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Project No.: 12CA68576
File No.: MC17215
Report No.: 12CA68576-FCC
Date: May 9, 2013
Model No.: DD020315PDA
FCC ID.: BEJDD020315PDA

FCC / IC Test Report

**in accordance with
FCC Part 15 Subpart C Section 15.247
& IC RSS-210 Issue 8**

for

Wireless module

LG Electronics Inc.

San4-1, Nakseongdeon-dong, Gwanak-gu, Seoul 151-919, Rep. of Korea

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Summary of Test Results:

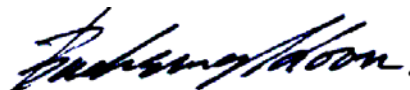
The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 15 C Section 15.247 and IC RSS-210 Issue 8					
No	Reference Clause No.		FCC Part15 Subpart C Conformance Requirements	Result Verdict	Remark
	FCC Rule	IC Rule			
1	15.247(a)	A8.2(a)	6dB Bandwidth Measurement	Complied	
2	-	Gen 4.4.1	99% Bandwidth Measurement	Complied	
3	15.247 (e)	A8.2(b)	Power Spectral Density Measurement	Complied	
4	-	-	Average Power Measurement	Complied	
5	15.247(b)	A8.4	Peak Power Measurement	Complied	
6	15.247(d)	A8.5	Conducted Spurious Emission Measurement	Complied	
7	15.247(d)	A8.5	Band Edges Measurement	Complied	
8	15.209	A8.5	Radiated Emission Measurement	Complied	
9	15.207	Gen 7.2.2	AC Conducted Emission Measurement	Complied	
*Note ¹ : N/T=Not Tested, N/A=Not Applicable					

Conclusion:

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.



Witnessed by
Hong Suk Oh, WiSE Associate Project Engineer
UL Verification Services – 3014ASEO
UL Korea Ltd.
May 9, 2013



Reviewed by
Sung Hoon Baek, WiSE Senior Project Engineer
UL Verification Services – 3014ASEO
UL Korea Ltd.
May 9, 2013

Test Report Details

Witnessed By: UL Korea Ltd.
33rd FL. GFC Center, 737 Yeoksam-dong, Gangnam-gu, Seoul, 135-984, Korea

Test Site: CTK Co., Ltd.
386-1, Ho-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, Korea
The test facility was deemed to have the environment and capabilities necessary to perform the tests included in the test package.

Applicant: LG Electronics Inc.
San4-1, Nakseongdeon-dong, Gwanak-gu, Seoul 151-919, Rep. of Korea

Manufacturer LG Innotek
93, 2sunhwan-ro 971beon-gil, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do, 361-726, Korea

Applicant Contact: Changhyun Ju
Phone: 82-2-2102-1629
E-mail: changhyun.ju@lge.com

Product Type: Wireless module

Model Number: DD020315PDA

Trademark



Sample Serial Number: N/A

Test standards: FCC Part 15 Subpart C Section 15.247 & IC RSS-210 Issue 8

Sample Receive Date: Apr. 11, 2013

Testing Start Date: Apr. 12, 2013

Date Testing Complete: Apr. 19, 2013

Overall Results: **Pass**

UL Korea Ltd. reports apply only to the specific test samples and test results submitted for UL's review. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the National Authorities. This report may contain test results that are not covered by the NVLAP or KOLAS accreditation.

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1. General Product Information

1.1. Equipment Description

DD020315PDA is the module that integrates Wireless LAN (WLAN). This embedded module is optimized for WLAN enabled handheld mobile device.

1.2. Details of Test Equipment (EUT)

- Equipment Type : Wireless module
- Model No. : DD020315PDA
- Type of test Equipment : module type
- Operating characteristic : Short range wireless device operating in the 2400 – 2483.5 ISM frequency band

1.3. Equipment Configuration

The EUT is consisted of the following component provided by the manufacturer.

Use*	Product Type	Manufacturer	Model	Comments
EUT	Wireless module	LG Innotek	DD020315PDA	-
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

1.4. Technical Data

Item	Type of Wireless module
Frequency Ranges	2400 – 2483.5 MHz
Output power	4 dBm, Typical : 1.0 dBm
Kind of modulation (s)	DSSS
Emission Designator	G1D
Channel	16 channel
Antenna Gain	2.62 dBi
Antenna information	PCB antenna
Working temperature	-30 ~ 85 °C
Supply Voltage	DC 3 V

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Frequency(MHz)	2400	2404	2408	2412	2416	2420	2424	2428	2432	2436	2440	2444	2448	2452	2456	2460	2464	2468	2472	2476
Efficiency(dB)	-2.26	-2.18	-2.14	-2.09	-2.06	-2.20	-1.99	-1.93	-1.89	-1.84	-1.72	-1.65	-1.61	-1.54	-1.56	-1.58	-1.60	-1.74	-1.85	-1.95
Efficiency(%)	59.44	60.49	61.07	61.77	62.23	60.25	63.21	64.10	64.71	65.39	67.35	68.40	68.99	70.13	69.81	69.45	69.11	66.96	65.35	63.89
TRG(dB)	-2.26	-2.18	-2.14	-2.09	-2.06	-2.20	-1.99	-1.93	-1.89	-1.84	-1.72	-1.65	-1.61	-1.54	-1.56	-1.58	-1.60	-1.74	-1.85	-1.95
TRG _{metal} (dB)	-4.77	-4.71	-4.68	-4.65	-4.62	-4.61	-4.57	-4.51	-4.47	-4.42	-4.30	-4.22	-4.18	-4.10	-4.11	-4.12	-4.12	-4.25	-4.36	-4.47
TRG _{PM} (dB)	-5.83	-5.74	-5.68	-5.61	-5.57	-5.91	-5.49	-5.42	-5.38	-5.33	-5.20	-5.15	-5.12	-5.05	-5.09	-5.13	-5.17	-5.32	-5.42	-5.51
UHRG(dB)	-5.46	-5.39	-5.36	-5.31	-5.29	-5.42	-5.23	-5.18	-5.15	-5.12	-5.00	-4.94	-4.92	-4.86	-4.88	-4.91	-4.93	-5.08	-5.19	-5.28
UHRG/TRG(%)	47.87	47.74	47.65	47.61	47.55	47.62	47.40	47.30	47.18	47.08	46.93	46.83	46.71	46.59	46.52	46.47	46.45	46.38	46.35	46.36
H-Plane	-3.09	-3.06	-3.07	-3.09	-3.12	-3.17	-3.21	-3.23	-3.28	-3.33	-3.30	-3.33	-3.41	-3.45	-3.60	-3.73	-3.87	-4.14	-4.39	-4.62
E1-Plane, AVG(dB)	-5.86	-5.83	-5.83	-5.82	-5.81	-5.81	-5.78	-5.73	-5.71	-5.66	-5.53	-5.46	-5.43	-5.36	-5.36	-5.39	-5.38	-5.53	-5.66	-5.78
E2-Plane, AVG(dB)	-4.08	-3.98	-3.95	-3.89	-3.85	-3.82	-3.76	-3.69	-3.64	-3.58	-3.45	-3.35	-3.29	-3.20	-3.20	-3.20	-3.20	-3.30	-3.39	-3.47
Peak Gain(dB)	2.30	2.36	2.39	2.42	2.41	2.23	2.42	2.46	2.47	2.47	2.57	2.59	2.59	2.62	2.55	2.47	2.37	2.21	2.06	1.94
Directivity(dB)	4.56	4.54	4.53	4.51	4.47	4.43	4.42	4.39	4.36	4.31	4.29	4.24	4.21	4.16	4.11	4.06	3.97	3.95	3.91	3.88
Minimum Gain(dB)	-12.59	-12.48	-12.53	-12.47	-12.59	-13.09	-12.69	-12.81	-12.78	-12.75	-12.56	-12.43	-12.29	-12.05	-11.97	-11.84	-11.75	-11.76	-11.73	-11.63
Test Condition	FS																			
Antenna Type																				
Average Efficiency	-1.86 dB, 65.10 %																			

Note ;

1. All the technical data described above were provided by the manufacturer.

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1.5. Antenna Information

Antenna Model Name : N/A
Antenna Type : PCB Antenna
Manufacturer : N/A
Transmit Gain dBi : 2.4 G : Max. 2.62 dBi

1.6. Equipment Type :

- ☒ Radio and ancillary equipment for fixed or semi-fixed use
☐ Radio and ancillary equipment for vehicular mounted use
☐ Radio and ancillary equipment for portable or handheld use
- ☐ Stand alone ☒ Host connected
- ☐ Self contained single unit ☒ Module with associated connection or interface

1.7. Technical descriptions and documents

The following documents was provided by the manufacturer.

No.	Document Title and Description
1	User Manual

1.8. Description of additional model name

Model name	Model name Designation	Description of design
DD020315PDA	Basic model	-

2. Test Specification

The following test specifications and standards have been applied and used for testing.

- 1) FCC Part 15 Subpart C Section 15.247 : Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz
- 2) ANSI C63.4:2009 : American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
- 3) ANSI C63.10:2009 : American National Standard for Testing Unlicensed Wireless Devices
- 4) KDB 558074 D01 DTS Meas Guidance v03r01 : Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

3. Test Conditions

3.1. Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Wireless module	LG Innotek	DD020315PDA	-
AE	Note PC	DELL INC.	Inspiron 6400	-
Note: Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment. SIM - Simulator (Not Subjected to Test)				

3.2. Input/Output Ports

No	Port Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
1	Power Input	DC	N	N	Connected to DC Power supply
2	Radio Antenna	I/O	N	Y	-
Note: *AC = AC Power Port DC = DC Power Port N/E = Non-Electrical I/O = Signal Input or Output Port (Not Involved in Process Control) TP = Telecommunication Ports					

3.3. Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	DC 3 V	0.028	-	DC	-	Rated of EUT
1	DC 3 V	-	-	DC	-	Normal operating voltage
2	AC 120 V			60 Hz		Rated of Note PC

3.4. Operating Frequencies

Mode #	Frequency tested
1	- Low : 2405 MHz - Mid : 2445MHz - Top : 2480 MHz

3.5. Operation Modes

Mode #	Description
1	Carrier on mode: Signal from the RF module was generated continuously for the representative channels (Low, Mid, High) by the test program incorporated
2	Carrier off (Idle) mode: RF carrier was not activated by the RF module
Note : 1. The measurements of the spurious emissions for transmitter on stand-by mode were performed as the receiver spurious emissions.	

3.6. Environment Conditions

Parameters	Normal condition
Temperature	+ 15°C ~ +35°C
Humidity	20% ~ 75%
Supply voltage	DC 3 V (Rated nominal voltage)
Note ; - The extreme condition is applied to the boundary limits of the declared operational environmental condition by the manufacturer. - The operating condition for humidity requirement has not been declared in the manufacturer's specification. - Test has been carried out for three frequencies specified above under the normal condition and for the extreme condition, minimum and maximum frequencies has been tested.	

3.7. Test Configurations

Mode #	Description
1	DC Power Supply EUT Power Line
2	DC Power Supply EUT Attenuator Power meter or Spectrum Analyzer
3	Note PC Wireless module to PC connecting Zig EUT Wireless Dongle Power Line

3.8. List of Test Equipment

No	Description	Manufacturer	Model	Identifier	Cal. Due
1	Signal Analyzer	Agilent	N9020A	MY48011598	2013-11-08
2	Spectrum Analyzer	Rohde & Schwarz	FSP-30	100994	2013-11-08
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2013-12-14
4	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2013-12-14
5	Trilog Broadband Antenna	SCHWARZBECK	VULB 9161 SE	9161-4133	2014-06-11
6	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2014-06-06
7	Attenuator	HP	8498A	1801A06913	2013-11-09
8	EPM Series Power Meter	HP	E4418A	GB38272734	2013-11-08
9	Power Sensor	HP	8487A	3318A03524	2013-07-10
10	Audio Analyzer	HP	8903B	2747A03432	2013-11-08
11	ESG-D Series Signal Generator	Agilent	E4432B	US40054094	2013-11-08
12	SYNTHESIZED SWEEPER	HP	8341B	2819A01563	2013-11-08
13	Attenuator	HP	8494A	3308A33351	2013-11-09
14	Temp&Humi Chamber	Kunpoong	JT-TH-556-1	9QE5-002	2014-01-16
15	DC POWER SUPPLY	Agilent	E3632A	MY40011638	2013-11-08
16	Horn Antenna	ETS-Lindgren	3115	00078895	2015-02-28
17	Horn Antenna	ETS-Lindgren	3116	00062916	2015-03-20
18	Dipole Antenna	SCHWARZBECK	VHA 9103	VHA91032557	2013-11-04
19	Dipole Antenna	SCHWARZBECK	UHA 9105	UHA91052417	2013-11-04
20	OPT H64 AMPLIFIER	HP	8447F	3113A06814	2014-03-21
21	PREAMPLIFIER	Agilent	8449B	3008A02307	2013-11-09
22	Radio Communication Tester	Rohde & Schwarz	CMU200	106765	2014-02-04
23	LISN	Rohde & Schwarz	ENV216	101235	2013-08-06
24	LISN	Rohde & Schwarz	ENV216	101236	2013-08-06
25	DC POWER SUPPLY	Agilent	E3632A	MY40011638	2013-11-08
26	EMI Test Receiver	Rohde & Schwarz	ESCI3	100032	2014-02-04
27	6dB Attenuator	R&S	DNF	272.4110.50	2013-11-09
28	AMPLIFIER	Sonoma Instrument Co.	310	291721	2014-03-21
29	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2013-06-29
30	Signal Generator	Rohde & Schwarz	SMB100A	175528	2013-10-08
31	Band Reject Filter	Wainwright Instruments GmbH	WRCGV 2400/2483- 2375/2505- 50/10EE	2	2013-09-11

4. Overview of Technical requirements

The following essential requirements and test specifications are relevant to the presumption of conformity FCC Part 15 Subpart C Section 15.247			Reported
Reference Clause No.	Essential technical requirements	Test method	
15.247(a)(2)	6 dB Bandwidth	ANSI C63.10-2009 KDB 558074	[X]
15.247(b)(3)	Maximum peak output power	ANSI C63.10-2009 KDB 558074	[X]
15.247(e)	Power spectral density	ANSI C63.10-2009 KDB 558074	[X]
15.205(a) 15.209(a) 15.247(d)	Transmitter radiated spurious emissions and Conducted spurious emission	ANSI C63.4-2009 KDB 558074	[X]
15.207	Transmitter AC power line conducted emission	ANSI C63.4-2009	[X]

5. Test Results

5.1. 6 dB Bandwidth

TEST: 6 dB Bandwidth		
Method	The transmitter output is connected to the Spectrum analyzer. 6 dB Bandwidth from the EUT was measured under the below setting condition. 1. Set resolution bandwidth (RBW) = 100 kHz. 2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW 3. Detector = Peak. 4. Trace mode = max hold. 5. Sweep = auto couple. 7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer.	
Reference Clause	Part15 C Section 15.247 (a)(2)	
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	32 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2405 MHz - 2480 MHz	Antenna port

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	2
Supplementary information: None		

Limits

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~928 MHz, 2400 ~ 2483.5 MHz, and 5725 ~ 5825 MHz bands. The minimum of 6 dB Bandwidth shall be at least 500 kHz.

5.1.1. Measurement Results

Table 1. Data Table of 6 dB Bandwidth

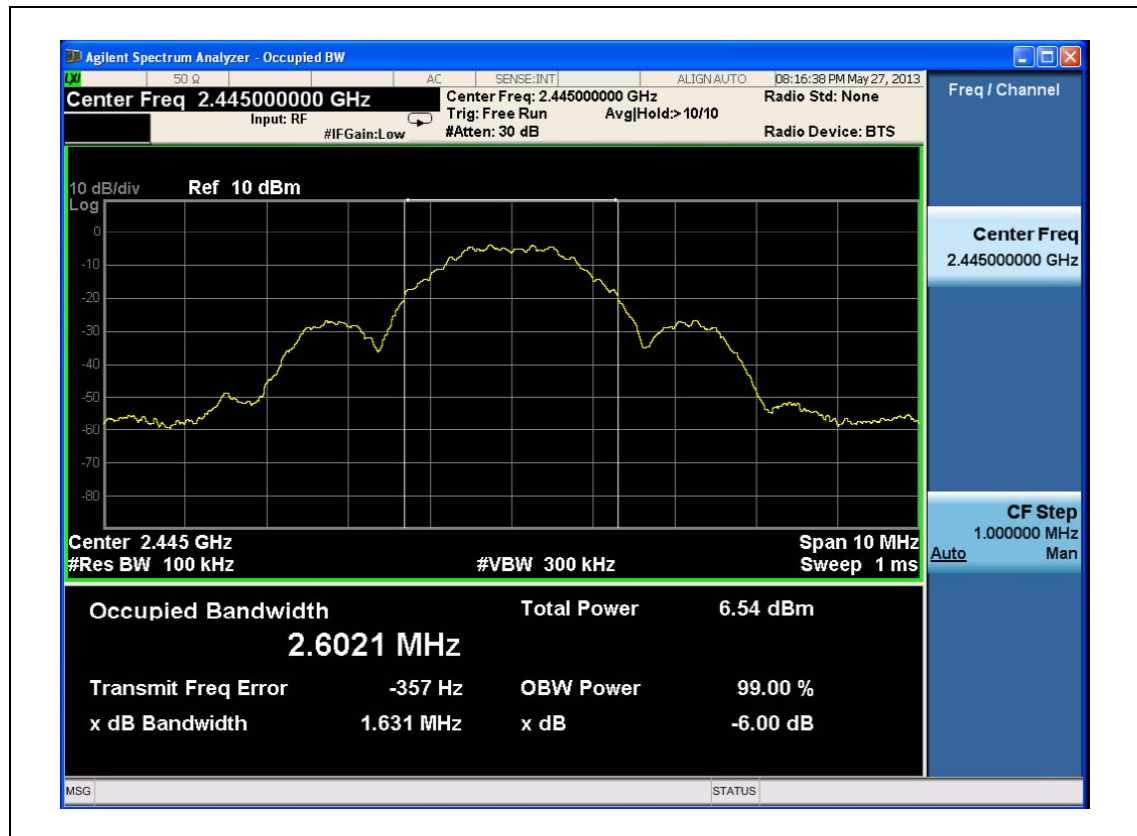
Frequency (MHz)	Channel No.	Test Results		
		6dB Bandwidth (MHz)	Occupied Bandwidth (MHz)	Result
2405	11	1.637	2.615	Complies
2445	19	1.631	2.602	Complies
2480	26	1.633	2.605	Complies

Figure 1. Plots of 6 dB Bandwidth

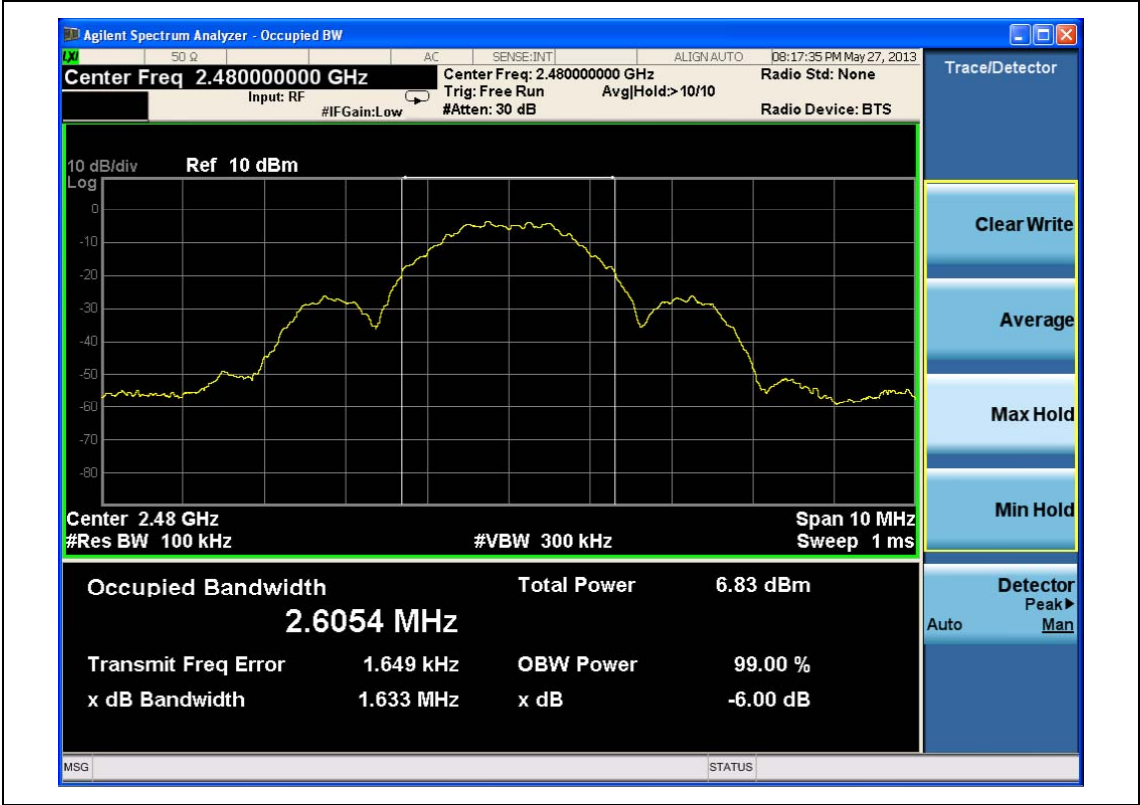
Low



Middle



High



5.2. Maximum Peak Output Power

TEST: Maximum Peak Output Power		
Method	Maximum Peak Output Power from the EUT were measured according to the dictates PK2 measurement procedure in section 9.1 of KDB 558074 1. This procedure may be used when the maximum available RBW of the measurement instrument is less than the DTS bandwidth.. 2. Set the RBW = 1 MHz. 3. Set the VBW $\geq 3 \times$ RBW 4. Set the span $\geq 1.5 \times$ DTS bandwidth.. 5. Detector = peak. 6. Sweep time = auto couple. 7. Trace mode = max hold. 8. Allow trace to fully stabilize. 9. Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector). If the instrument does not have a band power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.	
Reference Clause	Part15 C Section 15.247 (b)(3)	
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	32 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2405 MHz - 2480 MHz	Antenna port

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	2
Supplementary information: None		

Limits

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 MHz, 2400 ~2483.5 MHz, and 5725 ~ 5850 MHz band: 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antenna elements. The average must not include any intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antenna with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antenna of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Results

Table 2. Data Table of Maximum Peak Output Power

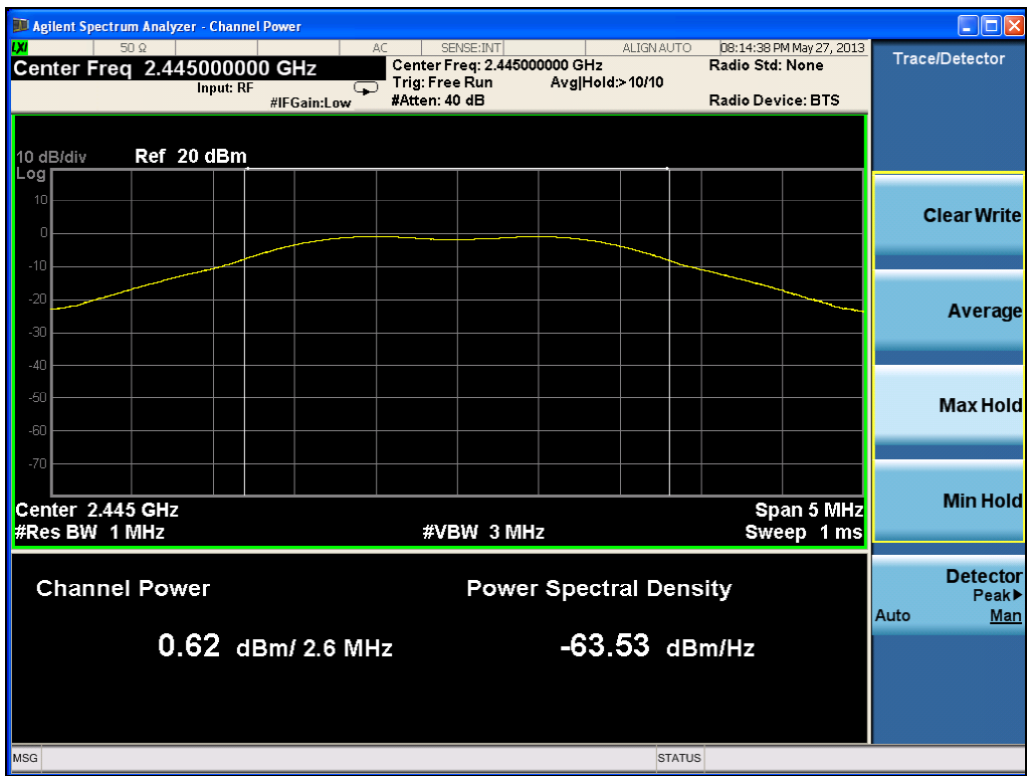
Frequency (MHz)	Channel No.	Measurement data (dBm)	Total Power (dBm)	Limit	Result
2405	11	0.85	3.16	30dBm	Complies
2445	19	0.62	2.93	30dBm	Complies
2480	26	0.77	3.08	30dBm	Complies
Note: Cable loss : 2.31 dB					

Figure 2. Plots of Maximum Peak Output Power

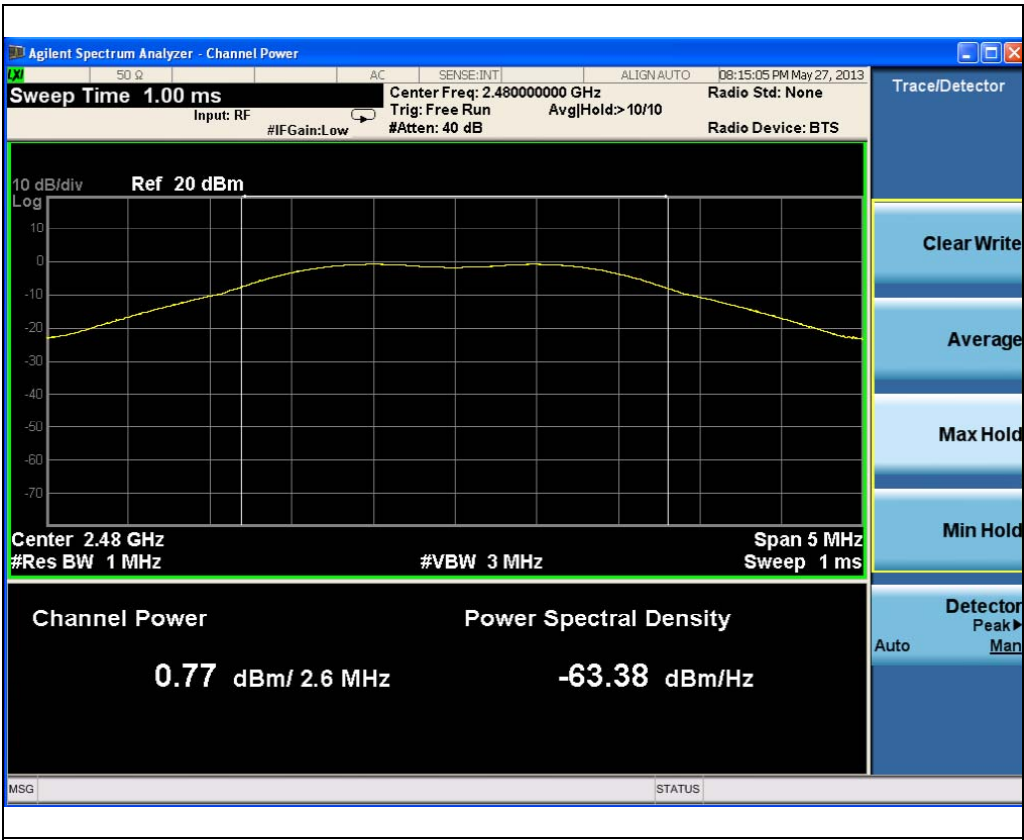
Low



Middle



High



5.3. Power Spectral Density

TEST: Power Spectral Density		
Method	Power Spectral Density from the EUT were measured according to the dictates PKPSD measurement procedure in section 10.2 of KDB 558074 1. Set analyzer center frequency to DTS channel center frequency. 2. Set the span to 1.5 times the DTS bandwidth. 3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$. 4. Set the VBW $\geq 3 \times \text{RBW}$. 5. Detector = peak. 6. Sweep time = auto couple. 7. Trace mode = max hold. 8. Allow trace to fully stabilize. 9. Use the peak marker function to determine the maximum amplitude level within the RBW. 10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.	
Reference Clause	Part15 C Section 15.247 (e)	
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	32 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	2405 MHz - 2480 MHz	Antenna port

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
1	1	2
Supplementary information: None		

Limits

§15.247(e) For digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dB m in any 3 kHz band any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Measurement Result

Table 3. Data Table of Power Spectral Density

Frequency (MHz)	Ch.	Test Results	
		dBm	dBm
2405	11	-12.858	-12.858
2445	19	-14.273	-14.273
2480	26	-13.730	-13.730

Figure 3. Plots of Power Spectral Density

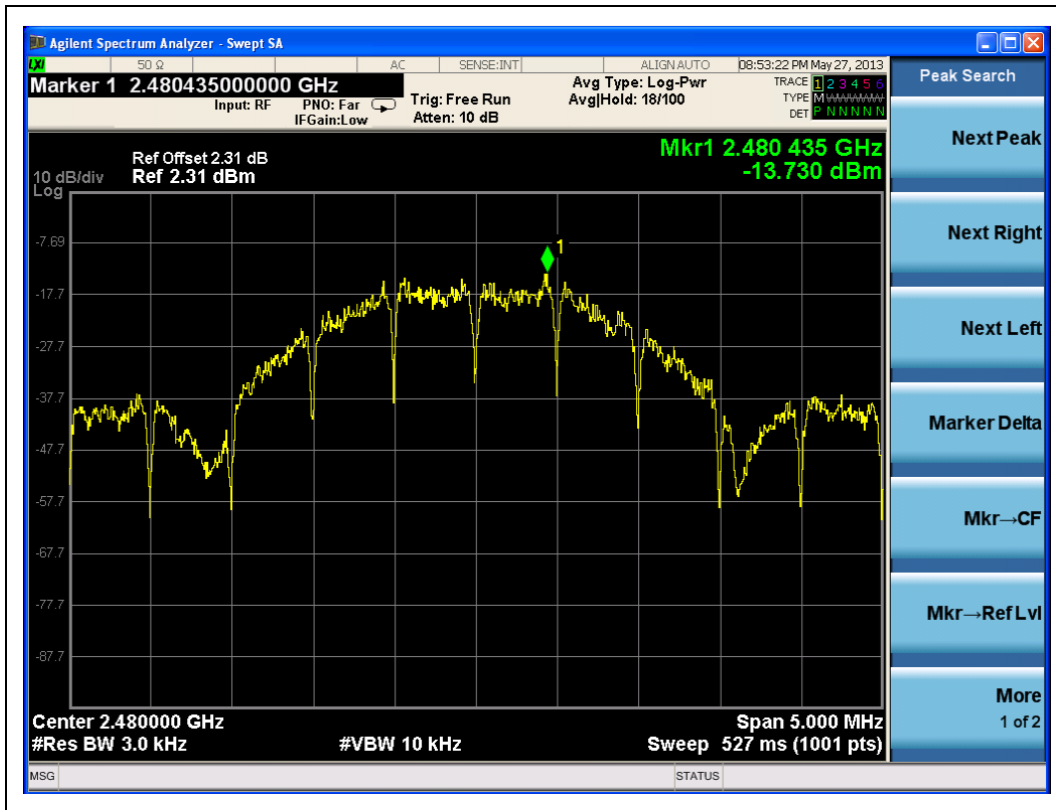
Low



Middle



High



5.4. Conducted spurious emission Measurement

TEST: Conducted spurious emission measurement		
Method	Transmitter output is connected to a spectrum analyzer and emissions from the EUT were measured according to the dictates in section 13.3.1 of KDB 558074 for Band-Edge and in section 11.2 for Non-Restricted frequency bands. Measurement Procedure – for Band-Edge 1. Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge). 2. Set span to 2 MHz / 3. RBW = 100 kHz. / 4. VBW $\geq 3 \times$ RBW. 5. Detector = peak. / 6. Sweep time = auto. 7. Trace mode = max hold. 8. Allow sweep to continue until the trace stabilizes (required measurement time may increase for low duty cycle applications) 9. Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency (femission) ± 0.5 MHz. If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by femission ± 0.5 MHz. Measurement Procedure – for Non-Restricted frequency bands 1. Set instrument center frequency to DTS channel center frequency. 2. Set the span to ≥ 1.5 times the DTS bandwidth. 3. Set the RBW = 100 kHz. / 4. Set the VBW $\geq 3 \times$ RBW. 5. Detector = peak. / 6. Sweep time = auto couple. 7. Trace mode = max hold. 8. Allow trace to fully stabilize.	
Reference Clause	Part15 C Section 15.247 (d)	
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	32 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 40 GHz	Antenna port

Configuration Settings

Test Item	Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
Conducted Spurious emission	1	1	2
Supplementary information: None			

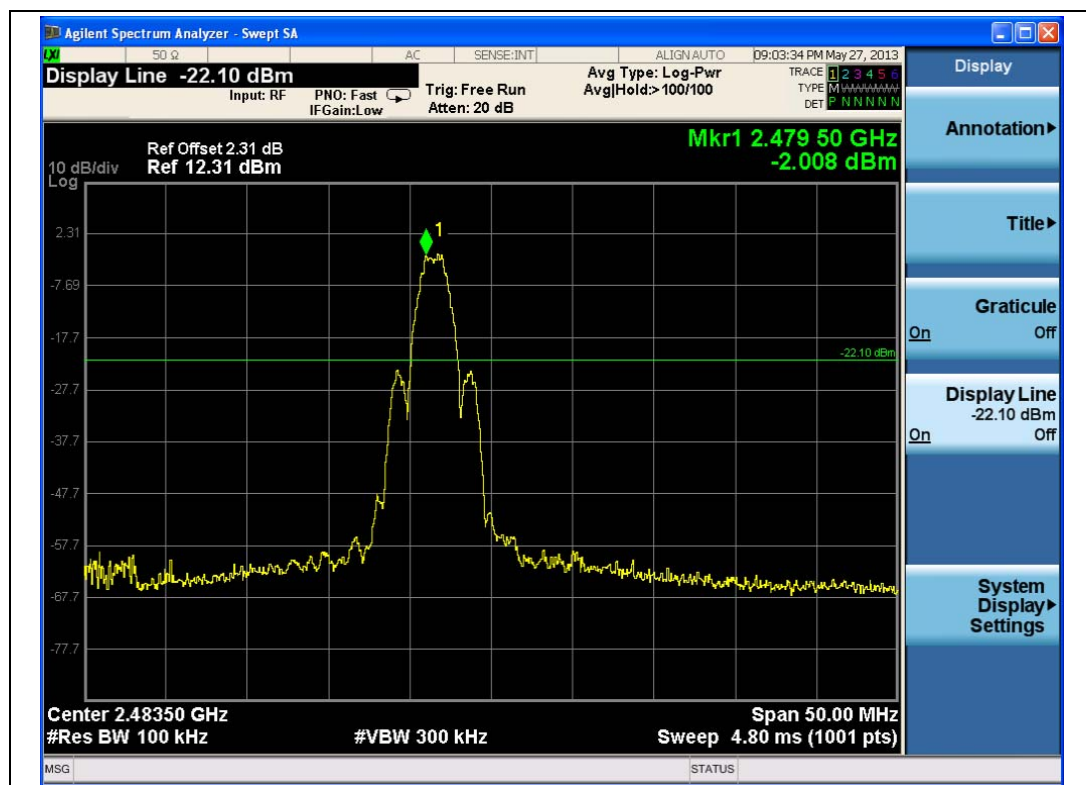
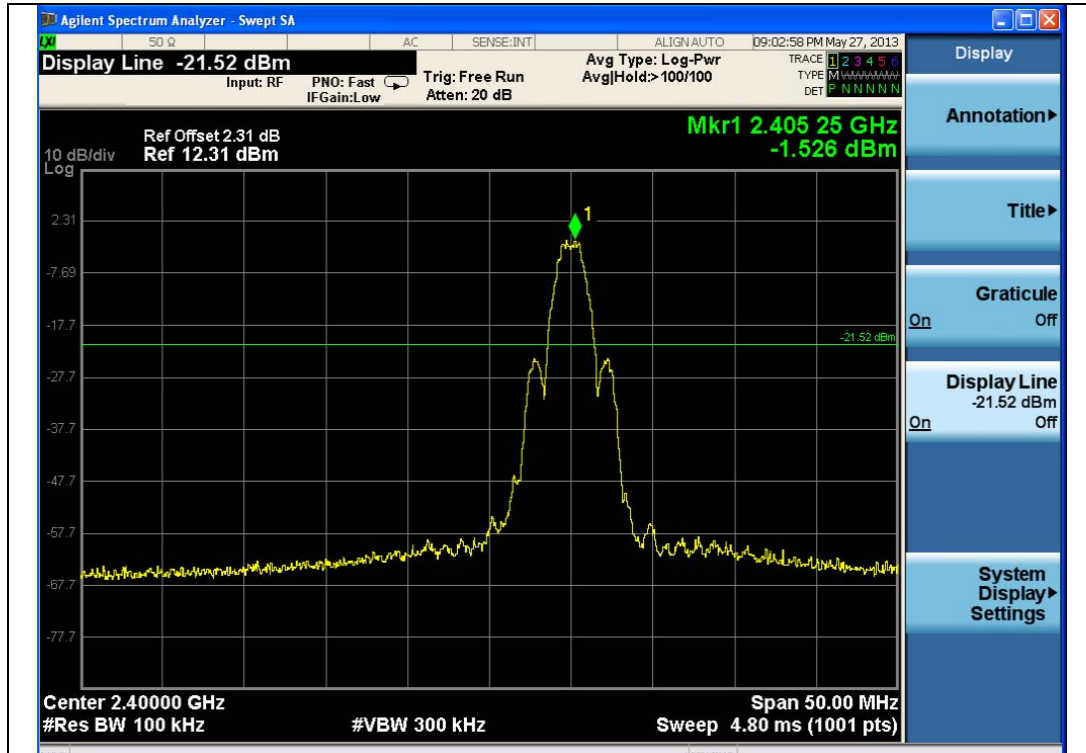
Limits

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

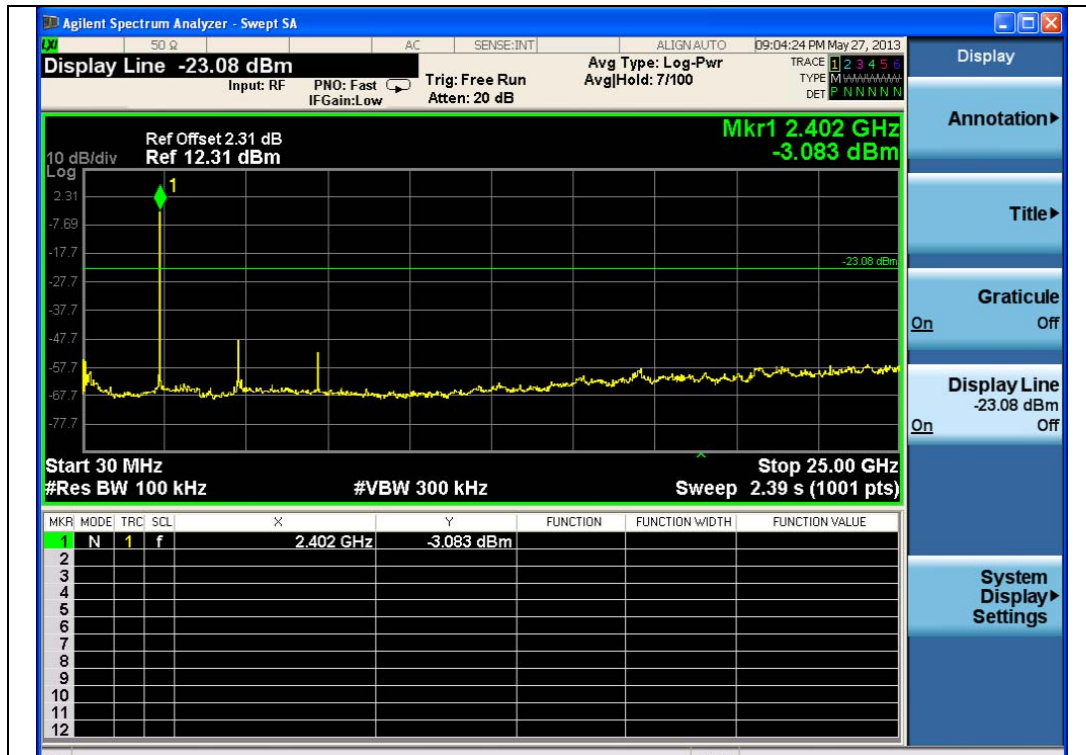
Measurement Results

Figure 4. Plots of Band-Edge and Non-Restricted frequency bands

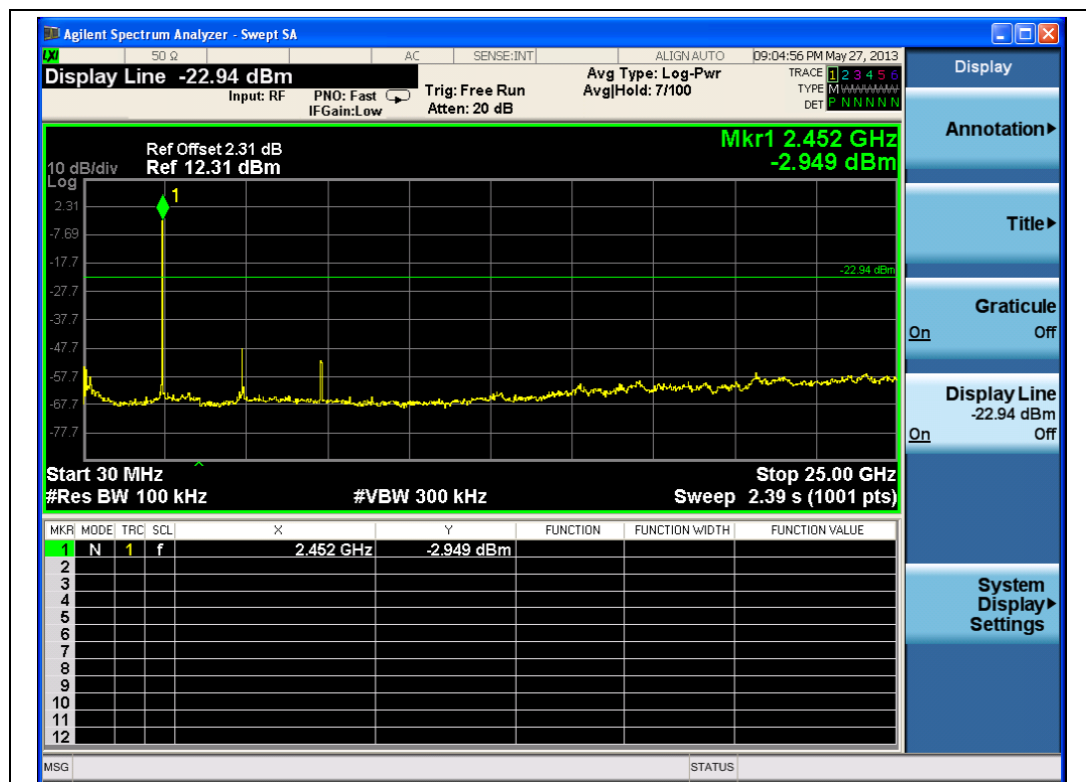
Low



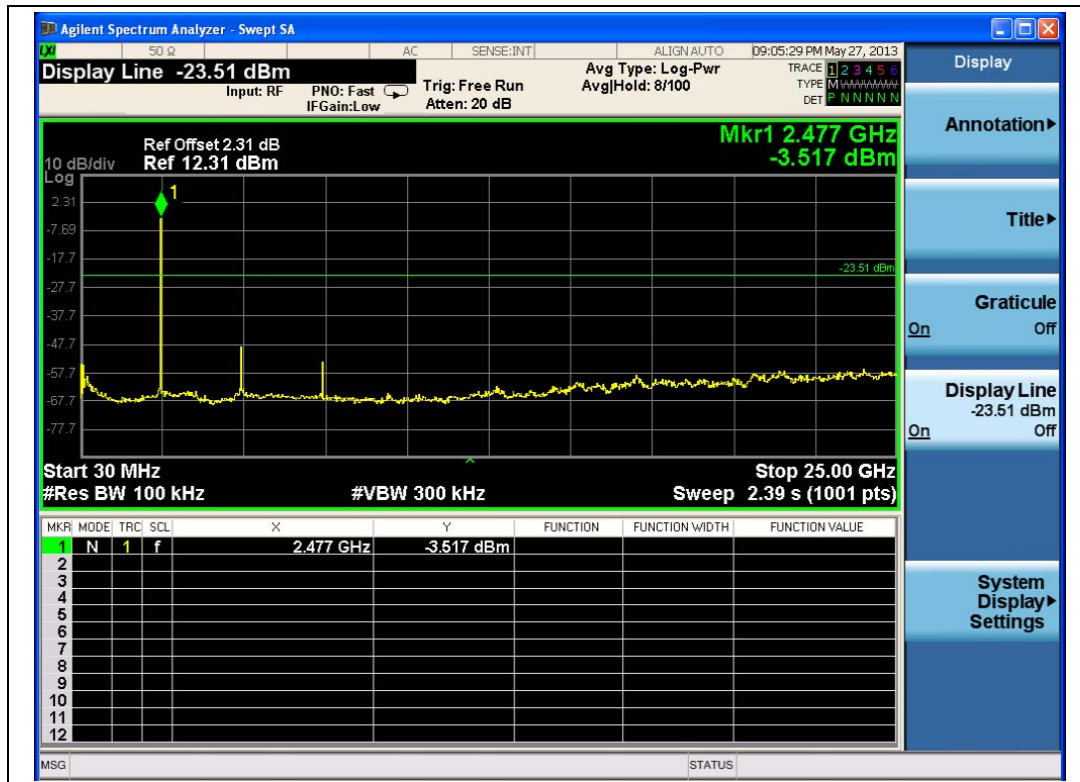
Band – edge (at 20 dB blow) – Low channel
Frequency Range = 30 MHz ~ 10th harmonic



Band – edge (at 20 dB blow) – Mid channel
Frequency Range = 30 MHz ~ 10th harmonic



Band – edge (at 20 dB blow) – High channel
Frequency Range = 30 MHz ~ 10th harmonic



5.5. Radiated Spurious Emissions Measurement

TEST: Radiated spurious emissions measurement		
Method	Radiated emissions from the EUT were measured according to ANSI C63.4 procedure. 1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation. The antenna is varied from 1 to 4 meters above the ground to find the maximum field strength. Measurement are made with both horizontal and vertical polarizations For fundamental investigation, the EUT was positioned for 3 orthogonal orientations. 2. For measurement below 1GHz, the resolution bandwidth is set to 120 kHz for peak detection and for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. Video bandwidth is set to VBW $\geq$ RBW. 3. For measurement above 1GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 1 MHz for peak measurement and 10 Hz for average measurement. 4. For 2.4GHz transmitter measurement, the spectrum from 30 MHz to 26GHz is investigated for Low, Mid and High channels.	
Reference Clause	Part15 C Section 15.247 (d)	
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	48 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30 MHz – 25 GHz	3 meter chamber

Configuration Settings

Test Item	Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
Radiated Spurious emission	1	1	1
Supplementary information: None			

Limits

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Distance (meters)	Field Strength (dBuV/m)	Field Strength (uV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

Test Results

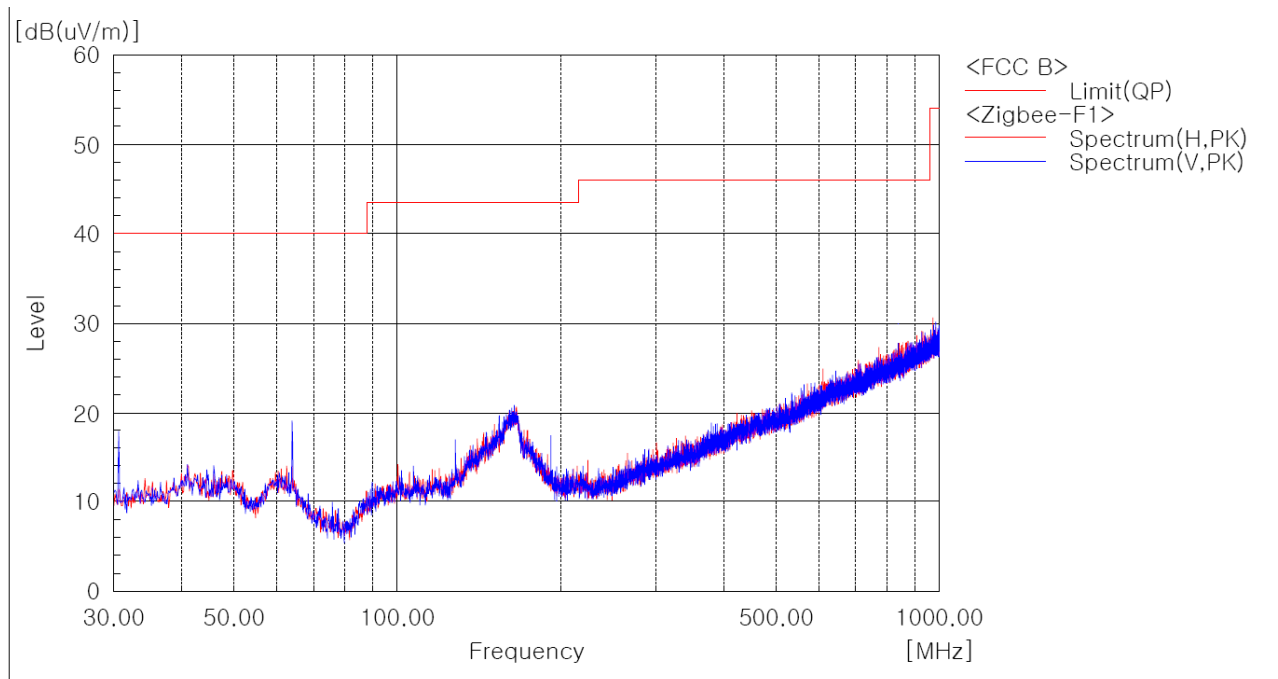
EUT		Measurement Detail	
Model	DD020315PDA	Frequency Range	Below 1000MHz
Mode	Low Channel(Worst Case)	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
No emissions were detected at a level greater than 20dB below limit.			

Test Data



Final Result

No.	Frequency (P)	c.f	Height	Angle
	[MHz]	[dB(1/m)]	[cm]	[deg]

Remark :

1. The field strength of spurious emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.

Test Results

EUT		Measurement Detail	
Model	DD020315PDA	Frequency Range	1-25GHz
Mode	Low Channel	Detector function	Average / Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
1828.63	48.7	5.3	Average

Test Data

Frequency [MHz]	Reading [dBuV / m]		Pol.	Height [m]	Correction Factor		Limits [dBuV / m]		Result [dBuV / m]		Margin [dB]	
	AV / Peak				Antenna	CL+Amp	AV / Peak		AV / Peak		AV / Peak	
1828.63	45.0	48.4	V	1.0	27.4	-23.7	54.0	74.0	48.7	52.1	5.3	21.9
4810.00	27.8	33.8	H	1.0	32.8	-18.4	54.0	74.0	42.2	48.2	11.8	25.8

Restricted band edge test data

Measured frequency range : 2310-2390 MHz, 2483.5-2500 MHz

Measured frequency range: 2510-2590 MHz, 2705-2800 MHz									
Frequency [MHz]	Reading [dBuV / m] AV / Peak	Pol.	Height [m]	Correction Factor		Limits [dBuV / m] AV / Peak	Result [dBuV / m] AV / Peak	Margin [dB] AV / Peak	
				Antenna	Amp. Gain				
No emissions were detected at a level greater than 20dB below limit.									

Test Results

EUT		Measurement Detail	
Model	DD020315PDA	Frequency Range	1-25GHz
Mode	High Channel	Detector function	Average / Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
1826.60	47.0	7.0	Average

Test Data

Frequency [MHz]	Reading [dBuV / m]		Pol.	Height [m]	Correction Factor		Limits [dBuV / m]		Result [dBuV / m]		Margin [dB]	
	AV / Peak				Antenna	CL+Amp	AV / Peak		AV / Peak		AV / Peak	
1826.60	43.3	46.8	V	1.0	27.4	-23.7	54.0	74.0	47.0	50.5	7.0	23.5
4960.00	23.0	30.2	H	1.0	33.0	-19.0	54.0	74.0	37.0	44.2	17.0	29.8

Restricted band edge test data

Measured frequency range : 2310-2390 MHz, 2483.5-2500 MHz

Measured Frequency Range : 2310 - 2390 MHz, 2483.5 - 2500 MHz												
Frequency [MHz]	Reading [dBuV / m] AV / Peak		Pol.	Height [m]	Correction Factor		Limits [dBuV / m] AV / Peak		Result [dBuV / m] AV / Peak		Margin [dB] AV / Peak	
					Antenna	CL+Amp						
2483.50	40.2	45.0	H	1.2	28.7	-22.4	54.0	74.0	46.5	51.3	7.5	22.7

Test Results

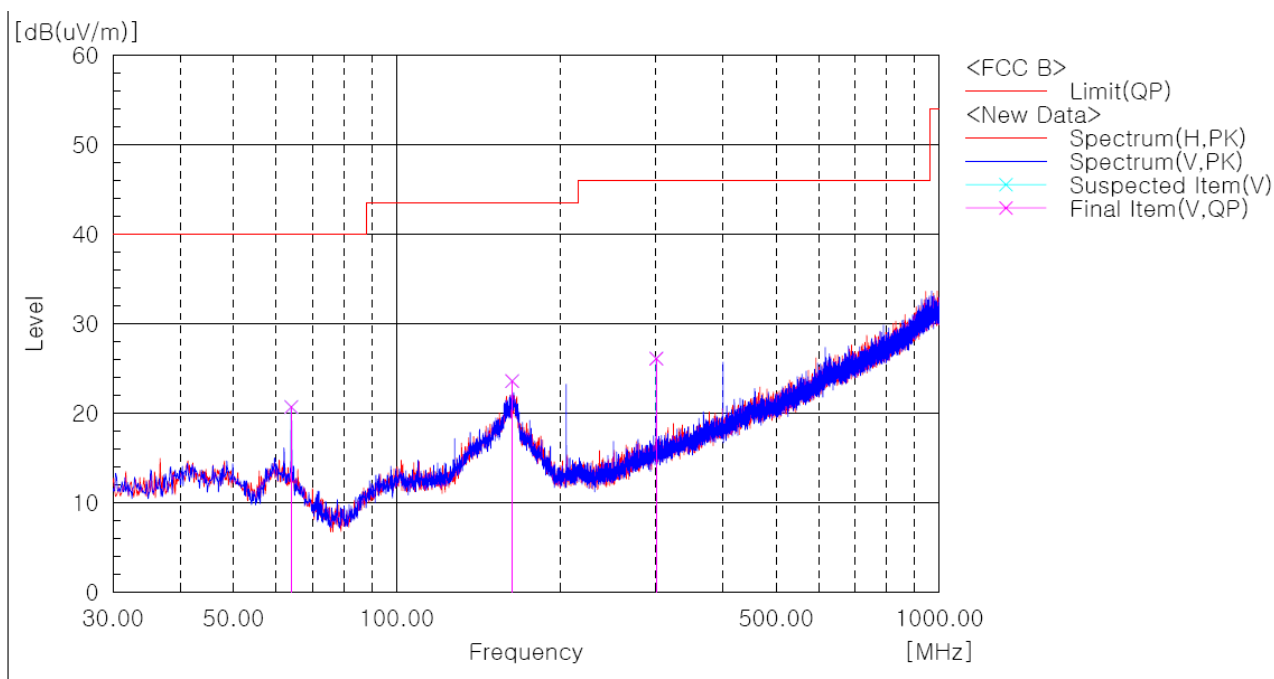
EUT		Measurement Detail	
Model	DD020315PDA	Frequency Range	Below 1000MHz
Mode	Receiver	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
63.95	20.7	19.3	Quasi-Peak

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	63.950	V	34.5	-13.8	20.7	40.0	19.3	205.0	216.0
2	163.254	V	28.7	-5.1	23.6	43.5	19.9	100.0	129.0
3	300.994	V	36.3	-10.2	26.1	46.0	19.9	100.0	129.0

Remark :

1. The field strength of spurious emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.

Test Results

EUT		Measurement Detail	
Model	DD020315PDA	Frequency Range	1-25GHz
Mode	Receiver	Detector function	Average / Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
No emissions were detected at a level greater than 20dB below limit.			

Test Data

Frequency [MHz]	Reading [dBuV / m] AV / Peak	Pol.	Height [m]	Correction		Limits [dBuV / m] AV / Peak	Result [dBuV / m] AV / Peak	Margin [dB] AV / Peak
				Factor				
				Antenna	Amp. Gain			
No emissions were detected at a level greater than 20dB below limit.								

Restricted band edge test data

Measured frequency range : 2310-2390 MHz, 2483.5-2500 MHz

Frequency [MHz]	Reading [dBuV / m] AV / Peak	Pol.	Height [m]	Correction Factor		Limits [dBuV / m] AV / Peak	Result [dBuV / m] AV / Peak	Margin [dB] AV / Peak
				Antenna	Amp. Gain			
No emissions were detected at a level greater than 20dB below limit.								

5.6. Transmitter AC Power Line Conducted Emission

TEST: Transmitter AC Power Line Conducted Emission		
Method	AC line conducted emissions from the EUT were measured according to the dictates of ANSI C63.4-2003. - The test procedure is performed in a 5.05m × 4.0m × 3.0m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m(W) × 1.5 m(L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. - The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. - The excess power cable between the EUT and the LISN was bundled. All connecting cables of EUT were moved to find the maximum emission.	
Basic Standard	FCC Part 15.207(a)	
Parameters recorded during the test	Laboratory Ambient Temperature	23 °C
	Relative Humidity	32 %
-	Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range	150 kHz to 30 MHz	AC power port of Note PC connected to EUT

Configuration Settings

Power Interface Mode # (See Section 3.3)	EUT Operation Mode # (See Section 3.5)	Test Configurations Mode # (See Section 3.7)
2	1	3
Supplementary information: None		

Limits

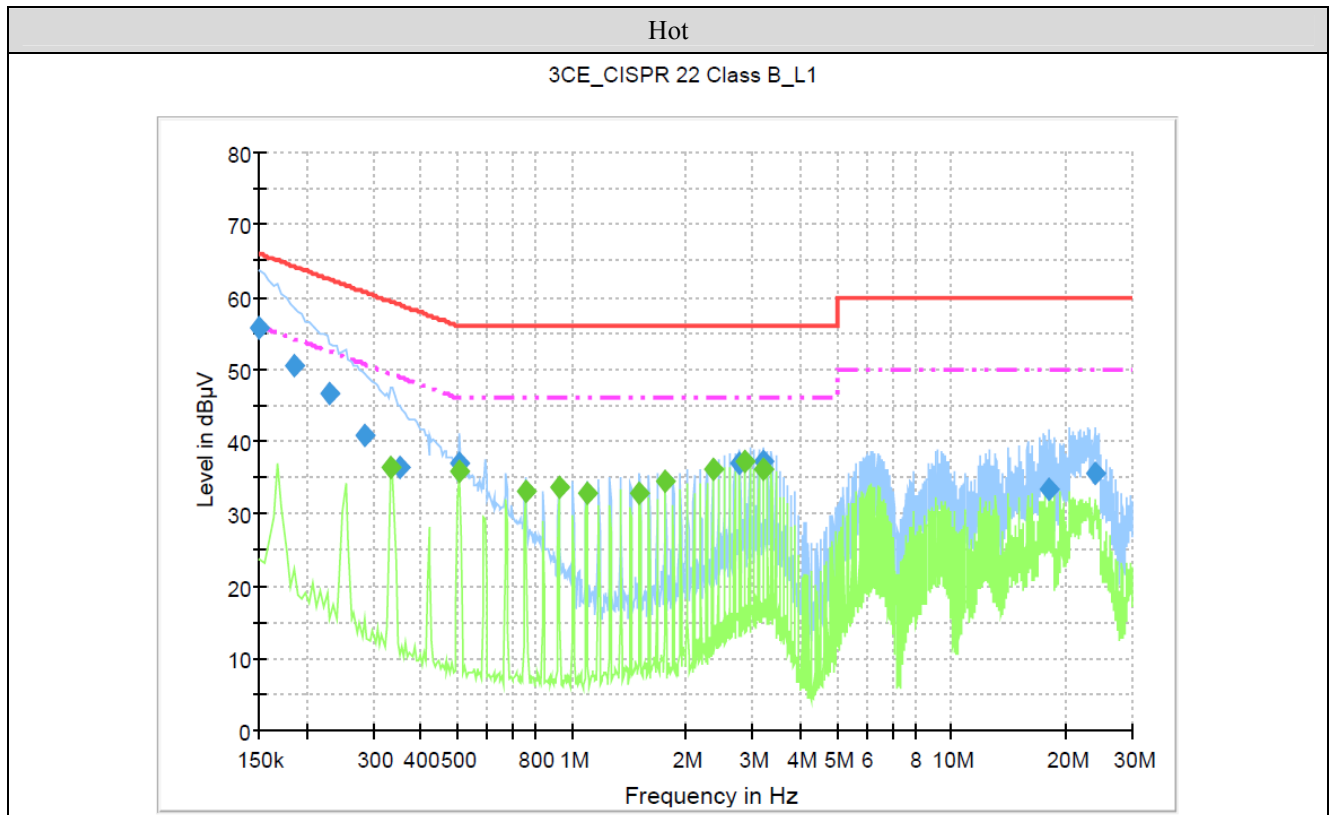
According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dB µV)	
	Quasi-peak	Average
0.15 – 0.5	66 - 56*	56 - 46*
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

Test Data and Results



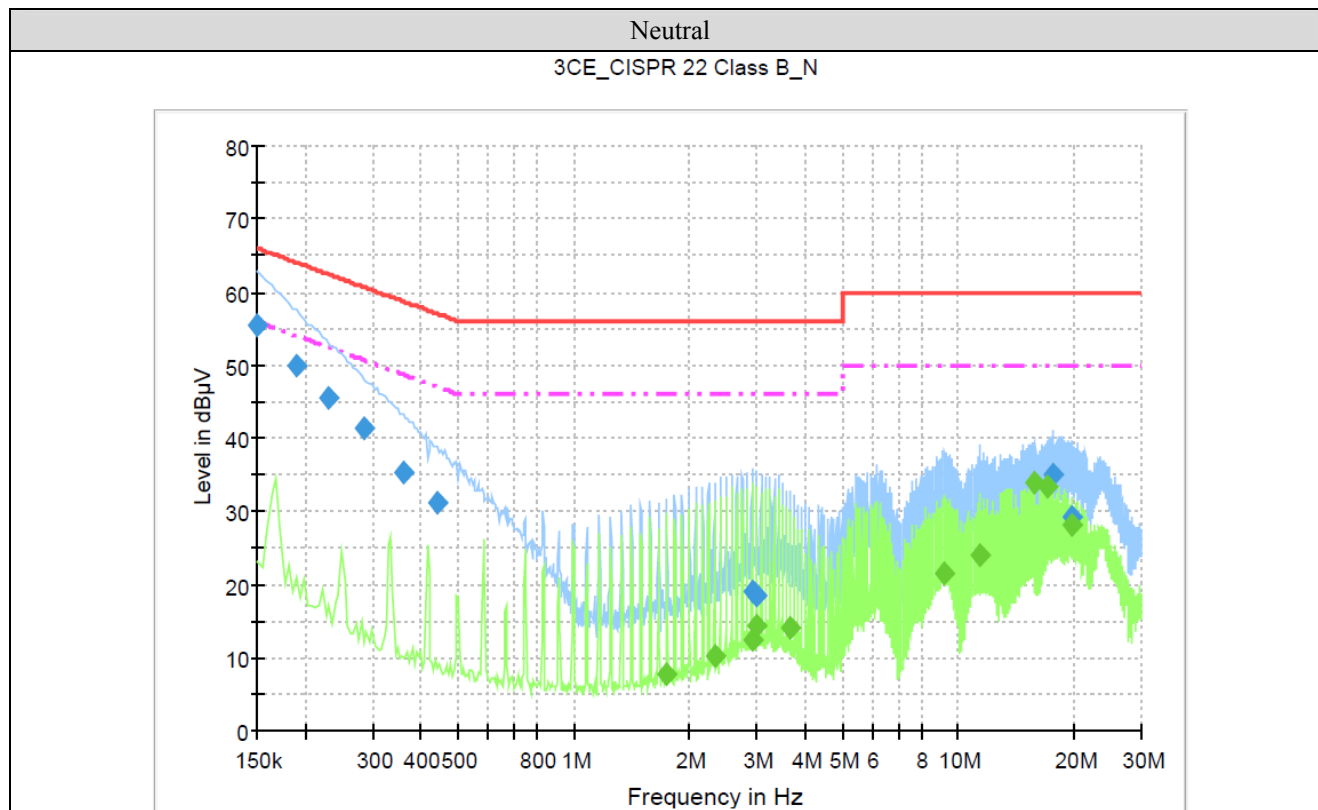
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	55.8	1000.0	9.000	On	L1	9.8	10.2	66.0
0.186000	50.5	1000.0	9.000	On	L1	10.0	13.7	64.2
0.231000	46.6	1000.0	9.000	On	L1	9.9	15.9	62.4
0.285000	41.0	1000.0	9.000	On	L1	10.0	19.7	60.7
0.352500	36.5	1000.0	9.000	On	L1	10.1	22.4	58.9
0.505500	36.9	1000.0	9.000	On	L1	10.1	19.1	56.0
2.778000	37.0	1000.0	9.000	On	L1	9.7	19.0	56.0
3.196500	37.3	1000.0	9.000	On	L1	9.7	18.7	56.0
18.082500	33.4	1000.0	9.000	On	L1	9.8	26.6	60.0
23.932500	35.6	1000.0	9.000	On	L1	10.0	24.4	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.334500	36.4	1000.0	9.000	On	L1	10.0	12.9	49.3
0.505500	35.8	1000.0	9.000	On	L1	10.1	10.2	46.0
0.757500	33.2	1000.0	9.000	On	L1	10.0	12.8	46.0
0.924000	33.7	1000.0	9.000	On	L1	9.9	12.3	46.0
1.095000	33.0	1000.0	9.000	On	L1	9.9	13.0	46.0
1.513500	32.9	1000.0	9.000	On	L1	9.8	13.1	46.0
1.765500	34.4	1000.0	9.000	On	L1	9.8	11.6	46.0
2.355000	36.3	1000.0	9.000	On	L1	9.8	9.7	46.0
2.859000	37.1	1000.0	9.000	On	L1	9.7	8.9	46.0
3.196500	36.2	1000.0	9.000	On	L1	9.7	9.8	46.0

Test Data and Results



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	55.5	1000.0	9.000	On	N	9.8	10.5	66.0
0.190500	49.8	1000.0	9.000	On	N	10.0	14.2	64.0
0.231000	45.5	1000.0	9.000	On	N	9.9	16.9	62.4
0.285000	41.5	1000.0	9.000	On	N	10.0	19.2	60.7
0.361500	35.2	1000.0	9.000	On	N	10.1	23.5	58.7
0.442500	31.2	1000.0	9.000	On	N	10.1	25.8	57.0
2.913000	19.0	1000.0	9.000	On	N	9.7	37.0	56.0
2.994000	18.5	1000.0	9.000	On	N	9.7	37.5	56.0
17.740500	34.9	1000.0	9.000	On	N	10.0	25.1	60.0
19.846500	29.4	1000.0	9.000	On	N	10.0	30.6	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.747500	7.7	1000.0	9.000	On	N	9.8	38.3	46.0
2.328000	10.1	1000.0	9.000	On	N	9.8	35.9	46.0
2.913000	12.3	1000.0	9.000	On	N	9.7	33.7	46.0
2.994000	14.4	1000.0	9.000	On	N	9.7	31.6	46.0
3.660000	14.0	1000.0	9.000	On	N	9.7	32.0	46.0
9.258000	21.5	1000.0	9.000	On	N	9.8	28.5	50.0
11.436000	24.0	1000.0	9.000	On	N	9.8	26.0	50.0
15.715500	33.9	1000.0	9.000	On	N	9.9	16.1	50.0
17.146500	33.4	1000.0	9.000	On	N	9.9	16.6	50.0
19.837500	28.1	1000.0	9.000	On	N	10.0	21.9	50.0

5.7. Antenna Requirement

5.7.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, 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. And according to FCC 47 CFR Section § 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

5.7.2 Antenna Connected Construction

The antenna used of this product is Metal Stamping Antenna Assembly and peak max gain of each antennas as below . :

Band	2400 – 2483.5 MHz
Antenna Gain (dBi)	2.62

APPENDIX A: ACCREDITATIONS AND AUTHORIZATIONS

Testing laboratories are accredited by the following accreditation bodies in accordance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

Korea: KOLAS No.119

The laboratories have been also notified to FCC by RRL as a Conformity Assessment Body, and designated to perform compliance testing on equipment subject to Declaration of Conformity (DOC) and Certification under Parts 15 and 18 of the FCC Rules.

APPENDIX B: MEASUREMENT UNCERTAINTIES

Test Item	Measurement uncertainty
Conducted emission	± 2.42 dB, Note 1
Radiated emission (Below 1 GHz)	± 3.54 dB, Note 1
Radiated emission (above 1 GHz)	± 4.16 dB, Note 2
ESD	Note 3
Radiated RF-electromagnetic field	± 0.86 dB, Note 3
Electrical fast transient/burst	Note 3
Surge	Note 3
Conducted RF field immunity	± 2.22 dB, Note 3
Voltage dips and short interruption	Note 3
Note 1: Measurement uncertainty is calculated in according with CISPR 16-4-2 (2003-11). The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k=2$. Note 2: Measurement uncertainty is calculated in according with CISPR 16-4-2 (2011-06). The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k=2$. Note 3: Measurement uncertainty is calculated in according with LAB34 (2002-08). The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k=2$.	