

CE Test Report

Equipment : BL600 Series Bluetooth Low Energy Module
Model No. : BL600-SA, BL600-SC, BL600-ST
Multiple Listing : Refer to item 1.1.1 for more details
Brand Name : Laird Technologies
Applicant : Laird Technologies
Address : 11160 Thompson Ave. / Lenexa, Kansas /
66219 / USA
Standard : EN 300 328 V1.9.1 (2015-02)
Received Date : Jan. 30, 2016
Tested Date : Jan. 30 ~ May 23, 2016

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.

Approved & Reviewed by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
ER330802-02	Rev. 01	Initial issue	Jun. 14, 2016

Summary of Test Results

Ref. Std. Clause	Test Items	Measured	Result
4.3.2.2	RF Output Power	7.23 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	The RF Output power is less than 10 dBm e.i.r.p. This item is not applicable	N/A
4.3.2.12	Geo-location Capability	The device has no this capability.	N/A

1 General Description

1.1 Information

1.1.1 Product Details

The following models are provided to this EUT.

Brand Name	Model Name		Product Name	Description
Laird Technologies	BL600-SA	BL620-SA	BL600 Series Bluetooth Low Energy Module	Integrated antenna onboard
	BL600-SC	BL620-SC		No integrated antenna, only IPEX MHF4 RF connector for external antenna
	BL600-ST	BL620-ST		No integrated antenna or RF IPEX connector – external antenna connection via RF Trace Pins
BL600-SA & BL620-SA only for marketing purpose. BL600-SC & BL620-SC only for marketing purpose. BL600-ST & BL620-ST only for marketing purpose.				

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

No.	EUT Model		Ant. Type	Ant. Brand/Model	Connector	Gain (dBi)
1	BL600-SA	BL620-SA	chip	ACX AT5020-E3R0HBANT/LF	NA	0.00
2	BL600-SC	BL620-SC	PCB Dipole	MAG. LAYERS SCIENTIFIC-TECHNICS CO., LTD PCA-4606-2G4C1-A33-CY	IPEX 4 Compatible	2.21
3	BL600-SC	BL620-SC	Dipole	MAG. LAYERS SCIENTIFIC-TECHNICS CO., LTD EDA-8709-2G4C1-B27-CY	IPEX Compatible(M HF4)	2.00
4	BL600-ST	BL620-ST	Dipole	MAG. LAYERS SCIENTIFIC-TECHNICS CO., LTD EDA-8709-2G4R2-A40-CY	SMA Male Reverse	2.00

1.1.4 EUT Operational Condition

Power Supply Type	3.3 / 1.8 Vdc from host		
Operational Climatic	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (75°C)	<input checked="" type="checkbox"/> Tmin (-25°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	nRFgo Studio		
Configuration	BL600-SA	BL600-SC	BL600-ST
Duty Cycle Of Test Signal (%)	69.35	69.81	70.29
Duty Factor (dB)	1.59	1.56	1.53

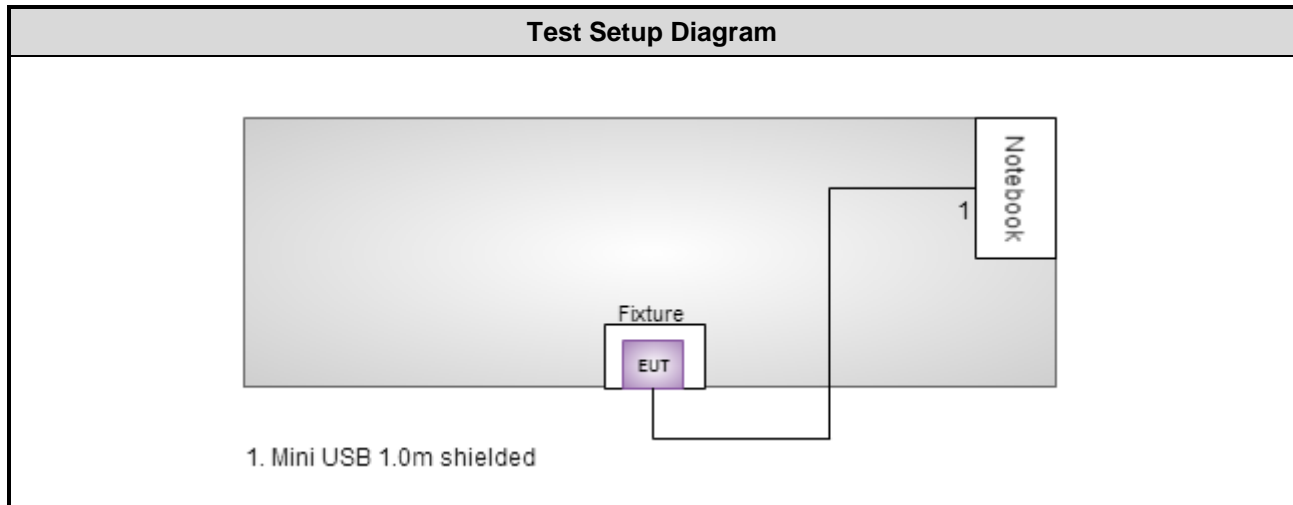
1.1.8 Power Setting

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

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	JPXMD12	DoC	USB, 1m shielded w/o core.
2	Fixture	---	---	---	---	---

1.3 Test Setup Chart



1.4 Test Equipment List and Calibration Data

Test Item	Radiated Emissions				
Test Site	Fully-anechoic chamber 2 / (05CH02-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	Agilent	N9010A	MY52221474	Sep. 08, 2015	Sep. 07, 2016
Bilog Antenna 30-1000MHz	SCHWARZBECK	VULB9168	9168-563	Dec. 29, 2015	Dec. 28, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	9120D-1205	Jan. 08, 2016	Jan. 07, 2017
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 04, 2016	Jan. 03, 2017
Preamplifier	Agilent	83017A	MY53270013	Jan. 27, 2016	Jan. 26, 2017
Preamplifier 30-1000MHz	EMC	EMC02325	980188	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22622/4	Dec. 04, 2015	Dec. 03, 2016
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22623/4	Dec. 04, 2015	Dec. 03, 2016
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22621/4	Dec. 04, 2015	Dec. 03, 2016
RF cable-4M	HUBER+SUHNER	SUCOFLEX104	MY22579/4	Dec. 04, 2015	Dec. 03, 2016
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-002	Dec. 04, 2015	Dec. 03, 2016
LF cable-3M	EMC	EMC8D-NM-NM-3000	131102	Dec. 04, 2015	Dec. 03, 2016
LF cable-10M	EMC	EMC8D-NM-NM-10000	131101	Dec. 04, 2015	Dec. 03, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
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
DC POWER SOURCE	GW INSTEK	GPC-3060D	EM884797	Oct. 20, 2015	Oct. 19, 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.					

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 V1.9.1 (2015-02)

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	$\pm 0.537 \text{ dB}$	$\pm 1.5 \text{ dB}$
Power Spectral Density, conducted	$\pm 0.463 \text{ dB}$	$\pm 3 \text{ dB}$
Unwanted Emissions, conducted	$\pm 2.505 \text{ dB}$	$\pm 3 \text{ dB}$
All emissions, radiated	$\pm 3.401 \text{ dB}$	$\pm 6 \text{ dB}$
Temperature	$\pm 0.6 \text{ }^{\circ}\text{C}$	$\pm 3 \text{ }^{\circ}\text{C}$
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	23°C / 63%	Nic Guan
Radiated Emission	05CH02-WS	19°C / 70%	Ryan Lee

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, 2, 3, 4 / 3.3 & 1.8Vdc
Power Spectral Density				
Occupied Channel Bandwidth	GFSK	2402 / 2480	1 Mbps	1, 2, 3, 4 / 3.3 Vdc
Transmitter unwanted emissions in the out of band domain	GFSK	2402 / 2480	1 Mbps	1, 2, 3, 4 / 3.3 & 1.8Vdc
Transmitter Spurious Emissions	GFSK	2402 / 2480	1 Mbps	1, 2, 3, 4 / 3.3 Vdc
Receiver Spurious Emissions				

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** for BT600-SA and Z-plane for BT 600-SC / -STresult was found as the worst case and was shown in this report.

2. The test configuration listed as follows:

Configuration 1: BL600-SA with Chip antenna, X-plane

Configuration 2: BL600-SC with PCB Dipole antenna., Z-plane

Configuration 3: BL600-SC with Dipole antenna. , Z-plane

Configuration 4: BL600-ST with Dipole antenna, Z-plane

3 Transmitter Test Results

3.1 RF Output Power

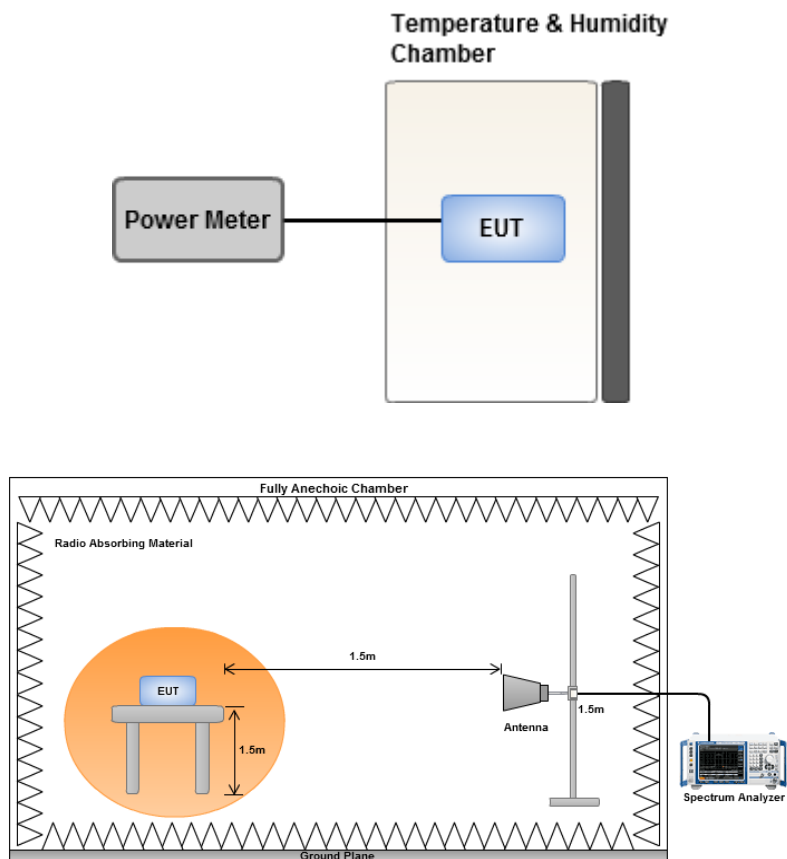
3.1.1 Limit of RF Output Power

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

3.1.2 Test Procedures

Reference to clause 5.3.2.2 of ETSI EN 300 328 V1.9.1 (2015-02).

3.1.3 Test Setup



3.1.4 Test Result of RF Output Power

For 3.3 Vdc from host

Test Configuration 1 / Radiated measurement

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
T _{nom} V _{nom}	2402	-0.98	20	Pass
T _{min} V _{nom}	2402	0.57	20	Pass
T _{max} V _{nom}	2402	-2.03	20	Pass
T _{nom} V _{nom}	2440	0.72	20	Pass
T _{min} V _{nom}	2440	2.25	20	Pass
T _{max} V _{nom}	2440	-0.36	20	Pass
T _{nom} V _{nom}	2480	-0.02	20	Pass
T _{min} V _{nom}	2480	1.49	20	Pass
T _{max} V _{nom}	2480	-1.08	20	Pass

Test Configuration 2 / Conducted measurement

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
T _{nom} V _{nom}	2402	5.85	20	Pass
T _{min} V _{nom}	2402	6.96	20	Pass
T _{max} V _{nom}	2402	4.18	20	Pass
T _{nom} V _{nom}	2440	5.95	20	Pass
T _{min} V _{nom}	2440	7.08	20	Pass
T _{max} V _{nom}	2440	4.17	20	Pass
T _{nom} V _{nom}	2480	5.66	20	Pass
T _{min} V _{nom}	2480	6.82	20	Pass
T _{max} V _{nom}	2480	4.05	20	Pass

Test Configuration 3 / Conducted measurement

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
$T_{nom} V_{nom}$	2402	5.64	20	Pass
$T_{min} V_{nom}$	2402	6.75	20	Pass
$T_{max} V_{nom}$	2402	3.97	20	Pass
$T_{nom} V_{nom}$	2440	5.74	20	Pass
$T_{min} V_{nom}$	2440	6.87	20	Pass
$T_{max} V_{nom}$	2440	3.96	20	Pass
$T_{nom} V_{nom}$	2480	5.45	20	Pass
$T_{min} V_{nom}$	2480	6.61	20	Pass
$T_{max} V_{nom}$	2480	3.84	20	Pass

Test Configuration 4 / Conducted measurement

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
$T_{nom} V_{nom}$	2402	6.67	20	Pass
$T_{min} V_{nom}$	2402	6.06	20	Pass
$T_{max} V_{nom}$	2402	3.56	20	Pass
$T_{nom} V_{nom}$	2440	6.89	20	Pass
$T_{min} V_{nom}$	2440	5.97	20	Pass
$T_{max} V_{nom}$	2440	3.63	20	Pass
$T_{nom} V_{nom}$	2480	7.23	20	Pass
$T_{min} V_{nom}$	2480	6.02	20	Pass
$T_{max} V_{nom}$	2480	3.59	20	Pass

For 1.8 Vdc from host

Test Configuration 1 / Radiated measurement

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
T _{nom} V _{nom}	2402	-0.99	20	Pass
T _{min} V _{nom}	2402	0.58	20	Pass
T _{max} V _{nom}	2402	-2.05	20	Pass
T _{nom} V _{nom}	2440	0.70	20	Pass
T _{min} V _{nom}	2440	2.23	20	Pass
T _{max} V _{nom}	2440	-0.38	20	Pass
T _{nom} V _{nom}	2480	-0.04	20	Pass
T _{min} V _{nom}	2480	1.51	20	Pass
T _{max} V _{nom}	2480	-1.09	20	Pass

Test Configuration 2 / Conducted measurement

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
T _{nom} V _{nom}	2402	5.83	20	Pass
T _{min} V _{nom}	2402	6.95	20	Pass
T _{max} V _{nom}	2402	4.16	20	Pass
T _{nom} V _{nom}	2440	5.94	20	Pass
T _{min} V _{nom}	2440	7.07	20	Pass
T _{max} V _{nom}	2440	4.15	20	Pass
T _{nom} V _{nom}	2480	5.64	20	Pass
T _{min} V _{nom}	2480	6.81	20	Pass
T _{max} V _{nom}	2480	4.04	20	Pass

Test Configuration 3 / Conducted measurement

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
$T_{nom} V_{nom}$	2402	5.62	20	Pass
$T_{min} V_{nom}$	2402	6.74	20	Pass
$T_{max} V_{nom}$	2402	3.95	20	Pass
$T_{nom} V_{nom}$	2440	5.73	20	Pass
$T_{min} V_{nom}$	2440	6.86	20	Pass
$T_{max} V_{nom}$	2440	3.94	20	Pass
$T_{nom} V_{nom}$	2480	5.43	20	Pass
$T_{min} V_{nom}$	2480	6.60	20	Pass
$T_{max} V_{nom}$	2480	3.83	20	Pass

Test Configuration 4 / Conducted measurement

RF Output Power (dBm)				
Condition	Freq. (MHz)	EIRP Power	Limit (dBm)	Results
$T_{nom} V_{nom}$	2402	6.65	20	Pass
$T_{min} V_{nom}$	2402	6.05	20	Pass
$T_{max} V_{nom}$	2402	3.54	20	Pass
$T_{nom} V_{nom}$	2440	6.87	20	Pass
$T_{min} V_{nom}$	2440	5.95	20	Pass
$T_{max} V_{nom}$	2440	3.64	20	Pass
$T_{nom} V_{nom}$	2480	7.21	20	Pass
$T_{min} V_{nom}$	2480	6.01	20	Pass
$T_{max} V_{nom}$	2480	3.57	20	Pass

3.2 Power Spectral Density

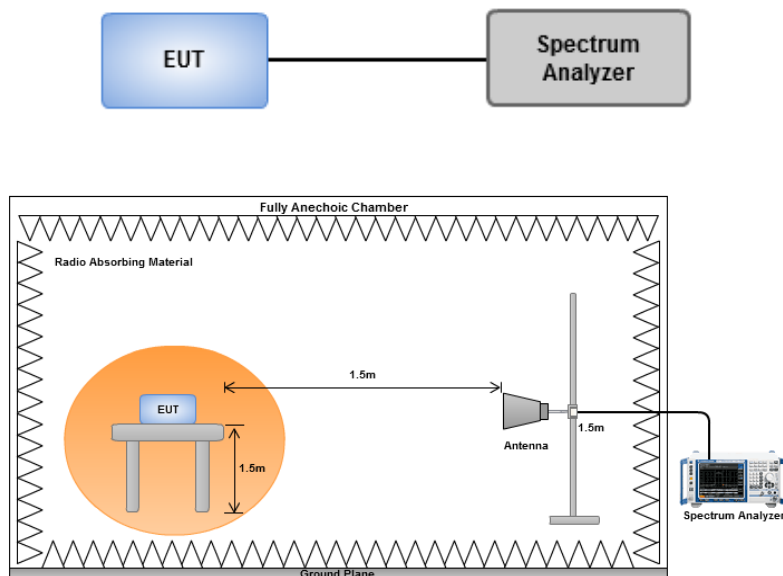
3.2.1 Limit of Power Spectral Density

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 5.3.3.2 of ETSI EN 300 328 V1.9.1 (2015-02).

3.2.3 Test Setup



3.2.4 Test Result of Power Spectral Density

For 3.3 Vdc from host

Test Configuration 1 / Radiated measurement

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	-1.06	10	Pass
GFSK-1Mbps	2440	0.64	10	Pass
GFSK-1Mbps	2480	-0.09	10	Pass

Test Configuration 2/ Conducted measurement

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	5.77	10	Pass
GFSK-1Mbps	2440	5.87	10	Pass
GFSK-1Mbps	2480	5.58	10	Pass

Test Configuration 3/ Conducted measurement

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	5.56	10	Pass
GFSK-1Mbps	2440	5.66	10	Pass
GFSK-1Mbps	2480	5.37	10	Pass

Test Configuration 4/ Conducted measurement

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	6.71	10	Pass
GFSK-1Mbps	2440	6.41	10	Pass
GFSK-1Mbps	2480	7.12	10	Pass

For 1.8 Vdc from host

Test Configuration 1 / Radiated measurement

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	-1.06	10	Pass
GFSK-1Mbps	2440	0.64	10	Pass
GFSK-1Mbps	2480	-0.09	10	Pass

Test Configuration 2/ Conducted measurement

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	5.74	10	Pass
GFSK-1Mbps	2440	5.85	10	Pass
GFSK-1Mbps	2480	5.53	10	Pass

Test Configuration 3/ Conducted measurement

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	5.53	10	Pass
GFSK-1Mbps	2440	5.64	10	Pass
GFSK-1Mbps	2480	5.32	10	Pass

Test Configuration 4/ Conducted measurement

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	6.70	10	Pass
GFSK-1Mbps	2440	6.39	10	Pass
GFSK-1Mbps	2480	7.10	10	Pass

3.3 Occupied Channel Bandwidth

3.3.1 Limit of Occupied Channel Bandwidth

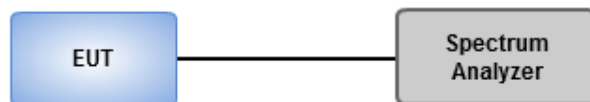
The Occupied Channel Bandwidth shall fall completely within 2.4~2.4835 GHz.

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 5.3.8.2 of ETSI EN 300 328 V1.9.1 (2015-02).

3.3.3 Test Setup



3.3.4 Test Result of Occupied Channel Bandwidth

Test Configuration 1

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	1.02	2401.52	2402.54	2400.0
GFSK-1Mbps	2480	1.03	2479.51	2480.55	2483.5

Test Configuration 2

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	1.02	2401.52	2402.54	2400.0
GFSK-1Mbps	2480	1.02	2479.51	2480.54	2483.5

Test Configuration 3

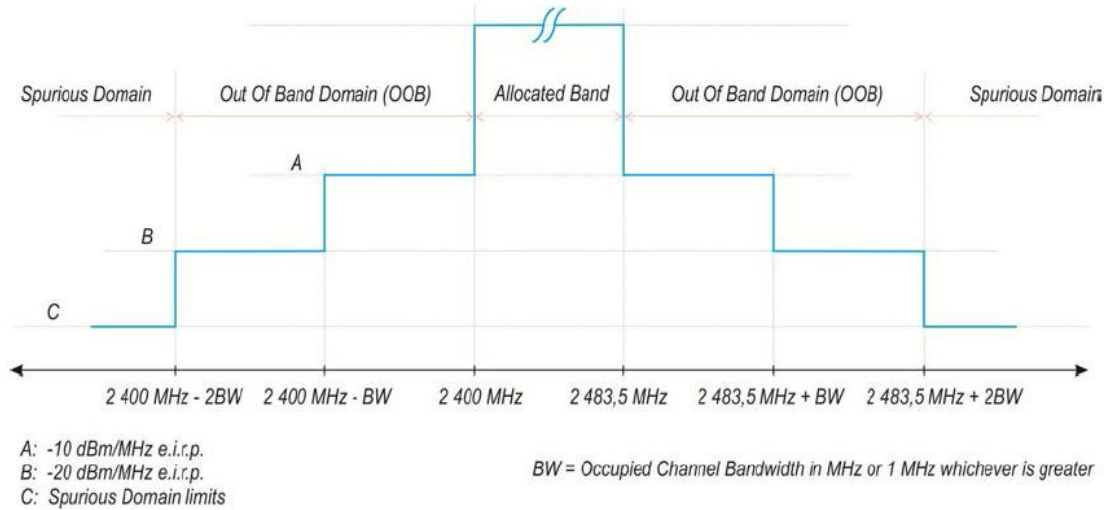
Modulation Mode	Frequency (MHz)	99% Bandwidth (MHz)	F _L at 99% BW (MHz)	F _H at 99% BW (MHz)	Limit F _L / F _H (MHz)
GFSK-1Mbps	2402	1.02	2401.52	2402.54	2400.0
GFSK-1Mbps	2480	1.02	2479.51	2480.54	2483.5

Test Configuration 4

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	1.03	2401.50	2402.53	2400.0
GFSK-1Mbps	2480	1.08	2479.47	2480.56	2483.5

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

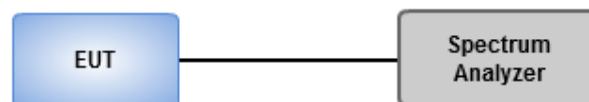
3.4.1 Limit of Transmitter Unwanted Emissions in the Out-Of-Band Domain



3.4.2 Test Procedures

Reference to clause 5.3.9.2 of ETSI EN 300 328 V1.9.1 (2015-02).

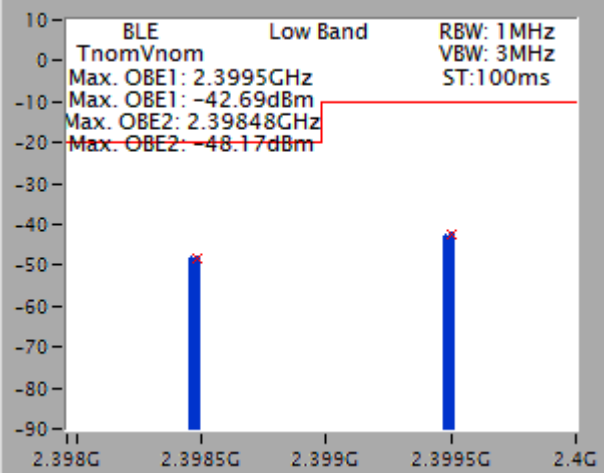
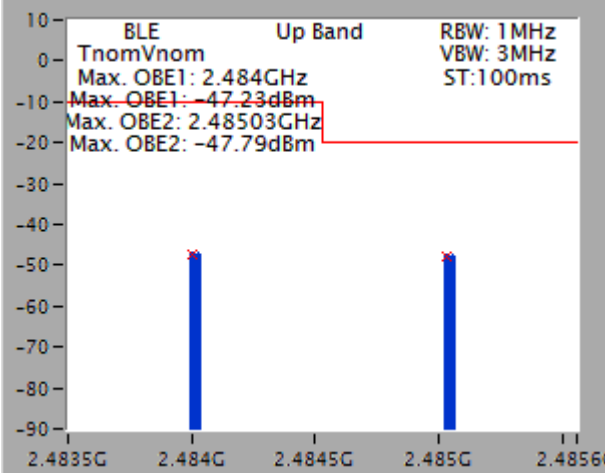
3.4.3 Test Setup



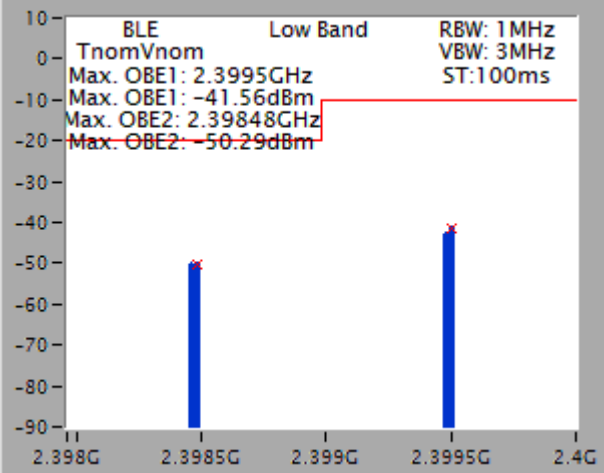
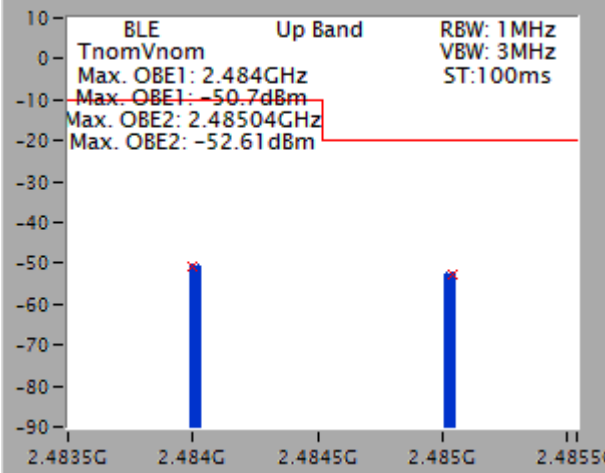
3.4.4 Test Result of Transmitter Unwanted Emissions in the Out-Of-Band Domain

For 3.3 Vdc from host

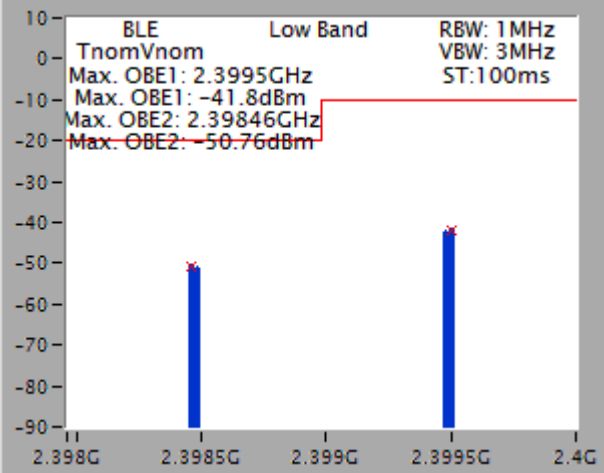
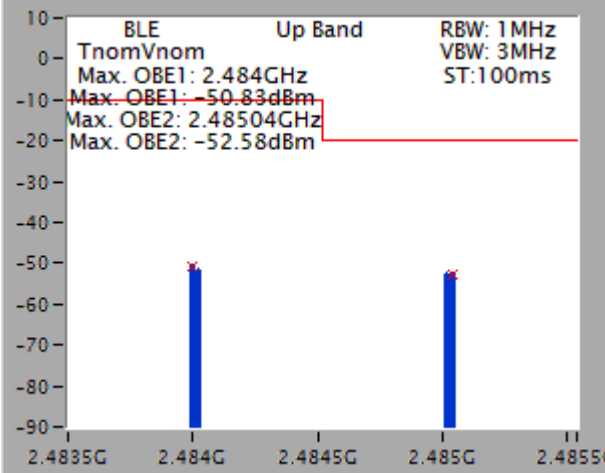
Test Configuration 1

Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-42.69	-10
TnomVnom	GFSK-1Mbps	2402	2398.48	-48.17	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-47.23	-10
TnomVnom	GFSK-1Mbps	2480	2485.03	-47.79	-20
Low Band			Up Band		
					

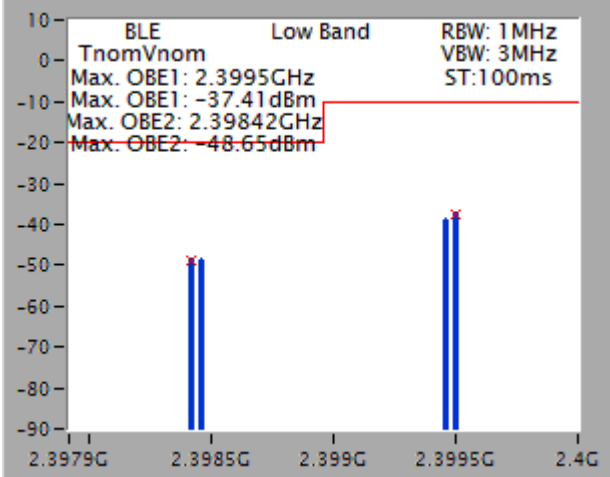
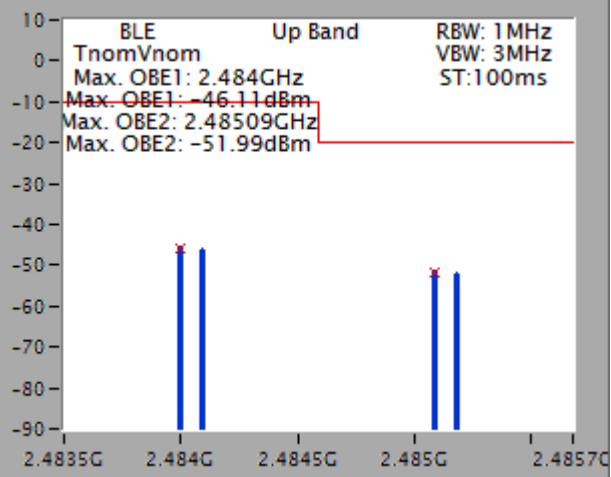
Test Configuration 2

Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-41.56	-10
TnomVnom	GFSK-1Mbps	2402	2398.48	-50.29	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-50.70	-10
TnomVnom	GFSK-1Mbps	2480	2485.04	-52.61	-20
Low Band			Up Band		
					

Test Configuration 3

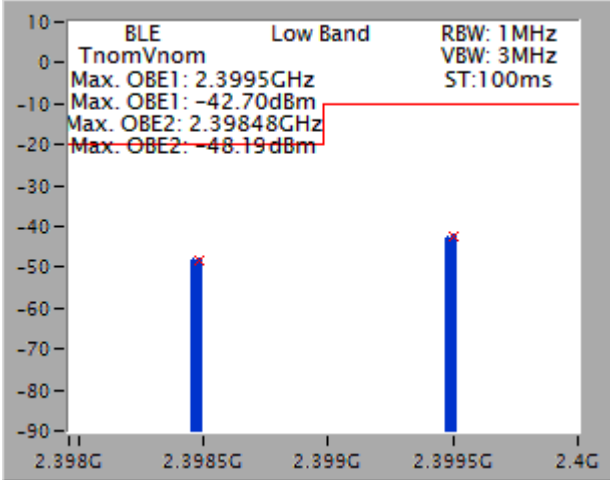
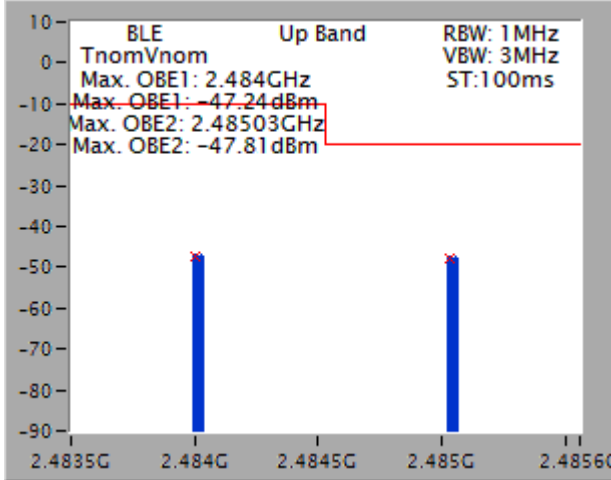
Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-41.80	-10
TnomVnom	GFSK-1Mbps	2402	2398.46	-50.76	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-50.83	-10
TnomVnom	GFSK-1Mbps	2480	2485.04	-52.58	-20
Low Band			Up Band		
					

Test Configuration 4

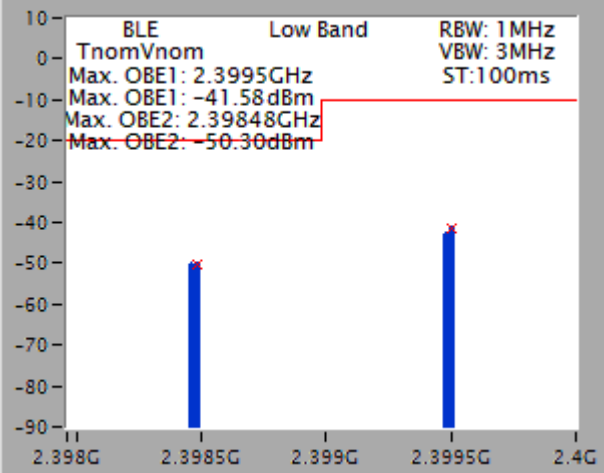
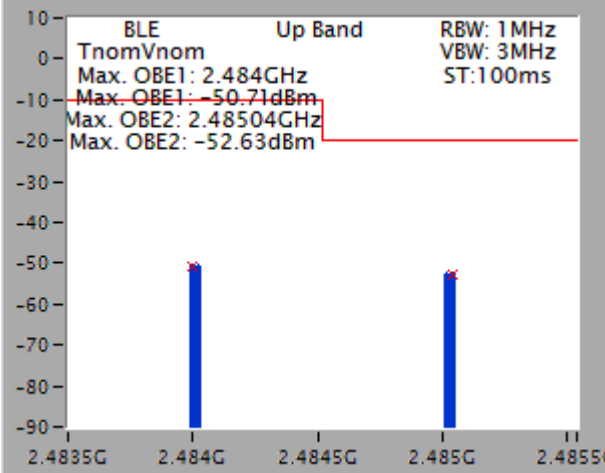
Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-37.41	-10
TnomVnom	GFSK-1Mbps	2402	2398.42	-48.65	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-46.11	-10
TnomVnom	GFSK-1Mbps	2480	2485.09	-51.99	-20
Low Band			Up Band		
					

For 1.8 Vdc from host

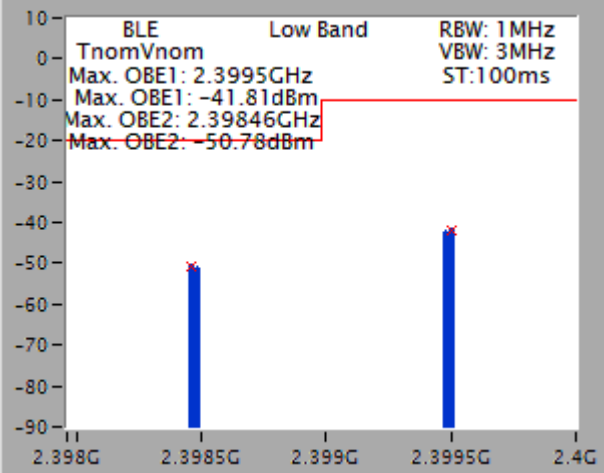
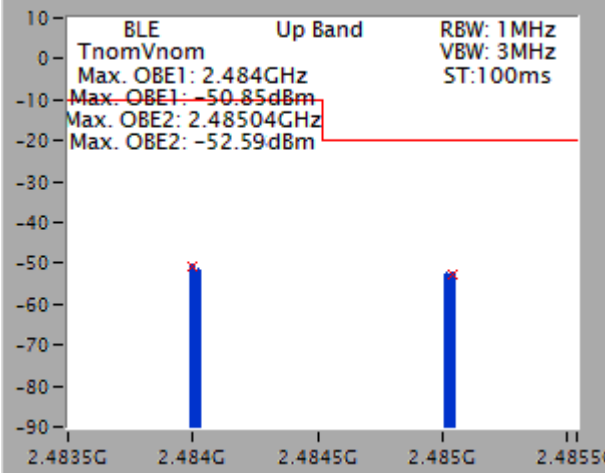
Test Configuration 1

Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-42.70	-10
TnomVnom	GFSK-1Mbps	2402	2398.48	-48.19	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-47.24	-10
TnomVnom	GFSK-1Mbps	2480	2485.03	-47.81	-20
Low Band			Up Band		
					

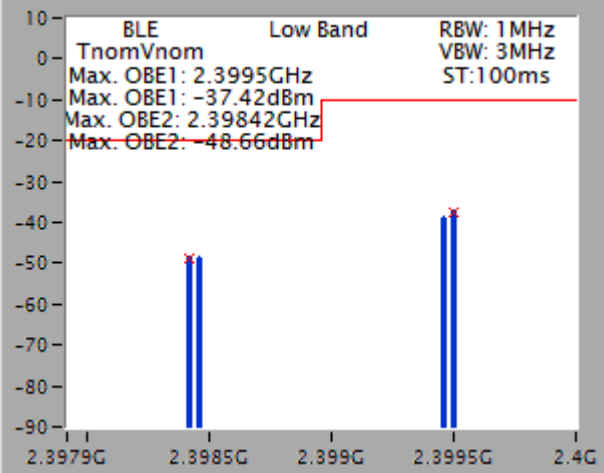
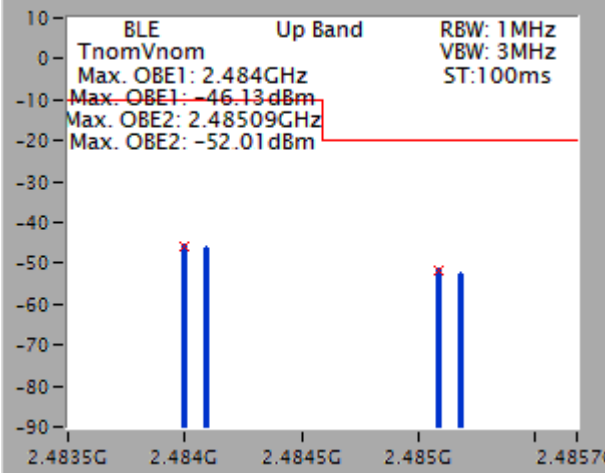
Test Configuration 2

Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-41.58	-10
TnomVnom	GFSK-1Mbps	2402	2398.48	-50.30	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-50.71	-10
TnomVnom	GFSK-1Mbps	2480	2485.04	-52.63	-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	-41.81	-10
TnomVnom	GFSK-1Mbps	2402	2398.46	-50.78	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-50.85	-10
TnomVnom	GFSK-1Mbps	2480	2485.04	-52.59	-20
Low Band			Up Band		
					

Test Configuration 4

Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
TnomVnom	GFSK-1Mbps	2402	2399.50	-37.42	-10
TnomVnom	GFSK-1Mbps	2402	2398.42	-48.66	-20
TnomVnom	GFSK-1Mbps	2480	2484.00	-46.13	-10
TnomVnom	GFSK-1Mbps	2480	2485.09	-52.01	-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

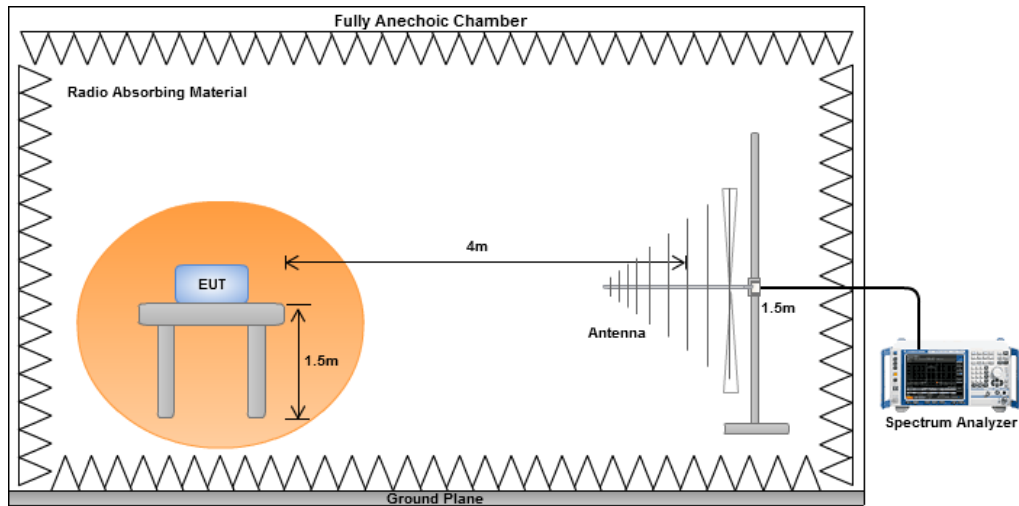
Frequency Range (MHz)	Maximum power (dBm)	Bandwidth (kHz)
30 to 47	-36	100
47 to 74	-54	100
74 to 87.5	-36	100
87.5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 862	-54	100
862 to 1000	-36	100
1000 to 12750	-30	1000

3.5.2 Test Procedures

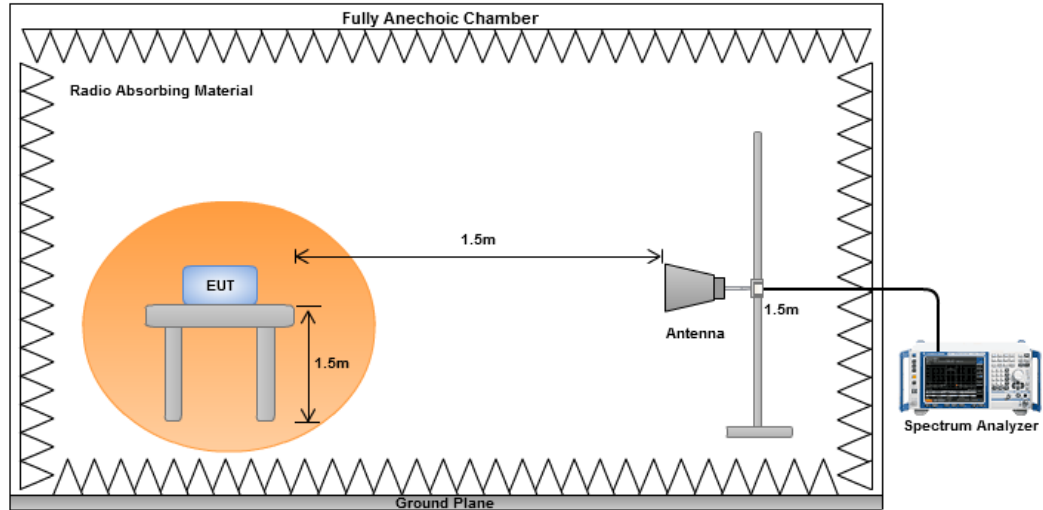
Reference to clause 5.3.10.2 of ETSI EN 300 328 V1.9.1 (2015-02).

3.5.3 Test Setup

Below 1GHz

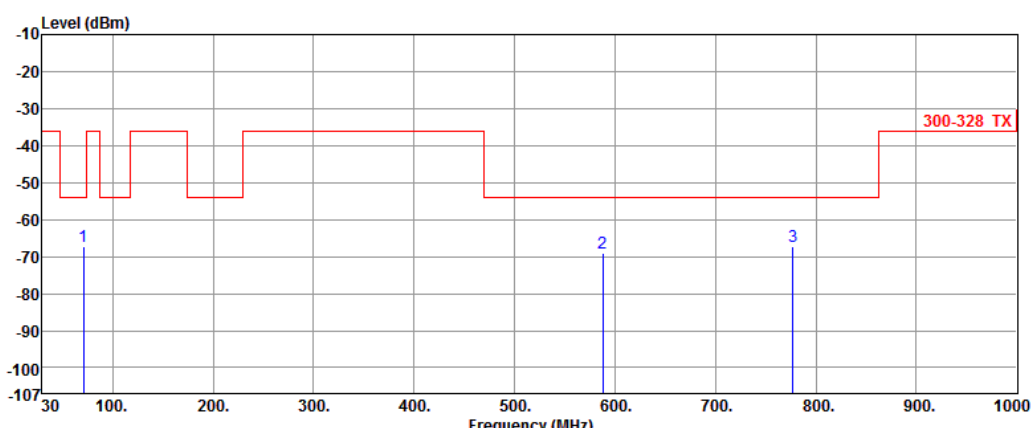


Above 1 GHz



3.5.4 Transmitter Spurious Unwanted Emissions (Below 1GHz)

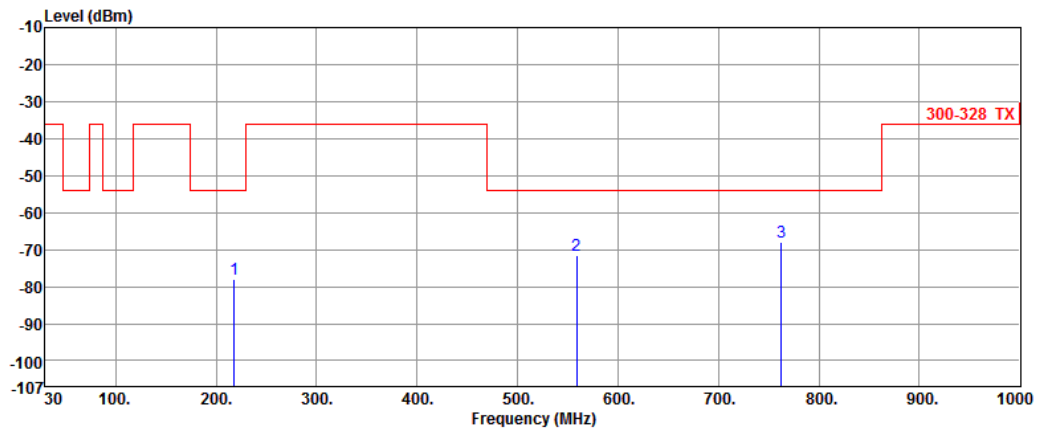
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-67.18	-54.00	-13.18	-3.38	-63.80
2	587.75	-69.23	-54.00	-15.23	6.17	-75.40
3	776.90	-67.42	-54.00	-13.42	9.01	-76.43

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

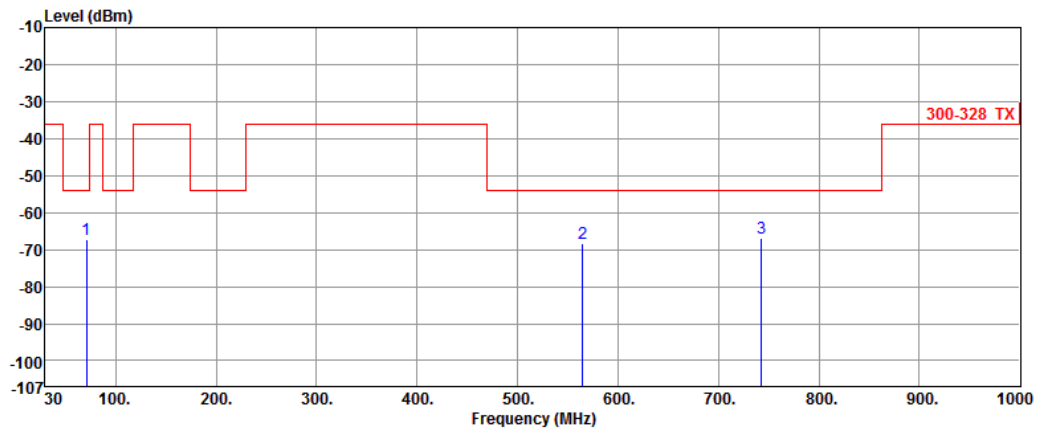


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	218.18	-77.85	-54.00	-23.85	-4.03	-73.82
2	558.65	-71.47	-54.00	-17.47	5.28	-76.75
3	762.35	-67.95	-54.00	-13.95	9.04	-76.99

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

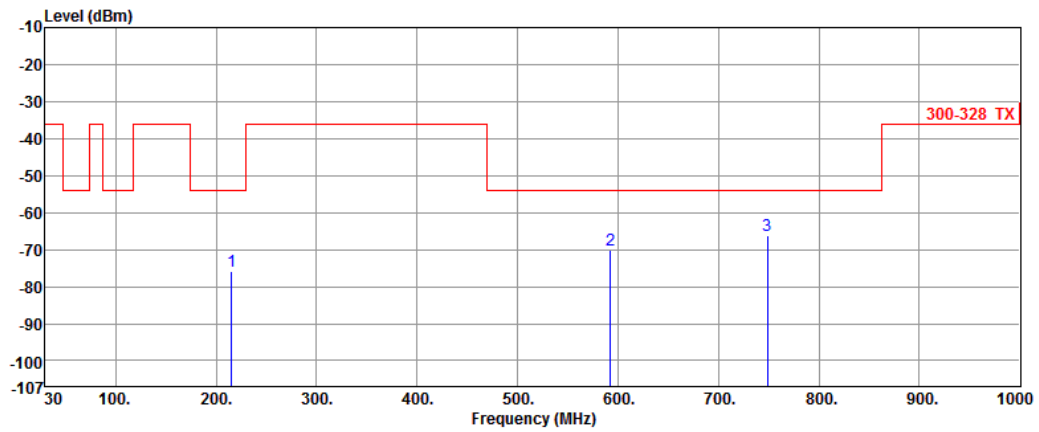


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-67.14	-54.00	-13.14	-3.38	-63.76
2	564.47	-68.44	-54.00	-14.44	5.27	-73.71
3	742.95	-67.00	-54.00	-13.00	8.64	-75.64

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

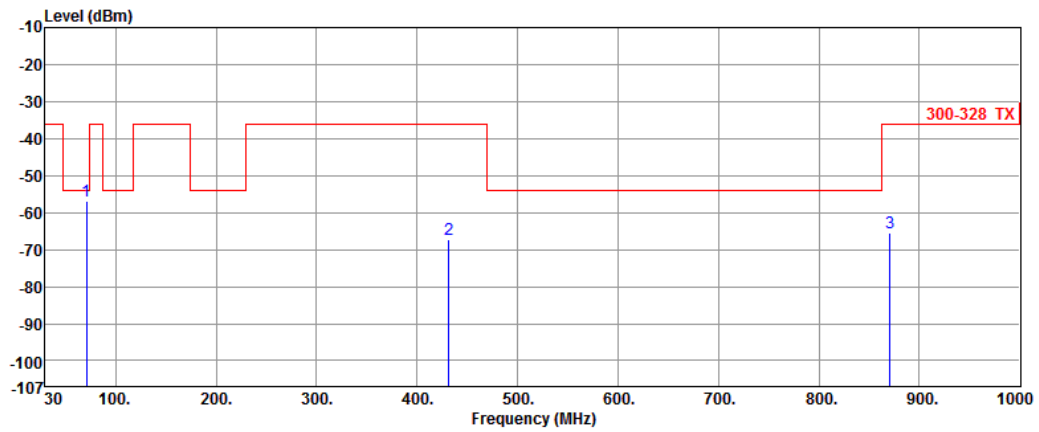


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	215.27	-75.82	-54.00	-21.82	-3.79	-72.03
2	592.60	-70.23	-54.00	-16.23	6.61	-76.84
3	748.77	-66.21	-54.00	-12.21	9.14	-75.35

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

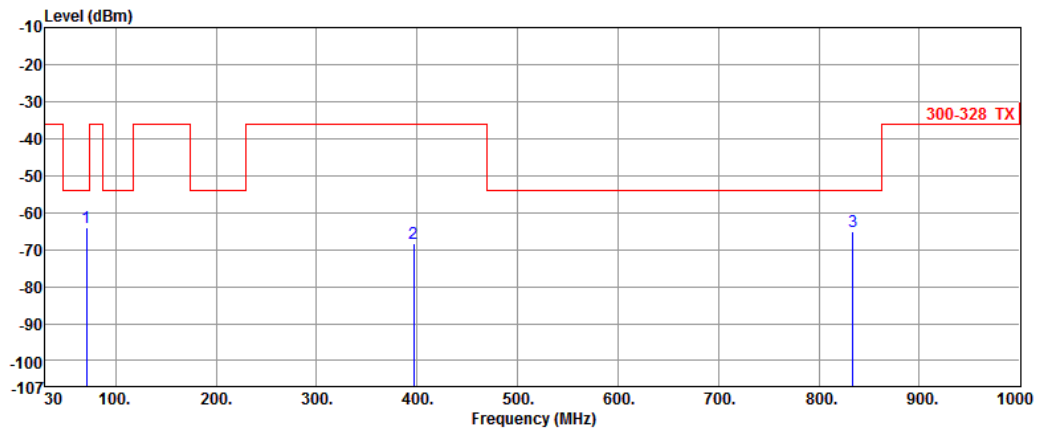


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-56.72	-54.00	-2.72	-3.38	-53.34
2	431.58	-67.28	-36.00	-31.28	2.74	-70.02
3	870.99	-65.60	-36.00	-29.60	10.37	-75.97

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

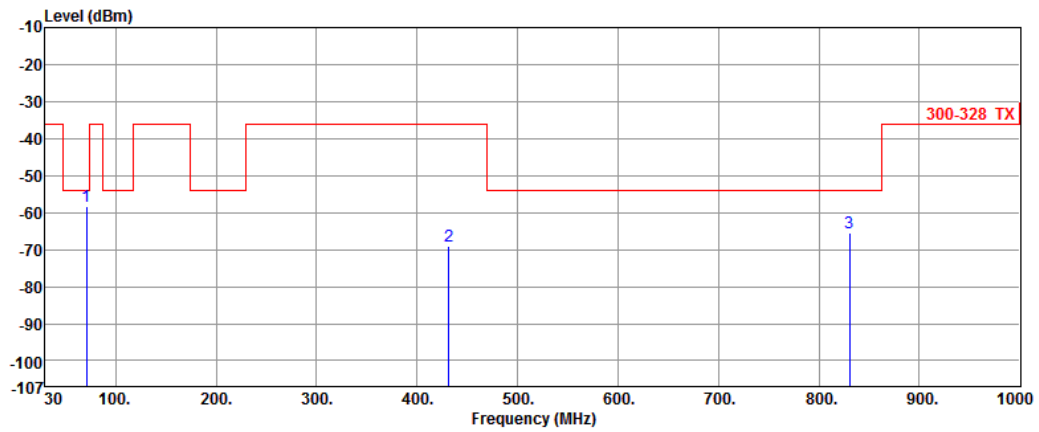


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-64.12	-54.00	-10.12	-3.85	-60.27
2	396.66	-68.51	-36.00	-32.51	1.31	-69.82
3	834.13	-65.04	-54.00	-11.04	10.27	-75.31

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	2

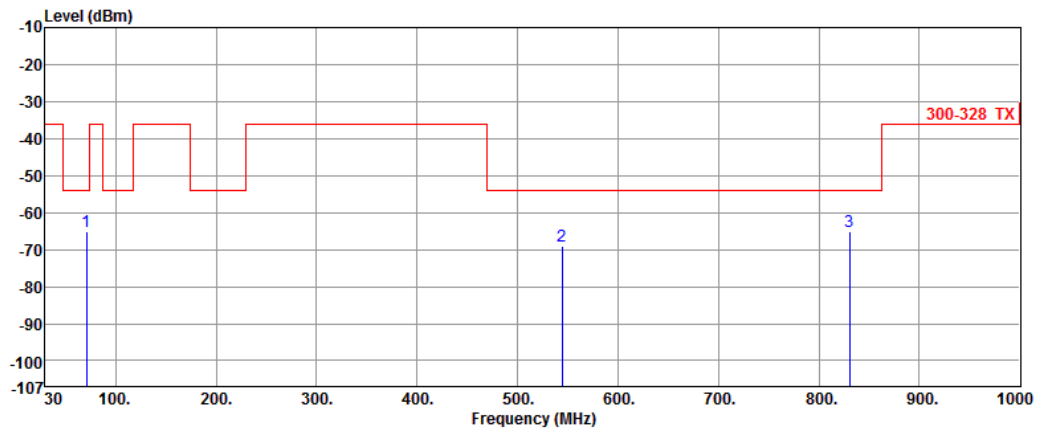


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-58.28	-54.00	-4.28	-528.18	469.90
2	431.58	-68.93	-36.00	-32.93	-528.18	459.25
3	830.25	-65.43	-54.00	-11.43	-527.66	462.23

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

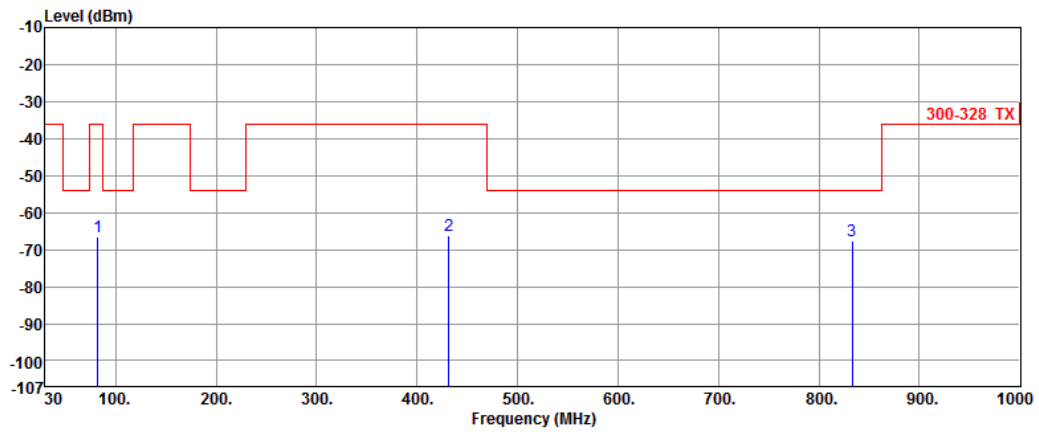


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-65.01	-54.00	-11.01	-3.85	-61.16
2	544.10	-69.02	-54.00	-15.02	4.80	-73.82
3	830.25	-65.24	-54.00	-11.24	10.24	-75.48

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

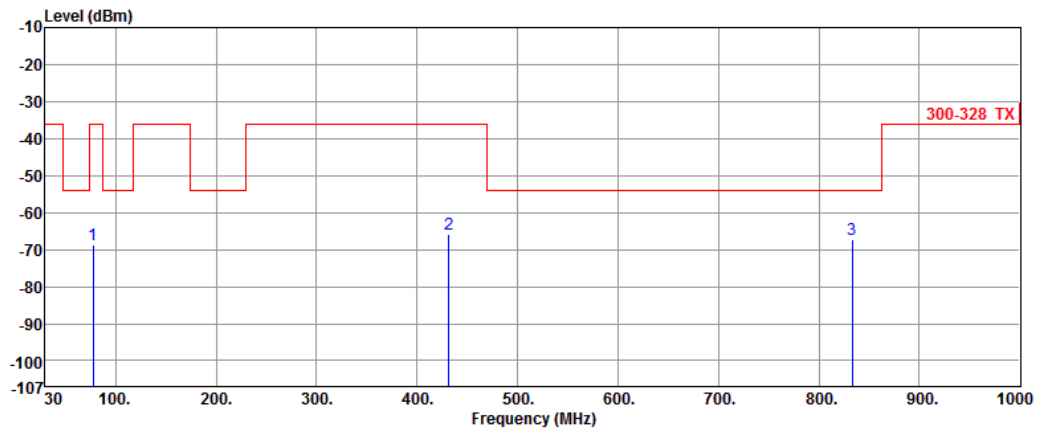


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	82.38	-66.56	-36.00	-30.56	-5.67	-60.89
2	431.58	-66.12	-36.00	-30.12	2.74	-68.86
3	833.16	-67.47	-54.00	-13.47	9.85	-77.32

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

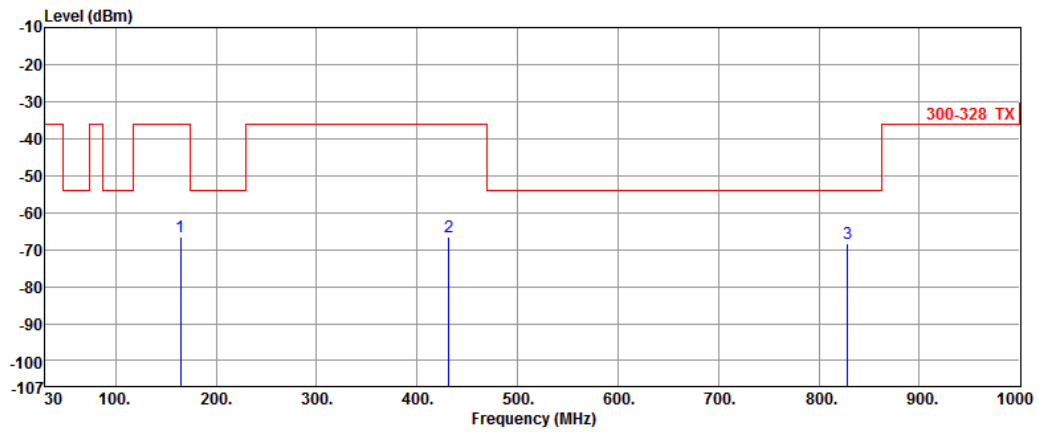


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	77.53	-68.66	-36.00	-32.66	-5.16	-63.50
2	431.58	-65.85	-36.00	-29.85	2.44	-68.29
3	833.16	-67.22	-54.00	-13.22	10.27	-77.49

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

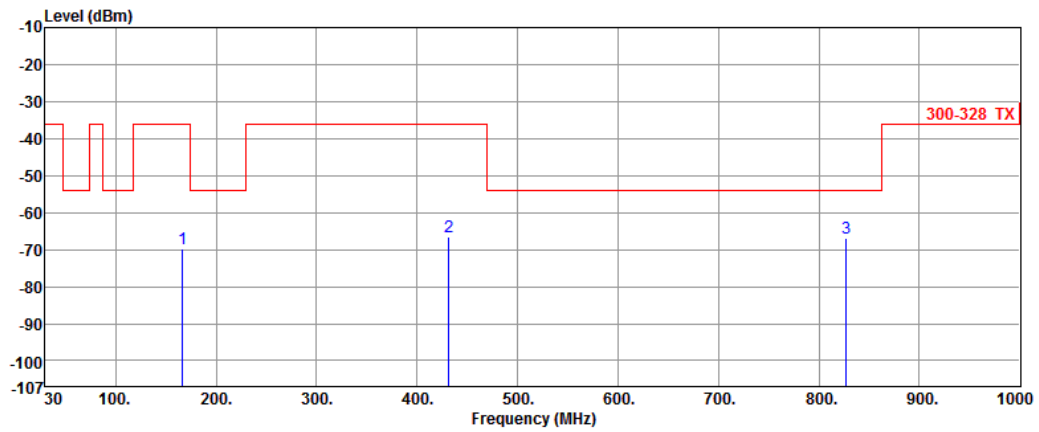


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	164.83	-66.62	-36.00	-30.62	-0.69	-65.93
2	431.58	-66.54	-36.00	-30.54	2.74	-69.28
3	828.31	-68.37	-54.00	-14.37	9.85	-78.22

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

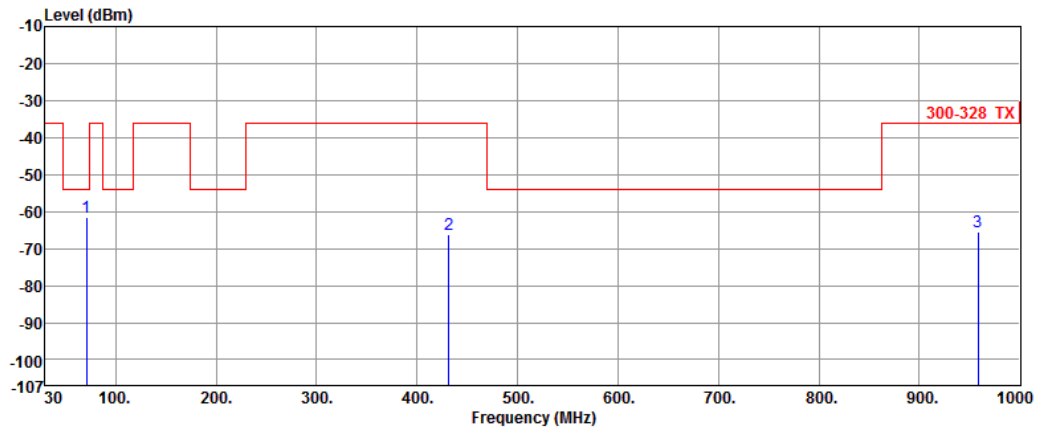


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	166.77	-69.69	-36.00	-33.69	-1.93	-67.76
2	431.58	-66.43	-36.00	-30.43	2.44	-68.87
3	827.34	-66.87	-54.00	-12.87	10.20	-77.07

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	4

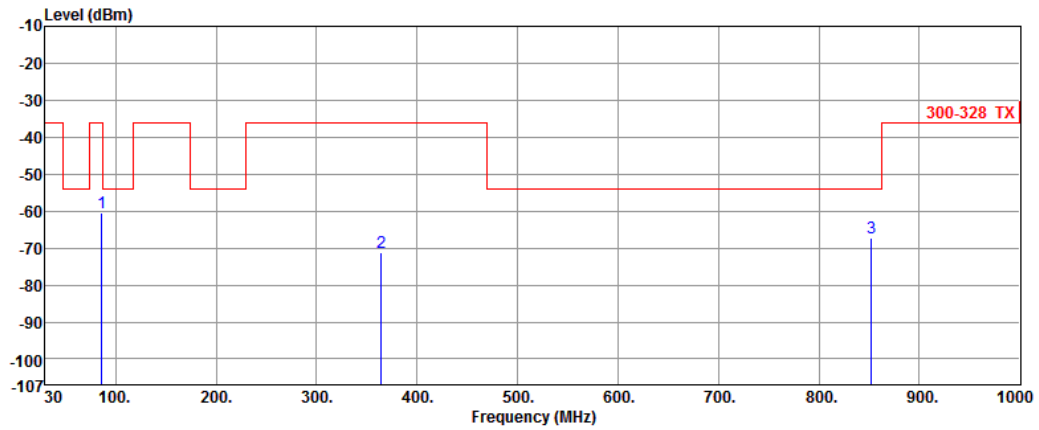


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-61.62	-54.00	-7.62	-3.38	-58.24
2	431.58	-66.23	-36.00	-30.23	2.74	-68.97
3	958.29	-65.43	-36.00	-29.43	11.58	-77.01

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	4

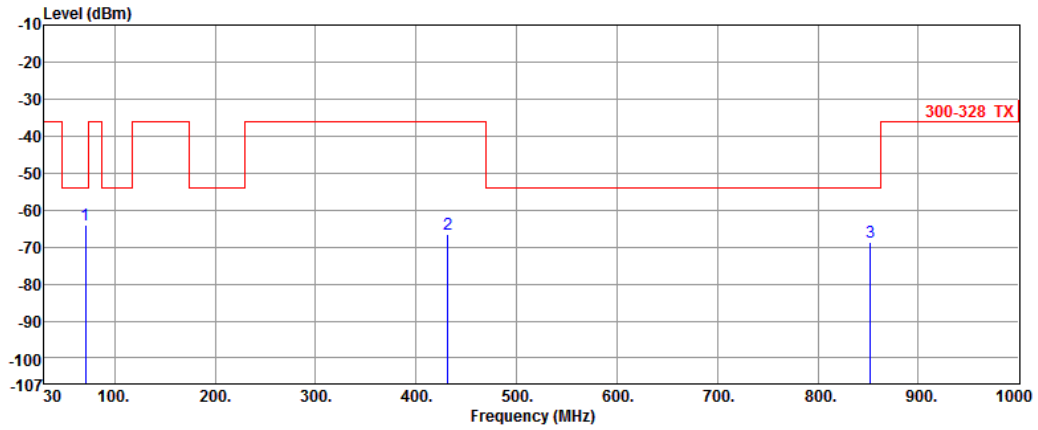


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	86.26	-60.62	-36.00	-24.62	-6.33	-54.29
2	364.65	-71.38	-36.00	-35.38	0.82	-72.20
3	852.56	-67.18	-54.00	-13.18	10.36	-77.54

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	4

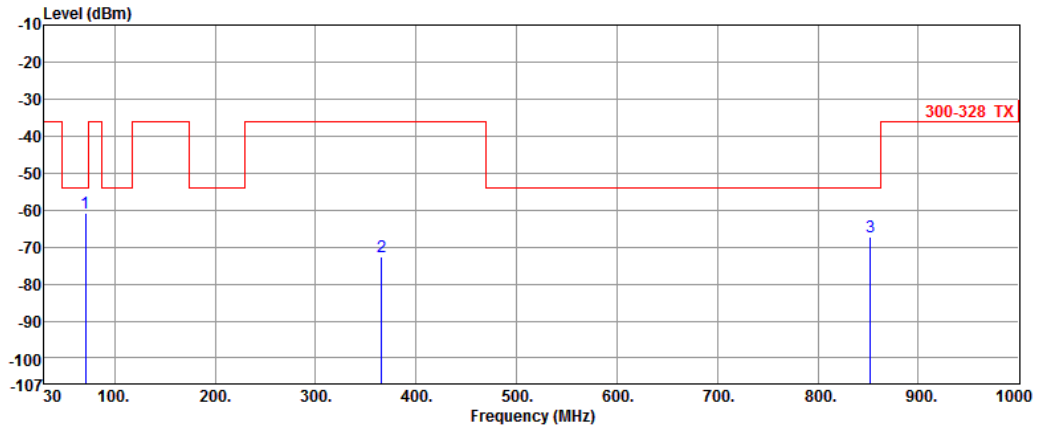


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-64.14	-54.00	-10.14	-3.38	-60.76
2	431.58	-66.55	-36.00	-30.55	2.74	-69.29
3	852.56	-68.80	-54.00	-14.80	10.10	-78.90

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	4



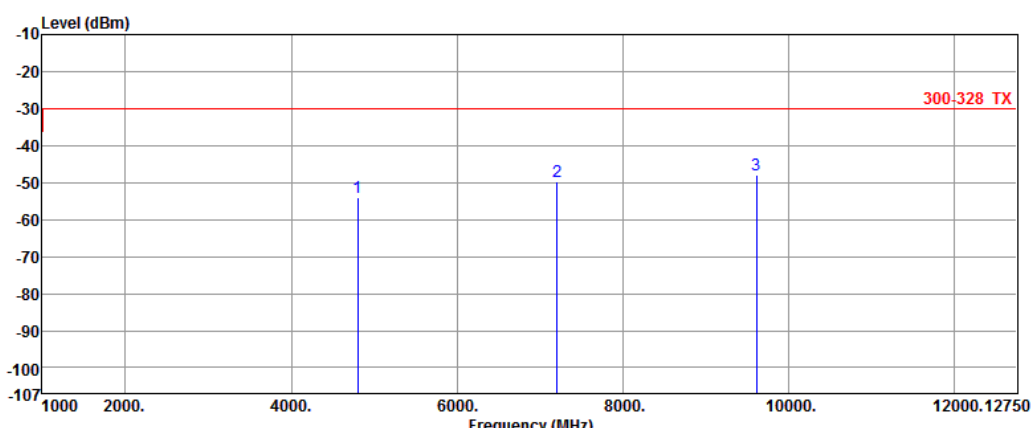
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-60.79	-54.00	-6.79	-3.85	-56.94
2	365.62	-72.58	-36.00	-36.58	0.87	-73.45
3	852.56	-67.37	-54.00	-13.37	10.36	-77.73

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

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

3.5.5 Transmitter Spurious Unwanted Emissions (Above 1GHz)

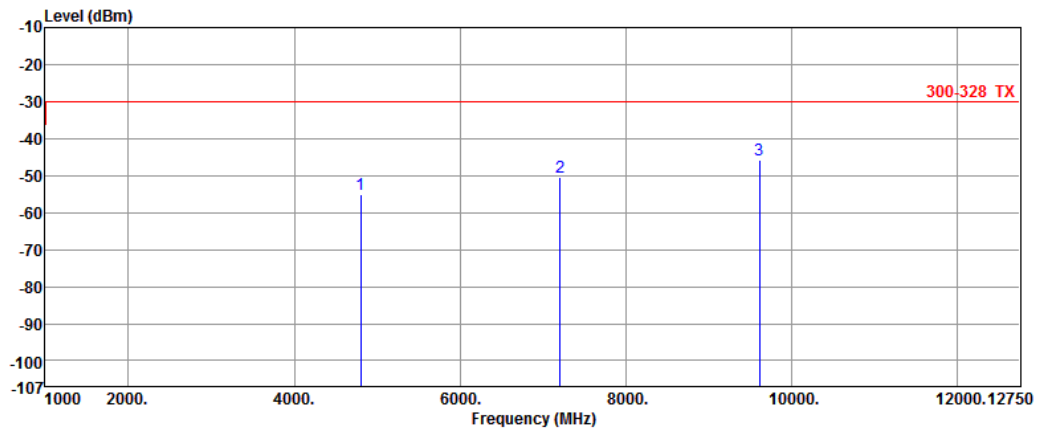
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.00	-54.14	-30.00	-24.14	9.33	-63.47
2	7206.16	-49.62	-30.00	-19.62	14.71	-64.33
3	9608.04	-47.88	-30.00	-17.88	18.55	-66.43

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

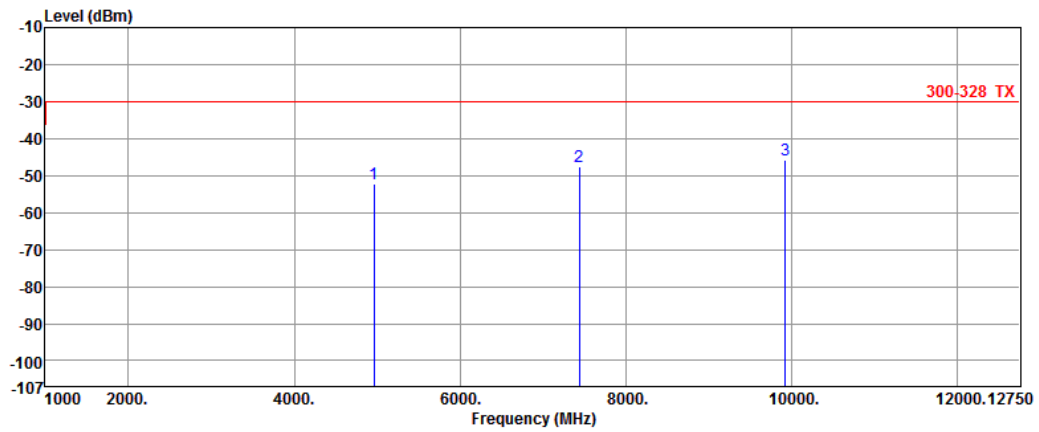


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.10	-55.22	-30.00	-25.22	9.33	-64.55
2	7205.78	-50.61	-30.00	-20.61	14.76	-65.37
3	9607.84	-45.68	-30.00	-15.68	19.08	-64.76

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

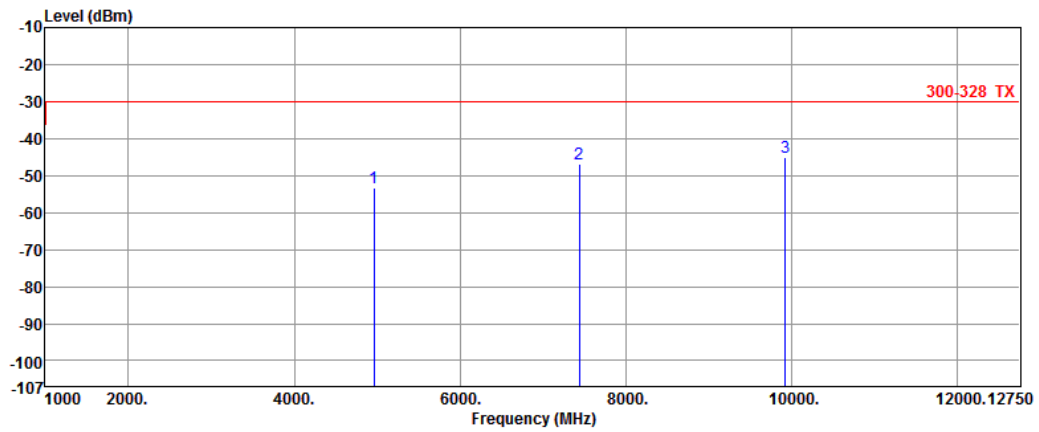


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.02	-52.27	-30.00	-22.27	9.24	-61.51
2	7439.97	-47.76	-30.00	-17.76	14.83	-62.59
3	9919.88	-45.92	-30.00	-15.92	18.91	-64.83

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

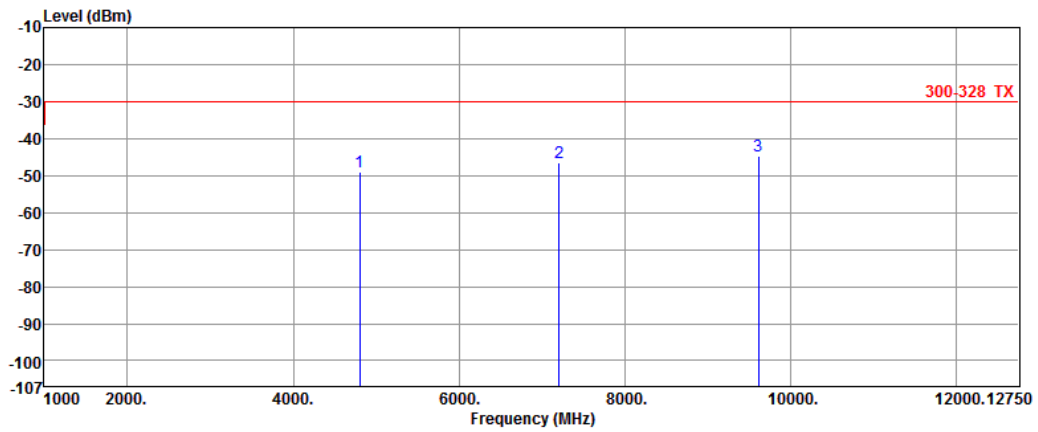


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.20	-53.38	-30.00	-23.38	9.01	-62.39
2	7439.79	-46.76	-30.00	-16.76	15.61	-62.37
3	9919.89	-44.99	-30.00	-14.99	19.48	-64.47

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

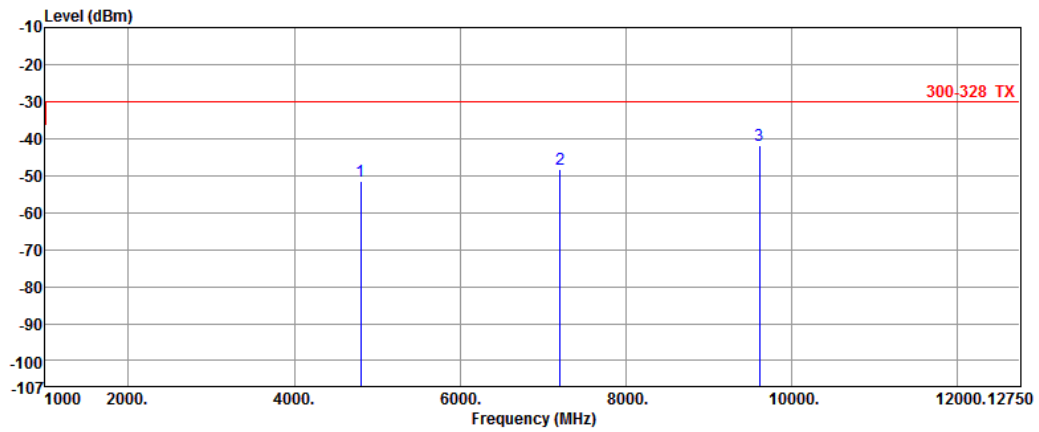


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.17	-49.07	-30.00	-19.07	9.33	-58.40
2	7207.31	-46.57	-30.00	-16.57	14.72	-61.29
3	9608.02	-44.57	-30.00	-14.57	18.55	-63.12

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

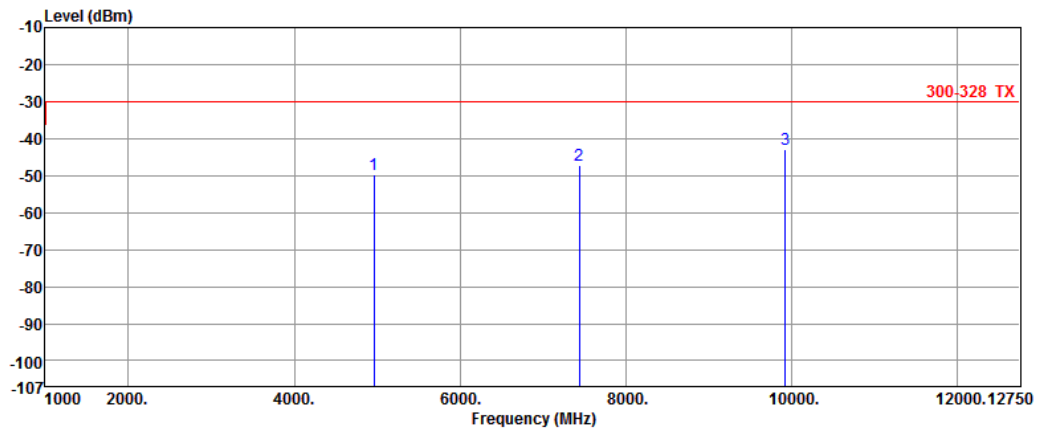


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.52	-51.53	-30.00	-21.53	9.33	-60.86
2	7205.77	-48.15	-30.00	-18.15	14.76	-62.91
3	9607.99	-41.80	-30.00	-11.80	19.08	-60.88

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	2

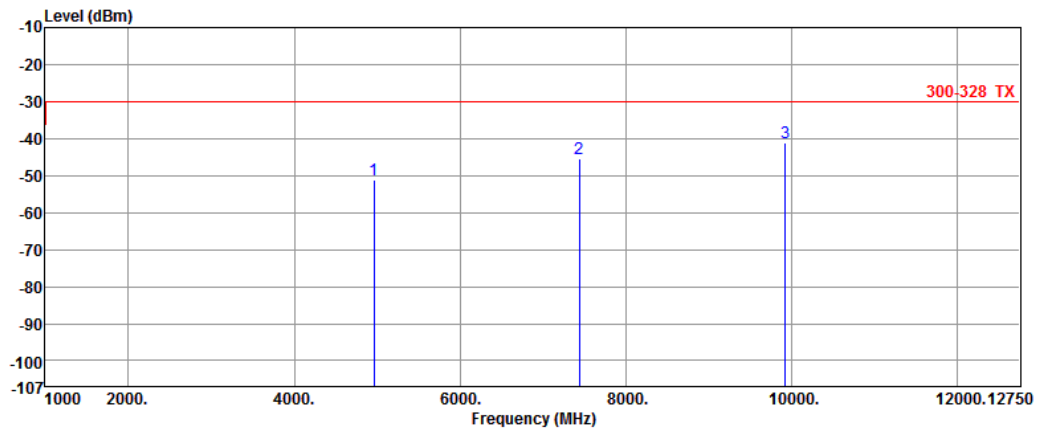


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.30	-49.64	-30.00	-19.64	9.24	-58.88
2	7440.07	-47.31	-30.00	-17.31	14.83	-62.14
3	9920.06	-42.93	-30.00	-12.93	18.91	-61.84

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	Vertical	Test Configuration	2

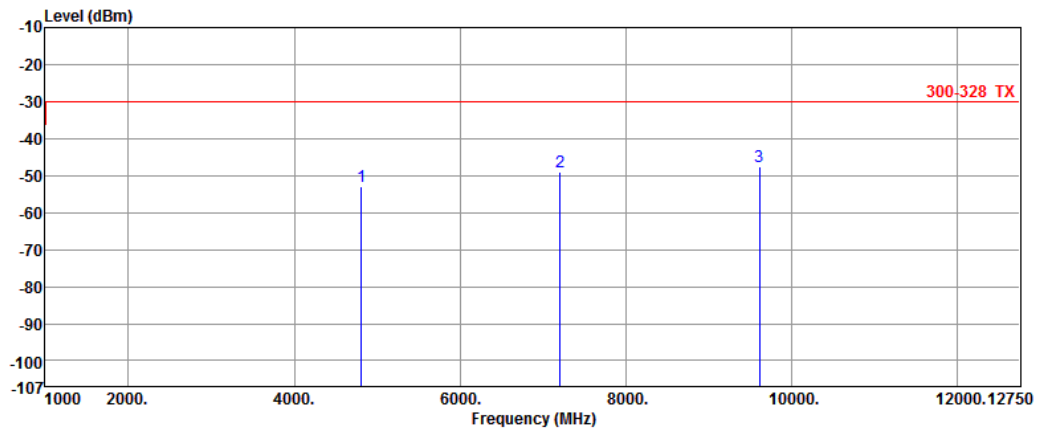


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.39	-51.17	-30.00	-21.17	9.01	-60.18
2	7439.82	-45.56	-30.00	-15.56	15.61	-61.17
3	9919.75	-41.24	-30.00	-11.24	19.48	-60.72

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

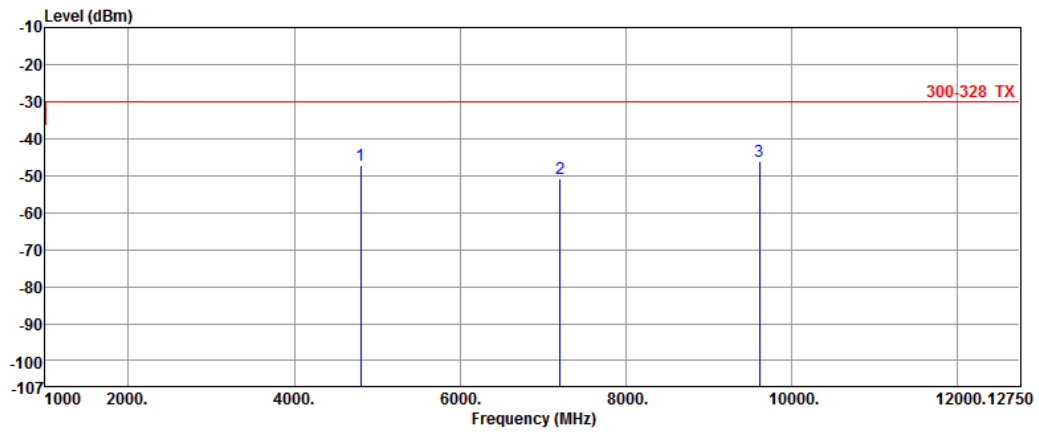


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4808.24	-53.06	-30.00	-23.06	9.31	-62.37
2	7206.01	-49.17	-30.00	-19.17	14.71	-63.88
3	9608.02	-47.64	-30.00	-17.64	18.55	-66.19

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	3

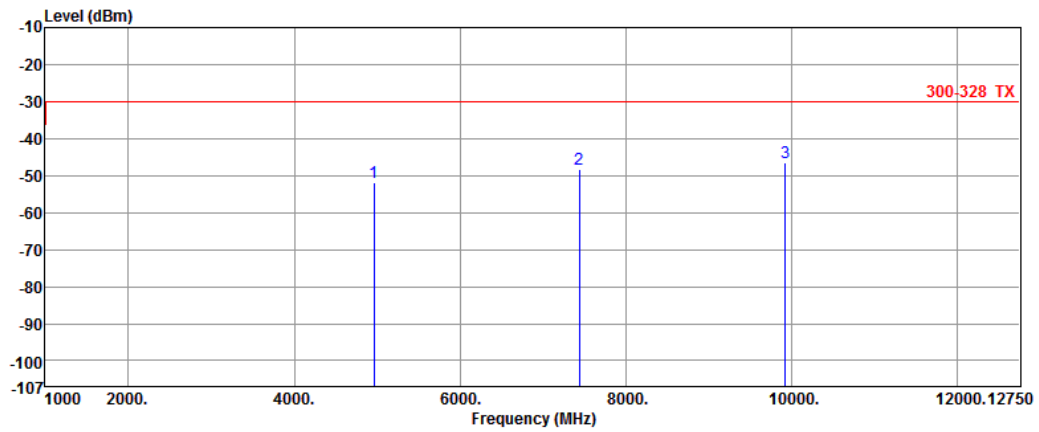


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.83	-47.17	-30.00	-17.17	9.34	-56.51
2	7206.05	-50.91	-30.00	-20.91	14.76	-65.67
3	9607.84	-46.30	-30.00	-16.30	19.08	-65.38

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

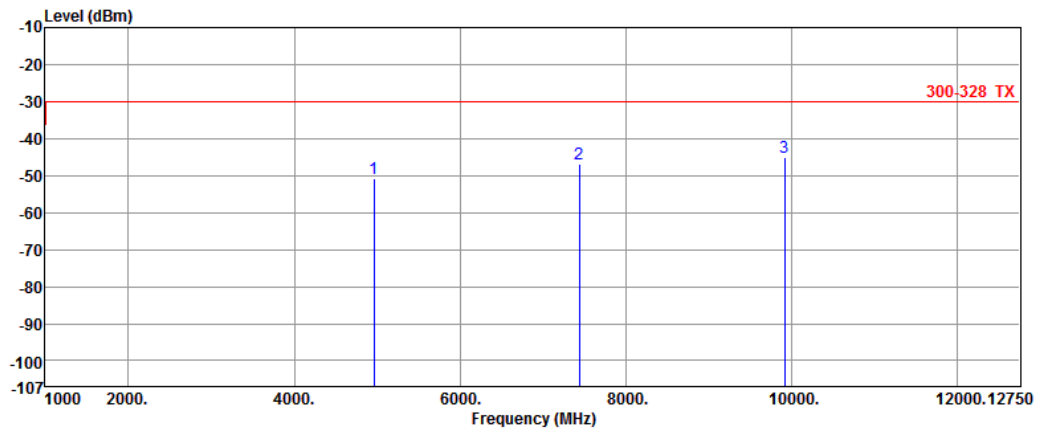


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.99	-51.92	-30.00	-21.92	9.24	-61.16
2	7440.11	-48.43	-30.00	-18.43	14.83	-63.26
3	9919.98	-46.59	-30.00	-16.59	18.91	-65.50

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

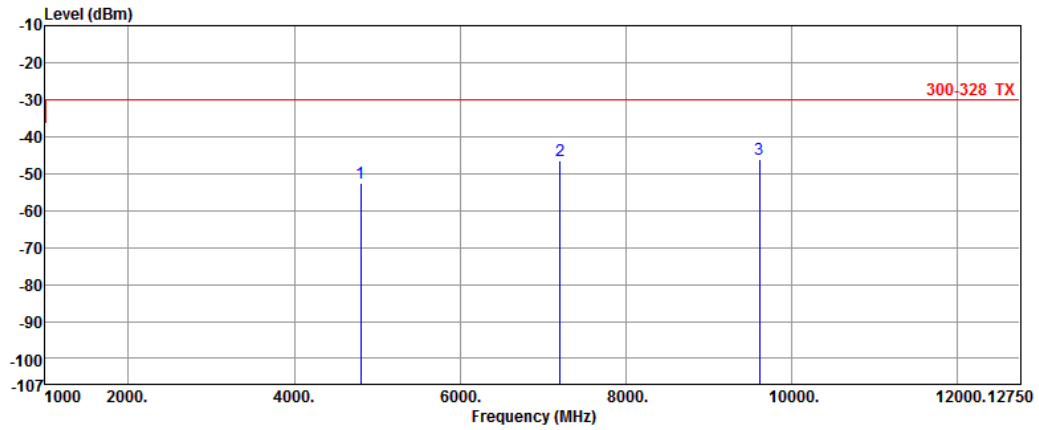


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.42	-50.63	-30.00	-20.63	9.01	-59.64
2	7438.51	-46.81	-30.00	-16.81	15.61	-62.42
3	9916.89	-45.15	-30.00	-15.15	19.47	-64.62

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	4

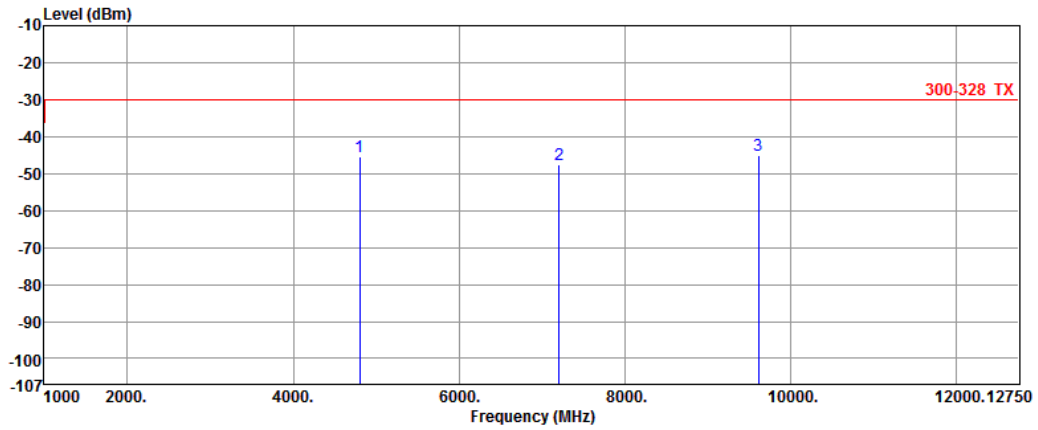


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.04	-52.64	-30.00	-22.64	9.33	-61.97
2	7206.23	-46.40	-30.00	-16.40	14.71	-61.11
3	9607.95	-46.10	-30.00	-16.10	18.55	-64.65

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	4

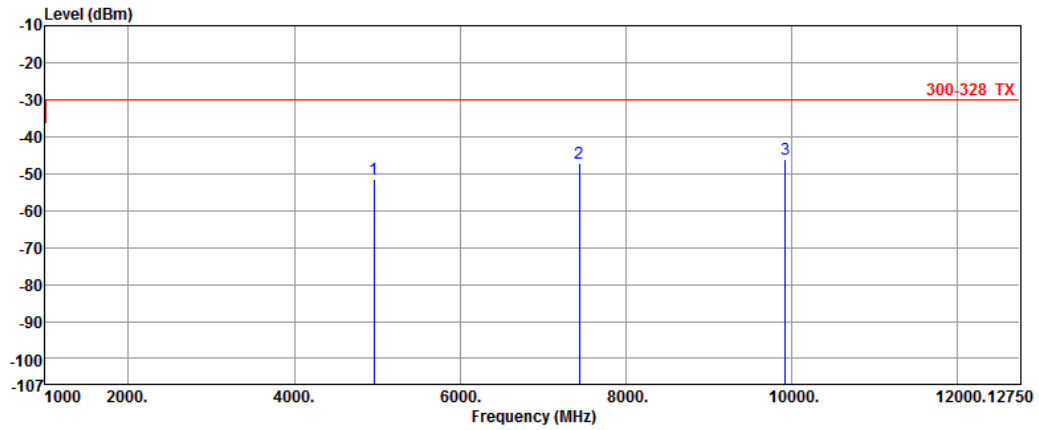


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.23	-45.54	-30.00	-15.54	9.33	-54.87
2	7205.51	-47.71	-30.00	-17.71	14.76	-62.47
3	9608.15	-44.92	-30.00	-14.92	19.09	-64.01

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	4

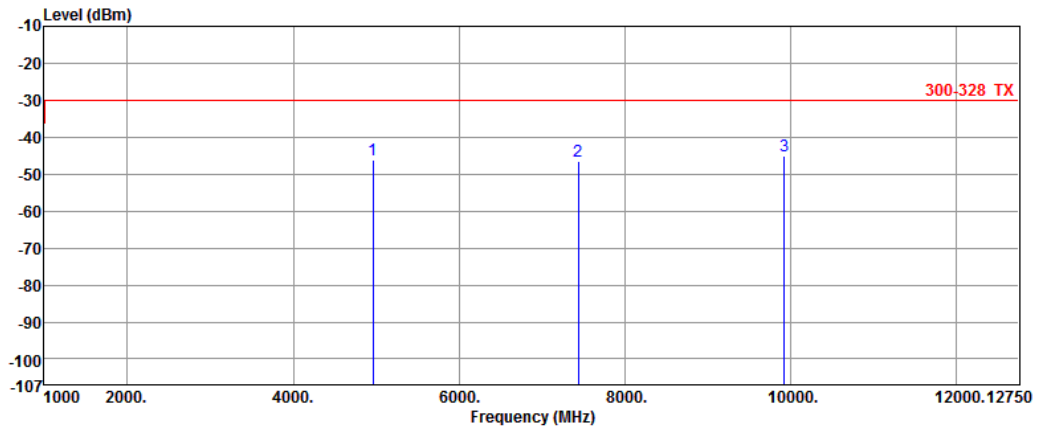


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4961.10	-51.52	-30.00	-21.52	9.25	-60.77
2	7440.62	-47.25	-30.00	-17.25	14.83	-62.08
3	9919.96	-45.98	-30.00	-15.98	18.91	-64.89

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	Vertical	Test Configuration	4



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.71	-46.13	-30.00	-16.13	9.01	-55.14
2	7439.90	-46.40	-30.00	-16.40	15.61	-62.01
3	9919.90	-44.93	-30.00	-14.93	19.48	-64.41

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

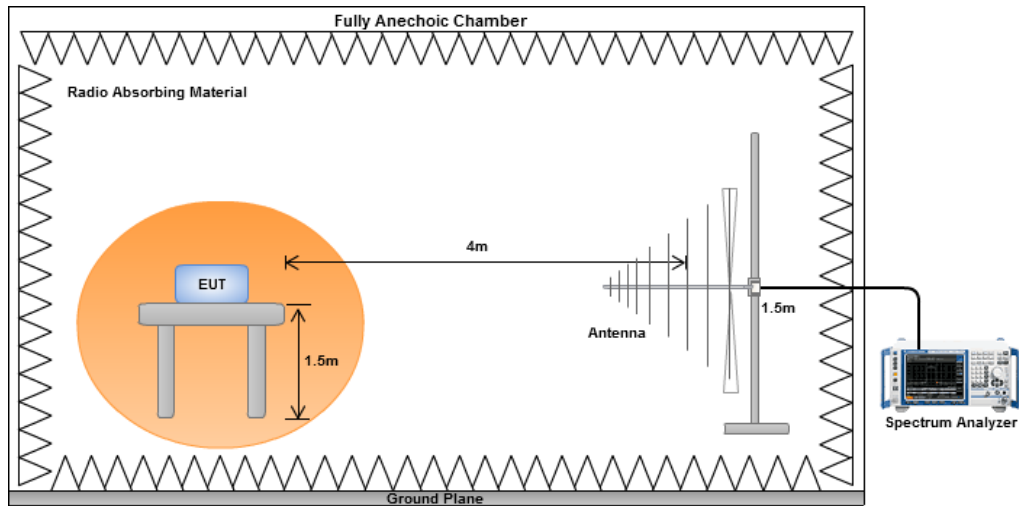
Frequency Range	Maximum power (dBm)	Measurement bandwidth (kHz)
30 MHz to 1 GHz	-57	100
Above 1 GHz to 12.75 GHz	-47	1000

4.1.2 Test Procedures

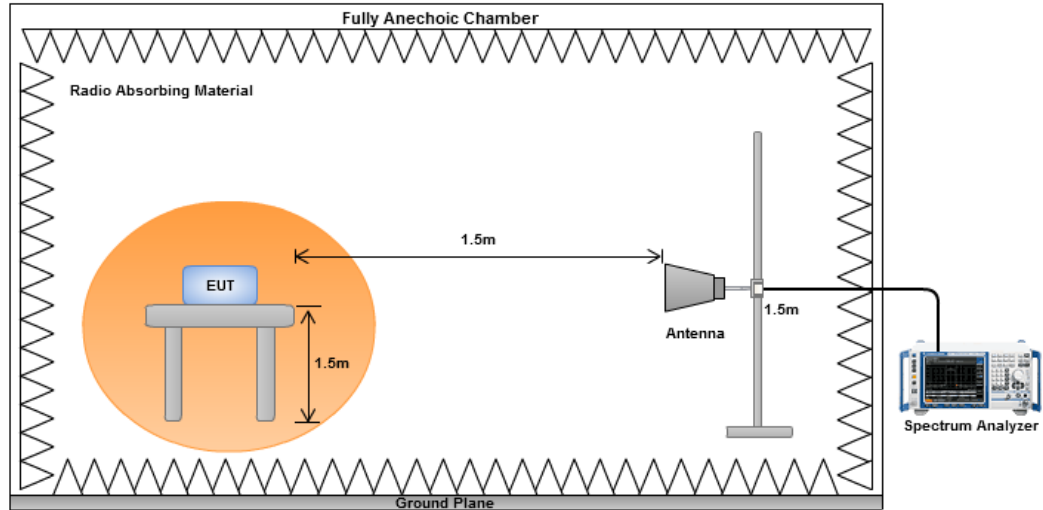
Reference to clause 5.3.11.2 of ETSI EN 300 328 V1.9.1 (2015-02).

4.1.3 Test Setup

Below 1GHz

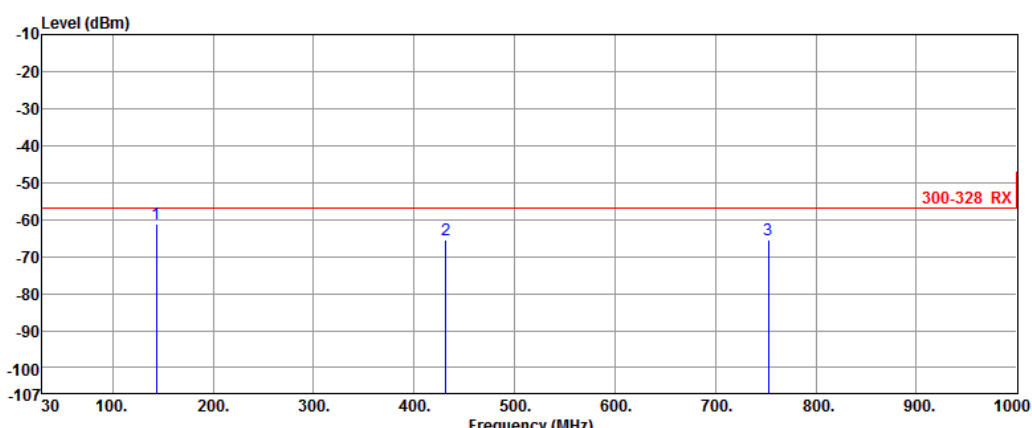


Above 1 GHz



4.1.4 Receiver Spurious Unwanted Emissions (Below 1GHz)

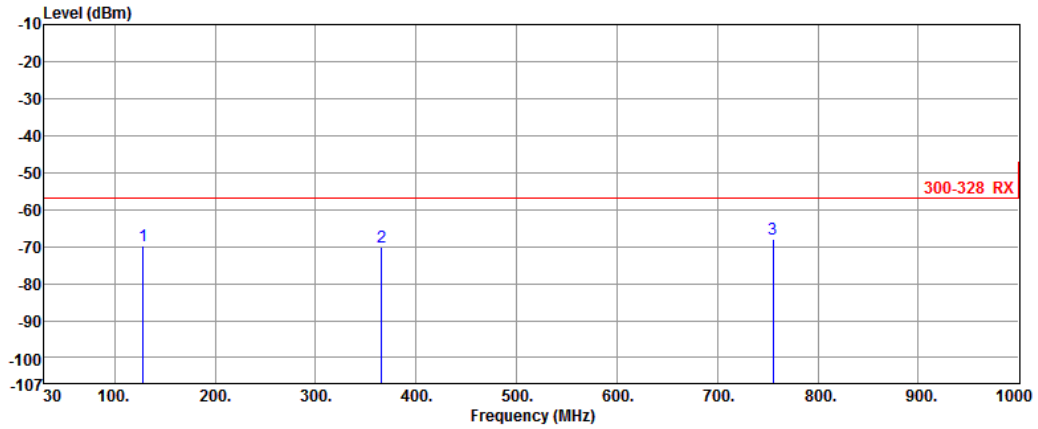
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	143.49	-61.07	-57.00	-4.07	-1.49	-59.58
2	431.58	-65.51	-57.00	-8.51	2.74	-68.25
3	752.65	-65.39	-57.00	-8.39	8.64	-74.03

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

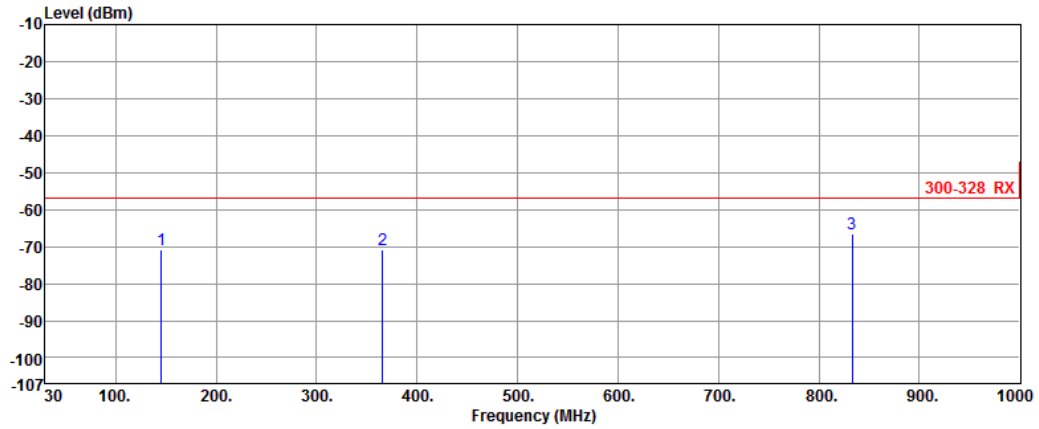


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	127.97	-69.78	-57.00	-12.78	-2.77	-67.01
2	365.62	-70.21	-57.00	-13.21	0.87	-71.08
3	755.56	-67.82	-57.00	-10.82	9.06	-76.88

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

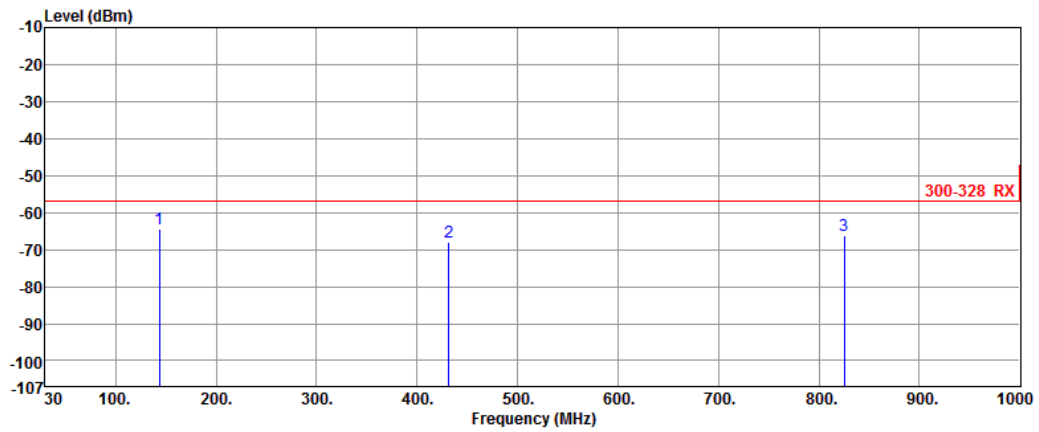


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	145.43	-70.68	-57.00	-13.68	-1.35	-69.33
2	365.62	-70.88	-57.00	-13.88	0.87	-71.75
3	833.16	-66.66	-57.00	-9.66	10.27	-76.93

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

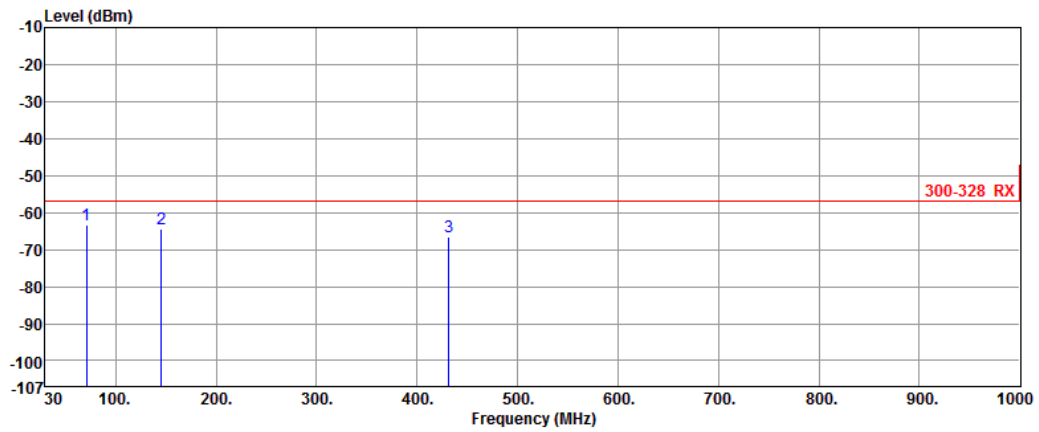


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	143.49	-64.25	-57.00	-7.25	-1.49	-62.76
2	431.58	-68.08	-57.00	-11.08	2.74	-70.82
3	825.40	-66.08	-57.00	-9.08	9.84	-75.92

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

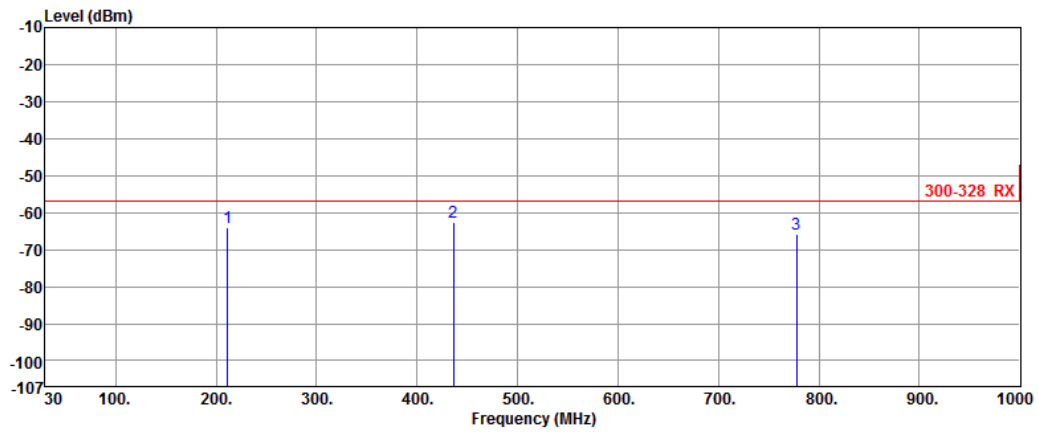


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-63.31	-57.00	-6.31	-3.38	-59.93
2	145.43	-64.48	-57.00	-7.48	-1.37	-63.11
3	431.58	-66.52	-57.00	-9.52	2.74	-69.26

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

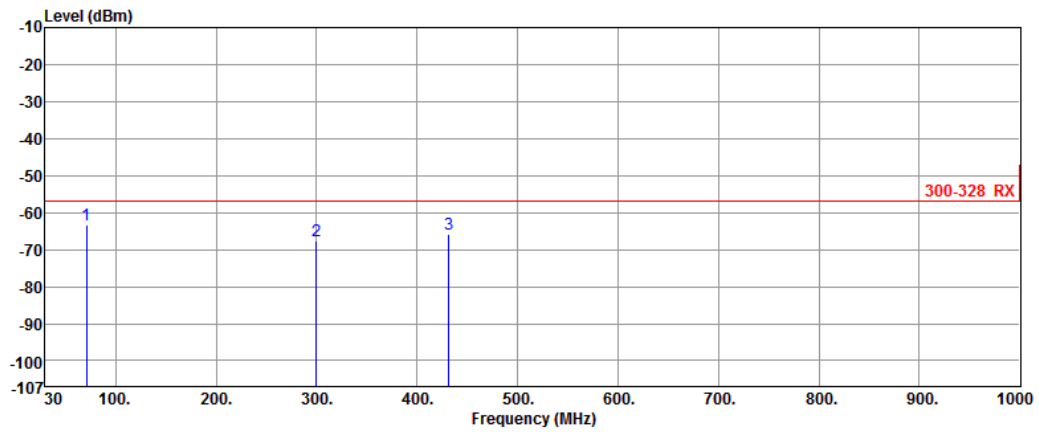


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	211.39	-63.90	-57.00	-6.90	-4.07	-59.83
2	436.43	-62.51	-57.00	-5.51	2.72	-65.23
3	777.87	-65.66	-57.00	-8.66	9.07	-74.73

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	2

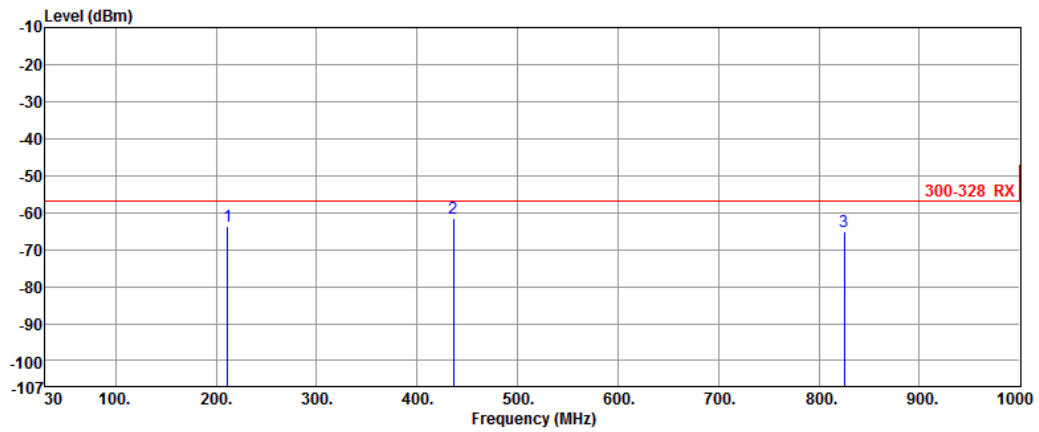


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-63.40	-57.00	-6.40	-3.38	-60.02
2	299.66	-67.61	-57.00	-10.61	-1.12	-66.49
3	431.58	-66.00	-57.00	-9.00	2.74	-68.74

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

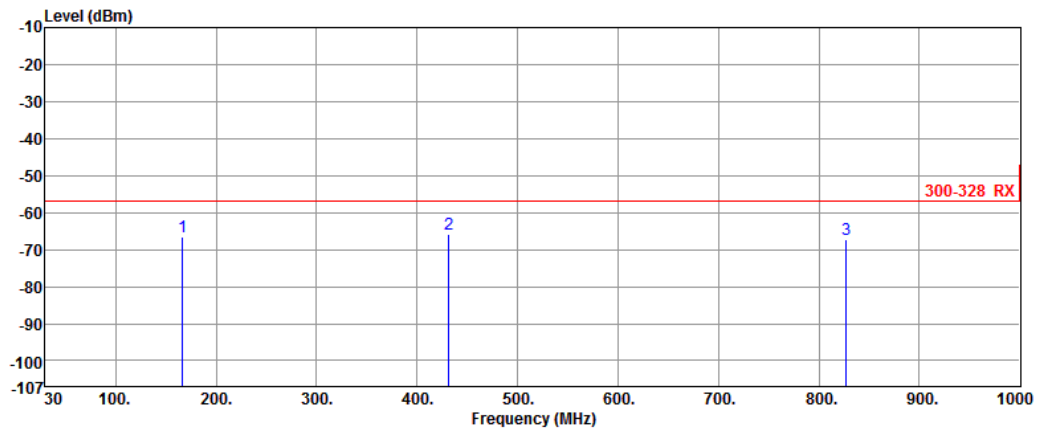


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	211.39	-63.87	-57.00	-6.87	-4.07	-59.80
2	436.43	-61.62	-57.00	-4.62	2.72	-64.34
3	825.40	-65.28	-57.00	-8.28	10.17	-75.45

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

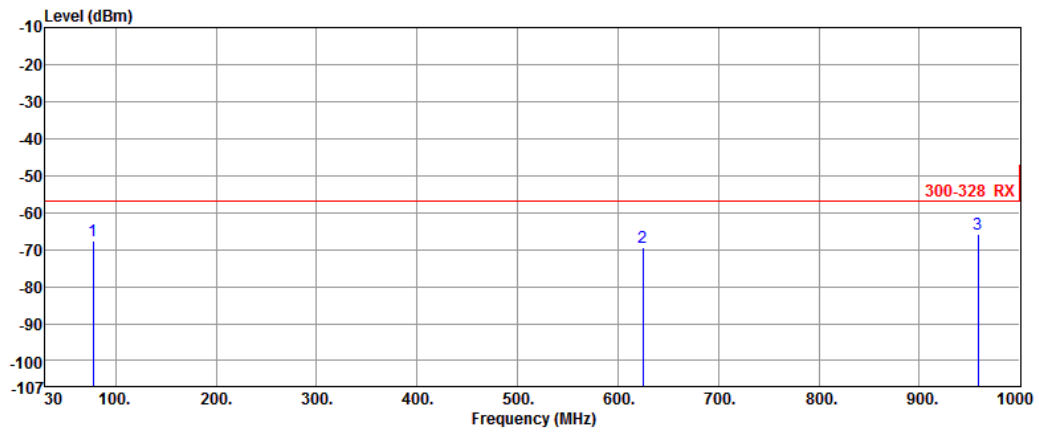


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	166.77	-66.55	-57.00	-9.55	-1.32	-65.23
2	431.58	-65.90	-57.00	-8.90	2.74	-68.64
3	827.34	-67.30	-57.00	-10.30	9.84	-77.14

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

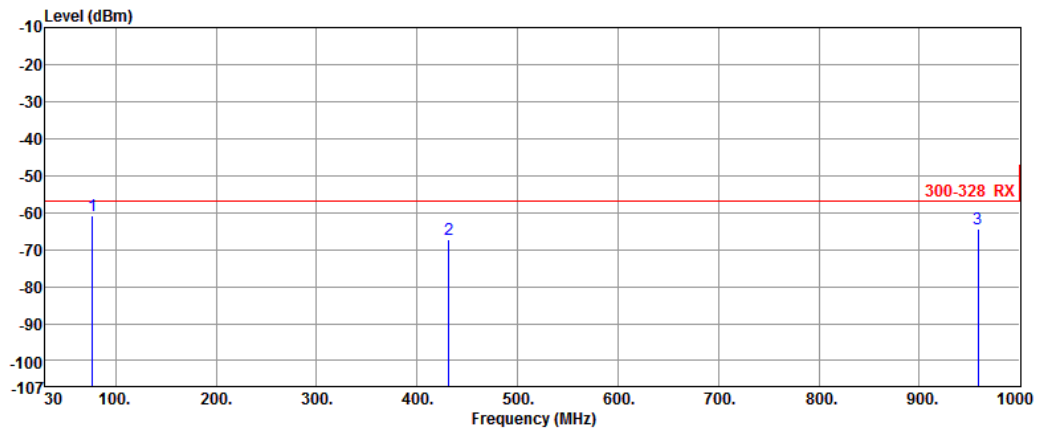


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	77.53	-67.63	-57.00	-10.63	-5.16	-62.47
2	624.61	-69.58	-57.00	-12.58	7.00	-76.58
3	958.29	-65.99	-57.00	-8.99	11.73	-77.72

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

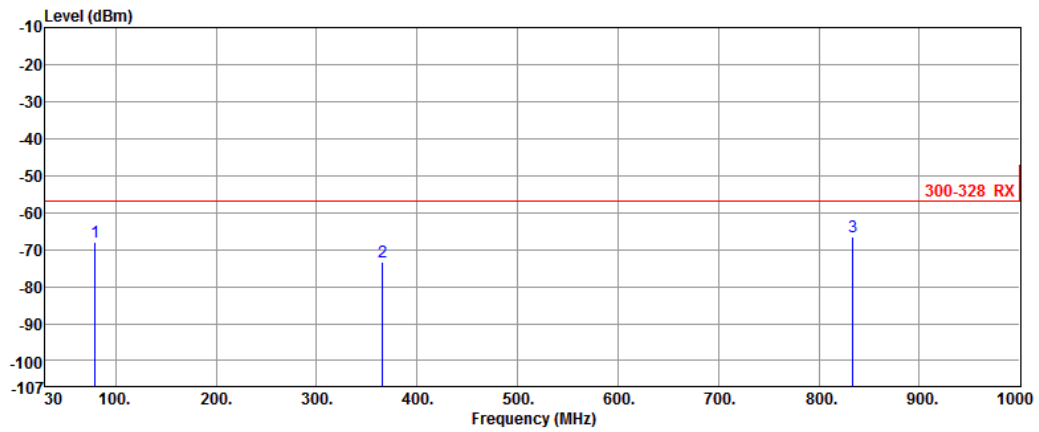


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	76.56	-60.86	-57.00	-3.86	-4.42	-56.44
2	431.58	-67.40	-57.00	-10.40	2.74	-70.14
3	958.29	-64.56	-57.00	-7.56	11.58	-76.14

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	3

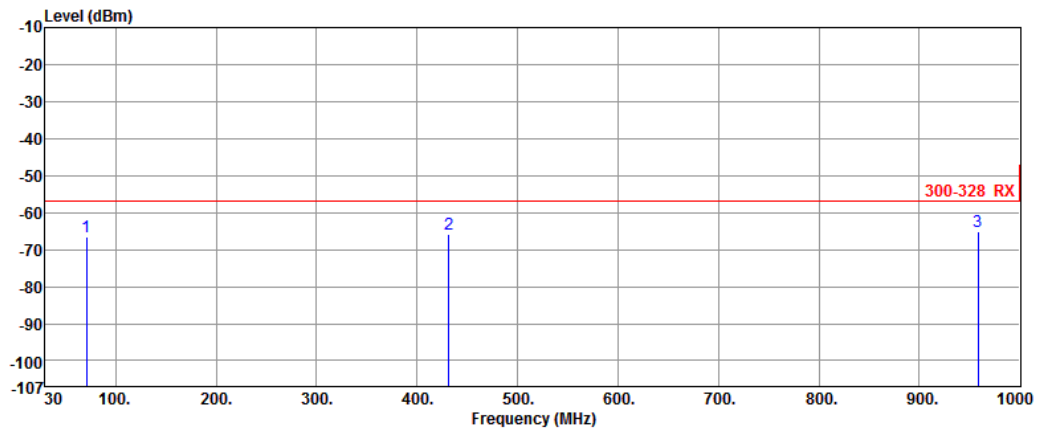


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	79.47	-67.83	-57.00	-10.83	-5.21	-62.62
2	365.62	-73.26	-57.00	-16.26	0.87	-74.13
3	834.13	-66.71	-57.00	-9.71	10.27	-76.98

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	Horizontal	Test Configuration	4

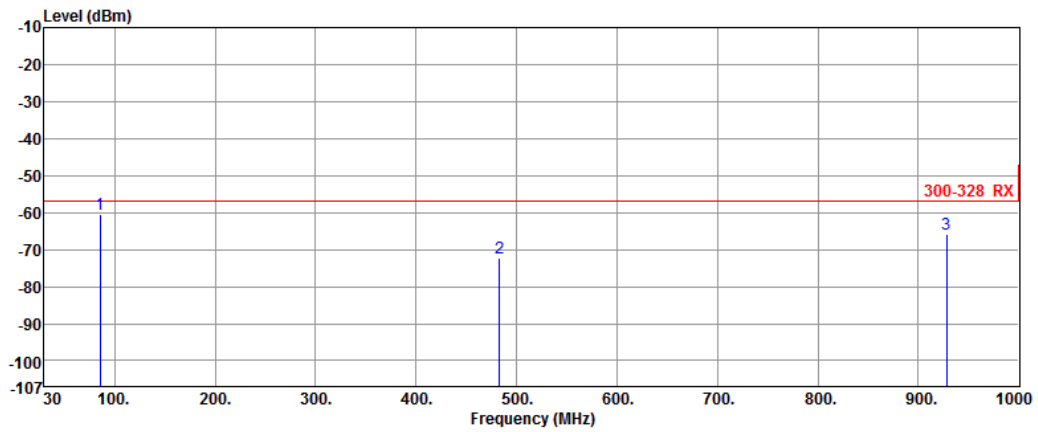


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-66.53	-57.00	-9.53	-3.38	-63.15
2	431.58	-65.92	-57.00	-8.92	2.74	-68.66
3	958.29	-65.19	-57.00	-8.19	11.58	-76.77

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	4

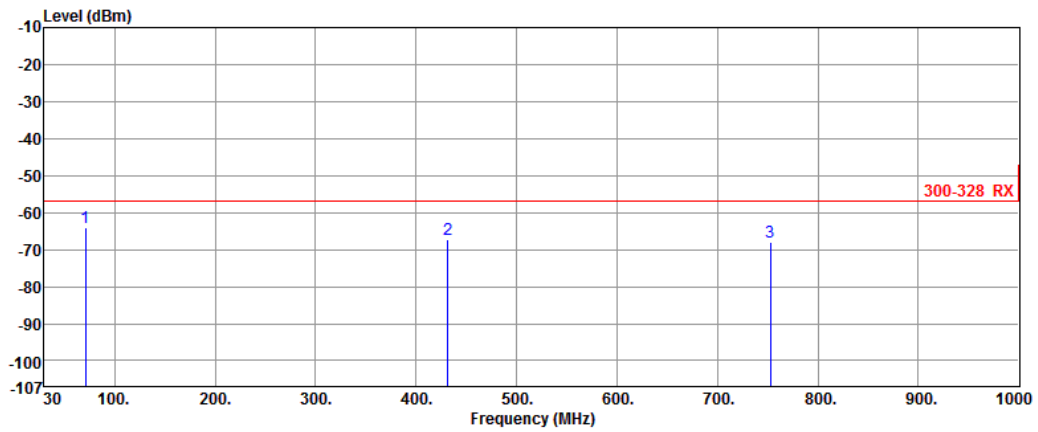


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	85.29	-60.49	-57.00	-3.49	-6.48	-54.01
2	482.99	-72.10	-57.00	-15.10	3.34	-75.44
3	928.22	-65.83	-57.00	-8.83	11.64	-77.47

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	4

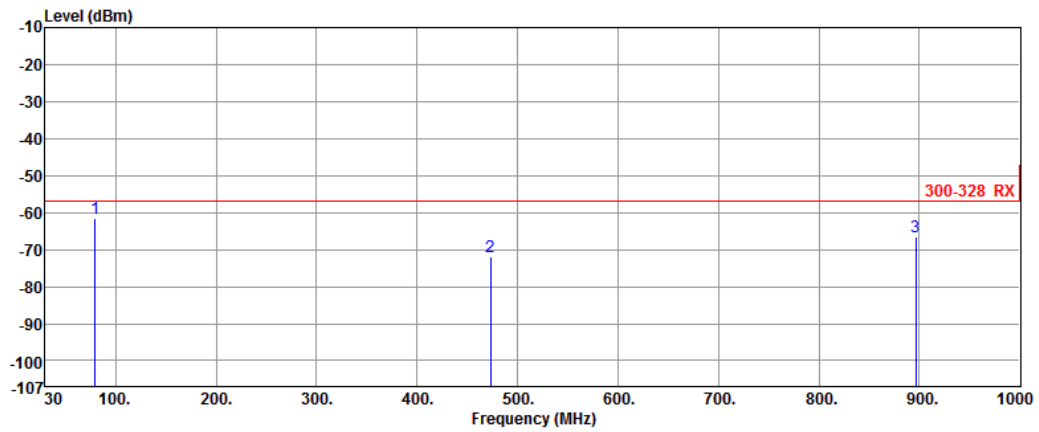


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	70.74	-63.91	-57.00	-6.91	-3.38	-60.53
2	431.58	-67.16	-57.00	-10.16	2.74	-69.90
3	752.65	-68.02	-57.00	-11.02	8.64	-76.66

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	4



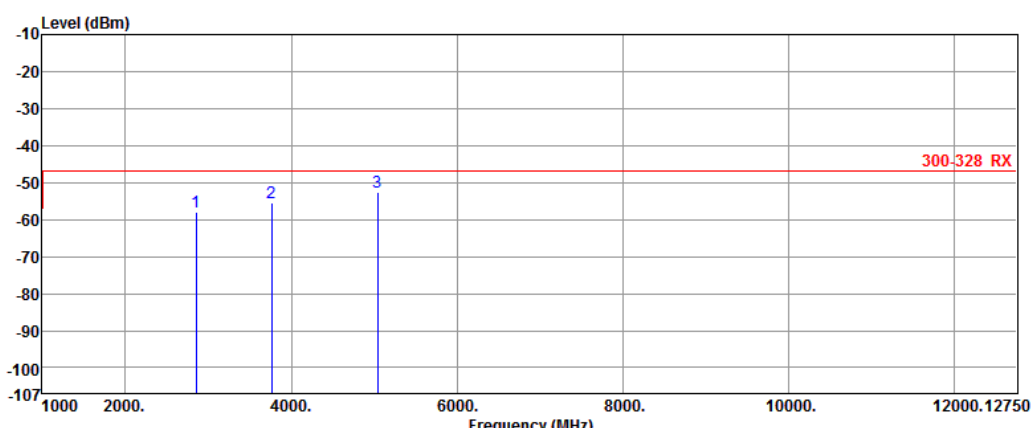
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	79.47	-61.39	-57.00	-4.39	-5.21	-56.18
2	473.29	-72.04	-57.00	-15.04	3.16	-75.20
3	896.21	-66.44	-57.00	-9.44	10.89	-77.33

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

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

4.1.5 Receiver Spurious Unwanted Emissions (Above 1GHz)

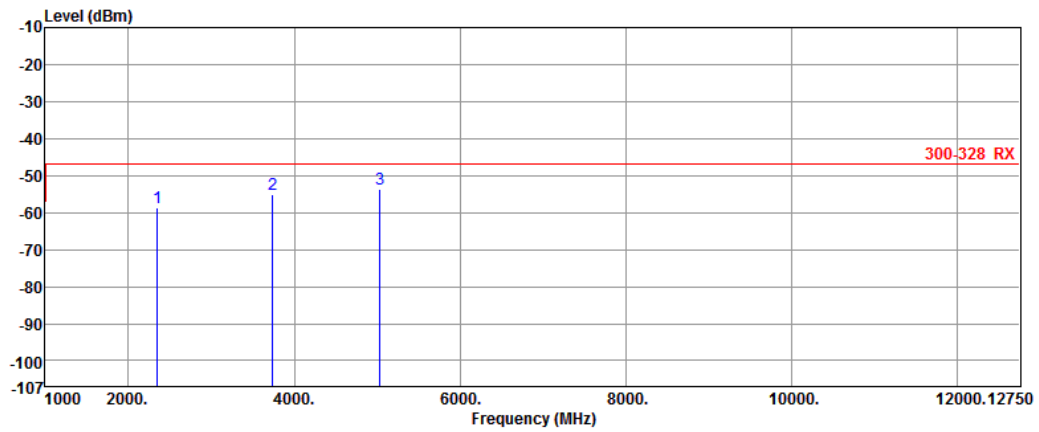
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal	Test Configuration	1



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2854.00	-57.83	-47.00	-10.83	3.01	-60.84
2	3766.00	-55.54	-47.00	-8.54	5.94	-61.48
3	5044.00	-52.63	-47.00	-5.63	9.51	-62.14

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

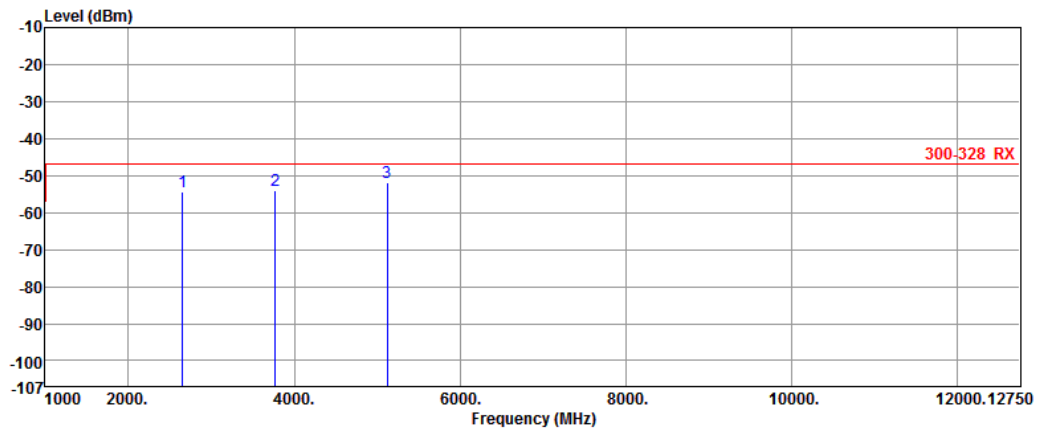


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2350.00	-58.72	-47.00	-11.72	1.89	-60.61
2	3742.00	-55.06	-47.00	-8.06	5.71	-60.77
3	5035.00	-53.69	-47.00	-6.69	9.42	-63.11

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

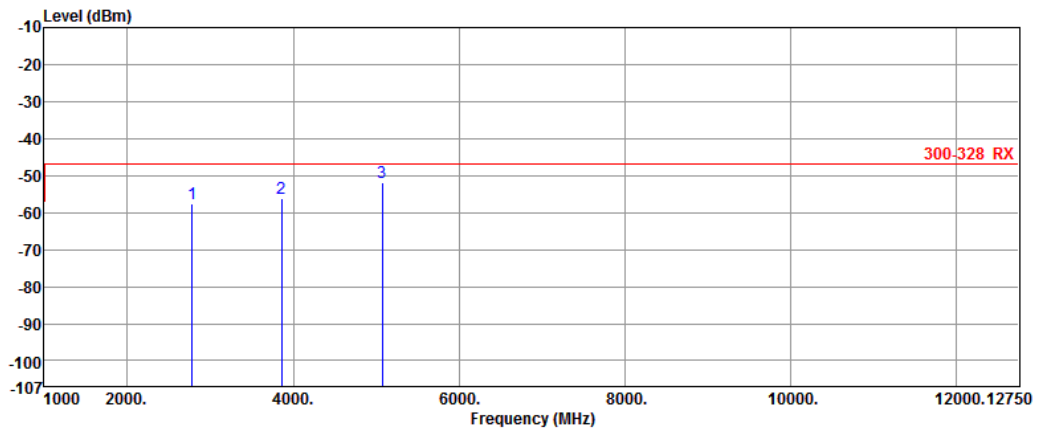


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2650.00	-54.40	-47.00	-7.40	1.82	-56.22
2	3774.00	-54.20	-47.00	-7.20	6.01	-60.21
3	5124.00	-51.73	-47.00	-4.73	9.56	-61.29

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

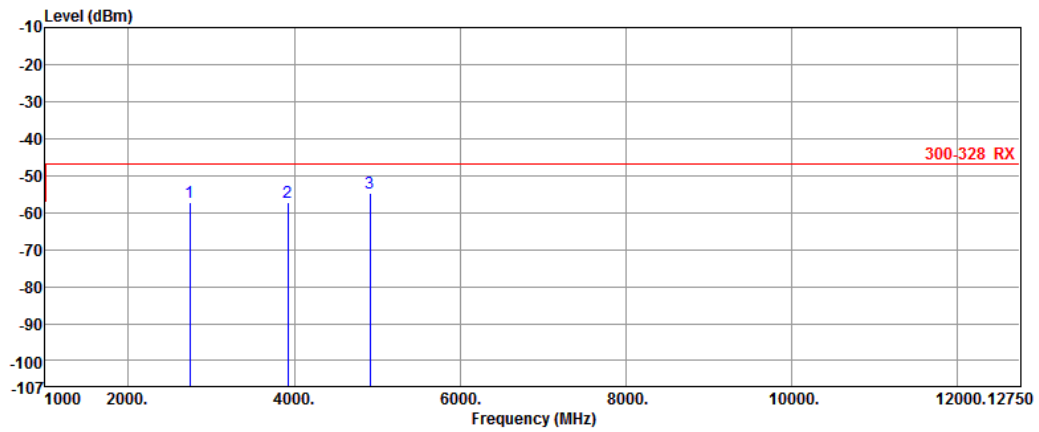


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2781.00	-57.50	-47.00	-10.50	2.71	-60.21
2	3862.00	-56.18	-47.00	-9.18	6.39	-62.57
3	5071.00	-51.95	-47.00	-4.95	9.84	-61.79

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

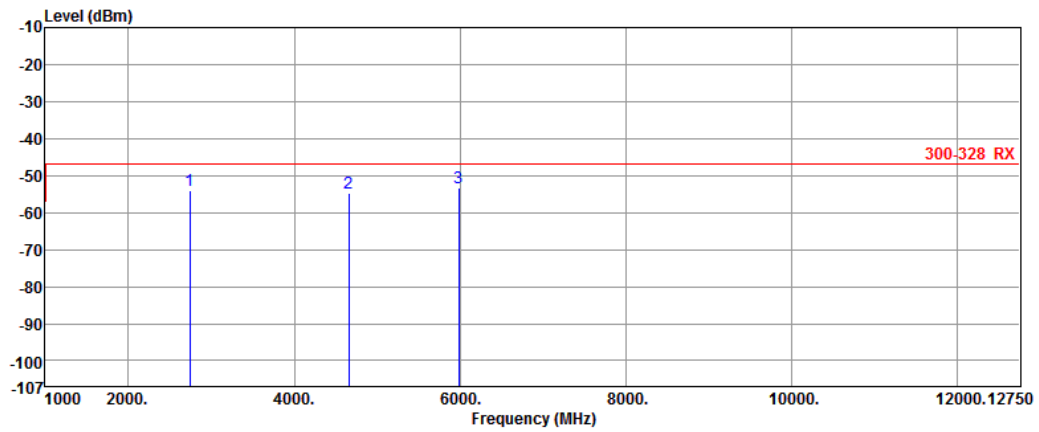


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2740.00	-57.39	-47.00	-10.39	2.35	-59.74
2	3920.00	-57.11	-47.00	-10.11	6.17	-63.28
3	4911.00	-54.74	-47.00	-7.74	8.94	-63.68

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

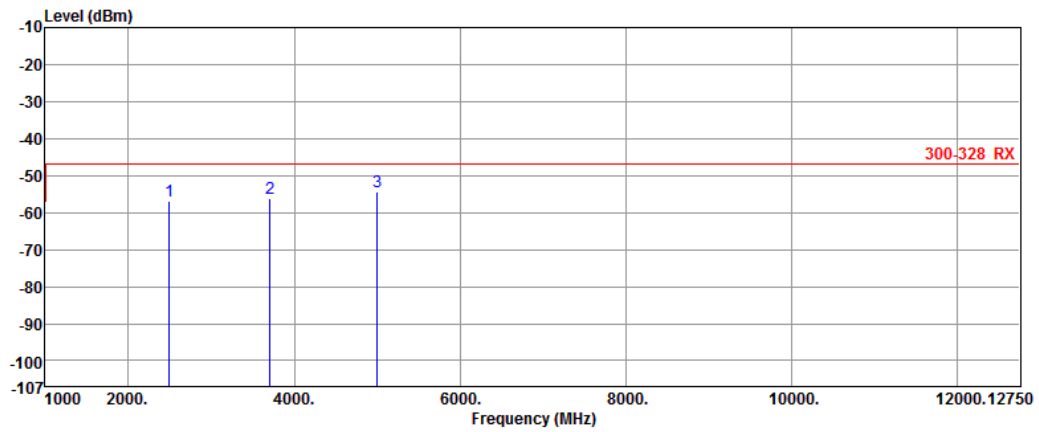


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2740.00	-53.86	-47.00	-6.86	2.51	-56.37
2	4660.00	-54.83	-47.00	-7.83	8.22	-63.05
3	5983.00	-53.21	-47.00	-6.21	10.86	-64.07

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	2

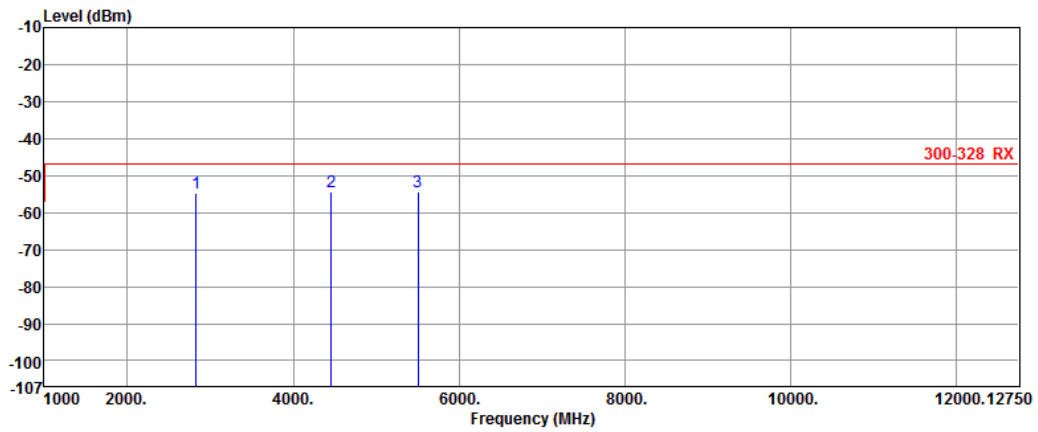


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2490.00	-57.01	-47.00	-10.01	1.41	-58.42
2	3705.00	-56.18	-47.00	-9.18	5.42	-61.60
3	4999.00	-54.50	-47.00	-7.50	9.48	-63.98

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

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

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical	Test Configuration	2

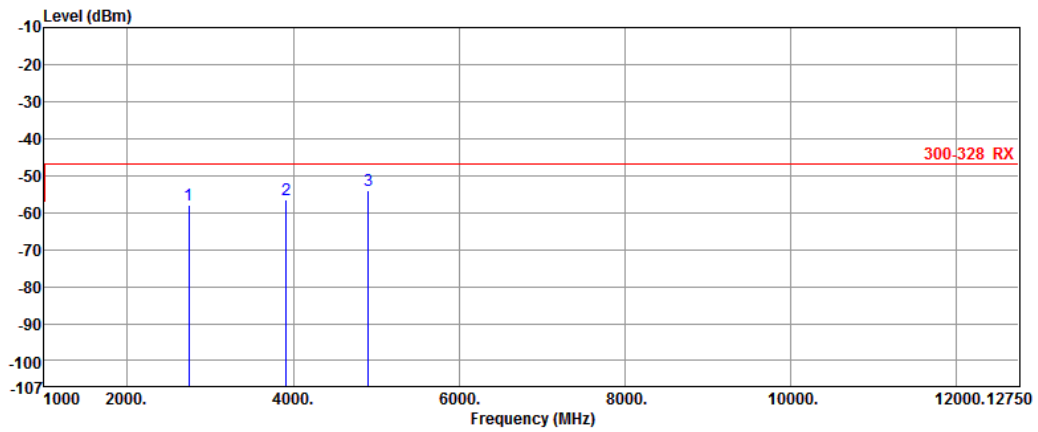


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2830.00	-54.82	-47.00	-7.82	2.97	-57.79
2	4457.23	-54.33	-47.00	-7.33	7.71	-62.04
3	5502.00	-54.55	-47.00	-7.55	9.67	-64.22

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

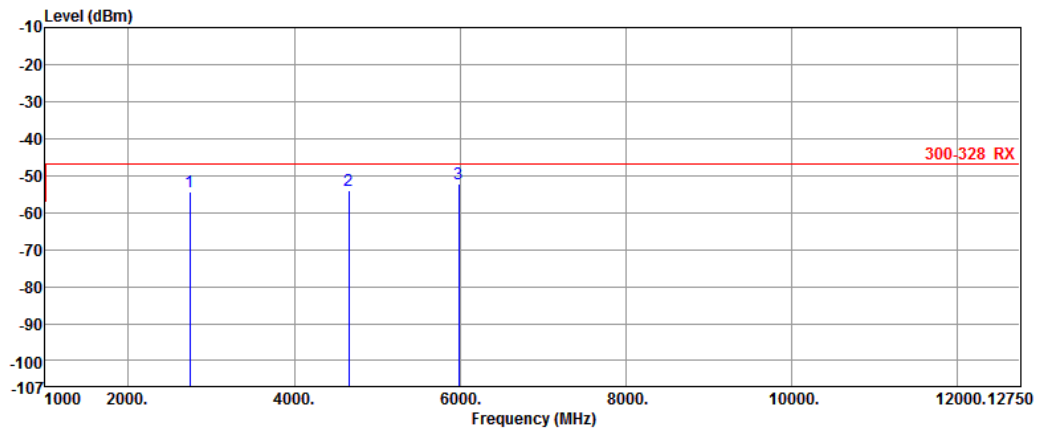


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2743.00	-57.83	-47.00	-10.83	2.37	-60.20
2	3919.00	-56.55	-47.00	-9.55	6.17	-62.72
3	4906.00	-54.18	-47.00	-7.18	8.91	-63.09

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

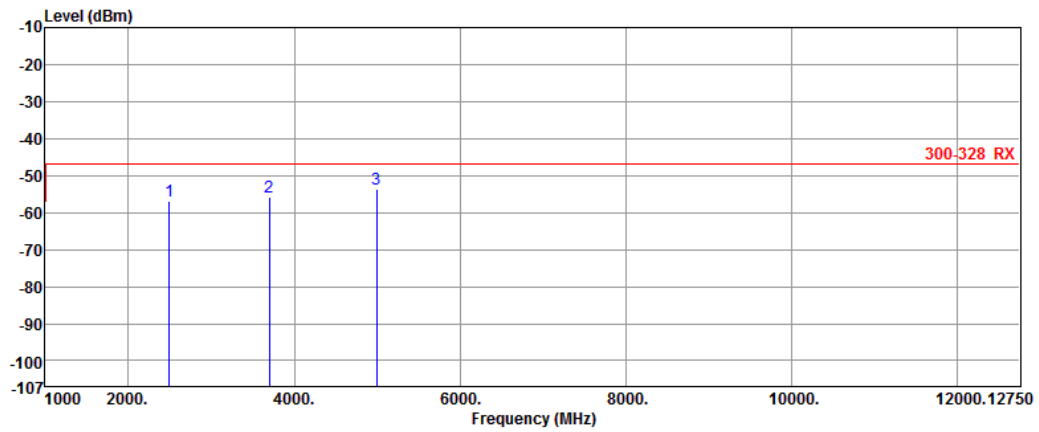


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2743.00	-54.35	-47.00	-7.35	2.53	-56.88
2	4661.00	-54.05	-47.00	-7.05	8.21	-62.26
3	5984.00	-52.07	-47.00	-5.07	10.87	-62.94

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

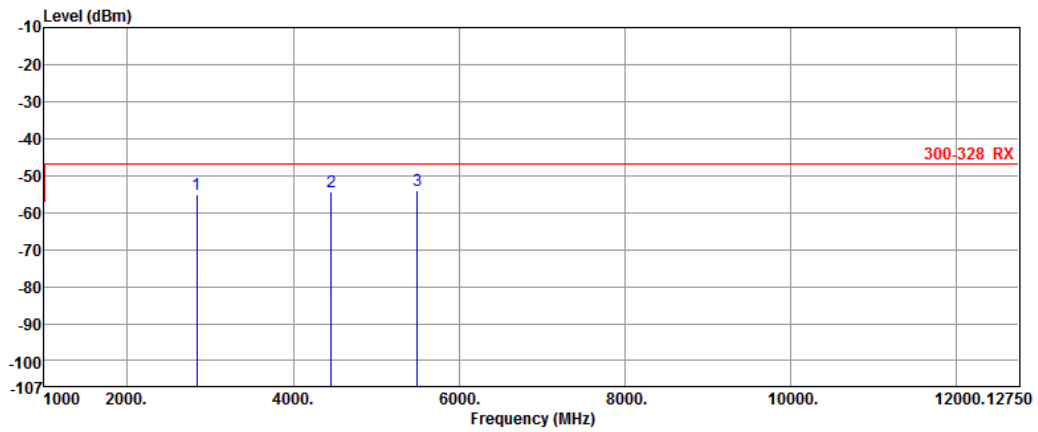


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2491.00	-57.01	-47.00	-10.01	1.41	-58.42
2	3702.00	-55.74	-47.00	-8.74	5.40	-61.14
3	4997.00	-53.82	-47.00	-6.82	9.47	-63.29

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

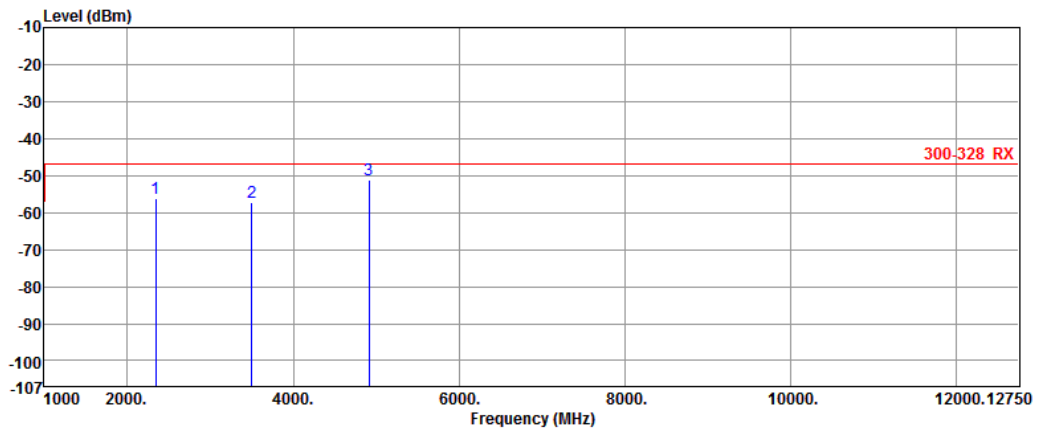


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2834.00	-55.17	-47.00	-8.17	2.99	-58.16
2	4458.00	-54.45	-47.00	-7.45	7.71	-62.16
3	5501.00	-54.09	-47.00	-7.09	9.66	-63.75

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	4

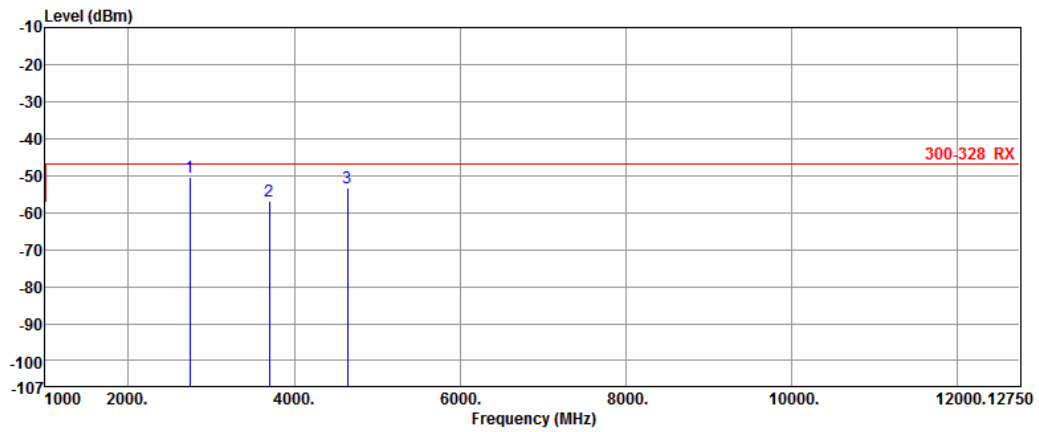


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2339.50	-56.19	-47.00	-9.19	1.78	-57.97
2	3502.75	-57.27	-47.00	-10.27	4.65	-61.92
3	4912.75	-51.15	-47.00	-4.15	8.95	-60.10

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	4

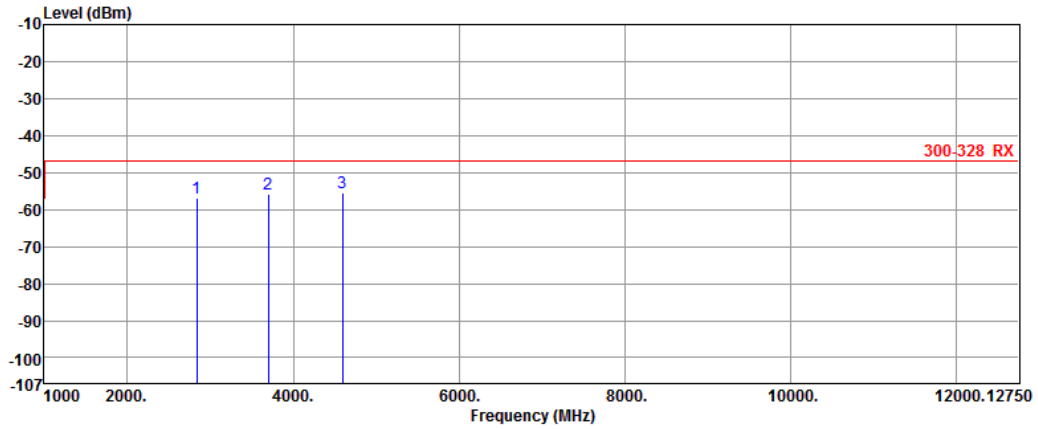


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2739.00	-50.60	-47.00	-3.60	2.51	-53.11
2	3702.50	-56.99	-47.00	-9.99	5.34	-62.33
3	4642.50	-53.28	-47.00	-6.28	8.30	-61.58

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	4

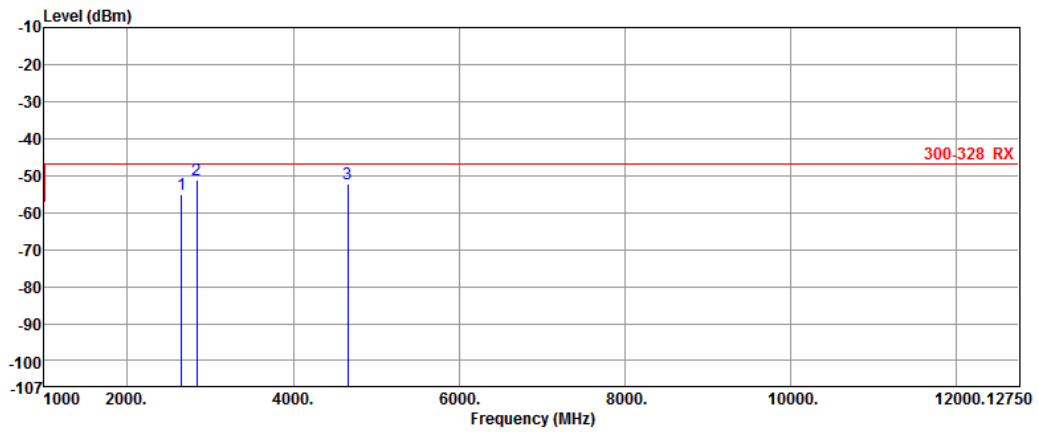


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2834.00	-56.84	-47.00	-9.84	2.91	-59.75
2	3702.00	-55.68	-47.00	-8.68	5.40	-61.08
3	4598.00	-55.54	-47.00	-8.54	8.56	-64.10

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	4



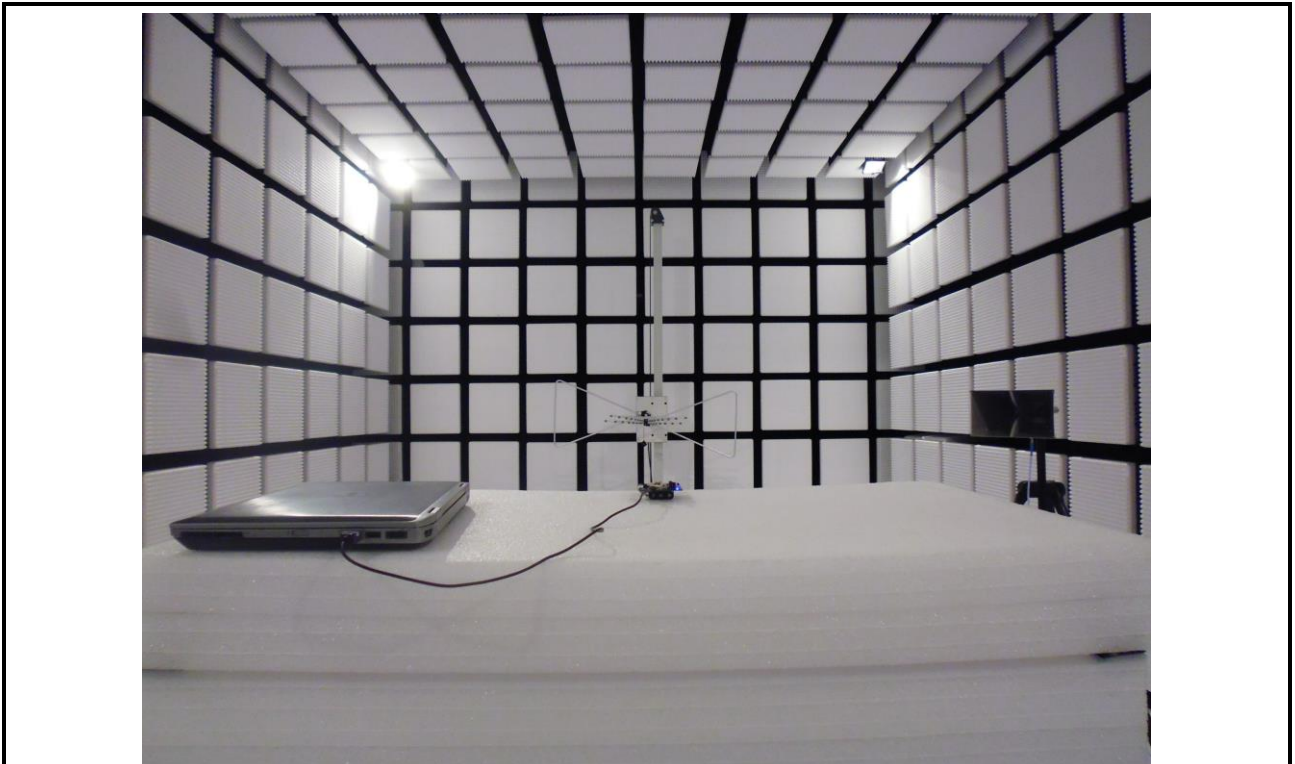
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	2652.00	-55.02	-47.00	-8.02	2.09	-57.11
2	2834.00	-51.00	-47.00	-4.00	2.99	-53.99
3	4661.00	-52.19	-47.00	-5.19	8.21	-60.40

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

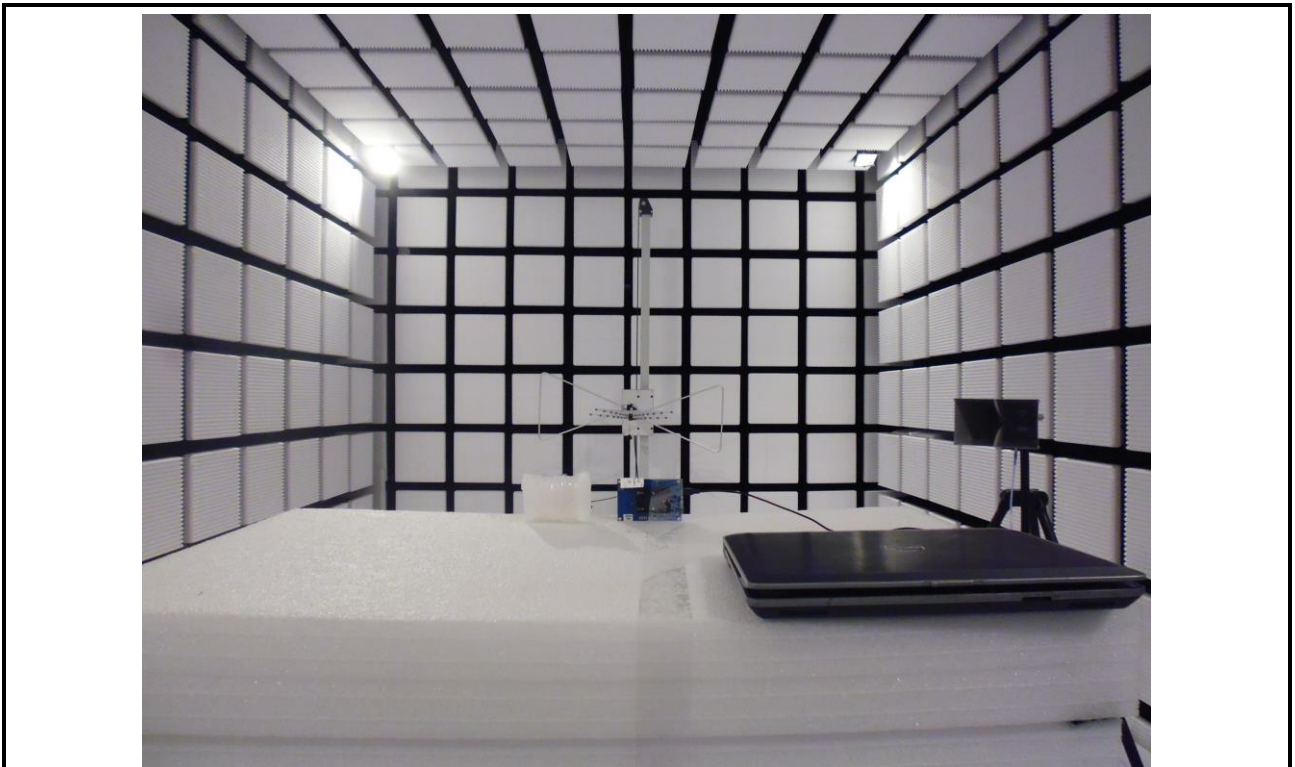
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm)

5 Photographs of the Test Configuration

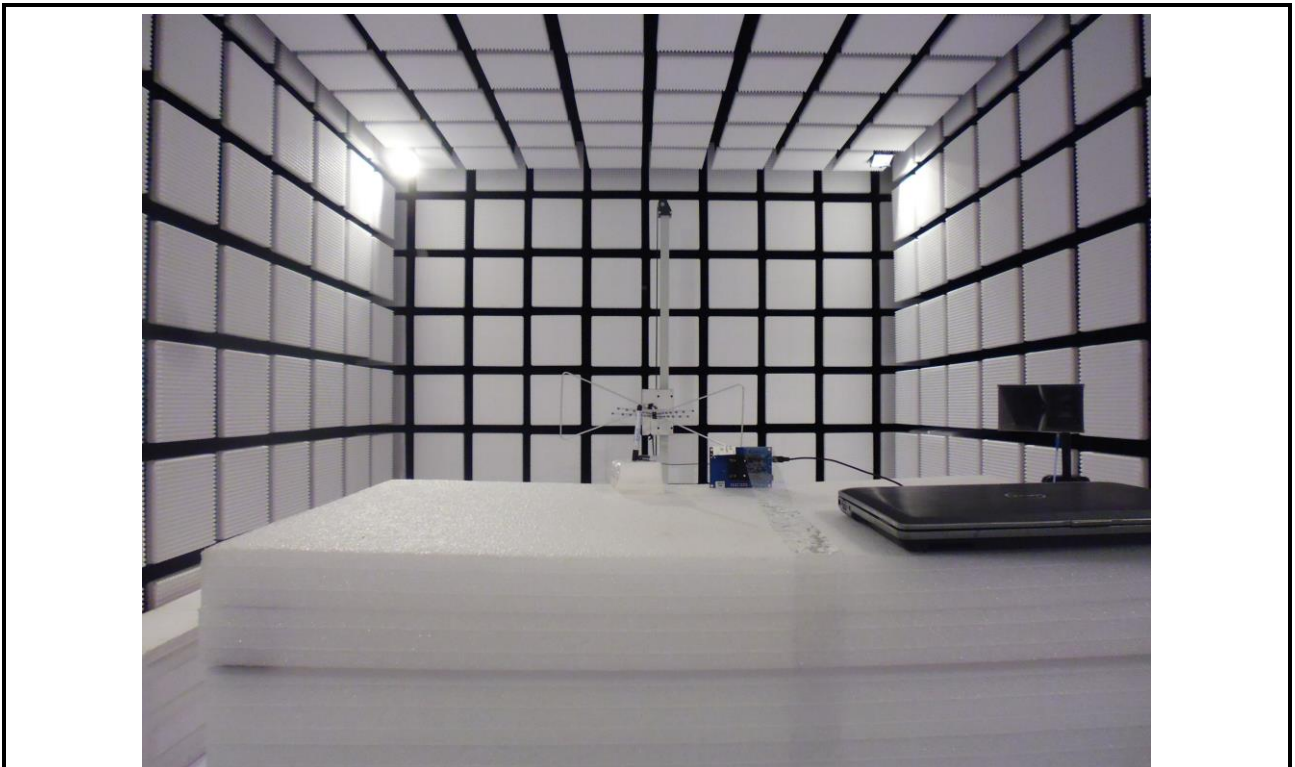
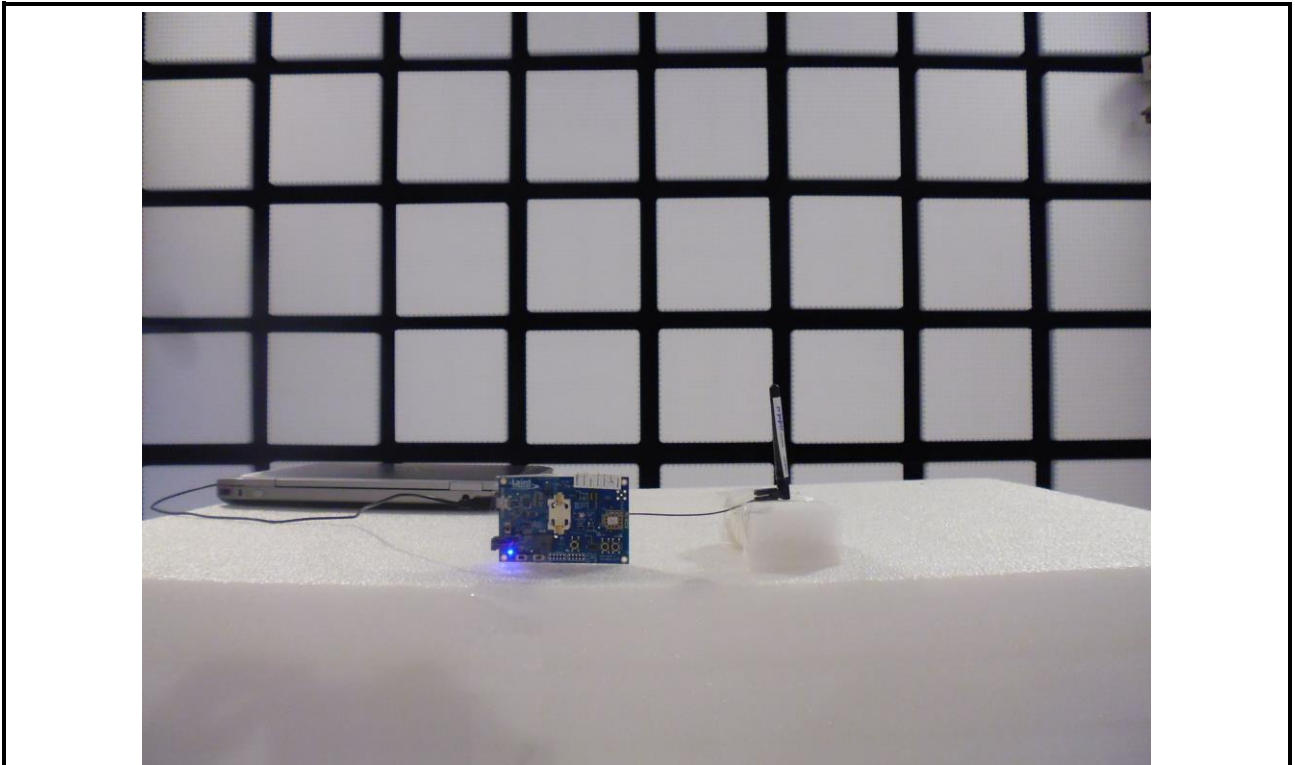
Spurious Emission Test (Configuration 1: BL600-SA with Chip antenna.)



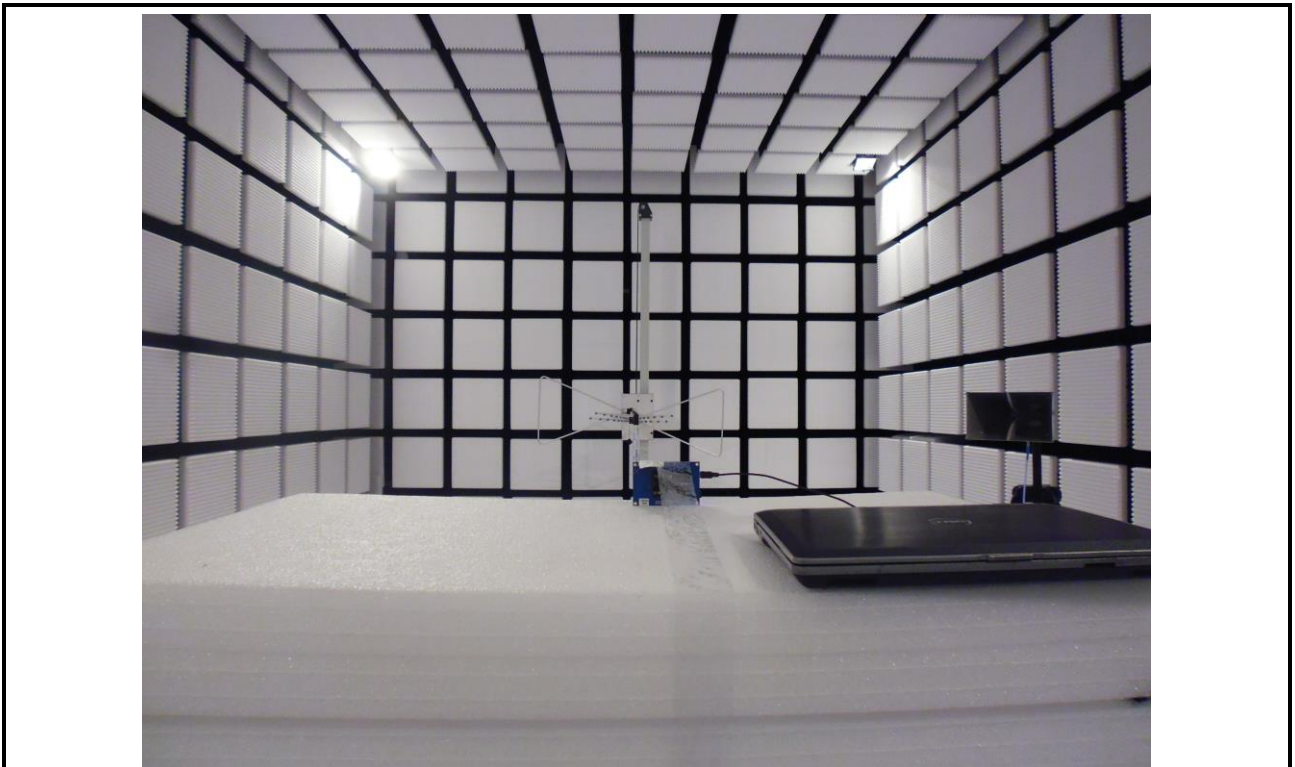
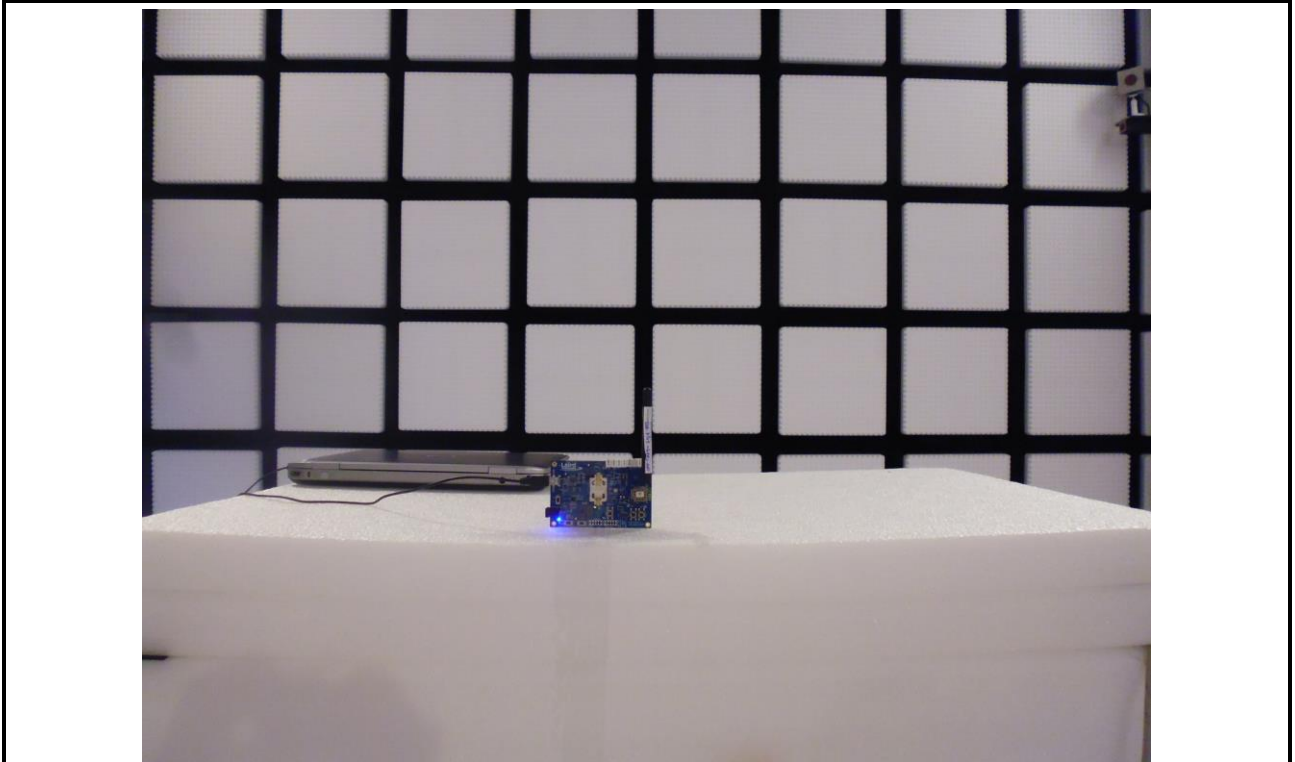
Spurious Emission Test (Configuration 2: BL600-SC with PCB Dipole antenna)



Spurious Emission Test (Configuration 3: BL600-SC with Dipole antenna.)



Spurious Emission Test (Configuration 4: BL600-ST with Dipole antenna)



6 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, 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 Hsiang. Location map can be found on our website <http://www.icertifi.com.tw>.

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

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==END==