

FCC TEST REPORT

(Part 15, Subpart C)

Applicant:	Neutron Holdings, Inc.
Address:	85 2nd St, San Francisco, CA 94105 USA

Manufacturer or Supplier:	MeiG Smart Technology Co., Ltd
Address:	No.146 Lingxia Rd, 4th Fenghuang Industrial Park, Fuyong Street, Bao'an District, Shenzhen, China.
Product:	Tracking device
Brand Name:	Lime
Model Name:	Lime-V3-US
FCC ID:	2APB2LIME-V3-US
Date of tests:	Oct. 30, 2018 ~ Nov. 18, 2018

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

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

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

Prepared by Roger Li Engineer / Mobile Department	Approved by Sam Tung Manager / Mobile Department
	
Date: Nov. 19, 2018	Date: Nov. 19, 2018

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF181029W010-1	Original release	Nov. 19, 2018



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	NA	NA
15.205 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -5.22dB at 2483.5MHz.
15.247(d)	Out of band Emission Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in ETSI TR 100 028-2001:

MEASUREMENT	UNCERTAINTY
AC Power Conducted emissions	$\pm 2.70\text{dB}$
All Radiated emissions	$\pm 4.48\text{dB}$
Conducted emissions	$\pm 2\text{ dB}$
Occupied Channel Bandwidth	$\pm 21.7\text{KHz}$
Conducted Output power	$\pm 1.03\text{ dB}$
Power Spectral Density	$\pm 0.95\text{ dB}$

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



2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Tracking device
BRAND NAME	Lime
MODEL NAME	Lime-V3-US
NOMINAL VOLTAGE	36Vdc (DC source) 3.7V (Li-ion, battery)
MODULATION TECHNOLOGY	DSSS, OFDM, DTS
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM BT-LE(GFSK) for DTS
TRANSMISSION RATE	802.11b: 11/ 5.5/ 2.0 / 1.0 Mbps 802.11g: 54/ 48/ 36 / 24 / 18 / 9/ 6 Mbps 802.11n: up to 135 Mbps BT_LE: 1 Mbps
OPERATING FREQUENCY	2412-2462MHz for 11b/g/n(HT20) 2422-2452MHz for 11n(HT40) 2402-2480MHz for BT-LE(GFSK)
MAX. OUTPUT POWER	WLAN: 151.008mW (Maximum) BT-LE: 2.046mW (Maximum)
ANTENNA TYPE	PIFA Antenna
ANTENNA GAIN	WLAN: 4.6dBi BT-LE: 4.4dBi
HW VERSION	V1.02
SW VERSION	S_MEIG_V2_AP_U_O_1.0.2
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The EUT incorporates a SISO function. Physically, the EUT provides one transmitter and one receiver.

MODULATION MODE	TX/RX FUNCTION
802.11b	1TX /1RX
802.11g	1TX /1RX
802.11n (20MHz)	1TX /1RX
802.11n (40MHz)	1TX /1RX
BT_LE	1TX /1RX



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3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.



2.2 DESCRIPTION OF TEST MODES

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

7 channels are provided for 802.11n (HT40):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

40 channels are provided for BT-LE (GFSK):

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



2.2.1 CONFIGURATION OF SYSTEM UNDER TEST

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

2.2.2 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 Y axis for radiated emission. Following test modes were selected for the final test, and the final worst case is marked in boldface and recorded in the report:

EUT CONFIGURE MODE	APPLICABLE TO				MODE
	RE<1G	RE≥1G	PLC	APCM	
-	√	√	-	√	-

Where **RE<1G**: Radiated Emission below 1GHz

RE≥1G: Radiated Emission above 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery.

RADIATED EMISSION TEST (BELOW 1GHz):

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n HT40	3 to 9	3	OFDM	BPSK	13.5
BT-LE	0 to 39	39	DTS	GFSK	1

**RADIATED EMISSION TEST (ABOVE 1GHz):**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	CCK	DBPSK	1.0
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
802.11n HT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n HT40	3 to 9	3, 6, 9	OFDM	BPSK	13.5
BT-LE	0 to 39	0,19, 39	DTS	GFSK	1

BANDEDGE MEASUREMENT:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 11	CCK	DBPSK	1.0
802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
802.11n HT20	1 to 11	1, 11	OFDM	BPSK	6.5
802.11n HT40	3 to 9	3, 9	OFDM	BPSK	13.5
BT-LE	0 to 39	0, 39	DTS	GFSK	1

**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, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	CCK	DBPSK	1.0
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
802.11n HT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n HT40	3 to 9	3, 6, 9	OFDM	BPSK	13.5
BT-LE	0 to 39	0, 19, 39	DTS	GFSK	1

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE<1G	22deg. C, 54%RH	DC 36V	Vincent
RE≥1G	22deg. C, 54%RH	DC 36V	Vincent
APCM	25deg. C, 60%RH	3.7Vdc from battery	Rain Wang



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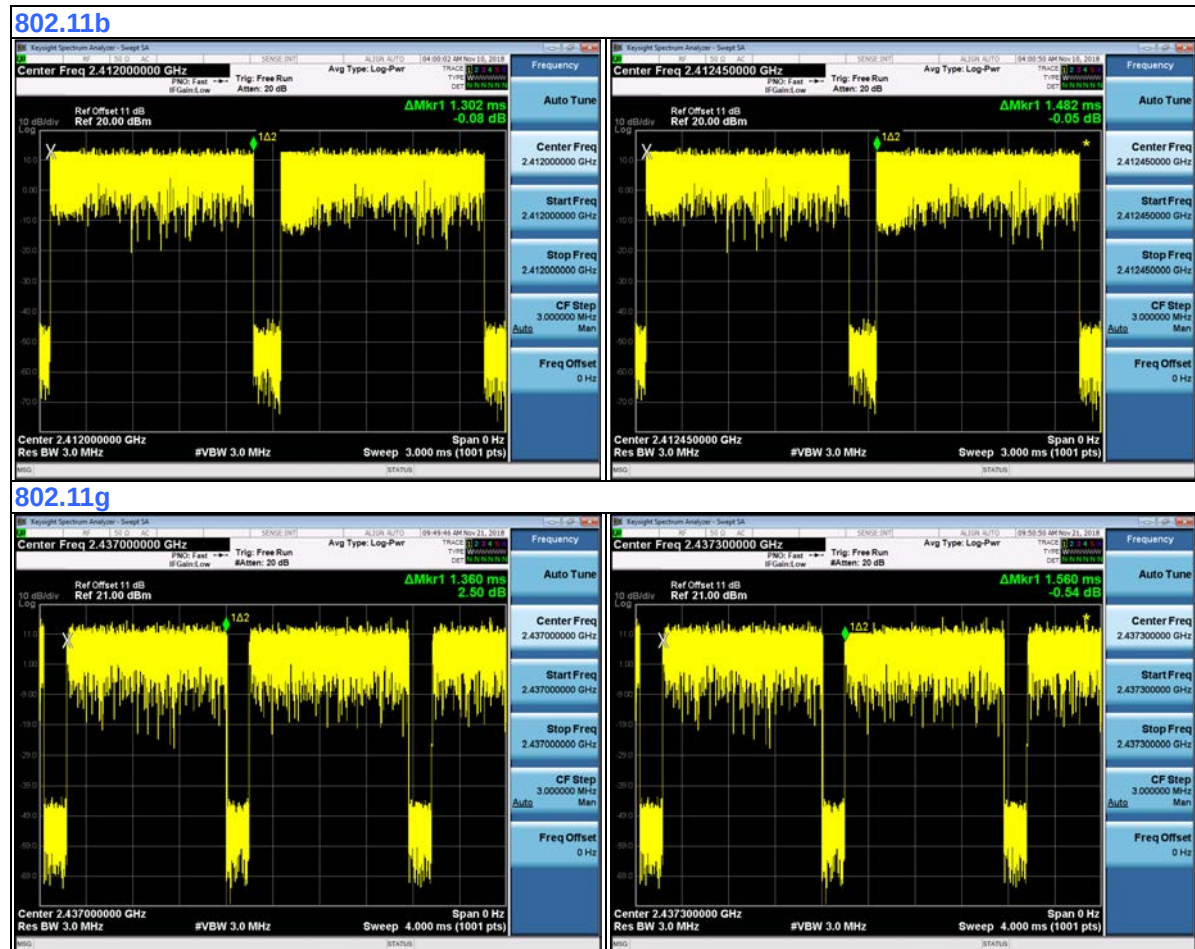
Test Report No.: RF181029W010-1

2.3 Duty Cycle of Test Signal

WIFI 2.4GHz

802.11b: Duty cycle = $1.302/1.482 = 0.879 < 98\%$, Duty factor = $10 * \log(1/0.879) = 0.56$

802.11g: Duty cycle = $1.360/1.560 = 0.872 < 98\%$, Duty factor = $10 * \log(1/0.872) = 0.60$





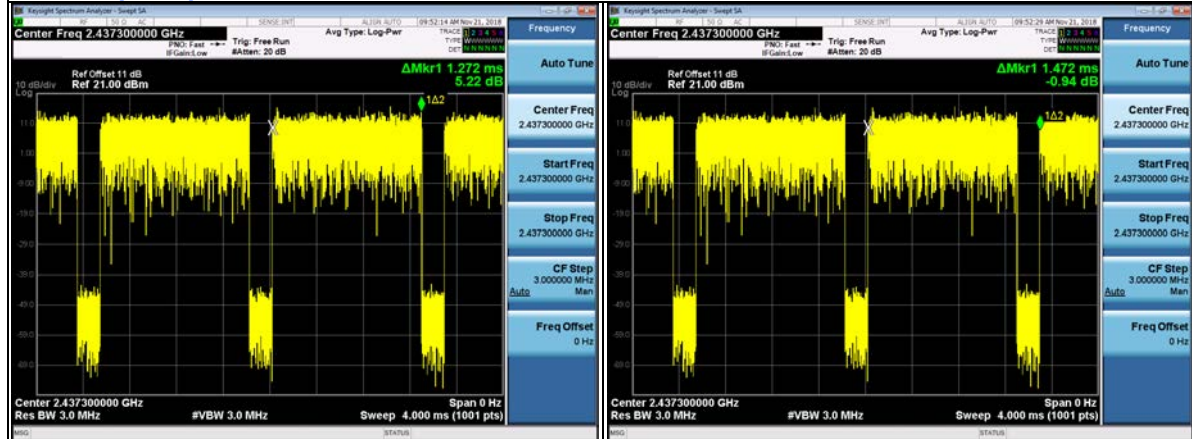
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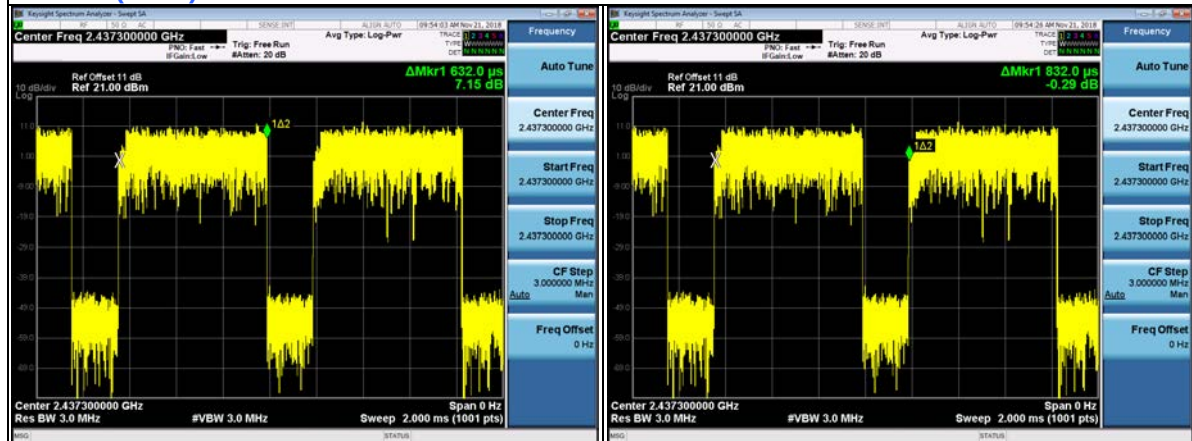
802.11n (HT20): Duty cycle = $1.272/1.472 = 0.864 < 98\%$, Duty factor = $10 * \log(1/0.864) = 0.63$

802.11n (HT40): Duty cycle = $0.632/0.832 = 0.760 < 98\%$, Duty factor = $10 * \log(1/0.760) = 1.19$

802.11n (HT20)



802.11n (HT40)





2.4 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

KDB 558074 D01 DTS Meas Guidance v04

ANSI C63.10-2013

Note:

1. All test items have been performed and recorded as per the above standards.
2. The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Certification). The test report has been issued separately.

2.5 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	PC	HP	A6608CN	3CR83825X3	N/A
2	DC source	LONG WEI	PS-6403D	010934269	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line: Unshielded, Detachable 1.5m
2	DC Line: Unshielded, Detachable 1.0m



3 TEST TYPES AND RESULTS

3.1 RADIATED EMISSION MEASUREMENT

3.1.1 LIMITS OF RADIATED EMISSION 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).

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.



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3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	Apr. 21,18	Apr. 20,19
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Nov. 26,16	Nov. 25,18
Horn Antenna	ETS-LINDGREN	3117	00168728	Nov. 26,16	Nov. 25,18
Loop antenna	Daze	ZN30900A	0708	Nov. 20,17	Nov. 19,18
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Dec. 16,16	Dec. 15,18
Test Software	E3	V 9.160323	N/A	N/A	N/A
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jul. 09,18	Jul. 08,19
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Mar. 16,18	Mar. 15,19
Signal Pre-Amplifier	EMSI	EMC 9135	980249	Jul. 09,18	Jul. 08,19
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jul. 09,18	Jul. 08,19
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Jul. 09,18	Jul. 08,19

- NOTE:**
1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 2. The test was performed in 3m Chamber.
 3. The FCC Site Registration No. is 525120; The Designation No. is CN1171.



3.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. 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 system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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 (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

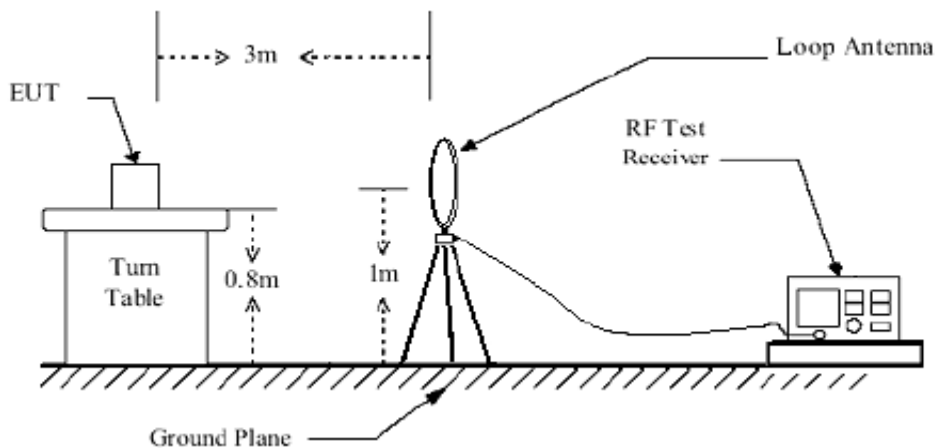
3.1.4 DEVIATION FROM TEST STANDARD

No deviation

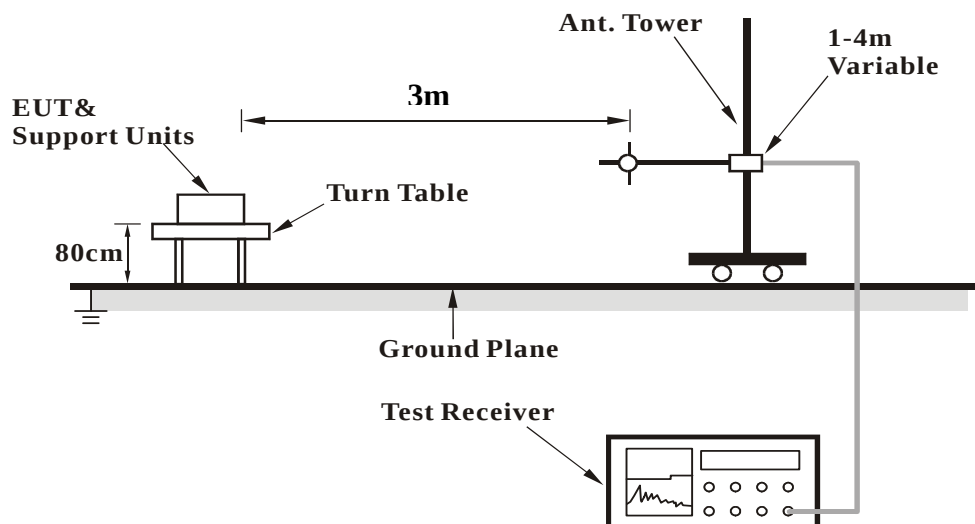


3.1.5 TEST SETUP

< Frequency Range below 30MHz >

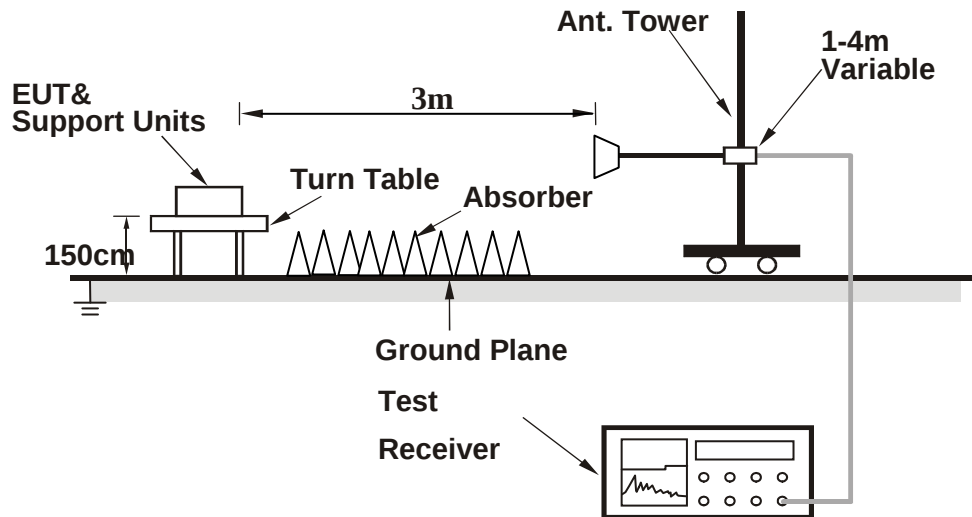


< Frequency Range 30MHz~1GHz >





<Frequency Range above 1GHz>



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

3.1.6 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.



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3.1.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

9 KHz – 30 MHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

30 MHz – 1GHz data:

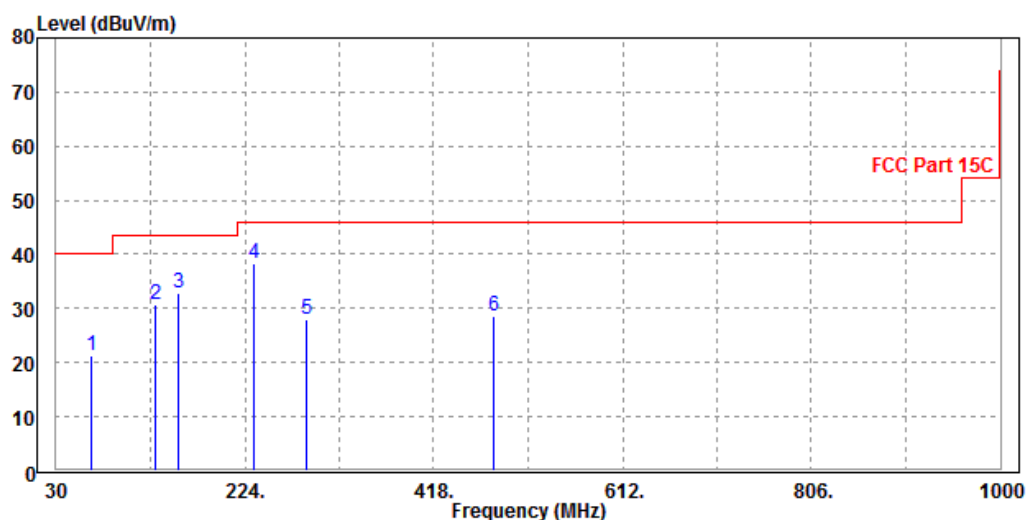
802.11n (40MHz)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
66.86	21.34	50.63	40	-18.66	6.74	1.25	37.28	100	80	QP
131.85	30.59	58.04	43.5	-12.91	7.67	1.76	36.88	100	80	QP
156.1	32.87	57.91	43.5	-10.63	9.81	1.91	36.76	100	80	QP
232.73	38.42	60.99	46	-7.58	11.61	2.35	36.53	100	80	QP
288.02	28.04	49.02	46	-17.96	12.86	2.66	36.5	100	80	QP
480.08	28.61	43.96	46	-17.39	18.16	3.4	36.91	100	80	QP

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.





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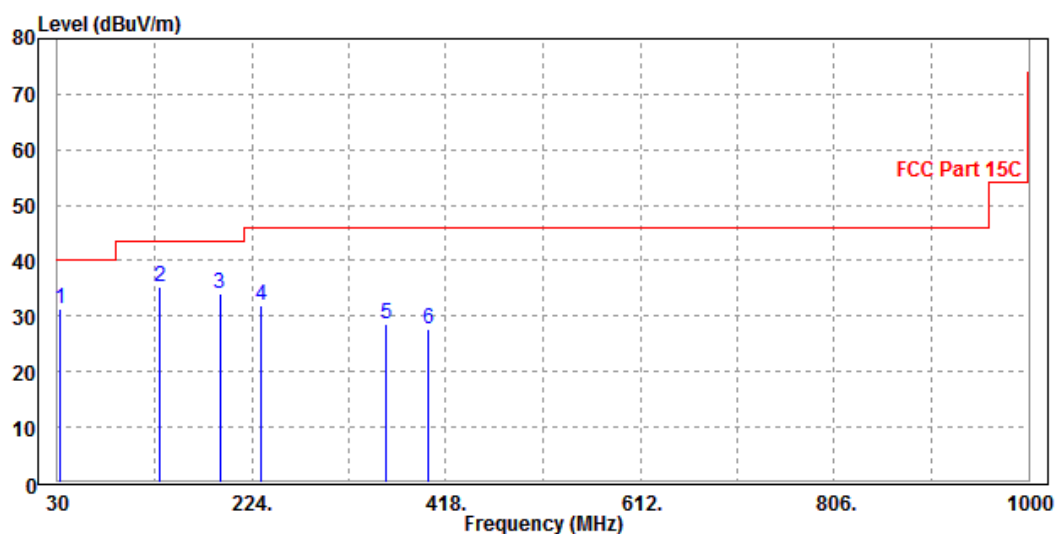
Test Report No.: RF181029W010-1

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
32.91	31.3	52.63	40	-8.7	15.37	0.84	37.54	100	80	QP
131.85	35.3	61.78	43.5	-8.2	8.64	1.76	36.88	100	80	QP
191.99	33.98	58.05	43.5	-9.52	10.4	2.13	36.6	100	80	QP
233.7	31.87	54.02	46	-14.13	12.02	2.36	36.53	100	80	QP
358.83	28.71	46.63	46	-17.29	15.74	2.97	36.63	100	80	QP
399.57	27.74	44.22	46	-18.26	17.09	3.15	36.72	100	80	QP

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.





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ABOVE 1GHz WORST-CASE DATA:

Note: For higher frequency, the emission is too low to be detected.

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	38.05	46.22	54	-15.95	32.87	4.88	45.92	100	130	Average
2390	50.18	58.35	74	-23.82	32.87	4.88	45.92	100	130	Peak
2412	92.02	100.14			32.89	4.9	45.91	100	130	Average
2412	101.81	109.93			32.89	4.9	45.91	100	130	Peak
2483.5	37.31	45.24	54	-16.69	32.98	4.98	45.89	100	130	Average
2483.5	49.63	57.56	74	-24.37	32.98	4.98	45.89	100	130	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	39.8	47.97	54	-14.2	32.87	4.88	45.92	100	220	Average
2390	48.76	56.93	74	-25.24	32.87	4.88	45.92	100	220	Peak
2412	90.77	98.89			32.89	4.9	45.91	100	220	Average
2412	99.05	107.17			32.89	4.9	45.91	100	220	Peak
2483.5	37.84	45.77	54	-16.16	32.98	4.98	45.89	100	220	Average
2483.5	50.02	57.95	74	-23.98	32.98	4.98	45.89	100	220	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2412MHz: Fundamental frequency.



**BUREAU
VERITAS**

Test Report No.: RF181029W010-1

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	36.08	44.25	54	-17.92	32.87	4.88	45.92	100	140	Average
2390	51.1	59.27	74	-22.9	32.87	4.88	45.92	100	140	Peak
2437	93.91	101.97			32.92	4.93	45.91	100	140	Average
2437	102.23	110.29			32.92	4.93	45.91	100	140	Peak
2483.5	37.28	45.21	54	-16.72	32.98	4.98	45.89	100	140	Average
2483.5	50.7	58.63	74	-23.3	32.98	4.98	45.89	100	140	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	38.09	46.26	54	-15.91	32.87	4.88	45.92	100	235	Average
2390	47.07	55.24	74	-26.93	32.87	4.88	45.92	100	235	Peak
2437	92.8	100.86			32.92	4.93	45.91	100	235	Average
2437	100.41	108.47			32.92	4.93	45.91	100	235	Peak
2483.5	37.92	45.85	54	-16.08	32.98	4.98	45.89	100	235	Average
2483.5	50.34	58.27	74	-23.66	32.98	4.98	45.89	100	235	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2437MHz: Fundamental frequency.



**BUREAU
VERITAS**

Test Report No.: RF181029W010-1

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.18	45.35	54	-16.82	32.87	4.88	45.92	100	330	Average
2390	49.12	57.29	74	-24.88	32.87	4.88	45.92	100	330	Peak
2462	89.32	97.31			32.95	4.96	45.9	100	330	Average
2462	97.63	105.62			32.95	4.96	45.9	100	330	Peak
2483.5	38.18	46.11	54	-15.82	32.98	4.98	45.89	100	330	Average
2483.5	50.79	58.72	74	-23.21	32.98	4.98	45.89	100	330	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	36.17	44.34	54	-17.83	32.87	4.88	45.92	100	300	Average
2390	48.64	56.81	74	-25.36	32.87	4.88	45.92	100	300	Peak
2462	91.14	99.13			32.95	4.96	45.9	100	300	Average
2462	100.36	108.35			32.95	4.96	45.9	100	300	Peak
2483.5	37.2	45.13	54	-16.8	32.98	4.98	45.89	100	300	Average
2483.5	52	59.93	74	-22	32.98	4.98	45.89	100	300	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2462MHz: Fundamental frequency.



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Test Report No.: RF181029W010-1

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	41.66	49.83	54	-12.34	32.87	4.88	45.92	100	100	Average
2390	56.8	64.97	74	-17.2	32.87	4.88	45.92	100	100	Peak
2412	87.37	95.49			32.89	4.9	45.91	100	100	Average
2412	100.6	108.72			32.89	4.9	45.91	100	100	Peak
2483.5	37.49	45.42	54	-16.51	32.98	4.98	45.89	100	100	Average
2483.5	48.76	56.69	74	-25.24	32.98	4.98	45.89	100	100	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	39.65	47.82	54	-14.35	32.87	4.88	45.92	100	215	Average
2390	51.54	59.71	74	-22.46	32.87	4.88	45.92	100	215	Peak
2412	83.63	91.75			32.89	4.9	45.91	100	215	Average
2412	98.16	106.28			32.89	4.9	45.91	100	215	Peak
2483.5	38.38	46.31	54	-15.62	32.98	4.98	45.89	100	215	Average
2483.5	49.8	57.73	74	-24.2	32.98	4.98	45.89	100	215	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2412MHz: Fundamental frequency.



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VERITAS**

Test Report No.: RF181029W010-1

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.34	45.51	54	-16.66	32.87	4.88	45.92	190	100	Average
2390	49.46	57.63	74	-24.54	32.87	4.88	45.92	190	100	Peak
2437	90.47	98.53			32.92	4.93	45.91	190	100	Average
2437	101.8	109.86			32.92	4.93	45.91	190	100	Peak
2483.5	38.23	46.16	54	-15.77	32.98	4.98	45.89	190	100	Average
2483.5	50.31	58.24	74	-23.69	32.98	4.98	45.89	190	100	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	38.36	46.53	54	-15.64	32.87	4.88	45.92	270	110	Average
2390	46.87	55.04	74	-27.13	32.87	4.88	45.92	270	110	Peak
2437	89.31	97.37			32.92	4.93	45.91	270	110	Average
2437	102.2	110.26			32.92	4.93	45.91	270	110	Peak
2483.5	36.13	44.06	54	-17.87	32.98	4.98	45.89	270	110	Average
2483.5	50.13	58.06	74	-23.87	32.98	4.98	45.89	270	110	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2437MHz: Fundamental frequency.



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VERITAS**

Test Report No.: RF181029W010-1

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	38.2	46.37	54	-15.8	32.87	4.88	45.92	100	80	Average
2390	49.27	57.44	74	-24.73	32.87	4.88	45.92	100	80	Peak
2462	88.59	96.58			32.95	4.96	45.9	100	80	Average
2462	101.88	109.87			32.95	4.96	45.9	100	80	Peak
2483.5	39.94	47.87	54	-14.06	32.98	4.98	45.89	100	80	Average
2483.5	52.8	60.73	74	-21.2	32.98	4.98	45.89	100	80	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.74	45.91	54	-16.26	32.87	4.88	45.92	200	100	Average
2390	49.42	57.59	74	-24.58	32.87	4.88	45.92	200	100	Peak
2462	86.3	94.29			32.95	4.96	45.9	200	100	Average
2462	100.42	108.41			32.95	4.96	45.9	200	100	Peak
2483.5	40.16	48.09	54	-13.84	32.98	4.98	45.89	200	100	Average
2483.5	53.24	61.17	74	-20.76	32.98	4.98	45.89	200	100	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2462MHz: Fundamental frequency.



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VERITAS**

Test Report No.: RF181029W010-1

802.11n (20MHz)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	41.29	49.46	54	-12.71	32.87	4.88	45.92	156	100	Average
2390	54.64	62.81	74	-19.36	32.87	4.88	45.92	156	100	Peak
2412	85.65	93.77			32.89	4.9	45.91	156	100	Average
2412	98.87	106.99			32.89	4.9	45.91	156	100	Peak
2483.5	37.52	45.45	54	-16.48	32.98	4.98	45.89	156	100	Average
2483.5	49.33	57.26	74	-24.67	32.98	4.98	45.89	156	100	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	38.38	46.55	54	-15.62	32.87	4.88	45.92	100	210	Average
2390	52.42	60.59	74	-21.58	32.87	4.88	45.92	100	210	Peak
2412	82.61	90.73			32.89	4.9	45.91	100	210	Average
2412	96.85	104.97			32.89	4.9	45.91	100	210	Peak
2483.5	37.79	45.72	54	-16.21	32.98	4.98	45.89	100	210	Average
2483.5	50.89	58.82	74	-23.11	32.98	4.98	45.89	100	210	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2412MHz: Fundamental frequency.



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VERITAS**

Test Report No.: RF181029W010-1

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	36.99	45.16	54	-17.01	32.87	4.88	45.92	260	100	Average
2390	48.66	56.83	74	-25.34	32.87	4.88	45.92	260	100	Peak
2437	83.98	92.04			32.92	4.93	45.91	260	100	Average
2437	101.49	109.55			32.92	4.93	45.91	260	100	Peak
2483.5	38.59	46.52	54	-15.41	32.98	4.98	45.89	260	100	Average
2483.5	51.14	59.07	74	-22.86	32.98	4.98	45.89	260	100	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.45	45.62	54	-16.55	32.87	4.88	45.92	150	100	Average
2390	48.89	57.06	74	-25.11	32.87	4.88	45.92	150	100	Peak
2437	84.8	92.86			32.92	4.93	45.91	150	100	Average
2437	101.31	109.37			32.92	4.93	45.91	150	100	Peak
2483.5	38.68	46.61	54	-15.32	32.98	4.98	45.89	150	100	Average
2483.5	50.33	58.26	74	-23.67	32.98	4.98	45.89	150	100	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2437MHz: Fundamental frequency.



**BUREAU
VERITAS**

Test Report No.: RF181029W010-1

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.64	45.81	54	-16.36	32.87	4.88	45.92	100	330	Average
2390	49.12	57.29	74	-24.88	32.87	4.88	45.92	100	330	Peak
2462	85.52	93.51			32.95	4.96	45.9	100	330	Average
2462	97.52	105.51			32.95	4.96	45.9	100	330	Peak
2483.5	39.65	47.58	54	-14.35	32.98	4.98	45.89	100	330	Average
2483.5	51.83	59.76	74	-22.17	32.98	4.98	45.89	100	330	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.59	45.76	54	-16.41	32.87	4.88	45.92	100	300	Average
2390	49.5	57.67	74	-24.5	32.87	4.88	45.92	100	300	Peak
2462	86.14	94.13			32.95	4.96	45.9	100	300	Average
2462	100.52	108.51			32.95	4.96	45.9	100	300	Peak
2483.5	40.66	48.59	54	-13.34	32.98	4.98	45.89	100	300	Average
2483.5	53.58	61.51	74	-20.42	32.98	4.98	45.89	100	300	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2462MHz: Fundamental frequency.



**BUREAU
VERITAS**

Test Report No.: RF181029W010-1

802.11n (40MHz)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	47.84	56.01	54	-6.16	32.87	4.88	45.92	100	100	Average
2390	64.74	72.91	74	-9.26	32.87	4.88	45.92	100	100	Peak
2422	81.83	89.91			32.91	4.92	45.91	100	100	Average
2422	95.9	103.98			32.91	4.92	45.91	100	100	Peak
2483.5	40.13	48.06	54	-13.87	32.98	4.98	45.89	100	100	Average
2483.5	52.73	60.66	74	-21.27	32.98	4.98	45.89	100	100	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	45.77	53.94	54	-8.23	32.87	4.88	45.92	100	210	Average
2390	60.85	69.02	74	-13.15	32.87	4.88	45.92	100	210	Peak
2422	81.17	89.25			32.91	4.92	45.91	100	210	Average
2422	94.09	102.17			32.91	4.92	45.91	100	210	Peak
2483.5	38.31	46.24	54	-15.69	32.98	4.98	45.89	100	210	Average
2483.5	53.25	61.18	74	-20.75	32.98	4.98	45.89	100	210	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2422MHz: Fundamental frequency.



**BUREAU
VERITAS**

Test Report No.: RF181029W010-1

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.12	51.29	54	-10.88	32.87	4.88	45.92	120	100	Average
2390	55.55	63.72	74	-18.45	32.87	4.88	45.92	120	100	Peak
2437	89.21	97.27			32.92	4.93	45.91	120	100	Average
2437	101.51	109.57			32.92	4.93	45.91	120	100	Peak
2483.5	44.03	51.96	54	-9.97	32.98	4.98	45.89	120	100	Average
2483.5	56.08	64.01	74	-17.92	32.98	4.98	45.89	120	100	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.22	51.39	54	-10.78	32.87	4.88	45.92	270	100	Average
2390	55.1	63.27	74	-18.9	32.87	4.88	45.92	270	100	Peak
2437	87.22	95.28			32.92	4.93	45.91	270	100	Average
2437	100.19	108.25			32.92	4.93	45.91	270	100	Peak
2483.5	42.88	50.81	54	-11.12	32.98	4.98	45.89	270	100	Average
2483.5	52.1	60.03	74	-21.9	32.98	4.98	45.89	270	100	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2437MHz: Fundamental frequency.



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CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	42.56	50.73	54	-11.44	32.87	4.88	45.92	100	80	Average
2390	54.35	62.52	74	-19.65	32.87	4.88	45.92	100	80	Peak
2452	85.58	93.59			32.94	4.95	45.9	100	80	Average
2452	99.25	107.26			32.94	4.95	45.9	100	80	Peak
2483.5	47.68	55.61	54	-6.32	32.98	4.98	45.89	100	80	Average
2483.5	64.15	72.08	74	-9.85	32.98	4.98	45.89	100	80	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	40.06	48.23	54	-13.94	32.87	4.88	45.92	100	300	Average
2390	51.14	59.31	74	-22.86	32.87	4.88	45.92	100	300	Peak
2452	82.8	90.81			32.94	4.95	45.9	100	300	Average
2452	97.14	105.15			32.94	4.95	45.9	100	300	Peak
2483.5	46.31	54.24	54	-7.69	32.98	4.98	45.89	100	300	Average
2483.5	64.28	72.21	74	-9.72	32.98	4.98	45.89	100	300	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2452MHz: Fundamental frequency.



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BELOW 1GHz WORST-CASE DATA:

9 KHz – 30 MHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

30 MHz – 1GHz data:

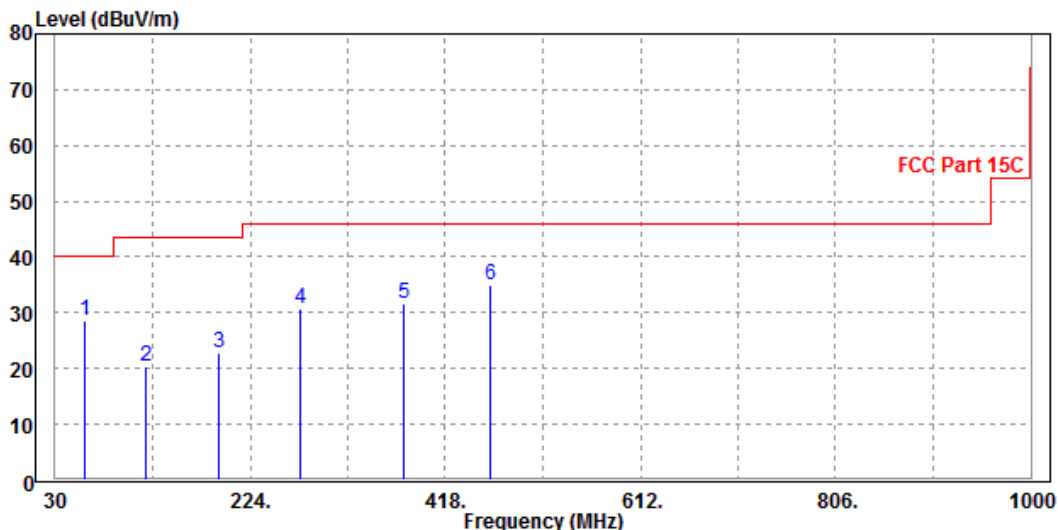
BT-LE (GFSK)

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
60.25	28.6	58.04	40	-11.4	6.82	1.07	37.33	120	250	QP
120.36	20.52	47.74	43.5	-22.98	8.41	1.45	37.08	120	250	QP
193.25	22.81	47.2	43.5	-20.69	10.43	1.76	36.58	120	250	QP
274.29	30.83	52.18	46	-15.17	13.23	2.12	36.7	120	250	QP
376.25	31.56	49.53	46	-14.44	16.32	2.52	36.81	120	250	QP
463.12	34.85	51.27	46	-11.15	17.67	2.85	36.94	120	250	QP

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value





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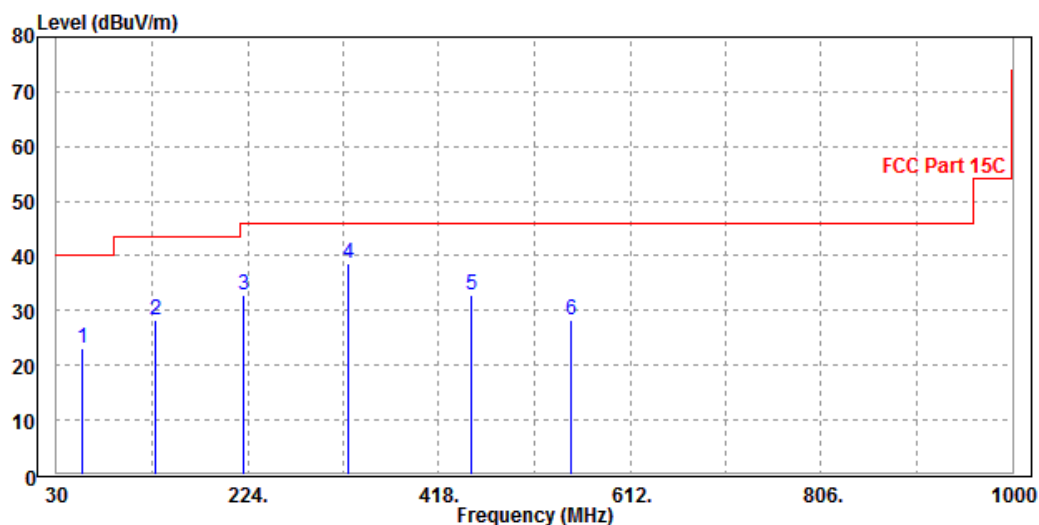
Test Report No.: RF181029W010-1

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
56.26	22.98	52.47	40	-17.02	6.8	1.04	37.33	100	360	QP
130.96	28.36	55.24	43.5	-15.14	8.62	1.49	36.99	100	360	QP
220.13	32.99	56.24	46	-13.01	11.45	1.89	36.59	100	360	QP
325.46	38.51	58.33	46	-7.49	14.64	2.31	36.77	100	360	QP
451.43	32.73	49.28	46	-13.27	17.56	2.81	36.92	100	360	QP
552.39	28.26	43.32	46	-17.74	19.05	3.08	37.19	100	360	QP

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value





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ABOVE 1GHz TEST DATA:

Note: For higher frequency, the emission is too low to be detected.

BT-LE (GFSK)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.61	46.23	54	-16.39	32.87	4.88	46.37	100	360	Average
2390	50.86	59.48	74	-23.14	32.87	4.88	46.37	100	360	Peak
2402	97.83	106.43			32.88	4.89	46.37	100	360	Average
2402	98.95	107.55			32.88	4.89	46.37	100	360	Peak
2483.5	36.83	45.24	54	-17.17	32.98	4.98	46.37	100	360	Average
2483.5	49.66	58.07	74	-24.34	32.98	4.98	46.37	100	360	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.24	45.86	54	-16.76	32.87	4.88	46.37	100	298	Average
2390	49.76	58.38	74	-24.24	32.87	4.88	46.37	100	298	Peak
2402	94.99	103.59			32.88	4.89	46.37	100	298	Average
2402	97.95	106.55			32.88	4.89	46.37	100	298	Peak
2483.5	36.85	45.26	54	-17.15	32.98	4.98	46.37	100	298	Average
2483.5	49.33	57.74	74	-24.67	32.98	4.98	46.37	100	298	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2402MHz: Fundamental frequency.



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Test Report No.: RF181029W010-1

CHANNEL	TX Channel 19	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.2	45.82	54	-16.8	32.87	4.88	46.37	160	50	Average
2390	49.01	57.63	74	-24.99	32.87	4.88	46.37	160	50	Peak
2440	100.65	109.15			32.93	4.94	46.37	160	50	Average
2440	101.93	110.43			32.93	4.94	46.37	160	50	Peak
2483.5	38.02	46.43	54	-15.98	32.98	4.98	46.37	160	50	Average
2483.5	49.19	57.6	74	-24.81	32.98	4.98	46.37	160	50	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	37.63	46.25	54	-16.37	32.87	4.88	46.37	100	260	Average
2390	48.4	57.02	74	-25.6	32.87	4.88	46.37	100	260	Peak
2440	101.34	109.84			32.93	4.94	46.37	100	260	Average
2440	102.78	111.28			32.93	4.94	46.37	100	260	Peak
2483.5	36.78	45.19	54	-17.22	32.98	4.98	46.37	100	260	Average
2483.5	50.02	58.43	74	-23.98	32.98	4.98	46.37	100	260	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2440MHz: Fundamental frequency.



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Test Report No.: RF181029W010-1

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	36.61	45.23	54	-17.39	32.87	4.88	46.37	120	50	Average
2390	50.51	59.13	74	-23.49	32.87	4.88	46.37	120	50	Peak
2480	99.94	108.35			32.98	4.98	46.37	120	50	Average
2480	101.89	110.3			32.98	4.98	46.37	120	50	Peak
2483.5	48.78	57.19	54	-5.22	32.98	4.98	46.37	120	50	Average
2483.5	56.7	65.11	74	-17.3	32.98	4.98	46.37	120	50	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	36.74	45.36	54	-17.26	32.87	4.88	46.37	118	360	Average
2390	50.05	58.67	74	-23.95	32.87	4.88	46.37	118	360	Peak
2480	98.6	107.01			32.98	4.98	46.37	118	360	Average
2480	99.97	108.38			32.98	4.98	46.37	118	360	Peak
2483.5	46.92	55.33	54	-7.08	32.98	4.98	46.37	118	360	Average
2483.5	58.75	67.16	74	-15.25	32.98	4.98	46.37	118	360	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2480MHz: Fundamental frequency.



3.2 6 dB BANDWIDTH MEASUREMENT

3.2.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

3.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Meter	ANRITSU	ML2495A	1506002	Mar. 02,18	Mar. 01,19
EXA Signal Analyzer	KEYSIGHT	N9010A-526	MY54510322	Mar. 16,18	Mar. 15,19
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510355	Mar. 16,18	Mar. 15,19
Power Sensor	ANRITSU	MA2411B	1339352	Mar. 16,18	Mar. 15,19

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 RF Oven room.

3.2.3 TEST PROCEDURE

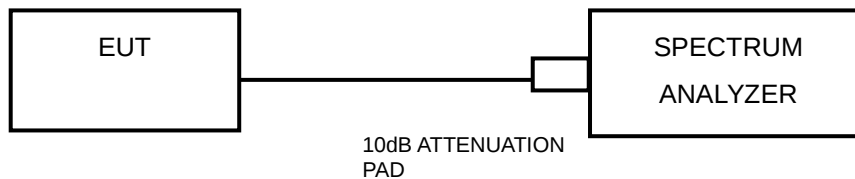
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



3.2.4 DEVIATION FROM TEST STANDARD

No deviation.

3.2.5 TEST SETUP



3.2.6 EUT OPERATING CONDITIONS

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



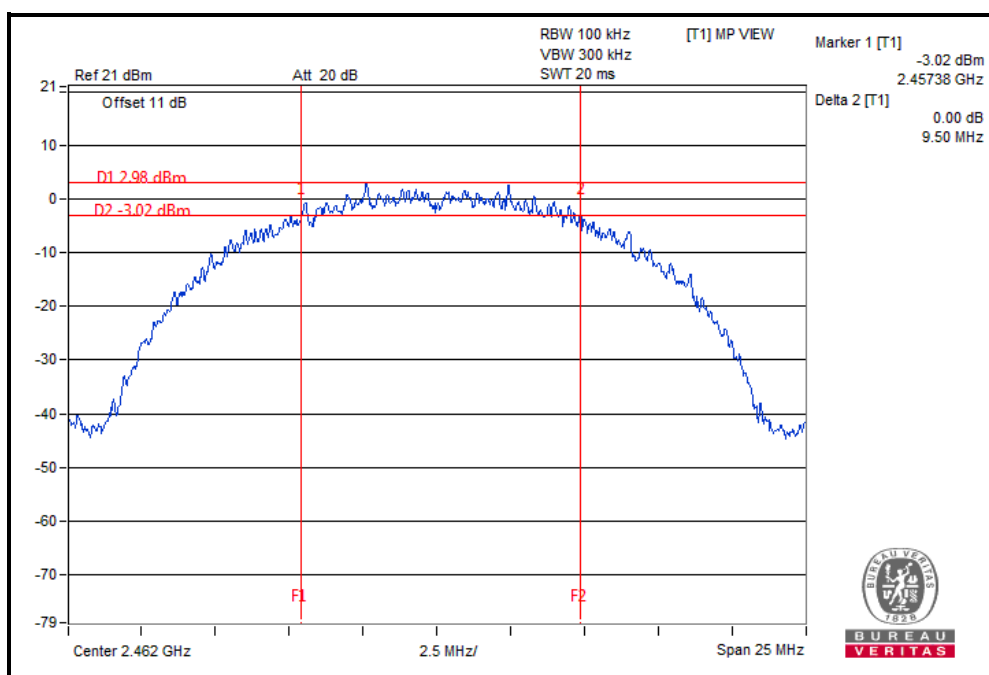
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3.2.7 TEST RESULTS

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	9.06	0.5	PASS
6	2437	9.05	0.5	PASS
11	2462	9.50	0.5	PASS



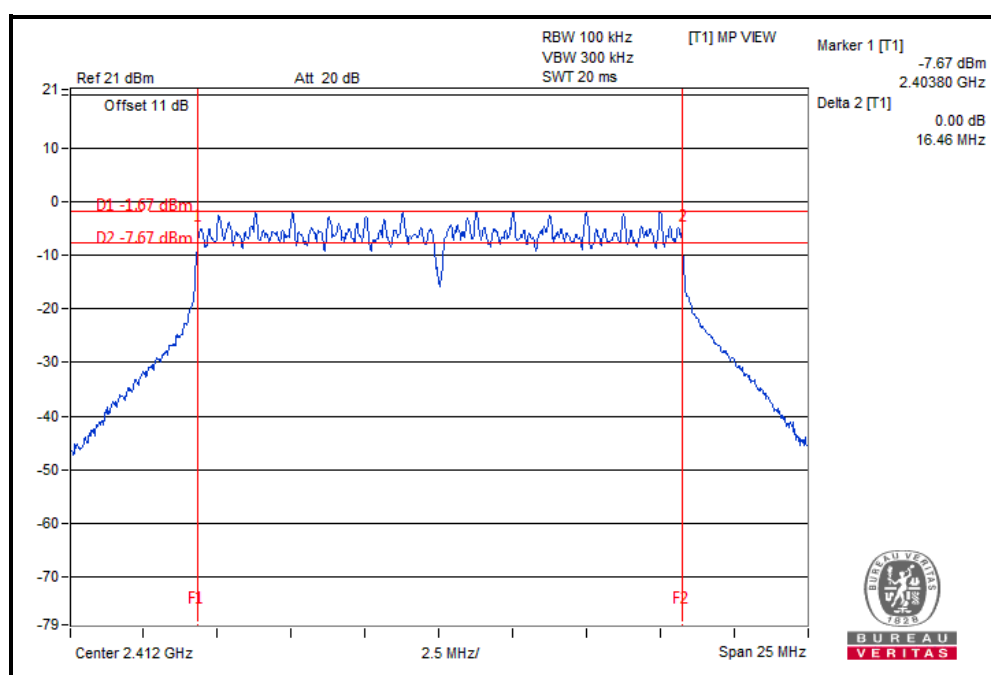


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802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	16.46	0.5	PASS
6	2437	16.45	0.5	PASS
11	2462	16.46	0.5	PASS



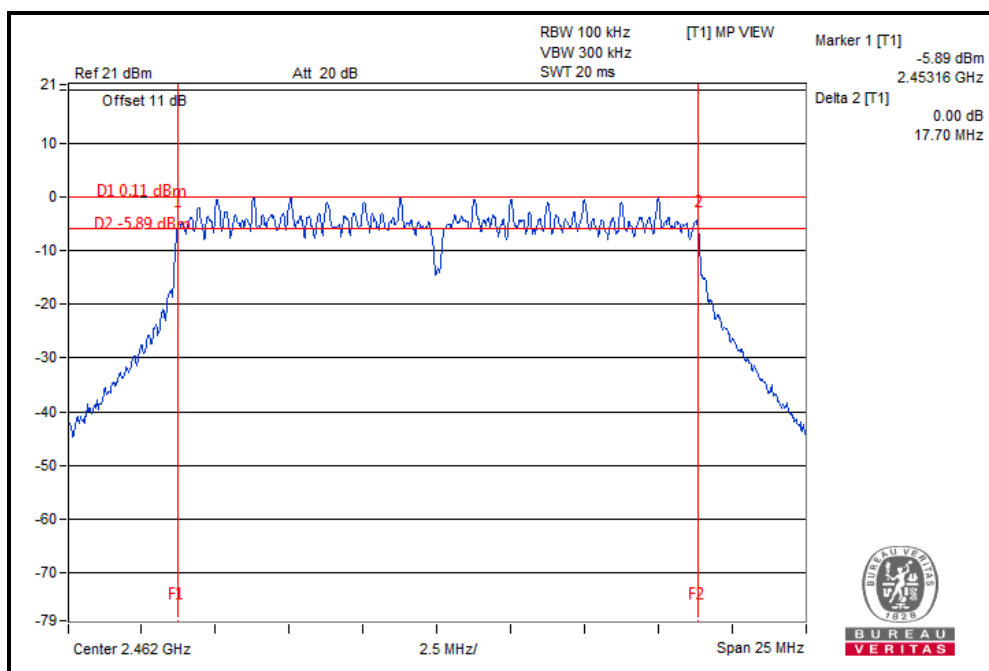


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802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	17.69	0.5	PASS
6	2437	17.59	0.5	PASS
11	2462	17.70	0.5	PASS



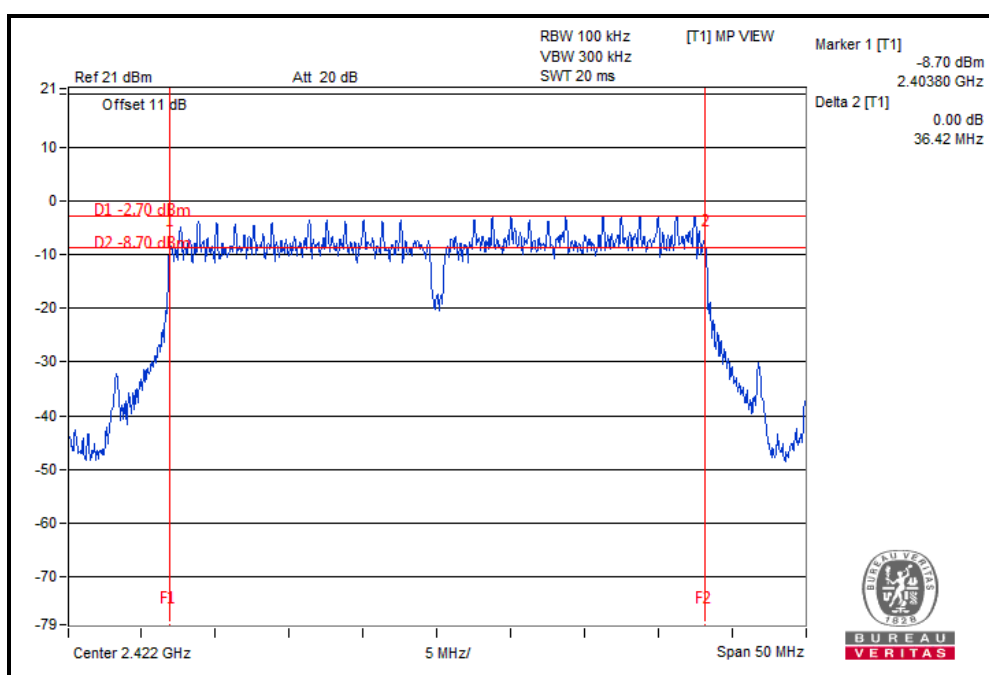


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802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
3	2422	36.42	0.5	PASS
6	2437	36.36	0.5	PASS
9	2452	36.07	0.5	PASS



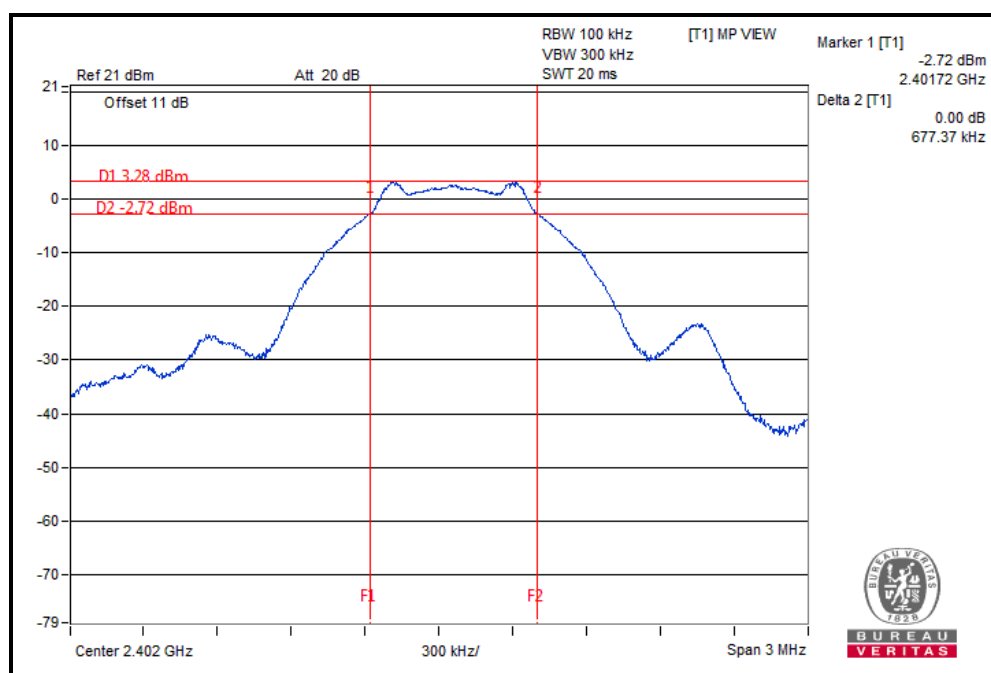


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BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	0.68	0.5	PASS
19	2440	0.68	0.5	PASS
39	2480	0.68	0.5	PASS



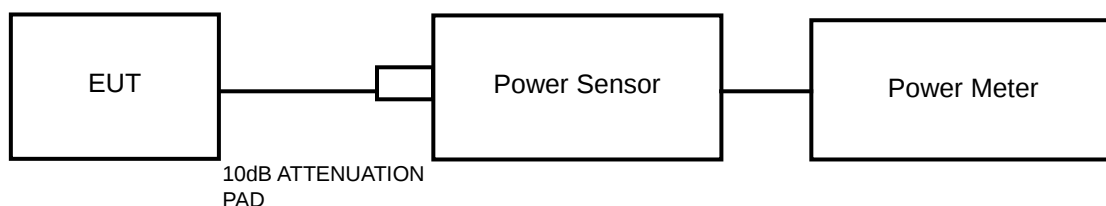


3.3 CONDUCTED OUTPUT POWER

3.3.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

3.3.2 TEST SETUP



3.3.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.3.4 TEST PROCEDURES

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

3.3.5 DEVIATION FROM TEST STANDARD

No deviation.

3.3.6 EUT OPERATING CONDITIONS

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

**3.3.7 TEST RESULTS****3.3.7.1 MAXIMUM PEAK OUTPUT POWER****802.11b**

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	15.45	35.075	1	PASS
6	2437	16.01	39.902	1	PASS
11	2462	14.96	31.333	1	PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	18.95	78.524	1	PASS
6	2437	19.25	84.140	1	PASS
11	2462	20.25	105.925	1	PASS

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	18.69	73.961	1	PASS
6	2437	18.60	72.444	1	PASS
11	2462	19.83	96.161	1	PASS

802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
3	2422	19.72	93.756	1	PASS
6	2437	19.85	96.605	1	PASS
9	2452	21.79	151.008	1	PASS



BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
0	2402	3.11	2.046	1	PASS
19	2440	2.86	1.932	1	PASS
39	2480	2.60	1.820	1	PASS



3.3.7.2 Average Output Power (FOR REFERENCE)

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

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	11.86	N/A
6	2437	12.32	N/A
11	2462	11.51	N/A

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	9.35	N/A
6	2437	10.32	N/A
11	2462	9.71	N/A

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	9.48	N/A
6	2437	10.25	N/A
11	2462	9.68	N/A

802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
3	2422	9.35	N/A
6	2437	9.89	N/A
9	2452	9.90	N/A



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BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
0	2402	2.25	N/A
19	2440	2.02	N/A
39	2480	1.73	N/A

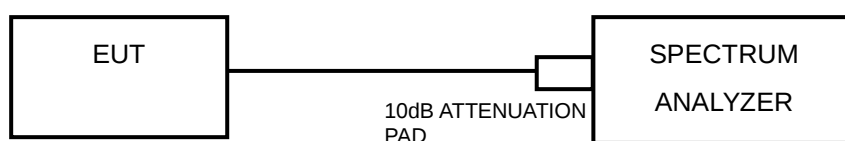


3.4 POWER SPECTRAL DENSITY MEASUREMENT

3.4.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

3.4.2 TEST SETUP



3.4.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.4.4 TEST PROCEDURE

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW $\geq 3 \times$ RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

3.4.5 DEVIATION FROM TEST STANDARD

No deviation.

3.4.6 EUT OPERATING CONDITION

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



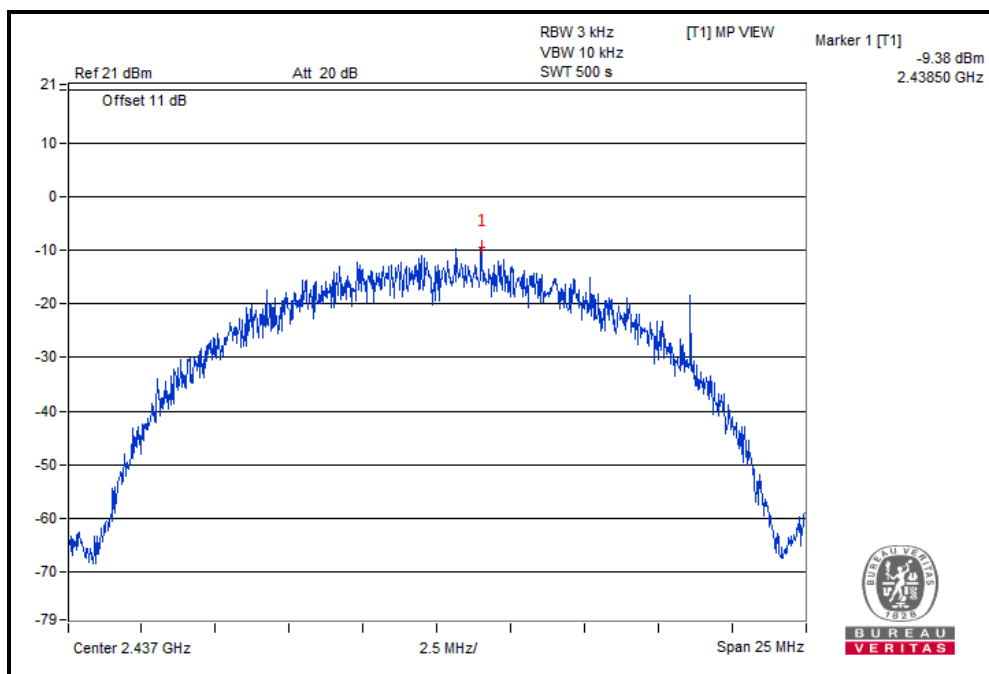
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3.4.7 TEST RESULTS

802.11b

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-10.13	8	PASS
6	2437	-9.38	8	PASS
11	2462	-10.72	8	PASS



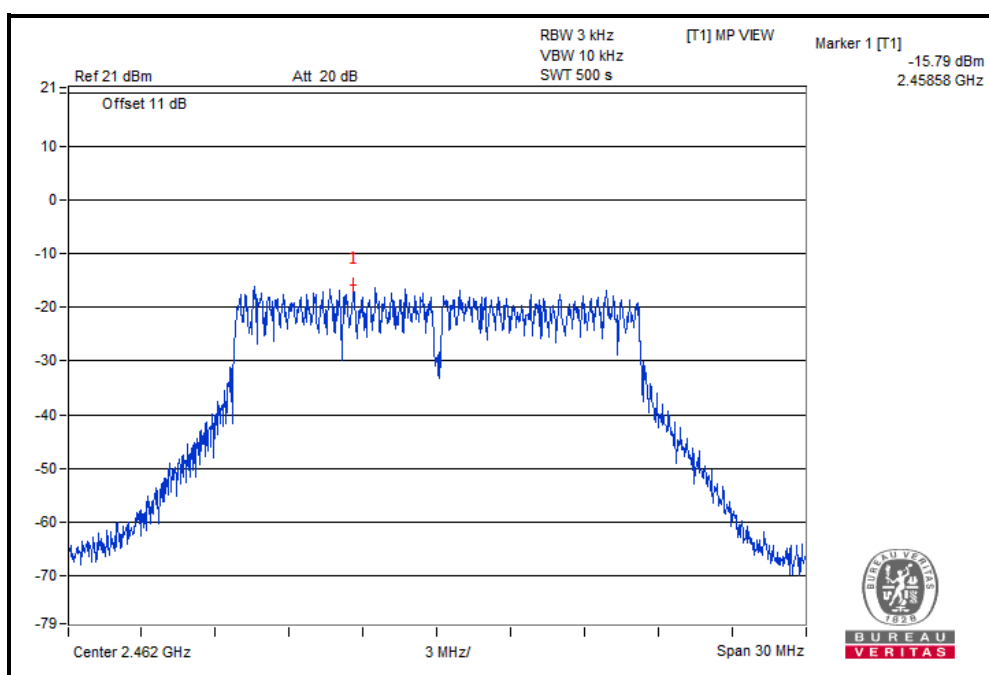


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VERITAS

Test Report No.: RF181029W010-1

802.11g

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-17.43	8	PASS
6	2437	-16.35	8	PASS
11	2462	-15.79	8	PASS



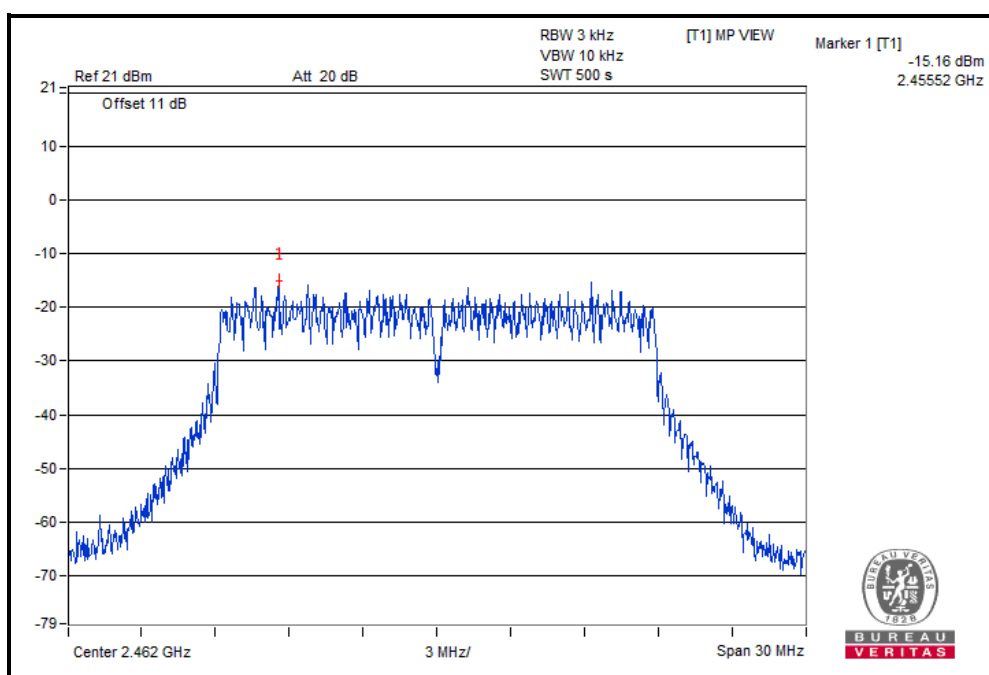


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VERITAS

Test Report No.: RF181029W010-1

802.11n (20MHz)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-16.47	8	PASS
6	2437	-15.75	8	PASS
11	2462	-15.16	8	PASS



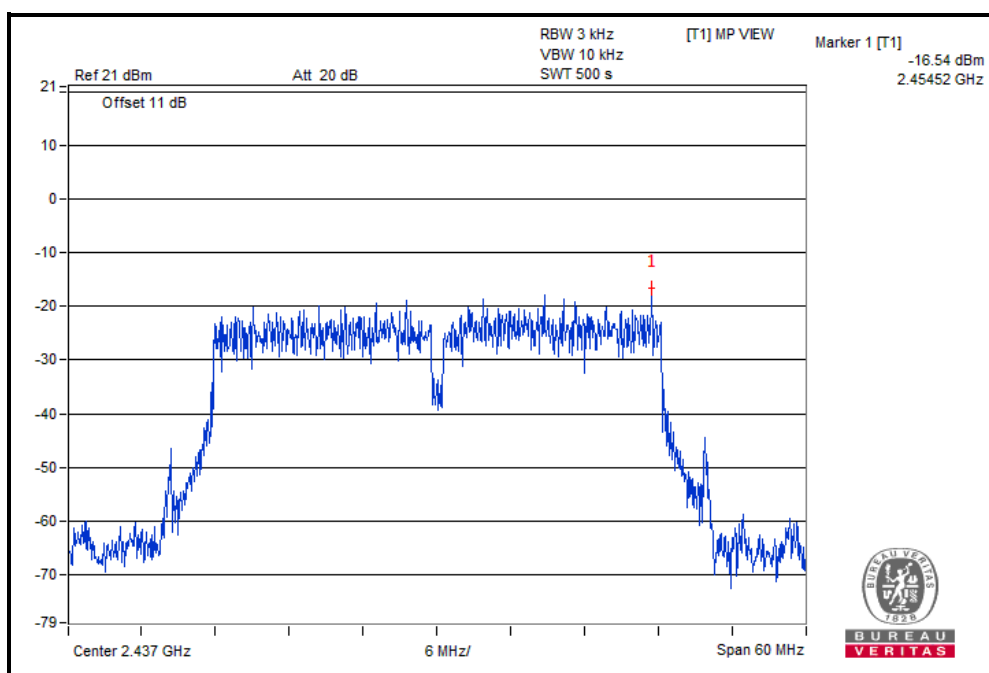


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Test Report No.: RF181029W010-1

802.11n (40MHz)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
3	2422	-18.69	8	PASS
6	2437	-16.54	8	PASS
9	2452	-18.20	8	PASS



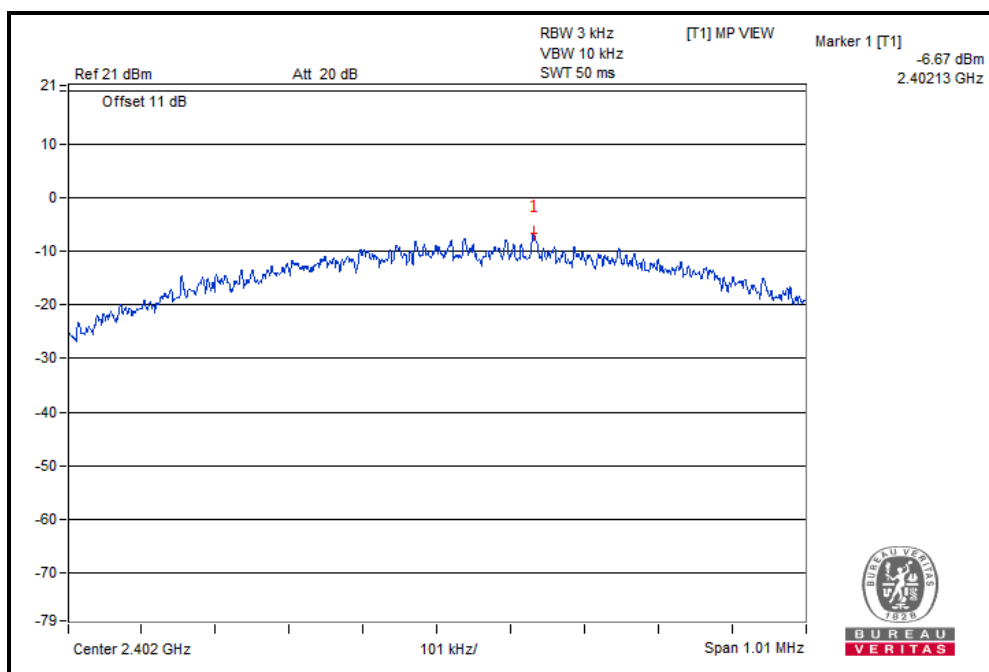


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VERITAS

Test Report No.: RF181029W010-1

BT-LE (GFSK)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-6.67	8	PASS
19	2440	-8.01	8	PASS
39	2480	-8.80	8	PASS



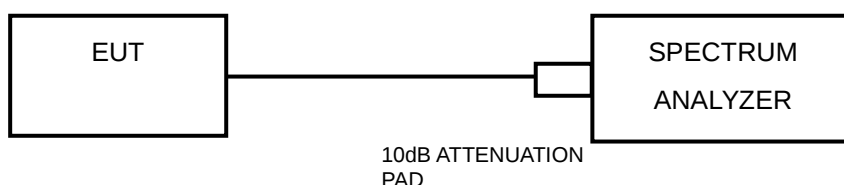


3.5 OUT OF BAND EMISSION MEASUREMENT

3.5.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

3.5.2 TEST SETUP



3.5.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.5.4 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.



MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

3.5.5 DEVIATION FROM TEST STANDARD

No deviation.

3.5.6 EUT OPERATING CONDITION

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

3.5.7 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.

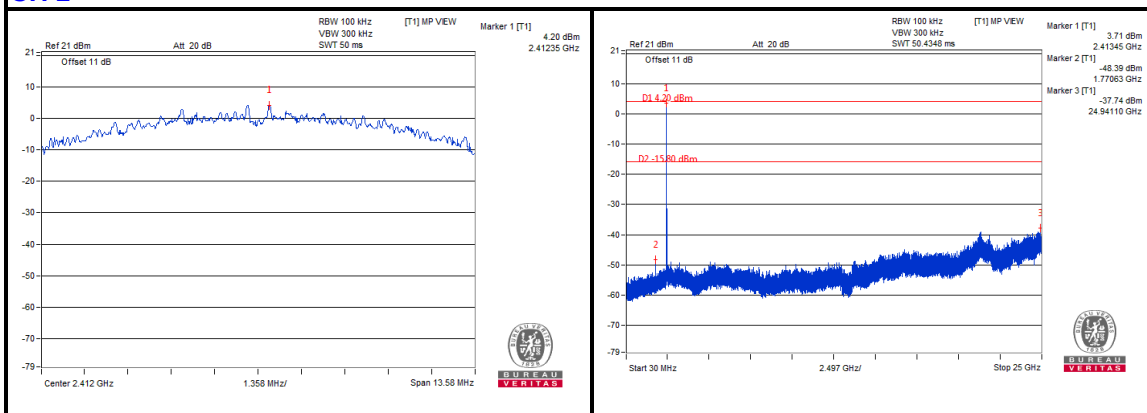


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VERITAS

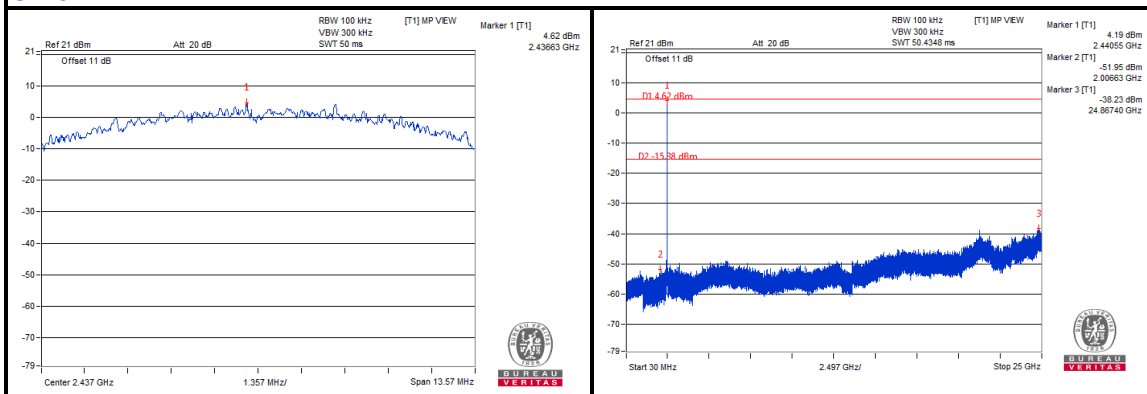
Test Report No.: RF181029W010-1

802.11b

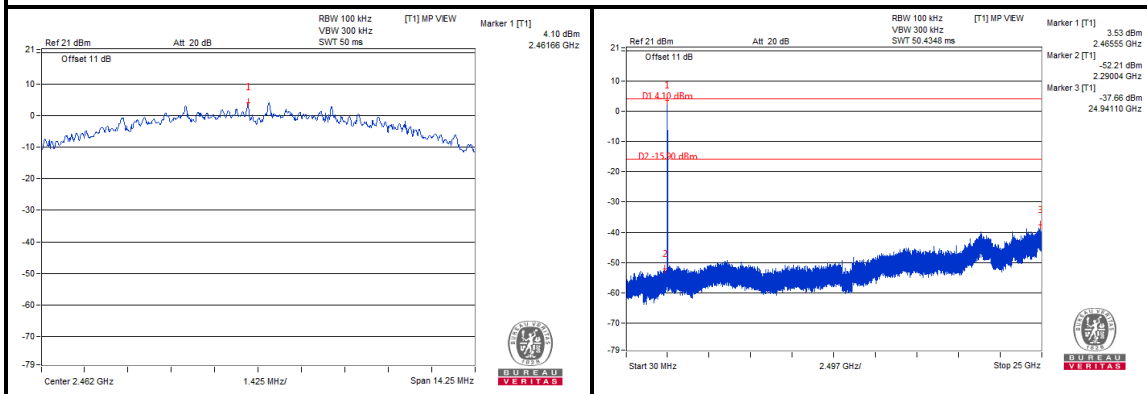
CH 1



CH 6



CH 11

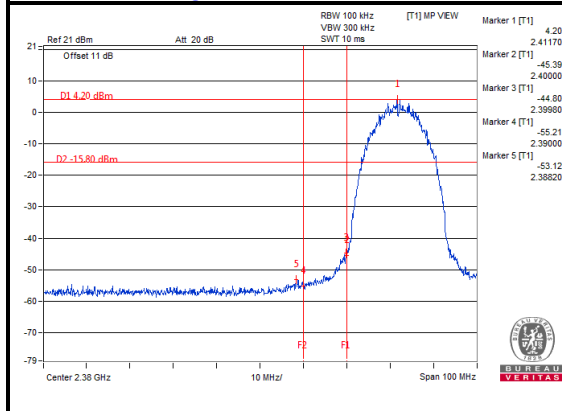




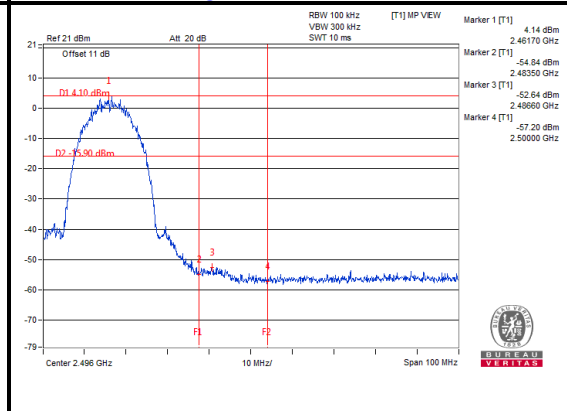
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VERITAS

Test Report No.: RF181029W010-1

CH 1 Band Edge



CH 11 Band Edge



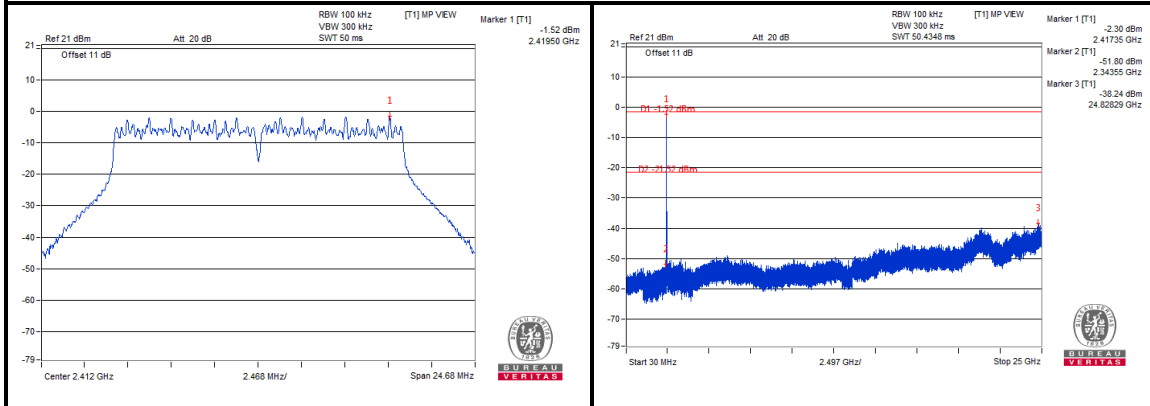


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VERITAS

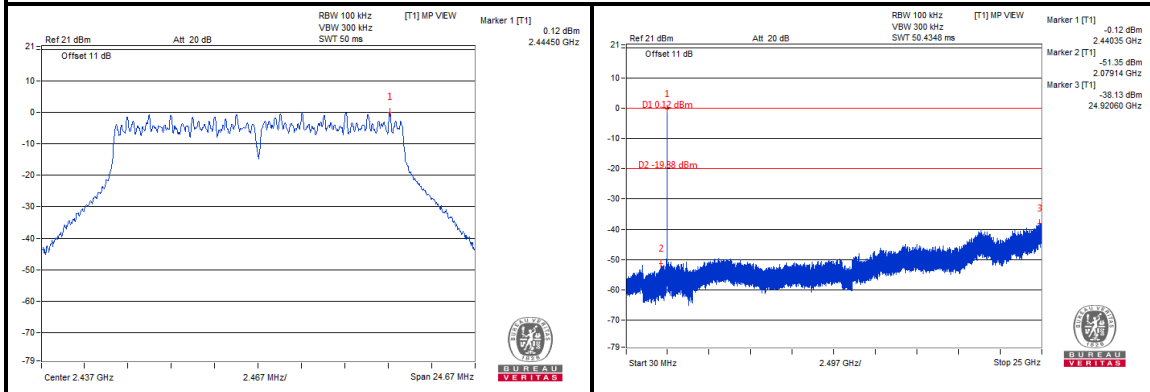
Test Report No.: RF181029W010-1

802.11g

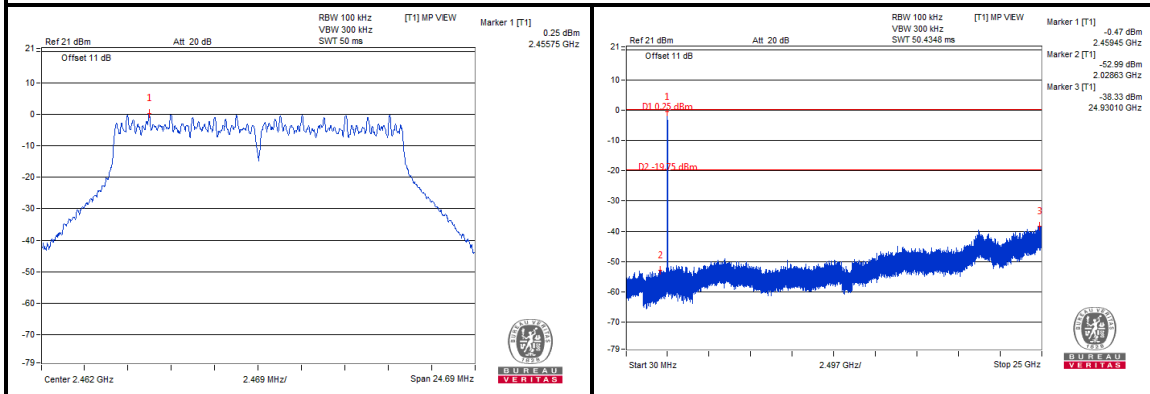
CH 1



CH 6



CH 11

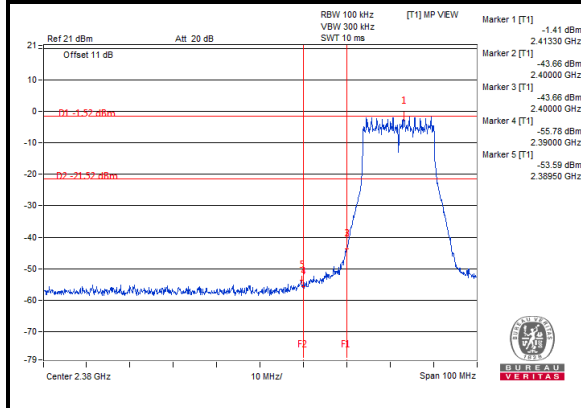




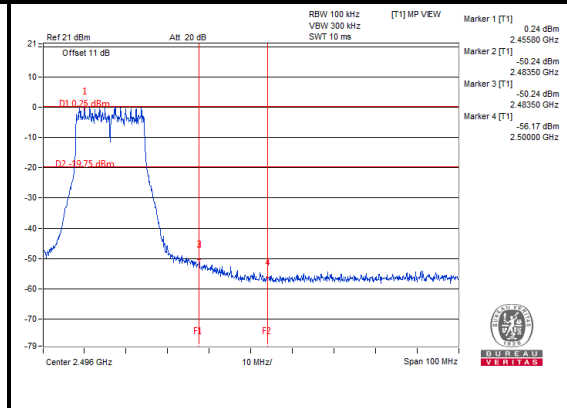
BUREAU
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Test Report No.: RF181029W010-1

CH 1 Band Edge



CH 11 Band Edge



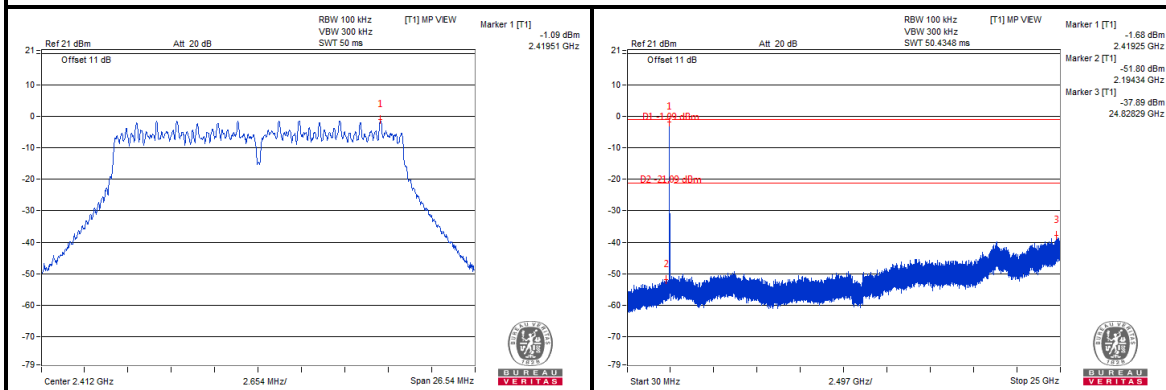


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VERITAS

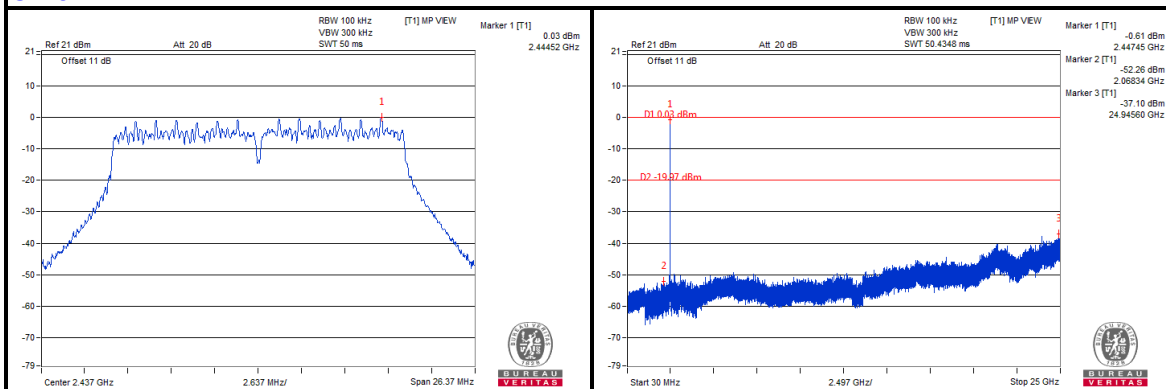
Test Report No.: RF181029W010-1

802.11n (20MHz)

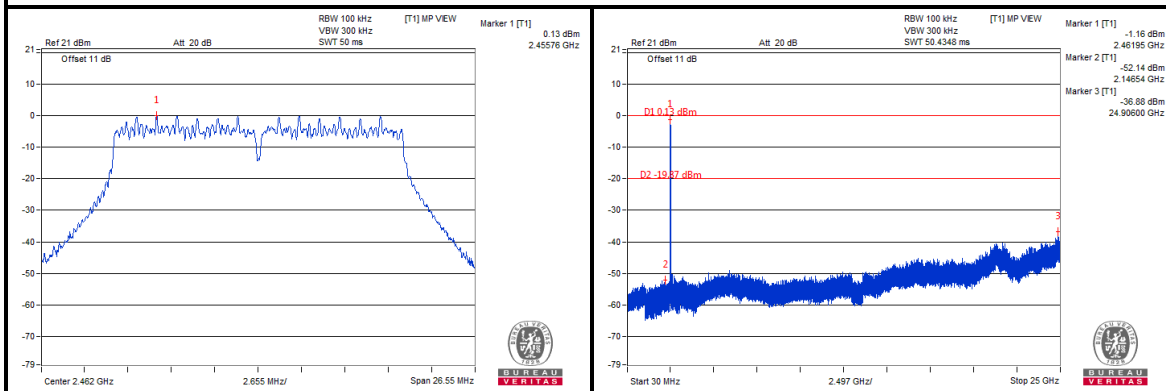
CH 1



CH 6



CH 11

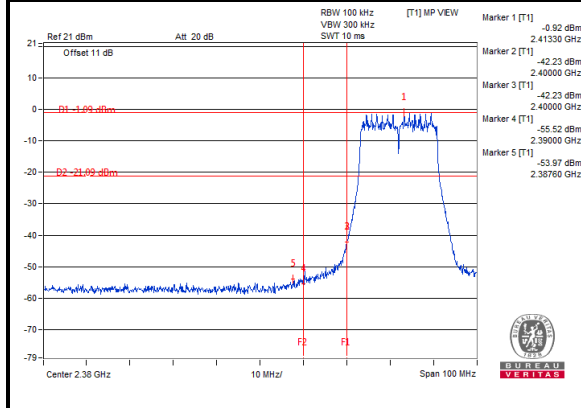




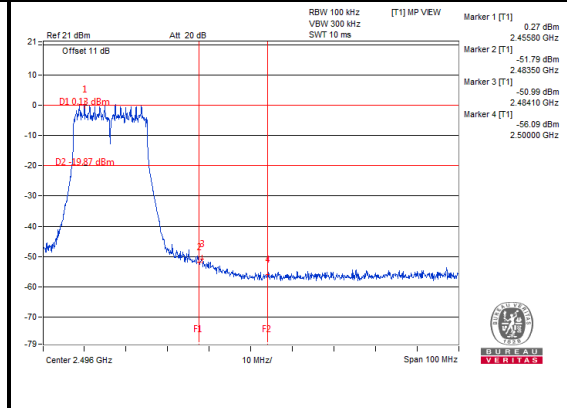
BUREAU
VERITAS

Test Report No.: RF181029W010-1

CH 1 Band Edge



CH 11 Band Edge



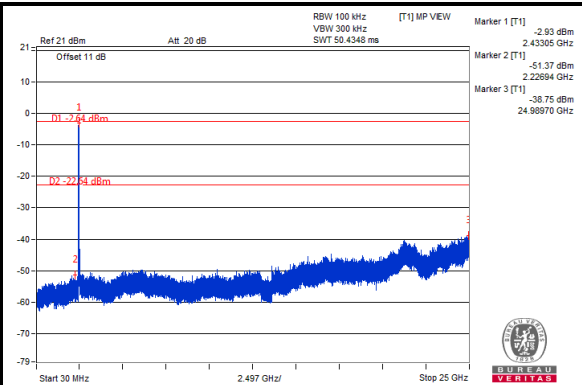
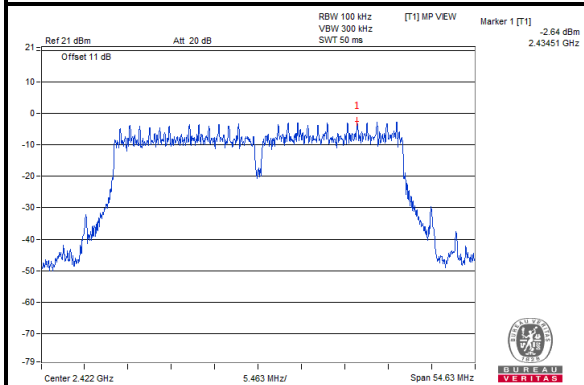


BUREAU
VERITAS

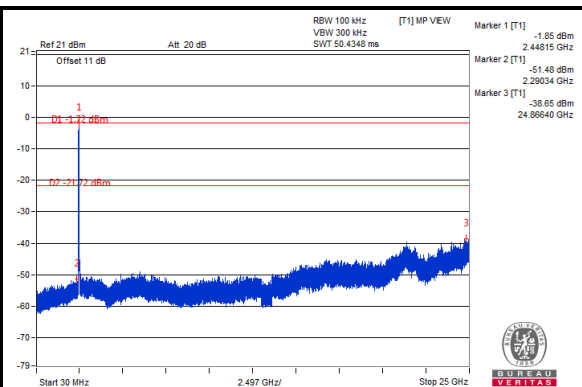
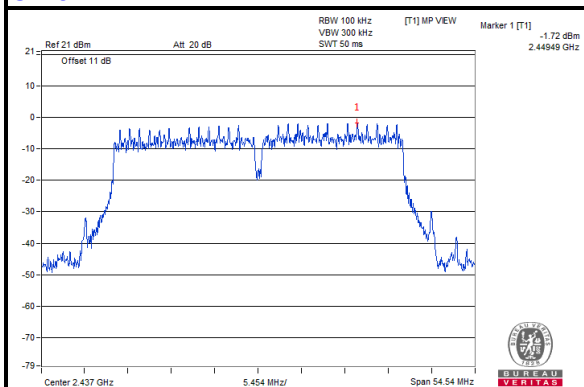
Test Report No.: RF181029W010-1

802.11n (40MHz)

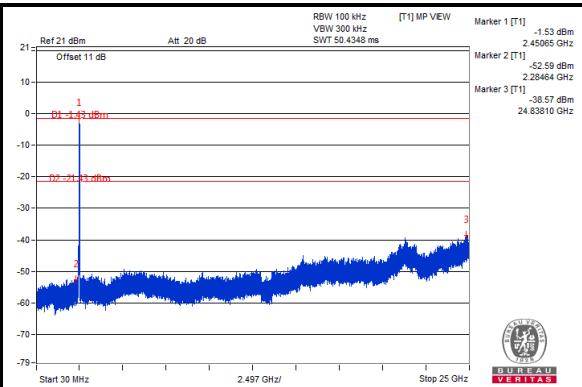
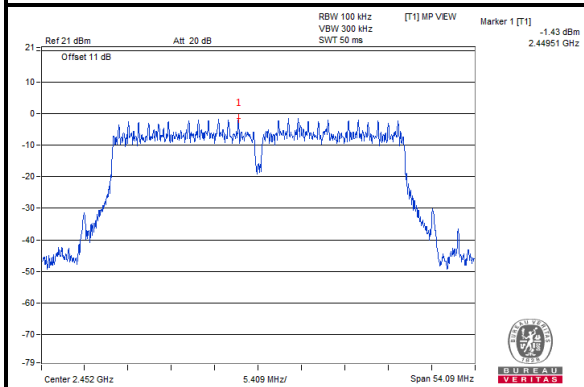
CH 3



CH 6



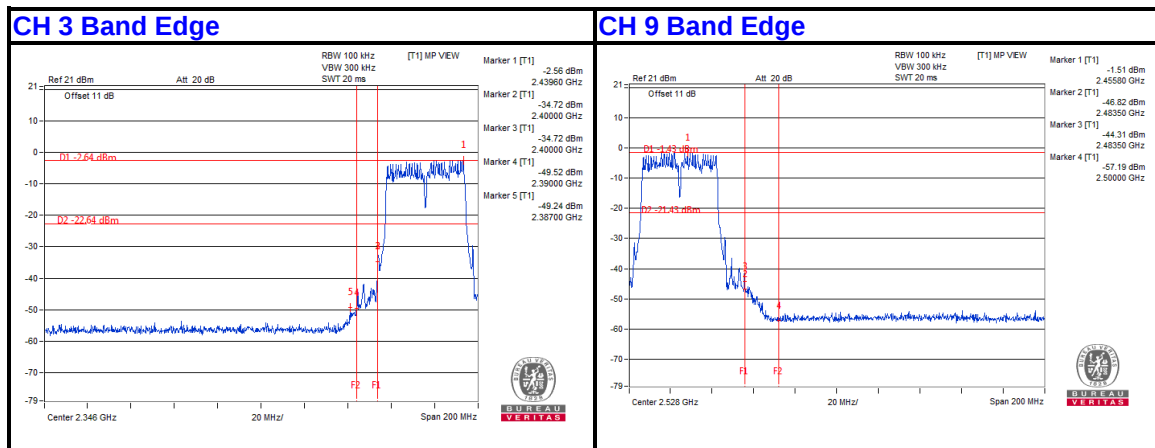
CH 9





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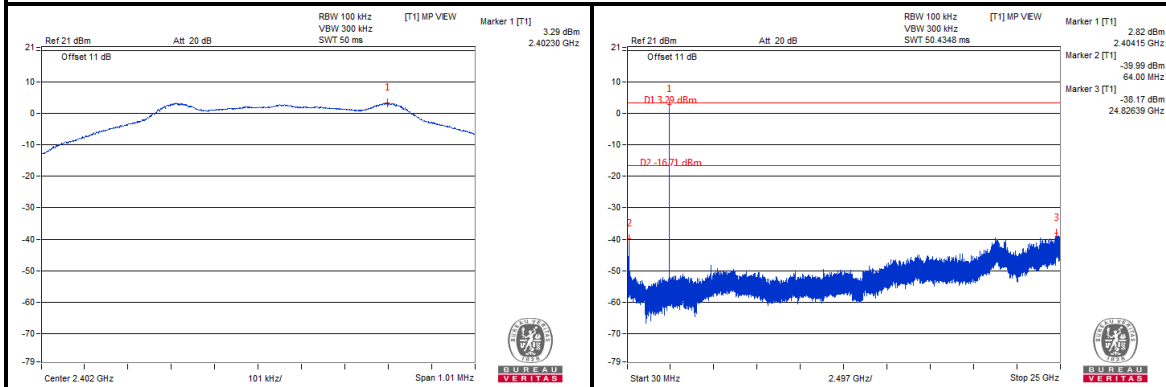


BUREAU
VERITAS

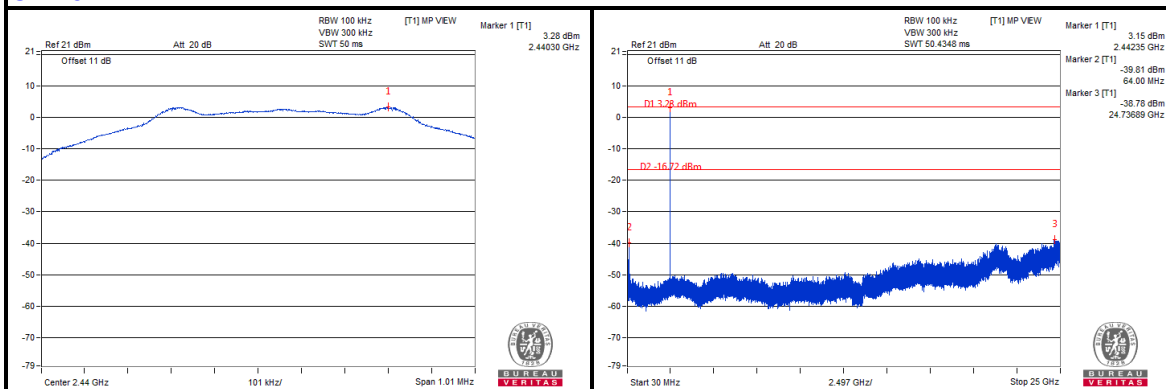
Test Report No.: RF181029W010-1

BT-LE (GFSK)

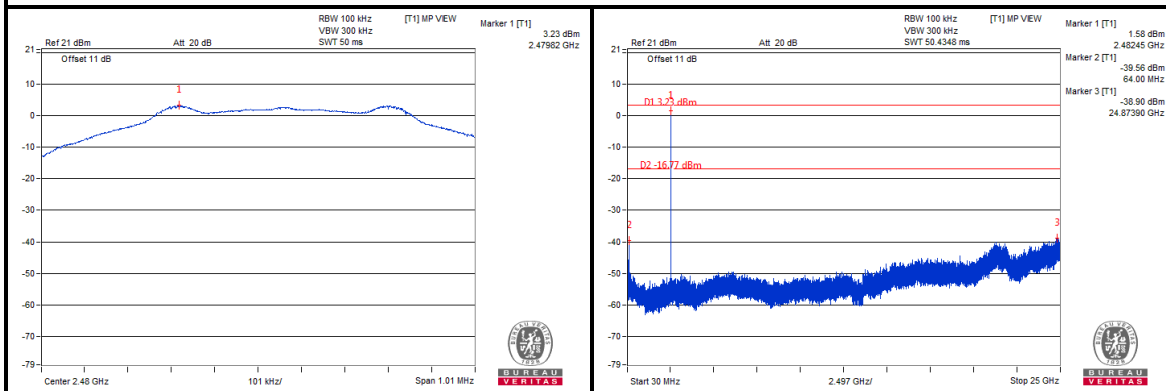
CH 0



CH 19



CH 39

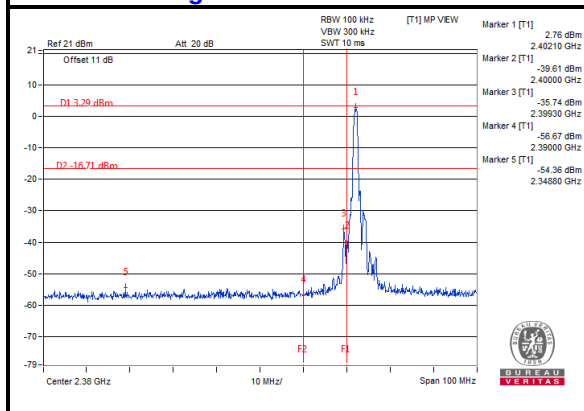




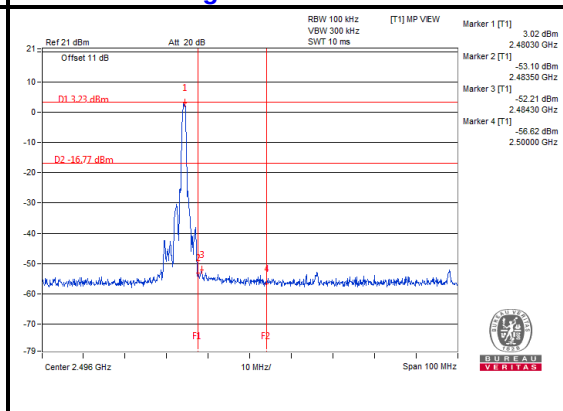
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VERITAS

Test Report No.: RF181029W010-1

CH 0 Band Edge



CH 39 Band Edge





Test Report No.: RF181029W010-1

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



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5 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---