TEST REPORT

DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea,17042 Tel : 031-321-2664, Fax : 031-321-1664

1. Report No: DRTFCC1704-0065

Dt&C

2. Customer

• Name : Sena Technologies, Inc.

• Address : 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, South Korea

3. Use of Report : FCC Original Grant

4. Product Name / Model Name : Momentum / SP42 FCC ID : S7A-SP42

5. Test Method Used : KDB 558074, ANSI C63.10-2013

Test Specification : FCC Part 15 Subpart C.247

RSS-247 Issue 2 (2017-02), RSS-GEN Issue 4 (2014-11)

6. Date of Test : 2017.03.13 ~ 2017.04.24

7. Testing Environment : See appended test report.

8. Test Result : Refer to the attached test result.

Affine ation	Tested by		Technical Manager					
Affirmation	Name : JungWoo Kim	(Signature)	Name : HyunSu Son	(Signature)				
The test i	results presented in this test repo	ort are limited or	nly to the sample supplied by a	applicant and				
the use of this	s test report is inhibited other that	an its purpose. T	his test report shall not be rep	produced except				
	in full, without the	written approval	of DT&C Co., Ltd.					
	2017.04.27.							
DT&C Co., Ltd.								
lf ti	his report is required to confirmat	ion of authentic	ity please contact to report@d	tnc net				

Test Report Version

Test Report No.	Date	Description
DRTFCC1704-0065	Apr. 27, 2017	Initial issue

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1. General Information

1.1 Testing Laboratory

DT&C	Co., I	_td.				
Stand	ard	Site num	nber	Address		
	\square	16578	3	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935		
FCC		80448	8	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935		
FUU		596748		42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935		
		678747		683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080		
IC	\square	5740A	-3	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935		
		5740A	-2	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080		
www.d	tnc.ne	<u>et</u>				
Teleph	one	:	+ 82	2-31-321-2664		
FAX		:	+ 82	2-31-321-1664		

1.2 Test Environment

Ambient Condition				
Temperature	+21 °C ~ +25 °C			
 Relative Humidity 	34 % ~ 42 %			

1.3 Measurement Uncertainty

Test items	Measurement uncertainty
Transmitter Output Power	0.92 dB (The confidence level is about 95 %, $k = 2$)
Conducted spurious emission	0.94 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)

1.4 Details of Applicant

Applicant	:	Sena Technologies,Inc.
Address	:	19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, South Korea
Contact person	:	Seunghyun Kim

1.5 Description of EUT

EUT	Momentum
Model Name	SP42
Add Model Name	NA
Serial Number	Identical prototype
Hardware version	1.0
Software version	1.0
Power Supply	DC 3.7 V
Frequency Range	2402 MHz ~ 2480 MHz
Module Type0 / Max. RF Output Power	9.37dBm
Module Type1 / Max. RF Output Power	2.47dBm
Modulation Technique	GFSK
Antenna Type /Antenna Gain (Module 0)	Chip antenna / PK : 0.535 dBi (Model : SENA_003)
Antenna Type /Antenna Gain (Module 1)_ANT1	External Antenna / PK : 1.200 dBi (Model : SENA-DP01-19.7)
Antenna Type /Antenna Gain (Module 1)_ANT 2	External Antenna / PK : 1.000 dBi (Model : SENA-DP02-19)

1.6 Declaration by the applicant / manufacturer

N/A

1.7 Test Equipment List

Туре	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N	
Spectrum Analyzer	Agilent Technologies	N9020A	16/09/09	17/09/09	MY50200834	
Digital Multimeter	Agilent Technologies	34401A	17/01/04	18/01/04	US36099541	
DC Power Supply	SM techno	SDP30-5D	17/01/05	18/01/05	305DLJ204	
Signal Generator	Rohde Schwarz	SMBV100A	17/01/04	18/01/04	255571	
Signal Generator	Rohde Schwarz	SMF100A	16/06/23	17/06/23	102341	
-	DODVOOL	D 15 170	16/04/22	17/04/22	100010 0	
Thermohygrometer	BODYCOM	BJ5478	17/04/11	18/04/11	120612-2	
Loop Antenna	Schwarzbeck	FMZB1513	16/04/22	18/04/22	1513-128	
Bilog Antenna	SCHAFFNER	CBL6112B	16/05/23	18/05/23	2737	
Horn Antenna	ETS-LINDGREN	3117	16/05/03	18/05/03	00140394	
Horn Antenna	A.H.Systems Inc.	SAS-574	15/09/03	17/09/03	155	
PreAmplifier	Agilent	8449B	17/01/11	18/01/11	3008A00370	
PreAmplifier	tsj	MLA-010K01-B01- 27	17/03/06	18/03/06	1844539	
EMI TEST RECEIVER	Rohde Schwarz	ESU	16/07/18	17/07/18	100469	
Highpass Filter	Wainwright Instruments	WHKX12-2580- 3000-18000-80SS	16/09/09	17/09/09	3	
Highpass Filter	Wainwright Instruments	WHNX6-6320- 8000-26500-40CC	16/09/13	17/09/13	1	
Attenuator	SMAJK	SMAJK-50-10	16/09/08	17/09/08	15081902	
Power Meter & Wide Bandwidth		ML2495A	16/05/02	17/05/02	1306007	
Sensor	Anritsu	MA2490A	16/05/02	17/05/02	1249001	

1.8 Summary of Test Results

FCC Part	RSS Std.	Parameter	Limit	Test Condition	Status Note 1	
15.247(a)	RSS-247 [5.2]	6 dB Bandwidth	> 500 kHz		С	
15.247(b)	RSS-247 [5.4]	Transmitter Output Power	< 1 Watt		С	
15.247(d)	RSS-247 [5.5]	Out of Band Emissions / Band Edge	20 dBc in any 100 kHz BW	Conducted	С	
15.247(e)	RSS-247 [5.2]	Transmitter Power Spectral Density	< 8 dBm/3 kHz	-	С	
-	RSS-Gen [6.6]	Occupied Bandwidth (99 %) RSS-Gen(6.6)		-	С	
15.247(d) 15.205 15.209	RSS-247 [5.5] RSS-GEN [8.9] RSS-GEN [8.10]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209 limits	Radiated	C Note 2	
15.207	RSS-Gen [8.8]	AC Line Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NA Note 3	
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: This test item was performed in each axis and the worst case data was reported.

Note 3: The power supply of this device is only DC (Internal Battery) and Bluetooth function is disabled in charging status.

2. Test Methodology

Generally the tests were performed according to the KDB558074 D01 v03r05. 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 KDB 558074.

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

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 KDB 558074. 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 as stated on section 12.1 of the KDB 558074.

The EUT is placed on a non-conductive table. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axes.

2.4 Description of Test Modes

The EUT has been tested with the operating condition for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting. The Bluetooth low energy mode with below low, middle and high channels were tested and reported.

		Frequency [MHz]			
	Test Mode	Lowest Frequency	Middle Frequency	Highest Frequency	
TM 1	BT LE	2402	2440	2480	
TM 2	-	-	-	-	
TM 3	-	-	-	-	
TM 4	-	-	-	-	

2.5 Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.



3. Test Result

3.1 Maximum Peak Conducted Output Power

Test Requirements and limit, §15.247(b) & RSS-247 [5.4]

A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer.

Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

3.1.1 Test Setup

Refer to the APPENDIX I.

3.1.2 Test Procedures

Maximum Peak Conducted Output Power is measured using Measurement Procedure Option 1 of KDB558074

1. Set the RBW ≥ DTS bandwidth. Actual RBW = 2 MHz

- 2. Set $VBW \ge 3 \times RBW$. Actual VBW = 6 MHz
- 3. Set span ≥ 3 x RBW.
- 4. Sweep time = auto couple
- 5. Detector = **peak**
- 6. Trace mode = **max hold**
- 7. Allow trace to fully stabilize
- 8. Use peak marker function to determine the peak amplitude level.

3.1.3 Test Results

<Module 0>

Test mode	Tested Channel	Frame Average Output Power	Peak Output Power
Test mode	rested Unaimer	dBm dBm	
	Lowest	2.76	6.19
TM 1	Middle	6.87	9.37
	Highest	6.64	9.16

<Module 1>

Test mode	Tested Channel	Frame Average Output Power	Peak Output Power	
		dBm	dBm	
T M 1	Lowest	-3.83	-1.56	
	Middle	-0.10	2.47	
	Highest	-0.15	2.35	

Note 1 : The frame average output power was tested using an average power meter for reference only. Note 2 : See next pages for actual measured spectrum plots.

<Module 0>

Peak Output Power



Peak Output Power

Test Channel : Middle

Test Channel : Lowest





Peak Output Power

Test Channel : Highest





<Module 1>

Peak Output Power



Peak Output Power

Test Channel : Middle

Test Channel : Lowest





Peak Output Power

Test Channel : Highest





3.2 6 dB Bandwidth Measurement

Test Requirements and limit, §15.247(a) & RSS-247 [5.2]

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

The minimum permissible 6 dB bandwidth is 500 kHz.

3.2.1 Test Setup

Refer to the APPENDIX I.

3.2.2 Test Procedures

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB558074

- 1. Set resolution bandwidth (RBW) = 100 kHz
- 2. Set the video bandwidth (VBW) \ge 3 x RBW.

(<u>RBW : 100 kHz / VBW : 300 kHz</u>)

- 3. Detector = **peak**.
- 4. Trace mode = **max hold**.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.

7. Option 1 - Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

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

3.2.3 Test Results

<Module 0>

Test Mode	Tested Channel	Test Results [MHz]	
TM 1	Lowest	0.686	
	Middle	0.695	
	Highest	0.704	

<Module 1>

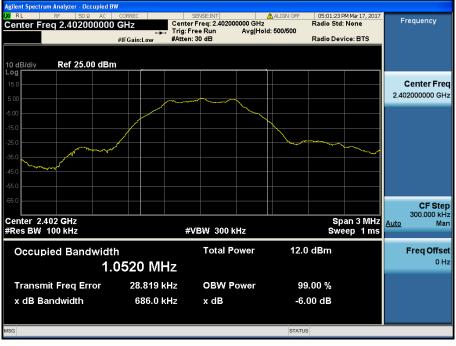
Test Mode	Tested Channel	Test Results [MHz]	
TM 1	Lowest	0.691	
	Middle	0.700	
	Highest	0.708	



<Module 0>

6 dB Bandwidth

Test Channel : Lowest



6 dB Bandwidth

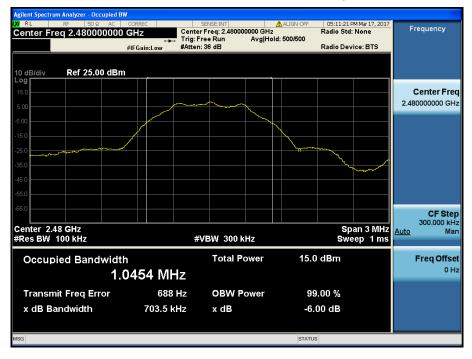
Test Channel : Middle





6 dB Bandwidth

Test Channel : Highest





<Module 1>

6 dB Bandwidth

Test Channel : Lowest



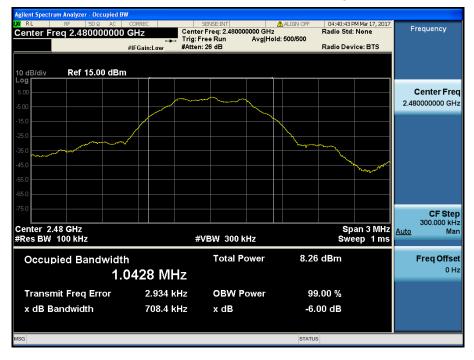
6 dB Bandwidth

Test Channel : Middle



6 dB Bandwidth

Test Channel : Highest



3.3 Maximum Power Spectral Density.

Test requirements and limit, §15.247(e) & RSS-247 [5.2]

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

Minimum Standard

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

3.3.1 Test Setup

Refer to the APPENDIX I.

3.3.2 Test Procedures

Method PKPSD of KDB558074 is used.

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

3.3.3 Test Results

<Module 0>

Test Mode	Tested Channel	PKPSD [dBm]	
TM 1	Lowest	-10.37	
	Middle	-6.74	
	Highest	-7.23	

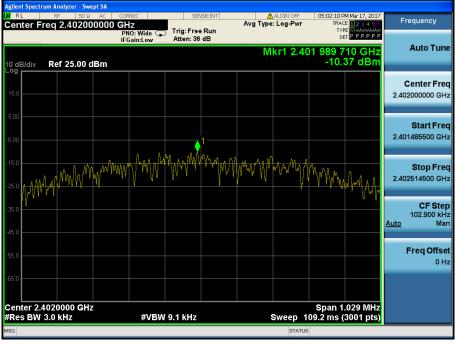
<Module 1>

Test Mode	Tested Channel	PKPSD [dBm]
TM 1	Lowest	-17.99
	Middle	-13.72
	Highest	-13.85



<Module 0>

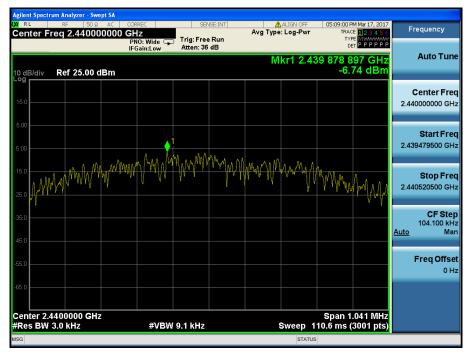
Maximum PKPSD



Maximum PKPSD

Test Channel : Middle

Test Channel : Lowest



Maximum PKPSD

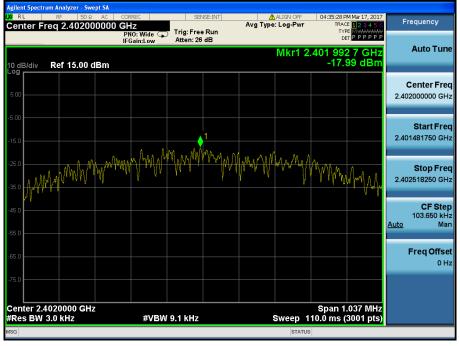
Test Channel : Highest





<Module 1>

Maximum PKPSD



Test Channel : Lowest

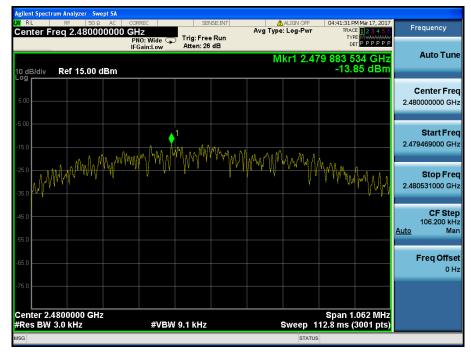
Maximum PKPSD

Test Channel : Middle



Maximum PKPSD

Test Channel : Highest



3.4 Unwanted Emissions (Conducted)

Test requirements and limit, §15.247(d) & RSS-247 [5.5]

§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions :

If **the peak output power procedure** is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20 dB** relative to the maximum measured in-band peak PSD level.

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

3.4.1 Test Setup

Refer to the APPENDIX I including path loss

3.4.2 Test Procedures

The transmitter output is connected to a spectrum analyzer.

- Measurement Procedure 1 Reference Level
- 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.

- Measurement Procedure 2 - Unwanted Emissions

- 1. Set the center frequency and span to encompass frequency range to be measured.
- 2. Set the RBW = 100 kHz.(Actual 1 MHz , See below note)
- 3. Set the VBW ≥ 3 x RBW.(Actual 3 MHz, See below note)
- 4. Detector = **peak**.
- 5. Ensure that the number of measurement points ≥ span / RBW
- 6. Sweep time = **auto couple.**
- 7. Trace mode = **max hold.**
- 8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
- 9. Use the peak marker function to determine the maximum amplitude level.

Note : The conducted spurious emission was tested with below settings.

Frequency range	RBW	VBW	Detector	Trace	Sweep Point
9 kHz ~ 30 MHz	100 kHz	300 kHz			
30 MHz ~ 10 GHz	1 MHz	3 MHz	Peak	Max Hold	40001
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 = 2001 to get accurate emission level within 100 kHz BW.

3.4.3 Test Results

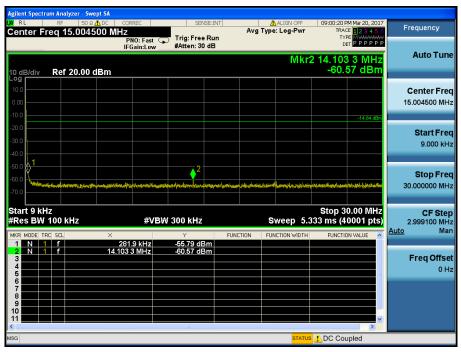
<Module 0>



Reference (Test Channel : Lowest)

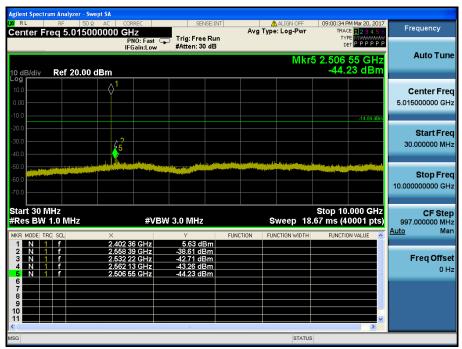
Low Band-edge (Test Channel : Lowest)





Conducted Spurious Emissions 1 (Test Channel : Lowest)

Conducted Spurious Emissions 2 (Test Channel : Lowest)





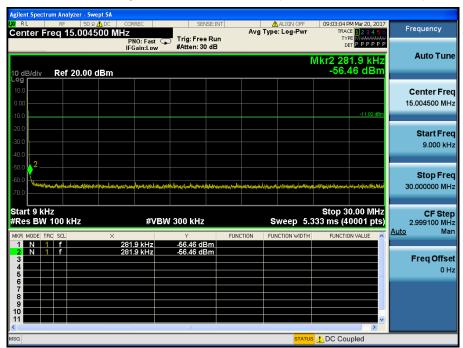
Conducted Spurious Emissions 3 (Test Channel : Lowest)





Reference (Test Channel : Middle)

Conducted Spurious Emissions 1 (Test Channel : Middle)

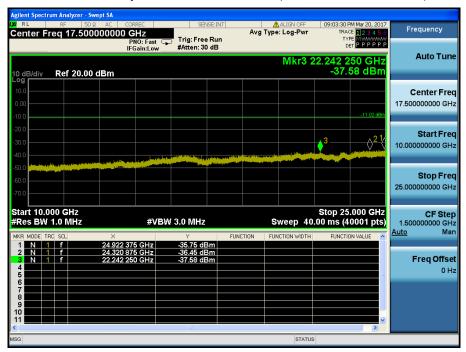




RE SOR AL OWNER Center Freq 5.015000000 GHz PRO: Fast Free Run IFGain:Low #Atten: 30 dB Mar 20. 3 Frequency Avg Type: Log-Pwr Auto Tune Mkr5 2.544 18 GHz -44.39 dBm Ref 20.00 dBm 10 dB/div **Center Freq** 5.015000000 GHz Start Freq 30.000000 MHz **∆}**5 Stop Freq 10.00000000 GHz CF Step 997.000000 MHz to Man Stop 10.000 GHz Sweep 18.67 ms (40001 pts) Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Auto N 1 f N 1 f N 1 f N 1 f N 1 f N 1 f N 1 f N 1 f -40.26 dBm -42.17 dBm -44.27 dBm -44.39 dBm Freq Offset 2.569 86 GHz 2.544 18 GHz 0 Hz STATUS

Conducted Spurious Emissions 2 (Test Channel : Middle)

Conducted Spurious Emissions 3 (Test Channel : Middle)





Reference (Test Channel : Highest)

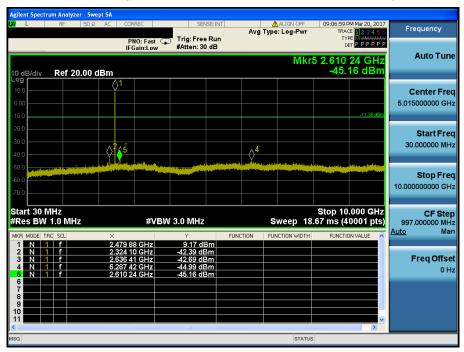
High Band-edge (Test Channel : Highest)



Frequency Center Freq 15.004500 MHz Avg Type: Log-Pwr TRACE PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB TYPE MWWWWWW DET P P P P P Auto Tune Mkr2 281.9 kHz -53.83 dBm Ref 20.00 dBm 10 dB/div Log **Center Freq** 15.004500 MHz Start Freq 9.000 kHz Stop Freq 30.000000 MHz **CF Step** 2.999100 MHz Man Start 9 kHz #Res BW 100 kHz Stop 30.00 MHz Sweep 5.333 ms (40001 pts) #VBW 300 kHz Auto -53.83 dBm -53.83 dBm N 1 f N 1 f 281.9 kHz 281.9 kHz Freq Offset 0 Hz DC Coupled

Conducted Spurious Emissions 1 (Test Channel : Highest)

Conducted Spurious Emissions 2 (Test Channel : Highest)





Conducted Spurious Emissions 3 (Test Channel : Highest)





<Module 1>

Dt&C

Agreen PF 50 g AC COrress A RL RF 50 g AC COrress PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB 08:51:50 PMIM TRACE ALIGN OFF Frequency Auto Tune Mkr1 2.402 013 GHz -1.97 dBm Ref 20.00 dBm 10 dB/div **Center Freq** 2.402000000 GHz Start Freq 2.400500000 GHz Stop Freq 2.403500000 GHz **CF Step** 300.000 kHz Man <u>Auto</u> Freq Offset 0 Hz Center 2.402000 GHz #Res BW 100 kHz Span 3.000 MHz Sweep 1.000 ms (3001 pts) #VBW 300 kHz

Reference (Test Channel : Lowest)

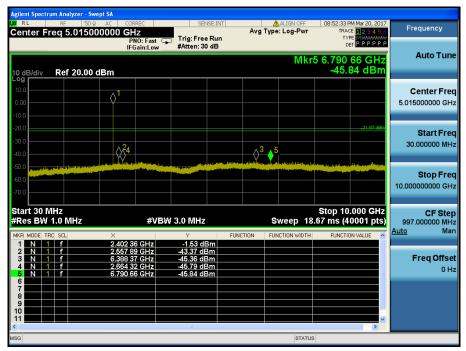
Low Band-edge (Test Channel : Lowest)



Mar 20, 2 ALIGN OFF Frequency Center Freq 15.004500 MHz TRACE TYPE MWWWWW DET P P P P P PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB Auto Tune Mkr2 281.9 kHz -55.61 dBm Ref 20.00 dBm 10 dB/div **Center Freq** 15.004500 MHz Start Freq 9.000 kHz Stop Freq 30.000000 MHz **CF Step** 2.999100 MHz Man Start 9 kHz #Res BW 100 kHz Stop 30.00 MHz Sweep 5.333 ms (40001 pts) #VBW 300 kHz Auto -55.61 dBm -55.61 dBm N 1 f N 1 f 281.9 kHz 281.9 kHz Freq Offset 0 Hz DC Coupled

Conducted Spurious Emissions 1 (Test Channel : Lowest)

Conducted Spurious Emissions 2 (Test Channel : Lowest)





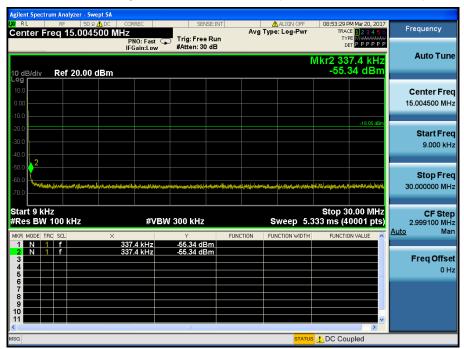
Conducted Spurious Emissions 3 (Test Channel : Lowest)

Agilent Spectrum Analyzer - Swept SA	
M RL RF 50 Ω AC CORREC SENSE.INT ▲ALIGN OFF 08:52:46 PM Mar 20, 2017 Center Freq 17.500000000 GHz Avg Type: Log-Pwr TRACE 12.3.4.5.6	iency
PNO: Fast Trig: Free Run IVE NUMBER IFGain:Low #Atten: 30 dB DET PPPPP	
10 dB/div Ref 20.00 dBm -37.40 dBm	ito Tune
	iter Freq 0000 GHz
	t art Freq 0000 GHz
	top Freq 0000 GHz
#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 40.00 ms (40001 pts) 1.50000	CF Step 0000 GHz
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE ALL ALL ALL ALL ALL ALL ALL ALL ALL AL	Man
2 N 1 f 21.274 375 GHz -37.15 dBm	e q Offset 0 Hz
MSG STATUS	



Reference (Test Channel : Middle)

Conducted Spurious Emissions 1 (Test Channel : Middle)

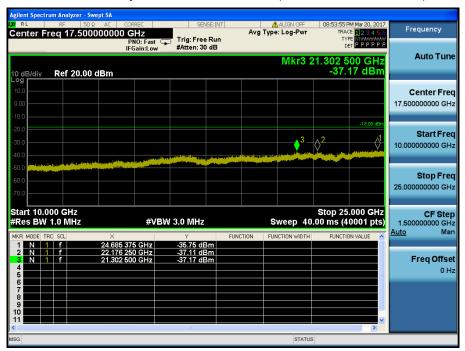




V RL RF | SUR RL OWNER Center Freq 5.015000000 GHz PRO: Fast Prig: Free Run IFGain:Low #Atten: 30 dB Mar 20, 2 Frequency Avg Type: Log-Pwr Auto Tune Mkr5 2.284 22 GHz -45.88 dBm Ref 20.00 dBm 10 dB/div **Center Freq** 5.015000000 GHz Start Freq 30.000000 MHz **∳**∫ \Diamond^4 e Stop Freq 10.00000000 GHz CF Step 997.000000 MHz Ito Man Stop 10.000 GHz Sweep 18.67 ms (40001 pts) Start 30 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Auto N 1 f N 1 f N 1 f N 1 f N 1 f N 1 f N 1 f N 1 f -45.34 dBm -45.62 dBm -45.87 dBm -45.88 dBm Freq Offset 99 39 GHz 57 05 GHz 34 22 GHz 0 Hz 2.28 STATUS

Conducted Spurious Emissions 2 (Test Channel : Middle)

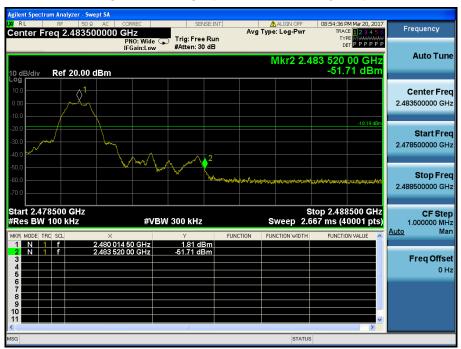
Conducted Spurious Emissions 3 (Test Channel : Middle)

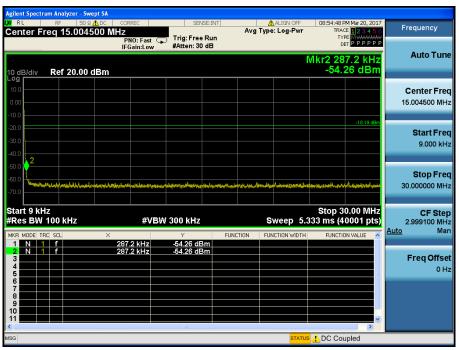




Reference (Test Channel : Highest)

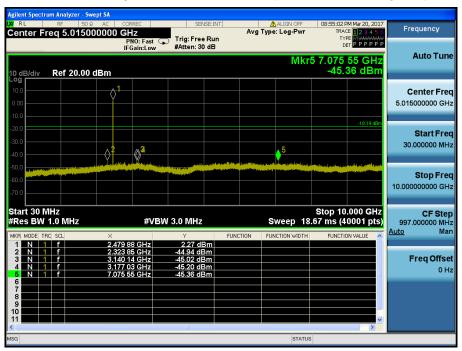
High Band-edge (Test Channel : Highest)





Conducted Spurious Emissions 1 (Test Channel : Highest)

Conducted Spurious Emissions 2 (Test Channel : Highest)





Conducted Spurious Emissions 3 (Test Channel : Highest)



3.5 Unwanted Emissions (Radiated)

Test Requirements and limit,

§15.247(d), §15.205, §15.209 & RSS-247 [5.5], RSS-Gen [8.9], RSS-Gen [8.10]

In any 100 kHz bandwidth outside the operating frequency band. In case the emission

fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

- FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 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 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240	3600 ~ 4400		
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

• 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.



3.5.1 Test Setup

Refer to the APPENDIX I.

3.5.2 Test Procedures

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

Note: Measurement Instrument Setting for Radiated Emission Measurements.

1. Frequency Range Below 1 GHz

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

2. Frequency Range > 1 GHz

Peak Measurement > 1 GHz

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

- 1. RBW = 1 MHz (unless otherwise specified).
- 2. VBW \geq 3 x RBW.
- 3. Detector = RMS (Number of points ≥ 2 x Span / RBW)
- 4. Averaging type = power (i.e., RMS).
- 5. Sweep time = auto.
- 6. Perform a trace average of at least 100 traces.
- 7. A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
- 1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.
- 2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
- 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.

<Module 0>

Test Mode	Duty Cycle (%)	T _{on} (ms)	T _{on} + T _{off} (ms)	DCF = 10 log(1/Duty) (dB)
TM 1	60.62	0.394	0.650	2.18

<Module 1>

Test Mode	Duty Cycle (%)	T _{on} (ms)	T _{on} + T _{off} (ms)	DCF = 10 log(1/Duty) (dB)
TM 1	60.62	0.394	0.650	2.18

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



3.5.3 Test Results

<Module 0>

Frequency Range : 9 kHz ~ 25 GHz

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2389.01	V	Y	PK	45.47	0.78	N/A	N/A	46.25	74.00	27.75
2388.99	V	Y	AV	35.46	0.78	2.18	N/A	38.42	54.00	15.58
4804.31	Н	Z	PK	48.31	7.63	N/A	N/A	55.94	74.00	18.06
4803.98	Н	Z	AV	39.85	7.63	2.18	N/A	49.66	54.00	4.34

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4879.35	Н	Z	PK	50.32	7.36	N/A	N/A	57.68	74.00	16.32
4879.67	Н	Z	AV	43.19	7.36	2.18	N/A	52.73	54.00	1.27

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.52	V	Y	PK	59.30	1.16	N/A	N/A	60.46	74.00	13.54
2483.55	V	Y	AV	48.47	1.16	2.18	N/A	51.81	54.00	2.19
4959.41	Н	Z	PK	49.61	7.48	N/A	N/A	57.09	74.00	16.91
4959.66	Н	Z	AV	41.58	7.48	2.18	N/A	51.24	54.00	2.76

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3 m to 1 m. In this case, the distance factor(-9.54 dB) is applied to the result. - Calculation of distance factor = 20 log(applied distance / required distance) = $20 \log(1 \text{ m} / 3 \text{ m}) = -9.54 \text{ dB}$

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

DCF = Duty Cycle Correction Factor.



<Module 1>_ANT1_ Model : SENA-DP01-19.7

Frequency Range : 9 kHz ~ 25 GHz

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2389.37	Н	Z	PK	49.54	0.78	N/A	N/A	50.32	74.00	23.68
2389.30	Н	Z	AV	39.09	0.78	2.18	N/A	42.05	54.00	11.95
4802.32	Н	Y	PK	43.72	7.63	N/A	N/A	51.35	74.00	22.65
4803.27	Н	Y	AV	33.51	7.63	2.18	N/A	43.32	54.00	10.68

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4880.41	Н	Y	PK	46.13	7.36	N/A	N/A	53.49	74.00	20.51
4879.86	Н	Y	AV	35.78	7.36	2.18	N/A	45.32	54.00	8.68

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.52	Н	Z	PK	56.83	1.16	N/A	N/A	57.99	74.00	16.01
2483.53	Н	Z	AV	46.77	1.16	2.18	N/A	50.11	54.00	3.89
4960.10	Н	Y	PK	45.94	7.48	N/A	N/A	53.42	74.00	20.58
4959.94	Н	Y	AV	35.61	7.48	2.18	N/A	45.27	54.00	8.73

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Information of Distance Factor

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

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

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG

 $\label{eq:Where, T.F = Total Factor, \quad AF = Antenna \ Factor, \quad CL = Cable \ Loss, \quad AG = Amplifier \ Gain,$

DCF = Duty Cycle Correction Factor.



<Module 1>_ANT2_ Model : SENA-DP02-19

Frequency Range : 9 kHz ~ 25 GHz

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2389.37	Н	Z	PK	46.34	0.78	N/A	N/A	47.12	74.00	26.88
2389.40	Н	Z	AV	36.62	0.78	2.18	N/A	39.58	54.00	14.42
4804.46	Н	Z	PK	44.26	7.63	N/A	N/A	51.89	74.00	22.11
4804.08	Н	Z	AV	33.89	7.63	2.18	N/A	43.70	54.00	10.30

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4879.87	Н	Z	PK	46.61	7.36	N/A	N/A	53.97	74.00	20.03
4879.88	Н	Z	AV	36.90	7.36	2.18	N/A	46.44	54.00	7.56

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.53	Н	Z	PK	57.20	1.16	N/A	N/A	58.36	74.00	15.64
2483.58	Н	Z	AV	47.54	1.16	2.18	N/A	50.88	54.00	3.12
4960.35	Н	Z	PK	46.03	7.48	N/A	N/A	53.51	74.00	20.49
4959.72	Н	Z	AV	36.02	7.48	2.18	N/A	45.68	54.00	8.32

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Information of Distance Factor

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

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

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. Sample Calculation.

 $Margin = Limit - Result \ / \ Result = Reading + T.F + D.C.F \ / \ T.F = AF + CL - AG$

 $\label{eq:Where, T.F = Total Factor, \quad AF = Antenna \ Factor, \quad CL = Cable \ Loss, \quad AG = Amplifier \ Gain,$

DCF = Duty Cycle Correction Factor.

3.6 Power line Conducted Emissions

Test Requirements and limit, §15.207 & RSS-Gen [8.8]

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies,

within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

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

* Decreases with the logarithm of the frequency

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

3.6.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

3.6.2 Test Procedures

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

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

3.6.3 Test Results

NA

3.7 Occupied Bandwidth

Test Requirements, RSS-Gen [6.6]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 % emission bandwidth, as calculated or measured.

3.7.1 Test Setup

3.7.2 Test Procedures

The 99 % power bandwidth was measured with a calibrated spectrum analyzer.

The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately $3 \times RBW$.

Spectrum analyzer plots are included on the following pages.

3.7.3 Test Results

<Module 0>

Test Mode	Tested Channel	Test Results (MHz)				
	Lowest	1.030				
TM 1	Middle	1.020				
	Highest	1.021				

<Module 1>

Test Mode	Tested Channel	Test Results (MHz)
	Lowest	1.025
TM 1	Middle	1.017
	Highest	1.019



<Module 0>

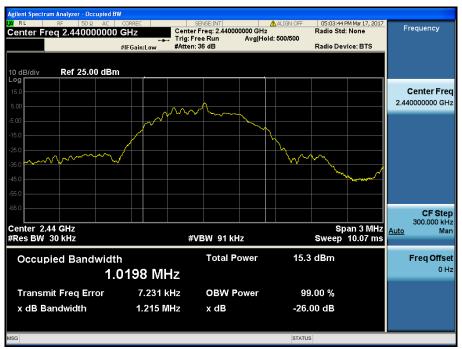
Occupied Bandwidth (99 %)

SENSE:INT ALIGN OFF Center Freq: 2.402000000 GHz Trig: Free Run Avg|Hold: 500/500 #Atten: 30 dB 05:01:33 PM Mar 17, 2017 Radio Std: None Frequency Center Freq 2.402000000 GHz Radio Device: BTS #IFGain:Low 10 dB/div Ref 25.00 dBm **Center Freq** 2.402000000 GHz $\sim \sim \sim$ mr v \sim **CF Step** 300.000 kHz Man Span 3 MHz Sweep 10.07 ms Center 2.402 GHz #Res BW 30 kHz Auto #VBW 91 kHz Total Power 11.8 dBm Freq Offset **Occupied Bandwidth** 0 Hz 1.0300 MHz 30.260 kHz **OBW Power** 99.00 % **Transmit Freq Error** 1.218 MHz x dB Bandwidth x dB -26.00 dB

Occupied Bandwidth (99 %)

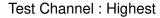
Test Channel : Middle

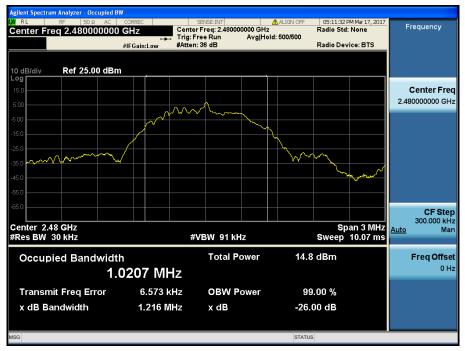
Test Channel : Lowest





Occupied Bandwidth (99 %)







<Module 1>

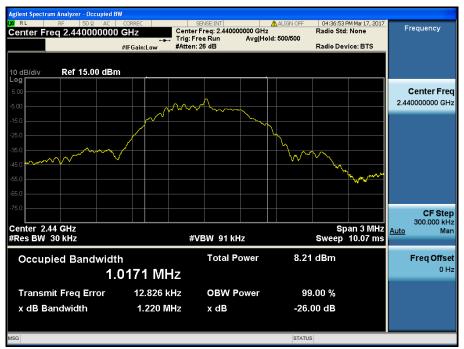
Occupied Bandwidth (99 %)

Test Channel : Lowest



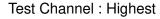
Occupied Bandwidth (99 %)

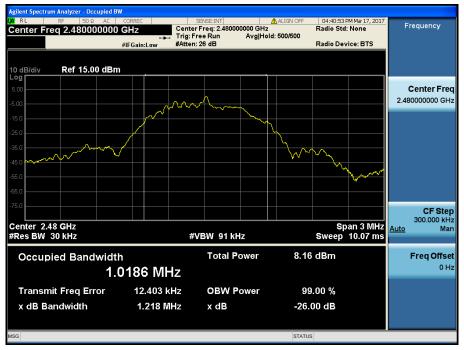
Test Channel : Middle





Occupied Bandwidth (99 %)





4. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203 & RSS-Gen [8.3]

"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."

Module 0 Model : SENA_003 The antenna type is a SMD antenna.(Refer to Internal Photo file.)

Module 1 ANT1_Model : SENA-DP01-19.7 The antenna is printed to the external PCB (Refer to Internal Photo file.)

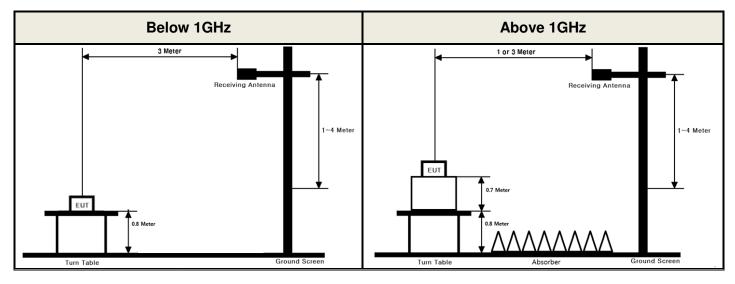
ANT2_Model : SENA-DP02-19 The antenna is printed to the external PCB (Refer to Internal Photo file.)

Therefore this E.U.T Complies with the requirement of §15.203.

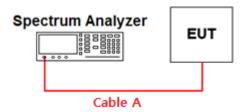
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	0.18	15	3.50
1	0.80	20	4.86
2.402 & 2.440 & 2.480	1.30	25	5.35
5	1.82	-	-
10	2.70	-	-

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)

APPENDIX II

Duty cycle plots

Test Procedure

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

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.)

<Module 0>

Duty Cycle

Swept SA ALIGN OFF Frequency Trig: Free Run Atten: 36 dB PNO: Fast IFGain:Low Auto Tune ∆Mkr3 0.03 di Ref 25.00 dBm 374 **Center Freq** X 2.44000000 GH; Start Freq 2.440000000 GHz anterioriante el fragilius pala liphnardy. Stop Freq 2.44000000 GHz Center 2.440000000 GHz Res BW 2.0 MHz Span 0 Hz Sweep 2.000 ms (1001 pts) CF Step 2.000000 MHz Man #VBW 6.0 MHz Auto 8.8 Freq Offset 8.81 c 0 Hz

Test Channel : Middle



<Module 1>

Dt&C

Duty Cycle

Test Channel : Middle

L	RF 50 Ω AC	CORREC	SENSE:INT	🛕 ALIGN OFF	04:38:10 PM Mar 17, 2017	Frequency
		PNO: Fast ↔ IFGain:Low	. Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr	TRACE 123456 TYPE WWWWWWW DET PPPPP	
) dB/div	Ref 20.00 dBm			Ĺ	∆Mkr3 650.0 µs 0.00 dB	Auto Tur
				4		Center Fre 2.440000000 GH
3.0 3.0 3.0						Start Fr 2.440000000 G
0.0 0.0 0.0	entri stalladational		Witnerwitcht	astarly	pakuvidona	Stop Fre 2.440000000 GF
enter 2.4 es BW 2.		#VBW	6.0 MHz	Sweep 2.	Span 0 Hz 000 ms (1001 pts)	CF Ste 2.000000 Mi <u>Auto</u> Mi
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	t (Δ) t t (Δ)	394.0 μs (Δ) 446.0 μs 650.0 μs (Δ) 446.0 μs	0.10 dB 1.93 dBm 0.00 dB 1.93 dBm			Freq Offs 0 I
7 8 9						
1					>	

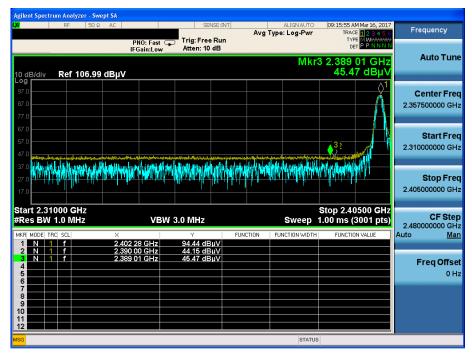


APPENDIX III

Unwanted Emissions (Radiated) Test Plot

<Module 0>

TM1 & Lowest & Y & Ver



TM1 & Lowest & Y & Ver

Detector Mode : AV

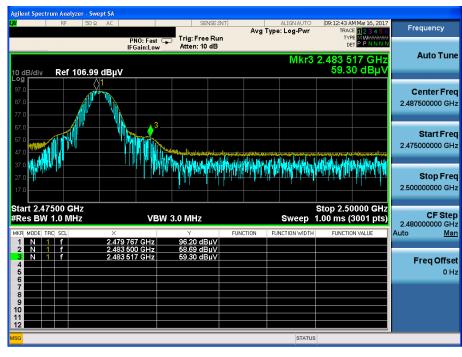
Detector Mode : PK

	RF 5	50Ω AC		SENSE		ALIGN AUTO	09:14:27 AM Mar 16, 2017	Frequency
			PNO: Fast	Trig: Free Ri	un Avgil	Type: Pwr(RMS) Hold: 200/200	TRACE 1 2 3 4 5 6 TYPE A WARAAAA	
			IFGain:Low	Atten: 10 dE	\$		DET A P N N N N	
						Mkra	3 2.388 99 GHz	Auto Tu
0 dB/div	Ref 106.	.99 dBµV					35.458 dBµV	
.og 97.0							1	
							X	Center Fi
87.0								2.357500000
77.0							H	
67.0								Start F
57.0							/ - ¥	2.310000000
47.0							32	2.0 10000000
37.0 14 4 4	للالى الالاء وأسابه	with the	din trilling	أرجرا والالافتير لرغم ومتراج	والمعاداة الفاضية الأ	A Martin Martin Mire	al Sala Hiller of a	
27.0		TING TING	an a	mandun muh		a ha ka	ovinatorii intij	Stop Fi
17.0	1		1	· · · ·				2.405000000
tart 2 31	000 GHz						Stop 2.40500 GHz	CF St
			VBV	V 3.0 MHz*		Sweep 1	.00 ms (3001 pts)	2.480000000
Res BW	1.0 MHz							2.4800000000
Res BW	RC SCL	×		Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
Res BW		2.40	1 99 GHz 0 00 GHz	91.313 dBµV	/	FUNCTION WIDTH	FUNCTION VALUE	
Res BW 1 N 1 2 N 1 3 N 1	RC SCL	2.40	1 99 GHz 0 00 GHz 8 99 GHz		/	FUNCTION WIDTH	FUNCTION VALUE	Auto <u>N</u>
Res BW	RC SCL	2.40	0 00 GHz	91.313 dBµV 34.989 dBµV	/	FUNCTION WIDTH	FUNCTION VALUE	Auto <u>N</u> Freq Off
Res BW 4KR MODE TF 1 N 1 2 N 1 3 N 1 4 5 6	RC SCL	2.40	0 00 GHz	91.313 dBµV 34.989 dBµV	/	FUNCTION WIDTH	FUNCTION VALUE	Auto <u>N</u> Freq Off
Res BW MKR MODE TF 1 N 1 2 N 1 3 N 1 4	RC SCL	2.40	0 00 GHz	91.313 dBµV 34.989 dBµV	/	FUNCTION WIDTH	FUNCTION VALUE	Auto <u>N</u> Freq Off
Res BW KR MODE TF 1 N 1 2 N 1 3 N 1 4 5 6 7 8 9	RC SCL	2.40	0 00 GHz	91.313 dBµV 34.989 dBµV	/	FUNCTION WIDTH	FUNCTION VALUE	Auto <u>N</u> Freq Off
Res BW MKR MODE TF 1 N 1 2 N 1 3 N 1 4	RC SCL	2.40	0 00 GHz	91.313 dBµV 34.989 dBµV	/	FUNCTION WIDTH	FUNCTION VALUE	

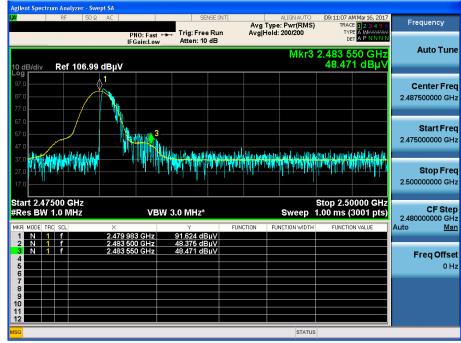


TM1 & Highest & Y & Ver

Detector Mode : PK

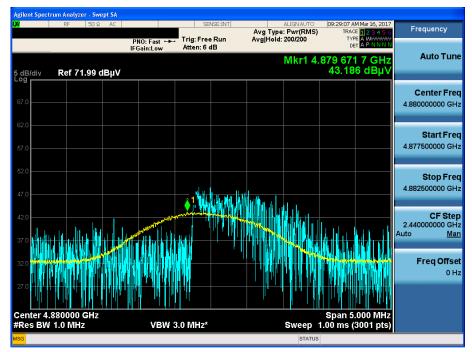


TM1 & Highest & Y & Ver





TM1 & Middle & Z & Hor



<Module 1>_ANT1_ Model : SENA-DP01-19.7

TM1 & Lowest & Z & Hor

Dt&C

Detector Mode : PK

	t Spectr		alyzer - Sv											
L <mark>XI</mark>		RF	50 :	Ω AC		S	ENSE:INT	Δνα	AL: Type: L			M Mar 16, 2017		Frequency
					PNO: Fast				iype. L	og-i wi	TY			
					IFGain:Low	Atten: 2	0 dB							Auto Tune
										Mkr		37 GHz		Auto Tune
10 dE Log	3/div	Re	f 116.9	9 dBµV			_				49.5	4 dBµV		
107														Center Freq
97.0												$ \rangle$	23	57500000 GHz
87.0												<u> </u>	2.0	0700000000112
77.0														
67.0														Start Freq
57.0											3		2.3	10000000 GHz
47.0	مسطليات	لعرب		a survey and a standard	and the second second second	antice here and a company				athearmore	and a second	- All and a second		
37.0	NAL UNIT	n alle	and the second state	durbels a	. Handa a that h	with asheath have		Anterit	with the state	de Alder de La	A A MINI WAY	Luk M		Stop Freq
27.0	NL.	ΜĮ	1.		AL MANA A	a dhuadh Li	n na hann	17077	'W 14		an i Mali I I		2/	105000000 GHz
27.0				4 (- · [·										
Star	t 2.31	000	GHz	_							Stop 2.4	0500 GHz		
#Re:	s BW	1.0	MHz		VB	W 3.0 MHz			S	weep	1.00 ms (3001 pts)	2/	CF Step 02000000 GHz
MKB 1	MODE TR	c sci		×		Y	F	UNCTION	FUNCT	ION WIDTH	FUNCTIO	ON VALUE	Auto	
1	N 1	f			2 28 GHz 0 00 GHz	93.85 d 48.17 d								
3	N 1	f			9 37 GHz	49.54 d	BuV							Freq Offset
4														0 Hz
6														0112
7														
9 10														
11														
12														
MSG										STATUS				

Detector Mode : AV

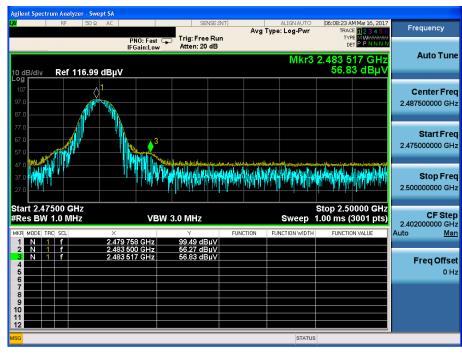
TM1 & Lowest & Z & Hor

u l	RF 50 :	Ω AC		SENS	EINT	ALIGN AUTO	06:13:04 AM Mar 16, 2017	-
		D	NO: Fast ↔	Trig: Free F		g Type: Pwr(RMS) alHold: 200/200	TRACE 1 2 3 4 5 6 TYPE A WWWWW	Frequency
			Gain:Low	Atten: 20 d	В		DET A P N N N N	
						Mkr	3 2.389 30 GHz	Auto Tu
0 dB/div	Ref 116.9	9 dBµV					39.088 dBµV	
-og 107								O antes Es
97.0							۸1	Center Fr 2.357500000 G
87.0							<u>X</u>	2.357500000 G
77.0								Start Fr
67.0								2.310000000 G
57.0							N	
47.0	h and a diation		to all an all	. It is low day	dullation and	lick (dialaction), addressio		
								Stop Fr
27.0	lines to a t	di ka ada	1.1.1.1	The set of the	ar de te labi	նին է անհերհե	also als had i	2.405000000 G
Start 2.3100 Res BW 1.			VBM	3.0 MHz*		Sweep	Stop 2.40500 GHz I.00 ms (3001 pts)	CF St
			A DAA				,	2.402000000 G
MKR MODE TRC	SCL	× 2.402.0	2 6 4 7	ү 90.324 dBu	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto <u>M</u>
2 N 1	f	2.390 0	0 GHz	38.582 dBµ	V			
3 N 1 4	f	2.389 3	IO GHz	39.088 dBµ	V			Freq Offs
5								0
6								
8								
9								
9								

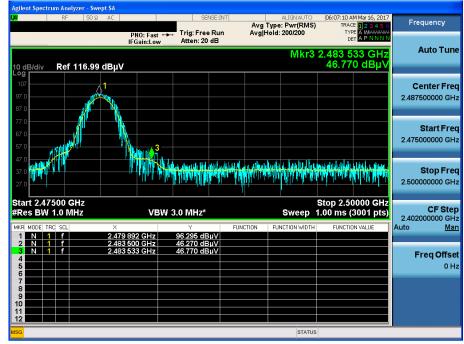


TM1 & Highest & Z & Hor

Detector Mode : PK

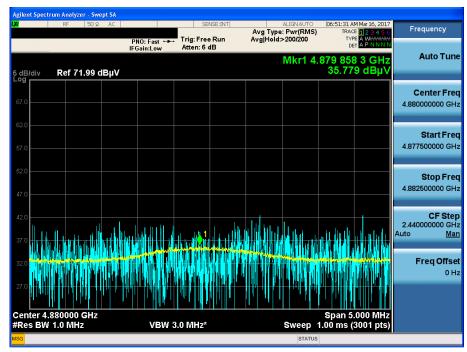


TM1 & Highest & Z & Hor





TM1 & Middle & Y & Hor



Detector Mode : PK

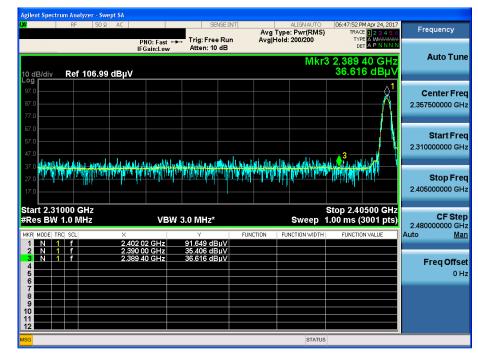
<Module 1>_ANT2_ Model : SENA-DP02-19

TM1 & Lowest & Z & Hor

🛈 Dt&C

lent Spectr		lyzer - Swe										
	RF	50 Ω	AC F	PNO: Fast 🕞 Gain:Low	Tain France		Avg	ALIGN AUTO Type: Log-Pwr	TRA	PM Apr 24, 2017 CE 123456 PE MW 44444 PE MW 44444 PE P P N N N N	Frequer	icy
dB/div	Ref	106.99	dBµV					Mkı		37 GHz 34 dBµ∨	Auto	Tune
										Â	Cente 2.3575000	
	برزم الإحسام د	mananala	aline diallatiin. aaila	allera dage terraria angliga	ato formation of the participation of the	Juptornup			3 :		Star 2.3100000	t Freq 00 GHz
	(AN) ANIA	ANA AND		ल्याय संचय व्यक्त			ing play	AND AN AN AN AN AN			Stoj 2.4050000	o Freq 00 GHz
nt 2.31 es BW	1.0 M		×	VBW	3.0 MHz		INCTION	Sweep	1.00 ms	0500 GHz (3001 pts)	CF 2.4800000 Auto	5 Step 00 GHz Man
N 1 N 1 N 1	f f f		2.402	28 GHz 00 GHz 37 GHz	94.87 dBj 44.87 dBj 46.34 dBj	IV .	NCTON	TONCTON WIDT				Offset 0 Hz
								STATU	s			

TM1 & Lowest & Z & Hor



TM1 & Highest & Z & Hor

Detector Mode : PK

RF 50 Ω	AC	SENSE:I		ALIGNAUTO		M Apr 24, 2017	Frequency
	PNO: Fast IFGain:Low	Trig: Free Rui		e. Logi wi	TYP	23456 Pe mw wwww et P P N N N N	
B/div Ref 116.99				Mkr3	2.483 5 57.2	25 GHz 0 dBµV	Auto Tun
							Center Fre 2.487500000 GH
	3	likeling and an interval and a second se					Start Free 2.475000000 GH:
	¹ hhnijyyy	NUM DEPARTMENT	hiller haldeskiller hal	Mud Mandah	h an	many Mark	Stop Free 2.500000000 GH:
t 2.47500 GHz s BW 1.0 MHz	VB	W 3.0 MHz		Sweep	1.00 ms (0000 GHz 3001 pts)	CF Step 2.480000000 GH:
NODE TRC SCL	× 2.479 758 GHz	γ 99.09 dBμV	FUNCTION FI	UNCTION WIDTH	FUNCTIO	ON VALUE	Auto <u>Mar</u>
N 1 f N 1 f	2.483 500 GHz 2.483 525 GHz	56.59 dBµV 57.20 dBµV					Freq Offse 0 H
				STATUS			

TM1 & Highest & Z & Hor

Frequency Avg Type: Pwr(RMS) Avg|Hold: 200/200 PNO: Fast +++ Trig: Free Run IFGain:Low Atten: 20 dB A White A P N N Auto Tune Mkr3 2.483 575 GHz 47.539 dBµ\ Ref 116.99 dBµV 0 dB/div **Center Freq** 2.487500000 GHz Start Freq 2.475000000 GHz **3** newer her mentioner and an internet and and a second and a second field and a second second and a second second Stop Freq 2.50000000 GHz Start 2.47500 GHz #Res BW 1.0 MHz Stop 2.50000 GHz 1.00 ms (3001 pts) **CF Step** 2.480000000 GHz Suto <u>Man</u> VBW 3.0 MHz* Sweep 47.790 dBµ\ 47.539 dBµ\ 2.483 575 GHz Freq Offset 0 Hz STATUS



TM1 & Middle & Z & Hor

