ETSI EN 300 328 RADIO TEST REPORT

On Behalf of

Shenzhen Shadow Crown Technology Co.,Ltd.

LED Projector

Model No.: See model list

Prepared for	:	Shenzhen Shadow Crown Technology Co.,Ltd.
Address	:	501-702, Building A9, Longwangmiao Industrial Building, East Baishixia Community, Fuyong Street, Baoan District, Shenzhen

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

Report Number	:	A2503316-C01-R04
Date of Receipt	:	January 4, 2024
Date of Test	:	January 4, 2024 – February 22, 2024
Date of Report	:	April 3, 2025
Version Number	:	V0
Test Result	**:**	**Pass**

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TEST REPORT DECLARATION

Applicant	:	Shenzhen Shadow Crown Technology Co.,Ltd.
Address	:	501-702, Building A9, Longwangmiao Industrial Building, East Baishixia Community, Fuyong Street, Baoan District, Shenzhen
Manufacturer	:	Shenzhen Shadow Crown Technology Co.,Ltd.
Address	:	501-702, Building A9, Longwangmiao Industrial Building, East Baishixia Community, Fuyong Street, Baoan District, Shenzhen
EUT Description	:	LED Projector
		(A) Model No. : See model list
		(B) Trademark : N/A

Measurement Standard Used:

ETSI EN 300 328 V2.2.2:2019

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. The measurement results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 300 328 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

Approved by (name + signature).....: Jack Xu
Project Manager

SHENZHEN ALPHA PRODUCT TESTING CO.,LTD
ALPHA PRODUCT TESTING

Date of issue..... .....: April 3, 2025

Revision History

Revision	Issue Date	Revisions	Revised By
V0	April 3, 2025	Initial released Issue	Yannis Wen

1. General Information

1.1. Description of Device (EUT)

EUT Name	:	LED Projector
Model No.	:	See model list
DIFF.	:	There is no difference between the models except the appearance color. So all the test were performed on the model YG691.
Power supply	:	AC 230V/50Hz

Radio Technology	:	Bluetooth EDR
Operation frequency	:	2402-2480MHz
Channel No.	:	79 channels
Channel Separation	:	1MHz
Modulation	:	GFSK, π/4-DQPSK, 8DPSK
Antenna Type	:	Internal antenna, Maximum Gain is 0dBi. (Antenna information is provided by applicant.)
Software version	:	V1.0
Hardware version	:	V1.0

This Co-license is based on report A2312177-C01-R06, the new models YG201, YG203, YG210, YG211, YG213, YG221, YG223, YG233, YG241, YG243, YG251, YG253, YG261, YG263, YG271, YG273, YG283, YG293, YG301, YG303, YG311, YG313, YG321, YG323, YG333, YG341, YG343, YG351, YG353, YG363, YG373, YG383, YG393, YG401, YG403, YG413, YG423, YG433, YG441, YG443, YG451, YG453, YG463, YG473, YG481, YG483, YG493, YG501, YG501, YG511, YG513, YG521, YG523, YG531, YG533, YG541, YG543, YG553, YG563, YG571, YG573, YG583, YG593 in Co-license are the same as original models YG691, YG231, YG281, YG291, YG351, YG331, YG361, YG371, YG381, YG391, YG411, YG421, YG431, YG461, YG471, YG491, YG551, YG561, YG581, YG591, YG621, YG621miniYG631, YG651, YG661, YG681, YG721, YG731, YG751, YG761, YG771, YG781, YG791, YG280, YG290, YG330, YG350, YG360, YG370, YG380, YG390, YG420, YG430, YG470, YG490, YG550, YG560, YG600, YG600Plus, YG620mini, YG650, YG680, YG690, YG720, YG730, YG750, YG760, YG770, YG780, YG790, W1K mentioned in test report A2312177-C01-R06 except for the address of the license holder ”501-702, Building A9, Longwangmiao Industrial Building, East Baishixia Community, Fuyong Street, Baoan District, Shenzhen”, no further test need.

a) The type of modulation used by the equipment:

■FHSS

□other forms of modulation

b) In case of FHSS modulation:

•In case of non-Adaptive Frequency Hopping equipment:

The number of Hopping Frequencies:

•In case of Adaptive Frequency Hopping Equipment:

The maximum number of Hopping Frequencies:

The minimum number of Hopping Frequencies:

The Dwell Time: ms maximum

The Minimum Channel Occupation Time: ms

c) Adaptive / non-adaptive equipment:

□non-adaptive Equipment

■adaptive Equipment without the possibility to switch to a non-adaptive mode

□adaptive Equipment which can also operate in a non-adaptive mode

d) In case of adaptive equipment:

The Channel Occupancy Time implemented by the equipment: ms

□The equipment has implemented an LBT based DAA mechanism

- In case of equipment using modulation different from FHSS:

□The equipment is Frame Based equipment

□The equipment is Load Based equipment

□The equipment can switch dynamically between Frame Based and Load Based equipment

The CCA time implemented by the equipment: ..... µs

The value q as referred to in clause 4.3.2.5.2.2.2 .....

■The equipment has implemented an non-LBT based DAA mechanism

□The equipment can operate in more than one adaptive mode

e) In case of non-adaptive Equipment:

The maximum RF Output Power (e.i.r.p.): …….

The maximum (corresponding) Duty Cycle: ……. %

Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):

f) The worst case operational mode for each of the following tests:

- RF Output Power

- Power Spectral Density

.....

- Duty cycle, Tx-Sequence, Tx-gap

.....

- Dwell time, Minimum Frequency Occupation & Hopping Sequence (only for FHSS equipment)

- Hopping Frequency Separation (only for FHSS equipment)

- Medium Utilisation

.....

- Adaptivity & Receiver Blocking

.....

- Occupied Channel Bandwidth

- Transmitter unwanted emissions in the OOB domain

- Transmitter unwanted emissions in the spurious domain

- Receiver spurious emissions

g) The different transmit operating modes (tick all that apply):

■Operating mode 1: Single Antenna Equipment

■Equipment with only 1 antenna

□Equipment with 2 diversity antennas but only 1 antenna active at any moment in time

□Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)

□Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming

□Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)

□High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1

□High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

□Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming

□Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)

□High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1

□High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2

NOTE: Add more lines if more channel bandwidths are supported.

h) In case of Smart Antenna Systems:

- The number of Receive chains: .....
- The number of Transmit chains: .....

□symmetrical power distribution

□asymmetrical power distribution

In case of beam forming, the maximum beam forming gain: .....

NOTE: Beam forming gain does not include the basic gain of a single antenna.

i) Operating Frequency Range(s) of the equipment:

- Operating Frequency Range 1: MHz to MHz
- Operating Frequency Range 2: ..... MHz to ..... MHz

NOTE: Add more lines if more Frequency Ranges are supported.

j) Occupied Channel Bandwidth(s):

Occupied Channel Bandwidth 1: …..

Occupied Channel Bandwidth 2: …..

NOTE: Add more lines if more channel bandwidths are supported.

k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):

■Stand-alone

□Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)

□Plug-in radio device (Equipment intended for a variety of host systems)

Other .....

l) The extreme operating conditions that apply to the equipment:

Operating temperature range: ….

Operating voltage range: □AC ■DC

Details provided are for the: ■stand-alone equipment

□combined (or host) equipment

□test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:

• Antenna Type

■Internal antenna

Antenna Gain: dBi

If applicable, additional beamforming gain (excluding basic antenna gain): ..... dB

□Temporary RF connector provided

□No temporary RF connector provided

□Dedicated Antennas (equipment with antenna connector)

□Single power level with corresponding antenna(s)

□Multiple power settings and corresponding antenna(s)

Number of different Power Levels: .....

Power Level 1: ..... dBm

Power Level 2: ..... dBm

Power Level 3: ..... dBm

NOTE 1: Add more lines in case the equipment has more power levels.

NOTE 2: These power levels are conducted power levels (at antenna connector).

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:

Details provided are for the: ■stand-alone equipment

□combined (or host) equipment

□test jig

Supply Voltage □AC mains State AC voltage……V

■DC State DC voltage : V

In case of DC, indicate the type of power source

□Internal Power Supply

□External Power Supply or AC/DC adapter

■Battery:.....

□Other:

o) Describe the test modes available which can facilitate testing:

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], proprietary, etc.):

q) If applicable, the statistical analysis referred to in clause 5.4.1 q)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)

s) Geo-location capability supported by the equipment:

□Yes

□The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user

■No

t) Describe the minimum performance criteria that apply to the equipment (see clause 4.3.1.12.3 or clause 4.3.2.11.3):

The minimum performance criterion shall be a PER less than or equal to 10 %.

The intended use of the equipment should be in the normal operation without lost the communication link or no unintentionally operation occurs.

1.2. Categorization

☐ Receiver category 1

Adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. shall be considered as receiver category 1 equipment.

☐ Receiver category 2

Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.

■ Receiver category 3

Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % or adaptive equipment with a maximum RF output power of 0 dBm e.i.r.p. shall be considered as receiver category 3 equipment.

1.3. Accessories of Device (EUT)

Accessories : /

Manufacturer : /

Model : /

Ratings : /

1.4. Ancillary Equipment Details

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

1.5. Test Lab Information

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,

Shenzhen, Guangdong, China

2. Summary of Measurement

2.1. Test Standard Description

EN 300 328 V2.2.2:2019 Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard for access to radio spectrum

2.2. Summary of Test Result

The following essential requirements and test specifications are relevant to the presumption of conformity under EN 300 328 V2.2.2:2019			
No	Test Parameter	Clause No	Results
Transmitter Parameters			
1	RF output power	4.3.1.2	Pass
2	Power Spectral Density	4.3.2.3	N/A
3	Duty Cycle, Tx-sequence, Tx-gap	4.3.1.3	N/A
4	Accumulated Transmit time, Frequency Occupation & Hopping Sequence	4.3.1.4	Pass
5	Hopping Frequency Separation	4.3.1.5	Pass
6	Medium Utilisation	4.3.1.6	N/A
7	Adaptivity	4.3.1.7	N/A
8	Occupied Channel Bandwidth	4.3.1.8	Pass
9	Transmitter unwanted emissions in the OOB domain	4.3.1.9	Pass
10	Transmitter unwanted emissions in the spurious domain	4.3.1.10	Pass
Receiver Parameters			
11	Receiver spurious emissions	4.3.1.11	Pass
12	Receiver Blocking	4.3.1.12	Pass
13	Geo-location capability	4.3.1.13	N/A
Note: 1.N/A is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device. 2. Decision rules for the conclusion of this test report: decision by actual test data without considering measurement uncertainty.			

2.3. Block Diagram of Configuration for Test

2.4. Test Mode

The special RF test software was used to control EUT work in Continuous Bluetooth TX mode, and select test channel, wireless mode.

Tested mode, channel, and data rate information			
Mode	data rate (Mpbs)	Channel	Frequency (MHz)
GFSK	1	Low :CH0	2402
	1	Middle: CH39	2441
	1	High: CH78	2480
π/4 DQPSK	2	Low :CH0	2402
	2	Middle: CH39	2441
	2	High: CH78	2480
8DPSK	3	Low :CH0	2402
	3	Middle: CH39	2441
	3	High: CH78	2480

2.5. Test Conditions

	Normal Conditions	Extreme Conditions
Temperature range	15-35℃	-10℃ and 45℃
Humidity range	20-75%	20-75%
Pressure range	86-106kPa	86-106kPa
Power supply	AC 230V/50Hz	AC 110V to AC 240V (declared by the manufacturer.)
Note 1: The test procedure described in clause 5.1 of EN 300 328 was used for extreme test procedure. 2: The Extreme Temperature and Extreme Voltages declared by the manufacturer.		

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

Item	MU	Remark
Uncertainty for Conducted Emission Test	1.63dB	
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.74 dB	Polarize: V
	3.76 dB	Polarize: H
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.77 dB	Polarize: H
	3.80 dB	Polarize: V
Uncertainty for radio frequency	5.06×10^{-8}GHz	
Uncertainty for conducted RF Power	0.40dB	

2.7. Test Equipment

Equipment	Manufacturer	Model No.	Firmware version	Serial No.	Last Cal.	Cal. Due day
Test Receiver	ROHDE&SCHWARZ	ESCI	4.42 SP1	101165	2023.08.16	2024.08.15
Test Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03 -102082-Wa	2023.08.16	2024.08.15
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.16	2024.08.15
Bilog Antenna	Schwarzbeck	VULB 9168	/	9168-627	2023.08.28	2024.08.27
Spectrum analyzer	SCHWARZBECK	FSV40-N	2.3	102137	2023.08.16	2024.08.15
Spectrum analyzer	SCHWARZBECK	FSU	4.71.SP5	200002	2023.08.16	2024.08.15
Amplifier	HP	HP8347A	/	2834A00455	2023.08.16	2024.08.15
Amplifier	Agilent	8449B	/	3008A02664	2023.08.16	2024.08.15
Horn Antenna	Schwarzbeck	BBHA 9120 D	/	2106	2023.08.19	2024.08.18
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2023.08.16	2024.08.15
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2023.08.16	2024.08.15
Pulse Limiter	Schwarzbeck	9516F	/	9618	2023.08.16	2024.08.15
ESD Tester	HAEFELY	PESD1610	/	H310546	2023.08.21	2024.08.20
Fixed Coaxial Attenuator(6dB Attenuation)	CD	ATT-0675	/	120540086	2023.08.16	2024.08.15
Coupling-Decoupling Network (CDN)	CD	CDN M2/M3	/	2302	2023.08.16	2024.08.15
Electromagnetic Injection Clamp (EMC-Clamp)	CD	EM-Clamp	/	0513A031201	2023.08.16	2024.08.15
Multifunctional Compact Immunity Test system	3ctest	CCS 600	CCS V4.0.9	ES0801655	2023.08.16	2024.08.15
Surge&EFT Coupling Decoupling Network	3ctest	SEPN 3832T	/	ES0951601	2023.08.16	2024.08.15
Voltage variation and PF magnetic field regulating device	3ctest	VMT2216S	/	ES0441601	2023.08.16	2024.08.15
Capacitive Coupling Clamp	3ctest	CCC 100	/	EC0441660	2023.08.16	2024.08.15
Combination Wave Surge Simulator	3ctest	CWS 600T	/	ES0311604	2023.08.16	2024.08.15
Unshielded symmetrical high - speed Interconnection Lines Coupling Decoupling Network	3ctest	CDN 405T8A1	/	ES2731602	2023.08.16	2024.08.15
Conducted	SKET	CITS_150K2	/	SK201910100	2023.08.16	2024.08.15

Immunity test System		30M		1_CITS		
Universal Radio Communication Tester	ROHDE&SCHWARZ	CMU200	V5.21	116785	2023.08.16	2024.08.15
Signal Generator	Agilent	N5182A	/	MY49060042	2023.08.16	2024.08.15
Vector Signal Generator	Agilent	E4438C	/	US44271917	2023.08.16	2024.08.15
Power meter	Agilent	E4419B	/	GB40202122	2023.08.16	2024.08.15
Power Sensor	Agilent	E9300A	/	MY41496628	2023.08.16	2024.08.15
Power Sensor	Agilent	E9304A	/	MY41496815	2023.08.16	2024.08.15
RF power Amplifier	OPHIR	5225R	/	1045	2023.08.16	2024.08.15
RF power Amplifier	OPHIR	5273R	/	1018	2023.08.16	2024.08.15
Antenna	SCHWARZBECK	STLP9128E-special	/	STLP9128Es#139	N/A	N/A
Antenna	SCHWARZBECK	STLP9128E-special	/	STLP 9149 #456	N/A	N/A
CMW500	ROHDE&SCHWARZ	CMW500	V 3.7.22	1201.0002K50-117239-sM	2023.08.16	2024.08.15
ISN	SCHWARZBECK	CAT3 8158	/	CAT3 8158 #167	2023.08.16	2024.08.15
ISN	SCHWARZBECK	CAT5 8158	/	S/N: 00316	2023.08.16	2024.08.15
ISN	SCHWARZBECK	NTFM 8158	/	S/N: 00273	2023.08.16	2024.08.15
HARMINICS&FLICKER MEASUREMENT SYSTEM	EVERFINE	HFM300_V200	/	200602005	2023.04.21	2024.04.20
BROADCAST TEST SYSTEM	R&S	SFU	/	100056	2023.08.16	2024.08.15
TV SIGNAL GENERATOR	FLUKE	54200M01	/	817010	2023.08.16	2024.08.15
AM/FM STEREO SIGNAL GENERATOR	MEGURO	MSG-2280	/	61080249	2023.08.16	2024.08.15
9*6*6 anechoic chamber	CHENYU	9*6*6	/	/	2022.05.18	2025.05.17
8*4*3 Shielded room	CHENYU	8*4*3	/	/	2022.05.18	2025.05.17
8*4*3 Shielded room	CHENYU	8*4*3	/	/	2022.05.18	2025.05.17

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

3. RF Output Power

3.1. Limit

The RF output power for FHSS equipment shall be equal to or less than 20dBm.

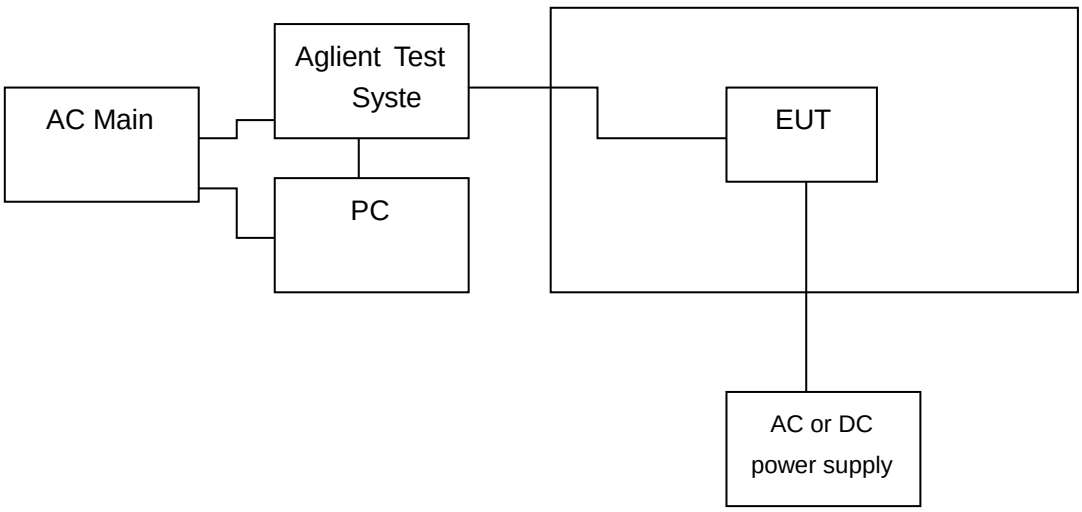
NOTE: For Non-adaptive FHSS equipment, the manufacturer may have declared a reduced RF Output Power (see clause 5.4.1 m) and associated Duty Cycle (see clause 5.4.1 e) that will ensure that the equipment meets the requirement for the Medium Utilization (MU) factor further described in clause 4.3.2.5. This is verified by the conformance test referred to in clause 4.3.2.5.4.

For non-adaptive FHSS equipment, where the manufacturer has declared an RF output power of less than 20dBm e.i.r.p., the RF output power shall be equal to or less than that declared value.

This limit shall apply for any combination of power level and intended antenna assembly.

Limit
20dBm

3.2. Test Setup



3.3. Test Procedure

Refer to ETSI EN 300 328 V2.2.2:2019 Clause 5.4.2.

3.4. Test Result

Condition	Mode	Frequency (MHz)	Antenna	Max Burst RMS Power (dBm)	Burst Number	Max EIRP (dBm)	Limit (dBm)	Verdict
NVHT	1-DH1	hopping	Ant1	-1.01	41	-1.01	20	Pass
NVLT	1-DH1	hopping	Ant1	-0.88	40	-0.88	20	Pass
NVNT	1-DH1	hopping	Ant1	-0.96	40	-0.96	20	Pass
NVHT	1-DH3	hopping	Ant1	-0.77	40	-0.77	20	Pass
NVLT	1-DH3	hopping	Ant1	-0.8	41	-0.8	20	Pass
NVNT	1-DH3	hopping	Ant1	-0.93	40	-0.93	20	Pass
NVHT	1-DH5	hopping	Ant1	-0.99	27	-0.99	20	Pass
NVLT	1-DH5	hopping	Ant1	-0.64	28	-0.64	20	Pass
NVNT	1-DH5	hopping	Ant1	-0.68	28	-0.68	20	Pass
NVHT	2-DH1	hopping	Ant1	-5.48	81	-5.48	20	Pass
NVLT	2-DH1	hopping	Ant1	-5.16	81	-5.16	20	Pass
NVNT	2-DH1	hopping	Ant1	-5.02	80	-5.02	20	Pass
NVHT	2-DH3	hopping	Ant1	-5	41	-5	20	Pass
NVLT	2-DH3	hopping	Ant1	-5.5	40	-5.5	20	Pass
NVNT	2-DH3	hopping	Ant1	-5.21	41	-5.21	20	Pass
NVHT	2-DH5	hopping	Ant1	-4.66	27	-4.66	20	Pass
NVLT	2-DH5	hopping	Ant1	-4.59	28	-4.59	20	Pass
NVNT	2-DH5	hopping	Ant1	-5.44	28	-5.44	20	Pass
NVHT	3-DH1	hopping	Ant1	-5.26	80	-5.26	20	Pass
NVLT	3-DH1	hopping	Ant1	-5.11	80	-5.11	20	Pass
NVNT	3-DH1	hopping	Ant1	-4.73	81	-4.73	20	Pass
NVHT	3-DH3	hopping	Ant1	-4.76	40	-4.76	20	Pass
NVLT	3-DH3	hopping	Ant1	-4.85	41	-4.85	20	Pass
NVNT	3-DH3	hopping	Ant1	-5	41	-5	20	Pass
NVHT	3-DH5	hopping	Ant1	-4.56	28	-4.56	20	Pass
NVLT	3-DH5	hopping	Ant1	-4.61	27	-4.61	20	Pass
NVNT	3-DH5	hopping	Ant1	-4.88	28	-4.88	20	Pass

4. Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

4.1. Limit

For Non-adaptive frequency Hopping systems

For non-adaptive FHSS equipment, the Hopping Frequency Separation shall be equal to or greater than the Occupied Channel Bandwidth (see clause 4.3.1.8), with a minimum separation of 100 kHz.

For FHSS equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for non-adaptive FHSS equipment operating in a mode where the RF Output power is less than 10 dBm e.i.r.p., the Hopping Frequency Separation shall be equal to or greater than 100 kHz.

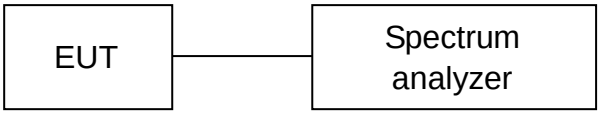
For Adaptive frequency Hopping systems

For adaptive FHSS equipment, the minimum Hopping Frequency Separation shall be 100 kHz.

Adaptive FHSS equipment that switched to a non-adaptive mode for one or more Hopping frequencies because interference was detected on each of these Hopping frequencies with a level above the threshold level defined in clause 4.3.1.7.2.2, point 5 or clause 4.3.1.7.3.2, point 5, does not have to comply with the Hopping Frequency Separation provided in clause 4.3.1.5.3.1 for non-adaptive FHSS equipment. If the Hopping Frequency Separation is below the Occupied Channel Bandwidth but greater than 100 kHz, the equipment is allowed to continue to operate with this Hopping Frequency Separation as long as the interference remains present on these Hopping frequencies. As this relaxed Hopping Frequency Separation only applies to adaptive FHSS equipment, the FHSS equipment shall continue to operate in an adaptive mode on all other Hopping frequencies.

Adaptive FHSS equipment which decided to operate in a non-adaptive mode on one or more Hopping frequencies without the presence of interference, shall comply with the limit for Hopping Frequency Separation for non-adaptive FHSS equipment defined in clause 4.3.1.5.3.1 (first paragraph) for these Hopping frequencies.

4.2. Test Setup



4.3. Test Procedure

Refer to EN 300 328 V2.2.2:2019 Clause 5.4.4

Connect the UUT to the spectrum analyzer and use the following settings:

Centre Frequency	Equal to the Hopping frequency being investigated
Frequency Span	0Hz
RBW	~ 50 % of the Occupied Channel Bandwidth (510KHz)
VBW	≥ RBW (510KHz)
Detector	RMS
sweep points	30 000
Trace	Clear / Write
Trigger	Free Run

4.4. Test Result

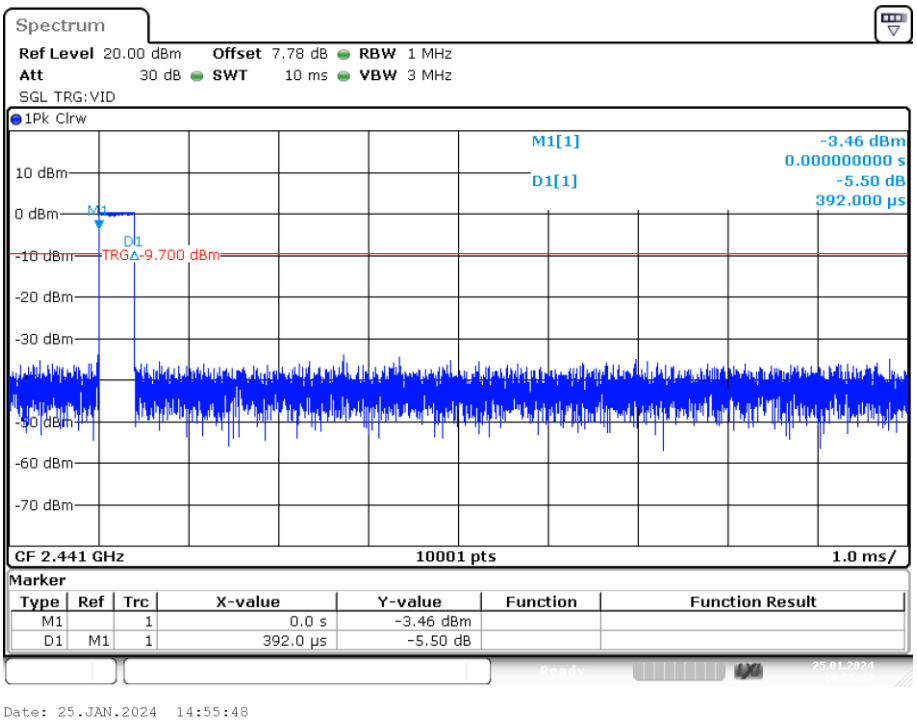
Accumulated Transmit Time

Condition	Mode	Frequency (MHz)	Antenna	Accumulated Transmit Time (ms)	Limit (ms)	Sweep Time (ms)	Burst Number	Verdict
NVNT	1-DH1	2441	Ant1	58.016	400	31600	148	Pass
NVNT	1-DH3	2441	Ant1	244.211	400	31600	149	Pass
NVNT	1-DH5	2441	Ant1	288.7	400	31600	100	Pass
NVNT	2-DH1	2441	Ant1	123.702	400	31600	318	Pass
NVNT	2-DH3	2441	Ant1	272.406	400	31600	166	Pass
NVNT	2-DH5	2441	Ant1	332.235	400	31600	115	Pass
NVNT	3-DH1	2441	Ant1	124.091	400	31600	319	Pass
NVNT	3-DH3	2441	Ant1	264.04	400	31600	161	Pass
NVNT	3-DH5	2441	Ant1	294.882	400	31600	102	Pass

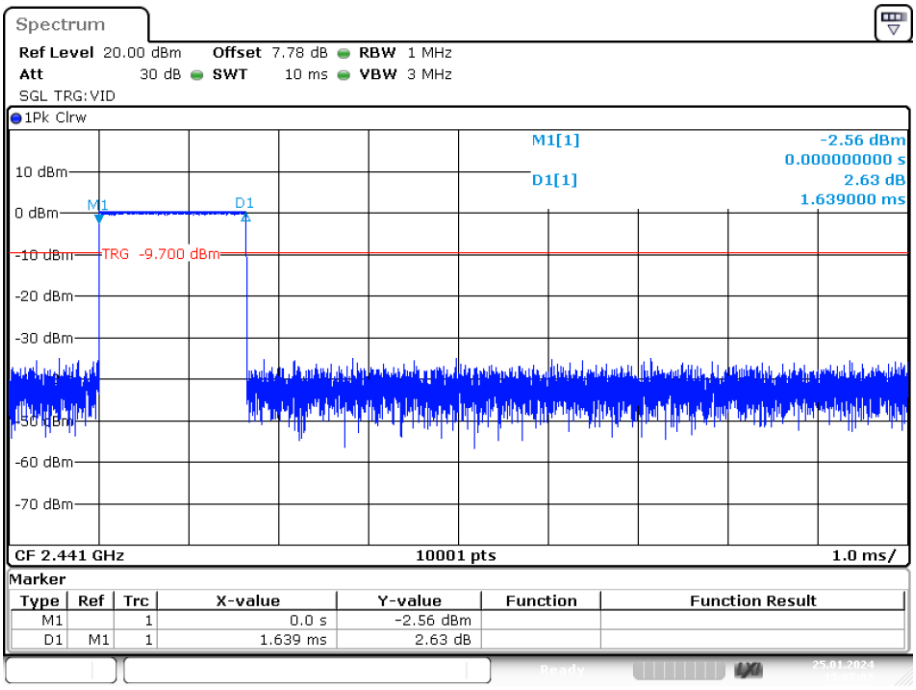
One Pulse Dwell Time:

Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)
NVNT	1-DH1	2441	Ant1	0.392
NVNT	1-DH3	2441	Ant1	1.639
NVNT	1-DH5	2441	Ant1	2.887
NVNT	2-DH1	2441	Ant1	0.389
NVNT	2-DH3	2441	Ant1	1.641
NVNT	2-DH5	2441	Ant1	2.889
NVNT	3-DH1	2441	Ant1	0.389
NVNT	3-DH3	2441	Ant1	1.64
NVNT	3-DH5	2441	Ant1	2.891

One Burst NVNT 1-DH1 2441MHz Ant1 One Burst

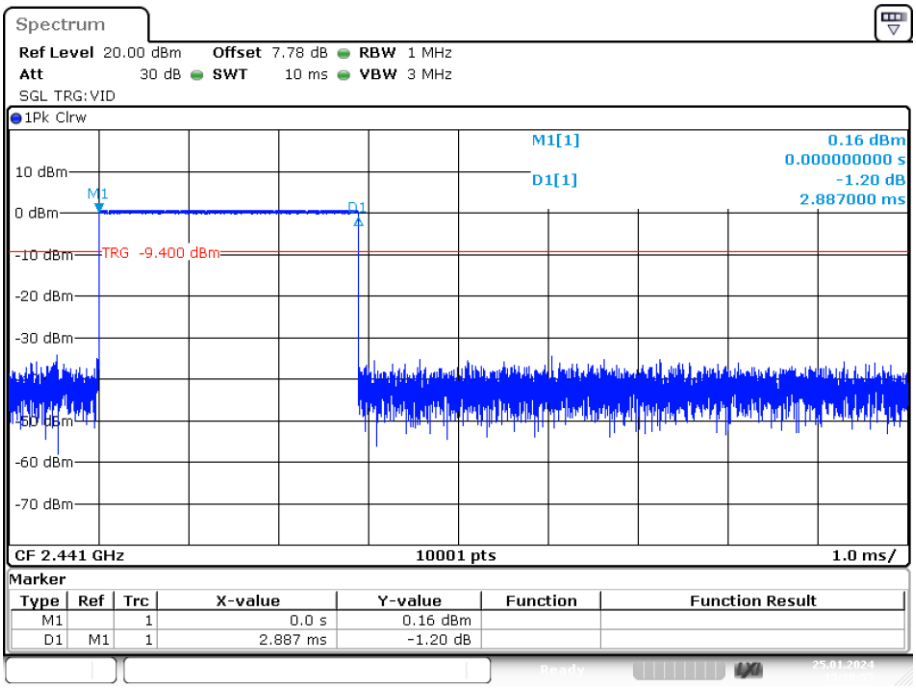


One Burst NVNT 1-DH3 2441MHz Ant1 One Burst



Date: 25.JAN.2024 15:07:02

One Burst NVNT 1-DH5 2441MHz Ant1 One Burst



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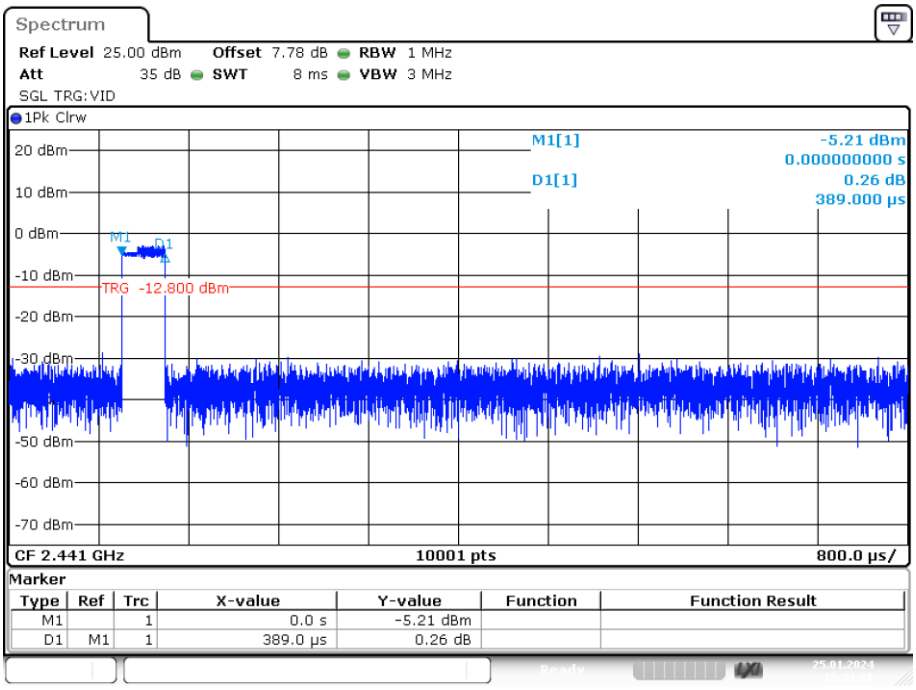
One Burst NVNT 2-DH1 2441MHz Ant1 One Burst



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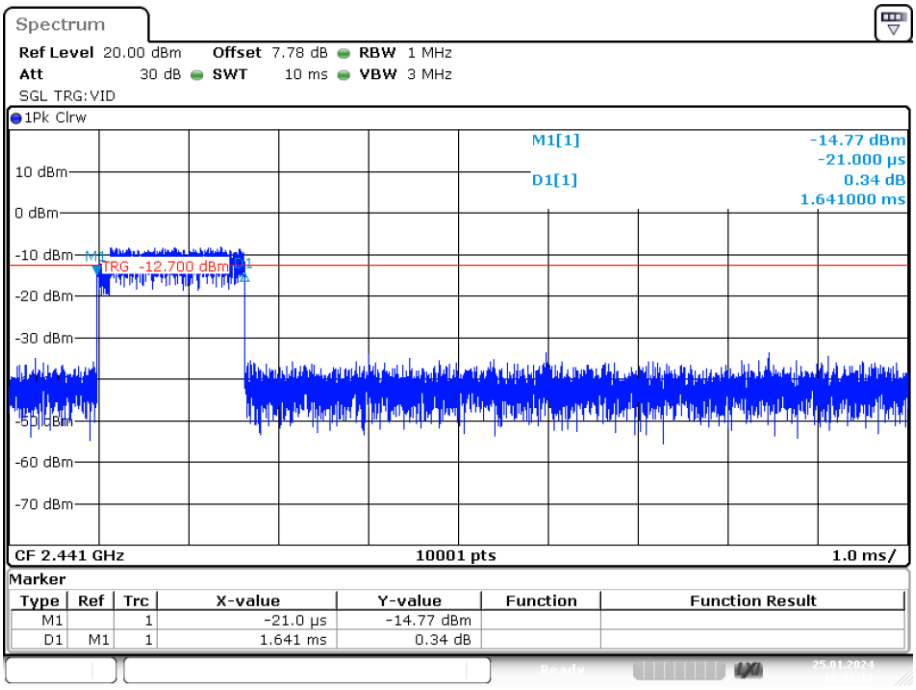
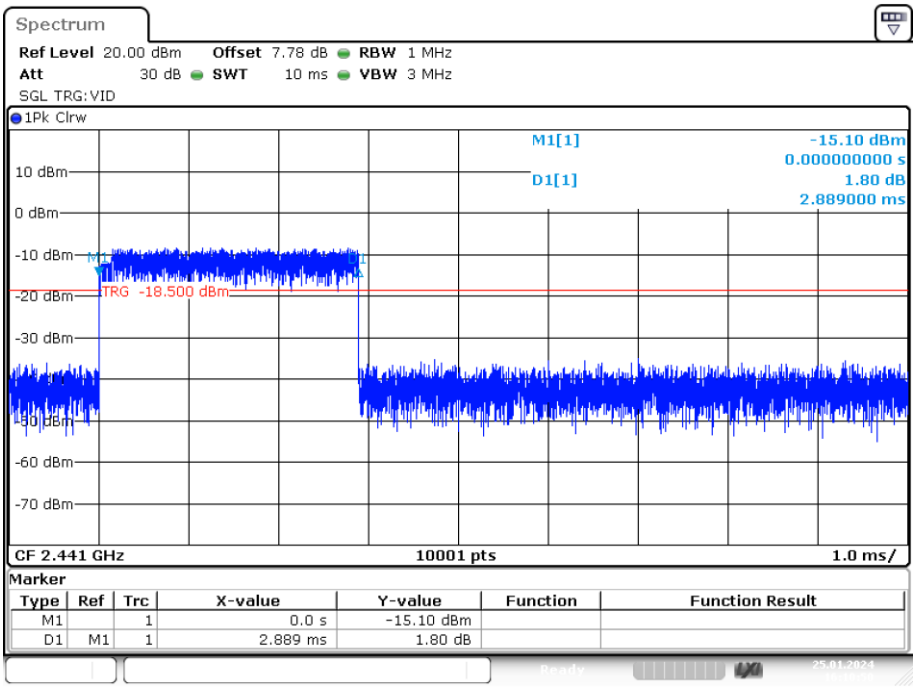
One Burst NVNT 2-DH3 2441MHz Ant1 One Burst



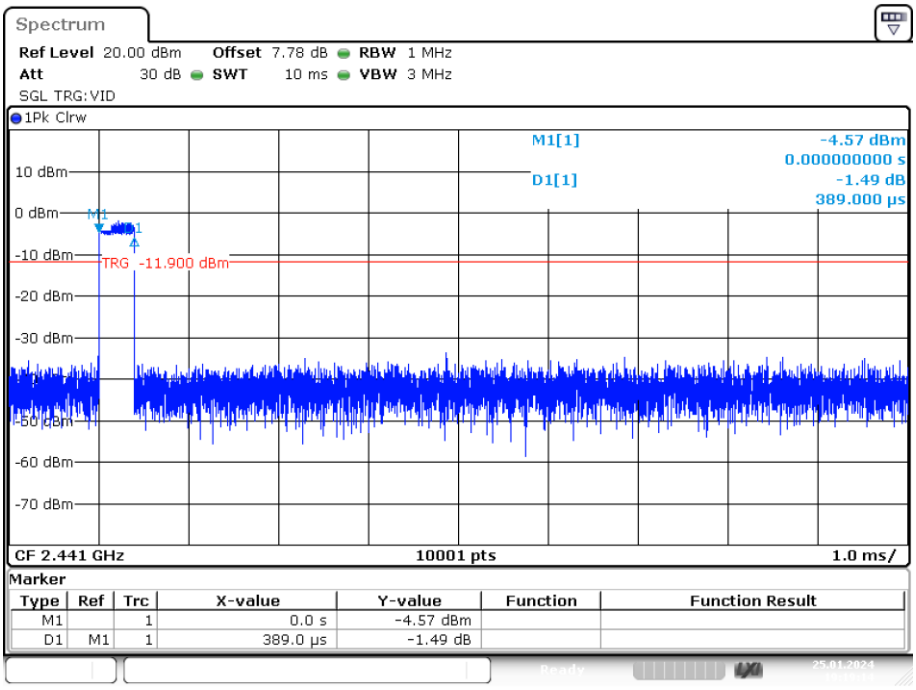
Date: 25.JAN.2024 16:03:10

One Burst NVNT 2-DH5 2441MHz Ant1 One Burst



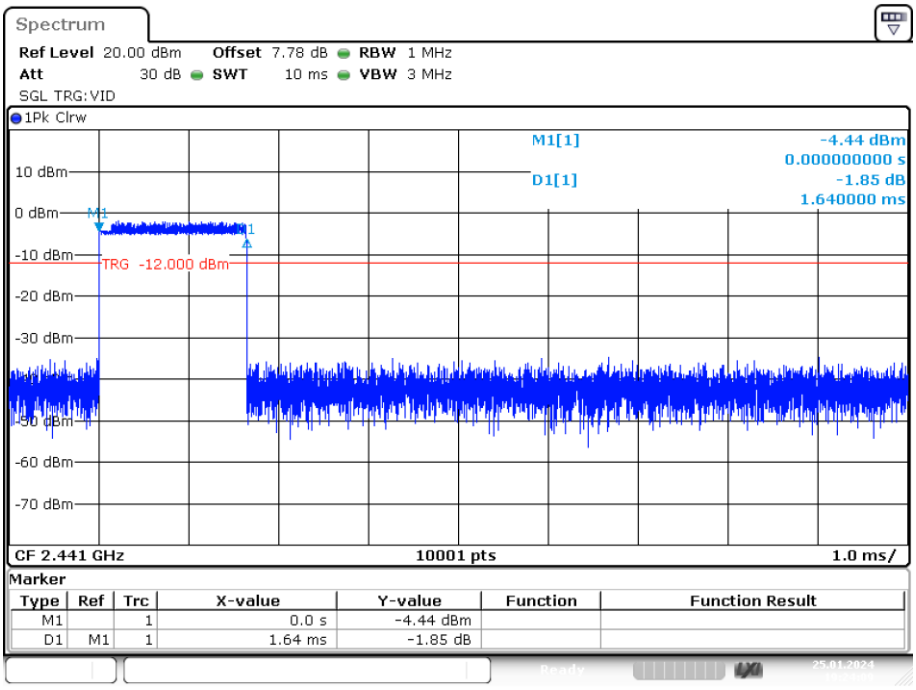
Date: 25.JAN.2024 16:10:50

One Burst NVNT 3-DH1 2441MHz Ant1 One Burst



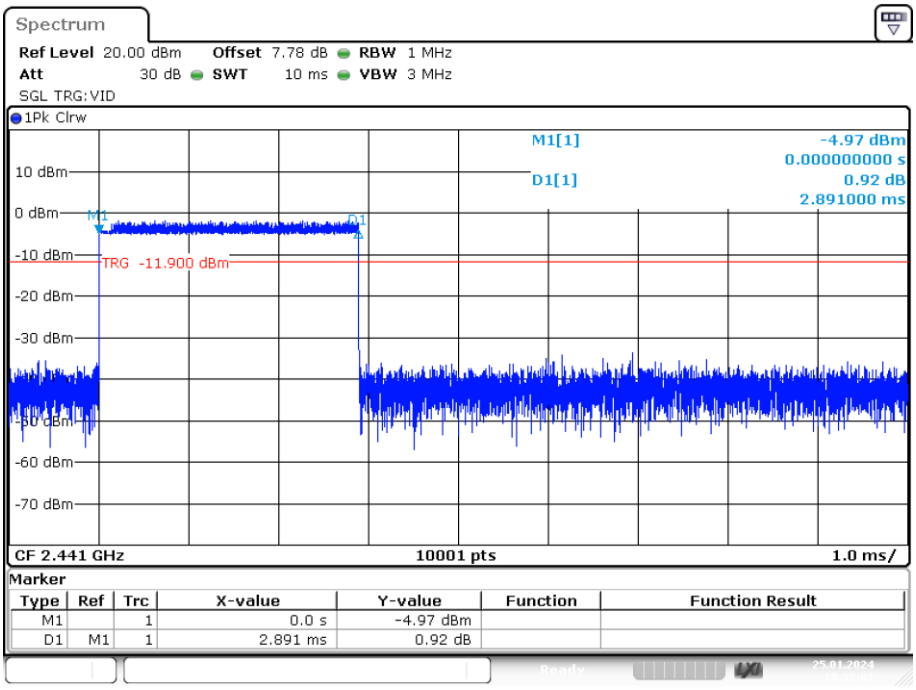
Date: 25.JAN.2024 19:19:14

One Burst NVNT 3-DH3 2441MHz Ant1 One Burst



Date: 25.JAN.2024 19:24:10

One Burst NVNT 3-DH5 2441MHz Ant1 One Burst

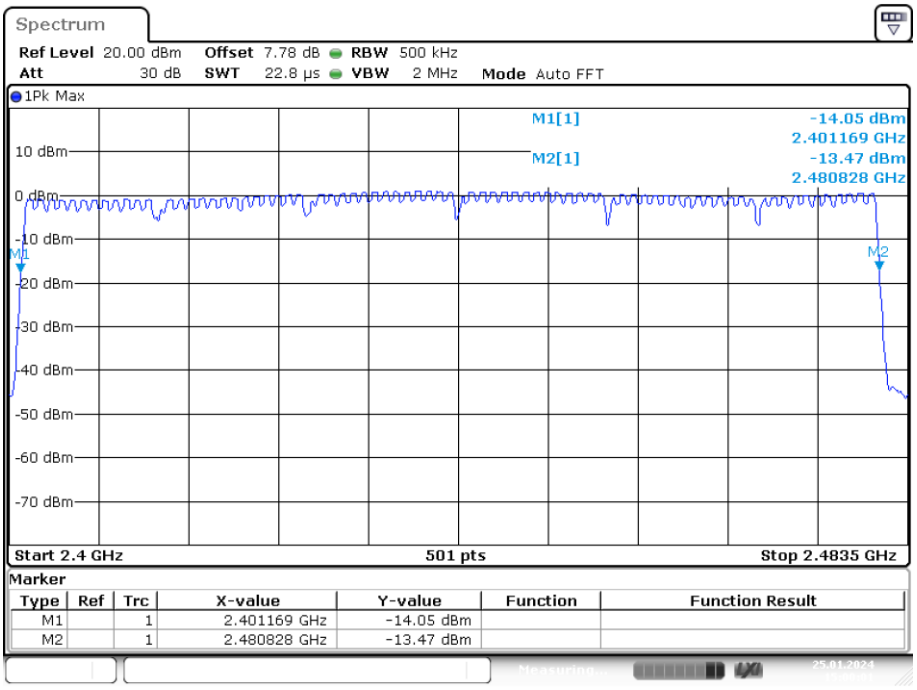


Date: 25.JAN.2024 19:32:02

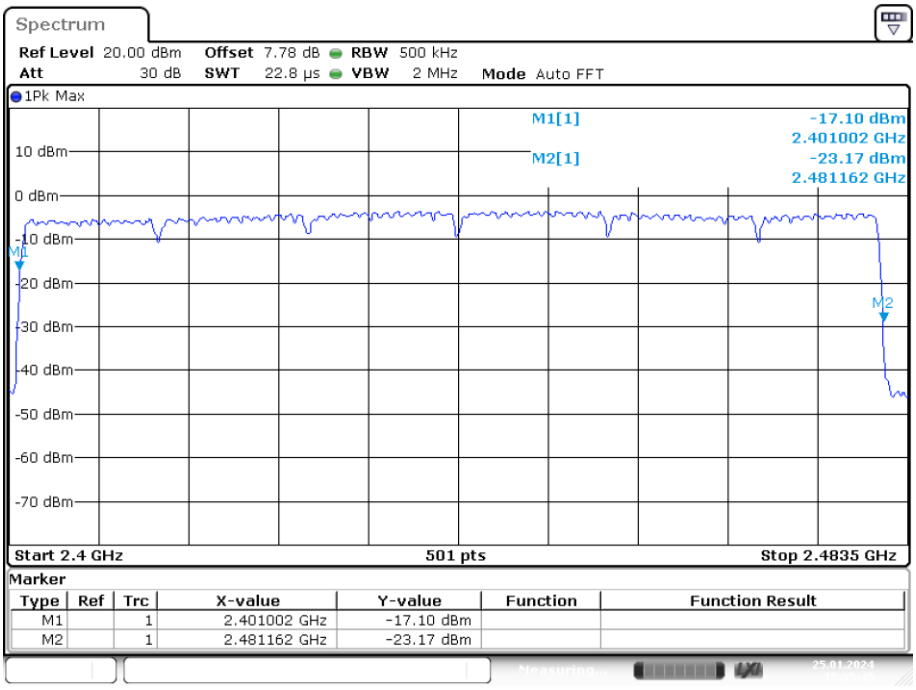
Hopping Sequence

Condition	Mode	Antenna	Hopping Number	Limit	Band Allocation (%)	Limit Band Allocation (%)	Verdict
NVNT	1-DH1	Ant1	79	15	95.4	70	Pass
NVNT	2-DH1	Ant1	79	15	96	70	Pass
NVNT	3-DH1	Ant1	79	15	96.2	70	Pass

Hopping Seq. NVNT 1-DH1 2441MHz Ant1

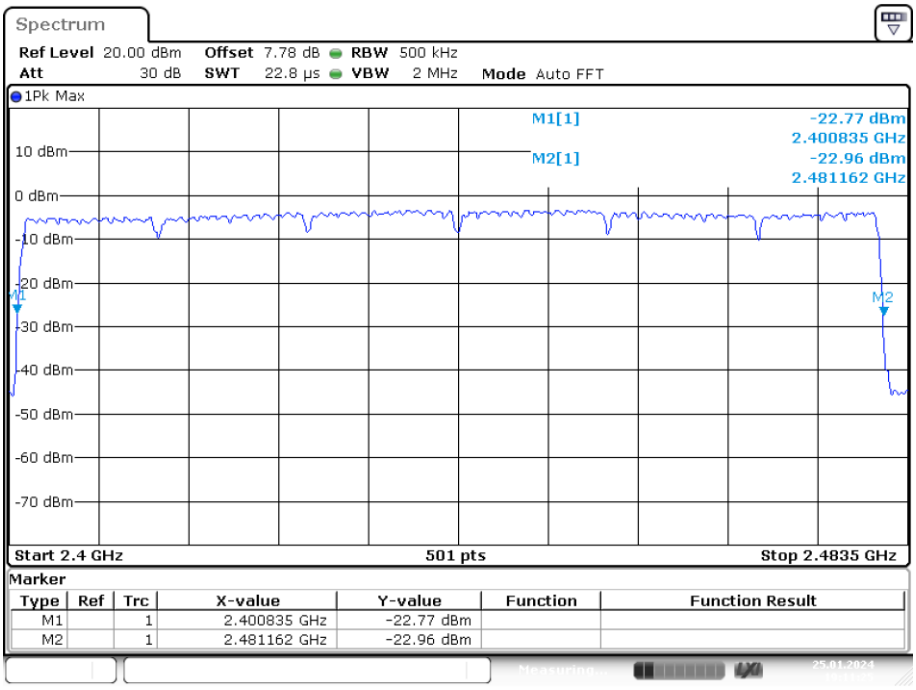


Hopping Seq. NVNT 2-DH1 2441MHz Ant1



Date: 25.JAN.2024 15:35:45

Hopping Seq. NVNT 3-DH1 2441MHz Ant1



Date: 25.JAN.2024 19:11:25

5. Hopping Frequency Separation

5.1. Limit

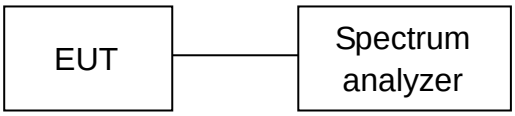
For Non-adaptive frequency Hopping systems

For adaptive FHSS equipment, the minimum Hopping Frequency Separation shall be 100 kHz.

For Adaptive frequency Hopping systems

For non-adaptive FHSS equipment, the Hopping Frequency Separation shall be equal to or greater than the Occupied Channel Bandwidth (see clause 4.3.1.8), with a minimum separation of 100 kHz.

5.2. Test Setup



5.3. Test Procedure

Refer to EN 300 328 V2.2.2:2019 Clause 5.4.5

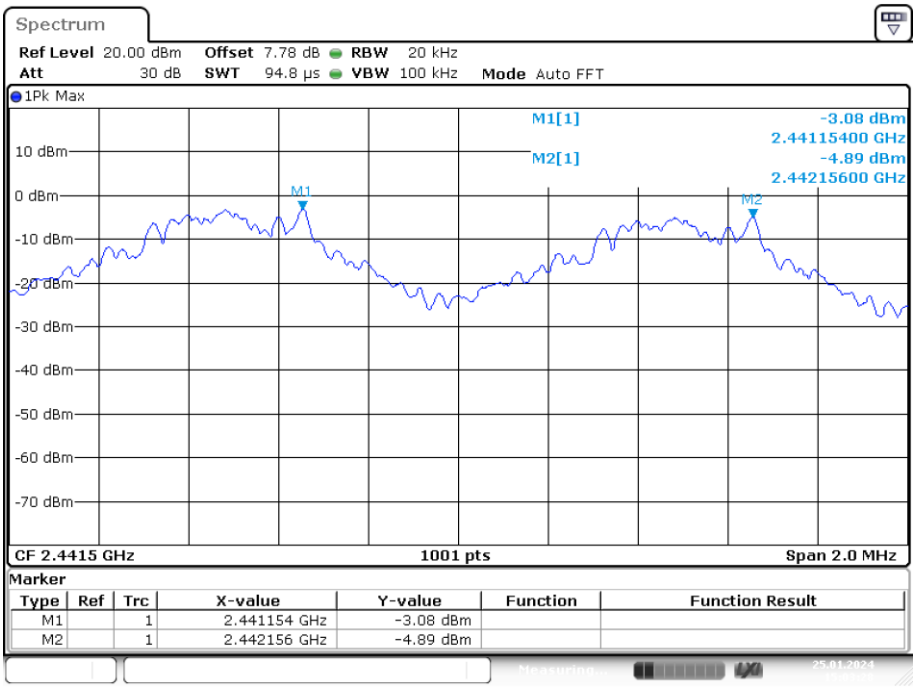
Connect the UUT to the spectrum analyzer and use the following settings:

Centre Frequency	Centre of the two adjacent Hopping frequencies
Frequency Span	Sufficient to see the complete power envelope of both Hopping frequencies
RBW	1 % of the Span
VBW	3 × RBW
Detector	Max Peak
Trace	Max hold
Sweep time	Auto

5.4. Test Result

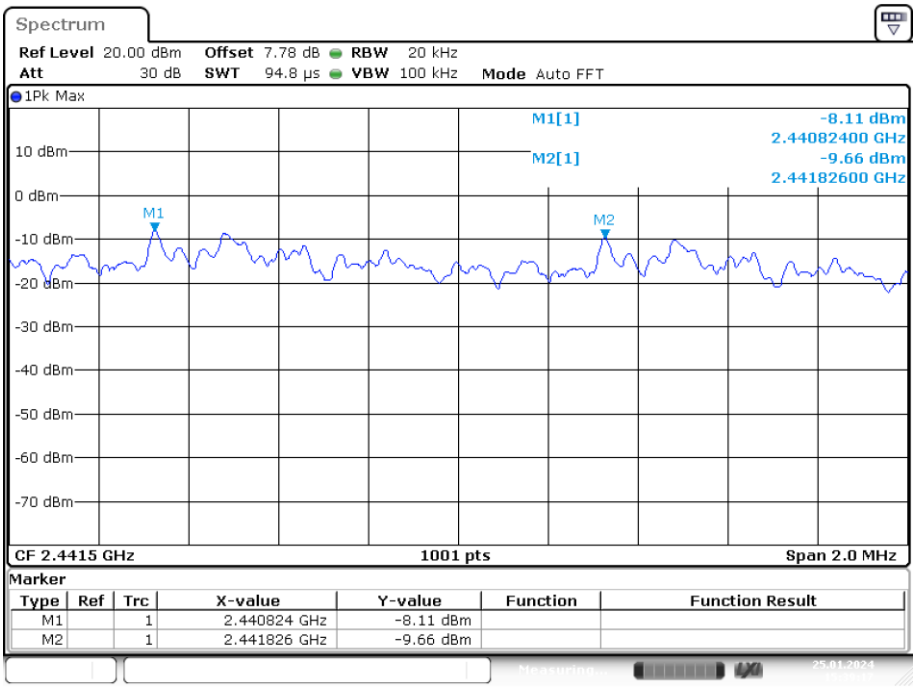
Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH1	Ant1	2441.154	2442.156	1.002	0.1	Pass
NVNT	2-DH1	Ant1	2440.824	2441.826	1.002	0.1	Pass
NVNT	3-DH1	Ant1	2440.982	2441.98	0.998	0.1	Pass

HFS NVNT 1-DH1 2441MHz Ant1



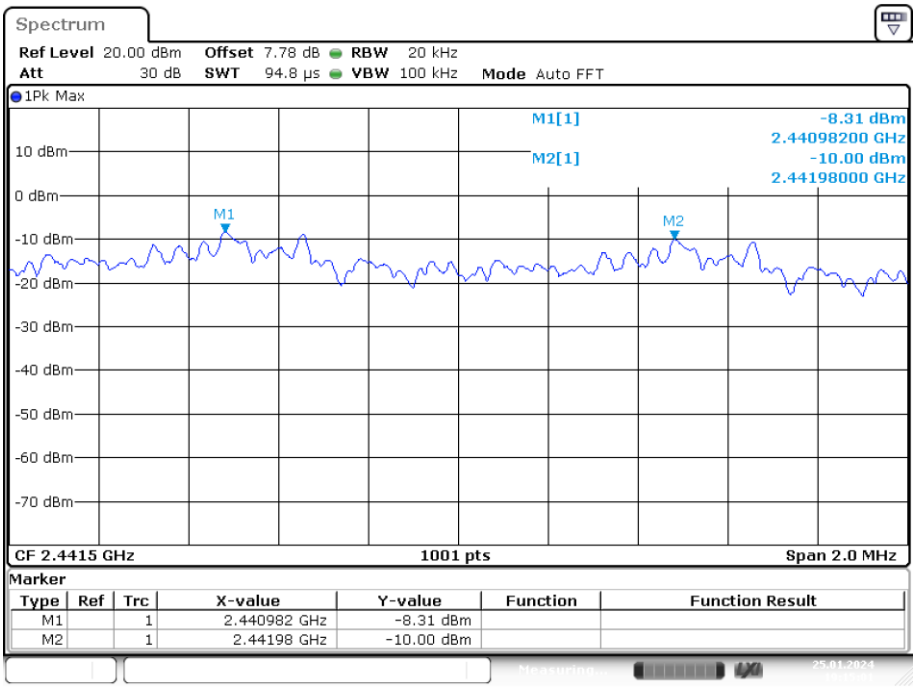
Date: 25.JAN.2024 15:03:28

HFS NVNT 2-DH1 2441MHz Ant1



Date: 25.JAN.2024 15:39:17

HFS NVNT 3-DH1 2441MHz Ant1



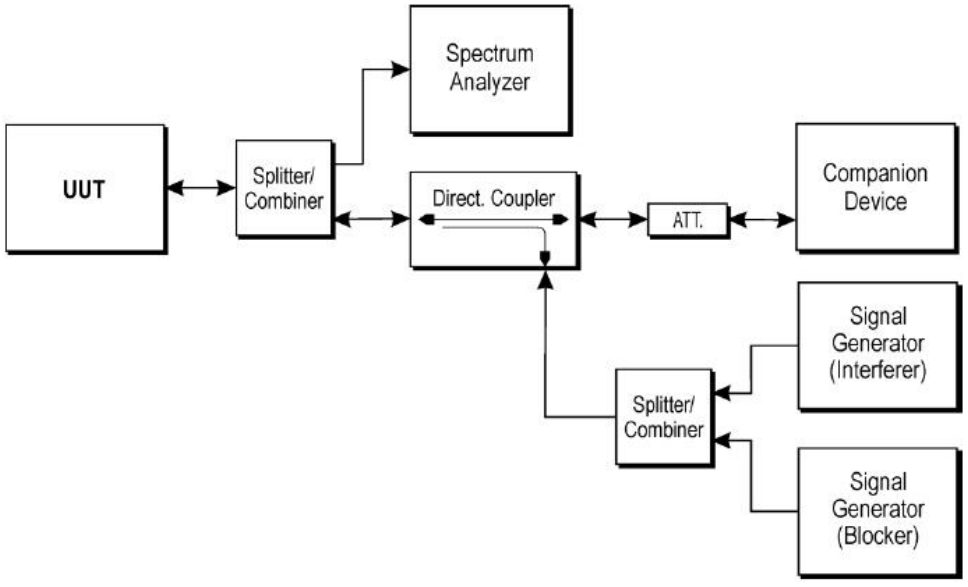
6. Adaptivity

6.1. Limit

The frequency range of the equipment is determined by the lowest and highest

Non-LBT based Detect And Avoid: 1 The Hopping frequency shall remain unavailable for a minimum time equal to 1 second or 5 times the actual number of Hopping frequencies in the current (adapted) channel map used by the equipment, multiplied with the Channel Occupancy Time whichever is greater. There shall be no transmissions during this silent period on this Hopping frequency. After this, the Hopping frequency may be considered again as an 'available' frequency.; 2 COT ＜ 40 ms; 3 Idle Period = 5% of COT≥100us; 4 Detection threshold level = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.);
LBT based Detect And Avoid (Frame Based Equipment): 1 Minimum Clear Channel Assessment (CCA) time = 18 us; 2 CCA observation time declared by the supplier; 3 COT ＜ 60 ms; 4 Idle Period = 5% of COT≥100us; 5 Detection threshold level = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.);
Short Control Signalling Transmissions: Short Control Signalling Transmissions shall have a maximum TxOn / (TxOn + TxOff) ratio of 10% within an observation period of 50msor within an observation period equal to the dwell time, whichever is less.

6.2. Test Setup



6.3. Test Procedure

Refer to EN 300 328 V2.2.2:2019 Clause 5.4.6.

6.4. Test Result

Not applicable

Note: The E.I.R.P. of EUT less than 10dBm, so not applicable.

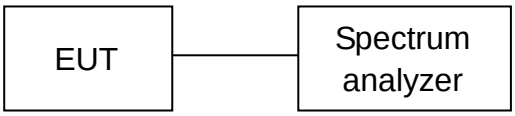
7. Occupied Channel Bandwidth

7.1. Limit

The Occupied Channel Bandwidth shall fall completely within the band 2.4GHz to 2.4835GHz.

In addition, for non-adaptive FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth for every occupied Hopping frequency shall be equal to or less than 5 MHz.

7.2. Test Setup



7.3. Test Procedure

Refer to EN 300 328 V2.2.2:2019 Clause 5.4.7.

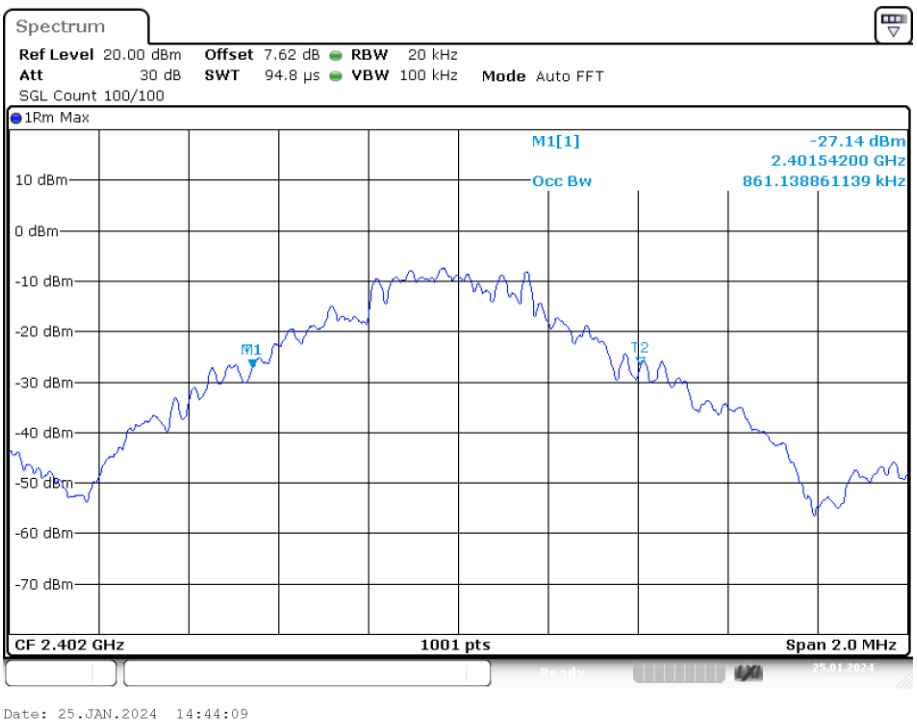
Connect the UUT to the spectrum analyzer and use the following settings:

Centre Frequency	The center frequency of the channel under test
Frequency Span	2 × Nominal Channel Bandwidth (e.g. 2 MHz for a 1MHz channel)
RBW	~ 1 % of the span without going below 1 %
VBW	3 × RBW
Detector	RMS
Trace	Max hold
Sweep Time	1s

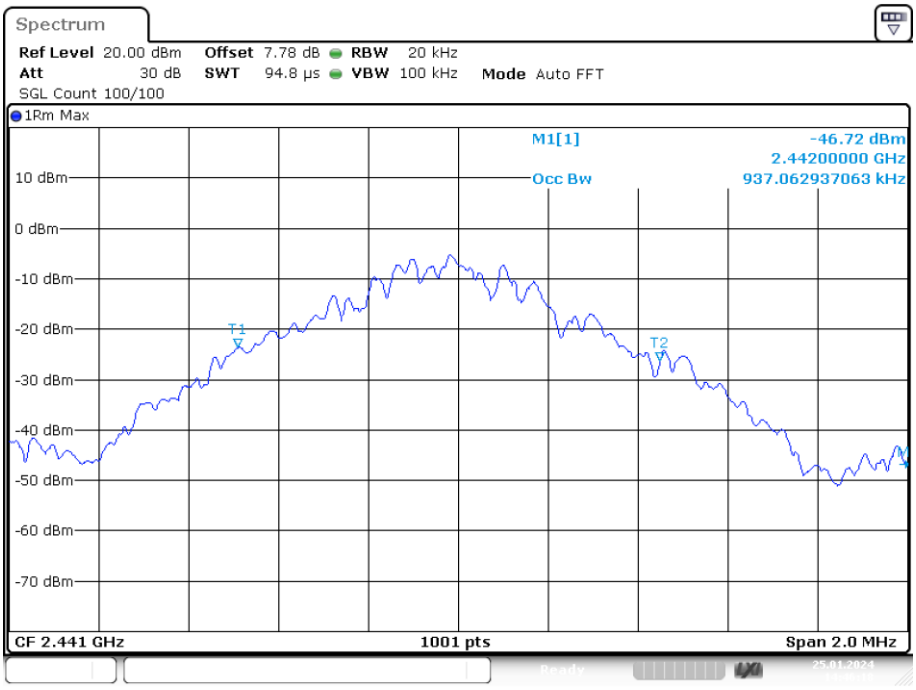
7.4. Test Result

Condition	Mode	Frequency (MHz)	Center Frequency (MHz)	OBW (MHz)	Lower Edge (MHz)	Upper Edge (MHz)	Limit OBW (MHz)	Verdict
NVNT	1-DH1	2402	2401.973	0.861	2401.542	2402.404	2400 - 2483.5MHz	Pass
NVNT	1-DH1	2441	2440.979	0.937	2440.51	2441.448	2400 - 2483.5MHz	Pass
NVNT	1-DH1	2480	2479.983	0.869	2479.548	2480.418	2400 - 2483.5MHz	Pass
NVNT	2-DH1	2402	2401.959	1.197	2401.361	2402.557	2400 - 2483.5MHz	Pass
NVNT	2-DH1	2441	2440.964	1.199	2440.365	2441.563	2400 - 2483.5MHz	Pass
NVNT	2-DH1	2480	2479.971	1.197	2479.373	2480.569	2400 - 2483.5MHz	Pass
NVNT	3-DH1	2402	2401.988	1.171	2401.403	2402.573	2400 - 2483.5MHz	Pass
NVNT	3-DH1	2441	2440.983	1.189	2440.389	2441.577	2400 - 2483.5MHz	Pass
NVNT	3-DH1	2480	2479.994	1.179	2479.405	2480.583	2400 - 2483.5MHz	Pass

OBW NVNT 1-DH1 2402MHz Ant1

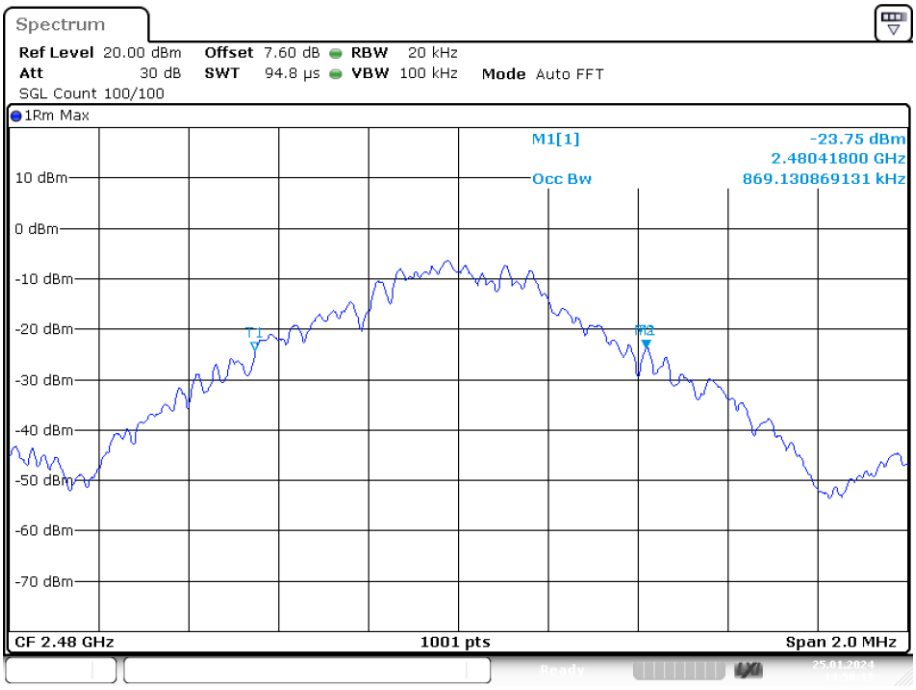


OBW NVNT 1-DH1 2441MHz Ant1



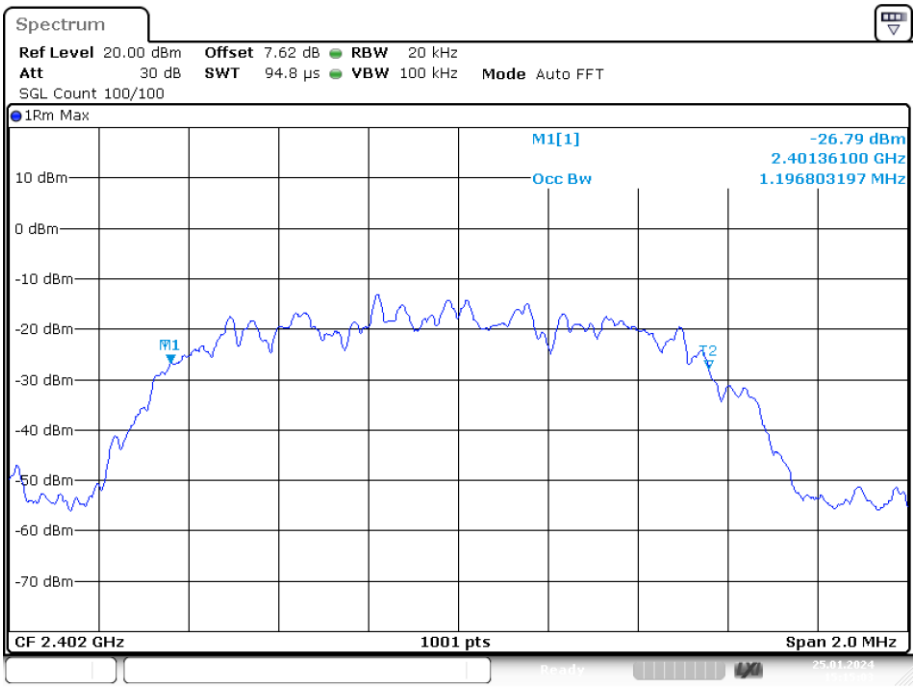
Date: 25.JAN.2024 14:46:18

OBW NVNT 1-DH1 2480MHz Ant1



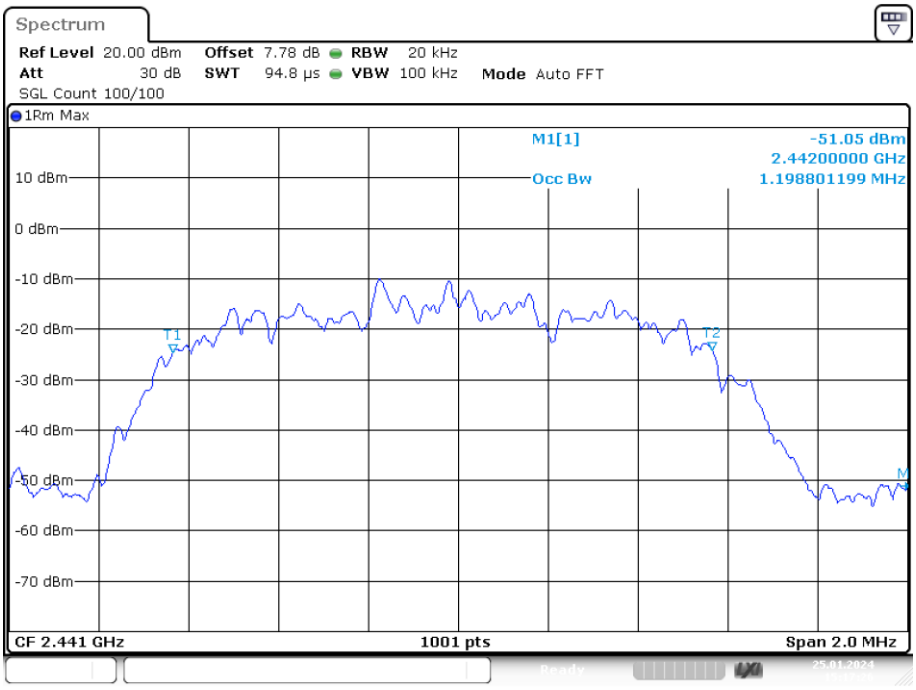
Date: 25.JAN.2024 14:50:13

OBW NVNT 2-DH1 2402MHz Ant1



Date: 25.JAN.2024 15:15:02

OBW NVNT 2-DH1 2441MHz Ant1



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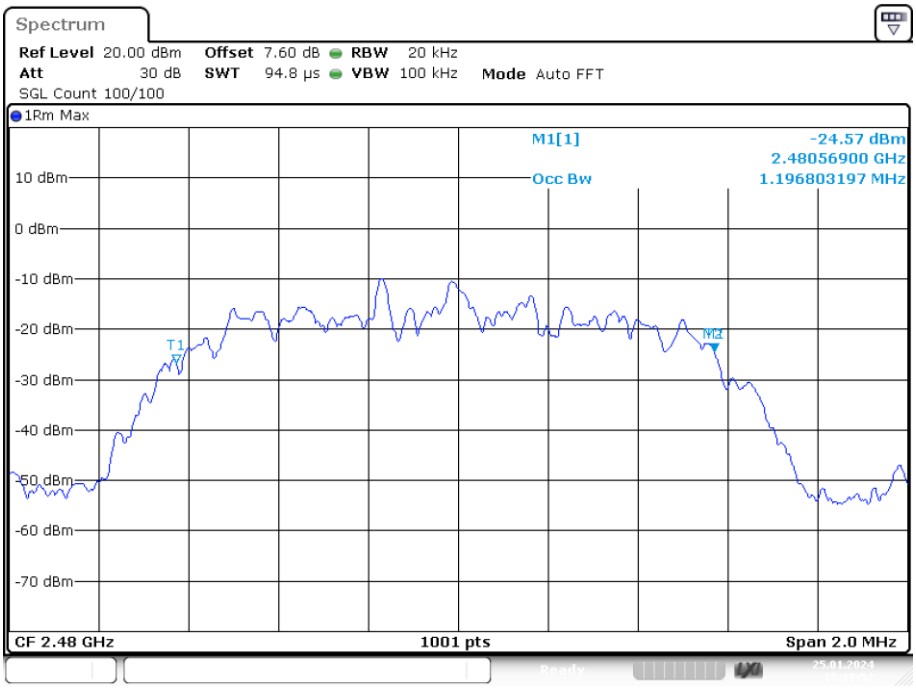
OBW NVNT 2-DH1 2480MHz Ant1



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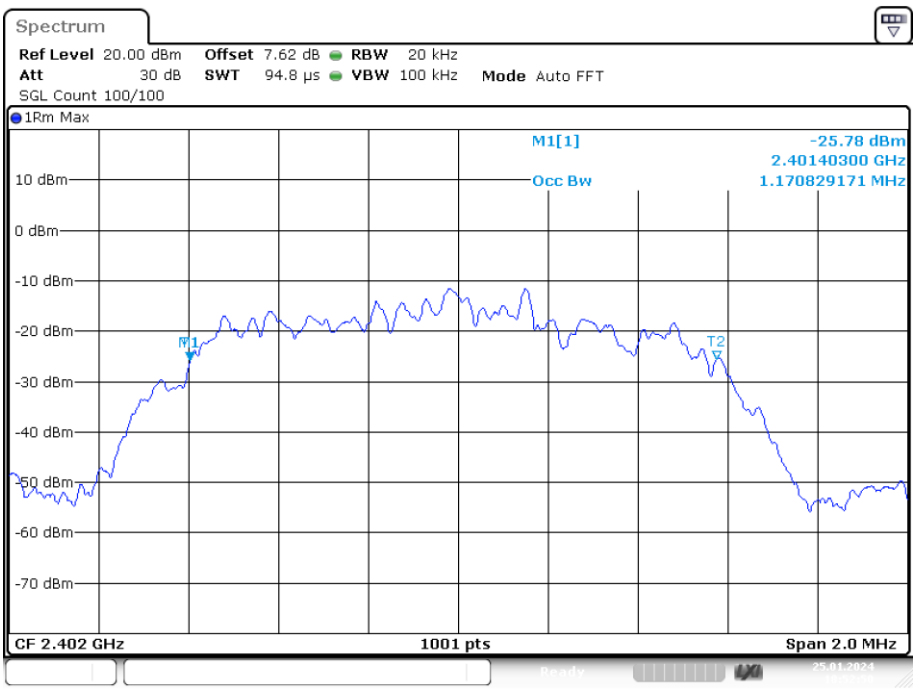
OBW NVNT 3-DH1 2402MHz Ant1



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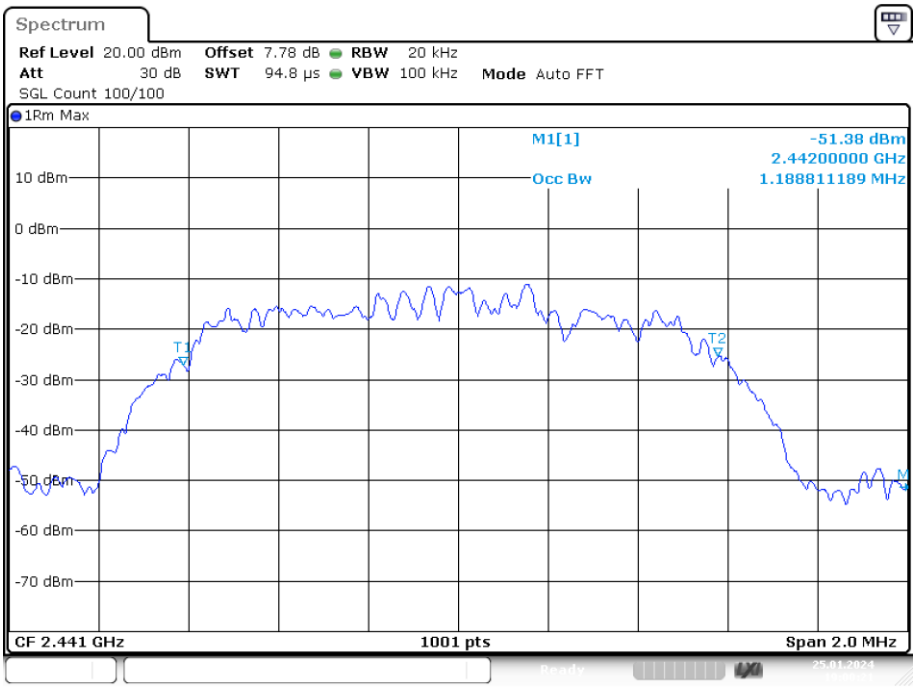
OBW NVNT 3-DH1 2441MHz Ant1



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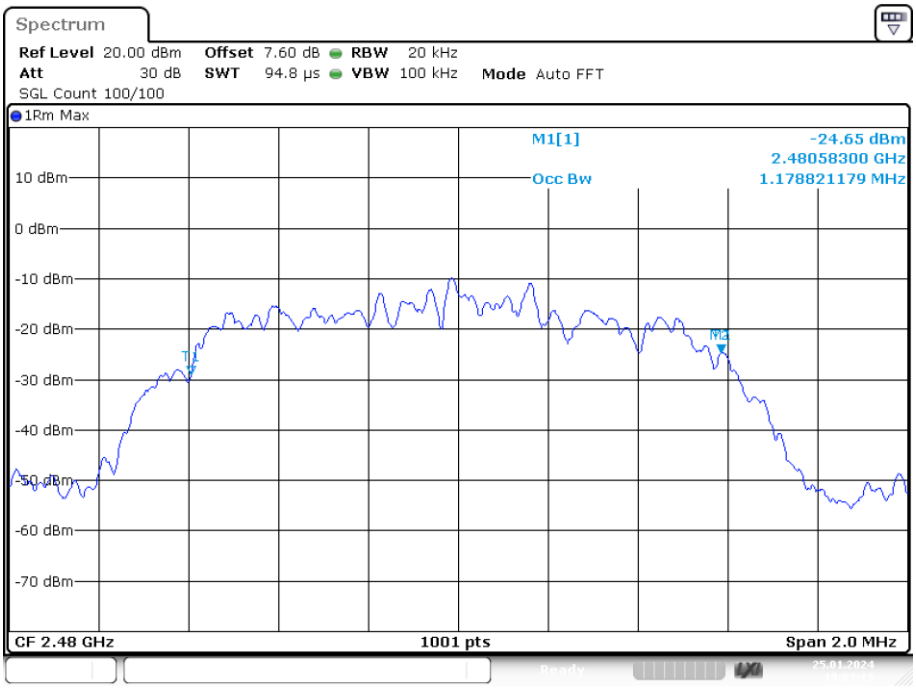
OBW NVNT 3-DH1 2480MHz Ant1



Date: 25.JAN.2024 19:03:13

8. Transmitter Unwanted Emissions in the Out-of-band Domain

8.1. Limit

The transmitter unwanted emissions in the out-of-band domain shall not exceed the values provided by the mask in figure 1.

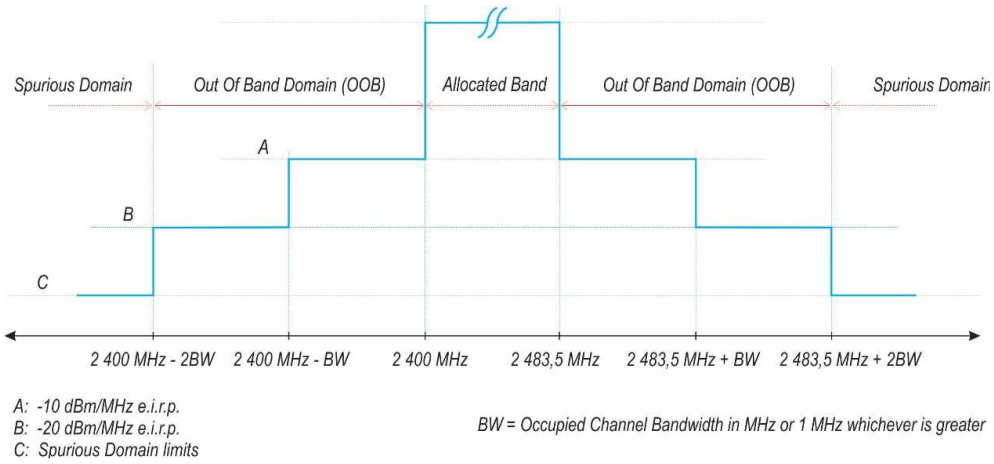
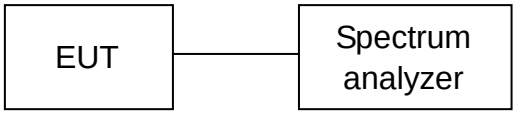


Figure 1: Transmit mask

8.2. Test Setup



8.3. Test Procedure

Refer to EN 300 328 V2.2.2:2019 Clause 5.4.8.

Connect the UUT to the spectrum analyzer and use the following settings:

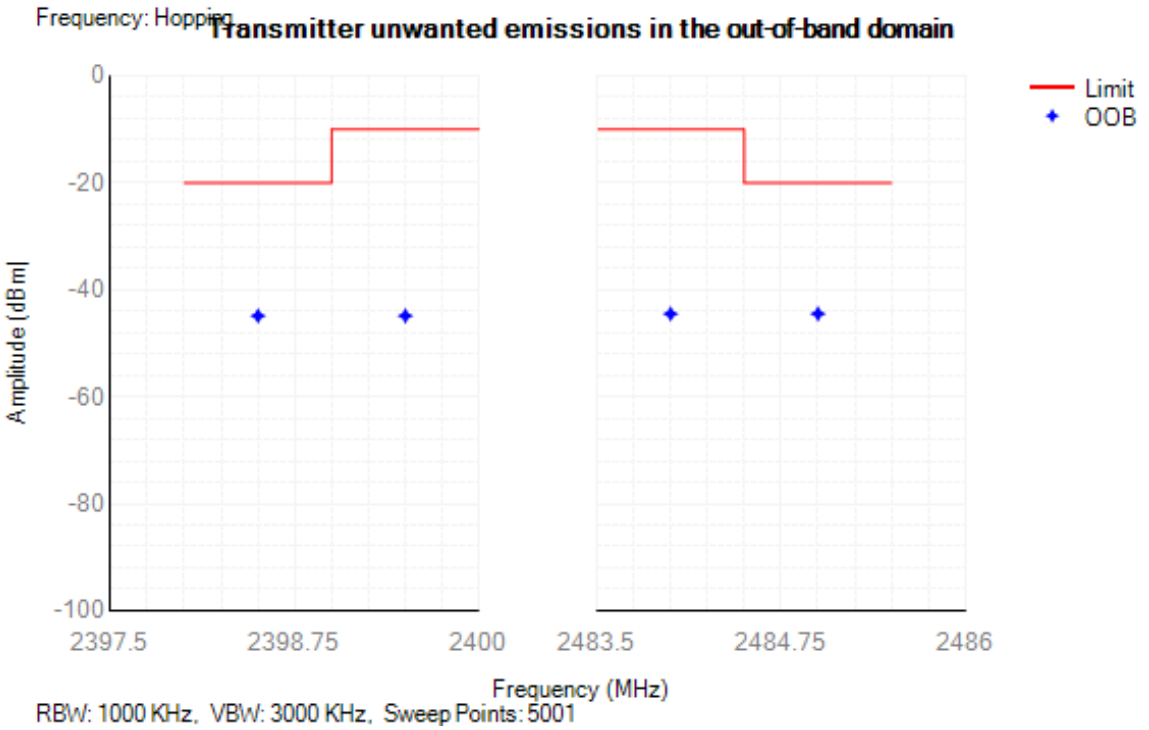
RBW/ VBW	1MHz/3MHz
Span	0Hz
Filter mode	Channel filter
Sweep mode	Single Sweep
Sweep Points	Sweep time [µs] / (1 µs) with a maximum of 30 000
Sweep Time:	> 120 % of the duration of the longest burst detected during the measurement of the RF Output Power
Detector	RMS
Trace mode	Max Hold
Trigger Mode	Video trigger

8.4. Test Result

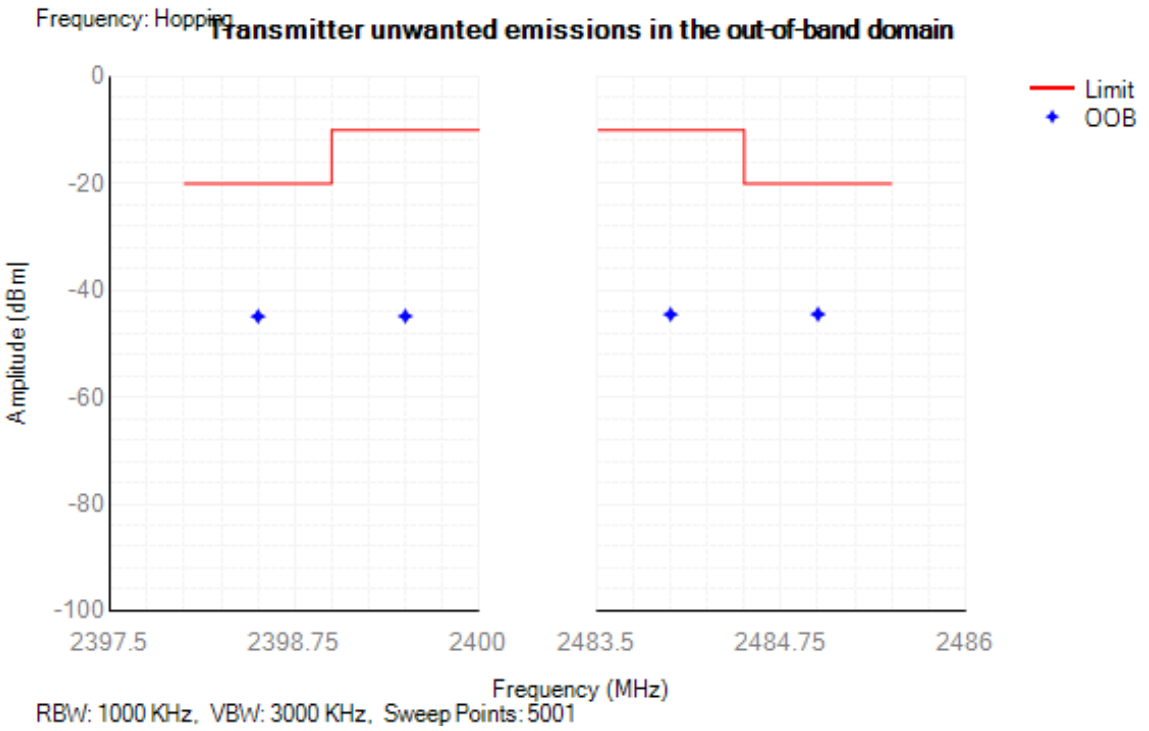
Condition	Mode	Frequency (MHz)	Antenna	OOB Frequency (MHz)	Level (dBm/MHz)	Limit (dBm/MHz)	Verdict
NVNT	1-DH1	Hopping	Ant1	2399.5	-44.87	-10	Pass
NVNT	1-DH1	Hopping	Ant1	2398.5	-44.88	-20	Pass
NVNT	1-DH1	Hopping	Ant1	2484	-44.5	-10	Pass
NVNT	1-DH1	Hopping	Ant1	2485	-44.49	-20	Pass
NVNT	1-DH1	Hopping	Ant1	2399.5	-44.84	-10	Pass
NVNT	1-DH1	Hopping	Ant1	2485	-44.47	-20	Pass
NVNT	2-DH1	Hopping	Ant1	2399.5	-44.85	-10	Pass
NVNT	2-DH1	Hopping	Ant1	2399.303	-44.84	-10	Pass
NVNT	2-DH1	Hopping	Ant1	2398.303	-44.87	-20	Pass
NVNT	2-DH1	Hopping	Ant1	2398.106	-44.88	-20	Pass
NVNT	2-DH1	Hopping	Ant1	2484	-44.5	-10	Pass
NVNT	2-DH1	Hopping	Ant1	2485	-44.49	-20	Pass
NVNT	2-DH1	Hopping	Ant1	2399.5	-44.88	-10	Pass
NVNT	2-DH1	Hopping	Ant1	2398.5	-44.9	-20	Pass
NVNT	2-DH1	Hopping	Ant1	2484.197	-44.51	-10	Pass
NVNT	2-DH1	Hopping	Ant1	2485.197	-44.47	-20	Pass
NVNT	2-DH1	Hopping	Ant1	2485.394	-44.51	-20	Pass
NVNT	3-DH1	Hopping	Ant1	2399.5	-44.81	-10	Pass
NVNT	3-DH1	Hopping	Ant1	2399.329	-44.82	-10	Pass
NVNT	3-DH1	Hopping	Ant1	2398.329	-44.84	-20	Pass
NVNT	3-DH1	Hopping	Ant1	2398.158	-44.83	-20	Pass
NVNT	3-DH1	Hopping	Ant1	2484	-44.47	-10	Pass

NVNT	3-DH1	Hopping	Ant1	2485	-44.46	-20	Pass
NVNT	3-DH1	Hopping	Ant1	2398.5	-44.85	-20	Pass
NVNT	3-DH1	Hopping	Ant1	2484	-44.5	-10	Pass
NVNT	3-DH1	Hopping	Ant1	2484.179	-44.45	-10	Pass
NVNT	3-DH1	Hopping	Ant1	2485.179	-44.44	-20	Pass
NVNT	3-DH1	Hopping	Ant1	2485.358	-44.44	-20	Pass

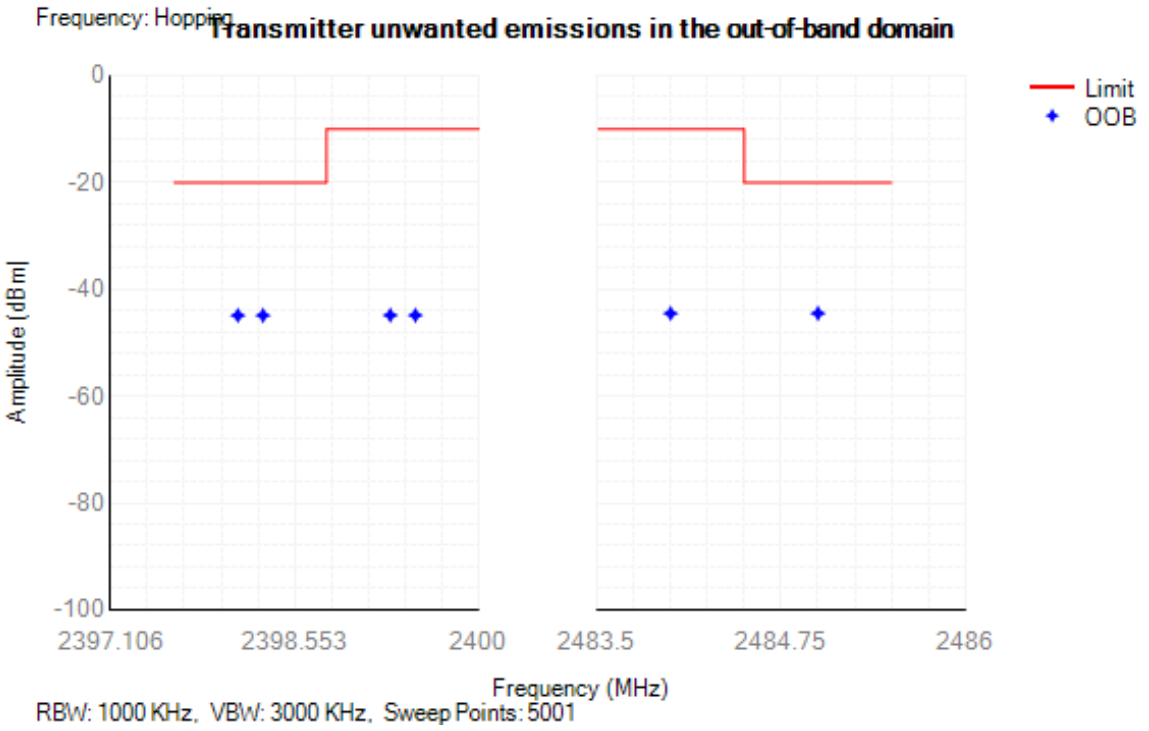
Tx. Emissions OOB NVNT 1-DH1 2402MHz Ant1



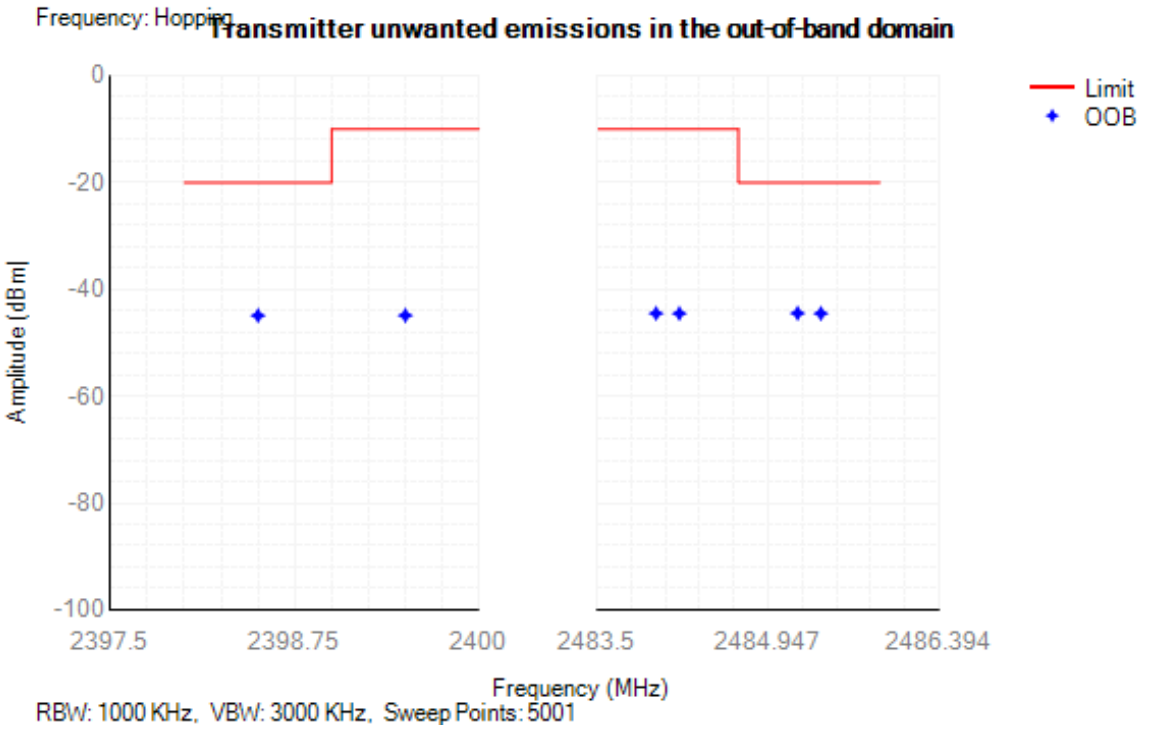
Tx. Emissions OOB NVNT 1-DH1 2480MHz Ant1



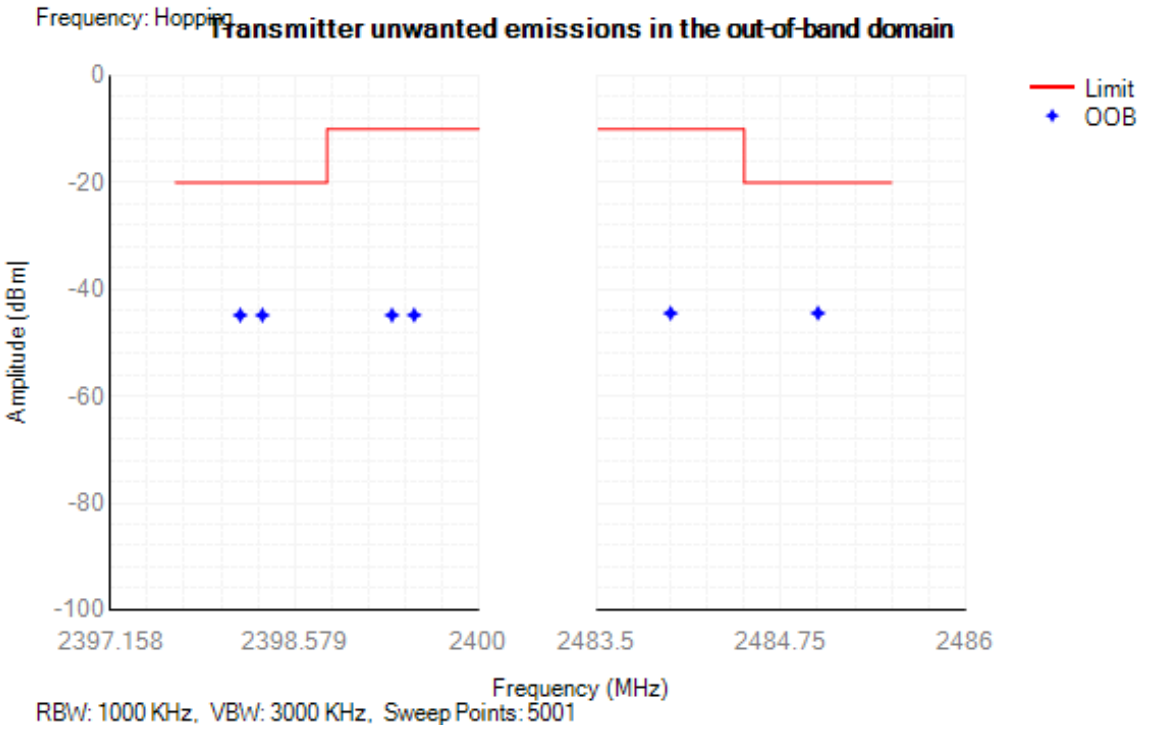
Tx. Emissions OOB NVNT 2-DH1 2402MHz Ant1



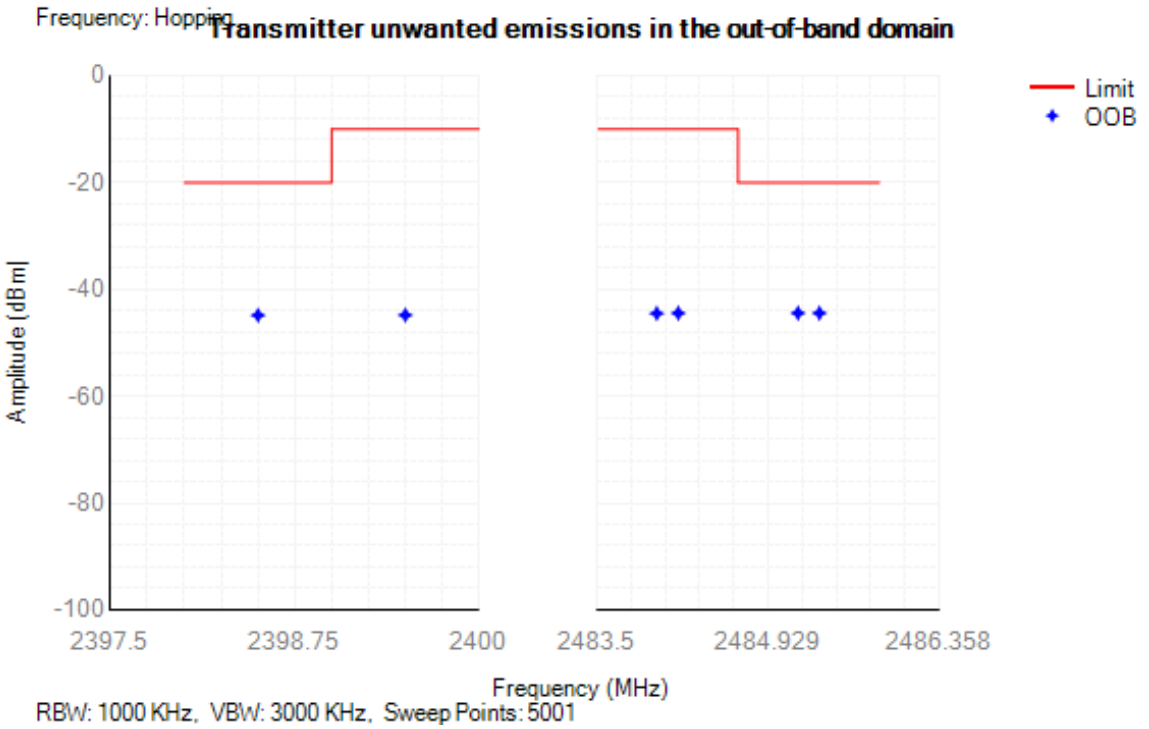
Tx. Emissions OOB NVNT 2-DH1 2480MHz Ant1



Tx. Emissions OOB NVNT 3-DH1 2402MHz Ant1



Tx. Emissions OOB NVNT 3-DH1 2480MHz Ant1



9. Transmitter Unwanted Emissions in the Spurious Domain

9.1. Limit

The transmitter unwanted emissions in the spurious domain shall not exceed the values given in following table .

Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 694 MHz	-54 dBm	100 kHz
694 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

9.2. Test Procedure

Refer to EN 300 328 V2.2.2:2019 Clause 5.4.9.

9.3. Test Result

Pass

Remark: This Report only show the test data of the worst case.

TX Spurious Emissions (Radiated):

Test Mode: GFSK CH0:2402MHz					
Frequency (MHz)	Antenna polarization	Result (dBm)	Limit (dBm)	Margin (dB)	Conclusion
97.70	H	-59.13	-54	-5.13	Pass
183.64	H	-68.25	-54	-14.25	Pass
4804.03	H	-54.89	-30	-24.89	Pass
7206.10	H	-57.51	-30	-27.51	Pass
81.30	V	-62.91	-36	-26.91	Pass
182.90	V	-61.49	-54	-7.49	Pass
4804.07	V	-62.37	-30	-32.37	Pass
7206.07	V	-52.84	-30	-22.84	Pass
Test Mode: GFSK CH78:2480MHz					
90.62	H	-62.08	-54	-8.08	Pass
727.25	H	-65.75	-36	-29.75	Pass
4960.13	H	-40.63	-30	-10.63	Pass
7439.72	H	-56.61	-30	-26.61	Pass
458.38	V	-48.83	-36	-12.83	Pass
885.98	V	-45.79	-36	-9.79	Pass
4960.06	V	-46.03	-30	-16.03	Pass
7439.60	V	-53.52	-30	-23.52	Pass

TX Spurious Emissions (Radiated):

Test Mode: π/4QPSK CH0:2402MHz					
Frequency (MHz)	Antenna polarization	Result (dBm)	Limit (dBm)	Margin (dB)	Conclusion
91.16	H	-60.88	-54	-6.88	Pass
188.94	H	-64.47	-54	-10.47	Pass
4804.06	H	-61.26	-30	-31.26	Pass
7206.06	H	-63.30	-30	-33.30	Pass
83.92	V	-54.36	-36	-18.36	Pass
204.52	V	-61.07	-54	-7.07	Pass
4804.01	V	-61.40	-30	-31.40	Pass
7206.10	V	-55.58	-30	-25.58	Pass
Test Mode: π/4QPSK CH78:2480MHz					
88.31	H	-64.15	-54	-10.15	Pass
192.13	H	-67.64	-54	-13.64	Pass
4959.56	H	-57.11	-30	-27.11	Pass
7439.78	H	-53.09	-30	-23.09	Pass
75.05	V	-62.95	-36	-26.95	Pass
188.79	V	-62.89	-54	-8.89	Pass
4959.97	V	-56.82	-30	-26.82	Pass
7440.61	V	-56.77	-30	-26.77	Pass

Test Mode: 8DPSK CH0:2402MHz					
Frequency (MHz)	Antenna polarization	Result (dBm)	Limit (dBm)	Margin (dB)	Conclusion
101.24	H	-58.96	-54	-4.96	Pass
181.00	H	-70.12	-54	-16.12	Pass
4804.02	H	-52.28	-30	-22.28	Pass
7205.98	H	-57.10	-30	-27.10	Pass
73.68	V	-59.82	-54	-5.82	Pass
178.74	V	-66.41	-54	-12.41	Pass
4804.10	V	-64.35	-30	-34.35	Pass
7205.95	V	-56.85	-30	-26.85	Pass
Test Mode: 8DPSK CH78:2480MHz					
89.54	H	-62.54	-54	-8.54	Pass
726.91	H	-63.58	-36	-27.58	Pass
4959.71	H	-42.95	-30	-12.95	Pass
7439.98	H	-51.64	-30	-21.64	Pass
464.06	V	-47.81	-36	-11.81	Pass
886.63	V	-46.34	-36	-10.34	Pass
4960.31	V	-43.02	-30	-13.02	Pass
7439.54	V	-54.70	-30	-24.70	Pass

10. Receiver Spurious Emissions

10.1. Limit

The spurious emissions of the receiver shall not exceed the values given in following table .

Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 1GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

10.2. Test Procedure

Refer to EN 300 328 V2.2.2:2019 Clause 5.4.10.

10.3. Test Result

Test Mode: GFSK CH0:2402MHz					
Frequency (MHz)	Antenna polarization	Result (dBm)	Limit (dBm)	Margin (dB)	Conclusion
94.56	H	-67.35	-57	-10.35	Pass
177.12	H	-62.18	-57	-5.18	Pass
2529.66	H	-67.69	-47	-20.69	Pass
3845.92	H	-67.50	-47	-20.50	Pass
98.24	V	-65.34	-57	-8.34	Pass
199.17	V	-69.72	-57	-12.72	Pass
2540.09	V	-58.04	-47	-11.04	Pass
3854.03	V	-60.14	-47	-13.14	Pass
Test Mode: GFSK CH78:2480MHz					
83.97	H	-62.42	-57	-5.42	Pass
195.58	H	-61.16	-57	-4.16	Pass
2537.83	H	-57.15	-47	-10.15	Pass
3841.73	H	-64.84	-47	-17.84	Pass
76.42	V	-65.92	-57	-8.92	Pass
190.51	V	-71.80	-57	-14.80	Pass
2544.37	V	-54.79	-47	-7.79	Pass
3844.85	V	-55.77	-47	-8.77	Pass

Remark: This Report only show the test plots of the worst case.

11. Receiver Blocking

11.1. Limit

While maintaining the minimum performance criteria as defined in clause 4.3.1.12.3, the blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided in table 6, table 7 or table 8.

Table 6: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2)	2380 2504	-34	CW
(-139 dBm + 10 × log10(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

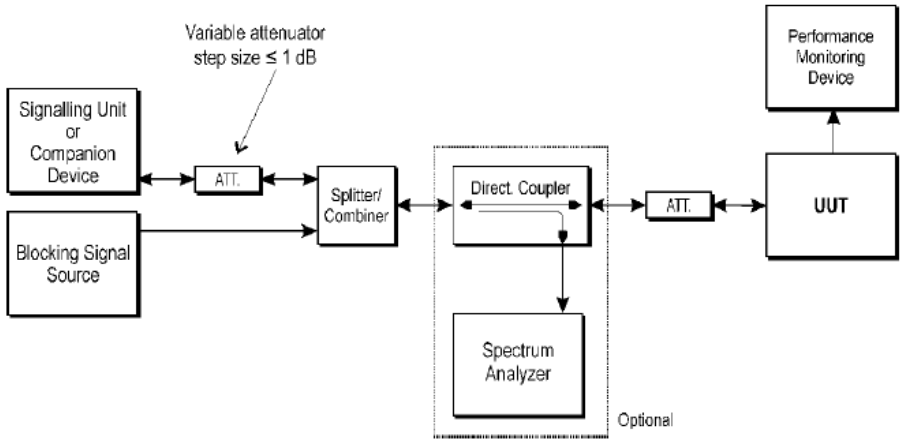
Table 7: Receiver Blocking parameters receiver Category 2 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-139 dBm + 10 × log10(OCBW) + 10 dB) or (-74+ 10 dB) dBm whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Table 8: Receiver Blocking parameters receiver Category 3 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-139 dBm + 10 × log10(OCBW) + 20 dB) or (-74+ 20 dB) dBm whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative the test may be performed using a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

11.2. Test Setup



11.3. Test Procedure

Refer to EN 300 328 V2.2.2:2019 Clause 5.4.11.

11.4. Test Result

Wanted signal mean power from companion device(dBm)	Channel frequency (MHz)	Blocking signal frequency (MHz)	Blocking signal power (dBm)	PER	PER limit
-60	Hopping	2380	-34	2.0	≤10%
	Hopping	2504		1.3	≤10%
	Hopping	2300		2.7	≤10%
	Hopping	2584		2.3	≤10%
Test result: Pass					
Note: 1. The equipment belongs to receiver category 3 and it shall be tested operating at Hopping mode. 2. Wanted signal mean power(dBm)= (-139 dBm + 10 × log10(OCBW) + 20 dB) or (-74+ 20 dB) dBm whichever is less. 3. When required blocking signals injected, communication link between the UUT and the associated companion device remains, and the performance still meet the minimum performance criterion PER≤10%.					

12. Geo-location Capability

12.1. Definition

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

12.2. Requirements

The geographical location determined by the equipment shall not be accessible to the user.

12.3. Test Result

Not apply.

This requirement only applies to equipment with geo-location capability. And this product does not have the Geo-location capability, thus, not apply to this product.

13. Photos of Test Setup

14. Photos of EUT

Please refer to the report A2503316-C01-R01.

15. Model list

YG691	YG231	YG281	YG291	YG351	YG331
YG361	YG371	YG381	YG391	YG411	YG421
YG431	YG461	YG471	YG491	YG551	YG561
YG581	YG591	YG621	YG621miniYG631	YG651	YG661
YG681	YG721	YG731	YG751	YG761	YG771
YG781	YG791	YG280	YG290	YG330	YG350
YG360	YG370	YG380	YG390	YG420	YG430
YG470	YG490	YG550	YG560	YG600	YG600Plus
YG620mini	YG650	YG680	YG690	YG720	YG730
YG750	YG760	YG770	YG780	YG790	W1K
.YG201	YG203	YG210	YG211	YG213	YG221
YG223	YG233	YG241	YG243	YG251	YG253
YG261	YG263	YG271	YG273	YG283	YG293
YG301	YG303	YG311	YG313	YG321	YG323
YG333	YG341	YG343	YG351	YG353	YG363
YG373	YG383	YG393	YG401	YG403	YG413
YG423	YG433	YG441	YG443	YG451	YG453
YG463	YG473	YG481	YG483	YG493	YG501
YG501	YG511	YG513	YG521	YG523	YG531
YG533	YG541	YG543	YG553	YG563	YG571
YG573	YG583	YG593			

------END OF REPORT-------