



Test Report No.: RF150211N026



FCC TEST REPORT

(Bluetooth EDR)

Product: Bluetooth PTT Car Kit
Model Name: AVK01G
FCC ID: WYPVK01011AA
Applicant: Sonim Technologies, Inc.
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Report No.: RF150211N026
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Test Report No.: RF150211N026

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF150211N026	Original release	May 20, 2015



1 CERTIFICATION

PRODUCT: Bluetooth PTT Car Kit
BRAND NAME: Sonim
MODEL NAME: AVK01G
APPLICANT: Sonim Technologies, Inc.
TESTED: May 05, 2015 ~ May 19, 2015
TEST SAMPLE: Identical Prototype
STANDARDS: **FCC Part 15, Subpart C. Section 15.249**
ANSI C63.10-2013

The above equipment has been tested by **Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch** and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Yuqiang Yin , **DATE:** May 20, 2015
(Yuqiang Yin / Engineer)

APPROVED BY : Glyn He , **DATE:** May 20, 2015
(Glyn He / Supervisor)



2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.249)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
§15.203	Antenna Requirement	PASS	No antenna connector is used
§15.207 (a)	Conducted Emission	N/A	Meet the requirement of limit.
§15.205	Restricted Band of Operation	PASS	Meet the requirement of limit.
§15.209 §15.249(a)	Radiated Emission	PASS	Meet the requirement of limit. Minimum passing margin is -3.3dB at 54.25MHz.
§15.215(c)	20dB Bandwidth Test	PASS	Meet the requirement of limit.

2.1 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	2.66dB
Radiated emissions	9KHz ~ 30MHz	2.74dB
	30MHz ~ 1GHz	3.55dB
	1GHz ~ 18GHz	4.84dB
	18GHz ~ 40GHz	1.94dB

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	Bluetooth PTT Car Kit
MODEL NAME	AVK01G
TYPE NUMBER	VK01011AA , VK01013AA
NOMINAL VOLTAGE	5.0Vdc (adapter or host equipment)
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK, 8DPSK, $\pi/4$ DQPSK
OPERATING FREQUENCY	2402MHz~2480MHz
NUMBER OF CHANNEL	79
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	DC Line: Unshielded, Detachable, 1.0m.

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.



3.2 DESCRIPTION OF TEST MODES

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and packet type. The EUT was tested under the following modes, and the final worst is marked in boldface and recorded in the report.

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	BW	
A	√	√	√	√	Powered by Adapter + BT link

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

RE≥1G: Radiated Emission above 1GHz
BW: 20db bandwidth

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

TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE	PACKET TYPE
Low, Middle, High	FHSS	GFSK	1M	DH1/3/5
Low, Middle, High	FHSS	π/4 DQPSK	2M	DH1/3/5
Low, Middle, High	FHSS	8DPSK	3M	DH1/3/5

CHANNEL NUMBER	TESTED CHANNEL	TESTED FREQUENCY
0	Low	2402 MHz
39	Middle	2441 MHz
78	High	2480 MHz

After estimating all the combination of every test mode, the result shown as below is the worst case.

TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE	PACKET TYPE
Low, Middle, High	FHSS	GFSK	1M	DH5
Low, Middle, High	FHSS	8DPSK	3M	DH5



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 15.249(2012-10)

ANSI C63.10-2013.

All test items have been performed and recorded as per the above standards. Due to the EUT is without AC input function, the test item CE was not tested.

NOTE: It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Verification). The test report has been issued separately.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent 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	Notebook PC	HP	4431s	CNU238944Z	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line: Unshielded, Detachable 1.5m; DC 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 (dBµV)	
	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	100340	May 11,15	May 10,16
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	May 11,15	May 10,16
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	May 11,15	May 10,16
Test software	ADT	ADT_Cond_V7.3.7	N/A	N/A	N/A

NOTE:

1. The test was performed in shielded room 553.
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.



4.1.3 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 150 Hz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

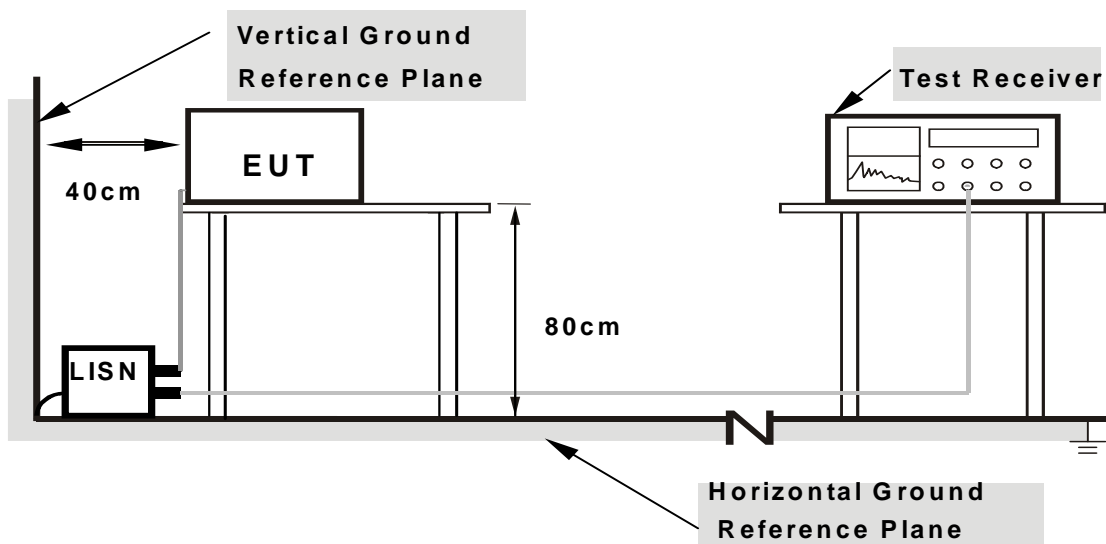
NOTE: All modes of operation were investigated and the worst-case emissions are reported.

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

Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 TEST RESULTS

N/A



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

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	ESU 26	100005	May 11,15	May 10,16
Bilog Antenna	Teseq	CBL 6111D	30643	Jul. 25, 14	Jul. 24, 15
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	May 30, 14	May 29, 16
Amplifier (9kHz-1GHz)	SONOMA	310D	186955	Mar. 04,15	Mar. 03, 16
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 20,14	Nov. 19,15
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 11,15	May 10,16
GPS Generator+ Antenna	TOJOIN	GNSS-5000A	E1-010119	Aug. 08, 14	Aug. 07, 15
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Apr. 19,14	Apr. 18,16
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
2. The test was performed in 966 Chamber.
3. The FCC Site Registration No. is 502831.



4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 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. The antenna is a broadband 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/spectrum 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 lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

- 1 The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
- 2 The resolution bandwidth of test receiver/spectrum analyzer is 1MHz 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. In this case the dwell time for a DH5 packet is $0.625 * 5$ per 75ms, (assuming one DH5 packet transmitted and then a DH1 packet received, 20 channels to cycle through would take 75ms on average before repeating a channel) so in any 100ms there would be, on average, two DH5 packets = 6.25ms per 100ms
Therefore, the duty cycle correlation factor be equal to: $20\log(6.25 / 100) = -24.1$ dB.
Average value = peak reading + $20\log(\text{duty cycle})$.
- 4 All modes of operation were investigated and the worst-case emissions are reported.



4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



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

4.2.6 EUT OPERATING CONDITIONS

Set the EUT under transmission condition continuously at specific channel frequency.



4.2.7 TEST RESULTS

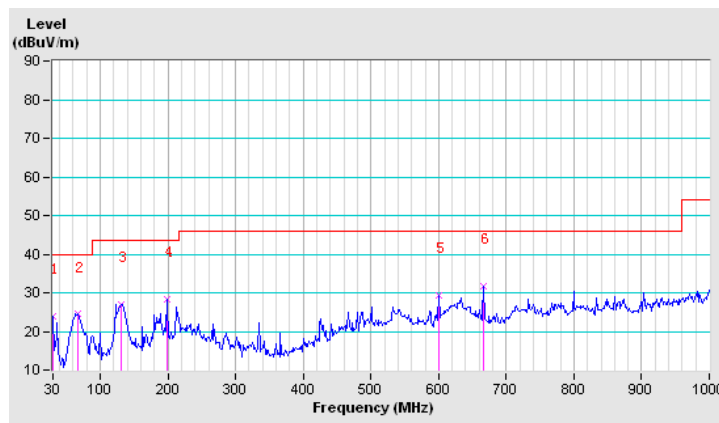
BELOW 1GHz WORST-CASE DATA: GFSK DH5

CHANNEL	Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	23.9 QP	40.0	-16.1	1.00 H	0	36.45	-12.55
2	67.18	24.4 QP	40.0	-15.6	1.00 H	0	49.62	-25.19
3	130.23	27.0 QP	43.5	-16.5	1.00 H	0	45.41	-18.41
4	198.13	28.3 QP	43.5	-15.2	1.00 H	0	49.41	-21.10
5	600.68	29.3 QP	46.0	-16.7	1.00 H	0	35.56	-6.30
6	666.97	31.6 QP	46.0	-14.4	1.00 H	0	36.93	-5.29

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



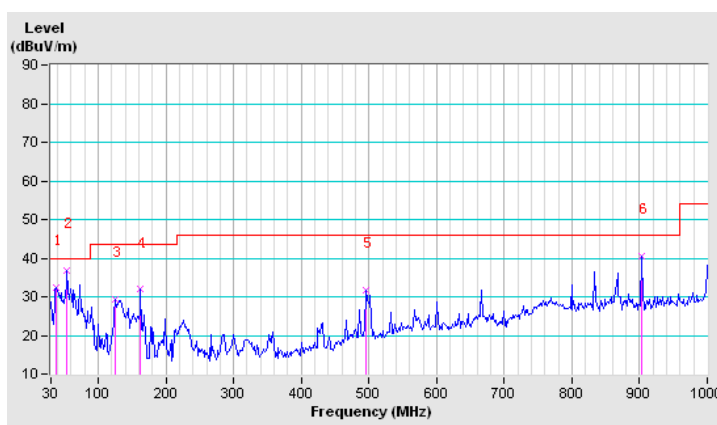


CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	38.08	32.4 QP	40.0	-7.6	1.00 V	0	48.78	-16.37
2	54.25	36.7 QP	40.0	-3.3	1.00 V	0	60.51	-23.81
3	125.38	29.5 QP	43.5	-14.0	1.00 V	0	47.98	-18.51
4	162.57	31.9 QP	43.5	-11.6	1.00 V	0	51.31	-19.43
5	495.60	31.7 QP	46.0	-14.3	1.00 V	0	40.36	-8.64
6	903.00	40.6 QP	46.0	-5.4	1.00 V	0	41.25	-0.66

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.





ABOVE 1GHz WORST-CASE DATA: GFSK DH5

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2400.00	50.3 PK	74.0	-23.7	1.64 H	71	47.11	3.19
2	2400.00	26.2 AV	54.0	-27.8	1.64 H	71	23.01	3.19
3	*2402.00	77.9 PK	114.0	-36.1	1.64 H	71	74.70	3.20
4	*2402.00	53.8 AV	94.0	-40.2	1.64 H	71	50.60	3.20
5	4804.00	46.5 PK	74.0	-27.5	1.00 H	171	37.09	9.41
6	4804.00	22.4 AV	54.0	-31.6	1.00 H	171	12.99	9.41
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2400.00	50.5 PK	74.0	-23.5	1.00 V	333	47.31	3.19
2	2400.00	26.4 AV	54.0	-27.6	1.00 V	333	23.21	3.19
3	*2402.00	82.3 PK	114.0	-31.7	1.00 V	333	79.10	3.20
4	*2402.00	58.2 AV	94.0	-35.8	1.00 V	333	55.00	3.20
5	4804.00	46.1 PK	74.0	-27.9	1.00 V	312	36.69	9.41
6	4804.00	22.0 AV	54.0	-32.0	1.00 V	312	12.59	9.41

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.



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CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	80.1 PK	114.0	-33.9	2.78 H	283	76.77	3.33
2	*2441.00	56.0 AV	94.0	-38.0	2.78 H	283	52.67	3.33
3	4882.00	46.0 PK	74.0	-28.0	1.00 H	278	36.46	9.54
4	4882.00	21.9 AV	54.0	-32.1	1.00 H	278	12.36	9.54
5	7323.00	49.2 PK	74.0	-24.8	1.00 H	360	37.35	11.85
6	7323.00	25.1 AV	54.0	-28.9	1.00 H	360	13.25	11.85
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	79.0 PK	114.0	-35.0	1.00 V	160	75.67	3.33
2	*2441.00	54.9 AV	94.0	-39.1	1.00 V	160	51.57	3.33
3	4882.00	45.3 PK	74.0	-28.7	1.00 V	313	35.76	9.54
4	4882.00	21.2 AV	54.0	-32.8	1.00 V	313	11.66	9.54
5	7323.00	49.4 PK	74.0	-24.6	1.00 V	0	37.55	11.85
6	7323.00	25.3 AV	54.0	-28.7	1.00 V	0	13.45	11.85

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

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CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	77.7 PK	114.0	-36.3	1.02 H	285	74.24	3.46
2	*2480.00	53.6 AV	94.0	-40.4	1.02 H	285	50.14	3.46
3	2483.50	50.3 PK	74.0	-23.7	1.02 H	285	46.83	3.47
4	2483.50	26.2 AV	54.0	-27.8	1.02 H	285	22.73	3.47
5	4960.00	45.8 PK	74.0	-28.2	1.00 H	335	36.14	9.66
6	4960.00	21.7 AV	54.0	-32.3	1.00 H	335	12.04	9.66
7	7440.00	48.5 PK	74.0	-25.5	1.00 H	0	36.73	11.77
8	7440.00	24.4 AV	54.0	-29.6	1.00 H	0	12.63	11.77

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	78.3 PK	114.0	-35.7	1.10 V	272	74.84	3.46
2	*2480.00	54.2 AV	94.0	-39.8	1.10 V	272	50.74	3.46
3	2483.50	48.8 PK	74.0	-25.2	1.10 V	272	45.33	3.47
4	2483.50	24.7 AV	54.0	-29.3	1.10 V	272	21.23	3.47
5	4960.00	45.6 PK	74.0	-28.4	1.00 V	211	35.94	9.66
6	4960.00	21.5 AV	54.0	-32.5	1.00 V	211	11.84	9.66
7	7440.00	48.6 PK	74.0	-25.4	1.00 V	360	36.83	11.77
8	7440.00	24.5 AV	54.0	-29.5	1.00 V	360	12.73	11.77

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.

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BT_8DPSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2400.00	49.9 PK	74.0	-24.1	1.62 H	45	46.71	3.19
2	2400.00	25.8 AV	54.0	-28.2	1.62 H	45	22.61	3.19
3	*2402.00	81.0 PK	114.0	-33.0	1.62 H	45	77.80	3.20
4	*2402.00	56.9 AV	94.0	-37.1	1.62 H	45	53.70	3.20
5	4804.00	46.6 PK	74.0	-27.4	1.00 H	189	37.19	9.41
6	4804.00	22.5 AV	54.0	-31.5	1.00 H	189	13.09	9.41
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2400.00	50.1 PK	74.0	-23.9	1.00 V	331	46.91	3.19
2	2400.00	26.0 AV	54.0	-28.0	1.00 V	331	22.81	3.19
3	*2402.00	78.3 PK	114.0	-35.7	1.00 V	331	75.10	3.20
4	*2402.00	54.2 AV	94.0	-39.8	1.00 V	331	51.00	3.20
5	4804.00	46.4 PK	74.0	-27.6	1.00 V	345	36.99	9.41
6	4804.00	22.3 AV	54.0	-31.7	1.00 V	345	12.89	9.41

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.



CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	78.7 PK	114.0	-35.3	2.80 H	283	75.37	3.33
2	*2441.00	54.6 AV	94.0	-39.4	2.80 H	283	51.27	3.33
3	4882.00	46.5 PK	74.0	-27.5	2.11 H	296	36.96	9.54
4	4882.00	22.4 AV	54.0	-31.6	2.11 H	296	12.86	9.54
5	7323.00	49.1 PK	74.0	-24.9	1.00 H	360	37.25	11.85
6	7323.00	25.0 AV	54.0	-29.0	1.00 H	360	13.15	11.85
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	79.1 PK	114.0	-34.9	1.00 V	273	75.77	3.33
2	*2441.00	55.0 AV	94.0	-39.0	1.00 V	273	51.67	3.33
3	4882.00	46.3 PK	74.0	-27.7	1.00 V	289	36.76	9.54
4	4882.00	22.2 AV	54.0	-31.8	1.00 V	289	12.66	9.54
5	7323.00	49.2 PK	74.0	-24.8	1.00 V	0	37.35	11.85
6	7323.00	25.1 AV	54.0	-28.9	1.00 V	0	13.25	11.85

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.



CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	78.2 PK	114.0	-35.8	2.00 H	282	74.74	3.46
2	*2480.00	54.1 AV	94.0	-39.9	2.00 H	282	50.64	3.46
3	2483.50	50.5 PK	74.0	-23.5	2.00 H	282	47.03	3.47
4	2483.50	26.4 AV	54.0	-27.6	2.00 H	282	22.93	3.47
5	4960.00	45.9 PK	74.0	-28.1	1.87 H	236	36.24	9.66
6	4960.00	21.8 AV	54.0	-32.2	1.87 H	236	12.14	9.66
7	7440.00	48.4 PK	74.0	-25.6	1.00 H	360	36.63	11.77
8	7440.00	24.3 AV	54.0	-29.7	1.00 H	360	12.53	11.77

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	78.8 PK	114.0	-35.2	1.10 V	275	75.34	3.46
2	*2480.00	54.7 AV	94.0	-39.3	1.10 V	275	51.24	3.46
3	2483.50	50.3 PK	74.0	-23.7	1.10 V	275	46.83	3.47
4	2483.50	26.2 AV	54.0	-27.8	1.10 V	275	22.73	3.47
5	4960.00	45.9 PK	74.0	-28.1	1.00 V	178	36.24	9.66
6	4960.00	21.8 AV	54.0	-32.2	1.00 V	178	12.14	9.66
7	7440.00	48.7 PK	74.0	-25.3	1.00 V	0	36.93	11.77
8	7440.00	24.6 AV	54.0	-29.4	1.00 V	0	12.83	11.77

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * " : Fundamental frequency.



4.3 20dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 20dB BANDWIDTH MEASUREMENT

According to FCC 15.215(c), must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer (10Hz-40GHz)	Rohde&Schwarz	FSV40	101003	Apr. 07,15	Apr. 06,16
Power Meter	Anritsu	ML2495A	1139001	Feb. 20,15	Feb. 19,16
Power Sensor	Anritsu	MA2411B	1126068	Feb. 20,15	Feb. 19,16
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 29, 14	Oct. 28, 15
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep.04,14	Sep. 03,15

NOTE:

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

4.3.3 TEST PROCEDURE

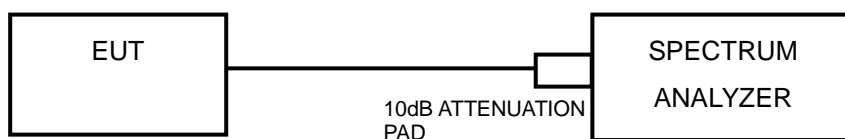
- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the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



4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

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

4.3.7 TEST RESULTS

GFSK DH5

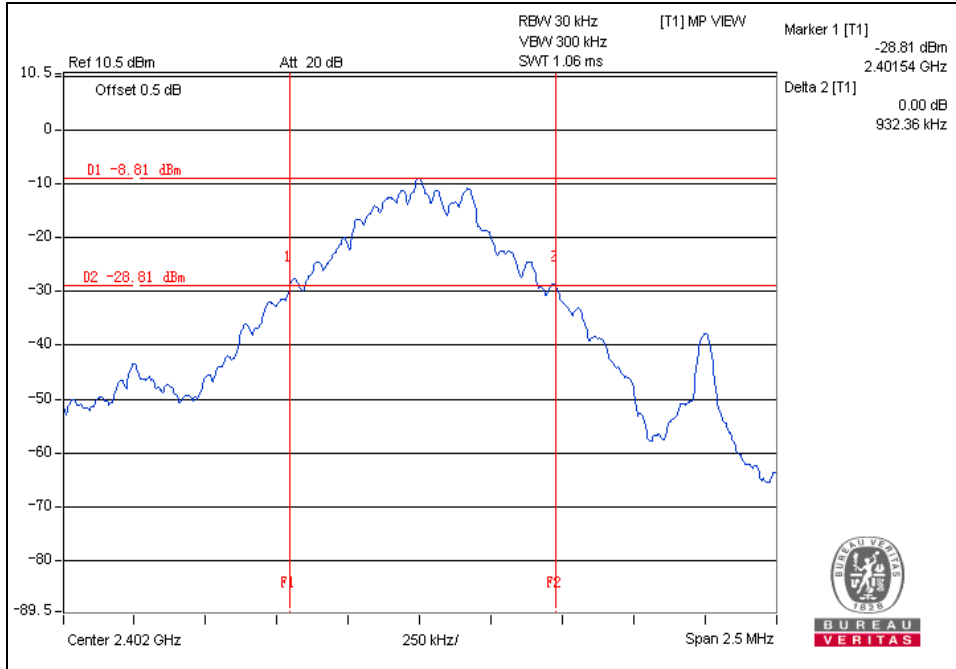
CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	PASS / FAIL
0	2402	0.932	PASS
39	2441	0.933	PASS
78	2480	0.869	PASS



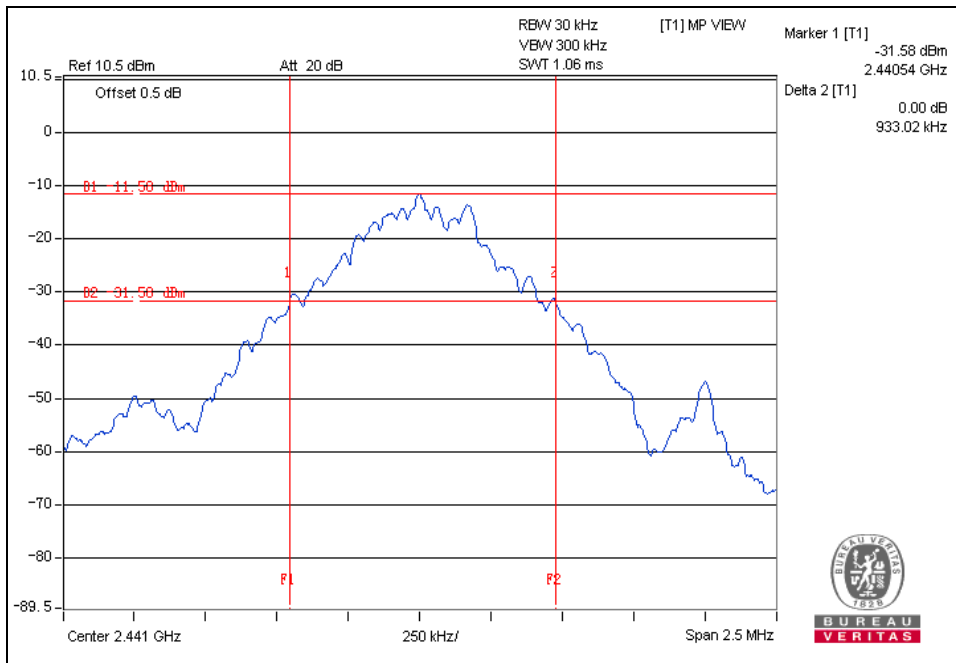
BUREAU VERITAS

Test Report No.: RF150211N026

CHANNEL 0



CHANNEL 39



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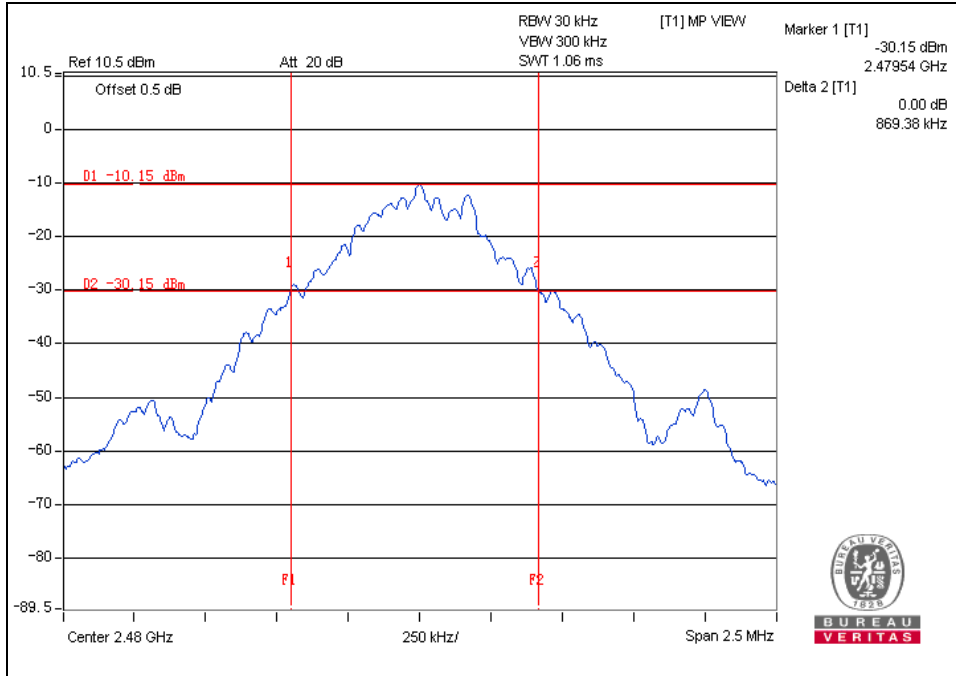
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**BUREAU
VERITAS**

Test Report No.: RF150211N026

CHANNEL 78





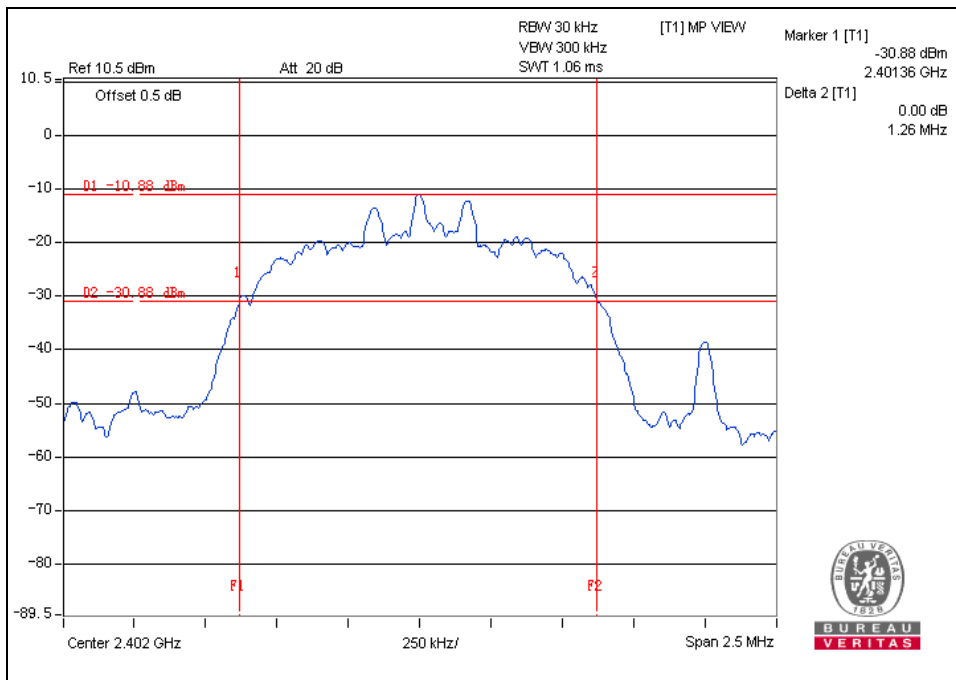
BUREAU VERITAS

Test Report No.: RF150211N026

8DPSK DH5

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)	PASS / FAIL
0	2402	1.26	PASS
39	2441	1.26	PASS
78	2480	1.26	PASS

CHANNEL 0



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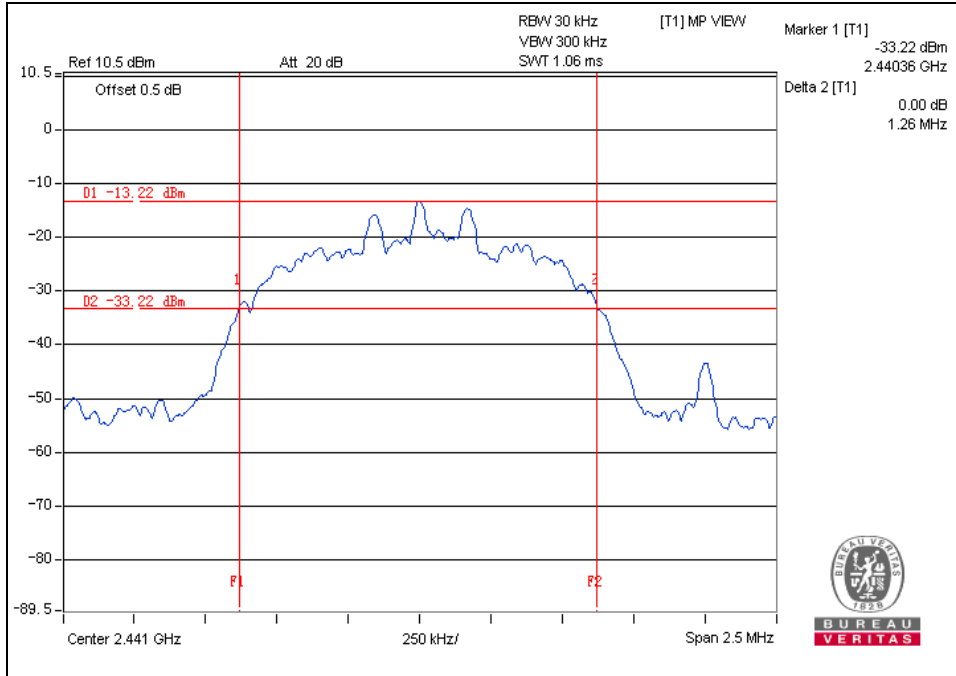
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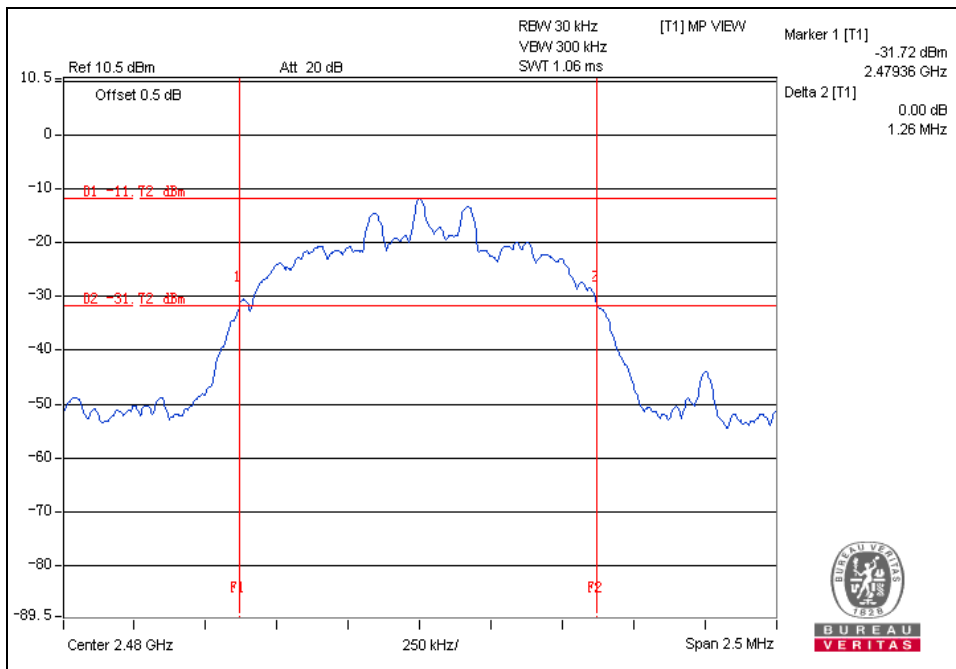
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5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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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---