason Chen	Configurations	Channel 5
Test Date	Oct. 27, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4883.78	20.77	54.00	-33.23	16.69	8.02	32.71	36.65	125	225	Average	HORIZONTAL
2	4883.78	52.08	74.00	-21.92	48.00	8.02	32.71	36.65	125	225	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4883.61	20.83	54.00	-33.17	16.75	8.02	32.71	36.65	130	276	Average	VERTICAL
2	4883.61	52.14	74.00	-21.86	48.06	8.02	32.71	36.65	130	276	Peak	VERTICAL

Temperature	22℃	Humidity	54%
Test Engineer	Zero Chen & Mason Chen	Configurations	Channel 10
Test Date	Oct. 27, 2016		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4958.84	20.35	54.00	-33.65	15.96	8.20	32.83	36.64	148	163	Average	HORIZONTAL
2	4958.84	51.66	74.00	-22.34	47.27	8.20	32.83	36.64	148	163	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4958.37	20.43	54.00	-33.57	16.04	8.20	32.83	36.64	100	335	Average	VERTICAL
2	4958.37	51.74	74.00	-22.26	47.35	8.20	32.83	36.64	100	335	Peak	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.5. Band Edge Emissions Measurement

4.5.1. Limit

Band edge emissions radiated outside of the specified frequency bands shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

4.5.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	100kHz/300kHz for Peak

4.5.3. Test Procedures

The test procedure is the same as section 4.4.3.

4.5.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.4.4.

4.5.5. Test Deviation

There is no deviation with the original standard.

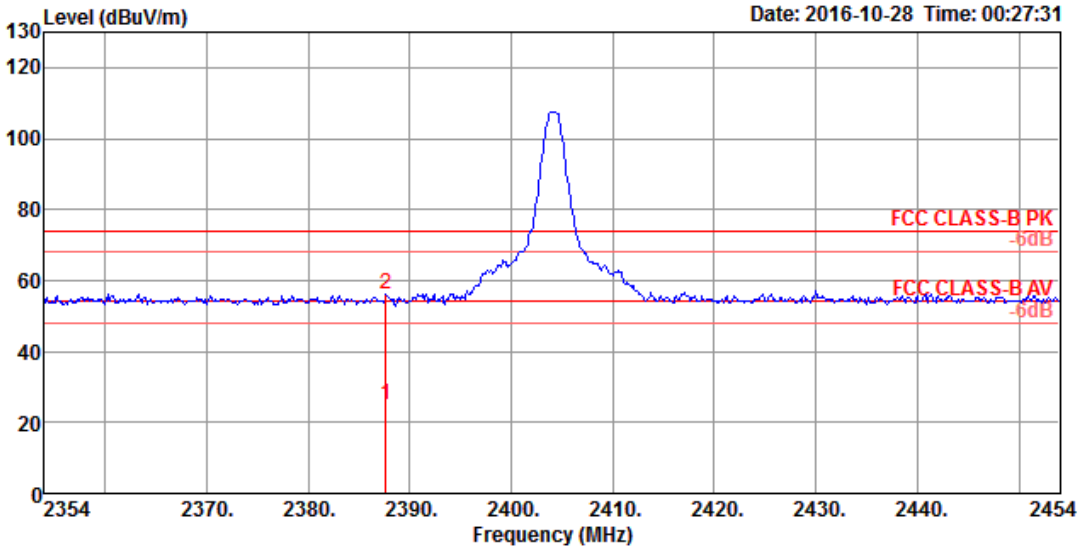
4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7. Test Result of Band Edge and Fundamental Emissions

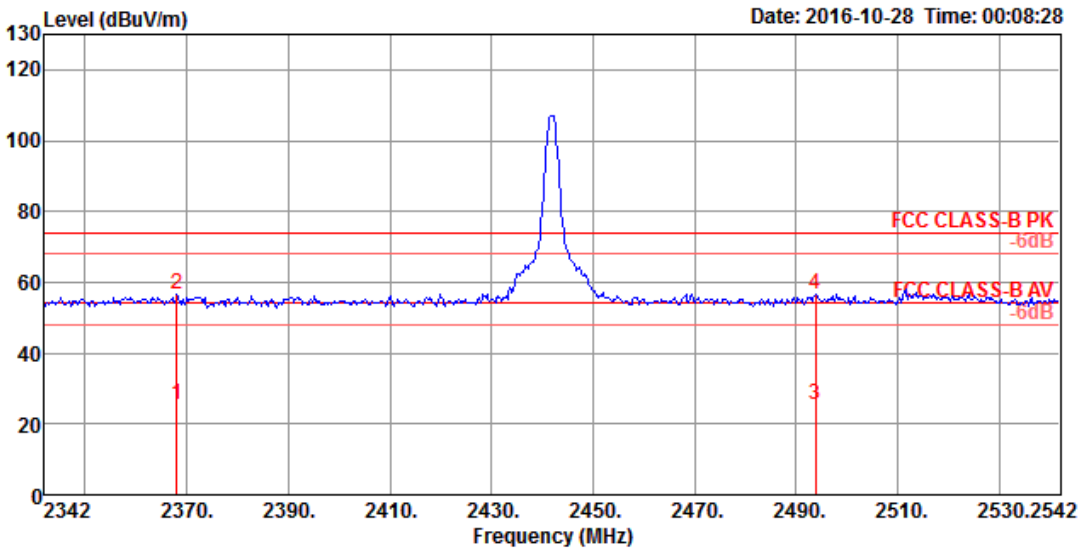
Temperature	22°C	Humidity	54%
Test Engineer	Zero Chen & Mason Chen	Configurations	Channel 1, 5, 10

Channel 1



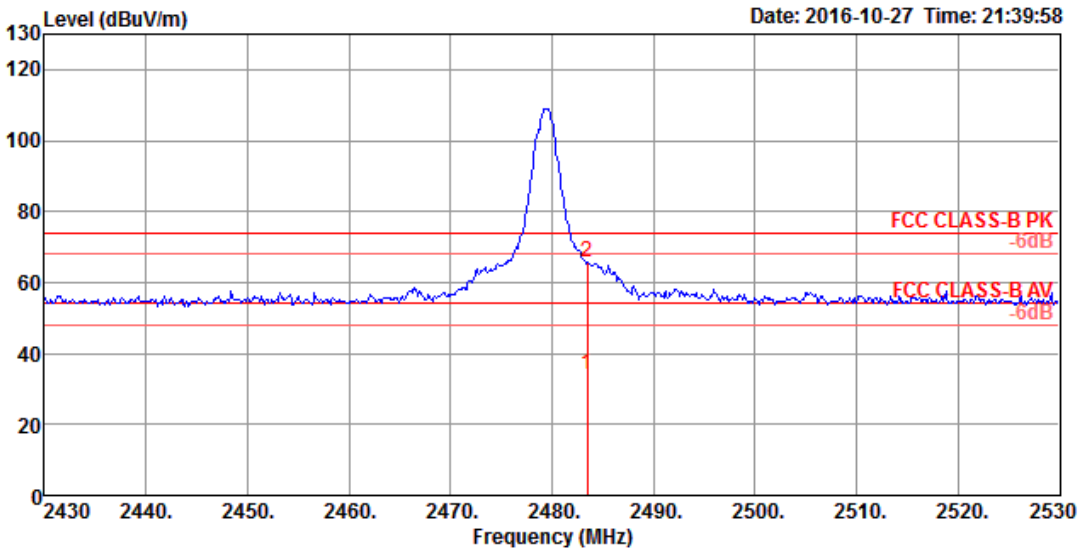
	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2387.60	24.76	54.00	-29.24	-8.27	5.13	27.90	0.00	262	312	Average	HORIZONTAL
2	2387.60	56.07	74.00	-17.93	23.04	5.13	27.90	0.00	262	312	Peak	HORIZONTAL

Channel 5



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2368.00	25.47	54.00	-28.53	-7.57	5.12	27.92	0.00	297	58	Average	HORIZONTAL
2	2368.00	56.78	74.00	-17.22	23.74	5.12	27.92	0.00	297	58	Peak	HORIZONTAL
3	2493.90	25.34	54.00	-28.66	-7.75	5.28	27.81	0.00	297	58	Average	HORIZONTAL
4	2493.90	56.65	74.00	-17.35	23.56	5.28	27.81	0.00	297	58	Peak	HORIZONTAL

Channel 10



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2483.50	34.21	54.00	-19.79	1.14	5.26	27.81	0.00	255	38	Average	HORIZONTAL
2	2483.50	65.52	74.00	-8.48	32.45	5.26	27.81	0.00	255	38	Peak	HORIZONTAL

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.6. Antenna Requirements

4.6.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.6.2. Antenna Connector Construction

Please refer to section 3.4 in this test report, antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Nov. 16, 2015	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 13, 2015	Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	Jan. 18, 2016	Conduction (CO02-CB)
COND Cable	Woken	Cable	01	0.15MHz ~ 30MHz	Dec. 01, 2015	Conduction (CO02-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	Conduction (CO02-CB)
Pulse Limiter	Schwarzbeck	VTSD 9561F	9561-F073	9kHz ~ 30MHz	Sep. 29, 2016	Conduction (CO02-CB)
BILOG ANTENNA	TESEQ	CBL6112D	37880	20MHz ~ 2GHz	Aug. 30, 2016	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	9610-4976	1GHz ~ 18GHz	Apr. 25, 2016	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 25, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Mar. 15, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 18, 2016	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP-40	100019	9kHz ~ 40GHz	Apr. 21, 2016	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 16, 2016	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-17	N/A	1 GHz ~ 18 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-1	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G-2	N/A	18GHz ~ 40 GHz	Nov. 02, 2015	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-I0-7	N/A	N/A	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec. 09, 2015	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 03, 2016	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-6	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-7	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-8	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
RF Cable-high	Woken	RG402	High Cable-9	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	RG402	High Cable-10	1 GHz – 26.5 GHz	Nov. 02, 2015	Conducted (TH01-CB)
Power Sensor	Agilent	U2021XA	MY53410001	50MHz~18GHz	Nov. 02, 2015	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

"*" Calibration Interval of instruments listed above is two years.

N.C.R. means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

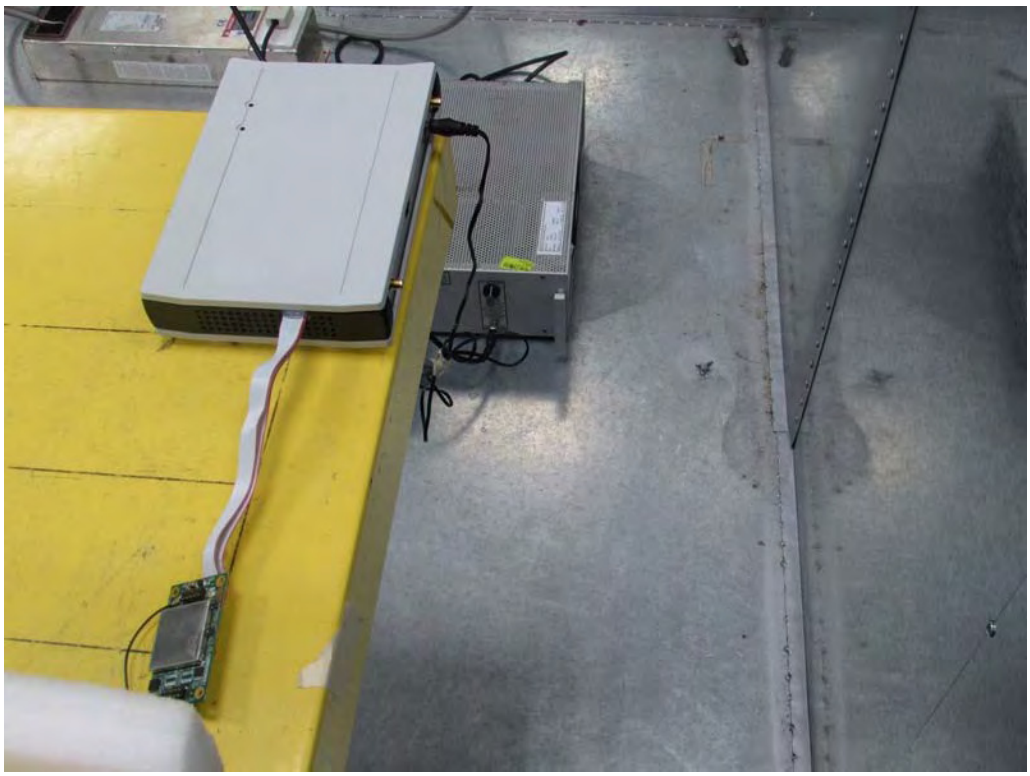
Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%

Appendix A. Test Photos

1. Photographs of Conducted Emissions Test Configuration

FRONT VIEW

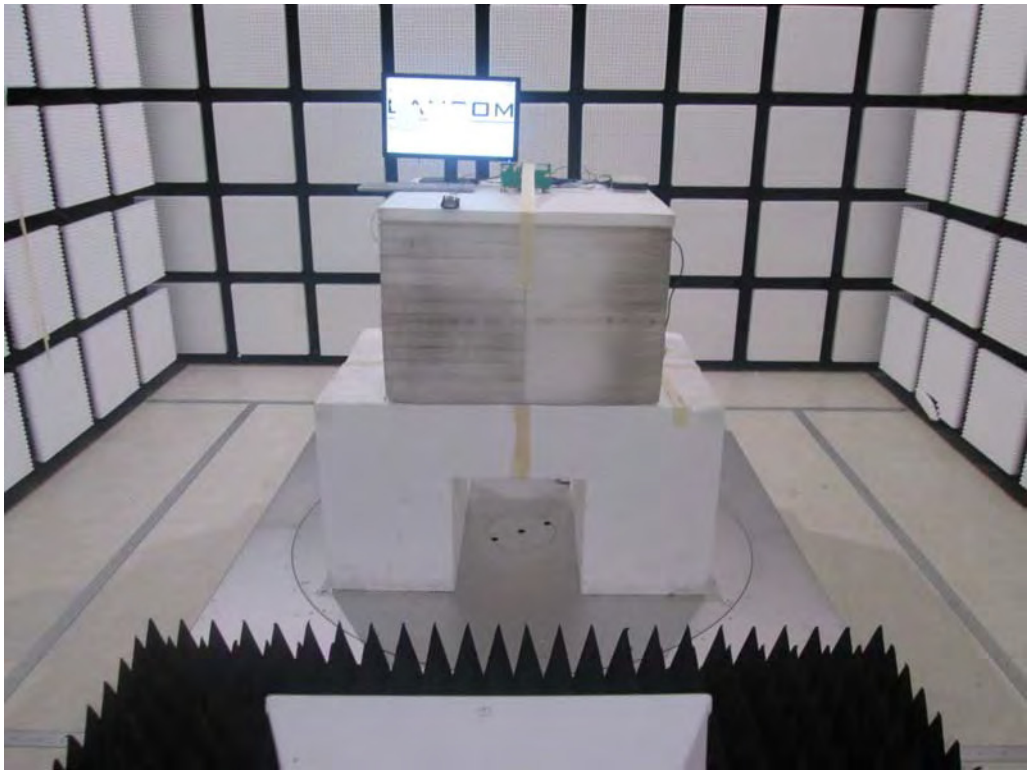
REAR VIEW



CLOSE-UP VIEW

2. Photographs of Field Strength of Fundamental Emissions Test Configuration

FRONT VIEW



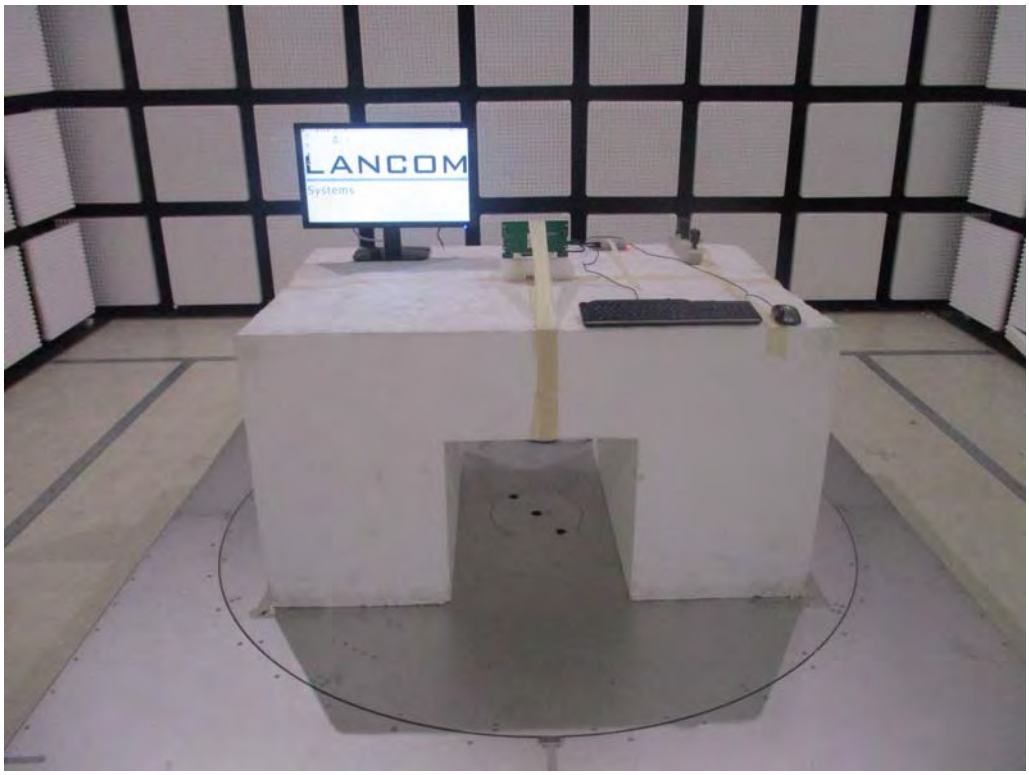
REAR VIEW

CLOSE-UP VIEW

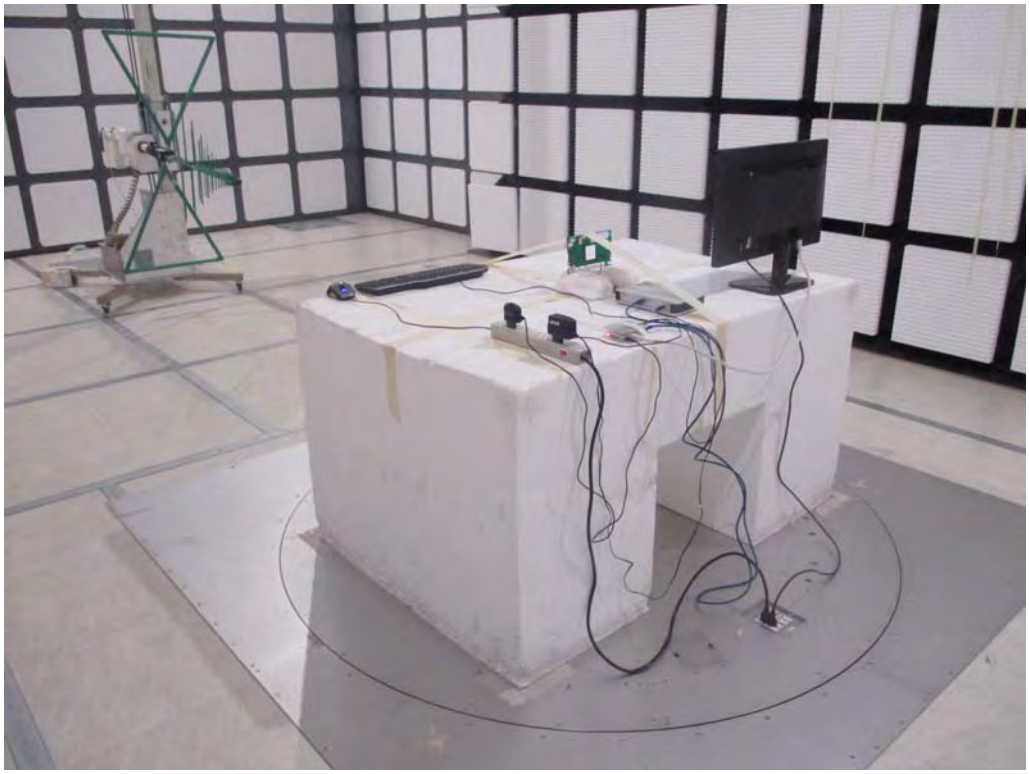
3. Photographs of Radiated Emissions Test Configuration

Test Configuration: 30MHz~1GHz

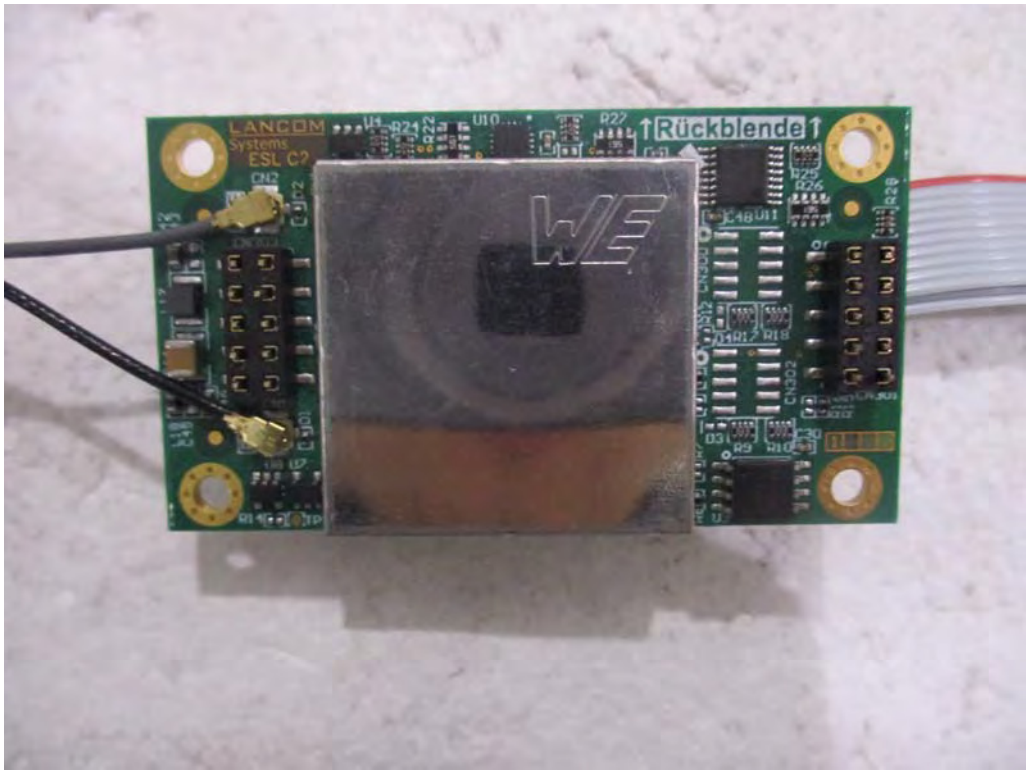
FRONT VIEW



REAR VIEW

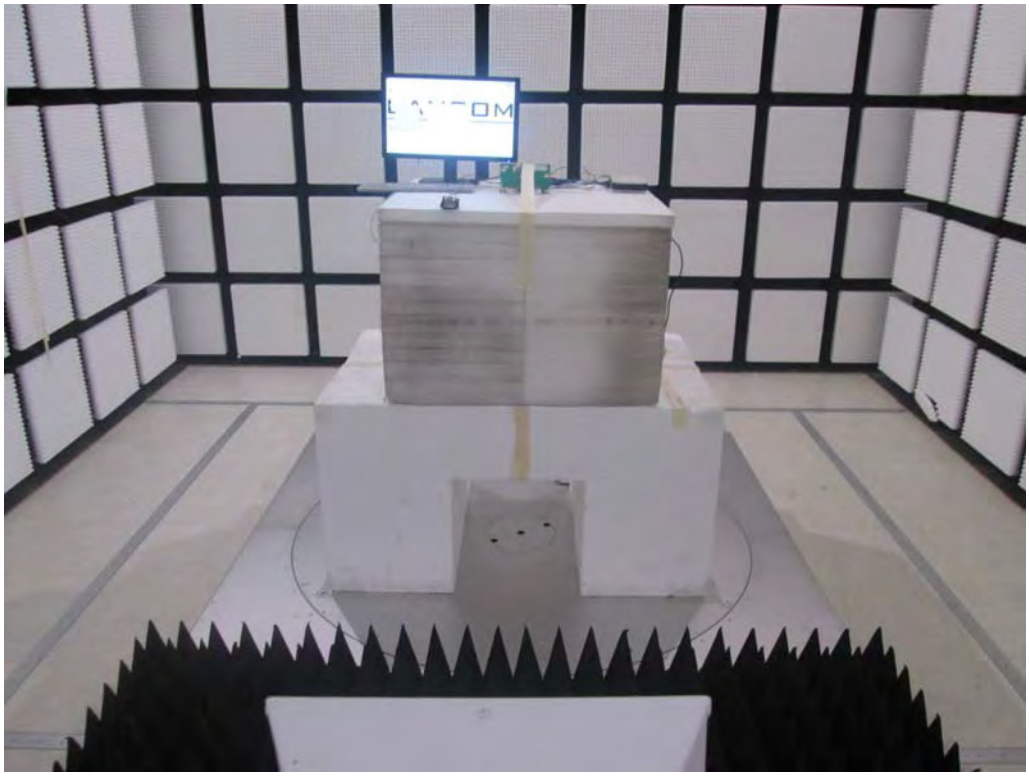


CLOSE-UP VIEW



Test Configuration: Above 1GHz

FRONT VIEW



REAR VIEW

CLOSE-UP VIEW