# **TEST REPORT**

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## 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: DRTFCC2006-0182					
2. Customer					
Name : LG Electronics USA, Inc.					
<ul> <li>Address : 111 Sylvan Avenue, North Building Englewood Cliffs, NJ 07632</li> </ul>					
3. Use of Report : FCC Original Grant					
4. Product Name / Model Name : Mobile Phone / LM-Q730BAW FCC ID : ZNFQ730BAW					
5. Test Method Used : KDB558074 D01v05r02, ANSI C63.10-2013					
Test Specification : FCC Part 15 Subpart C.247					
6. Date of Test : 2020.05.28 ~ 2020.06.09					
7. Location of Test : 🛛 Permanent Testing Lab					
8. Testing Environment : Refer to appended test report.					
9. Test Result : Refer to the attached test result.					
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.					
Tested by Reviewed by					
Affirmation Name : JungWoo Kim Statute Name : GeunKi Son (Signature)					
2020.06.25.					
DT&C Co., Ltd.					
Not abided by KS Q ISO / IEC 17025 and KOLAS accreditation.					

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



## **Test Report Version**

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2006-0182	Jun. 25, 2020	Initial issue	JungWoo Kim	GeunKi Son

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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
FAX	:	+ 82-31-321-1664

## **1.2 Test Environment**

Ambient Condition			
<ul> <li>Temperature</li> </ul>	+20 °C ~ +24 °C		
<ul> <li>Relative Humidity</li> </ul>	35 % ~ 44 %		

#### **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	0.9 dB (The confidence level is about 95 %, $k = 2$ )
AC conducted emission	3.6 dB (The confidence level is about 95 %, k=2)
Radiated spurious emission (1 GHz Below)	4.9 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.1 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	:	111 Sylvan Avenue, North Building Englewood Cliffs, NJ 07632
Contact person	:	Kyung-Su Han

## 1.5 Description of EUT

EUT	Mobile Phone
Model Name	LM-Q730BAW
Add Model Name	LM-Q730HA, LMQ730BAW, LMQ730HA, Q730BAW, Q730HA
Serial Number Identical prototype	
Power Supply DC 3.87 V	
Frequency Range	2 402 MHz ~ 2 480 MHz
Max. RF Output Power	6.25 dBm
Modulation Technique	GFSK
Antenna Specification	Antenna Type: PIFA Antenna Gain: -1 dBi (PK)

## **1.6 Declaration by the applicant / manufacturer**

N/A

## **1.7 Test Equipment List**

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N	
Spectrum Analyzer	Agilent Technologies	N9020A	20/02/26	21/02/26	MY46471251	
Spectrum Analyzer			19/12/16	20/12/16	MY48011700	
Spectrum Analyzer	Agilent Technologies	N9020A	19/12/16	20/12/16	MY48010133	
DC Power Supply	Agilent Technologies	66332A	19/12/16	20/12/16	US37476998	
Multimeter	FLUKE	17B	19/12/16	20/12/16	26030065WS	
Signal Generator	Rohde Schwarz	SMBV100A	19/12/16	20/12/16	255571	
Signal Generator	ANRITSU	MG3695C	19/12/16	20/12/16	173501	
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-1	
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-2	
Thermohygrometer	BODYCOM	BJ5478	19/06/25	20/06/25	N/A	
HYGROMETER	TESTO	608-H1	20/01/21	21/01/21	34862883	
Loop Antenna	Schwarzbeck	FMZB1513	20/02/19	22/02/19	1513-128	
BILOG ANTENNA	Schwarzbeck	VULB 9160	19/04/23	21/04/23	9160-3362	
Horn Antenna	ETS-Lindgren	3115	20/01/30	22/01/30	6419	
Horn Antenna	A.H.Systems Inc.	SAS-574	19/07/03	21/07/03	155	
PreAmplifier	tsj	MLA-0118-B01-40	19/12/16	20/12/16	1852267	
PreAmplifier	tsj	MLA-1840-J02-45	19/06/27	20/06/27	16966-10728	
PreAmplifier	H.P	8447D	19/12/16	20/12/16	2944A07774	
High Pass Filter Wainwright Instruments		WHKX12-935- 1000-15000-40SS	19/06/26	20/06/26	8	
High Pass Filter	Wainwright Instruments	WHKX10-2838- 3300-18000-60SS	19/06/26	20/06/26	1	
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5- 6SS	19/06/27	20/06/27	3	
Attenuator	Hefei Shunze	SS5T2.92-10-40	19/06/27	20/06/27	16012202	
Attenuator	SRTechnology	F01-B0606-01	19/06/27	20/06/27	13092403	
Attenuator	Aeroflex/Weinschel	20515	19/06/27	20/06/27	Y2370	
Attenuator	SMAJK	SMAJK-2-3	19/06/27	20/06/27	2	
Attenuator	SMAJK	SMAJK-50-10	19/06/25	20/06/25	15081903	
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A MA2490A	19/06/24	20/06/24	1306007 1249001	
EMI Receiver	ROHDE&SCHWARZ	ESW44	19/07/30	20/07/30	101645	
EMI Test Receiver	Rohde Schwarz	ESU	20/01/20	21/01/20	100538	
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	19/09/17	20/09/17	101333	
LISN	SCHWARZBECK	NSLK 8128 RC	19/11/04	20/11/04	8128 RC-387	
Cable	Junkosha	MWX241	20/01/13	21/01/13	G-04	
Cable	Junkosha	MWX241	20/01/13	21/01/13	G-07	
Cable	DT&C	Cable	20/01/13	21/01/13	G-13	
Cable	DT&C	Cable	20/01/13	21/01/13	G-14	
Cable	HUBER+SUHNER	SUCOFLEX 104	20/01/13	21/01/13	G-15	
Cable	Radiall	TESTPRO3	20/01/16	21/01/16	M-01	
Cable	Junkosha	MWX315	20/01/16	21/01/16	M-05	
Cable	Junkosha	MWX221	20/01/16	21/01/16	M-06	
Cable	Radiall	TESTPRO3	20/01/16	21/01/16	RF-92	
Cable DT&C			20/01/16		RF-82	

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 Limit		Test Condition	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 Watt		С	
15.247(d)	RSS-247 [5.5]	Out of Band Emissions / Band Edge	20 dBc in any 100 kHz BW	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 FCC 15.209 limits Emission Limits)		Radiated	C Note 3	
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 2: For ra	Note 1: <b>C</b> =Comply <b>NC</b> =Not Comply <b>NT</b> =Not Tested <b>NA</b> =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.					

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## 2. Test Methodology

The measurement procedures described in the ANSI C63.10-2013 and the guidance provided in KDB558074 D01v05r02 were used in measurement of the EUT.

The EUT was tested per the guidance of KDB558074 D01v05r02. 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 D01v05r02.

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 D01v05r02. 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. 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.

Test Mode	Description	Frequency [MHz]			
		Lowest Frequency	Middle Frequency	Highest Frequency	
TM 1	BT LE(1Mbps)	2 402	2 440	2 480	
TM 2	BT LE(2Mbps)	2 402	2 440	2 480	

#### 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**

- KDB558074 D01v05r02 Section 8.3.1.3
- ANSI C63.10-2013 Section 11.9.1.1

#### RBW ≥ DTS bandwidth

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	Testeu Channer	dBm	dBm
	Lowest	4.84	5.36
TM 1	Middle	6.05	6.25
	Highest	4.58	5.54
	Lowest	4.87	5.34
TM 2	Middle	6.07	6.24
	Highest	4.61	5.55

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.



TM 1 Test Channel : Lowest



#### **Peak Output Power**

TM 1 Test Channel : Middle



TM 1 Test Channel : Highest







#### **Peak Output Power**

TM 2 Test Channel : Middle





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

- KDB558074 D01v05r02 Section 8.2
- ANSI C63.10-2013 Section 11.8.2
- 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
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Test Mode	Tested Channel	Test Results [MHz]		
	Lowest	0.672		
TM 1	Middle	0.694		
	Highest	0.672		
	Lowest	1.183		
TM 2	Middle	1.176		
	Highest	1.156		

TM 1 Test Channel : Lowest



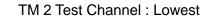
6 dB Bandwidth

#### TM 1 Test Channel : Middle



#### TM 1 Test Channel : Highest







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**

- KDB558074 D01v05r02 Section 8.4
- ANSI C63.10-2013 Section 11.10.2

#### 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 : 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	-10.94	
TM 1	Middle	-9.97	
	Highest	-10.80	
	Lowest	-13.33	
TM 2	Middle	-12.47	
	Highest	-13.16	

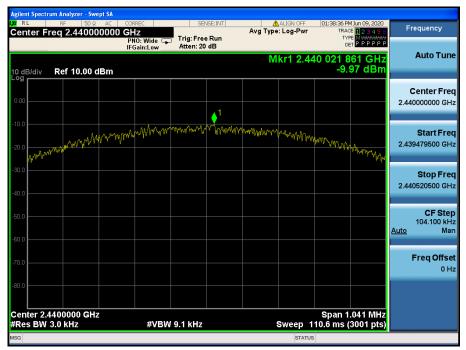
**Dt&C** 





#### Maximum PKPSD

TM 1 Test Channel : Middle



TM 1 Test Channel : Highest



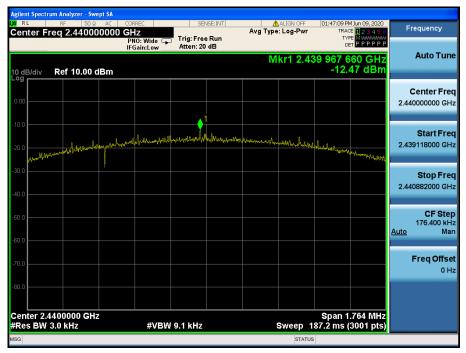
🛈 Dt&C





#### 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

- KDB558074 D01v05r02 Section 8.5
- ANSI C63.10-2013 Section 11.11

#### **Reference level measurement**

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  $\geq$  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 PSD level LIMIT LINE = 20 dB below of the reference level.

#### **Emission level measurement**

- 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 ≥ 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 spurious emission was 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	40 001
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 = 2 001 to get accurate emission level within 100 kHz BW.

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#### 3.4.3 Test Results

RL	<u>m Analyzer - Swe</u> RF 50 ຊ 'eq 2.40200	AC COR 10000 GH PN	Z O: Wide 😱	Trig: Free			ALIGN OFF	TRAC	M Jun 09, 2020 CE 1 2 3 4 5 6 PE M WWWWWW ET P P P P P P	F	requency
) dB/div	Ref 20.00 d		ain:Low	Atten: 30	dB	М	kr1 2.4	02 252 (	00 GHz 15 dBm		Auto Tun
0.0		Manhan			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		, 1-				Center Fre 2000000 G⊦
.00	reconcernent of the second sec							the second second		2.40	<b>Start Fre</b> 1496000 GH
).0 ).0										2.40	<b>Stop Fre</b> 2504000 GH
										<u>Auto</u>	CF Ste 100.800 kł Mi
											Freq Offs 0 I
0.0											
enter 2.4 Res BW	020000 GHz 100 kHz	2	#VBW	300 kHz			Sweep 1	Span 1 1.000 ms (	.008 MHz (3001 pts)		
3							STATU	s			

#### TM 1 Reference (Test Channel : Lowest)

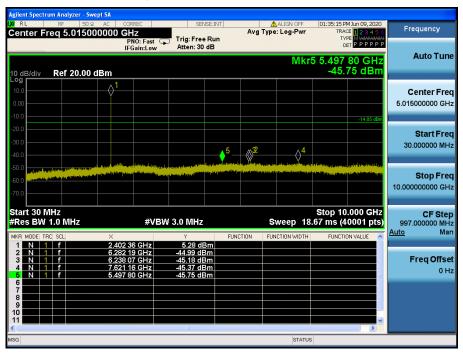
TM 1 Low Band-edge (Test Channel : Lowest)



Agilent Spectrum Analyzer - Swept					
Σα RL RF 50 Ω ΔΩ Center Freq 15.004500		SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	01:35:07 PM Jun 09, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency
10 dB/div Ref 20.00 dB	IFGain:Low	Atten: 30 dB		DET P P P P P P Vikr1 308.2 kHz -54.77 dBm	Auto Tune
10.0 0.00 -10.0				-14.85 dBm	Center Freq 15.004500 MHz
-20.0				- 19.05 050	Start Freq 9.000 kHz
-50.0 -60.0 -70.0	hind Alar wath man that his an	e can be an a fair and a start fair fair fair fair fair fair fair fair	lad shirtan to a survey and a survey of the	htsinninannanitähitsinduttaasinekkyöt	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz	#VBW	300 kHz	Sweep 5.3	Stop 30.00 MHz 33 ms (40001 pts)	<b>CF Step</b> 2.999100 MHz <u>Auto</u> Man
N         1         F           2	308.2 kHz	-54.77 dBm		PONCTION VALUE	<b>Freq Offset</b> 0 Hz
6 7 8 9 9 10					
<		Ш			
ISG			STATUS	L DC Coupled	

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

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



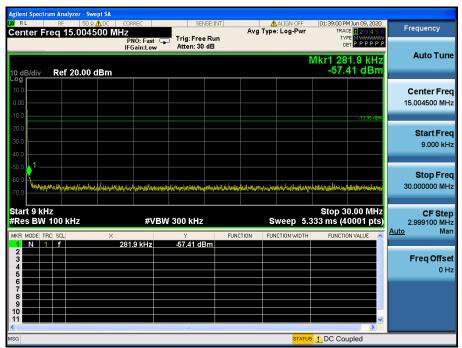
	Ω AC CORREC	SENSE:INT	🔥 ALIGN OFF	01:35:24 PM Jun 09, 2020	Frequency
enter Freq 17.50	DOOOOOOO GHz PNO: Fast G IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P P	
dB/div Ref 20.00	) dBm		Mkr3 2	4.944 125 GHz -30.47 dBm	Auto Tun
99 0.0 00 0.0				-14.85 dBm	Center Fre 17.500000000 G⊦
0.0		يون و موجود بر المراجع			Start Fre 10.000000000 GH
0.0					<b>Stop Fre</b> 25.000000000 GH
art 10.000 GHz Res BW 1.0 MHz	#VBI	N 3.0 MHz	Sweep 40	Stop 25.000 GHz .00 ms (40001 pts)	CF Ste 1.50000000 GF Auto Ma
	× 24.754 375 GHz	-30.25 dBm	VCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Huto</u> int
1 N 1 f 2 N 1 f 3 N 1 f 4	23.413 750 GHz 24.944 125 GHz	-30.26 dBm -30.47 dBm			
2 N 1 f	23.413 750 GHz				Freq Offs 0 F

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



#### TM 1 Reference (Test Channel : Middle)

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



	n Analyzer - S									
RL		Ω AC	CORREC	SENS	E:INT		ALIGN OFF e: Log-Pwr		PM Jun 09, 2020	Frequency
enter Fre	eq 5.0150	00000	PNO: Fast IFGain:Low	Trig: Free F Atten: 30 d		Ci A i Abi	e. Log-r wi	T		
0 dB/div	Ref 20.00	dBm					Mkr		00 GHz 52 dBm	Auto Tune
<b>°g</b> 10.0		\$ <sup>1</sup>							-13.95 dBm	Center Fre 5.015000000 GH
0.0 0.0 0.0					4¢	2 5_	A and a strategy of the strate			Start Fre 30.000000 MH
50.0 50.0 70.0							a kila para dan siran p			<b>Stop Fre</b> 10.000000000 GH
tart 30 Mi Res BW 1			#VE	W 3.0 MHz		s	weep 18	Stop 1 .67 ms (4	0.000 GHz 40001 pts)	CF Ste 997.000000 MH Auto Ma
KR         MODE         TRC           1         N         1           2         N         1           3         N         1           4         N         1           5         N         1           6         1         1	SCL f f f f f	5.80 7.10 5.01	40 25 GHz 52 45 GHz 54 53 GHz 15 25 GHz 09 00 GHz	6.13 dBr -45.27 dBr -45.31 dBr -45.43 dBr -45.52 dBr	n n n	CTION FUI	NCTION WIDTH	FUNCT	ION VALUE	Freq Offse 0 H
7 8 9 0 1										
									>	

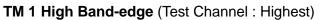
#### TM 1 Conducted Spurious Emissions 2 (Test Channel : Middle)

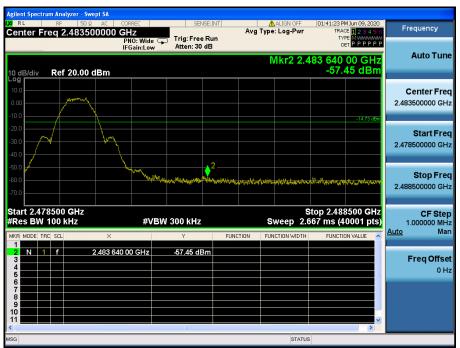
TM 1 Conducted Spurious Emissions 3 (Test Channel : Middle)





#### TM 1 Reference (Test Channel : Highest)

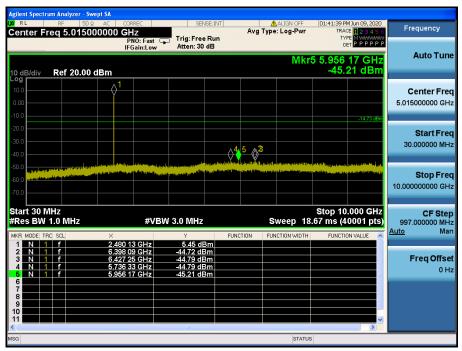




Agilent Spectrum Analyzer - Swej XI RL RF 50 Q		SENSE:INT	ALIGN OFF	01:41:30 PM Jun 09, 2020	
Center Freq 15.0045			Avg Type: Log-Pwr	TRACE 123456 TYPE MWWWWW DET PPPPP	Frequency
10 dB/div Ref 20.00 d		TREEL OF WE	1	/lkr1 300.7 kHz -56.00 dBm	Auto Tune
10.0 0.00 -10.0					Center Freq 15.004500 MHz
-20.0				-14.73 dBm	Start Freq 9.000 kHz
-50.0	nnyntuskytsiski, attiviskinnets	eretisterunteten productionen automatist	natolalitan antaantii sii aanayoo too ahayoo	wolfenhanikan miniskanan	<b>Stop Fred</b> 30.000000 MHz
Start 9 kHz #Res BW 100 kHz		/ 300 kHz	-	Stop 30.00 MHz 33 ms (40001 pts)	CF Step 2.999100 MH: Auto Mar
MKR         MODE         TRC         SCL           1         N         1         f	× 300.7 kHz	Y FUNC -56.00 dBm	TION FUNCTION WIDTH	FUNCTION VALUE	Freq Offse 0 H:
9 10 11 11 14 14 14 14 14 14 14 14 14 14 14		ш	STATUS	↓ DC Coupled	

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

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



	Ω AC CORREC	SENSE:INT	🛕 ALIGN OFF	01:41:47 PM Jun 09, 2020	Frequency
enter Freq 17.500	DOOOOOO GHZ PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P	
) dB/div Ref 20.00			Mkr3 2	4.086 875 GHz -30.80 dBm	Auto Tur
<b>29</b> 0.0 .00				-14.73 dĐm	Center Fre 17.500000000 Gi
0.0 0.0 0.0	المنافقة المراجع المراجع المراجع المراجع	and a subscription of the second seco			<b>Start Fr</b> 10.000000000 G
		and the second			<b>Stop Fr</b> 25.000000000 G
				Stop 25.000 GHz	
tart 10.000 GHz Res BW 1.0 MHz		3W 3.0 MHz	· · · · ·	.00 ms (40001 pts)	1.50000000 G
Res BW 1.0 MHz           R MODE         TRC         SCL           N         1         f           N         1         f           N         1         f           N         1         f           N         1         f	#VE 24.965 500 GHz 24.752 500 GHz 24.086 875 GHz		Sweep 40	FUNCTION VALUE	1.500000000 G <u>Auto</u> M Freq Offs
Res BW 1.0 MHz           IF MODE         TRC SCL           1         N         1           2         N         1	× 24.965 500 GHz 24.752 500 GHz	Y FL -29.88 dBm -30.60 dBm	· · · · ·	.00 ms (40001 pts)	CF Sta 1.50000000 G <u>Auto</u> M Freq Offs 0

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



#### TM 2 Reference (Test Channel : Lowest)

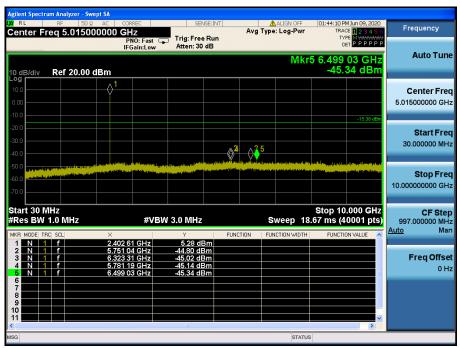
TM 2 Low Band-edge (Test Channel : Lowest)



₩ RL RF 50 2 <u>A</u> DC Center Freq 15.004500 M	CORREC	SENSE:INT				
	PNO: Fast 🗔	Trig: Free Run		ALIGN OFF	01:44:01 PM Jun 09, 2020 TRACE 1 2 3 4 5 6 TYPE M MMMMMM DET P P P P P P	Frequency
10 dB/div Ref 20.00 dBm	IFGain:Low	Atten: 30 dB		٢	Vkr1 296.9 kHz -56.29 dBm	Auto Tune
Log 10.0 0.00 -10.0					-15.38 dBm	Center Freq 15.004500 MHz
-20.0					-15,30 000	Start Freq 9.000 kHz
-60.0	( <sub>ป</sub> องสำนัญร่างประกาณระชาวอาร์อาร์อ	nhaliwihandushinanan	where the second of	Hayanga Lunyarihinga anga	d March Maryan and Anglanda and Anglanda	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz	#VBW	300 kHz	FUNCTION	Sweep 5.3	Stop 30.00 MHz 333 ms (40001 pts)	CF Step 2.999100 MHz Auto Man
1         N         1         F           2         3         -         -           3         -         -         -           4         -         -         -           5         -         -         -	296.9 kHz	-56.29 dBm				Freq Offset 0 Hz
6 8 9 9 10 10 10 10 10 10 10 10 10 10 10 10 10						
< MSG		III		STATUS	DC Coupled	

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

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



RL RF 50	Swept SA DΩ AC CORREC	SENSE:INT	ALIGN OFF	01:44:18 PM Jun 09, 2020	
enter Freq 17.50			Avg Type: Log-Pwr	TRACE 123456 TYPE MWWWWW DET P P P P P	Frequency
0 dB/div Ref 20.00			Mkr3 2	Auto Tun	
• g 10.0 0.00				-15.38 dBm	Center Fre 17.500000000 GH
40.0	Some law of the state of the product of the	ally sendered by the second			<b>Start Fre</b> 10.000000000 GH
50.0 70.0					<b>Stop Fre</b> 25.000000000 GH
tart 10.000 GHz Res BW 1.0 MHz	#VB	W 3.0 MHz	Sweep 40	Stop 25.000 GHz .00 ms (40001 pts)	CF Ste 1.50000000 GH
KR MODE TRC SCL	× 24.821 125 GHz	Y FI -30.36 dBm	JNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Ma
2 N 1 F 3 N 1 F 4 5	24.062 125 GHz 23.369 875 GHz	-31.23 dBm -31.53 dBm			<b>Freq Offse</b> 0 H
6 7 8 9					
1				~	

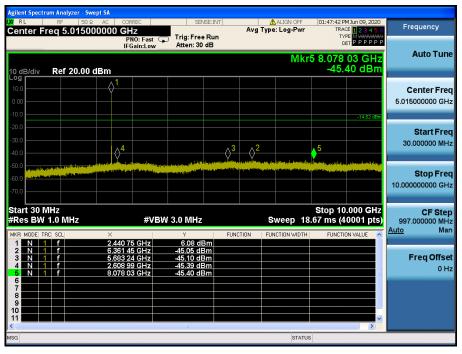
## TM 2 Conducted Spurious Emissions 3 (Test Channel : Lowest)



#### TM 2 Reference (Test Channel : Middle)

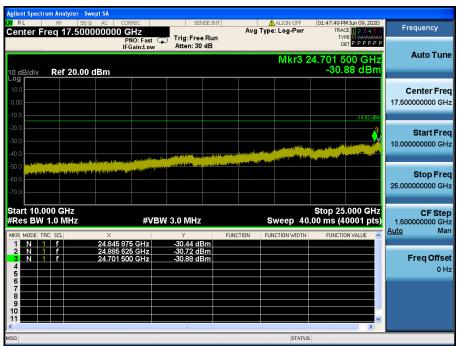
TM 2 Conducted Spurious Emissions 1 (Test Channel : Middle)

RL RF 50 Ω ▲ DC Center Freg 15.004500 I		SENSE:INT	ΑναΤι	ALIGN OFF	01:47:33 PM Jun 09, 2020 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast 😱 IFGain:Low	Trig: Free Run Atten: 30 dB		pe. Log i m		
0 dB/div Ref 20.00 dBm	Auto Tur					
• <b>9</b> 10.0 0.00 10.0					-14.52 dBm	Center Fre 15.004500 MH
20.0						Start Fre 9.000 kH
50.0 50.0 70.0 	there the second state of the s	Lyingaalii ในร่างไรรี่มาระการสารสารสารสาร	htter for the second state	Niphanan Arta Lapanay	ladaterry, constituted at the other characteristic	Stop Fre 30.000000 M⊦
tart 9 kHz Res BW 100 kHz		300 kHz			Stop 30.00 MHz 333 ms (40001 pts)	CF Ste 2.999100 MH Auto Ma
IKR MODE TRC SCL ×	312.7 kHz	-57.32 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Freq Offs
4       5       6       7       8						



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

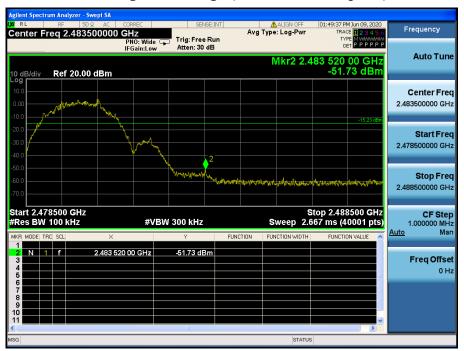
# TM 2 Conducted Spurious Emissions 3 (Test Channel : Middle)





# TM 2 Reference (Test Channel : Highest)

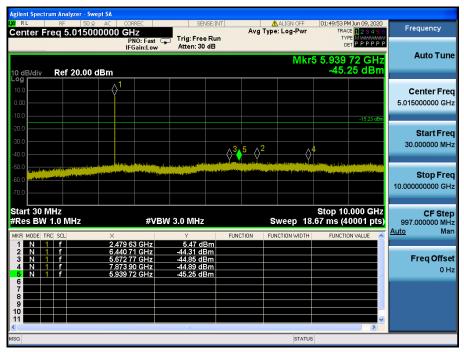
TM 2 High Band-edge (Test Channel : Highest)



enter F		າຂ <u>∧</u> ດເ   ແ 4500 MHz	DRREC		E:INT		ALIGN OFF : Log-Pwr	TRA	M Jun 09, 2020 CE 123456	Frequency
			PNO: Fast G Gain:Low	Trig: Free Atten: 30 o						Auto Tun
0 dB/div	Ref 20.0	0 dBm						-55.	65 dBm	
10.0										Center Fre
0.00 10.0										15.004500 M⊢
20.0									-15.23 dBm	Otest Fre
30.0										<b>Start Fre</b> 9.000 kH
40.0										
50.0 🔶 ' — 60.0 🖳										Stop Fre
70.0	the of the states of the state	andyktingskingel	reliter (hereiner icher	an in the second second second	فاور والإدر والموسط	in a subscription of the s	al mithing the state	taris/igtaphidrogram	Wywhatmhytere	30.000000 MH
tart 9 kH Res BW	lz 100 kHz		#VBV	N 300 kHz		s	weep 5.		0.00 MHz 0001 pts)	<b>CF Ste</b> 2.999100 MH
ikr mode ti		×		Y			NCTION WIDTH			<u>Auto</u> Ma
1 N 1 2 3	f	28	1.9 kHz	-55.65 dB	m					Freq Offse
4										0 H
6										
7 8 9 9										
7 8									~	

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

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



		DRREC	SENSE:INT		ALIGN OFF	01:50:02 PM Jun 09, 2020	Frequency
enter Freq 1		PNO: Fast 🗔	Trig: Free Run Atten: 30 dB	Avg Type	: Log-Pwr	TRACE 12345 ( TYPE MWWWWW DET PPPPP	
	I	Gain:Low	Atten: 30 dB		Mkr3 2	3.905 750 GHz	Auto Tur
odB/div Ref	20.00 dBm					-30.34 dBm	
0.0							Center Fre
							17.500000000 GH
0.0						-15.23 dBm	
0.0							Otort Err
0.0							Start Fre 10.000000000 GH
0.0				a particular and an a particular and and	a ta faile a fa		10.0000000000
			Statistics of the state of the				
0.0							Stop Fre
0.0							25.00000000 Gł
	87					Stop 25.000 GHz	
		#VBW	/ 3.0 MHz	S	weep 40	.00 ms (40001 pts)	1.50000000 GI
Res BW 1.0 N		#VBW	/ 3.0 MHz		ICTION WIDTH	.00 ms (40001 pts)	
Res BW 1.0 N	ЛНZ × 24.867 24	50 GHz	۲ -29.59 dBm		· · ·	· · · · ·	
Res BW 1.0 N KR MODE TRC SCL 1 N 1 f 2 N 1 f	ЛНz ×	50 GHz 25 GHz	Y		· · ·	· · · · ·	Auto Ma
Res BW 1.0 N KR MODE TRC SCL 1 N 1 f 2 N 1 f	ЛНZ 24.867 24 24.960 62	50 GHz 25 GHz	-29.59 dBm -29.95 dBm		· · ·	· · · · ·	Auto Ma Freq Offs
2 N 1 f 3 N 1 f 4	ЛНZ 24.867 24 24.960 62	50 GHz 25 GHz	-29.59 dBm -29.95 dBm		· · ·	· · · · ·	Auto Ma Freq Offs
Res         BW         1.0 M           KR         MODE         TRC         SCL           1         N         1         f           2         N         1         f           3         N         1         f           4         -         -         -           5         -         -         -           6         -         -         -           7         -         -         -	ЛНZ 24.867 24 24.960 62	50 GHz 25 GHz	-29.59 dBm -29.95 dBm		· · ·	· · · · ·	Auto Ma Freq Offs
Res         BW         1.0 M           KR         MODE         TRC         SCL           1         N         1         f           2         N         1         f           3         N         1         f           5         5         5           6         7         7           8         9         9	ЛНZ 24.867 24 24.960 62	50 GHz 25 GHz	-29.59 dBm -29.95 dBm		· · ·	· · · · ·	Auto Ma Freq Offs
Res         BW         1.0         N           1         N         1         f           2         N         1         f           3         N         1         f           4         -         -         -           5         -         -         -           6         -         -         -           7         -         -         -         -	ЛНZ 24.867 24 24.960 62	50 GHz 25 GHz	-29.59 dBm -29.95 dBm		· · ·	· · · · ·	

# 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 MHz ~ 72 MHz, 76 MHz ~ 88 MHz, 174 MHz ~ 216 MHz or 470 MHz ~ 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 frequency bands listed below :

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.414 25 ~ 8.414 75	108 ~ 121.94	1 300 ~ 1 427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1 435 ~ 1 626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.173 5 ~ 2.190 5	12.519 75 ~ 12.520 25	149.9 ~ 150.05	1 645.5 ~ 1 646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.576 75 ~ 12.577 25	156.524 75 ~ 156.525 25	1 660 ~ 1 710	8.025 ~ 8.5	22.01 ~ 23.12
4.177 25 ~ 4.177 75	13.36 ~ 13.41	156.7 ~ 156.9	1 718.8 ~ 1 722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.207 25 ~ 4.207 75	16.42 ~ 16.423	162.0125 ~ 167.17	2 200 ~ 2 300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.694 75 ~ 16.695 25	167.72 ~ 173.2	2 310 ~ 2 390	10.6 ~ 12.7	36.43 ~ 36.5
6.267 75 ~ 6.268 25	16.804 25 ~ 16.804 75	240 ~ 285	2 483.5 ~ 2 500	13.25 ~ 13.4	Above 38.6
6.311 75 ~ 6.312 25	25.5 ~ 25.67	322 ~ 335.4	2 690 ~ 2 900		
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3 260 ~ 3 267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3 332 ~ 3 339		
8.376 25 ~ 8.386 75	74.8 ~ 75.2	960 ~ 1 240	3 345.8 ~ 3 358		
			3 600 ~ 4 400		

• 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 1 000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 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.

- KDB558074 D01v05r02 Section 8.6
- ANSI C63.10-2013 Section 11.12
- 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 <sub>on</sub> (ms)	T <sub>on</sub> + T <sub>off</sub> (ms)	DCF = 10 log(1 / Duty) (dB)
TM 1	85.20	2.130	2.500	0.70
TM 2	57.04	1.070	1.876	2.44

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

# 3.5.3 Test Results

#### - Test Notes

- 1. The radiated emissions were investigated 9 kHz to 25 GHz. And no other spurious and harmonic emissions were found below 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,

DCF = Duty Cycle Correction Factor.

# Frequency Range : 9 kHz ~ 25 GHz \_TM 1\_Nomal

# Lowest Channel

Frequency (MHz)	ANT Pol	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)
2 389.89	Н	Х	PK	49.79	4.80	N/A	N/A	54.59	74.00	19.41
2 388.59	Н	Х	AV	39.35	4.80	0.70	N/A	44.85	54.00	9.15
4 804.05	Н	Z	PK	49.27	0.78	N/A	N/A	50.05	74.00	23.95
4 803.75	Н	Z	AV	38.77	0.78	0.70	N/A	40.25	54.00	13.75

#### Middle Channel

Frequency (MHz)	ANT Pol	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)
4 880.18	Н	Z	PK	49.89	1.32	N/A	N/A	51.21	74.00	22.79
4 879.56	Н	Z	AV	39.56	1.30	0.70	N/A	41.56	54.00	12.44

# Highest Channel

Frequency (MHz)	ANT Pol	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)
2 483.73	Н	Х	PK	48.96	5.25	N/A	N/A	54.21	74.00	19.79
2 483.76	Н	Х	AV	39.11	5.25	0.70	N/A	45.06	54.00	8.94
4 959.95	Н	Z	PK	49.54	1.61	N/A	N/A	51.15	74.00	22.85
4 959.63	Н	Z	AV	38.87	1.61	0.70	N/A	41.18	54.00	12.82

# Frequency Range : 9 kHz ~ 25 GHz \_TM 2\_Nomal

# Lowest Channel

Frequency (MHz)	ANT Pol	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)
2 388.84	Н	Х	PK	49.56	4.80	N/A	N/A	54.36	74.00	19.64
2 389.25	Н	Х	AV	39.06	4.80	2.44	N/A	46.30	54.00	7.70
4 804.28	Н	Z	PK	49.05	0.78	N/A	N/A	49.83	74.00	24.17
4 804.38	Н	Z	AV	38.86	0.78	2.44	N/A	42.08	54.00	11.92

# Middle Channel

Frequency (MHz)	ANT Pol	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)
4 879.97	Н	Z	PK	49.30	1.31	N/A	N/A	50.61	74.00	23.39
4 879.58	Н	Z	AV	39.18	1.31	2.44	N/A	42.93	54.00	11.07

# Highest Channel

Frequency (MHz)	ANT Pol	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)
2 483.54	Н	Х	PK	49.69	5.25	N/A	N/A	54.94	74.00	19.06
2 483.63	Н	Х	AV	40.17	5.25	2.44	N/A	47.86	54.00	6.14
4 959.76	Н	Z	PK	49.35	1.61	N/A	N/A	50.96	74.00	23.04
4 959.77	Н	Z	AV	38.98	1.61	2.44	N/A	43.03	54.00	10.97



#### 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  $\mu$ H/50 ohms line impedance stabilization network (LISN).

	Conducted I	₋imit (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.

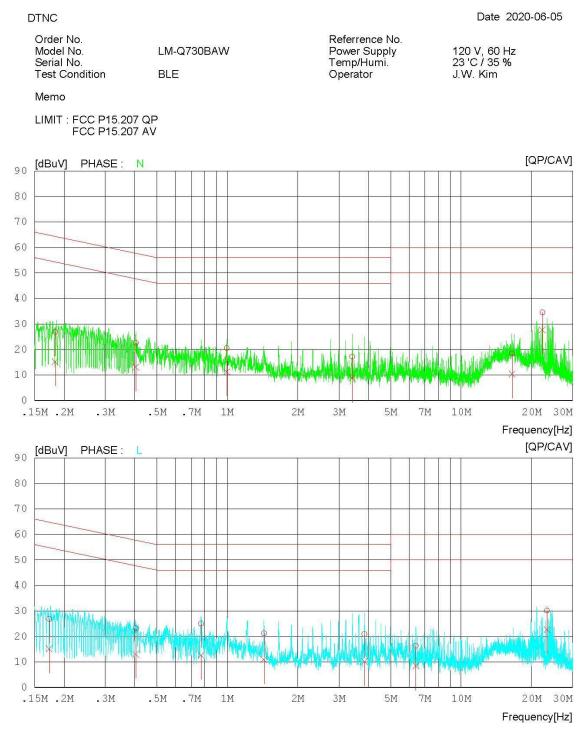
- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- 2. The EUT was connected 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

Refer to the next page. (The worst case data was reported. The worst data is TM 1 & Middle)

# AC Line Conducted Emissions (Graph)

# **Results of Conducted Emission**



DTNC

# AC Line Conducted Emissions (List)

# **Results of Conducted Emission**

Date 2020-06-05

Order No. Model No. Serial No. Test Condition			LM-Q730BAW BLE					Referrence No. Power Supply Temp/Humi. Operator			120 V, 60 Hz 23 'C / 35 % J.W. Kim		
Memo	)												
LIMIT	: FCC P15 FCC P15	and a state of the											
NO	FREQ	READI	ING CAV	C.FACTOR				IMIT CAV		MARGIN P CAV	PHASE		
	[MHz]	QP [dBuV][		[dB]	QP CA [dBuV][dI		QP [dBu\	/] [dBuV		P CAV uV][dBuV	]		
1	0.18361	17.03	5.23	9.95	26.9815.	18	64.32	54.32	37.3	4 39.14	N		
2	0.40607	12.64	3.12	9.98	22.6213.	10	57.73	47.73	35.1	134.63	Ν		
3	0.99484	10.63	1.26	9.98	20.6111.	24	56.00	46.00	35.3	934.76	Ν		
4	3.42641	7.11 -	1.33	10.09	17.20 8.	76	56.00	46.00		0 37.24	N		
	16.51526	7.87 -		10.49	18.3610.		60.00	50.00	41.6	439.57	Ν		
0.000	22.27455	Contraction and the second	ALC: 10.13.2 MINES	10.55	34.5727.	710750	60.00	50.00		3 22.35	Ν		
7	0.17306		5.22	9.94	26.8015.	1000	64.81	54.81	- 이곳이곳 - 이상자(	139.65	L		
8	0.40628		3.16	9.96	23.1713.		57.72	47.72		534.60	L		
9	0.77219		2.65	9.97	24.9712.		56.00	46.00		3 33.38	L		
10	1.43492	ALCONOMIC ACCOUNTS OF	0.89	10.00	21.24 10.		56.00	46.00		635.11	L		
11	3.85974			10.11	20.9110.		56.00	46.00		935.91	L		
12	6.39951			10.18	16.37 8.		60.00	50.00		3 41.62	L		
13	23.28951	19.501.	2.25	10.53	30.0322.	18	60.00	50.00	29.9	7 27.22	L		

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# 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

-NA

# 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

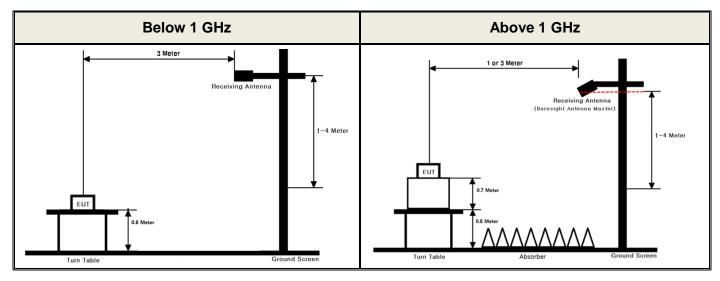
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient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

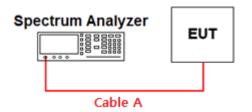
# **APPENDIX I**

# Test set up diagrams

## Radiated Measurement



#### Conducted Measurement



#### Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	0.34	15	3.68
1	0.97	20	4.78
2.402 & 2.440 & 2.480	1.52	25	5.96
5	1.94	-	-
10	2.74	-	-

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

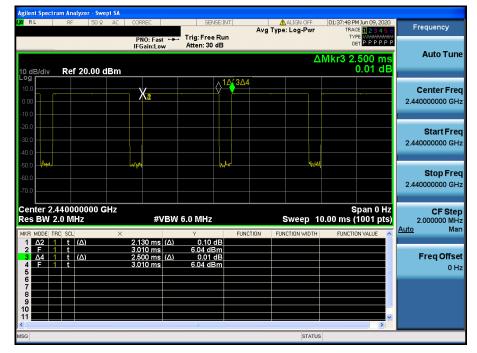
#### Duty Cycle was measured using Section 6.0 b) of KDB558074 D01v05r02 :

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**

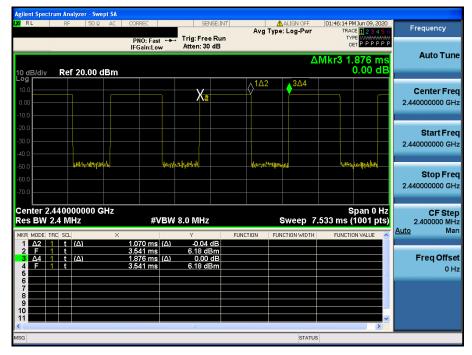
#### TM 1 Test Channel : Middle





**Duty Cycle** 

#### TM 2 Test Channel : Middle

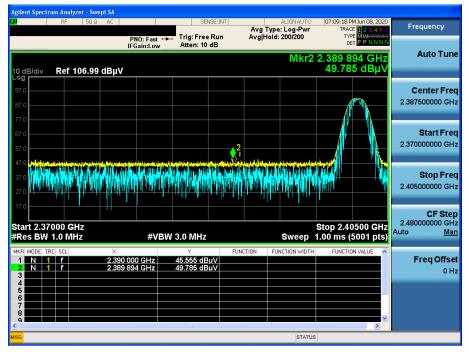


**Detector Mode : PK** 

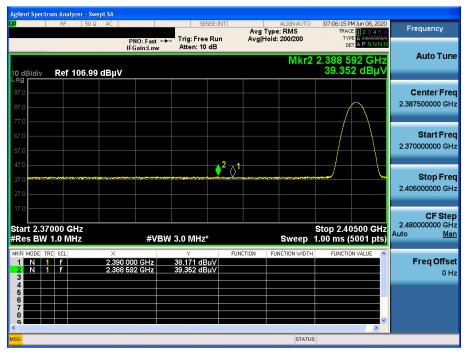
# **APPENDIX III**

# **Unwanted Emissions (Radiated) Test Plot**

# TM1 & Lowest & X & Hor



#### TM1 & Lowest & X & Hor

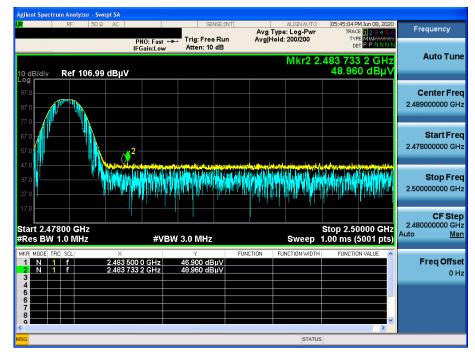




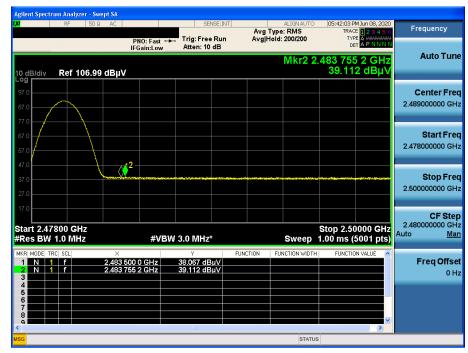
#### TM1 & Highest & X & Hor

**Dt&C** 

**Detector Mode : PK** 



#### TM1 & Highest & X & Hor





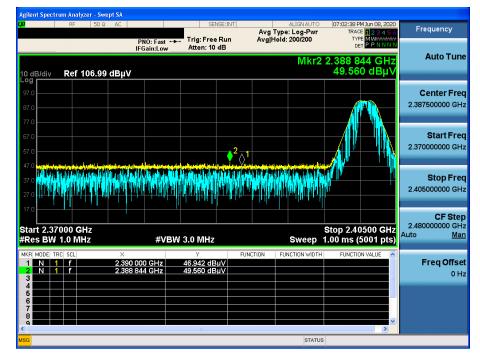
#### TM1 & Middle & Z & Hor

<b>u</b>		Analyzer RF	50 Ω				SENSE:INT		ALIGN AUTO		M Jun 08, 2020	Eregueneu
					PNO: Fast IFGain:Low	Trig: F Atten:	ree Run 6 dB	Avg Type Avg Hold:		TYP	E 1 2 3 4 5 6 E A WWWWW T A P N N N N	Frequency
5 dB/di	iv R	lef 66.	99 d	BμV					Mkr1	4.879 5 39.55	62 GHz 9 dBµV	Auto Tu
												Center Fi
62.0 —												4.880000000
57.0												
52.0												Start F 4.877500000 0
47.0 —												Stop Fi
42.0 —						î1						4.882500000 0
37.0	(Maran	alaya (sariya)	<b>witch</b>	denangui	han managementer	and a break the second	ter Barrel for the street	hand the state of the	wainterform	a lang side and said to be	n an the second second	CF S
												2.44000000 0 Auto
32.0 —												
27.0												Freq Off
22.0 -												0
	r 4.880 BW 1.0				#VE	W 3.0 MI	lz*		Sweep	Span 5. 1.00 ms (	000 MHz 5001 pts)	
ISG									STATUS			

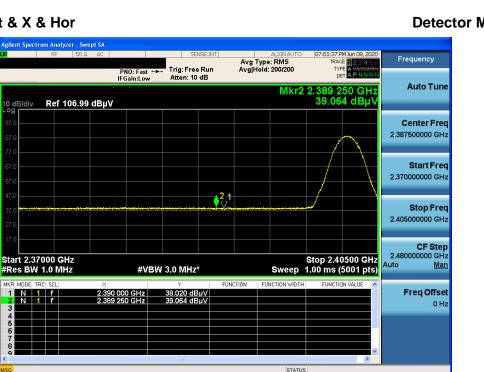
#### TM2 & Lowest & X & Hor

🛈 Dt&C

**Detector Mode : PK** 



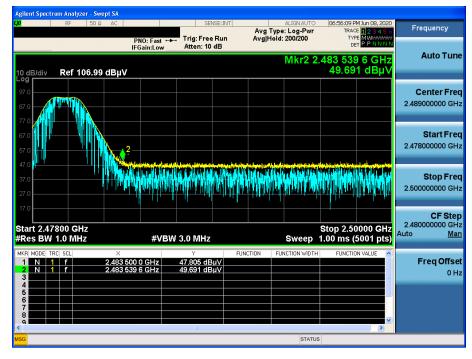
#### TM2 & Lowest & X & Hor





# TM2 & Highest & X & Hor

#### **Detector Mode : PK**



#### TM2 & Highest & X & Hor





# TM2 & Highest & Z & Hor

KI	RF	50Ω AC		SENSE:INT		ALIGN AUTO	07:31:11 PM Jun 08, 20 TRACE 1 2 3 4 5	
	_		PNO: Fast ↔ IFGain:Low	Trig: Free Run Atten: 6 dB	Avg Hol	d: 200/200	DET A P N N N	
dB/div	Ref 6	6.99 dBµV				Mkr1	4.959 769 GH 38.979 dBµ	z Auto Tui V
								Center Fr
62.0								4.960000000 G
57.0								
52.0								Start Fr 4.957500000 G
47.0								Stop Fr
42.0				1				4.962500000 G
37.0	whendadaya	rdiplinisti antarretti		Hadriden Harristoner	had an		ni na mana na falika na mana na falimpada na	CF St
32.0								2.480000000 G Auto <u>N</u>
								Freq Offs
27.0								0
22.0								
	.960000 / 1.0 MH		#VBV	/ 3.0 MHz*		Sweep	Span 5.000 MH 1.00 ms (5001 pts	Z S)
ISG						STATUS		