TEST REPORT

DT&C Co., Ltd.

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1.	Report No	:	DRTFCC1912-0312
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Dt&C

- 2. Customer
 - Name (FCC) : HYUNDAI MOBIS CO., LTD. / Name (IC) : Hyundai MOBIS Co., Ltd
 - Address (FCC) : 203, Teheran-ro Gangnam-gu, Seoul, South Korea 135-977
 Address (IC) : 203, Teheran-ro Gangnam-gu Seoul 135-977 Korea (Republic Of)
- 3. Use of Report : FCC & IC Original Grant
- 4. Product Name / Model Name : DISPLAY CAR SYSTEM / DA330S8AN(FCC), DA330S8KN(IC) FCC ID : TQ8-DA330S8AN / IC : 5074A-DA330S8KN
- 5. Test Method Used : KDB558074 D01v05r02, ANSI C63.10-2013 Test Specification : FCC Part 15.247

RSS-247 Issue 2, RSS-GEN Issue 5

- 6. Date of Test : 2019.11.04 ~ 2019.11.20
- 7. Testing Environment : See appended test report.
- 8. Test Result : Refer to the attached test result.

Affirmation	Tested by	<u> </u>	Reviewed by	He.
Ammadon	Name : JungWoo Kim	(Autor)	Name : JaeJin Lee	(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.

2019.12.09.

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	Tested by	Reviewed by
DRTFCC1912-0312	Dec. 09, 2019	Initial issue	JungWoo Kim	JaeJin Lee



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1. EUT DESCRIPTION

FCC Equipment Class	Digital Transmission System(DTS)
Product	DISPLAY CAR SYSTEM
Model Name(FCC)	DA330S8AN
Model Name(IC)	DA330S8KN
Add Model Name	NA
Hardware Version	1.0
Software Version	1.0
Serial Number	Radiated: 96160-38710 Conducted: 96160-S8710
Power Supply	DC 14.4 V
Frequency Range	• 802.11b/g/n(20 MHz) : 2412 MHz ~ 2462 MHz
Max. RF Output Power	2.4GHz Band • 802.11b : 14.27 dBm • 802.11g : 21.26 dBm • 802.11n (HT20) : 20.98 dBm
Modulation Type	• 802.11b: CCK, DSSS • 802.11g/n: OFDM
Antenna Specification	Antenna type: PCB Pattern Antenna Antenna gain: -0.01 dBi

2. INFORMATION ABOUT TESTING

2.1 Test mode

Test	Worst case data rate	Tested Frequency(MHz)		
mode		Lowest Middle		Highest
TM 1	802.11b 1 Mbps	2412	2437	2462
TM 2	802.11g 6 Mbps	2412	2437	2462
TM 3	802.11n(HT20) MCS 0	2412	2437	2462

Note 1: The worst case data rate is determined as above test mode according to the power measurements. Note 2: The power measurement results for all modes and data rate were reported.

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.3 Tested environment

Temperature	:	20 °C ~ 25 °C
Relative humidity content	:	35 % ~ 45 %
Details of power supply	:	DC 14.4 V

2.4 EMI suppression Device(s) / Modifications

EMI suppression device(s) added and/or modifications made during testing \rightarrow None

2.5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C 63.4-2014 and ANSI C 63.10-2013. 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	0.7 dB (The confidence level is about 95 %, $k = 2$)
Conducted spurious emission	1.0 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 %, $k = 2$)

3. SUMMARY OF TESTS

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 %)	RSS-Gen(6.7)		С
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	С
15.207	RSS-Gen [8.8]	AC Line Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NA Note3
15.203	RSS-Gen [8.3]	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 device is installed in a car. Therefore the power source is a battery of car.

4. 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.

4.1 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.

4.2 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.

4.3 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.

4.4 Description of test modes

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics. A test program is used to control the EUT for staying in continuous transmitting mode.

Operation test setup for EUT

- Test Software Version: BI3.GEN.001
- Power setting: Default of EUT



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.

6. FACILITIES AND ACCREDITATIONS

6.1 Facilities

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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

- IC Test site No. : 5740A

www.dtnc.net	-	
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

6.2 Equipment

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, loop, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

7. ANTENNA REQUIREMENTS

7.1 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 internal antenna is printed on the PCB. Therefore this E.U.T Complies with the requirement of §15.203



8. TEST RESULT

8.1 6dB bandwidth

Test Requirements and limit, §15.247(a)

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

The minimum permissible 6 dB bandwidth is 500 kHz.

Test Configuration:

Refer to the APPENDIX I.

Test Procedure:

- 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. 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.

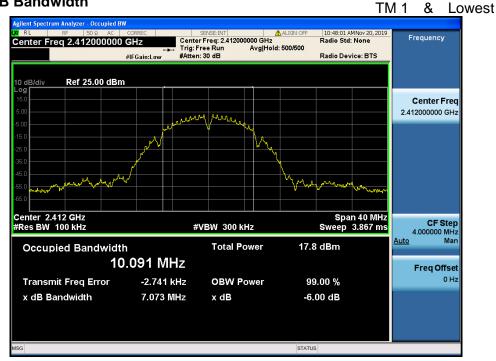
Test Results: Comply

Test Mode	Frequency	Test Results[MHz]
	Lowest	7.07
TM 1	Middle	7.10
	Highest	7.11
	Lowest	16.08
TM 2	Middle	16.32
	Highest	16.35
	Lowest	17.29
ТМ 3	Middle	17.32
	Highest	17.06



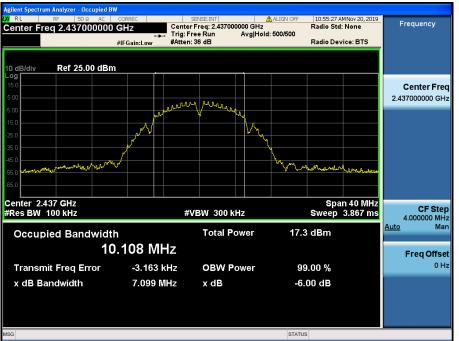
RESULT PLOTS

6 dB Bandwidth



6 dB Bandwidth

TM 1 & Middle



TM 1 & Highest gilent Spectrum Analyzer - Occupied BW CHZ Center Freq: 2.46200000 GHz Trig: Freq Run Avg|Hold: 500/500 #IFGain:Low #Atten: 36 dB 11:15:04 AM Nov 20, 2019 Radio Std: None Frequency Center Freq 2.462000000 GHz Radio Device: BTS Ref 25.00 dBm B/div .oa **Center Freq** 2.462000000 GHz MARIN LAR. 4 Center 2.462 GHz #Res BW 100 kHz Span 40 MHz Sweep 3.867 ms CF Step 4.000000 MHz Man #VBW 300 kHz <u>Auto</u> **Occupied Bandwidth** Total Power 17.0 dBm 10.094 MHz Freq Offset **OBW Power** 0 Hz Transmit Freq Error -1.757 kHz 99.00 % x dB Bandwidth 7.112 MHz x dB -6.00 dB STATUS

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6 dB Bandwidth





TM 2 & Highest gilent Spectrum Analyzer - Occupied BW CHZ Center Freq: 2.46200000 GHz Trig: Freq Run Avg|Hold: 500/500 #IFGain:Low #Atten: 30 dB 12:02:48 PM Nov 20, 2019 Radio Std: None Frequency Center Freq 2.462000000 GHz Radio Device: BTS Ref 20.00 dBm B/div .oa **Center Freq** 2.462000000 GHz A 1 Mundae. ο_{NA} Center 2.462 GHz #Res BW 100 kHz Span 40 MHz Sweep 3.867 ms CF Step 4.000000 MHz Man #VBW 300 kHz <u>Auto</u> **Occupied Bandwidth** Total Power 16.5 dBm 16.415 MHz Freq Offset 0 Hz Transmit Freq Error -4.619 kHz **OBW** Power 99.00 % x dB Bandwidth 16.35 MHz x dB -6.00 dB STATUS

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6 dB Bandwidth





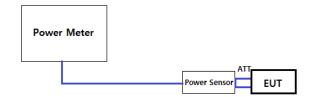
TM 3 & Highest gilent Spectrum Analyzer - Occupied BW CHZ Center Freq: 2.46200000 GHz Trig: Freq Run Avg|Hold: 500/500 #IFGain:Low #Atten: 30 dB 01:12:14 PM Nov 20, 2019 Radio Std: None Frequency Center Freq 2.462000000 GHz Radio Device: BTS Ref 20.00 dBm B/div **Center Freq** 2.462000000 GHz 0 Å A A Un travelle Center 2.462 GHz #Res BW 100 kHz Span 40 MHz Sweep 3.867 ms CF Step 4.000000 MHz Man #VBW 300 kHz <u>Auto</u> **Occupied Bandwidth** Total Power 16.1 dBm 17.601 MHz Freq Offset 0 Hz Transmit Freq Error 8.496 kHz **OBW** Power 99.00 % x dB Bandwidth 17.06 MHz x dB -6.00 dB STATUS

8.2 Maximum peak conducted output power

Test Requirements and limit, §15.247(b)

The maximum permissible conducted output power is 1 Watt.

Test Configuration



Test Procedure

1. PKPM1 Peak power meter method of KDB558074 D01V05R02

The maximum conducted output powers were measured using a broadband peak RF power meter which has greater video bandwidth than DUT's DTS bandwidth and utilize a fast-responding diode detector.

2. Method AVGPM-G (Measurement using a gated RF average power meter) of KDB558074 D01V05R02

The average conducted output powers were measured using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.



Test Results: Comply

F ree at			Maxim	um Peak Co	nducted Ou	tput Power	(dBm) for <u>8</u>	02.11b	
Freq. (MHz)	Det.								
		1	2	5.5	11	-	-	-	-
2412	PK	14.27	14.02	13.71	13.96	-	-	-	-
2412	AV	10.87	10.76	10.79	10.80	-	-	-	-
2437	PK	13.74	13.65	13.52	13.53	-	-	-	-
2437	AV	10.46	10.37	10.38	10.38	-	-	-	-
2462	PK	13.69	13.48	13.46	13.60	-	-	-	-
2402	AV	10.40	10.31	10.33	10.33	-	-	-	-

F ree r		Maximum Peak Conducted Output Power (dBm) for <u>802.11g</u>										
Freq. (MHz)	Det.				e [Mbps]							
		6	9	12	18	24	36	48	54			
2412	PK	21.26	21.16	20.65	20.01	19.38	19.73	19.31	18.48			
2412	AV	11.27	11.23	11.21	10.54	10.77	10.75	10.92	10.42			
2437	PK	20.79	20.69	20.17	19.54	18.91	19.30	18.88	18.05			
2437	AV	10.67	10.63	10.63	9.94	10.21	10.19	10.37	9.88			
2462	PK	20.88	20.82	20.31	19.68	19.04	19.41	18.99	18.15			
2402	AV	10.59	10.55	10.56	9.89	10.13	10.12	10.30	9.80			

F ree or		Maximum Peak Conducted Output Power (dBm) for <u>802.11n(HT20)</u> Data Rate [MCS]									
Freq. (MHz)	Det.										
		0	1	2	3	4	5	6	7		
2412	PK	20.97	20.06	20.12	20.41	20.13	20.26	20.47	20.42		
2412	AV	10.59	10.41	10.53	10.55	10.51	10.53	10.47	10.35		
2437	PK	20.56	19.64	19.73	20.04	19.77	19.92	20.13	20.08		
2437	AV	10.08	9.92	10.06	10.08	10.04	10.08	10.05	9.94		
2462	PK	20.98	20.07	20.14	20.44	20.17	20.32	20.55	20.52		
2402	AV	10.03	9.86	9.99	10.01	9.97	10.00	9.94	9.84		

8.3 Maximum power spectral density

Test requirements and limit, §15.247(e)

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.

Test Configuration:

Refer to the APPENDIX I.

Test Procedure

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

Method PKPSD (peak PSD)

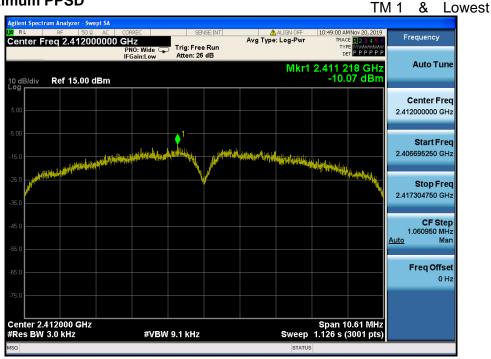
- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. Set the span to **1.5 times** the DTS bandwidth.
- 3. Set the RBW to : $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
- 4. Set the VBW \geq 3 x RBW
- 5. Detector = **Peak**
- 6. Sweep time = **Auto couple**
- 7. Trace mode = **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.

Test Results: Comply

Test Mode	Frequency	RBW	PKPSD [dBm]
	Lowest	3 kHz	-10.07
TM 1	Middle	3 kHz	-10.94
	Highest	3 kHz	-11.86
	Lowest	3 kHz	-12.49
TM 2	Middle	3 kHz	-13.33
	Highest	3 kHz	-12.92
	Lowest	3 kHz	-13.80
TM 3	Middle	3 kHz	-14.00
	Highest	3 kHz	-13.64

RESULT PLOTS





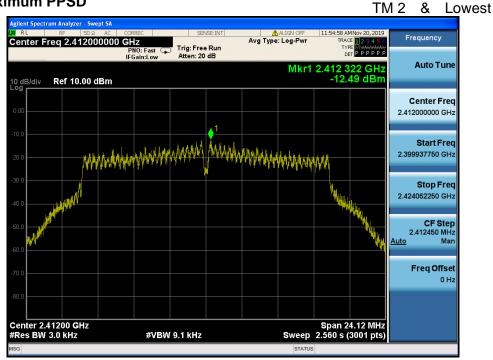
Maximum PPSD

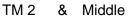
TM 1 & Middle





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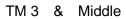


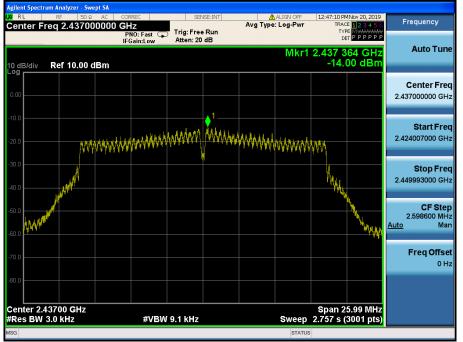




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8.4 Out of band emissions at the band edge / conducted spurious emissions

Test requirements and limit, §15.247(d)

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

Test Configuration:

Refer to the APPENDIX I.

Test Procedure

- 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.

- 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 \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 spurious emission was tested with below settings. **Frequency range: 9 kHz ~ 30 MHz** RBW = 100 kHz, VBW = 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

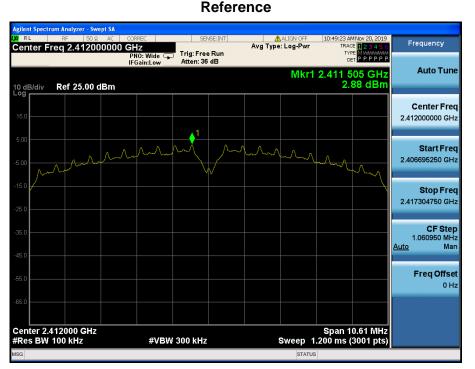
Frequency range: 30 MHz ~ 10 GHz, 10 GHz ~25 GHz RBW = 1 MHz, VBW = 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)

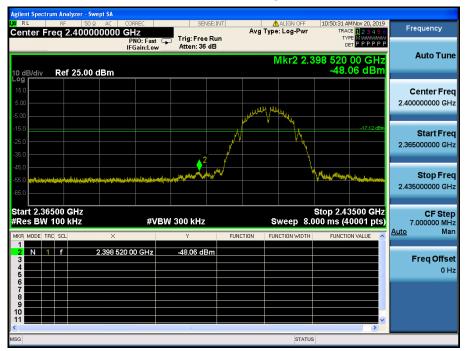
If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

RESULT PLOTS

TM 1 & Lowest



Low Band-edge



	um Analyzer - S									
Center Fi	RF 50 req 15.004	1500 MHz			BE:INT		ALIGN OFF	TRAC	4Nov 20, 2019 E 123456	Frequency
			PNO: Fast ⊂ FGain:Low	Atten: 36					е Милиини ТРРРРРР	Auto Tune
10 dB/div	Ref 25.00) dBm						49.5 Wkr1	2.7 kHz 53 dBm	Auto Tune
Log 15.0										Center Freq
5.00										15.004500 MHz
-5.00									-17.12 dBm	
-25.0										Start Freq
-35.0										9.000 kHz
-45.0 🔶 1										Stop Freq
-55.0	magistrangendsagilary	problem of the birth process of the	den and the contemption	hannowshipphatois	teis in the state of the	hannana	فالمدور والمجارية والمرود والمرود والم	Anatoinette Character		30.000000 MHz
Start 9 k⊦ #Res BW			#VB	W 300 kHz		s	weep 5.3	Stop 30 333 ms (40	0.00 MHz 0001 pts)	CF Step 2.999100 MHz
MKR MODE TH		×		Y			NCTION WIDTH	FUNCTIO		<u>Auto</u> Man
1 N 1 2	f	28	2.7 kHz	-49.53 dB	m					
3										Freq Offset 0 Hz
5										0 H2
7 8										
9										
11									~	
<									>	

Agilent Spectrum Analyzer - Swe ໝັດເມັດ RF 50 ຂ Center Freq 5.01500	AC CORREC	SENSE:INT	ALIGN OFF	10:51:07 AM Nov 20, 2019 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast IFGain:Low	Trig: Free Run Atten: 36 dB		5 5.411 56 GHz	Auto Tune
10 dB/div Ref 25.00 c Log 15.0 5.00	iBm ↓1			-40.29 dBm	Center Freq 5.015000000 GHz
-5.00 -15.0 -25.0 -35.0	∂4	5		-17.12.dBm	Start Freq 30.000000 MHz
-45.0 -55.0 -65.0					Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz MKR MODE TRC SCL	#VBW	7 3.0 MHz 7 FUT 5.92 dBm	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts) FUNCTION VALUE	CF Step 997.000000 MHz <u>Auto</u> Man
2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f 6 7	3.063 12 GHz 6.295 15 GHz 3.255 30 GHz 5.411 56 GHz	-39.74 dBm -39.98 dBm -40.06 dBm -40.29 dBm			Freq Offset 0 Hz
8 9 10 11 MSG		89	STATU	s	

RL	RF 5	50 Ω AC	CORREC	SENSE	INT	ALIGN OFF	10:51:26 AMNov 20, 2019	9
enter F	req 17.50	000000	D GHz PNO: Fast C IFGain:Low	Trig: Free R Atten: 36 dB	un	vg Type: Log-Pwr	TRACE 1 2 3 4 5 TYPE M WWWWW DET P P P P P	44
) dB/div	Ref 25.0	00 dBm				Mkr3 :	21.421 375 GHz -32.53 dBm	
9 5.0 .00								Center Fre 17.500000000 G⊢
5.0 5.0 5.0					Per for The suprementation of the second	3-	-17.12 dBn	Start Fre 10.000000000 G⊦
5.0								Stop Fre 25.000000000 GH
	1.0 MHz		#VB	W 3.0 MHz			Stop 25.000 GHz 0.00 ms (40001 pts	CF Ste 1.500000000 GH Auto Ma
KR MODE TI 1 N 1 2 N 1 3 N 1 4 5		24.173	I 375 GHz 3 500 GHz I 375 GHz	-29.04 dBm -30.58 dBm -32.53 dBm		I FUNCTION WIDTH	FUNCTION VALUE	Freq Offs
6 7 8 9 0								
				Ш			>	

TM 1 & Middle

Reference



	um Analyzer - S									
Center Fi	RF 50 req 15.004		DRREC	SEN	SE:INT		ALIGN OFF	TRAC	MNov 20, 2019 E 1 2 3 4 5 6	Frequency
Contor II	0q 10.00-		PNO:Fast ⊂ FGain:Low	Trig: Free Atten: 36			-	TYI Di	PE MWWWWW TPPPPP	
			-Galli.LUW	Thaten. 00	40			Mkrt 29	3.4 kHz	Auto Tune
10 dB/div	Ref 25.00	dBm					•		95 dBm	
Log 15.0										Center Freg
5.00										15.004500 MHz
-5.00										
-15.0									-17.99 dBm	
-25.0										Start Freq 9.000 kHz
-35.0 - ,										9.000 KHZ
-45.0										
-55.0	and a state of a			أيتحمال وريابا ورير مرفق	1	In section 1		failer a ka		Stop Freq
-65.0		And the second second	nedarli di madanda Pe	report of the base from the base	n an the stand of the stand	(Antonio (Alterno)		a an	an and the second s	30.000000 MHz
	-							<u></u>		
Start 9 kH #Res BW			#VB	W 300 kHz		s	weep 5.3	500 3 333 ms (4	0.00 MHz 0001 pts)	CF Step 2.999100 MHz
MKR MODE TP	RC SCL	×		Y	FUNC	TION FUI	NCTION WIDTH	FUNCTIO	ON VALUE	<u>Auto</u> Man
1 N 1 2	f	28	3.4 kHz	-47.95 dB	m					
3										Freq Offset
5									=	0 Hz
6										
8										
10										
11									>	
MSG							STATUS	上 DC Cou	upled	

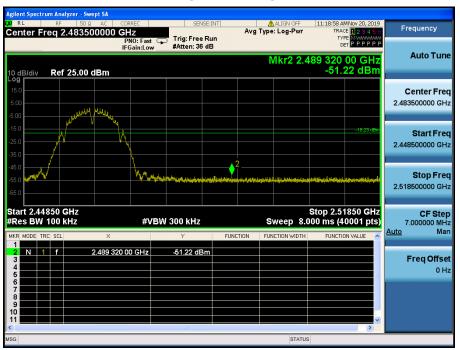


Agilent Spectrum Analyzer - Swept S		SENSE:INT		ALIGN OFF	11:03:44 AMNov 20, 201	9
Center Freq 17.500000		Trig: Free Run		ype: Log-Pwr	TRACE 12345 TYPE MWAWAA	6 Frequency
10 dB/div Ref 25.00 dBr	IFGain:Low	Atten: 36 dB		Mkr3 2	оет ^{ререр} 1.409 000 GH: -32.01 dBn	Auto Tune
15.0 5.00 -5.00						Center Freq 17.50000000 GHz
-15.0 -25.0 -35.0		Constant of Market States		3-		Start Freq 10.000000000 GHz
-45.0 -55.0 -65.0						Stop Freq 25.000000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz		Sweep 40	Stop 25.000 GH: 00 ms (40001 pts	
1 N 1 f 24	× .901 000 GHz	⊻ -29.74 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto
	.237 250 GHz .409 000 GHz	-30.10 dBm -32.01 dBm				Freq Offset 0 Hz
7 8 9 10						
11					· · · · · · · · · · · · · · · · · · ·	
MSG				STATUS		

TM1 & Highest

ent Spectrum Analyzer - Swept SA 11:16:26 AMNov 20, 2019 TRACE 1 2 3 4 5 6 TYPE M WAWWW DET P P P P P Center Freq 2.462000000 GHz PN0: Wide C IFGain:Low Atten: 36 dB ALIGN OFF SENSE:INT Frequency Auto Tune Mkr1 2.462 505 GHz 1.78 dBm Ref 25.00 dBm 10 dB/div **Center Freq** 2.462000000 GHz Start Freq 2.456666000 GHz Stop Freq 2.467334000 GHz **CF Step** 1.066800 MHz Man Auto **Freq Offset** 0 Hz Center 2.462000 GHz #Res BW 100 kHz Span 10.67 MHz Sweep 1.200 ms (3001 pts) #VBW 300 kHz

High Band-edge



igilent Spectrum Analyzer - Swo CRL RF 50 Q Center Freq 15.0045		SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	11:19:15 AMNov 20, 2019 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast G IFGain:Low	Trig: Free Run #Atten: 36 dB		TYPE MWWWWW DET PPPPP	Auto Tune
10 dB/div Ref 25.00 (lBm			Mkr1 302.9 kHz -50.29 dBm	Auto Tune
15.0					Center Fre
5.00					15.004500 MH
15.0				-18.23 dBm	Start Fre
-25.0					9.000 kH
1 1					Stop Ero
45.0 1 55.0 West and a straight at the state of the state	กระกับแล้งมีเป็นการการการการการการการการการการการการการก	427y-1414-1424,424-1424,14181924.34	bereitzteitzteitzteitzteitzteitzteitzteit	antranspondent media all premier interdistinging.	
45.0 1 56.0 Without out of the state of the	สมนักษณฑาษาราช เหลียงไม่ (Ing Vites โก โรย สุขางชีว	landaa hadaa hada hada hada ahaa	buyun herinti minimun kati ngeni anga Ame		30.000000 MH
45 0 56 0		W 300 KHz		Stop 30.00 MHz 333 ms (40001 pts)	30.000000 M⊢ CF Ste 2.999100 M⊦
45 0 1 55 0 55 0 55 0 55 0 55 0 55 0 55 0 55 0 55 0 55 0 56 0 56 0 56		∿ 300 kHz		Stop 30.00 MHz 333 ms (40001 pts)	30.000000 MH CF Ste 2.999100 MH
45 0 1 55 0 4 56 0 50 50 50 50 50 50 50 50 50 50 50 50 5	#VBV	V 300 kHz	Sweep 5.3	Stop 30.00 MHz 333 ms (40001 pts)	30.000000 MH CF Ste 2.999100 MH <u>Auto</u> Ma Freq Offse
4500 1 5600 5600 5600 5600 5600 5600 5600 5600	#VBV	V 300 kHz	Sweep 5.3	Stop 30.00 MHz 333 ms (40001 pts)	30.000000 MH CF Ste 2.999100 MH <u>Auto</u> Ma Freq Offse
45 0 1 55 0 55 0	#VBV	V 300 kHz	Sweep 5.3	Stop 30.00 MHz 333 ms (40001 pts)	Stop Free 30.00000 MH CF Step 2.999100 MH Auto Freq Offse 0 H
AS 0 1 AS 0 1	#VBV	V 300 kHz	Sweep 5.3	Stop 30.00 MHz 333 ms (40001 pts)	30.000000 MH CF Ste 2.999100 MH <u>Auto</u> Ma Freq Offse

Agilent Spectrum Analyzer - Swept		OTHER WIT			
Center Freq 5.015000	000 GHz	Trig: Free Run	ALIGN OFF Avg Type: Log-Pwr	11:19:34 AMNov 20, 2019 TRACE 1 2 3 4 5 6 TYPE M WARMAN	Frequency
10 dB/div Ref 25.00 dE	PNO: Fast G	#Atten: 36 dB	Mkr	5 6.885 87 GHz -40.13 dBm	Auto Tune
					Center Freq 5.015000000 GHz
-15.0 -25.0 -35.0	. Us se lifting and a static descent		4 5	-16,29 uBm	Start Freq 30.000000 MHz
-45.0 -55.0 -66.0					Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VBV	/ 3.0 MHz	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz Auto Man
MKR MODE TRC SCI 1 N 1 F 2 N 1 F 3 N 1 F 4 N 1 F 5 N 1 F 6 - - - 7 - - - 9 - - - 9 - - - 11 - - -	X 2.462 18 GHz 5.111 21 GHz 5.327 31 GHz 6.310 35 GHz 6.885 87 GHz	Y Full 4 83 dBm - -39.46 dBm - -39.90 dBm - -40.93 dBm - -40.13 dBm -	FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
MSG			STATU	3	

50 Ω AC CORREC 000000000 GHz PN0: Fast	SENSE:INT	ALIGN OFF	11:19:52 AMNov 20, 2019	
IFGain:Low	Trig: Free Run #Atten: 36 dB	Avg Type: Log-Pwr	TRACE 123456 TYPE MWWWWW DET PPPPP	Frequency
	#Atten: 00 4B	Mkr3 2	1.490 000 GHz -31.11 dBm	Auto Tun
				Center Fre 17.500000000 GH
			-18.23 ugn	Start Fre 10.000000000 GH
				Stop Fre 25.000000000 GF
#VE	8W 3.0 MHz	Sweep 40	Stop 25.000 GHz .00 ms (40001 pts)	CF Ste 1.50000000 GH Auto Ma
× 24.778 375 GHz 24.315 625 GHz 21.490 000 GHz	-28.22 dBm -30.25 dBm -31.11 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offse
			>	
	× 24.778 375 GHz 24.315 625 GHz	#VBW 3.0 MHz	00 dBm	00 dBm -31.11 dBm 00 dBm -31.11 dBm 100 dBm -31.11 dBm 24.315 625 GHz -30.25 GHz 21.490 000 GHz -31.11 dBm

TM 2 & Lowest

Reference



Low Band-edge



enter F	RF 50 req 15.004	4500 MHz	RREC			Avg Type: L	IGN OFF .og-Pwr	TRAC	MNov 20, 2019 CE 1 2 3 4 5 6	Frequency
		F IF	PNO: Fast ⊂ Gain:Low	Trig: Free Atten: 30 of the second						Auto Tun
0 dB/div	Ref 20.00) dBm							1.9 kHz 81 dBm	
og 10.0										Center Fre
0.00										15.004500 M⊢
0.0									-21.45 dBm	Start Fre
0.0										9.000 kH
10.0 1										
in n 🔽 ———										
1	liter and a second				to to be at					
	hi yarang yang ang ka	n de al anticipation de la constant	lion Wierselatinskal	1.11 (1.11) (1.11) (1.11)	الإد برا الرواميكي مسكر هسال	i,hayeesi,adheayeesee	Viran alan ana ang kang kang kang kang kang kang	afgest, gestaren bild fest an order	blandouroptiniste	
0.0 0.0 tart 9 kH	lz	trysfyrig ha thefrei yng hef			n free a fair a fair a dh'			Stop 3	Наміницина 0.00 MHz 0001 pts)	30.000000 Mi
tart 9 kH Res BW	lz 100 kHz	X		на амфана (ф. 1994) W 300 kHz Y	function of the second se	Swe		Stop 3 333 ms (4	Madestation 0.00 MHz 0001 pts)	30.000000 MI CF Ste 2.999100 MI
0.0 tart 9 kH Res BW	IZ 100 kHz	×		W 300 kHz	FUNCTIO	Swe	eep 5.3	Stop 3 333 ms (4	0001 pts)	30.000000 MH CF Ste 2.999100 MH <u>Auto</u> Ma
1 N 1 3 4	IZ 100 kHz	×	#VB	W 300 kHz Y	FUNCTIO	Swe	eep 5.3	Stop 3 333 ms (4	0001 pts)	30.000000 MH CF Ste 2.999100 MH <u>Auto</u> Ma Freq Offs
tart 9 kl- Res BW	IZ 100 kHz	×	#VB	W 300 kHz Y	FUNCTIO	Swe	eep 5.3	Stop 3 333 ms (4	0001 pts)	30.000000 MH CF Ste 2.999100 MH <u>Auto</u> Ma Freq Offs
itart 9 kH Res BW KR MODE TI 1 N 1 2 3 4 5	IZ 100 kHz	×	#VB	W 300 kHz Y	FUNCTIO	Swe	eep 5.3	Stop 3 333 ms (4	0001 pts)	30.000000 M⊢ CF Ste 2.999100 M⊢ <u>Auto</u> Ma Freq Offse
50.0 tart 9 kH Res BW KR MODE TH 1 N 1 2 3 4 4 5 6 7 8	IZ 100 kHz	×	#VB	W 300 kHz Y	FUNCTIO	Swe	eep 5.3	Stop 3 333 ms (4	0001 pts)	Stop Fre 30.000000 MH 2.999100 MH <u>Auto</u> Ma Freq Offse 0 H

	um Analyzer - Swept									
Center Fr	RF 50 Q /	AC CORF			E:INT		ALIGN OFF	TRAC	MNov 20, 2019 E 1 2 3 4 5 6	Frequency
		PN	0: Fast 🖵 ain:Low	Trig: Free Atten: 30					PPPPPP	
							Mkr	5 5.026	47 GHz	Auto Tune
10 dB/div Log	Ref 20.00 dB	m						-46.4	49 dBm	
10.0		<u> </u>								Center Freq
0.00										5.015000000 GHz
-10.0										
-20.0									-21.45.dBm	Start Freq
-30.0										30.000000 MHz
-40.0					5	2 <mark>3</mark>				
		Ander								Stop Freq
-60.0										10.000000000 GHz
-70.0										
Start 30 N									.000 GHz	CF Step
#Res BW	1.0 MHz		#VBW	3.0 MHz		S	weep 18	.67 ms (4	0001 pts)	997.000000 MHz Auto Man
MKR MODE TF	RC SCL	× 2.412.58	CH7	Y 8.94 dB		TION FUN	NCTION WIDTH	FUNCTIO	N VALUE	Auto Mari
2 N 1 3 N 1	f f	5.821 57 6.584 78	GHz	-46.11 dB -46.26 dB	m					Freq Offset
4 N 1	f	2.816 62	GHz	-46.30 dB	m					0 Hz
5 N 1 6	T	5.026 47	GHZ	-46.49 dB	m				=	
8										
9										
11									~	
MSG				_11			STATUS	5		

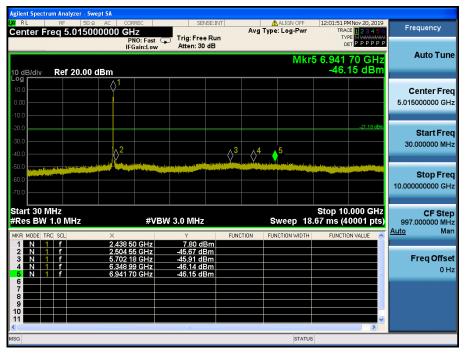
RL	RF 5	DΩ AC O	ORREC	SENSE	INT	1	ALIGN OFF	11:57:22 A	M Nov 20, 2019	-
enter F	req 17.50	0000000	GHz PNO: Fast ⊂ FGain:Low	Trig: Free F Atten: 30 d		Avg Type	: Log-Pwr	TY	CE 123456 PE MWWWWWW ET P P P P P P	Frequency
) dB/div	Ref 20.0	0 dBm					Mkr3 2		250 GHz 99 dBm	Auto Tur
°g 10.0 0.00 0.0										Center Fre 17.500000000 GH
:0.0 :0.0									-21.45 dBm 3 $-\sqrt{2}$	Start Fre 10.000000000 GF
i0.0										Stop Fre 25.000000000 GF
	1.0 MHz		#VB	W 3.0 MHz		S	weep 40	Stop 25 .00 ms (4	.000 GHz 0001 pts)	CF Ste 1.50000000 GF Auto Mi
KR MODE TO 1 N 1 2 N 1 3 N 1 4		× 24.931 7 24.212 5 23.487 2	00 GHz	-34.99 dBn -36.06 dBn -36.99 dBn	1	CTION FUN	CTION WIDTH	FUNCTI	ON VALUE	Freq Offs
5 6 7 8 9 0										
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TM 2 & Middle

Reference



Center Fr		ງຂ <u>≜</u> ວເ ແ 4500 MHz	RREC	SENSE	Avg	ALIGN OFF Type: Log-Pwr	12:01:32 PMN TRACE	123456	Frequency
			PNO: Fast Gain:Low	Trig: Free R Atten: 30 dl			DET		Auto Tune
10 dB/div	Ref 20.0	0 dBm					4 Wkr1 285 -56.0	IdBm	
10.0 0.00									Center Fred 15.004500 MH:
-20.0								<u>-21.19 dBm</u>	Start Fred 9.000 kH;
-50.0 1	hadiringka katalaka sa ta	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	MatriAthataNin	igen alhierindes), ophistore	ur an	halifalloranlorgaphonesia	ุด Maradising Mandol App	laten an	Stop Free 30.000000 MH;
Start 9 kH #Res BW	100 kHz		#VB	W 300 kHz		Sweep 5.3		001 pts)	CF Step 2.999100 MH: Auto Mar
MKR MODE TR	f SCL	× 28	5.7 kHz	√ -56.01 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE	
3 4 5								=	Freq Offse 0 Ha
6 7 8 9									
10 11								~	



Agilent Spectrum Analyzer - Swept SA				
X RL RF 50Ω AC CORREC Center Freq 17.500000000 GHz	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	12:02:08 PM Nov 20, 2019 TRACE 1 2 3 4 5 6	Frequency
PNO: F IFGain:I	ast 🕞 Trig: Free Run .ow Atten: 30 dB			
		Mkr3 2	23.285 125 GHz	Auto Tune
10 dB/div Ref 20.00 dBm			-36.75 dBm	
10.0				Center Freq
0.00				17.500000000 GHz
-10.0				
-20.0			-21.19 dBm	Start Freq
-30.0			$\rightarrow^3 \rightarrow^2 \Diamond$	10.00000000 GHz
-40.0	and a second			
-50.0	A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER			Stop Freq
-60.0				25.00000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz	¢VBW 3.0 MHz	Sween 40	Stop 25.000 GHz .00 ms (40001 pts)	CF Step 1.50000000 GHz
MKR MODE TRC SCL X		NCTION FUNCTION WIDTH	FUNCTION VALUE	Auto Man
1 N 1 f 24.792 250 GH	z -35.50 dBm	NCTION FONCTION WIDTH	FONCTION VALUE	
2 N 1 f 24.146 125 GH 3 N 1 f 23.285 125 GH				Freq Offset
5				0 Hz
6				
8				
10			~	
	10		>	
MSG		STATUS	3	

TM 2 & Highest



High Band-edge



Reference

LXI RL	um Analyzer - Swep RF 50 ຊ 🥂	DC CORREC	SEI	VSE:INT		ALIGN OFF		Nov 20, 2019	Frequency
Center Fi	req 15.00450	DO MHz PNO: Fa IFGain:L	st 🕞 Trig: Free ow Atten: 30		Avg Type	: Log-Pwr	TRACI TYP DE	123456 MWWWWW PPPPPP	
10 dB/div	Ref 20.00 dl	Вm				ſ	4 Mkr1 28 -53.7	4.2 kHz ′1 dBm	Auto Tune
Log 10.0 0.00									Center Freq 15.004500 MHz
-20.0 -30.0 -40.0								-21.89.dBm	Start Freq 9.000 kHz
-50.0	المالية المراجع فالمالية والمعالية والمحالية والمحالية والمحالية والمحالية والمحالية والمحالية والمحالية والمح	(n-hanyilatan hajinin qaraan ha	iterate had a state of the stat	, the bir state of the state of	h l hadraddyddae	gisseretes este	blegist-telespeciester,	ynydi fedrafayr	Stop Freq 30.000000 MHz
Start 9 kH #Res BW	100 kHz		VBW 300 kHz				133 ms (40		CF Step 2.999100 MHz Auto Mar
MKR MODE TF 1 N 1 2 3 4 5		× 284.2 kH	z53.71 dł	Sm	CTION FUN	ICTION WIDTH	FUNCTIO	N VALUE	Freq Offset 0 Hz
6 7 8 9 9 10 11									
< MSG			Ш			STATUS	LDC Cou		

	0Ω AC CORREC	SENSE:INT		LIGN OFF	12:06:52 PM Nov 20, 2019	
Center Freq 5.015	PNO: Fast G	Trig: Free Run	Avg Type: I	Log-Pwr	TRACE 12345 TYPE MWWWWW DET PPPPP	₩
10 dB/div Ref 20.0	IFGain:Low	Atten: 30 dB		Mkr5	3.132 66 GHz -46.75 dBm	Auto Tune
10.0 0.00						Center Freq 5.015000000 GHz
-20.0	53		¢ ² ♦	4	-21.89 dBr	Start Freq 30.000000 MHz
-50.0						Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz		V 3.0 MHz			Stop 10.000 GHz 67 ms (40001 pts	
MKR MODE TRC SCL 1 N 1 F 2 N 1 F 3 N 1 F 4 N 1 F 5 N 1 F 6 - - - 9 - - - 9 - - - 10 - - -	× 2.461 43 GHz 5.830 80 GHz 3.259 78 GHz 7.001 77 GHz 3.132 66 GHz	7,51 dBm -45.03 dBm -46.33 dBm -46.64 dBm -46.75 dBm		IION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
MSG				STATUS		

RL			ORREC	SENSE:		ALIGN OFF	12:07:11 PM Nov 20,	
enter F	req 17.50	0000000	GHZ PNO:Fast ⊂ Gain:Low	Trig: Free Ru Atten: 30 dB		/g Type: Log-Pwr	TRACE 123 TYPE MWW DET P P P	
0 dB/div	Ref 20.0		Gain:Low	Atten: 30 dB		Mkr3 2	4.068 125 G -36.67 dl	HZ Auto T
.og 10.0 0.00								Center F 17.500000000
20.0 30.0 40.0					net the system of the system o		-21.8	9.48m Start F 10.000000000
50.0 (Weithin 60.0 70.0								Stop F 25.000000000
	1.0 MHz		#VB	N 3.0 MHz			Stop 25.000 (.00 ms (40001	pts) 1.50000000
KR MODE TF 1 N 1 2 N 1 3 N 1 4 1 1		× 24.740 81 24.552 62 24.068 12	25 GHz	-34.90 dBm -36.32 dBm -36.67 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Freq Of
6 7 8 9 0								
1				Ш				>

TM 3 & Lowest

Reference



Low Band-edge



Agnent Spectr	um Analyzer - Sw RF 50 S		RREC	SEN	BE:INT		ALIGN OFF		1Nov 20, 2019	Frequency
Center Fi	req 15.004	Р	NO: Fast 🖸 Gain:Low	Trig: Free Atten: 30		Avg Type	: Log-Pwr	TRAC TYP DE	E 1 2 3 4 5 6 E M WWWWWW T P P P P P P	
10 dB/div	Ref 20.00	dBm					ſ	Mkr1 29: -55.0	2.4 kHz)3 dBm	Auto Tune
10.00										Center Fred 15.004500 MHz
-20.0									21.48.dBm	Start Fred 9.000 kH:
-50.0	Water ful in the factors and	kuphathympithi	le of the last strategy bear	معينية المراجعة المراجعة الم	strate and the second	ر	er manifest Autom	rgalay juon republic filmate	nan digi dala sharifan	Stop Free 30.000000 MH;
Start 9 kH #Res BW	100 kHz		#VB	W 300 kHz				333 ms (4)		CF Step 2.999100 MH Auto Mar
MKR MODE TF 1 N 1 2 3 4 5		× 292	.4 kHz	∀ -55.03 dB		CTION FU	ICTION WIDTH	FUNCTIO	N VALUE	Freq Offse
5 6 7 8 9 10										
11 				III				DC Cou	>	

Agilent Spectrun	n Analyzer - Swej RF 50 Q	pt SA AC COR	DEC	CEN	SE:INT	ALIGN OFF	10/40/17 0	4Nov 20, 2019	
Center Fre		0000 GH				pe: Log-Pwr	TRAC	E 1 2 3 4 5 6 E M WWWWW	Frequency
	Ref 20.00 d	IFG	io: Fast C	Atten: 30		Mkr	5 4.939	98 GHz 76 dBm	Auto Tune
Log 10.0 0.00		1 							Center Freq 5.015000000 GHz
-20.0 -20.0 -30.0 -40.0					⁵ \∂ ²	 		-21.48 dBm	Start Freq 30.000000 MHz
-50.0 -60.0 -70.0									Stop Freq 10.000000000 GHz
Start 30 MH #Res BW 1	.0 MHz		#VBV	V 3.0 MHz		Sweep 18	.67 ms (4		CF Step 997.000000 MHz Auto Man
MKR MODE TRC 1 N 1 2 N 1 3 N 1 4 N 1 5 N 1 6	f f f f f	× 2.413 8: 5.581 7: 6.411 0: 7.664 2: 4.939 9:	9 GHz 5 GHz 3 GHz	¥ 45.36 dB 45.92 dB 46.73 dB 46.76 dB	m m m m	UNCTION WIDTH	PONCILL	N VALUE	Freq Offset 0 Hz
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RL	RF 50	DΩ AC	CORREC	SENSE:	INT	ALIGN OFF	12:43:35 PM Nov 20, 2019	_
enter Fr	eq 17.50	0000000	PNO: Fast C	Trig: Free R	ın	g Type: Log-Pwr	TRACE 12345 (TYPE MWWWWWW DET PPPPP	4
			IFGain:Low_	Atten: 30 dE		Mkr3 2	3.341 000 GHz	Auto Tun
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tart 10.00	0 GHz						Stop 25.000 GHz	CF Ste
Res BW 1			#VB	W 3.0 MHz		Sweep 40	.00 ms (40001 pts)	1.50000000 GH
IKR MODE TRO		×		Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto Ma
1 N 1 2 N 1	f		750 GHz 250 GHz	-34.80 dBm -36.66 dBm				
3 N 1	f	23.341	000 GHz	-37.31 dBm				Freq Offs
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TM 3 & Middle

Reference



LXI RL	um Analyzer - S RF 50 req 15.004	Ω <u>∧</u> DC CO 1500 MHz P	RREC	SENSI	A	ALIGN OFI	r TRA	MNov 20, 2019 CE 1 2 3 4 5 6 PE M WWWWW ET P P P P P P	Frequency
10 dB/div	Ref 20.00		Gain:Low	Atten: 30 d	8		Mkr1 28		Auto Tune
10.00									Center Free 15.004500 MH
-20.0								-22.12 dBm	Start Free 9.000 kH:
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Start 9 kH #Res BW	100 kHz	×	#VB\	V 300 kHz	FUNCTION	Sweep	5.333 ms (4	0.00 MHz 0001 pts)	CF Ste 2.999100 MH <u>Auto</u> Ma
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RL RF 5	0Ω AC CORREC	SI	ENSE:INT	4	ALIGN OFF	12:48:10 PM Nov	20, 2019	_
enter Freq 5.015		Fast Trig: Fre		Avg Type	: Log-Pwr	TRACE	23456 ///////// PPPPP	Frequency
0 dB/div Ref 20.0					Mkr	5 6.405 07 -45.84		Auto Tun
	¹							Center Fre 5.015000000 GH
20.0 	4		$\langle \rangle^3 \langle \rangle^2$	5			22.12.dBm	Start Fre 30.000000 MH
50.0 								Stop Fre 10.00000000 GF
tart 30 MHz Res BW 1.0 MHz		#VBW 3.0 MH			•	Stop 10.000 .67 ms (4000	1 pts)	CF Ste 997.000000 Mł Auto Mi
N 1 F 1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f 6 6 6 6	× 2.436 26 G 5.657 07 G 5.249 05 G 2.552 91 G 6.405 07 G	Hz -45.32 c Hz -45.32 c Hz -45.74 c	IBm IBm IBm		ICTION WIDTH	FUNCTION VA		Freq Offs 0 F
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Agilent Spectrum Analyzer - Swept SA				
RL RF 50 Ω AC CORF Center Freq 17.500000000 G	7	ALIGN OFF Avg Type: Log-Pwr	12:48:28 PM Nov 20, 2019 TRACE 1 2 3 4 5 6	Frequency
PN	D: Fast 🕞 Trig: Free Run hin:Low Atten: 30 dB			
		Mkr3 2	23.371 750 GHz	Auto Tune
10 dB/div Ref 20.00 dBm			-36.87 dBm	
10.0				Center Freq
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-50.0	and a second	A LOGICAL DESCRIPTION OF THE OWNER		Stop Freq
-70.0				25.00000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Sween 40	Stop 25.000 GHz .00 ms (40001 pts)	CF Step 1.50000000 GHz
MKRI MODEL TRCI SCL X		UNCTION FUNCTION WIDTH	FUNCTION VALUE	Auto Man
1 N 1 f 24.808 000	GHz -34.53 dBm		TONCHON VALUE	
2 N 1 f 24.197 500 3 N 1 f 23.371 750	GHz -36.45 dBm GHz -36.87 dBm			Freq Offset
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TM 3 & Highest

nt So m Ana ent SA 01:14:41 PMNov 20, 2019 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P DAT RL RF 150.9 AL UNINESS Center Freq 2.462000000 GHz PNO: Fast C Trig: Free Run IFGain:Low Atten: 30 dB SENSE:INT ALIGN OFF Frequency Auto Tune Mkr1 2.463 271 GHz -2.33 dBm Ref 20.00 dBm 10 dB/div **Center Freq** 2.462000000 GHz www. mar and a start Start Freq andrew мĥ 2.449206500 GHz Stop Freq 2.474793500 GHz CF Step 2.558700 MHz Man Auto **Freq Offset** 0 Hz Center 2.46200 GHz #Res BW 100 kHz Span 25.59 MHz Sweep 2.600 ms (3001 pts) #VBW 300 kHz

High Band-edge



a RL Center F	RF 50 req 15.004	4500 MHz		SENS			ALIGN OFF	TRAC	4Nov 20, 2019 E 1 2 3 4 5 6	Frequency
		 	PNO: Fast Gain:Low	Trig: Free F Atten: 30 d						Auto Tun
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tart 9 kl Res BW	Hz 100 kHz		#VB	W 300 kHz		s	weep 5.3		0.00 MHz 0001 pts)	CF Ste 2.999100 MH
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	req 5.015000000	CORREC		Avg T	ALIGN OFF	TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast 🕞 IFGain:Low	Trig: Free Run Atten: 30 dB		Mkr	DET P P P P P	Auto Tune
10 dB/div	Ref 20.00 dBm					-45.78 dBm	
Log 10.0 0.00 -10.0	¢	1					Center Freq 5.015000000 GHz
-20.0 -30.0 -40.0		2		54	tet as the	22.33 dBm	Start Freq 30.000000 MHz
-50.0 -60.0 -70.0							Stop Freq 10.000000000 GHz
Start 30 M #Res BW	1.0 MHz	#VBW	3.0 MHz		Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz Auto Man
MKR MODE TF 1 N 1 2 N 1 3 N 1 4 N 1 5 N 1 6	f 2.4 f 2.4 f 5.5	461 68 GHz 487 61 GHz 523 47 GHz 912 30 GHz 470 13 GHz	6.21 dBm -40.71 dBm -45.23 dBm -45.31 dBm -45.78 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
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RL	RF	50Ω AC CC	RREC	SENSE	INT		ALIGN OFF	01:16:41 F	MNov 20, 2019	
enter Fi	eq 17.50	00000000		Tuini Ene e F		Avg Typ	e: Log-Pwr	TRA		Frequency
			PNO:Fast ⊂ Gain:Low	Trig: Free F Atten: 30 d						
							Mkr3.2	1 400 3	375 GHz	Auto Tun
0 dB/div	Ref 20.0	0 dBm					WIKIO 2		31 dBm	
.og	Rei 20.0									
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1 N 1 2 N 1	f	24.876 62 23.380 00	25 GHz	-35.54 dBn -37.05 dBn						
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8.5 Radiated spurious emissions

Test Requirements and limit, §15.247(d), §15.205, §15.209

In any 100 kHz bandwidth outside the operating frequency band, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 KHz bandwidth within the band. 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 frequency 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 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	608 ~ 614	3345.8 ~ 3358		
		960 ~ 1240	3600 ~ 4400		

• 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.

Test Configuration

Refer to the APPENDIX I.

Test Procedure

- 1. The EUT is placed on a non-conductive table, emission measurements at below 1 GHz, the table height is 80 cm and 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 1 or 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.

- KDB558074 D01v05r02 - Section 8.6

- ANSI C63.10-2013 – Section 11.12

Peak Measurement

RBW = As specified in below table, VBW \ge 3 x RBW, Sweep = Auto, Detector = Peak, Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

Average Measurement:

- 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/D), where D is the duty cycle.
- 2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/D), where D 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.

Duty Cycle Correction factor

Test Mode	Date rate	Duty Cycle (D)	Duty Cycle Correction Factor (dB)
TM 1	1Mbps	0.9928	NA
TM 2	6Mbps	0.9533	0.21
TM 3	MCS 0	0.9496	0.22

Note: Refer to the APPENDIX II for duty cycle plot.



Test Results: Comply

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : TM 1

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	2389.58	V	Х	PK	53.02	2.34	N/A	N/A	55.36	74.00	18.64
	2389.66	V	Х	AV	41.57	2.34	N/A	N/A	43.91	54.00	10.09
Lowest	4824.09	Н	Х	PK	49.42	1.94	N/A	N/A	51.36	74.00	22.64
Lowest	4823.92	Н	Х	AV	39.57	1.94	N/A	N/A	41.51	54.00	12.49
	7234.33	V	Х	PK	50.21	8.45	N/A	N/A	58.66	74.00	15.34
	7234.77	V	Х	AV	41.55	8.45	N/A	N/A	50.00	54.00	4.00
	4873.58	Н	Х	PK	50.31	2.10	N/A	N/A	52.41	74.00	21.59
Middle	4874.08	Н	Х	AV	39.65	2.10	N/A	N/A	41.75	54.00	12.25
wildule	7309.91	V	Х	PK	48.40	8.97	N/A	N/A	57.37	74.00	16.63
	7310.04	V	Х	AV	38.65	8.97	N/A	N/A	47.62	54.00	6.38
	2484.34	V	Х	PK	52.07	2.81	N/A	N/A	54.88	74.00	19.12
	2483.68	V	Х	AV	41.35	2.81	N/A	N/A	44.16	54.00	9.84
Highost	4923.92	Н	Х	PK	50.88	2.12	N/A	N/A	53.00	74.00	21.00
Highest	4924.13	Н	Х	AV	39.69	2.12	N/A	N/A	41.81	54.00	12.19
	7386.54	V	Х	PK	48.66	8.59	N/A	N/A	57.25	74.00	16.75
	7387.34	V	Х	AV	38.23	8.58	N/A	N/A	46.81	54.00	7.19

Note.

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

2. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F + DCCF + DCF / T.F = AF + CL – AG Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

3. Information of Distance Factor.

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

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



Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	2388.67	V	Х	PK	54.08	2.33	N/A	N/A	56.41	74.00	17.59
Louiset	2389.17	V	Х	AV	43.10	2.33	0.21	N/A	45.64	54.00	8.36
Lowest	4823.57	Н	Х	PK	49.46	1.93	N/A	N/A	51.39	74.00	22.61
	4824.01	Н	Х	AV	39.64	1.94	0.21	N/A	41.79	54.00	12.21
Middle	4874.23	Н	Х	PK	50.14	2.10	N/A	N/A	52.24	74.00	21.76
Middle	4873.52	Н	Х	AV	39.79	2.10	0.21	N/A	42.10	54.00	11.90
	2483.56	V	Х	PK	53.39	2.81	N/A	N/A	56.20	74.00	17.80
Llichaat	2483.68	V	Х	AV	41.63	2.81	0.21	N/A	44.65	54.00	9.35
Highest	4923.59	Н	Х	PK	49.68	2.12	N/A	N/A	51.80	74.00	22.20

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : TM 2

Note.

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

2.12

0.21

N/A

41.89

54.00

12.11

2. Sample Calculation.

4923.54

Н

Х

AV

Margin = Limit - Result / Result = Reading + T.F + DCCF + DCF / T.F = AF + CL - AG Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

39.56

3. Information of Distance Factor.

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

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



Rudiatod											
Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	2389.60	V	Х	PK	55.13	2.34	N/A	N/A	57.47	74.00	16.53
Louvoot	2389.74	V	Х	AV	43.22	2.34	0.22	N/A	45.78	54.00	8.22
Lowest	4823.91	Н	Х	PK	49.64	1.94	N/A	N/A	51.58	74.00	22.42
	4824.16	Н	Х	AV	39.55	1.94	0.22	N/A	41.71	54.00	12.29
Middle	4874.17	Н	Х	PK	49.86	2.10	N/A	N/A	51.96	74.00	22.04
Middle	4874.13	Н	Х	AV	39.66	2.10	0.22	N/A	41.98	54.00	12.02
	2484.20	V	Х	PK	52.35	2.81	N/A	N/A	55.16	74.00	18.84
Lishaat	2483.61	V	Х	AV	41.55	2.81	0.22	N/A	44.58	54.00	9.42
Highest	4924.41	Н	Х	PK	50.47	2.12	N/A	N/A	52.59	74.00	21.41

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : TM 3

Note.

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

2.12

0.22

N/A

41.88

54.00

12.12

2. Sample Calculation.

4923.93

Н

Х

AV

Margin = Limit - Result / Result = Reading + T.F + DCCF + DCF / T.F = AF + CL - AG Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

39.54

3. Information of Distance Factor.

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

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



8.6 Power-line conducted emissions

Test Requirements and limit, §15.207

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

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

Frequency Range	Conducted Limit (dBuV)					
(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.

Test Procedure

- 1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
- 2. The EUT is connected via LISN to the test power supply.
- 3. The measurement results are obtained as described below:
- 4. Detectors Quasi Peak and Average Detector.
- Test Results: NA

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.

TEST CONFIGURATION

Refer to the APPENDIX I.

TEST PROCEDURE

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- 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 3x RBW.

TEST RESULTS: Comply

Test Mode	Frequency	Test Results[MHz]		
	Lowest	10.35		
TM 1	Middle	10.37		
	Highest	10.34		
	Lowest	17.02		
TM 2	Middle	17.06		
	Highest	17.02		
	Lowest	18.58		
ТМ 3	Middle	18.09		
	Highest	18.05		

Test Mode: TM 1 & 2412 MHz

RESULT PLOTS

Occupied Bandwidth

Spectrum Analyzer - Occupied 10:48:07 AMNov 20, 2019 Radio Std: None Frequency Center Freq: 2.412000000 GHz Trig: Free Run Avg|Hol #Atten: 30 dB Center Freq 2.412000000 GHz Avg|Hold: 500/500 #IFGain:Low Radio Device: BTS Ref 25.00 dBm **Center Freq** 2.412000000 GHz Center 2.412 GHz #Res BW 430 kHz Span 40 MHz Sweep 1 ms **CF Step** 4.000000 MHz Man #VBW 1.3 MHz Auto Total Power 13.1 dBm **Occupied Bandwidth** 10.353 MHz **Freq Offset** Transmit Freq Error 1.348 kHz **OBW Power** 99.00 % 0 Hz x dB Bandwidth 14.17 MHz x dB -26.00 dB STATUS

Occupied Bandwidth

Test Mode: TM 1 & 2437 MHz



Test Mode: TM 1 & 2462 MHz



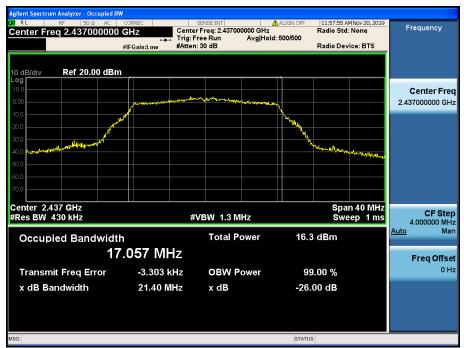


Test Mode: TM 2 & 2412 MHz



Occupied Bandwidth

Test Mode: TM 2 & 2437 MHz





Test Mode: TM 2 & & 2462 MHz





Test Mode: TM 3 & 2412 MHz



Occupied Bandwidth

Test Mode: TM 3 & 2437 MHz



Test Mode: TM 3 & 2462 MHz



9. LIST OF TEST EQUIPMENT

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	19/06/26	20/06/26	US47360812
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY48011700
Spectrum Analyzer	Agilent Technologies	N9020A	19/06/26	20/06/26	MY46471251
DC Power Supply	Agilent Technologies	66332A	18/12/19	19/12/19	US37476998
DC Power Supply	SM techno	SDP30-5D	19/06/24	20/06/24	305DMG305
Multimeter	FLUKE	17B	18/12/18	19/12/18	26030065WS
Signal Generator	Rohde Schwarz	SMBV100A	18/12/19	19/12/19	255571
Signal Generator	ANRITSU	MG3695C	18/12/10	19/12/10	173501
Thermohygrometer	BODYCOM	BJ5478	18/12/27	19/12/27	120612-1
Thermohygrometer	BODYCOM	BJ5478	18/12/27	19/12/27	120612-2
Thermohygrometer	BODYCOM	BJ5478	19/07/03	20/07/03	N/A
Loop Antenna	ETS-Lindgren	6502	19/09/18	21/09/18	00226186
BILOG ANTENNA	Schwarzbeck	VULB 9160	19/04/23	21/04/23	9160-3362
Horn Antenna	ETS-Lindgren	3115	18/01/30	20/01/30	6419
Horn Antenna	Schwarzbeck	BBHA 9120C	17/12/04	19/12/04	9120C-561
Horn Antenna	A.H.Systems Inc.	SAS-574	19/07/03	21/07/03	155
PreAmplifier	tsj	MLA-0118-J01-45	18/12/19	19/12/19	17138
PreAmplifier	tsj	MLA-1840-J02-45	19/06/27	20/06/27	16966-10728
PreAmplifier	H.P	8447D	18/12/18	19/12/18	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	ML2496A MA2411B	18/12/19	19/12/19	1338004 1306053
EMI Receiver	ROHDE&SCHWARZ	ESW44	19/07/30	20/07/30	101645
Cable	Junkosha	MWX241	19/01/14	20/01/14	G-04
Cable	Junkosha	MWX241	19/01/14	20/01/14	G-07
Cable	DT&C	Cable	19/01/14	20/01/14	G-13
Cable	DT&C	Cable	19/01/14	20/01/14	G-14
Cable	HUBER+SUHNER	SUCOFLEX 104	19/01/14	20/01/14	G-15
Cable	Radiall	TESTPRO3	19/01/16	20/01/16	M-01
Cable	Junkosha	MWX315	19/01/16	20/01/16	M-05
Cable	Junkosha	MWX221	19/01/16	20/01/16	M-06
Cable	Radiall	TESTPRO3	19/01/15	20/01/15	RF-65
Test Software	tsj	Radiated Emission Measurement	N/A	N/A	Version 2.00.0177

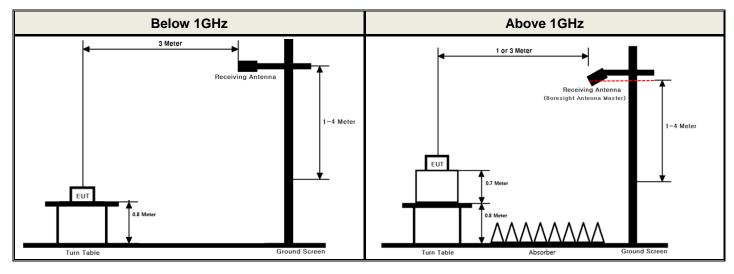
Note 1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017

Note 2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

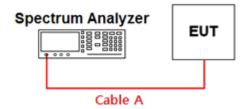
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	0.48	15	1.44
1	0.78	20	1.71
2.412 & 2.437 & 2.462	0.92	25	2.26
5	1.02	-	-
10	1.17	-	-

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

Middle

&

APPENDIX II

Duty cycle plots

Test Procedure

Duty Cycle

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.)

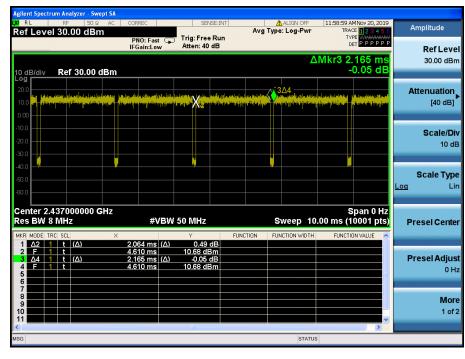
TM 1 Sweep/Control Ava Type: Log-Pwr Time 50.00 m PNO: Fast Trig: Free Run Atten: 36 dB Sweep Time 50.00 ms ΛM Ref 25.00 dBm 3A4 X Center 2.437000000 GHz Res BW 8 MHz Span 0 Hz Sweep 50.00 ms (10001 pts) #VBW 50 MHz 0.11 dB 13.94 dD (Δ) *(*Δ) -0.22 dl 13.94 dBr Gate (Δ) [Off,LO] Points 10001

TDt&C

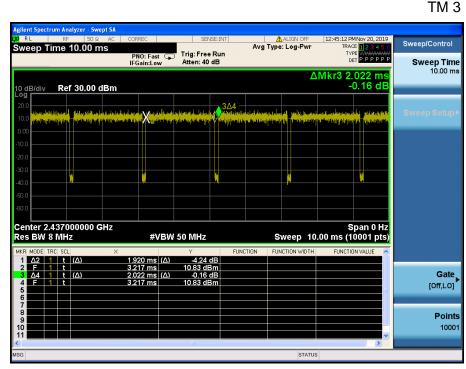
TM 2 & Mid

Middle

Duty Cycle



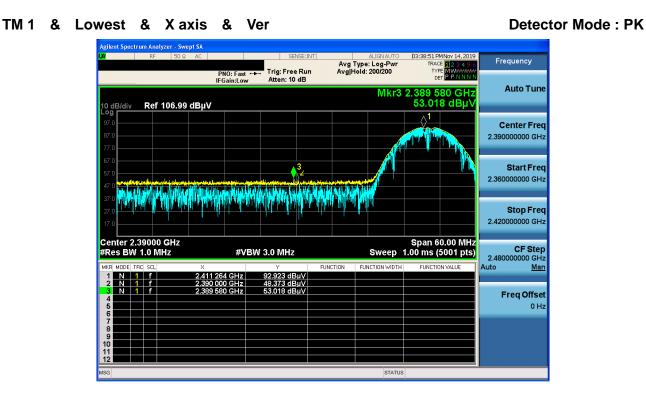
& Middle



Duty Cycle

APPENDIX III

Unwanted Emissions (Radiated) Test Plot



TM 1 & Lowest & X axis & Ver





TM 1 & Highest & X axis & Ver

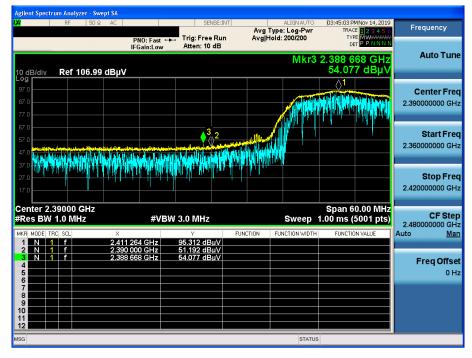


TM 1 & Highest & X axis & Ver

zer - Sv Frequency Avg Type: RMS Avg|Hold: 200/200 Trig: Free Run Atten: 10 dB ACE 1 2 3 4 TYPE A WWWW DET A P N N PNO: Fast +++ IFGain:Low Auto Tune Mkr3 2.483 680 GHz 41.348 dBµ\ Ref 106.99 dBµV l0 dB/div .og **r** \Diamond^1 **Center Freq** 2.483500000 GHz Start Freq 2.453500000 GHz 3 Stop Freq 2.513500000 GHz Center 2.48350 GHz #Res BW 1.0 MHz Span 60.00 MHz Sweep 1.00 ms (5001 pts) CF Step 2.48000000 GHz #VBW 3.0 MHz* Auto Man 88.127 dBµ\ 41.244 dBµ\ 41.348 dBµ\ Freq Offset 4 0 Hz 10 11 12



TM 2 & Lowest & X axis & Ver

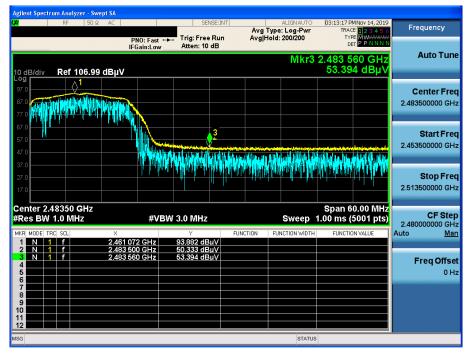


TM 2 & Lowest & X axis & Ver

it Spectrum Analyzer - Si in the state Frequency Avg Type: RMS Avg|Hold: 200/200 TYPE A WWW Trig: Free Run Atten: 10 dB PNO: Fast +++ IFGain:Low Auto Tune Mkr3 2.389 172 GHz 43.100 dBµ\ Ref 106.99 dBµV 10 dB/div Log **Center Freq** 2 390000000 GHz Start Freq 2.36000000 GHz 32 Stop Freq 2.420000000 GHz Center 2.39000 GHz #Res BW 1.0 MHz Span 60.00 MHz Sweep 1.00 ms (5001 pts) CF Step 2.48000000 GHz #VBW 3.0 MHz* Auto Man 2.411 2 2.390 r 38.438 dB 42.062 dBµ\ 43.100 dBµ\ 2.389 172 GHz N Freq Offset 4 0 Hz 10 11 12



TM 2 & Highest & X axis & Ver

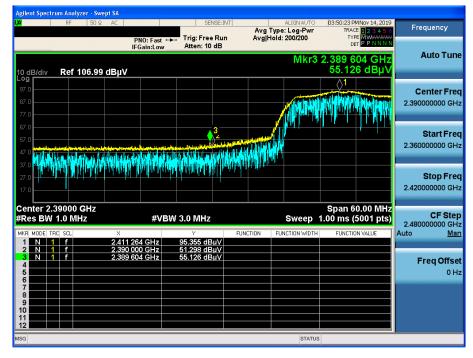


TM 2 & Highest & X axis & Ver





TM 3 & Lowest & X axis & Ver



TM 3 & Lowest & X axis & Ver

gilent Spectrum Analyzer - Swept SA Frequency Avg Type: RMS Avg|Hold: 200/200 TYPE A WAAA DET A P N Trig: Free Run Atten: 10 dB PNO: Fast ← IFGain:Low Auto Tune Mkr3 2.389 736 GH: 43.218 dBµ\ Ref 106.99 dBµV 10 dB/div -og **Center Freq** 2.390000000 GHz Start Freq 2.360000000 GHz Stop Freq 2.420000000 GHz Center 2.39000 GHz #Res BW 1.0 MHz Span 60.00 MHz 1.00 ms (5001 pts) CF Step 2.48000000 GHz #VBW 3.0 MHz* Sweep Man Auto 42.053 dBµ\ 43.218 dBµ\ N 389 736 GHz Freq Offset 0 Hz 10 STATUS

Detector Mode : AV

Pages: 72 / 75



TM 3 & Highest & X axis & Ver



TM 3 & Highest & X axis & Ver



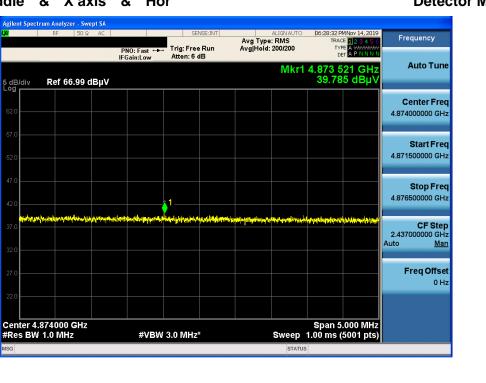
Detector Mode : AV



TM 1 & Lowest & X axis & Ver



TM 2 & Middle & X axis & Hor



Dt&C

TM 3 & Middle & X axis & Hor

