AS/NZS Test Report

Equipment	:	**802.11ac Professional Wi-Fi + BT5.0 Module**
Model No.	:	**SU60-SOMC (453-00003), SU60-SOMC-2G (453-00004) (please refer to section 1.1.1 for more details.)**
Brand Name	:	**Laird**
Applicant	:	**Laird Technologies**
Address	:	**W66N220 Commerce Court, Cedarburg, Wisconsin 53012, USA**
Standard	:	**AS/NZS 4268:2017**
Received Date	:	**Apr. 11, 2018**
Tested Date	:	**Sep. 19 ~ Oct. 04, 2018**

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: **Approved by:**

James Fan / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
AR841101AE	Rev. 01	Initial issue	Dec. 21, 2018

Summary of Test Results

Ref. Std. Clause (ACMA 4268)	Ref. Std. Clause (EN 300 328)	Test Items	Measured	Result
6.3	4.3.2.2	RF Output Power	9.98 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
6.5	4.3.2.7	Emission Bandwidth	Meet the requirement of limit.	Pass
6.6	4.3.2.7	Operating Frequencies	Meet the requirement of limit.	Pass
6.4	4.3.2.8	Transmitter unwanted emissions in the out of band domain	Meet the requirement of limit.	Pass
6.4	4.3.2.9	Transmitter unwanted emissions in the spurious domain	Meet the requirement of limit.	Pass
7.2	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 judgement of conformity in the report is based on the measurement results excluding the measurement uncertainty.
Comments and Explanations:
None

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	SU60-SOMC (453-00003)	802.11ac Professional Wi-Fi + BT5.0 Module	2G/1G MCP
	SU60-SOMC-2G (453-00004)		4G/2G MCP
✦ The above models, both options were assessed and **SU60-SOMC-2G (453-00004)** was found to be worst case and was selected for the final testing.			

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	V4.2 LE	2402-2480	0-39 [40]	1 Mbps
Note 1: Bluetooth LE (Low energy) uses GFSK modulation.				

1.1.3 Antenna Details

No.	Brand	Model	Type	Connector	Gain (dBi)
1	LSR	001-0009	Dipole	IPEX U.FL	2
2	Laird	NanoBlade-IP04	PCB Dipole	IPEX U.FL	2
3	Laird	MAF95310 Mini NanoBlade Flex	PCB Dipole	IPEX U.FL	2.79
4	LSR	FlexPIFA 001-0016	PIFA	IPEX U.FL	2.5
5	Ethertronics	WLAN_1000146	Magnetic Dipole	IPEX U.FL	2.5
6	Laird	MIMO FlexPIFA Antenna	PIFA	IPEX U.FL	2
7	LSR	001-0009 (with filter)	Dipole	IPEX U.FL	2

1.1.4 EUT Operational Condition

Power Supply Type	3.3 Vdc from host		
SW Version	6.0.0.x		
Operational Climatic	☒ Tnom (20°C)	☒ Tmax (85°C)	☒ Tmin (-30°C)

1.1.5 Accessories

Accessories		
No.	**Equipment**	**Description**
1	AC Adapter	Brand Name: I.T.E POWER SUPPLY Model Name: MU12AY120100-A1 Power Rating: I/P: 100-240Vac, 50/60Hz, 0.3A O/P: 12Vdc, 1A Power Line: 1.48m non-shielded cable without core

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	Test Command	
Modulation Mode	**Duty Cycle Of Test Signal (%)**	**Duty Factor (dB)**
GFSK-1Mbps	62.66%	2.03

1.1.8 Power Setting

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

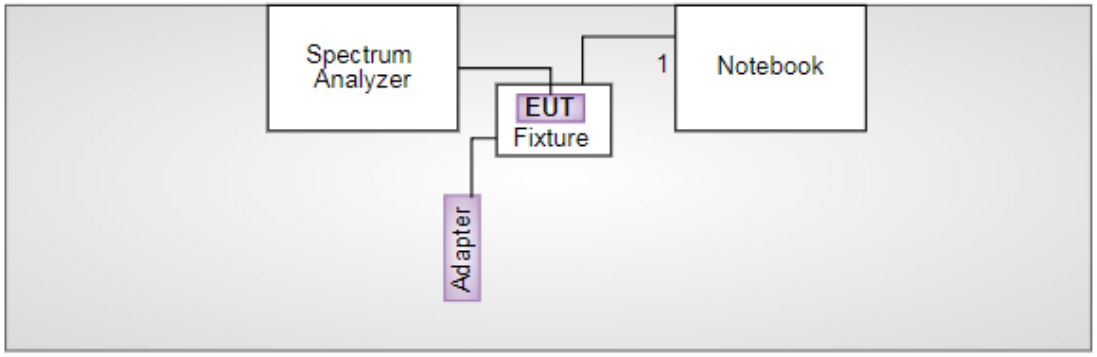
1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**S/N**	**Remarks**
1	Notebook	DELL	Latitude E6430	F2JB4X1	---
2	Notebook	DELL	Latitude E6430	D3LNYW1	---
3	Fixture	---	---	---	Provided by applicant.

Note: Fixture is provided by applicant.

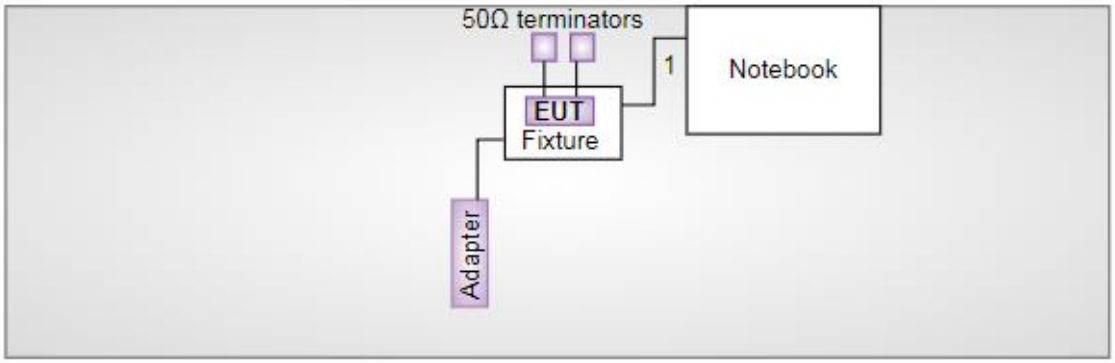
1.3 Test Setup Chart

Test Setup Diagram (Conducted)



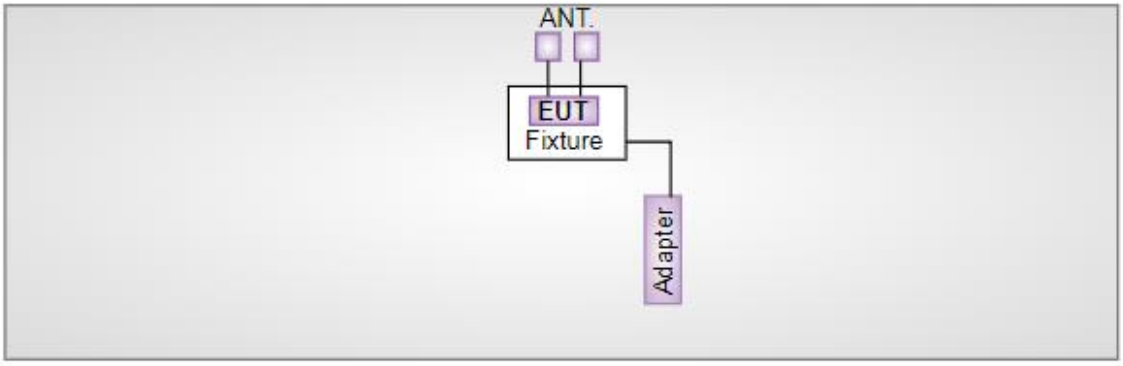
No.	Signal cable / Length (m)
1	USB, 1m shielded.

Test Setup Diagram (Radiated > 30 MHz)



No.	Signal cable / Length (m)
1	USB, 1m shielded.

Test Setup Diagram (Radiated ≤ 30 MHz)



1.4 Test Equipment List and Calibration Data

Test Item	Radiated Emissions				
Test Site	Fully-anechoic chamber 2 / (05CH02-WS)				
Tested Date	Sep. 19, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	Agilent	N9010A	MY52221474	Oct. 16, 2017	Oct. 15, 2018
Bilog Antenna 30-1000MHz	SCHWARZBECK	VULB9168	9168-563	Jan. 02, 2018	Jan. 01, 2019
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	9120D-1205	Jan. 11, 2018	Jan. 10, 2019
Preamplifier	Agilent	83017A	MY53270013	Dec. 26, 2017	Dec. 25, 2018
Preamplifier	EMC	EMC02325	980188	Dec. 12, 2017	Dec. 11, 2018
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22622/4	Dec. 05, 2017	Dec. 04, 2018
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22623/4	Dec. 05, 2017	Dec. 04, 2018
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22621/4	Dec. 05, 2017	Dec. 04, 2018
RF cable-4M	HUBER+SUHNER	SUCOFLEX104	MY22579/4	Dec. 05, 2017	Dec. 04, 2018
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-002	Dec. 05, 2017	Dec. 04, 2018
LF cable-3M	EMC	EMC8D-NM-NM-3000	131102	Dec. 05, 2017	Dec. 04, 2018
LF cable-10M	EMC	EMC8D-NM-NM-10000	131101	Dec. 05, 2017	Dec. 04, 2018
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)				
Tested Date	Oct. 04, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101486	Nov. 21, 2017	Nov. 20, 2018
Power Sensor	Agilent	U2021XA	MY53480019	Jan. 29, 2018	Jan. 28, 2019
Power Sensor	Agilent	U2021XA	MY53510003	Jan. 29, 2018	Jan. 28, 2019
Power Sensor	Agilent	U2021XA	MY54070003	Feb. 08, 2018	Feb. 07, 2019
Power Sensor	Agilent	U2021XA	MY54060013	Feb. 08, 2018	Feb. 07, 2019
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 01, 2017	Nov. 30, 2018
Combiner(1X2)	woken	0120A02201801O	DOM2AEW1A23	Dec. 04, 2017	Dec. 03, 2018
Combiner(1X4)	woken	0120A04056002D	111204	Dec. 04, 2017	Dec. 03, 2018
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.					

Test Item	Receiver Blocking				
Test Site	(05CH02-WS)				
Tested Date	Sep. 26, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Wireless connectivity tester	ROHDE&SCHWARZ	CMW270	100856	Nov. 13, 2017	Nov. 12, 2018
Signal Generator	R&S	SMB100A	175727	Oct. 26, 2017	Oct. 25, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX_104	500202/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX_104	296088/4	Dec. 07, 2017	Dec. 06, 2018
RF Cable	HUBER+SUHNER	SUCOFLEX_104	329023/4	Dec. 07, 2017	Dec. 06, 2018
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emissions				
Test Site	(10CH01-HY)				
Tested Date	Sep. 26, 2018				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Receiver	R&S	ESR3	102051	May 03, 2018	May 02, 2019
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2017	Nov. 12, 2018
RF Cable-R10m	Suhner Switzerland + Rosenberger	RG223/U + UAA220A-0	CB022-DOOR	Nov. 11, 2017	Nov. 10, 2018
Turn Table	HD	DT 60 RPS	1513/004/00	NA	NA
Software	AUDIX	e3	6.120210g	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:

AS/NZS 4268:2017
EN 300 328 V2.1.1 (2016-11)

1.6 Measurement Uncertainty

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

Measurement Uncertainty		
Parameters	**Uncertainty**	**Limit**
Occupied Channel Bandwidth	±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 ^{o}C	±3 °C
Supply voltages	±0.16 %	±3 %
Time	±0.1 %	±5 %

2 Test Configuration

2.1 Testing Condition

Testing Location			
☒	ICC Lab	ADD : No.3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan (R.O.C.) TEL : 886-3-271-8666 FAX : 886-3-318-0155	
☒	Sporton Lab	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL : 886-3-327-3456 FAX : 886-3-327-0973	

Test Item	Test Site	Ambient Condition	Tested By
RF Conducted	TH01-WS	25°C / 65%	Ryan Lee
Radiated Emission > 30 MHz	05CH02-WS	24°C / 65%	Ryan Lee
Receiver Blocking	05CH02-WS	22.5°C / 64%	Ryan Lee
Radiated Emission ≤ 30 MHz	10CH01-HY*	22°C / 62%	Jack Li

Note: * ICC lab subcontracts this test item to Sporton Lab (TAF:1190).

Sporton Lab is a TAF accreditation test firm and also is an approved provider of ICC la

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
Power Spectral Density				
Occupied Channel Bandwidth	GFSK	2402 / 2480	1 Mbps	2
Transmitter unwanted emissions in the out of band domain				
Transmitter Spurious Emissions ≤ 30 MHz Receiver Spurious Emissions ≤ 30 MHz	GFSK	2402 / 2480	1 Mbps	1, 2, 3, 4
Transmitter Spurious Emissions >30 MHz	GFSK	2402 / 2480	1 Mbps	2
Receiver Spurious Emissions >30 MHz				
Receiver Blocking	GFSK	2402 / 2480	1 Mbps	2

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** result was found as the worst case and was shown in this report.
2. 4 types antenna are used for this device, highest gain antenna of each type is selected to perform test as below test configuration.

   Configuration 1 : Dipole antenna with 2 dBi gain

   Configuration 2 : PCB Dipole antenna with 2.79dBi gain

   Configuration 3 : PIFA antenna with 2.5dBi gain

   Configuration 4 : Magnetic Dipole with 2.5dBi gain
3. Two 50Ω terminators are connected to antenna port of EUT for radiated emission measurement.

3 Transmitter Test Results

3.1 RF Output Power

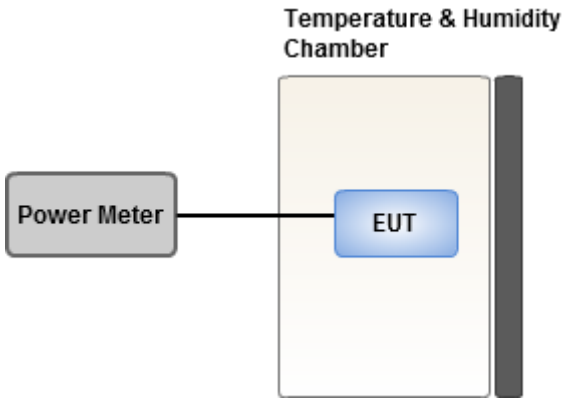
3.1.1 Limit of RF Output Power

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

3.1.2 Test Procedures

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

3.1.3 Test Setup



3.1.4 Test Result of RF Output Power

Test Configuration 1

RF Output Power (dBm)				
Condition	**Freq. (MHz)**	**EIRP Power**	**Limit (dBm)**	**Results**
$T_{nom}V_{nom}$	2402	8.77	20	Pass
$T_{min}V_{nom}$	2402	9.19	20	Pass
$T_{max}V_{nom}$	2402	8.28	20	Pass
$T_{nom}V_{nom}$	2440	8.27	20	Pass
$T_{min}V_{nom}$	2440	8.69	20	Pass
$T_{max}V_{nom}$	2440	7.75	20	Pass
$T_{nom}V_{nom}$	2480	7.82	20	Pass
$T_{min}V_{nom}$	2480	8.23	20	Pass
$T_{max}V_{nom}$	2480	7.33	20	Pass

Test Configuration 2

RF Output Power (dBm)				
Condition	**Freq. (MHz)**	**EIRP Power**	**Limit (dBm)**	**Results**
$T_{nom}V_{nom}$	2402	9.56	20	Pass
$T_{min}V_{nom}$	2402	**9.98**	20	Pass
$T_{max}V_{nom}$	2402	9.07	20	Pass
$T_{nom}V_{nom}$	2440	9.06	20	Pass
$T_{min}V_{nom}$	2440	9.48	20	Pass
$T_{max}V_{nom}$	2440	8.54	20	Pass
$T_{nom}V_{nom}$	2480	8.61	20	Pass
$T_{min}V_{nom}$	2480	9.02	20	Pass
$T_{max}V_{nom}$	2480	8.12	20	Pass

Test Configuration 3

RF Output Power (dBm)				
Condition	**Freq. (MHz)**	**EIRP Power**	**Limit (dBm)**	**Results**
$T_{nom}V_{nom}$	2402	9.27	20	Pass
$T_{min}V_{nom}$	2402	9.69	20	Pass
$T_{max}V_{nom}$	2402	8.78	20	Pass
$T_{nom}V_{nom}$	2440	8.77	20	Pass
$T_{min}V_{nom}$	2440	9.19	20	Pass
$T_{max}V_{nom}$	2440	8.25	20	Pass
$T_{nom}V_{nom}$	2480	8.32	20	Pass
$T_{min}V_{nom}$	2480	8.73	20	Pass
$T_{max}V_{nom}$	2480	7.83	20	Pass

Test Configuration 4

RF Output Power (dBm)				
Condition	**Freq. (MHz)**	**EIRP Power**	**Limit (dBm)**	**Results**
$T_{nom}V_{nom}$	2402	9.27	20	Pass
$T_{min}V_{nom}$	2402	9.69	20	Pass
$T_{max}V_{nom}$	2402	8.78	20	Pass
$T_{nom}V_{nom}$	2440	8.77	20	Pass
$T_{min}V_{nom}$	2440	9.19	20	Pass
$T_{max}V_{nom}$	2440	8.25	20	Pass
$T_{nom}V_{nom}$	2480	8.32	20	Pass
$T_{min}V_{nom}$	2480	8.73	20	Pass
$T_{max}V_{nom}$	2480	7.83	20	Pass

3.2 Power Spectral Density

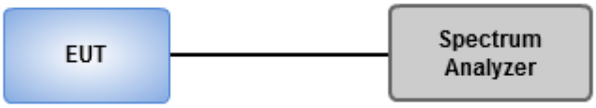
3.2.1 Limit of Power Spectral Density

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 V2.1.1 (2016-11).

3.2.3 Test Setup



3.2.4 Test Result of Power Spectral Density

Test Configuration 1

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	8.71	10	Pass
GFSK-1Mbps	2440	8.21	10	Pass
GFSK-1Mbps	2480	7.76	10	Pass

Test Configuration 2

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	9.50	10	Pass
GFSK-1Mbps	2440	9.00	10	Pass
GFSK-1Mbps	2480	8.55	10	Pass

Test Configuration 3

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	9.21	10	Pass
GFSK-1Mbps	2440	8.71	10	Pass
GFSK-1Mbps	2480	8.26	10	Pass

Test Configuration 4

Modulation Mode	Freq. (MHz)	Power Density (dBm/1MHz)	Limit (dBm/1MHz)	Results
GFSK-1Mbps	2402	9.21	10	Pass
GFSK-1Mbps	2440	8.71	10	Pass
GFSK-1Mbps	2480	8.26	10	Pass

3.3 Emission Bandwidth and Operating Frequencies

3.3.1 Limit of Emission Bandwidth and Operating Frequencies

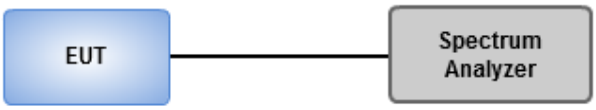
The Emission Bandwidth for each frequency shall fall completely within 2.4~2.4835 GHz.

For non-adaptive Frequency Hopping equipment with e.i.r.p greater than 10 dBm, the Emission Bandwidth for every occupied hopping frequency shall be equal to or less than the value declared by the supplier. This declared value shall not be greater than 5 MHz.

3.3.2 Test Procedures

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

3.3.3 Test Setup



3.3.4 Test Result of Emission Bandwidth and Operating Frequencies

Test Configuration 2

Summary

Mode	OBW (Hz)	ITU-Code
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	1.026M	1M03F1D

OBW = 99% occupied bandwidth;

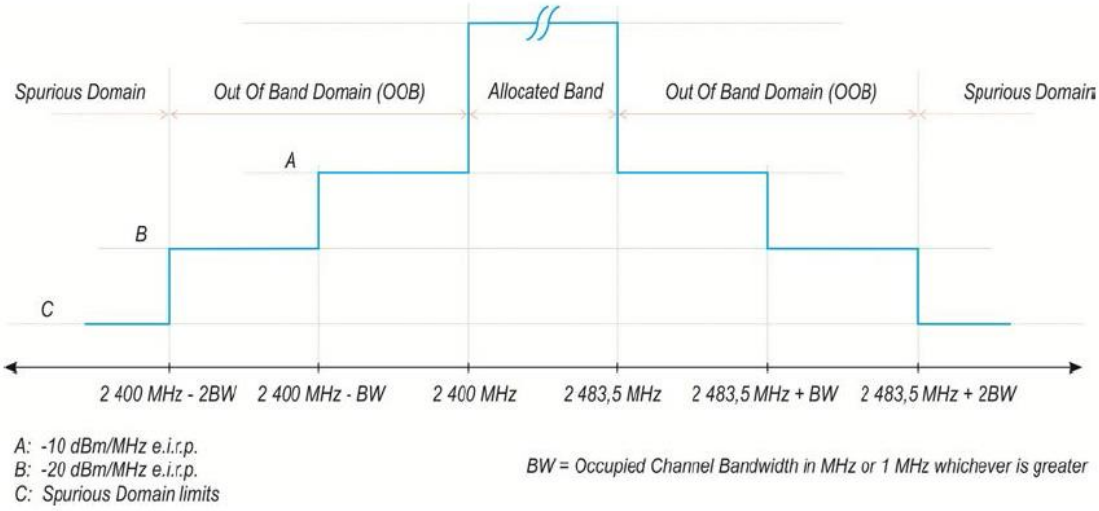
Result

Mode	Result	Limit (Hz)	fl-OBW (Hz)	fh-OBW (Hz)	OBW (Hz)	N dB (Hz)
BT-LE(1Mbps)	-	-	-	-	-	-
2402MHz_TnomVnom	Pass	2.4-2.4835G	2.401502G	2.402529G	1.026M	658k
2480MHz_TnomVnom	Pass	2.4-2.4835G	2.479501G	2.480528G	1.026M	657k

fl-OBW = fl lower edge 99% occupied bandwidth; **fh-OBW** = fh higher edge 99% occupied bandwidth; **OBW** = 99% occupied bandwidth;
N dB = 6dB down bandwidth;

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

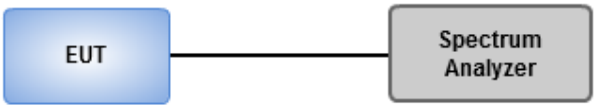
3.4.1 Limit of Transmitter Unwanted Emissions in the Out-Of-Band Domain



3.4.2 Test Procedures

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

3.4.3 Test Setup



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

Test Configuration 1

Summary

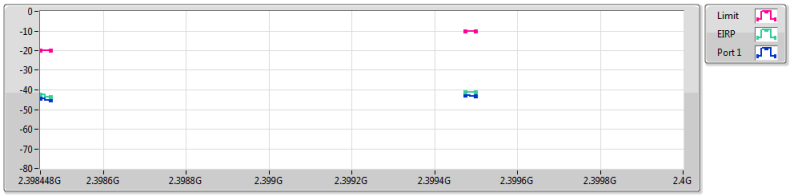
Mode	EIRP-A (dBm)	Limit-A (dBm)	EIRP-B (dBm)	Limit-B (dBm)
2.4-2.4835GHz	-	-	-	-
BT-LE(1Mbps)	-41.04	-10	-41.57	-20

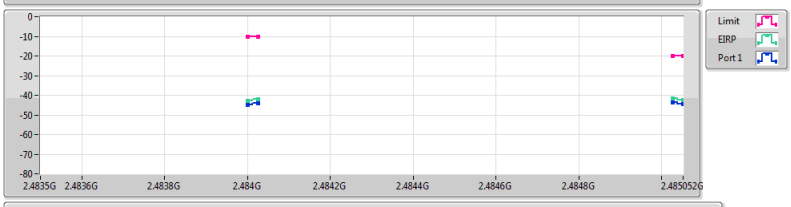
Result

Mode	Result	Freq (Hz)	EIRP (dBm)	Limit (dBm)	Freq (Hz)	EIRP (dBm)	Limit (dBm)
BT-LE(1Mbps)	-	-	-	-	-	-	-
2402MHz_TnomVnom	Pass	2.398448G	-42.35	-20	2.399474G	-41.04	-10
2402MHz_TnomVnom	Pass	2.485026G	-41.57	-20	2.484026G	-42.06	-10
2480MHz_TnomVnom	Pass	2.398448G	-43.36	-20	2.399474G	-43.47	-10
2480MHz_TnomVnom	Pass	2.485026G	-42.33	-20	2.484026G	-42.61	-10

BT-LE(1Mbps) **Mask**

2402MHz_TnomVnom

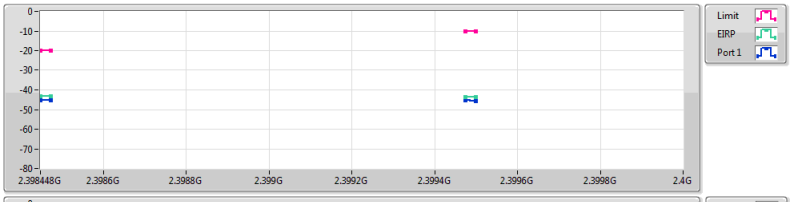


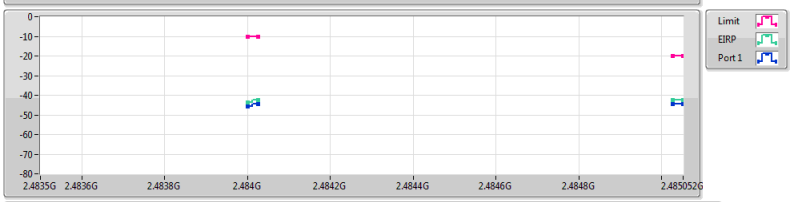


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398448G	-42.35	-20	2.399474G	-41.04	-10	2.484026G	-42.06	-10	2.485026G	-41.57	-20

BT-LE(1Mbps) **Mask**

2480MHz_TnomVnom





Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398448G	-43.36	-20	2.399474G	-43.47	-10	2.484026G	-42.61	-10	2.485026G	-42.33	-20

Test Configuration 2

Summary

Mode	EIRP-A (dBm)	Limit-A (dBm)	EIRP-B (dBm)	Limit-B (dBm)
2.4-2.4835GHz	-	-	-	-
BT-LE(1Mbps)	-39.81	-10	-41.17	-20

Result

Mode	Result	Freq (Hz)	EIRP (dBm)	Limit (dBm)	Freq (Hz)	EIRP (dBm)	Limit (dBm)
BT-LE(1Mbps)	-	-	-	-	-	-	-
2402MHz_TnomVnom	Pass	2.398448G	-42.19	-20	2.399474G	-39.81	-10
2402MHz_TnomVnom	Pass	2.485052G	-41.95	-20	2.484G	-41.75	-10
2480MHz_TnomVnom	Pass	2.398448G	-42.48	-20	2.3995G	-41.90	-10
2480MHz_TnomVnom	Pass	2.485052G	-41.17	-20	2.484026G	-42.28	-10

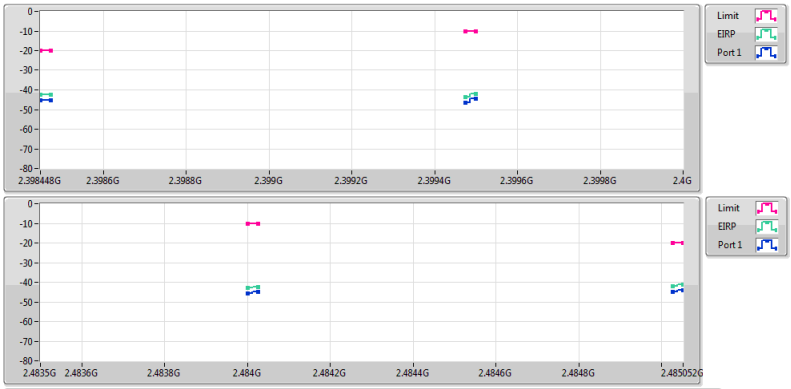
BT-LE(1Mbps) **Mask**

2402MHz_TnomVnom

Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398448G	-42.19	-20	2.399474G	-39.81	-10	2.484G	-41.75	-10	2.485052G	-41.95	-20

BT-LE(1Mbps) **Mask**

2480MHz_TnomVnom



Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398448G	-42.48	-20	2.3995G	-41.90	-10	2.484026G	-42.28	-10	2.485052G	-41.17	-20

Test Configuration 3

Summary

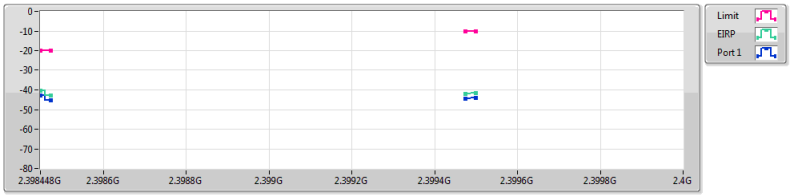
Mode	EIRP-A (dBm)	Limit-A (dBm)	EIRP-B (dBm)	Limit-B (dBm)
2.4-2.4835GHz	-	-	-	-
BT-LE(1Mbps)	-40.78	-10	-40.24	-20

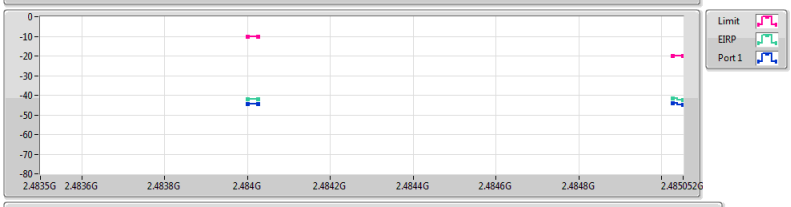
Result

Mode	Result	Freq (Hz)	EIRP (dBm)	Limit (dBm)	Freq (Hz)	EIRP (dBm)	Limit (dBm)
BT-LE(1Mbps)	-	-	-	-	-	-	-
2402MHz_TnomVnom	Pass	2.398448G	-40.24	-20	2.3995G	-41.52	-10
2402MHz_TnomVnom	Pass	2.485026G	-41.55	-20	2.484026G	-42.09	-10
2480MHz_TnomVnom	Pass	2.398474G	-41.84	-20	2.3995G	-41.07	-10
2480MHz_TnomVnom	Pass	2.485026G	-42.25	-20	2.484G	-40.78	-10

BT-LE(1Mbps) **Mask**

2402MHz_TnomVnom

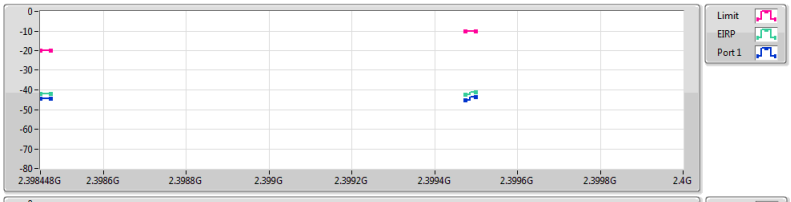


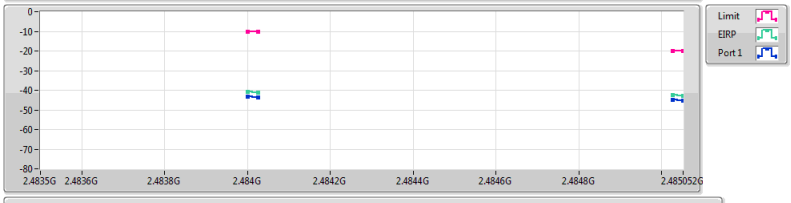


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398448G	-40.24	-20	2.3995G	-41.52	-10	2.484026G	-42.09	-10	2.485026G	-41.55	-20

BT-LE(1Mbps) **Mask**

2480MHz_TnomVnom





Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398474G	-41.84	-20	2.3995G	-41.07	-10	2.484G	-40.78	-10	2.485026G	-42.25	-20

Test Configuration 4

Summary

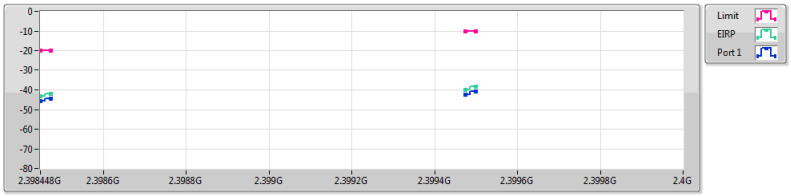
Mode	EIRP-A (dBm)	Limit-A (dBm)	EIRP-B (dBm)	Limit-B (dBm)
2.4-2.4835GHz	-	-	-	-
BT-LE(1Mbps)	-38.46	-10	-41.33	-20

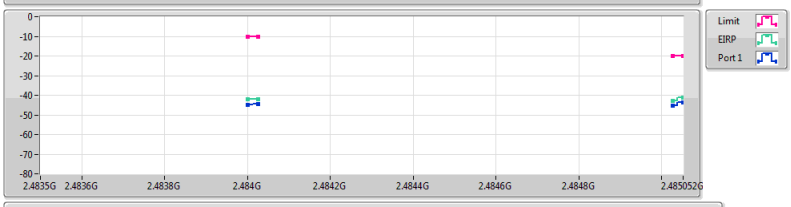
Result

Mode	Result	Freq (Hz)	EIRP (dBm)	Limit (dBm)	Freq (Hz)	EIRP (dBm)	Limit (dBm)
BT-LE(1Mbps)	-	-	-	-	-	-	-
2402MHz_TnomVnom	Pass	2.398474G	-41.84	-20	2.3995G	-38.46	-10
2402MHz_TnomVnom	Pass	2.485052G	-41.33	-20	2.484026G	-41.95	-10
2480MHz_TnomVnom	Pass	2.398448G	-41.76	-20	2.3995G	-41.07	-10
2480MHz_TnomVnom	Pass	2.485026G	-41.89	-20	2.484026G	-41.71	-10

BT-LE(1Mbps) **Mask**

2402MHz_TnomVnom

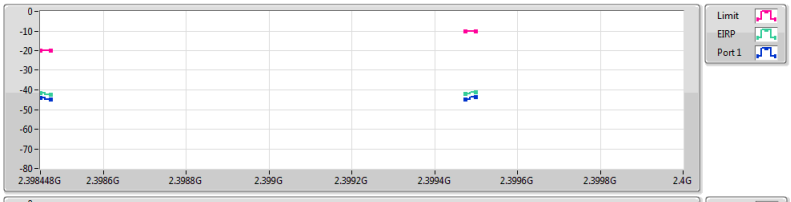


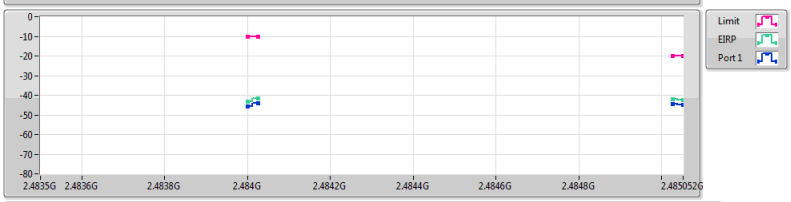


Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398474G	-41.84	-20	2.3995G	-38.46	-10	2.484026G	-41.95	-10	2.485052G	-41.33	-20

BT-LE(1Mbps) **Mask**

2480MHz_TnomVnom





Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)	Freq(Hz)	EIRP(dBm)	Limit(dBm)
2.398448G	-41.76	-20	2.3995G	-41.07	-10	2.484026G	-41.71	-10	2.485026G	-41.89	-20

3.5 Transmitter Unwanted Emissions in the Spurious Domain

3.5.1 Limit of Transmitter Unwanted Emissions in the Spurious Domain

Spurious Emissions Limit (Peak Power)	Frequency Range	Measurement Bandwidth
-56 dBW (2.5μW) e.i.r.p (59 dBμV/m at 10 metres)	< 150 kHz	1 kHz
	150 kHz – 30 MHz	10 kHz

Frequency Range (MHz)	Maximum power (dBm)	Bandwidth (kHz)
30 to 47	-36	100
47 to 74	-54	100
74 to 87,5	-36	100
87,5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 862	-54	100
862 to 1000	-36	100
1000 to 12750	-30	1000

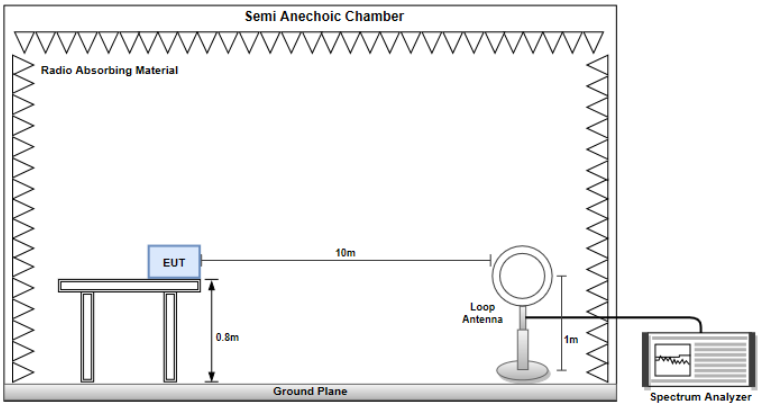
3.5.2 Test Procedures

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

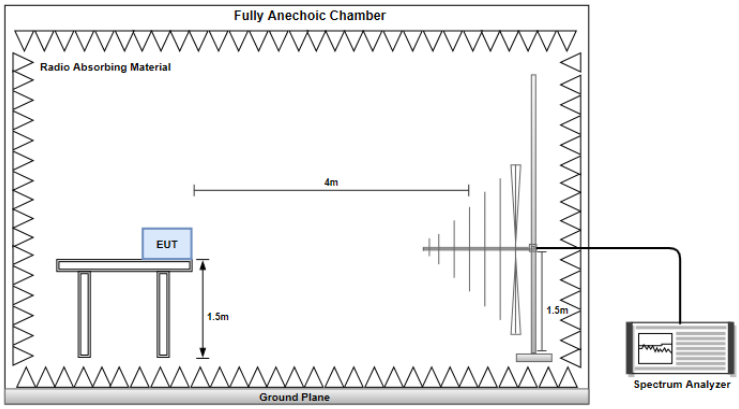
3.5.3 Test Setup

Radiated Emission

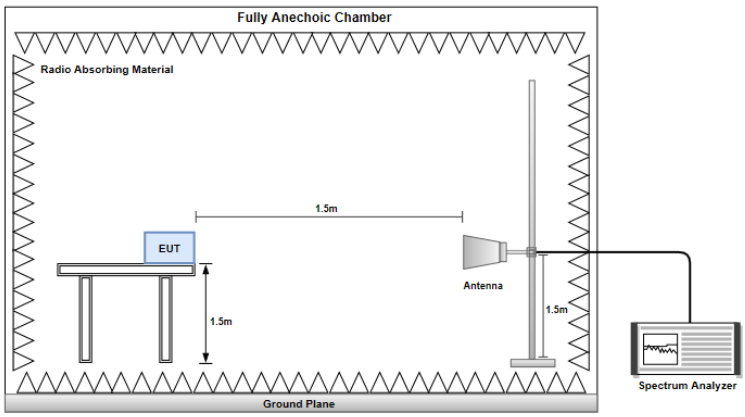
Below 30MHz



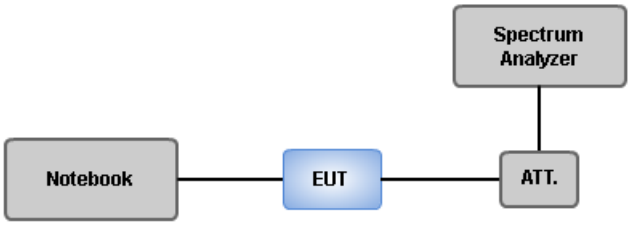
Below 1GHz



Above 1 GHz



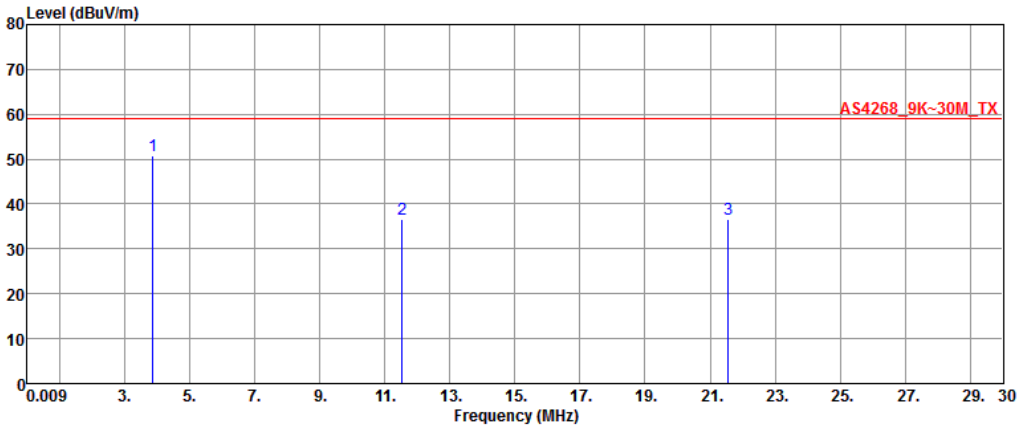
Conducted Emission



Test Configuration 1

3.5.4 Transmitter Radiated Unwanted Emissions (≤ 30MHz)

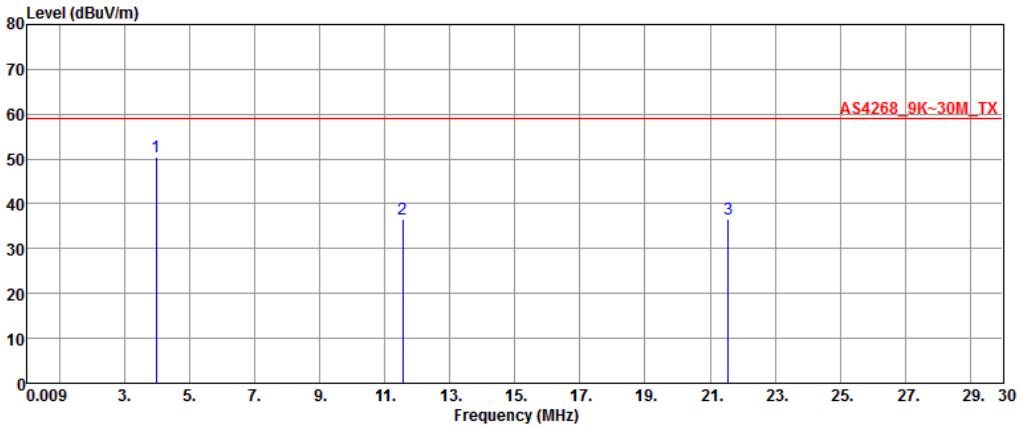
Modulation	GFSK	**Test Freq. (MHz)**	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.87	50.88	59.00	-8.12	20.04	30.84
2	11.52	36.54	59.00	-22.46	21.48	15.06
3	21.56	36.65	59.00	-22.35	22.55	14.10

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

Modulation	GFSK	Test Freq. (MHz)	2480



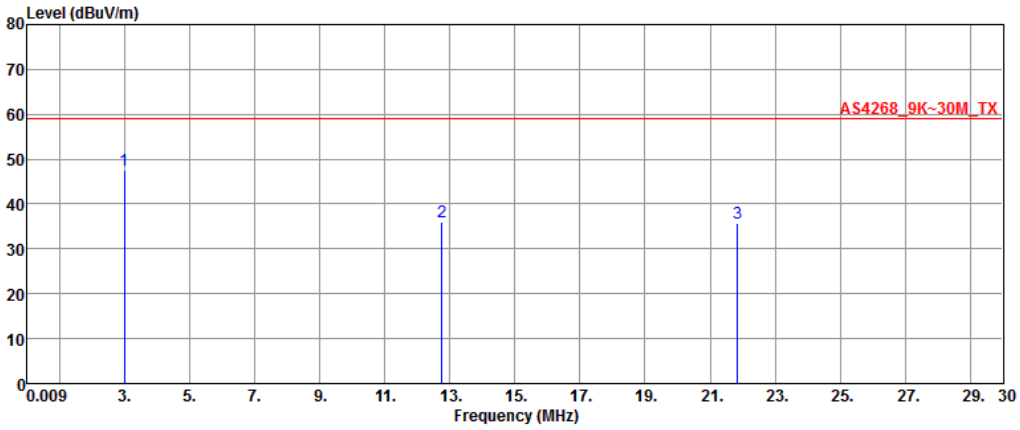
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.96	50.56	59.00	-8.44	20.09	30.47
2	11.54	36.55	59.00	-22.45	21.49	15.06
3	21.56	36.54	59.00	-22.46	22.55	13.99

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

Test Configuration 2

3.5.5 Transmitter Radiated Unwanted Emissions (≤ 30MHz)

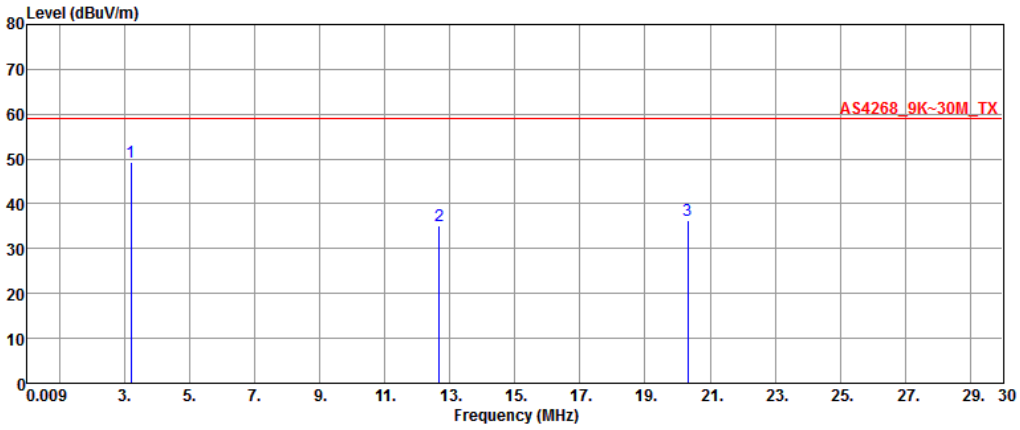
Modulation	GFSK	**Test Freq. (MHz)**	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	2.98	47.49	59.00	-11.51	19.54	27.95
2	12.76	36.11	59.00	-22.89	21.67	14.44
3	21.84	35.73	59.00	-23.27	22.55	13.18

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

Modulation	GFSK	Test Freq. (MHz)	2480



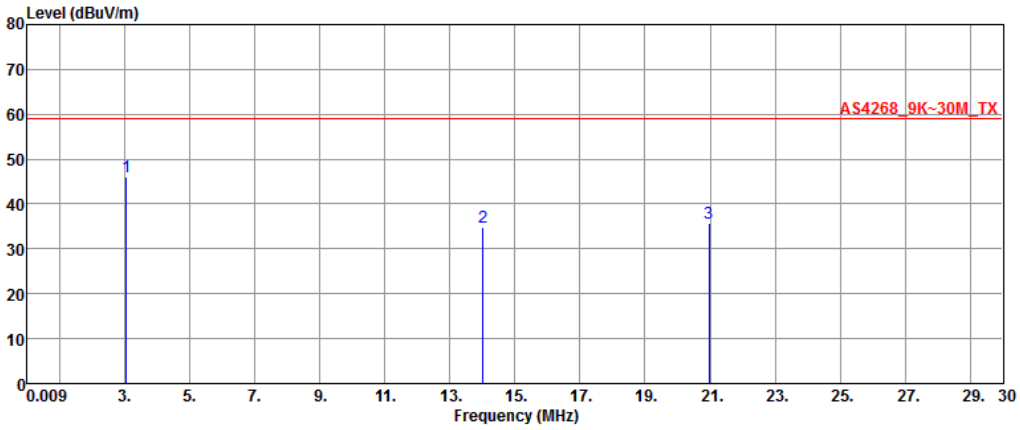
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.19	49.42	59.00	-9.58	19.65	29.77
2	12.67	35.17	59.00	-23.83	21.66	13.51
3	20.31	36.24	59.00	-22.76	22.52	13.72

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

Test Configuration 3

3.5.6 Transmitter Radiated Unwanted Emissions (≤ 30MHz)

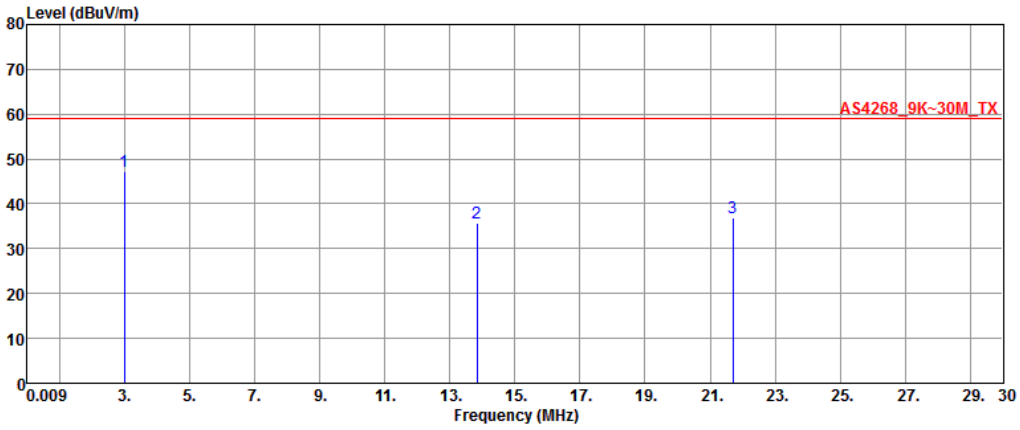
Modulation	GFSK	**Test Freq. (MHz)**	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.04	46.05	59.00	-12.95	19.55	26.50
2	14.01	34.87	59.00	-24.13	21.84	13.03
3	20.97	35.80	59.00	-23.20	22.53	13.27

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

Modulation	GFSK	Test Freq. (MHz)	2480



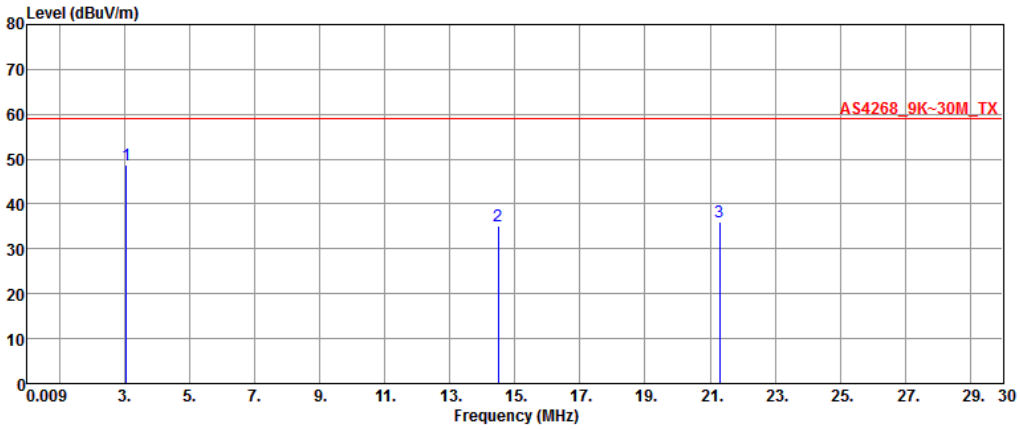
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	2.98	47.34	59.00	-11.66	19.54	27.80
2	13.83	35.85	59.00	-23.15	21.82	14.03
3	21.69	36.75	59.00	-22.25	22.55	14.20

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

Test Configuration 4

3.5.7 Transmitter Radiated Unwanted Emissions (≤ 30MHz)

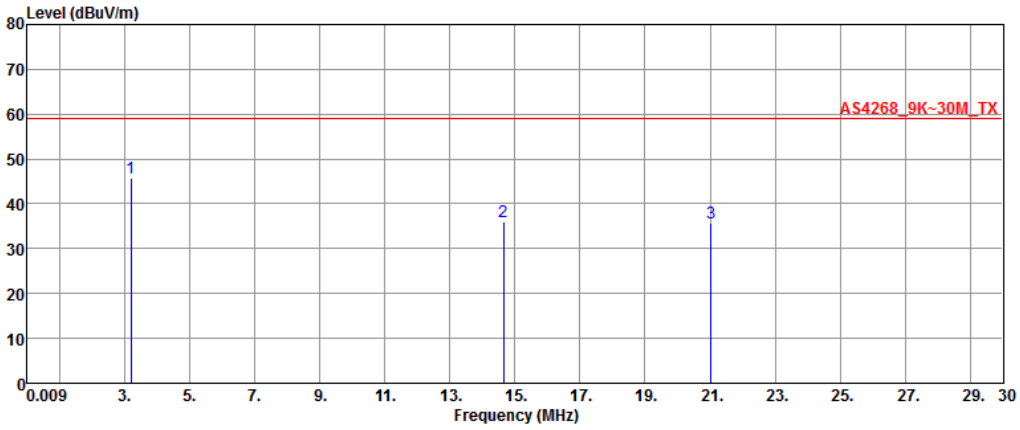
Modulation	GFSK	**Test Freq. (MHz)**	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.04	48.86	59.00	-10.14	19.55	29.31
2	14.49	35.11	59.00	-23.89	21.91	13.20
3	21.30	35.87	59.00	-23.13	22.54	13.33

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

Modulation	GFSK	Test Freq. (MHz)	2480

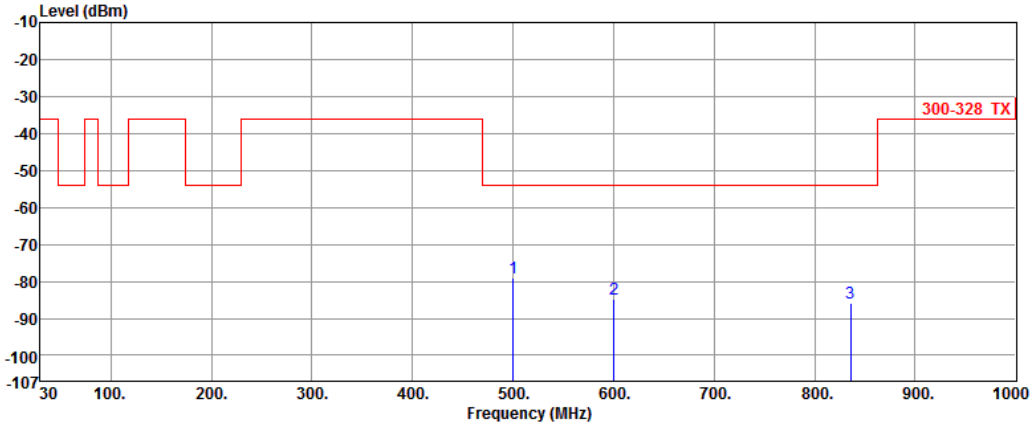


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.19	45.62	59.00	-13.38	19.65	25.97
2	14.64	36.00	59.00	-23.00	21.93	14.07
3	21.03	35.69	59.00	-23.31	22.53	13.16

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

3.5.8 Transmitter Conducted Unwanted Emissions (Below 1GHz)

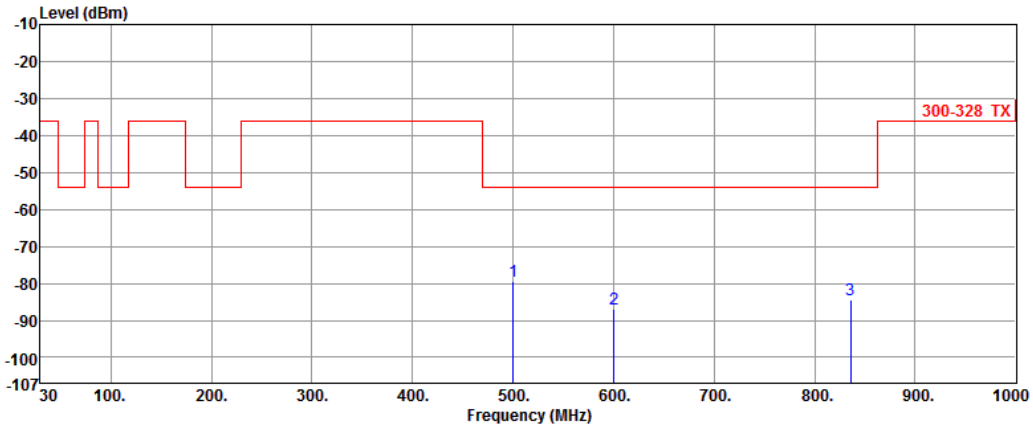
Modulation	GFSK	Test Freq. (MHz)	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	500.45	-79.03	-54.00	-25.03	0.00	-79.03
2	600.36	-84.72	-54.00	-30.72	0.00	-84.72
3	836.07	-85.74	-54.00	-31.74	0.00	-85.74

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

Modulation	GFSK	Test Freq. (MHz)	2480

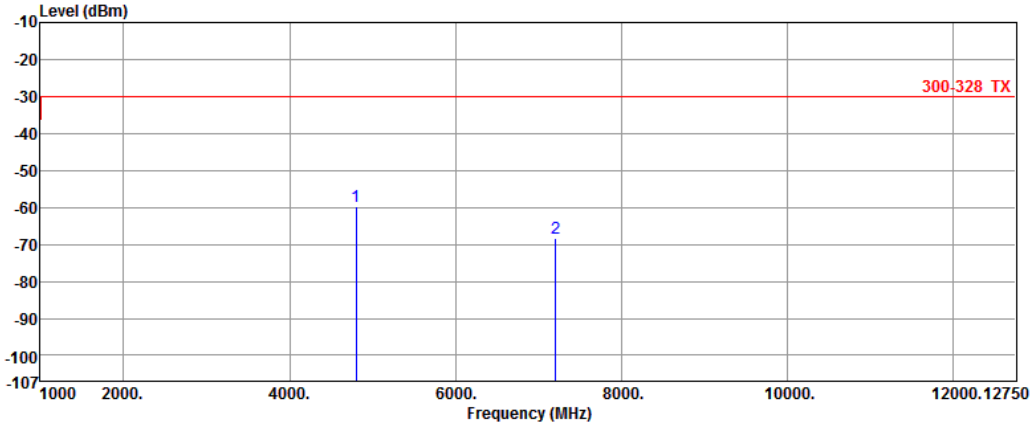


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	500.45	-79.31	-54.00	-25.31	0.00	-79.31
2	600.36	-86.84	-54.00	-32.84	0.00	-86.84
3	836.07	-84.29	-54.00	-30.29	0.00	-84.29

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

3.5.9 Transmitter Conducted Unwanted Emissions (Above 1GHz)

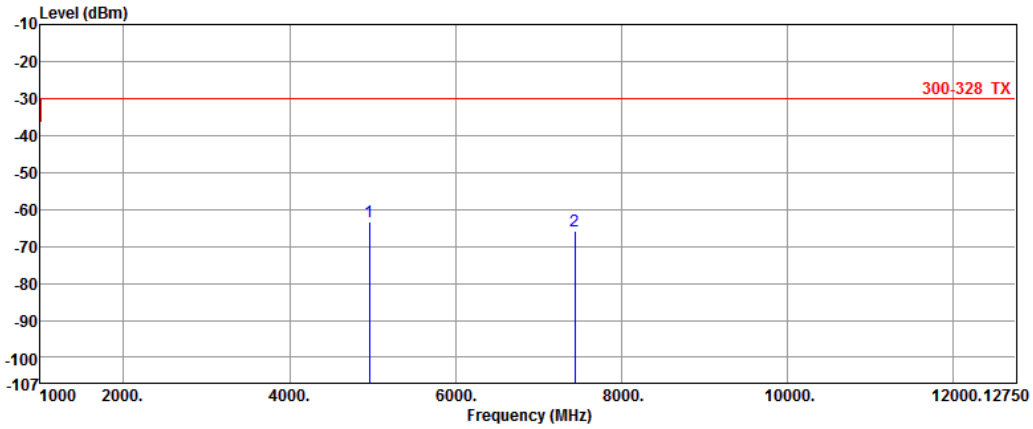
Modulation	GFSK	Test Freq. (MHz)	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.52	-59.73	-30.00	-29.73	0.00	-59.73
2	7205.74	-68.51	-30.00	-38.51	0.00	-68.51

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

Modulation	GFSK	Test Freq. (MHz)	2480

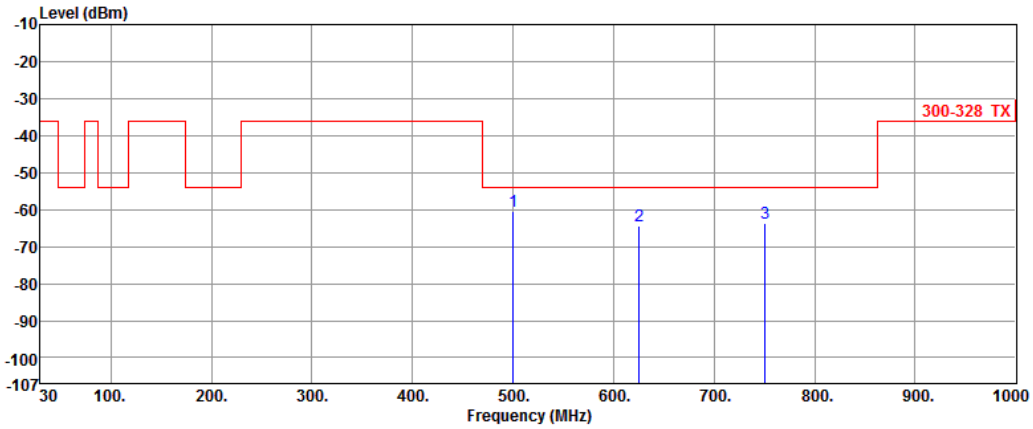


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4959.71	-63.29	-30.00	-33.29	0.00	-63.29
2	7440.65	-65.68	-30.00	-35.68	0.00	-65.68

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

3.5.10 Transmitter Radiated Unwanted Emissions (Below 1GHz)

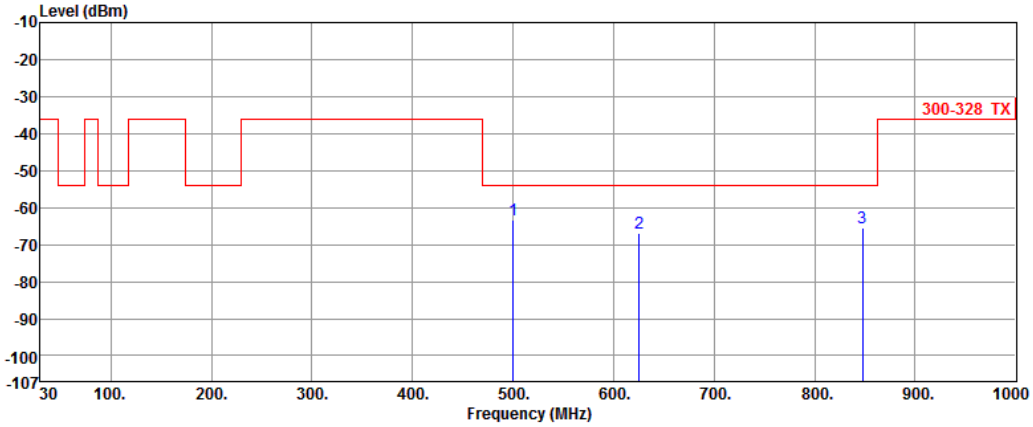
Modulation	GFSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	500.45	-60.45	-54.00	-6.45	3.46	-63.91
2	625.58	-64.43	-54.00	-10.43	5.90	-70.33
3	750.71	-63.70	-54.00	-9.70	7.95	-71.65

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

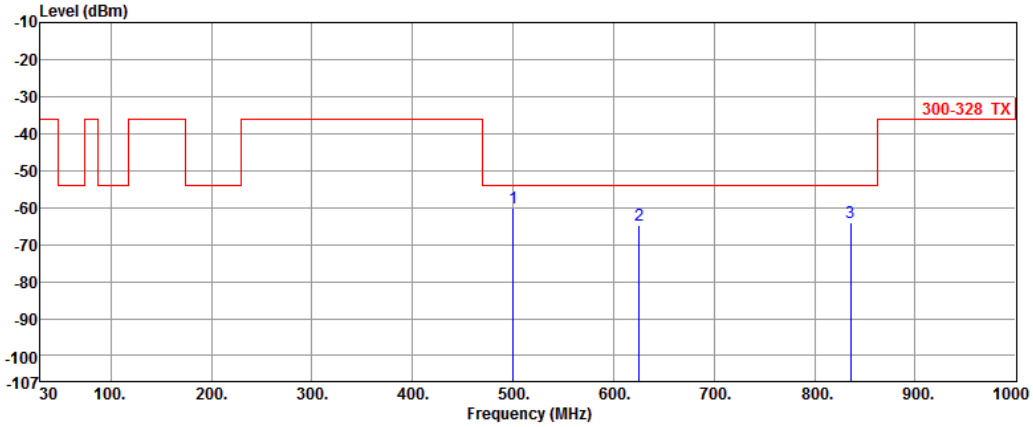
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	500.45	-63.27	-54.00	-9.27	3.37	-66.64
2	625.58	-66.94	-54.00	-12.94	5.94	-72.88
3	847.71	-65.48	-54.00	-11.48	9.26	-74.74

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

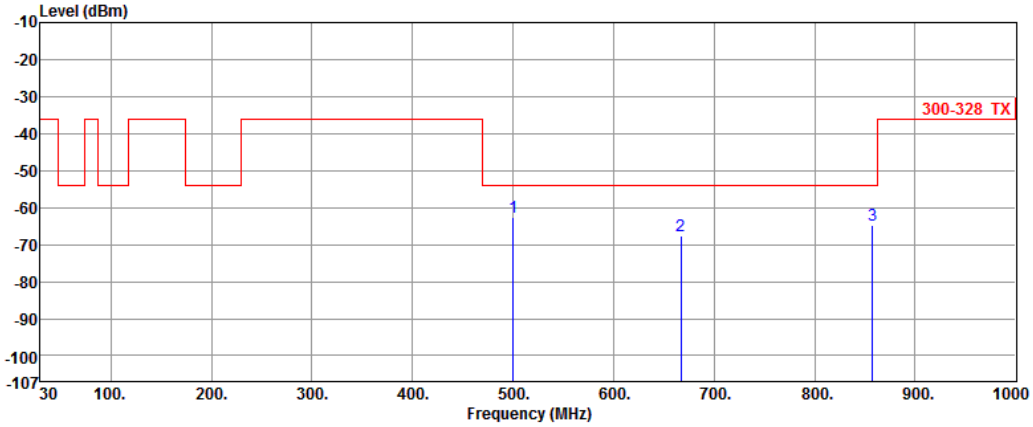
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	500.45	-60.13	-54.00	-6.13	3.46	-63.59
2	625.58	-64.63	-54.00	-10.63	5.90	-70.53
3	836.07	-64.09	-54.00	-10.09	9.07	-73.16

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		

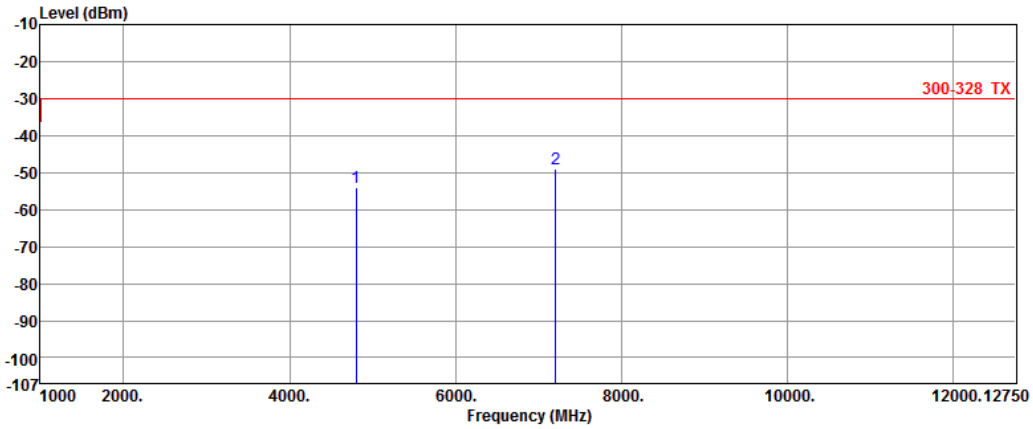


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	500.45	-62.70	-54.00	-8.70	3.37	-66.07
2	667.29	-67.56	-54.00	-13.56	6.30	-73.86
3	857.41	-64.68	-54.00	-10.68	9.37	-74.05

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

3.5.11 Transmitter Radiated Unwanted Emissions (Above 1GHz)

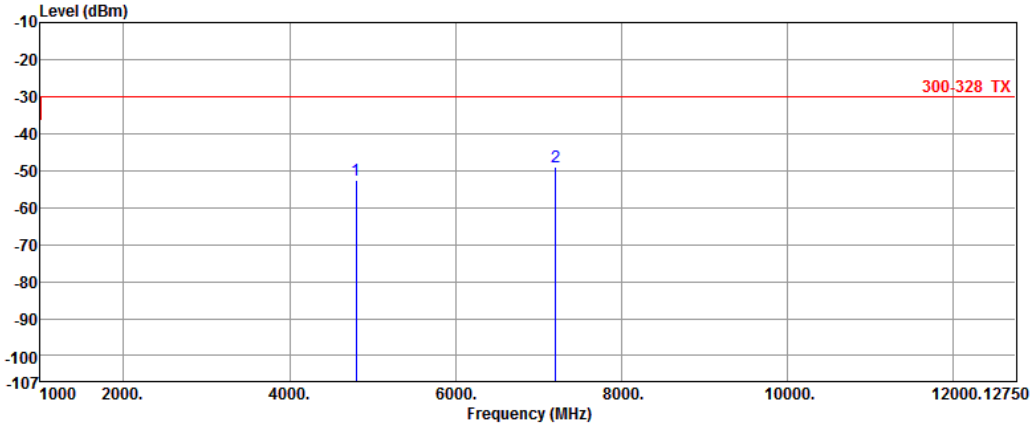
Modulation	GFSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.42	-54.00	-30.00	-24.00	12.67	-66.67
2	7206.86	-48.95	-30.00	-18.95	17.26	-66.21

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

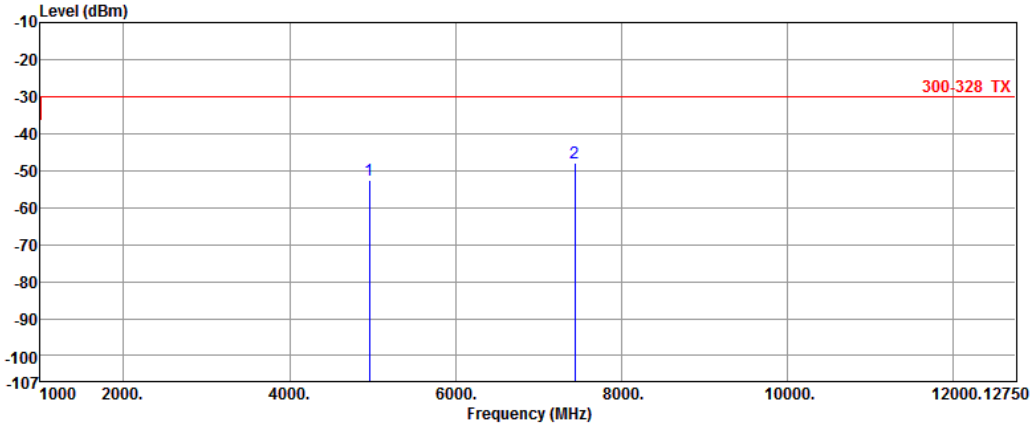
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.52	-52.43	-30.00	-22.43	12.66	-65.09
2	7206.40	-49.06	-30.00	-19.06	16.74	-65.80

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

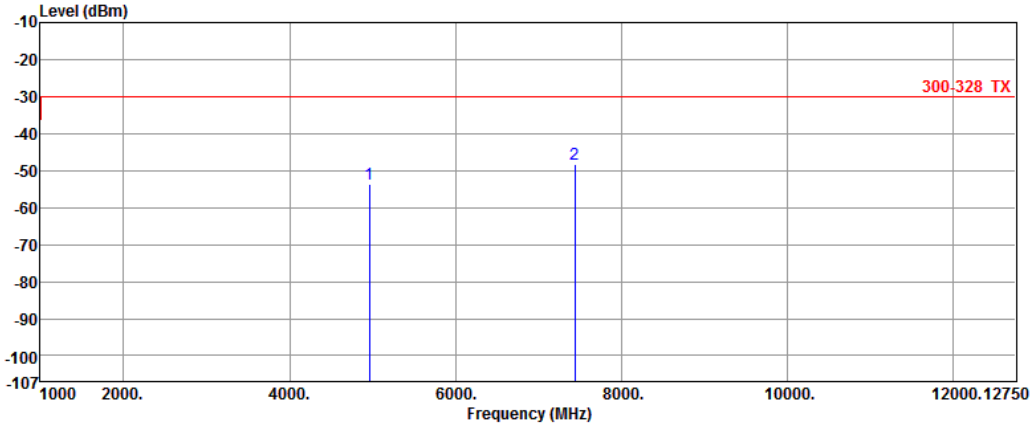
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.82	-52.61	-30.00	-22.61	12.60	-65.21
2	7440.70	-47.98	-30.00	-17.98	17.28	-65.26

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		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.86	-53.57	-30.00	-23.57	12.94	-66.51
2	7440.67	-48.20	-30.00	-18.20	17.00	-65.20

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

Spurious Emissions Limit (Peak Power)	Frequency Range	Measurement Bandwidth
-56 dBW (2.5μW) e.i.r.p (59 dBμV/m at 10 metres)	< 150 kHz	1 kHz
	150 kHz – 30 MHz	10 kHz

Frequency Range	Maximum power (dBm)	Measurement bandwidth (kHz)
30 MHz to 1 GHz	-57	100
Above 1 GHz to 12,75 GHz	-47	1000

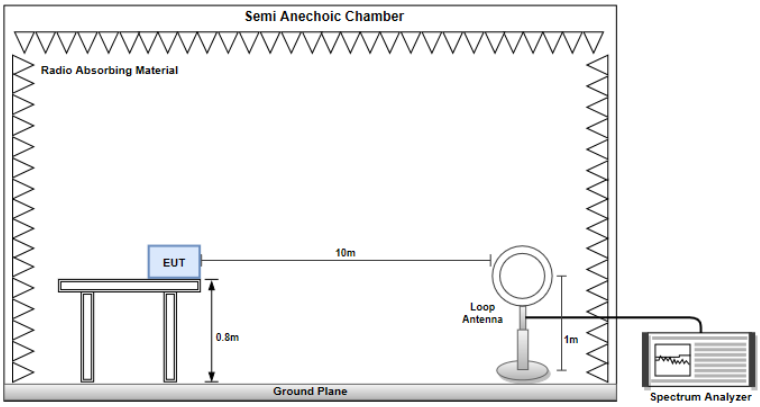
4.1.2 Test Procedures

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

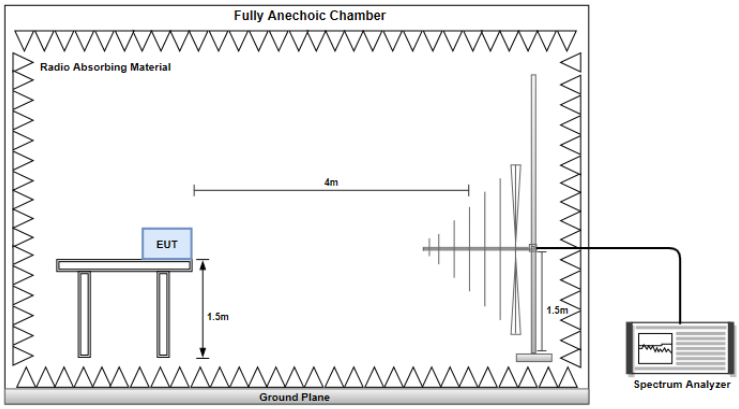
4.1.3 Test Setup

Radiated Emission

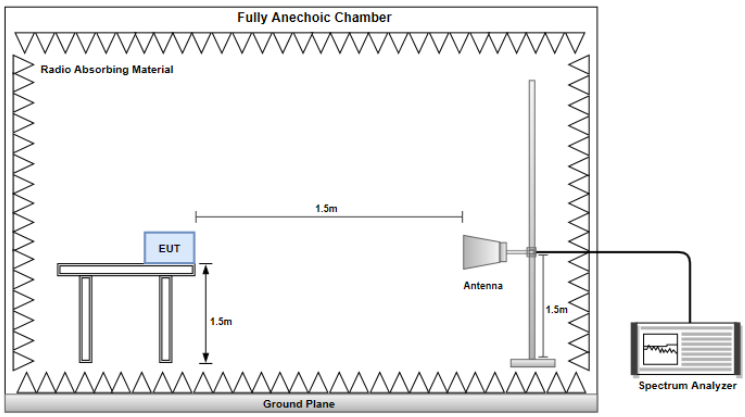
Below 30MHz



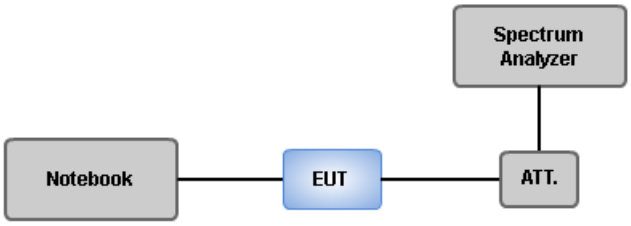
Below 1GHz



Above 1 GHz



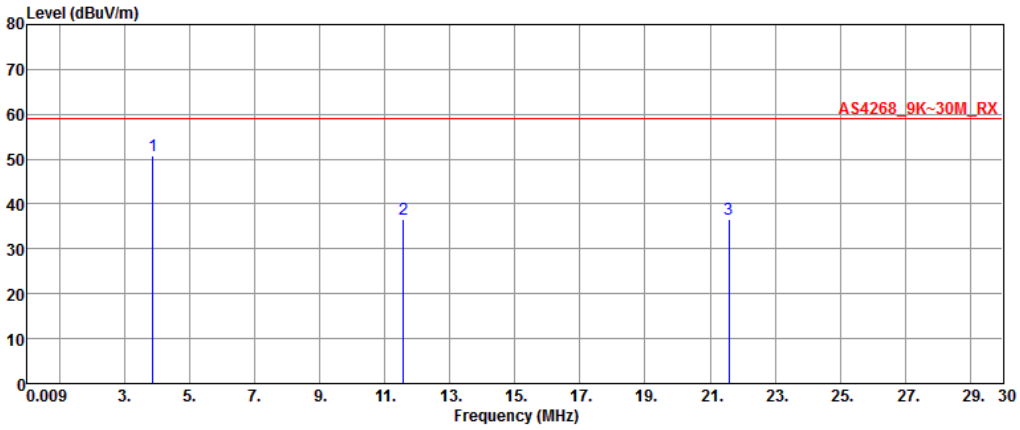
Conducted Emission



Test Configuration 1

4.1.4 Receiver Radiated Unwanted Emissions (≤ 30MHz)

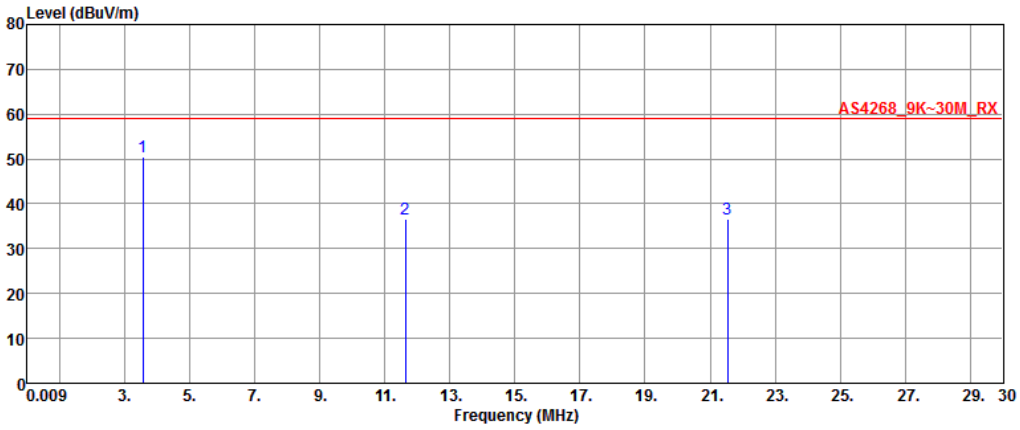
Modulation	GFSK	**Test Freq. (MHz)**	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.86	50.65	59.00	-8.35	20.03	30.62
2	11.56	36.53	59.00	-22.47	21.49	15.04
3	21.58	36.52	59.00	-22.48	22.55	13.97

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

Modulation	GFSK	Test Freq. (MHz)	2480



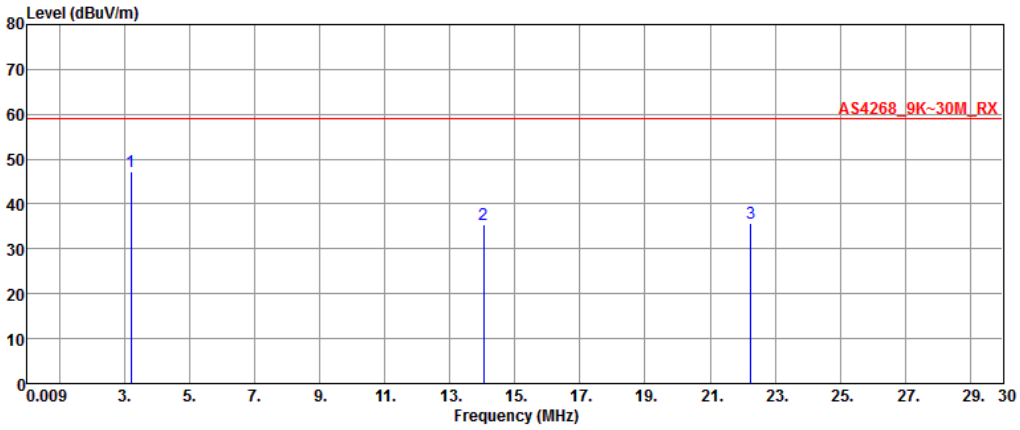
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.56	50.54	59.00	-8.46	19.88	30.66
2	11.64	36.54	59.00	-22.46	21.50	15.04
3	21.54	36.65	59.00	-22.35	22.55	14.10

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

Test Configuration 2

4.1.5 Receiver Radiated Unwanted Emissions (≤ 30MHz)

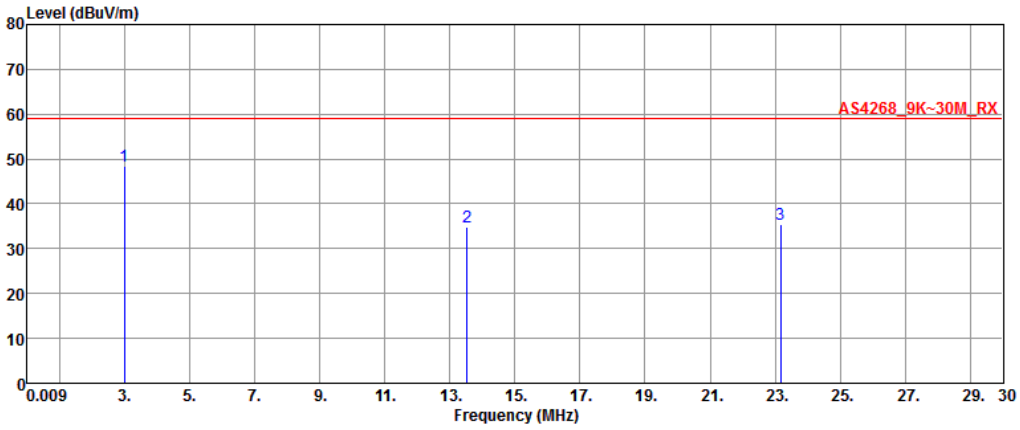
Modulation	GFSK	**Test Freq. (MHz)**	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.19	47.35	59.00	-11.65	19.65	27.70
2	14.04	35.35	59.00	-23.65	21.85	13.50
3	22.26	35.63	59.00	-23.37	22.56	13.07

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

Modulation	GFSK	Test Freq. (MHz)	2480



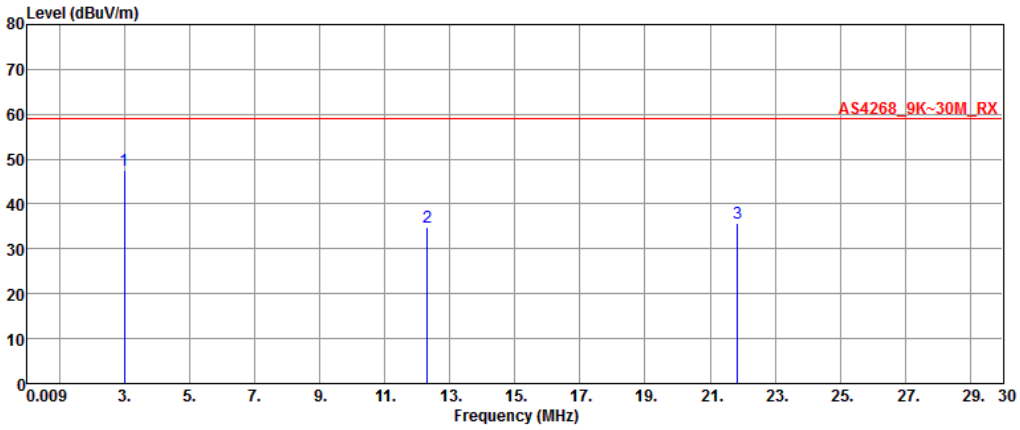
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	2.98	48.36	59.00	-10.64	19.54	28.82
2	13.53	34.86	59.00	-24.14	21.78	13.08
3	23.16	35.56	59.00	-23.44	22.59	12.97

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

Test Configuration 3

4.1.6 Receiver Radiated Unwanted Emissions (≤ 30MHz)

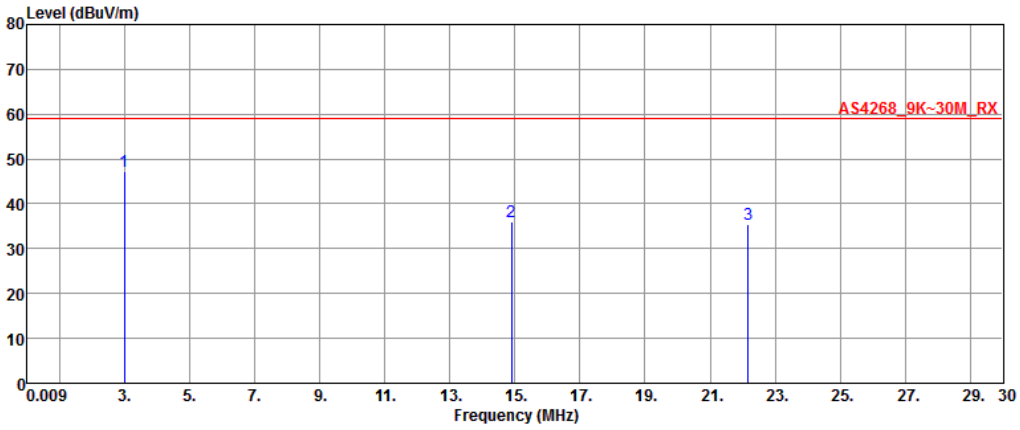
Modulation	GFSK	**Test Freq. (MHz)**	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	2.98	47.60	59.00	-11.40	19.54	28.06
2	12.31	34.79	59.00	-24.21	21.61	13.18
3	21.84	35.60	59.00	-23.40	22.55	13.05

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

Modulation	GFSK	Test Freq. (MHz)	2480



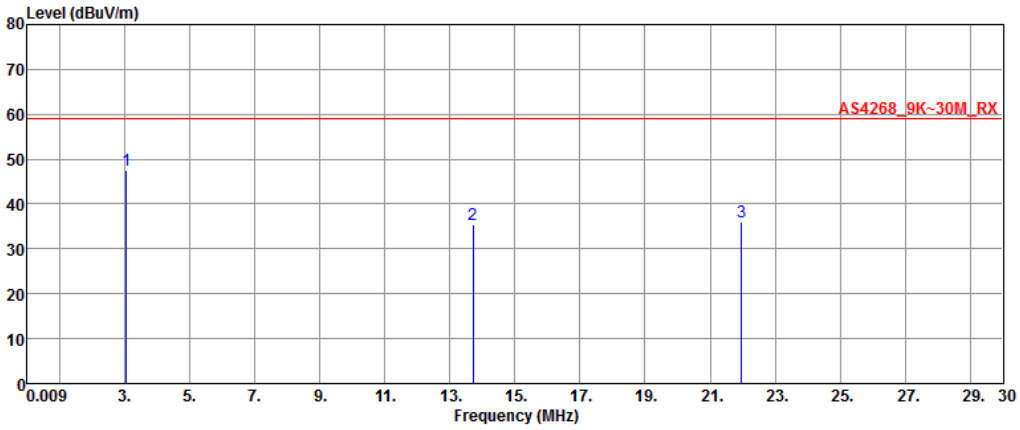
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	2.98	47.34	59.00	-11.66	19.54	27.80
2	14.88	35.99	59.00	-23.01	21.96	14.03
3	22.17	35.57	59.00	-23.43	22.56	13.01

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

Test Configuration 4

4.1.7 Receiver Radiated Unwanted Emissions (≤ 30MHz)

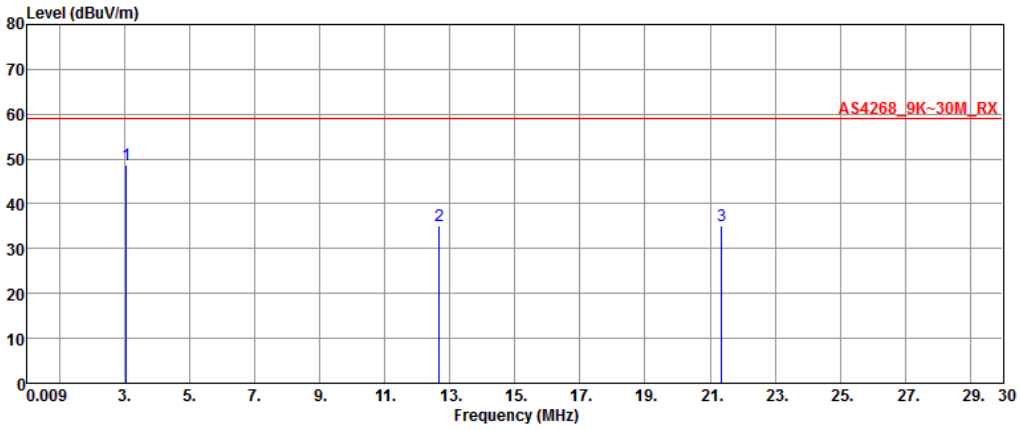
Modulation	GFSK	**Test Freq. (MHz)**	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.04	47.65	59.00	-11.35	19.55	28.10
2	13.71	35.52	59.00	-23.48	21.81	13.71
3	21.96	35.93	59.00	-23.07	22.56	13.37

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

Modulation	GFSK	Test Freq. (MHz)	2480

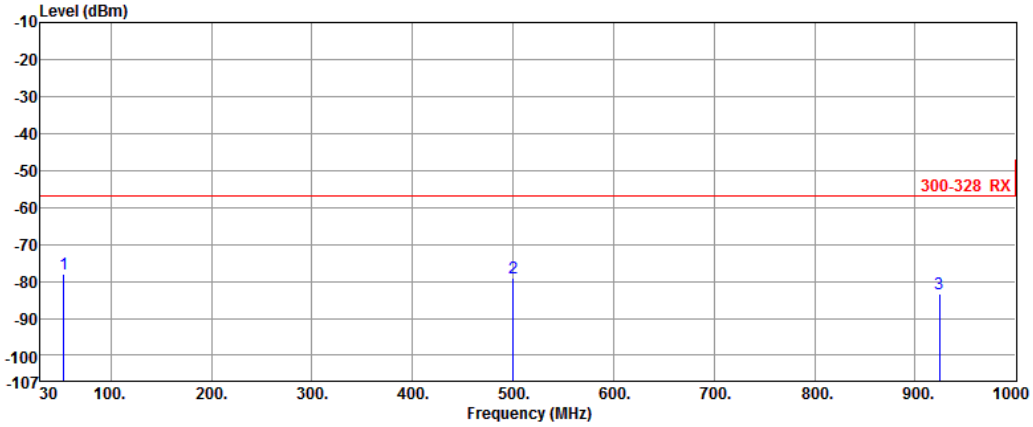


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBuV/m	dBuV/m	dB	dB	dBuV
1	3.04	48.79	59.00	-10.21	19.55	29.24
2	12.67	35.24	59.00	-23.76	21.66	13.58
3	21.36	35.20	59.00	-23.80	22.54	12.66

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

4.1.8 Receiver Conducted Unwanted Emissions (Below 1GHz)

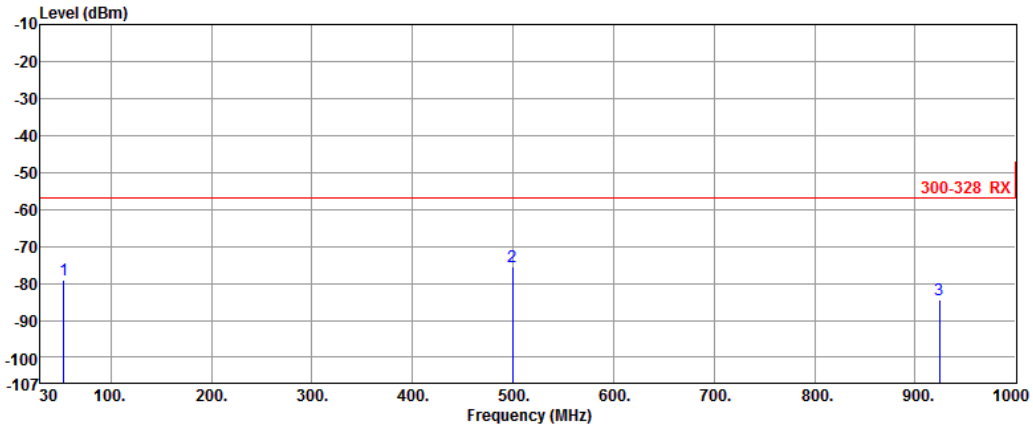
Modulation	GFSK	Test Freq. (MHz)	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	53.28	-77.92	-57.00	-20.92	0.00	-77.92
2	500.45	-79.10	-57.00	-22.10	0.00	-79.10
3	924.34	-83.32	-57.00	-26.32	0.00	-83.32

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

Modulation	GFSK	Test Freq. (MHz)	2480

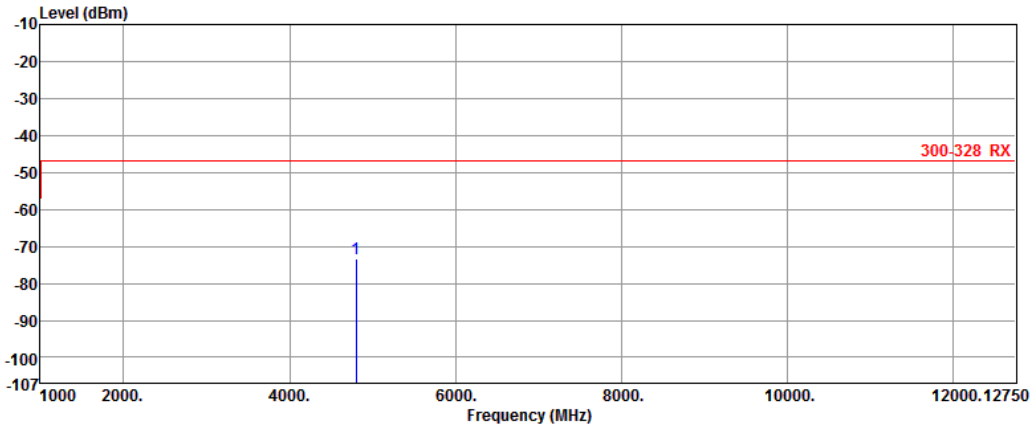


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	53.28	-79.22	-57.00	-22.22	0.00	-79.22
2	499.48	-75.65	-57.00	-18.65	0.00	-75.65
3	924.34	-84.43	-57.00	-27.43	0.00	-84.43

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

4.1.9 Receiver Conducted Unwanted Emissions (Above 1GHz)

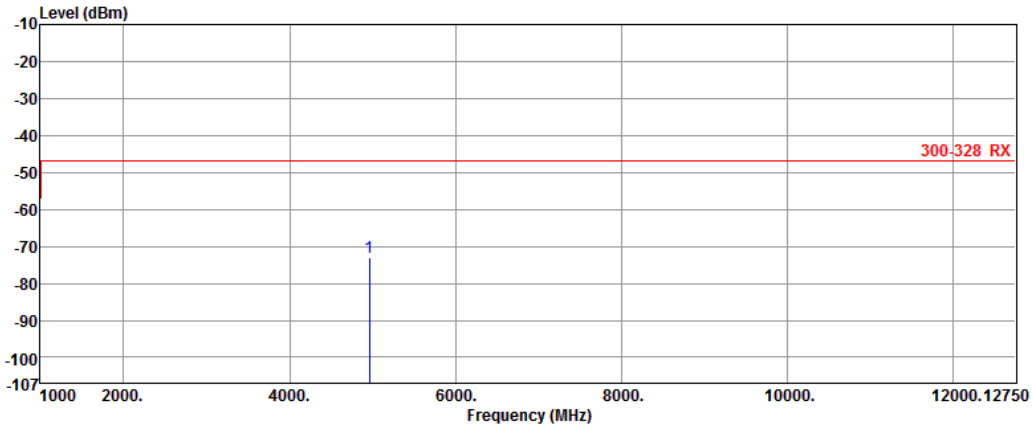
Modulation	GFSK	Test Freq. (MHz)	2402



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.99	-73.28	-47.00	-26.28	0.00	-73.28

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

Modulation	GFSK	Test Freq. (MHz)	2480

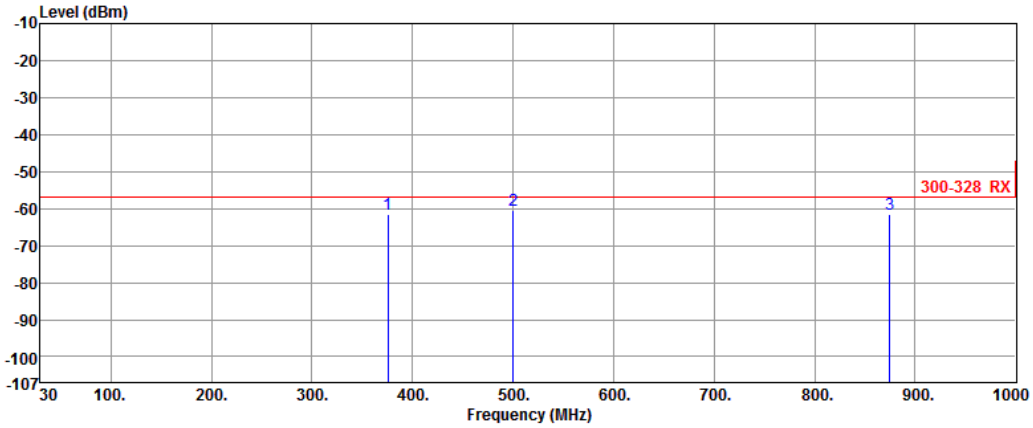


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.11	-72.94	-47.00	-25.94	0.00	-72.94

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

4.1.10 Receiver Radiated Unwanted Emissions (Below 1GHz)

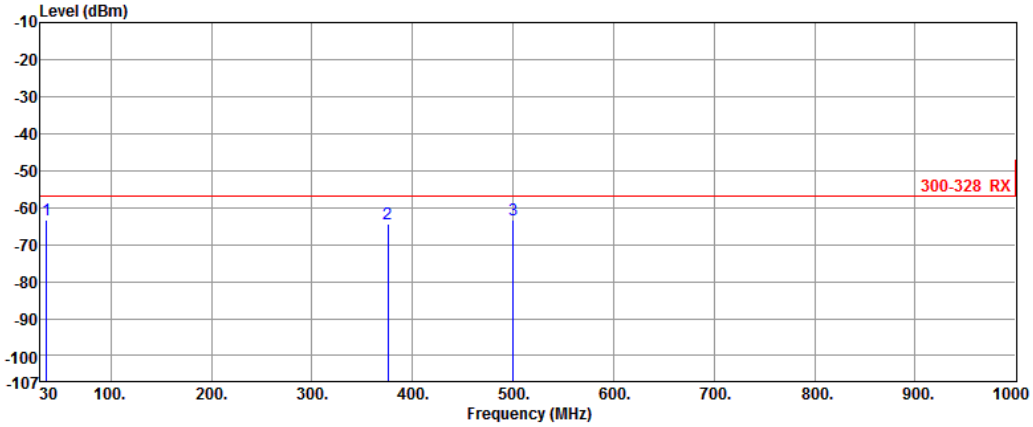
Modulation	GFSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	375.32	-61.60	-57.00	-4.60	0.06	-61.66
2	500.45	-60.60	-57.00	-3.60	3.46	-64.06
3	874.87	-61.61	-57.00	-4.61	9.63	-71.24

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

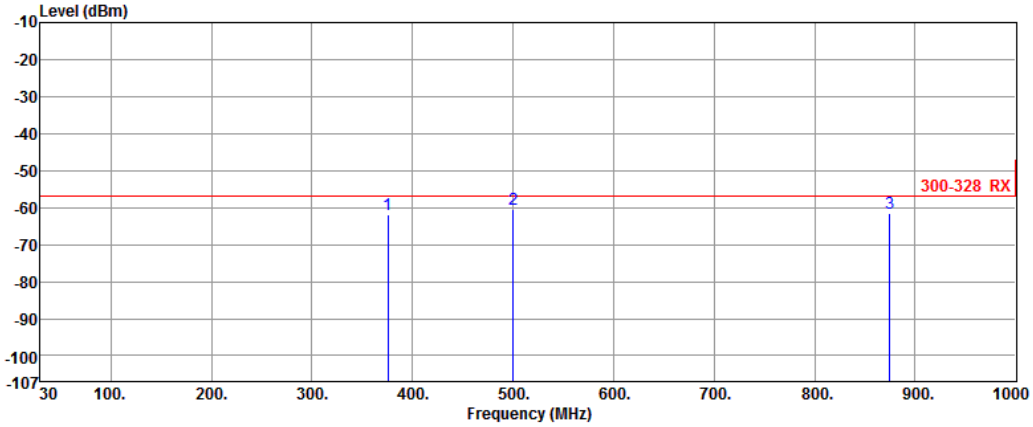
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	35.82	-63.46	-57.00	-6.46	-1.67	-61.79
2	375.32	-64.25	-57.00	-7.25	0.73	-64.98
3	500.45	-63.18	-57.00	-6.18	3.37	-66.55

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

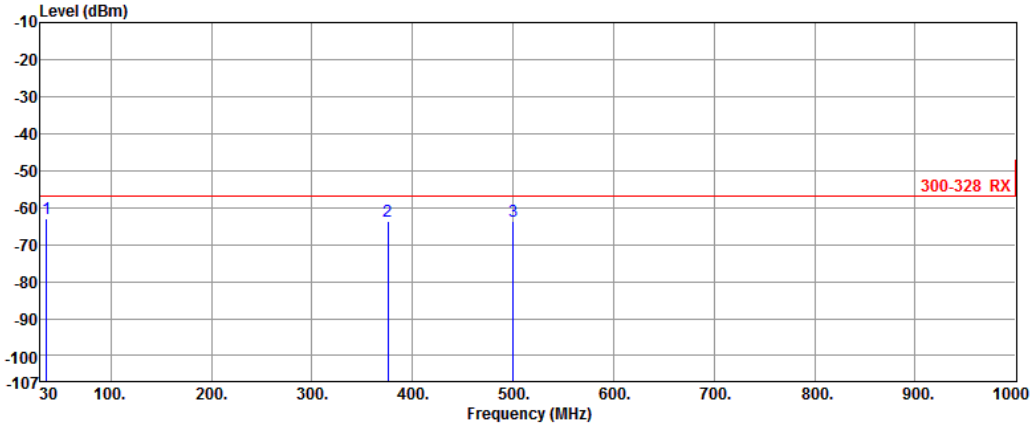
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	375.32	-62.05	-57.00	-5.05	0.06	-62.11
2	500.45	-60.33	-57.00	-3.33	3.46	-63.79
3	874.87	-61.48	-57.00	-4.48	9.63	-71.11

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	Vertical		

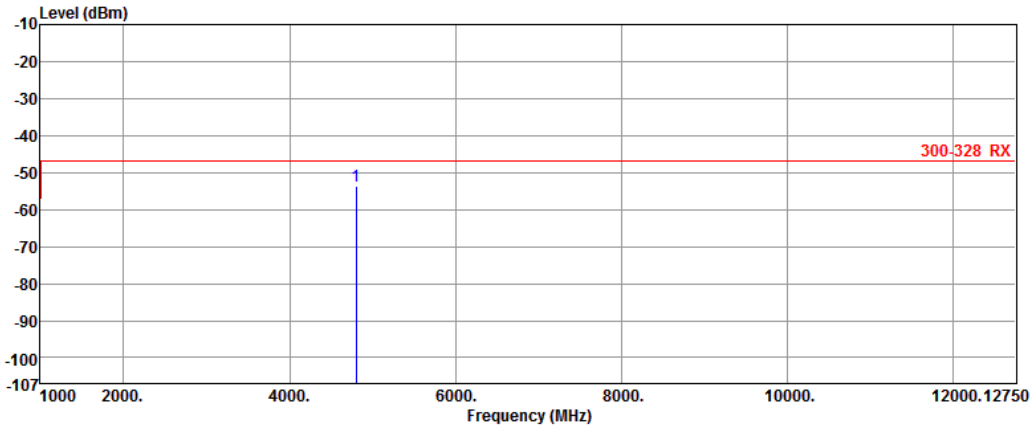


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	35.82	-62.94	-57.00	-5.94	-1.67	-61.27
2	375.32	-63.82	-57.00	-6.82	0.73	-64.55
3	500.45	-63.77	-57.00	-6.77	3.37	-67.14

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

4.1.11 Receiver Radiated Unwanted Emissions (Above 1GHz)

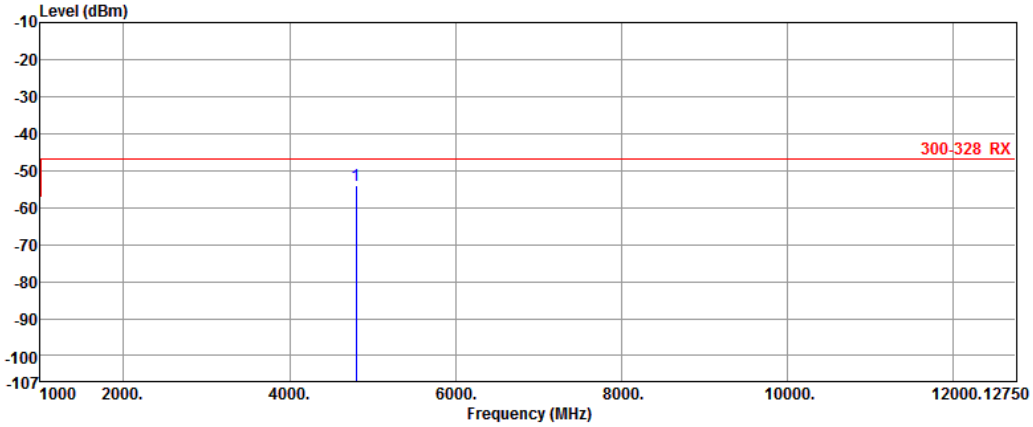
Modulation	GFSK	**Test Freq. (MHz)**	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.99	-53.76	-47.00	-6.76	12.67	-66.43

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

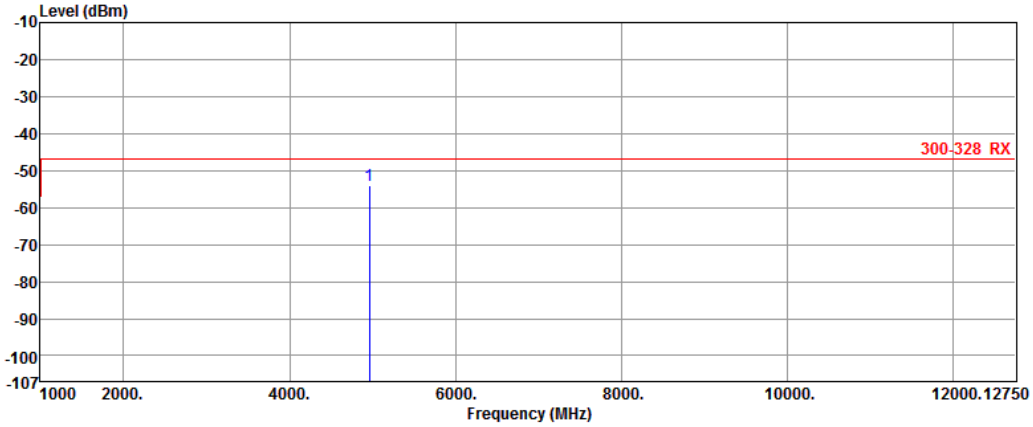
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.01	-54.01	-47.00	-7.01	12.66	-66.67

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

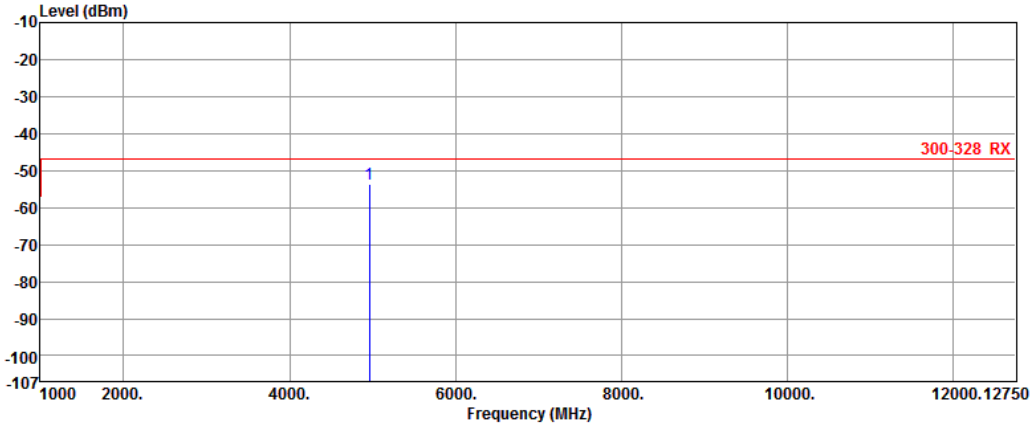
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.01	-53.95	-47.00	-6.95	12.60	-66.55

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		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4960.00	-53.74	-47.00	-6.74	12.93	-66.67

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

5 Receiver Blocking Test Results

5.1 Receiver Blocking

5.1.1 Limit of Receiver Blocking

Receiver Blocking Parameters for Receiver Category 1 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (see Note 2)**	**Type of Blocking Signal**
P_{min} + 6 dB	2 380 2 503,5	-53	CW
P_{min} + 6 dB	2 300 2 330 2 360	-47	CW
P_{min} + 6 dB	2 523,5 2 553,5 2 583,5 2 613,5 2 643,5 2 673,5	-47	CW
Note 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria (The minimum performance criterion shall be a PER less than or equal to 10 %) in the absence of any blocking signal. Note 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

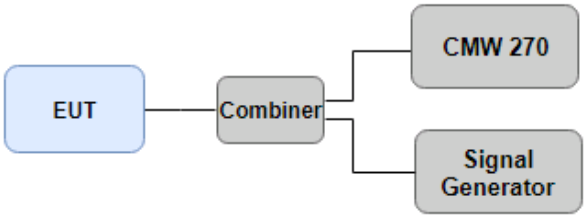
Receiver Blocking Parameters for Receiver Category 2 Equipment Limit			
Wanted Signal Mean Power from Companion Device (dBm)	**Blocking Signal Frequency (MHz)**	**Blocking Signal Power (dBm) (see Note 2)**	**Type of Blocking Signal**
P_{min} + 6 dB	2 380 2 503,5	-57	CW
P_{min} + 6 dB	2 300 2 583,5	-47	CW
Note 1: P_{min} is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria (The minimum performance criterion shall be a PER less than or equal to 10 %) in the absence of any blocking signal. Note 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.			

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

5.1.2 Test Procedures

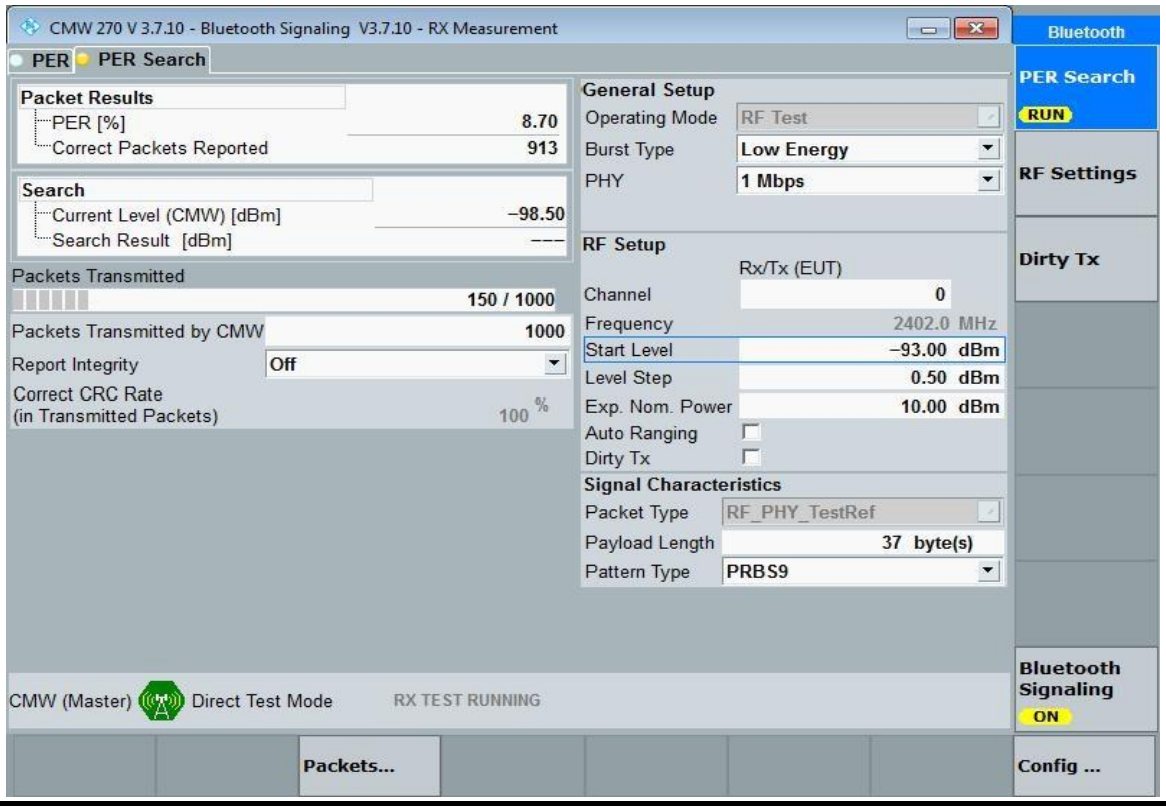
Reference to clause 5.4.11.2 of ETSI EN 300 328 V2.1.1 (2016-11).

5.1.3 Test Setup



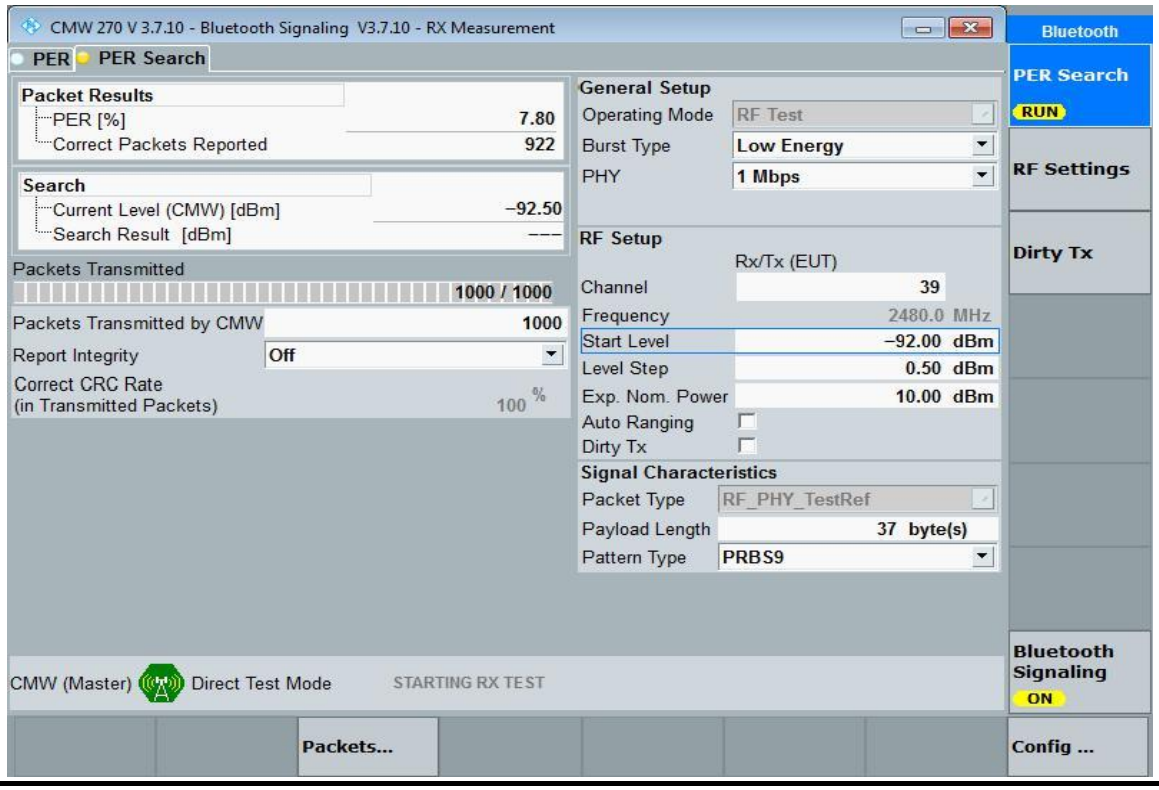
5.1.4 Test Result of Receiver Blocking

2402 MHz



Receiver Category	2		
Sensitivity Level (dBm)	-93		
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-87	2380.0	-54.21	Pass
-87	2503.5		Pass
-87	2300.0	-44.21	Pass
-87	2583.5		Pass

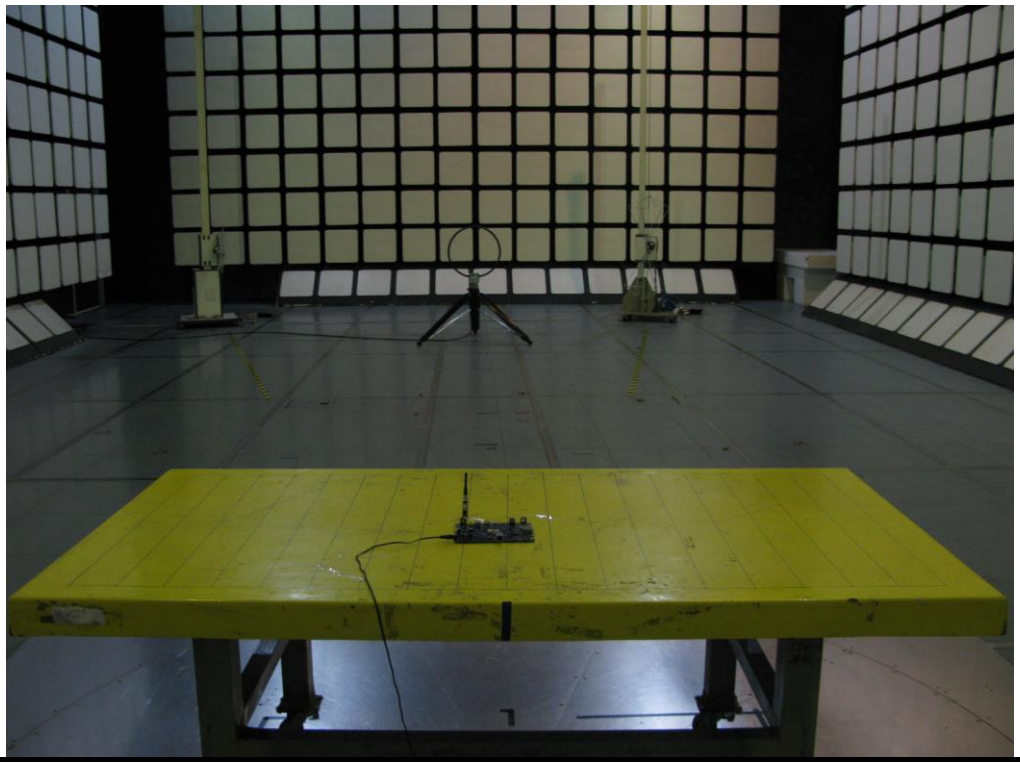
2480 MHz

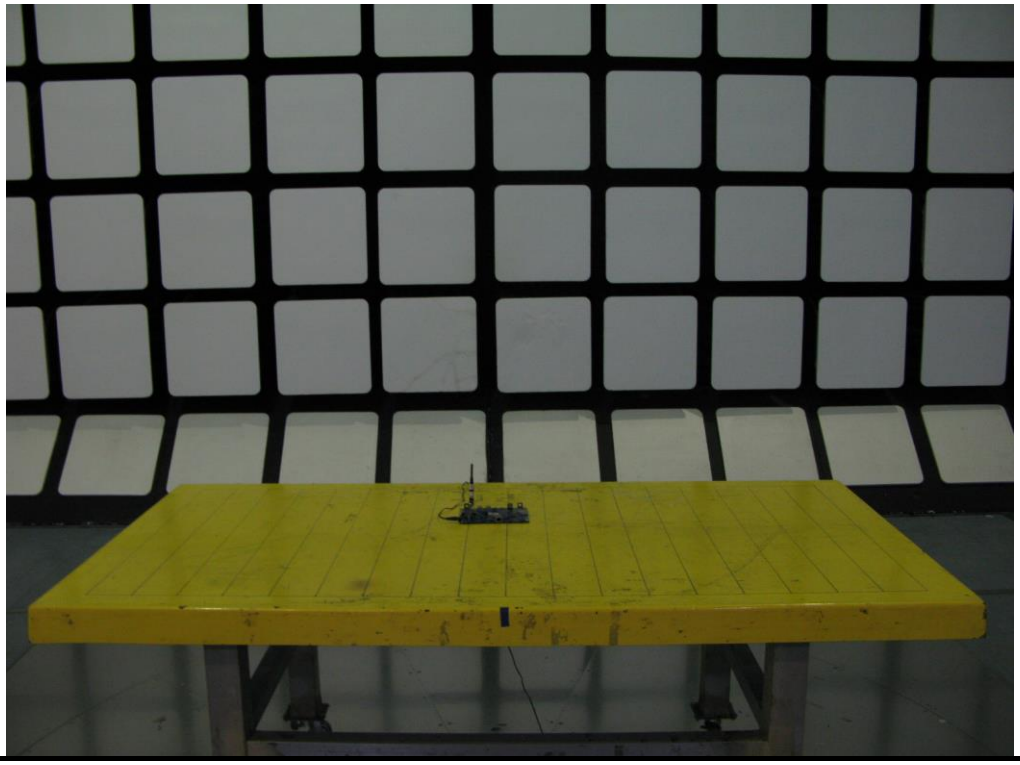


Receiver Category	2		
Sensitivity Level (dBm)	-92		
Wanted Signal Mean Power from Companion Device (dBm)	Blocking Signal Frequency (MHz)	Blocking Signal Power (dBm)	Test Result
-86	2380.0	-54.21	Pass
-86	2503.5		Pass
-86	2300.0	-44.21	Pass
-86	2583.5		Pass

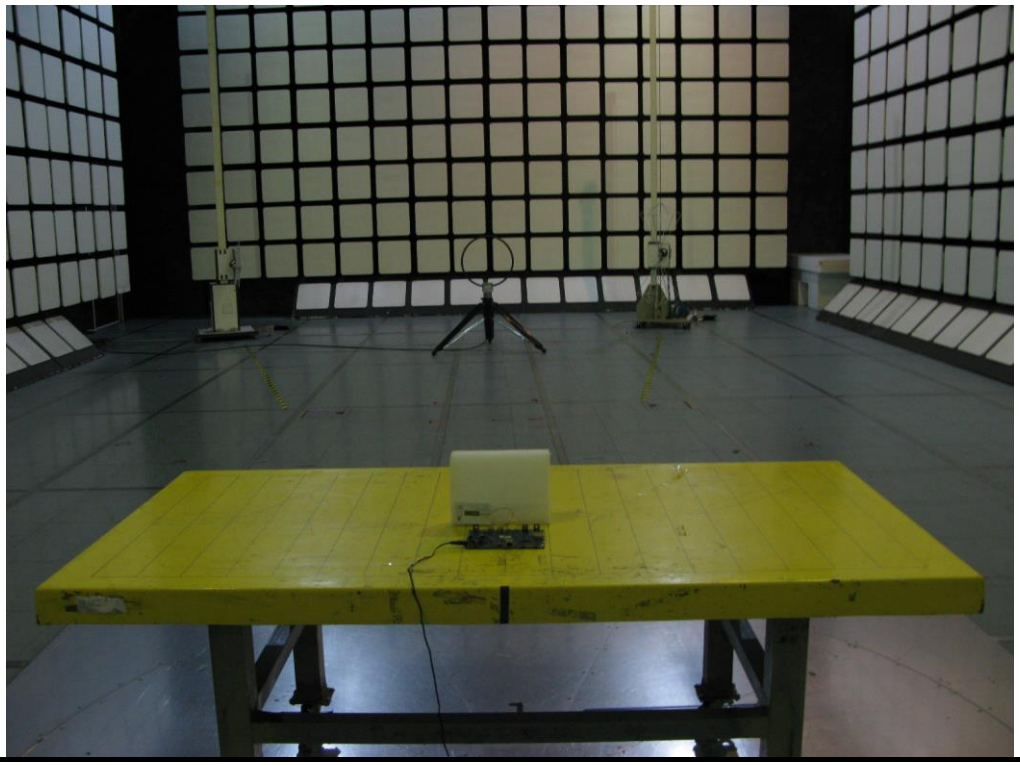
6 Photographs of the Test Configuration

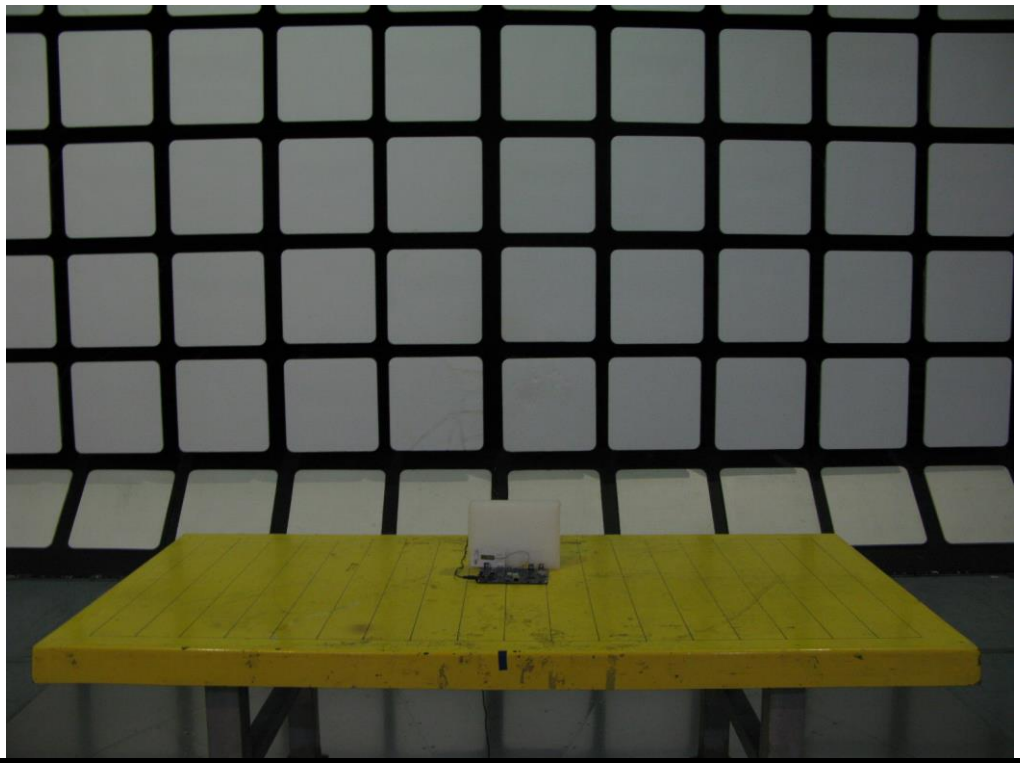
Spurious Emission Test below 30MHz (Dipole antenna)



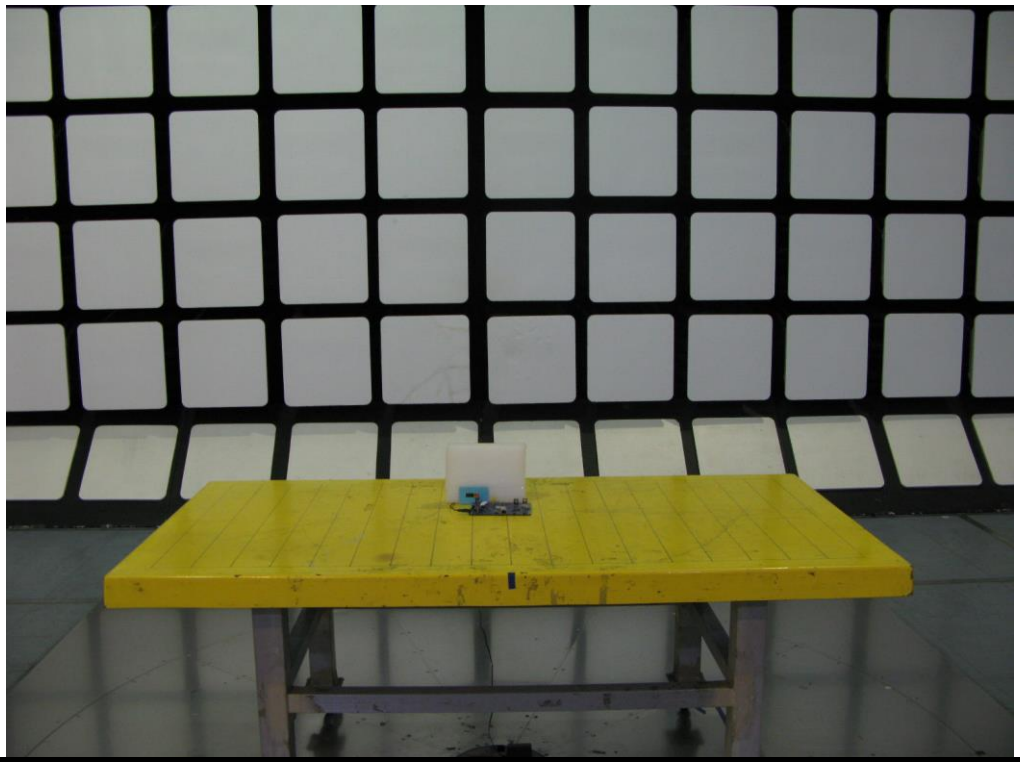


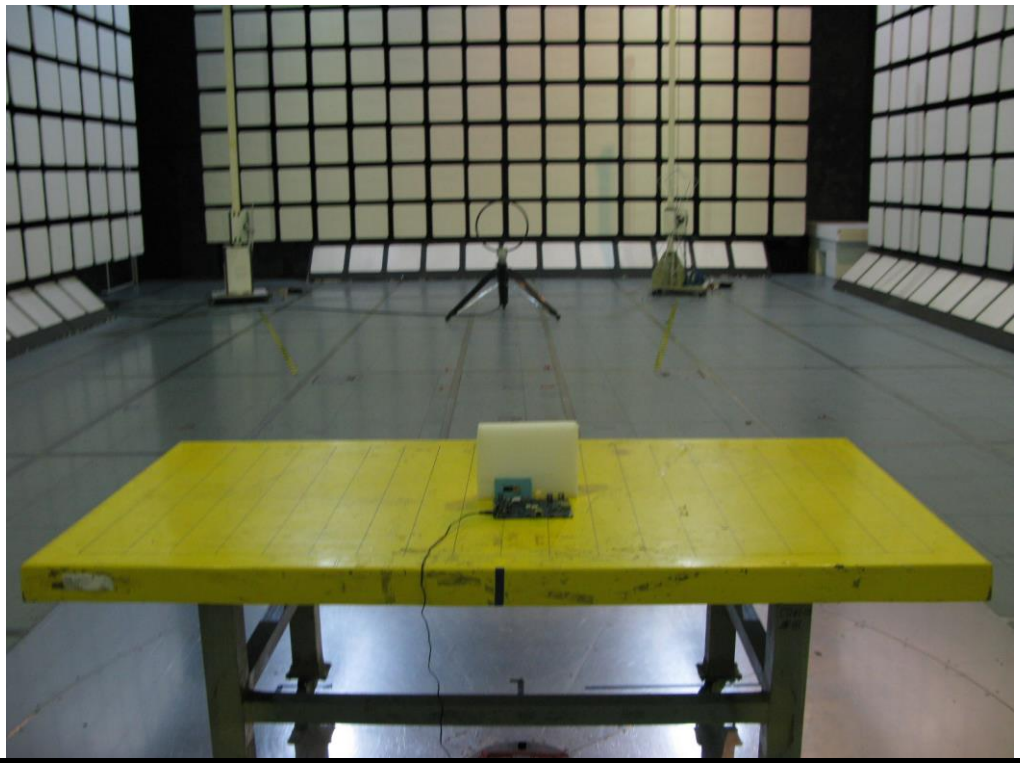
Spurious Emission Test below 30MHz (PCB Dipole antenna)



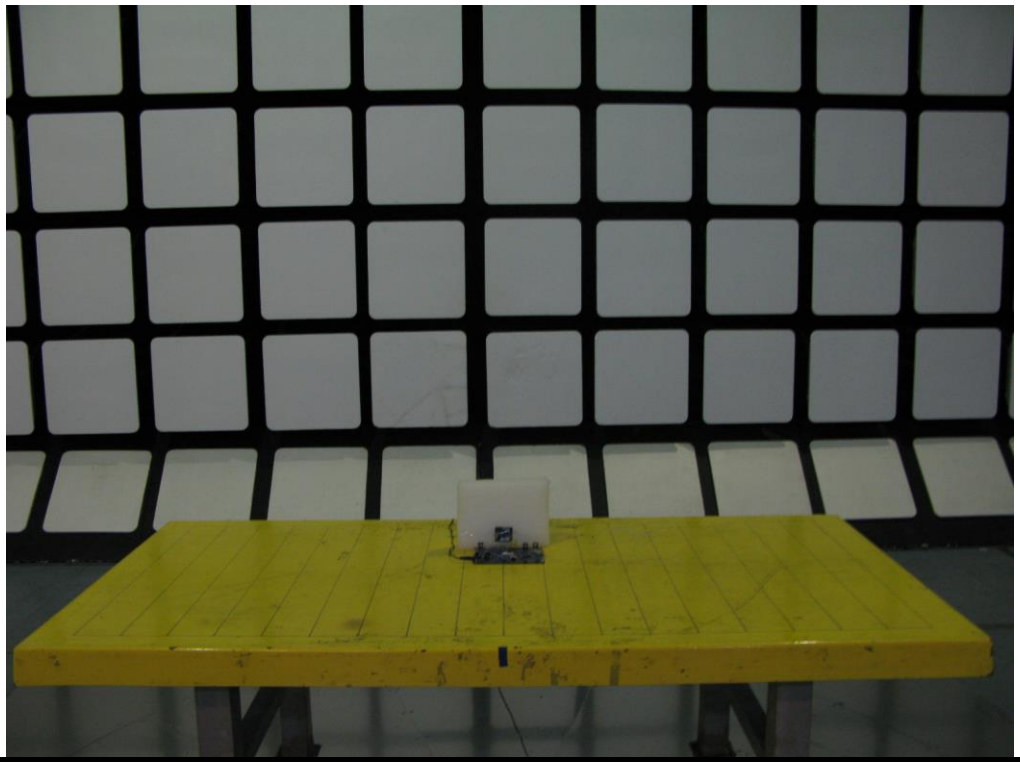


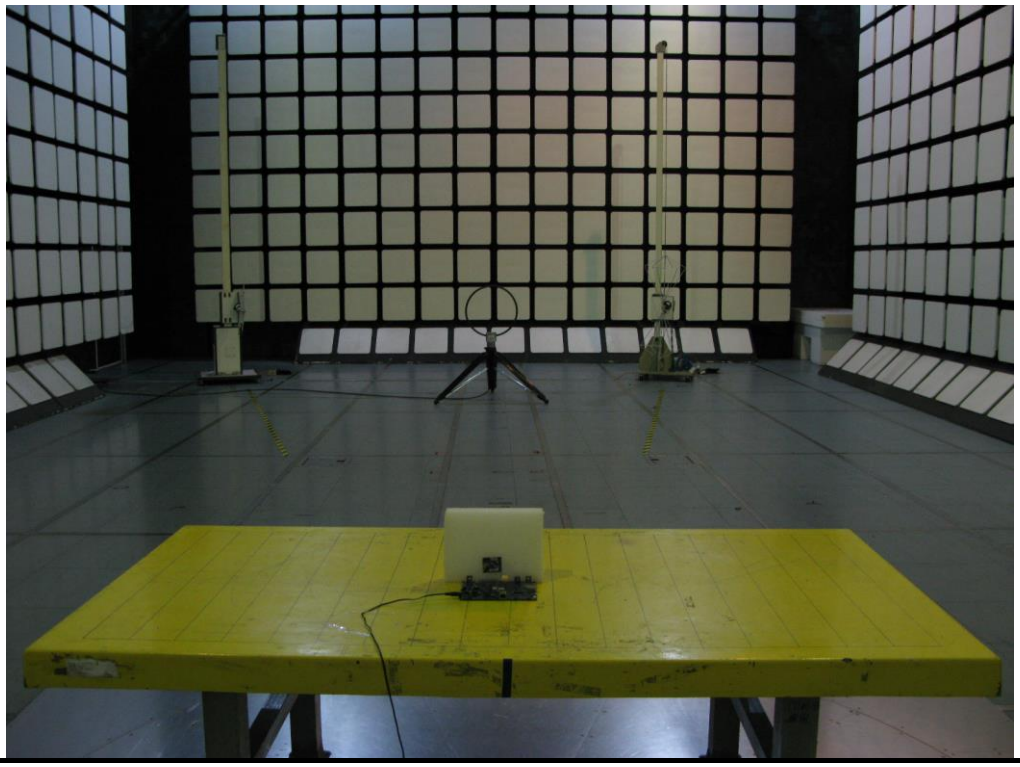
Spurious Emission Test below 30MHz (PIFA antenna)



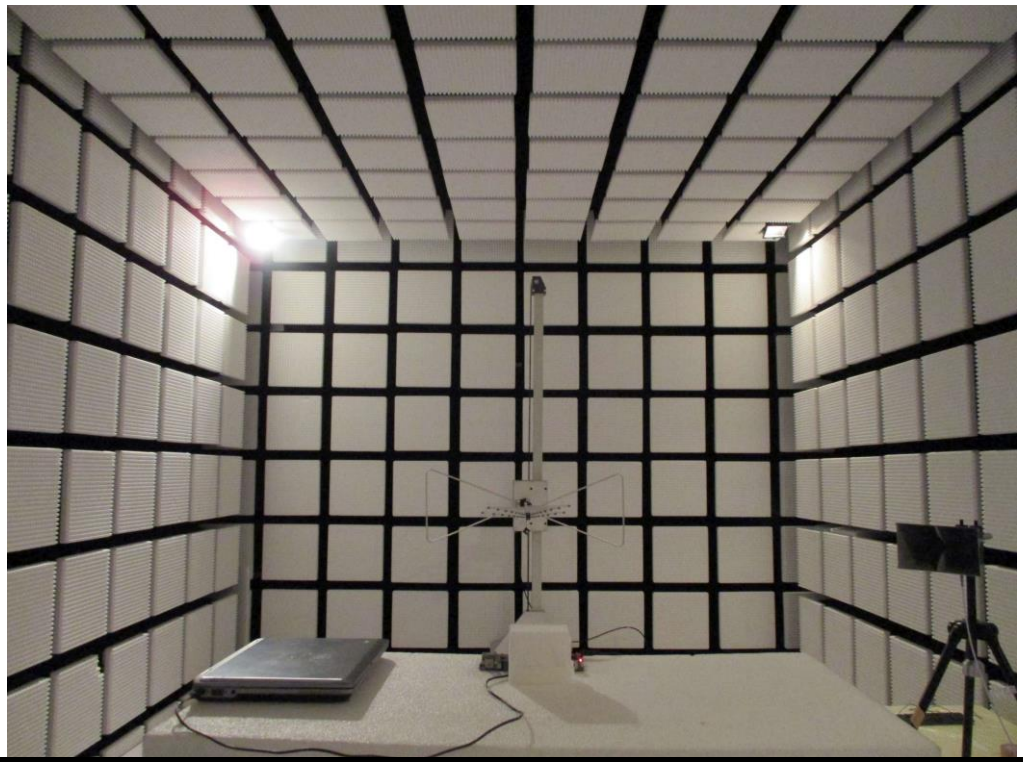


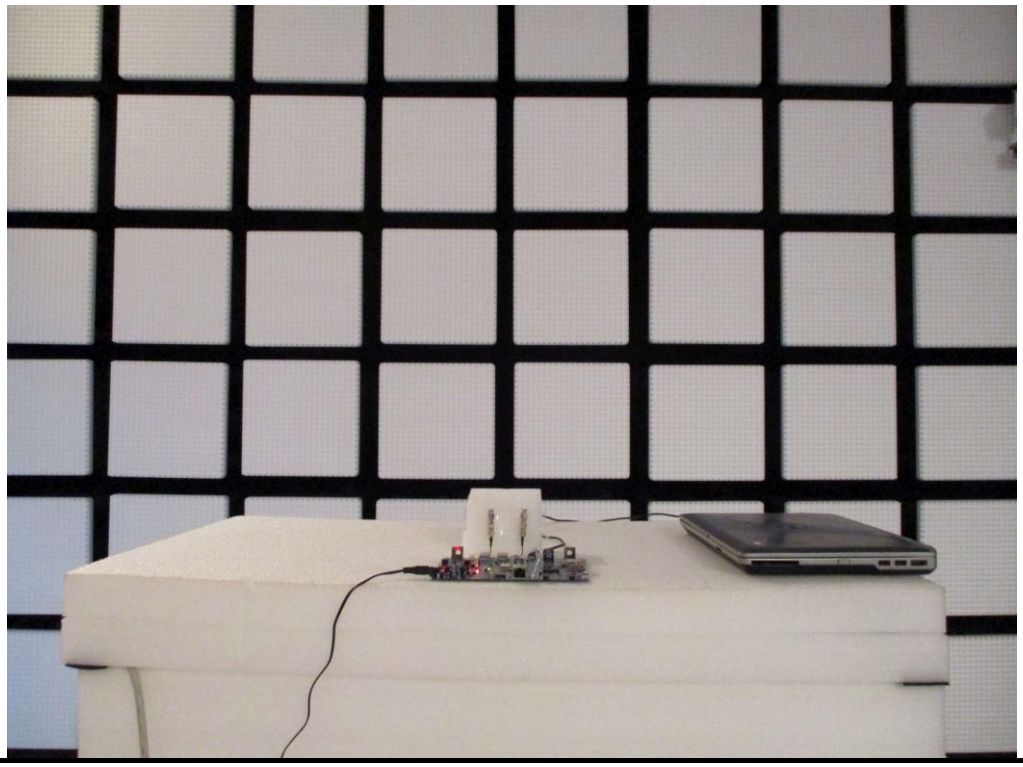
Spurious Emission Test below 30MHz (Magnetic Dipolewith)



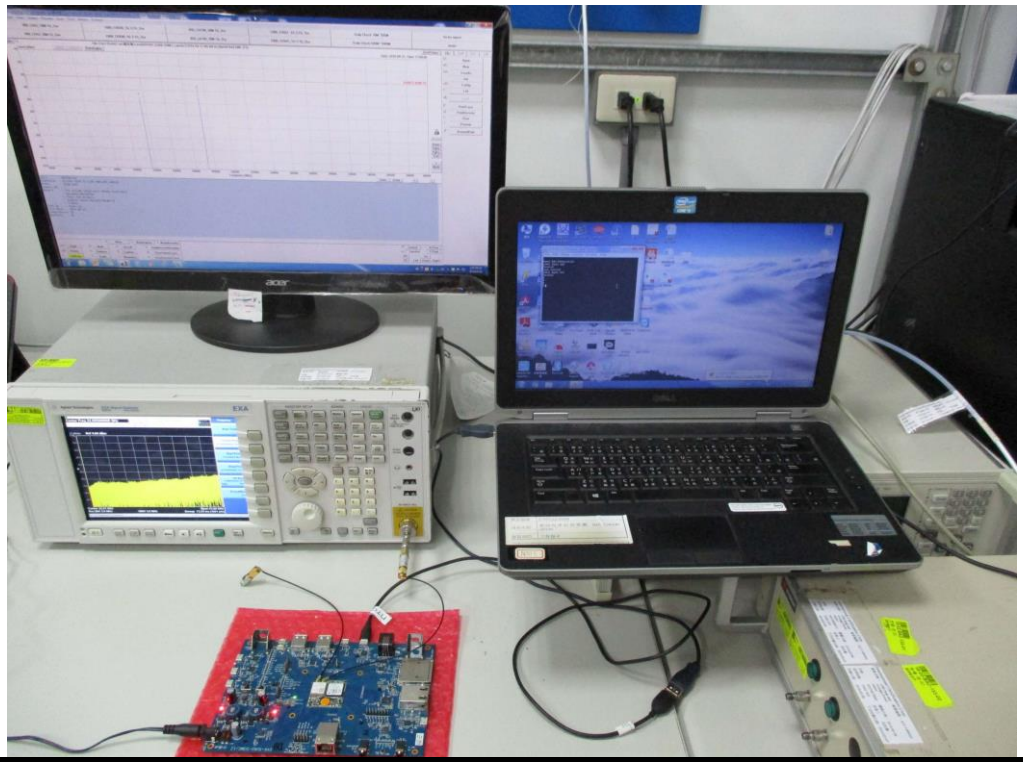


Radiated Spurious Emission Test above 30MHz





Conducted Spurious Emission Test



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	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	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

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