FCC RADIO TEST REPORT

Applicant	:	SteelSeries ApS.
Address	:	656 W Randolph St., Suite 3E Chicago, IL 60661, USA
Equipment	:	HEADSET
Model No.	:	HS-00021
Trade Name	:	steelseries
FCC ID	:	ZHK-HS00021

I HEREBY CERTIFY THAT :

The sample was received on Apr. 09, 2019 and the testing was completed on May. 15, 2019 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Mark Liao / Supervisor

Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory

Contents

History of this test report

Report No.	Issue Date	Description
TEFI1904074-975	May. 16, 2019	Original

1. Summary of Test Procedure and Test Results

1.1 Applicable Standards

ANSI C63.4:2014

ANSI C63.10:2013

FCC Rules and Regulations Part 15 Subpart C §15.247

FCC Rule	. Description of Test	Result
15.203	. Antenna Requirement	PASS
15.207	. AC Power Line Conducted Emission	N/A
15.209 15.205	. Radiated Spurious Emission	PASS
15.247(d)	. Conducted Spurious Emission	PASS
15.247(a)(2)	. 6dB Bandwidth	PASS
15.247(b)	. Maximum Peak Output Power	PASS
15.247(e)	. Power Spectral Density	PASS

*The principle of judgment is made according to the laboratory's reporting control and measurement uncertainty standard procedures.

*This EUT has been also tested and compiled with the requirement of FCC Part 15, Subpart B, recorded in a separate test report(TEFD1904074).

2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Modulation Type	π/4-DQPSK
Frequency Range	2403.35MHz~2477.35MHz
Antenna Type	Antenna 1 : Printed Antenna 2 : Metal
Antenna Gain	Antenna 1 :1.58dBi Antenna 2 :0.48dBi

Note: For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.2 Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
***01**	2403.35	15	2431.35	29	2459.35
02	2405.35	16	2433.35	30	2461.35
03	2407.35	17	2435.35	31	2463.35
04	2409.35	18	2437.35	32	2465.35
05	2411.35	19	2439.35	33	2467.35
06	2413.35	***20**	**2441.35**	34	2469.35
07	2415.35	21	2443.35	35	2471.35
08	2417.35	22	2445.35	36	2473.35
09	2419.35	23	2447.35	37	2475.35
10	2421.35	24	2449.35	***38**	**2477.35**
11	2423.35	25	2451.35	--	--
12	2425.35	26	2453.35	--	--
13	2427.35	27	2455.35	--	--
14	2429.35	28	2457.35	--	--

Note: Channels remarked * are selected to perform test.

2.3 Test Mode and Test Software

a. During testing, the interface cables and equipment positions were varied according to ANSI C63.10.
b. The complete test system included Notebook and EUT for RF test.
c. An executive program, ” VMItest 1.1.6.42” under win7 was executed to transmit and receive data.
d. The following test modes were performed for the test:
Test Mode 1. π/4-DQPSK, Ant 1
Test Mode 2. π/4-DQPSK, Ant 2

2.4 Description of Test System

RF Conducted				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	ASUS	P2430U	N/A	Adapter / 1.8m / NS

Radiated Emissions				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	DELL	Latitude E5470	N/A	Adapter / 1.8m / NS

AC Power Line Conducted Emission				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	DELL	Latitude E5470	N/A	Adapter / 1.8m / NS

2.5 General Information of Test

Test Site	**Cerpass Technology Corporation Test Laboratory** Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582	
	FCC	TW1079, TW1061,TW1439
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication test C-4663 for Conducted emission test R-4399, R-4218 for Radiated emission test G-10812, G-10813 for radiated disturbance above 1GHz
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 25,000MHz	
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.	

Test Item	Test Site	Tested Date	Environmental Conditions	Tested By
RF Conducted	RFCON01-NK	2019/05/14	22℃ / 63%	Nick Guan
Radiated Emissions	3M02-NK	2019/05/08	25℃ / 50%	Spree Yeh
RF Conduction	CON01-NK	2019/05/15	22℃ / 43%	Spree Yeh

2.6 Measurement Uncertainty

Measurement Item	Uncertainty
Radiated Spurious Emission(9KHz~30MHz)	±3.405dB
Radiated Spurious Emission(30MHz~1GHz)	±5.326dB
Radiated Spurious Emission(1GHz~25GHz)	±5.918dB
Conducted Spurious Emission	±2.156dB
6dB Bandwidth	±4.401%
Peak Output Power(Conducted Power Meter)	±1.31dB
Power Spectral Density	±2.146dB
Duty Cycle	±0.17%

3. Test Equipment and Ancillaries Used for Tests

Test Item	Radiated Emissions				
Test Site	Semi Anechoic Room(3M02-NK)				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Bilog Antenna	Schwarzbeck	VULB9168	275	2018/09/17	2019/09/16
Active Loop Antenna	EMCO	6507	40855	2018/05/22	2019/05/21
Horn Antenna	EMCO	3115	31589	2019/04/01	2020/03/31
Horn Anrenna	EMCO	3116	31974	2018/09/07	2019/09/06
EMI Receiver	ROHDE & SCHWARZ	ESCI	101423	2018/06/11	2019/06/10
Spectrum Analyzer	ROHDE & SCHWARZ	FSP 40	100219	2018/07/03	2019/07/02
Preamplifier	EM Electronics corp.	EM330	60660	2019/03/11	2020/03/10
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2018/09/18	2019/09/17
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2019/04/07	2020/04/06
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1316	2018/09/12	2019/09/11
Cable-0.5m(1G-40G)	Rapidtek	40GHZ 50CM	38MS-38MS50314	2019/04/09	2020/04/08
Cable-3m(1G-40G)	Rapidtek	40GHZ 300CM	38MS-38MS300314	2019/04/09	2020/04/08
Cable-8m(1G-40G)	Rapidtek	40GHZ 800CM	38MS-38MS800314	2019/04/10	2020/04/09
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA

Test Item	RF Conducted				
Test Site	RFCON01-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Spectrum Analyzer	ROHDE & SCHWARZ	FSP 40	100219	2018/07/03	2019/07/02
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2019/04/07	2020/04/06
Attenuator	KEYSIGHT	8491B	MY39250705	2018/09/04	2019/09/03
TEMP & HUMI CHAMBER	T-MACHINE	TMJ-9712	T-12-040111	2018/08/30	2019/08/29
Power Sensor	Anritsu	MA2411B	1207295	2019/04/11	2020/04/10

Test Item	AC Power Line Conducted Emission				
Test Site	CON02-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
EMI Receiver	ROHDE & SCHWARZ	ESCI	100821	2018/9/12	2019/09/11
Line Impedance Stabilization Network	Schwarzbeck	NSLK 8127	8127-740	2018/6/13	2019/06/12
Pulse Limiter	ROHDE & SCHWARZ	ESH3-Z2	101933	2018/9/4	2019/09/03
E3	AUDIX	v8.2014-8-6	RK-000531	NA	NA

4. Antenna Requirements

4.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

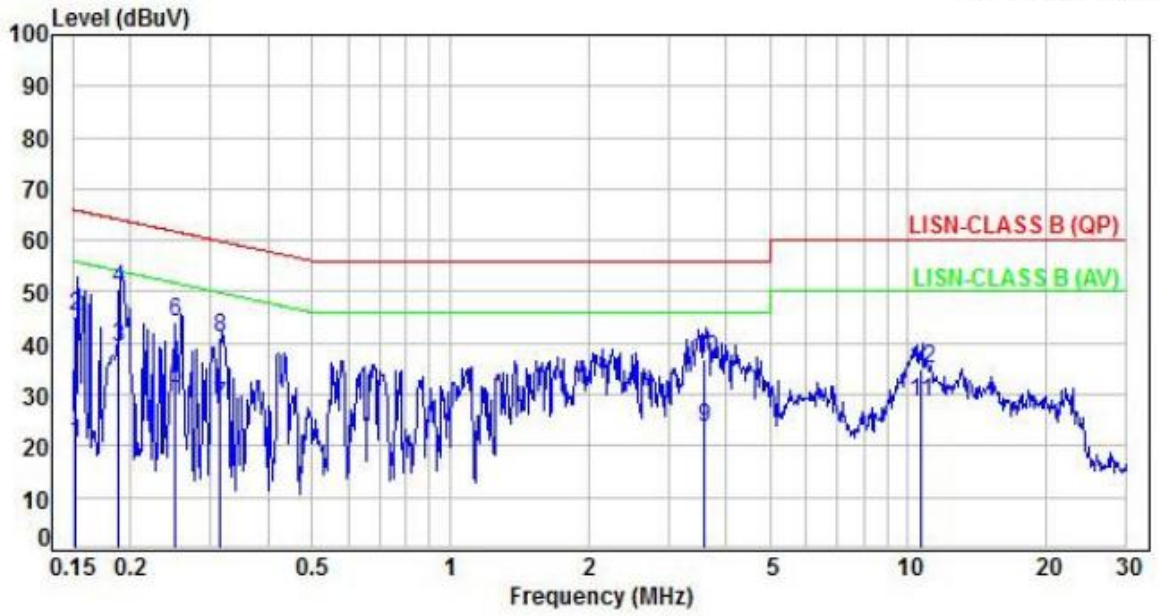
And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2 Antenna Construction and Directional Gain

Brand :	Merry
Model :	31TX67500U02
Antenna Type	Antenna 1 : Printed
	Antenna 2 : Metal
Frequency Range	2400 MHz ~2500 MHz
Antenna Gain	Antenna 1 :1.58dBi
	Antenna 2 :0.48dBi

5. Test of AC Power Line Conducted Emission

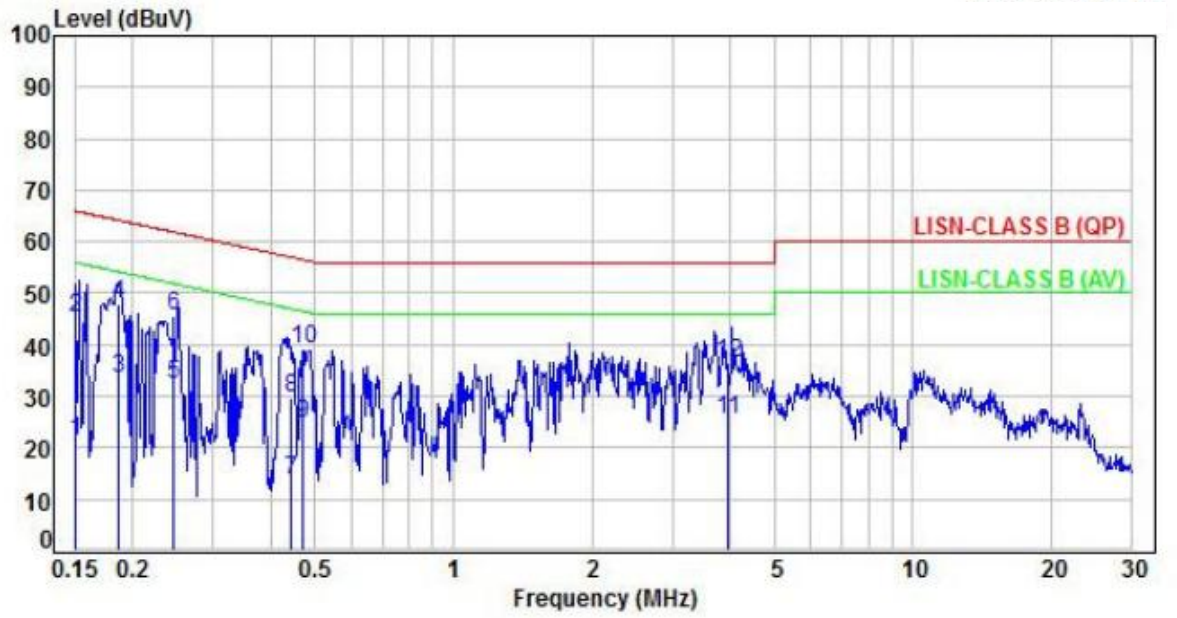
Power	:	DC 5V From System	Pol/Phase	:	LINE
Test Mode	:	TX Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.92	10.78	20.70	55.89	-35.19	Average	P
2	0.15	9.92	35.33	45.25	65.89	-20.64	QP	P
3	0.19	9.92	29.28	39.20	54.12	-14.92	Average	P
4	0.19	9.92	40.66	50.58	64.12	-13.54	QP	P
5	0.25	9.92	21.11	31.03	51.71	-20.68	Average	P
6	0.25	9.92	34.18	44.10	61.71	-17.61	QP	P
7	0.31	9.93	17.69	27.62	49.89	-22.27	Average	P
8	0.31	9.93	31.15	41.08	59.89	-18.81	QP	P
9	3.59	10.08	13.66	23.74	46.00	-22.26	Average	P
10	3.59	10.08	26.87	36.95	56.00	-19.05	QP	P
11	10.63	10.30	18.34	28.64	50.00	-21.36	Average	P
12	10.63	10.30	24.54	34.84	60.00	-25.16	QP	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss

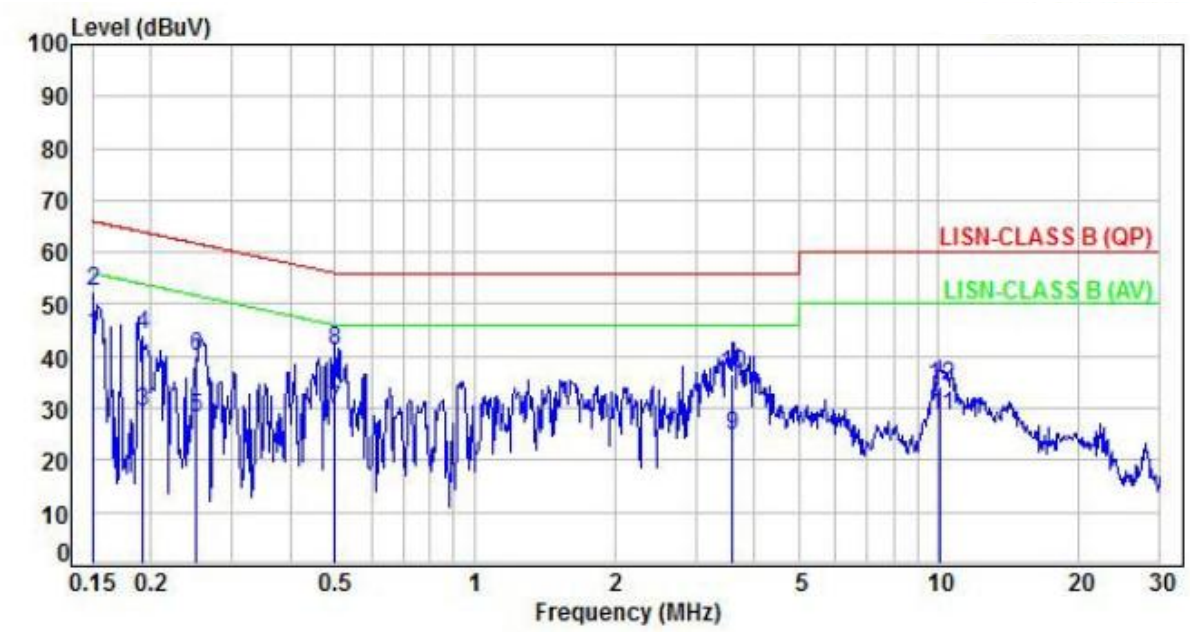
Power	:	DC 5V From System	Pol/Phase	:	NEUTRAL
Test Mode	:	TX Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.95	11.18	21.13	55.96	-34.83	Average	P
2	0.15	9.95	35.37	45.32	65.96	-20.64	QP	P
3	0.19	9.95	23.59	33.54	54.17	-20.63	Average	P
4	0.19	9.95	38.14	48.09	64.17	-16.08	QP	P
5	0.25	9.95	22.37	32.32	51.91	-19.59	Average	P
6	0.25	9.95	35.65	45.60	61.91	-16.31	QP	P
7	0.44	9.96	3.80	13.76	46.99	-33.23	Average	P
8	0.44	9.96	19.74	29.70	56.99	-27.29	QP	P
9	0.47	9.96	14.84	24.80	46.52	-21.72	Average	P
10	0.47	9.96	29.33	39.29	56.52	-17.23	QP	P
11	3.95	10.11	15.23	25.34	46.00	-20.66	Average	P
12	3.95	10.11	26.36	36.47	56.00	-19.53	QP	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss

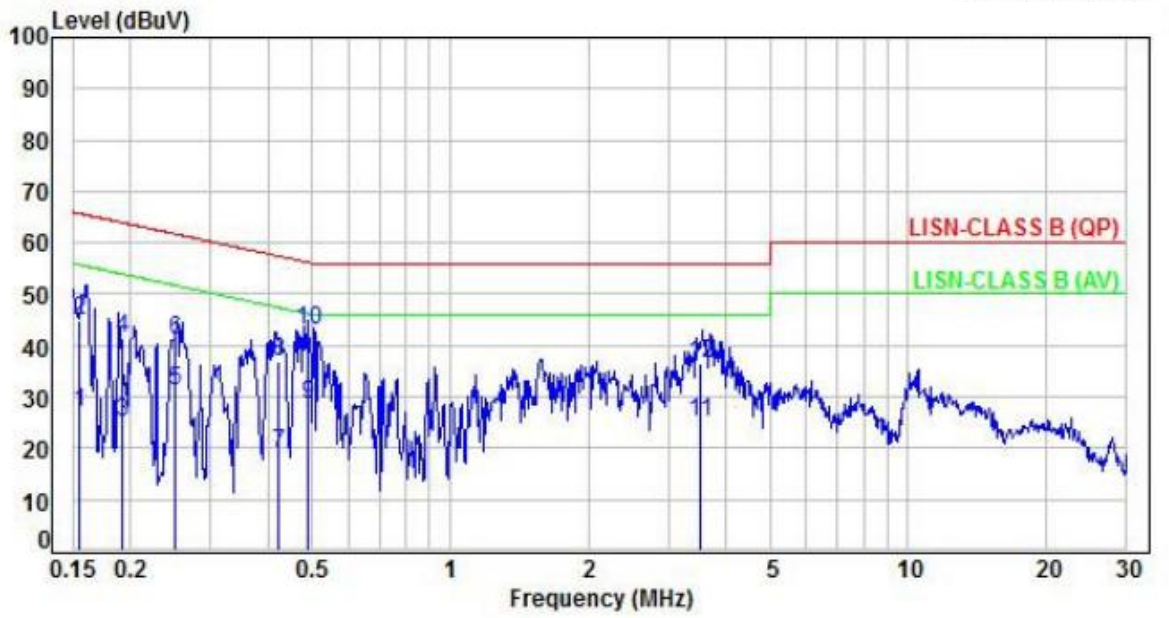
Power	:	DC 5V From System	Pol/Phase	:	LINE
Test Mode	:	TX Mode 2		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.92	34.08	44.00	56.00	-12.00	Average	P
2	0.15	9.92	42.46	52.38	66.00	-13.62	QP	P
3	0.19	9.92	19.35	29.27	53.92	-24.65	Average	P
4	0.19	9.92	34.29	44.21	63.92	-19.71	QP	P
5	0.25	9.92	18.32	28.24	51.74	-23.50	Average	P
6	0.25	9.92	30.12	40.04	61.74	-21.70	QP	P
7	0.50	9.94	19.81	29.75	46.02	-16.27	Average	P
8	0.50	9.94	31.12	41.06	56.02	-14.96	QP	P
9	3.60	10.08	14.63	24.71	46.00	-21.29	Average	P
10	3.60	10.08	26.36	36.44	56.00	-19.56	QP	P
11	10.09	10.27	18.32	28.59	50.00	-21.41	Average	P
12	10.09	10.27	23.97	34.24	60.00	-25.76	QP	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss

Power	:	DC 5V From System	Pol/Phase	:	NEUTRAL
Test Mode	:	TX Mode 2		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.16	9.95	17.04	26.99	55.70	-28.71	Average	P
2	0.16	9.95	34.97	44.92	65.70	-20.78	QP	P
3	0.19	9.95	15.14	25.09	53.93	-28.84	Average	P
4	0.19	9.95	31.63	41.58	63.93	-22.35	QP	P
5	0.25	9.95	21.16	31.11	51.72	-20.61	Average	P
6	0.25	9.95	31.24	41.19	61.72	-20.53	QP	P
7	0.42	9.96	9.05	19.01	47.41	-28.40	Average	P
8	0.42	9.96	26.85	36.81	57.41	-20.60	QP	P
9	0.49	9.96	18.62	28.58	46.19	-17.61	Average	P
10	0.49	9.96	32.82	42.78	56.19	-13.41	QP	P
11	3.51	10.09	15.02	25.11	46.00	-20.89	Average	P
12	3.51	10.09	26.57	36.66	56.00	-19.34	QP	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=(LISN or ISN or Current Probe)Factor + Cable Loss

6. Test of Spurious Emission (Radiated)

6.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

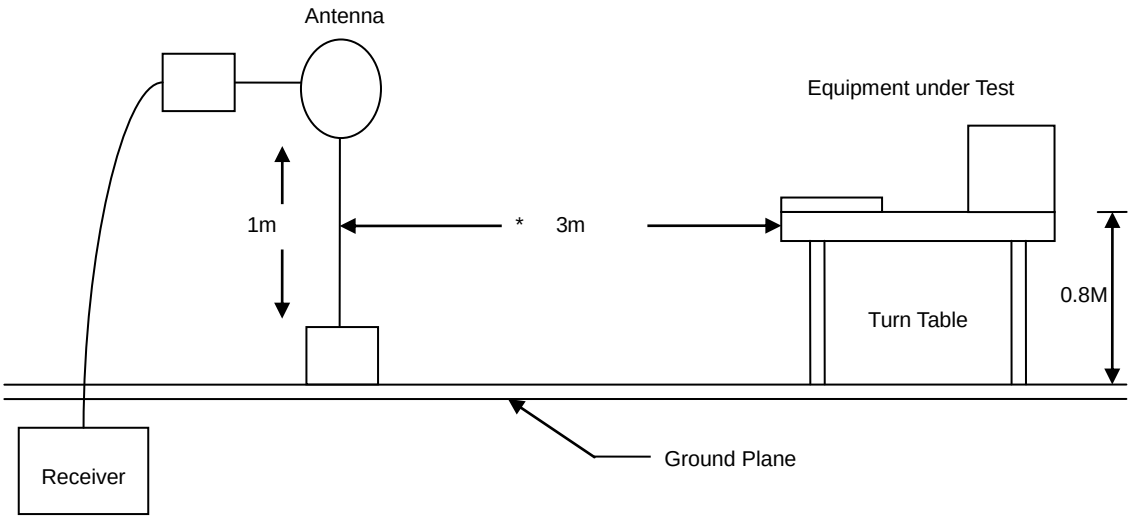
Frequency (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

6.2 Test Procedures

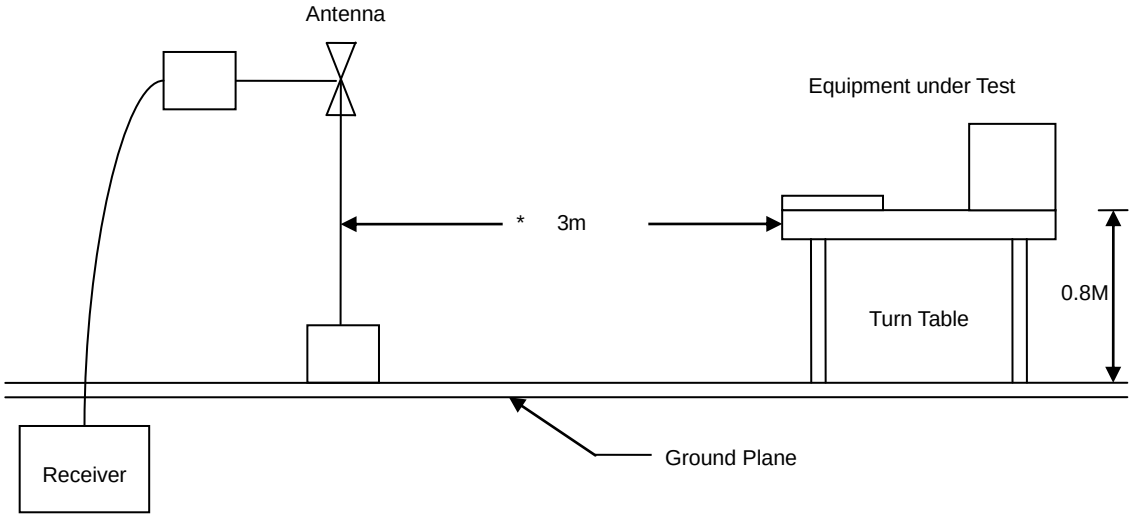
a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
i. “Cone of radiation” has been considered to be 3dB bandwidth of the measurement antenna.

6.3 Typical Test Setup

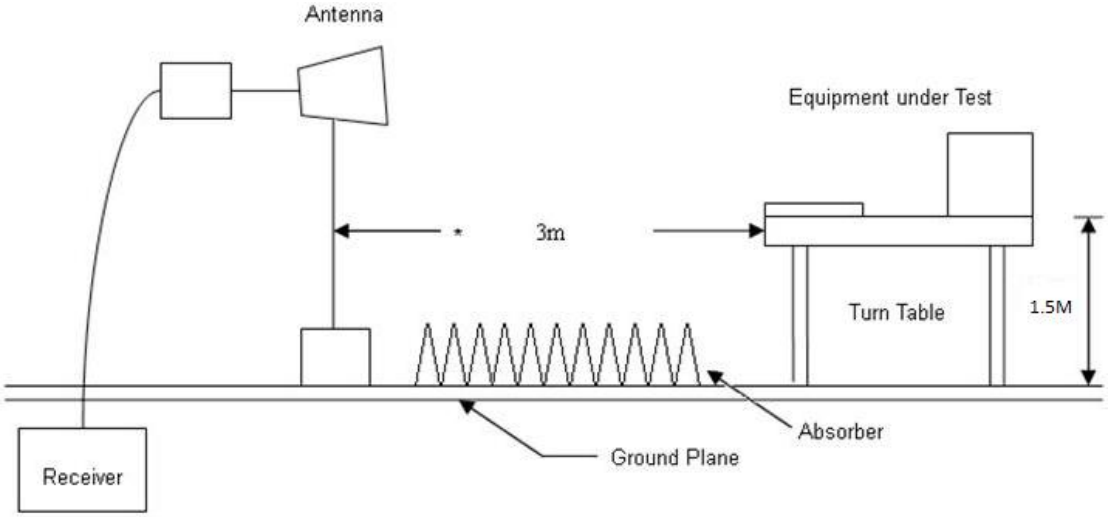
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup

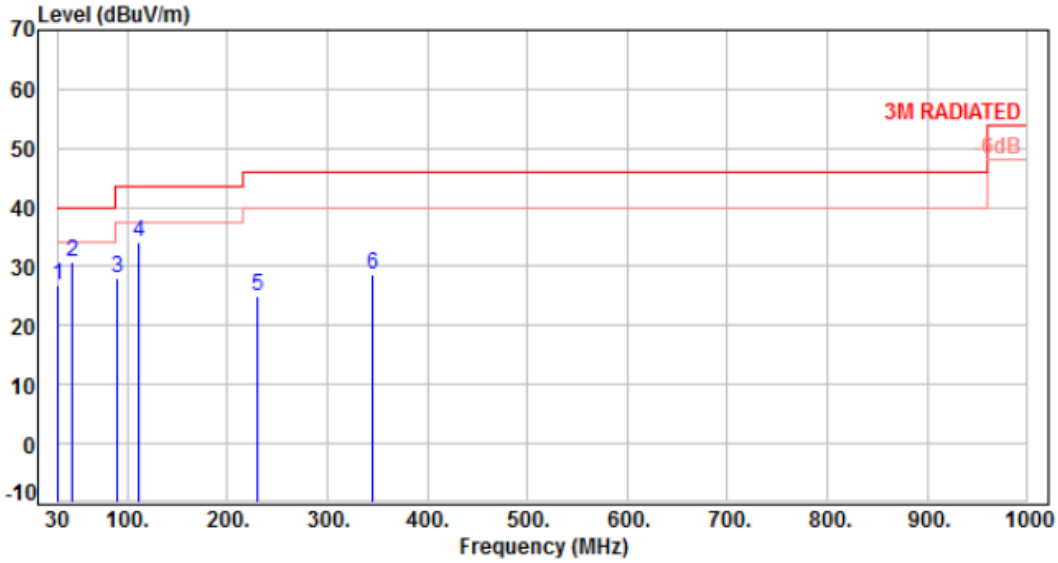


6.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

6.5 Test Result and Data (30MHz ~ 1GHz)

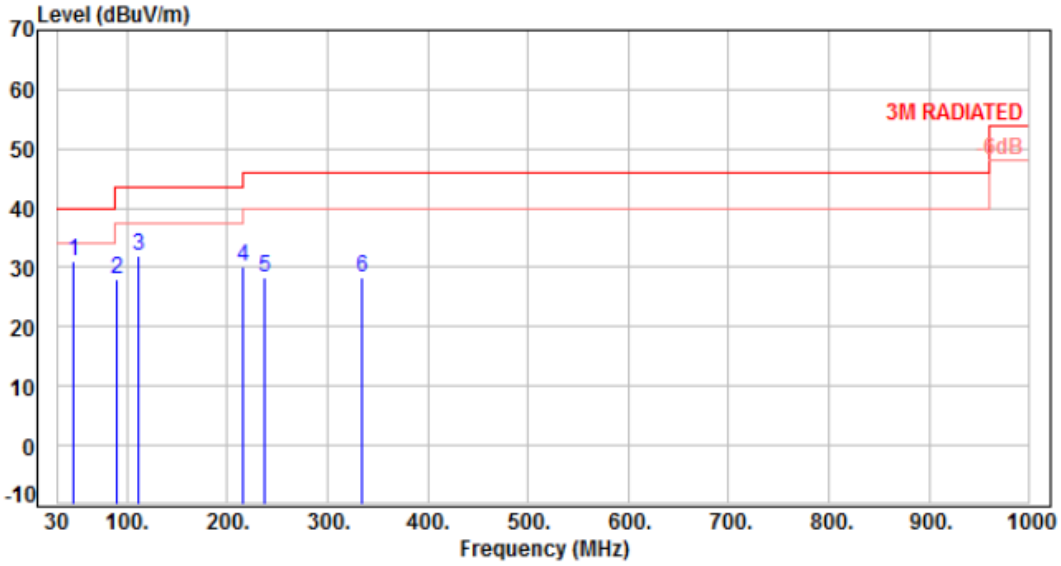
Power	:	DC 5V From System	Pol/Phase	:	VERTICAL
Test Mode	:	TX Mode 1			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	30.00	-10.51	37.46	26.95	40.00	-13.05	Peak	400	0	P
2	44.55	-9.44	40.26	30.82	40.00	-9.18	Peak	400	0	P
3	90.14	-15.50	43.40	27.90	43.50	-15.60	Peak	400	0	P
4	110.51	-12.81	47.04	34.23	43.50	-9.27	Peak	400	0	P
5	229.82	-11.66	36.75	25.09	46.00	-20.91	Peak	400	0	P
6	344.28	-7.41	35.90	28.49	46.00	-17.51	Peak	400	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

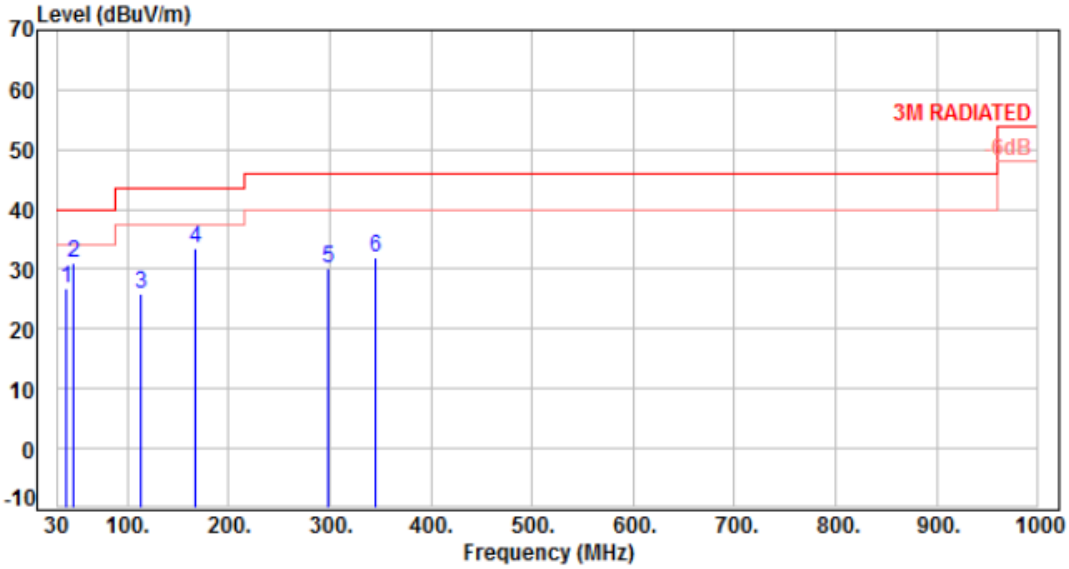
Power	:	DC 5V From System	Pol/Phase	:	HORIZONTAL
Test Mode	:	TX Mode 1			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	46.49	-9.31	40.28	30.97	40.00	-9.03	Peak	100	0	P
2	90.14	-15.50	43.56	28.06	43.50	-15.44	Peak	100	0	P
3	110.51	-12.81	44.86	32.05	43.50	-11.45	Peak	100	0	P
4	215.27	-11.70	41.79	30.09	43.50	-13.41	Peak	100	0	P
5	237.58	-10.90	39.20	28.30	46.00	-17.70	Peak	100	0	P
6	333.61	-7.61	36.02	28.41	46.00	-17.59	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

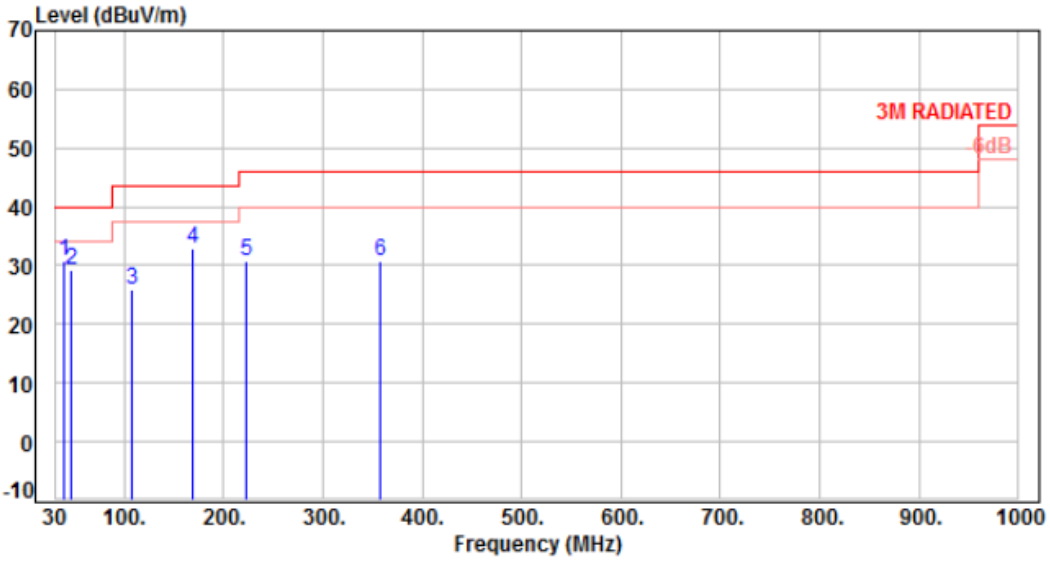
Power	:	DC 5V From System	Pol/Phase	:	VERTICAL
Test Mode	:	TX Mode 2			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	38.73	-9.81	36.49	26.68	40.00	-13.32	Peak	400	0	P
2	46.49	-9.31	40.48	31.17	40.00	-8.83	Peak	400	0	P
3	112.45	-12.57	38.59	26.02	43.50	-17.48	Peak	400	0	P
4	167.74	-9.44	43.00	33.56	43.50	-9.94	Peak	400	0	P
5	298.69	-8.72	38.90	30.18	46.00	-15.82	Peak	400	0	P
6	344.28	-7.41	39.24	31.83	46.00	-14.17	Peak	400	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

Power	:	DC 5V From System	Pol/Phase	:	HORIZONTAL
Test Mode	:	TX Mode 2			

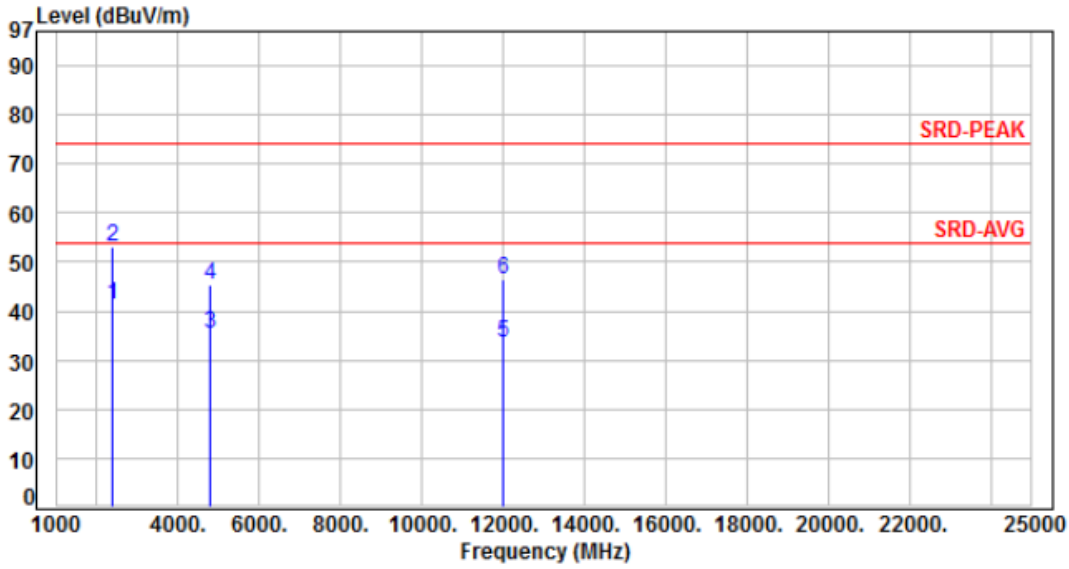


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	38.73	-9.81	40.44	30.63	40.00	-9.37	Peak	100	0	P
2	46.49	-9.31	38.66	29.35	40.00	-10.65	Peak	100	0	P
3	108.57	-13.05	38.80	25.75	43.50	-17.75	Peak	100	0	P
4	168.71	-9.53	42.34	32.81	43.50	-10.69	Peak	100	0	P
5	223.03	-11.67	42.49	30.82	46.00	-15.18	Peak	100	0	P
6	356.89	-7.12	37.74	30.62	46.00	-15.38	Peak	100	0	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

6.6 Test Result and Data (1GHz ~ 25GHz)

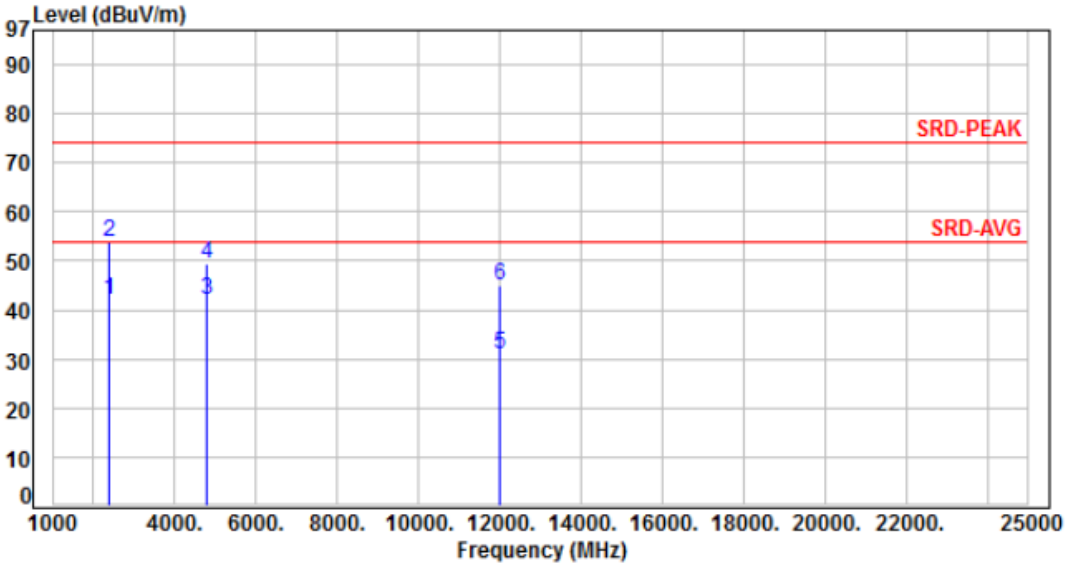
Power	:	DC 5V From System	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1, CH01			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.61	56.07	41.46	54.00	-12.54	Average	185	182	P
2	2390.00	-14.61	67.82	53.21	74.00	-20.79	Peak	185	182	P
3	4806.70	-6.90	42.28	35.38	54.00	-18.62	Average	100	172	P
4	4806.70	-6.90	52.42	45.52	74.00	-28.48	Peak	100	172	P
5	12016.75	4.63	28.77	33.40	54.00	-20.60	Average	100	360	P
6	12016.75	4.63	42.02	46.65	74.00	-27.35	Peak	100	360	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

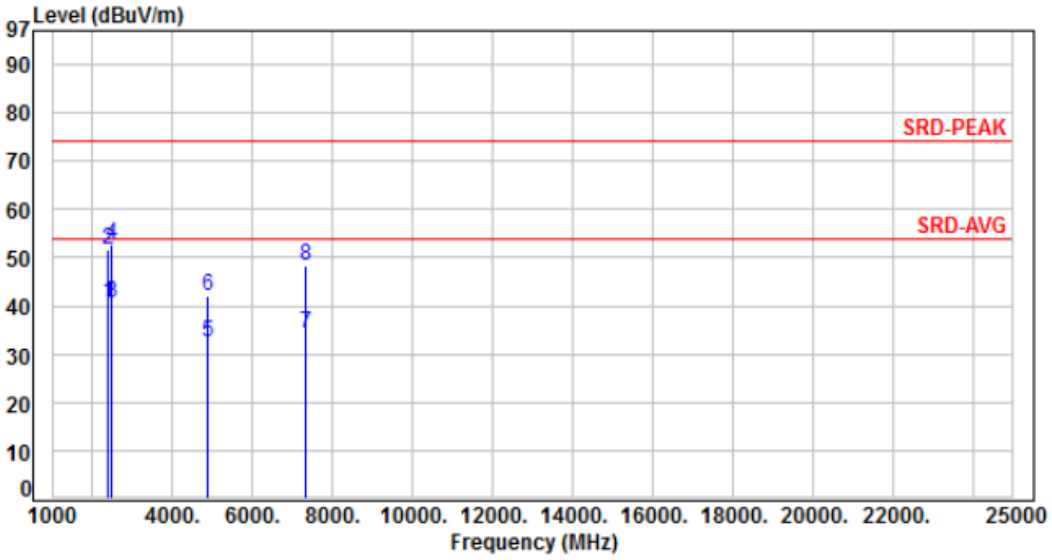
Power	:	DC 5V From System	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1, CH01			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.61	56.55	41.94	54.00	-12.06	Average	100	14	P
2	2390.00	-14.61	68.41	53.80	74.00	-20.20	Peak	100	14	P
3	4806.70	-6.90	48.85	41.95	54.00	-12.05	Average	195	20	P
4	4806.70	-6.90	56.22	49.32	74.00	-24.68	Peak	195	20	P
5	12016.75	4.63	26.27	30.90	54.00	-23.10	Average	100	135	P
6	12016.75	4.63	40.51	45.14	74.00	-28.86	Peak	100	135	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

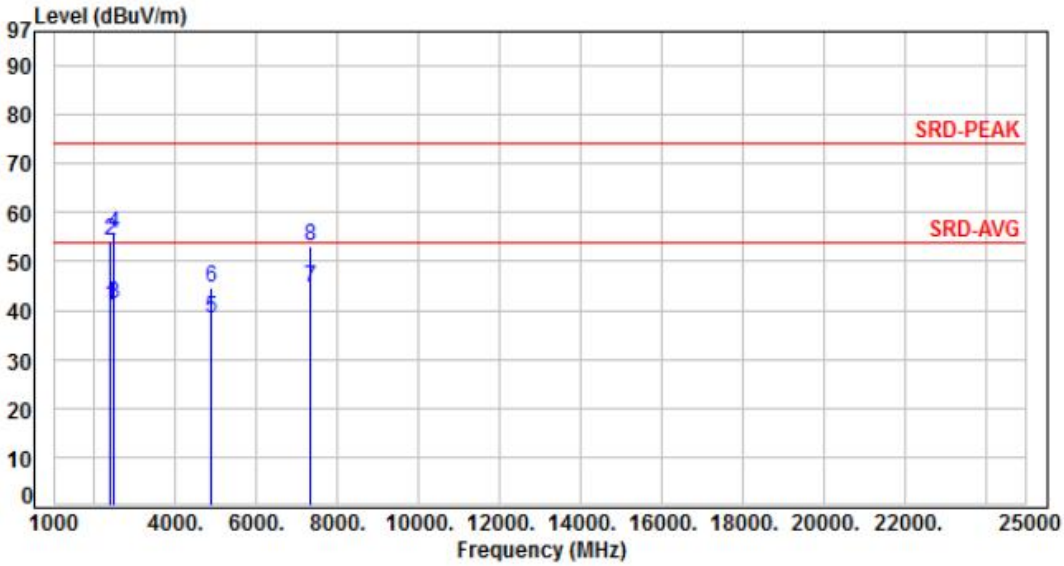
Power	:	DC 5V From System		Pol/Phase	:	VERTICAL	
Test Mode	:	Mode 1, CH20					



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.61	55.17	40.56	54.00	-13.44	Average	160	183	P
2	2390.00	-14.61	66.26	51.65	74.00	-22.35	Peak	160	183	P
3	2483.50	-14.22	54.91	40.69	54.00	-13.31	Average	160	183	P
4	2483.50	-14.22	66.83	52.61	74.00	-21.39	Peak	160	183	P
5	4882.70	-6.60	39.23	32.63	54.00	-21.37	Average	195	67	P
6	4882.70	-6.60	48.66	42.06	74.00	-31.94	Peak	195	67	P
7	7324.05	-1.27	35.41	34.14	54.00	-19.86	Average	100	178	P
8	7324.05	-1.27	49.49	48.22	74.00	-25.78	Peak	100	178	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

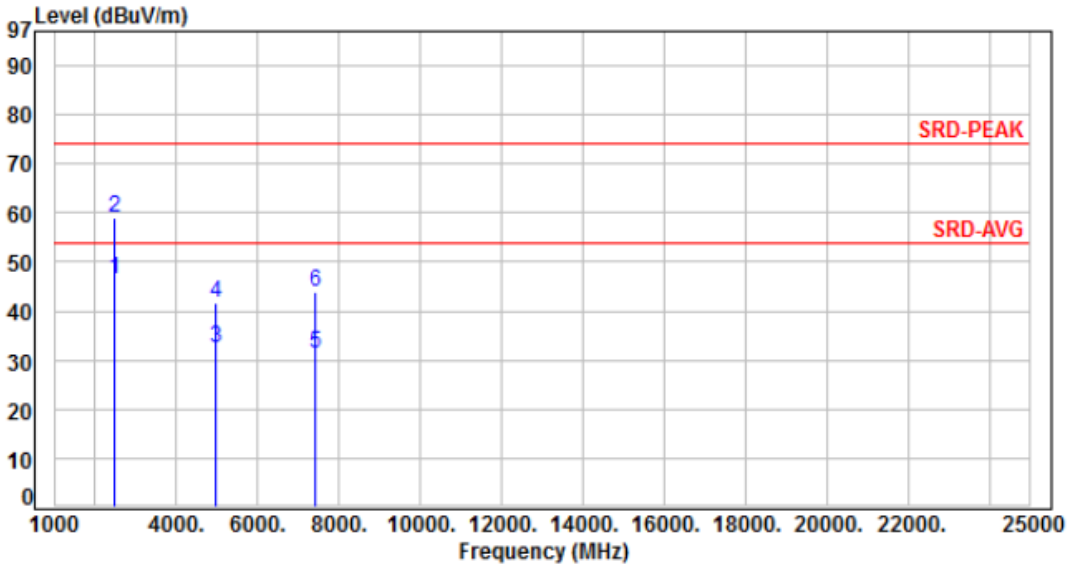
Power :	DC 5V From System	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 1, CH20		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.61	55.58	40.97	54.00	-13.03	Average	192	65	P
2	2390.00	-14.61	68.92	54.31	74.00	-19.69	Peak	192	65	P
3	2483.50	-14.22	55.41	41.19	54.00	-12.81	Average	192	65	P
4	2483.50	-14.22	69.74	55.52	74.00	-18.48	Peak	192	65	P
5	4882.70	-6.60	45.06	38.46	54.00	-15.54	Average	200	15	P
6	4882.70	-6.60	51.24	44.64	74.00	-29.36	Peak	200	15	P
7	7324.05	-1.27	45.80	44.53	54.00	-9.47	Average	181	19	P
8	7324.05	-1.27	54.54	53.27	74.00	-20.73	Peak	181	19	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

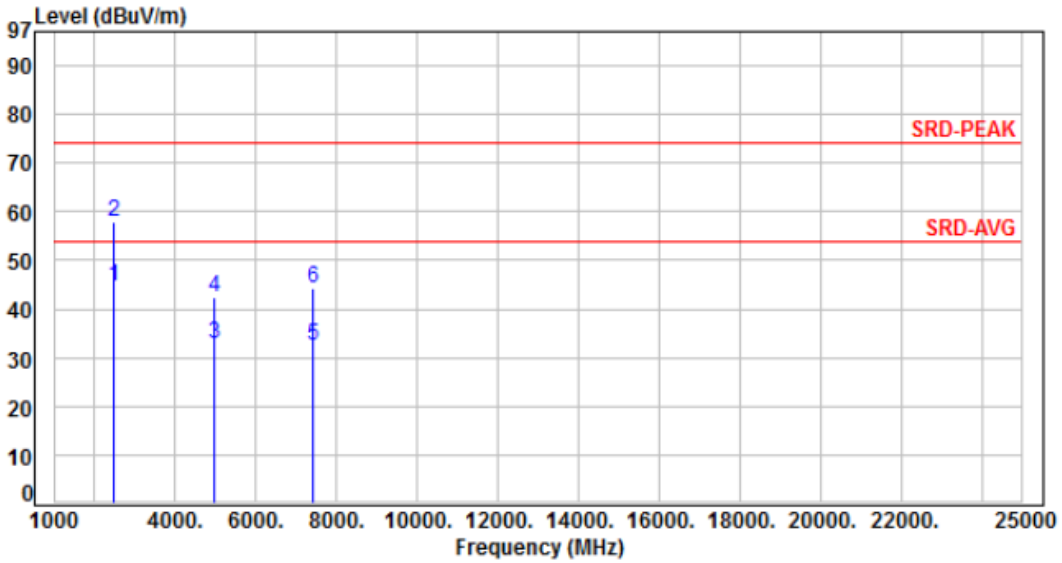
Power	:	DC 5V From System	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1, CH38			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-14.22	60.70	46.48	54.00	-7.52	Average	100	195	P
2	2483.50	-14.22	73.24	59.02	74.00	-14.98	Peak	100	195	P
3	4951.96	-6.42	38.84	32.42	54.00	-21.58	Average	100	65	P
4	4951.96	-6.42	48.09	41.67	74.00	-32.33	Peak	100	65	P
5	7432.05	-1.14	32.37	31.23	54.00	-22.77	Average	100	210	P
6	7432.05	-1.14	45.16	44.02	74.00	-29.98	Peak	100	210	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

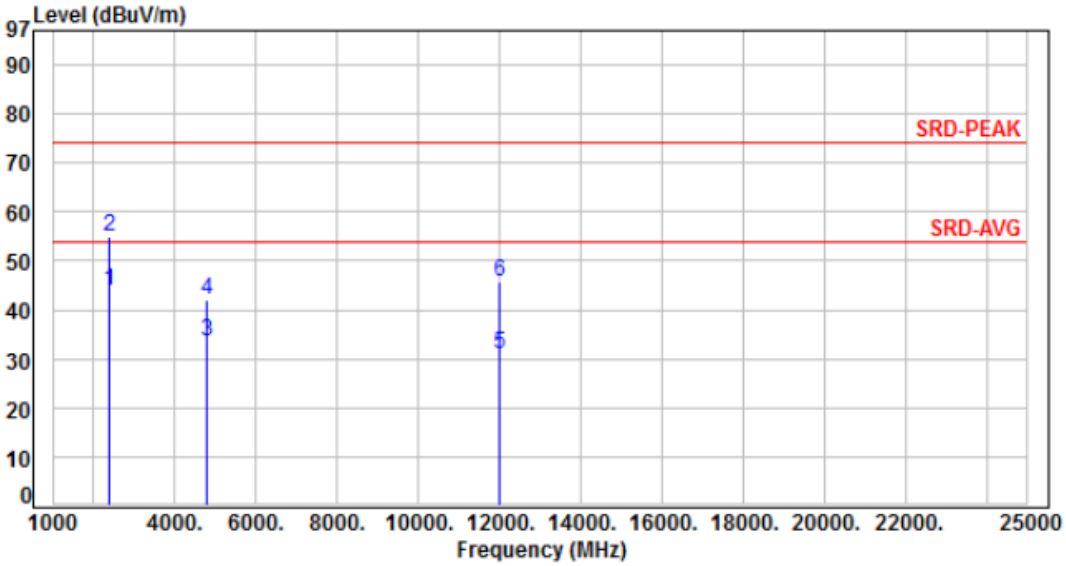
Power	:	DC 5V From System	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1, CH38			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-14.22	59.00	44.78	54.00	-9.22	Average	120	148	P
2	2483.50	-14.22	72.08	57.86	74.00	-16.14	Peak	120	148	P
3	4951.96	-6.42	39.13	32.71	54.00	-21.29	Average	100	70	P
4	4951.96	-6.42	48.82	42.40	74.00	-31.60	Peak	100	70	P
5	7432.05	-1.14	33.45	32.31	54.00	-21.69	Average	100	50	P
6	7432.05	-1.14	45.48	44.34	74.00	-29.66	Peak	100	50	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

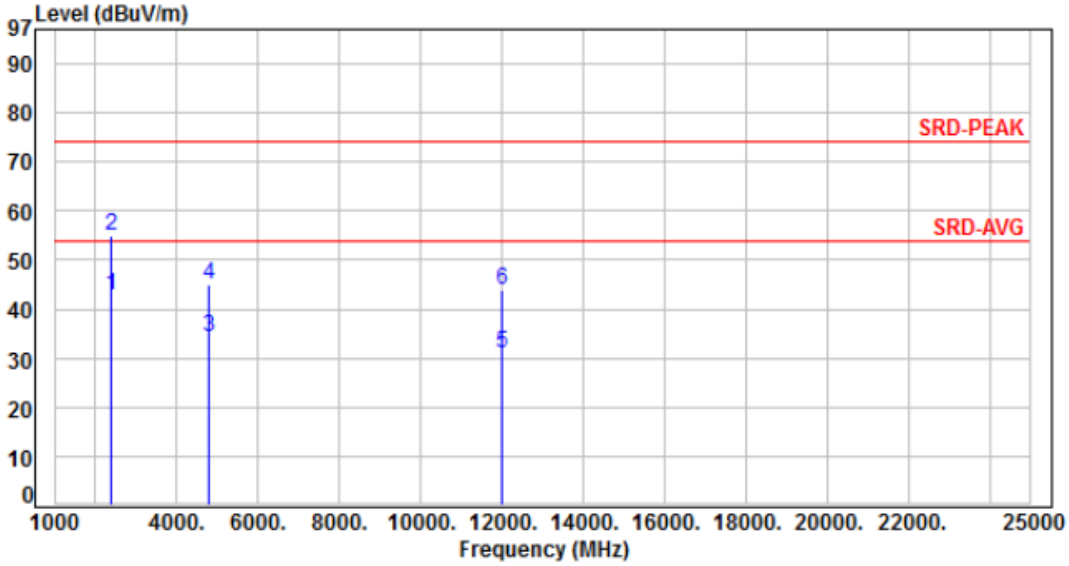
Power	:	DC 5V From System	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2, CH01			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.61	58.58	43.97	54.00	-10.03	Average	100	276	P
2	2390.00	-14.61	69.60	54.99	74.00	-19.01	Peak	100	276	P
3	4806.70	-6.90	40.41	33.51	54.00	-20.49	Average	100	360	P
4	4806.70	-6.90	49.12	42.22	74.00	-31.78	Peak	100	360	P
5	12016.75	4.63	26.34	30.97	54.00	-23.03	Average	100	153	P
6	12016.75	4.63	41.24	45.87	74.00	-28.13	Peak	100	153	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

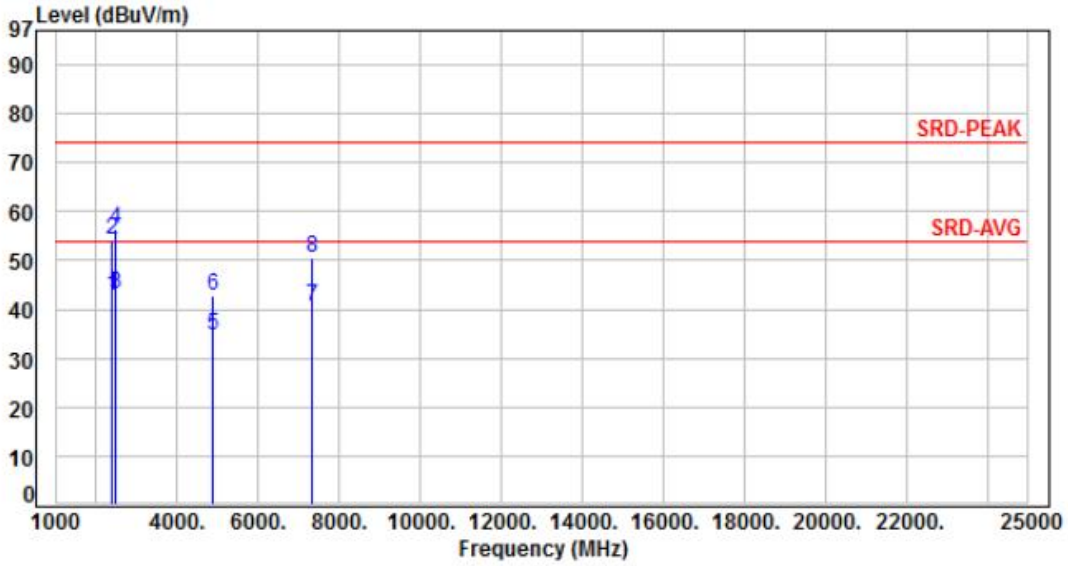
Power	:	DC 5V From System	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 2, CH01			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.61	57.46	42.85	54.00	-11.15	Average	100	23	P
2	2390.00	-14.61	69.60	54.99	74.00	-19.01	Peak	100	23	P
3	4806.70	-6.90	41.14	34.24	54.00	-19.76	Average	100	18	P
4	4806.70	-6.90	51.89	44.99	74.00	-29.01	Peak	100	18	P
5	12016.75	4.63	26.38	31.01	54.00	-22.99	Average	100	337	P
6	12016.75	4.63	39.31	43.94	74.00	-30.06	Peak	100	337	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

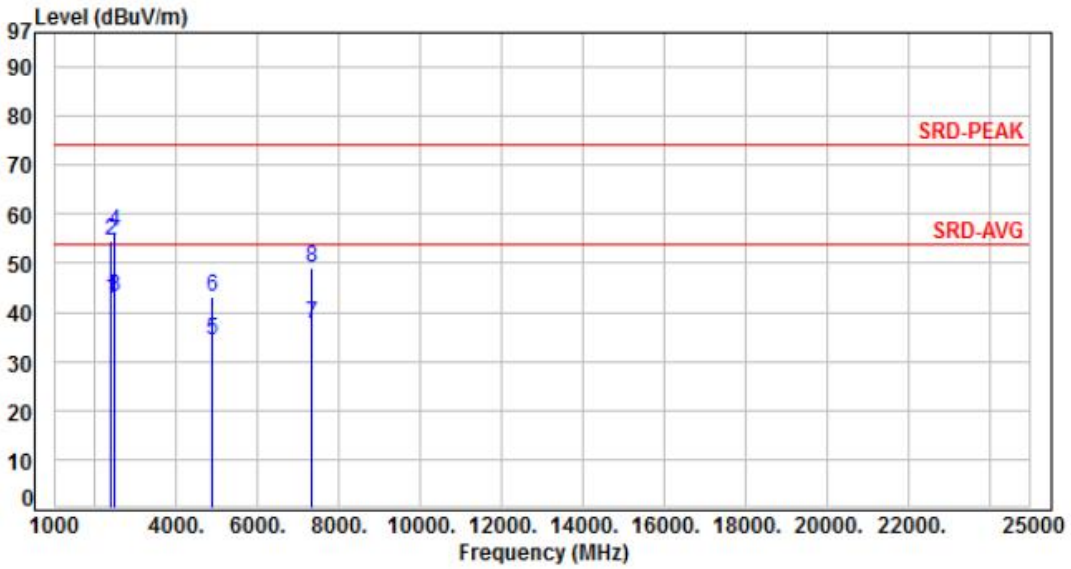
Power	:	DC 5V From System	Pol/Phase	:	VERTICAL		
Test Mode	:	Mode 2, CH20					



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.61	57.23	42.62	54.00	-11.38	Average	100	275	P
2	2390.00	-14.61	68.94	54.33	74.00	-19.67	Peak	100	275	P
3	2483.50	-14.22	57.27	43.05	54.00	-10.95	Average	100	275	P
4	2483.50	-14.22	70.63	56.41	74.00	-17.59	Peak	100	275	P
5	4880.00	-6.61	41.27	34.66	54.00	-19.34	Average	100	23	P
6	4880.00	-6.61	49.28	42.67	74.00	-31.33	Peak	100	23	P
7	7324.05	-1.27	41.81	40.54	54.00	-13.46	Average	110	358	P
8	7324.05	-1.27	51.79	50.52	74.00	-23.48	Peak	110	358	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

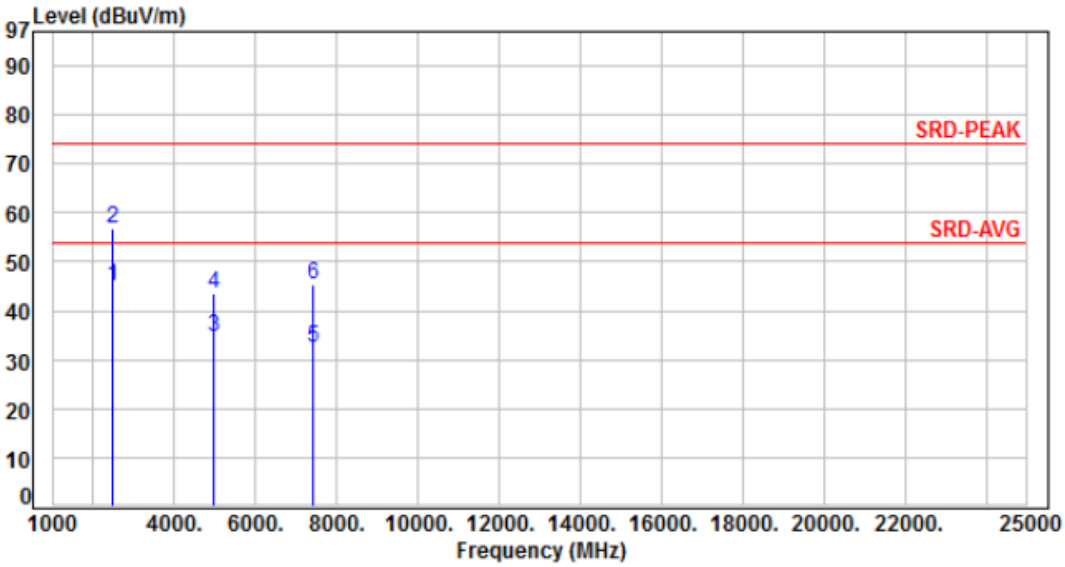
Power	:	DC 5V From System	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 2, CH20			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.61	57.28	42.67	54.00	-11.33	Average	100	25	P
2	2390.00	-14.61	69.14	54.53	74.00	-19.47	Peak	100	25	P
3	2483.50	-14.22	57.36	43.14	54.00	-10.86	Average	100	25	P
4	2483.50	-14.22	70.53	56.31	74.00	-17.69	Peak	100	25	P
5	4880.00	-6.61	40.75	34.14	54.00	-19.86	Average	182	20	P
6	4880.00	-6.61	49.61	43.00	74.00	-31.00	Peak	182	20	P
7	7324.05	-1.27	39.03	37.76	54.00	-16.24	Average	100	38	P
8	7324.05	-1.27	50.41	49.14	74.00	-24.86	Peak	100	38	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

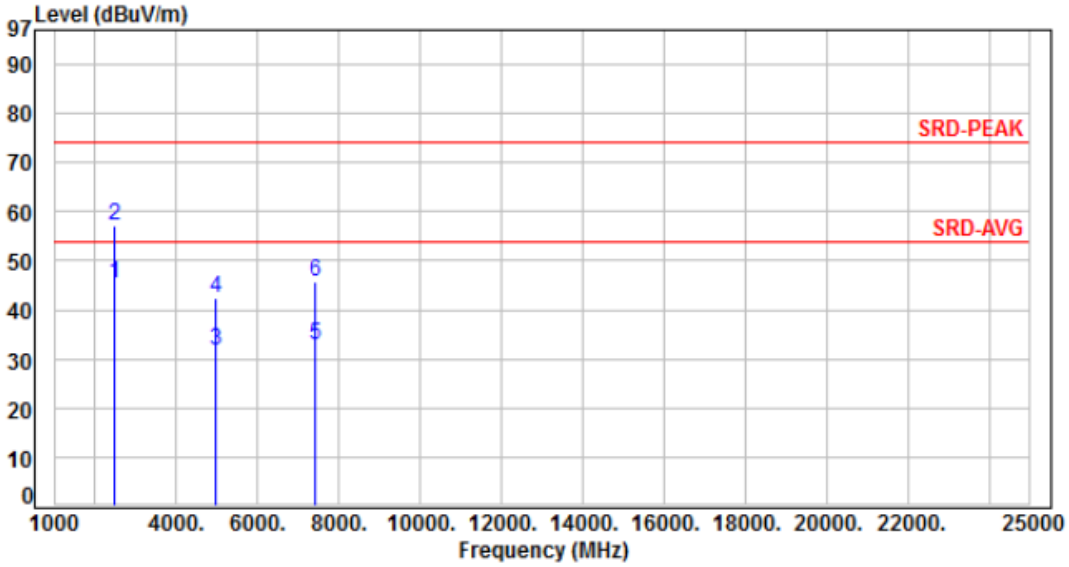
Power	:	DC 5V From System	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2, CH38			



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-14.22	59.10	44.88	54.00	-9.12	Average	100	273	P
2	2483.50	-14.22	71.12	56.90	74.00	-17.10	Peak	100	273	P
3	4952.02	-6.42	41.00	34.58	54.00	-19.42	Average	130	53	P
4	4952.02	-6.42	49.94	43.52	74.00	-30.48	Peak	130	53	P
5	7432.05	-1.14	33.43	32.29	54.00	-21.71	Average	100	360	P
6	7432.05	-1.14	46.67	45.53	74.00	-28.47	Peak	100	360	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

Power	:	DC 5V From System		Pol/Phase	:	HORIZONTAL	
Test Mode	:	Mode 2, CH38					



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-14.22	59.69	45.47	54.00	-8.53	Average	100	25	P
2	2483.50	-14.22	71.34	57.12	74.00	-16.88	Peak	100	25	P
3	4952.02	-6.42	38.01	31.59	54.00	-22.41	Average	100	60	P
4	4952.02	-6.42	48.67	42.25	74.00	-31.75	Peak	100	60	P
5	7432.05	-1.14	33.81	32.67	54.00	-21.33	Average	100	38	P
6	7432.05	-1.14	46.92	45.78	74.00	-28.22	Peak	100	38	P

Note: Level=Reading+Factor
Margin=Level-Limit
Factor=Antenna Factor + cable loss - Amplifier Factor

6.7 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

**: Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

7. Test of Spurious Emission (Conducted)

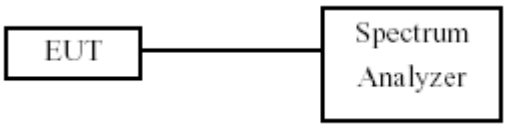
7.1 Test Limit

Below –20dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

7.2 Test Procedure

a. The transmitter output was connected to the spectrum analyzer via a low loss cable.
b. Set RBW of spectrum analyzer to 100 KHz and VBW of spectrum analyzer to 300 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
c. Peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20dB relative to the maximum measured in-band peak PSD level.
d. The band edges was measured and recorded.

7.3 Test Setup Layout



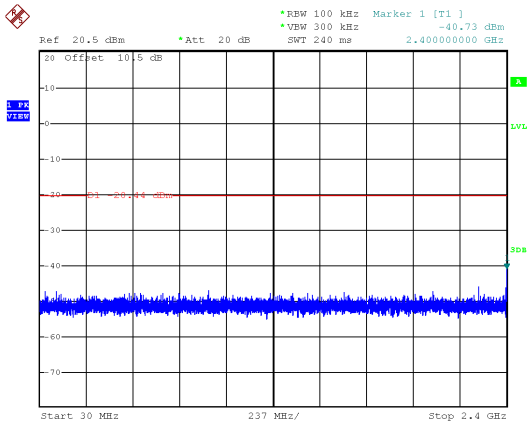
7.4 Test Result and Data

Test Result : PASS

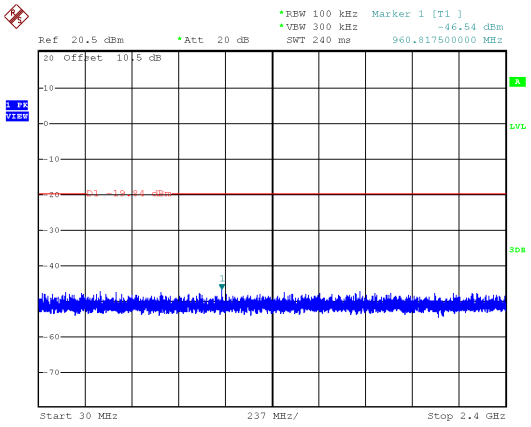
Note: Test plots refer to the following pages.

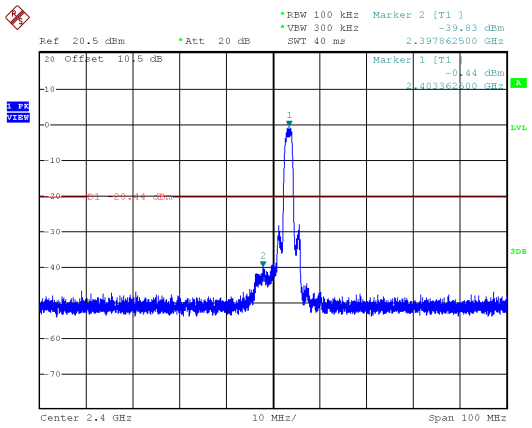
Modulation Mode: π/4-DQPSK, ANT1

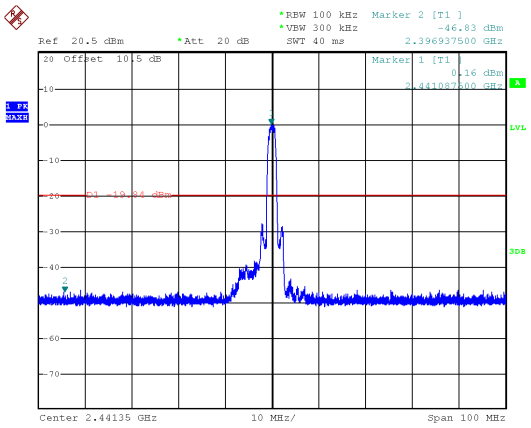
Channel: 1

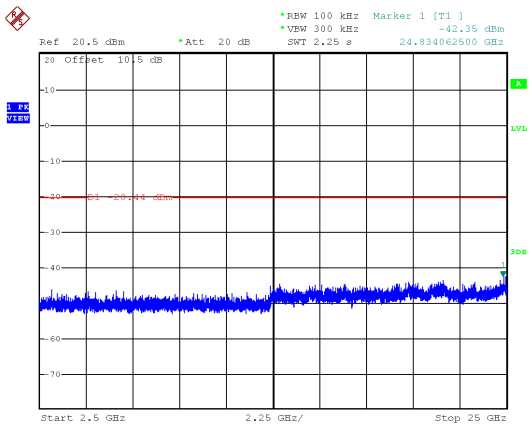


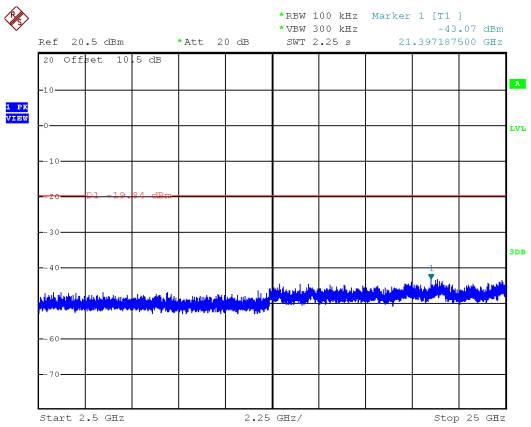
Channel: 20



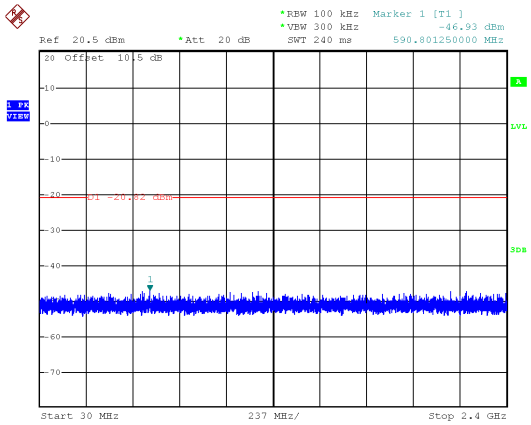


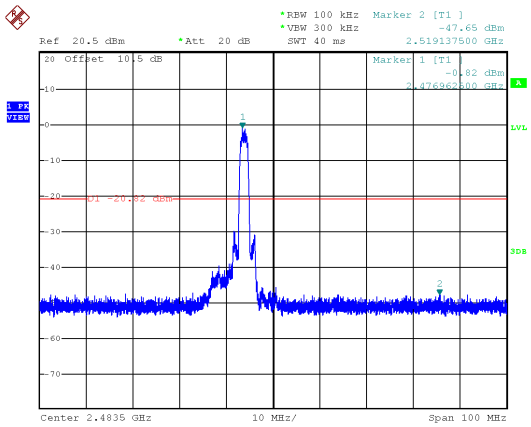


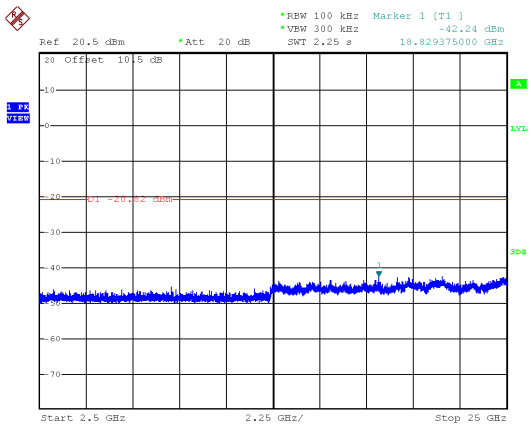




Modulation Mode: π/4-DQPSK, ANT1
Channel: 38

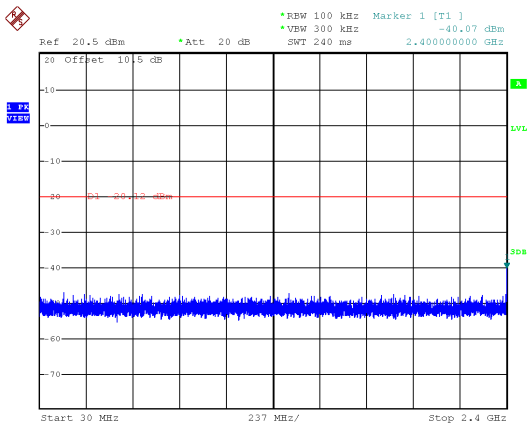




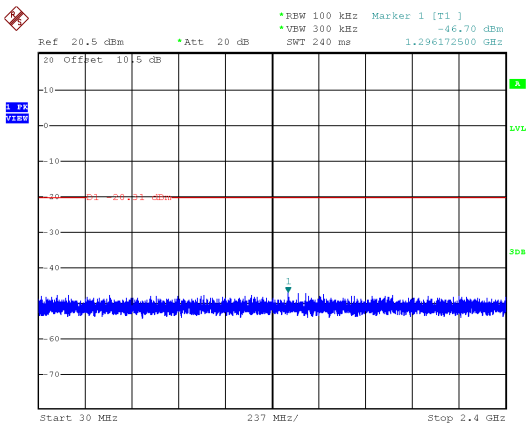


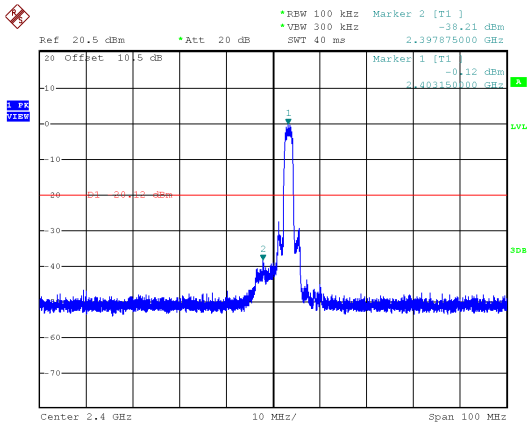
Modulation Mode: π/4-DQPSK, ANT2

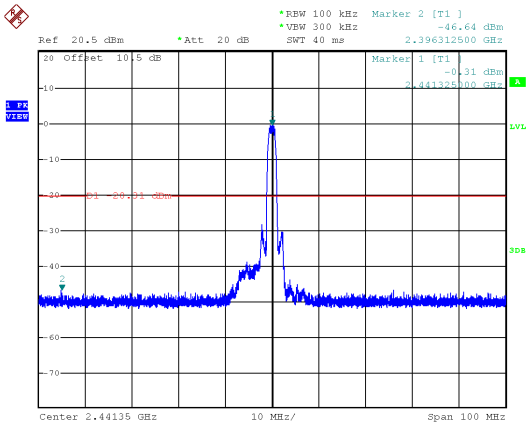
Channel: 1

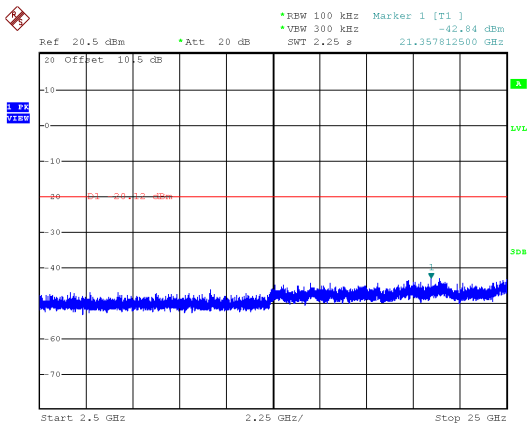


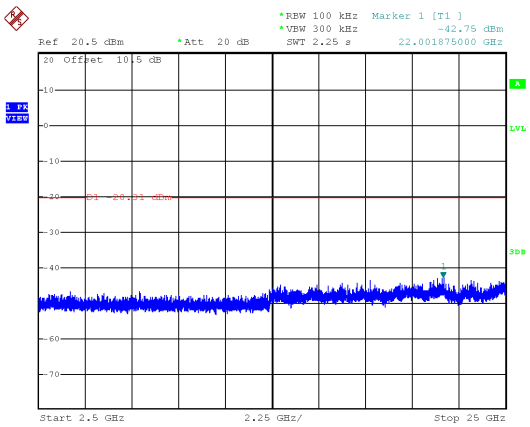
Channel: 20



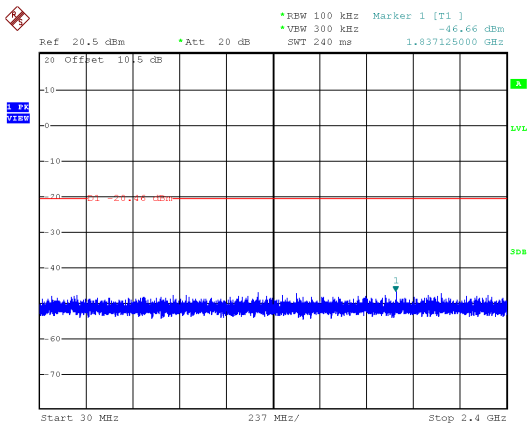


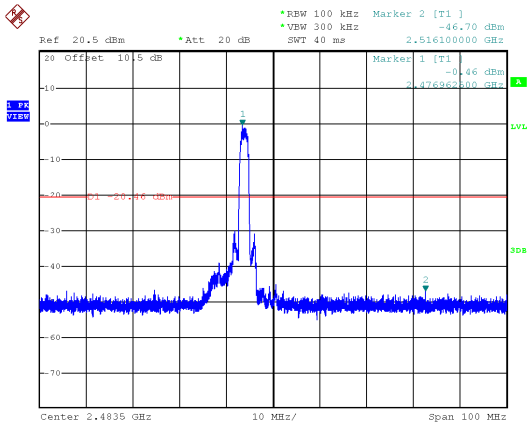


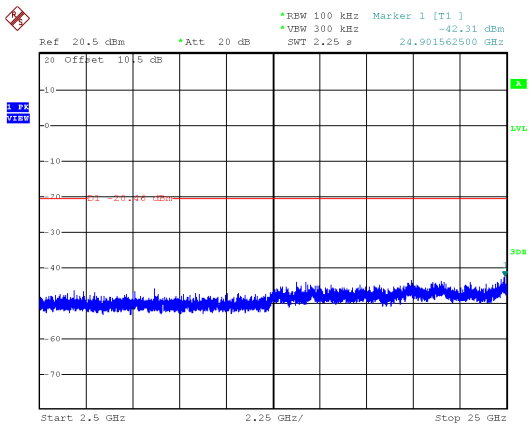




Modulation Mode: π/4-DQPSK, ANT2
Channel: 38







8. On Time, Duty Cycle and Measurement methods

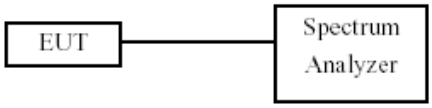
8.1 Test Limit

None; for reporting purposes only.

8.2 Test Procedure

KDB 558074 Zero-Span Spectrum Analyzer Method.

8.3 Test Setup Layout

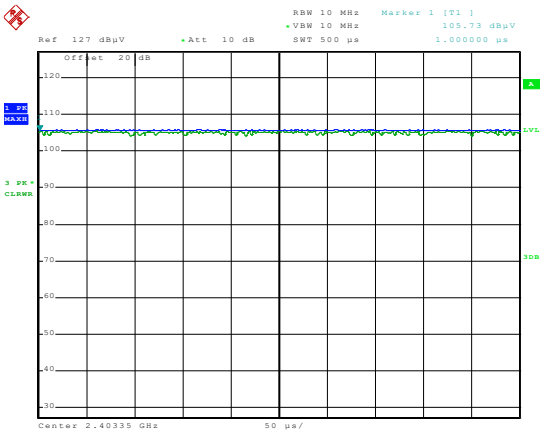


8.4 Test Result and Data

Modulation Mode	On Time (ms)	Period Time (ms)	Duty Cycle (%)
π/4-DQPSK	100.00	100.00	100.00%

Note: Test plots refer to the following pages.

Modulation Mode: π/4-DQPSK



9. 6dB Bandwidth Measurement Data

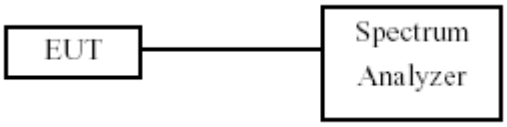
9.1 Test Limit

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

9.2 Test Procedures

a. The transmitter output was connected to the spectrum analyzer.
b. Set RBW of spectrum analyzer to 1~5% of the emission bandwidth and VBW ≥ 3x RBW.
c. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.
d. The 6dB Bandwidth was measured and recorded.

9.3 Test Setup Layout



9.4 Test Result and Data

Test Result : PASS

ANT1

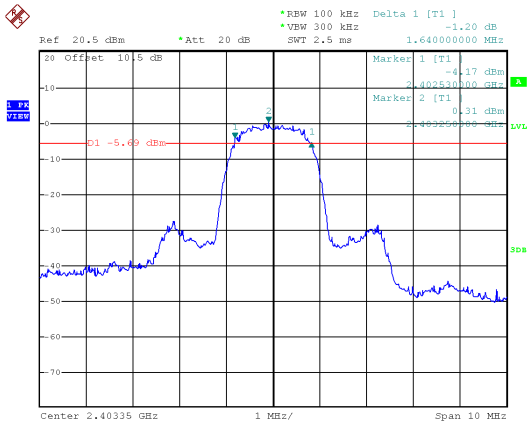
Modulation Mode	Channel	Frequency (MHz)	6dB Bandwidth (KHz)	Limit (KHz)
π/4-DQPSK	1	2403.35	1640.00	500
	20	2441.35	1660.00	500
	38	2477.35	1640.00	500

ANT2

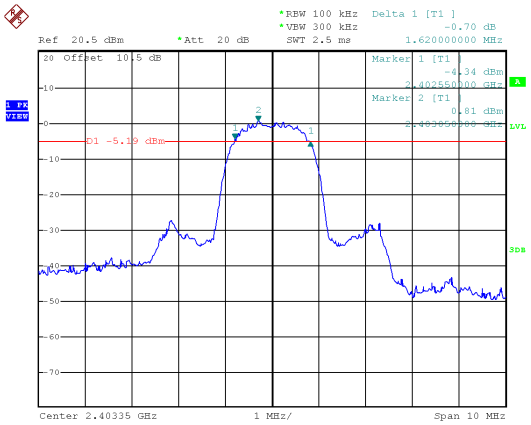
Modulation Mode	Channel	Frequency (MHz)	6dB Bandwidth (KHz)	Limit (KHz)
π/4-DQPSK	1	2403.35	1620.00	500
	20	2441.35	1660.00	500
	38	2477.35	1660.00	500

Note: Test plots refer to the following pages.

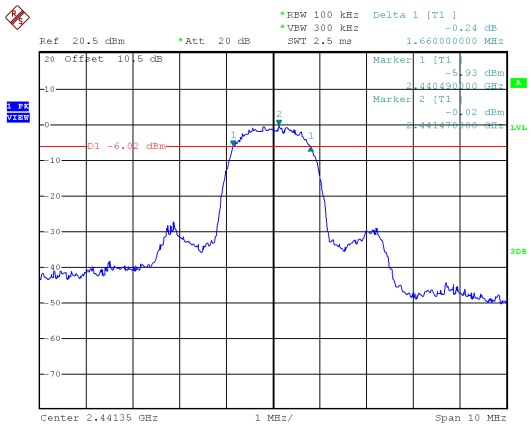
Modulation Mode: π/4-DQPSK, ANT1
Channel: 1



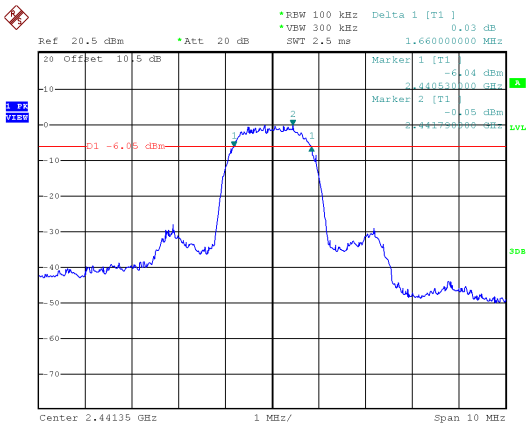
Modulation Mode: π/4-DQPSK, ANT2
Channel: 1



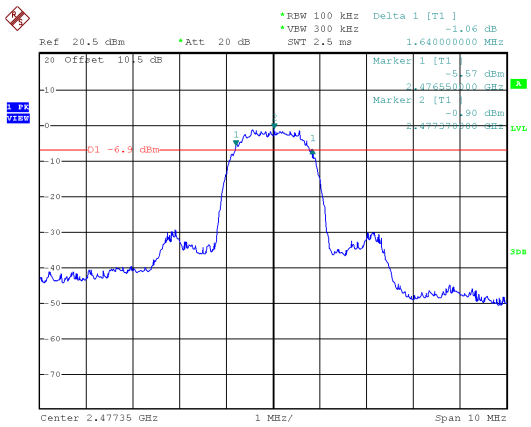
Channel: 20



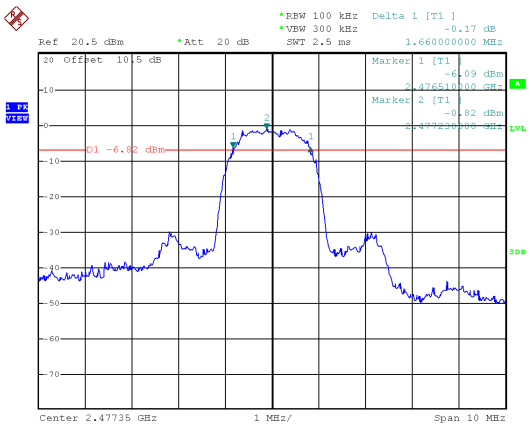
Channel: 20



Channel: 38



Channel: 38



10. Maximum Peak and Average Output Power

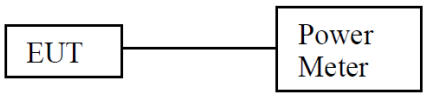
10.1 Test Limit

The Maximum Peak Output Power Measurement is 30dBm.

10.2 Test Procedures

The antenna port (RF output) of the EUT was connected to the input (RF input) of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

10.3 Test Setup Layout



10.4 Test Result and Data

Test Result : PASS

ANT1

Modulation Mode	Channel	Frequency (MHz)	Power Output (dBm)	
			Peak	Average
π/4-DQPSK	1	2403.35	4.19	2.26
	20	2441.35	3.7	1.77
	38	2477.35	3.15	1.16

ANT2

Modulation Mode	Channel	Frequency (MHz)	Power Output (dBm)	
			Peak	Average
π/4-DQPSK	1	2403.35	3.85	1.94
	20	2441.35	3.34	1.46
	38	2477.35	2.92	0.84

*Average power is for reference only.

11. Power Spectral Density

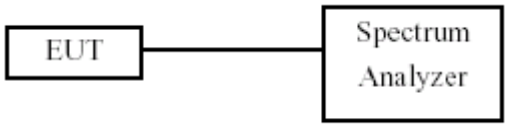
11.1 Test Limit

The Maximum of Power Spectral Density Measurement is 8dBm.

11.2 Test Procedures

a. The transmitter output was connected to spectrum analyzer.
b. The spectrum analyzer's resolution bandwidth were set at 3KHz RBW and 30KHz VBW as that of the fundamental frequency. Set the sweep time=auto couple.
c. The power spectral density was measured and recorded.

11.3 Test Setup Layout



11.4 Test Result and Data

Test Result : PASS

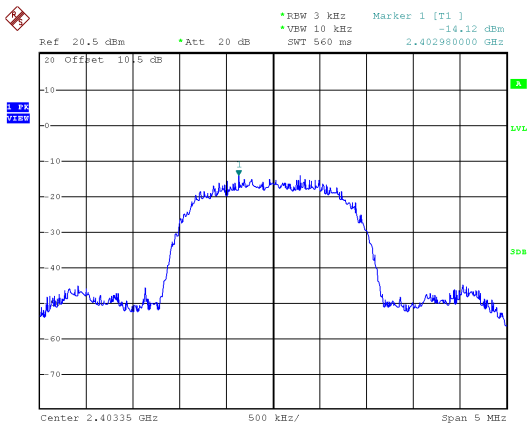
ANT1

Modulation Mode	Channel	Frequency (MHz)	Maximum Power Density of 3KHz Bandwidth(dBm)	Limit
π/4-DQPSK	1	2403.35	**-14.12**	8.00
	20	2441.35	-14.51	8.00
	38	2477.35	-14.95	8.00

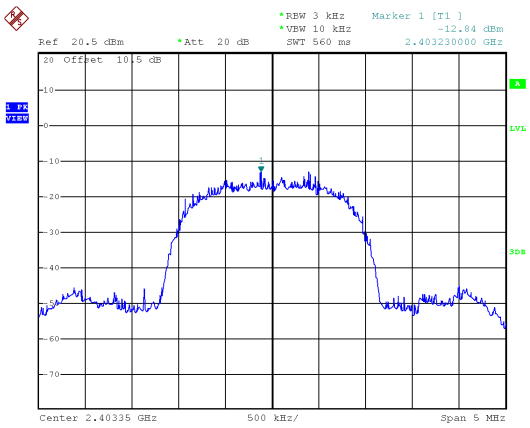
ANT2

Modulation Mode	Channel	Frequency (MHz)	Maximum Power Density of 3KHz Bandwidth(dBm)	Limit
π/4-DQPSK	1	2403.35	**-12.84**	8.00
	20	2441.35	-13.34	8.00
	38	2477.35	-15.15	8.00

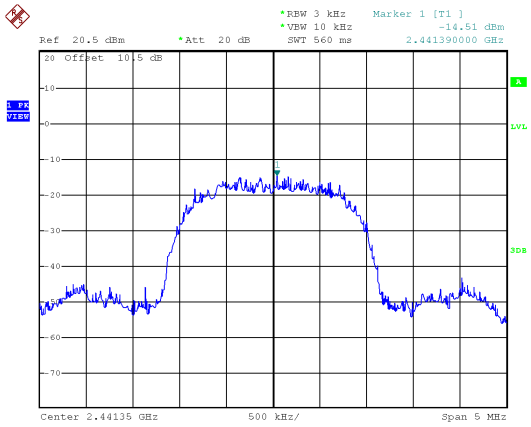
Modulation Mode: π/4-DQPSK, ANT1
Channel: 1



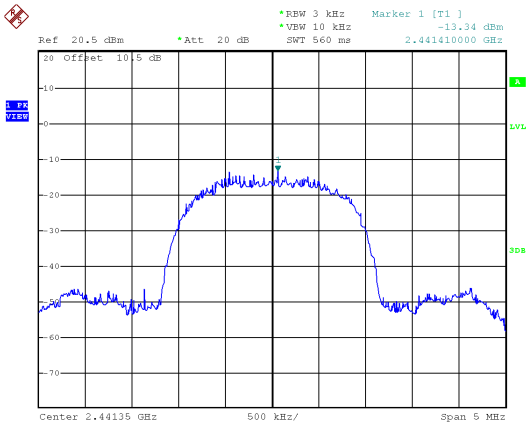
Modulation Mode: π/4-DQPSK, ANT2
Channel: 1



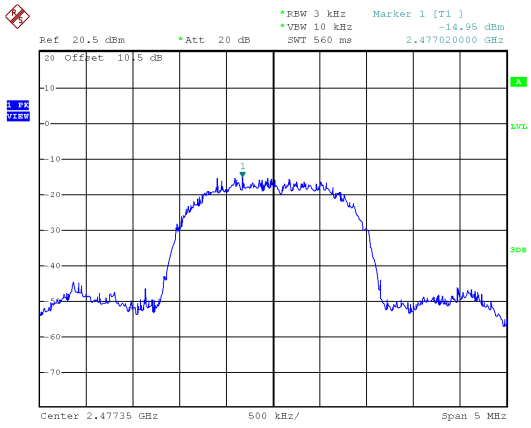
Channel: 20



Channel: 20



Channel: 38



Channel: 38