



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 Issue: 2017-06-26

Date of Test: 2017-06-12 to 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:

Approved by:

Jackie.Deng



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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				
	GDI-EXDRFT201,GDI-EXDRFT202,GDI-EXDRFT203,GDI-EXDRFT204,				
	GDI-EXDRFT205,GDI-EXDRFT206,GDI-EXDRFT207,GDI-EXDRFT208,				
Listed Models:	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:	5.0V1.0A (supplied by adapter)/Built-in Battery: 3.7V2600mAh 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	Inybluetool				
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-A02-3 4	2648A04738	2016.12.02	2017.12.01
5	TRILOG Super Broadband test Antenna	SCHWARZBE CK	VULB9160	9160-3206	2016.12.03	2017.12.02
6	Broadband Horn Antenna	SCHWARZBE CK	BBHA9120D	452	2016.12.03	2017.12.02
7	SHF-EHF Horn	SCHWARZBE CK	BBHA9170	BBHA917036 7	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	MY4943042 8	2017.06.07	2018.06.06
Note	: The SMA antenna cor SMA antenna connect	nector is soldere or is listed in the	d on the PCB board equipment list.	in order to perf	orm conducted	tests and this



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)	Conducte	d 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.









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)

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	0.49-1.705 3 20log(24000/F(KHz))+ 40log(30/3)		24000/F(KHz)
1.705-30	1.705-30 3 20log(30)+ 40log(30/3)		30
30-88	30-88 3		100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960 3		54.0	500

Radiated emission limits



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











Radiated Emissions Test Data Above 1GHz

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

(a) Antenna polarization: Horizontal

(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



Frequency	Reading	Correct	Measure	Limit	Margin	Detector
(MHz)	Level	Factor	Level	(dBuV/m)	(dB)	Туре
	(dBuV)	(dB)	(dBuV/m)			
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

(a) Antenna polarization: Horizontal

(b) Antenna polarization: Vertical

Frequency	Reading	Correct	Measure	Limit	Margin	Detector
(MHz)	Level	Factor	Level	(dBuV/m)	(dB)	Туре
	(dBuV)	(dB)	(dBuV/m)			
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



PEAK

AVERAGE

21.07

10.61

74 54



	(
Frequency	Reading	Correct	Measure	Limit	Margin	Detector				
(MHz)	Level	Factor	Level	(dBuV/m)	(dB)	Туре				
	(dBuV)	(dB)	(dBuV/m)							
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				

52.93

43.39

12.1

12.1

(a) Antenna polarization: Horizontal

(b) Antenna polarization: Vertical

9920

9920

40.83

31.29

Frequency	Reading	Correct	Measure	Limit	Margin	Detector
(MHz)	Level	Factor	Level	(dBuV/m)	(dB)	Туре
	(dBuV)	(dB)	(dBuV/m)			
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 :	ТХ	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 highe	est channel. Then the field				
	strength was measured at 2483.5-2500 MHz.						
	3. The data of 2390MHz and 2483.5MHz was the worst.						

Teet	Ant Dol			Reading		Act		Limit	
Nede		I/V (MHz)	Peak	AV		Peak	AV	Peak	AV
Mode	Π/ V		(dBuv)	(dBuv)		(dBuv/m)	(dBuv/m)	(dBuv/m)	(dBuv/m)
2402MHz	V	2390	42.45	31.57	-5.79	36.66	25.78	74	54
	Н	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
	Н	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		Pass
Middle	2440	-4.31	-4.96	30	Pass
High	2480	-5.02	-5.58		Pass

Duty cycle used in all test items: 100%

🔤 Kej	ysight Sp	ectrum Analyzer - Swe	pt SA								_	
₩ Ref	Leve	RF 50 Ω	AC		SEN	SE:INT	Avg Type	ALIGN OFF	05:26:00 P	M Jun 19, 2017 E 1 2 3 4 5 6	A	mplitude
10 di	B/div	Ref Offset -1 o	: iB Bm	PNO: Fast 🕞 FGain:Low	Trig: Free Atten: 32	e Run ! dB	Avg Hold	:>100/100	TYI Di	PE MWWWWW ET PNNNNN		Ref Level 20.00 dBm
Log,											A	ttenuation [32 dB]
0.00 -10.0												Scale/Div 10 dB
-20.0 -30.0											<u>Log</u>	Scale Type Lin
-40.0 -50.0											Pi	resel Center
+60.0											P	r esel Adjust 0 Hz
-70.0 Cen Res	ter 2.4	140000000 G	Hz	#VBM	3.0 MHz			Sweep	8 333 ms.	pan 0 Hz		More 1 of 2
MSG	E.V.			"vDvv	0.0 191112				US	roo r ptoj		



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		Pass
Middle	2440	-21.604	8.00	Pass
High	2480	-22.254		Pass



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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) \geq 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

EUT	SPECTRUM
	ANALYZER

6.6.5 Test result

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



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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



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



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, $RBW \ge 1\%$ of the span, $VBW \ge RBW$, 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



Keysight Spectrum Analyzer - Sw 05:38:54 PM Jun 19, 2017 TRACE 1 2 3 4 5 6 TYPE M ALIGN OFF Avg Type: Log-Pwr Avg|Hold:>100/100 Peak Search Marker 1 9.000000 kHz PNO: Wide Trig: Free Run IFGain:Low Atten: 30 dB Next Peak kr1 9.000 kHz -48.383 dBm 10 dB/div Ref 20.00 dBm Next Pk Right Next Pk Left Marker Delta Mkr→CF mannam Mkr→RefLvl man man wanter margan More 1 of 2 Start 9.00 kHz #Res BW 1.0 kHz Stop 150.00 kHz Sweep 134.8 ms (1001 pts) #VBW 3.0 kHz 6 L DC Coupled

CH 00



🔤 Ke	ysight Spectru	ım Analyzer - Sv	vept SA								- 6 -
<mark>ıxı</mark> Mar	ker 1 1	RF 50 S	0 kHz		SE	NSE:INT	Avg Type	ALIGN OFF	05:39:21 PI TRAC	1 Jun 19, 2017 E 1 2 3 4 5 6	Peak Search
10 d	Bídiy	ef 20.00	dBm	PNO: Wide IFGain:Low	Atten: 30) dB	Avg Hold:	:>100/100 N	lkr1 150 -60.8	.00 kHz 76 dBm	Next Peak
Lõg 10.0											Next Pk Right
0.00 -10.0											Next Pk Left
-20.0 -30.0											Marker Delta
-40.0 -50.0										-36.40 dBm	Mkr→CF
-60.0	1 										Mkr→RefLvl
Star #Pe	t 0.150 I	MHz KHz	l'HUILAN AN AND AN	#\/B1A	Wataninta. I 30 kHz	www.wilwow	llyrnys (* Roly Juny)	Sween 0	Stop 10	ակարվեսիներ .000 MHz 1001 pts)	More 1 of 2
MSG	5-1544 10	-11112-		<i></i>	50 KHZ				DC Cou	pled	

📥 Ke	ysight Spe	ctrum Ana	alyzer - Sw	ept SA								
<mark>.x</mark> Mar	ker 1	RF 22.30	50 Ω		7	SEI	NSE:INT	Avg Type	ALIGN OFF	05:37:48 P	M Jun 19, 2017	Peak Search
					PNO: Fast 📮 FGain:Low	Trig: Free Atten: 30	e Run) dB	Avg Hold	:>100/100			NextPeak
10 di Log	B/div	Ref 2	20.00 c	lBm						-60.0	30 MHZ 30 dBm	
10.0												Next Pk Right
0.00 -10.0												Next Pk Left
-20.0											-26.40 dBm	Marker Delta
-40.0												Mkr→CF
-50.0 -60.0	Mr. Mary	Vludyhad	ᢩᡇᠵᢏᡗᡃᡟᡁᠶ	muna	᠋ᢗᡟᢔᡊ᠆ᡔ᠇ᡊᢣ᠕ᡁᡕ	whatw	ᡧᠮᢦᢦᠶᠿᢧᢑᠰᢌ᠕	1 Mr.Varmarch	ninhum	Y-Yorall Marsh	g/Whather	Mkr→RefLvl
-70.0 Star	t 10. <u>0</u>	0 MHz								Stop 3	0.00 MHz	More 1 of 2
#Re	s BW	100 kl	IZ		#VBW	/ 300 kHz			Sweep 1	.933 ms (1001 pts)	
MSG										6		



🤐 Keysight Spectrum Analyzer - Swept SA 👘 🚱 🛃										
<mark>w</mark> Marke	RF 50 Ω AC er 1 2.53371000000	0 GHz	SENS	E:INT		ALIGN OFF	05:38:02 PM TRAC	1 Jun 19, 2017	Peak Search	
10 dB/d	liv Ref 20.00 dBm	PNO: Fast G	Atten: 30 o	B	Avginoid.	M	r1 2.53	^{P NNNNN} 3 7 GHz 36 dBm	Next Peak	
Log									Next Pk Right	
0.00 — -10.0 —									Next Pk Left	
-20.0								-26.40 dBm	Marker Delta	
-40.0 —									Mkr→CF	
-50.0 -60.0	_ส บเฟน์(ปี _ส ป _{ีส} ารเปล่างุณคามปฏมได้และค่า	st/Altocharterations.or	frithelightskiptigenskipfor	ylashadhayoox4e	elypper al wele bet	พ่งจากการ	1 Journ Hingston	Kannalyahanan	Mkr→RefLvl	
-70.0	030 CH2						Stop 2	000 CH2	More 1 of 2	
#Res E	3W 100 kHz	#VBW	300 kHz			Sweep 2	83.9 m <u>s (</u>	1001 pt <u>s)</u>		
MSG							5			





CH 19



🔤 Keys	ight Spectrum	n Analyzer - Sw	/ept SA								- 6 -
<mark>.xı</mark> Mark	er 1 9.9	ະ 50 Ω 87000	kHz		SEI	ISE:INT		ALIGN OFF	05:42:00 PI TRAC	MJun 19, 2017 E 1 2 3 4 5 6	Peak Search
10 dBi	/div Re	ef 20.00 (dBm	NO: Wide ⊆ Gain:Low	Atten: 30) dB	Avg Hold.	. 89/100	Mkr1 9. -48.4	987 kHz 02 dBm	Next Peak
10.0 -											Next Pk Right
0.00 - -10.0 -											Next Pk Left
-20.0 = -30.0 =											Marker Delta
-40.0	1									-46.77 dBm	Mkr→CF
-60.0	Well Work	WWW.A	walwwy.	MUMM	Mr Murlan	www.alu	የሙስጣቢ ለ	в п. ам			Mkr→RefLvl
Start	9.00 kH BW 1.0	z kHz		#VBW	3.0 kHz			Sweep_1	Stop 15	ላቸላሚጥጥ 50.00 kHz 1001 pts)	More 1 of 2
MSG									DC Cou	upled	



🔤 Keys	sight Spec	trum Analyzer - Sw	ept SA								- 5 -
<mark>(X)</mark> Mark	(or 1 '	RF 50 Ω			SEI	NSE:INT		ALIGN OFF	05:42:31 Pf TRAC	1 Jun 19, 2017	Peak Search
mean		155.05000		PNO: Wide	Trig: Fre	e Run D d B	Avg Hold	>100/100	TYP		
				IFGalli.LOW	Atten: 0			N	kr1 150	85 kHz	Next Peak
10 dB	/div	Ref 20.00 d	dBm						-60.3	85 dBm	
Log						ſ					
10.0											Next Pk Right
10.0											
0.00											
											Next Pk Left
-10.0											
-20.0											Marker Delta
20.0											Warker Deka
-30.0										36.77 dBm	
-40.0											
											WIKI→CF
-50.0											
	1										
-60.0	<u>. </u>										Mkr→RefLvi
-70.0	Yn were										
1,0.0	40,940	hedrological and a second	bry and the	fullyfullygan man	Monnal Walland	www.www.hubding.org	of Manadahas	adalana	mantherite	Margaretter	More
_ L											1 of 2
start #Res	0.150 BW_1	0 kHz		#VBA	30 kHz			Sween_9	Stop 10 4.20 ms.(1001 MHz	
MSG					- 010 Hill /2			I STATUS		ipled	

- Ke	eysight Spec	trum Analyz	er - Swept	SA								
<mark>IXI</mark> Mar	ker 1	^{RF} 29.160	50 Ω 00000			SEI	NSE:INT	Avg Type	ALIGN OFF	05:41:06 P	M Jun 19, 2017	Peak Search
				PI IF(NO: Fast 🕞 Gain:Low	Trig: Free Atten: 3	e Run 0 dB	Avg Hold:	:>100/100	۳۲ D Mkr1 29		NextPeak
10 d	B/div	Ref 20	.00 dB	m						-60.1	52 dBm	
10.0												Next Pk Right
0.00												Next Pk Left
-10.0												Marker Delta
-30.0											-20.77 UBM	
-40.0												Mkr→CF
-60.0	ᢣᡰ᠕ᠰᡅᢇᡟ	uwy.ml.m	Joy and a Cl	n Marine	᠕ᠺᢑᠰᠬᠬᢦᠼᡎᢔ	ᠬᠶᡗᡰᡊᡁᡟᡁᡐᡇᡰᠺ	โรรรไม _่ ระที่ได้จะสาวสุดใ	y www.	enn ^a n-dhan	pluljelo ⁿⁱ nstru	1 www.halernet	Mkr→RefLvl
-70.0 Stai) MHz								Stop 3	0 00 MHz	More 1 of 2
#Re	s BW 1	100 kHz			#VBW	300 kHz			Sweep	1.933 ms ((1001 pts)	
MSG									🚺 STATU	IS		



🔤 Keysight Spectrum Analyzer - Swept SA										
<mark>w</mark> Marker 1	RF 50 Ω AC 2.604990000000) GHz	SENSE	:INT	Avg Type	ALIGN OFF	05:41:18 PM TRAC	1 Jun 19, 2017	Peak Search	
10 dB/div	Ref 20.00 dBm	PNO: Fast IFGain:Low	Atten: 30 dl	un B	Avg Hold:	M	cr1 2.60	5 0 GHz 97 dBm	Next Peak	
10.0									Next Pk Right	
0.00 -10.0							1		Next Pk Left	
-20.0								-26.77 dBm	Marker Delta	
-40.0									Mkr→CF	
-60.0	understywerstanderstart	Hanjaanahankepaanke	hind fame of the	halippinetenseelle	hand a stand of the second of the second s	sodin Misselvik	VI VPAUNINI MINI	hqiftiminaq _{an} gileti	Mkr→RefLvl	
Start 0.03	30 GHz						Stop 3	000 GHz	More 1 of 2	
#Res BW	100 kHz	#VBW	300 kHz			sweep 2	83.9 ms (1001 pts)		
MSG						UN STATUS	5			









🔤 Keysight Spectrum Ana	lyzer - Swept SA					- 6 ×
warker 1 9.564	50 Ω <u>∧</u> DC 000 kHz	SEN		ALIGN OFF 05:46:29 e: Log-Pwr TF	9 PM Jun 19, 2017 RACE 1 2 3 4 5 6	Peak Search
10 dB/div Ref 2	PNO IFGa 20.00 dBm	l:Wide G Trig:Free in:Low Atten:30) dB	-48.	9.564 kHz 302 dBm	NextPeak
10.0						Next Pk Right
-10.0						Next Pk Left
-20.0						Marker Delta
-40.0					-47.34 dBm	Mkr→CF
-60.0	mandantara	Algerand	m when the state			Mkr→RefLvl
Start 9.00 kHz #Res BW 1. <u>0 kH</u>	z	#VBW 3.0 <u>kHz</u>		Sweep 134.8 ms	150.00 kHz s (1001 pt <u>s)</u>	More 1 of 2
MSG				Costatus 1 DC C	Coupled	
ii				Transmission and the second se		



🔤 Kej	sight Spec	trum Analyzer -	Swept SA								
I <mark>XI</mark> Mar	cor 1	RF 5	0 Ω <mark>1</mark> DC		SEI	NSE:INT		ALIGN OFF	05:47:01 PI TRAC	1 Jun 19, 2017	Peak Search
Meu		150.0000		PNO: Wide G	Trig: Fre Atten: 3	e Run 0 dB	Avg Hold	>100/100	TYP		
10 dE	3/div	Ref 20.0	0 dBm					Μ	lkr1 150 -60.4	.00 kHz 72 dBm	Next Peak
10.0											Next Pk Right
0.00 -10.0											Next Pk Left
-20.0											Marker Delta
-30.0 -40.0										-37.34 dBm	Mkr→CF
-50.0 -60.0	1										Mkr→RefLvl
-70.0	U. Head and the second second	threader and a second	MU-4, MV-4.14	KulupaiNataumiphi	1914hAndrew	Naharan	haphannelsar	gh (palamatrich)	hahyaantahile	ylogoddaeddaeddaeddae	More
Star #Re	t 0.150 8 BW 1	MHz		#\/B\A	30 kHz			Sween 9	Stop 10	.000 MHz 1001 pts)	1 of 2
MSG				<i>"</i> •EM					L DC Cou	pled	





Keysight Spectrum Analy	yzer - Swept SA								- đ 🔀		
Warker 1 2 6703	50 Ω AC	GHZ	SEN	SE:INT		ALIGN OFF	05:45:31 Pf TRAC	4 Jun 19, 2017 E 1 2 3 4 5 6	Peak Search		
		PNO: Fast	Trig: Free	Run	Avg Hold:	18/100	TYP				
	Mkr1 2 670 3 GHz										
10 dB/div Ref 2	0.00 dBm						-56.1	30 dBm			
Log				/							
10.0									Next Pk Right		
10.0									Ĵ		
0.00											
									Next Pk Left		
-10.0									NEXT FR LEIL		
-20.0											
								-27.34 dBm	Marker Delta		
-30.0											
40.0											
-40.0									Mkr→CF		
-50.0								•			
						1.	🔶				
-60.0		mannahan	بهير والعامينية الل	waldelight	really have been	manyulunhar		r-1throppenhour	Mkr→RefLvl		
Man	or majore of the										
-70.0											
									More		
Start 0.030 GHz							Stop 3	.000 GHz	1 of 2		
#Res BW 100 kH	z	#VBW	300 kHz			Sweep 2	83.9 ms (1001 pts)			
MSG							3				





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7 Test setup photo

CE TEST SETUP PHOTO



RE TEST SETUP PHOTO



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