
RF Test Report

Report No.: AGC00552191002EE04

PRODUCT DESIGNATION : Smart Phone

BRAND NAME : CUBOT

MODEL NAME : X20

APPLICANT : Shenzhen Huafurui Technology Co., Ltd.

DATE OF ISSUE : Oct. 23, 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	/	Oct. 23, 2019	Valid	Initial release



TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION	4
2. TECHNICAL INFORMATION.....	5
2.1 EUT DESCRIPTION	5
2.2 SUPPORT EQUIPMENT	6
2.3 DESCRIPTION OF TEST MODES.....	6
3. DETAILS OF TEST	8
3.1 IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION	8
3.2 LIST OF TEST EQUIPMENTS	8
3.3 ENVIRONMENTAL CONDITIONS	10
3.4 MEASUREMENT UNCERTAINTY	10
4. ETSI EN 300 328 REQUIREMENTS.....	11
4.1 RF OUTPUT POWER.....	11
4.2 ACCUMULATED TRANSMIT TIME, FREQUENCY OCCUPATION AND HOPPING SEQUENCE	15
4.3 HOPPING FREQUENCY SEPARATION.....	22
4.4 OCCUPIED CHANNEL BANDWIDTH.....	23
4.5 TRANSMITTER UNWANTED EMISSIONS IN THE OUT OF BAND DOMAIN.....	27
4.6 TRANSMITTER SPURIOUS EMISSIONS.....	29
4.7 RECEIVER SPURIOUS EMISSIONS	39
4.8 RECEIVER BLOCKING.....	46
APPENDIX A: PHOTOGRAPHS OF THE TEST SETUP	48



1. TEST RESULT CERTIFICATION

Applicant	Shenzhen Huafului Technology Co., Ltd.
Address	Unit 1401 &1402, 14/F, Jin qi zhi gu mansion (No. 4 building of Chong wen Garden), Crossing of the Liu xian street and Tang ling road, Tao yuan street, Nan shan district, Shenzhen, P.R. China
Manufacturer	Shenzhen Huafului Technology Co., Ltd.
Address	Unit 1401 &1402, 14/F, Jin qi zhi gu mansion (No. 4 building of Chong wen Garden), Crossing of the Liu xian street and Tang ling road, Tao yuan street, Nan shan district, Shenzhen, P.R. China
Factory Name	Shenzhen Huafului Technology Co., Ltd.
Address	Unit 1401 &1402, 14/F, Jin qi zhi gu mansion (No. 4 building of Chong wen Garden), Crossing of the Liu xian street and Tang ling road, Tao yuan street, Nan shan district, Shenzhen, P.R. China
Product Designation	Smart Phone
Brand Name	CUBOT
Test Model	X20
Date of test	Oct. 14, 2019 to Oct. 22, 2019
Deviation	None
Condition of Test Sample	Normal
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.

The test results of this report relate only to the tested sample identified in this report.

Prepared By



Donjon Huang
(Project Engineer)

Oct. 22, 2019

Reviewed By



Max Zhang
(Reviewer)

Oct. 23, 2019

Approved By



Forrest Lei
(Authorized Officer)

Oct. 23, 2019

2. TECHNICAL INFORMATION

2.1 EUT DESCRIPTION

Operating Frequency Range(s)	2402MHz~2480MHz
Modulation type	FHSS
Bluetooth Version	V4.2
Modulation	<input checked="" type="checkbox"/> Basic Rate(GFSK) <input checked="" type="checkbox"/> EDR (PI/4-DQPSK) <input checked="" type="checkbox"/> EDR(8-DPSK) <input type="checkbox"/> BLE(GFSK)
Adaptive / non-adaptive equipment	Adaptive Equipment
The number of Hopping Frequencies	79
The maximum RF Output Power (e.i.r.p.)	0.5dBm
Hardware Version	E965_MAIN_PCB_V1.0
Software Version	CUBOT_X20_9071C-1_V01_20190920
Antenna designation	Hardware antenna
Antenna gain	0dBi
Nominal voltages	DC 3.85V by battery
Extreme Temperature	Low Temperature (TL) = -10°C High Temperature (TH) = +40°C

Note:

1. The above information was declared by the applicant.
2. The equipment submitted are representative production models.
3. The EUT can not 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. Please refer to Photo report for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.
8. The maximum temperature of 40 is not a standard requirement and is measured according to the maximum service temperature stated by the manufacturer.

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, 8-DPSK).
2. All modes have been tested and the worst mode test data recording in the test report, if no any other data.



A) OBJECTIVE

Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU for the FHSS function of the EUT.

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;
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TEST ITEMS AND THE RESULTS ARE AS BELLOW:

No	Basic Standard	Test Type	The worst case operational 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 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.

3. DETAILS OF TEST

3.1 IDENTIFICATION OF THE RESPONSIBLE TESTING LOCATION

Company Name:	Attestation of Global Compliance (Shenzhen) Co., Ltd.
Address	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.	S/N	Calibration Date	Calibration Due.
SIGNAL ANALYZER	Agilent	N9020A	MY52090123	Sep. 09, 2019	Sep. 08, 2020
SIGNAL GENERATOR	Agilent	N5182A	MY50140530	Sep. 09, 2019	Sep. 08, 2020
SIGNAL GENERATOR	Agilent	E8257D	MY45141029	Sep. 09, 2019	Sep. 08, 2020
USB Wideband Power Sensor	Agilent	U2021XA	MY54110007	Sep. 09, 2019	Sep. 08, 2020
USB Wideband Power Sensor	Agilent	U2021XA	MY54110009	Sep. 09, 2019	Sep. 08, 2020
USB Wideband Power Sensor	Agilent	U2021XA	MY54110014	Sep. 09, 2019	Sep. 08, 2020
USB Wideband Power Sensor	Agilent	U2021XA	MY54110012	Sep. 09, 2019	Sep. 08, 2020
USB Simultaneous Sampling Multifunction DAQ	Agilent	U2531A	MY5211038	Sep. 09, 2019	Sep. 08, 2020
2.4 GHz Filter	Micro-Tronics	BRM50702	017	Feb. 27, 2019	Feb. 26, 2020
VECTOR ANALYZER	Agilent	E4440A	MY44303916	June 12, 2019	June 11, 2020
Trilog-Broadband Antenna	SCHWARZBEK	VULB 9168	VULB 9168-492	Mar. 01, 2018	Feb. 28, 2020
Trilog-Broadband Antenna	SCHWARZBEK	VULB 9168	VULB 9168-494	Mar. 01, 2018	Feb. 28, 2020
Amplifier	EM	EM30180	060552	June 12, 2019	June 11, 2020
Horn Antenna	EM	EM-AH-10180	67	Mar. 01, 2018	Feb. 28, 2020
HORN ANTENNA	ETS	3117	00034609	Mar. 01, 2018	Feb. 28, 2020
Horn Ant (18G-40GHz)	Schwarzbeck	BBHA 9170	#768	Mar. 01, 2018	Feb. 28, 2020
Horn Ant (18G-40GHz)	ETS	QWH_SL_18_40_K_SG	N/A	Mar. 01, 2018	Feb. 28, 2020

UNIVERSAL RADIO COMMUNICATION TESTER	R&S	CMW500	120909	July 11, 2019	July 10, 2020
Adjustable attenuator	warison	WATT-6SR1211 (1dB, 10dB)	N/A	June 12, 2019	June 11, 2020
Attenuator	Weinachel Corp	58-30-33 (30dB)	N/A	June 12, 2019	June 11, 2020
Power divider	Mini-Circuits	SF781901412	ZFRSX-183-S+	July 11, 2019	July 10, 2020
Directional Coupler	Werlatone	C5571-10	99463	June 12, 2019	June 11, 2020



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: $\pm 3\%$



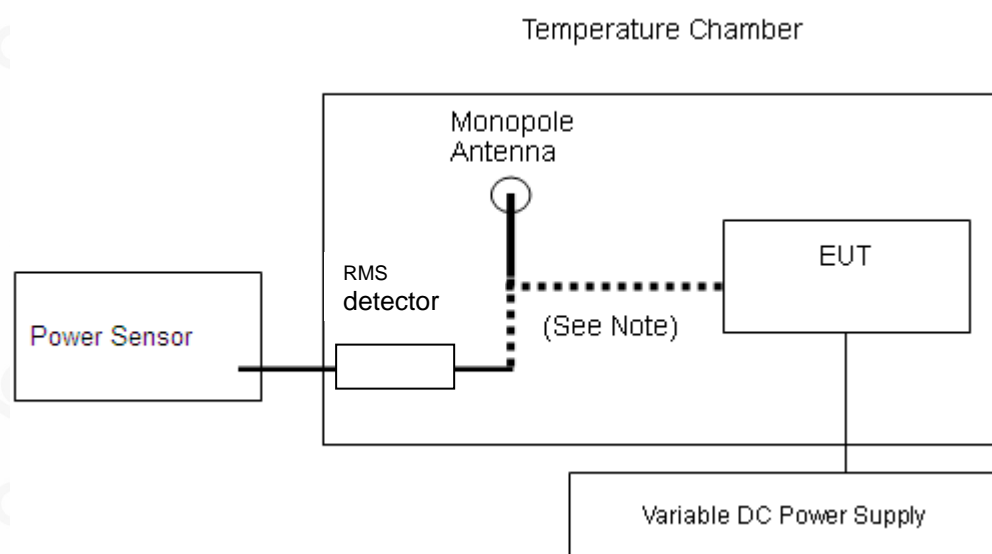
4. ETSI EN 300 328 requirements

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.

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.

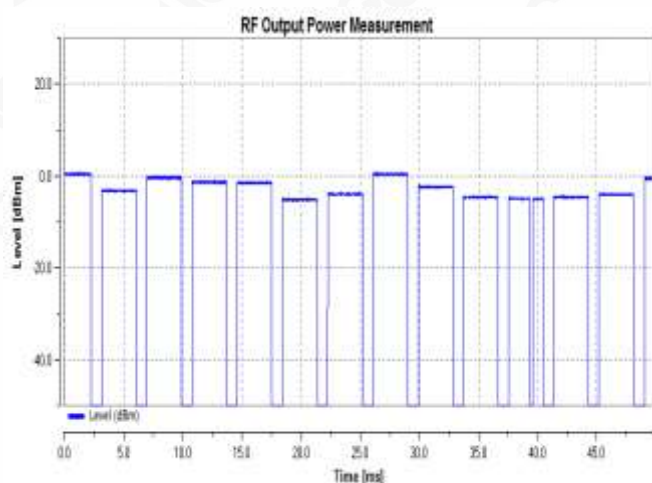
TEST RESULTS

Operation Mode:	Normal Hopping	Test Date:	Oct.18, 2019
Temperature:	24.1°C	Tested by:	Donjon
Humidity:	52.9% RH		
Number of Burst		= 10	
Measurement Time		= 45.48ms	

TEST CONDITIONS		RF OUTPUT POWER MEASUREMENT RESULT FOR GFSK MODULATION (dBm)		
		Temp (25)°C	Temp (-10)°C	Temp (40)°C
CHANNEL	VOL POWER/GAIN	DC 3.85V	DC 3.85V	DC 3.85V
Normal Hopping	Result	0.46	0.42	0.43
Limit		20dBm		

1*GFSK(1M)DH1:HoppingChannel:(Temp - Normal)

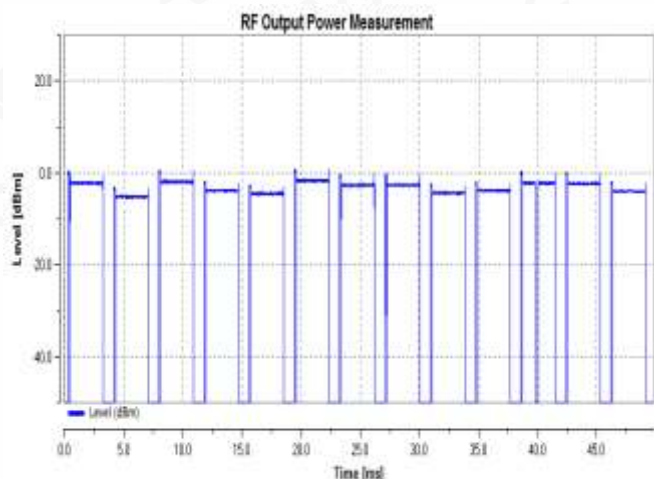
Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
Hopping Channel	Normal	0.46	0.46



TEST CONDITIONS		RF OUTPUT POWER MEASUREMENT RESULT FOR $\pi/4$ -DQPSK MODULATION (dBm)		
		Temp (25)°C	Temp (-10)°C	Temp (40)°C
CHANNEL	VOL POWER/GAIN	DC 3.85V	DC 3.85V	DC 3.85V
Normal Hopping	Result	0.5	0.41	0.46
Limit		20dBm		

2* π 4DQPSK(2M)DH3:HoppingChannel:(Temp-Normal)

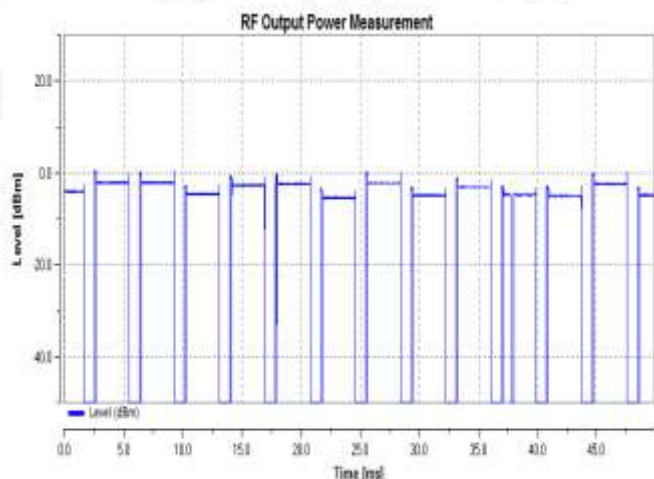
Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
Hopping Channel	Normal	0.5	0.5



TEST CONDITIONS		RF OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MOUDULATION (dBm)		
		Temp (25)°C	Temp (-10)°C	Temp (40)°C
CHANNEL	VOL POWER/GAIN	DC 3.85V	DC 3.85V	DC 3.85V
Normal Hopping	Result	0.11	0.09	0.08
Limit		20dBm		

3*8DPSK(3M) DH5:Hopping Channel: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
Hopping Channel	Normal	0.11	0.11



Note: Result=Reading+ Ant. Gain
The reading value included cable loss.

4.2 ACCUMULATED TRANSMIT TIME, FREQUENCY OCCUPATION AND HOPPING SEQUENCE

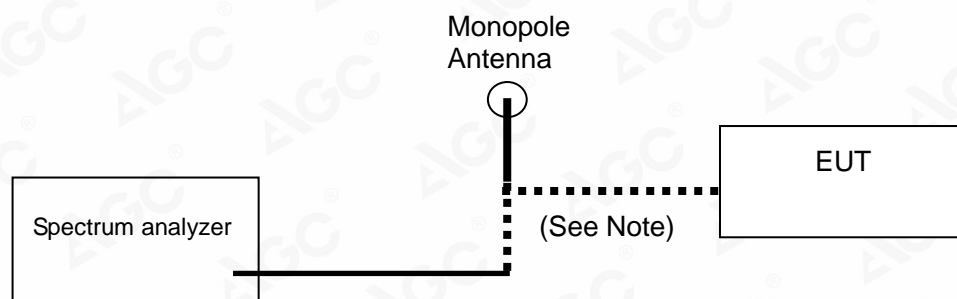
ETSI EN 300 328 SUBCLAUSE 4.3.1.4.1

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

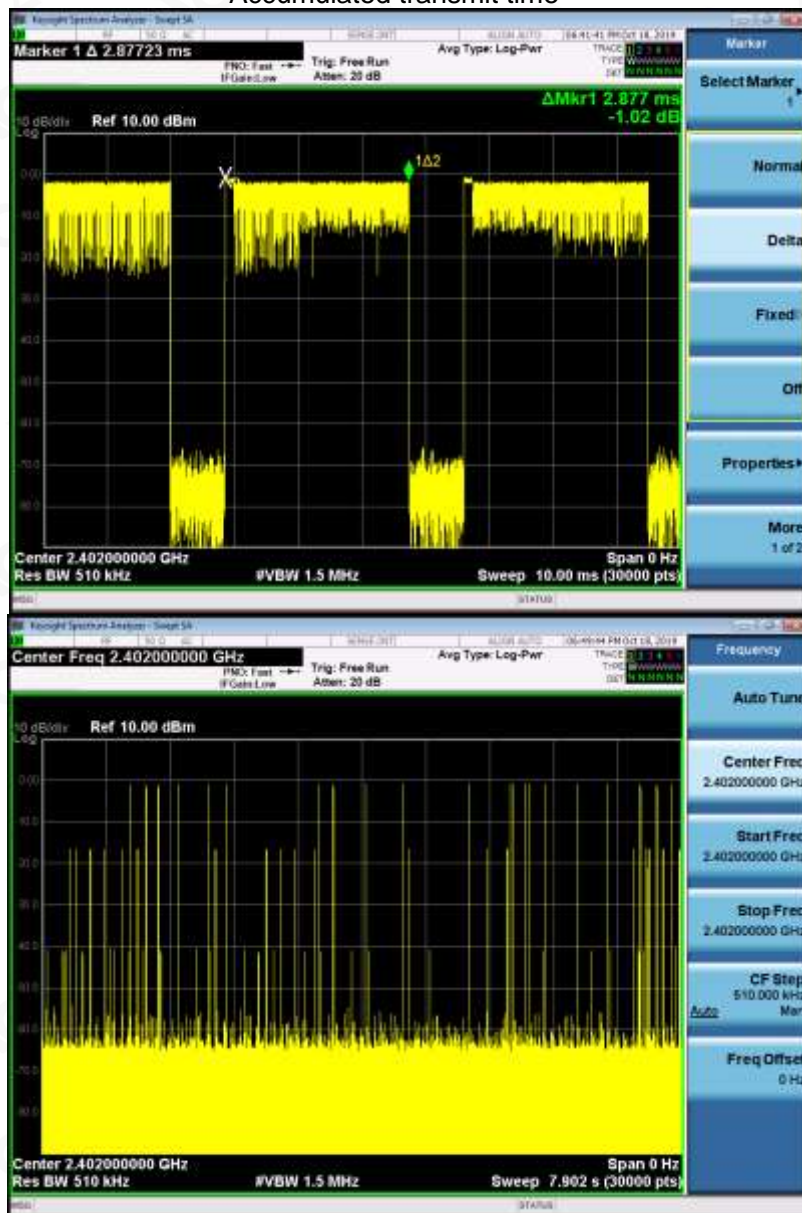
1. Please refer to ETSI EN300328 V2.1.1 Section 5.4.4

TEST RESULT

Bluetooth 3Mbps (DH5) Test Result

Channel	Accumulated transmit time (ms)	Limit (ms)	Frequency Occupation (pcs)	Limit (pcs)
Low	241.668	≤400	6	≥1

Accumulated transmit time



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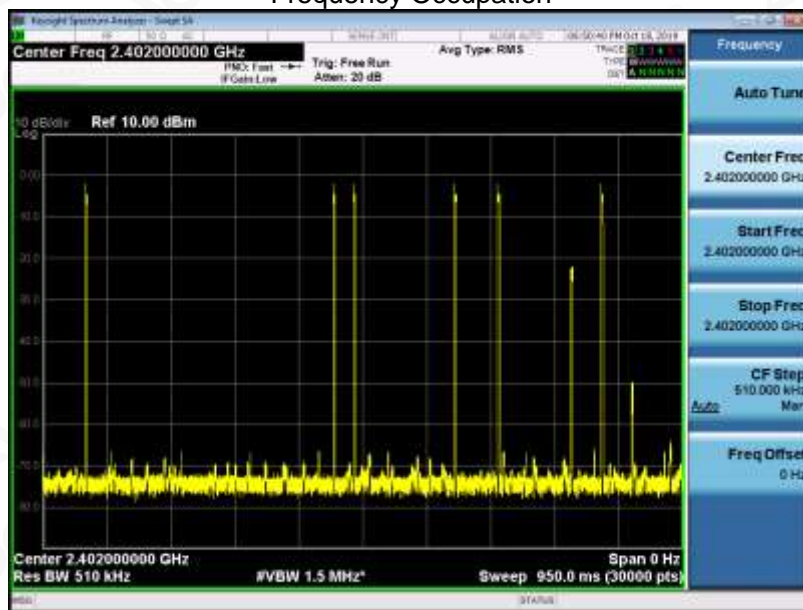
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Frequency Occupation



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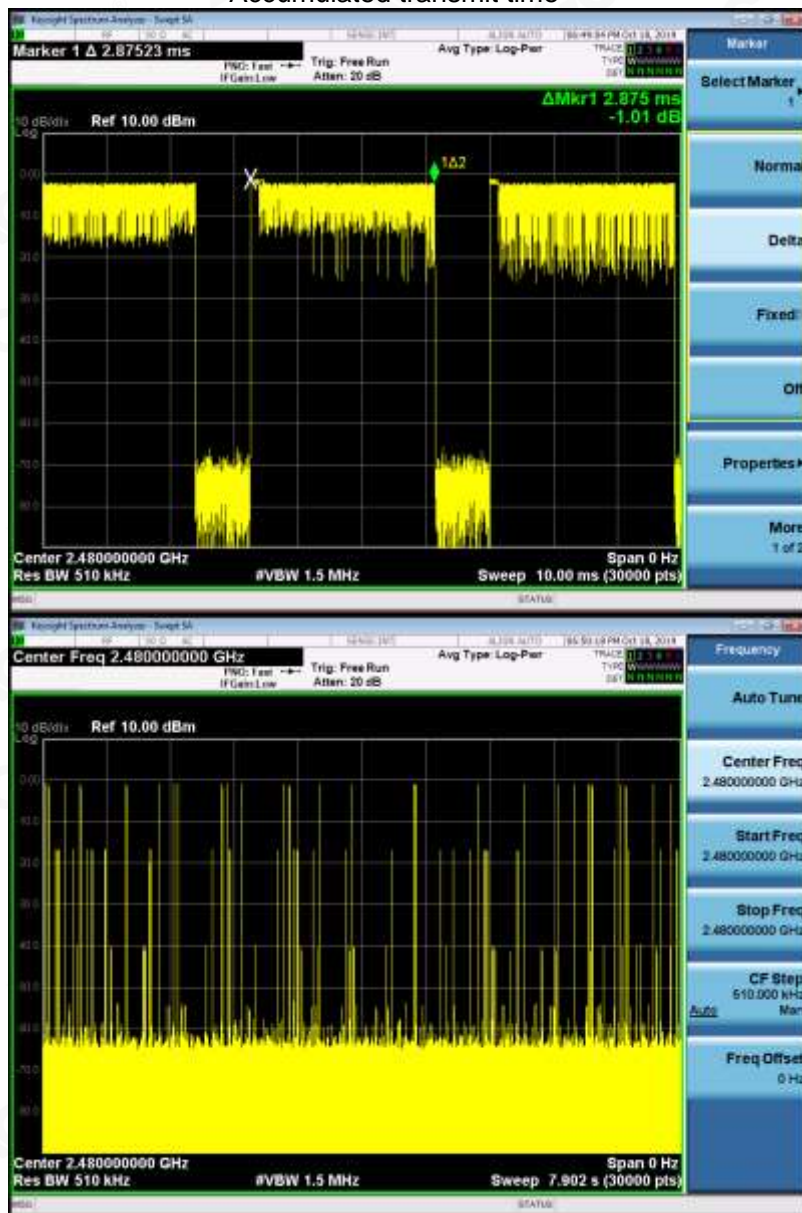
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Bluetooth 3Mbps(DH5) Test Result

Channel	Accumulated transmit time (ms)	Limit (ms)	Frequency Occupation (pcs)	Limit (pcs)
High	299.00	≤400	4	≥1

Accumulated transmit time



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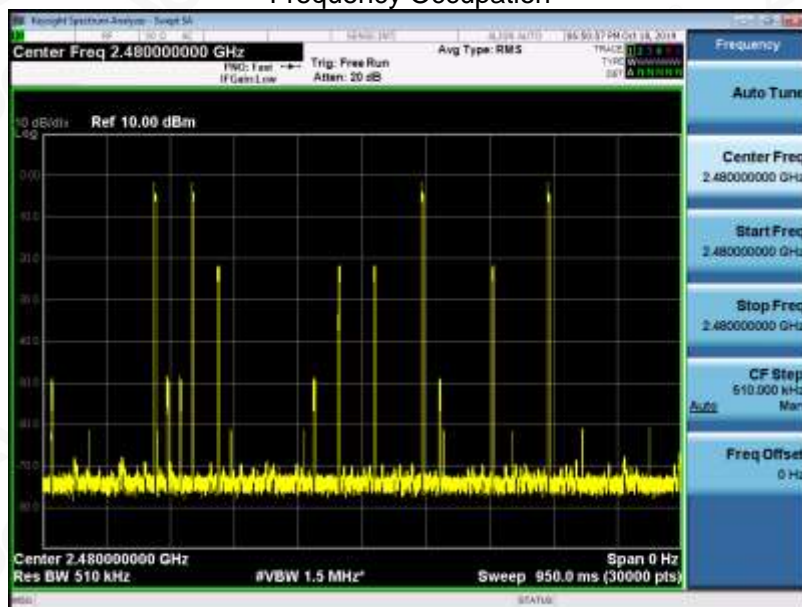
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Frequency Occupation



- 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	2.40202	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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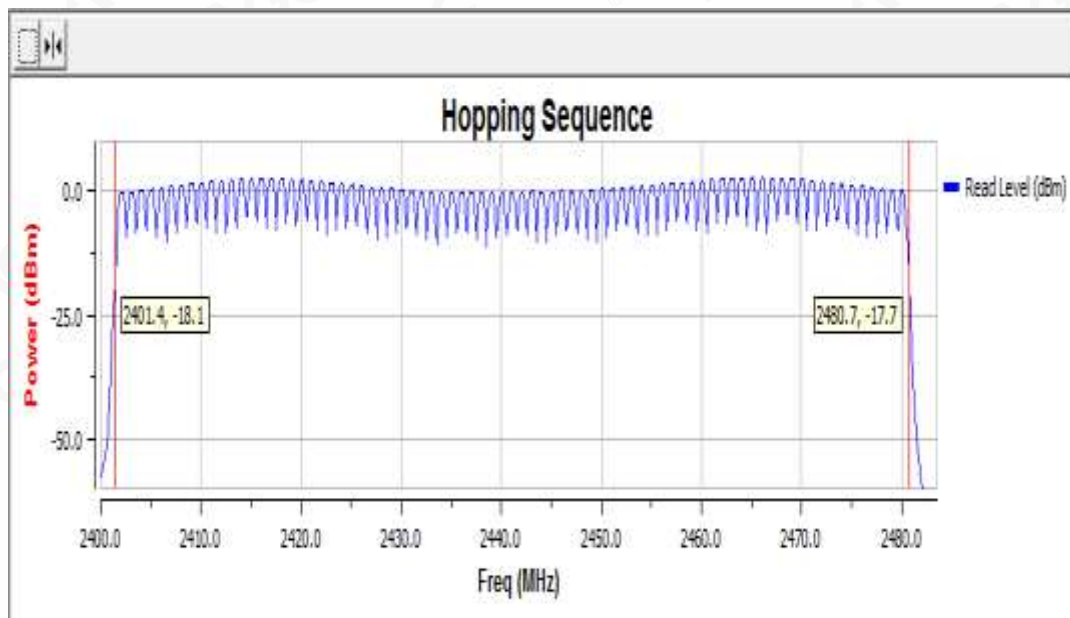
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Hopping Channel Test Plot

Hopping Sequence (MHz)	79.32
Hopping Number	79



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4.3 HOPPING FREQUENCY SEPARATION

ETSI EN 300 328 SUBCLAUSE 4.3.1.5

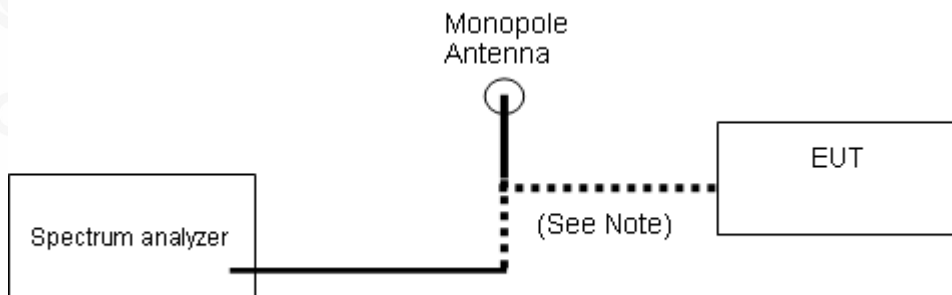
For Non-adaptive frequency hopping systems:

The minimum Hopping Frequency Separation shall be equal to Occupied Channel Bandwidth (see clause 4.3.1.8) 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

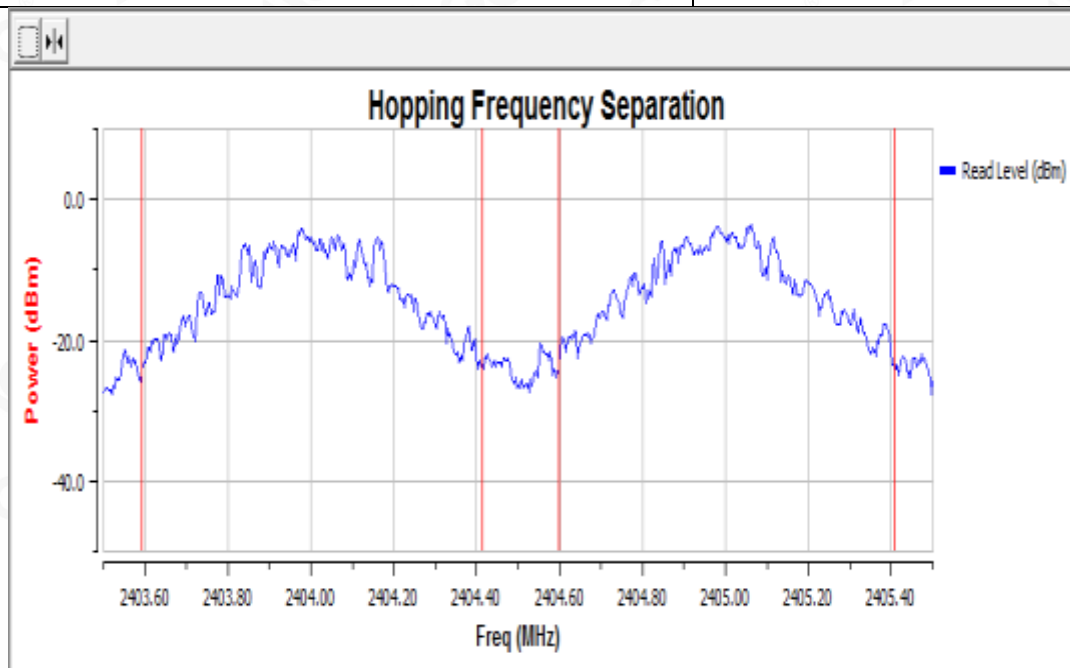


TEST PROCEDURE

Test Procedure please refer to clause 5.4.5.2

TEST RESULT

Hopping Frequency Separation (MHz)	1.00
------------------------------------	------



Hopping Frequency Separation (F_{HS}) = $F_{2C} - F_{1C}$ = 1.00 MHz

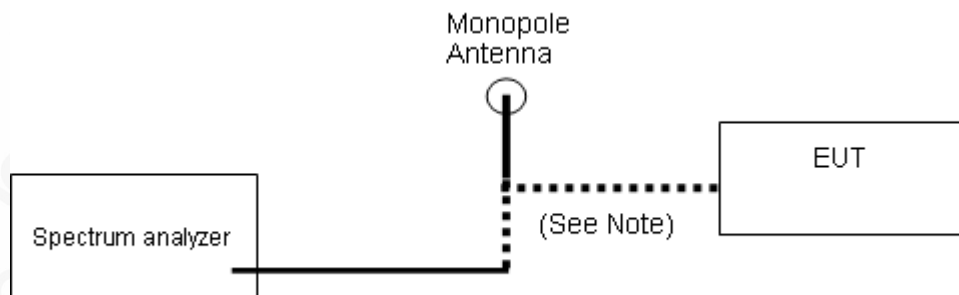
Note: The modulation used during test is GFSK and this is the worst case.

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 5.4.7.1 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 RESULT

1*GFSK(1M) DH1:CH Low-2402:

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH Low-2402	0.879	2402



2*GFSK(1M) DH1:CH High-2480:

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH High-2480	0.88	2480



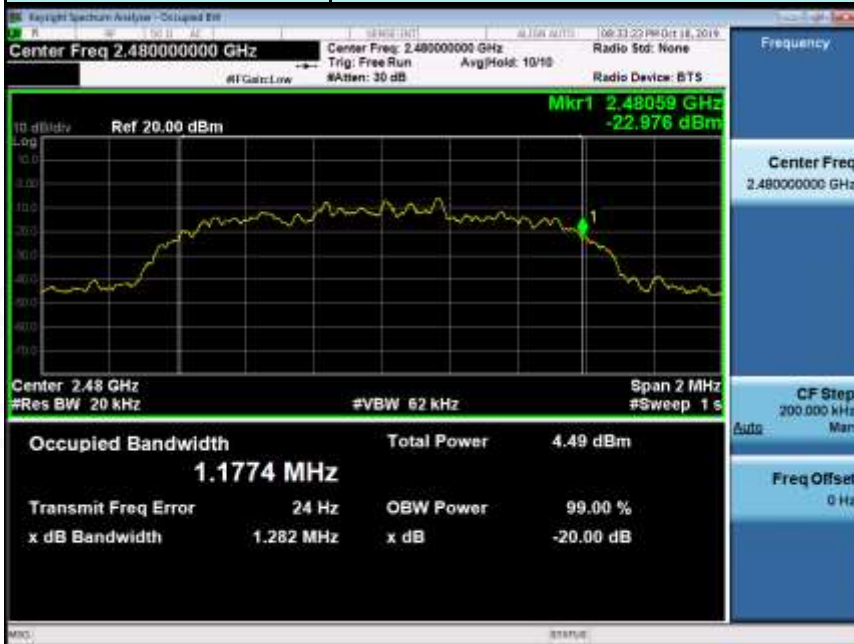
3* π 4DQPSK(2M) DH3:CH Low-2402:

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH Low-2402	1.176	2402



4* π 4DQPSK(2M) DH3:CH High-2480:

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH High-2480	1.177	2480



5*8DPSK(3M) DH5:CH Low-2402:

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH Low-2402	1.189	2402



6*8DPSK(3M) DH5:CH High-2480:

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH High-2480	1.192	2480



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

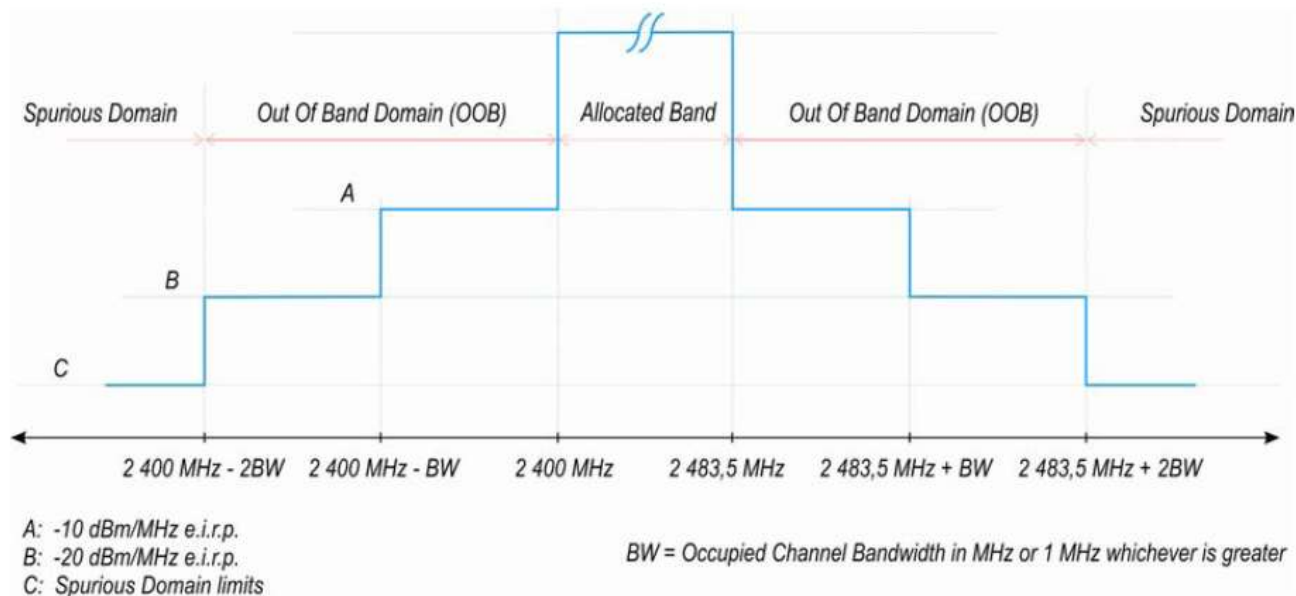
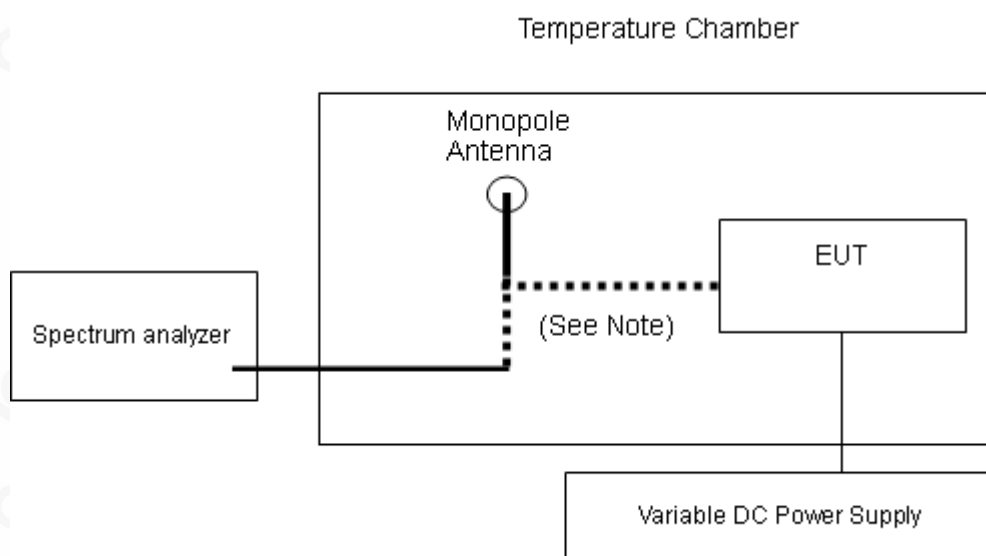


Figure 1: Transmit mask

TEST CONFIGURATION



For have temporary antenna connector product

TEST PROCEDURE

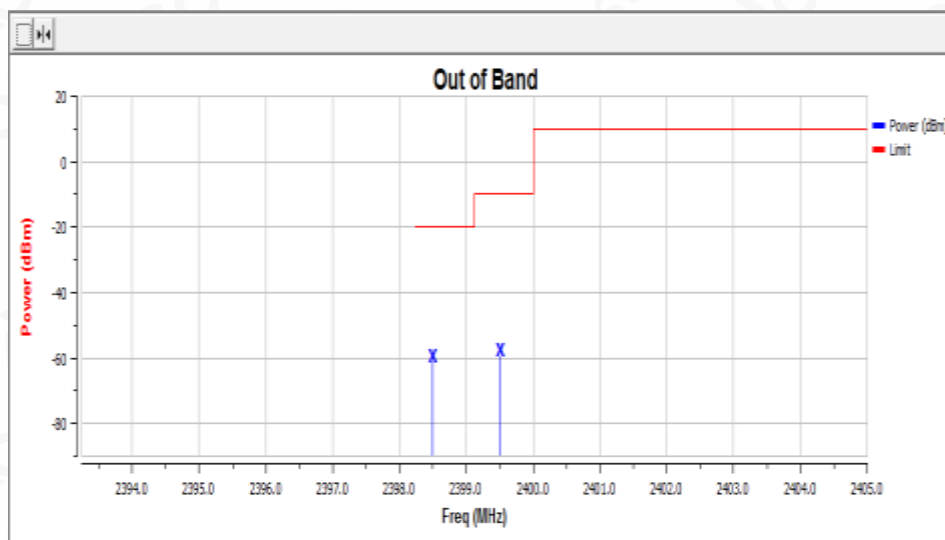
Test Procedure Please refer to ETSI EN 300 328 (V2.1.1) Clause 5.4.8.2.

TEST RESULT

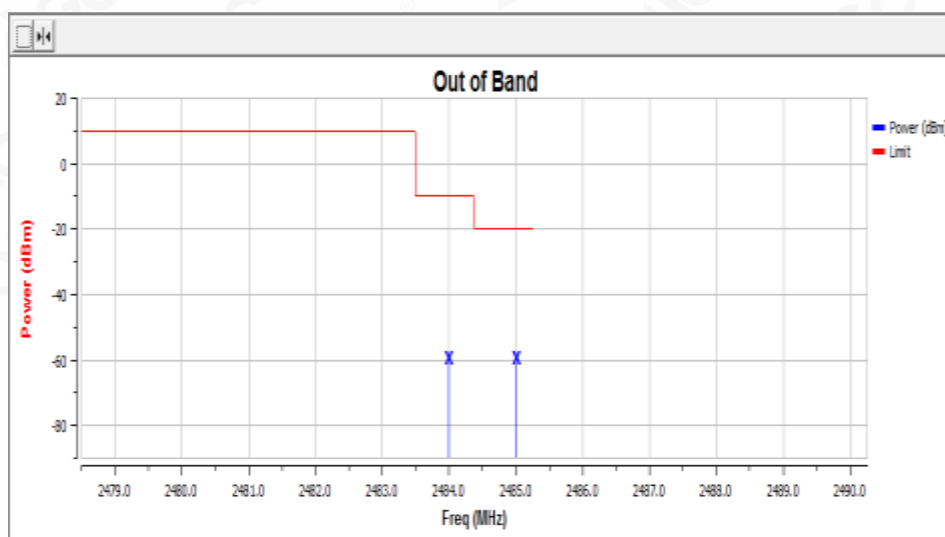
see the next page

NORMAL TEMPERATURE

Channel	Antenna	Frequency	Level	Limit
CH Low-2402	Antenna 1	2399.5	-59.68	-10
CH Low-2402	Antenna 1	2398.5	-61.14	-20



Channel	Antenna	Frequency	Level	Limit
CH High-2480	Antenna 1	2484	-61.1	-10
CH High-2480	Antenna 1	2485	-61.17	-20



Note: The modulation used during test is GFSK is the worst case.

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

TEST PROCEDURE

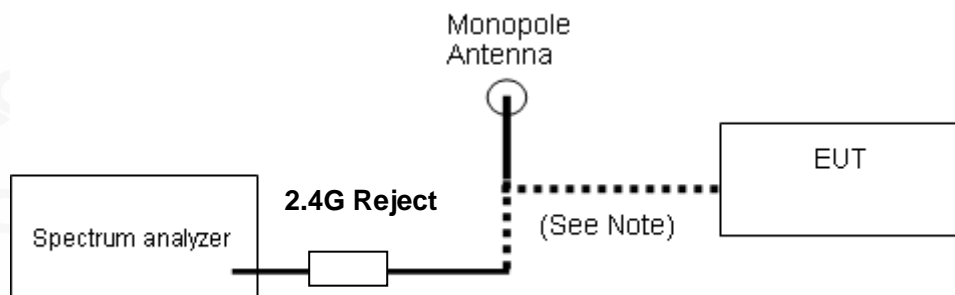
Refer to chapter 5.4.9.2 of ETSI EN 300 328 V2.1.1

Measurement

Measurement	
<input checked="" type="checkbox"/> Conducted measurement	<input checked="" type="checkbox"/> Radiated measurement

CONDUCTED MEASUREMENT

TEST CONFIGURATION



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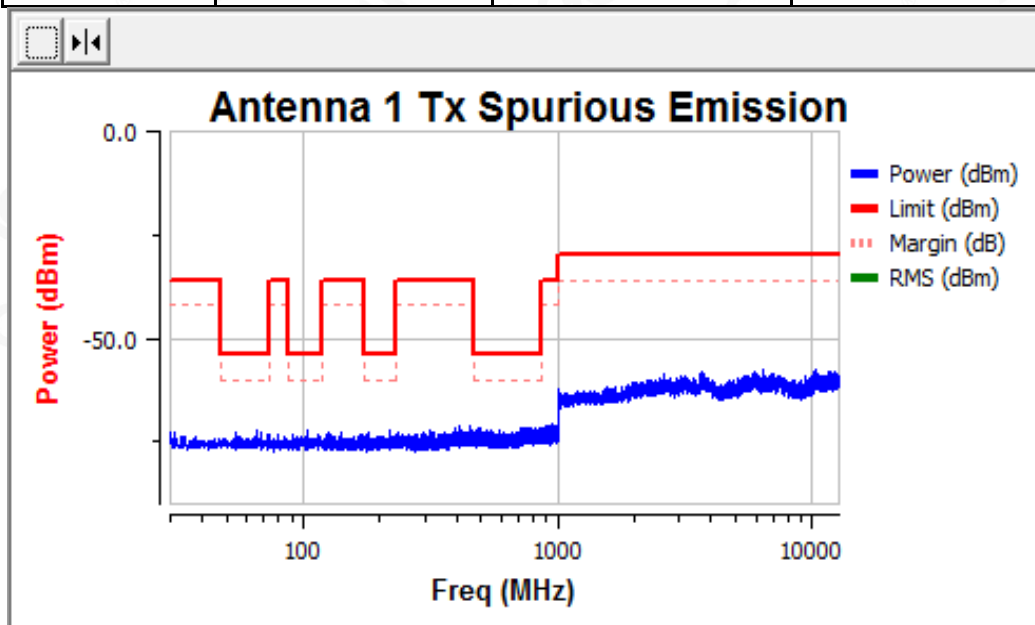
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CONDUCTED RESULTS: (Worst Case: Low channel, 1Mbps)

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
716.200	-71.03	-54.00	-17.03	Pass
11556.000	-57.52	-30.00	-27.52	Pass



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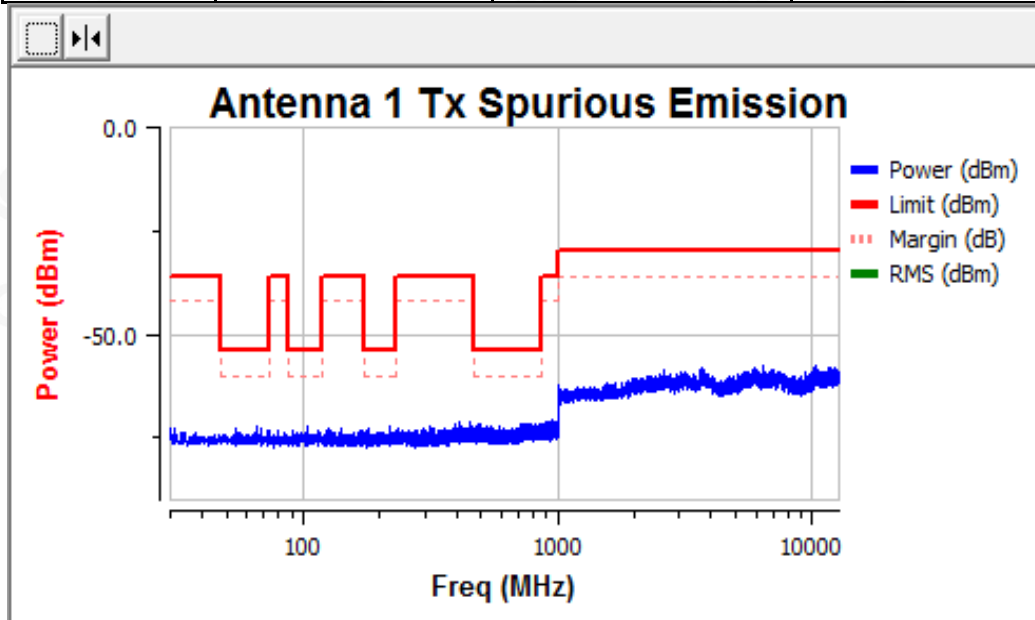
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(Worst Case: High channel, 1Mbps)

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
855.813	-71.11	-54.00	-17.11	Pass
12209.000	-57.25	-30.00	-27.25	Pass



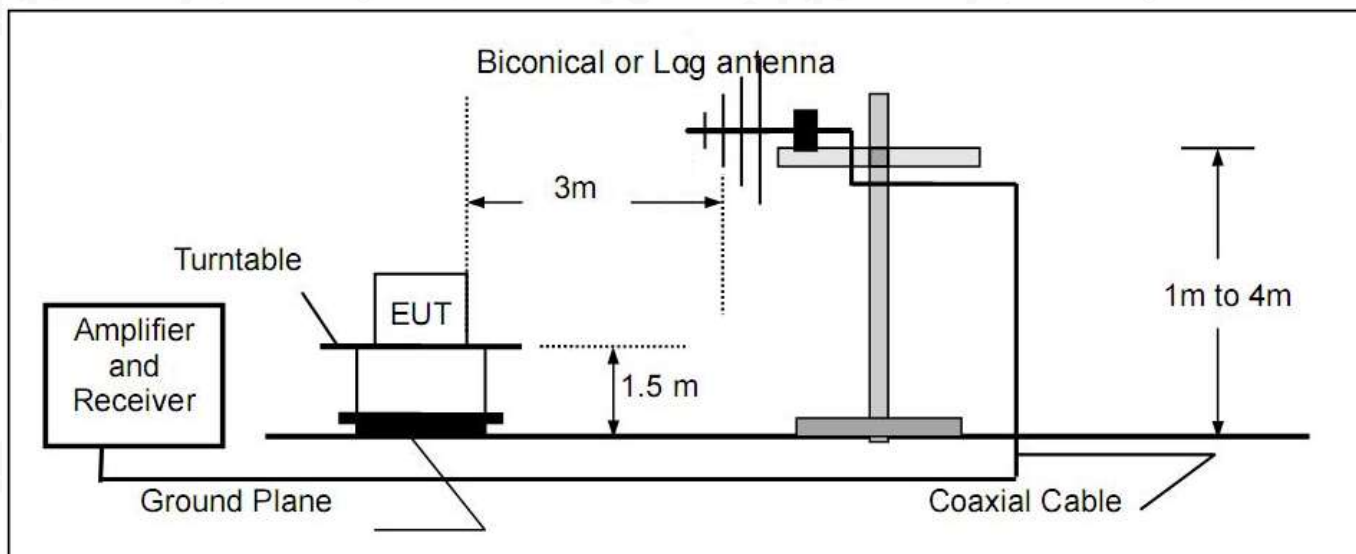
Note: 1. All the modes had been test but only the worst data record in the report.
2. The 2.4G fundamental frequency is filtered out.

RADIATED MEASUREMENT

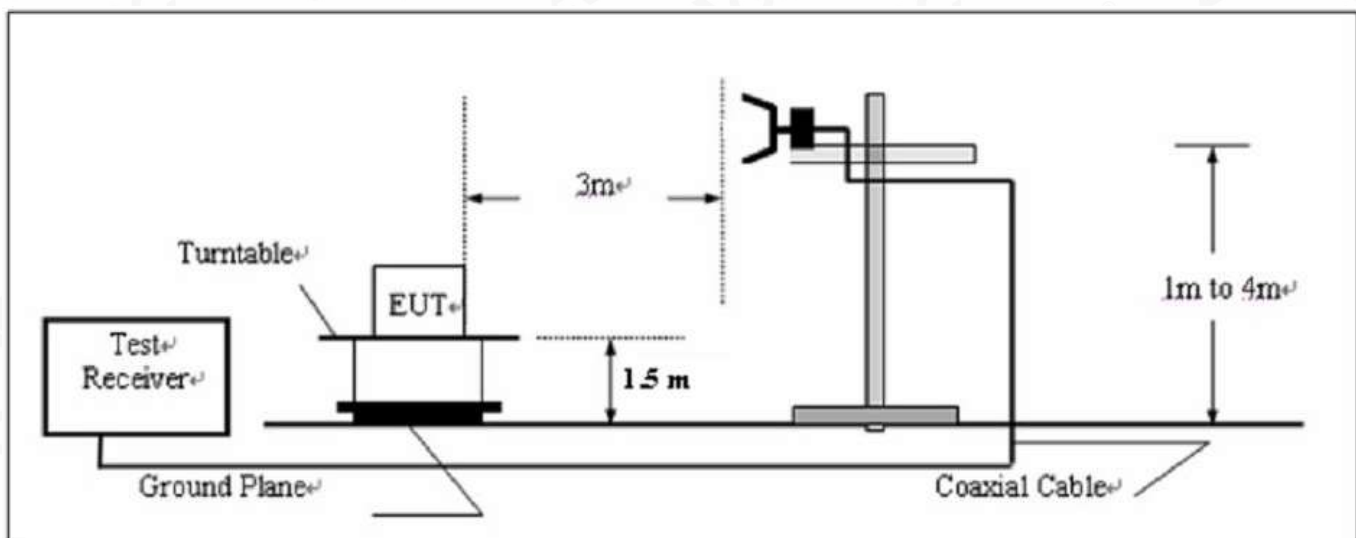
TEST SETUP

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 (Button Function) has been activated to set the EUT on specific status.

Below 1GHz

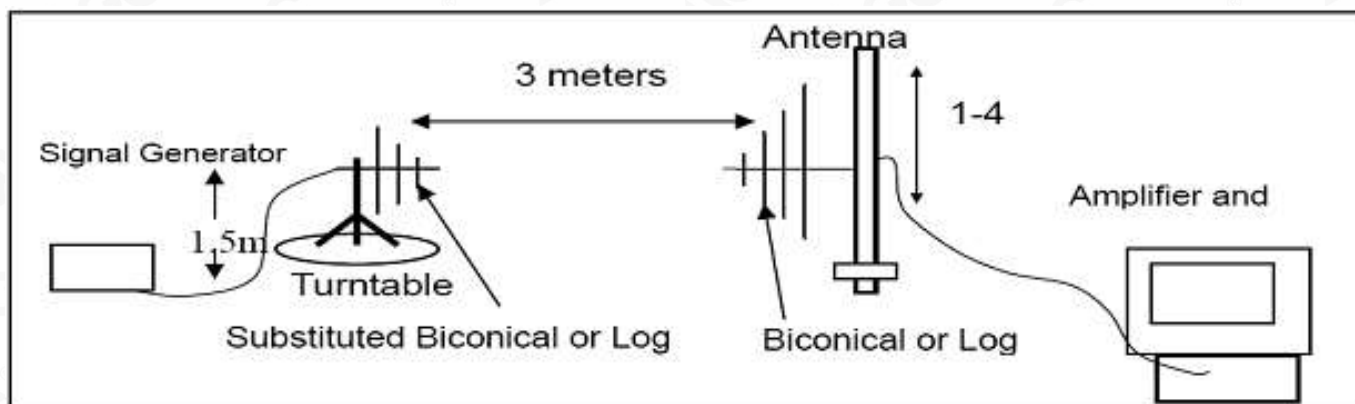


Above 1GHz

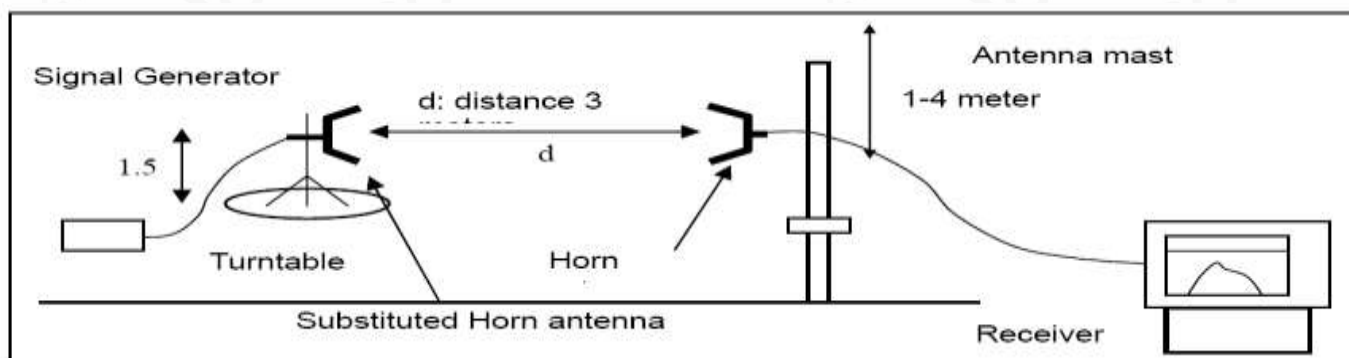


Radiated Method

SUBSTITUTION METHOD: (RADIATED EMISSIONS)
RADIATED BELOW 1GHZ



RADIATED ABOVE 1 GHZ



TEST RESULTS for Radiated Method
(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)
85.90	30.70	V	-61.93	0.48	0.70	-61.71	-36.00	25.71
130.35	30.97	V	-60.83	0.49	0.10	-61.22	-36.00	25.22
240.43	31.04	V	-65.36	0.52	6.60	-59.28	-36.00	23.28
325.97	30.58	V	-65.15	0.53	6.10	-59.58	-36.00	23.58
334.56	31.20	V	-65.62	0.53	5.94	-60.21	-36.00	24.21
827.60	31.54	V	-66.05	0.66	6.45	-60.25	-54.00	6.25
Other(30-100)	--	V	--	--	--	--	-36.00/-54.00	--
83.83	31.89	H	-59.24	0.48	0.38	-59.34	-36.00	23.34
131.55	31.09	H	-58.29	0.49	0.08	-58.70	-36.00	22.70
243.24	30.48	H	-68.01	0.52	6.78	-61.75	-36.00	25.75
325.52	31.21	H	-66.34	0.53	6.10	-60.77	-36.00	24.77
735.24	30.53	H	-64.74	0.59	6.60	-58.74	-54.00	4.74
827.90	31.46	H	-66.25	0.66	6.45	-60.46	-54.00	6.46
Other(30-100)	--	H	--	--	--	--	-36.00/-54.00	--



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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)
4804.03	46.24	V	-48.31	2.64	9.30	-41.65	-30.00	11.65
7328.44	31.44	V	-57.43	3.11	11.45	-49.10	-30.00	19.10
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
4804.37	41.69	H	-49.16	2.64	9.30	-42.50	-30.00	12.50
7246.77	31.08	H	-58.44	3.13	11.34	-50.24	-30.00	20.24
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.

(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)
94.14	30.87	V	-60.94	0.48	1.72	-59.70	-54.00	5.70
145.86	30.34	V	-59.18	0.49	0.30	-59.37	-36.00	23.37
242.69	31.13	V	-67.31	0.52	6.72	-61.11	-36.00	25.11
344.26	30.34	V	-64.25	0.53	5.62	-59.16	-36.00	23.16
385.72	30.84	V	-65.24	0.54	6.45	-59.33	-36.00	23.33
864.48	31.31	V	-64.09	0.68	5.72	-59.05	-36.00	23.05
Other(30-1000)	--	V	--	--	--	--	-36.00/-54.00	--
92.50	32.18	H	-60.16	0.48	1.56	-59.08	-54.00	5.08
145.76	30.24	H	-61.58	0.49	0.30	-61.77	-36.00	25.77
253.28	29.74	H	-65.61	0.52	7.22	-58.91	-36.00	22.91
336.40	30.99	H	-66.99	0.53	5.86	-61.66	-36.00	25.66
647.79	30.87	H	-68.75	0.59	7.17	-62.17	-54.00	8.17
720.36	30.83	H	-64.19	0.58	6.30	-58.47	-54.00	4.47
Other(30-1000)	--	H	--	--	--	--	-36.00/-54.00	--



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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)
4960.59	45.70	V	-49.19	2.75	9.62	-42.32	-30.00	12.32
7328.56	30.90	V	-69.71	3.11	11.45	-61.37	-30.00	31.37
Other(1000-12750)	--	V	--	--	--	--	-30.00	--
4960.74	41.00	H	-47.54	2.75	9.62	-40.68	-30.00	10.68
7246.47	30.63	H	-70.56	3.13	11.34	-62.35	-30.00	32.35
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

The level of spurious emissions shall be measured as, either:

- Their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment (cabinet radiation); or
- Their effective radiated power when radiated by cabinet and antenna in case of integral antenna equipment with no temporary antenna connectors.

Testing shall be performed when the equipment is in a receive-only mode.

LIMIT

Note: In case of equipment with antenna connectors, these limits apply to emissions at the antenna port (conducted) and to the emissions radiated by the cabinet. In case of integral antenna equipment (without temporary antenna connectors), these limits apply to emissions radiated by the equipment.

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 section 4.7 in this test report

TEST PROCEDURE

Refer to chapter 5.4.10.2 of ETSI EN 300 328 V2.1.1

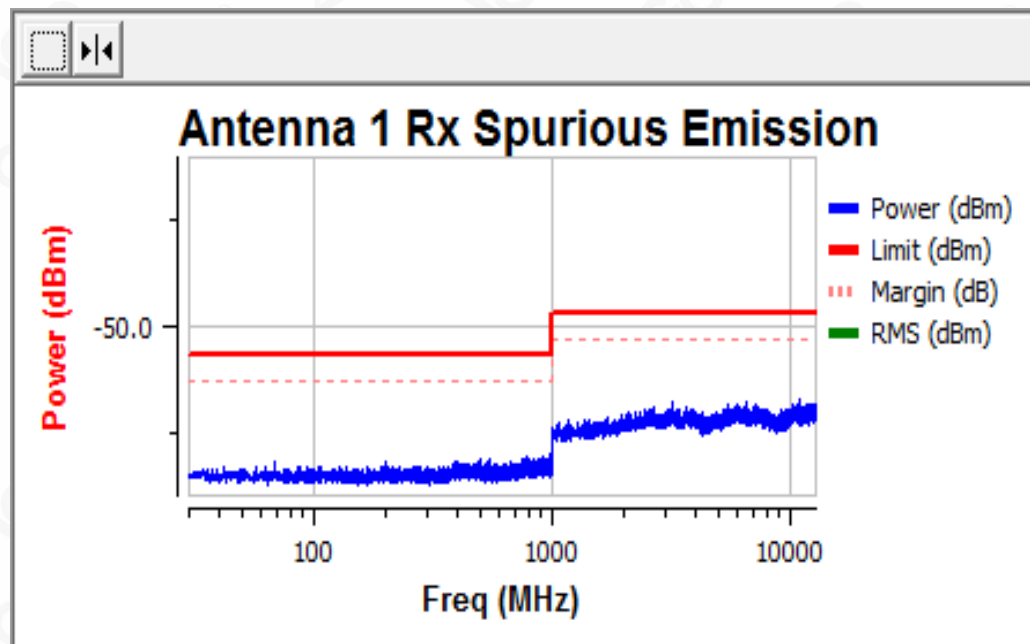
Measurement

Measurement	
<input checked="" type="checkbox"/> Conducted measurement	<input checked="" type="checkbox"/> Radiated measurement

CONDUCTED MEASUREMENT

TEST RESULTS FOR CONDUCTED METHOD RECEIVER MODE (Worst Case: Low channel, 1Mbps)

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
842.484	-80.55	-57.00	-23.55	Pass
10816.000	-66.58	-47.00	-19.58	Pass



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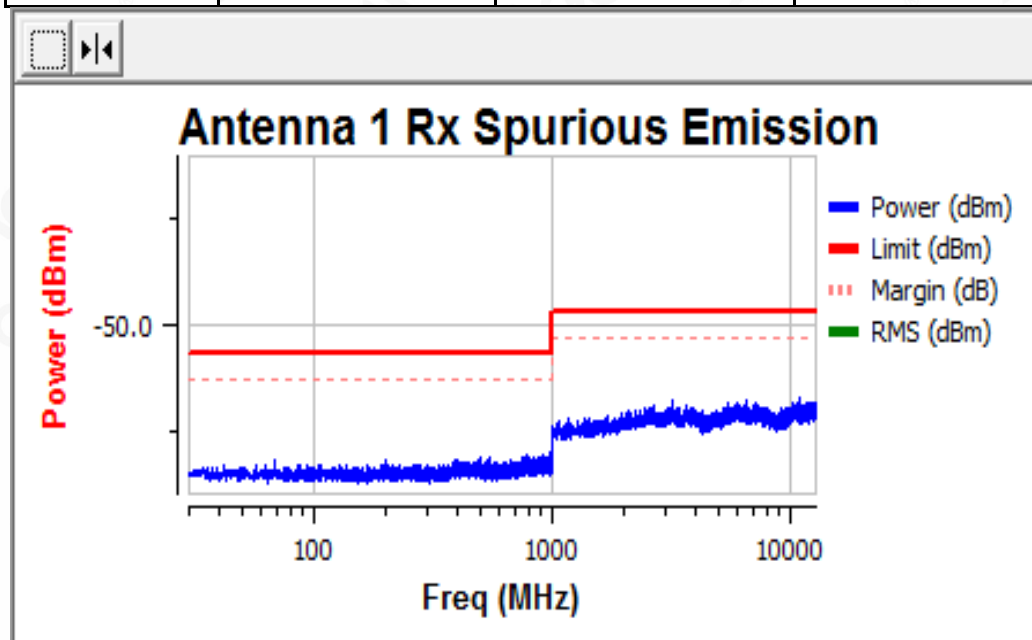
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RECEIVER MODE (Worst Case:High channel, 1Mbps)

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
931.701	-79.83	-57.00	-22.83	Pass
12184.000	-67.39	-47.00	-20.39	Pass



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

2. Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measure.

3. The effective radiated power has been considered in this test.

RADIATED MEASUREMENT

(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)
114.33	30.41	V	-72.21	0.48	1.40	-71.29	-57.00	14.29
176.89	31.58	V	-73.31	0.51	2.88	-70.94	-57.00	13.94
229.68	29.57	V	-77.59	0.52	6.84	-71.27	-57.00	14.27
496.40	30.82	V	-77.71	0.56	7.04	-71.23	-57.00	14.23
664.93	30.30	V	-77.35	0.59	6.98	-70.96	-57.00	13.96
879.53	31.02	V	-75.70	0.69	5.87	-70.52	-57.00	13.52
Other(30-1000)	--	V	--	--	--	--	-57.00	--
84.65	32.25	H	-71.18	0.48	0.54	-71.12	-57.00	14.12
109.69	31.30	H	-71.77	0.48	1.28	-70.97	-57.00	13.97
218.67	31.15	H	-77.42	0.52	7.46	-70.48	-57.00	13.48
485.17	30.69	H	-77.20	0.56	7.00	-70.76	-57.00	13.76
554.97	30.74	H	-79.80	0.57	6.78	-73.59	-57.00	16.59
635.25	31.04	H	-78.47	0.58	7.20	-71.85	-57.00	14.85
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)
4948.25	29.29	V	-67.83	2.74	9.58	-60.99	-47.00	13.99
--	--	V	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
4952.53	29.93	H	-66.21	2.74	9.60	-59.36	-47.00	12.36
--	--	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.

(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)
84.92	31.37	V	-70.49	0.48	0.54	-70.43	-57.00	13.43
154.30	31.74	V	-70.53	0.50	0.70	-70.33	-57.00	13.33
249.15	31.78	V	-76.57	0.52	7.06	-70.03	-57.00	13.03
394.50	30.72	V	-75.67	0.54	6.48	-69.73	-57.00	12.73
484.18	29.50	V	-76.92	0.56	6.98	-70.50	-57.00	13.50
894.57	30.40	V	-75.33	0.70	6.18	-69.85	-57.00	12.85
Other(30-1000)	--	V	--	--	--	--	-57.00	--
109.69	31.14	H	-70.28	0.48	1.28	-69.48	-57.00	12.48
188.03	31.31	H	-75.47	0.51	4.78	-71.20	-57.00	14.20
224.98	31.21	H	-79.21	0.52	7.70	-72.03	-57.00	15.03
472.87	30.96	H	-75.81	0.55	6.82	-69.54	-57.00	12.54
501.62	31.13	H	-77.49	0.56	6.97	-71.08	-57.00	14.08
725.02	31.09	H	-77.13	0.59	6.55	-71.17	-57.00	14.17
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)
4980.57	29.85	V	-68.55	2.77	9.66	-61.66	-47.00	14.66
--	--	V	--	--	--	--	--	--
Other(1000-12750)	--	V	--	--	--	--	-47.00	--
4914.02	30.17	H	-68.19	2.72	9.52	-61.38	-47.00	14.38
--	--	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 is a measure of the ability of the equipment to receive a wanted signal on its operating channel without exceeding a given degradation in the presence of an unwanted signal (blocking signal) on frequencies other than those of the operating band provided in table 1.

4.8.1 LIMIT

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

Table 7: Receiver Blocking parameters receiver category 2 equipment

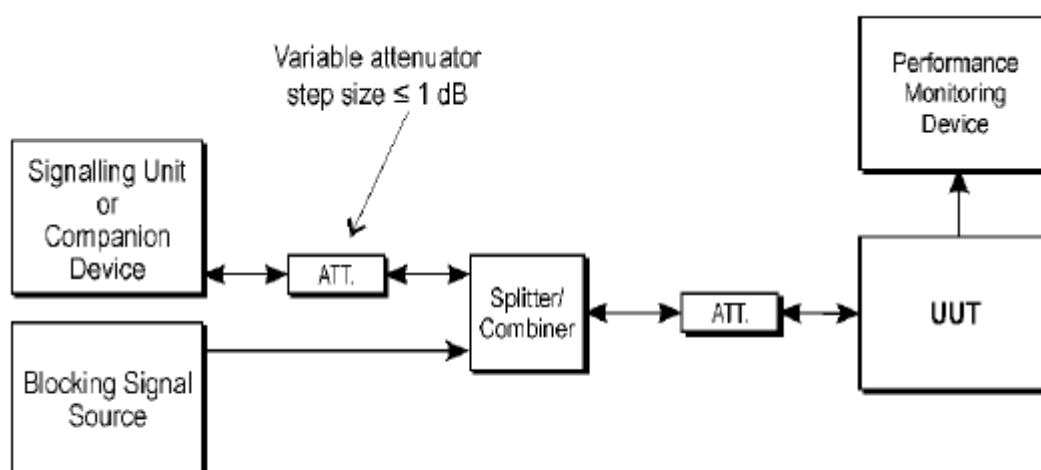
Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 2)	Type of blocking signal
$P_{\min} + 6 \text{ dB}$	2 380 2 503,5	-57	CW
$P_{\min} + 6 \text{ dB}$	2 300 2 583,5	-47	CW
NOTE 1: P_{\min} is the minimum level of the wanted signal (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.			

Note: Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % or adaptive equipment with a maximum RF output power of 10 dBm e.i.r.p. shall be considered as receiver category 2 equipment.

4.8.2 TEST PROCEDURE

Test Procedure please refer to clause 5.4.11.2

4.8.3 TEST CONFIGURATION



Test Set-up for receiver blocking

4.8.4 TEST RESULTS

GFSK MODE(HOPPING CHANNEL)

Wanted Signal Power (MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result (PER)	Limit (PER)	Result
P ₋₈₄ +6dB	2380	-57	0.47%	10%	Pass
P ₋₈₄ +6dB	2503.5	-57	1.25%	10%	Pass
P ₋₈₄ +6dB	2300	-47	2.30%	10%	Pass
P ₋₈₄ +6dB	2583.5	-47	1.18%	10%	Pass

π /4DQPSK MODE(HOPPING CHANNEL)

Wanted Signal Power (MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result (PER)	Limit (PER)	Result
P ₋₈₂ +6dB	2380	-57	0.22%	10%	Pass
P ₋₈₂ +6dB	2503.5	-57	0.40%	10%	Pass
P ₋₈₂ +6dB	2300	-47	1.31%	10%	Pass
P ₋₈₂ +6dB	2583.5	-47	1.19%	10%	Pass

8DPSK MODE(HOPPING CHANNEL)

Wanted Signal Power (MHz)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result (PER)	Limit (PER)	Result
P ₋₈₃ +6dB	2380	-57	1.42%	10%	Pass
P ₋₈₃ +6dB	2503.5	-57	0.50%	10%	Pass
P ₋₈₃ +6dB	2300	-47	1.39%	10%	Pass
P ₋₈₃ +6dB	2583.5	-47	1.18%	10%	Pass



APPENDIX A: PHOTOGRAPHS OF THE TEST SETUP

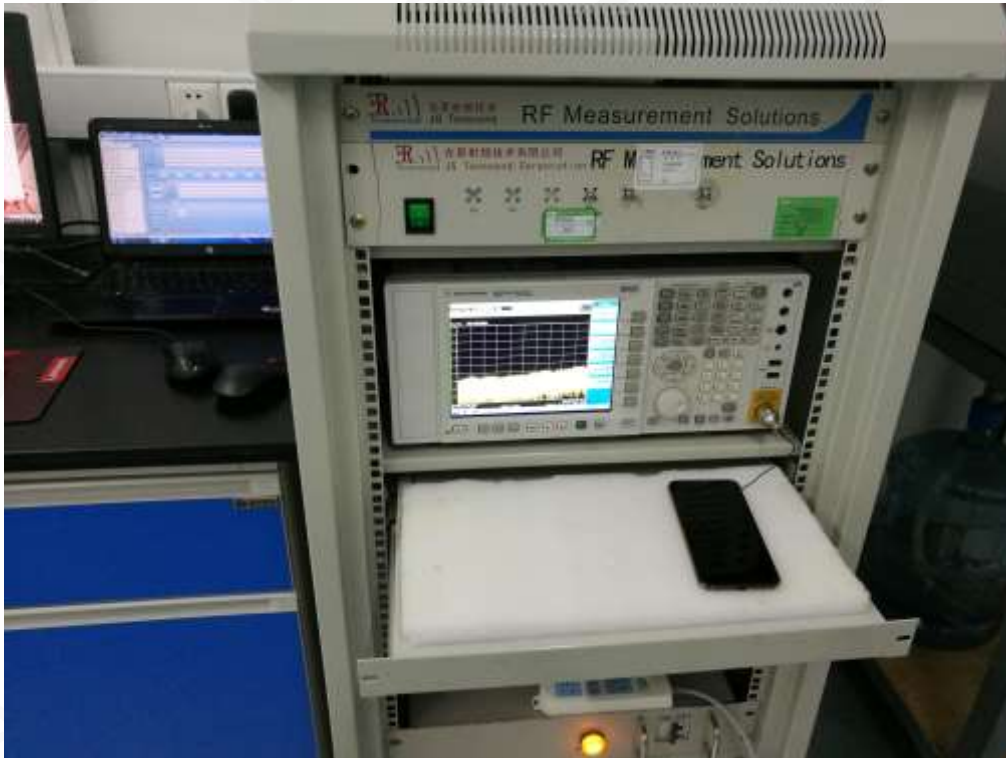
RADIATED SPURIOUS EMISSION TEST SETUP



RADIATED SPURIOUS EMISSION-ABOVE 1G TEST SETUP



CONDUCTED TEST SETUP



----END OF REPORT----



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