CE Test Report

Equipment	:	**CC2564 Bluetooth HCI Module**
Model No.	:	**CC2564MODN**
Brand Name	:	**Texas Instruments**
Applicant	:	**Texas Instruments Inc**
Address	:	**12500 TI Blvd, Dallas USA 75243**
Standard	:	**EN 300 328 V1.8.1 (2012-06)**
Received Date	:	**Dec. 04, 2013**
Tested Date	:	**Feb. 12 ~ Feb. 21, 2014**

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

Testing Laboratory
2732

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Release Record

Report No.	Version	Description	Issued Date
ER3D0402-01AD	Rev. 01	Initial issue	Apr. 24, 2014

Summary of Test Results

Ref. Std. Clause	Test Items	Measured	Result
4.3.1.1	RF Output Power	10.23dBm	Pass
4.3.1.2	Duty cycle, Tx-Sequence, Tx-gap	Only for non-adaptive equipment	N/A
4.3.1.3	Dwell time, Minimum Frequency Occupation & Hopping Sequence	Meet the requirement of limit.	Pass
4.3.1.4	Hopping Frequency Separation	Meet the requirement of limit.	Pass
4.3.1.5	Medium Utilisation (MU) factor	Only for non-adaptive equipment	N/A
4.3.1.6	Adaptivity	Meet the requirement of limit.	Pass
4.3.1.7	Occupied Channel Bandwidth	Meet the requirement of limit.	Pass
4.3.1.8	Transmitter unwanted emissions in the out of band domain	Meet the requirement of limit.	Pass
4.3.1.9	Transmitter unwanted emissions in the spurious domain	Meet the requirement of limit.	Pass
4.3.1.10	Receiver spurious emissions	Meet the requirement of limit.	Pass
4.3.1.11	Receiver Blocking	Meet the requirement of limit.	Pass

1 General Description

1.1 Information

1.1.1 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	BR V2.1	2402-2480	0-78 [79]	1 Mbps
2400-2483.5	EDR V2.1	2402-2480	0-78 [79]	2 Mbps
2400-2483.5	EDR V2.1	2402-2480	0-78 [79]	3 Mbps
Note 1: Bluetooth BR uses a GFSK. Note 2: Bluetooth EDR uses a combination of π/4-DQPSK and 8DPSK.				

1.1.2 Antenna Details

Ant. No.	Type	Gain (dBi)	Brand	Model
1	Chip antenna	-1.38	MAG.LAYERS	LTA-5320-2G4S3-A1

1.1.3 EUT Operational Condition

Type of Power Supply	3.3Vdc from host		
Operational Voltage	☒ Vnom (3.3 V)	☒ Vmax (4.8 V)	☒ Vmin (2.2 V)
Operational Climatic	☒ Tnom (20°C)	☒ Tmax (85°C)	☒ Tmin (-40°C)

1.1.4 Adaptive Equipment

Adaptive Equipment		
☐	non-Adaptive Equipment:	
	The maximum RF Output Power (e.i.r.p.): dBm	
	The maximum (corresponding) Duty Cycle: %	
☒	Adaptive Equipment without the possibility to switch to a non-adaptive mode:	
	☒	The equipment has implemented an LBT based DAA mechanism:
		☐ The equipment is Frame Based equipment
		☒ The equipment is Load Based equipment
		☐ The equipment can switch dynamically between Frame Based and Load Based equipment
	☐	The equipment has implemented an non-LBT based DAA mechanism
	☐	The equipment can operate in more than one adaptive mode
	☐	Adaptive Frequency Hopping using other forms of DAA (non-LBT based)/without Short Control Signaling Transmissions
☐	Adaptive Equipment which can also operate in a non-adaptive mode	

1.1.5 Accessories

N/A

1.1.6 Channel List

Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

1.1.7 Test Tool and Duty Cycle

Test Tool	HCITester 3.0.0.24
Duty Cycle Of Test Signal (%)	BR: 77.93%, EDR: 77.87%
Duty Factor (dB)	BR: 1.08, EDR: 1.09

1.1.8 Power Setting

Modulation Mode	**Test Frequency (MHz)**		
	2402	**2441**	**2480**
GFSK/1Mbps	0X18	0X18	0X18
8DPSK/3Mbps	0x18	0x18	0x18

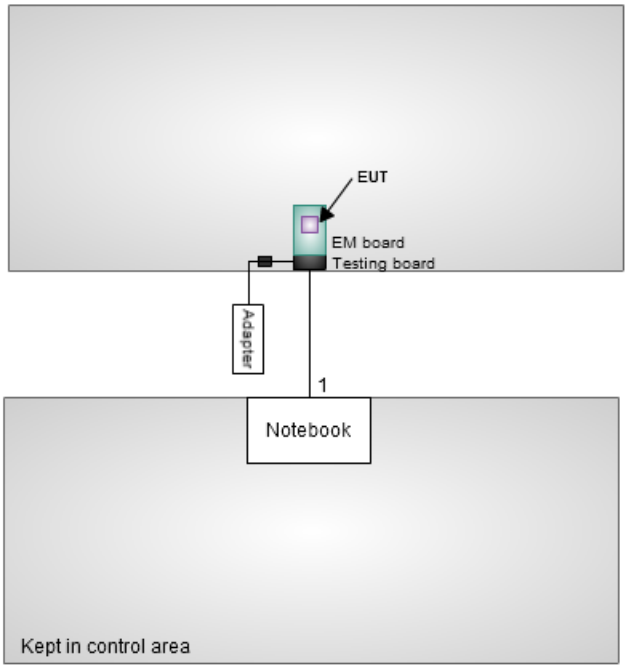
1.2 Local Support Equipment List

Support Equipment List						
No.	**Equipment**	**Brand**	**Model**	**S/N**	**FCC ID**	**Signal cable / Length (m)**
1	Notebook	DELL	E6430	---	---	RS232, 3m non-shielded
2	Testing board	Ampak	WSDT-70XX _EVB_V00	---	---	---
3	EM Board	---	---	---	---	---

Note: No. 2-3 are provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram – Radiated Test



1. RS232, 3m non-shielded

1.4 Test Equipment List and Calibration Data

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Jan. 25, 2014	Jan. 24, 2015
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Dec. 11, 2013	Dec. 10, 2014
Power Meter	Anritsu	ML2495A	1241002	Oct. 24, 2013	Oct. 23, 2014
Power Sensor	Anritsu	MA2411B	1207366	Oct. 24, 2013	Oct. 23, 2014
Signal Generator	R&S	SMB100A	175727	Jan. 07, 2014	Jan. 06, 2015
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emissions				
Test Site	Fully-anechoic chamber 1 / (05CH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	Agilent	N9010A	MY52221474	Sep. 26, 2013	Sep. 25, 2014
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-523	Jan. 23, 2014	Jan. 22, 2015
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1094	Feb. 06, 2014	Feb. 05, 2015
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 14, 2014	Jan. 13, 2015
Preamplifier	Agilent	83017A	MY39501310	Dec. 18, 2013	Dec. 17, 2014
Preamplifier	EMC	EMC02325	980146	Dec. 26, 2013	Dec. 25, 2014
Preamplifier	EM	EM18G40G	060572	Jun. 20, 2013	Jun. 19, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16617/4	Jan. 28, 2014	Jan. 27, 2015
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16609/4	Jan. 28, 2014	Jan. 27, 2015
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16608/4	Jan. 28, 2014	Jan. 27, 2015
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16126/4	Dec. 18, 2013	Dec. 17, 2014
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-005	Dec. 18, 2013	Dec. 17, 2014
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-006	Dec. 18, 2013	Dec. 17, 2014
Power Meter	Anritsu	ML2495A	1218007	Oct. 31, 2013	Oct. 30, 2014
Power Sensor	Anritsu	MA2411B	1207367	Oct. 31, 2013	Oct. 30, 2014
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 V1.8.1 (2012-06)

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	± 0.004 %	± 5 %
RF output power, conducted	±0.551 dB	±1.5 dB
Power Spectral Density, conducted	±0.979 dB	±3 dB
Unwanted Emissions, conducted	±2.919 dB	±3 dB
All emissions, radiated	±2.962 dB	±6 dB
Temperature	±0.3 °C	±1 °C
Humidity	±0.43%	±5%
DC and low frequency voltages	±0.28%	±3%
Time	±1%	±5%
Duty Cycle	±1%	±5%

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
RF Conducted	TH01-WS	22.1°C / 61%	Jack Li
Radiated Emission	05CH01-WS	16°C / 60%	Walker Hou

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Test Configuration
RF Output Power	GFSK 8DPSK	Hopping	1 Mbps 3 Mbps	---
Dwell Time Minimum Frequency Occupation Hopping Sequence	GFSK 8DPSK	Hopping	1 Mbps 3 Mbps	---
Hopping Frequency Separation	GFSK 8DPSK	two-adjacent	1 Mbps 3 Mbps	---
Occupied Channel Bandwidth	GFSK 8DPSK	2402 / 2480 2402 / 2480	1 Mbps 3 Mbps	---
Transmitter unwanted emissions in the OOB domain	GFSK 8DPSK	Hopping	1 Mbps 3 Mbps	---
Transmitter Spurious Emissions	GFSK 8DPSK	2402 / 2480 2402 / 2480	1 Mbps 3 Mbps	---
Receiver Spurious Emissions	GFSK 8DPSK	2402 / 2480 2402 / 2480	1 Mbps 3 Mbps	---
Adaptivity / Receiver Blocking	GFSK	2402 / 2480	1 Mbps	---
NOTE: The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** result was found as the worst case and was shown in this report.				

3 Transmitter Test Results

3.1 RF Output Power

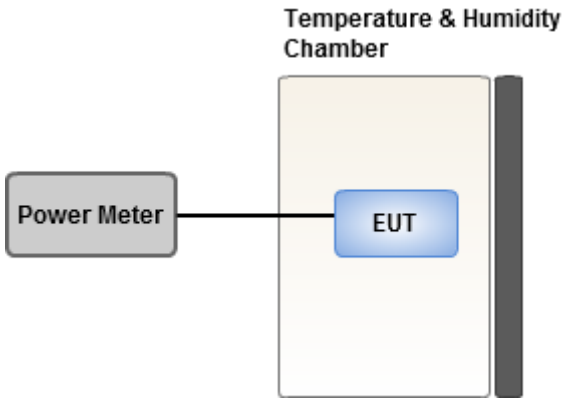
3.1.1 Limit of RF Output Power

The maximum RF output power for adaptive Frequency Hopping equipment 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 V1.8.1 (2012-06).

3.1.3 Test Setup



3.1.4 Test Result of RF Output Power

Condition	Modulation Mode	Freq. (MHz)	EIRP Power	Limit (dBm)
$T_{nom}V_{nom}$	GFSK/1Mbps	Hopping	9.63	20
$T_{min}V_{nom}$	GFSK/1Mbps	Hopping	10.23	20
$T_{max}V_{nom}$	GFSK/1Mbps	Hopping	9.05	20

Condition	Modulation Mode	Freq. (MHz)	EIRP Power	Limit (dBm)
$T_{nom}V_{nom}$	8DPSK/3Mbps	Hopping	8.98	20
$T_{min}V_{nom}$	8DPSK/3Mbps	Hopping	9.48	20
$T_{max}V_{nom}$	8DPSK/3Mbps	Hopping	8.41	20

3.2 Dwell Time, Minimum Frequency Occupation and Hopping Sequence

3.2.1 Limit of Dwell Time, Minimum Frequency Occupation and Hopping Sequence

The Dwell Time is the time that a particular hopping frequency would be occupied by the transmitter during a single hop. The equipment itself is not required to transmit on this hopping frequency during the Dwell Time.

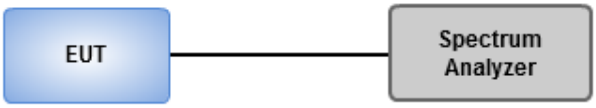
The Minimum Frequency Occupation Time is the minimum time each hopping frequency shall be occupied within a given period.

The Hopping Sequence of a Frequency Hopping system is the unrepeated pattern of the hopping frequencies used by the equipment.

3.2.2 Test Procedures

Reference to clause 5.3.4.2 of ETSI EN 300 328 V1.8.1 (2012-06).

3.2.3 Test Setup



3.2.4 Test Result of Dwell Time

Modulation Mode	Freq. (MHz)	Hopping Mode	Worst Duty Cycle Data Packet	Minimum Number of Hop Freq. (N)	Dwell Time per Hop (ms)	Number of Hop in [N x MDT]	[N x MDT] (s)	Dwell Time in [N x MDT] (ms)	Max. Dwell Time (MDT) Limit (ms)
GFSK/1Mbps	Hopping	Non-AFH	DH5	79	2.93	106.6	31.6	312.34	400.00
8DPSK/3Mbps	Hopping	AFH	DH5	20	2.92	106.6	8	311.27	400.00

3.2.5 Test Result of Minimum Frequency Occupation

Modulation Mode	Freq. (MHz)	Hopping Mode	Worst Duty Cycle Data Packet	Actual No. of Hopping Freq. (N)	Dwell Time per Hop (ms)	No. of Hop in [4 x dwell time per hop x N]	[4 x dwell time per hop x N] (ms)	Dwell Time in [4 x dwell time per hop x N] (ms)	Min. No. of Hopping Limit in [4 x dwell time per hop x N]
GFSK/1Mbps	Hopping	Non-AFH	DH5	79	2.93	3.13	925.88	9.17	1
8DPSK/3Mbps	Hopping	AFH	DH5	20	2.92	3.11	233.60	9.08	1

3.2.6 Test Result of Hopping Sequence

Modulation Mode	Freq. (MHz)	Hopping Mode	Hopping Channels	Hopping Channels Limits	F_l 20dB (MHz)	F_h 20dB (MHz)	Min. Hopping Range (%)	Min. Hopping Range Limit (%)
GFSK/1Mbps	Hopping	Non-AFH	79	15	N/A	N/A	N/A	N/A
8DPSK/3Mbps	Hopping	AFH	20	20	2418	2479	78.21%	70.00%

3.3 Hopping Frequency Separation

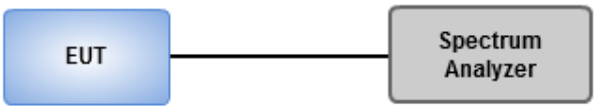
3.3.1 Limit of Hopping Frequency Separation

The minimum Hopping Frequency Separation shall be equal to Occupied Channel Bandwidth of a single hop, with a minimum separation of 100 kHz.

3.3.2 Test Procedures

Reference to clause 5.3.5.2 of ETSI EN 300 328 V1.8.1 (2012-06).

3.3.3 Test Setup



3.3.4 Test Result of Hopping Frequency Separation

Modulation Mode	Freq. (MHz)	Hopping Mode	$F2402_{PK}$ (MHz)	$F2403_{PK}$ (MHz)	F_{HS} (MHz)	Limit F_{HS} (MHz)
GFSK/1Mbps	two-adjacent	Non-AFH	2402.069	2403.069	1.0000	1
8DPSK/3Mbps	two-adjacent	AFH	2480.108	2481.108	1.0000	1

3.4 Occupied Channel Bandwidth

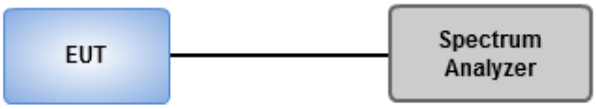
3.4.1 Limit of Occupied Channel Bandwidth

The Occupied Channel Bandwidth for each hopping 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 Occupied Channel Bandwidth for every occupied hopping frequency shall be equal to or less than the value declared by the supplier. This declared value shall not be greater than 5 MHz.

3.4.2 Test Procedures

Reference to clause 5.3.8.2 of ETSI EN 300 328 V1.8.1 (2012-06).

3.4.3 Test Setup

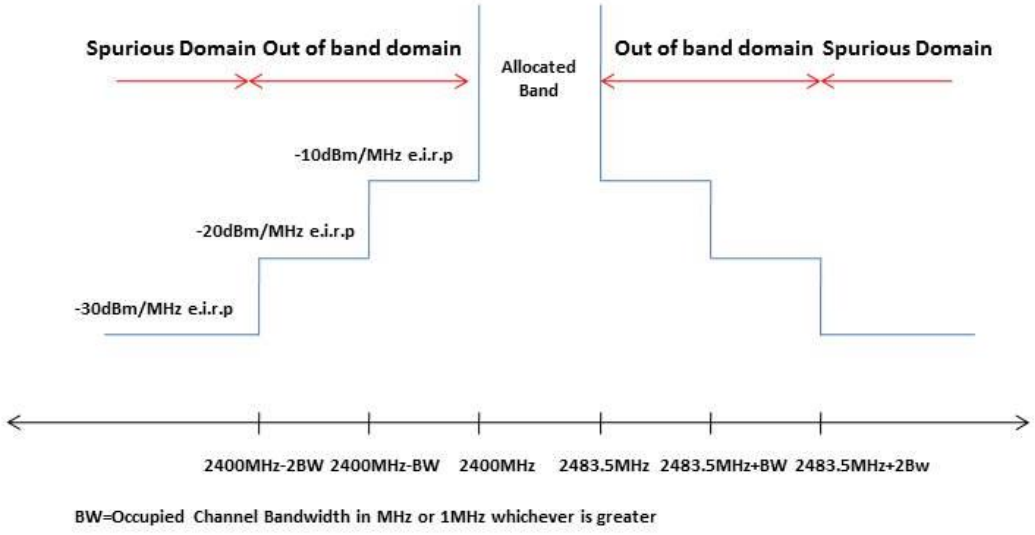


3.4.4 Test Result of Occupied Channel Bandwidth

Modulation Mode	Frequency (MHz)	99% Bandwidth (MHz)	F_L at 99% BW (MHz)	F_H at 99% BW (MHz)	20dB Bandwidth (MHz)	Limit F_L / F_H (MHz)
GFSK/1Mbps	2402	0.912	2401.558	2402.47	1.114	2400.0
GFSK/1Mbps	2480	0.926	2479.551	2480.477	1.099	2483.5
8DPSK/3Mbps	2402	1.266	2401.385	2402.651	1.432	2400.0
8DPSK/3Mbps	2480	1.259	2479.384	2480.643	1.425	2483.5

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

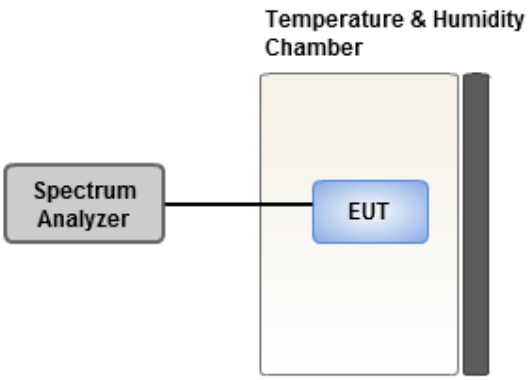
3.5.1 Limit of Transmitter Unwanted Emissions in the Out-Of-Band Domain



3.5.2 Test Procedures

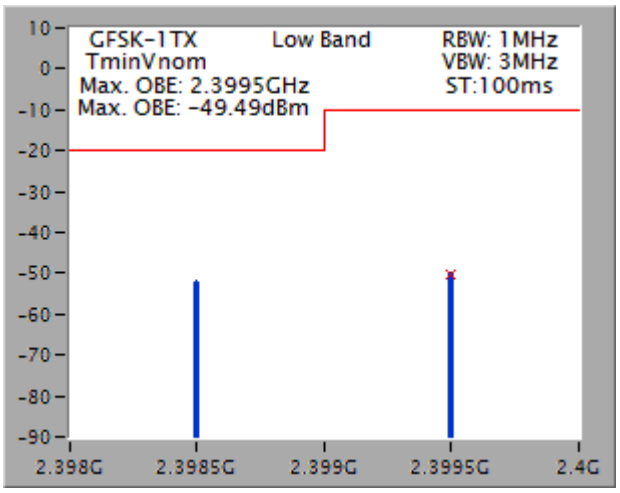
Reference to clause 5.3.9.2 of ETSI EN 300 328 V1.8.1 (2012-06).

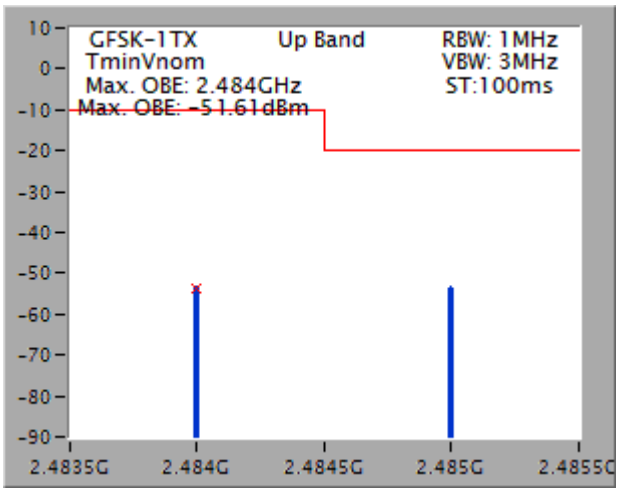
3.5.3 Test Setup



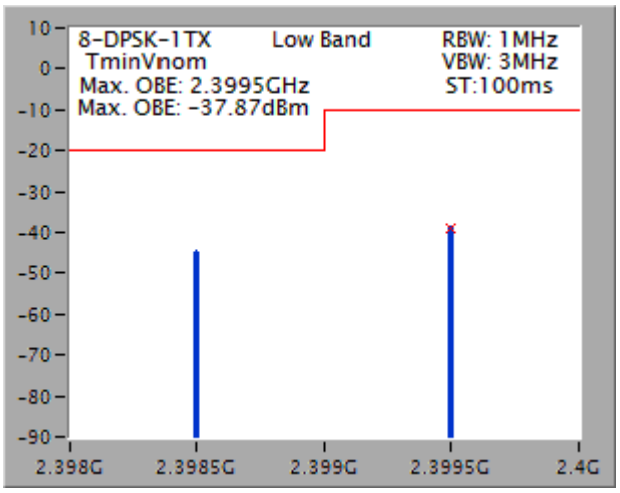
3.5.4 Test Result of Transmitter Unwanted Emissions in the Out-Of-Band Domain

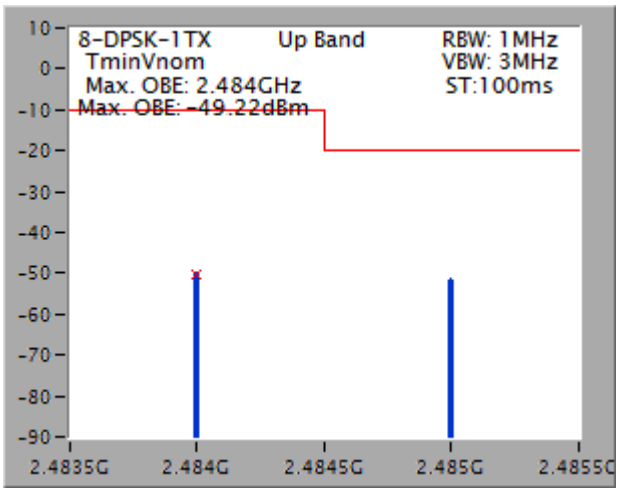
Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
$T_{nom}V_{nom}$	GFSK/1Mbps	Hopping	2399.5	-49.62	-10
$T_{min}V_{nom}$	GFSK/1Mbps	Hopping	2399.5	-49.49	-10
$T_{max}V_{nom}$	GFSK/1Mbps	Hopping	2399.5	-51.50	-10
$T_{nom}V_{nom}$	GFSK/1Mbps	Hopping	2485	-51.71	-10
$T_{min}V_{nom}$	GFSK/1Mbps	Hopping	2485	-51.61	-10
$T_{max}V_{nom}$	GFSK/1Mbps	Hopping	2485	-52.12	-10
Low Band			**Up Band**		





Condition	Modulation Mode	Freq. (MHz)	OOB Freq. (MHz)	OOB Emissions (dBm)	Limit (dBm)
$T_{nom}V_{nom}$	8DPSK/3Mbps	Hopping	2399.5	-38.70	-10
$T_{min}V_{nom}$	8DPSK/3Mbps	Hopping	2399.5	-37.87	-10
$T_{max}V_{nom}$	8DPSK/3Mbps	Hopping	2399.5	-40.20	-10
$T_{nom}V_{nom}$	8DPSK/3Mbps	Hopping	2484	-49.93	-10
$T_{min}V_{nom}$	8DPSK/3Mbps	Hopping	2484	-49.22	-10
$T_{max}V_{nom}$	8DPSK/3Mbps	Hopping	2484	-51.44	-10
Low Band			**Up Band**		





3.6 Transmitter Unwanted Emissions In The Spurious Domain

3.6.1 Limit of Transmitter Unwanted Emissions In The Spurious Domain

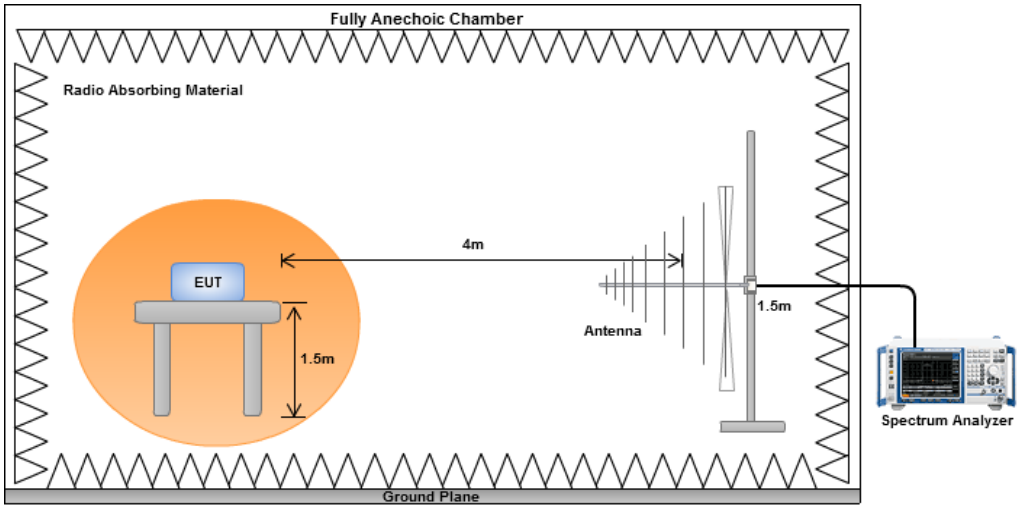
Frequency Range (MHz)	Maximum power (dBm) e.r.p (<=1GHz) e.i.r.p (>1GHz)	Bandwidth (kHz)
30 to 47	-36	100
47 to 74	-54	100
74 to 87.5	-36	100
87.5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 862	-54	100
862 to 1000	-36	100
1000 to 12750	-30	1000

3.6.2 Test Procedures

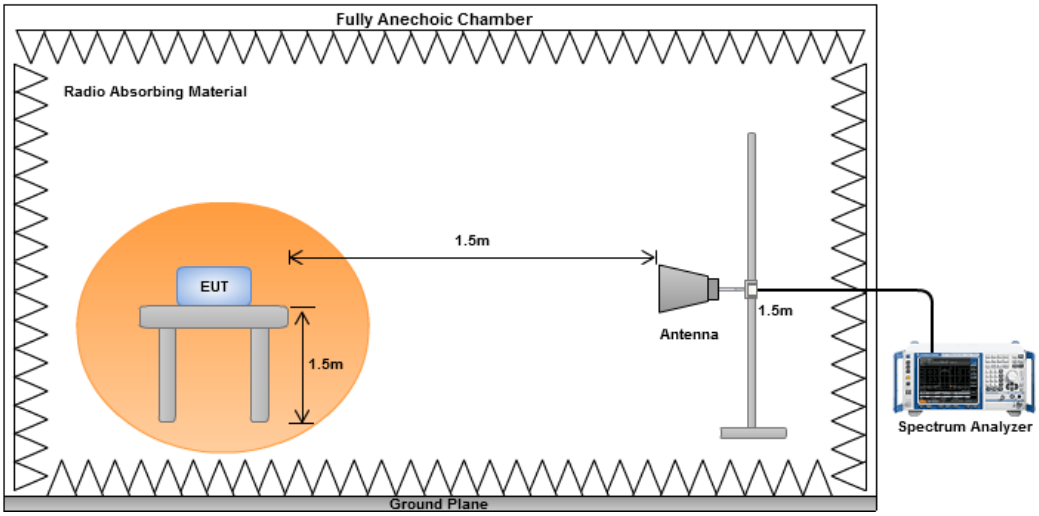
Reference to clause 5.3.10.2 of ETSI EN 300 328 V1.8.1 (2012-06).

3.6.3 Test Setup

Below 1GHz

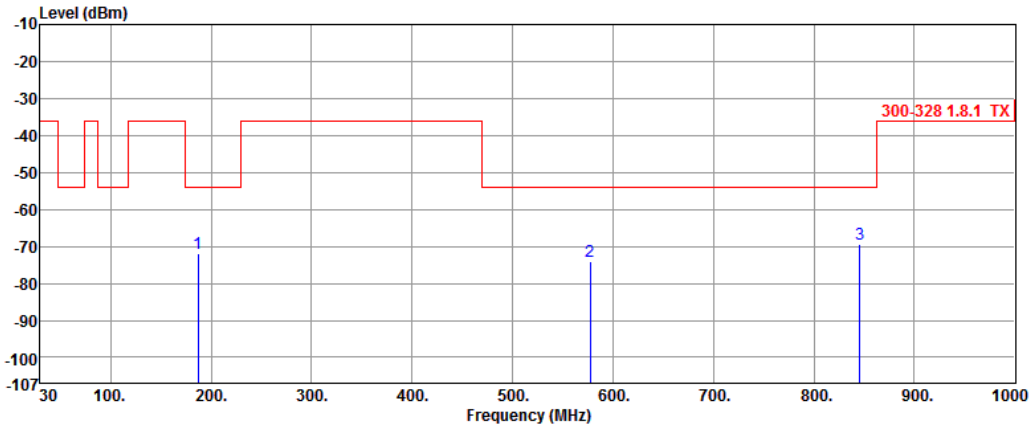


Above 1 GHz



3.6.4 Transmitter Spurious Emissions (Below 1GHz)

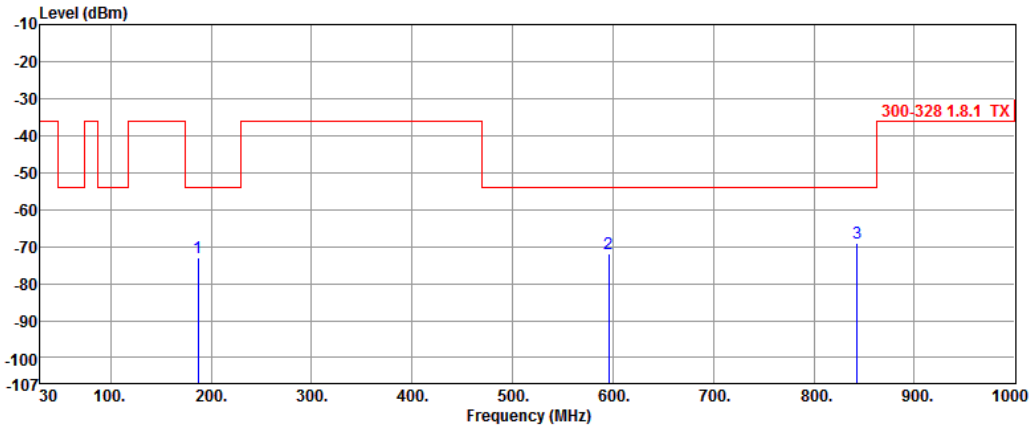
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	187.14	-71.96	-54.00	-17.96	-4.84	-67.12
2	577.08	-74.13	-54.00	-20.13	4.21	-78.34
3	845.77	-69.36	-54.00	-15.36	8.44	-77.80

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

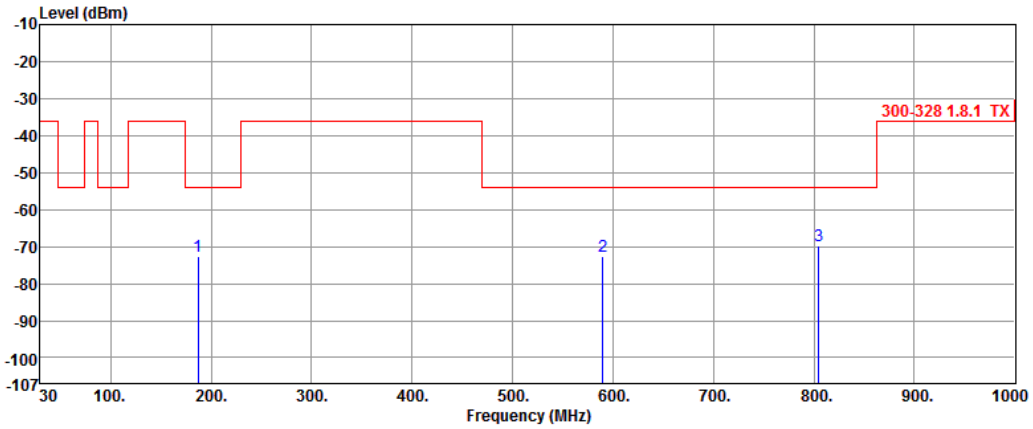
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	187.14	-72.96	-54.00	-18.96	-4.84	-68.12
2	595.51	-71.75	-54.00	-17.75	5.03	-76.78
3	842.86	-69.12	-54.00	-15.12	8.29	-77.41

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

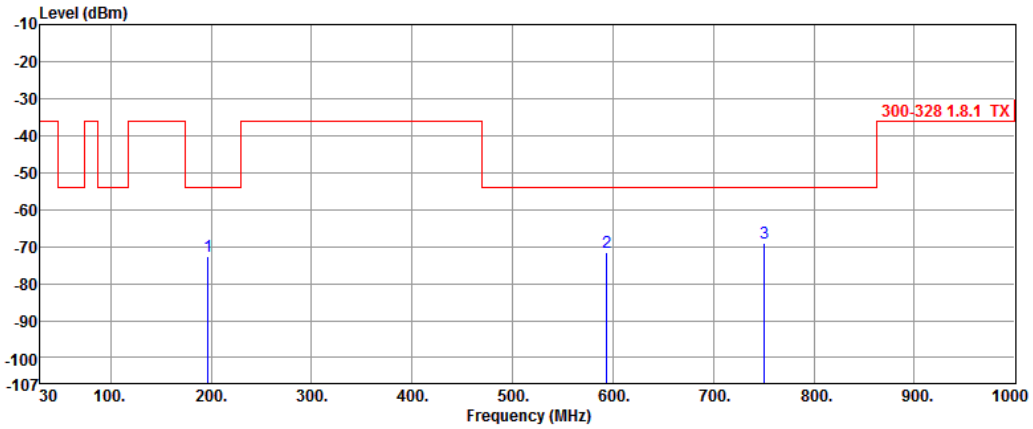
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	187.14	-72.77	-54.00	-18.77	-4.84	-67.93
2	589.69	-72.64	-54.00	-18.64	4.80	-77.44
3	805.03	-69.78	-54.00	-15.78	7.52	-77.30

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

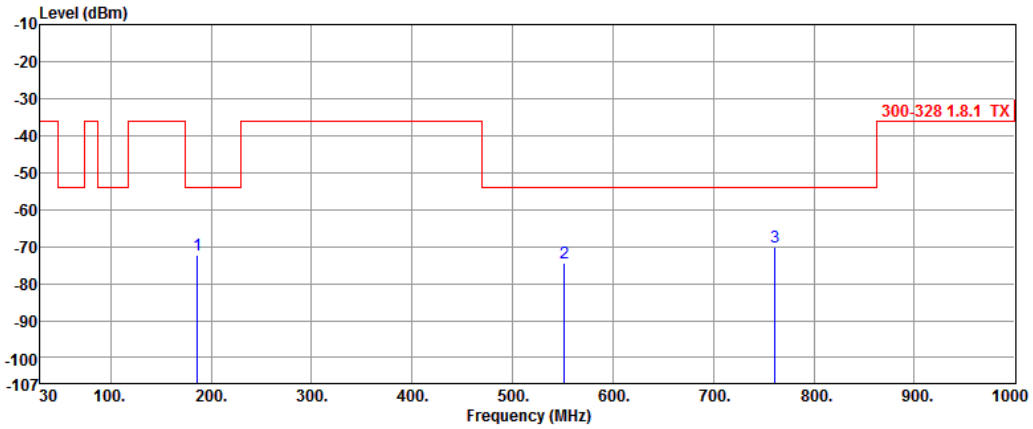
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	196.84	-72.59	-54.00	-18.59	-5.05	-67.54
2	593.57	-71.67	-54.00	-17.67	4.96	-76.63
3	750.71	-69.16	-54.00	-15.16	7.08	-76.24

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

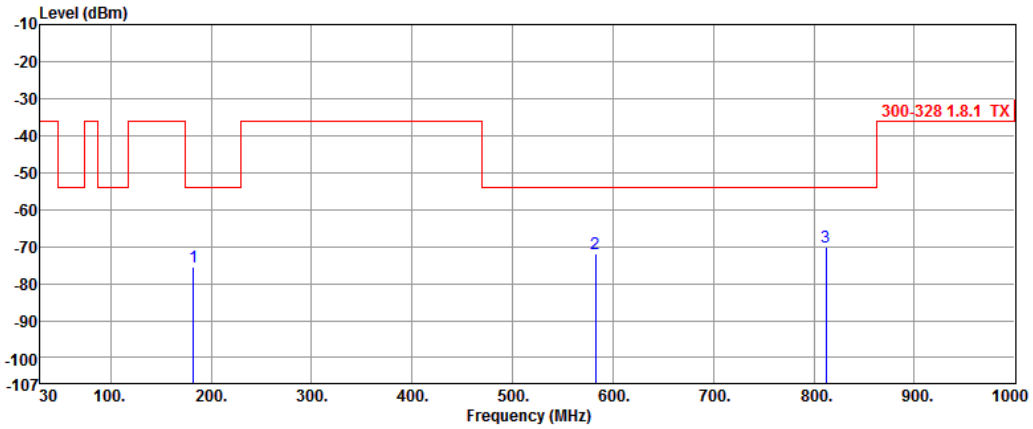
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	186.17	-72.22	-54.00	-18.22	-4.86	-67.36
2	551.86	-74.38	-54.00	-20.38	3.24	-77.62
3	761.38	-70.06	-54.00	-16.06	7.29	-77.35

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

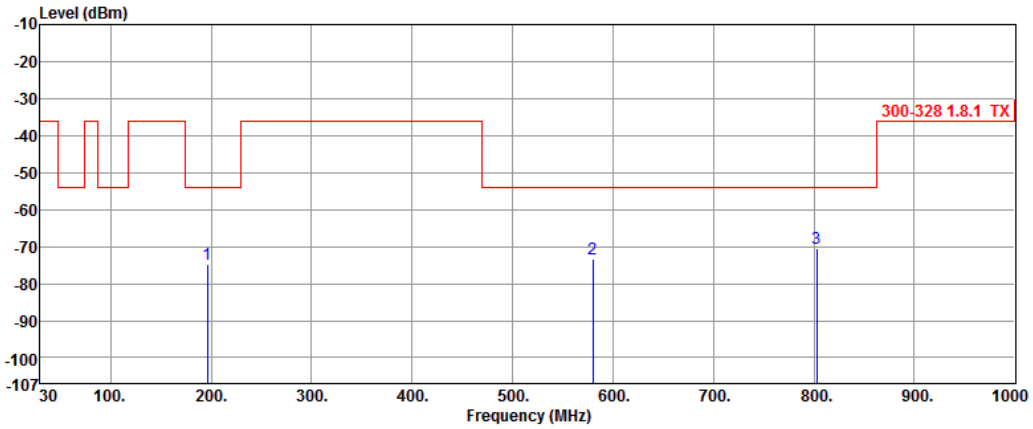
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	182.29	-75.63	-54.00	-21.63	-4.17	-71.46
2	582.90	-71.84	-54.00	-17.84	4.40	-76.24
3	811.82	-69.97	-54.00	-15.97	7.62	-77.59

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

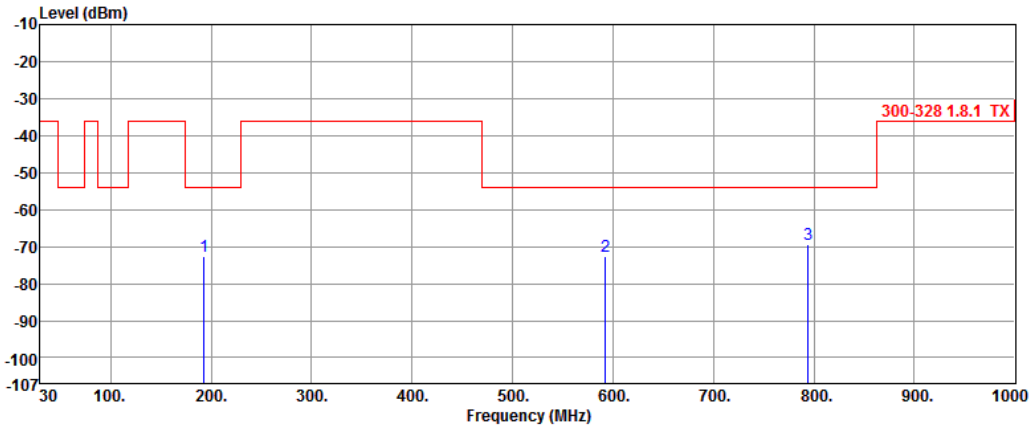
Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	195.87	-74.82	-54.00	-20.82	-4.90	-69.92
2	579.99	-73.47	-54.00	-19.47	4.30	-77.77
3	803.09	-70.35	-54.00	-16.35	7.51	-77.86

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

Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		

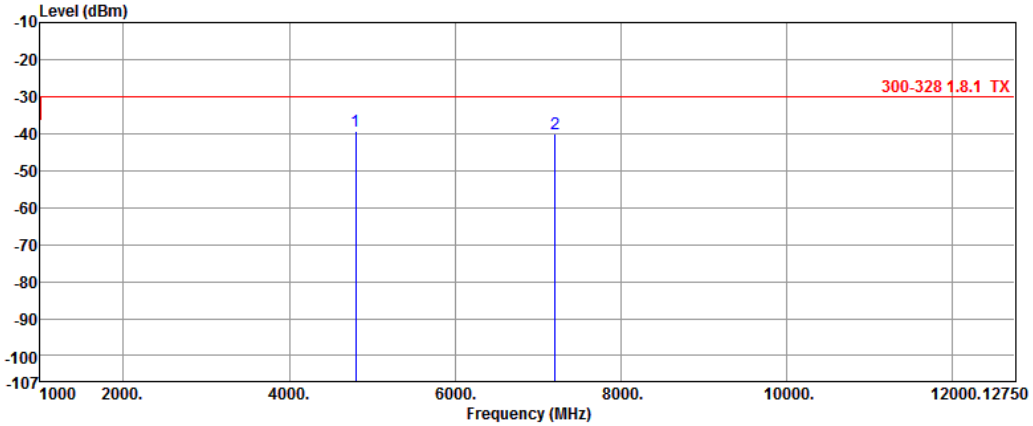


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	192.96	-72.71	-54.00	-18.71	-4.77	-67.94
2	592.60	-72.70	-54.00	-18.70	4.91	-77.61
3	794.36	-69.53	-54.00	-15.53	7.29	-76.82

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

3.6.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

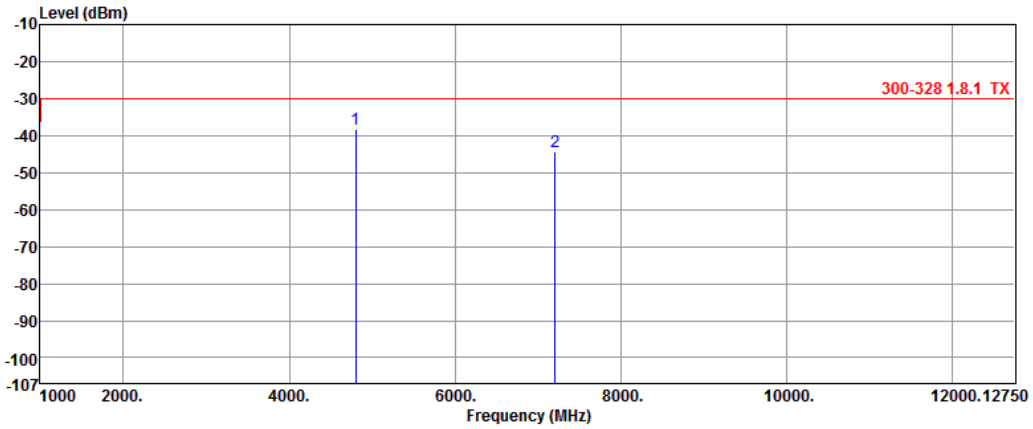
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.90	-39.27	-30.00	-9.27	7.88	-47.15
2	7206.42	-40.19	-30.00	-10.19	12.79	-52.98

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

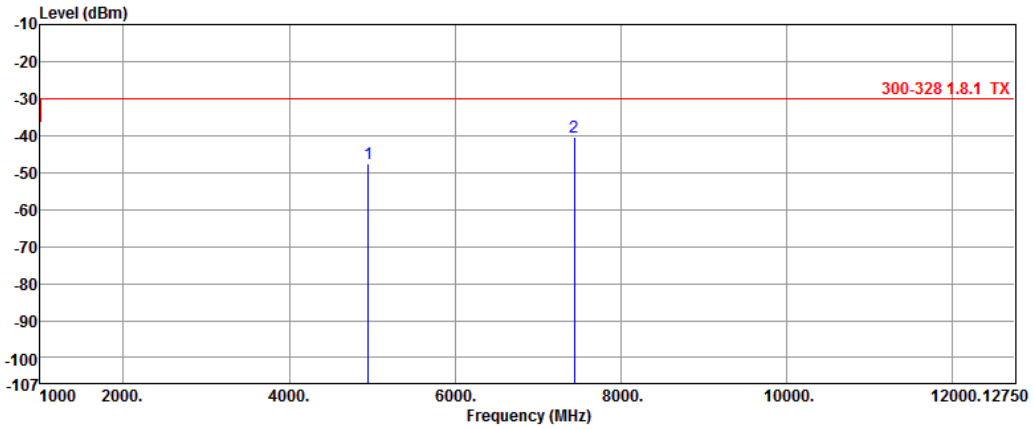
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.39	-38.20	-30.00	-8.20	7.56	-45.76
2	7205.87	-44.50	-30.00	-14.50	13.17	-57.67

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

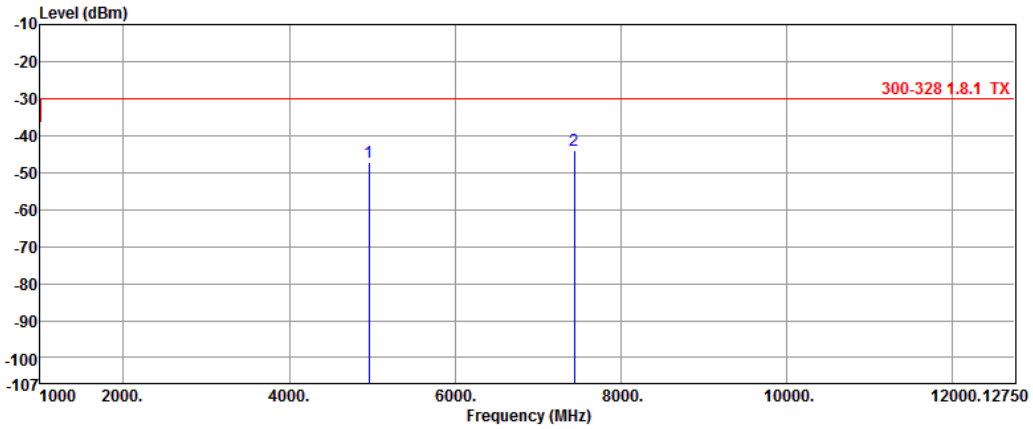
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4957.74	-47.76	-30.00	-17.76	8.58	-56.34
2	7436.76	-40.54	-30.00	-10.54	13.16	-53.70

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

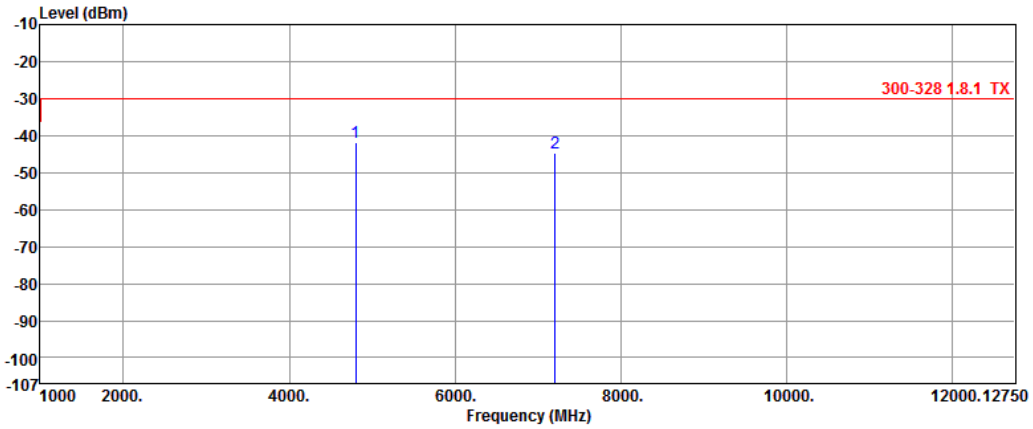
Modulation	GFSK	**Test Freq. (MHz)**	2480
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4958.32	-47.34	-30.00	-17.34	8.77	-56.11
2	7437.64	-44.04	-30.00	-14.04	13.56	-57.60

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

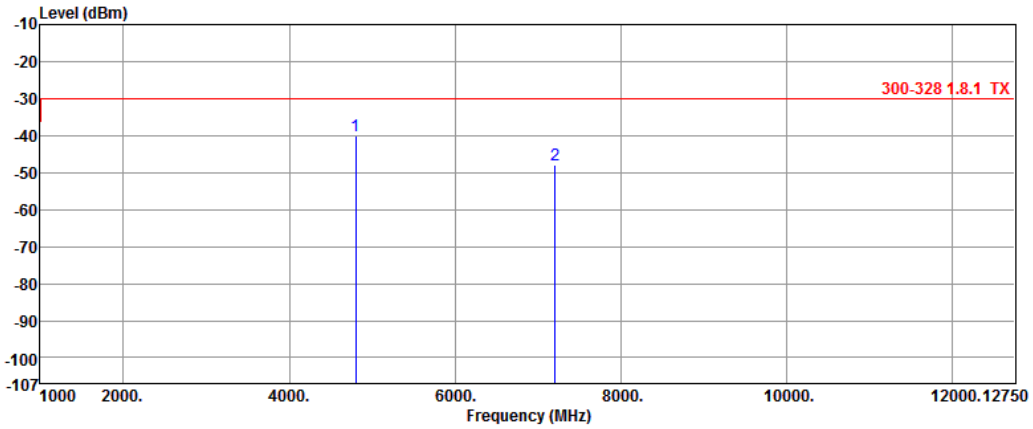
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4804.01	-41.90	-30.00	-11.90	7.88	-49.78
2	7205.99	-44.69	-30.00	-14.69	12.78	-57.47

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

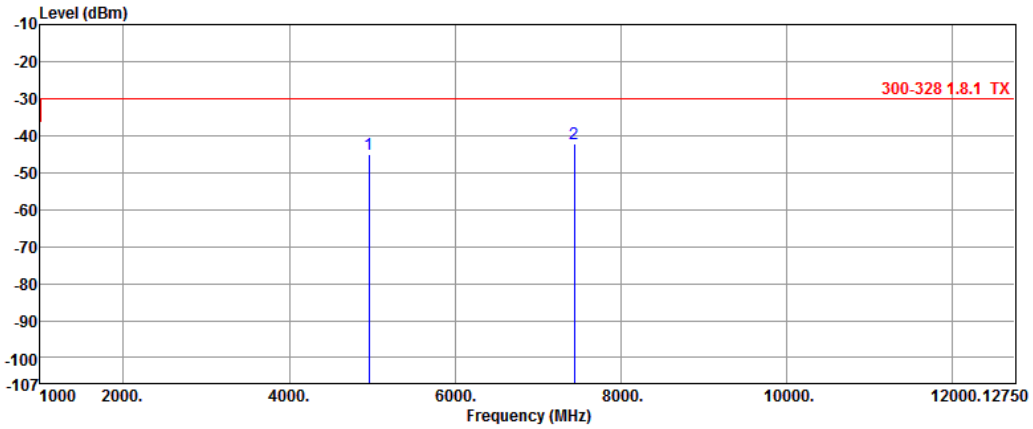
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.96	-40.00	-30.00	-10.00	7.56	-47.56
2	7206.09	-47.83	-30.00	-17.83	13.17	-61.00

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

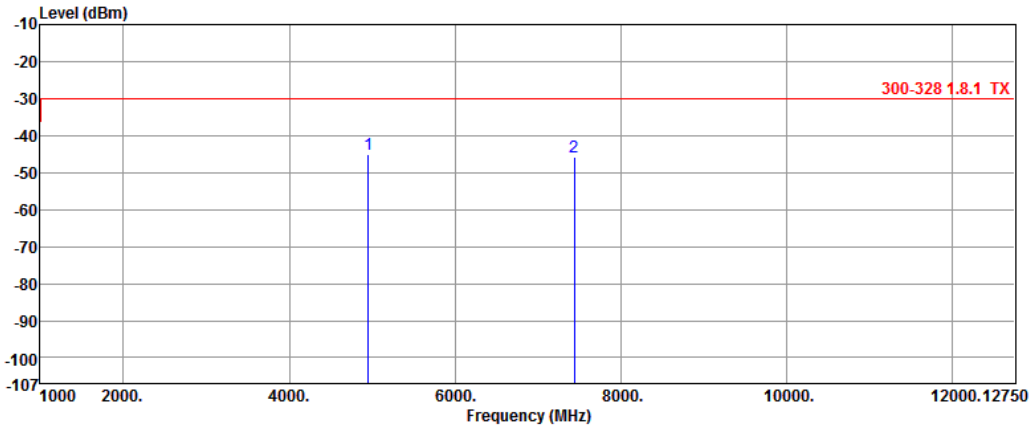
Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4958.42	-45.14	-30.00	-15.14	8.58	-53.72
2	7437.54	-42.19	-30.00	-12.19	13.15	-55.34

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

Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4957.77	-45.23	-30.00	-15.23	8.76	-53.99
2	7437.25	-45.87	-30.00	-15.87	13.55	-59.42

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

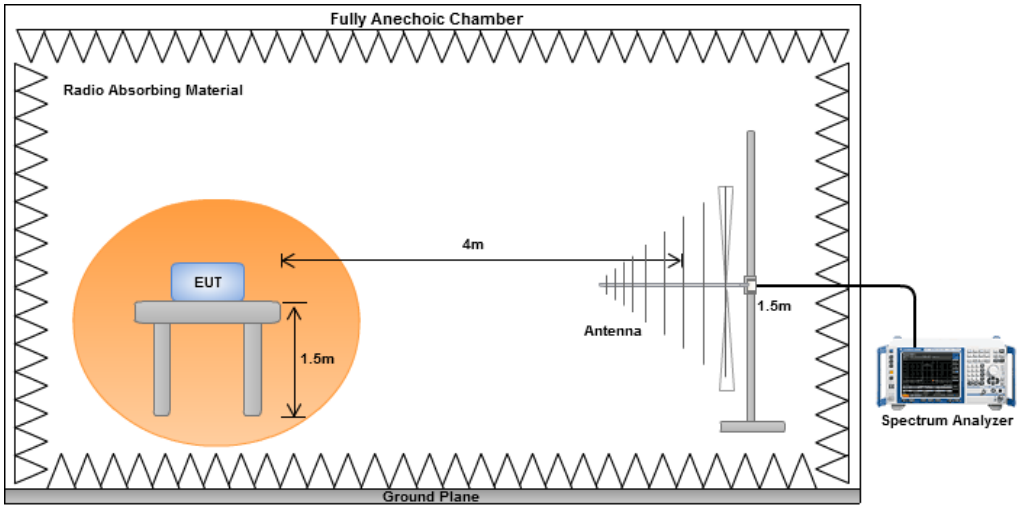
Frequency Range	Maximum power (dBm) e.r.p (<=1GHz) e.i.r.p (>1GHz)	Measurement bandwidth (kHz)
30 MHz to 1 GHz	-57	100
Above 1 GHz to 12,75 GHz	-47	1000

4.1.2 Test Procedures

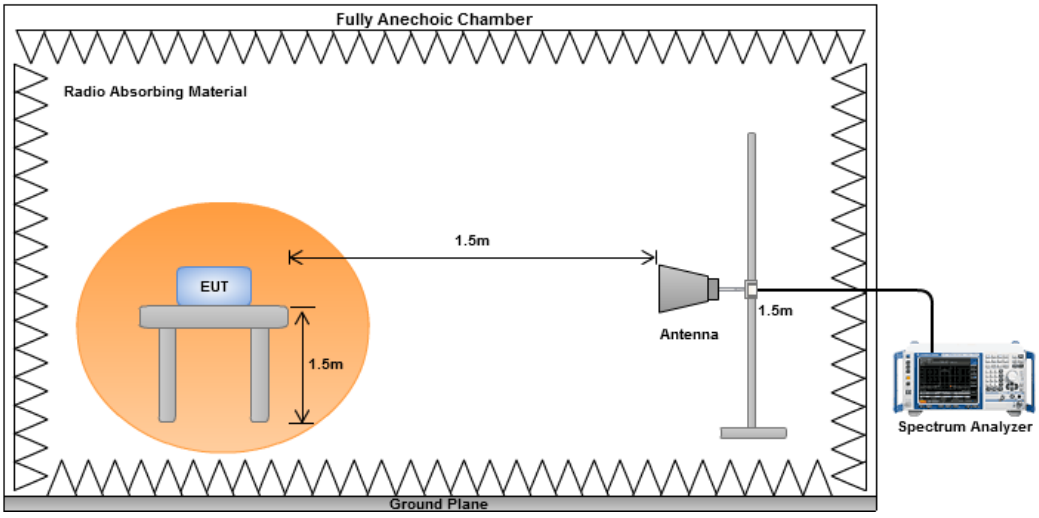
Reference to clause 5.3.11.2 of ETSI EN 300 328 V1.8.1 (2012-06).

4.1.3 Test Setup

Below 1GHz

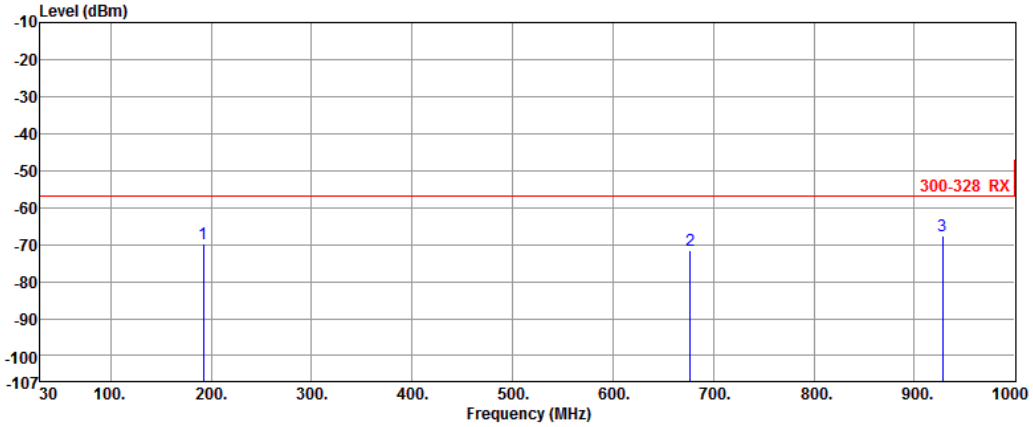


Above 1 GHz



4.1.4 Receiver Spurious Emissions (Below 1GHz)

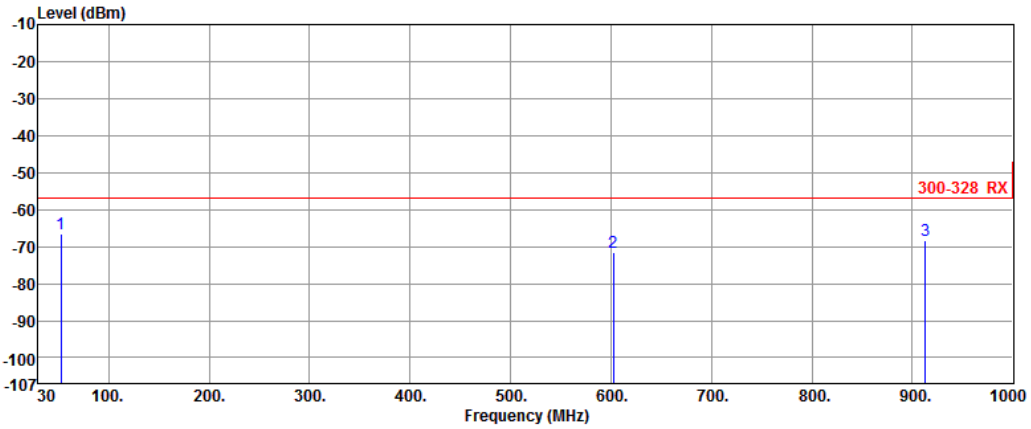
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	191.99	-69.61	-57.00	-12.61	-4.78	-64.83
2	676.99	-71.45	-57.00	-14.45	5.38	-76.83
3	928.22	-67.64	-57.00	-10.64	9.81	-77.45

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

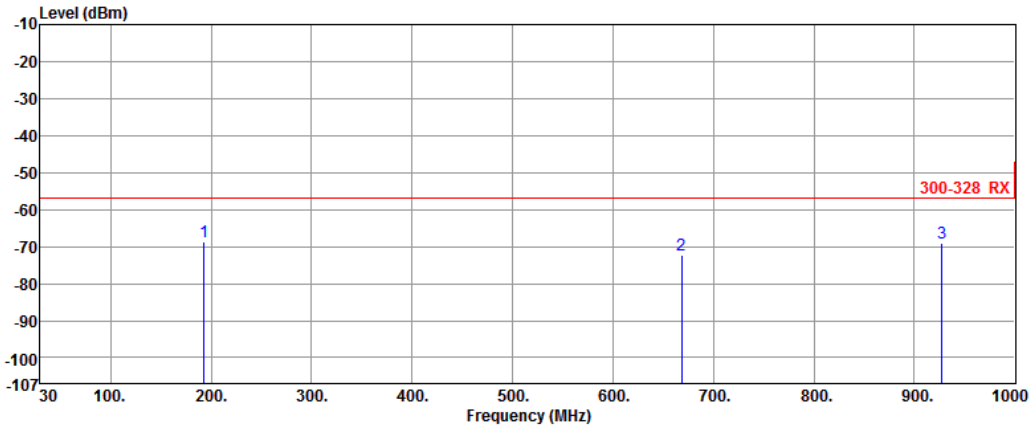
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	52.31	-66.49	-57.00	-9.49	-0.53	-65.96
2	602.30	-71.51	-57.00	-14.51	5.45	-76.96
3	912.70	-68.22	-57.00	-11.22	9.37	-77.59

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

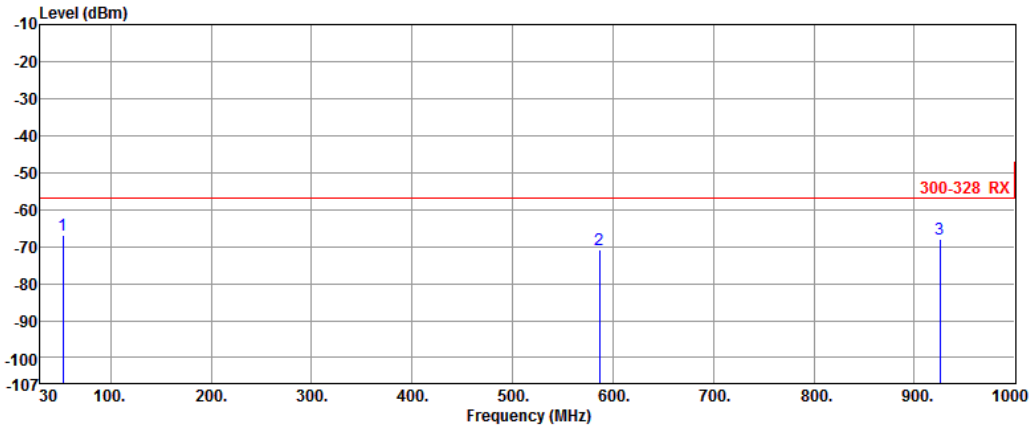
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	192.96	-68.63	-57.00	-11.63	-4.77	-63.86
2	668.26	-72.22	-57.00	-15.22	5.40	-77.62
3	927.25	-68.99	-57.00	-11.99	9.76	-78.75

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

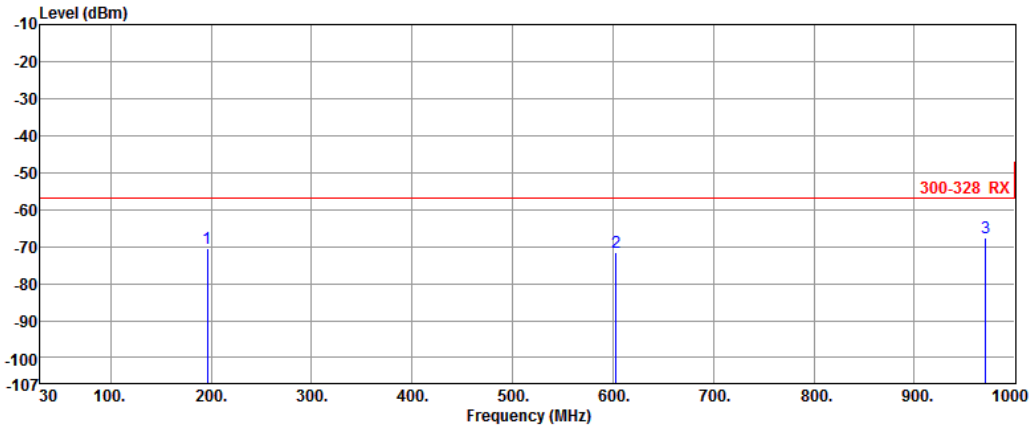
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	52.31	-66.97	-57.00	-9.97	-0.53	-66.44
2	586.78	-70.95	-57.00	-13.95	4.60	-75.55
3	925.31	-67.84	-57.00	-10.84	9.68	-77.52

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

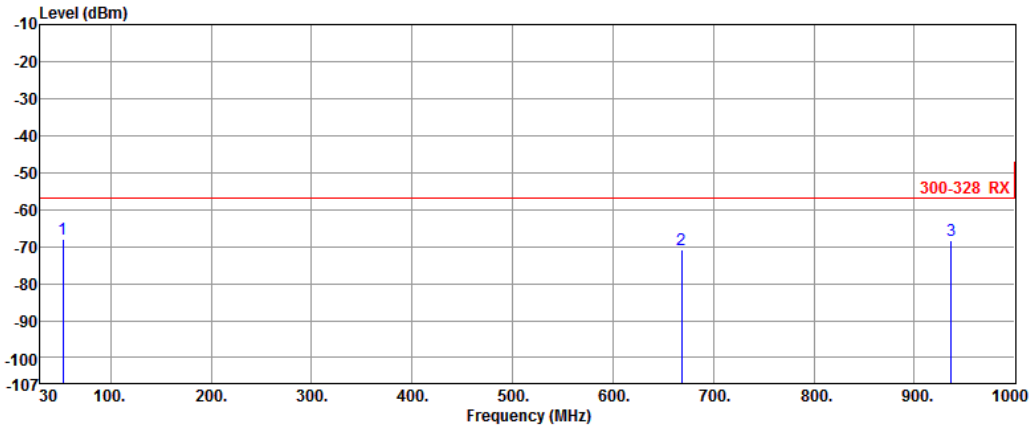
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	195.87	-70.44	-57.00	-13.44	-4.90	-65.54
2	603.27	-71.58	-57.00	-14.58	5.55	-77.13
3	970.90	-67.66	-57.00	-10.66	9.61	-77.27

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

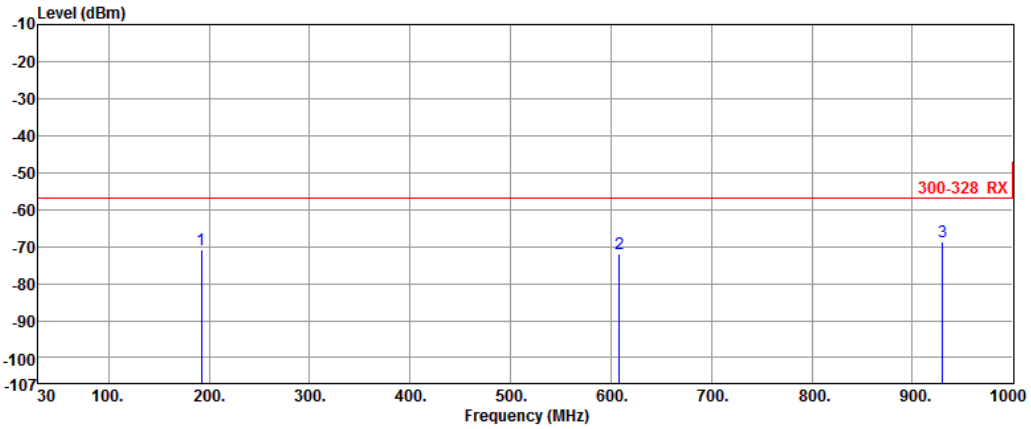
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	52.31	-68.12	-57.00	-11.12	-0.53	-67.59
2	668.26	-70.86	-57.00	-13.86	5.40	-76.26
3	936.95	-68.44	-57.00	-11.44	9.68	-78.12

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

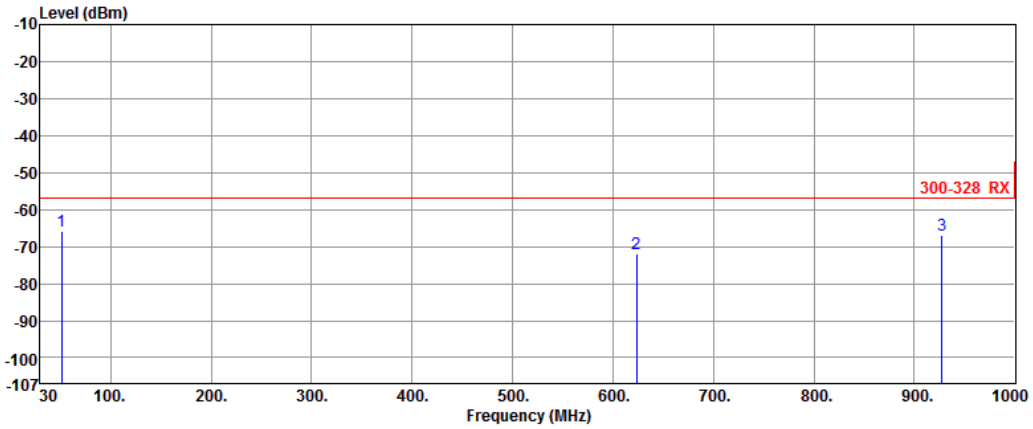
Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	191.99	-70.82	-57.00	-13.82	-4.78	-66.04
2	608.12	-71.84	-57.00	-14.84	5.68	-77.52
3	930.16	-68.70	-57.00	-11.70	9.88	-78.58

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

Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		

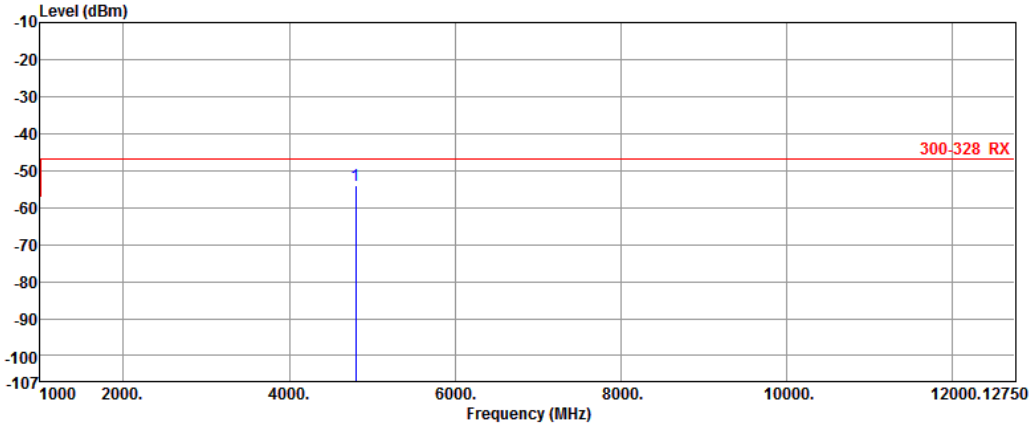


	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	51.34	-66.01	-57.00	-9.01	-0.06	-65.95
2	623.64	-71.79	-57.00	-14.79	5.35	-77.14
3	927.25	-66.79	-57.00	-9.79	9.76	-76.55

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

4.1.5 Receiver Radiated Unwanted Emissions (Above 1GHz)

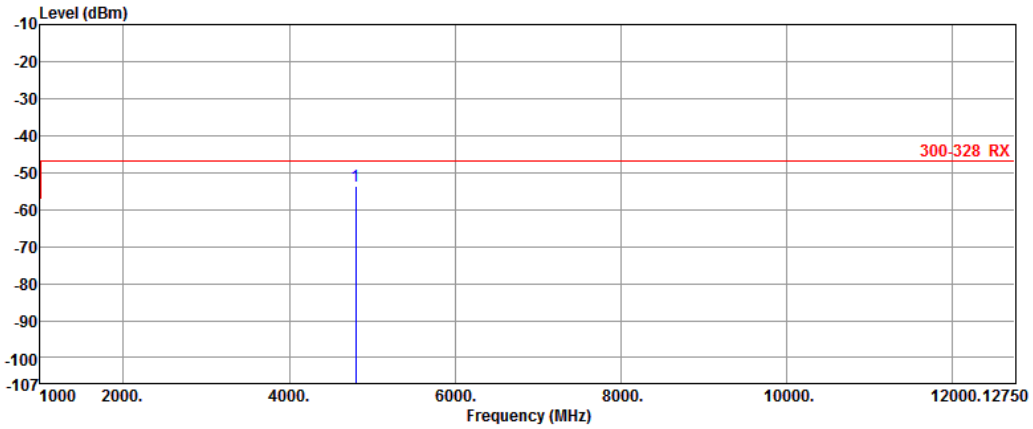
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.05	-53.95	-47.00	-6.95	7.88	-61.83

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

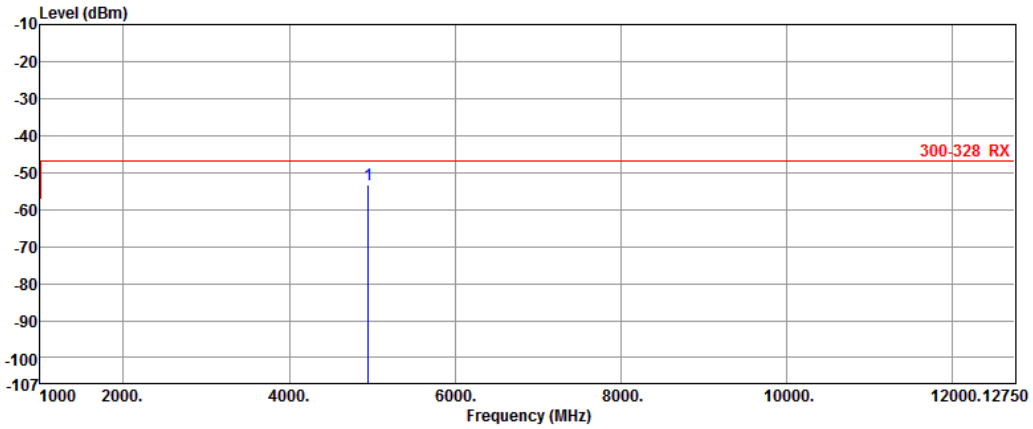
Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.84	-53.76	-47.00	-6.76	7.56	-61.32

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

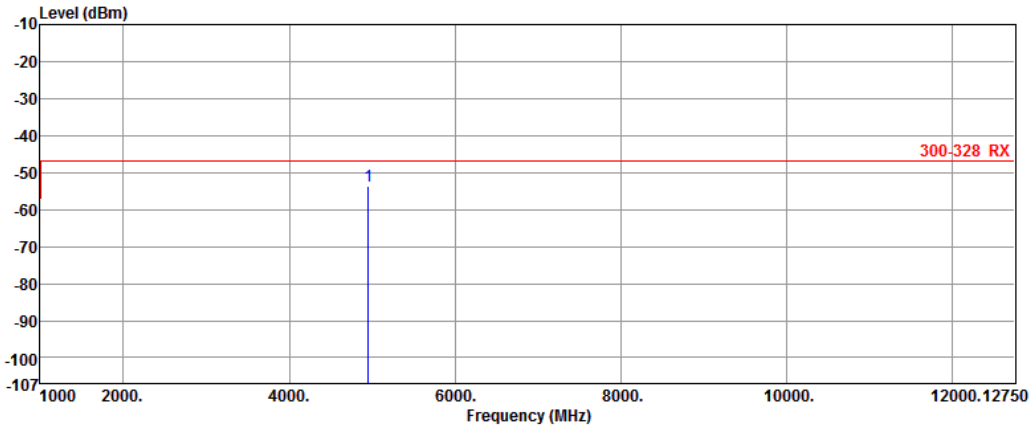
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4956.74	-53.28	-47.00	-6.28	8.58	-61.86

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

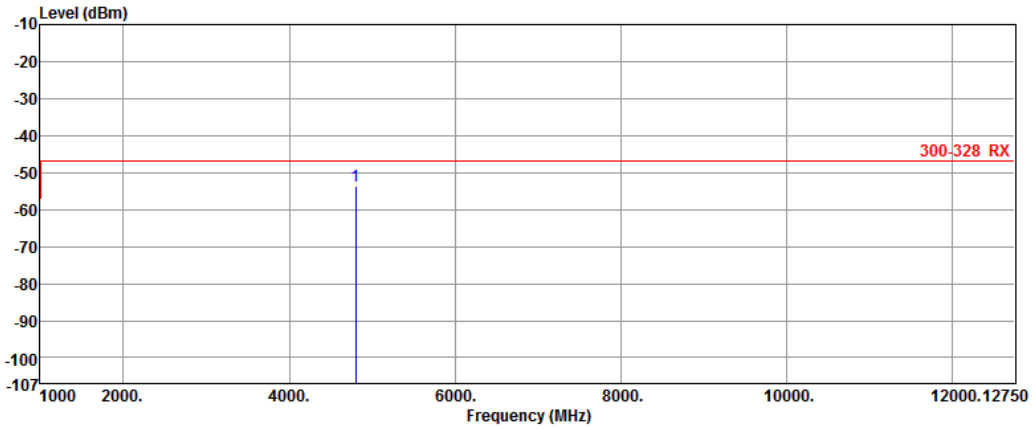
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4956.79	-53.49	-47.00	-6.49	8.74	-62.23

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

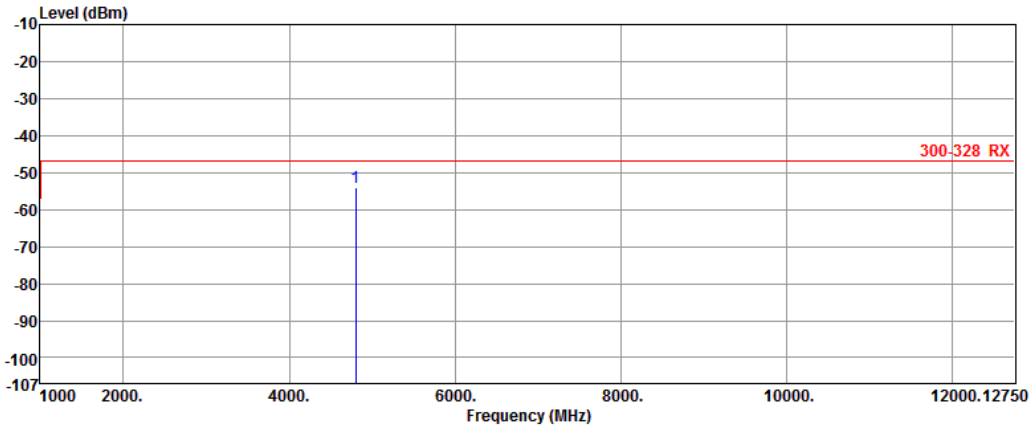
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4803.22	-53.82	-47.00	-6.82	7.88	-61.70

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

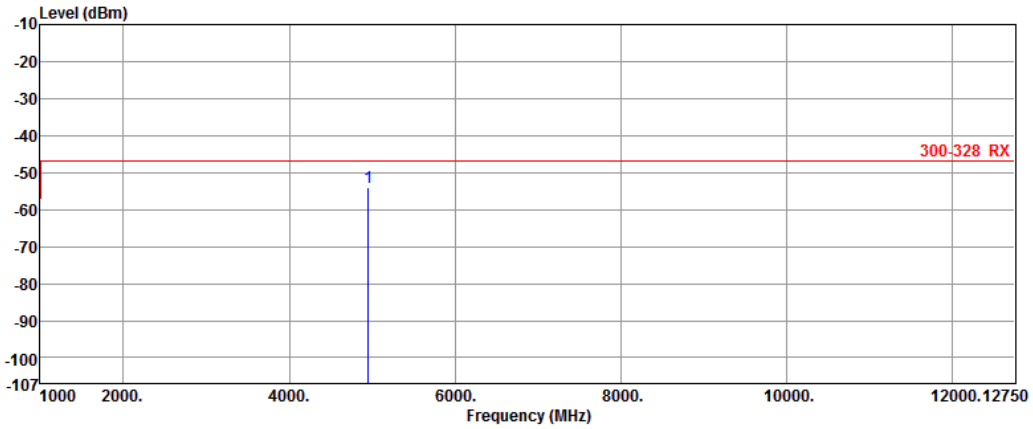
Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4802.89	-54.20	-47.00	-7.20	7.56	-61.76

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

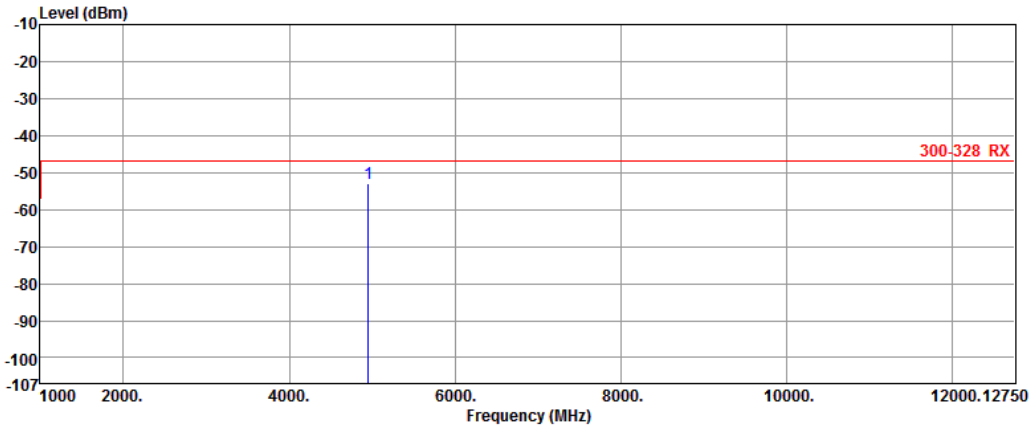
Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4956.99	-54.12	-47.00	-7.12	8.58	-62.70

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

Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	4956.90	-53.04	-47.00	-6.04	8.74	-61.78

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

5 Adaptivity Test Results

5.1 Adaptivity and Receiver Blocking

5.1.1 Limit of Adaptivity and Receiver Blocking

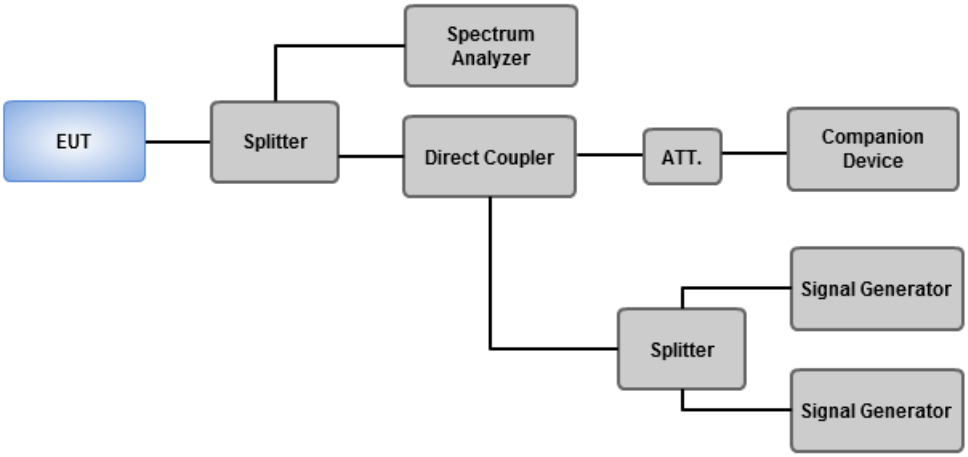
Adaptivity and Receiver Blocking Limit
☒ Only for adaptive systems and RF Output Power > 10 dBm
☐ Non-LBT based Detect and Avoid: ◆ minimum remain unavailable = 1sec; ◆ minimum Idle Period time = 100us; ◆ maximum Channel Occupancy Time (COT) = 40ms ◆ i.e. COT [40ms] + Idle Period [2ms - 5% of COT]; N x [COT+Idle]; ◆ detection threshold level = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm);
☐ LBT based Detect and Avoid (Frame Based Equipment): ◆ minimum Clear Channel Assessment (CCA) time = 20 us; ◆ CCA declared by the supplier ◆ COT = 1 ms to 10 ms ◆ Idle Period = 5% of COT ◆ e.g. CCA [120us] + COT [10ms] + Idle Period [0.5ms - 5% of COT]; ◆ detection threshold level = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm);
☒ LBT based Detect and Avoid (Load Based Equipment with spectrum sharing mechanism IEEE Std.): ◆ LBT based spectrum sharing mechanism may implement IEEE Std. 802.11-2007 clauses 15, 17, 18 or 19, in IEEE Std. 802.11n-2009, clause 20 or in IEEE Std. 802.15.4-2006, ◆ level = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm); Pout e.i.r.p.= Max output Power
☐ LBT based Detect and Avoid (Load Based Equipment): ◆ minimum Clear Channel Assessment (CCA) time = 20 us; ◆ COT ≤ (13 / 32) x q ms; q=[4..32] ; 1.625ms – 13ms; ◆ R = number of clear idle slots are randomly [1..q]. Every time an Extended CCA is required and the R value stored in a counter. Extended CCA = R x CCA ◆ i.e. for channel occupied then R = 4 idle slots; COT [1.625ms; q=4]; idle slots [1] - Extended CCA [60us, R=3]; ◆ detection threshold level = -70 dBm/MHz + 20 - Pout e.i.r.p. (Pout in dBm);
☒ Short Control Signalling Transmissions: ◆ Short Control Signalling Transmissions shall have a maximum duty cycle of 10 % within an observation period of 50 ms.

Receiver Blocking Parameters				
Equipment Type	**Wanted Signal Mean Power from Companion Device**	**Blocking Signal Frequency (MHz)**	**Blocking Signal Mean power (dBm)**	**Type of Interfering Signal**
LBT	sufficient to maintain the link (see note 2)	2395 or 2488,5 (see note 1)	-30	CW
Non-LBT	-30 dBm			
Note 1: The highest blocking frequency shall be used for testing the lowest operating hopping frequency, while the lowest blocking frequency shall be used for testing the highest hopping frequency. Note 2: A typical value which can be used in most cases is -50 dBm/MHz.				

5.1.2 Test Procedures

Reference to clause 5.3.7.2 of ETSI EN 300 328 V1.8.1 (2012-06).

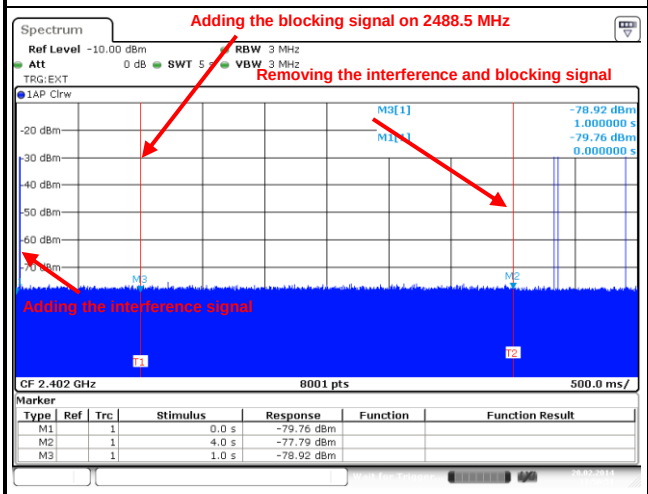
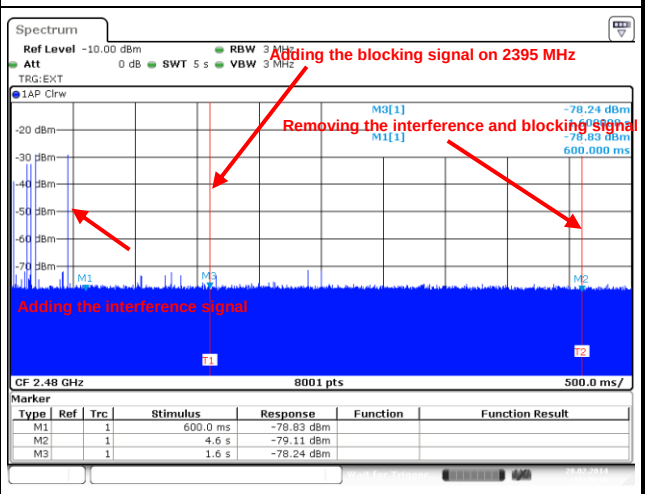
5.1.3 Test Setup



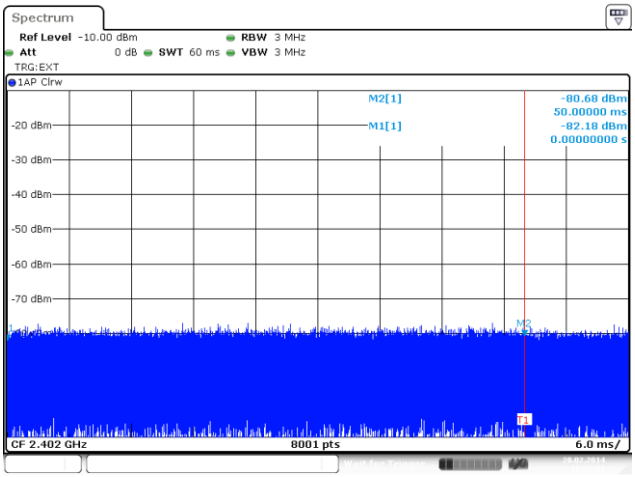
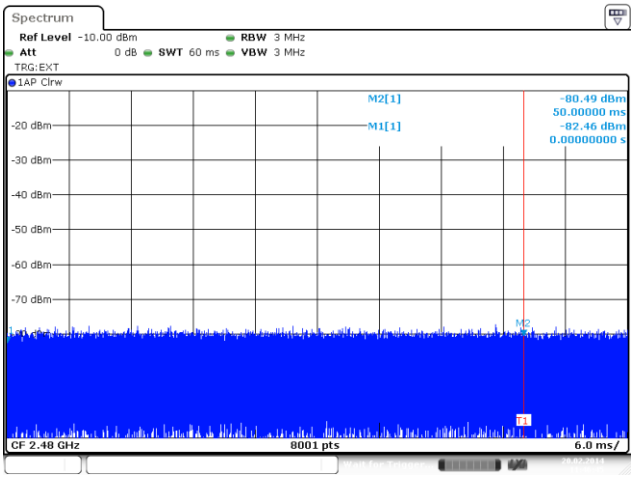
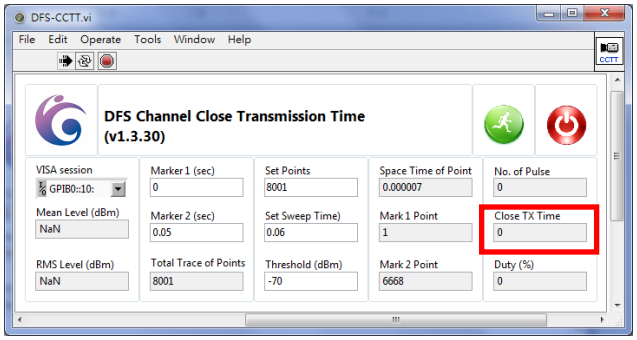
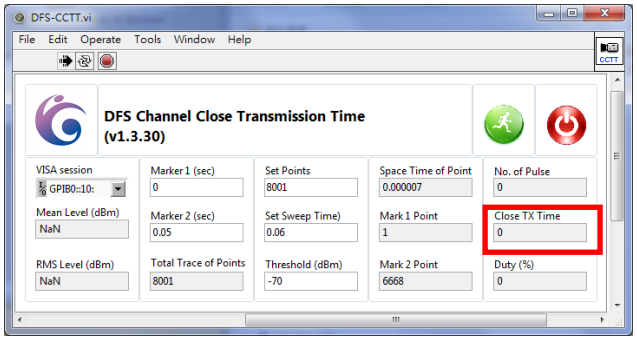
5.1.4 Test Result of Adaptivity, Receiver Blocking and Short Control Signalling Transmissions

Adaptivity & Receiver Blocking Result.				
Adaptivity Detection Threshold Level (dBm)		-58.85		
Receiver Blocking Signal Level (dBm)		-30		
Modulation Mode	**Freq. (MHz)**	**Adaptivity**	**Receiver Blocking Test Status**	**Short Control Signalling Transmissions (ms)**
GFSK	2402	Pass	Pass	0
GFSK	2480	Pass	Pass	0
Limit		N/A	N/A	5

5.1.5 Test Result of Adaptivity and Receiver Blocking Plots

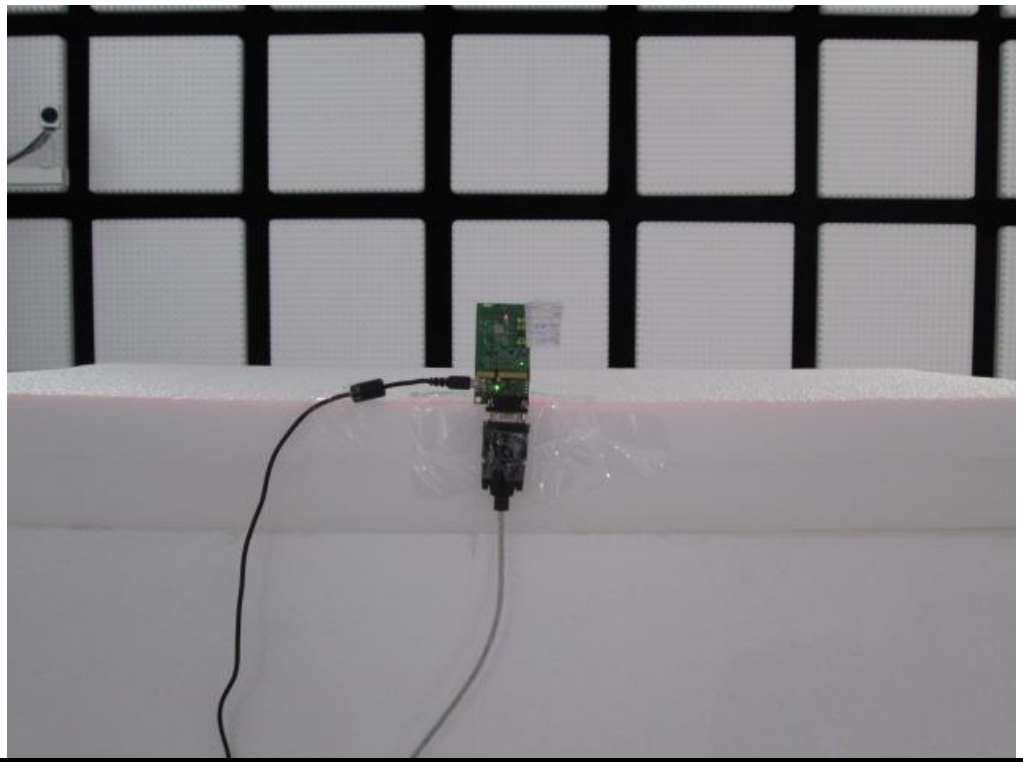
Adaptivity & Receiver blocking Result Plots	
GFSK - 2402MHz	GFSK - 2480MHz
	

5.1.6 Test Result of Short Control Signalling Transmissions Plots

Short Control Signalling Transmissions Plots	
GFSK - 2402MHz	**GFSK - 2480MHz**
	
BT - 2402MHz	**BT - 2480MHz**
	

6 Photographs of the Test Configuration

Spurious Emission Test



Conducted 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, 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.

Linkou

Tel: 886-2-2601-1640

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

Kwei Shan

Tel: 886-3-271-8666

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

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

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

==END==