

# CE Test Report

**Equipment** : Bluetooth Dual Mode UART AT featuring smartBASIC

**Model No.** : BT900-SA, BT900-SC  
(please refer to 1.1.1 for more details.)

**Brand Name** : Laird Technologies

**Applicant** : Laird Technologies

**Address** : W66N220 Commerce Court, Cedarburg,  
Wisconsin 53012, USA

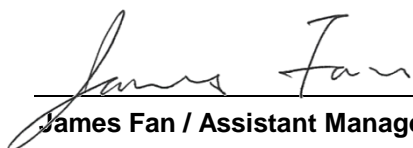
**Standard** : EN 300 328 V2.1.1 (2016-11)

**Received Date** : Apr. 06, 2017

**Tested Date** : Jan. 25 ~ Jan. 26, 2016 (for original test)  
Apr. 23, 2017 (for new test)

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

  
James Fan / Assistant Manager

Approved by:

  
Gary Chang / Manager



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## Release Record

Report No.	Version	Description	Issued Date
ER442807-06AE	Rev. 01	Initial issue	Apr. 28, 2017

## Summary of Test Results

Ref. Std. Clause	Test Items	Measured	Result
4.3.2.2	RF Output Power	9.20 dBm	Pass
4.3.2.3	Power Spectral Density	Meet the requirement of limit.	Pass
4.3.2.4	Duty Cycle, Tx-sequence, Tx-gap	Only for non-adaptive equipment	N/A
4.3.2.5	Medium Utilisation (MU) factor	Only for non-adaptive equipment	N/A
4.3.2.6	Adaptivity	The RF Output power is less than 10 dBm e.i.r.p. This item is not applicable.	N/A
4.3.2.7	Occupied Channel Bandwidth	Meet the requirement of limit.	Pass
4.3.2.8	Transmitter unwanted emissions in the out of band domain	Meet the requirement of limit.	Pass
4.3.2.9	Transmitter unwanted emissions in the spurious domain	Meet the requirement of limit.	Pass
4.3.2.10	Receiver spurious emissions	Meet the requirement of limit.	Pass
4.3.2.11	Receiver Blocking	Meet the requirement of limit.	Pass
4.3.2.12	Geo-location Capability	The device has no this capability.	N/A

# 1 General Description

## 1.1 Information

This report is issued as a supplementary report to original ICC report no. ER442807-04AE. The difference is concerned with following items:

- ✧ Updating standard version from V1.9.1 to V2.1.1.
- ✧ New applicant address for above change

Therefore, related test items had been performed and presented in the following sections.

### 1.1.1 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
Laird Technologies	BT900-SA	Bluetooth Dual Mode UART AT featuring smartBASIC	Integrated antenna onboard
	BT900-SC		No integrated antenna, only IPEX connector for external antenna

### 1.1.2 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number	Data Rate
2400-2483.5	V4.0 LE	2402-2480	0-39 [40]	1 Mbps
Note 1: Bluetooth LE (Low energy) uses GFSK modulation.				

### 1.1.3 Antenna Details

Ant. No.	EUT Model	Type	Ant. Brand / Model	Gain (dBi)	Connector
1	BT900-SC	Dipole	Nearson S181FL-L-RMM-2450S	2	UFL
2		PCB Dipole	Laird EBL2449A1-15UFL	2	
3		Dipole	Laird MAF94190	2	
4		Dipole	Laird WRR2400- IP04-B(MAF94019)	1.5	
5	BT900-SA	Chip	ACX AT3216-B2R7HAA_3216	0.5	N/A

Note: 3 dipole antennas are used for this device, and highest gain antenna is selected to perform raiddated emission test. After pre-test with antenna 1 & 3, **antenna 1** was found as the worst case and was shown in this report.

#### 1.1.4 EUT Operational Condition

<b>Power Supply Type</b>	3.3Vdc from host		
<b>SW Version</b>	9.1.12.0		
<b>Operational Climatic</b>	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (85°C)	<input checked="" type="checkbox"/> Tmin (-40°C)

#### 1.1.5 Accessories

N/A

#### 1.1.6 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
37	2402	18	2442
0	2404	19	2444
1	2406	20	2446
2	2408	21	2448
3	2410	22	2450
4	2412	23	2452
5	2414	24	2454
6	2416	25	2456
7	2418	26	2458
8	2420	27	2460
9	2422	28	2462
10	2424	29	2464
38	2426	30	2466
11	2428	31	2468
12	2430	32	2470
13	2432	33	2472
14	2434	34	2474
15	2436	35	2476
16	2438	36	2478
17	2440	39	2480

#### 1.1.7 Test Tool and Duty Cycle

<b>Test Tool</b>	BlueTest3
<b>Duty Cycle Of Test Signal (%)</b>	66.52%
<b>Duty Factor (dB)</b>	1.77

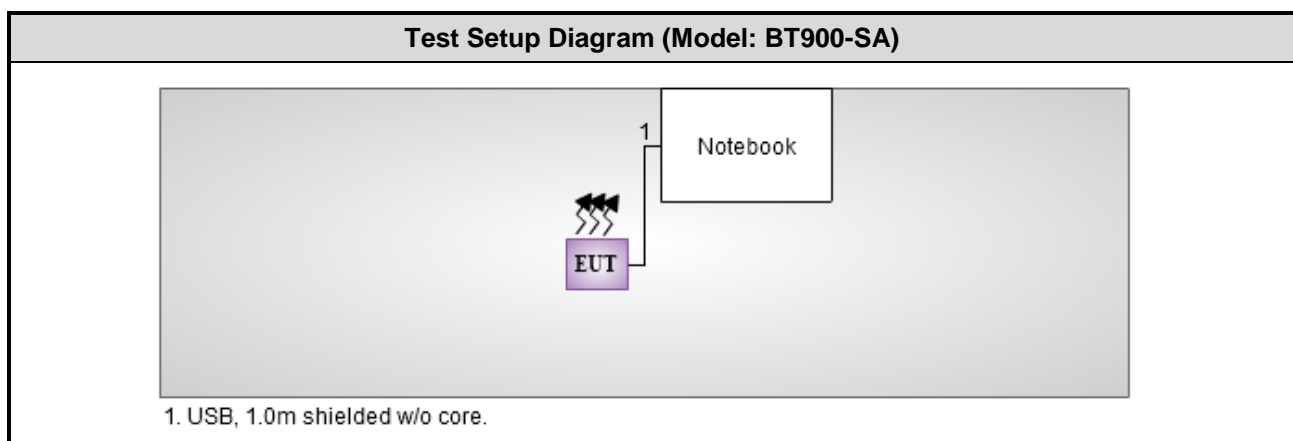
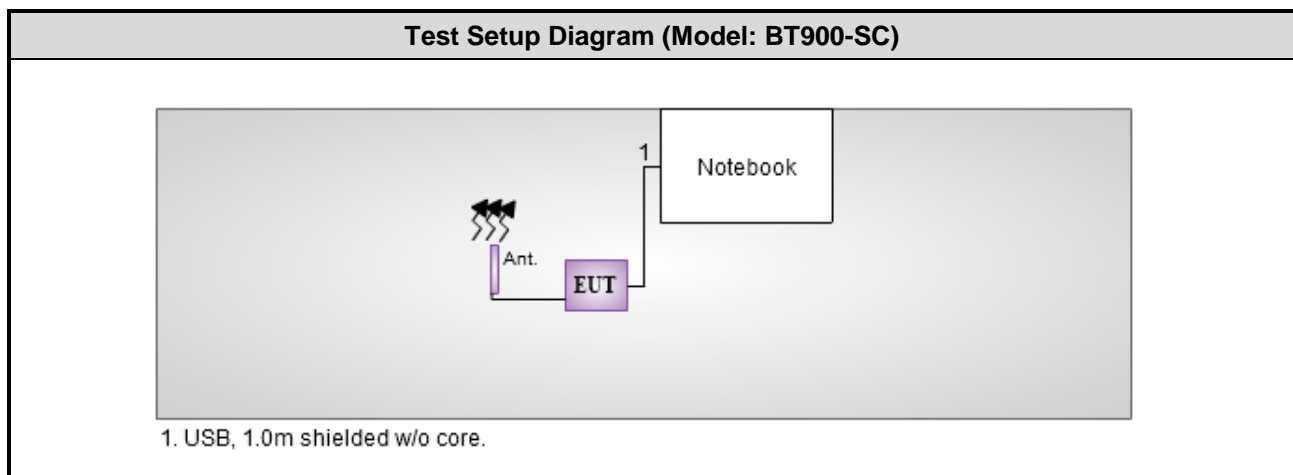
### 1.1.8 Power Setting

Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
GFSK-1Mbps	0X22C8=8	0X22C8=8	0X22C8=8

## 1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	E6430	---	DoC	USB, 1m shielded w/o core.

## 1.3 Test Setup Chart



## 1.4 Test Equipment List and Calibration Data

<b>Test Item</b>	Radiated Emissions				
<b>Test Site</b>	Fully-anechoic chamber 1 / (05CH01-WS)				
<b>Tested Date</b>	Jan. 25, 2016				
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Calibration Date</b>	<b>Calibration Until</b>
Spectrum Analyzer	Agilent	N9010A	MY54200247	Aug. 24, 2015	Aug. 23, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-524	Oct. 03, 2015	Oct. 02, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1094	Oct. 20, 2015	Oct. 19, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 04, 2016	Jan. 03, 2017
Preamplifier	Agilent	83017A	MY39501310	Dec. 11, 2015	Dec. 10, 2016
Preamplifier	EMC	EMC02325	980146	Oct. 14, 2015	Oct. 13, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16609/4	Dec. 04, 2015	Dec. 03, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16608/4	Dec. 04, 2015	Dec. 03, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16617/4	Dec. 04, 2015	Dec. 03, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-005	Dec. 04, 2015	Dec. 03, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-006	Dec. 04, 2015	Dec. 03, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

<b>Test Item</b>	RF Conducted				
<b>Test Site</b>	(TH01-WS)				
<b>Tested Date</b>	Jan. 26, 2016				
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Calibration Date</b>	<b>Calibration Until</b>
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101486	Oct. 14, 2015	Oct. 13, 2016
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 27, 2015	Nov. 26, 2016
Power Meter	Anritsu	ML2495A	1241002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 2016
Signal Generator	R&S	SMB100A	175727	Oct. 05, 2015	Oct. 04, 2016
DC POWER SOURCE	GW INSTRON	GPC-3060D	EM884797	Oct. 20, 2015	Oct. 19, 2016
AC POWER SOURCE	APC	AFC-500W	F312060012	Oct. 26, 2015	Oct. 25, 2016
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Measurement Software	Agilent	EN RF test	1.1501125	NA	NA
Note: Calibration Interval of instruments listed above is one year.					



<b>Test Item</b>	Receiver Blocking				
<b>Test Site</b>	(05CH01-WS)				
<b>Tested Date</b>	Apr. 23, 2017				
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Calibration Date</b>	<b>Calibration Until</b>
Signal Generator	R&S	SMB100A	175727	Oct. 19, 2016	Oct. 18, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX_104	500202/4	Dec. 16, 2016	Dec. 15, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX_104	296088/4	Dec. 16, 2016	Dec. 15, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX_104	329023/4	Dec. 16, 2016	Dec. 15, 2017
Note: Calibration Interval of instruments listed above is one year.					

## 1.5 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

EN 300 328 V2.1.1 (2016-11)

## 1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ( $k=2$ ))

Measurement Uncertainty		
Parameters	Uncertainty	Limit
Occupied Channel Bandwidth	$\pm 0.0034$ %	$\pm 5$ %
RF output power, conducted	$\pm 0.537$ dB	$\pm 1.5$ dB
Power Spectral Density, conducted	$\pm 0.463$ dB	$\pm 3$ dB
Unwanted Emissions, conducted	$\pm 2.505$ dB	$\pm 3$ dB
All emissions, radiated	$\pm 3.401$ dB	$\pm 6$ dB
Temperature	$\pm 0.6$ °C	$\pm 3$ °C
Supply voltages	$\pm 0.16$ %	$\pm 3$ %
Time	$\pm 0.1$ %	$\pm 5$ %

## 2 Test Configuration

### 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
RF Conducted	TH01-WS	22°C / 65%	Ryan Lee Nic Guan
Radiated Emission	05CH01-WS	20°C / 65%	Chris Zeng
Receiver Blocking	05CH01-WS	23°C / 62%	Tom Shu

### 2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Test Configuration
RF Output Power	GFSK	2402 / 2440 / 2480	1 Mbps	1, 3
Power Spectral Density				
Occupied Channel Bandwidth	GFSK	2402 / 2480	1 Mbps	1
Transmitter unwanted emissions in the out of band domain				1, 3
Transmitter Spurious Emissions	GFSK	2402 / 2480	1 Mbps	1, 2, 3
Receiver Spurious Emissions				
Receiver Blocking	GFSK	2402 / 2480	1 Mbps	1, 3

**NOTE:**

- The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Z-plane** result was found as the worst case and was shown in this report.
- 3 types antenna are used for this device, each type is selected to perform radiated emission test as below test configuration.
  - Configuration 1 : BT900-SC with Antenna 1 (Dipole antenna)
  - Configuration 2 : BT900-SC with Antenna 2 (PCB Dipole)
  - Configuration 3 : BT900-SA with Antenna 5 (Chip antenna)

### 3 Transmitter Test Results

#### 3.1 RF Output Power

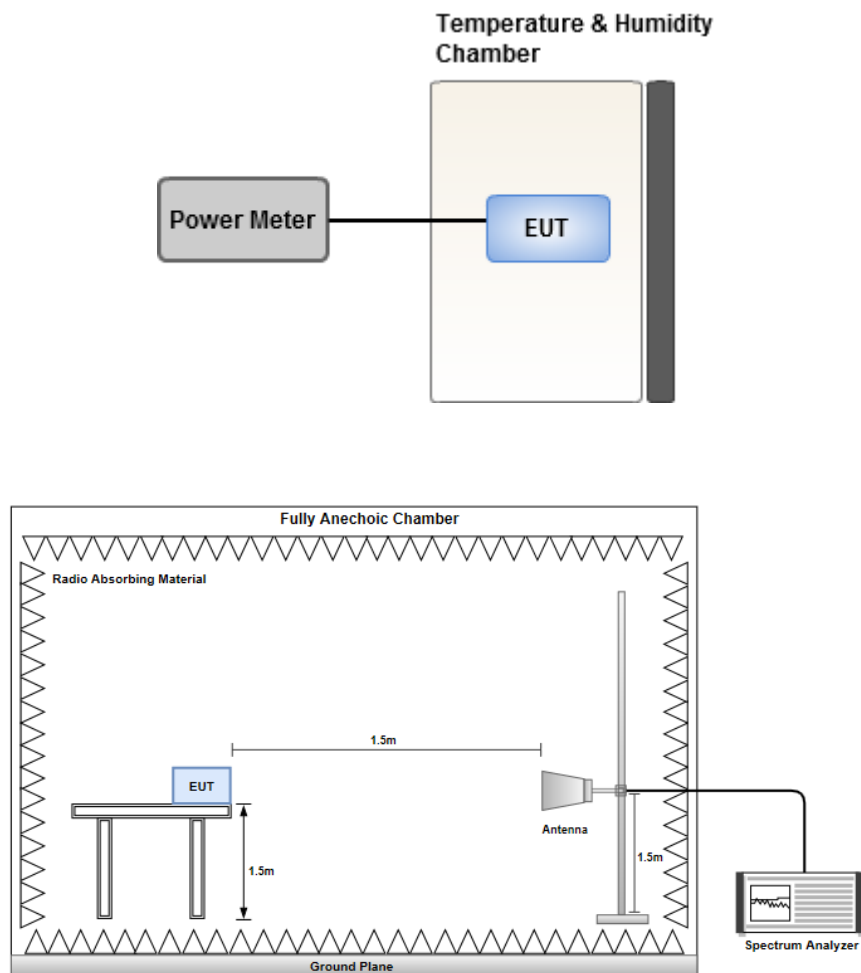
##### 3.1.1 Limit of RF Output Power

The maximum RF output power shall be equal to or less than 20 dBm

##### 3.1.2 Test Procedures

Reference to clause 5.4.2.2 of ETSI EN 300 328 V2.1.1 (2016-11).

##### 3.1.3 Test Setup



### 3.1.4 Test Result of RF Output Power

#### Test Configuration 1

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
$T_{nom}V_{nom}$	2402	8.58	20	Pass
$T_{min}V_{nom}$	2402	8.03	20	Pass
$T_{max}V_{nom}$	2402	7.25	20	Pass
$T_{nom}V_{nom}$	2440	8.92	20	Pass
$T_{min}V_{nom}$	2440	8.47	20	Pass
$T_{max}V_{nom}$	2440	7.58	20	Pass
$T_{nom}V_{nom}$	2480	9.16	20	Pass
$T_{min}V_{nom}$	2480	8.62	20	Pass
$T_{max}V_{nom}$	2480	7.83	20	Pass

Note: Test method is conducted.

#### Test Configuration 3

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
$T_{nom}V_{nom}$	2402	5.10	20	Pass
$T_{min}V_{nom}$	2402	4.57	20	Pass
$T_{max}V_{nom}$	2402	3.77	20	Pass
$T_{nom}V_{nom}$	2440	7.64	20	Pass
$T_{min}V_{nom}$	2440	7.08	20	Pass
$T_{max}V_{nom}$	2440	6.32	20	Pass
$T_{nom}V_{nom}$	2480	<b>9.20</b>	20	Pass
$T_{min}V_{nom}$	2480	8.59	20	Pass
$T_{max}V_{nom}$	2480	7.89	20	Pass

Note: Test method is radiated.

## 3.2 Power Spectral Density

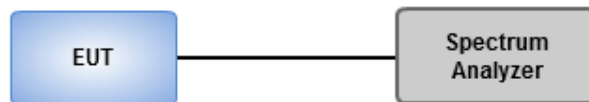
### 3.2.1 Limit of Power Spectral Density

For equipment using wide band modulations other than FHSS (e.g. DSSS, OFDM, etc.), the maximum Power Spectral Density is limited to 10 dBm per MHz.

### 3.2.2 Test Procedures

Reference to clause 5.4.3.2 of ETSI EN 300 328 V2.1.1 (2016-11).

### 3.2.3 Test Setup



### 3.2.4 Test Result of Power Spectral Density

Test Configuration 1

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	8.32	10	Pass
GFSK-1Mbps	2440	8.71	10	Pass
GFSK-1Mbps	2480	8.94	10	Pass

Test Configuration 3

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	5.01	10	Pass
GFSK-1Mbps	2440	7.22	10	Pass
GFSK-1Mbps	2480	8.19	10	Pass

### 3.3 Occupied Channel Bandwidth

#### 3.3.1 Limit of Occupied Channel Bandwidth

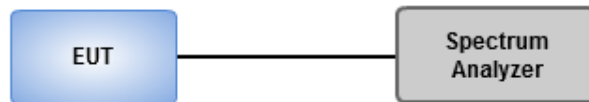
The Occupied Channel Bandwidth shall fall completely within 2.4~2.4835 GHz.

In addition, for non-adaptive equipment 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.

#### 3.3.2 Test Procedures

Reference to clause 5.4.7.2 of ETSI EN 300 328 V2.1.1 (2016-11).

#### 3.3.3 Test Setup

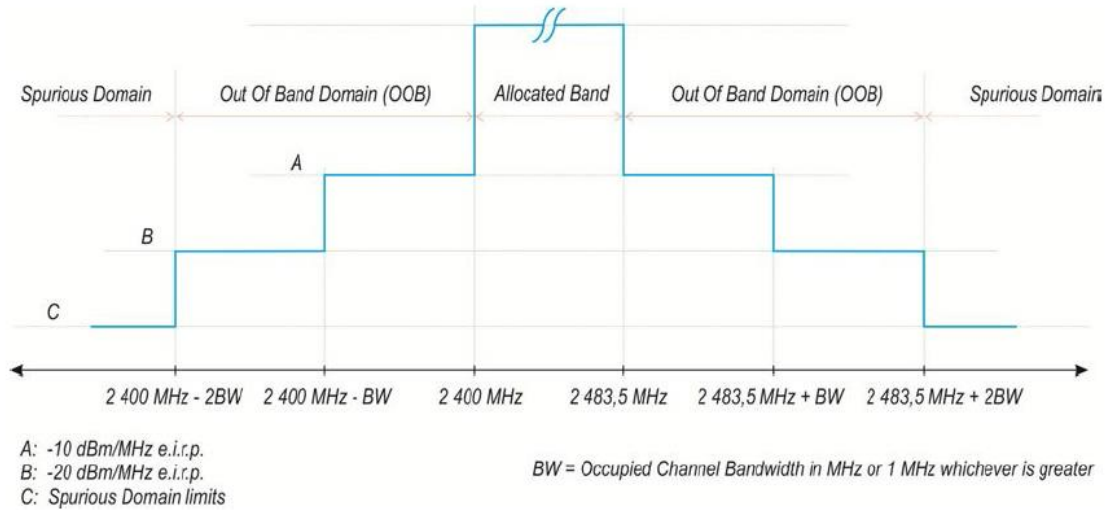


#### 3.3.4 Test Result of Occupied Channel Bandwidth

Modulation Mode	Frequency (MHz)	99% Bandwidth (MHz)	$F_L$ at 99% BW (MHz)	$F_H$ at 99% BW (MHz)	Limit $F_L / F_H$ (MHz)
GFSK-1Mbps	2402	1.04	2401.49	2402.53	2400.0
GFSK-1Mbps	2480	1.04	2479.48	2480.52	2483.5

### 3.4 Transmitter Unwanted Emissions in the Out-Of-Band Domain

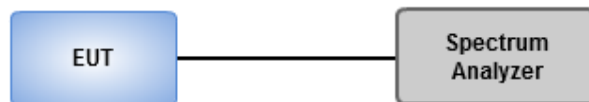
#### 3.4.1 Limit of Transmitter Unwanted Emissions in the Out-Of-Band Domain



#### 3.4.2 Test Procedures

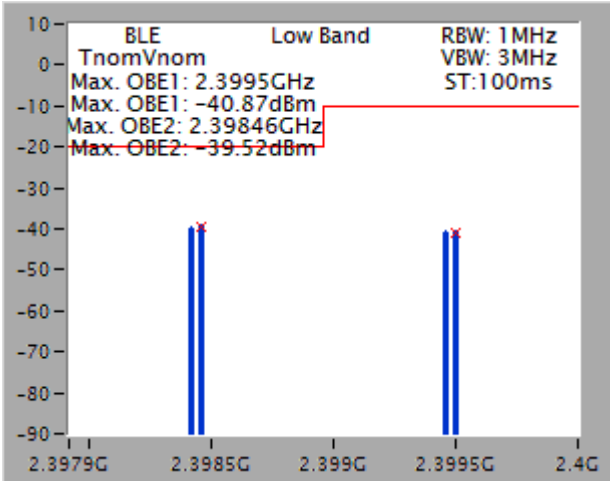
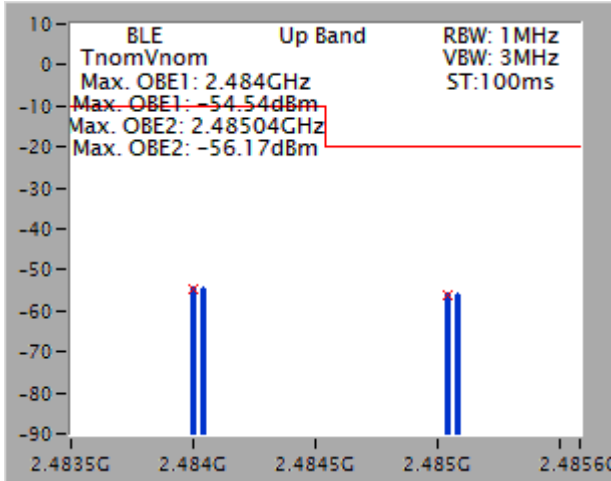
Reference to clause 5.4.8.2 of ETSI EN 300 328 V2.1.1 (2016-11).

#### 3.4.3 Test Setup



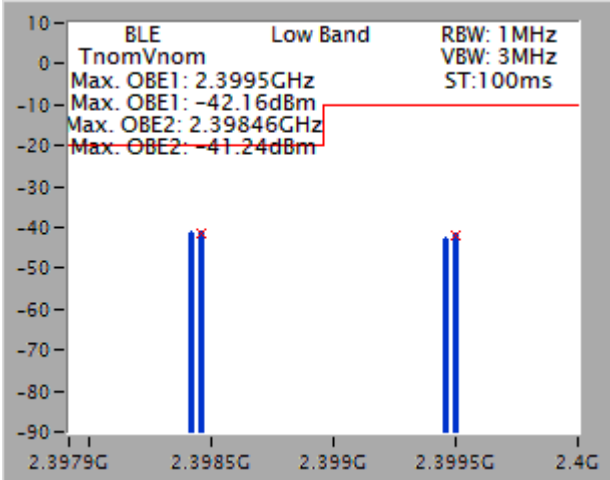
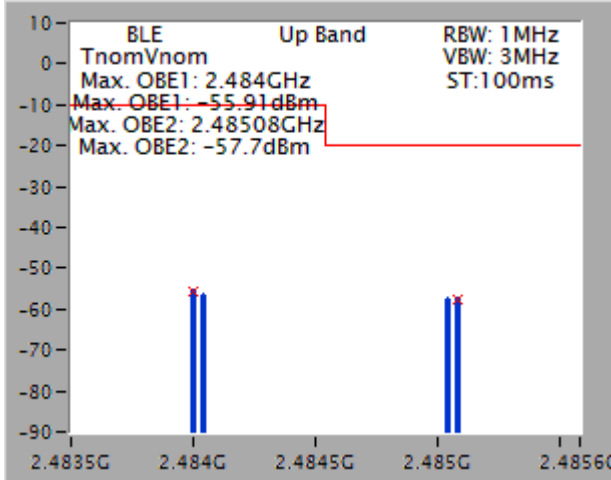
### 3.4.4 Test Result of Transmitter Unwanted Emissions in the Out-Of-Band Domain

Test Configuration 1

Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-40.87	-10
TnomVnom	GFSK-1Mbps	2402	2398.46	-39.52	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-54.54	-10
TnomVnom	GFSK-1Mbps	2480	2485.04	-56.17	-20
Low Band			Up Band		
					



### Test Configuration 3

Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-42.16	-10
TnomVnom	GFSK-1Mbps	2402	2398.46	-41.24	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-55.91	-10
TnomVnom	GFSK-1Mbps	2480	2485.08	-57.70	-20
Low Band			Up Band		
					

### 3.5 Transmitter Unwanted Emissions in the Spurious Domain

#### 3.5.1 Limit of Transmitter Unwanted Emissions in the Spurious Domain

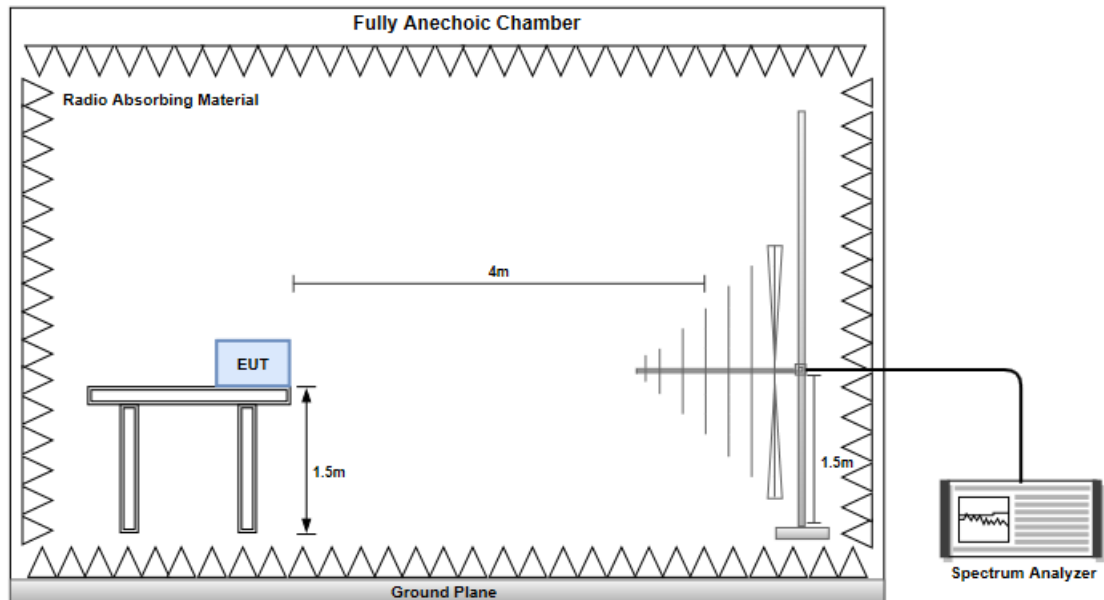
Frequency Range (MHz)	Maximum power (dBm)	Bandwidth (kHz)
30 to 47	-36	100
47 to 74	-54	100
74 to 87.5	-36	100
87.5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 862	-54	100
862 to 1000	-36	100
1000 to 12750	-30	1000

#### 3.5.2 Test Procedures

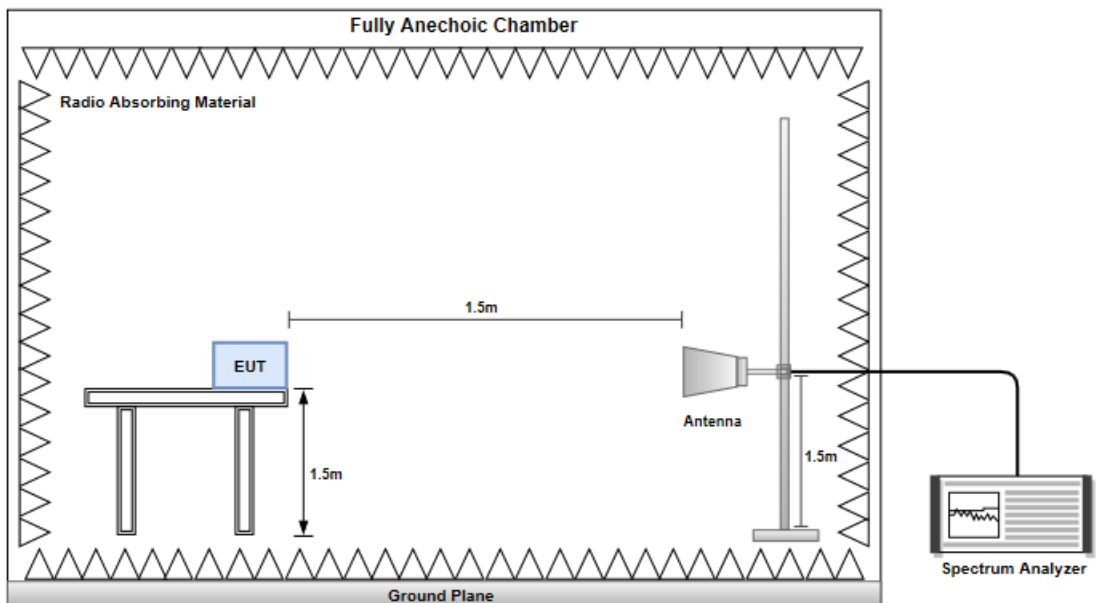
Reference to clause 5.4.9.2 of ETSI EN 300 328 V2.1.1 (2016-11).

### 3.5.3 Test Setup

#### Below 1GHz

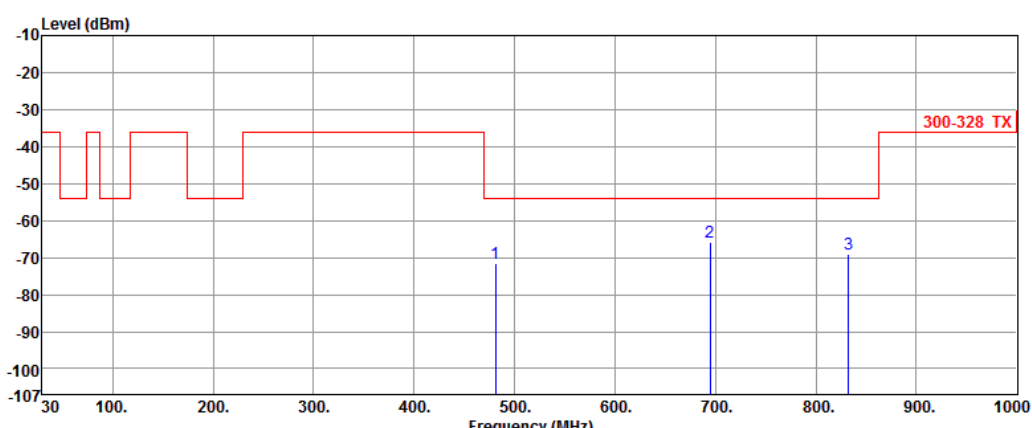


#### Above 1 GHz



### 3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

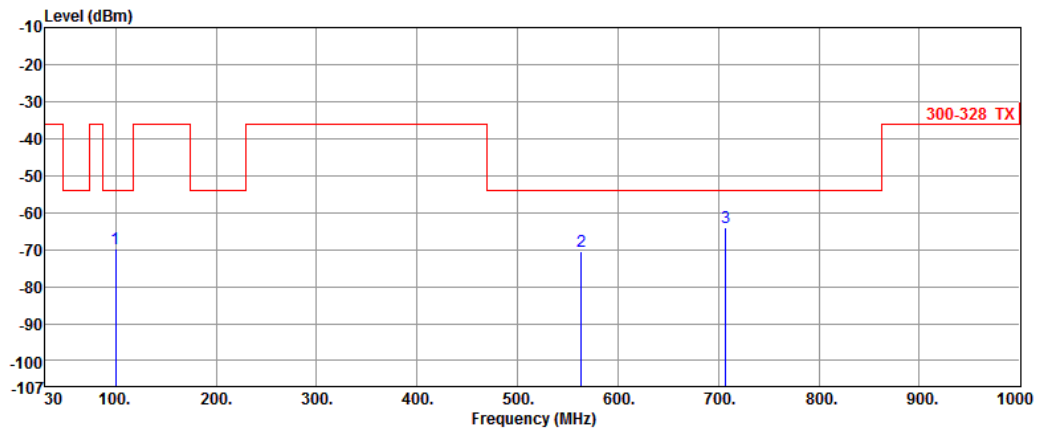
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1

	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	481.05	-71.41	-54.00	-17.41	2.81	-74.22
2	694.45	-65.95	-54.00	-11.95	7.52	-73.47
3	832.19	-68.89	-54.00	-14.89	8.97	-77.86

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
 Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1

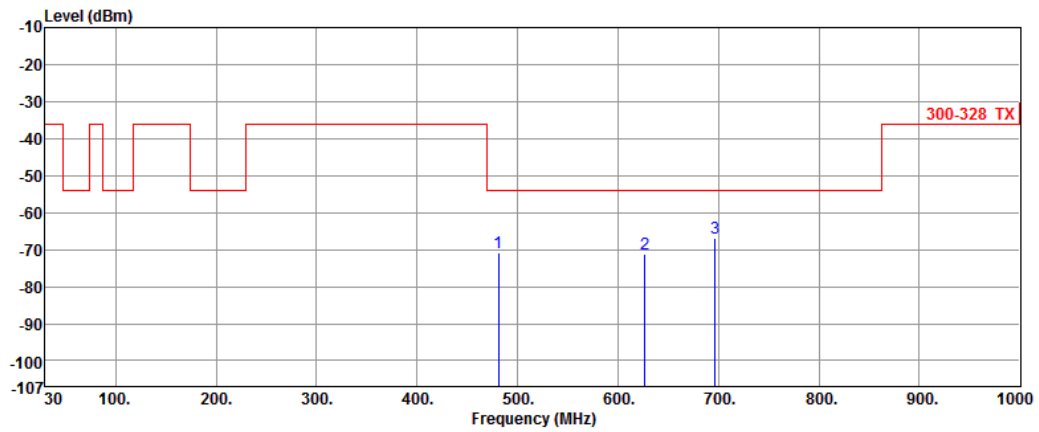


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.84	-69.87	-54.00	-15.87	-4.94	-64.93
2	563.50	-70.52	-54.00	-16.52	4.62	-75.14
3	707.06	-63.92	-54.00	-9.92	7.28	-71.20

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	1

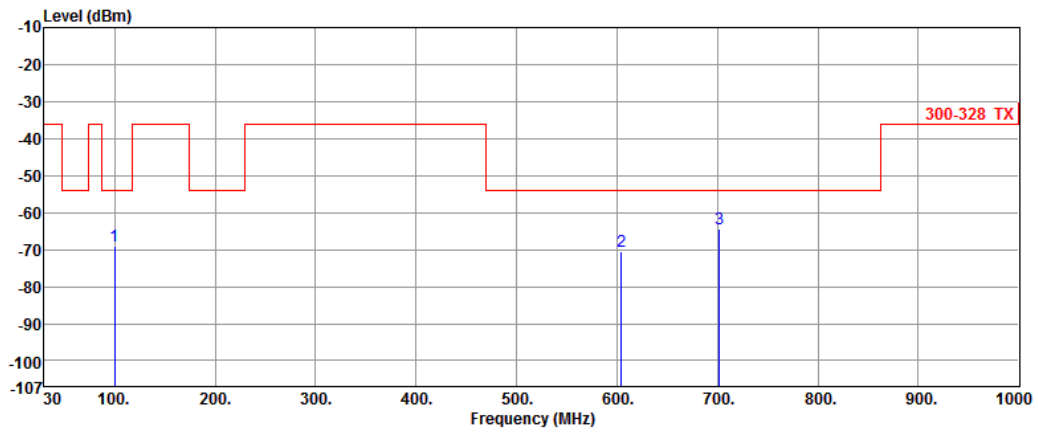


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	481.05	-71.00	-54.00	-17.00	2.81	-73.81
2	626.55	-71.12	-54.00	-17.12	6.17	-77.29
3	696.39	-67.03	-54.00	-13.03	7.50	-74.53

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1

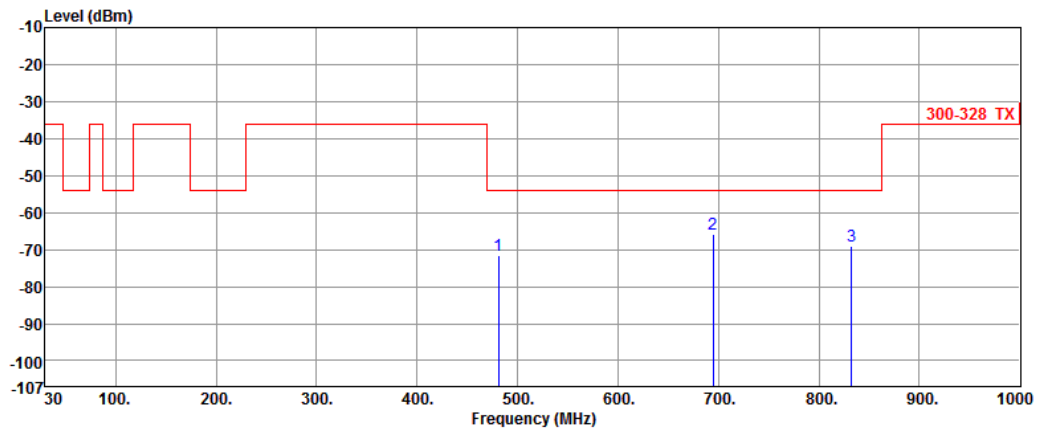


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.84	-69.05	-54.00	-15.05	-4.94	-64.11
2	604.24	-70.32	-54.00	-16.32	6.15	-76.47
3	702.21	-64.50	-54.00	-10.50	7.16	-71.66

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2



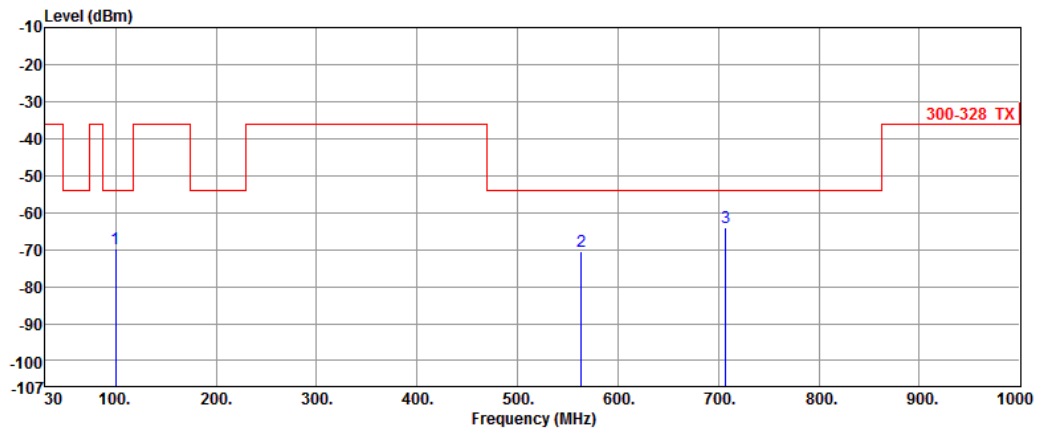
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	481.05	-71.41	-54.00	-17.41	2.81	-74.22
2	694.45	-65.95	-54.00	-11.95	7.52	-73.47
3	832.19	-68.89	-54.00	-14.89	8.97	-77.86

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)



<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	2

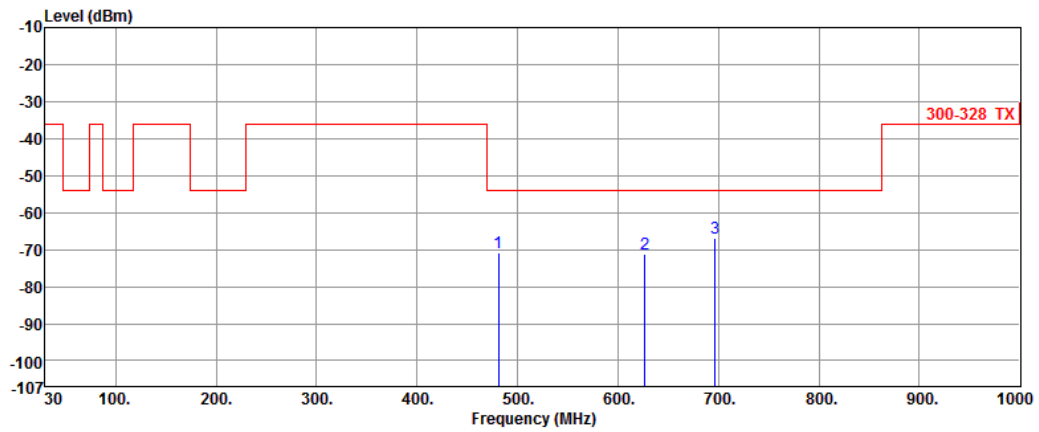


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.84	-69.87	-54.00	-15.87	-4.94	-64.93
2	563.50	-70.52	-54.00	-16.52	4.62	-75.14
3	707.06	-63.92	-54.00	-9.92	7.28	-71.20

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2

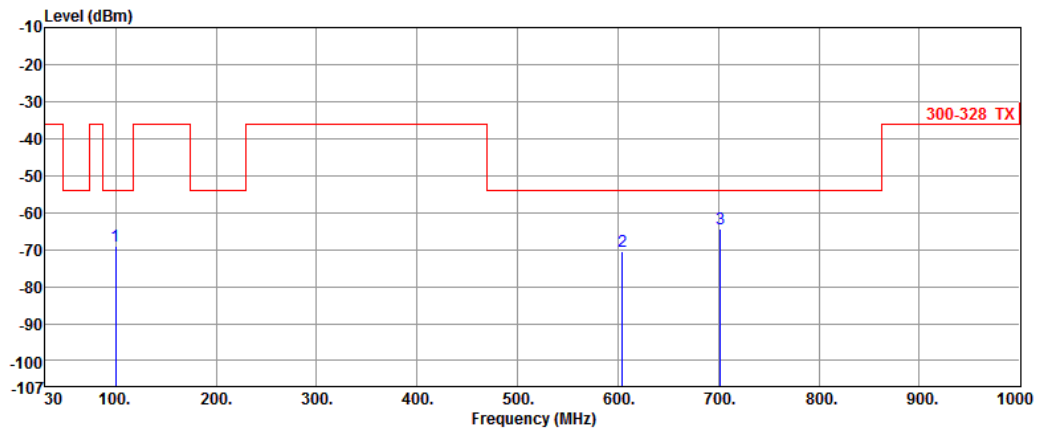


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	481.05	-71.00	-54.00	-17.00	2.81	-73.81
2	626.55	-71.12	-54.00	-17.12	6.17	-77.29
3	696.39	-67.03	-54.00	-13.03	7.50	-74.53

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	2

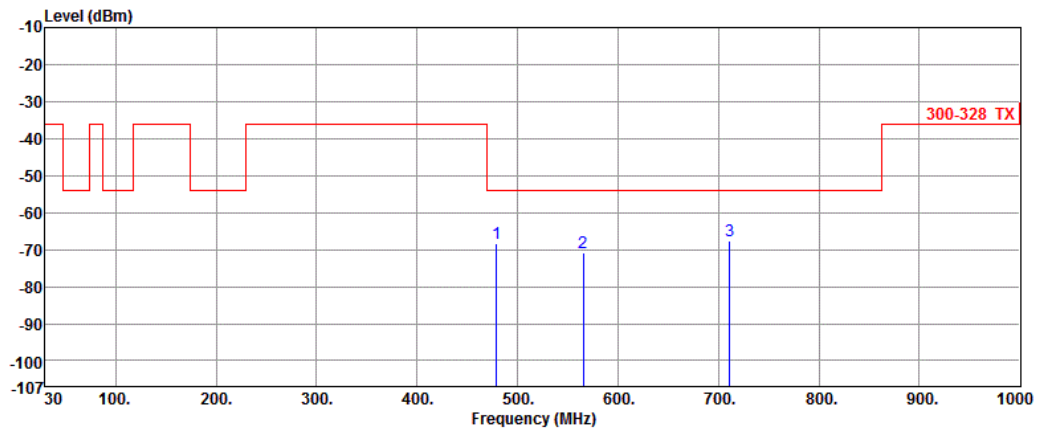


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.84	-69.05	-54.00	-15.05	-4.94	-64.11
2	604.24	-70.32	-54.00	-16.32	6.15	-76.47
3	702.21	-64.50	-54.00	-10.50	7.16	-71.66

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	3

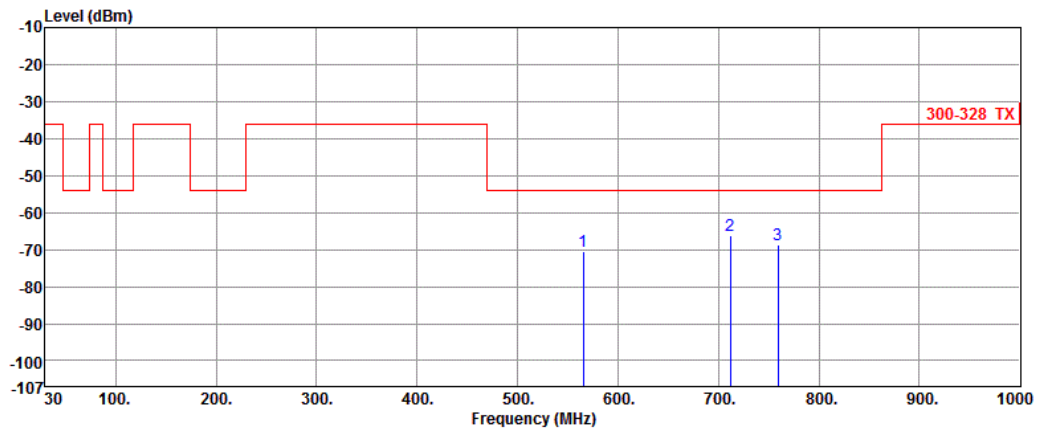


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	479.11	-68.51	-54.00	-14.51	2.81	-71.32
2	565.44	-71.02	-54.00	-17.02	4.48	-75.50
3	710.94	-67.76	-54.00	-13.76	7.50	-75.26

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	3

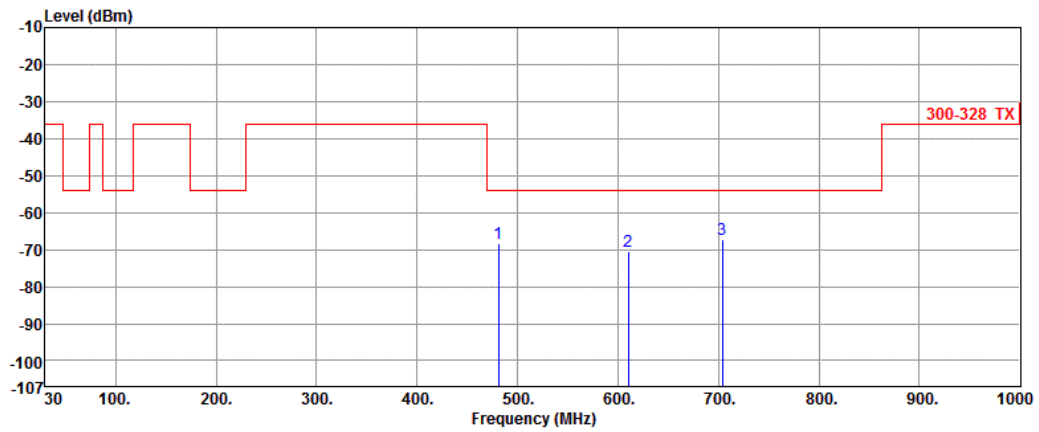


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	565.44	-70.43	-54.00	-16.43	4.69	-75.12
2	711.91	-66.13	-54.00	-12.13	7.41	-73.54
3	759.44	-68.69	-54.00	-14.69	8.82	-77.51

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	3

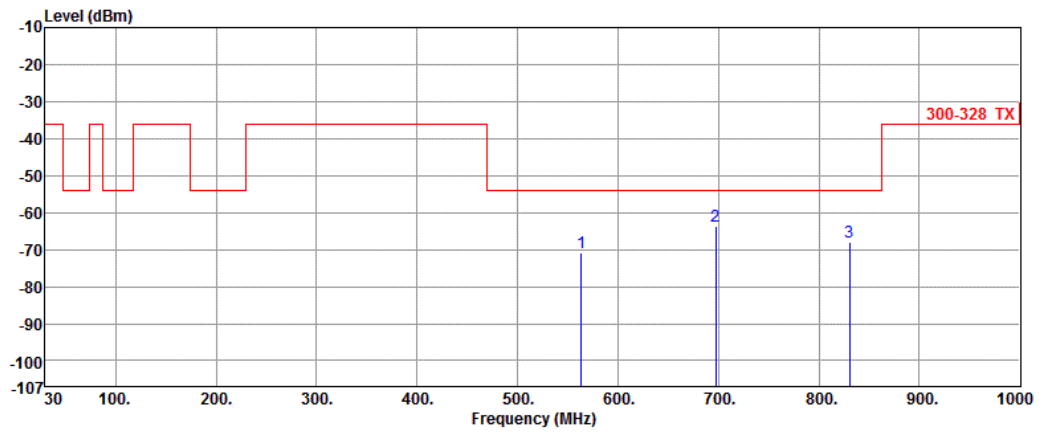


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	481.05	-68.28	-54.00	-14.28	2.81	-71.09
2	610.06	-70.58	-54.00	-16.58	6.29	-76.87
3	704.15	-67.39	-54.00	-13.39	7.51	-74.90

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	3



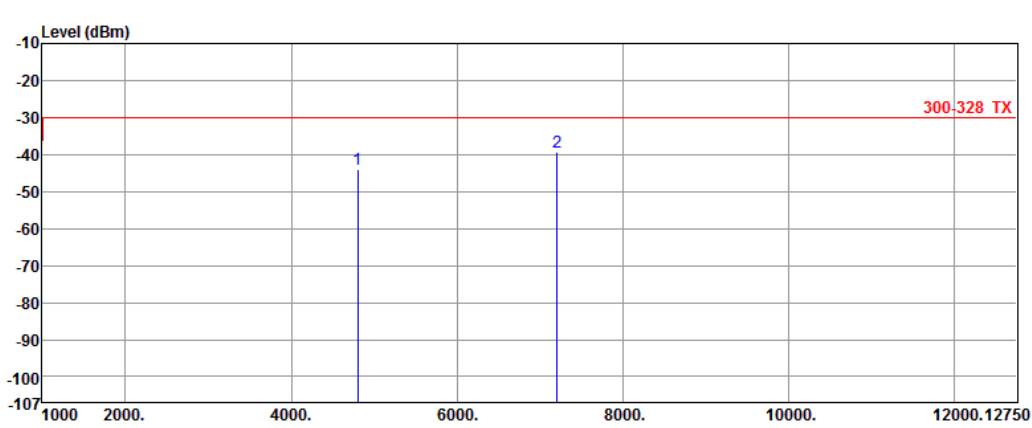
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	563.50	-70.85	-54.00	-16.85	4.62	-75.47
2	697.36	-63.78	-54.00	-9.78	7.12	-70.90
3	830.25	-67.91	-54.00	-13.91	9.28	-77.19

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

### 3.5.5 Transmitter Spurious Emissions (Above 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1

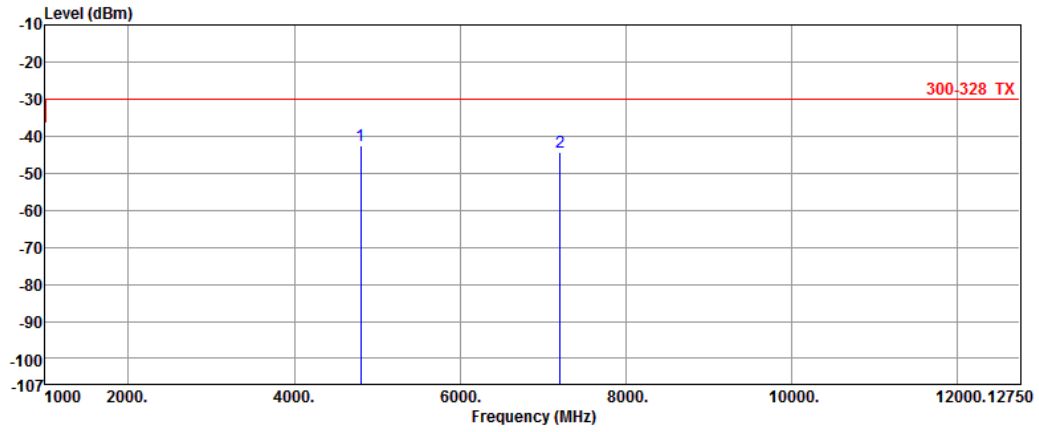
  


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.58	-43.93	-30.00	-13.93	8.44	-52.37
2	7206.83	-39.50	-30.00	-9.50	12.69	-52.19

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
 Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)



Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical	Test Configuration	1

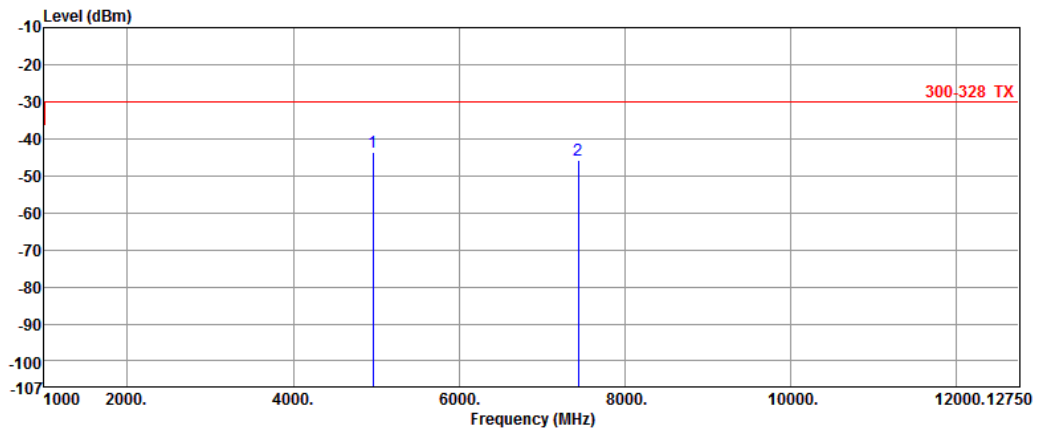


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.58	-42.63	-30.00	-12.63	7.81	-50.44
2	7206.58	-44.43	-30.00	-14.43	12.95	-57.38

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	1

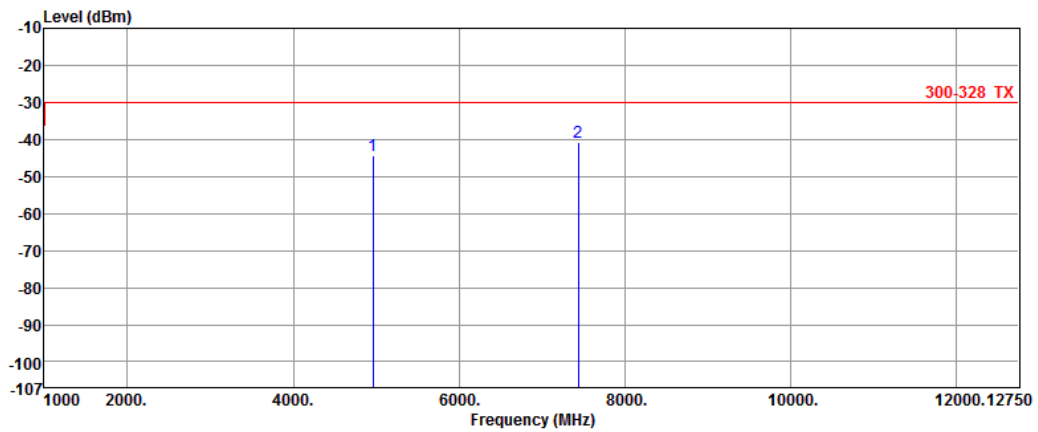


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.41	-43.62	-30.00	-13.62	9.42	-53.04
2	7439.29	-45.90	-30.00	-15.90	12.55	-58.45

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical	Test Configuration	1

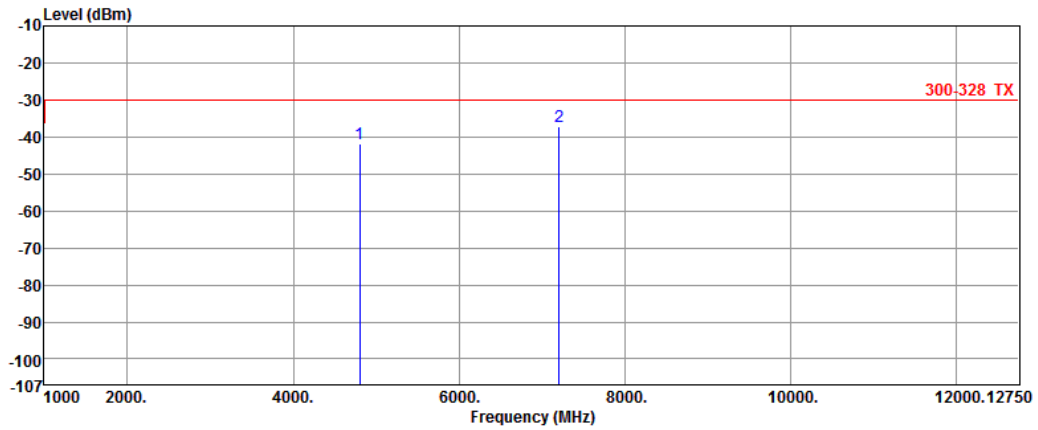


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.42	-44.27	-30.00	-14.27	8.68	-52.95
2	7439.27	-40.69	-30.00	-10.69	12.93	-53.62

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2

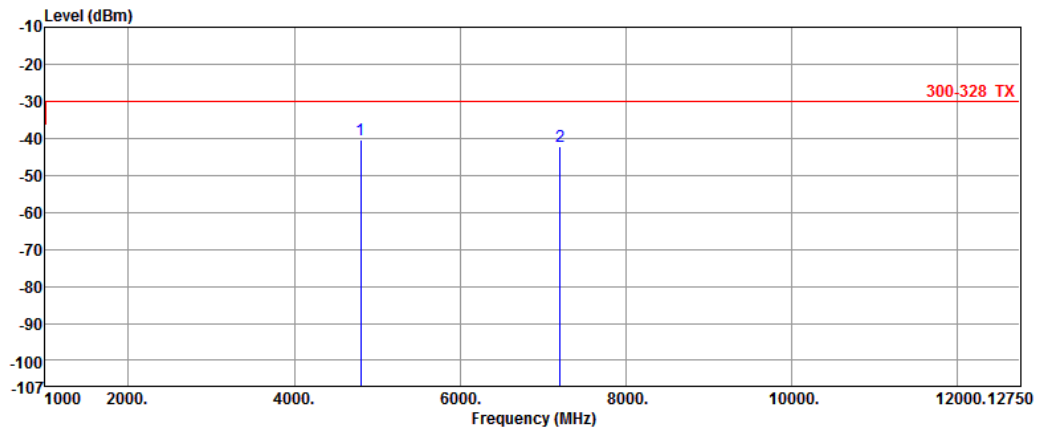


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.58	-41.78	-30.00	-11.78	8.44	-50.22
2	7206.83	-37.35	-30.00	-7.35	12.69	-50.04

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	2

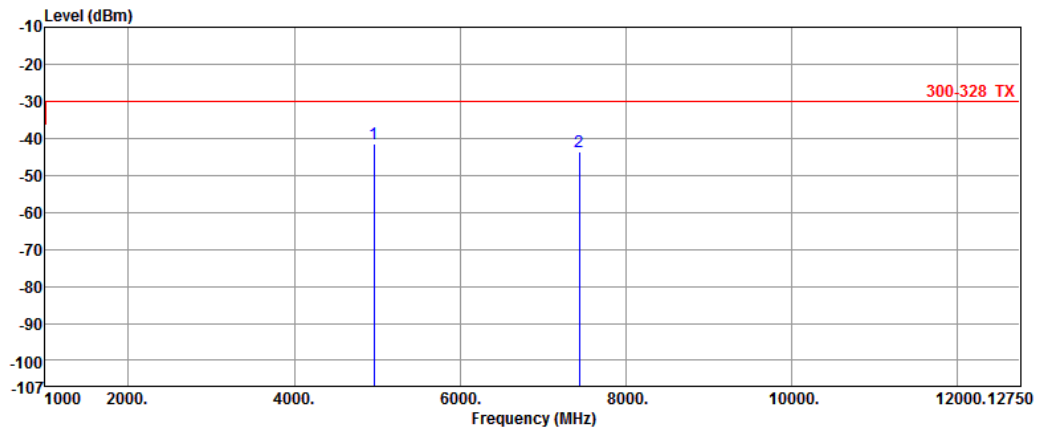


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.58	-40.48	-30.00	-10.48	7.81	-48.29
2	7206.58	-42.28	-30.00	-12.28	12.95	-55.23

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2

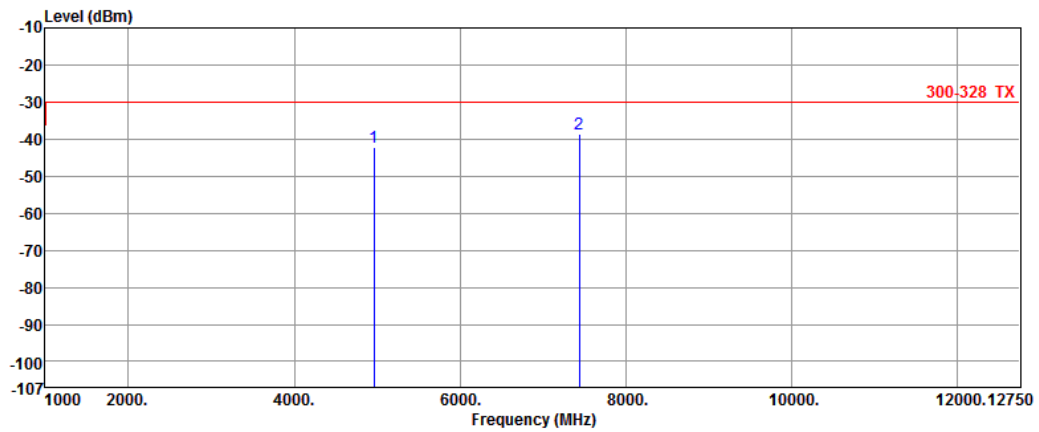


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.41	-41.47	-30.00	-11.47	9.42	-50.89
2	7439.29	-43.75	-30.00	-13.75	12.55	-56.30

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	2

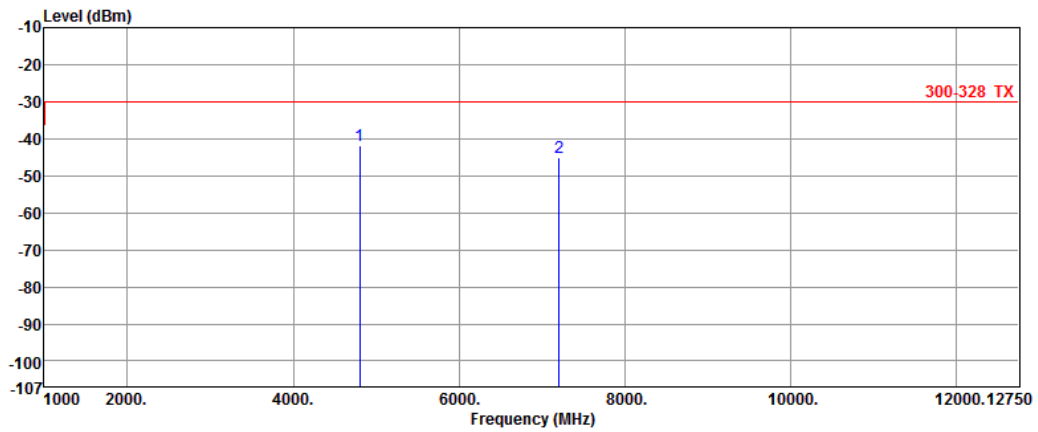


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.42	-42.12	-30.00	-12.12	8.68	-50.80
2	7439.27	-38.54	-30.00	-8.54	12.93	-51.47

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	3



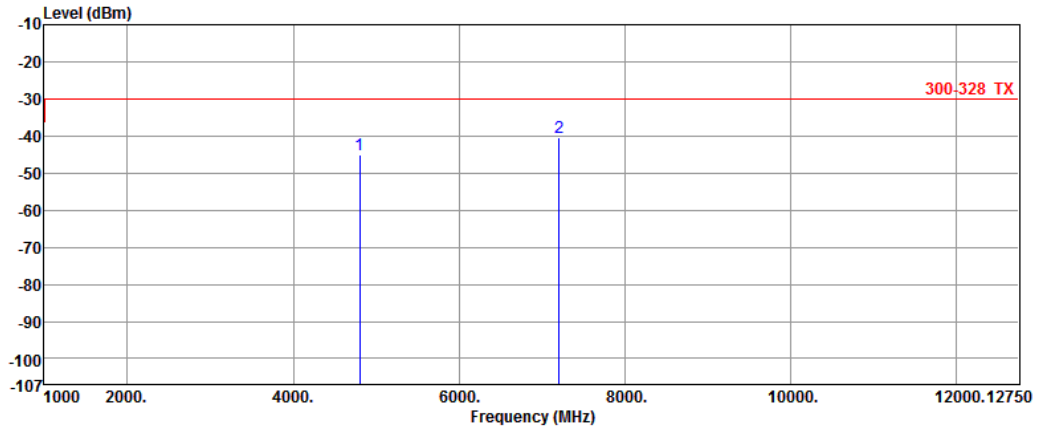
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.55	-41.69	-30.00	-11.69	8.44	-50.13
2	7206.68	-45.23	-30.00	-15.23	12.69	-57.92

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)



<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	3

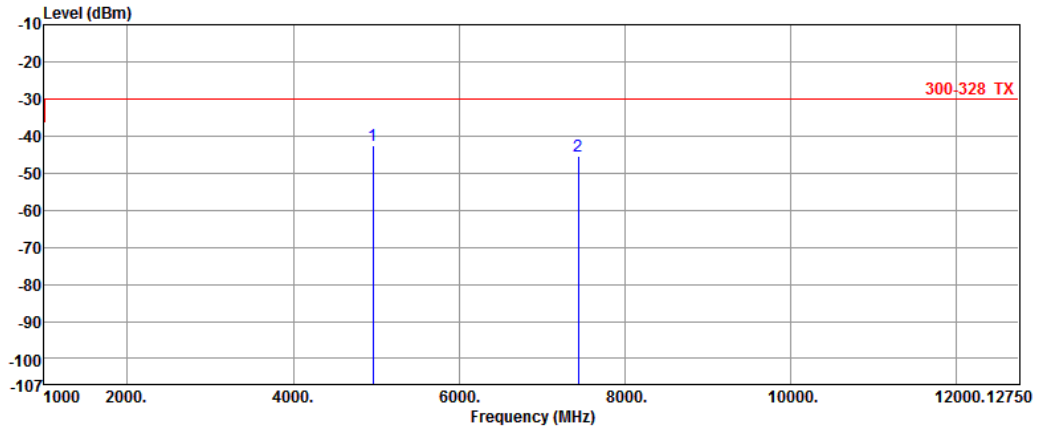


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.38	-45.13	-30.00	-15.13	7.81	-52.94
2	7206.68	-40.57	-30.00	-10.57	12.95	-53.52

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	3

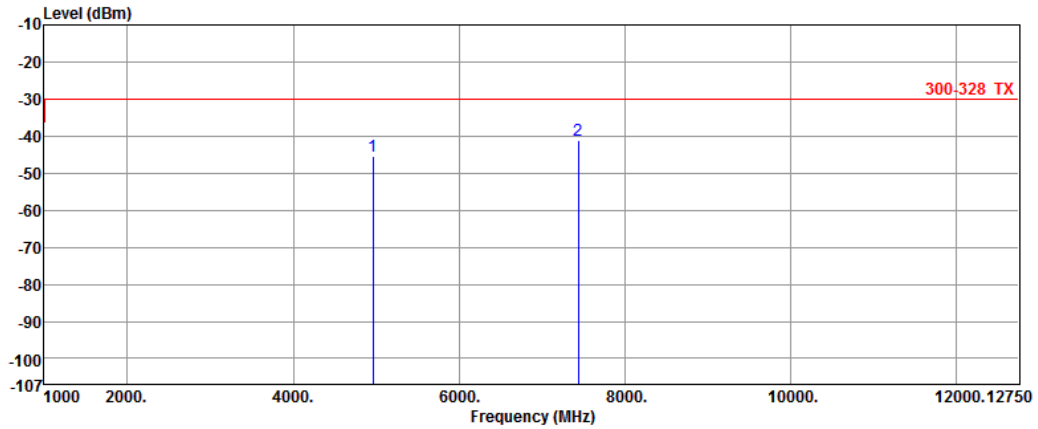


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.55	-42.63	-30.00	-12.63	9.43	-52.06
2	7439.29	-45.35	-30.00	-15.35	12.55	-57.90

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	3



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.47	-45.38	-30.00	-15.38	8.68	-54.06
2	7439.21	-41.24	-30.00	-11.24	12.93	-54.17

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

## 4 Receiver Test Results

### 4.1 Receiver Spurious Emissions

#### 4.1.1 Limit of Receiver Spurious Emissions

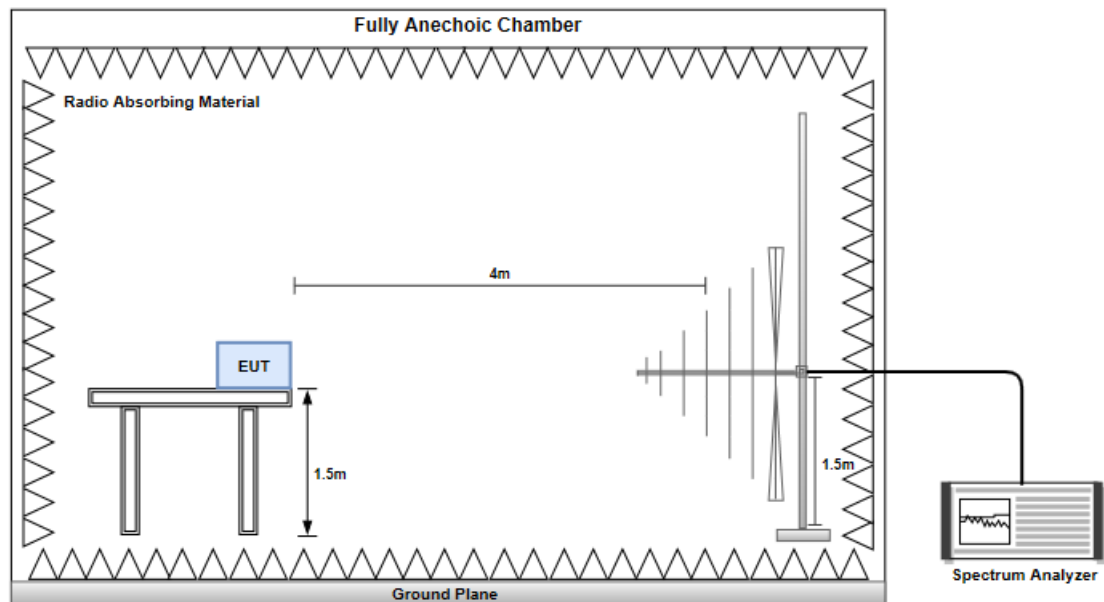
Frequency Range	Maximum power (dBm)	Measurement bandwidth (kHz)
30 MHz to 1 GHz	-57	100
Above 1 GHz to 12.75 GHz	-47	1000

#### 4.1.2 Test Procedures

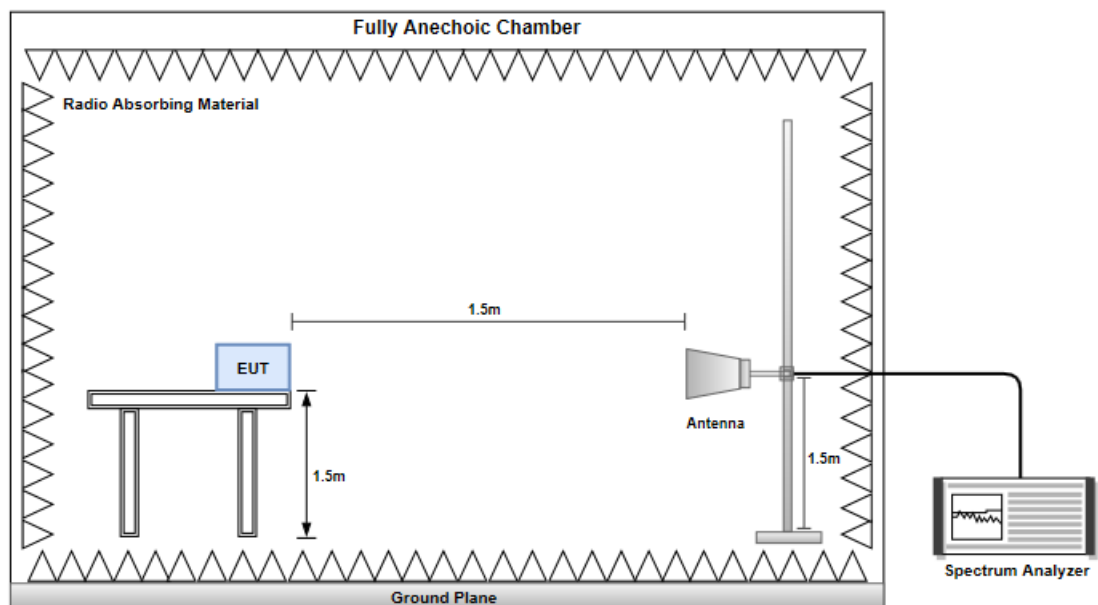
Reference to clause 5.4.10.2 of ETSI EN 300 328 V2.1.1 (2016-11).

### 4.1.3 Test Setup

#### Below 1GHz

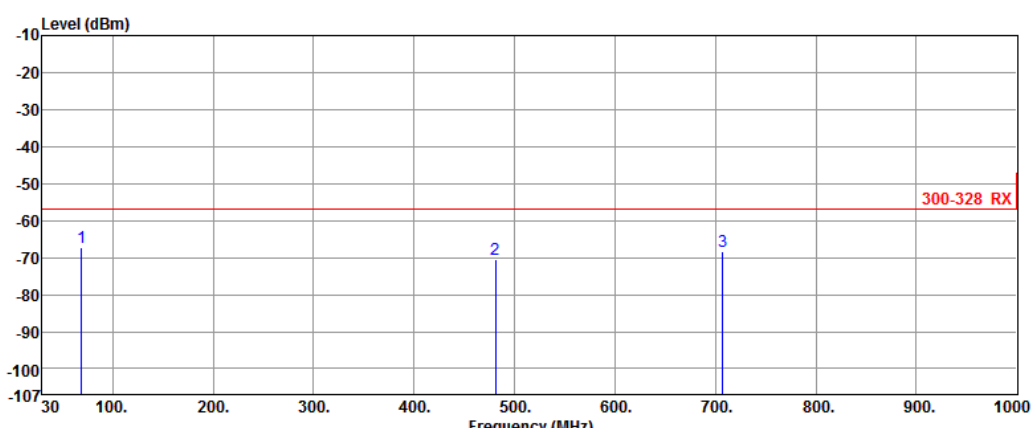


#### Above 1 GHz



#### 4.1.4 Receiver Radiated Unwanted Emissions (Below 1GHz)

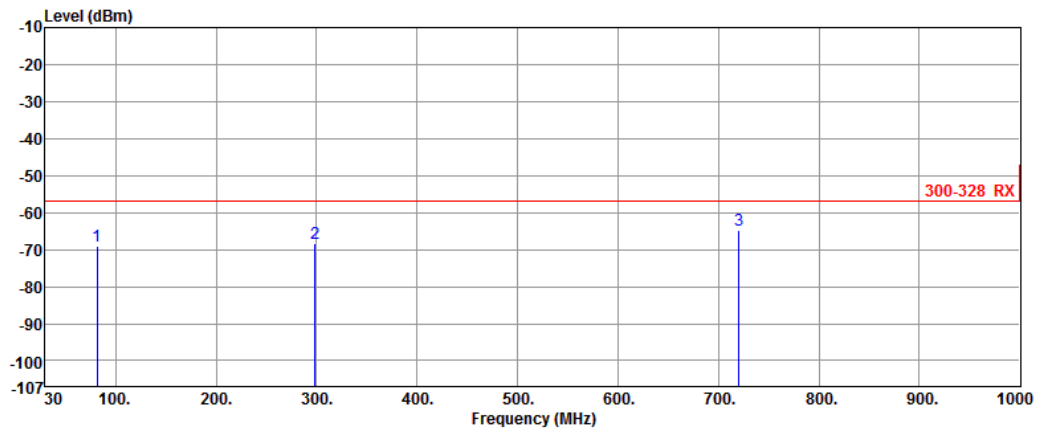
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1

	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	68.80	-67.19	-57.00	-10.19	-2.08	-65.11
2	481.05	-70.61	-57.00	-13.61	2.81	-73.42
3	707.06	-68.18	-57.00	-11.18	7.50	-75.68

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
 Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1

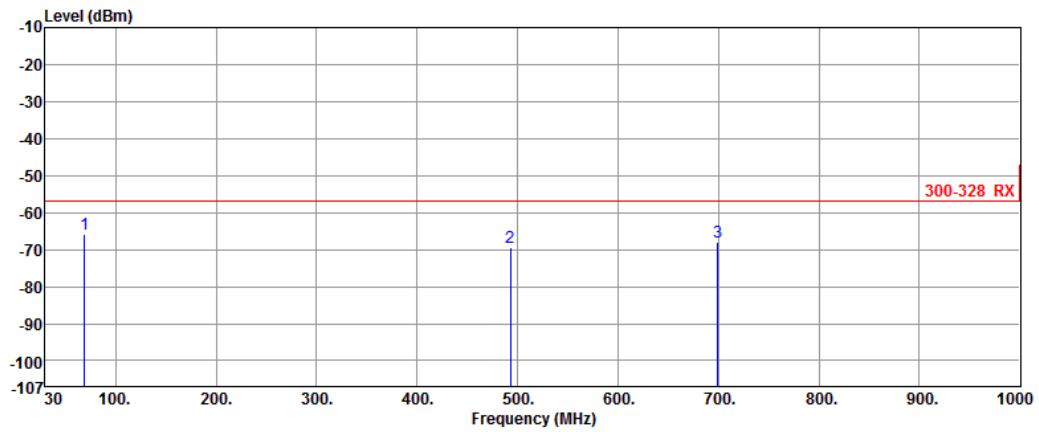


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	81.41	-69.21	-57.00	-12.21	-5.59	-63.62
2	298.69	-68.43	-57.00	-11.43	-1.65	-66.78
3	720.64	-64.89	-57.00	-7.89	7.70	-72.59

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	1



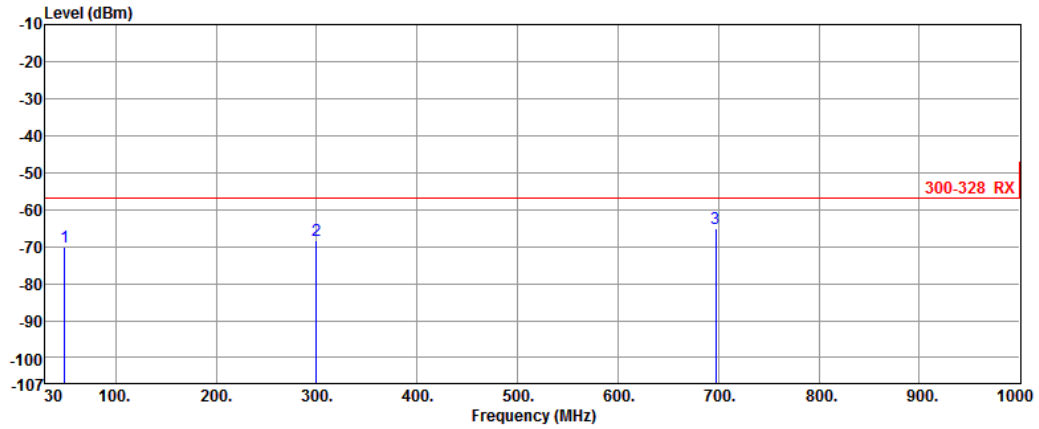
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	68.80	-65.84	-57.00	-8.84	-2.08	-63.76
2	492.69	-69.57	-57.00	-12.57	2.90	-72.47
3	699.30	-67.98	-57.00	-10.98	7.47	-75.45

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)



<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1

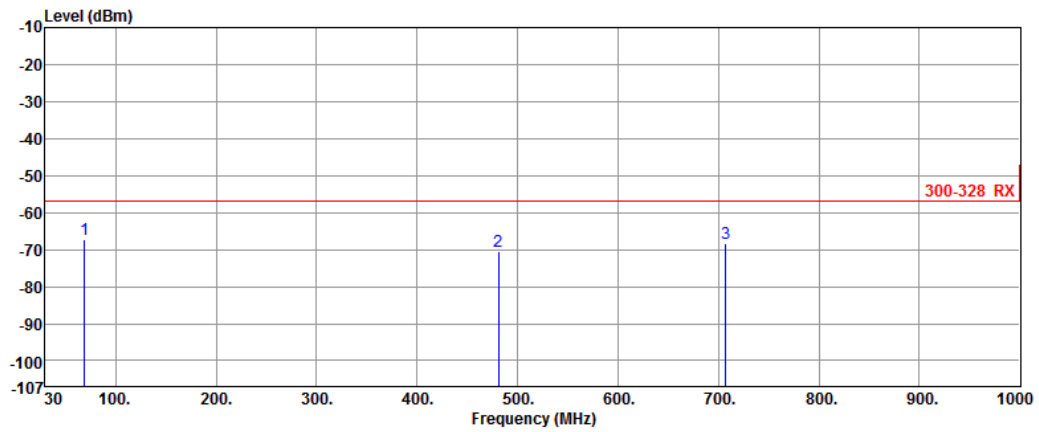


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	49.40	-69.99	-57.00	-12.99	-1.43	-68.56
2	299.66	-68.30	-57.00	-11.30	-1.64	-66.66
3	697.36	-65.08	-57.00	-8.08	7.12	-72.20

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2

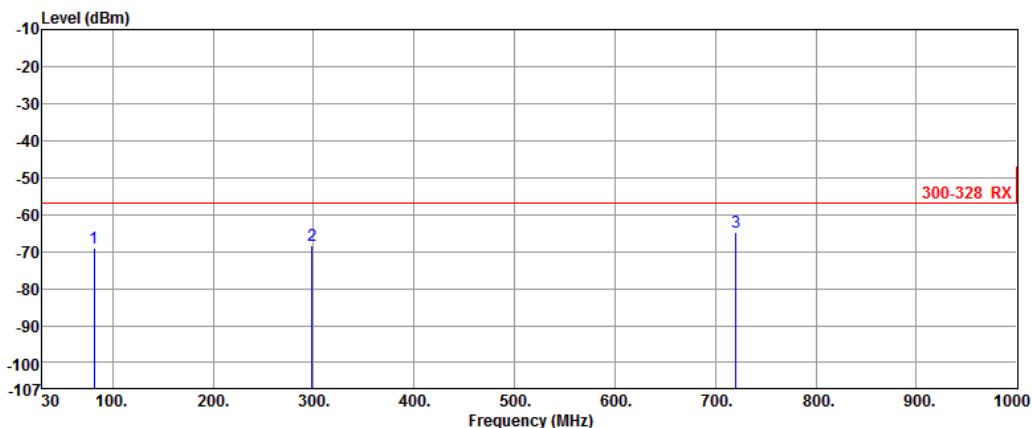


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	68.80	-67.19	-57.00	-10.19	-2.08	-65.11
2	481.05	-70.61	-57.00	-13.61	2.81	-73.42
3	707.06	-68.18	-57.00	-11.18	7.50	-75.68

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical	Test Configuration	2

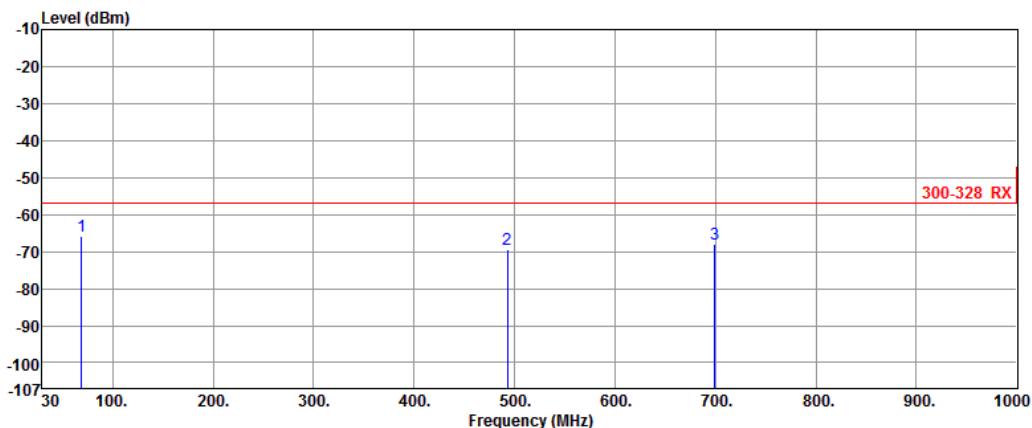
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	81.41	-69.21	-57.00	-12.21	-5.59	-63.62
2	298.69	-68.43	-57.00	-11.43	-1.65	-66.78
3	720.64	-64.89	-57.00	-7.89	7.70	-72.59

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
 Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2



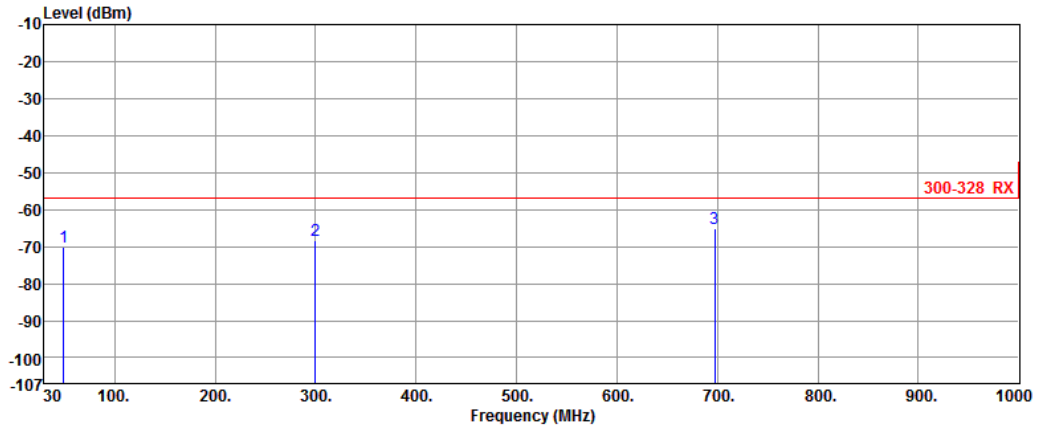
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	68.80	-65.84	-57.00	-8.84	-2.08	-63.76
2	492.69	-69.57	-57.00	-12.57	2.90	-72.47
3	699.30	-67.98	-57.00	-10.98	7.47	-75.45

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	2

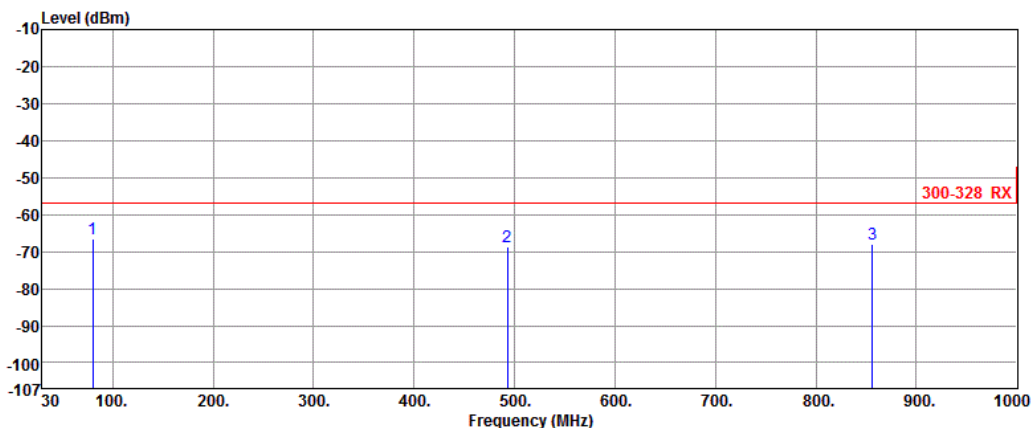


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	49.40	-69.99	-57.00	-12.99	-1.43	-68.56
2	299.66	-68.30	-57.00	-11.30	-1.64	-66.66
3	697.36	-65.08	-57.00	-8.08	7.12	-72.20

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	3

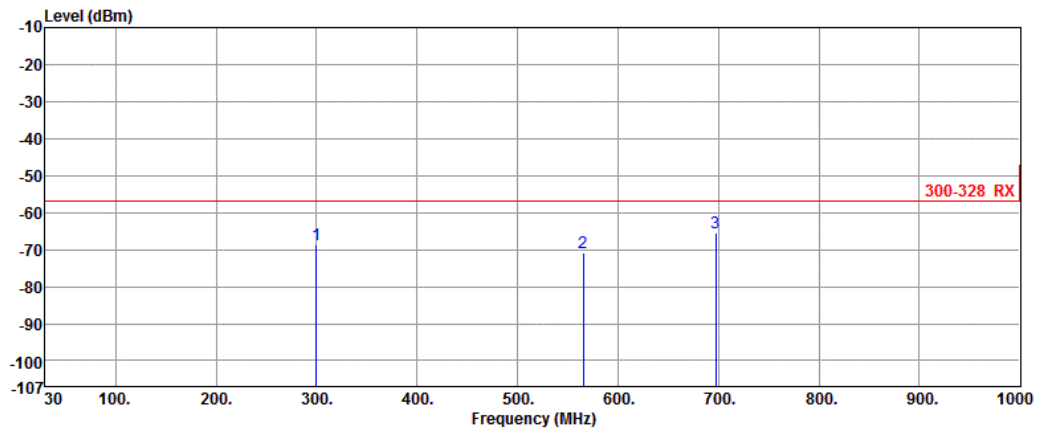
  


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	80.44	-66.70	-57.00	-9.70	-6.59	-60.11
2	492.69	-68.62	-57.00	-11.62	2.90	-71.52
3	856.44	-67.89	-57.00	-10.89	9.21	-77.10

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
 Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	3

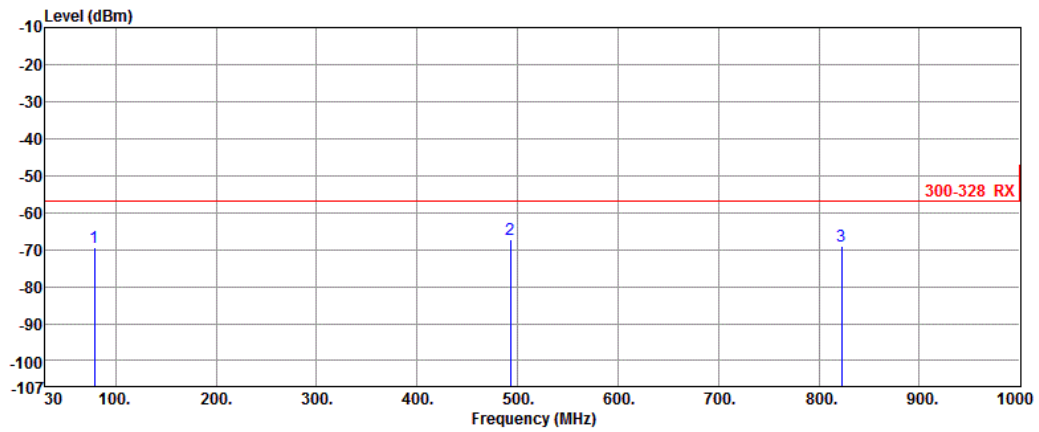


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	299.66	-68.76	-57.00	-11.76	-1.64	-67.12
2	565.44	-70.86	-57.00	-13.86	4.69	-75.55
3	697.36	-65.41	-57.00	-8.41	7.12	-72.53

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	3



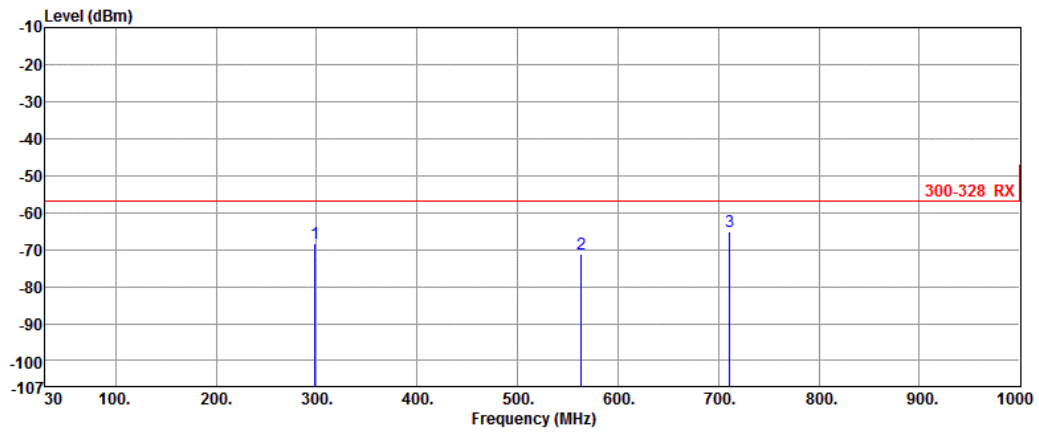
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	78.50	-69.56	-57.00	-12.56	-5.82	-63.74
2	492.69	-67.41	-57.00	-10.41	2.90	-70.31
3	822.49	-68.94	-57.00	-11.94	8.70	-77.64

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)



<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	3



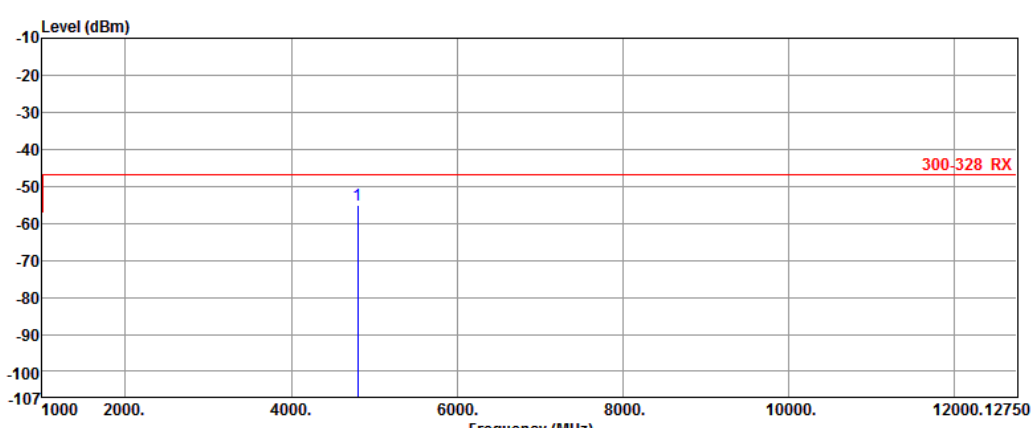
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	298.69	-68.45	-57.00	-11.45	-1.65	-66.80
2	563.50	-71.04	-57.00	-14.04	4.62	-75.66
3	710.94	-65.05	-57.00	-8.05	7.37	-72.42

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

#### 4.1.5 Receiver Spurious Emissions (Above 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1

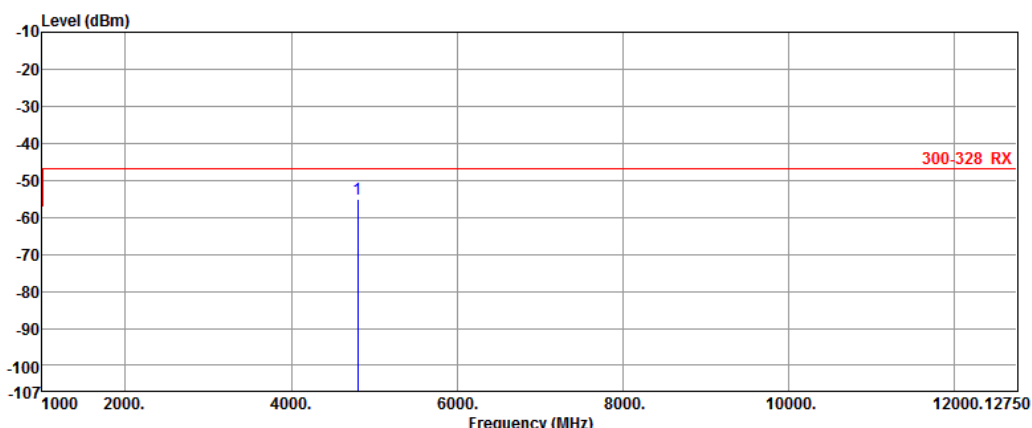
  


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.23	-55.27	-47.00	-8.27	8.43	-63.70

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical	Test Configuration	1



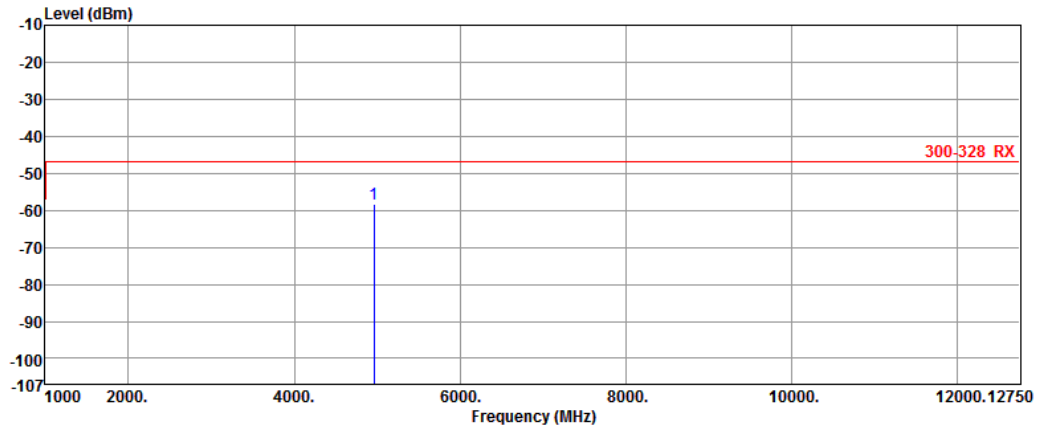
Freq.	Measured value	Limit	Margin	Factor	Reading
MHz	dBm	dBm	dB	dB	dBm
1 4804.05	-55.03	-47.00	-8.03	7.81	-62.84

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal	Test Configuration	1

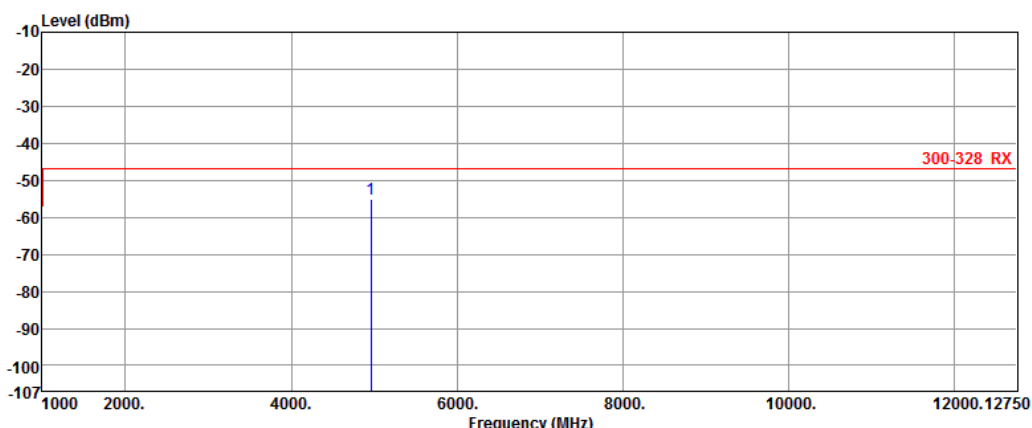


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.27	-58.27	-47.00	-11.27	9.43	-67.70

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical	Test Configuration	1

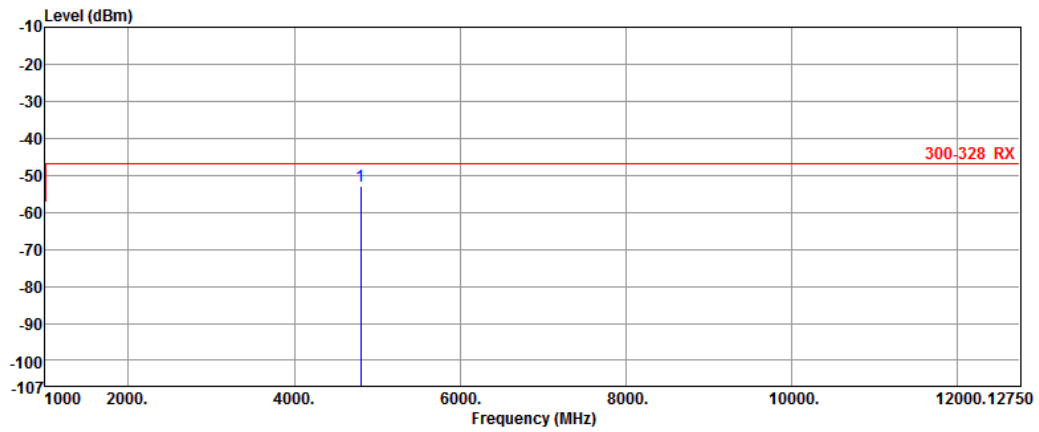
  


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4961.05	-55.00	-47.00	-8.00	8.69	-63.69

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
 Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2

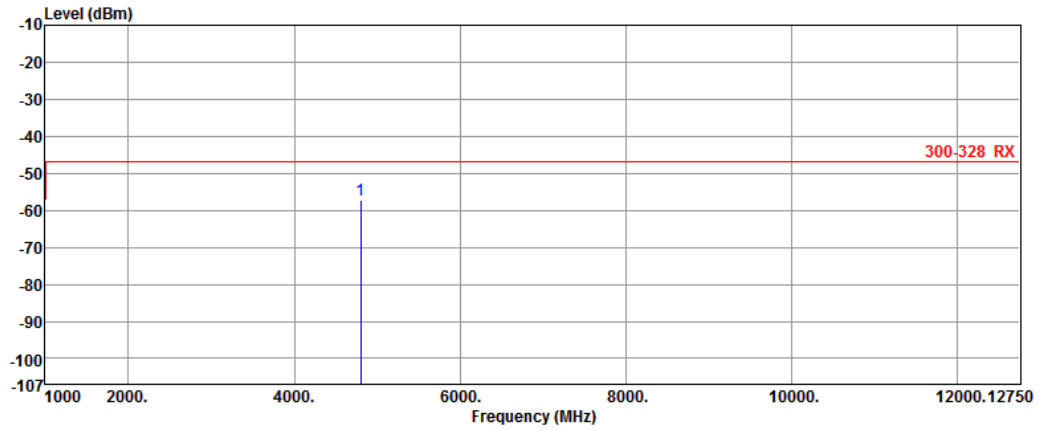


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.23	-53.12	-47.00	-6.12	8.43	-61.55

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	2

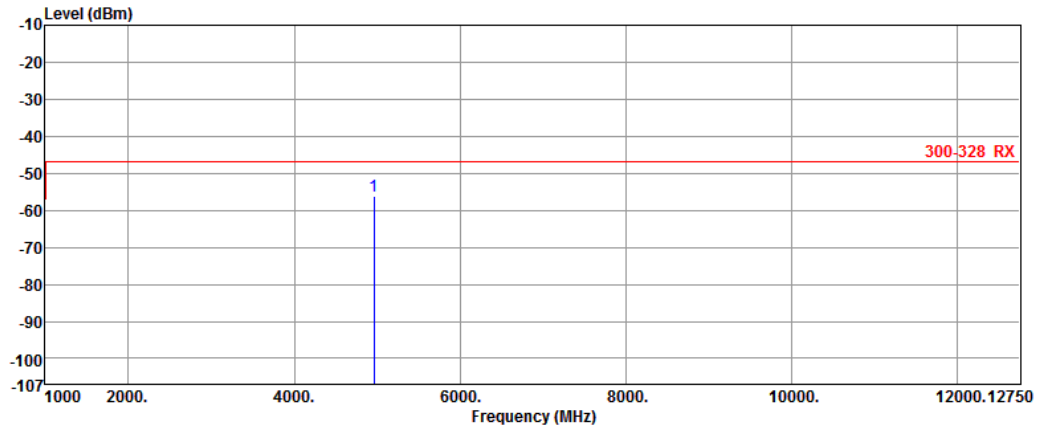


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.05	-57.18	-47.00	-10.18	7.81	-64.99

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2



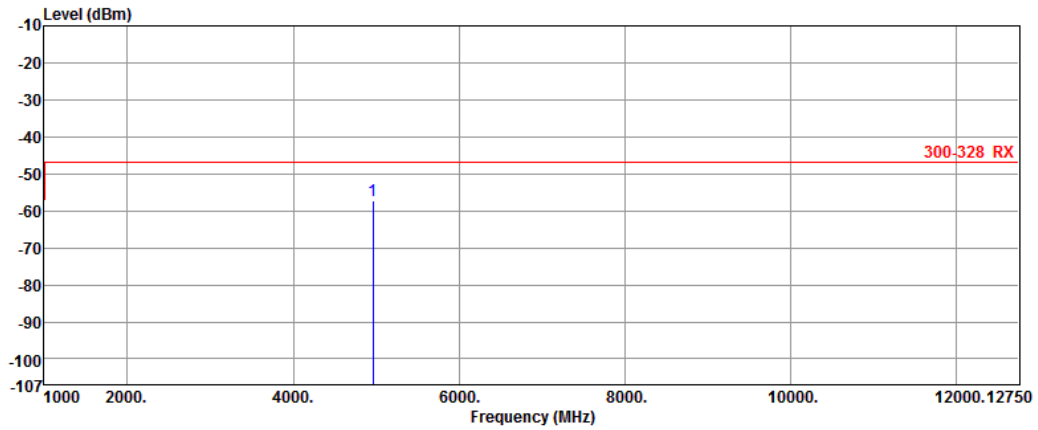
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.27	-56.12	-47.00	-9.12	9.43	-65.55

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)



<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	2



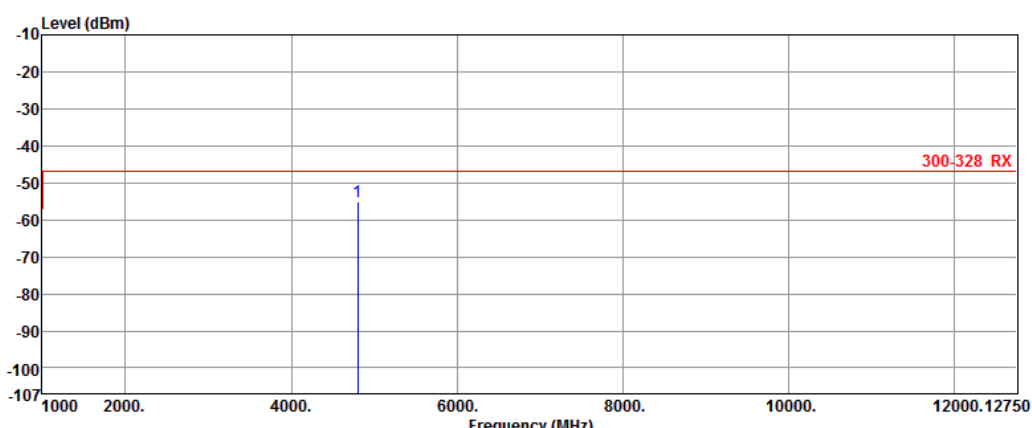
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4961.05	-57.15	-47.00	-10.15	8.69	-65.84

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	3



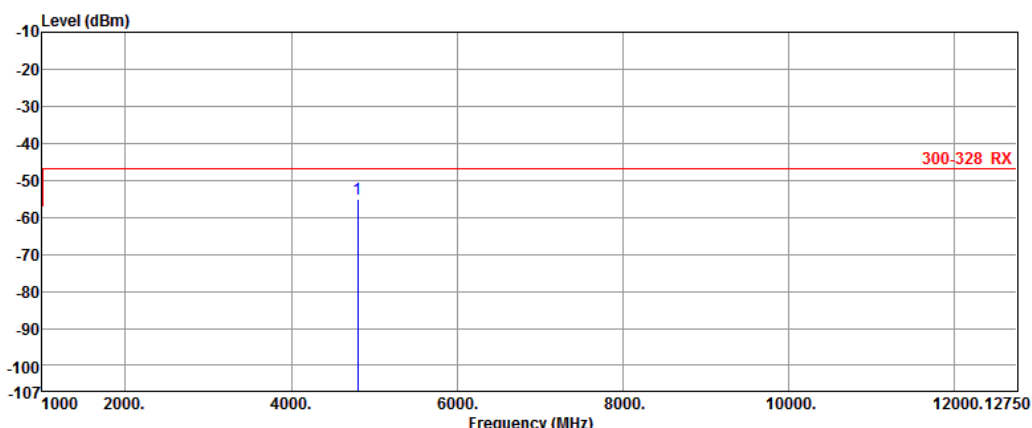
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4802.74	-55.23	-47.00	-8.23	8.43	-63.66

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical	Test Configuration	3

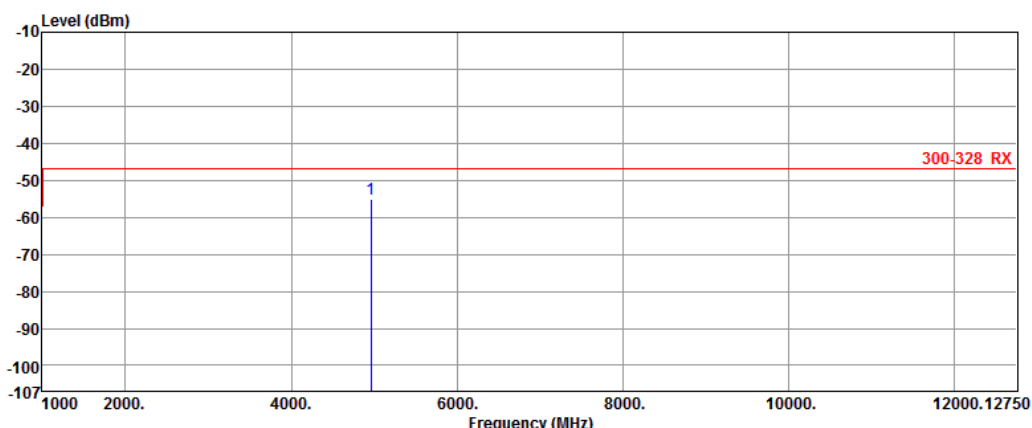
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.23	-55.08	-47.00	-8.08	7.81	-62.89

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
 Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal	Test Configuration	3

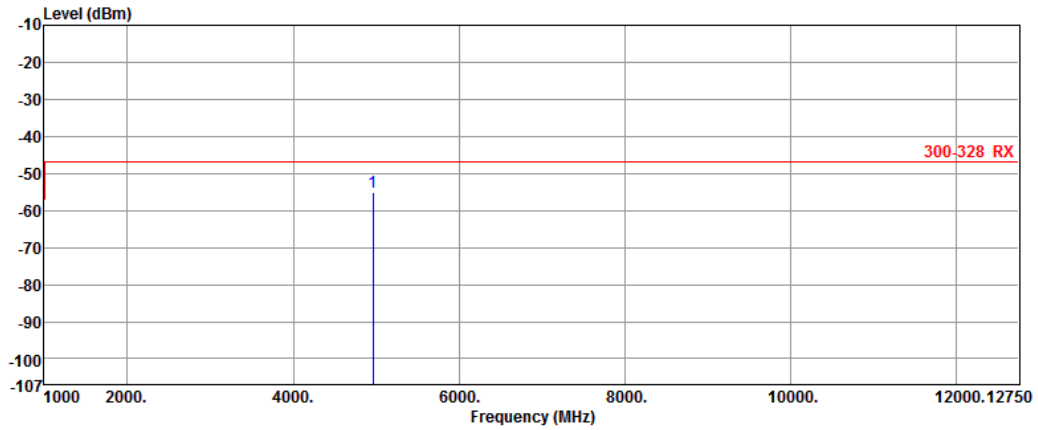


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.08	-54.99	-47.00	-7.99	9.42	-64.41

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)  
 Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	3



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4961.13	-54.99	-47.00	-7.99	8.69	-63.68

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB)

Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

## 5 Receiver Blocking Test Results

### 5.1 Receiver Blocking

#### 5.1.1 Limit of Receiver Blocking

Receiver Blocking Parameters for Receiver Category 1 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see Note 2)	Type of Blocking Signal
$P_{min} + 6 \text{ dB}$	2 380 2 503,5	-53	CW
$P_{min} + 6 \text{ dB}$	2 300 2 330 2 360	-47	CW
$P_{min} + 6 \text{ dB}$	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW

Note 1:  $P_{min}$  is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria (The minimum performance criterion shall be a PER less than or equal to 10 %) in the absence of any blocking signal.

Note 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

Receiver Blocking Parameters for Receiver Category 2 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see Note 2)	Type of Blocking Signal
$P_{min} + 6 \text{ dB}$	2 380 2 503,5	-57	CW
$P_{min} + 6 \text{ dB}$	2 300 2 583,5	-47	CW

Note 1:  $P_{min}$  is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria (The minimum performance criterion shall be a PER less than or equal to 10 %) in the absence of any blocking signal.

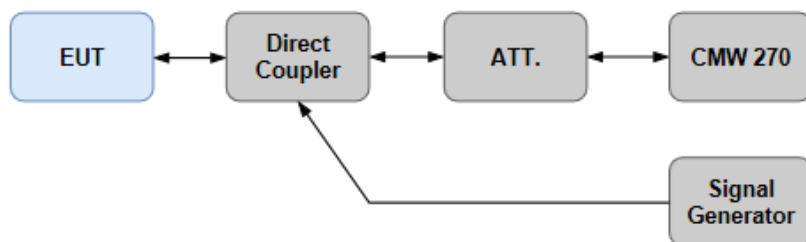
Note 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.

Receiver Blocking Parameters for Receiver Category 3 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see Note 2)	Type of Blocking Signal
$P_{\min} + 12 \text{ dB}$	2 380 2 503,5	-57	CW
$P_{\min} + 12 \text{ dB}$	2 300 2 583,5	-47	CW
<p>Note 1: <math>P_{\min}</math> is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria (The minimum performance criterion shall be a PER less than or equal to 10 %) in the absence of any blocking signal.</p> <p>Note 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.</p>			

### 5.1.2 Test Procedures

Reference to clause 5.4.11.2 of ETSI EN 300 328 V2.1.1 (2016-11).

### 5.1.3 Test Setup



## 5.1.4 Test Result of Receiver Blocking

### Configuration 1: Dipole antenna

**2402 MHz**

Bluetooth Signaling - V3.5.60 - RX Measurement - Base V 3.5.120

**PER PER Search**

Packet Results  
PER [%] -----  
Correct Packets Reported -----

Packets Transmitted  
1000 / 1000

Packets Transmitted by CMW 1000

Report Integrity Off

Correct CRC Rate (in Transmitted Packets) 100 %

**General Setup**

Operating Mode RF Test

Burst Type Low Energy

**RF Setup**

Rx/Tx (EUT) 0

Channel 2402.0 MHz

Tx Level (CMW) -83.00 dBm

Exp. Nom. Power 9.00 dBm

Auto Ranging ☐

Dirty Tx ☐

**Signal Characteristics**

Packet Type RF\_PHY\_TestRef

Payload Length 37 byte(s)

Pattern Type PRBS9

CMW (Master) Direct Test Mode IDLE

Repetition ...

Packets...

Test Results

☐ Save to file  Display : ☒ Standard ☐ BER

C:\Users\NCC\AppData\Local\CSR Ltd.\BlueTest3\wetapplog.txt

```

Opening \\.\csr0.
Transport active.
(gem) (Hardware ID 0x2429) firmware version 8891.
BLE TEST RX successful
Received packet count: 960
BLE TEST END successful

```

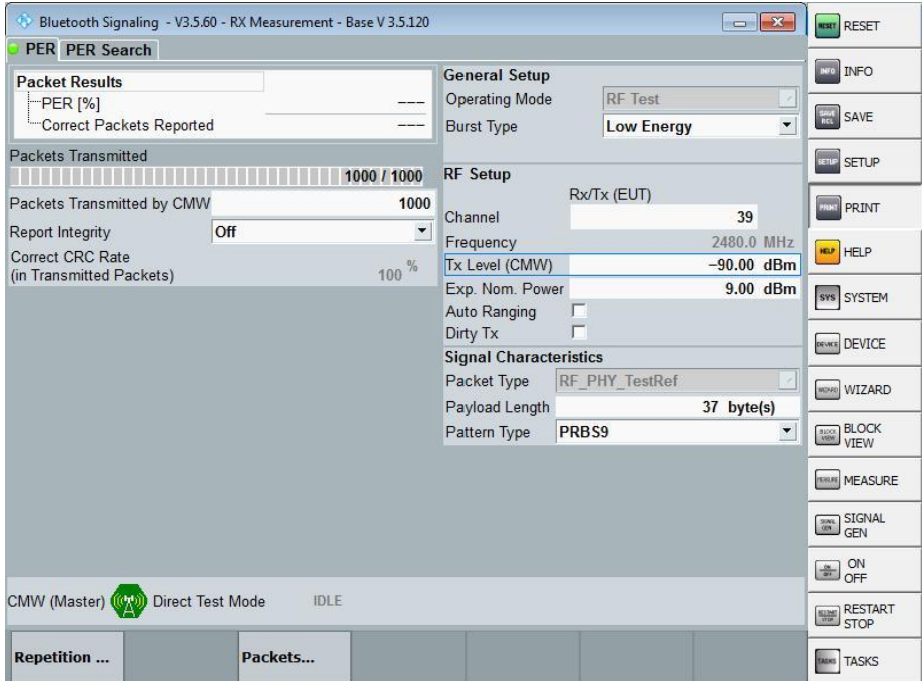
Packet Sent Numbers	1000
Packet Received Numbers	960
PER(%)	4

Note: BLE mode of this product can't fully control by our BT tester, so PER result was reported through "CSR Blue test3" software

PER minimum performance criteria	10 %		
Sensitivity Level	-83	dBm	
Want Signal Mean Power form Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-77	2380	-55	Pass
-77	2503.5		Pass
-77	2300	-45	Pass
-77	2583.5		Pass



**2480 MHz**



The screenshot shows the 'Bluetooth Signaling - V3.5.60 - RX Measurement - Base V 3.5.120' window. The 'PER Search' tab is active. The 'General Setup' section shows 'Operating Mode' as 'RF Test' and 'Burst Type' as 'Low Energy'. The 'RF Setup' section shows 'Channel' as 39, 'Frequency' as 2480.0 MHz, 'Tx Level (CMW)' as -90.00 dBm, and 'Exp. Nom. Power' as 9.00 dBm. The 'Signal Characteristics' section shows 'Packet Type' as 'RF\_PHY\_TestRef', 'Payload Length' as 37 byte(s), and 'Pattern Type' as 'PRBS9'. The 'Packet Results' section shows 'PER [%]' as ---, 'Correct Packets Reported' as ---, 'Packets Transmitted' as 1000 / 1000, 'Packets Transmitted by CMW' as 1000, 'Report Integrity' as Off, and 'Correct CRC Rate (in Transmitted Packets)' as 100 %. The status bar at the bottom shows 'CMW (Master)' and 'Direct Test Mode'.

Test Results

☐ Save to file        Display : ☒ Standard    ☐ BER

D:\Users\1\AppData\Local\CSR Ltd.\BlueTest3\wetestapplog.txt

```

Opening COM8.
Transport active.
(gem) (Hardware ID 0x2429) firmware version 8241.
BLE TEST RX successful
Received packet count: 967
BLE TEST END successful

```

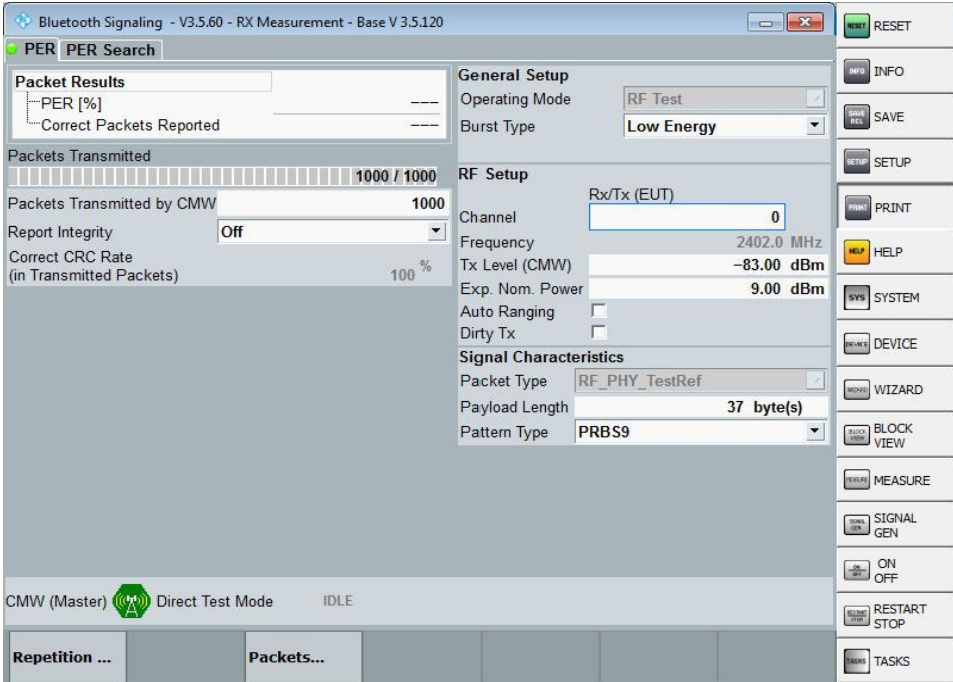
Packet Sent Numbers	1000
Packet Received Numbers	967
PER(%)	3.3

Note: BLE mode of this product can't fully control by our BT tester, so PER result was reported through "CSR Blue test3" software

PER minimum performance criteria	10 %		
Sensitivity Level	-90	dBm	
Want Signal Mean Power form Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-84	2380	-55	Pass
-84	2503.5		Pass
-84	2300	-45	Pass
-84	2583.5		Pass

### Configuration 3: Chip antenna

2402 MHz



RESET

INFO

SAVE

SETUP

PRINT

HELP

SYSTEM

DEVICE

WIZARD

BLOCK VIEW

MEASURE

SIGNAL GEN

ON OFF

RESTART STOP

TASKS

Test Results

☐ Save to file        Display : ☒ Standard    ☐ BER

C:\Users\ICC\AppData\Local\CSR Ltd.\BlueTest3\wetapplog.txt

```

Opening W:\csr0.
Transport active.
(gem) (Hardware ID 0x2429) firmware version 8891.
BLE TEST RX successful
Received packet count: 960
BLE TEST END successful

```

Packet Sent Numbers	1000
Packet Received Numbers	960
PER(%)	4

Note: BLE mode of this product can't fully control by our BT tester, so PER result was reported through "CSR Blue test3" software

PER minimum performance criteria	10 %		
Sensitivity Level	-83	dBm	
Want Signal Mean Power form Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-77	2380	-56.5	Pass
-77	2503.5		Pass
-77	2300	-46.5	Pass
-77	2583.5		Pass

## 2480 MHz

Bluetooth Signaling - V3.5.60 - RX Measurement - Base V 3.5.120

**PER Search**

Packet Results  
 PER [%] \_\_\_\_\_  
 Correct Packets Reported \_\_\_\_\_

Packets Transmitted  
 1000 / 1000

Packets Transmitted by CMW 1000

Report Integrity Off

Correct CRC Rate (in Transmitted Packets) 100 %

**General Setup**  
 Operating Mode RF Test  
 Burst Type Low Energy

**RF Setup**  
 Rx/Tx (EUT)  
 Channel 39  
 Frequency 2480.0 MHz  
 Tx Level (CMW) -90.00 dBm  
 Exp. Nom. Power 9.00 dBm  
 Auto Ranging ☐  
 Dirty Tx ☐

**Signal Characteristics**  
 Packet Type RF\_PHY\_TestRef  
 Payload Length 37 byte(s)  
 Pattern Type PRBS9

CMW (Master) Direct Test Mode IDLE

Repetition ... Packets...

RESET  
INFO  
SAVE  
SETUP  
PRINT  
HELP  
SYSTEM  
DEVICE  
WIZARD  
BLOCK VIEW  
MEASURE  
SIGNAL GEN  
ON OFF  
RESTART STOP  
TASKS

Test Results

☐ Save to file  Display : ☒ Standard ☐ BER

D:\Users\1\AppData\Local\CSR Ltd\BlueTest3\uetapplog.txt

Opening COM8.  
 Transport active.  
 (gem) (Hardware ID 0x2429) firmware version 8241.  
 BLE TEST RX successful  
 Received packet count: 967  
 BLE TEST END successful

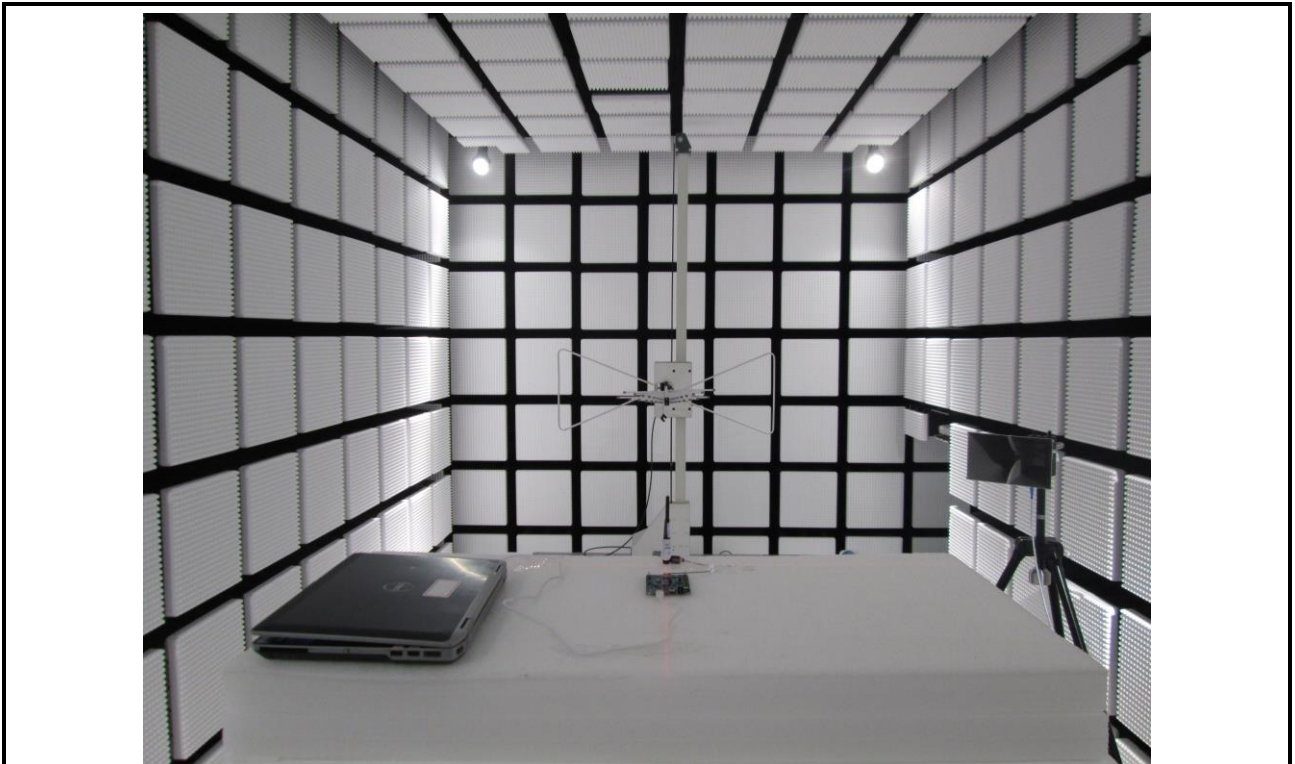
Packet Sent Numbers	1000
Packet Received Numbers	967
PER(%)	3.3

Note: BLE mode of this product can't fully control by our BT tester, so PER result was reported through "CSR Blue test3" software

PER minimum performance criteria	10 %		
Sensitivity Level	-90	dBm	
Want Signal Mean Power form Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-84	2380	-56.5	Pass
-84	2503.5		Pass
-84	2300	-46.5	Pass
-84	2583.5		Pass

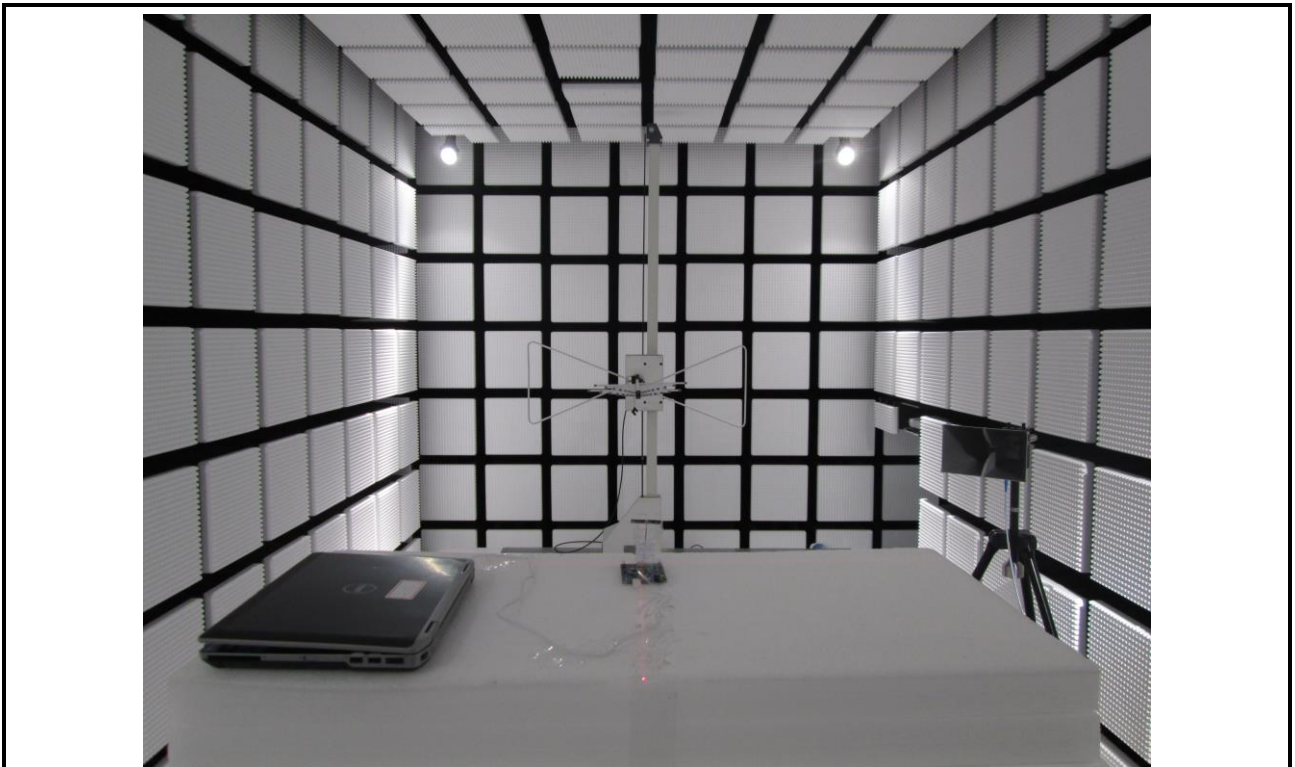
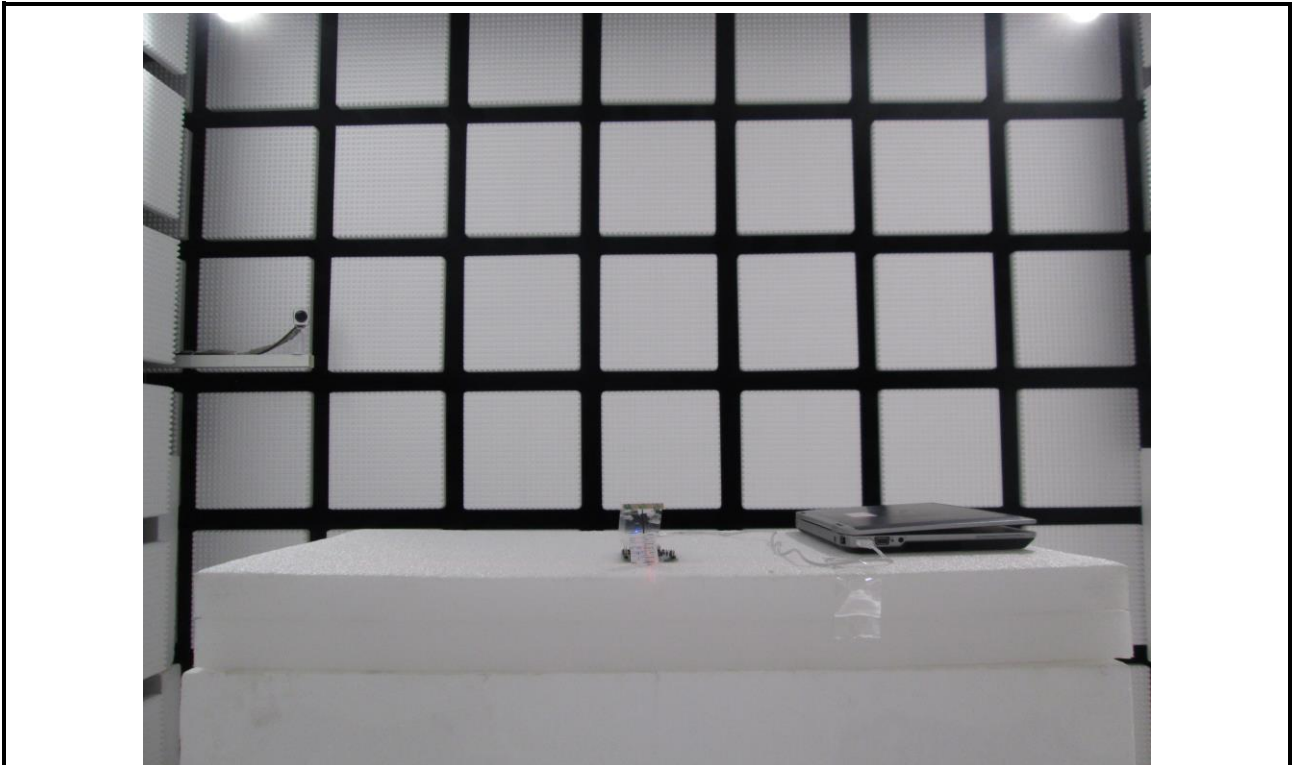
## 6 Photographs of the Test Configuration

### Spurious Emission Test (Configuration 1: Dipole antenna)

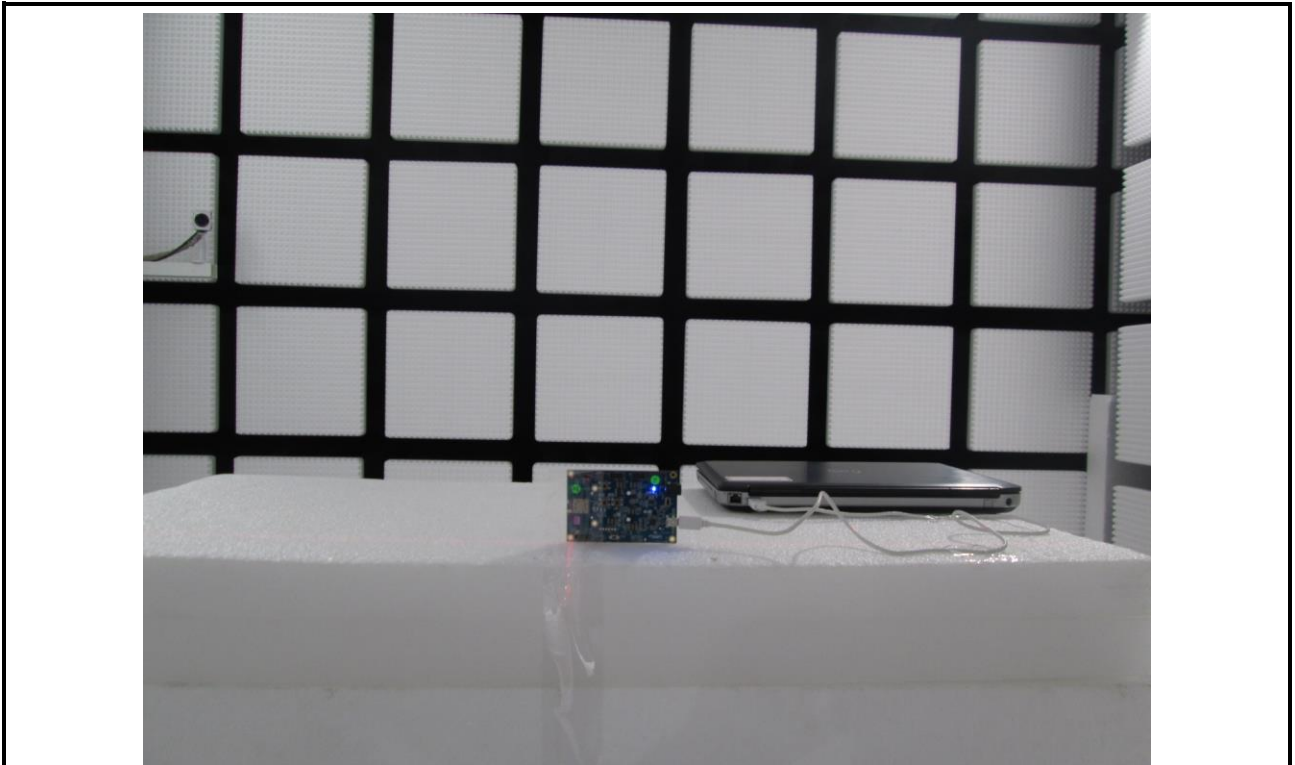




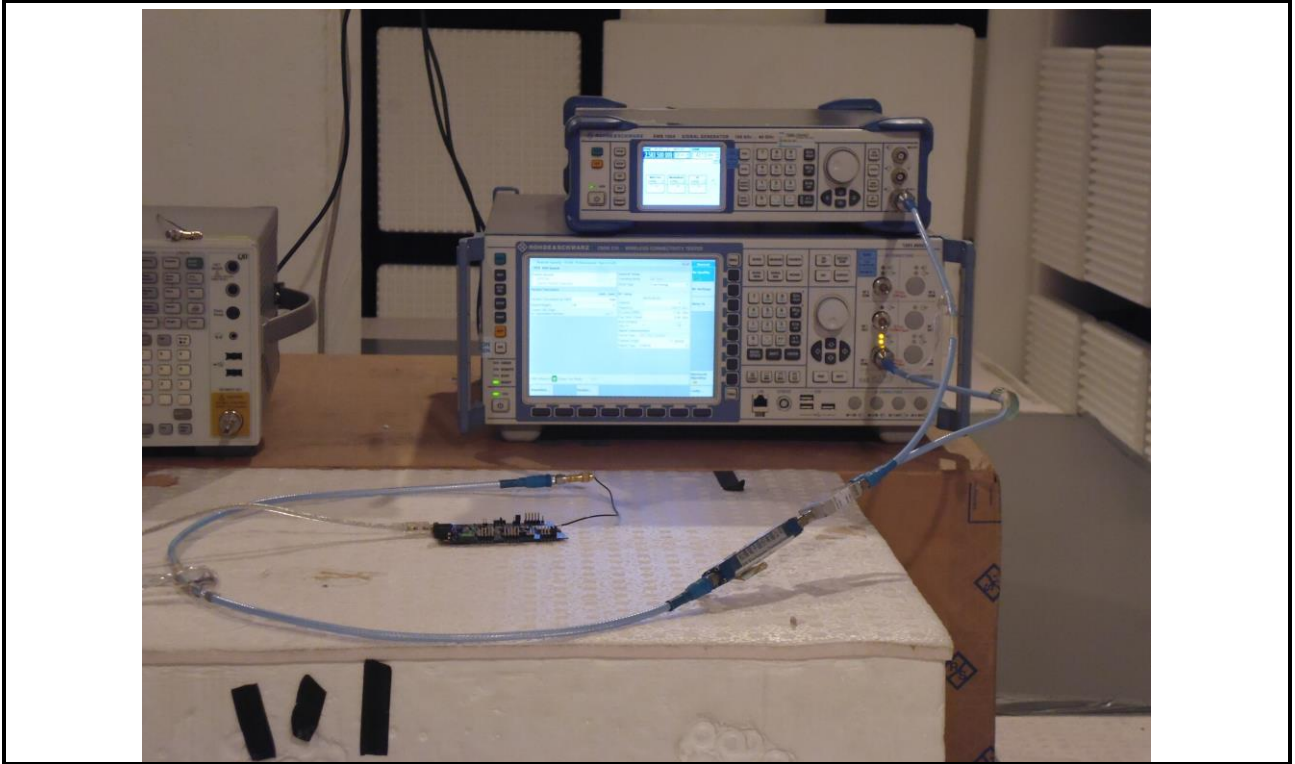
**Spurious Emission Test (Configuration 2: PCB Dipole antenna)**



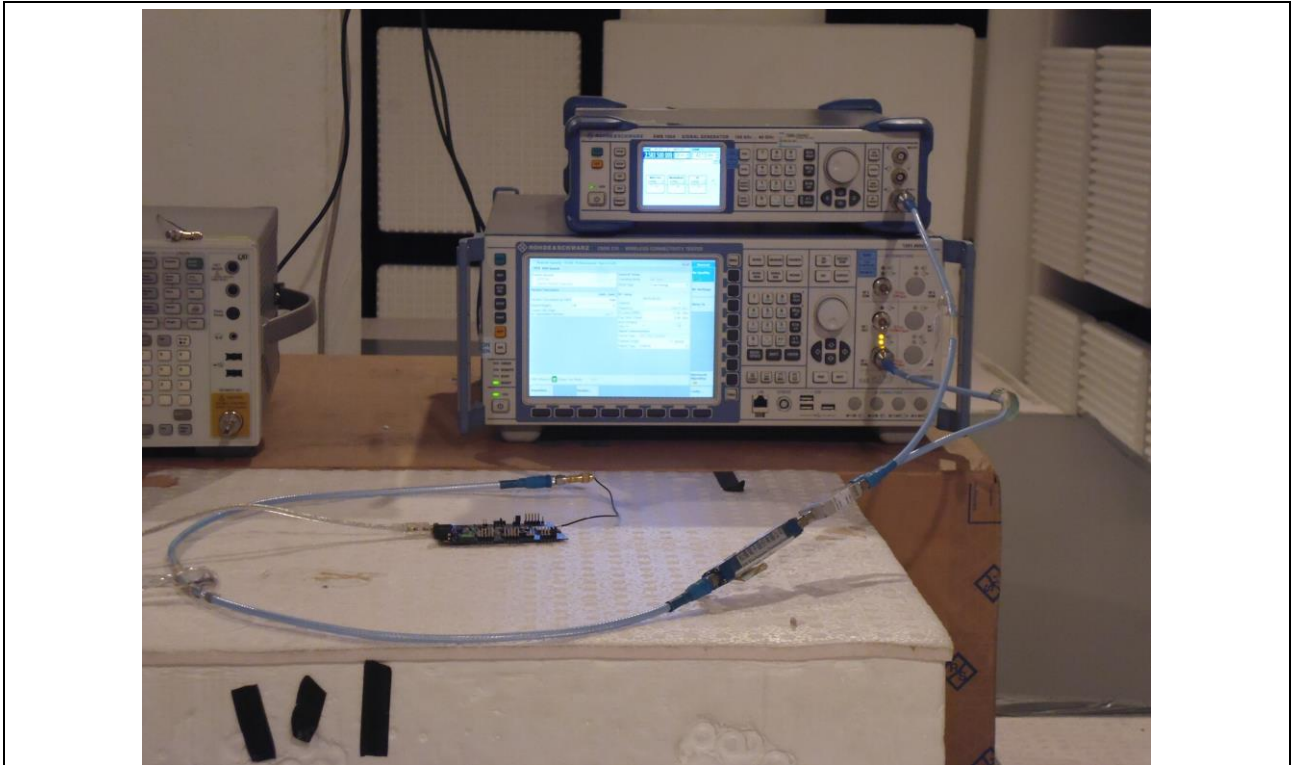
**Spurious Emission Test (Configuration 3: Chip antenna)**



**Receiver Blocking Test (Configuration 1: Dipole antenna)**



**Receiver Blocking Test (Configuration 3: Chip antenna)**





## 7 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

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