TEST REPORT

DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea,17042 Tel : 031-321-2664, Fax : 031-321-1664

1. Report No: DRTFCC1811-0263

Dt&C

- 2. Customer
 - Name : LG Electronics USA, Inc.
 - Address : 1000 Sylvan Ave. Englewood Cliffs, New Jersey, United States 07632
- 3. Use of Report : FCC Original Grant
- 4. Product Name / Model Name : Mobile Phone / LM-V405EBW

FCC ID : ZNFV405EBW

5. Test Method Used : KDB558074 D01v05

Test Specification : FCC Part 15 Subpart C.247

- 6. Date of Test : 2018.10.30 ~ 2018.11.07
- 7. Testing Environment : Refer to appended test report.
- 8. Test Result : Refer to the attached test result.

Affirmation	Tested by	,	Reviewed by	Ang
	Name : SunGeun Lee	(Sizagare)	Name : Geunki Son	(Signature)

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

2018.11.27.

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1811-0263	Nov. 27, 2018	Initial issue

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1. General Information

1.1 Testing Laboratory

DT&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The test site complies with the requirements of § 2.948 according to ANSI C63.4-2014.

- FCC MRA Accredited Test Firm No. : KR0034

www.dtnc.net		
Telephone	:	+ 82-31-321-2664
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1.2 Test Environment

Ambient Condition				
 Temperature 	+21 °C ~ +27 °C			
 Relative Humidity 	42 % ~ 48 %			

1.3 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014 and ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence.

Test items	Measurement uncertainty
Transmitter Output Power	0.9 dB (The confidence level is about 95 %, $k = 2$)
Conducted spurious emission	1.0 dB (The confidence level is about 95 %, $k = 2$)
AC conducted emission	2.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, $k = 2$)



1.4 Details of Applicant

Applicant	:	LG Electronics USA, Inc.
Address	:	1000 Sylvan Ave. Englewood Cliffs, New Jersey, United States 07632
Contact person	:	Kyung-Su Han

1.5 Description of EUT

EUT	Mobile Phone
Model Name	LM-V405EBW
Add Model Name	LMV405EBW, V405EBW, LM-V405EAW, LMV405EAW, V405EAW, LM-V405EB, LMV405EB, V405EB, LM-V405EA, LMV405EA, V405EA, V405EA
Serial Number	Identical prototype
Power Supply	DC 3.85 V
Frequency Range	2402 MHz ~ 2480 MHz
Max. RF Output Power	9.12 dBm
Modulation Technique	GFSK
Antenna Specification	Antenna Type: PIFA Antenna Gain: -3.4 dBi (PK)

1.6 Declaration by the applicant / manufacturer

N/A

1.7 Test Equipment List

Spectrum Analyzer Agilent Teo Multimeter FLUKE	M M eck eck gren eck	N9020A N9020A 17B 66332A SMBV100A MG3695C PC-5000TRH-II BJ5478 BJ5478 608-H1 FMZB1513 VULB 9160	18/07/06 18/01/03 17/12/26 17/12/27 17/12/27 18/02/12 18/07/18 1801/03 18/07/09 18/02/10 18/01/30	19/07/06 19/01/03 18/12/26 18/12/27 18/12/27 19/02/12 19/07/18 19/07/09 19/02/10	US47360812 MY48011700 26030065WS US37473833 255571 173501 N/A 120612-1 N/A
Multimeter FLUKE DC Power Supply Agilent Teat Signal Generator Rohde Sch Signal Generator ANRITSU IN/OUT Thermohygrometer SATO Thermohygrometer BODYCON Thermohygrometer BODYCON HYGROMETER TESTO Loop Antenna Schwarzbe BILOG ANTENNA Schwarzbe Horn Antenna ETS-Lindg Horn Antenna A.H.Syster PreAmplifier tsj	chnologies hwarz M M eck eck gren eck	17B 66332A SMBV100A MG3695C PC-5000TRH-II BJ5478 BJ5478 608-H1 FMZB1513	17/12/26 17/12/27 17/12/27 18/02/12 18/07/18 18/07/09 18/02/10	18/12/26 18/12/27 18/12/27 19/02/12 19/07/18 19/01/03 19/07/09	26030065WS US37473833 255571 173501 N/A 120612-1
DC Power SupplyAgilent TerSignal GeneratorRohde SclSignal GeneratorANRITSUIN/OUT ThermohygrometerSATOThermohygrometerBODYCONThermohygrometerBODYCONHYGROMETERTESTOLoop AntennaSchwarzboBILOG ANTENNASchwarzboHorn AntennaETS-LindgHorn AntennaA.H.SysterPreAmplifiertsj	hwarz M M eck eck gren eck	66332A SMBV100A MG3695C PC-5000TRH-II BJ5478 BJ5478 608-H1 FMZB1513	17/12/27 17/12/27 18/02/12 18/07/18 1801/03 18/07/09 18/02/10	18/12/27 18/12/27 19/02/12 19/07/18 19/07/09	US37473833 255571 173501 N/A 120612-1
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Signal Generator ANRITSU IN/OUT Thermohygrometer SATO Thermohygrometer BODYCON Thermohygrometer BODYCON HYGROMETER TESTO Loop Antenna Schwarzbe BILOG ANTENNA Schwarzbe Horn Antenna ETS-Lindg Horn Antenna A.H.Syster PreAmplifier tsj	M M eck eck gren eck	MG3695C PC-5000TRH-II BJ5478 BJ5478 608-H1 FMZB1513	18/02/12 18/07/18 1801/03 18/07/09 18/02/10	19/02/12 19/07/18 19/01/03 19/07/09	173501 N/A 120612-1
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Thermohygrometer BODYCOI HYGROMETER TESTO Loop Antenna Schwarzbe BILOG ANTENNA Schwarzbe Horn Antenna ETS-Lindg Horn Antenna Schwarzbe Horn Antenna Schwarzbe PreAmplifier tsj	M eck eck gren eck	BJ5478 608-H1 FMZB1513	18/07/09 18/02/10	19/07/09	
HYGROMETER TESTO Loop Antenna Schwarzbe BILOG ANTENNA Schwarzbe Horn Antenna ETS-Lindg Horn Antenna Schwarzbe Horn Antenna Schwarzbe PreAmplifier tsj	eck eck gren eck	608-H1 FMZB1513	18/02/10		N/A
Loop Antenna Schwarzbe BILOG ANTENNA Schwarzbe Horn Antenna ETS-Lindg Horn Antenna Schwarzbe Horn Antenna A.H.Syster PreAmplifier tsj PreAmplifier tsj	eck gren eck	FMZB1513		19/02/10	-
BILOG ANTENNA Schwarzbe Horn Antenna ETS-Lindg Horn Antenna Schwarzbe Horn Antenna A.H.Syster PreAmplifier tsj	eck gren eck		18/01/30		34862883
Horn AntennaETS-LindgHorn AntennaSchwarzbeHorn AntennaA.H.SysterPreAmplifiertsjPreAmplifiertsj	gren eck	VULB 9160		20/01/30	1513-128
Horn Antenna Schwarzba Horn Antenna A.H.System PreAmplifier tsj PreAmplifier tsj	eck		18/07/13	20/07/13	3359
Horn Antenna A.H.System PreAmplifier tsj PreAmplifier tsj		3115	17/01/13	19/01/13	9202-3820
PreAmplifier tsj PreAmplifier tsj		BBHA 9120C	17/12/04	19/12/04	9120C-561
PreAmplifier tsj	IIIS IIIC.	SAS-574	17/07/31	19/07/31	155
PreAmplifier tsj		MLA-0118-J01-45	18/02/08	19/02/08	17138
Attenuator SMA.IK		MLA-1840-J02-45	18/07/06	19/07/06	16966-10728
		SMAJK-50-10	18/07/03	19/07/03	3-50-10
Attenuator SMAJK		SMAJK-2-3	18/07/02	19/07/02	3
Attenuator Aeroflex/W	Veinschel	56-3	18/07/02	19/07/02	Y2370
Attenuator SRTechno	blogy	F01-B0606-01	18/07/02	19/07/02	13092403
Attenuator Hefei Shur	nze	SS5T2.92-10-40	18/07/03	19/07/03	16012202
High Pass Filter Wainwrigh	nt Instruments	WHNX8.0/26.5-6SS	18/07/02	19/07/02	3
High Pass Filter Wainwrigh	nt Instruments	WHKX12-935-1000- 15000-40SS	18/07/02	19/07/02	8
• •	nt Instruments	WHKX10-2838-3300- 18000-60SS	18/07/02	19/07/02	1
Power Meter & Anritsu Wide Bandwidth Sensor		ML2496A MA2411B	17/12/27	18/12/27	1338004 1249303
DC block KEYSIGH	т	N9398C	17/12/27	18/12/27	MY46457035
EMI Test Receiver Rohde Sch	hwarz	ESW44	18/08/06	19/08/06	101645
PreAmplifier Tsj		MLA-10K01-B01-27	18/01/11	19/01/11	2005354
EMI Test Receiver Rohde Sch	hwarz	ESCI7	18/02/12	19/02/12	100910
PULSE LIMITER Rohde Sch	hwarz	ESH3-Z2	18/09/27	19/09/27	101333
LISN SCHWAR	ZBECK	NNLK 8121	18/03/20	19/03/20	06183
Cable DT&C		Cable	18/07/05	19/07/05	RF-82
Cable DT&C		Cable	18/07/05	19/07/05	RF-55
Cable HUBER+S	SUHNER	SUCOFLEX	17/12/22	18/12/22	C-1
Cable HUBER+S	SUHNER	SUCOFLEX	17/12/22	18/12/22	C-2
Cable HUBER+S	SUHNER	SUCOFLEX	17/12/22	18/12/22	C-3
Cable HUBER+S	SUHNER	SUCOFLEX	17/12/22	18/12/22	C-4
Cable Junkosha		MWX241	18/06/25	19/06/25	G-04
Cable Junkosha		MWX241	18/06/25	19/06/25	G-07
Cable DT&C		CABLE	18/07/06	19/07/06	G-13
Cable DT&C		CABLE	18/07/06		+
Cable HUBER+S		1		19/07/06	G-14

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017. Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

1.8 Summary of Test Results

FCC Part	RSS Std.	Parameter	er Limit		Status Note 1
15.247(a)	RSS-247 [5.2]	6 dB Bandwidth	> 500 kHz		С
15.247(b)	RSS-247 [5.4]	Transmitter Output Power< 1 WattOut of Band Emissions / Band Edge20 dBc in any 100 kHz BW			С
15.247(d)	RSS-247 [5.5]			Conducted	с
15.247(e)	RSS-247 [5.2]	Transmitter Power Spectral Density	< 8 dBm/3 kHz		с
-	RSS-Gen [6.7]	Occupied Bandwidth (99 %)	NA		NA
15.247(d) 15.205 15.209	RSS-247 [5.5] RSS-GEN [8.9] RSS-GEN [8.10]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209 limits	Radiated	C Note 3, 4
15.207	RSS-Gen [8.8]	AC Line Conducted Emissions FCC 15.207 limits		AC Line Conducted	С
15.203	-	Antenna Requirements	FCC 15.203	-	С

Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable

Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS.

Note 3: This test item was performed in each axis and the worst case data was reported.

Note 4: This device supports wireless charging capability.

So per KDB 648474 D03 v01r04, the radiated test items were performed both normal and charging conditions. For wireless charging condition, the handset is placed on the representative charging pad under normal conditions and in a simulated call configuration.



2. Test Methodology

The measurement procedures described in the ANSI C63.10-2013 and the guidance provided in KDB558074 D01v05 were used in measurement of the EUT.

The EUT was tested per the guidance of KDB558074 D01v05. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the test mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

2.3 General Test Procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB558074 D01v05.

So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2013.

The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB558074 D01v05. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2013 as stated on section 12.1 of the KDB558074 D01v05.

The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axes.

2.4 Description of Test Modes

The EUT has been tested with the operating condition for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting. The Bluetooth low energy mode with below low, middle and high channels were tested and reported.

		Frequency [MHz]			
Test Mode	Description	Lowest Frequency	Middle Frequency	Highest Frequency	
TM 1	BT LE(1Mbps)	2402	2440	2480	
TM 2	BT LE(2Mbps)	2402	2440	2480	
TM 3	BT LE(1Mbps) with WPC	2402	2440	2480	
TM 4	BT LE(2Mbps) with WPC	2402	2440	2480	

2.5 Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.



3. Test Result

3.1 Maximum Peak Conducted Output Power

Test Requirements and limit, §15.247(b) & RSS-247 [5.4]

A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer.

Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

3.1.1 Test Setup

Refer to the APPENDIX I.

3.1.2 Test Procedures

Maximum Peak Conducted Output Power is measured using Measurement Procedure Option 1 of KDB558074 D01v05

1. Set the RBW ≥ DTS bandwidth. Actual RBW = 2 MHz & 2.4 MHz

- 2. Set $VBW \ge 3 \times RBW$. Actual VBW = 6 MHz & 8 MHz
- 3. Set span ≥ 3 x 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.

3.1.3 Test Results

Test mode	Tested Channel	Burst Average Output Power	Peak Output Power
Test mode		dBm	dBm
	Lowest	7.42	8.00
TM 1	Middle	7.85	8.44
	Highest	8.06	9.05
	Lowest	7.41	8.15
TM 2	Middle	7.82	8.43
	Highest	8.02	9.12

Note 1 : The Burst average output power was tested using an average power meter for reference only.

Note 2 : See next pages for actual measured spectrum plots.



Peak Output Power

TM 1 Test Channel : Lowest



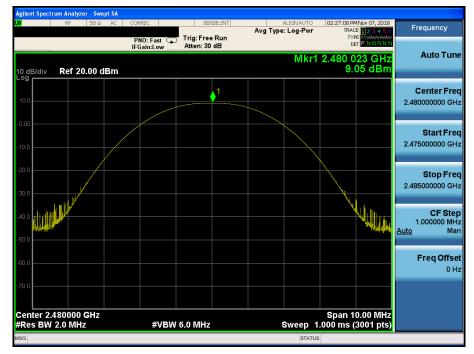
Peak Output Power

TM 1 Test Channel : Middle



Peak Output Power

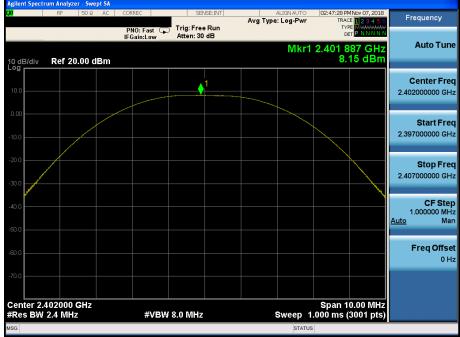
TM 1 Test Channel : Highest



Dt&C

Peak Output Power

TM 2 Test Channel : Lowest



Peak Output Power

TM 2 Test Channel : Middle





Peak Output Power

TM 2 Test Channel : Highest



3.2 6 dB Bandwidth Measurement

Test Requirements and limit, §15.247(a) & RSS-247 [5.2]

The bandwidth at 6 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the EUT's antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6 dB bandwidth is 500 kHz.

3.2.1 Test Setup

Refer to the APPENDIX I.

3.2.2 Test Procedures

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB558074 D01v05

- 1. Set resolution bandwidth (RBW) = 100 kHz
- 2. Set the video bandwidth (VBW) \ge 3 x RBW.

(<u>RBW : 100 kHz / VBW : 300 kHz</u>)

- 3. Detector = **peak**.
- 4. Trace mode = **max hold**.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.
- 7. Option 1 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.

Option 2 - The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW \ge 3 × RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \ge 6 dB.

3.2.3 Test Results

Test Mode	Tested Channel	Test Results [MHz]
	Lowest	0.713
TM 1	Middle	0.719
	Highest	0.716
	Lowest	1.267
TM 2	Middle	1.254
	Highest	1.256

TM 1 Test Channel : Lowest



6 dB Bandwidth

TM 1 Test Channel : Middle



TM 1 Test Channel : Highest



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TM 2 Test Channel : Lowest



6 dB Bandwidth

TM 2 Test Channel : Middle



TM 2 Test Channel : Highest



3.3 Maximum Power Spectral Density.

Test requirements and limit, §15.247(e) & RSS-247 [5.2]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

3.3.1 Test Setup

Refer to the APPENDIX I.

3.3.2 Test Procedures

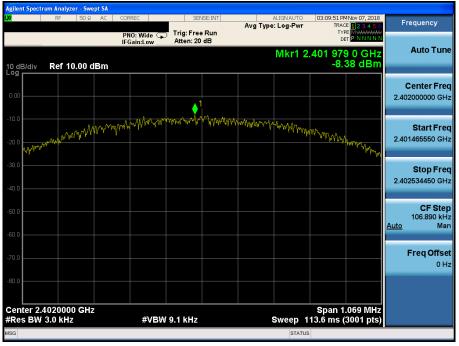
Method PKPSD of KDB558074 D01v05 is used.

- 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 : 3 kHz ≤ RBW ≤ 100 kHz.
- 4. Set the VBW \geq 3 x 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.

3.3.3 Test Results

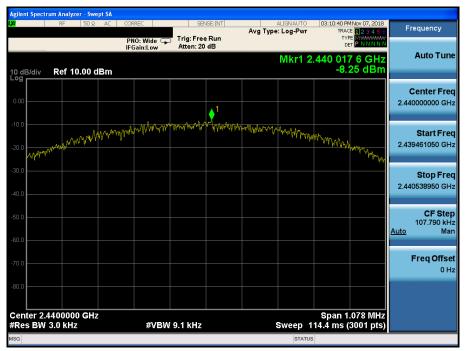
Test Mode	Tested Channel	PKPSD [dBm]
	Lowest	-8.38
TM 1	Middle	-8.25
	Highest	-7.02
	Lowest	-10.79
TM 2	Middle	-10.72
	Highest	-9.38





Maximum PKPSD

TM 1 Test Channel : Middle

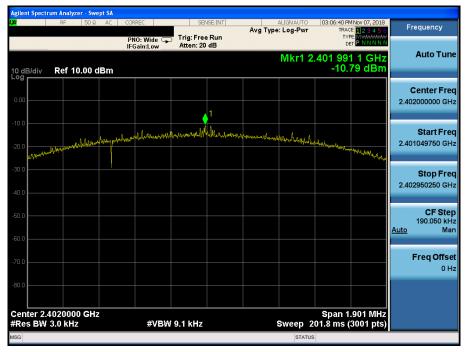


TM 1 Test Channel : Highest



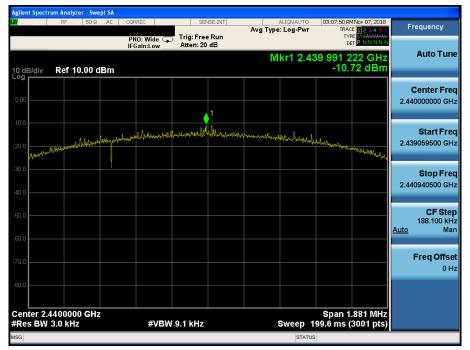


TM 2 Test Channel : Lowest



Maximum PKPSD

TM 2 Test Channel : Middle



TM 2 Test Channel : Highest





3.4 Unwanted Emissions (Conducted)

Test requirements and limit, §15.247(d) & RSS-247 [5.5]

§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions :

If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** 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.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** 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 inband average PSD level.

In either case, attenuation to levels below the general emission limits specified in §15.209(a) is not required.

3.4.1 Test Setup

Refer to the APPENDIX I including path loss

3.4.2 Test Procedures

The transmitter output is connected to a spectrum analyzer.

- Measurement Procedure 1 – Reference Level of KDB558074 D01v05

- 1. Set instrument center frequency to DTS channel center frequency.
- 2. Set the span to \geq 1.5 times the DTS bandwidth.
- 3. Set the RBW = 100 kHz.
- 4. Set the VBW \ge 3 x 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 PSD level LIMIT LINE = 20 dB below of the reference level.

- Measurement Procedure 2 - Unwanted Emissions of KDB558074 D01v05

- 1. Set the center frequency and span to encompass frequency range to be measured.
- 2. Set the RBW = 100 kHz.(Actual 1 MHz , See below note)
- 3. Set the VBW ≥ 3 x RBW.(Actual 3 MHz, See below note)
- 4. Detector = **peak**.
- 5. Ensure that the number of measurement points \geq span / RBW
- 6. Sweep time = **auto couple.**
- 7. Trace mode = **max hold.**
- 8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
- 9. Use the peak marker function to determine the maximum amplitude level.

Note : The conducted s	purious emission was	s tested with below settings.

Frequency range	RBW	VBW	Detector	Trace	Sweep Point
9 kHz ~ 30 MHz	100 kHz	300 kHz			
30 MHz ~ 10 GHz	1 MHz	3 MHz	Peak	Max Hold	40001
10 GHz ~ 25 GHz	1 MHz	3 MHz			

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

FCC ID: ZNFV405EBW

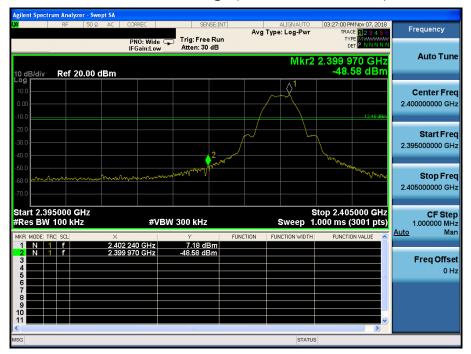
3.4.3 Test Results

🛈 Dt&C



TM 1 Reference (Test Channel : Lowest)

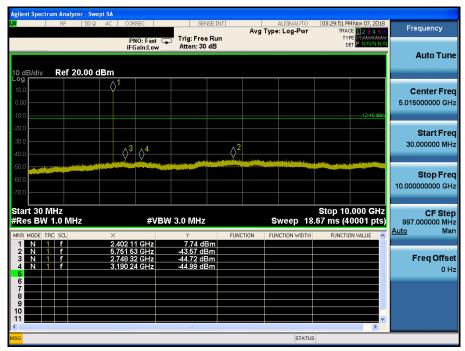
TM 1 Low Band-edge (Test Channel : Lowest)



Agilent Spectrum Analyzer -					
L XI RF 50	DΩ 🚹 DC 🔋 CORREC	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	03:28:31 PM Nov 07, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast	Trig: Free Run	Avg Type. Log-Fwi	TYPE MWWWWWW DET P N N N N N	
	IFGain:Low	Atten: 30 dB		DET P NNNN	
				Mkr1 293.2 kHz	Auto Tune
10 dB/div Ref 20.0	0 dBm			-53.19 dBm	
Log					
10.0					Center Freq
0.00					15.004500 MHz
-10.0				12.45 dBm	
-20.0					01
-30.0					Start Freq
-40.0					9.000 kHz
-50.0					Stop Freq
-60.0	والعواداد المردية القطان والمعاور والله	والمراجعة والماوحة والغرياف الاختوات المرجو	وريستعذره فيهجرونا الماس أسبيه والاجتر معريأوس	بالديد والمعالية المعادية المعادية المحالية	30.000000 MHz
-70.0					00.000000 11112
				Ot 00 00 MU	
Start 9 kHz #Res BW 100 kHz	#\/B)/	V 300 kHz	Sween 5	Stop 30.00 MHz 333 ms (40001 pts)	CF Step 2.999100 MHz
					Auto Man
MKR MODE TRC SCL	× 293.2 kHz	Y FUN -53.19 dBm	CTION FUNCTION WIDTH	FUNCTION VALUE	<u>Maro</u> mari
2	293.2 KH2	-55. 19 dBm			
3 4					Freq Offset
5					0 Hz
6					
8					
9					
11				~	
<		illi illi		>	
MSG			STATUS	DC Coupled	

TM 1 Conducted Spurious Emissions 1 (Test Channel : Lowest)

TM 1 Conducted Spurious Emissions 2 (Test Channel : Lowest)



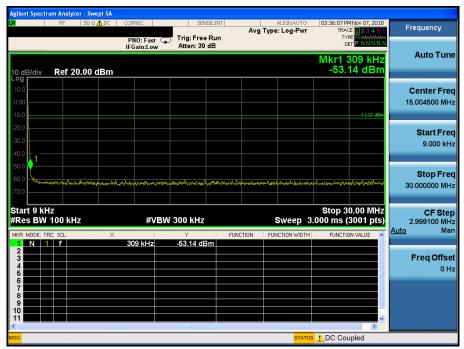


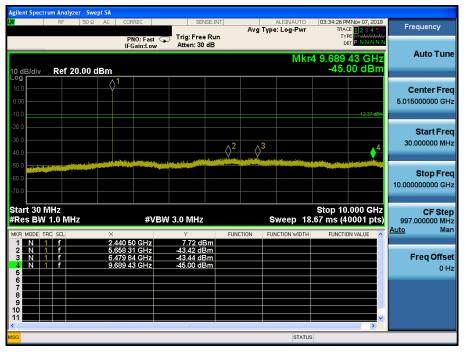
TM 1 Conducted Spurious Emissions 3 (Test Channel : Lowest)



TM 1 Reference (Test Channel : Middle)

TM 1 Conducted Spurious Emissions 1 (Test Channel : Middle)





TM 1 Conducted Spurious Emissions 2 (Test Channel : Middle)

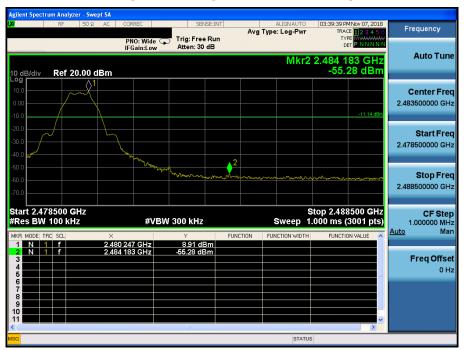
TM 1 Conducted Spurious Emissions 3 (Test Channel : Middle)





TM 1 Reference (Test Channel : Highest)

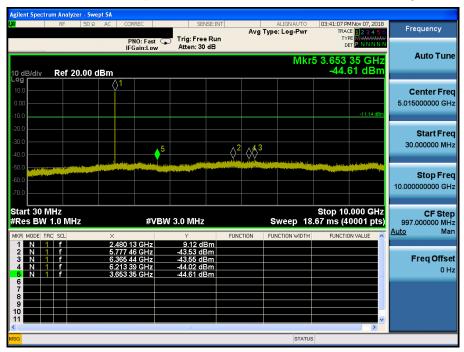
TM 1 High Band-edge (Test Channel : Highest)



	Spectr		alyzer - Sv												
l ,XI		RF	50 \$	R <u>Å</u> DC	CORF	REC			VSE:INT		Avg Typ	ALIGNAUTO	· TRA	M Nov 07, 2018 CE 123456	Frequency
					PN IFG	0: Fast ain:Low	P	Trig: Free Atten: 30							Auto Tupo
10 dE Log r	3/div	Rei	f 20.00	dBm								_	-54.	77 dBm	
10.0															Center Freq
0.00															15.004500 MHz
-10.0	1													-11.14 dBm	
-20.0 - -30.0 -															Start Freq
-40.0															9.000 kHz
-50.0	1														
-60.0	-	الأخيد ليوه	+ 1000000000000000000000000000000000000	فلنغد أسبح كمادا	و المراجع ال	al workship	. و بولز دو	لمحطحيط أتعيند لدلة	مرا ال مسرية ا	بفللدينان	a hourseaso	بالمنظور الاوجه	ungel forstation where	ويعادرون والمراد	Stop Freq 30.000000 MHz
-70.0				- prove		W1 0 1 1 1					the product of				00.000000 11112
Star #Res	t9kH sBW		kHz			#VI	BW	300 kHz			ę	Sweep {	Stop 3 5.333 ms (4	80.00 MHz 10001 pts)	CF Step 2.999100 MHz
	IODE TF			×				Y		FUNCT	ION FL	INCTION WIDT	H FUNCT	ION VALUE	<u>Auto</u> Man
2	N 1	1			281.9	9 kHz		-54.77 dE	3m						Freq Offset
3 4 5															0 Hz
67														=	
8															
10 11															
<								Ш							
MSG												STAT	<mark>ບຣ</mark> <u>ト</u> DC Co	upled	

TM 1 Conducted Spurious Emissions 1 (Test Channel : Highest)

TM 1 Conducted Spurious Emissions 2 (Test Channel : Highest)



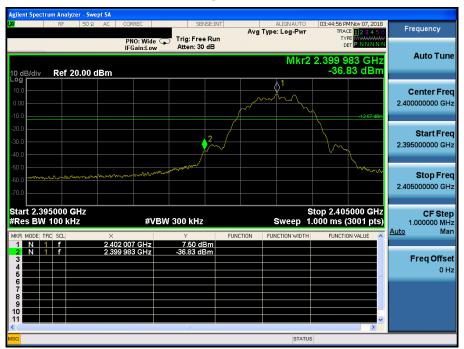
	RF	50 Ω	AC	CORREC		SEI	NSE:INT			JAUTO		MNov 07, 2018	Frequency
				PNO: I IFGain:	ast 🖵 Low	Trig: Free Atten: 30		Avg	Type: Lo	g-Pwr	T	CE 123456 PE MWWWWW ET P NNNNN	Frequency
dB/div	Ref 20	.00 d	Bm						М	kr5 2		875 GHz 80 dBm	Auto Tun
9 0.0 00 0.0												-11.14 dBm	Center Fre 17.500000000 GH
).0).0).0					and the second second				5-	_} ³		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Start Fre 10.000000000 G⊦
0.0 0.0 0.0					القلطين (الأعين								Stop Fre 25.000000000 GF
art 10.00 Res BW 1	.0 MHz				#VBW	/ 3.0 MHz					00 ms (4	.000 GHz 0001 pts)	CF Ste 1.50000000 GF Auto Ma
KR MODE TRO 1 N 1 2 N 1 3 N 1 4 N 1 5 N 1	f f f f f		24.31 21.42 22.93	4 750 GH 7 500 GH 9 250 GH 3 000 GH 9 375 GH	lz lz lz	-31.75 df -33.41 df -34.74 df -36.31 df -37.80 df	3m 3m 3m 3m	UNCTION	FUNCTION	N WIDTH	FUNCTI	ON VALUE	Freq Offse
3		_	_	_			_			STATUS		>	

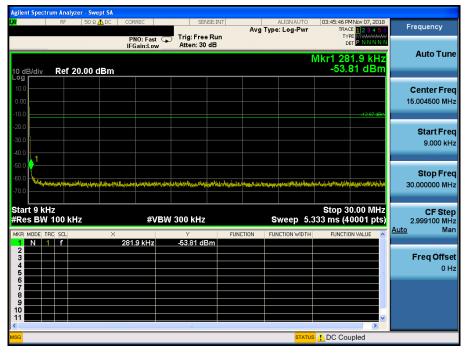
TM 1 Conducted Spurious Emissions 3 (Test Channel : Highest)



TM 2 Reference (Test Channel : Lowest)

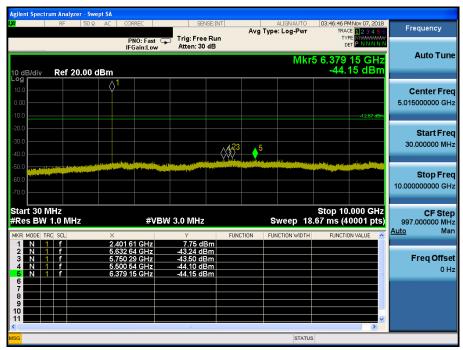
TM 2 Low Band-edge (Test Channel : Lowest)





TM 2 Conducted Spurious Emissions 1 (Test Channel : Lowest)

TM 2 Conducted Spurious Emissions 2 (Test Channel : Lowest)





		RF 50 G	AC CC	RREC	SEA	ISE:INT		ALIGNAUTO	02:47:26	MNov 07, 2018	
		vг эн и	E AC CC				Avg Ty	rpe: Log-Pwr	TRA	CE 123456	Frequency
				NO: Fast	Trig: Free Atten: 30				T	PE N N N N N	
			li	Gain:Low	Atten: 30	ab					Auto Tur
								Mkr5 2		375 GHz	
0 dB/di	v R	ef 20.00	dBm				_		-35	22 dBm	
10.0											Contor Fr
											Center Fre
0.00											17.50000000 GI
10.0								_		-12.67 dBm	
20.0										0 0 1	Start Fre
30.0									\ <mark>4</mark>	3^{3} (2^{2})	10.00000000 G
40.0								and the second second second second	Constant of the	A CONTRACTOR	10.00000000 Gi
1.00	and growth diffe							and the second design of the s	-		
50.0		1									Stop Fre
0.00											
70.0											25.000000000 GI
70.0									Stop 2	5.000 GHz	25.00000000 GI
" tart 11				#VE	BW 3.0 MHz			Sweep 40	Stop 2: .00 ms (4	5.000 GHz 10001 pts)	25.00000000 GI CF Ste 1.50000000 G
tart 10 Res B	W 1.0	MHz	×		Y			Sweep 40	.00 ms (4	5.000 GHz 10001 pts)	25.00000000 GI CF Ste 1.50000000 G
tart 10 Res B	W 1.0	MHz	24.824 12	25 GHz	۲ -31.32 dE	3m			.00 ms (4	10001 pts)	25.00000000 GI CF Ste 1.50000000 G
tart 10 Res B	W 1.0	MHz	24.824 12 24.218 12 23.409 25	25 GHz 25 GHz 50 GHz	-31.32 dE -33.46 dE -33.64 dE	3m 3m 3m			.00 ms (4	10001 pts)	25.000000000 GI CF Ste 1.500000000 GI <u>Auto</u> M
tart 10 Res B KR MODE 1 N 2 N 3 N 4 N	W 1.0	MHz	24.824 12 24.218 12 23.409 25 21.961 3	25 GHz 25 GHz 50 GHz 75 GHz	-31.32 dE -33.46 dE -33.64 dE -35.22 dE	3m 3m 3m 3m			.00 ms (4	10001 pts)	25.000000000 Gi CF Ste 1.50000000 Gi <u>Auto</u> Mi Freq Offs
tart 10 Res B	W 1.0	MHz	24.824 12 24.218 12 23.409 25	25 GHz 25 GHz 50 GHz 75 GHz	-31.32 dE -33.46 dE -33.64 dE	3m 3m 3m 3m			.00 ms (4	10001 pts)	25.000000000 Gi CF Ste 1.50000000 Gi <u>Auto</u> Mi Freq Offs
TOLD tart 11 Res B KR MODE 1 N 2 N 3 N 4 N 5 N 6 7	W 1.0	MHz	24.824 12 24.218 12 23.409 25 21.961 3	25 GHz 25 GHz 50 GHz 75 GHz	-31.32 dE -33.46 dE -33.64 dE -35.22 dE	3m 3m 3m 3m			.00 ms (4	10001 pts)	25.00000000 GI CF Ste 1.50000000 GI
6 7 8	W 1.0	MHz	24.824 12 24.218 12 23.409 25 21.961 3	25 GHz 25 GHz 50 GHz 75 GHz	-31.32 dE -33.46 dE -33.64 dE -35.22 dE	3m 3m 3m 3m			.00 ms (4	10001 pts)	25.000000000 Gi CF Ste 1.50000000 Gi <u>Auto</u> Mi Freq Offs
70.0 itart 11 Res B KR MODE 1 N 2 N 3 N 4 N 5 N 6 7 8 9 10	W 1.0	MHz	24.824 12 24.218 12 23.409 25 21.961 3	25 GHz 25 GHz 50 GHz 75 GHz	-31.32 dE -33.46 dE -33.64 dE -35.22 dE	3m 3m 3m 3m			.00 ms (4	10001 pts)	25.000000000 Gi CF Ste 1.50000000 Gi <u>Auto</u> Mi Freq Offs
TOD tart 11 Res B KR MODE 1 N 2 N 3 N 4 N 5 N 6 7 8	W 1.0	MHz	24.824 12 24.218 12 23.409 25 21.961 3	25 GHz 25 GHz 50 GHz 75 GHz	-31.32 dE -33.46 dE -33.64 dE -35.22 dE	3m 3m 3m 3m			.00 ms (4	10001 pts)	25.000000000 Gi CF Ste 1.50000000 Gi <u>Auto</u> Mi Freq Offs

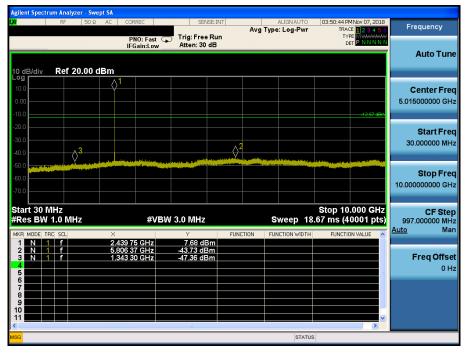
TM 2 Conducted Spurious Emissions 3 (Test Channel : Lowest)



TM 2 Reference (Test Channel : Middle)

TM 2 Conducted Spurious Emissions 1 (Test Channel : Middle)

Agilent Spectrum Analyzei X/ RF	- Swept SA 50 Ω ▲ DC CORREC	SENSE: IN	п	ALIGNAUTO	03:51:28 PM Nov 07, 2018	
		ast 😱 Trig: Free Rui	Avg Typ	e: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Frequency
10 dB/div Ref 20	.00 dBm			1	//kr1 287.9 kHz -53.86 dBm	Auto Tune
10.0 0.00 -10.0					-1257 dBn	Center Free 15.004500 MH
-20.0						Start Fre 9.000 kH
-50.0	ท _{อไม้สา} นให้สมปีชื่อสารการมีขางเร [ิ] สาราง	taa too kan ta'a ta	ethjeles,ettede forstationije at boenere	ะ เพ	whishessieses	Stop Fre 30.000000 MH
Start 9 kHz #Res BW 100 kHz	×	#VBW 300 kHz		Sweep 5.3	Stop 30.00 MHz 33 ms (40001 pts)	CF Ste 2.999100 M⊢ Auto Ma
1 N 1 f 2 3 4 5 6	287.9 kł	Hz -53.86 dBm				Freq Offse 0 ⊢
7 8 9 10 11						
< Isg				STATUS	DC Coupled	



TM 2 Conducted Spurious Emissions 2 (Test Channel : Middle)

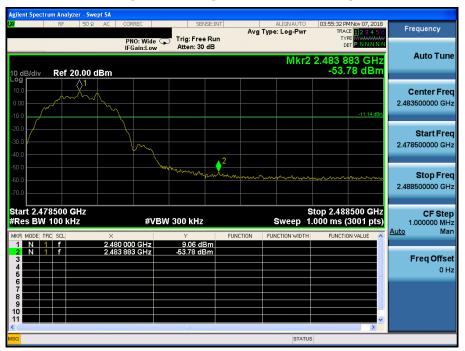
TM 2 Conducted Spurious Emissions 3 (Test Channel : Middle)





TM 2 Reference (Test Channel : Highest)

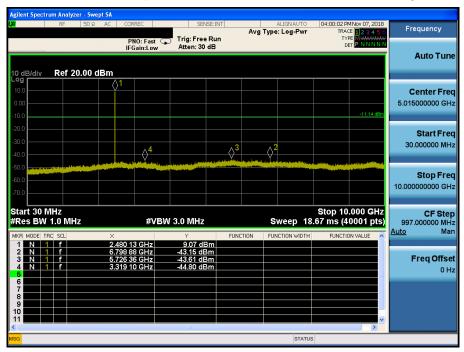
TM 2 High Band-edge (Test Channel : Highest)



Agilent Spectr													
L <mark>XI</mark>	RF	50 Ω <mark>/</mark>	1 DC	CORREC		SEN		Avg	ALIGNA		TRAC	MNov 07, 2018 CE 123456 PE M WWWWWW	
10 dB/div	Ref 2	20.00 d	IBm	PNO: Fast IFGain:Lov		Atten: 30				ľ	₀ //kr1 28	et ^p NNNNN 6.4 kHz 95 dBm	
Log 10.0 0.00 -10.0												-11.14 dBm	Center Freq 15.004500 MHz
-20.0 -30.0 -40.0													Start Freq 9.000 kHz
-50.0 -60.0 -70.0	****	indekan jedna sjela	4/bårstersettersett	ann an thatach	an a	ngalarati ki Mandara	stury, fullon (o ^l istori	hter, geissent von	nterfelyfelyfer yn yn fw	didaan	ا موادر «فرور المراجع مورد».	gei peile betapptek gibteg	Stop Freq 30.000000 MHz
Start 9 kH #Res BW		lz		#V	/BW 3	00 kHz			Sweep	5.3		0.00 MHz 0001 pts)	2.999100 MHz
MKR MODE TF 1 N 1 2 3 3 4 5 5 6 6 7 8 9 9 10 11 11			× 2	286.4 kHz		Y -52.95 dE		NCTION	FUNCTION W			ON VALUE	Auto Man Freq Offset 0 Hz
MSG									s	TATUS	L DC Cou	upled	

TM 2 Conducted Spurious Emissions 1 (Test Channel : Highest)

TM 2 Conducted Spurious Emissions 2 (Test Channel : Highest)





TM 2 Conducted Spurious Emissions 3 (Test Channel : Highest)

3.5 Unwanted Emissions (Radiated)

Test Requirements and limit,

§15.247(d), §15.205, §15.209 & RSS-247 [5.5], RSS-Gen [8.9], RSS-Gen [8.10]

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed.

- FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 MHz, 76 ~ 88 MHz, 174 ~ 216 MHz or 470 ~ 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

• FCC Part 15.205 (a)): Only spurious emissions are	permitted in any of the frequence	y bands listed below :
-----------------------	--------------------------------	-----------------------------------	------------------------

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240	3600 ~ 4400		
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

• FCC Part 15.205(b) : The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.



3.5.1 Test Setup

Refer to the APPENDIX I.

3.5.2 Test Procedures

- 1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Repeat above procedures until the measurements for all frequencies are complete.

Note: Measurement Instrument Setting for Radiated Emission Measurements.

1. Frequency Range Below 1 GHz

RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak

2. Frequency Range > 1 GHz

Peak Measurement > 1 GHz

RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto, Trace mode = Max Hold until the trace stabilizes

Average Measurement> 1GHz

- 1. RBW = 1 MHz (unless otherwise specified).
- 2. VBW \geq 3 x RBW.
- 3. Detector = RMS (Number of points ≥ 2 x Span / RBW)
- 4. Averaging type = power (i.e., RMS).
- 5. Sweep time = auto.
- 6. Perform a trace average of at least 100 traces.
- 7. A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
- 1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.
- 2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
- 3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

Test Mode	Duty Cycle (%)	T _{on} (ms)	T _{on} + T _{off} (ms)	DCF = 10 log(1/Duty) (dB)
TM 1	85.36	2.134	2.500	0.69
TM 2	57.38	1.077	1.875	2.41

Note : Refer to appendix II for duty cycle measurement procedure and plots



3.5.3 Test Results

Frequency Range : 9 kHz ~ 25 GHz _TM 1_Normal

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2388.71	V	Z	PK	52.24	2.69	N/A	N/A	54.93	74.00	19.07
2388.76	V	Z	AV	41.73	2.69	0.69	N/A	45.11	54.00	8.89
4804.51	Н	Х	PK	49.82	1.44	N/A	N/A	51.26	74.00	22.74
4804.30	Н	Х	AV	39.59	1.44	0.69	N/A	41.72	54.00	12.28

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4879.60	Н	Х	PK	51.15	1.63	N/A	N/A	52.78	74.00	21.22
4879.51	Н	Х	AV	39.58	1.63	0.69	N/A	41.90	54.00	12.10

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2484.41	V	Z	PK	52.10	3.10	N/A	N/A	55.20	74.00	18.80
2484.40	V	Z	AV	41.47	3.10	0.69	N/A	45.26	54.00	8.74
4959.87	Н	Х	PK	50.18	1.87	N/A	N/A	52.05	74.00	21.95
4960.08	Н	Х	AV	39.29	1.87	0.69	N/A	41.85	54.00	12.15

<u>Note.</u>

1. The radiated emissions were investigated 9kHz to 25GHz. And no other spurious and harmonic emissions were found above listed frequencies.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3 m to 1 m. In this case, the distance factor (-9.54 dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = 20 log(1 m / 3 m) = -9.54 dB

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

Frequency Range : 9 kHz ~ 25 GHz _TM 2_Normal

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2389.66	V	Y	PK	52.10	2.70	N/A	N/A	54.80	74.00	19.20
2389.56	V	Y	AV	41.82	2.70	2.41	N/A	46.93	54.00	7.07
4804.09	V	Z	PK	50.79	1.44	N/A	N/A	52.23	74.00	21.77
4804.33	V	Z	AV	39.36	1.44	2.41	N/A	43.21	54.00	10.79

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4880.02	V	Z	PK	51.06	1.63	N/A	N/A	52.69	74.00	21.31
4879.80	V	Z	AV	39.69	1.63	2.41	N/A	43.73	54.00	10.27

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2486.26	V	Y	PK	52.75	3.10	N/A	N/A	55.85	74.00	18.15
2486.33	V	Y	AV	41.92	3.10	2.41	N/A	47.43	54.00	6.57
4959.60	V	Z	PK	50.05	1.87	N/A	N/A	51.92	74.00	22.08
4960.23	V	Z	AV	39.53	1.87	2.41	N/A	43.81	54.00	10.19

Note.

1. The radiated emissions were investigated 9kHz to 25GHz. And no other spurious and harmonic emissions were found above listed frequencies.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3 m to 1 m. In this case, the distance factor (-9.54 dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = 20 log(1 m / 3 m) = -9.54 dB

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

Frequency Range : 9 kHz ~ 25 GHz _TM 3_ Wireless Charging

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2388.75	Н	Х	PK	52.10	2.69	N/A	N/A	54.79	74.00	19.21
2388.76	Н	Х	AV	41.46	2.69	0.69	N/A	44.84	54.00	9.16
4803.75	Н	Х	PK	50.04	1.44	N/A	N/A	51.48	74.00	22.52
4803.96	Н	Х	AV	39.23	1.44	0.69	N/A	41.36	54.00	12.64

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4879.61	Н	Х	PK	50.41	1.63	N/A	N/A	52.04	74.00	21.96
4879.59	Н	Х	AV	39.69	1.63	0.69	N/A	42.01	54.00	11.99

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2484.35	Н	Х	PK	51.97	3.10	N/A	N/A	55.07	74.00	18.93
2484.32	Н	Х	AV	41.38	3.10	0.69	N/A	45.17	54.00	8.83
4960.55	Н	Х	PK	49.59	1.87	N/A	N/A	51.46	74.00	22.54
4959.61	Н	Х	AV	39.57	1.87	0.69	N/A	42.13	54.00	11.87

Note.

1. The radiated emissions were investigated 9kHz to 25GHz. And no other spurious and harmonic emissions were found above listed frequencies.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3 m to 1 m. In this case, the distance factor (-9.54 dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = 20 log(1 m / 3 m) = -9.54 dB

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

Frequency Range : 9 kHz ~ 25 GHz _TM 4_ Wireless Charging

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2389.35	Н	Х	PK	51.86	2.70	N/A	N/A	54.56	74.00	19.44
2389.52	Н	Х	AV	41.50	2.70	2.41	N/A	46.61	54.00	7.39
4804.04	Н	Х	PK	49.72	1.44	N/A	N/A	51.16	74.00	22.84
4803.78	Н	Х	AV	39.24	1.44	2.41	N/A	43.09	54.00	10.91

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4879.69	Н	Х	PK	50.43	1.63	N/A	N/A	52.06	74.00	21.94
4879.64	Н	Х	AV	39.38	1.63	2.41	N/A	43.42	54.00	10.58

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.72	Н	Х	PK	52.23	3.10	N/A	N/A	55.33	74.00	18.67
2483.81	Н	Х	AV	41.87	3.10	2.41	N/A	47.38	54.00	6.62
4960.38	Н	Х	PK	49.79	1.87	N/A	N/A	51.66	74.00	22.34
4959.64	Н	Х	AV	39.18	1.87	2.41	N/A	43.46	54.00	10.54

Note.

1. The radiated emissions were investigated 9kHz to 25GHz. And no other spurious and harmonic emissions were found above listed frequencies.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3 m to 1 m. In this case, the distance factor (-9.54 dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = 20 log(1 m / 3 m) = -9.54 dB

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. Sample Calculation.

3.6 Power line Conducted Emissions

■ Test Requirements and limit, §15.207 & RSS-Gen [8.8]

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 μ H/50 ohms line impedance stabilization network (LISN).

	Conducted	Limit (dBuV)
Frequency Range (MHz)	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

3.6.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

3.6.2 Test Procedures

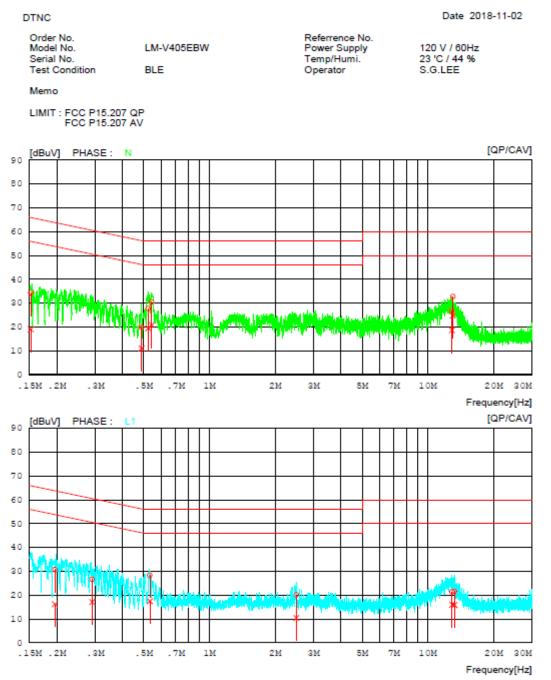
Conducted emissions from the EUT were measured according to the ANSI C63.10-2013.

- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (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.
- 2. 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.
- 3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
- 4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

3.6.3 Test Results

AC Line Conducted Emissions (Graph)

Results of Conducted Emission



AC Line Conducted Emissions (List)

Results of Conducted Emission

Order No. Model No. Serial No. Test Condition LM-V405EBW Reference No. Power Supply Temp/Humi. 120 V / 60Hz Memo LIMIT: FCC P15.207 QP FCC P15.207 AV S.G.LEE Memo LIMIT: FCC P15.207 QP FCC P15.207 AV Resolution LIMIT MARGIN QP PHASE QP CAV QP CAV	DTNC			Date 2018-11-02
LIMIT : FCC P15.207 QP FCC P15.207 AV NO FREQ READING C.FACTOR RESULT QP CAV QP CAV QP CAV [MHz] [dBuV][dBuV] [dB] [dB] [dBuV][dBuV] [dBuV] [dBuV] [dBuV] [dBuV] [dBuV] [dBuV] 1 0.15208 23.99 8.72 10.28 34.27 19.00 65.89 55.89 31.62 36.89 N 2 0.48851 9.84 1.00 10.02 19.86 11.02 56.19 46.19 36.33 35.17 N 3 0.52450 17.70 9.50 10.02 27.72 19.52 56.00 46.00 28.28 26.48 N 4 0.54388 20.47 10.75 10.03 30.50 20.78 56.00 46.00 28.28 26.48 N 4 0.54388 20.47 10.75 10.03 30.50 20.78 56.00 46.00 27.30 25.22 N 5 12.88920 16.35 8.25 10.45 26.80 18.70 60.00 50.00 32.0 31.30 N 6 13.00680 22.25 14.32 10.45 32.70 24.77 60.00 50.00 27.30 25.23 N 7 0.19597 20.69 6.16 10.00 30.69 16.16 63.78 53.78 33.09 37.62 L1 8 0.29021 16.60 7.12 9.98 26.58 17.10 60.52 50.52 33.94 33.42 L1 9 0.53340 18.29 7.40 10.00 28.29 17.40 56.00 46.00 27.71 28.60 L1 10 2.50040 9.93 0.23 10.14 21.33 15.90 60.00 50.00 38.67 34.10 L1	Model No. Serial No.	 Power Su Temp/Hu	pply 120 mi. 23 '	C / 44 %
NO FECC P15.207 AV NO FREQ QF READING CAV [MH#] C.FACTOR [dBuV][dBuV] RESULT [dBuV][dBuV] LIMIT QF MARGIN QF PHASE QF 1 0.15208 23.99 8.72 10.28 34.27 19.00 65.89 55.89 31.62 36.89 N 2 0.48851 9.84 1.00 10.02 19.86 11.02 56.19 46.19 36.33 35.17 N 3 0.52450 17.70 9.50 10.02 27.72 19.52 56.00 46.00 28.28 26.48 N 4 0.54388 20.47 10.75 10.03 30.50 20.78 56.00 46.00 28.28 26.48 N 4 0.54388 20.47 10.75 10.03 30.50 20.78 56.00 46.00 25.50 22 N 5 12.88920 16.35 8.25 10.45 32.70 20.05 50.00 27.02 25.23 N	Memo			
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11 12.91660 10.92 5.49 10.41 21.3315.90 60.00 50.00 38.6734.10 L1		 		

3.7 Occupied Bandwidth

Test Requirements, RSS-Gen [6.7]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 % emission bandwidth, as calculated or measured.

3.7.1 Test Setup

3.7.2 Test Procedures

The 99 % power bandwidth was measured with a calibrated spectrum analyzer.

The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3 × RBW.

Spectrum analyzer plots are included on the following pages.

3.7.3 Test Results

-NA

4. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203

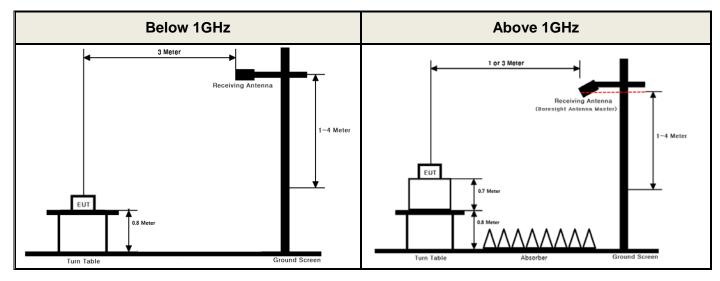
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

The antenna is attached on the device by means of unique coupling method (Spring Tension). Therefore this E.U.T Complies with the requirement of §15.203

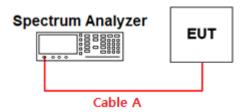
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	0.44	15	3.20
1	0.66	20	3.80
2.402 & 2.440 & 2.480	1.06	25	4.40
5	1.80	-	-
10	2.50	-	-

Note 1: The path loss from EUT to Spectrum analyzer was measured and used for test. Path loss (S/A's correction factor) = Cable A

APPENDIX II

Duty cycle plots

Test Procedure

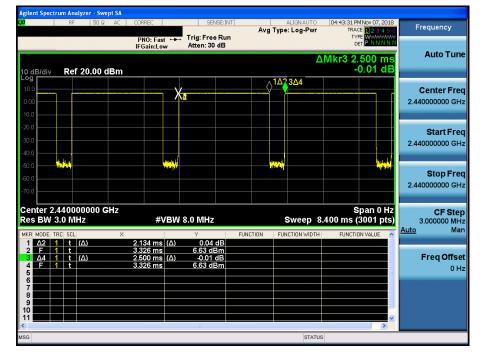
Duty Cycle was measured using Section 6.0 b) of KDB558074 D01v05 :

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW \geq OBW if possible; otherwise, set RBW to the largest available value. Set VBW \geq RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T \leq 16.7 microseconds.)

Duty Cycle

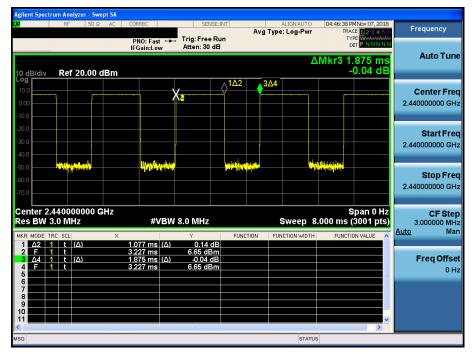
TM 1 Test Channel : Middle





Duty Cycle

TM 2 Test Channel : Middle

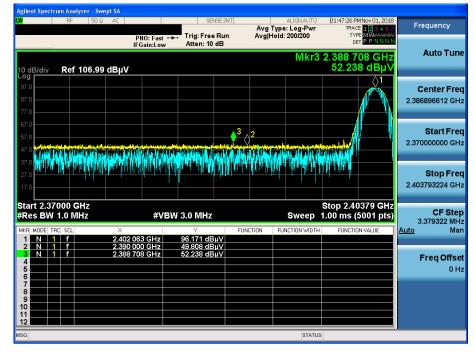


APPENDIX III

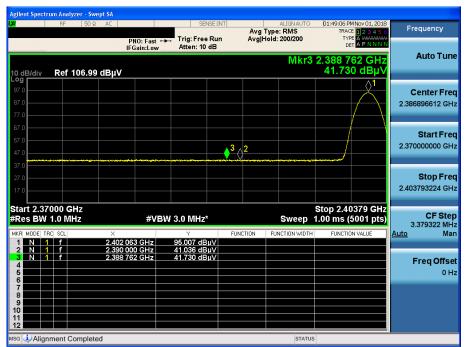
Unwanted Emissions (Radiated) Test Plot_Normal



Detector Mode : PK



TM1 & Lowest & Z & Ver



TDt&C

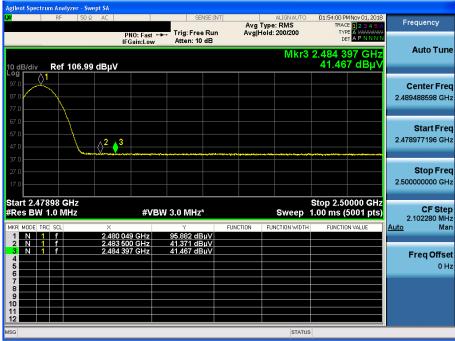
FCC ID: ZNFV405EBW

TM1 & Highest & Z & Ver

Detector Mode : PK

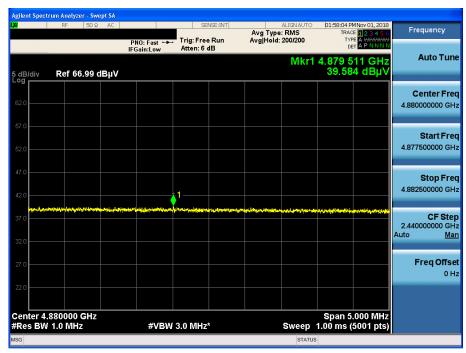
Agilent Spectrum Analyzer - Swept SA							
RF 50Ω AC		SENSE:IN	Avg Typ	ALIGN AUTO pe: Log-Pwr d: 200/200	TRAC	MNov 01, 2018 E 123456 PE MWAAAAAA	Frequency
10 dB/div Ref 106.99 dBµV	PNO: Fast ↔ IFGain:Low	Trig: Free Rur Atten: 10 dB			2.484 4	14 GHz 5 dBµV	Auto Tune
Log 97.0 87.0 77.0							Center Fred 2.489488598 GH:
67.0 57.0 47.0 37.0	3 ()				(dimbalicit)		Start Free 2.478977196 GH:
27.0 17.0		hitti ta					Stop Free 2.500000000 GH
Start 2.47898 GHz #Res BW 1.0 MHz	#VBV	/ 3.0 MHz		Sweep	1.00 ms (0000 GHz 5001 pts)	CF Step 2.102280 MH
	049 GHz	γ 98.317 dBμV	FUNCTION F	UNCTION WIDTH	FUNCTIO	ON VALUE	<u>Auto</u> Mar
	3 500 GHz I 414 GHz	47.874 dBµV 52.095 dBµV					Freq Offse 0 Hi
7 8 9 9 10							
11 12							
MSG				STATUS			

TM1 & Highest & Z & Ver





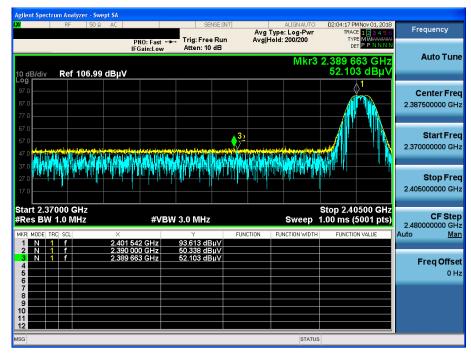
TM1 & Middle & X & Hor



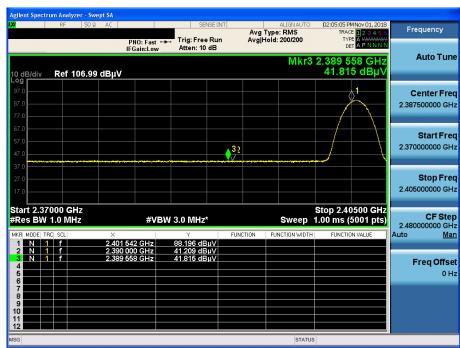


TM2 & Lowest & Y & Ver

Detector Mode : PK

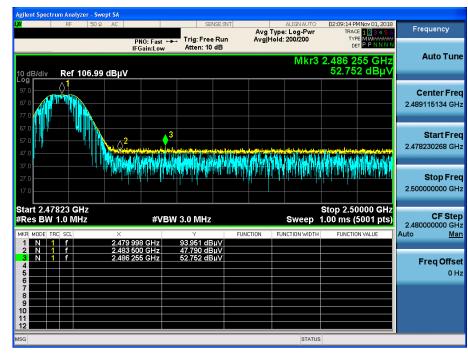


TM2 & Lowest & Y & Ver



TM2 & Highest & Y & Ver

Detector Mode : PK



TM2 & Highest & Y & Ver

ept SA





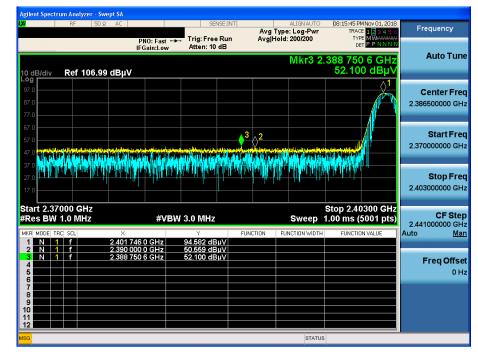
TM2 & Highest & Z & Ver

XI	RF	50 Ω	AC			SENSE:INT		ALIGN AUTO		Nov 01, 2018	E
				PNO: Fast IFGain:Low		ree Run 6 dB		/pe: RMS ld: 200/200	TRACE TYPE DET	123456 A WATATATA A P N N N N	Frequency
dB/div	Ref 6	6.99 d	BμV	II SUMEON				Mkr1	4.960 22 39.528	27 GHz 3 dBµV	Auto Tu
62.0											Center Fr
											4.960000000 G
57.0											Start Fr
52.0											4.957500000 G
47.0											Stop Fr
42.0						1-					4.962500000 G
37.0	and a fight for the particular f	dende Standige of Standige	nar dalar siya	elefensken et finseller	an a	intellinethered the paper	komitis ininesuis	n de Ministe de Johns in spanne	**** {} *** } ***		CF St 2.48000000 G Auto M
32.0											<u> </u>
27.0											Freq Offs 0
22.0											
center 4	.960000	GHz							Span 5.	000 MHz	
Res BW				#V	BW 3.0 MI	IZ*		Sweep	1.00 ms (5	001 pts)	

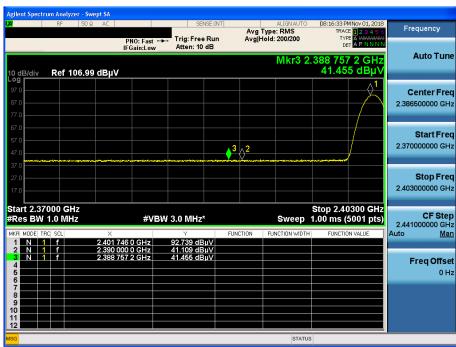
Unwanted Emissions (Radiated) Test Plot_Wireless Charging

TM3 & Lowest & X & Hor

Detector Mode : PK



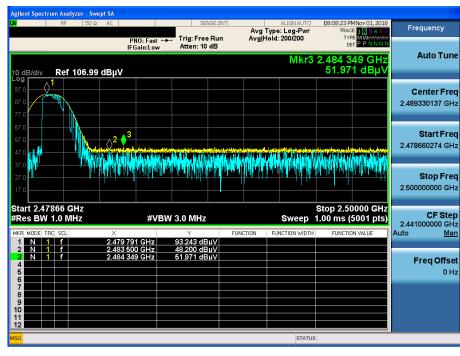
TM3 & Lowest & X & Hor





TM3 & Highest & X & Hor

Detector Mode : PK



TM3 & Highest & X & Hor





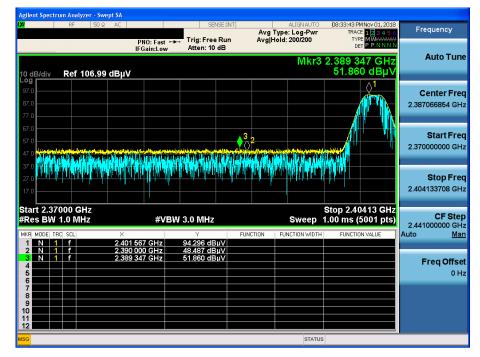
TM3 & Highest & X & Hor

XI	RF 50 G	2 AC			VSE:INT	Avg Type	ALIGN AUTO		1 2 3 4 5 6 A +++++++++++++++++++++++++++++++++++	Frequency
			PNO: Fast ↔ IFGain:Low	Trig: Free Atten: 6 d	iB	Avg Hold:		DE	APNNNN	Auto Tui
5 dB/div	Ref 66.99	dBµV					Mkr1	4.959 6 39.56	06 GHz 7 dBµV	Auto Tu
										Center Fr
62.0										4.96000000 G
57.0										Otort Er
52.0										Start Fr 4.957500000 G
47.0										Stop Fr
42.0				1						4.962500000 G
37.0	an a	ed dategited	tertile the state of the state	and the second street	line in the second	man the second secon	edulatelet and a sub-light	hafirthatentintensi	hjelonaar jaal vardal hi	CF Ste
32.0										2.441000000 G Auto <u>M</u>
32.0										
27.0										Freq Offs 0
22.0										
	.960000 GHz 1.0 MHz		#VBW	(3.0 MHz	5		Sweep	Span 5. 1.00 ms (:	000 MHz 5001 pts)	
ISG							STATUS			

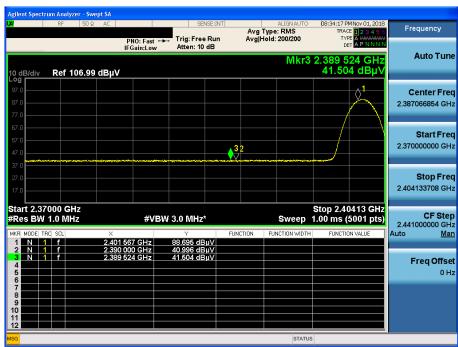
Dt&C

TM4 & Lowest & X & Hor

Detector Mode : PK



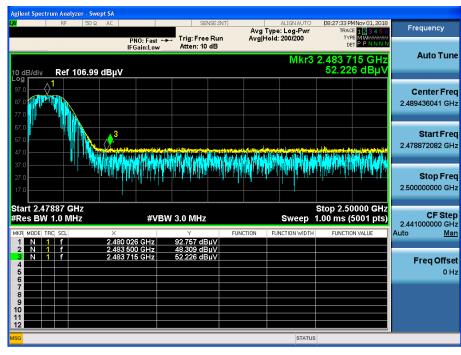
TM4 & Lowest & X & Hor



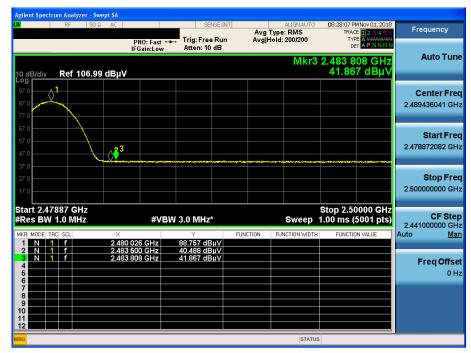


TM4 & Highest & X & Hor

Detector Mode : PK



TM4 & Highest & X & Hor





TM4 & Highest & X & Hor

