RF Test Report

Report No.: AGC01813161203EE04

PRODUCT DESIGNATION	:	3G Dual-SIM Smartphone
BRAND NAME	:	vonino
MODEL NAME	:	Volt S
CLIENT	:	Vonino ELectronics LTD
DATE OF ISSUE	:	Dec. 30, 2016
STANDARD(S)	:	EN 300 328 V1.9.1 (2015-02)
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Dec. 30, 2016	Valid	Original Report

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

Applicant Name	Vonino ELectronics LTD
Address	Miramar Tower 10F- No.1010, 132 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong
Manufacturer Name	Gui zhou Fortuneship Technology Co., Ltd
Address	No. 4 Plant, High-tech Industrial Park, Xinpu Economic Development Zone) Jingkai Road, Xinpu Jingkai District, Xinpu New District, Zunyi City, Guizhou Province, P. R. China
Product Designation	3G Dual-SIM Smartphone
Brand Name	vonino
Test Model	Volt S
Date of test	Dec. 15, 2016 to Dec. 22, 2016
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 V1.9.1. 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.

2. TECHNICAL INFORMATION

2.1EUT DESCRIPTION

Operating Frequency Range(s)	2402MHz~2480MHz
Modulation type	FHSS
Modulation	GFSK, π /4-DQPSK, 8-DPSK
Bluetooth Version	V 3.0
Adaptive / non-adaptive equipment	Adaptive Equipment
The number of Hopping Frequencies	79
The maximum RF Output Power (e.i.r.p.)	-1.64dBm
Hardware Version	ZH066-MB-V3.0
Software Version	N/A
Antenna designation	PIFA antenna
Antenna gain	1.0dBi
Nominal voltages	DC 3.8V by battery
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 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 v1.9.1.
7. Please refer to Appendix Ⅰ for the photographs of the EUT. For more details, please refer to the User's manual of the EUT.

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, π /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

Perform Radio Spectrum tests for CE Marking according to **the provisions of article 3.2** of the R&TTE Directive (1999/5/EC) for the Bluetooth function of the EUT.

B) TEST STANDARDS AND RESULTS

The EUT has been tested according to ETSI EN 300 328 V1.9.1 (2015-02).

ETSI EN 300 328 V1.9.1 (2015-02)	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems;Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

TEST ITEMS AND THE RESULTS ARE AS BELLOW:

№	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 4.3.1.8	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	N/A	N/A
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, 11 are not applicable.

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 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China
Address 2:	B112-B113, Building 12, Baoan Building Materials Center, No.1 of Xixiang Inner Ring Road, Baoan District, Shenzhen, Guangdong, P.R.China

3.2 LIST OF TEST EQUIPMENTS

Description	Manufacturer	Model No.	S/N	Calibration Date	Calibration Due.
SIGNAL ANALYZER	Agilent	N9020A	MY49100060	Oct.10, 2016	Oct.09,2017
SIGNAL GENERATOR	Agilent	N5182A	MY50140530	Oct.10, 2016	Oct.09,2017
SIGNAL GENERATOR	Agilent	E8257D	MY45141029	Oct.10, 2016	Oct.09,2017
USB Wideband Power Sensor	Agilent	U2021XA	MY54110007	Oct.10, 2016	Oct.09,2017
USB Wideband Power Sensor	Agilent	U2021XA	MY54110009	Oct.10, 2016	Oct.09,2017
USB Wideband Power Sensor	Agilent	U2021XA	MY54110014	Oct.10, 2016	Oct.09,2017
USB Wideband Power Sensor	Agilent	U2021XA	MY54110012	Oct.10, 2016	Oct.09,2017
USB Simultaneous Sampling Multifunction DAQ	Agilent	U2531A	MY5211038	Oct.10, 2016	Oct.09,2017
2.4 GHz Filter	Micro-Tronics	BRM50702	017	Mar.01,2016	Feb.28,2017
VECTOR ANALYZER	Agilent	E4440A	MY44303916	July 02, 2016	July 01,2017
Trilog-Broadband Antenna	SCHWARZBEK	VULB 9168	VULB 9168-492	Mar.01, 2016	Feb.28,2017
Trilog-Broadband Antenna	SCHWARZBEK	VULB 9168	VULB 9168-494	Mar.12,2016	Mar.11,2017
Amplifier	EM	EM30180	060552	Feb.29,2016	Feb.28,2017
Horn Antenna	EM	EM-AH-10180	67	Mar.01,2016	Feb.28,2017

3.3 ENVIRONMENTAL CONDITIONS

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

- Temperature: 15-35ºC
- 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 %

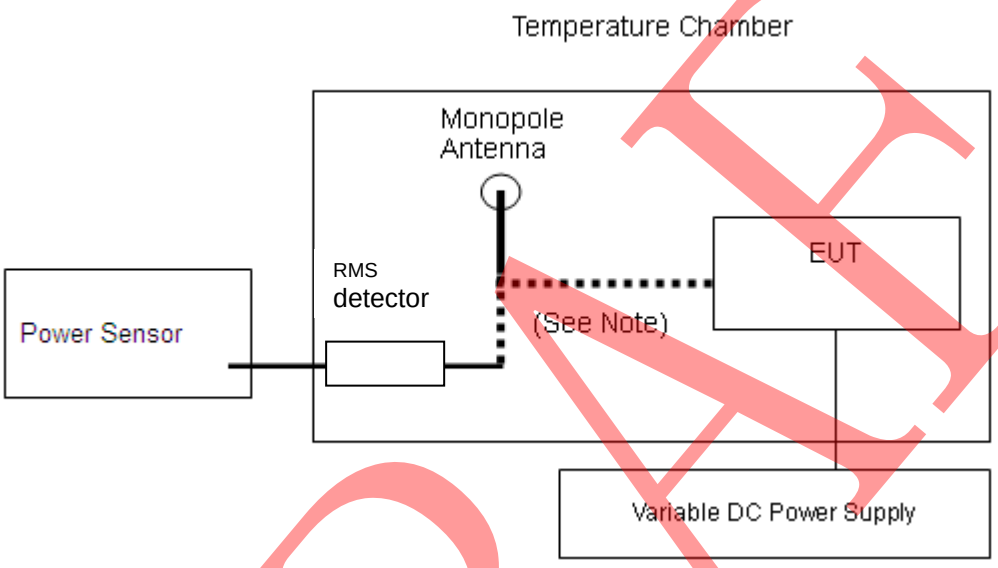
4. ETSI EN 300 328 requirements

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 (V1.9.1) clause 5.3.2.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.9.1) clause 5.3.2.2.1 for the measurement method.

TEST RESULTS

Operation Mode:	Normal Hopping	Test Date:	Dec. 19, 2016
Temperature:	23.6°C	Tested by:	Dota
Humidity:	54.2 % RH		
Number of Burst		= 10	
Measurement Time		= 45.48ms	

TEST CONDITIONS		RF OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	VOL / POWER/GAIN	DC 3.8V	DC 3.8V	DC 3.8V
Normal Hopping	Result	**-1.64**	-1.76	-1.69
Limit		20dBm		

1*GFSK(1M) DH1:Hopping Channel: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
Hopping Channel	Normal	-2.64	-1.64

TEST CONDITIONS		RF OUTPUT POWER MEASUREMENT RESULT FORΠ /4-DQPSK MOUDULATION (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	VOL / POWER/GAIN	DC 3.8V	DC 3.8V	DC 3.8V
Normal Hopping	Result	**-2.54**	-2.55	-2.79
Limit		20dBm		

2*GFSK(2M) DH3:Hopping Channel: (Temp - Normal)

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
Hopping Channel	Normal	-3.54	-2.54

TEST CONDITIONS		RF OUTPUT POWER MEASUREMENT RESULT FOR 8-DPSK MOUDULATION (dBm)		
		Temp (25)°C	Temp (-20)°C	Temp (55)°C
CHANNEL	VOL / POWER/GAIN	DC 3.8V	DC 3.8V	DC 3.8V
Normal Hopping	Result	-2.45	-2.31	**-2.12**
Limit		20dBm		

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

Channel	Voltage	Conducted Power (dBm)	EIRP (dBm)
Hopping Channel	Normal	-3.12	-2.12

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 4.3.1.4.3

The Accumulated Transmit Time on any hopping frequency shall not be greater than 400 ms within any observation period of 400 ms multiplied by the minimum number of hopping frequencies (N) that have to be used.
In order for the equipment to comply with the Frequency Occupation requirement, it shall meet either of the following two options:
Option 1: Each hopping frequency of the hopping sequence shall be occupied at least once within a period not exceeding four times the product of the dwell time and the number of hopping frequencies in use.
Option 2: The occupation probability for each frequency shall be between ((1 / U) × 25 %) and 77 % where U is the number of hopping frequencies in use.
The hopping sequence(s) shall contain at least N hopping frequencies at all times, where N is 15 or 15 divided by the minimum Hopping Frequency Separation in MHz, whichever is the greater.
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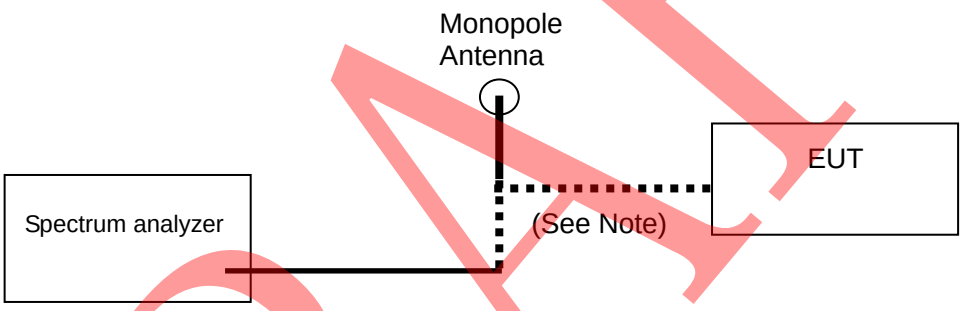
TEST CONFIGURATION

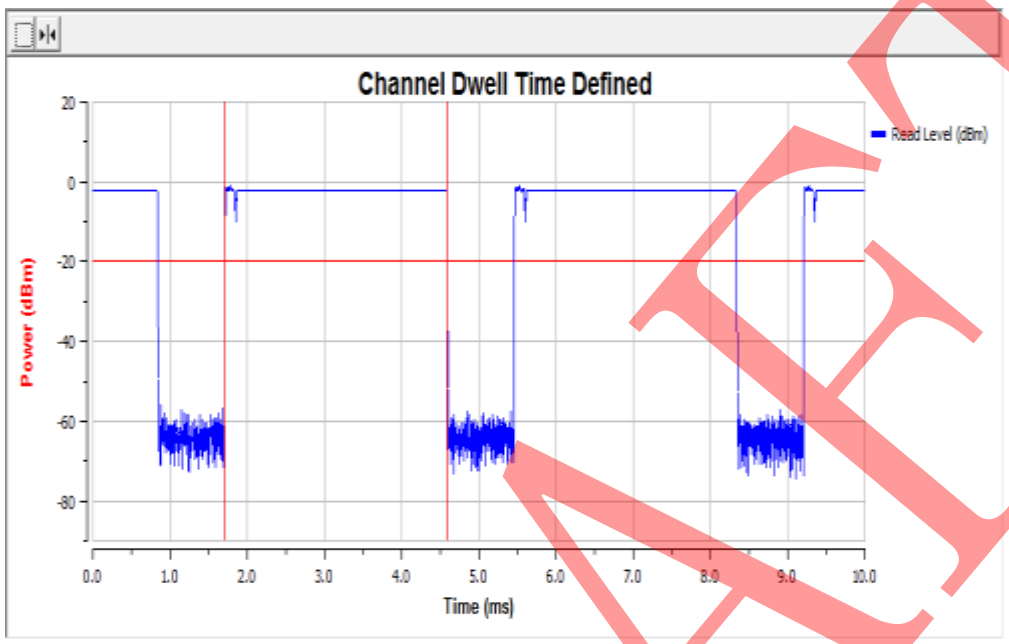


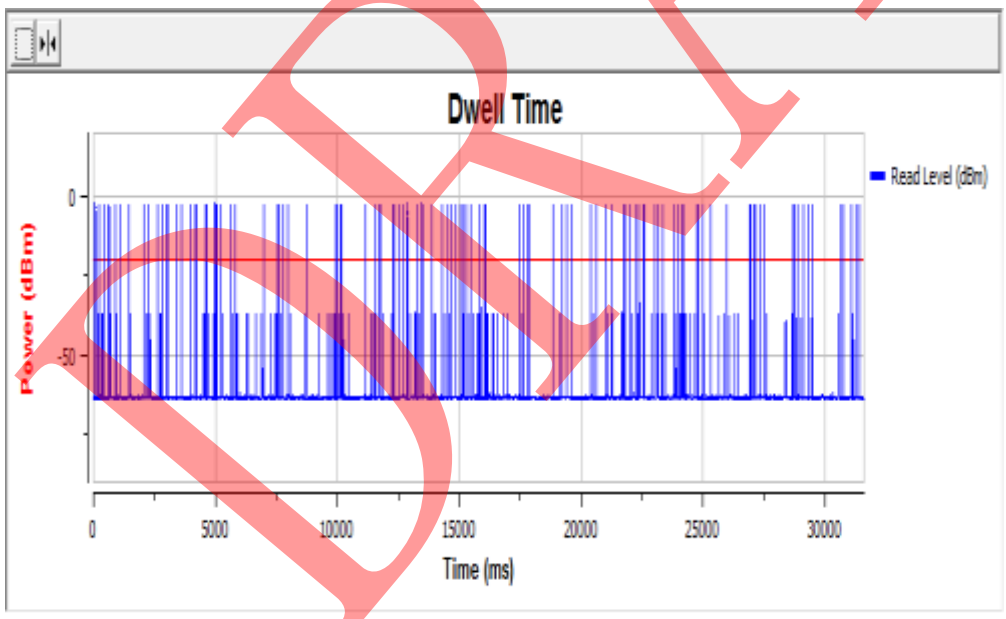
TEST PROCEDURE
1. Please refer to ETSI EN300328 V1.9.1 Section 5.3.4
2. The test procedure of Accumulated Transmit Time Frequency Occupation shall be as follows:
   • The output of the transmitter shall be connected to a spectrum analyzer or equivalent.
   • The analyzer shall be set as follows:
   - Centre Frequency: Equal to the hopping frequency being investigated
   - Frequency Span: 0 Hz
   - RBW: ~ 50 % of the Occupied Channel Bandwidth
   - VBW: ⩾ RBW - Detector Mode: RMS
   - Sweep time: Equal to the applicable observation period (see clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2)
   - Number of sweep points: 30 000
   - Trace mode: Clear / Write
   - Trigger: Free Run
3. Make the following changes on the analyzer about hopping sequence:
   - Start Frequency: 2 400 MHz
   - Stop Frequency: 2 483,5 MHz
   - RBW: ~ 50 % of the Occupied Channel Bandwidth (single hopping frequency)
   - VBW: ⩾ RBW
   - Detector Mode: RMS
   - Sweep time: 1 s
   - Trace Mode: Max Hold

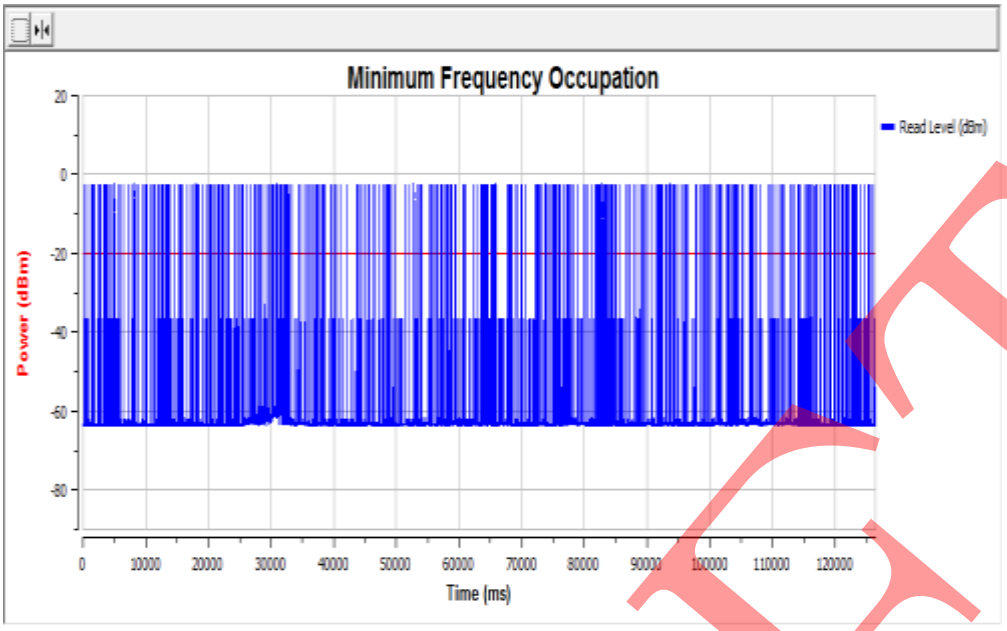
TEST RESULT (Dwell Time)

1*8DPSK(3M) DH5:CH Low-2402:

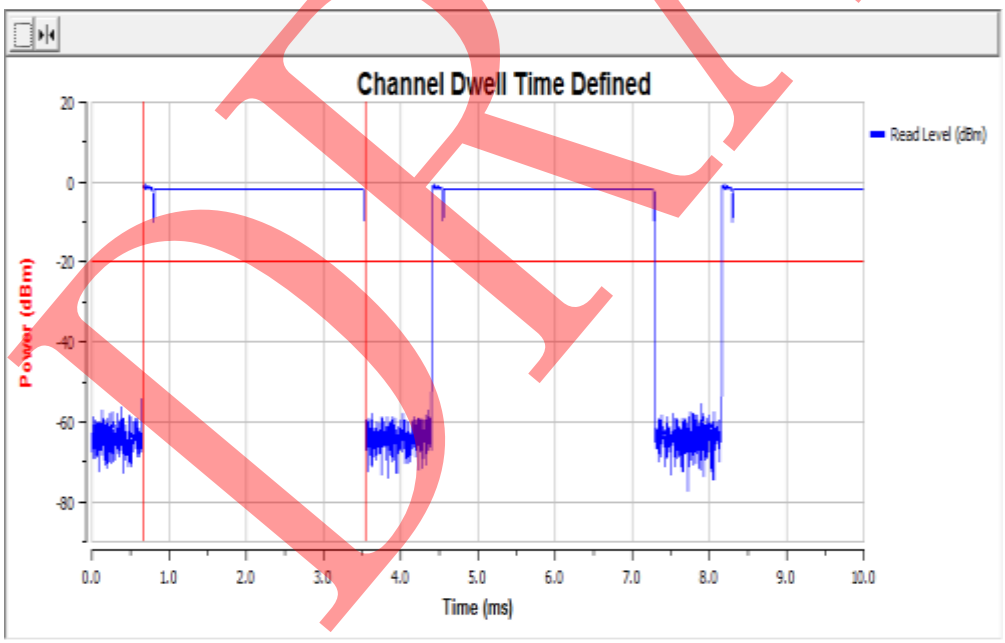
Length of Transimission Time (ms)	2.88
Dwell Time (ms)	307.2
Minimum Frequency Occupation (ms)	1228.8



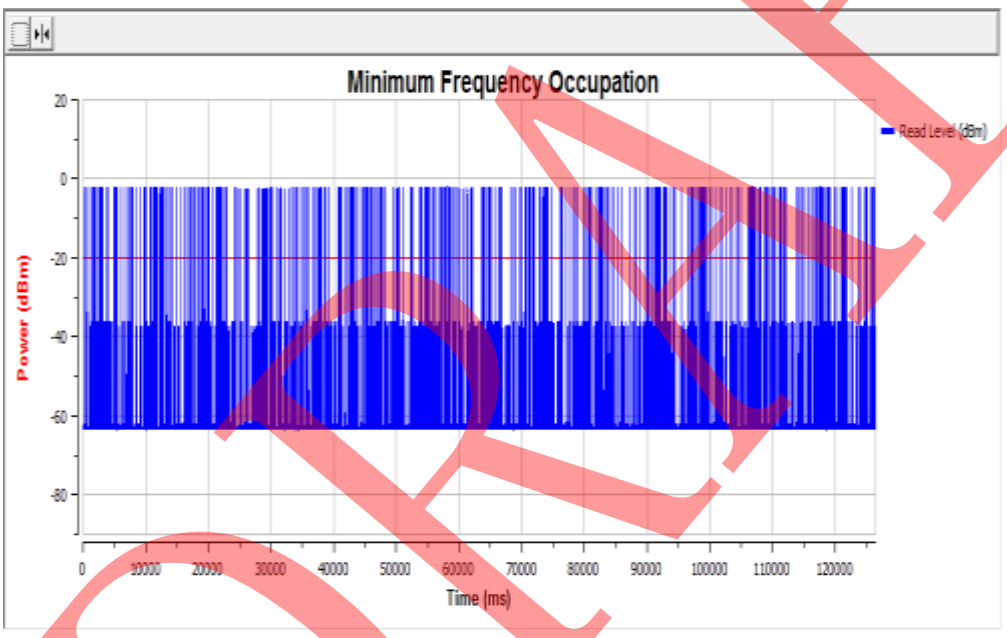




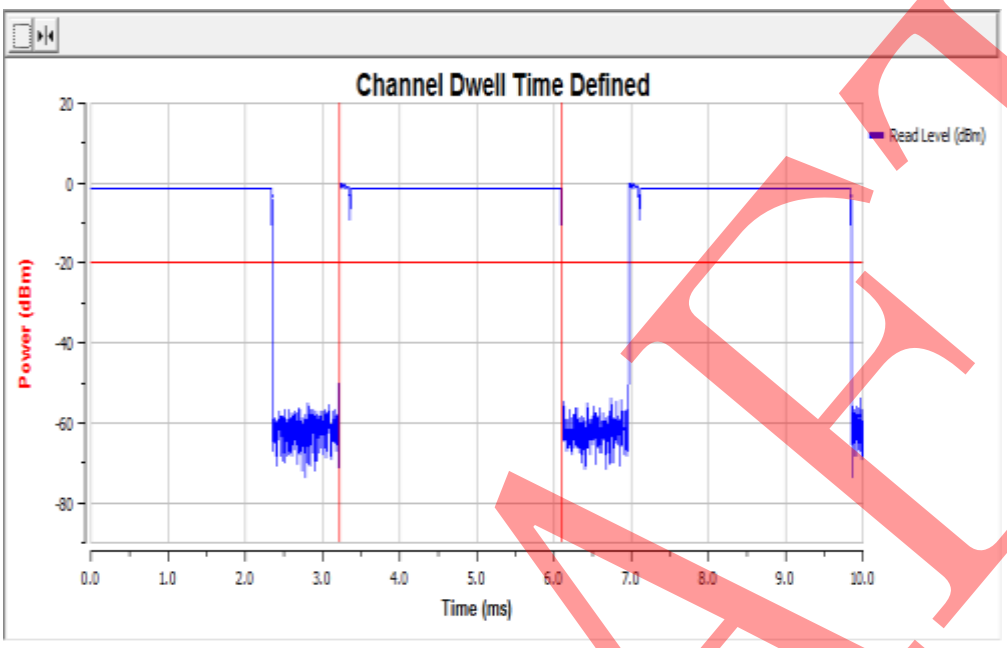
2*8DPSK(3M) DH5:CH Mid-2441:	
Length of Transimission Time (ms)	2.88
Dwell Time (ms)	307.2
Minimum Frequency Occupation (ms)	1228.8

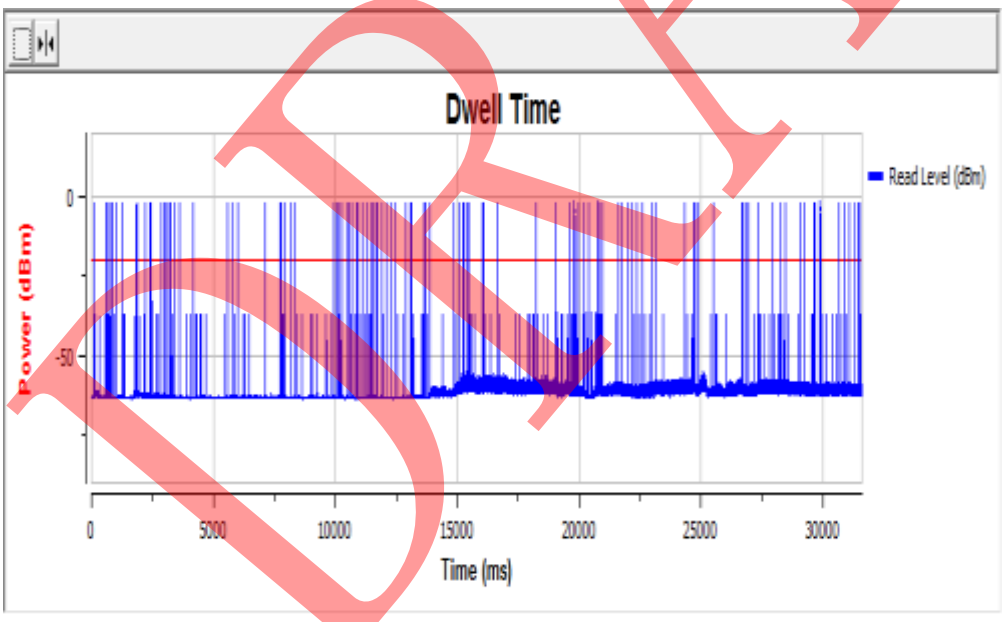


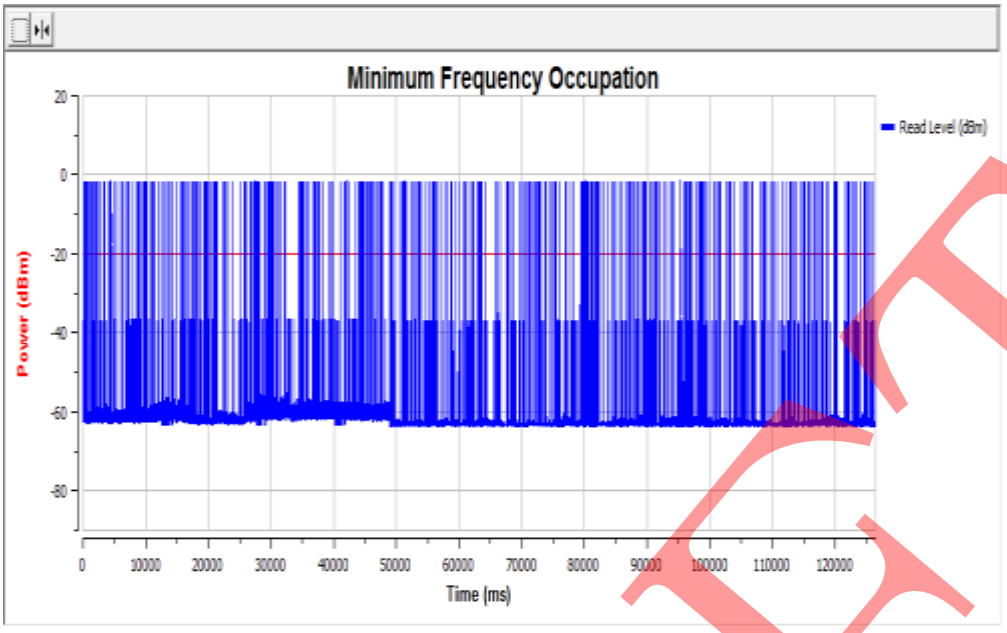

Dwell Time
Read Level (dBm)
Power (dBm)
0
-50
0
5000
10000
15000
20000
25000
30000
Time (ms)


Minimum Frequency Occupation
Read Level (dBm)
Power (dBm)
20
0
-20
-40
-60
-80
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
120000
Time (ms)

3*8DPSK(3M) DH5:CH High-2480:	
Length of Transimission Time (ms)	2.88
Dwell Time (ms)	307.2
Minimum Frequency Occupation (ms)	1228.8







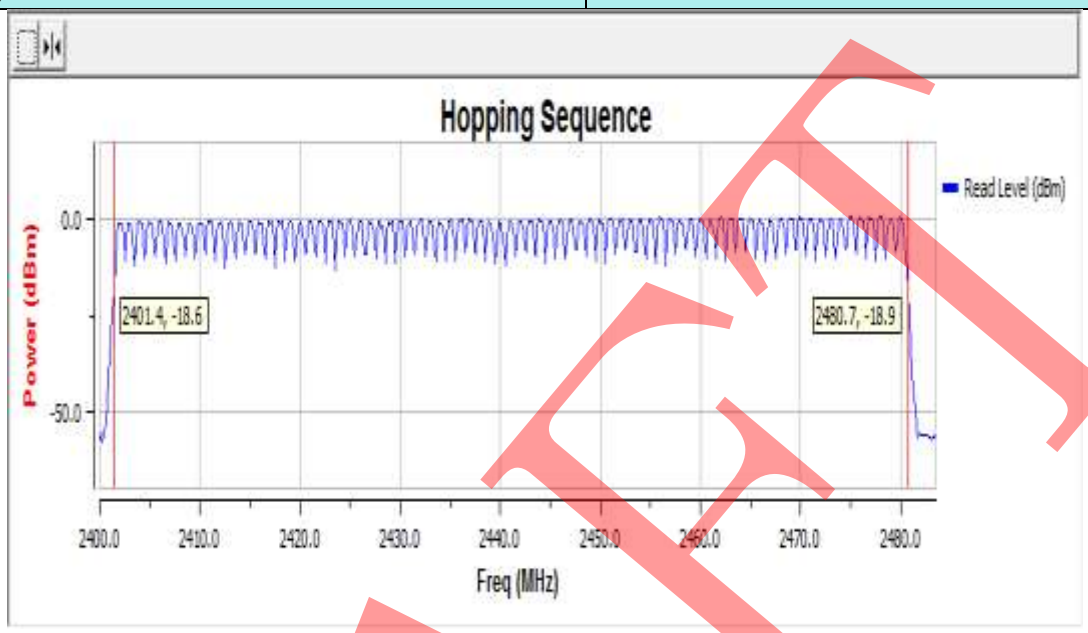
Note: 1) All the modes had been tested, but only the worst data recorded in the report.
2) Accumulated Transmit Time=length of transimission time*(1600/6)/79*31.6
3) Minimum Frequency Occupation= Accumulated Transmit Time*4

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		

Hopping Channel Test Plot

Hopping Sequence (MHz)	79.32
Hopping Number	79



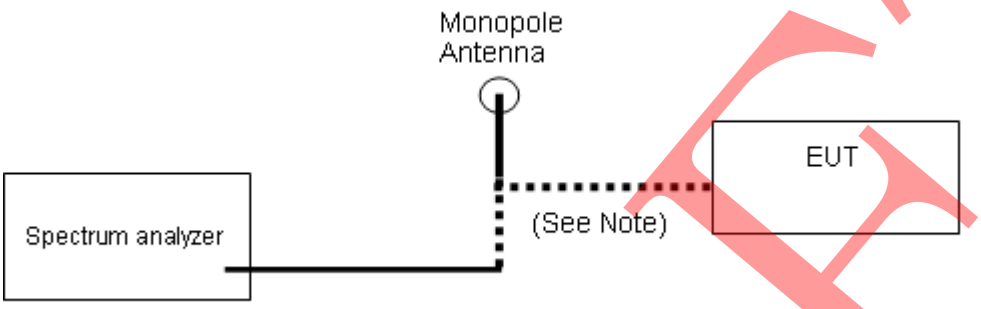
4.3 HOPPING FREQUENCY SEPARATION

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 5.3.5.2.1

TEST RESULT

Hopping Frequency Separation (MHz)

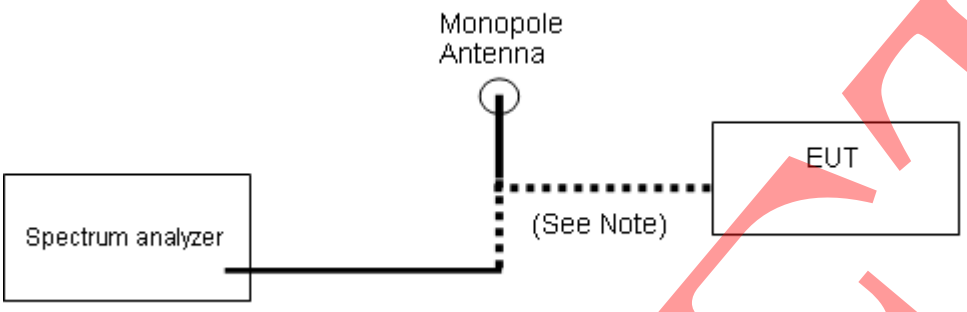
Hopping Frequency Separation (F_{HS}) = $F2_C$ - $F1_C$=0.998 MHz
Note: The modulation used during test is GFSK and this is the worst case.

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 when considering a single hopping frequency.

CONFIGURATION



TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.9.1) clause 5.3.8.1 for the test conditions.
2. Please refer to ETSI EN 300 328 (V1.9.1) clause 5.3.8.2 the measurement method.
3. The Test equipment information as following
   - Centre Frequency: The centre frequency of the channel under test
   - Resolution BW: ~ 1 % of the span without going below 1 %
   - Video BW: 3 × RBW
   - Frequency Span for frequency hopping equipment: Lowest frequency separation that is used within the hopping sequence
   - Frequency Span for other types of equipment: 2 × Nominal Channel Bandwidth (e.g. 40 MHz for a 20 MHz channel)
   - Detector Mode: RMS
   - Trace Mode: Max Hold
   - Sweep time: 1 s

TEST RESULT

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

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH Low-2402	0.813	2402

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

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH High-2480	0.813	2480

3*π4DQPSK(2M) DH3:CH Low-2402:

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH Low-2402	1.056	2402

4*π4DQPSK(2M) DH3:CH High-2480:

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH High-2480	1.056	2480

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

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH Low-2402	1.053	2402

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

Channel	Occupied Bandwidth (MHz)	Measured Freq (MHz)
CH High-2480	1.052	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

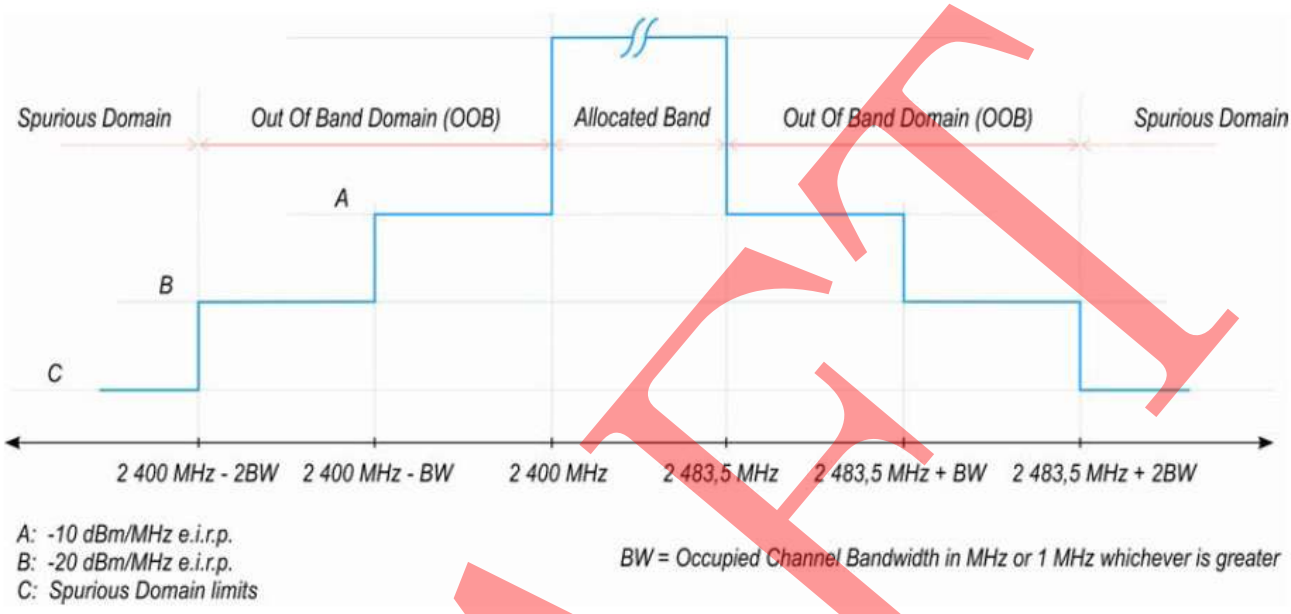
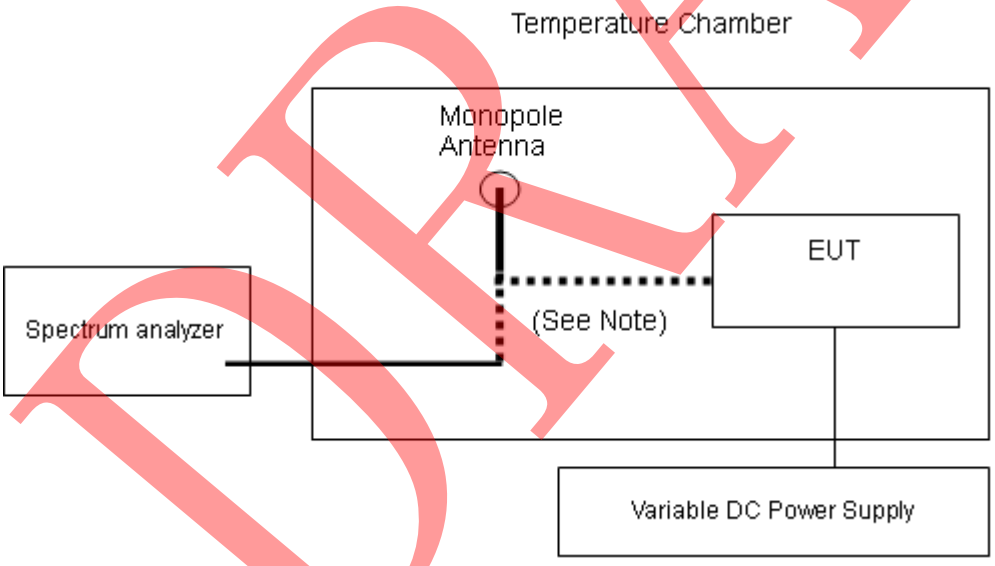
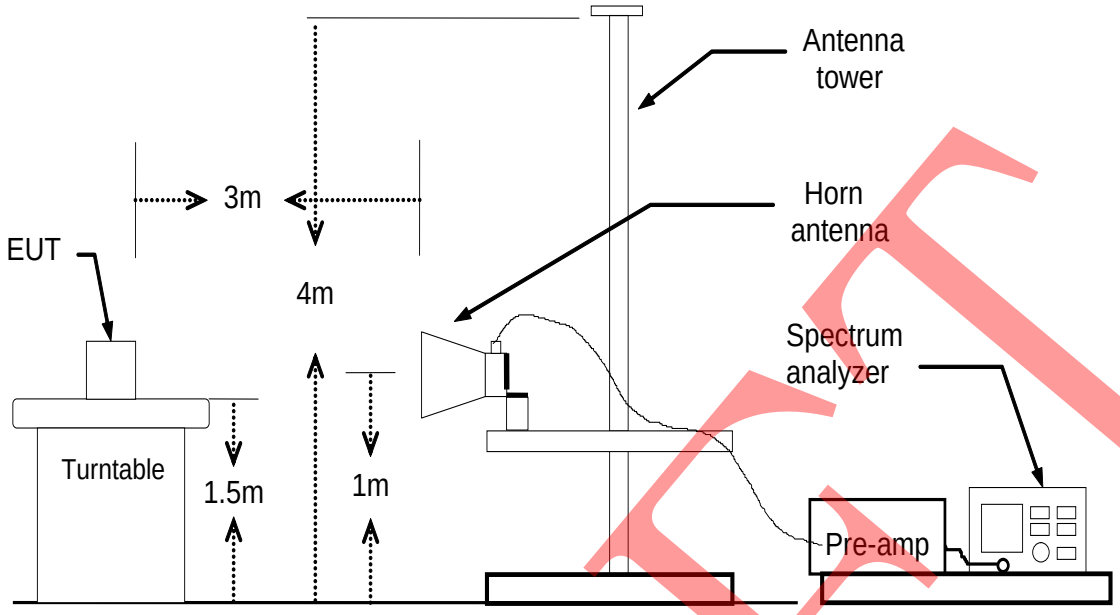


Figure 1: Transmit mask

TEST CONFIGURATION



For have temporary antenna connector product



For have no temporary antenna product

TEST PROCEDURE

Test Procedure Please refer to Clause 5.3.9.2.1

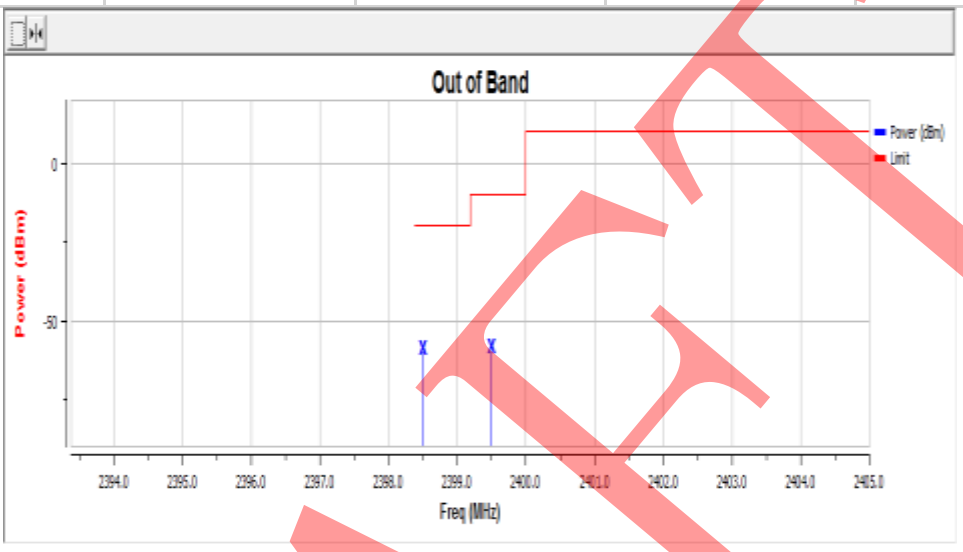
- Centre Frequency: 2 484 MHz
- Span: 0 Hz
- Resolution BW: 1 MHz
- Filter mode: Channel filter
- Video BW: 3 MHz
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep Mode: Continuous
- Sweep Points: Sweep Time [s] / (1 µs) or 5 000 whichever is greater
- Trigger Mode: Video trigger
- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

TEST RESULT

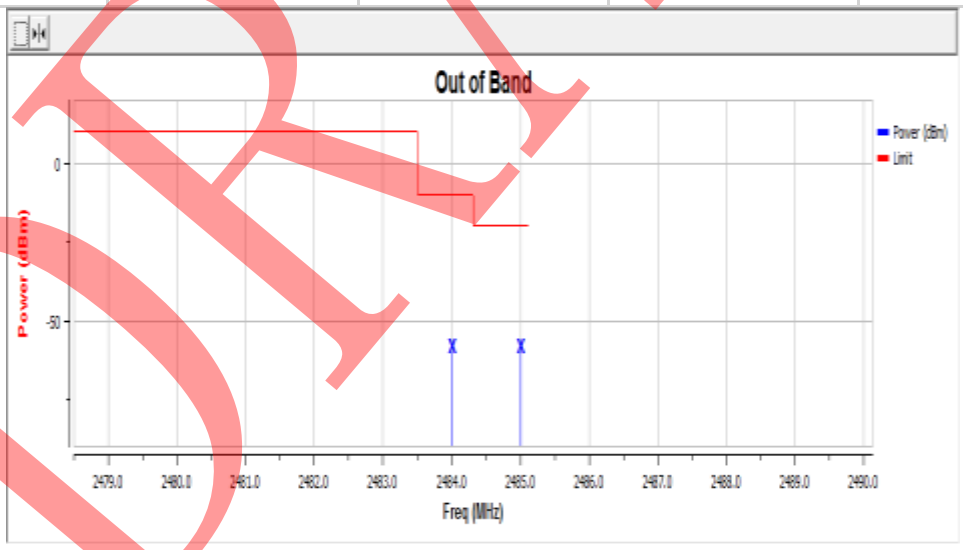
see the next page

NORMAL TEMPERATURE

Channel	Antenna	Frequency	Level	Limit
CH Low-2402	Antenna 1	2399.5	-59.91	-10
CH Low-2402	Antenna 1	2398.5	-60.24	-20

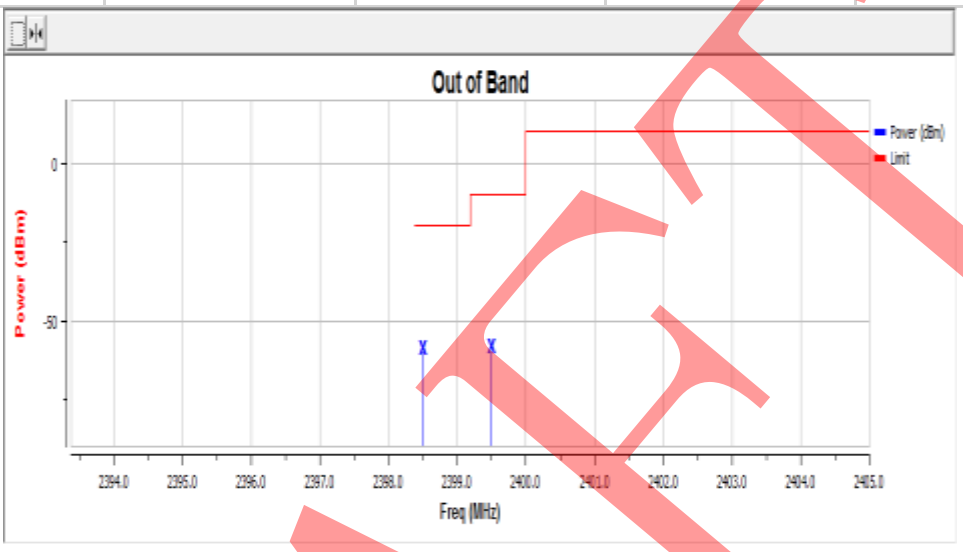


Channel	Antenna	Frequency	Level	Limit
CH High-2480	Antenna 1	2484	-60.11	-10
CH High-2480	Antenna 1	2485	-60.13	-20

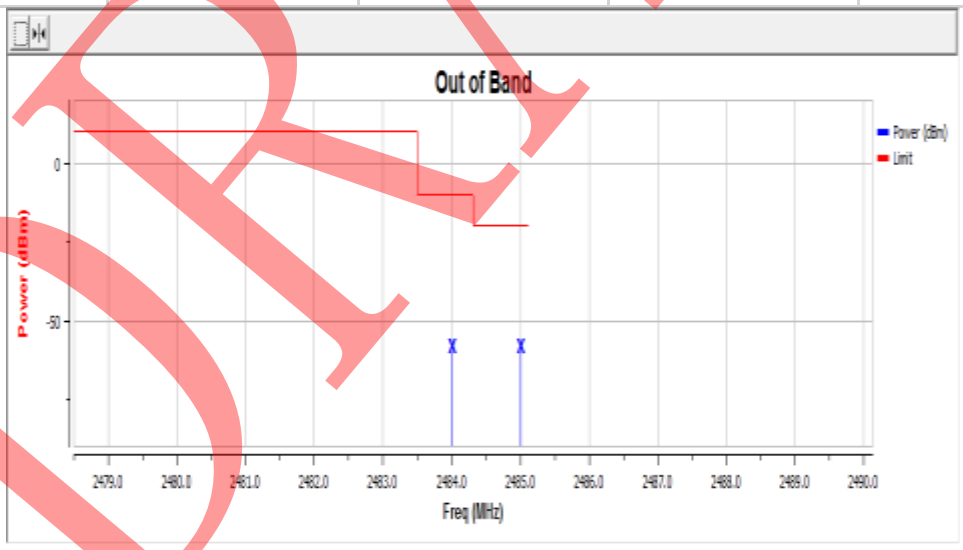


LOW TEMPERATURE

Channel	Antenna	Frequency	Level	Limit
CH Low-2402	Antenna 1	2399.5	-59.93	-10
CH Low-2402	Antenna 1	2398.5	-60.29	-20

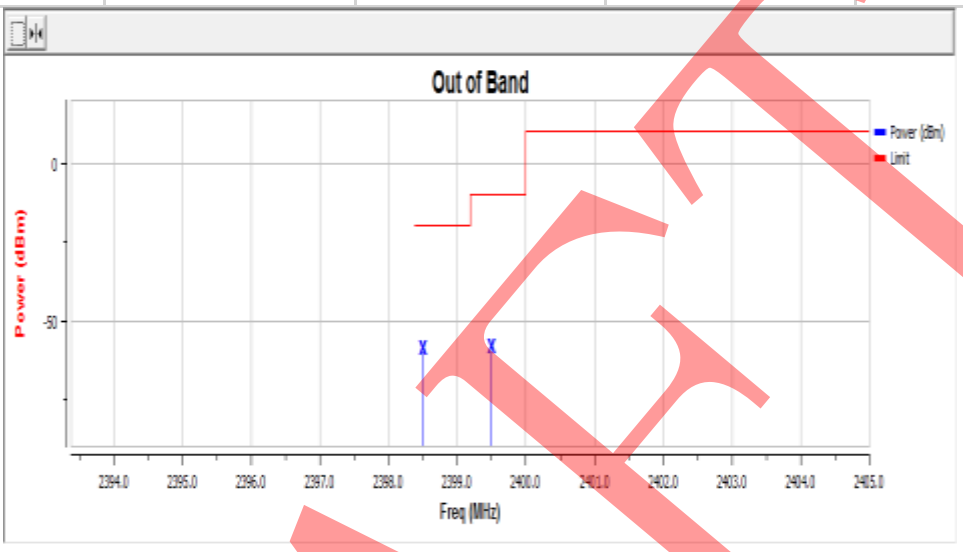


Channel	Antenna	Frequency	Level	Limit
CH High-2480	Antenna 1	2484	-60.16	-10
CH High-2480	Antenna 1	2485	-60.14	-20

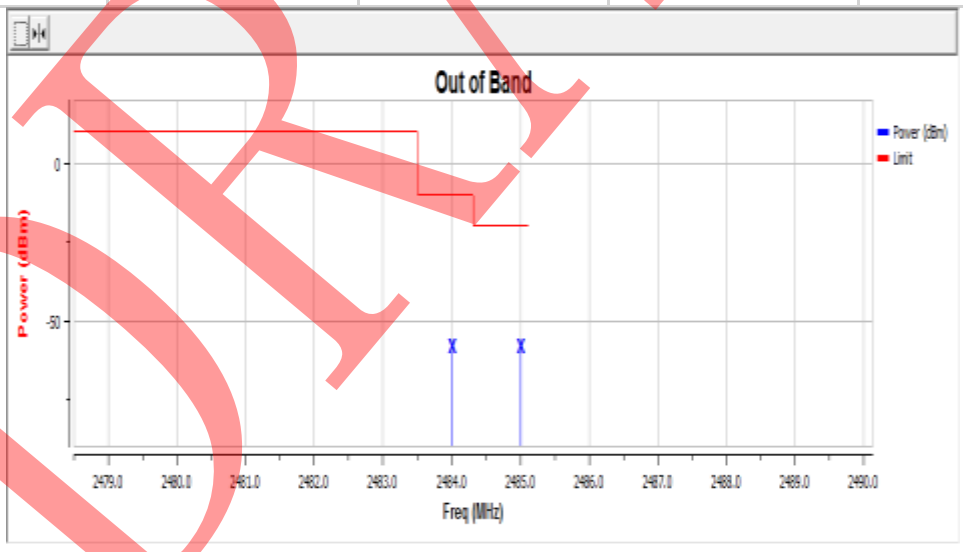


HIGH TEMPERATURE

Channel	Antenna	Frequency	Level	Limit
CH Low-2402	Antenna 1	2399.5	-59.91	-10
CH Low-2402	Antenna 1	2398.5	-60.24	-20



Channel	Antenna	Frequency	Level	Limit
CH High-2480	Antenna 1	2484	-60.13	-10
CH High-2480	Antenna 1	2485	-60.12	-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: Limit

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

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.

TEST PROCEDURE

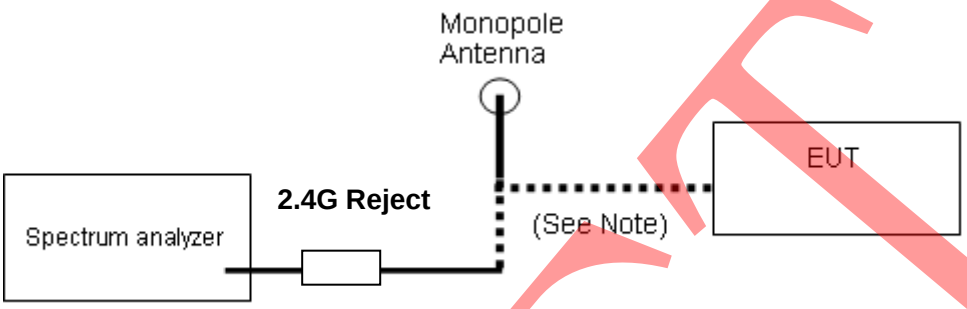
Refer to chapter 5.3.10.2 of ETSI EN 300 328 V1.9.1

Measurement

Measurement	
☒Conducted measurement	☒Radiated measurement

CONDUCTED MEASUREMENT

TEST CONFIGURATION



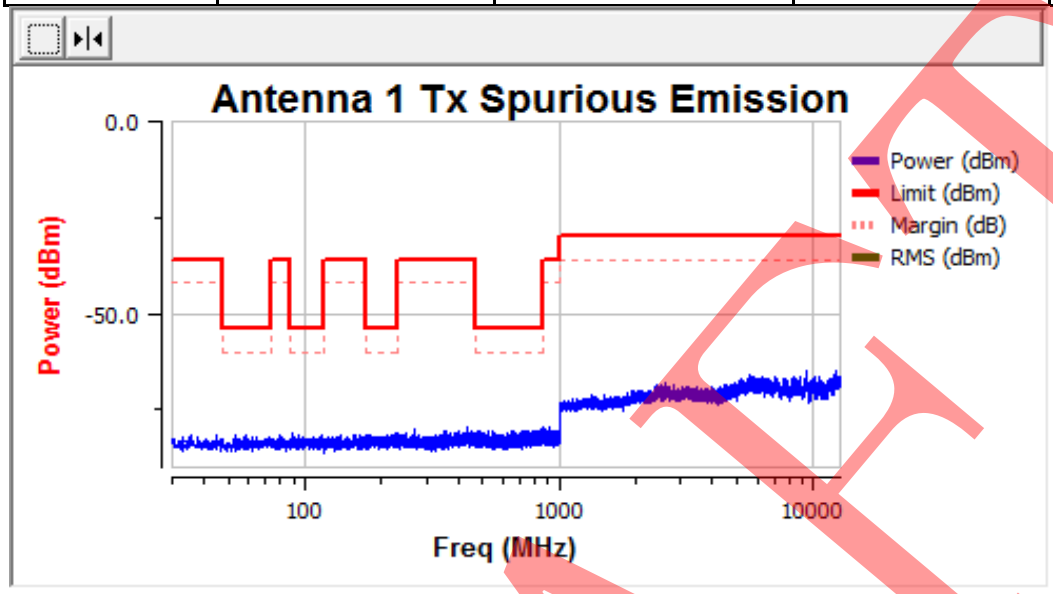
Conducted Method

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 (V1.9.1) clause 5.3.10.2.1 for the conducted method.
2. Please refer to ETSI EN 300 328 (V1.9.1) clause 5.3.10.2.2 for the radiated method.

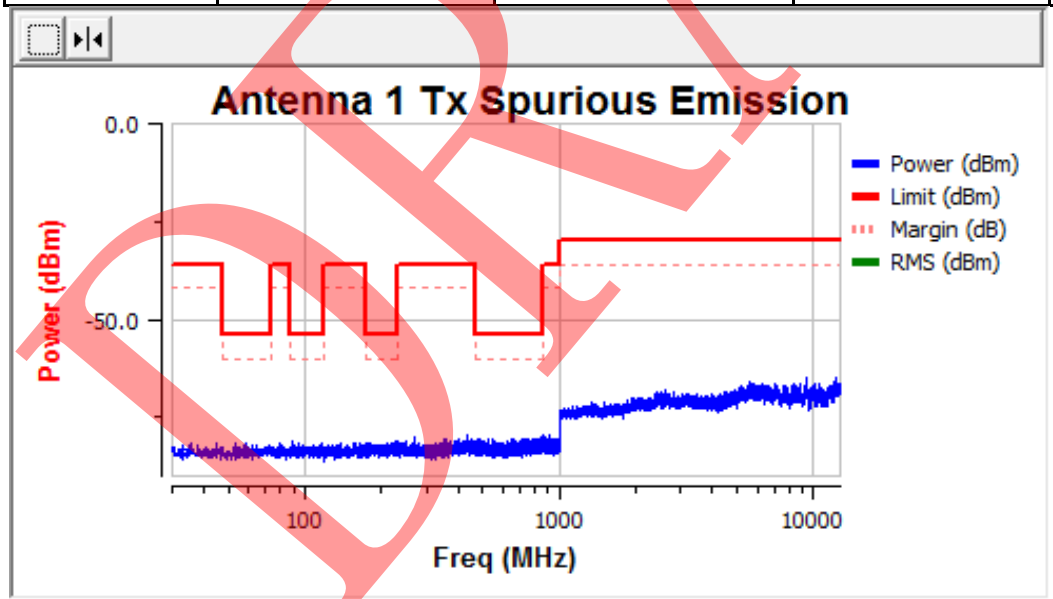
CONDUCTED RESULTS: (Worst Case: Low channel, 1Mbps)

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
858.927	-78.83	-54.00	-24.83	Pass
12167.000	-64.49	-30.00	-34.49	Pass



(Worst Case: High channel, 1Mbps)

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
836.258	-79.35	-54.00	-25.35	Pass
12336.000	-64.40	-30.00	-34.40	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.

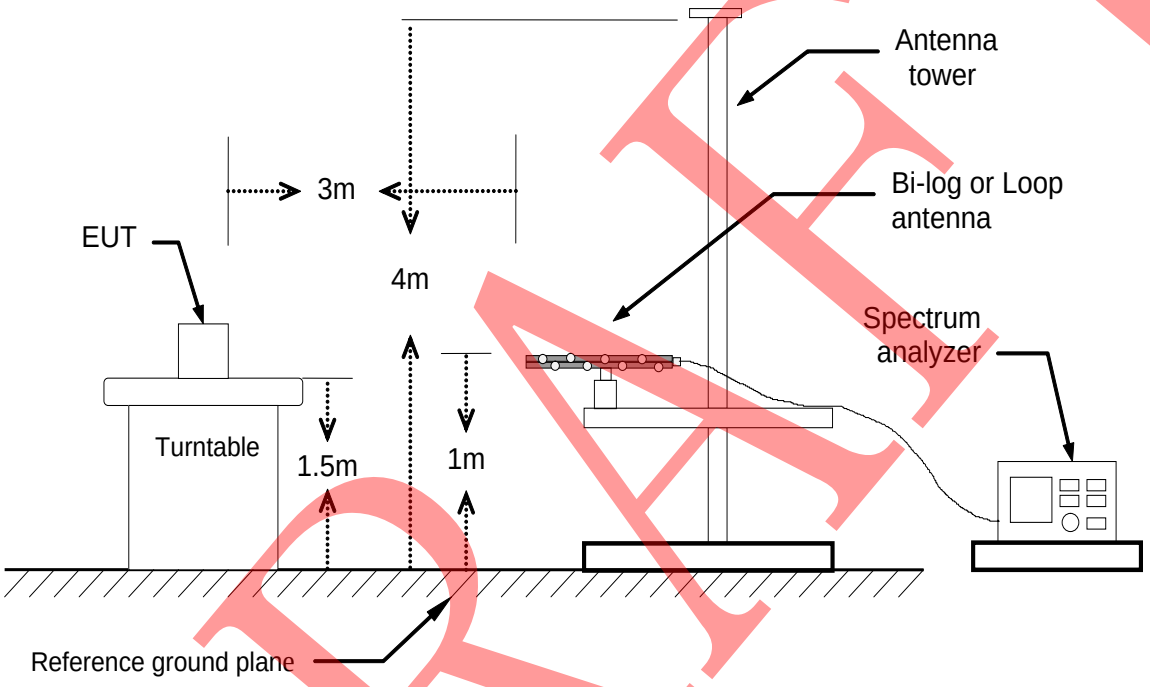
3. The effective radiated power has been considered in this test.

RADIATED MEASUREMENT

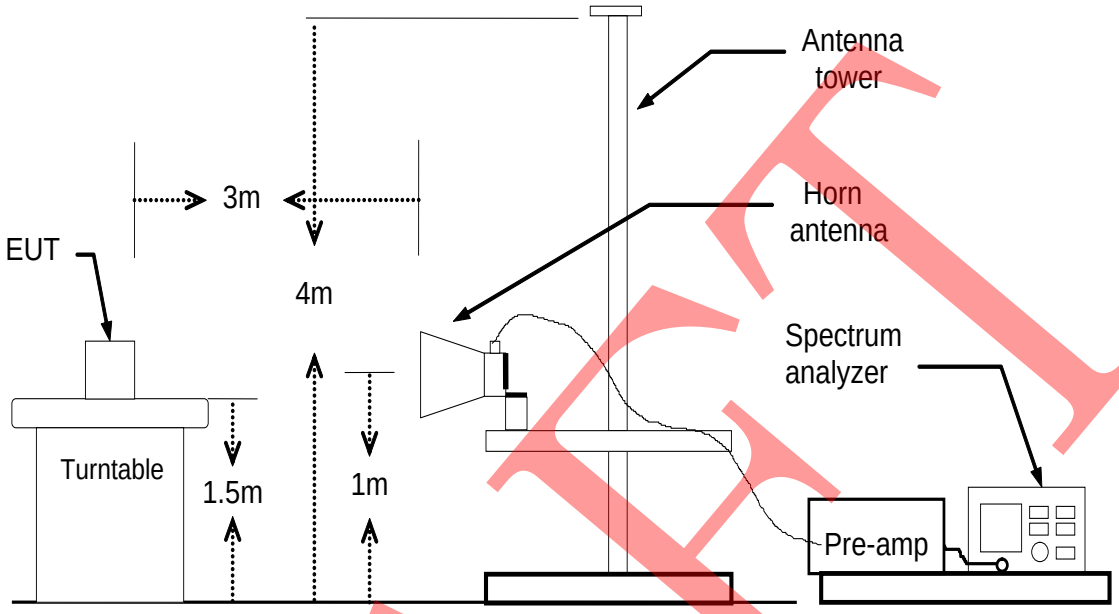
TEST SETUP

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

TEST RESULTS for Radiated Method

Transmitter Operating Mode (Worst case: 1Mbps)

SPURIOUS EMISSION FREQUENCY RANGE	30MHz ~ 1GHz	OPERATING CHANNEL	Low	
Frequency (MHz)	**Antenna Polarization**	**Level (dBm)**	**Limit (dBm)**	**Margin (dB)**
34.06	H	-64.92	-36	-28.92
62.77	H	-68.34	-54	-14.34
135.86	H	-65.25	-36	-29.25
447.97	H	-71.12	-36	-35.12
795.53	H	-66.53	-54	-12.53
967.75	H	-62.34	-36	-26.34
59.82	V	-69.21	-54	-15.21
221.14	V	-67.23	-54	-13.23
149.52	V	-64.13	-36	-28.13
200.62	V	-67.49	-54	-13.49
402.6	V	-72.89	-36	-36.89
908.63	V	-63.02	-36	-27.02
30MHz ~ 1GHz	H	--	-36	>10
30MHz ~ 1GHz	V	--	-36	>10
30MHz ~ 1GHz	H	--	-54	>10
30MHz ~ 1GHz	V	--	-54	>10

NOTE: 1.The emission behavior belongs to narrowband spurious emission.

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

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

Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)
35.38	H	-66.03	-36	-30.03
65.46	H	-69.2	-54	-15.2
160.17	H	-65	-36	-29
333.85	H	-72.69	-36	-36.69
483.08	H	-73.82	-54	-19.82
941.47	H	-62.92	-36	-26.92
56.88	V	-70.81	-54	-16.81
200.6	V	-66.47	-54	-12.47
127.27	V	-64.22	-36	-28.22
201.7	V	-66.81	-54	-12.81
353.64	V	-71.27	-36	-35.27
909.2	V	-63.32	-36	-27.32
30MHz ~ 1GHz	H	--	-36	>10
30MHz ~ 1GHz	V	--	-36	>10
30MHz ~ 1GHz	H	--	-54	>10
30MHz ~ 1GHz	V	--	-54	>10

NOTE: 1.The emission behavior belongs to narrowband spurious emission.

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

Standby Mode:

NO.	Frequency	Measurement Bandwidth	Level	Limit	Margin
	MHz	KHz	dBm	dBm	dB
Standby Mode ,Antenna Polarization: Vertical					
1	30-1000	100	\	-54	>20
2	30-1000	100	\	-36	>20
Standby Mode ,Antenna Polarization: Horizontal					
1	30-1000	100	\	-54	>20
2	30-1000	100	\	-36	>20

Conclusion: PASS

Above 1GHz (1GHz-12.75GHz)

NO.	Frequency	Measurement Bandwidth	Level	Limit	Margin
	MHz	KHz	dBm	dBm	dB
TX:2402MHz ,Antenna Polarization: Vertical					
1	4804	1000	-49.63	-30	>10
2	7206	1000	-51.54	-30	>10
3	9608	1000	\	-30	>40
4	12010	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2402MHz ,Antenna Polarization: Horizontal					
1	4804	1000	-51.87	-30	>10
2	7206	1000	-48.79	-30	>10
3	9608	1000	\	-30	>40
4	12010	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2441MHz ,Antenna Polarization: Vertical					
1	4882	1000	-56.60	-30	>10
2	7323	1000	-54.21	-30	>10
3	9764	1000	\	-30	>40
4	12205	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2441MHz ,Antenna Polarization: Horizontal					
1	4882	1000	-53.15	-30	>10
2	7323	1000	-55.40	-30	>10
3	9764	1000	\	-30	>40
4	12205	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2480MHz ,Antenna Polarization: Vertical					
1	4960	1000	-52.30	-30	>10
2	7440	1000	-50.28	-30	>10
3	9920	1000	\	-30	>40

4	12400	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
TX:2480MHz ,Antenna Polarization: Horizontal					
1	4960	1000	-57.99	-30	>10
2	7440	1000	-59.12	-30	>10
3	9920	1000	\	-30	>40
4	12400	1000	\	-30	>40
5	Other(1000-12750)	1000	\	-30	>40
Measurement uncertainty:±3.2dB					

Standby Mode:

NO.	Frequency	Measurement Bandwidth	Level	Limit	Margin
	MHz	KHz	dBm	dBm	dB
Standby Mode ,Antenna Polarization: Vertical					
1	1000-12750	1000	\	-30	>20
Standby Mode ,Antenna Polarization: Horizontal					
1	1000-12750	1000	\	-30	>20

Conclusion: PASS

4.7 Receiver Spurious Emissions

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

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

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.

TEST PROCEDURE

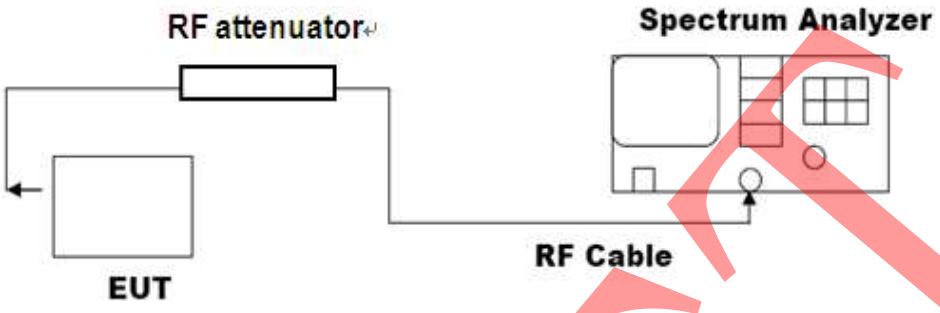
Refer to chapter 5.3.11.2 of ETSI EN 300 328 V1.9.1

Measurement

Measurement	
☒Conducted measurement	☒Radiated measurement

CONDUCTED MEASUREMENT

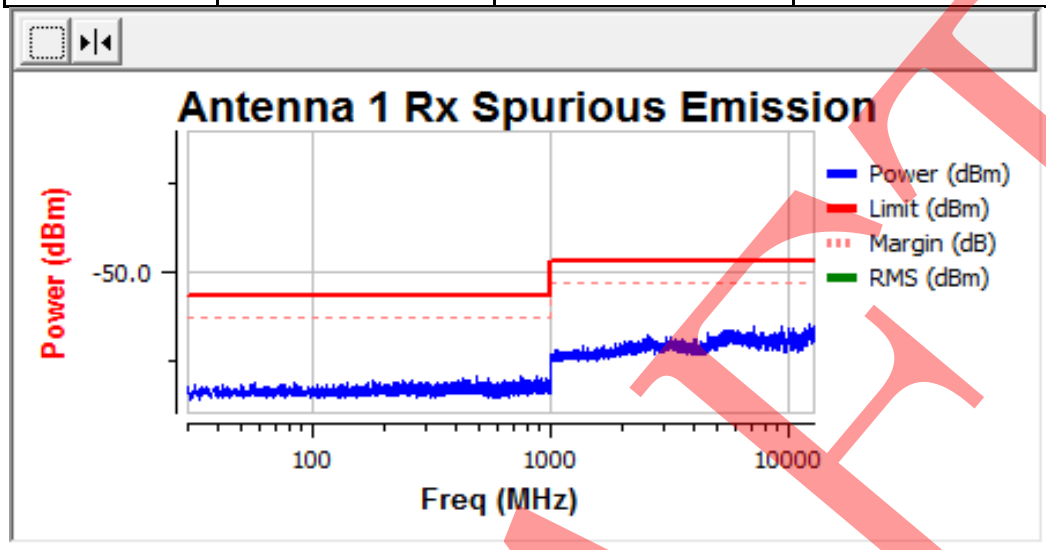
TEST CONFIGURATION



TEST RESULTS FOR CONDUCTED METHOD

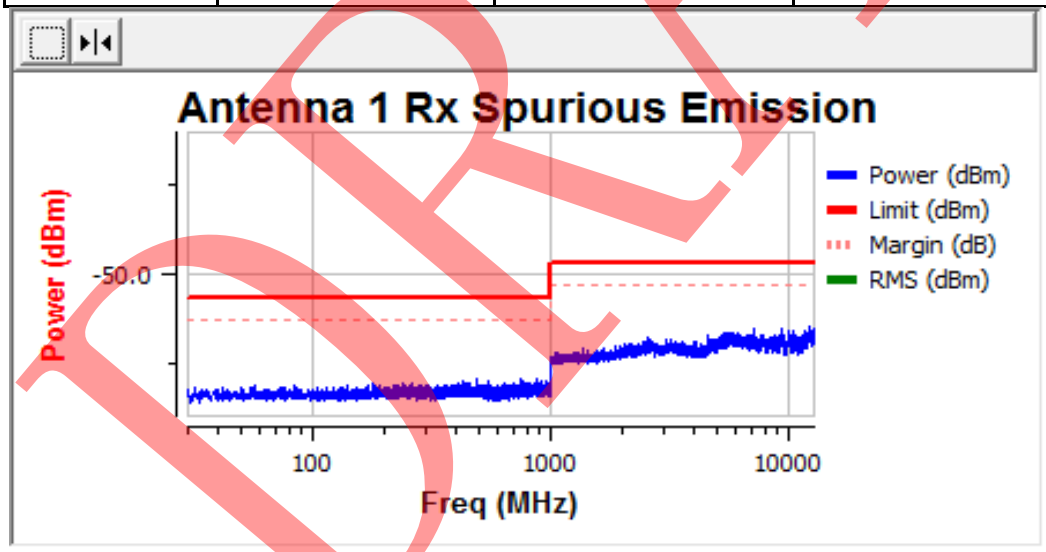
RECEIVER MODE (Worst Case: Low channel, 1Mbps)

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
744.220	-79.04	-57.00	-22.04	Pass
12205.000	-64.34	-47.00	-17.34	Pass



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

Freq	RMS Level (dBm)	Limit (dBm)	Over Limit (dB)	Status
876.245	-79.22	-57.00	-22.22	Pass
12140.000	-64.66	-47.00	-17.66	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

TEST SETUP

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

TEST CONFIGURATION

Radiated Method: Same as section 4.6 in this test report

TEST RESULTS for Radiated Method (Worst case :1Mbps)

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)
75.16	30.11	V	-71	0.1	0.33	-70.77	-57	-13.77
181.34	30.79	V	-71.14	0.18	0.5	-70.82	-57	-13.82
426.3	30.74	V	-70.97	0.26	0.48	-70.75	-57	-13.75
736.29	31.81	V	-71.18	0.51	0.82	-70.87	-57	-13.87
515.5	30.48	V	-70.03	0.38	0.49	-69.92	-57	-12.92
570.56	31.28	V	-71.06	0.43	0.44	-71.05	-57	-14.05
76.45	30.68	H	-70.37	0.14	0.09	-70.42	-57	-13.42
184.2	30.74	H	-70.49	0.22	0.44	-70.27	-57	-13.27
736.13	31.01	H	-70.57	0.5	0.53	-70.54	-57	-13.54
426.17	29.88	H	-70.9	0.25	0.88	-70.27	-57	-13.27
513.38	31.61	H	-70.59	0.35	0.5	-70.44	-57	-13.44
572.23	31.32	H	-71.1	0.46	0.73	-70.83	-57	-13.83
30MHz ~ 1GHz	--	V	--	--	--	--	-57	>10
30MHz ~ 1GHz	--	H	--	--	--	--	-57	>10

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

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)
75.78	30.11	V	-71.00	0.17	0.33	-70.84	-57	-13.84
181.92	30.79	V	-71.14	0.22	0.50	-70.86	-57	-13.86
426.58	30.74	V	-70.97	0.36	0.48	-70.85	-57	-13.85
736.69	31.81	V	-71.18	0.64	0.82	-71.00	-57	-14.00
515.88	30.48	V	-70.03	0.53	0.49	-70.07	-57	-13.07
570.82	31.28	V	-71.06	0.35	0.44	-70.97	-57	-13.97
76.81	30.68	H	-70.37	0.19	0.09	-70.47	-57	-13.47
184.72	30.74	H	-70.49	0.28	0.44	-70.33	-57	-13.33
736.89	31.01	H	-70.57	0.68	0.53	-70.72	-57	-13.72
426.60	29.88	H	-70.90	0.41	0.88	-70.43	-57	-13.43
512.56	31.61	H	-70.59	0.50	0.50	-70.59	-57	-13.59
572.62	31.32	H	-71.10	0.62	0.73	-70.99	-57	-13.99
30MHz ~ 1GHz	--	V	--	--	--	--	-57	>10
30MHz ~ 1GHz	--	H	--	--	--	--	-57	>10

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

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)
1954.19	39.77	V	-62.69	2.03	0.52	-64.2	-47	-17.2
--	--	V	--	--	--			
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
2443.31	39.04	H	-62.62	1.9	0.71	-63.81	-47	-16.81
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
1GHz-12.75 GHz	--	V	--	--	--	--	-47	>10
1GHz-12.75 GHz	--	H	--	--	--	--	-47	>10

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

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)
1954.87	39.77	V	-62.69	2.08	0.52	-64.25	-47	-17.25
--	--	V	--	--	--			
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
--	--	V	--	--	--	--	--	--
2443.79	39.04	H	-62.62	1.97	0.71	-63.88	-47	-16.88
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
--	--	H	--	--	--	--	--	--
1GHz-12.75 GHz	--	V	--	--	--	--	-47	>10
1GHz-12.75 GHz	--	H	--	--	--	--	-47	>10

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

Remarks:

1. The emission behaviour belongs to narrowband spurious emission.
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.

4.8. RECEIVER BLOCKING

ETSI EN300328 SUBCLAUSE 4.3.1.12

This requirement does not apply to non-adaptive equipment or adaptive equipment operating in a non-adaptive mode.
In addition, this requirement does not apply for equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.
Adaptive Frequency Hopping equipment shall comply with the requirements defined in clause 4.3.1.7.2 (LBT based DAA) or clause 4.3.1.7.3 (non-LBT based DAA) in the presence of a blocking signal with characteristics as provided in table 3.

Table 3: Receiver Blocking parameters

Equipment Type (LBT/non- LBT)	Wanted signal mean power from companion device	Blocking signal frequency [MHz]	Blocking signal power [dBm]	Type of interfering signal
LBT	sufficient to maintain the link (see note 2)	2 395 or 2 488,5 (see note 1)	-35	CW
Non-LBT	-30 dBm			
NOTE 1: The highest blocking frequency shall be used for testing hopping frequencies within the range 2 400 MHz to 2 442 MHz, while the lowest blocking frequency shall be used for testing hopping frequencies within the range 2 442 MHz to 2 483,5 MHz. See clause 5.3.7.1.				
NOTE 2: A typical value which can be used in most cases is -50 dBm/MHz.				

TEST PROCEDURE

1. Please refer to ETSI EN 300 328 clause 5.3.7.1 for the test conditions.
2. Please refer to ETSI EN 300 328 clause 5.3.7.2 for the measurement methods.

TEST RESULTS

N/A

APPENDIX A: PHOTOGRAPHS OF THE TEST SETUP

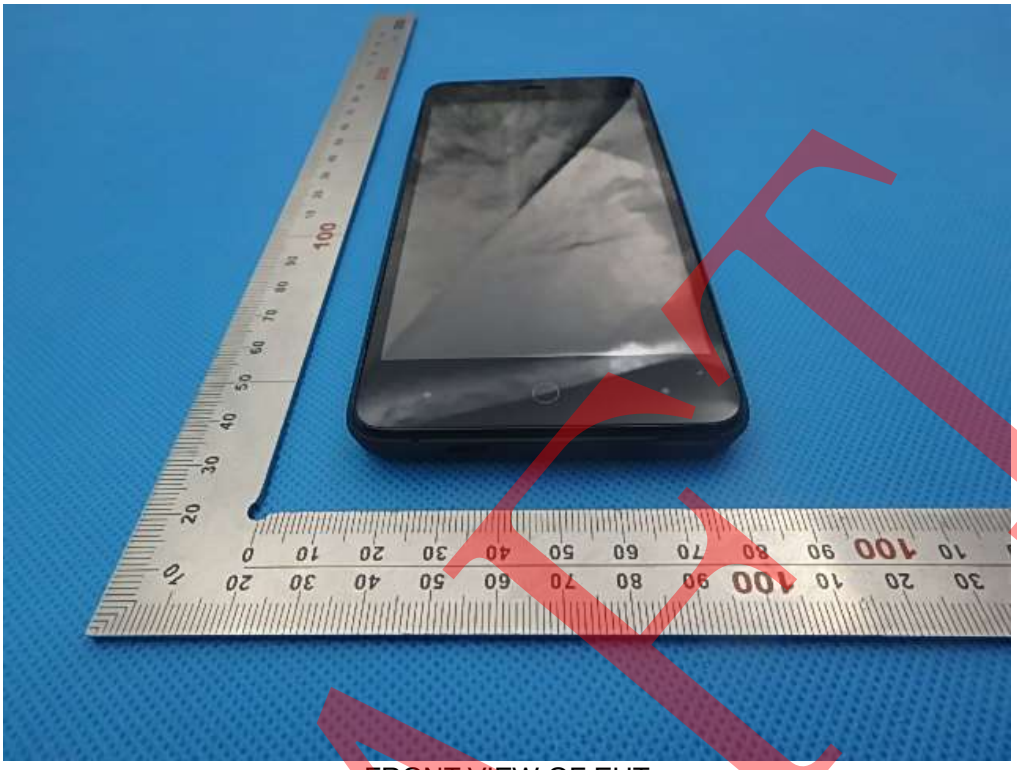
RADIATED SPURIOUS EMISSION TEST SETUP

APPENDIX B: PHOTOGRAPHS OF EUT

All VIEW OF EUT

TOP VIEW OF EUT

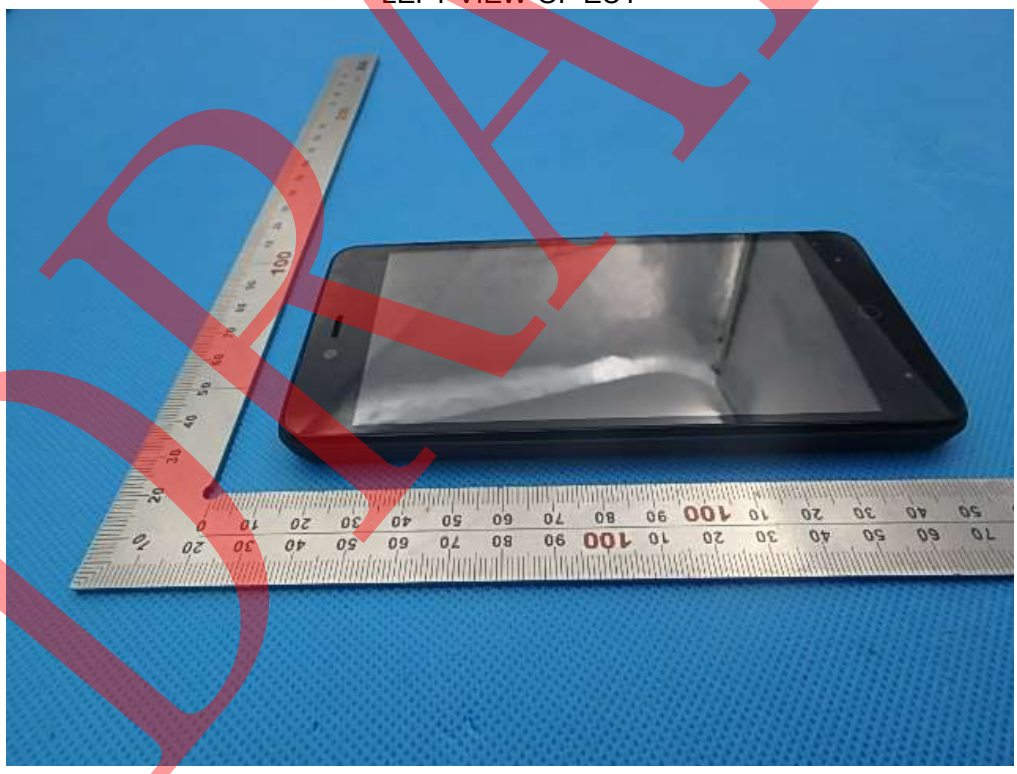
BOTTOM VIEW OF EUT



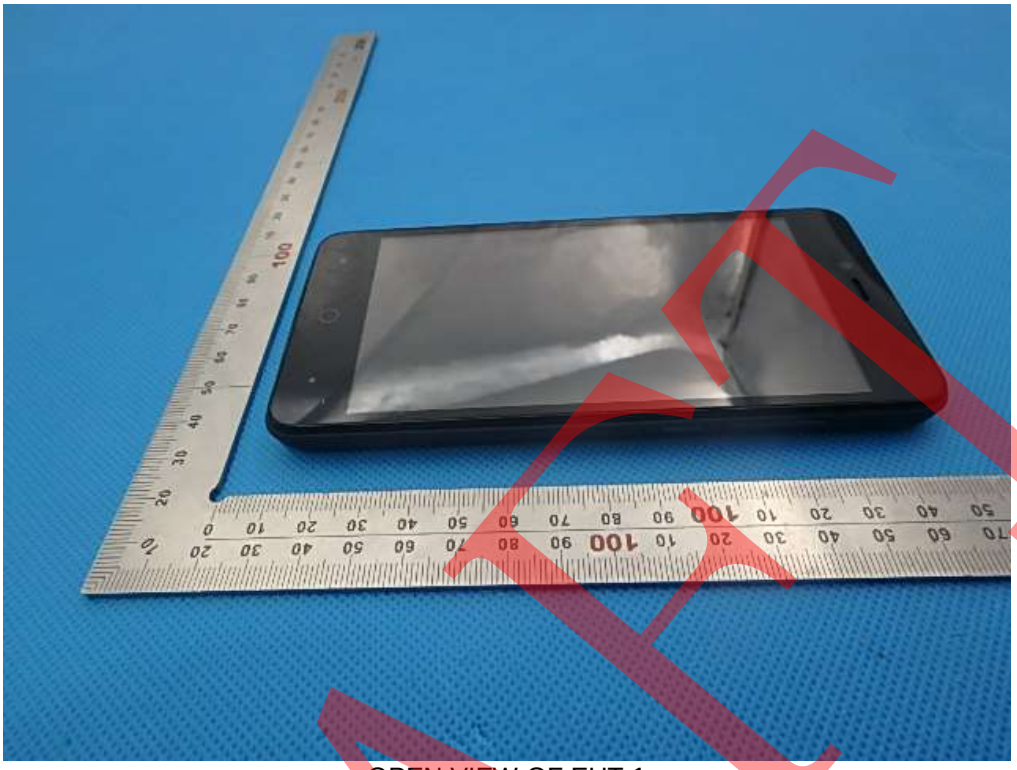
FRONT VIEW OF EUT

BACK VIEW OF EUT

LEFT VIEW OF EUT

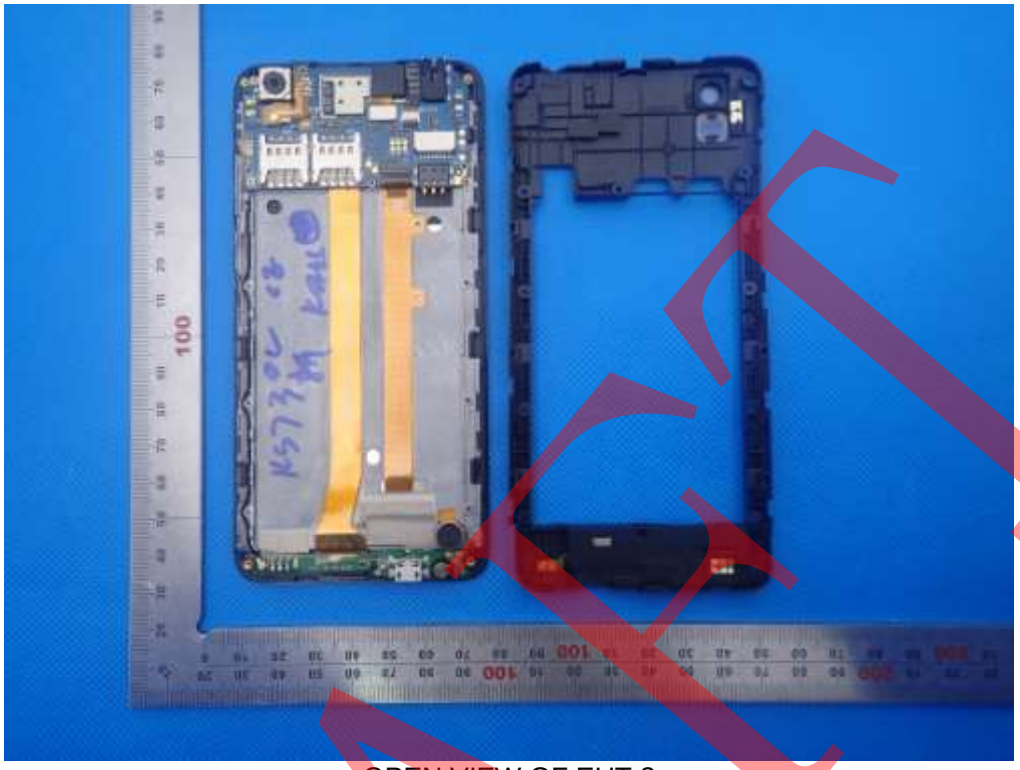


RIGHT VIEW OF EUT



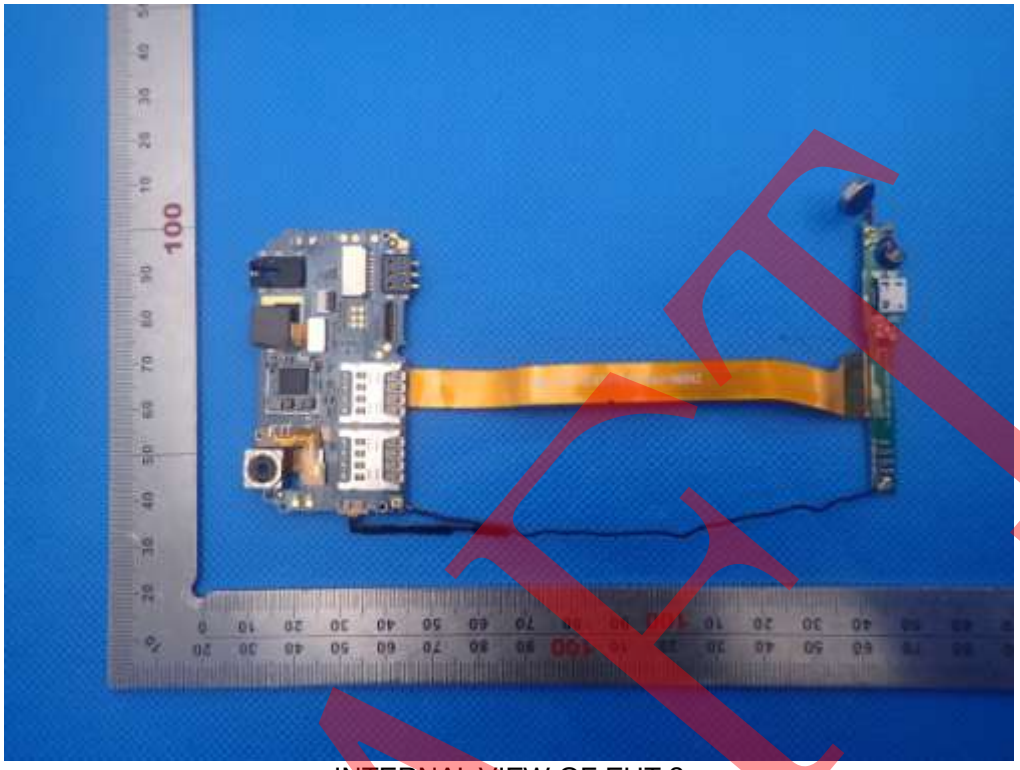
OPEN VIEW OF EUT-1

OPEN VIEW OF EUT-2

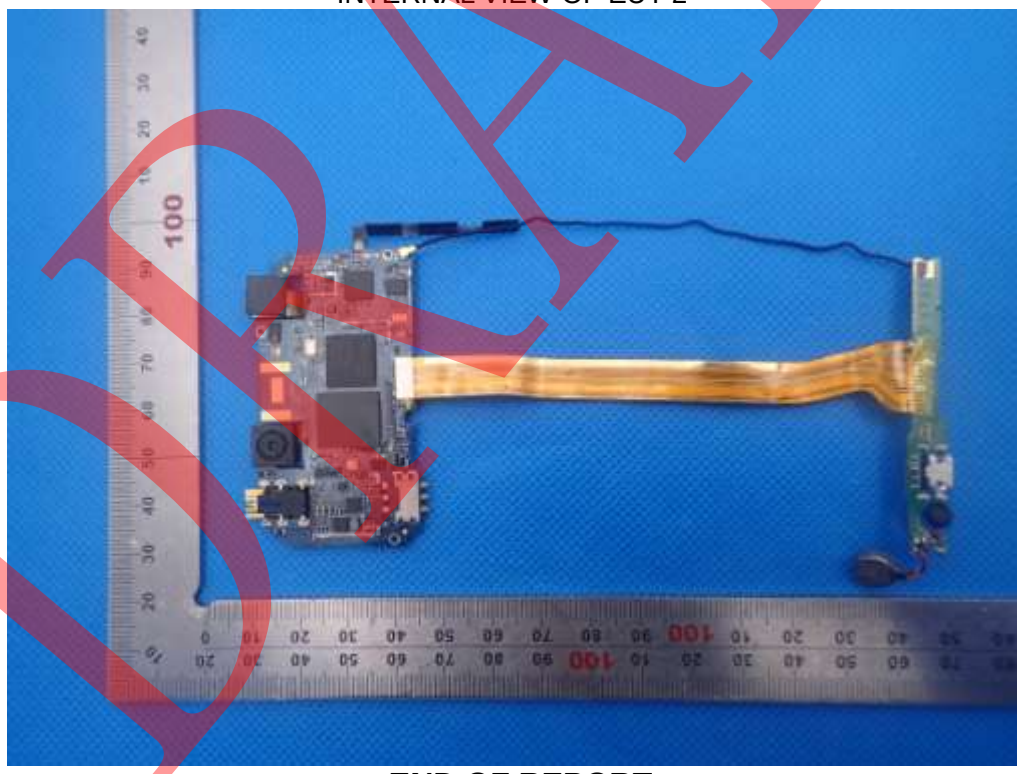


OPEN VIEW OF EUT-3

INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



----END OF REPORT----