Report No. REP008726

Test Report

Product	Electronic Control Unit for vehicle Integration
Name and address of the applicant	CPAC Systems AB Bergskroken 3, 431 37 Mölndal, Sweden
Name and address of the manufacturer	CPAC Systems AB Bergskroken 3, 431 37 Mölndal, Sweden
Model	SID 2.0
Rating	24VDC
Trademark	CPAC Systems AB
Serial number	See page 3
Additional information	This test report covers Bluetooth Classic. (The radio module is from Alps UGCZ1 containing Qualcomm QCA6175A)
Tested according to	**ETSI EN 300 328 v2.2.2 (2019-07)** Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz band; Harmonised Standard for access to radio spectrum
Order number	PRJ0024292
Tested in period	2023-02-24 to 2023-03-16
Issue date	2023-05-15
Name and address of the testing laboratory	Nemko Scandinavia AS Instituttveien 6, 2007 Kjeller, Norway

An accredited technical test executed under the Norwegian accreditation scheme

Prepared by [G.Suhanthakumar]	Approved by [Jan G Eriksen]

Revision history

Revision #	Date	sign	Order #	Description
A	2023-05-15	gns	PRJ0024292	First issued

THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in “Summary of Test Data”.

CONTENTS

1 Test Information

1.1 Tested Item

Name	CPAC Systems AB
Model/version	SID 2.0
Serial number	23040034
Hardware identity and/or version	P-01
Software identity and/or version	Hydra_BTSW_1.0
Adaptivity	N/A (Output Power ≤ 10 dBm)
Frequency Range	2402 - 2480 MHz
Number of Channels	79
Channel BW	1 MHz
Operating Mode	Transceiver, Frequency Hopping Spread Spectrum (FHSS)
Type of Modulation	GFSK, 8-DPSK and π/4-DQPSK
Rated Output Power	≤+10 dBm (max)
Power supply	24VDC
Antenna Connector	FAKRA
Number of Antennas	See cl.1.3 of this report
Antenna gain	See cl.1.3 of this report
Antenna Diversity Supported	No
Smart Antenna System	No
Receiver	Yes, Catogory 2
Geo-Location capability	Not implemented

Description of Test Item

Electronic Control Unit for vehicle Integration

1.2 Model Variants

According to the manufacturer the following models have same RF parts and RF modules.

Model/type	LTE Module mounted	Superseal 26	Tested
SID 2.0 (tested at Nemko)	Yes	version 1	☒
SID 2.0M	No (Marine commercial)	version 2	
SID 2.0MLTE	Yes (Marine leisure)	version 2	
SID 2.0X (EU only)	Yes	version 1	

1.3 Antenna types

Declared by the manufacturer.

Name	P/N	Max gain (dBi)	Function
2J 2× 4G/3G/2G MIMO, 2× 2.4/5.0 GHz MIMO and GNSS	2J #2J4A50PCFa	3.7	2.4GHz Wifi+BT
2J 2× 4G/3G/2G MIMO, 2× 2.4/5.0 GHz MIMO and GNSS	2J #2J4A50PCFa	4	2G+3G+4G
TE ANTENNA BASE FULL FEAT	Volvo #23311779	7	2.4GHz Wifi+BT
TE ANTENNA BASE FULL FEAT	Volvo #23311779	7	2G+3G+4G
TE ANTENNA INTERIOR PHONE	Volvo #23311714	3	2G+3G+4G
TE ANTENNA INTERIOR WLAN	Volvo #23311706	3.5	2.4GHz Wifi+BT

1.4 Receiver Categories

Receiver Category 1	- **Adaptive equipment with maximum RF Output Power greater that 10 mW e.i.r.p.**
Receiver Category 2	- **Non-adaptive equipment with MU Factor greater than 1% and less than or equal to 10%, or** - **Any equipment with a maximum RF output power greater than 0 dBm e.i.r.p and less than or equal to 10 dBm e.i.r.p.**
Receiver Category 3	- **Non-adaptive equipment with a maximum MU factor of 1%, or** - **Any equipment with a maximum RF output power of 0 dBm e.i.r.p.**

NOTE: Non-adaptive equipment is categorized as receiver category 2 or receiver category 3.

1.5 Normal test condition

Temperature:	20 – 23 °C
Relative humidity:	20 – 45 %
Normal test voltage:	24 V DC

The values are the limit registered during the test period.

1.6 Extreme test conditions

	Voltage	Temperature
Minimum	**8 VDC**	**-40 °C**
Maximum	**32 VDC**	**+85 °C**

Extreme test conditions were defined by the manufacturer.

1.7 Test Engineer

G.Suhanthakumar

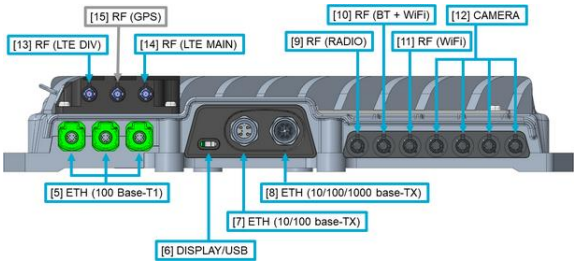
1.8 Test Equipment

See list of test equipment in clause 7.

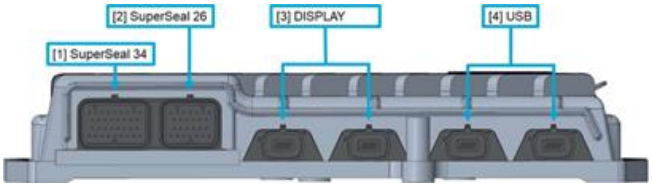
1.9 Worst Case Mode

Channel no	Frequency (MHz)	Modulation	Modulation	Modulation
Hopping	**Hopping**	**GFSK/1Mbit**	**π/4-DQPSK/2Mbit**	**8-DPSK/3Mbit**
1	**2402**	**GFSK/1Mbit**	**π/4-DQPSK/2Mbit**	**8-DPSK/3Mbit**
40	**2442**	**GFSK/1Mbit**	**π/4-DQPSK/2Mbit**	**8-DPSK/3Mbit**
79	**2480**	**GFSK/1Mbit**	**π/4-DQPSK/2Mbit**	**8-DPSK/3Mbit**

Note: /



Connectors – rear side



1.10 Other Comments

The EUT have been tested to ETSI EN 300328 V2.2.2 and all tests are Passed.

All radiated measurements and conducted RF measurements are done with DC power supply.

2 TEST REPORT SUMMARY

2.1 General

The tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with

EN 300 328 V2.2.2 (2019-07):

Wideband Transmission systems; Data transmission equipment operating in the 2,4 GHz band;
Harmonised Standard for access to radio spectrum

The test methods have been in accordance with Nemko TM-NO-WLS-500 and EN 300 328 where applicable. Radiated tests were performed is accordance with Nemko TM-NO-WLS-500 and EN 300 328. Radiated emissions are made in a 3m fully-anechoic chamber.

☐ Production Unit

☒ Pre-production Unit

2.2 Abbreviations

The following abbreviations are used in the test summary:

- **N/A** Not applicable. The testcase is not applicable for the tested equipment.
- **N/T** Not tested. The testcase is not covered by this test report.
- **U** Unconditional (test is mandatory)
- **C** Conditional (test is mandatory if certain conditions are met)

2.3 Test Summary

Harmonized Standard EN 300 328 Relationship between the present document and the essential requirements of Directive 2014/53/EU					
Technical Reqirement reference		**Technical Requirement Conditionality**		**Test Specification**	
Description	**Reference Clause No**	**U/C**	**Condition**	**Reference Clause No.**	**Verdict**
RF Output Power	4.3.1.2 or 4.3.2.2	U		5.4.2	**Pass**
Power Spectral Density	4.3.2.3	C	Only for modulations other than FHSS	5.4.3	**N/A[1]**
Duty cycle, Tx-Sequence, Tx-gap	4.3.1.3 or 4.3.2.4	C	Only for non-adaptive equipment	5.4.2	**N/A[2]**
Accumulated Transmit time, Frequency Occupation and Hopping Sequence	4.3.1.4	C	Only for FHSS	5.4.4	**Pass**
Hopping Frequency Separation	4.3.1.5	C	Only for FHSS	5.4.5	**Pass**
Medium Utilisation Factor	4.3.1.6 or 4.3.2.5	C	Only for non-adaptive equipment	5.4.2	**N/A[2]**
Adaptivity	4.3.1.7 or 4.3.2.6	C	Only for adaptive equipment	5.4.6	**N/A[1]**
Occupied Channel Bandwidth	4.3.1.8 or 4.3.2.7	U		5.4.7	**Pass**
Transmitter unwanted emissions in the Out-of-Band domain	4.3.1.9 or 4.3.2.8	U		5.4.8	**Pass**
Transmitter unwanted emissions in the spurious domain	4.3.1.10 or 4.3.2.9	U		5.4.9	**Pass**
Receiver spurious emissions	4.3.1.11 or 4.3.2.10	U		5.4.10	**Pass**
Receiver Blocking	4.3.1.12 or 4.3.2.11	U		5.4.11	**Pass**
Geo-location capability	4.3.1.13 or 4.3.2.12	C	Optional feature	N/A	**N/A[3]**

[1] FHSS equipment

[2] Below 10dBm

[3] Not implemented

3 Test Results

3.1 RF output power

ETSI EN 300 328 Clause 4.3.1.2

Conducted RF measurements done with maximum antenna gain to get eirp. Standard FAKRA RF connector is provided for 2 types of detachable antenna.

Channel Frequency (MHz)	Measured values (dBm)		
	GFSK	π/4-DQPSK	8-DPSK
2402	9.0	6.4	5.7
2440	9.5	6.1	5.8
2480	9.7	5.9	5.9

Duty cycle: 32%

Nominal conditions - RF output power (rms)

antenna gain is declared by the manufacturer.

Limits: Clause 4.3.1.2.3

Maximum Effective Radiated Power shall be less than or equal to 100 mW (20 dBm) e.i.r.p.

Test Equipment Used: 2, 3, 4, 5, 6

3.2 RF Output Power, extreme conditions

ETSI EN 300 328 Clause 4.3.1.2

Channel Frequency (MHz)	Voltage	Temp.	Measured values (dBm)		
			GFSK	π/4-DQPSK	8-DPSK
Hopping	8VDC	-40°C	9.0	6.4	5.7
2402			9.0	6.4	5.7
2440			9.5	6.1	5.8
2480			9.7	5.9	5.9
Hopping	32VDC	-40°C	10.0	7.6	6.9
2402			10.0	7.6	6.9
2440			10.0	6.8	6.5
2480			10.0	6.8	6.8
Hopping	8VDC	+85°C	7.8	5.2	4.5
2402			7.8	5.2	4.5
2440			8.2	5.0	4.5
2480			8.4	4.9	4.7
Hopping	32VDC	+85°C	7.5	4.9	4.2
2402			7.5	4.9	4.2
2440			9.4	6.0	5.7
2480			9.3	5.5	5.5

antenna gain declared by the manufacturer is used.

Limits: Clause 4.3.1.2.3

Maximum Equivalent Isotropic Radiated Power shall be less than or equal to 100 mW (20 dBm)

Test Equipment Used: 1, 8, 9

3.3 Duty Cycle, Tx-Sequence, Tx-Gap

ETSI EN 300 328 Clause 4.3.1.3

N/A

These requirements apply to non-adaptive FHSS equipment or to adaptive FHSS equipment operating in a non-adaptive mode.

These requirements do not apply for equipment with a declared RF Output power of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.

Limits: Clause 4.3.1.3.3

For non-adaptive Frequency Hopping equipment, the Duty Cycle shall be equal to or less than the minimum value declared by the supplier. In addition, the maximum Tx-sequence time shall be 5 ms while the minimum Tx-gap time shall be 5 ms.

Test Equipment Used: /

3.4 Accumulated Transmit Time, Minimum Frequency Occupation and Hopping Sequence

ETSI EN 300 328 Clause 4.3.1.4

	GFSK	π/4-DQPSK	8-DPSK
Accumulated Transmit time ms	**69.4**	**77.3**	**1.64**
Time of Occupancy, ms	**0.77**	**3.6**	**11.45**
Hopping Sequence	**79**	**79**	**79**

Modulation	Band Allocation (%)	Band Allocation (MHz)	Band Allocation Low Frequency (MHz)	Band Allocation High Frequency (MHz)
GFSK	**96**	**79.51**	**2401.37**	**2480.88**
π/4-DQPSK	**96**	**79.76**	**2401.12**	**2480.88**
8-DPSK	**96**	**79.76**	**2401.12**	**2480.88**

The tested EUT is a Bluetooth FHSS device and fulfils the requirements for non-adaptive frequency hopping equipments

Limits: Clause 4.3.1.4.3

Non-adaptive Frequency Hopping systems:
The accumulated Dwell Time on any hopping frequency shall not be greater than 15ms within any 15ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

The hopping sequence(s) shall contain at least N hopping frequencies where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.

The minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

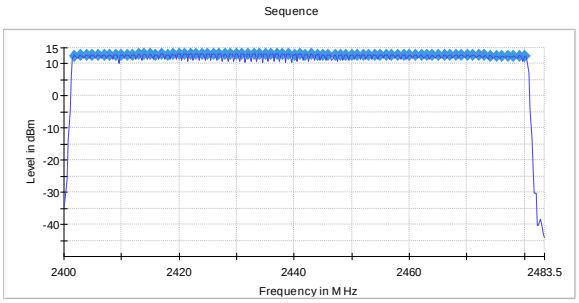
Adaptive Frequency Hopping Systems:
Adaptive Frequency Hopping Systems shall be capable of operating over a minimum of 70% of the band specified in clause 1.

The maximum accumulated dwell time on any hopping frequency shall be 400 ms within any period of 400 ms multiplied by minimum number of hopping frequencies (N) that have to be used.

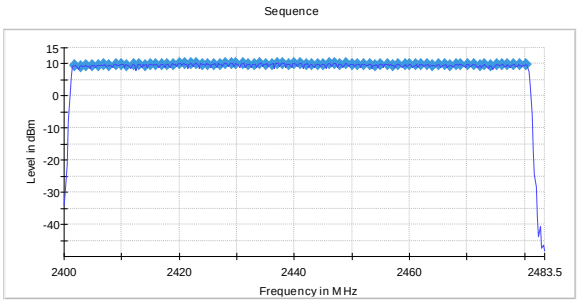
The hopping sequence shall contain at least N hopping frequencies at all time, where N is 15 or 15 divided by the minimum hopping frequency separation in MHz, whichever is greater.

The Minimum Frequency Occupation Time shall be equal to one dwell time within a period not exceeding four times the product of the dwell time per hop and the number of hopping frequencies in use.

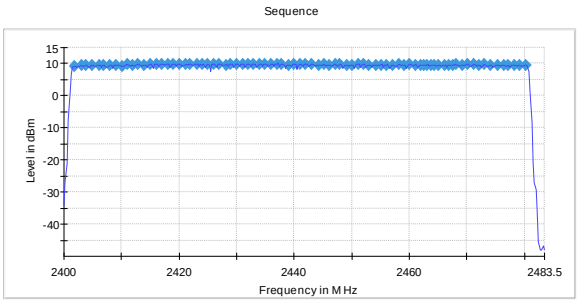
Test Equipment Used: 1



Hopping sequence, GFSK



Hopping sequence, π/4-DQPSK



Hopping sequence, 8-DPSK

3.5 Hopping Frequency Separation

ETSI EN 300 328 Clause 4.3.1.5

Occupied Channel Bandwidth GFSK:	
BW_{CHAN}	**0.91 MHz**
F_{HS}	**1.02 MHz**
Limit	**0.1 MHz**

Occupied Channel Bandwidth π/4-DQPSK:	
BW_{CHAN}	**1.16 MHz**
F_{HS}	**1.01 MHz**
Limit	**0.1 MHz**

Occupied Channel Bandwidth 8-DPSK:	
BW_{CHAN}	**1.17 MHz**
F_{HS}	**0.98 MHz**
Limit	**0.1 MHz**

See definitions in ETSI EN 300 328 V2.2.2 clause 4.2.1.5

Limits: Clause 4.3.1.5.3.1

For non-adaptive Frequency Hopping equipment, the minimum Hopping Frequency Separation shall be equal to the Occupied Channel Bandwidth. For adaptive frequency hopping systems the minimum Frequency Hopping Separation shall be 100 kHz.

Test Equipment Used: 1

3.6 Medium Utilisation (MU) factor

ETSI EN 300 328 subclause 4.3.1.6

Not applicable for equipment with maximum declared RF Output Power of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output Power is less than 10 dBm e.i.r.p.

Calculated value: /

Limits: Clause 4.3.1.6.3

For non-adaptive Frequency Hopping equipment, the maximum Medium Utilisation factor shall be 10 %.

Test Equipment Used: /

3.7 Adaptivity

ETSI EN 300 328 subclause 4.3.1.7

Cl.4.3.1.6.1 – Adaptive Frequency Hopping using LBT Based Detect and Avoid:

Not applicable for non-adaptive Frequency Hopping equipment.

Not applicable for equipment with maximum declared RF Output Power of less then 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output Power is less than 10 dBm e.i.r.p.

Cl.4.3.1.6.2 – Adaptive Frequency Hopping using other forms of Detect and Avoid (non-LBT based):

Not applicable for non-adaptive Frequency Hopping equipment.

Not applicable for equipment with maximum declared RF Output Power of less then 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output Power is less than 10 dBm e.i.r.p.

Cl.4.3.1.6.3 – Short Control Signalling Transmissions:

Not applicable for non-adaptive Frequency Hopping equipment.

Not applicable for equipment with maximum declared RF Output Power of less then 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output Power is less than 10 dBm e.i.r.p.

Limits: Clause 4.3.1.7.3.2

Test Equipment Used: /

3.8 Occupied Channel Bandwidth

ETSI EN 300 328 Clause 4.3.1.8

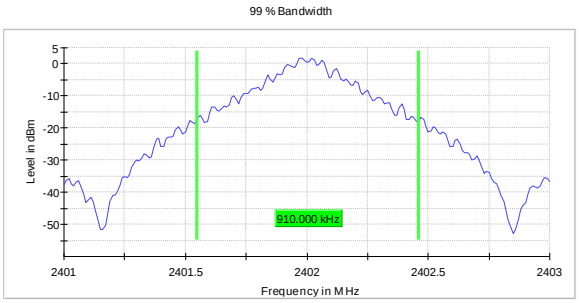
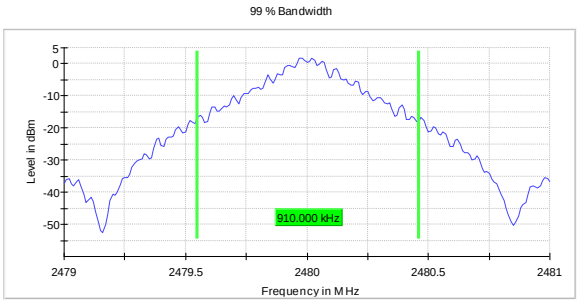
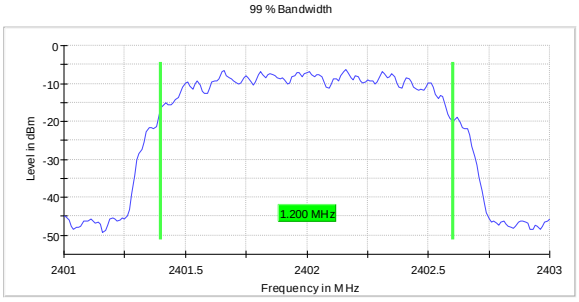
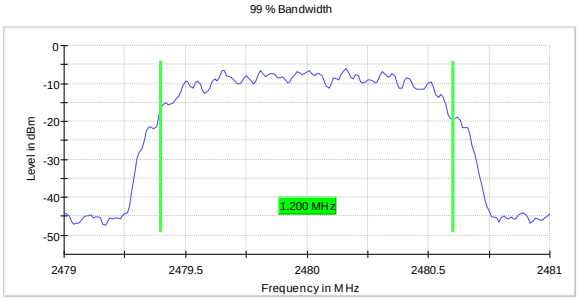
Channel Frequency (MHz)	Occupied Channel Bandwidth (MHz)		
	GFSK	**π/4-DQPSK**	**8-DPSK**
2402	0.91	1.2	1.2
2442	/	/	/
2480	0.91	1.2	1.2

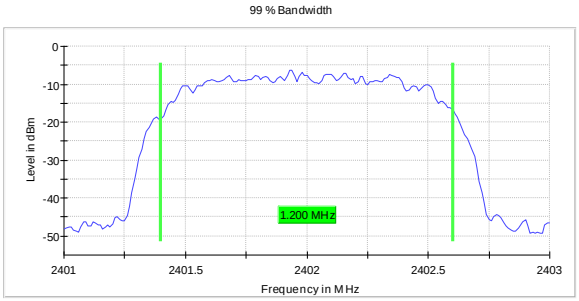
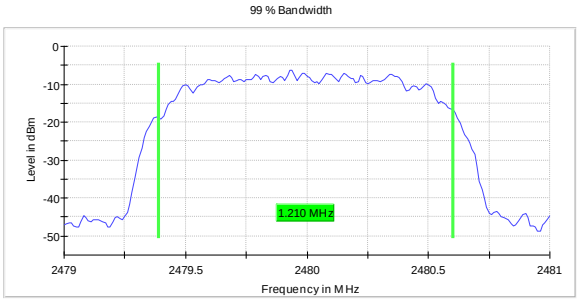
Comment: Measured conducted with a spectrum analyzer with OBW function and RMS Detector.

Limits: Clause 4.3.1.8.3

The Occupied Channel Bandwidth shall fall completely within the 2400 – 2483.5 MHz band.

Test Equipment Used: 1, 9

	
Occupied Bandwidth 2402 MHz, GFSK	**Occupied Bandwidth 2480 MHz, GFSK**
	
Occupied Bandwidth 2402 MHz, π/4-DQPSK	**Occupied Bandwidth 2480 MHz, π/4-DQPSK**

	
Occupied Bandwidth 2402 MHz, 8-DPSK	**Occupied Bandwidth 2480 MHz, 8-DPSK**

3.9 Transmitter unwanted emissions in the Out-of-band domain

ETSI EN 300 328 Clause 4.3.1.9

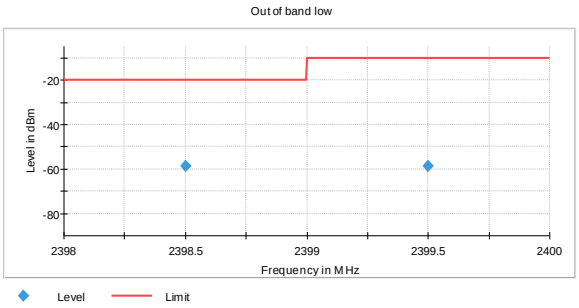
Out of Band Domain	Emission Level (dBm/MHz)		
	GFSK	**π/4-DQPSK**	**8-DPSK**
A: 2400MHz -2BW to 2400MHz -BW	< -40	< -40	< -40
B: 2400MHz -BW to 2400MHz	< -30	< -30	< -30
B: 2400MHz to 2400MHz +BW	< -30	< -30	< -30
A: 2400MHz +BW to 2400MHz +2BW	< -40	< -40	< -40
Measurement Uncertainty	**± 2.0 dB**		

Comment: Measured conducted with a spectrum analyzer with rms Detector.

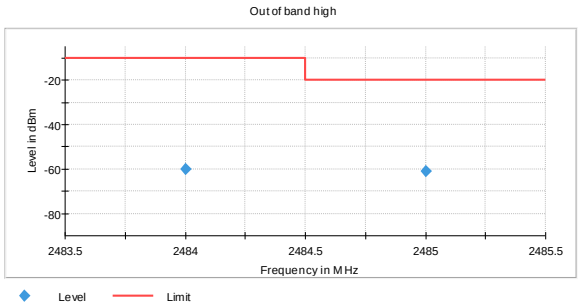
Limits: Clause 4.3.1.9.3

Out of Band Domain	Limit (dBm/MHz)
A	-20 dBm/MHz e.i.r.p.
B	-10 dBm/MHz e.i.r.p.

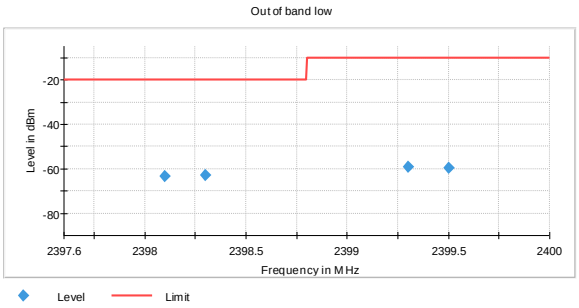
Test Equipment Used: 1, 9



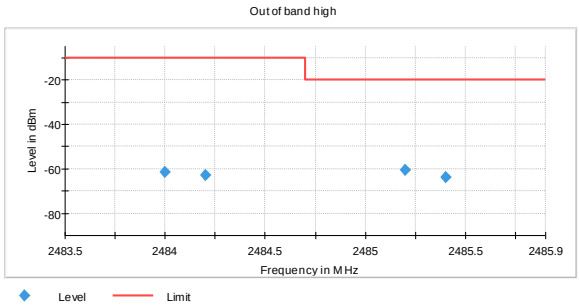
Out of Band Emissions 2402 MHz, GFSK



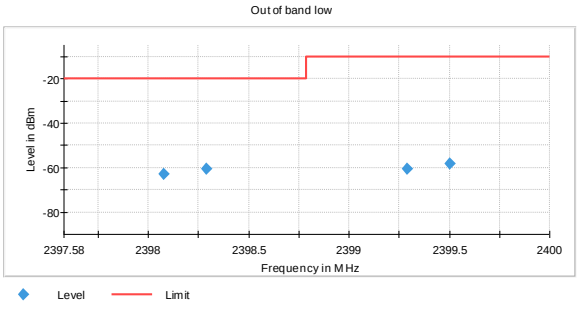
Out of Band Emissions 2480 MHz, GFSK



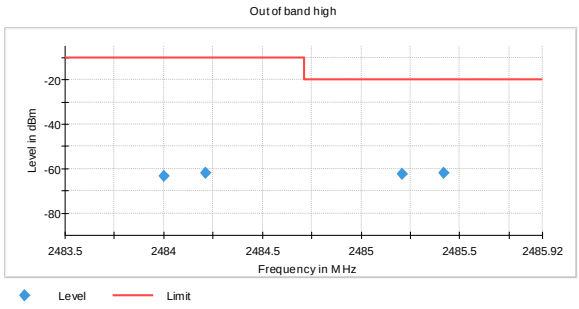
Out of Band Emissions 2402 MHz, π/4-DQPSK



Out of Band Emissions 2480 MHz, π/4-DQPSK



Out of Band Emissions 2402 MHz, 8-DPSK



Out of Band Emissions 2480 MHz, 8-DPSK

3.10 Transmitter spurious emissions - Radiated conducted (Operating)

ETSI EN 300 328 subclause 4.3.1.10

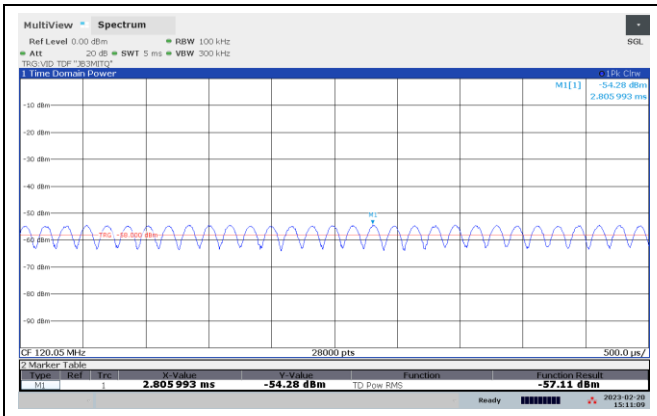
Frequency (MHz)	Spurious Emission Level (dBm)		
	GFSK	π/4-DQPSK	8-DPSK
120	-57.11		
30 - 1000 (all limit: -54 dBm)	<-60	<-60	<-60
30 - 1000 (all limit: -36 dBm)	<-50	<-50	<-50
1000 - 12750	<-40	<-40	<-40

Measured with 50 ohm termination at antenna port 10, according to the cl. 5.4.9.1 a) in EN300 328 v2.2.2.
Below 1 GHz measured with base antenna.
Also measured conducted.

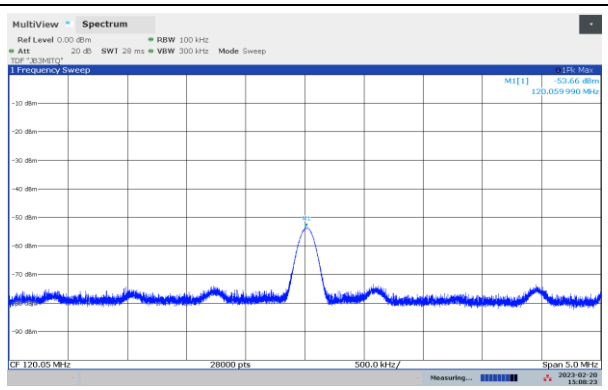
Limits: Clause 4.3.1.10.3

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

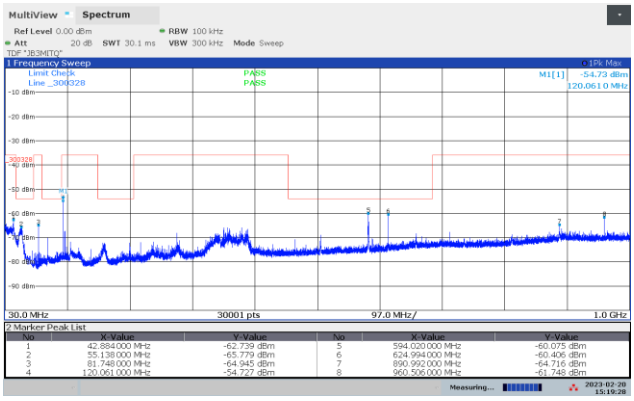
Test Equipment Used: 2, 4, 5, 6, 7



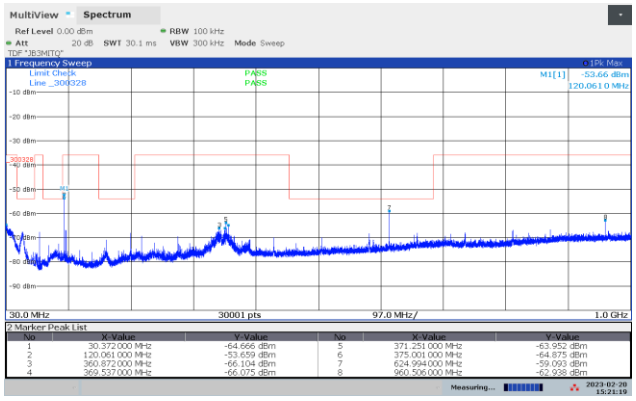
Radiated Emissions, 120 MHz, HP, rms



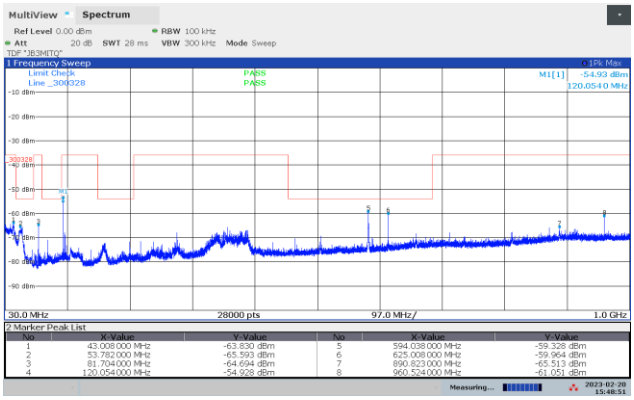
Radiated Emissions, 120 MHz, HP, PK



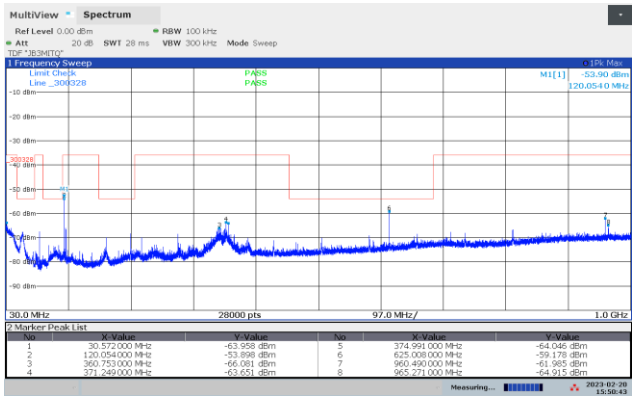
Radiated Emissions 30-1000 MHz, 2402 MHz, GFSK, VP



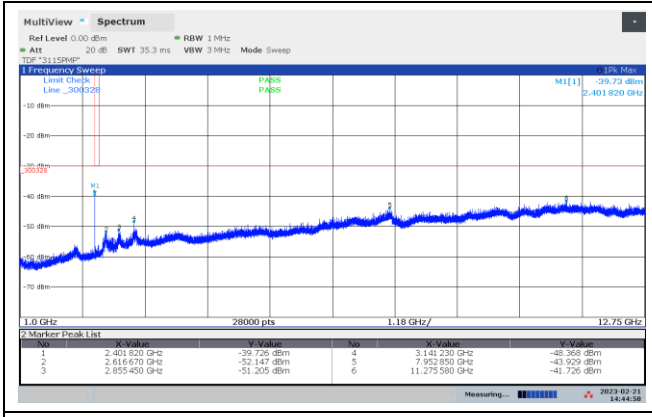
Radiated Emissions 30-1000 MHz, 2402 MHz, GFSK, HP



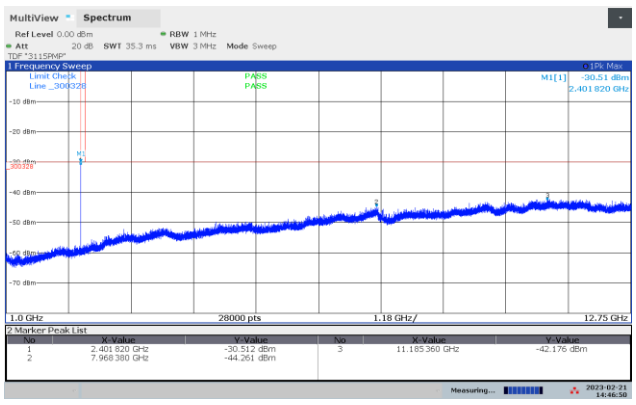
Radiated Emissions 30-1000 MHz, 2480 MHz, GFSK, VP



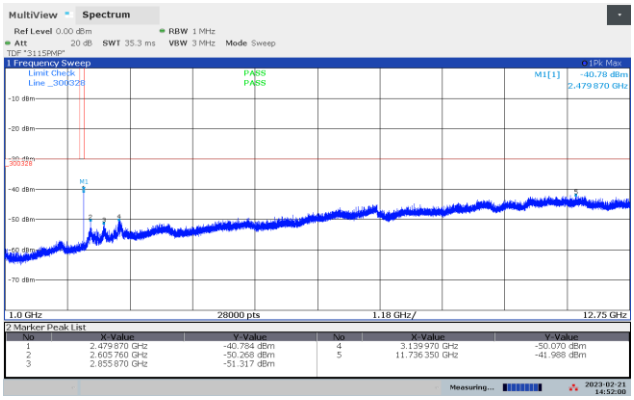
Radiated Emissions 30-1000 MHz, 2480 MHz, GFSK, HP



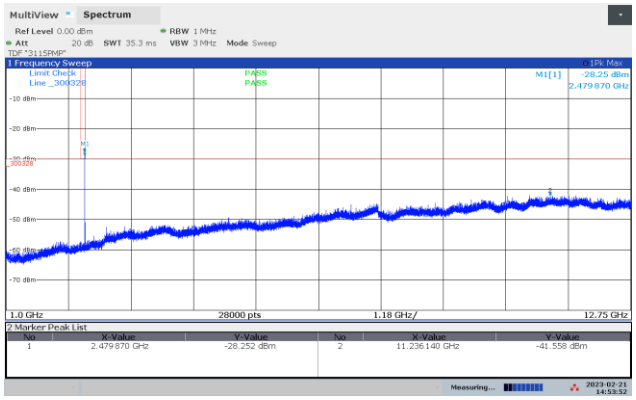
Radiated Emissions 1-12.75 GHz, 2402 MHz, GFSK, VP



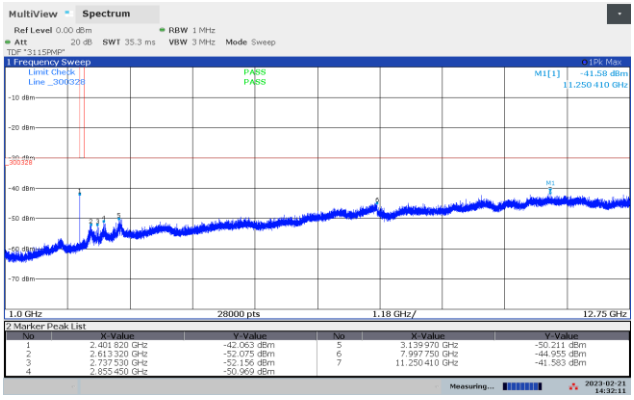
Radiated Emissions 1-12.75 GHz, 2402 MHz, GFSK, HP



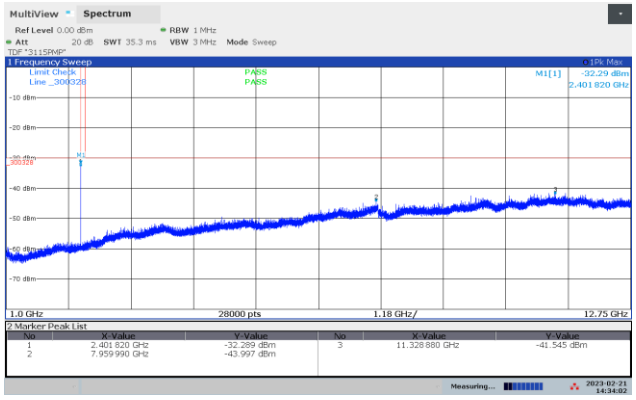
Radiated Emissions 1-12.75 GHz, 2480 MHz, GFSK, VP



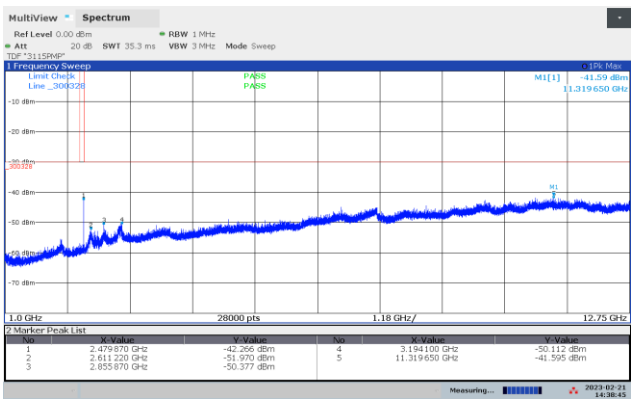
Radiated Emissions 1-12.75 GHz, 2480 MHz, GFSK, HP



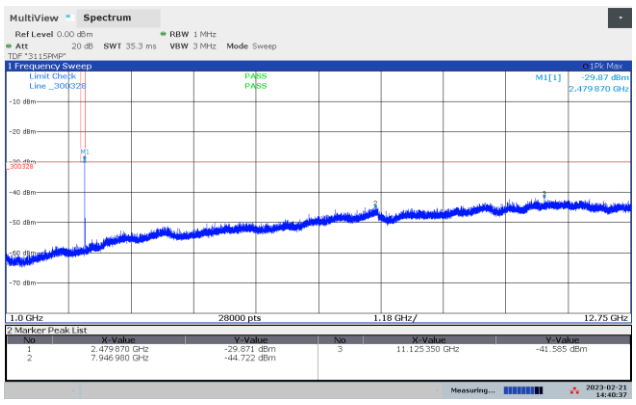
Radiated Emissions 1-12.75 GHz, 2402 MHz, π/4-DQPSK, VP



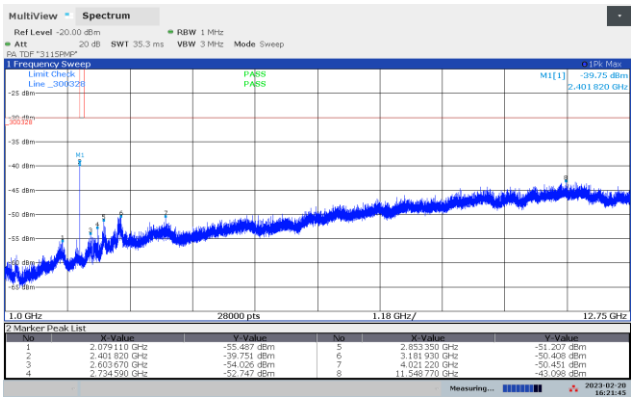
Radiated Emissions 1-12.75 MHz, 2402 GHz, π/4-DQPSK, HP



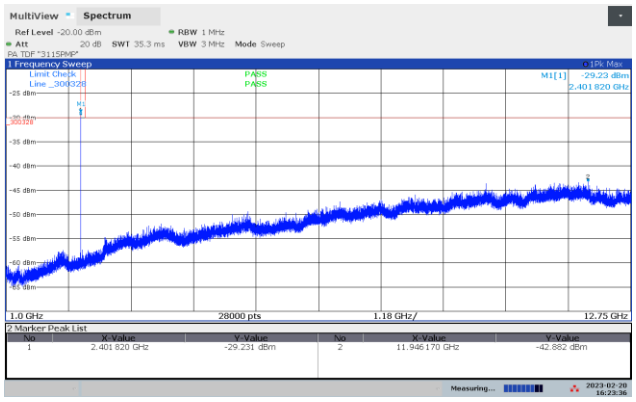
Radiated Emissions 1-12.75 GHz, 2480 GHz, π/4-DQPSK, VP



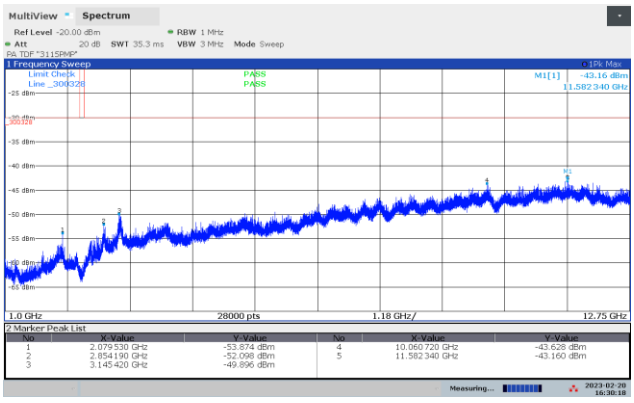
Radiated Emissions 1-12.75 MHz, 2480 GHz, π/4-DQPSK, HP



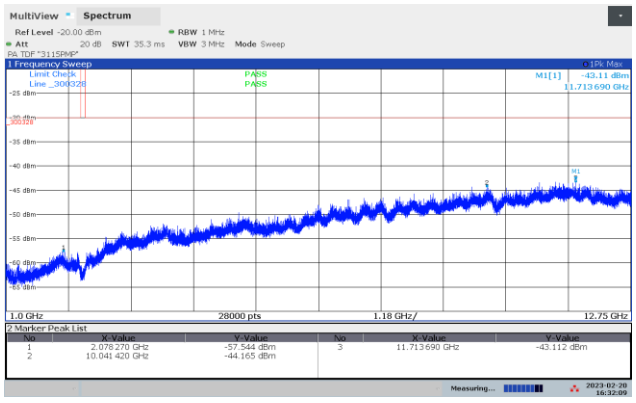
Radiated Emissions 1-12.75 GHz, 2402 GHz, 8-DPSK, VP



Radiated Emissions 1-12.75 MHz, 2402 GHz, 8-DPSK, HP

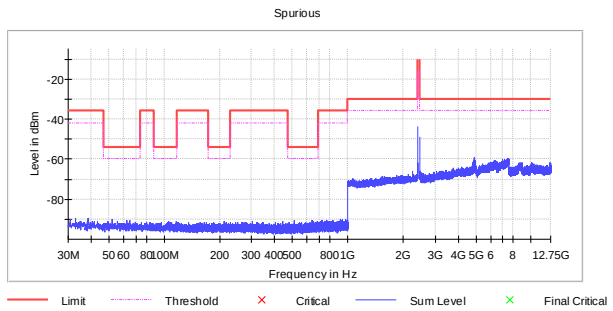


Radiated Emissions 1-12.75 GHz, 2402 GHz, 8-DPSK, VP



Radiated Emissions 1-12.75 MHz, 2402 GHz, 8-DPSK, HP

Conducted TX emissions.

	
Conducted TX spurious emissions, in hopping mode	

3.11 Receiver spurious emissions – Radiated and conducted

ETSI EN 300 328 subclause 4.3.1.11

Frequency (MHz)	Detector	Polarization	Spurious Emission Level (dBm)
120	rms	HP	-57.11
30 – 1000 (all others)	PK	VP/HP	< -63
1000 – 12750 (all others)	PK	VP/HP	< -53

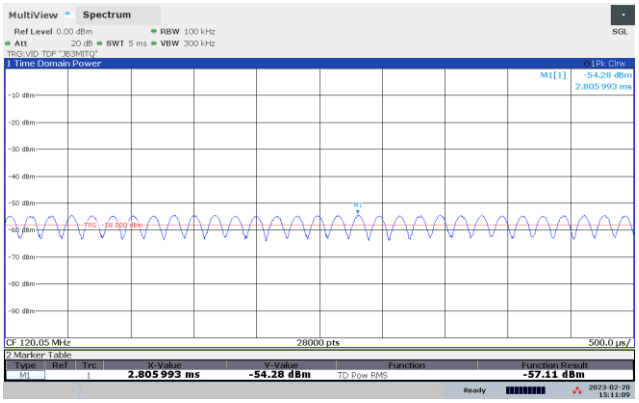
Measured with 50 ohm termination at antenna port 10, according to the cl. 5.4.9.1 a) in EN300 328 v2.2.2.
Below 1 GHz measured with base antenna.
Also measured conducted.

The 847 MHz emission is not from the EUT.
RBW of 100 kHz is used above 1 GHz to reduce the noise level. None detected above 1 GHz.

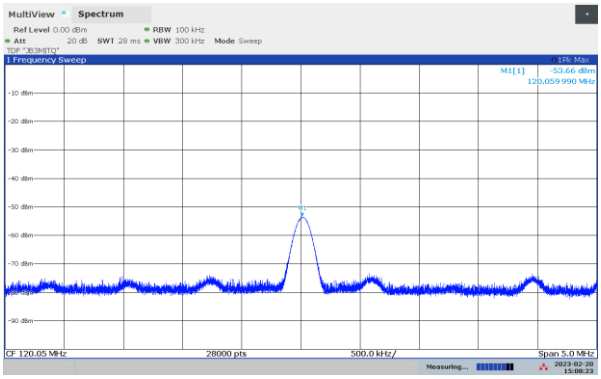
Limits: Clause 4.3.2.11.3

Frequency Range	Limit
30 MHz to 1 GHz	-57 dBm
above 1 GHz to 12.75 GHz	-47 dBm

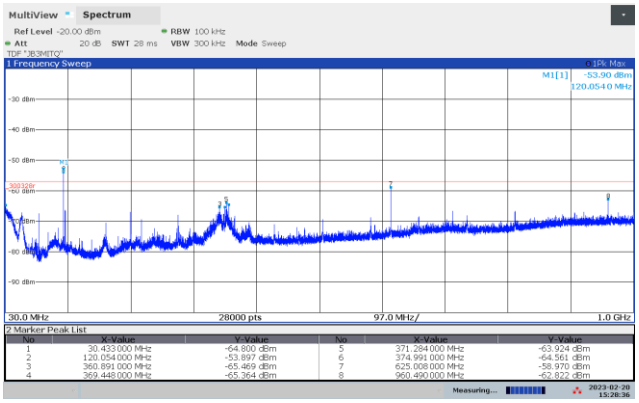
Test Equipment Used: 2, 4, 5, 6



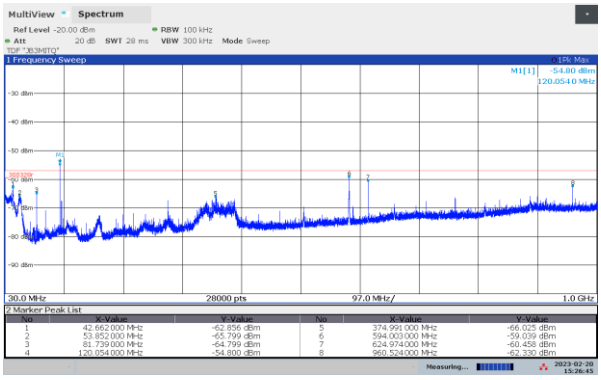
Radiated Emissions, 120 MHz, HP, rms



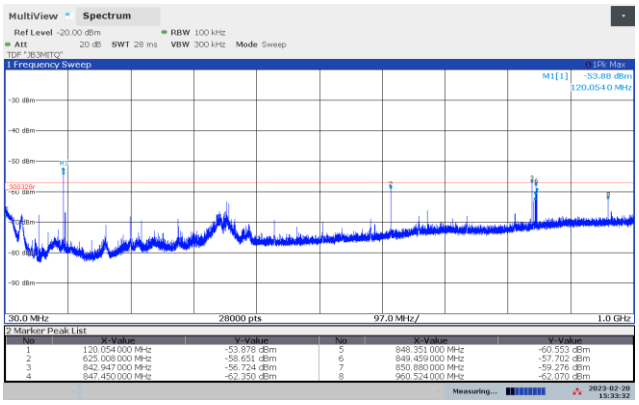
Radiated Emissions, 120 MHz, HP, PK



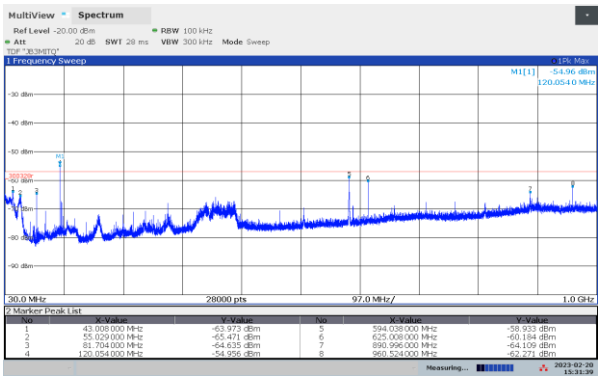
Radiated Emissions, ch2402MHz,30 -1000MHz, HP



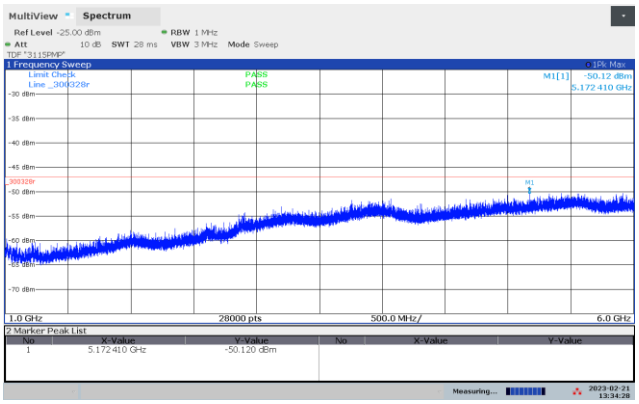
Radiated Emissions, ch2402MHz, 30 -1000MHz, VP



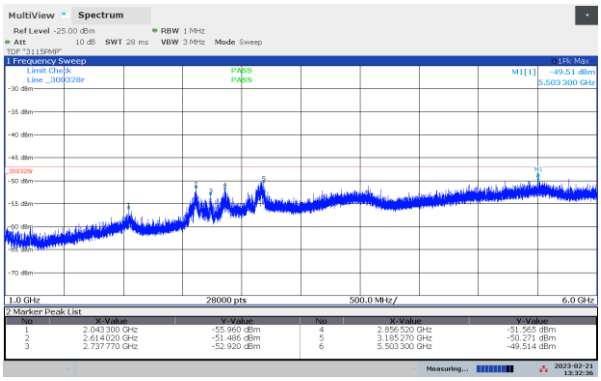
Radiated Emissions, ch2480MHz,30 -1000MHz, HP



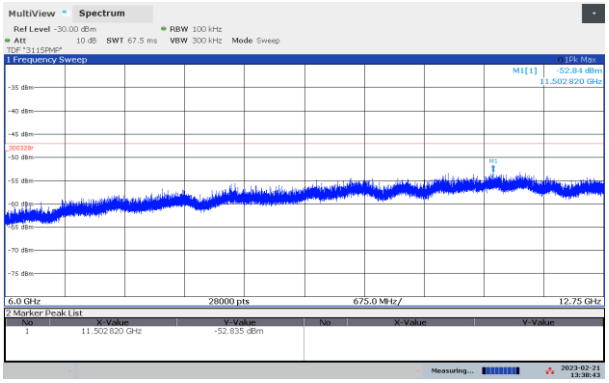
Radiated Emissions, ch2480MHz, 30 -1000MHz, VP



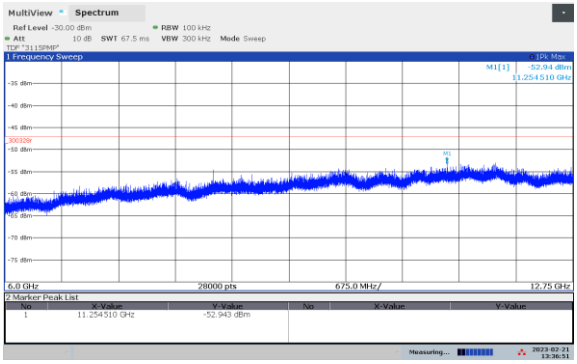
Radiated Emissions, ch2402MHz, 1 - 6GHz, HP , pre-scan



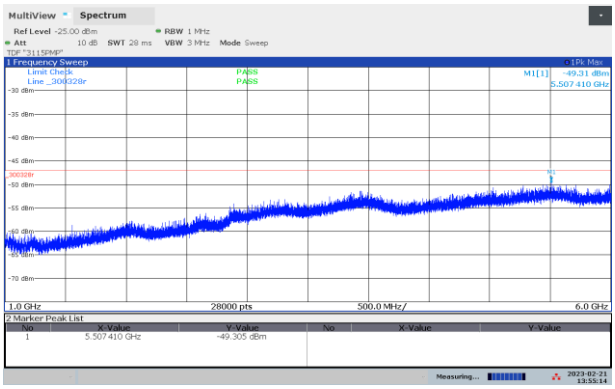
Radiated Emissions, ch2402MHz, 1 - 6GHz,VP, pre-scan



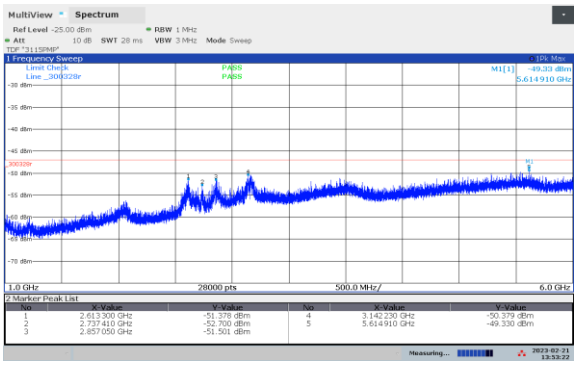
Radiated Emissions,ch2402MHz, 6 - 12.75GHz, HP, pre-scan



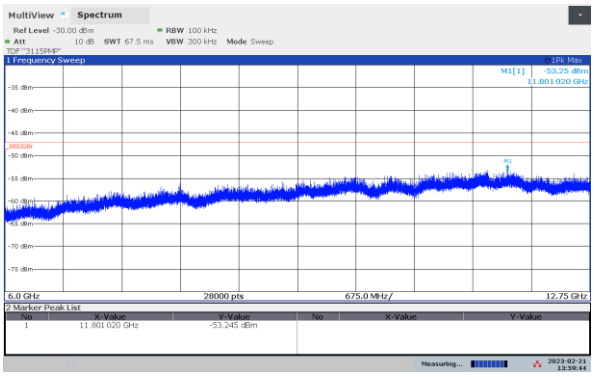
Radiated Emissions,ch2402MHz, 6 - 12.75GHz,VP, pre-scan



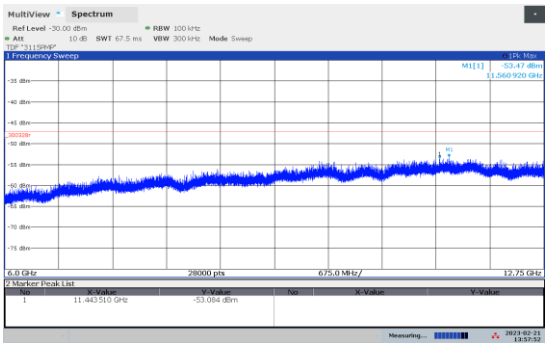
Radiated Emissions,ch2480MHz, 1 - 6GHz, HP, pre-scan



Radiated Emissions,ch2480MHz, 1 - 6GHz, VP, pre-scan

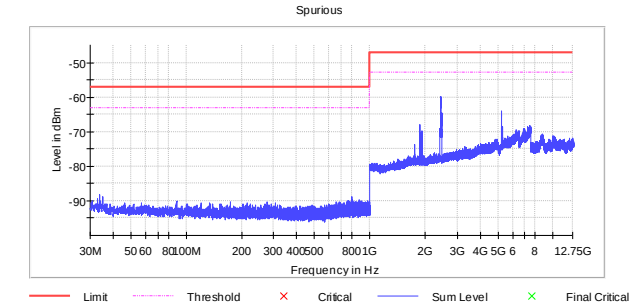


Radiated Emissions,ch2480MHz, 6 - 12.75GHz, HP, pre-scan

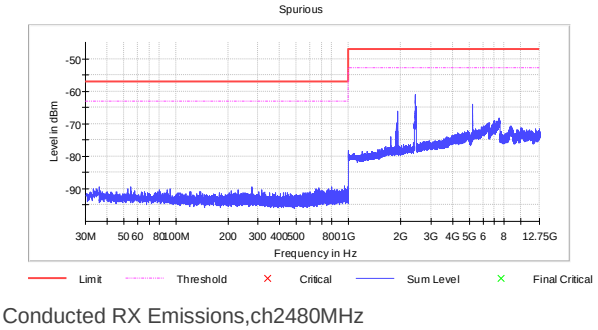


Radiated Emissions,ch2480MHz, 6 - 12.75GHz, VP, pre-scan

Conducted RX spurious emissions Measurements



Conducted RX Emissions,ch2402MHz



Conducted RX Emissions,ch2480MHz

3.12 Receiver Blocking

ETSI EN 300 328 Clause 4.3.1.12

Conducted measurements: Modulation type GFSK

Wanted signal (dBm) §	Channel (Mhz)	Blocking signal frequency [MHz]	Blocking signal power* [dBm]	Observed PER (%)
-75.1	2402	2 300	-32.19	< 4
-75.1		2 380	-32.19	< 4
-75.1	2480	2 504	-32.19	< 4
-75.1		2 584	-32.19	< 4

1000 packets were sent for each test. The PER was monitored on R&S CMW 500.
Ch2402MHz and Ch2480 MHz
OCBW = 0.9 MHz (GFSK)
§: -139 dBm + 10 x log10(OCBW) + 10 dB= -63.46 dBm

***Blocking signal power with antenna gain of 7 dBi is used for ch2402MHz and for ch2480MHz.**

Limits: Clause 4.3.1.12.4.3
Receiver Category 2

Wanted signal mean power from companion device	Blocking signal frequency [MHz]	Blocking signal power [dBm]	Type of blocking signal	Performance criteria
(-139 dBm + 10 x log10(OCBW) + 10 dB) or (-74 dBm + 10 dB), whichever is less	2380	-34	CW	≤ 10%
	2504			
	2300			
	2584			
OCBW is in Hz Note 3: Level above is assuming antenna gain of 0 dBi, the above level have to be corrected for antenna gain in case of conducted measurements				

Test Equipment Used: 10, 11, 12, 13

3.13 Geo-Location capability

ETSI EN 300 328 subclause 4.3.1.13

Description	Yes/NO
Geo-location capability implemented	NO
Accessible to user	NO

Requirements: Clause 4.3.2.13.3

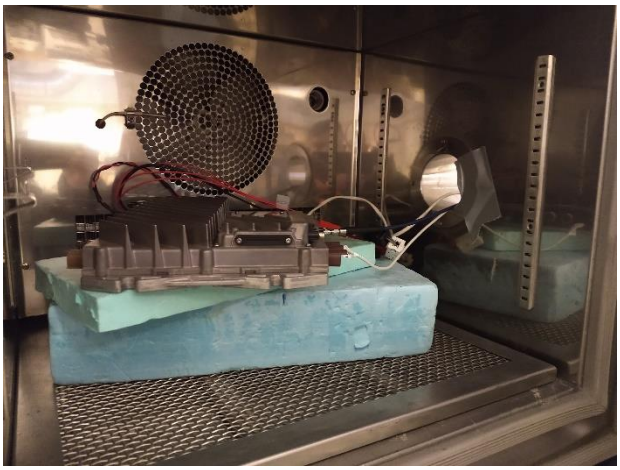
The geographical location determined by the equipment as defined in cl. 4.3.2.13.2 shall not be accessible to the user.

4 Test Setups

Radiated measurements with 50ohm termination

Radiated measurements with antenna type Interior WLAN

Radiated measurements with antenna type 2J



Climatic tests

5 PHOTOGRAPHS OF THE EUT

External photos

View from above

View from rear

View of antenna ports

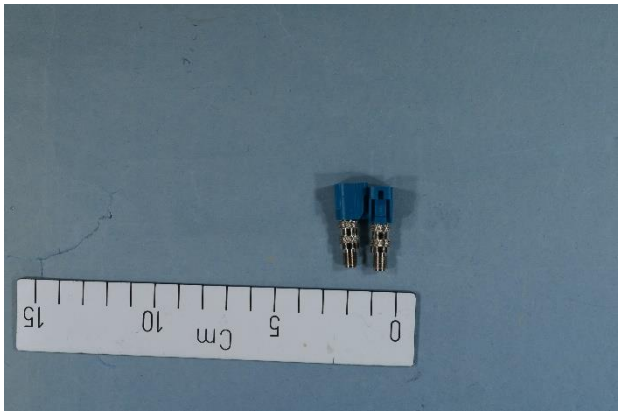
View of power port

View of antenna type Interior WLAN

View of antenna type 2J

Power connector

Audio connector



FAKRA to SMA RF connector for conducted test

Display- rear side

Display front side

Display cable

6 Test Equipment Used

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the testhouse.

No	Ref. No	Description	Manufacturer	Type	Cal. date	Cal. due
1.	LR 1808	Spectrum Analyzer	Rohde & Schwarz	FSVA3044	08.2022	08.2023
2.	LR 1806	Power meter	Rohde & Schwarz	OSP220	08.2022	08.2023
3.	LR 1793	Power Meter	Rohde & Schwarz	OSP-B157W8Plus	08.2022	08.2023
4.	LR 1807	Vector Signal generator	Rohde & Schwarz	SMW200A	08.2022	08.2023
5.	LR 1656	Signal generator	Rohde & Schwarz	SMB100A	01.2023	01.2024
6.	-	EMC 32, TS8997 (Soft ware)	Rohde & Schwarz	11.40.00	N/A	
7.	LR 1640	Spectrum Analyzer	Rohde & Schwarz	FSW26	01.2023	01.2024
8.	LR 1673	Attenuator	NARDA	4768-10	Cal b4 use	
9.	LR 1747	Pre-Amplifier	Miteg	JS4	08.2022	08.2023
10.	LR 1330	Double Ridged Horn Antenna	EMCO	3115	11.2022	11.2026
11.	LR 1614	Highpass Filter	Trilithic	6HC3000/18000	Cal b4 use	
12.	LR 1615	Highpass Filter	Trilithic	6HC2500/18000	Cal b4 use	
13.	LR 1785	Notch filter	Microwave circuits	NO324415	Cal b4 use	
14.	N-4525	Biconical-Log hybrid	Sunol Sciences	JB3	07.2022	07.2024
15.	LR 1083	Climatic Chamber	ACS	TY 80	03.2022	03.2023
16.	LR 1713	Power Supply	TTi	CPX400S	Cal b4 use	
17.	LR 1598	Multimeter, Digital	Fluke	87 V	04.2022	04.2024
18.	LR 1528	Hybrid	NARDA	4356B	Cal b4 use	
19.	LR1526	Directional coupler	Agilent	87300C	Cal b4 use	
20.	LR1627	Cable			Cal b4 use	
21.	LR1634	Cable			Cal b4 use	
22.	LR 1791	Communication analyser	Rohde & Schwarz	CMW 500	01.2022	01.2024