



Project No.: TM-2312000427P Report No.: TMTN2312001599NR IC: 1752B-LP70XBT

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INDUSTRY CANADA RSS-247 TEST REPORT

For

AUTOMATIC WIRELESS TURNTABLE

Model: AT-LP70XBT

Brand Name: audio-technica

Issued for

Audio-Technica Corporation 2-46-1 Nishi-naruse, Machida, Tokyo 194-8666, JAPAN

Issued by

Compliance Certification Services Inc.

Tainan Lab. No. 168, Ln. 523, Sec. 3, Zhongzheng Rd., Rende Dist., Tainan City, 717017, Taiwan Issued Date: March 07, 2024

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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	February 19, 2024	Initial Issue	All Page	Gina Lin
01	March 07, 2024	See the following note rev.01	All Page	Gina Lin

Note:

Rev.00 Issue Date: February 19, 2024 Original report.

Rev.01 Issue Date: March 07, 2024 Update applicable standard.



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1. TEST REPORT CERTIFICATION

Applicant	:	Audio-Technica Corporation 2-46-1 Nishi-naruse, Machida, Tokyo 194-8666, JAPAN
Manufacturer	:	Audio-Technica Corporation 2-46-1 Nishi-naruse, Machida, Tokyo 194-8666, JAPAN
Equipment Under Test	:	AUTOMATIC WIRELESS TURNTABLE
Model Number	:	AT-LP70XBT
Data Applies To	:	N/A
Brand Name	:	audio-technica
Date of Test	:	December 27, 2023 ~ January 10, 2024

APPLICABLE STANDARD			
Standard	Test Result		
IC RSS-247 Issue 3: 2023	PASS		

Statements of Conformity

Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

John Chan

John Chen Supervisor



2. TEST RESULT SUMMARY

IC Standard Section	Report Section	Test Item	Result
-	3	ANTENNA REQUIREMENT	Pass
RSS-247(5.1)(A)	8.1	20dB BANDWIDTH	Pass
RSS-GEN 6.7	8.2	99% BANDWIDTH	Pass
RSS-247(5.4)(B)	8.3	MAXIMUM PEAK OUTPUT POWER	Pass
RSS-247(5.1)(B)	8.4	HOPPING CHANNEL SEPARATION	Pass
RSS-247(5.4)(B)	8.5	NUMBER OF HOPPING FREQUENCY USED	Pass
RSS-247(5.1)(D)	8.6	DWELL TIME	Pass
-	8.7	DUTY CYCLE	-
RSS-247(5.5)	8.8	CONDUCTED SPURIOUS EMISSION	Pass
RSS-GEN 8.10	8.9	RADIATED EMISSIONS	Pass
RSS-GEN 8.9	8.10	CONDUCTED EMISSION	Pass



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3. EUT DESCRIPTION

3.1 DESCRIPTION OF EUT & POWER

Product Name	AUTOMATIC WIRELESS TURNTABLE	
Model Number	AT-LP70XBT	
Model Different	N/A	
Brand Name	audio-technica	
Received Date	December 25, 2023	
Reported Date	January 24, 2024	
Operating Frequency	2402MHz ~ 2480MHz	
Tronomit Deals Desser	GFSK : 1.122dBm / 1.29mW	
Transmit Peak Power	8DPSK: 1.002dBm / 1.26mW	
Channel Spacing	1MHz	
	GFSK Mode:1 Mbps	
Transmit Data Rate	4/πDQPSK Mode : 2Mbps	
	8DPSK Mode : 3Mbps	
Modulation Technique	GFSK、π/4DQPSK、8DPSK	
Number of Channels	79 Channels	
Power Supply	AC 100-240V	
	Manufacturer: Sunitec	
Antonna Typo	Type: Layout Antenna	
Antenna Type	Model: AT-LP70XBT	
	Gain: 3.33 dBi	
Firmware Version	V1.0	
Software Version	V1.0	

Power Adapter :

Manufacturer	Model No.	Power Input	Power Output
SHENZHEN FUJIA APPLIANCE CO.,LTD	FJ-SW1261200500DN	100-240V~ 50/60Hz 0.4A Max	12Vdc 0.5A 6.0W

Remark:

- 1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
- 2. For more details, please refer to the User's manual of the EUT.



4. DESCRIPTION OF TEST MODES

The EUT (ST) had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2402
Middle	2441
High	2480

Radiated Emission Test (Below 1 GHz):

- ☑ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Example Selected for the final test as listed below.

Normal Linking

Radiated Emission Test (Above 1 GHz):

- ☑ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Example Selected for the final test as listed below.

Tested Channel	Modulation Technology	Modulation Type	Packet Type
Low, Mid, High	FHSS	GFSK	DH5
Low, Mid, High	FHSS	8-DPSK	3-DH5

Bandedge Measurement :

- ☑ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Example Selected for the final test as listed below.

Tested Channel	Modulation Technology	Modulation Type	Packet Type
Low, Mid, High	FHSS	GFSK	DH5
Low, Mid, High	FHSS	8-DPSK	3-DH5



Antenna Port Conducted Measurement :

- ☑ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Example Selected for the final test as listed below.

Tested Channel	Modulation Technology	Modulation Type	Packet Type
Low, Mid, High	FHSS	GFSK	DH5
Low, Mid, High	FHSS	8-DPSK	3-DH5

5. TEST METHODOLOGY

The tests documented in this report were performed in accordance with IC RSS-247 Issue 3 (August 2023), IC RSS-Gen Issue 5 (March 2019), ANSI C63.10: 2013. This submittal(s) (test report) is intended for IC Certification No: **1752B-LP70XBT** filing to comply with Industry CANADA RSS247.



6. FACILITIES AND ACCREDITATION

6.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.8, Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

No. 168, Ln. 523, Sec. 3, Zhongzheng Rd., Rende Dist., Tainan City 717, Taiwan

CAB Identifier: TW1109

The sites are constructed in conformance with the requirements of ANSI C63.10:2013 and CISPR 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4, CISPR 16-1-5.

6.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Taiwan	TAF
Taiwan	IAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada (ISED#: 2324H)
Germany	TUV NORD
Taiwan	BSMI
USA	FCC



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The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Radiated Emission, 9kHz~30MHz Test Site : CB1166	±2.7dB
Radiated Emission, 30 MHz ~1GHz Test Site : CB1166	±3.76dB
Radiated Emission, 1GHz ~18GHz Test Site : CB1166	±4.43dB
Radiated Emission, 18GH~26.5GHz Test Site : CB1166	±4.79dB
Radiated Emission, 26.5GH~40GHz Test Site : CB1166	±4.72dB
Power Line Conducted Emission, 9kHz~30MHz	±1.83dB
Band Width	0.025%
Peak Output Power MU	±1.9dB
Band Edge MU	±0.264dBuV
Channel Separation MU	±361.69Hz
Duty Cycle MU	±0.2%
Frequency Stability MU	±0.493Hz
Temperature	±0.5
Humidity	±3%

This measurement uncertainty is confidence of approximately 95%, k=2



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Chamber 1166 Room (Radiation Test)								
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due			
Active Loop Antenna	ETS-LINDREN	6502	8905-2356	09/04/2023	09/03/2024			
Attenuator	MCL	BW-S15W5	0535	01/19/2023	01/18/2024			
Bilog Antenna with 6dB Attenuator	SUNOL SCIENCES & JB1 & N-6-06 EMCI		A021306 & 10/03/2023 AT-N0682		10/02/2024			
Cable	EMCI	EM102-KMKM	CB1166-01	06/17/2023	06/16/2024			
Double Ridged Guide Horn Antenna	ETS-LINDGREN	3116	00078900	03/25/2023	03/24/2024			
EMI Test Receiver	R&S	ESCI	101203	10/16/2023	10/15/2024			
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/25/2023	07/24/2024			
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-788(98006)	04/18/2023	04/17/2024			
Notch Filter	MICRO-TRONICS	BRM50702-01	018	01/19/2023	01/18/2024			
Pre-Amplifier	EMCI	EMC012645	980098	01/19/2023	01/18/2024			
Pre-Amplifier	Com-Power	PAM-840A	461378	06/07/2023	06/06/2024			
Software		Excel(ccs-	-o6-2020 v1.1),e3(v	(6.101222)				

For §8.1~8.8

Chamber 1166 Room (Conducted Test)									
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due				
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	07/25/2023	07/24/2024				
SMA Cable+10dB Attenuator	CCS	SMA+10dB ATT	SMA/10dB	01/19/2023	01/18/2024				
Software	Excel(ccs-o6-2020 v1.1)								

For §8.10

Conducted Emission room #1							
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due		
BNC Coaxial Cable	CCS	BNC50	11	01/19/2023	01/18/2024		
EMI Test Receiver	R&S	ESCS 30	100348	12/05/2023	12/04/2024		
LISN	R&S	ENV216	101495	07/12/2023	07/11/2024		
LISN	SCHWARZBECK	NNLK8130	8130124	01/18/2023	01/17/2024		
Pulse Limiter	SCHWARZBECK	VTSD 9561-F	797	01/19/2023	01/18/2024		
Test S/W			e3(v6.101222)				



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7. SETUP OF EQUIPMENT UNDER TEST 7.1 SETUP CONFIGURATION OF EUT

EMI



RF





7.2 SUPPORT EQUIPMENT

For EMI test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable			
1	Speaker System	infotec	SP-102	DOC	N/A			
2	Wireless Speaker	PHILIPS	TAS1505	DOC	N/A			
No.	b. Signal cable description							
А	DC Power Cable	ver Cable Unshielded, 1.5m 1 pcs. with 1 core.						
В	Audio Cable	Shielded, 1.0m 1 pcs.						

For RF test

No.	Product	Manufacturer	Model No.	Certify No.	Power cable			
1	Note Book	Acer	Z5WE1	N/A	Unshielded, 1.8m with 1 core.			
No.	Signal cable description							
А	DC Power	Unshielded, 1.5m 1 pcs. with 1 core.						
В	Audio	Shielded, 1.0	Shielded, 1.0m 1 pcs.					
С	Micro USB	Shielded, 2.0	Shielded, 2.0m 1 pcs. with 1 core.					

Note:

1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3) shd. = shielded; unshd. = unshielded



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1. Set up all computers like the setup diagram.

- 2. The "Blue Test 3 V3.3.9.1137" software was used for testing
- 3. Choose Transport "DEBUG" and Device "USB DBG(100)"

BT1.0 \ 3.0

TX Mode:

```
PACKET TX
    Channel 1~5: 0,39,78
    GFSK(DH1):
    Packet Type:DH1 > Packet Length 27
   Power(0-9): 6
    GFSK(DH3):
   Packet Type:DH3 > Packet Length 183
   Power(0-9):6
    GFSK(DH5):
   Packet Type:DH5 > Packet Length 339
    Power(0-9): 6
   8-DPSK(3DH1):
    Packet Type:3DH1 > Packet Length 83
   Power(0-9): 6
   8-DPSK(3DH3):
    Packet Type:3DH3 > Packet Length 552
   Power(0-9):6
    8-DPSK(3DH5):
    Packet Type:3DH5 > Packet Length 1021
    Power(0-9): 6
RX Mode:
    PACKET RX
```



BT4.0 \$ 5.0

TX Mode:

BLE TEST TX Channel > 0,20,39 (0-39) Length > 37 Bit pattern > Pseudo-rdm 9 PHY > 1M (2M)

RX Mode:

BLE TEST RX Channel > 0 (0-39) PHY > 1M (2M)

- 4. All of the function are under run.
- 5. Start test.

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8. IC RSS-247 REQUIREMENTS 8.1 20dB BANDWIDTH FOR HOPPING

LIMITS

Limit : N/A

TEST SETUP



TEST PROCEDURE

The 20dB bandwidth was measured with a spectrum analyzer connected to RF antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer N dB Points function, the 20dB bandwidth of the emission was determined.



TEST RESULTS

Model Name	AT-LP70XBT	Test By	Peter Chu
Temp & Humidity	22.5°C, 45%	Test Date	2023/12/27

Modulation Type: GFSK / DH5

Channel	Channel Frequency (MHz)	20dB Bandwidth (kHz)	Two-third of 20dB Bandwidth (MHz)
Low	2402	1121.00	0.75
Middle	2441	1120.00	0.75
High	2480	1119.00	0.75

Modulation Type: 8-DPSK / 3-DH5

Channel	Channel Frequency (MHz)	Channel Frequency (MHz) 20dB Bandwidth (kHz)	
Low	2402	1399.00	0.93
Middle	2441	1396.00	0.93
High	2480	1396.00	0.93



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20dB BANDWIDTH

CH Low / GFSK											
颠 Keysig	ht Spect	rum Analyzer -	Swept SA								
una ⊺ Cente	er Fre	RF 50 50	000000 GH	Hz	SEI	NSE:INT	#Avg Typ Avg Hold	ALIGN AUTO e: RMS :>10/10	12:00:47 AM TRAC TYP	I Jan 03, 2024 E 1 2 3 4 5 6 E M WM WWW	Frequency
		Ref Offset	IF	Gain:Low	#Atten: 2	0 dB		Mkr1	2.402 1	60 GHz	Auto Tune
10 dB/d	liv	Ref 21.40) dBm		1				0.80	з авт	
11.4 —											Center Freq
1.40						♦ ¹					
9.60						\square					Start Freq 2.399500000 GHz
-0.00							-20.00	dB			
-18.6				7			1.121	MHz			Stop Freq 2.404500000 GHz
-28.6											
-38.6 —			- I want	\sim				m			2.402000000 GHz Auto Man
-48.6		John Anna	NN SAND					- North	A WWWWWWWWW	Mannah a	
-58.6	Wrv '	' 								. 1 1004	Freq Offset 0 Hz
-68.6											
Center	r 2.40)2000 GH	z						Span 5	000 MHz	
#Res E	BW 1	00 kHz		#VBW	/ 300 kHz			Sweep 1	.000 ms (1001 pts)	
MSG								STATUS	5		
					CH N	liddle	e / GF	SK			
顚 Keysig	ht Spect	rum Analyzer -	Swept SA								- 5 💌
Cente	er Fre	RF 50	000000 GH	− − − − − − − −	Trig: Free	e Run	#Avg Typ Avg Hold	ALIGN AUTO e: RMS :>10/10	12:00:07 AM TRAC TYP	I Jan 03, 2024 E 1 2 3 4 5 6 E M WM WWW	Frequency
10 dB(d	41	Ref Offset	⊪ 11.4 dB	Gain:Low	#Atten: 2	0 dB		Mkr1	2.441 1	60 GHz 42 dBm	Auto Tune
	IIV	Kei 21.40									
11.4 —											Center Freq 2.441000000 GHz
1.40 —					~	≜ ¹					
-8.60 —											Start Freq 2.438500000 GHz
19.6							-20.00	dB			
-10.0				7			1.120	MHz			Stop Freq 2.443500000 GHz
-20.6											CE Sten
-38.6			- northand					www.			2.402000000 GHz Auto <u>Man</u>
-48.6 -58.6	4ngy	yaho wan	aller a constrained and a co						a good years	V ^a -Mr Wayon	Freq Offset 0 Hz
-68.6		_									
	- 2.44	1000 01	-						Onon F	000 541-	
#Res E	1 2.44 BW 1	00 kHz	2	#VBW	/ 300 kHz			Sweep 1	span 5. .000 ms (1001 MHZ 1001 pts)	
MSG								STATUS	6		



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CH Low / 8-DPSK Center Freq 2.40200000 GHz
PN0: Wide C
IFGain:Low
Trig: Free Run
#Atten: 20 dB 11:57:14 PM Jan 02, 2024 TRACE 1 2 3 4 5 6 TYPE M WHWWW DET P P A N N N #Avg Type: RMS Avg|Hold:>10/10 Frequency Mkr1 2.402 160 GHz -2.213 dBm Auto Tune Ref Offset 11.4 dB Ref 21.40 dBm 10 dB/div Center Freq 2.402000000 GHz 1.4 ê Start Freq 2.399500000 GHz 8.60 18.6 -20.00 dB Stop Freq 1.399 MHz 2.404500000 GHz 28 CF Step 2.40200000 GHz 38. Auto Man 48.6 man have مم ا wwwww Freq Offset -58.6 0 Hz 68 Span 5.000 MHz Sweep 1.000 ms (1001 pts) Center 2.402000 GHz #Res BW 100 kHz #VBW 300 kHz STATUS CH Middle / 8-DPSK 11:57:57 PM Jan 02, 2024 TRACE 1 2 3 4 5 6 TYPE M WWW DET P P A N N N Center Freq 2.441000000 GHz PNO: Wide IFGain:Low #Atten: 20 dB #Avg Type: RMS Avg|Hold:>10/10 Frequency Mkr1 2.441 165 GHz -1.999 dBm Auto Tune Ref Offset 11.4 dB Ref 21.40 dBm 10 dB/div Center Frea 11 2.441000000 GHz 1.4 Start Freq 2.438500000 GHz 8.60 18.6 -20.00 dB Stop Freq 1.396 MHz 2.443500000 GHz 28. **CF Step** 2.40200000 GHz 38. Auto Man 48. www.www.www. mah Freq Offset -58.6 0 Hz 68 Center 2.441000 GHz Span 5.000 MHz Sweep 1.000 ms (1001 pts) #Res BW 100 kHz #VBW 300 kHz STATUS



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8.2 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST SETUP



TEST PROCEDURE

- 1. The spectrum shall be set as follows :
 - Span : The minimum span to fully display the emission and approximately 20dB below peak level.

RBW : The set to 1% to 3% of the selected span.

VBW: The video bandwidth shall be set to 3 times the resolution bandwidth.

Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

- 2. Compute the combined power of all signal responses contained in the trace by covering all the data points.
- 3. For 99% occupied BW, place the markers at the frequency at which 0.5% of the power lies to the right of the right marker and 0.5% of the power lies to the left of the left marker.
- 4. The 99% BW is the bandwidth between the right and left markers.



TEST RESULTS

Model Name	AT-LP70XBT	Test By	Peter Chu
Temp & Humidity	22.5°C, 45%	Test Date	2023/12/27

Modulation Type: GFSK / DH5

Channel	Channel Frequency (MHz)	99% Occupied Power Bandwidth (kHz)
Low	2402	874.81
Middle	2441	874.76
High	2480	871.20

Modulation Type: 8-DPSK / 3DH5

Channel	Channel Frequency (MHz)	99% Occupied Power Bandwidth (kHz)			
Low	2402	1187.80			
Middle	2441	1186.10			
High	2480	1188.10			



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99% BANDWIDTH

CH Low (GFSK) Keysight Spectrum Analyzer - Occupied BV ALIGN AUTO 11:21:05 PM Jan 02, 2024 Radio Std: None
 sense:INT]
 ALIGN AU

 Center Freq: 2.402000000 GHz
 Trig: Free Run

 Avg|Hold:>10/10
 #Atten: 20 dB
 Trace/Detector Center Freq 2.402000000 GHz Ţ Radio Device: BTS #IFGain:Low Ref 25.00 dBm 10 dB/div **Clear Write** 5.0 5.0 15. Average 25 Max Hold 85 Span 3 MHz Sweep 10.07 ms Center 2.402 GHz #Res BW 30 kHz #VBW 100 kHz Min Hold 7.78 dBm **Occupied Bandwidth Total Power** 874.81 kHz Detector Sample -6.579 kHz Man Transmit Freq Error **OBW Power** 99.00 % Auto x dB Bandwidth 1.142 MHz x dB -26.00 dB STATUS CH Middle (GFSK) 📕 Keysight Spectrum Analyzer - Occupied BW 11:23:57 PM Jan 02, 2024 Radio Std: None ALIGN AUTO
 sense:INT]
 ALIGN AU

 Center Freq: 2.441000000 GHz
 Trig: Free Run

 Avg|Hold:>10/10
 #Atten: 20 dB
 Trace/Detector Center Freq 2.441000000 GHz Radio Device: BTS #IFGain:Low Ref 25.00 dBm 10 dB/div Clear Write 5 M 15 Average 25. 25 Max Hold han the Span 3 MHz Sweep 10.07 ms Center 2.441 GHz #Res BW 30 kHz #VBW 100 kHz Min Hold **Occupied Bandwidth Total Power** 8.01 dBm 874.76 kHz Detector Sample -7.195 kHz 99.00 % Man **Transmit Freq Error OBW Power** Auto x dB Bandwidth 1.141 MHz x dB -26.00 dB STATUS



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	CHL	_ow (8-DP	SK)		
Keysight Spectrum Analyzer - Occupied BW					- 6 -
UXI T RF 50 Ω DC		SENSE:INT	ALIGN AUTO 11:30:22 P	M Jan 02, 2024	Trace/Detector
Center Freq 2.402000000 G	Hz Cente	r Freq: 2.402000000 GHz Free Run AvalHolo	d:>10/10 Radio Std	None	Theorem
#II	Gain:Low #Atter	n: 20 dB	Radio Dev	ice: BTS	
10 dB/div Ref 25.00 dBm					
Log					
5.00					Clear Write
5.00					
-5.00	~ month	month and			
-15.0			1		Average
-25.0					Average
-35.0					
45.0			- Longonom		
-55.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Max Hold
-65.0					
Center 2 402 GHz			Sn	an 3 MHz	
#Res BW 30 kHz	#	VBW 100 kHz	Sweep	10.07 ms	Min Hold
			· · · · ·		WIIITHOID
Occupied Bandwidth		Total Power	4.83 dBm		
1.18	878 MHz				Detector
					Sample►
Transmit Freq Error	-3.516 kHz	OBW Power	99.00 %		Auto <u>Man</u>
x dB Bandwidth	1.363 MHz	x dB	-26.00 dB		
Merc			2117472		
DOW			514105		
	CH M	iddle (8-DI	PSK)		
Keysight Spectrum Analyzer - Occupied BW T	CH M	iddle (8-Df	PSK)	M Jan 02, 2024	
∭ Кеузіght Spectrum Analyzer - Оссиріеd ВW IX т RF 50 Ω ОС Center Freq 2.441000000 G	CH M	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std	M Jan 02, 2024 : None	Trace/Detector
Keysight Spectrum Analyzer - Occupied BW T	CH M	iddle (8-DI SENSE:INT] r Freq: 2.441000000 GHz rree Run AvgiHolo : 20 dB	ALIGN AUTO 111:28:46 P Radio Std Radio Dev	MJan 02, 2024 : None ice: BTS	Trace/Detector
If Keysight Spectrum Analyzer - Occupied BW If T RF 50 Ω DC Center Freq 2.441000000 G # #	CH M Hz Gain:Low	iddle (8-DF SENSE:INT] r Freq: 2.441000000 GHz ree Run Avg Holo 1: 20 dB	ALIGN AUTO 11:28:46 P Radio Std Radio Dev	MJan 02, 2024 : None ice: BTS	Trace/Detector
Keysight Spectrum Analyzer - Occupied BW T RF 50.0 DC Center Freq 2.441000000 Gi ##	Hz Gain:Low	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std d:>10/10 Radio Dev	MJan 02, 2024 None ice: BTS	Trace/Detector
Keysight Spectrum Analyzer - Occupied BW T	CH M Hz Cente Fain:Low #Atter	iddle (8-DF SENSE:INT Freq: 2.441000000 GHz Freq: 2.441000000 GHz Y 20 dB	ALIGN AUTO 11:28:46 P Radio Std Radio Dev	M Jan 02, 2024 None ice: BTS	Trace/Detector
Image: Keysight Spectrum Analyzer - Occupied BW T RF 50.0 DC Center Freq 2.441000000 Gi #II #II 10 dB/div Ref 25.00 dBm Log 15.0	CH M Hz Cente ² Gain:Low #Atter	iddle (8-DI SENSE:INT) Freq: 2.441000000 GHz Freq: 0.441000000 GHz Avg Hold	ALIGN AUTO 11:28:46 P Radio Std Radio Dev	M Jan 02, 2024 None ice: BTS	Trace/Detector
Keysight Spectrum Analyzer - Occupied BW W T RF 50.0 DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm 15.0 5.00 15.0	CH M Hz Cente Gain:Low #Atter	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std d:>10/10 Radio Dev	M Jan 02, 2024 None ice: BTS	Trace/Detector Clear Write
Keysight Spectrum Analyzer - Occupied BW Image: Center Freq 2.441000000 G Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm 15.0 5.00	CH M Hz Gain:Low	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std d:>10/10 Radio Dev	MJan 02, 2024 None ice: BTS	Trace/Detector
Keysight Spectrum Analyzer - Occupied BW M T RF 50.0 DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm 5.00 6.00 6.00 -15.0 9 9	CH M	iddle (8-DF	ALIGN AUTO [11:28:46 P Radio Std d:>10/10 Radio Dev	MJan 02, 2024 None ice: BTS	Trace/Detector
Image: Keysight Spectrum Analyzer - Occupied BW T RF S0 0 DC Center Freq 2.441000000 G Center Freq 2.44100000 G #II 10 dB/div Ref 25.00 dBm 5.00 5.00 5.00 5.00 5.00 5.00 5.00 5.00 5.00 5.00 5.00 5.00	CH M Hz Cente Trig: I Gain:Low #Atter	iddle (8-DF	ALIGN AUTO [11:28:46 P Radio Std d:>10/10 Radio Dev	M Jan 02, 2024 None ice: BTS	Trace/Detector Clear Write
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Image: Keysight Spectrum Analyzer - Occupied BW RF 50 Ω DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm 15.0 - 5.00 - 5.00 - 5.00 - 6.00 - 75.0 - 75.0 - 75.0 -	CH M	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std d:>10/10 Radio Dev	MJan 02, 2024 Nore ice: BTS	Clear Write
Keysight Spectrum Analyzer - Occupied BW X NF S0.0 DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm 15.0	CH M Hz Cente Gain:Low #Atter	iddle (8-DI	ALIGN AUTO 11:28:46 P Radio Std a:>10/10 Radio Dev	MJan 02, 2024 None ice: BTS	Clear Write
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Keysight Spectrum Analyzer - Occupied BW Center Freq 2.441000000 G Image: Content Freq 2.4410000000 G Image: Content Freq 2.44100000000000000000000000000000000000	CH M	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std d:>10/10 Radio Dev	M Jan 02, 2024 None ice: BTS	Clear Write Average Max Hold
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Image: Keysight Spectrum Analyzer - Occupied BW T RF 50.0 DC Center Freq 2.441000000 G #II #II III III 10 dB/div Ref 25.00 dBm	CH M Hz Cente Gain:Low Trig: I #Atter	iddle (8-DF	ALIGN AUTO [11:28:46 P Radio Std d:>10/10 Radio Dev	M Jan 02, 2024 None ice: BTS	Clear Write Average Max Hold Min Hold
Keysight Spectrum Analyzer - Occupied BW M T RF S0.0 DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm #II 500 #II #III 600 #III #III #III 500 #III #IIII #IIIII 600 #IIIIIII #IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	CH M	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std d:>10/10 Radio Dev	MJan 02, 2024 None ice: BTS	Clear Write Average Max Hold Min Hold
Image: Spectrum Analyzer - Occupied BW Image: Spectrum Analyzer - Occupied BW Image: Spectrum Analyzer - Occupied BW Image: Spectrum Analyzer - Occupied Bandwidth	CH M	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std radio Dev	۲ אוש 10, 2024 None ice: BTS	Clear Write Average Max Hold Min Hold
Keysight Spectrum Analyzer - Occupied BW X T RF S0.0 DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm #II 15.0	CH M	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std a:>10/10 Radio Dev Addio Dev Stationary Sp Sweep 5.41 dBm	MJan 02, 2024 Nore ice: BTS	Clear Write Clear Write Max Hold Min Hold Detector
Keysight Spectrum Analyzer - Occupied BW Center Freq 2.441000000 G Image: Context Gradient Context Cont	CH M Hz Cente Gain:Low Trig: I #Atter #Atter # B61 MHz	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std a:>10/10 Radio Dev Radio Dev Sweep 5.41 dBm	MJan 02, 2024 None ice: BTS	Clear Write Clear Write Average Max Hold Min Hold Detector Sample* Auto
Keysight Spectrum Analyzer - Occupied BW M T Is	CH M Hz Cente Gain:Low Trig: I #Atter Gain:Low # Atter 7 861 MHz -2.933 kHz	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std d:>10/10 Radio Dev Radio Dev Sweep 5.41 dBm 99.00 %	MJan 02, 2024 None ice: BTS	Trace/Detector Clear Write Average Max Hold Min Hold Detector Sample ► Auto Man
Keysight Spectrum Analyzer - Occupied BW M T RF 50.0 DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm	CH M Hz Cente Trig: 1 Gain:Low #Atter # #Atter #Atter #Atter #Atter #Atter #Atter #Atter #Atter #Atter #Atter #Atter	iddle (8-DF	2SK)	Mian 02, 2024 None ice: BTS	Clear Write Clear Write Average Max Hold Min Hold Detector Sample ► Auto Man
Keysight Spectrum Analyzer - Occupied BW T RF 50.0 DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm Log	CH M Hz Cente Trig: 1 Gain:Low #Atter # # # # # # # # # # # # #	iddle (8-DF	2SK)	MJan 02, 2024 None ice: BTS	Clear Write Clear Write Average Max Hold Min Hold Detector Sample ▶ Auto Man
Keysight Spectrum Analyzer - Occupied BW M T RF 50.0 DC Center Freq 2.441000000 G #II 10 dB/div Ref 25.00 dBm	CH M Hz Cente Trig: I Gain:Low Trig: I #Atter # # # # # # # # # # # # #	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std a:>10/10 Radio Dev Control Radio Dev Radio Dev Sreep 5.41 dBm 99.00 % -26.00 dB	MJan 02, 2024 None ice: BTS	Trace/Detector Clear Write Average Max Hold Min Hold Detector Sample ► Auto Man
Keysight Spectrum Analyzer - Occupied BW Center Freq 2.441000000 G Center Freq 2.441000000 G Image: Context of the second s	CH M Hz Cente Gain:Low Trig: I Gain:Low #Atter 4 Cente Trig: I Atter 7 4 4 4 4 4 4 4 4 4 4 4 4 4	iddle (8-DF	2SK)	MJan 02, 2024 None ice: BTS	Trace/Detector Clear Write Average Max Hold Min Hold Detector Sample ► Auto Man
Keysight Spectrum Analyzer - Occupied BW Center Freq 2.441000000 G Image: Context Conte	CH M Hz Gain:Low Hz Gain:Low Frig: Trig: Hz Trig: Hz Hz Hz Hz Hz Hz Hz Hz Hz Hz	iddle (8-DF	ALIGN AUTO 11:28:46 P Radio Std radio Dev Radio Dev Radio Dev Sradio Dev Status	MJan 02, 2024 None ice: BTS	Trace/Detector Clear Write Average Max Hold Min Hold Detector Sample ► Auto Man



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	С	H High (8-DP	SK)				
🎉 Keysight Spectrum Analyzer - Occupier	d BW							- 6 ×
Center Freq 2.4800000	00 GHz #IFGain:Low	SENSE:INT Center Freq: 2.4800 Trig: Free Run #Atten: 20 dB	00000 GHz Avg Hold	ALIGN AUTO I:>10/10	11:26:40 P Radio Std: Radio Dev	M Jan 02, 2024 : None ice: BTS	Trac	e/Detector
10 dB/div Ref 25.00 d	Bm							
15.0 5.00								Clear Write
-15.0								Average
-45.0 -65.0				- brow	M. Marker	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Max Hold
Center 2.48 GHz #Res BW 30 kHz		#VBW 100	kHz		Sp Sweep	an 3 MHz 10.07 ms		Min Hold
Occupied Bandwi	dth	Total F	Power	5.02	dBm			
	1.1881 MH	z						Detector Sample►
Transmit Freq Error	-3.202 kl	HZ OBW F	ower	99	.00 %		Auto	Man
x dB Bandwidth	1.366 MI	Hz xdB		-26.	00 dB			
MSG				STATUS				



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8.3 MAXIMUM PEAK OUTPUT POWER

LIMITS

RSS-247 Issue 3 § 5.4 For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

TEST SETUP



TEST PROCEDURE

The RF power output was measured with a Spectrum Analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A power meter was used to record the shape of the transmit signal.

Peak Power set:

- 1. RBW \geq DTS bandwidth.
- 2. Set the VBW \geq [3 × RBW].
- 3. Set the span \geq [1.5 × DTS bandwidth].
- 4. Detector = peak.
- 5. Sweep time = auto couple.
- 6.Trace mode = max hold.
- 7. Allow trace to fully stabilize.

8.Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.



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Report No.: TMTN2312001599NR

Average power set:

1.Measure the duty cycle D of the transmitter output signal

2. Set span to at least 1.5 times the OBW.

3. Set the RBW = ≥ DTS bandwidth

4. Set VBW \geq [3 × RBW].

5. Number of points in sweep \geq [2 × span / RBW]. (This gives bin-to-bin spacing \leq RBW / 2, so that narrowband signals are not lost between frequency bins.)

6.Manually set sweep time \geq [10 × (number of points in sweep) × (total ON/OFF period of the transmitted signal)].

7. Set detector = RMS (power averaging).

8. Perform a single sweep.

9. Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW.
 10. Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.



TEST RESULTS

Model Name	AT-LP70XBT	Test By	Peter Chu
Temp & Humidity	22.5°C, 45%	Test Date	2023/12/27

Modulation Type: GFSK / DH5

Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)	Limit (mW)	Result
Low	2402	0.88	1.22		PASS
Mid	2441	1.12	1.29	125	PASS
High	2480	1.04	1.27		PASS

Modulation Type: 8-DPSK / 3-DH5

Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)	Limit (mW)	Result
Low	2402	0.74	1.19		PASS
Mid	2441	1.00	1.26	125	PASS
High	2480	0.97	1.25		PASS



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Average Power Data

Modulation Type: GFSK / DH5

Channel	Channel Frequency (MHz)	Measure Power (dBm)	10 log (1 / D)	Average Power (dBm)
Low	2402	-0.54	1.10	0.57
Middle	2441	-0.25	1.10	0.85
High	2480	-0.34	1.10	0.77

Modulation Type: 8-DPSK / 3-DH5

Channel	Channel Frequency (MHz)	Measure Power (dBm)	10 log (1 / D)	Average Power (dBm)
Low	2402	-3.79	1.10	-2.68
Middle	2441	-3.51	1.10	-2.40
High	2480	-3.59	1.10	-2.48



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MAXIMUM PEAK OUTPUT POWER

				СН	Low	/ GFS	δK			
🎉 Keysight S	pectrum Analyzer - Sv	wept SA								- 5 -
Center	RF 50 S Freq 2.4020	2 DC 00000 GH P	lz NO:Fast ⊂	SE	NSE:INT	#Avg Typ Avg Hold	ALIGN AUTO e: RMS :>10/10	12:03:01 AM TRACE TYPE	Jan 03, 2024 1 2 3 4 5 6 MWWWWW	Frequency
10 dB/div	Ref Offset 1 Ref 21.40	1.4 dB dBm	Gain:Low	#Atten: 2	0 dB		Mkr1	2.401 8 0.87	20 GHz ′8 dBm	Auto Tune
										Contor From
11.4										2 402000000 GHz
				1						2.402000000 0112
1.40					<u> </u>		-			Start Freq
-8.60										2.400500000 GHz
	and the second s									
-18.6	·									Stop Freq
-28.6										2.403500000 GHz
										CE Sten
-38.6										2.402000000 GHz
-48.6										Auto <u>Man</u>
										Freq Offset
-58.6										0 Hz
-68.6										
Center 2	.402000 GHz	:				1	1	Span 3.	000 MHz	
#Res BV	1.0 MHz		#VBW	3.0 MHz			Sweep 1	.000 ms (1	001 pts)	
MSG							STATUS	5		
				<u>CH N</u>	liddle	e / GF	SK			
💓 Keysight S	pectrum Analyzer - Sv	wept SA		SE			ALIGN AUTO	12:07:50 AM	lan 03 2024	
Center	Freq 2.4410	00000 GH	lz NO:Fast ⊊	Trig: Fre #Atten: 2	e Run 0 dB	#Avg Typ Avg∣Hold	e: RMS :>10/10	TRACE TYPE DE	1 2 3 4 5 6 MAMWWW P P A N N N	Frequency
10 dB/div	Ref Offset 1 Ref 21.40	1.4 dB dBm	Junicow				Mkr1	2.440 8 1.12	20 GHz 2 dBm	Auto Tune
										Center Fred
11.4										2.441000000 GHz
				1						
1.40										Start Freq
-8.60										2.439500000 GHz
-18.6										Stop Freq
-28.6										2.442500000 GHz
										CE Sten
-38.6										2.402000000 GHz
-48.6										Auto <u>Man</u>
										Freg Offset
-58.6										0 Hz
-68.6										
Center 2	.441000 GHz	:	1	I	1	1	1	Span 3.	000 MHz	
#Res BV	1.0 MHz		#VBW	3.0 MHz			Sweep 1	.000 ms (1	001 pts)	
MSG							STATUS	6		



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		CH	High	/ GFS	K			
🍺 Keysight Sp	ectrum Analyzer - Swept SA							- 6 -
Center F	RF 50 Ω DC	GHz	SENSE:INT	#Avg Type:	IGN AUTO	12:08:24 AI TRAC	4 Jan 03, 2024 E 1 2 3 4 5 6	Frequency
		PNO: Fast FIG: FIG: FIG: FIG: FIG: FIG: FIG: FIG:	20 dB	Avg Hold:>	10/10	DE		
10 dB/div	Ref Offset 11.4 dB				Mkr1	2.479 8 1.0	26 GHz 41 dBm	Auto i une
Log								
								Center Freq
11.4		<u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u>						2.480000000 GHz
1.40		•						
								Start Freq
-8.60								2.478500000 GHz
~								
-18.6							\sim	Stop Freq
20.0								2.481500000 GHz
-20.6								
-38.6								CF Step
								2.402000000 GHz
-48.6								<u></u>
								Eren Offset
-58.6			_					0 Hz
-68.6								
Center 2.	480000 GHz					Span 3	.000 MHz	
#Res BW	1.0 MHz	#VBW 3.0 MH	z	S	weep 1	1.000 ms (1001 pts)	
MSG					STATU	s		



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					CH L	ow /	8-DP	SK			
Kevs	ight Spect	trum Analyzer - S	went SA	_	-		-	_			
LXI	T	RF 50	Ω DC		SEN	ISE:INT		ALIGN AUTO	12:15:47 AM	4 Jan 03, 2024	
Cent	er Fre	eq 2.4020	00000 GI	HZ NO:Fast ⊊ Gain:Low	Trig: Free #Atten: 20	Run dB	#Avg Typ Avg Hold	e: RMS :>10/10	TRAC TYP DE	E 1 2 3 4 5 6 E M A M WWW T P P A N N N	Frequency
10 dB/	div	Ref Offset 1 Ref 21.40	1.4 dB dBm	Guinteon				Mkr1	2.401 9 0.7	75 GHz 41 dBm	Auto Tune
11.4											Center Freq 2.402000000 GHz
1.40 - -8.60 -						,1					Start Freq 2.399500000 GHz
-18.6 -	,	- A Contraction of the second second									Stop Freq 2.404500000 GHz
-28.6 -											CF Step 2.40200000 GHz
-48.6											Auto <u>Man</u>
-58.6 -											Freq Offset 0 Hz
-68.6											
Cente	er 2.40	02000 GHz	z						Span 5	.000 MHz	
#Res	BW 1	I.5 MHz		#VBW	5.0 MHz			Sweep 1	.000 ms (1001 pts)	
MSG								OTATIO			
								STATUS	·		
								STATUS			
				С	H Mi	ddle	/ 8-DI	PSK			
🎉 Keys	ight Spect	trum Analyzer - S	wept SA	С	H Mi	ddle	/ 8-DI	PSK			
i Keys M Cent	ight Spect ⊤ er Fr€	trum Analyzer - S RF 50 eq 2.4410	wept SA Ω DC 000000 GH	Hz NO: Fast	SEN Trig: Free #Atten: 2		/ 8-DI #Avg Typ Avg Hold	PSK ALIGN AUTO e: RMS :>10/10	12:12:17 AM TRAC TYP DE	1 Jan 03, 2024 ≡ 1 2 3 4 5 6 ≅ MA MWW TP P A N N N	Frequency
Meys VI Cent 10 dB/	ight Spect ⊤ er Fre /div	trum Analyzer - S RF 50 eq 2.4410 Ref Offset 1 Ref 21.40	wept SA Ω DC 000000 Gł P IF 1.4 dB dBm	C Hz NO: Fast Gain:Low	SH Mi SEN Trig: Free #Atten: 20		/ 8-D	ALIGN AUTO •: RMS :>10/10 Mkr1	12:12:17 A) TRAC TYP 2.440 9 1.0	^{1Jan 03,2024} E1 2 3 4 5 6 EMA MWWW TP P A NN N 70 GHz 02 dBm	Frequency Auto Tune
E Keys Cent 10 dB/ Log 11.4	ight Spect T er Fre	trum Analyzer - 5 RF 50 eq 2.4410 Ref Offset 1 Ref 21.40	wept SA Ω DC P P I.4 dB dBm	Hz NO: Fast Gain:Low	SEN Trig: Free #Atten: 20	ddle ISE:INT D dB	/ 8-DI #Avg Typ Avg Hold	PSK ALIGN AUTO e: RMS :>10/10 Mkr1	12:12:17 AP TRAC TvF DE 2.440 9 1.0	^{4Jan 03,2024} El 12 3 4 5 6 Мамичу TP P A NNN 70 GHz 02 dBm	Frequency Auto Tune Center Freq 2.44100000 GHz
10 dB/ Log 11.4 - 1.40 - -8.60 -	ight Spect	trum Analyzer - 5 RF 50 eq 2.4410 Ref Offset 1 Ref 21.40	wept SA Ω DC 000000 Gi P IF 1.4 dB dBm	C +z NO: Fast Gain:Low	SEN Trig: Free #Atten: 20	ddle ISE:INT D dB	/ 8-DI #Avg Typ AvglHold	PSK ALIGN AUTO :: RMS :>10/10 Mkr1	12:12:17 AV TRAC TVF DE 2.440 9 1.00	4Jan 03, 2024 E [1 2 3 4 5 6 E МАНЖЖУ TP P A NNN 70 GHz 02 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz
10 dBy 11.4 - -8.60 - -28.6 -	ight Spect	trum Analyzer - S RF S0 eq 2.4410 Ref Offset 1 Ref 21.40	wept SA Ω DC P IF 1.4 dB dBm	C	SEN Trig: Free #Atten: 20	ddle ise:INT P Run D dB	/ 8-DI #Avg Typ AvglHold	PSK ALIGN AUTO MERMS >>10/10 Mkr1	12:12:17 AV TRAC TVF DE 2.440 9 1.00	4Jan 03, 2024 E [1 2 3 4 5 6 E Маники TP P ANNW 70 GHz 02 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz Stop Freq 2.43500000 GHz
■ Keys () Cent 10 dB/ Log 11.40 = -8.60 = -38.6 = -38.6 =	ight Spect	trum Analyzer - S RF S0 eq 2.4410 Ref Offset 1 Ref 21.40	weept SA Ω DC 14 dB dBm	C NO: Fast ← Gain:Low	SEN Trig: Free #Atten: 20	ddle ISE:INT P dB	/ 8-DI #Avg Typ AvgiHold	PSK ALION AUTO e: RMS >10110 Mkr1	12:12:17 AV TRAD TYP 2.440 9 1.00	11an 03, 2024 £[1 2 3 4 5 6 е Манимин тР Р АNNN 70 GHz 02 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz Auto Man
■ Keyso Cent 10 dBJ 11.4 - -8.60 - -18.6 - -38.6 - -48.6 - -48.6 - -68.6 -	ight Species	trum Analyzer - S RF S0 eq 2.4410 Ref Offset 1 Ref 21.40	wept SA Ω DC P IF 1.4 dB dBm	C	Trig: Free #Atten: 20	ddle Run dd db	/ 8-DI #Avg Typ AvglHold	PSK ALION AUTO e: RMS >>10/10 Mkr1	12:12:17 AV TRAC TVF DE 2.440 9 1.0	4Jan 03, 2024 E [1 2 3 4 5 6 HE MA HAWWW TP P ANWWW 7 P O GHZ 02 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz 2.443500000 GHz Auto Man Freq Offset
Keys Cent 10 dB/ 11.4 - -	ight Spectra	trum Analyzer - 5 RF 50 eq 2.4410 Ref Offset 1 Ref 21.40	weept SA 2 DC 1.4 dB dBm	C	SEN Trig: Free #Atten: 20	ddle	/ 8-DI	PSK ALION AUTO e: RMS >10/10 Mkr1	12:12:17 AV TRAC TVF DE 2.440 9 1.00	4Jan 03, 2024 E[12 3 4 5 6 E]MAHWWW TP P ANNN 70 GHz 02 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz CF Step 2.402000000 GHz Auto Man Freq Offset 0 Hz
Keys Cent 10 dB/ 11.4 - 1.40 - 8.60 <td>ight Spectra</td> <td>trum Analyzer - S RF S0 eq 2.4410 Ref Offset 1 Ref 21.40 41000 GH2</td> <td>weept SA Ω DC 100000 GF P IF 1.4 dB dBm</td> <td>C</td> <td>Trig: Free #Atten: 20</td> <td>ddle se:int Run d d d d d d</td> <td>/ 8-DI #Avg Typ AvglHold</td> <td>PSK ALION AUTO WKr1 MKr1</td> <td>12:12:17 AV TRAC TVF DE 2.440 9 1.00</td> <td>13an 03, 2024 E [1 2 3 4 5 6 H Р нимич TP P AUMW 70 GHz 02 dBm</td> <td>Frequency Auto Tune Center Freq 2.441000000 GHz 2.438500000 GHz 2.438500000 GHz 2.443500000 GHz 2.402000000 GHz Auto Man Freq Offset 0 Hz</td>	ight Spectra	trum Analyzer - S RF S0 eq 2.4410 Ref Offset 1 Ref 21.40 41000 GH2	weept SA Ω DC 100000 GF P IF 1.4 dB dBm	C	Trig: Free #Atten: 20	ddle se:int Run d d d d d d	/ 8-DI #Avg Typ AvglHold	PSK ALION AUTO WKr1 MKr1	12:12:17 AV TRAC TVF DE 2.440 9 1.00	13an 03, 2024 E [1 2 3 4 5 6 H Р нимич TP P AUMW 70 GHz 02 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz 2.438500000 GHz 2.438500000 GHz 2.443500000 GHz 2.402000000 GHz Auto Man Freq Offset 0 Hz
■ Keys Cent 10 dB/ 11.4 - -8.60 - -8.60 - -38.6 - -48.6 - -68.6 - -68.6 - Centa #Res	ight Spectra	trum Analyzer - S RF S0 eq 2.4410 Ref Offset 1 Ref 21.40 41000 GHz 1.5 MHz	weept SA Ω DC P IF 1.4 dB dBm 	C	SEN MIC	ddle Reint d d d d d d d d d d d d d d d d d d d	/ 8-DI #Avg Typ AvglHold	PSK ALION AUTO WERTS >>10/10 Mkr1 Sweep 1	12:12:17 AV TRAC TVF DE 2.440 9 1.00 1.00 5.000 ms (13an 03, 2024 E [1 2 3 4 5 6 HE MANNWW TP P ANNWW TP P ANNW TP P ANN	Frequency Auto Tune Center Freq 2.441000000 GHz 2.438500000 GHz 2.438500000 GHz 2.443500000 GHz 2.40200000 GHz Auto Man Freq Offset 0 Hz



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		(CH Hi	gh / 8	8-DP	SK			
颠 Keysight Spe	ctrum Analyzer - Swept SA								- 6 -
Center F	RF 50 Ω DC) GHz	SENS	E:INT	#Avg Type	ALIGN AUTO E: RMS	12:11:45 A	MJan 03, 2024	Frequency
		PNO: Fast 🕞 IFGain:Low	#Atten: 20	dB	Avg Hold:	>10/10	D		Auto Tomo
10 dB/div	Ref Offset 11.4 dB Ref 21.40 dBm					Mkr	1 2.479 9 0.9	60 GHz 74 dBm	Auto i une
Log									
									Center Freq
11.4			≜ 1						2.480000000 GHz
1.40									Start From
-8.60					_		<u> </u>		2.477500000 GHz
-18.6									Stop Freq 2.482500000 GHz
-28.6									
-38.6									CF Step
10.0									2.402000000 GHz Auto <u>Man</u>
-48.6									
-58.6									Freq Offset 0 Hz
-68.6									
Center 2.4 #Res BW	180000 GHz 1.5 MHz	#VBW	5.0 MHz			Sweep	Span 5	.000 MHz 1001 pts)	
MSG						STAT	JS		



AVERAGE POWER

					CH	Low	/ GFS	SK			
🊺 Ke	ysight Spe	ctrum Analyzer - Sv	vept SA								- 5 -
Cen	ter Fr	eq 2.4020	00000 GH	lz NO: Fast ⊂	Trig: Fre	e Run	#Avg Typ Avg Hold	e: RMS : 1/1	TRAC	E 1 2 3 4 5 6 E MAMWWW T A P A N N N	Frequency
10 di	3/div	Ref Offset 17 Ref 21.40	1.4 dB dBm	Gain:Low	#Atten: 2	.0 0.5		Mkr1	2.401 9	88 GHz 39 dBm	Auto Tune
Log 11.4											Center Freq 2.40200000 GHz
1.40						1					
-8.60											Start Freq 2.400500000 GHz
-18.6											Stop Freq
-28.6											2.403500000 GHz
-38.6											CF Step 2.402000000 GHz Auto <u>Man</u>
-48.6											Freq Offset
-68.6											0 Hz
Cen	ter 2.4	02000 GHz							Span 3	.000 MHz	
#Re	s BW	1.0 MHz		#VBW	/ 3.0 MHz	*		#Sweep	50.00 s (1001 pts)	
MSG								STATUS	5		n
					СН	Mid	/ GFS	κ			
🎉 Ke	ysight Spe	ctrum Analyzer - Sv	vept SA		CH	Mid	/ GFS	K			
⊯ ĸ∈ W Cen	ysight Spe T	ctrum Analyzer - Sv RF 50 S req 2.4410	vept SA 2 DC 00000 GH IFi	HZ NO: Fast ⊂ Gain:Low	CH SEI	Mid .	/ GFS #Avg Typ Avg Hold	ALIGN AUTO e: RMS : 1/1	12:07:18 Al TRAC TYF DE	MJan 03, 2024 E 1 2 3 4 5 6 M A MWWW T A P A N N N	Frequency
Ke Ku Cen	ysight Spe ⊤ ter Fr 3/div	ctrum Analyzer - Sv RF 50 ی req 2.4410 Ref Offset 11 Ref 21.40	vept SA 2 DC 000000 GH Pi IF4 1.4 dB dBm	<mark>IZ</mark> NO: Fast ⊂ <mark>⊾</mark> Gain:Low	CH SE Trig: Fre #Atten: 2	Mid NSE:INT e Run 0 dB	/ GFS #Avg Typ Avg Hold	ALIGN AUTO Ne: RMS : 1/1 Mkr1	12:07:18 AI TRAC TV DE 2.440 9 -0.2	MJan 03, 2024 = 1 2 3 4 5 6 = M A M WWW TA P A N N N 888 GHz 52 dBm	Frequency Auto Tune
Ке (Х) Сеп 10 dl Log	ysight Spe ⊤ ter Fr B/div	Ref Offset 1' RF 150 c Ref 2.4410	vept SA 2 DC P P IF4 1.4 dB dBm	Iz NO: Fast ⊂ → Gain:Low	CH Trig: Free #Atten: 2	Mid .	/ GFS #Avg Typ Avg Hold	ALIGN AUTO ••: RMS : 1/1 Mkr1	12:07:18 A/ TRAC TY DE 2.440 9 -0.2	^{MJan 03,2024} ≝ 1 2 3 4 5 6 ≝ Markwww JA P A N N N 88 GHz 52 dBm	Frequency Auto Tune Center Freq 2.44100000 GHz
10 di Log	ysight Spe ⊺ Iter Fr 3/div	Ref Offset 17	vept SA 2 DC 000000 GH P F1 1.4 dB dBm	łz N0: Fast G Sain:Low	CH SEI Trig: Fre- #Atten: 2	Mid NSE:INT e Run 0 dB	/ GFS	ALIGN AUTO e: RMS :1/1 Mkr1	12:07:18 AA	^{И]an 03, 2024} I=[1 2 3 4 5 6 E МАНИКИ ITA P A NN N 888 GHz 52 dBm	Frequency Auto Tune Center Freq 2.44100000 GHz Start Freq
10 di Log 11.4 1.40	ysight Spe T	Ref Offset 1' Ref 21.40	wept SA 2 DC PP IFI 1.4 dB dBm	Iz NO: Fast C Gain:Low	CH	Mid .	/ GFS	ALIGN AUTO e: RMS : 1/1 Mkr1	12:07:19 AI TRAC TRAC 09 2.440 9 -0.2	4)an 02, 2024 IE [1 2 3 4 5 6 IF [2 3 5 6 IF [2	Frequency Auto Tune Center Freq 2.44100000 GHz Start Freq 2.439500000 GHz
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р ке си Сеп 10 di Log 11.4 1.40 -8.60 -18.6 -28.6 -38.6	ysight Spe T ter Fr 3/div	Ref Offset 1' Ref 21.40	vept SA 2 DC P IF4 1.4 dB dBm	1z VO:Fast Gain:Low	CH SEI #Atten: 2	Mid , NSE-INT e Run 0 dB	/ GFS	ALIGN AUTO e: RMS : 1/1 Mkr1	12:07:18 AM TRAC TYS DP -0.2	4Jan 03, 2024 =[12 3 3 4 5 6 ⊭[MA MWWW TA P ANNN B88 GHz 52 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.439500000 GHz CF Step 2.40200000 GHz
10 di Cen 11.4 11.4 -8.60 -18.6 -28.6 -38.6	3/div	Ref Offset 1 Ref 21.40	vept SA 2 DC P P If4 dBm	Iz NO: Fast G Sain:Low	CH SEE #Atten: 2		/ GFS	ALIGN AUTO e: RMS : 1/1 Mkr1	12:07:18 AI TRAC TRAC DO 2.440 9 -0.2	4)an 03, 2024 E [1 2 3 4 5 6 IN A HAWAY TA P ANNN 188 GHz 52 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.439500000 GHz 2.442500000 GHz 2.402000000 GHz Auto Man
201 Ke 201 Cen 10 di 11.4 1.40 -8.60 -18.6 -38.6 -38.6 -48.6 -58.6	3/div	ctrum Analyzer - Su RF 50 5 req 2.4410 Ref Offset 1' Ref 21.40	vept SA 2 DC P P IF4 dBm	12 Sain:Low	CH SEE #Atten: 2	Mid ,	/ GFS	K	12:07:18 AM	4Jan 03, 2024 FE [1 2 3 4 5 6 FE MA HWWW 14 P ANNN 188 GHz 52 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.439500000 GHz 2.432500000 GHz 2.442500000 GHz 2.442500000 GHz 2.442500000 GHz Auto Man Freq Offset 0 Hz
2011 Kei 2011 11.4 11.40 -8.60 -18.6 -38.6 -48.6 -68.6 -68.6	3/div	Ctrum Analyzer - Su RF 50 5 req 2.4410 Ref Offset 1' Ref 21.40	vept SA 2 DC P P IF4 dBm	12 Contraction of the second s	CH SEE #Atten: 2	Mid ,	/ GFS	K	12:07:18 Al TRAC TYP 2.440 9 -0.2	Alan 03, 2024 =[1] 2 3 4 5 6 =[MAMWWW 52 dBm 	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.439500000 GHz Stop Freq 2.442500000 GHz 2.442500000 GHz Auto Man Freq Offset 0 Hz
Ke Cen Cen 11.4 1.40 -8.60 -38.6 -38.6 -68.6 Cen #Re	ysight Spe T Iter Fr 3/div ter 2.4 s BW	Ctrum Analyzer - Su RF 50 5 req 2.4410 Ref Offset 1' Ref 21.40	vept SA 2 DC P P IF4 dBm	1z Gain:Low	CH	Mid .	/ GFS	#Sweep	12:07:18 Al TRAC TYP 2.440 9 -0.2	Alan 03, 2024 E[12 3 4 5 6 E[MAMWWW 52 dBm 88 GHz 52 dBm 	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.439500000 GHz Stop Freq 2.442500000 GHz 2.442500000 GHz Auto Man Freq Offset 0 Hz



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					CH	ligh	/ GFS	SK			
🊺 Key	ysight Sp	ectrum Analyzer - Sw	ept SA								- 6 -
Cen	ter F	RF 50 Ω req 2.48000	DC 00000 G	Hz	SEN	SE:INT	#Avg Typ	ALIGN AUTO	12:09:43 AI TRAC	4 Jan 03, 2024 E 1 2 3 4 5 6	Frequency
			1	PNO: Fast 🕞 FGain:Low	#Atten: 2	0 dB	AvgiHold	: 1/1	DE		Auto Tuno
10 dE	3/div	Ref Offset 11 Ref 21.40 (.4 dB 1Bm					Mkr1	2.479 9 -0.3	67 GHz 37 dBm	Auto Tune
LUg											Contor From
11.4											2.480000000 GHz
					Å	1					
1.40					Y						Start Freq
-8.60											2.478500000 GHz
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-28.6											
38.6											CF Step
- 30.0											2.402000000 GHz Auto Man
-48.6											
											Freg Offset
-58.6											0 Hz
-68 G											
-00.0											
Con	tor 2								Enon 2	000 MHz	
#Res	s BW	1.0 MHz		#VBW	/ 3.0 MHz			#Sweep	50.00 s (1001 pts)	
MSG								STATUS	5	. ,	L



					CHI	ow /	8-DP	SK			
Ke	vsight Spect	rum Analyzer - Sw	ept SA		5.1 2	2 /		5.1		_	
LXI	T	RF 50 Ω	DC		SEN	SE:INT		ALIGN AUTO	12:15:23 A	4 Jan 03, 2024	
Cer	iter Fre	q 2.40200	00000 GH	Hz	Tria: Free	Run	#Avg Typ	e:RMS ·1/1	TRAC	E123456	Frequency
			IF	NO: Fast 🕞 Gain:Low	#Atten: 20) dB	Arginoid		DE	APANNN	
		Dof Offect 11	4 40					Mkr1	2.402 0	00 GHz	Auto Tune
10 d	B/div	Ref 21.40	dBm						-3.7	86 dBm	
Log											
											Center Freq
11.4											2.402000000 GHz
1.40					l î	1					Start Fred
											2,399500000 GHz
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-18.6											Stop Freq
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	r										CF Step
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-48.6				1							
50.0											Freq Offset
-98.6				1							0 Hz
60 G											
-66.6											
Cen	ter 2.40	2000 GHz							Span 5	.000 MHz	
#Re	s BW 1	.5 MHz		#VBW	/ 5.0 MHz*	r		#Sweep	50.00 s (1001 pts)	
MSG								STATUS			
					<u></u>			.			
					CH M	/lid /	8-DP	SK			
🎉 Ke	ysight Spects	rum Analyzer - Sw	rept SA		CH M	/lid /	8-DP	SK			
Ke	ysight Spect	rum Analyzer - Sw RF 50 Ω	rept SA			/id /	8-DP		12:13:39 Al	MJan 03, 2024	Frequency
Ke Ke Cen	ysight Spect ⊤ Iter Fre	rum Analyzer - Sw RF 50 Ω 2 44100	rept SA DC D0000 GH	Hz NO: Fast (Nid /	8-DP; #Avg Typ Avg Hold	ALIGN AUTO ne: RMS : 1/1	12:13:39 Al TRAC TYF	MJan 03, 2024 ≅ 1 2 3 4 5 6 ≈ M & M WWW	Frequency
Ke Ke Cer	ysight Specti ⊤ Iter Fre	rum Analyzer - Sw RF 50 Ω 2 q 2.44100	rept SA DC DC D DOOOO GH P IF	Hz NO:Fast ⊂ Gain:Low	CH N SEN Trig: Free #Atten: 20		8-DP #Avg Typ Avg Hold	SK ALIGN AUTO IN: RMS : 1/1	12:13:39 Al TRAC TYF DE	1Jan 03, 2024 E 1 2 3 4 5 6 E M A M WWW T A P A N N N	Frequency
iii Ке IXI Cen	ysight Spectr ⊤ Iter Fre	rum Analyzer - Sw RF 50 Ω 2 q 2.44100 Ref Offset 11	rept SA DC DC P D0000 GH IF 4 dB	−IZ NO: Fast ⊂ Gain:Low	CH N SEN Trig: Free #Atten: 20	SE:INT Run OdB	8-DP #Avg Typ Avg Hold	SK ALIGN AUTO e: RMS : 1/1 Mkr1	12:13:39 Al TRAC TYF DE 2.440 9	MJan 03, 2024 E 1 2 3 4 5 6 E M&MWWW ET A P A N N N P5 GHz	Frequency Auto Tune
∭аке (Ж) Сеп	ysight Spect T Iter Fre B/div	rum Analyzer - Sw RF 50 Ω iq 2.44100 Ref Offset 11 Ref 21.40 (rept SA DC DC P DO000 GH IF IF .4 dB dBm	Hz NO: Fast ⊂ Gain:Low	CH N SEN Trig: Free #Atten: 20	Aid /	8-DP #Avg Typ Avg Hold	SK ALIGN AUTO Ne: RMS : 1/1 Mkr1	12:13:39 AJ TRAC TYP 2.440 9 -3.5	^{4]an 03, 2024} ≅1 2 3 4 5 6 ≊ M& MWWW TA P A N N 775 GHz 08 dBm	Frequency Auto Tune
₩ Ke W Cer	ysight Specti T Iter Fre B/div	rum Analyzer - Sw RF 50 Ω iq 2.44100 Ref Offset 11 Ref 21.40 d	rept SA DC DOOOO GH P IF .4 dB dBm	Hz NO:Fast ⊂ Gain:Low	CH N SEN Trig: Free #Atten: 20	Aid /	8-DP #Avg Typ Avg Hold	SK ALIGN AUTO Ie: RMS : 1/1 Mkr1	12:13:39 AI TRAC TYP DE 2.440 9 -3.5	MJan 03, 2024 = 1 2 3 4 5 6 = MAMWWW = A N N N 75 GHz 08 dBm	Frequency Auto Tune
ĨĨ Ke X Cer 10 di Log	ysight Spects T Iter Fre B/div	rum Analyzer - Sw RF 50 Ω cq 2.44100 Ref Offset 11 Ref 21.40 (ept SA DC DOOOO GH P IF .4 dB dBm	Hz NO: Fast ⊂ Gain:Low	CH N SEN Trig: Free #Atten: 20	Aid /	8-DP #Avg Typ Avg Hold	SK ALIGN AUTO Ie: RMS : 1/1 Mkr1	12:13:39 AI TRAC TVF DE 2.440 9 -3.5	MJan 03, 2024 ¹² 1 2 3 4 5 6 ²⁵ MAMWWW ¹⁷ A P A N N N 75 GHz 08 dBm	Frequency Auto Tune
<mark>∭ Ке</mark> (ул Сеп 10 di Log	ysight Specti T Iter Fre	rum Analyzer - Sw RF 50 Ω cq 2.44100 Ref Offset 11 Ref 21.40 (ept SA DC DC P IF .4 dB dBm	Hz NO: Fast ⊂	CH N SEN Trig: Free #Atten: 20	Aid /	8-DP: #Avg Typ Avg Hold	ALIGN AUTO we: RMS :: 1/1 Mkr1	12:13:39 AJ TRAC TYP DE 2.440 9 -3.5	ијап 03, 2024 i= 11 2 3 4 5 6 MAAMWWW TA P A N N N 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz
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и ке ул Сеп 11.40 -18.60 -28.6	ysight Spect	rum Analyzer - Sw RF 50 Q Q 2.44100 Ref Offset 11 Ref 21.40 (ept SA DC DC 00000 GF IF 4 dB dBm	IZ NO: Fast G Gain:Low	CH M	Aid /	8-DP: #Avg Typ AvgiHold	SK ALIGN AUTO e: RMS : 1/1 Mkr1	12:13:39 AI TRAC 17 9 2.440 9 -3.5	MJan 03, 2024 E[123456 T] 2 3456 T] 2 3457 T] 2 3477 T] 2 34777 T] 2 34777 T] 2 34777 T] 2 347777 T] 2 3477777777777777777777777777777777777	Frequency Auto Tune Center Freq 2.44100000 GHz Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz
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10 di Cen 11.4 1.40 -18.6 -28.6	ysight Spect	um Analyzer - Sto Ω ℝF 50 Ω q 2.4410(Ref Offset 11 Ref 21.40 (ept SA DC D0000 GF IF 4 dB dBm	+z N0: Fast ⊂ Gain:Low	CH M	Aid /	8-DP: #Avg Typ AvglHold	SK ALIGN AUTO ••: RMS •: 1/1 Mkr1	12:13:39 AI TRAC TYP 2.440 9 -3.5	Alan 03, 2024 E[] 2 3 4 5 6 E[MA HWWW 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.44100000 GHz 2.43850000 GHz 2.43850000 GHz 2.443500000 GHz
10 di Cen 11.4 1.40 -18.6 -28.6 -38.6	ysight Spect	um Analyzer - Sto Ω RF 50 Ω rg 2.4410(Ref Offset 11 Ref 21.40 (ept SA DC DC P IF 4 dB dBm	Hz NO: Fast Gain:Low	CH M	Aid /	8-DP: #Avg Typ AvgiHold	SK ALIGN AUTO ••: RMS :: 1/1 Mkr1	12:13:39 Al TRAC TYP 2.440 9 -3.5	4Jan 03, 2024 E [1 2 3 4 5 6 E MA MWWW T A P A NN N 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.44100000 GHz Start Freq 2.43850000 GHz Stop Freq 2.44350000 GHz CF Step 2.40200000 GHz Auto Man
10 di Cen 11.4 1.40 -18.6 -28.6 -38.6	ysight Spect	um Analyzer - So Ω RF So Ω q 2.4410(Ref Offset 11 Ref 21.40 (ept SA DO OOO GH P IF 4 dB dBm	Hz NO: Fast ⊂ Gain:Low	CH M	1id /	8-DP: #Avg Typ AvgiHold	SK ALIGN AUTO e: RMS : 1/1 Mkr1	12:13:39 AM TRAC TYP 2.440 9 -3.5	4Jan 03, 2024 HE [1 2 3 4 5 6 HE MA MWWW 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz CF Step 2.40200000 GHz Auto Man
10 dl Cen 11.4 1.40 -8.60 -18.6 -38.6 -48.6	sight Spect	um Analyzer - Su RF 50 Ω q 2.44100 Ref Offset 11 Ref 21.40 0	rept SA DC DC D	Hz NO: Fast Gain:Low	CH M	Aid /	8-DP: #Avg Typ Avg Hold	SK ALIGN AUTO e: RMS : 1/1 Mkr1	12:13:39 AM TRAC TYS D 2.440 9 -3.5	4Jan 03, 2024 HE [1 2 3 4 5 6 HE MAMWWW 775 GHZ 08 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz 2.438500000 GHz 2.438500000 GHz 2.443500000 GHz 2.402000000 GHz Auto Man Freq Offset
10 di Cen 11.4 11.4 -8.60 -18.6 -38.6 -38.6 -48.6	B/div	um Analyzer - Sw № 50 Q Q 2.44100 Ref Offset 11 Ref 21.40 (ept SA DC 00000 GF P IF 4 dB dBm	-IZ NO: Fast G Gain:Low	CH M	Aid /	8-DP:	SK ALIGN AUTO e: RMS : 1/1 Mkr1	12:13:39 AI TRAC TYP 2.440 9 -3.5	Alan 03, 2024	Frequency Auto Tune Center Freq 2.441000000 GHz 2.438500000 GHz 2.438500000 GHz 2.443500000 GHz Auto Man Freq Offset 0 Hz
10 di Cer 11.4 11.4 -8.60 -18.6 -38.6 -38.6 -48.6 -58.6	B/div	rum Analyzer - Sw RF 50 Q Q 2.44100 Ref Offset 11 Ref 21.40 0	ept SA DC DC D0000 GH P IF 4 dB dBm	-IZ NO: Fast (→ Gain:Low	CH M	Aid /	8-DP:	SK ALIGN AUTO e: RMS : 1/1 Mkr1	12:13:39 AI TRAC TYP 2.440 9 -3.5	Alan 03, 2024 ∉[12 3 4 5 6 E] MAAHWWW 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz 2.438500000 GHz 2.438500000 GHz 2.443500000 GHz 2.402000000 GHz Auto Man Freq Offset 0 Hz
Ke	sight Spect	um Analyzer - Sw <u>ℝ</u> F 50 Ω Q Q 2.44100 Ref Offset 11 Ref 21.40 0 	rept SA DC DC D0000 GH P IF 4 dB dBm	1z N0: Fast ⊂ Gain:Low	CH M	Aid /	8-DP:	SK ALIGN AUTO ••: RMS : 1/1 Mkr1	12:13:39 AI TRAC TYP 2.440 9 -3.5	Alan 03, 2024 E [] 2 3 4 5 6 E MAANWWW 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.44100000 GHz 2.438500000 GHz 2.438500000 GHz 2.443500000 GHz 2.402000000 GHz Auto Man Freq Offset 0 Hz
Keine Kei	sight Spect	um Analyzer - Sto Ω RF 50 Ω rg 2.4410(Ref Offset 11 Ref 21.40 (ept SA DC DC P IF 4 dB dBm	+z NO: Fast ⊂ Gain:Low	CH M	Aid /	8-DP:	SK ALIGN AUTO e: RMS :: 1/1 Mkr1	12:13:39 AI TRAC TV9 2.440 9 -3.5	Alan 03, 2024 =[12 3 4 5 6 HA HWWW 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.44100000 GHz Start Freq 2.43850000 GHz Stop Freq 2.443500000 GHz CF Step 2.40200000 GHz Auto Man Freq Offset 0 Hz
тке ул Сеп 10 di 11.4 1.40 -18.6 -28.6 -38.6 -48.6 -68.6 -68.6 Сеп	sight Spect	um Analyzer - Sto Ω RF Sto Ω rg 2.4410(Ref Offset 11 Ref 21.40 (ept SA DC DC P IF 4 dB dBm	Hz NO: Fast Gain:Low	CH M	1id /	8-DP:	SK ALIGN AUTO ••: RMS •: 1/1 Mkr1	12:13:39 AM	4Jan 03, 2024 HE [1 2 3 4 5 6 HM A MANNAN 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz CF Step 2.402000000 GHz Auto Man Freq Offset 0 Hz
10 di Cer 11.4 1.40 -8.60 -18.6 -28.6 -38.6 -48.6 -68.6 -68.6 Cen #Re	sight Spect	um Analyzer - So Ω RF So Ω Q 2.44100 Ref Offset 11 Ref 21.40 0 	Pept SA DC DC D	Hz NO: Fast Gain:Low #VBM	CH M		8-DP:	SK ALIGN AUTO e: RMS : 1/1 Mkr1 #Sweep	12:13:39 AM TRAC TYP 2.440 9 -3.5	4Jan 03, 2024 HE [1 2 3 4 5 6 HE MA MWWW 75 GHz 08 dBm	Frequency Auto Tune Center Freq 2.441000000 GHz Start Freq 2.438500000 GHz Stop Freq 2.443500000 GHz CF Step 2.40200000 GHz Auto Man Freq Offset 0 Hz



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			(СН Н	igh /	8-DP	SK			
🍺 Keysight Spe	ectrum Analyzer - Swep	t SA								- J - X
Center F	RF 50 Ω req 2.480000	DC 0000 GH	z	SEN	ISE:INT	#Avg Typ	ALIGN AUTO e: RMS	12:11:13 A	M Jan 03, 2024	Frequency
		PN	IO: Fast 🖵 Gain:Low	#Atten: 2	0 dB	Avginoid	: 1/1	DE	A P A N N N	
	D-608						Mkr1	2.479 9	50 GHz	Auto Tune
10 dB/div	Ref 21.40 dE	3m						-3.5	85 dBm	
LUg										Center Fred
11.4										2.48000000 GHz
1.40				•	1					Start Freg
-8.60										2.477500000 GHz
0.00										
-18.6										Stop Freg
										2.482500000 GHz
-28.6										
-38.6										CF Step
										2.402000000 GHz Auto Man
-48.6										
										Freq Offset
-58.6										0 Hz
-68.6										
Center 2.4	180000 GHz					1	1	Span 5	.000 MHz	
#Res BW	1.5 MHz		#VBW	5.0 MHz	•		#Sweep	50.00 s (1001 pts)	
MSG							STATUS	5		



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Report No.: TMTN2312001599NR 8.4 HOPPING CHANNEL SEPARATION

LIMITS

RSS-247 section 5.1 (b) Frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the -20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

TEST SETUP



TEST PROCEDURE

- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- 3. By using the MaxHold function record the separation of adjacent channels.
- 4. Measure the frequency difference of these two adjacent channels by spectrum analyzer MARK function. And then plot the result on spectrum analyzer screen.
- 5. Repeat above procedures until all frequencies measured were complete.



TEST RESULTS

Refer to section 8.1, 20dB bandwidth measurement, the measured channel separation should be greater than two-third of 20dB bandwidth or Minimum bandwidth.

Model Name	AT-LP70XBT	Test By	Peter Chu
Temp & Humidity	22.5°C, 45%	Test Date	2023/12/27

Modulation Type: GFSK / DH5

Channel	Adjacent Hopping Channel Separation (MHz)	Two –third of 20dB bandwidth (MHz)	Minimum Bandwidth (kHz)	Result
2402MHz	1.00	0.75	25	PASS
2441MHz	1.00	0.75	25	PASS
2480MHz	1.00	0.75	25	PASS

Modulation Type: 8-DPSK / 3-DH5

Channel	Adjacent Hopping Channel Separation (kHz)	Two –third of 20dB bandwidth (kHz)	Minimum Bandwidth (kHz)	Result
2402MHz	1.00	0.93	25	PASS
2441MHz	1.00	0.93	25	PASS
2480MHz	1.00	0.93	25	PASS



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HOPPING CHANNEL SEPARATION

							G	FSK	(Lov	v)			
1	(eysight)	Spect	trum A	Analyzer - Sw	ept SA				<u>`</u>				- 7 -
w Ce	nter	Fre	RF eq 2	50 Ω 2.40200	DC 00000 GH	-lz	SET	NSE:INT	#Avg	ALIGN AUT Type: RMS	TO 12:17:02	M Jan 12, 2024	Frequency
					PI IF	NO: Wide ∟ Gain:Low	#Atten: 2	.0 dB	ייוּפּיא	lolu.~ tor to		ET P P A N N N	
10	dB/div	v	Ref Ref	Offset 11	.4 dB dBm						۵Mkr1 1.(-0)00 MHz).028 dB	Autorune
Log 11. 1.4	J .4		-								●1∆2		Center Freq 2.402000000 GHz
-8.6	٥ <u>–</u>		+					2	\leftarrow			\searrow	
-18. -28. -38	6		+										Start Freq 2.400500000 GHz
-48. -58.	6												Stop Freq 2.403500000 GHz
Ce #R	nter : es Bi	2.4(W 1	020	00 GHz kHz	×	#VB1	W 300 kHz		INCTION	#Sweep	Span 3 100.0 ms	3.000 MHz (1001 pts)	CF Step 1.00000000 GHz Auto <u>Man</u>
1 2 3 4 5	Δ2 F		f	(Δ)	1.00 2.402 00	<u>0 MHz</u> (Δ 0 GHz) -0.028 0.065 di	dB Bm		FONCION			Freq Offset 0 Hz
6 7 8 9 10													
11													
MSG										ST/	ATUS		

	GFSK(M	liddle)		
🎉 Keysight Spectrum Analyzer - Swept SA				- 5 💌
Center Freq 2.44100000	0 GHz	ALIGN AUTO	12:19:15 AM Jan 12, 2024 TRACE 1 2 3 4 5 6	Frequency
	IFGain:Low #Atten: 20 dB	Avginola.>10110	DET P P A N N N	
Ref Offset 11.4 dB 10 dB/div Ref 21.40 dBm		ΔΜ	kr1 1.000 MHz -0.005 dB	Auto Tune
Log 11.4 1.40 -8.60	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		1Δ2	Center Freq 2.441000000 GHz
-18.6				Start Freq 2.439500000 GHz
-48.6				Stop Freq 2.442500000 GHz
Center 2.441000 GHz #Res BW 100 kHz	#VBW 300 kHz	#Sweep 10	Span 3.000 MHz 0.0 ms (1001 pts)	CF Step 1.000000000 GHz Auto Man
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	1.000 MHz (△) -0.005 dB 41.000 GHz -0.051 dBm -1.000 MHz (△) -0.003 dB 41.000 GHz -0.051 dBm	TION FUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
7 - 8 - 9 - 10 - 11 - < □	HI HI			
MSG		STATUS		



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GFSK(High) Keysight S trum Analy zer - Swept SA Center Freq 2.48000000 GHz PNO: Wide C IFGain:Low #Atten: 20 dB 12:21:17 AM Jan 12, 2024 TRACE 1 2 3 4 5 6 TYPE MWHWWW DET P P A N N N Frequency #Avg Type: RMS Avg|Hold:>10/10 Auto Tune ΔMkr1 -1.000 MHz -0.005 dB Ref Offset 11.4 dB Ref 21.40 dBm 11 1∆2 **Center Freq** 2.480000000 GHz .4 5 8.6 18. Start Freq 28. 2.478500000 GHz 38 h-m^-**** -48. Stop Freq -58 2.481500000 GHz 68. Center 2.480000 GHz #Res BW 100 kHz Span 3.000 MHz #Sweep 100.0 ms (1001 pts) **CF Step** 1.000000000 GHz uto <u>Man</u> #VBW 300 kHz Auto MKR MODE T f (Δ) -1.000 MHz (Δ) 2.480 000 GHz Δ2 F -0.005 dB -0.082 dBm Freq Offset 0 Hz <u>10</u> 11 STATUS

8-DPSK (Low)	
💓 Keysight Spectrum Analyzer - Swept SA	- 5 💌
Image: Center Freq 2.40200000 GHz Sense:INT Allon Auto 12:25:49 AMJan 12,20 Center Freq 2.40200000 GHz #Avg Type: RMS TRACE [1:2:34 PN0: Wide □ Trig: Free Run Avg[Hold:>10/10 Trie Hwm Hwm	Frequency
IFGain:Low #Atten: 20 dB DETIFIER AN	Auto Tune
Ref Offset 11.4 dB کانالہ 10 dB/div Ref 21.40 dBm 0.513 d	В
	Center Fred
1.40 Δ 2	2.402000000 GHz
-8.60	<u> </u>
-18.6	Start Freq
-28.6	2.400500000 GHz
-38.6	
-40.5	Stop Freq
-68.6	2.403500000 GHz
#Res BW 100 kHz #VBW 300 kHz #Sweep 100.0 ms (1001 pt	CF Step s) 1.000000000 GHz
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE	Auto <u>Man</u>
1 Δ2 1 f (Δ) 1.000 MHz (Δ) 0.513 dB 2 F 1 f 2.402 000 GHz -3.342 dBm	
3 4	
6	=
7 8 9	
9 10 10	
	•
MSG STATUS	

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8-DPSK (Middle) Keysight S trum Analyzer - Swept S Center Freq 2.44100000 GHz PNO: Wide Trig: Free Run IFGain:Low #Atten: 20 dB 12:24:57 AM Jan 12, 2024 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P A N N N Frequency #Avg Type: RMS Avg|Hold:>10/10 Auto Tune ΔMkr3 1.000 MHz -0.005 dB Ref Offset 11.4 dB Ref 21.40 dBm $\overline{2^{142}}$ 11 **Center Freq ≜**^{3∆4} 2.441000000 GHz .4 12-m -8.6 18. Start Freq 28. 2.439500000 GHz 38. -48. Stop Freq -58 2.442500000 GHz 68. Center 2.441000 GHz #Res BW 100 kHz Span 3.000 MHz #Sweep 100.0 ms (1001 pts) **CF Step** 1.000000000 GHz uto <u>Man</u> #VBW 300 kHz Auto MKR MODELT f (Δ) f f (Δ) f -1.000 MHz (Δ)
 2.441 000 GHz
 1.000 MHz (Δ)
 2.441 000 GHz 0.055 dB -2.850 dBm -0.005 dB -2.850 dBm 1 Δ2 2 F 3 Δ4 4 F Freq Offset 0 Hz 10 11 STATUS

Image: Keysight Spectrum Analyzer - Swept SA Image: Comparison of the system of the sys	×
XI RF 50 Ω DC SENSE:INT ALIGN AUTO 12:22:23 AM Jan 12, 2024	
Center Freq 2.480000000 GHz #Avg Type: RMS TRACE 1 2 3 4 5 6 PN0: Wide Trig: Free Run Avg Hold:>10/10 TYPE MMAWWW PN0: Wide Trig: Free Run Avg Hold:>10/10 TYPE MMAWWW	<u> </u>
IFGain:Low #Atten: 20 dB ΔMkr1 -1.000 MHz Ref Offset 11.4 dB -0.026 dB -0.026 dB	une
	F req GHz
-18.6 Start 1 -28.6	Freq GHz
-48.6	Freq GHz
Center 2.480000 GHz Span 3.000 MHz CF s #Res BW 100 kHz #VBW 300 kHz #Sweep 100.0 ms (1001 pts) 1.00000000 Miss Model Tree Set X Y FUNCTION FUNCTION WIDTH FUNCTION WALL Auto	Step GHz <u>Man</u>
Δ2 1 f (Δ) -1.000 MHz (Δ) -0.026 dB Final Fina	ffset 0 Hz