

# CE Test Report

**Equipment** : Bluetooth v4.0 Dual-Mode UART HCI Module  
**Model No.** : BT830-SA, BT830-ST  
(Please refer to item 1.1.1 for more details.)  
**Brand Name** : Laird Connectivity  
**Applicant** : Laird Connectivity, Inc.  
**Address** : W66N220 Commerce Court, Cedarburg,  
Wisconsin 53012, USA  
**Standard** : EN 300 328 V2.2.2 (2019-07)  
**Received Date** : Jun. 18, 2020  
**Tested Date** : May 05 ~ May 15, 2014 (for original test)  
Jun. 18, 2020 (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



## Table of Contents

<b>1</b>	<b>GENERAL DESCRIPTION .....</b>	<b>5</b>
1.1	Information.....	5
1.2	Local Support Equipment List .....	7
1.3	Test Setup Chart .....	7
1.4	Test Equipment List and Calibration Data.....	8
1.5	Testing Applied Standards .....	9
1.6	Deviation from Test Standard and Measurement Procedure.....	9
1.7	Measurement Uncertainty .....	9
<b>2</b>	<b>TEST CONFIGURATION .....</b>	<b>10</b>
2.1	Testing Condition .....	10
2.2	Testing Facility.....	10
2.3	The Worst Test Modes and Channel Details .....	10
<b>3</b>	<b>TRANSMITTER TEST RESULTS.....</b>	<b>11</b>
3.1	RF Output Power.....	11
3.2	Power Spectral Density .....	13
3.3	Occupied Channel Bandwidth .....	14
3.4	Transmitter Unwanted Emissions in the Out-Of-Band Domain.....	15
3.5	Transmitter Unwanted Emissions in the Spurious Domain .....	18
<b>4</b>	<b>RECEIVER TEST RESULTS .....</b>	<b>44</b>
4.1	Receiver Spurious Emissions.....	44
<b>5</b>	<b>RECEIVER BLOCKING TEST RESULTS.....</b>	<b>70</b>
5.1	Receiver Blocking.....	70
<b>6</b>	<b>PHOTOGRAPHS OF THE TEST CONFIGURATION .....</b>	<b>75</b>
<b>7</b>	<b>TEST LABORATORY INFORMATION .....</b>	<b>79</b>

---

## Release Record

Report No.	Version	Description	Issued Date
ER442804-04AE	Rev. 01	Initial issue	Jul. 30, 2020

## Summary of Test Results

Ref. Std. Clause	Test Items	Measured	Result
4.3.2.2	RF Output Power	9.73 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

### Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

### Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

# 1 General Description

## 1.1 Information

This report is issued as a supplementary report to original ICC report no. ER442804-02AE. The difference is concerned with following items:

- ✧ Updating standard version from V2.1.1 to V2.2.2.
- ✧ New applicant name & brand name.

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 Connectivity	BT830-SA	Bluetooth v4.0 Dual-Mode UART HCI Module	chip antenna
	BT830-ST	Bluetooth v4.0 Dual-Mode UART HCI Module	trace to 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	BT830-SA	Chip	ACX AT3216-B2R7HAA_3216	0.5	N/A
2	BT830-ST	Dipole	Nearson S181FL-L-RMM-2450S	2.0	UFL
3	BT830-ST	PCB Dipole	Laird EBL2449A1-15UFL	2.0	UFL
4	BT830-ST	Dipole	Laird MAF94190	2.0	UFL
5	BT830-ST	Dipole	Laird WRR2400- IP04-B(MAF94019)	1.5	UFL

Note1: Ant.2 & Ant.4 were pretested and found that Ant. 2 was the worst case. Therefore, Ant.2 & Ant.3 were selected for final testing for model BT830-ST.

### 1.1.4 EUT Operational Condition

<b>Power Supply Type</b>	3.3Vdc from host		
<b>SW Version</b>	1.0.0.7		
<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

Test Tool	BlueTest3
Duty Cycle Of Test Signal (%)	79.68%
Duty Factor (dB)	0.99

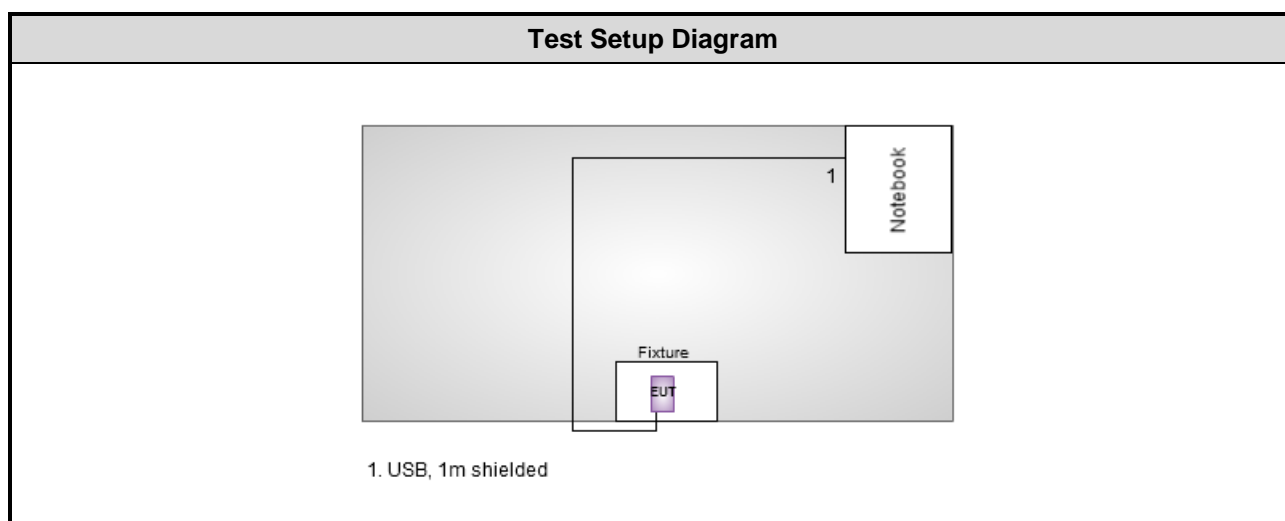
### 1.1.8 Power Setting

Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
GFSK-1Mbps	63	63	63

## 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	3NXMD12	DoC	USB, 1m shielded w/o core.
2	Fixture	---	---	---	---	---

## 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 2 / (05CH02-WS)				
<b>Tested Date</b>	May 05, 2014				
<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	MY52221474	Sep. 26, 2013	Sep. 25, 2014
Bilog Antenna 30-1000MHz	SCHWARZBECK	VULB9168	9168-563	Feb. 07, 2014	Feb. 06, 2015
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	9120D-1205	Feb. 20, 2014	Feb. 19, 2015
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 14, 2014	Jan. 13, 2015
Preamplifier	Agilent	83017A	MY53270013	Feb. 11, 2014	Feb. 10, 2015
Preamplifier 30-1000MHz	EMC	EMC02325	980188	Feb. 11, 2014	Feb. 10, 2015
Preamplifier	EM	EM18G40G	060572	Jun. 20, 2013	Jun. 19, 2014
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22622/4	Jan. 29, 2014	Jan. 28, 2015
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22623/4	Jan. 29, 2014	Jan. 28, 2015
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22621/4	Jan. 29, 2014	Jan. 28, 2015
RF cable-4M	HUBER+SUHNER	SUCOFLEX104	MY22579/4	Jan. 29, 2014	Jan. 28, 2015
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-002	Jan. 27, 2014	Jan. 26, 2015
LF cable-3M	EMC	EMC8D-NM-NM-3000	131102	Jan. 27, 2014	Jan. 26, 2015
LF cable-10M	EMC	EMC8D-NM-NM-10000	131101	Jan. 27, 2014	Jan. 26, 2015
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>	May 15, 2014				
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Calibration Date</b>	<b>Calibration Until</b>
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2014	Feb. 16, 2015
Spectrum Analyzer	Agilent	N9010A	MY53400091	Oct. 07, 2013	Oct. 06, 2014
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Dec. 11, 2013	Dec. 10, 2014
Power Meter	Anritsu	ML2495A	1241002	Oct. 24, 2013	Oct. 23, 2014
Power Sensor	Anritsu	MA2411B	1207366	Oct. 24, 2013	Oct. 23, 2014
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>	Jun. 18, 2020				
<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Calibration Date</b>	<b>Calibration Until</b>
Wireless connectivity tester	ROHDE&SCHWARZ	CMW270	100856	Oct. 24, 2019	Oct. 23, 2020
Signal Generator	ROHDE&SCHWARZ	SMBV100A	263146	Jan. 15, 2020	Jan. 14, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX_104	500202/4	Oct. 16, 2019	Oct. 15, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX_104	296088/4	Oct. 16, 2019	Oct. 15, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX_104	329023/4	Oct. 16, 2019	Oct. 15, 2020
Combiner(1X2)	WOKEN	2WAYDIV	12101200003	Oct. 16, 2019	Oct. 15, 2020
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 V2.2.2 (2019-07)

## 1.6 Deviation from Test Standard and Measurement Procedure

None

## 1.7 Measurement Uncertainty

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	±0.0034 %	±5 %
RF output power, conducted	±0.537 dB	±1.5 dB
Power Spectral Density, conducted	±0.463 dB	±3 dB
Unwanted Emissions, conducted	±2.505 dB	±3 dB
All emissions, radiated	±3.401 dB	±6 dB
Temperature	±0.6 °C	±3 °C
Supply voltages	±0.16 %	±3 %
Time	±0.1 %	±5 %

## 2 Test Configuration

### 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
RF Conducted	TH01-WS	22.5°C / 63%	Jack Li
Radiated Emission	05CH02-WS	22°C / 62%	Allen Yu
Receiver Blocking	05CH01-WS	25°C / 65%	Jack Li

### 2.2 Testing Facility

Test Laboratory	International Certification Corp.
Test Site	TH01-WS, 05CH01-WS
Address of Test Site (Kwei Shan)	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

Test Site	05CH02-WS
Address of Test Site (Kwei Shan II)	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

### 2.3 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, 2
Power Spectral Density				
Occupied Channel Bandwidth	GFSK	2402 / 2480	1 Mbps	1
Transmitter unwanted emissions in the out of band domain	GFSK	2402 / 2480	1 Mbps	1, 2
Transmitter Spurious Emissions	GFSK	2402 / 2480	1 Mbps	1, 2, 3
Receiver Spurious Emissions				
Receiver Blocking	GFSK	2402 / 2480	1 Mbps	2

**NOTE:**

- The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** result was found as the worst case and was shown in this report.
- The test configuration listed as follows:
  - Configuration 1: BT830-SA with Ant.1 Chip antenna.
  - Configuration 2: BT830-ST with Ant.2 Dipole antenna.
  - Configuration 3: BT830-ST with Ant.3 PCB Dipole antenna.

### 3 Transmitter Test Results

#### 3.1 RF Output Power

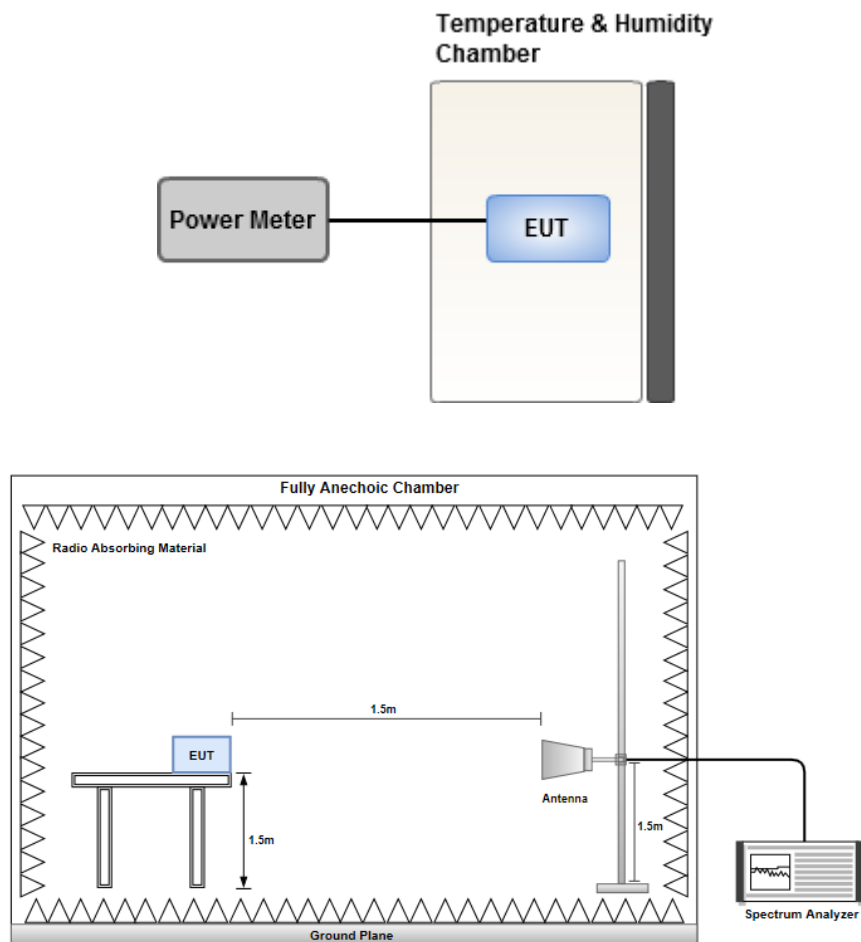
##### 3.1.1 Limit of RF Output Power

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 V2.2.2 (2019-07).

##### 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
TnomVnom	2402	5.83	20	Pass
TminVnom	2402	5.26	20	Pass
TmaxVnom	2402	3.89	20	Pass
TnomVnom	2440	6.67	20	Pass
TminVnom	2440	6.39	20	Pass
TmaxVnom	2440	5.48	20	Pass
TnomVnom	2480	8.27	20	Pass
TminVnom	2480	8.00	20	Pass
TmaxVnom	2480	7.29	20	Pass

#### Test Configuration 2

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
TnomVnom	2402	8.19	20	Pass
TminVnom	2402	8.03	20	Pass
TmaxVnom	2402	7.25	20	Pass
TnomVnom	2440	9.41	20	Pass
TminVnom	2440	8.47	20	Pass
TmaxVnom	2440	7.58	20	Pass
TnomVnom	2480	9.73	20	Pass
TminVnom	2480	8.62	20	Pass
TmaxVnom	2480	7.83	20	Pass

## 3.2 Power Spectral Density

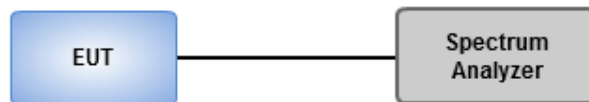
### 3.2.1 Limit of Power Spectral Density

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 V2.2.2 (2019-07).

### 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	5.47	10	Pass
GFSK-1Mbps	2440	6.56	10	Pass
GFSK-1Mbps	2480	8.24	10	Pass

Test Configuration 2

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	7.99	10	Pass
GFSK-1Mbps	2440	9.33	10	Pass
GFSK-1Mbps	2480	9.64	10	Pass

### 3.3 Occupied Channel Bandwidth

#### 3.3.1 Limit of Occupied Channel Bandwidth

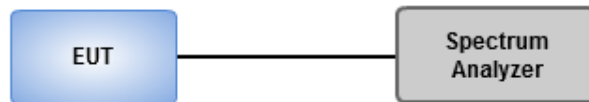
The Occupied Channel Bandwidth shall fall completely within 2.4~2.4835 GHz.

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 V2.2.2 (2019-07).

#### 3.3.3 Test Setup

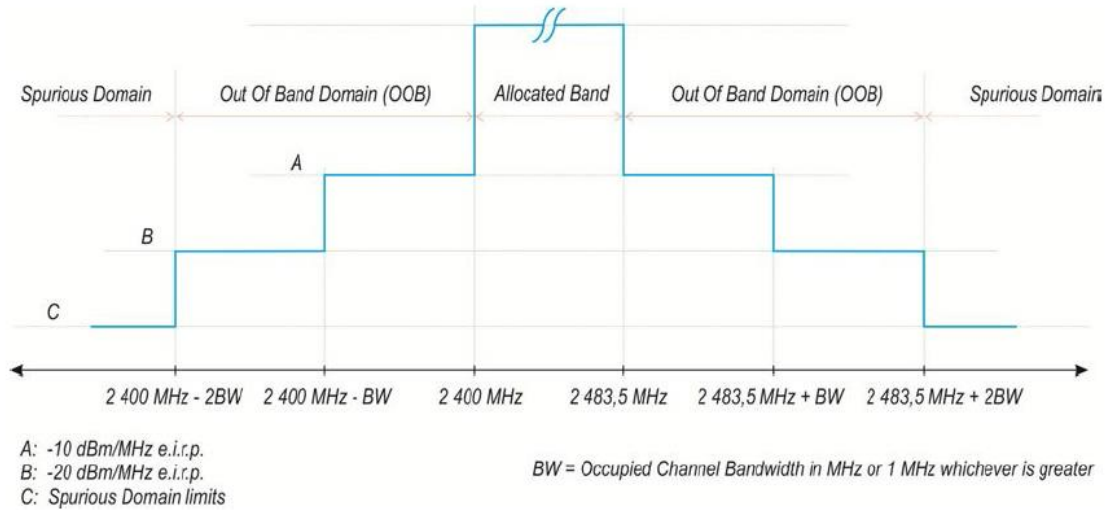


#### 3.3.4 Test Result of Occupied Channel Bandwidth

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	1.05	2401.47	2402.52	2400.0
GFSK-1Mbps	2480	1.07	2479.45	2480.52	2483.5

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

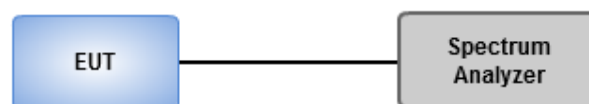
#### 3.4.1 Limit of Transmitter Unwanted Emissions in the Out-Of-Band Domain



#### 3.4.2 Test Procedures

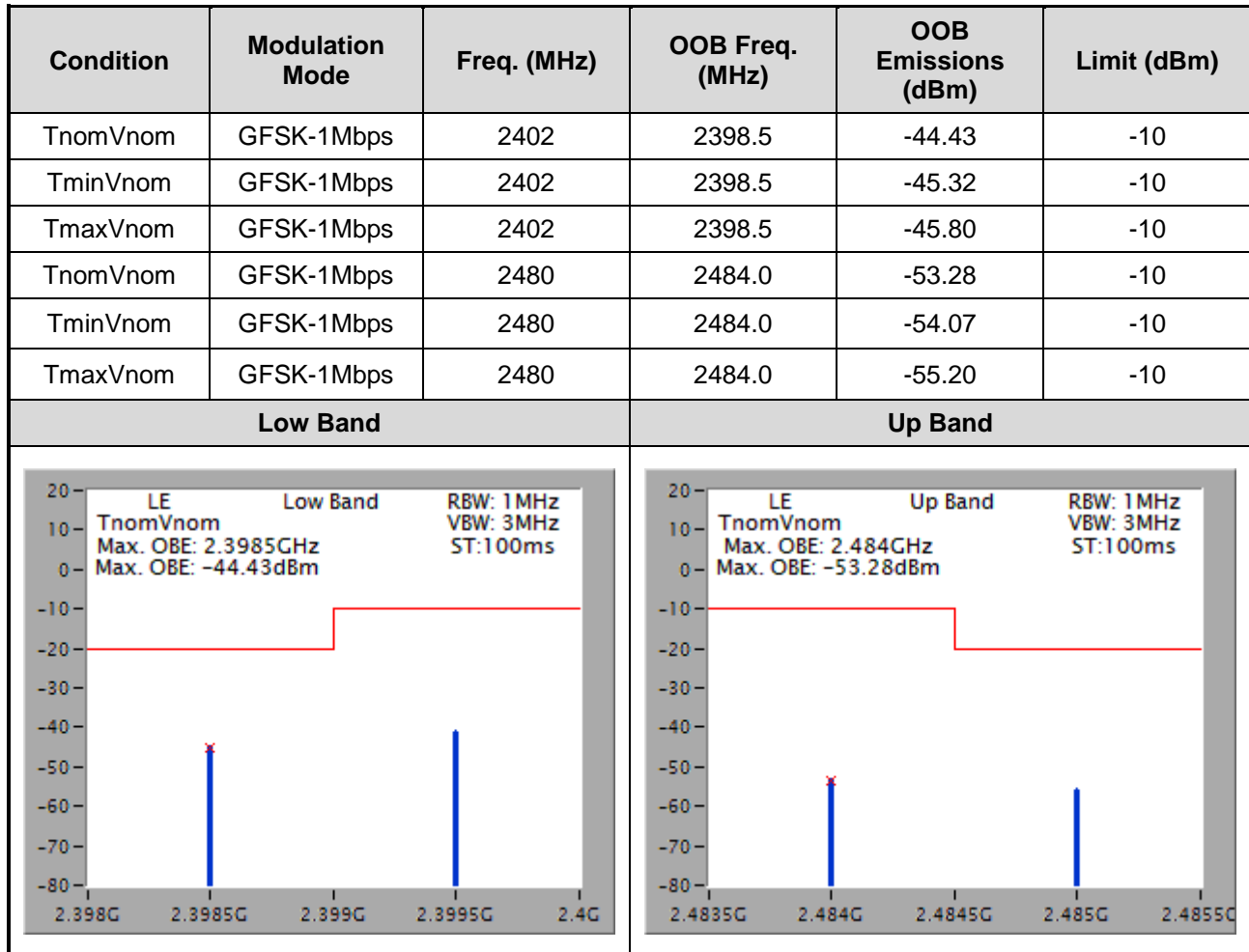
Reference to clause 5.4.8.2 of ETSI EN 300 328 V2.2.2 (2019-07).

#### 3.4.3 Test Setup



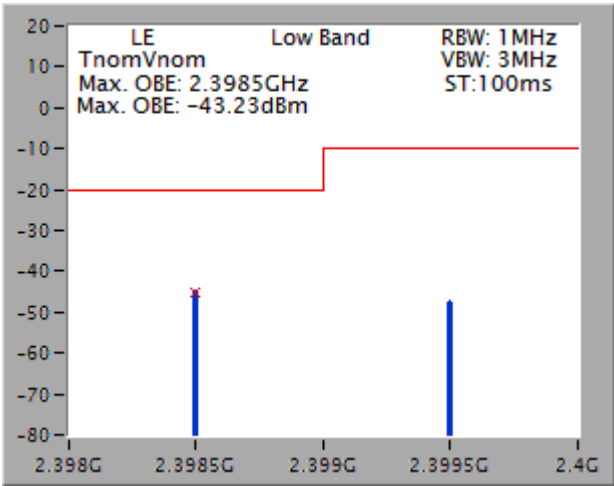
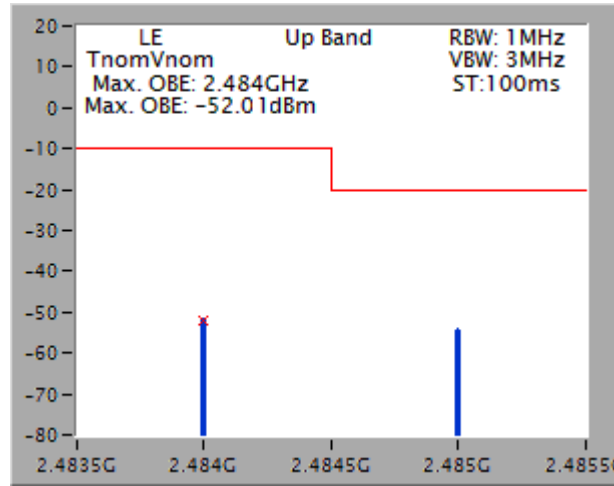
### 3.4.4 Test Result of Transmitter Unwanted Emissions in the Out-Of-Band Domain

Test Configuration 1





### Test Configuration 2

Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2398.5	-43.23	-10
TminVnom	GFSK-1Mbps	2402	2398.5	-43.76	-10
TmaxVnom	GFSK-1Mbps	2402	2398.5	-44.44	-10
TnomVnom	GFSK-1Mbps	2480	2484.0	-52.01	-10
TminVnom	GFSK-1Mbps	2480	2484.0	-52.62	-10
TmaxVnom	GFSK-1Mbps	2480	2484.0	-53.13	-10
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

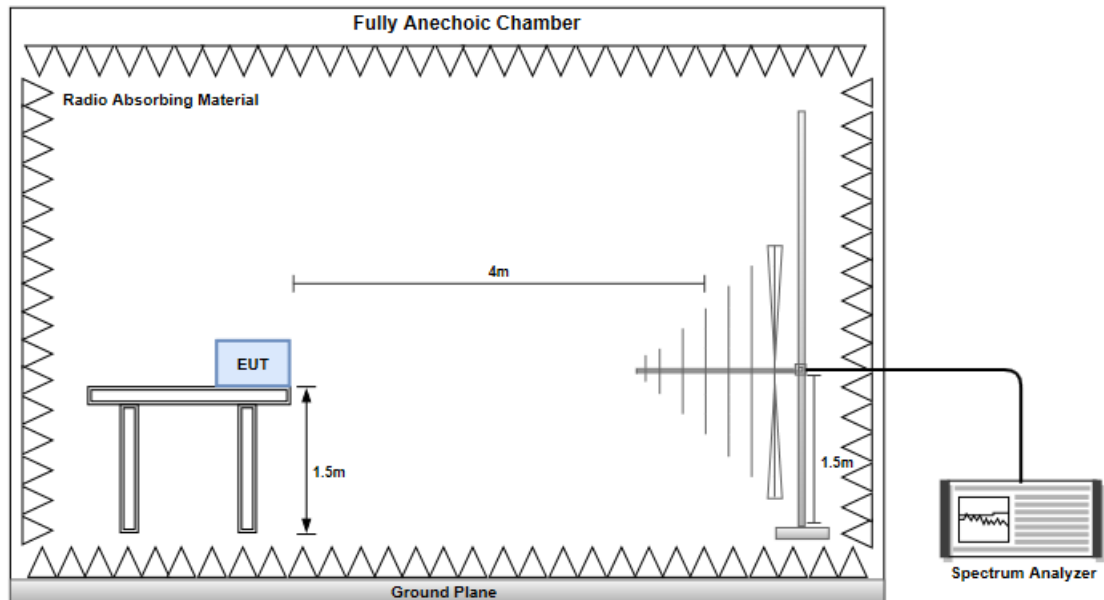
Frequency Range (MHz)	Maximum power (dBm)	Bandwidth (kHz)
30 to 47	-36	100
47 to 74	-54	100
74 to 87,5	-36	100
87,5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 694	-54	100
694 to 1000	-36	100
1000 to 12750	-30	1000

#### 3.5.2 Test Procedures

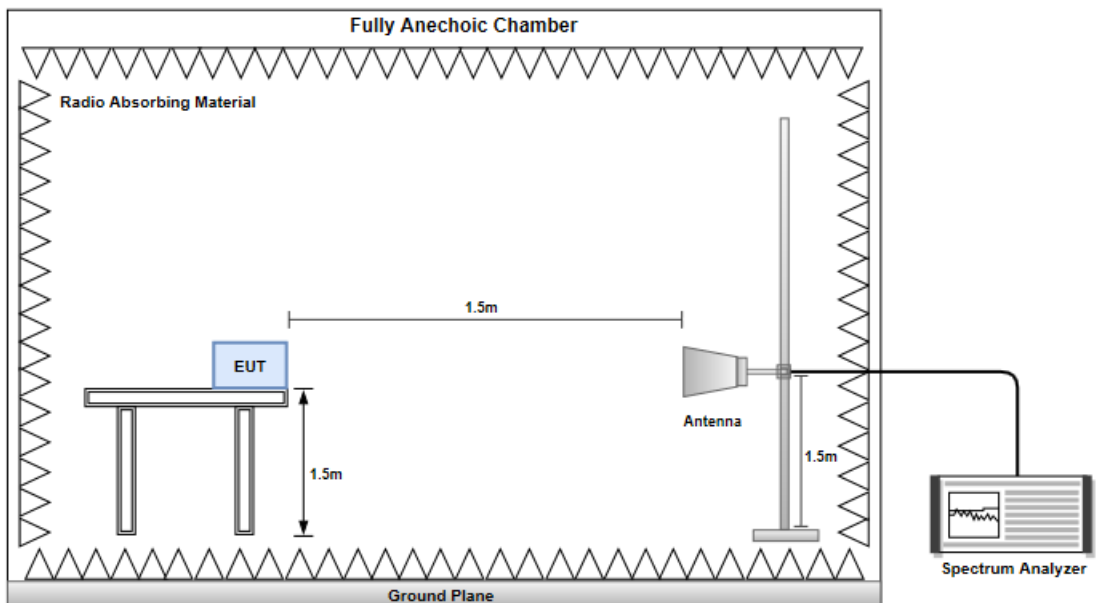
Reference to clause 5.4.9.2 of ETSI EN 300 328 V2.2.2 (2019-07).

### 3.5.3 Test Setup

#### Below 1GHz

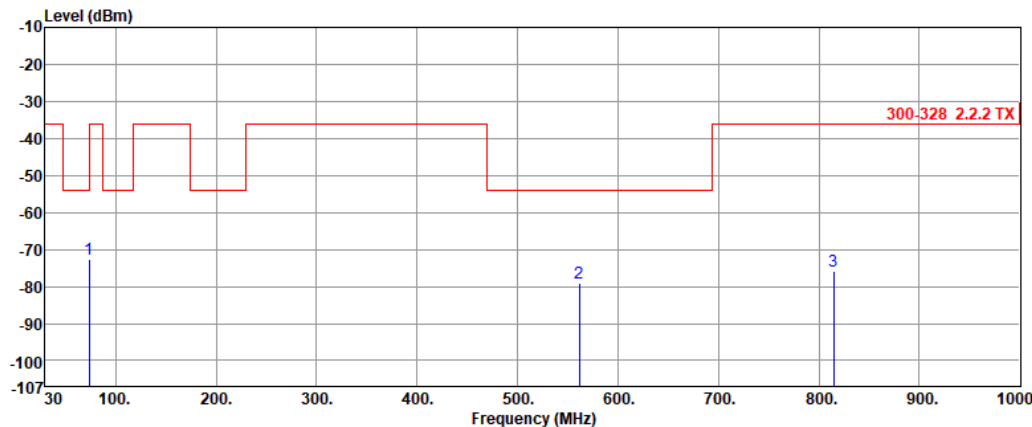


#### Above 1 GHz



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

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

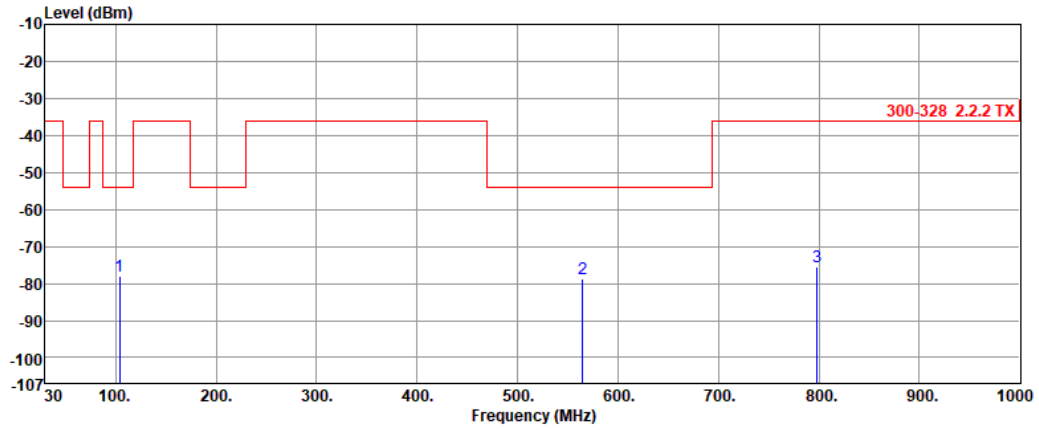


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	73.65	-72.60	-54.00	-18.60	-5.65	-66.95
2	561.56	-79.00	-54.00	-25.00	4.75	-83.75
3	814.73	-75.85	-36.00	-39.85	9.82	-85.67

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

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

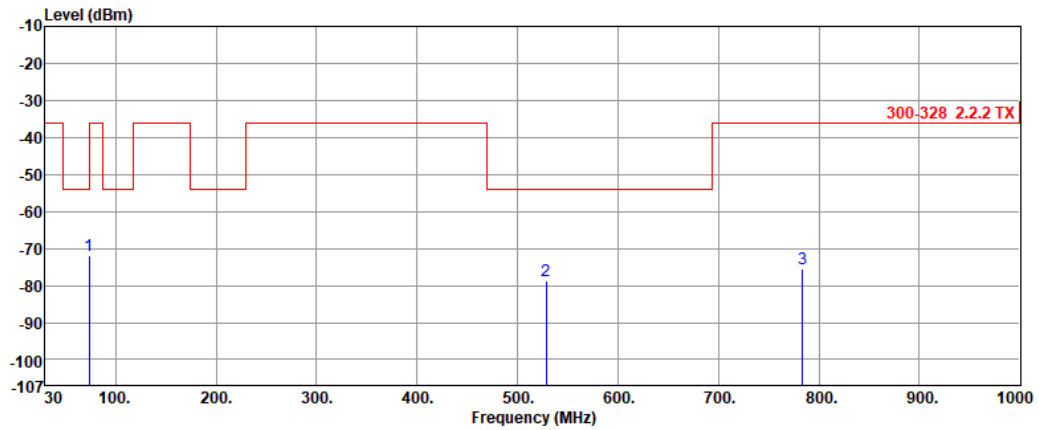
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical	Test Configuration	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	103.72	-77.85	-54.00	-23.85	-3.45	-74.40
2	564.47	-78.67	-54.00	-24.67	6.08	-84.75
3	798.24	-75.54	-36.00	-39.54	9.29	-84.83

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

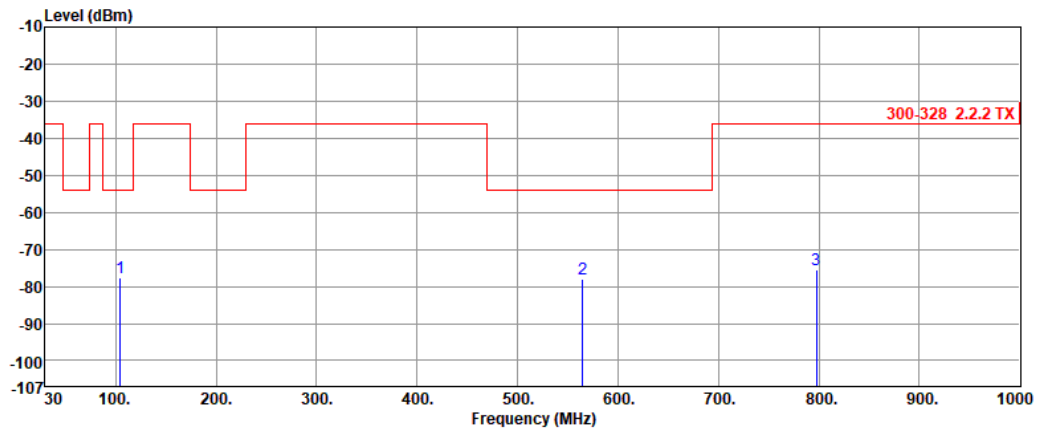
<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	73.65	-71.97	-54.00	-17.97	-5.65	-66.32
2	528.58	-78.78	-54.00	-24.78	4.36	-83.14
3	783.69	-75.52	-36.00	-39.52	9.58	-85.10

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

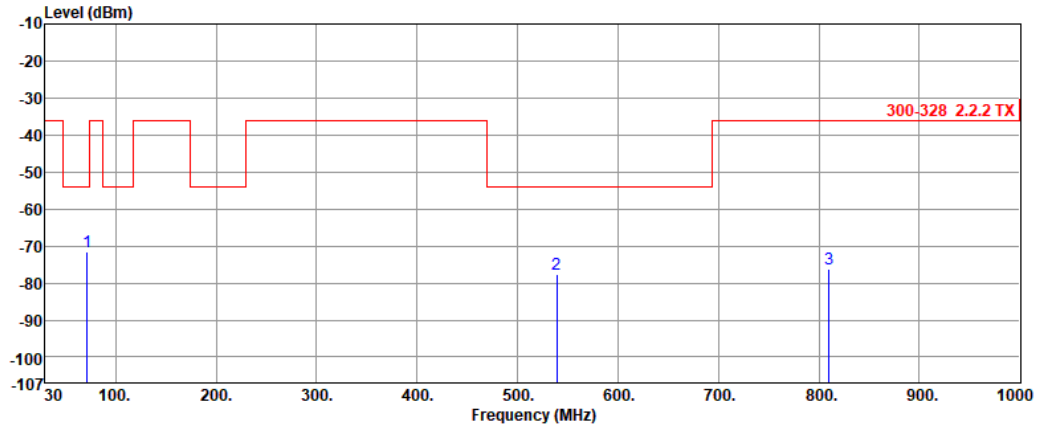
<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	104.69	-77.60	-54.00	-23.60	-3.28	-74.32
2	564.47	-78.09	-54.00	-24.09	6.08	-84.17
3	797.27	-75.44	-36.00	-39.44	9.26	-84.70

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



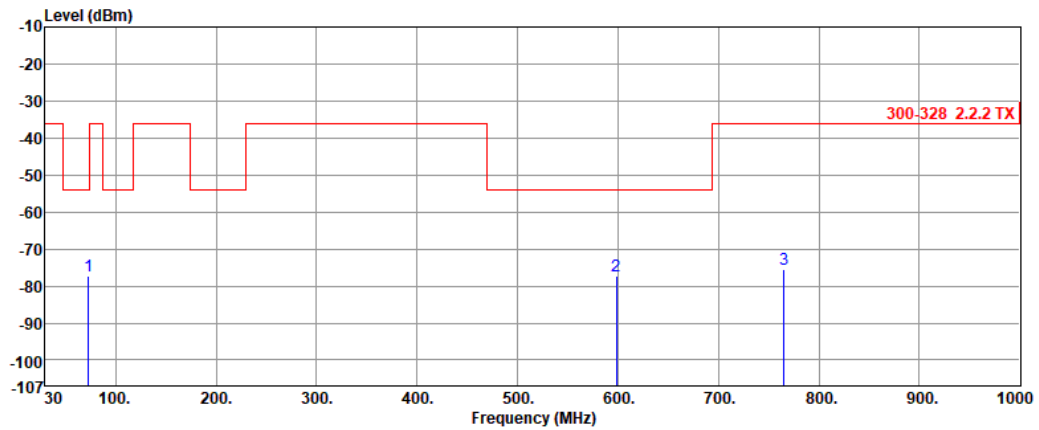
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	71.71	-71.56	-54.00	-17.56	-4.95	-66.61
2	539.25	-77.77	-54.00	-23.77	4.50	-82.27
3	809.88	-76.32	-36.00	-40.32	9.75	-86.07

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

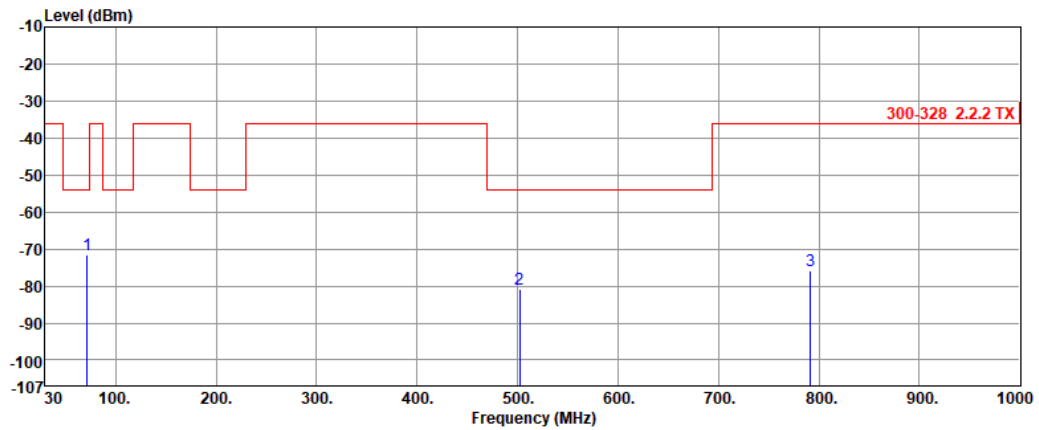


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	72.68	-77.19	-54.00	-23.19	-5.77	-71.42
2	598.42	-77.14	-54.00	-23.14	7.13	-84.27
3	765.26	-75.66	-36.00	-39.66	8.48	-84.14

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

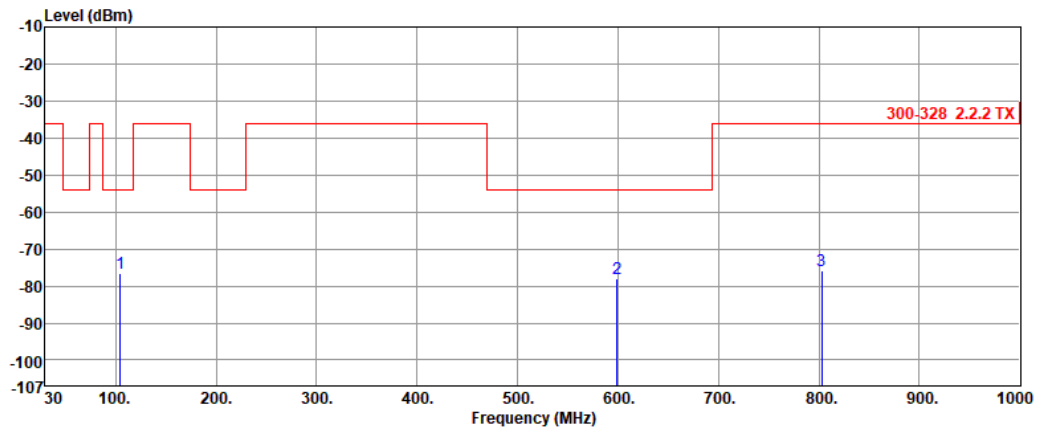


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	71.71	-71.71	-54.00	-17.71	-4.95	-66.76
2	502.39	-80.96	-54.00	-26.96	3.69	-84.65
3	791.45	-75.71	-36.00	-39.71	9.71	-85.42

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

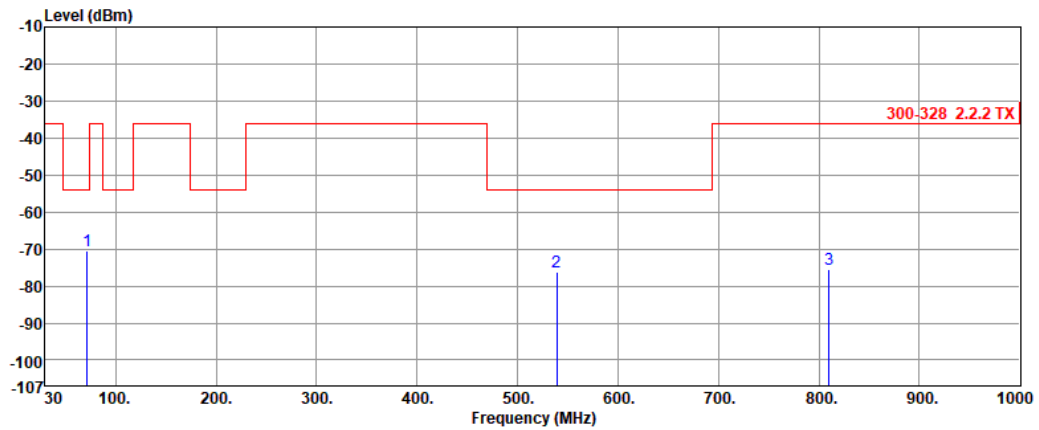


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	104.69	-76.75	-54.00	-22.75	-3.28	-73.47
2	599.39	-77.87	-54.00	-23.87	7.13	-85.00
3	803.09	-75.81	-36.00	-39.81	9.42	-85.23

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>	2402
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	3

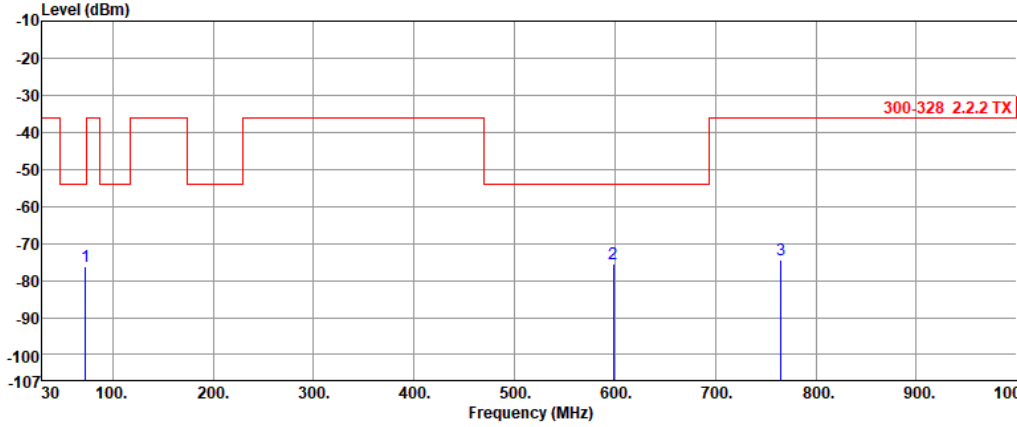


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	71.71	-70.35	-54.00	-16.35	-4.95	-65.40
2	539.25	-76.35	-54.00	-22.35	4.50	-80.85
3	809.88	-75.55	-36.00	-39.55	9.75	-85.30

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

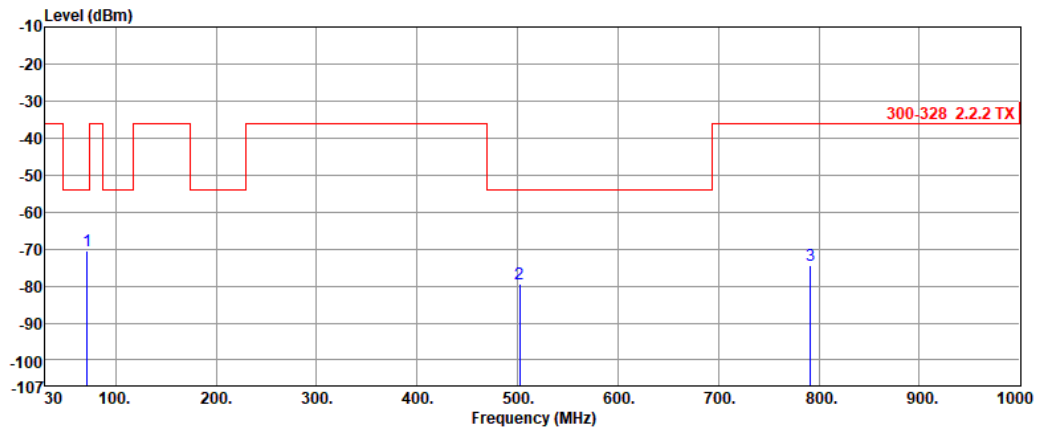
  


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	72.66	-76.17	-54.00	-22.17	-5.76	-70.41
2	598.44	-75.35	-54.00	-21.35	7.13	-82.48
3	765.22	-74.31	-36.00	-38.31	8.48	-82.79

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

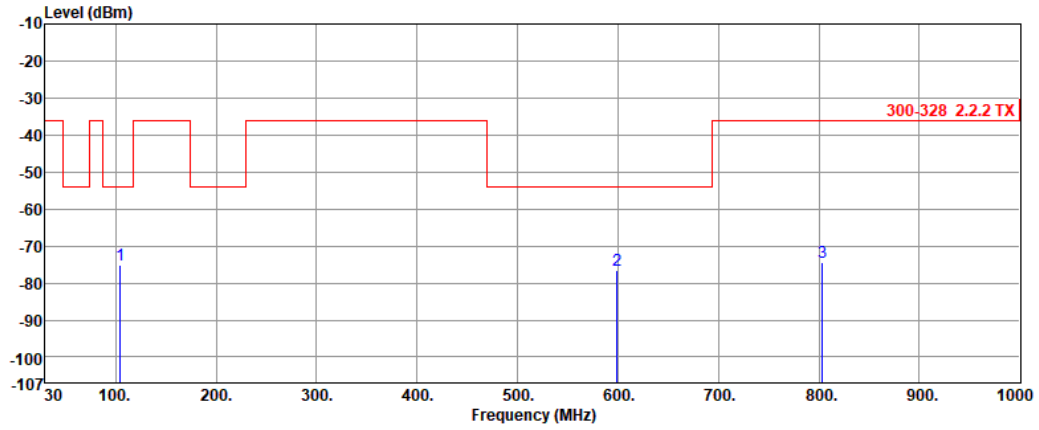


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	71.71	-70.65	-54.00	-16.65	-4.95	-65.70
2	502.36	-79.32	-54.00	-25.32	3.69	-83.01
3	791.44	-74.35	-36.00	-38.35	9.71	-84.06

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	3



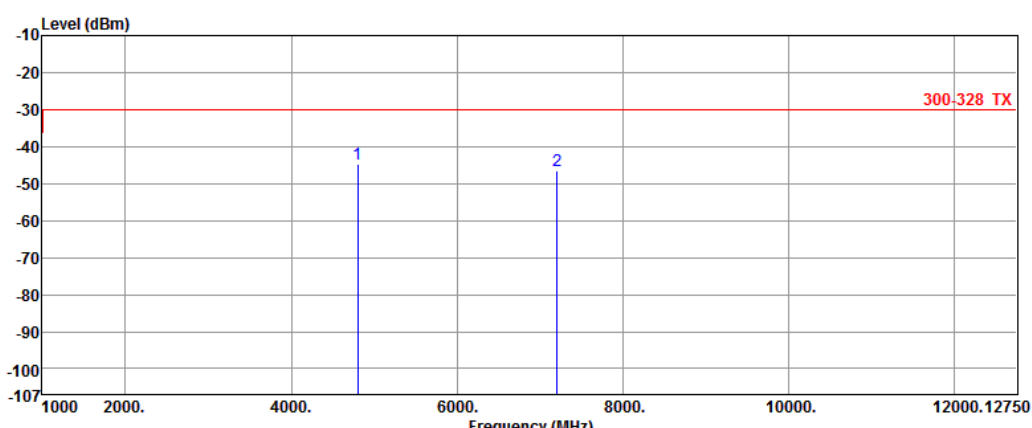
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	104.65	-75.18	-54.00	-21.18	-3.29	-71.89
2	599.31	-76.58	-54.00	-22.58	7.13	-83.71
3	803.19	-74.35	-36.00	-38.35	9.42	-83.77

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

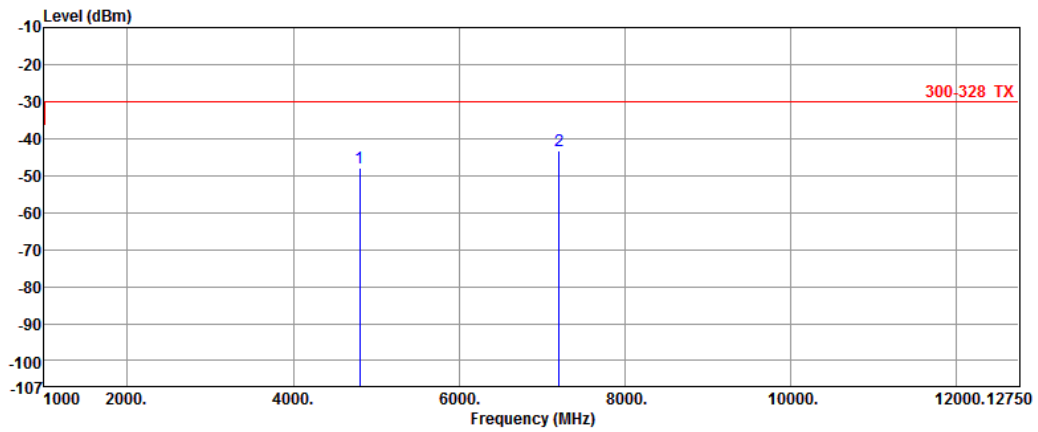
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.56	-44.83	-30.00	-14.83	11.64	-56.47
2	7205.13	-46.42	-30.00	-16.42	17.38	-63.80

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



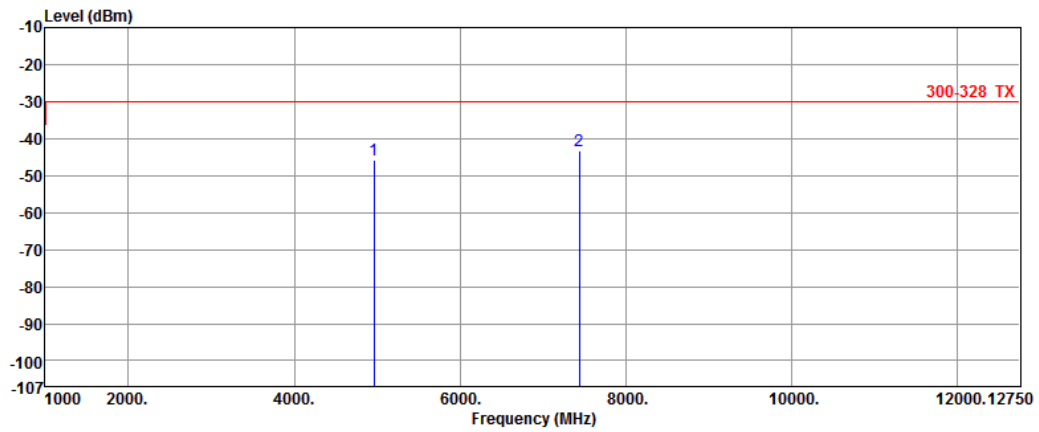
<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.80	-47.96	-30.00	-17.96	11.89	-59.85
2	7204.23	-43.15	-30.00	-13.15	17.16	-60.31

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

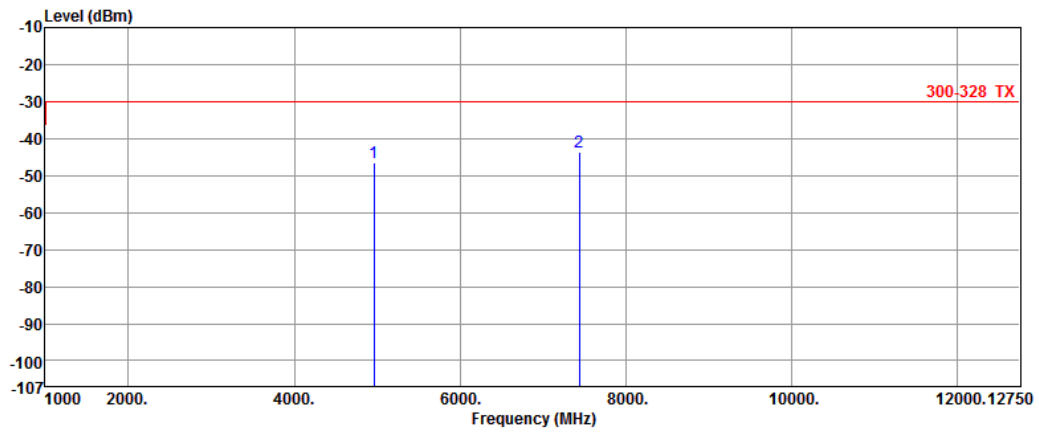
<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.94	-45.64	-30.00	-15.64	12.23	-57.87
2	7439.25	-43.46	-30.00	-13.46	17.00	-60.46

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

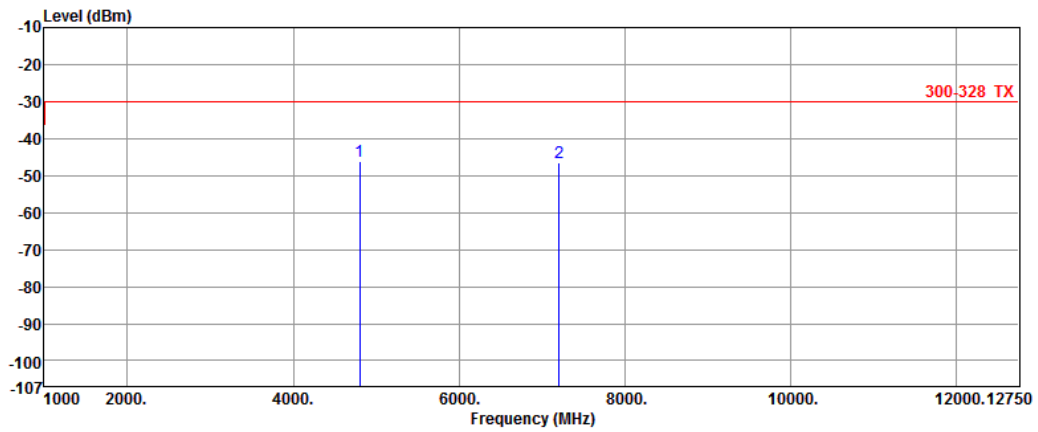
<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.94	-46.41	-30.00	-16.41	11.66	-58.07
2	7439.12	-43.69	-30.00	-13.69	17.72	-61.41

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>	2402
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	2

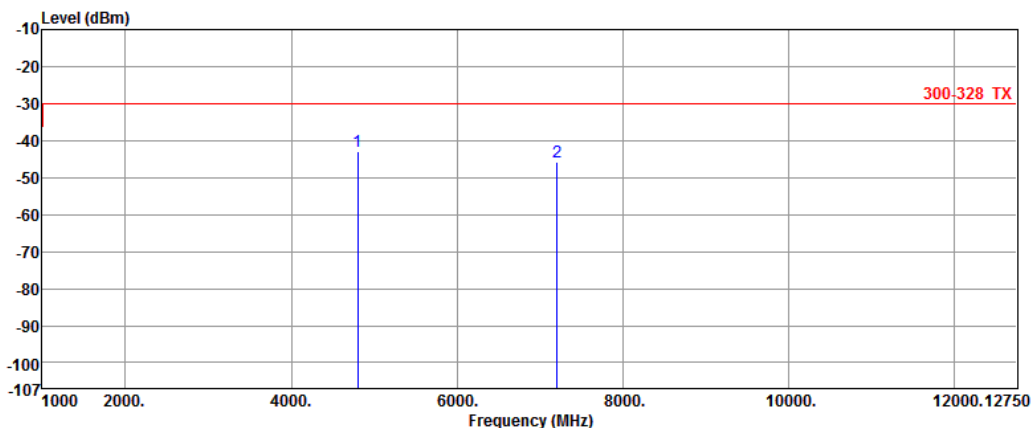


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.60	-46.13	-30.00	-16.13	11.64	-57.77
2	7206.69	-46.60	-30.00	-16.60	17.38	-63.98

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

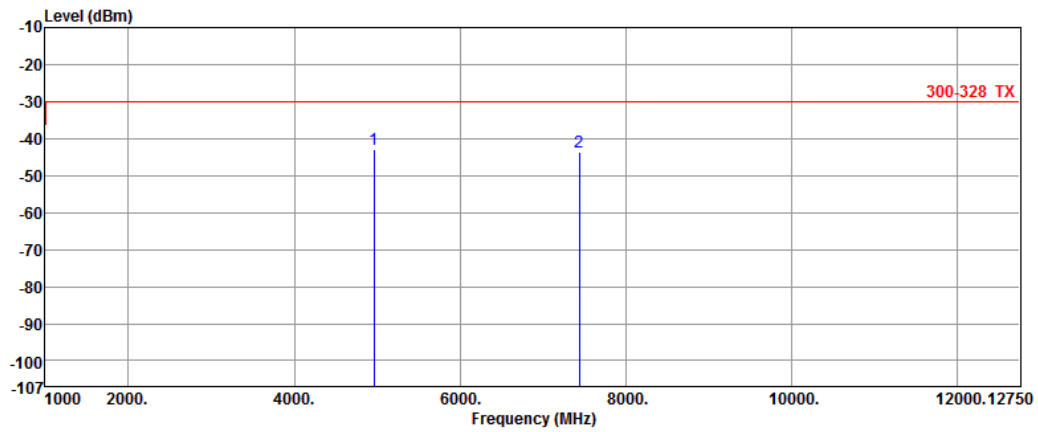
  


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.58	-42.84	-30.00	-12.84	11.89	-54.73
2	7205.19	-45.75	-30.00	-15.75	17.16	-62.91

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

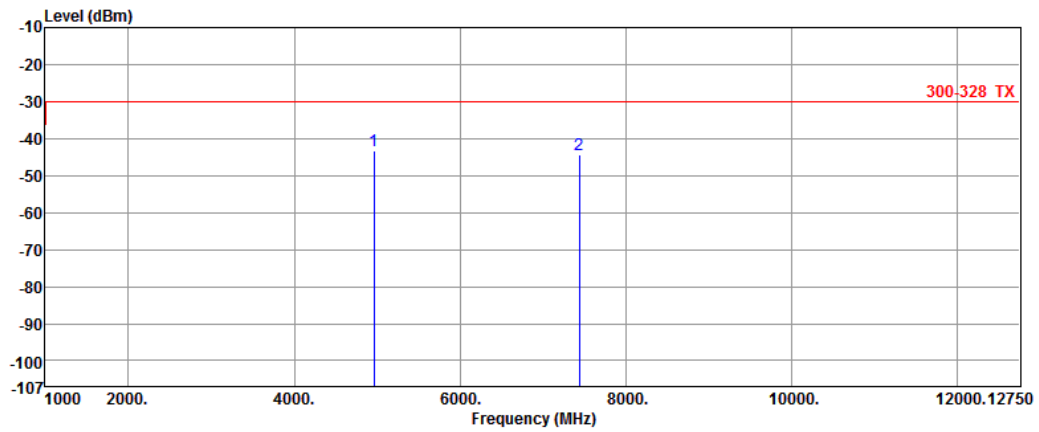


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.37	-43.08	-30.00	-13.08	12.22	-55.30
2	7439.09	-43.55	-30.00	-13.55	17.00	-60.55

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

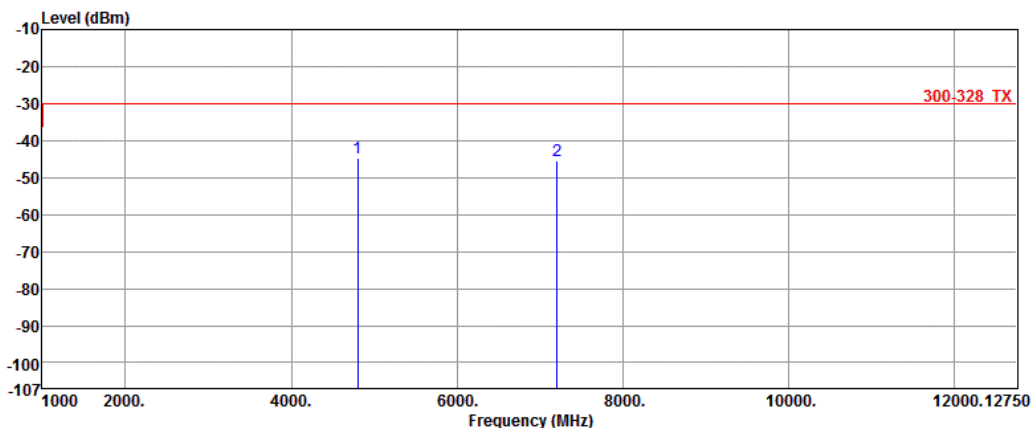


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.57	-43.20	-30.00	-13.20	11.66	-54.86
2	7439.56	-44.23	-30.00	-14.23	17.71	-61.94

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

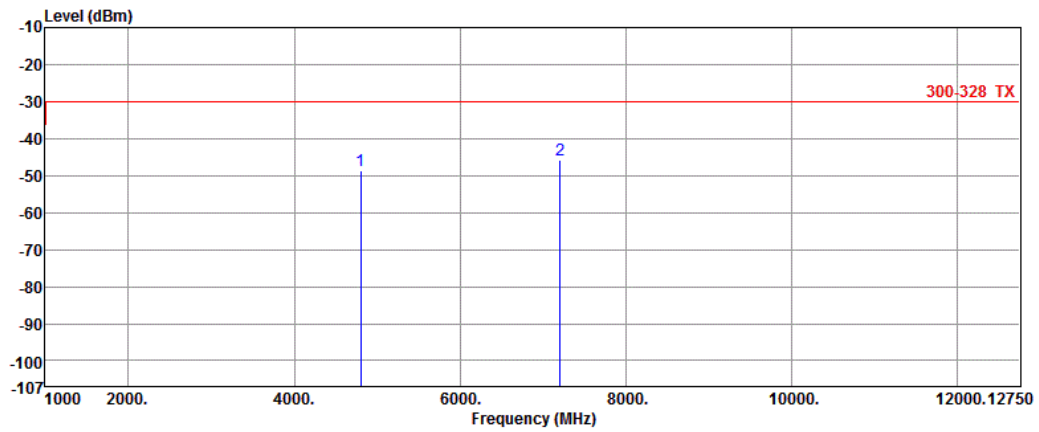
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.48	-44.85	-30.00	-14.85	11.64	-56.49
2	7205.45	-45.61	-30.00	-15.61	17.38	-62.99

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

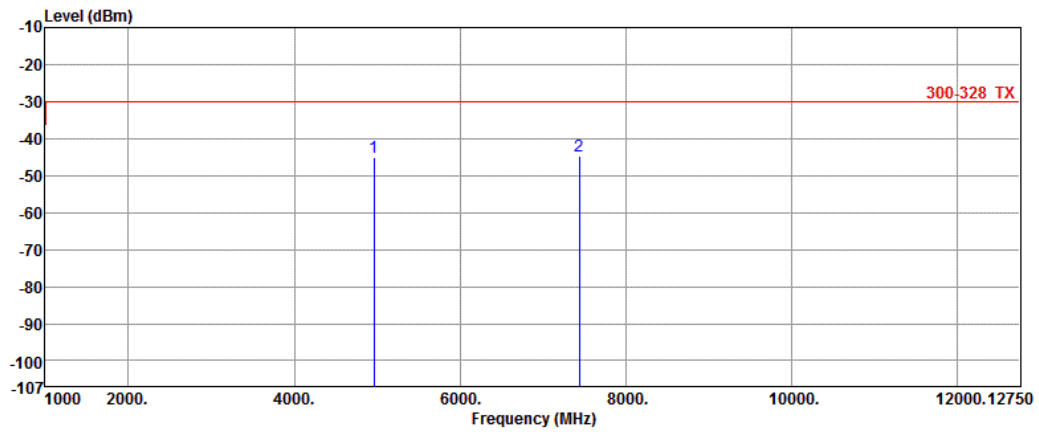


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.35	-48.73	-30.00	-18.73	11.90	-60.63
2	7206.93	-45.76	-30.00	-15.76	17.17	-62.93

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

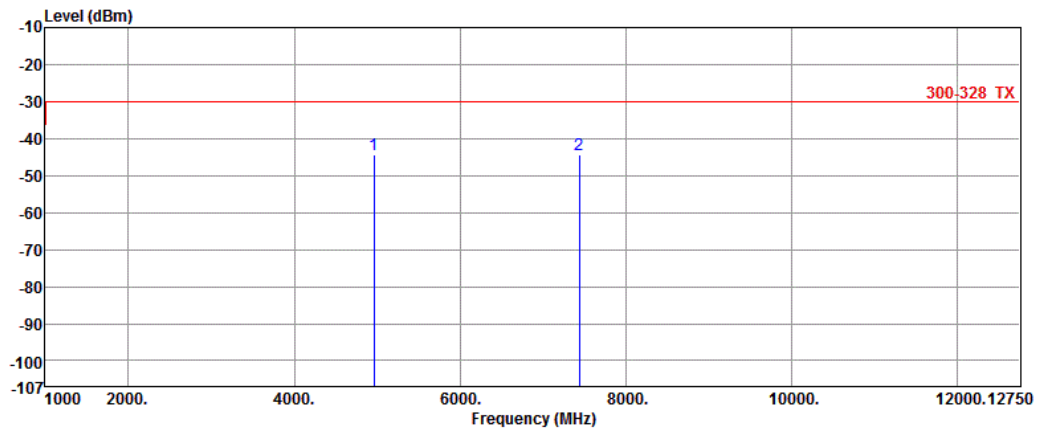


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.85	-44.95	-30.00	-14.95	12.23	-57.18
2	7439.31	-44.56	-30.00	-14.56	17.00	-61.56

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	4959.54	-44.40	-30.00	-14.40	11.66	-56.06
2	7439.05	-44.45	-30.00	-14.45	17.72	-62.17

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

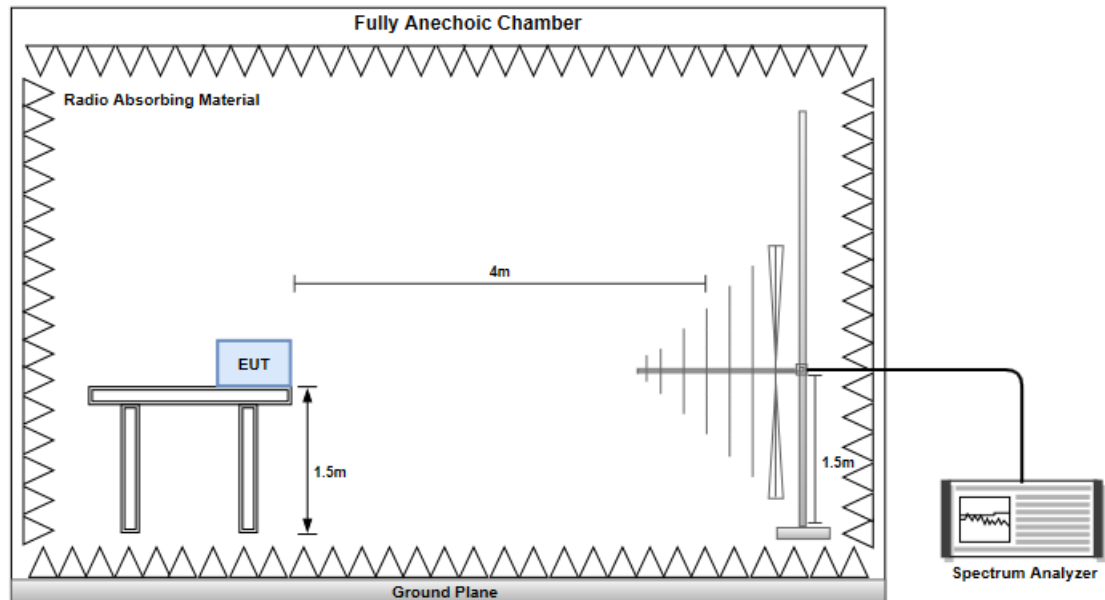
Frequency Range	Maximum power (dBm)	Measurement bandwidth (kHz)
30 MHz to 1 GHz	-57	100
Above 1 GHz to 12.75 GHz	-47	1000

#### 4.1.2 Test Procedures

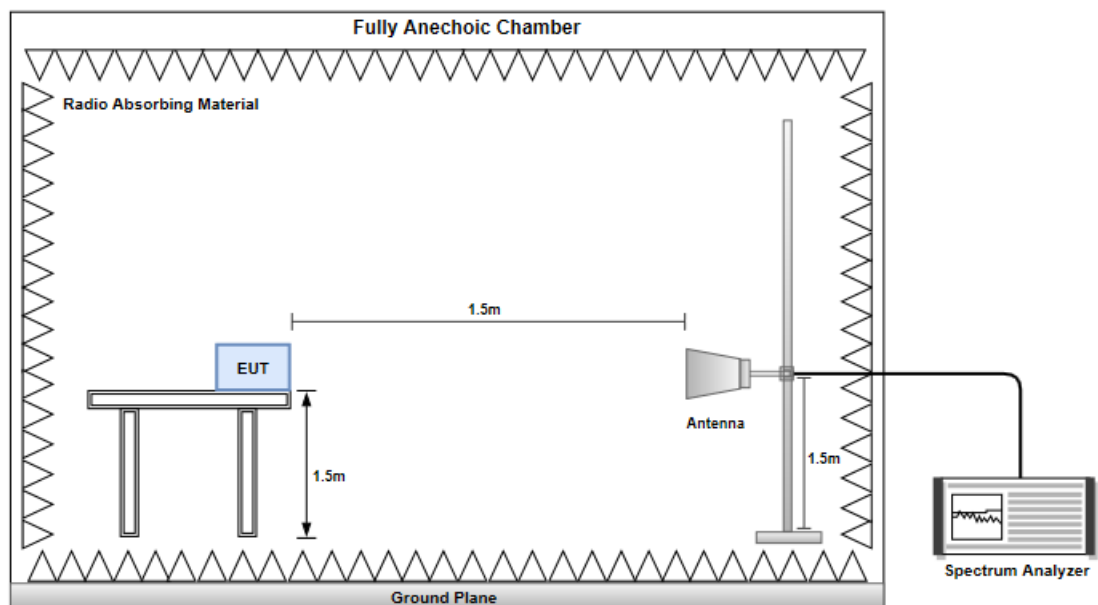
Reference to clause 5.4.10.2 of ETSI EN 300 328 V2.2.2 (2019-07).

### 4.1.3 Test Setup

#### Below 1GHz

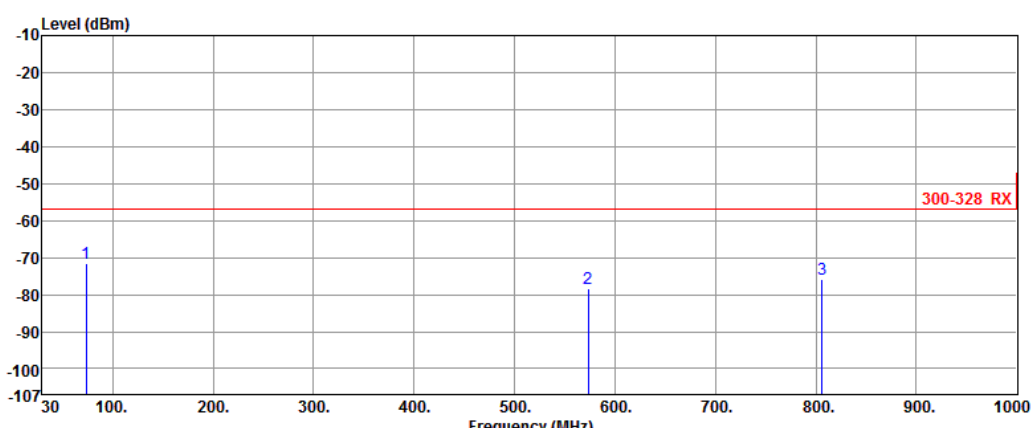


#### Above 1 GHz



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

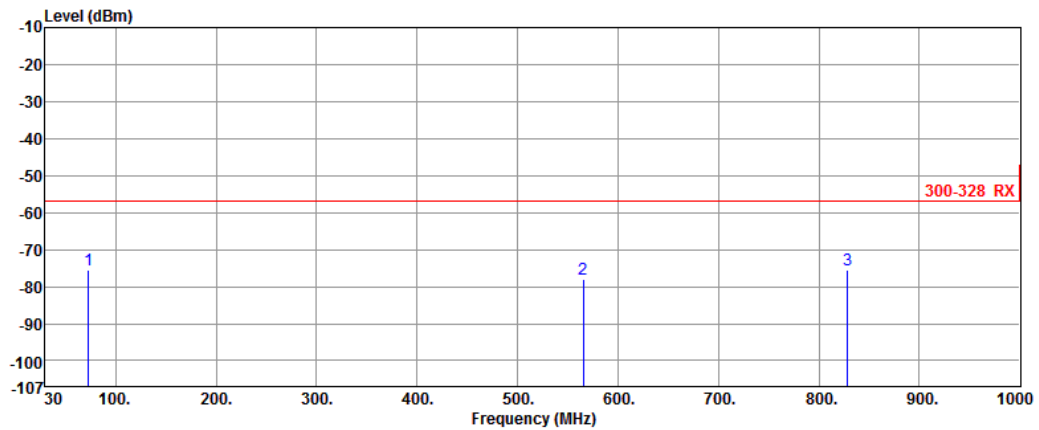
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1

	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	73.65	-71.54	-57.00	-14.54	-15.11	-56.43
2	573.20	-78.39	-57.00	-21.39	-2.24	-76.15
3	806.00	-75.92	-57.00	-18.92	1.71	-77.63

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

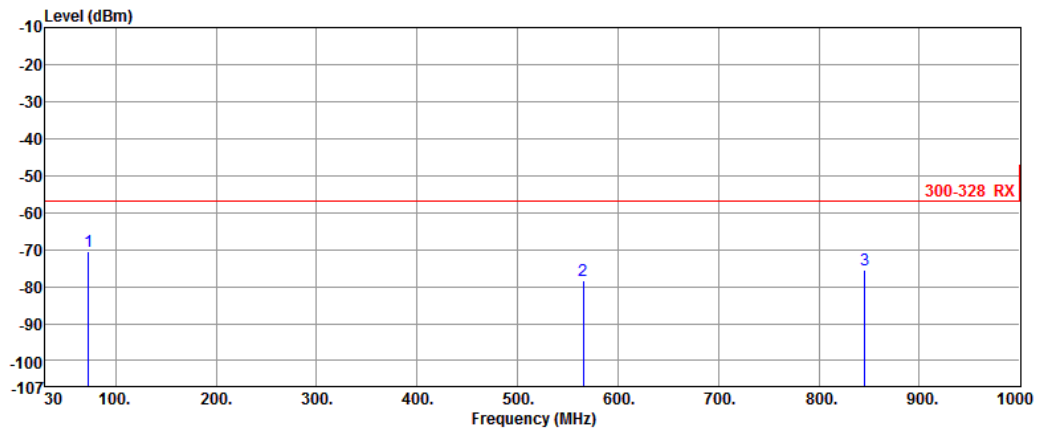
<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2402
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	72.68	-75.40	-57.00	-18.40	-14.39	-61.01
2	565.44	-77.99	-57.00	-20.99	-2.28	-75.71
3	828.31	-75.33	-57.00	-18.33	1.74	-77.07

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

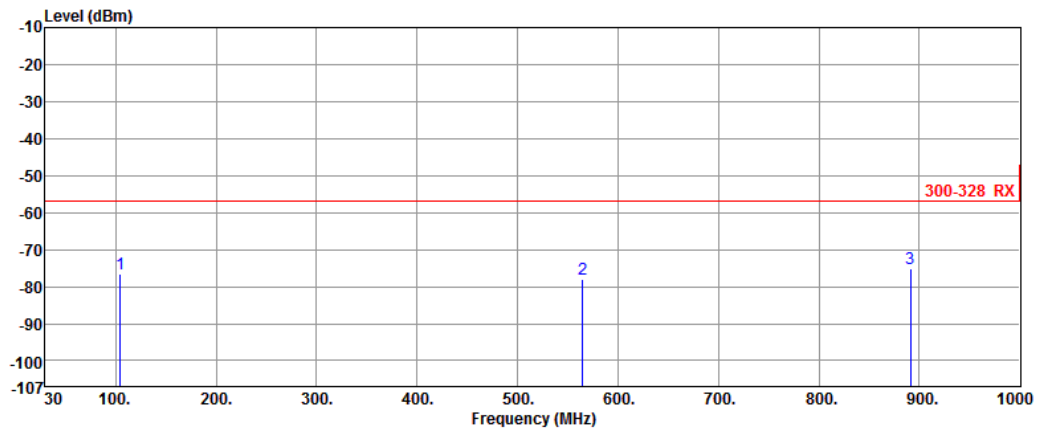


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	72.68	-70.42	-57.00	-13.42	-14.48	-55.94
2	565.44	-78.54	-57.00	-21.54	-2.54	-76.00
3	845.77	-75.57	-57.00	-18.57	1.72	-77.29

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



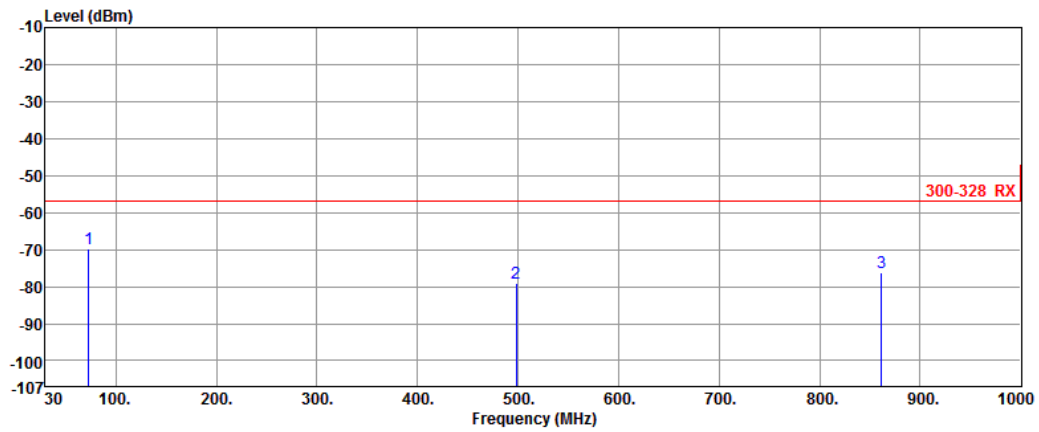
<b>Modulation</b>	GFSK	<b>Test Freq. (MHz)</b>	2480
<b>Polarization</b>	Vertical	<b>Test Configuration</b>	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	104.69	-76.45	-57.00	-19.45	-9.65	-66.80
2	564.47	-77.94	-57.00	-20.94	-2.32	-75.62
3	891.36	-75.16	-57.00	-18.16	2.56	-77.72

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

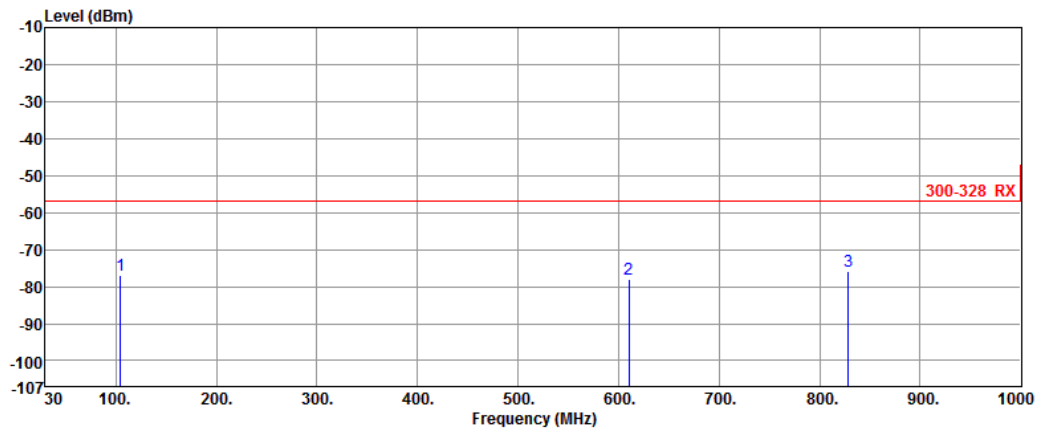


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	72.68	-69.87	-57.00	-12.87	-14.48	-55.39
2	498.51	-79.18	-57.00	-22.18	-3.82	-75.36
3	861.29	-76.05	-57.00	-19.05	1.93	-77.98

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

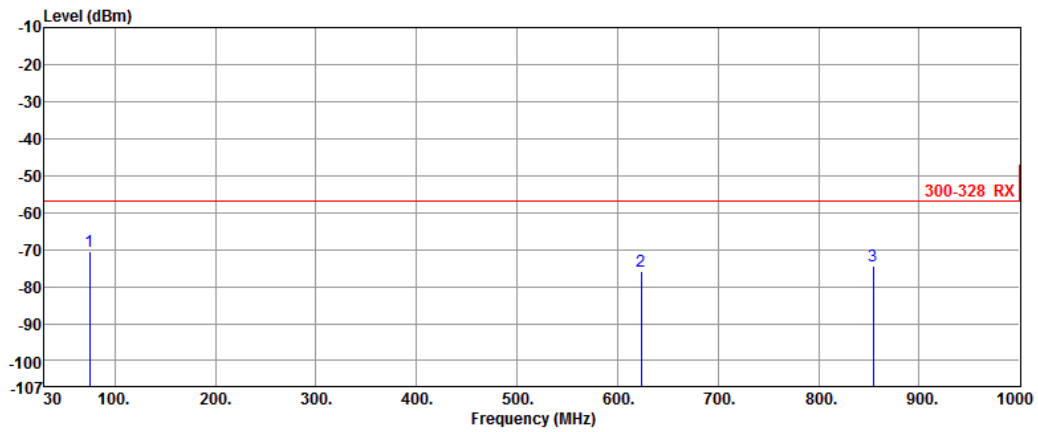


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	104.69	-76.95	-57.00	-19.95	-9.65	-67.30
2	610.06	-78.18	-57.00	-21.18	-0.59	-77.59
3	828.31	-75.87	-57.00	-18.87	1.74	-77.61

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

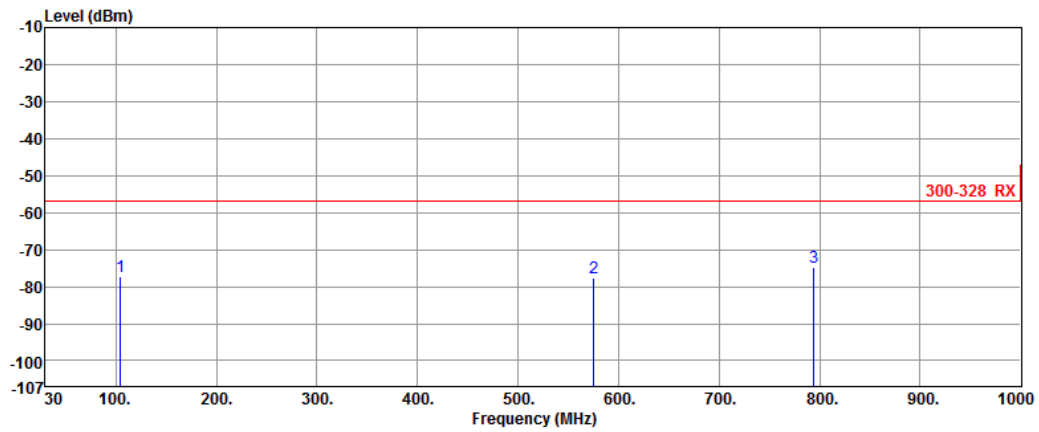


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	74.62	-70.61	-57.00	-13.61	-15.72	-54.89
2	623.64	-75.70	-57.00	-18.70	-0.98	-74.72
3	854.50	-74.57	-57.00	-17.57	1.84	-76.41

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>	2

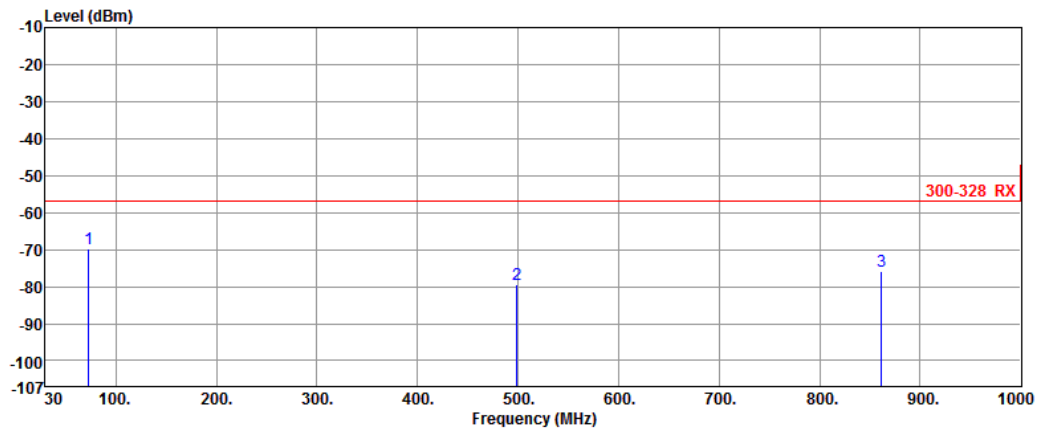


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	104.69	-77.40	-57.00	-20.40	-9.65	-67.75
2	575.14	-77.51	-57.00	-20.51	-1.86	-75.65
3	794.36	-74.87	-57.00	-17.87	1.91	-76.78

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

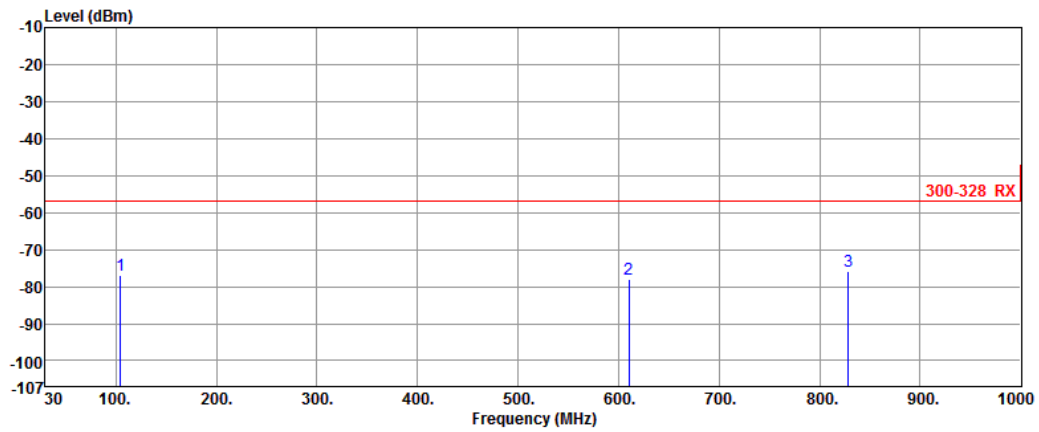


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	72.65	-69.67	-57.00	-12.67	-14.46	-55.21
2	498.55	-79.29	-57.00	-22.29	-3.82	-75.47
3	861.25	-75.85	-57.00	-18.85	1.93	-77.78

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

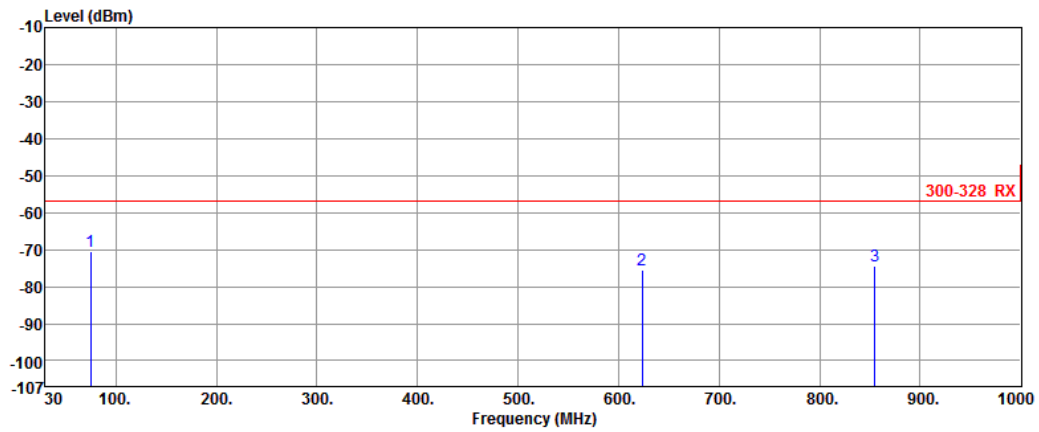


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	104.64	-76.84	-57.00	-19.84	-9.64	-67.20
2	610.00	-78.11	-57.00	-21.11	-0.59	-77.52
3	828.33	-75.73	-57.00	-18.73	1.74	-77.47

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>	2480
<b>Polarization</b>	Horizontal	<b>Test Configuration</b>	3



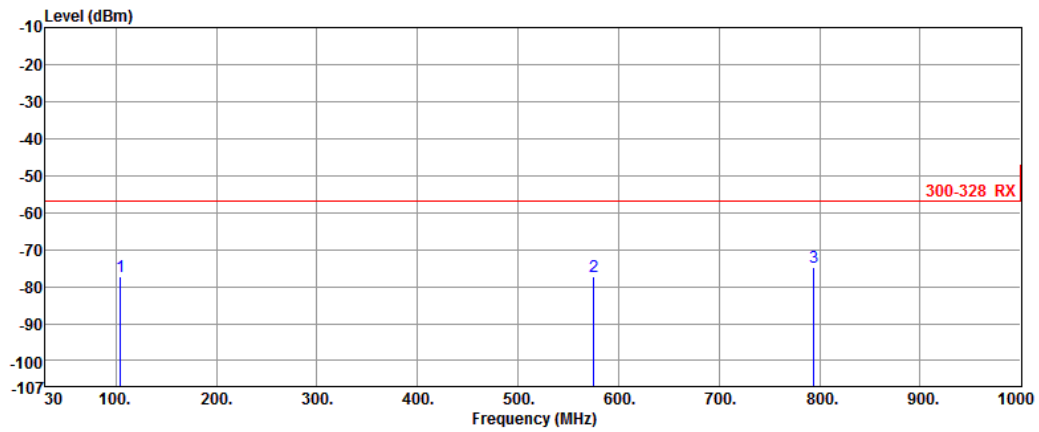
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	74.66	-70.55	-57.00	-13.55	-15.75	-54.80
2	623.65	-75.55	-57.00	-18.55	-0.98	-74.57
3	854.64	-74.33	-57.00	-17.33	1.84	-76.17

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



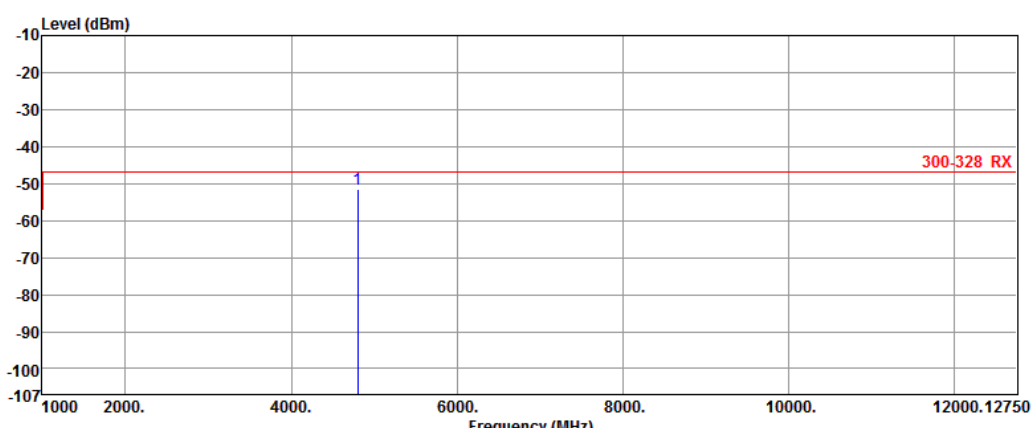
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	104.66	-77.33	-57.00	-20.33	-9.64	-67.69
2	575.12	-77.41	-57.00	-20.41	-1.86	-75.55
3	794.33	-74.65	-57.00	-17.65	1.91	-76.56

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

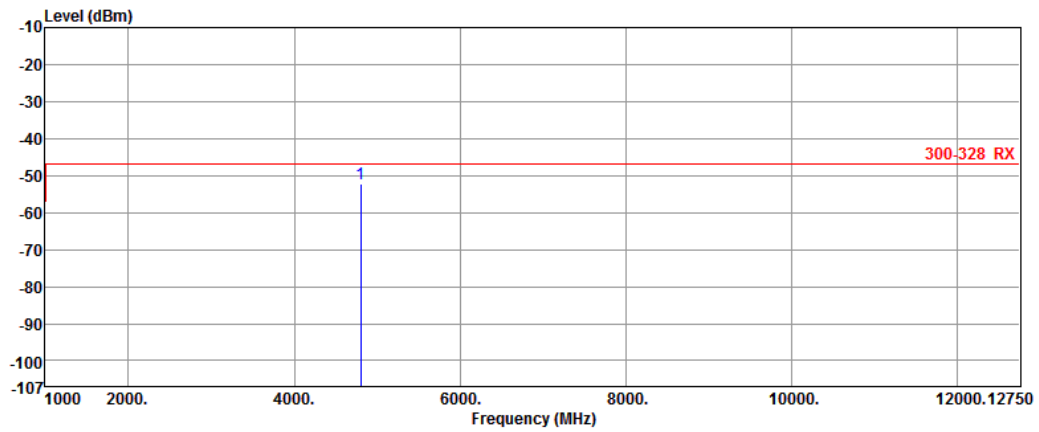
  


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4801.50	-51.63	-47.00	-4.63	11.65	-63.28

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

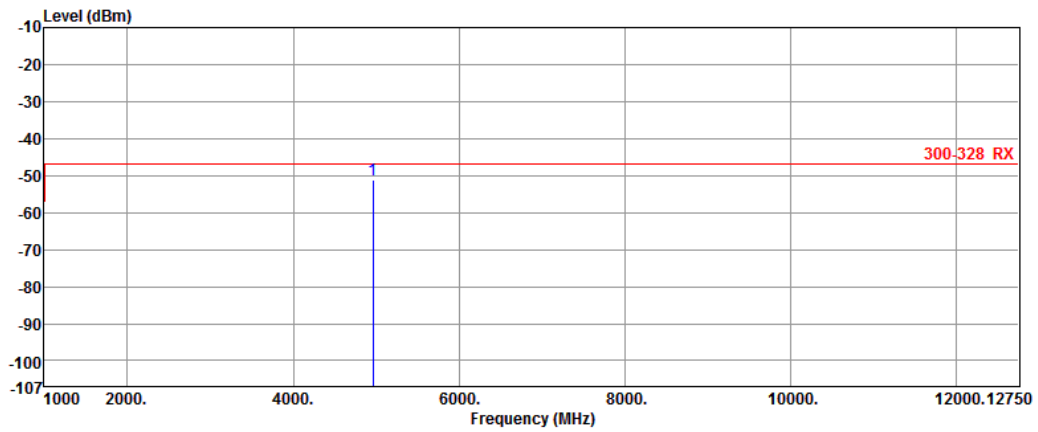
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical	Test Configuration	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4801.90	-52.09	-47.00	-5.09	11.91	-64.00

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

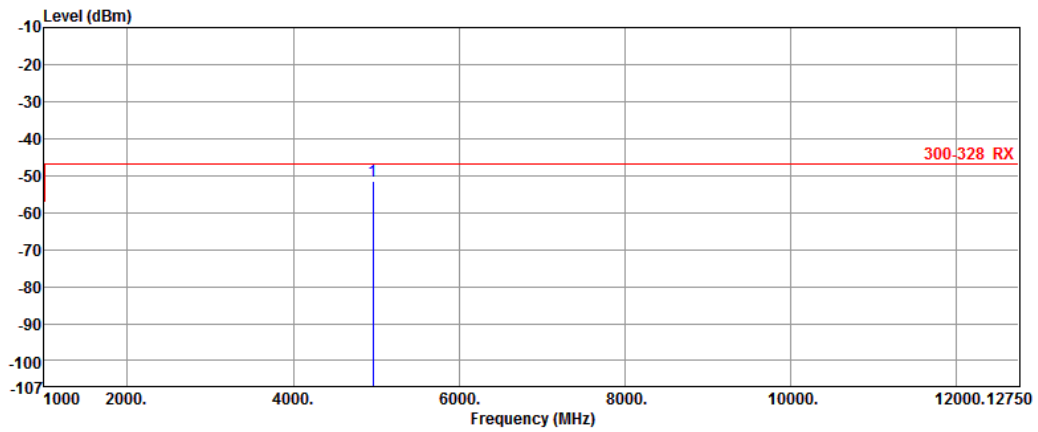
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal	Test Configuration	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.44	-51.29	-47.00	-4.29	12.23	-63.52

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

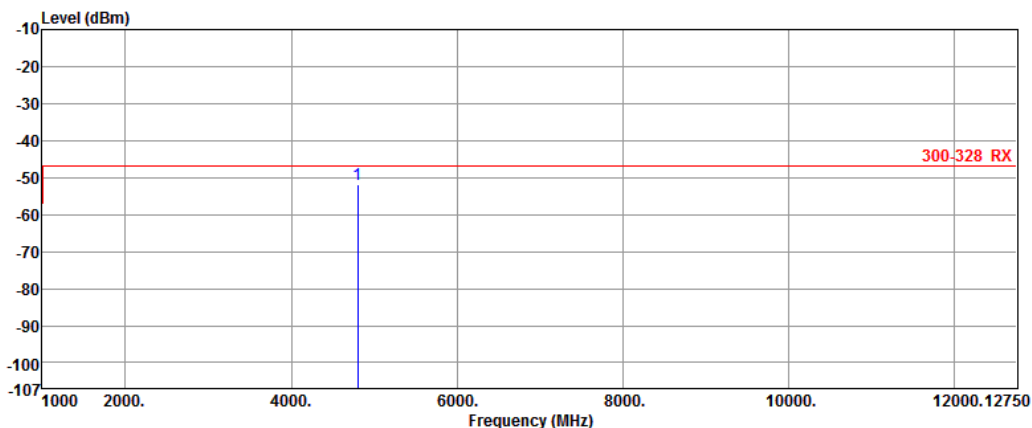


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.64	-51.51	-47.00	-4.51	11.66	-63.17

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	2



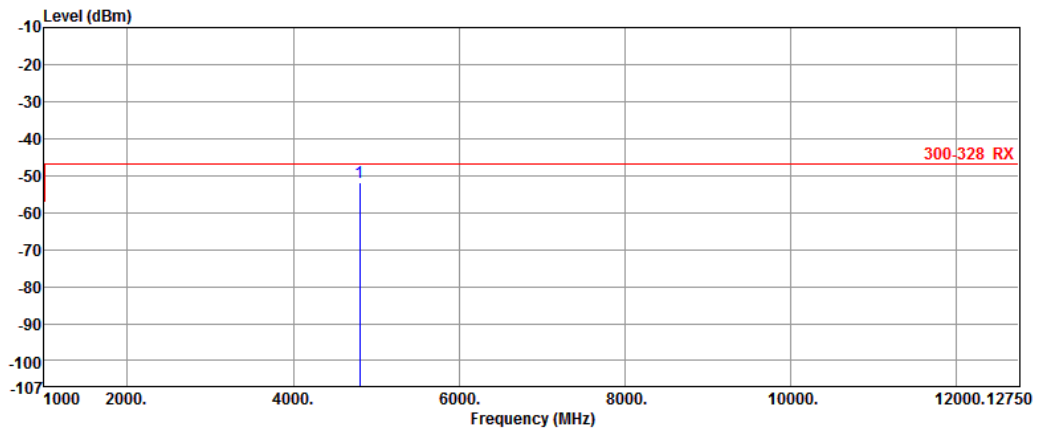
Freq.	Measured value	Limit	Margin	Factor	Reading
MHz	dBm	dBm	dB	dB	dBm
1 4801.63	-51.96	-47.00	-4.96	11.65	-63.61

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

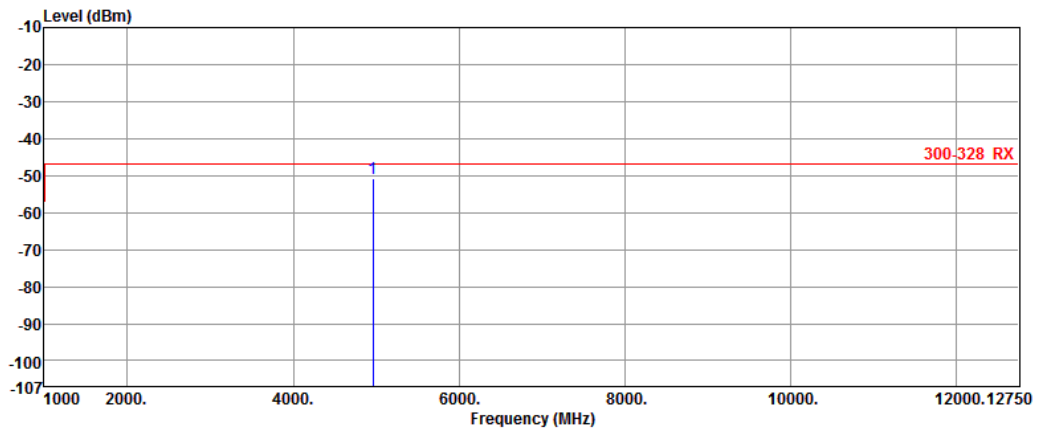


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4801.55	-51.90	-47.00	-4.90	11.91	-63.81

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



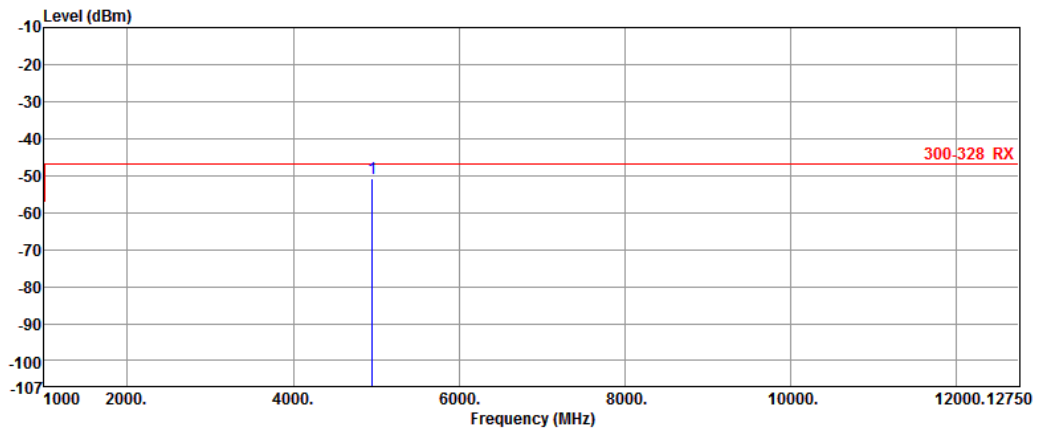
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.23	-50.91	-47.00	-3.91	12.23	-63.14

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	2

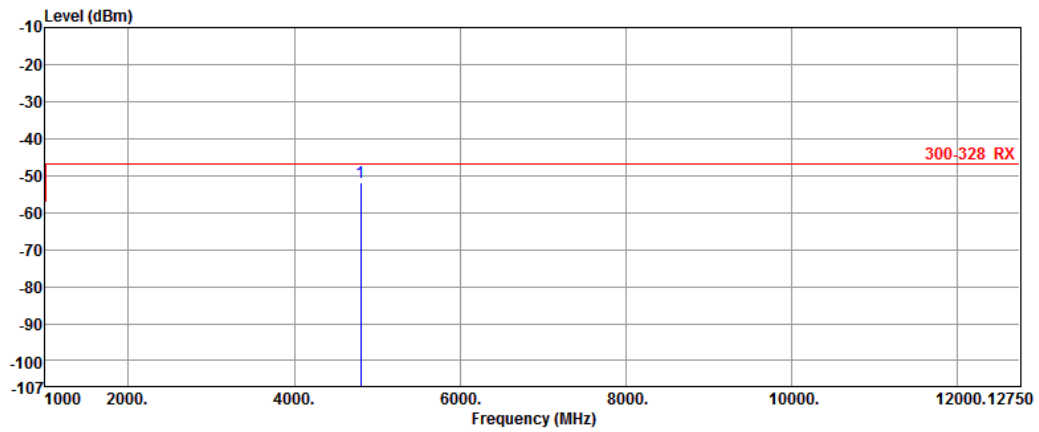


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4957.84	-50.84	-47.00	-3.84	11.65	-62.49

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

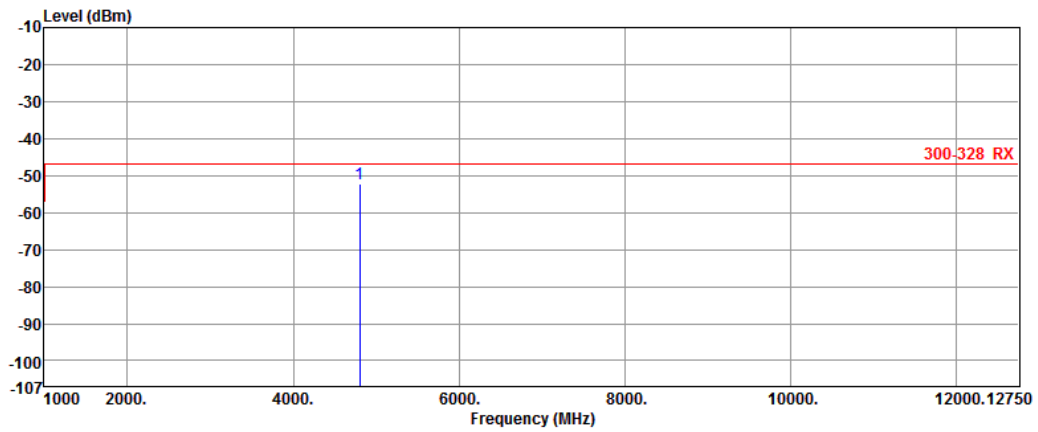


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4801.88	-51.95	-47.00	-4.95	11.65	-63.60

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



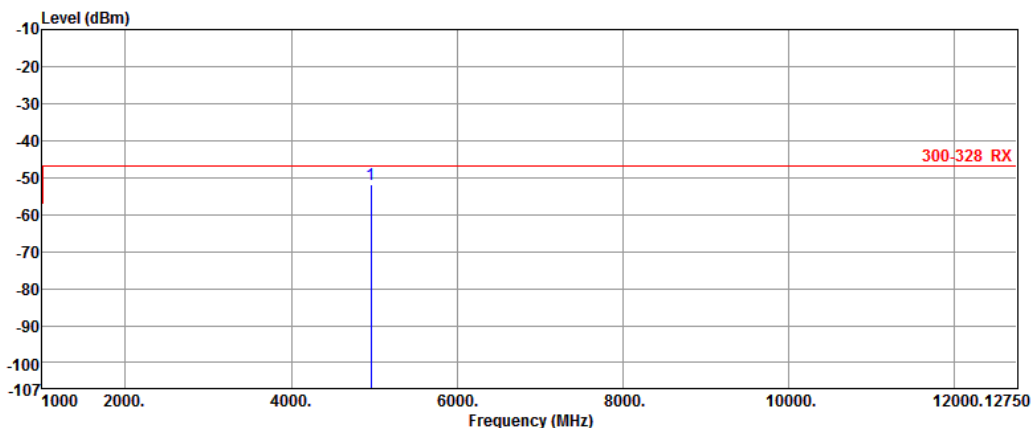
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4802.20	-52.24	-47.00	-5.24	11.90	-64.14

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



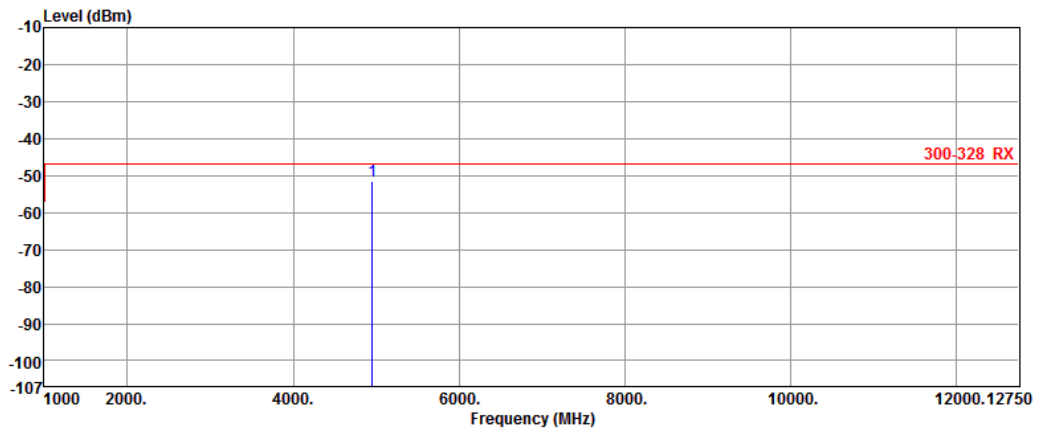
Freq.	Measured value	Limit	Margin	Factor	Reading
MHz	dBm	dBm	dB	dB	dBm
1 4961.38	-51.93	-47.00	-4.93	12.25	-64.18

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	3



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4957.97	-51.50	-47.00	-4.50	11.65	-63.15

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) (see notes 1 and 4)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 4)	Type of Blocking Signal
(-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × log10(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		
<p>Note 1: OCBW is in Hz.</p> <p>Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P<sub>min</sub> + 26 dB where P<sub>min</sub> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>Note 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P<sub>min</sub> + 20 dB where P<sub>min</sub> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>Note 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.</p>			

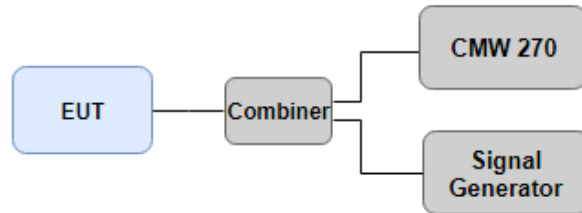
Receiver Blocking Parameters for Receiver Category 2 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm) (see notes 1 and 3)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 3)	Type of Blocking Signal
$(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 10 \text{ dB})$ or $(-74 \text{ dBm} + 10 \text{ dB})$ whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
<p>Note 1: OCBW is in Hz.</p> <p>Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to <math>P_{\min} + 26 \text{ dB}</math> where <math>P_{\min}</math> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>Note 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.</p>			

Receiver Blocking Parameters for Receiver Category 3 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm) (see notes 1 and 3)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm) (see note 3)	Type of Blocking Signal
$(-139 \text{ dBm} + 10 \times \log_{10}(\text{OCBW}) + 20 \text{ dB})$ or $(-74 \text{ dBm} + 20 \text{ dB})$ whichever is less	2 380 2 504 2 300 2 584	-34	CW
<p>Note 1: OCBW is in Hz.</p> <p>Note 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to <math>P_{\min} + 30 \text{ dB}</math> where <math>P_{\min}</math> is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.</p> <p>Note 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned.</p>			

## 5.1.2 Test Procedures

Reference to clause 5.4.11.2 of ETSI EN 300 328 V2.2.2 (2019-07).

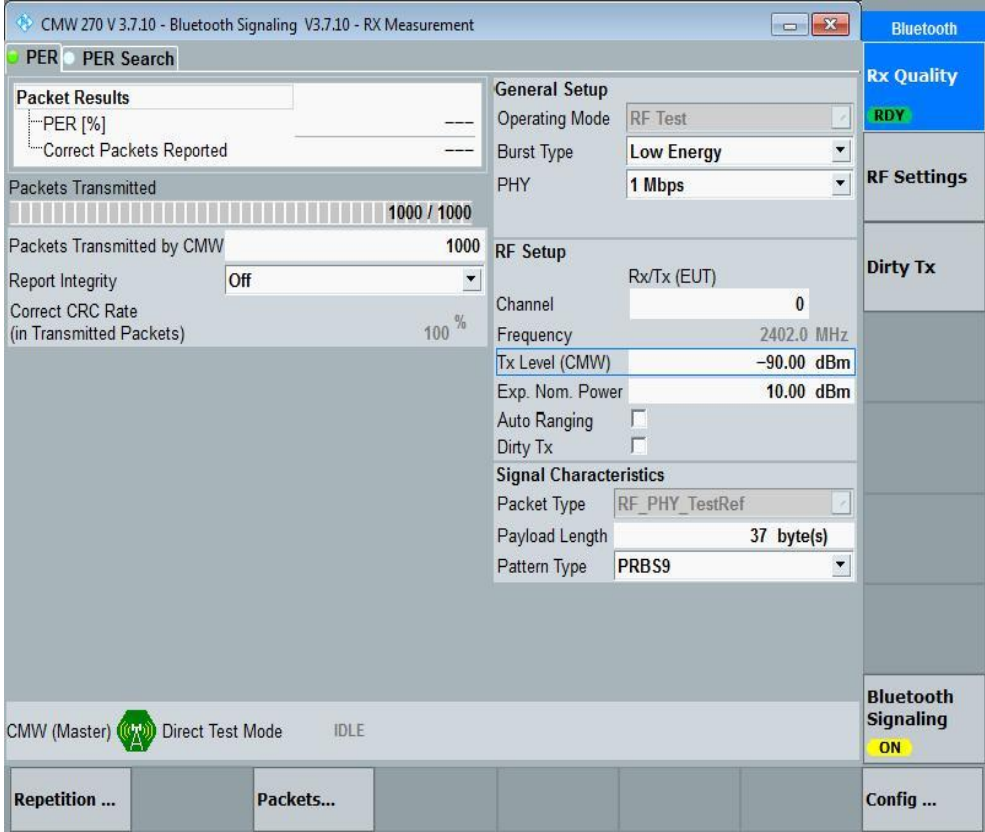
### 5.1.3 Test Setup



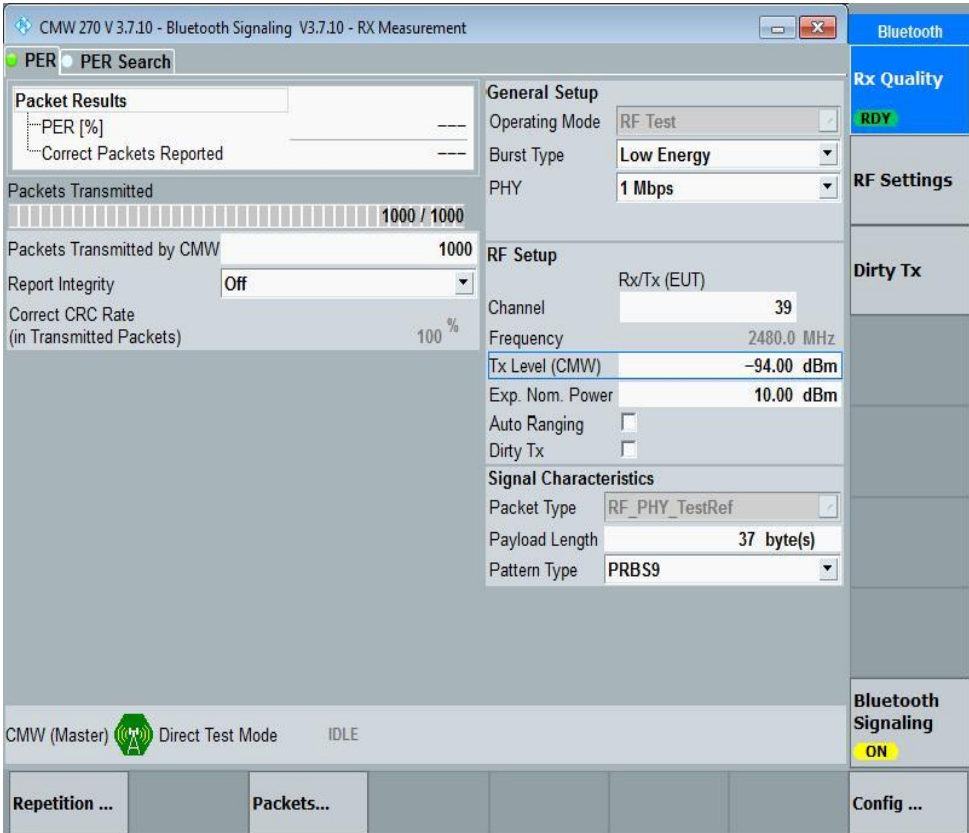


## 5.1.4 Test Result of Receiver Blocking

### Test Configuration 2

2402 MHz	
	
<pre> BLE TEST END successful Received packet count: 931 BLE TEST END successful </pre>	
Packet Sent Numbers	1000
Packet Received Numbers	931
PER(%)	6.9

Receiver Category	2		
Performance Criteria Limit	PER ≤ 10 %		
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-66.79	2380	-32	Pass
-66.79	2504	-32	Pass
-66.79	2300	-32	Pass
-66.79	2584	-32	Pass

2480 MHz	
	
<pre>Received packet count: 935 BLE TEST END successful</pre>	
Packet Sent Numbers	1000
Packet Received Numbers	935
PER(%)	6.5

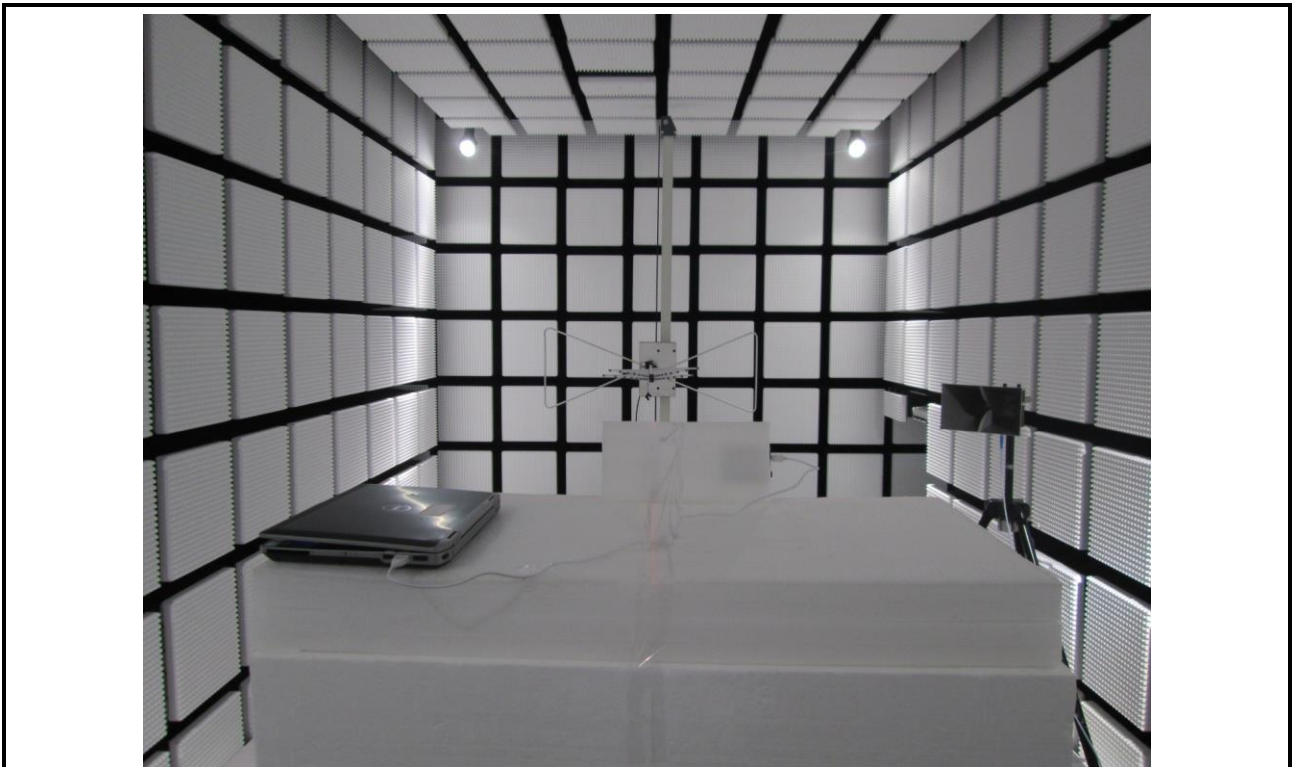
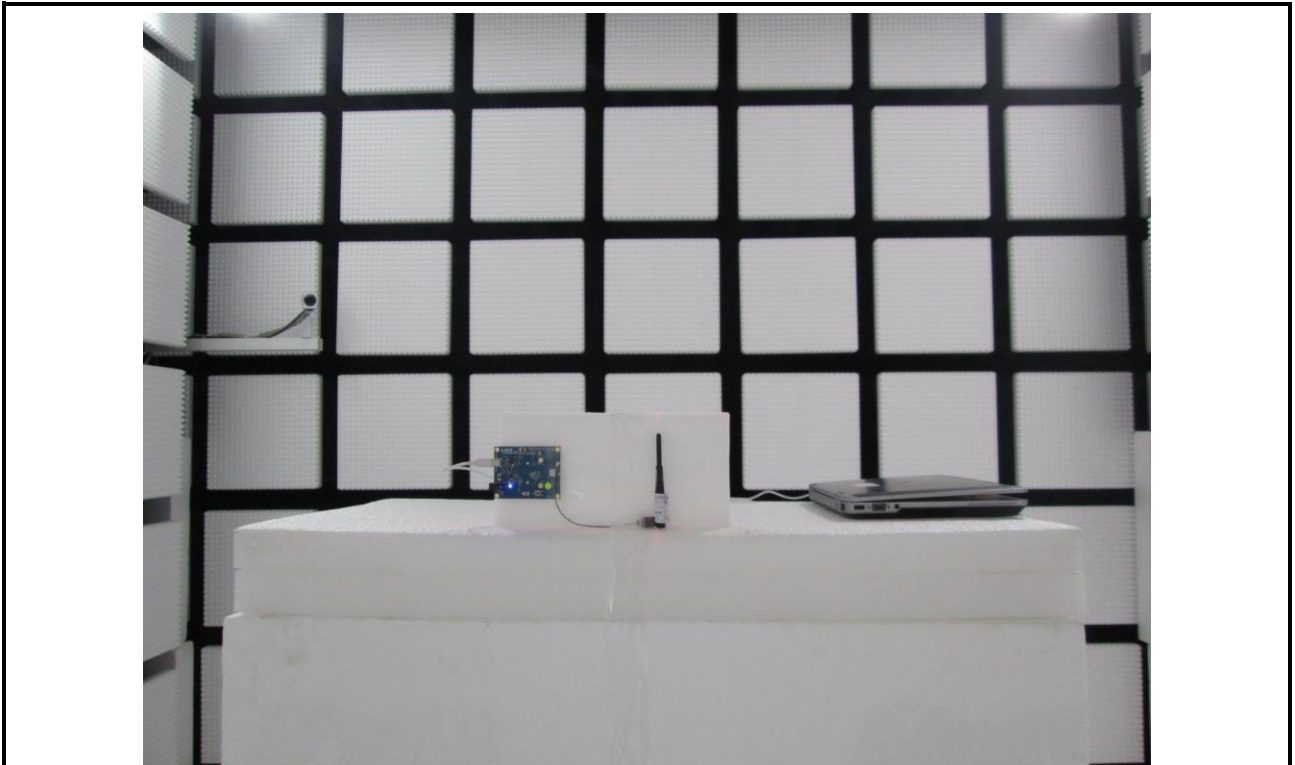
Receiver Category	2		
Performance Criteria Limit	PER ≤ 10 %		
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-66.71	2380	-32	Pass
-66.71	2504	-32	Pass
-66.71	2300	-32	Pass
-66.71	2584	-32	Pass

## 6 Photographs of the Test Configuration

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

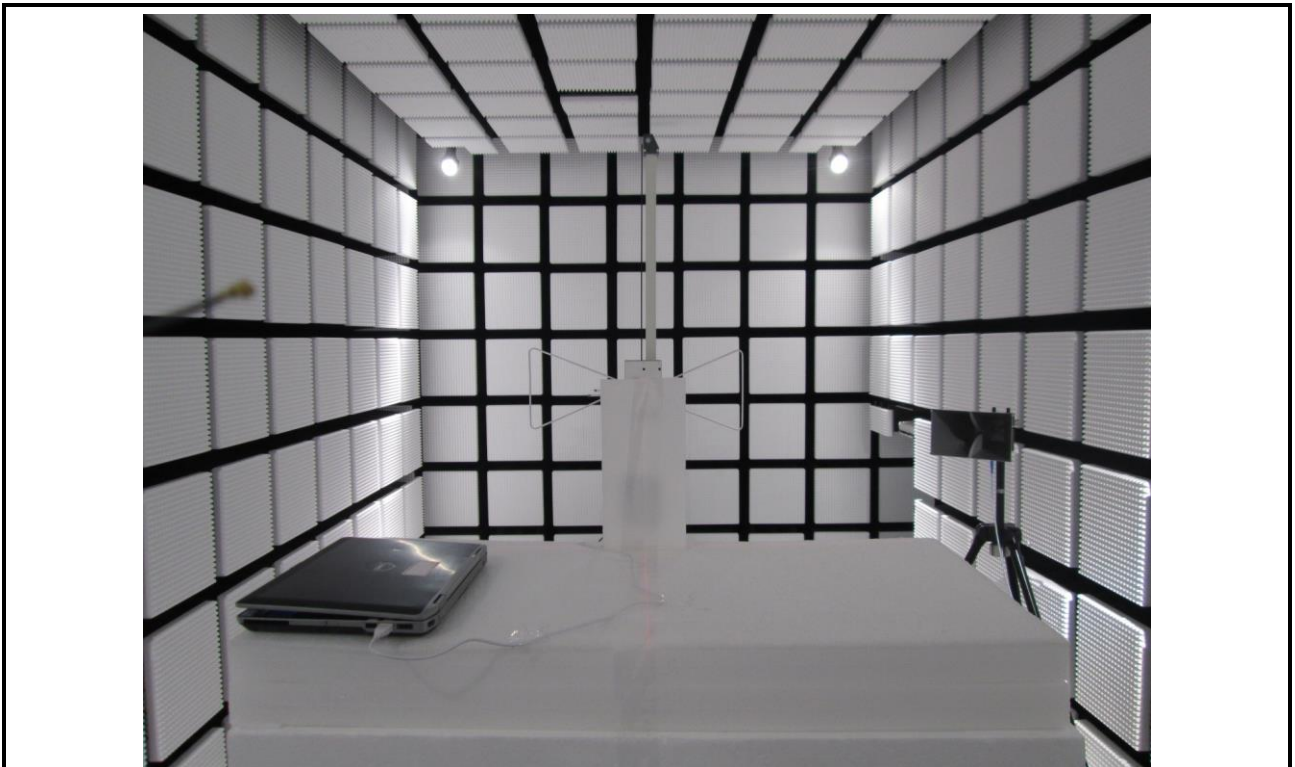


**Spurious Emission Test (Configuration 2: Dipole antenna antenna)**

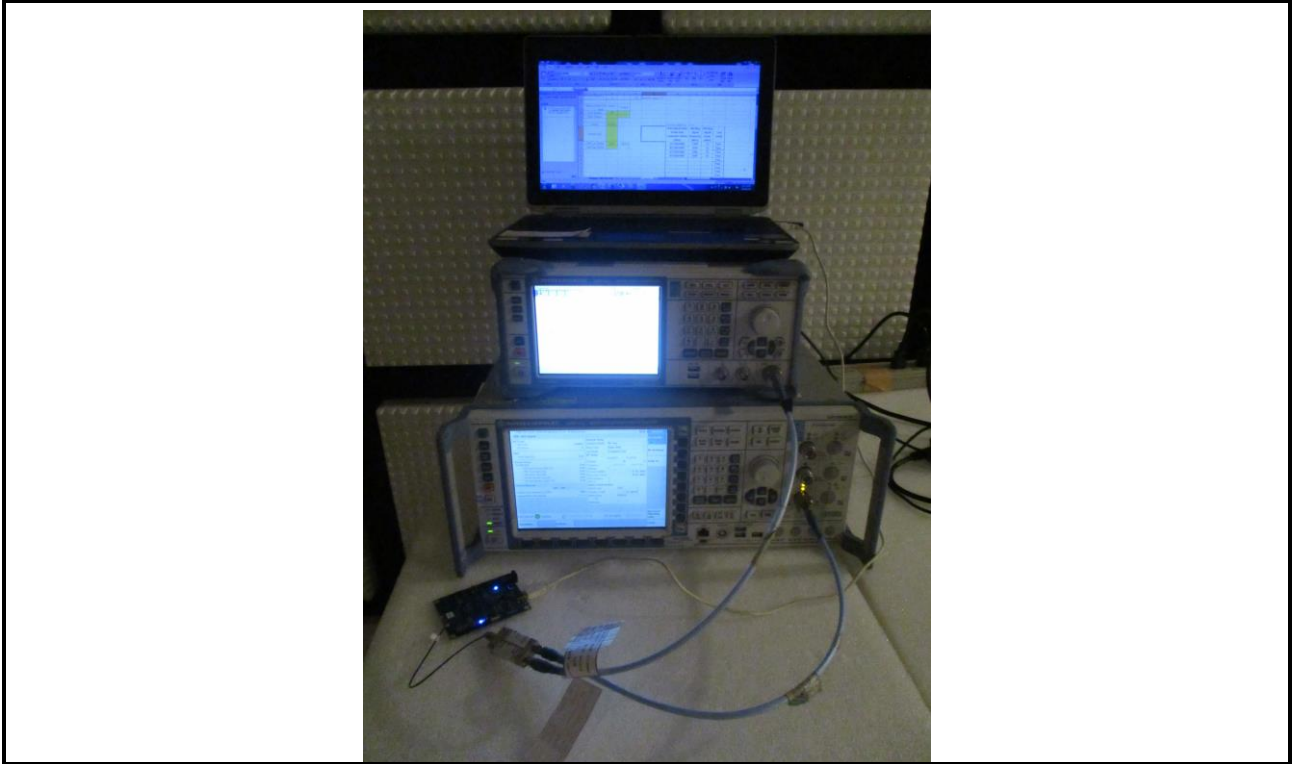




**Spurious Emission Test (Configuration 3: PCB Dipole antenna antenna)**



### Receiver Blocking Test



## 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>.

### **Linkou**

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin  
Kou District, New Taipei City,  
Taiwan, R.O.C.

### **Kwei Shan**

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,  
Kwei Shan District, Tao Yuan City  
333, Taiwan, R.O.C.

### **Kwei Shan Site II**

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd  
St., Kwei Shan District, Tao Yuan  
City 333, Taiwan, R.O.C..

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC\_Service@icertifi.com.tw

==END==