Test Report

Part 15 subpart C

Client Information:

Applicant : Grace Digital Inc.

Applicant add. : Grace Digital Inc.10531 4S Commons Drive #166 Suite #430 San Diego, CA 92127,United States

EUT Information:

EUT Name : ECODRIFT
Model No. : GDI-EXDRFT200
Listed Models : GDI-EXDRFT201,GDI-EXDRFT202,GDI-EXDRFT203,GDI-EXDRFT204, GDI-EXDRFT205,GDI-EXDRFT206,GDI-EXDRFT207,GDI-EXDRFT208, GDI-EXDRFT209,GDI-EXDRFT210,GDI-EXDRFT211,GDI-EXDRFT212, GDI-EXDRFT213,GDI-EXDRFT214,GDI-EXDRFT215,GDI-EXDRFT216, GDI-EXDRFT217,GDI-EXDRFT218,GDI-EXDRFT219,GDI-EXDRFT220
Brand Name: ECOXGEAR
FCC ID : 2AAUI-GDIEXDRFT

Prepared By:

Dongguan Yaxu (AiT) Technology Limited
Add. : No.22, Jinqianling Third Street, Jitigang, Huangjiang,Dongguan, Guangdong, China

Date of Receipt: 2017-06-12 Date of Test: 2017-06-12 to 2017-06-26
Date of Issue: 2017-06-26 Test Result: **Pass**

This device described above has been tested by Dongguan Yaxu (AiT) Technology Limited, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
*This test report must not be used by the client to claim product endorsement by any agency of the U.S. Government.

Reviewed by: Seal.Chen **Approved by:** Jackie.Deng

1 Contents

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2 Test Summary

2.1 Test Description

Test Item	Test Requirement	Result
Antenna Requirement	FCC Part 15.247(b)(4)/15.203	PASS
Conducted Emission	FCC Part 15.207	PASS
Radiated Emissions	FCC Part 15.247(d)/ 15.205	PASS
Maximum Peak Output Power	FCC Part 15.247(b)	PASS
Power Spectral Density	FCC Part 15.247(e)	PASS
6dB Bandwidth	FCC Part 15.247(a)(2)	PASS
Spurious RF Conducted Emission	FCC Part 15.247(d)	PASS
Band Edge	FCC Part 15.247(d)	PASS

2.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties. The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. The maximum value of the uncertainty as below:

No.	Item	Uncertainty
1	Conducted Emission Test	1.20dB
2	Radiated Emission Test	3.30dB

3 Test Facility

The test facility is recognized, certified or accredited by the following organizations:

.CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2005 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on Apr. 18, 2013

.FCC- Registration No: 248337

The 3m Semi-Anechoic Chamber, 3m/10m Open Area Test Site and Shielding Room of Dongguan Yaxu (AiT) Technology Limited have been registered by Federal Communications Commission (FCC) on Aug.29, 2014.

.Industry Canada(IC)-Registration No: IC6819A-1 & IC6819A-2

The 3m Semi-Anechoic Chamber and 3m/10m Open Area Test Site of Dongguan Yaxu (AiT) Technology Limited have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing on Oct. 01, 2014.

.VCCI- Registration No: 2705

The 3m/10m Open Area Test Site, Shielding Room and 3m Chamber of Dongguan Yaxu (AiT) Technology Limited have been registered by Voluntary Control Council for Interference on Nov. 21, 2012. The Telecommunication Ports Conducted Disturbance Measurement of Dongguan Yaxu (AiT) Technology Limited have been registered by Voluntary Control Council for Interference on May. 13, 2013.

.TUV NORD

Dongguan Yaxu (AiT) Technology Limited has been assessed on Jun. 13, 2013 that it can carry out EMC tests by order and under supervision of TUV NORD.

.ITS- Registration No: TMPSHA031

Dongguan Yaxu (AiT) Technology Limited has been assessed and included in Intertek Shanghai TMP Program regarding Laboratory facilities and test equipment on Jul.22, 2012.

3.1 Deviation from standard

None

3.2 Abnormalities from standard conditions

None

4 General Information

4.1 General Description of EUT

Manufacturer:	NEO Telecom Corporation.
Manufacturer Address:	7F, 674-24, Anyang Dong, Manan Gu, Anyang City, Kyunggi Do South Korea
EUT Name:	ECODRIFT
Model No:	GDI-EXDRFT200
Listed Models:	GDI-EXDRFT201,GDI-EXDRFT202,GDI-EXDRFT203,GDI-EXDRFT204, GDI-EXDRFT205,GDI-EXDRFT206,GDI-EXDRFT207,GDI-EXDRFT208, GDI-EXDRFT209,GDI-EXDRFT210,GDI-EXDRFT211,GDI-EXDRFT212, GDI-EXDRFT213,GDI-EXDRFT214,GDI-EXDRFT215,GDI-EXDRFT216, GDI-EXDRFT217,GDI-EXDRFT218,GDI-EXDRFT219,GDI-EXDRFT220
Brand Name:	ECOXGEAR
Derivative model No.:	N/A
Serial No:	N/A
Operation frequency:	2402 MHz to 2480 MHz
Channel separation:	2MHz
NUMBER OF CHANNEL:	40
Modulation Technology:	GFSK
Bluetooth version:	Bluetooth 4.2
Product Hardware Version:	ZINC_0
Product Software Version:	V1.0
Radio Hardware Version:	CSR64110
Radio Software Version:	SP_V1.0
Antenna Type:	Internal Antenna
Antenna Gain:	-0.62dBi
Power Supply:	5.0V⎓1.0A (supplied by adapter)/Built-in Battery: 3.7V⎓2600mAh 9.62Wh
Adapter information:	Model: GA050100 Input: AC 100-240V～50/60Hz 0.3A Output:DC 5.0V/1A
Test Software Version:	EZ EMC
RF power setting in TEST SW	mybluetool
Note:	
1.	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

Description of Channel:					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2430	28	2458
1	2404	15	2432	29	2460
2	2406	16	2434	30	2462
3	2408	17	2436	31	2464
4	2410	18	2438	32	2466
5	2412	19	2440	33	2468
6	2414	20	2442	34	2470
7	2416	21	2444	35	2472
8	2418	22	2446	36	2474
9	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456		

4.2 Description of Test conditions

(1) E.U.T. test conditions:
For intentional radiators, measurements of the variation of the input power or the adiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(2) Frequency range of radiated measurements:
The test range will be up to the tenth harmonic of the highest fundamental frequency.

(3) Pre-test the EUT in all transmitting mode at the lowest (2402 MHz), middle (2440 MHz) and highest (2480 MHz) channel with different data packet and conducted to determine the worst-case mode, only the worst-case results are recorded in this report.

(4) The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

4.3 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	signal cable
1	Notebook	DELL	N/A	N4010	N/A	N/A	N/A

4.4 EUT Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	signal cable
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

5 Equipments List for All Test Items

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	Spectrum Analyzer	ADVANTEST	R3182	150900201	2016.06.29	2017.06.28
2	EMI Measuring Receiver	R&S	ESR	101660	2016.12.12	2017.12.11
3	Low Noise Pre Amplifier	Tsj	MLA-10K01-B01-27	1205323	2016.06.29	2017.06.28
4	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A04738	2016.12.02	2017.12.01
5	TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2016.12.03	2017.12.02
6	Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2016.12.03	2017.12.02
7	SHF-EHF Horn	SCHWARZBECK	BBHA9170	BBHA9170367	2016.12.03	2017.12.02
8	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.09.26	2017.09.25
9	EMI Test Receiver	R&S	ESCI	100124	2016.06.29	2017.06.28
10	LISN	Kyoritsu	KNW-242	8-837-4	2016.06.29	2017.06.28
11	LISN	Kyoritsu	KNW-407	8-1789-3	2016.06.29	2017.06.28
12	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2016.09.25	2017.09.24
13	Loop Antenna	ARA	PLA-1030/B	1029	2017.03.20	2018.03.19
14	Radiated Cable 1#（30MHz-1GHz）	FUJIKURA	5D-2W	01	2017.01.04	2018.01.03
15	Radiated Cable 2#（1GHz -25GHz）	FUJIKURA	10D2W	02	2016.12.25	2017.12.24
16	Conducted Cable 1#(9KHz-30MHz)	FUJIKURA	1D-2W	01	2017.01.04	2018.01.03
17	SMA Antenna connector	Dosin	Dosin-SMA	N/A	N/A	N/A
18	Signal Analyzer	Agilent	N9020A	MY49430428	2017.06.07	2018.06.06
Note: The SMA antenna connector is soldered on the PCB board in order to perform conducted tests and this SMA antenna connector is listed in the equipment list.						

6 Test Result

6.1 Antenna Requirement

6.1.1 Standard requirement

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 (c), 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.

6.1.2 EUT Antenna

The antenna is layout on PCB board and no consideration of replacement. Antenna gain is -0.62dBi.

6.2 Conduction Emissions Measurement

6.2.1 Applied procedures / Limit

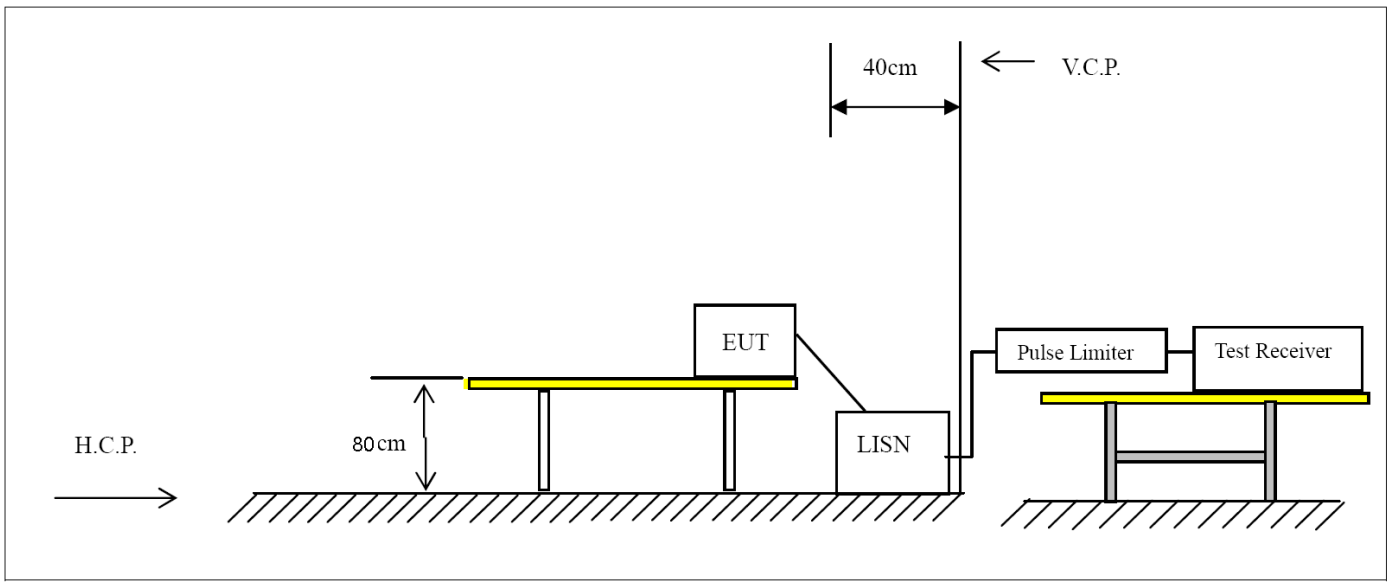
Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

Note: Decreases with the logarithm of the frequency.

6.2.2 Test procedure

EUT was placed upon a wooden test table 0.8m above the horizontal metal reference plane and 0.4m from the vertical ground plane, and it was connected to an AMN. The closest distance between the boundary of the EUT and the surface of the AMN is 0.8m. All peripherals were connected to another AMN, and placed at a distance of 10cm from each other. A spectrum and receiver was connected to the RF output port of the AMN. Both average and quasi-peak value were detected.

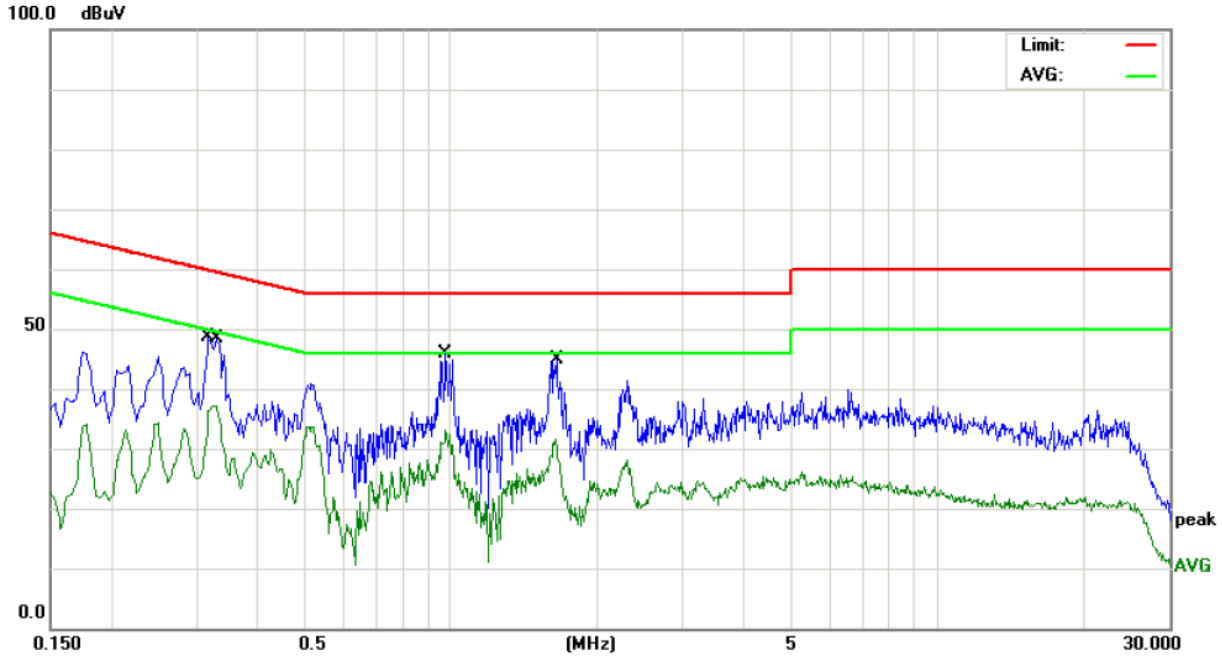
6.2.3 Test setup



6.2.4 Test results

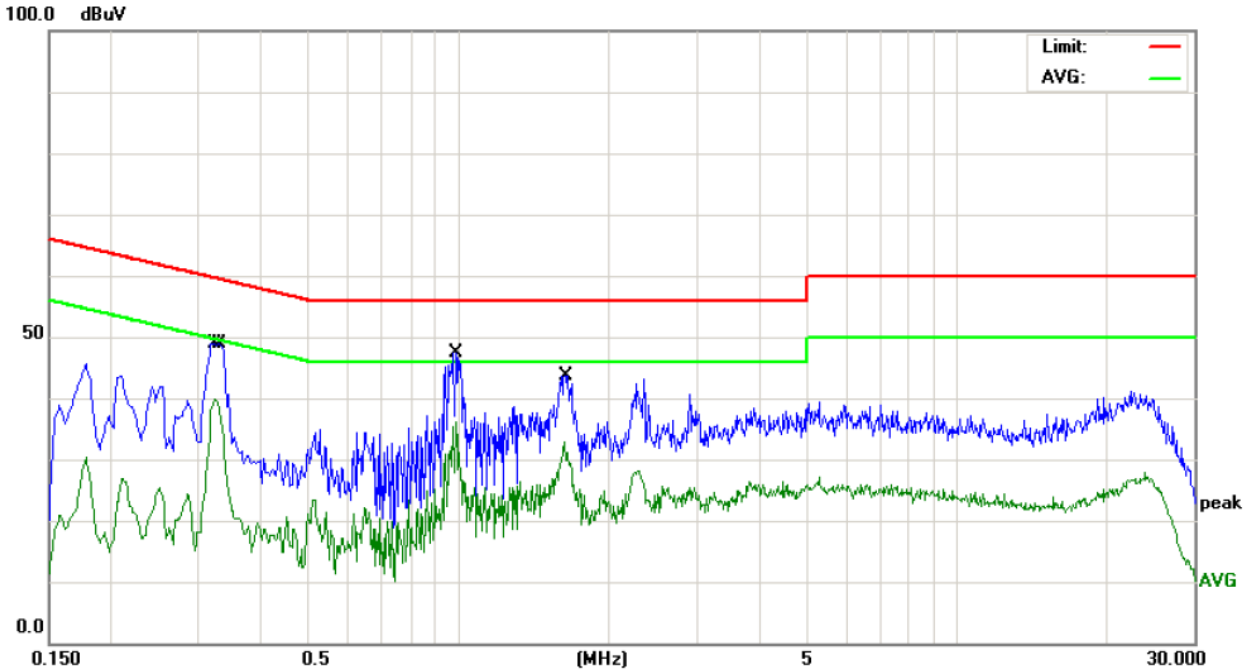
Remark: We tested three Channels in AC 120V/60Hz and AC 240V/50Hz, the worst case was recorded.

Power supply:	DC 5V From Adapter AC 120V/60Hz	Polarization	L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3180	38.30	10.20	48.50	59.76	-11.26	QP	
2		0.3300	26.92	10.18	37.10	49.45	-12.35	AVG	
3	*	0.9740	35.97	9.93	45.90	56.00	-10.10	QP	
4		0.9740	23.18	9.93	33.11	46.00	-12.89	AVG	
5		1.6420	21.61	9.97	31.58	46.00	-14.42	AVG	
6		1.6500	34.97	9.97	44.94	56.00	-11.06	QP	

Power supply:	DC 5V From Adapter AC 120V/60Hz	Polarization	N



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3220	29.79	10.19	39.98	49.65	-9.67	AVG	
2		0.3300	38.78	10.18	48.96	59.45	-10.49	QP	
3	*	0.9860	37.54	9.94	47.48	56.00	-8.52	QP	
4		0.9860	26.28	9.94	36.22	46.00	-9.78	AVG	
5		1.6300	22.91	9.97	32.88	46.00	-13.12	AVG	
6		1.6420	33.76	9.97	43.73	56.00	-12.27	QP	

6.3 Radiated Emissions Measurement

6.3.1 Applied procedures / Limit

a.The EUT was placed on the top of a turn table 0.8 meters (for measurement at frequency below 1GHz) and a turn table 1.5 meters (for measurement at frequency above 1GHz) above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter, for the test frequency of above 1GHz, horn antenna opening in the test would have been facing the EUT when rise or fall) and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. The resolution bandwidth and video bandwidth of the test receiver was 1MHz and 1MHz for Peak detection at frequency above 1GHz. g. Test the EUT in the lowest channel (2402MHz), the middle channel (2440MHz), the Highest channel (2480MHz)

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

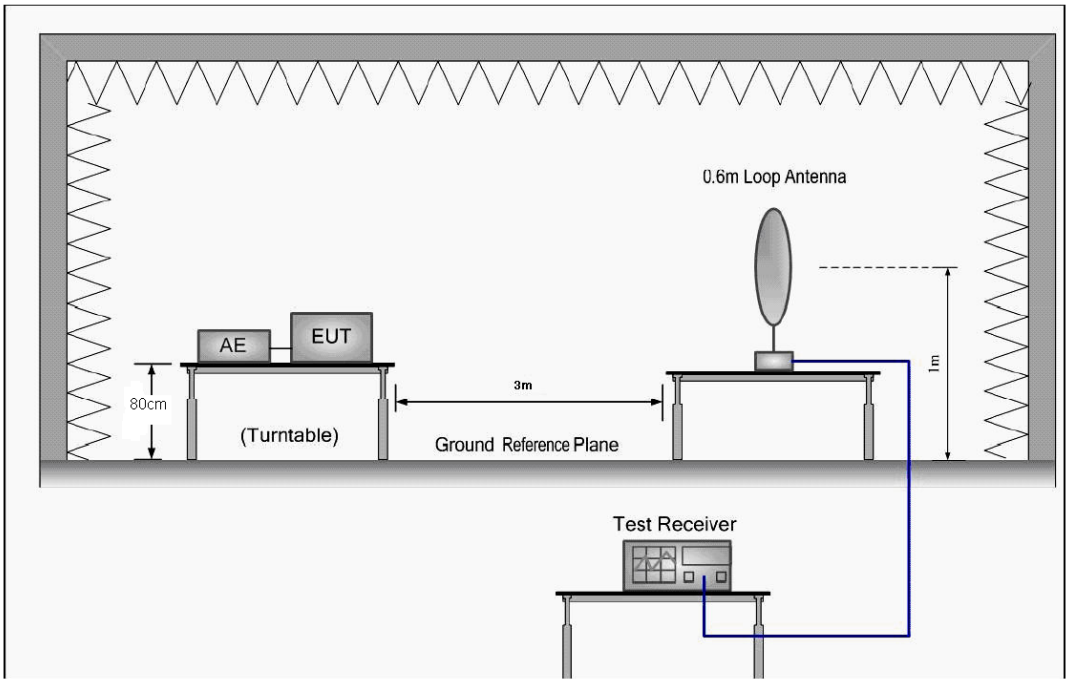
Radiated emission limits

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

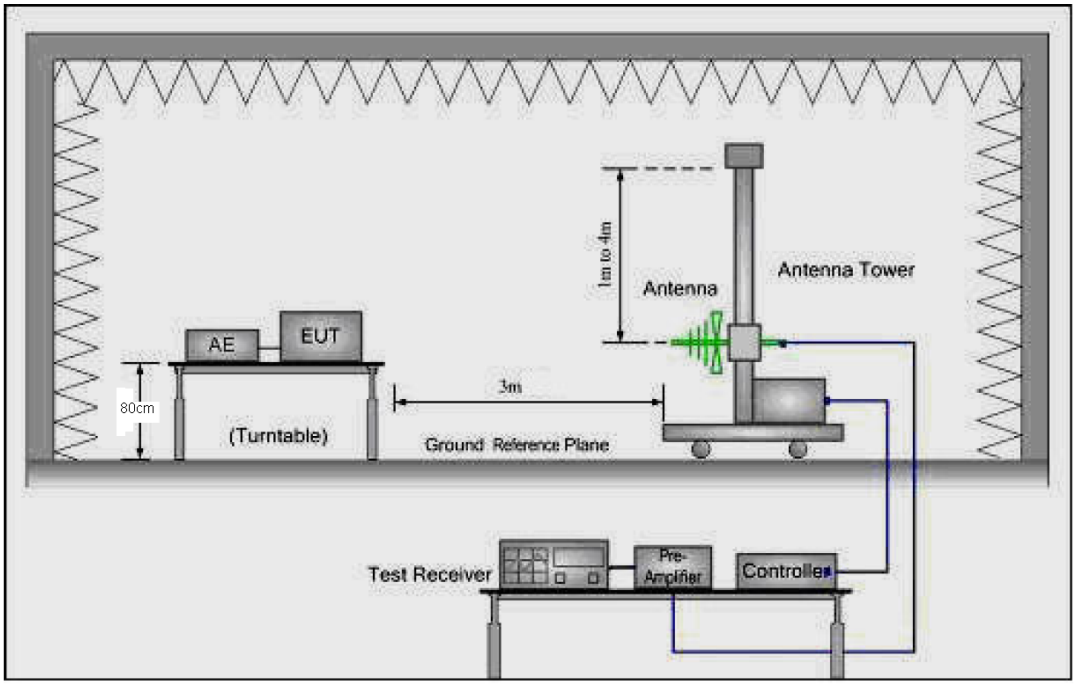
6.3.2 Test setup

Test Configuration:

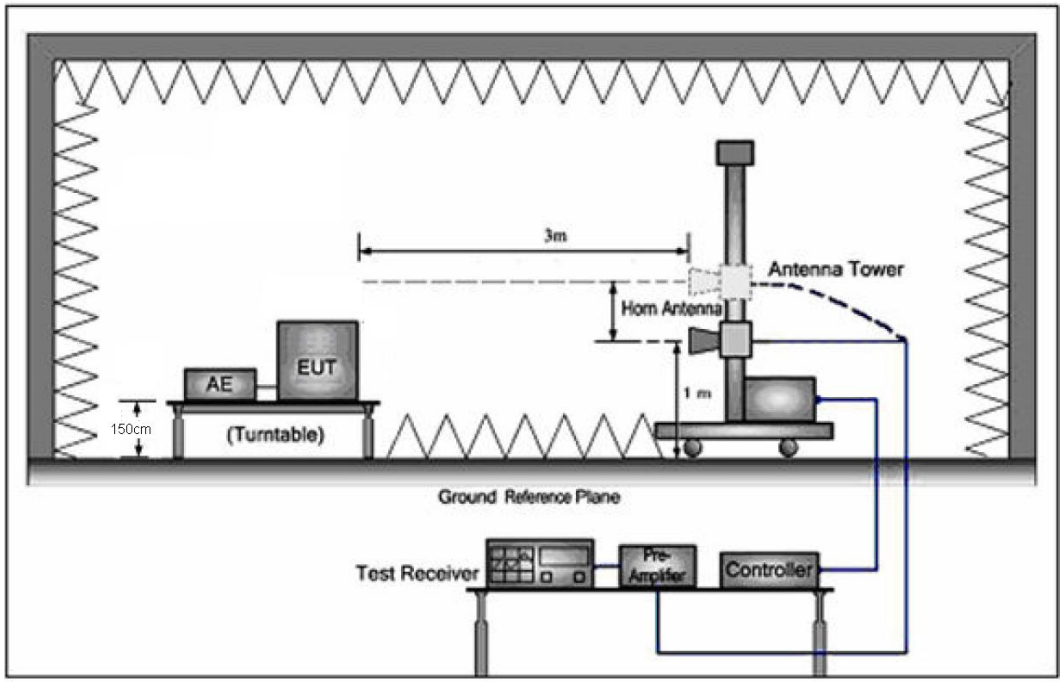
1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



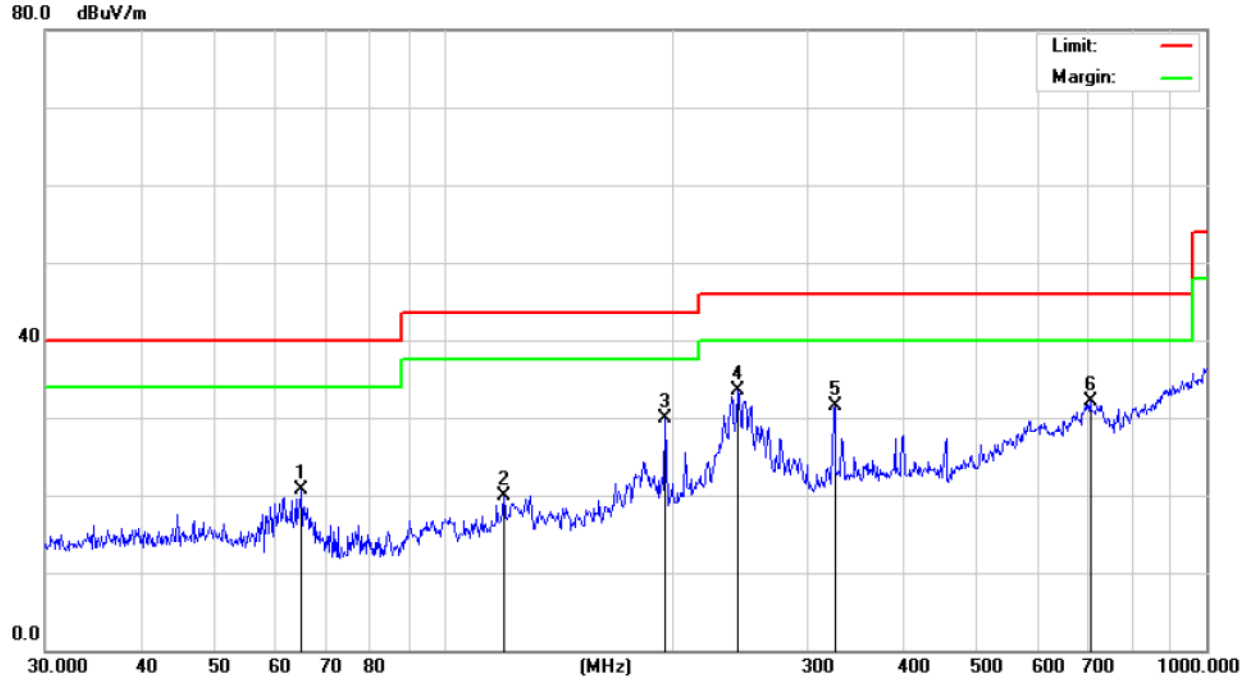
6.3.3 Test Result

Radiated Emissions Test Data Below 30MHz

No emission found between lowest internal used/generated frequencies to 30MHz.

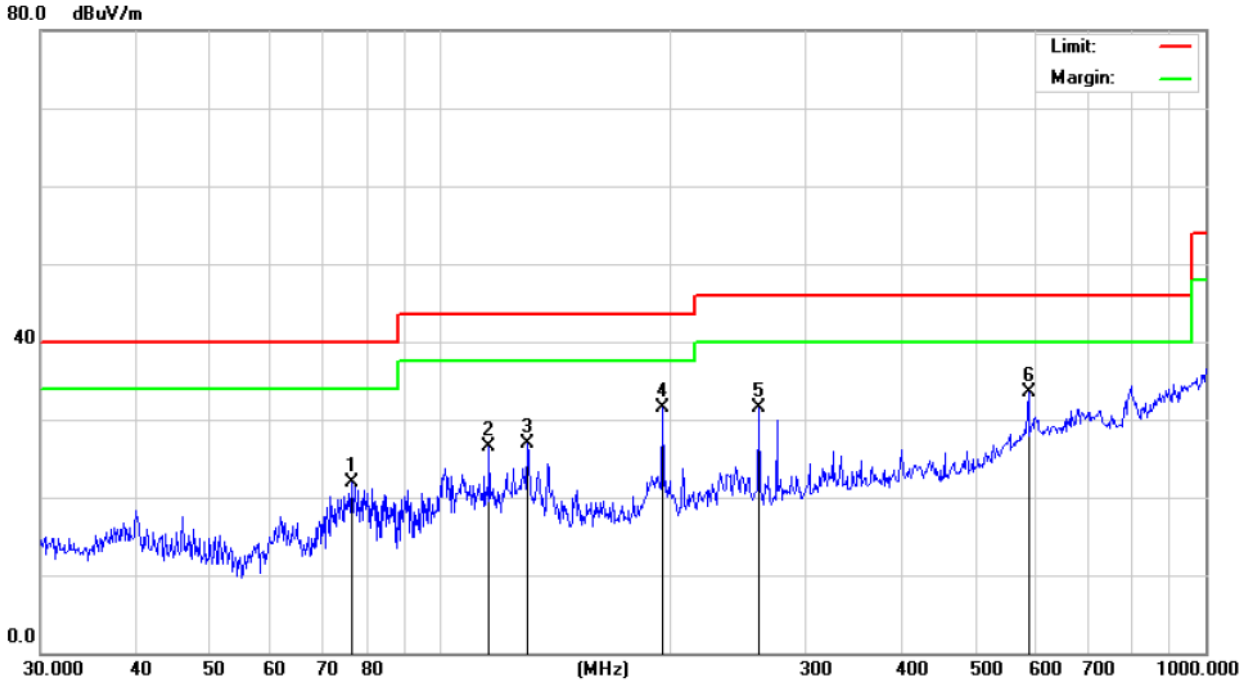
Radiated Emissions Test Data Below 1GHz

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		65.1145	38.24	-17.44	20.80	40.00	-19.20	QP			
2		119.8556	34.81	-14.90	19.91	43.50	-23.59	QP			
3		195.1365	45.59	-15.76	29.83	43.50	-13.67	QP			
4	*	243.3772	47.50	-14.01	33.49	46.00	-12.51	QP			
5		325.5958	40.22	-8.75	31.47	46.00	-14.53	QP			
6		704.2261	32.01	0.08	32.09	46.00	-13.91	QP			

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		76.5121	40.99	-19.17	21.82	40.00	-18.18	QP			
2		115.7256	40.80	-14.25	26.55	43.50	-16.95	QP			
3		129.9225	41.81	-14.93	26.88	43.50	-16.62	QP			
4	*	195.1365	47.77	-16.36	31.41	43.50	-12.09	QP			
5		260.1444	44.40	-12.82	31.58	46.00	-14.42	QP			
6		586.8437	35.85	-2.35	33.50	46.00	-12.50	QP			

Radiated Emissions Test Data Above 1GHz

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4804	46.25	5.06	51.31	74	22.69	PEAK
4804	37.49	5.06	42.55	54	11.45	AVERAGE
7206	44.89	7.03	51.92	74	22.08	PEAK
7206	35.64	7.03	42.67	54	11.33	AVERAGE
9608	40.64	10.63	51.27	74	22.73	PEAK
9608	30.76	10.63	41.39	54	12.61	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4804	48.52	5.06	53.58	74	20.42	PEAK
4804	37.65	5.06	42.71	54	11.29	AVERAGE
7206	47.43	7.03	54.46	74	19.54	PEAK
7206	38.45	7.03	45.48	54	8.52	AVERAGE
9608	42.06	10.63	52.69	74	21.31	PEAK
9608	33.76	10.63	44.39	54	9.61	AVERAGE

Note:

10~25GHz at least have 20dB margin. No recording in the test report.

Measurement Level = Reading Level + Factor

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier

Lowest channel: 2402 MHz

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4880	45.37	5.14	50.51	74	23.49	PEAK
4880	34.41	5.14	39.55	54	14.45	AVERAGE
7320	42.81	7.54	50.35	74	23.65	PEAK
7320	31.97	7.54	39.51	54	14.49	AVERAGE
9760	41.05	11.39	52.44	74	21.56	PEAK
9760	30.83	11.39	42.22	54	11.78	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4880	46.27	5.14	51.41	74	22.59	PEAK
4880	35.27	5.14	40.41	54	13.59	AVERAGE
7320	44.35	7.54	51.89	74	22.11	PEAK
7320	35.47	7.54	43.01	54	10.99	AVERAGE
9760	41.62	11.39	53.01	74	20.99	PEAK
9760	32.74	11.39	44.13	54	9.87	AVERAGE

Note:

10~25GHz at least have 20dB margin. No recording in the test report.

Measurement Level = Reading Level + Factor

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier

Middle Channel: 2440 MHz

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4960	44.37	5.22	49.59	74	24.41	PEAK
4960	35.82	5.22	41.04	54	12.96	AVERAGE
7440	41.49	8.06	49.55	74	24.45	PEAK
7440	32.14	8.06	40.20	54	13.80	AVERAGE
9920	40.83	12.1	52.93	74	21.07	PEAK
9920	31.29	12.1	43.39	54	10.61	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4960	45.91	5.22	51.13	74	22.87	PEAK
4960	36.45	5.22	41.67	54	12.33	AVERAGE
7440	43.76	8.06	51.82	74	22.18	PEAK
7440	34.05	8.06	42.11	54	11.89	AVERAGE
9920	41.54	12.1	53.64	74	20.36	PEAK
9920	31.94	12.1	44.04	54	9.96	AVERAGE

Note:

10~25GHz at least have 20dB margin. No recording in the test report.

Measurement Level = Reading Level + Factor

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier

Highest Channel: 2480 MHz

6.3.4 TEST RESULTS (Restricted Bands Requirements)

EUT：	ECODRIFT	Model Name ：	GDI-EXDRFT200
Test Mode ：	TX	Test Voltage ：	DC 3.7V
Note：	1. The transmitter was setup to transmit at the lowest channel. Then the field strength was measured at 2310-2390 MHz. 2. The transmitter was setup to transmit at the highest channel. Then the field strength was measured at 2483.5-2500 MHz. 3. The data of 2390MHz and 2483.5MHz was the worst.		

Test Mode	Ant.Pol. H/V	Freq. (MHz)	Reading		Ant/CF CF(dB)	Act		Limit	
			Peak (dBuv)	AV (dBuv)		Peak (dBuv/m)	AV (dBuv/m)	Peak (dBuv/m)	AV (dBuv/m)
2402MHz	V	2390	42.45	31.57	-5.79	36.66	25.78	74	54
	H	2390	41.82	30.64	-5.79	36.03	24.85	74	54
2480MHz	V	2483.5	43.05	32.84	-4.98	38.07	27.86	74	54
	H	2483.5	43.42	31.95	-4.98	38.44	26.97	74	54

Remark：

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode.

(2) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

(3) Corr.Factor = Antenna Factor + Cable Loss – Pre-amplifier.

6.4 Maximum Output Power Measurement

6.4.1 Limit

The Maximum Peak Output Power Measurement is 30dBm.

6.4.2 Test procedure

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power,9.1.2. and Average conducted output power, 9.2.3.1.

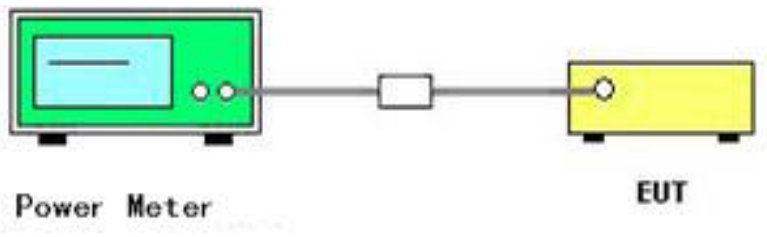
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

The maximum Average conducted output power may be measured using a wideband RF power meter with a thermocouple derector or equivalent. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

6.4.3 Deviation from standard

No deviation.

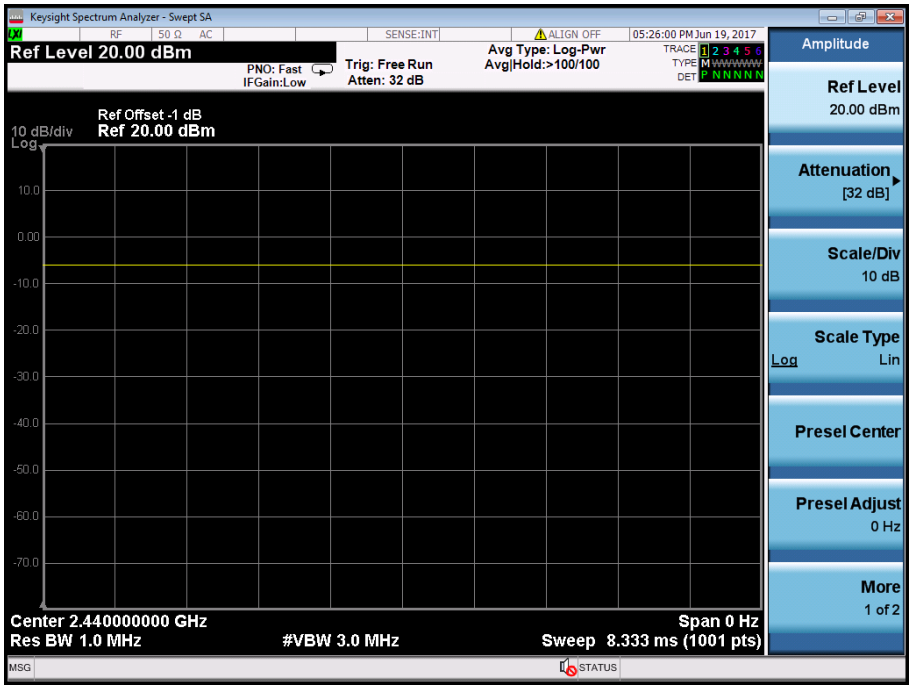
6.4.4 Test setup



6.4.5 Test results

Channel	Channel frequency (MHz)	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
Low	2402	-4.86	-5.42	30	Pass
Middle	2440	-4.31	-4.96		Pass
High	2480	-5.02	-5.58		Pass

Duty cycle used in all test items: 100%



6.5 Power Spectral Density

6.5.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

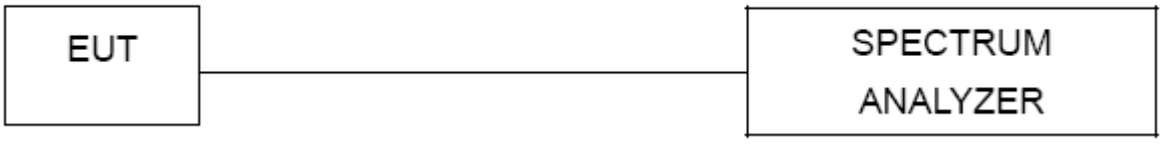
6.5.2 Test procedure

According to KDB558074 D01 DTS Measurement Guidance Section 10.2
Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
Set the RBW =100 kHz.
Set the VBW =300 KHz.
Set the span to 1.5 times the DTS channel bandwidth.
Detector = peak.
Sweep time = auto couple.
Trace mode = max hold.
Allow trace to fully stabilize.
Use the peak marker function to determine the maximum power level.
If measured value exceeds limit, reduce RBW(no less than 3 kHz)and repeat.
The resulting peak PSD level must be 8 dBm.

6.5.3 Deviation from standard

No deviation.

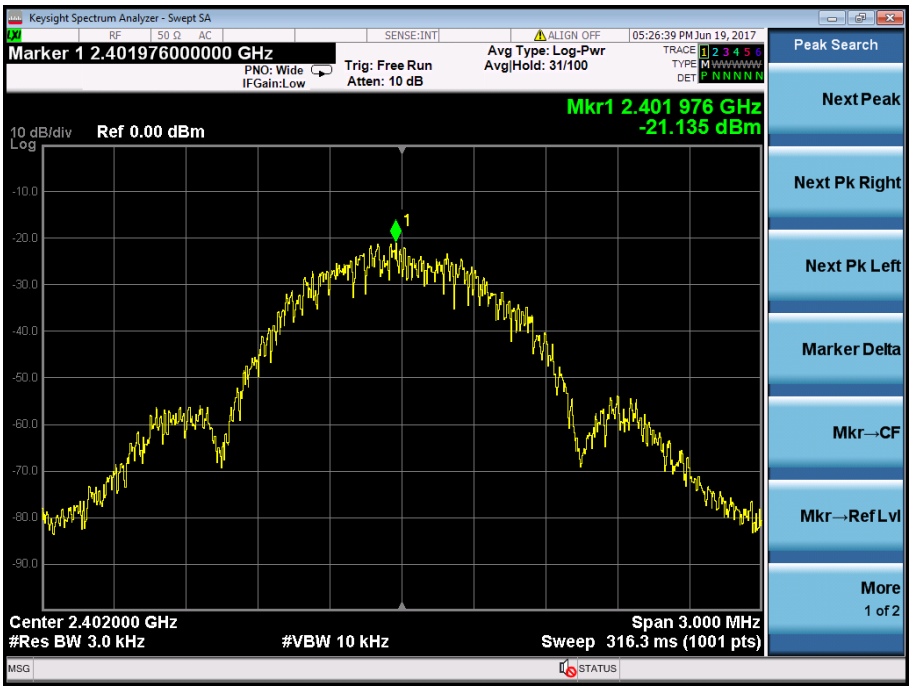
6.5.4 Test setup



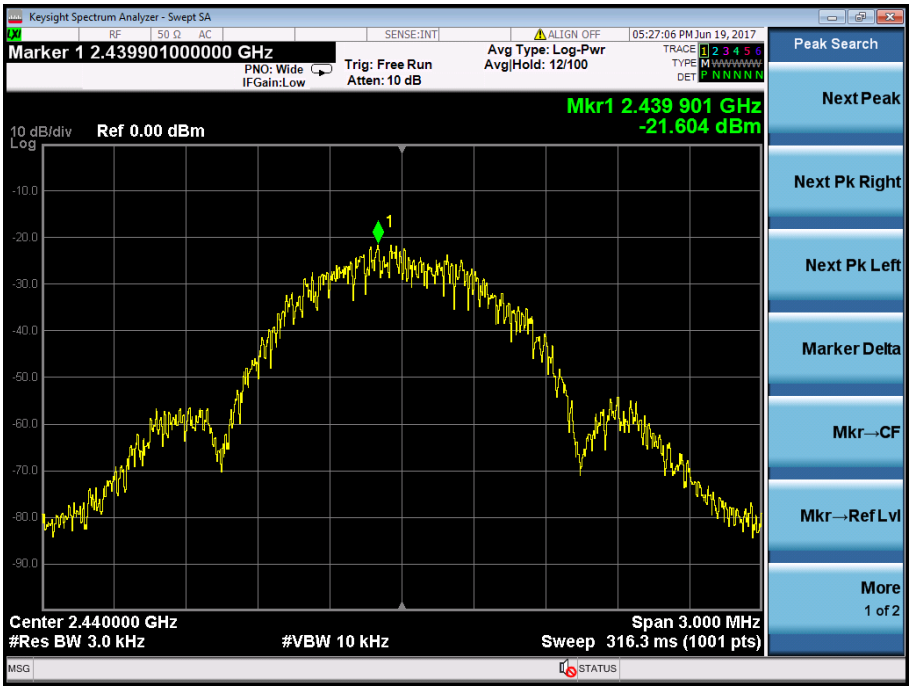
6.5.5 Test results

Channel	Channel frequency (MHz)	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
Low	2402	-21.135	8.00	Pass
Middle	2440	-21.604		Pass
High	2480	-22.254		Pass

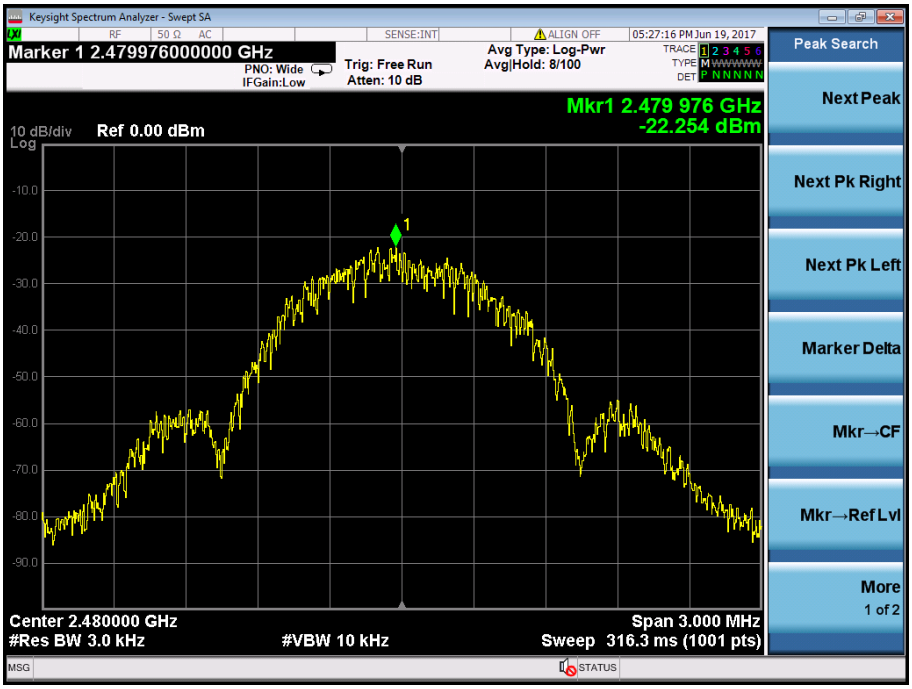
CH 00



CH 19


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.439901000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 12/100
05:27:06 PM Jun 19, 2017
Mkr1 2.439 901 GHz
-21.604 dBm
10 dB/div
Log
Ref 0.00 dBm
Center 2.440000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 3.000 MHz
Sweep 316.3 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

CH 39


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.479976000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 8/100
05:27:16 PM Jun 19, 2017
Mkr1 2.479 976 GHz
-22.254 dBm
10 dB/div
Log
Ref 0.00 dBm
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 3.000 MHz
Sweep 316.3 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

6.6 6dB Bandwidth

6.6.1 Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

6.6.2 Test procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz.
The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
According to KDB558074 D01 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.6.3 Deviation from standard

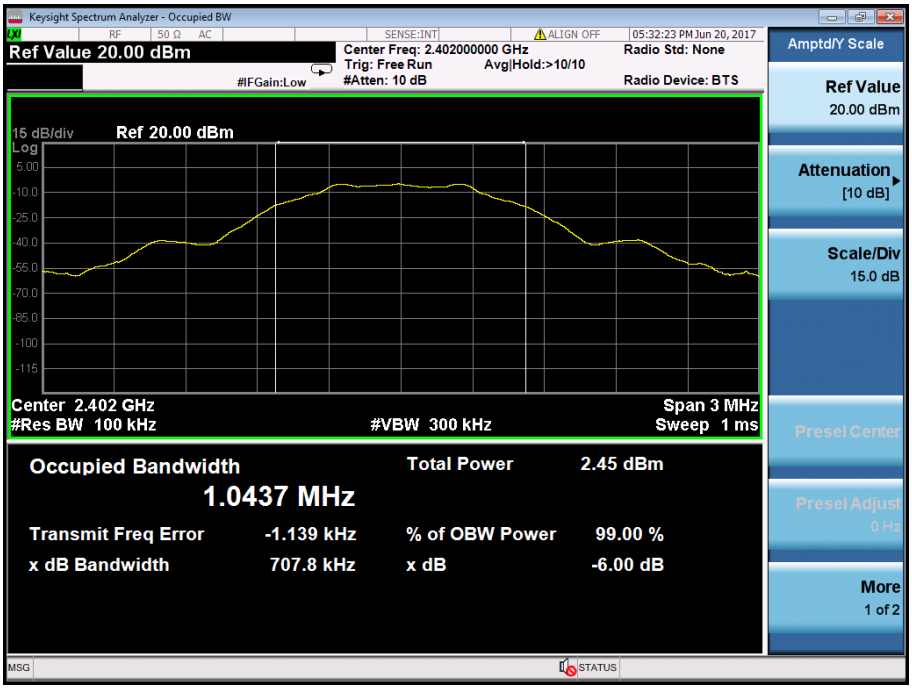
No deviation.

6.6.4 Test setup

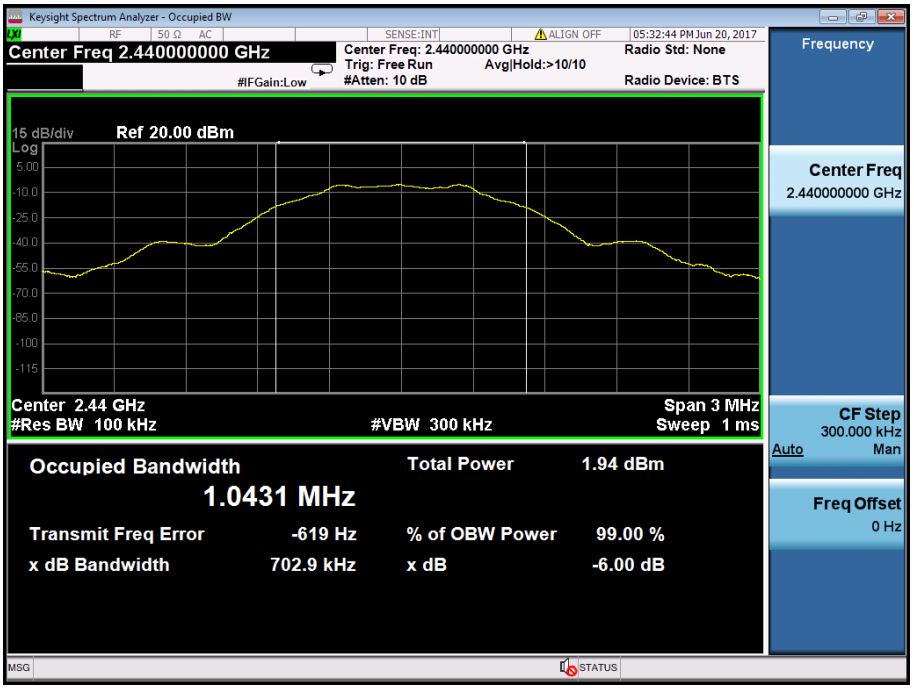
6.6.5 Test result

Channel	Channel frequency (MHz)	6dB Bandwidth (KHz)	Limit (KHz)	Result
Low	2402	707.8	≥500	Pass
Middle	2440	702.9		Pass
High	2480	704.5		Pass

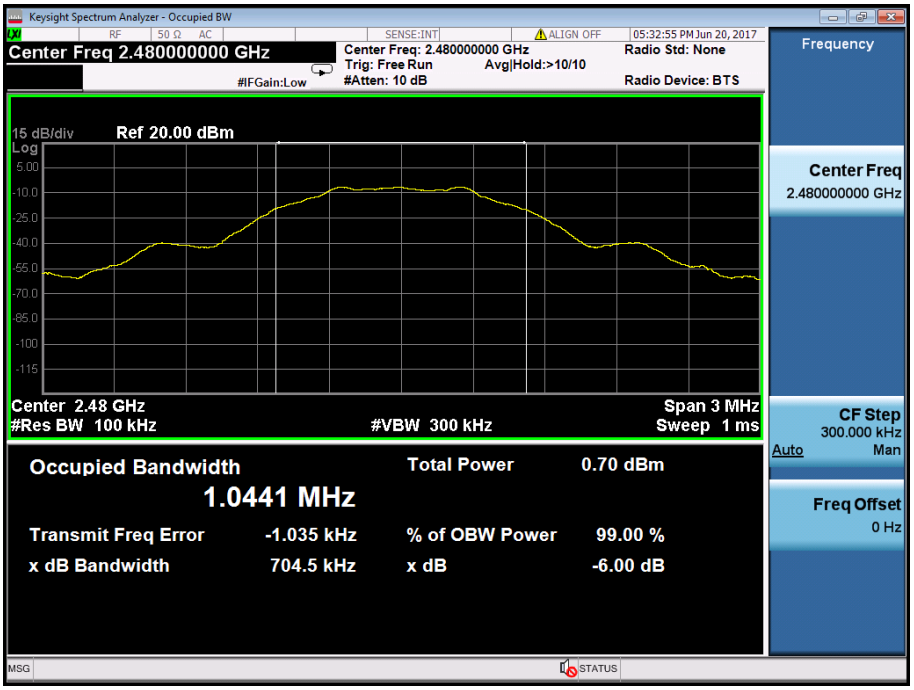
CH 00


Keysight Spectrum Analyzer - Occupied BW
Ref Value 20.00 dBm
Center Freq: 2.402000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
15 dB/div
Ref 20.00 dBm
Log
Center 2.402 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
1.0437 MHz
Total Power 2.45 dBm
Transmit Freq Error -1.139 kHz
% of OBW Power 99.00 %
x dB Bandwidth 707.8 kHz
x dB -6.00 dB
Amptd/Y Scale
Ref Value
20.00 dBm
Attenuation
[10 dB]
Scale/Div
15.0 dB
Presel Center
Presel Adjust
0 Hz
More
1 of 2

CH 19


Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.440000000 GHz
Center Freq: 2.440000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
#IFGain:Low
15 dB/div
Ref 20.00 dBm
Log
Center 2.44 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
1.0431 MHz
Total Power 1.94 dBm
Transmit Freq Error -619 Hz
% of OBW Power 99.00 %
x dB Bandwidth 702.9 kHz
x dB -6.00 dB
Frequency
Center Freq
2.440000000 GHz
CF Step
300.000 kHz
Auto
Man
Freq Offset
0 Hz

CH 39


Keysight Spectrum Analyzer - Occupied BW
RF 50 Ω AC
SENSE:INT
ALIGN OFF
05:32:55 PM Jun 20, 2017
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#IFGain:Low
#Atten: 10 dB
Radio Std: None
Radio Device: BTS
Frequency
15 dB/div
Ref 20.00 dBm
Log
5.00
-10.0
-25.0
-40.0
-55.0
-70.0
-85.0
-100
-115
Center Freq
2.480000000 GHz
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
CF Step
300.000 kHz
Auto
Man
Occupied Bandwidth
1.0441 MHz
Total Power
0.70 dBm
Freq Offset
0 Hz
Transmit Freq Error
-1.035 kHz
% of OBW Power
99.00 %
x dB Bandwidth
704.5 kHz
x dB
-6.00 dB
MSG
STATUS

6.7 Band edge

6.7.1 Limit

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see § 15.205(c)).

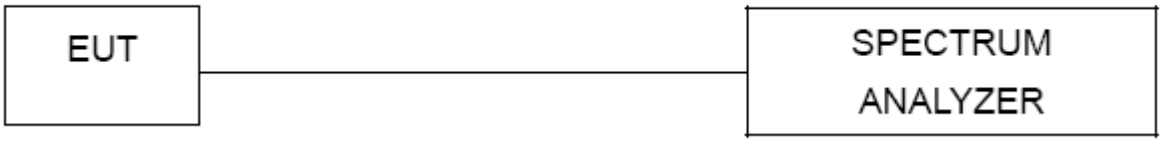
6.7.2 Test procedure

a. The testing follows KDB558074 D01 DTS Measurement Guidance Section 13.2
b. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
c. Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation, RBW ≥ 1% of the span, VBW ≥ RBW, Sweep = auto,
Detector function = peak, Trace = max hold

6.7.3 Deviation from standard

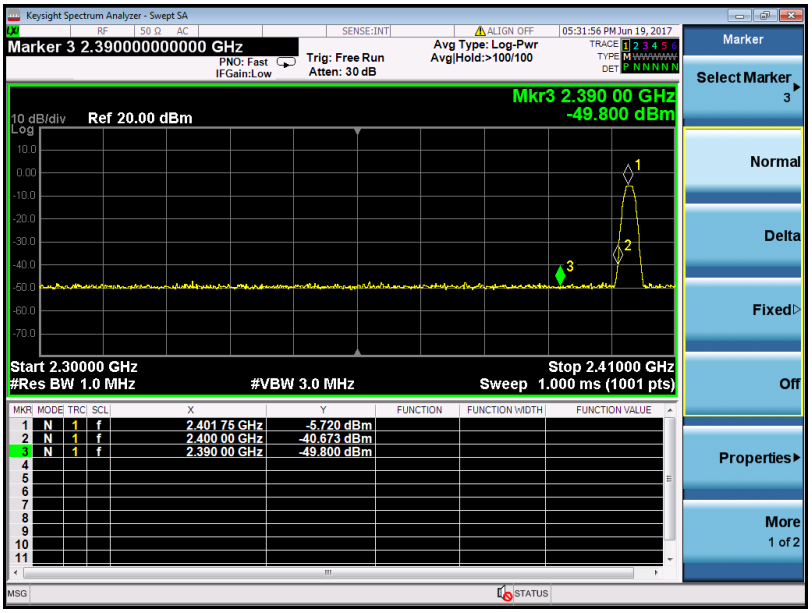
No deviation.

6.7.4 Test setup



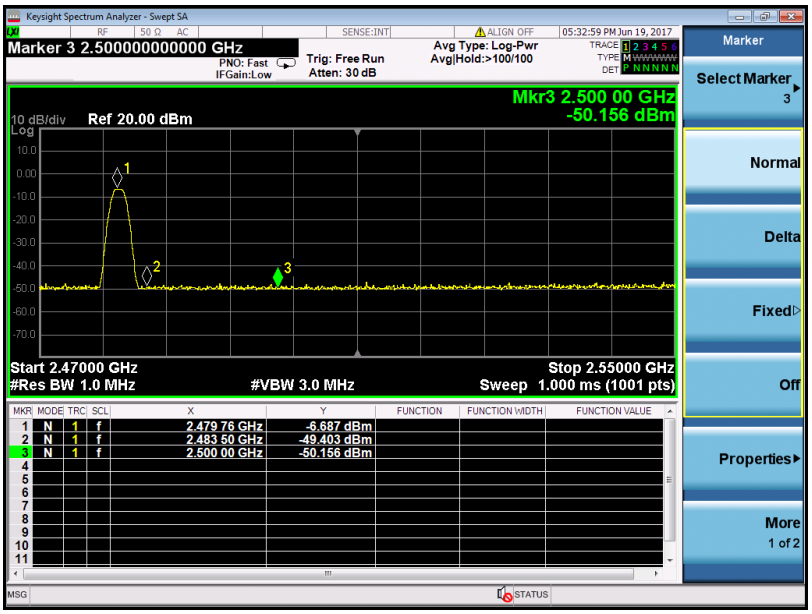
6.7.5 Test results

Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	-34.953	-20	PASS



2402

Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2483.50	-42.716	-20	PASS



2480

6.8 Conducted Spurious Emissions

6.8.1 Applied procedures / Limit

In any 100 kHz 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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see § 15.205(c)).
For below 30MHz,For 9KHz-150kHz,150K-10MHz,We use the RBW 1KHz,10KHz, So the limit need to calculated by “10lg(BW1/BW2)“. for example For9KHz-150kHz,RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

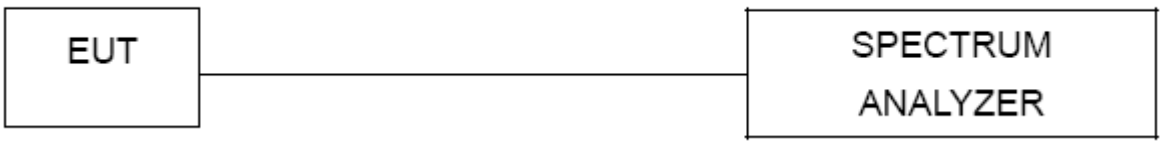
6.8.2 Test procedure

a.The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b.Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation, RBW ≥ 1% of the span, VBW ≥ RBW, Sweep = auto,
Detector function = peak, Trace = max hold

6.8.3 Deviation from standard

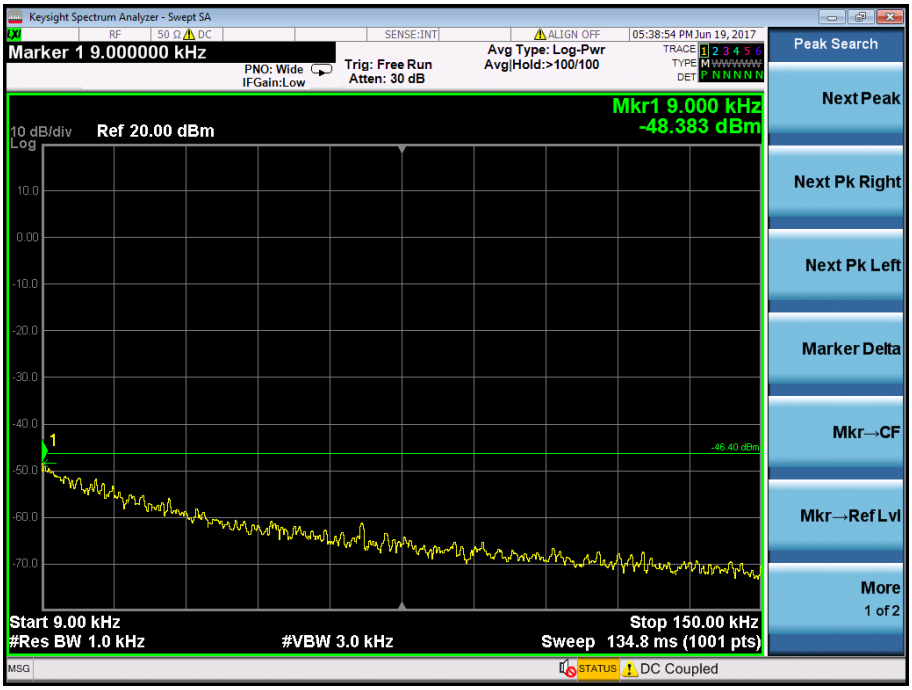
No deviation.

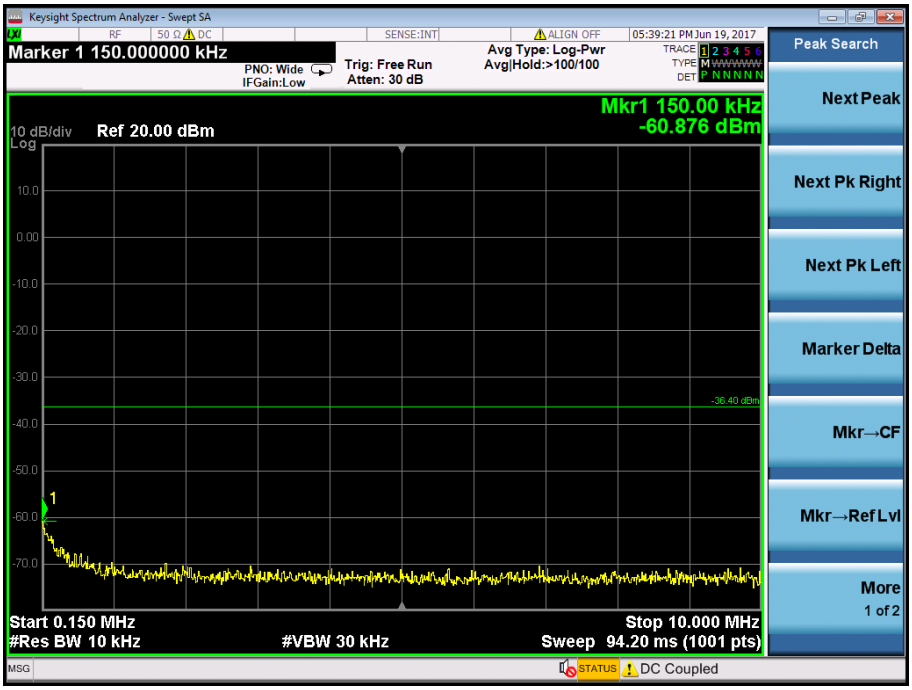
6.8.4 Test setup

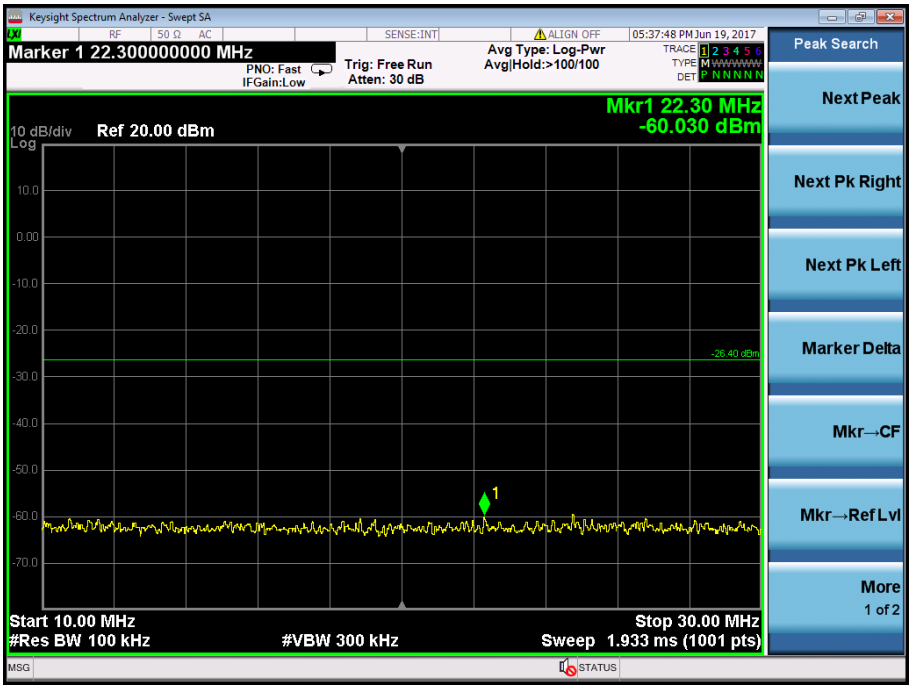


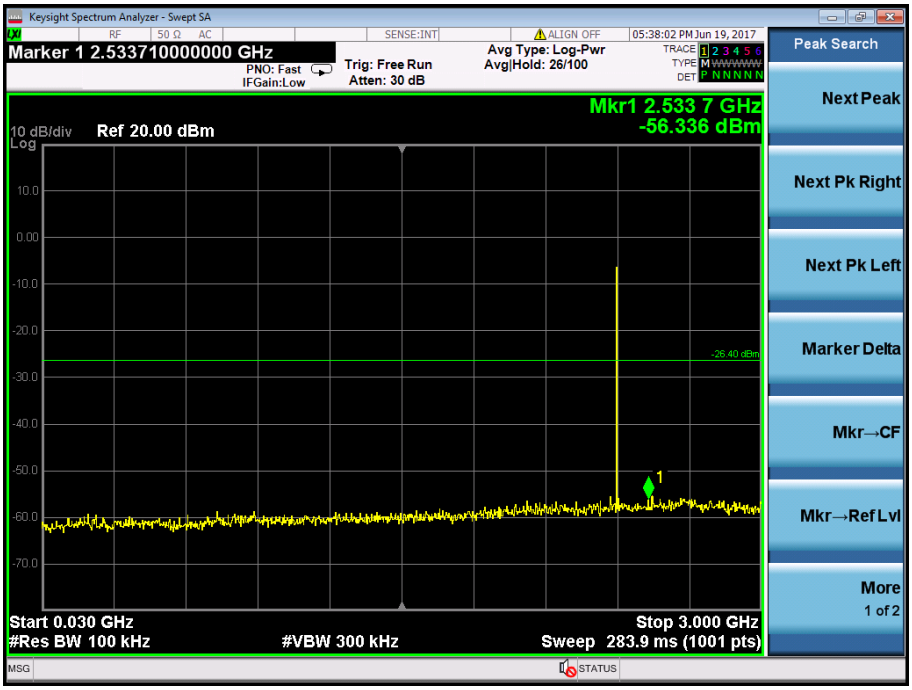
6.8.5 Test results

CH 00




Keysight Spectrum Analyzer - Swept SA
Marker 1 150.000000 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:39:21 PM Jun 19, 2017
Mkr1 150.00 kHz
-60.876 dBm
10 dB/div
Log
Ref 20.00 dBm
-36.40 dBm
Start 0.150 MHz
#Res BW 10 kHz
#VBW 30 kHz
Stop 10.000 MHz
Sweep 94.20 ms (1001 pts)
DC Coupled
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

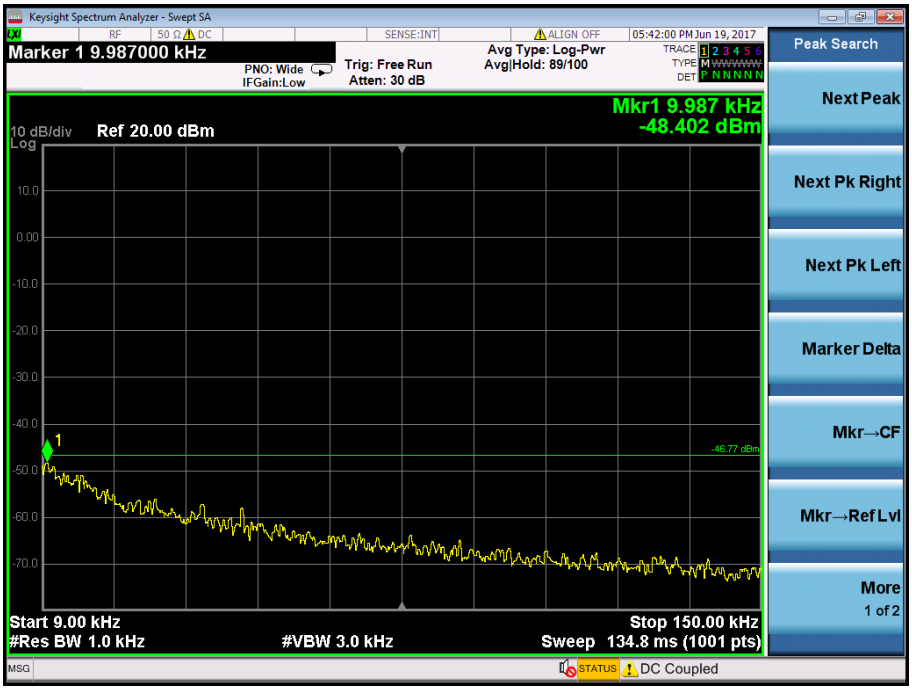

Keysight Spectrum Analyzer - Swept SA
Marker 1 22.300000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:37:48 PM Jun 19, 2017
Mkr1 22.30 MHz
-60.030 dBm
10 dB/div
Log
Ref 20.00 dBm
-26.40 dBm
Start 10.00 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 30.00 MHz
Sweep 1.933 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

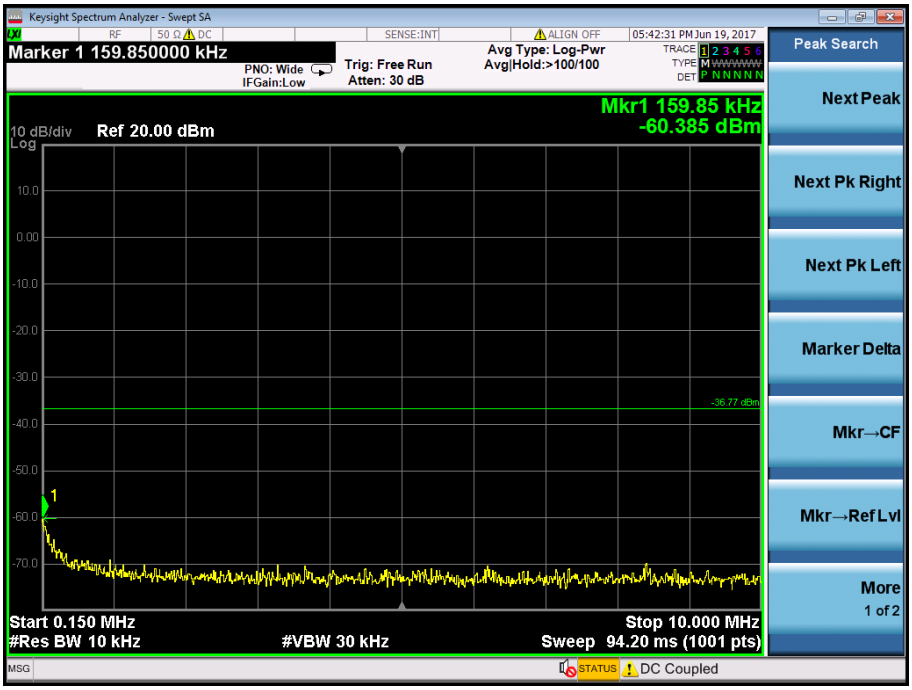

Keysight Spectrum Analyzer - Swept SA
Marker 1 2.533710000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 26/100
05:38:02 PM Jun 19, 2017
Mkr1 2.533 7 GHz
-56.336 dBm
10 dB/div
Log
Ref 20.00 dBm
-26.40 dBm
Start 0.030 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 3.000 GHz
Sweep 283.9 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

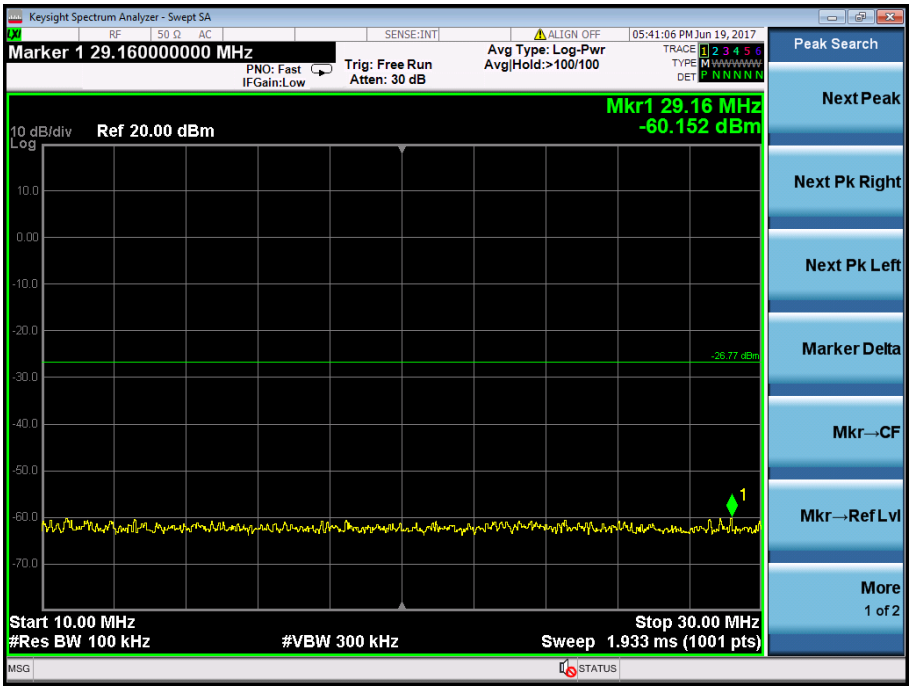

Keysight Spectrum Analyzer - Swept SA
Marker 1 24.714000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 2/100
05:38:14 PM Jun 19, 2017
Mkr1 24.714 GHz
-46.411 dBm
10 dB/div
Log
Ref 20.00 dBm
-26.40 dBm
Start 3.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.103 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

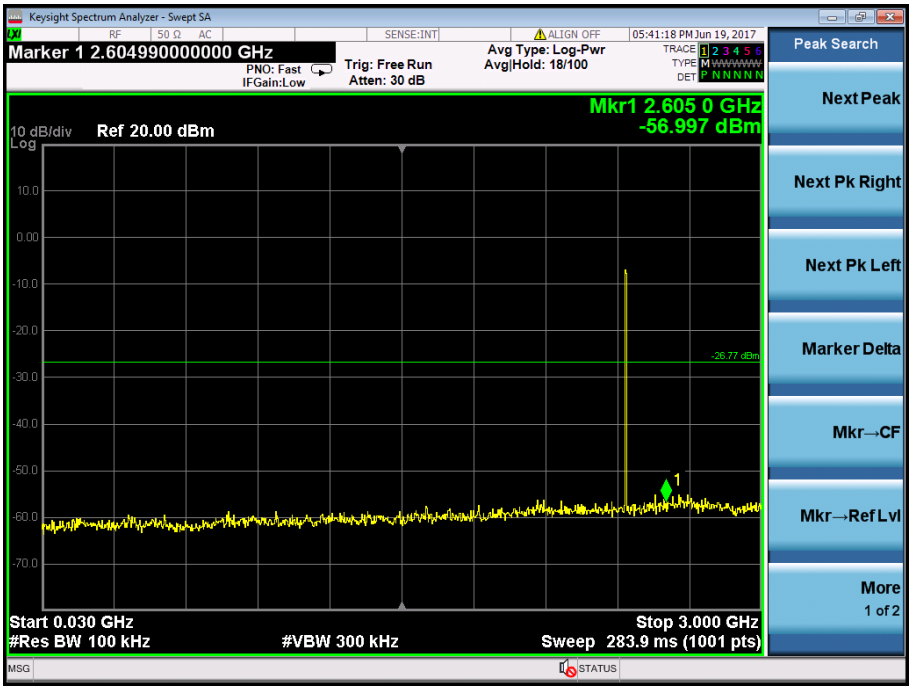
CH 19


Keysight Spectrum Analyzer - Swept SA
Display Line -26.77 dBm
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:40:49 PM Jun 19, 2017
Mkr1 2.439 991 GHz
-6.762 dBm
10 dB/div
Log
Ref 20.00 dBm
-26.77 dBm
Center 2.440000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3.000 MHz
Sweep 1.000 ms (1001 pts)
Display
Annotation
Title
Graticule
On Off
Display Line
-26.77 dBm
On Off
System
Display
Settings
MSG
STATUS


Keysight Spectrum Analyzer - Swept SA
Marker 1 9.987000 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 89/100
05:42:00 PM Jun 19, 2017
Mkr1 9.987 kHz
-48.402 dBm
10 dB/div
Log
Ref 20.00 dBm
-46.77 dBm
Start 9.00 kHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Stop 150.00 kHz
Sweep 134.8 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS
DC Coupled


Keysight Spectrum Analyzer - Swept SA
Marker 1 159.850000 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:42:31 PM Jun 19, 2017
Mkr1 159.85 kHz
-60.385 dBm
10 dB/div
Log
Ref 20.00 dBm
-36.77 dBm
Start 0.150 MHz
#Res BW 10 kHz
#VBW 30 kHz
Stop 10.000 MHz
Sweep 94.20 ms (1001 pts)
DC Coupled
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 29.160000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:41:06 PM Jun 19, 2017
Mkr1 29.16 MHz
-60.152 dBm
10 dB/div
Log
Ref 20.00 dBm
-26.77 dBm
Start 10.00 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 30.00 MHz
Sweep 1.933 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

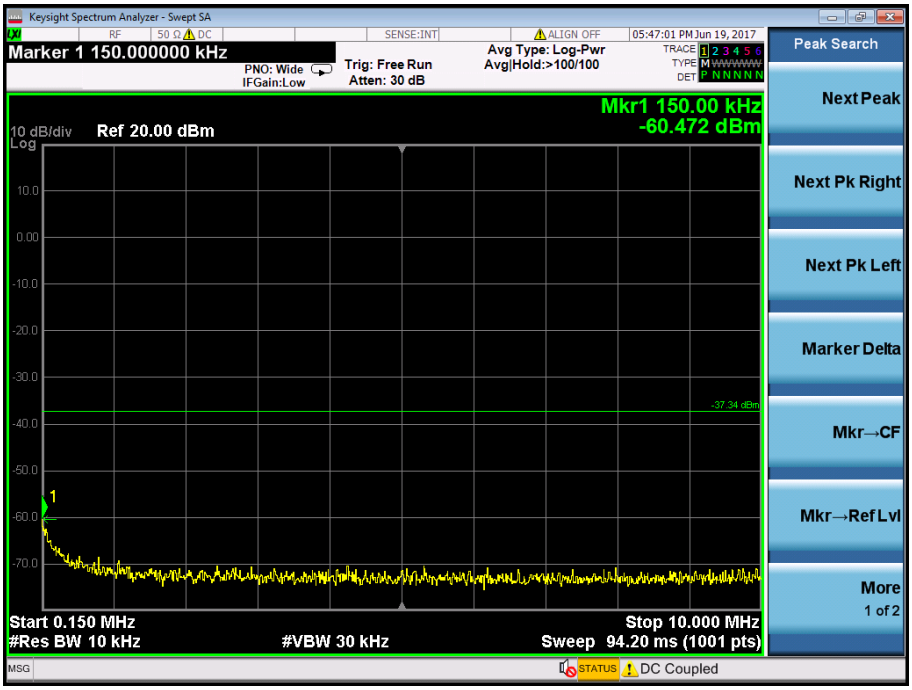

Keysight Spectrum Analyzer - Swept SA
Marker 1 2.604990000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 18/100
05:41:18 PM Jun 19, 2017
Mkr1 2.605 0 GHz
-56.997 dBm
10 dB/div
Log
Ref 20.00 dBm
-26.77 dBm
Start 0.030 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 3.000 GHz
Sweep 283.9 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

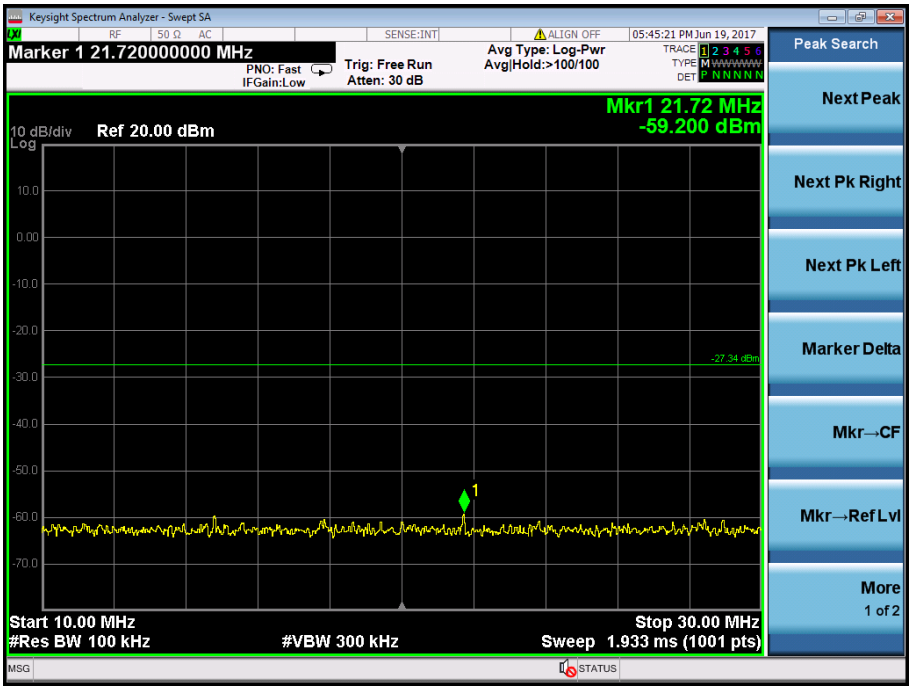

Keysight Spectrum Analyzer - Swept SA
Marker 1 21.414000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 2/100
05:41:29 PM Jun 19, 2017
Mkr1 21.414 GHz
-46.918 dBm
10 dB/div
Log
Ref 20.00 dBm
-26.77 dBm
Start 3.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.103 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

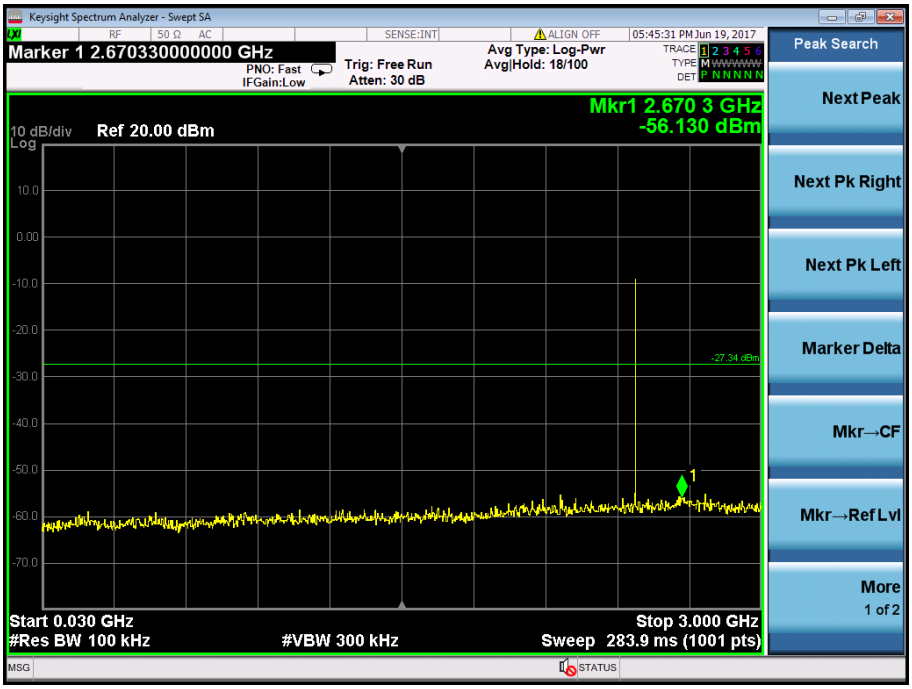
CH 39


Keysight Spectrum Analyzer - Swept SA
Display Line -27.34 dBm
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:45:04 PM Jun 19, 2017
Mkr1 2.479 991 GHz
-7.339 dBm
10 dB/div
Log
Ref 20.00 dBm
-27.34 dBm
Center 2.480000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3.000 MHz
Sweep 1.000 ms (1001 pts)
Display
Annotation
Title
Graticule
On Off
Display Line
-27.34 dBm
On Off
System
Display
Settings
MSG
STATUS


Keysight Spectrum Analyzer - Swept SA
Marker 1 9.564000 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:46:29 PM Jun 19, 2017
Mkr1 9.564 kHz
-48.302 dBm
10 dB/div
Log
Ref 20.00 dBm
-47.34 dBm
Start 9.00 kHz
#Res BW 1.0 kHz
#VBW 3.0 kHz
Stop 150.00 kHz
Sweep 134.8 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS
DC Coupled


Keysight Spectrum Analyzer - Swept SA
Marker 1 150.000000 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:47:01 PM Jun 19, 2017
Mkr1 150.00 kHz
-60.472 dBm
10 dB/div
Log
Ref 20.00 dBm
-37.34 dBm
Start 0.150 MHz
#Res BW 10 kHz
#VBW 30 kHz
Stop 10.000 MHz
Sweep 94.20 ms (1001 pts)
DC Coupled
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 21.720000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:45:21 PM Jun 19, 2017
Mkr1 21.72 MHz
-59.200 dBm
10 dB/div
Log
Ref 20.00 dBm
-27.34 dBm
Start 10.00 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 30.00 MHz
Sweep 1.933 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.670330000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 18/100
05:45:31 PM Jun 19, 2017
Mkr1 2.670 3 GHz
-56.130 dBm
10 dB/div
Log
Ref 20.00 dBm
-27.34 dBm
Start 0.030 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 3.000 GHz
Sweep 283.9 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS


Keysight Spectrum Analyzer - Swept SA
Marker 1 24.714000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 3/100
05:45:44 PM Jun 19, 2017
Mkr1 24.714 GHz
-46.473 dBm
10 dB/div
Log
Ref 20.00 dBm
-27.34 dBm
Start 3.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.103 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

7 Test setup photo

CE TEST SETUP PHOTO

RE TEST SETUP PHOTO