Radio
Measurement and Test Report

For

Vonino Electronics LTD.

Miramar Tower 10F- NO.1010, 132 Nathan Road, Tsim Sha Tsui,

Kowloon, Hong Kong

Test Standards:	EN 300 328 V1.9.1 (2015-02)
Product Description:	Smart Phone
Tested Model:	JAX S
Report No.:	STR16108061E-4
Tested Date:	2016-10-13 to 2016-10-14
Issued Date:	2016-10-14
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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Vonino Electronics LTD.
Address of applicant: Miramar Tower 10F- NO.1010, 132 Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong

Manufacturer: Shenzhen Fortuneship Technology Co., Ltd
Address of manufacturer: Room 701-716, 7th Floor, Kanghesheng Building, No.1 ChuangSheng Road, Nanshan District, Shenzhen,

General Description of EUT	
Product Name:	Smart Phone
Brand Name:	VONINO
Model No.:	JAX S
Adding Model(s):	/
Rated Voltage:	DC 3.8V Rechargeable Li-Polymer Battery
Battery Capacity:	2000mAh
Power Adapter:	VNA-V50JS
	Input: 100-240Vac, 50/60Hz, 0.2A; Output: 5.0V⎓ 1.0A, L.P.S
Software Version:	MEDIACOM_M_PPXG515_V01_20160409_171404_ZH066_CF9_KS671HD_DATAMATIC_W18_B65003_20160409_16G2G_64P8_DDR3_HD_W18_ALS_Hall_171404_OTA
Hardware Version:	ZH066V3.0
Radio Technology:	Bluetooth V4.0
Operation Frequency:	2402MHz-2480MHz
Modulation:	GFSK, Pi/4 DQPSK, 8DPSK
Antenna Type:	Integral
Antenna Gain:	0.7dBi
Note: The test data is gathered from a production sample, provided by the manufacturer.	

E.1 Product Information (Bluetooth 2.1+ EDR)	
a) Type of modulation:	☒ FHSS ☐ other forms of modulation
b) In case of FHSS modulation:	
Max. No. of hopping freq.:	79 CH
Min. No. of hopping freq.:	16 CH
Accumulated Dwell time:	320ms
Frequency Occupation(Burst Number)	1
c) Adaptive / non-adaptive:	adaptive equipment without a non-adaptive mode
d) In case of adaptive equipment:	The equipment has implemented an LBT based DAA mechanism
e) In case of non-adaptive equipment:	No
f) The worst case operational mode for each of the following tests:	
RF output power	DH1
Accumulated dwell time	DH5
Minimum frequency occupation	DH1
Occupied channel bandwidth	DH1, 2DH1 (Min, Max)
Transmitter unwanted emissions in the OOB domain	2DH1
Transmitter unwanted emissions in the spurious domain	DH1
Receiver spurious emissions	DH1
g) Operating mode(antenna):	Single Antenna Equipment
h) In case of smart antenna systems:	No
i)Operating frequency range(s) of the equipment:	2402 MHz to 2480 MHz
j) Occupied channel bandwidth(s):	Bandwidth 1(Min): 0.84MHz Bandwidth 2(Max): 1.08MHz
k) Type of equipment:	☐ Stand-alone ☒ Combined equipment ☐ Plug-in device
l) The extreme operating conditions	
Extreme voltage range:	DC 3.3V to 4.35V
Extreme temperature range:	-20℃ to 55℃
m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:	
Antenna type:	☒ Integral Antenna ☐ Dedicated Antennas
Antenna Gain:	0.7dbi
n)Nominal voltage:	Battery DC 3.8V
o)Describe the test modes available which can facilitate testing:	Please refer to Section 1.5
p) The equipment type	Bluetooth
E.2 Power Level Setting	

Highest EIRP value:	4.07dBm
Conducted power:	3.37dBm
Listed as power setting:	Default
E.3 Additional Information	
Modulation:	GFSK, Pi/4 DQPSK, 8DPSK
Unmodulated modes:	No
Duty cycle:	Continuous operation possible for testing purposes
Type of the UUT:	Production models
Supporting equipment:	Combined equipment

E.1 Product Information (Bluetooth V4.0)	
a) Type of modulation:	☐ FHSS ☒ other forms of modulation
b) Adaptive / non-adaptive:	Adaptive equipment without a non-adaptive mode
c) In case of adaptive equipment:	The equipment has implemented an LBT based DAA mechanism
d) In case of non-adaptive equipment:	No
e) The worst case operational mode for each of the following tests	
RF output power:	BLE
Power spectrum density:	BLE
Occupied channel bandwidth:	BLE
Transmitter unwanted emissions in the OOB domain:	BLE
Transmitter unwanted emissions in the spurious domain:	BLE
Receiver spurious emissions:	BLE
f) Operating mode(antenna):	Single Antenna Equipment
g) In case of smart antenna Systems:	No
h) Operating frequency range(s) of the equipment:	2402MHz-2480MHz
i) Occupied channel bandwidth(s):	Bandwidth 1(Min): 1.02MHz Bandwidth 2(Max): 1.02MHz
j) Type of equipment:	☐ Stand-alone ☒ Combined equipment ☐ Plug-in device
k) The extreme operating conditions	
Extreme voltage range:	DC 3.3V to 4.35V
Extreme temperature range:	-20℃ to 55℃
l) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels	
Antenna type:	☒ Integral Antenna ☐ Dedicated Antennas
Antenna gain:	0.7dbi
m)Nominal voltage:	Battery DC 3.8V
n) Describe the test modes available	Please refer to Section 1.5

which can facilitate testing:	
o) The equipment type	Bluetooth
E.2 Power Level Setting	
Highest EIRP value:	-4.85dBm
Conducted power:	-5.55dBm
Listed as power setting:	Default
E.3 Additional Information	
Modulation:	GFSK
Unmodulated modes:	No
Duty cycle:	Continuous operation possible for testing purposes
Type of the UUT:	Production models
Supporting equipment:	Combined equipment

1.2 Test Standards

The following report is prepared on behalf of the Vonino Electronics LTD. in accordance with ETSI EN 300328, 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 essential requirements under article 3.2 of the R&TTE Directive.

The objective of the manufacturer is to demonstrate compliance with ETSI EN 300328.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the emission/immunity should be checked to ensure compliance has been maintained

1.3 Test Methodology

All measurements contained in this report were conducted with ETSI EN 300328, 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 essential requirements under article 3.2 of the R&TTE Directive.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

1.5 EUT Setup and Test Mode

The equipment under test (EUT) was configured to measure its highest possible emission/immunity level. The test modes were adapted according to the operation manual for use, the EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	EDR	2402/2441/2480MHz
TM2	Hopping	2402-2480MHz
TM3	BLE	2402/2442/2480MHz

Modulation Configure			
Modulation	Packet	Packet Type	Packet Size
GFSK	DH1	4	27
	DH3	11	183
	DH5	15	339
Pi/4 DQPSK	2DH1	20	54
	2DH3	26	367
	2DH5	30	379
8DPSK	3DH1	24	83
	3DH3	27	552
	3DH5	31	1021
Note: The bluetooth has been tested on the modulation of GFSK, (Pi/4)DQPSK and 8DPSK, compliance test and record the worst case.			

Test Conditions					
	Normal	LTLV	LTHV	HTLV	HTHV
Temperature (℃)	20	-20	-20	55	55
Voltage (V)	3.8	3.3	4.35	4.35	3.3

Accessories Equipment List and Details			
Description	**Manufacturer**	**Model No.**	**Serial Number**
Notebook	Lenovo	E10	LR-63C8R
Accessories Cable List and Details			
Cable Description	**Length (m)**	**Shielded/Unshielded**	**With Core/Without Core**
/	/	/	/
EUT Cable List and Details			
Cable Description	**Length (m)**	**Shielded/Unshielded**	**With Core/Without Core**
USB Cable	1.0	Shielded	Without Ferrite
Earphone Cable	1.4	Unshielded	Without Ferrite

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	±0.42dB
Occupied Bandwidth	---	±1×10-7
Power Spectral Density	Conducted	±0.70dB
Transmitter Spurious Emissions	Radiated	±5.2dB
Receiver Spurious Emissions	Radiated	±5.2dB

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Spectrum Analyzer	Agilent	N9020A	US47140102	2016-06-04	2017-06-03
Signal Generator	Agilent	83752A	3610A01453	2016-06-04	2017-06-03
Vector Signal Generator	Agilent	N5182A	MY47070202	2016-06-04	2017-06-03
Power Sensor	Agilent	U2021XA	MY54250019	2016-06-04	2017-06-03
Power Sensor	Agilent	U2021XA	MY54250021	2016-06-04	2017-06-03
Power Sensor	Agilent	U2021XA	MY54210040	2016-06-04	2017-06-03
Power Sensor	Agilent	U2021XA	MY54260021	2016-06-04	2017-06-03
Simultaneous Sampling	Agilent	U2531A	TW54243509	2016-06-04	2017-06-03
Power Splitter	Mini-Circuits	Z4PD-642W-S+	N846501416	2016-06-04	2017-06-03
Spectrum Analyzer	R&S	FSP	836079/035	2016-06-04	2017-06-03
Pre-amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
Pre-amplifier	Compliance Direction	PAP-0118	24002	2016-06-04	2017-06-03
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2016-06-04	2017-06-03
Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-06-04	2017-06-03

2. SUMMARY OF TEST RESULTS

Standards	Reference	Description of Test Item	Result
EN 300328 V1.9.1 (2015-02)	4.3.1.2 / 4.3.2.2	RF Output Power	Passed
	4.3.2.3	Power Spectral Density	Passed
	4.3.1.3 / 4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	N/A
	4.3.1.4	Accumulated Transmit Time, Frequency Occupation and Hopping Sequence	Passed
	4.3.1.5	Hopping Frequency Separation	Passed
	4.3.1.6 / 4.3.2.5	Medium Utilisation (MU) Factor	N/A
	4.3.1.7 / 4.3.2.6	Adaptivity (Adaptive Frequency Hopping)	N/A
	4.3.1.8 / 4.3.2.7	Occupied Channel Bandwidth	Passed
	4.3.1.9 / 4.3.2.8	Transmitter Unwanted Emissions in the Out-of-band Domain	Passed
	4.3.1.10 / 4.3.2.9	Transmitter Unwanted Emissions in the Spurious Domain	Passed
	4.3.1.11 / 4.3.2.10	Receiver Spurious Emissions	Passed
	4.3.1.12 / 4.3.2.11	Receiver Blocking	N/A
Passed: The EUT complies with the essential requirements in the standard Failed: The EUT does not comply with the essential requirements in the standard N/A: not applicable			

3. RF Output Power

3.1 Standard Applicable

According to Section 4.3.1.2.3, 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. 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.

According to Section 4.3.2.2.3, For adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be 20 dBm. The maximum RF output power for non-adaptive equipment shall be declared by the supplier and shall not exceed 20 dBm. For non-adaptive equipment using wide band modulations other than FHSS, the maximum RF output power shall be equal to or less than the value declared by the supplier.

3.2 Test Procedure

According to section 5.3.2.2.1.1 of the standard EN 300328, the test procedure shall be as follows:

Step 1:

• Use a fast power sensor suitable for 2,4 GHz and capable of 1 MS/s.

• Use the following settings: - Sample speed 1 MS/s or faster.

- The samples must represent the power of the signal.

- Measurement duration: For non-adaptive equipment: equal to the observation period defined in clauses 4.3.1.2.1 or 4.3.2.3.1. For adaptive equipment, the measurement duration shall be long enough to ensure a minimum number of bursts (at least 10) are captured.

NOTE 1: For adaptive equipment, to increase the measurement accuracy, a higher number of bursts may be used.

Step 2:

• For conducted measurements on devices with one transmit chain:

- Connect the power sensor to the transmit port, sample the transmit signal and store the raw data.Use these stored samples in all following steps.

• For conducted measurements on devices with multiple transmit chains:

- Connect one power sensor to each transmit port for a synchronous measurement on all transmit ports.

- Trigger the power sensors so that they start sampling at the same time. Make sure the time difference between the samples of all sensors is less than half the time between two samples.

- For each individual sampling point (time domain), sum the coincident power samples of all ports and store them. Use these summed samples in all following steps..

Step 3:

• Find the start and stop times of each burst in the stored measurement samples.

The start and stop times are defined as the points where the power is at least 30 dB below the highest value of the stored samples in step 2.

NOTE 2: In case of insufficient dynamic range, the value of 30 dB may need to be reduced appropriately.

Step 4:

• Between the start and stop times of each individual burst calculate the RMS power over the burst using the formula below. Save these Pburst values, as well as the start and stop times for each burst.

$$P_{burst} = \frac{1}{k}\sum_{n=1}^{k} P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number

Step 5:

• The highest of all Pburst values (value "A" in dBm) will be used for maximum e.i.r.p. calculations.

Step 6:

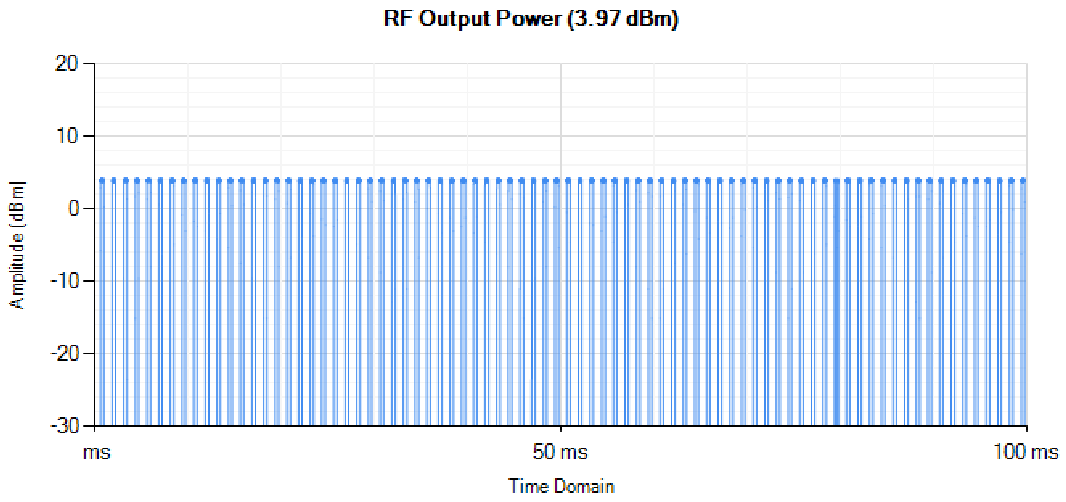
• Add the (stated) antenna assembly gain "G" in dBi of the individual antenna.
• If applicable, add the additional beamforming gain "Y" in dB.
•If more than one antenna assembly is intended for this power setting, the maximum overall antenna gain (G or G + Y) shall be used.
• The RF Output Power (P) shall be calculated using the formula below: P = A + G + Y
• This value, which shall comply with the limit given in clause 4.3.1.2.3 or clause 4.3.2.2.3, shall be recorded in the test report.

3.3 Summary of Test Results

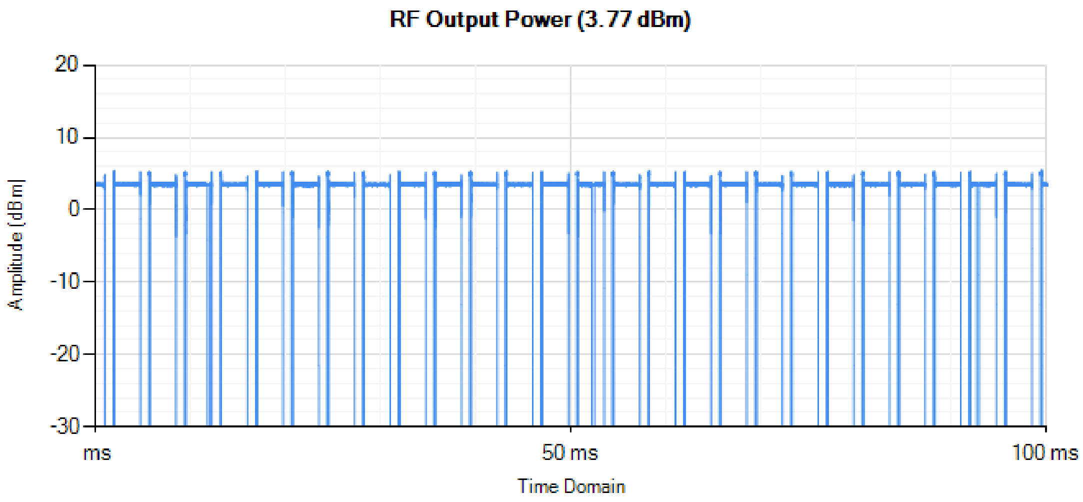
EDR Mode				
Test Conditions	**EIRP (dBm)**			**Limit**
	GFSK DH1	**Pi/4 DQPSK 2DH1**	**8DPSK 3DH1**	**dBm**
Normal	3.97	3.77	4.07	20
LTLV	3.85	3.75	4.07	20
LTHV	3.89	3.72	4.05	20
HTHV	3.92	3.70	4.00	20
HTLV	3.96	3.73	4.01	20

BLE Mode				
Test Conditions	**EIRP (dBm)**			**Limit**
	Lowest CH	**Middle CH**	**Highest CH**	**dBm**
Normal	-5.18	-4.85	-4.95	20
LTLV	-5.25	-4.87	-4.99	20
LTHV	-5.23	-4.89	-4.97	20
HTHV	-5.19	-4.90	-4.98	20
HTLV	-5.27	-4.96	-4.99	20

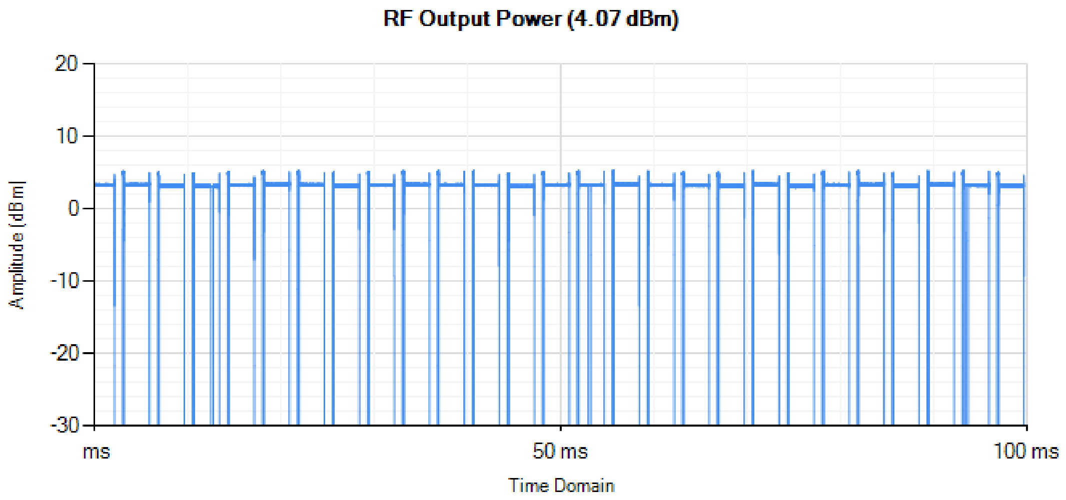
GFSK DH1



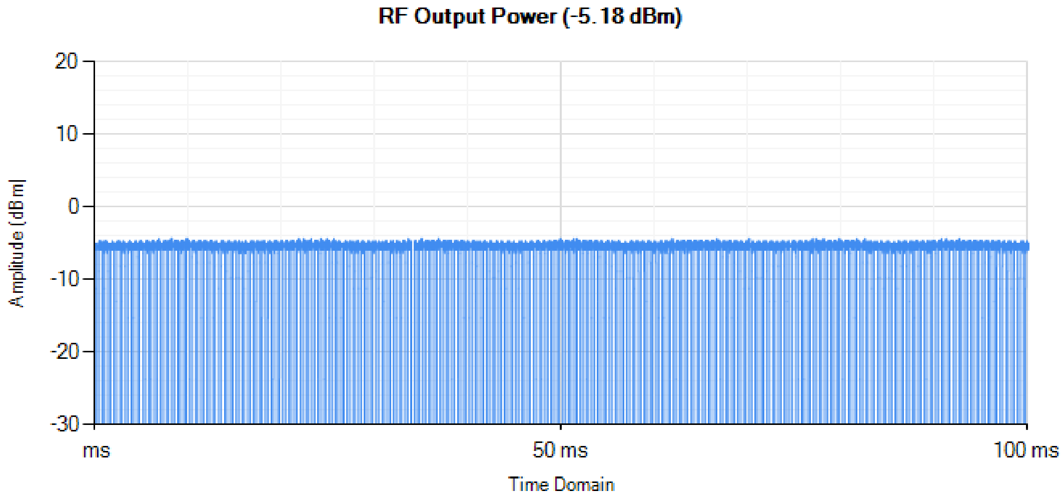
Pi/4 DQPSK 2DH1



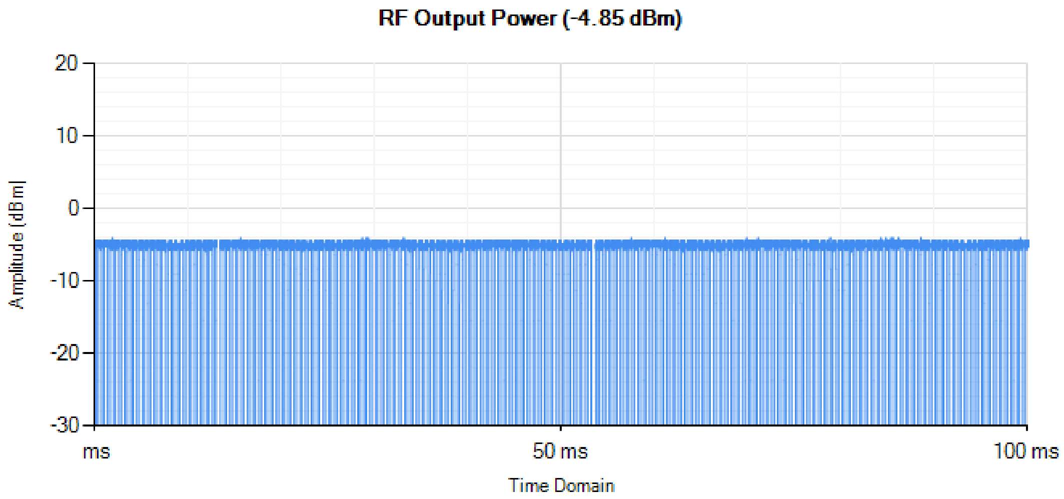
8DPSK 3DH1



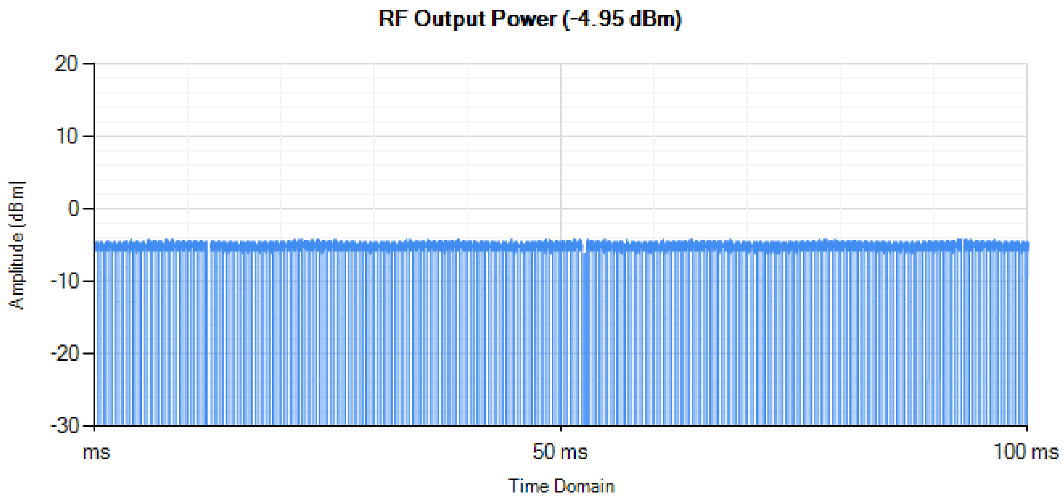
BLE Lowest Channel



BLE Middle Channel



BLE Highest Channel



4. Accumulated Transmit Time, Frequency Occupation and Hopping Sequence

4.1 Standard Application

According to section 4.3.1.4.3,
Adaptive Frequency Hopping equipment shall be capable of operating over a minimum of 70 % of the band specified in clause 1.
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.

4.2 Test procedure

According to section 5.3.4.2.1, the test procedure shall be as follows:
Step 1:
• 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

Step 2:
• Save the trace data to a file for further analysis by a computing device using an appropriate software application or program.

Step 3:
• Indentify the data points related to the frequency being investigated by applying a threshold.

The data points resulting from transmissions on the hopping frequency being investigated are assumed to have much higher levels compared to data points resulting from transmissions on adjacent hopping frequencies. If a clear determination between these transmissions is not possible, the RBW in step 1 shall be further reduced. In addition, a channel filter may be used.

• Count the number of data points identified as resulting from transmissions on the frequency being investigated and multiply this number by the time difference between two consecutive data points.

Step 4:
• The result in step 3 is the accumulated Dwell Time which shall comply with the limit provided in clauses 4.3.1.4.3.1 or 4.3.1.4.3.1 and which shall be recorded in the test report.

Step 5:
NOTE 1: This step is only applicable for equipment implementing Option 1 in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2 for complying with the Frequency Occupation requirement and the manufacturer decides to demonstrate compliance with this requirement via measurement.
• Make the following changes on the analyser and repeat step 2 and step 3.
Sweep time: 4 × Dwell Time × Actual number of hopping frequencies in use
The hopping frequencies occupied by the equipment without having transmissions during the dwell time (blacklisted frequencies) should be taken into account in the actual number of hopping frequencies in use. If this number cannot be determined (number of blacklisted frequencies unknown) it shall be assumed that the equipment uses the maximum possible number of hopping frequencies.
• The result shall be compared to the limit for the Frequency Occupation defined in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2. The result of this comparison shall be recorded in the test report.

Step 6:
• Make the following changes on the analyzer:
- 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: 1s
- Trace Mode: Max Hold
- Trigger: Free Run

NOTE 2: The above sweep time setting may result in long measuring times. To avoid such long measuring times, an FFT analyser could be used.
• Wait for the trace to stabilize. Identify the number of hopping frequencies used by the hopping sequence.
• The result shall be compared to the limit (value N) defined in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2. This value shall be recorded in the test report.
For equipment with blacklisted frequencies, it might not be possible to verify the number of hopping frequencies in use. However they shall comply with the requirement for Accumulated Transmit Time and Frequency Occupation assuming the minimum number of hopping frequencies (N) defined in clause 4.3.1.4.3.1 or clause 4.3.1.4.3.2 is used.

Step 7:
• For adaptive systems, using the lowest and highest -20 dB points from the total spectrum envelope obtained in

step 6, it shall be verified whether the system uses 70 % of the band specified in clause 1. The result shall be recorded in the test report.

RBW/RBW=500/500kHz

4.3 Summary of Test Results/Plots

Modulation	Test Channel	Packet	Maximum Accumulated Dwell Time	
			Acc. Dwell Time	Limit
			ms	ms
GFSK	2402MHz	DH5	320	<400
	2441MHz	DH5	320	<400
	2480MHz	DH5	320	<400
Test Period: 400ms X Minimum number of hopping frequencis (N) Accumulated Dwell Time = Time slot length (Dwell time) X Number of data points within a test period				
Note: Test data is corrected with the worse case, which the packet length is GFSK DH5				

Modulation	Test Channel	Packet	Frequency Occupation requirement	
			Burst Number	Limit(Burst Number)
GFSK	2402MHz	DH1	2	⩾1
	2441MHz	DH1	2	⩾1
	2480MHz	DH1	2	⩾1
Test Period: 4 X Dwell time X Minimum number of hopping frequencies (N) Occupation Time = Time slot length (Dwell time) X Number of data points within a test period				
Note: Test data is corrected with the worst case, which the packet length is GFSK DH1				

Frequency Band	Number of Hopping Frequencies (N)	Limit	Result
2400-2483.5MHz	79	15	Passed
	-20dB Points Occupied Bandwidth	**Limit**	**Result**
	79.47	58.45MHz = 70% X 83.5MHz	Passed

5. Hopping Frequency Separation

5.1 Standard Application

According to section 4.3.1.5.3,
For adaptive Frequency Hopping equipment, the minimum Hopping Frequency Separation shall be 100 kHz.

Adaptive Frequency Hopping equipment, which for one or more hopping frequencies, has switched to a non-adaptive mode because interference was detected on all these hopping positions with a level above the threshold level defined in clause 4.3.1.7.2.2 or clause 4.3.1.7.3.2, is allowed to continue to operate with a minimum Hopping Frequency Separation of 100 kHz on these hopping frequencies as long as the interference is present on these frequencies. The equipment shall continue to operate in an adaptive mode on other hopping frequencies.
Adaptive Frequency Hopping equipment which decided to operate in a non-adaptive mode on one or more hopping frequencies without the presence of interference, shall comply with the limit in clause 4.3.1.5.3.1 for these hopping frequencies as well as with all other requirements applicable to non-adaptive frequency hopping equipment.

5.2 Test procedure

According to the section 5.3.5.2.1, the option 2 test method shall be used.
Step 1:
The output of the transmitter shall be connected to a spectrum analyzer or equivalent.
The analyzer shall be set as follows:
- Centre Frequency: Centre of the two adjacent hopping frequencies
- Frequency Span: Sufficient to see the complete power envelope of both hopping frequencies
- RBW: 1 % of the Span
- VBW: 3 ×RBW
- Detector Mode: RMS
- Trace Mode: Max Hold
- Sweep Time: 1s

NOTE: Depending on the nature of the signal (modulation), it might be required to use a much longer sweep time, e.g. in case switching transients are present in the signals to be investigated.

Step 2:
• Wait for the trace to stabilize.
• Use the marker-delta function to determine the Hopping Frequency Separation between the centres of the two adjacent hopping frequencies (e.g. by indentifying peaks or notches at the centre of the power envelope for the two adjacent signals). This value shall be compared with the limits defined in clause 4.3.1.5.3 and shall be recorded in the test report.
RBW/VBW=30/100kHz

5.3 Summary of Test Results/Plots

Test Mode	Test Channel	Adjacent Channel	Channel Seaparation	Limit
	MHz	MHz	MHz	MHz
GFSK	2402	2403	1.01	>0.1
	2480	2479	1.01	>0.1
8DPSK	2402	2403	1.01	>0.1
	2480	2479	1.01	>0.1

6. Power Spectral Density

6.1 Standard Applicable

According to Section 4.3.2.3.3, For equipment using wide band modulations other than FHSS, the maximum Power Spectral Density is limited to 10 dBm per MHz.

6.2 Test Procedure

According to section 5.3.3.2.1 of the standard EN 300328, the test procedure shall be as follows:
Step 1:
Connect the UUT to the spectrum analyser and use the following settings:
• Start Frequency: 2 400 MHz
• Stop Frequency: 2 483,5 MHz
• Resolution BW: 10 kHz
• Video BW: 30 kHz
• Sweep Points: > 8 350
NOTE: For spectrum analysers not supporting this number of sweep points, the frequency band may be segmented.
• Detector: RMS
• Trace Mode: Max Hold
• Sweep time: 10 s; the sweep time may be increased further until a value where the sweep time has no impact on the RMS value of the signal
For non-continuous signals, wait for the trace to stabilize.
Save the data (trace data) set to a file.
Step 2:
For conducted measurements on smart antenna systems using either operating mode 2 or operating mode 3 (see clause 5.1.3.2), repeat the measurement for each of the transmit ports. For each sampling point (frequency domain), add up the coincident power values (in mW) for the different transmit chains and use this as the new data set.
Step 3:
Add up the values for power for all the samples in the file using the formula below.

$$P_{Sum} = \sum_{n=1}^{k} P_{sample}(n)$$

with 'k' being the total number of samples and 'n' the actual sample number
Step 4:
Normalize the individual values for power (in dBm) so that the sum is equal to the RF Output Power (e.i.r.p.) measured in clause 5.3.2 and save the corrected data. The following formulas can be used:

$$C_{Corr} = P_{Sum} - P_{e.i.r.p.}$$

$$P_{Samplecorr}(n) = P_{Sample}(n) - C_{Corr}$$

with 'n' being the actual sample number

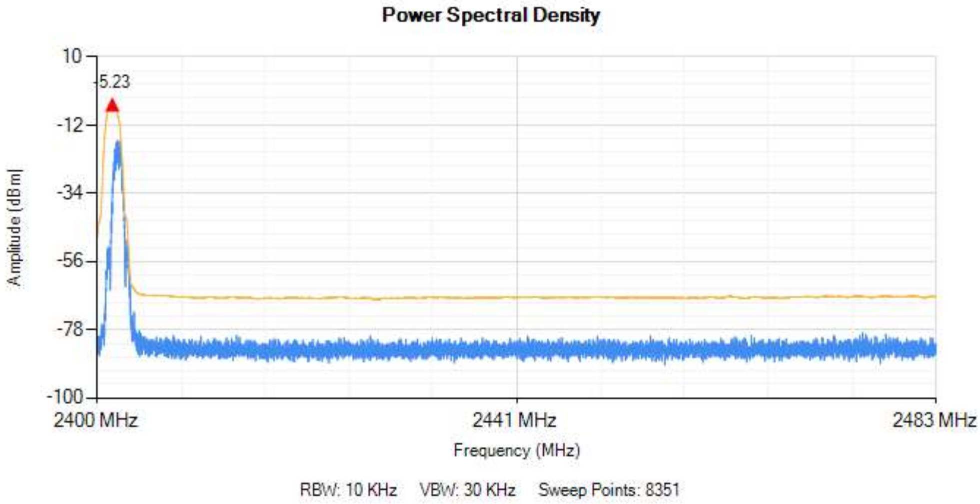
Step 5:
Starting from the first sample $P_{Samplecorr}(n)$ (lowest frequency), add up the power (in mW) of the following samples representing a 1 MHz segment and record the results for power and position (i.e. sample #1 to sample #100). This is the Power Spectral Density (e.i.r.p.) for the first 1 MHz segment which shall be recorded.
Step 6:
Shift the start point of the samples added up in step 5 by one sample and repeat the procedure in step 5 (i.e. sample #2 to sample #101).
Step 7:
Repeat step 6 until the end of the data set and record the Power Spectral Density values for each of the 1 MHz segments.
From all the recorded results, the highest value is the maximum Power Spectral Density for the UUT. This value, which shall comply with the limit given in clause 4.3.2.3.3, shall be recorded in the test report.

RBW/VBW=10/30 kHz

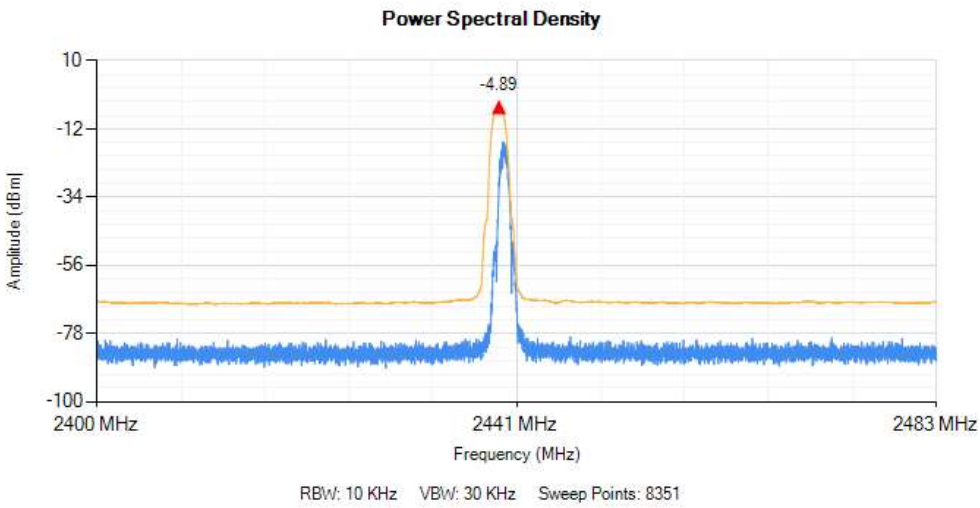
6.3 Summary of Test Results

Test Mode	Test Frequency	Spectral Density	Limit
	MHz	dBm/MHz	dBm/MHz
BLE	2402	-5.23	10
	2440	-4.89	10
	2480	-4.99	10

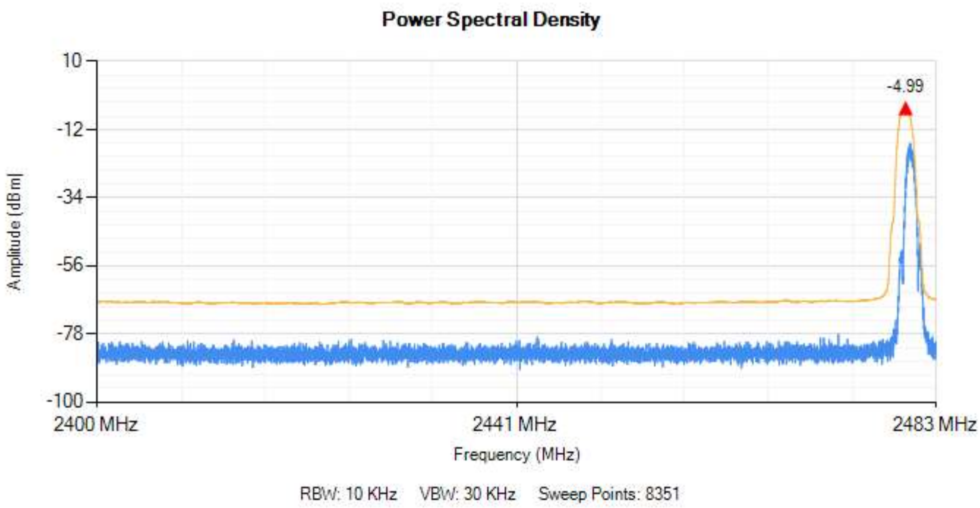
BLE Lowest Channel



BLE Middle Channel



BLE Highest Channel



7. Occupied Channel Bandwidth

7.1 Standard Application

According to section 4.3.1.8.3. The Occupied Channel Bandwidth for each hopping frequency shall fall completely within the band given in clause 1.
For non-adaptive Frequency Hopping equipment with e.i.r.p greater than 10 dBm, the Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than the value declared by the supplier. This declared value shall not be greater than 5 MHz.

According to section 4.3.2.7.3. The Occupied Channel Bandwidth shall fall completely within the band given in clause 1. In addition, for non-adaptive systems using wide band modulations other than FHSS and with e.i.r.p greater than 10 dBm, the occupied channel bandwidth shall be less than 20 MHz.

7.2 Test procedure

According to the section 5.3.8.2.1, the measurement procedure shall be as follows:
Step 1:
Connect the UUT to the spectrum analyser and use the following settings:
• 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

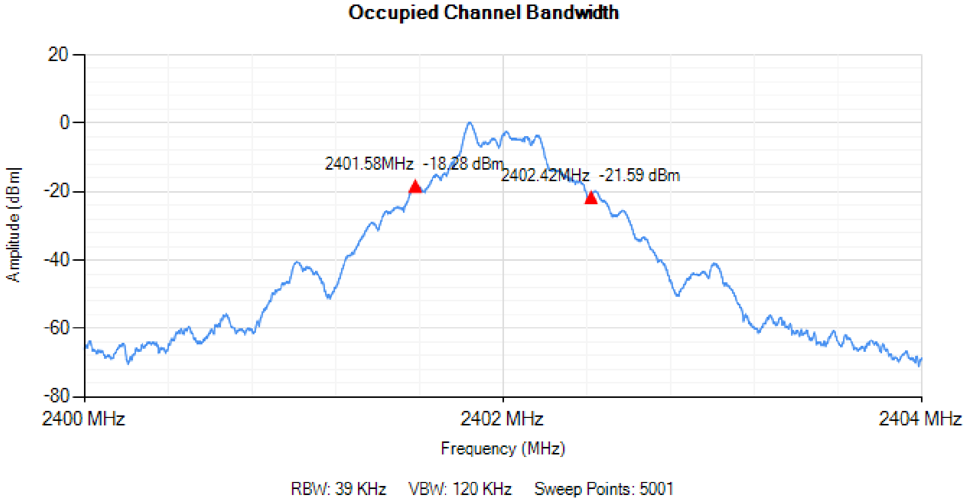
Step 2:
Wait until the trace is completed.
Find the peak value of the trace and place the analyser marker on this peak.

Step 3:
Use the 99 % bandwidth function of the spectrum analyser to measure the Occupied Channel Bandwidth of the UUT. This value shall be recorded.

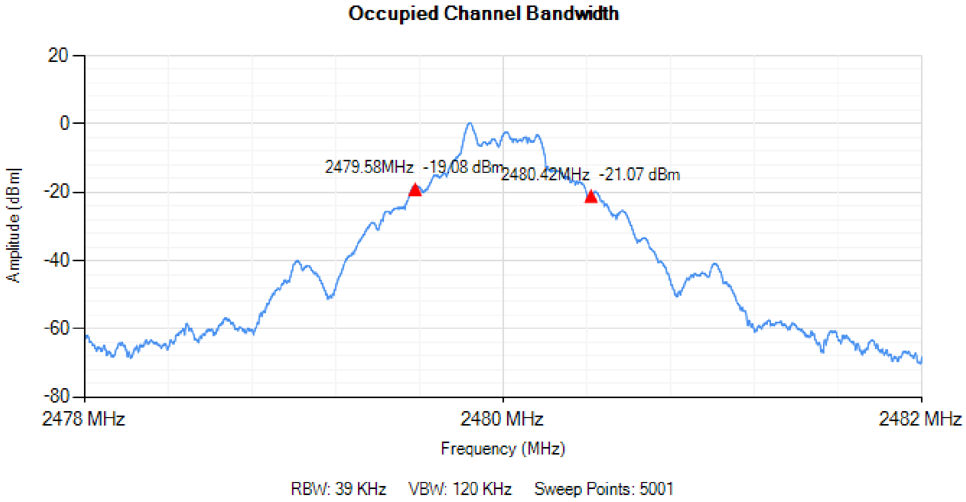
7.3 Summary of Test Results/Plots

Test Mode	Test Channel	Measured Value
	MHz	MHz
GFSK DH1	2402	0.84
	2480	0.84
Pi/4 DQPSK 2DH1	2402	1.08
	2480	1.08
8DPSK 3DH1	2402	1.07
	2480	1.08
BLE	2402	1.02
	2480	1.02

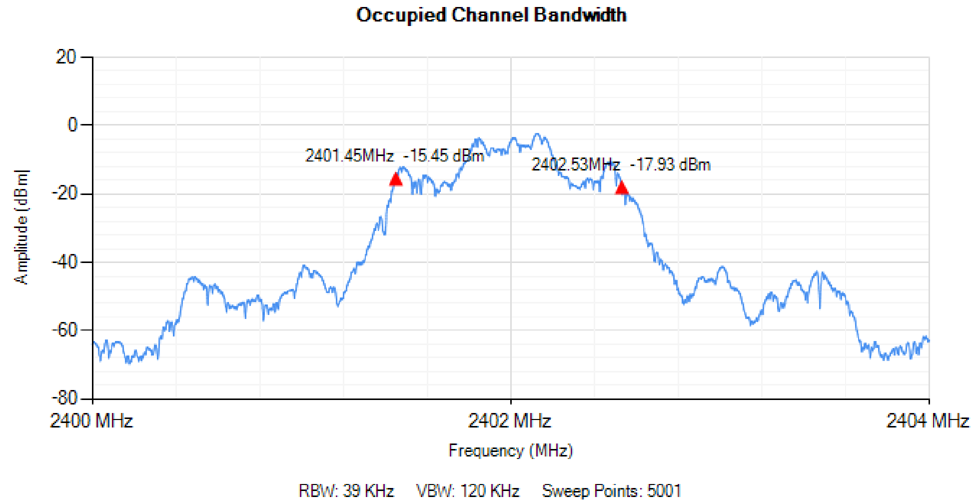
GFSK DH1 Lowest Channel



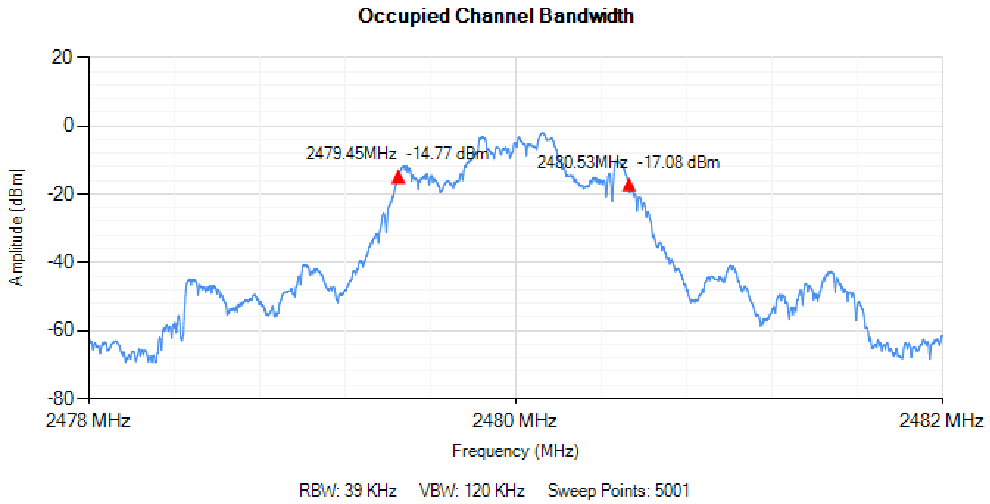
GFSK DH1 Highest Channel



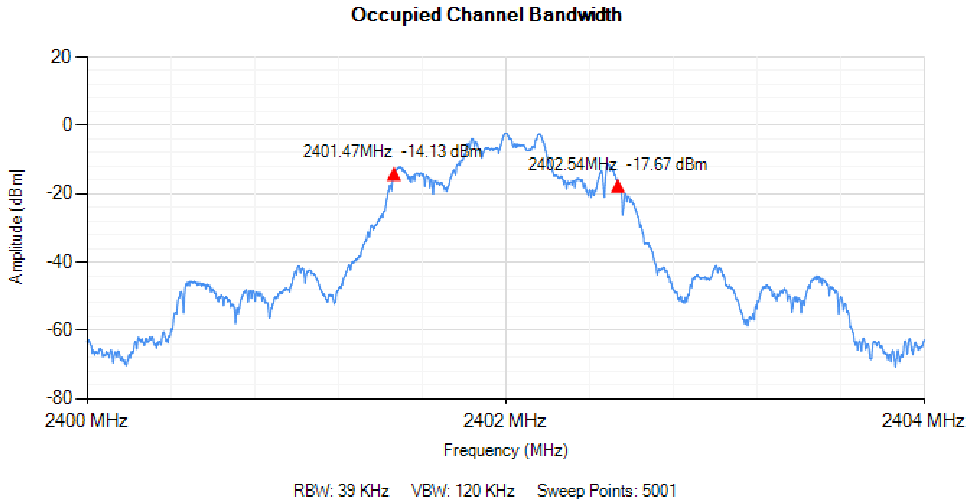
Pi/4 DQPSK 2DH1 Lowest Channel



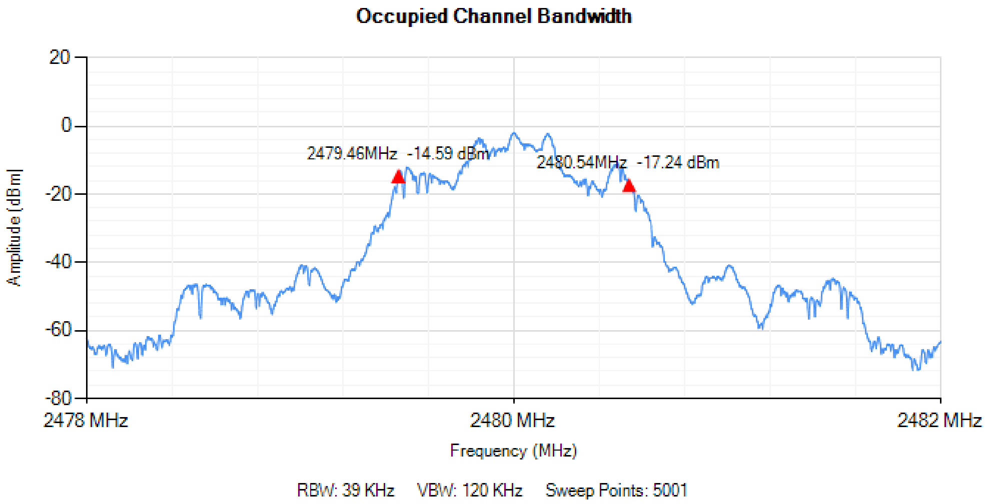
Pi/4 DQPSK 2DH1 Highest Channel

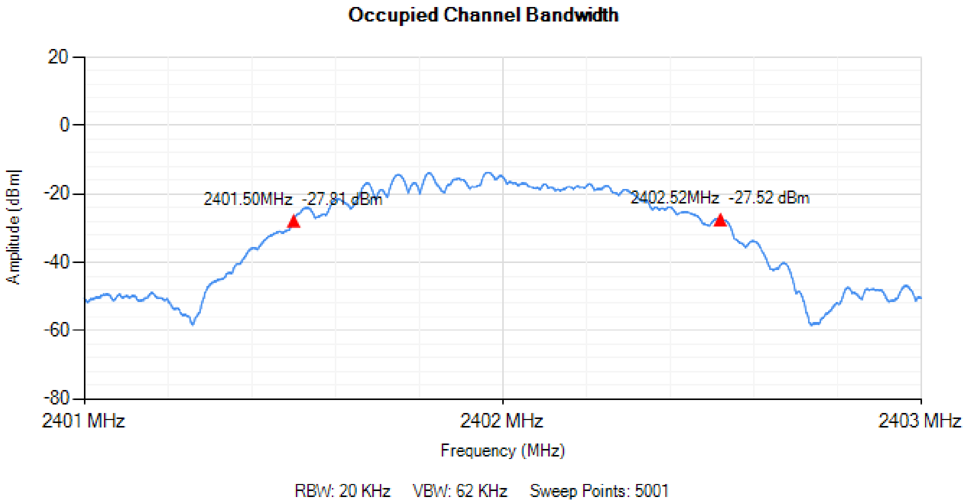
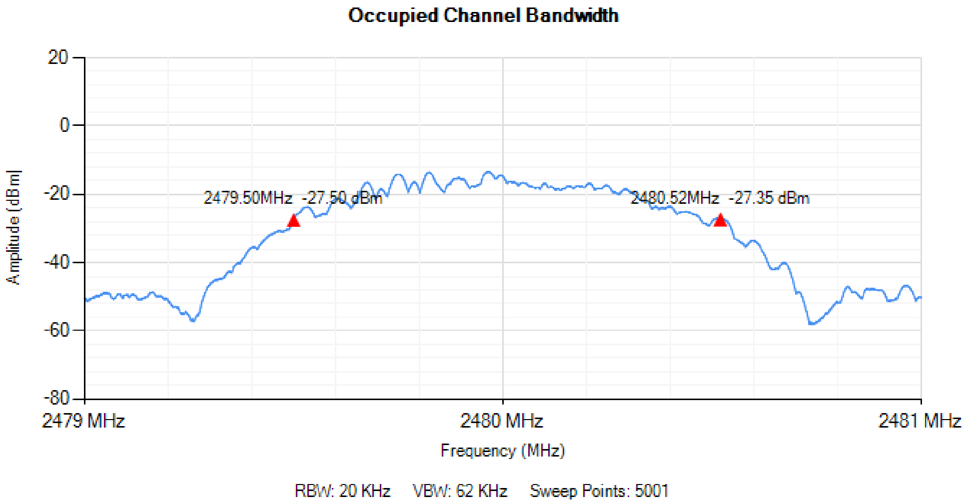


8DPSK 3DH1 Lowest Channel



8DPSK 3DH1 Highest Channel

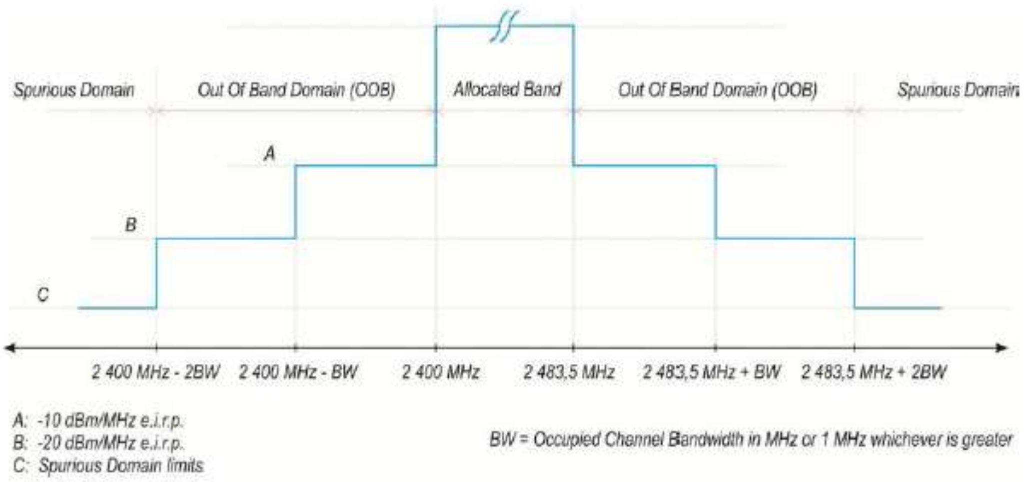


BLE Lowest Channel

BLE Highest Channel


8. Transmitter Unwanted Emissions in the Out-of-band Domain

8.1 Standard Application

According to section 4.3.1.9.3&4.3.2.8.3, The transmitter unwanted emissions in the out-of-band domain but outside the allocated band, shall not exceed the values provided by the mask in figure below



Within the 2 400 MHz to 2 483,5 MHz band, the Out-of-band emissions are fulfilled by compliance with the Occupied Channel Bandwidth requirement

8.2 Test procedure

According to the section 5.3.9.2.1, the measurement procedure shall be as follows:
The Out-of-band emissions within the different horizontal segments of the mask provided in figures 1 and 3 shall be measured using the steps below. This method assumes the spectrum analyser is equipped with the Time Domain Power option.

Step 1:
• Connect the UUT to the spectrum analyser and use the following settings:
- 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 μ s) or 5 000 whichever is greater
- Trigger Mode: Video trigger
NOTE 1: In case video triggering is not possible, an external trigger source may be used.
- Sweep Time: > 120 % of the duration of the longest burst detected during the measurement of the RF Output Power

Step 2: (segment 2 483,5 MHz to 2 483,5 MHz + BW)

• Adjust the trigger level to select the transmissions with the highest power level.

• For frequency hopping equipment operating in a normal hopping mode, the different hops will result in signal bursts with different power levels. In this case the burst with the highest power level shall be selected.

• Set a window (start and stop lines) to match with the start and end of the burst and in which the RMS power shall be measured using the Time Domain Power function.

• Select RMS power to be measured within the selected window and note the result which is the RMS power within this 1 MHz segment (2 483,5 MHz to 2 484,5 MHz). Compare this value with the applicable limit provided by the mask.

• Increase the centre frequency in steps of 1 MHz and repeat this measurement for every 1 MHz segment within the range 2 483,5 MHz to 2 483,5 MHz + BW. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + BW - 0,5 MHz (which means this may partly overlap with the previous 1 MHz segment).

Step 3: (segment 2 483,5 MHz + BW to 2 483,5 MHz + 2BW)

• Change the centre frequency of the analyser to 2 484 MHz + BW and perform the measurement for the first 1 MHz segment within range 2 483,5 MHz + BW to 2 483,5 MHz + 2BW. Increase the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 483,5 MHz + 2 BW - 0,5 MHz.

Step 4: (segment 2 400 MHz - BW to 2 400 MHz)

• Change the centre frequency of the analyser to 2 399,5 MHz and perform the measurement for the first 1 MHz segment within range 2 400 MHz - BW to 2 400 MHz Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz.

Step 5: (segment 2 400 MHz - 2BW to 2 400 MHz - BW)

• Change the centre frequency of the analyser to 2 399,5 MHz - BW and perform the measurement for the first 1 MHz segment within range 2 400 MHz - 2BW to 2 400 MHz - BW. Reduce the centre frequency in 1 MHz steps and repeat the measurements to cover this whole range. The centre frequency of the last 1 MHz segment shall be set to 2 400 MHz - 2BW + 0,5 MHz.

Step 6:

• In case of conducted measurements on equipment with a single transmit chain, the declared antenna assembly gain "G" in dBi shall be added to the results for each of the 1 MHz segments and compared with the limits provided by the mask given in figure 1 or figure 3. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered.

• In case of conducted measurements on smart antenna systems (equipment with multiple transmit chains), the measurements need to be repeated for each of the active transmit chains. The declared antenna assembly gain "G" in dBi for a single antenna shall be added to these results. If more than one antenna assembly is intended for this power setting, the antenna with the highest gain shall be considered. Comparison with the applicable limits shall be done using any of the options given below:

- Option 1: the results for each of the transmit chains for the corresponding 1 MHz segments shall be added. The additional beamforming gain "Y" in dB shall be added as well and the resulting values compared with the limits provided by the mask given in figure 1 or figure 3.

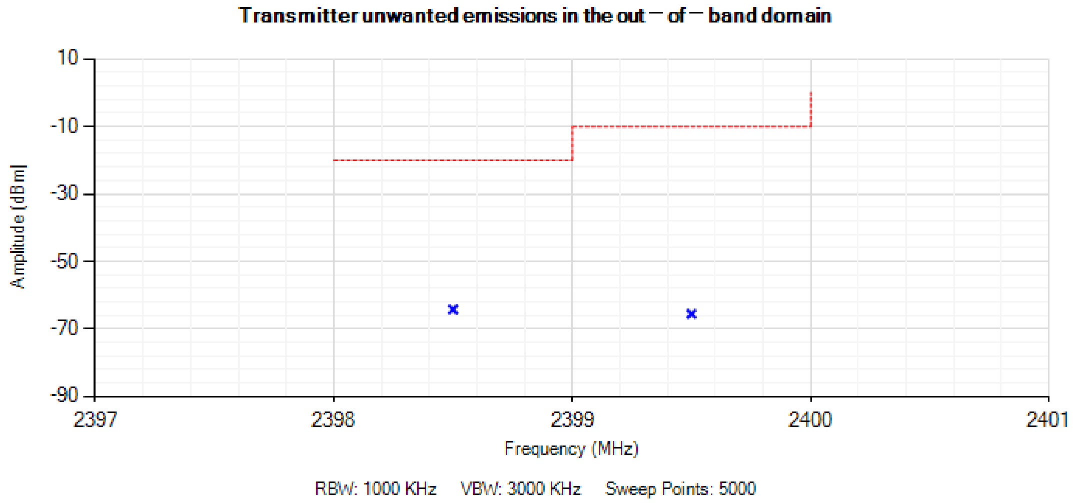
NOTE 2: A ch refers to the number of active transmit chains.
It shall be recorded whether the equipment complies with the mask provided in figure 1 or figure 3.

RBW=1MHz VBW=3MHz

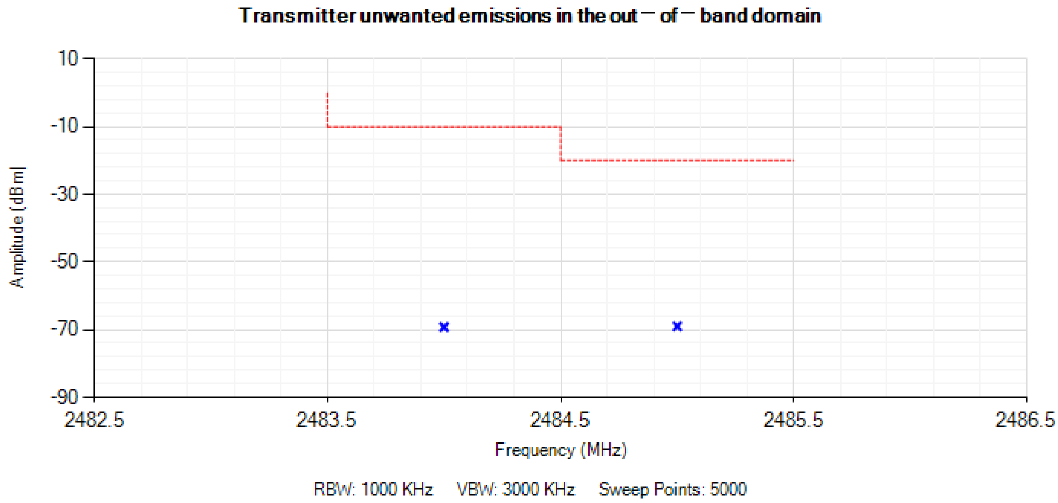
8.3 Summary of Test Results/Plots

Test CH.	**Test Segment**	**Max. Emissions Reading (dBm)**					**Limit**
	MHz	**Normal**	**LTLV**	**LTHV**	**HTHV**	**HTLV**	**dBm**
Test Mode: GFSK DH1							
Lowest	2400-BW to 2400	-65.21	-65.14	-60.54	-61.57	-61.27	-10
	2400-2BW to 2400-BW	-64.56	-61.70	-64.56	-61.44	-61.05	-20
Highest	2483.5 to 2483.5+BW	-68.21	-65.99	-67.38	-65.74	-66.15	-10
	2483.5+BW to 2483.5+2BW	-68.25	-64.47	-63.34	-67.39	-66.97	-20
Test Mode: Pi/4 DQPSK 2DH1							
Lowest	2400-BW to 2400	-56.24	-51.62	-54.48	-55.43	-51.84	-10
	2400-2BW to 2400-BW	-63.24	-60.09	-62.86	-59.96	-60.86	-20
Highest	2483.5 to 2483.5+BW	-66.13	-65.15	-65.25	-65.57	-64.53	-10
	2483.5+BW to 2483.5+2BW	-67.14	-64.75	-66.58	-62.79	-64.29	-20
Test Mode: 8DPSK 3DH1							
Lowest	2400-BW to 2400	-65.13	-63.11	-63.40	-64.66	-64.95	-10
	2400-2BW to 2400-BW	-65.46	-64.97	-62.35	-63.38	-62.48	-20
Highest	2483.5 to 2483.5+BW	-67.53	-63.05	-66.72	-65.73	-65.50	-10
	2483.5+BW to 2483.5+2BW	-67.87	-65.80	-65.99	-65.57	-67.16	-20
Test Mode: BLE							
Lowest	2400-BW to 2400	-65.13	-63.37	-62.74	-60.58	-63.73	-10
	2400-2BW to 2400-BW	-65.46	-61.11	-63.14	-61.00	-61.06	-20
Highest	2483.5 to 2483.5+BW	-67.88	-64.05	-67.61	-66.81	-67.87	-10
	2483.5+BW to 2483.5+2BW	-67.53	-65.68	-66.77	-63.20	-64.64	-20
Note 1: BW please refer to section 7.3 Note 2: the data just list the worst cases							

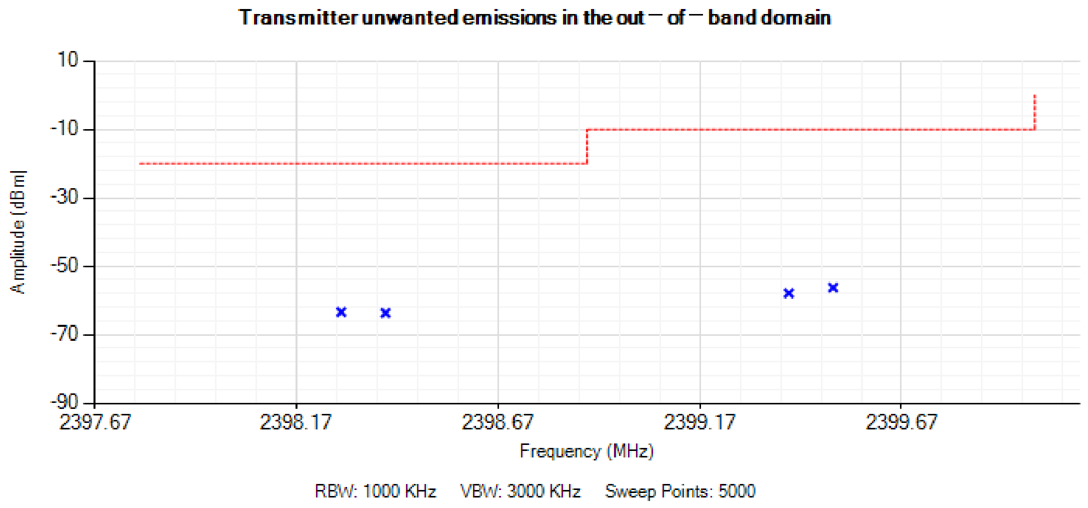
GFSK DH1 Lowest Channel



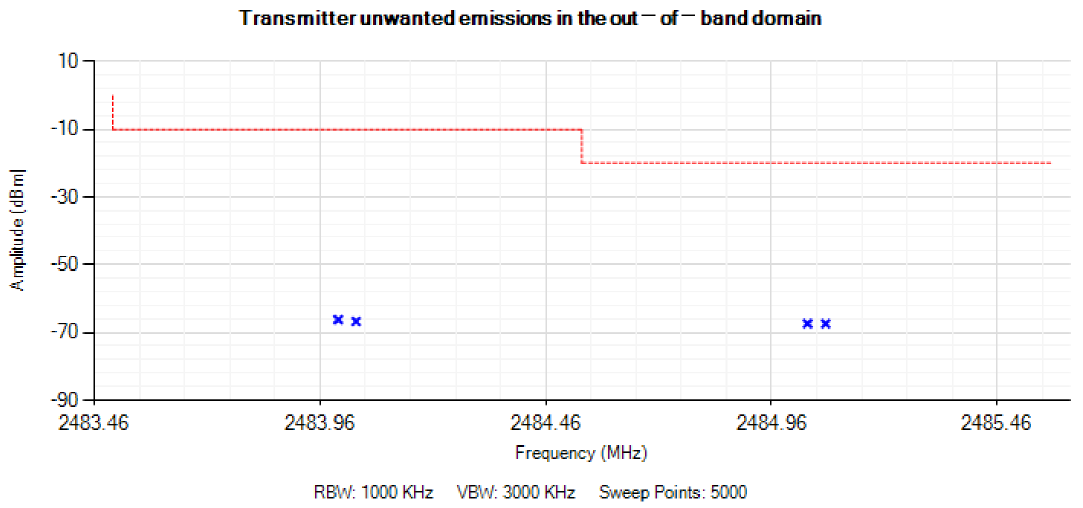
GFSK DH1 Highest Channel



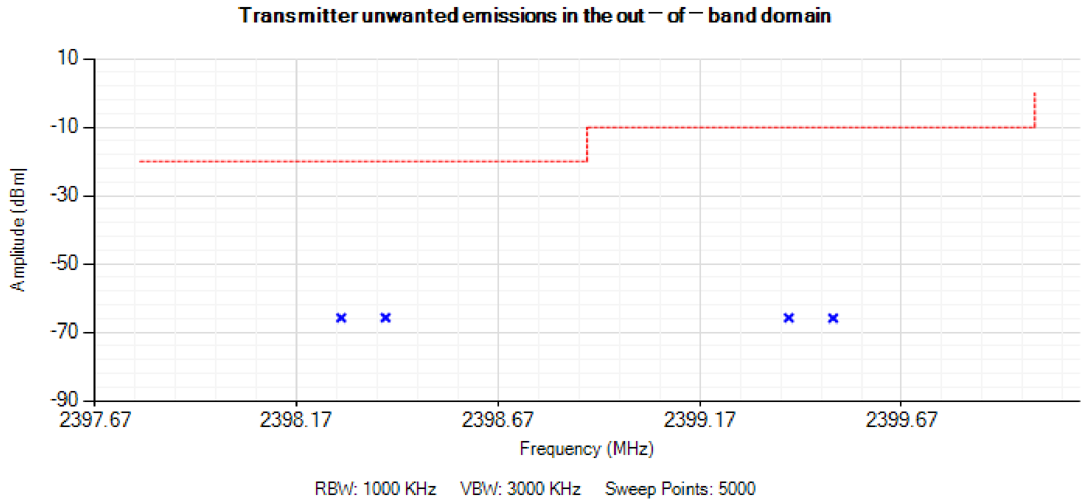
Pi/4 DQPSK 2DH1 Lowest Channel



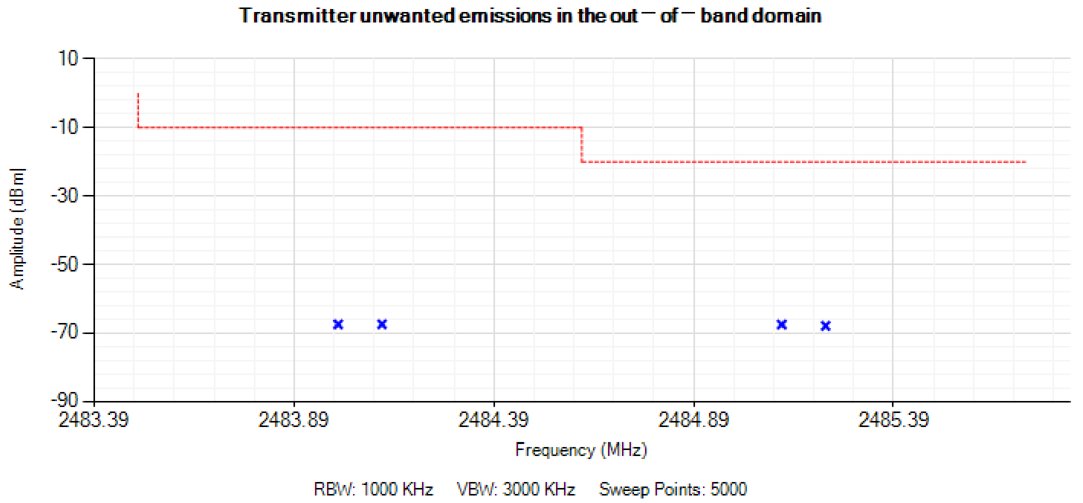
Pi/4 DQPSK 2DH1 Highest Channel



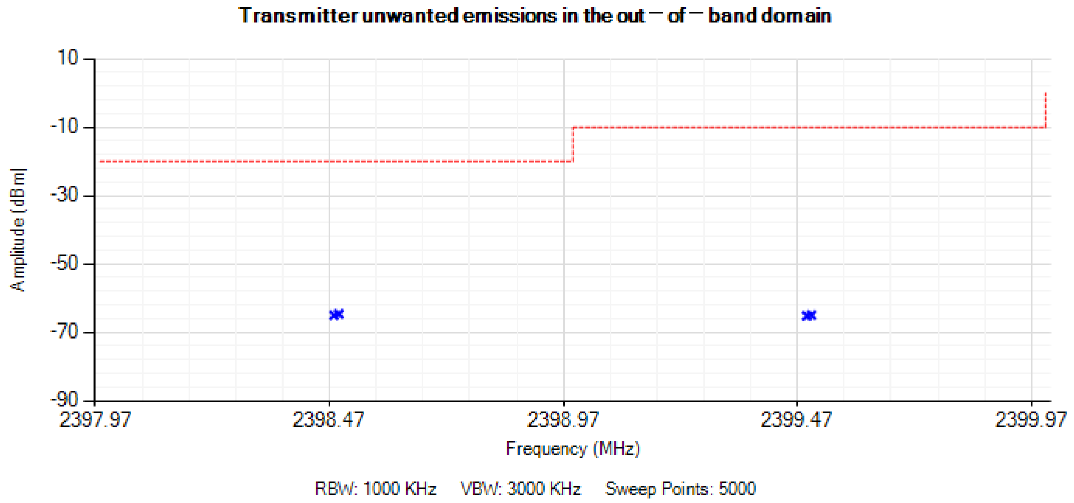
8DPSK 3DH1 Lowest Channel



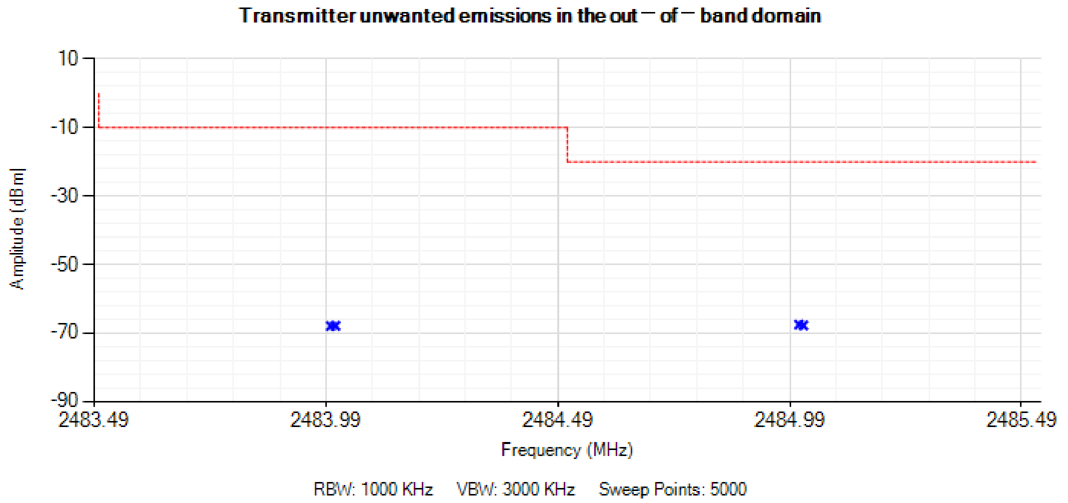
8DPSK 3DH1 Highest Channel



BLE Lowest Channel



BLE Highest Channel



9. Transmitter Unwanted Emissions in the Spurious Domain

9.1 Standard Applicable

According to section 4.3.1.10.3& 4.3.2.9.3
The transmitter unwanted emissions in the spurious domain shall not exceed the values given in the following table.

Frequency range	Maximum power	Bandwidth
30 MHz to 47 MHz	-36 dBm	100 kHz
47 MHz to 74 MHz	-54 dBm	100 kHz
74 MHz to 87,5 MHz	-36 dBm	100 kHz
87,5 MHz to 118 MHz	-54 dBm	100 kHz
118 MHz to 174 MHz	-36 dBm	100 kHz
174 MHz to 230 MHz	-54 dBm	100 kHz
230 MHz to 470 MHz	-36 dBm	100 kHz
470 MHz to 862 MHz	-54 dBm	100 kHz
862 MHz to 1 GHz	-36 dBm	100 kHz
1 GHz to 12,75 GHz	-30 dBm	1 MHz

9.2 Test Procedure

See clause 5.1 for the test conditions. These measurements shall only be performed at normal test conditions.
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

The device under test has an integral antenna and the radiated measurement shall apply to the device, using the method of measurement as described in the EN300328 section 5.3.10.2.

RBW=100kHz VBW=300kHz 30MHz-1GHz
RBW=1MHz VBW=3MHz 1GHz-12.75GHz

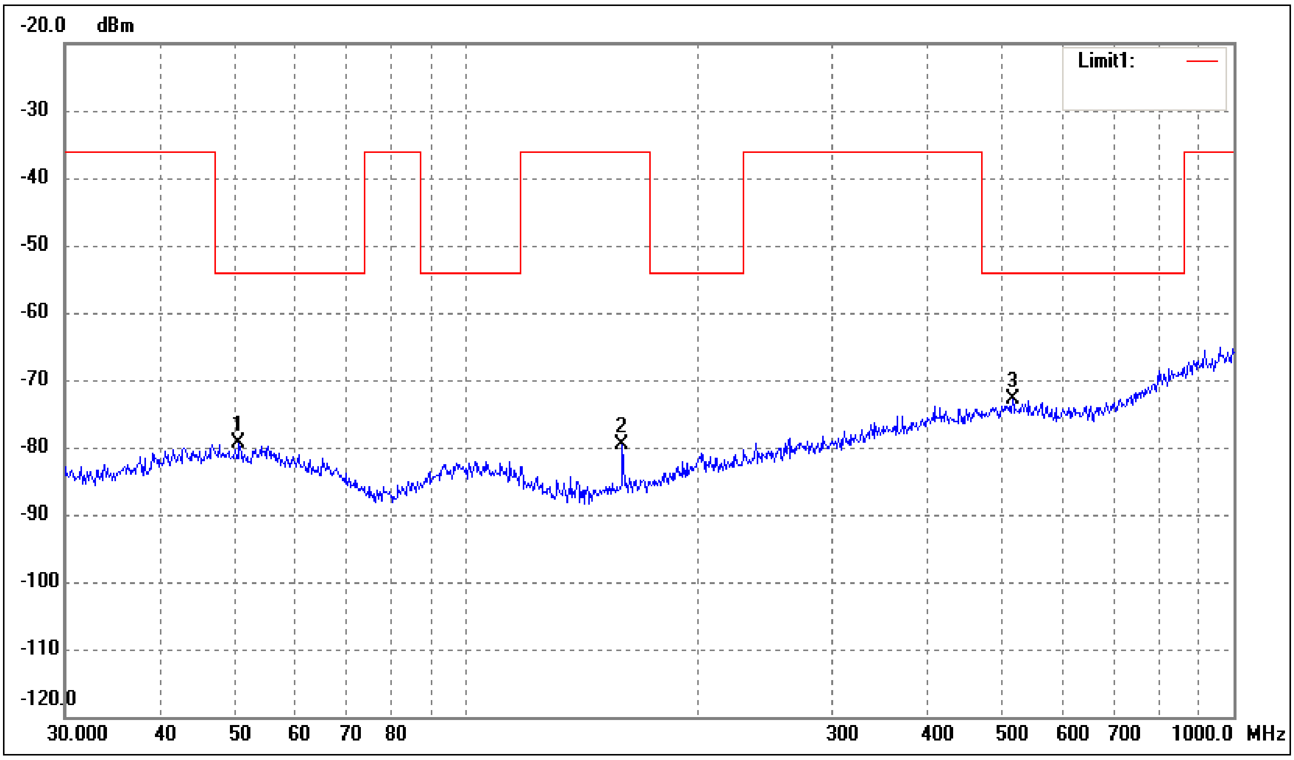
9.3 Summary of Test Results/Plots

According to the data, the EUT complied with the EN 300328 standards, and had the worst cases:

Spurious Emission from 30MHz to 1GHz

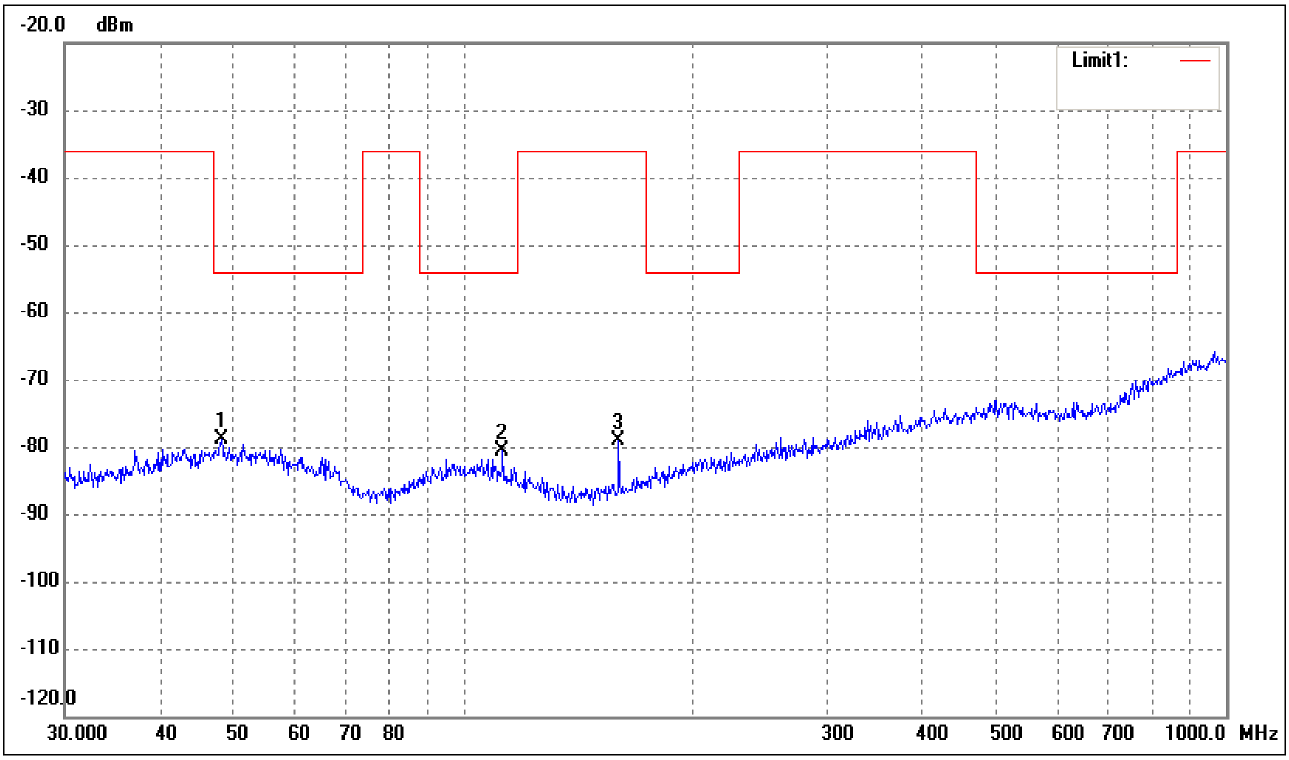
Test Mode: Transmitting-Lowest channel

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	50.5860	-83.58	4.30	-79.28	-54.00	-25.28	ERP
2	159.7844	-79.12	-0.55	-79.67	-36.00	-43.67	ERP
3	515.4374	-83.42	10.61	-72.81	-54.00	-18.81	ERP

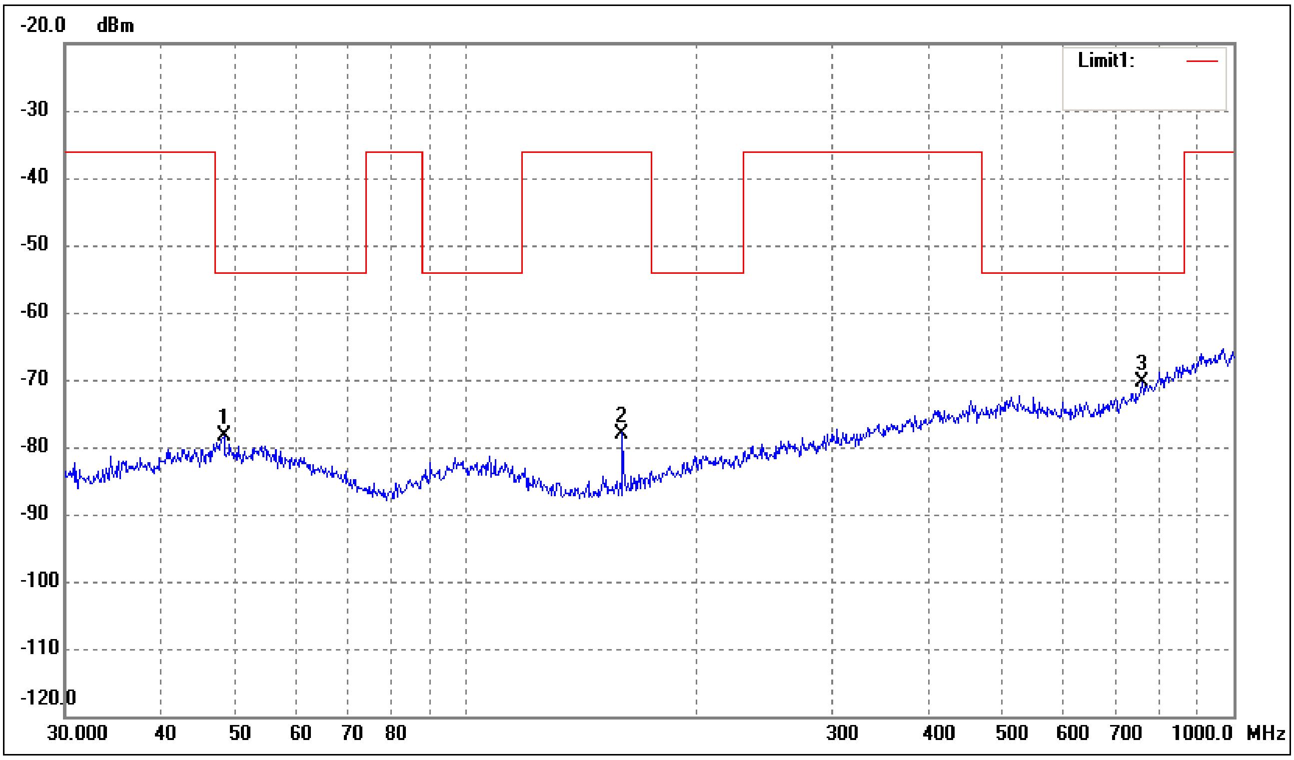
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	48.1626	-83.23	4.34	-78.89	-54.00	-24.89	ERP
2	112.5244	-82.31	1.78	-80.53	-54.00	-26.53	ERP
3	159.7844	-78.47	-0.55	-79.02	-36.00	-43.02	ERP

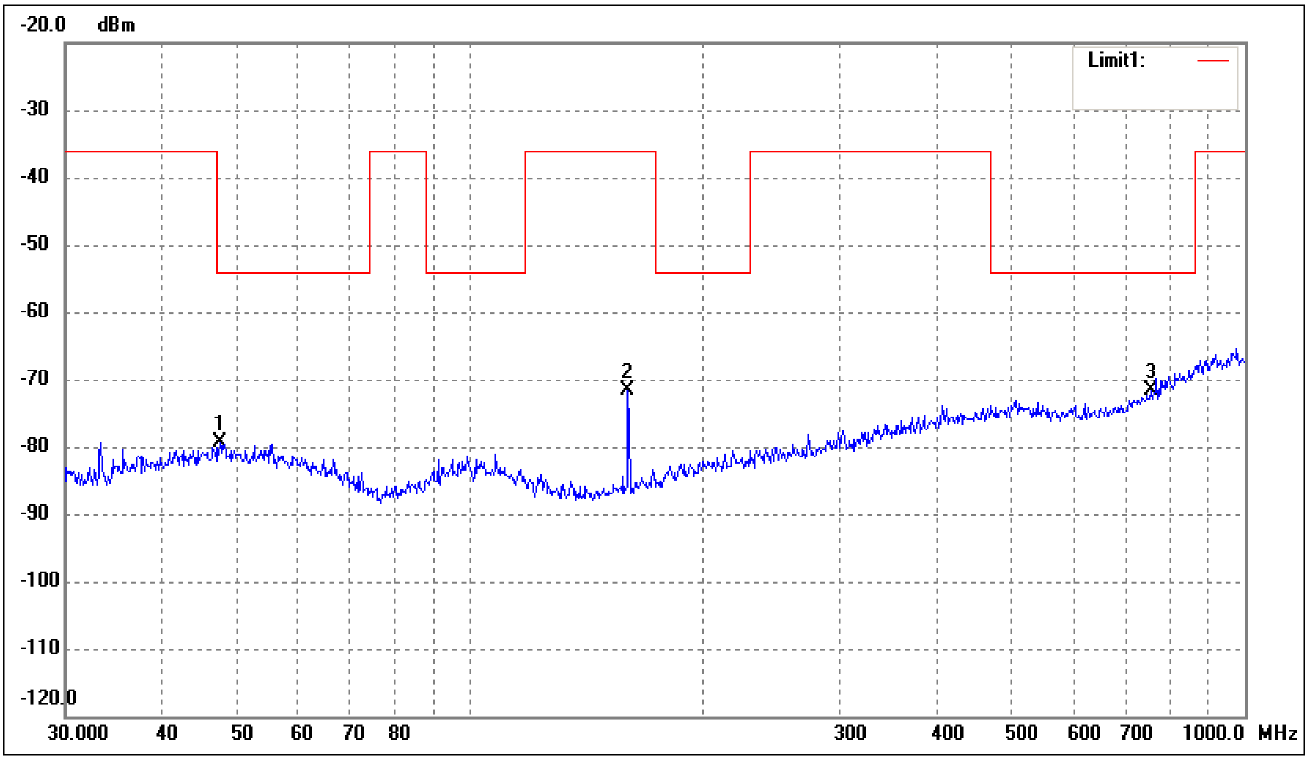
Test Mode: Transmitting-Highest channel

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	48.3318	-82.80	4.35	-78.45	-54.00	-24.45	ERP
2	159.7844	-77.45	-0.55	-78.00	-36.00	-42.00	ERP
3	760.7036	-83.45	13.19	-70.26	-54.00	-16.26	ERP

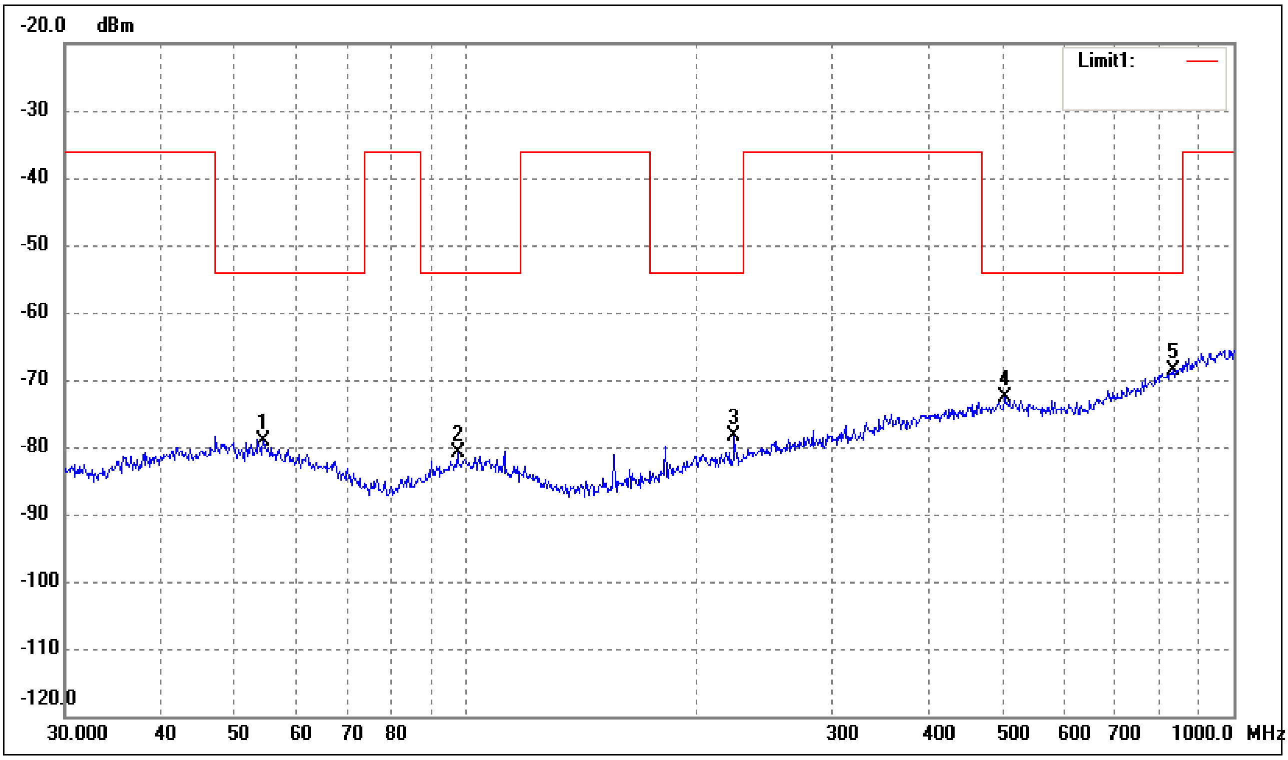
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	47.4918	-83.67	4.35	-79.32	-54.00	-25.32	ERP
2	159.7844	-70.97	-0.55	-71.52	-36.00	-35.52	ERP
3	755.3873	-86.59	14.90	-71.69	-54.00	-17.69	ERP

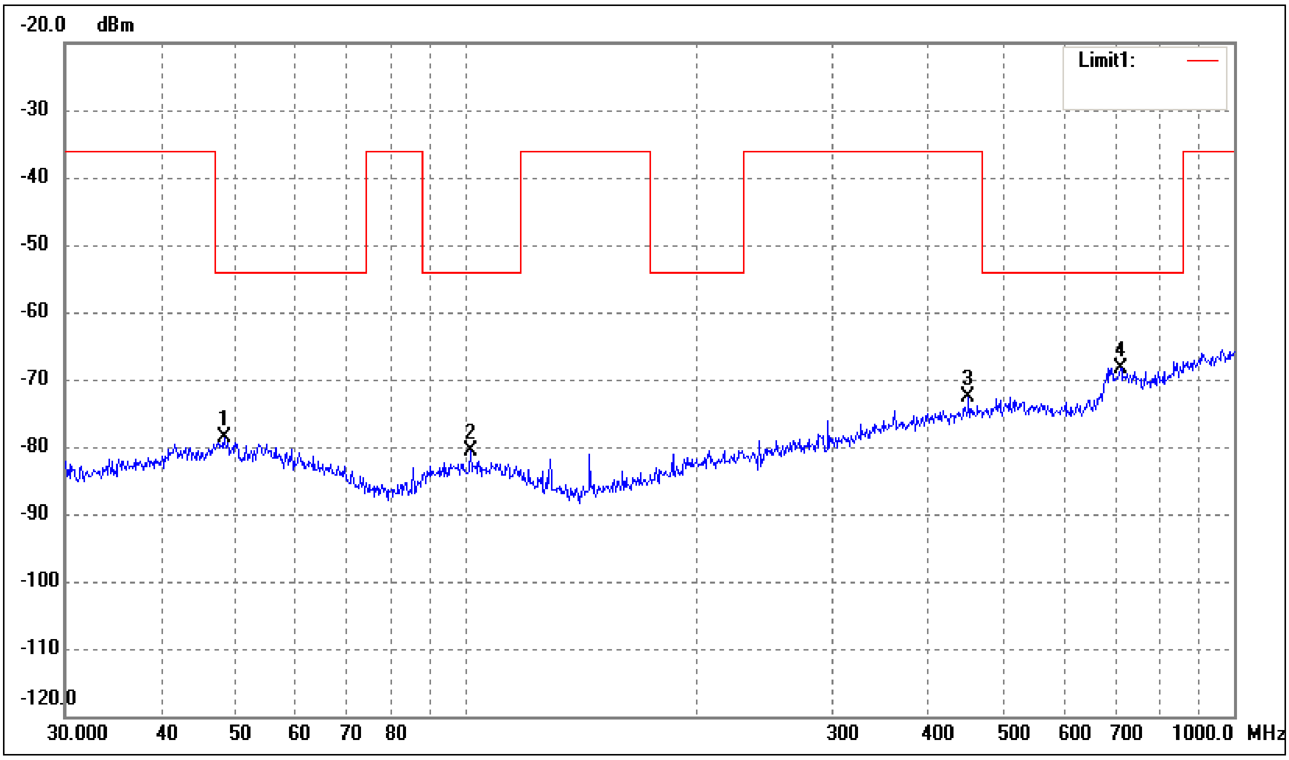
Test Mode: Transmitting-Lowest channel(BLE)

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	54.4516	-83.08	3.90	-79.18	-54.00	-25.18	ERP
2	97.4560	-82.88	1.93	-80.95	-54.00	-26.95	ERP
3	223.7334	-81.53	3.10	-78.43	-54.00	-24.43	ERP
4	502.9395	-83.33	10.66	-72.67	-54.00	-18.67	ERP
5	833.3171	-83.94	15.30	-68.64	-54.00	-14.64	ERP

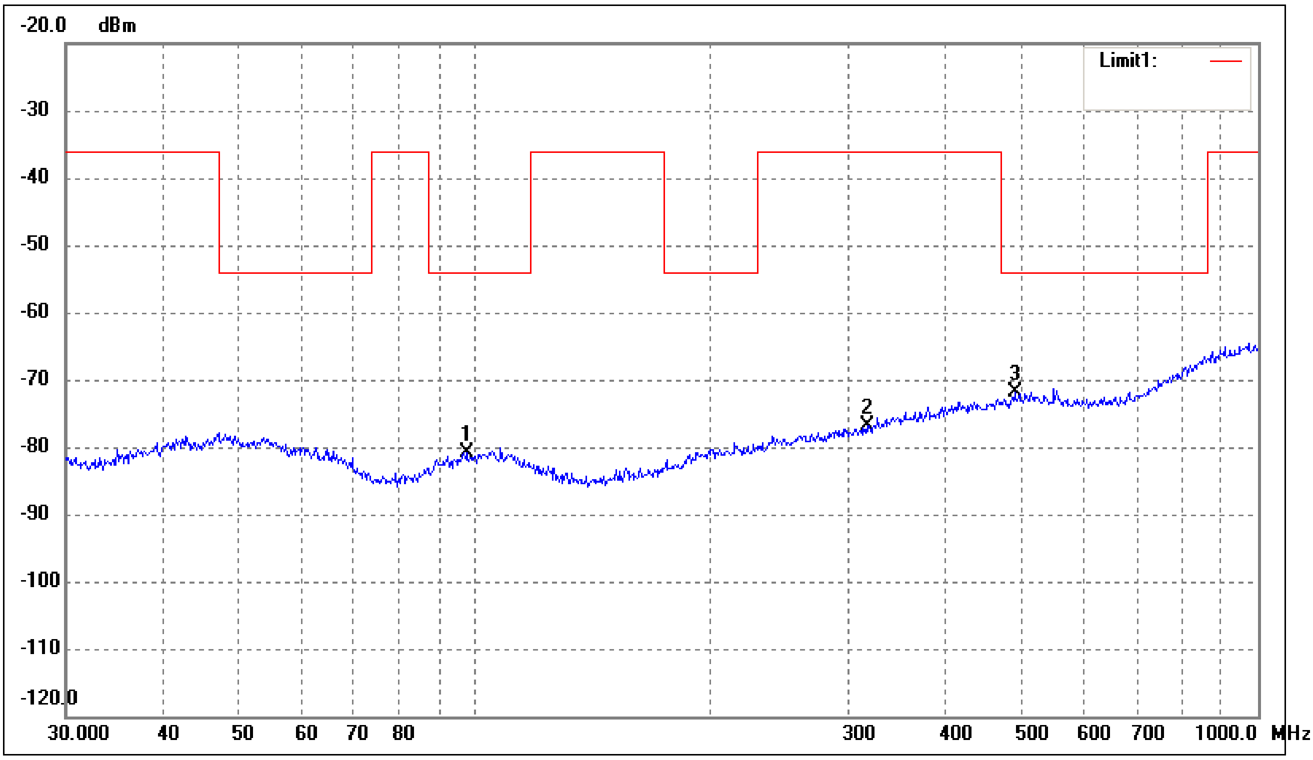
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	48.3318	-82.99	4.35	-78.64	-54.00	-24.64	ERP
2	101.2885	-82.82	2.24	-80.58	-54.00	-26.58	ERP
3	451.1350	-82.34	9.64	-72.70	-36.00	-36.70	ERP
4	711.6734	-82.52	14.18	-68.34	-54.00	-14.34	ERP

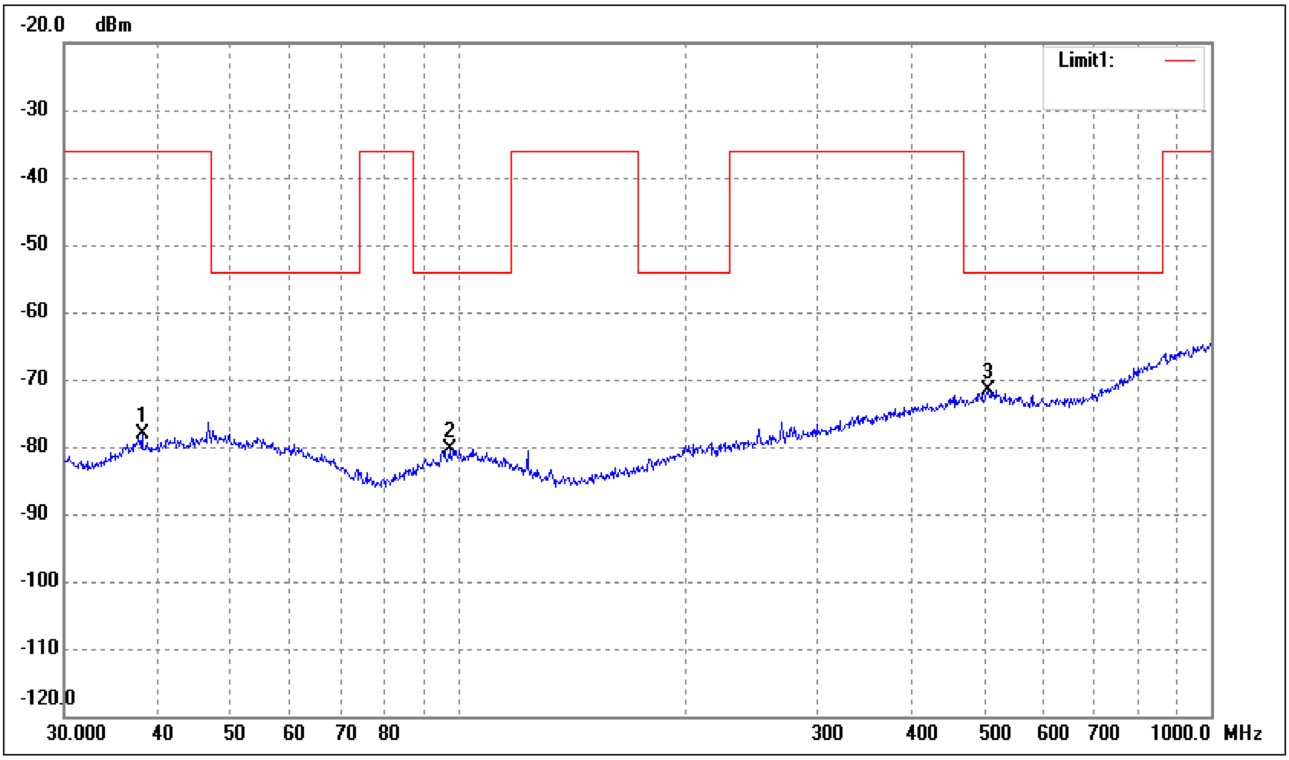
Test Mode: Transmitting-Highest channel(BLE)

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	97.4560	-82.74	1.93	-80.81	-54.00	-26.81	ERP
2	316.5890	-82.94	6.17	-76.77	-36.00	-40.77	ERP
3	489.0269	-82.28	10.43	-71.85	-54.00	-17.85	ERP

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	38.0783	-81.04	2.97	-78.07	-36.00	-42.07	ERP
2	97.4560	-82.31	1.93	-80.38	-54.00	-26.38	ERP
3	506.4791	-82.41	10.83	-71.58	-54.00	-17.58	ERP

Spurious Emission Above 1GHz

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Lowest Channel-2402MHz						
4804.00	-48.57	7.86	-40.71	-30	-10.71	H
7206.00	-47.68	12.80	-34.88	-30	-4.88	H
4804.00	-47.73	7.86	-39.87	-30	-9.87	V
7206.00	-46.88	12.80	-34.08	-30	-4.08	V
Highest Channel-2480MHz						
4960.00	-48.15	8.32	-39.83	-30	-9.83	H
7440.00	-49.29	13.86	-35.43	-30	-5.43	H
4960.00	-49.62	8.32	-41.30	-30	-11.30	V
7440.00	-49.75	13.86	-35.89	-30	-5.89	V

For BLE

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Lowest Channel-2402MHz						
4804.00	-49.91	7.86	-42.05	-30	-12.05	H
7206.00	-47.20	12.80	-34.40	-30	-4.40	H
4804.00	-47.93	7.86	-40.07	-30	-10.07	V
7206.00	-47.01	12.80	-34.21	-30	-4.21	V
Highest Channel-2480MHz						
4960.00	-47.72	8.32	-39.40	-30	-9.40	H
7440.00	-48.57	13.86	-34.71	-30	-4.71	H
4960.00	-48.96	8.32	-40.64	-30	-10.64	V
7440.00	-50.79	13.86	-36.93	-30	-6.93	V

Note 1: Testing is carried out with frequency rang 30MHz to 12.75GHz, which above 4th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Note 2: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.
And The worst case of EDR mode is DH1

Conducted Transmitter Spurious Emission:

For BR, EDR Worst case is DH1

Measurement frequency range(MHz)	Max. spurious emission frequency (MHz)	Measured value dBm	Limit dBm	Result
Low Channel 2402MHz				
30-47	36.96	-58.26	-36	Pass
47-74	62.61	-56.09	-54	Pass
74-87.5	76.52	-61.30	-36	Pass
87.5-118	102.17	-66.09	-54	Pass
118-174	143.04	-66.52	-36	Pass
174-230	198.26	-68.70	-54	Pass
230-470	420.00	-56.09	-36	Pass
470-862	630.87	-65.65	-54	Pass
862-1000	1998.70	-54.35	-36	Pass
1000-12750	2779.57	-60.00	-30	Pass
High Channel 2480MHz				
30-47	32.17	-66.09	-36	Pass
47-74	56.52	-66.96	-54	Pass
74-87.5	75.65	-60.00	-36	Pass
87.5-118	116.52	-59.57	-54	Pass
118-174	152.17	-56.52	-36	Pass
174-230	220.43	-60.43	-54	Pass
230-470	375.65	-66.52	-36	Pass
470-862	792.17	-59.57	-54	Pass
862-1000	2010.43	-65.22	-36	Pass
1000-12750	5423.48	-51.74	-30	Pass

For BLE

Measurement frequency range(MHz)	Max. spurious emission frequency (MHz)	Measured value dBm	Limit dBm	Result
Low Channel 2402MHz				
30-47	39.57	-50.00	-36	Pass
47-74	59.57	-64.35	-54	Pass
74-87.5	74.78	-56.96	-36	Pass
87.5-118	100.00	-62.61	-54	Pass
118-174	134.78	-59.13	-36	Pass
174-230	177.39	-57.39	-54	Pass
230-470	299.57	-66.52	-36	Pass
470-862	639.13	-65.22	-54	Pass
862-1000	1556.52	-58.26	-36	Pass
1000-12750	3579.57	-46.09	-30	Pass
High Channel 2480MHz				
30-47	30.00	-56.52	-36	Pass
47-74	47.83	-61.30	-54	Pass
74-87.5	83.48	-69.13	-36	Pass
87.5-118	110.43	-58.70	-54	Pass
118-174	141.74	-61.74	-36	Pass
174-230	199.13	-56.52	-54	Pass
230-470	259.57	-51.30	-36	Pass
470-862	609.57	-54.78	-54	Pass
862-1000	2453.04	-63.04	-36	Pass
1000-12750	2904.78	-53.91	-30	Pass

Note 1: Testing is carried out with frequency rang 30MHz to 12.75GHz, which emissions are too small are not list above .

10. Receiver Spurious Emissions

10.1 Standard Applicable

According to section 4.3.1.11.3&4.3.2.10.3, The spurious emissions of the receiver shall not exceed the values given in table below
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. Spurious emission limits for receivers

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

10.2 Test Procedure

See clause 5.1 for the test conditions. These measurements shall only be performed at normal test conditions.
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

The device under test has an integral antenna and the radiated measurement shall apply to the device, using the method of measurement as described in the EN300328 section 5.3.11.2.

RBW=100kHz VBW=300kHz 30MHz-1GHz
RBW=1MHz VBW=3MHz 1GHz-12.75GHz

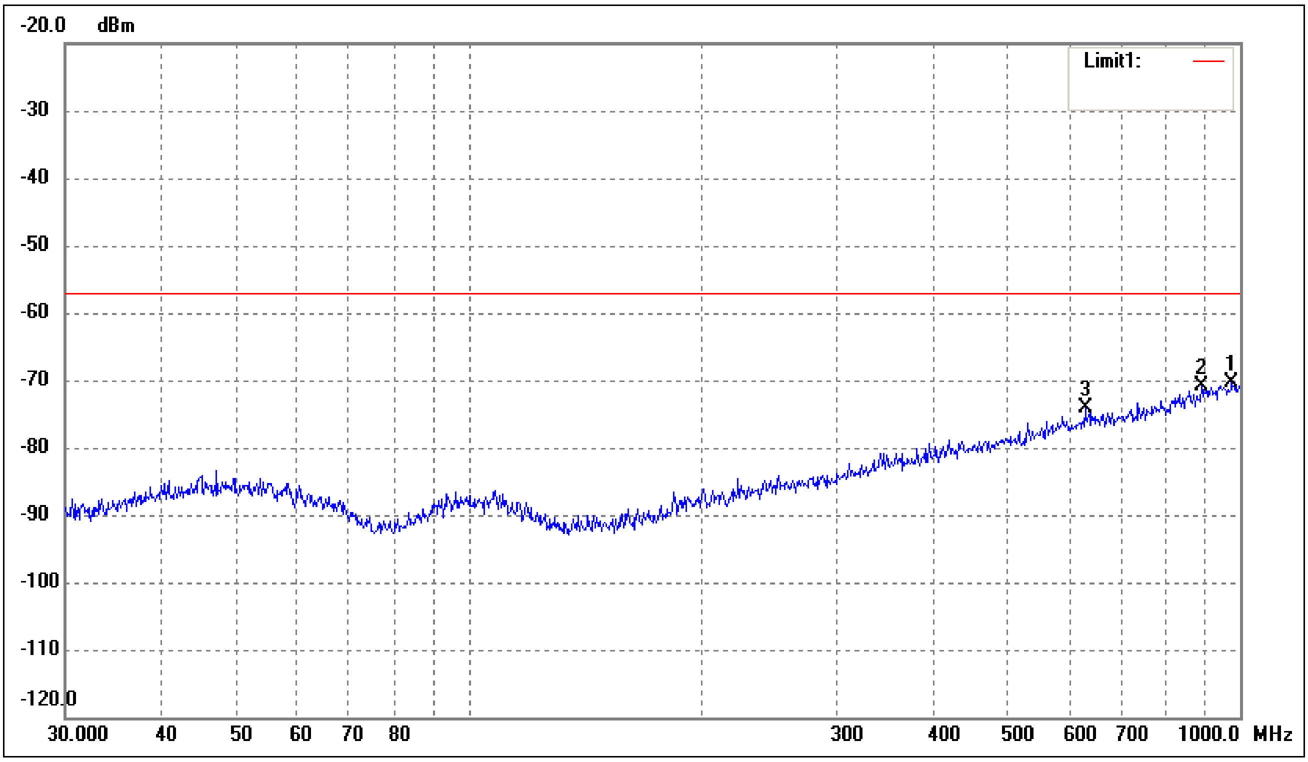
10.3 Summary of Test Results/Plots

According to the data, the EUT complied with the EN 300328 standards, and had the worst case:

EDR Mode The worst case is DH1

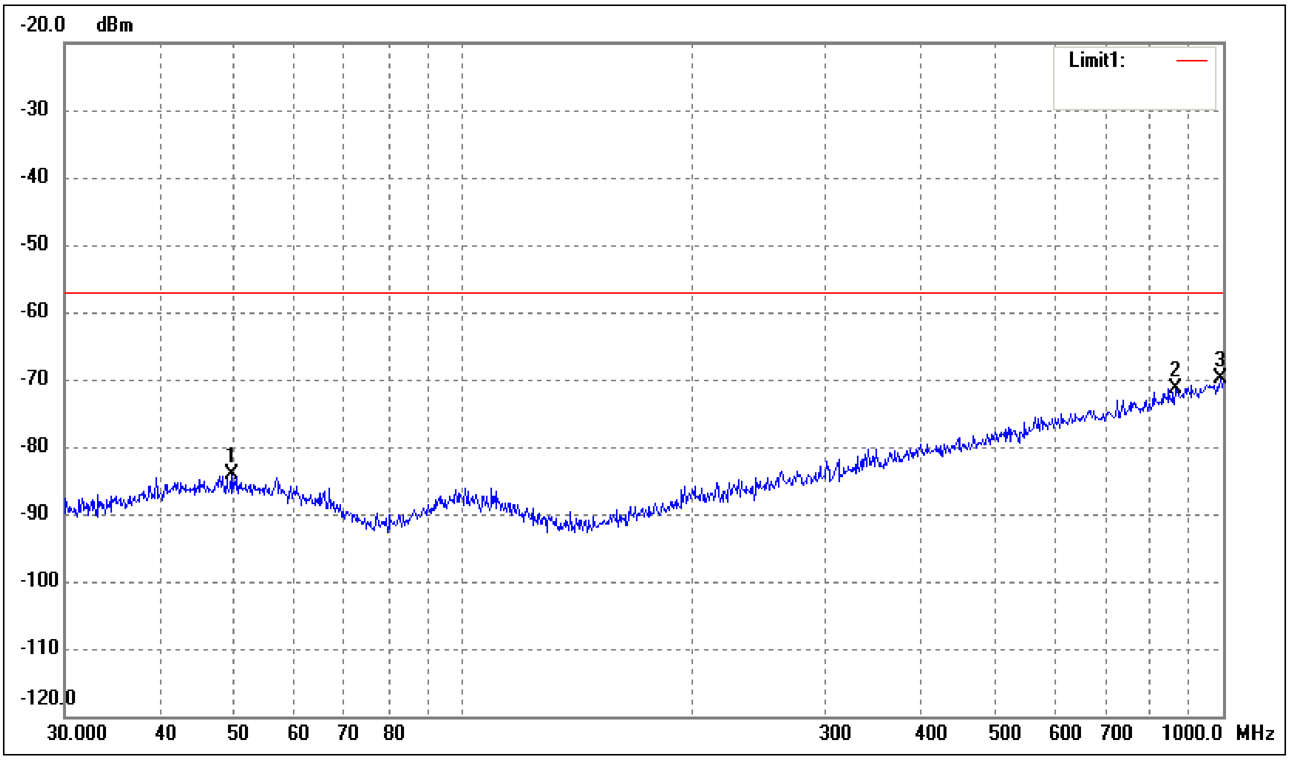
Test Mode: Receiving

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	975.7529	-88.58	18.12	-70.46	-57.00	-13.46	ERP
2	890.7278	-87.71	16.90	-70.81	-57.00	-13.81	ERP
3	629.4772	-84.60	10.36	-74.24	-57.00	-17.24	ERP

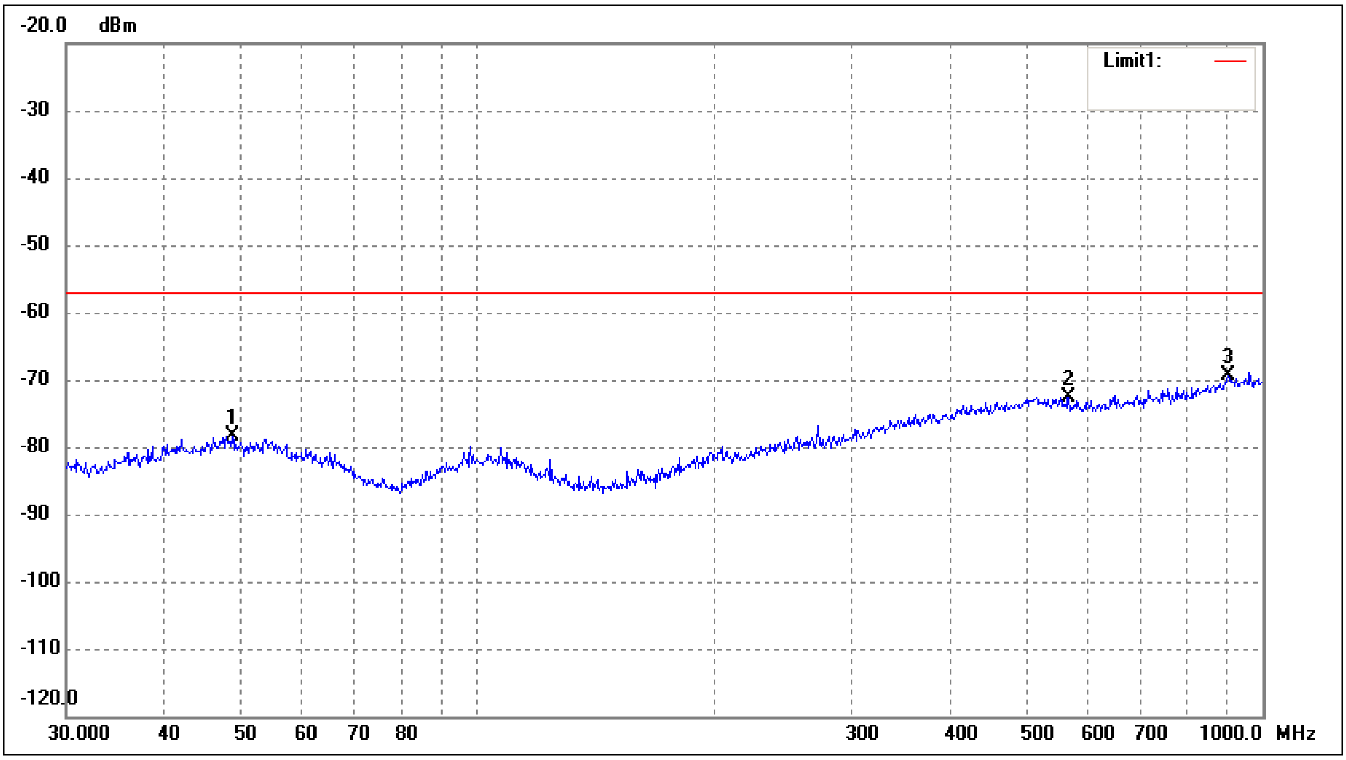
Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	49.7068	-88.38	4.36	-84.02	-57.00	-27.02	ERP
2	866.0879	-87.87	16.51	-71.36	-57.00	-14.36	ERP
3	993.0114	-88.14	18.38	-69.76	-57.00	-12.76	ERP

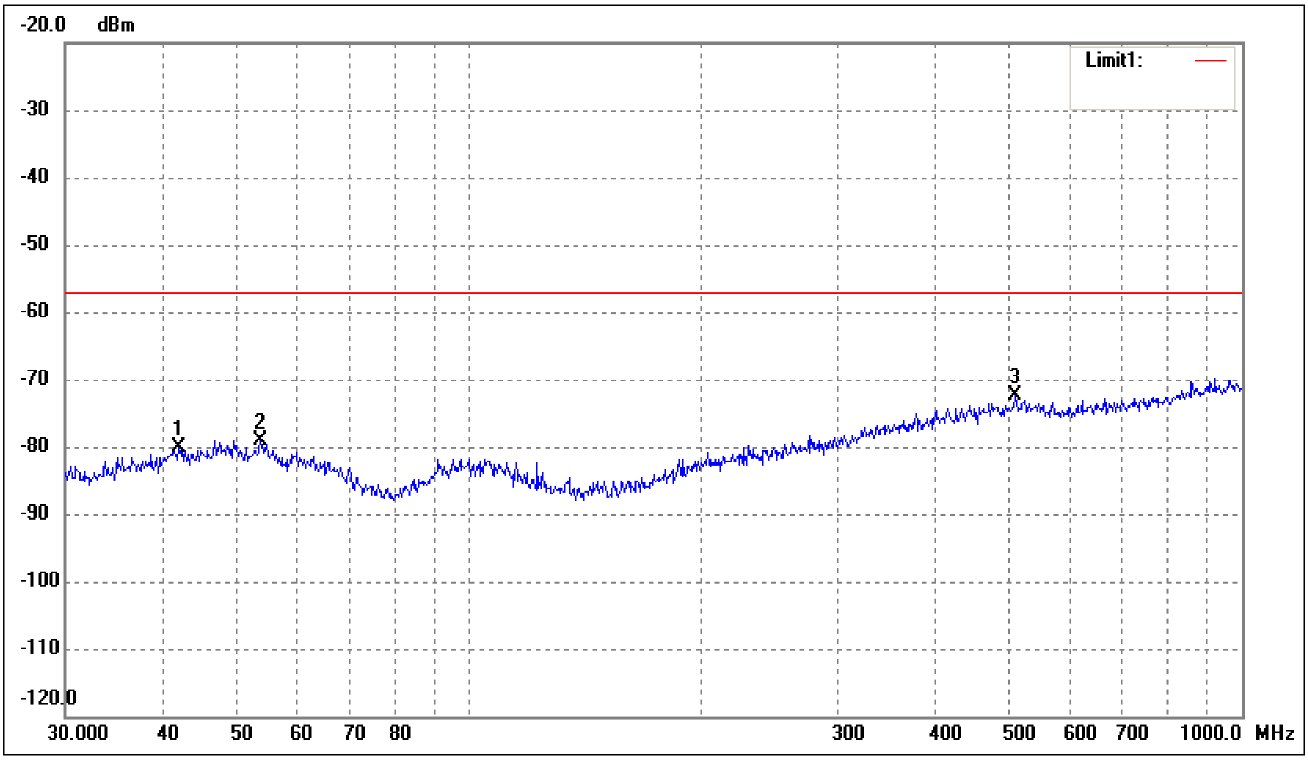
BLE Mode

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	
1	48.8429	-70.83	-7.45	-78.28	-57.00	-21.28	ERP
2	566.6223	-73.01	0.48	-72.53	-57.00	-15.53	ERP
3	903.3094	-74.91	5.42	-69.49	-57.00	-12.49	ERP

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	
1	42.0066	-83.88	3.75	-80.13	-57.00	-23.13	ERP
2	53.6932	-83.06	3.98	-79.08	-57.00	-22.08	ERP
3	508.2582	-82.96	10.63	-72.33	-57.00	-15.33	ERP

Note: Testing is carried out with frequency rang 30MHz to 12.75GHz, which above 1GHz are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Conducted Receiver Spurious Emission:

Hopping Mode

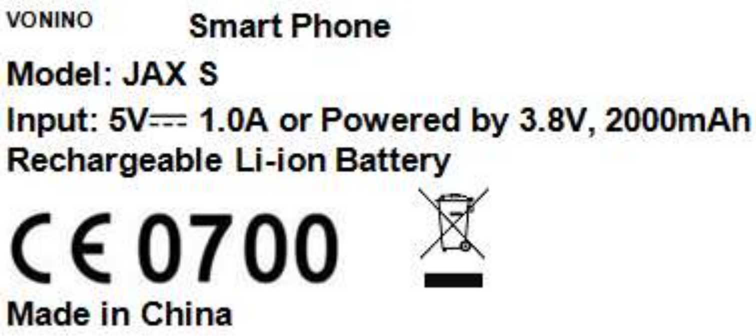
Measurement frequency range(MHz)	Max. spurious emission frequency (MHz)	Measured value dBm	Limit dBm	Result
30-1000	736.09	-58.26	-57	Pass
1000-12750	8413.91	-55.65	-47	Pass

BLE Mode

Measurement frequency range(MHz)	Max. spurious emission frequency (MHz)	Measured value dBm	Limit dBm	Result
30-1000	108.26	-66.96	-57	Pass
1000-12750	10764.78	-57.83	-47	Pass

EXHIBIT 1 - PRODUCT LABELING

Proposed CE Label Format



Specifications: Text is Black in color and is justified. Labels are printed in indelible ink on permanent adhesive backing or silk-screened onto the EUT or shall be affixed at a conspicuous location on the EUT. The ‘CE’ marking must be affixed to the EUT or to its data plate. Where this is not possible or not warranted on account of the nature of the apparatus, it must be affixed to the packaging, if any, and to the accompanying documents. The ‘CE’ marking is allowed less than 5 mm but must clear. If the ‘CE’ marking is reduced or enlarged the proportions given in the above graduated drawing must be respected. The Importer name, address and Manufacturer name and address should indicate on marking label or packaging or in a document accompanying

Proposed Label Location on EUT

CE Label Location

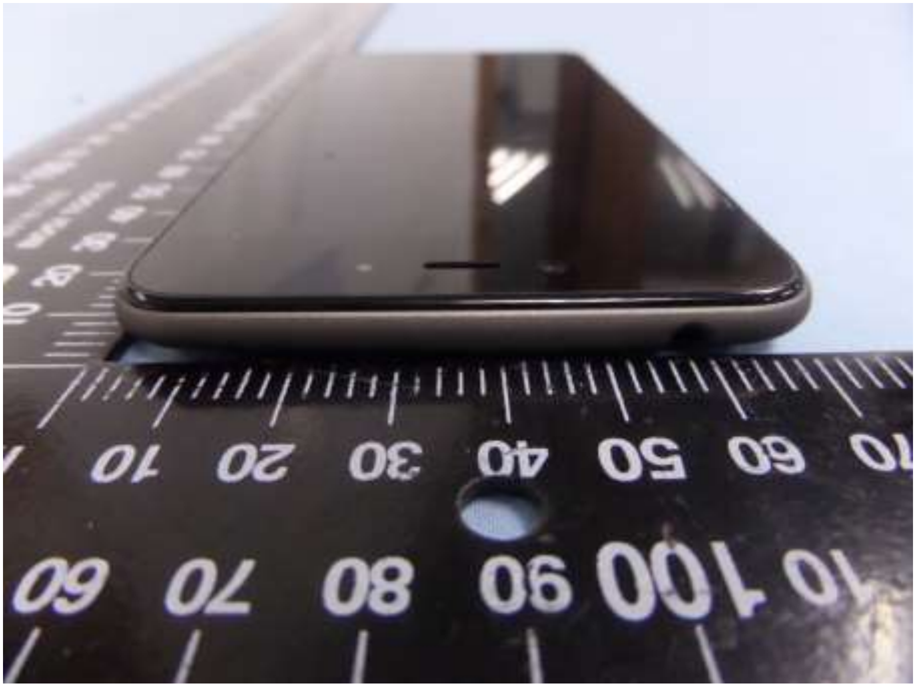
EXHIBIT 2 - EUT PHOTOGRAPHS

EUT View 1

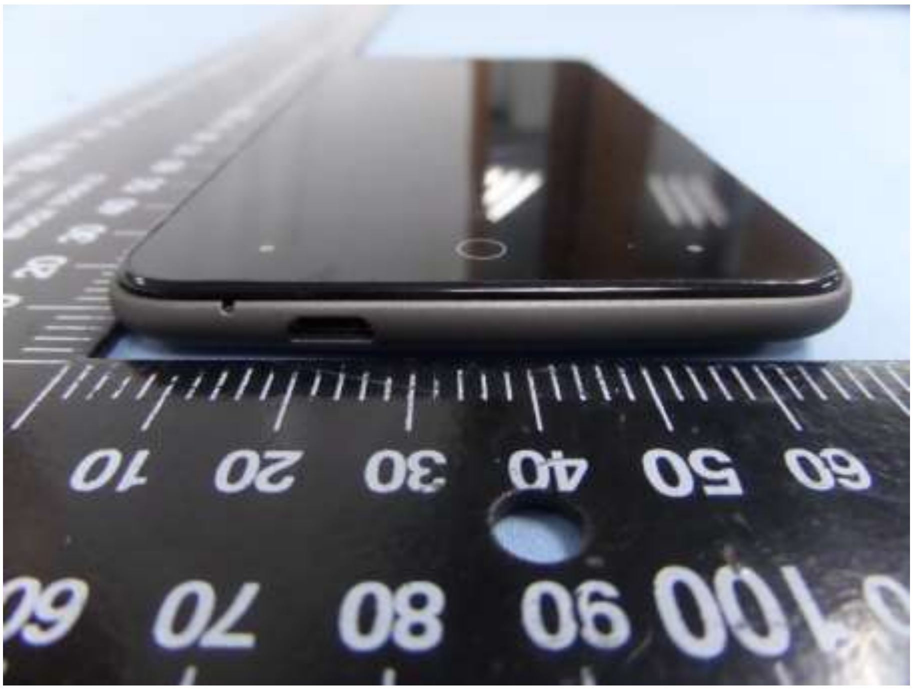
EUT View 2

EUT View 3

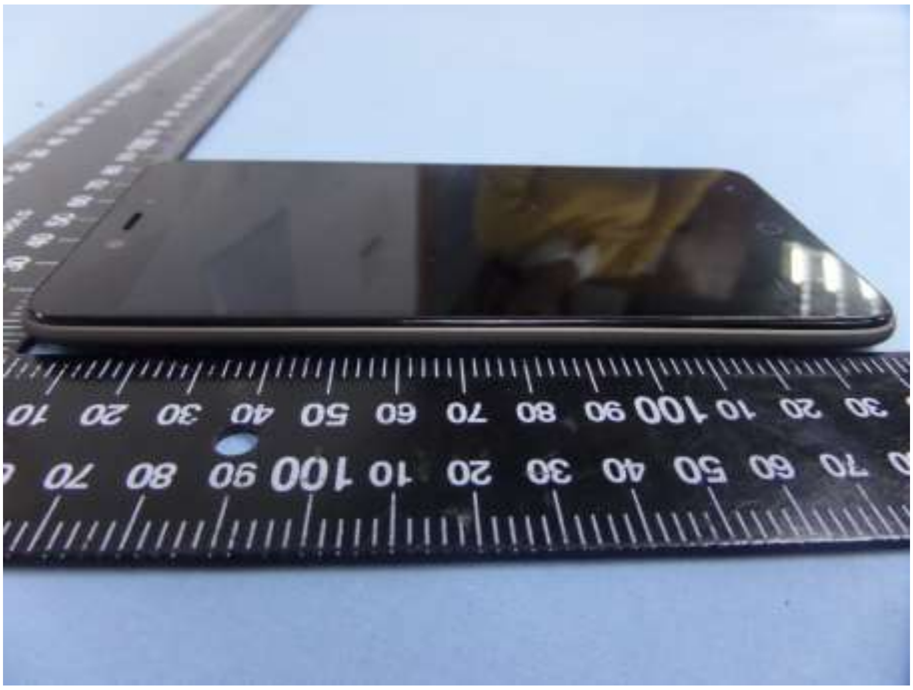
EUT View 4



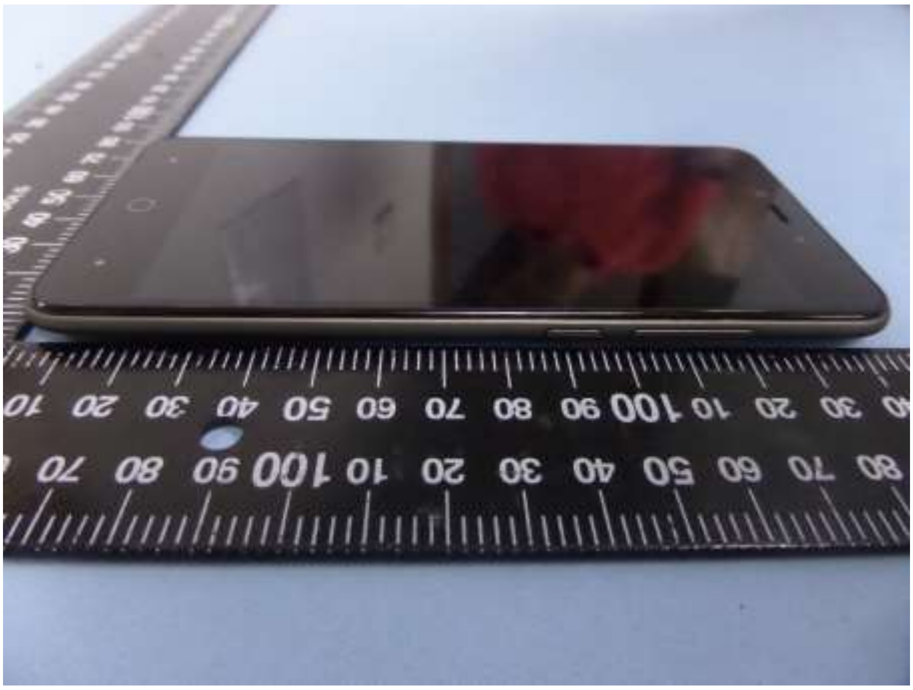
EUT View 5



EUT View 6



EUT View 7



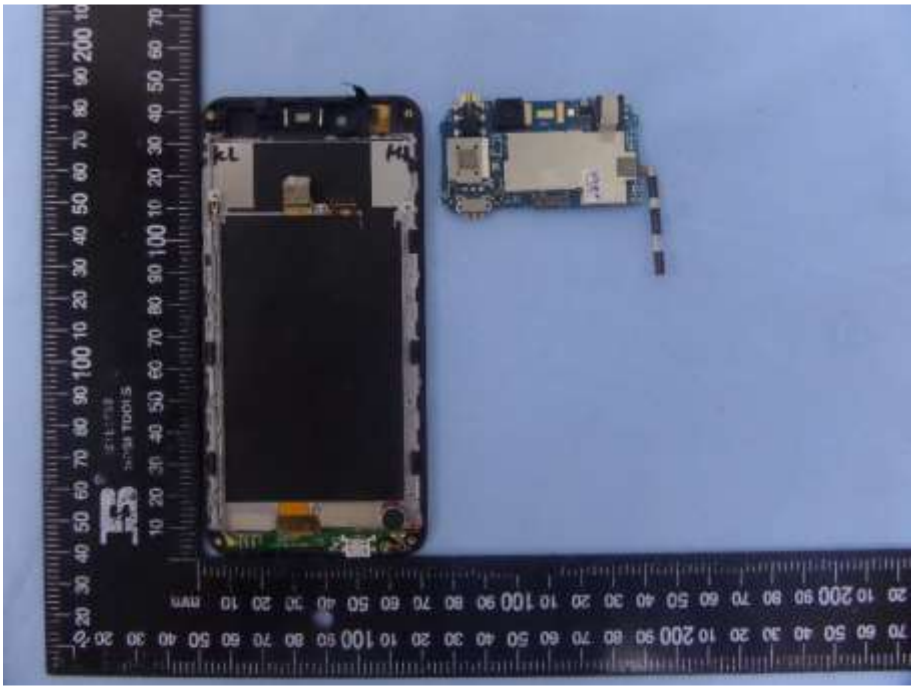
EUT Housing and Board View 1

Wi-Fi/BT/GPS Ant.

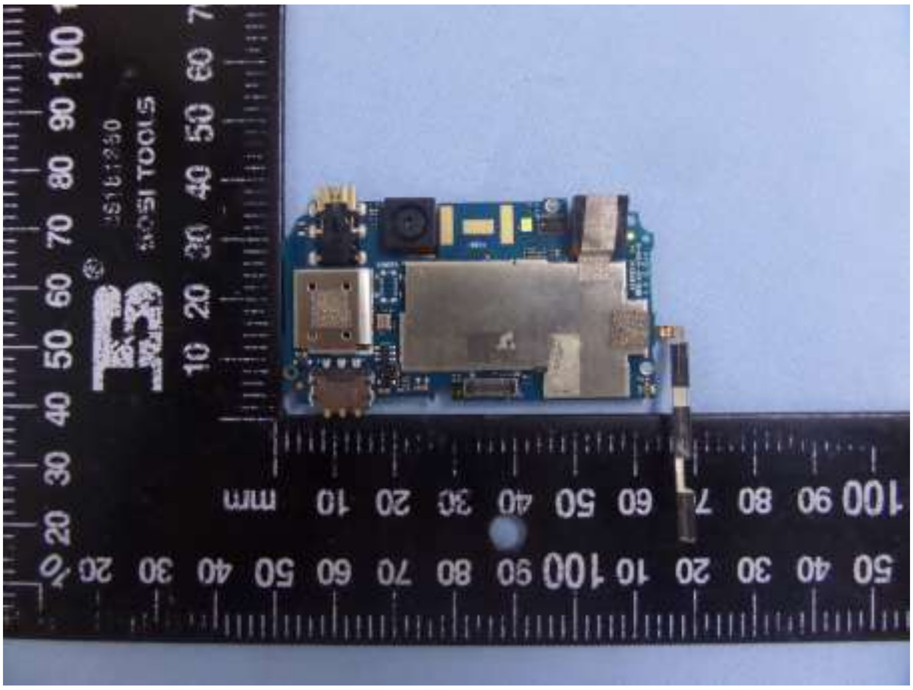
GSM/WCDMA Ant.

EUT Housing and Board View 2

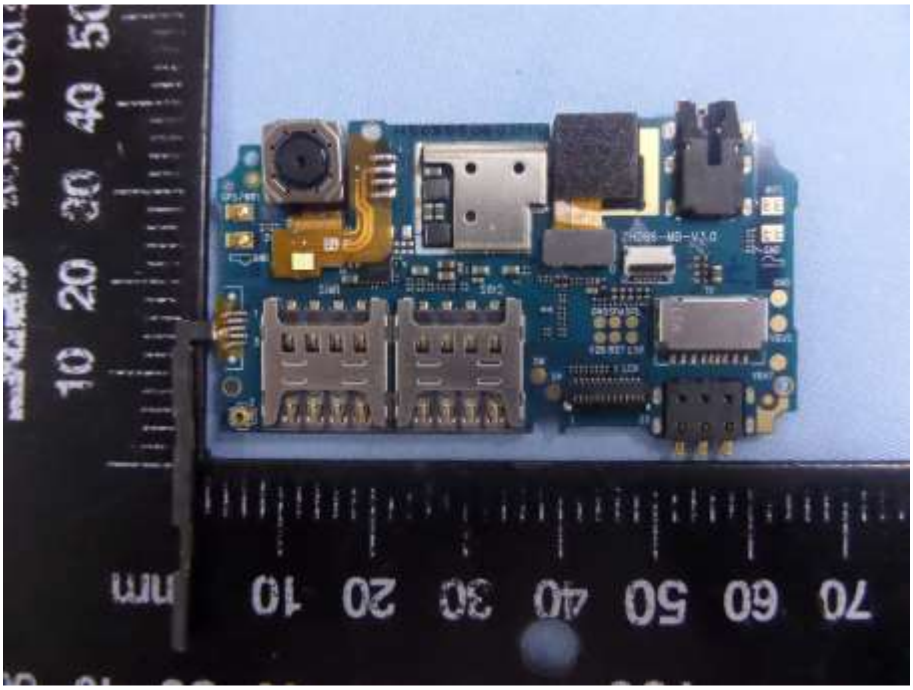
EUT Housing and Board View 3



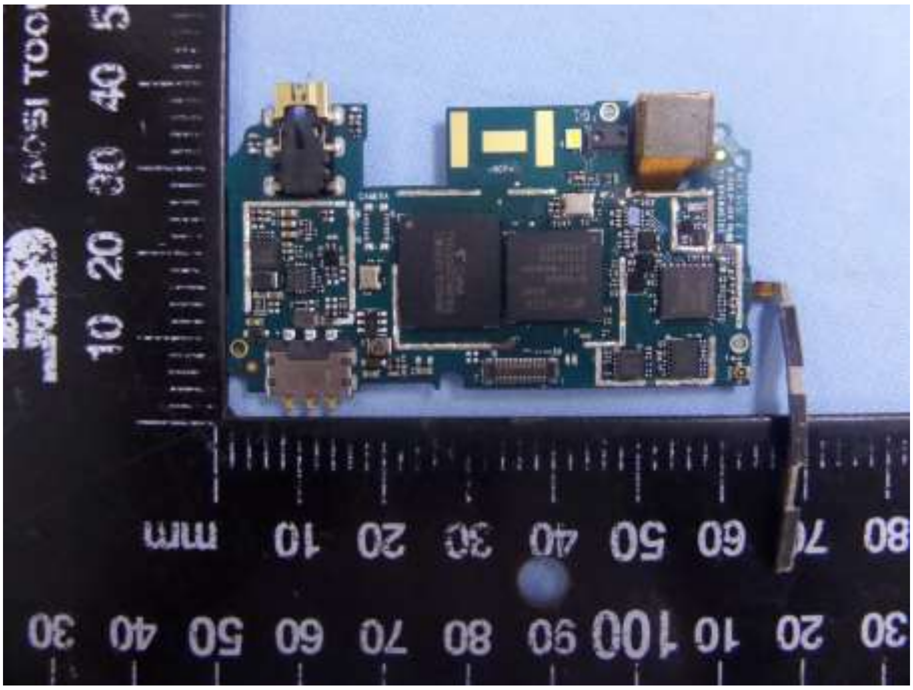
Solder Board-Component View 1



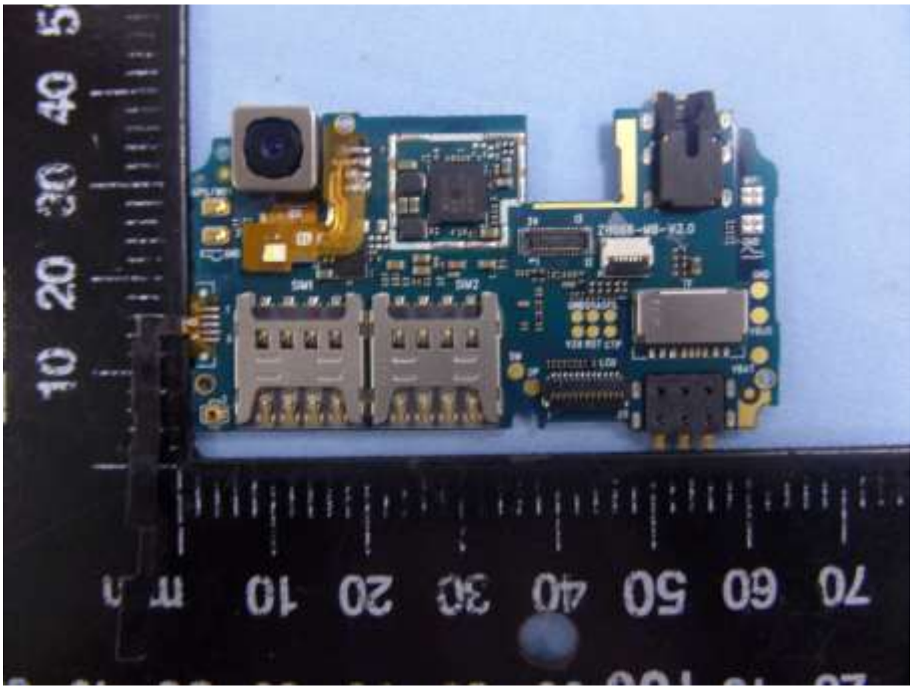
Solder Board-Component View 2



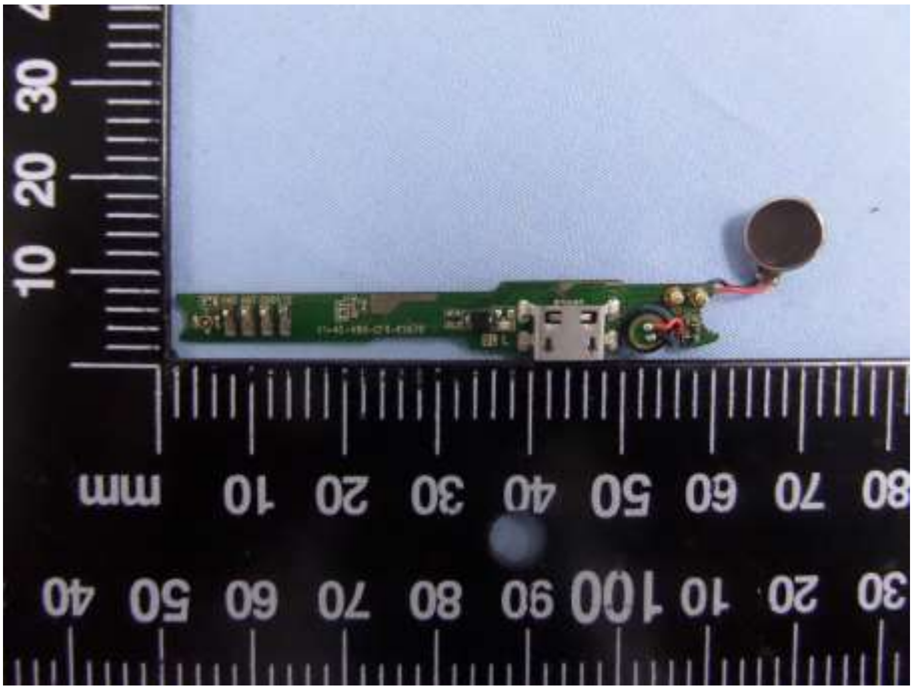
Solder Board-Component View 3



Solder Board-Component View 4



Solder Board-Component View 5



Solder Board-Component View 6

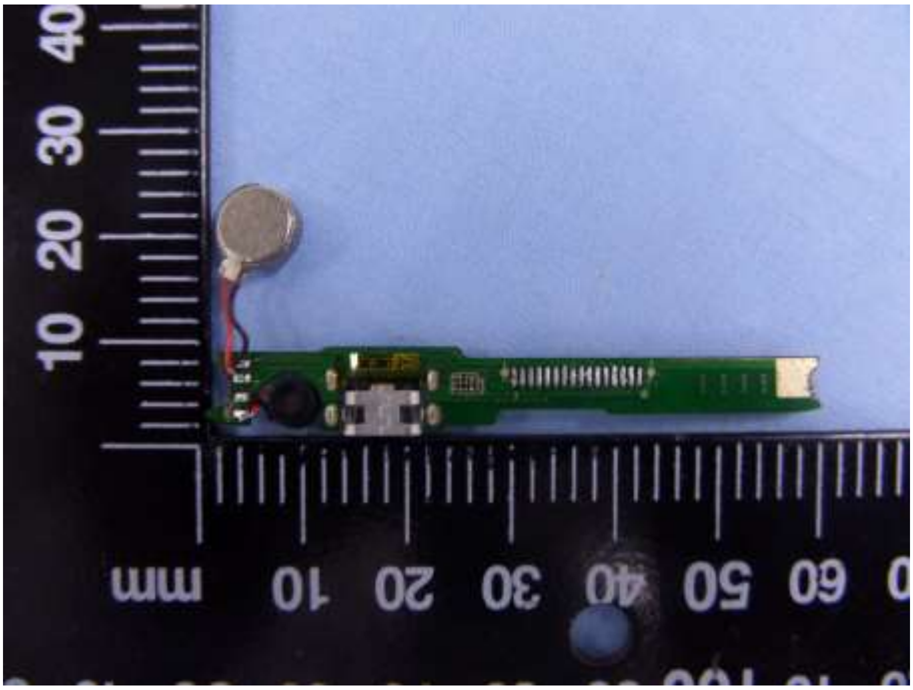


EXHIBIT 3 - TEST SETUP PHOTO

Spurious Emission Test Setup (Below 1GHz)

Spurious Emission Test Setup (Above 1GHz)

Extreme Condition Test Setup

******* END OF REPORT *******