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RF Test Report

Report No.: AGC04426180701EE04

PRODUCT DESIGNATION	:	ACTIVE NOISE CANCELLATION BLUETOOTH HEADPHONE
BRAND NAME	:	LY
MODEL NAME	:	ANC-CLF01, F01, C1, P328.141 Swisspeak ANC headphone, DG320
MANUFACTURER	:	
DATE OF ISSUE	:	Aug. 07, 2018
STANDARD(S)	:	EN 300 328 V2.1.1 (2016-11)
REPORT VERSION	:	V1.0

*A*ttestation of *G*lobal *C*ompliance (Shenzhen) Co., Ltd

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Aug. 07, 2018	Valid	Initial release

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Tel: +86-755 2908 1955 Fax: +86-755 2600 8484 E-mail: agc@agc-cert.com 400 089 2118
Add: 2/F. , Building 2, No.1-4,Chaxi Sanwei Technical Industrial Park,Gushu, Xixiang, Baoan District, Shenzhen, Guangdong China

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1. TEST RESULT CERTIFICATION

Manufacturer	
Address	
Factory	
Address	
Product Designation	ACTIVE NOISE CANCELLATION BLUETOOTH HEADPHONE
Brand Name	LY
Test Model	ANC-CLF01
Series Model	F01, C1, P328.141 Swisspeak ANC headphone, DG320
Difference Description	All the same except for the model name
Date of test	Jul. 25, 2018 to Aug. 04, 2018

We (AGC), Attestation of Global Compliance (Shenzhen) Co., Ltd has tested the product mentioned above in compliance with the requirements set forth in the European Standard ETSI EN 300 328 V2.1.1. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. The test results of this report relate only to the tested sample identified in this report.

Tested By Henry Zhang

Henry Zhang(Zhang Zhuorui) Aug. 04, 2018

Reviewed By Cool Cheng

Cool Cheng(Cheng Mengguo) Aug. 07, 2018

Approved By Forrest Lei

Forrest Lei(Lei Yonggang)
Authorized Officer Aug. 07, 2018

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2. TECHNICAL INFORMATION

2.1 EUT DESCRIPTION

Modulation type	FHSS
Bluetooth Version	V4.1
Modulation	GFSK, π /4-DQPSK, 8DPSK
Receiver Category	Category 2
Hardware Version	ANC-CLF01_REV-V0.1
Software Version	F01_V0.1
Adaptive / non-adaptive equipment	Adaptive Equipment
The number of Hopping Frequencies	79
The maximum RF Output Power (e.i.r.p.)	3.53dBm
The different transmit operating modes	Operating mode 1: Single Antenna Equipment Equipment with only 1 antenna
Operating Frequency Range(s)	2402MHz~2480MHz
Occupied Channel Bandwidth(s)	1.115MHz
Accumulated transmit time	309.72ms(max)
Type of Equipment	Stand-alone
Antenna designation	PCB Antenna
Antenna gain	2dBi
Nominal voltages	DC 3.7V by battery
The extreme operating conditions	Extreme test temperature: -10°C~45°C

Note:

1. The above information was declared by the applicant.
2. The equipment submitted are representative production models.
3. The EUT provides Bluetooth wireless interface operating at 2.4G ISM band (2402MHz-2480MHz). The EUT use Frequency Hopping Spread Spectrum (FHSS) modulation.
4. Only the Bluetooth was tested according the standard requirement.
5. The EUT is an adaptive equipment and hand-portable station according to ETSI EN 300 328 V2.1.1.

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6. Please refer to Appendix Ⅰ for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.
7. The EUT didn't support BLE.

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2.2 SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	PC	HP	RT3290	A.E

2.3 DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX
4	Low channel (RX Mode)
5	Middle channel (RX Mode)
6	High channel (RX Mode)
7	Normal hopping

Note:

1. All the transmit mode would tested with each modulation (GFSK, π /4-DQPSK, 8DPSK).
2. All modes have been tested and the worst mode test data recording in the test report, if no any other data.

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A) OBJECTIVE

Perform Radio Spectrum tests for CE Marking according to the provisions of article 3.2 of the RED Directive

B) TEST STANDARDS AND RESULTS

The EUT has been tested according to ETSI EN 300 328 V2.1.1 (2016-11).

ETSI EN 300 328 V2.1.1 (2016-11)	Wideband transmission systems ;Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

TEST ITEMS AND THE RESULTS ARE AS BELOW:

№	Basic Standard	Test Type	The worst case operational mode	Result
1	ETSI EN 300 328 4.3.1.2	RF Output Power	Mode 7	Pass
2	ETSI EN 300 328 4.3.1.3	Duty Cycle,Tx-sequence,Tx-gap	N/A	N/A
3	ETSI EN 300 328 4.3.1.4	Accumulated Transmit time, Frequency Occupation and hopping sequence	Mode 1/2/3/7	Pass
4	ETSI EN 300 328 4.3.1.5	Hopping Frequency Separation	Mode 7	Pass
5	ETSI EN 300 328 4.3.1.6	Medium Utilisation	N/A	N/A
6	ETSI EN 300 328 4.3.1.7	Adaptivity (Adaptive Frequency Hopping)	N/A	N/A
7	ETSI EN 300 328 4.3.1.8	Occupied Channel Bandwidth	Mode 1/3	Pass
8	ETSI EN 300 328 4.3.1.9	Transmitter unwanted emission in the out of band domain	Mode 1/3	Pass
9	ETSI EN 300 328 4.3.1.10	Transmitter unwanted emission in the Spurious domain	Mode 1/3	Pass
10	ETSI EN 300 328 4.3.1.11	Receiver Spurious emissions	Mode 4/6	Pass
11	ETSI EN 300 328 4.3.1.12	Receiver Blocking	Mode 7	Pass
12	ETSI EN 300328 4.3.1.13	Geo-location capability	N/A	N/A

Note:

1. N/A means it's not applicable to this item.
2. Owing to the maximum declared RF Output power (e.i.r.p.) less than 10 dBm, so the item 2, 5, 6 are not applicable.

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3. DETAILS OF TEST

3.1 IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

Company Name:	Attestation of Global Compliance (Shenzhen) Co., Ltd.
Address:	2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China

3.2 LIST OF TEST EQUIPMENTS

Description	Manufacturer	Model No.	S/N	Calibration Date	Calibration Due.
Signal Analyzer	AGILENT	N9020A	MY49100060	Nov.09, 2017	Nov.08,2018
Signal Generator	AGILENT	N5182A	MY50140530	Oct.16, 2017	Oct.15, 2018
Signal Generator	AGILENT	E8257D	MY45141029	Oct.16, 2017	Oct.15, 2018
USB Wideband Power Sensor	AGILENT	U2021XA	MY54110007	Oct.16, 2017	Oct.15, 2018
USB Wideband Power Sensor	AGILENT	U2021XA	MY54110009	Oct.16, 2017	Oct.15, 2018
USB Wideband Power Sensor	AGILENT	U2021XA	MY54110014	Oct.16, 2017	Oct.15, 2018
USB Wideband Power Sensor	AGILENT	U2021XA	MY54110012	Oct.16, 2017	Oct.15, 2018
USB Simultaneous Sampling Multifunction DAQ	AGILENT	U2531A	MY5211038	Oct.16, 2017	Oct.15, 2018
2.4 GHz Filter	MICRO-TRONICS	BRM50702	017	Mar.01, 2018	Feb.28, 2019
Spectrum Analyzer	AGILENT	E4440A	US41421290	July 13, 2018	July 12, 2019
Wideband Frequency Antenna	SCHWARZBECK	VULB9168	VULB9168-494	Mar.12, 2018	Mar.11, 2019
Horn Antenna	EM	EM-AH-10180	67	Mar.01, 2018	Feb.28, 2019
Amplifier	EM	EM30180	060552	Mar.01, 2018	Feb.28, 2019
Bluetooth Tester	R&S	CMW270	1201.0002K75-100528-Tu WIRELESSCONN.TESTER	Oct.10, 2017	Oct.09, 2018
Signal generator	R&S	SMBV100A	ST113247Z	Oct.10, 2017	Oct.09, 2018
Attenuator	Wariors	W13	11324	N/A	N/A
Power spliter	Mini-Circuits	ZFRSC-183-S	3122	N/A	N/A
Small environmental tester	ESPEC	SH-242	--	Mar.02, 2018	Mar. 01, 2019

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3.3 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

- Normal Temperature: 15~35ºC
- Extreme Temperature: -10~45ºC
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

3.4 MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in Measurement” (GUM) published by ISO.

- Uncertainty of Radio Frequency, Uc=±1 x 10^{-5}
- Uncertainty of total RF power, conducted, Uc = ±1.5dB
- Uncertainty of RF power density, conducted, Uc = ±3dB
- Uncertainty of spurious emissions, conducted, Uc = ±3dB
- Uncertainty of all emissions, radiated, Uc = ±6dB
- Uncertainty of Temperature: ±1° C
- Uncertainty of Humidity: ±5 %
- Uncertainty of DC and low frequency voltages: ±3 %

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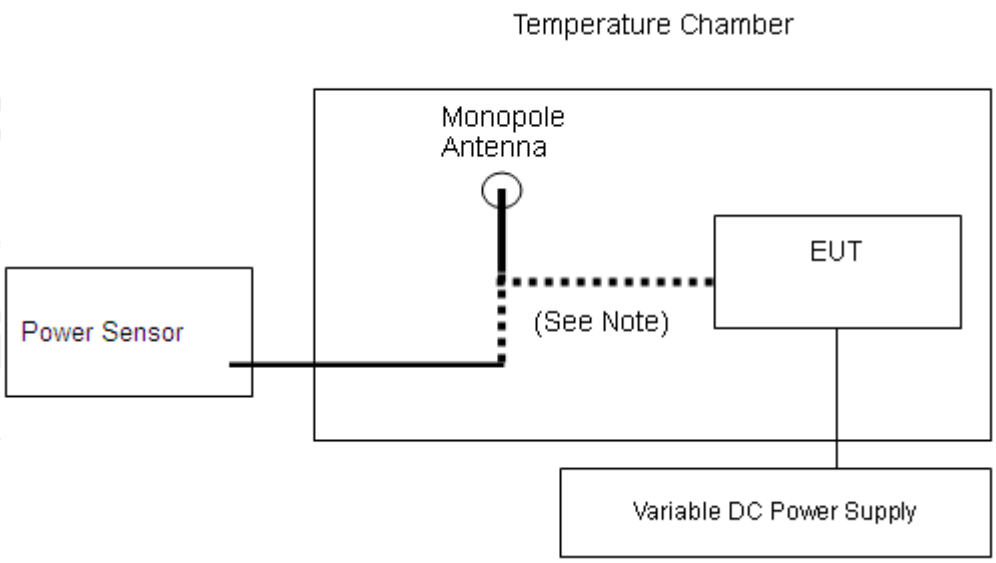
4. ETSI EN 300 328 REQUIREMENTS

4.1 RF OUTPUT POWER

EN 300 328 Clause 4.3.1.2

The maximum RF output power for adaptive Frequency Hopping equipment shall be equal to or less than 20 dBm.The maximum RF output power for non-adaptive Frequency Hopping equipment shall be declared by the supplier. See clause 5.3.1 m). The maximum RF output power for this equipment shall be equal to or less than the value declared by the supplier. This declared value shall be equal to or less than 20 dBm.

Test Configuration



Remarks:
EUT was direct connected to test equipment through coupling device.

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TEST PROCEDURE

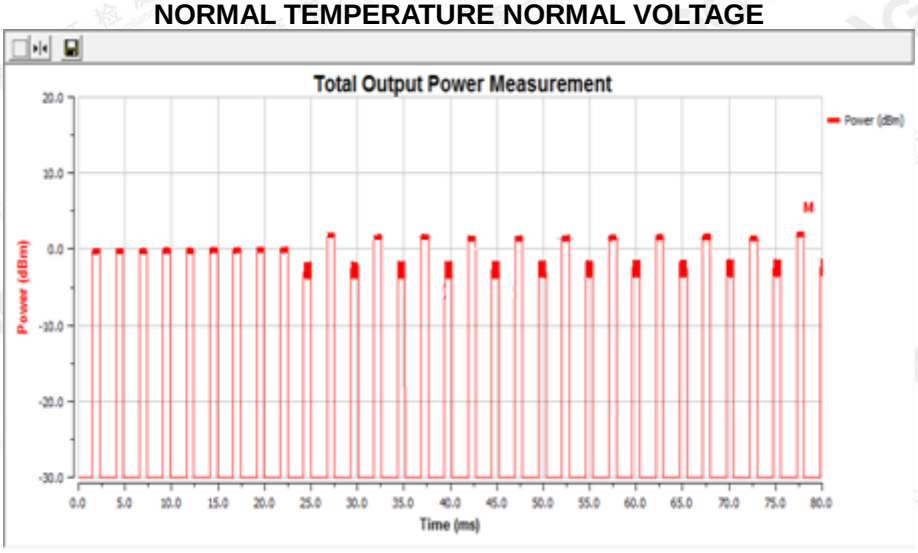
1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.3 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.2 for the measurement method.

TEST RESULTS

Temperature:	25°C	Tested by:	Henry
Humidity:	55 % RH	Detector:	RMS
Number of Burst		>= 10	
Measurement Time		= 45.48ms	

TEST CONDITIONS	GFSK MODULATION RF OUTPUT POWER (dBm)		
	Temp (25)°C	Temp (-10)°C	Temp (45)°C
Result	DC 3.7V	DC 3.7V	DC 3.7V
Normal Hopping	3.53	3.51	3.46
Limit	20dBm		

NORMAL TEMPERATURE NORMAL VOLTAGE



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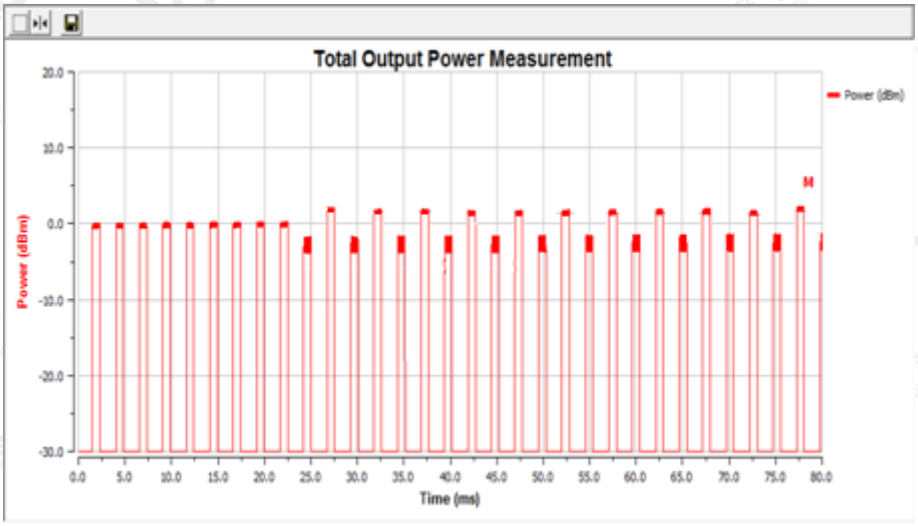
LOW TEMPERATURE NORMAL VOLTAGE



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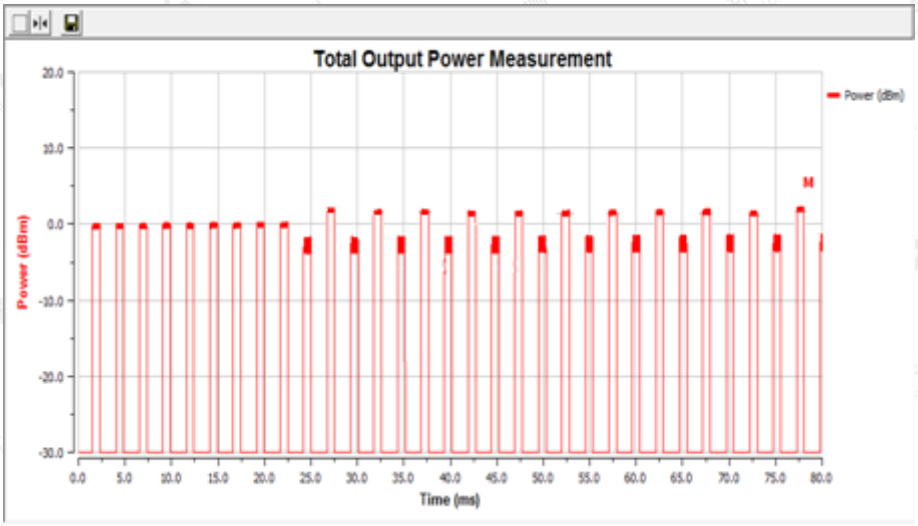

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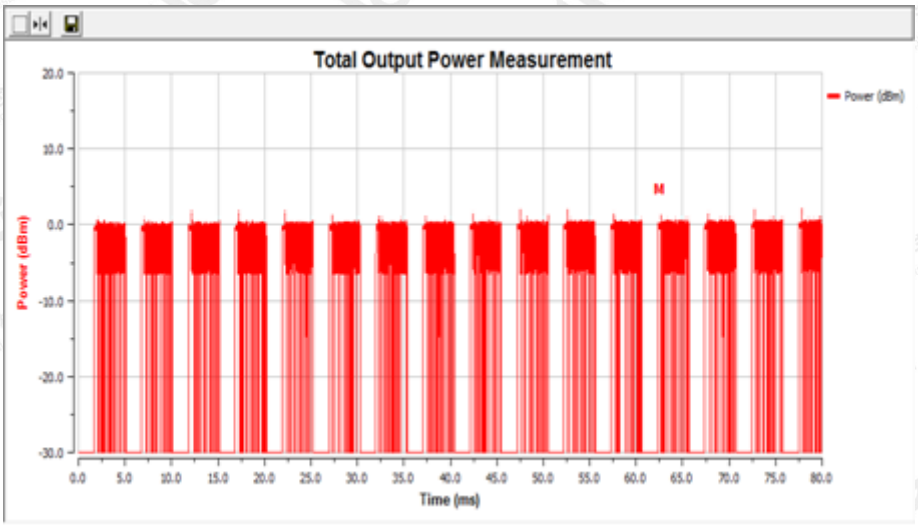
TEST CONDITIONS	Π /4-DQPSK MODULATION RF OUTPUT POWER (dBm)		
	Temp (25)°C	Temp (-10)°C	Temp (45)°C
Result	DC 3.7V	DC 3.7V	DC 3.7V
Normal Hopping	3.08	3.06	3.01
Limit	20dBm		

NORMAL TEMPERATURE NORMAL VOLTAGE



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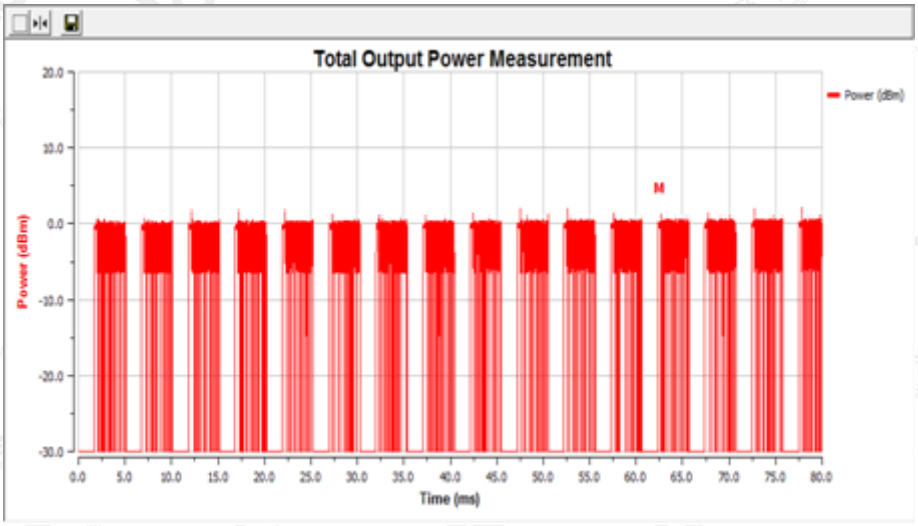
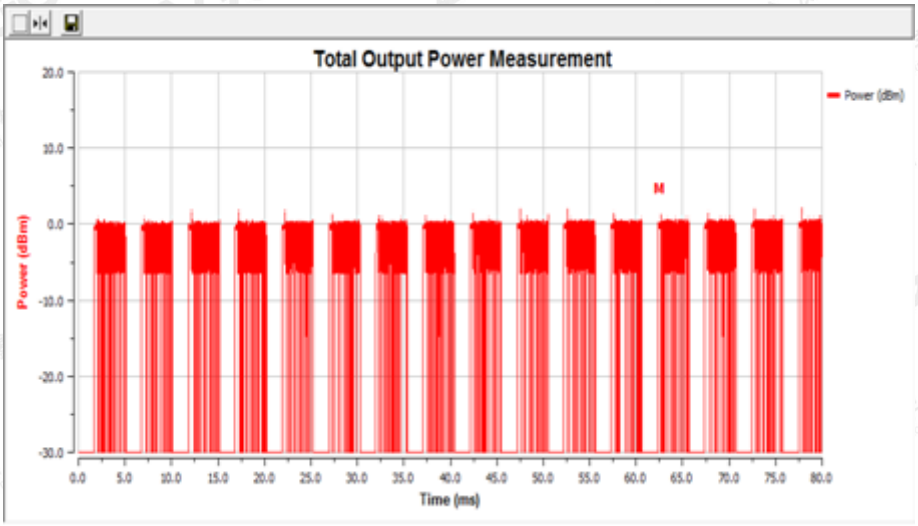
LOW TEMPERATURE NORMAL VOLTAGE



HIGH TEMPERATURE NORMAL VOLTAGE



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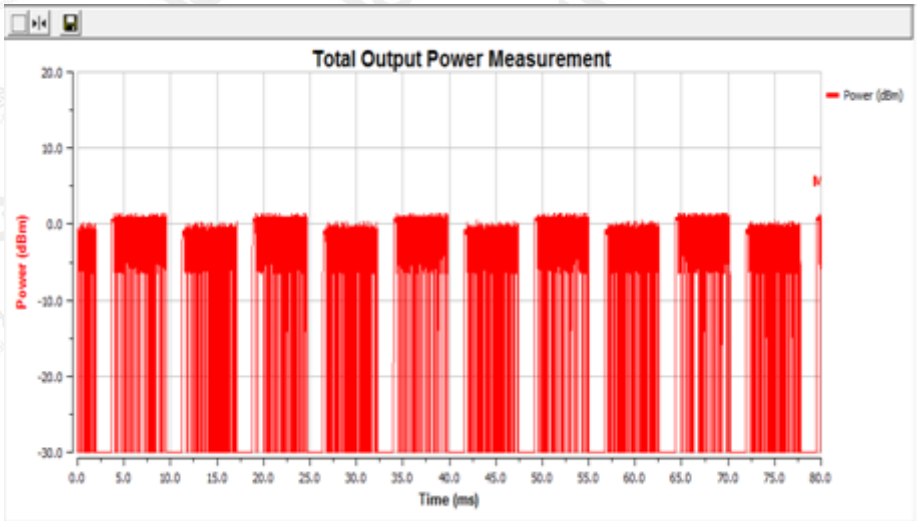
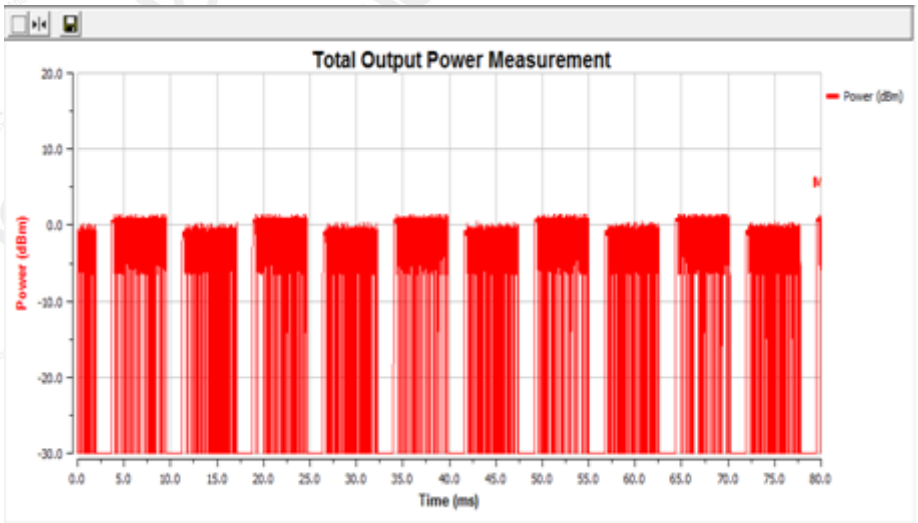
TEST CONDITIONS	8DPSK MODULATION RF OUTPUT POWER (dBm)		
	Temp (25)°C	Temp (-10)°C	Temp (45)°C
Result	DC 3.7V	DC 3.7V	DC 3.7V
Normal Hopping	2.92	2.90	2.86
Limit	20dBm		

NORMAL TEMPERATURE NORMAL VOLTAGE



LOW TEMPERATURE NORMAL VOLTAGE



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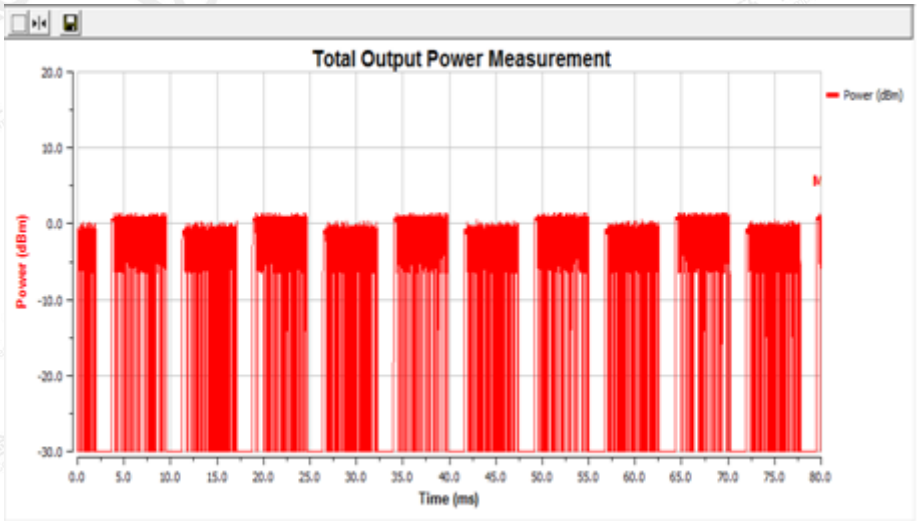
HIGH TEMPERATURE NORMAL VOLTAGE



Note: Result=Reading+ Ant. Gain

Conclusion: PASS

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4.2 ACCUMULATED TRANSMIT TIME, FREQUENCY OCCUPIATION AND HOPPING SEQUENCE

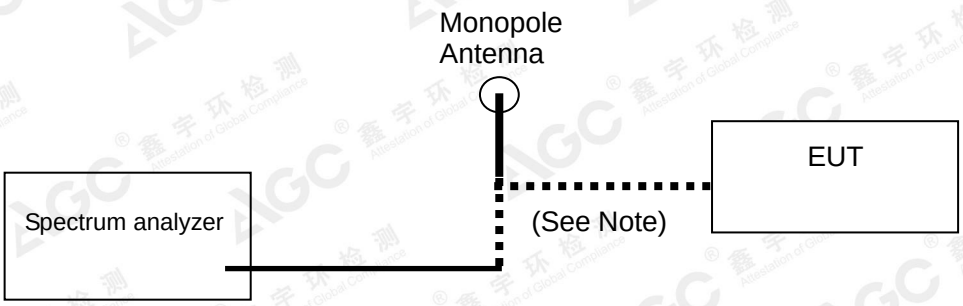
ETSI EN 300 328 SUBCLAUSE 4.3.1.4
HOPPING SEQUENCE

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	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.
☒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.

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN300328 V2.1.1 Section 5.4.4

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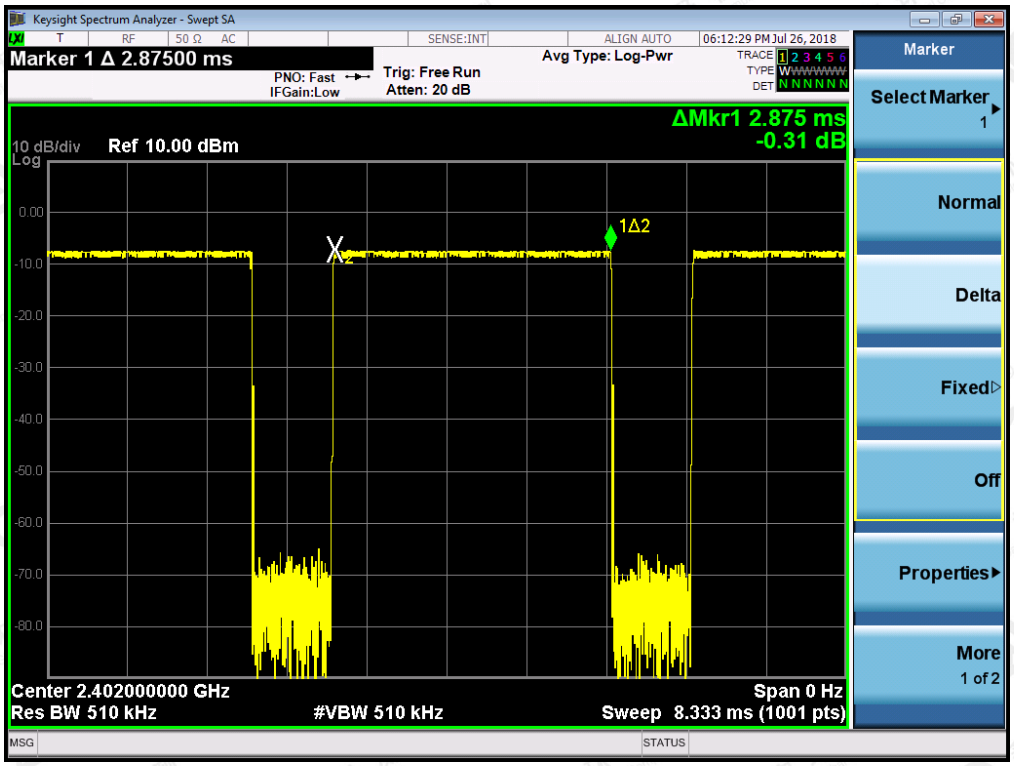
TEST RESULT (Accumulated Transmit Time)

Bluetooth 1Mbps(DH5) Test Result

Channel	Pulse time(ms)	Accumulated transmit time (ms)	Limit (ms)
Low	2.875	307.05	400
High	2.867	306.20	400

Low Channel



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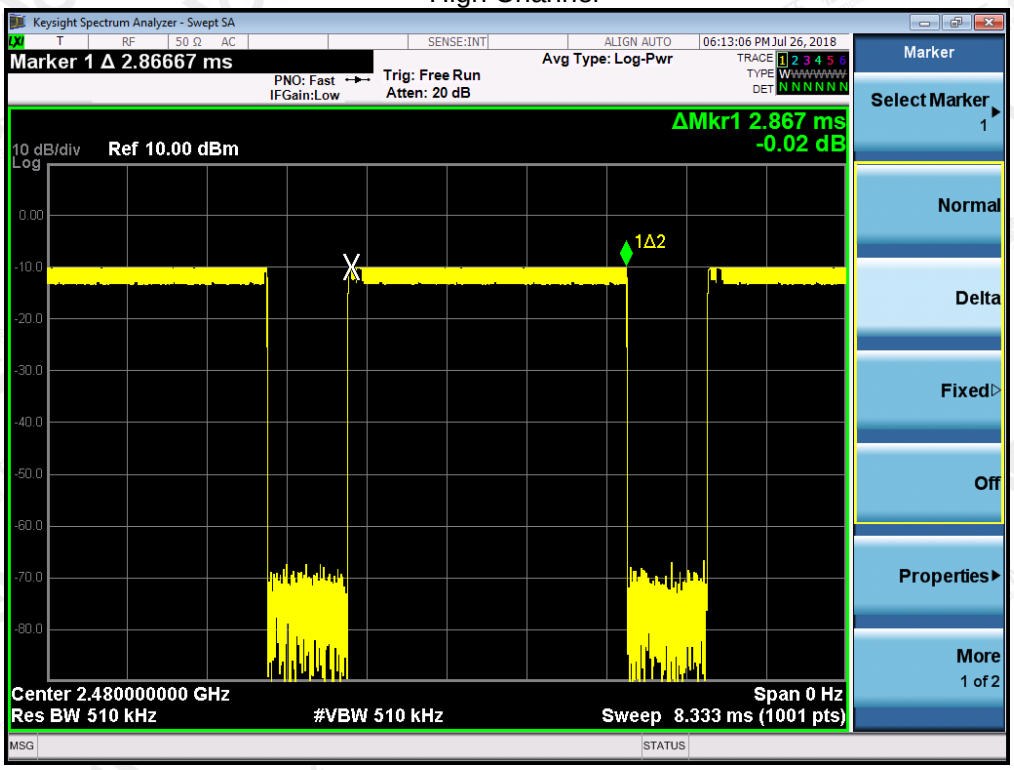
High Channel



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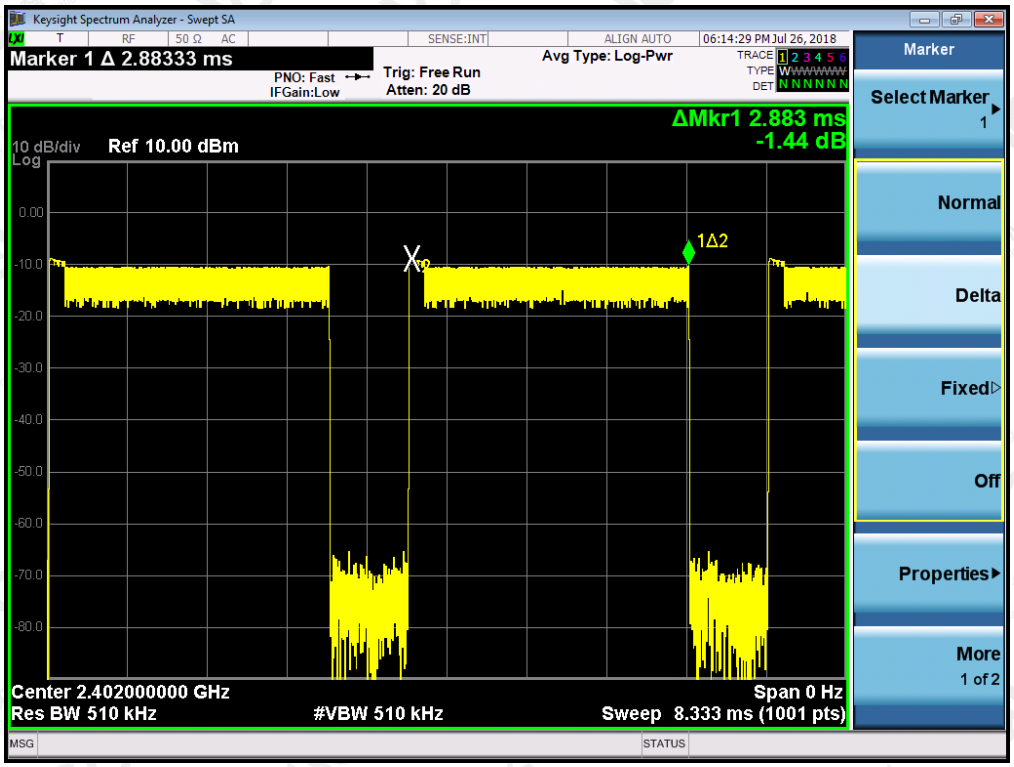
Bluetooth 2Mbps(DH5) Test Result

Channel	Pulse time(ms)	Accumulated transmit time (ms)	Limit (ms)
Low	2.883	307.90	400
High	2.875	307.05	400

Low Channel



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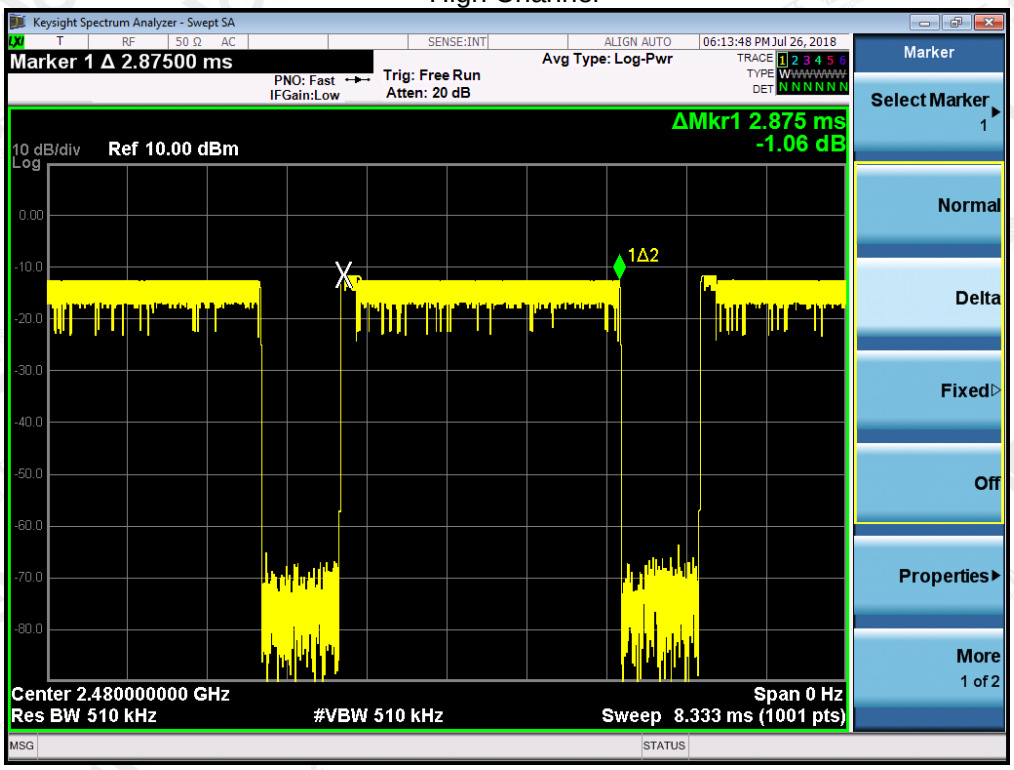
High Channel



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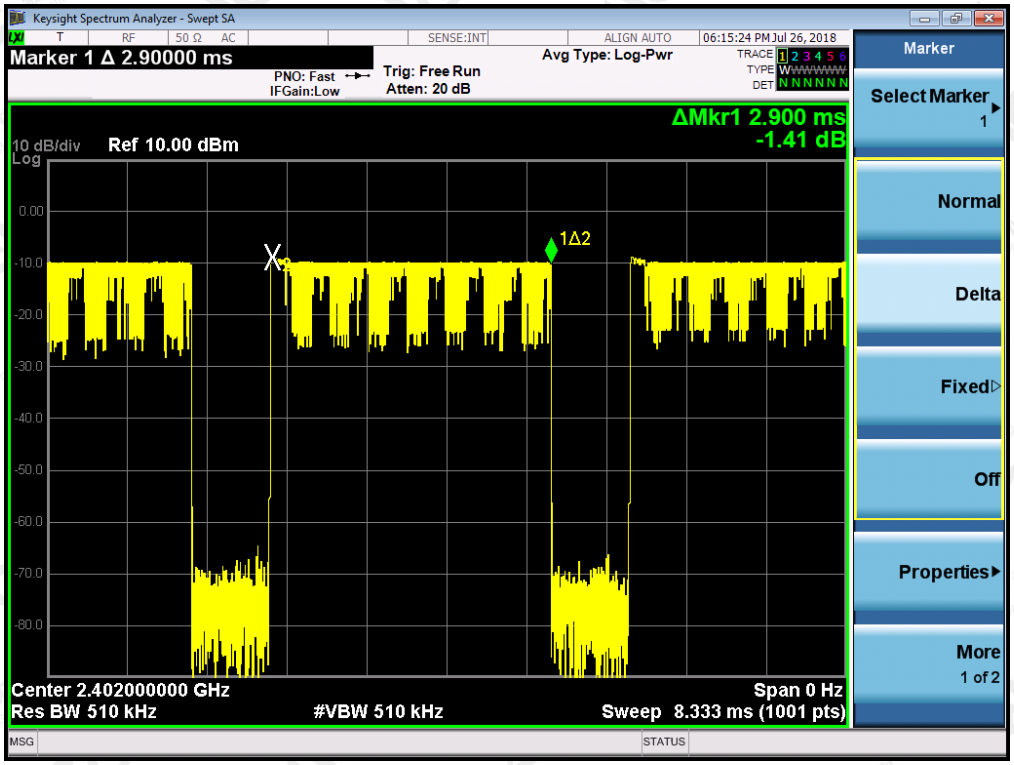
Bluetooth 3Mbps(DH5) Test Result

Channel	Pulse Time(ms)	Accumulated transmit time (ms)	Limit (ms)
Low	2.900	309.72	400
High	2.883	307.90	400

Low Channel



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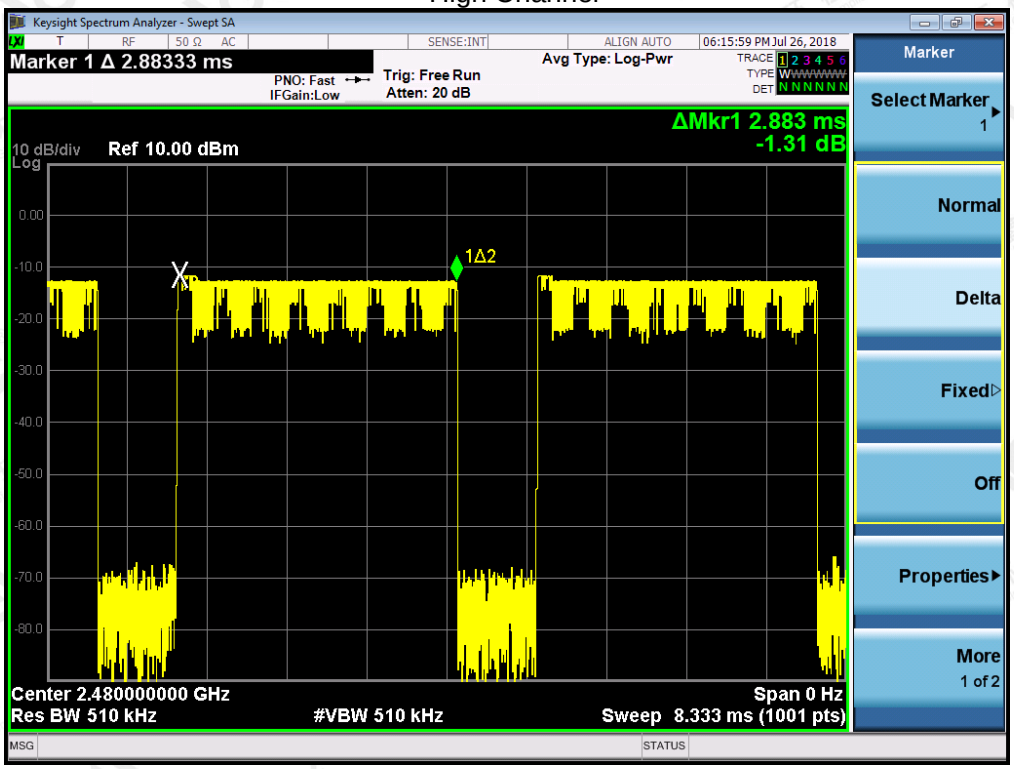
High Channel



Note: Accumulated transmit time=pulse time*hopping numbers,
Hopping numbers={1000/[(0.625*time slot+0.625) *79]}*31.6
Time slot(DH1,DH3,DH5)

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TEST RESULT FOR HOPPING SEQUENCE

Channel	Frequency (GHz)	Channel	Frequency (GHz)
01	2.40202	42	2.44302
02	2.40302	43	2.44402
03	2.40402	44	2.44502
04	2.40502	45	2.44602
05	2.40602	46	2.44702
06	2.40702	47	2.44802
07	2.40802	48	2.44902
08	2.40902	49	2.45002
09	2.41002	50	2.45102
10	2.41102	51	2.45202
11	2.41202	52	2.45302
12	2.41302	53	2.45402
13	2.41402	54	2.45502
14	2.41502	55	2.45602
15	2.41602	56	2.45702
16	2.41702	57	2.45802
17	2.41802	58	2.45902
18	2.41902	59	2.46002
19	2.42002	60	2.46102
20	2.42102	61	2.46202
21	2.42202	62	2.46302
22	2.42302	63	2.46402
23	2.42402	64	2.46502
24	2.42502	65	2.46602
25	2.42602	66	2.46702
26	2.42702	67	2.46802
27	2.42802	68	2.46902
28	2.42902	69	2.47002
29	2.43002	70	2.47102
30	2.43102	71	2.47202
31	2.43202	72	2.47302
32	2.43302	73	2.47402
33	2.43402	74	2.47502
34	2.43502	75	2.47602
35	2.43602	76	2.47702
36	2.43702	77	2.47802
37	2.43802	78	2.47902
38	2.43902	79	2.48002
39	2.44002		
40	2.44102		
41	2.44202		

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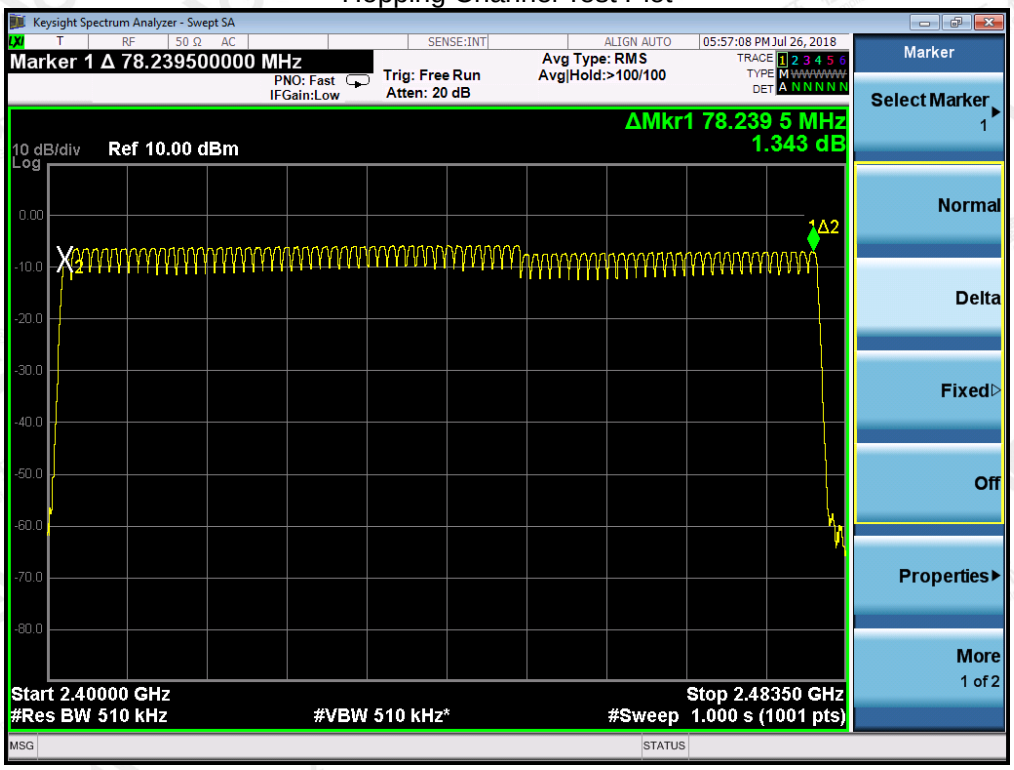
Hopping Channel Test Plot



Note: The test data has 79 channels.

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TEST RESULT FOR FREQUENCY OCCUPATION

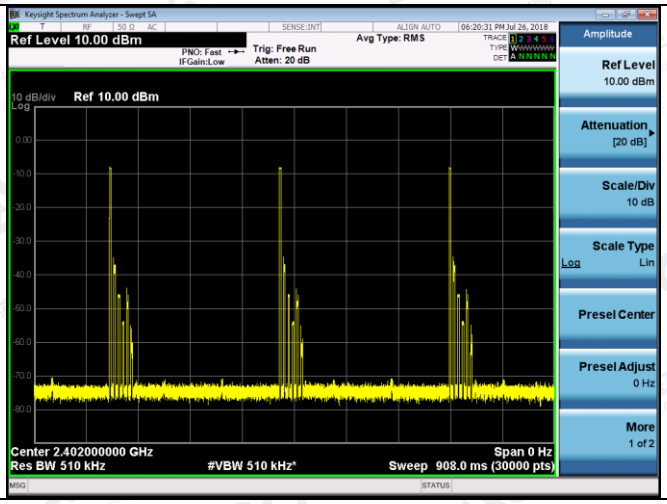
Test Result

Channel	Modulation	Frequency occupation (pcs)	Limit (pcs)	Result
LCH	GFSK	3	≥1	Pass
	π /4-DQPSK	3		Pass
	8DPSK	3		Pass
HCH	GFSK	3		Pass
	π /4-DQPSK	3		Pass
	8DPSK	3		Pass

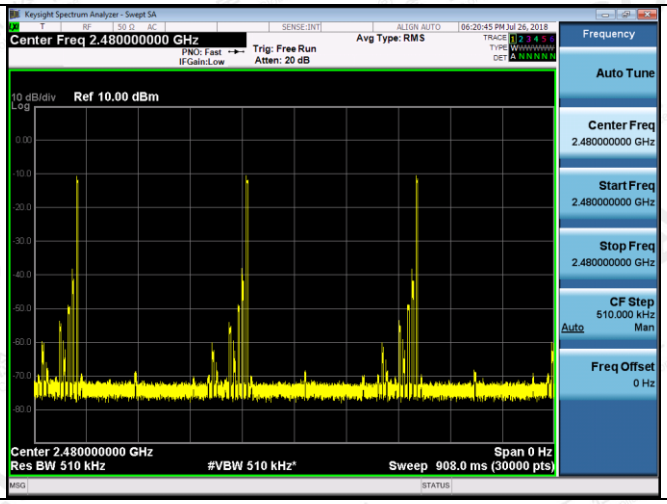
Test Graphs

Minimum Frequency Occupation

GFSK

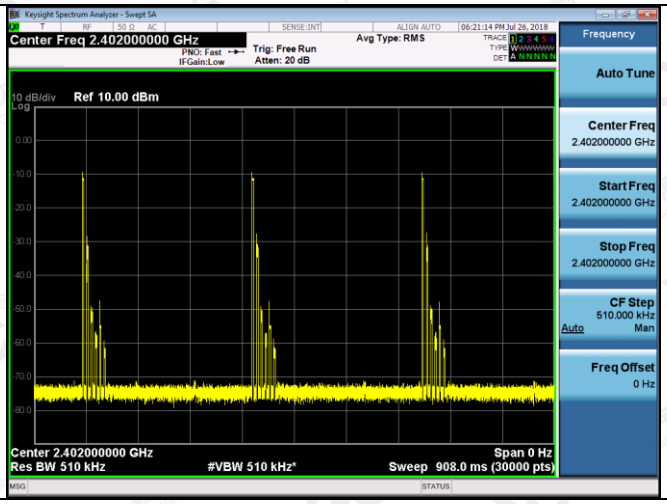


CH00

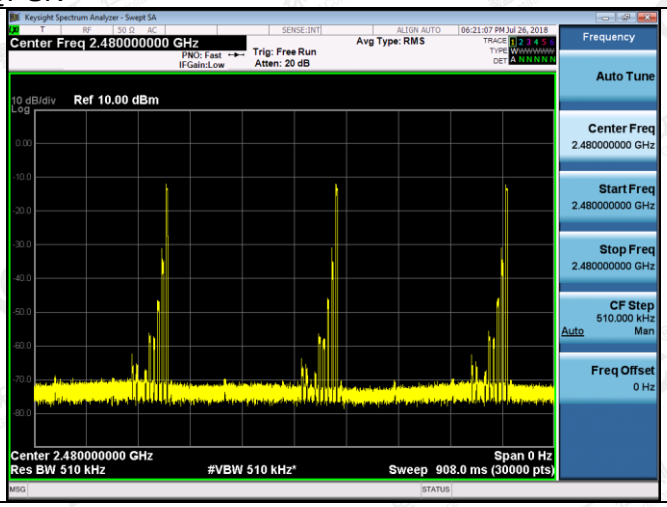


CH78

π /4-DQPSK



CH00



CH78

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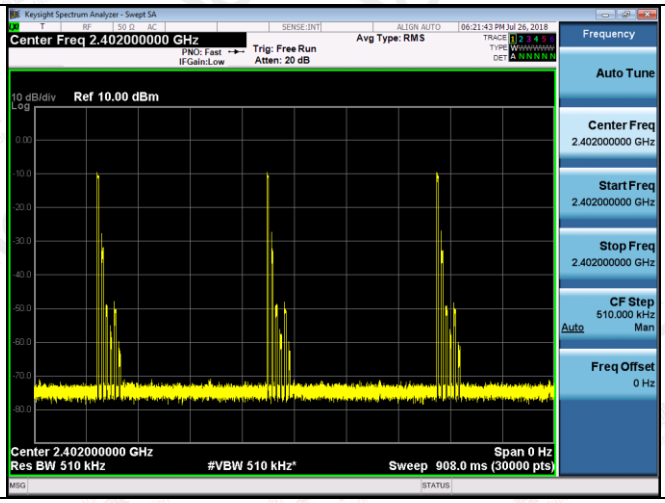
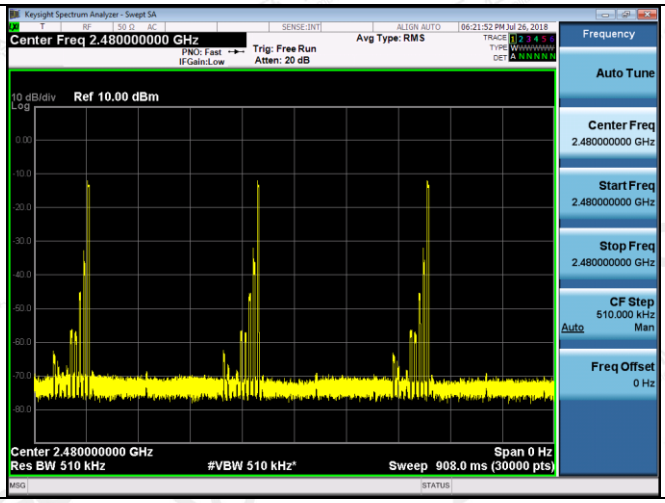
8DPSK	
	
CH00	CH78

Note: pcs means the number of hopping sequence.

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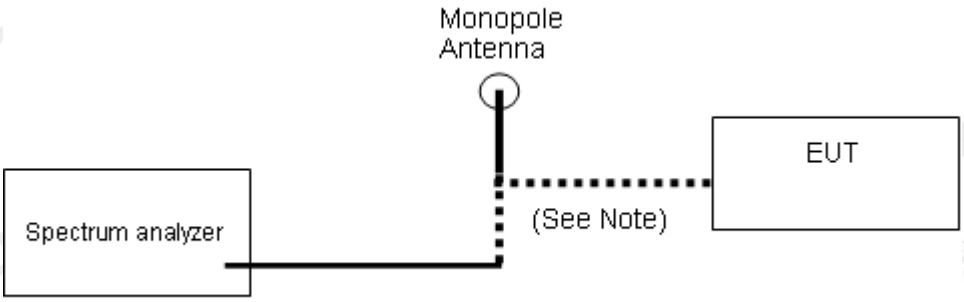
4.3 HOPPING FREQUENCY SEPARATION

ETSI EN 300 328 SUBCLAUSE **4.3.1.5**

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

For Adaptive frequency hopping systems:
The minimum Hopping Frequency Separation shall be 100 kHz.

CONFIGURATION



TEST PROCEDURE

Test Procedure please refer to clause 5.4.5

TEST RESULT

Hopping frequency separation Test Plot-1

Hopping Frequency Separation (F_{HS}) = $F2_C$ - $F1_C$=1.000MHz
Note: The modulation used during test is 8DPSK and this is the worst case.
Conclusion: PASS

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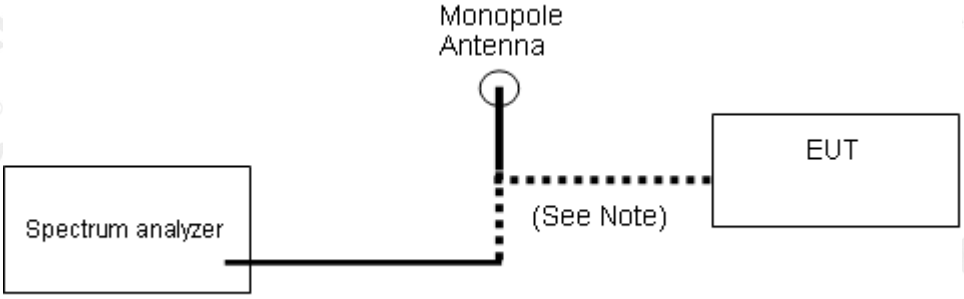
4.4 OCCUPIED CHANNEL BANDWIDTH

EN300328 4.3.1.8 OCCUPIED CHANNEL BANDWIDTH

The Occupied Channel Bandwidth is the bandwidth that contains 99 % of the power of the signal.

CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.3 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.7 the measurement method.
3. The Test equipment information as following
   Centre frequency: 2402MHz,2480MHz
   Resolution bandwidth: 20kHz
   Video bandwidth: 62kHz
   Detector mode :RMS
   Trace mode :Max Hold

TEST RESULT

TEST ITEM	OCCUPIED CHANNEL BANDWIDTH
TEST MODE	GFSK MOUDULATION

MEASUREMENT RESULT		
Test Data (MHz)		**Criteria**
Low Channel	0.824	PASS
High Channel	0.815	PASS

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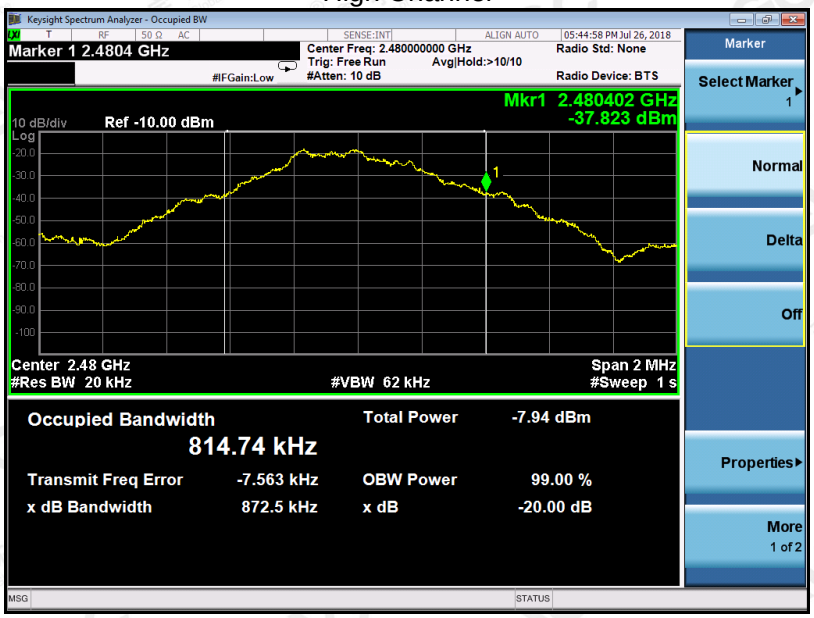
Low Channel

High Channel



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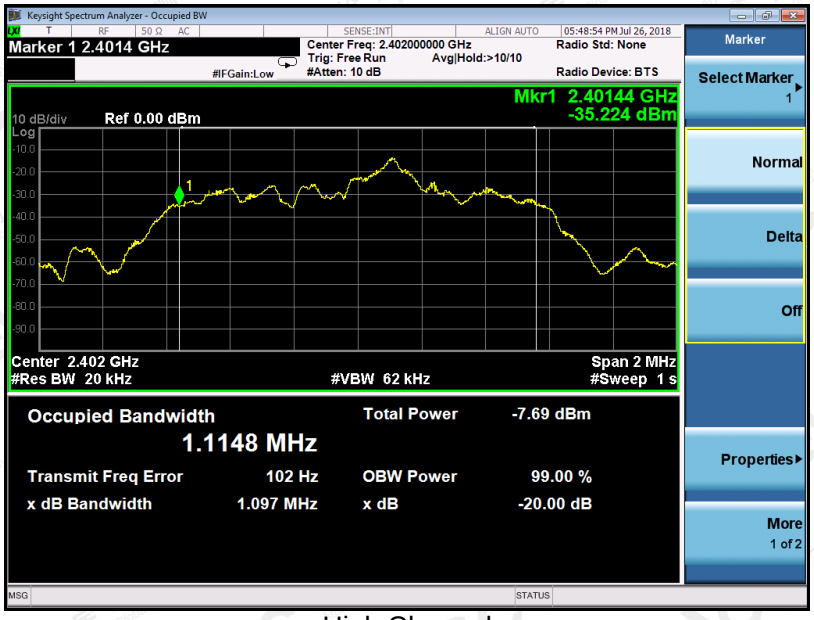
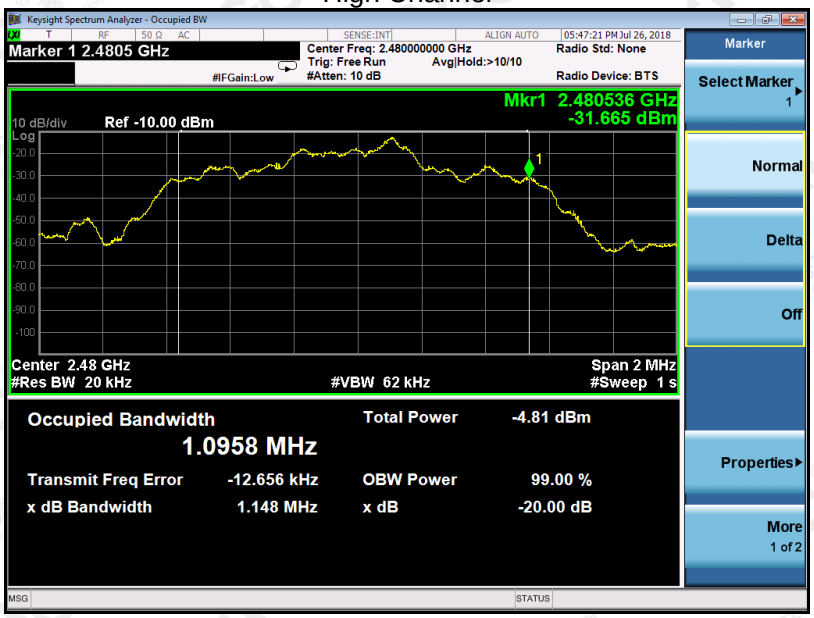
TEST ITEM	OCCUPIED CHANNEL BANDWIDTH
TEST MODE	Π /4-DQPSK MODULATION

MEASUREMENT RESULT		
Test Data (MHz)		**Result**
Low Channel	1.115	PASS
High Channel	1.096	PASS

Low Channel



High Channel



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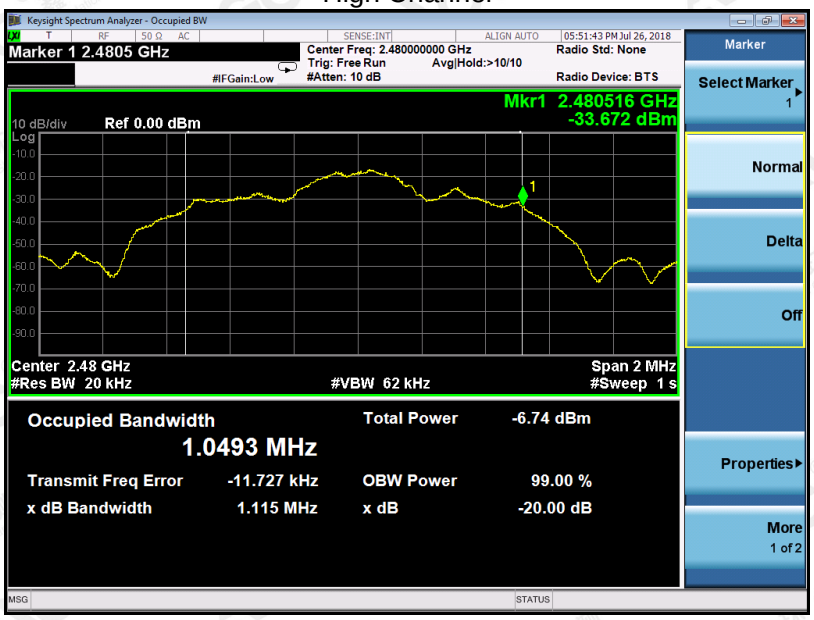
TEST ITEM	OCCUPIED CHANNEL BANDWIDTH
TEST MODE	8DPSK MODULATION

MEASUREMENT RESULT		
Test Data (MHz)		**Result**
Low Channel	1.049	PASS
High Channel	1.049	PASS

Low Channel

High Channel



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4.5TRANSMITTER UNWANTED EMISSIONS IN THE OUT OF BAND DOMAIN

EN300328 4.3.1.9 TRANSMITTER UNWANTED EMISSIONS IN THE OUT OF BAND DOMAIN

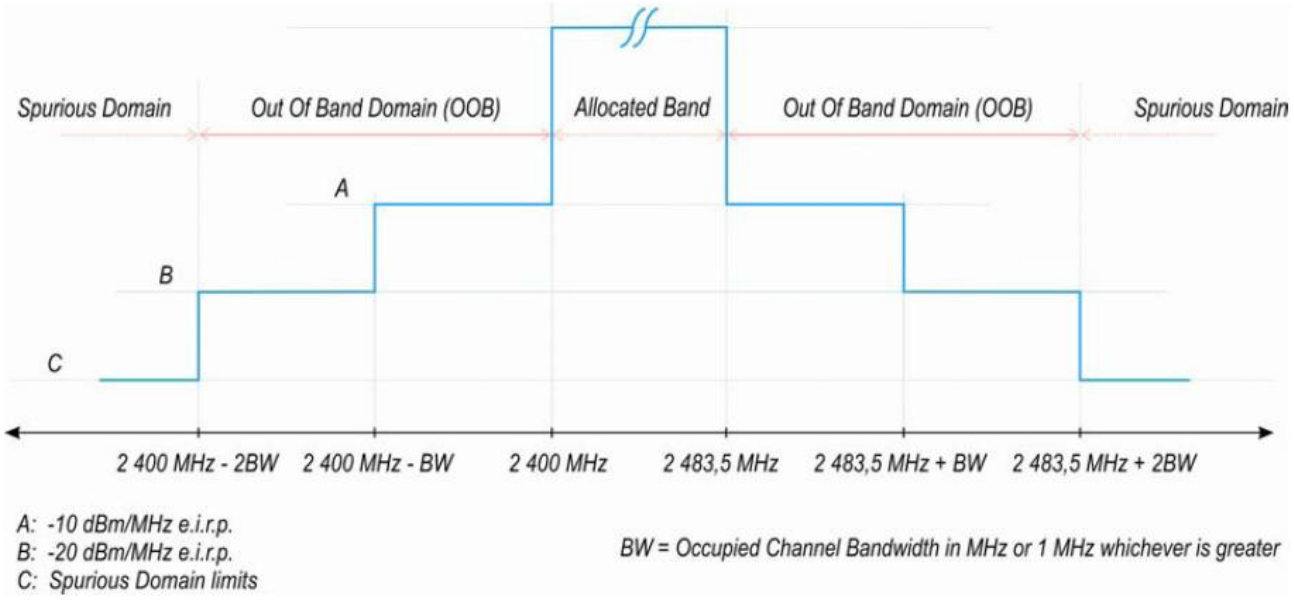
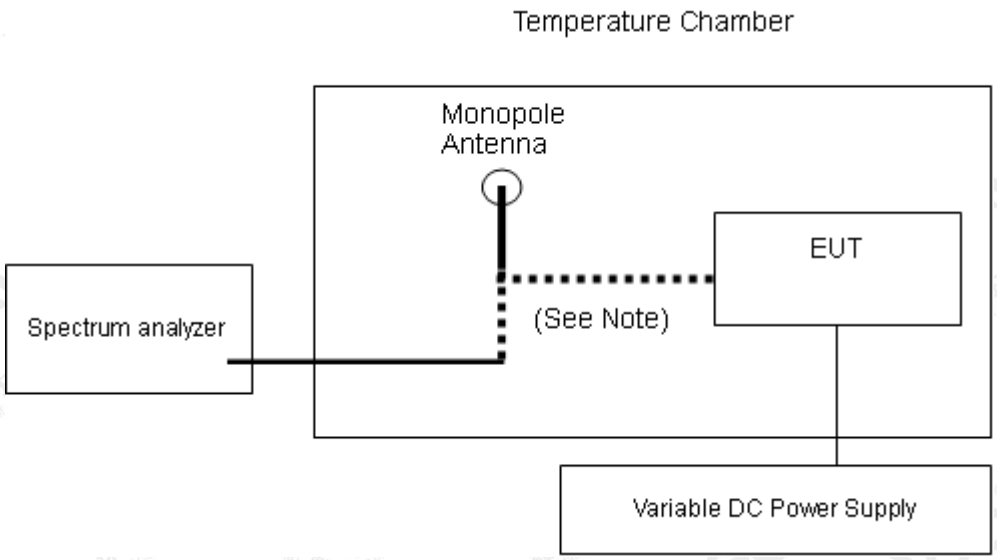


Figure 1: Transmit mask

TEST CONFIGURATION



For have temporary antenna connector product

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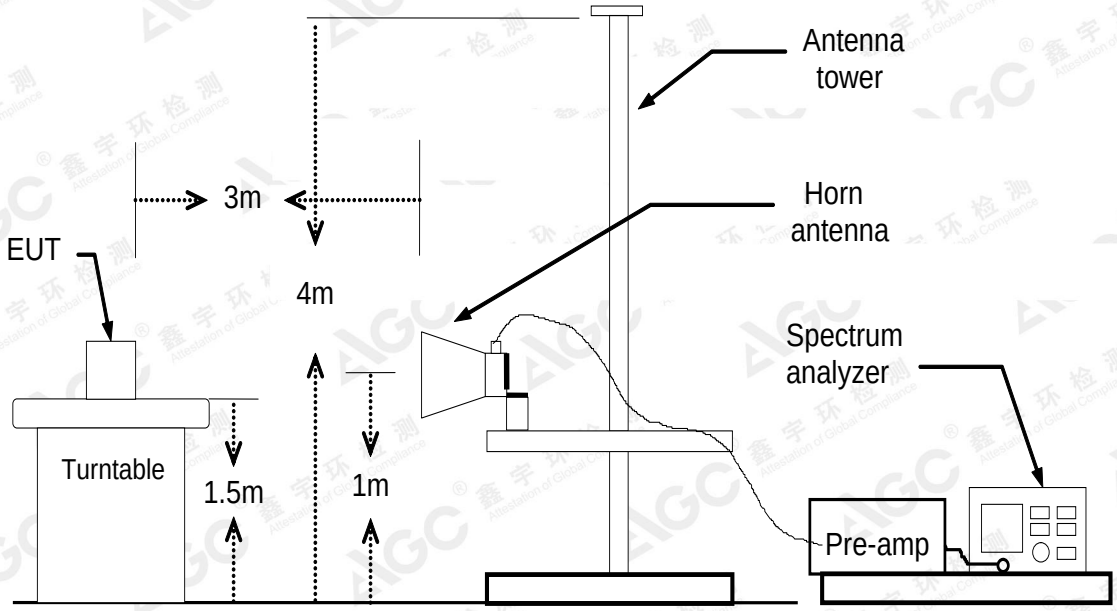

For have no temporary antenna product

TEST PROCEDURE

Test Procedure Please refer to Clause 5.4.8

TEST RESULT

see the next page

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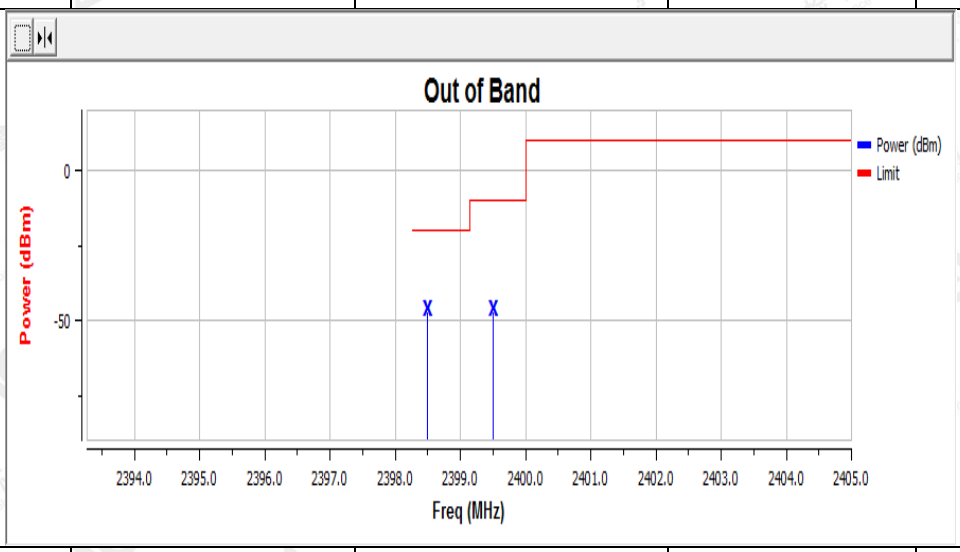
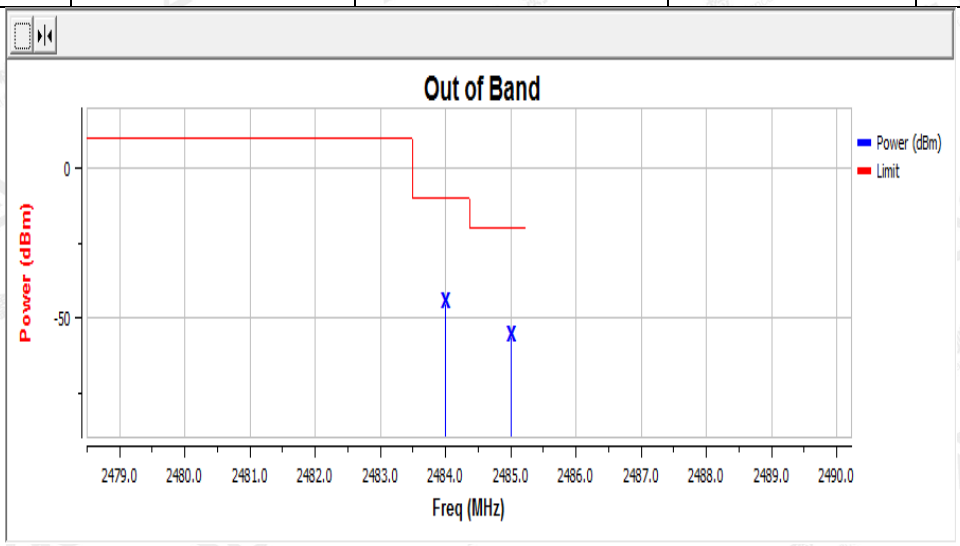
NORMAL TEMPERATURE NORMAL VOLTAGE

Channel	Antenna	Freq(MHz)	Level	Limit
CH Low-2402	Antenna 1	2399.5	-47.62	-10
CH Low-2402	Antenna 1	2398.5	-47.68	-20



Channel	Antenna	Freq(MHz)	Level	Limit
CH High-2480	Antenna 1	2484	-45.97	-10
CH High-2480	Antenna 1	2485	-57.23	-20



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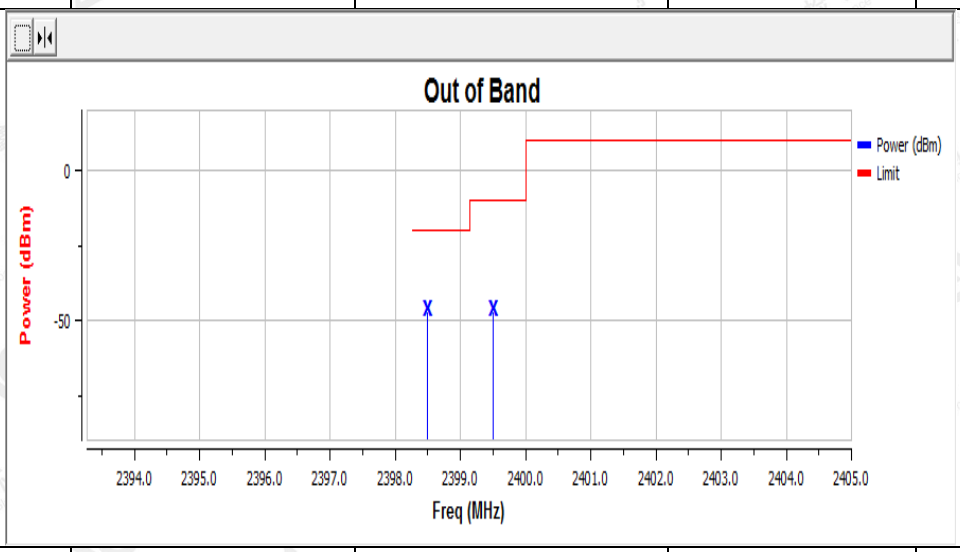
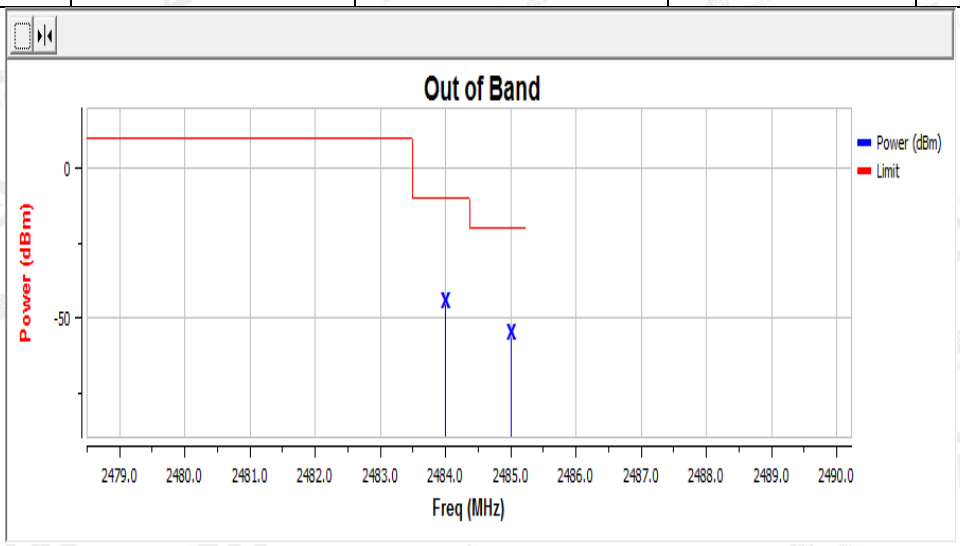
LOW TEMPERATURE NORMAL VOLTAGE

Channel	Antenna	Freq(MHz)	Level	Limit
CH Low-2402	Antenna 1	2399.5	-47.8	-10
CH Low-2402	Antenna 1	2398.5	-47.71	-20



Channel	Antenna	Freq(MHz)	Level	Limit
CH High-2480	Antenna 1	2484	-45.93	-10
CH High-2480	Antenna 1	2485	-56.85	-20



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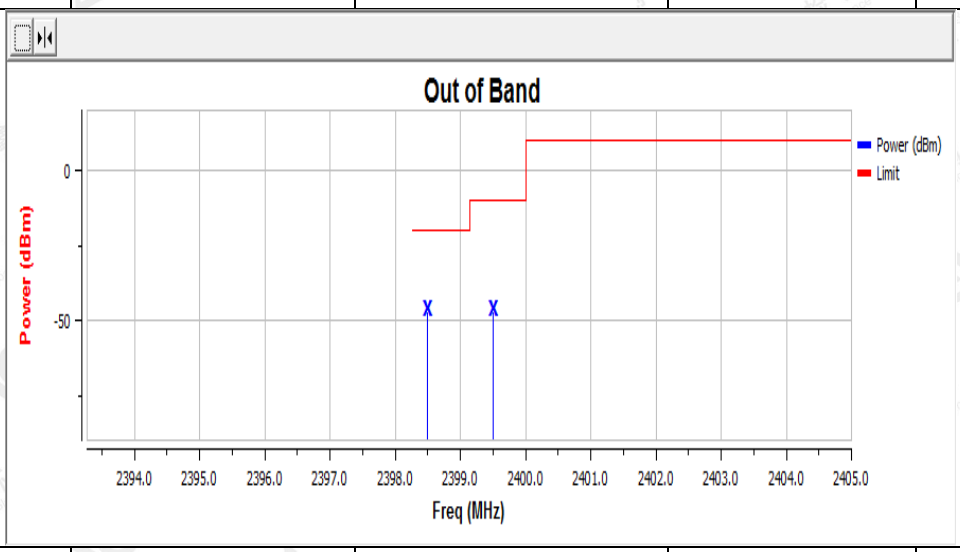
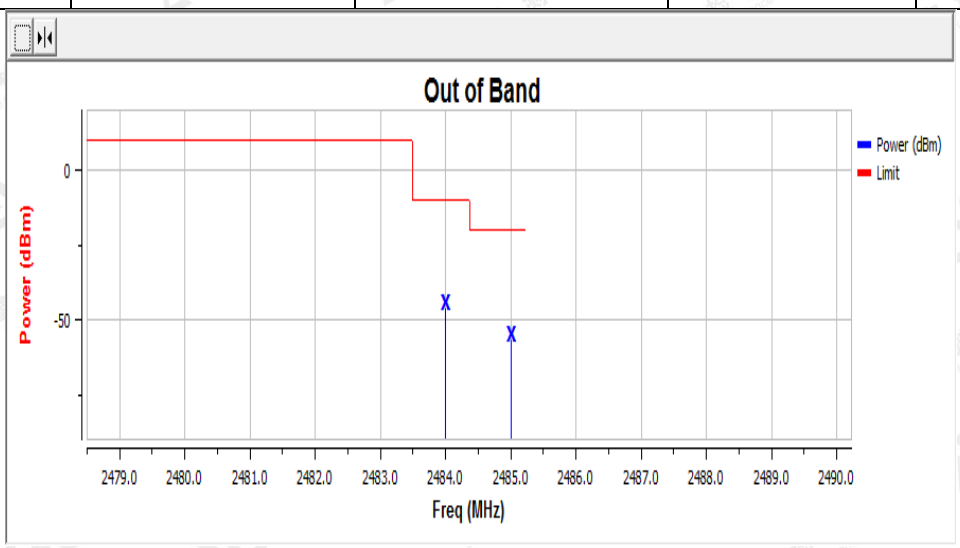
HIGH TEMPERATURE NORMAL VOLTAGE

Channel	Antenna	Freq(MHz)	Level	Limit
CH Low-2402	Antenna 1	2399.5	-47.8	-10
CH Low-2402	Antenna 1	2398.5	-47.7	-20



Channel	Antenna	Freq(MHz)	Level	Limit
CH High-2480	Antenna 1	2484	-46.2	-10
CH High-2480	Antenna 1	2485	-56.94	-20



Note: The worst modulation used during test is GFSK.
Conclusion: PASS

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4.6 TRANSMITTER SPURIOUS EMISSIONS

Spurious emissions are emissions outside the frequency range(s) of the equipment as defined in Clause 4.3.1.10.3.

Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the out-of-band domain as indicated in figure 1 when the equipment is in Transmit mode.

The spurious emissions of the transmitter shall not exceed the values in tables in the indicated bands:

Frequency Range	Maximum Power e.r.p(<=1GHz)/e.i.r.p(>1GHz)	Bandwidth
30MHz to 47MHz	-36dBm	100kHz
47MHz to 74MHz	-54dBm	100kHz
74MHz to 87.5MHz	-36dBm	100kHz
87.5MHz to 118MHz	-54dBm	100kHz
118MHz to 174MHz	-36dBm	100kHz
174MHz to 230MHz	-54dBm	100kHz
230MHz to 470MHz	-36dBm	100kHz
470MHz to 862MHz	-54dBm	100kHz
862MHz to 1GHz	-36dBm	100kHz
1GHz to 12.75GHz	-30dBm	1MHz

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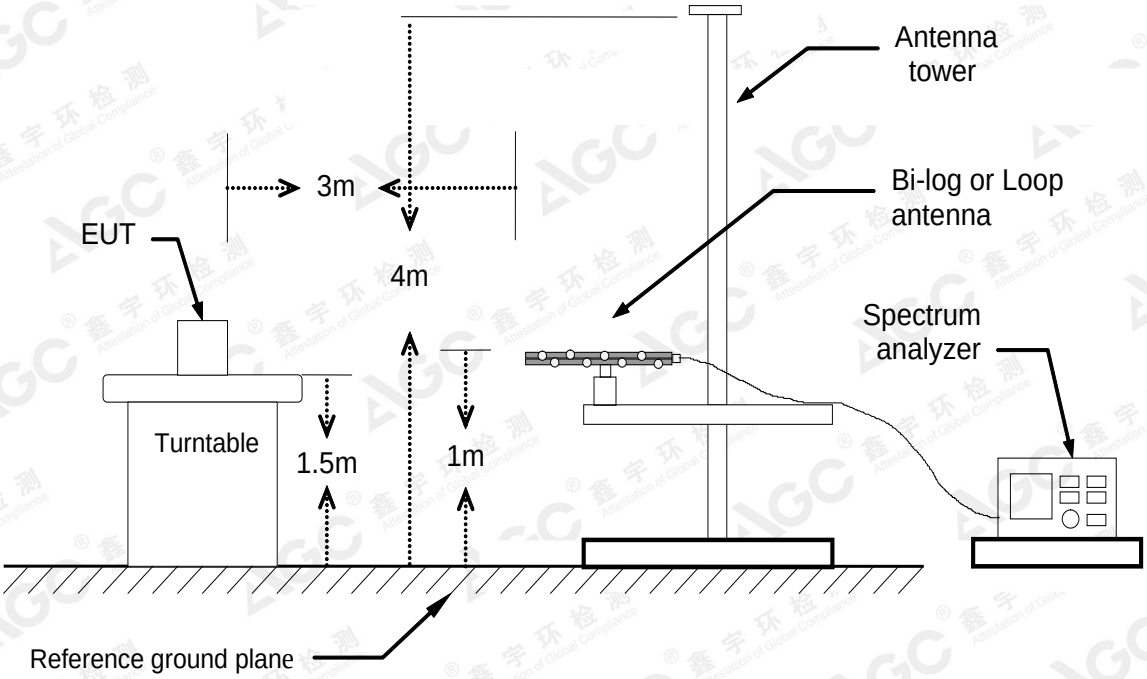
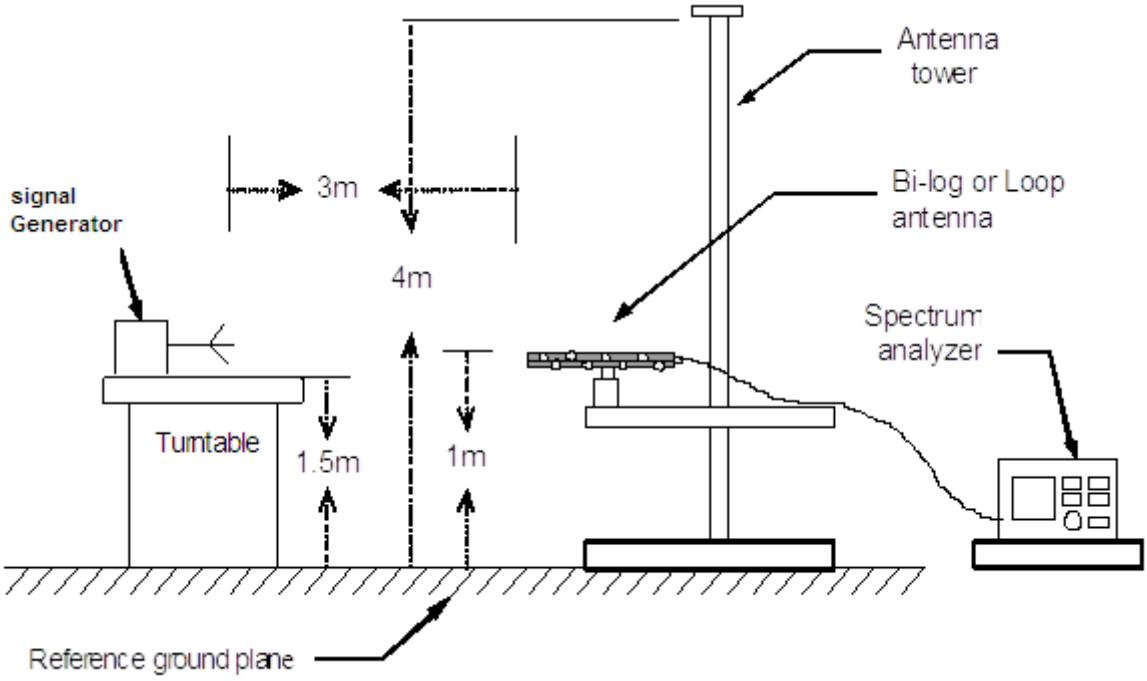
Test Configuration

Below 1GHz





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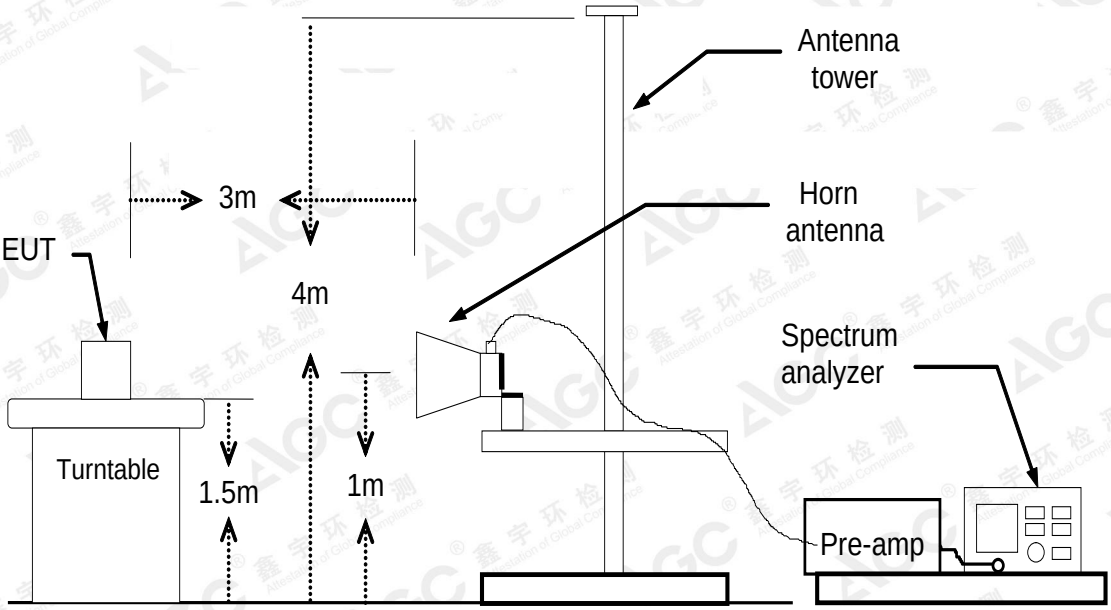
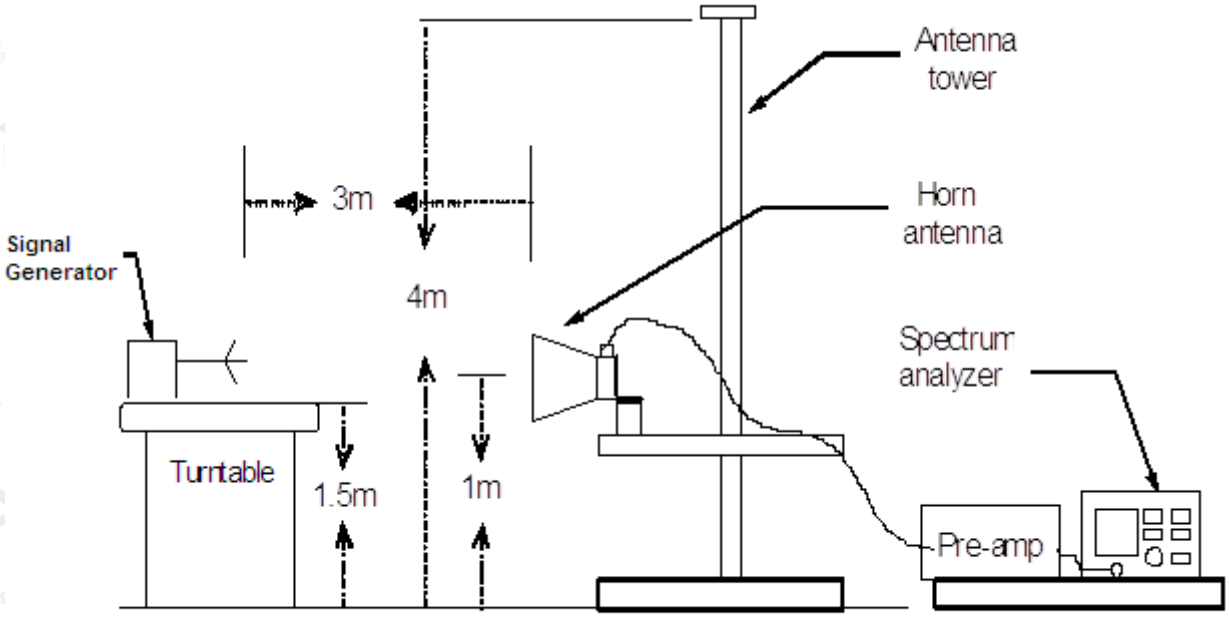
Above 1GHz





Radiated Method

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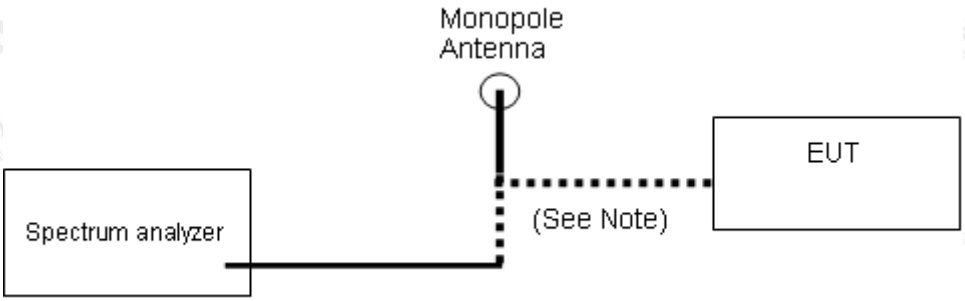

Conducted Method

TEST PROCEDURE

1. Replace the UUT with the substitution antenna as shown as above radiated method setup diagram. The substitution and the measurement antenna shall be vertically polarized.
2. Connect a signal generator to the substitution antenna and set it to the frequency being investigated.
3. The measurement antenna shall be raised or lowered, to ensure that the maximum signal is received.
4. Subsequently, the power of the signal generator is adjusted until the same level is obtained as recorded from the UUT.
5. The radiated power is equal to the power supplied by the signal generator, plus the gain of substitution antenna, minus the cable loss.
6. This measurement shall be replaced in horizontal polarization.

TEST SETTING

The emissions over the range 30 MHz to 1 000 MHz shall be identified.
Spectrum analyzer settings:
• Resolution bandwidth: 100 kHz
• Video bandwidth: 300 kHz
• Detector mode: Peak
• Trace Mode: Max Hold
• Sweep Points: ≥ 19400

The emissions over the range 1 GHz to 12.75 GHz shall be identified.
Spectrum analyzer settings:
• Resolution bandwidth: 1 MHz
• Video bandwidth: 3 MHz
• Detector mode: Peak
• Trace Mode: Max Hold
• Sweep Points: ≥ 23500

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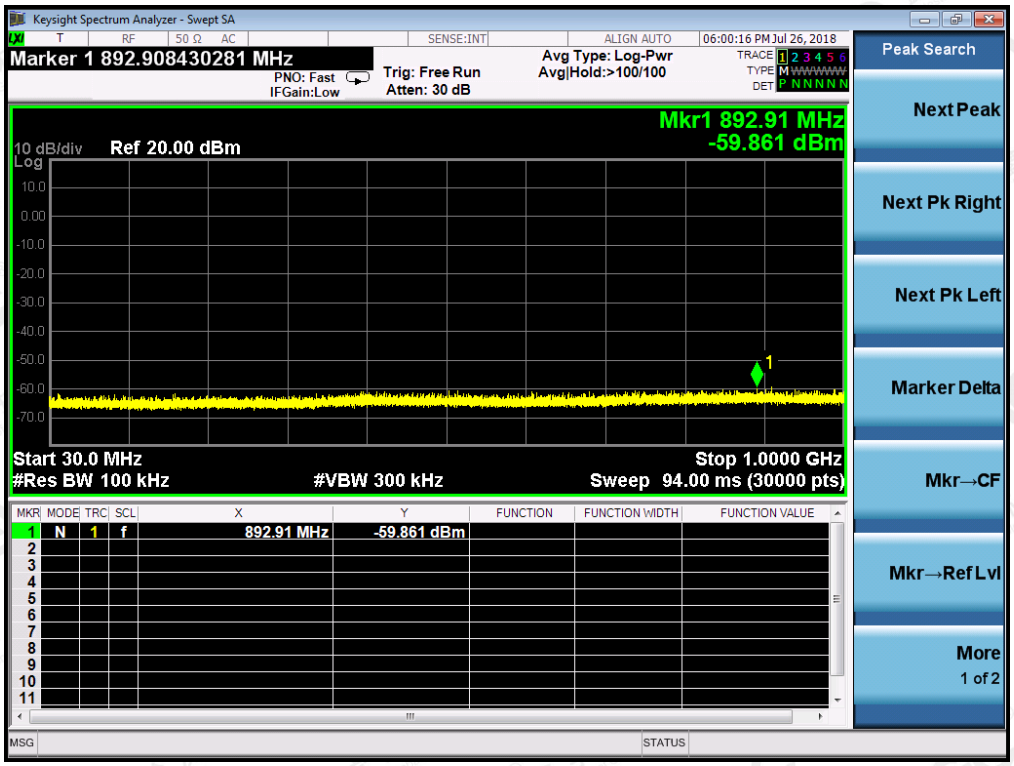
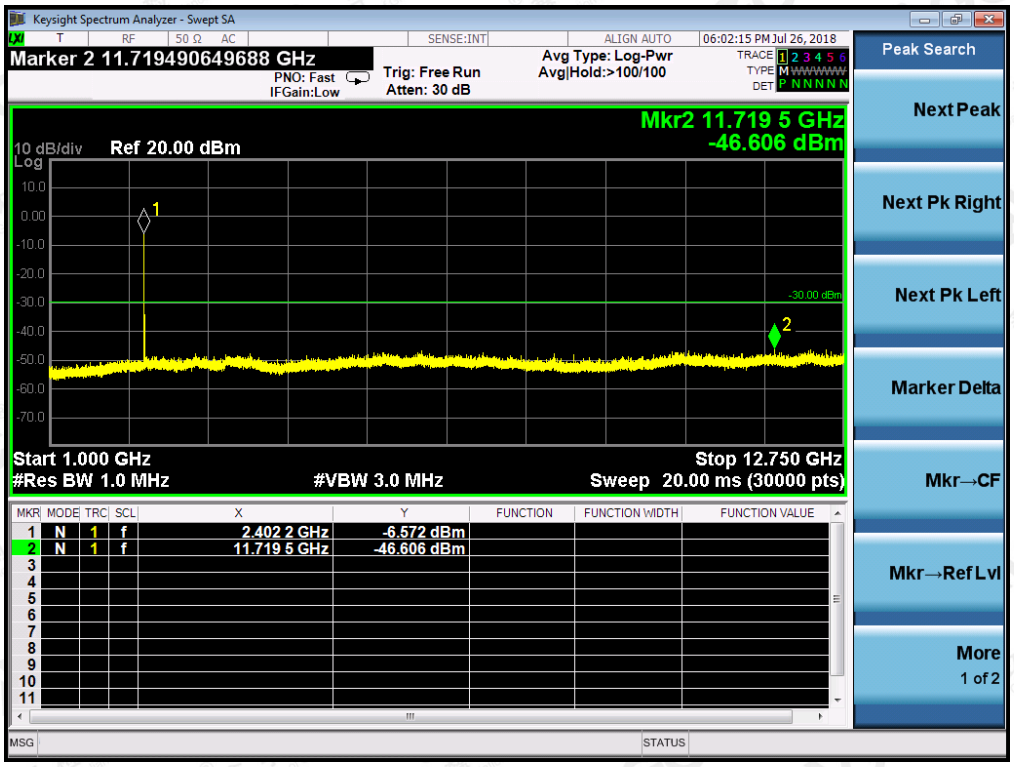
CONDUCTED RESULTS: (Worst Case: Low channel, 1Mbps)





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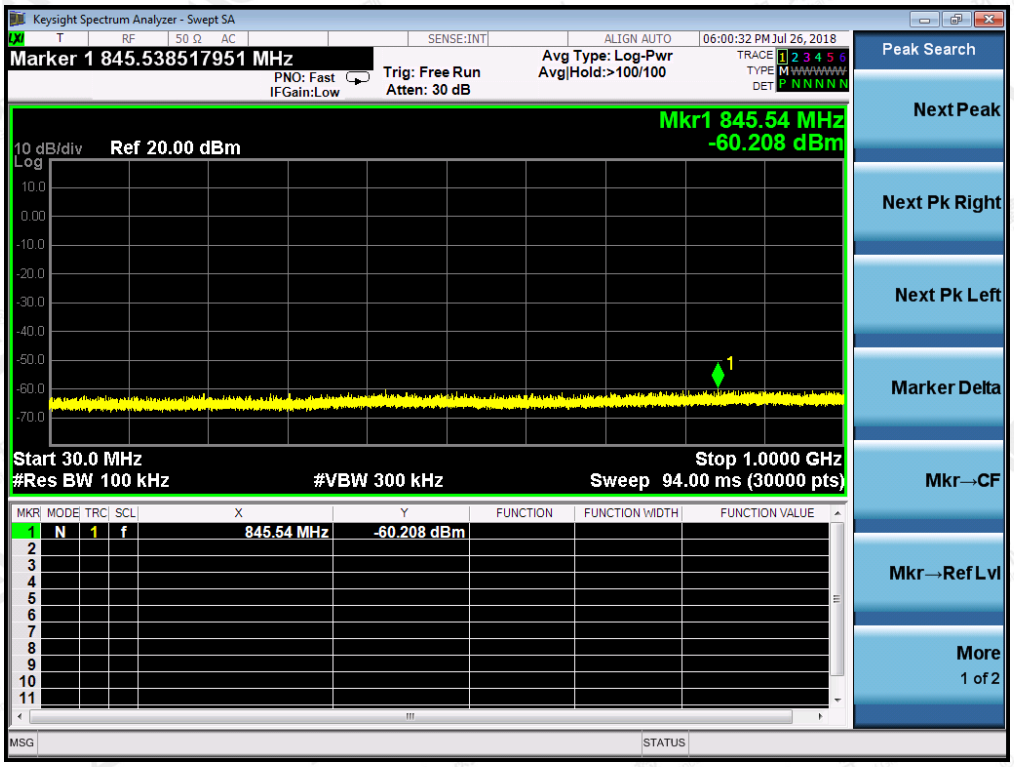
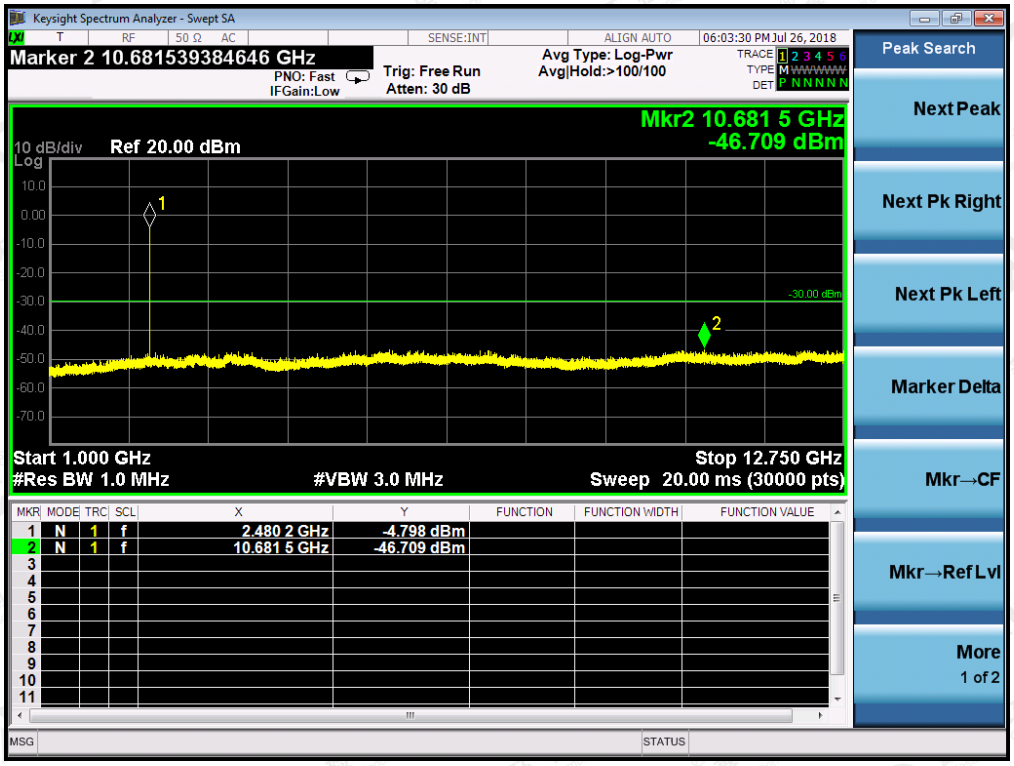
(Worst Case: High channel, 1Mbps)





Note: All the modes have been tested but only the worst data recorded in the report.

Conclusion: PASS

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TEST RESULTS FOR RADIATED METHOD (Worst case :1Mbps)

Low Channel: Transmitter Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
84.98	30.59	V	-60.90	0.48	0.54	-60.84	-36.00	24.84
130.29	30.47	V	-60.68	0.49	0.10	-61.07	-36.00	25.07
240.09	30.94	V	-68.10	0.52	6.60	-62.02	-36.00	26.02
326.04	30.39	V	-66.35	0.53	6.10	-60.78	-36.00	24.78
334.46	30.88	V	-62.82	0.53	5.94	-57.41	-36.00	21.41
827.56	31.29	V	-65.40	0.66	6.45	-59.61	-54.00	5.61
Other(30-1000)	--	V	--	--	--	--	-36.00/-54.00	--
83.51	32.34	H	-57.19	0.48	0.38	-57.29	-36.00	21.29
131.88	31.07	H	-60.91	0.49	0.08	-61.32	-36.00	25.32
242.85	29.51	H	-67.53	0.52	6.72	-61.33	-36.00	25.33
325.45	30.48	H	-66.39	0.53	6.10	-60.82	-36.00	24.82
735.72	30.72	H	-68.13	0.59	6.60	-62.13	-54.00	8.13
827.41	30.65	H	-65.13	0.66	6.45	-59.34	-54.00	5.34
Other(30-1000)	--	H	--	--	--	--	-36.00/-54.00	--

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High Channel: Transmitter Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
87.28	30.90	V	-60.39	0.48	0.98	-59.89	-36.00	23.89
146.09	30.99	V	-60.02	0.49	0.38	-60.13	-36.00	24.13
243.09	30.80	V	-67.85	0.52	6.78	-61.59	-36.00	25.59
344.30	30.03	V	-64.90	0.53	5.62	-59.81	-36.00	23.81
385.67	30.84	V	-65.61	0.54	6.45	-59.70	-36.00	23.70
864.76	31.69	V	-64.29	0.68	5.72	-59.25	-36.00	23.25
Other(30-1000)	--	V	--	--	--	--	-36.00/-54.00	--
93.24	31.85	H	-59.95	0.48	1.64	-58.79	-54.00	4.79
146.10	30.52	H	-59.50	0.49	0.38	-59.61	-36.00	23.61
252.76	29.62	H	-65.57	0.52	7.18	-58.91	-36.00	22.91
336.09	30.71	H	-67.28	0.53	5.86	-61.95	-36.00	25.95
648.04	31.03	H	-67.59	0.59	7.18	-61.00	-54.00	7.00
719.96	30.90	H	-67.14	0.58	6.22	-61.51	-54.00	7.51
Other(30-1000)	--	H	--	--	--	--	-36.00/-54.00	--

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Low Channel: Transmitter Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4804.15	45.86	V	-48.97	2.64	9.30	-42.30	-30.00	12.30
7328.56	31.02	V	-57.36	3.11	11.45	-49.03	-30.00	19.03
7429.58	31.25	V	-68.24	3.09	11.59	-59.75	-30.00	29.75
Other(30-1000)	--	V	--	--	--	--	-36.00/-54.00	--
4804.47	41.16	H	-48.94	2.64	9.30	-42.28	-30.00	12.28
7247.08	30.94	H	-58.41	3.13	11.34	-50.20	-30.00	20.20
7339.59	40.56	H	-59.46	3.11	11.46	-51.11	-30.00	21.11
Other(30-1000)	--	H	--	--	--	--	-36.00/-54.00	--

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High Channel: Transmitter Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
2564.50	47.17	V	-58.41	1.58	7.93	-52.07	-30.00	22.07
4960.17	46.21	V	-49.34	2.75	9.62	-42.47	-30.00	12.47
7328.91	31.25	V	-67.76	3.11	11.45	-59.42	-30.00	29.42
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
2563.88	52.13	H	-57.23	1.58	7.93	-50.88	-30.00	20.88
4960.57	41.25	H	-47.64	2.75	9.62	-40.77	-30.00	10.77
7246.96	30.68	H	-68.71	3.13	11.34	-60.50	-30.00	30.50
Other(1000-12750)	--	H	--	--	--	--	-30.00	--

Note: All the above "--" means that the other spectrum have 20dB margin. No recording in the test report.

Conclusion: PASS

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4.7 RECEIVER SPURIOUS EMISSIONS

TEST LIMIT

SPURIOUS EMISSION LIMITS FOR RECEIVERS

Frequency range	Maximum power	Measurement bandwidth
30MHz to 1GHz	-57dBm	100kHz
1GHz to 12.75GHz	-47dBm	1MHz

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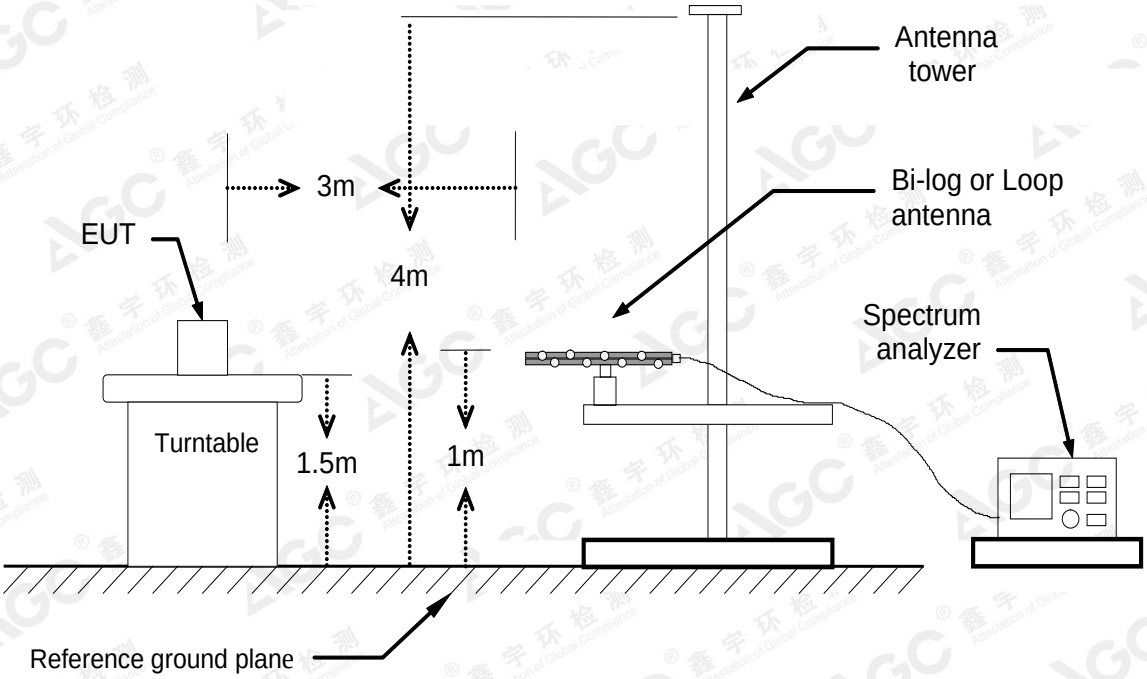
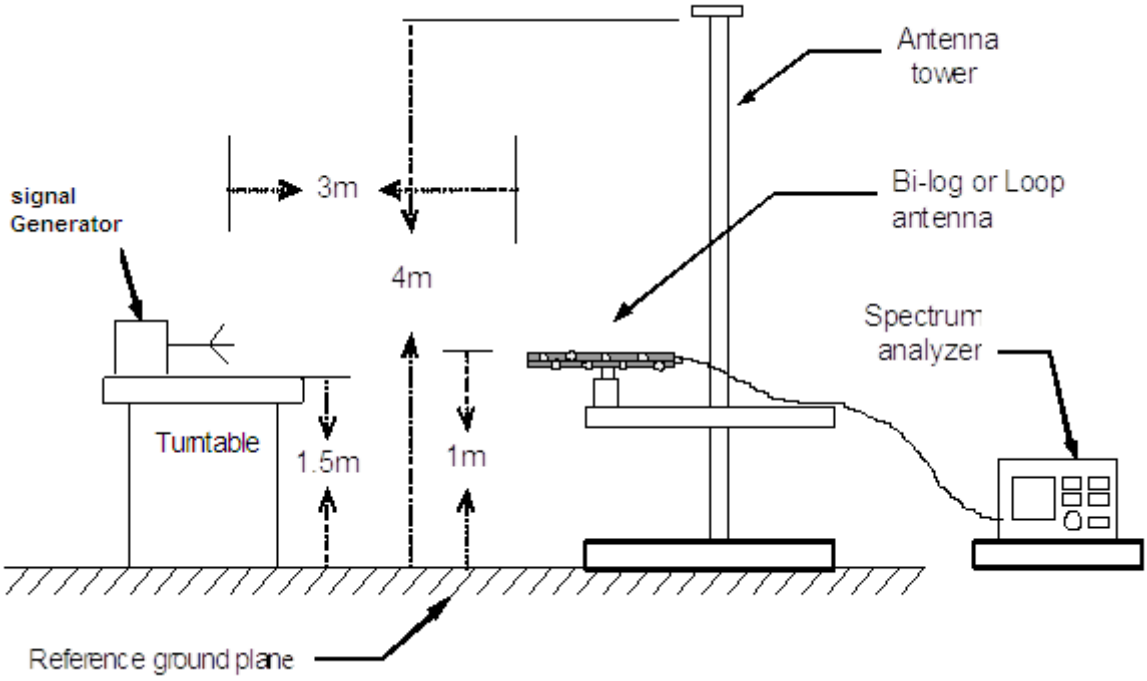
Test Configuration

Below 1GHz





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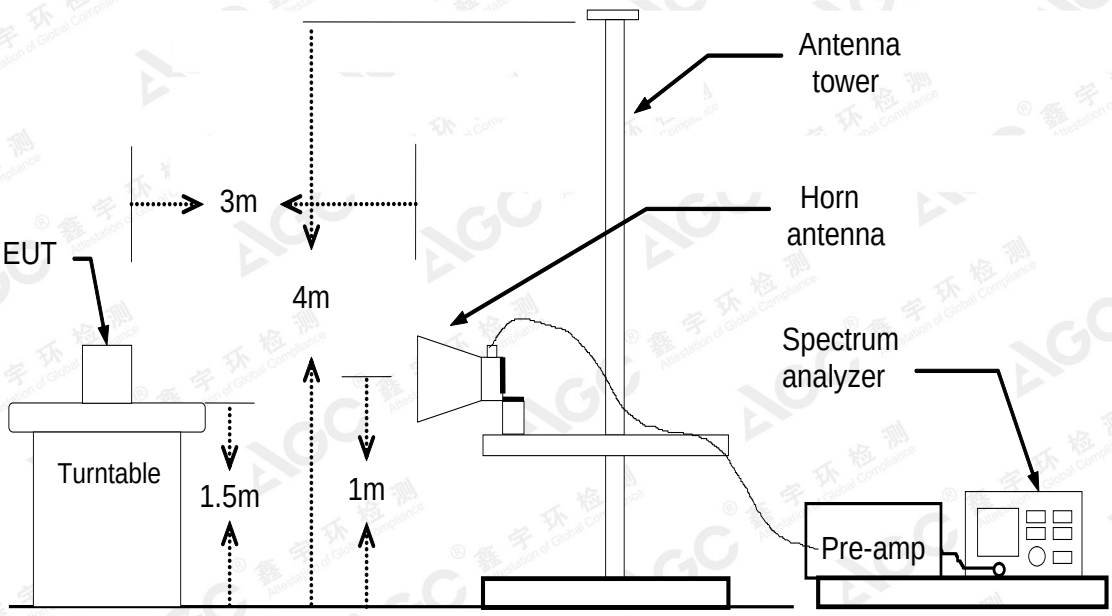
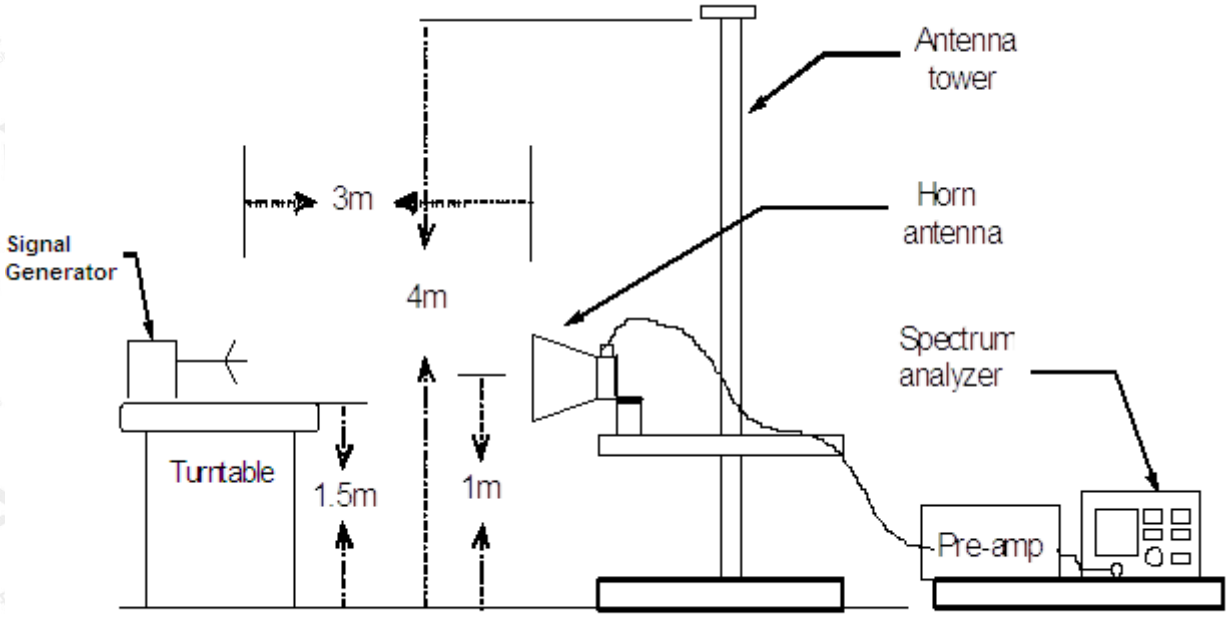
Above 1GHz





Radiated Method

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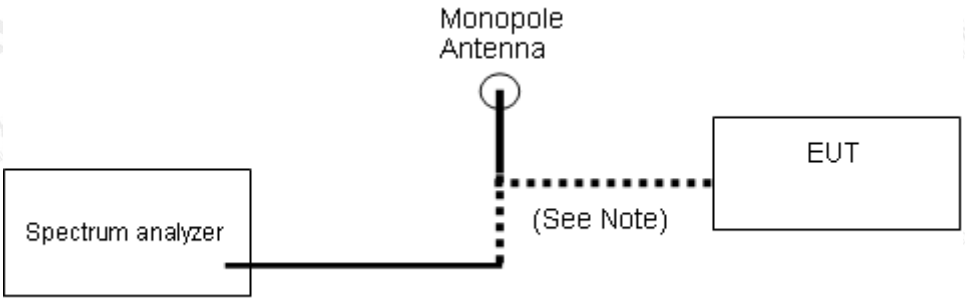

Conducted Method

TEST PROCEDURE

1. Replace the UUT with the substitution antenna as shown as above radiated method setup diagram. The substitution and the measurement antenna shall be vertically polarized.
2. Connect a signal generator to the substitution antenna and set it to the frequency being investigated.
3. The measurement antenna shall be raised or lowered, to ensure that the maximum signal is received.
4. Subsequently, the power of the signal generator is adjusted until the same level is obtained as recorded from the UUT.
5. The radiated power is equal to the power supplied by the signal generator, plus the gain of substitution antenna, minus the cable loss.
6. This measurement shall be replaced in horizontal polarization.

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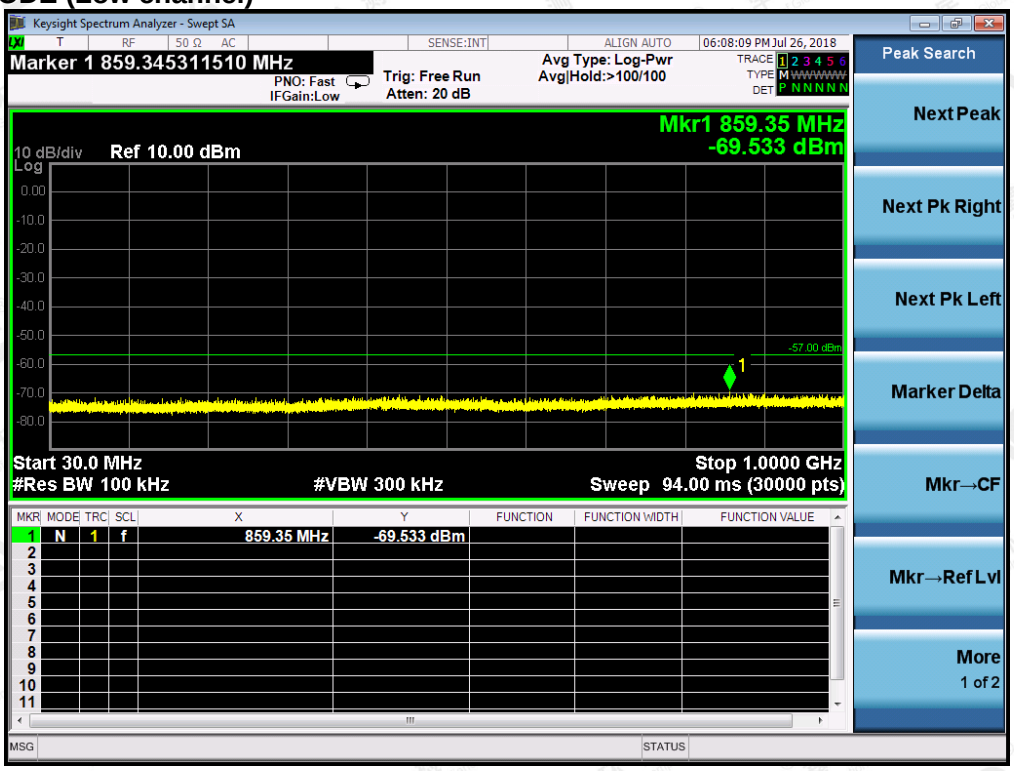
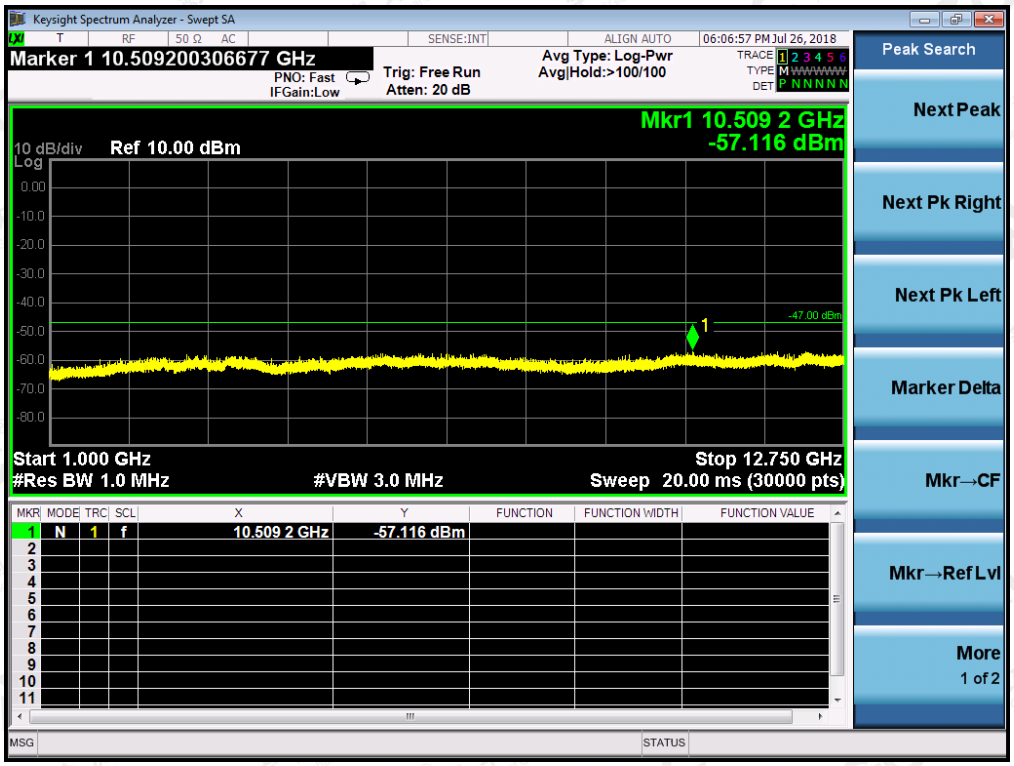
TEST RESULTS FOR CONDUCTED METHOD

RECEIVER MODE (Low channel)





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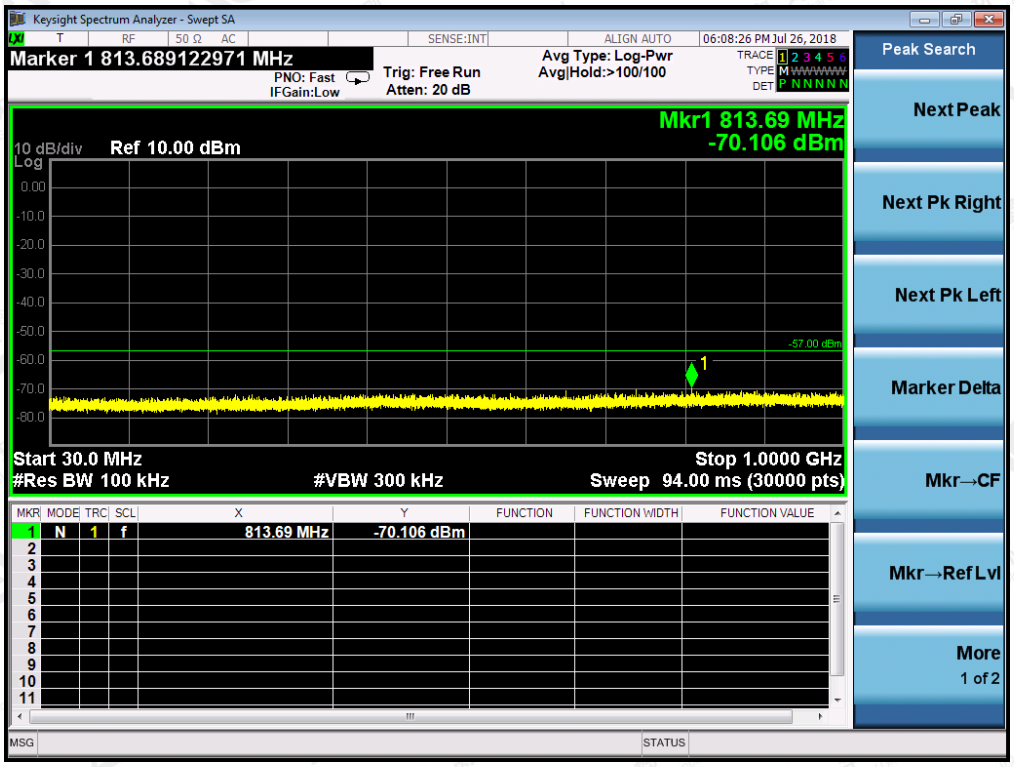
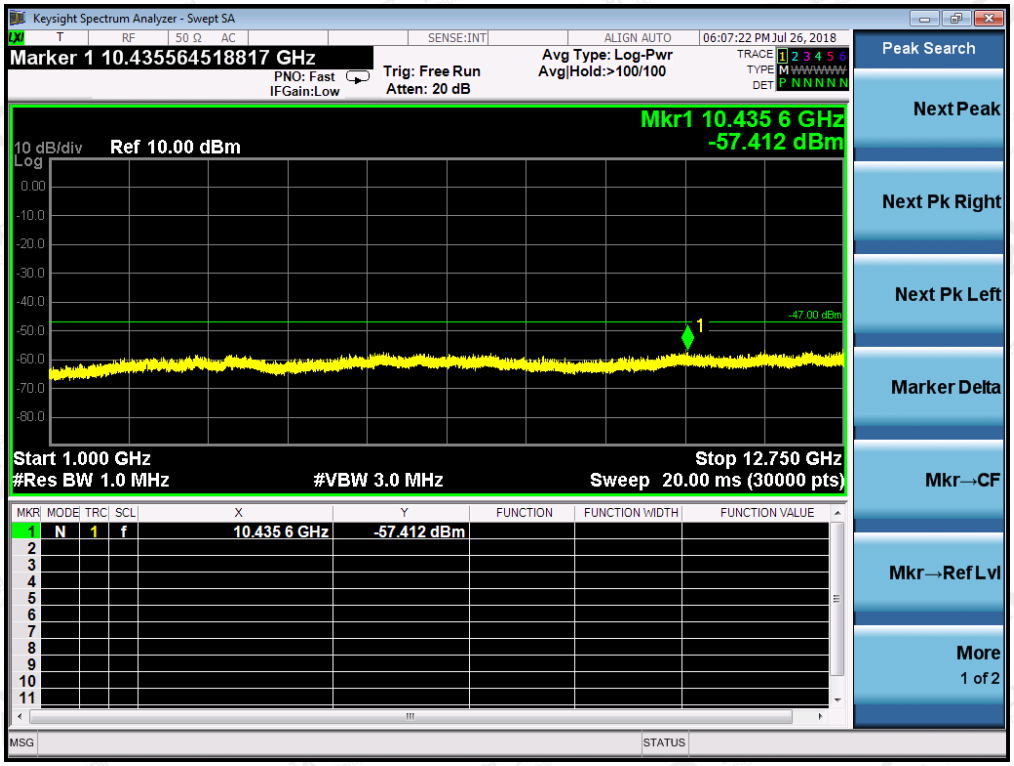
(High channel)





Note: All the modes have been tested but only the worst data recorded in the report.

Conclusion: PASS

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TEST RESULTS FOR RADIATED METHOD

Low Channel: Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
114.88	30.86	V	-72.02	0.48	1.40	-71.10	-57.00	14.10
176.72	31.91	V	-73.62	0.51	2.88	-71.25	-57.00	14.25
229.12	30.31	V	-77.71	0.52	6.84	-71.39	-57.00	14.39
496.29	29.96	V	-77.54	0.56	7.04	-71.06	-57.00	14.06
665.25	30.47	V	-77.43	0.59	6.95	-71.07	-57.00	14.07
879.70	30.83	V	-76.46	0.69	5.87	-71.28	-57.00	14.28
Other(30-1000)	--	V	--	--	--	--	-57.00	--
84.37	32.23	H	-71.20	0.48	0.54	-71.14	-57.00	14.14
110.17	30.71	H	-72.28	0.48	1.40	-71.36	-57.00	14.36
219.23	31.02	H	-77.48	0.52	7.38	-70.62	-57.00	13.62
485.36	30.62	H	-77.34	0.56	7.00	-70.90	-57.00	13.90
555.09	31.13	H	-79.90	0.57	6.80	-73.67	-57.00	16.67
634.95	31.41	H	-79.02	0.58	7.22	-72.38	-57.00	15.38
Other(30-1000)	--	H	--	--	--	--	-57.00	--

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High Channel: Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
85.35	31.54	V	-70.23	0.48	0.70	-70.01	-57.00	13.01
154.58	31.55	V	-70.64	0.50	0.70	-70.44	-57.00	13.44
248.78	31.47	V	-76.66	0.52	7.02	-70.16	-57.00	13.16
394.80	30.81	V	-75.94	0.54	6.48	-70.00	-57.00	13.00
484.26	28.99	V	-76.37	0.56	6.98	-69.95	-57.00	12.95
895.16	30.22	V	-75.32	0.70	6.20	-69.82	-57.00	12.82
Other(30-1000)	--	V	--	--	--	--	-57.00	--
109.60	30.87	H	-70.30	0.48	1.28	-69.50	-57.00	12.50
188.14	31.69	H	-75.38	0.51	4.78	-71.11	-57.00	14.11
224.64	30.66	H	-79.07	0.52	7.70	-71.89	-57.00	14.89
472.76	31.12	H	-76.31	0.55	6.82	-70.04	-57.00	13.04
502.00	31.16	H	-77.18	0.56	6.97	-70.77	-57.00	13.77
725.41	30.52	H	-76.75	0.59	6.55	-70.78	-57.00	13.78
Other(30-1000)	--	H	--	--	--	--	-57.00	--

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Tel: +86-755 2908 1955 Fax: +86-755 2600 8484 E-mail: agc@agc-cert.com 400 089 2118
Add: 2/F. , Building 2, No.1-4,Chaxi Sanwei Technical Industrial Park,Gushu, Xixiang, Baoan District, Shenzhen, Guangdong China

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Low Channel: Receiver Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4947.88	28.52	V	-70.42	2.74	9.58	-63.58	-47.00	16.58
--	--	V	--	--	--	--	-47.00	--
--	--	V	--	--	--	--	-47.00	--
--	--	V	--	--	--	--	-47.00	--
--	--	V	--	--	--	--	-47.00	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
4953.15	29.67	H	-67.50	2.74	9.60	-60.64	-47.00	13.64
--	--	H	--	--	--	--	-47.00	--
--	--	H	--	--	--	--	-47.00	--
--	--	H	--	--	--	--	-47.00	--
--	--	H	--	--	--	--	-47.00	--
Other(1000-12750)	--	H	--	--	--	--	-47.00	--

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High Channel: Receiver Spurious Emission above 1GHz (1GHz-12.75GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4980.23	30.25	V	-66.98	2.77	9.66	-60.08	-47.00	13.08
--	--	V	--	--	--	--	-47.00	--
--	--	V	--	--	--	--	-47.00	--
--	--	V	--	--	--	--	-47.00	--
--	--	V	--	--	--	--	-47.00	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
4914.11	29.97	H	-69.49	2.72	9.52	-62.68	-47.00	15.68
--	--	H	--	--	--	--	-47.00	--
--	--	H	--	--	--	--	-47.00	--
--	--	H	--	--	--	--	-47.00	--
--	--	H	--	--	--	--	-47.00	--
Other(1000-12750)	--	H	--	--	--	--	-47.00	--

Note: All the above "--" means that the other spectrum have 20dB margin. No recording in the test report.

Conclusion: PASS

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4.8. RECEIVER BLOCKING

ETSI EN300328 SUBCLAUSE 4.3.1.12

This requirement applies to all receiver categories as defined in clause 4.2.3.
Performance Criteria
The minimum performance criterion shall be a PER less than or equal to 10 %. The manufacturer may declare alternative performance criteria as long as that is appropriate for the intended use of the equipment (see clause 5.4.1.t)).
Receiver Category 1
Table 6 contains the Receiver Blocking parameters for Receiver Category 1 equipment.

Table 6: Receiver Blocking parameters for 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 wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 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
Table 7 contains the Receiver Blocking parameters for Receiver Category 2 equipment.

Table 7: Receiver Blocking parameters 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 4.3.1.12.3 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.

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Receiver Category 3

Table 8 contains the Receiver Blocking parameters for Receiver Category 3 equipment.

Table 8: Receiver Blocking parameters 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 4.3.1.12.3 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.

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 clause 5.4.11.1 for the test conditions.
2. Please refer to ETSI EN 300 328 clause 5.4.11.2 for the measurement methods.

TEST RESULTS:

For GFSK

(Low channel RX, DUT Mode, Category 2)

Wanted signal mean power from companion device(dBm)	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Type of blocking signal	Limit PER	Performance PER	Result
Pmin (-82)+6	2380	-57	CW	10%	0.15%	Pass
Pmin (-82)+6	2503.5	-57	CW	10%	0.09%	
Pmin (-82)+6	2300	-47	CW	10%	0.12%	Pass
Pmin (-82)+6	2583.5	-47	CW	10%	0.14%	

(High channel RX, DUT Mode, Category 2)

Wanted signal mean power from companion device(dBm)	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Type of blocking signal	Limit PER	Performance PER	Result
Pmin (-82)+6	2380	-57	CW	10%	0.11%	Pass
Pmin (-82)+6	2503.5	-57	CW	10%	0.08%	
Pmin (-82)+6	2300	-47	CW	10%	0.12%	Pass
Pmin (-82)+6	2583.5	-47	CW	10%	0.13%	

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Add: 2/F. , Building 2, No.1-4,Chaxi Sanwei Technical Industrial Park,Gushu, Xixiang, Baoan District, Shenzhen, Guangdong China

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For π /4-DQPSK

(Low channel RX, DUT Mode, Category 2)

Wanted signal mean power from companion device(dBm)	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Type of blocking signal	Limit PER	Performance PER	Result
Pmin (-82)+6	2380	-57	CW	10%	0.19%	Pass
Pmin (-82)+6	2503.5	-57	CW	10%	0.6%	
Pmin (-82)+6	2300	-47	CW	10%	0.21%	Pass
Pmin (-82)+6	2583.5	-47	CW	10%	0.11%	

(High channel RX, DUT Mode, Category 2)

Wanted signal mean power from companion device(dBm)	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Type of blocking signal	Limit PER	Performance PER	Result
Pmin (-82)+6	2380	-57	CW	10%	0.15%	Pass
Pmin (-82)+6	2503.5	-57	CW	10%	0.18%	
Pmin (-82)+6	2300	-47	CW	10%	0.11%	Pass
Pmin (-82)+6	2583.5	-47	CW	10%	0.17%	

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For 8DPSK

(Low channel RX, DUT Mode, Category 2)

Wanted signal mean power from companion device(dBm)	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Type of blocking signal	Limit PER	Performance PER	Result
Pmin (-82)+6	2380	-57	CW	10%	0.13%	Pass
Pmin (-82)+6	2503.5	-57	CW	10%	0.16%	
Pmin (-82)+6	2300	-47	CW	10%	0.17%	Pass
Pmin (-82)+6	2583.5	-47	CW	10%	0.15%	

(High channel RX, DUT Mode, Category 2)

Wanted signal mean power from companion device(dBm)	Blocking Signal Frequency(MHz)	Blocking Signal Power(dBm)	Type of blocking signal	Limit PER	Performance PER	Result
Pmin (-82)+6	2380	-57	CW	10%	0.10%	Pass
Pmin (-82)+6	2503.5	-57	CW	10%	0.28%	
Pmin (-82)+6	2300	-47	CW	10%	0.17%	Pass
Pmin (-82)+6	2583.5	-47	CW	10%	0.15%	

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APPENDIX A: PHOTOGRAPHS OF THE TEST SETUP

Refer to Attached file (APPENDIX I).

APPENDIX B: PHOTOGRAPHS OF THE EUT

Refer to Attached file (APPENDIX I).

----END OF REPORT----

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