

FCC 15.247 & RSS-247 2.4 GHz Test Report

for

LG Electronics Inc.

**222, LG-ro Jinwi-myeon, Pyeongtaek-Si, Gyeonggi-Do,
451-713, Korea**

Product Name : Lighting Gateway
Model Name : 9GW97185D6
Brand : LG
FCC ID : BEJ9GW97185D6
IC : 2703H-9GW97185D6

**Prepared by: : AUDIX Technology Corporation,
EMC Department**



The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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TEST REPORT CERTIFICATION

Applicant : LG Electronics Inc.
Manufacturer : LG Electronics Inc.
EUT Description
(1) Product : Lighting Gateway
(2) Model : 9GW97185D6
(3) Brand : LG
(4) Power Rating : DC 5V

Applicable Standards:

47 CFR FCC Part 15 Subpart C
RSS-Gen (Issue 5), April 2018
RSS-247 (Issue 2), February 2017
ANSI C63.10:2013
KDB 558074 D01 DTS Meas Guidance v05r01

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2019. 04. 01

Reviewed by:



(Sabrina Wang/Administrator)

Approved by:



(Ben Cheng/Manager)



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1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2019. 04. 01	Original Report	EM-F190101

2. SUMMARY OF TEST RESULTS

Rule		Description	Results
FCC	IC		
15.207	RSS-Gen §8.8	Conducted Emission	PASS
15.247(d)/ 15.205	RSS-Gen §8.9 RSS-247 §5.5	Radiated Band Edge and Radiated Spurious Emission	PASS
15.247(a)(2)	RSS-247 §5.2(1)	6dB Bandwidth	PASS
15.247(b)(3)	RSS-247 §5.4(4)	Maximum Peak Output	PASS
15.247(d)	RSS-247 §5.5	Conducted Band Edges and Conducted Spurious Emission	PASS
15.247 (e)	RSS-247 §5.2(2)	Peak Power Spectral Density	PASS
15.203	RSS-Gen §8.3	Antenna Requirement	Compliance

3. GENERAL INFORMATION

3.1. Description of Application

Applicant	LG Electronics Inc. 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 451-713 Korea
Manufacturer	LG Electronics Inc. 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 451-713 Korea
Product	Lighting Gateway
Brand	LG
Model	9GW97185D6

3.2. Description of EUT

Test Model	9GW97185D6
Serial Number	N/A
Power Rating	DC 5V (Refer to AC adapter rating)
RF Features	ZigBee (IEEE 802.15.4)
Transmit Type	1T1R
Sample Status	Production
Date of Receipt	2019. 03. 05
Date of Test	2019. 03. 06 ~ 04. 01
Interface Ports of EUT	• One PoE Port • One DC Input Port
Accessories Supplied	• AC Adapter • USB DC Cable

3.3. Antenna Information

Antenna Part Number	Manufacture	Antenna Type	Frequency	Max Gain
---	BLUECOM	PCB	2.4GHz Band	1.74dBi

3.4. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (Mbps)
ZigBee (IEEE 802.15.4)	2405-2480	16	DSSS (O-QPSK)	0.25

Channel List							
ZigBee (IEEE 802.15.4)							
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
11	2405	15	2425	19	2445	23	2465
12	2410	16	2430	20	2450	24	2470
13	2415	17	2435	21	2455	25	2475
14	2420	18	2440	22	2460	26	2480

3.5. Descriptions of Key Components

Item	Supplier	Model / Type	Character
AC Adapter (Wall-mount, 2C)	LG	MCS-H06WP	I/P: 100-240Vac, 50/60Hz, 0.5A O/P: 9Vdc, 1.8A or 5Vdc, 1.8A
	USB DC Cable: Unshielded, Detachable, 1.2m		

3.6. Test Configuration

Item	ZigBee
Duty Cycle	- This product has a correction factor based on the computed worst-case value for an 802.15.4-compliant ZigBee stack, which is 66%. Note that the 66% measurement assumes worst-case values achieved in several randomization functions, so your observed, real-world application performance will almost certainly be less than this number. - This product usually use a duty cycle(On time/total time) is 3.93/100ms that 13.76% and the actual worst case possible is a full data payload, with three consecutive ACK and one NACK is 17.04/100ms that is 17%.
Duty Cycle Correction Factor	-15.37dB

AC Conduction	
Test Case	Normal operation

Item	Mode	Test Channel
Radiated Test Case	Radiated Band Edge ^{Note1}	ZigBee
	Radiated Spurious Emission ^{Note1 & 2}	ZigBee
Conducted Test Case	6dB Bandwidth	ZigBee
	Peak Output Power	ZigBee
	Band Edge	ZigBee
	Spurious Emission	ZigBee
	Peak Power Spectral Density	ZigBee

Note 1: ☒ Mobile Device

☐ Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: ☐ Lie ☐ Side ☐ Stand

Note 2: Low, mid, and high channels were measured, only the worst channel of each modulation was presented in this report.

3.7. Tested Supporting System List

3.7.1. Support Peripheral Unit

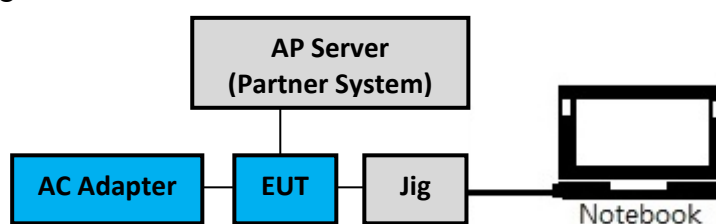
No.	Product	Brand	Model No.	Serial No.	Approval
1.	Notebook PC	acer	MS2362	N/A	Contains FCC ID: PPD-AAR5B225
2.	Test Jig	N/A	N/A	N/A	N/A
3.	Power Socket	N/A	N/A	N/A	N/A
4.	AP Server	ASUS	RT-N18U	N/A	FCC ID: MSQ-RTN18U IC: 3568A-RTN18U

3.7.2. Cable Lists

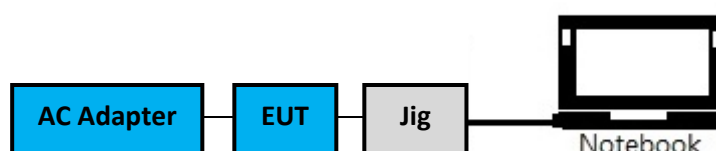
No.	Cable Description Of The Above Support Units
1.	LAN Cable: Shielded, Detachable, 1.0m Adapter: Chicony, M/N CPA09-A065N1, DC Cord: Shielded, Undetachable, 1.8m, Bonded a ferrite core AC Power Cord: Non-Shielded, Detachable, 1.8m
2.	BUS Cable: Non-Shielded, Detachable, 0.1m USB Cable: Shielded, Detachable, 1.8m
3.	Power Cord: Non-Shielded, Detachable, 1.8m
4.	AC Adapter: CWT, M/N:CAP018121 DC Cord: Unshielded, Undetachable, 1.5m LAN Cable: Shielded, Detachable, 10.0m with a core

3.8. Setup Configuration

3.8.1. EUT Configuration for Power Line & Radiated Emission



3.8.2. EUT Configuration for RF Conducted Test Item



3.9. Operating Condition of EUT

Test program “ember.desktop” is used for enabling EUT RF function under continues transmitting and choosing data rate/ channel.

3.10. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2005 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 (1) No. 8 Shielding Room (2) Semi-Anechoic Chamber (IC Test Site Registration No.:5183B-1) (3) Fully Anechoic Chamber (IC Test Site Registration No.:5183B-4)

3.11. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conduction Test	150kHz~30MHz	±3.50dB
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	±5.82dB

Remark : Uncertainty = $ku_c(y)$

Test Item	Uncertainty
6dB Bandwidth	± 0.05kHz
Maximum peak output power	± 0.33dB
Power spectral density	± 0.13dB
Conducted Emission Limitations	± 0.13dB

4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR3	101774	2019.01.22	1 Year
2.	A.M.N.	R&S	ENV4200	100169	2018.11.14	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2018.12.19	N.C.R.
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2019.01.12	1 Year
5.	Signal Cable	Yeida	RG/58AU	CE-08	2018.09.21	1 Year
6.	Digital Thermo- Hygro Meter	iMax	HTC-1	No.8 S/R	2018.04.20	1 Year
7.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2018.09.12	1 Year
2.	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2019.01.30	1 Year
3.	Test Receiver	R & S	ESCS30	100338	2018.06.20	1 Year
4.	Amplifier	HP	8447D	2944A06305	2019.01.30	1 Year
5.	Amplifier	HP	8449B	3008A02678	2019.03.07	1 Year
6.	Loop Antenna	R&S	HFH2-Z2	891847/27	2017.12.18	2 Years
7.	Bilog Antenna	CHASE	CBL6112D	33821	2019.01.19	1 Year
8.	Horn Antenna	COM-POWER	AH-840	101092	2018 05.07	1 Year
9.	Horn Antenna	ETS-Lindgren	3117	00135902	2019.03.13	1 Year
10.	2.4GHz Notch Filter	K&L	7NSL10-2441.5E130.5-00	1	2018.07.24	1 Year
11.	High-Pass Filter	Microwave	H3G018G1	484796	2018.08.22	1 Year
12.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2018.04.20	1 Year
13.	Digital Thermo-Hygro Meter	iMax	E-512	RF-02	2018.04.20	1 Year
14.	Test Software	Audix	e3	V.6.110601	N.C.R.	N.C.R.

4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2018.04.26	1 Year
2.	Power Meter	Anritsu	ML2495A	1145008	2018.11.07	1 Year
3.	Power Sensor	Anritsu	MA2411B	1126096	2018.11.07	1 Year
4.	Digital Thermo-Hygro Meter	Shenzhen Datronn Electronics	KT-905	RF	2018.04.20	1 Year

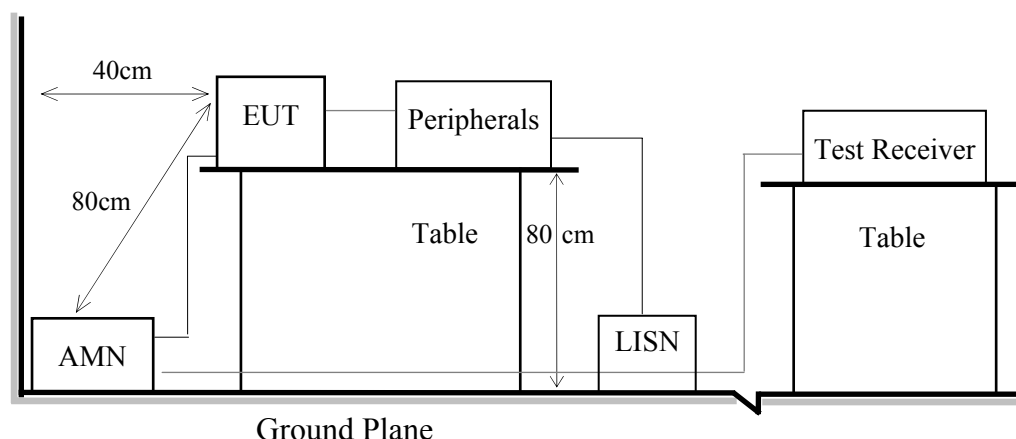
5. CONDUCTED EMISSION

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.8

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB μ V	56 ~ 46 dB μ V
500kHz ~ 5MHz	56 dB μ V	46 dB μ V
5MHz ~ 30MHz	60 dB μ V	50 dB μ V

Remark 1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.

2.: The lower limit applies to the band edges.

5.3. Test Procedure

- 5.3.1. To set up the EUT as indicated in ANSI C 63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
- 5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)
- 5.3.4. Checking frequency range from 150 kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

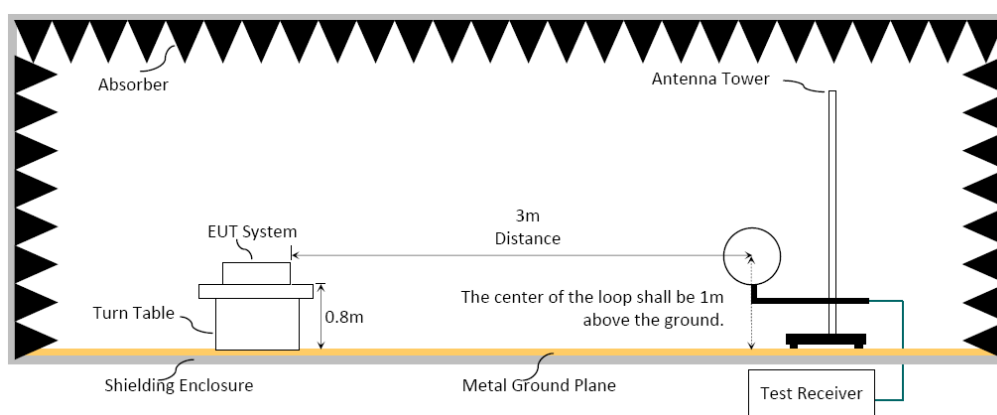
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

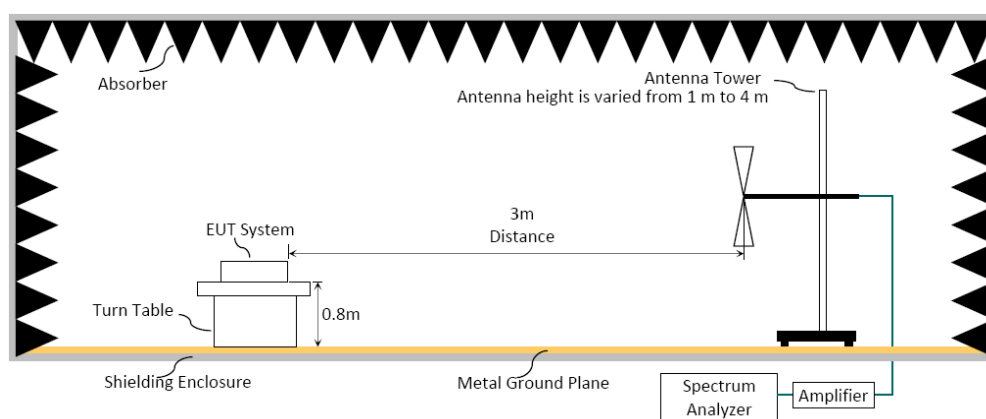
6.1.1. Block Diagram of EUT

Indicated as section 3.8

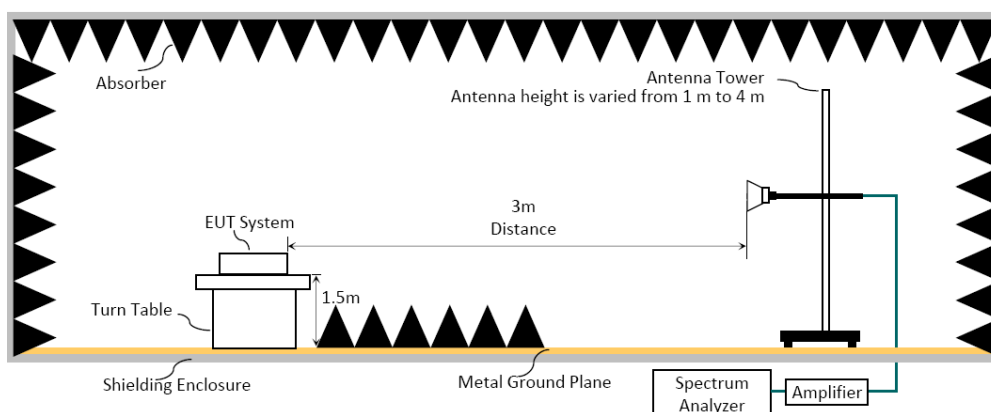
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000 MHz



6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Limits	
		dBμV/m	μV/m
0.009 - 0.490	300	$67.6 - 20 \log f(\text{kHz})$	$2400/f \text{ kHz}$
0.490 - 1.705	30	$87.6 - 20 \log f(\text{kHz})$	$24000/f \text{ kHz}$
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark : (1) $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$

- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 25GHz:

The EUT setup on the turn table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1 GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1) RBW = 120KHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

Frequency above 1GHz to 10th harmonic (up to 25 GHz):

Peak Detector:

- (1) RBW = 1MHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.
- (7) When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

Average Detector:☐ **Option 1:**

(1)RBW = 1MHz

(2)VBW $\geq 1/T$.

Modulation Type	T (ms)	1/ T (kHz)	VBW Setting (kHz)
ZigBee	---	---	10Hz

N/A: 1/ T is not implemented when duty cycle presented in section 3.7 is $\geq 98\%$.

(1)Detector = Peak.

(2)Sweep time = auto.

(3)Trace mode = max hold.

(4)Allow sweeps to continue until the trace stabilizes.

☒ **Option 2:**

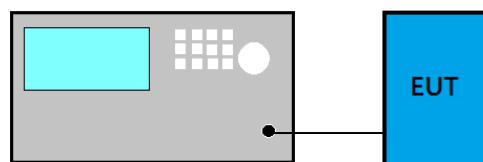
Average Emission Level= Peak Emission Level+ D.C.C.F.

6.4. Measurement Result Explanation☒ Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading☐ Average Emission Level=Antenna Factor + Cable Loss + Meter Reading☒ Average Emission Level= Peak Emission Level+ DCCFDuty Cycle Correction Factor (DCCF)= $20\log(TX_{on}/TX_{on+off})$ presented in section 3.6☐ ERP= Peak Emission Level-95.2dB-2.14dB**6.5. Test Results**

Please refer to Appendix A.

7. 6dB BANDWIDTH

7.1. Block Diagram of Test Setup



7.2. Specification Limits

The minimum 6dB bandwidth shall be at least 500kHz.

7.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v05r01:

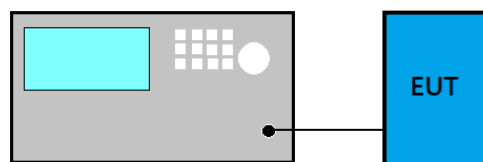
- (1) Set RBW = 100 kHz.
- (2) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -6 dB to record the final bandwidth.

7.4. Test Results

Please refer to Appendix A

8. MAXIMUM PEAK OUTPUT POWER

8.1. Block Diagram of Test Setup



8.2. Specification Limits

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5MHz is : 1Watt. (30dBm), and E.I.R.P.: 4Watt (36dBm)

8.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v05r01:

☐ **PKPM1 Peak power meter method:**

EUT is connected to power sensor and record the maximum output power.

☒ **Maximum peak conducted output power method:**

- (1) Set the RBW $\geq$ DTS bandwidth
- (2) Set VBW $\geq 3 \times$ RBW
- (3) Set span $\geq 3 \times$ RBW.
- (4) Sweep time = auto couple
- (5) Detector = peak.
- (6) Trace mode = max hold.
- (7) Allow trace to fully stabilize.
- (8) Use peak marker function to determine the peak amplitude level.

☐ **Method AVGPM (Measurement using an RF average power meter):**

EUT is connected to power sensor and record the maximum average output power and duty cycle factor is added when duty cycle presented in section 3.7 is $< 98\%$.

☐ **Method AVGSA-2 (Spectrum channel power)**

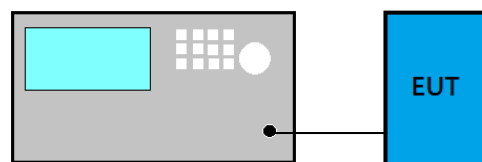
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 -5% of OBW
- (3) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
- (8) Duty cycle factor is added when duty cycle presented in section 3.7 is $< 98\%$.

8.4. Test Results

Please refer to Appendix A

9. EMISSION LIMITATIONS

9.1. Block Diagram of Test Setup



9.2. Specification Limits

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, that the required attenuation shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a)/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 (See Section 15.205(c)).

9.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v05r01:

■ Reference Level

- (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 : 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 to find the max PSD as reference level.

■ Emission Level Measurement

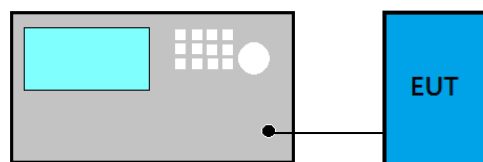
- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW : 100 kHz.
- (4) Set the VBW $\geq 3 \times$ RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max level.

9.4. Test Results

Please refer to Appendix A

10. POWER SPECTRAL DENSITY

10.1. Block Diagram of Test Setup



10.2. Specification Limits

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

10.3. Test Procedure

Following measurement procedure is reference to KDB 558074 D01 DTS Meas Guidance v05r01:

☒ Method PKPSD (peak PSD)

- (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.
- (10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

☐ Method AVGPSD-2

- (1) Using peak PSD procedure step 1 to step 4.
- (2) Detector = RMS detector
- (3) Sweep time = auto couple
- (4) Trace mode = trace averaging over a minimum of 100 traces
- (5) Use the peak marker function to determine the maximum amplitude level.
- (6) Duty cycle factor is added when duty cycle presented in section 3.7 < 98%.
- (7) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

10.4. Test Results

Please refer to Appendix A



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11.DEVIATION TO TEST SPECIFICATIONS

【NONE】



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APPENDIX A

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APPDNDIX A

TEST DATA AND PLOTS

(Model: 9GW97185D6)

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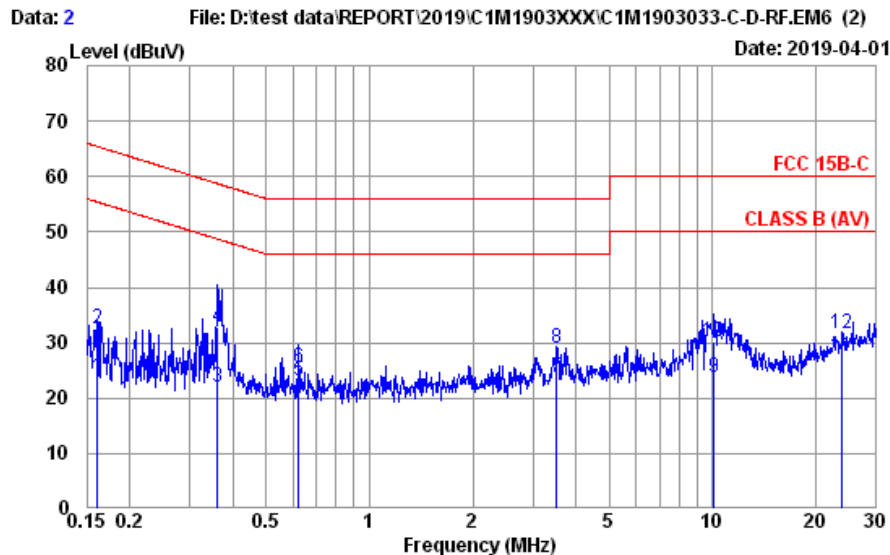
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A.1 CONDUCTED EMISSION

Test Date	2019/04/01	Temp./Hum.	25°C/51%
Test Voltage	AC 120V 60Hz (Via AC Adapter)		



Site no. : No.8 Shielded Room Data no. : 2
Condition : ENV4200 100169 LISN Phase : NEUTRAL
Limit : FCC 15B-C
Env. / Ins. : 25°C / 51% ESR3 (1774) Engineer : Xar Zhuo
EUT : 96W97185D6
Power Rating : 120Vac/60Hz
Test Mode : Operating

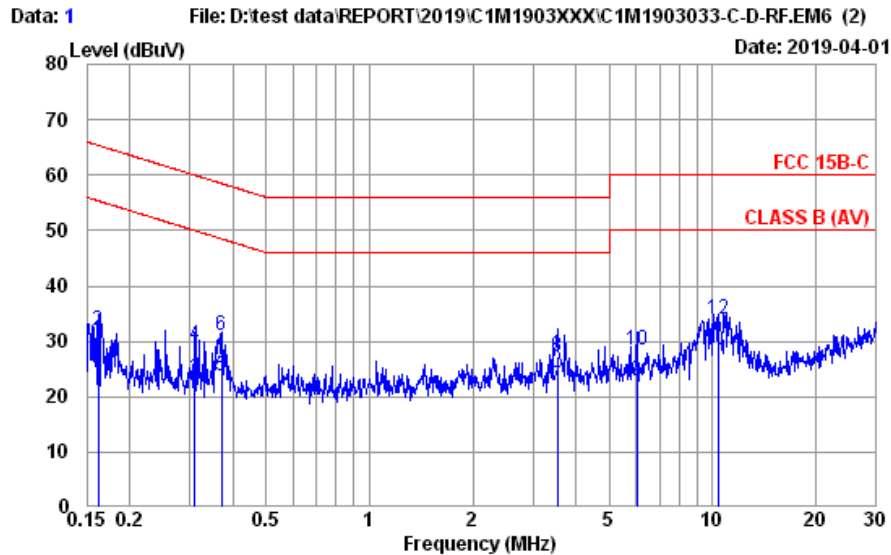
	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.161	10.68	0.03	9.86	3.11	23.68	55.43	31.75	Average
2	0.161	10.68	0.03	9.86	12.01	32.58	65.43	32.85	QP
3	0.361	10.51	0.04	9.86	1.65	22.06	48.69	26.63	Average
4	0.361	10.51	0.04	9.86	12.49	32.90	58.69	25.79	QP
5	0.621	10.48	0.05	9.86	2.73	23.12	46.00	22.88	Average
6	0.621	10.48	0.05	9.86	5.01	25.40	56.00	30.60	QP
7	3.509	10.62	0.10	9.87	3.16	23.75	46.00	22.25	Average
8	3.509	10.62	0.10	9.87	8.52	29.11	56.00	26.89	QP
9	10.072	11.38	0.19	9.89	2.34	23.80	50.00	26.20	Average
10	10.072	11.38	0.19	9.89	8.73	30.19	60.00	29.81	QP
11	23.888	14.74	0.29	9.97	2.61	27.61	50.00	22.39	Average
12	23.888	14.74	0.29	9.97	6.56	31.56	60.00	28.44	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.

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Test Date	2019/04/01	Temp./Hum.	25°C/51%
Test Voltage	AC 120V 60Hz (Via AC Adapter)		



Site no. : No.8 Shielded Room Data no. : 1
Condition : ENV4200 100169 LISN Phase : LINE
Limit : FCC 15B-C
Env. / Ins. : 25°C / 51% ESR3 (1774) Engineer : Xar Zhuo
EUT : 9GW97185D6
Power Rating : 120Vac/60Hz
Test Mode : Operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.162	10.60	0.03	9.86	3.30	23.79	55.38	31.59	Average
2	0.162	10.60	0.03	9.86	11.38	31.87	65.38	33.51	QP
3	0.310	10.48	0.04	9.86	2.63	23.01	49.97	26.96	Average
4	0.310	10.48	0.04	9.86	8.84	29.22	59.97	30.75	QP
5	0.371	10.46	0.04	9.86	3.37	23.73	48.47	24.74	Average
6	0.371	10.46	0.04	9.86	10.63	30.99	58.47	27.48	QP
7	3.528	10.53	0.10	9.87	1.52	22.02	46.00	23.98	Average
8	3.528	10.53	0.10	9.87	6.70	27.20	56.00	28.80	QP
9	6.024	10.82	0.14	9.88	2.05	22.89	50.00	27.11	Average
10	6.024	10.82	0.14	9.88	7.67	28.51	60.00	31.49	QP
11	10.397	11.26	0.19	9.89	5.30	26.64	50.00	23.36	Average
12	10.397	11.26	0.19	9.89	12.56	33.90	60.00	26.10	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.

A.2 RADIATED EMISSION

Test Date	2019/04/01	Temp./Hum.	22°C/53%
Test Voltage	AC 120V, 60Hz (via AC Adapter)		

A.2.1 Emissions within Restricted Frequency Bands

A.2.1.1 Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1 GHz

Mode	ZigBee	Frequency	TX 2405MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
56.19	13.42	1.96	10.11	25.49	40.00	14.51	Peak
176.47	15.70	3.60	14.38	33.68	43.50	9.82	Peak
250.19	19.40	3.98	18.20	41.58	46.00	4.42	Peak
375.32	21.88	5.46	12.41	39.75	46.00	6.25	Peak
749.74	25.91	7.32	5.86	39.09	46.00	6.91	Peak
874.87	27.03	7.96	4.75	39.74	46.00	6.26	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
54.25	13.84	1.93	18.72	34.49	40.00	5.51	Peak
94.02	16.43	2.55	15.46	34.44	43.50	9.06	Peak
125.06	18.57	3.06	12.33	33.96	43.50	9.54	Peak
250.19	19.40	3.98	12.80	36.18	46.00	9.82	Peak
375.32	21.88	5.46	4.72	32.06	46.00	13.94	Peak
749.74	25.91	7.32	3.38	36.61	46.00	9.39	Peak

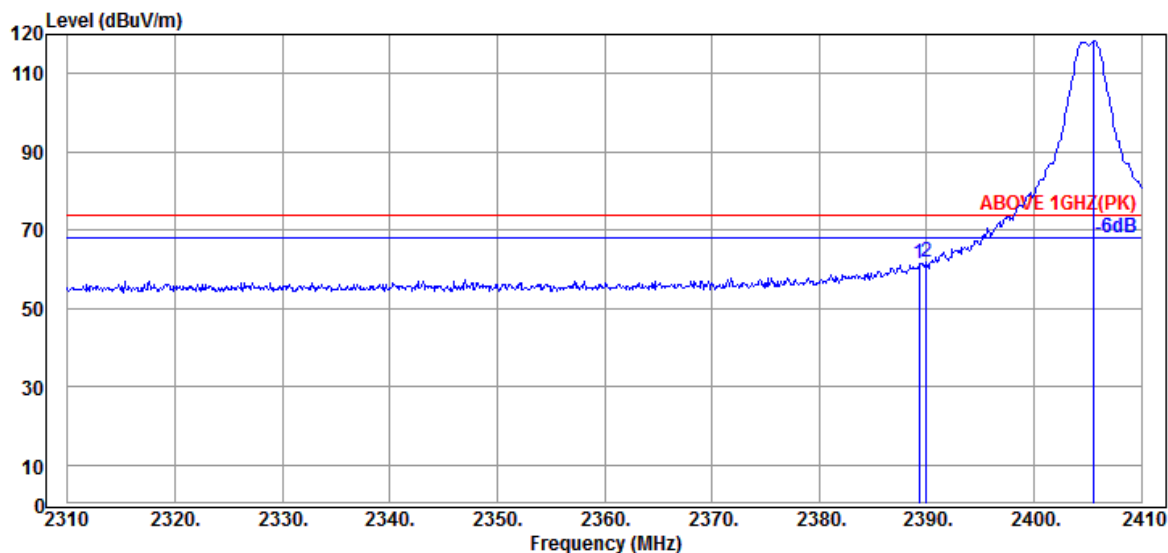
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A.2.1.3 Frequency Above 1 GHz to 10th harmonics

Band Edge:

Mode	ZigBee	Frequency	TX 2405MHz
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Antenna at Horizontal Polarization

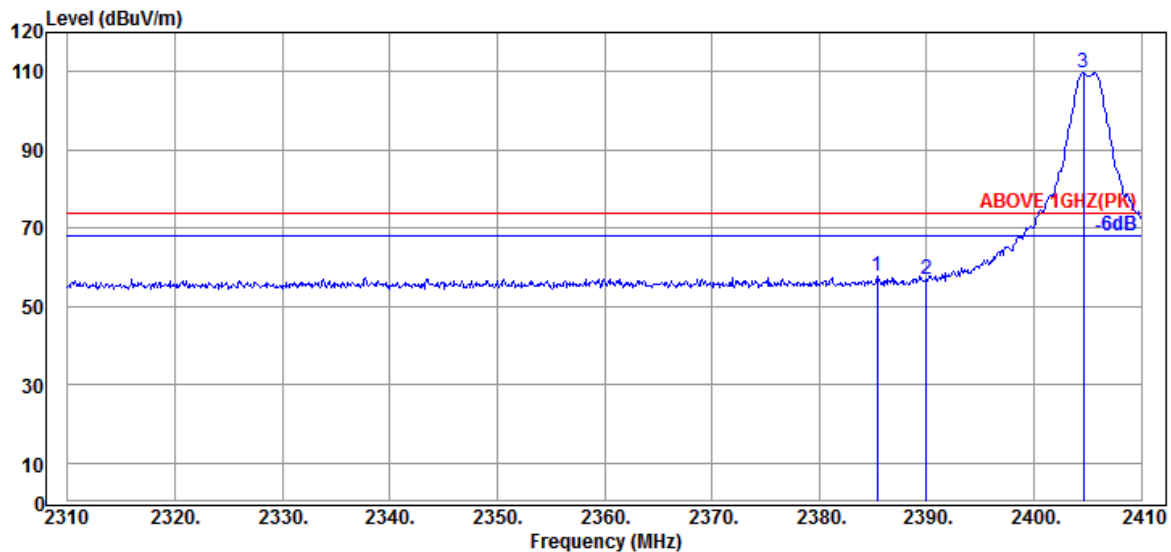
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2389.30	32.52	8.17	20.92	61.61	74.00	12.39	Peak
2390.00	32.52	8.17	21.00	61.69	74.00	12.31	Peak
@ 2405.60	32.61	8.18	77.45	118.24	---	---	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2389.30	61.61	-15.37	46.24	54.00	7.76	Average
2390.00	61.69	-15.37	46.32	54.00	7.68	Average

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Mode	ZigBee	Frequency	TX 2405MHz
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Antenna at Vertical Polarization

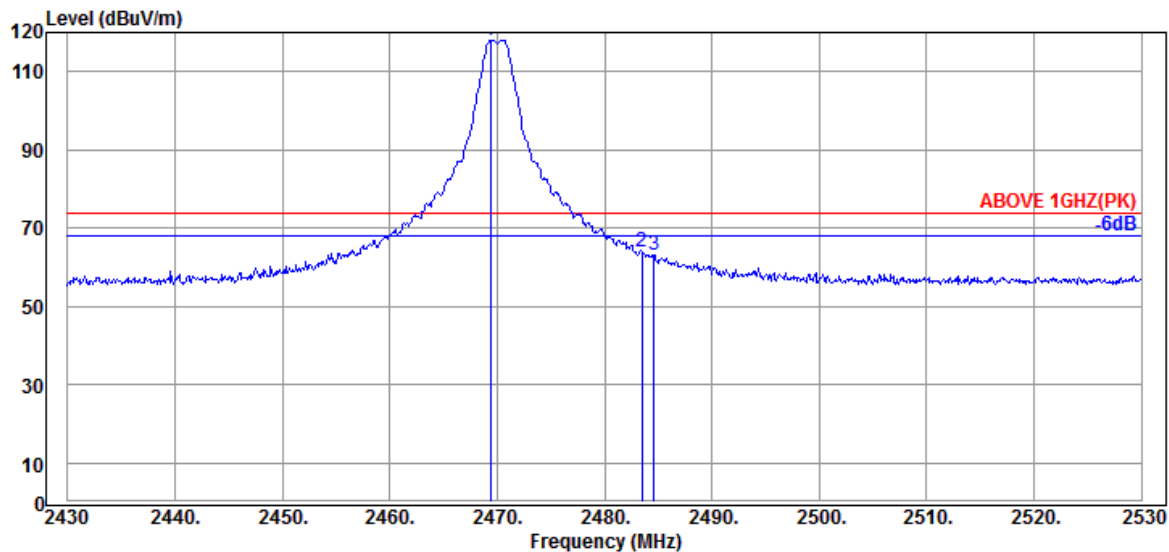
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2385.40	32.52	8.17	17.17	57.86	74.00	16.14	Peak
2390.00	32.52	8.17	16.29	56.98	74.00	17.02	Peak
@ 2404.60	32.61	8.18	68.76	109.55	---	---	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2385.40	57.86	-15.37	42.49	54.00	11.51	Average
2390.00	56.98	-15.37	41.61	54.00	12.39	Average

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Mode	ZigBee	Frequency	TX 2470MHz
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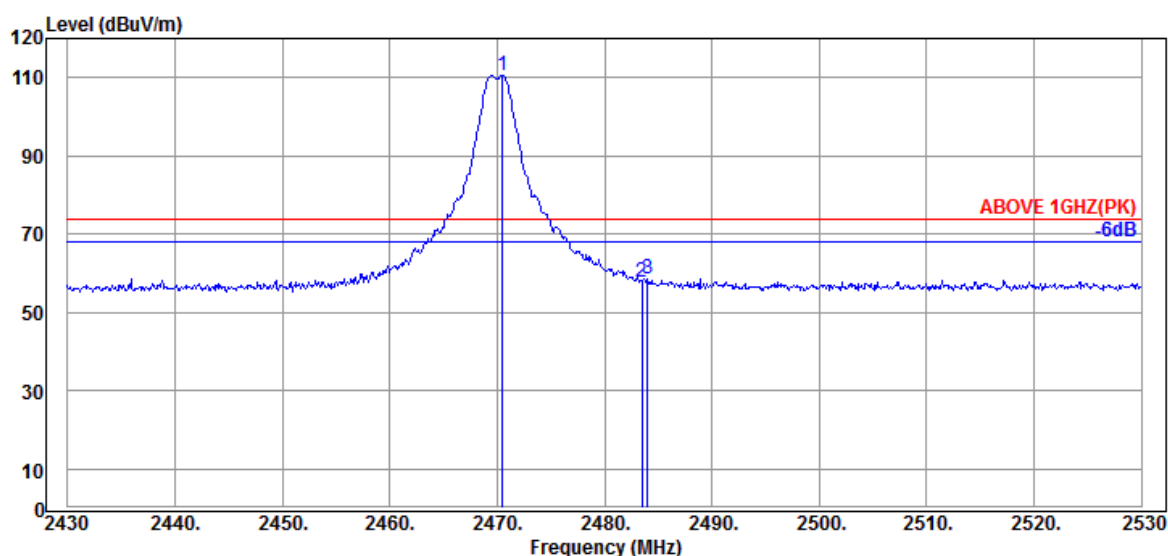
Antenna at Horizontal Polarization

	Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@	2469.40	32.88	8.20	77.03	118.11	---	---	Peak
	2483.50	32.94	8.20	22.92	64.06	74.00	9.94	Peak
	2484.60	32.94	8.20	22.12	63.26	74.00	10.74	Peak
	Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark	
	2483.50	64.06	-15.37	48.69	54.00	5.31	Average	
	2484.60	63.26	-15.37	47.89	54.00	6.11	Average	

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Mode	ZigBee	Frequency	TX 2470MHz
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Antenna at Vertical Polarization

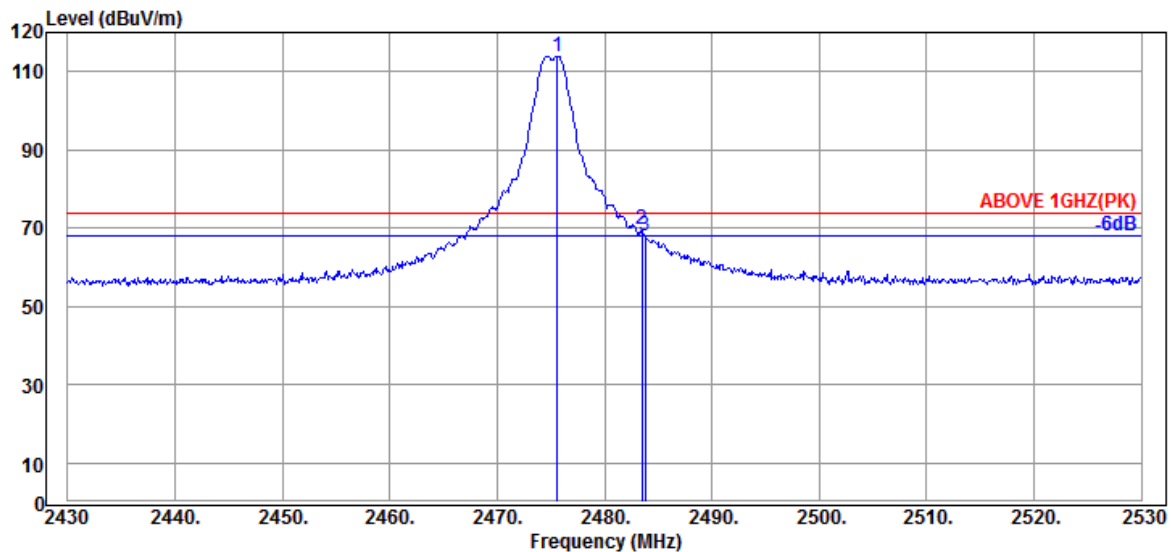
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2470.50	32.88	8.20	69.36	110.44	---	---	Peak
2483.50	32.94	8.20	16.72	57.86	74.00	16.14	Peak
2484.00	32.94	8.20	17.53	58.67	74.00	15.33	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2483.50	57.86	-15.37	42.49	54.00	11.51	Average
2484.00	58.67	-15.37	43.30	54.00	10.70	Average

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Mode	ZigBee	Frequency	TX 2475MHz
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Antenna at Horizontal Polarization

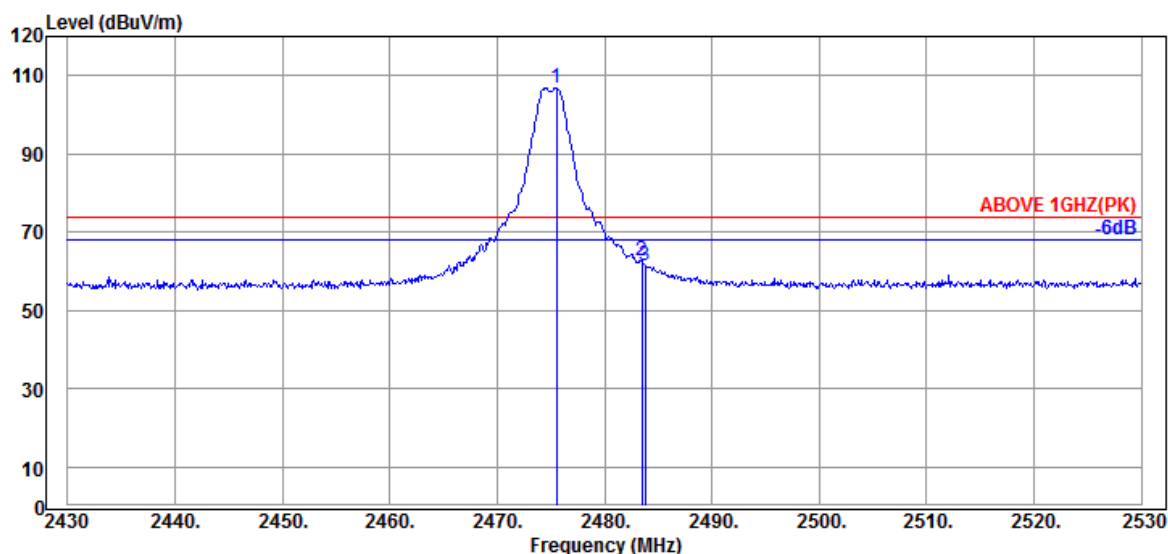
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2475.60	32.91	8.20	72.79	113.90	---	---	Peak
2483.50	32.94	8.20	28.42	68.56	74.00	5.44	Peak
2483.80	32.94	8.20	27.10	67.24	74.00	6.76	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2483.50	68.56	-15.37	53.19	54.00	0.81	Average
2483.80	67.24	-15.37	51.87	54.00	2.13	Average

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Mode	ZigBee	Frequency	TX 2475MHz
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Antenna at Vertical Polarization

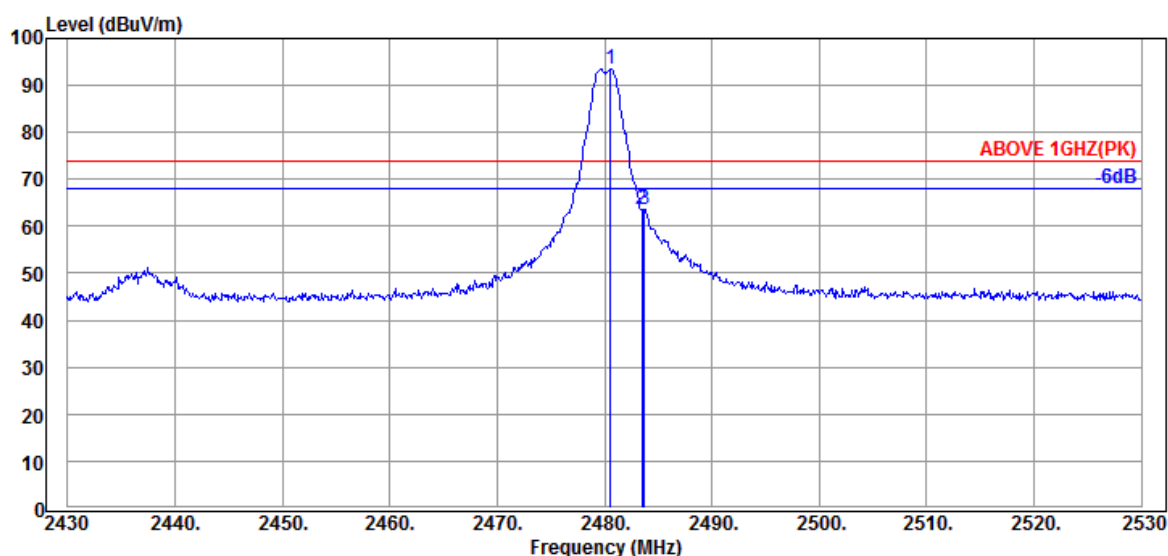
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2475.50	32.91	8.20	65.70	106.81	---	---	Peak
2483.50	32.94	8.20	21.53	62.67	74.00	11.33	Peak
2483.80	32.94	8.20	20.28	61.42	74.00	12.58	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2483.50	62.67	-15.37	47.30	54.00	6.70	Average
2483.80	61.42	-15.37	46.05	54.00	7.95	Average

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Mode	ZigBee	Frequency	TX 2480MHz
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Antenna at Horizontal Polarization

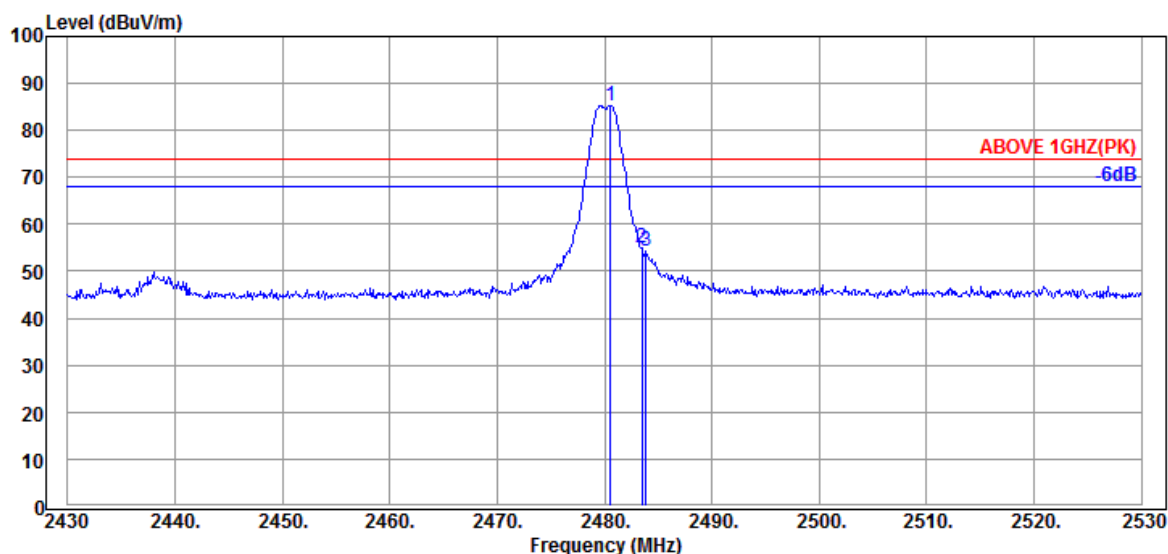
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2480.60	32.91	8.20	52.35	93.46	---	---	Peak
2483.50	32.94	8.20	22.30	63.44	74.00	10.56	Peak
2483.70	32.94	8.20	22.50	63.64	74.00	10.36	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2483.50	63.44	-15.37	48.07	54.00	5.93	Average
2483.70	63.64	-15.37	48.27	54.00	5.73	Average

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Mode	ZigBee	Frequency	TX 2480MHz
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Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2480.60	32.91	8.20	44.28	85.39	---	---	Peak
2483.50	32.94	8.20	13.68	54.82	74.00	19.18	Peak
2483.90	32.94	8.20	13.22	54.36	74.00	19.64	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2483.50	54.82	-15.37	39.45	54.00	14.55	Average
2483.90	54.36	-15.37	38.99	54.00	15.01	Average

A.2.2 Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

Mode	ZigBee	Frequency	TX 2405MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4812.00	34.19	10.32	12.62	57.13	74.00	16.87	Peak
7217.00	35.91	11.92	7.73	55.56	74.00	18.44	Peak
9620.00	37.26	14.33	10.55	62.14	74.00	11.86	Peak
Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark	
4812.00	57.13	-15.37	41.76	54.00	12.24	Average	
7217.00	55.56	-15.37	40.19	54.00	13.81	Average	
9620.00	62.14	-15.37	46.77	54.00	7.23	Average	

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4812.00	34.19	10.32	11.62	56.13	74.00	17.87	Peak
7217.00	35.91	11.92	4.72	52.55	74.00	21.45	Peak
9620.00	37.26	14.33	9.47	61.06	74.00	12.94	Peak
Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark	
4812.00	56.13	-15.37	40.76	54.00	13.24	Average	
7217.00	52.55	-15.37	37.18	54.00	16.82	Average	
9620.00	61.06	-15.37	45.69	54.00	8.31	Average	

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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4880.00	34.23	10.38	12.19	56.80	74.00	17.20	Peak
7322.00	35.87	12.01	13.25	61.13	74.00	12.87	Peak
9760.00	37.45	14.42	11.44	63.31	74.00	10.69	Peak
Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark	
4880.00	56.80	-15.37	41.43	54.00	12.57	Average	
7322.00	61.13	-15.37	45.76	54.00	8.24	Average	
9760.00	63.31	-15.37	47.94	54.00	6.06	Average	

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4880.00	34.23	10.38	11.18	55.79	74.00	18.21	Peak
7322.00	35.87	12.01	10.17	58.05	74.00	15.95	Peak
9760.00	37.45	14.42	9.42	61.29	74.00	12.71	Peak
Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark	
4880.00	55.79	-15.37	40.42	54.00	13.58	Average	
7322.00	58.05	-15.37	42.68	54.00	11.32	Average	
9760.00	61.29	-15.37	45.92	54.00	8.08	Average	

Mode	ZigBee	Frequency	TX 2480MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4960.00	34.28	10.45	0.58	45.31	74.00	28.69	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4960.00	45.31	-15.37	29.94	54.00	24.06	Average

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4960.00	34.28	10.45	0.66	45.39	74.00	28.61	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4960.00	45.39	-15.37	30.02	54.00	23.98	Average

A.2.3 Emissions in Non-restricted Frequency Bands:

Pursuant to KDB 558074 D01 DTS Meas Guidance v05r01 that emission levels below the FCC 15.209(a)/RSS-Gen Section 8.9 table 4 general radiated emissions limits is not required.

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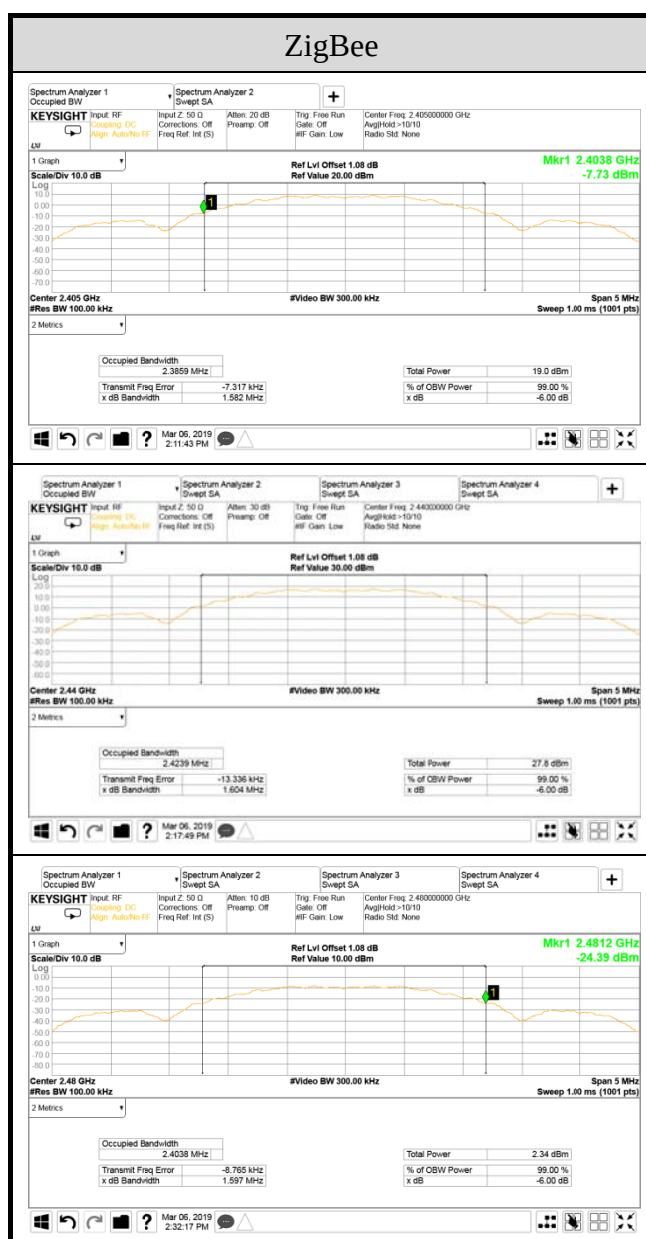
A.3 6dB BANDWIDTH

Test Date	2019/03/06	Temp./Hum.	24°C /55%
Cable Loss	1.08dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)

A.3.1 6dB Bandwidth Result

Mode	Centre Frequency (MHz)	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz) (Reference only)	Limit
ZigBee	2405	1.582	2.3859	>500kHz
	2440	1.604	2.4239	
	2480	1.597	2.4038	

A.3.2 Measurement Plots



A.4 MAXIMUM PEAK OUTPUT POWER

Test Date	2019/03/06	Temp./Hum.	24°C /55%
Cable Loss	1.08dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)

A.4.1 Peak Output Power

Mode	Centre Frequency (MHz)	Peak Output Power (dBm)		Antenna Gain (dBi)	Output Power (E.I.R.P.)		Limit
		(dBm)	(W)		(dBm)	(W)	
ZigBee	2405	18.02	0.063	1.74	19.76	0.095	< 30dBm (1W) (Maximum Peak Output Power) < 36dBm (4W) (E.I.R.P)
	2440	17.95	0.062		19.69	0.093	
	2470	18.02	0.063		19.76	0.095	
	2475	15.60	0.036		17.34	0.054	
	2480	-1.68	0.001		0.06	0.001	

Note: The results have been included cable loss.

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A.4.2 Measurement Plots

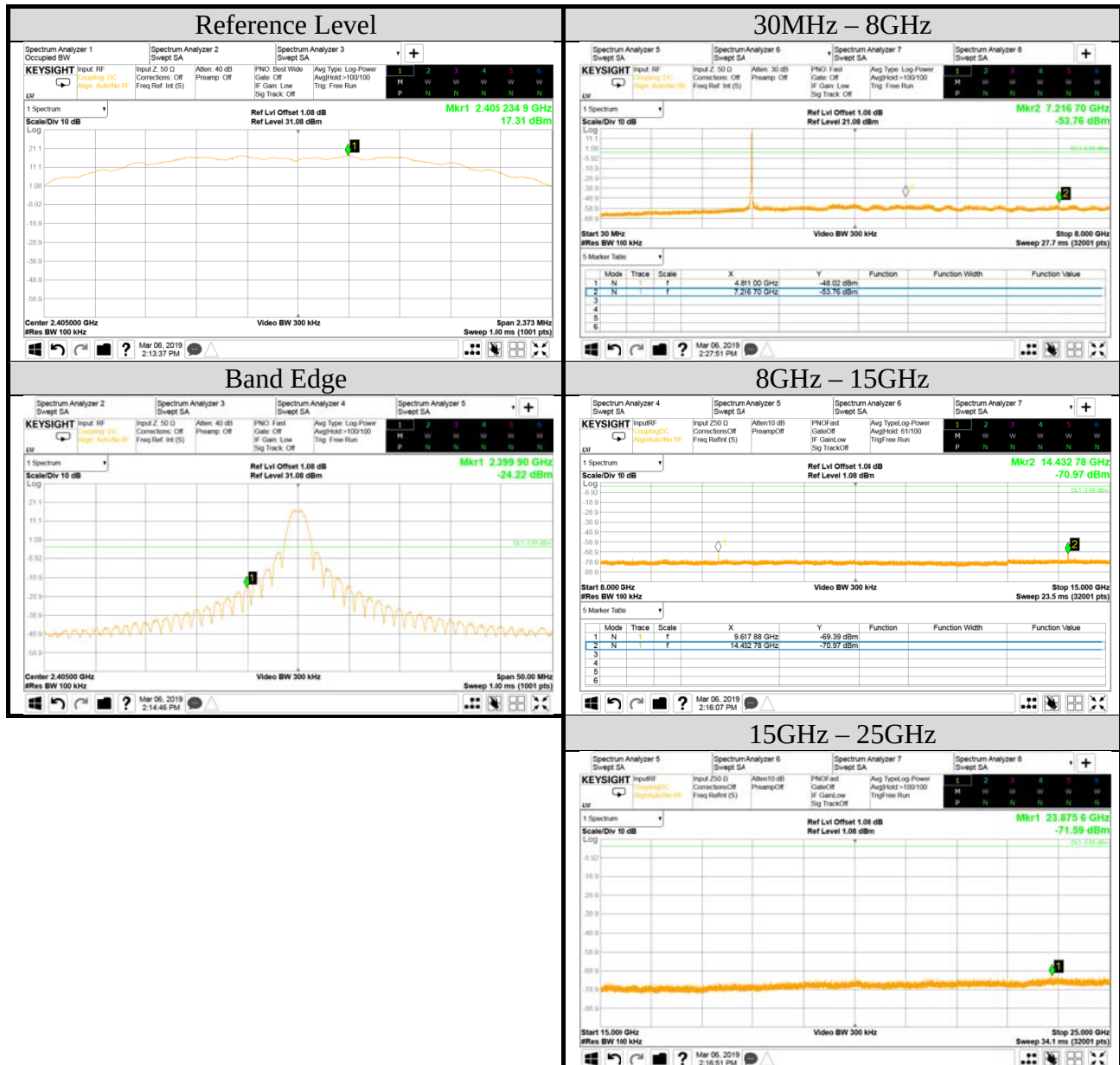


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A.5 EMISSION LIMITATIONS

Test Date	2019/03/06	Temp./Hum.	23°C/55%
Cable Loss	1.08dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	ZigBee	Frequency	TX 2405MHz
Simultaneous Factor10 log(n) (Note: "n" is antenna number)	0		

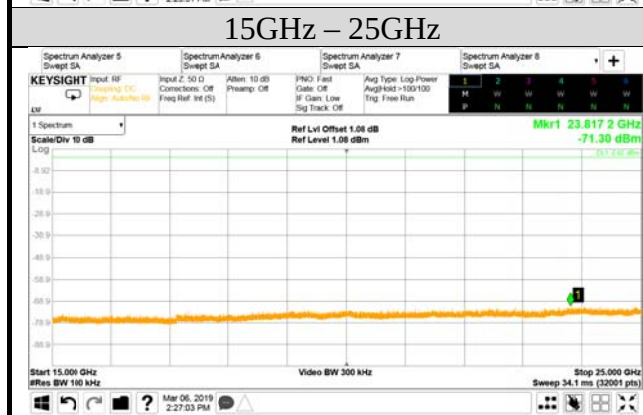
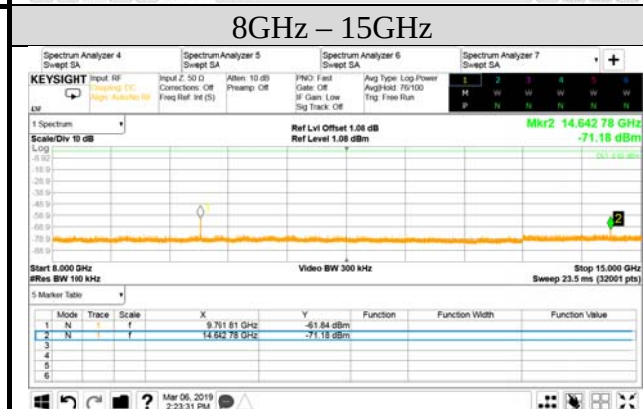
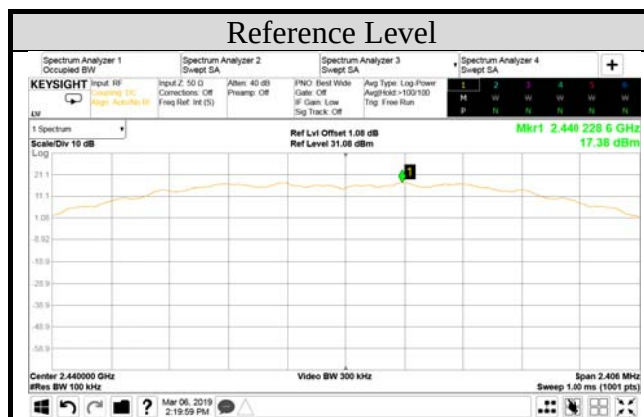


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Test Date	2019/03/06	Temp./Hum.	23°C/55%
Cable Loss	1.08dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	ZigBee	Frequency	TX 2440MHz
Simultaneous Factor	10 log(n) (Note: "n" is antenna number)		0



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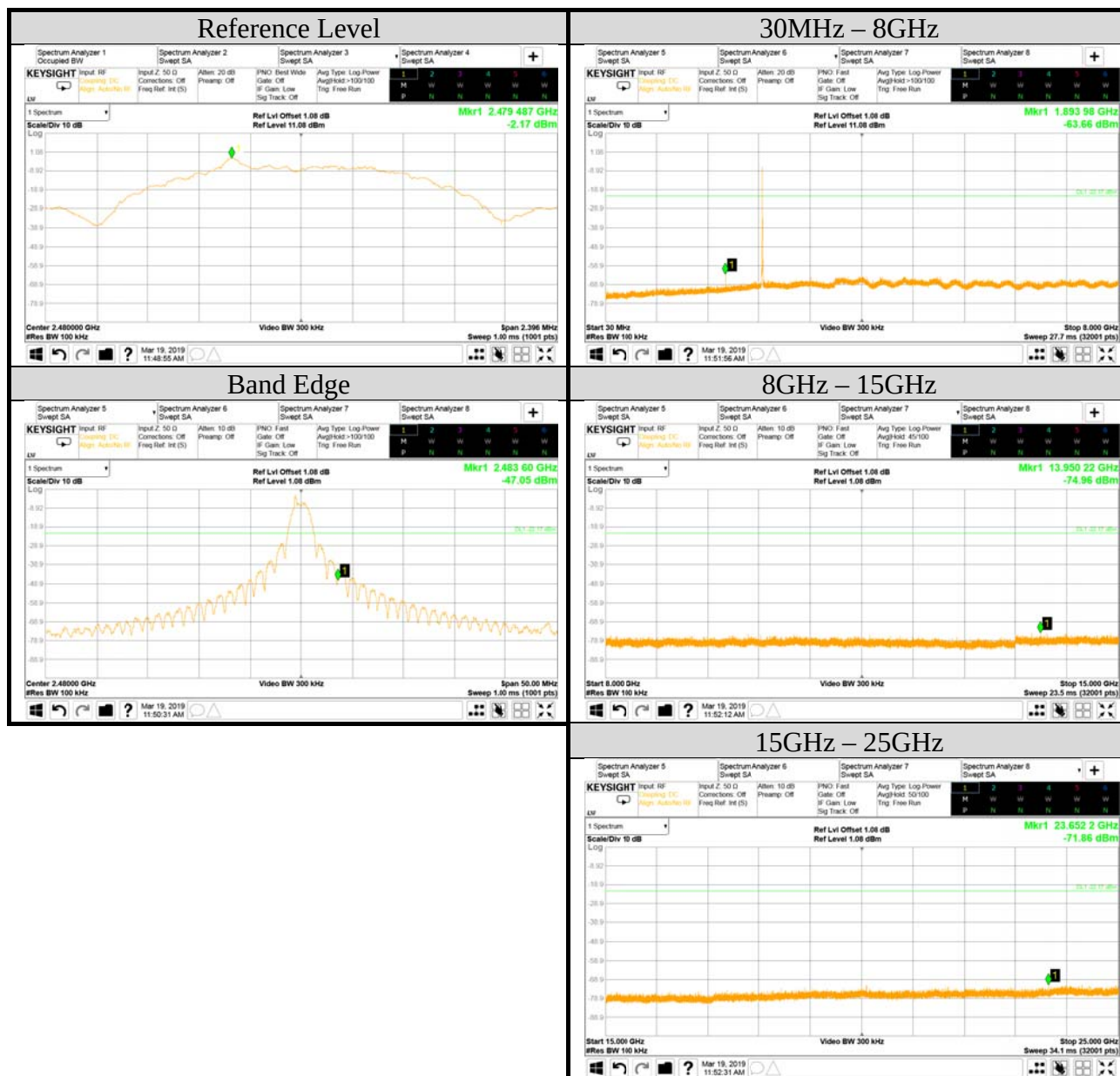
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Test Date	2019/03/19	Temp./Hum.	22°C/58%
Cable Loss	1.08dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Mode	ZigBee	Frequency	TX 2480MHz
Simultaneous Factor10 log(n) (Note: "n" is antenna number)			0



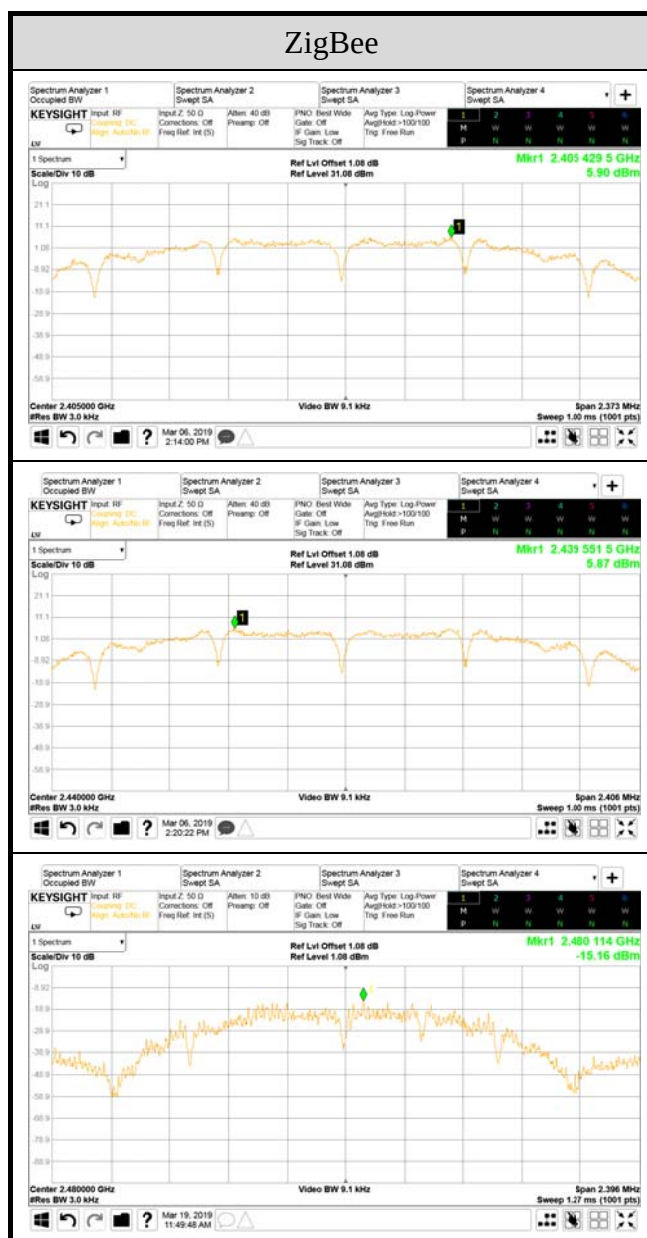
A.6 POWER SPECTRAL DENSITY

Test Date	2019/03/06 ~ 19	Temp./Hum.	22~23°C /55~58%
Cable Loss	1.08dB	Test Voltage	AC 120V, 60Hz (via AC Adapter)
Simultaneous Factor	10 log(n) (Note: "n" is antenna number)		0

A.6.1 Power Spectral Density Result

Mode	Centre Frequency (MHz)	Power Spectral Density (dBm)	Limit
ZigBee	2405	5.90	< 8 dBm/3kHz
	2440	5.87	
	2480	-15.16	

A.6.2 Measurement Plots



Note: All results have been included cable loss and Simultaneous Factor.



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APPENDIX B

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APPENDIX B

TEST PHOTOGRAPHS

(Model: 9GW97185D6)