N° 1-6736
Scope available
on www.cofrac.fr

TEST REPORT

EUT Description	**WLAN and BT, 2x2 PCIe M.2 1216 adapter card**
Brand Name	**Intel®**
Model Name	**BE201D2W**
Date of Test Start/End	**2024-01-10 / 2024-02-13**
Features	**2x2 Wi-Fi - Bluetooth®** (see section 5)
Description	**Modular sample**

Applicant	**Intel Corporation SAS**
Address	**425 Rue de Goa – Le Cargo B6 – 06600 Antibes, FRANCE**
Contact Person	**Irina Vicente**
Telephone/Fax/ Email	**irina.vicente@intel.com**

Reference Standards	**ETSI EN 300 328 V2.2.2** **(see section 1)**

Test Report identification	**231120-05.TR02**
Revision Control	**Rev. 00** **This test report revision replaces any previous test report revision** **(see section 8)**

The test results relate only to the samples tested.
Reference to accreditation shall be used only by full reproduction of test report.

Issued by

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Cedric REQUIN
(Test Engineer Lead)

Reviewed by

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Zayd OUACHICHA
(Technical Manager)

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1. Standards, reference documents and applicable test methods

1. ETSI EN300 328 v2.2.2, Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

2. General conditions, competences and guarantees

- ✓ Intel Corporation SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2017 testing laboratory accredited by the French Committee for Accreditation (Cofrac) with the certificate number 1-6736.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities

3. Environmental Conditions

✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	23.5ºC ± 1.1ºC
Humidity	43.8% ± 9.3%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	231120-05.S04	WIFI 7 Module	BE201D2W	WFM:60452EB8A42F	2024-01-05	Conducted + Adaptivity Tests
	231109-03.S50	Extender	PCB00862-00_A	2305108150	2023-11-10	
	200702-02.S05	Laptop	HP(HSN-I41C-5)	00095002K9	2020-07-07	
#02	231120-05.S12	WIFI 7 Module	BE201D2W	WFM: F8FE5ECDC927	2024-02-06	Receiver Blocking Tests
	231109-03.S49	Extender	PCB00862-00_A	2305108150	2023-11-10	
	200702-02.S03	Laptop	HP(HSN-I41C-5)	00095002JP	2020-07-10	
#03	231120-05.S03	WiFi 7 Module	BE201D2W	60452EB8A3BC	2024-01-05	Used for Radiated Spurious Emissions tests
	220225-03.S07	Microwave Absorber	Eccosorb BSR-1	-	2022-03-14	
	231109-03.S48	Adaptor	PCB00866-00_A	124627	2023-11-24	
	200611-03.S31	Extender	ADEXELEC	-	2020-08-19	
	200504-04.S07	Laptop	Latitude 5401	BVHLK13	2020-06-02	
	230223-02.S47	Triband Antenna	-	005	2023-04-20	
	230223-02.S48	Triband Antenna	-	006	2023-04-20	
	231120-05.S21	WiFi 7 Module	BE201D2W	F8FE5CDCA49	2024-02-07	
	180001-01.S21	Socket	1216SD to M.2	-	2021-06-07	
#04	231120-05.S02	WiFi 7 Module	BE201D2W	60452EB8A407	2024-01-05	Used for Radiated Spurious Emissions tests
	220225-03.S07	Microwave Absorber	Eccosorb BSR-1	-	2022-03-14	
	231109-03.S47	Adaptor	PCB00866-00_A	124727	2023-11-24	
	220915-09.S01	Extender	ADEXELEC	-	2022-04-06	
	200611-03.S30	Laptop	Latitude 5401	6DJLK13	2020-08-19	
	230223-02.S49	Triband Antenna	-	007	2023-04-20	
	230223-02.S50	Triband Antenna	-	008	2023-04-20	
	231120-05.S20	WiFi 7 Module	BE201D2W	F8FE5ECDCB43	2024-02-07	
	180001-01.S21	Socket	1216SD to M.2	-	2021-06-07	

5. EUT Features

The herein information is provided by the customer.

Intel WRF Lab declines any responsibility for the accuracy of the stated customer provided information, especially if it has any impact on the correctness of test results presented in this report.

<table>
<tr><td>Brand Name</td><td>Intel®</td></tr>
<tr><td>Model Name</td><td>BE201D2W</td></tr>
<tr><td>Software Version</td><td>Radiated: DRTU.05312.99.0.85
Conducted: DRTU.05726.99.0.86</td></tr>
<tr><td>Driver Version</td><td>Radiated: 99.0.85.3
Conducted: 99.0.86.3</td></tr>
<tr><td>Supported Radios</td><td>802.11b/g/n/ax/be 2.4GHz
802.11a/n/ac/ax/be 5.2GHz
5.6GHz
5.8GHz
802.11ax/be 6.0GHz
Bluetooth 2.4GHz</td></tr>
<tr><td>Antenna Information</td><td>
<table>
<tr><th>Transmitter</th><th>Chain A(1)</th><th>Chain B(2)</th></tr>
<tr><td>Manufacturer</td><td>Intel WRF Lab</td><td>Intel WRF Lab</td></tr>
<tr><td>Antenna type</td><td>PIFA</td><td>PIFA</td></tr>
<tr><td>Part number</td><td>WRF-Tri Band-Antenna</td><td>WRF-Tri Band-Antenna</td></tr>
<tr><td>Antenna peak gain (dBi)</td><td>3</td><td>3</td></tr>
</table>
</td></tr>
</table>

6. Remarks and comments

1. According to the applicant declaration the device is operating as an adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. so it is considered as receiver category 1.

7. Test Verdicts summary

The statement of conformity to applicable standards in the table below are based on the measured values, without taking into account the measurement uncertainties.

7.1. BT Basic Rate / Enhanced Data Rate

Mode	ETSI clause	Test	Verdict
2.4GHz	4.3.1.2	RF output power	P
	4.3.1.3	Duty Cycle, Tx-sequence, TX gap	P
	4.3.1.4	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	P
	4.3.1.5	Hopping Frequency Separation	P
	4.3.1.6	Medium Utilization (MU) factor	P
	4.3.1.7	Adaptivity (Adaptive Frequency Hopping)	P
	4.3.1.8	Occupied Channel Bandwidth	P
	4.3.1.9	Transmitter unwanted emissions in the out-of-band domain	P
	4.3.1.10	Transmitter unwanted emissions in the spurious domain	P
	4.3.1.11	Receiver spurious emissions	P
	4.3.1.12	Receiver Blocking	P

P: Pass
F: Fail
NM: Not Measured
NA: Not Applicable

8. Document Revision History

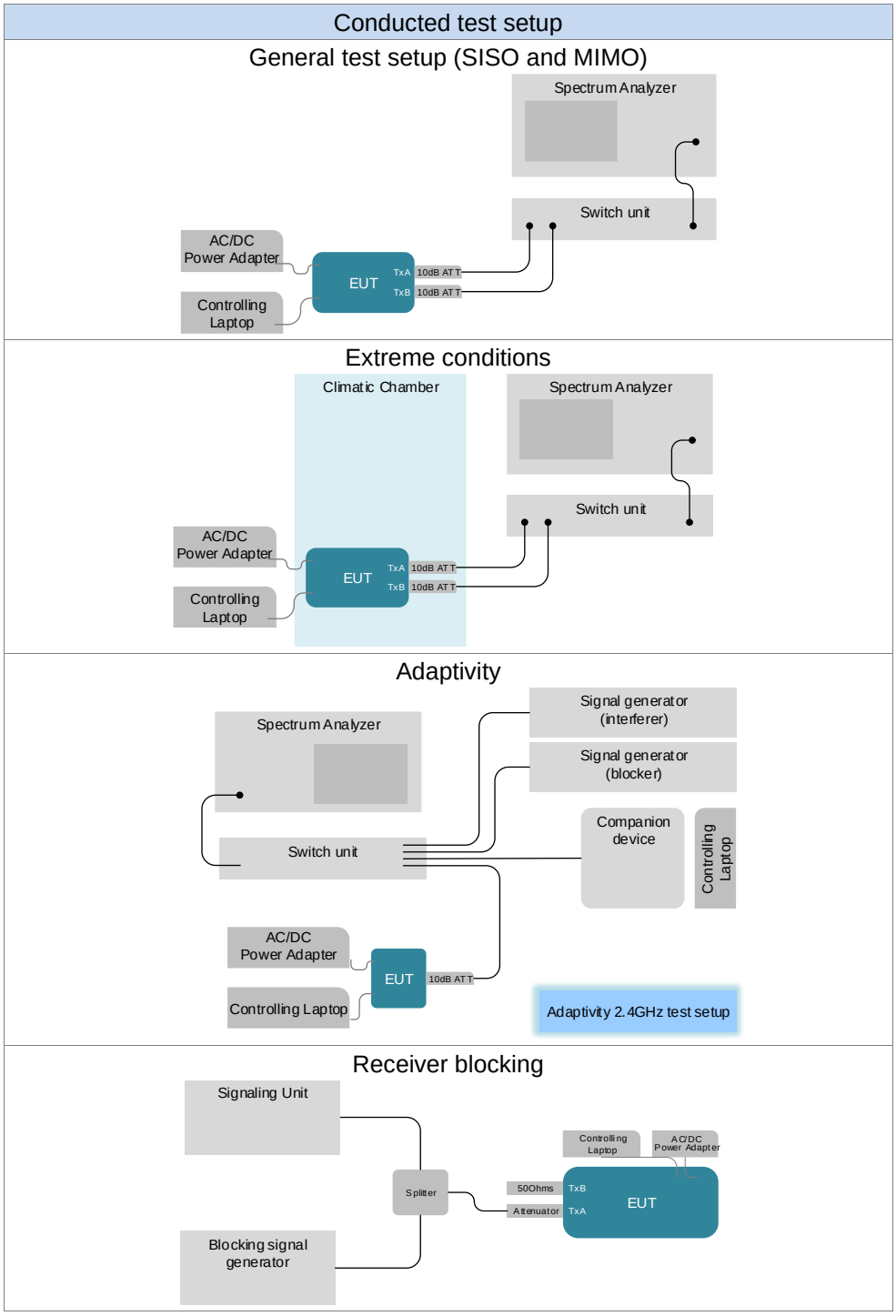
Revision #	Modified by	Revision Details
Rev. 00	R.SIMONINI T.GAMAIN	First Issue

Annex A. Test & System Description

A.1 Measurement System

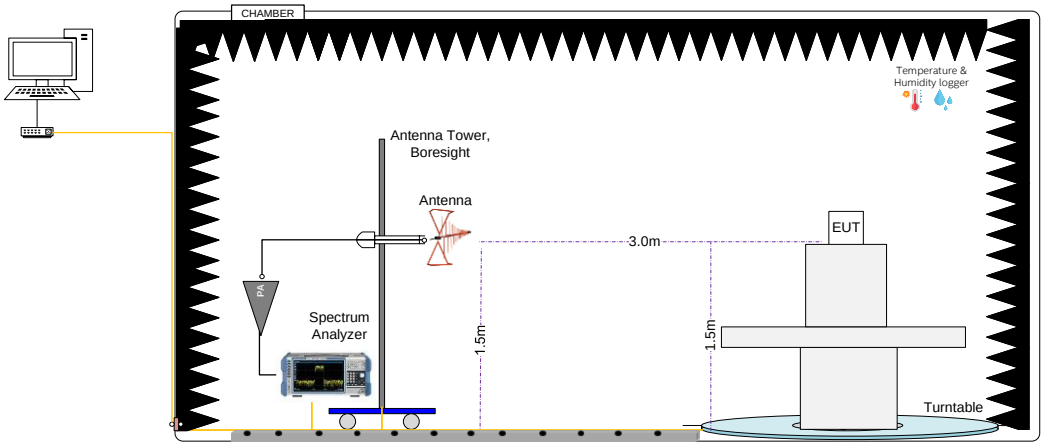
Measurements were performed using the following setups and made in accordance to the general provisions of ETSI EN 300 328 V2.2.2

Rohde & Schwarz TS8997 system with the switching unit OSP120, OSP B-157 and software EMC32 were employed. The DUT was installed in a test fixture and then connected to a laptop computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes, using the Intel proprietary tool DRTU.
Setups for conducted and radiated measurements are shown below.

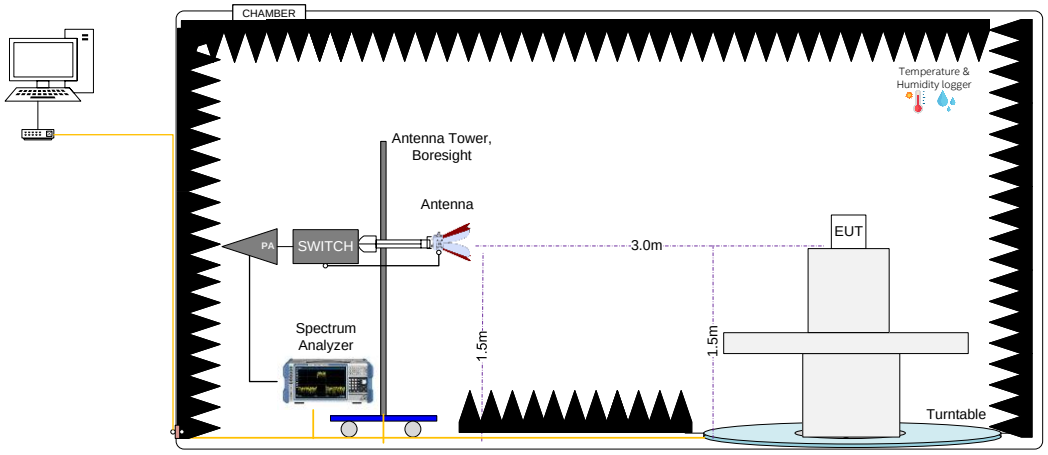


Radiated test setup

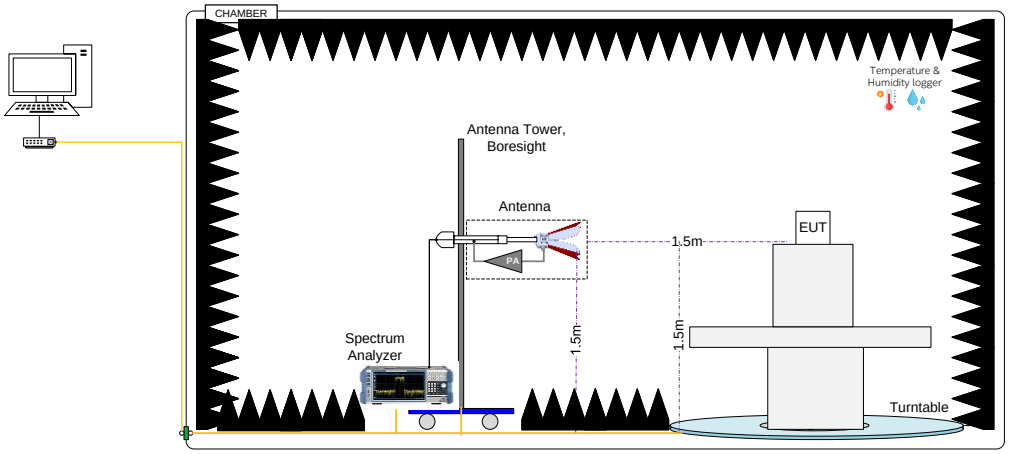
Radiated Setup 30 MHz - 1 GHz (Transmitter tests)



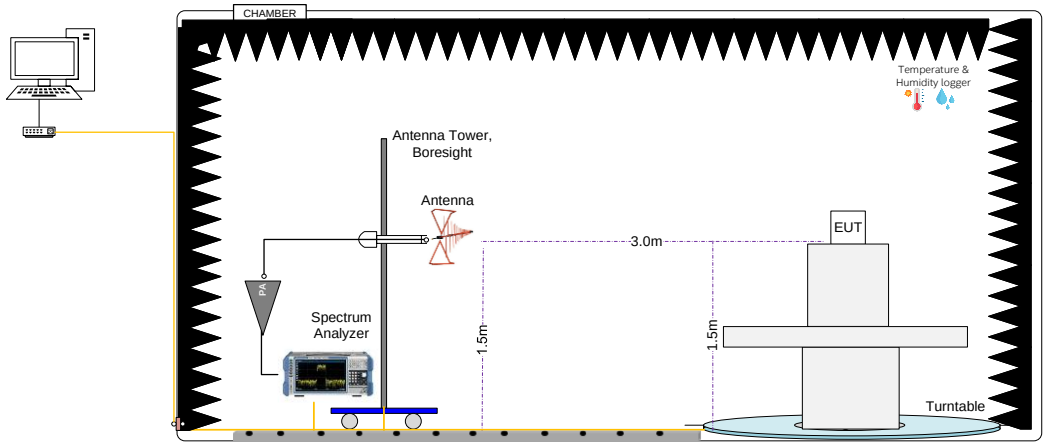
Radiated Setup 1 GHz – 11 GHz (Transmitter tests)



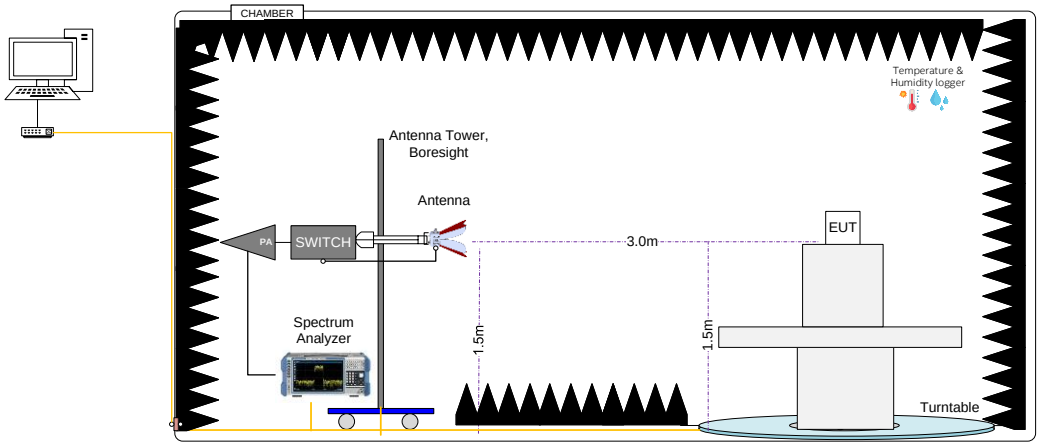
Radiated Setup 11 GHz – 12.75 GHz (Transmitter tests)



Radiated Setup 30 MHz – 1 GHz (Receiver tests)



Radiated Setup 1 GHz – 12.75 GHz (Receiver tests)



A.2 Test Equipment List

Conducted setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
017-015	Switch unit	OSP 120	101172	Rohde & Schwarz	2022-04-29	2024-04-29
481-000	Access point 802.11n	AIR-CAP3502E-A-K9	FTX1438S6P4	Cisco	N/A	N/A
017-003	DC Power supply	E3640A	MY40006885	Agilent	N/A	N/A
133-000	Oscilloscope	RTE1052	101135	Rohde & Schwarz	2022-03-25	2024-03-25
299-000	Multimeter	34401A	US360546853146A00597	HPAgilent	2022-01-18	2024-01-18*
311-000	Climatic chamber	SLT34/40	56746020930010	Secasi	2023-12-20	2025-12-20
134-000	Spectrum analyzer	FSV30	103308	Rohde & Schwarz	2023-07-26	2025-07-26
273-000	Spectrum analyzer	FSV30	103309	Rohde & Schwarz	2023-02-01	2025-02-01
503-000	Spectrum analyzer	FSVA3013	102318	Rohde & Schwarz	2023-08-09	2025-08-09
017-000	Measurement Software	WMS32 V11.40	200226	Rohde & Schwarz	N/A	N/A
363-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D0EB1A	AVTECH	2023-09-28	2025-09-28
237-000	10dB directional coupler	MC2047-10	01-062	Fairview	2023-03-03	2024-03-03
017-005	RF Cable 0.5m	PE3CA1039	-	Pasternack	2023-03-03	2024-03-03
017-006	RF Cable 1.2m	PE3C0666	-	Pasternack	2023-03-03	2024-03-03
017-007	Cable SMA Male to ML51-P	HRMP-ML51LP	DTR178-100RS	Hirose	2023-03-03	2024-03-03
017-008	Cable SMA Male to ML51-P	HRMP-ML51LP	DTR178-100RS	Hirose	2023-03-03	2024-03-03
281-000	Thermometer	t3000FC	46320036	Fluke	2022-03-03	2024-03-03
017-011	RF Cable 2m	0900670672000PJ	1936949	Radiall	2023-03-03	2024-03-03
017-012	RF Cable 2m	0900670672000PJ	1936947	Radiall	2023-03-03	2024-03-03
017-019	10dB attenuator	-	-	Pasternack	2023-03-03	2024-03-03
017-020	10dB attenuator	-	-	Pasternack	2023-03-03	2024-03-03
008-025	Power Sensor	NRP-Z57	101280	Rohde & Schwarz	2022-04-22	2024-04-22

*Equipment not used outside of calibration period
N/A: Not Applicable

Receiver blocking Setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
125-000	Communication tester	CMW500	129337	Rohde & Schwarz	2023-04-20	2025-04-20
130-000	Signal generator	SMB100A	178217	Rohde & Schwarz	2023-07-26	2025-07-26
018-005	SMA-SMA 45cm RF Cable	FMC020285-18	-	Fairview Microwave	2023-03-03	2024-03-03
363-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D0EB1A	AVTECH	2023-09-28	2025-09-28
018-000	2 Way SMA Power Divider	PE2084	-	Pasternack	2023-03-03	2024-03-03
016-003	SMA-SMA 45cm RF Cable	FMC0202085-18	-	Fairview Microwave	2023-03-03	2024-03-03
018-006	SMA-SMA 45cm RF Cable	FMC0202085-18	-	Fairview Microwave	2023-03-03	2024-03-03

N/A: Not Applicable

Radiated Setup #1

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
006-000*	Anechoic Chamber	FACT3	5720	ETS-Lindgren	2022-01-21	2024-02-21
006-008	Measurement SW, v11.30	EMC32	100623	Rohde & Schwarz	N/A	N/A
259-000	Temp & Humidity Logger	RA12E-TH-RAS	RA12-B9BD70	Avtech	2022-06-27	2024-06-27
006-001	Turn Table	ETS	-	ETS-Lindgren	N/A	N/A
006-011	Boresight antenna mast	BAM 4.0-P	P/278/2890.01	Maturo	N/A	N/A
007-008	Double Horn Ridged antenna +PA	3116C-PA	00169308bis + 00196308	ETS-Lindgren	2023-0-30	2025-05-30
057-000	Double Horn Ridged antenna	3117	167062	ETS-Lindgren	2022-07-08	2024-07-08
006-061	Bi-Log Periodic antenna	CBL6143A	61382	Teseq	2022-10-24	2024-10-24
147-000	Spectrum analyzer	FSW43	101847	Rohde & Schwarz	2022-11-30	2024-11-30
301-000	Amplifier 9kHz-1300MHz	8447F	3113A07440	HP	2023-03-03	2024-03-03
261-000	Amplifier 1GHz-18GHz	3117-PA	00157993	ETS-Lindgren	2023-02-20	2024-02-20
006-068	RF Switch	RC-2SP6T-40	02112090061	Micro-Circuits	2023-08-22	2024-08-22
006-066	Cable 7m – 25MHz to 40GHz	R286304174	20.46.370	Radiall	2023-08-16	2024-08-16
006-063	Cable 30cm – 1GHz to 40GHz	PE371-12	-	Pasternack	2023-02-27	2024-02-27
006-064	Cable 30cm – 1GHz to 40GHz	PE371-12	-	Pasternack	2023-02-27	2024-02-27
006-065	Cable 60cm – 25MHz to 1GHz	PE300-24	-	Pasternack	2023-06-02	2024-06-02

N/A: Not Applicable
*Within a grace period of 30 days

Radiated Setup #2

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
007-000	Anechoic chamber	RFD-FA-100	5996	ETS Lindgren	2021-09-14	2024-03-14
127-000	Spectrum Analyzer	FSV40	101358	Rohde & Schwarz	2023-01-27	2025-01-27
007-007	Double Ridge Horn (1- 18GHz)	3117	00152266	ETS Lindgren	2022-03-29	2024-03-29
007-006	Switch & Positioner	EMCenter	00151232	ETS Lindgren	N/A	N/A
059-000	Double Ridge Horn (1- 18GHz)	3117	201542	ETS-Lindgren	2023-09-26	2025-09-26
264-000	Amplifier 1GHz-18GHz	3117-PA	00169546	ETS-Lindgren	2023-02-20	2024-02-20
007-011*	RF Cable 1-18GHz - 6.5m	140-8500-11-51	001	Atem	2023-02-15	2024-03-15
007-005	Measurement SW, v11.20.00	EMC32	100401	Rohde & Schwarz	N/A	N/A
007-003	Antenna Tower	2171B-3.0M	00150123	ETS Lindgren	N/A	N/A
007-002	Turntable	-	-	ETS Lindgren	N/A	N/A
007-014*	RF Cable 18-40 GHz 6m	R286304009	1747364	Radiall	2023-02-16	2024-03-16
007-022*	RF Cable 1-18GHz, 1.5m	0501050991200GX	19.23.493	Radiall	2023-02-13	2024-03-13
007-015*	RF Cable 1GHz-18GHz 1.5m	-	-	Spirent	2023-02-13	2024-03-13
007-018*	RF Cable 1-9.5GHz 1.2m	0500990991200KE	-	Radiall	2023-02-13	2024-03-13
007-020*	RF Cable 1-18GHz, 1.2 m	2301761761200PJ	12.22.1104	Radiall	2023-02-15	2024-03-15
349-000	Temp & Humidity Logger	RA12E-TH1-RAS	RA12-D4F8C3	Avtech	2023-11-30	2025-11-30

N/A: Not Applicable
*Within a grace period of 30 days

Shared Radiated Equipment

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
412-000	DRTU Power finder V2.1	-	-	Intel	NA	NA
139-000	Power Sensor	NRP-Z81	104383	Rohde & Schwarz	2023-04-21	2025-04-21
061-000	Power Sensor	NRP-Z81	104386	Rohde & Schwarz	2022-03-25	2024-03-25
140-000	Power Sensor	NRP-Z81	104382	Rohde & Schwarz	2022-03-25	2024-03-25
423-000	Power Sensor	NRP-Z81	101152	Rohde & Schwarz	2022-05-18	2024-05-18

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the table below with a coverage factor of k = 2 to indicate a 95% level of confidence:

Measurement type	Uncertainty	Unit
Occupied Channel Bandwidth	±2.08	%
RF Output Power, conducted	±0.99	dB
Power Spectral Density, conducted	±0.99	dB
Unwanted Emission, conducted	±0.89	dB
Radiated test < 1GHz	±4.03	dB
Radiated test 1GHz –12.75 GHz	±4.01	dB
Temperature	±0.30	ºC
Supply voltages	<±0.01	%
Time	±0.01	%

Annex B. Test Results

The herein test results were performed by:

Test case measurement	Test Personnel
RF output power, duty cycle	T.Gamain
Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	T.Gamain
Hopping frequency separation	T.Gamain
Adaptivity (Adaptive Frequency Hopping)	T.Gamain
Occupied channel bandwidth	T.Gamain
Transmitter unwanted emission in the out-of-band domain	T.Gamain
Transmitter unwanted emissions in the spurious domain	K.Khatib, R.Simonini
Receiver spurious emissions	K.Khatib, R.Simonini
Receiver blocking	Z.Ouachicha

B.1 Test Conditions

ETSI clause	Conditions	ETSI EN 300 328 V2.2.2 Annex E
5.1.2.1	The normal temperature and humidity conditions for tests shall be any convenient combination of temperature and humidity within the following ranges: • Temperature: +15 °C to +35 °C; • Relative humidity: 20 % to 75 %.	
5.1.2.2	The normal test voltage for the equipment shall be the nominal voltage for which the equipment was designed.	**"Information provided by the customer"**
5.1.3	Some tests in the present document need to be repeated at extreme temperatures. Where that is the case, measurements shall be made over the extremes of the operating temperature range as declared by the manufacturer.	

B.2 RF output Power

Test limits

ETSI clause	Limits
4.3.1.2.3	The RF output power for FHSS equipment shall be equal to or less than 20 dBm. For non-adaptive FHSS equipment, where the manufacturer has declared an RF output power lower than 20 dBm 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.

Test conditions

ETSI clause	Conditions
5.4.2.1	The measurements for RF output power shall be performed at both normal environmental conditions and at the extremes of the operating temperature range. The equipment shall be operated under its worst case configuration (for example modulation, bandwidth, data rate, power) with regards to the requirement being tested.

Test procedure

The conducted setups shown in section *Test & System Description* were used to measure the RF output power accordingly with ETSI EN 300 328 V2.2.2 §5.3.2. The antenna terminal of the EUT is connected to the OSP120 through an attenuator and a cable. System connection cable loss is compensated by the EMC32 software on the measured parameters.

Antenna gain is taken into account and added by the software to the measurements. The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

Results tables

Normal conditions

			Power [dBm]	
Mode	Packet	Meas Duty Cycle. [%]	Measured Conducted	EIRP
BR	DH5	76.79	14.8	17.8
EDR	2DH5	76.83	12.7	15.7
EDR	3DH5	76.88	12.5	15.5
LE	1M	61.66	14.8	17.8

Extreme temperature conditions (Tmax = +70°C)

			Power [dBm]	
Mode	Packet	Meas Duty Cycle. [%]	Measured Conducted	EIRP
BR	DH5	76.79	14.2	17.2
EDR	2DH5	76.83	12.1	15.1
EDR	3DH5	76.88	11.9	14.9
LE	1M	61.66	14.2	17.2

Extreme temperature conditions (Tmin = -10°C)

			Power [dBm]	
Mode	Packet	Meas Duty Cycle. [%]	Measured Conducted	EIRP
BR	DH5	76.79	15.1	18.1
EDR	2DH5	76.83	13.1	16.1
EDR	3DH5	76.88	12.9	15.9
LE	1M	61.66	14.7	17.7

B.3 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

Test limits

<table>
<tr><th>ETSI clause</th><th>Limits</th></tr>
<tr><td>4.3.1.4.3.2</td><td>
Adaptive FHSS equipment
Adaptive FHSS equipment shall be capable of operating over a minimum of 70 % of the band specified in table 1.
Table 1: Service frequency bands
<table>
<tr><th></th><th>Service frequency bands</th></tr>
<tr><td>Transmit</td><td>2 400 MHz to 2 483,5 MHz</td></tr>
<tr><td>Receive</td><td>2 400 MHz to 2 483,5 MHz</td></tr>
</table>
The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.

In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:
Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.
Option 2: The occupation probability for each frequency shall be between ((1 / U) × 25 %) and 77 % where U is the number of hopping frequencies in use.

The hopping sequence(s) shall contain at least N hopping frequencies at all times, where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.
</td></tr>
</table>

Test conditions

ETSI clause	Conditions
5.4.4.1	These measurements shall only be performed at normal test conditions. The equipment shall be configured to operate at its maximum Dwell Time and maximum Duty Cycle. The measurement shall be performed on a minimum of two (active) hopping frequencies chosen arbitrary from the actual hopping sequence.

Test procedure

The conducted setup shown in section *Test & System Description* was used to measure the Accumulated Transmit Time accordingly with ETSI EN 300 328 V2.2.2 §5.4.4.2.1. Minimum Frequency Occupation and Hopping Sequence. The antenna terminal of the EUT is connected to the OSP120 through an attenuator and a cable, the spectrum analyzer is connected to the receiver port on the OSP. System connection cable loss is compensated by the EMC32 software on the measured parameters.

Results tables

Dwell Time

Mode	Packet Type	Frequency [MHz]	Accumulated Transmit Time (ms)	Measurement Time (ms)
BR	DH5	2402	40.305	6000
		2480	71.975	6000
EDR	2DH5	2402	43.179	6000
		2480	46.059	6000
EDR	3DH5	2402	72.009	6000
		2480	43.211	6000
LE	1M	2404	100.194	6000
		2478	100.199	6000

$Measurement\ Time_{ms} = 400_{ms} \times 15\ (minimum\ hoppping\ frequencies) = 6000ms$

Minimum Frequency Occupation

Mode	Packet Type	Frequency [MHz]	Minimum Frequency Occupation (ms)	Limit (ms)	Measurement Time (ms)
BR	DH5	2402	1233.13	> 0	126400
		2480	1204.36	> 0	126400
EDR	2DH5	2402	1225.40	> 0	126400
		2480	1193.59	> 0	126400
EDR	3DH5	2402	1212.10	> 0	126400
		2480	1226.38	> 0	126400
LE	1M	2404	5.01	> 0	126400
		2478	5.01	> 0	126400

$Measurement\ Time_{ms} = 4 \times Dwell\ time_{ms} \times\ (Actual\ number\ of\ hopping\ frequencies\ in\ uses) = 126400ms$

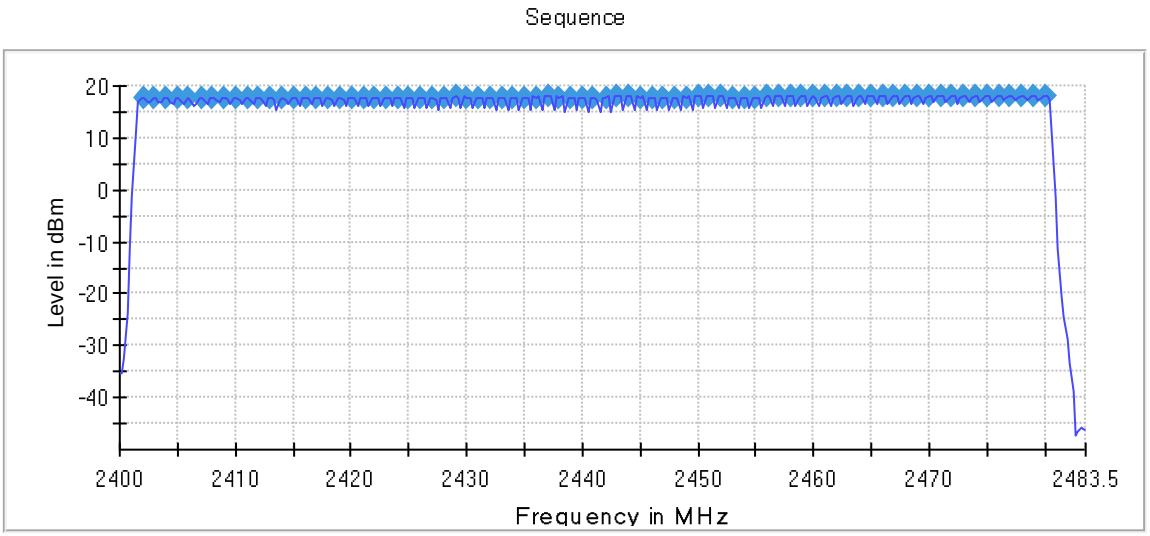
Hopping sequence

Mode	Packet Type	Number of Hopping frequencies
BR	DH5	79
EDR	2DH5	79
EDR	3DH5	79
LE	1M	37

Hopping Sequence Results

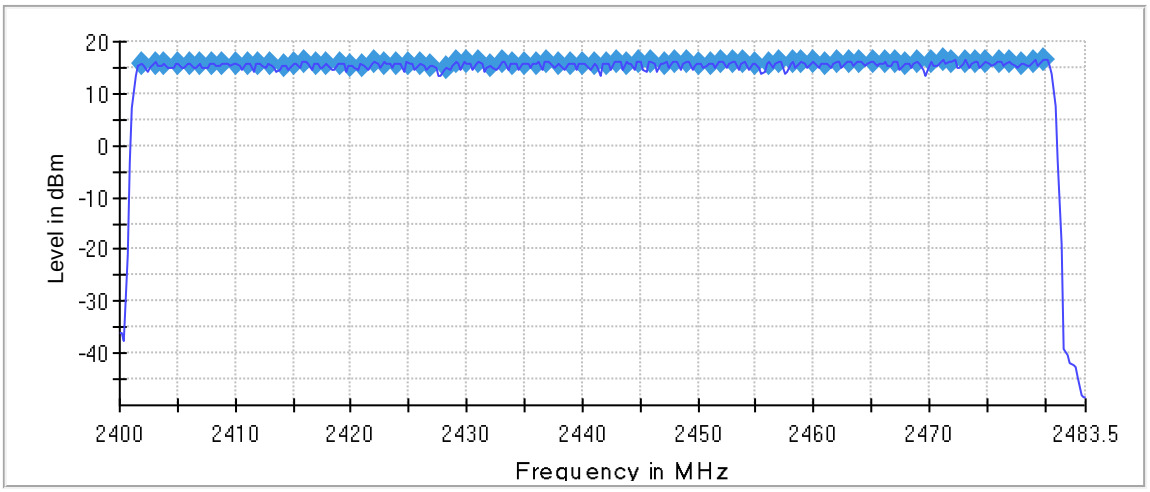
BR - GFSK

DH5



EDR - π/4 DQPSK

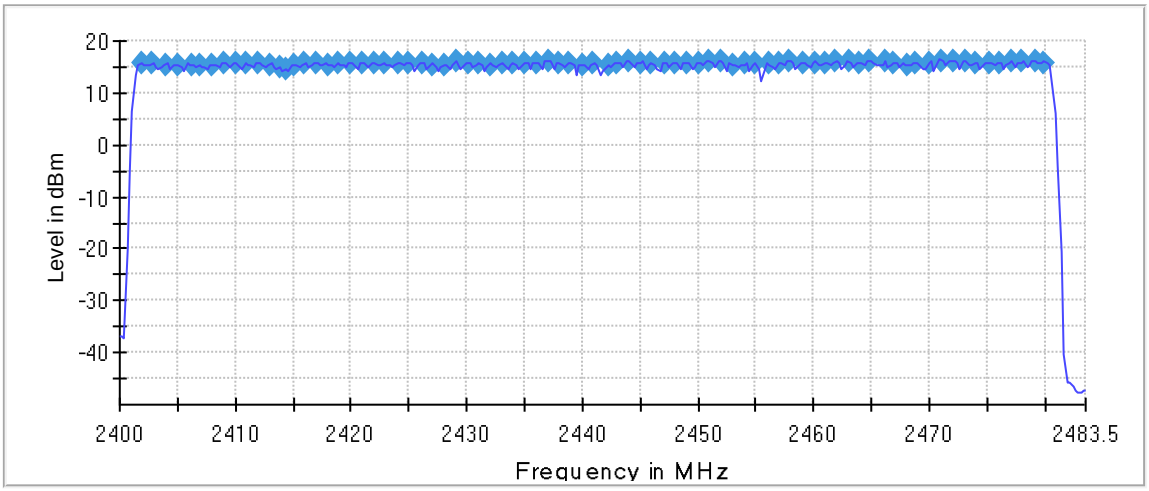
2DH5



EDR - 8PSK

3DH5

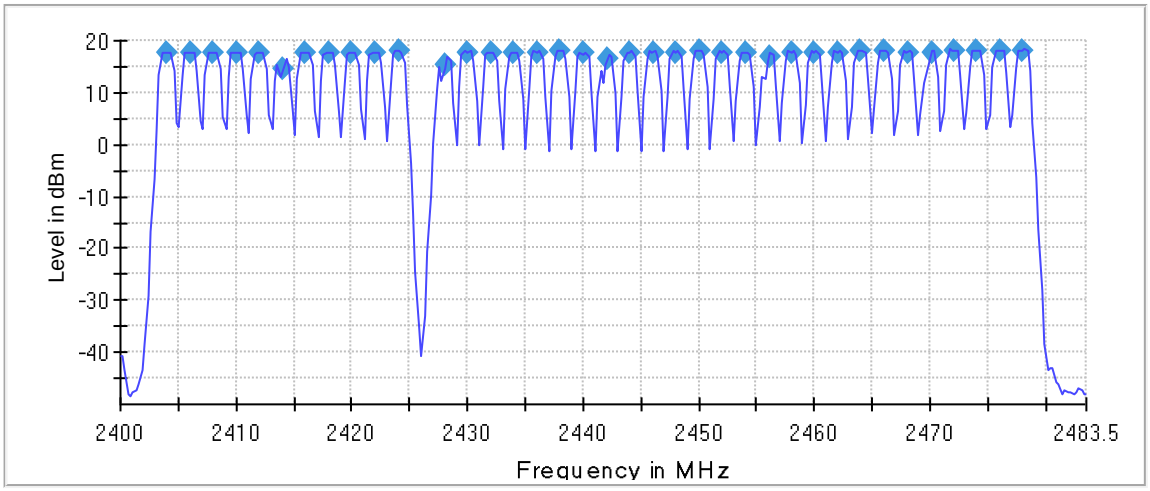
Sequence



LE – 1M

1M

Sequence



B.4 Hopping frequency separation

Tests limits

ETSI clause	Limits
4.3.1.5.3.2	For adaptive FHSS equipment, the minimum Hopping Frequency Separation shall be 100 kHz

Test conditions

ETSI clause	Conditions
5.4.5.1	These measurements shall only be performed at normal test conditions. The measurement shall be performed on two adjacent hopping frequencies.

Test procedure

The conducted setup shown in section *Test & System Description* was used to measure the hopping frequency separation accordingly with ETSI EN 300 328 V2.2.2 §5.4.5.2.1. The antenna terminal of the EUT is connected to the OSP120 through an attenuator and a cable, the spectrum analyzer is connected to the receiver port on the OSP. System connection cable loss is compensated by the EMC32 software on the measured parameters.

Results tables

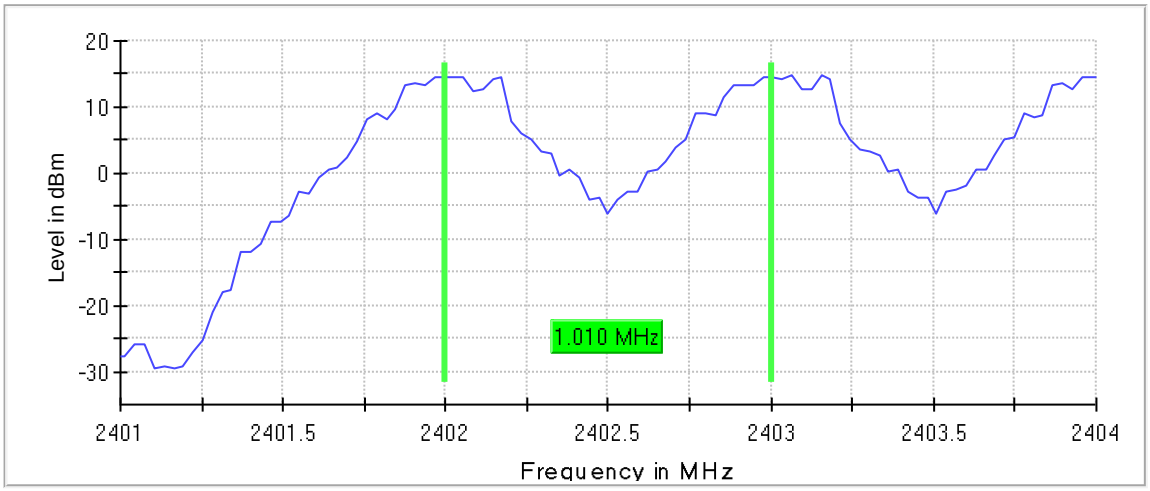
Mode	Frequency [MHz]	Hopping frequency separation [MHz]
BR	2401.995050	1.010
	2403.004950	
EDR π/4-DQPSK	2478.995050	1.010
	2480.004950	
EDR 8-DPSK	2401.995050	1.010
	2403.004950	
LE 1M	2441.990099	2.020
	2444.009901	

Results screenshot

BR - GFSK

DH5

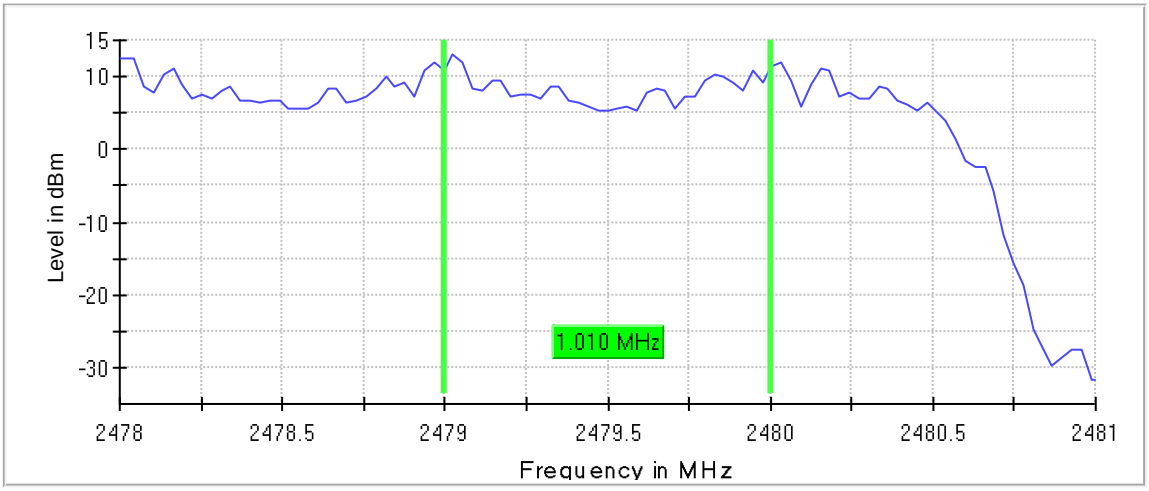
HFS



EDR - π/4 DQPSK

2DH5

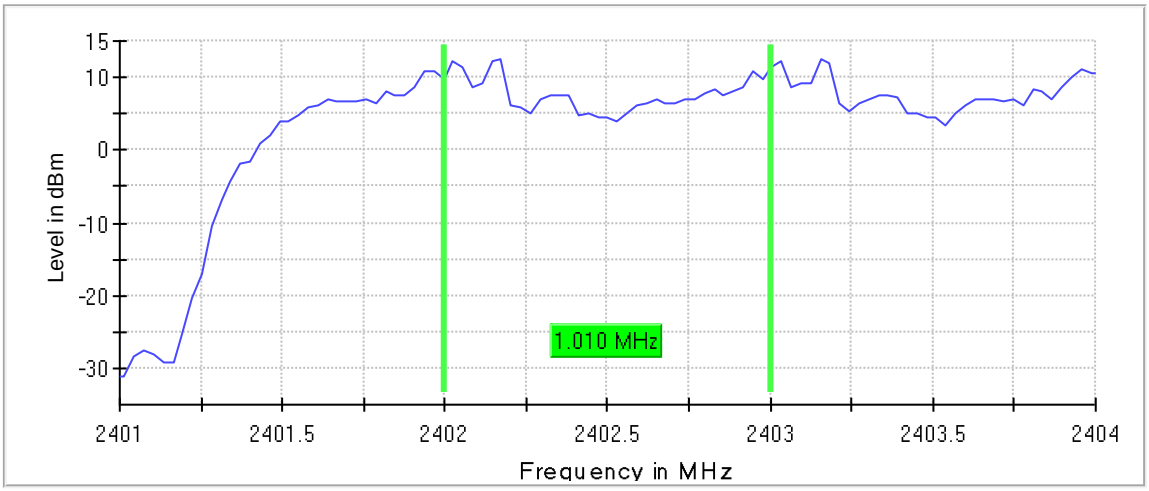
HFS



EDR - 8PSK

3DH5

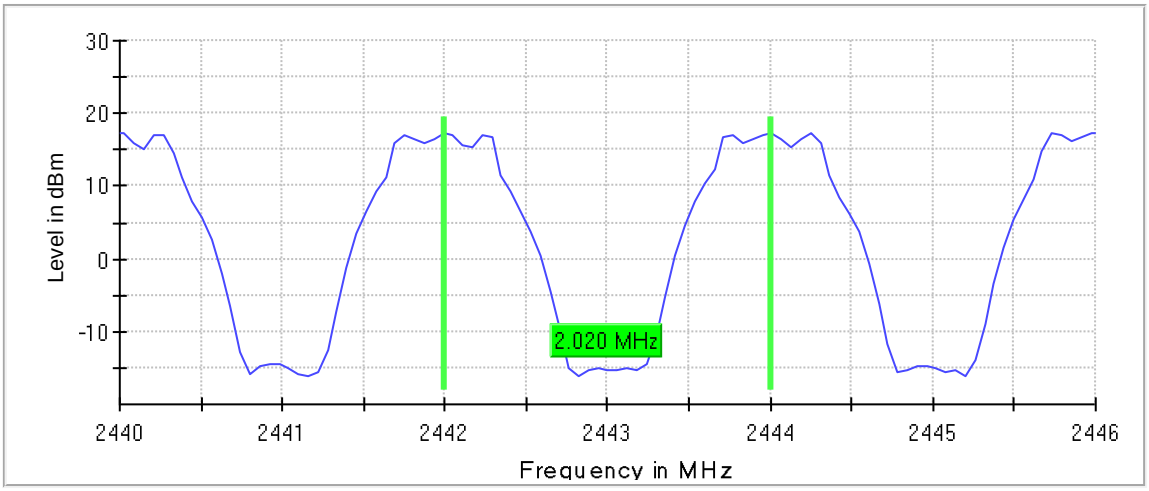
HFS



LE - 1M

1M

HFS



B.5 Adaptivity (Adaptive Frequency Hopping)

Test limits

ETSI clause	Limits
4.3.1.7.2.2	*Adaptive FHSS using LBT.* Adaptive FHSS equipment using LBT shall comply with the following minimum set of requirements: 1) At the start of every dwell time, before transmission on a hopping frequency, the equipment shall perform a Clear Channel Assessment (CCA) check using energy detect. The CCA observation time shall be not less than 0,2 % of the Channel Occupancy Time with a minimum of 18 µs. If the equipment finds the hopping frequency to be clear, it may transmit immediately. 2) If it is determined that a signal is present with a level above the detection threshold defined in step 5 the hopping frequency shall be marked as 'unavailable'. Then the equipment may jump to the next frequency in the hopping scheme even before the end of the dwell time, but in that case the 'unavailable' channel cannot be considered as being 'occupied' and shall be disregarded with respect to the requirement of the minimum number of hopping frequencies as defined in clause 4.3.1.4.3.2. Alternatively, the equipment can remain on the frequency during the remainder of the dwell time. However, if the equipment remains on the frequency with the intention to transmit, it shall perform an Extended CCA check in which the (unavailable) channel is observed for a random duration between the value defined for the CCA observation time in step 1 and 5 % of the Channel Occupancy Time defined in step 3. If the Extended CCA check has determined the frequency to be no longer occupied, the hopping frequency becomes available again. If the Extended CCA time has determined the channel still to be occupied, it shall perform new Extended CCA checks until the channel is no longer occupied. 3) The total time during which an equipment has transmissions on a given hopping frequency without reevaluating the availability of that frequency is defined as the Channel Occupancy Time. The Channel Occupancy Time for a given hopping frequency, which starts immediately after a successful CCA, shall be less than 60 ms followed by an Idle Period of minimum 5 % of the Channel Occupancy Time with a minimum of 100 µs. After the Idle Period has expired, the procedure as in step 1 shall be repeated before having new transmissions on this hopping frequency during the same dwell time. For LBT based adaptive FHSS equipment with a dwell time < 60 ms, the maximum Channel Occupancy Time is limited by the dwell time. 4) 'Unavailable' channels may be removed from or may remain in the Hopping Sequence, but in any case: - apart from Short Control Signalling Transmissions referred to in clause 4.3.1.7.4, there shall be no transmissions on 'unavailable' channels; - a minimum of N hopping frequencies as defined in clause 4.3.1.4.3.2 shall always be maintained. 5) The detection threshold shall be proportional to the transmit power of the transmitter: for a 20 dBm e.i.r.p. transmitter the detection threshold level (TL) shall be equal to or less than -70 dBm/MHz at the input to the receiver assuming a 0 dBi (receive) antenna assembly. This threshold level (TL) may be corrected for the (receive) antenna assembly gain (G); however, beamforming gain (Y) shall not be taken into account. For power levels less than 20 dBm e.i.r.p., the detection threshold level may be relaxed to: TL = -70 dBm/MHz + 10 × log10 (100 mW / Pout) (Pout in mW e.i.r.p.) 6) The equipment shall comply with the requirements defined in step 1 to step 4 of the present clause in the presence of an unwanted CW signal as defined in table 2.

5.4.6.2.1.2	**Table 2: Unwanted Signal parameters** Wanted signal mean power from companion device (dBm) / Unwanted signal frequency (MHz) / Unwanted CW signal power (dBm) sufficient to maintain the link (see note 2) / 2395 or 2488.5 (see note 1) / -35 (see note 3) NOTE 1 : The highest frequency shall be used for testing operating channels within the range 2 400 MHz to 2 442 MHz, while the lowest frequency shall be used for testing operating channels within the range 2 442 MHz to 2 483,5 MHz. See clause 5.4.6.1. NOTE 2: A typical conducted value which can be used in most cases is -50 dBm/MHz. NOTE 3: The level specified is the level in front of the UUT antenna. In case of conducted measurements, this level has to be corrected by the actual antenna assembly gain. Step4, Note 2: The UUT is assumed to stop transmissions within a period equal to the maximum Channel Occupancy Time.

Test conditions

ETSI clause	Conditions
5.4.6.1	These measurements shall only be performed at normal test conditions.

Test procedure

The adaptivity setup shown in section *Test & System Description* was used to measure adaptivity. The EUT (client) is connected to a companion device through a power splitter and an attenuator. Proprietary software was used on the EUT to configure a normal transmission with sufficient payload.

Interference and unwanted signals are emulated by using a modulated signal and a continuous wave (CW) respectively, generated by the vector signal generator (VSG) and the continuous wave generator.

The power levels for the signals are as follows:
EUT = max power level
Interference signal (modulated signal), considering antenna gain = -67dBm/MHz at antenna connector
Unwanted signal (CW) = -32dBm

The frequency used for the interference signal is the same as the transmission frequency of the tested channel. The unwanted signal is fixed at 2488.5 MHz for the lowest channel tested and to 2395 MHz for the highest channel tested.

Results tables

2423 MHz

Normal Operation

DutyCycle DUT (%)	Monitoring Length (ms)	COT Max (ms)	Limit Max (ms)	COT Min (ms)	Number of COTs	Idle Time Min (ms)	Idle Time Max (ms)	Idle Time Limit Min (ms)
4.355	10000.000	7.229	15.000	0.110	291	0.516	121.491	0.500

Reaction on Interferer and Blocker

DC in max DC Evaluation Window (%)	Limit Max (%)	Result	Length of max DC Evaluation Window (ms)	Start of max DC Evaluation Window (ms)
2.687	10.000	**PASS**	15.000	3136.491

Stop of max DC Evaluation Window (ms)	Interferer On (ms)	Blocker On (ms)	Monitoring Offset (ms)	Monitoring Start (ms)	Monitoring Length (ms)
3151.491	1000.000	62000.000	15.000	1015.000	121985.000

2474 MHz

Normal Operation

DutyCycle DUT (%)	Monitoring Length (ms)	COT Max (ms)	Limit Max (ms)	COT Min (ms)	Number of COTs	Idle Time Min (ms)	Idle Time Max (ms)	Idle Time Limit Min (ms)
4.196	10000.000	7.229	15.000	0.116	235	1.065	242.765	0.500

Reaction on Interferer and Blocker

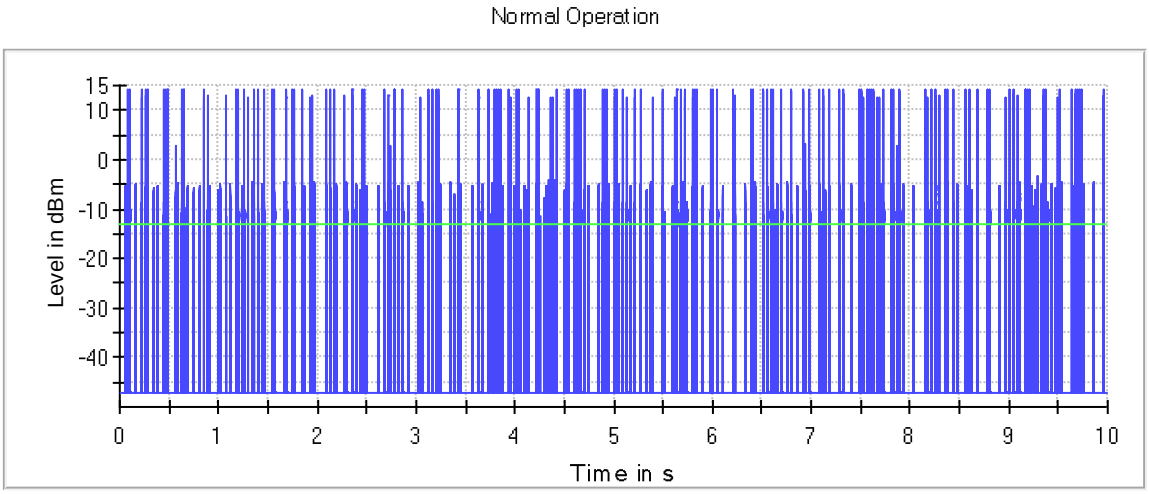
DC in max DC Evaluation Window (%)	Limit Max (%)	Result	Length of max DC Evaluation Window (ms)	Start of max DC Evaluation Window (ms)
3.580	10.000	**PASS**	15.000	3567.743

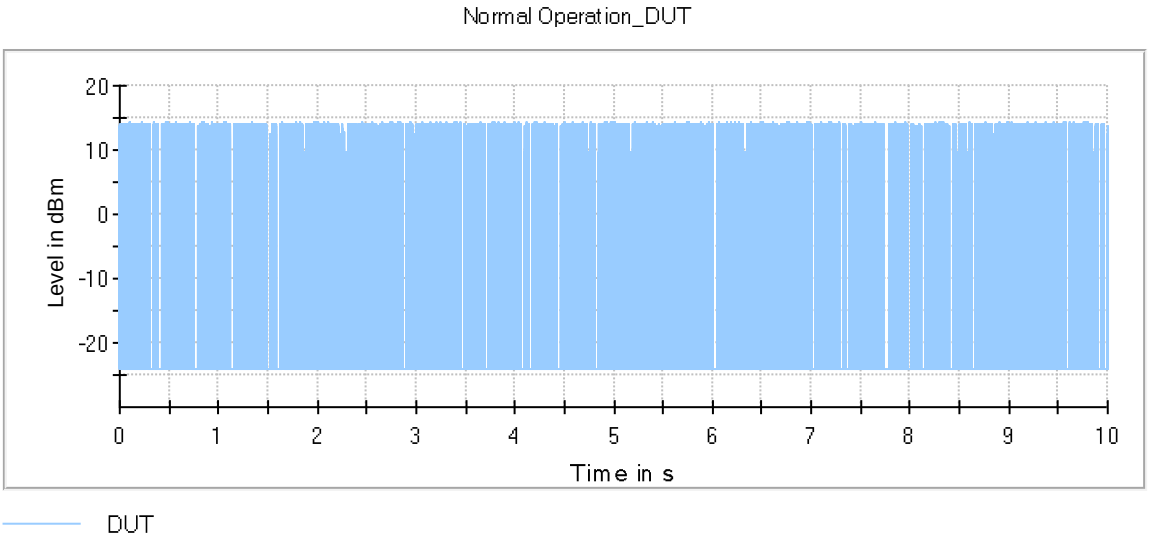
Stop of max DC Evaluation Window (ms)	Interferer On (ms)	Blocker On (ms)	Monitoring Offset (ms)	Monitoring Start (ms)	Monitoring Length (ms)
3582.743	1000.000	62000.000	15.000	1015.000	121985.000

Results Screenshot

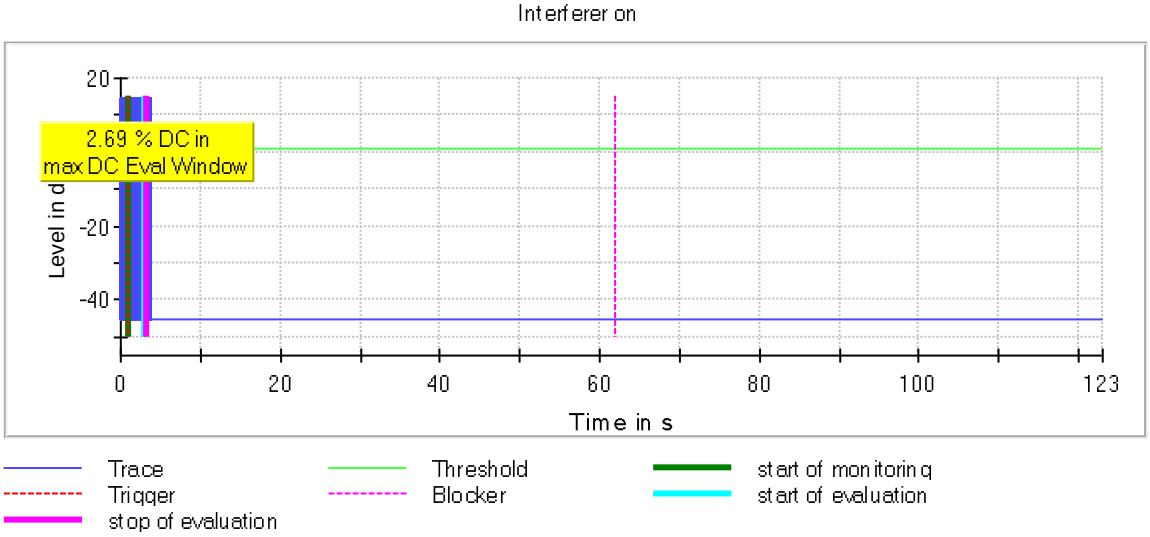
2423 MHz

Normal Operation



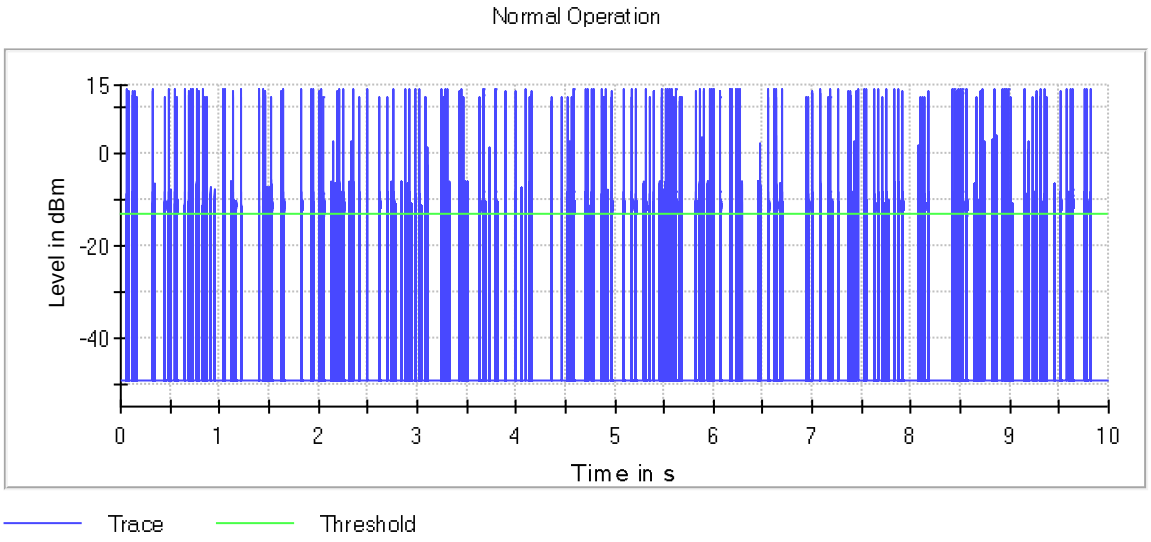


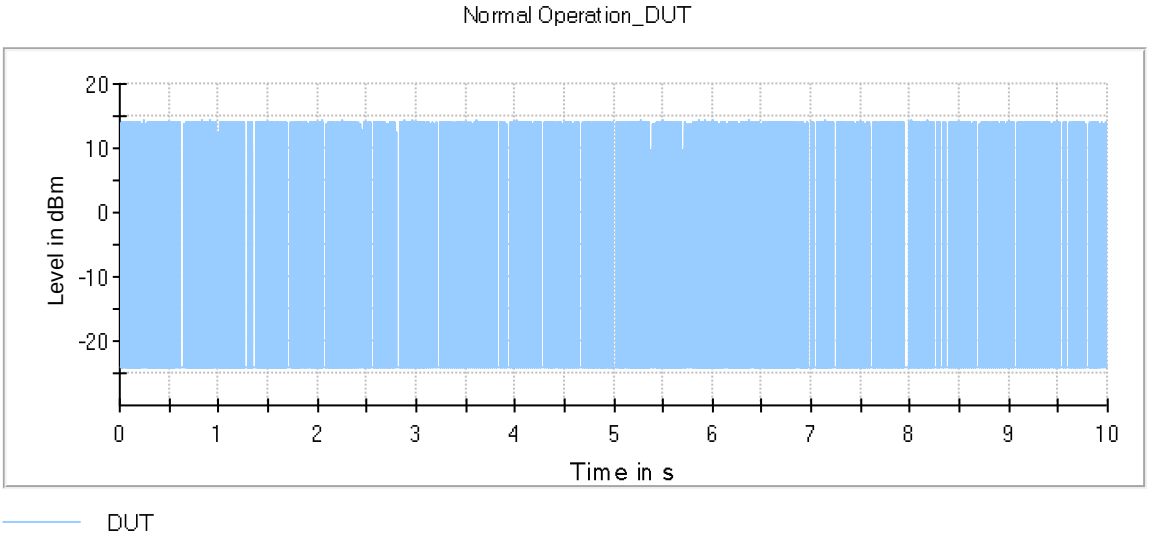
Reaction on Interferer and Blocker



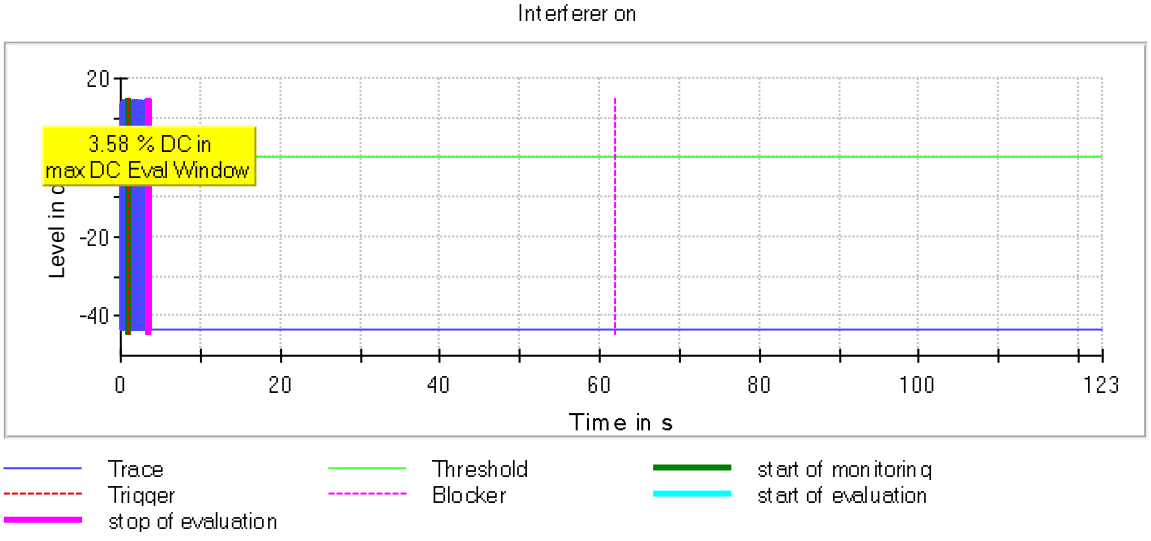
2474 MHz

Normal Operation





Reaction on Interferer and Blocker



B.6 Occupied Channel Bandwidth

Test limits

ETSI clause	Limits
4.3.1.8.3	The Occupied Channel Bandwidth for each hopping frequency shall be within the band given in table 1. *(2.4 GHz to 2.4835 GHz)*

Test conditions

ETSI clause	Conditions
5.4.7.1	These measurements shall only be performed at normal test conditions. The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range.

Test procedure

The conducted setup shown in section *Test & System Description* was used to measure the occupied channel bandwidth accordingly with ETSI EN 300 328 V2.2.2 §5.4.7.2.1. The antenna terminal of the EUT is connected to the OSP120 through an attenuator and a cable, the spectrum analyzer is connected to the receiver port on the OSP. System connection cable loss is compensated by the EMC32 software on the measured parameters.

Results tables

Low channel

Mode	Packet Type	Frequency [MHz]	Channel Center Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Lower Band Edge (MHz)
BR	DH5	2402	2402	0.781	2401.606965
EDR	2DH5	2402	2402	0.997	2401.500000
EDR	3DH5	2402	2402	0.990	2401.507463
LE	1M	2404	2404	0.930	2403.527363

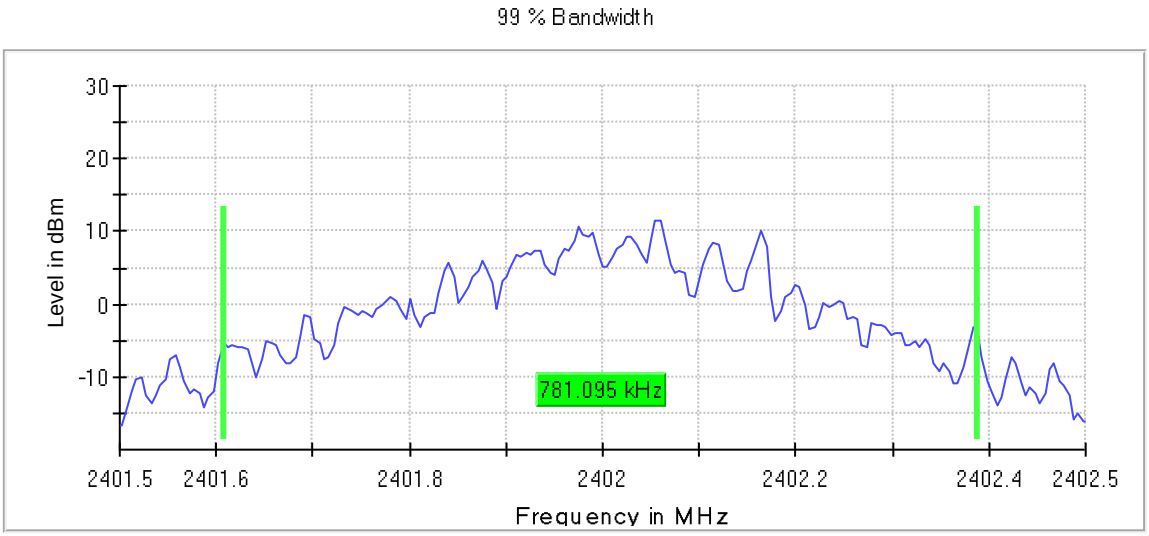
High channel

Mode	Packet Type	Frequency [MHz]	Channel Center Frequency (MHz)	Occupied Channel Bandwidth (MHz)	Upper Band Edge (MHz)
BR	DH5	2480	2480	0.781	2480.388060
EDR	2DH5	2480	2480	0.993	2480.492537
EDR	3DH5	2480	2480	0.995	2480.497512
LE	1M	2478	2478	0.930	2478.457711

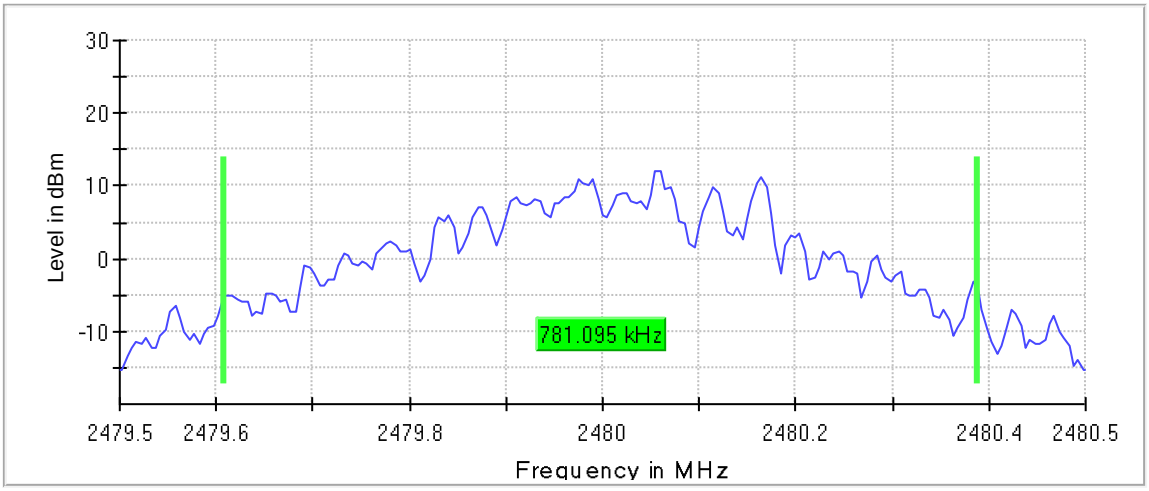
Results screenshot

BR – DH5

BW – 2402 MHz

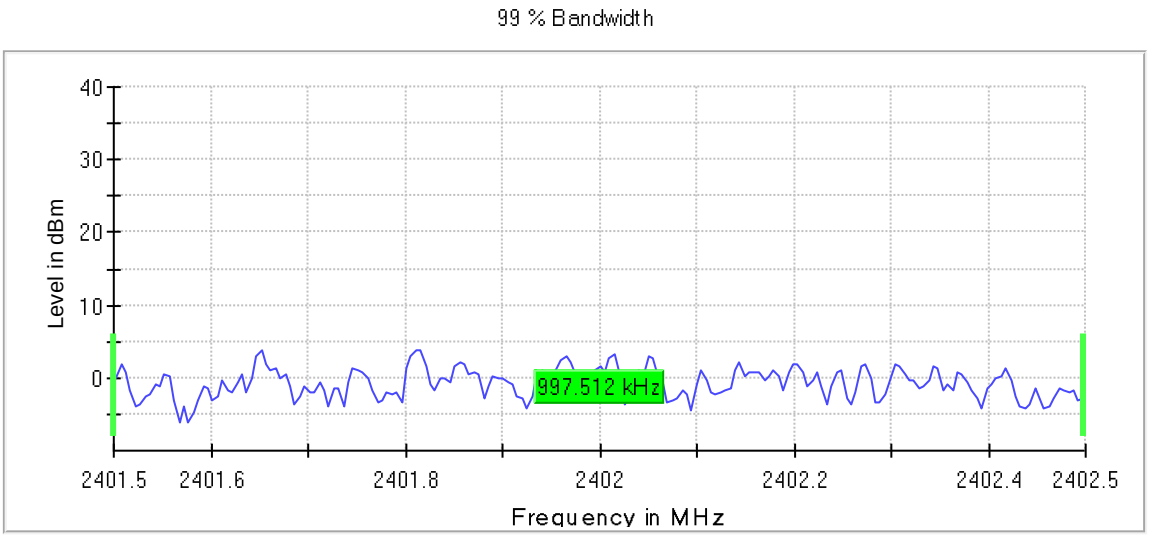


BW – 2480 MHz

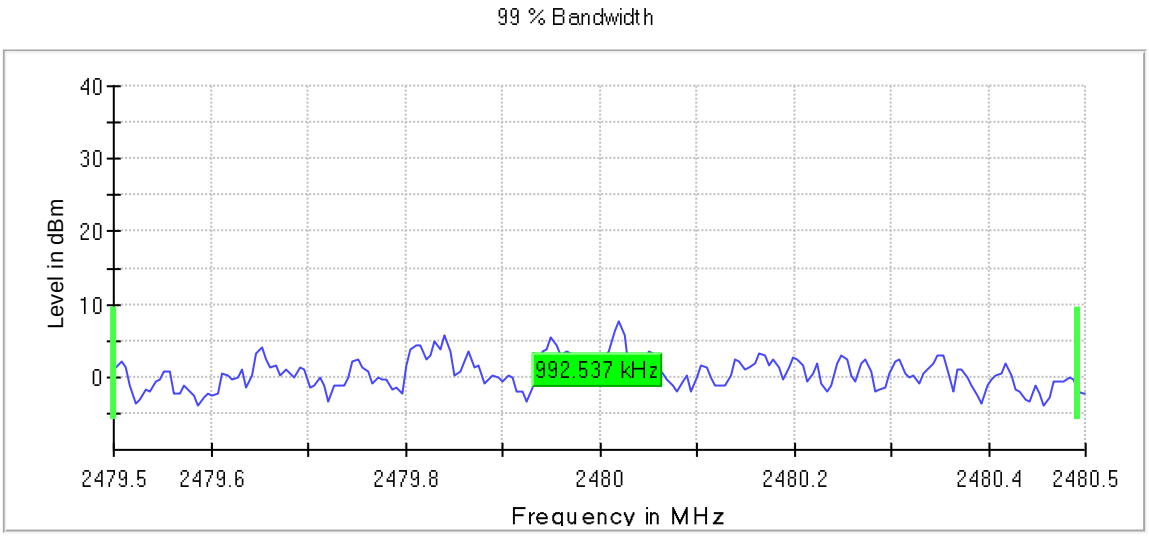


EDR – 2DH5

BW – 2402 MHz

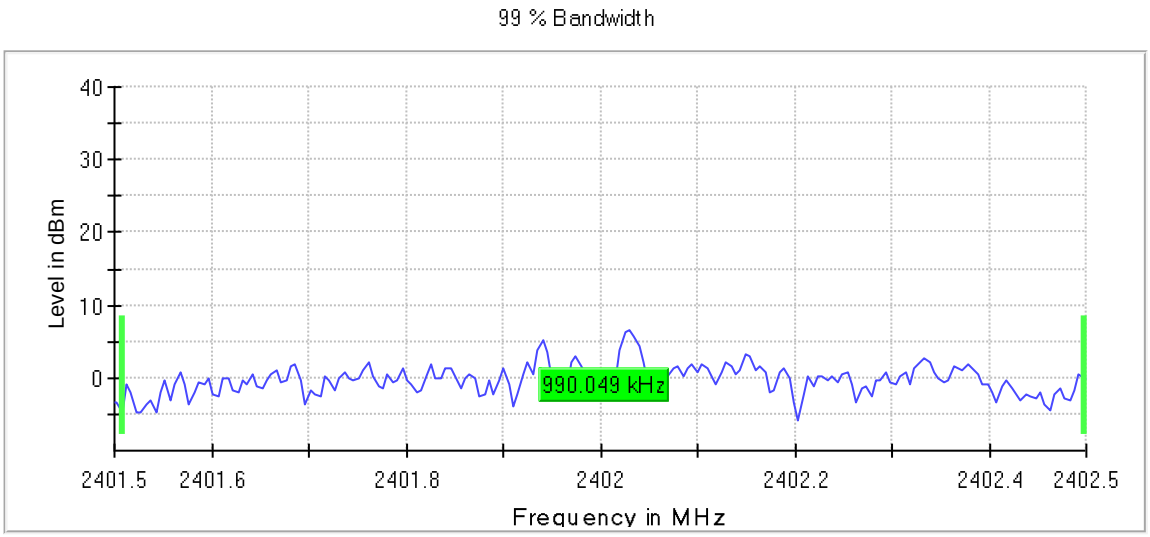


BW – 2480 MHz

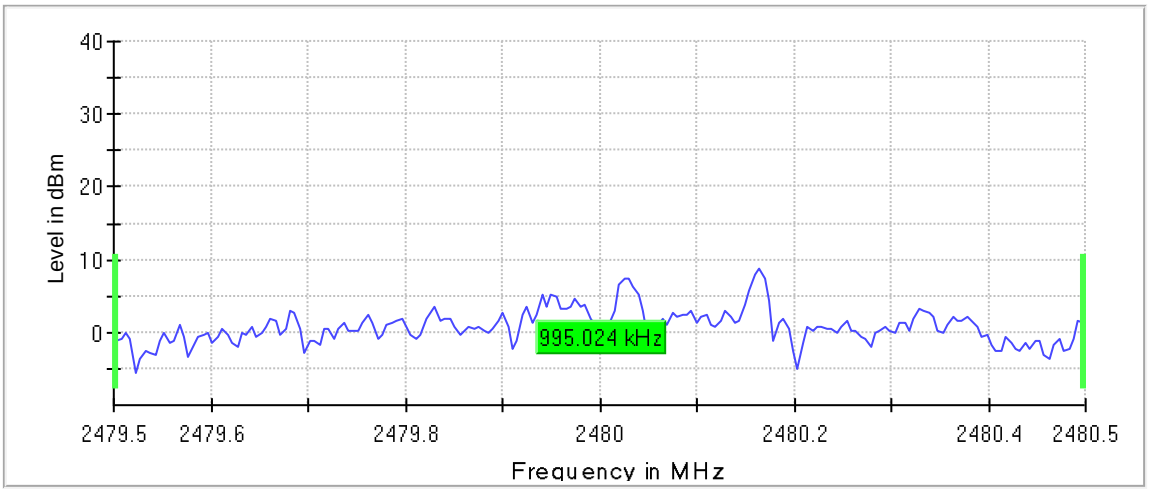


EDR – 3DH5

BW – 2402 MHz

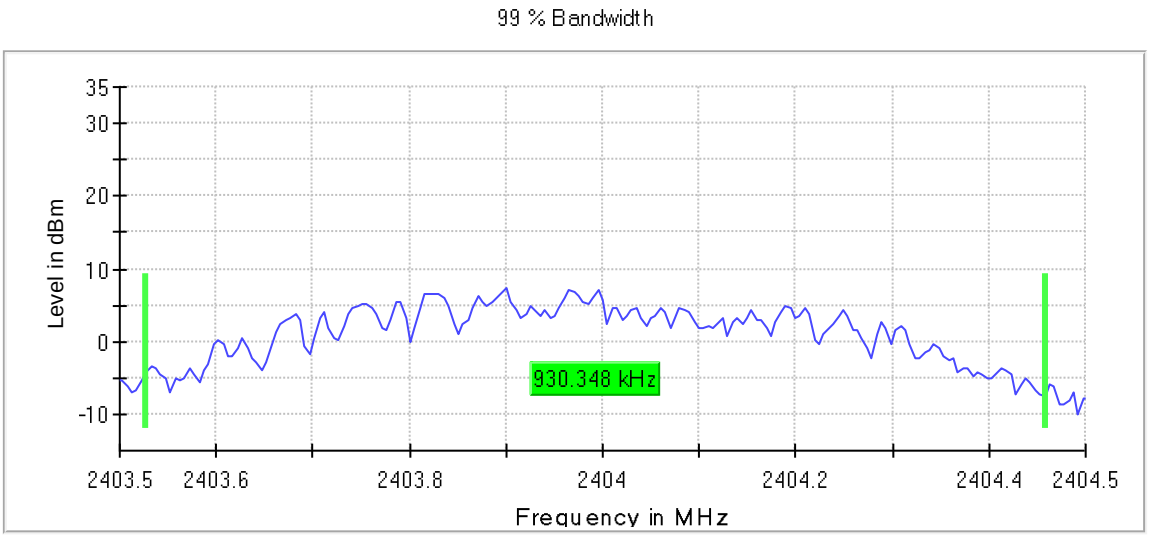


BW – 2480 MHz

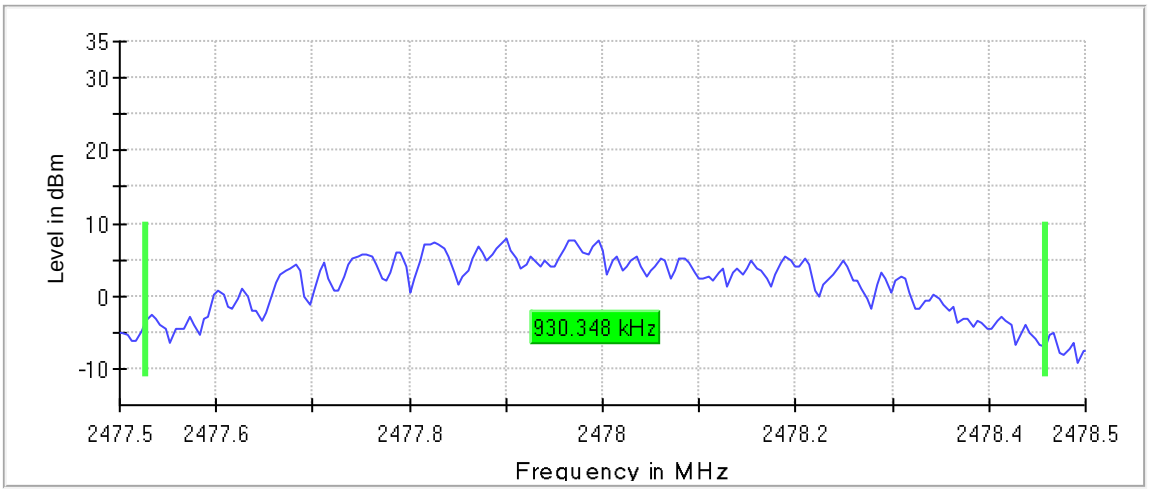


LE – 1M

BW – 2402 MHz

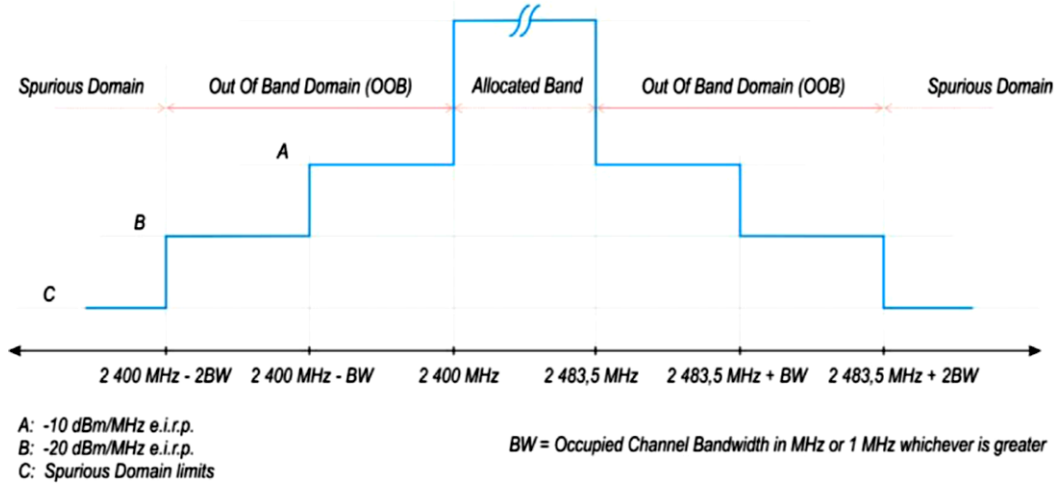


BW – 2480 MHz



B.7 Transmitter unwanted emission in the out-of-band domain

Test limits

ETSI clause	Limits
4.3.1.9.3	The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure 1 

Test conditions

ETSI clause	Limits
5.4.8.1	These measurements shall only be performed at normal test conditions. For FHSS equipment, the measurements shall be performed during normal operation (hopping).

Test procedure

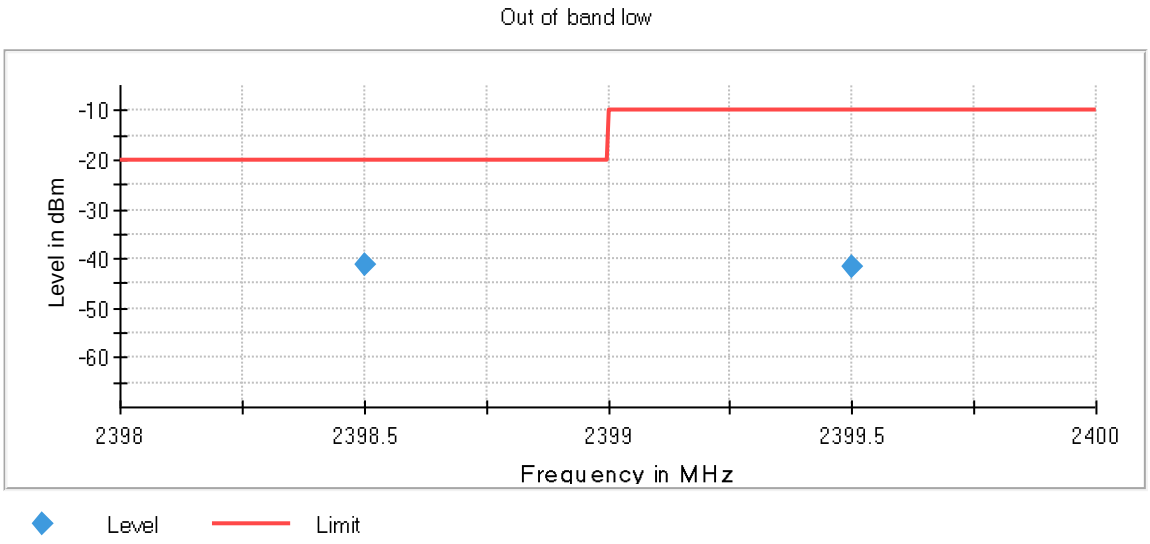
The conducted setup shown in section *Test & System Description* was used to measure the unwanted emissions in the out of band domain (Band Edge) accordingly with ETSI EN 300 328 V2.2.2 §5.4.8.2.1. The antenna terminal of the EUT is connected to the OSP120 through an attenuator and a cable, the spectrum analyzer is connected to the receiver port on the OSP. System connection cable loss is compensated by the EMC32 software on measured parameters.

Antenna gain is taken into account and added by the software to the measurements. EMC32 provides the mask and the frequency limits based in the measured channel bandwidth. Maximum values for each limit level (-10dBm and -20dBm) are pointed by markers.

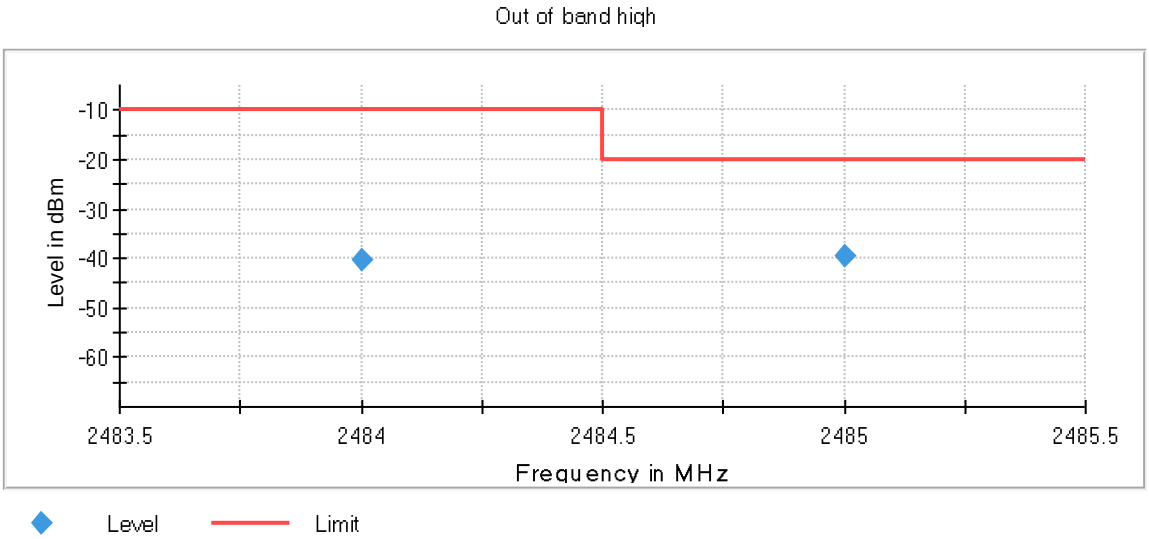
Results screenshot

BR – DH5

UNWANTED OOB Low Freq Section



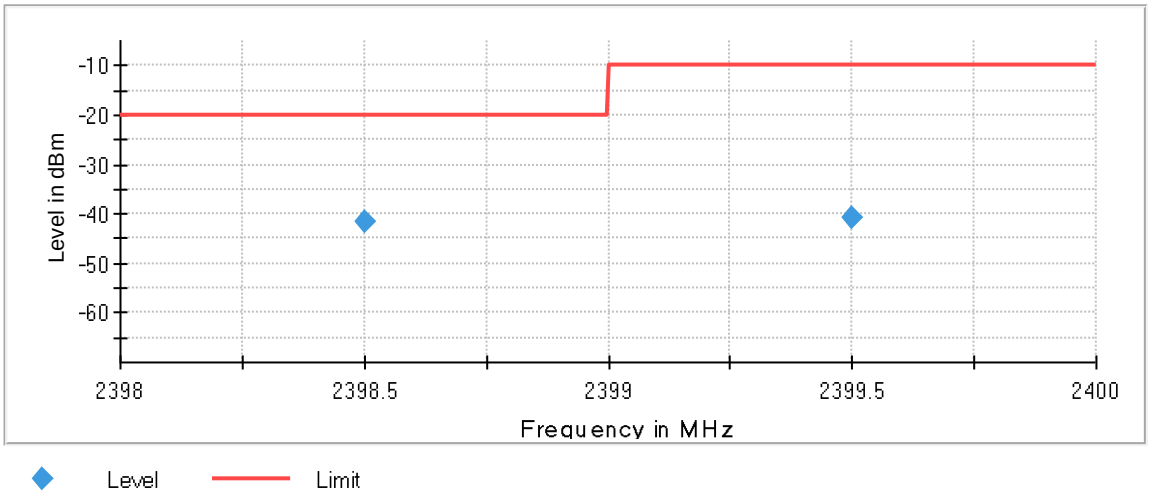
UNWANTED OOB High Freq Section



EDR – 2DH5

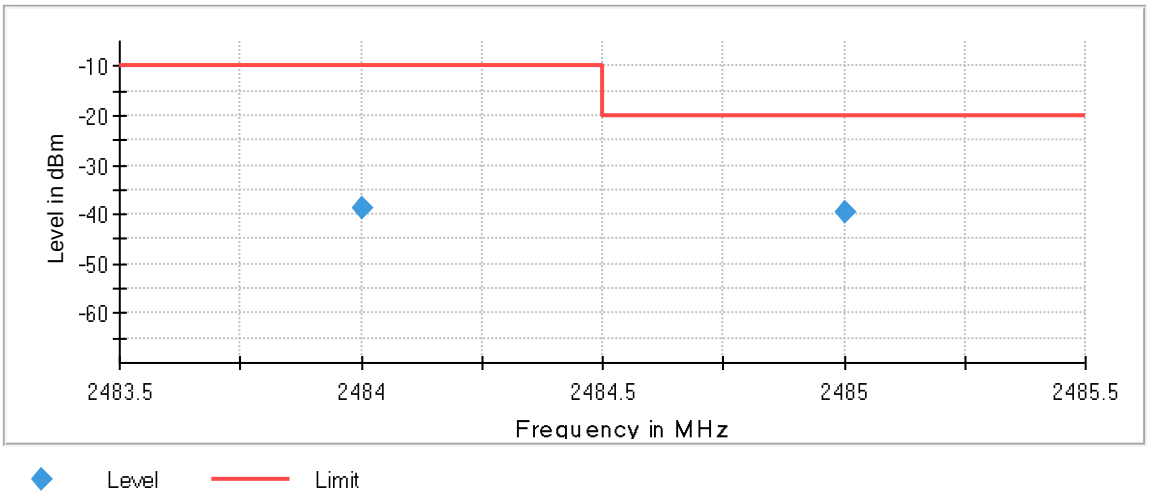
UNWANTED OOB Low Freq Section

Out of band low



UNWANTED OOB High Freq Section

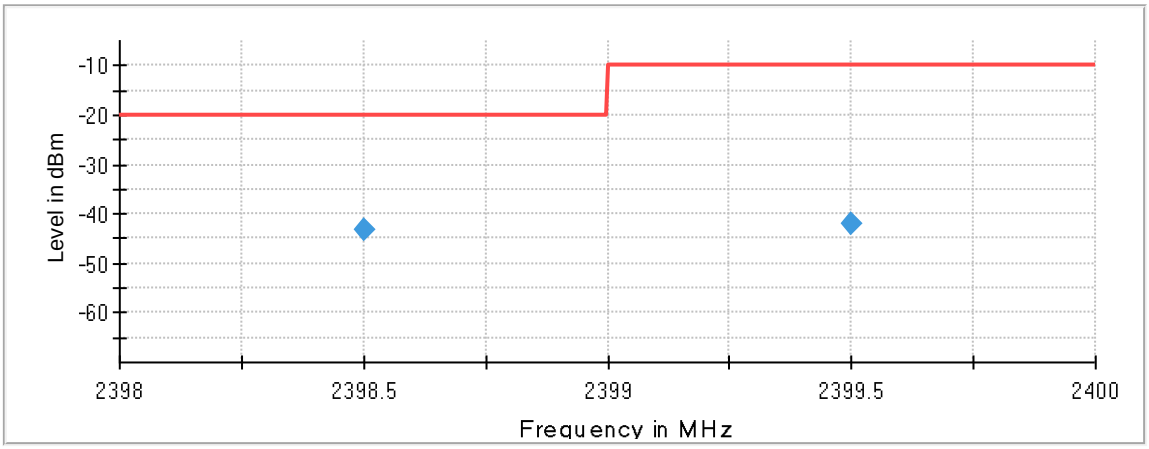
Out of band high



EDR – 3DH5

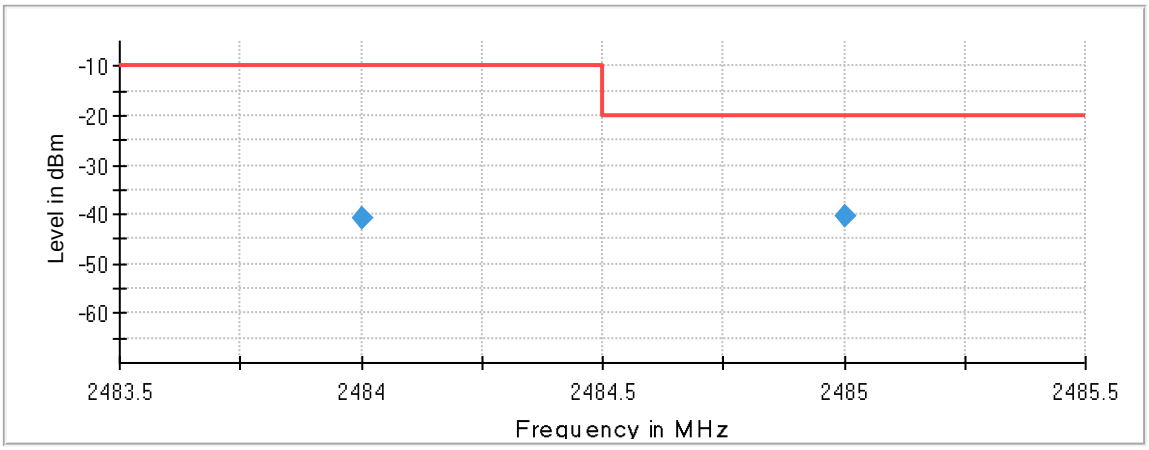
UNWANTED OOB Low Freq Section

Out of band low



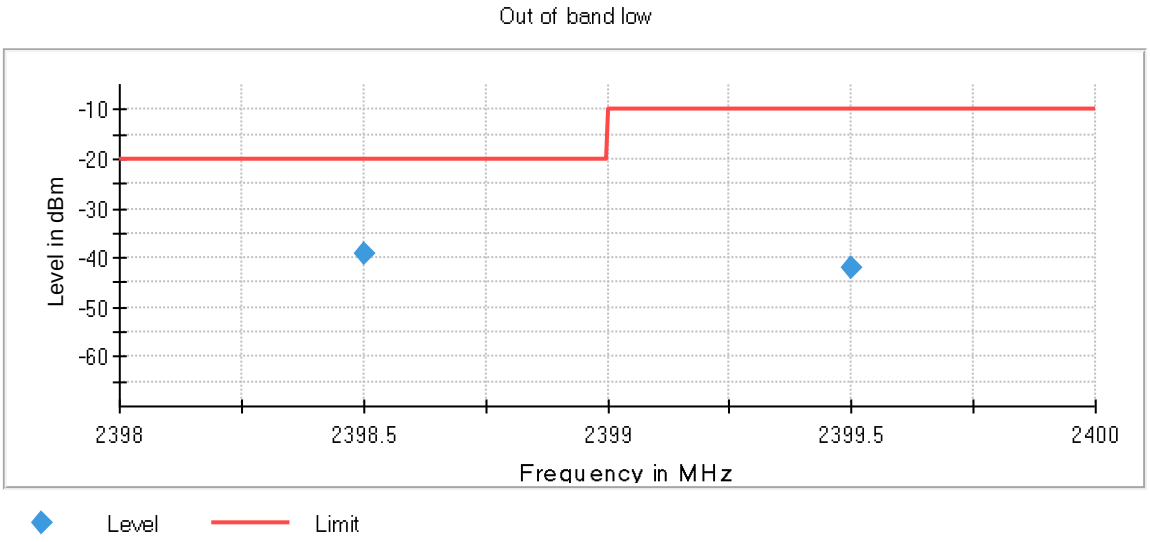
UNWANTED OOB High Freq Section

Out of band high

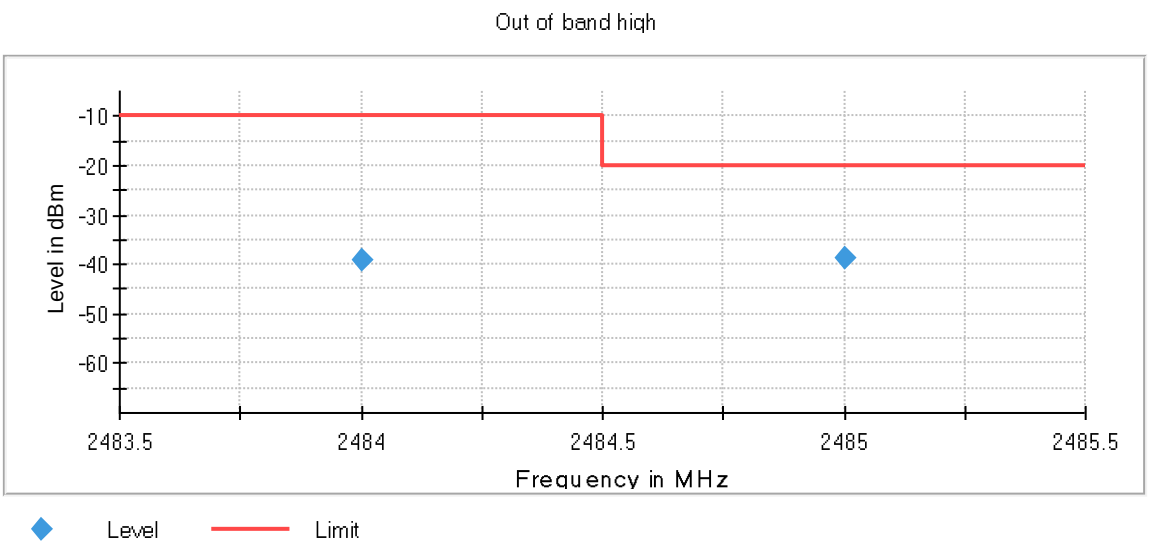


LE – 1M

UNWANTED OOB Low Freq Section



UNWANTED OOB High Freq Section



B.8 Transmitter unwanted emissions in the spurious domain

Test limits

<table>
<tr><th>ETSI clause</th><th>Limits</th></tr>
<tr><td>4.3.1.10.3</td><td>The transmitter unwanted emissions in the spurious domain shall not exceed the values given in table 4.
For emissions radiated by the cabinet or emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and as e.i.r.p. for emissions above 1 GHz.

Table 4: Transmitter limits for spurious emissions
<table>
<tr><th>Frequency range</th><th>Maximum power</th><th>Bandwidth</th></tr>
<tr><td>30 MHz to 47 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>47 MHz to 74 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr>
<tr><td>74 MHz to 87.5 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>87.5 MHz to 118 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr>
<tr><td>118 MHz to 174 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>174 MHz to 230 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr>
<tr><td>230 MHz to 470 MHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>470 MHz to 694 MHz</td><td>-54 dBm</td><td>100 kHz</td></tr>
<tr><td>694 MHz to 1 GHz</td><td>-36 dBm</td><td>100 kHz</td></tr>
<tr><td>1 GHz to 12.75 GHz</td><td>-30 dBm</td><td>1 MHz</td></tr>
</table>
</td></tr>
</table>

Test conditions

ETSI clause	Limits
5.4.8.1	These measurements shall only be performed at normal test conditions. For equipment using FHSS modulation, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. When this is not possible, the measurement shall be performed during normal operation (hopping).

Test procedure

The radiated setups (transmitter) shown in section *Test & System Description* were used to measure the transmission spurious emissions accordingly with ETSI EN 300 328 V2.2.2 §5.4.9.2.1. Depending of the frequency range and bands being tested, different antennas and filters were used, in consequence different setups are employed.

The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.

The radiated spurious emission was measured on the worst case configuration selected from each transmission mode on the low and high channel.

Test Results

Tx Spurious Emissions – 30MHz to 12.75GHz

Tx Spurious Emissions – BR, GFSK, DH5, 2402 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
562.5	-69.3	RMS	-51.9	17.4	V
10035.9	-46.4	RMS	-30.0	16.4	V
12039.9	-60.0	RMS	-30.0	30.0	V

Tx Spurious Emissions – BR, GFSK, DH5, 2480 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
215.4	-70.8	RMS	-51.9	18.9	H
10019.6	-46.5	RMS	-30.0	16.5	V
12051.1	-59.9	RMS	-30.0	29.9	V

Tx Spurious Emissions – BR, π/4-DQPSK, 2-DH5, 2402 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
50.0	-70.3	RMS	-51.9	18.4	V
10030.2	-46.5	RMS	-30.0	16.5	V
12050.8	-59.8	RMS	-30.0	29.8	V

Tx Spurious Emissions – BR, π/4-DQPSK, 2-DH5, 2480 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
50.0	-69.4	RMS	-51.9	17.5	V
9996.6	-47.8	RMS	-30.0	17.8	H
12050.8	-59.9	RMS	-30.0	29.9	V

Tx Spurious Emissions – BR, EDR, 8-DPSK, 3-DH5, 2402 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
215.4	-70.7	RMS	-51.9	18.8	H
10103.0	-46.0	RMS	-30.0	16.0	H
12036.5	-59.8	RMS	-30.0	29.8	V

Tx Spurious Emissions – BR, EDR, 8-DPSK, 3-DH5, 2480 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
50.0	-68.9	RMS	-51.9	17.0	V
10134.6	-46.1	RMS	-30.0	16.1	V
10273.6	-45.9	RMS	-30.0	15.9	V
12066.9	-59.8	RMS	-30.0	29.8	V

B.9 Receiver spurious emissions

Test limits

<table>
<tr><th>ETSI clause</th><th>Limits</th></tr>
<tr><td>4.3.1.11.3</td><td>The spurious emissions of the receiver shall not exceed the values given in table below.

For emissions radiated by the cabinet or for emissions radiated by integral antenna equipment (without antenna connectors), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.
<table>
<tr><th>Frequency range</th><th>Maximum power</th><th>Bandwidth</th></tr>
<tr><td>30 MHz to 1GHz</td><td>-57 dBm</td><td>100 kHz</td></tr>
<tr><td>1GHz to 12.75 GHz</td><td>-47 dBm</td><td>1 MHz</td></tr>
</table>
</td></tr>
</table>

Test conditions

ETSI clause	Limits
5.4.10.1	These measurements shall only be performed at normal test conditions. Testing shall be performed when the equipment is in a receive-only mode. For FHSS equipment, the measurements may be performed when normal hopping is disabled. In this case measurements need to be performed when operating at the lowest and the highest hopping frequency. These frequencies shall be recorded. When disabling the normal hopping is not possible, the measurement shall be performed during normal operation (hopping).

Test procedure

The radiated setups (receiver) shown in section *Test & System Description* were used to measure the receiver spurious emissions accordingly with ETSI EN 300 328 V2.2.2 §5.4.10.2.2. Depending of the frequency range and bands being tested, different antennas and filters were used, in consequence different setups are employed.

The final measurement is done by varying the antenna height from 1 to 4 meters, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.

The radiated spurious emission was measured on the worst case configuration selected from each transmission mode on the low and high channel

Test Results

Rx Spurious Emissions – 30 MHz to 12.75 GHz

Rx Spurious Emissions – BR, GFSK, DH5, 2402 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
169.9	-65.2	RMS	-54.9	10.3	V
10500.7	-51.0	RMS	-47.0	4.0	V

Rx Spurious Emissions – BR, GFSK, DH5, 2480 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
169.5	-68.1	RMS	-54.9	13.2	V
10499.9	-49.1	RMS	-47.0	2.1	V

Rx Spurious Emissions – BR, π/4-DQPSK, 2-DH5, 2402 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
187.5	-68.4	RMS	-54.9	13.5	H
10499.9	-49.3	RMS	-47.0	2.3	V

Rx Spurious Emissions – BR, π/4-DQPSK, 2-DH5, 2480 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
170.3	-67.8	RMS	-54.9	12.9	H
10500.7	-49.0	RMS	-47.0	2.0	V

Rx Spurious Emissions – BR, π/4-DQPSK, 3-DH5, 2402 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
90.3	-66.0	RMS	-54.9	11.1	V
10499.9	-49.2	RMS	-47.0	2.2	V

Rx Spurious Emissions – BR, π/4-DQPSK, 3-DH5, 2480 MHz

Frequency	Level	Detector	Limit	Margin	Polar
MHz	dBm	---	dBm	dB	---
166.4	-68.4	RMS	-54.9	13.5	V
10499.9	-49.0	RMS	-47.0	2.0	V

B.10 Receiver Blocking

Test limits

<table>
<tr><th>ETSI clause</th><th>Limits</th></tr>
<tr><td>4.3.1.12.3

4.3.1.12.4</td><td>
The minimum performance criterion shall be a PER less than or equal to 10 %.

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 below.

Receiver blocking parameters for Receiver Category 1 equipment
<table>
<tr><th>Wanted signal mean power from companion device (dBm) (see notes 1 and 4)</th><th>Blocking signal frequency (MHz)</th><th>Blocking signal power (dBm) (see note 4)</th><th>Type of blocking signal</th></tr>
<tr><td>(-133 dBm + 10 × log₁₀(OCBW)) or -68 dBm whichever is less (see note 2)</td><td>2380
2504
2300
2584</td><td rowspan="2">-34</td><td rowspan="2">CW</td></tr>
<tr><td>(-139 dBm + 10 × log₁₀(OCBW)) or -74 dBm whichever is less (see note 3)</td><td>2300
2330
2360
2524
2584
2674</td></tr>
<tr><td colspan="4">
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.
</td></tr>
</table>
</td></tr>
</table>

Test conditions

ETSI clause	Conditions
5.4.11.1	These measurements shall only be performed at normal test conditions.

Test procedure

The receiver blocking setup shown in section *Test & System Description* was used to measure receiver blocking signal. The signaling Unit is a CMW500.

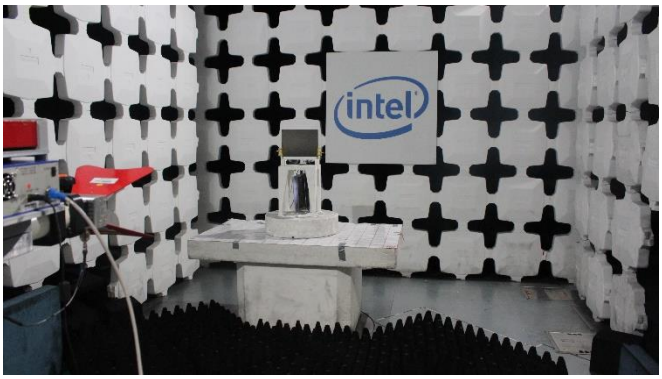
The packet error rate (PER) is measured with the CMW500. The blocking signal is emulated by the Signal generator SMB100A. Antenna gain and insertion loss are taken into account.

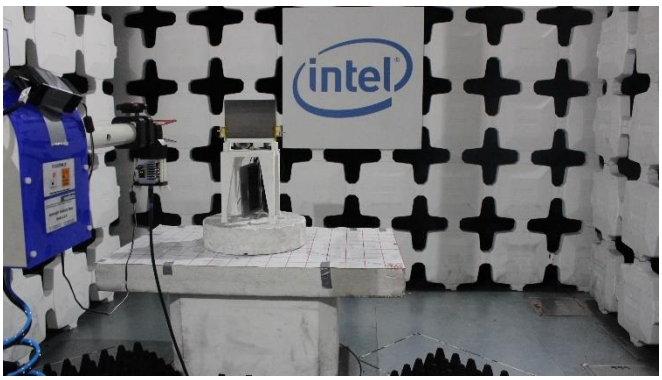
Test results

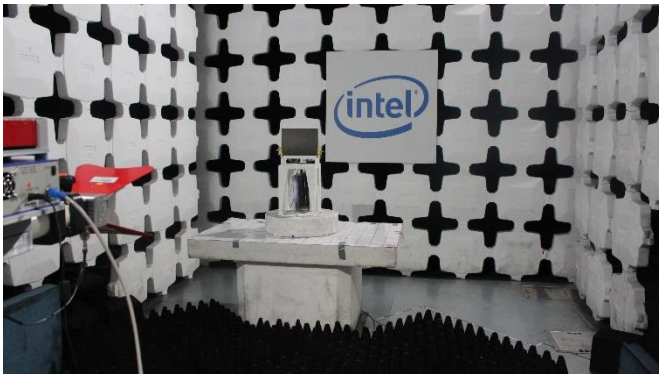
Configuration	99% Occupied bandwidth [MHz]	Wanted signal mean power from companion device (dBm)	PER [%] Without blocking signal	Blocking signal [MHz]	Blocking signal Power at DUT input [dBm]	PER [%] With Blocking signal	Verdict
		Without blocking signal		With blocking signal			
BT DH5-Hopping Chain A	0.78	-76.08	0.89	2380	-36.00	0.71	Pass
				2504		0.92	Pass
		-82.08	1.07	2300		1.03	Pass
				2360		0.49	Pass
				2330		0.67	Pass
				2524		1.19	Pass
				2584		0.79	Pass
				2674		1.07	Pass

Annex C. Photographs

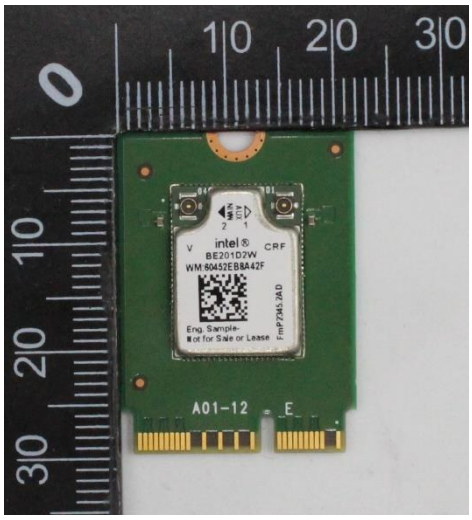
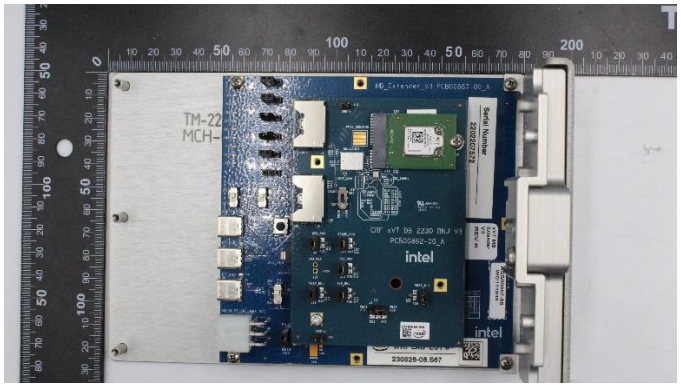
C.1 Test Setup

Radiated Setup 30 MHz – 1 GHz (Transmitter tests)	Radiated Setup 1 GHz – 11 GHz (Transmitter tests)
	

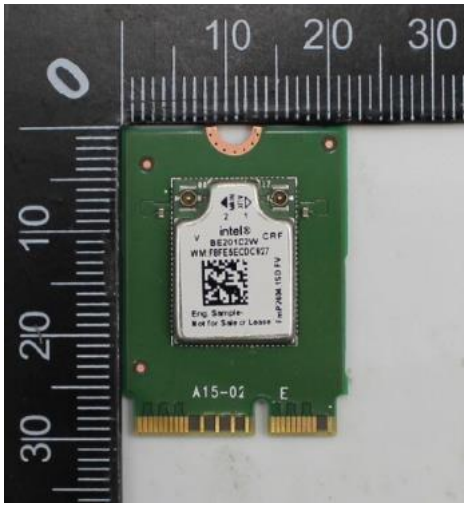
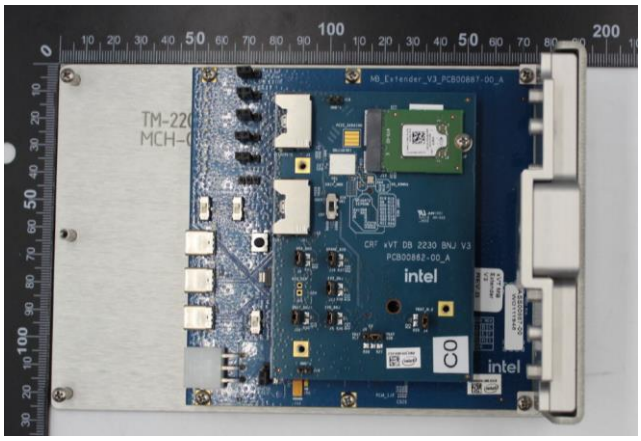
Radiated Setup 11 GHz – 12.75 GHz (Transmitter tests)


Radiated Setup 30 MHz – 1 GHz (Receiver tests)	Radiated Setup 1 GHz – 12.75 GHz (Receiver tests)
	

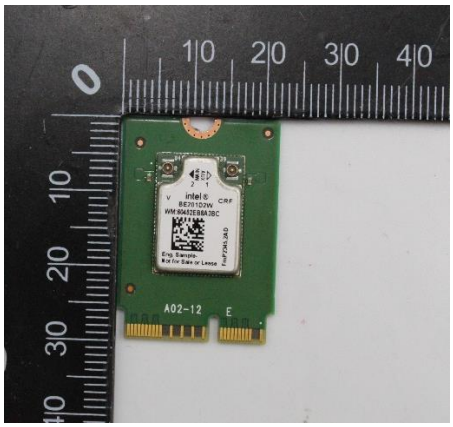
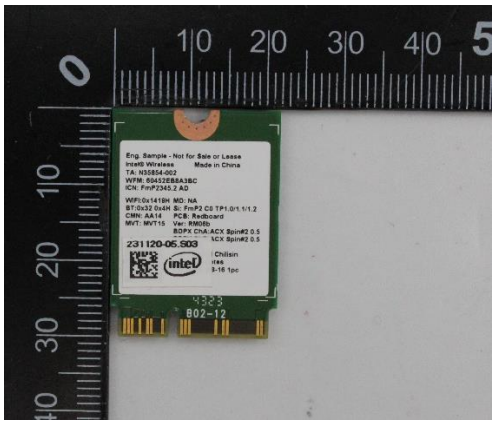
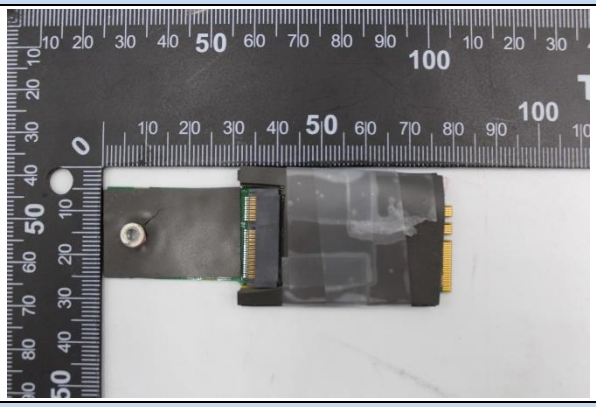
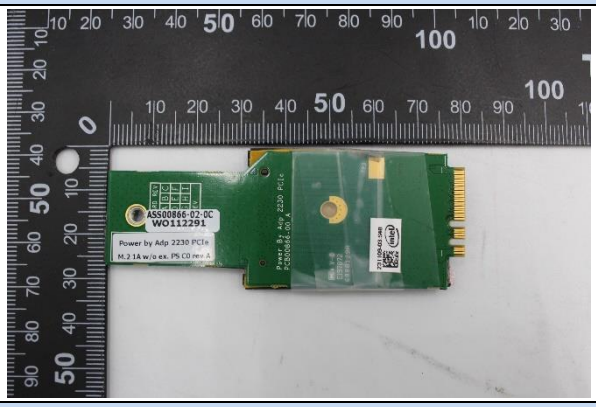
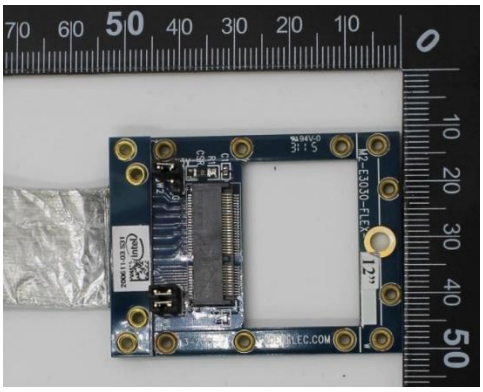
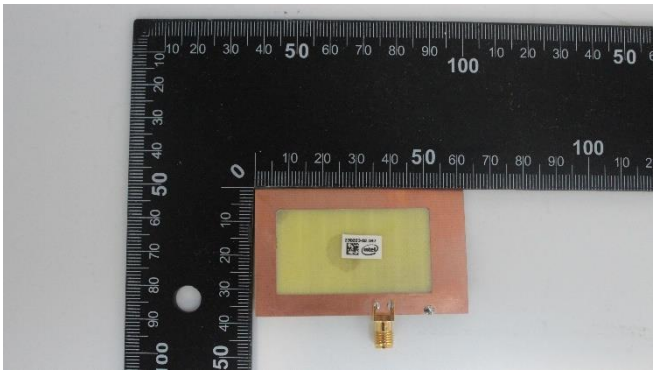
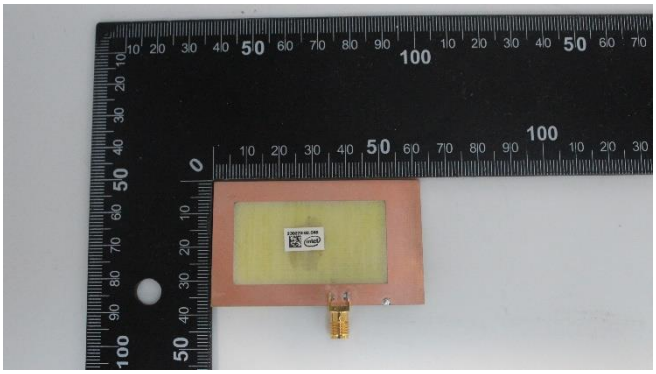
C.2 Test Sample

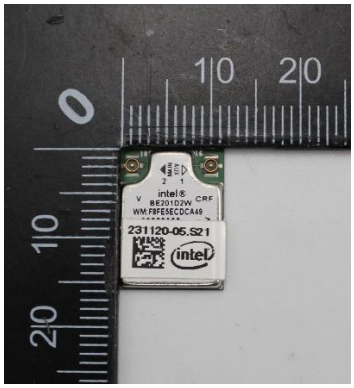
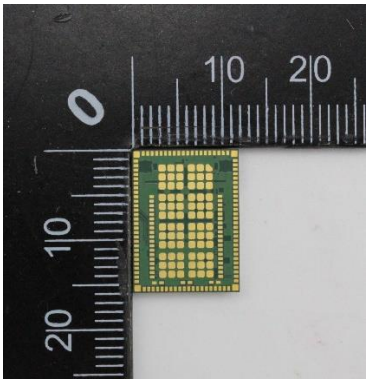
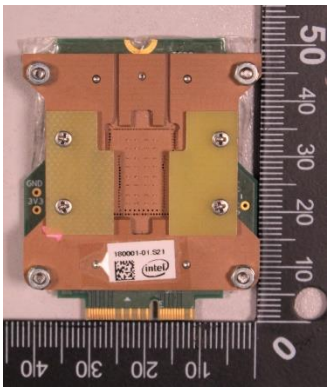
Sample #01	
Module Front	Module Back
	
Extender board	Laptop
	

Sample #02

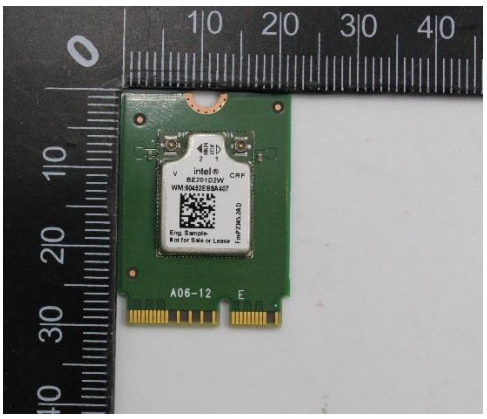
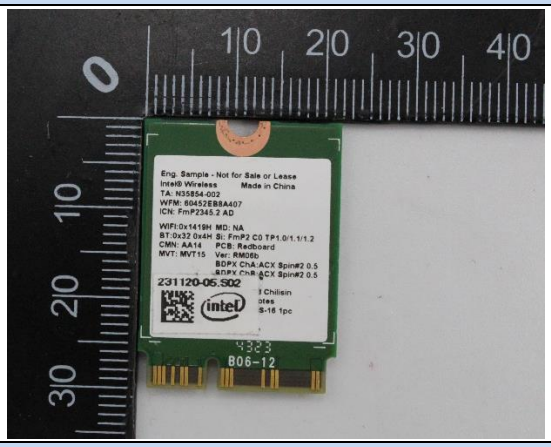
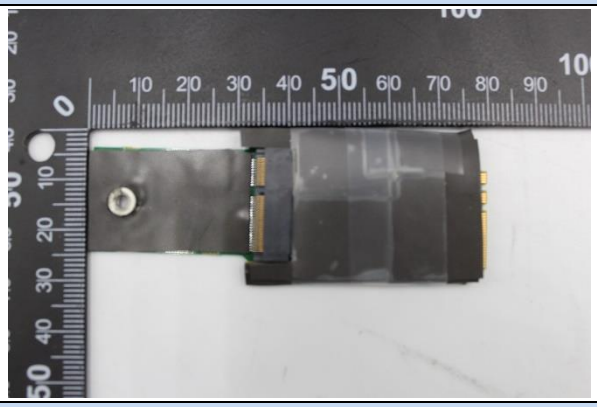
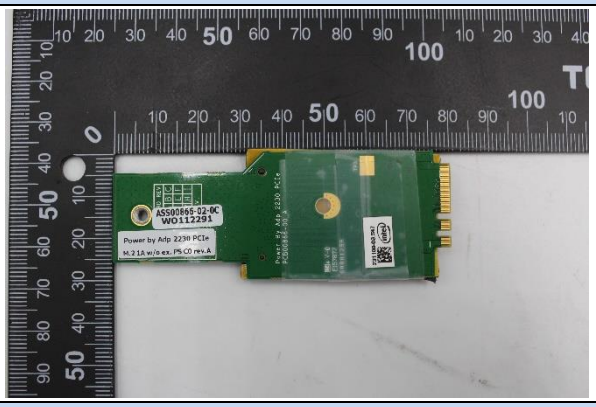
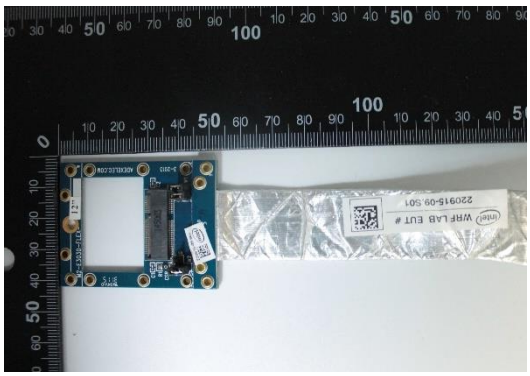
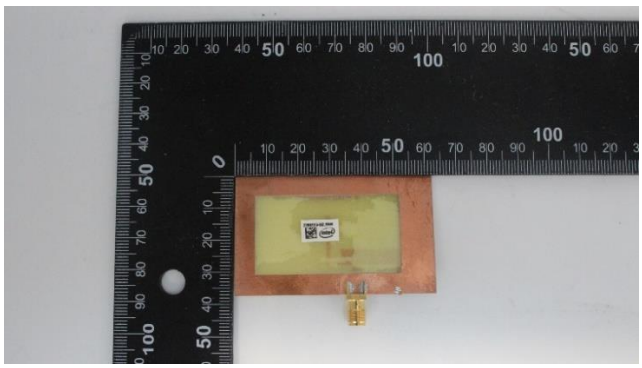
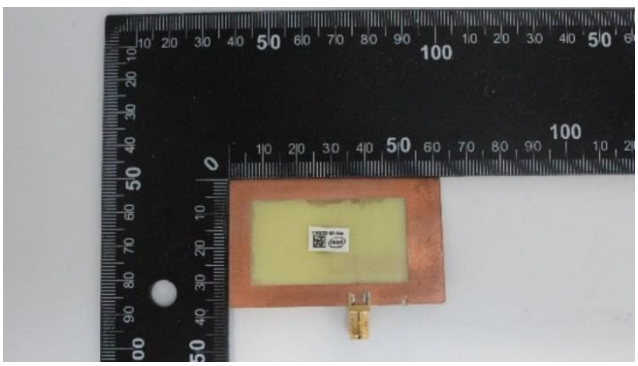
Module Front	Module Back
	
Extender board	**Laptop**
	

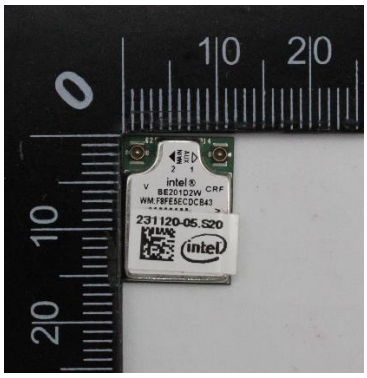
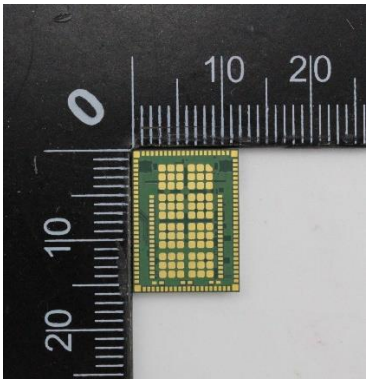
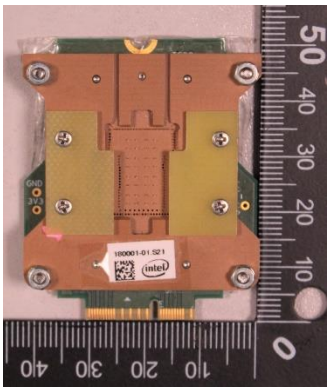
Sample #03

Module Front	Module Back
	
Adaptor Front	**Adaptor Back**
	
Extender board	**Laptop**
	
Main antenna	**Aux antenna**
	

Module Front	Module back
	
Socket Front	**Socket Back**
	

Sample #04

Module Front	Module Back
	
Adaptor Front	**Adaptor Back**
	
Extender board	**Laptop**
	
Main antenna	**Aux antenna**
	

Module Front	Module back
	
Socket Front	**Socket Back**
	

End of the report

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