

# **RF REPORT**

# FCC ID: 2AZFE-AN1

On Behalf of

# Shenzhen Shadow Crown Technology Co., Ltd.

# **LED** Projector

# Model No.: An1, An2, An3, E88, LU-1, An2 Pro, E88 Pro, NX-2, NS-1, NS-1 PRO

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Address	:	A9 East 5th F Guangdong,	A9 East 5th Floor, Industrial Building,Longwang Miao, Fuyong District , Shenzhen, Guangdong, P.R.China.			
EUT Description	:	LED Projecto	or			
	(A)	Model No.	:	An1, An2, An3, E88, LU-1, An2 Pro, E88 Pro, NX-2, NS-1, NS-1 PRO		
	(B)	Trademark	:	N/A		
Macouromont St	anda	rd I lood				

# **TEST REPORT DECLARATION**

Measurement Standard Used:

### FCC Rules and Regulations Part 15 Subpart C Section 15.247

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. Also, this report shows that the EUT is technically compliant with above listed standard(s) requirements.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Yannis Wen Tested by (name + signature) .....: Project Engineer

Reak Yang Approved by (name + signature) .....: : **Project Manager** 

Date of issue .....: April 13, 2023

Vannis wen Rr. Ks

# **Revision History**

Revision	Issue Date	Revisions	Revised By
V0	April 13, 2023	Initial released Issue	Yannis Wen

# **1** General Information

# 1.1 Description of Device (EUT)

Product Name	•••	LED Projector
Trademark	:	N/A
Model Number	•	An1, An2, An3, E88, LU-1, An2 Pro, E88 Pro, NX-2, NS-1, NS-1 PRO
DIFF	:	There is no difference between the models except the appearance color. So all the test were performed on the model An1.
Power Supply	:	AC 120/60Hz
Operation Frequency	:	2402MHz to 2480MHz
Number of Channels	:	79
Modulation Type	:	GFSK, π/4 DQPSK, 8DPSK
Antenna Type	•	PCB antenna
Antenna Gain	:	-0.58dBi (Max)

## 1.2 Test Lab information

Shenzhen Alpha Product Testing Co., Ltd Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission Registration Number: 293961 Designation Number: CN1236

July 15, 2019 Certificated by IC Registration Number: CN0085

# 2 Summary of test

# 2.1 Test Standard description:

The tests were performed according to following standards:

FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

## 2.2 Summary of test

Item	Requirement	Method	Result
Antenna requirement	Part 15.203		Pass
Conducted Emission at AC power line	FCC Part 15.207(a)	ANSI C63.10-2013 section 6.2	Pass
Occupied Bandwidth	FCC Part 15.215(c)	ANSI C63.10-2013, section 6.9.2	Pass
Maximum Conducted Output Power	FCC Part 15.247(b)(1)	ANSI C63.10-2013, section 7.8.5	Pass
Channel Separation	FCC Part 15.247(a)(1)	ANSI C63.10-2013, section 7.8.2	Pass
Number of Hopping Frequencies	FCC Part 15.247(a)(1)(iii)	ANSI C63.10-2013, section 7.8.3	Pass
Dwell Time	FCC Part 15.247(a)(1)(iii)	ANSI C63.10-2013, section 7.8.4	Pass
Emissions in non-restricted frequency bands	FCC Part 15.247(d)	7.8.8	Pass
Band edge emissions (Radiated)	FCC Part 15.247(d)	ANSI C63.10-2013 section 6.6.4	Pass
Emissions in restricted frequency bands (below 1GHz)	FCC Part 15.247(d)	ANSI C63.10-2013 section 6.6.4	Pass
Emissions in restricted frequency bands (above 1GHz)	FCC Part 15.247(d)	ANSI C63.10-2013 section 6.6.4	Pass

# 2.3 Test Mode Description

Tested mode, channel, and data rate information			
Mode	Channel	Frequency (MHz)	
	L: CH0	2402	
Carrier Tx Mode	M: CH39	2441	
	H: CH78	2480	
GFSK / Pi/4-DQPSK / 8-DPSK hopping on Tx Mode	CH0 to CH78	2402 to 2480	
	L: CH0	2402	
GFSK / PI/4-DQFSK / O-DFSK	M: CH39	2441	
hopping on 1X Mode	H: CH78	2480	

# 2.4 Measurement Uncertainty (95% confidence levels, k=2)

ltem	Uncertainty
Uncertainty for Power point Conducted Emissions Test	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber	3.74dB(Polarize: V)
(30MHz to 1GHz)	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber	3.77dB(Polarize: V)
(1GHz to 25GHz)	3.80dB(Polarize: H)
Uncertainty for radio frequency	5.06×10 <sup>-8</sup> GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	<b>0.2</b> °C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

N/A

N/A

Equipment	Manufacture	Model No.	Firmware version	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2022.05.17	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2022.08.22	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2022.08.22	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03- 102082-Wa	2022.08.22	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2022.08.22	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2021.08.30	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2021.08.30	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00059	2021.08.30	2Year
RF Cable	Resenberger	Cable 1	/	RE1	2022.08.22	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2022.08.22	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2022.08.22	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2022.08.22	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2022.08.22	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2022.08.22	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2022.08.23	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	/	00946	2021.08.30	2 Year
Preamplifier	SKET	LNPA_1840 -50	/	SK2018101801	2022.08.22	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2022.08.22	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2022.08.22	1 Year
Temp. & Humid. Chamber	Weihuang	WHTH- 1000-40- 880	/	100631	2022.08.22	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2022.08.22	1 Year
Adjustable attenuator	MWRFtest	N/A	/	N/A	N/A	N/A

# 2.5 Test Equipment

10dB Attenuator

Mini-Circuits

Software Information					
Test Item	Software Name	Manufacturer	Version		
RE	EZ-EMC	farad	Alpha-3A1		
CE	EZ-EMC	farad	Alpha-3A1		
RF-CE	MTS 8310	MWRFtest	2.0.0.0		

1

DC-6G

N/A

# 3 Evaluation Results (Evaluation)

# 3.1 Antenna requirement

Test Requirement:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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.
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## 3.1.1 Conclusion:

The EUT antenna is PCB antenna. It complies with the standard requirement.

# 4 Radio Spectrum Matter Test Results (RF)

# 4.1 Conducted Emission at AC power line

Test Requirement:	Except as shown in paragraphs (b)a that is designed to be connected to frequency voltage that is conducted or frequencies, within the band 150 the following table, as measured usi stabilization network (LISN).	Except as shown in paragraphs (b)and (c)of this section, 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 $\mu$ H/50 ohms line impedance stabilization network (LISN).								
Test Limit:	Frequency of emission (MHz)	Conducted limit (dBµV)	imit (dBµV)							
		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.									
Test Method:	Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices									

## 4.1.1 E.U.T. Operation:

Operating Environment:										
Temperature:23.8 °CHumidity:54.2 %Atmospheric Pressure:101.6 kPa										
Pre test mode: All modes										
Final test mode: TX-GFSK (hopping off)										

## 4.1.2 Test Setup Diagram:



## 4.1.3 Test Result:

TX-GFSK (hopping ff) / Line: Line /CH: L



1 *	0.1680	45.57	9.93	55.50	65.06 -9.56	QP	
2	0.1680	30.31	9.93	40.24	55.06 -14.82	AVG	
3	0.2220	42.21	9.94	52.15	62.74 -10.59	peak	
4	0.3600	34.12	9.95	44.07	58.73 -14.66	peak	
5	1.0140	24.14	9.92	34.06	56.00 -21.94	peak	
6	2.7780	22.84	9.94	32.78	56.00 -23.22	peak	
7	19.0920	27.21	10.44	37.65	60.00 -22.35	peak	



## TX-GFSK (hopping on) / Line: Neutral

Note: All modes have been tested, and only worst data was listed in this report.

4.2 Occupied Ba	ndwidth
Test Requirement:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Limit:	Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.
Test Method:	Occupied bandwidth—relative measurement procedure
Procedure:	<ul> <li>a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.</li> <li>b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.</li> <li>c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given in 4.1.5.2.</li> <li>d) Steps a) through c) might require iteration to adjust within the specified tolerances.</li> <li>e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target "-xx dB down" requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.</li> <li>f) Set detection mode to peak and trace mode to max hold.</li> <li>g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).</li> </ul>
	<ul> <li>value).</li> <li>h) Determine the "-xx dB down amplitude" using [(reference value) - xx].</li> <li>Alternatively, this calculation may be made by using the marker-delta function of the instrument.</li> <li>i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).</li> <li>j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "-xx dB down amplitude" determined in step h). If a marker is below this "-xx dB down amplitude" value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.</li> <li>k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).</li> </ul>

## 4.2.1 E.U.T. Operation:

Operating Environment:										
Temperature:22.5 °CHumidity:51.5 %Atmospheric Pressure:102 kPa										
Pre test mode: TX-GFSK(hopping off), TX-Pi/4DQPSK (hopping off), TX-8DPSK (hopping off)										
Final test mode: TX-GFSK(hopping off), TX-Pi/4DQPSK (hopping off), TX-8DPSK (hopping off)										

# 4.2.2 Test Setup Diagram:



## 4.2.3 Test Result:

Condition	Mode	Frequency	Antenna	99%	-20 dB	Limit -20 dB	Verdict
		(MHz)		OBW	Bandwidth	Bandwidth (MHz)	
				(MHz)	(MHz)		
NVNT	1-DH1	2402	Ant 1	0.777	0.858	/	Pass
NVNT	1-DH1	2441	Ant 1	0.823	0.884	/	Pass
NVNT	1-DH1	2480	Ant 1	0.821	0.882	/	Pass
NVNT	2-DH1	2402	Ant 1	1.163	1.234	/	Pass
NVNT	2-DH1	2441	Ant 1	1.167	1.236	/	Pass
NVNT	2-DH1	2480	Ant 1	1.159	1.198	/	Pass
NVNT	3-DH1	2402	Ant 1	1.153	1.21	/	Pass
NVNT	3-DH1	2441	Ant 1	1.143	1.208	/	Pass
NVNT	3-DH1	2480	Ant 1	1.157	1.206	/	Pass

### OBW NVNT 1-DH1 2402MHz Ant1



Date: 4.APR.2023 14:22:55

#### -20dB Bandwidth NVNT 1-DH1 2402MHz Ant1



Date: 4.APR.2023 14:23:03

#### OBW NVNT 1-DH1 2441MHz Ant1



Date: 4.APR.2023 14:31:12

#### -20dB Bandwidth NVNT 1-DH1 2441MHz Ant1



Date: 4.APR.2023 14:31:20

#### OBW NVNT 1-DH1 2480MHz Ant1

Spect	rum											
Ref L	evel	20.00 dBm	Offset 7	7.60 dB 🧉	RBW 30 kH	z						
🛛 Att		30 dB	SWT 6	i3.3 µs 🧉	VBW 100 kH	z	Mode /	uto FFT				
SGL Co	unt 1	00/100										
●1Pk M.	ах											
							M	1[1]			-	44.82 dBm
10 dBm											2.481	00000 GHz
TO UBIII							0	cc Bw			821.1788	21178 kHz
0 dBm—												
0 0.0.11					1000	~						
-10 dBm	<u> </u>				JV w	~	2	-				
			_		$\mathcal{A}$			$\sum$	+2			
-20 dBm	∩—		T	$\sim$	-				$\sqrt{\pi}$			
			and	r					1	$\sim$		
-30 dBm	∩— -		~~~~						_	~~~~~		
		$\sim$	ľ								~~	
-40 dBm	∩+-	~									<u> </u>	M
m	1	/										~~*
-50 dBh	<del>ا</del> لسر											$\mathbf{S}$
												Ť
-60 aBm												
70 d0 m												
-70 ubii												
CF 2.4	B GHz				1001	pts					Spa	n 2.0 MHz
Marker												
Туре	Ref	Trc	X-value		Y-value		Func	tion		Fund	tion Result	
M1		1	2.4	B1 GHz	-44.82 dB	m						
T1		1	2.479590	41 GHz	-22.39 dB	m	0	CC BW			821.1788	21178 kHz
<u>T2</u>		1	2.480411	59 GHz	-20.91 dB	m						
		Υ						e a d y			1,70	14.04.2023

Date: 4.APR.2023 14:32:38

#### -20dB Bandwidth NVNT 1-DH1 2480MHz Ant1



Date: 4.APR.2023 14:32:47

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## OBW NVNT 2-DH1 2402MHz Ant1

Spect	rum											
Ref L	evel	20.00 dBm	Offset 7	7.62 dB 🧉	RBW 30	<hz< th=""><th></th><th></th><th></th><th></th><th></th><th></th></hz<>						
🛛 Att		30 dB	SWT 6	63.3 μs 🧉	<b>VBW</b> 100	κΗz	Mode a	Auto FF	Т			
SGL Co	ount 1	.00/100										
😑 1Pk M	ax											
							M	1[1]			-	48.21 dBm
10 dBm											2.403	00000 GHz
10 000							0	cc Bw			1.1628	37163 MHz
0 dBm-												
-10 dBm	∩				$-\Lambda$	$\wedge$		<u> </u>				
				A.	$\sim \sim$	~ `	$\sim \sim$	$\sim$	$\sim$	Т2		
-20 dBm	י−+			$\sim$ $\sim$		_		· ·	$- \checkmark$	<u> </u>		
		$\sim$								1		
-30 dBr	+-י	^`				_					5	
-40 dBn	דרי	1										
Ro dos	$\sim$										~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
-20 abu	1-4-										V	
-60 dBr												
00 001	'											
-70 dBm	<b>`</b> ⊢											
05.0.4		-			10	21					0	
CF 2.4	UZ GF	12			10	or pr	\$				spa	ri 2.0 MHZ
Marker	<b>D</b> -6	1 7	¥	1	V	- 1	<b>F</b>					
Type	Ket	1	x-value		-49.21	dam	Func	tion		unctio	n kesult	
T1		1	2.40	50 GHz	-40.21	dBm	0	CC BW			1 16283	37163 MHz
T2		1	2.402575	42 GHz	-20.22	dBm		00 044			1,1020	51 200 1112
		7					)	_	2111211		F4.	14.04.2023
		Л					F			- 4		

Date: 4.APR.2023 14:40:12

## -20dB Bandwidth NVNT 2-DH1 2402MHz Ant1

Spect	rum									
Ref L	evel	20.00 dBm	Offset 7.62	dB 😑 R	<b>BW</b> 30 kHz	:				
Att		30 dB	<b>SWT</b> 63.3	µs 👄 V	BW 100 kHz	Mode /	Auto FFT			
SGL Co	ount 1	00/100								
●1Pk M	ax									
						M	1[1]		9,409	-6.73 dBm
10 dBm						M	2[1]		2.402	26 48 dBm
							-[-]		2.401	39000 GHz
0 dBm-					M	1				
-10 dBr					$\wedge$					
10 000	.				$1 \sim 1$	$\sim$				
-20 dBn	n	M	1	~~~	• ·	×	~ ~ ~ ~	$\sim\sim$	ма	
		~	~						₹	
-30 dBn	∩_+	^							5	
40 dBm										
-40 UBII	-	1								
-50 dBn	$\triangle$	$\sim$							<u> </u>	$\Lambda \rightarrow$
~~.										
-60 dBr	n									
-70 dBn										
CF 2.4	02 GH	lz			1001	pts			Spa	n 2.0 MHz
Marker										]
Туре	Ref	Trc	X-value		Y-value	Func	tion	Fund	tion Result	
M1 M2		1	2.402002 G	Hz	-6.73 dBr	n				
M3		1	2.402624 G	Hz	-26.35 dBr	n				
		1							4.5474	14.04.2023
		Л					eady		4/1	

Date: 4.APR.2023 14:40:21

#### OBW NVNT 2-DH1 2441MHz Ant1



Date: 4.APR.2023 14:42:18

#### -20dB Bandwidth NVNT 2-DH1 2441MHz Ant1



Date: 4.APR.2023 14:42:27

#### OBW NVNT 2-DH1 2480MHz Ant1



Date: 4.APR.2023 14:47:51

#### -20dB Bandwidth NVNT 2-DH1 2480MHz Ant1



Date: 4.APR.2023 14:48:02

### OBW NVNT 3-DH1 2402MHz Ant1

			0			0 011	- 2 - 102				
Spectru	m	)									
Ref Lev	el 20.0	0 dBm	Offset	7.62 dB (	RBW	30 kHz					· · · · ·
Att		30 dB	SWT	53.3 µs (	VBW	100 kHz	Mode	Auto FFT			
SGL Coun	t 100/1	100									
⊖1Pk Max											
							M	1[1]		-	48.89 dBm
10 40 m										2.403	00000 GHz
10 aBm—							0	cc Bw		1.1528	47153 MHz
0.48m											
0 ubm											
-10 dBm-						$ \land$					
-10 000					L/N	$\sim$	$\sim\sim$	$\sim$			
-20 dBm—			$r_1 \wedge \sim$	$\sim$	Vĩ-	×		$\sim$			
20 000			~~						- La Contra	h	
-30 dBm—					_					~	
-40 dBm—	- /	<u> </u>									
-SQ dBm~	<u>1</u>				_						لقہہ ( کہ
$\sim$											
-60 dBm—											
-70 dBm—											
CE 2.402	GHz					1001 r	nts			Sna	n 2.0 MHz
Markor											
Tyne R	ef   Tr	r	X-value	<u>ا</u> د	Y-1	value	Euno	tion	Euno	tion Result	. 1
M1		1	2.4	O3 GHz	-4	8.89 dBm	1 4110		- dife		
T1		1	2.401432	57 GHz	-2	2.76 dBm	0	cc Bw		1.1528	47153 MHz
T2		1	2.402585	41 GHz	-2	25.12 dBm					
	1							io adu		4.00	04.04.2023
										and the second s	

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## -20dB Bandwidth NVNT 3-DH1 2402MHz Ant1

Spect	rum									
Ref L	evel	20.00 dBm	Offset 7	.62 dB 😑 F	<b>RBW</b> 30 kH	z				
🖷 Att		30 dB	SWT 6	3.3 µs 👄 ۷	/BW 100 kH	z Mode /	Auto FFT			
SGL Co	ount 1	00/100								
⊖1Pk M	ax .									
						M	1[1]			-6.35 dBm
10 dBm	$\rightarrow$						0[1]		2.402	200400 GHz
						191	2[1]		2 401	41600 CHz
0 dBm-					M	1			2.101	1000 012
10 10-						K.				
-10 aBn					$\sim$	m				
-20 dBm	n		m	~~~ \/	~			m		
			Y					1 2	MB V	
-30 dBn	n-+-								h	
-40 dBn	n									
-50 dBr	~~h	1								$\wedge$
	, . 	·							Ĭ	$\sim$
-60 dBm	n									
-70 dBr	n									
CF 2.4	02 GH	lz			1001	pts			Spa	n 2.0 MHz
Marker										
Туре	Ref	Trc	X-value		Y-value	Func	tion	Fund	ction Result	t l
M1		1	2.40200	)4 GHz	-6.35 dB	m				
M2 M2		1	2.40141	ID GHZ	-25.71 dB	m				
. 1913			2.40202		-20.29 UB					J
		Д				R			1,70	19404-2028

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#### OBW NVNT 3-DH1 2441MHz Ant1

Spect	rum										
Ref L	evel	20.00 dBm	Offset 7	7.78 dB 🏾	■ RBW	30 kHz					
Att		30 dB	SWT 6	53.3 µs 🧉	<b>VBW</b> 1	.00 kHz	Mode /	Auto FFT			
SGL Co	ount 1	.00/100									
⊖1Pk M	ax										
							M	1[1]		-	47.27 dBm
10 dBm	_				_					2.442	00000 GHz
			Occ Bw 1.142857143 MHz								
0 dBm-	_				_						
-10 dBn	n-+-			h -	-H		$\sim \sim$				
			TI	$\sim$	∽r ĭ			$n \sim$	V ~~ T	2	
-20 dBn	n+		7					- V	- Y - ~	۴	
		~								~	
-30 dBn	n-+-	- [~~									
10 10											
-40 aBn											
bo do	$\sim$	~								ا د	~ \ ~
-30/801	"										<u> </u>
-60 dBo											
00 001	"										
-70 dBn	n										
/0 000	.										
05.0.4						1001					
CF 2.4	41 GF	IZ				1001 pt	s			spa	n 2.0 MHZ
Marker							_				
Туре	Ref	Trc	X-value	2001	Y-va	lue	Func	tion	Fund	tion Result	
M1 T1		1	2.4		-47.	27 aBm	~	00 BW		1 1400	57142 MU-
T2		1	2.44159	74 GHz	-20.	23 dBm	0			1.1428	57145 MH2
			2.44139		-21	25 0011					
		Л					F			440	1981982028

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#### -20dB Bandwidth NVNT 3-DH1 2441MHz Ant1



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#### OBW NVNT 3-DH1 2480MHz Ant1



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#### -20dB Bandwidth NVNT 3-DH1 2480MHz Ant1



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# 4.3 Maximum Conducted Output Power

Test Requirement:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test Limit:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
Test Method:	Output power test procedure for frequency-hopping spread-spectrum (FHSS) devices
Procedure:	<ul> <li>This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test: <ul> <li>a) Use the following spectrum analyzer settings:</li> <li>1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.</li> <li>2) RBW &gt; 20 dB bandwidth of the emission being measured.</li> <li>3) VBW &gt;= RBW.</li> <li>4) Sweep: Auto.</li> <li>5) Detector function: Peak.</li> <li>6) Trace: Max hold.</li> <li>b) Allow trace to stabilize.</li> <li>c) Use the marker-to-peak function to set the marker to the peak of the emission.</li> <li>d) The indicated level is the peak output power, after any corrections for external attenuators and cables.</li> <li>e) A plot of the test results and setup description shall be included in the test report.</li> <li>NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.</li> </ul> </li> </ul>

## 4.3.1 E.U.T. Operation:

Operating Environment:								
Temperature:	С	Humidity:	54.2 %	Atmospheric Pressure:	101.6 kPa			
Pre test mode: TX-GFSK(hopping off), TX-Pi/4DQPSK (hopping off), TX-8DPS						SK (hopping off)		
Final test mode: TX-GFSK(hopping off), TX-Pi/4DQPSK (hopping off), TX-8DPSK (hopping off)								

# 4.3.2 Test Setup Diagram:



# 4.3.3 Test Result:

Condition	Mode	Frequency	Antenna	Conducted Power	Duty Factor	Limit	Verdict
		(MHz)		(dBm)	(dB)	(dBm)	
NVNT	1-DH1	2402	Ant1	-3.825	0	21	Pass
NVNT	1-DH1	2441	Ant1	-2.596	0	21	Pass
NVNT	1-DH1	2480	Ant1	-0.847	0	21	Pass
NVNT	1-DH3	2441	Ant1	-2.493	0	21	Pass
NVNT	1-DH5	2441	Ant1	-2.537	0	21	Pass
NVNT	2-DH1	2402	Ant1	-3.389	0	21	Pass
NVNT	2-DH1	2441	Ant1	-2.363	0	21	Pass
NVNT	2-DH1	2480	Ant1	-0.377	0	21	Pass
NVNT	2-DH3	2441	Ant1	-1.986	0	21	Pass
NVNT	2-DH5	2441	Ant1	-1.912	0	21	Pass
NVNT	3-DH1	2402	Ant1	-3.11	0	21	Pass
NVNT	3-DH1	2441	Ant1	-2.149	0	21	Pass
NVNT	3-DH1	2480	Ant1	-0.325	0	21	Pass
NVNT	3-DH3	2441	Ant1	-1.84	0	21	Pass
NVNT	3-DH5	2441	Ant1	-1.657	0	21	Pass

# 4.4 Channel Separation

Test Requirement:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band 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 the systems operate with an output power no greater than 125 mW.
Test Limit:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band 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 the systems operate with an output power no greater than 125 mW.
Test Method:	Carrier frequency separation
Procedure:	<ul> <li>The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:</li> <li>a) Span: Wide enough to capture the peaks of two adjacent channels.</li> <li>b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.</li> <li>c) Video (or average) bandwidth (VBW) ≥ RBW.</li> <li>d) Sweep: Auto.</li> <li>e) Detector function: Peak.</li> <li>f) Trace: Max hold.</li> <li>g) Allow the trace to stabilize.</li> <li>Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.</li> </ul>

# 4.4.1 E.U.T. Operation:

Operating Environment:								
Temperature:	23.8 °	C	Humidity:	54.2 %	Atmospheric Pressure:	101.6 kPa		
Pre test mode:		TX-GF	SK(hopping	on), TX-Pi/4DQ	PSK (hopping on), TX-8DF	SK (hopping on)		
Final test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPSK (hopping on)								

# 4.4.2 Test Setup Diagram:



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### 4.4.3 Test Result:

Condition	Mode	Antenna	Hopping	Hopping Freq2	HFS	Limit	Verdict
			Freq1 (MHz)	(MHz)	(MHz)	(MHz)	
NVNT	1-DH1	Ant1	2441.01	2442.011	1.001	0.884	Pass
NVNT	2-DH1	Ant1	2440.848	2441.848	1	0.824	Pass
NVNT	3-DH1	Ant1	2440.848	2441.848	1	0.805	Pass



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#### CFS NVNT 2-DH1 2441MHz Ant1

Spectrur	n 📔								
Ref Leve	1 20.00 dt	3m Offset	7.78 dB (	BRBW 30 kH	z				
🗎 Att	30	dB SWT	63.3 µs (	VBW 100 kH	z Mode /	Auto FFT			
⊖1Pk Max									
					M	1[1]			-4.06 dBm
10 dBm-								2.440	84800 GHz
10 000					M	2[1]			-4.00 dBm
0 dBm	M1					M2	1	2.441	84800 GHZ
	Ň					Ā			
~		$\nabla$	$\sim$	$\sim$	$\sim\sim$		$\nabla$		$\sim$
-20 dBm—									
-30 dBm									
-40 dBm—									
-50 dBm—									
-60 dBm									
-70 dBm—									
CE 2 4415	CH7			1001	nts			Sna	n 2 0 MHz
Markor				1001	pes			004	12.0 0012
	f	X-value	e	Y-value	Eunc	tion	Fund	tion Result	1
M1	1	2.4408	48 GHz	-4.06 dB	m		1 dite		
M2	1	2.4418	48 GHz	-4.00 dB	m				
	)[				Mea	suring		4,70	4.04.2023

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## CFS NVNT 3-DH1 2441MHz Ant1

Spectrum Ref Level 20.00 dBm Offset 7.78 dB Att 30 dB SWT 63.3 µs 1Pk Max	RBW 30 kHz     VBW 100 kHz     Mode Auto FFT     M1[1]	-4.00 dBm
Ref Level         20.00         dBm         Offset         7.78         dB           ● Att         30 dB         SWT         63.3 μs           ● 1Pk Max	RBW 30 kHz     VBW 100 kHz     Mode Auto FFT     M1[1]	-4.00 dBm
Att 30 dB SWT 63.3 μs     1Pk Max	VBW 100 kHz Mode Auto FFT      M1[1]	-4.00 d9m
●1Pk Max	M1[1]	-4.00 dBm
	M1[1]	-4.00 dBm
		2.44084800 GHz
10 dBm	M2[1]	-3.95 dBm
		2.44184800 GHz
0 dBm M1		
-10 dBm		
-20 dBm	v v -	
-30 dBm		
-So dbin		
-40 dBm		
-40 dBill		
-50 dBm		
-60 dBm		
-70 dBm		
CF 2.4415 GHz	1001 pts	Span 2.0 MHz
Marker	•	·
Type Ref Trc X-value	Y-value Function	Function Result
M1 1 2.440848 GHz	-4.00 dBm	
M2 1 2.441848 GHz	-3.95 dBm	
	Measuring	04.04.2023

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# 4.5 Number of Hopping Frequencies

Test Requirement:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Limit:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	Number of hopping frequencies
Procedure:	<ul> <li>The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:</li> <li>a) Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.</li> <li>b) RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.</li> <li>c) VBW ≥ RBW.</li> <li>d) Sweep: Auto.</li> <li>e) Detector function: Peak.</li> <li>f) Trace: Max hold.</li> <li>g) Allow the trace to stabilize.</li> <li>It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.</li> </ul>

# 4.5.1 E.U.T. Operation:

Operating Environment:									
Temperature:	23.8 °	С	Humidity:	54.2 %	Atmospheric Pressure:	101.6 kPa			
Pre test mode:		TX-GF	PSK (hopping on), TX-8DF	PSK (hopping on)					
Final test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPSK (hopping on)									

## 4.5.2 Test Setup Diagram:



## 4.5.3 Test Result:

Condition	Mode	Antenna	Hopping Number	Limit	Verdict
NVNT	1-DH1	Ant1	79	15	Pass
NVNT	2-DH1	Ant1	79	15	Pass
NVNT	3-DH1	Ant1	79	15	Pass
	Honning			nt1	



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### Hopping No. NVNT 2-DH1 2441MHz Ant1

Spect	rum	ı ]											(	₩)
Ref L	evel	20.00 dBn	n Offset 7	7.78 dB	● RBV	<b>V</b> 100 kH	z						`	
Att		30 dB	B SWT 9	94.8 µs	■ VBV	₩ 300 kH	Z	Mode /	Auto FF	Т				_
⊖1Pk M	lax													
								M	1[1]			_	-3.81 d	Bm
10 dBm												2.4	018370 (	GHZ
								IVI.	2[1]			2.4	-4.74 u 804105 (	GHz
0/dBm-					_							2.1	- A AM	2
<u>I</u> VVV	111	MAAAAA	MAMMAN	NUM	MAN	MMM	M	hhhh	MW	W	MANN	MMM	MWY	ī.
-16.080	"	<b>.</b>	1											
20 dag			]											
-20 0611	"													
-80 dBr	n—													
00 0.0.11	.													
40 dBm	n—													Щ
V														ha
-50 dBr	n—				_									_
-60 dBr	n—												-	_
														_ I
-70 dBn	n—				+									_
														_ I
Start 2	2.4 G	Hz				1001	pts					Stop 2	2.4835 GI	Hz
Marker														$\neg$
Туре	Ret	f Trc	X-value	9	Y	-value		Func	tion		Fund	tion Resu	lt	
M1		1	2.4018	37 GHz		-3.81 dB	m							_
<u>[ M2</u> ]		1	2.48041	05 GHz		-4.74 dB	m							
		Л						Mea	suring.	1		1,10	04.04.2023	

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## Hopping No. NVNT 3-DH1 2441MHz Ant1

			riopp	ing it	0.144				1270101			_
Spect	rum										(	₽
Ref L	evel	20.00 dBm	Offset	7.78 dB (	● RBW	100 kHz					`	
Att 🗧		30 dB	SWT	94.8 µs (	VBW	300 kHz	Mode /	Auto FFT				
😑 1Pk M	ax											
							M	1[1]			-3.42 d	lBm
10 dBm										2.40	18370 0	GHz
TO UDIII							M	2[1]			-5.16 d	Bm
Man								I	1	2.48	04105 0	GHZ
	6.6.6.K	6.668.1.46	NBBARNE	AL AL NA	k K K K K K	KRANN	кккурьь.	<u>ት የየየለ</u> ከ	ለከክ እለለ ከስ እ	. ስለስስስ በእ	ሐስ ሌለ ሰንጅ	2
	WU	NNNNI	MARANARA	AVAAN	NAUAN	JAMAA	MADANA	1445441	เป็นใส่งใงบิญ	ปกลงการการ	0.01.000	
-20 000	" [`	· •				•		ř.		4	1 1	
-20 dBn												
	·											
-80 dBr	1											
00 0.0.11	·											
-40 dBm	n											И.,
V	·											՟ฃկ
-50 dBr	n											
00 401	·											
-60 dBm	n——				_							
-70 dBm	n——											
Start 2	.4 GH	IZ				1001	pts			Stop 2	.4835 GI	HZ
Marker		1 = 1					1 -					
Type	Ref	Trc	X-value	37.045	Y-1	value	Func	tion	Fun	ction Result		
M2		1	2.48041	05 GHZ		-5.16 dBr	n					
		1 4	2.40041			0.10 001			-		04 04 2022	_
		Л					Mea			1,70	0440442023	

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4.6 Dwell Time	
Test Requirement:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Limit:	Fequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Method:	Time of occupancy (dwell time)
Procedure:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Zero span, centered on a hopping channel. b) RBW shall be <= channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel. c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel. d) Detector function: Peak. e) Trace: Max hold. Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. Determine the number of hops over the sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation: (Number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time) The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation. The measured transmit time and time between hops shall be consistent with the values described in the operational description for the EUT.

## 4.6.1 E.U.T. Operation:

Operating Envir	onmen	t:								
Temperature:23.8 °CHumidity:54.2 %Atmospheric Pressure:101.6 kPa										
Pre test mode:		TX-GF	SK(hopping	on), TX-Pi/4DQ	PSK (hopping on), TX-8DF	SK (hopping on)				
Final test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPSK (hopping on)										

# 4.6.2 Test Setup Diagram:



#### 4.6.3 Test Result:

Condition	Mode	Frequency	Antenna	Pulse	Total Dwell	Period	Limit	Verdict
		(MHz)		Time (ms)	Time (ms)	Time (ms)	(ms)	
NVNT	1-DH1	2441	Ant1	0.376	120.320	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.631	260.960	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.879	307.093	31600	400	Pass
NVNT	2-DH1	2441	Ant1	0.385	123.200	31600	400	Pass
NVNT	2-DH3	2441	Ant1	1.637	261.920	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.878	306.987	31600	400	Pass
NVNT	3-DH1	2441	Ant1	0.387	123.840	31600	400	Pass
NVNT	3-DH3	2441	Ant1	1.637	261.920	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.886	307.840	31600	400	Pass



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### Dwell NVNT 1-DH1 2441MHz Ant1 Accumulated



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#### Dwell NVNT 1-DH3 2441MHz Ant1 One Burst

Spect	rum												
Ref Le	vel 2	0.00 dBm	Offset 7	.78 dB	e RB	W 1 MHz							
Att		30 dE	e swt	10 ms	e vb	W 3 MHz							
SGL TF	RG: VIE	)											
⊖1Pk Cl	rw												
								M	1[1]				-2.90 dBm
10 dBm	$\rightarrow$							D1	111			0.0	2 000000000 85 06 0
												1	.631000 ms
0 dBm-	MI		D1		-								
10.10			I T										
-111 aBn	Т	RG -11.3	D0 dBm										
-20 dBm	<u> </u>												
-30 dBm	י—ר				_								
Here Hald	anna		1.11	والاستان	وللاوراف	e na denicia de la	a.t	الأراب المتلاط والمعا	يبدد أالبة الار	المان	ana Lista.	والريسانين والا	techdati bi datteri adhea.
di i si si si				ang si sa sa	1.1.1		h a th	1.000.000					al a serie de la constante de La constante de la constante de
-Fini den	<u>[5]</u>		a Val	il di alti di	, March	di dadhiduda	Aliel	AND IN THE	بالأرابية بالا	tzluhi.	i, la Milan, Mila Mali	haladd da laite	ohila kalik italimpa ir ja
dalap.	· · ·			1.1.24	"   ·	- 11 I			Ref. of		11 N. 1	10.000	· 1º 1
-60 dBr	∩												
-70 dBr	+-י		+										
CF 2.4	41 G⊦	lz				1000	1 pt	ts					1.0 ms/
Marker													
Туре	Ref	Trc	X-value		۱	/-value		Funct	tion		Fun	ction Resu	lt 🔤
M1	641	1	1.	0.0 s		-2.90 dE	-m						
	IMI T		1.0	STUR		0.00	1B			_			
								R				100	0970972023

Date: 4.APR.2023 15:26:45

### Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated



Date: 4.APR.2023 15:27:19

#### Dwell NVNT 1-DH5 2441MHz Ant1 One Burst

Spect	rum	J											
Ref Le	vel 2	:0.00 d	Bm Offset 7	7.78 dB (	● R	BW 1 MHz							
Att		30	dB 👄 SWT	10 ms (	• Y	BW 3 MHz							
SGL TR	G:VID	)											
O IPK CI	rw												10.71 dDm
								IVI.	1[1]			-	-5.000 us
10 dBm·	-							D	[1]				-1.77 dB
0 -10												2.	879000 ms
о авт—													
-10 dBm	Mi	DC 11	200 d0 m										
	h		ul naulta undul lam	փու տվա	Щ. ЦЦ								
-20 dBm	ι <u> </u>				_								
-30 dBm	۱ <del></del>												
بالهرك وال	grili					فنغط وفرقا وارو	had	lihin di Lihin	<b>Weath</b>	a anti-	والدائي المالي اداريه	dista lide di brandari	we had a state
la di a	a tal					الدين مناريب الله بر مناريب	. a	. no alla	الد سالي		hila taile and	and a later of the later	and and a
-50 авн	<u>, 11</u>				_1	CALCULATION OF	11	ada. Childell		16,40	a de la constante de la constan	A CONTRACTOR OF A CONTRACTOR A CONTRACTOR A CON	an <sup>b</sup> hailt tha an a
1.11													
-60 dBm	۱ <del></del>												
-70 dBm	)												
CF 2.44	41 G⊦	lz				1000	1 pt	s					1.0 ms/
Marker	- (	I											
M1	Ref	1	X-value	5.0 us		-12.71 dB	m	Func	tion		Func	tion Result	
D1	M1	1	2.0	379 ms		-1.77 c	IB						
		1			-			) R	eady	1		100	4.04.2023

Date: 4.APR.2023 15:27:56

### Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated



Date: 4.APR.2023 15:28:30

#### Dwell NVNT 2-DH1 2441MHz Ant1 One Burst

Specti	rum	J								
Ref Le	vel 2	0.00 dB	m Offset 7	7.78 dB 🧉	RBW 1 MHz					
Att		30 (	dB 👄 SWT	10 ms 🖷	VBW 3 MHz					
SGL TR	G: VIE	)								
O 1PK Ch	rw									0.07.40
						IVI	1[1]		0.00	-2.27 aBm
10 dBm-	+					D	1[1]		0.00	-2.72 dB
	M1									385.000 µs
U aBm—	-	1								
-10 dBm		1								
	"	RG -10.	900 dBm							
-20 dBm	<u> </u>	_								
🔥 30 dBm	ι <del></del>				_					
lis ablas	n na li	والالبر	adulta wite standel are doube	د الدهالييان	فأدرهم ورزية لأبقر ومؤلاويل	the state of the least sector	الاعمادي وفلهنا	والأناب ومعاور	والطط المحدة الردار	la contrada de
			e a buildea.	an In	l talt a cat d	dia ang		i lini ta h		
-solideric		- ting	( L), III, LHAAAAA	IN MARKEN	en dan andara dan dan dan dan sebelah d	a il da to statis		rainet in the se	d shulling of the state	hill in shi kiloh
		1.1	1 1 . 11	r 11		4. 6.	1 · · ·	"	1 I I	The second
-60 dBm	<u>ا</u> ل-۱			-						
-70 dBm	<del>ا ا</del> ۱									
CF 2.44	41 G⊦	lz			1000	1 pts				1.0 ms/
Marker										
Type	Ref	Trc	X-value		Y-value	Func	tion	Fund	ction Result	
D1	M1	1	38	0.0 S	-2.27 dB	in iB				
<u> </u>		) <u>-</u>			2.1.2.3		han a start a s	(11111111)	4.961	4.04.2023

Date: 4.APR.2023 15:39:10

### Dwell NVNT 2-DH1 2441MHz Ant1 Accumulated



Date: 4.APR.2023 15:39:45

#### Dwell NVNT 2-DH3 2441MHz Ant1 One Burst

Spect	rum										
Ref Le	vel 2	20.00 dBr	n Offset	7.78 dB	RBW 1	MHz					
Att		30 d	B 👄 SWT	10 ms	<b>ө үвж</b> з	MHz					
SGL TR	RG: VI	D									
O IRM C	irw						M	1[1]			-0.52 dBm
								1[1]		0.00	-9.32 uBm
10 dBm·	-						D	[1]			3.88 dB
0 dBm										1.	637000 ms
U UBIII-	MI		<b>1</b>								
-10 dBm	1	PC 11.7									
	''	RG -11.7									
-20 dBm											
00 d0-											
-30 aBm	רי										
440HBh	uulu			whether the	Helder Har	Blass and	ala di Unata	all the large of		h h mail unit	Hanth Installer
in the second				a se and a	na i l'a contrata na	a secondaria	na telar di.	en en tiken sterke	and a second of a second s	density of the first starts	die turnelass also
, Stational	14th			i makin bi	haithirdi a i	<b>Philippe</b>		in sei di Almand	ita da Ministria di s	rkhablimahaata	
1.0.1	1.1			a di di	h i h am h	. <b>ф</b> . 1	en tulo	her over de se	. I I . I .	and and	the constant of
-60 dBm	די										
-70 dBm	<u> </u>										
CE 2 44	41 CF	-17				10001 n	ts				10ms/
Marker	11 01	12									1.0 /1137
Type	Ref	Trc	X-valı	ie	Y-val	ue	Func	tion	Fund	tion Result	1
M1		1		0.0 s	-9.1	52 dBm					
D1	M1	1	1	.637 ms	3	3.88 dB					
							R	eady		100	14.04.2023

Date: 4.APR.2023 15:44:09



Dwell NVNT 2-DH3 2441MHz Ant1 Accumulated

Date: 4.APR.2023 15:44:43



Specti	rum												
Ref Le	vel	20.00 dBr	m Offset 7	.78 dB	📄 R	BW 1 MHz							
Att		30 d	B 👄 SWT	10 ms	• •	BW 3 MHz							
SGL TR	G:VI	ID											
⊖1Rm C	lrw												
								M	1[1]			-	16.62 dBm
10 dBm·								D:					137.000 µs
									.[]			2.	878000 ms
0 dBm—	-+												
-10 dBm		TRG -11.8	300 dBm										
-20 dBm		latanahira a	nesson and a ton as de	ntas articidad da	1 1								
20 0.011	רח י	a a cot fire a c	and the second filter of each	the secondary	1								
-30 dBm	<b>۱</b>				-								
									Ι.				
<sub>ማ</sub> ትወ <sup>4</sup> ძዳወ	1+++				1		H۲.	is the late	r dugbat	di tau	ille the tetre plantation of		and a primition
· · · · ·						an a				l		n an	and the second
1. Horn					лıн	البيبية الإلابية البراي	h h	d <u>a de loca</u> ti	in in the	iήή		Les ball de la company de l	and the part of the
-60 dBm	Ľ						1.	ч.				' I	
-00 001	'												
-70 dBm	<b>∖</b>												
CF 2.44	41 G	Hz				1000	1 p†	ts					1.0 ms/
Marker							<u> </u>						
Туре	Ref	Trc	X-value			Y-value		Fund	tion		Fund	tion Result	
M1		1	-13	7.0 µs		-16.62 dB	m						
D1	M:	1 1	2.8	878 ms		-1.07 c	JВ						
		][						R	e a d y			4/4	14.04.2023

Date: 4.APR.2023 15:45:11





Date: 4.APR.2023 15:45:45

#### Dwell NVNT 3-DH1 2441MHz Ant1 One Burst

Spect	rum	ſ								
Ref Le	vel 2	20.00 de	3m Offset 7	.78 dB 😑	RBW 1 MHz					
Att		30	dB 👄 SWT	10 ms 👄	VBW 3 MHz					
SGL TR	RG: VI	D								
⊖1Pk Cl	lrw									
							M1[1]			-4.74 dBm
10 dBm	$\rightarrow$				_		01[1]		0.00	-5 57 dB
							1[1]			387.000 us
0 dBm-		10					+			
	T									
10 dBn	nT	RGA-10	.500 dBm							
-20 dBn	n									
20 001										
-30 dBn	n									
anthus.			an anna thair	du. La	الاستان المالية	las atticas contra	المتعالم المراجد	1. And the	and a settion	and the second
. It of a matche			nada secoi.a.dibio	WI DAWARA	il de la construction de la constru La construction de la construction d	and different	i "Uli i Año, ive	an an index is a second second	in he abride na sie he	all addresses the A
t hàn diad	L MAL	hlle	nin talah dalaman	All man ab	AND ALIA DU LADER	ii. Ir. In the state of the sta	uku, kéloné ka	ditand links in the	aa dah ka dahihi	a kana kita ana bi
t-stridel	<b>n</b> -+			an he	- In a flore -	- <b>4</b> 1-1 - 10-11		a a a a a a a a a a a a a a a a a a a	- <u>Ultanin (</u>	
-60 dBn	∩		· · ·				<u> </u>			1.1
00 0.0.1	.									
-70 dBn	n-+-						+			
CF 2.4	41 Gł	Ηz	1	l	1000	1 pts		1		1.0 ms/
Marker										
Туре	Ref	Trc	X-value		Y-value	Fun	ction	Fui	nction Result	
M1		1		0.0 s	-4.74 dB	m				
	M1	.  1	38	7.0 µs	-5.57 (	18				
		T					Ready		120	04.04.2023

Date: 4.APR.2023 16:03:07

### Dwell NVNT 3-DH1 2441MHz Ant1 Accumulated



Date: 4.APR.2023 16:03:41

#### Dwell NVNT 3-DH3 2441MHz Ant1 One Burst

Spect	rum												
Ref Le	vel 2	20.00 dBm	Offset 7	.78 dB	● RBV	/ 1 MHz							
Att		30 dB	👄 SWT	10 ms	● VBV	🛿 3 MHz							
SGL TR	G:VI	D											
● 1PK CI	rw		1										6 4 4 JD
								M	1[1]			0.00	-6.11 dBm
10 dBm	+							D1	111			0.00	-2.30 dB
												1.	637000 ms
0 dBm-	M	of program in the second											
10 dBm													
10 000	ידי	RG -10.5											
-20 dBm	<u>ا</u> ـــــ												
-30 dBm	ι <u> </u>				i de la composition de	ակարողությ	-						
iku a husud	and a		1 Law	ah al la	ad Abh.	h debuilts has	h.UA	لطالب لله أبر	n data da da da	L.L	Minute Instance and	وللالة، وول وهو وور وو	والمعادية فلابته والا
a natar				11 I I I I I I I I I I I I I I I I I I		the defines	HT 11	a shuli e s		. 14	n ea natient fa	a maa al Aliaa	
加加加	444		Ling .	AL AND	·		ų.	un ala initi n	literina (	14 14	i Marka di Singka	بالربا الماليط زاله	il Marinda (Julia) Kat
00 00			1 1"	- P							. at the	n	1 - 1º F
-60 dBrr	∩												
-70 dBm	۱ <del>-  </del>												
CF 2.4	41 GI	lz				1000	L pt	ts					1.0 ms/
Marker													
Туре	Ref	Trc	X-value	,	Y	value		Funct	tion		Fund	tion Result	
M1	M1	1	1.	0.0 s		-6.11 dB	m ID						
	1 1 1		1.0	537 IIIS		-2.301	0	<u> </u>					4.04.2022
								R				1/1	1980982025

Date: 4.APR.2023 16:05:45

### Dwell NVNT 3-DH3 2441MHz Ant1 Accumulated



Date: 4.APR.2023 16:06:19

#### Dwell NVNT 3-DH5 2441MHz Ant1 One Burst

Spect	rum	J											
Ref Le	vel 2	20.00 dB	m Offset 7	.78 dB (	● R	BW 1 MHz							
Att		30 c	ib 👄 SWT	10 ms (	• Y	BW 3 MHz							
SGL TR	G: VII	0											
⊖1Rm C	lrw												
								M	1[1]				15.67 dBm
10 dBm	$\rightarrow$							D1	111				-30.000 µs
												2.	886000 ms
0 dBm—	-+												
-10 dBm	Junda	RG -11.	900 dBm	<u>di si di si si</u>	<u>.</u>								
-20 dBr		alit i dua	hostan natali i	dall to a									
-20 ubii	' <b>Г</b> '	. I alla I. I	अग्रेम । आगम् । का	n   Julii	1								
-30 dBm	<b>_</b>												
-AG HBM	1 <del></del>						Map	ula la di	http://	un di bi	the state of the s		inter it des inter al teste
						Weiter in die						eptiere e	
A SAME BARL	1440				-		dili.	, and the late	i ti ti	t, it shiti	iti ku ju ini iti	anin dalah se	i i si
[ [						a Hhra	r P	or total ac	чµ.	11.1	The second	and the	1.1 here
-60 dBm	די י												
70 dBm													
-70 UBII	'												
CF 2.4	41 GH	1Z				1000	ı pt	15					1.0 ms/
Marker	Def	Tun	¥	1		M. unline	-	<b>F</b>	lan	1	<b>F</b>	tion Decolt	
M1	Ker	1	x-value	0.0.05		-15.67 dB	m	Funct	ion	_	Fund	alon Result	
D1	M1	1	2.8	86 ms		-2.49 0	1B						
		1			-			R	eady	1		100	4.04.2023

Date: 4.APR.2023 16:07:44



Dwell NVNT 3-DH5 2441MHz Ant1 Accumulated

Date: 4.APR.2023 16:08:18

4.7 Emissions in	n non-restricted frequency bands
Test Requirement:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Method:	Conducted spurious emissions test methodology
Procedure:	Conducted spurious emissions shall be measured for the transmit frequency, per 5.5 and 5.6, and at the maximum transmit powers. Connect the primary antenna port through an attenuator to the spectrum analyzer input; in the results, account for all losses between the unlicensed wireless device output and the spectrum analyzer. The instrument shall span 30 MHz to 10 times the operating frequency in GHz, with a resolution bandwidth of 100 kHz, video bandwidth of 300 kHz, and a coupled sweep time with a peak detector. The band 30 MHz to the highest frequency may be split into smaller spans, as long as the entire spectrum is covered.

## 4.7.1 E.U.T. Operation:

Operating Environment:										
Temperature:	perature: 23.8 °C Humidity: 54.2 % Atmospheric Pressure: 101.6 kPa									
Pre test mode: TX-GFSK(hopping off), TX-Pi/4DQPSK (hopping off), TX-8DPSK (hopping off)										
Final test mode: TX-GFSK(hopping off), TX-Pi/4DQPSK (hopping off), TX-8DPSK (hopping off)										

# 4.7.2 Test Setup Diagram:



## 4.7.3 Test Result:

Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission

Spect	rum										
Ref Le Att SGL C	e <b>vel</b> 2 ount 1	:0.00 c 30 .0/10	IBm Offset 7 dB SWT	265 ms 👄	RBW 100 kHz VBW 300 kHz	Mode	Auto Sw	/еер			
😑 1Pk M	lax										
10 dBm	M1					ח ח	41[1] 42[1]			2.4	-4.07 dBm 02070 GHz 37.39 dBm 90218 GHz
-10 dBr	n										
-20 dBr	nD	1 -24	.336 dBm M3 M4	M	5		M2				
-40 dBr	n 📙	والدائم ورارا	Love and the state of the state	in the sector of the sec	mar by the second second						
المعامية المحال المعامية مراجع	11	ال (مرسو <sub>لي</sub>	and the second	dana dalam							
-60 dBr	n						+				
-70 dBr	n-+						+				
Start 3	30.0 M	1Hz			30001	pts	_			Stop	26.5 GHz
Marker											
Туре	Ref	Trc	X-valu	e	Y-value	Fun	ction	1	Functio	n Result	
M1		1	2.40	207 GHz	-4.07 dBn	n					
M2		1	16.690	218 GHz	-37.39 dBr	n					
M3		1	4.994	007 GHz	-41.19 dBr	n					
M4		1	7.183	959 GHz	-41.87 dBr	n					
<u>M5</u>		1	9.707	+32 GHZ	-41.24 dBr	n					
		J					Ready			0	4.04.2023

Date: 4.APR.2023 14:23:37

			1.	Spunou	12 14			~	44110	11 12 7	<b>\</b>			
Spect	rum	J												
Ref Le	vel 2	0.00 d	lBm	Offset 7.	78 dB 🧉	RB	W 100 kHz							
Att 30 dB SWT 265 ms  VBW 300 kHz Mode Auto Sweep														
SGL Co	ount 1	0/10												
😑 1Pk M	ax													
		M1[1] -2.02 dB										-2.02 dBm		
10 dBm	$\rightarrow$		_										2.4	40900 GHz
	м1								M:	2[1]			-	36.71 dBm
0 dBm-	Ţ		-			_							15.1	99075 GHz
-10 dBa														
-10 UBI	'													
-20 dBn		1 00	500 4	0										
	T	1 -22.	508 u	BIII										
-30 dBn	n-++-								M2					
-40 dBn			мз	M4	N	45							an denated on the second	e e.d. e. rem. a.
- to abit	والملدين	La Manuella							a sub-	CH (Holl) Le	اليعيان	International Station	the Articles Street and	a Anna Anna (b
page 400	, <u>11 10 10 10 10 10 10 10 10 10 10 10 10 1</u>	and the second second	1. 1	1										
-60 dBn	n- -													
-70 dBn	n													
Start 3	<u>п.п м</u>	IHz					3000	1 nt	5				Ston	26.5 GHz
Marker	01010					_	0000				_		0101	2010 0112
Type	Ref			X-value		1	Y-value	1	Funct	ion	1	Fund	tion Result	1
M1	Roi	1		2.440	)9 GHz		-2.02 dB	m	- une			T diff.	scion result	
M2		1		15.19907	'5 GHz		-36.71 dB	m						
M3		1		4.74077	'8 GHz		-40.96 dB	m						
M4		1		7.1654	I3 GHz		-41.28 dB	m						
M5		1		9.85742	9 GHz		-40.64 dB	m						
									R	eady	1		4/4	14.04.2023

Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission

Date: 4.APR.2023 14:31:43

## Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Emission

Spect	rum											
Ref Level 20.00 dBm Offset 7.60 dB 🖷 RBW 100 kHz												
Att		30	dB SWT 2	65 ms 🧉	<b>VBW</b> 300 kHz	N	lode Au	uto Sw	еер			
SGL Co	ount 1	0/10										
● 1Pk Max												
		M1[1] -0.79 d										-0.79 dBm
10 dBm	$\rightarrow$										2.4	79720 GHz
	MI						M:	2[1]			-	·37.66 dBm
0 dBm-	- <u>T</u> -										6.9	88081 GHz
10 40-												
-10 aBn												
-20 dBn		1 -20.7	731 dBm									
		1 -20.7										
-30 dBm	n		M2									<u> </u>
10.10		1	M3 🛛 🛉 M4	N.	15			and the set	1			
-40 dBn		and an other Ass		والمالا والمالية بتريان	PARTY CAR SPACE AND AND	100		an ar a sugar Langung an an				
a destant		distant and the second second	Break and a second second second	and the second sec	and the second second second							
-60 dBr	n-+-											<u> </u>
70 40-												
-70 aBri												
Start 3	0.0 M	Hz			3000	1 pt	s				Stop	26.5 GHz
Marker												]
Туре	Ref	Trc	X-valu	9	Y-value		Funct	tion		Fund	ction Result	:
M1		1	2.479	72 GHz	-0.79 dB	m						
M2		1	6.9880	81 GHz	-37.66 dB	m						
M3		1	4.8669	51 GHZ	-41.26 dB	m						
M5		1	0.9956	63 GHZ	-41.10 GB	m						
		· ·	9.0030		-40.10 UB	101		_	_			
							R				DX0	0410412023

Date: 4.APR.2023 14:33:23



Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission

Date: 4.APR.2023 14:41:00