EN 300 328 RF Test Report (BT-EDR)

Report No.: RE171207E10I-1

Test Model: BLACK bean

Received Date: Jan. 17, 2017

Test Date: Mar. 05, 2017

Issued Date: Apr. 15, 2019

Applicant: UAB 8devices

Address: Antakalnio 17, LT-10312, Vilnius, Lithuania

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RE171207E10I-1	Original release.	Apr. 15, 2019

1 Certificate of Conformity

Product:	BLACK-Bean
Brand:	8devices
Test Model:	BLACK bean
Sample Status:	R&D SAMPLE
Applicant:	UAB 8devices
Test Date:	Mar. 05, 2017
Standards:	EN 300 328 V2.1.1 (2016-11)

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Phoenix Huang , **Date:** Apr. 15, 2019

Phoenix Huang / Specialist

Approved by : , **Date:** Apr. 15, 2019

May Chen / Manager

2 Summary of Test Results

The EUT has been tested according to the following specifications:

EN 300 328 V2.1.1		
Clause	**Test Parameter**	**Results**
4.3.1.12	Receiver Blocking (Only for Adaptive equipment)	Pass

2.1 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSW8	101497	Aug. 11, 2016	Aug. 10, 2017
ESG Vector signal generator Agilent	E4438C	MY47271330 506 602 UNJ	Sep. 26, 2016	Sep. 25, 2017
Upgrade the software license on current E4438C ESG Agilent	E4438CK-403	ESG E4_010004	NA	NA
ESG Vector signal generator Agilent	E4438C	MY45094468/0 05 506 602 UK6 UNJ	Nov. 25, 2016	Nov. 24, 2017
Upgrade the software license on current E4438C ESG Agilent	E4438CK-403	ESG E4_010001	NA	NA
MXG X-Series RF Vector Signal Generator Agilent	N5182B	MY53052647	July 25, 2016	July 24, 2017
Direct Coupler EMCI	CS20-18-436/16	1139	NA	NA
Power Splitter/combiner Mini-Circuits	ZN4PD-642W-S +	408501327_0 3	Oct. 11, 2016	Oct. 10, 2017
Power Splitter/combiner Mini-Circuits	ZN4PD-642W-S +	408501327_0 4	Oct. 11, 2016	Oct. 10, 2017

NOTE: 1. The test was performed in Adaptivity room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Mar. 05, 2017

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Parameter	Uncertainty
Occupied Channel Bandwidth	±1.132x10^{-4} %
RF output power, conducted	±1.207dB
Power Spectral Density, conducted	±1.207dB
Unwanted Emissions, conducted	±3dB
All emissions, radiated	±4.925dB
Temperature	±0.6°C
Supply voltages	±0.04%
Time	±5 %

2.3 Maximum Measurement Uncertainty

For the test methods, according to ETSI EN 300 328 standard, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028-1, in particular in annex D of the ETSI TR 100 028-2.

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1,5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±3 °C
Supply voltages	±3 %
Time	±5 %

2.4 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-EDR)

Product	BLACK-Bean
Brand	8devices
Test Model	BLACK bean
Status of EUT	R&D SAMPLE
Nominal Voltage	3.3Vdc from host equipment
Voltage Operation Range	Vnom= 230Vac
Temperature Operating Range	-10℃ ~ 70℃
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS, OFDM
Transfer Rate	Up to 3Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Adaptive/Non-Adaptive	☐ non-adaptive Equipment ☒ adaptive Equipment without the possibility to switch to a non-adaptive mode ☐ adaptive Equipment which can also operate in a non-adaptive mode
EIRP Power (Measured Max. Average)	8.34dBm
Antenna Type	See item 3.2
Antenna Connector	See item 3.2
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. This is a supplementary report of Report No: RE171207E10I-A-1. The differences between them are as below information:
   - ◆ Upgraded standard version to EN 300 328 V2.1.1 .
2. According to above conditions, only Receiver Blocking test item need to be performed. And all data was verified to meet the requirements.
3. There are Bluetooth technology and WLAN technology used for the EUT.
4. The EUT support multiple function, therefore the WLAN OFDM will be cover BT OFDM (low power) scenario.
5. The modular of Bluetooth technology has two variant designs as following table:

Variant No.	Remark
SKU #1	TX/RX on transmitter circuit of J1
SKU #2	TX/RX on transmitter circuit of J2
Note: From the above variant designs, the spurious emissions worst case was found in **SKU #1.** Therefore only the test data of the mode was recorded in this report.	

6. WLAN/BT coexistence mode:

   ◆ 1x1 WLAN + BT:

   ➢ 5GHz 802.11a/an (or 11ac) transmit concurrent with BT.

   ➢ 2.4GHz: timely shared coexistence.

7. Spurious Emission (conducted & radiated emission) of the simultaneous operation (WiFi <5GHz> & Bluetooth) have been evaluated and no non-compliance found. The detail combinations of transmitters / frequencies / modes as below table

Mode	Available Channel	Tested Channel	Modulation Technology
5 GHz (802.11a) + Bluetooth (GFSK)	36 to 140	36	OFDM
	0 to 78	78	FHSS

8. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Antenna

The antenna gain was declared by client; please refer to the following table:

Ant. No.	Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
1	Main	WNC	81-EBJ15.005	PIFA	3.00	Band 1&2: 2.56	1.15	Band 1&2: 1.70	IPEX	300
						Band 3: 4.76		Band 3: 1.74		
						Band 4: 4.76		Band 4: 1.79		
	Aux	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08	1.15	Band 1&2: 1.70	IPEX	300
						Band 3: 3.31		Band 3: 1.74		
						Band 4: 2.42		Band 4: 1.79		
2	Main	WNC	81.ED415.001	PIFA	0.22	Band 1&2: 5.56	0.96	Band 1&2: 1.29	IPEX	300
						Band 3: 5.03		Band 3: 1.36		
						Band 4: 3.14		Band 4: 1.38		
	Aux	WNC	81.ED415.001	PIFA	1.48	Band 1&2: 5.17	0.96	Band 1&2: 1.29	IPEX	300
						Band 3: 5.34		Band 3: 1.36		
						Band 4: 2.93		Band 4: 1.38		

Note: 1. Above antenna gains of antenna are Total (H+V).

3.3 Description of Test Modes

79 channels are provided for BT-EDR mode:

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

3.3.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to	Description
	RB	
-	√	-

Where **RB:** Receiver Blocking

Receiver Blocking Test:

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 78	FHSS	GFSK	DH1

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RB	23deg. C, 64%RH	230Vac, 50Hz	Gary Cheng

3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

EN 300 328 V2.1.1 (2016-11)

All test items have been performed and recorded as per the above standards.

4 Test Procedure and Results

4.1 Receiver Blocking

4.1.1 Limits of Receiver Blocking

This requirement applies to all receiver categories.

Receiver Category		
☐Category 1	☒Category 2	☐Category 3
Minimum performance criterion	☒PER ≦10%	
	☐Alternative performance criteria (See note)	
Note: The manufacturer was declared performance criteria is x% for the intended use of the equipment.		

Receiver Category 1 Equipment			
Wanted signal mean power from companion device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 2)**	**Type of blocking signal**
P_{min} + 6 dB	2 380 2 503.5	-53	CW
P_{min} + 6 dB	2 300 2 330 2 360	-47	CW
P_{min} + 6 dB	2 523.5 2 553.5 2 583.5 2 613.5 2 643.5 2 673.5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

Receiver Category 2 Equipment			
Wanted signal mean power from companion device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 2)**	**Type of blocking signal**
P_{min} + 6 dB	2 380 2 503.5	-57	CW
P_{min} + 6 dB	2 300 2 583.5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

Receiver Category 3 Equipment			
Wanted signal mean power from companion device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (See note 2)**	**Type of blocking signal**
P_{min} + 12 dB	2 380 2 503.5	-57	CW
P_{min} + 12 dB	2 300 2 583.5	-47	CW
NOTE 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal. NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

4.1.2 Test Procedure

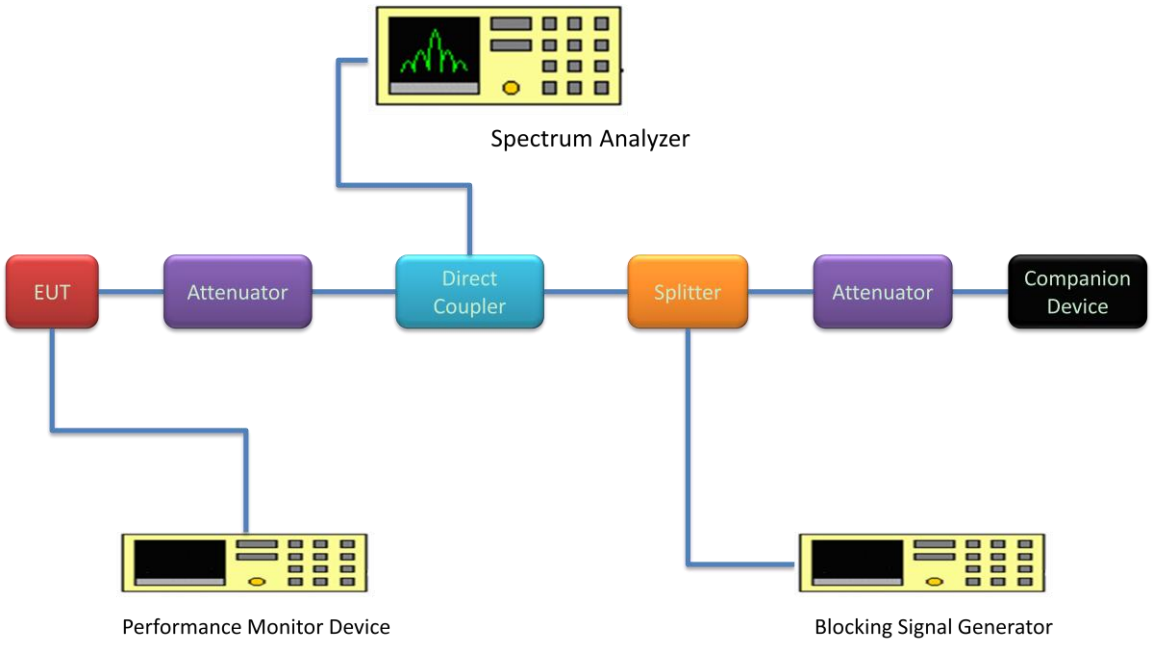
Refer to chapter 5.4.11 of EN 300 328 V2.1.1.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement

4.1.3 Deviation from Test Standard

No deviation.

4.1.4 Test Setup Configuration



4.1.5 Test Results

Receiver Category 2 Equipment

Receiver blocking performance when operating at the lowest operating channel				
P_{min}: -83.5dBm			antenna gain(G) : 3.62 dBi	
The actual blocking signal power(Note1)			☒ at the antenna connector ☐ in front of the antenna	
Note1: For the conducted measurements , the level shall be corrected as follows: the actual blocking signal power = blocking signal power + G				
Channel	**Wanted signal mean power from companion device (dBm)**	**Blocking signal frequency (MHz)**	**The actual blocking signal power (dBm)**	**Pass/Fail**
0	-77.5	2380	-53.38	Pass
		2503.5	-53.38	Pass
		2300	-43.38	Pass
		2583.5	-43.38	Pass

Receiver blocking performance when operating at the highest operating channel				
P_{min}: -83.5dBm			antenna gain(G) : 3.62 dBi	
The actual blocking signal power(Note1)			☒ at the antenna connector ☐ in front of the antenna	
Note1: For the conducted measurements , the level shall be corrected as follows: the actual blocking signal power = blocking signal power + G				
Channel	**Wanted signal mean power from companion device (dBm)**	**Blocking signal frequency (MHz)**	**The actual blocking signal power (dBm)**	**Pass/Fail**
78	-77.5	2380	-53.38	Pass
		2503.5	-53.38	Pass
		2300	-43.38	Pass
		2583.5	-43.38	Pass

Appendix - Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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Appendix A – Original Report No.: RE171207E10I-A-1

EN 300 328 RF Test Report (BT-EDR)

Report No.:	RE171207E10I-A-1
Test Model:	BLACK-Bean
Received Date:	Oct. 08, 2014
Test Date:	Nov. 11, 2014 ; July 23 to 27, 2016
Issued Date:	Apr. 15, 2019
Applicant:	UAB 8devices
Address:	Antakalnio 17, LT-10312, Vilnius, Lithuania
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RE171207E10I-A-1	Original release.	Apr. 15, 2019

1 Certificate of Conformity

Product:	BLACK-Bean
Brand:	8devices
Test Model:	BLACK-Bean
Sample Status:	R&D SAMPLE
Applicant:	UAB 8devices
Test Date:	Nov. 11, 2014 ; July 23 to 27, 2016
Standards:	EN 300 328 V1.9.1 (2015-02)

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Phoenix Huang / Specialist , **Date:** Apr. 15, 2019

Approved by : May Chen / Manager , **Date:** Apr. 15, 2019

2 Summary of Test Results

The EUT has been tested according to the following specifications:

EN 300 328 V1.9.1		
Clause	**Test Parameter**	**Results**
	Transmitter Parameters	
4.3.1.2	RF Output Power	Pass
4.3.1.3	Duty cycle, Tx-sequence, Tx-gap (Non-adaptive equipment)	Not Applicable
4.3.1.4	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence (FHSS equipment)	Pass
4.3.1.5	Hopping Frequency Separation (FHSS equipment)	Pass
4.3.1.6	Medium Utilisation (Non-Adaptive Equipment)	Not Applicable
4.3.1.7	Adaptivity (Adaptive Equipment)	Not Applicable (Note 1)
4.3.1.8	Occupied Channel Bandwidth	Pass
4.3.1.9	Transmitter Unwanted Emission in the OOB Domain	Pass
4.3.1.10	Transmitter Unwanted Emissions in the Spurious Domain	Pass
4.3.1.13	Geo-location capability	Not Applicable
	Receiver Parameters	
4.3.1.11	Receiver Spurious Emissions	Pass
4.3.1.12	Receiver Blocking (Only for Adaptive equipment)	Not Applicable (Note 1)

Note: 1.These requirements do not apply for equipment with a maximum declared RF Output power of less than 10 dBm EIRP or for equipment when operating in a mode where the RF Output power is less than 10 dBm EIRP.

2.1 Test Instruments

For spurious emissions test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Keysight	N9030A	MY54490679	July 23, 2016	July 22, 2017
Pre_Amplifier Agilent	8447D	2944A10626	Feb. 21, 2016	Feb. 20, 2017
Pre_Amplifier HP	8449B	3008A01281	Jan. 16, 2016	Jan. 15, 2017
Pre_Amplifier EMCI	EMC184045	980143	Jan. 15, 2016	Jan. 14, 2017
TRILOG Antenna SCHWARZBECK	VULB9168	9168-162	Jan. 20, 2016	Jan. 19, 2017
Horn_Antenna SCHWARZBECK	BBHA9120-D1	D124	Jan. 20, 2016	Jan. 19, 2017
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Jan. 19, 2016	Jan. 18, 2017
Software	ADT_Radiated _V7.6.15.9.4	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208411	NA	NA
Power meter Anritsu	ML2495A	0824006	May 26, 2016	May 25, 2017
Power sensor Anritsu	MA2411B	0738172	May 26, 2016	May 25, 2017
ESG Vector signal generator Agilent	E4438C	Y45094468/00 5 506 602 UK6 UNJ	Dec. 01, 2015	Nov. 30, 2016

NOTE: 1. The test was performed in RF Fully Chamber No. 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: July 23 to 27, 2016

For Transmitter Unwanted Emission in the OOB Domain test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP40	100036	Jan. 27, 2016	Jan. 26, 2017
Spectrum Analyzer Keysight	N9030A	MY54490570	July 06, 2016	July 05, 2017
AC Power Source Extech Electronics	6502	1140503	NA	NA
Temperature & Humidity Chamber TERCHY	MHU-225AU	911033	Dec. 03, 2015	Dec. 02, 2016
DC Power Supply GOOD WILL INSTRUMENT CO., LTD.	GPC - 3030D	7700087	NA	NA
ESG Vector signal generator Agilent	E4438C	Y45094468/005 506 602 UK6 UNJ	Dec. 01, 2015	Nov. 30, 2016
Power meter Anritsu	ML2495A	0824006	May 26, 2016	May 25, 2017
Power sensor Anritsu	MA2411B	0738172	May 26, 2016	May 25, 2017
Software	ADT_RF Test Software V6.6.5.3	NA	NA	NA
Digital Multimeter FLUKE	87III	73680266	Nov. 10, 2015	Nov. 09, 2016
MXG X-Series RF Vector Signal Generator Agilent	N5182B	MY53051263	Aug. 10, 2015	Aug. 09, 2016
MIMO Powermeasurement Test set (4X4) Agilent	U2021XA	U2021XA_01	Aug. 08, 2015	Aug. 07, 2016
Switch Box Agilent	PS-X10-100	PS-X10-100_01	NA	NA
Test Receiver Agilent	N9038A	MY54450088	July 20, 2016	July 19, 2017

NOTE: 1. The test was performed in Oven room 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: July 25, 2016

For other test items

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100037	Oct. 30, 2014	Oct. 29, 2015
AC Power Source EXTECH Electronics	6502	1140503	NA	NA
Temperature & Humidity Chamber TERCHY	MHU-225AU	911033	Dec. 09, 2013	Dec. 08, 2014
DC Power Supply GOOD WILL INSTRUMENT CO., LTD.	GPC - 3030D	7700087	NA	NA
ESG Vector signal generator Agilent	E4438C	MY47271330 506 602 UNJ	Apr. 28, 2014	Apr. 27, 2015
Upgrade the software license on current E4438C ESG Agilent	E4438CK-403	ESG E4_010004	NA	NA
ESG Vector signal generator Agilent	E4438C	MY45094468/0 05 506 602 UK6 UNJ	Dec. 06, 2013	Dec. 05, 2014
Upgrade the software license on current E4438C ESG Agilent	E4438CK-403	ESG E4_010001	NA	NA
Power meter Anritsu	ML2495A	0824006	May 22, 2014	May 21, 2015
Power sensor Anritsu	MA2411B	0738172	May 22, 2014	May 21, 2015
Software	Total Power Measurement Tools V7.1	NA	NA	NA
Software	ADT_RF Test Software V6.6.5.3	NA	NA	NA

NOTE: 1. The test was performed in Oven room A.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Nov. 11, 2014

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Parameter	Uncertainty
Occupied Channel Bandwidth	±1.132x10^{-4} %
RF output power, conducted	±1.207dB
Power Spectral Density, conducted	±1.207dB
Unwanted Emissions, conducted	±3dB
All emissions, radiated	±4.925dB
Temperature	±0.6°C
Supply voltages	±0.04%
Time	±5 %

2.3 Maximum Measurement Uncertainty

For the test methods, according to ETSI EN 300 328 standard, the measurement uncertainty figures shall be calculated in accordance with ETSI TR 100 028-1 [1], ETSI TS 103 051 [2] and ETSI TS 103 052 [3] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1,5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Supply voltages	±3 %
Time	±5 %

2.4 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-EDR)

Product	BLACK-Bean
Brand	8devices
Test Model	BLACK-Bean
Status of EUT	R&D SAMPLE
Nominal Voltage	3.3Vdc from host equipment
Voltage Operation Range	Vnom= 230Vac
Temperature Operating Range	-10℃ ~ 70℃
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS, OFDM
Transfer Rate	Up to 3Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Adaptive/Non-Adaptive	☐ non-adaptive Equipment ☒ adaptive Equipment without the possibility to switch to a non-adaptive mode ☐ adaptive Equipment which can also operate in a non-adaptive mode
EIRP Power (Measured Max. Average)	8.34dBm
Antenna Type	See item 3.2
Antenna Connector	See item 3.2
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. There are Bluetooth technology and WLAN technology used for the EUT.
2. The EUT support multiple function, therefore the WLAN OFDM will be cover BT OFDM (low power) scenario.
3. The modular of Bluetooth technology has two variant designs as following table:

Variant No.	Remark
SKU #1	TX/RX on transmitter circuit of J1
SKU #2	TX/RX on transmitter circuit of J2
Note: From the above variant designs, the spurious emissions worst case was found in **SKU #1.** Therefore only the test data of the mode was recorded in this report.	

4. WLAN/BT coexistence mode:
   - ◆ 1x1 WLAN + BT:
     - ➢ 5GHz 802.11a/an (or 11ac) transmit concurrent with BT.
     - ➢ 2.4GHz: timely shared coexistence.
5. Spurious Emission (conducted & radiated emission) of the simultaneous operation (WiFi <5GHz> & Bluetooth) have been evaluated and no non-compliance found. The detail combinations of transmitters / frequencies / modes as below table

Mode	Available Channel	Tested Channel	Modulation Technology
5 GHz (802.11a) + Bluetooth (GFSK)	36 to 140	36	OFDM
	0 to 78	78	FHSS

6. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Antenna

The antenna gain was declared by client; please refer to the following table:

Ant. No.	Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
1	Main	WNC	81-EBJ15.005	PIFA	3.00	Band 1&2: 2.56	1.15	Band 1&2: 1.70	IPEX	300
						Band 3: 4.76		Band 3: 1.74		
						Band 4: 4.76		Band 4: 1.79		
	Aux	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08	1.15	Band 1&2: 1.70	IPEX	300
						Band 3: 3.31		Band 3: 1.74		
						Band 4: 2.42		Band 4: 1.79		
2	Main	WNC	81.ED415.001	PIFA	0.22	Band 1&2: 5.56	0.96	Band 1&2: 1.29	IPEX	300
						Band 3: 5.03		Band 3: 1.36		
						Band 4: 3.14		Band 4: 1.38		
	Aux	WNC	81.ED415.001	PIFA	1.48	Band 1&2: 5.17	0.96	Band 1&2: 1.29	IPEX	300
						Band 3: 5.34		Band 3: 1.36		
						Band 4: 2.93		Band 4: 1.38		

Note: 1. Above antenna gains of antenna are Total (H+V).

3.3 Description of Test Modes

79 channels are provided for BT-EDR mode:

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

3.3.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to											Description
	ROP	DC/TS/TG	ATT/FO/HS	HFS	MU	AD	OCB	EOB	SE< 1G	SE≥ 1G	RB	
-	√	-	√	√	-	-	√	√	√	√	-	-

Where **ROP:** RF Output Power

DC/TS/TG: Duty Cycle/ Tx-Sequence / Tx-gap

ATT/MFO/HS: Accumulated Transmit Time / Frequency Occupation/ Hopping Sequence

HFS: Hopping Frequency Separation

MU: Medium Utilisation

AD: Adaptivity (Channel Access Mechanism)

OCB: Occupied Channel Bandwidth

EOB: Transmitter r unwanted emissioin in the out-of-band domain

SE<1G: Spurious Emissions below 1GHz

SE≥1G: Spurious Emissions above 1GHz

RB: Receiver Blocking

RF Output Power:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet type, data rates and antenna ports (if EUT with antenna diversity architecture).

Available Channel	Tested Channel	Modulation Type	Packet Type
0 to 78	Hopping mode	GFSK	DH5
0 to 78	Hopping mode	8DPSK	3DH5

Accumulated Transmit Time / Frequency Occupation / Hopping Sequence:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet type, data rates and antenna ports (if EUT with antenna diversity architecture).

Available Channel	Tested Channel	Modulation Type	Packet Type
0 to 78	Hopping mode	GFSK	DH1, DH3, DH5
0 to 78	Hopping mode	8DPSK	3DH1, 3DH3, 3DH5

Hopping Frequency Separation:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet type, data rates and antenna ports (if EUT with antenna diversity architecture).

Available Channel	Tested Channel	Modulation Type	Packet Type
0 to 78	0, 78	GFSK	DH5
0 to 78	0, 78	8DPSK	3DH5

Occupied Channel Bandwidth:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet type, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type	Packet Type
0 to 78	0, 78	GFSK	DH5
0 to 78	0, 78	8DPSK	3DH5

Transmitter unwanted emissioin in the out-of-band domain:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet type, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type	Packet Type
0 to 78	0, 78	GFSK	DH5
0 to 78	0, 78	8DPSK	3DH5

Spurious Emissions Test (Below 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet type, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type	Packet Type
0 to 78	78	GFSK	DH5
0 to 78 Receiver	78	-	-

Spurious Emissions Test (Above 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, packet type, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type	Packet Type
0 to 78	0, 78	GFSK	DH5
0 to 78 Receiver	0, 78	-	-

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
ROP	25deg. C, 60%RH	230Vac, 50Hz	Chiashiang Lin
DT/MFO/HS	25deg. C, 60%RH	230Vac, 50Hz	Chiashiang Lin
HFS	25deg. C, 60%RH	230Vac, 50Hz	Chiashiang Lin
OCB	25deg. C, 60%RH	230Vac, 50Hz	Chiashiang Lin
EOB	25deg. C, 60%RH	230Vac, 50Hz	Chiashiang Lin
SE<1G	22deg. C, 65%RH	230Vac, 50Hz	Louis Tseng
SE≥1G	22deg. C, 65%RH	230Vac, 50Hz	Louis Tseng

3.4 Description of Support Units

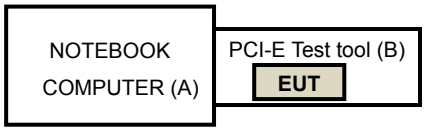
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	NOTEBOOK COMPUTER	DELL	E5430	GM1SKV1	FCC DoC	Provided by Lab
B	PCI-E Test tool	Qualcomm Atheros	NA	NA	NA	Supplied by Client

NOTE:

1. All power cords of the above support units are non-shielded (1.8 m).

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

EN 300 328 V1.9.1 (2015-02)

All test items have been performed and recorded as per the above standard.

4 Test Procedure and Results

Transmitter Parameters

4.1 RF Output Power

4.1.1 Limits of RF Output Power

Condition	Frequency Band	Limit (e.i.r.p)
Under all test conditions	2400 ~ 2483.5 MHz	AV: 20dBm

4.1.2 Test Procedures

Refer to chapter 5.3.2.2 of EN 300 328 V1.9.1.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement

4.1.3 Deviation from Test Standard

No deviation.

4.1.4 Test Setup

The measurements for RF output power was performed at both normal environmental conditions and at the extremes of the operating temperature. Controlling software (QRCT-CONN) has been activated to set the EUT on specific channel and power level.

4.1.5 Test Results

TEST CONDITION			EIRP POWER (dBm)
GFSK			
Tnom(℃)	25	Vnom(v)	8.12
Tmin(℃)	-10	Vnom(v)	8.34
Tmax(℃)	70	Vnom(v)	7.94
8DPSK			
Tnom(℃)	25	Vnom(v)	8.03
Tmin(℃)	-10	Vnom(v)	8.23
Tmax(℃)	70	Vnom(v)	7.83

4.2 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

4.2.1 Limits of Dwell time, Minimum Frequency Occupation and Hopping Sequence

Accumulated Transmit Time	
Condition	**Limit**
☐Non-adaptive frequency hopping systems	≤ 15 ms
☒Adaptive frequency hopping systems	≤ 400 ms

Frequency Occupation	
Condition	**Limit**
☐Non-adaptive frequency hopping systems	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	

hopping Sequence(s)	
Condition	**Limit**
☐Non-adaptive frequency hopping systems	≥15 hopping frequencies or 15/minimum Hopping Frequency Separation in MHz , whichever is the greater.
☒Adaptive frequency hopping systems	Operating frequency band ≥58.45MHz (Operating over a minimum of 70 % of the operating in the band 2,4 GHz to 2,4835 GHz)
	≥15 hopping frequencies or 15/minimum Hopping Frequency Separation in MHz, whichever is the greater.

4.2.2 Test Procedure

Refer to chapter 5.3.4.2 of EN 300 328 V1.9.1.

Measurement	
☒Conducted measurement	☐ Radiated measurement

4.2.3 Deviation from Test Standard

No deviation

4.2.4 Test Setup

The measurements only were performed at normal test conditions. The equipment was configured to operate at its maximum Dwell Time and maximum Duty Cycle. The measurement was performed on a minimum of 2 hopping frequencies chosen arbitrary from the actual hopping sequence. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. Controlling software (QRCT-CONN) has been activated to set the EUT on specific status.

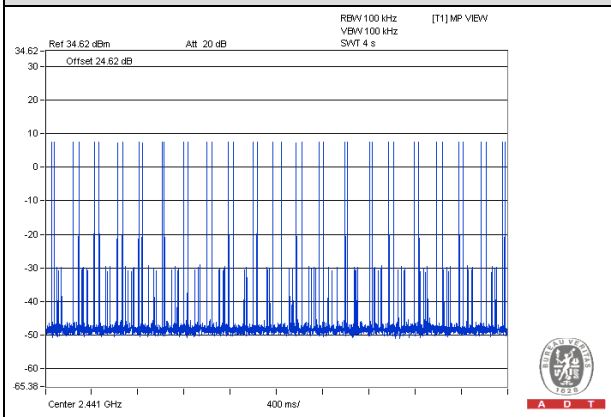
4.2.5 Test Results

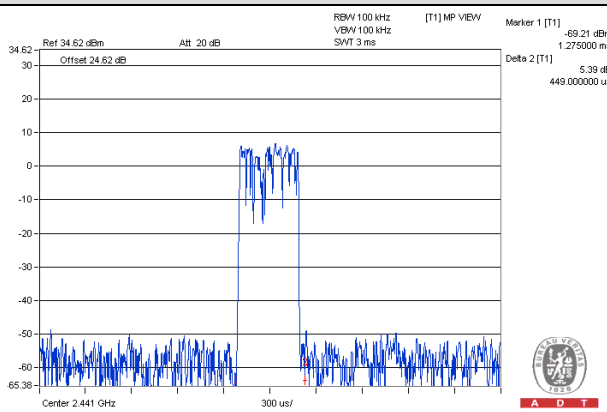
GFSK

DWELL TIME									
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (ms)	Result (ms)	Limit (ms)	PASS / FAIL
		period (Sec)	sweep time (Sec)	times in a sweep	times in a period				
DH1	79	31.6	4	42	331.8	0.449	148.9782	400	PASS
DH3	79	31.6	4	21	165.9	1.688	280.0392	400	PASS
DH5	79	31.6	4	12	94.8	2.962	280.7976	400	PASS

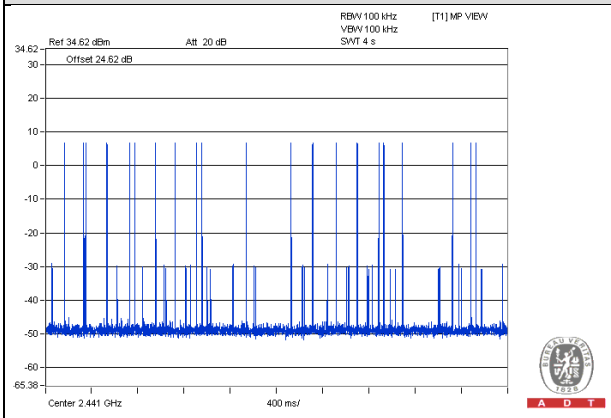
NOTE: Test plots of the transmitting time slot are shown as below.

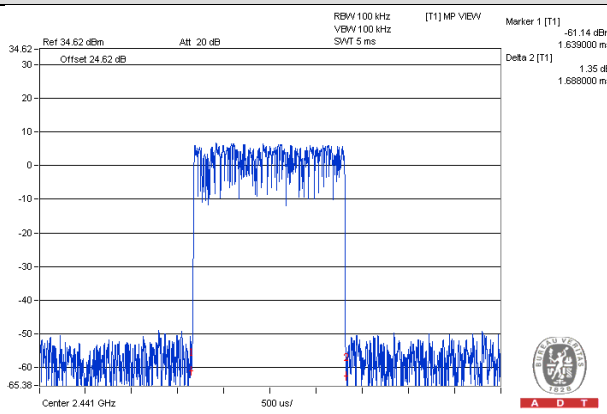
DH1


RBW 100 kHz
VBW 100 kHz
SWT 4 s
[T1] MP VIEW
Ref 34.62 dBm
Att 20 dB
Offset 24.62 dB
34.62
65.38
Center 2.441 GHz
400 ms/

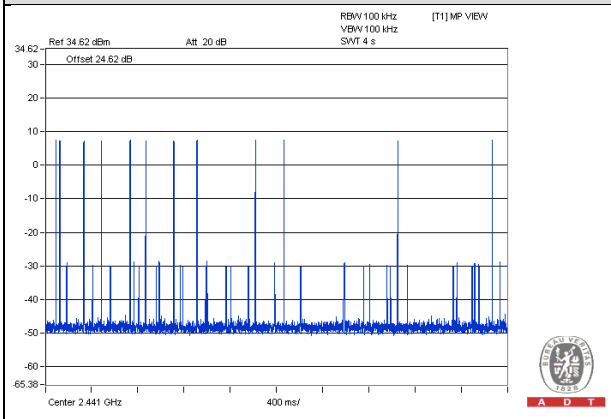

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MP VIEW
Ref 34.62 dBm
Att 20 dB
Offset 24.62 dB
Marker 1 [T1]
-69.21 dBm
1.275000 ms
Delta 2 [T1]
5.39 dB
449.000000 us
34.62
65.38
Center 2.441 GHz
300 us/

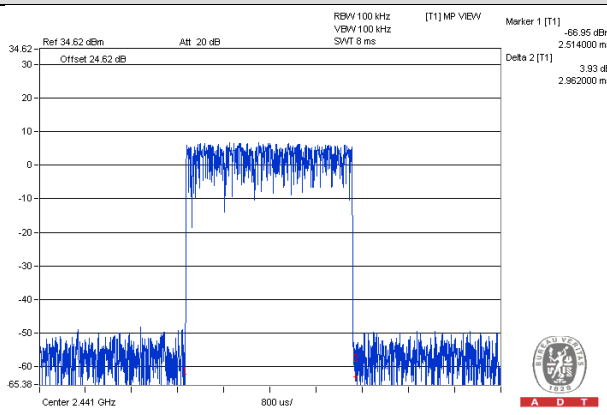
DH3


RBW 100 kHz
VBW 100 kHz
SWT 4 s
[T1] MP VIEW
Ref 34.62 dBm
Att 20 dB
Offset 24.62 dB
34.62
65.38
Center 2.441 GHz
400 ms/


RBW 100 kHz
VBW 100 kHz
SWT 5 ms
[T1] MP VIEW
Ref 34.62 dBm
Att 20 dB
Offset 24.62 dB
Marker 1 [T1]
-61.14 dBm
1.639000 ms
Delta 2 [T1]
1.35 dB
1.688000 ms
34.62
65.38
Center 2.441 GHz
500 us/

DH5


RBW 100 kHz
VBW 100 kHz
SWT 4 s
[T1] MP VIEW
Ref 34.62 dBm
Att 20 dB
Offset 24.62 dB
34.62
65.38
Center 2.441 GHz
400 ms/

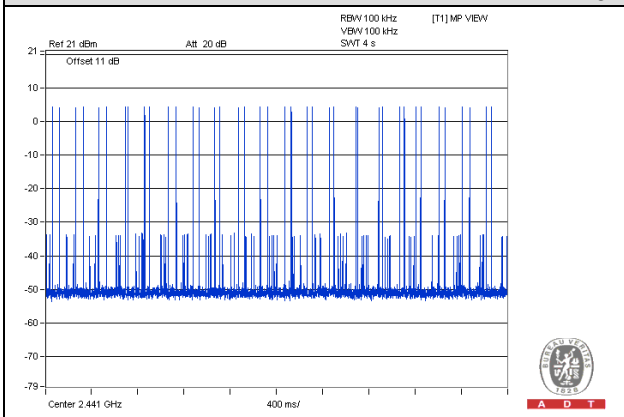

RBW 100 kHz
VBW 100 kHz
SWT 8 ms
[T1] MP VIEW
Ref 34.62 dBm
Att 20 dB
Offset 24.62 dB
Marker 1 [T1]
-66.95 dBm
2.514000 ms
Delta 2 [T1]
3.93 dB
2.962000 ms
34.62
65.38
Center 2.441 GHz
800 us/

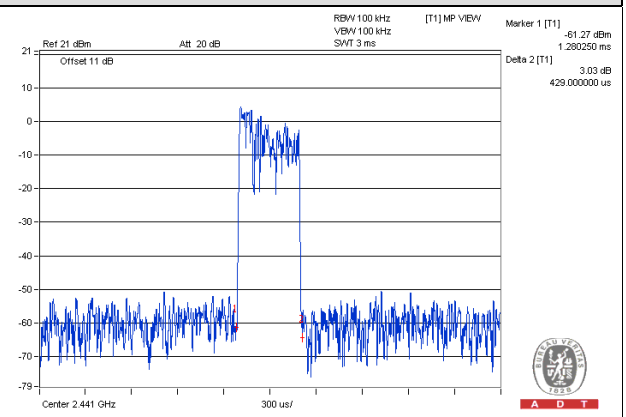
8DPSK

DWELL TIME									
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (ms)	Result (ms)	Limit (ms)	PASS / FAIL
		period (Sec)	sweep time (Sec)	times in a sweep	times in a period				
3DH1	79	31.6	4	40	316	0.429	135.564	400	PASS
3DH3	79	31.6	4	21	165.9	1.673	277.5507	400	PASS
3DH5	79	31.6	4	12	94.8	2.936	278.3328	400	PASS

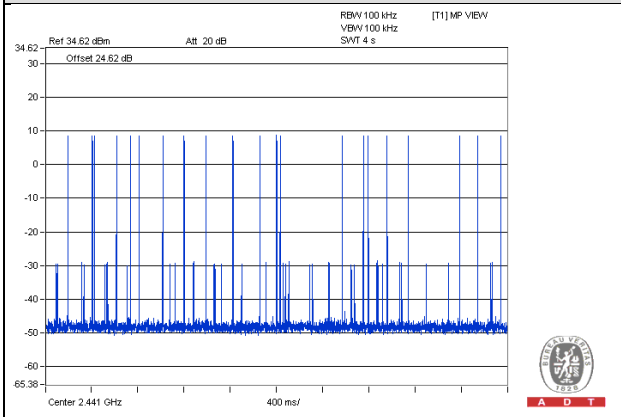
NOTE: Test plots of the transmitting time slot are shown as below.

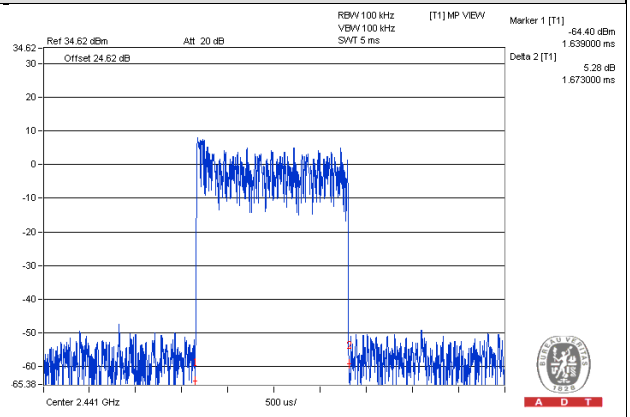
3DH1



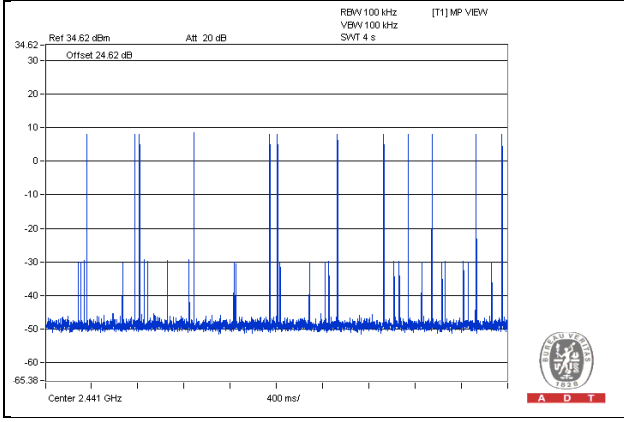


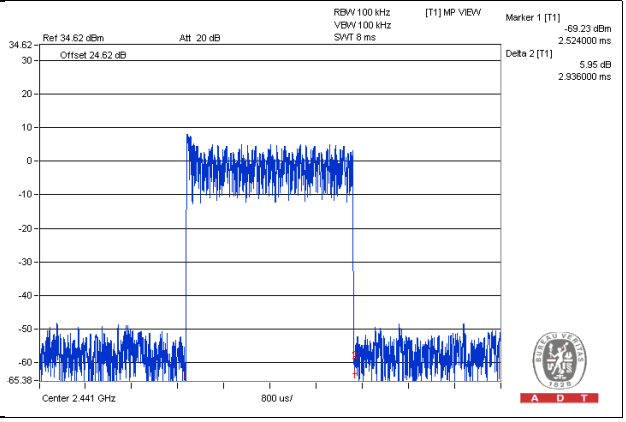
3DH3





3DH5

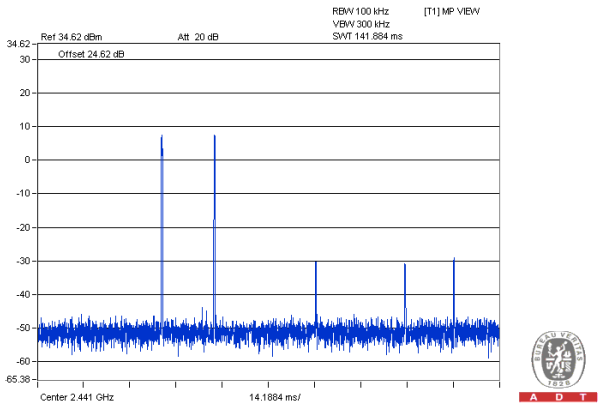




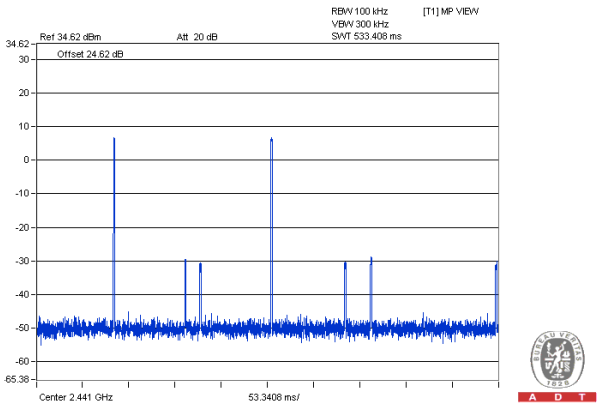
GFSK

MINIMUM FREQUENCY OCCUPATION TIME					
Number of Hopping Channel	Number of transmission in a period of 4 * Dwell time * number of hopping channel	Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
79	2	0.449	0.898	0.449	PASS
79	2	1.688	3.376	1.688	PASS
79	3	2.962	8.886	2.962	PASS

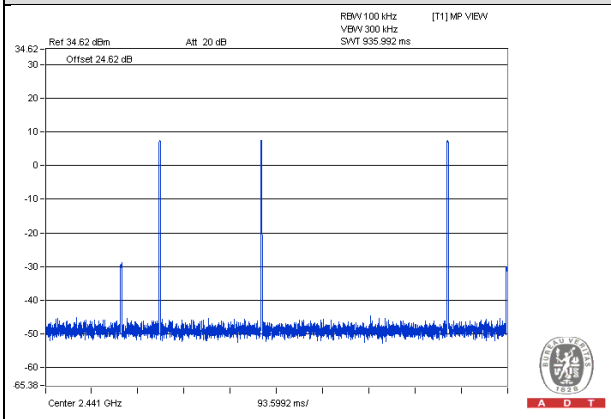
DH1



DH3



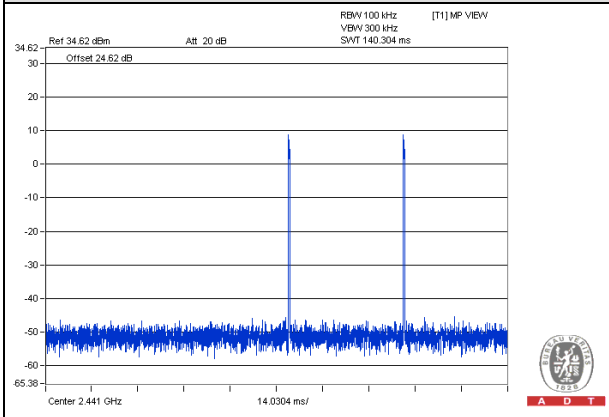
DH5



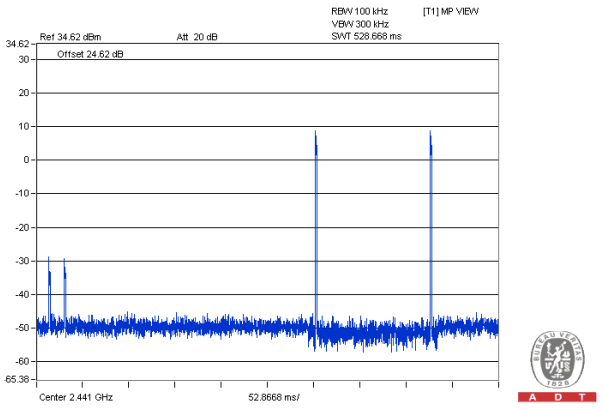
8DPSK

MINIMUM FREQUENCY OCCUPATION TIME					
Number of Hopping Channel	Number of transmission in a period of 4 * Dwell time * number of hopping channel	Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
79	2	0.429	0.858	0.429	PASS
79	2	1.673	3.346	1.673	PASS
79	1	2.936	2.936	2.936	PASS

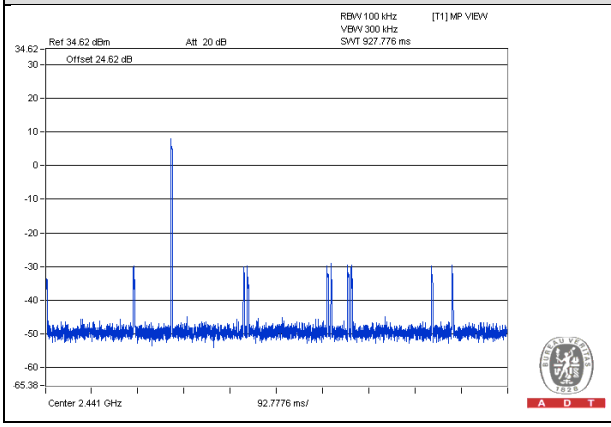
3DH1



3DH3



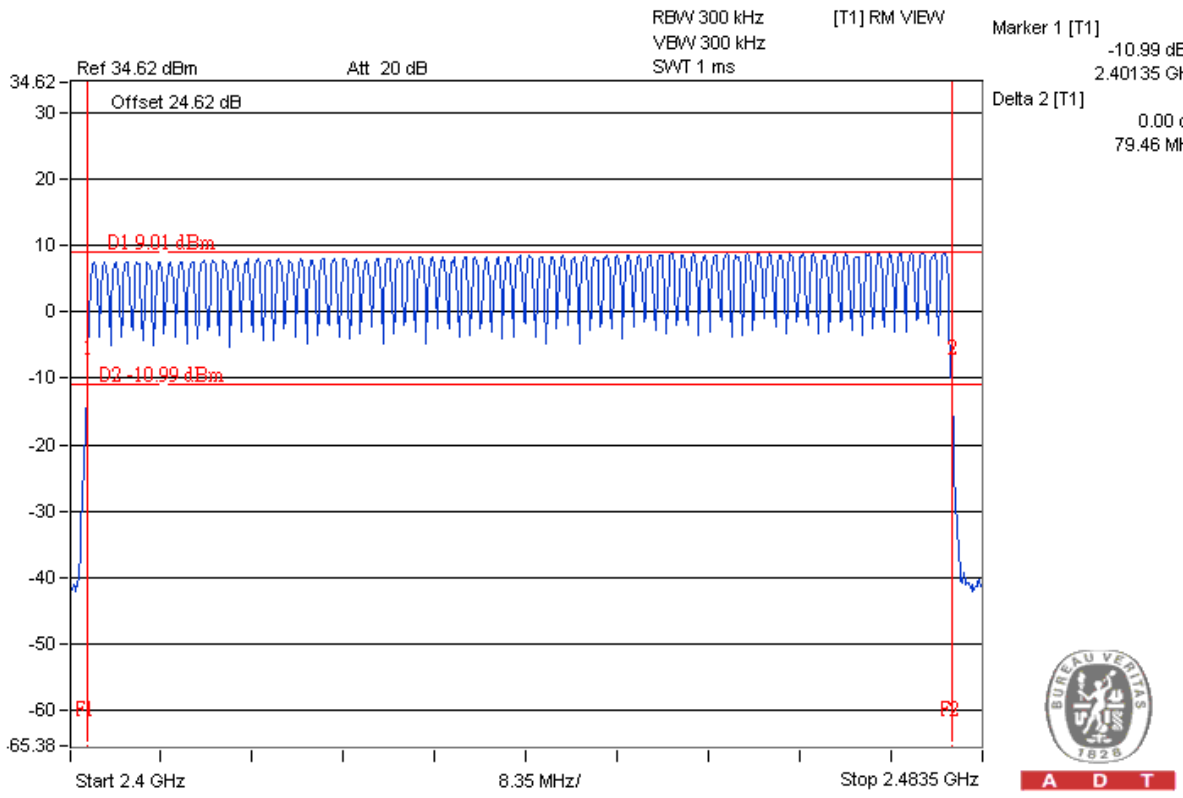
3DH5



GFSK

HOPPING SEQUENCE(S)			
Mode	**Amount of Hopping frequency**	**Limit**	**PASS/FAIL**
DH5	79	≥15 hopping frequencies	PASS
Mode	**Operating hopping Bandwidth (MHz)**	**Limit**	**PASS/FAIL**
DH5	79.46	≥58.45MHz	PASS

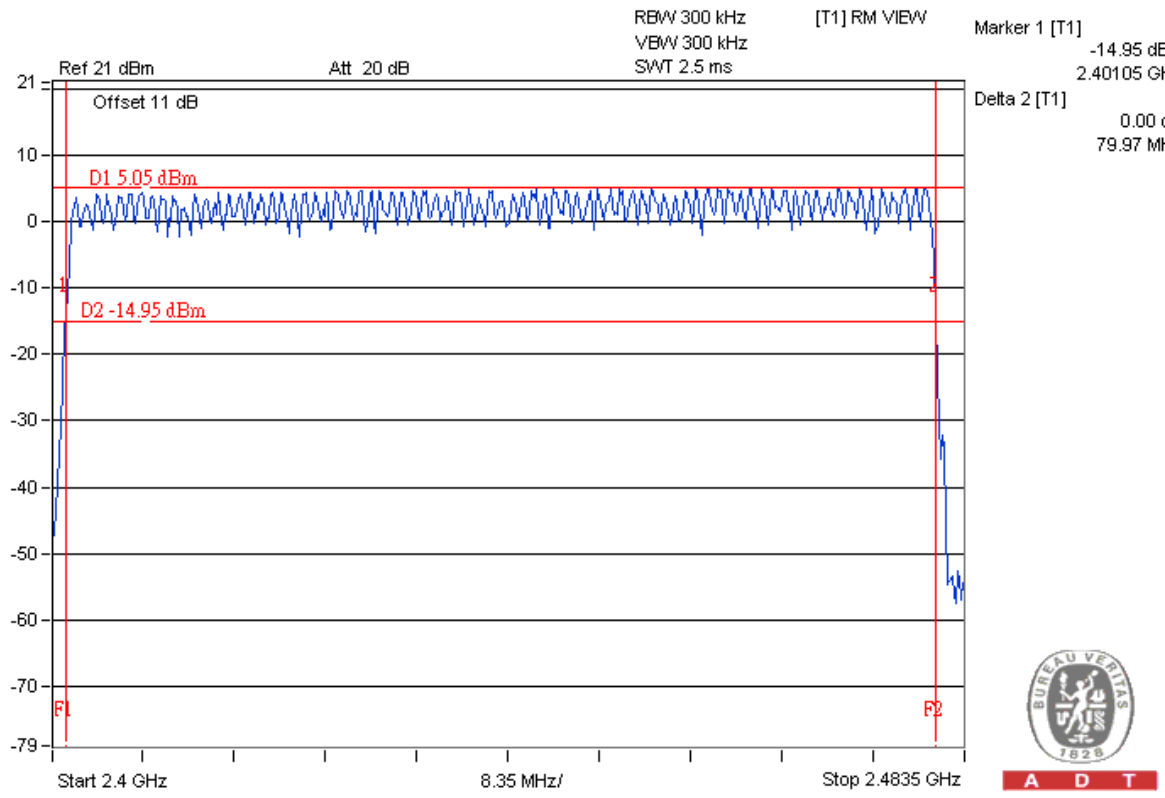
DH5



8DPSK

HOPPING SEQUENCE(S)			
Mode	**Amount of Hopping frequency**	**Limit**	**PASS/FAIL**
3DH5	79	≥15 hopping frequencies	PASS
Mode	**Operating hopping Bandwidth (MHz)**	**Limit**	**PASS/FAIL**
3DH5	79.97	≥58.45MHz	PASS

3DH5



4.3 Hopping Frequency Separation

4.3.1 Limits of Hopping Frequency Separation

Condition	Limit
☐Non-adaptive frequency hopping systems	The minimum Hopping Frequency Separation shall be equal to Occupied Channel Bandwidth of a single hop, with a minimum separation of 100 kHz.
☒Adaptive frequency hopping systems	The minimum Hopping Frequency Separation shall be 100 kHz.

4.3.2 Test Procedure

Refer to chapter 5.3.5.2 of EN 300 328 V1.9.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

4.3.3 Deviation from Test Standard

No deviation

4.3.4 Test Setup

The measurements were performed at normal test conditions. The measurement was performed on 2 adjacent hopping frequencies. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. Controlling software (QRCT-CONN) has been activated to set the EUT on specific status.

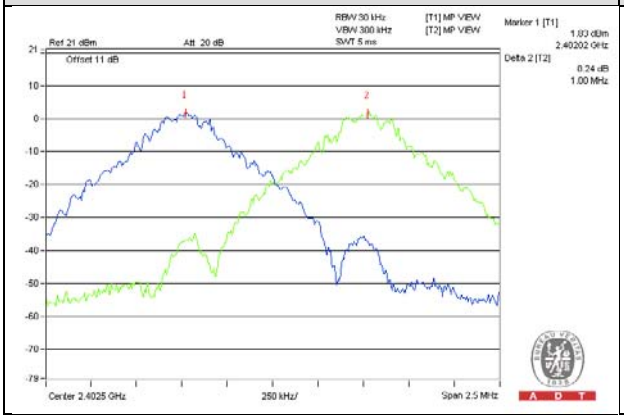
4.3.5 Test Results

GFSK

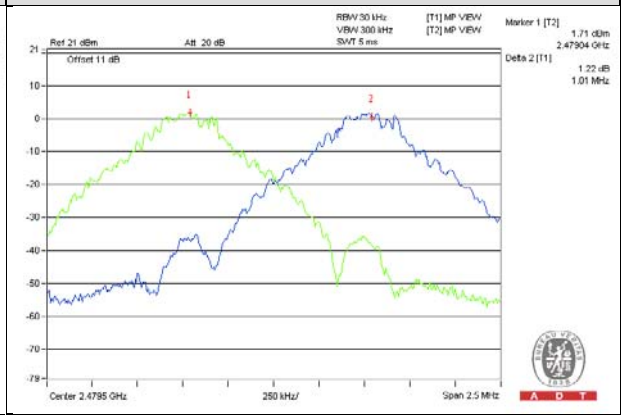
Channel Number	Freq. (MHz)	Channel Separation (MHz)	LIMIT(MHz)	PASS /FAIL
			Minimum	
0	2402	1	0.1	PASS
78	2480	1.01	0.1	PASS

Note: The limitation is from OCB of a single hop and this value must greater and equal to 100kHz.

CH0



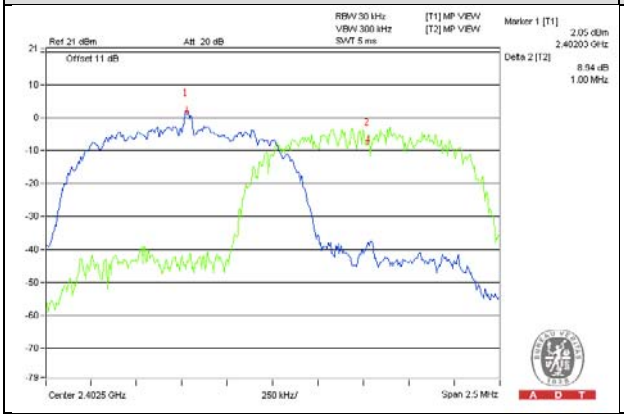
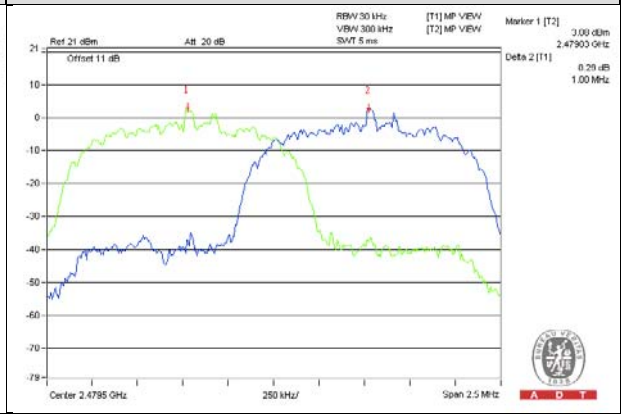
CH78



8DPSK:

Channel Number	Frequency (MHz)	Channel Separation (MHz)	Minimum Limit (MHz)	Pass /Fail
0	2402	1	0.1	PASS
78	2480	1	0.1	PASS

Note: The limitation is from OCB of a single hop and this value must greater and equal to 100kHz.

CH0	CH78
	

4.4 Occupied Channel Bandwidth

4.4.1 Limit of Occupied Channel Bandwidth

Condition		Limit
All types of equipment		Shall fall completely within the band 2400 to 2483.5 MHz.
Additional requirement	For non-adaptive using wide band modulations other than FHSS system and e.i.r.p >10dBm.	Less than 20MHz
	For non-adaptive Frequency Hopping system and e.i.r.p >10dBm.	Less than 5MHz

4.4.2 Test Procedure

Refer to chapter 5.3.8.2 of EN 300 328 V1.9.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

4.4.3 Deviation from Test Standard

No deviation.

4.4.4 Test Setup

These measurements only were performed at normal test conditions. The measurement shall be performed only on the lowest and the highest frequency within the stated frequency range. Using software to force the EUT to hop or transmit on a single Hopping Frequency. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. Controlling software (QRCT-CONN) has been activated to set the EUT on specific status.

4.4.5 Test Results

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	MEASURED FREQUENCIES		LIMIT	PASS/FAIL
			FL (MHz)	FH (MHz)		
0	2402	0.9	2401.56	2402.46	FL > 2400 MHz and FH < 2483.5 MHz	PASS
78	2480	0.9	2479.56	2480.46		PASS

Note : FL is the lowest frequency of the 99% occupied bandwidth of power envelope.

FH is the highest frequency of the 99% occupied bandwidth of power envelope.

8DPSK

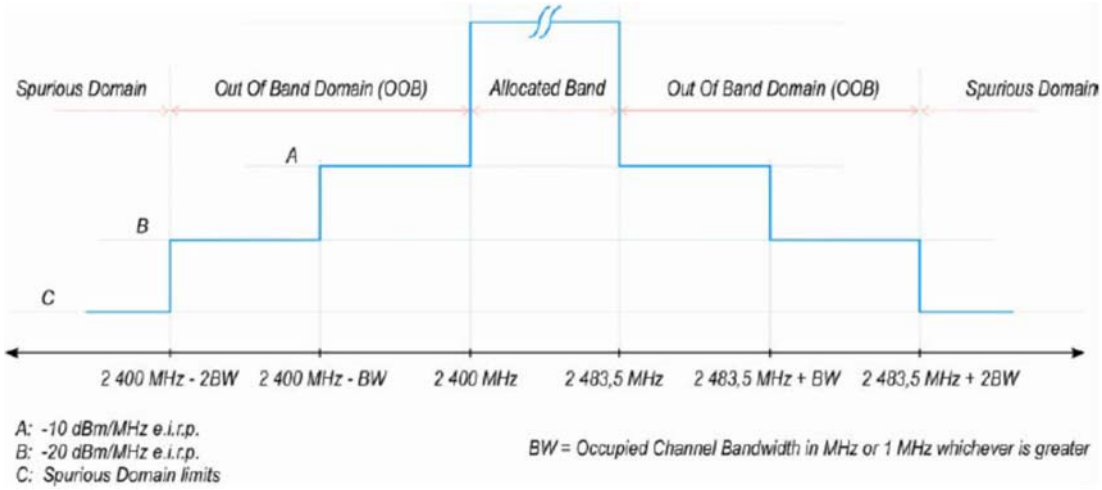
CHANNEL	CHANNEL FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	MEASURED FREQUENCIES		LIMIT	PASS/FAIL
			FL (MHz)	FH (MHz)		
0	2402	1.2	2401.41	2402.61	FL > 2400 MHz and FH < 2483.5 MHz	PASS
78	2480	1.2	2479.41	2480.61		PASS

Note: FL is the lowest frequency of the 99% occupied bandwidth of power envelope.
FH is the highest frequency of the 99% occupied bandwidth of power envelope.

4.5 Transmitter Unwanted Emissions in the Out-of-Band Domain

4.5.1 Limits of Transmitter Unwanted Emission in the Out-of-Band Domain

Condition	Limit
Under normal conditions	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 below figure.



4.5.2 Test Procedure

Refer to chapter 5.3.9.2 of EN 300 328 V1.9.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement

4.5.3 Deviation from Test Standard

No deviation

4.5.4 Test Setup

The measurements were performed at normal environmental conditions. The equipment was performed normal operation (hopping) during test. The equipment was configured to operate under its worst case situation with respect to output power. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. The frequency has to be recorded for the right and left end above threshold of highest and lowest channel respectively.

4.5.5 Test Results

GFSK:

Channel Frequency		2402MHz				2480MHz			
Test Condition		OOB Emission (MHz)				OOB Emission (MHz)			
		2399 ~ 2400		2398 ~ 2399		2483.5 ~ 2484.5		2484.5 ~ 2485.5	
		Freq. (MHz)	Power (dBm/ MHz)	Freq. (MHz)	Power (dBm/ MHz)	Freq. (MHz)	Power (dBm/ MHz)	Freq. (MHz)	Power (dBm/ MHz)
Tnom 25℃	Vnom(v)	2399.50	-43.00	2398.50	-45.35	2484.00	-44.68	2485.00	-45.40
Power Limit (dBm/MHz)		-10.00		-20.00		-10.00		-20.00	
Pass/Fail		Pass		Pass		Pass		Pass	

8DPSK:

Channel Frequency		2402MHz				2480MHz			
Test Condition		OOB Emission (MHz)				OOB Emission (MHz)			
		2398.8 ~ 2400		2397.6 ~ 2398.8		2483.5 ~ 2484.7		2484.7 ~ 2485.9	
		Freq. (MHz)	Power (dBm/ MHz)	Freq. (MHz)	Power (dBm/ MHz)	Freq. (MHz)	Power (dBm/ MHz)	Freq. (MHz)	Power (dBm/ MHz)
Tnom 25℃	Vnom(v)	2399.50	-38.97	2398.30	-45.26	2484.00	-44.71	2485.20	-45.47
Power Limit (dBm/MHz)		-10.00		2399.50		-33.14		2398.29	
Pass/Fail		Pass		Pass		Pass		Pass	

4.6 Transmitter Spurious Emissions

4.6.1 Limits of Transmitter Spurious Emissions

Frequency Range	Maximum Power Limit (e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz))	Bandwidth
30 MHz to 47 MHz	-36dBm	100kHz
47 MHz to 74 MHz	-54dBm	100kHz
74 MHz to 87,5 MHz	-36dBm	100kHz
87,5 MHz to 118 MHz	-54dBm	100kHz
118 MHz to 174 MHz	-36dBm	100kHz
174 MHz to 230 MHz	-54dBm	100kHz
230 MHz to 470 MHz	-36dBm	100kHz
470 MHz to 862 MHz	-54dBm	100kHz
862 MHz to 1 GHz	-36dBm	100kHz
1GHz ~ 12.75GHz	-30dBm	1MHz

4.6.2 Test Procedure

Refer to chapter 5.3.10.2 of EN 300 328 V1.9.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement
For Conducted measurement: The level of unwanted emissions shall be measured as their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).	

4.6.3 Deviation from Test Standard

No deviation.

4.6.4 Test Setup

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.
3. The equipment was configured to operate under its worst case situation with respect to output power.
4. The test setup has been constructed as the normal use condition. Controlling software (QRCT-CONN) has been activated to set the EUT on specific status.

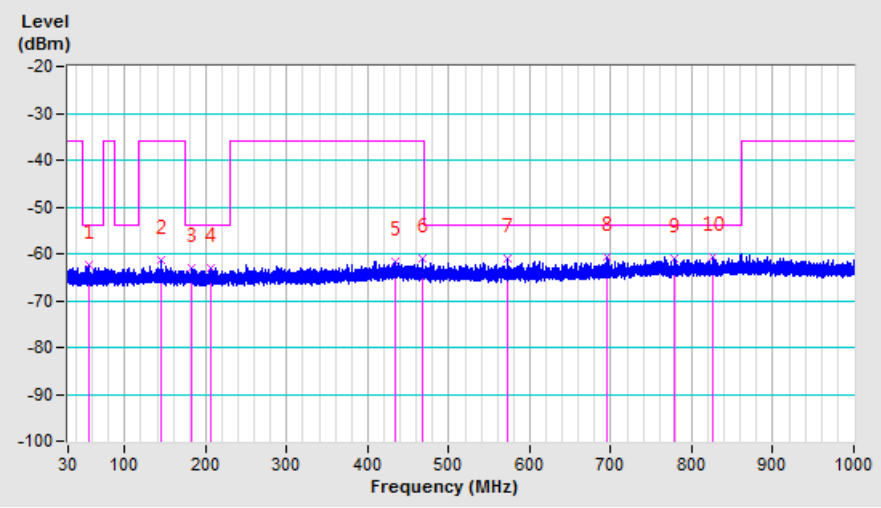
4.6.5 Test Results (Operating - Conducted)

Below 1GHz Worst-Case Data

BT_GFSK

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	78

SPURIOUS EMISSION LEVEL			
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin
55.00	-62.47	-54.00	-8.47
145.66	-61.44	-36.00	-25.44
182.71	-62.95	-54.00	-8.95
206.86	-63.09	-54.00	-9.09
433.32	-61.75	-36.00	-25.75
468.17	-61.11	-36.00	-25.11
572.83	-61.07	-54.00	-7.07
696.08	-60.83	-54.00	-6.83
777.99	-61.04	-54.00	-7.04
825.39	-60.63	-54.00	-6.63
4961.00	-38.41	-36.00	-2.41
7440.00	-44.94	-36.00	-8.94
9920.00	-44.24	-36.00	-8.24

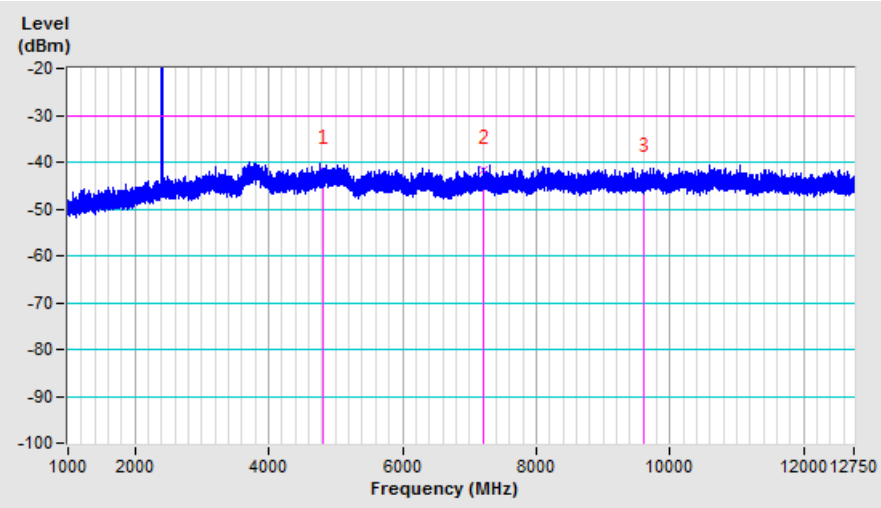


Above 1GHz Worst-Case Data

BT_GFSK

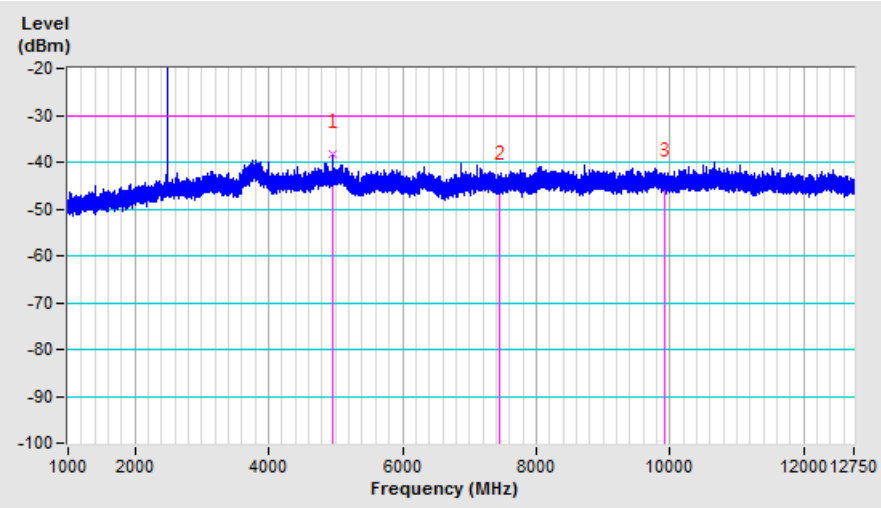
SPURIOUS EMISSION FREQUENCY RANGE	1 GHz ~ 12.75 GHz	OPERATING CHANNEL	0

SPURIOUS EMISSION LEVEL			
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin
4804.00	-41.66	-30.00	-11.66
7206.00	-41.85	-30.00	-11.85
9608.00	-43.34	-30.00	-13.34



SPURIOUS EMISSION FREQUENCY RANGE	1 GHz ~ 12.75 GHz	OPERATING CHANNEL	78

SPURIOUS EMISSION LEVEL			
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin
4961.00	-38.41	-30.00	-8.41
7440.00	-44.94	-30.00	-14.94
9920.00	-44.24	-30.00	-14.24



4.6.6 Test Results (Operating - Radiated)

Below 1GHz Worst-Case Data

BT_GFSK

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	78

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
48.00	H	-70.49	-54.00	-16.49
48.00	V	-68.51	-54.00	-14.51
67.75	H	-62.27	-54.00	-8.27
67.75	V	-65.35	-54.00	-11.35
135.46	H	-61.37	-36.00	-25.37
144.01	H	-63.10	-36.00	-27.10
144.01	V	-64.56	-36.00	-28.56
463.82	V	-69.68	-36.00	-33.68
466.47	H	-68.03	-36.00	-32.03
494.47	V	-72.67	-54.00	-18.67
499.47	H	-66.96	-54.00	-12.96
533.03	H	-75.61	-54.00	-21.61
579.48	V	-72.54	-54.00	-18.54
640.08	V	-69.37	-54.00	-15.37
644.38	H	-72.40	-54.00	-18.40
721.14	V	-71.92	-54.00	-17.92
748.09	H	-70.20	-54.00	-16.20
758.94	V	-69.93	-54.00	-15.93
799.74	V	-65.96	-54.00	-11.96
812.84	H	-68.63	-54.00	-14.63

Above 1GHz Worst-Case Data

BT_GFSK

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 12.75GHz	OPERATING CHANNEL	0, 78

SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
0	4804.00	H	-56.94	-30.00	-26.94
	4804.00	V	-56.03	-30.00	-26.03
	7206.00	H	-52.19	-30.00	-22.19
	7206.00	V	-52.02	-30.00	-22.02
	9608.00	H	-48.66	-30.00	-18.66
	9608.00	V	-47.43	-30.00	-17.43
78	4960.00	H	-56.34	-30.00	-26.34
	4960.00	V	-55.98	-30.00	-25.98
	7440.00	H	-50.87	-30.00	-20.87
	7440.00	V	-49.45	-30.00	-19.45
	9920.00	H	-48.30	-30.00	-18.30
	9920.00	V	-48.77	-30.00	-18.77

Receiver Parameters

4.7 Receiver Spurious Radiation

4.8 Limit of Receiver Spurious Radiation

Frequency Range	Maximum Power Limit (e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz))
30MHz ~ 1GHz	-57dBm
1GHz ~ 12.75GHz	-47dBm

4.8.1 Test Procedure

Refer to chapter 5.3.11.2 of EN 300 328 V1.9.1.

Measurement	
☒ Conducted measurement	☐ Radiated measurement
For Conducted measurement: The level of unwanted emissions shall be measured as their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).	

4.8.2 Deviation from Test Standard

No deviation.

4.8.3 Test Setup

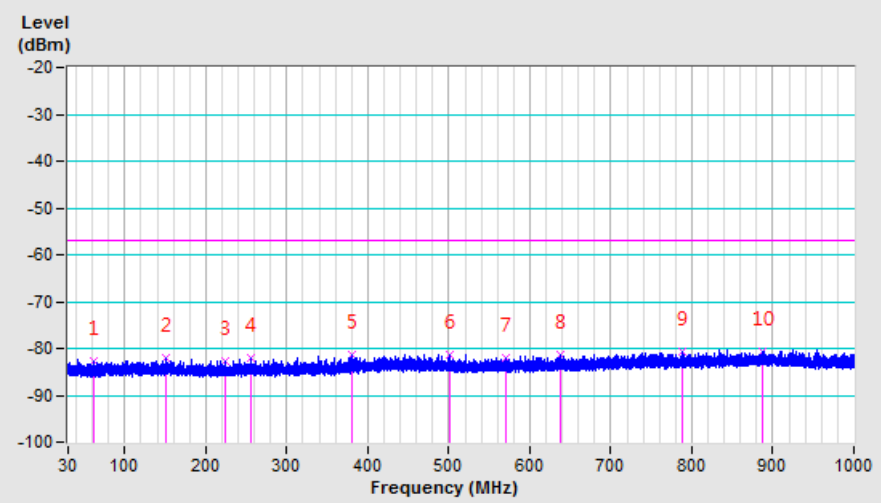
1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. Testing was performed when the equipment was in a receive-only mode.
3. The measurements were performed when normal hopping was disabled. In this case measurements were performed when operating at the lowest and the highest hopping frequency.
4. The test setup has been constructed as the normal use condition. Controlling software (QRCT-CONN) has been activated to set the EUT on specific status.

4.8.4 Test Results (Operating - Conducted)

RX Below 1GHz Worst-Case Data

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	78

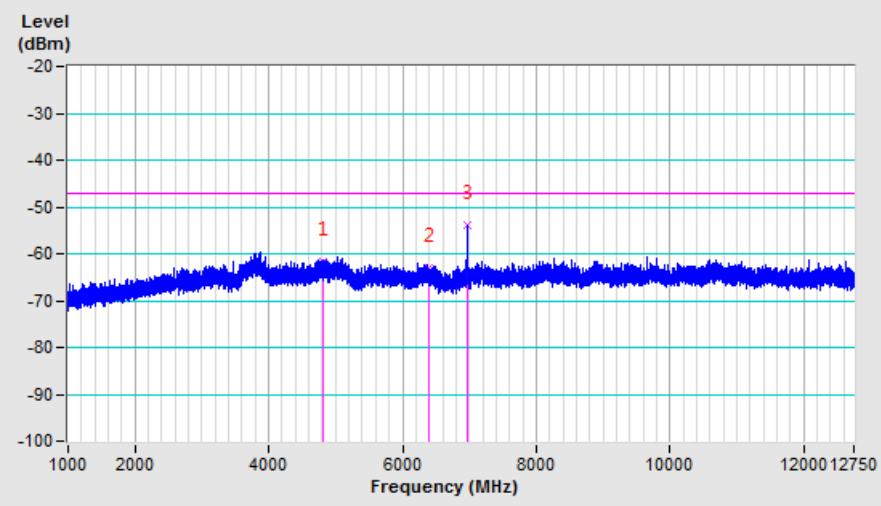
SPURIOUS EMISSION LEVEL			
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin
62.35	-82.73	-57.00	-25.73
151.61	-82.02	-57.00	-25.02
223.66	-82.70	-57.00	-25.70
254.86	-81.97	-57.00	-24.97
381.37	-81.39	-57.00	-24.39
501.97	-81.23	-57.00	-24.23
570.63	-81.98	-57.00	-24.98
638.18	-81.43	-57.00	-24.43
788.09	-80.77	-57.00	-23.77
886.79	-80.53	-57.00	-23.53



RX Above 1GHz Worst-Case Data

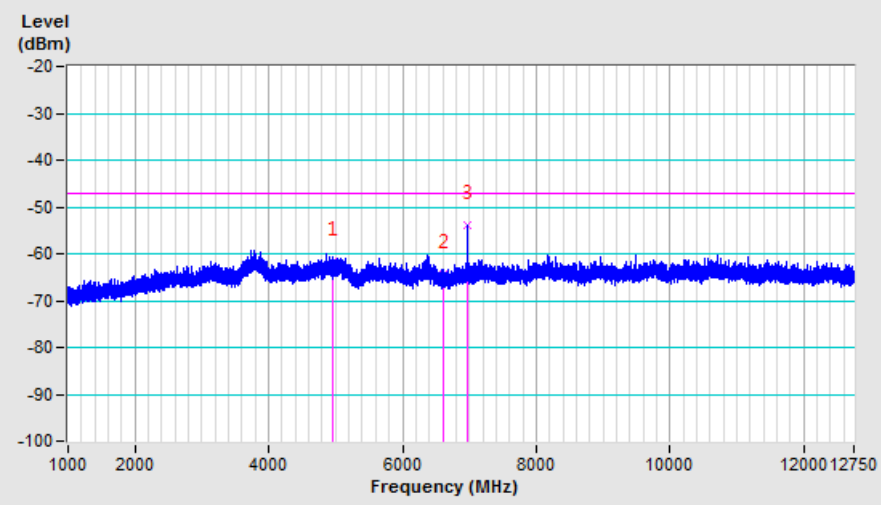
SPURIOUS EMISSION FREQUENCY RANGE	1 GHz ~ 12.75 GHz	OPERATING CHANNEL	0

SPURIOUS EMISSION LEVEL			
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin
4803.99	-61.54	-47.00	-14.54
6405.32	-62.97	-47.00	-15.97
6960.71	-53.93	-47.00	-6.93



SPURIOUS EMISSION FREQUENCY RANGE	1 GHz ~ 12.75 GHz	OPERATING CHANNEL	78

SPURIOUS EMISSION LEVEL			
Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin
4959.99	-61.70	-47.00	-14.70
6613.32	-64.48	-47.00	-17.48
6960.71	-53.83	-47.00	-6.83



4.8.5 Test Results (Operating - Radiated)

RX Below 1GHz Worst-Case Data

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	78

SPURIOUS EMISSION LEVEL				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
48.00	V	-69.17	-57.00	-12.17
67.75	H	-62.48	-57.00	-5.48
67.75	V	-65.84	-57.00	-8.84
135.46	H	-60.87	-57.00	-3.87
144.01	H	-63.33	-57.00	-6.33
338.72	H	-65.61	-57.00	-8.61
373.77	H	-65.62	-57.00	-8.62
443.92	V	-69.80	-57.00	-12.80
466.62	H	-67.43	-57.00	-10.43
480.07	V	-68.98	-57.00	-11.98
529.83	H	-74.52	-57.00	-17.52
560.03	V	-67.80	-57.00	-10.80
572.13	V	-67.03	-57.00	-10.03
586.23	V	-65.25	-57.00	-8.25
615.68	H	-71.49	-57.00	-14.49
699.43	H	-69.85	-57.00	-12.85
708.63	V	-67.35	-57.00	-10.35
747.34	H	-70.68	-57.00	-13.68
758.94	V	-69.15	-57.00	-12.15
842.59	V	-68.32	-57.00	-11.32

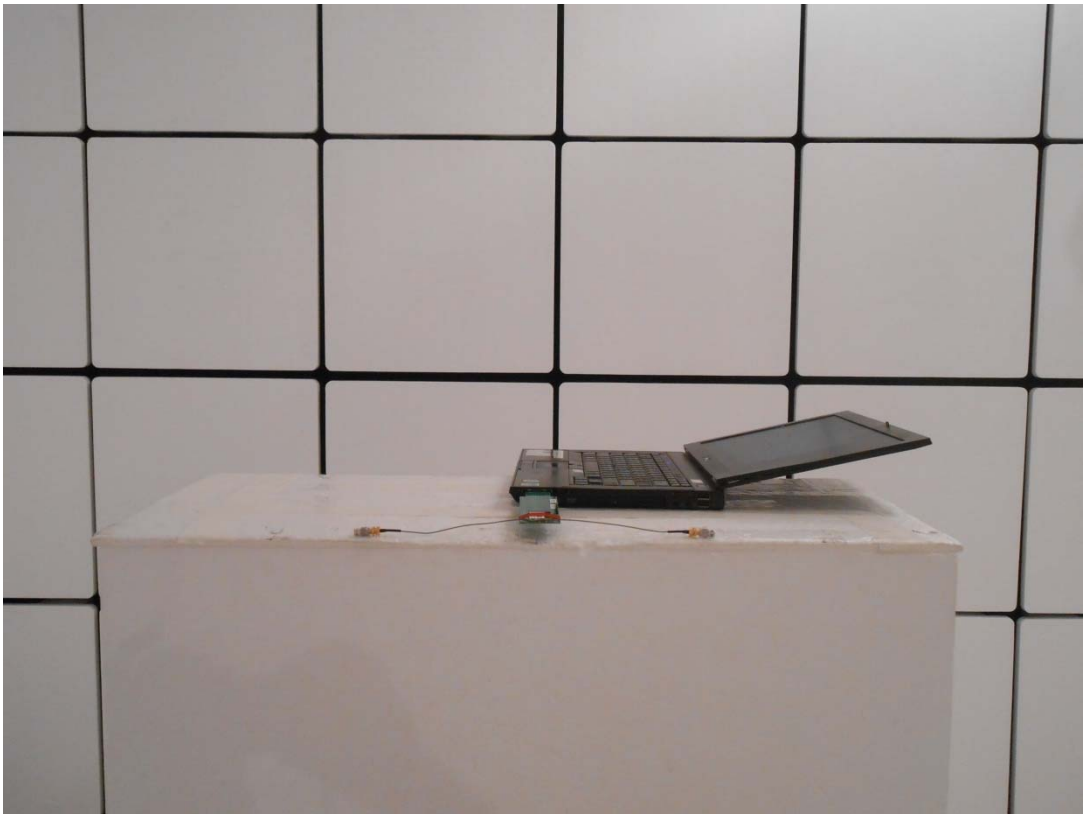
RX Above 1GHz Worst-Case Data

SPURIOUS EMISSION FREQUENCY RANGE	1GHz ~ 12.75GHz	OPERATING CHANNEL	0, 78

SPURIOUS EMISSION LEVEL					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
0	3202.66	H	-59.57	-47.00	-12.57
	3202.66	V	-60.71	-47.00	-13.71
	4803.99	H	-57.78	-47.00	-10.78
	4803.99	V	-56.27	-47.00	-9.27
78	3306.66	H	-61.05	-47.00	-14.05
	3306.66	V	-60.70	-47.00	-13.70
	4959.99	H	-57.30	-47.00	-10.30
	4959.99	V	-57.21	-47.00	-10.21

5 Photographs of the Test Configuration

TX / RX SPURIOUS EMISSION TEST



Appendix - Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
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Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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