



BUREAU  
VERITAS Test Report No.: RF180522W002-2



Certificate # 3939.01

# VARIANT FCC TEST REPORT

## (Part 15, Subpart C)

Applicant:	FIH International Co., Ltd.
Address:	No.18, Tongji zhonglu, Beijing Economic & Technological Development Area

Manufacturer or Supplier:	HMD Global Oy
Address:	Karaportti 2 02610 Espoo FINLAND
Product:	GSM/WCDMA/LTE Mobile Phone
Brand Name:	Nokia
Model Name:	TA-1049
FCC ID:	2AJOTTA-1049
Date of tests:	May 23, 2018 ~ Oct. 19, 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: Oct. 19, 2018

Date: Oct. 19, 2018

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## TABLE OF CONTENTS

<b>RELEASE CONTROL RECORD .....</b>	<b>3</b>
<b>1 SUMMARY OF TEST RESULTS.....</b>	<b>4</b>
1.1 MEASUREMENT UNCERTAINTY .....	4
<b>2 GENERAL INFORMATION .....</b>	<b>5</b>
2.1 GENERAL DESCRIPTION OF EUT .....	5
2.2 DESCRIPTION OF TEST MODES .....	7
2.2.1 CONFIGURATION OF SYSTEM UNDER TEST.....	8
2.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL.....	8
2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS .....	10
2.4 DESCRIPTION OF SUPPORT UNITS .....	10
<b>3 TEST TYPES AND RESULTS.....</b>	<b>11</b>
3.1 CONDUCTED EMISSION MEASUREMENT .....	11
3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT .....	11
3.1.2 TEST INSTRUMENTS.....	11
3.1.3 TEST PROCEDURES .....	12
3.1.4 DEVIATION FROM TEST STANDARD .....	12
3.1.5 TEST SETUP.....	13
3.1.6 EUT OPERATING CONDITIONS .....	13
3.1.7 TEST RESULTS .....	14
3.2 RADIATED EMISSION MEASUREMENT .....	16
3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT .....	16
3.2.2 TEST INSTRUMENTS.....	17
3.2.3 TEST PROCEDURES .....	18
3.2.4 DEVIATION FROM TEST STANDARD .....	18
3.2.5 TEST SETUP.....	19
3.2.6 EUT OPERATING CONDITIONS .....	20
3.2.7 TEST RESULTS .....	21
<b>4 PHOTOGRAPHS OF THE TEST CONFIGURATION.....</b>	<b>27</b>
<b>5 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB .....</b>	<b>28</b>



BUREAU  
VERITAS Test Report No.: RF180522W002-2

## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF180522W002-2	Original release	Oct. 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	PASS	Meet the requirement of limit. Minimum passing margin is -10.09dB at 17.928000MHz.
15.205 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -6.67dB at 2483.5MHz.
15.247(d)	Out of band Emission Measurement	N/A	N/A
15.247(a)(2)	6dB bandwidth	N/A	N/A
15.247(b)	Conducted Output power	N/A	N/A
15.247(e)	Power Spectral Density	N/A	N/A
15.203	Antenna Requirement	N/A	N/A

### 1.1 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	2.68dB
	30MHz ~ 1GHz	3.26dB
	1GHz ~ 18GHz	4.48dB
	18GHz ~ 40GHz	4.12dB

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	GSM/WCDMA/LTE Mobile Phone
BRAND NAME	Nokia
MODEL NAME	TA-1049
NOMINAL VOLTAGE	5.0Vdc (adapter or host equipment) 3.9Vdc (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) 2402-2480MHz for BT-LE(GFSK)
ANTENNA TYPE	PIFA Antenna with -0.77dBi gain
HW VERSION	HW0313
SW VERSION	000C_0_34A
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable: non-shielded, detachable, 1.0m Earphone cable: non-shielded, detachable, 1.5m

#### 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
BT _LE	1TX /1RX

3. This report is issued as a supplementary report to the original report RF180131W003-2. The differences compared with original report are updated Hardware Version and adding 2<sup>nd</sup> Manufacturer of metal frame.



**List of Accessories:**

ACCESSORIES	BRAND	MANUFACTURER	MODEL	SPECIFICATION
Adapter 1	Salcomp	Salcomp (Shenzhen) Co., Ltd.	FC0202	I/P: 100-240Vac, 150mA O/P: 5Vdc, 1000mA
Adapter 2	Aohai	DONGGUAN AOHAI TECHNOLOGY CO., LTD.	AD-5WU	I/P: 100-240Vac, 150mA O/P: 5Vdc, 1000mA
Battery	SCUD	SCUD (Fujian) Electronics CO., Ltd.	HE336	Rating: 3.85Vdc, 2900mAh
Earphone 1	Nokia	FIT	WH-108	1.5m non-shielded cable w/o core
Earphone 2	Nokia	OBO	WH-108	1.5m non-shielded cable w/o core
USB Cable	Nokia	FIH	CA-190CD	1.0m non-shielded cable w/o core



## 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		

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 HT20	1 to 11	11	OFDM	BPSK	6.5
BT-LE	0 to 39	39	DTS	GFSK	1



BUREAU  
VERITAS Test Report No.: RF180522W002-2

**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)
802.11n HT20	1 to 11	1	OFDM	BPSK	6.5
BT-LE	0 to 39	39	DTS	GFSK	1

**POWER LINE CONDUCTED EMISSION TEST:**

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 HT20	1 to 11	11	OFDM	BPSK	6.5

**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE<1G	22deg. C, 54%RH	DC 5V from adaptor	Vincent
RE≥1G	22deg. C, 54%RH	DC 5V from adaptor	Vincent
PLC	24deg. C, 55%RH	DC 5V from adaptor	Joho Wen



## 2.3 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**

**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.

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

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



### 3 TEST TYPES AND RESULTS

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ 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.

##### 3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR3	101900	Mar. 15,18	Mar. 14,19
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Mar. 15,18	Mar. 14,19

**NOTE:**

1. The test was performed in CE shielded 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.



### 3.1.3 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.

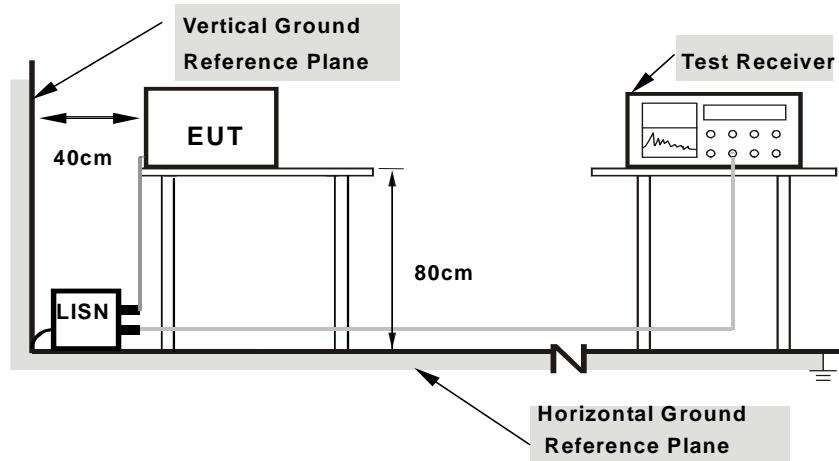
**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

### 3.1.4 DEVIATION FROM TEST STANDARD

No deviation.



### 3.1.5 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 cm from other units and other metal planes

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

### 3.1.6 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.



### 3.1.7 TEST RESULTS

#### CONDUCTED WORST-CASE DATA:

Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	24deg. C, 55RH
Tested By	Joho Wen	TEST DATE	2018/5/24

Frequency (MHz)	QuasiPeak (dB <sub>AV</sub> )	CAverage (dB <sub>AV</sub> )	Limit (dB <sub>AV</sub> )	Margin (dB)	Line	Filter	Corr. (dB)
0.156000	---	28.54	55.67	-27.13	L	ON	9.6
0.156000	41.31	---	65.67	-24.36	L	ON	9.6
0.392000	---	17.92	48.02	-30.10	L	ON	9.7
0.392000	32.42	---	58.02	-25.60	L	ON	9.7
0.484000	---	22.68	46.27	-23.59	L	ON	9.7
0.484000	33.40	---	56.27	-22.87	L	ON	9.7
0.800000	---	16.68	46.00	-29.32	L	ON	9.7
0.800000	28.82	---	56.00	-27.18	L	ON	9.7
17.556000	---	34.23	50.00	-15.77	L	ON	9.9
17.556000	42.85	---	60.00	-17.15	L	ON	9.9
17.896000	---	33.56	50.00	-16.44	L	ON	9.9
17.896000	42.52	---	60.00	-17.48	L	ON	9.9

**REMARKS:** 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

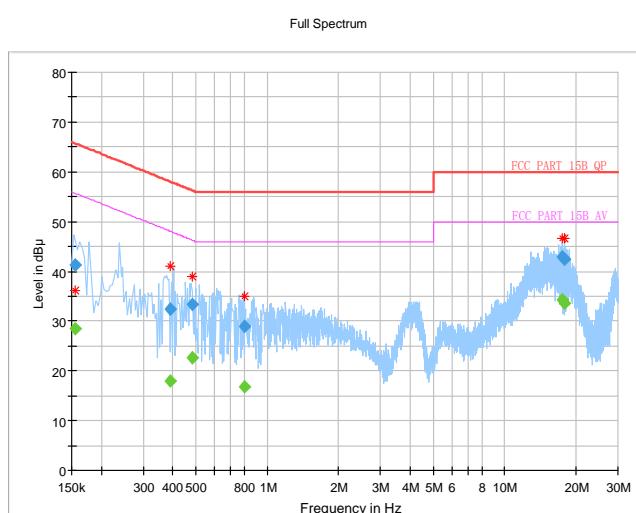
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

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.



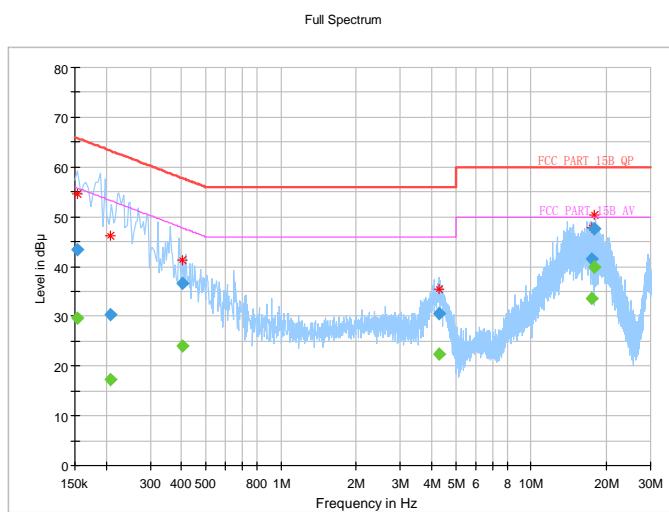


Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	24deg. C, 55RH
Tested By	Joho Wen	TEST DATE	2018/5/24

Frequency (MHz)	QuasiPeak (dB <sup>1/2</sup> V)	CAverage (dB <sup>1/2</sup> V)	Limit (dB <sup>1/2</sup> V)	Margin (dB)	Line	Filter	Corr. (dB)
0.154000	---	29.63	55.78	-26.15	N	ON	9.9
0.154000	43.41	---	65.78	-22.37	N	ON	9.9
0.208000	---	17.20	53.28	-36.08	N	ON	9.9
0.208000	30.35	---	63.28	-32.93	N	ON	9.9
0.404000	---	23.91	47.77	-23.86	N	ON	10.1
0.404000	36.68	---	57.77	-21.09	N	ON	10.1
4.280000	---	22.32	46.00	-23.68	N	ON	9.8
4.280000	30.67	---	56.00	-25.33	N	ON	9.8
17.516000	---	33.60	50.00	-16.40	N	ON	10.0
17.516000	41.53	---	60.00	-18.47	N	ON	10.0
<b>17.928000</b>	<b>---</b>	<b>39.91</b>	<b>50.00</b>	<b>-10.09</b>	<b>N</b>	<b>ON</b>	<b>10.0</b>
17.928000	47.61	---	60.00	-12.39	N	ON	10.0

**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.





### 3.2 RADIATED EMISSION MEASUREMENT

#### 3.2.1 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 (dB<sub>u</sub>V/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.



### 3.2.2 TEST INSTRUMENTS

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-003 61	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, GRRG/CHINA and NIM/CHINA.  
2. The test was performed in 3m Chamber.  
3. The FCC Site Registration No. is 525120.



### 3.2.3 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/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.

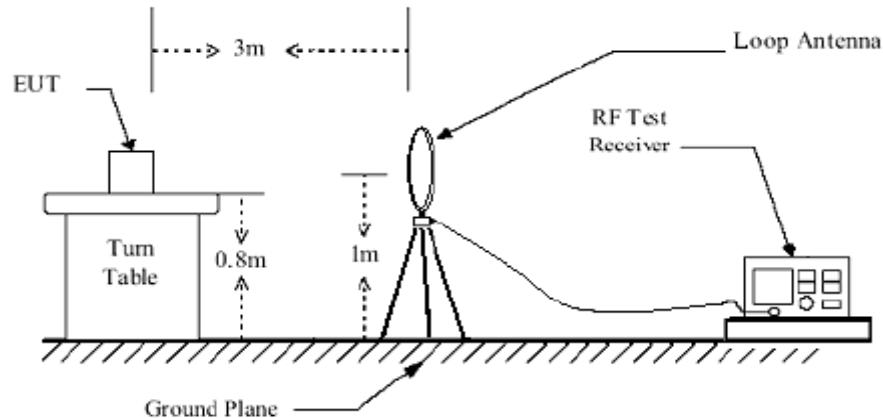
### 3.2.4 DEVIATION FROM TEST STANDARD

No deviation

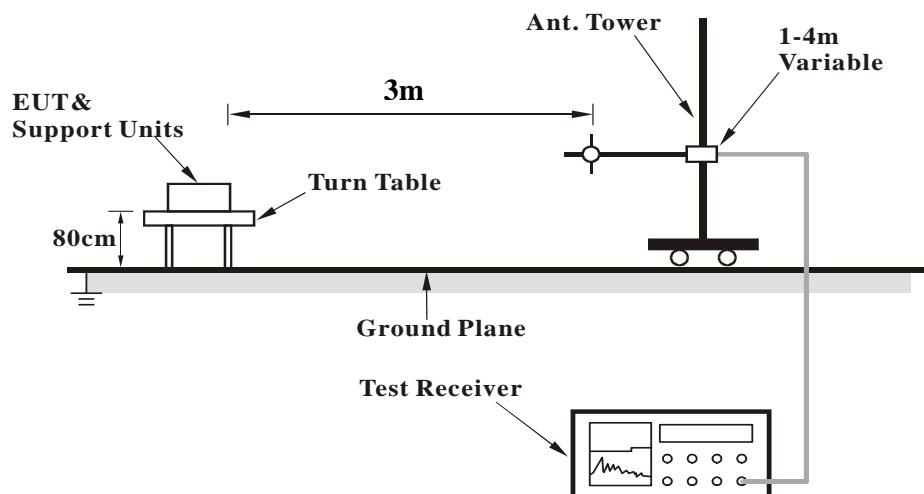


### 3.2.5 TEST SETUP

#### < Frequency Range below 30MHz >

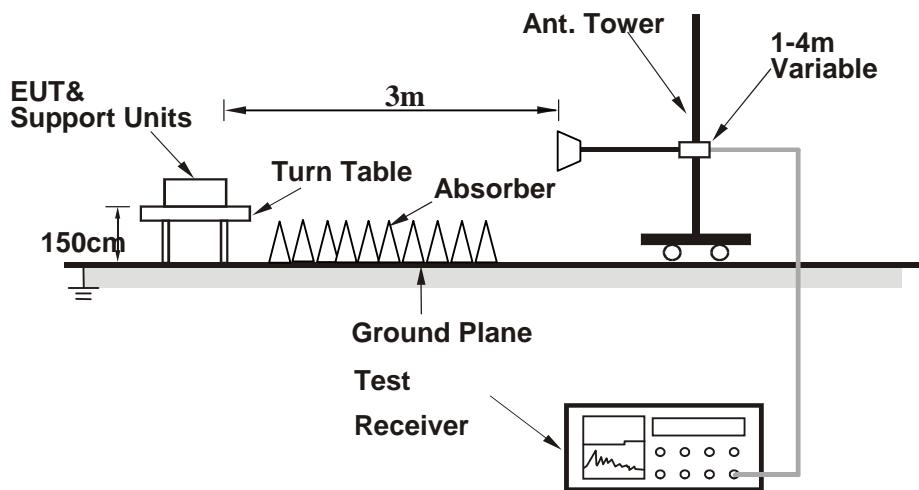


#### < Frequency Range 30MHz~1GHz >





<Frequency Range above 1GHz>



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

### 3.2.6 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.



### 3.2.7 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:

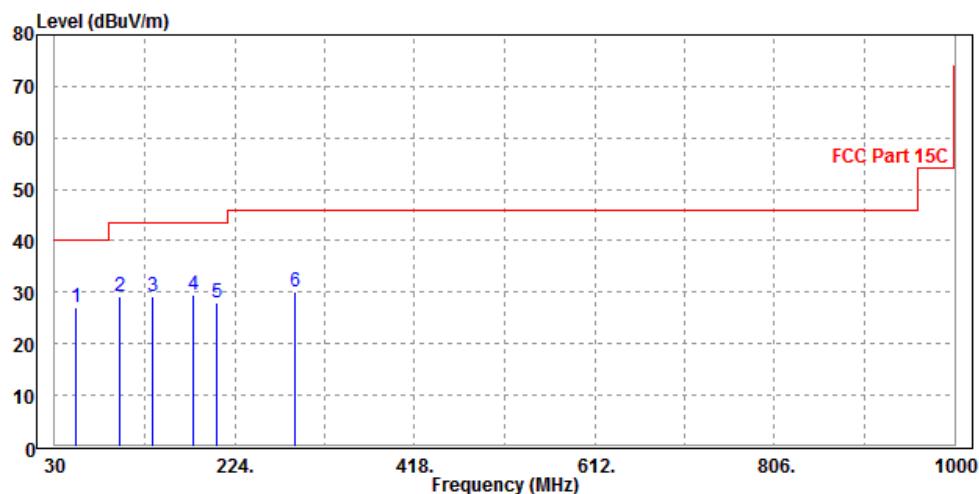
**802.11n (20MHz)**

CHANNEL	TX Channel 11	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
53.14	27.13	56.92	40	-12.87	6.47	1.1	37.36	200	0	QP
100.39	29.26	56.72	43.5	-14.24	7.99	1.54	36.99	200	0	QP
135.85	29.13	56.37	43.5	-14.37	7.83	1.79	36.86	200	0	QP
178.78	29.4	54.12	43.5	-14.1	9.92	2.05	36.69	200	0	QP
204.51	27.97	52	43.5	-15.53	10.31	2.2	36.54	200	0	QP
289.62	30.07	51.03	46	-15.93	12.88	2.66	36.5	200	0	QP

#### REMARKS:

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



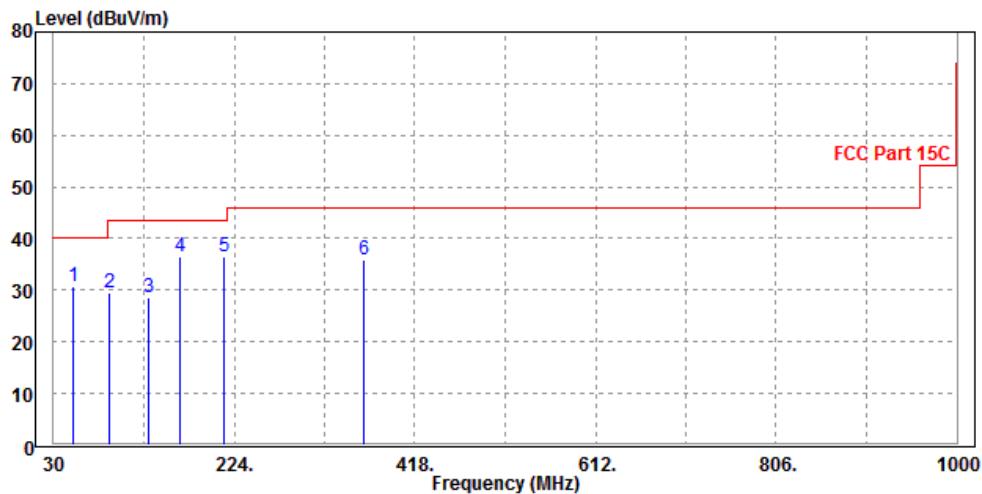


CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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
51.13	30.76	60.56	40	-9.24	6.49	1.08	37.37	100	0	QP
89.19	29.4	58.12	43.5	-14.1	6.88	1.45	37.05	100	0	QP
132.01	28.68	56.12	43.5	-14.82	7.68	1.76	36.88	100	0	QP
165.55	36.59	61.23	43.5	-6.91	10.12	1.97	36.73	100	0	QP
212.35	36.59	60.22	43.5	-6.91	10.67	2.24	36.54	100	0	QP
362.58	35.79	53.81	46	-10.21	15.63	2.99	36.64	100	0	QP

**REMARKS:**

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





**ABOVE 1GHz WORST-CASE DATA:**

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

**802.11n (20MHz)**

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	42.24	50.99	54	-11.76	32.29	4.88	45.92	100	98	Average	
2390	51.66	60.41	74	-22.34	32.29	4.88	45.92	100	98	Peak	
2462	96.18	104.76			32.36	4.96	45.9	100	98	Average	
2462	105.08	113.66			32.36	4.96	45.9	100	98	Peak	
2483.5	46.46	54.99	54	-7.54	32.38	4.98	45.89	100	98	Average	
2483.5	63.34	71.87	74	-10.66	32.38	4.98	45.89	100	98	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	44.49	53.24	54	-9.51	32.29	4.88	45.92	100	98	Average	
2390	51.03	59.78	74	-22.97	32.29	4.88	45.92	100	98	Peak	
2462	96.96	105.54			32.36	4.96	45.9	100	98	Average	
2462	102.84	111.42			32.36	4.96	45.9	100	98	Peak	
<b>2483.5</b>	<b>47.33</b>	<b>55.86</b>	<b>54</b>	<b>-6.67</b>	<b>32.38</b>	<b>4.98</b>	<b>45.89</b>	<b>100</b>	<b>98</b>	<b>Average</b>	
2483.5	65.01	73.54	74	-8.99	32.38	4.98	45.89	100	98	Peak	

**REMARKS:**

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



**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:**

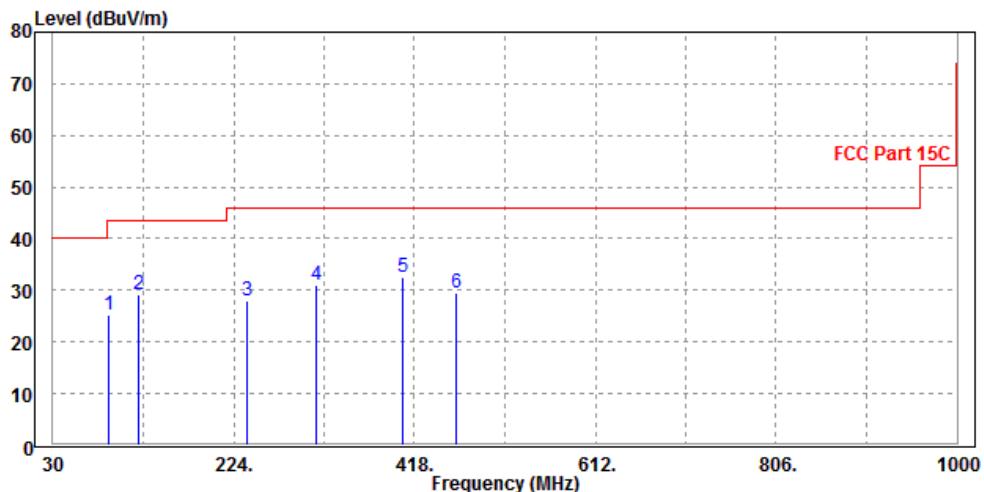
**BT-LE (GFSK)**

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
89.12	25.31	54.04	43.5	-18.19	6.87	1.45	37.05	100	360	QP
122.61	29.13	56.98	43.5	-14.37	7.38	1.7	36.93	100	360	QP
238.78	28.04	50.29	46	-17.96	11.88	2.39	36.52	100	360	QP
312.06	31.17	51.42	46	-14.83	13.51	2.77	36.53	100	360	QP
405.05	32.48	48.78	46	-13.52	17.26	3.17	36.73	100	360	QP
462.85	29.51	45.09	46	-16.49	17.95	3.34	36.87	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



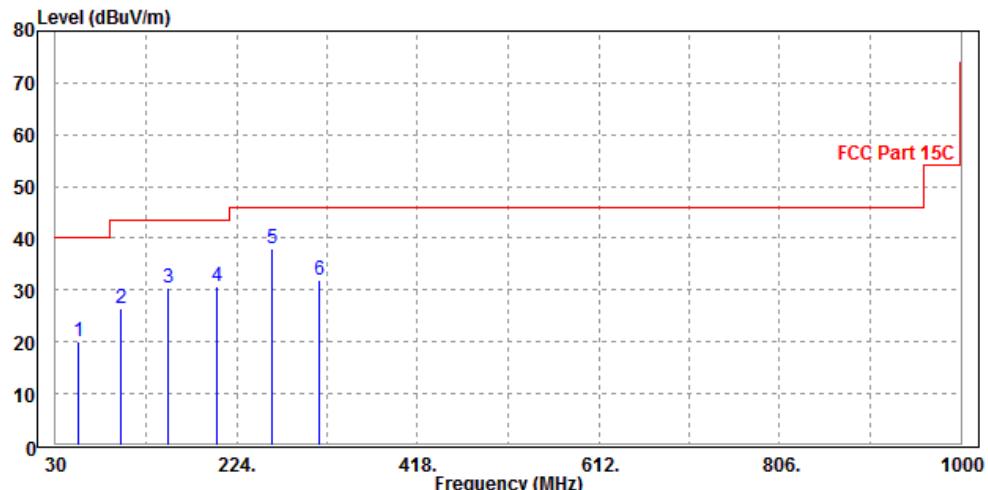


CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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
55.12	20.11	49.88	40	-19.89	6.45	1.13	37.35	100	0	QP
99.56	26.55	54.05	43.5	-16.95	7.95	1.54	36.99	100	0	QP
150.82	30.29	55.92	43.5	-13.21	9.28	1.88	36.79	100	0	QP
203.62	30.68	54.76	43.5	-12.82	10.27	2.19	36.54	100	0	QP
262.01	38.02	59.49	46	-7.98	12.54	2.51	36.52	100	0	QP
312.1	31.79	52.04	46	-14.21	13.51	2.77	36.53	100	0	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





**BUREAU  
VERITAS** Test Report No.: RF180522W002-2

**ABOVE 1GHz TEST DATA:**

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

**BT-LE (GFSK)**

<b>CHANNEL</b>	TX Channel 39	<b>DETECTOR FUNCTION</b>		Peak (PK)
<b>FREQUENCY RANGE</b>	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	43.12	54	-16.36	32.29	8.15	45.92	100	15	Average
2390	58.75	64.23	74	-15.25	32.29	8.15	45.92	100	15	Peak
2480	95.29	100.5			32.38	8.31	45.9	100	15	Average
2480	106.36	111.57			32.38	8.31	45.9	100	15	Peak
2483.5	39.46	44.65	54	-14.54	32.38	8.32	45.89	100	15	Average
2483.5	60.09	65.28	74	-13.91	32.38	8.32	45.89	100	15	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	38.58	44.06	54	-15.42	32.29	8.15	45.92	100	170	Average
2390	56.75	62.23	74	-17.25	32.29	8.15	45.92	100	170	Peak
2480	96.38	101.59			32.38	8.31	45.9	100	170	Average
2480	103.02	108.23			32.38	8.31	45.9	100	170	Peak
2483.5	36.07	41.26	54	-17.93	32.38	8.32	45.89	100	170	Average
2483.5	57.04	62.23	74	-16.96	32.38	8.32	45.89	100	170	Peak

**REMARKS:**

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



**BUREAU  
VERITAS** Test Report No.: RF180522W002-2

## 4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## **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---**