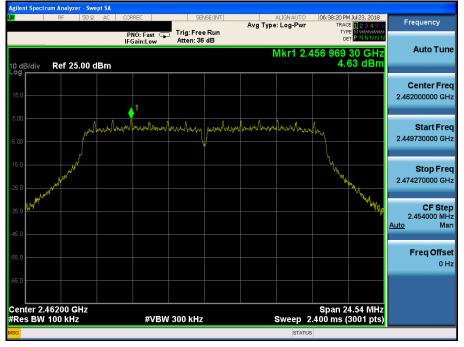


Agilent Spectrum Analyzer - Swept	SA				
<b>LXI</b> RF 50Ω /	AC CORREC	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	06:37:15 PM Jul 23, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast 📮 IFGain:Low	Trig: Free Run Atten: 36 dB			
10 dB/div Ref 25.00 dB	m		Mkr3 1	7.014 750 GHz -36.24 dBm	Auto Tune
Log 15.0 5.00					Center Freq 17.50000000 GHz
-15.0 -25.0 -35.0				-14.10 dBm	<b>Start Freq</b> 10.000000000 GHz
-45.0					<b>Stop Freq</b> 25.00000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz		/ 3.0 MHz		Stop 25.000 GHz .00 ms (40001 pts)	CF Step 1.50000000 GHz Auto Man
MKR MODE TRC SCL	× 4.873 250 GHz	۲ F -27.72 dBm	UNCTION FUNCTION WIDTH	FUNCTION VALUE	
2 N 1 f 2 3 N 1 f 1 4 5	1.434 500 GHz 7.014 750 GHz	-31.12 dBm -36.24 dBm			<b>Freq Offset</b> 0 Hz
6 7 8 9 10					
11				~	
MSG			STATUS	,	

# **Dt&C**

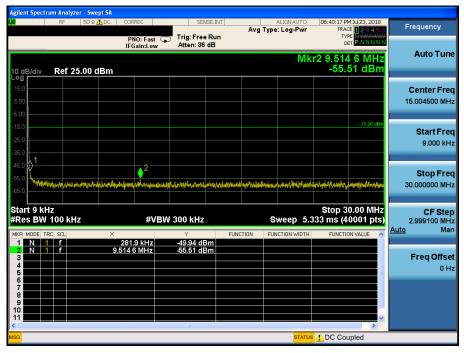
# TM 2 & 2462

# Reference



# **High Band-edge**





Agilent Spectrum Analyzer - Sw	ept SA				
<b>ιχι</b> RF 50 Ω	AC CORREC	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	06:41:42 PM Jul 23, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast G IFGain:Low	Trig: Free Run Atten: 36 dB	ing type. Log t ki	TYPE MWWWWWW DET P N N N N N	
10 dB/div Ref 25.00	dBm		Mkr	2 5.348 50 GHz -38.95 dBm	Auto Tune
15.0 5.00					Center Freq 5.015000000 GHz
-15.0 -25.0 -35.0		2	and Ministry and And Inc and -	-15.36 dBm	Start Freq 30.000000 MHz
-45.0					<b>Stop Freq</b> 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VB\	N 3.0 MHz	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz Auto Man
MKR MODE TRC SCL	× 2.465 17 GHz	12.26 dBm	CTION FUNCTION WIDTH	FUNCTION VALUE	Auto Man
2 N 1 f 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	5.348 50 GHz	-38.95 dBm			<b>Freq Offset</b> 0 Hz
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9					
11		III		>	
MSG			STATUS		

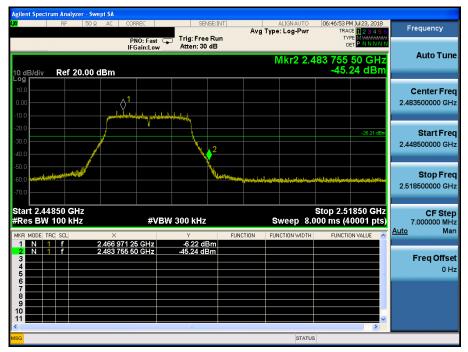


# TM 2 & 2472

# Reference



# **High Band-edge**



RF	50 Ω 🚹 DC	CORREC	SENSE:	INT	ALIGN AUTO	06:47:24 PM	4 Jul 23, 2018	
		PNO: Fast G IFGain:Low	Trig: Free Ru Atten: 30 dB	un	j Type: Log-Pwr	TYP	23456 Pe MWWWWW P NNNNN	Frequency
dB/div Ref 20	0.00 dBm				Mk		8 MHz 75 dBm	Auto Tur
og 0.0 0.00 0.00								Center Fre 15.004500 MF
							-26.21 dBm	<b>Start Fre</b> 9.000 kł
	ويوافقه أوافد والمتراجع والمتراجع	handalan ya ana	prophosision of the sound how with ge	hybotanampirk/hydraw	idersztettettettettettettettettettettettettet	eliterteriteritertel	etsetaat taabeen dag	Stop Fre 30.000000 Mi
						Ston 3	0.00 MHz	
	z	#VB	W 300 kHz		Sweep 5.3	33 ms (4	0001 pts)	2.999100 M
Res BW 100 kH;	X	293.2 kHz	۲ -55.00 dBm	FUNCTION	Sweep 5.3 FUNCTION WIDTH	333 ms (4	0001 pts)	2.999100 M
Res         BW         100 kH;           R         MODE         TRC         SCL           1         N         1         f           2         N         1         f           3         -         -         -           4         -         -         -           5         -         -         -	X		Y			333 ms (4	0001 pts)	2.999100 Mi <u>Auto</u> Mi <b>Freq Offs</b>
2 N 1 f 3 4 5 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	X	293.2 kHz	۲ -55.00 dBm			333 ms (4	0001 pts)	CF Ste 2.999100 MI <u>Auto</u> M Freq Offs 0 I
Res         BW         100 kH;           In         1         f           2         N         1         f           3         -         -         -           4         -         -         -         -           5         -         -         -         -         -           6         - <td< td=""><td>X</td><td>293.2 kHz</td><td>۲ -55.00 dBm</td><td></td><td></td><td>333 ms (4</td><td>0001 pts)</td><td>2.999100 Mi <u>Auto</u>Mi <b>Freq Offs</b></td></td<>	X	293.2 kHz	۲ -55.00 dBm			333 ms (4	0001 pts)	2.999100 Mi <u>Auto</u> Mi <b>Freq Offs</b>

Agilent Spectrum Analyzer - Swe	≥pt SA				
<mark>(X)</mark> RF 50 Ω	AC CORREC	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	06:48:51 PM Jul 23, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type. Log-t wi	TYPE MWWWWWW DET P N N N N N	
			Mkr	3 6.474 61 GHz	Auto Tune
10 dB/div Ref 20.00 c	dBm			-45.47 dBm	
10.0	<u>1</u>				Center Freq
0.00	<u> </u>				5.015000000 GHz
-10.0					
-20.0					
-30.0				-26.21 dBm	Start Freq
-40.0		2	▲3		30.000000 MHz
-40.0		a superior and the second s		and a substant	
					Stop Freq
-60.0					10.00000000 GHz
-70.0					
Start 30 MHz				Stop 10.000 GHz	CF Step
#Res BW 1.0 MHz	#VE	W 3.0 MHz	Sweep 18	.67 ms (40001 pts)	997.000000 MHz
MKR MODE TRC SCL	×		VCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1 f 2 N 1 f	2.468 41 GHz 4.967 39 GHz	1.32 dBm -45.34 dBm			
3 N 1 f	6.474 61 GHz	-45.47 dBm			Freq Offset
4				=	0 Hz
6					
8					
9					
11				~	
MSG		Ш	STATUS		
MBG			STATUS		

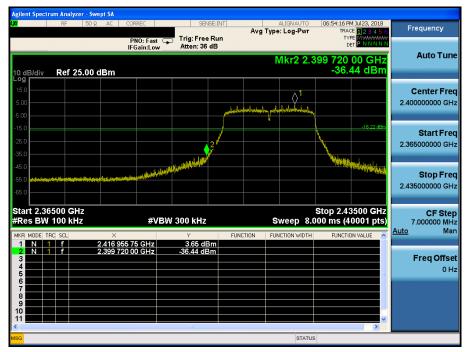


# TM 3 & 2412

### Reference



## Low Band-edge



	er - Swept SA									
RF	50 Ω 🧥 DC	CORREC		SEN	SE:INT	0	ALIGNAUTO		M Jul 23, 2018 25 <b>1 2 3 4 5 6</b>	Frequency
		PNO: Fas IFGain:Lo		Trig: Free Atten: 36		Avgiyp	e: Log-Pwr	TY	ET P N N N N N	
10 dB/div <b>Ref 2</b> :	5.00 dBm						Mkr		9 9 MHz 89 dBm	Auto Tune
5.00 5.00										Center Fred 15.004500 MH
-15.0 -25.0 -35.0									-16.22 dBm	Start Free 9.000 kH
45.0 🖗 '										
55.0	Histolikov matadista	by of the sector in the sector of the sector	(iined an other	mendensalis	daartat kant	2 withingthe state of the state	www.	#ay-spitel-fitel.dat	erinterphotological	
55.0 65.0 Start 9 kHz				Mitterrediky 300 kHz	daastet Versch	withting the state of the state	Sweep 5.3	Stop 3	0.00 MHz	30.000000 MH CF Ste 2.999100 MH
55.0 Start 9 KHz FRes BW 100 KH MKR MODE TRC SCL 1 N 1 f	z	#\ 281.9 kHz	VBW 3	300 kHz Y -49.70 dB	FUI			Stop 3 33 ms (4	0.00 MHz	30.000000 MH CF Step 2.999100 MH
55 0 55 0 56 0	z	#	VBW 3	300 kHz Y	FUI	entre	Sweep 5.3	Stop 3 33 ms (4	0.00 MHz 0001 pts)	30.00000 МН СF Ste 2.999100 МН <u>Auto</u> Ма Freq Offse
55.0 55.0	z	#\ 281.9 kHz	VBW 3	300 kHz Y -49.70 dB	FUI	entre	Sweep 5.3	Stop 3 33 ms (4	0.00 MHz 0001 pts)	30.000000 MH CF Step 2.999100 MH <u>Auto</u> Ma Freq Offse
55.0 Start 9 kHz #Res BW 100 kH MKR MODE: TRC SCL 1 N 1 f 2 N 1 f 3 4 5 5 6 7 8	z	#\ 281.9 kHz	VBW 3	300 kHz Y -49.70 dB	FUI	entre	Sweep 5.3	Stop 3 33 ms (4	0.00 MHz 0001 pts)	Stop Free           30.000000 MH:           2.999100 MH:           Auto           Freq Offse           0 H:

Agilent Spectrum Analyzer - Swe	ot SA					
<b>ιχι</b> RF 50 Ω	AC CORREC	SENSE:IN		ALIGNAUTO Type: Log-Pwr	06:56:53 PM Jul 23, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast IFGain:Low	Trig: Free Run Atten: 36 dB		Type: Log-Pwr		
10 dB/div Ref 25.00 d	Bm			Mkr	3 9.148 56 GHz -40.33 dBm	Auto Tune
Log 15.0 -5.00						Center Freq 5.015000000 GHz
-15.0 -25.0 -35.0			2	a definition of the second second	-16.22 dBm	Start Freq 30.000000 MHz
-45.0 -55.0 -65.0						<b>Stop Freq</b> 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VE	3W 3.0 MHz		Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz
MKR MODE TRC SCL	× 2.417 82 GHz	۲ 11.28 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 N 1 f 3 N 1 f 4 5 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	5.713 40 GHz 9.148 56 GHz	-38.91 dBm -40.33 dBm				Freq Offset 0 Hz
6 7 8 9 9						
10 11 <		ш			×	
MSG				STATUS		

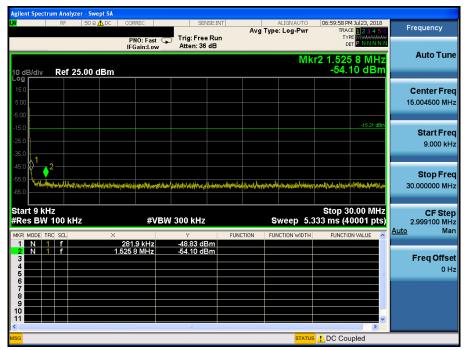


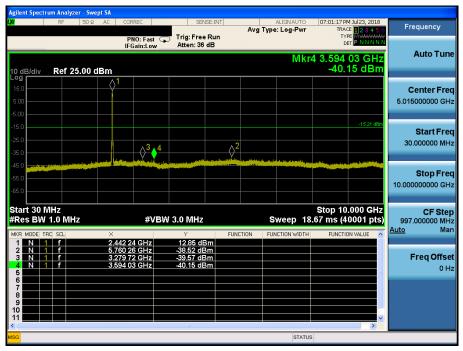
# 🛈 Dt&C

# TM 3 & 2437

# Reference







Agilent Spectr	um Anal RE	yzer - Swe 50 Ω	AC	CORRE	c		ENSE:I	NT			ALIGNAUTO	07:02:11 6	M Jul 23, 2018	-	
~	Tu	00 32	~		:Fast (				Avg		: Log-Pwr	TRA T)		-	Frequency
				IFGai	in:Low	Atten:							et <mark>P N N N N</mark>		Auto Tune
10 dB/div	Ref	25.00 c	lBm								Mkr4 2		00 GHz 41 dBm		Auto Tune
15.0															Center Free
5.00 -5.00														17	.500000000 GH
-15.0												4	-15.21 dBr	10	Start Free
-35.0		anton ( la marta)									<u> </u>	Contraction of the local division of the loc			
-55.0														25	Stop Fred
-65.0	00 CL	17										Stop 25	.000 GHz		05.04
#Res BW					#VB	W 3.0 MH	z			S	weep 40.				CF Step 500000000 GH; to Mar
MKR MODE TF	f			5 250 (		Y -27.93		FUNC	CTION	FUN	ICTION WIDTH	FUNCTI	ON VALUE		
2 N 1 3 N 1 4 N 1 5	f f f		21.47	1 875 ( 3 875 ( 8 000 (	GHz	-29.12 -31.10 -32.41	dBm								Freq Offse 0 Hi
6 7 8															
9 10 11															
<													>		
SG											STATUS				

# **Dt&C**

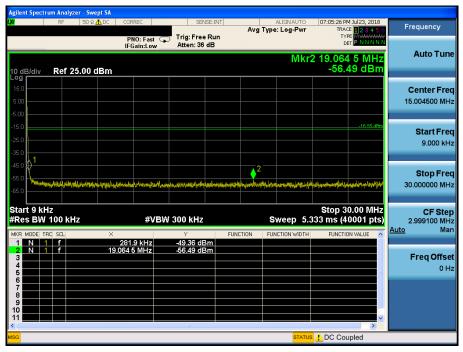
# TM 3 & 2462

# Reference



# **High Band-edge**





Agilent Spect	rum Ana	lyzer - Sw	ept SA									
LXI	RF	50 <u>Ω</u>	AC	CORREC		SEN	SE:INT		ALIGNAUTO		M Jul 23, 2018	Frequency
				DNA		Trig: Free	Run	Avg Ty	pe: Log-Pwr	TRAC TY	CE 123456 PE MWWWWWW	rrequency
				IFGain	Fast 🖵 :Low	Atten: 36				D	et P N N N N N	
	_								Mkr	2.5.564	85 GHz	Auto Tune
	B-4		-1155						IVINI	_30	06 dBm	
10 dB/div Log	Rei	25.00		4						-00.		
15.0				<u></u>								Center Freq
5.00			Ĭ									5.015000000 GHz
												5.01500000 GH2
-5.00												
-15.0											-16.55 dBm	Start Freq
-25.0												30.000000 MHz
-35.0							▲2					30.000000 MHz
				وطالب ومالك	ed and a		and a state of the	and the second second		10	u	
-45.0 <b>constant</b>												Stop Freq
-55.0												
-65.0												10.00000000 GHz
Start 30 I	MHz									Stop 10	.000 GHz	CF Step
#Res BW	1.0 N	/Hz			#VBW	3.0 MHz			Sweep 18	.67 ms (4	0001 pts)	997.000000 MHz
MKR MODE T	IBC SCL		X			Y	ELIN	TION F	UNCTION WIDTH	ELINCTIO	DN VALUE – 🔼	<u>Auto</u> Man
1 N				466 17 G	Hz	11.41 dB						
2 N 1	1 f		5.5	564 85 G	Hz	-39.06 dB	m					Eren Offent
3					_		_					Freq Offset
5												0 Hz
6												
7												
9												
10												
<											>	
MSG								_	STATU	3		
	_		_						0.410			



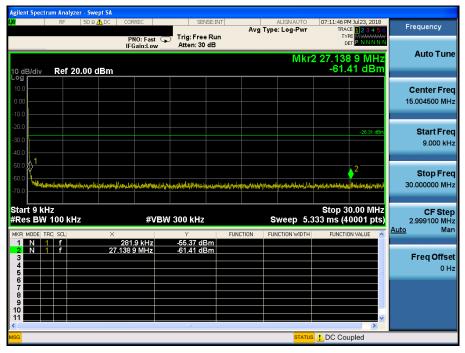
# TM 3 & 2472

# Reference



# **High Band-edge**





Agilent Spectrum Analyzer - Sw					
<b>ເXI</b> RF 50 ທີ	2 AC CORREC	SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	07:13:04 PM Jul 23, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast 🕞 IFGain:Low	Trig: Free Run Atten: 30 dB		DET P N N N N N	
			Mkr	4 4.864 45 GHz	Auto Tune
10 dB/div Ref 20.00	dBm			-45.58 dBm	
Log 10.0	<u>1</u>				Center Freq
0.00	↓ Ŷ'				5.015000000 GHz
-10.0					
-20.0					Otent From
-30.0				-26.31 dBm	Start Freq 30.000000 MHz
-40.0		$4^{4}$	3		
-50.0	and the second				Oton From
-60.0					Stop Freq 10.00000000 GHz
-70.0					10.000000000000000
Start 30 MHz				Stop 10.000 GHz	CF Step
#Res BW 1.0 MHz	#VBV	V 3.0 MHz	Sweep 18	.67 ms (40001 pts)	997.000000 MHz
MKR MODE TRC SCL	×		ICTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1 f 2 N 1 f	2.466 92 GHz 5.340 27 GHz	1.19 dBm -45.08 dBm			
3 N 1 f 4 N 1 f	6.342 26 GHz 4.864 45 GHz	-45.43 dBm -45.58 dBm			Freq Offset 0 Hz
5					0112
7					
9					
10				~	
<		110	074710	<b>&gt;</b>	
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

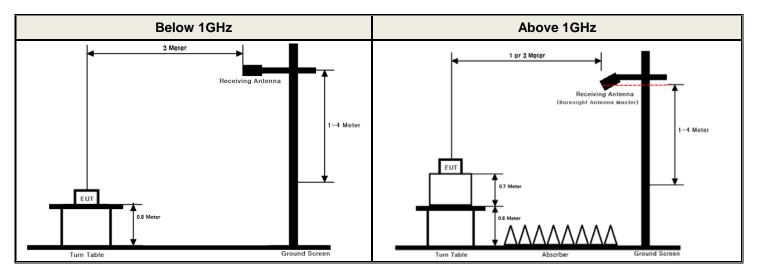
\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part,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

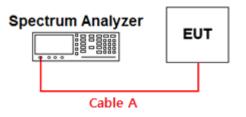
# Test Configuration



# 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.

#### Conducted Measurement



#### Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)	
0.03	0.14	15	0.93	
1	0.32	20	1.38	
2.412 & 2.437 & 2.462 & 2.472	0.42	25	1.52	
5	0.58	-	-	
10	0.70	-	-	

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, Applied only when it was used externally)



### Measurement Instrument Setting for Radiated Emission Measurements.

The radiated emission was tested according to the section 6.3, 6.4, 6.5 and 6.6 of the ANSI C63.10-2013 with following settings.

#### Peak Measurement

RBW = As specified in below table, VBW  $\geq$  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/x), where x is the duty cycle.
- 2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
- 3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

#### **Duty Cycle Correction factor**

Test Mode	Date rate	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
TM 1	1 Mbps	99.84	0.01
TM 2	6 Mbps	99.17	0.04
TM 3	MCS 0	98.95	0.05

#### Test Results: Comply

Please refer to next page for data table and the appendix I for worst data plots.



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)
	2387.88	Н	Y	PK	52.25	2.70	N/A	N/A	54.95	74.00	19.05
2412	2387.88	Н	Y	AV	42.15	2.70	N/A	N/A	44.85	54.00	9.15
2412	4823.96	V	Y	PK	50.19	1.49	N/A	N/A	51.68	74.00	22.32
	4823.64	V	Y	AV	39.64	1.49	N/A	N/A	41.13	54.00	12.87
0407	4874.11	V	Y	PK	52.30	1.62	N/A	N/A	53.92	74.00	20.08
2437	4874.02	V	Y	AV	45.07	1.62	N/A	N/A	46.69	54.00	7.31
	2483.98	Н	Y	PK	51.58	3.10	N/A	N/A	54.68	74.00	19.32
0400	2483.98	Н	Y	AV	41.65	3.10	N/A	N/A	44.75	54.00	9.25
2462	4923.94	V	Y	PK	49.82	1.78	N/A	N/A	51.60	74.00	22.40
	4923.93	V	Y	AV	39.31	1.78	N/A	N/A	41.09	54.00	12.91
	2483.86	Н	Y	PK	51.60	3.10	N/A	N/A	54.70	74.00	19.30
2472	2483.86	Н	Y	AV	42.63	3.10	N/A	N/A	45.73	54.00	8.27
2472	4944.85	V	Y	PK	50.34	1.83	N/A	N/A	52.17	74.00	21.83
	4944.82	V	Y	AV	38.71	1.83	N/A	N/A	40.54	54.00	13.46

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

Note.

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

2. Sample Calculation.

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

3. Information of Distance Factor.

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

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



Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	2389.99	Н	Y	PK	59.07	2.70	N/A	N/A	61.77	74.00	12.23
0440	2389.95	Н	Y	AV	45.04	2.70	N/A	N/A	47.74	54.00	6.26
2412	4824.17	V	Y	PK	49.79	1.49	N/A	N/A	51.28	74.00	22.72
	4823.89	V	Y	AV	39.12	1.49	N/A	N/A	40.61	54.00	13.39
0407	4873.32	V	Y	PK	49.78	1.62	N/A	N/A	51.40	74.00	22.60
2437	4873.60	V	Y	AV	38.90	1.62	N/A	N/A	40.52	54.00	13.48
	2483.87	Н	Y	PK	57.24	3.10	N/A	N/A	60.34	74.00	13.66
0.400	2483.81	Н	Y	AV	44.40	3.10	N/A	N/A	47.50	54.00	6.50
2462	4925.44	V	Y	PK	49.08	1.78	N/A	N/A	50.86	74.00	23.14
	4925.22	V	Y	AV	38.80	1.78	N/A	N/A	40.58	54.00	13.42
	2483.55	V	Z	PK	58.06	3.10	N/A	N/A	61.16	74.00	12.84
0470	2483.63	V	Z	AV	45.09	3.10	N/A	N/A	48.19	54.00	5.81
2472	4943.03	V	Y	PK	49.32	1.83	N/A	N/A	51.15	74.00	22.85
	4942.95	V	Y	AV	38.75	1.83	N/A	N/A	40.58	54.00	13.42

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

Note.

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

2. Sample Calculation.

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

3. Information of Distance Factor.

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

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



Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	2389.80	Н	Y	PK	55.35	2.70	N/A	N/A	58.05	74.00	15.95
0440	2389.50	Н	Y	AV	44.03	2.70	N/A	N/A	46.73	54.00	7.27
2412	4824.19	V	Y	PK	49.76	1.49	N/A	N/A	51.25	74.00	22.75
	4824.28	V	Y	AV	38.95	1.49	N/A	N/A	40.44	54.00	13.56
0407	4874.72	V	Y	PK	49.63	1.62	N/A	N/A	51.25	74.00	22.75
2437	4874.11	V	Y	AV	39.03	1.62	N/A	N/A	40.65	54.00	13.35
	2484.08	Н	Y	PK	56.00	3.10	N/A	N/A	59.10	74.00	14.90
2462	2483.93	Н	Y	AV	43.56	3.10	N/A	N/A	46.66	54.00	7.34
2402	4923.51	V	Y	PK	49.89	1.78	N/A	N/A	51.67	74.00	22.33
	4923.71	V	Y	AV	38.75	1.78	N/A	N/A	40.53	54.00	13.47
	2483.71	V	Z	PK	59.83	3.10	N/A	N/A	62.93	74.00	11.07
2472	2483.51	V	Z	AV	46.01	3.10	N/A	N/A	49.11	54.00	4.89
241Z	4944.26	V	Y	PK	49.54	1.83	N/A	N/A	51.37	74.00	22.63
	4944.15	V	Y	AV	38.68	1.83	N/A	N/A	40.51	54.00	13.49

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

Note.

1. The radiated emissions were investigated 9kHz 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	Conducted Limit (dBuV)					
(MHz)	Quasi-Peak	Average				
0.15 ~ 0.5	66 to 56 *	56 to 46 *				
0.5 ~ 5	56	46				
5 ~ 30	60	50				

\* Decreases with the logarithm of the frequency

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

# Test Procedure

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

#### **Test Results: Comply**(Refer to next page.)

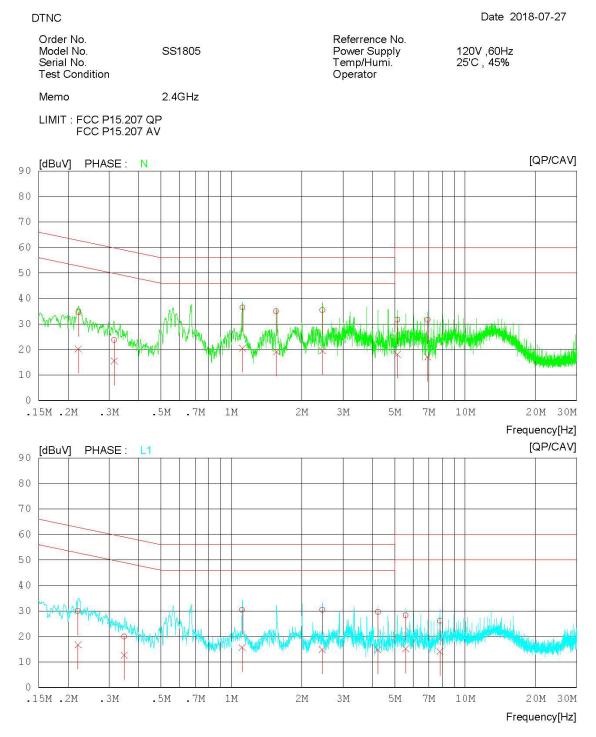
The worst data was reported.



# RESULT PLOTS TM2 & 2437MHz

# AC Line Conducted Emissions (Graph)

# **Results of Conducted Emission**



DTNC

# AC Line Conducted Emissions (List)

# **Results of Conducted Emission**

Date 2018-07-27

Order No. Model No. Serial No. Tost Condition	SS1805	
Test Condition		

Referrence No. Power Supply Temp/Humi. Operator

120V ,60Hz 25'C , 45%

Memo 2.4GHz

LIMIT : FCC P15.207 QP FCC P15.207 AV

NO	FREQ	READING OP CAV	C.FACTOR	RESULT QP CAV	LIMIT QP CAV	MARGIN QP CAV	PHASE
	[MHz]	[dBuV] [dBuV	] [dB]	[dBuV] [dBuV	~	~	V]
1	0.22165	24.72 10.32	9.90	34.6220.22	62.76 52.76	28.14 32.54	Ν
2	0.31563	13.86 5.59	9.90	23.7615.49	59.82 49.82	36.0634.33	Ν
3	1.11680	26.57 10.63	9.93	36.50 20.56	56.00 46.00	19.50 25.44	Ν
4	1.55720	25.06 9.16	9.94	35.0019.10	56.00 46.00	21.00 26.90	Ν
5	2.45280	25.48 9.49	9.96	35.44 19.45	56.00 46.00	20.5626.55	Ν
6	5.13200	21.62 8.10	10.07	31.6918.17	60.00 50.00	28.31 31.83	Ν
7	6.91360	21.73 7.06	10.04	31.7717.10	60.00 50.00	28.23 32.90	Ν
8	0.22077	20.08 6.83	9.90	29.9816.73	62.79 52.79	32.81 36.06	L1
9	0.34803	10.05 2.69	9.90	19.9512.59	59.01 49.01	39.0636.42	L1
10	1.11200	20.46 5.71	9.93	30.3915.64	56.00 46.00	25.6130.36	L1
11	2.44760	20.46 4.97	9.96	30.4214.93	56.00 46.00	25.58 31.07	L1
12	4.23800	19.54 4.79	10.04	29.5814.83	56.00 46.00	26.4231.17	L1
13	5.56980	18.17 5.20	10.06	28.23 15.26	60.00 50.00	31.7734.74	L1
14	7.80620	15.98 4.03	10.07	26.0514.10	60.00 50.00	33.95 35.90	L1

# 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	17/12/28	18/12/28	MY50200816
Spectrum Analyzer	Agilent Technologies	N9020A	18/01/03	19/01/03	MY48011700
Multimeter	FLUKE	17B	17/12/26	18/12/26	26030065WS
Signal Generator	Rohde Schwarz	SMBV100A	17/12/27	18/12/27	255571
Signal Generator	ANRITSU	MG3695C	18/02/12	19/02/12	173501
Thermohygrometer	BODYCOM	BJ5478	18/07/09	19/07/09	N/A
Thermohygrometer	BODYCOM	BJ5478	18/01/03	19/01/03	120612-1
Loop Antenna	Schwarzbeck	FMZB1513	18/01/30	20/01/30	1513-128
BILOG ANTENNA	Schwarzbeck	VULB 9160	18/07/13	20/07/13	3359
50W 10dB ATT	SMAJK	SMAJK-50-10	18/07/04	19/07/04	2-50-10
Horn Antenna	ETS-Lindgren	3115	17/01/13	19/01/13	9202-3820
Horn Antenna	Schwarzbeck	BBHA 9120C	17/12/04	19/12/04	9120C-561
Horn Antenna	A.H.Systems Inc.	SAS-574	17/07/31	19/07/31	155
PreAmplifier	tsj	MLA-010K01- B01-27	18/02/27	19/02/27	1844538
PreAmplifier	tsj	MLA-0118-J01- 45	18/02/08	19/02/08	17138
PreAmplifier	tsj	MLA-1840-J02- 45	18/07/06	19/07/06	16966-10728
EMI Test Receiver	ROHDE&SCHWARZ	ESR7	18/02/13	19/02/13	101061
Attenuator	SMAJK	SMAJK-2-3	18/07/02	19/07/02	3
Attenuator	Aeroflex/Weinschel	56-3	17/12/27	18/12/27	Y2370
Attenuator	SRTechnology	F01-B0606-01	18/07/02	19/07/02	13092403
Attenuator	Hefei Shunze	SS5T2.92-10-40	17/12/27	18/12/27	16012202
High Pass Filter	Wainwright Instruments	WHNX12-935- 1000-15000-40SS	18/07/02	19/07/02	8
High Pass Filter	Wainwright Instruments	WHNX8.0/26.5- 6SS	17/12/26	18/12/26	3
High Pass Filter	Wainwright Instruments	WHKX10-2838- 3300-18000- 60SS	18/07/02	19/07/02	1
Power Meter & Wide	Anritsu	ML2495A	17/12/27	18/12/27	1306007
Bandwidth Sensor		MA2490A			1249001
PULSE LIMITER	Rohde Schwarz	ESH3-Z2	17/09/29	18/09/29	101333
LISN	SCHWARZBECK	NNLK 8121	18/03/20	19/03/20	06183
Cable	DT&C	CABLE	18/01/10	19/01/10	RF-55
Cable	DT&C	CABLE	18/03/26	19/03/26	RF-68
Cable	DT&C	CABLE	18/03/26	19/03/26	P-IN
Cable	DT&C	CABLE	18/03/26	19/03/26	RF-71
Cable	DT&C	CABLE	18/06/22	19/06/22	RF-82
Cable	Radiall	TESTPRO3	18/06/22	19/06/22	RF-74
Cable	Radiall	TESTPRO3	18/06/22	19/06/22	RF-66
Cable	HUBER+SUHNER	SUCOFLEX	17/12/22	18/12/22	C-1
Cable	HUBER+SUHNER	SUCOFLEX	17/12/22	18/12/22	C-2
Cable	HUBER+SUHNER	SUCOFLEX	17/12/22	18/12/22	C-3
Cable	HUBER+SUHNER	SUCOFLEX	17/12/22	18/12/22	C-4

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**

# Duty cycle plots

# Test Procedure

# Duty Cycle was measured using section 6.0 b) of KDB558074 D01V04 :

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

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

# **Duty Cycle**

TM 1(1Mbps) & 2437

			PNO: Fast IFGain:Low		Free Run I: 40 dB		Type: Log-Pwr	TYPE	123456 WWWWWW PNNNNN	Frequency
0 dB/div	Ref 3	0.00 dBn	1				Δ	Mkr3 12. 0.	24 ms 89 dB	Auto Tur
.og 20.0 10.0 0.00				×.			₹3∆4	<b></b>		Center Fre 2.437000000 Gi
10.0 20.0 30.0										<b>Start Fr</b> 2.437000000 G
40.0 50.0 60.0										<b>Stop Fr</b> 2.437000000 G
Les BW 8	8 MHZ		×	3W 50 MI		FUNCTION	Sweep 50	Sp .67 ms (40) FUNCTION	<u> </u>	<b>CF St</b> e 8.000000 M <u>Auto</u> M
1 Δ2 2 F 3 Δ4 4 F 5 6	1 t 1 t (Δ		12.22 ms(, 22.67 ms 12.24 ms(, 22.67 ms	20.84 () 0	.07 dB 4 dBm .89 dB 0 dBm					Freq Offs 0
7 8 9 10										

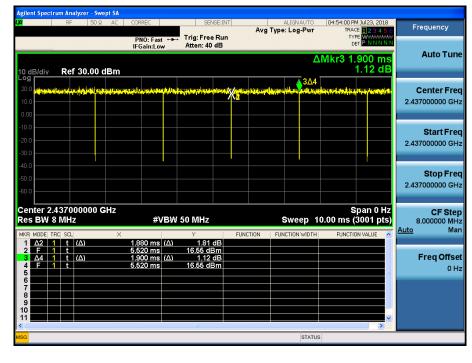
# **Dt&C**

# TM 2(6Mbps) & 2437

# Duty Cycle

ent Spectrum Analyzer - Swept SA					
RF 50 Ω AC		: Free Run	ALIGNAUTO Type: Log-Pwr	04:53:04 PM Jul 23, 2018 TRACE 1 2 3 4 5 6 TYPE WWWWW DET P N N N N N	Frequency
B/div Ref 30.00 dBm	IFGain:Low Atte	en: 40 dB	ΔN	/kr3 2.050 ms -0.27 dB	Auto Tun
) Prostopation in the state of	tinin himana, titlan matfind	e.e.e.energiane	3∆4 	heinen hallmersterapistan	Center Fre 2.437000000 GH
					<b>Start Fre</b> 2.437000000 GH
					<b>Stop Fre</b> 2.437000000 GH
nter 2.437000000 GHz BW 8 MHz	#VBW 50 M		Sweep 10.	Span 0 Hz 00 ms (3001 pts)	CF Ste 8.000000 MH <u>Auto</u> Ma
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	5.590 ms 18. 2.050 ms (Δ)	0.32 dB 78 dBm 0.27 dB 78 dBm			Freq Offs 0 F
				~	
			STATUS	>	

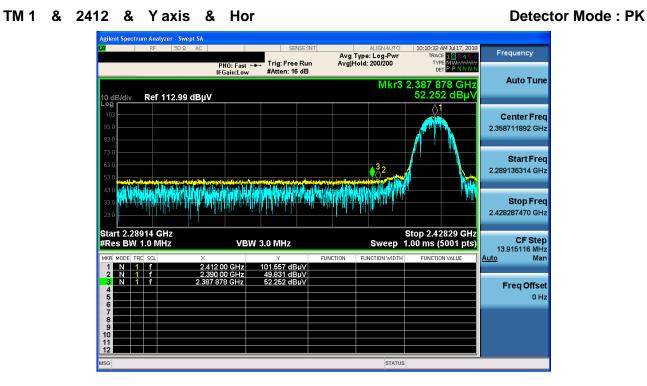
# TM 3(MCS0) & 2437



# **Duty Cycle**

# **APPENDIX II**

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



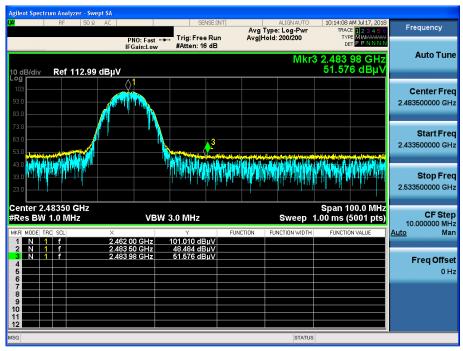
# TM 1 & 2412 & Yaxis & Hor

	RF	50Ω AC	PNO: Fast ← IFGain:Low	SENS Trig: Free F #Atten: 16 d	Avg tun Avg	ALIGN AUTO Type: RMS Hold: 200/200	10:11:22 AM Jul 17, 2 TRACE 1 2 3 4 TYPE A WAW DET A P N N	56 Frequency
0 dB/div	Ref 112	2.99 dBµV	II Gam.Low			Mkr3	2.387 878 GF 42.154 dBp	HZ Auto Tu
og 103 33.0 33.0								<b>Center Fr</b> 2.358711892 G
73.0 53.0 53.0 43.0						32		Start Fr 2.289136314 G
33.0 23.0								<b>Stop Fr</b> 2.428287470 G
tart 2.28 Res BW	914 GHz 1.0 MHz		VBV	/ 3.0 MHz*		Sweep	Stop 2.42829 G 1.00 ms (5001 p	ts) CF Ste 13.915116 M
KR MODE TF	f f		2 00 GHz 0 00 GHz	Y 96.153 dBµ 41.457 dBµ		FUNCTION WIDTH	FUNCTION VALUE	Auto M
3 N 1 4 5 6	f	2.387	878 GHz	42.154 dBµ'	Ý			Freq Offs 0
7 8 9 0 1								
2								

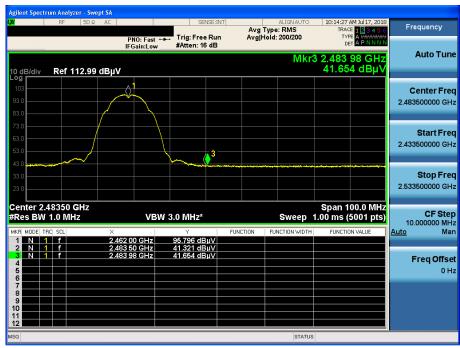
**Detector Mode : PK** 



# TM 1 & 2462 & Yaxis & Hor

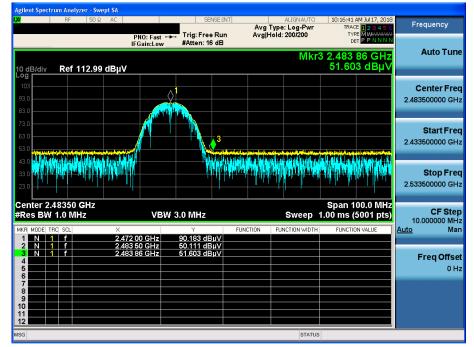


#### TM 1 & 2462 & Yaxis & Hor





# TM 1 & 2472 & Yaxis & Hor



# TM 1 & 2472 & Yaxis & Hor

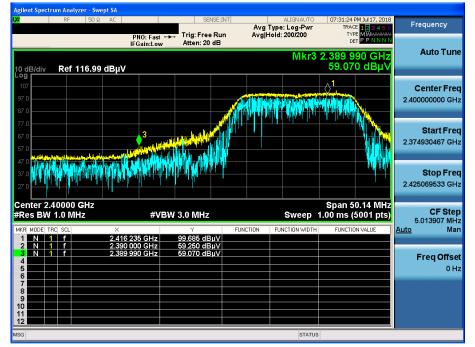
#### er - Swept SA Frequency Avg Type: RMS Avg|Hold: 200/200 TYPE A UNANA PNO: Fast +++ Trig: Free Run IFGain:Low #Atten: 16 dB Auto Tune Mkr3 2.483 86 GHz 42.631 dBµ\ Ref 112.99 dBµV 10 dB/div -og **Center Freq** 2.483500000 GHz Start Freq 2.433500000 GHz 3 Stop Freq 2.533500000 GHz Center 2.48350 GHz #Res BW 1.0 MHz Span 100.0 MHz 1.00 ms (5001 pts) **CF Step** 10.000000 MHz <u>o</u> Man VBW 3.0 MHz\* Sweep Auto 42.568 dBµV 42.631 dBµV 2.483 50 GHz 2.483 86 GHz Ň Freq Offset 0 Hz STATUS

# **Detector Mode : AV**

Pages: 74 / 82



# TM 2 & 2412 & Yaxis & Hor



# TM 2 & 2412 & Yaxis & Hor

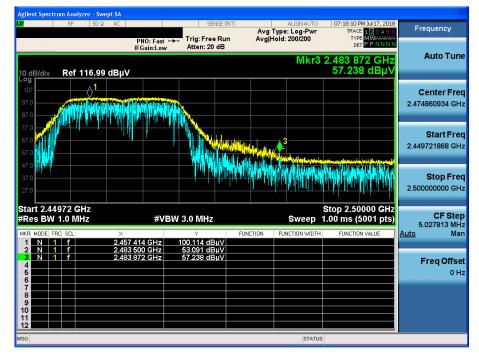
#### er - Swept SA Frequency Avg Type: RMS Avg|Hold: 200/200 Trig: Free Run Atten: 20 dB DET A P N N N PNO: Fast 🔸 Mkr3 2.389 950 GHz 45.039 dBµV Auto Tune 10 dB/div \_og Ref 116.99 dBµV **Center Freq** $\Diamond^1$ 2.400000000 GHz Start Freq 2.374930467 GHz 3 Stop Freq 2.425069533 GHz Center 2.40000 GHz #Res BW 1.0 MHz Span 50.14 MHz Sweep 1.00 ms (5001 pts) CF Step 5.013907 MHz Man #VBW 3.0 MHz\* Auto <u>44.953 dBµ\</u> 45.039 dBu\ Ň 2.389 950 GHz Freq Offset 0 Hz STATUS

# Detector Mode : AV

Pages: 75 / 82



# TM 2 & 2462 & Yaxis & Hor



# TM 2 & 2462 & Yaxis & Hor

#### Swept SA Frequency Avg Type: RMS Avg|Hold: 200/200 Trig: Free Run Atten: 20 dB DET A P N N N PNO: Fast IFGain:Low Mkr3 2.483 812 GHz 44.399 dBµV Auto Tune Ref 116.99 dBµV 0 dB/div **Center Freq** 2.474860934 GHz Start Freq 2.449721868 GHz 4 Stop Freq 2.50000000 GHz Start 2.44972 GHz #Res BW 1.0 MHz Stop 2.50000 GHz 1.00 ms (5001 pts) **CF Step** 5.027813 MHz Man #VBW 3.0 MHz\* Sweep Auto 43.073 dBµ\ 44.399 dBu\ 2.483 500 GHz 2.483 812 GHz Ň Freq Offset 0 Hz STATUS

# **Detector Mode : AV**

# Detector Mode : PK

**Detector Mode : PK** 



#### :04:22 PM Jul 17, 2018 TRACE 12345 TYPE MW Frequency Avg Type: Log-Pwr Avg|Hold: 200/200 Trig: Free Run Atten: 10 dB PNO: Fast +++ IFGain:Low Auto Tune Mkr3 2.483 547 GH: 58.057 dBµ\ Ref 106.99 dBµV **Center Freq** 2.480543640 GHz ner ner her en Start Freq 2.461087280 GHz TT DE MALEY CIDMAN Stop Freq 2.50000000 GHz Start 2.46109 GHz #Res BW 1.0 MHz Stop 2.50000 GHz 1.00 ms (5001 pts) CF Step 3.891272 MHz Man #VBW 3.0 MHz Sweep Auto 89.499 dBµV 55.174 dBµV 58.057 dBµV 2.483 500 GHz 2.483 547 GHz Freq Offset 0 Hz STATUS

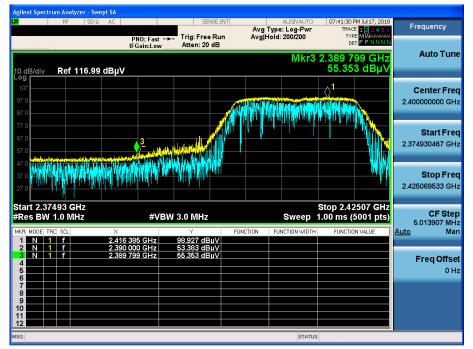
# TM 2 & 2472 & Zaxis & Ver







# TM 3 & 2412 & Yaxis & Hor



# TM 3 & 2412 & Yaxis & Hor

#### er - Swept SA Jul 17. 201 Frequency Avg Type: RMS Avg|Hold: 200/200 Trig: Free Run Atten: 20 dB DET A P N N N PNO: Fast 🔸 Auto Tune Mkr3 2.389 499 GHz 44.033 dBµ√ 10 dB/div \_og Ref 116.99 dBµV **Center Freq** 2.400000000 GHz Start Freq 2.374930467 GHz 3 Stop Freq 2.425069533 GHz Start 2.37493 GHz #Res BW 1.0 MHz Stop 2.42507 GHz 1.00 ms (5001 pts) CF Step 5.013907 MHz Man #VBW 3.0 MHz\* Sweep Auto 43.105 dBµ\ 44.033 dBu\ Ň 2 389 499 GH Freq Offset 0 Hz STATUS

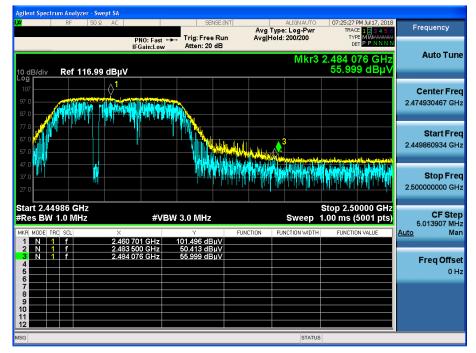
# **Detector Mode : AV**

# Detector Mode : PK

**Detector Mode : PK** 



# TM 3 & 2462 & Yaxis & Hor



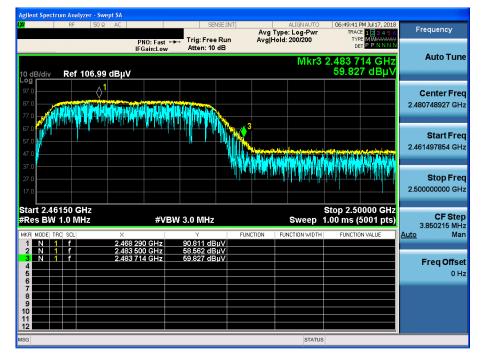
# TM 3 & 2462 & Yaxis & Hor





# **Detector Mode : PK**

# TM 3 & 2472 & Zaxis & Ver



#### TM 3 & 2472 & Zaxis & Ver

#### Frequency Avg Type: RMS Avg|Hold: 200/200 Trig: Free Run Atten: 10 dB DET A P N N PNO: Fast +++ IFGain:Low Auto Tune Mkr3 2.483 506 GHz 46.013 dBµ\ Ref 106.99 dBµV 0 dB/div Center Freq **∂**¹ 2.480748927 GHz Start Freq 3 2.461497854 GHz Stop Freq 2.500000000 GHz Start 2.46150 GHz #Res BW 1.0 MHz Stop 2.50000 GHz 1.00 ms (5001 pts) CF Step 3.850215 MHz #VBW 3.0 MHz\* Sweep Man \uto 2.483 500 GHz 2.483 506 GHz 45.974 dBµ\ 46.013 dBµ\ Freq Offset 0 Hz 10 12

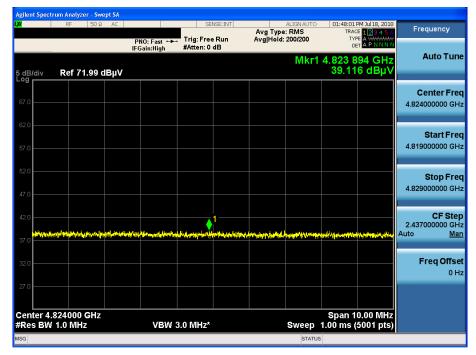
**Detector Mode : AV** 



# TM 1 & 2437 & Yaxis & Ver



## TM 2 & 2412 & Y axis & Ver





#### TM 3 & 2437 & Yaxis & Ver

