

FCC Test Report

Equipment : ASUS Tablet
Brand Name : ASUS
Model No. : P023
FCC ID : MSQP023
Standard : 47 CFR FCC Part 15.247
Operating Band : 2400 MHz – 2483.5 MHz
FCC Classification : DTS
Applicant : ASUSTeK COMPUTER INC.
Manufacturer : 4F, No. 150, LI-TE RD., PEITOU, TAIPEI, TAIWAN

The product sample received on May 08, 2015 and completely tested on Jun. 02, 2015. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Vic Hsiao / Supervisor



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APPENDIX A. TEST PHOTOS

APPENDIX B. PHOTOGRAPHS OF EUT



Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]: 2.840MHz 44.15 (Margin 11.85 dB) – QP 35.28 (Margin 10.72 dB) - AV	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	LE: 677.3000 kHz	≥500kHz	Complied
3.3	15.247(b)	RF Output Power (Maximum Peak Conducted Output Power)	Power [dBm] LE: 5.05	Power [dBm] LE:30	Complied
3.4	15.247(e)	Power Spectral Density	PSD [dBm/100kHz] LE: -11.10	PSD [dBm/3kHz]: 8	Complied
3.5	15.247(d)	Transmitter Bandedge Emissions	Restricted Bands [dBuV/m at 3m]: 2349.98MHz 57.35 (Margin 16.65 dB) - PK 47.36 (Margin 6.64 dB) - AV	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied
3.6	15.247(d)	Transmitter Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 833.16MHz 41.64 (Margin 4.36 dB) – PK	Non-Restricted Bands: > 20 dBc Restricted Bands: FCC 15.209	Complied



1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information				
Frequency Range (MHz)	Bluetooth Version	Ch. Frequency (MHz)	Channel Number	RF Output Power (dBm)
2400-2483.5	v4.0 LE	2402-2480	0-39 [40]	5.05

Note 1: Bluetooth LE (Low Energy) using GFSK modulation for DTS digital modulation.
Note 2: RF output power specifies that Maximum Peak Conducted Output Power.

1.1.2 Antenna Information

Antenna Category	
<input checked="" type="checkbox"/>	Integral antenna (antenna permanently attached)
<input checked="" type="checkbox"/>	Temporary RF connector provided
<input type="checkbox"/>	No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.

Antenna General Information			
No.	Ant. Cat.	Ant. Type	Gain (dBi)
1	Integral	PIFA	2.75



1.1.3 SKU Information

SKU NO.	Sku 1	Sku 2
M/B	Z300C MAIN BOARD HDI	
CPU	INTEL PMB8016 E100 SoFIA 3GR 361 balls pin	
eMMC	KINGSTON / KE4CN3K6A // 8G	HYNIX / H26M52103FMR //16G
Memory	LPDDR3	LPDDR3
	ELPIDA / EDF8132A3MA-GD-F-R // 1G	SAMSUNG / K4E8E304EE-EGCE //1G
WIFI/BT/GPS	INTEL / PMB9102	
Front Camera	CAMERA MODULE 2M PIXELCHICONY/CIFE22120003870LH	CAMERA MODULE 0.3M PIXEL CHICONY / CIFE05220003870LH
Rear Camera	CAMERA MODULE 5M PIXELCHICONY/CJAE56020003870LH	CAMERA MODULE 2M PIXEL CHICONY / CIFE22220003870LH
LCD TOUCH SCREEN 10.1'	LCD TOUCH SCREEN 10.1'	
	CPT / CLAT101WR61	
Battery	Amperex Technology Limited / DC 3.8 Vdc, 4750 mAh/ 4890 mAh (MIN/TYP), 18.5 Wh	

Note: The EUT was pre-tested with SKU 1 and SKU 2, the worst case was SKU 2 and recorded in this report.

1.1.4 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	<input type="checkbox"/> Production ; <input type="checkbox"/> Pre-Production ; <input checked="" type="checkbox"/> Prototype
Type of EUT	
<input checked="" type="checkbox"/>	Stand-alone
<input type="checkbox"/>	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment – Brand Name / Model No.: ...
<input type="checkbox"/>	Plug-in radio (EUT intended for a variety of host systems) Host System – Brand Name / Model No.: ...
<input type="checkbox"/>	Other:



1.1.5 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
<input checked="" type="checkbox"/> Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)
<input checked="" type="checkbox"/> 67.45% - test mode single channel – LE	1.71

1.1.6 EUT Operational Condition

Supply Voltage	<input checked="" type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC	
Type of DC Source	<input checked="" type="checkbox"/> From Host System	<input checked="" type="checkbox"/> External AC adapter	<input checked="" type="checkbox"/> Li-ion Battery

1.2 Accessories and Support Equipment

Accessories				
AC Adapter 1	Brand Name	ASUS	Model Name	PA-1070-07
	Vendor	LITEON		
	Power Rating	I/P:100-240Vac,0.25A, O/P: 5.2Vdc,1350mA		
AC Adapter 2	Brand Name	ASUS	Model Name	PSM06A-050Q
	Vendor	PHIHONG		
	Power Rating	I/P:100 -240Vac,0.25A, O/P: 5.2Vdc,1350mA		
AC Adapter 3	Brand Name	ASUS	Model Name	AD2005320
	Vendor	PI		
	Power Rating	I/P:100 -240Vac,0.25A, O/P: 5.2Vdc,1350mA		
Li-ion Battery	Brand Name	ASUS	Model Name	C11P1502
	Vendor	ATL	Power Rating	3.8Vdc, 4750mAh
USB Cable 1	Brand Name	ASUS	Model Name	L65U2009-CS-B
	Vendor	ASAP		
USB Cable 2	Brand Name	ASUS	Model Name	CUBB04M-AS0D0-EF
	Vendor	FOXCONN		
Docking	Brand Name	ASUS	Model Name	DA01
Z stylus / ASUS AC Touch pen	Brand Name	HanvonPenTech	Model Name	PAD-22 Z STYLUS

Note: Regarding to more detail and other information, please refer to user manual.

Support Equipment - RF Conducted			
No.	Equipment	Brand Name	Model Name
1	BT Station	RS	CBT

Support Equipment – AC Conduction and Radiated Emission			
No.	Equipment	Brand Name	Model Name
1	Notebook PC	DELL	E5530
2	BT Station (Remote)	RS	CBT



1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ◆ ANSI C63.10-2009
- ◆ FCC KDB 558074 D01 v03r02
- ◆ 47 CFR FCC Part 15

1.4 Testing Location Information

Testing Location			
<input checked="" type="checkbox"/>	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.	
		TEL : 886-3-327-3456	FAX : 886-3-327-0973
Test Condition	Test Site No.	Test Engineer	Test Environment
AC Conduction	CO04-HY	Zeus	23°C / 54%
RF Conducted	TH01-HY	Rory	22.7°C / 61.3%
Radiated Emission	03CH03-HY	Allen	25°C / 49%

1.5 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty		
Test Item		Uncertainty
AC power-line conducted emissions		±2.3 dB
Emission bandwidth, 6dB bandwidth		±0.6 %
RF output power, conducted		±0.1 dB
Power density, conducted		±0.6 dB
Unwanted emissions, conducted	9 – 150 kHz	±0.4 dB
	0.15 – 30 MHz	±0.4 dB
	30 – 1000 MHz	±0.6 dB
	1 – 18 GHz	±0.5 dB
	18 – 40 GHz	±0.5 dB
	40 – 200 GHz	N/A
All emissions, radiated	9 – 150 kHz	±2.5 dB
	0.15 – 30 MHz	±2.3 dB
	30 – 1000 MHz	±2.6 dB
	1 – 18 GHz	±3.6 dB
	18 – 40 GHz	±3.8 dB
	40 – 200 GHz	N/A
Temperature		±0.8 °C
Humidity		±5 %
DC and low frequency voltages		±0.9%
Time		±1.4 %
Duty Cycle		±0.6 %

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing			
Bluetooth Version	Transmit Chains (N _{TX})	Data Rate	Modulation Mode
v4.0 LE	1	1 Mbps	LE-1Mbps
Note 1: Bluetooth LE (Low Energy) using GFSK modulation for DTS digital modulation. Note 2: Modulation modes consist below configuration: DSSS LE-1Mbps: GFSK (1Mbps)			




2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter			
Test Software Version	Wifi_BT Test		
Modulation Mode	2402 MHz	2440 MHz	2480 MHz
LE, 1Mbps	Default	Default	Default

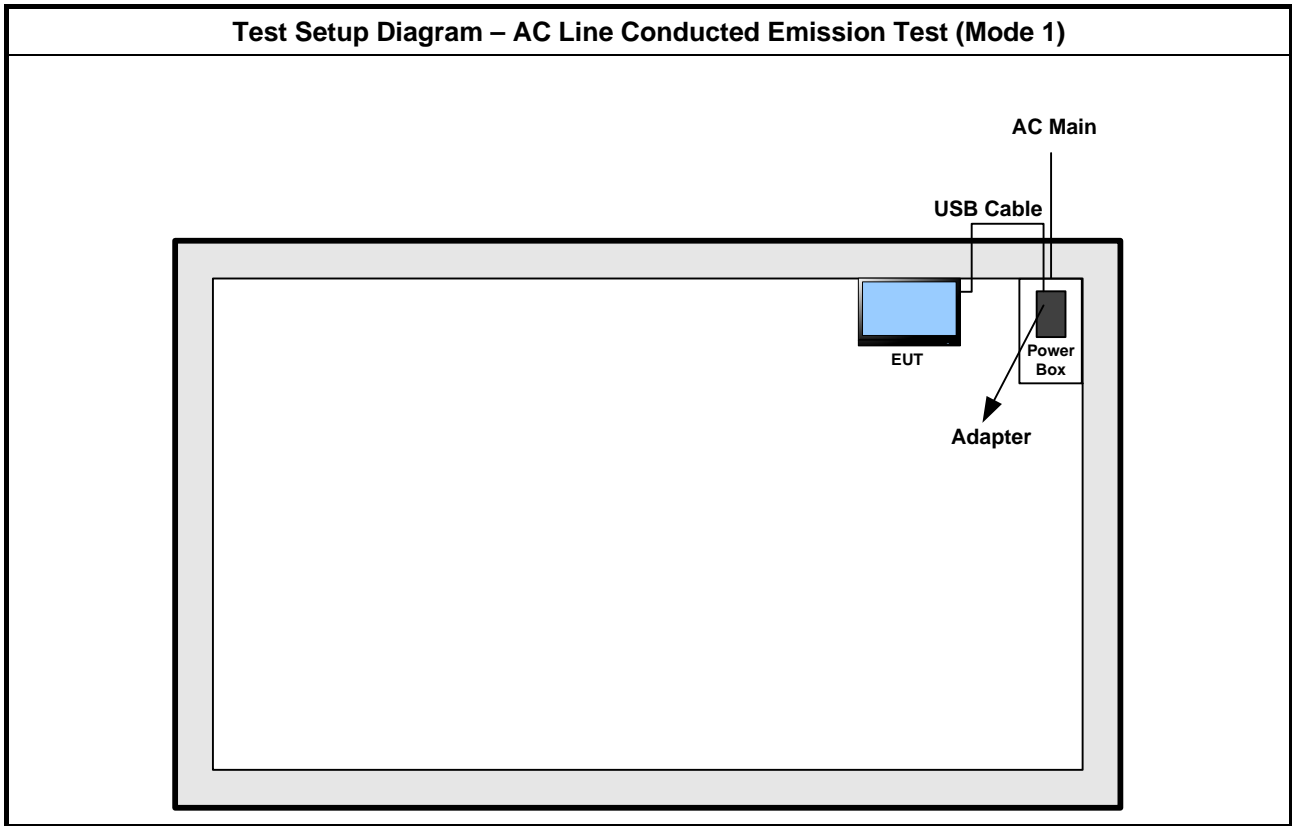
2.3 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	SKU #2 + AC Adapter 1 + USB Cable 1
2	SKU #2 + AC Adapter 2 + USB Cable 1
3	SKU #2 + AC Adapter 3 + USB Cable 1
4	SKU #2 + USB Cable 1
5	SKU #2 + USB Cable 2
6	SKU #1 + AC Adapter 1 + USB Cable 1
Operating mode 1 was the worst case and it is recorded in this test report.	

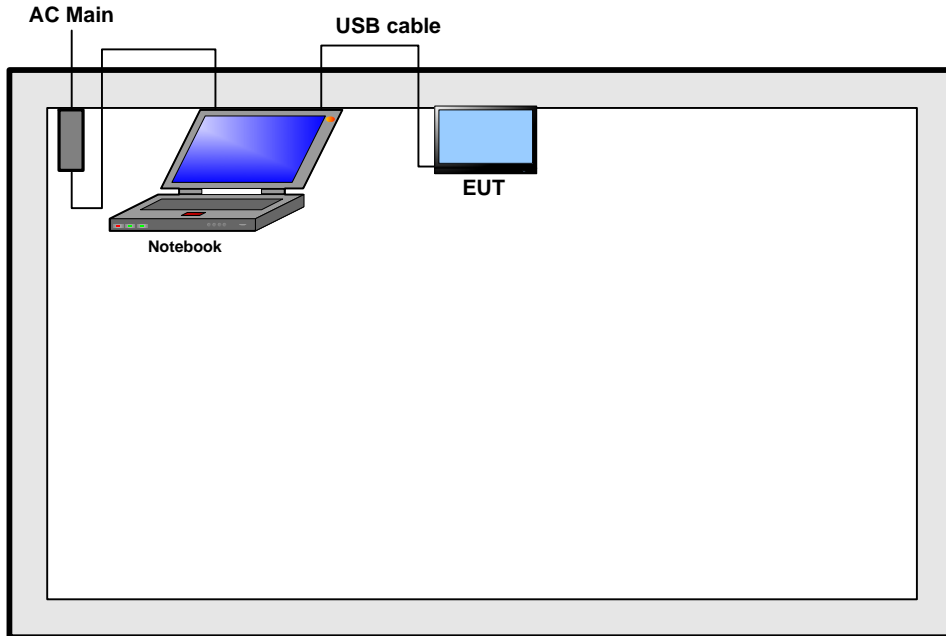
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power, Power Spectral Density, 6 dB Bandwidth
Test Condition	Conducted measurement at transmit chains
Modulation Mode	LE-1Mbps

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions		
Test Condition	Radiated measurement		
User Position	<input type="checkbox"/> EUT will be placed in fixed position.		
	<input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions.		
	<input checked="" type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed three orthogonal planes.		
Operating Mode	Operating Mode Description		
Radiated Emissions Below 1GHz	1. SKU #2 + AC Adapter 1 + USB Cable 1		
	2. SKU #2 + AC Adapter 2 + USB Cable 1		
	3. SKU #2 + AC Adapter 3 + USB Cable 1		
	4. SKU #2 + USB Cable 1		
	5. SKU #2 + USB Cable 2		
	6. SKU #1 + AC Adapter 1 + USB Cable 1		
Operating mode 4 was the worst case and it is recorded in this test report.			
Radiated Emissions Above 1GHz	1. SKU #2 + AC Adapter 1 + USB Cable 1		
Modulation Mode	LE-1Mbps		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			
Worst Planes of EUT	V		

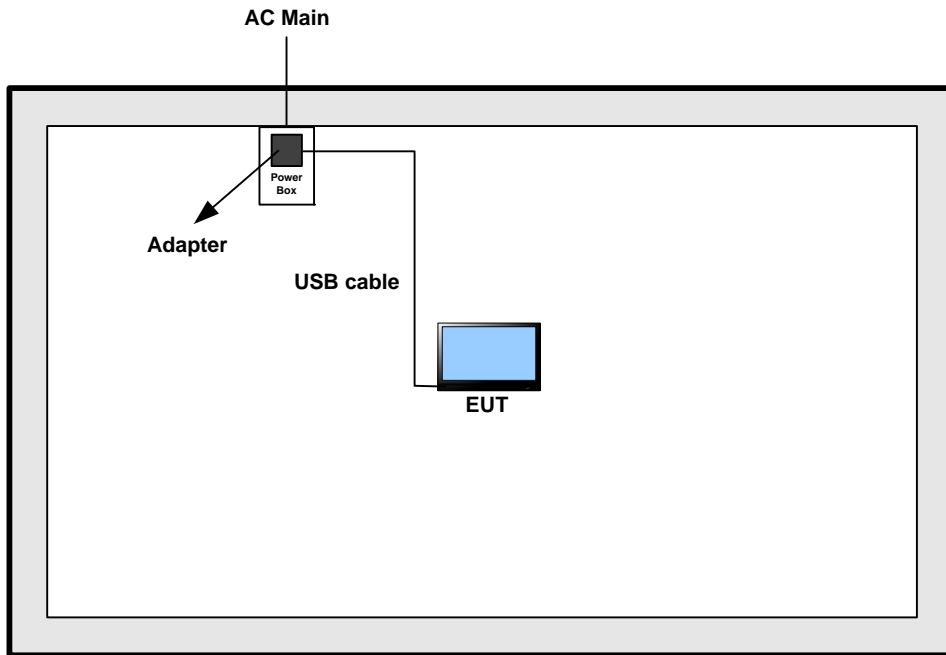
2.4 Test Setup Diagram



Test Setup Diagram - Radiated Test Below 1GHz (Mode 4)



Test Setup Diagram - Radiated Test Above 1GHz (Mode 1)



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

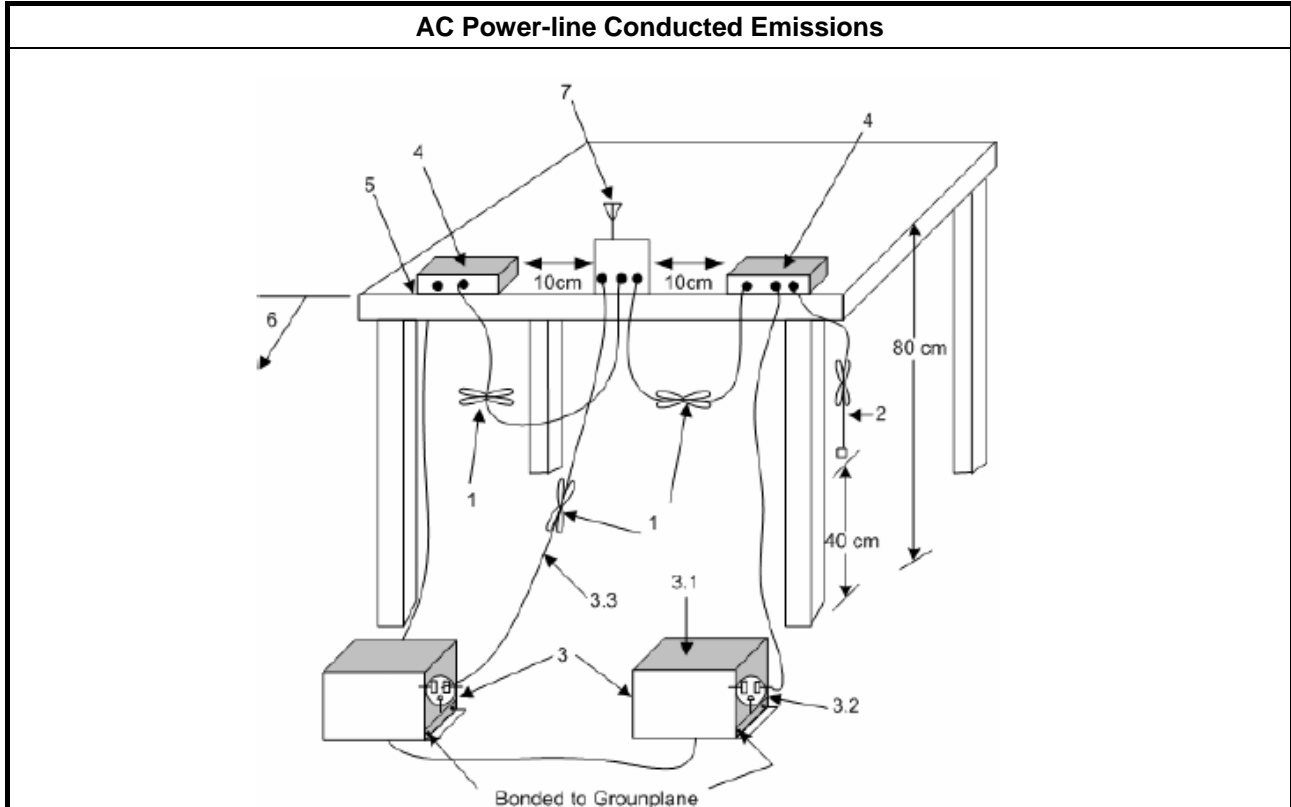
3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

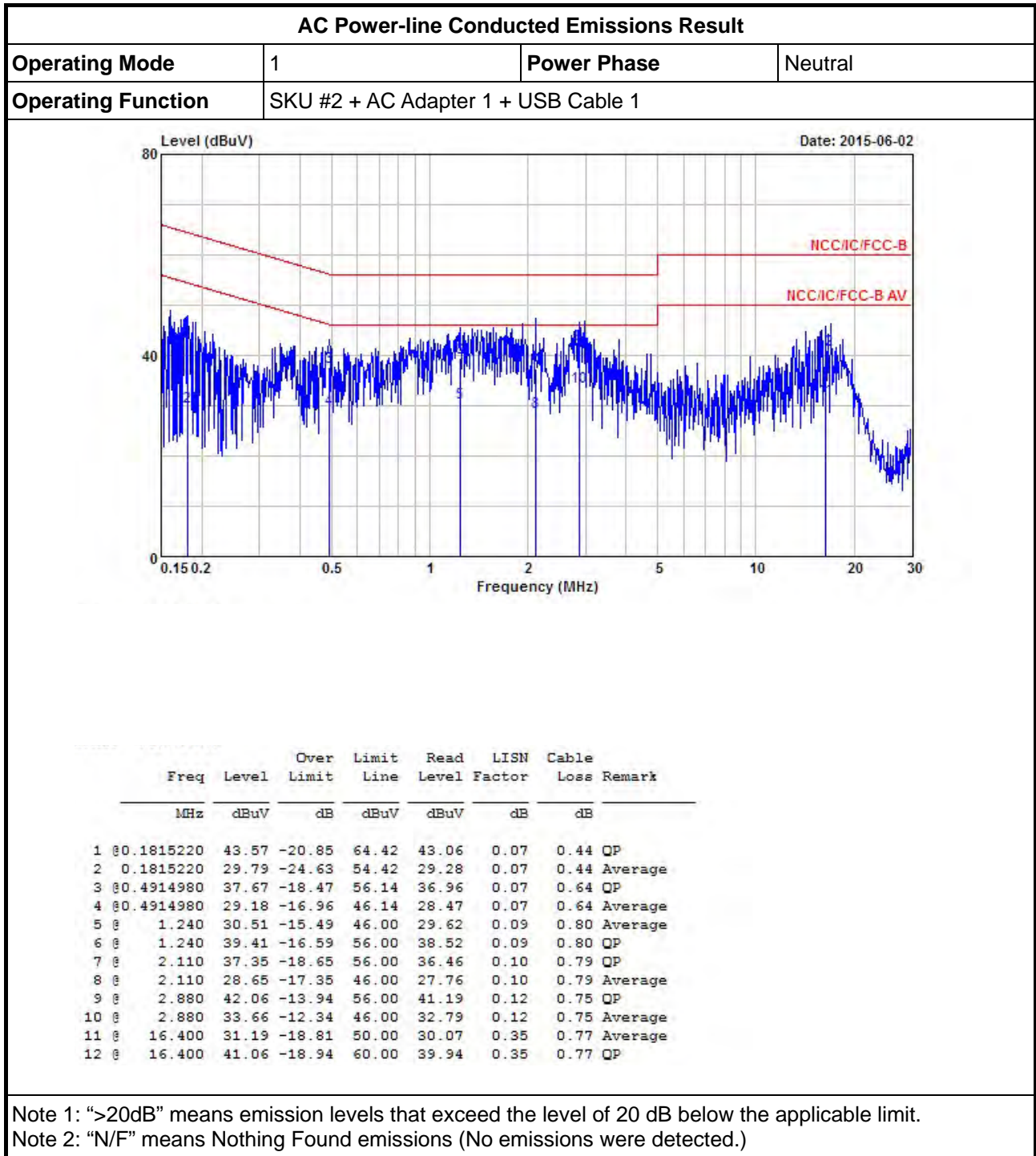
Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup





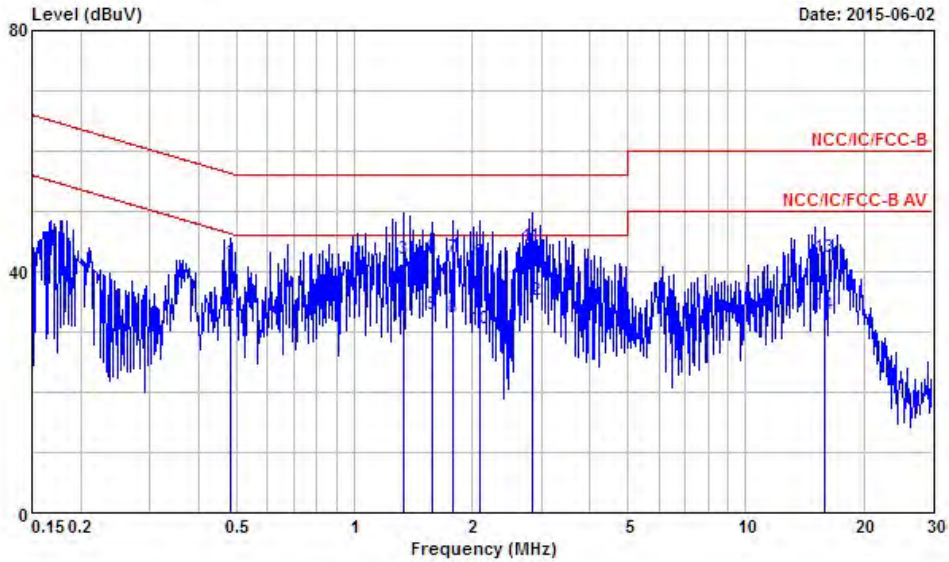
3.1.5 Test Result of AC Power-line Conducted Emissions





AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	SKU #2 + AC Adapter 1 + USB Cable 1		



Line	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.4811910	41.55	-14.77	56.32	40.84	0.07	0.64	QP
2	0.4811910	32.53	-13.79	46.32	31.82	0.07	0.64	Average
3	1.340	42.08	-13.92	56.00	41.19	0.09	0.80	QP
4	1.340	32.02	-13.98	46.00	31.13	0.09	0.80	Average
5	1.580	32.97	-13.03	46.00	32.08	0.09	0.80	Average
6	1.580	42.43	-13.57	56.00	41.54	0.09	0.80	QP
7	1.790	42.47	-13.53	56.00	41.57	0.10	0.80	QP
8	1.790	32.36	-13.64	46.00	31.46	0.10	0.80	Average
9	2.090	41.50	-14.50	56.00	40.61	0.10	0.79	QP
10	2.090	30.56	-15.44	46.00	29.67	0.10	0.79	Average
11	2.840	44.15	-11.85	56.00	43.29	0.11	0.75	QP
12	2.840	35.28	-10.72	46.00	34.42	0.11	0.75	Average
13	15.890	42.24	-17.76	60.00	41.14	0.32	0.78	QP
14	15.890	32.92	-17.08	50.00	31.82	0.32	0.78	Average

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

3.2 6dB Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit	
Systems using digital modulation techniques:	
<input checked="" type="checkbox"/>	6 dB bandwidth \geq 500 kHz.

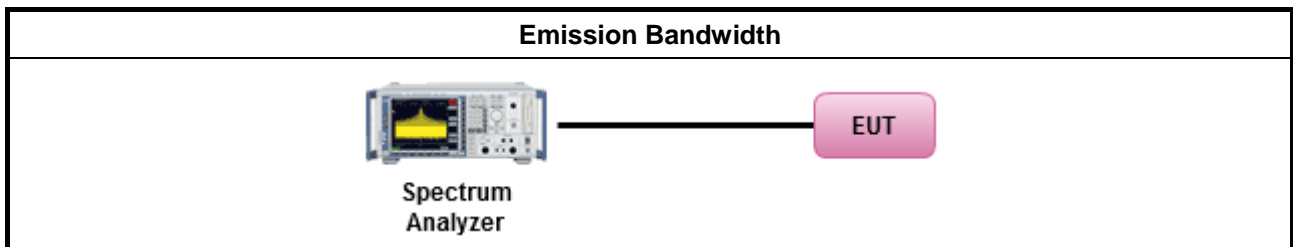
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

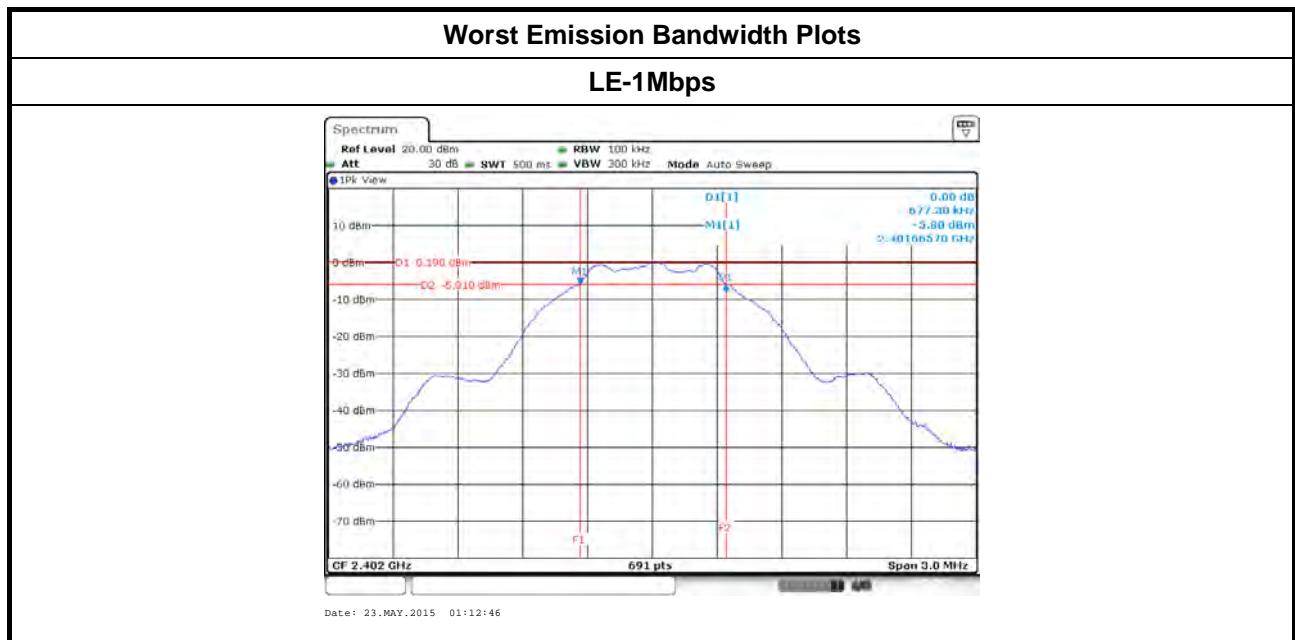
Test Method	
<input checked="" type="checkbox"/>	For the emission bandwidth shall be measured using one of the options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 8.1 Option 1 for 6 dB bandwidth measurement.
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 8.2 Option 2 for 6 dB bandwidth measurement.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

Emission Bandwidth Result			
Modulation Mode	Freq. (MHz)	99% Bandwidth (kHz)	6dB Bandwidth (kHz)
LE-1Mbps	2402	1063.6758	677.3000
LE-1Mbps	2440	1059.3342	677.3000
LE-1Mbps	2480	1063.6758	703.3000
Limit		N/A	≥500 kHz
Result		Complied	



3.3 RF Output Power

3.3.1 RF Output Power Limit

RF Output Power Limit for Digital Modulation Systems	
Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit	
<input checked="" type="checkbox"/> 2400-2483.5 MHz Band:	
<input checked="" type="checkbox"/>	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
<input type="checkbox"/>	Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm
e.i.r.p. Power Limit:	
<input checked="" type="checkbox"/> 2400-2483.5 MHz Band	
<input checked="" type="checkbox"/>	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)
P_{Out} = maximum peak conducted output power or maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi. P_{eirp} = e.i.r.p. Power in dBm.	

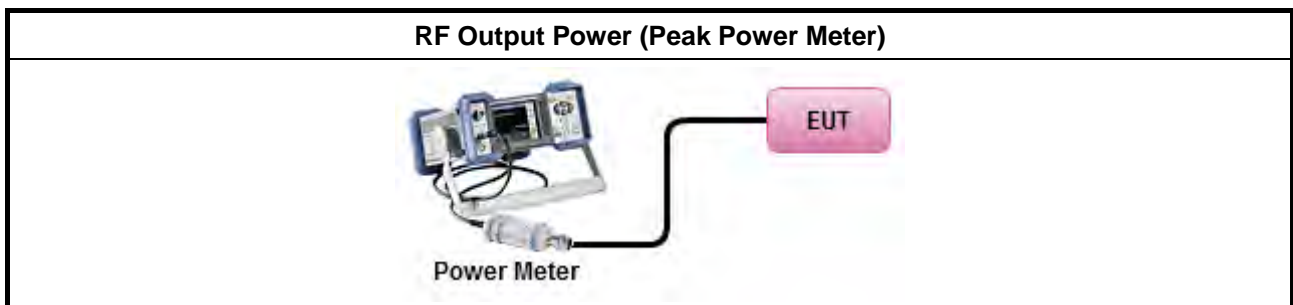
3.3.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.3.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/> Maximum Peak Conducted Output Power	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.10.2.1 a) for peak power meter.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.10.2.1 a) for spectrum analyzer - (RBW \geq EBW).
<input checked="" type="checkbox"/> For conducted measurement.	
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.3.4 Test Setup





3.3.5 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	RF Output Power	Power Limit	Antenna Gain (dBi)	EIRP Power	EIRP Limit
LE-1Mbps	2402	5.05	30	2.75	7.80	36
LE-1Mbps	2440	4.42	30	2.75	7.17	36
LE-1Mbps	2480	4.59	30	2.75	7.34	36
Result		Complied				

3.3.6 Test Result of Maximum Average Conducted Output Power

Maximum Average Conducted Output Power Result						
Condition		RF Output Power (dBm)				
Modulation Mode	Freq. (MHz)	Average Power	Duty Factor (dB)	RF Output Power	Antenna Gain (dBi)	EIRP Power
LE-1Mbps	2402	2.99	1.71	4.70	2.75	7.45
LE-1Mbps	2440	2.35	1.71	4.06	2.75	6.81
LE-1Mbps	2480	2.51	1.71	4.22	2.75	6.97
Result		Complied				

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit
<input checked="" type="checkbox"/> Power Spectral Density (PSD) \leq 8 dBm/3kHz

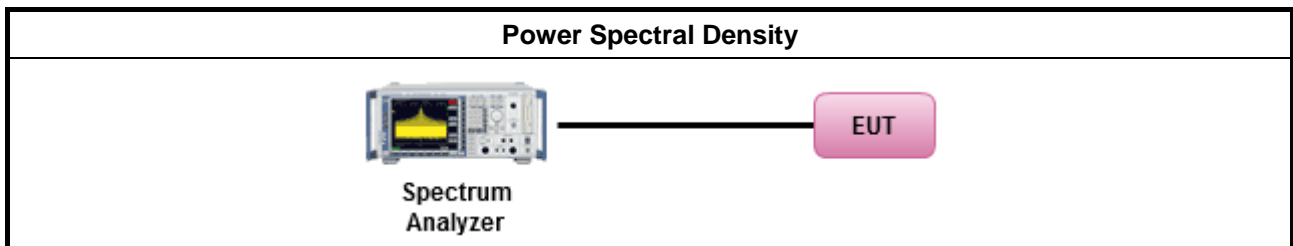
3.4.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.4.3 Test Procedures

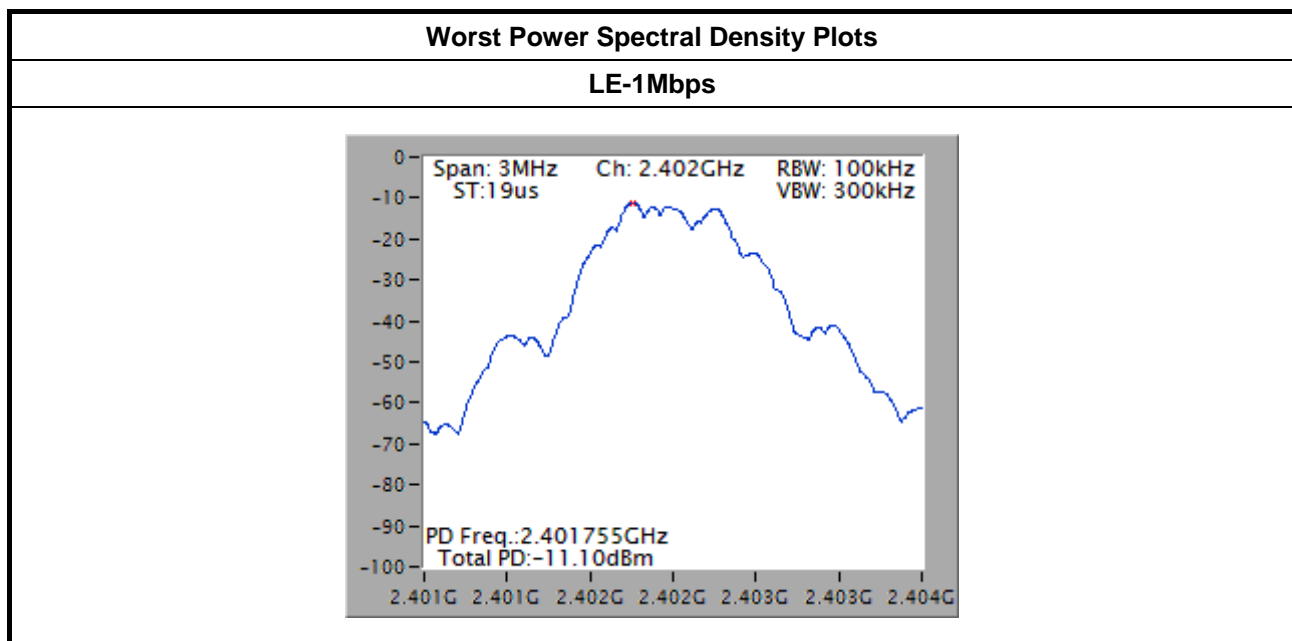
Test Method
<input checked="" type="checkbox"/> Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.2 Method PKPSD (RBW=3-100kHz;detector=peak).. [duty cycle \geq 98% or external video / power trigger]
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.3 Method AVGPSD-1 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.4 Method AVGPSD-1 Alt. (slow sweep speed) duty cycle < 98% and average over on/off periods with duty factor
<input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 10.5 Method AVGPSD-2 (spectral trace averaging).
<input type="checkbox"/> Refer as FCC KDB 558074, clause 10.6 Method AVGPSD-2 Alt. (slow sweep speed)
<input checked="" type="checkbox"/> For conducted measurement.
<input checked="" type="checkbox"/> The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/> The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.

3.4.4 Test Setup



3.4.5 Test Result of Power Spectral Density

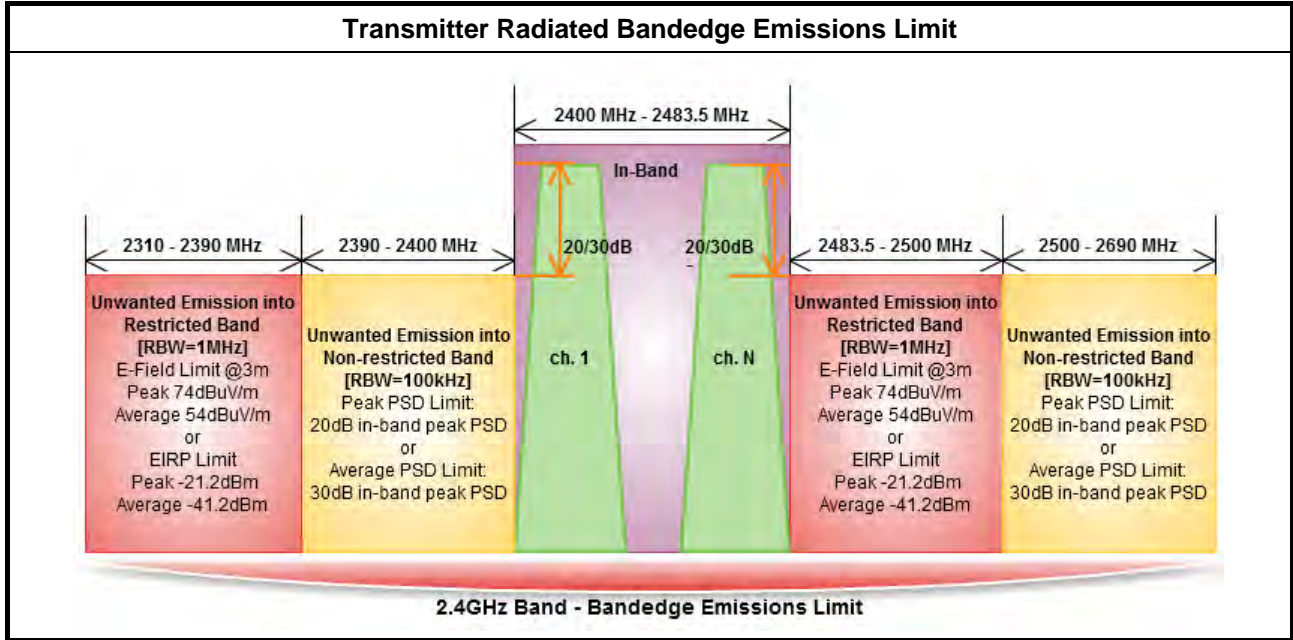
Power Spectral Density Result			
Modulation Mode	Freq. (MHz)	PSD (dBm/100kHz)	PSD Limit (dBm/3kHz)
LE-1Mbps	2402	-11.10	8
LE-1Mbps	2440	-11.46	8
LE-1Mbps	2480	-11.82	8
Result		Complied	



Note : Have been offset 15.2dBm for 3kHz data.

3.5 Transmitter Bandedge Emissions

3.5.1 Transmitter Radiated Bandedge Emissions Limit



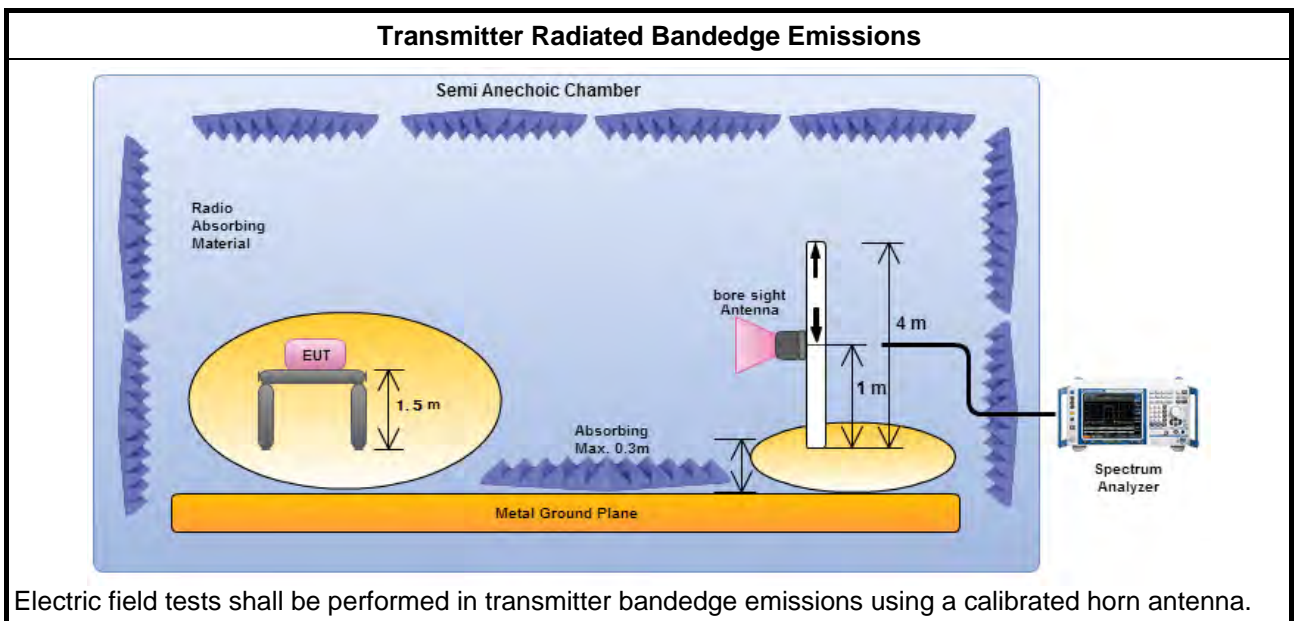
3.5.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.5.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$)
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW $\geq 1/T$).
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$, where T is pulse time.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 11.3 and 12.2.4 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For the transmitter bandedge emissions shall be measured using following options below:
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 13.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.
<input checked="" type="checkbox"/>	For radiated measurement, refer as FCC KDB 558074, clause 12.2.7 and ANSI C63.10, clause 6.6. Test distance is 3m.
<input type="checkbox"/>	For conducted measurement, refer as FCC KDB 558074, clause 12.2.2.

3.5.4 Test Setup





3.5.5 Transmitter Radiated Bandedge Emissions

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Non-restricted Band)							
Modulation	Test Freq. (MHz)	In-band PSD [i] (dBuV/100 kHz)	Freq. (MHz)	Out-band PSD [o] (dBuV/100 kHz)	[i] – [o] (dB)	Limit (dB)	Pol.
LE-1Mbps	2402	102.23	2394.66	59.33	42.90	20	H
LE-1Mbps	2480	100.11	2551.02	60.69	39.42	20	H

Note 1: Measurement worst emissions of receive antenna polarization

2400-2483.5MHz Transmitter Radiated Bandedge Emissions (Restricted Band)									
Modulation Mode	Freq. (MHz)	Measure Distance (m)	Freq. (MHz) PK	Level (dBuV/m) PK	Limit (dBuV/m) PK	Freq. (MHz) AV	Level (dBuV/m) AV	Limit (dBuV/m) AV	Pol.
LE-1Mbps	2402	3	2350.39	57.35	74	2349.98	47.36	54	H
LE-1Mbps	2480	3	2486.56	58.75	74	2483.53	47.07	54	H

Note 1: Measurement worst emissions of receive antenna polarization.
 Note 2: Average emission setting: RBW=1MHz; VBW ≥ 1/T, where T is "Pulse On Time", e.g., LE VBW≥1/625us, VBW=3kHz.

3.6 Transmitter Unwanted Emissions

3.6.1 Transmitter Radiated Unwanted Emissions Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Un-restricted Band Emissions Limit	
RF output power procedure	Limit (dB)
Peak output power procedure	20
Average output power procedure	30

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

3.6.2 Measuring Instruments

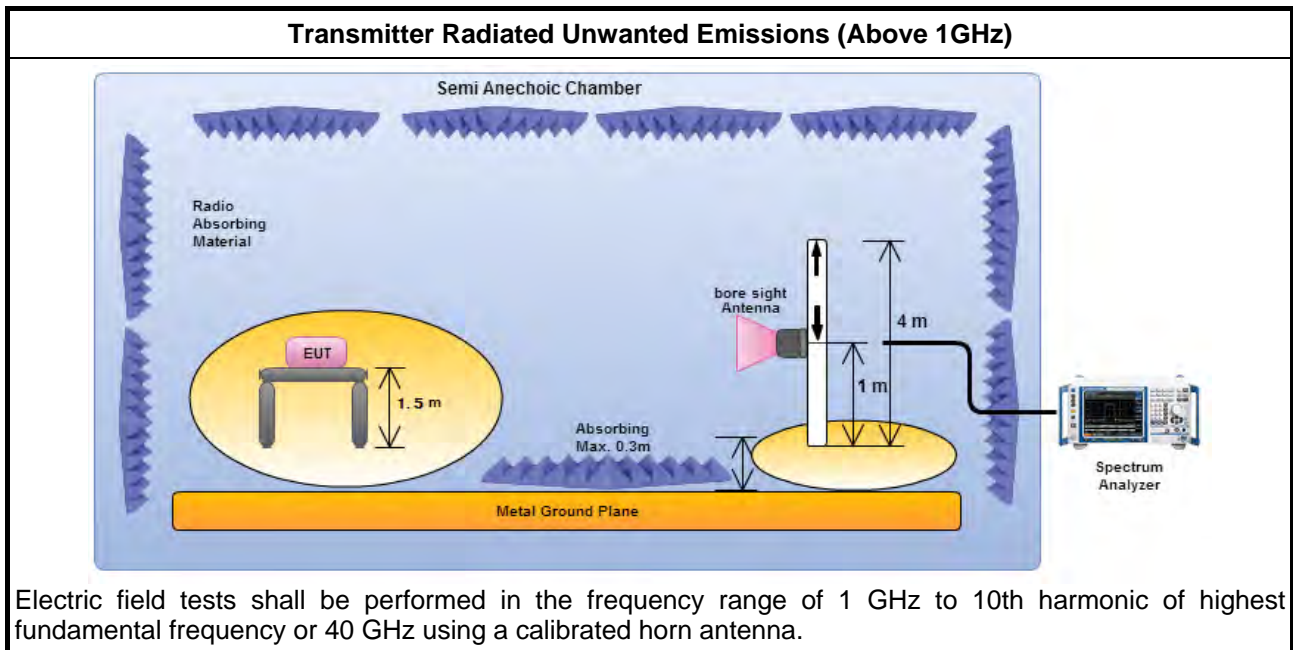
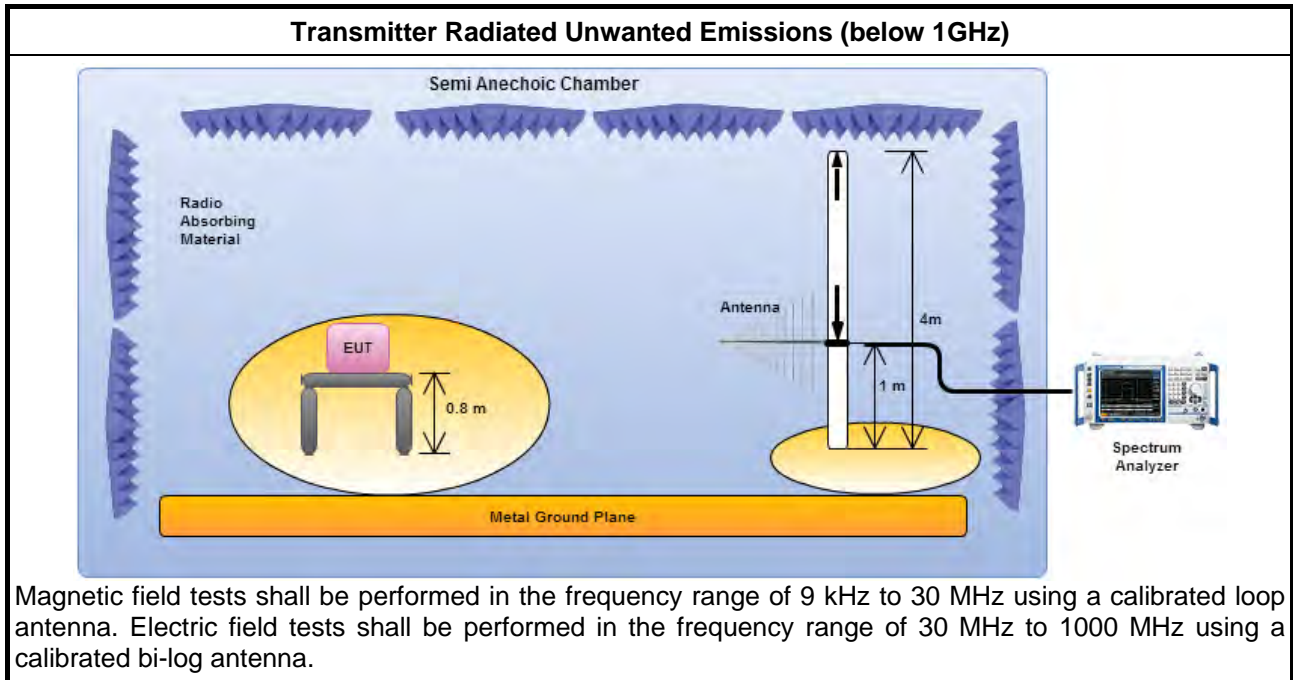
Refer a test equipment and calibration data table in this test report.



3.6.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle \geq 98%)
<input type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW \geq 1/T).
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW \geq 1/T, where T is pulse time.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 11.3 and 12.2.4 measurement procedure peak limit.
<input checked="" type="checkbox"/>	Refer as FCC KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit.
<input checked="" type="checkbox"/>	For radiated measurement, refer as FCC KDB 558074, clause 12.2.7.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1 GHz and test distance is 3m.
<input type="checkbox"/>	For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2.

3.6.4 Test Setup

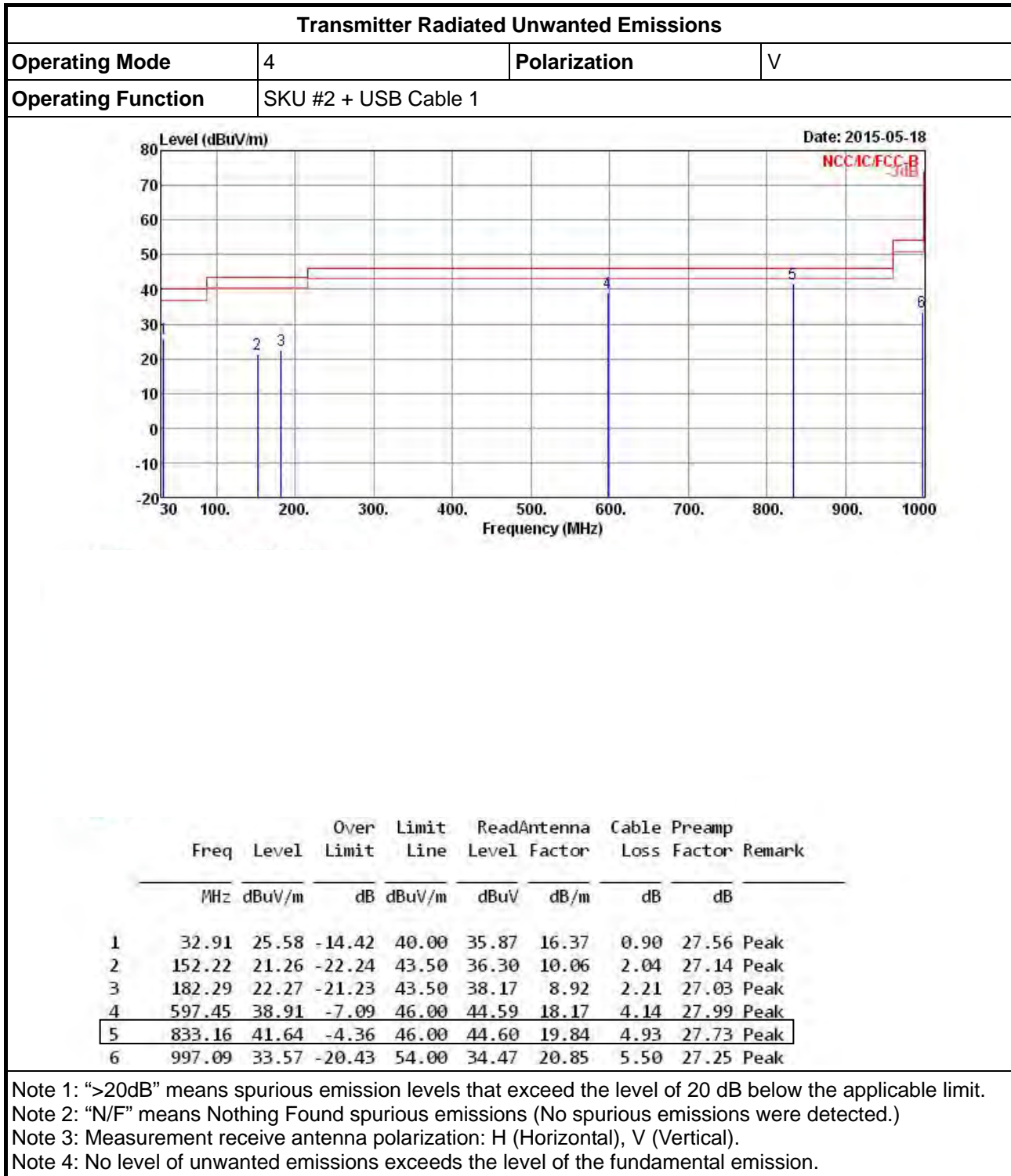


Note: FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 02, 2014.

3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

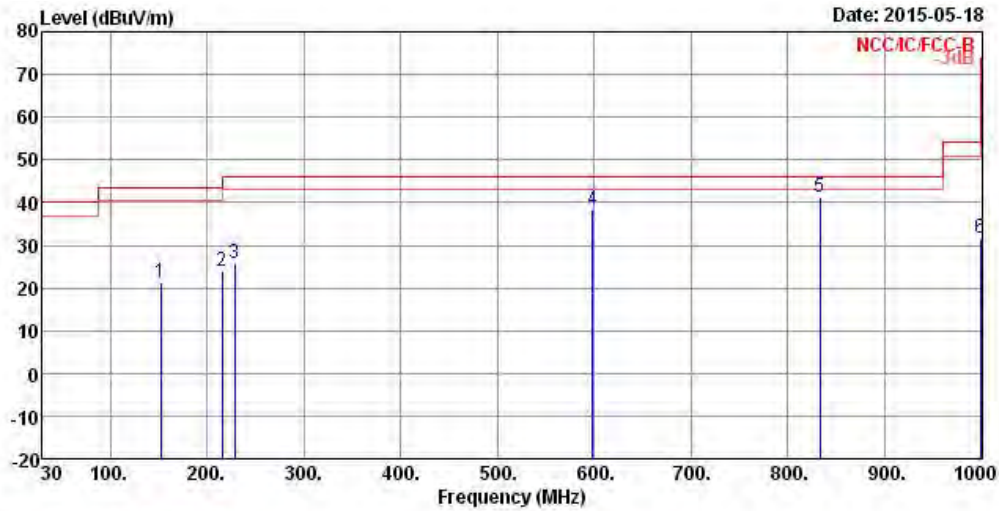
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)





Transmitter Radiated Unwanted Emissions			
Operating Mode	4	Polarization	H
Operating Function	SKU #2 + USB Cable 1		

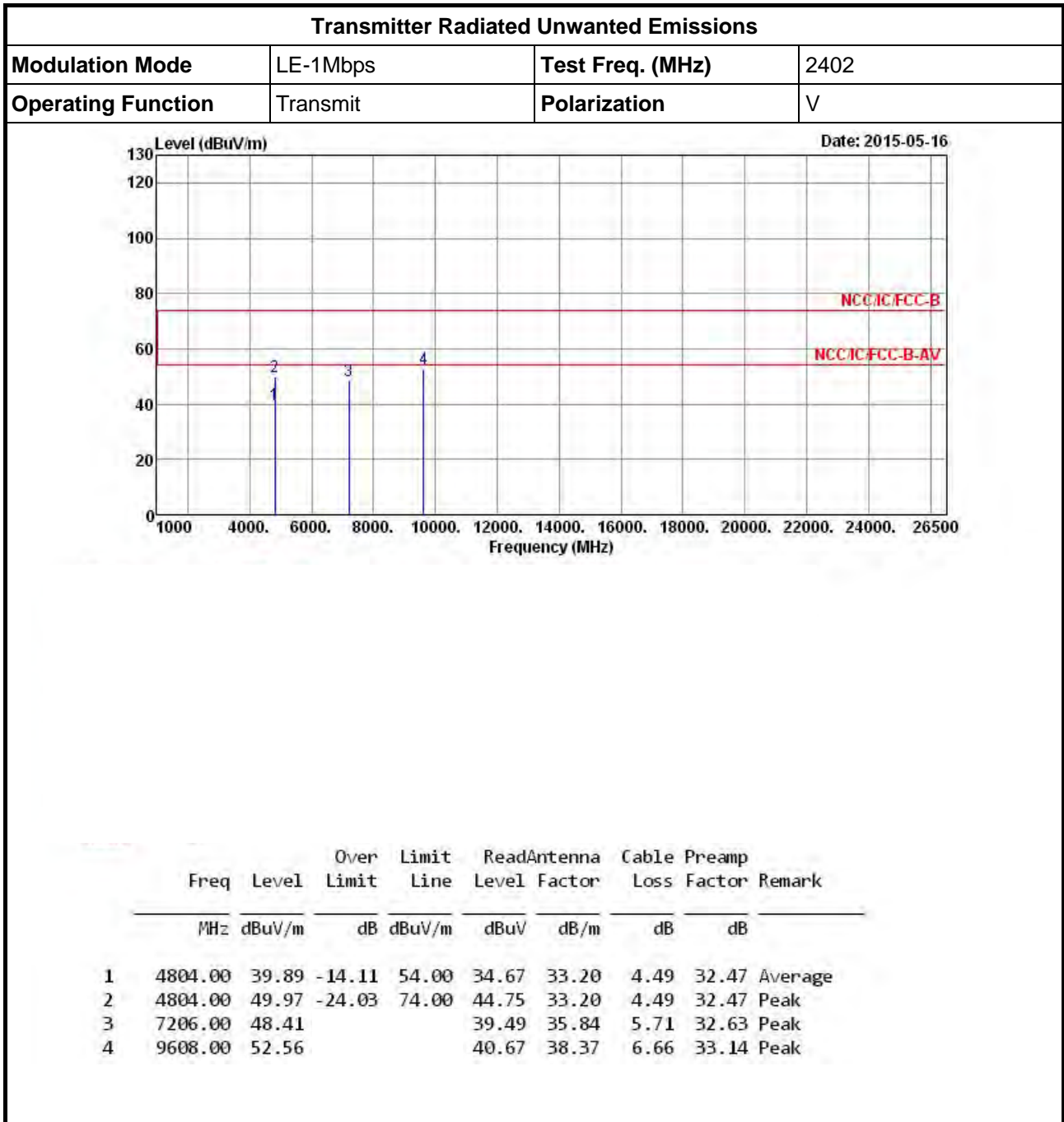


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	152.220	21.44	-22.06	43.50	36.48	10.06	2.04	27.14	Peak
2	215.270	23.88	-19.62	43.50	39.50	8.88	2.41	26.91	Peak
3	228.850	25.59	-20.41	46.00	40.27	9.70	2.49	26.87	Peak
4	598.420	38.15	-7.85	46.00	43.83	18.17	4.14	27.99	Peak
5	833.160	41.25	-4.75	46.00	44.21	19.84	4.93	27.73	Peak
6	999.000	31.79	-22.21	54.00	32.66	20.86	5.51	27.24	Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical).
 Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.



3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

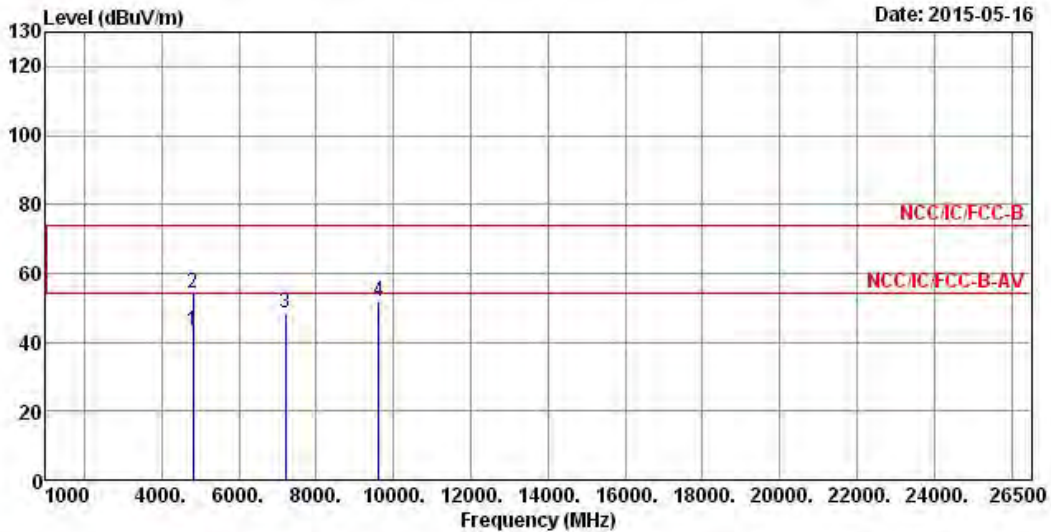


Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
 Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
 Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (102.76 dBuV/m).
 Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.



Transmitter Radiated Unwanted Emissions

Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2402
Operating Function	Transmit	Polarization	H



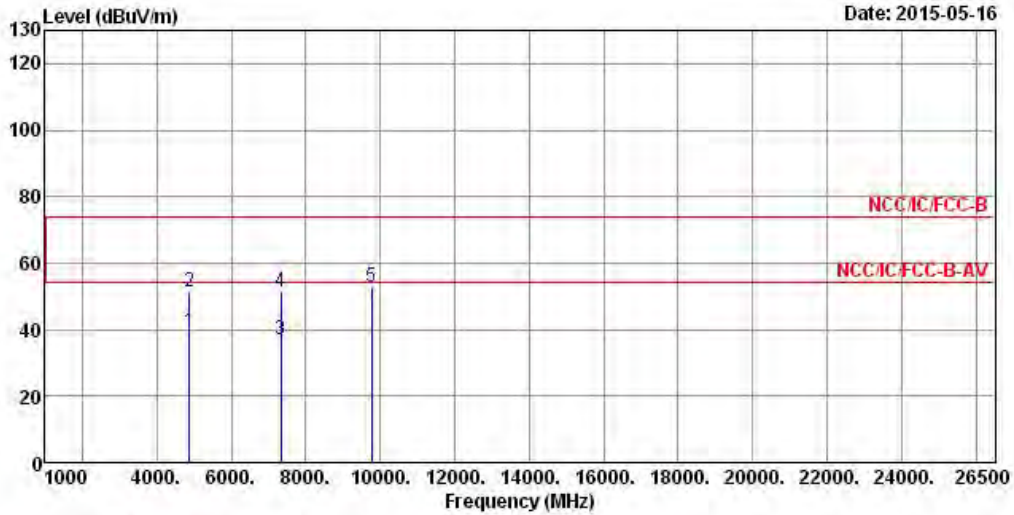
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	4804.00	43.27	-10.73	54.00	38.05	33.20	4.49	32.47 Average
2	4804.00	54.22	-19.78	74.00	49.00	33.20	4.49	32.47 Peak
3	7206.00	48.63			39.71	35.84	5.71	32.63 Peak
4	9608.00	51.72			39.83	38.37	6.66	33.14 Peak

- Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
- Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
- Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
- Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
- Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (102.76 dBuV/m).
- Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.



Transmitter Radiated Unwanted Emissions

Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2440
Operating Function	Transmit	Polarization	V



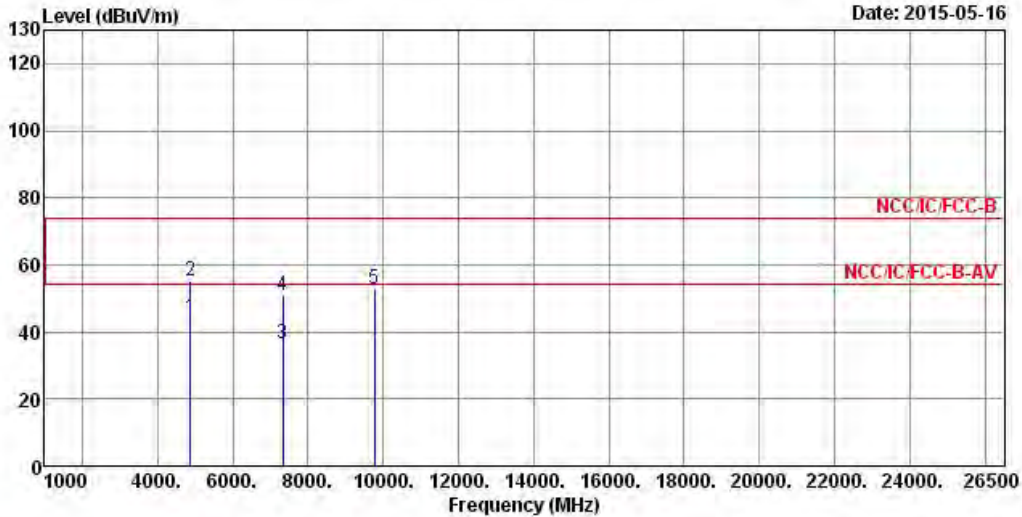
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4880.00	39.54	-14.46	54.00	34.17	33.31	4.51	32.45	Average
2	4880.00	51.19	-22.81	74.00	45.82	33.31	4.51	32.45	Peak
3	7320.00	37.13	-16.87	54.00	27.90	36.15	5.75	32.67	Average
4	7320.00	51.22	-22.78	74.00	41.99	36.15	5.75	32.67	Peak
5	9760.00	52.64			40.43	38.61	6.73	33.13	Peak

- Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
- Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
- Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
- Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
- Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (100.65 dBuV/m).
- Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.



Transmitter Radiated Unwanted Emissions

Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2440
Operating Function	Transmit	Polarization	H



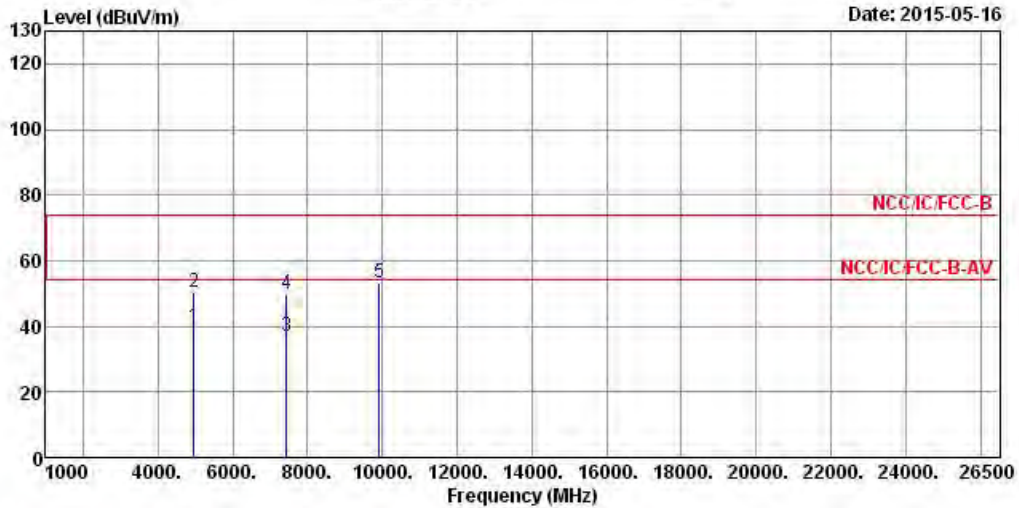
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Loss	Preamp Factor	Remark	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4880.00	44.30	-9.70	54.00	38.93	33.31	4.51	32.45	Average
2	4880.00	55.31	-18.69	74.00	49.94	33.31	4.51	32.45	Peak
3	7320.00	36.33	-17.67	54.00	27.10	36.15	5.75	32.67	Average
4	7320.00	50.63	-23.37	74.00	41.40	36.15	5.75	32.67	Peak
5	9760.00	52.88			40.67	38.61	6.73	33.13	Peak

- Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
- Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
- Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
- Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
- Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (100.65dBuV/m).
- Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.



Transmitter Radiated Unwanted Emissions

Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2480
Operating Function	Transmit	Polarization	V



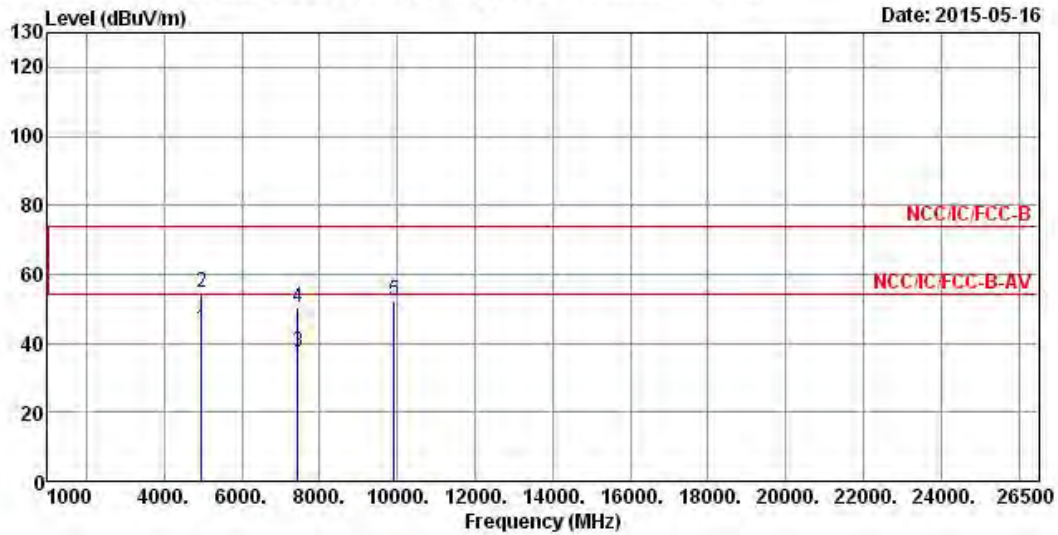
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Remark	
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	
			dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4960.00	39.58	-14.42	54.00	34.01	33.44	4.57	32.44	Average
2	4960.00	50.41	-23.59	74.00	44.84	33.44	4.57	32.44	Peak
3	7440.00	37.13	-16.87	54.00	27.59	36.47	5.79	32.72	Average
4	7440.00	49.98	-24.02	74.00	40.44	36.47	5.79	32.72	Peak
5	9920.00	53.12			40.56	38.89	6.80	33.13	Peak

- Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
- Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
- Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
- Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
- Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (100.62dBuV/m).
- Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.



Transmitter Radiated Unwanted Emissions

Modulation Mode	LE-1Mbps	Test Freq. (MHz)	2480
Operating Function	Transmit	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4960.00	44.06	-9.94	54.00	38.49	33.44	4.57	32.44	Average
2	4960.00	54.88	-19.12	74.00	49.31	33.44	4.57	32.44	Peak
3	7440.00	37.30	-16.70	54.00	27.76	36.47	5.79	32.72	Average
4	7440.00	50.42	-23.58	74.00	40.88	36.47	5.79	32.72	Peak
5	9920.00	52.47			39.91	38.89	6.80	33.13	Peak

- Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
- Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
- Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
- Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.
- Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 20 dB relative to the maximum measured in-band level (100.62dBuV/m).
- Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.



4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Apr. 15, 2015	AC Conducted
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 22, 2015	AC Conducted
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	Oct. 31, 2014	AC Conducted
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	AC Conducted

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101500	9KHz~40GHz	May 05, 2015	RF Conducted
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jul. 31, 2014	RF Conducted
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jul. 26, 2014	RF Conducted
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Jan. 29, 2015	RF Conducted
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Jan. 29, 2015	RF Conducted
BT Station	R&S	CBT	100959	N/A	Aug. 26, 2014	RF Conducted

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



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Nov. 29, 2014	Radiation
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 11, 2015	Radiation
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Sep. 01, 2014	Radiation
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Apr. 02, 2015	Radiation
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 20, 2014	Radiation
Horn Antenna	ETS • LINDGREN	3115	6741	1GHz ~ 18GHz	Jul. 11, 2014	Radiation
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	Jan. 27, 2015	Radiation
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 15, 2014	Radiation
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec. 12, 2014	Radiation
Turn Table	EM Electronics	EM Electronics	060615	0 ~ 360 degree	N/A	Radiation
Antenna Mast	MF	MF-7802	MF780208179	1 ~ 4 m	N/A	Radiation

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	Feb. 02, 2015	Radiation

Note: Calibration Interval of instruments listed above is two years.