

TEST REPORT

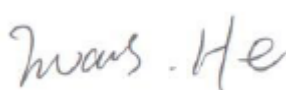
Applicant	Green Power One Co., Ltd
Address	No.26, Hongyun Street, Qingxi Town, Dongguan City, Guangdong Province

Manufacturer or Supplier	Green Power One Co., Ltd
Address	No.26, Hongyun Street, Qingxi Town, Dongguan City, Guangdong Province
Product	Speaker
Brand Name	N/A
Model	18WMS014
Additional Model & Model Difference	N/A
Date of tests	April 26 to July 09, 2018

the tests have been carried out according to the requirements of the following standards:

☒ **FCC Part 15, Subpart C, Section 15.247**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Evans He Project Engineer/ EMC Department	Approved by Chris Chen Supervisor / EMC Department
	 Date: July 10, 2018

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TABLE OF CONTENTS

RELEASE CONTROL RECORD	5
1 SUMMARY OF TEST RESULTS.....	6
2 MEASUREMENT UNCERTAINTY	7
3 GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT.....	8
3.2 DESCRIPTION OF TEST MODES	9
3.2.1. CONFIGURATION OF SYSTEM UNDER TEST	10
3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL	10
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS	12
3.4 DESCRIPTION OF SUPPORT UNITS	12
4 TEST TYPES AND RESULTS.....	13
4.1. CONDUCTED EMISSION MEASUREMENT	13
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT	13
4.1.2 TEST INSTRUMENTS.....	13
4.1.3 TEST PROCEDURES	14
4.1.4 DEVIATION FROM TEST STANDARD	14
4.1.5 TEST SETUP.....	15
4.1.6 EUT OPERATING CONDITIONS	15
4.1.7 TEST RESULTS.....	16
4.2. RADIATED EMISSION AND BANDEDGE MEASUREMENT	18
4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT.....	18
4.2.2 TEST INSTRUMENTS.....	19
4.2.3 TEST PROCEDURES	20
4.2.4 DEVIATION FROM TEST STANDARD.....	21
4.2.5 TEST SETUP.....	21
4.2.6 EUT OPERATING CONDITIONS	22
4.2.7 TEST RESULTS	23
4.3 NUMBER OF HOPPING FREQUENCY USED	27
4.3.1 LIMIT OF HOPPING FREQUENCY USED	27
4.3.2 TEST SETUP.....	27
4.3.3 TEST INSTRUMENTS.....	27
4.3.4 TEST PROCEDURES	29
4.3.5 DEVIATION FROM TEST STANDARD.....	29
4.3.6 TEST RESULTS	29

4.4 DWELL TIME ON EACH CHANNEL	31
4.4.1 LIMIT OF DWELL TIME USED	31
4.4.2 TEST SETUP	31
4.4.3 TEST INSTRUMENTS	31
4.4.4 TEST PROCEDURES	31
4.4.5 DEVIATION FROM TEST STANDARD	32
4.4.6 TEST RESULTS	32
4.5 CHANNEL BANDWIDTH	35
4.5.1 LIMITS OF CHANNEL BANDWIDTH	35
4.5.2 TEST SETUP	35
4.5.3 TEST INSTRUMENTS	35
4.5.4 TEST PROCEDURE	35
4.5.5 DEVIATION FROM TEST STANDARD	35
4.5.6 EUT OPERATING CONDITION	35
4.5.7 TEST RESULTS	36
4.6 HOPPING CHANNEL SEPARATION	40
4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION	40
4.6.2 TEST SETUP	40
4.6.3 TEST INSTRUMENTS	40
4.6.4 TEST PROCEDURES	40
4.6.5 DEVIATION FROM TEST STANDARD	40
4.6.6 TEST RESULTS	41
4.7 CONDUCTED OUTPUT POWER	45
4.7.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT	45
4.7.2 TEST SETUP	45
4.7.3 TEST INSTRUMENTS	45
4.7.4 TEST PROCEDURES	45
4.7.5 DEVIATION FROM TEST STANDARD	45
4.7.6 EUT OPERATING CONDITION	45
4.7.7 TEST RESULTS	46
4.8 OUT OF BAND EMISSION MEASUREMENT	47
4.8.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT	47
4.8.2 TEST INSTRUMENTS	47
4.8.3 TEST PROCEDURE	47
4.8.4 DEVIATION FROM TEST STANDARD	47
4.8.5 EUT OPERATING CONDITION	47
4.8.6 TEST RESULTS	47



Test Report No.: RF180620N030

5	PHOTOGRAPHS OF THE TEST CONFIGURATION	53
6	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	54



Test Report No.: RF180620N030

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF180620N030	Original release	July 10, 2018

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Number of Hopping Frequency Used	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.247(d)& 15.209	Transmitter Radiated Emission	PASS	Meet the requirement of limit.
15.247(d)	Out of band Emission Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

NOTE: Test Lab Information:

Lab: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

Test Lab Address: Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District Shenzhen, Guangdong, 518108, People's Republic of China

2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	3.11dB
Radiated emissions	9KHz ~ 30MHz	3.11dB
	30MHz ~ 1GMHz	2.73dB
	1GHz ~ 18GHz	5.12dB
	18GHz ~ 40GHz	5.34dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Speaker
MODEL NO.	18WMS014
ADDITIONAL MODEL	N/A
FCC ID	2AQLASPKA18BLU
POWER SUPPLY	DC 5V from adapter DC 3.7 from battery
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, $\pi/4$ DQPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
PEAK OUTPUT POWER	0.511mW (Max. Measured)
ANTENNA TYPE	PIFA Antenna, -0.5dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	AC Cable: Unshielded, Non-detachable, 1.5m

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 180620N030) for detailed product photo.

3.2 DESCRIPTION OF TEST MODES

79 channels are provided to this EUT:

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

3.2.1. CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photograph of the test configuration for reference.

3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports

The worst case was found when positioned on X axis for radiated emission.

Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
A	√	√	√	√	DC 5V from adapter

Where **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission

RE≥1G: Radiated Emission above 1GHz
APCM: Antenna Port Conducted Measurement

RADIATED EMISSION TEST (BELOW 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	39	FHSS	GFSK	DH5

For the test results, only the worst case was shown in test report.

RADIATED EMISSION TEST (ABOVE 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	0, 39, 78	FHSS	GFSK	DH5
0 to 78	0, 39, 78	FHSS	$\pi/4$ DQPSK	2DH5

POWER LINE CONDUCTED EMISSION TEST:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
A	0 to 78	Hopping	FHSS	GFSK	DH5

ANTENNA PORT CONDUCTED MEASUREMENT:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
0 to 78	0, 39, 78	FHSS	GFSK	DH5
0 to 78	0, 39, 78	FHSS	$\pi/4$ DQPSK	2DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	25deg. C, 55%RH	DC 5V from adapter	Evans He
RE≥1G	25deg. C, 55%RH	DC 5V from adapter	Evans He
PLC	26deg. C, 57%RH	DC 5V from adapter	Aaron Liang
APCM	22deg. C, 57%RH	DC 5V from adapter	Aaron Liang

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C. Section 15.247
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an dependent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Phone	Huawei	honor 9	N/A	N/A
2	Adaptor	TECNO	A8-501000	N/A	N/A
3	Laptop	Lenovo	E40	N/A	N/A
4					

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	Aux in line: Unshielded, Detachable 1.0m
2	USB Line: Unshielded, Detachable 1.5m

4 TEST TYPES AND RESULTS

4.1. CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCS30	8471241027	Jan. 05,18	Jan. 04,19
Artificial Mains Network	SCHWARZBECK	8127	8127713	Jan. 05,18	Jan. 04,19
ISN	Com-Power	ISN T800	34373	Jan. 05,18	Jan. 04,19
Test software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

NOTE:

1. The test was performed in shielded room 843.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.

4.1.3 TEST PROCEDURES

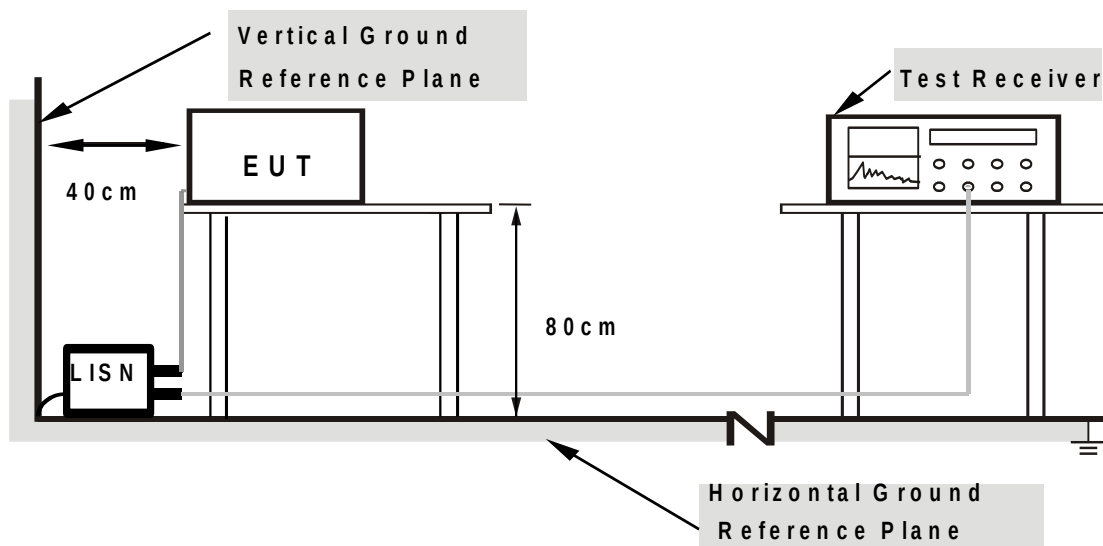
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



Note: 1.Support units were connected to second LISN .

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80
from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT OPERATING CONDITIONS

- Turned on the power and connected of all equipment.
- EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

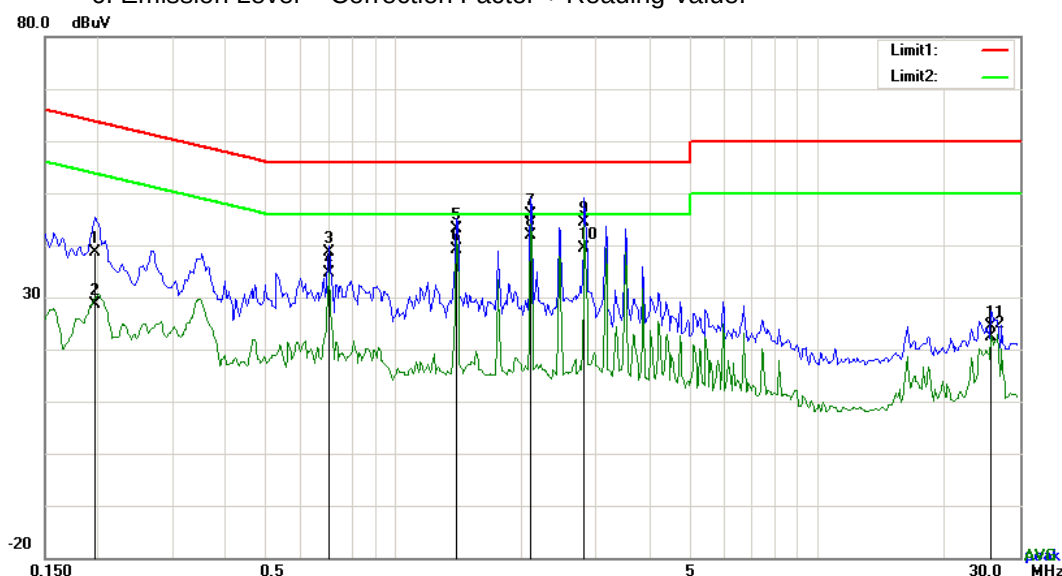
4.1.7 TEST RESULTS

CONDUCTED WORST-CASE DATA: GFSK CH39

PHASE	Line	6dB BANDWIDTH	9kHz
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No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB}	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	L1	0.1968	28.57	QP	10.03	38.60	63.74	-25.14
2	L1	0.1968	18.56	AVG	10.03	28.59	53.74	-25.15
3	L1	0.7038	28.69	QP	10.03	38.72	56.00	-17.28
4	L1	0.7038	24.57	AVG	10.03	34.60	46.00	-11.40
5	L1	1.4097	33.05	QP	10.04	43.09	56.00	-12.91
6	L1	1.4097	29.01	AVG	10.04	39.05	46.00	-6.95
7	L1	2.1078	35.83	QP	10.04	45.87	56.00	-10.13
8	L1	2.1078	31.72	AVG	10.04	41.76	46.00	-4.24
9	L1	2.8098	34.22	QP	10.05	44.27	56.00	-11.73
10	L1	2.8098	29.29	AVG	10.05	39.34	46.00	-6.66
11	L1	25.6941	13.99	QP	10.41	24.40	60.00	-35.60
12	L1	25.6941	11.85	AVG	10.41	22.26	50.00	-27.74

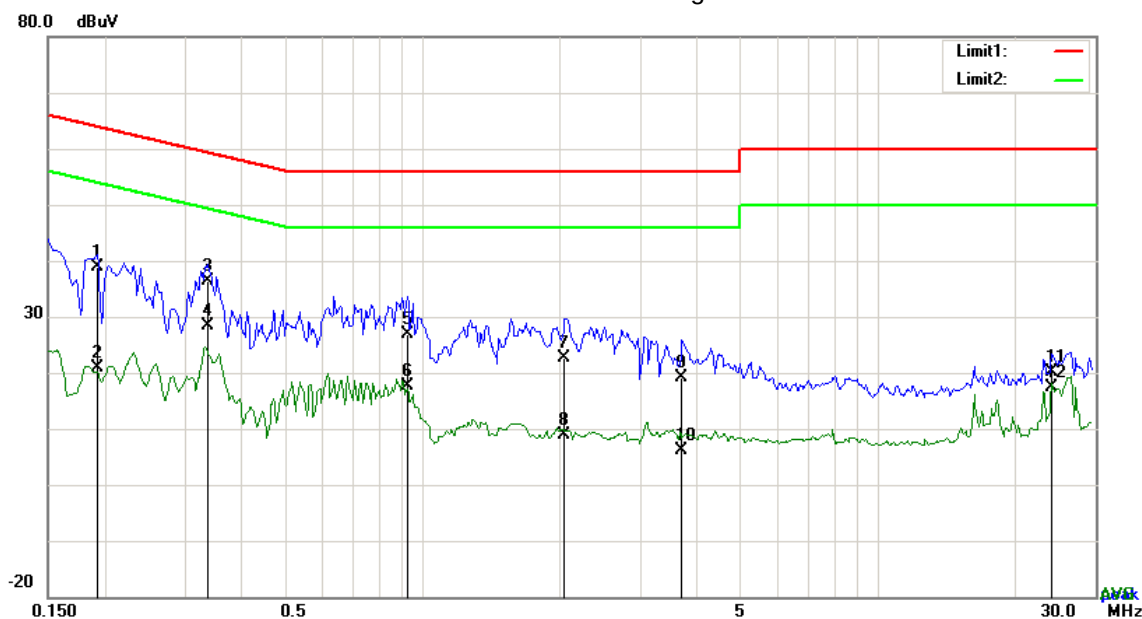
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



PHASE	Neutral	6dB BANDWIDTH	9kHz
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No.	P/L	Frequency (MHz)	Reading (dBuV)	Detector	Corrected (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)
1	N	0.1929	28.77	QP	10.02	38.79	63.91	-25.12
2	N	0.1929	10.96	AVG	10.02	20.98	53.91	-32.93
3	N	0.3372	26.40	QP	10.02	36.42	59.27	-22.85
4	N	0.3372	18.28	AVG	10.02	28.30	49.27	-20.97
5	N	0.9261	16.85	QP	10.03	26.88	56.00	-29.12
6	N	0.9261	7.59	AVG	10.03	17.62	46.00	-28.38
7	N	2.0532	12.63	QP	10.04	22.67	56.00	-33.33
8	N	2.0532	-1.11	AVG	10.04	8.93	46.00	-37.07
9	N	3.7098	8.99	QP	10.06	19.05	56.00	-36.95
10	N	3.7098	-3.99	AVG	10.06	6.07	46.00	-39.93
11	N	24.0249	9.92	QP	10.32	20.24	60.00	-39.76
12	N	24.0249	7.02	AVG	10.32	17.34	50.00	-32.66

- REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



4.2. RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). Other emissions shall be at least 20dB below the highest level of the desired power.

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06-1 00262-eQ	Jan. 05, 18	Jan. 04, 19
Bilog Antenna	Sunol Sciences	JB6	A110712	Feb. 08, 18	Feb. 07, 19
Signal Amplifier	HP	8447E	443008	Jan. 25,18	Jan. 24,19
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 19,15	Oct. 18,18
MXA signal analyzer	Agilent	N9020A	MY49100060	Jan. 05, 18	Jan. 04, 19
Horn Antenna	COM-POWER	HAH-118	71259	Jan. 26,18	Jan. 25,19
Horn Antenna	COM-POWER	HAH-118	71283	Feb. 02, 18	Feb. 01, 19
AMPLIFIER	EM Electornic Corporation	EM01G26G	60613	Jan. 25,18	Jan. 24,19
AMPLIFIER	Emc Instruments Corporation	Emc012645	980077	Jan. 05, 18	Jan. 04, 19
Test Software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

NOTE:

1. The test was performed in 966 Chamber.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The horn antenna is used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 535293.

4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) above the ground at a 3 meters semi-anechoic chamber. 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. For below 1GHz was used bilog antenna, and above 1GHz was used horn antenna, and its 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 and the rotatable 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. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.
- g. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

NOTE:

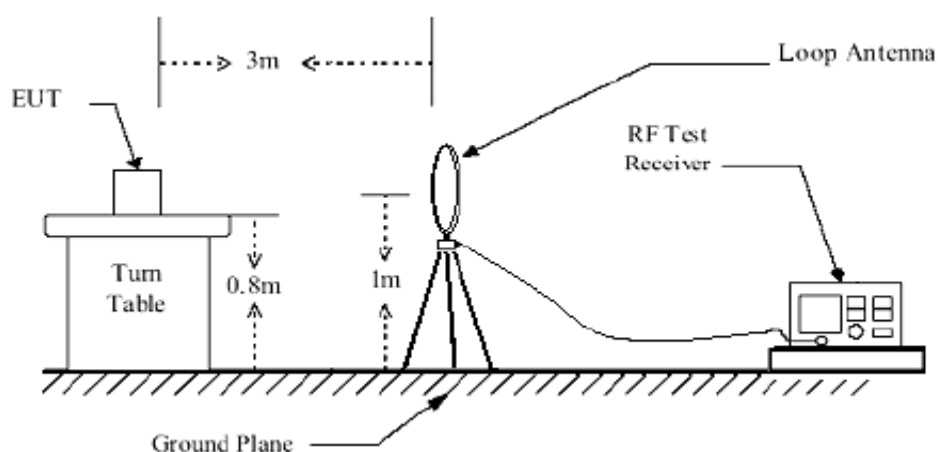
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. Bluetooth duty factor correction is not correct as it is based on 79 channels, worst case would be with AFH enabled and device using the minimum of 20 channels. Channel hop rate = 800 hops/second (AFH Mode), Adjusted channel hop rate for DH5 mode = 133.33 hops/second, Time per channel hop = $1 / 133.33$ hops/second = 7.5 ms, Time to cycle through all channels = 7.5×20 channels = 150 ms, Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s), Worst case dwell time = 7.5 ms, Duty cycle connection factor = $20\log_{10}(7.5\text{ms} / 100\text{ms})$ = -22.5 dB. Average value = peak reading + $20\log(\text{duty cycle})$.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

4.2.4 DEVIATION FROM TEST STANDARD

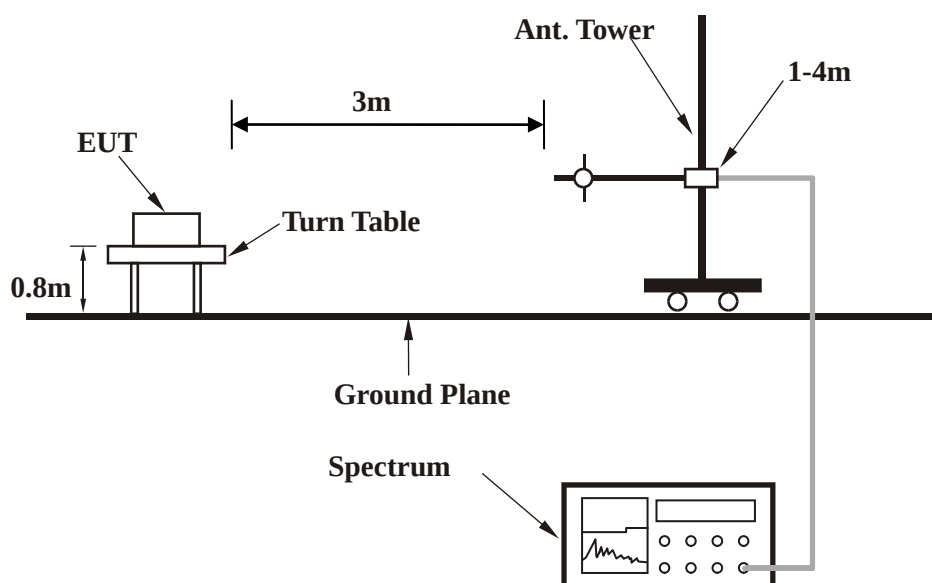
No deviation.

4.2.5 TEST SETUP

Below 30MHz test setup

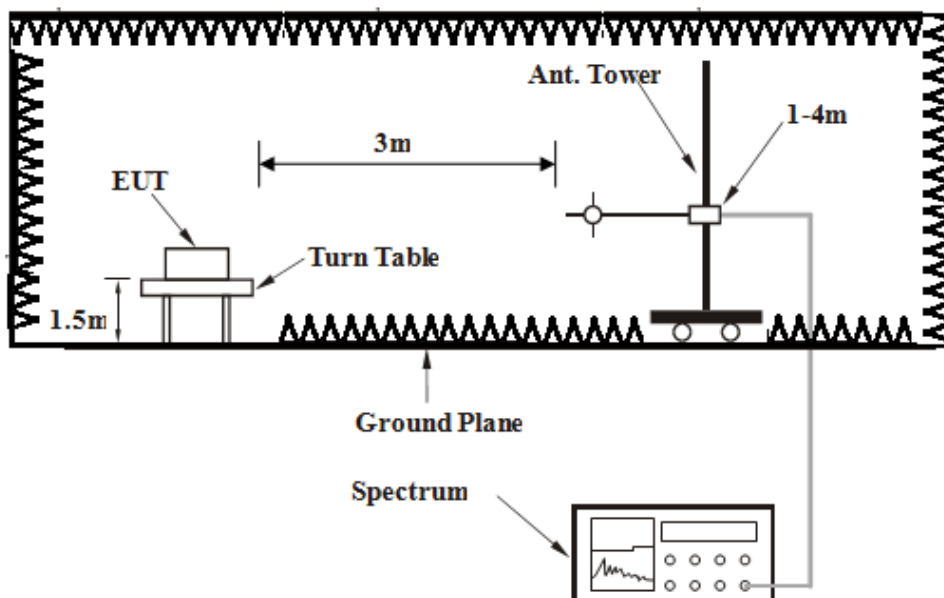


Below 1GHz test setup



Note: For the actual test configuration, please refer to the attached file (Test Setup Photo).

Above 1GHz test setup



Note: For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

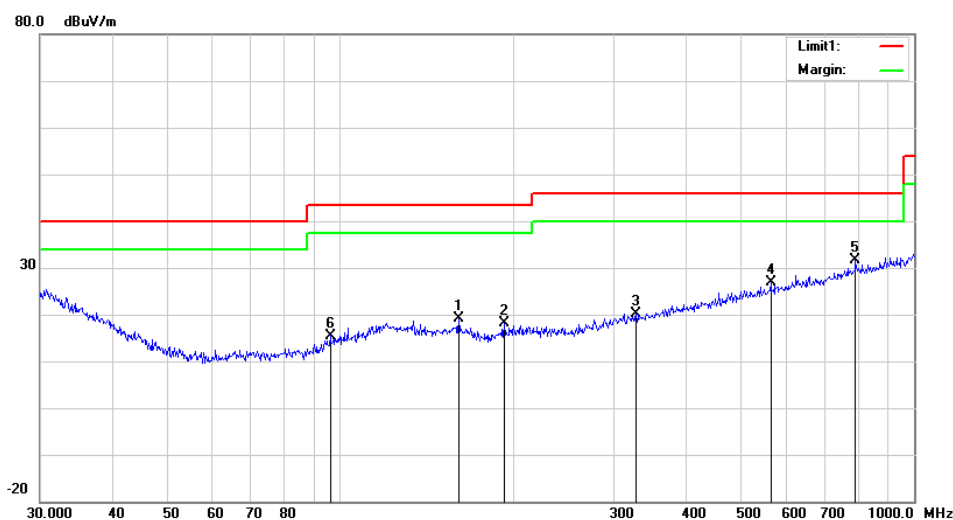
GFSK DH5

CHANNEL	Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 m											
No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	160.9089	27.59	peak	12.53	22.27	1.39	19.24	43.50	-24.26	100	293
2	193.0945	27.15	peak	11.72	22.34	1.54	18.07	43.50	-25.43	100	122
3	327.8873	26.19	peak	14.19	22.21	1.93	20.10	46.00	-25.90	100	51
4	562.6624	27.38	peak	18.58	21.67	2.48	26.77	46.00	-19.23	200	229
5	790.6188	28.65	peak	21.29	21.17	2.94	31.71	46.00	-14.29	100	128
6	96.0986	27.34	peak	9.46	22.32	1.02	15.50	43.50	-28.00	100	243

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Ant Factor (dB/m) + Cab Factor (dB) - PA Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Result level – Limit value

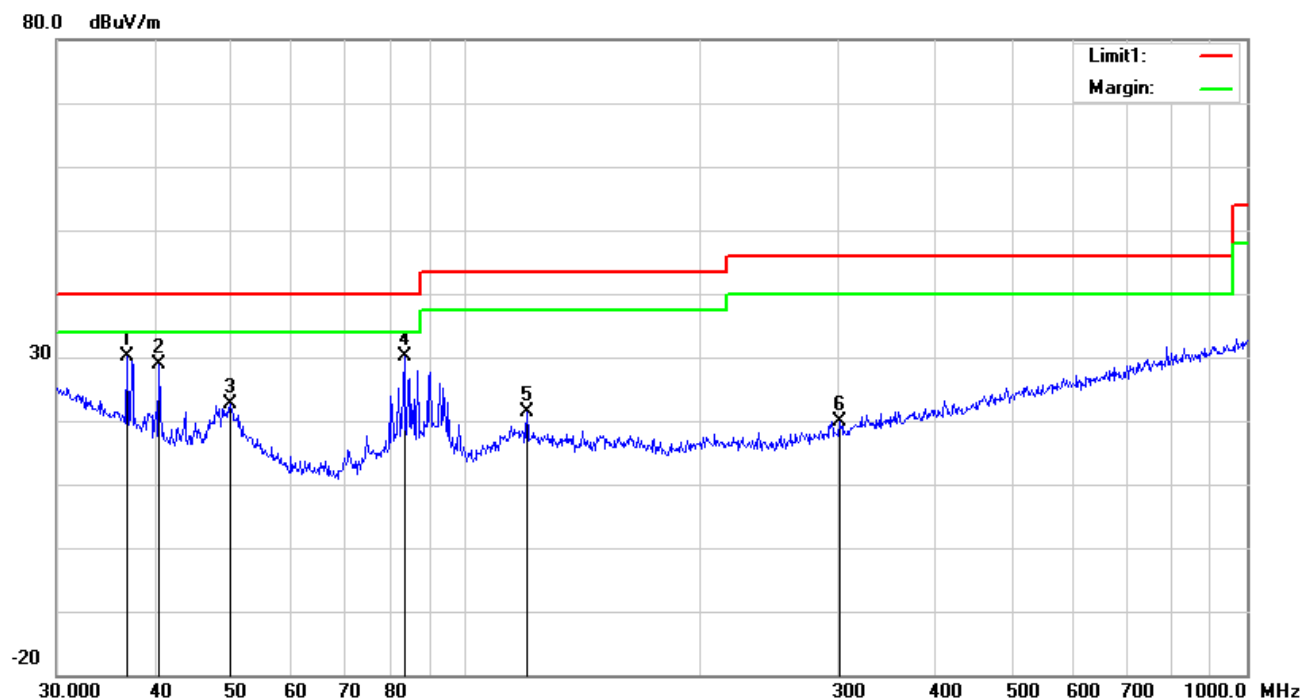


CHANNEL	Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL at 3 m											
No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)
1	36.8953	35.33	peak	16.17	22.26	0.77	30.01	40.00	-9.99	100	164
2	40.5591	36.78	peak	13.53	22.28	0.79	28.82	40.00	-11.18	200	133
3	50.0566	35.79	peak	8.39	22.38	0.80	22.60	40.00	-17.40	100	309
4	83.5222	43.73	peak	7.74	22.38	1.06	30.15	40.00	-9.85	100	201
5	119.8556	28.71	peak	13.87	22.36	1.16	21.38	43.50	-22.12	100	306
6	301.4224	26.72	peak	13.63	22.29	1.80	19.86	46.00	-26.14	100	339

REMARKS:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Ant Factor (dB/m) + Cab Factor (dB) - PA Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Result level – Limit value





ABOVE 1GHz DATA

BT

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

Low Channel (2402 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4804	46.35	AV	V	33.39	7.22	48.46	38.5	54	-15.5
4804	47.9	AV	H	33.39	7.22	48.46	40.05	54	-13.95
4804	66.48	PK	V	33.39	7.22	48.46	58.63	74	-15.37
4804	64.11	PK	H	33.39	7.22	48.46	56.26	74	-17.74
13644	25.87	AV	V	39.81	11.41	46.74	30.35	54	-23.65
13644	24.94	AV	H	39.81	11.41	46.74	29.42	54	-24.58
13644	44.72	PK	V	39.81	11.41	46.74	49.2	74	-24.8
13644	44.84	PK	H	39.81	11.41	46.74	49.32	74	-24.68

CHANNEL	Middle Channel	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

Middle Channel (2441 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4882	42.73	AV	V	33.62	7.53	48.36	35.52	54	-18.48
4882	45.06	AV	H	33.62	7.53	48.36	37.85	54	-16.15
4882	65.25	PK	V	33.62	7.53	48.36	58.04	74	-15.96
4882	62.99	PK	H	33.62	7.53	48.36	55.78	74	-18.22
7856	35.09	AV	V	38	8.47	47.29	34.27	54	-19.73
7856	32.85	AV	H	38	8.47	47.29	32.03	54	-21.97
7856	51.09	PK	V	38	8.47	47.29	50.27	74	-23.73
7856	52.81	PK	H	38	8.47	47.29	51.99	74	-22.01



CHANNEL	High Channel	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

High Channel (2480 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4960	48.8	AV	V	33.89	7.86	48.31	42.24	54	-11.76
4960	48.75	AV	H	33.89	7.86	48.31	42.19	54	-11.81
4960	66.17	PK	V	33.89	7.86	48.31	59.61	74	-14.39
4960	67.79	PK	H	33.89	7.86	48.31	61.23	74	-12.77
17904	22.66	AV	V	41.4	16.48	46.83	33.71	54	-20.29
17904	19.26	AV	H	41.4	16.48	46.83	30.31	54	-23.69
17904	40.51	PK	V	41.4	16.48	46.83	51.56	74	-22.44
17904	41.13	PK	H	41.4	16.48	46.83	52.18	74	-21.82

REMARKS:

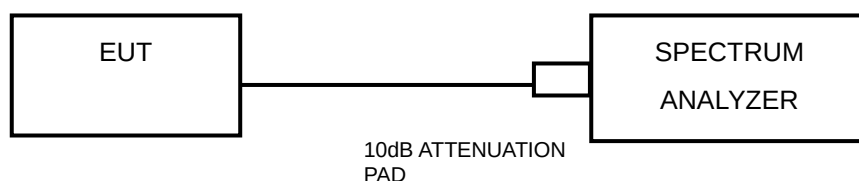
1. Field strength value(AV) (dBuV/m) = Field strength value(PK) (dBuV/m) + Average Factor (dB).
2. Margin value = Field strength value – Limit value..
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. . " * ": Fundamental frequency.

4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

At least 15 channels frequencies, and should be equally spaced.

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Instrument	Model	Serial #	Cal Date	Cal Due
Power Sensor	Dare RPR3006C/P/W	N/A	Jan. 05, 18	Jan. 04, 19
Power Sensor	Dare RPR3006C/P/W	N/A	Jan. 05, 18	Jan. 04, 19
Agilent ESA-E SERIES SPECTRUM ANALYZER	E4407B	MY45108319	Feb. 11, 18	Feb. 10, 19
EMI test receiver	ESL6	1300.5001K06- 100262-eQ	Jan. 05, 18	Jan. 04, 19
Power Splitter	1#	1#	Dec. 09, 17	Dec. 08, 18
SYNTHESIZED SIGNAL GENERATOR	8665B	3744A01293	Jan. 05, 18	Jan. 04, 19
DC Power Supply	E3640A	MY40004013	Jan. 05, 18	Jan. 04, 19
Bilog Antenna (30MHz~6GHz)	JB6	A110712	Feb. 08, 18	Feb. 07, 19
Bilog Antenna (30MHz~2GHz)	JB1	A112017	Jan. 26, 18	Jan. 25, 19
A-INFOMW Horn Antenna (1~18GHz)	AH-118	71259	Jan. 26, 18	Jan. 25, 19
Pre-Amplifier (100MHz-26.5GHz)	EMC 012645	980077	May 19, 17	May 18, 18
Pre-Amplifier (18GHz-40GHz)	EMC 184045	980102	Nov. 08, 17	Nov. 07, 18
EMCO Horn Antenna (1~18GHz)	AH-118	71283	Feb. 02, 18	Feb. 01, 19

**Test Report No.: RF180620N030**

OPT 010 AMPLIFIER (0.1~1300MHz)	8447E	2727A02430	Dec. 09, 17	Dec. 08, 18
Horn Antenna	BBHA 9170	BBHA9170147	Mar. 15, 17	Mar. 14, 18
Microwave Preamplifier (0.5 ~ 18GHz)	PAM-118	443008	Dec. 09, 17	Dec. 08, 18
Attenuator	MINI	N/A	Dec. 09, 17	Dec. 08, 18
Test Software	EZ-EMC	ver.lcp-03A1	N/A	N/A

NOTE:

1. The test was performed in RF Oven room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.3.4 TEST PROCEDURES

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- d. Set the SA on View mode and then plot the result on SA screen.
- e. Repeat above procedures until all frequencies measured were completed.

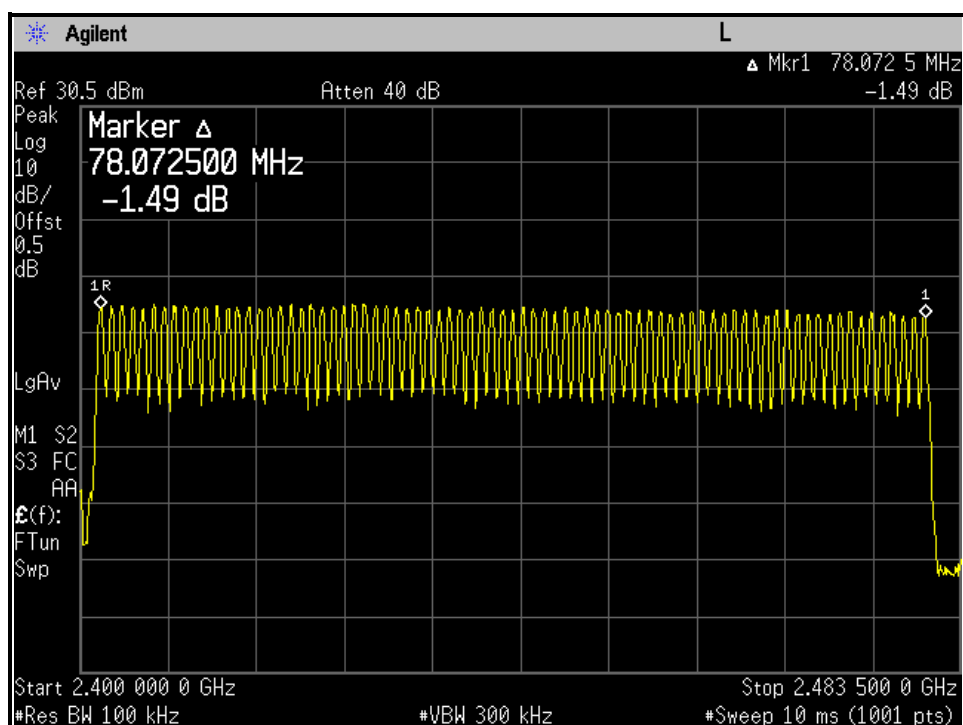
4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

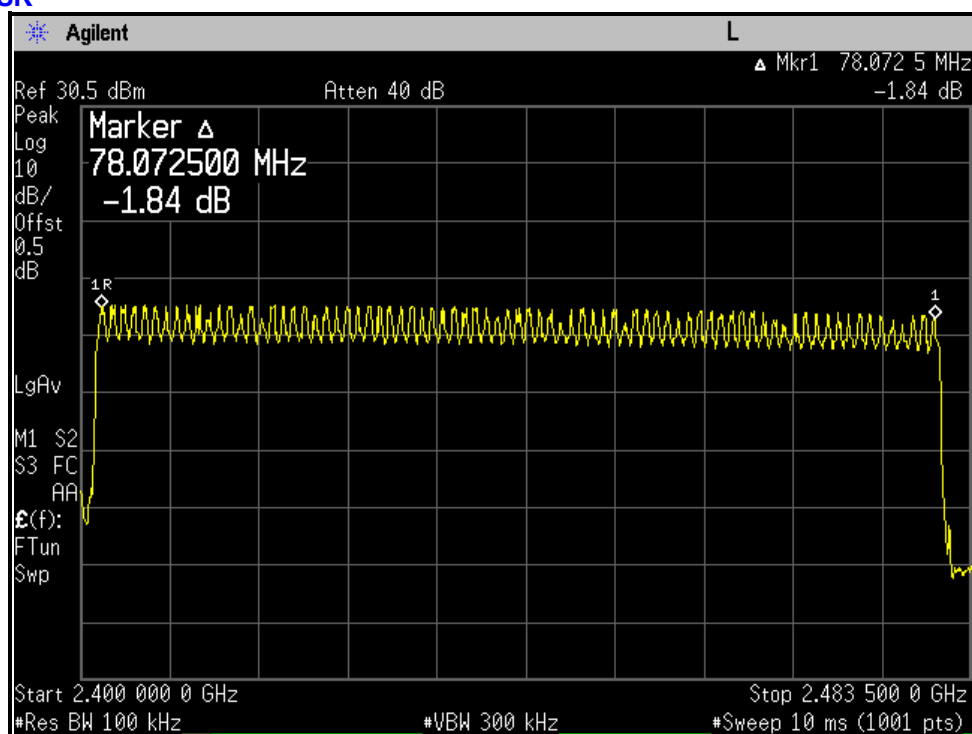
4.3.6 TEST RESULTS

There are 79 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

GFSK



$\pi/4$ DQPSK

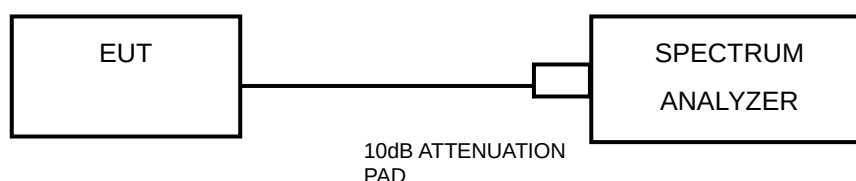


4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.4.4 TEST PROCEDURES

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 TEST RESULTS

GFSK

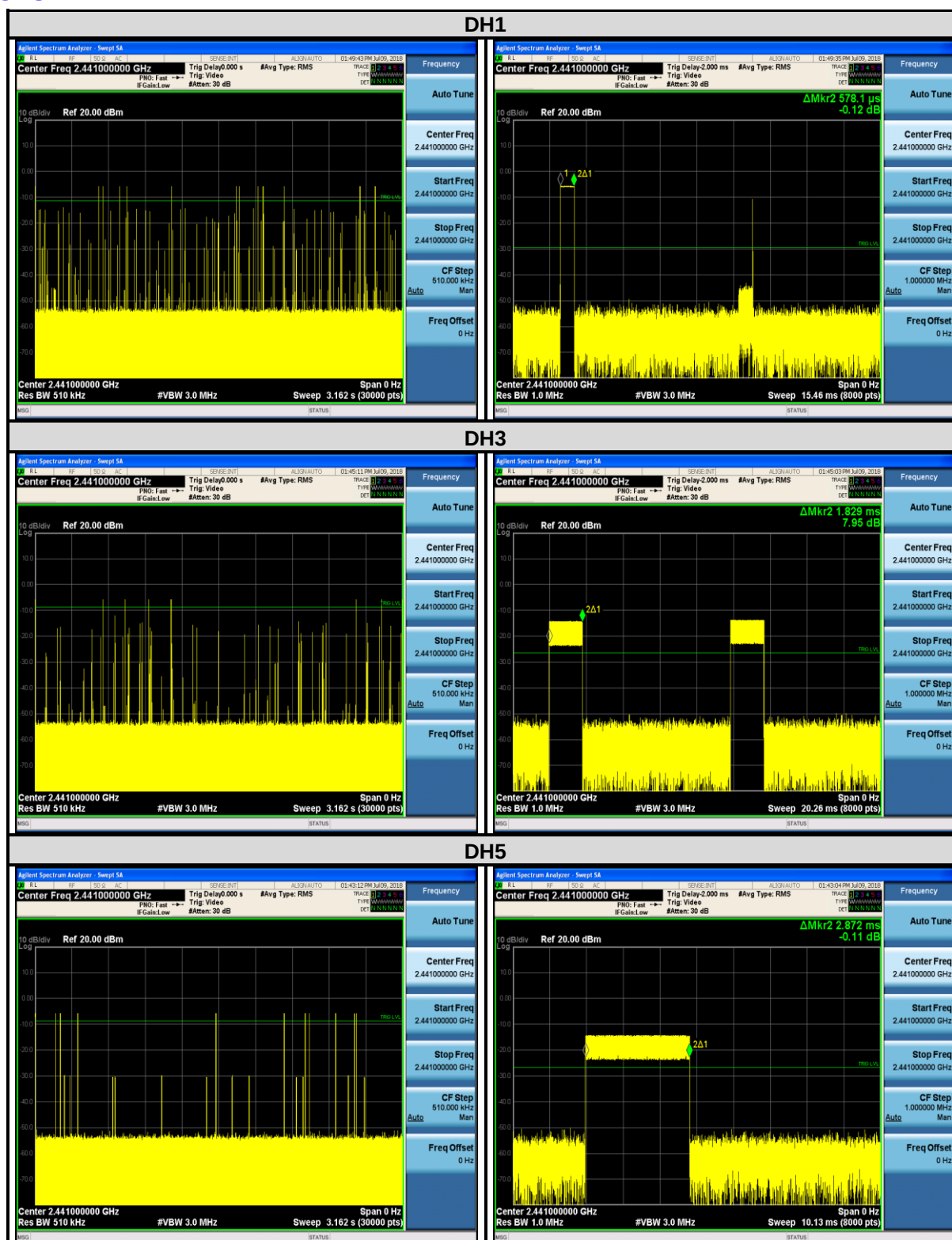
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	3.16	16	160	0.58	92.8	400	PASS
DH3	79	31.6	3.16	7	70	1.83	128.1	400	PASS
DH5	79	31.6	3.16	11	110	2.87	315.7	400	PASS

$\pi/4$ DQPSK

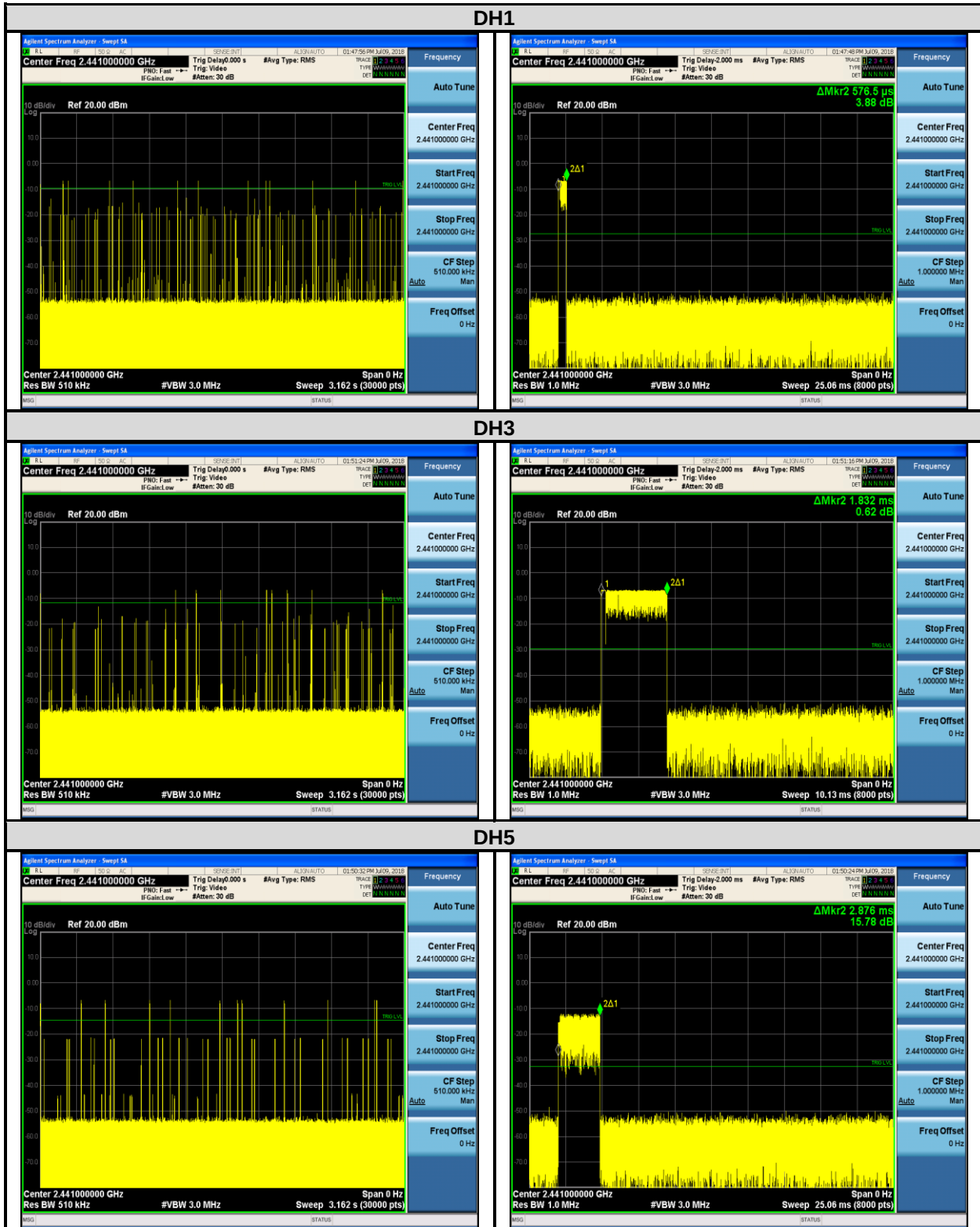
Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
DH1	79	31.6	3.16	13	130	0.58	75.4	400	PASS
DH3	79	31.6	3.16	14	140	1.83	256.2	400	PASS
DH5	79	31.6	3.16	12	120	2.88	345.6	400	PASS

NOTE: Test plots of the transmitting time slot are shown on next page.

GFSK



$\pi/4$ DQPSK

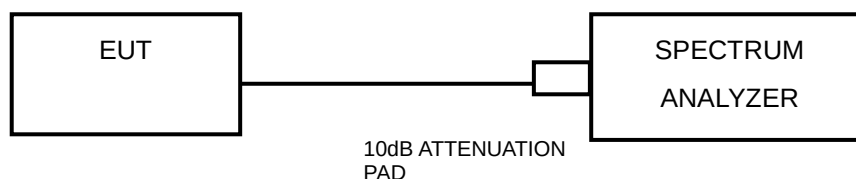


4.5 CHANNEL BANDWIDTH

4.5.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.5.4 TEST PROCEDURE

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

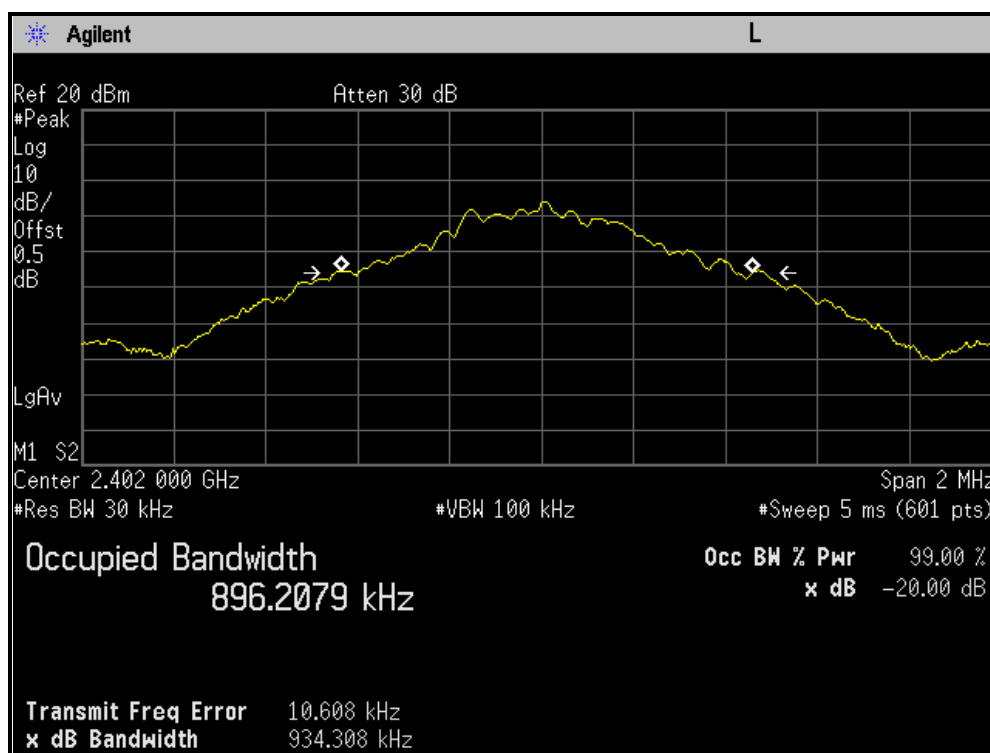
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

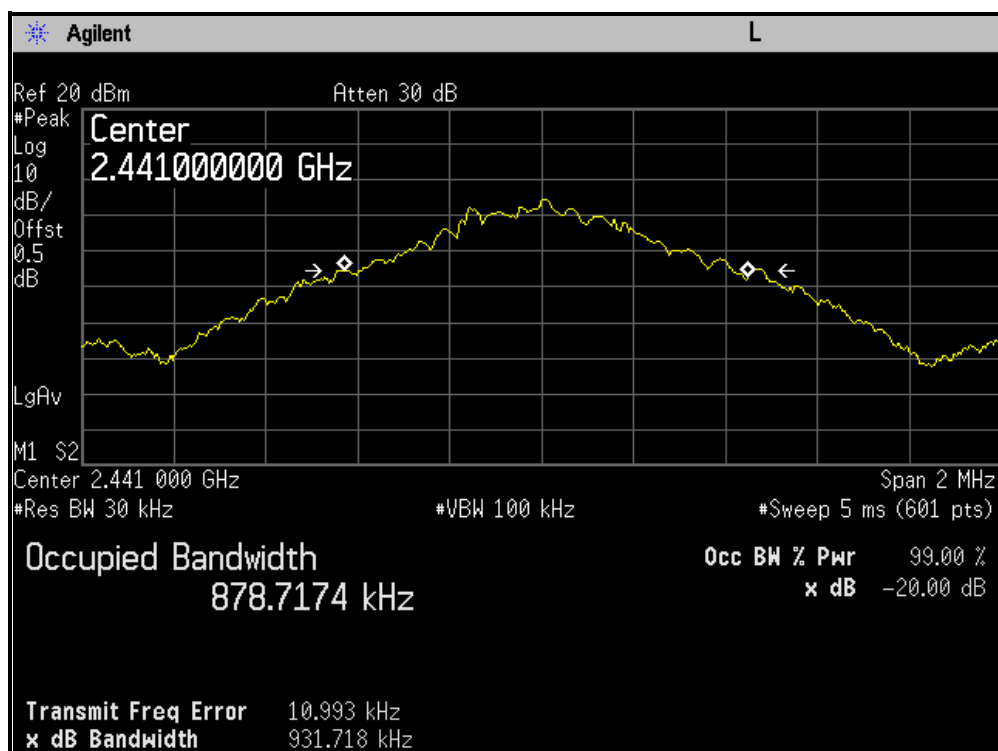
GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.934
39	2441	0.932
78	2480	0.938

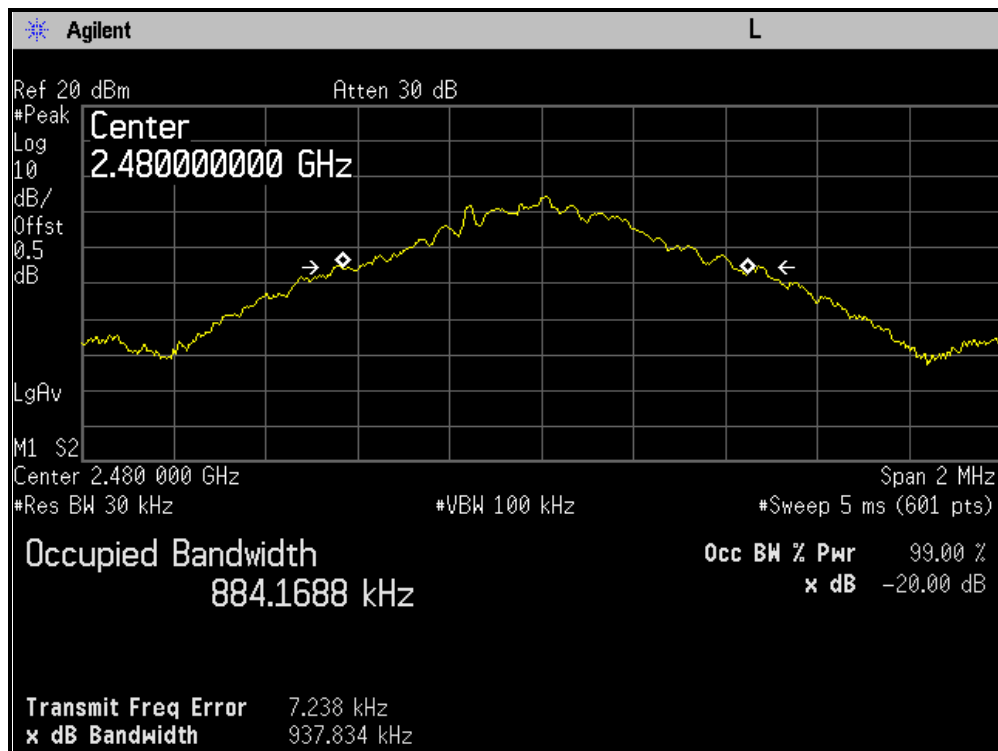
CH 0



CH 39



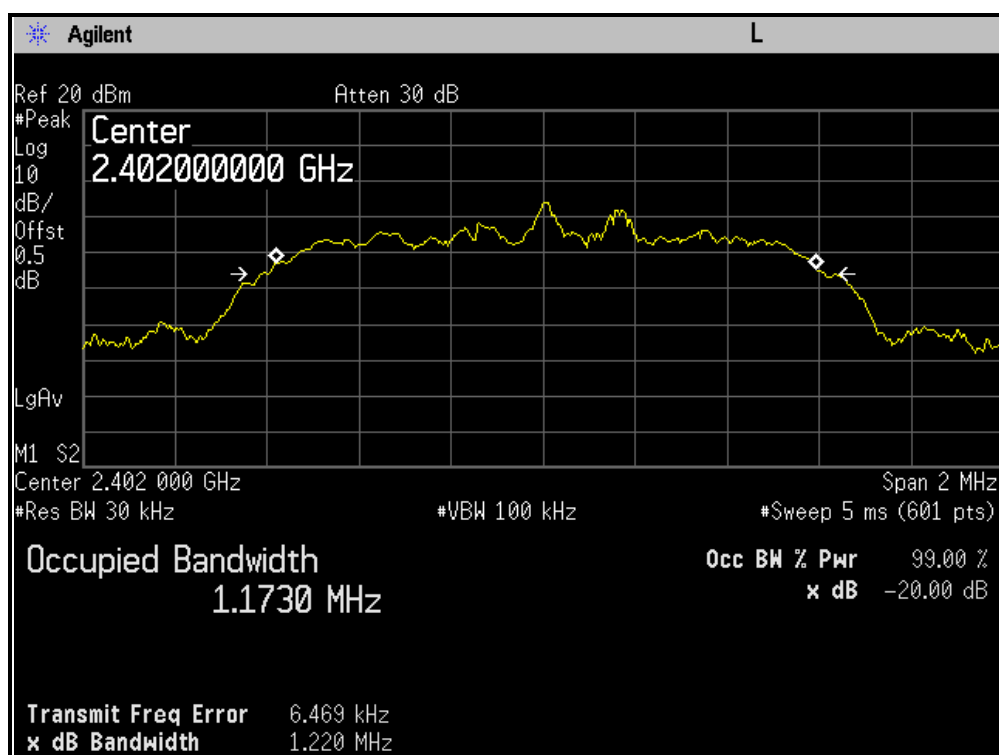
CH 78



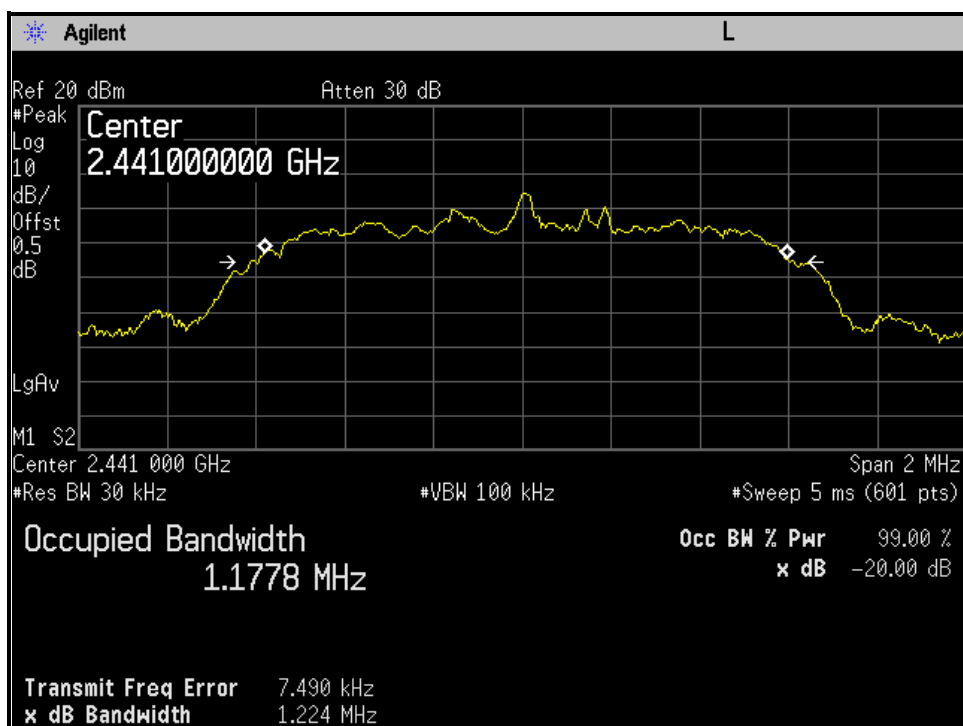
$\pi/4$ DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.220
39	2441	1.224
78	2480	1.255

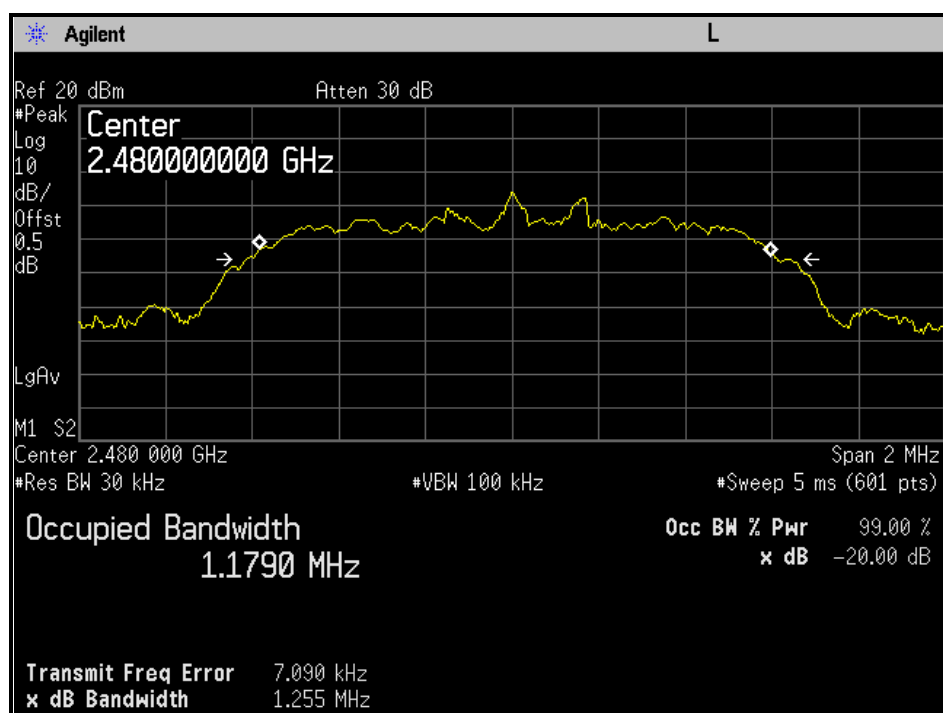
CH 0



CH 39



CH 78

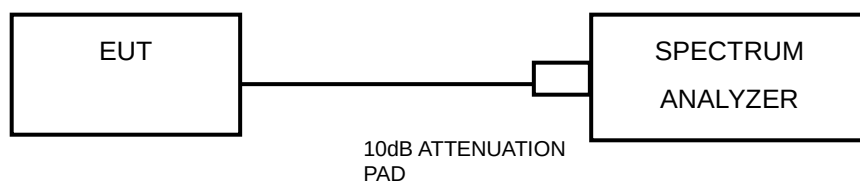


4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater).

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.6.4 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

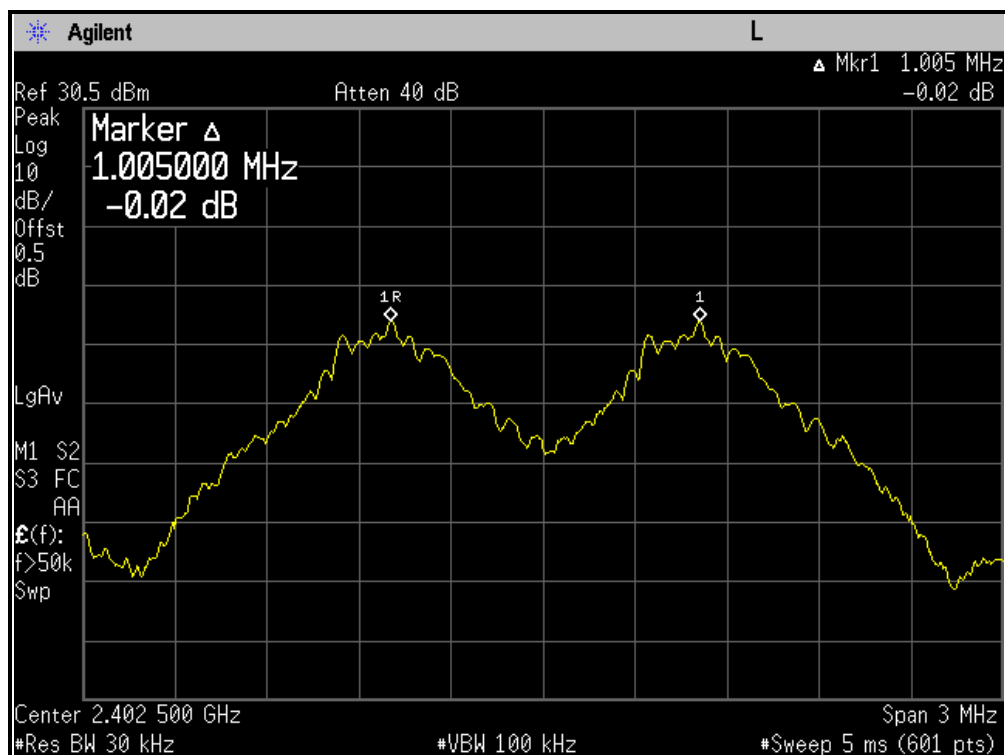
4.6.6 TEST RESULTS

GFSK

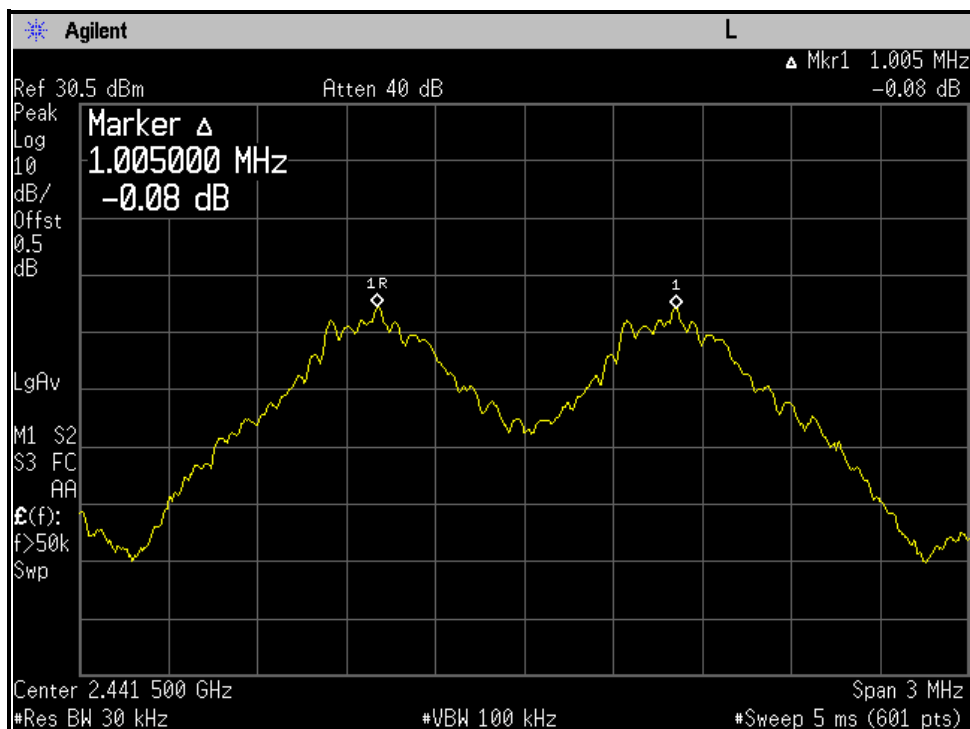
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.005	0.934	0.934	PASS
39	2441	1.005	0.932	0.932	PASS
78	2480	1.005	0.938	0.938	PASS

NOTE: The minimum limit is two-third 20dB bandwidth.

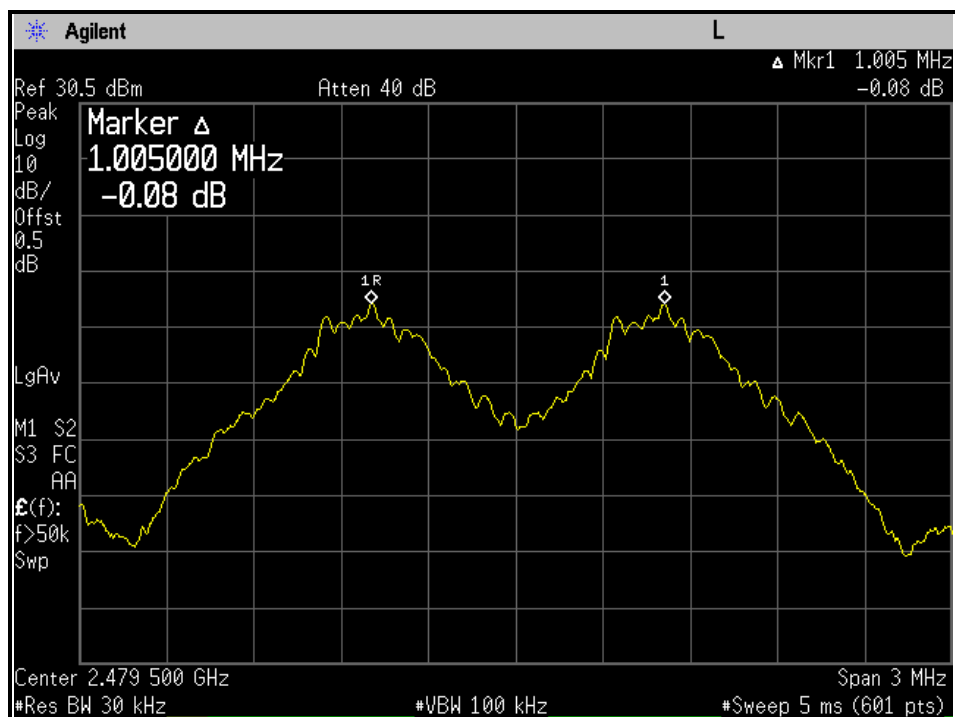
CH 0



CH 39



CH 78

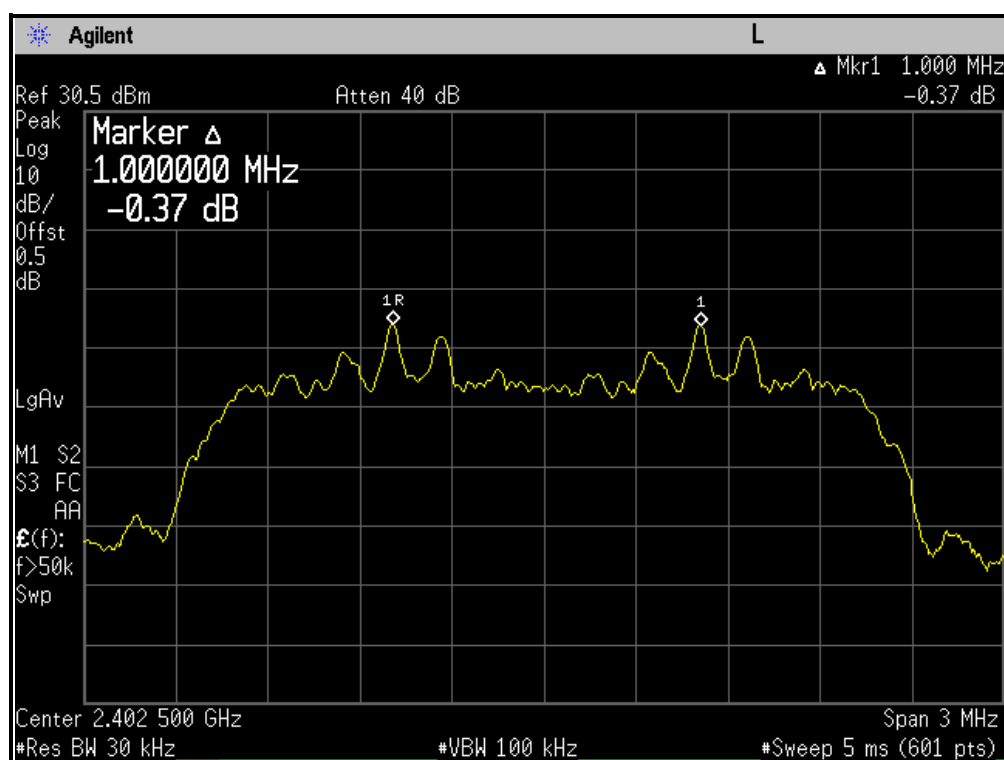


$\pi/4$ DQPSK

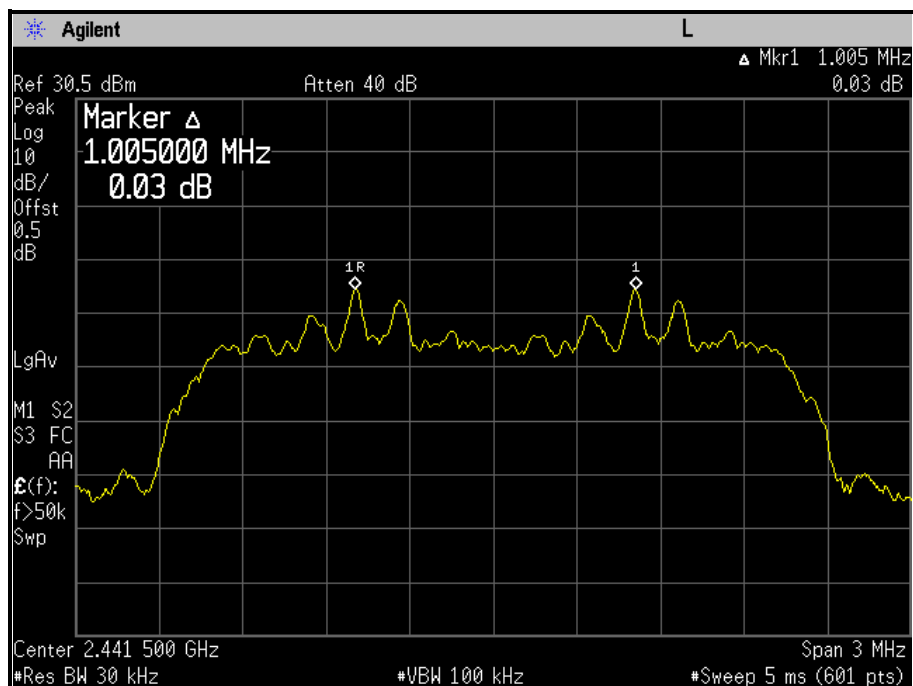
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.000	1.220	0.813	PASS
39	2441	1.005	1.224	0.816	PASS
78	2480	1.005	1.255	0.837	PASS

NOTE: The minimum limit is two-third 20dB bandwidth.

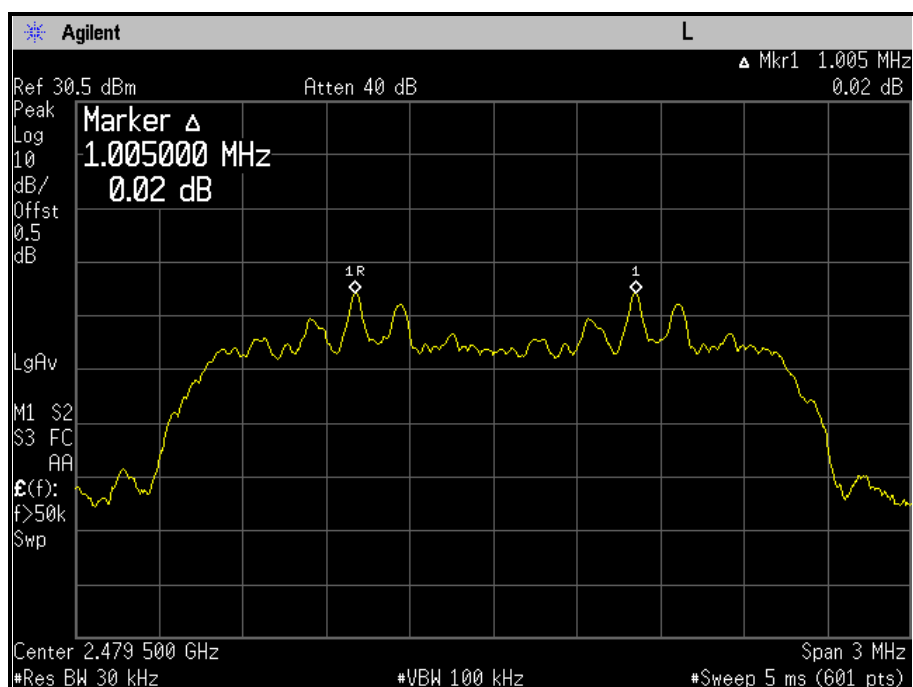
CH 0



CH 39



CH 78

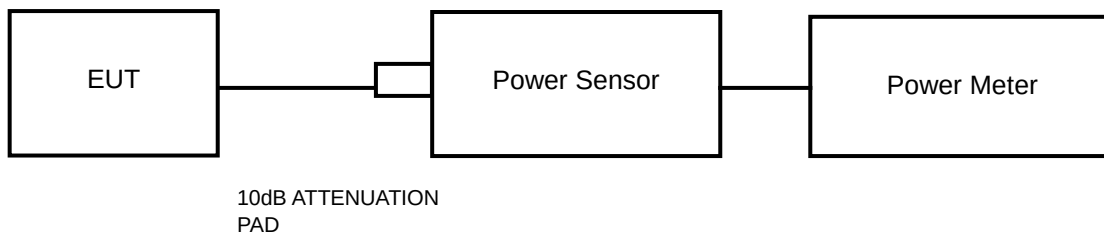


4.7 CONDUCTED OUTPUT POWER

4.7.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 125mW.

4.7.2 TEST SETUP



4.7.3 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.7.4 TEST PROCEDURES

A peak power sensor was used on the output port of the EUT. A peak power meter was used to read the response of the peak power sensor. Record the peak power level.

4.7.5 DEVIATION FROM TEST STANDARD

No deviation.

4.7.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.7.7 TEST RESULTS

MAXIMUM PEAK OUTPUT POWER

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	-4.08	0.391	1000	PASS
39	2441	-4.64	0.344	1000	PASS
78	2480	-5.84	0.261	1000	PASS

$\pi/4$ DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	-2.92	0.511	125	PASS
39	2441	-3.37	0.460	125	PASS
78	2480	-3.60	0.437	125	PASS

AVERAGE OUTPUT POWER(FOR REFERENCE)

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	AVERAGE POWER (mW)
0	2402	-7.52	0.177
39	2441	-8.22	0.151
78	2480	-8.55	0.140

$\pi/4$ DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	AVERAGE POWER (mW)
0	2402	-7.64	0.172
39	2441	-8.41	0.144
78	2480	-8.91	0.129

4.8 OUT OF BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100KHz RBW).

4.8.2 TEST INSTRUMENTS

Refer to section 4.3.3 to get information of above instrument.

4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. of Spectrum Analyzer was set RBW to 100 kHz and VBW to 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. Detector = PEAK and Trace mode = Max Hold. The band edges was measured and recorded.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation.

4.8.5 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.8.6 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level. D2 line indicates the 20dB offset below D1. It shows compliance to the requirement.



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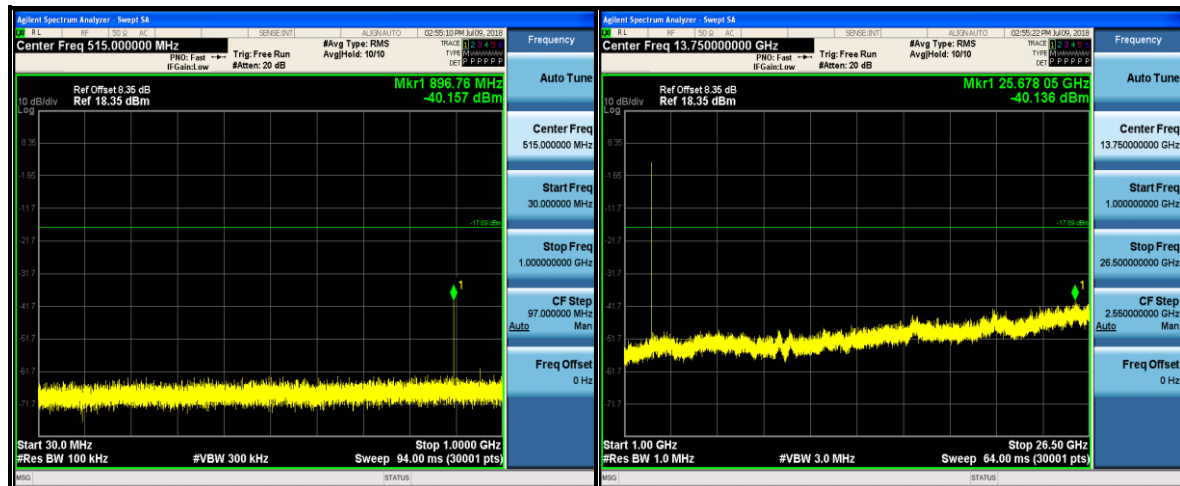
No. 34, Chenwulu Section, Guantai Rd., Houjie
Town, Dongguan City,
Guangdong 523942, China

Tel: +86 769 8593 5656
Fax: +86 769 8593 1080
Email: customerservice.dg@cn.bureauveritas.com



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Page 49 of 54

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Report Version 1

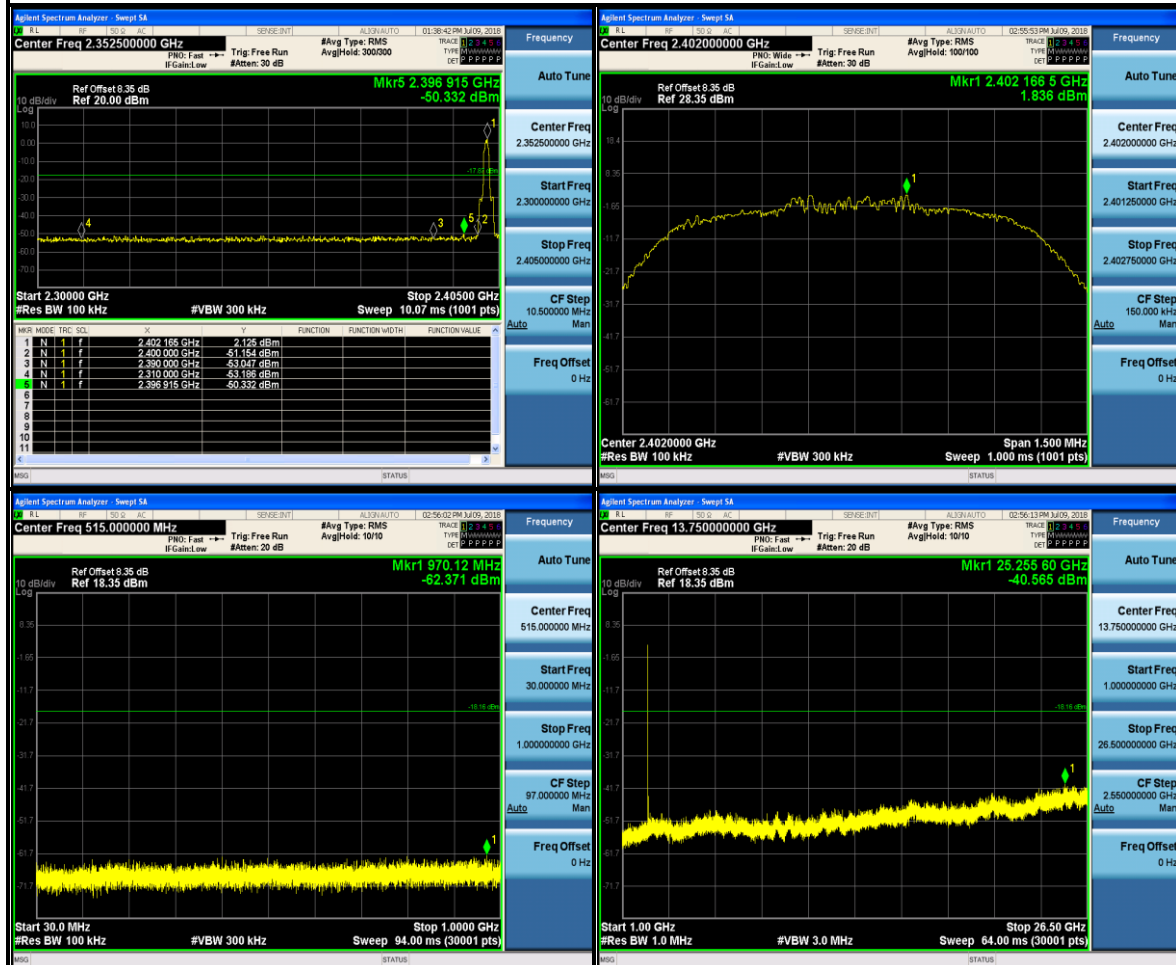


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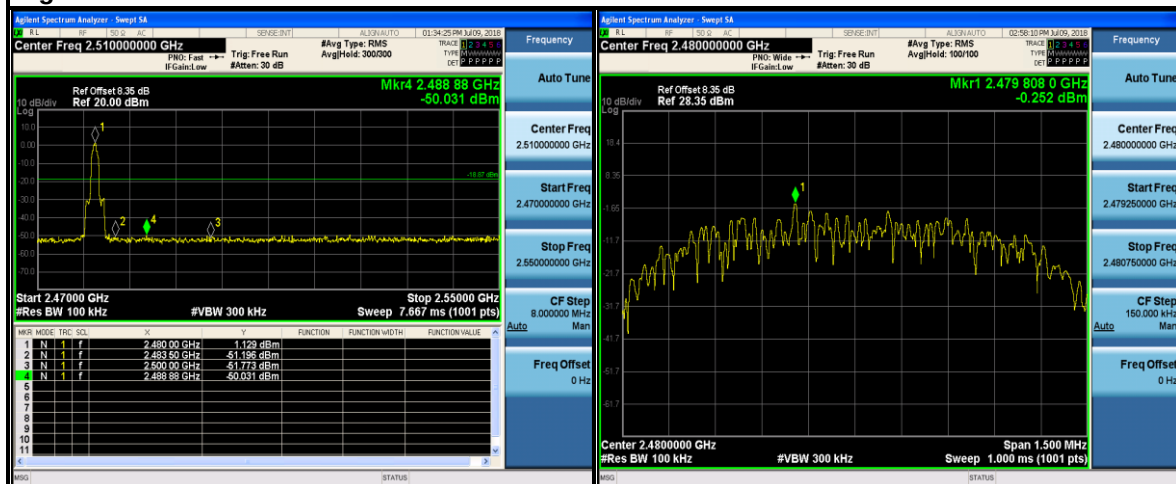
Test Report No.: RF180620N030

$\pi/4$ DQPSK

Low Channel



High Channel



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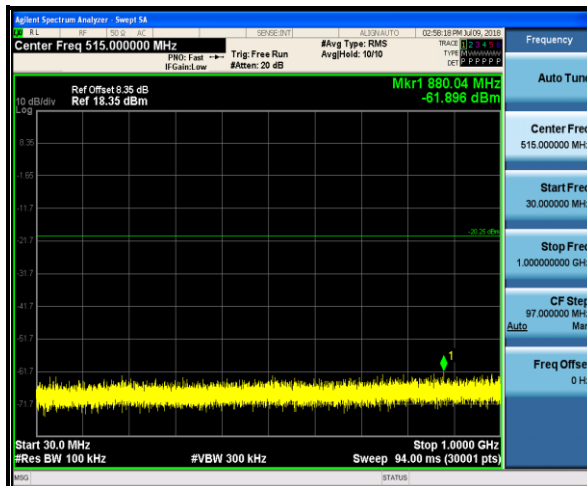
No. 34, Chenwulu Section, Guantai Rd., Houjie
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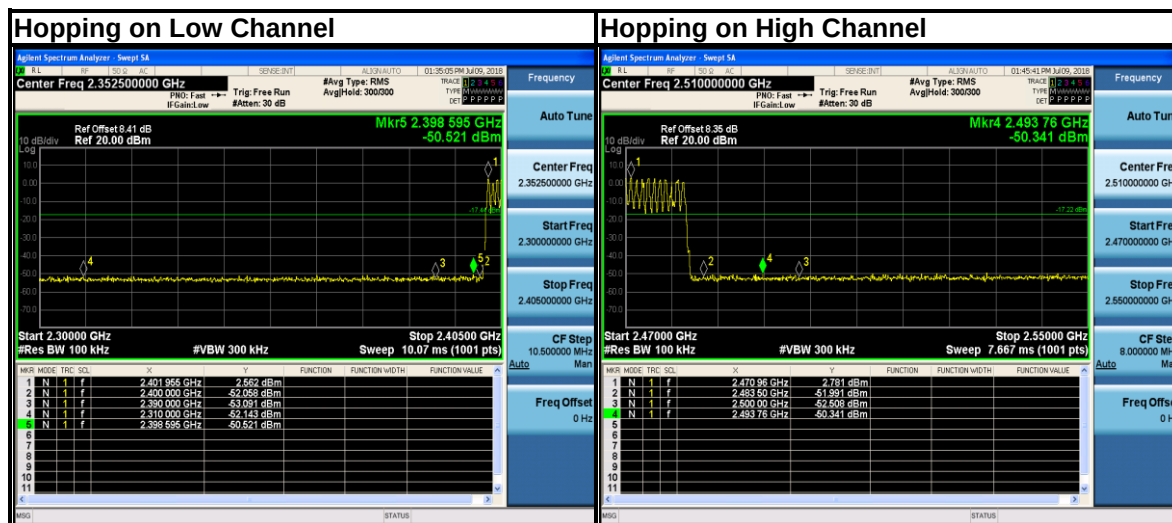
No. 34, Chenwulu Section, Guantai Rd., Houjie
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Guangdong 523942, China

Page 51 of 54

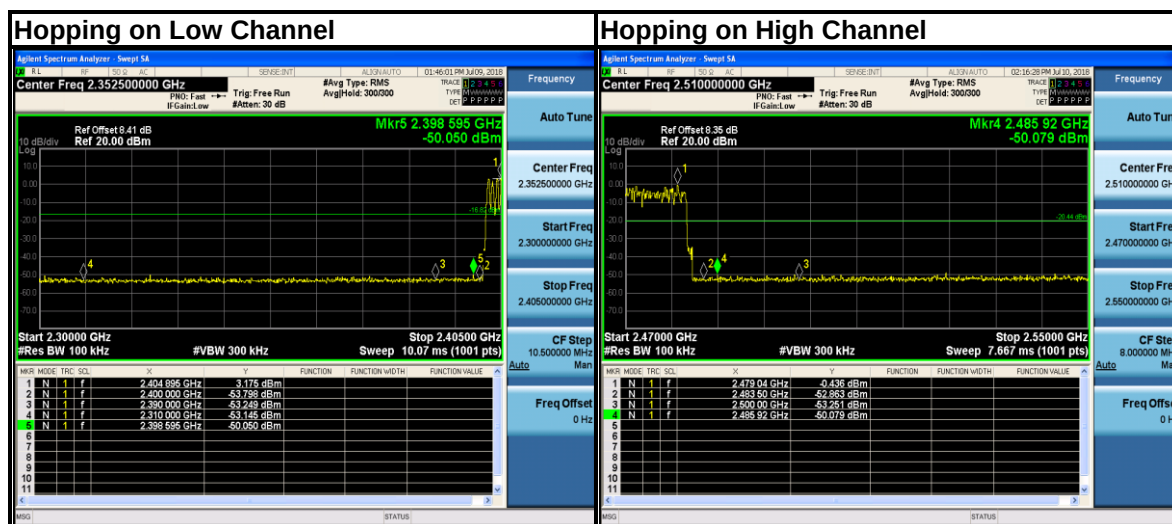
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$\pi/4$ DQPSK





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5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---