TEST REPORT

DT&C Co., Ltd.

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1. Report No: DRTFCC1912-0308

Dt&C

- 2. Customer
 - Name : HYUNDAI MOBIS CO., LTD.
 - Address : 203, Teheran-ro Gangnam-gu, Seoul, South Korea, 135-977
- 3. Use of Report : FCC Original Grant
- 4. Product Name / Model Name : DIGITAL CAR AUDIO SYSTEM / ADC10SVGG FCC ID : TQ8-ADC10SVGG
- 5. Test Method Used : KDB558074 D01v05r02, ANSI C63.10-2013 Test Specification : FCC Part 15.247
- 6. Date of Test : 2019.11.05 ~ 2019.11.22
- 7. Testing Environment : See appended test report.
- 8. Test Result : Refer to the attached test result.

Affirmation	Tested by	61	Reviewed by
Ammation	Name : InHee Bae	- Sh	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.

2019.12.04.

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			
DRTFCC1912-0308	Dec. 04, 2019	Initial issue			



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1. EUT DESCRIPTION

FCC Equipment Class	Digital Transmission System(DTS)
Product	DIGITAL CAR AUDIO SYSTEM
Model Name	ADC10SVGG
Add Model Name	ADC11SVGG, ADC12SVGG, ADC13SVGG, ADC10SVGN, ADC11SVGN, ADC10SVMG, ADC10SVMG, ADC14SVGG
Hardware Version	1.0
Software Version	1.0
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 : 12.86 dBm • 802.11g : 19.89 dBm • 802.11n (HT20) : 19.89 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		
ТМ 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	:	21 °C ~ 24 °C
Relative humidity content		35 % ~ 43 %
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	0.9 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	···· · · · · · · · · · · · · · · · · ·		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)		NA
15.247(d) 15.205 15.209	RSS-247 [5.5] RSS-GEN [8.9] RSS-GEN [8.10]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209 limits	Radiated	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.



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

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					

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.

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	7.11		
TM 1	Middle	7.12		
	Highest	7.10		
	Lowest	16.33		
TM 2	Middle	16.32		
	Highest	16.33		
	Lowest	17.14		
ТМ 3	Middle	17.53		
	Highest	17.33		



RESULT PLOTS

6 dB Bandwidth

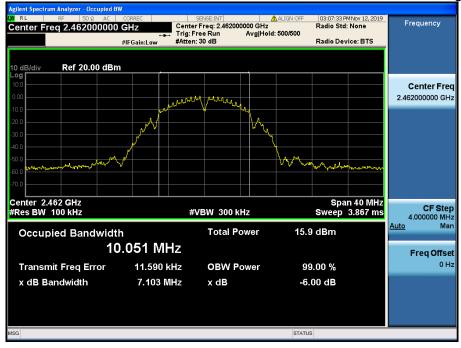


6 dB Bandwidth

TM 1 & Middle



TM 1 & Highest

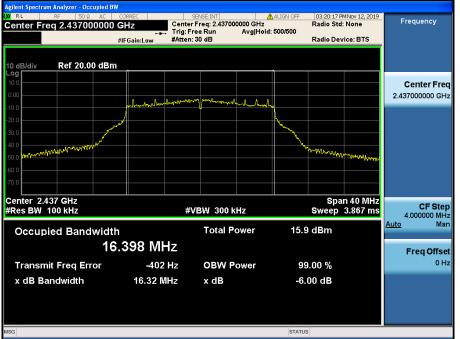


🛈 Dt&C

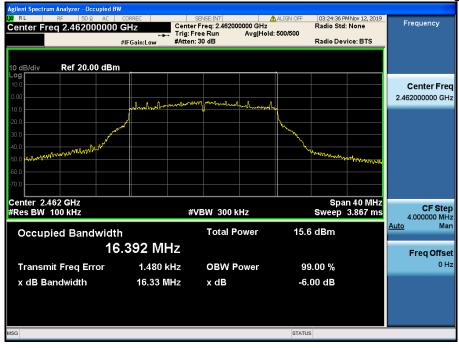


6 dB Bandwidth





TM 2 & Highest



🛈 Dt&C



6 dB Bandwidth





🛈 Dt&C

TM 3 & Highest

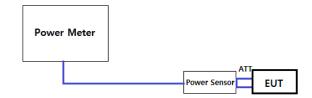


8.2 Maximum peak conducted output power

Test Requirements and limit, §15.247(b)

The maximum permissible conducted output power is 1 Watt.

Test Configuration



Test Procedure

- KDB558074 D01v05r02 Section 8.3.1.3
- ANSI C63.10-2013 Section 11.9.1.3

PKPM1 Peak power meter method

- 1. 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.
- KDB558074 D01v05r02 Section 8.3.2.3
- ANSI C63.10-2013 Section 11.9.2.3.2

Method AVGPM-G

 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

From		Maximum Peak Conducted Output Power (dBm) for 802.11b							
Freq. (MHz)	Det.				Data Rat	e [Mbps]			
		1	2	5.5	11	-	-	-	-
PK	PK	12.79	12.76	12.70	12.73	-	-	-	-
2412	AV	9.77	9.76	9.69	9.71	-	-	-	-
2437	PK	12.86	12.83	12.78	12.81	-	-	-	-
2437	AV	9.78	9.73	9.64	9.69	-	-	-	-
2462	PK	12.34	12.33	12.25	12.30	-	-	-	-
	AV	9.22	9.11	9.15	9.20	-	-	-	-

F ree a		Maximum Peak Conducted Output Power (dBm) for <u>802.11g</u>										
Freq. (MHz)	Det.	Data Rate [Mbps]										
		6	9	12	18	24	36	48	54			
2412	PK	19.63	19.40	19.43	19.61	19.54	19.46	19.45	19.48			
	AV	9.98	9.78	9.75	9.77	9.92	9.94	9.86	9.92			
2437	PK	19.89	19.77	19.83	19.67	19.82	19.85	19.65	19.70			
2437	AV	9.91	9.88	9.68	9.78	9.81	9.73	9.71	9.82			
2462	PK	19.70	19.53	19.46	19.49	19.69	19.64	19.53	19.49			
2402	AV	9.74	9.60	9.67	9.67	9.73	9.60	9.69	9.52			

From		Maximum Peak Conducted Output Power (dBm) for <u>802.11n(HT20)</u>										
Freq. (MHz)	Det.	Data Rate [MCS]										
		0	1	2	3	4	5	6	7			
2412 -	PK	19.89	19.81	19.79	19.83	19.81	19.69	19.67	19.84			
	AV	10.05	9.81	9.92	9.90	9.81	10.01	10.03	9.87			
2437	PK	19.59	19.37	19.56	19.57	19.58	19.44	19.56	19.39			
2437	AV	9.96	9.78	9.94	9.89	9.77	9.87	9.74	9.86			
2462	PK	19.70	19.46	19.68	19.69	19.57	19.64	19.57	19.47			
2462	AV	9.65	9.52	9.58	9.58	9.43	9.53	9.53	9.42			



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	-11.26
TM 1	Middle	3 kHz	-11.64
	Highest	3 kHz	-12.57
	Lowest	3 kHz	-13.92
TM 2	Middle	3 kHz	-14.06
	Highest	3 kHz	-14.33
	Lowest	3 kHz	-14.29
ТМ 3	Middle	3 kHz	-15.39
	Highest	3 kHz	-15.03

RESULT PLOTS





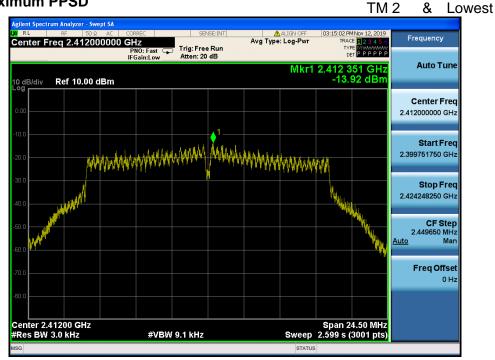
Maximum PPSD

TM 1 & Middle



TM 1 & Highest gilent Spectrum Analyzer - Swept SA Center Freq 2.462000000 GHz PNO: Wide C IFGain:Low Atten: 20 dB ALIGN OFF lov 12, 2019 Frequency RACE 123456 TYPE MWWWWWW DET PPPPP Mkr1 2.461 261 GHz -12.57 dBm Auto Tune B/div Ref 10.00 dBm 10 c **Center Freq** 2.462000000 GHz • Start Freq والمعد الساعية والمالية والمعاد و بالشاري in Maria ا بن المالغان 2.456672750 GHz **WARMAN WAR** un de la contraction de la con **Stop Freq** 2.467327250 GHz **CF Step** 1.065450 MHz Man <u>Auto</u> Freq Offset 0 Hz Center 2.462000 GHz #Res BW 3.0 kHz Span 10.65 MHz Sweep 1.131 s (3001 pts) #VBW 9.1 kHz

Dt&C



Maximum PPSD

TM2 & Middle





Dt&C



Maximum PPSD

TM 3 & Middle





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**

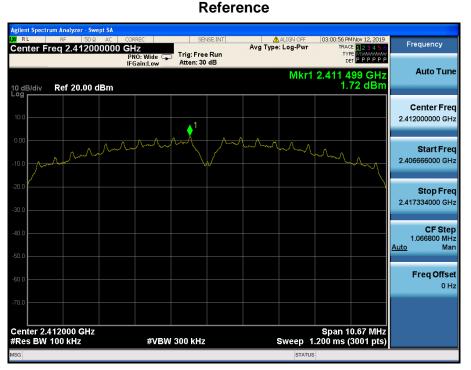
Frequency range: 30 MHz ~ 10 GHz, 10 GHz ~25 GHz RBW = 1 MHz, VBW = 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

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

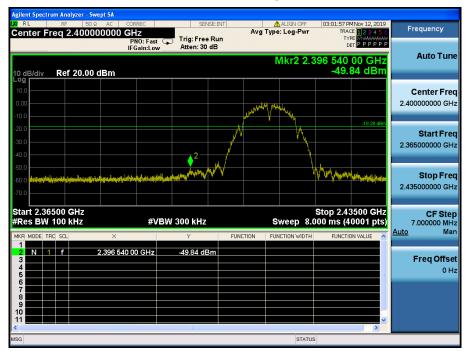
If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

RESULT PLOTS

TM 1 & Lowest



Low Band-edge



Agilent Spectru	um Analyzer - Swept RF 50 Q A		SENSE: IN	IT.	ALIGN OFF	03:02:05 PM Nov 12, 2019	_
	eq 15.00450		Trig: Free Ru	Avg	Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P P	Frequency
10 dB/div	Ref 20.00 dE	IFGain:Low	Atten: 30 dB		ſ	/kr1 290.2 kHz -43.42 dBm	Auto Tune
Log 10.0 0.00							Center Freq 15.004500 MHz
-20.0 -30.0 -40.0						-18.28 dBm	Start Freq 9.000 kHz
-70.0		elanet Makilan (ji kearreis) di	Madhayr chwrai grynil blaywrwiyd	Utiwayoyhthorma	441) ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	layayarayada dariyilga waliyilga b	Stop Freq 30.000000 MHz
Start 9 kH #Res BW	100 kHz	#VB	W 300 kHz	FUNCTION	Sweep 5.3	Stop 30.00 MHz 33 ms (40001 pts)	CF Step 2.999100 MHz Auto Man
1 N 1 2 3 4 5 6	f	290.2 kHz	-43.42 dBm				Freq Offset 0 Hz
0 7 8 9 10 11						~	
MSG					STATUS	L DC Coupled	

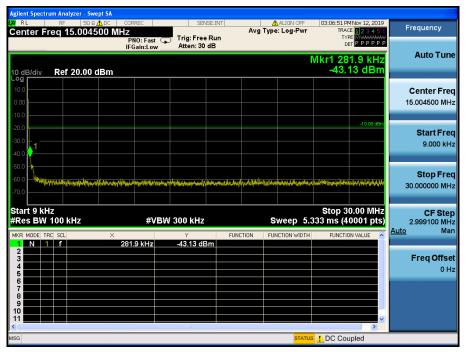
	um Analyzer - Sw							
Center Fi	RF 50 Ω req 5.01500		SENSE:INT		ALIGN OFF	TRACE	Nov 12, 2019	Frequency
		PNO: Fast C IFGain:Low	Trig: Free Run Atten: 30 dB			TYP	PPPPP	
					Mkr	5 9.468		Auto Tune
10 dB/div Log	Ref 20.00	dBm				-41.9	7 dBm	
10.0		1						Center Freq
0.00		<u> </u>						5.015000000 GHz
-10.0								
-20.0							-18.28 dBm	Start Freq
-30.0						∧4	5	30.000000 MHz
-40.0		an an an a the solid to the first state	قىرلىغىس ر	ale anali cale our distant	والمحادثين والمحادث	Land and a line	and a strength of	
-50.0	and the second sec		The state of the s	فتتعرف والتشتر فالمراوية		Carlo III a carlo III a	a a caller a caller	Stop Freq
-60.0								10.000000000 GHz
-70.0								
Start 30 M						Stop 10.		CF Step
#Res BW	1.0 MHz	#VB	W 3.0 MHz		Sweep 18	.67 ms (40	001 pts)	997.000000 MHz Auto Man
MKR MODE TF	RC SCL	× 2.411 09 GHz	⊻ 4.83 dBm	FUNCTION FU	INCTION WIDTH	FUNCTIO	N VALUE	<u>Auto</u> Man
2 N 1	÷ f	9.517 95 GHz	-41.24 dBm					Ere # Offert
3 N 1 4 N 1	f f	9.508 23 GHz 8.773 94 GHz	-41.70 dBm -41.82 dBm					Freq Offset 0 Hz
5 N 1	f	9.468 10 GHz	-41.97 dBm				=	0112
7								
9								
11							~	
MSG					STATUS			
mag					518105			



TM 1 & Middle

Reference





Agilent Spectrum Analyzer - S X/ RL RF 50		SENSE:INT	ALIGN OFF	03:07:00 PMNov 12, 2019	
Center Freq 5.0150			Avg Type: Log-Pwr	TRACE 123456	Frequency
	PNO: Fast C IFGain:Low	Trig: Free Run Atten: 30 dB		DET P P P P P	
	IFGam.cow	Theorem of the	Miles	5 9.379 12 GHz	Auto Tune
10 dB/div Ref 20.00	dDay		IVINI	-42.13 dBm	
10 dB/div Ref 20.00				42.10 abii	
10.0	<mark>1</mark>				Center Fred
0.00	Y				5.015000000 GH
10.0					
20.0				-19.08 dBm	
					Start Free
-30.0				∧ 53	30.000000 MH:
-40.0	and the second second second		and the second of the second	And the substrate of th	
-50.0 All statistics of the statistics from		ALL NO. OF A DESCRIPTION OF A DESCRIPTIO		No. of Concession, Name	Oton Ero
-60.0					Stop Free 10.000000000 GH
70.0					10.00000000 GH.
Start 30 MHz #Res BW 1.0 MHz	#\/B\	₩ 3.0 MHz	Sween 19	Stop 10.000 GHz .67 ms (40001 pts)	CF Step
					997.000000 MH Auto Mar
MKR MODE TRC SCL	× 2.437 01 GHz	Y F 4.28 dBm	UNCTION FUNCTION WIDTH	FUNCTION VALUE	
2 N 1 f	9.401 05 GHz	-41.51 dBm			_
3 N 1 f	9.498 51 GHz 9.448 91 GHz	-41.55 dBm -41.68 dBm			Freq Offse
5 N 1 f	9.379 12 GHz	-42.13 dBm		=	он
6 7					
8					
9					
11				~	
<		III.			
SG			STATUS		

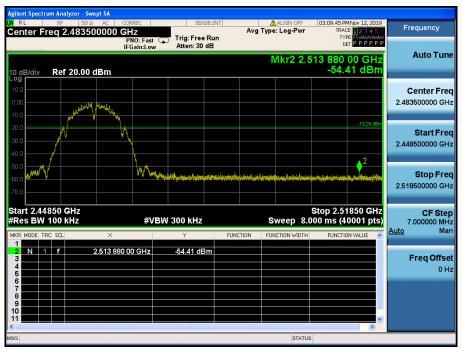
Agilent Spect		ılyzer - Swe	pt SA								
Center F	_{RF} rea 1			ORREC		ISE:INT	Avg	ALIGN OFF	TRAC	4Nov 12, 2019 E <mark>1 2 3 4 5 6</mark>	Frequency
				PNO: Fast =Gain:Low					TYI Di	Е Милиини Т Р Р Р Р Р Р	
								Mkr3 2	3.895 6	25 GHz	Auto Tune
10 dB/div Log	Ref	20.00 d	Bm						-29.	39 dBm	
10.0											Center Freq
0.00											17.500000000 GHz
-10.0										-10 08 dBm	
-20.0										3 ³	Start Freq
-30.0						والمتلقين والمتلاور	مامدر والكل	Lange Street Street	and a state of the		10.00000000 GHz
-40.0		and an address of the second			and the second						
-50.0											Stop Freq
-70.0											25.00000000 GHz
Start 10.0 #Res BW				#V	BW 3.0 MHz			Sweep 40	25 Stop 00 ms (4	.000 GHz 0001 pts)	CF Step 1.50000000 GHz
MKR MODE T	RC SCL		×		Y		ICTION	FUNCTION WIDTH	FUNCTIO	IN VALUE	<u>Auto</u> Man
1 N 1 2 N 1	1 f 1 f		23.816 1 23.968 3		-29.22 dE -29.67 dE						
3 N 1	l f		23.895 6	25 GHz	-29.89 dE	3m					Freq Offset
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8 9											
10										~	
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TM 1 & Highest

Reference



High Band-edge



Agilent Spectru	m Analyzer - Swep RF 50 Ω /		SENSE:I	NT	ALIGN OFF	03:09:52 PM Nov 12, 2019	
	eq 15.0045	DO MHz PNO: Fast	Talas France Da	Avg	Type: Log-Pwr	TRACE 123456 TYPE MWWWWW DET PPPPP	Frequency
10 dB/div	Ref 20.00 d	IFGain:Low BM	Atten: 30 dB		1	/kr1 281.9 kHz -43.25 dBm	Auto Tune
10.0 0.00							Center Freq 15.004500 MHz
-20.0 -30.0 -40.0						-19.20 dBm	Start Freq 9.000 kHz
-70.0		Argel firsted to all yet of south a few to	apantanya, Indiana di ana di kasara di ana di kasara di kasara di kasara di kasara di kasara di kasara di kasa Na kasara di	nije la cipis dinada	nthijas, k ^a istrosojast (t _{ete} sterjik)	anistiya jita wajiya ta kata wajiya ta kata wa ta kata w	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 1	100 kHz	#VE	3W 300 kHz	FUNCTION	Sweep 5.3	Stop 30.00 MHz 33 ms (40001 pts)	CF Step 2.999100 MHz Auto Man
1 N 1 2 3 4 5 6	f	281.9 kHz	-43.25 dBm				Freq Offset 0 Hz
7 8 9 10 11						~	
MSG					STATUS	L DC Coupled	

Agilent Spectrum	n Analyzer - Swept S RF 50 Ω A		SENSE: J	TT I	ALIGN OFF	03:10:02 PM Nov 12, 20	10
	q 5.0150000			Avg	Type: Log-Pwr	103:10:02 PM Nov 12, 20 TRACE 1234 TYPE MWWW DET PPPPP	Frequency
		IFGain:Low	Atten: 30 dB				
	Ref 20.00 dBr	n			Mkr	5 9.536 40 GH -42.33 dBi	
10.0		1					Center Freq
-10.0							5.015000000 GHz
-20.0						-19.20 di	Bin Start Freq
-30.0						4 📈 5	30.000000 MHz
-40.0	and provident provident and provident	an taking dilakana	dealers and the strength of the second strength of the second strength of the strength of the second strength of t	a bloce cynterfeleinau jw	A MARKED BOTTOM AND A MARKED B		
-60.0	anda ya kana kata da sa kata da s						Stop Freq 10.00000000 GHz
-70.0							10.00000000 GH2
Start 30 MH #Res BW 1		#VB	W 3.0 MHz		Sweep 18	Stop 10.000 GH .67 ms (40001 pt	
MKR MODE TRC		×	Y	FUNCTION	FUNCTION WIDTH		Auto Man
1 N 1 2 N 1	f	2.461 18 GHz 9.419 75 GHz	3.96 dBm -42.03 dBm				Freq Offset
3 N 1 4 N 1 5 N 1	f	9.587 49 GHz 7.952 66 GHz 9.536 40 GHz	-42.14 dBm -42.25 dBm -42.33 dBm				0 Hz
6 7		0.000 40 0112	42.00 a.D.m				-
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TM 2 & Lowest

Reference



Low Band-edge



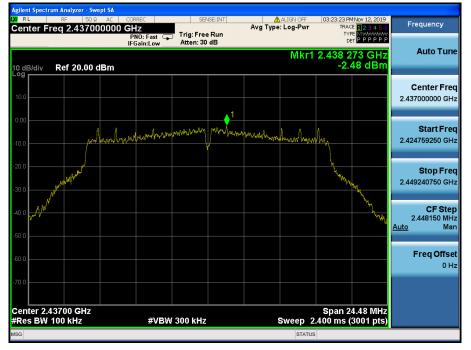
Agilent Spectru	m Analyzer - Swept RF 50 Ω Λ		SENSE: IN	п	ALIGN OFF	03:16:25 PM Nov 12, 2019	
	eq 15.00450	0 MHz PNO: Fast	Trig: Free Ru	Avg	Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P P	Frequency
10 dB/div	Ref 20.00 dE	IFGain:Low	Atten: 30 dB		ſ	/kr1 281.9 kHz -44.47 dBm	Auto Tune
Log 10.0 0.00							Center Freq 15.004500 MHz
-20.0 -30.0 -40.0						22.42 dBn	Start Freq 9.000 kHz
-50.0 -60.0	ANY recordering to provide the first	andalistin and an and a star	Hadrahan (ng baga kan baran	strater with a cash	un kalender og hat	www.haitaalaalitaalitaalitaalitaalita	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 1	00 kHz		W 300 kHz			Stop 30.00 MHz 33 ms (40001 pts)	CF Step 2.999100 MHz Auto Man
MKR MODE TRO 1 N 1 2 3 3 4 5 5 6		× 281.9 kHz	∨ -44.47 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Freq Offset
7 8 9 10 11			- MI			×	
MSG					STATUS	L DC Coupled	

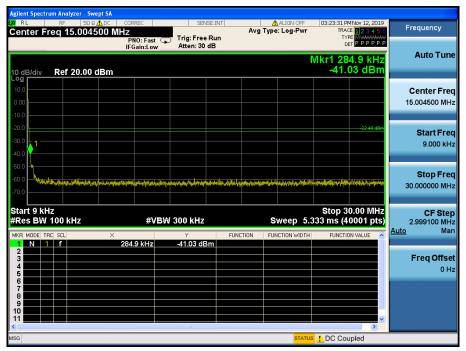
Agilent Spectrum Analyzer - Swept SA							
RL RF 50 Ω AC Center Freq 5.015000000) GHz	SENSE:INT		ALIGN OFF	03:16:34 PM TRACE	123456	Frequency
	PNO: Fast 🕞 IFGain:Low	Trig: Free Run Atten: 30 dB			DE	PPPPP	
				Mkr	5 8.840 4	19 GHz	Auto Tune
10 dB/div Ref 20.00 dBm					-42.0	9 dBm	
10.0	1						Center Freq
0.00							5.015000000 GHz
-10.0							
-20.0	2						Start Freq
-30.0					<u> </u>	(8) ³⁴	30.000000 MHz
-40.0	and a second	and the second states	- Station of the state	ويتقالدون والمعاليون والمعاليون	and the second	ing the Alexandropert	
-50.0 setting to the set of the set of the set of the set	A CONTRACTOR OF STREET, SALES	the south the plant the strength	ير اور ول محمد ويور حد	ورياني ملطان وري وياهدنا	an airean ann ann ann	and a state of the second second	Stop Freq
-60.0							10.000000000 GHz
-70.0							
Start 30 MHz					Stop 10.		CF Step
#Res BW 1.0 MHz	#VBN	3.0 MHz		Sweep 18			997.000000 MHz Auto Man
MKR MODE TRC SCL X	412 83 GHz	⊻ 7.01 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	N VALUE	<u>Auto</u> murr
2 N 1 f 2.	397 88 GHz	-26.47 dBm					Freq Offset
4 N 1 f 9.	409 78 GHz 479 57 GHz	-41.98 dBm -42.02 dBm					0 Hz
5 N 1 f 8.	840 49 GHz	-42.09 dBm					0112
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8							
10						~	
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MSG				STATUS			



TM 2 & Middle

Reference





Agilent Spectrum Analyzer - Sw					
	AC CORREC	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	03:23:39 PM Nov 12, 2019 TRACE 1 2 3 4 5 6	Frequency
Center Freq 5.01500	PNO: Fast G IFGain:Low	⊃ Trig: Free Run Atten: 30 dB	Avg Type. Log-t wi	TYPE MWWWWW DET PPPPP	
10 dB/div Ref 20.00	dBm		Mkr	5 6.181 74 GHz -41.92 dBm	Auto Tune
Log 10.0 0.00					Center Freq 5.015000000 GHz
-20.0		and the state of t	5	-22.48 dBm	Start Freq 30.000000 MHz
-50.0					Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VBV	V 3.0 MHz	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz Auto Man
MKR MODE TRC SCL	× 2.438 25 GHz	Y F 6.88 dBm	UNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1 F 2 N 1 F 3 N 1 F 4 N 1 F 5 N 1 F	2.438 25 GHZ 9.464 11 GHZ 9.585 50 GHZ 9.399 81 GHZ 6.181 74 GHZ	6.88 dBm -40.51 dBm -40.76 dBm -41.39 dBm -41.92 dBm		=	Freq Offset 0 Hz
6 7 8 9 10					
11				~	
MSG		100	STATUS		
			STATUS		

Agilent Spectrum Analyzer - Swept SA				
(X) RL RF 50Ω AC CORREC	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	03:23:48 PM Nov 12, 2019 TRACE 1 2 3 4 5 6	Frequency
Center Freq 17.500000000 GHz PNO: Fa IFGain:Lu		Avg Type. Logi wi		
		Mkr3 2	3.948 500 GHz	Auto Tune
10 dB/div Ref 20.00 dBm			-29.23 dBm	
10.0				Center Freq
0.00				17.500000000 GHz
-10.0				
-20.0			3 18 dBm	Otoret From
-30.0				Start Freq 10.00000000 GHz
-40.0				10.000000000000
-50.0				
-60.0				Stop Freq
-70.0				25.00000000 GHz
Start 10.000 GHz			Stop 25.000 GHz	
	VBW 3.0 MHz	Sweep 40	.00 ms (40001 pts)	CF Step 1.50000000 GHz
MKR MODE TRC SCL X		NCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1 f 23.778 625 GH 2 N 1 f 23.885 125 GH				
3 N 1 f 23.948 500 GH;	-29.23 dBm			Freq Offset
5			=	0 Hz
6				
8				
10				
11			>	
MSG		STATUS	3	

TM 2 & Highest

nt So ctrum Analy ent S/ OR RL RF 500 AC UNINES Center Freq 2.462000000 GHz PNO:Fast IFGain:Low Atten: 30 dB 03:26:43 PM Nov 12, 20 TRACE 2 3 4 ALIGN OFF Frequency DET P P P P P Auto Tune Mkr1 2.463 282 GHz -2.49 dBm Ref 20.00 dBm 10 dB/div Loa **Center Freq** 2.462000000 GHz Manmannam monum Start Freq 2.449755500 GHz Stop Freq 2.474244500 GHz CF Step 2.448900 MHz Man Auto Freq Offset 0 Hz Center 2.46200 GHz #Res BW 100 kHz Span 24.49 MHz Sweep 2.400 ms (3001 pts) #VBW 300 kHz

High Band-edge



Agilent Spectrum Analyzer	- Swept SA 50 Ω / DC CORREC	SENSE: IN	т І	ALIGN OFF	03:27:54 PM Nov 12, 2019	
Center Freq 15.0	04500 MHz PNO: Fast	Tailer Free Prove	Avg	Type: Log-Pwr	TRACE 123456 TYPE MWWWWW DET PPPPP	Frequency
10 dB/div Ref 20.	IFGain:Low 00 dBm	Auen. 30 dB		Γ	/lkr1 281.9 kHz -43.31 dBm	Auto Tune
10.0 0.00						Center Freq 15.004500 MHz
-20.0 -30.0 -40.0					22.49 dBm	Start Freq 9.000 kHz
-50.0 -60.0 -70.0	ntul (y and the second of the	หมุ่งไหม่ไรที่ร่างใจกลุ่งสุขามหางไป	Na ang kang pangan ng kang Manak	lley, i, ettip het give frag, et spile fri	reformation and the festive to prove the	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz		3W 300 kHz		•	Stop 30.00 MHz 33 ms (40001 pts)	CF Step 2.999100 MHz Auto Man
MKR MODE TRC SCL 1 N 1 f 2 - - - 3 - - - 4 - - - 5 - - - 6 - - -	× 281.9 kHz	-43.31 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Freq Offset
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9					v >	
MSG				STATUS	L DC Coupled	

Og R.L RF SO & AC CORREC SERVE:INT Autor OFF ID32803 PM/Wv 12, 2019 Frequency Center Freq 5.015000000 GHz, IFGain:Low Trig: Free Run Atten: 30 dB Avg Type: Log-Pwr Trace 2.2 dF Auto Tun 10 dE/div Ref 20.00 dBm 42.38 dBm Center Free 5.01500000 GHz Auto Tun 200 1 20.0<
Mkr5 3.146 87 GHz Auto Tun 10 dB/div Ref 20.00 dBm Center Fre 100 1 5.01500000 GH 100 200 2249 dm 300 15 30.00000 MH
Image: Non-state Control of Control o
10.0 1 Center Fre 0.00 -
-30.0
a barrier and the second s
4500 Free Stop Free -600 - - - - - - - - Stop Free 10.000000000 GH -700 -
Start 30 MHz Stop 10.000 GHz CF Ste #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 18.67 ms (40001 pts) 997.00000 MHz
I I 2.1402 33 0112 0.00 dBIII 2 N 1 f 9.33 375 GHz 4.11.00 dBm 3 N 1 f 9.421 24 GHz 4.11.00 dBm Freq Offset 4 N 1 f 9.421 24 GHz 4.12.80 dBm OH 5 N 1 f 3.043 97 GHz 4.2.30 dBm OH
6 1 1 1 1 7 1 1 1 1 8 1 1 1 1 9 1 1 1 1
MSG STATUS

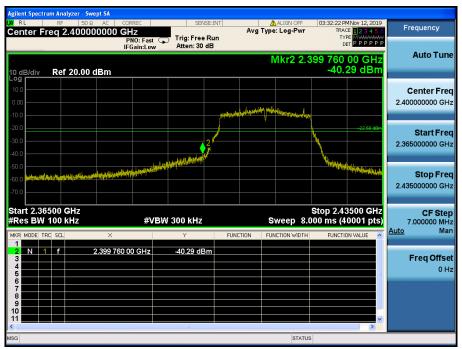


TM 3 & Lowest

Reference



Low Band-edge



Agilent Spectr	um Analyzer - Swe RF 50 Ω		SENSE:]	NT	ALIGN OFF	03:32:30 PM Nov 12, 2019	
	req 15.0045	00 MHz PNO: Fast	Trig: Free Ru	Avg	Type: Log-Pwr		Frequency
10 dB/div	Ref 20.00 d	IFGain:Low BM	Atten: 30 dB		٢	43.08 dBm	Auto Tune
Log 10.0 0.00							Center Freq 15.004500 MHz
-20.0 -30.0 -40.0						-22.58 dBm	Start Freq 9.000 kHz
-50.0 -60.0	ha kiran atin ing kani na tang	Haar Sh ^{ha} lf (Kalapa) (Kabar) para (Kal	in Walna and an air had a succeed as her	anter anti-	maninanitanitani	giran dagi kangan pangan kan kan kan ka	Stop Freq 30.000000 MHz
Start 9 kH #Res BW	100 kHz	#VI	300 kHz	FUNCTION	Sweep 5.3	Stop 30.00 MHz 33 ms (40001 pts)	
1 N 1 2 3		[^] 281 <u>.9</u> kHz	-43.08 dBm	FUNCTION		FUNCTION VALUE	Freq Offset 0 Hz
8 9 10 11 <			an		STATUS	↓ DC Coupled	

Agilent Spectrum Analyzer					
Center Freq 5.015	50 Ω AC CORREC	SENSE:IN	Avg Type: Log	-Pwr TRACE 123456	Frequency
	PNO: Fast IFGain:Lov		1	TYPE MWWWWWW DET P P P P P	
				Mkr5 9.513 71 GHz	Auto Tune
10 dB/div Ref 20.0	00 dBm			-41.94 dBm	
Log 10.0	^1				Center Freq
0.00					5.015000000 GHz
-10.0					
-20.0				-22.58 dBm	Start Freq
-30.0				5_	30.000000 MHz
-40.0			n an tain an Tablanan - Albana - Shaka	n ha and a face of the state of	
-50.0 desember through the			أثقتنا يتتقد ومشنا ومسند		Oton Enun
-60.0					Stop Freq 10.00000000 GHz
-70.0					10.00000000000000112
Start 30 MHz				Stop 10.000 GHz	CF Step
#Res BW 1.0 MHz	#V	BW 3.0 MHz	Swee	p 18.67 ms (40001 pts)	997.000000 MHz
MKR MODE TRC SCL	×	Y	FUNCTION FUNCTION	WIDTH FUNCTION VALUE	<u>Auto</u> Man
1 N 1 f 2 N 1 f	2.410 84 GHz 3.140 14 GHz	6.53 dBm -41.46 dBm			
3 N 1 f 4 N 1 f	3.134 16 GHz 3.158 84 GHz	-41.68 dBm -41.82 dBm			Freq Offset
5 N 1 f	9.513 71 GHz	-41.94 dBm			0 Hz
7					
8 9					
10				~	
<		illi -		>	
MSG				STATUS	



TM 3 & Middle

Reference



Agilent Spectrum Analyzer - Sw					
X RL RF 50 ହ Center Freq 15.004		SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	03:36:34 PM Nov 12, 2019 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency
	PNO: Fast IFGain:Low	Atten: 30 dB		DETPPPP	Auto Tune
10 dB/div Ref 20.00	dBm			Mkr1 281.9 kHz -44.35 dBm	Auto Tune
10.0 0.00 -10.0					Center Freq 15.004500 MHz
-20.0				-23.65 dBm	Start Freq 9.000 kHz
-50.0	ri forsalaki nyagatafranya ili arapa	then the transforment to the contraction of the second	ฟารสีมาระกิจามาามามีสมาระนับ	จงการสีสันวาทอาการใจมาแล้งการผู้ไ	Stop Fred 30.000000 MHz
Start 9 kHz #Res BW 100 kHz	#VE	W 300 kHz	Sweep 5.	Stop 30.00 MHz 333 ms (40001 pts)	CF Step 2.999100 MHz <u>Auto</u> Man
1 N 1 f 2 3 3 4 5	281.9 kHz	-44.35 dBm	UNCTION FORCHON WIDTH		Freq Offset 0 Hz
6 7 8 9 10					
11				>	
SG			STATUS	DC Coupled	

Agilent Spectrum Analyzer - S			A 11 491 499		
RE SO Center Freq 5.0150		SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	03:36:43 PM Nov 12, 2019 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast G IFGain:Low	Trig: Free Run Atten: 30 dB		DET P P P P P	
	ii Gainicow		Mkr	5 6.922 01 GHz	Auto Tune
10 dB/div Ref 20.00	dBm			-42.15 dBm	
10.0					Center Fred
0.00	, Y				5.015000000 GH;
10.0					
-20.0				-23.65 dBm	Otort Erec
-30.0			<u>_</u>	. 22	Start Free 30.000000 MH;
-40.0	Q [#]		∮ ⁵		00.000000 Mil 12
-50.0 - South and the second states	In the second second second second		ang daga pang mang pang berta dalam pang berta pang berta pang berta pang berta pang berta pang berta pang ber Pang berta pang berta p	And the second	
-60.0					Stop Free 10.000000000 GH
-70.0					10.00000000 GH:
Start 30 MHz				Stop 10.000 GHz	OE Oter
#Res BW 1.0 MHz	#VB\	V 3.0 MHz	Sweep 18	.67 ms (40001 pts)	CF Step 997.000000 MHz
MKR MODE TRC SCL	×		JNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Mar
1 N 1 f	2.438 25 GHz 9.457 13 GHz	5.77 dBm -41.65 dBm			
3 N 1 f	9.584 50 GHz 3.091 54 GHz	-42.07 dBm -42.12 dBm			Freq Offse
5 N 1 f	6.922 01 GHz	-42.15 dBm		=	0 H:
6 7					
8					
10				~	
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Agilent Spectrum Analyzer - Swept SA				
M RL RF 50Ω AC Center Freq 17.50000000	PNO: Fast 😱 Trig: Free Rur	Avg Type: Log-Pwr	03:36:51 PM Nov 12, 2019 TRACE 2 3 4 5 6 TYPE MMMMMM DET P P P P P P	Frequency
10 dB/div Ref 20.00 dBm	IFGain:Low Atten: 30 dB	Mkr3 2	23.717 500 GHz -29.96 dBm	Auto Tune
10.0 0.00				Center Freq 17.500000000 GHz
-20.0 -30.0 -40.0			3 2 65 dBm	Start Freq 10.000000000 GHz
-50.0				Stop Freq 25.000000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 40	Stop 25.000 GHz .00 ms (40001 pts)	CF Step 1.50000000 GHz <u>Auto</u> Man
1 N 1 f 23.85 2 N 1 f 23.92 3 N 1 f 23.92 5 S S S S S S S S S S S S S S S S S S S	8 500 GHz -29.24 dBm 7 500 GHz -29.52 dBm 7 500 GHz -29.96 dBm			Freq Offset 0 Hz
6 7 8 9 10				
< MSG	aut -	STATUS		

TM 3 & Highest

Reference



High Band-edge



Agilent Spectrum Analyzer	- Swept SΛ 50 Ω Λ DC CORREC	SENSE:INT		ALIGN OFF	03:41:16 PM Nov 12, 2019	
Center Freq 15.0	04500 MHz PNO: Fast	Trig: Free Run		e: Log-Pwr	TRACE 123456 TYPE MWWWWW DET PPPPP	Frequency
10 dB/div Ref 20.	IFGain:Low 00 dBm	Atten: 30 dB		ſ	/kr1 281.9 kHz -42.58 dBm	Auto Tune
10.0 0.00						Center Freq 15.004500 MHz
-20.0 -30.0 -40.0					-23.81 dBm	Start Freq 9.000 kHz
-50.0	telyy top hild a general production of the terminal	han mahadan kanan ka Kanan kanan kana	altaliyetetetetetetetetetetetetetetetetetetet	(disentation of street)	ymentek mith/synfithetakenteure	Stop Freq 30.000000 MHz
Start 9 kHz #Res BW 100 kHz		300 kHz			Stop 30.00 MHz 33 ms (40001 pts)	CF Step 2.999100 MHz Auto Man
MKR MODE TRC SCL 1 N 1 f 2 3 - - 3 - - - 4 - - - 5 - - - 6 - - -	× 281.9 kHz	42.58 dBm	FUNCTION FU	NCTION WIDTH	FUNCTION VALUE	Freq Offset
7 8 9 10 11		10			~	
MSG				STATUS	1 DC Coupled	

Agilent Spectrum Analyzer - Sw					
Center Freq 5.0150	AC CORREC 00000 GHz	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	03:41:25 PM Nov 12, 2019 TRACE 12 3 4 5 6	Frequency
	PNO: Fast 🕞 IFGain:Low	Trig: Free Run Atten: 30 dB		TYPE MWWWWWW DET P P P P P P	
			Mkr	5 3.113 97 GHz	Auto Tune
10 dB/div Ref 20.00	dBm			-42.54 dBm	
10.0	1				Center Freq
0.00					5.015000000 GHz
-10.0					
-20.0				-23.81 dBm	Start Freq
-30.0	// 5				30.000000 MHz
-40.0	a source berner the second	والمحافظ والمتعادين والمحافظ والمحاف	and the second	here and a second and a second second	
-50.0 mission and the second s	A CONTRACTOR OF A CONTRACTOR	in the second		and the second data	Stop Freq
-60.0					10.00000000 GHz
-70.0					
Start 30 MHz			A	Stop 10.000 GHz	CF Step
#Res BW 1.0 MHz		V 3.0 MHz		.67 ms (40001 pts)	997.000000 MHz Auto Man
MKR MODE TRC SCL	× 2.462 93 GHz	5.16 dBm	UNCTION FUNCTION WIDTH	FUNCTION VALUE	
2 N 1 F 3 N 1 F	2.989 59 GHz 9.437 94 GHz	-40.90 dBm -41.25 dBm			Freq Offset
4 N 1 f	3.051 16 GHz 3.113 97 GHz	-42.26 dBm -42.54 dBm			0 Hz
6	0.110 01 0112	42.0440			
8					
10					
11 <				× >	
MSG			STATUS		





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.

Test Mode	Date rate	T _{on} (ms)	Ton(ms) Ton+off (ms)		DCCF = 10 log(1/D) (dB)	
TM 1	1Mbps	12.420	12.510	0.9928	0.03	
TM 2	6Mbps	2.064	2.164	0.9538	0.21	
TM 3	MCS 0	1.922	2.120	0.9066	0.43	

Duty Cycle Correction factor

Note1: Where, T= Transmission duration / D= Duty cycle Note2: Please refer to the appendix II for duty cycle plots.

Test Results: Comply

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : <u>TM 1</u>

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)
	2389.05	V	Х	PK	51.84	2.34	N/A	N/A	54.18	74.00	19.82
	2388.84	V	Х	AV	41.70	2.34	0.03	N/A	44.07	54.00	9.93
Lowoot	4824.10	Н	Х	PK	50.15	1.94	N/A	N/A	52.09	74.00	21.91
Lowest	4824.36	Н	Х	AV	39.47	1.94	0.03	N/A	41.44	54.00	12.56
	7234.29	V	Х	PK	51.53	8.45	N/A	N/A	59.98	74.00	14.02
	7234.68	V	Х	AV	43.42	8.45	0.03	N/A	51.90	54.00	2.10
	4873.70	Н	Х	PK	50.97	2.12	N/A	N/A	53.09	74.00	20.91
Middle	4873.65	Н	Х	AV	39.71	2.12	0.03	N/A	41.86	54.00	12.14
wildule	7309.25	V	Х	PK	49.09	8.97	N/A	N/A	58.06	74.00	15.94
	7309.78	V	Х	AV	40.52	8.97	0.03	N/A	49.52	54.00	4.48
	2486.42	V	Х	PK	52.57	2.81	N/A	N/A	55.38	74.00	18.62
	2483.66	V	Х	AV	41.80	2.81	0.03	N/A	44.64	54.00	9.36
Highoot	4923.93	Н	Х	PK	50.66	2.12	N/A	N/A	52.78	74.00	21.22
Highest	4923.69	Н	Х	AV	39.60	2.12	0.03	N/A	41.75	54.00	12.25
	7386.78	V	Х	PK	48.35	8.59	N/A	N/A	56.94	74.00	17.06
	7387.26	V	Х	AV	39.39	8.58	0.03	N/A	48.00	54.00	6.00

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

Dt&C

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)
	2389.20	V	Х	PK	55.44	2.34	N/A	N/A	57.78	74.00	16.22
	2389.93	V	Х	AV	44.56	2.34	0.21	N/A	47.11	54.00	6.89
Louiset	4824.03	н	Х	PK	50.03	1.94	N/A	N/A	51.97	74.00	22.03
Lowest	4823.64	н	Х	AV	39.43	1.94	0.21	N/A	41.58	54.00	12.42
	7234.32	V	Х	PK	60.80	8.45	N/A	N/A	69.25	74.00	4.75
	7234.81	V	Х	AV	40.08	8.45	0.21	N/A	48.74	54.00	5.26
	4874.11	Н	Х	PK	49.95	2.12	N/A	N/A	52.07	74.00	21.93
Mistalla	4874.22	Н	Х	AV	39.63	2.12	0.21	N/A	41.96	54.00	12.04
Middle	7310.53	V	Х	PK	53.84	8.98	N/A	N/A	62.82	74.00	11.18
	7310.90	V	Х	AV	38.01	8.98	0.21	N/A	47.20	54.00	6.80
	2484.06	V	Х	PK	53.20	2.81	N/A	N/A	56.01	74.00	17.99
	2483.64	V	Х	AV	42.24	2.81	0.21	N/A	45.26	54.00	8.74
l l'ab s st	4924.58	н	Х	PK	50.84	2.12	N/A	N/A	52.96	74.00	21.04
Highest	4924.45	н	Х	AV	39.46	2.12	0.21	N/A	41.79	54.00	12.21
	7387.17	V	Х	PK	51.86	8.59	N/A	N/A	60.45	74.00	13.55
	7387.55	V	Х	AV	37.64	8.58	0.21	N/A	46.43	54.00	7.57

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : <u>TM 2</u>

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

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

Dt&C

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)
	2389.99	V	Х	PK	57.44	2.34	N/A	N/A	59.78	74.00	14.22
	2389.71	V	Х	AV	44.76	2.34	0.43	N/A	47.53	54.00	6.47
Lowest	4823.88	н	Х	PK	49.80	1.94	N/A	N/A	51.74	74.00	22.26
Lowest	4824.14	н	Х	AV	39.33	1.94	0.43	N/A	41.70	54.00	12.30
	7236.82	Н	Х	PK	59.06	8.45	N/A	N/A	67.51	74.00	6.49
	7236.09	н	Х	AV	40.14	8.45	0.43	N/A	49.02	54.00	4.98
	4874.05	Н	Х	PK	49.92	2.12	N/A	N/A	52.04	74.00	21.96
Middle	4874.32	н	Х	AV	39.49	2.12	0.43	N/A	42.04	54.00	11.96
widdie	7311.14	н	Х	PK	54.90	8.98	N/A	N/A	63.88	74.00	10.12
	7312.88	н	Х	AV	37.62	8.99	0.43	N/A	47.04	54.00	6.96
	2484.28	V	Х	PK	52.13	2.81	N/A	N/A	54.94	74.00	19.06
	2484.87	V	Х	AV	41.69	2.81	0.43	N/A	44.93	54.00	9.07
Lligheet	4923.72	н	Х	PK	49.87	2.12	N/A	N/A	51.99	74.00	22.01
Highest	4923.58	н	Х	AV	39.58	2.12	0.43	N/A	42.13	54.00	11.87
	7385.31	Н	Х	PK	51.57	8.59	N/A	N/A	60.16	74.00	13.84
	7384.40	Н	Х	AV	37.35	8.58	0.43	N/A	46.36	54.00	7.64

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. 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

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 (MHz)	Conducted Limit (dBuV)					
	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



9. LIST OF TEST EQUIPMENT

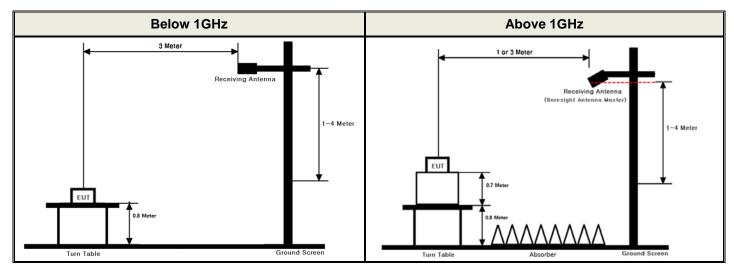
Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY49060056
Spectrum Analyzer	Agilent Technologies	N9020A	18/12/19	19/12/19	MY48011700
Spectrum Analyzer	Agilent Technologies	N9020A	19/06/26	20/06/26	MY46471251
DC Power Supply	Agilent Technologies	66332A	19/06/25	20/06/25	MY43001173
DC Power Supply	SM techno	SDP30-5D	19/06/25	20/06/25	305DMG304
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	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(10dB)	Hefei Shunze	SS5T2.92-10-40	19/06/27	20/06/27	16012202
Attenuator(6dB)	SRTechnology	F01-B0606-01	19/06/27	20/06/27	13092403
Attenuator(3dB)	Aeroflex/Weinschel	20515	19/06/27	20/06/27	Y2370
Attenuator(3dB)	SMAJK	SMAJK-2-3	19/06/27	20/06/27	2
Attenuator(3dB)	Cernexwave	CFADC2603U5	19/06/27	20/06/27	C11729
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A MA2490A	19/06/27	20/06/27	1338003 1249304
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	DT&C	Cable	19/01/14	20/01/14	RF-10

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.

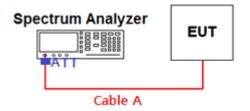
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	3.01	15	7.64
1	3.78	20	8.64
2.412 & 2.437 & 2.462	4.26	25	9.53
5	5.06	-	-
10	6.57	-	-

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 + Attenuator (Attenuator, Applied only when it was used externally)

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 Avg Type: Log-Pwr Sweep/Control ne 80.00 ms PNO: Fast Trig: Free Run Atten: 30 dB Sweep Time 80.00 m AMkr3 12.51 6.40 Ref 20.00 dBm d X Span 0 Hz Sweep 80.00 ms (10001 pts Center 2.437000000 GHz Res BW 8 MHz #VBW 50 MHz t (Δ) 6.31 Gate (Δ) íΔì 6.31 dE [Off.LO] Points 10001 STATUS

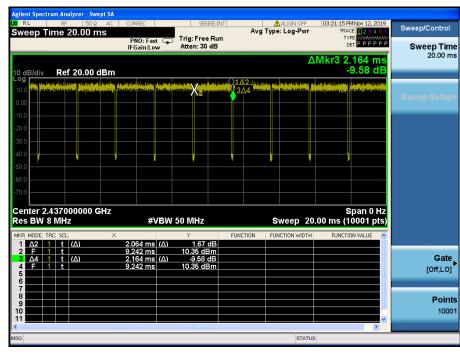
TRF-RF-236(04)171516

Dt&C

TM 2 &

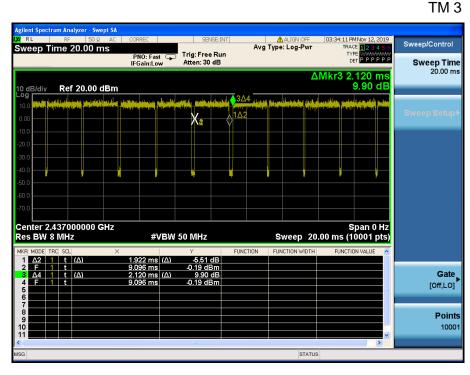
Middle

Duty Cycle



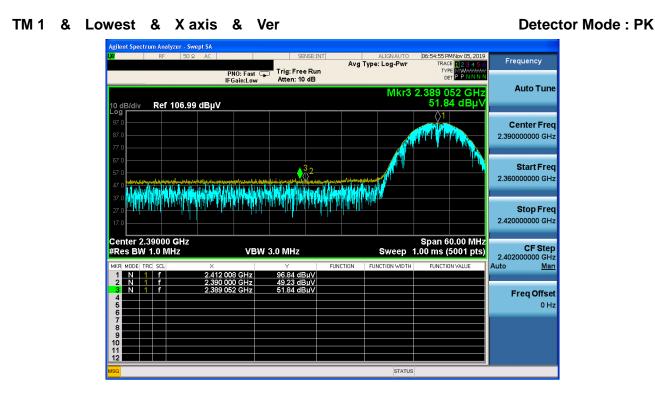
Duty Cycle

& Middle



APPENDIX III

Unwanted Emissions (Radiated) Test Plot



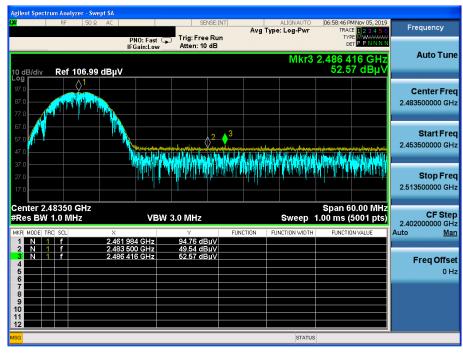
TM 1 & Lowest & X axis & Ver



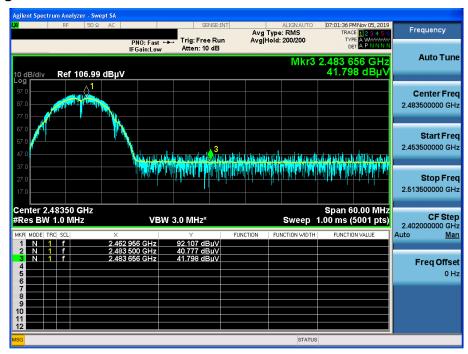


TM 1 & Highest & X axis & Ver

Detector Mode : PK



TM 1 & Highest & X axis & Ver



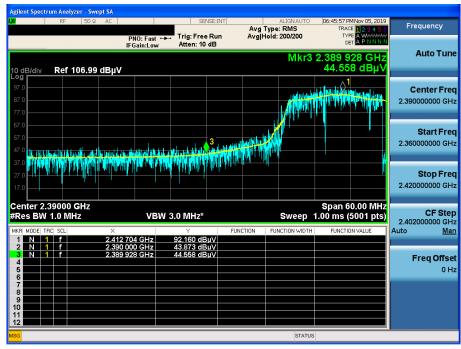
Detector Mode : PK



TM 2 & Lowest & X axis & Ver



TM 2 & Lowest & X axis & Ver



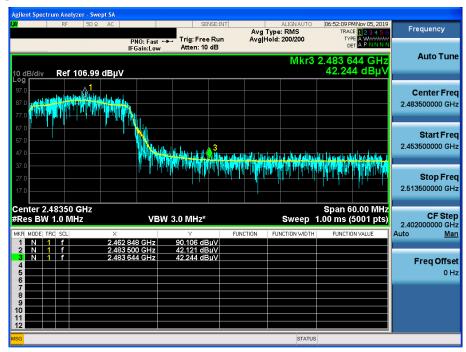


TM 2 & Highest & X axis & Ver

Detector Mode : PK



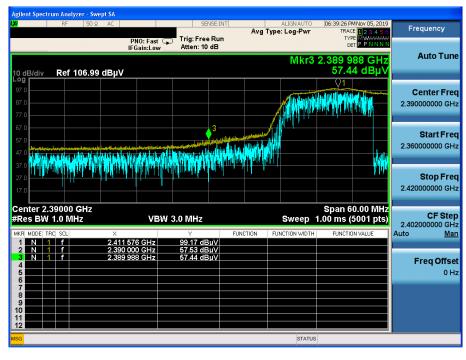
TM 2 & Highest & X axis & Ver



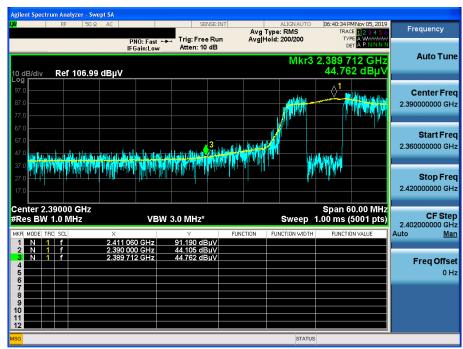


TM 3 & Lowest & X axis & Ver

Detector Mode : PK



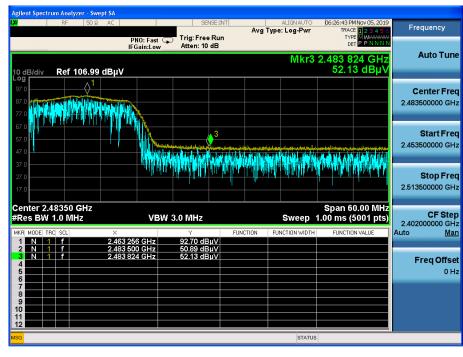
TM 3 & Lowest & X axis & Ver



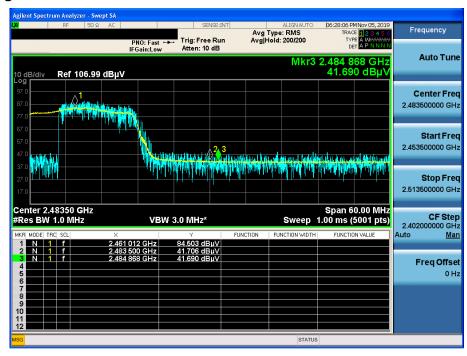


TM 3 & Highest & X axis & Hor

Detector Mode : PK

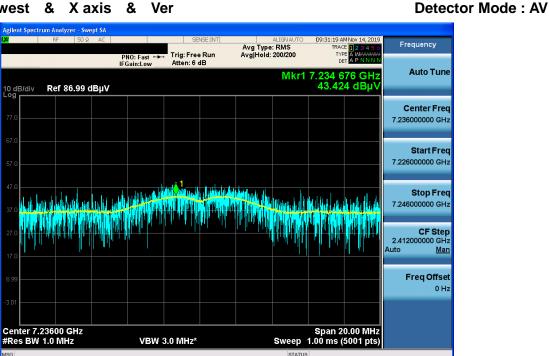


TM 3 & Highest & X axis & Hor



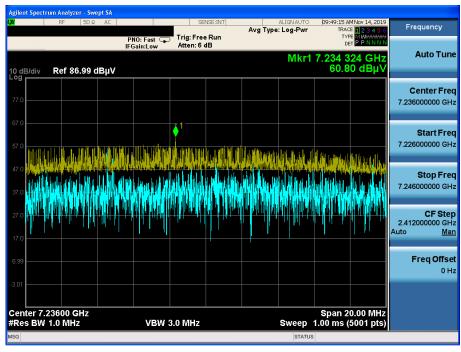
Dt&C

Lowest & X axis & Ver **TM 1** &



TM 2 & Lowest & X axis & Ver









TM 3 & Lowest & X axis & Ver



