

RF Test Report

Report No.:AGC04094190101EE04

PRODUCT DESIGNATION : Bluetooth speaker

BRAND NAME : N/A

MODEL NAME : CT183069

CLIENT :

DATE OF ISSUE : Jan. 15, 2019

STANDARD(S) : EN 300 328 V2.1.1(2016-11)

REPORT VERSION : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 15, 2019	Valid	Initial Release

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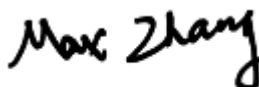
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1. TEST RESULT CERTIFICATION

Applicant	
Address	
manufacturer	
Address	
Factory	
Address	
Product Designation	Bluetooth speaker
Brand Name	N/A
Test Model	CT183069
Date of test	Jan. 08, 2019 to Jan. 15, 2019
Deviation	None
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-EC-BR/RF

We (AGC), Attestation of Global Compliance (Shenzhen) Co., Ltd. for 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.

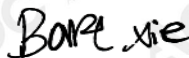
Tested By



Max Zhang(Zhang Yi)

Jan. 15, 2019

Reviewed By



Bart Xie(Xie Xiaobin)

Jan. 15, 2019

Approved By



Forrest Lei(Lei Yonggang)

Authorized Officer

Jan. 15, 2019

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2. TECHNICAL INFORMATION

2.1 EUT DESCRIPTION

Operating Frequency Range(s)	2402MHz~2480MHz
Modulation type	FHSS
Modulation	GFSK, $\pi/4$ -DQPSK
Bluetooth Version	V4.2
Adaptive / non-adaptive equipment	Adaptive Equipment
The number of Hopping Frequencies	79
The maximum RF Output Power (e.i.r.p.)	-6.02dBm
Hardware Version	V1.0
Software Version	V1.0
Antenna designation	PCB antenna
Antenna gain	-0.58dBi
Power Supply	DC 3.7V
The extreme operating conditions	Operating temperature range: -20°C~55°C

Note:

1. The above information was declared by the applicant.
2. The equipment submitted representative production models.
3. The EUT cannot operated unmodulated.
4. The EUT provides Bluetooth wireless interface operating at 2.4G ISM band (2402MHZ-2480MHZ). The EUT use Frequency Hopping Spread Spectrum (FHSS) modulation.
5. Only the Bluetooth was tested according the standard requirement.
6. The EUT is a multi-radio equipment and hand-portable station according to ETSI EN 300 328 v2.1.1.
7. For more details, please refer to the User's manual of the EUT.

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2.2 SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	PC	Dell	INSPIRON	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	Normal Hopping
5	Low channel (Receiver Mode)
6	Middle channel (Receiver Mode)
7	High channel (Receiver Mode)

Note:

1. All the transmit mode would tested with each modulation (GFSK, $\pi/4$ -DQPSK).
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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OBJECTIVE

Perform Radio Spectrum tests for CE Marking according to the provisions of article 3.2 of the Radio Equipment Directive (2014/53/EU) for the BT function of the EUT.

A) TEST STANDARDS AND RESULTS

The EUT has been tested according to ETSI EN 300 328 V2.1.1

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
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TEST ITEMS AND THE RESULTS ARE AS BELLOW:

No	Basic Standard	Test Type	Test Mode	Result
1	ETSI EN 300 328 4.3.1.2	RF Output Power	Mode 4	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 1,2,3,4	Pass
4	ETSI EN 300 328 4.3.1.5	Hopping Frequency Separation	Mode 4	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 5,7	Pass
11	ETSI EN 300 328 4.3.1.12	Receiver Blocking	Mode 4	Pass

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.
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

3.2 LIST OF TEST EQUIPMENTS

Description	Manufacturer	Model No.	Calibration Date	Calibration Due.
MXG X-Series Vector Signal Generator	Agilent	N5182B	Sep. 20, 2018	Sep. 19, 2019
RF Analog Signal Generator	Agilent	N5171B	Sep. 20, 2018	Sep. 19, 2019
EXA Signal Analyzer	Agilent	N9010A	Sep. 20, 2018	Sep. 19, 2019
USB Wideband Power Sensor	Agilent	U2021XA	Sep. 20, 2018	Sep. 19, 2019
USB Wideband Power Sensor	Agilent	U2021XA	Sep. 20, 2018	Sep. 19, 2019
USB Wideband Power Sensor	Agilent	U2021XA	Sep. 20, 2018	Sep. 19, 2019
USB Wideband Power Sensor	Agilent	U2021XA	Sep. 20, 2018	Sep. 19, 2019
2.4G Band Fliter	MICRO TRONICS	BRM50702	Sep. 20, 2018	Sep. 19, 2019
ANTENNA	A.H.	SAS-521-4	Mar. 01, 2018	Feb. 28, 2020
ANTENNA	Schwarzbeck	9168	Mar. 01, 2018	Feb. 28, 2020
HORN ANTENNA	E.M.	EM-AH-10180	Mar. 01, 2018	Feb. 28, 2020
HORN ANTENNA	ETS	3117	Mar. 01, 2018	Feb. 28, 2020
RF Cable	SUIRONG	30MHz-26GHz	Mar. 01, 2018	Feb. 28, 2020

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3.3 ENVIRONMENTAL CONDITIONS

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

- Temperature: 15-35°C
- 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, $U_c = \pm 1 \times 10^{-5}$
- Uncertainty of total RF power, conducted, $U_c = \pm 1.5\text{dB}$
- Uncertainty of RF power density, conducted, $U_c = \pm 3\text{dB}$
- Uncertainty of spurious emissions, conducted, $U_c = \pm 3\text{dB}$
- Uncertainty of all emissions, radiated, $U_c = \pm 6\text{dB}$
- Uncertainty of Temperature: $\pm 1^\circ\text{C}$
- Uncertainty of Humidity: $\pm 5\%$
- Uncertainty of DC and low frequency voltages: $\pm 3\%$

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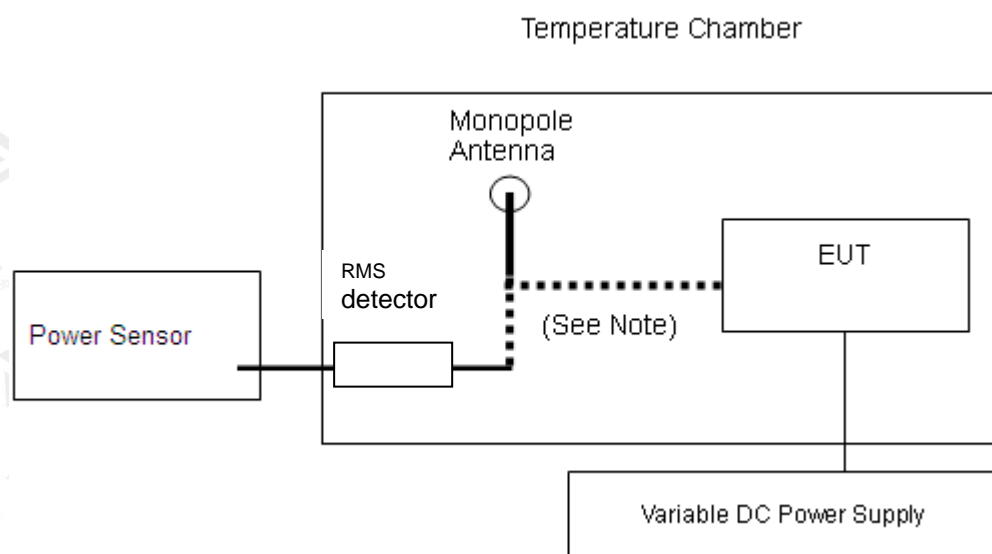
4. ETSI EN 300 328 REQUIREMENTS

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

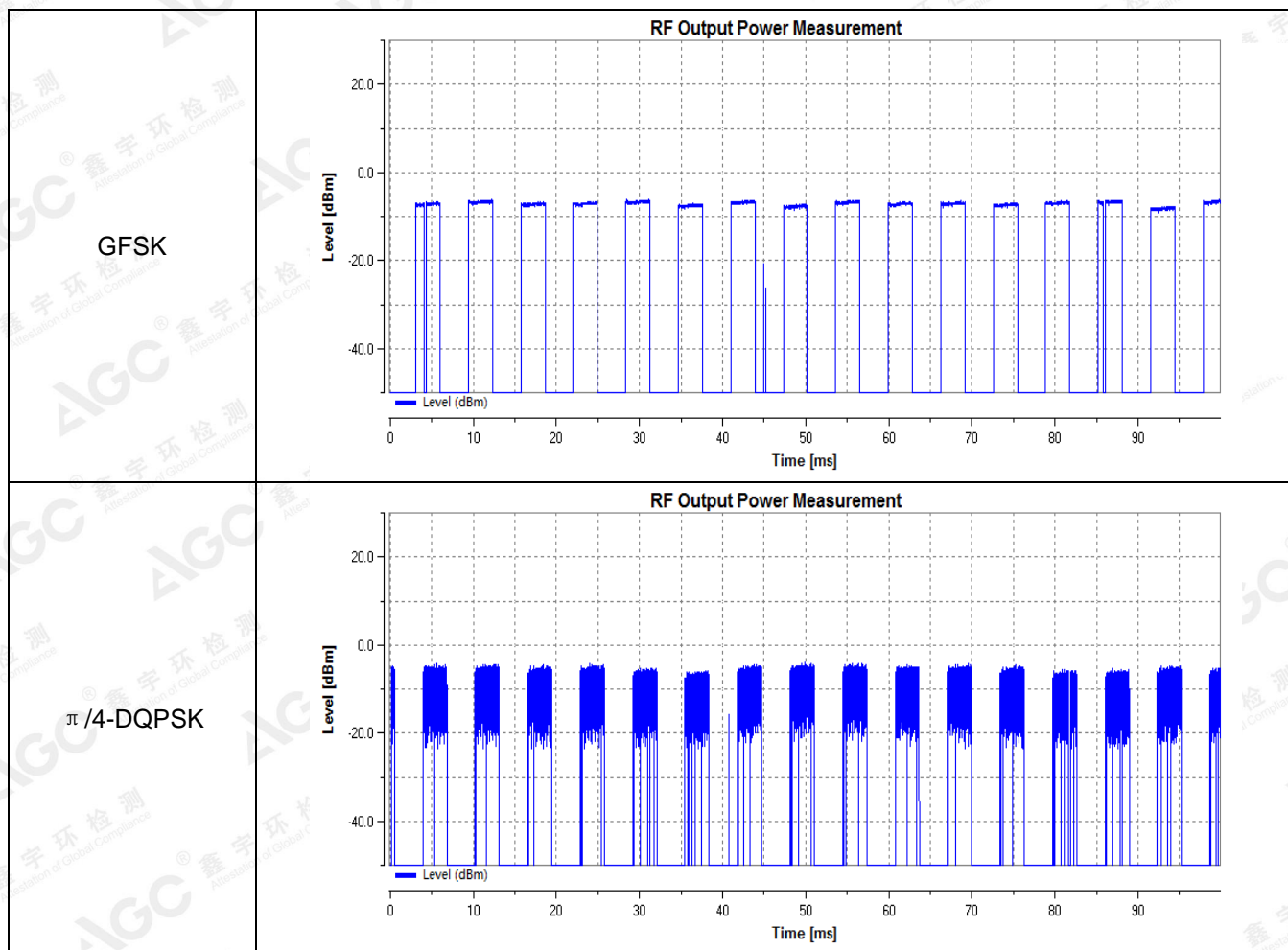
1. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.2.2.1 for the measurement method.

TEST RESULTS

Operation Mode:	Hopping mode	Test Date:	Jan. 10, 2019
Temperature:	25°C	Tested by:	Max
Humidity:	55 % RH		
Number of Burst	= 13		
Measurement Time	= 50ms		

TEST CONDITIONS	RF OUTPUT POWER MEASUREMENT RESULT (dBm)		
	Temp (25)°C	Temp (-20)°C	Temp (55)°C
FOR GFSK MODULATION	-6.58	-6.54	-6.51
II/4-DQPSK MODULATION	-6.09	-6.06	-6.02
Limit	20dBm		

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Note: Result=Reading+ Ant. Gain

Only the worst case recorded in the test report.

Conclusion: PASS

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4.2 ACCUMULATED TRANSMIT TIME, FREQUENCY OCCUPATION AND HOPPING SEQUENCE

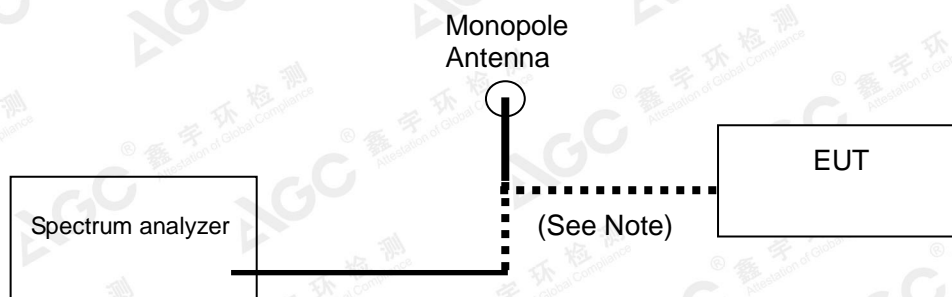
ETSI EN 300 328 SUBCLAUSE 4.3.1.4

ACCUMULATED TRANSMIT TIME	
CONDITION	LIMIT
<input type="checkbox"/> Non-adaptive frequency hopping systems	≤ 15 ms
<input checked="" type="checkbox"/> Adaptive frequency hopping systems	≤ 400 ms

FREQUENCY OCCUPATION	
CONDITION	LIMIT(OPTION 1)
<input type="checkbox"/> 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.
<input checked="" type="checkbox"/> Adaptive frequency hopping systems	

HOPPING SEQUENCE(S)	
CONDITION	LIMIT
<input type="checkbox"/> Non-adaptive frequency hopping systems	≥5 hopping frequencies or 5/minimum Hopping Frequency Separation in MHz , whichever is the greater.
<input checked="" type="checkbox"/> 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

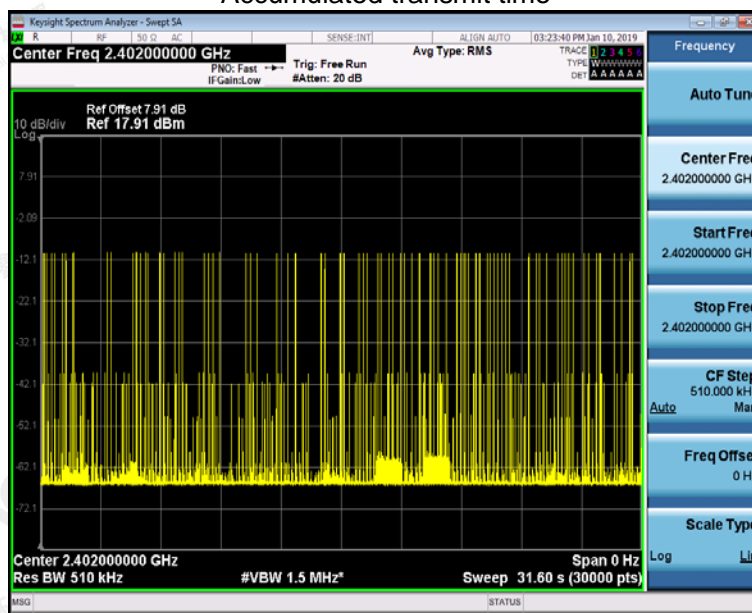
Please refer to ETSI EN300328 V2.1.1 Section 5.4.4

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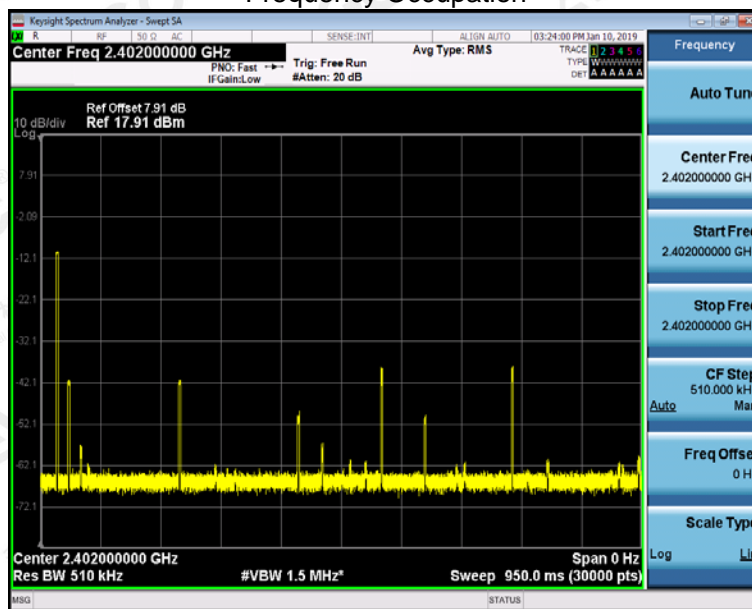
Bluetooth 2Mbps (2DH5) Test Result

Channel	Accumulated transmit time (ms)	Limit (ms)	Frequency Occupation (pcs)	Limit (pcs)
Low	298.093	≤400	1	≥1

Accumulated transmit time



Frequency Occupation

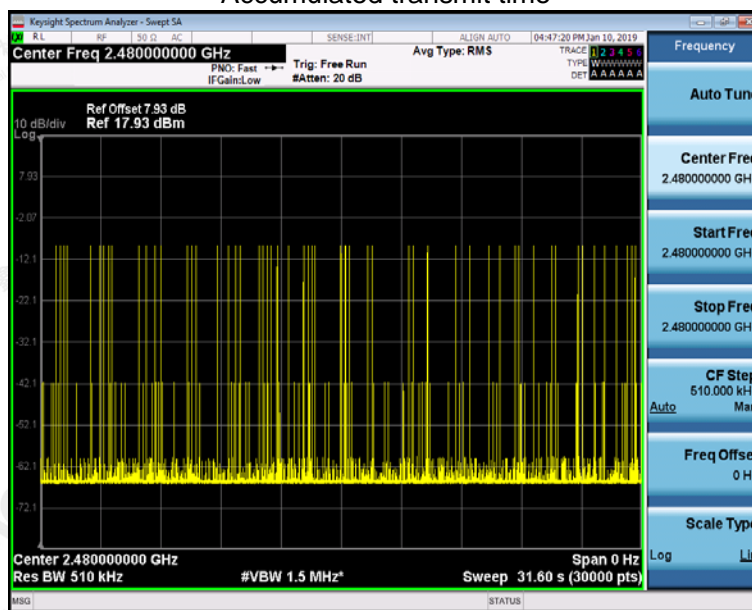


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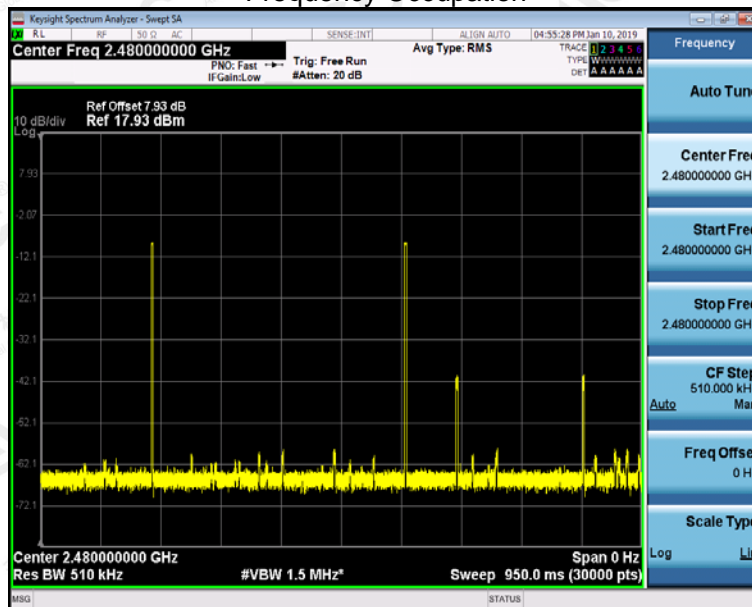
Bluetooth 2Mbps(DH5) Test Result

Channel	Accumulated transmit time (ms)	Limit (ms)	Frequency Occupation (pcs)	Limit (pcs)
High	190.653	≤400	2	≥1

Accumulated transmit time



Frequency Occupation



- Note:**
- 1) All the modes had been tested, but only the worst data recorded in the report.
 - 2) The Accumulated transmit time and Dwell Time are calculated by a computing device using an appropriate software application or program.
 - 3) Sweep time for Frequency Occupation= Dwell Time*4*79

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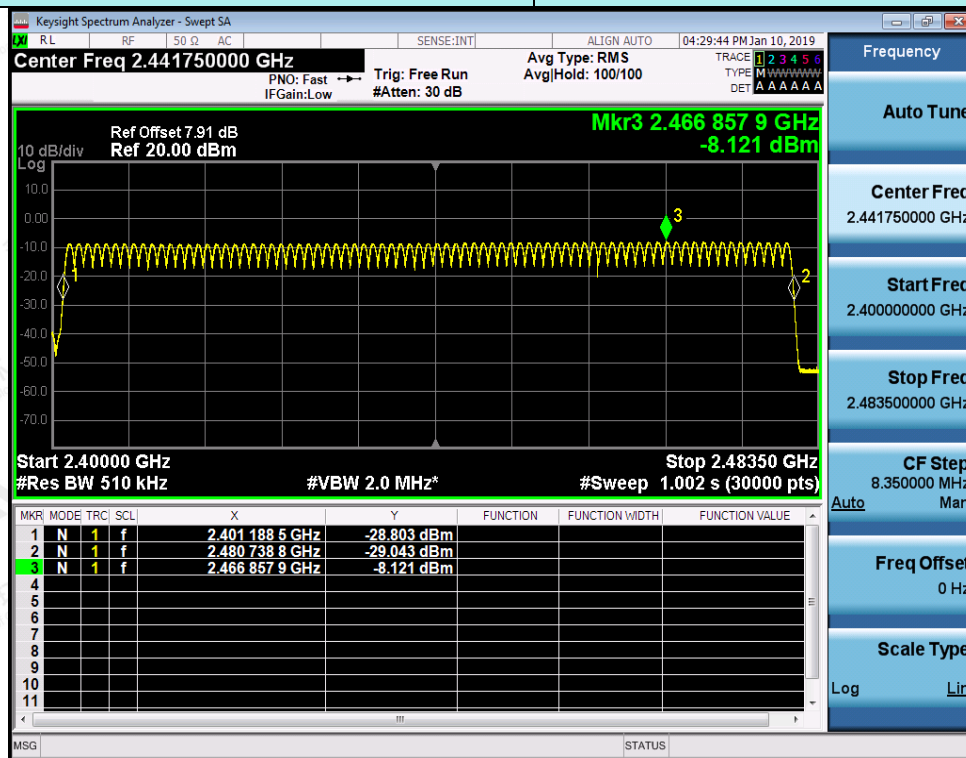
TEST RESULT FOR HOPPING SEQUENCE

Channel	Frequency (GHz)	Channel	Frequency (GHz)
01	2.402	42	2.443
02	2.403	43	2.444
03	2.404	44	2.445
04	2.405	45	2.446
05	2.406	46	2.447
06	2.407	47	2.448
07	2.408	48	2.449
08	2.409	49	2.450
09	2.410	50	2.451
10	2.411	51	2.452
11	2.412	52	2.453
12	2.413	53	2.454
13	2.414	54	2.455
14	2.415	55	2.456
15	2.416	56	2.457
16	2.417	57	2.458
17	2.418	58	2.459
18	2.419	59	2.460
19	2.420	60	2.461
20	2.421	61	2.462
21	2.422	62	2.463
22	2.423	63	2.464
23	2.424	64	2.465
24	2.420	65	2.466
25	2.426	66	2.467
26	2.427	67	2.468
27	2.428	68	2.469
28	2.429	69	2.470
29	2.430	70	2.471
30	2.431	71	2.472
31	2.432	72	2.473
32	2.433	73	2.474
33	2.434	74	2.475
34	2.435	75	2.476
35	2.436	76	2.477
36	2.437	77	2.478
37	2.438	78	2.479
38	2.439	79	2.480
39	2.440		
40	2.441		
41	2.442		

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Hopping Channel Test Plot

Hopping Sequence (MHz)	79.55
Hopping Number	79



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4.3 HOPPING FREQUENCY SEPARATION

ETSI EN 300 328 SUBCLAUSE 4.3.1.5

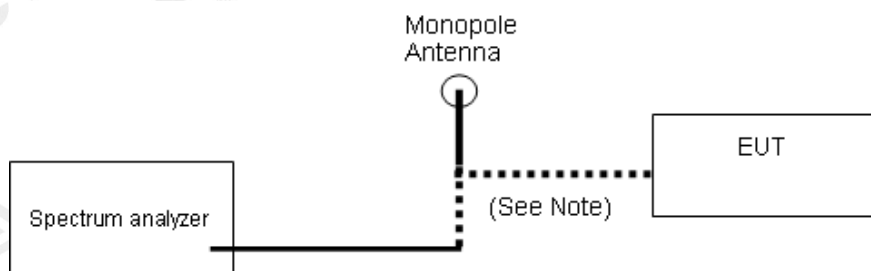
For Non-adaptive frequency hopping systems:

The minimum Hopping Frequency Separation shall be equal to Occupied Channel Bandwidth (see clause 4.3.1.7) of a single hop, 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 5.4.5.2.1

TEST RESULT

Hopping Frequency Separation (MHz) 0.988



Note: The modulation used during test is $\pi/4$ DQPSK and this is the worst case.

Conclusion: PASS

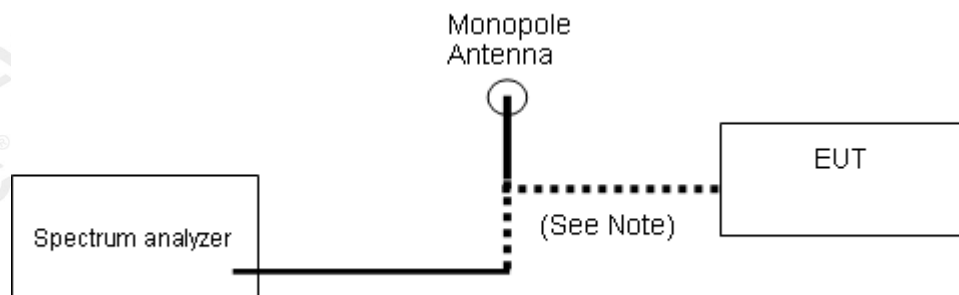
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4.4 OCCUPIED CHANNEL BANDWIDTH

EN300328 4.3.1.4 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 5.4.7.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V2.1.1) clause 5.4.7.2 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

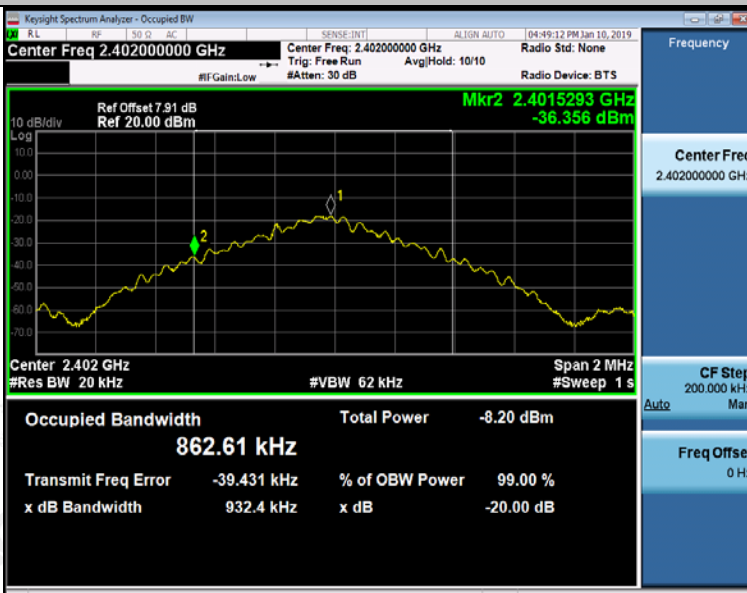
TEST RESULTS

Modulation	Channel	OBW [MHz]	FL@OBW	FH@OBW	Verdict
GFSK	LCH	0.86261	2401.529	---	PASS
GFSK	HCH	0.86319	---	2480.391	PASS
$\pi/4$ DQPSK	LCH	1.1890	2401.370	---	PASS
$\pi/4$ DQPSK	HCH	1.1892	---	2480.558	PASS

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Graphs

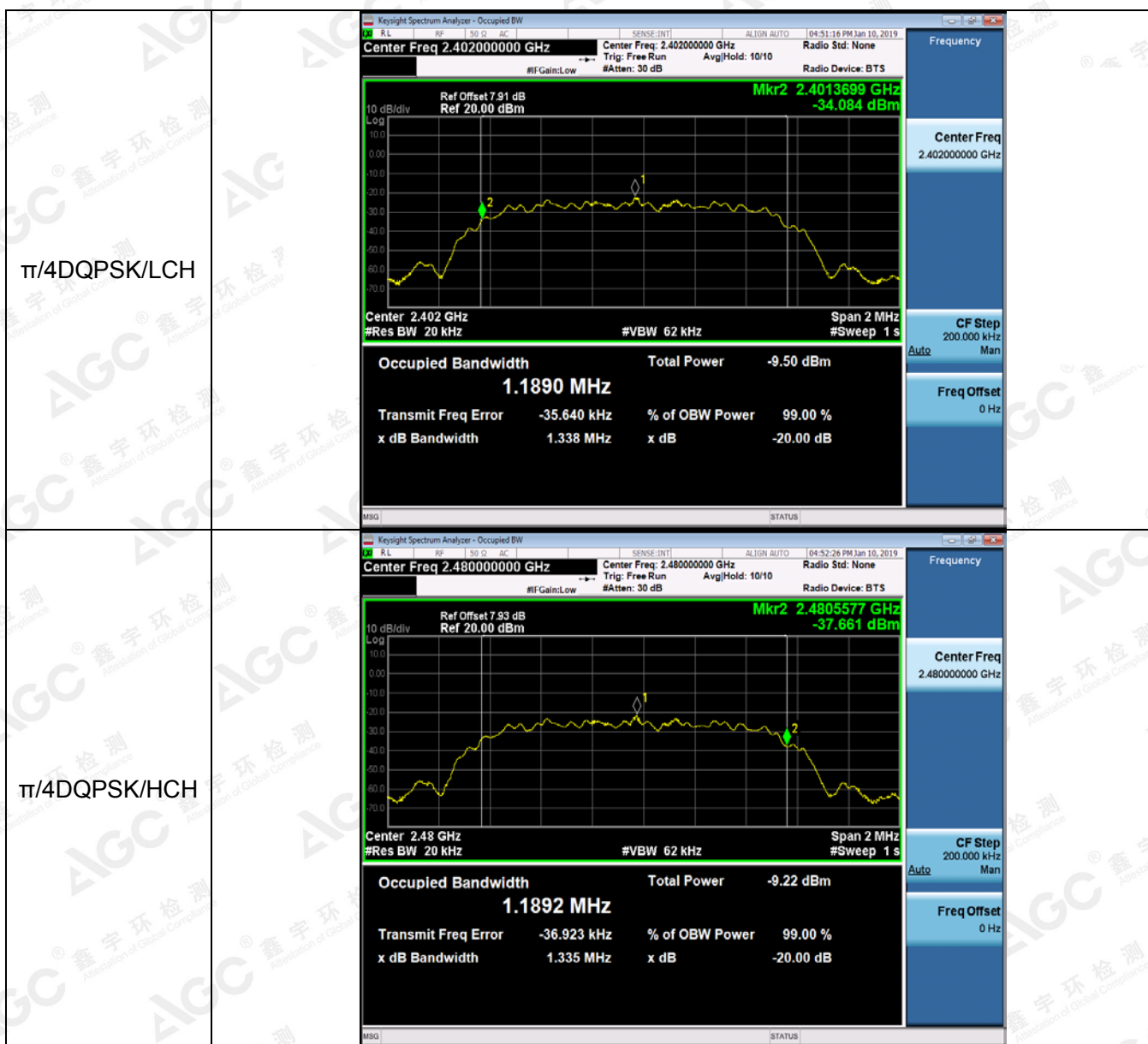
GFSK/LCH



GFSK/HCH



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4.5 TRANSMITTER UNWANTED EMISSIONS IN THE OUT OF BAND DOMAIN

EN300328 4.3.1.9 TRANSMITTER UNWANTED EMISSIONS IN THE OUT OF BAND DOMAIN

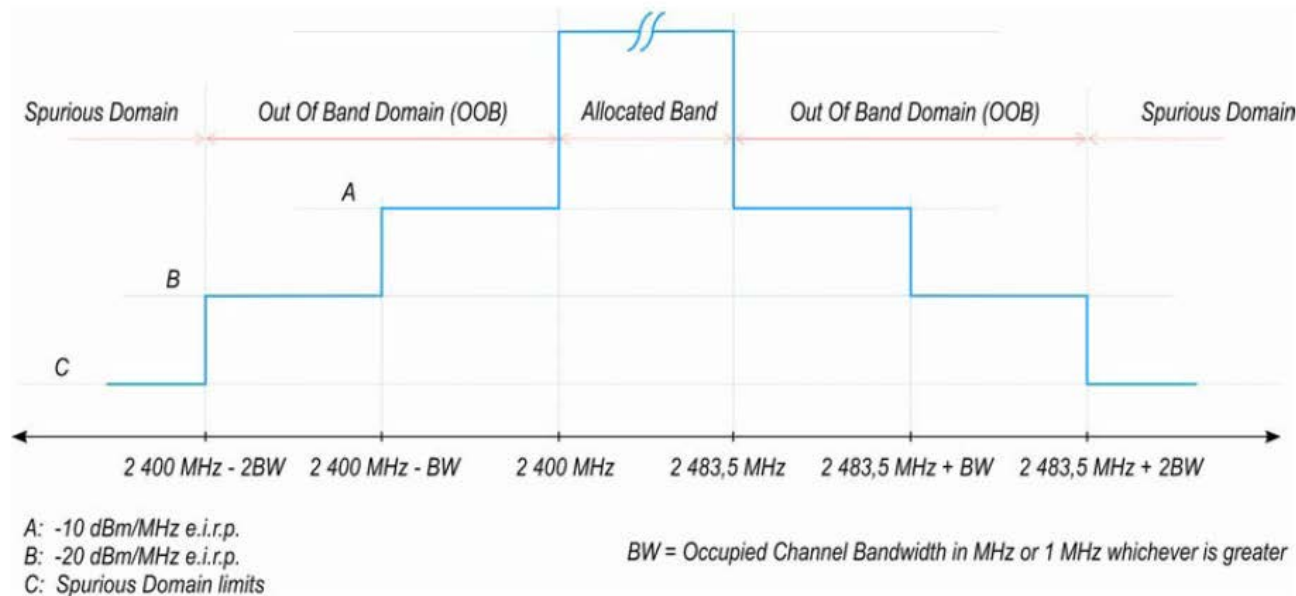
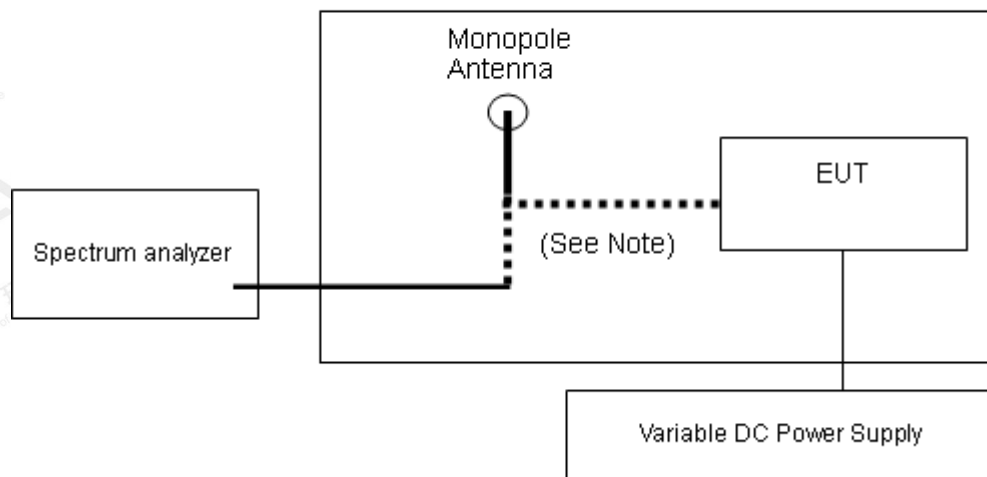


Figure 1: Transmit mask

TEST CONFIGURATION

Temperature Chamber



For have temporary antenna connector product

TEST PROCEDURE

Test Procedure Please refer to ETSI EN 300 328 (V2.1.1) Clause 5.4.8.2.1

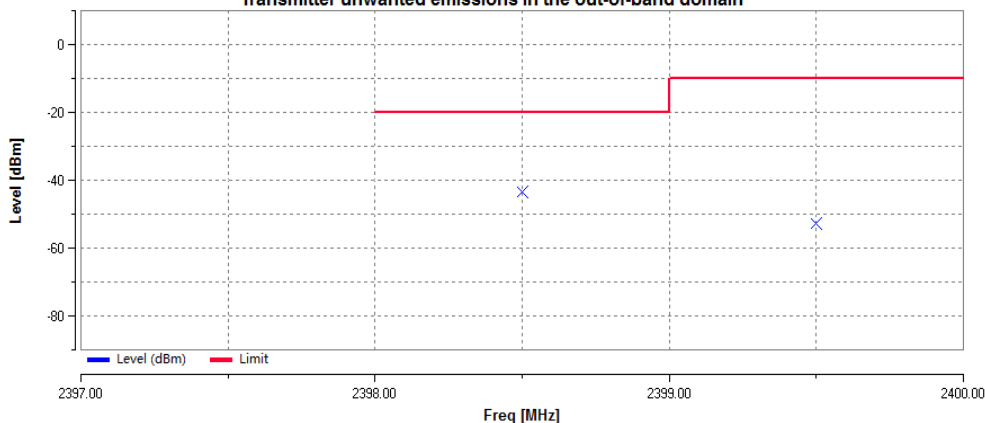
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TEST RESULT

TEST CONDITIONS	Hopping mode		
	Temp (25)°C	Temp (-20)°C	Temp (55)°C
GFSK MOUDULATION	PASS	PASS	PASS
Π/4-DQPSK MOUDULATION	PASS	PASS	PASS

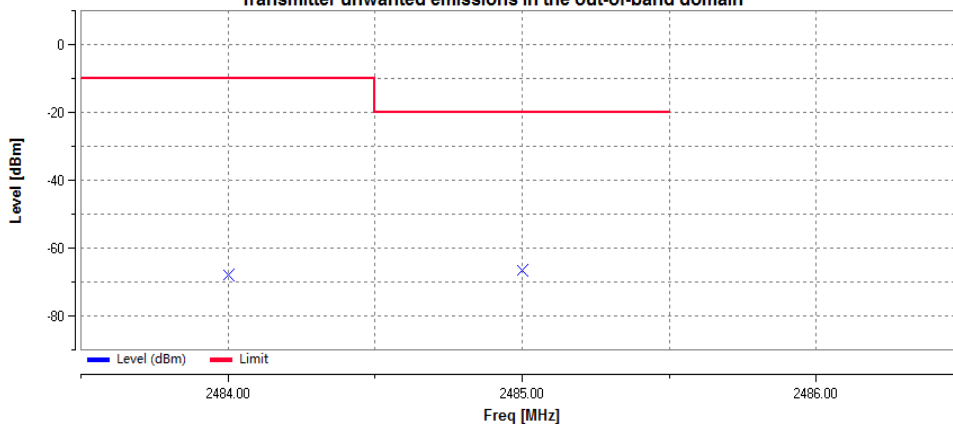
GFSK-LOW BAND

Transmitter unwanted emissions in the out-of-band domain



GFSK-HIGH BAND

Transmitter unwanted emissions in the out-of-band domain



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

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.

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:

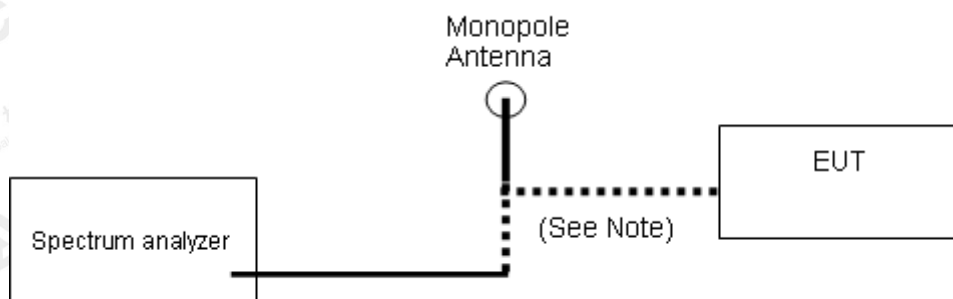
Frequency Range	Maximum Power e.r.p(<=1GHz)/e.i.r.p(>1GHz)	Bandwidth
30MHZ to 47MHZ	-36dBm	100kHz
47MHZ to 74MHZ	-54dBm	100kHz
74MHZ to 87.5MHZ	-36dBm	100kHz
87.5MHZ to 118MHZ	-54dBm	100kHz
118MHZ to 174MHZ	-36dBm	100kHz
174 MHZ to 230MHZ	-54dBm	100kHz
230 MHZ to 470MHZ	-36dBm	100kHz
470 MHZ to 862MHZ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

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TEST PROCEDURE

- 1) The emissions over the range 30 MHz to 1 000 MHz shall be identified.
- 2) Spectrum analyzer settings:
Resolution bandwidth: 100 kHz
Video bandwidth: 300 kHz
Detector mode: Peak
Sweep Points: $\geq 19\,400$
Trace Mode: Max Hold
- 3) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.
- 4) The emissions over the range 1 GHz to 12,75 GHz shall be identified.
- 5) Resolution bandwidth: 1 MHz
Video bandwidth: 3 MHz
Detector mode: Peak
Trace Mode: Max Hold
Sweep Points: $\geq 23\,500$
- 6) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.

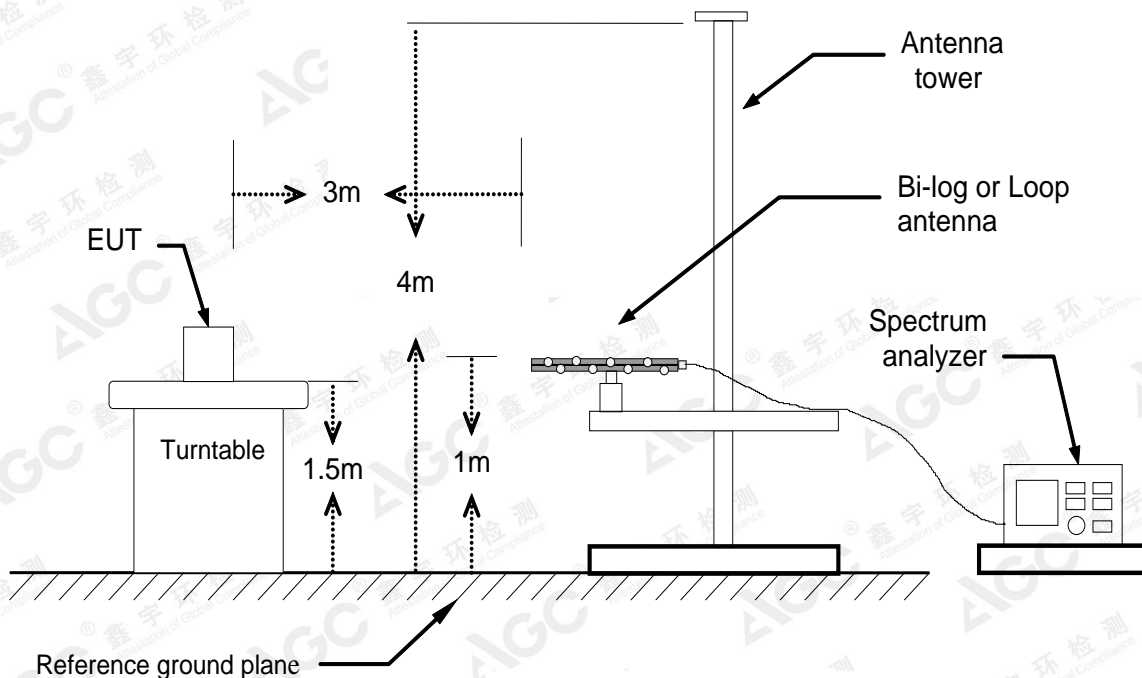
Test Configuration



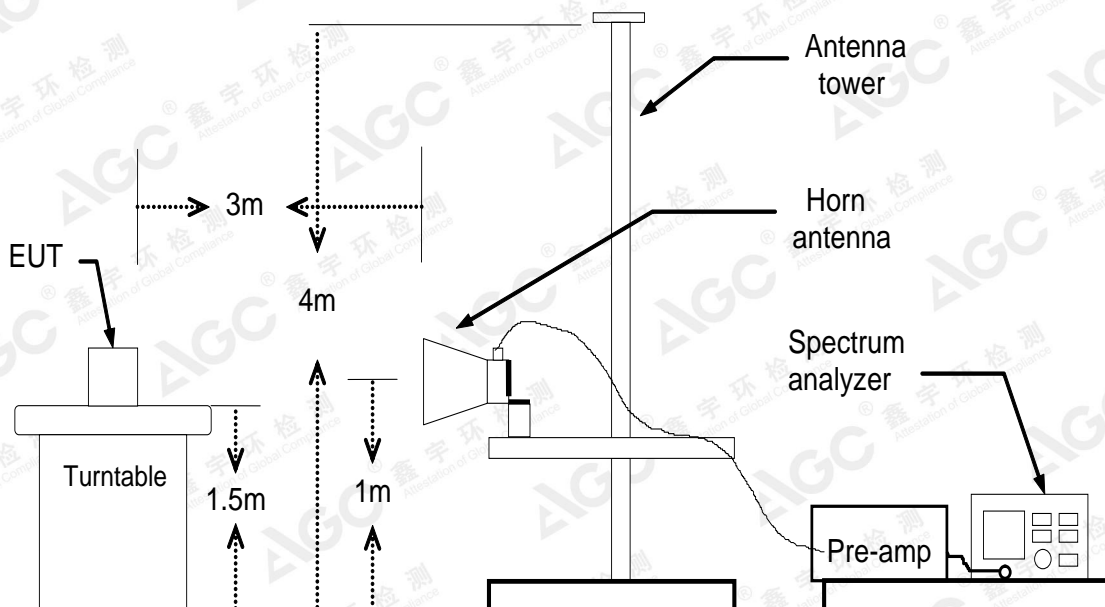
Conducted Method

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Below 1GHz



Above 1GHz

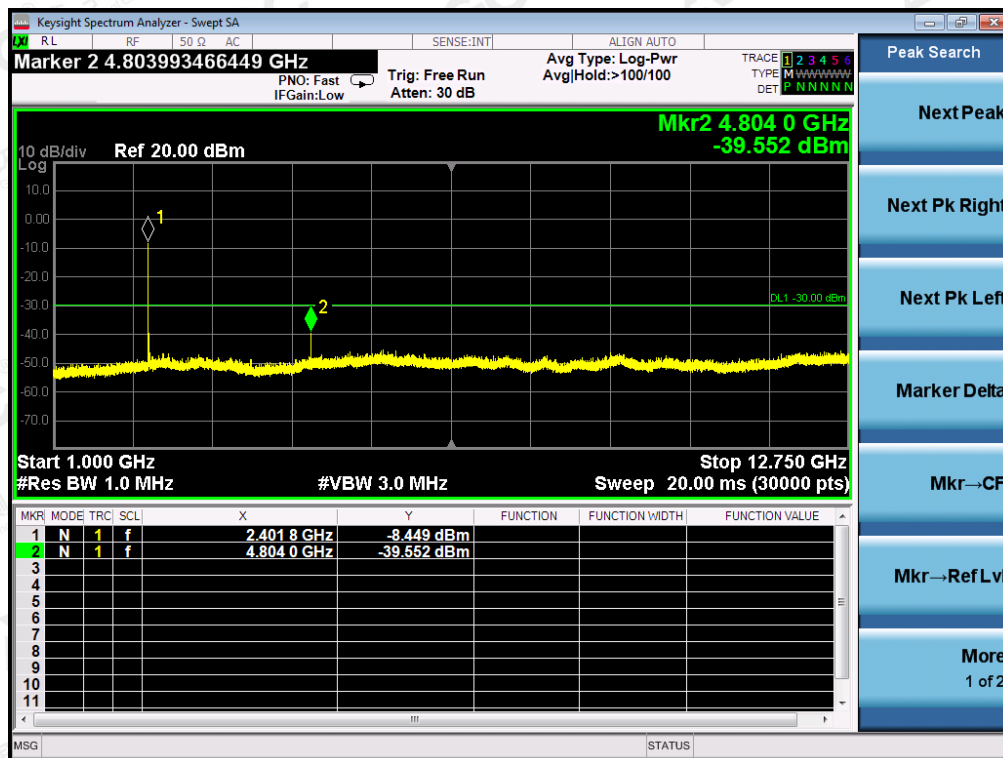
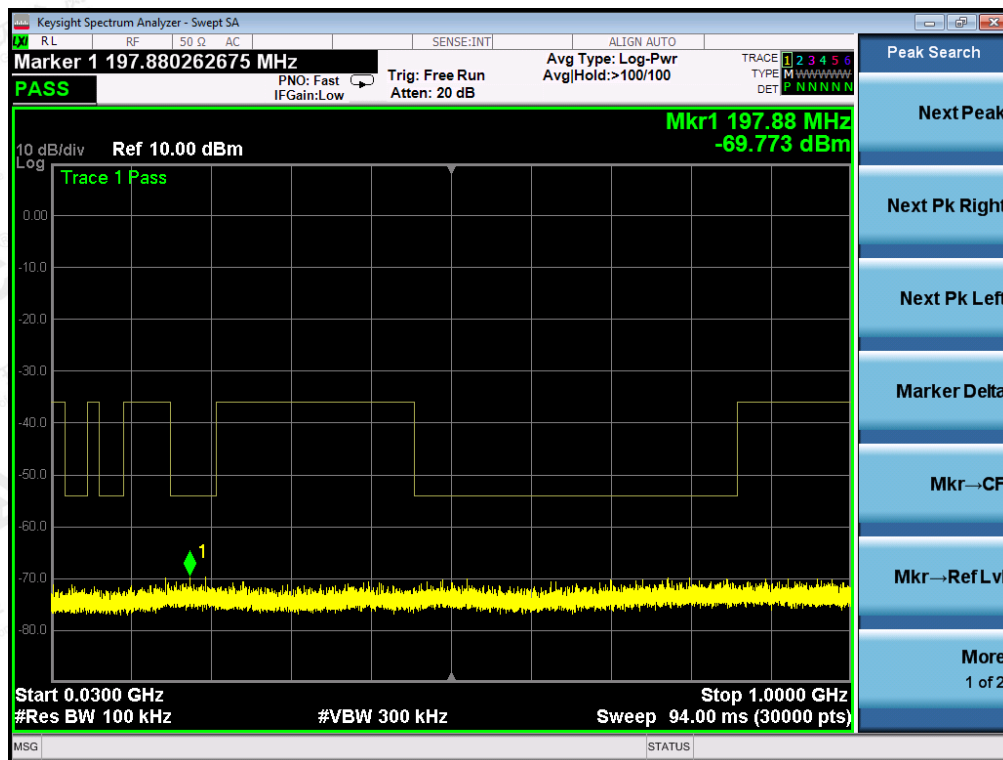


Radiated Method

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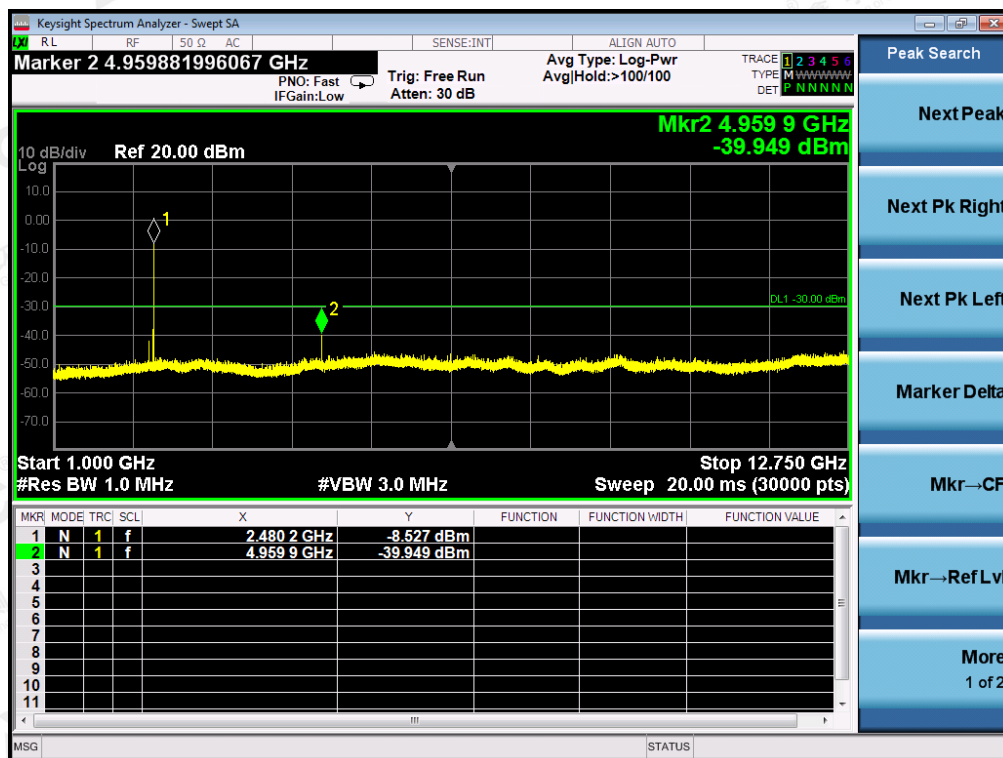
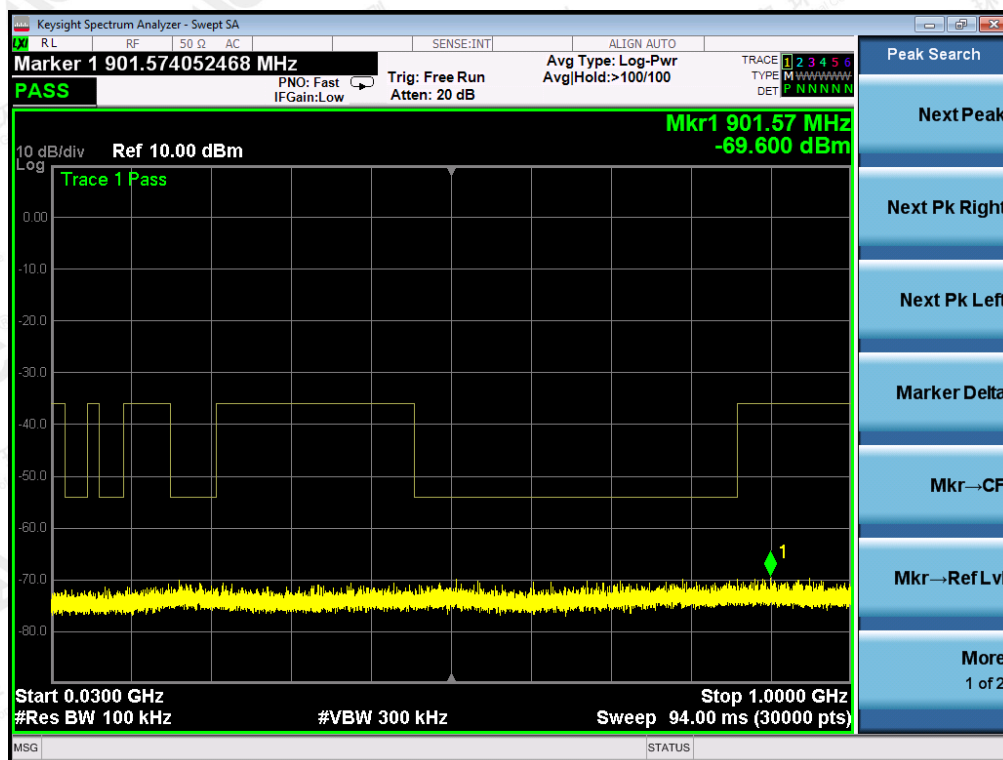
CONDUCTED RESULTS:

(Worst Case: Low channel, 1Mbps)



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(Worst Case: High channel, 1Mbps)



Note: 1. All the modes had been test but only the worst data record in the report.

2. The 2.4G fundamental frequency is not considered to compare with the limit.

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

Transmitter Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
93.76	32.91	V	-61.86	0.04	1.64	-60.26	-54.00	6.26
160.57	27.90	V	-66.93	0.06	1.20	-65.79	-36.00	29.79
356.65	30.26	V	-68.47	0.25	6.28	-62.44	-36.00	26.44
425.84	27.29	V	-72.12	0.33	7.00	-65.46	-36.00	29.46
628.12	29.78	V	-69.51	0.51	7.22	-62.80	-54.00	8.80
755.60	27.45	V	-71.84	0.61	6.35	-66.10	-54.00	12.10
Other(30-1000)	--	V	--	--	--	--	-36.00	--
106.43	30.61	H	-63.03	0.04	0.92	-62.15	-54.00	8.15
153.90	27.68	H	-66.48	0.06	0.70	-65.84	-36.00	29.84
351.74	29.98	H	-67.86	0.25	5.63	-62.47	-36.00	26.47
429.52	26.91	H	-72.14	0.34	6.92	-65.55	-36.00	29.55
633.40	29.86	H	-70.44	0.52	7.24	-63.71	-54.00	9.71
729.17	28.34	H	-71.26	0.59	6.75	-65.10	-54.00	11.10
Other(30-1000)	--	H	--	--	--	--	-36.00	--

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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	52.25	V	-48.57	2.65	9.34	-41.88	-30.00	11.88
7206	47.14	V	-53.86	3.13	11.32	-45.67	-30.00	15.67
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
4804	52.27	H	-47.85	2.65	9.34	-41.16	-30.00	11.16
7206	44.69	H	-56.10	3.13	11.32	-47.91	-30.00	17.91
Other(1000-12750)	--	H	--	--	--	--	-30.00	--

Note: 1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "--" remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

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(Worst Case: High channel, 1Mbps)

Transmitter Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
95.18	31.09	V	-63.03	0.04	1.80	-61.27	-54.00	7.27
160.35	27.16	V	-68.09	0.06	1.20	-66.95	-36.00	30.95
353.93	30.34	V	-68.42	0.25	5.89	-62.78	-36.00	26.78
424.51	26.92	V	-72.15	0.33	7.02	-65.46	-36.00	29.46
631.95	29.29	V	-70.62	0.52	7.28	-63.86	-54.00	9.86
758.70	27.23	V	-71.54	0.61	6.50	-65.65	-54.00	11.65
Other(30-1000)	--	V	--	--	--	--	-36.00	--
107.95	31.79	H	-62.63	0.04	1.04	-61.63	-54.00	7.63
152.87	26.51	H	-67.82	0.06	0.70	-67.18	-36.00	31.18
353.12	29.72	H	-69.26	0.25	5.89	-63.62	-36.00	27.62
431.58	27.20	H	-73.09	0.34	6.83	-66.60	-36.00	30.60
629.25	29.42	H	-71.17	0.51	7.26	-64.42	-54.00	10.42
727.92	27.43	H	-72.78	0.59	6.65	-66.72	-54.00	12.72
Other(30-1000)	--	H	--	--	--	--	-36.00	--

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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)
4960	52.46	V	-47.24	2.65	9.34	-40.55	-30.00	10.55
7440	46.44	V	-54.83	3.13	11.32	-46.64	-30.00	16.64
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
4960	51.77	H	-48.99	2.65	9.34	-42.30	-30.00	12.30
7440	43.81	H	-57.53	3.13	11.32	-49.34	-30.00	19.34
Other(1000-12750)	--	H	--	--	--	--	-30.00	--

Note: 1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "--" remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

Conclusion: PASS

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4.7 Receiver Spurious Emissions

ETSI EN300328 SUBCLAUSE 4.3.1.11

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode. The spurious emissions of the receiver shall not exceed the values given in table 5.

Table 5: Spurious emission limits for receivers

Frequency range	Maximum power, e.r.p.	Measurement bandwidth
30 MHz to 1 GHz	-57 dBm	100 kHz
1 GHz to 12,75 GHz	-47 dBm	1 MHz

Test Configuration

Same as 4.6.

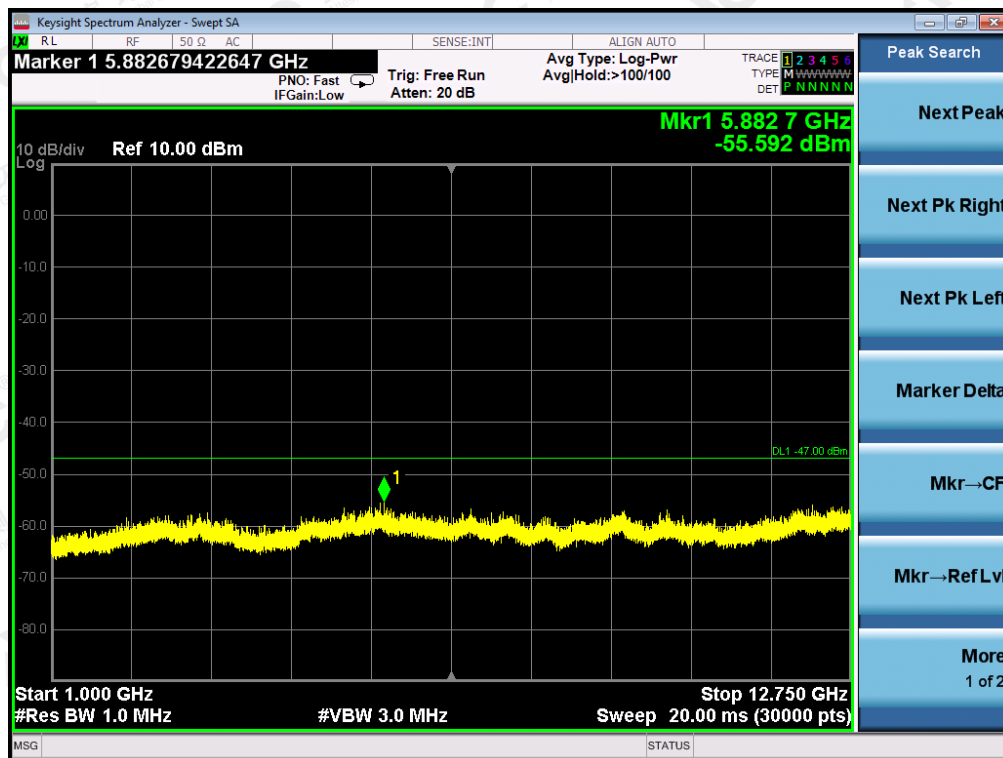
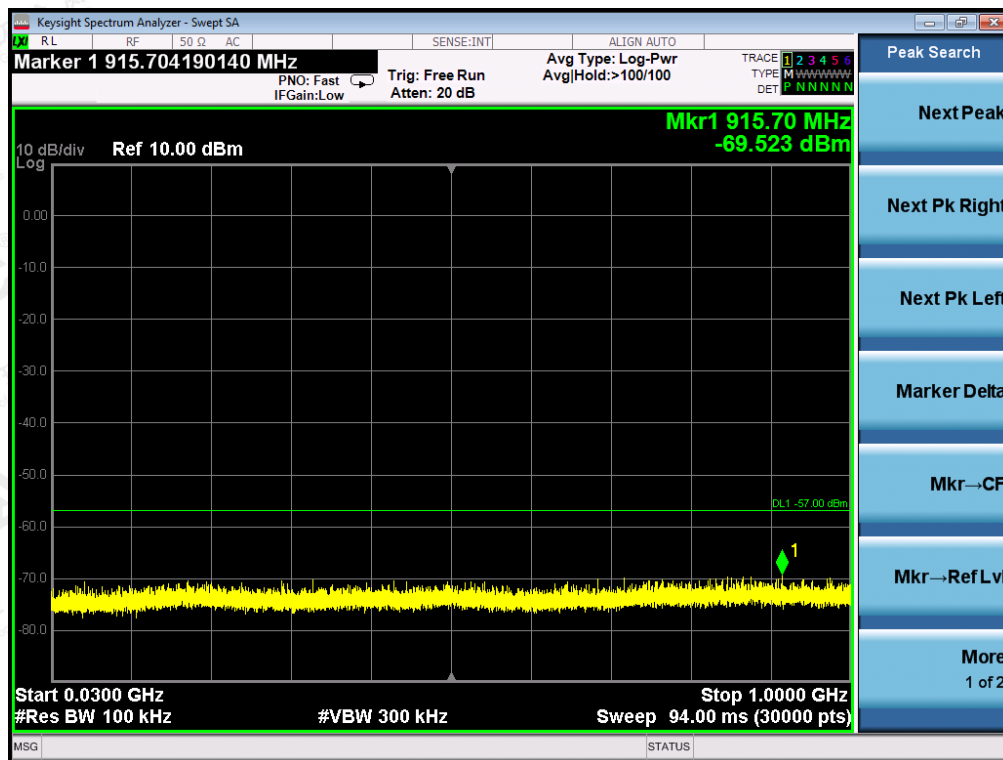
TEST PROCEDURE

- 1) The emissions over the range 30 MHz to 1 000 MHz shall be identified.
- 2) Spectrum analyzer settings:
 Resolution bandwidth: 100 kHz
 Video bandwidth: 300 kHz
 Detector mode: Peak
 Sweep Points: $\geq 19\,400$
 Trace Mode: Max Hold
- 3) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits.
- 4) The emissions over the range 1 GHz to 12,75 GHz shall be identified.
- 5) Resolution bandwidth: 1 MHz
 Video bandwidth: 3 MHz
 Detector mode: Peak
 Trace Mode: Max Hold
 Sweep Points: $\geq 23\,500$
- 6) Allow the trace to stabilize. Any emissions identified during the sweeps above and that fall within the 6 dB range below the applicable limit or above, shall be individually measured using RMS detector and compared to the limits..

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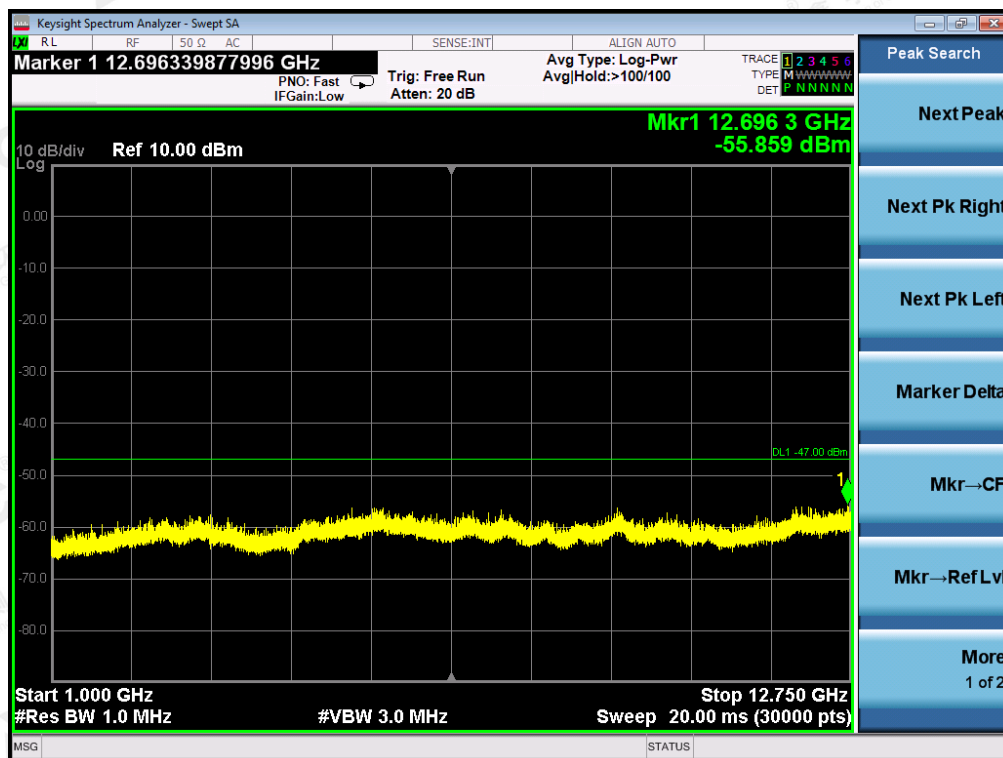
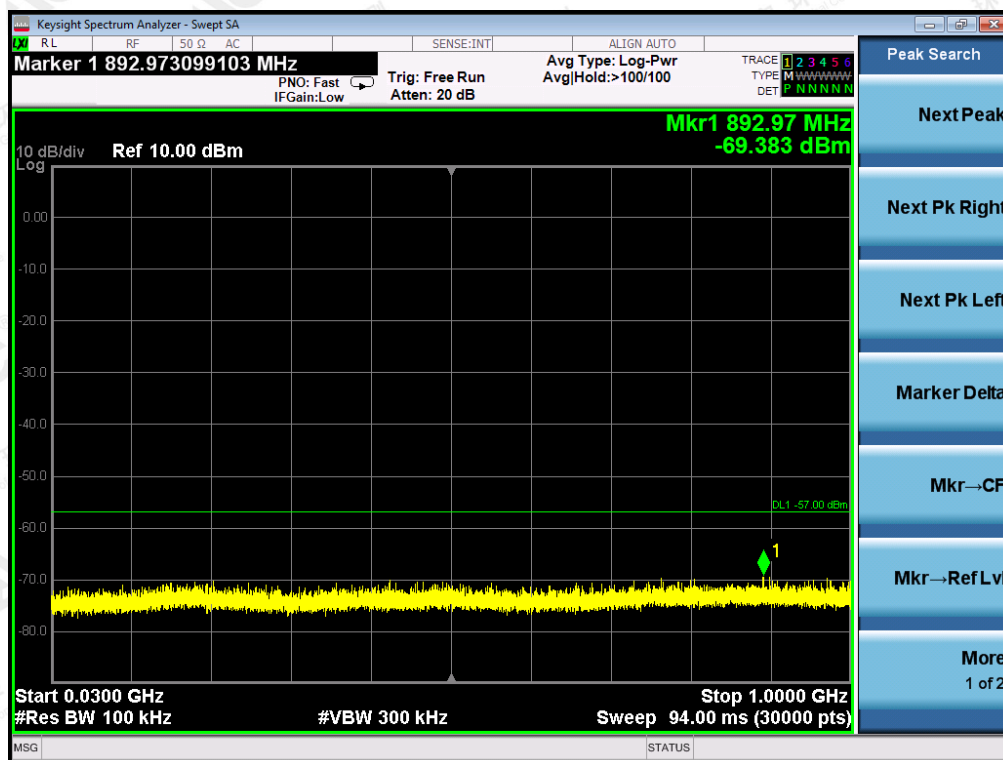
TEST RESULTS FOR CONDUCTED METHOD

RECEIVER MODE (Worst Case: Low channel, 1Mbps)



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(Worst Case: High channel, 1Mbps)



Note: 1. All the modes had been test but only the worst data record in the report.

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TEST RESULTS FOR RADIATED METHOD
(Worst Case: Low channel, 1Mbps)

Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
122.36	26.05	V	-68.66	0.04	0.60	-68.10	-57.00	11.10
158.22	28.94	V	-65.25	0.06	1.00	-64.31	-57.00	7.31
355.33	29.33	V	-70.43	0.25	6.15	-64.53	-57.00	7.53
535.73	27.96	V	-70.94	0.45	6.90	-64.49	-57.00	7.49
672.01	30.93	V	-68.21	0.55	6.72	-62.04	-57.00	5.04
831.38	29.70	V	-68.66	0.66	6.37	-62.95	-57.00	5.95
Other(30-1000)	--	V	--	--	--	--	-57.00	--
134.27	28.05	H	-65.71	0.05	0.02	-65.74	-57.00	8.74
159.59	29.50	H	-64.83	0.06	1.10	-63.79	-57.00	6.79
343.62	29.45	H	-69.99	0.24	5.64	-64.59	-57.00	7.59
540.14	28.05	H	-71.86	0.45	7.20	-65.11	-57.00	8.11
675.49	28.96	H	-70.69	0.55	6.60	-64.64	-57.00	7.64
830.52	28.45	H	-70.81	0.66	6.30	-65.17	-57.00	8.17
Other(30-1000)	--	H	--	--	--	--	-57.00	--

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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)
1548.40	31.05	V	-68.56	1.22	6.84	-62.94	-47.00	15.94
--	--	V	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
1545.25	33.44	H	-66.15	1.19	6.67	-60.67	-47.00	13.67
--	--	H	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-47.00	--

Note: 1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "--" remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

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(Worst Case: High channel, 1Mbps)

Receiver Spurious Emission below 1GHz (30MHz-1GHz)

Frequency	Reading Level	Antenna	S.G.	Cable Loss	Ant.Gain	Emission Level	Limit	Margin
(MHz)	(dBuv/m)	Polarization	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
125.08	27.58	V	-65.09	0.05	0.30	-64.84	-57.00	7.84
157.21	29.96	V	-64.52	0.06	0.90	-63.68	-57.00	6.68
359.73	29.33	V	-70.12	0.26	6.67	-63.71	-57.00	6.71
535.20	27.05	V	-71.93	0.45	6.90	-65.47	-57.00	8.47
673.00	30.73	V	-67.62	0.55	6.68	-61.49	-57.00	4.49
833.24	29.72	V	-70.16	0.66	6.51	-64.31	-57.00	7.31
Other(30-1000)	--	V	--	--	--	--	-57.00	--
138.94	28.54	H	-64.96	0.05	0.00	-65.01	-57.00	8.01
164.37	28.75	H	-65.23	0.06	1.52	-63.77	-57.00	6.77
344.23	29.58	H	-69.96	0.24	5.62	-64.58	-57.00	7.58
536.40	28.68	H	-71.36	0.45	6.96	-64.85	-57.00	7.85
677.25	29.33	H	-69.04	0.55	6.52	-63.07	-57.00	6.07
828.94	27.98	H	-70.61	0.66	6.40	-64.87	-57.00	7.87
Other(30-1000)	--	H	--	--	--	--	-57.00	--

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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)
1706.98	31.62	V	-68.11	1.22	6.84	-62.49	-47.00	15.49
--	--	V	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
1756.27	33.13	H	-66.82	1.19	6.67	-61.34	-47.00	14.34
--	--	H	--	--	--	--	--	--
Other(1000-12750)	--	H	--	--	--	--	-47.00	--

Note: 1.The margins of the other spectrum are not exceeding the minimum value of margin, and this part of the results without recording in the test report.

2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "--" remark, if no specific emission from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

Conclusion: PASS

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4.8. RECEIVER BLOCKING

Receiver Blocking parameters for Receiver Category 2 equipment

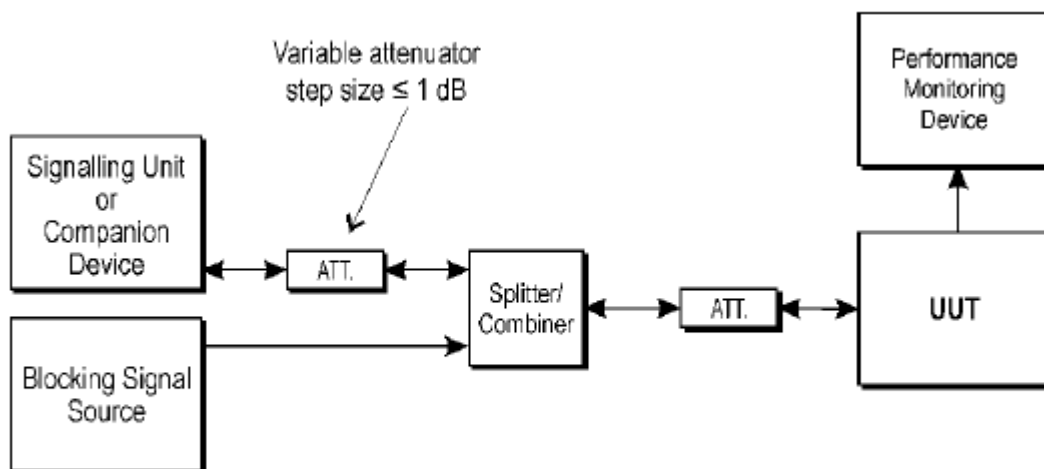
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
Pmin + 6 dB	2 380 2 503,5	-57	CW
Pmin + 6 dB	2 300 2 583.5	-47	CW

NOTE 1: Pmin is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in EN 300 328 V2.1.1 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.

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TEST CONFIGURATION



Test Set-up for receiver blocking

TEST PROCEDURE

- 1) The UUT shall be set to the lowest operating channel.
- 2) The blocking signal generator is set to the first frequency as defined in the appropriate table corresponding to the receiver category and type of equipment.
- 3) With the blocking signal generator switched off, a communication link is established between the UUT and the associated companion device using the test setup shown in the Test Set-up. The attenuation of the variable attenuator shall be increased in 1 dB steps to a value at which the minimum performance criteria is still met. The resulting level for the wanted signal at the input of the UUT is P_{min} . This signal level (P_{min}) is increased by the value provided in the table corresponding to the receiver category and type of equipment.
- 4) The blocking signal at the UUT is set to the level provided in the table corresponding to the receiver category and type of equipment. It shall be verified and recorded in the test report that the performance criteria is met.
- 5) Repeat step 4 for each remaining combination of frequency and level for the blocking signal as provided in the table corresponding to the receiver category and type of equipment.
- 6) Repeat step 2 to step 5 with the UUT operating at the highest operating channel.

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TEST RESULT

Receiver Category 2 equipment(GFSK Hopping mode)

Wanted Signal Power (MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result (PER)	Limit (PER)	Result
P _{min} +6dB	2380	-57	1.17%	10%	Pass
P _{min} +6dB	2503.5	-57	0.90%	10%	Pass
P _{min} +6dB	2300	-47	1.50%	10%	Pass
P _{min} +6dB	2583.5	-47	1.00%	10%	Pass

 Receiver Category 2 equipment ($\pi/4$ -DQPSK Hopping mode)

Wanted Signal Power (MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result (PER)	Limit (PER)	Result
P _{min} +6dB	2380	-57	1.34%	10%	Pass
P _{min} +6dB	2503.5	-57	0.83%	10%	Pass
P _{min} +6dB	2300	-47	1.83%	10%	Pass
P _{min} +6dB	2583.5	-47	0.81%	10%	Pass

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APPENDIX A: PHOTOGRAPHS OF TEST SETUP



----END OF REPORT----

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