EN 300 328 RF Test Report

Report No.:	RE181227C16
Test Model:	AZ1801
Series Model:	CQ-RZ38A0AN, CQ-RZ38A1AN, CQ-RZ38A2AN,CQ-RZ19A0AN, CQ-RZ19A1AN, CQ-RZ39A0AN, CQ-RZ39A1AN, CQ-RZ39A2AN, CQ-RZ1AA0AN, CQ-RZ1AA1AN, CQ-RZ1AA2AN (Refer to item 3.1 for more detail)
Received Date:	Dec. 27, 2018
Test Date:	Jan. 10 ~ Jan. 12, 2019
Issued Date:	Jan. 17, 2019
Applicant:	Panasonic India Pvt Ltd.
Address:	Plot No.1, State Highway 15, 15A, Village Bid Dadri, Jhajjar-124103 Haryana, India
Manufacture:	Panasonic India Pvt Ltd.
Manufacture's address:	Plot No.1, State Highway 15, 15A, Village Bid Dadri, Jhajjar-124103 Haryana, India
Factory:	Panasonic India Pvt Ltd.
Factory's address:	Plot No.1, State Highway 15, 15A, Village Bid Dadri, Jhajjar-124103 Haryana, India
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

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Release Control Record

Issue No.	Description	Date Issued
RE181227C16	Original release.	Jan. 17, 2019

1 Certificate of Conformity

Product:	Car Audio
Brand:	Panasonic
Test Model:	AZ1801
Series Model:	CQ-RZ38A0AN, CQ-RZ38A1AN, CQ-RZ38A2AN,CQ-RZ19A0AN, CQ-RZ19A1AN, CQ-RZ39A0AN, CQ-RZ39A1AN, CQ-RZ39A2AN, CQ-RZ1AA0AN, CQ-RZ1AA1AN, CQ-RZ1AA2AN (Refer to item 3.1 for more detail)
Sample Status:	Engineering sample
Applicant:	Panasonic India Pvt Ltd.
Test Date:	Jan. 10 ~ Jan. 12, 2019
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 RF characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Jan. 17, 2019

Polly Chien / Specialist

Approved by : _____ , **Date:** Jan. 17, 2019

Bruce Chen / Project Engineer

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
4.3.1.2	RF Output Power	Pass
4.3.1.3	Duty cycle, Tx-sequence, Tx-gap (Only for non-Adaptive equipment)	Not Applicable
4.3.1.4	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence (Only for FHSS equipment)	Pass
4.3.1.5	Hopping Frequency Separation (Only for FHSS equipment)	Pass
4.3.1.6	Medium Utilisation (Only for non-Adaptive Equipment)	Not Applicable
4.3.1.7	Adaptivity (Adaptive Equipment)	Not Applicable (Note)
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
4.3.1.11	Receiver Spurious Emissions	Pass
4.3.1.12	Receiver Blocking	Pass
4.3.1.13	Geo-location capability (Only for equipment with geo-location capability)	Not Applicable

Note: 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

Description & Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Spectrum Analyzer Agilent	N9030A	MY54490561	Aug. 01, 2018	Jul. 31, 2019
Spectrum Analyzer Rohde & Schwarz	FSV40	100980	Apr. 17, 2018	Apr. 16, 2019
MIMO Powermeasurement Test set (4X4) KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 17, 2018	Jul. 16, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-158	Nov. 26, 2018	Nov. 25, 2019
HORN Antenna ETS	3117	00034128	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna TESEQ	HLA 6121	45745	Jun. 14, 2018	Jun. 13, 2019
Preamplifier Agilent	8449B	3008A01963	Aug. 21, 2018	Aug. 20, 2019
Preamplifier Agilent	8447D	2944A10627	Aug. 21, 2018	Aug. 20, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-RF1-03 (223650/4)	Aug. 21, 2018	Aug. 20, 2019
RF signal cable INFINET	CA3501-3501-G.90 (3m) & CA3501-3501-F.90 (2m)	INF090 (3m)*2 & TCF427S (2m)*1	Aug. 21, 2018	Aug. 20, 2019
Software ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-440H	9707	NA	NA
Turn Table ADT	NA	SN40303	NA	NA
Controller Max-Full	MF-7802	MF7802093	NA	NA
Temperature & Humidity chamber TERCHY	MHU-225AU	920842	Jun. 01, 2018	May 31, 2019

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa RF Chamber 1.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.

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	±1.229x10^{-6} %
RF output power, conducted	±1.371 dB
Power Spectral Density, conducted	±2.889 dB
Unwanted Emissions, conducted	±1.34 dB
All emissions, radiated	±3.013 dB
Temperature	±0.23 °C
Supply voltages	±0.3 %
Time	±2.53 %

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 ETR 100 028-1 [4] 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	±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

Product	Car Audio
Brand	Panasonic
Test Model	AZ1801
Series Model	CQ-RZ38A0AN, CQ-RZ38A1AN, CQ-RZ38A2AN,CQ-RZ19A0AN, CQ-RZ19A1AN, CQ-RZ39A0AN, CQ-RZ39A1AN, CQ-RZ39A2AN, CQ-RZ1AA0AN, CQ-RZ1AA1AN, CQ-RZ1AA2AN
Model Difference	For marketing purpose
Sample Status	Engineering sample
Nominal Voltage	12Vdc (Power Supply)
Normal Testing Voltage	12Vdc
Temperature Operating Range	-30~65℃
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	1/2/3Mbps
Operating Frequency	2402~2480MHz
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)	-2.04dBm
Antenna Type	Pattern antenna with -1.8dBi
Antenna Connector	NA
Accessory Device	NA
Cable Supplied	NA

3.2 Description of Test Modes

79 channels are provided to this EUT:

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		

3.2.1 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/FO/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

Note:
1. The antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane.

RF Output Power Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	Hopping mode	FHSS	GFSK	DH5
	0 to 78	Hopping mode	FHSS	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, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	Hopping mode	FHSS	GFSK	DH5
	0 to 78	Hopping mode	FHSS	8DPSK	3DH5

Hopping Frequency Separation:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	Hopping mode	FHSS	GFSK	DH5
	0 to 78	Hopping mode	FHSS	8DPSK	3DH5

Occupied Channel Bandwidth:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 78	FHSS	GFSK	DH5
	0 to 78	0, 78	FHSS	8DPSK	3DH5

Transmitte Unwanted Emissions in the Out-of-band Domain Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 78	FHSS	GFSK	DH5
	0 to 78	0, 78	FHSS	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, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0	FHSS	GFSK	DH5

Spurious Emissions Test (Above 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 78	FHSS	GFSK	DH5
	0 to 78	0, 78	FHSS	8DPSK	3DH5

Receiver Blocking Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 78	FHSS	GFSK	DH5

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
ROP	25 deg. C, 60% RH	12Vdc	Chris Lin
ATT/FO/HS	25 deg. C, 60% RH	12Vdc	Chris Lin
HFS	25 deg. C, 60% RH	12Vdc	Chris Lin
OCB	25 deg. C, 60% RH	12Vdc	Chris Lin
EOB	25 deg. C, 60% RH	12Vdc	Chris Lin
SE<1G	26 deg. C, 66% RH	230Vac, 50Hz (system)	Randy Wu
SE≥1G	26 deg. C, 66% RH	230Vac, 50Hz (system)	Randy Wu
RB	23 deg. C, 62% RH	12Vdc	Nick Hsu

3.3 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.

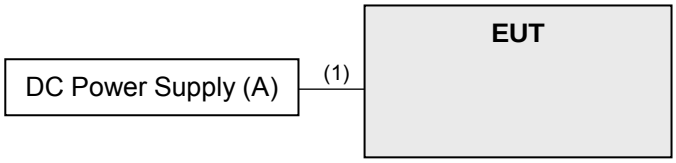
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DC power supply	Keysight	U8002A	MY56330015	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A was placed under the test table.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC cable	1	2	N	0	-

3.3.1 Configuration of System under Test



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 standards:

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

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 5.4.2 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

The measurement was performed at both normal environmental conditions and at the extremes of the operating temperature. This measurement was performed during normal operation (hopping) and operating on all hopping positions. 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. Controlling software (provided by manufacturer) 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)	-2.87
Tmin(℃)	-30	Vnom(v)	-2.06
Tmax(℃)	+65	Vnom(v)	-3.01
8DPSK			
Tnom(℃)	+25	Vnom(v)	-2.88
Tmin(℃)	-30	Vnom(v)	**-2.04**
Tmax(℃)	+65	Vnom(v)	-3.04

4.2 Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

4.2.1 Limits of Accumulated Transmit 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	☒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.
☒Adaptive frequency hopping systems	

Hopping Sequence(s)	
Condition	Limit
☐Non-adaptive frequency hopping systems	≥5 hopping frequencies or 15MHz/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 15MHz/minimum Hopping Frequency Separation in MHz, whichever is the greater.

4.2.2 Test Procedure

Refer to chapter 5.4.4 of EN 300 328 V2.1.1.

Measurement Method	
☒ 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 (provided by manufacturer) has been activated to set the EUT on specific status.

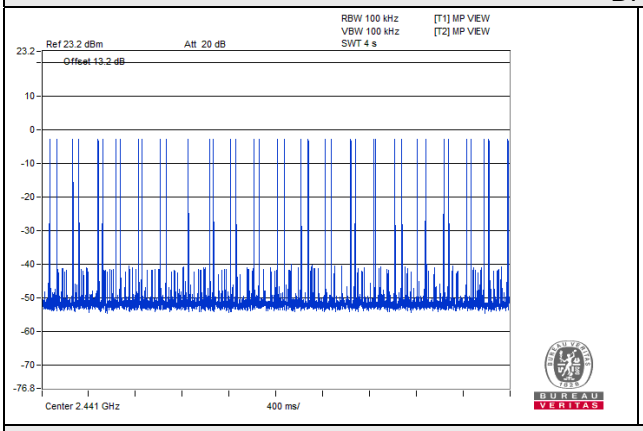
4.2.5 Test Results

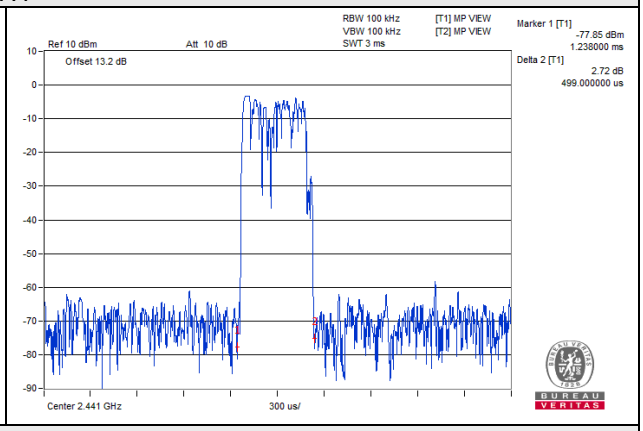
GFSK

Accumulated Transmit Time							
Mode	Number of Hopping Channel	NTP (Sec) Number of transmission in a period (channel number *0.4 sec)	Number of Hop in NTP	Dwell Time per Hop (ms)	Dwell Time in NTP (ms)	Limit (ms)	Pass / Fail
DH1	79	31.6	323.9	0.499	161.626	400	Pass
DH3	79	31.6	165.9	1.755	291.155	400	Pass
DH5	79	31.6	110.6	3.010	332.906	400	Pass

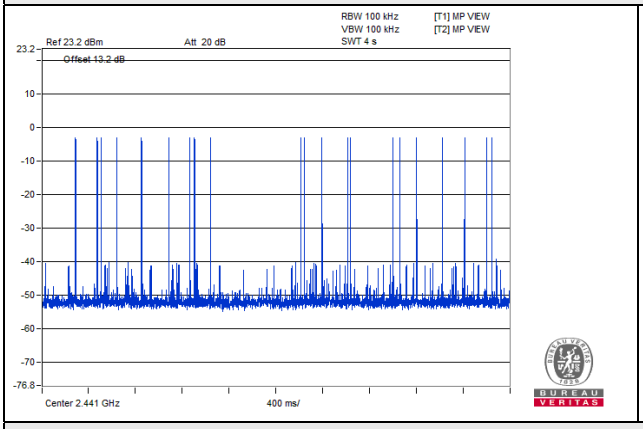
Note: Test plots of the transmitting time slot are shown as below.

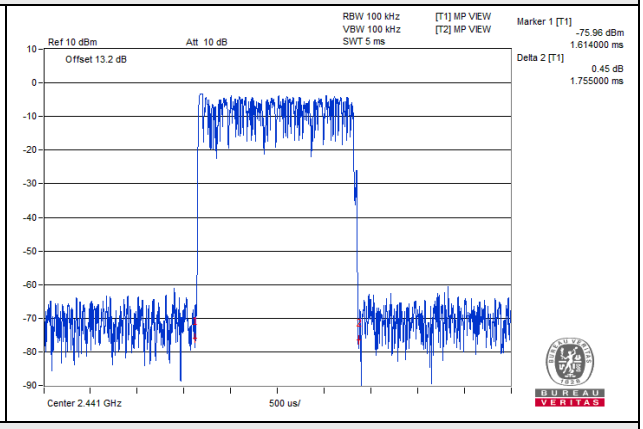
DH1



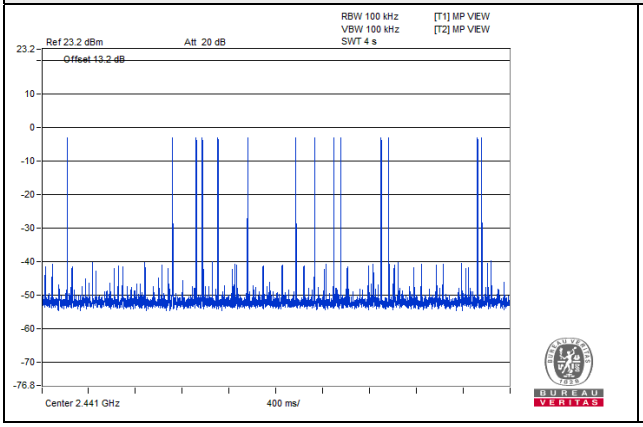


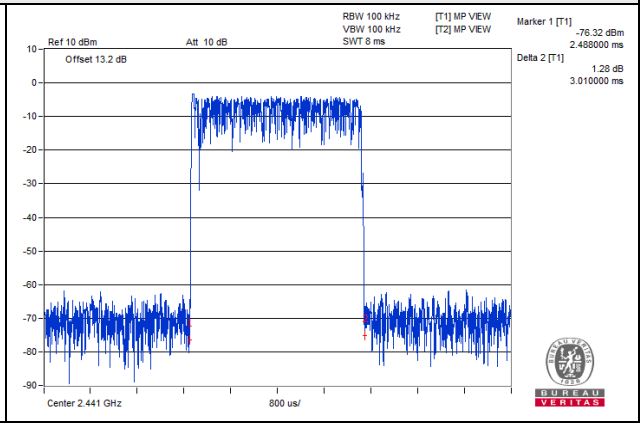
DH3





DH5



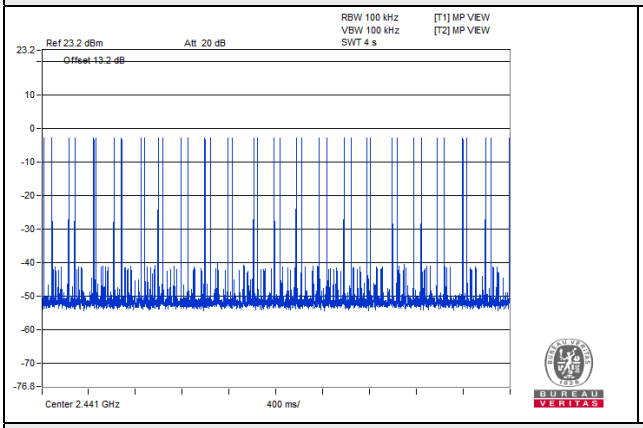


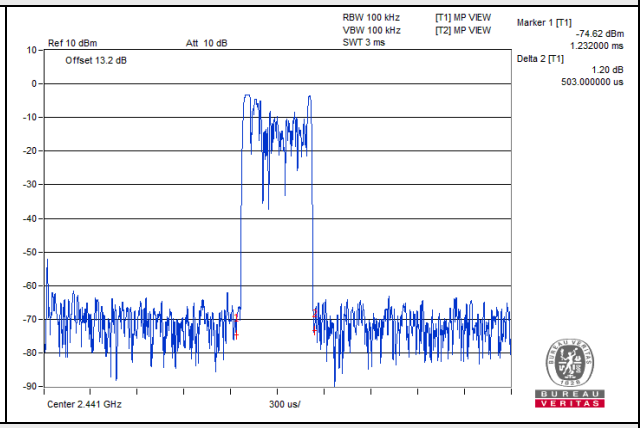
8DPSK

Accumulated Transmit Time							
Mode	Number of Hopping Channel	NTP (Sec) Number of transmission in a period (channel number *0.4 sec)	Number of Hop in NTP	Dwell Time per Hop (ms)	Dwell Time in NTP (ms)	Limit (ms)	Pass / Fail
3DH1	79	31.6	323.9	0.503	162.922	400	Pass
3DH3	79	31.6	173.8	1.743	302.933	400	Pass
3DH5	79	31.6	110.6	2.972	328.703	400	Pass

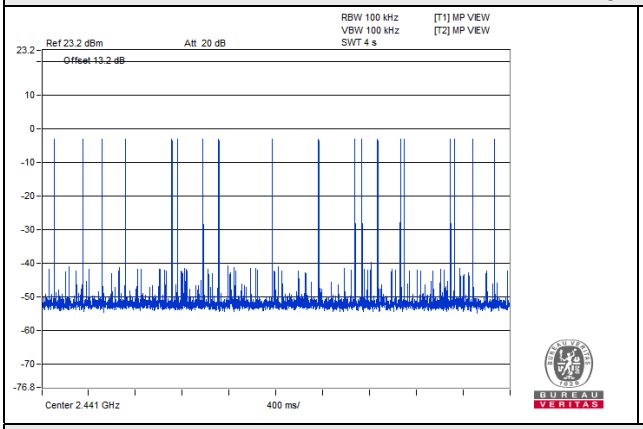
Note: Test plots of the transmitting time slot are shown as below.

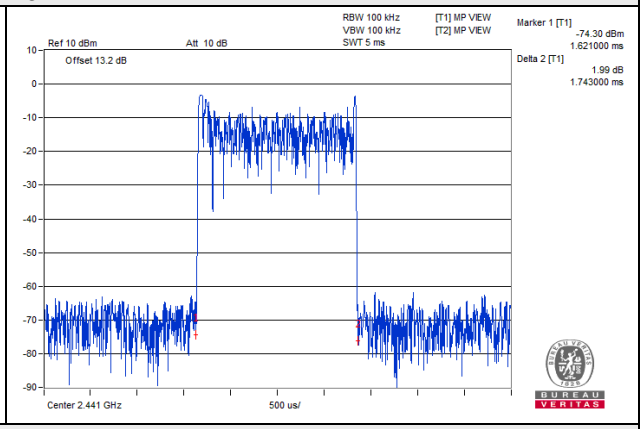
3DH1



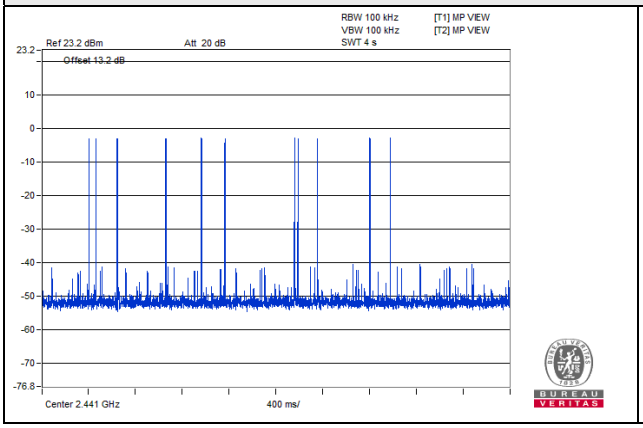


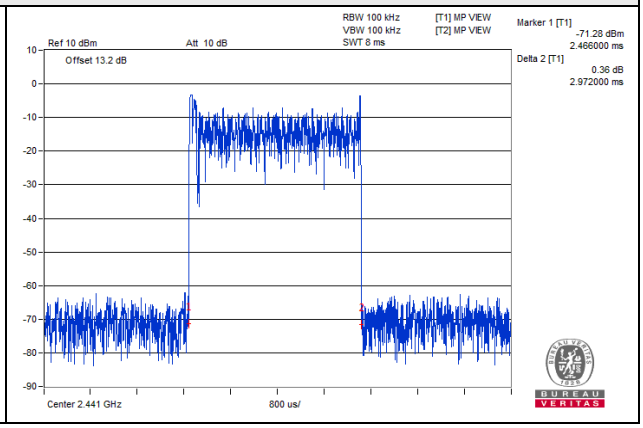
3DH3





3DH5

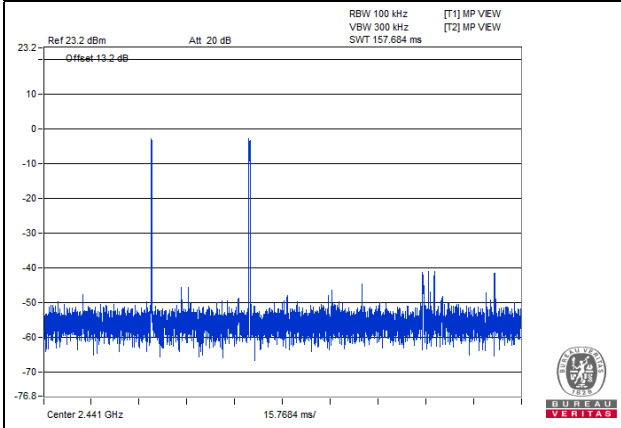




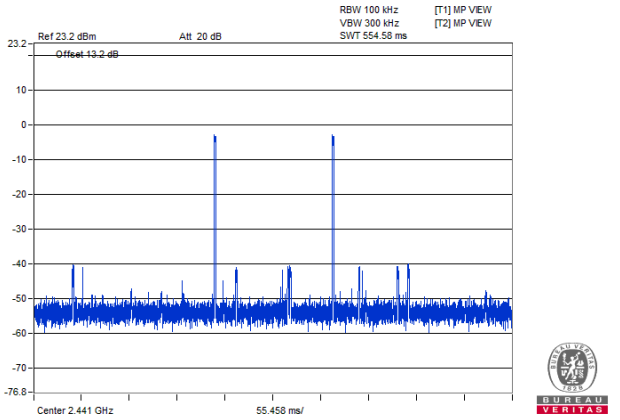
GFSK

Minimum Frequency Occupation Time							
Mode	Number of Hopping Channel	Dwell Time per Hop (ms)	T_{FO} (ms) 4 × Dwell Time × Actual number of hopping frequencies in use	Number of Hop in T_{FO}	Dwell Time in T_{FO}	Limit-Minimum number of Hopping in T_{FO}	Pass / Fail
DH1	79	0.499	157.684	2	0.998	1	Pass
DH3	79	1.755	554.580	2	3.510	1	Pass
DH5	79	3.010	951.160	2	6.020	1	Pass

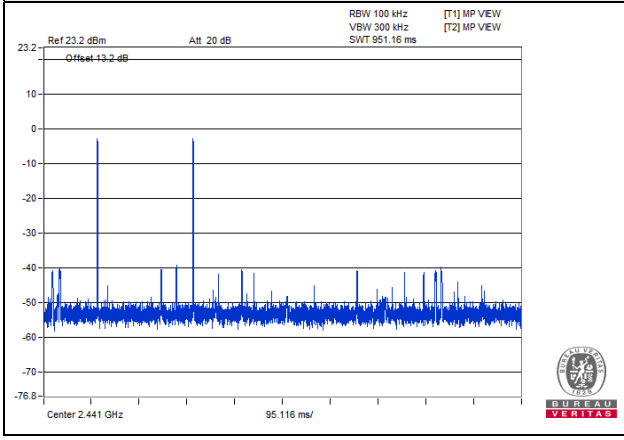
DH1



DH3



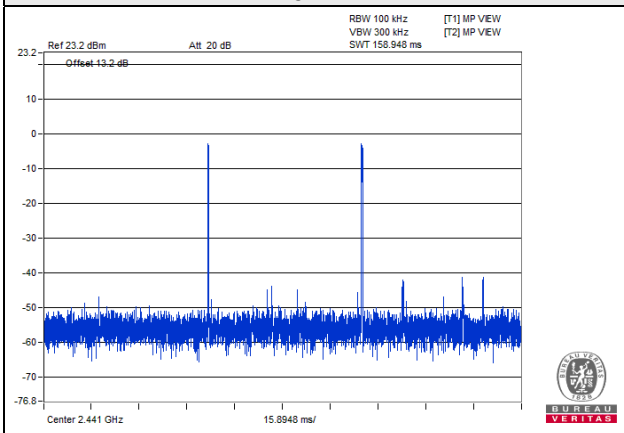
DH5



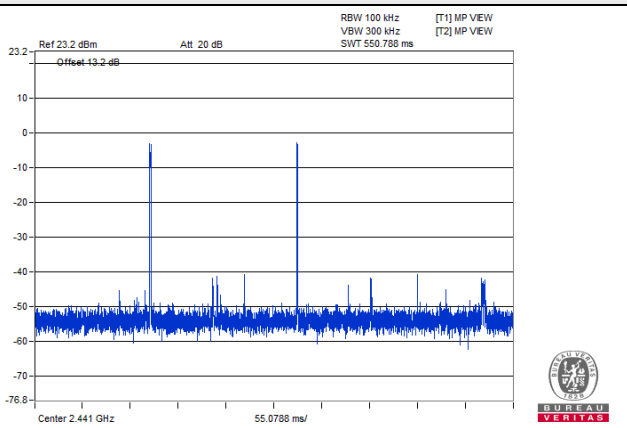
8DPSK

Minimum Frequency Occupation Time							
Mode	Number of Hopping Channel	Dwell Time per Hop (ms)	T_{FO} (ms) 4 × Dwell Time × Actual number of hopping frequencies in use	Number of Hop in T_{FO}	Dwell Time in T_{FO}	Limit-Minimum number of Hopping in T_{FO}	Pass / Fail
3DH1	79	0.503	158.948	2	1.006	1	Pass
3DH3	79	1.743	550.788	2	3.486	1	Pass
3DH5	79	2.972	939.152	2	5.944	1	Pass

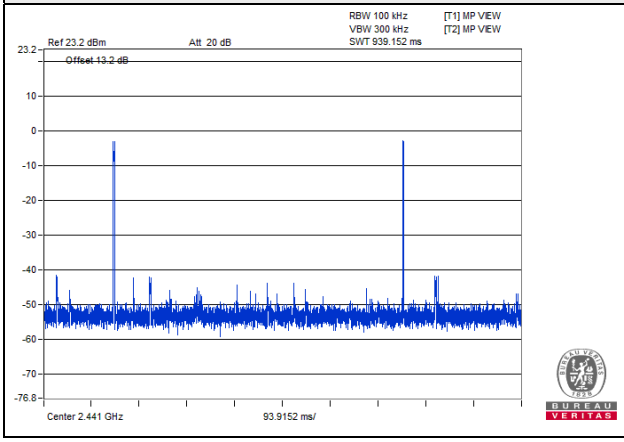
3DH1



3DH3

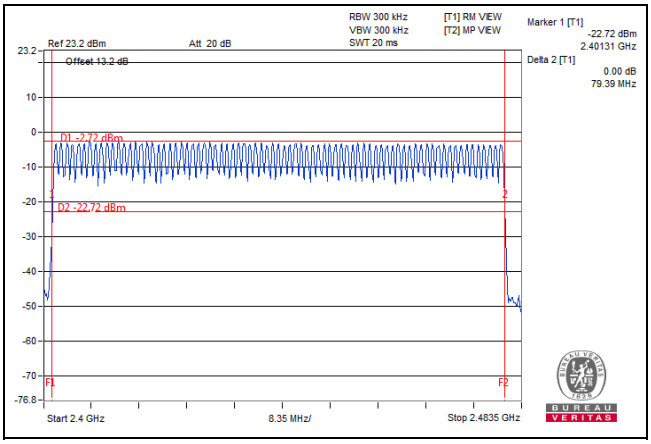


3DH5



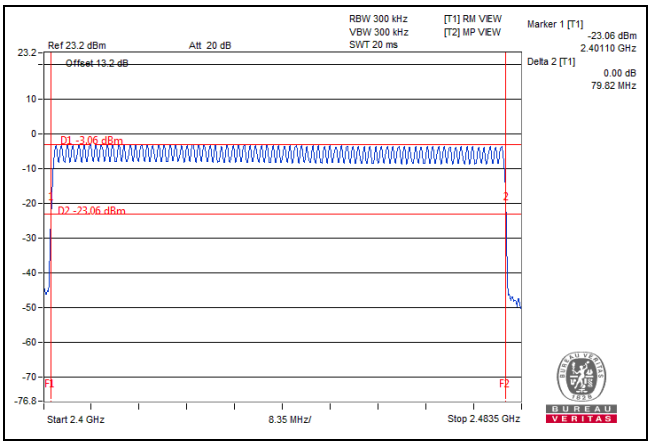
GFSK

Hopping Sequence(s)		
Amount of Hopping frequency	Limit	Pass/Fail
79	≥15 hopping frequencies	Pass
Operating Hopping Bandwidth (MHz)	Limit	Pass/Fail
79.39	≥58.45MHz	Pass



8DPSK

Hopping Sequence(s)		
Amount of Hopping frequency	Limit	Pass/Fail
79	≥15 hopping frequencies	Pass
Operating Hopping Bandwidth (MHz)	Limit	Pass/Fail
79.82	≥58.45MHz	Pass



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 5.4.5 of EN 300 328 V2.1.1.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement

4.3.3 Deviation from Test Standard

No deviation

4.3.4 Test Setup

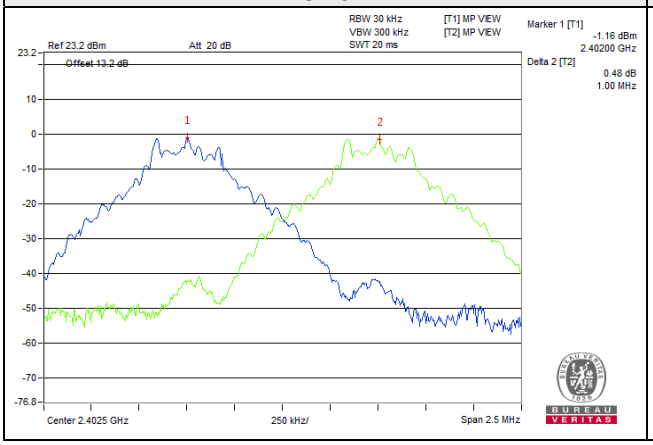
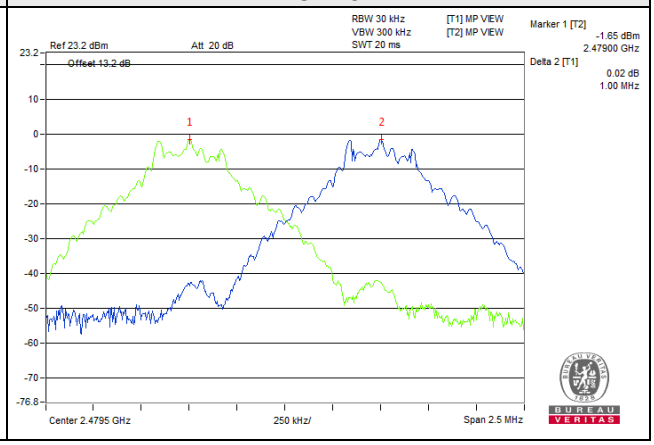
The measurement was performed at normal environmental conditions only. The measurement was performed on 2 adjacent hopping frequencies. The equipment was configured to operate under its worst case situation with respect to output power. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. Controlling software (provided by manufacturer) has been activated to set the EUT on specific status.

4.3.5 Test Results

GFSK

Channel	Frequency (MHz)	Channel Separation (MHz)	Minimum Limit (MHz)	Pass /Fail
0	2402	1.00	0.1	Pass
78	2480	1.00	0.1	Pass

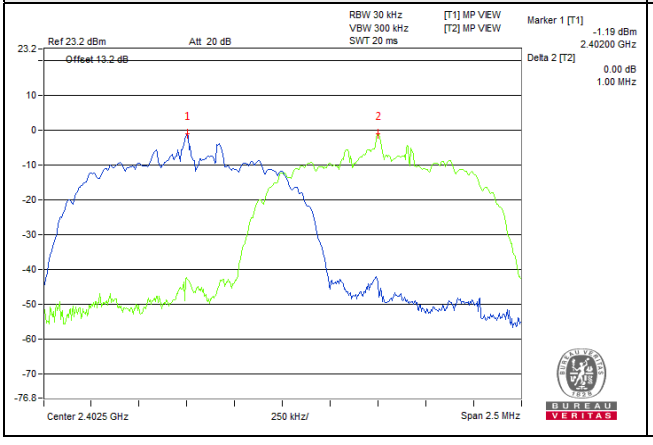
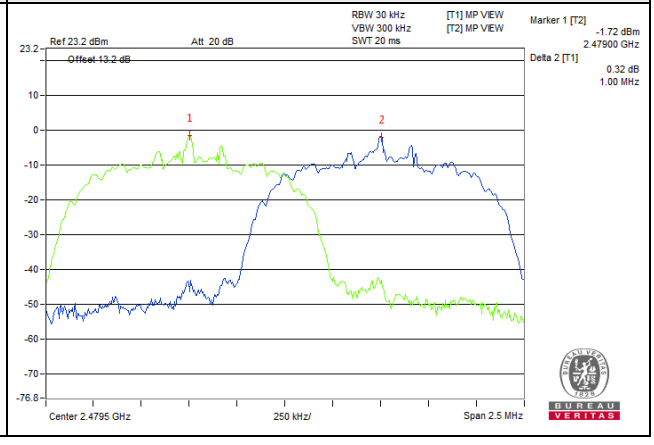
Note: The limitation is from OCB of a single hop and this value must greater and equal to 100kHz.

CH0	CH78
	

8DPSK

Channel	Frequency (MHz)	Channel Separation (MHz)	Minimum Limit (MHz)	Pass /Fail
0	2402	1.00	0.1	Pass
78	2480	1.00	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 5.4.7 of EN 300 328 V2.1.1.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement

4.4.3 Deviation from Test Standard

No deviation.

4.4.4 Test Setup

The measurement was performed at normal environmental conditions only. This measurement was performed at the lowest and the highest channel. Using software to force the EUT to hop or transmit on a single Hopping Frequency. 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.) Controlling software (provided by manufacturer) 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
			F_L (MHz)	F_H (MHz)		
0	2402	0.89	2401.56	2402.45	F_L > 2400 MHz and F_H < 2483.5 MHz	Pass
78	2480	0.88	2479.56	2480.44		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

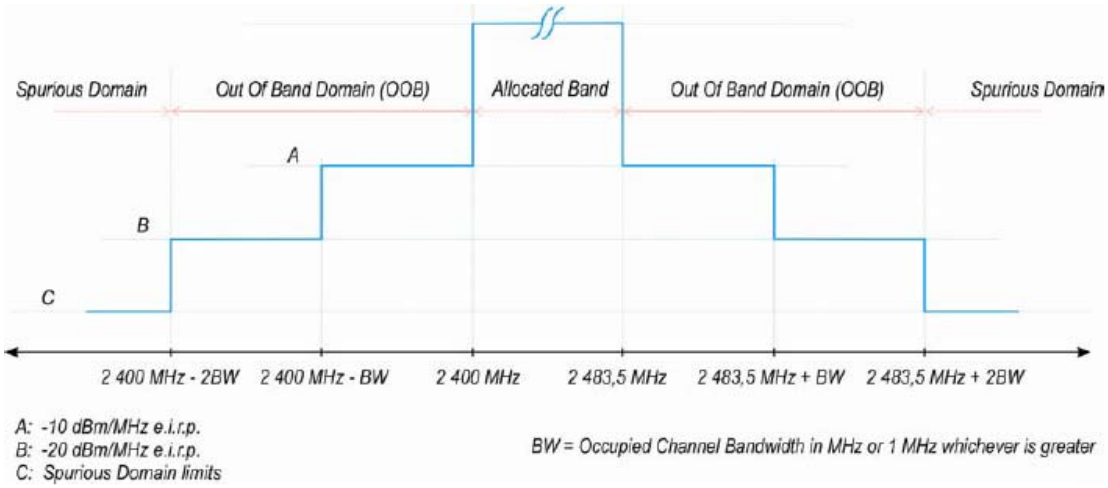
Channel	Channel Frequency (MHz)	Occupied Bandwidth (MHz)	Measured Frequencies		Limit	Pass/Fail
			F_L (MHz)	F_H (MHz)		
0	2402	1.20	2401.40	2402.60	F_L > 2400 MHz and F_H < 2483.5 MHz	Pass
78	2480	1.20	2479.40	2480.60		Pass

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 Emissions 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 5.4.8 of EN 300 328 V2.1.1.

Measurement Method	
☒ 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 and shall be repeated at the extremes of the operating temperature. The measurement was performed at the lowest and the highest channel on which the equipment can operate. 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	-32.15	2398.50	-44.34	2484.00	-46.26	2485.00	-49.67
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	-36.96	2398.30	-42.65	2484.00	-42.99	2485.20	-44.57
Limit (dBm/MHz)			-10.00		-20.00		-10.00		-20.00	
Pass/Fail			Pass		Pass		Pass		Pass	

4.6 Transmitter Unwanted Emissions in the Spurious Domain

4.6.1 Limits of Transmitter Unwanted Emissions in the Spurious Domain

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 5.4.9 of EN 300 328 V2.1.1.

Measurement Method	
☐ 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 (provided by manufacturer) has been activated to set the EUT on specific status.

4.6.5 Test Results

Below 1GHz worst-case data: GFSK

Frequency Range	25MHz ~ 1GHz	Operating Channel	0

Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
36.06	H	-76.22	-36.00	-40.22
36.11	V	-73.12	-36.00	-37.12
145.58	H	-73.99	-36.00	-37.99
145.58	V	-70.35	-36.00	-34.35
221.20	H	-67.26	-54.00	-13.26
301.08	H	-70.98	-36.00	-34.98
307.58	V	-71.97	-36.00	-35.97
440.43	V	-72.33	-36.00	-36.33
541.26	H	-71.60	-54.00	-17.60
612.08	V	-69.99	-54.00	-15.99
846.05	H	-67.53	-54.00	-13.53
856.92	V	-66.35	-54.00	-12.35

Above 1GHz worst-case data:

GFSK

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	0, 78

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
0	4803.82	H	-54.24	-30.00	-24.24
	4803.87	V	-55.70	-30.00	-25.70
	7206.04	V	-45.65	-30.00	-15.65
	7206.07	H	-44.75	-30.00	-14.75
78	4959.93	V	-54.60	-30.00	-24.60
	4959.98	H	-55.16	-30.00	-25.16
	7440.00	V	-43.03	-30.00	-13.03
	7440.02	H	-44.12	-30.00	-14.12

8DPSK

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	0, 78

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
0	4803.76	H	-54.56	-30.00	-24.56
	4804.06	V	-57.38	-30.00	-27.38
	7205.90	H	-45.18	-30.00	-15.18
	7206.03	V	-46.56	-30.00	-16.56
78	4959.88	H	-55.50	-30.00	-25.50
	4959.92	V	-54.59	-30.00	-24.59
	7439.94	V	-43.23	-30.00	-13.23
	7440.02	H	-44.36	-30.00	-14.36

4.7 Receiver Spurious Emissions

4.7.1 Limit of Receiver Spurious Emissions

Frequency Range	Maximum Power Limit e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz ~ 1 GHz	-57dBm	100 kHz
1 GHz ~ 12.75 GHz	-47dBm	1 MHz

4.7.2 Test Procedure

Refer to chapter 5.4.10 of EN 300 328 V2.1.1.

Measurement Method	
☐ 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).	

4.7.3 Deviation from Test Standard

No deviation.

4.7.4 Test Setup

1. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration).
2. 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 (provided by manufacturer) has been activated to set the EUT on specific status.

4.7.5 Test Results

Below 1GHz worst-case data: GFSK

Frequency Range	25MHz ~ 1GHz	Operating Channel	0

Spurious Emission Level				
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
37.23	H	-74.82	-57.00	-17.82
57.55	V	-77.68	-57.00	-20.68
143.20	H	-68.78	-57.00	-11.78
145.63	V	-70.91	-57.00	-13.91
184.29	H	-70.11	-57.00	-13.11
251.90	H	-76.44	-57.00	-19.44
301.08	V	-71.83	-57.00	-14.83
349.63	V	-74.09	-57.00	-17.09
405.51	H	-68.89	-57.00	-11.89
535.15	V	-71.27	-57.00	-14.27
606.21	H	-69.10	-57.00	-12.10
839.55	V	-67.23	-57.00	-10.23

Above 1GHz worst-case data: GFSK

Frequency Range	1GHz ~ 12.75GHz	Operating Channel	0, 78

Spurious Emission Level					
Channel	Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
0	4803.15	H	-56.82	-30.00	-26.82
	4804.73	V	-56.96	-30.00	-26.96
78	4959.97	H	-56.05	-30.00	-26.05
	4960.80	V	-56.46	-30.00	-26.46

4.8 Receiver Blocking

4.8.1 Limit 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 declared the 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.			

4.8.2 Test Procedure

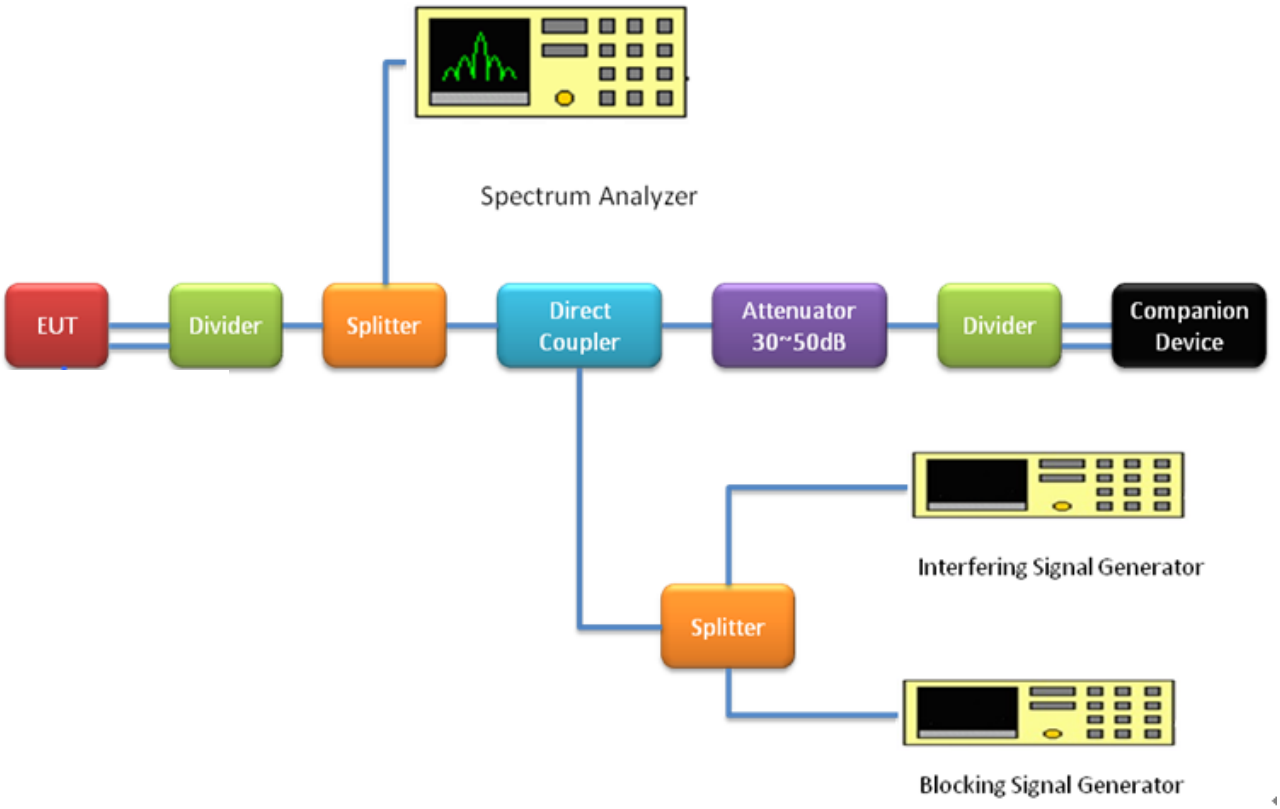
Refer to chapter 5.4.11 of EN 300 328 V2.1.1.

Measurement Method	
☒ Conducted measurement	☐ Radiated measurement

4.8.3 Deviation from Test Standard

No deviation.

4.8.4 Test Setup Configuration



4.8.5 Test Results

GFSK

Receiver blocking performance when operating at the lowest operating channel	
P_{min}: -87 dBm	antenna gain(G): -1.8 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)	PER (%)	Pass/Fail
0	P_{min} + 6 dB	2380	-58.8	0	Pass
		2503.5	-58.8	0	Pass
		2300	-48.8	0	Pass
		2583.5	-48.8	0	Pass

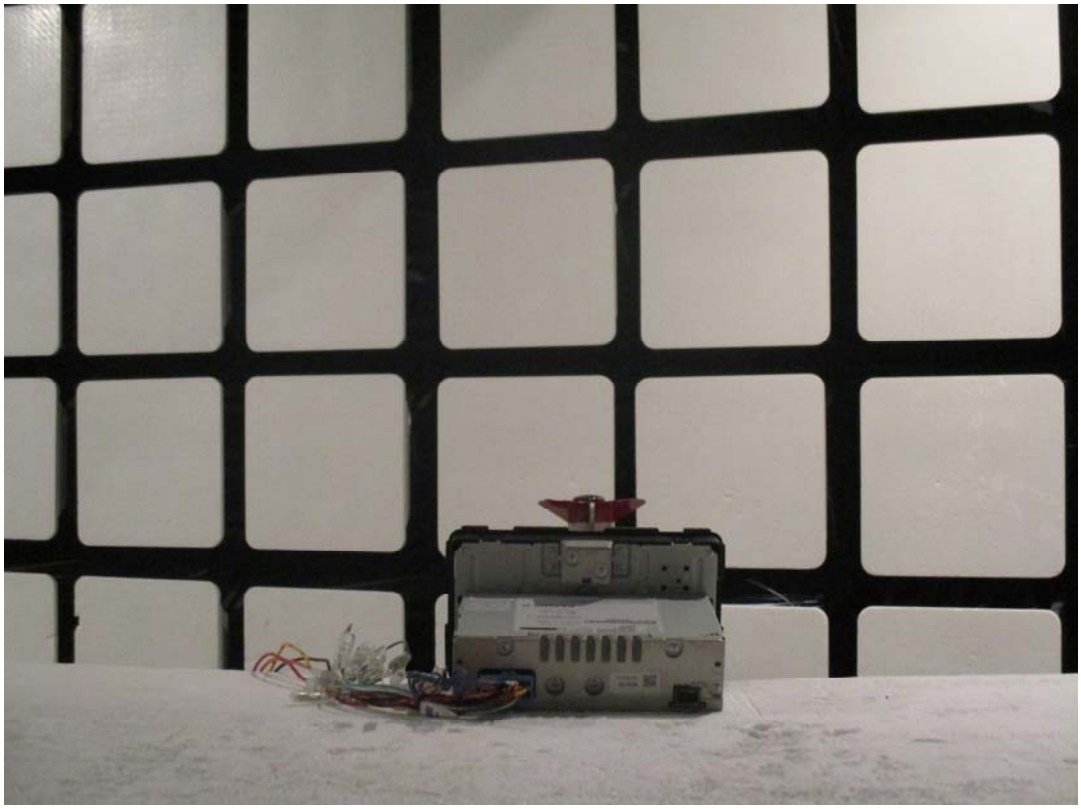
Receiver blocking performance when operating at the lowest operating channel	
P_{min}: -87 dBm	antenna gain(G): -1.8 dBi
The actual blocking signal power(Note1)	☒ at the antenna connector
	☐ in front of the antenna

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)	PER (%)	Pass/Fail
78	P_{min} + 6 dB	2380	-58.8	0	Pass
		2503.5	-58.8	0	Pass
		2300	-48.8	0	Pass
		2583.5	-48.8	0	Pass

5 Photographs of the Test Configuration

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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

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Fax: 886-2-26051924

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