

FCC Test Report (BT-LE) Report No.: RFBDKG-WTW-P20120012 FCC ID: JNZRR0017 Test Model: RR0017 Received Date: Feb. 27, 2021 Test Date: Feb. 27 to Mar. 23, 2021 Issued Date: Mar. 30, 2021 Applicant: Logitech Far East Ltd Address: #2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C. Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan FCC Registration / 723255 / TW2022 **Designation Number:**



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Release Control Record

Issue No.	Description	Date Issued
RFBDKG-WTW-P20120012	Original release.	Mar. 30, 2021



1 Certificate of Conformity

Product:	REMOTE
Brand:	Logitech
Test Model:	RR0017
Sample Status:	Engineering sample
Applicant:	Logitech Far East Ltd
Test Date:	Feb. 27 to Mar. 23, 2021
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247)
	ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan 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 : _	Vivian Huang / Specialist	_, Date:	Mar. 30, 2021	
Approved by:	Clark Lin / Technical Manager	_, Date:	Mar. 30, 2021	



2 Summary of Test Results

	47 CFR FCC Part 15, St	bpart C (Sec	ction 15.247)
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	NA	Without AC power port of the EUT.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -4.5 dB at 34.70 MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is Pogo pin not a standard connector.

Note:

- 1. For 2.4 GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A.
- 2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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	Expanded Uncertainty (k=2) (±)
Conducted emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.



3 General Information

3.1 General Description of EUT (BT-LE)

Product	REMOTE
Brand	Logitech
Test Model	RR0017
Status of EUT	Engineering sample
Power Supply Rating	DC 3V from battery
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 1 Mbps
Operating Frequency	2.402 ~ 2.480 GHz
Number of Channel	40
Output Power	1.419 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x2
Cable Supplied	NA

Note:

1. The EUT may have a lot of colors for marketing requirement.

2. The EUT could be supplied with battery as the following table:

Brand Name	Model No.	Spec.
Panasonic	CR2032	DC 3V

3. The antenna provided to the EUT, please refer to the following table:

Antenna Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
4.34	2.4-2.4835	Dipole	Pogo pin

4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

5. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.



3.2 Description of Test Modes

40 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (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



3.2.1 Test Mode Applicability and Tested Channel Detail

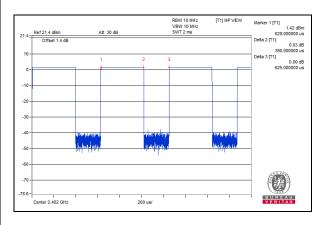
EUT		APPLICABLE TO			DESCRIPTION
ONFIGURE MODE	RE≥1G	RE<1G	PLC AI	РСМ	DESCRIPTION
-	\checkmark	\checkmark	-		-
ere	G: Radiated ledge Measure	Emission above 1GHz &	RE<1G: Radiated Er	nission below 10	GHz
		Conducted Emission	APCM: Antenna Por		
			d of each 3 axis. The wor ue to the EUT is powered		nd when positioned on X-plane.
			•	, ,	
adiated Emi	ission Te	st (Above 1GHz):			
_					
					l possible combinations
architectur		iodulations, data rat	es and antenna por	S (II EUT WIT	antenna diversity
_	,) was (were) selecte	ed for the final test a	s listed below	
		,			-
AVAIL. CHAN		TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
		0.40.20	OFEK	1	
0 to	39	0, 19, 39	GFSK	1	
Pre-Scan between a architectur	has been available m re).	odulations, data rat	es and antenna por	s (if EUT with	
 Pre-Scan between a architectur Following 	has been available m re). channel(s	conducted to detern nodulations, data rat		s (if EUT with	antenna diversity
Pre-Scan between a architectur	has been available m re). channel(s ABLE	conducted to detern nodulations, data rat	es and antenna por	s (if EUT with	antenna diversity
 Pre-Scan between a architectur Following 	has been available m re). channel(s ABLE INEL	conducted to detern nodulations, data rat) was (were) selecte	es and antenna port ed for the final test a	s (if EUT with s listed below	antenna diversity
 Pre-Scan between a architectur Following AVAIL CHAN 0 to Intenna Port This item i mode. Pre-Scan between a architectur	has been available m re). channel(s ABLE NNEL 39 t Conduct includes a has been available m re).	conducted to detern nodulations, data rat) was (were) selecte TESTED CHANNEL 39 ed Measurement: Il test value of each conducted to detern nodulations, data rat	es and antenna port ed for the final test a MODULATION TYPE GFSK mode, but only inclu nine the worst-case es and antenna port	s (if EUT with s listed below DATA RATE (1 ides spectrum mode from al s (if EUT with	mantenna diversity
 Pre-Scan between a architectur Following AVAIL CHAN 0 to Intenna Port This item i mode. Pre-Scan between a architectur	has been available m re). channel(s ABLE NNEL 39 t Conduct includes a has been available m re).	conducted to detern nodulations, data rat) was (were) selecte TESTED CHANNEL 39 ed Measurement: Il test value of each conducted to detern nodulations, data rat	es and antenna port ed for the final test a MODULATION TYPE GFSK mode, but only inclu	s (if EUT with s listed below DATA RATE (1 ides spectrum mode from al s (if EUT with	mantenna diversity
 Pre-Scan between a architectur Following AVAIL CHAN 0 to Intenna Port This item i mode. Pre-Scan between a architectur	has been available m re). channel(s NEL 39 t Conduct includes a has been available m re). channel(s	conducted to detern nodulations, data rat) was (were) selecte TESTED CHANNEL 39 ed Measurement: Il test value of each conducted to detern nodulations, data rat	es and antenna port ed for the final test a MODULATION TYPE GFSK mode, but only inclu nine the worst-case es and antenna port	s (if EUT with s listed below DATA RATE (1 ides spectrum mode from al s (if EUT with	n antenna diversity Mbps) n plot of worst value of eac l possible combinations n antenna diversity
 Pre-Scan between a architectur Following AVAIL CHAN 0 to Intenna Port This item i mode. Pre-Scan between a architectur Following AVAIL	has been available m re). channel(s ABLE NEL 339 t Conduct as been available m re). channel(s ABLE NNEL	conducted to determ nodulations, data rat) was (were) selecte TESTED CHANNEL 39 ed Measurement: Il test value of each conducted to determ nodulations, data rat	es and antenna port ed for the final test a MODULATION TYPE GFSK mode, but only inclu nine the worst-case es and antenna port ed for the final test a	s (if EUT with s listed below DATA RATE (1 ides spectrum mode from al s (if EUT with s listed below	n antenna diversity Mbps) n plot of worst value of eac I possible combinations n antenna diversity
 Pre-Scan between a architectur Following AVAIL CHAN 0 to Intenna Port This item i mode. Pre-Scan between a architectur Following AVAIL AVAIL	has been available m re). channel(s ABLE NEL 339 t Conduct as been available m re). channel(s ABLE NNEL	conducted to determ nodulations, data rat) was (were) selected TESTED CHANNEL 39 ed Measurement: Il test value of each conducted to determ nodulations, data rat) was (were) selected TESTED CHANNEL	es and antenna port ed for the final test a MODULATION TYPE GFSK mode, but only inclu nine the worst-case es and antenna port ed for the final test a MODULATION TYPE	s (if EUT with s listed below DATA RATE (1 ides spectrum mode from al s (if EUT with s listed below DATA RATE (n antenna diversity Mbps) n plot of worst value of eac I possible combinations n antenna diversity
 Pre-Scan between a architectur Following AVAIL O to ntenna Port This item i mode. Pre-Scan between a architectur Following AVAIL AVAIL	has been available m re). channel(s ABLE NNEL 339 t Conduct includes a has been available m re). channel(s ABLE NNEL 39	conducted to determ nodulations, data rat) was (were) selected TESTED CHANNEL 39 ed Measurement: Il test value of each conducted to determ nodulations, data rat) was (were) selected TESTED CHANNEL	es and antenna port ed for the final test a MODULATION TYPE GFSK mode, but only inclu nine the worst-case es and antenna port ed for the final test a MODULATION TYPE	s (if EUT with s listed below DATA RATE (1 ides spectrum mode from al s (if EUT with s listed below DATA RATE (n antenna diversity Mbps) n plot of worst value of each l possible combinations n antenna diversity

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 71%RH	3Vdc	Sampon Chen
RE<1G	24deg. C, 66%RH	3Vdc	Sampon Chen
APCM	25deg. C, 60%RH	3Vdc	Jyunchun Lin



3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered. Duty cycle = 0.39 ms/0.625 ms = 0.624, Duty factor = 10 * log(1/Duty cycle) = 2.05 dB





3.4 Description of Support Units

The EUT has been tested as an independent unit.

3.4.1 Configuration of System under Test

Battery*2	
EUT	



3.5 General Description of Applied Standards and References

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

Test Standard: FCC Part 15, Subpart C (15.247) ANSI C63.10-2013

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

References Test Guidance: KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.



4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.

- 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 3. 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.



4.1.2 Test Instruments

For Radiated Emission Test (Above 1GHz):

DESCRIPTION &	MODEL NO.	SERIAL NO.	CALIBRATED	CALIBRATED
MANUFACTURER	MODEL NO.	SERIAL NO.	DATE	UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 01, 2020	Nov. 30, 2021
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 22, 2020	Nov. 21, 2021
Pre-Amplifier EMCI	EMC 12630 SE		Apr. 08, 2020	Apr. 07, 2021
RF Cable	EMC104-SM-SM-1200	160922	Dec. 25, 2020	Dec. 24, 2021
RF Cable	EMC104-SM-SM-2000	180502	Apr. 29, 2020	Apr. 28, 2021
RF Cable	EMC104-SM-SM-6000	180418	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 22, 2020	Nov. 21, 2021
RF Cable	EMC102-KM-KM-1200	160924	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC-KM-KM-4000	200214	Mar. 10, 2021	Mar. 09, 2022
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in 966 Chamber No. 4.

3. Tested Date: Mar. 23, 2021



DESCRIPTION &	MODEL NO.	SERIAL NO.	CALIBRATED	CALIBRATED
MANUFACTURER	WODEL NO.	SERIAL NO.	DATE	UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 01, 2020	Nov. 30, 2021
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Mar. 05, 2021	Mar. 04, 2022
RF Cable	5D-FB	LOOPCAB-001	Jan. 07, 2021	Jan. 06, 2022
RF Cable	5D-FB	LOOPCAB-002	Jan. 07, 2021	Jan. 06, 2022
Pre-Amplifier EMCI	EMC330N	980701	Mar. 10, 2021	Mar. 09, 2022
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 06, 2020	Nov. 05, 2021
RF Cable	8D	966-6-1	Apr. 04, 2020	Apr. 03, 2021
RF Cable	8D	966-4-2	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-3	Mar. 18, 2020	Mar. 17, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	Jan. 11, 2021	Jan. 10, 2022
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

For Radiated Emission Test (Below 1GHz):

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in 966 Chamber No. 4.

3. Tested Date: Mar. 11, 2021



For Band-Edge Test:					
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL	
Test Receiver Agilent	N9038A	MY51210202	Dec. 01, 2020	Nov. 30, 2021	
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 22, 2020	Nov. 21, 2021	
Pre-Amplifier EMCI	EMC 12630 SE	980638	Apr. 08, 2020	Apr. 07, 2021	
RF Cable	EMC104-SM-SM-1200	160922	Dec. 25, 2020	Dec. 24, 2021	
RF Cable	EMC104-SM-SM-2000	180502	Apr. 29, 2020	Apr. 28, 2021	
RF Cable	EMC104-SM-SM-6000	180418	Apr. 29, 2020	Apr. 28, 2021	
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 11, 2021	Jan. 10, 2022	
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 22, 2020	Nov. 21, 2021	
RF Cable	EMC102-KM-KM-1200	160924	Jan. 11, 2021	Jan. 10, 2022	
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021	
Software	ADT_Radiated_V8.7.08	NA	NA	NA	
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA	

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in 966 Chamber No. 4.

3. Tested Date: Feb. 27, 2021



For other test items:					
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL	
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021	
Power meter Anritsu	ML2495A	1529002	July 22, 2020	July 21, 2021	
Power sensor Anritsu	MA2411B	1339443	July 22, 2020	July 21, 2021	
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021	
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA	

NOTE: 1. The test was performed in Oven room 2.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

3. Tested Date: Mar. 12, 2021



4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case 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 Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 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 height of antenna 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasipeak 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 ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
- 4. All modes of operation were investigated and the worst-case emissions are reported.

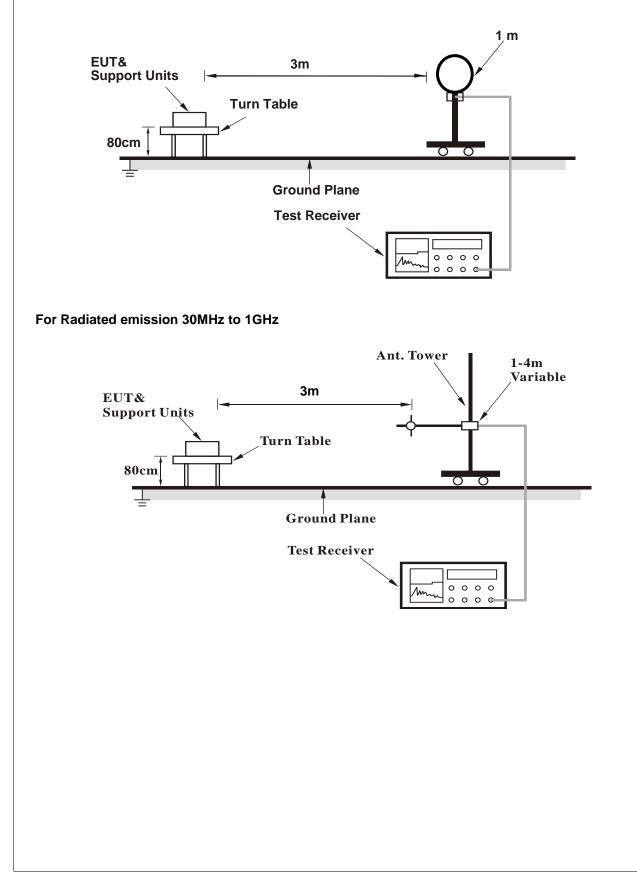
4.1.4 Deviation from Test Standard

No deviation.

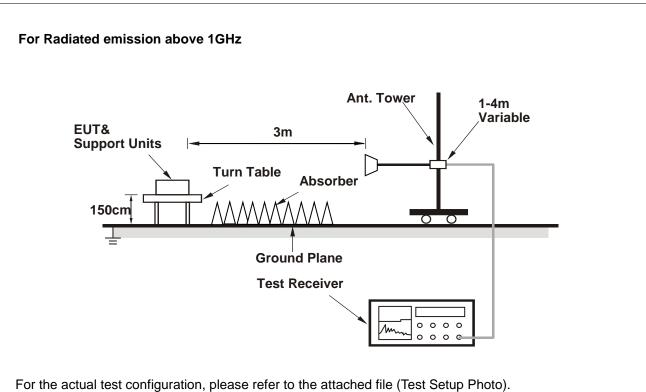


4.1.5 Test Setup

For Radiated emission below 30MHz







- 4.1.6 EUT Operating Conditions
- a. Placed the EUT on the testing table.
- b. Controlling software (nRFgo Studio [v1.21.2.10]) has been activated to set the EUT under transmission condition continuously at specific channel frequency.



4.1.7 Test Results

Above 1GHz Data:

RF Mode	TX BT_LE-1M	Channel	CH 0:2402 MHz
Frequency Range	1GHz ~ 25GHz	Detector Eurotion	Peak (PK)
		Detector Function	Average (AV)

	Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)	
1	2377.00	53.5 PK	74.0	-20.5	1.88 H	102	57.9	-4.4	
2	2377.00	42.6 AV	54.0	-11.4	1.88 H	102	47.0	-4.4	
3	*2402.00	97.0 PK			1.88 H	102	101.4	-4.4	
4	*2402.00	96.0 AV			1.88 H	102	100.4	-4.4	
5	4804.00	55.7 PK	74.0	-18.3	1.04 H	69	55.7	0.0	
6	4804.00	47.8 AV	54.0	-6.2	1.04 H	69	47.8	0.0	
		Ante	enna Polarit	y & Test Di	stance : Ver	tical at 3 m			
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)	
1	2381.00	53.1 PK	74.0	-20.9	3.44 V	360	57.5	-4.4	
2	2381.00	42.4 AV	54.0	-11.6	3.44 V	360	46.8	-4.4	
3	*2402.00	92.1 PK			3.44 V	360	96.5	-4.4	
4	*2402.00	91.0 AV			3.44 V	360	95.4	-4.4	
5	4804.00	44.7 PK	74.0	-29.3	1.56 V	212	44.7	0.0	

Remarks:

4804.00

6

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)

-15.3

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

1.56 V

212

38.7

0.0

3. Margin value = Emission Level – Limit value

38.7 AV

4. The other emission levels were very low against the limit.

54.0

5. " * ": Fundamental frequency.



RF Mode	TX BT_LE-1M	Channel	CH 19:2440 MHz
Eroquonov Bongo		Detector Eurotion	Peak (PK)
Frequency Range	1GHz ~ 25GHz	Detector Function	Average (AV)

	Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)	
1	*2440.00	97.5 PK			1.59 H	103	101.9	-4.4	
2	*2440.00	96.5 AV			1.59 H	103	100.9	-4.4	
3	4880.00	56.5 PK	74.0	-17.5	1.04 H	64	56.4	0.1	
4	4880.00	48.1 AV	54.0	-5.9	1.04 H	64	48.0	0.1	
5	7320.00	44.4 PK	74.0	-29.6	1.21 H	181	38.1	6.3	
6	7320.00	34.9 AV	54.0	-19.1	1.21 H	181	28.6	6.3	

Antenna Polarity & Test Distance : Vertical at 3 m

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	92.9 PK			3.78 V	353	97.3	-4.4
2	*2440.00	91.9 AV			3.78 V	353	96.3	-4.4
3	4880.00	44.8 PK	74.0	-29.2	1.52 V	219	44.7	0.1
4	4880.00	38.8 AV	54.0	-15.2	1.52 V	219	38.7	0.1
5	7320.00	42.8 PK	74.0	-31.2	1.35 V	178	36.5	6.3
6	7320.00	32.7 AV	54.0	-21.3	1.35 V	178	26.4	6.3

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. Margin value = Emission Level – Limit value

4. The other emission levels were very low against the limit.

5. " * ": Fundamental frequency.



RF Mode	TX BT_LE-1M	Channel	CH 39:2480 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK)
Frequency Range	1GHZ ~ 25GHZ		Average (AV)

		Anter	na Polarity	& Test Dist	ance : Horiz	zontal at 3 n	n	
No	Frequency (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	97.6 PK			1.79 H	104	102.1	-4.5
2	*2480.00	96.7 AV			1.79 H	104	101.2	-4.5
3	2483.50	60.2 PK	74.0	-13.8	1.79 H	104	64.7	-4.5
4	2483.50	42.8 AV	54.0	-11.2	1.79 H	104	47.3	-4.5
5	4960.00	57.7 PK	74.0	-16.3	1.09 H	58	57.1	0.6
6	4960.00	48.8 AV	54.0	-5.2	1.09 H	58	48.2	0.6
7	7440.00	44.1 PK	74.0	-29.9	1.15 H	174	37.4	6.7
8	7440.00	34.6 AV	54.0	-19.4	1.15 H	174	27.9	6.7
		Ante	enna Polarit	y & Test Dis	stance : Ver	tical at 3 m		
No	Frequency (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	92.3 PK			3.99 V	352	96.8	-4.5
2	*2480.00	91.2 AV			3.99 V	352	95.7	-4.5
3	2499.00	53.0 PK	74.0	-21.0	3.99 V	352	57.5	-4.5
4	2499.00	42.7 AV	54.0	-11.3	3.99 V	352	47.2	-4.5

7440.00 **Remarks:**

5

6

7

8

4960.00

4960.00

7440.00

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)

1.52 V

1.52 V

1.34 V

1.34 V

226

226

174

174

44.3

38.3

36.0

25.8

0.6

0.6

6.7

6.7

-29.1

-15.1

-31.3

-21.5

3. Margin value = Emission Level – Limit value

44.9 PK

38.9 AV

42.7 PK

32.5 AV

4. The other emission levels were very low against the limit.

74.0

54.0

74.0

54.0

5. " * ": Fundamental frequency.



Below 1GHz Data:

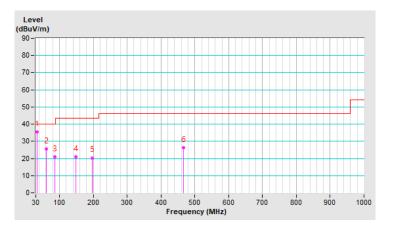
RF Mode	TX BT_LE-1M	Channel	CH 39:2480 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

	Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)	
1	34.70	35.5 QP	40.0	-4.5	2.00 H	72	49.1	-13.6	
2	60.53	25.4 QP	40.0	-14.6	2.00 H	340	38.9	-13.5	
3	85.41	21.0 QP	40.0	-19.0	2.00 H	140	39.6	-18.6	
4	147.54	20.9 QP	43.5	-22.6	1.00 H	352	33.5	-12.6	
5	196.11	20.4 QP	43.5	-23.1	2.00 H	347	36.2	-15.8	
6	467.23	26.3 QP	46.0	-19.7	2.00 H	132	34.0	-7.7	

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. Margin value = Emission Level Limit value
- 4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
- 5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



RF Mode	TX BT_LE-1M	Channel	CH 39:2480 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

	Antenna Polarity & Test Distance : Vertical at 3 m							
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	34.51	26.2 QP	40.0	-13.8	1.50 V	0	39.8	-13.6
2	60.51	30.0 QP	40.0	-10.0	1.50 V	360	43.5	-13.5
3	117.52	24.0 QP	43.5	-19.5	1.00 V	30	38.9	-14.9
4	157.51	23.9 QP	43.5	-19.6	1.00 V	78	36.4	-12.5
5	615.71	30.6 QP	46.0	-15.4	2.00 V	190	35.1	-4.5
6	896.28	37.0 QP	46.0	-9.0	2.00 V	259	36.9	0.1

Remarks:

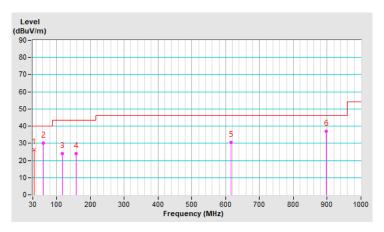
1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. Margin value = Emission Level - Limit value

4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.

5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



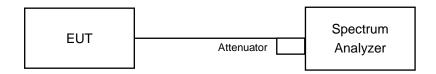


4.2 6dB Bandwidth Measurement

4.2.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

- a. Set resolution bandwidth (RBW) = 100kHz
- b. Set the video bandwidth (VBW) \ge 3 x RBW, Detector = Peak.
- c. Trace mode = max hold.
- d. Sweep = auto couple.
- e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.2.5 Deviation from Test Standard

No deviation.

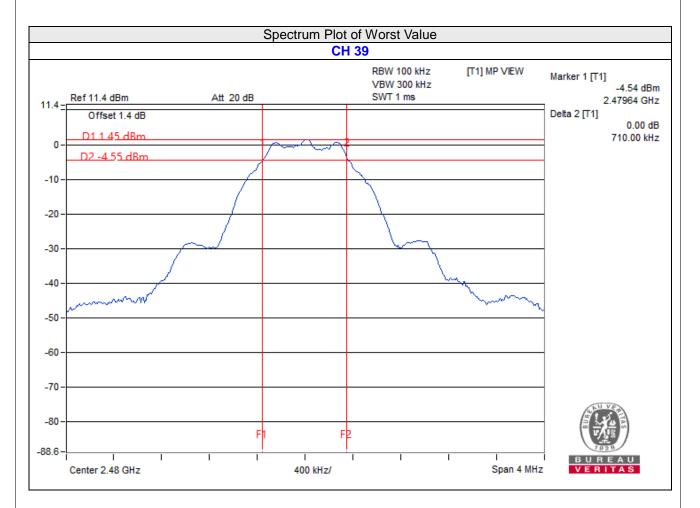
4.2.6 EUT Operating Conditions

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



4.2.7 Test Results

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.72	0.5	Pass
19	2440	0.72	0.5	Pass
39	2480	0.71	0.5	Pass





4.3 Conducted Output Power Measurement

4.3.1 Limits of Conducted Output Power Measurement

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

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 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.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.3.6.



4.3.7 Test Results

FOR PEAK POWER

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	1.327	1.23	30	Pass
19	2440	1.387	1.42	30	Pass
39	2480	1.419	1.52	30	Pass

FOR AVERAGE POWER

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	1.312	1.18
19	2440	1.377	1.39
39	2480	1.406	1.48

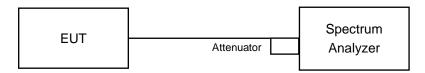


4.4 **Power Spectral Density Measurement**

4.4.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedure

- a. Set analyzer center frequency to DTS channel center frequency.
- b. Set the span to 1.5 times the DTS bandwidth.
- c. Set the RBW to: $3 \text{ kHz} \le \text{RBW} \le 100 \text{ kHz}$.
- d. Set the VBW \geq 3 × RBW.
- e. Detector = peak.
- f. Sweep time = auto couple.
- g. Trace mode = max hold.
- h. Allow trace to fully stabilize.
- i. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.4.5 Deviation from Test Standard

No deviation.

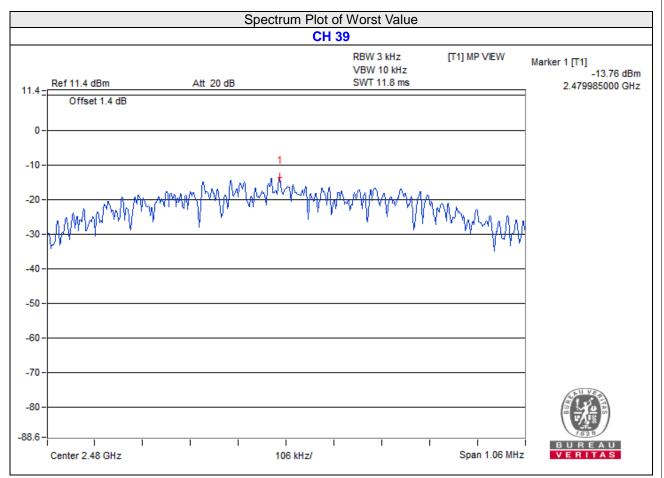
4.4.6 EUT Operating Condition

Same as Item 4.3.6.



4.4.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-13.85	8	Pass
19	2440	-13.85	8	Pass
39	2480	-13.76	8	Pass





4.5 Conducted Out of Band Emission Measurement

4.5.1 Limits of Conducted Out of Band Emission Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

MEASUREMENT PROCEDURE REF

- 1. Set the RBW = 100 kHz.
- 2. Set the VBW \geq 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 OOBE

- 1. Set RBW = 100 kHz.
- 2. Set VBW ≥ 300 kHz.
- 3. Detector = peak.
- 4. Sweep = auto couple.
- 5. Trace Mode = max hold.
- 6. Allow trace to fully stabilize.
- 7. Use the peak marker function to determine the maximum amplitude level.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest and highest channel frequencies individually.

4.5.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



						H 0
	Ref 11.4 dBm	Att 20 dB	RBW 100 kHz VBW 300 kHz SWT 50 ms	[T1] MP VIEW	Marker 1 [T1] 1.26 dBm 2.40200 GHz	RBW 100 kHz [T1] MP VEW Marker 1 [T1] 0.23 VBW 300 kHz VBW 300 kHz 0.23 0.23 11 4Ref 11.4 dBm Att 20 dB SWT 250 ma 2.39902
11.4=	Offset 1.4 dB		1		2.40200 GHZ	11.4 Offset 1.4 dB 1 1
0 -		~~~~~	+			0 - D11.26 dBm 035.28 035.28 035.28 040 040 040 040 040 040 040 040 040 04
-10-						-10
-20 -						-20- D2 -18 74 dBm
-30 -						-30
-40 -						-40
-50 -						-50 -
						والاعداد ومرافق ومساور وتعدارته والماسية والعربة والمال والمتحالية فيرود والرار وتعاقد المرود والمراجع
-60 -						-60
-70 -						-70-
-80 -						-80-
-88.6 -	Center 2.402 GHz	1 1	108 kHz/	Span 1.08 MHz	B U R E A U VERITAS	-88.6- Start 30 MHz 2.497 GHz/ Stop 25 GHz VER 4.0
			RBW 100 kHz	[T1] MP VIEW		RBW 100 Mtz [T1] MP VEW Mediat 1 171
	Ref 11.4 dBm	Att 20 dB	RBW 100 kHz VBW 300 kHz SWT 50 ms	LUD WE VIEW	Marker 1 [T1] 1.28 dBm 2.44000 GHz	VBW 300 kHz 0.81
11.4 <u>-</u>	Offset 1.4 dB		1		2.44000 GHZ	11.4 Offset 1.4 dB Marker 2 [T1] -56.51
0 -			+		-	0- D1128dBm 889.61 Marker 3 [T1] -44.78
-10-						-10
-20 -						-20- D2-18/72 dBm
-30 -						-30
-40 -						-40
-50 -						-50 -
						🕹 🔬 👘 🖓 🕹 🕹 🕹 🕹 🕹 🕹 🕹 🕹 🕹 🕹 🕹 🕹 🕹
-60 -]	
-70 -					ATU VER	-70-
-80 -						-80-
-88.6-	Center 2.44 GHz	1 1	108 kHz/	I I Span 1.08 MHz	B U R E A U VERITAS	-88.6 Start 30 MHz 2.497 GHz/ Stop 25 GHz VERITAS
			100 A 100			
					CH	1 39
	Ref 11.4 dBm	Att 20 dB	RBW 100 kHz VBW 300 kHz SWT 50 ms	[T1] MP VIEW	Marker 1 [T1] 1.41 dBm 2.48000 GHz	RBW 100 Mtz [T1] MP VEW Marker 1 [T1] VBW 300 Mtz 0.72: 114_Ref 11.4 dBm Att 20 dB SWT 250 ma 240015 SWT 250 ma
11.4 _±	Offset 1.4 dBm		1		2.48000 GHz	11.4 Offset 1.4 dB Marker 2 [T1]
0 -		~				0- D114/tdRm 966.37 Marker 3 [11] -4.176
-10-						-10
-20 -						-20 -18 59 dBm
-30 -						-30 -
-40 -						-40
-50 -					1	
-60 -						
-70 -					(U.YP)	.70-
-80 -						-80 -
-88.6-	Center 2.48 GHz	1 1	1 I I I	I I Span 1.06 MHz		-88.6- Start 30 MHz 2.497 GHz/ Stop 25 GHz UREAU
	center 2.48 GHz		106 kHz/		VERITAS	
		CH	0 Band ed			CH 39 Band edge
	Def 44 4 12	44 00 10	RBW 100 kHz VBW 300 kHz	[T1] MP VIEW	Marker 1 [T1] 1.08 dBm 2 40220 GHz	RBW 100 bHz [T1] MP VEW Marker 1 [T1] VBW 300 bHz VBW 300 bHz 1.48 , Ref 11.4 dBm Att 20 dB SWT 1 ms 2.480m
11.4 _±	Ref 11.4 dBm Offset 1.4 dB	Att 20 dB	SWT 1 ms	1	2.40220 GHz Marker 2 [T1] -48.20 dBm 2.40000 GHz	11.4
0 -	D1 1.26 dBm				-48.20 dBm 2.40000 GHz Marker 3 [T1] -48.06 dBm 2 39980 GHz	0 D11+LRm 24050 0 Marte3 (T1550 0 4000 Marte3 (T1550) 0 4000 Mart
-10-					-48.06 dBm 2.39980 GHz	-10
-20 -	D2 -18.74 dBm				2.39980 GHz Marker 4 [T1] -60.28 dBm 2.39000 GHz	-10
				\square	Marker 5 [T1] -57.49 dBm	
20					2.33520 GHz	-30
-30 -						-40
-40 -		5				-50
		tan mining	۸. رویک کرور اللی کرد ور رویک کرد کرد. مراجع	wonder a cond ^{er}	-	-60- ¹⁰
-40 -	y statuly for the states of the second					-70-
-40 - -50 -						-80-
-40 - -50 - -60 -						
-40 - -50 - -60 - -70 -		1 1	1 1 1	F2 F1	BUREAU	-88.6-
-40 - -50 - -60 - -70 - -80 -			1 1 1 10 MHz/	F2 F1	BUREAU VERITAS	FI F2
-40 - -50 - -60 - -70 - -80 -			1 I I 10 MHz/	F2 F1 Span 100 MHz	DUREAU VERITAS	-88.6-
-40 - -50 - -60 - -70 - -80 -		1 1	1 I I 10 MH2/	F2 F1		-88.6-
-40 - -50 - -60 - -70 - -80 -			1 I I 10 MH2/	F2 F1		-88.6-

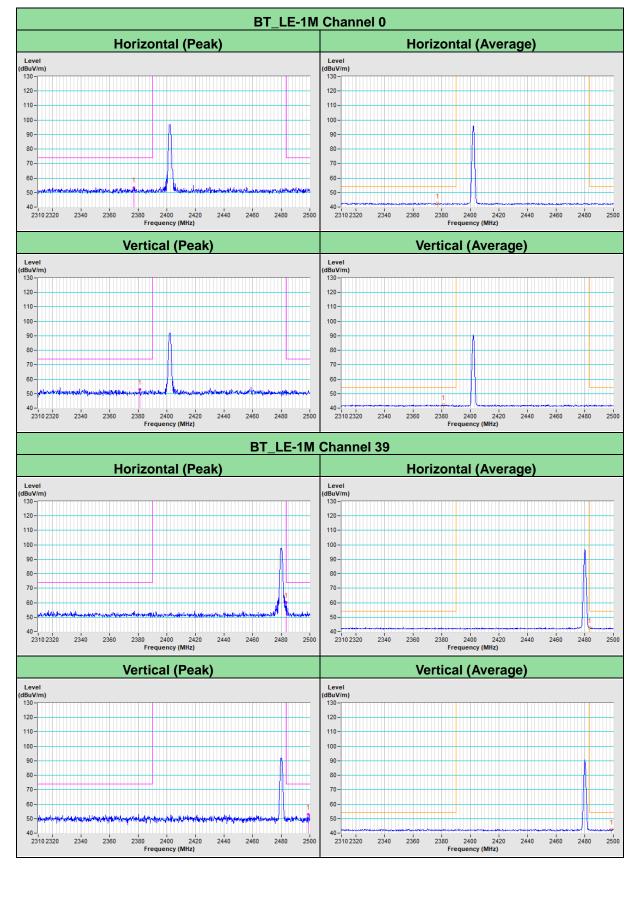


5 Pictures of Test Arrangements

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









Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab

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Email: <u>service.adt@tw.bureauveritas.com</u> Web Site: <u>www.bureauveritas-adt.com</u>

The address and road map of all our labs can be found in our web site also.

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