

RF REPORT

FCC ID: SY4-A02045

On Behalf of

Shanghai Huace Navigation Technology Ltd.

Geodetic GNSS Receiver

Model No.: i89

Prepared for Address	•	e Navigation Technology Ltd. Road, Qingpu District, 201706 Shanghai, China
Prepared By Address	•	a Product Testing Co., Ltd .2, Lixin Road, Fuyong Street, Bao'an District, 518103, ngdong, China
	Report Number Date of Receipt Date of Test Date of Report Version Number	 August 1, 2023 August 1, 2023 to August 30, 2023

ALPHA's reports is using a digital certificate that is trusted on Adobe's official server. If there is no digital certificate or the digital certificate shows damaged in your report. Please do not accept the report. E-mail: service@a-lab.cn Tel: 4008-3008-95Website:http://www.a-lab.cn

TABLE OF CONTENTS

Description

Page

1	Gene	ral Information	6
	1.1 1.2 1.3 1.4 1.5	Description of Device (EUT) Test Lab information Accessories of Device (EUT) Tested Supporting System Details Block Diagram of connection between EUT and simulators	6 6 6
2	Sumr	nary of test	7
	2.1 2.2 2.3 2.4 2.5	Test Standard description: Summary of test Test Mode Description Measurement Uncertainty (95% confidence levels, k=2) Test Equipment	7 8 8
3	Evalu	ation Results (Evaluation)1	10
	3.1	Antenna requirement 1 3.1.1 Conclusion:	
4	Radio	o Spectrum Matter Test Results (RF)	11
	4.1	Conducted Emission at AC power line	11
		 4.1.1 E.U.T. Operation:	11
	4.2	Occupied Bandwidth 1	14
		 4.2.1 E.U.T. Operation:	15
	4.3	Maximum Conducted Output Power	26
		4.3.1 E.U.T. Operation: 2 4.3.2 Test Setup Diagram: 2 4.3.3 Test Result: 2	27
	4.4	Channel Separation	28
		4.4.1 E.U.T. Operation: 2 4.4.2 Test Setup Diagram: 2 4.4.3 Test Result: 2	28 29
	4.5	Number of Hopping Frequencies	
		4.5.1 E.U.T. Operation: 3 4.5.2 Test Setup Diagram: 3 4.5.3 Test Result: 3	31
	4.6	Dwell Time	
		4.6.1 E.U.T. Operation: 3 4.6.2 Test Setup Diagram: 3 4.6.3 Test Result: 3	35
	4.7	Emissions in non-restricted frequency bands	
		4.7.1 E.U.T. Operation: 4 4.7.2 Test Setup Diagram: 4 4.7.3 Test Result: 4	47
	4.8	Band edge emissions (Radiated)	
		4.8.1 E.U.T. Operation: 5 4.8.2 Test Result: 5	

	4.9 I	Emissions in restricted frequency bands (below 1GHz)	
	4	4.9.1 E.U.T. Operation:	
	4	4.9.2 Test Result:	61
	4.10 I	Emissions in restricted frequency bands (above 1GHz)	63
	4	4.10.1 E.U.T. Operation:	
	4	4.10.2 Test Result:	
5	Test S	Setup Photos	
		Constructional Details (EUT Photos)	

TEST REPORT DECLARATION

Applicant :	Shanghai Huace Navigation Technology Ltd.
Address :	577 Songying Road, Qingpu District, 201706 Shanghai, China
Manufacturer :	Shanghai Huace Navigation Technology Ltd.
Address :	577 Songying Road, Qingpu District, 201706 Shanghai, China
EUT Description :	Geodetic GNSS Receiver
(A)	Model No. : i89

(B) Trademark



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.

Tested by (name + signature)

Yannis Wen Project Engineer

anniz wen

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

Date of issue: August 30, 2023

Revision History

Revision	Issue Date	Revisions	Revised By
V0	August 30, 2023	Initial released Issue	Yannis Wen

1 General Information

1.1 Description of Device (EUT)

Product Name	:	Geodetic GNSS Receiver	
Model Number	:	i89	
DIFF	: N/A		
Power Supply	:	DC 7.2V from battery, DC 5V from adapter	
Operation Frequency	:	2402MHz to 2480MHz	
Number of Channels	:	79	
Modulation Type	:	GFSK, π/4 DQPSK, 8DPSK	
Antenna Type	:	Internal antenna	
Antenna Gain	:	0dBi (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

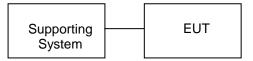
1.3 Accessories of Device (EUT)

:	C Adapter	
:	DACPOWER ELEC.	
:	EA1012AVRU-050	
Ratings AC Input: 100-240Vac, 1.0a 50-60Hz DC Output: 5.0V=2.4A 12.0W		
	:	

1.4 Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	Notebook PC	Lenovo	ThinkPad E14	N/A	N/A

1.5 Block Diagram of connection between EUT and simulators



The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

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	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		
GFSK / Pi/4-DQPSK / 8-DPSK	L: CH0	2402		
hopping off Tx Mode	M: CH39	2441		
	H: CH78	2480		

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

Item	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	5.06×10⁻8GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

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	2023.08.16	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2023.08.16	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03- 102082-Wa	2023.08.16	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2023.08.16	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2023.08.28	1Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2023.08.19	1Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.19	1Year
RF Cable	Resenberger	Cable 1	/	RE1	2023.08.16	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2023.08.16	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2023.08.16	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2023.08.16	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2023.08.16	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2023.08.16	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2023.08.16	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2023.08.19	1Year
Preamplifier	SKET	LNPA_1840 -50	/	SK2018101801	2023.08.16	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2023.08.16	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2023.08.16	1 Year
Temp. & Humid. Chamber	Teelong	TL-HW408S	/	TL-20191205-01	2023.07.25	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2023.08.16	1 Year
Adjustable attenuator	MWRFtest	N/A	/	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	/	N/A	N/A	N/A

2.5 Test Equipment

	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								

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.
-------------------	--

3.1.1 Conclusion:

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

4 Radio Spectrum Matter Test Results (RF)

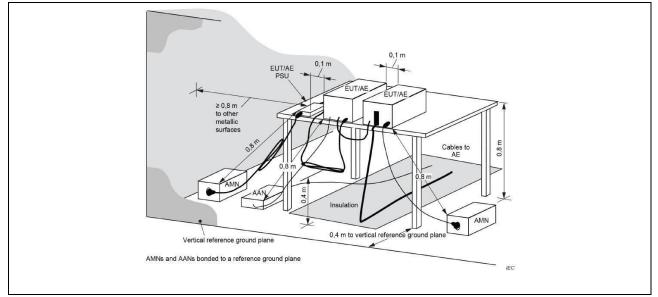
4.1 Conducted Emission at AC power line

Test Requirement:	Except as shown in paragraphs (b)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 μ H/50 ohms line impedance stabilization network (LISN).									
Test Limit:	Frequency of emission (MHz)	Conducted limit (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	*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:

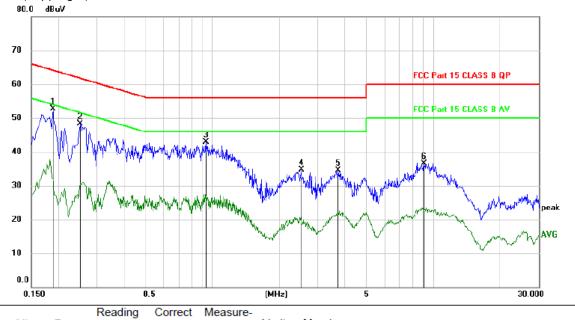
Operating Environment:										
Temperature:	Temperature:23.8 °CHumidity:54.2 %Atmospheric Pressure:101.6 kPa									
Pre test mode:	Pre test mode: All modes									
Final test mode: TX-GFSK (hopping off)										

4.1.2 Test Setup Diagram:



4.1.3 Test Result:

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

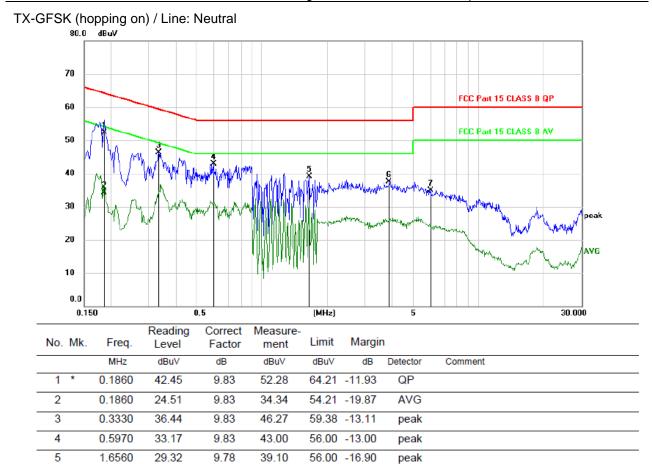


No. Mk.	Freq.	Level	Factor	ment	Limit	Margir	n	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1890	42.82	9.83	52.65	64.08	-11.43	peak	
2	0.2519	38.49	9.83	48.32	61.69	-13.37	peak	
3	0.9300	32.98	9.84	42.82	56.00	-13.18	peak	
4	2.5140	24.84	9.79	34.63	56.00	-21.37	peak	
5	3.7140	24.68	9.84	34.52	56.00	-21.48	peak	
6	9.0810	26.55	9.96	36.51	60.00	-23.49	peak	

*:Maximum data x:Over limit !:over margin

(Reference Only

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable



*:Maximum data x:Over limit !:over margin

27.65

25.02

9.84

9.91

37.49

34.93

6

7

3.8760

5.9970

(Reference Only

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

56.00 -18.51

60.00 -25.07

peak

peak

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

Occupied Bandwidth

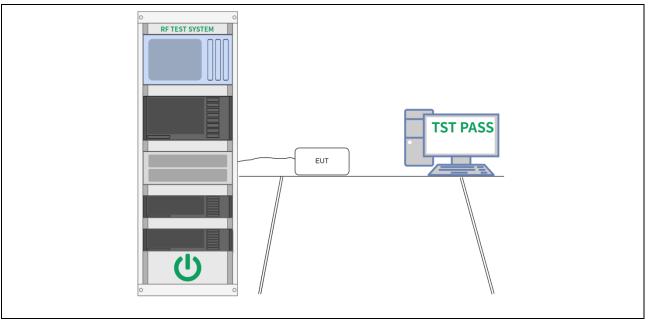
4.2

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 Test Requirement: 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. Occupied bandwidth—relative measurement procedure Test Method: Procedure: 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. 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. 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. d) Steps a) through c) might require iteration to adjust within the specified tolerances. 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. f) Set detection mode to peak and trace mode to max hold. 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). h) Determine the "-xx dB down amplitude" using [(reference value) - xx]. Alternatively, this calculation may be made by using the marker-delta function of the instrument. 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). 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 the marker is at or slightly below the "-xx dB down amplitude" determined in step h). Reset the marker-delta 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. 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).

4.2.1 E.U.T. Operation:

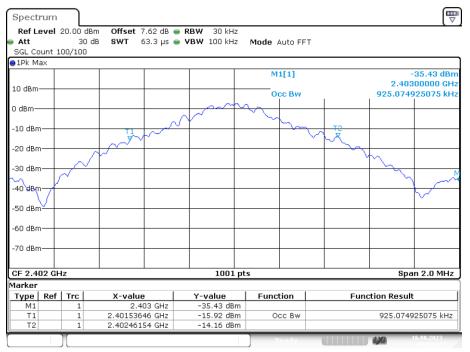
Operating Environment:										
Temperature:	Temperature:22.5 °CHumidity:51.5 %Atmospheric Pressure:102 kPa									
Pre test mode:	Pre test mode: TX-GFSK(hopping off), TX-Pi/4DQPSK (hopping off), TX-8DPSK (hopping off)									
Final test mode: TX-GFSK(hopping off), TX-Pi/4DQPSK (hopping off), TX-8DPSK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

4.2.2 Test Setup Diagram:



4.2.3 Test Result:

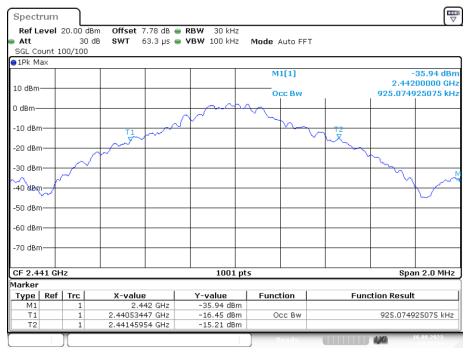
Condition	Mode	Frequency	Antenna	99%	-20 dB	Limit -20 dB	Verdict
		(MHz)		OBW	Bandwidth	Bandwidth (MHz)	
				(MHz)	(MHz)		
NVNT	1-DH1	2402	Ant 1	0.925	0.99	/	Pass
NVNT	1-DH1	2441	Ant 1	0.925	0.984	/	Pass
NVNT	1-DH1	2480	Ant 1	0.931	0.976	/	Pass
NVNT	2-DH1	2402	Ant 1	1.197	1.352	/	Pass
NVNT	2-DH1	2441	Ant 1	1.197	1.358	/	Pass
NVNT	2-DH1	2480	Ant 1	1.201	1.352	/	Pass
NVNT	3-DH1	2402	Ant 1	1.203	1.34	/	Pass
NVNT	3-DH1	2441	Ant 1	1.203	1.342	/	Pass
NVNT	3-DH1	2480	Ant 1	1.203	1.344	/	Pass



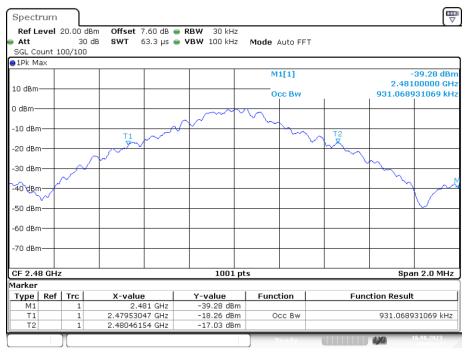
OBW NVNT 1-DH1 2402MHz Ant1

Date: 16.AUG.2023 06:54:12

OBW NVNT 1-DH1 2441MHz Ant1



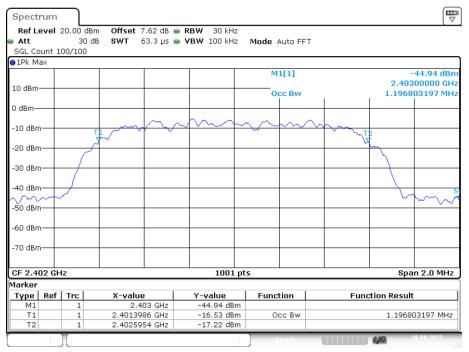
Date: 16.AUG.2023 07:00:55



OBW NVNT 1-DH1 2480MHz Ant1

Date: 16.AUG.2023 07:07:17

OBW NVNT 2-DH1 2402MHz Ant1



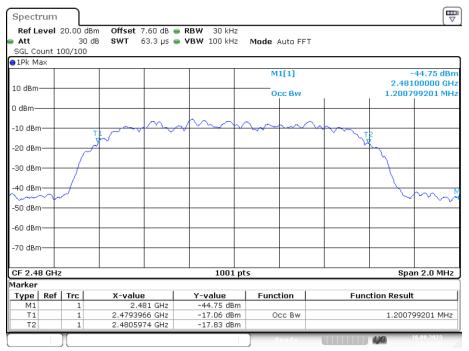
Date: 16.AUG.2023 10:07:36

Spectru	m					
Ref Leve Att SGL Coun	3	0 dB SWT 63.3	dB ● RBW 30 kHz µs ● VBW 100 kHz	Mode Auto FF1	-	
⊖1Pk Max						
10 dBm				M1[1]		-42.85 dBm 2.44200000 GHz
10 abiii				Occ Bw		1.196803197 MHz
0 dBm						
-10 dBm—			m	\sim		0
-20 dBm—		×			J.	Ę
-20 ubiii—	1					
-30 dBm—	+ /					
-40 dBm—						han
-50 dBm—						
50 abiii						
-60 dBm—						
-70 dBm—						
CF 2.441	GHZ		1001 p	ts		Span 2.0 MHz
Marker Type R	ef Trc	X-value	Y-value	Function	Eupo	ction Result
M1	1	2.442 G			- Tune	Alon Acount
Τ1	1	2.4403986 G				1.196803197 MHz
T2	1	2.4415954 G	Hz -16.89 dBm			
				Ready		16.08.2023

OBW NVNT 2-DH1 2441MHz Ant1

Date: 16.AUG.2023 10:10:58

OBW NVNT 2-DH1 2480MHz Ant1



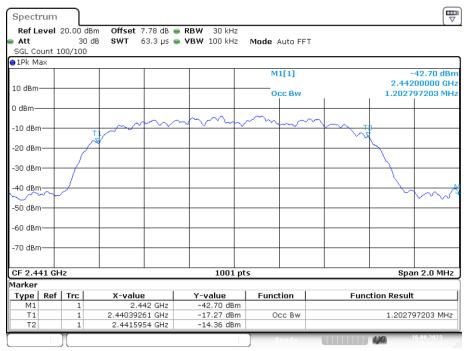
Date: 16.AUG.2023 10:12:19

10 dBm 0cc Bw 2.4030000 GHz 10 dBm 0cc Bw 1.202797203 MHz 0 dBm 0cc Bw 1.202797203 MHz -10 dBm -20 dBm -20 dBm -30 dBm -30 dBm -30 dBm -70 dBm -30 dBm -30 dBm	Spectrum	<u> </u>					
10 dBm M1[1] -45.53 dBm 10 dBm 0cc Bw 1.202797203 MHz 0 dBm 0cc Bw 1.202797203 MHz -10 dBm -20 dBm -40 dBm -20 dBm -30 dBm -40 dBm -30 dBm -40 dBm -40 dBm -50 dBm -50 dBm -50 dBm -50 dBm -50 dBm -50 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -71 1 2.403 GHz -45.53 dBm -71 1 2.40139261 GHz -18.58 dBm	Att	30	dB SWT 63.3 µs	-	Mode Auto FF	Г	
10 dBm 2.4030000 GHz 0 dBm 0cc Bw -10 dBm -10 dBm -20 dBm -10 dBm -30 dBm -10 dBm -30 dBm -10 dBm -30 dBm -10 dBm -20 dBm -10 dBm -20 dBm -10 dBm -20 dBm -10 dBm -30 dBm -10 dBm -30 dBm -10 dBm -30 dBm -10 dBm -20 dBm -10 dBm -30 dBm -10 dBm -20 dBm -10 dBm -30 dBm -10 dBm -20 dBm -10 dBm <td>●1Pk Max</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	●1Pk Max						
0 dBm -10 dBm -20 dBm -20 dBm -20 dBm -30 dBm -30 dBm -30 dBm -30 dBm -30 dBm -30 dBm -30 dBm -40 dBm -50 dBm -50 dBm -50 dBm -50 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -71 I 1 2.40139261 GHz -18.58 dBm -1.202797203 MHz	10 dBm						2.40300000 GHz
-20 dBm -30 dBm -30 dBm -40 dBm -50 dBm -50 dBm -50 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -71 1 2.4013 GHz -45.53 dBm -18.58 dBm -1.202797203 MHz -1.202797203 MHZ -1.202797	0 dBm				OLL BW	_	1.202797203 MHz
-20 dBm -30 dBm -30 dBm -40 dBm -50 dBm -50 dBm -50 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -71 1 2.4013 GHz -45.53 dBm -18.58 dBm -1.202797203 MHz -1.202797203 MHZ -1.202797					\sim	~	
-30 dBm -40 dBm -40 dBm -50 dBm -50 dBm -60 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -71 1 2.40139261 GHz -18.58 dBm -18.58 dBm Occ Bw 1.202797203 MHz	-10 dBm-				- vmz		
-30 dBm -40 dBm -40 dBm -50 dBm -50 dBm -60 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -70 dBm -71 1 2.40139261 GHz -18.58 dBm -18.58 dBm Occ Bw 1.202797203 MHz	-20 dBm		× –			~ ~ ~	
40 dBm -40 dBm	-20 00111	1					
-50 dBm -60 dBm -70	-30 dBm						
-50 dBm -60 dBm -70	40 40-						
-60 dBm60 dB	-40 aBm						
-70 dBm	-50 dBm-						
Type Ref Trc X-value Y-value Function Function Result M1 1 2.40139261 GHz -18.58 dBm Occ Bw 1.202797203 MHz							
CF 2.402 GHz 1001 pts Span 2.0 MHz Marker Youlue Function Function Result M1 1 2.40139261 GHz -45.53 dBm -18.58 dBm 0cc Bw 1.202797203 MHz	-60 dBm						
CF 2.402 GHz 1001 pts Span 2.0 MHz Marker Youlue Function Function Result M1 1 2.40139261 GHz -45.53 dBm -18.58 dBm 0cc Bw 1.202797203 MHz	-70 dBm						
Marker Yope Ref Trc X-value Y-value Function Function Result M1 1 2.403 GHz -45.53 dBm - </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
Marker Your State Your State Function Function Result M1 1 2.403 GHz -45.53 dBm	CF 2.402 G	Hz		1001 pt	s		Span 2.0 MHz
M1 1 2.403 GHz -45.53 dBm T1 1 2.40139261 GHz -18.58 dBm Occ Bw 1.202797203 MHz	Marker						
T1 1 2.40139261 GHz -18.58 dBm Occ Bw 1.202797203 MHz	Type Ref	Trc			Function	Fun	ction Result
					0		4 000707000 181-
		_			UCC BW		1.202797203 MHz
	1.6	7	211020904 0112	10.00 000	· · · · · ·		15.09.2022

OBW NVNT 3-DH1 2402MHz Ant1

Date: 16.AUG.2023 11:00:44

OBW NVNT 3-DH1 2441MHz Ant1



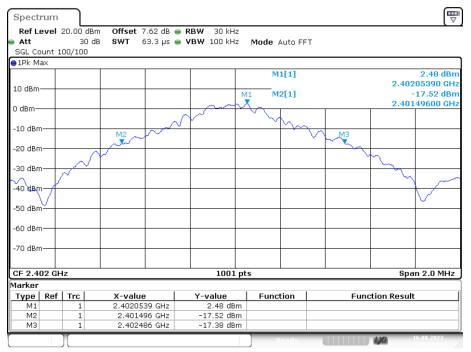
Date: 16.AUG.2023 11:05:22

OBW NVNT 3-DH1 2480MHz Ant1

Spectru	m						
	el 20.00		set 7.60 dB				
Att		30 dB SW	T 63.3 µs	• VBW 100 kHz	Mode Auto FF	т	
SGL Cour	nt 100/10	10					
⊖1Pk Max							
					M1[1]		-42.91 dBm 2.48100000 GHz
10 dBm—					Occ Bw		1.202797203 MHz
0 dBm							
U UBIII							
-10 dBm—			\sim		\sim	\sim	
		T C	~				ŧ l
-20 dBm—	+						
-30 dBm—	1						
-40 dBm—							
~~~							V V
-50 dBm—							,
-60 dBm—	+						
-70 dBm—							
-70 abiii							
05.0.40.0				1001	<b>4</b> -		
CF 2.48 ( Marker				1001 p	15		Span 2.0 MHz
	ef   Trc	I v.	value	Y-value	Function	E	ction Result
Type R M1	er 1rc 1		2.481 GHz	-42.91 dBm	Function	Fund	
T1	1		939061 GHz	-18.25 dBm	Occ Bw		1.202797203 MHz
T2	1	2.48	059341 GHz	-15.99 dBm			
					Ready		16.08.2023
							11:09:29 ///

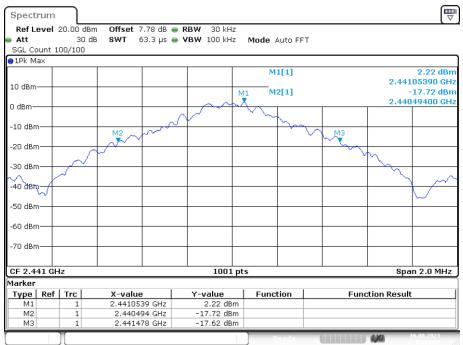
Date: 16.AUG.2023 11:08:29

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



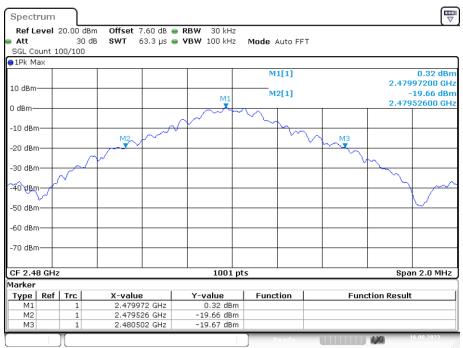
Date: 16.AUG.2023 06:54:19





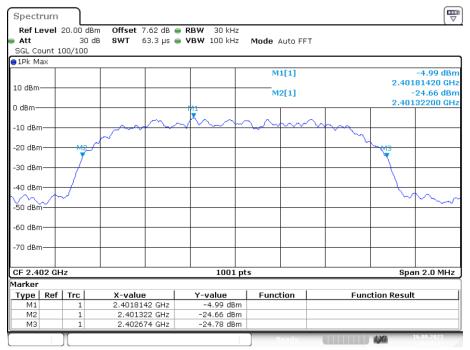
Date: 16.AUG.2023 07:01:03





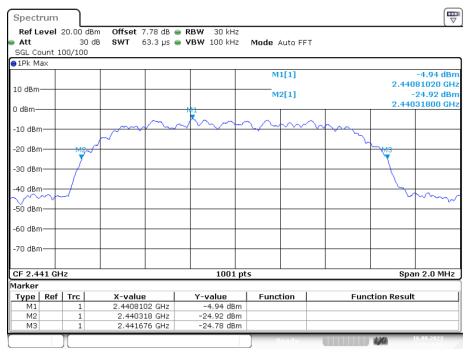
Date: 16.AUG.2023 07:07:26

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



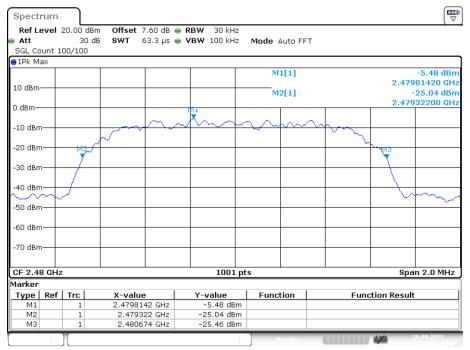
Date: 16.AUG.2023 10:07:43

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



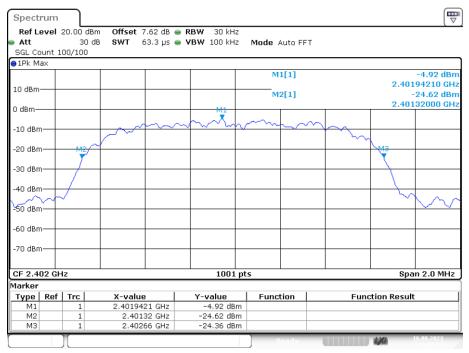
Date: 16.AUG.2023 10:11:06

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



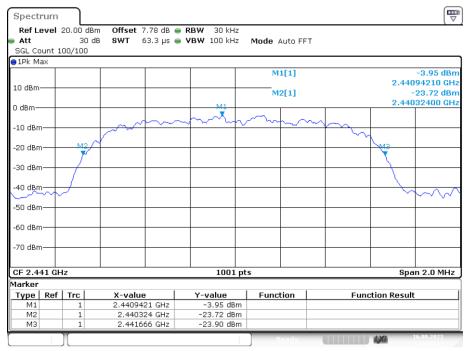
Date: 16.AUG.2023 10:12:28

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

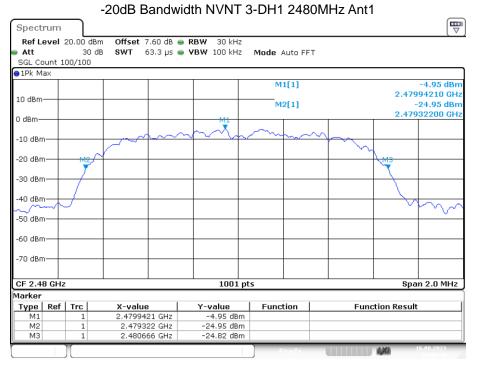


Date: 16.AUG.2023 11:00:54

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



Date: 16.AUG.2023 11:05:32



Date: 16.AUG.2023 11:08:40

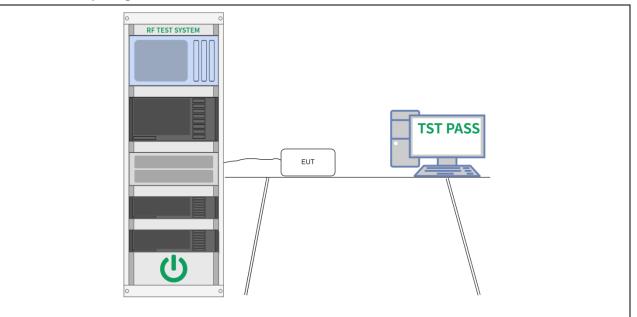
# 4.3 Maximum Conducted Output Power

	-
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:	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: a) Use the following spectrum analyzer settings: 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel. 2) RBW > 20 dB bandwidth of the emission being measured. 3) VBW >= RBW. 4) Sweep: Auto. 5) Detector function: Peak. 6) Trace: Max hold. b) Allow trace to stabilize. c) Use the marker-to-peak function to set the marker to the peak of the emission. d) The indicated level is the peak output power, after any corrections for external attenuators and cables. e) A plot of the test results and setup description shall be included in the test report. 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.

## 4.3.1 E.U.T. Operation:

Operating Environment:										
Temperature:	Temperature:23.8 °CHumidity:54.2 %Atmospheric Pressure:101.6 kPa									
Pre test mode:	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)										

## 4.3.2 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	5.687	0	21	Pass
NVNT	1-DH1	2441	Ant1	5.23	0	21	Pass
NVNT	1-DH1	2480	Ant1	2.796	0	21	Pass
NVNT	1-DH3	2441	Ant1	4.507	0	21	Pass
NVNT	1-DH5	2441	Ant1	4.569	0	21	Pass
NVNT	2-DH1	2402	Ant1	2.706	0	21	Pass
NVNT	2-DH1	2441	Ant1	3.015	0	21	Pass
NVNT	2-DH1	2480	Ant1	2.521	0	21	Pass
NVNT	2-DH3	2441	Ant1	3.689	0	21	Pass
NVNT	2-DH5	2441	Ant1	3.462	0	21	Pass
NVNT	3-DH1	2402	Ant1	3.437	0	21	Pass
NVNT	3-DH1	2441	Ant1	4.195	0	21	Pass
NVNT	3-DH1	2480	Ant1	3.407	0	21	Pass
NVNT	3-DH3	2441	Ant1	4.61	0	21	Pass
NVNT	3-DH5	2441	Ant1	4.203	0	21	Pass

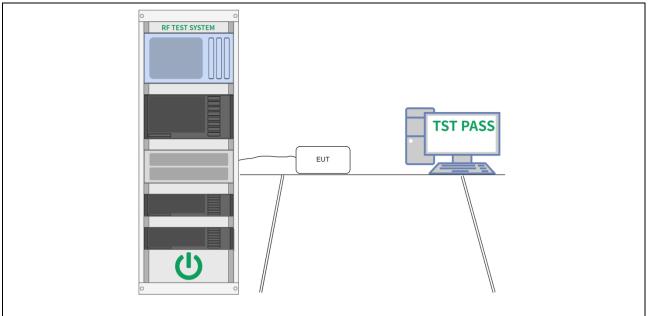
# 4.4 Channel Separation

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:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: a) Span: Wide enough to capture the peaks of two adjacent channels. 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. c) Video (or average) bandwidth (VBW) ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. 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.

## 4.4.1 E.U.T. Operation:

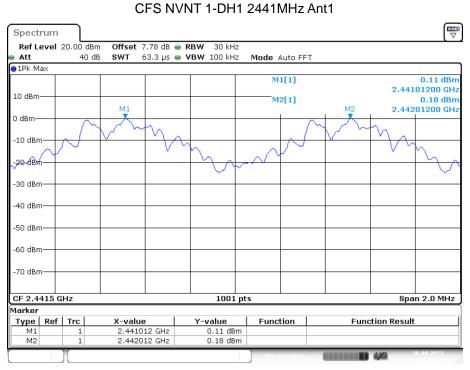
Operating Environment:									
Temperature:23.8 °CHumidity:54.2 %Atmospheric Pressure:101.6 kPa									
Pre test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPSK (hopping					SK (hopping on)				
Final test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPSK (hopping						SK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

## 4.4.2 Test Setup Diagram:



### 4.4.3 Test Result:

Condition	Mode	Antenna	Hopping Freq1	Hopping Freq2	HFS	Limit	Verdict
			(MHz)	(MHz)	(MHz)	(MHz)	
NVNT	1-DH1	Ant1	2441.012	2442.012	1	0.984	Pass
NVNT	2-DH1	Ant1	2441.01	2442.01	1	0.905	Pass
NVNT	3-DH1	Ant1	2441.012	2442.014	1.002	0.895	Pass



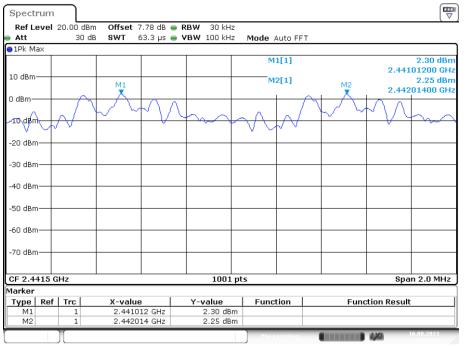
Date: 16.AUG.2023 07:15:47

### CFS NVNT 2-DH1 2441MHz Ant1

Spectr	um									
Ref Le	vel 3	20.00 (	dBm Offset	7.78 dB 👄	RBW 30 kHz	2				
Att		30	dB SWT	63.3 µs 👄	<b>VBW</b> 100 kHz	Mode	Auto FFT			
⊖1Pk Ma	х									
						м	1[1]		2.441	1.94 dBm 01000 GHz
10 dBm-			M1			M	2[1]	M2	2.442	1.92 dBm 01000 GHz
0 dBm—		1		m					M	$\wedge$
-10 dBm	$\mathbf{Y}$	$\prec$			$\uparrow \lor$	$\checkmark$	$\sim$		2	$\sim$ $\vee$
-20 dBm·	+									
-30 dBm-	+									
-40 dBm·	+									
-50 dBm	+									
-60 dBm	+									
-70 dBm·	+									
CF 2.44	15 G	Hz			1001	pts			Spa	n 2.0 MHz
Marker										
	Ref		X-valu		Y-value	Func	tion	Fund	tion Result	
M1 M2		1		LO1 GHz	1.94 dBr 1.92 dBr					
						Mea	suring		4/4	6.08.2023

Date: 16.AUG.2023 10:29:01

### CFS NVNT 3-DH1 2441MHz Ant1



Date: 16.AUG.2023 11:15:21

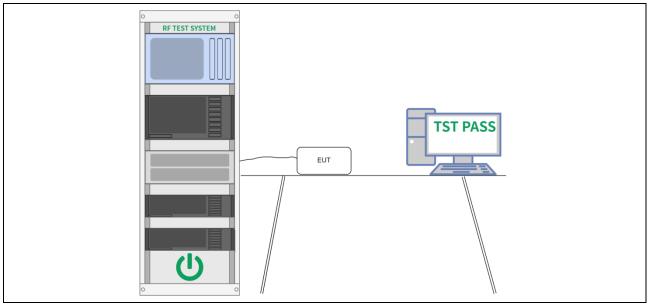
# 4.5 Number of Hopping Frequencies

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:	The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings: 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. 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. c) VBW ≥ RBW. d) Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize. 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.

## 4.5.1 E.U.T. Operation:

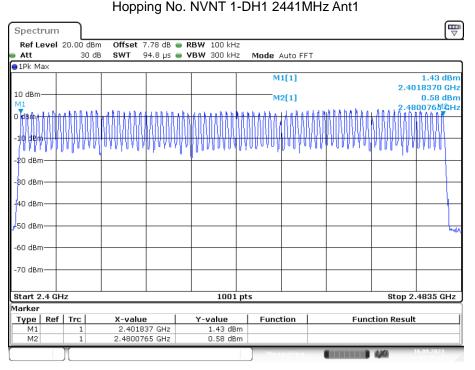
Operating Environment:									
Temperature:23.8 °CHumidity:54.2 %Atmospheric Pressure:101.6 kPa									
Pre test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPS					SK (hopping on)				
Final test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPSK (hopping						SK (hopping on)			

## 4.5.2 Test Setup Diagram:



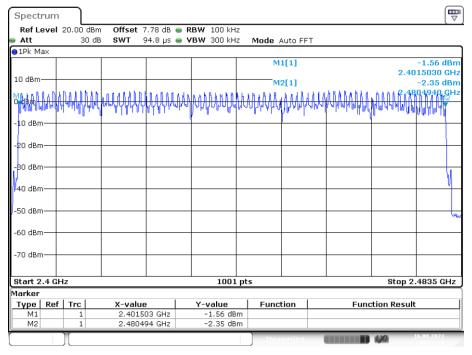
#### 4.5.3 Test Result:

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										



Date: 16.AUG.2023 07:19:17

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



Date: 16.AUG.2023 10:32:29

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

Ref Level         20.0 dBm         Offset         7.78 dB         RBW         100 kHz           Att         30 dB         SWT         94.8 µs         VBW         300 kHz         Mode         Auto FFT           1Pk Max         M1[1]         3.77 df         C.4018370 G         2.4018370 G         2.96 pt           10 dBm         M1[1]         2.4018370 G         2.96 pt         2.96 pt           0 dBm         M2[1]         2.96 pt         2.96 pt           -10 dBm         M2[1]         2.96 pt         4.00 pt           -20 dBm         M1         M1         4.00 pt         4.00 pt           -30 dBm         -0         -0         -0         -0           -50 dBm         -0         -0         -0         -0           -70 dBm         -0         -0         -0         -0           -70 dBm         -0         -0         -0         -0           Start 2.4 GHz         1001 pts         Stop 2.4835 GH           Marker         -0         -0         -0         -0			порр	nng ivo	$\mathbf{S}$ . INVINT $\mathbf{S}$		+4 I IVI	ΠΖ ΑΠΕΙ			
Att         30 db         SWT         94.8 µs         VBW         300 kHz         Mode         Auto FFT           1Pk Max         M1[1]         3.77 db         2.4018370 G         2.4018370 G         2.4018370 G         2.96 db         2.96 db <th>Spectrum</th> <th>n</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>ſ</th> <th>₽</th>	Spectrum	n								ſ	₽
Att         30 dB         SWT         94.8 µs         VBW 300 kHz         Mode         Auto FFT           1Pk Max         M1[1]         3.77 db         2.4018370 G         2.4018370 G         2.96 db           10 dBm         M2[1]         2.96 db         2.96 db         2.96 db         2.96 db           -10 dBm         M1[1]         3.77 db         2.4018370 G         2.96 db         2.96 db           -20 dBm         M1[1]         0.97 db         1.001 PV         1.00	Ref Leve	1 20.00 dBm	Offset	7.78 dB (	BRBW 100 kH	z					_
10 dBm     2.4018370 G       10 dBm     2.4018370 G       0 dBm     2.96 dF       -10 dBm     -20 dBm       -20 dBm     -20 dBm       -30 dBm     -20 dBm       -20 dBm     -20 dBm       -30 dBm     -20 dBm       -20 dBm     -20 dBm       -20 dBm     -20 dBm       -20 dBm     -20 dBm       -20 dBm     -20 dBm       -30 dBm     -20 dBm       -20 dBm     -20 dBm </th <th>Att</th> <th>30 d8</th> <th>SWT</th> <th>94.8 µs (</th> <th><b>• VBW</b> 300 kH</th> <th>z Mode A</th> <th>uto FFT</th> <th></th> <th></th> <th></th> <th></th>	Att	30 d8	SWT	94.8 µs (	<b>• VBW</b> 300 kH	z Mode A	uto FFT				
10. dBm       2.4018370 G         0. dBm       2.96,42         -10 dBm       100 H         -20 dBm       100 H	⊜1Pk Max										_
10. dBm     2.96 dE       -10 dBm     -10 dBm       -20 dBm     -10 dBm       -20 dBm     -10 dBm       -30 dBm     -10 dBm       -20 dBm     -10 dBm       -20 dBm     -10 dBm       -30 dBm     -10 dBm       -20 dBm     -10 dBm       -20 dBm     -10 dBm       -20 dBm     -10 dBm       -30 dBm     -10 dBm       -30 dBm     -10 dBm       -40 dBm     -10 dBm       -50 dBm     -10 dBm       -60 dBm     -10 dBm       -70 dBm     -10 dBm						M	l[1]			3.77 d	Bm
0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0	10 d0m								2.40		
0 dBm     -10 dBm       -20 dBm     -20 dBm       -20 dBm     -20 dBm       -30 dBm     -30 dBm       -40 dBm     -30 dBm       -50 dBm     -30 dBm       -70 dBm     -30 dBm       -50 dBm     -30 dBm       -20 dBm     -30 dBm       -30 dBm     -30 dBm       -30 dBm     -30 dBm       -50 dBm     -30 dBm	M1									2.96	Bm
-10 dBm -20 dBm -20 dBm -20 dBm -30 dBm -40 dBm -50 dBm -50 dBm -50 dBm -70	-P970700	INNARLANA	•VVVVVV	111111	հներիներին	አለእአለለ	አክክክል	ነዚዜስ ክሲ ክሲ ክሲ ክ			iHz
-20 dBm	MANNUM	NAMANAN NA	NUMPIN.	YTYDYI	NYKNYNYYYN	งงาบงาง	אריען	ա օվ օպ կվեր չվե	կուհիրտովին	101711	
-20 dBm	- 0 dBm-	· · · · ·			17		·				
-80 dBm											
40 dBm       -50 dBm         -50 dBm       -60 dBm         -60 dBm       -60 dBm         -70 dBm       -70 dBm         -	-20 dBm-										
40 dBm       -50 dBm         -50 dBm       -60 dBm         -60 dBm       -60 dBm         -70 dBm       -70 dBm         -											
-50 dBm -60 dBm -70	-80 dBm										
-50 dBm -60 dBm -70											
-60 dBm -70	40 dBm										-
-60 dBm -70											
-70 dBm70 dB	-50 dBm										Ł
-70 dBm70 dB											~
Start 2.4 GHz     1001 pts     Stop 2.4835 GF       Marker     Type   Ref   Trc   X-value   Y-value   Function   Function Result	-60 dBm			-							
Start 2.4 GHz     1001 pts     Stop 2.4835 GF       Marker     Type   Ref   Trc   X-value   Y-value   Function   Function Result											
Marker Type   Ref   Trc   X-value   Y-value   Function   Function Result	-70 dBm—										
Marker Type   Ref   Trc   X-value   Y-value   Function   Function Result											
Type Ref Trc X-value Y-value Function Function Result	Start 2.4 G	GHz	1	1	1001	pts		I	Stop 2.	4835 GI	Ηz
	Marker										
		f Trc					ion	Fun	ction Result		
	M1	1									_
M2 1 2.48016 GHz 2.96 dBm	M2	1	2.480	)16 GHz	2.96 dB	m					
Ne asoring 🗰 16.09.2023		)(				Mea	suring		4,20	6.08.2023	

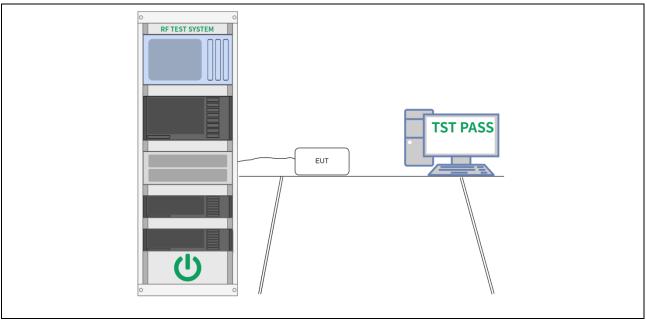
Date: 16.AUG.2023 11:18:52

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. 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 in the period specified in the requirements) = (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 Environment:									
Temperature:23.8 °CHumidity:54.2 %Atmospheric Pressure:101.6 kPa									
Pre test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPSK (hopping or						PSK (hopping on)			
Final test mode: TX-GFSK(hopping on), TX-Pi/4DQPSK (hopping on), TX-8DPSK (hopping on)						SK (hopping on)			

# 4.6.2 Test Setup Diagram:



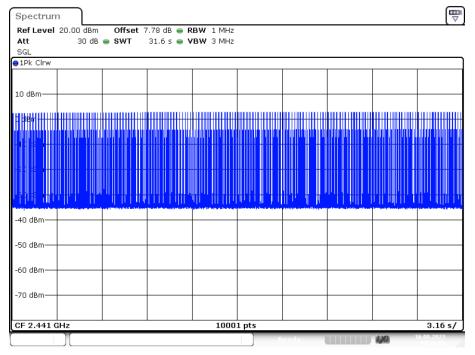
### 4.6.3 Test Result:

Condition	Mode	Frequency	Antenna	Pulse	Total Dwell	Burst	Period	Limit	Verdict
		(MHz)		Time	Time (ms)	Count	Time	(ms)	
				(ms)			(ms)		
NVNT	1-DH1	2441	Ant1	0.381	119.253	313	31600	400	Pass
NVNT	1-DH3	2441	Ant1	1.637	247.187	151	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.886	323.232	112	31600	400	Pass
NVNT	2-DH1	2441	Ant1	0.388	124.936	322	31600	400	Pass
NVNT	2-DH3	2441	Ant1	1.639	239.294	146	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.885	294.27	102	31600	400	Pass
NVNT	3-DH1	2441	Ant1	0.387	122.292	316	31600	400	Pass
NVNT	3-DH3	2441	Ant1	1.637	237.365	145	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.887	314.683	109	31600	400	Pass

### Dwell NVNT 1-DH1 2441MHz Ant1 One Burst

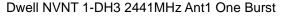
Specti	rum															₽	
Ref Le	Ref Level 20.00 dBm Offset 7.78 dB  RBW 1 MHz															<u> </u>	
Att			dB (	SWT	10 ms	e ve	3 MHz										
SGL TR		D															
⊖1Pk Clr	rw																
								M1[1]							-10.30 -10.00		
10 dBm-	$\rightarrow$								D1[1]							)0 µs )1 dB	
								Di[1]						381.000 µs			
0 dBm—															1		
	M	RG1-7.	400 (	dBm													
-10 dBm	i – ti		1														
-20 dBm																	
-30 dBm																	
-30 UBII	'												1				
للواله أواريا	(Mr.	. ditt	yrl, b	الأروراب والبراج الرائل	with with a	Linh	<u>All Asilla shuke</u>	111	h she hada	ur ur un de si	ակտի	diport	philip	denhaltmak	հեկտի	with	
and not	i . a															1	
USC BBM	<u>1</u>	<u>1</u> 177	14	n celan	h ^a nn an th	dia a l	an ann a s	1,8	- <u>111111</u>	LINE AND			del 1	Muddanapada,	hu hu h	410 4	
1.1				· •			e e que	Ľ .	1 I I						1 ' "	- T	
-60 dBm	·-+					-		-							<u> </u>		
-70 dBm	+							-							<u> </u>	_	
CF 2.44	11 ĠI	Hz					1000	1 pt	5	•					1.0 r	ns/	
Marker																$\neg$	
Туре	Ref	ef Trc		X-value		Y-value			Function		Function Result						
M1		1		-10.0 μs			-10.30 dBm										
D1	M1	. 1		38	31.0 µs		0.91 (	iB									
									) R	e ad y	1			170	16.08.202	8	

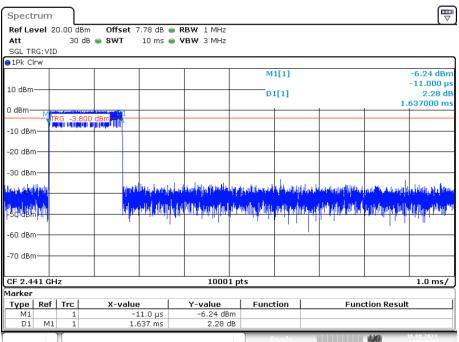
Date: 16.AUG.2023 07:19:26



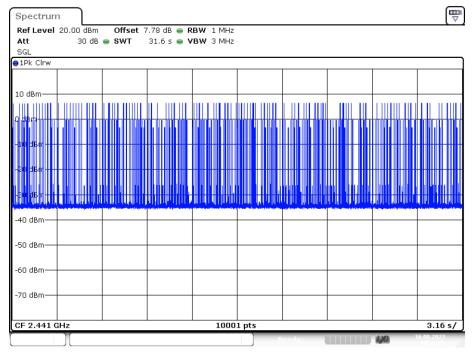
### Dwell NVNT 1-DH1 2441MHz Ant1 Accumulated

Date: 16.AUG.2023 07:20:01



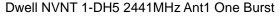


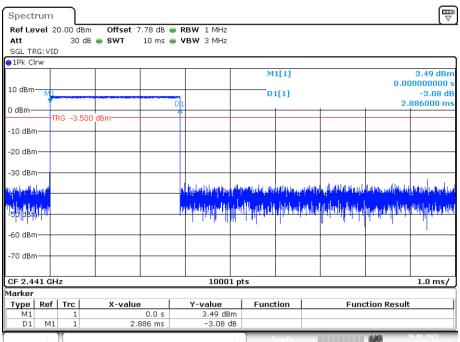
Date: 16.AUG.2023 07:25:30



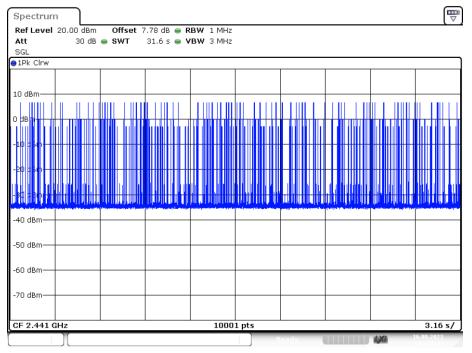
### Dwell NVNT 1-DH3 2441MHz Ant1 Accumulated

Date: 16.AUG.2023 07:26:05



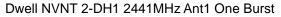


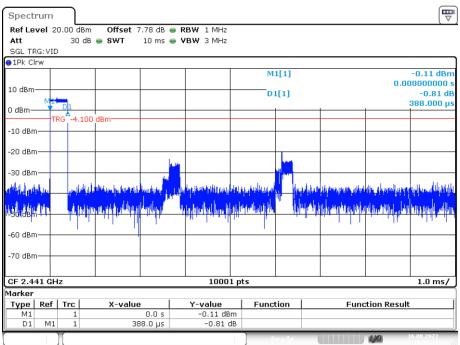
Date: 16.AUG.2023 07:27:08



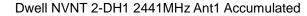
# Dwell NVNT 1-DH5 2441MHz Ant1 Accumulated

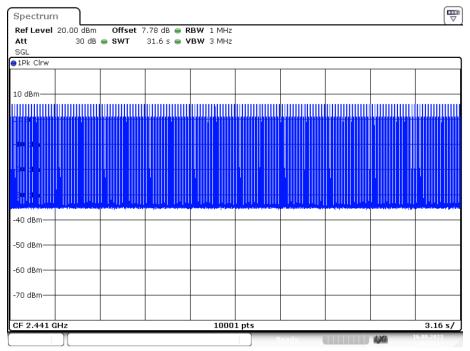
Date: 16.AUG.2023 07:27:42



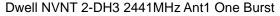


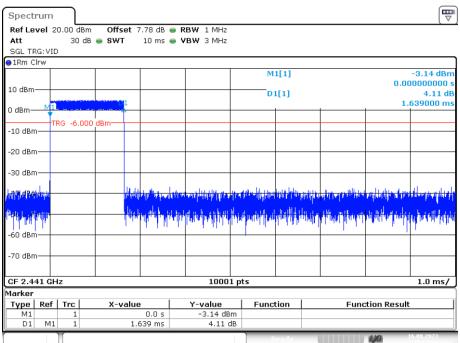
Date: 16.AUG.2023 10:32:39



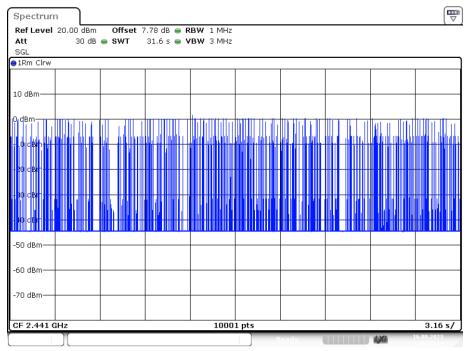


Date: 16.AUG.2023 10:33:13



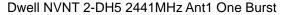


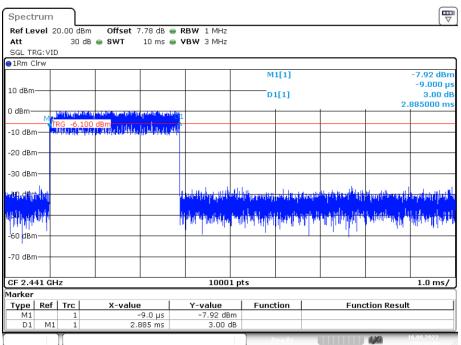
Date: 16.AUG.2023 10:54:53



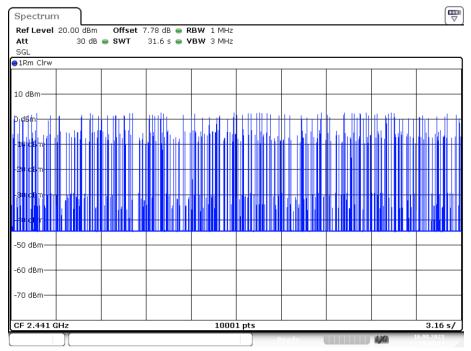
Dwell NVNT 2-DH3 2441MHz Ant1 Accumulated

Date: 16.AUG.2023 10:55:27





Date: 16.AUG.2023 10:56:40



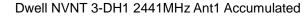
### Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated

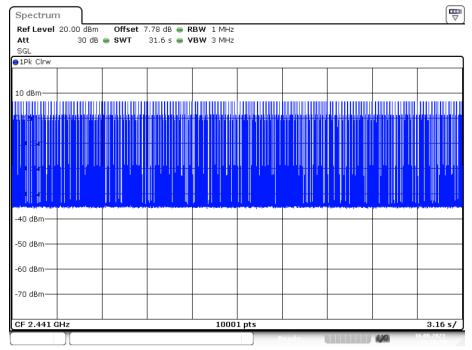
Date: 16.AUG.2023 10:57:14

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

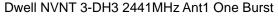
Spectrum	
Ref Level 20.00 dBm Offset 7.78 dB 👄 RBW 1 MHz	
Att 30 dB 🖷 SWT 10 ms 🖷 VBW 3 MHz	
SGL TRG:VID	
M1[1]	-8.06 dBm
10 dBm	-11.000 µs
D1[1]	2.66 dE
0 dBm	387.000 µs
MTR® 13.400 dBm	
-10 dBm	
-20 dBm	
-30 dBm	
والمرابعة والمرابعة المرابعة والمرابعة و	ببالمعد الأجريم عايلات
	ar a tribul a fait
i 1966 ya ga shekari ya kana ya kana dadi ing kana da kana da kana kana kana kana kan	shi ka ni ki je kula i
	1.4
-60 dBm	
-70 dBm	
CF 2.441 GHz 10001 pts	1.0 ms/
Marker	
Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         -11.0 µs         -8.06 dBm         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -         -	
D1 M1 1 387.0 µs 2.66 dB	

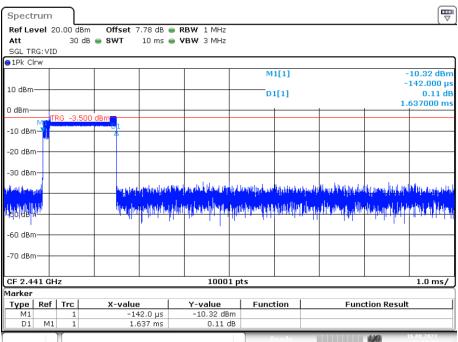
Date: 16.AUG.2023 11:19:05





Date: 16.AUG.2023 11:19:39

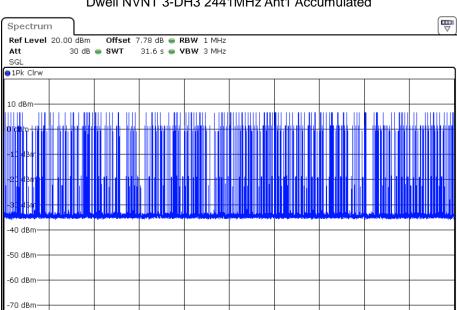




Date: 16.AUG.2023 11:57:12

3.16 s/

LX.



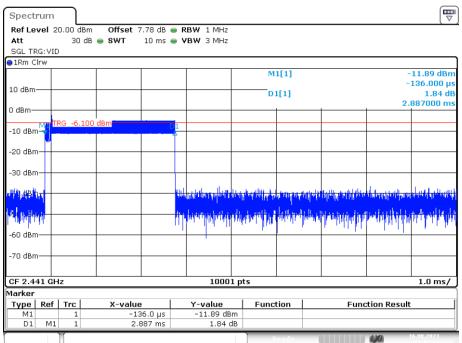
# Dwell NVNT 3-DH3 2441MHz Ant1 Accumulated

Date: 16.AUG.2023 11:57:46

CF 2.441 GHz

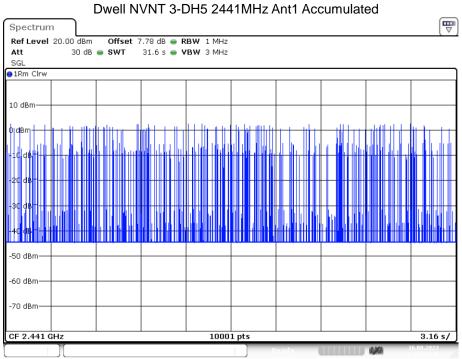


10001 pts



Date: 16.AUG.2023 12:05:14

#### Page45 of85



Date: 16.AUG.2023 12:05:48

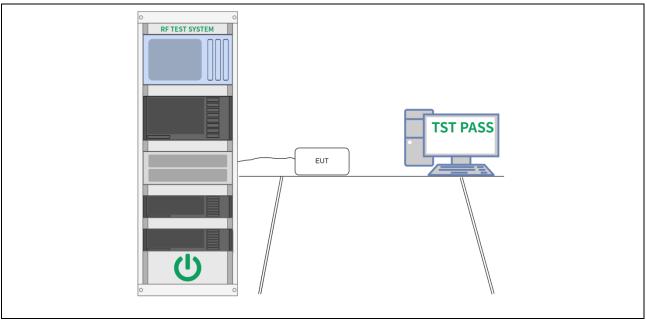
4.7 Emissions in	non-restricted frequency bands
Test Requirement:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below 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.
471 EUT Operatio	

# 4.7.1 E.U.T. Operation:

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

# 4.7 Emissions in non-restricted frequency bands

# 4.7.2 Test Setup Diagram:



_

# 4.7.3 Test Result:

Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission

Spect	rum							Ę		
Ref Le Att SGL Co		30		_	RBW 100 kHz VBW 300 kHz	Mode Auto S	weep			
∋1Pk M	эх									
10 dBm- 0 dBm-	MI					M1[1]		5.97 dBn 2.402070 GH -37.98 dBn 19.706916 GH		
-10 dBm -20 dBm		1 -14.9	967 dBm							
-30 dBm -40 dBm		N	13 M4	M5			M2			
a substant			and he will be a first of the f	يەلەر قىرىيى يېرى 1946-يالەر خىمىيىر يېرى		and the set of the set	in state and the state of			
-60 dBm	+									
-70 dBm	+									
Start 3	0.0 M	Hz			30001 p	its		Stop 26.5 GHz		
Marker										
Туре	Ref	Trc	X-val		Y-value	Function	Fu	nction Result		
M1		1		207 GHz	5.97 dBm					
M2		1		916 GHz	-37.98 dBm					
M3		1		5485 GHz	-41.18 dBm					
M4 M5		1		6903 GHz	-42.36 dBm -40.79 dBm					
		)[				Ready	(11111)	16.08.2023		

Date: 16.AUG.2023 06:54:55

		_	rx. Spt	ILIO	JS IN	/1	I 1-DH1	2	44 I IV		<b>M</b> T	I Emiss	ion	
Spect	rum	J												
Ref Le	vel 2	0.00 c	Bm Offs	et 7.	78 dB 🧉	RB	W 100 kHz							
Att		30	dB SWT	2	65 ms 🧉	Ve	300 kHz	Þ	lode A	uto Swe	eep			
SGL Co	ount 1	0/10									·			
😑 1Pk M	ax													
									M	1[1]				2.88 dBm
10 dBm													2.	440900 GHz
									M	2[1]				-37.80 dBm
0 dBm-													20.	706599 GHz
-10 dBm														
-10 aBm	· •	1 15	461 dBm											
-20 dBm	ι	1 -15	401 UBIII											
-30 dBm	ו++											M2		
-40 dBrr			МЗ	M4		15			ومعردات الم		Lina		a analian ana a	a state for a la
-40 UBI	العراسي	مىرىلىلىمى	and the second second	19.000	and a short for					London.	4.6.5	the base of the state of the state	the state of the second	and Annual Annual State
new croff		and the second se	and the second second											
-60 dBm	י−+													
-70 dBm														
-70 0611	'													
								<u> </u>						
Start 3	0.0 M	IHZ					3000	1 pt:	5				Sto	p 26.5 GHz
Marker														
Туре	Ref	Trc		value			Y-value	_	Func	tion		Fund	ction Resu	t
M1		1			09 GHz		2.88 dB							
M2 M3		1			99 GHz 07 GHz		-37.80 dB -41.02 dB							
M4		1			52 GHz		-41.50 dB							
M5		1			72 GHz		-41.03 dB							
		1								_			18.34%	16.08.2023
									ļ				1.71	

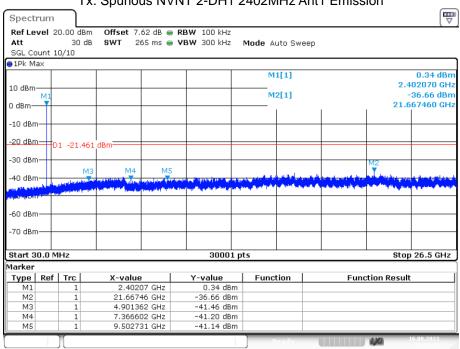
Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission

Date: 16.AUG.2023 07:01:26

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

Spectr	um										[₩
Ref Lev Att	<b>el</b> 20	). 00 di 30		_	RBW 100 kHz VBW 300 kHz	Mada	Auto Sw				
SGL COL	int 10		UD 3WI 20	55 IIIS 🛑	YBW 300 KH2	Moue	AULU SW	еер			
1Pk Ma		720									
							M1[1]				3.19 dBn
10 dBm–										2.	479720 GH
10 0000	T					1	M2[1]				-37.84 dBr
0 dBm—							1			21.	993041 GH
-10 dBm-											
-10 uBill-											
-20 dBm-		-17.3	355 dBm		_		-				
-30 dBm-			мз		-					M2	
-40 dBm-		4.1.000	▼	M.				بسلعجب		and the state of the	
COLORISM PROF	فيطلبها	A Lines	and and the strength of the strength of	and all the desidents			in sintene	بليارة حيار	a a surface	the second second	a part and particular
na da Dalle				1.							
-60 dBm-											
00 00111											
-70 dBm-	-										
Start 30	.0 MI	Ηz	·		30001	pts	•			Sto	p 26.5 GHz
1arker											
Туре	Ref	Trc	X-value		Y-value		ction		Fund	tion Resu	t
M1		1		72 GHz	3.19 dBr						
M2		1	21.99304		-37.84 dBn						
M3 M4		1	5.00106		-40.00 dBn -42.30 dBn						
M5		1	9.93242		-42.30 dBr						
		-								4.171	16.08.2023
	J	1								1,20	

Date: 16.AUG.2023 07:08:02



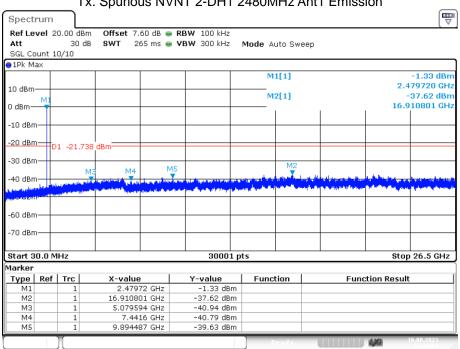
Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission

Date: 16.AUG.2023 10:08:17

# Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Emission

Spectrum										
Ref Level 2			_							
Att	30 d	IB <b>SWT</b> 265	ms 🔵 VI	3W 300 kHz	Mode A	uto Sw	еер			
SGL Count 1	.0/10									
1Pk Max										
					M	1[1]				-1.10 dBn
10 dBm —						0[1]				140900 GH -37.32 dBn
M1					IVI	2[1]				-37.32 uBn 388743 GH
) dBm						1	1	1	10.0	
-10 dBm										
20 dBm	1 -20.4	00 dBm								
-30 dBm		10	M5			M2				
-40 dBm	l Manual I	43 M4	MS			Local Ville		une en		HILL BURE
A STATE OF STREET, STREET, STREET, ST.	·			an all a shake being a	والمتحادية والمردوع	1 Section	a factor of	and a family strength	and the state of the second	A. Barray Street
	Constraints of the									
-60 dBm										
-70 dBm										
Start 30.0 M	1Hz			30001	nts				Stor	) 26.5 GHz
larker				00001	203				010	5 2010 UNE
	Trc	X-value	1	Y-value	Func	tion		Funct	ion Result	•
M1	1	2.4409	GHz	-1.10 dBm				Tunci	.ion Kesur	
M2	1	16.888743		-37.32 dBn						
MЗ	1	4.994007		-41.01 dBn	1					
M4	1	7.259839	GHz	-41.72 dBn	1					
M5	1	9.832723	GHz	-40.59 dBn	1					
	1					lo adv			DØ.	16.08.2023

Date: 16.AUG.2023 10:11:29



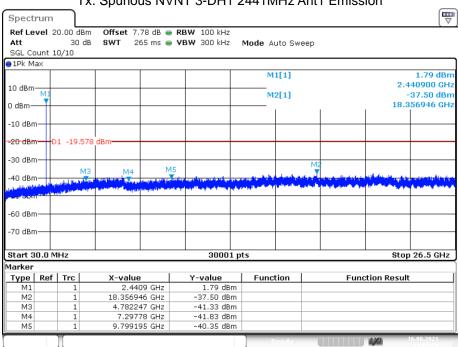
Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Emission

Date: 16.AUG.2023 10:13:04

# Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Emission

Spectru	ım					. 10210					
Ref Lev		<b>ل</b> 0.00 d	Bm Offset 7.	62 dB 🧉	RBW 100 kHz						( ~
Att			dB <b>SWT</b> 20	65 ms 🧉	<b>VBW</b> 300 kHz	Mode A	uto Sw	еер			
SGL Cou		0/10									
⊖1Pk Ma>	<										
						M	1[1]				-1.17 dBm
10 dBm—	+									2	.402070 GHz
1	M1					M	2[1]				-37.35 dBm
0 dBm—	<b>T</b>									21.	.283645 GHz
10.10-											
-10 dBm-											
-20 dBm-		1 20	433 dBm								
	11	1 -20.	455 0011								
-30 dBm-										12	-
		P	13 M4	M	5						
-40 dBm-		المكان والمعادرة	Report Front Sector	the part of all	THE TREE STREET AT MANY						
		and a part of	and the second second second	abore Redente	dealer was the set of the first at a data of	and the second			A REAL PROPERTY OF		
-60 dBm-	+										
-70 dBm-	+										
Start 30	.0 M	IHz			30001 pt	ts				Sto	p 26.5 GHz
Marker											
Type   I	Ref	Trc	X-value	. 1	Y-value	Func	tion		Fund	ction Resu	lt
M1		1	2.4020	07 GHz	-1.17 dBm						
M2		1	21.28364	45 GHz	-37.35 dBm						
MЗ		1	4.65254		-40.42 dBm						
M4		1	7.04896		-40.83 dBm						
M5		1	9.7700	78 GHz	-40.29 dBm						
							eadv			120	16.08.2023

Date: 16.AUG.2023 11:01:34



Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Emission

Date: 16.AUG.2023 11:05:58