TEST REPORT

DT&C Co., Ltd.

Dt&C		DT&C Co., Ltd. on-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
	Те	I : 031-321-2664, Fax : 031-321-1664
1. Report No: DRTFCC2112-0150		
2. Customer		
Name (FCC) : VNC Automotive		
Address (FCC) : BetjemanHouse,104H	lillsRoad,Cambridge	e,Cambridgeshire, United Kingdom CB2 1LQ
3. Use of Report : FCC Original Grant		
4. Product Name / Model Name : CCV FCC ID : 2A3OS00008	/001 / Cobalt Cub	e
5. FCC Regulation(s): Part 15.247		
Test Method used: KDB558074 D07	1v05r02, ANSI C6	63.10-2013
6. Date of Test : 2021.11.11 ~ 2021.1	1.29	
7. Location of Test : 🛛 Permanent Te	esting Lab	On Site Testing
8. Testing Environment : See appende	ed test report.	
9. Test Result : Refer to the attached t	test result.	
The results shown in this test report refer This test report is not related to KOLAS ac		s) tested unless otherwise stated.
Tested by		Reviewed by
Affirmation Name : SeungMin Gil	(Semalare)	Name : JaeJin Lee (Signature)
	2021 . 12 . 0	01.
ſ	DT&C Co.	. Ltd.
		icity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2112-0150	Dec. 01, 2021	Initial issue	SeungMin Gil	JaeJin Lee

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	60

1. General Information

1.1. Description of EUT

Equipment Class	Digital Transmission System (DTS)
Product Name	CCV001
Model Name	Cobalt Cube
Add Model Name	-
Firmware Version Identification Number	CCV0001.0
EUT Serial Number	No Specified
Power Supply	DC 12 V
Frequency Range	• 802.11b/g/n(20 MHz) : 2 412 MHz ~ 2 462 MHz
Modulation Technique	• 802.11b: CCK, DSSS • 802.11g/n: OFDM
Antenna Specification	Antenna Type: Chip Antenna Gain: 2.24 dBi (PK)

Band	Mode	Tx. frequency(MHz)	Max. conducted power(dBm)
	802.11b	2 412 ~ 2 462	16.74
2.4 GHz	802.11g	2 412 ~ 2 462	22.84
	802.11n (HT20)	2 412 ~ 2 462	22.96

1.2. Declaration by the applicant / manufacturer

N/A

1.3. Testing Laboratory

DT&C Co., Lt	d.	
The 3 m test sit	te and	conducted measurement facility used to collect the radiated data are located at the
42, Yurim-ro, 1	54beor	n-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.
	•	with the requirements of Part 2.948 according to ANSI C63.4-2014. nation No. : KR0034
www.utric.rict		T
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.4. Testing Environment

Ambient Condition	
 Temperature 	+21 ℃ ~ +24 ℃
 Relative Humidity 	+38 % ~ +45 %

1.5. Measurement Uncertainty

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

Parameter	Measurement uncertainty
Antenna-port conducted emission	1.0 dB (The confidence level is about 95 %, $k = 2$)
AC power-line conducted emission	3.4 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (1 GHz Below)	4.9 dB (The confidence level is about 95 %, $k = 2$)
Radiated emission (1 GHz ~ 18 GHz)	5.0 dB (The confidence level is about 95 %, k = 2)
Radiated emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, $k = 2$)

1.6. Test Equipment List

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	21/08/30	22/08/30	MY46471622
Spectrum Analyzer	Agilent Technologies	N9020A	20/12/16	21/12/16	MY48011700
Spectrum Analyzer	Agilent Technologies	N9020A	21/06/24	22/06/24	US47360812
DC Power Supply	Agilent Technologies	66332A	21/06/24	22/06/24	US37473422
DC Power Supply	SM techno	SDP30-5D	21/06/24	22/06/24	305DNF079
Multimeter	FLUKE	17B+	20/12/16	21/12/16	36390701WS
Signal Generator	Rohde Schwarz	SMBV100A	20/12/16	21/12/16	255571
Signal Generator	ANRITSU	MG3695C	20/12/16	21/12/16	173501
Thermohygrometer	BODYCOM	BJ5478	20/12/16	21/12/16	120612-1
Thermohygrometer	BODYCOM	BJ5478	20/12/16	21/12/16	120612-2
Thermohygrometer	BODYCOM	BJ5478	21/06/24	22/06/24	N/A
Loop Antenna	ETS-Lindgren	6502	21/01/28	23/01/28	00226186
BILOG ANTENNA	Schwarzbeck	VULB 9160	20/12/16	21/12/16	3362
Horn Antenna	ETS-Lindgren	3117	21/06/24	22/06/24	00143278
Horn Antenna	A.H.Systems Inc.	SAS-574	21/06/24	22/06/24	155
PreAmplifier	tsj	MLA-0118-B01-40	20/12/16	21/12/16	1852267
PreAmplifier	tsj	MLA-1840-J02-45	21/06/24	22/06/24	16966-10728
PreAmplifier	H.P	8447D	20/12/16	21/12/16	2944A07774
High Pass Filter	Wainwright Instruments	WHKX12-935-1000- 15000-40SS	21/06/24	22/06/24	8
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300- 18000-60SS	21/06/24	22/06/24	1
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5-6SS	21/06/24	22/06/24	3
Attenuator	Hefei Shunze	SS5T2.92-10-40	21/06/24	22/06/24	16012202
Attenuator	Aeroflex/Weinschel	56-3	21/06/24	22/06/24	Y2370
Attenuator	SMAJK	SMAJK-2-3	21/06/24	22/06/24	3
Attenuator	SMAJK	SMAJK-2-3	21/06/24	22/06/24	2
Attenuator	Aeroflex/Weinschel	86-20-11	21/06/24	22/06/24	432
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A MA2490A	21/06/24	22/06/24	1306007 1249001
Cable	DT&C	Cable	21/01/08	22/01/08	G-1
Cable	DT&C	Cable	21/01/08	22/01/08	G-2
Cable	HUBER+SUHNER	SUCOFLEX 100	21/01/08	22/01/08	G-3
Cable	DT&C	Cable	21/01/08	22/01/08	G-4
Cable	Junkosha	MWX241	21/01/08	22/01/08	mmW-1
Cable	Junkosha	MWX241	21/01/08	22/01/08	mmW-4
Cable	HUBER+SUHNER	SUCOFLEX100	21/01/08	22/01/08	M-01
Cable	HUBER+SUHNER	SUCOFLEX100	21/01/08	22/01/08	M-02
Cable	JUNFLON	MWX241	21/01/08	22/01/08	M-03
Cable	JUNFLON	J12J101757-00	21/01/08	22/01/08	M-07
Cable	HUBER+SUHNER	SUCOFLEX106	21/01/08	22/01/08	M-09
Cable	DT&C	Cable	21/01/05	22/01/05	RFC-44
Test Software	tsj	Radiated Emission Measurement	NA	NA	Version 2.00.0177

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



2. Test Methodology

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

The EUT was tested per the guidance of KDB558074 D01v05r02. And ANSI C63.10-2013 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing.

2.1. EUT Configuration

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

2.2. EUT Exercise

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

2.3. General Test Procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB558074 D01v05r02.

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

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

Radiated Emissions

Basically the radiated tests were performed with KDB558074 D01v05r02. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2013 as stated on section 12.1 of the KDB558074 D01v05r02.

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.

2.4. 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.



2.5. Description of Test Modes

The EUT has been tested with the operating condition for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting.

Transmitting Configuration of EUT

Mode	Data rate
802.11b	1 Mbps ~ 11 Mbps
802.11g	6 Mbps ~ 54 Mbps
802.11n(HT20)	MCS 0 ~ MCS 7

EUT Operation test setup

- Test Software: Setting in EUT

- Power setting: Default of EUT

Test Mode

Test mode	Worst case data rate	Tested Frequency (MHz)		
TM 1	802.11b 11 Mbps	2 412	2 437	2 462
TM 2	802.11g 6 Mbps	2 412	2 437	2 462
ТМ 3	802.11n(HT20) MCS 0	2 412	2 437	2 462

Note1: The worst case data rate was determined according to the power measurements.

Note2: The power measurement results for all modes and data rate were reported.

3. Antenna Requirements

According to Part 15.203

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

The antenna is permanently attached on the device. Therefore this E.U.T complies with the requirement of Part 15.203

4. Summary of Test Result

FCC part section(s)	Test Description Limit		Test Condition	Status Note 1	
15.247(a)	6 dB Bandwidth	> 500 kHz		С	
15.247(b)	Maximum Peak Output Power	< 1 Watt		С	
15.247(d)	Unwanted Emissions(Conducted)	20 dBc in any 100 kHz BW	Conducted	С	
15.247(e)	Power Spectral Density	< 8 dBm / 3 kHz		С	
15.247(d) 15.205 15.209	Unwanted Emissions(Radiated)	Part 15.209 limits (Refer to section 5.5)	Radiated	C Note 3	
15.207	AC Power-Line Conducted Emissions	Part 15.207 limits (Refer to section 5.6)	AC Line Conducted	NA Note4	
15.203Antenna RequirementsPart 15.203 (Refer to section 3)		-	С		
Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable Note 2: For radiated emission tests below 30 MHz were performed on semi-anechoic chamber which is correlated with OATS. Note 3: This test item was performed in three orthogonal EUT positions and the worst case data was reported. Note 4: This device is installed in a car. Therefore the power source is a battery of car.					

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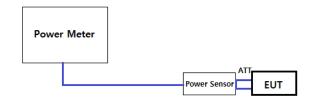


5. Test Result

- 5.1. Maximum Peak Output Power
- Test Requirements and limit, Part 15.247(b)

The maximum permissible conducted output power is 1 Watt.

5.1.1. Test Setup



5.1.2. Test Procedures

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

RBW ≥ DTSPKPM1 Peak-reading power meter method

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

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.

5.1.3. Test Results

- Refer to the next page



	_	-			Maximum P	eak Conduc	ted Output F	ower (dBm)			
Mode	Freq. (MHz)	Det.				Data Rat	te (Mbps)				
	(12)	1	2	5.5	11	-	-	-	-	
	2 412	PK	16.22	16.46	16.47	16.72	-	-	-	-	
	2412	AV	12.95	13.27	13.55	13.54	-	-	-	-	
802.11b	0.407	2 437	PK	16.31	16.49	16.44	16.74	-	-	-	-
002.110	2 437	AV	13.08	13.33	13.59	13.60	-	-	-	-	
	2 462	PK	16.22	16.28	16.32	16.43	-	-	-	-	
	2 402	AV	13.29	13.42	13.41	13.44	-	-	-	-	

	_				Maximum P	eak Conduc	ted Output F	ower (dBm)		
Mode	Freq. (MHz)	Det.				Data Rat	e (Mbps)			
	(11112)		6	9	12	18	24	36	48	54
	2 412	PK	22.81	22.33	22.52	22.28	22.22	22.23	20.47	20.88
		AV	13.53	13.77	13.79	13.56	13.74	13.45	12.10	12.09
902 11a	2 437	PK	22.84	22.34	22.41	22.30	22.29	22.22	20.57	20.56
802.11g	2 437	AV	13.61	13.65	13.66	13.64	13.72	13.59	12.18	12.29
	2 462	PK	22.53	22.26	22.16	22.15	22.23	22.37	20.66	20.75
	2 402	AV	13.63	13.67	13.73	13.59	13.55	13.67	12.24	12.31

	_	-			Maximum P	eak Conduc	ted Output F	ower (dBm)				
Mode	Freq. (MHz)	Det.		Data Rate (MCS)								
	(1112)		0	1	2	3	4	5	6	7		
	2 412	PK	22.96	22.43	22.36	22.40	22.37	21.48	21.01	20.94		
		AV	13.98	13.22	13.20	14.02	13.35	12.41	11.04	11.30		
802.11n	2 4 2 7	PK	22.93	22.46	22.37	22.46	22.44	21.67	21.08	20.99		
(HT20)	2 437	AV	14.03	13.29	13.40	13.84	13.52	12.56	11.17	11.21		
	2 462	PK	22.73	22.26	22.37	22.25	22.27	21.34	21.26	21.14		
	2 402	AV	14.02	13.35	13.29	14.16	13.47	12.45	11.16	11.32		

5.2. 6 dB Bandwidth

Test Requirements and limit, Part 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 EUT's antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6 dB bandwidth is 500 kHz.

5.2.1. Test Setup

Refer to the APPENDIX I.

5.2.2. Test Procedures

- KDB558074 D01v05r02 Section 8.2
- ANSI C63.10-2013 Section 11.8.2
- 1. Set resolution bandwidth (RBW) = 100 kHz
- 2. Set the video bandwidth (VBW) \ge 3 x RBW.
- 3. Detector = **Peak**.
- 4. Trace mode = **max hold**.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.
- 7. Option 1 Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

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

5.2.3. Test Results

Test Mode	Frequency	Test Results (MHz)
	2 412	7.05
TM 1	2 437	7.65
	2 462	7.44
	2 412	15.52
TM 2	2 437	15.17
	2 462	15.21
	2 412	15.22
TM 3	2 437	15.23
	2 462	15.21

TM 1 & 2412



6 dB Bandwidth

TM 1 & 2437

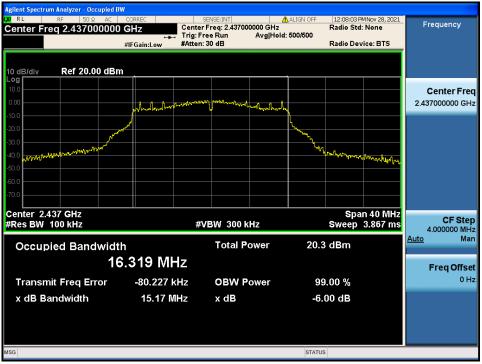






6 dB Bandwidth

<u>TM 2 & 24</u>37







🛈 Dt&C



6 dB Bandwidth

TM 3 & 2 437

Agilent Spectrum Analyzer - Occupied I XI RL RF 50 Ω AC	BW CORREC	SENSE:INT	ALIGN OFF	12:22:26 PMNov 28, 2021	
Center Freq 2.43700000		enter Freq: 2.437000000 GHz	d: 500/500	Radio Std: None Radio Device: BTS	Frequency
10 dB/div Ref 20.00 dB	m				
0.00	- And have have and	and more and and me	h		Center Freq 2.437000000 GHz
10.0 20.0 30.0			- And		
40.0 ***********************************			ا بر	Manaka Manalanaka	
70.0					
Center 2.437 GHz Res BW 100 kHz		#VBW 300 kHz		Span 40 MHz Sweep 3.867 ms	CF Step 4.000000 MHz
Occupied Bandwid		Total Power	21.2	dBm	<u>Auto</u> Mar
1	7.518 MHz				Freq Offset
Transmit Freq Error	-57.258 kHz	OBW Power	99	0.00 %	0 H:
x dB Bandwidth	15.23 MHz	x dB	-6.	00 dB	
SG			STATUS	3	



Test requirements and limit, Part 15.247(e)

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

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.

5.3.1. Test Setup

Refer to the APPENDIX I.

5.3.2. Test Procedures

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

Method PKPSD (peak PSD)

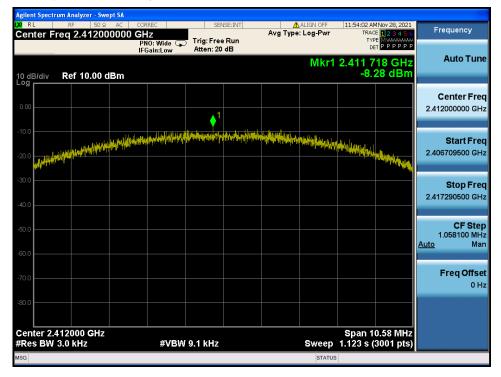
- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. Set the span to **1.5 times** the DTS bandwidth.
- 3. Set the RBW : 3 kHz ≤ RBW ≤ 100 kHz.
- 4. Set the VBW \geq 3 x RBW.
- 5. Detector = peak.
- 6. Sweep time = **auto couple.**
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.
- 10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3.3. Test Results

Test Mode	Frequency	RBW	PKPSD (dBm)	Limit (dBm / 3 kHz)	
	2 412	3 kHz	-8.28	8.00	
TM 1	2 437	3 kHz	-8.96	8.00	
	2 462	3 kHz	-8.22	8.00	
	2 412	3 kHz	-8.96	8.00	
TM 2	2 437	3 kHz	-9.11	8.00	
	2 462	3 kHz	-9.19	8.00	
	2 412	3 kHz	-8.46	8.00	
ТМ 3	2 437	3 kHz	-8.24	8.00	
	2 462	3 kHz	-8.60	8.00	

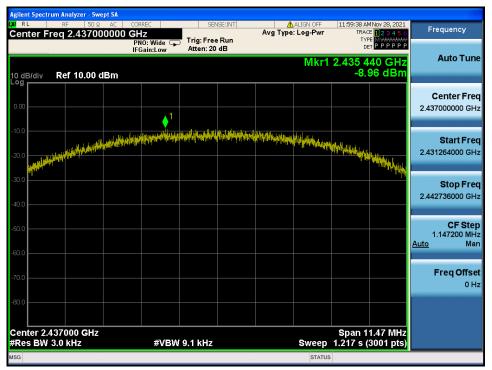


TM 1 & 2412



Power Spectral Density

TM 1 & 2437



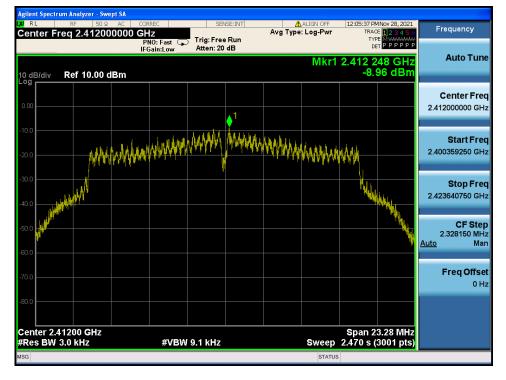


TM 1 & 2462

KI RL	um Analyzer - Swep RF 50 Ω req 2.462000	AC CORR 0000 GH2 PNC	z): Wide 🖵	Trig: Free		ALIGN OFF : Log-Pwr	TRAC	4Nov 28, 2021 E 1 2 3 4 5 6 PE MWWWWW T P P P P P P	Frequency
10 dB/div	Ref 10.00 di		ain:Low	Atten: 20	αB	Mkr1	2.460 9	36 GHz 22 dBm	Auto Tune
- og 0.00				1					Center Free 2.462000000 GH:
-20.0	a tin a t	hankinghtheterite			n in the state of the state	iidaadar-teastaa.	rated at the state	hert of the state	Start Fre 2.456418500 GH
-30.0									Stop Fre 2.467581500 GH
50.0									CF Ste 1.116300 M⊢ <u>Auto</u> Ma
70.0									Freq Offso 0 ⊢
Center 2.4	162000 GHz		#\/B\A	0.1 1/13		Swoon	Span 1	1.16 MHz	
#Res BW	3.0 KHZ		#VBW	9.1 kHz		Sweep	-	3001 pts)	



TM 2 & 2412



Power Spectral Density

TM 2 & 2437





TM 2 & 2462



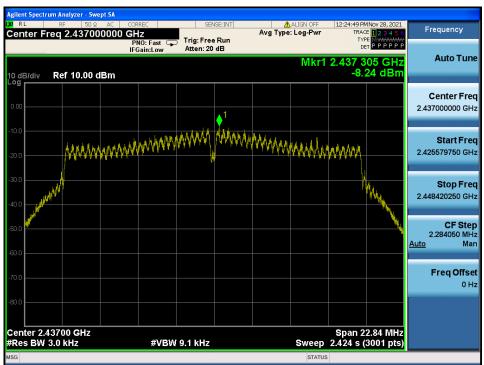


TM 3 & 2412



Power Spectral Density

TM 3 & 2437





TM 3 & 2462





5.4. Unwanted Emissions (Conducted)

Test requirements and limit, Part 15.247(d)

In any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions :

If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3) requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level. If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to 15.247(b)(3) requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured inband average PSD level. In either case, attenuation to levels below the general emission limits specified in §15.209(a) is not required.

5.4.1. Test Setup

Refer to the APPENDIX I including path loss

5.4.2. Test Procedures

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

Reference level measurement

- 1. Set instrument center frequency to DTS channel center frequency.
- 2. Set the span to \geq 1.5 times the DTS bandwidth.
- 3. Set the RBW = 100 kHz.
- 4. Set the VBW \geq 3 x RBW.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum PSD level LIMIT LINE = 20 dB below of the reference level.

Emission level measurement

- 1. Set the center frequency and span to encompass frequency range to be measured.
- 2. Set the RBW = 100 kHz.(Actual 1 MHz , See below note)
- 3. Set the VBW ≥ 3 x RBW. (Actual 3 MHz, See below note)
- 4. Detector = peak.
- 5. Ensure that the number of measurement points \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 unwanted emission(conducted) was tested with below settings.

Frequency range	RBW	VBW	Detector	Trace	Sweep Point
9 kHz ~ 30 MHz	100 kHz	300 kHz			
30 MHz ~ 10 GHz	1 MHz	3 MHz	Peak	Max Hold	40 001
10 GHz ~ 25 GHz	1 MHz	3 MHz			

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2 001 to get accurate emission level within 100 kHz BW.

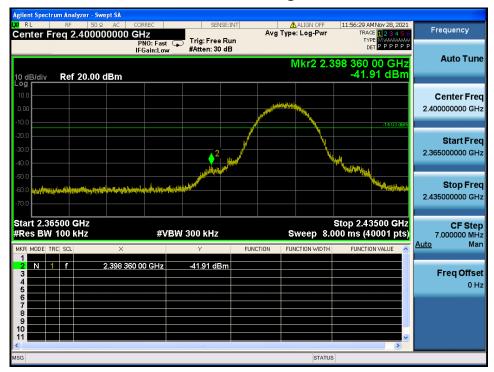
5.4.3. Test Results

TM 1 & 2412

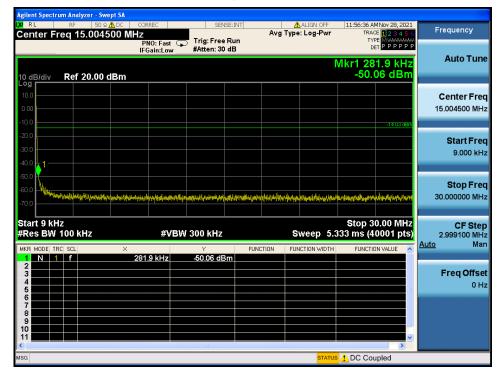
nt Spectrum Analyzer - Swept S/ ALIGN OFF 11:54:16 AMNov 3 TRACE Frequency Center Freq 2.412000000 GHz Trig: Free Run Atten: 30 dB PNO: Wide 🖵 IFGain:Low Auto Tune Mkr1 2.410 988 GHz 5.97 dBm Ref 20.00 dBm 10 dB/div Log **Center Freq** 2.412000000 GHz n. 46 i Start Freq 2.406709500 GHz Stop Freq 2.417290500 GHz **CF Step** 1.058100 MHz Man <u>Auto</u> Freq Offset 0 Hz Center 2.412000 GHz #Res BW 100 kHz Span 10.58 MHz Sweep 1.200 ms (3001 pts) #VBW 300 kHz STA

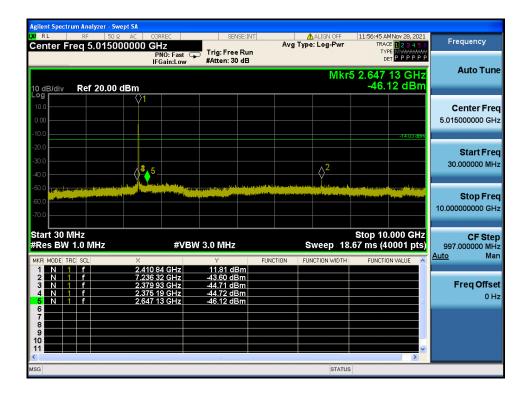
Reference

Low Band-edge

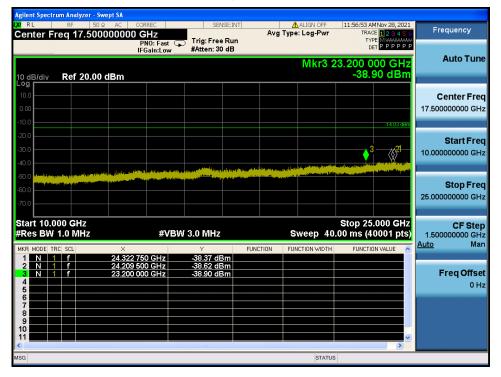








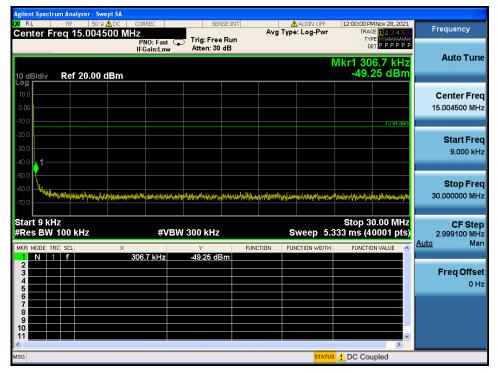




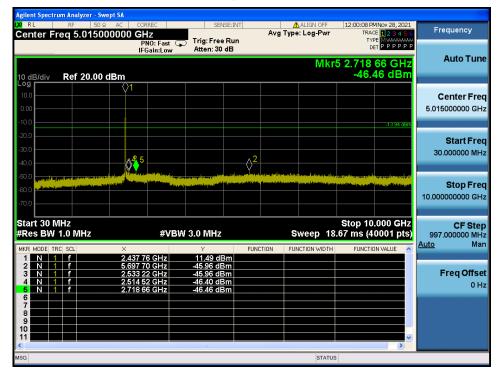
TM 1 & 2437

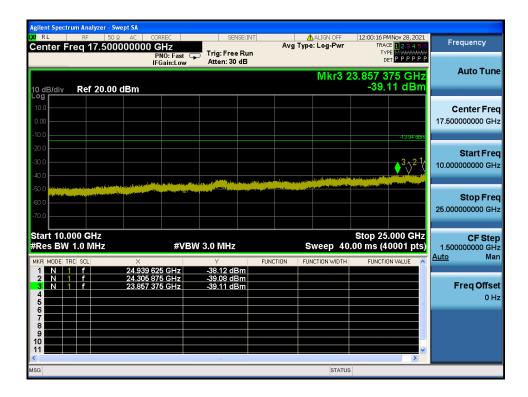
Reference









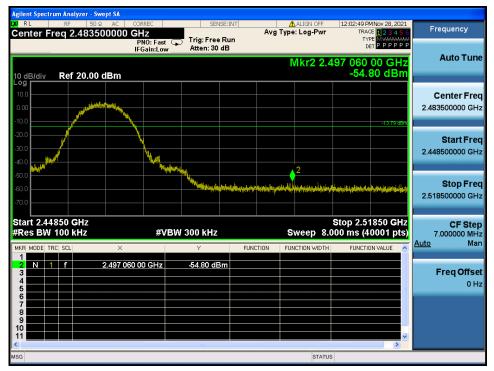


TM 1 & 2462

Reference

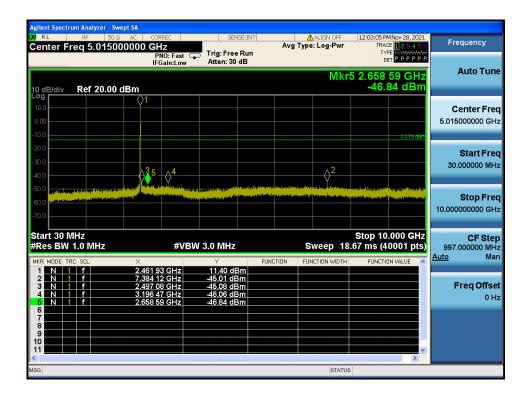


High Band-edge





Agilent Spectrum Analyzer - ^{XI} RL RF 5 Center Freq 15.00	0 Ω 🔥 DC CORREC	SENSE:INT	Avg Type: L	.og-Pwr TRA	MNov 28, 2021 CE 1 2 3 4 5 6 PE MWWWWW	Frequency
10 dB/div Ref 20.0	IFGain:Low	Atten: 30 dB		Mkr1 28	1.9 kHz 21 dBm	Auto Tune
10.0 0.00					-1 3.79 dBm	Center Fred 15.004500 MH
-20.0 -30.0 -40.0						Start Free 9.000 kH
-50.0	he de man ann an an ann an an an an an an an an		งารสอสุดรีประสงให้ระกระวูปร	newerld with a character and practically its	teranan dariyan	Stop Fre 30.000000 MH
Start 9 kHz #Res BW 100 kHz	×	300 kHz		eep 5.333 ms (4	0.00 MHz 0001 pts)	CF Ste 2.999100 MH Ito Ma
1 N 1 f 2 - - - 3 - - - 4 - - - 5 - - - 6 - - - 7 - - - 8 - - - 9 - - -	281.9 kHz	-49.21 dBm				Freq Offse 0 H
10 11 11 11 11		Ш			upled	





Agilent Spectrum Analyzer - Swept SA				
X RL RF 50 Ω AC Center Freg 17.500000000	CORREC SENSE:INT	Avg Type: Log-Pwr	12:03:13 PMNov 28, 2021 TRACE 1 2 3 4 5 6	Frequency
10 dB/div Ref 20.00 dBm	PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB		TRACE 123456 TYPE MWWWW Det PPPPP 4.950 125 GHz -38.87 dBm	Auto Tune
Log 10.0 0.00			-13.75 oBm	Center Freq 17.500000000 GHz
-20.0		ha far standing sugar to a sta	2-3.	Start Freq 10.000000000 GHz
-50.0				Stop Freq 25.00000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz		Stop 25.000 GHz .00 ms (40001 pts)	CF Step 1.50000000 GHz Auto Mar
2 N 1 f 24.262	9 250 GHz	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
SG		STATUS		

TM 2 & 2412

Reference

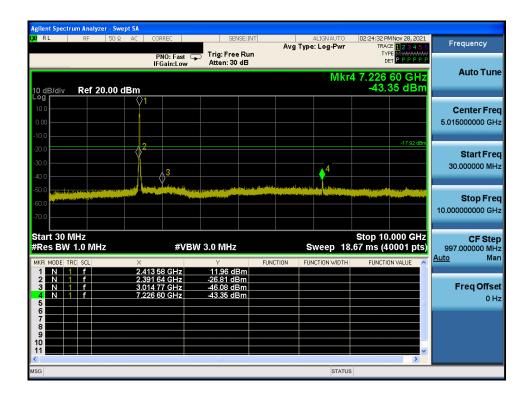


Low Band-edge





Agilent Spectrum Analyzer - Swe X/ RL RF 50 ຊ Center Freq 15.0045	oc correc	SENSE:INT		ALIGN OFF e: Log-Pwr	12:07:22 PM Nov 28, 2021 TRACE 1 2 3 4 5 6 TYPE MWWWW	Frequency
10 dB/div Ref 20.00 c	PNO: Fast G IFGain:Low	Trig: Free Run #Atten: 30 dB			Mkr1 289.4 kHz -50.20 dBm	Auto Tune
- 0 g 10.0 - 0.00 - 10.0						Center Fre 15.004500 MH
20.0					-17.92 dBm	Start Fre 9.000 kH
50.0 60.0 70.0	naktifena patrami, eteineti fasialisinale	Marilling had a far an	n-lulauralalalalalaradh	n windon a population	hterpelakopit yang beterten pelangan	Stop Fre 30.000000 MH
Start 9 kHz Res BW 100 kHz	#VB\ × 289.4 kHz	V 300 kHz -50.20 dBm		Weep 5.3	Stop 30.00 MHz 333 ms (40001 pts) FUNCTION VALUE	2.999100 MH
2 1 2 3 3 4 2 4 5 6 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 2 4 1 1 2 4 1 1 2 4 1 1 1 1						Freq Offse 0 H
7 8 9 10 11					~	
SG				STATUS	DC Coupled	



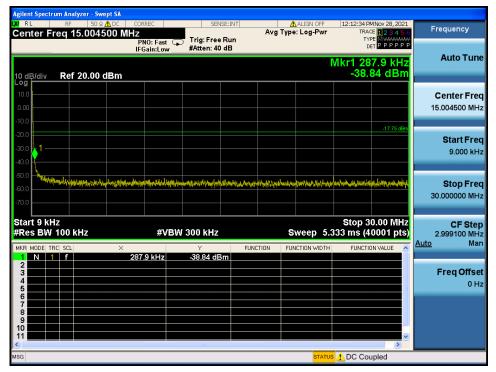




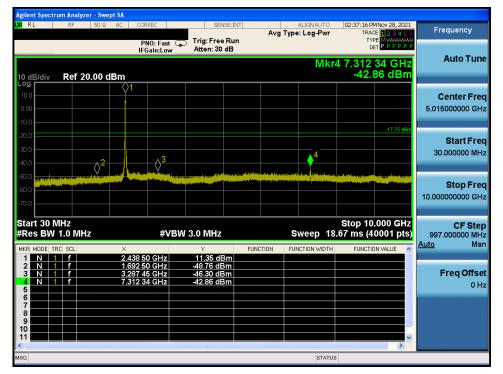
TM 2 & 2437

Reference





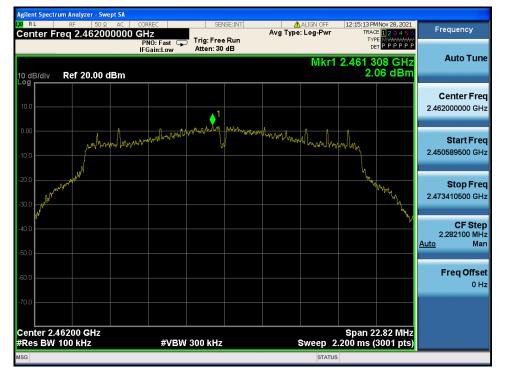




Center Freq 17.500000000 GHz Avg Type: Log-Pwr Trace Pwr Auto 10 db/div Ref 20.00 dBm -28.35 dBm	RL	RF 50	DΩ AC C	ORREC	SENSE:II	NT	ALIGN OFF	12:12:51 PM	Nov 28, 2021	
Mkr3 24.093 250 GHz -28.35 dBm Auto 0 dB/div Ref 20.00 dBm -28.35 dBm Center 0 dB/div Ref 20.00 dBm -28.27 dBm Center 1 N 1 f 24.637 750 GHz -27.50 dBm CF 1 N 1 f 24.037 750 GHz -28.27 dBm CF 1 N 1 f 24.037 750 GHz -28.35 dBm CF 1 N 1 f 24.037 750 GHz -28.35 dBm CF 1 N 1 f 24.037 750 GHz -28.35 dBm CF 1 N 1 f 24.037 750 GHz -28.35 dBm CF 1 N 1 f 24.037 750 GHz	enter Fr		0000000	GHz PNO: Fast	Trig: Free Ru	Avg		TRACE	123456 Mwaaaaaa	Frequency
100 Center 110 Center 111 Center 111 Center 111 Center 111 Center 111 Center 111 Center		Ref 20.00					Mkr3 2			Auto Tur
Start Start Start 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000	10.0 0.00									Center Fre 17.500000000 GH
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 <td>0.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-17 ⁷⁶ dBm 3 41</td> <td>Start Fre 10.000000000 GF</td>	0.0								-17 ⁷⁶ dBm 3 41	Start Fre 10.000000000 GF
KR MODE TR Sweep 40.00 ms (40001 pts) 1.5000000 KR MODE TRC SCL X Y FUNCTION FUNCTION VIDTH FUNCTION VALUE Auto 1 N 1 f 24,626 500 GHz 275.60 dBm 20 1 FUNCTION FUNCTION VIDTH FUNCTION VALUE Auto 2 N 1 f 24,037 760 GHz 28.27 dBm F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F F	0.0									Stop Fr 25.00000000 G
KR MODE Telepide PUNCTION FUNCTION FUNCTION VALUE Function Function				#VB۱	W 3.0 MHz		Sweep 40			CF Ste 1.50000000 G Auto M
3 N 1 f 24.093 250 GHz -28.35 dBm 4 - - - - - - Freq C 5 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - <	Res BW									
	KR MODE TR	f	24.626 5		-27.50 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N VALUE	Auto M
1 <u></u>	KR MODE TR 1 N 1 2 N 1 3 N 1 4 1 1 5 1 1	f	24.626 5 24.037 7	50 GHz	-27.50 dBm -28.27 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N VALUE	Freq Offs
	KR MODE TR 1 N 1 2 N 1 3 N 1 4 - - 5 - - 6 - - 7 - - 9 - - 0 - -	f	24.626 5 24.037 7	50 GHz	-27.50 dBm -28.27 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	N VALUE	Freq Offs

TM 2 & 2462

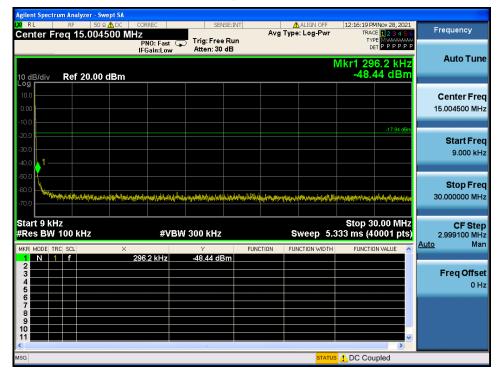
Reference

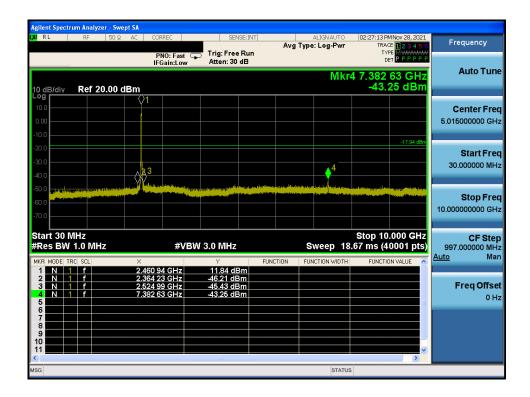


High Band-edge













TM 3 & 2412

Reference

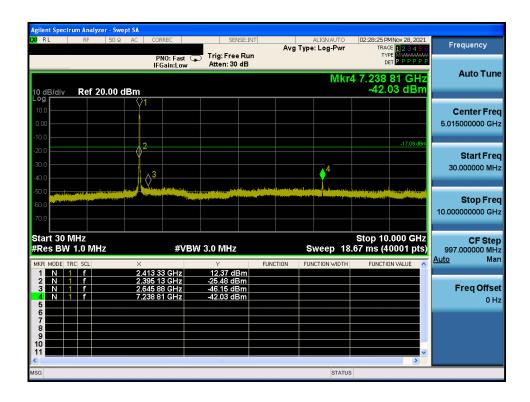


Low Band-edge





XI RL	n Analyzer - Swept RF 50 Ω ▲1 eq 15.00450	DC CORREC	SENSE:II	Avg	ALIGN OFF	TYPE	123456 Mwananan	Frequency
10 dB/div	Ref 20.00 dB	IFGain:Low _	Atten: 30 dB			Mkr1 281	.9 kHz 5 dBm	Auto Tune
10.0 0.00								Center Fred 15.004500 MHz
-20.0							-17.09 dBm	Start Free 9.000 kH
-50.0 -60.0 -70.0	hanningenner	edekataskovet konstatilaskovat	alada ay si tiliya ing pagagaga ay dadi	let af the constraint for the	hts/1924tsentestationspirities	hadan destante	ularang di fiyor tidayak	Stop Fred 30.000000 MHz
Start 9 kHz #Res BW 1	SCL	#VB	W 300 kHz Y	FUNCTION	Sweep 5.3			CF Step 2.999100 MH <u>Auto</u> Ma
1 N 1 2 3 4 5 6 9	f	281.9 kHz	-49.85 dBm					Freq Offse 0 H
7 8 9 10 11			10				~	
ISG					STATUS	L DC Coup	oled	





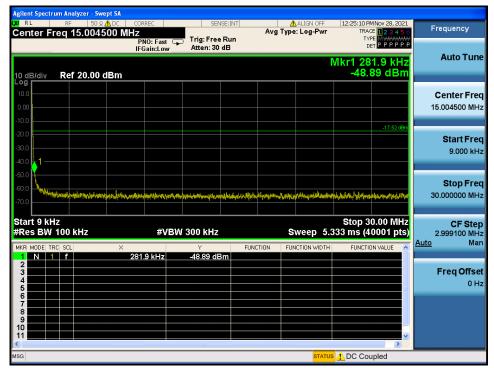


TM 3 & 2437

Reference



Conducted Spurious Emissions



Pages: 47 / 67



Agilent Spectrum Analyzer - S					
X/RL RF 50	Ω AC CORREC	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	02:29:43 PM Nov 28, 2021 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast G IFGain:Low	⊃ Trig: Free Run Atten: 30 dB	Avg Type. Logi wi	TYPE MWWWWW DET PPPPP	
10 dB/div Ref 20.00			Mkr	4 7.311 84 GHz -42.89 dBm	Auto Tune
Log 10.0 0.00					Center Fred 5.015000000 GH:
-20.0	2 3 3		¢4	-17.52 dBm	Start Free 30.000000 MH:
-50.0 -60.0 -70.0			Shara ang Hili Karpina ang Kalang Ang Karpina ang Karpina ang Karpina ang Karpina ang Karpina ang Karpina ang K Karpina ang Karpina ang Kar Karpina ang Karpina ang Kar	el a tenen de un en la la contra la persona de la contra d en el la contra de la	Stop Fred 10.000000000 GH
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 MH Auto Mai
MKR MODE: TRC: SC. 1 NN 1 F 2 NN 1 F 4 N 1 F 4 N 1 F 6 6 7 8 9 9 10 11 8 4 8 7 8 9 9 10 11 8 1 8 1 8 1 8 1 8 1 8 1 8 1	× 2.438 75 GHz 2.392 64 GHz 2.866 22 GHz 7.311 84 GHz	Y EUN 11.69 dBm -42.20 dBm -46.64 dBm -42.89 dBm	CTION FUNCTION WIDTH	FUNCTION VALUE	Freq Offse 0 H
SG			STATUS		

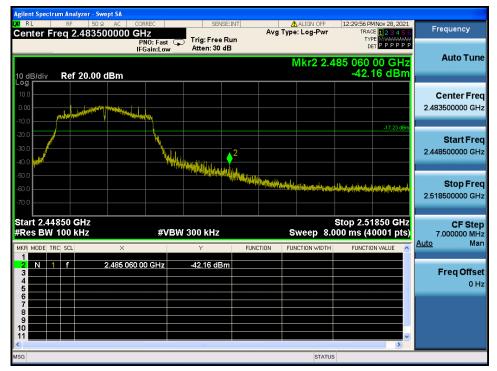


TM 3 & 2462

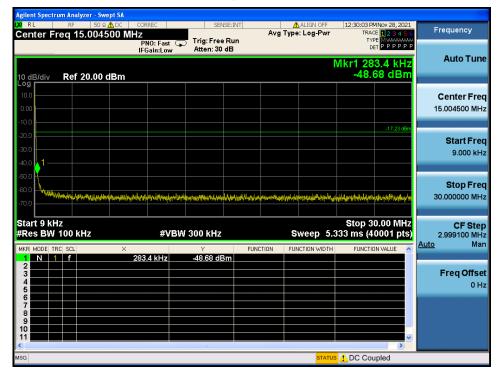
Reference

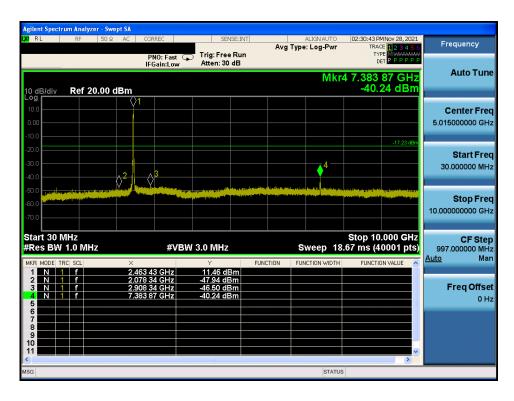


High Band-edge













5.5. Unwanted Emissions (Radiated)

Test Requirements and limit,

Part 15.247(d), Part 15.205, Part 15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of Part 15.247 the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Frequency (MHz)	FCC Limit (uV/m)	Measurement Distance (m)
0.009 - 0.490	2 400 / F (kHz)	300
0.490 - 1.705	2 4000 / F (kHz)	30
1.705 – 30.0	30	30

- Part 15.209 : General requirement

Frequency (MHz)	FCC Limit (uV/m)	Measurement Distance (m)
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

**Except as provided in paragraph (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.

- Part 15.205(a): Restricted band of operation

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.414 25 ~ 8.414 75	108 ~ 121.94	1 300 ~ 1 427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1 435 ~ 1 626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.173 5 ~ 2.190 5	12.519 75 ~ 12.520 25	149.9 ~ 150.05	1 645.5 ~ 1 646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.576 75 ~ 12.577 25	156.524 75 ~ 156.525 25	1 660 ~ 1 710	8.025 ~ 8.5	22.01 ~ 23.12
4.177 25 ~ 4.177 75	13.36 ~ 13.41	156.7 ~ 156.9	1 718.8 ~ 1 722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.207 25 ~ 4.207 75	16.42 ~ 16.423	162.012 5 ~ 167.17	2 200 ~ 2 300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.694 75 ~ 16.695 25	167.72 ~ 173.2	2 310 ~ 2 390	10.6 ~ 12.7	36.43 ~ 36.5
6.267 75 ~ 6.268 25	16.804 25 ~ 16.804 75	240 ~ 285	2 483.5 ~ 2 500	13.25 ~ 13.4	Above 38.6
6.311 75 ~ 6.312 25	25.5 ~ 25.67	322 ~ 335.4	2 655 ~ 2 900		
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3 260 ~ 3 267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3 332 ~ 3 339		
8.376 25 ~ 8.386 75	74.8 ~ 75.2	960 ~ 1 240	3 345.8 ~ 3 358		
			3 600 ~ 4 400		

5.5.1. Test Setup

Refer to the APPENDIX I.

5.5.2. Test Procedures

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

Note: Measurement Instrument Setting for Radiated Emission Measurements.

- KDB558074 D01v05r02 Section 8.6
- ANSI C63.10-2013 Section 11.12

1. Frequency Range Below 1 GHz

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

2. Frequency Range > 1 GHz

Peak Measurement > 1 GHz

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

- 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)	T _{on+off} (ms)	$D = T_{on} / (T_{on+off})$	DCCF = 10 log(1/D) (dB)					
TM 1	1 Mbps	0.845	0.880	0.959 7	0.18					
TM 2	54 Mbps	1.396	1.438	0.970 8	0.13					
TM 3	MCS 7	1.308	1.351	0.968 2	0.14					

Duty Cycle Correction factor

Note1: Where, T= Transmission duration / D= Duty cycle

Note2: Please refer to the appendix II for duty cycle plots.

5.5.3. Test Results

Test Notes _

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

2. Information of Distance Correction Factor

For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.

In this case, the distance factor is applied to the result.

- Calculation of distance correction factor

At frequencies below 30 MHz = 40 log(tested distance / specified distance)

At frequencies at or above 30 MHz = 20 log(tested distance / specified distance)

When distance factor is "N/A", the measurements were performed at the specified distance and distance factor is not applied.

3. Sample Calculation.

Margin = Limit – Result / Result = Reading + TF+ DCCF + DCF / TF = AF + CL + HL + AL – AG Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, HL = High pass filter Loss, AL = Attenuator Loss, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

Tested Frequency (MHz)	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
	2 388.26	Н	Х	PK	50.05	4.46	N/A	N/A	54.51	74.00	19.49
2 412	2 389.71	Н	Х	AV	40.32	4.46	0.18	N/A	44.96	54.00	9.04
2 412	4 823.76	Н	Х	PK	50.42	2.33	N/A	N/A	52.75	74.00	21.25
	4 824.03	Н	Х	AV	39.82	2.33	0.18	N/A	42.33	54.00	11.67
2 437	4 873.50	Н	Х	PK	50.59	2.16	N/A	N/A	52.75	74.00	21.25
2 437	4 874.29	Н	Х	AV	39.65	2.17	0.18	N/A	42.00	54.00	12.00
	2 484.84	Н	Х	PK	51.28	5.42	N/A	N/A	56.70	74.00	17.30
2 462	2 483.61	Н	Х	AV	40.45	5.40	0.18	N/A	46.03	54.00	7.97
2 402	4 923.76	Н	Х	PK	50.63	2.44	N/A	N/A	53.07	74.00	20.93
	4 923.66	Н	Х	AV	39.39	2.44	0.18	N/A	42.01	54.00	11.99

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

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

Tested Frequency (MHz)	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
	2 389.85	Н	Х	PK	53.02	4.46	N/A	N/A	57.48	74.00	16.52
2 412	2 389.17	Н	Х	AV	41.72	4.46	0.13	N/A	46.31	54.00	7.69
2 412	4 823.89	Н	Х	PK	50.54	2.33	N/A	N/A	52.87	74.00	21.13
	4 823.67	Н	Х	AV	39.60	2.33	0.13	N/A	42.06	54.00	11.94
2 437	4 873.88	Н	Х	PK	49.95	2.16	N/A	N/A	52.11	74.00	21.89
2 437	4 873.56	Н	Х	AV	39.54	2.16	0.13	N/A	41.83	54.00	12.17
	2 484.42	Н	Х	PK	58.28	5.41	N/A	N/A	63.69	74.00	10.31
2 462	2 483.68	Н	Х	AV	44.01	5.40	0.13	N/A	49.54	54.00	4.46
2 402	4 923.81	Н	Х	PK	50.42	2.44	N/A	N/A	52.86	74.00	21.14
	4 923.77	Н	Х	AV	39.44	2.44	0.13	N/A	42.01	54.00	11.99



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

Tested Frequency (MHz)	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	TF (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin(dB)
	2 388.75	Н	Х	PK	53.83	4.46	N/A	N/A	58.29	74.00	15.71
2 412	2 389.58	Н	Х	AV	41.25	4.46	0.14	N/A	45.85	54.00	8.15
2412	4 824.09	Н	Х	PK	50.61	2.33	N/A	N/A	52.94	74.00	21.06
	4 824.13	Н	Х	AV	39.53	2.33	0.14	N/A	42.00	54.00	12.00
2 437	4 874.11	Н	Х	PK	50.74	2.16	N/A	N/A	52.90	74.00	21.10
2 437	4 874.11	Н	Х	PK	50.74	2.16	N/A	N/A	52.90	74.00	21.10
	2 483.84	Н	Х	PK	60.19	5.40	N/A	N/A	65.59	74.00	8.41
2 462	2 483.67	Н	Х	AV	44.73	5.40	0.14	N/A	50.27	54.00	3.73
2 402	4 923.89	Н	Х	PK	49.55	2.44	N/A	N/A	51.99	74.00	22.01
	4 924.40	Н	Х	AV	39.59	2.45	0.14	N/A	42.18	54.00	11.82



5.6. AC Power-Line Conducted Emissions

Test Requirements and limit, Part 15.207

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

	Conducted Limit (dBuV)					
Frequency Range (MHz)	Quasi-Peak	Average				
0.15 ~ 0.5	66 to 56 *	56 to 46 *				
0.5 ~ 5.0	56	46				
5 ~ 30	60	50				

* Decreases with the logarithm of the frequency

5.6.1. Test Setup

NA

5.6.2. Test Procedures

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

- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- 2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
- 3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
- 4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

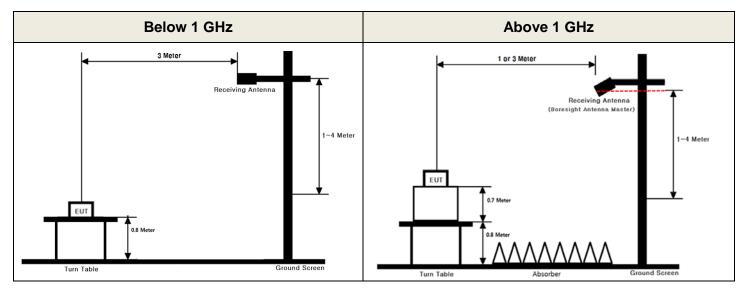
5.6.3. Test Results

NA

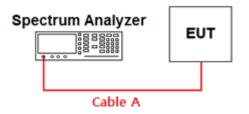
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement





APPENDIX II

Duty cycle plots

Test Procedures

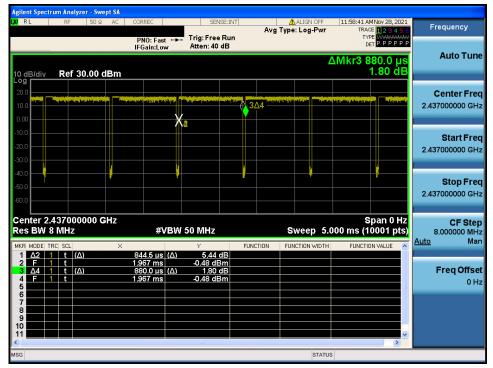
- KDB558074 D01v05r02 - Section 6

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 ≥ 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 zerospan method of measuring duty cycle shall not be used if $T \le 16.7$ microseconds.)

Duty Cycle

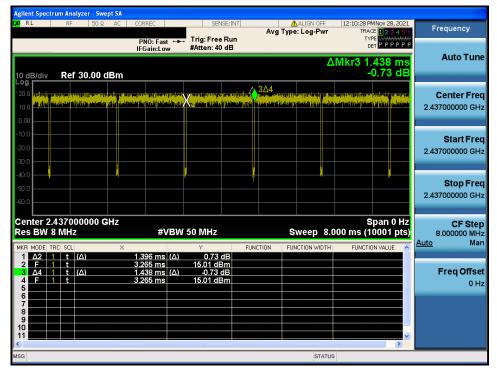
TM 1 2 437 MHz &





Duty Cycle

TM 2 & 2 437 MHz



TM 3 & 2 437 MHz

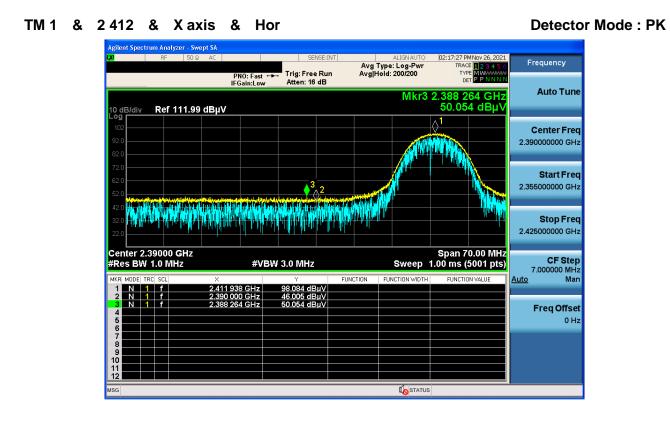
Duty Cycle

			Swept SA	CORRI	EC		SENSE:1	INT		ALIGN OFF	12:23	:04 PM Not	v 28, 2021		
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4 F	1										_		=		
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6															
6 7 8															
6															
6 7 8 9															



APPENDIX III

Unwanted Emissions (Radiated) Test Plot

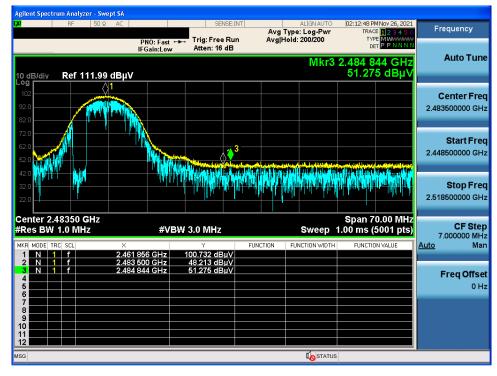


TM 1 & 2412 & Xaxis & Hor

	rum Analyzer - S										
LXI	RF 50	ΩAC		SENS	E:INT	Avg Type	ALIGNAUTO		MNov 26, 2021	Freque	ency
			PNO: Fast ← IFGain:Low	Trig: Free F Atten: 16 d		Avg Hold:		TY D		0	o Tune
10 dB/div Log	Ref 111.9	9 dBµV					Mkr3	2.389 7 40.31	′06 GHz 7 dBµV	Au	orune
102 92.0 82.0								⊘¹		Cent 2.390000	er Freq 000 GHz
72.0 62.0 52.0 42.0							/			St a 2.355000	a rt Freq 000 GHz
32.0 22.0										St d 2.425000	o p Freq 000 GHz
Center 2. #Res BW	39000 GHz 1.0 MHz		#VB	W 3.0 MHz*			Sweep	Span 7 1.00 ms (0.00 MHz 5001 pts)		F Step
MKR MODE TR			442 GHz 000 GHz	ү 91.832 dBµ 39.566 dBµ		FUI FUI	NCTION WIDTH	FUNCTI	ON VALUE	<u>Auto</u>	Man
3 N 1 4 5 6	f		706 GHz	40.317 dBµ						Free	Offset 0 Hz
7 8 9 10 11 12											
MSG							I ostatus	5			

Detector Mode : PK

TM 1 & 2462 & Xaxis & Hor



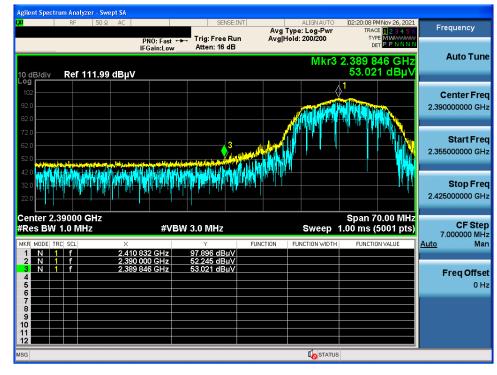
TM 1 & 2462 & X axis & Hor

Analyzer - Sv SENSE:INT ALIGN AU Avg Type: RMS Avg|Hold: 200/200 AUTO 02:11:23 PM No v 26, 2l Frequency TRACE TYPE DET Trig: Free Run Atten: 16 dB PNO: Fast + Auto Tune Mkr3 2.483 612 GH2 40.447 dBu Ref 111.99 dBµV **A Center Freq** 2.483500000 GHz Start Freq 2.448500000 GHz 3 Stop Freq 2.518500000 GHz Center 2.48350 GHz #Res BW 1.0 MHz Span 70.00 MHz Sweep 1.00 ms (5001 pts) CF Step 7.000000 MHz Man #VBW 3.0 MHz* FUNCTION Auto .483 500 GHz .483 612 GHz 40.061 dBµ 40.447 dBµ Freq Offset 0 Hz 10 11 12 **I**STATUS



TM 2 & 2412 & X axis & Hor

Detector Mode : PK



TM 2 & 2412 & Xaxis & Hor

Frequency Avg Type: RMS Avg|Hold: 200/200 Trig: Free Run Atten: 16 dB PNO: Fast IFGain:Low DET A P N Auto Tune Mkr3 2.389 174 GHz 41.721 dBµ√ Ref 111.99 dBµV 10 dB/div **Center Freq** \Diamond^1 2.39000000 GHz Start Freq 2.355000000 GHz 32 Stop Freq 2.425000000 GHz Center 2.39000 GHz #Res BW 1.0 MHz Span 70.00 MHz Sweep 1.00 ms (5001 pts) CF Step 7.000000 MHz #VBW 3.0 MHz* FUNCTION EUNCTION WIDT FUNCTION VALUE Auto Man 90.570 dBµ 40.746 dBµ 41.721 dBµ 2.390 000 GHz 2.389 174 GHz N Freq Offset 0 Hz

Detector Mode : PK



TM 2 & 2462 & Xaxis & Hor

nt Spectrum Analyzer - Swept SA ALIGNAUTO Avg Type: Log-Pwr Avg|Hold: 200/200 SENSE:INT 02:08:54 PM Frequency TRACE 1234 TYPE MWARA DET PPNN PNO: Fast +++ Trig: Free Run IFGain:Low Atten: 16 dB Auto Tune Mkr3 2.48 4 4 2 4 58.278 dBu\ Ref 111.99 dBµV $\langle \rangle 1$ **Center Freq** 2.483500000 GHz Start Freq وروارار المكالي 2.448500000 GHz Stop Freq 2.518500000 GHz Center 2.48350 GHz #Res BW 1.0 MHz Span 70.00 MHz 1.00 ms (5001 pts) CF Step 7.000000 MHz Man #VBW 3.0 MHz Sweep FUNCTION Auto FUNC 51.802 dBµV 58.278 dBµV N Freq Offset 0 Hz 10 11 12 **I**STATUS SG

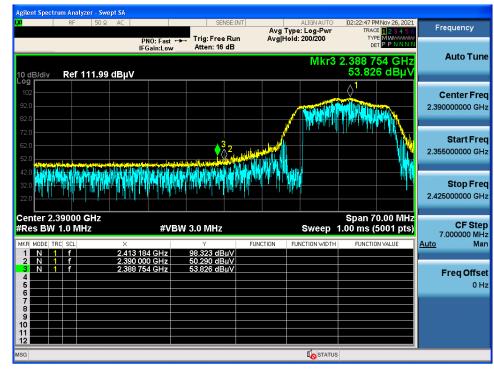
TM 2 & 2462 & Xaxis & Hor





TM 3 & 2 412 & X axis & Hor

Detector Mode : PK



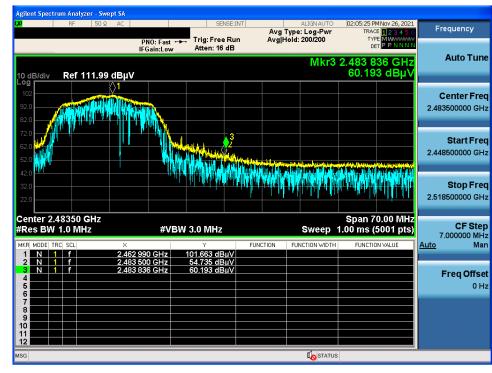
TM 3 & 2412 & Xaxis & Hor

Frequency Avg Type: RMS Avg|Hold: 200/200 Trig: Free Run Atten: 16 dB PNO: Fast IFGain:Low A WWW DE Mkr3 2.389 580 GHz 41.254 dBµV Auto Tune Ref 111.99 dBµV 10 dB/div **Center Freq** \Diamond 2.39000000 GHz Start Freq 2.355000000 GHz Stop Freq 2.425000000 GHz Center 2.39000 GHz #Res BW 1.0 MHz Span 70.00 MHz Sweep 1.00 ms (5001 pts) CF Step 7.000000 MHz #VBW 3.0 MHz* Man FUNCTION EUNCTION WIDT FUNCTION VALUE Auto 2.390 000 GHz 2.389 580 GHz 40.596 dBµ 41.254 dBµ N Freq Offset 0 Hz



TM 3 & 2462 & X axis & Hor

Detector Mode : PK



TM 3 & 2462 & Xaxis & Hor



Detector Mode : AV

TM 1 & 2412 & Xaxis & Hor



TM 2 & 2412 & X axis & Hor



Detector Mode : AV

TM 3 & 2 462 & X axis & Hor

	RF 50 Ω	AC		SEI	NSE:INT	Avg Type			MNov 26, 2021 E 1 2 3 4 5 6	Frequency
			PNO: Fast	Trig: Free Atten: 6 d		Avg Hold:		TYI	E A WARAWAA A P N N N N	
dB/div	Ref 66.99 (lBμV					Mkr1	4.924 3 39.58	99 GHz 8 dBµV	Auto Tun
2.0										Center Fre 4.924000000 G⊦
2.0										Start Fre 4.921500000 G⊦
2.0					Ĵ	 				Stop Fre 4.926500000 G⊦
2.0	and the second stand from	*******	yaya bariya aniya ya inga kata da da ya	athaullan yit faran ya ha	iking indigi	hingolethe allowed	******	harrinin san Alimika	n henter och alt spe	CF Ste 2.462000000 GH Auto <u>Ma</u>
										Freq Offs 0 H
enter 4.9	24000 GHz							Snan 5	.000 MHz	
Res BW			#VBW	3.0 MHz	*			1.00 ms (5001 pts)	
G							I STATUS			