Report No.:DDT-R22120725-10E05

Issued Date: Feb. 27, 2023

FCC CERTIFICATION TEST REPORT

FOR

Applicant	**:**	KREAFUNK APS
Address	**:**	Klamsagervej 35 A, st.8230 Abyhoj, Denmark
Equipment under Test	**:**	Bluetooth speaker
Model No.	**:**	aGO Stone
Trade Mark	**:**	KREAFUNK
FCC ID	**:**	2ACVC-AGOSTONE
Manufacturer	**:**	Shenzhen Winnershine Electronics Co., Ltd
Address	**:**	Floor 3, Building 1, 32# JIAHUA Road, BAO'AN Community, YuanShan Street, Long Gang district, Shenzhen

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

Tel.: +86-0769-38826678, **E-mail:** ddt@dgddt.com, http://www.dgddt.com

REPORT

Table of Contents

Test Report Declare

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Address	:	Floor 3, Building 1, 32# JIAHUA Road, BAO'AN Community, YuanShan Street, Long Gang district, Shenzhen

Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C

Test Procedure Used:

ANSI C63.10:2013

We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No.:	DDT-R22120725-10E05		
Date of Receipt:	Feb. 09, 2023	**Date of Test:**	Feb. 15, 2023 ~ Feb. 24, 2023

Prepared By:

Sanvin Zheng

Sanvin Zheng/Engineer

Approved By:

DONGGUAN DONGDIAN TESTING SERVICE CO., LTD. APPROVED

Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Feb. 27, 2023	

1. Summary of Test Results

Description of Test Item	Standard	Verdict
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1)	Pass
20 dB Bandwidth	FCC Part 15: 15.247(a)(1)	Pass
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1)	Pass
Number of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii)	Pass
Dwell Time	FCC Part 15: 15.247(a)(1)(iii)	Pass
Radiated Emission	FCC Part 15: 15.205(a) FCC Part 15: 15.209(a) FCC Part 15: 15.247(d)	Pass
Band Edge Compliance	FCC Part 15: 15.205(a) FCC Part 15: 15.209(a) FCC Part 15: 15.247(d)	Pass
Power Line Conducted Emissions	FCC Part 15: 15.207(a)	Pass
Antenna Requirement	FCC Part 15: 15.203	Pass

2. General Test Information

2.1. Description of EUT

EUT* Name	:	Bluetooth speaker
Model Number	:	aGO Stone
EUT* Function Description	:	Please reference user manual of this device
Power Supply	:	DC 5V powered by an external adapter Build in 3.7V lithium battery.
Radio Specification	:	Bluetooth V5.1
Operation Frequency	:	2402 MHz - 2480 MHz
Modulation	:	GFSK, π/4-DQPSK
Data Rate	:	1 Mbps, 2 Mbps
Antenna	:	Chip antenna, maximum PK gain: 3.49 dBi
Sample Number	:	S22120725-09 for conductive S22120725-10 for radiation

Note: EUT is the ab. of equipment under test.

Channel information					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	27	2429	54	2456
1	2403	28	2430	55	2457
2	2404	29	2431	56	2458
3	2405	30	2432	57	2459
4	2406	31	2433	58	2460
5	2407	32	2434	59	2461
6	2408	33	2435	60	2462
7	2409	34	2436	61	2463
8	2410	35	2437	62	2464
9	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	Remark
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	Description	Remark
AC Adapter	SAMSUNG	EP-TA200	N/A	Input: 100-240V~50-60Hz Output: 9.0V/1.67A or 5.0V/2.0A

2.4. Block diagram of EUT configuration for test

EUT

Test software: FCC_assist 1.0.2.2.exe

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

The pathloss of external cable: 0.5 dB (According to the manufacturer's claims)

Tested mode, channel, information			
Mode	Setting Tx Power	Channel	Frequency (MHz)
GFSK hopping on Tx mode	10	CH0 to CH78	2402 to 2480
π/4-DQPSK hopping on Tx mode	10	CH0 to CH78	2402 to 2480
GFSK hopping off Tx mode	10	CH0	2402
	10	CH39	2441
	10	CH78	2480
π/4-DQPSK hopping off Tx mode	10	CH0	2402
	10	CH39	2441
	10	CH78	2480

2.5. Deviations of test standard

No deviation.

2.6. Test environment conditions

Temperature range:	+15℃ to +35 ℃
Humidity range:	20% to 75%
Pressure range:	86 kPa to106 kPa

2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, http://www.dgddt.com, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, R-20155, G-20118

2.8. Measurement uncertainty

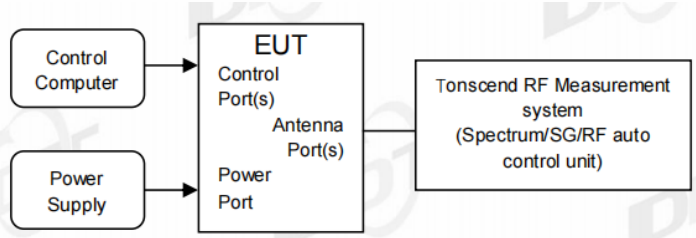
Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86 dB (10 MHz ≤ f < 3.6 GHz);
	1.38 dB (3.6 GHz ≤ f < 8 GHz)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB (10 MHz ≤ f < 3.6 GHz);
	1.38 dB (3.6 GHz ≤ f < 8 GHz)
Frequencies Stability	6.7 x 10^{-8} (Antenna couple method)
	5.5 x 10^{-8} (Conducted method)
Conducted spurious emissions	0.86 dB (10 MHz ≤ f < 3.6 GHz);
	1.40 dB (3.6 GHz ≤ f < 8 GHz)
	1.66 dB (8 GHz ≤ f < 26.5 GHz)
Uncertainty for radio frequency (RBW < 20 kHz)	3×10^{-8}
Temperature	0.4 ℃
Humidity	2 %
Uncertainty for Radiation Emission test (9 kHz – 30 MHz)	3.44 dB
Uncertainty for Radiation Emission test (30 MHz - 1 GHz)	4.70 dB (Antenna Polarize: V)
	4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1 GHz - 40 GHz)	4.10 dB (1 - 6 GHz)
	4.40 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power line conduction emission test	3.34dB (150KHz-30MHz)
	3.72dB (9KHz-150KHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☒ RF Connected Test (Tonscend RF Measurement System 3#)					
Signal &Spectrum analyzer	R&S	FSV40	101407	Jul. 21, 2022	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	May 18, 2022	1 Year
EXG Analog Signal Generator	KEYSIGHT	N5173A	MY62152058	May 26, 2022	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180912	May 18, 2022	1 Year
RF Control Unit	Tonscend	JS0806-2	20C8060230	May 18, 2022	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	May 26, 2022	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.3.2.22	N/A	N/A
☒ Radiation 3#chamber					
EMI Test Receiver	R&S	ESU26	100472	May 19, 2022	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	May 17, 2022	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Sep. 29, 2022	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	01429	Jul. 22, 2022	1 Year
Double Ridged Horn Antenna	Schwarzbeck	BBHA9120 D	02468	Sep. 29, 2022	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 06, 2022	1 Year
Pre-amplifier	COM-POWER	PAM-118A	18040084	Aug.17, 2022	1 Year
Pre-amplifier	COM-POWER	PAM-840A	461369	Apr. 11, 2022	1 Year
RE Cable	N/A	W23.02 CP1-X2 + W23.09 AP1-X8+ JCT26S-NJ-NJ-1.5M+ JCT26S-NJ-NJ-1.5M	4.5M+8M+1.5M+1.5M	Aug.17, 2022	1 Year
RF Cable	Yuhu Technology	JCTB810-NJ-NJ-9M	21123964	May 19, 2022	1 Year
RF Cable	Yuhu Technology	ZT26S-SMAJ-SMAJ-1M	21073466	Aug.17, 2022	1 Year
Test software	Tonscend	JS32-RE	V 5.0.0.1	N/A	N/A
☒ Power Line Conducted Emissions Test 1#					
Test Receiver	R&S	ESCI	100551	Aug. 26, 2022	1 Year
LISN 1	R&S	ENV216	101109	Aug. 26, 2022	1 Year
LISN 2	R&S	ESH2-Z5	100309	Aug. 26, 2022	1 Year
Pulse Limiter	R&S	ESH3-Z2	101242	Aug. 26, 2022	1 Year
CE Cable 1	HUBSER	N/A	W10.01	Aug. 26, 2022	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A
Test Receiver	R&S	ESCI	100551	Aug. 26, 2022	1 Year

4. 20 dB Bandwidth

4.1. Block diagram of test setup



4.2. Limits

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.

4.3. Test procedure

(1) The test according to ANSI C63.10-2013 clause 6.9.2.

(2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results

(3) Set the EUT as maximum power setting and enable the EUT transmit continuously

(4) Use the following spectrum analyzer settings for the 20 dB bandwidth measurement:

RBW:	1% to 5% of the OBW
VBW:	approximately three times RBW
Span:	between 2 times and 5 times the OBW
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold

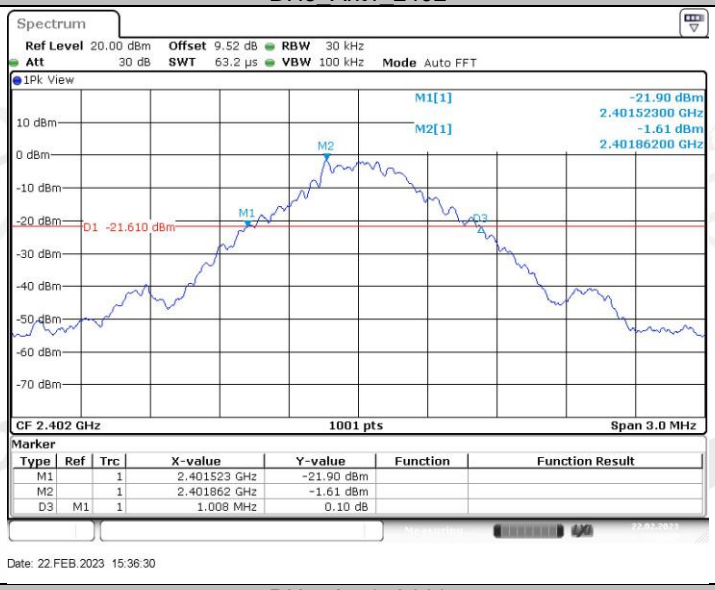
(5) Measure and record the results in the report.

4.4. test result

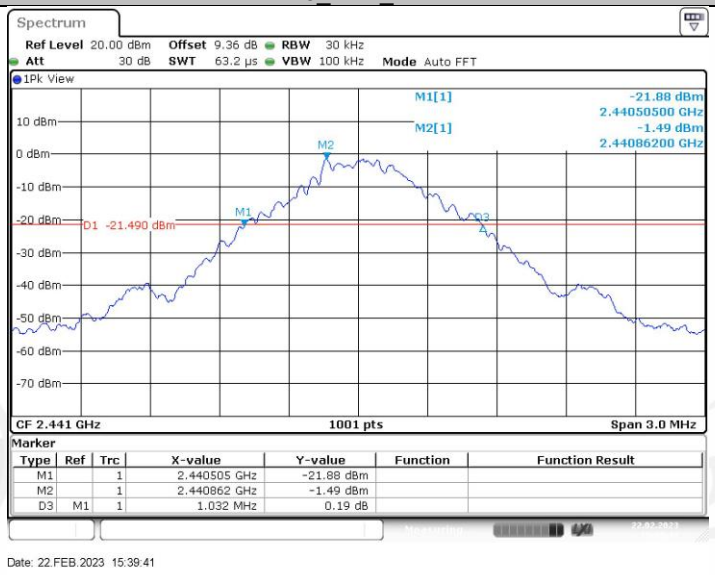
Test Mode	Antenna	Frequency [MHz]	20dB EBW[MHz]
DH5	Ant1	2402	1.01
		2441	1.03
		2480	1.08
2DH5	Ant1	2402	1.35
		2441	1.37
		2480	1.41

4.5. Test graphs

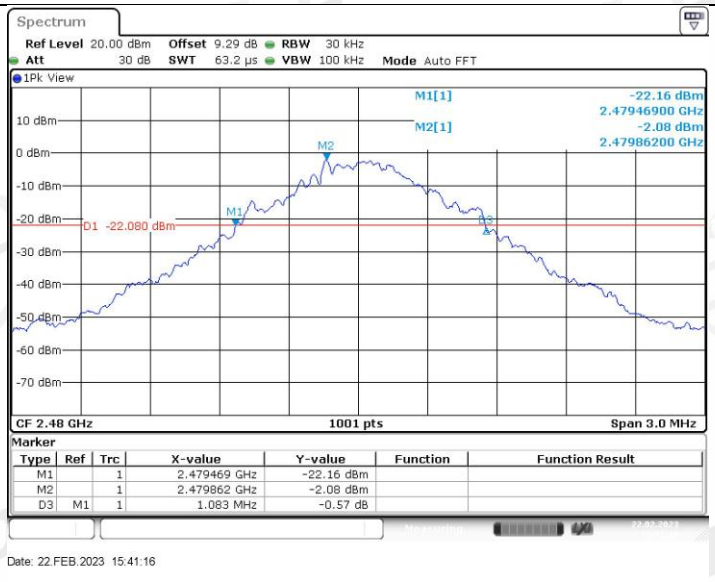
DH5_Ant1_2402



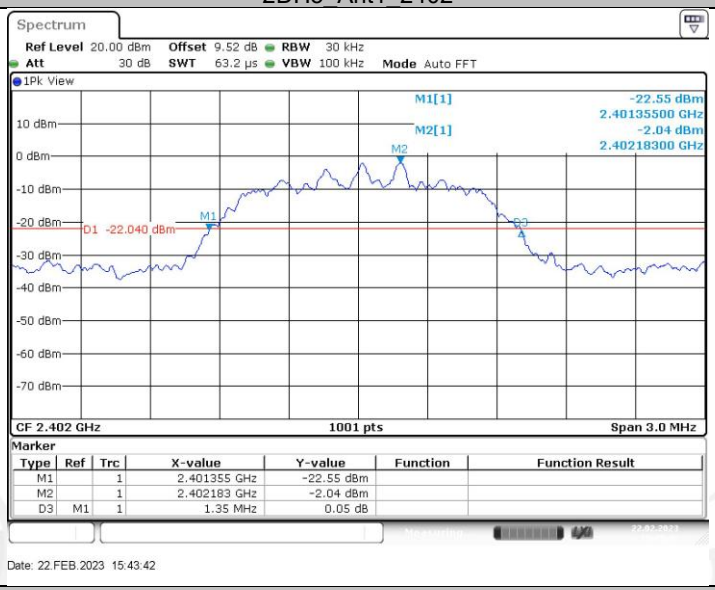
DH5_Ant1_2441



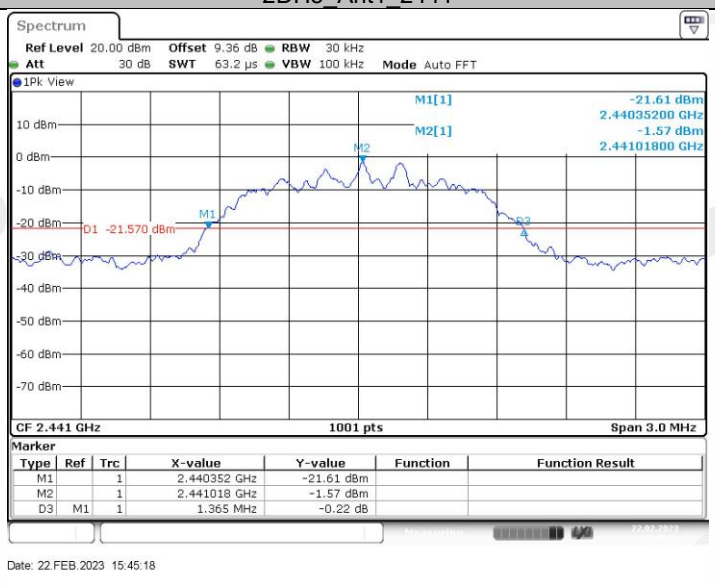
DH5_Ant1_2480



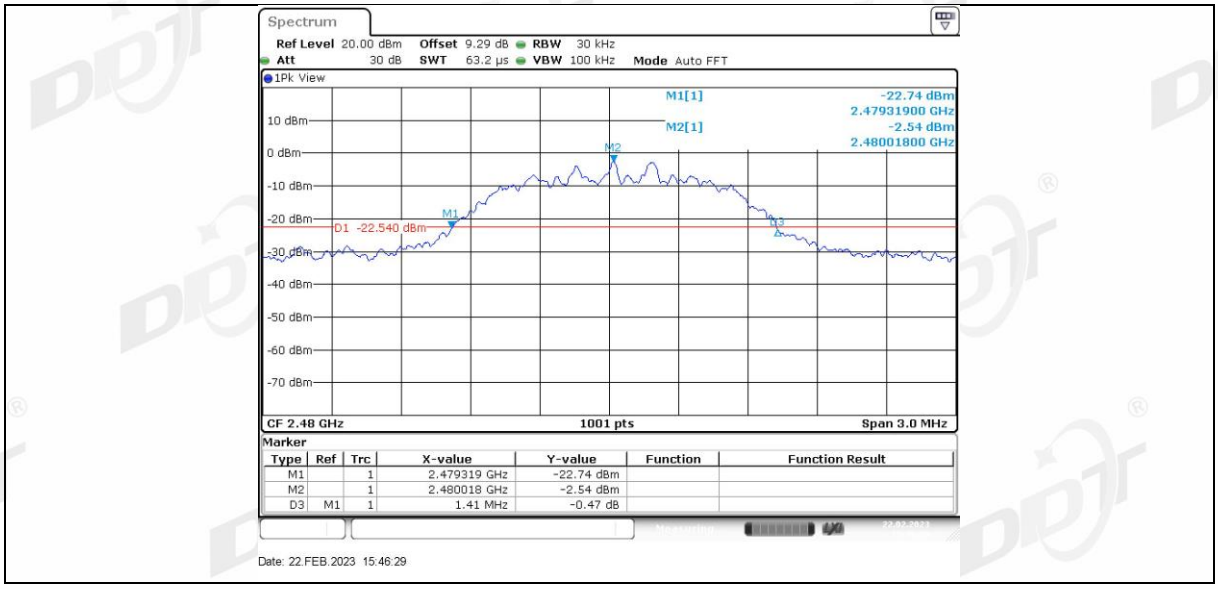
2DH5_Ant1_2402



2DH5_Ant1_2441

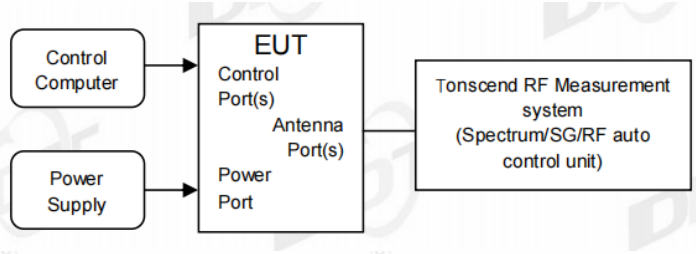


2DH5_Ant1_2480


Spectrum
Ref Level 20.00 dBm Offset 9.29 dB RBW 30 kHz
Att 30 dB SWT 63.2 µs VBW 100 kHz Mode Auto FFT
1Pk View
M1[1] -22.74 dBm
2.47931900 GHz
M2[1] -2.54 dBm
2.48001800 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
D1 -22.540 dBm
M1
M2
M3
CF 2.48 GHz
1001 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.479319 GHz -22.74 dBm
M2 1 2.480018 GHz -2.54 dBm
D3 M1 1 1.41 MHz -0.47 dB
Date: 22.FEB.2023 15:46:29

5. 99% Bandwidth

5.1. Block diagram of test setup



5.2. Limits

Just for Report.

5.3. Test procedure

(6) The test according to ANSI C63.10-2013 clause 6.9.3.

(7) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results

(8) Set the EUT as maximum power setting and enable the EUT transmit continuously

(9) Use the following spectrum analyzer settings for the 99% bandwidth measurement:

RBW:	1% to 5% of the OBW
VBW:	approximately three times RBW
Span:	between 1.5 times and 5.0 times the OBW
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold

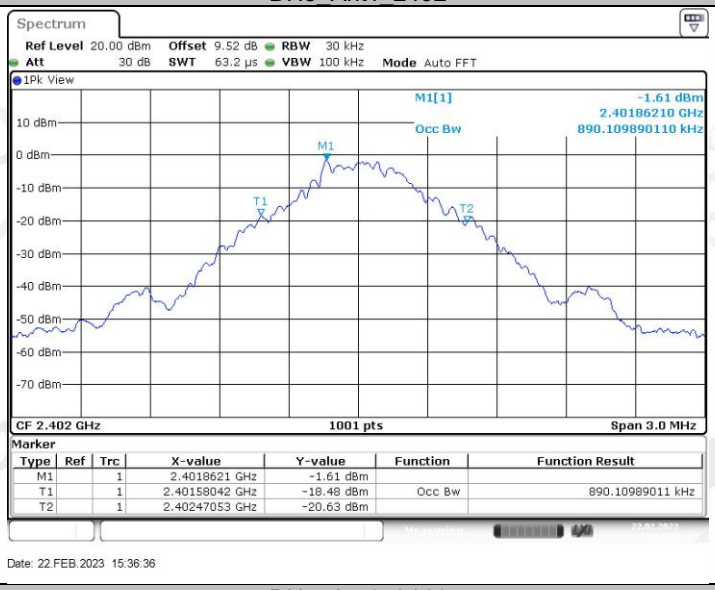
(10) Measure and record the results in the report.

5.4. Test Result

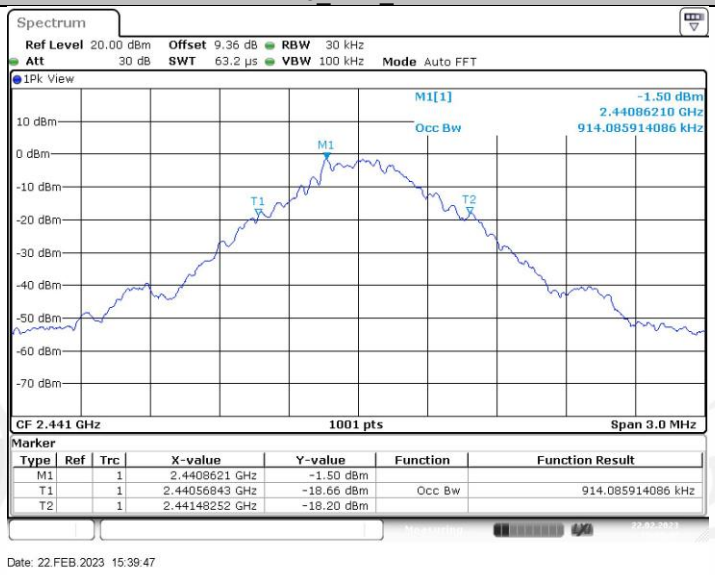
Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	FL[MHz]	FH[MHz]
DH5	Ant1	2402	0.890	2401.5804	2402.4705
		2441	0.914	2440.5684	2441.4825
		2480	1.001	2479.5205	2480.5215
2DH5	Ant1	2402	1.241	2401.4066	2402.6474
		2441	1.307	2440.3736	2441.6803
		2480	1.412	2479.3167	2480.7283

5.5. Test Graphs

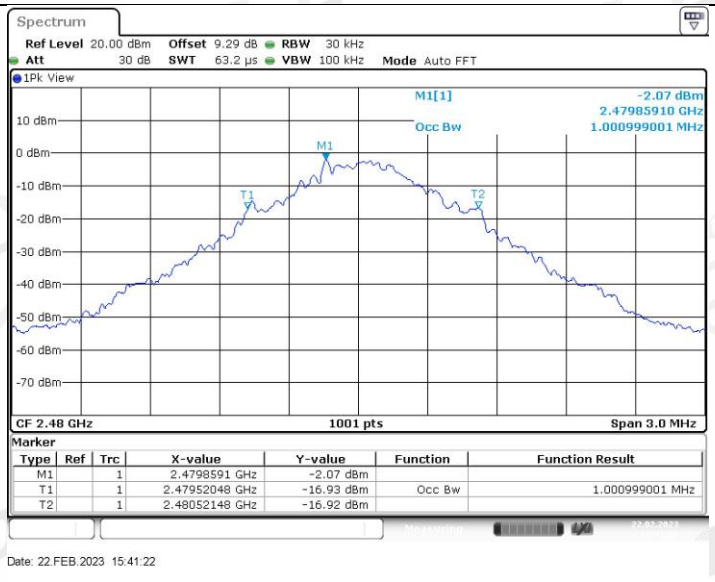
DH5_Ant1_2402



DH5_Ant1_2441



DH5_Ant1_2480



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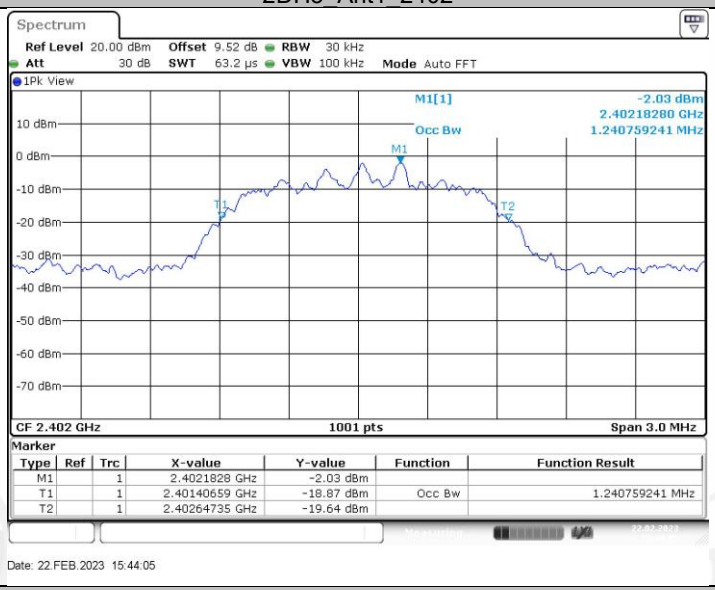

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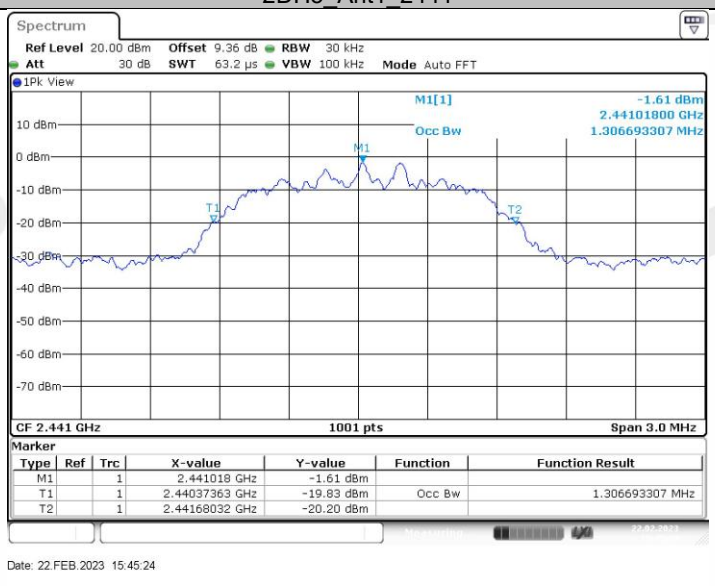

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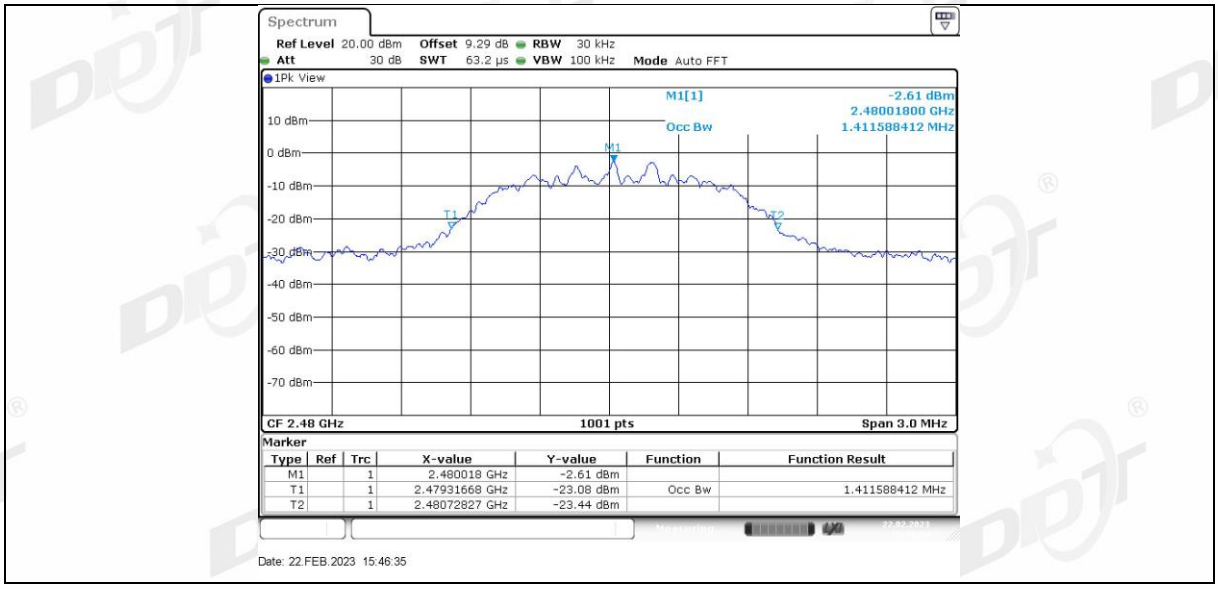
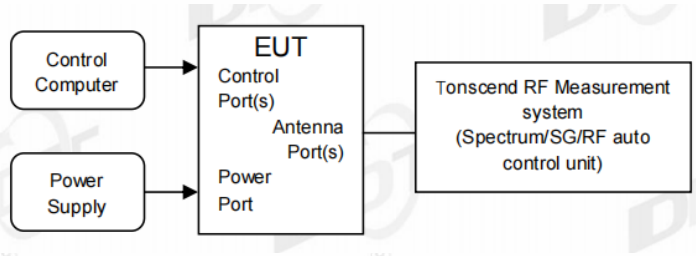

Spectrum
Ref Level 20.00 dBm Offset 9.29 dB RBW 30 kHz
Att 30 dB SWT 63.2 µs VBW 100 kHz Mode Auto FFT
1Pk View
M1[1] -2.61 dBm
2.48001800 GHz
Occ Bw 1.411588412 MHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
CF 2.48 GHz
1001 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.480018 GHz -2.61 dBm
T1 1 2.47931668 GHz -23.08 dBm Occ Bw 1.411588412 MHz
T2 1 2.48072827 GHz -23.44 dBm
Date: 22.FEB.2023 15:46:35

6. Maximum Peak Output Power

6.1. Block diagram of test setup



6.2. Limits

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, the e.i.r.p shall not exceed 4W.

6.3. Test procedure

(1) The test according to ANSI C63.10-2013 clause 7.8.5.

(2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.

(3) Set the EUT as maximum power setting and enable the EUT transmit continuously.

(4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

RBW:	> 20 dB bandwidth of the emission being measured.
VBW:	VBW ⩾ RBW.
Span:	Approximately five times the 20 dB bandwidth, centered on a hopping channel.
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold

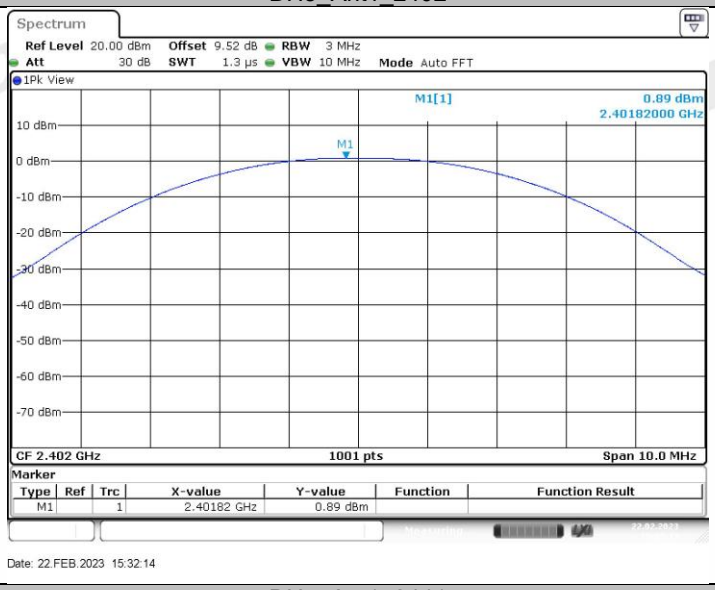
(5) Use the marker-to-peak function to set the marker to the peak of the emission and record the results in the report.

6.4. Test Result Peak

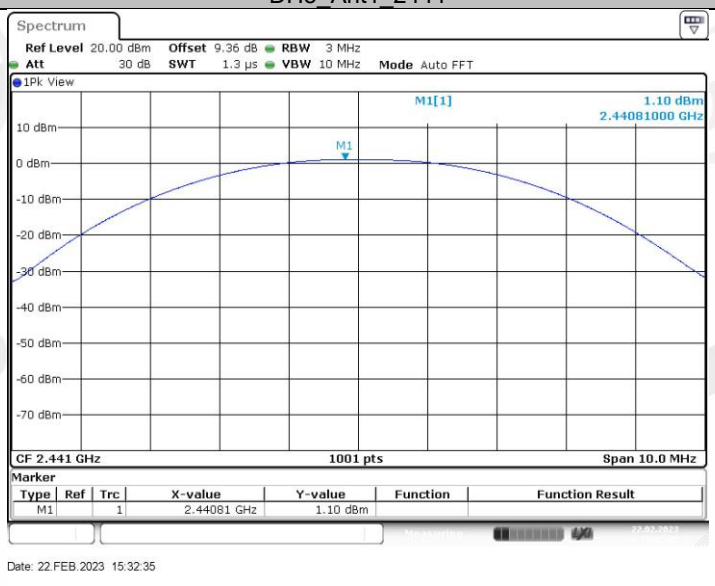
Test Mode	Antenna	Frequency [MHz]	Conducted Peak Power [dBm]	Conducted Limit [dBm]	Verdict
DH5	Ant1	2402	0.89	≤20.97	PASS
		2441	1.10	≤20.97	PASS
		2480	0.57	≤20.97	PASS
2DH5	Ant1	2402	1.03	≤20.97	PASS
		2441	**1.23**	≤20.97	PASS
		2480	0.72	≤20.97	PASS

6.5. Test graphs

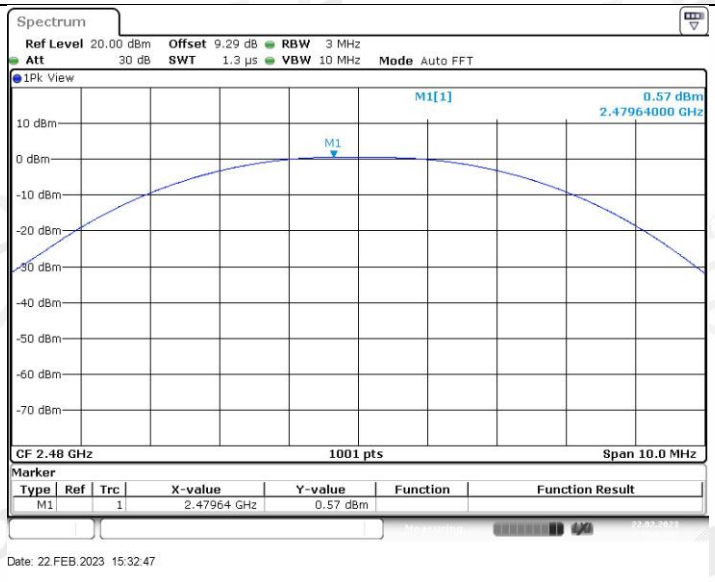
DH5_Ant1_2402



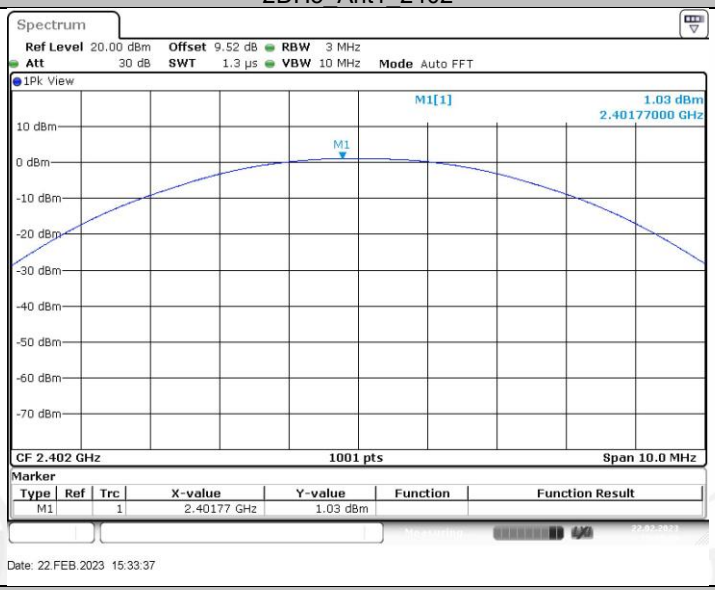
DH5_Ant1_2441



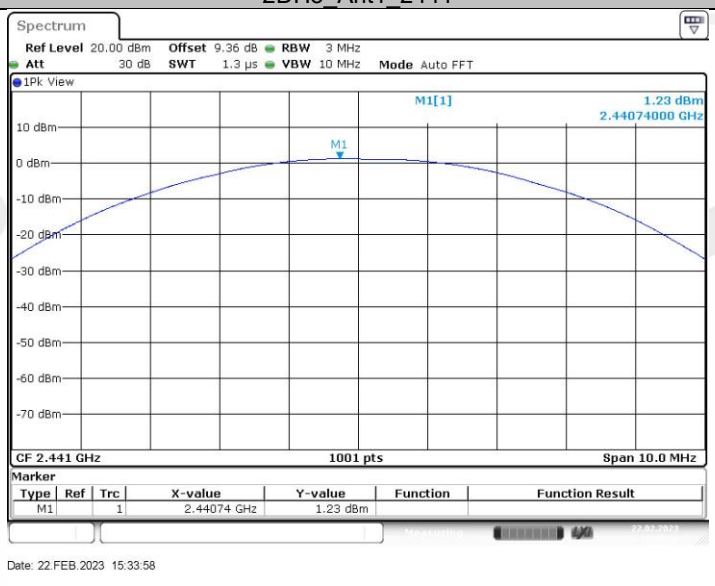
DH5_Ant1_2480



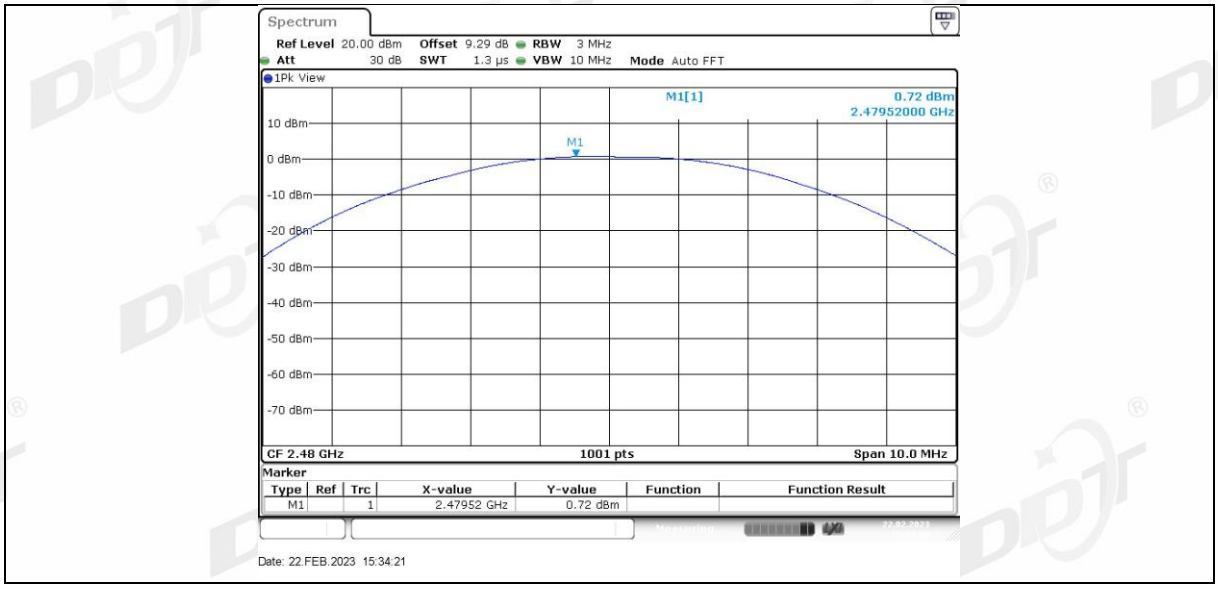
2DH5_Ant1_2402



2DH5_Ant1_2441

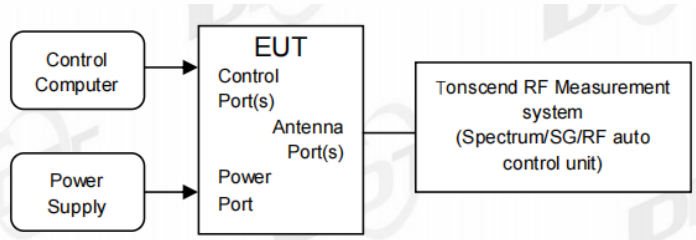


2DH5_Ant1_2480


Spectrum
Ref Level 20.00 dBm Offset 9.29 dB RBW 3 MHz
Att 30 dB SWT 1.3 µs VBW 10 MHz Mode Auto FFT
1Pk View
M1[1] 0.72 dBm
2.47952000 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
CF 2.48 GHz
1001 pts
Span 10.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.47952 GHz 0.72 dBm
Date: 22.FEB.2023 15:34:21

7. Carrier Frequency Separation

7.1. Block diagram of test setup



7.2. Limits

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.

7.3. Test procedure

(1) The test according to ANSI C63.10-2013 clause 7.8.2.

(2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.

(3) Set the EUT as maximum power setting and enable the EUT transmit continuously.

(4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

RBW:	approximately 30% of the channel spacing
VBW:	VBW ⩾ RBW.
Span:	Wide enough to capture the peaks of two adjacent channels.
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold

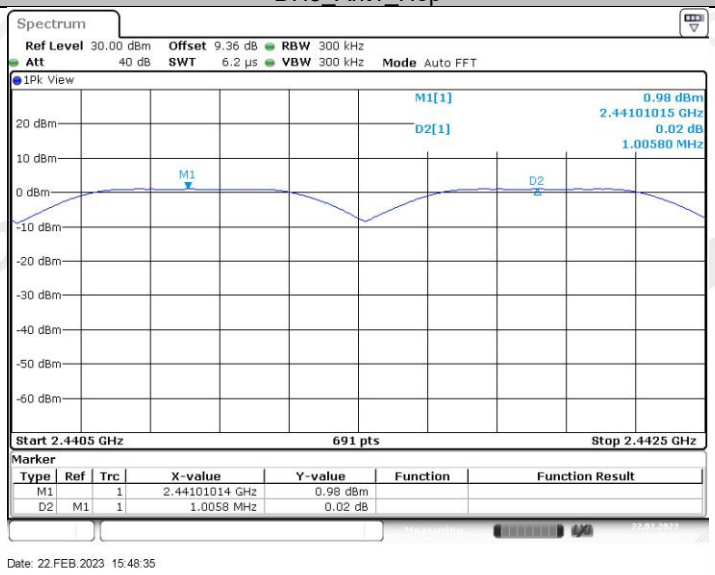
(5) Use the marker-delta function to determine the separation between the peaks of the adjacent channels and record the results in the report.

7.4. Test result

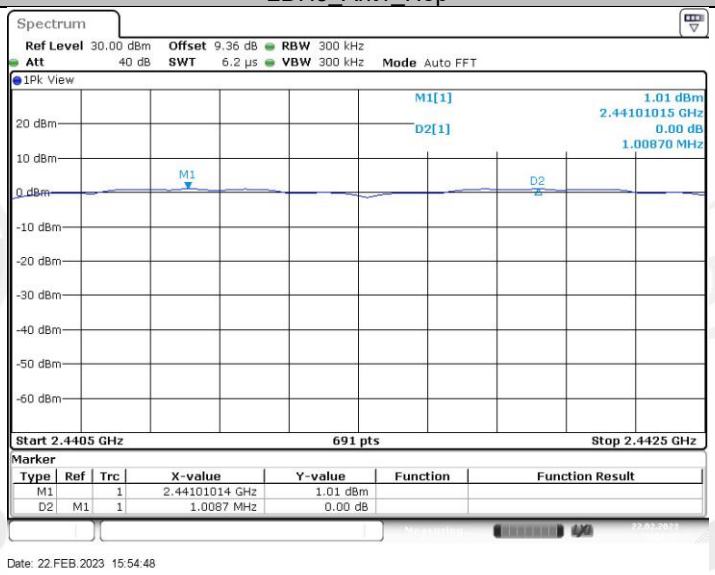
Test Mode	Antenna	Frequency [MHz]	Result [MHz]	Limit [MHz]	Verdict
DH5	Ant1	Hop	1.006	≥0.720	PASS
2DH5	Ant1	Hop	1.009	≥0.940	PASS

7.5. Test graphs

DH5_Ant1_Hop

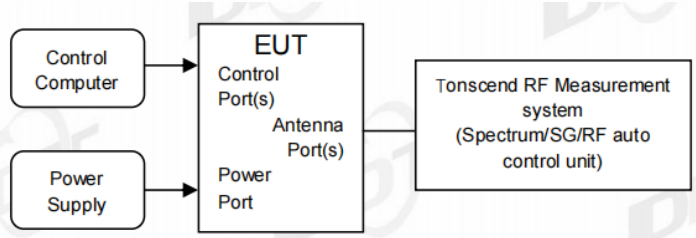


2DH5_Ant1_Hop



8. Dwell Time

8.1. Block diagram of test setup



8.2. Limits

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.

8.3. Test procedure

(1) The test according to ANSI C63.10-2013 clause 7.8.4.

(2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.

(3) Set the EUT as maximum power setting and enable the EUT transmit continuously.

(4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

RBW:	≤ channel spacing and where possible RBW should be set >>1 / T
VBW:	VBW ≥ RBW.
Span:	Zero span, centered on a hopping channel.
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold

Measure and record the results in the report.

(5) The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

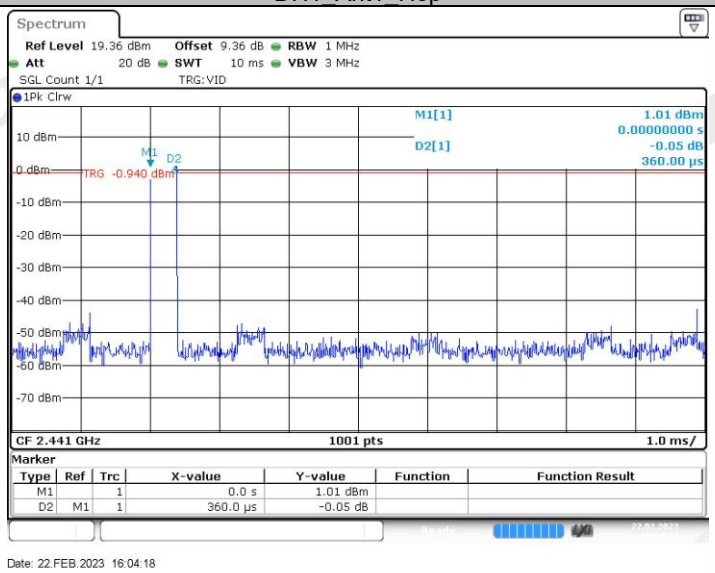
(6) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set, and calculate dwell time with formula Dwell time = total hops *pulse's on time.

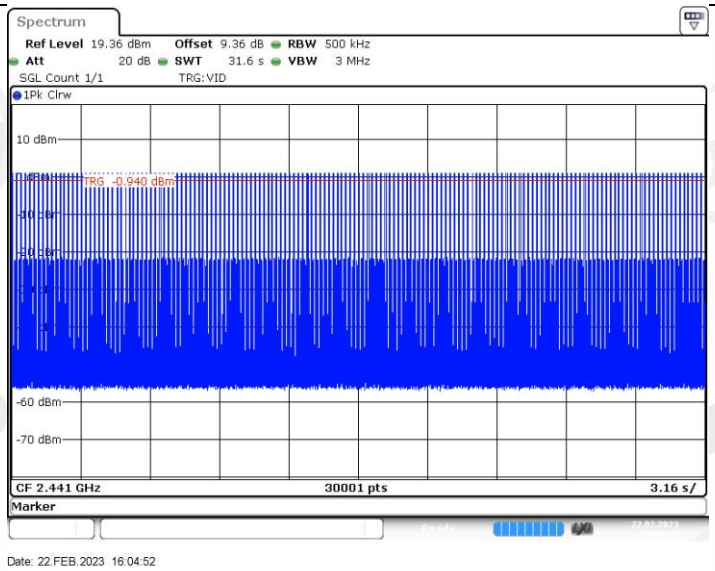
8.4. Test result

Test Mode	Antenna	Frequency [MHz]	Burst Width [ms]	Total Hops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.360	320	0.115	≤0.4	PASS
DH3	Ant1	Hop	1.620	150	0.243	≤0.4	PASS
DH5	Ant1	Hop	2.860	113	0.323	≤0.4	PASS
2DH1	Ant1	Hop	0.370	319	0.118	≤0.4	PASS
2DH3	Ant1	Hop	1.630	162	0.264	≤0.4	PASS
2DH5	Ant1	Hop	2.870	99	0.284	≤0.4	PASS

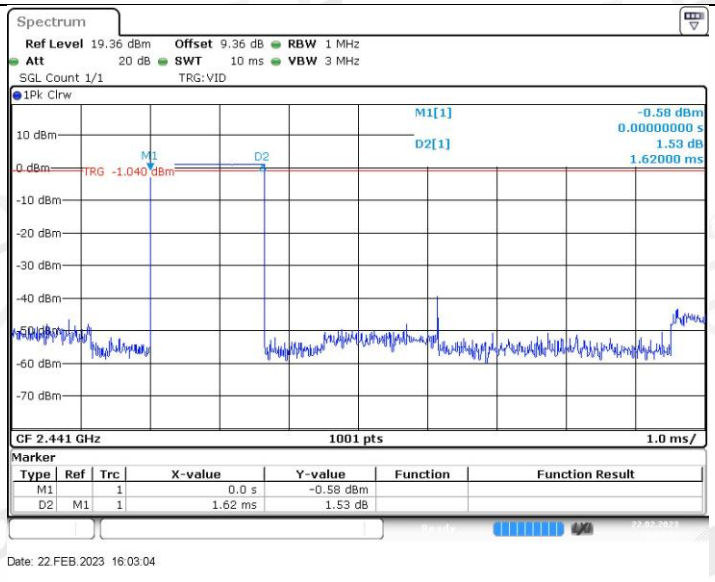
8.5. Test graphs

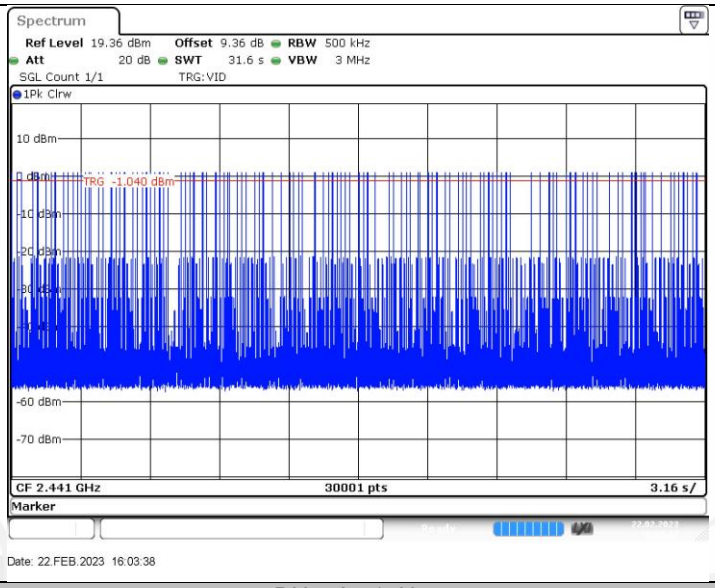
DH1_Ant1_Hop



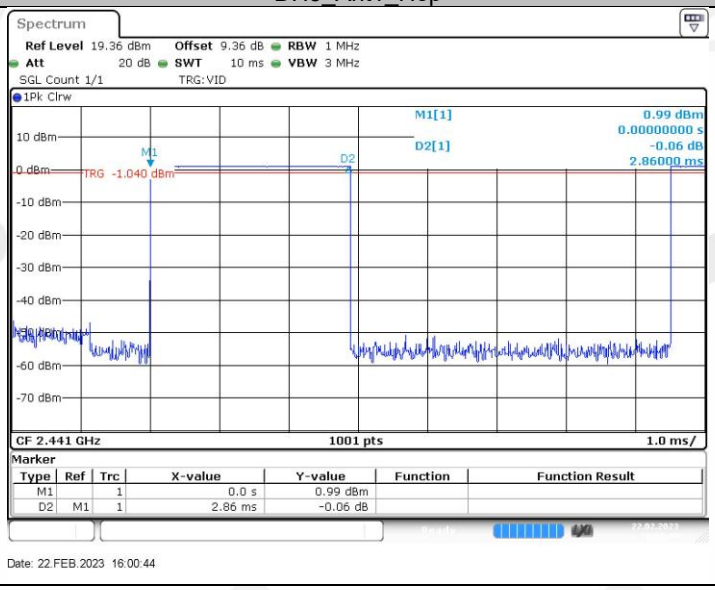


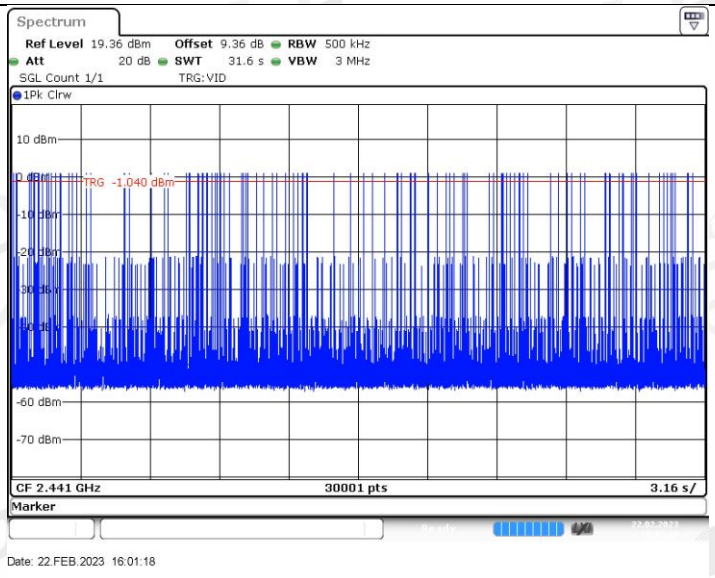
DH3_Ant1_Hop


Spectrum
Ref Level 19.36 dBm Offset 9.36 dB RBW 1 MHz
Att 20 dB SWT 10 ms VBW 3 MHz
SGL Count 1/1 TRG:VID
1Pk Clrw
M1[1] -0.58 dBm
0.00000000 s
D2[1] 1.53 dB
1.62000 ms
TRG -1.040 dBm
CF 2.441 GHz 1001 pts 1.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 0.0 s -0.58 dBm
D2 M1 1 1.62 ms 1.53 dB
Date: 22.FEB.2023 16:03:04

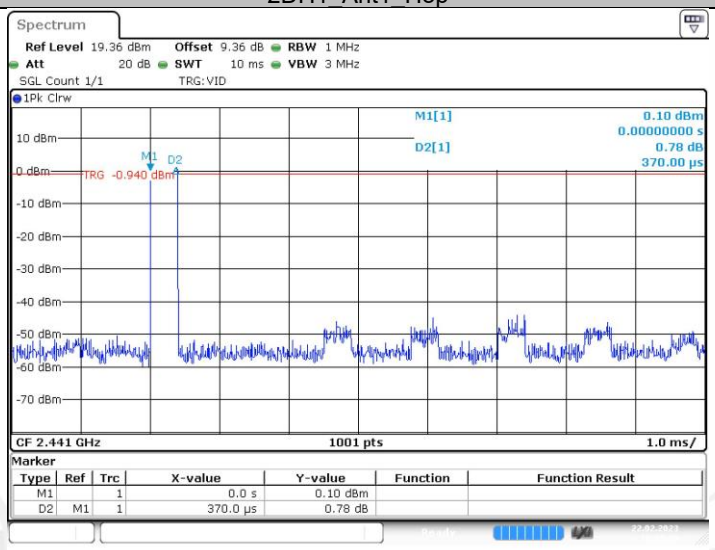

Spectrum
Ref Level 19.36 dBm Offset 9.36 dB RBW 500 kHz
Att 20 dB SWT 31.6 s VBW 3 MHz
SGL Count 1/1 TRG:VID
1Pk Clrw
TRG -1.040 dBm
CF 2.441 GHz 30001 pts 3.16 s/
Marker
Date: 22.FEB.2023 16:03:38

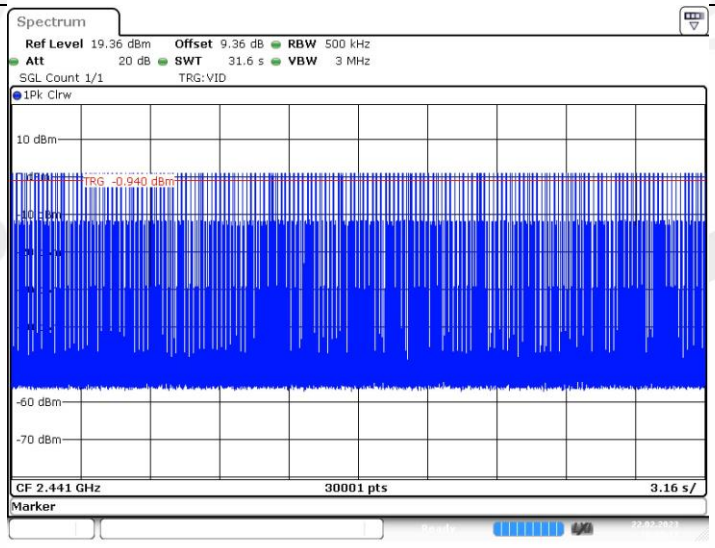
DH5_Ant1_Hop


Spectrum
Ref Level 19.36 dBm Offset 9.36 dB RBW 1 MHz
Att 20 dB SWT 10 ms VBW 3 MHz
SGL Count 1/1 TRG:VID
1Pk Clrw
M1[1] 0.99 dBm
0.00000000 s
D2[1] -0.06 dB
2.86000 ms
TRG -1.040 dBm
CF 2.441 GHz 1001 pts 1.0 ms/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 0.0 s 0.99 dBm
D2 M1 1 2.86 ms -0.06 dB
Date: 22.FEB.2023 16:00:44

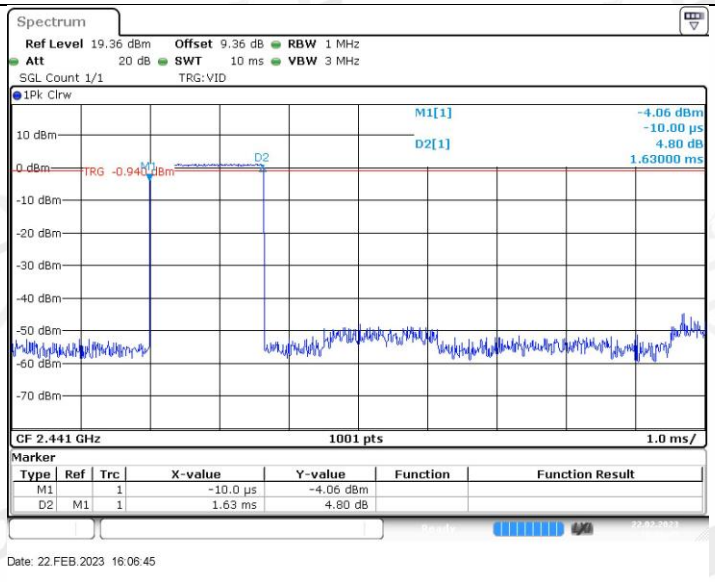


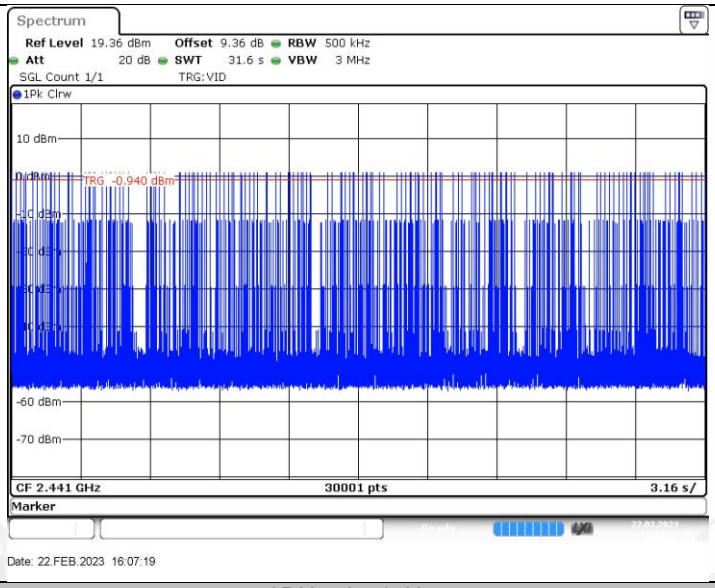
2DH1_Ant1_Hop



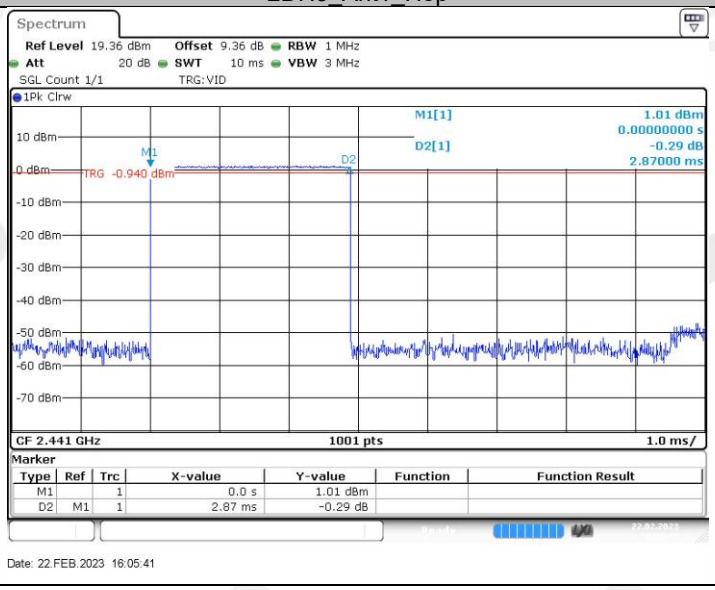


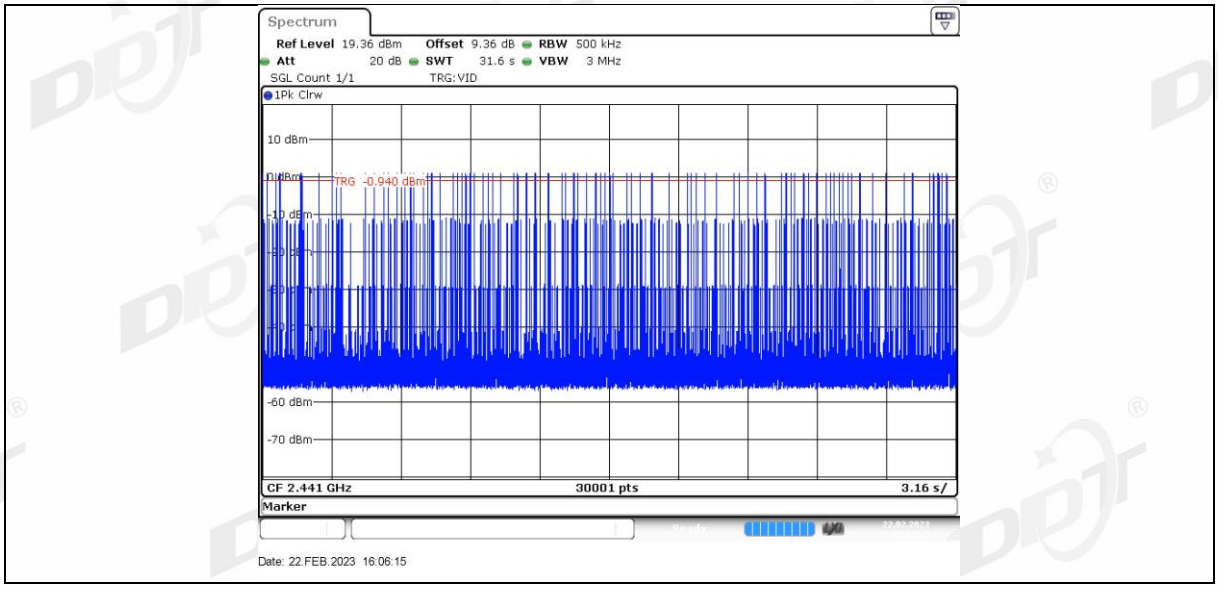
2DH3_Ant1_Hop





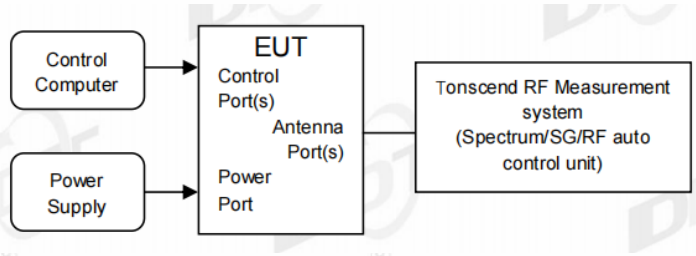
2DH5_Ant1_Hop




Spectrum
Ref Level 19.36 dBm Offset 9.36 dB RBW 500 kHz
Att 20 dB SWT 31.6 s VBW 3 MHz
SGL Count 1/1 TRG: VID
1Pk Clrw
10 dBm
TRG -0.940 dBm
-10 dBm
-60 dBm
-70 dBm
CF 2.441 GHz 30001 pts 3.16 s/
Marker
Date: 22.FEB.2023 16:06:15

9. Number of Hopping Channel

9.1. Block diagram of test setup



9.2. Limits

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

9.3. Test procedure

(1) The test according to ANSI C63.10-2013 clause 7.8.3.

(2) Connect EUT's antenna output to spectrum analyzer by RF cable, the path loss was compensated to the results.

(3) Set the EUT as maximum power setting and enable the EUT transmit continuously.

(4) Use the following spectrum analyzer settings for the maximum peak output power measurement:

RBW:	RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW:	VBW ≥ RBW.
Span:	The frequency band of operation
Detector Mode:	Peak
Sweep time:	Auto
Trace mode:	Max hold

Measure and record the results in the report.

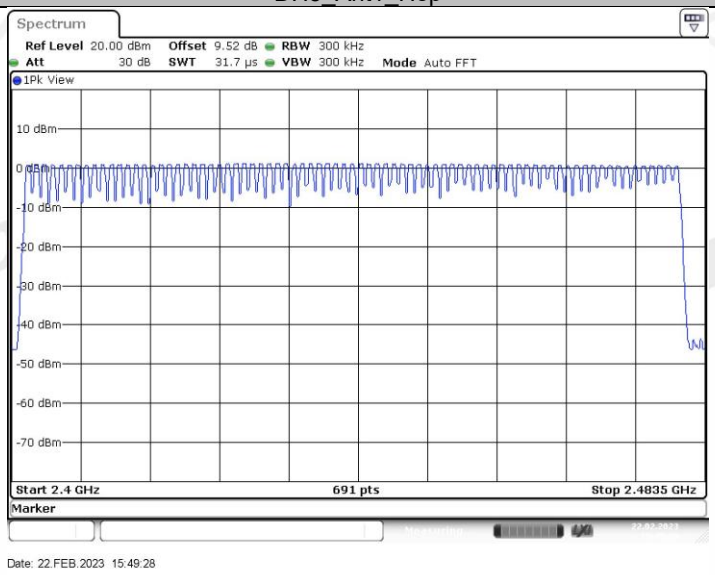
(5) Measure the hopping number and record the results in the report.

9.4. Test result

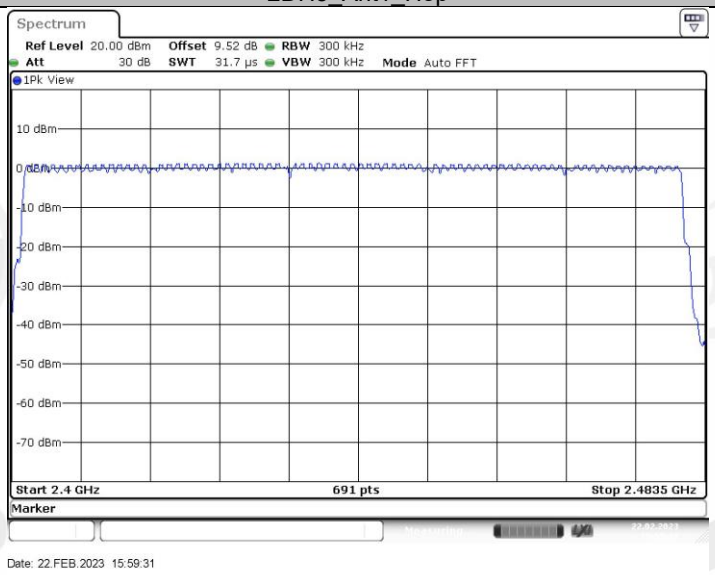
Test Mode	Antenna	Frequency [MHz]	Result [Num]	Limit [Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS

9.5. Test graphs

DH5_Ant1_Hop

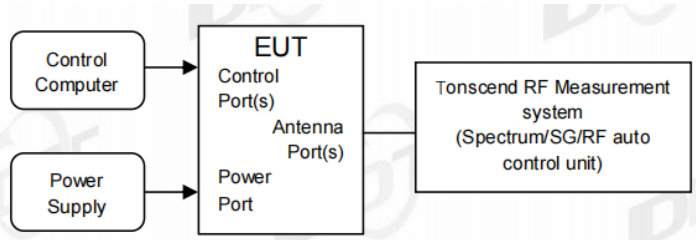


2DH5_Ant1_Hop



10. Band Edge Compliance (Conducted Method)

10.1. Block diagram of test setup



10.2. Limit

All restriction band should comply with 15.209, other emission should be at least 20dB below the fundamental.

10.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Detector Mode:	Peak
Sweep time:	Auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

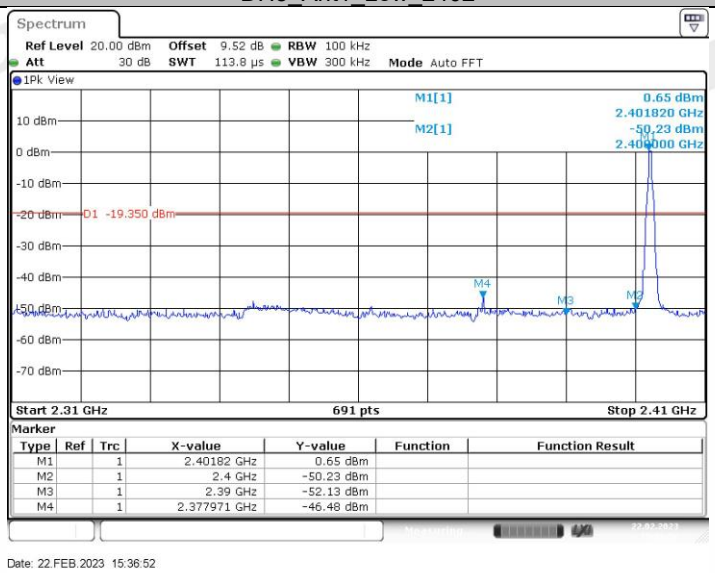
(4) Then mark the maximum amplitude of all unwanted emissions outside of the authorized frequency band.

10.4. Test result

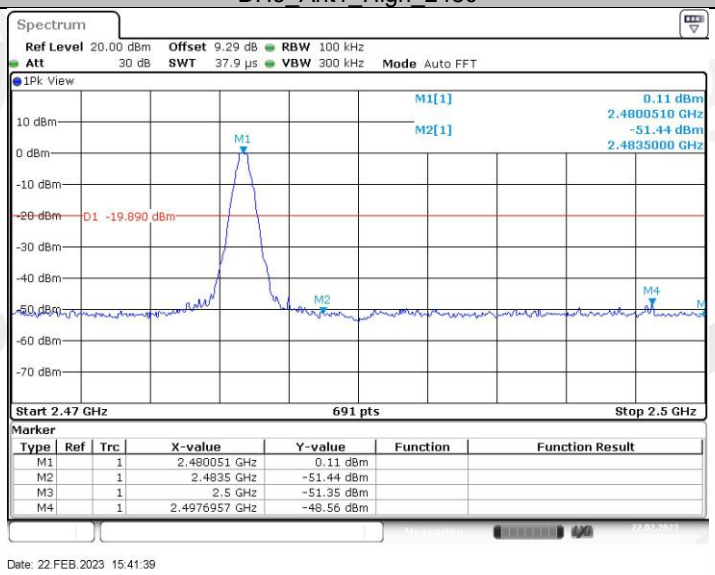
Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass
π/4-DQPSK	Hopping off 2402	Pass
	Hopping off 2480	Pass
	Hopping on	Pass

10.5. Test graphs

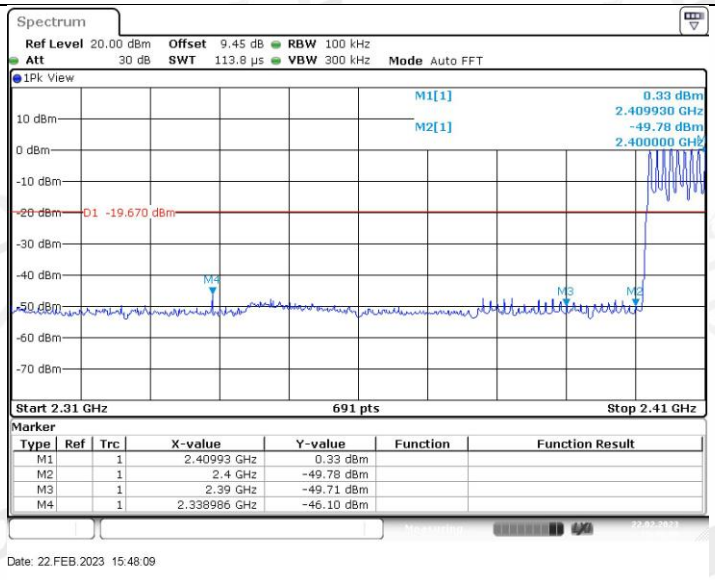
DH5_Ant1_Low_2402



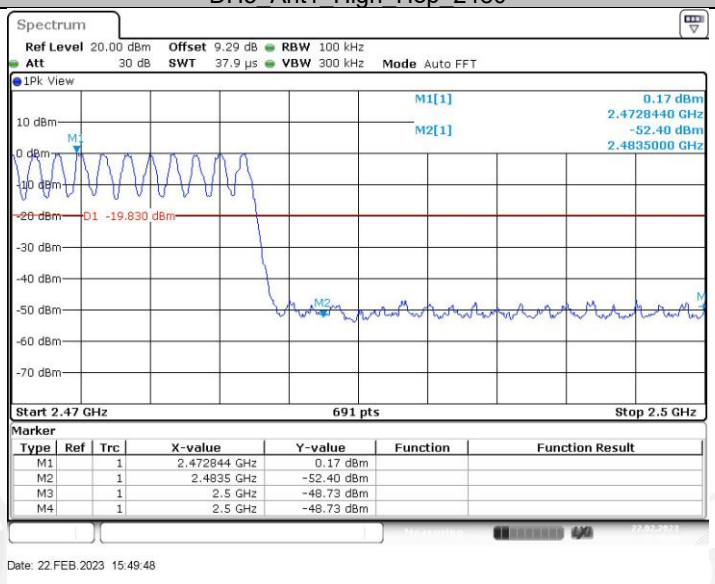
DH5_Ant1_High_2480



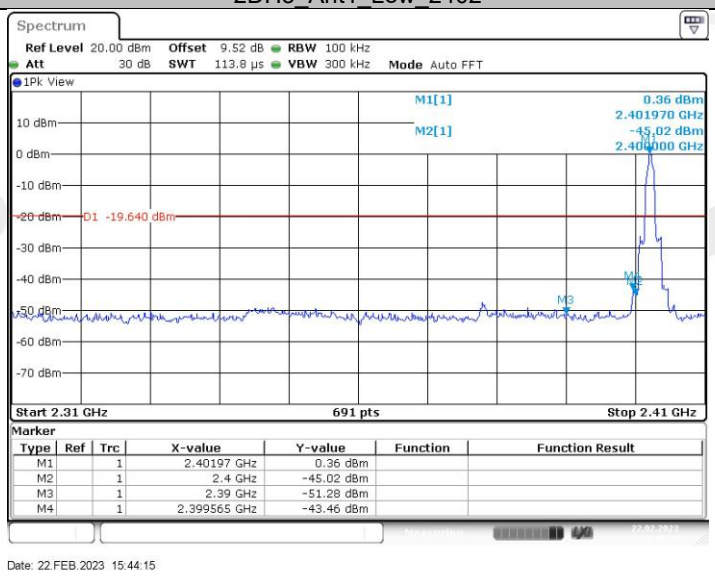
DH5_Ant1_Low_Hop_2402



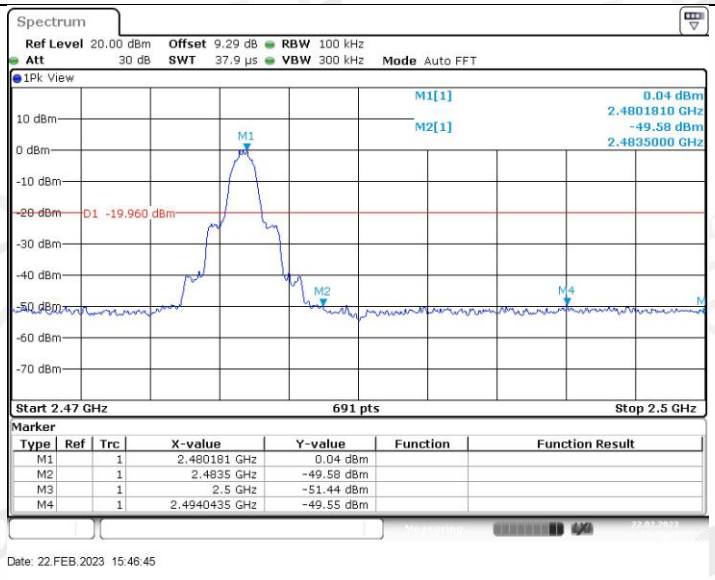
DH5_Ant1_High_Hop_2480



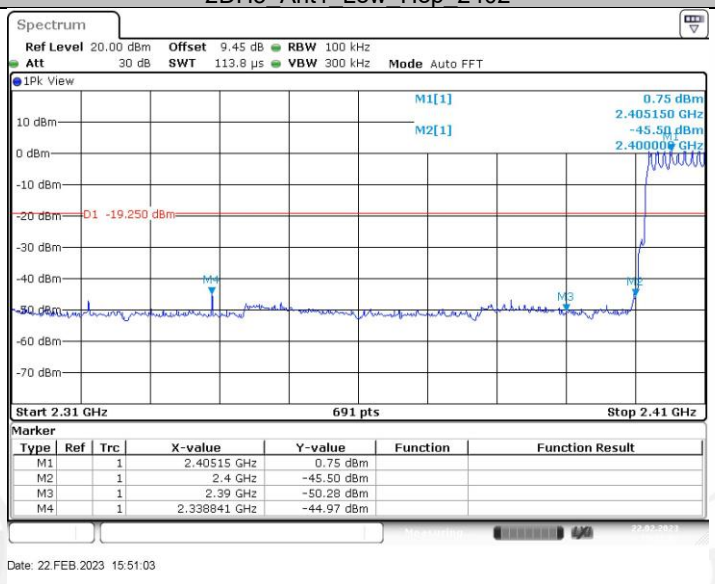
2DH5_Ant1_Low_2402



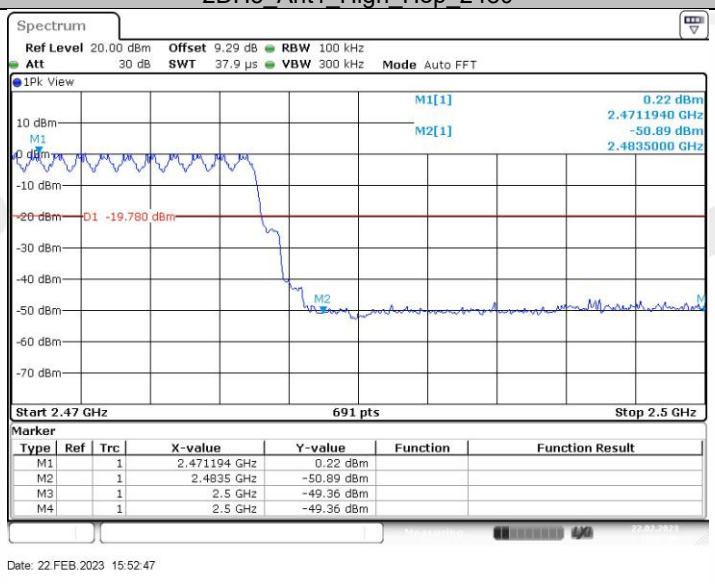
2DH5_Ant1_High_2480



2DH5_Ant1_Low_Hop_2402

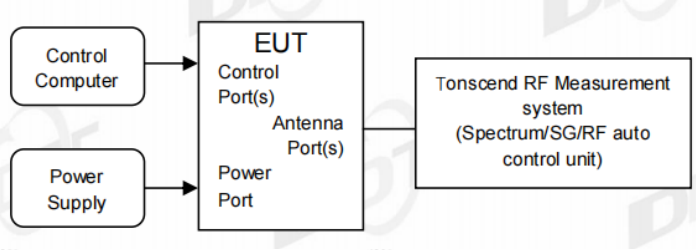


2DH5_Ant1_High_Hop_2480



11. RF Conducted Spurious Emissions

11.1. Block diagram of test setup



11.2. Limits

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in 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.

11.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

Center frequency	Test frequency
RBW:	100 kHz
VBW:	300 kHz
Span	Wide enough to capture the peak level of the in-band emission
Detector Mode:	Peak
Sweep time:	Auto
Trace mode	Max hold

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

RBW:	100 kHz
VBW:	300 kHz
Span	Encompass frequency range to be measured
Number of measurement points	≥span/RBW
Detector Mode:	Peak
Sweep time:	Auto
Trace mode	Max hold

Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

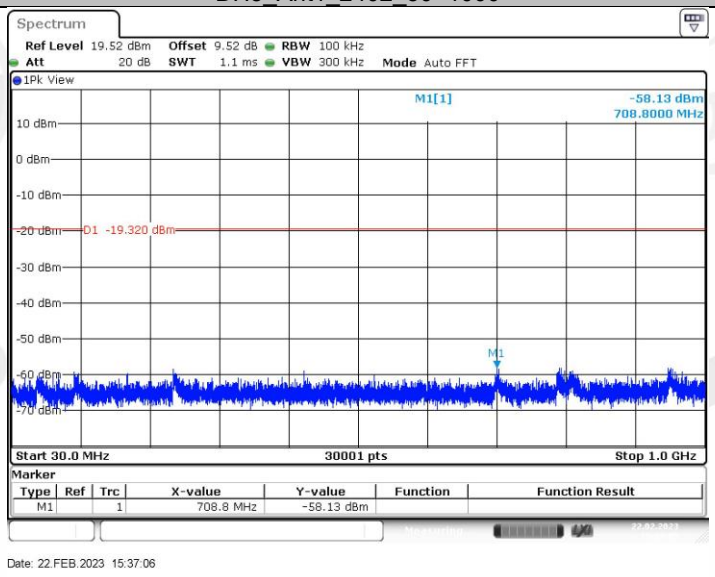
11.4. Test result

Mode	Freq. (MHz)	Verdict
GFSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass
π/4-DQPSK	Hopping off 2402	Pass
	Hopping off 2441	Pass
	Hopping off 2480	Pass

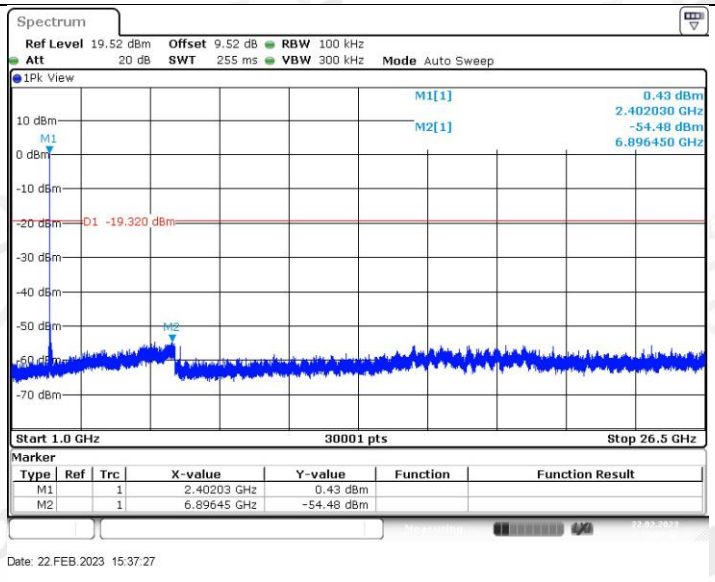
11.5. Test graphs

DH5_Ant1_2402_0~Reference

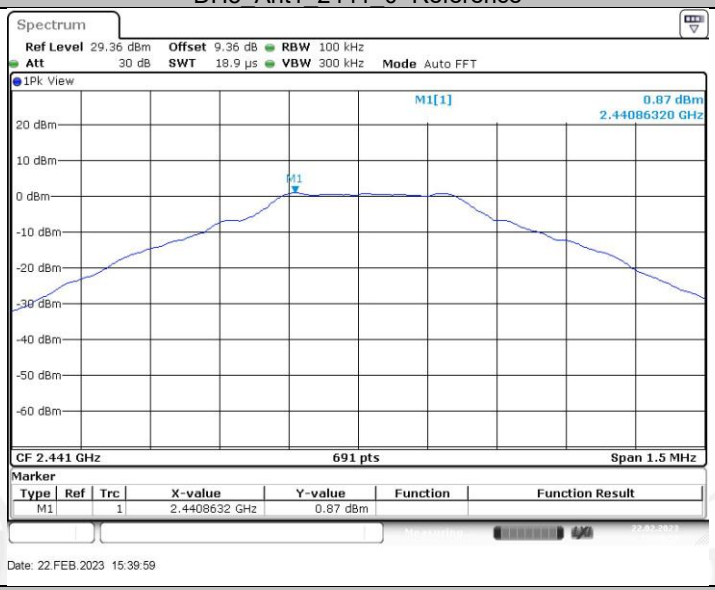
DH5_Ant1_2402_30~1000



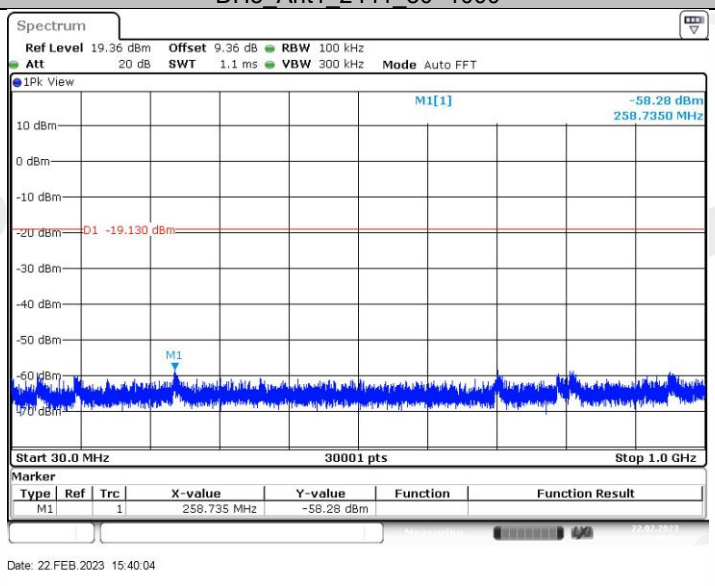
DH5_Ant1_2402_1000~26500



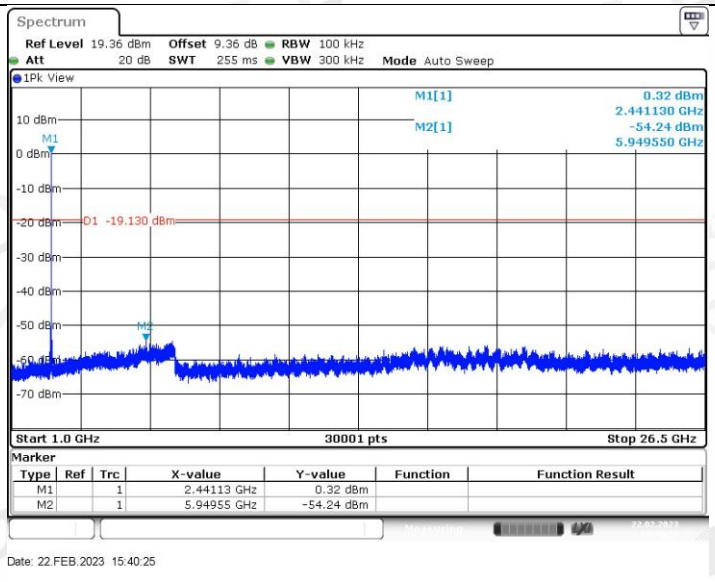
DH5_Ant1_2441_0~Reference



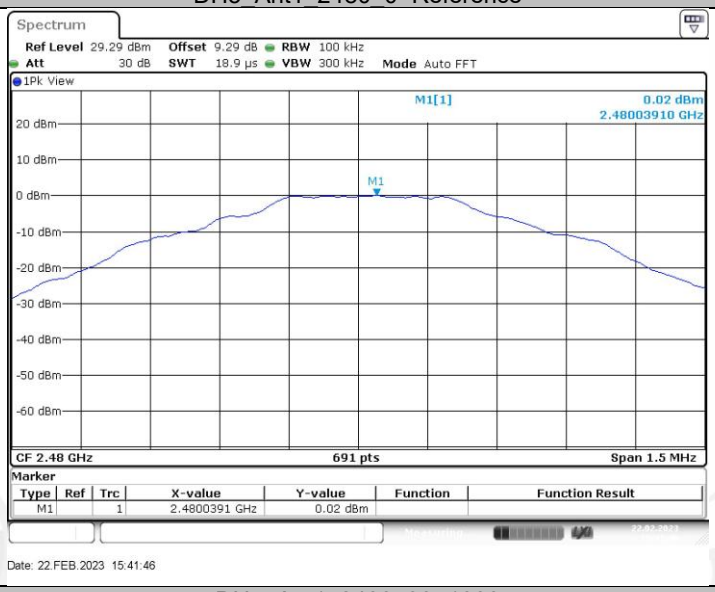
DH5_Ant1_2441_30~1000



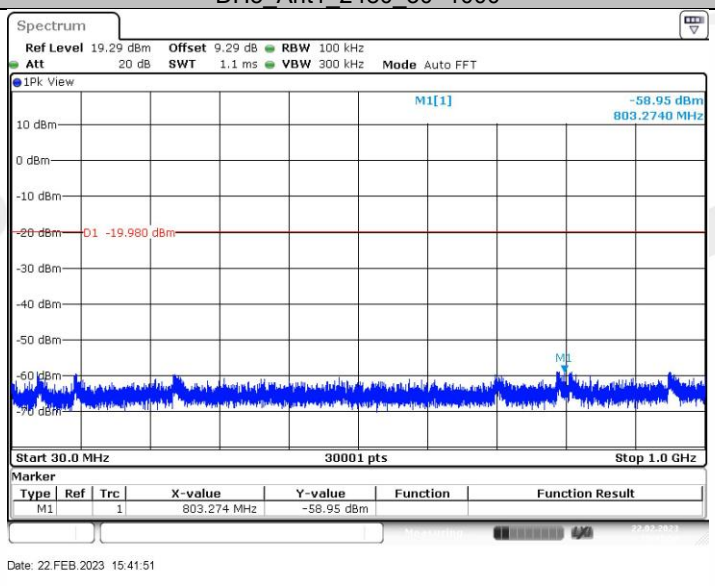
DH5_Ant1_2441_1000~26500



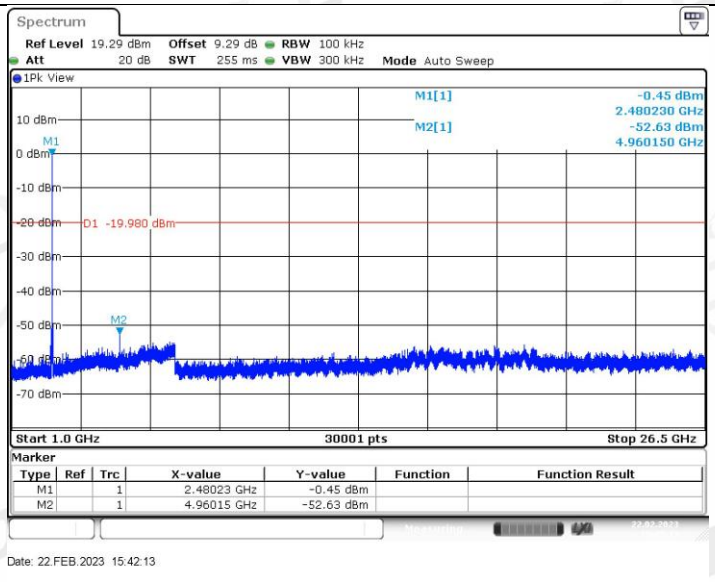
DH5_Ant1_2480_0~Reference



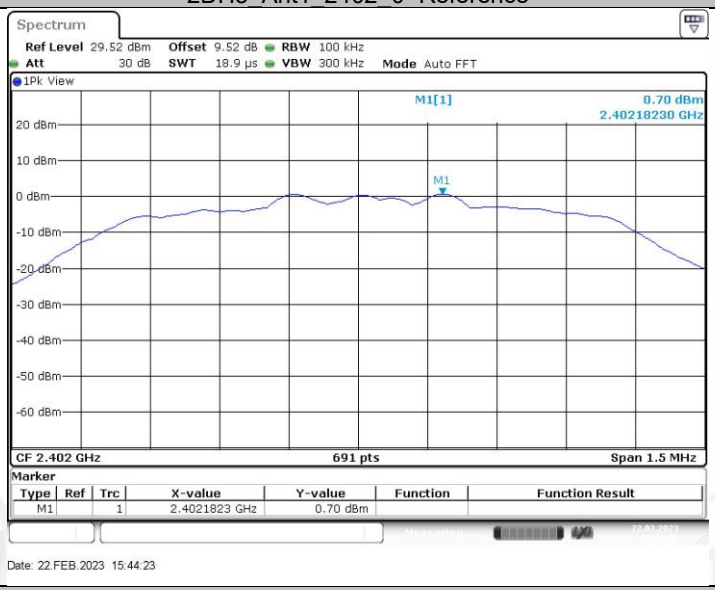
DH5_Ant1_2480_30~1000



DH5_Ant1_2480_1000~26500



2DH5_Ant1_2402_0~Reference



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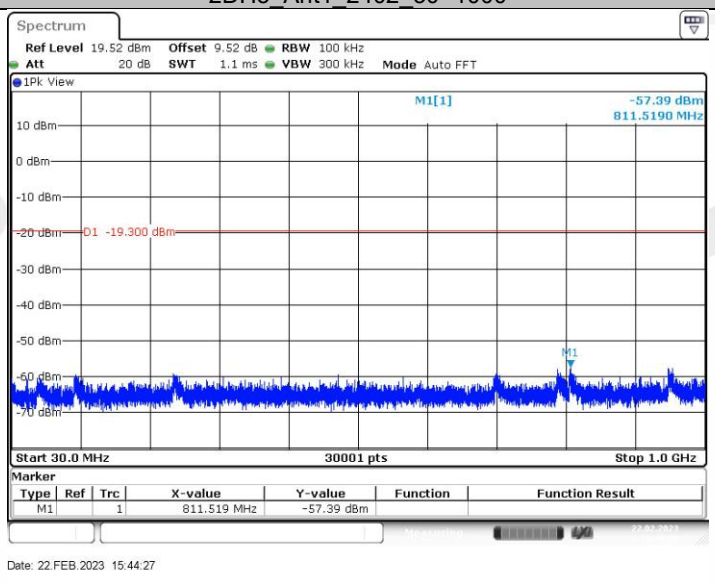
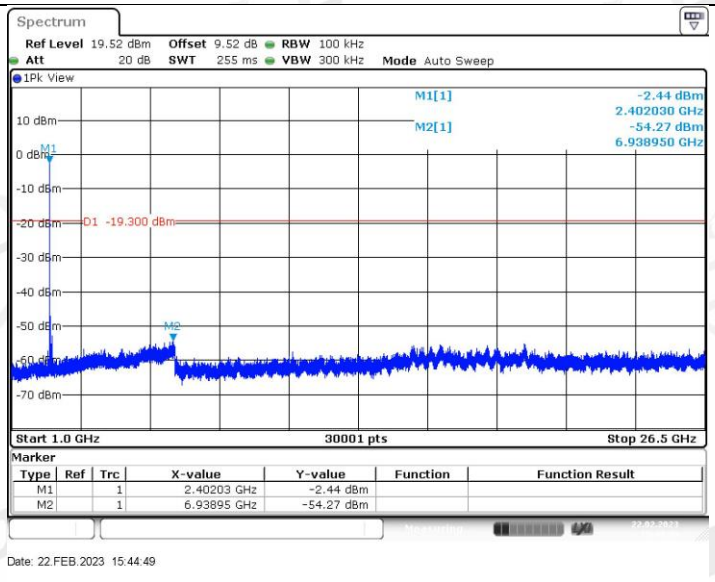


2DH5_Ant1_2402_1000~26500



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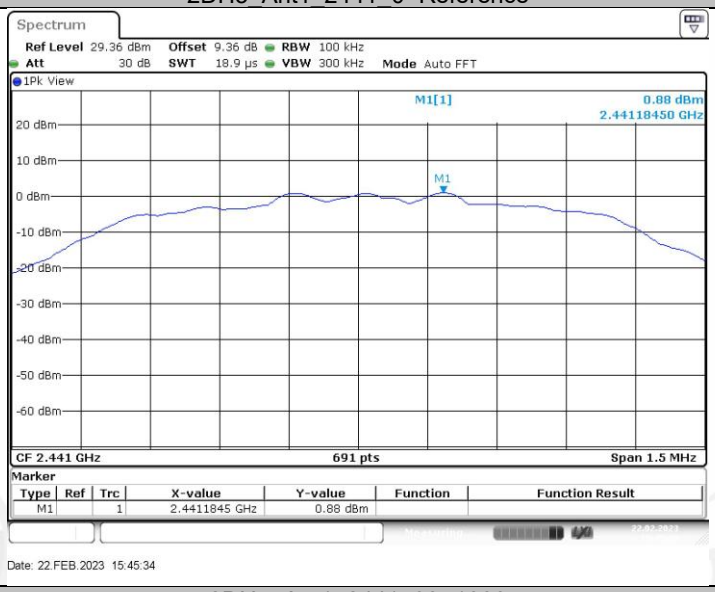

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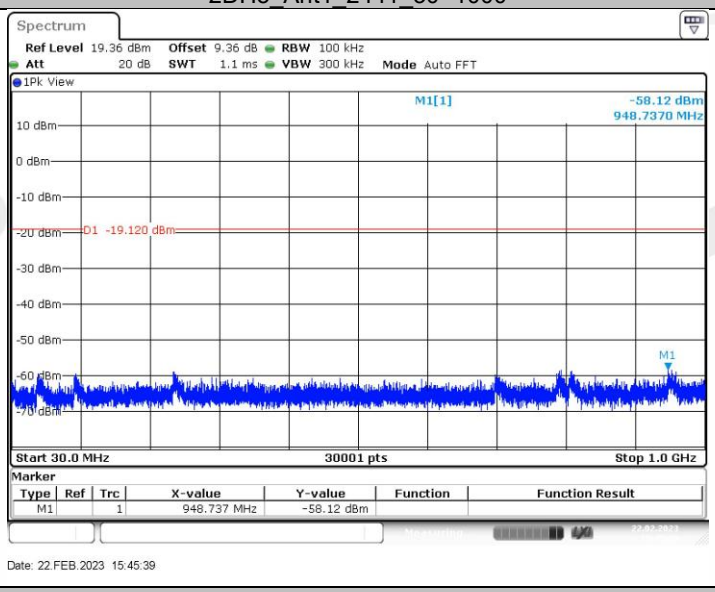

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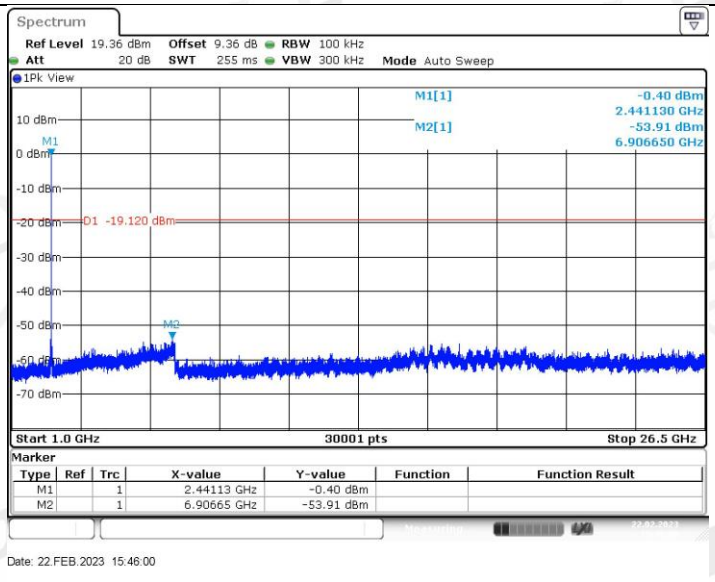

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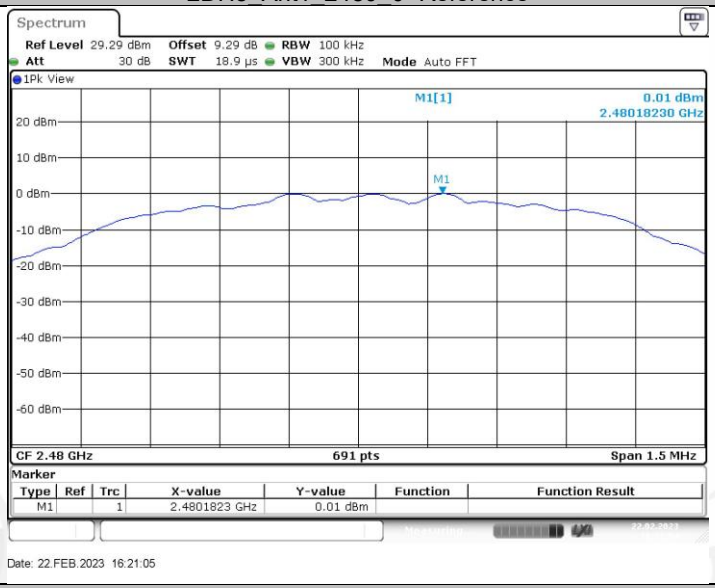

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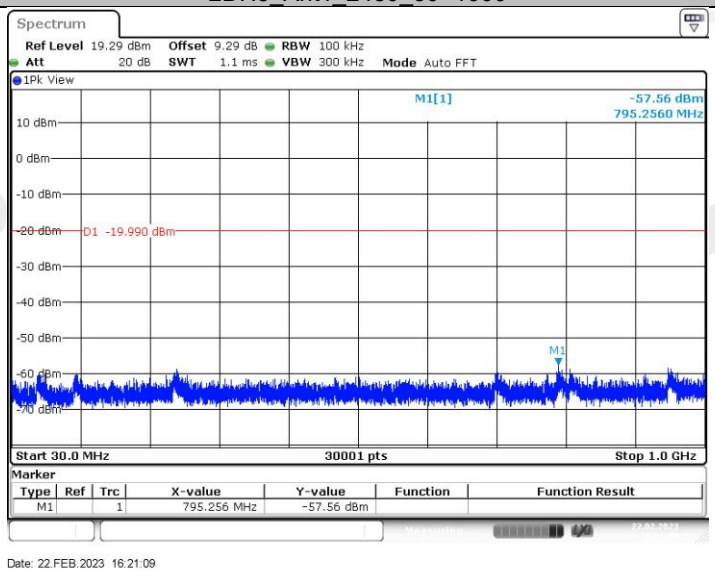

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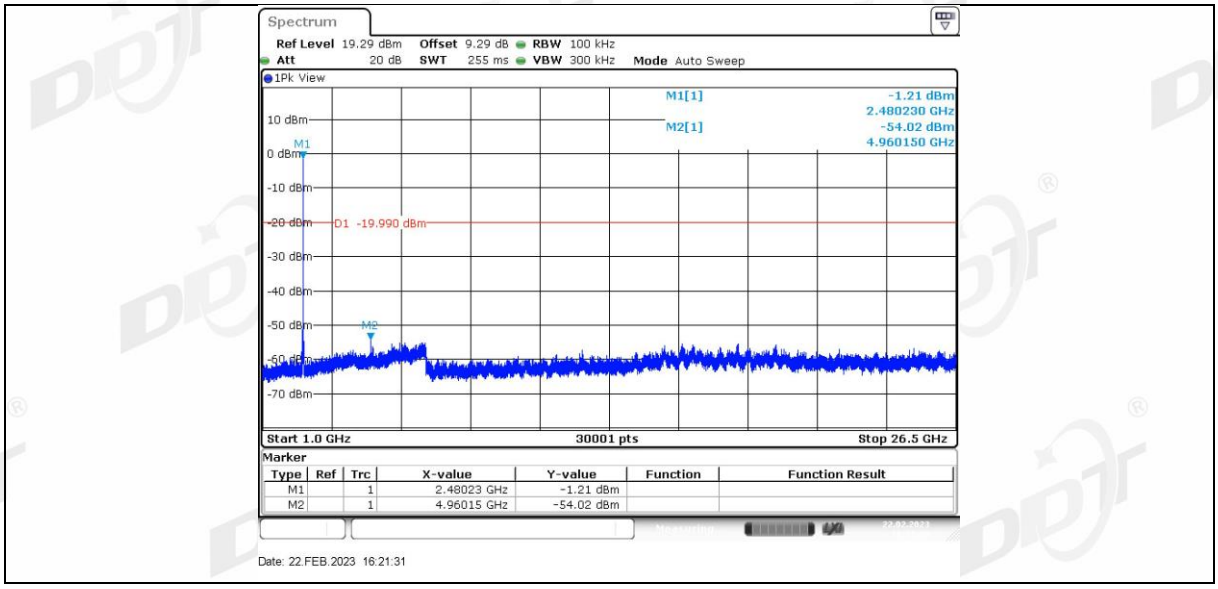
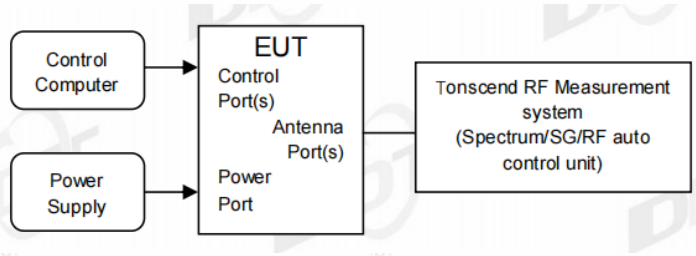

Spectrum
Ref Level 19.29 dBm Offset 9.29 dB RBW 100 kHz
Att 20 dB SWT 255 ms VBW 300 kHz Mode Auto Sweep
1Pk View
M1[1] -1.21 dBm
2.480230 GHz
M2[1] -54.02 dBm
4.960150 GHz
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm
M1
D1 -19.990 dBm
M2
Start 1.0 GHz
30001 pts
Stop 26.5 GHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.48023 GHz -1.21 dBm
M2 1 4.96015 GHz -54.02 dBm
Date: 22.FEB.2023 16:21:31

12. Duty cycle

12.1. Block diagram of test setup



12.2. Limit

Just for Report.

12.3. Test procedure

(1) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, The cable loss and attenuator loss have been put into spectrum analyzer as amplitude offset.

set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the middle hopping channel.

Resolution BW: 10 MHz.

Video BW: 10 MHz.

Span: Zero span.

Detector: Peak.

Trace Mode: Max hold.

Sweep: Video Trigger

(2) When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.

(3) Calculate dwell time follow below formula:

Duty cycle= Pulse's on time / Burst cycle