

FCC Test Report

Report No.: RFBFKV-WTW-P24010580-1

FCC ID: L6AITK100-2

Test Model: ITK100-2

Received Date: 2024/1/25

Test Date: 2024/1/27 ~ 2024/2/2

Issued Date: 2024/3/11

Applicant: BlackBerry

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 788550 / TW0003



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Release Control Record

Issue No.	Description	Date Issued
RFBFKV-WTW-P24010580-1	Original release	2024/3/11

1 Certificate of Conformity

Product: Radar S2 IS

Brand: BlackBerry

Test Model: ITK100-2

Sample Status: Engineering sample

Applicant: BlackBerry

Test Date: 2024/1/27 ~ 2024/2/2

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 RF characteristics under the conditions specified in this report.

Prepared by : Polly Chien, **Date:** 2024/3/11
Polly Chien / Specialist

Approved by : Jeremy Lin, **Date:** 2024/3/11
Jeremy Lin / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	N/A	Power supply is from battery.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -7.3dB at 497.54MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
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	No antenna connector is used.

NA: Not Applicable

Note: 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	Specification	Expanded Uncertainty (k=2) (±)
RF Output Power	-	1.371 dB
Power Spectral Density	-	1.017 dB
6 dB Bandwidth	-	206.5 Hz
Occupied Bandwidth	-	72 Hz
Conducted Out of Band Emissions	9 kHz ~ 40 GHz	2.79 dB
Unwanted Emissions below 1 GHz	9 kHz ~ 30 MHz	3.59 dB
	30 MHz ~ 1 GHz	3.6 dB
Unwanted Emissions above 1 GHz	1 GHz ~ 18 GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Radar S2 IS
Brand	BlackBerry
Test Model	ITK100-2
Sample Status	Engineering sample
Power Supply Rating	3.6Vdc from battery
Modulation Type	half-sine shaped OQPSK
Operating Frequency	903-927MHz
Number of Channel	25
Transfer Rate	80kbps
Output Power	84.140mW
Antenna Type	Refer to note
Antenna Connector	Refer to note
Accessory Device	Refer to note
Cable Supplied	NA

Note:

1. The EUT uses following accessories.

Battery		
Brand	Model	Specification
Blackberry	BAT-63845-001	Power Rating : 3.6Vdc, 19Ah

2. The following antennas were provided to the EUT.

Antenna Type	Connector	Gain(dBi)
Monopole	N/A	2.18

*Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

3.2 Description of Test Modes

25 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	903	11	913	21	923
2	904	12	914	22	924
3	905	13	915	23	925
4	906	14	916	24	926
5	907	15	917	25	927
6	908	16	918		
7	909	17	919		
8	910	18	920		
9	911	19	921		
10	912	20	922		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	Note	√	-

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement

PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1GHz

APCM: Antenna Port Conducted Measurement

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-axis**.
2. Radiated emission test (below 1GHz) chosen the worst maximum power.
3. No need to concern of Conducted Emission due to the EUT is powered by battery.

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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
-	1	903MHz	half-sine shaped OQPSK	80
-	13	915MHz	half-sine shaped OQPSK	80
-	25	927MHz	half-sine shaped OQPSK	80

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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
-	1	903MHz	half-sine shaped OQPSK	80
-	13	915MHz	half-sine shaped OQPSK	80
-	25	927MHz	half-sine shaped OQPSK	80

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.

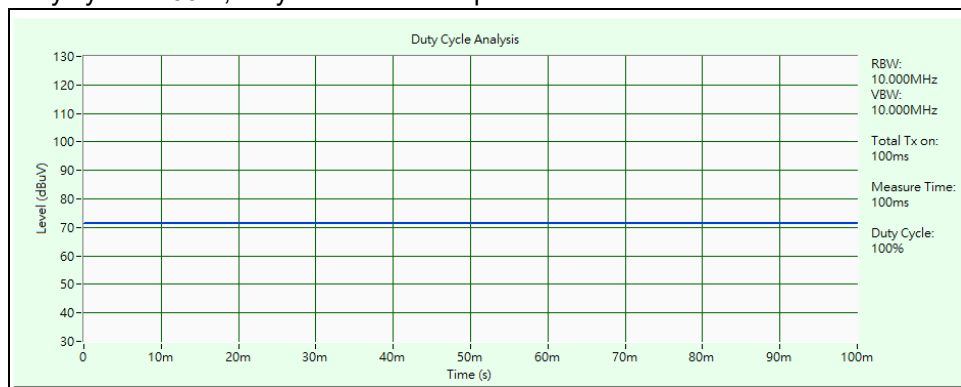
EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (kbps)
-	1	903MHz	half-sine shaped OQPSK	80
-	13	915MHz	half-sine shaped OQPSK	80
-	25	927MHz	half-sine shaped OQPSK	80

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	23 deg. C, 67% RH	3.6Vdc	Adair Peng
RE<1G	23 deg. C, 67% RH	3.6Vdc	Adair Peng
APCM	25 deg. C, 60% RH	3.6Vdc	Grey Lin

3.3 Duty Cycle of Test Signal

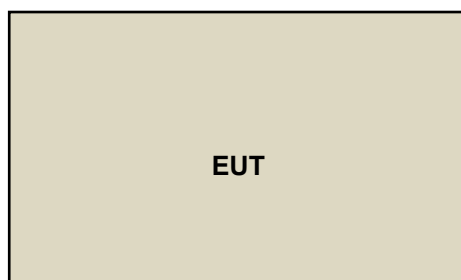
Duty cycle =100%, duty factor is not required.



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.4.1 Configuration of System under Test



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 30dB 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

Radiated emission below 1GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn BV ADT	AT100	AT93021705	N/A	N/A
Bi_Log Antenna Schwarzbeck	VULB 9168	9168-160	2023/10/17	2024/10/16
Loop Antenna Electro-Metrics	EM-6879	269	2023/9/23	2024/9/22
Loop Antenna TESEQ	HLA 6121	45745	2023/8/8	2024/8/7
MXE EMI Receiver Keysight	N9038A	MY55420137	2023/5/3	2024/5/2
Preamplifier Agilent	8447D	2944A10638	2023/5/7	2024/5/6
Preamplifier EMCI	EMC001340	980201	2023/9/27	2024/9/26
RF Coaxial Cable Woken	8D-FB	Cable-CH9-01	2023/5/7	2024/5/6
Signal & Spectrum Analyzer R&S	FSW43	101867	2023/12/29	2024/12/28
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table BV ADT	TT100	TT93021705	N/A	N/A
Turn Table Controller BV ADT	SC100	SC93021705	N/A	N/A

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 HY - 966 chamber 4.

Radiated emission above 1GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Antenna Tower & Turn BV ADT	AT100	AT93021705	N/A	N/A
Boresight antenna tower fixture BV	BAF-02	5	N/A	N/A
Horn Antenna Schwarzbeck	BBHA 9120D	9120D-1169	2023/11/12	2024/11/11
	BBHA 9170	9170-480	2023/11/12	2024/11/11
		BBHA9170243	2023/11/12	2024/11/11
MXE EMI Receiver Keysight	N9038A	MY55420137	2023/5/3	2024/5/2
Notch Filter Micro-Tronics	BRM17690	004	2024/1/23	2025/1/22
	BRM50716	060	2023/12/25	2024/12/24
Preamplifier Agilent	8449B	3008A02367	2024/1/6	2025/1/5
Preamplifier EMCI	EMC 184045	980116	2023/9/27	2024/9/26
RF Coaxial Cable EMCI	EMC102-KM-KM-600	150928	2023/7/8	2024/7/7
	EMC102-KM-KM-3000	150929	2023/7/8	2024/7/7
RF Coaxial Cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	2024/1/6	2025/1/5
RF Coaxial Cable HUBER+SUHNER&EMCI	SUCOFLEX 104& EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	2024/1/6	2025/1/5
Signal & Spectrum Analyzer R&S	FSW43	101867	2023/12/29	2024/12/28
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	N/A	N/A	N/A
Turn Table BV ADT	TT100	TT93021705	N/A	N/A
Turn Table Controller BV ADT	SC100	SC93021705	N/A	N/A

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 HY - 966 chamber 4.

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 detect 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:

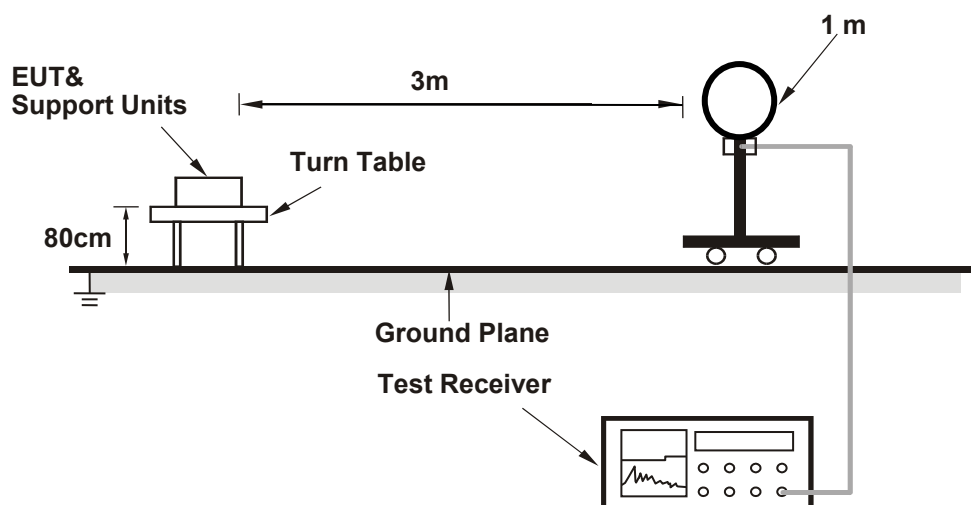
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) 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

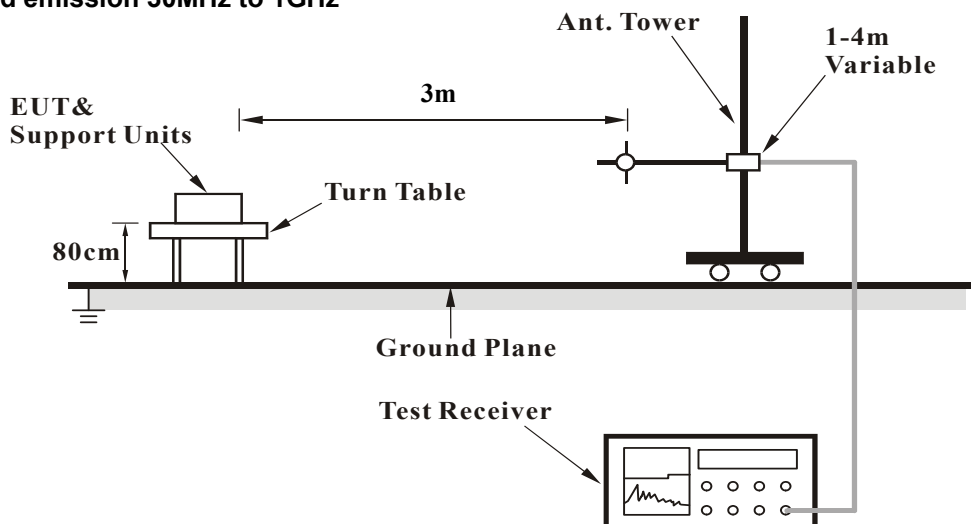
No deviation.

4.1.5 Test Setup

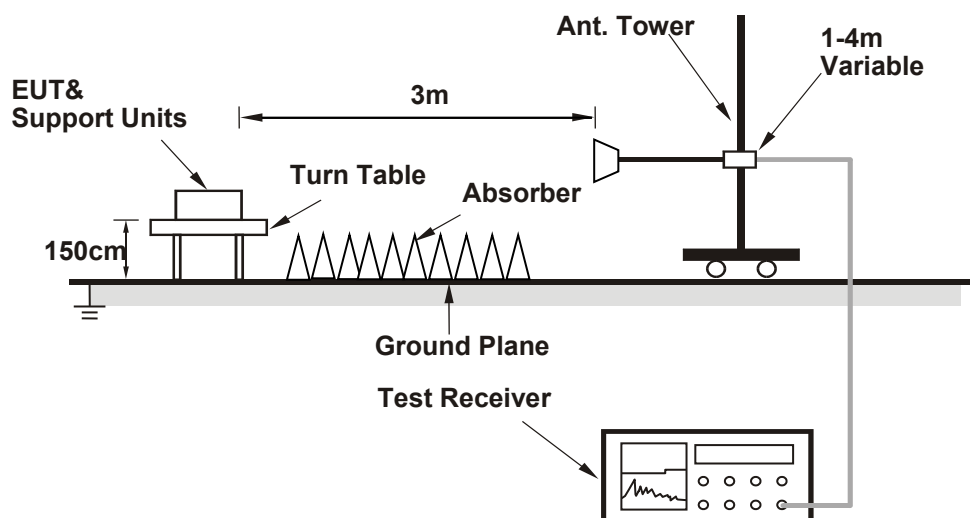
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

CHANNEL	TX Channel 1	DATA RATE	80kbps
FREQUENCY RANGE	902MHz ~ 928MHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	902.00	70.7 QP	81.4	-10.7	1.11 H	142	38.5	32.2
2	*903.00	111.4 QP			1.11 H	142	79.2	32.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	902.00	74.5 QP	85.3	-10.8	1.11 V	39	42.3	32.2
2	*903.00	115.3 QP			1.11 V	39	83.1	32.2

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.
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 13	DATA RATE	80kbps
FREQUENCY RANGE	902MHz ~ 928MHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*915.00	112.8 QP			1.08 H	143	80.3	32.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*915.00	116.6 QP			1.11 V	43	84.1	32.5

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.
5. " * " : Fundamental frequency.

CHANNEL	TX Channel 25	DATA RATE	80kbps
FREQUENCY RANGE	902MHz ~ 928MHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*927.00	112.2 QP			1.12 H	140	79.6	32.6
2	928.00	67.8 QP	82.2	-14.4	1.12 H	140	35.2	32.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*927.00	116.8 QP			1.07 V	45	84.2	32.6
2	928.00	71.2 QP	86.8	-15.6	1.07 V	45	38.6	32.6

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.
5. " * ": Fundamental frequency.

Above 1GHz Data

CHANNEL	TX Channel 1	DATA RATE	80kbps
FREQUENCY RANGE	1GHz ~ 10GHz	DETECTOR FUNCTION	Peak (PK) Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2709.00	50.6 PK	74.0	-23.4	1.16 H	159	51.9	-1.3
2	2709.00	42.8 AV	54.0	-11.2	1.16 H	159	44.1	-1.3
3	3612.00	52.5 PK	74.0	-21.5	2.36 H	68	51.7	0.8
4	3612.00	42.4 AV	54.0	-11.6	2.36 H	68	41.6	0.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2709.00	47.2 PK	74.0	-26.8	1.50 V	60	48.5	-1.3
2	2709.00	38.1 AV	54.0	-15.9	1.50 V	60	39.4	-1.3
3	3612.00	50.1 PK	74.0	-23.9	1.13 V	41	49.3	0.8
4	3612.00	39.7 AV	54.0	-14.3	1.13 V	41	38.9	0.8

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.
5. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 13	DATA RATE	80kbps
FREQUENCY RANGE	1GHz ~ 10GHz	DETECTOR FUNCTION	Peak (PK) Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2745.00	50.0 PK	74.0	-24.0	1.12 H	160	51.1	-1.1
2	2745.00	41.8 AV	54.0	-12.2	1.12 H	160	42.9	-1.1
3	3660.00	53.4 PK	74.0	-20.6	2.39 H	62	52.1	1.3
4	3660.00	42.9 AV	54.0	-11.1	2.39 H	62	41.6	1.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2745.00	46.5 PK	74.0	-27.5	1.54 V	58	47.6	-1.1
2	2745.00	37.3 AV	54.0	-16.7	1.54 V	58	38.4	-1.1
3	3660.00	51.2 PK	74.0	-22.8	1.20 V	45	49.9	1.3
4	3660.00	41.5 AV	54.0	-12.5	1.20 V	45	40.2	1.3

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value.
5. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 25	DATA RATE	80kbps
FREQUENCY RANGE	1GHz ~ 10GHz	DETECTOR FUNCTION	Peak (PK) Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2781.00	49.3 PK	74.0	-24.7	1.59 H	159	50.6	-1.3
2	2781.00	41.0 AV	54.0	-13.0	1.59 H	159	42.3	-1.3
3	3708.00	53.6 PK	74.0	-20.4	2.00 H	53	52.0	1.6
4	3708.00	43.2 AV	54.0	-10.8	2.00 H	53	41.6	1.6
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2781.00	46.1 PK	74.0	-27.9	1.42 V	69	47.4	-1.3
2	2781.00	36.4 AV	54.0	-17.6	1.42 V	69	37.7	-1.3
3	3708.00	51.4 PK	74.0	-22.6	1.26 V	49	49.8	1.6
4	3708.00	40.6 AV	54.0	-13.4	1.26 V	49	39.0	1.6

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.
5. " # ": The radiated frequency is out of the restricted band.

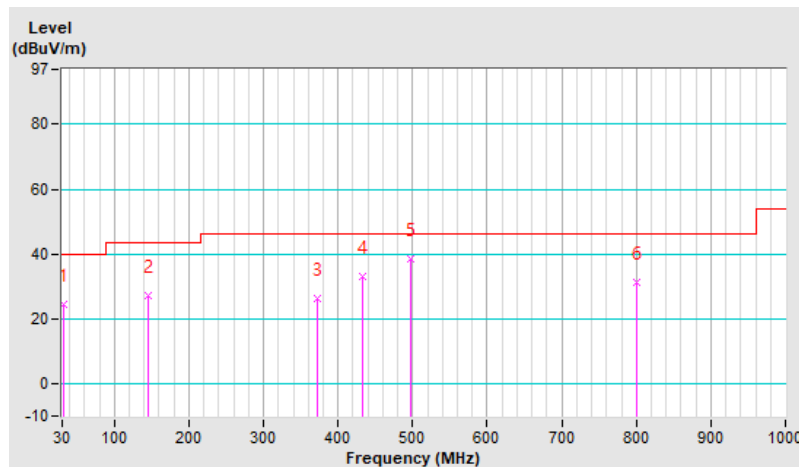
Below 1GHz worst-case data:

CHANNEL	TX Channel 1	DATA RATE	80kbps
FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	31.94	24.3 QP	40.0	-15.7	2.00 H	48	35.3	-11.0
2	144.46	27.0 QP	43.5	-16.5	1.50 H	283	36.4	-9.4
3	372.41	26.1 QP	46.0	-19.9	1.00 H	142	32.5	-6.4
4	432.55	33.1 QP	46.0	-12.9	2.00 H	229	38.3	-5.2
5	497.54	38.3 QP	46.0	-7.7	2.00 H	216	42.4	-4.1
6	800.18	31.3 QP	46.0	-14.7	1.00 H	218	29.0	2.3

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

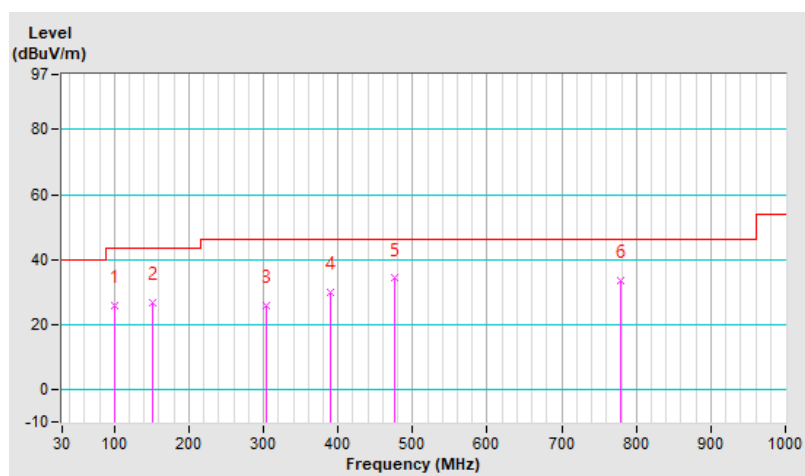


CHANNEL	TX Channel 1	DATA RATE	80kbps
FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	99.84	25.7 QP	43.5	-17.8	1.00 V	246	39.4	-13.7
2	151.25	26.8 QP	43.5	-16.7	1.00 V	33	35.8	-9.0
3	303.54	25.9 QP	46.0	-20.1	1.00 V	341	33.5	-7.6
4	388.90	29.8 QP	46.0	-16.2	1.00 V	246	35.9	-6.1
5	475.23	34.2 QP	46.0	-11.8	1.00 V	249	38.6	-4.4
6	779.81	33.6 QP	46.0	-12.4	1.00 V	328	31.4	2.2

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



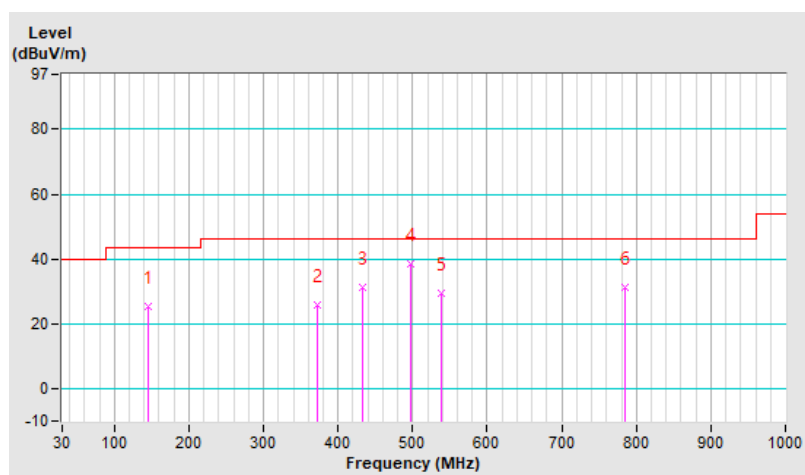
CHANNEL	TX Channel 13	DATA RATE	80kbps
FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	144.46	25.5 QP	43.5	-18.0	2.00 H	309	34.9	-9.4
2	372.41	26.0 QP	46.0	-20.0	2.00 H	136	32.4	-6.4
3	432.55	31.3 QP	46.0	-14.7	1.50 H	210	36.5	-5.2
4	497.54	38.7 QP	46.0	-7.3	2.00 H	210	42.8	-4.1
5	538.28	29.3 QP	46.0	-16.7	1.00 H	213	32.7	-3.4
6	785.63	31.1 QP	46.0	-14.9	2.00 H	117	29.0	2.1

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

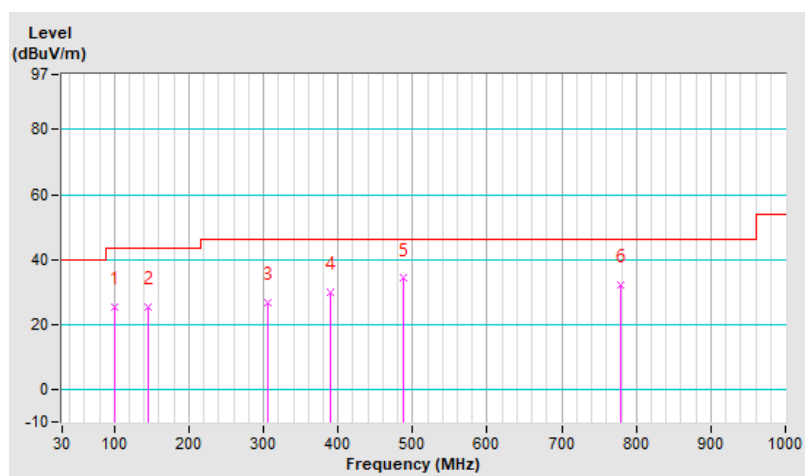


CHANNEL	TX Channel 13	DATA RATE	80kbps
FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	99.84	25.4 QP	43.5	-18.1	1.00 V	329	39.1	-13.7
2	144.46	25.5 QP	43.5	-18.0	1.00 V	160	34.9	-9.4
3	305.48	26.8 QP	46.0	-19.2	1.50 V	125	34.5	-7.7
4	388.90	29.9 QP	46.0	-16.1	1.00 V	237	36.0	-6.1
5	486.87	34.2 QP	46.0	-11.8	1.00 V	239	38.5	-4.3
6	779.81	32.2 QP	46.0	-13.8	1.00 V	48	30.0	2.2

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.



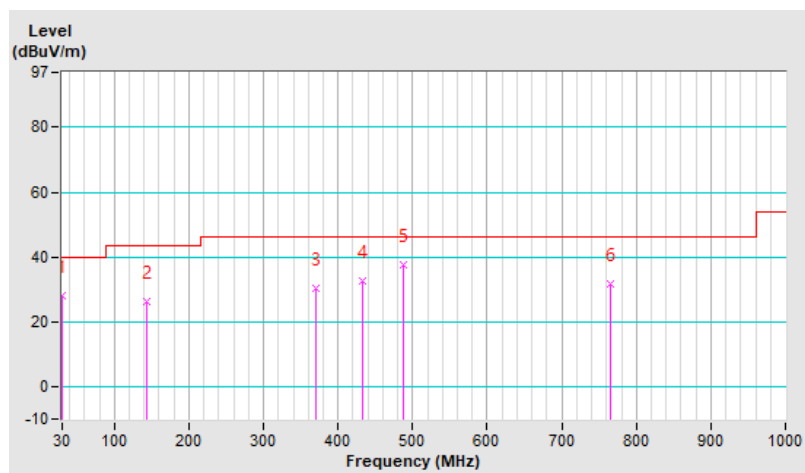
CHANNEL	TX Channel 25	DATA RATE	80kbps
FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.97	28.0 QP	40.0	-12.0	2.00 H	14	39.2	-11.2
2	143.49	26.4 QP	43.5	-17.1	2.00 H	285	35.9	-9.5
3	370.47	30.4 QP	46.0	-15.6	1.00 H	230	36.8	-6.4
4	432.55	32.6 QP	46.0	-13.4	2.00 H	218	37.8	-5.2
5	486.87	37.7 QP	46.0	-8.3	2.00 H	213	42.0	-4.3
6	766.23	31.8 QP	46.0	-14.2	1.49 H	184	29.8	2.0

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 of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

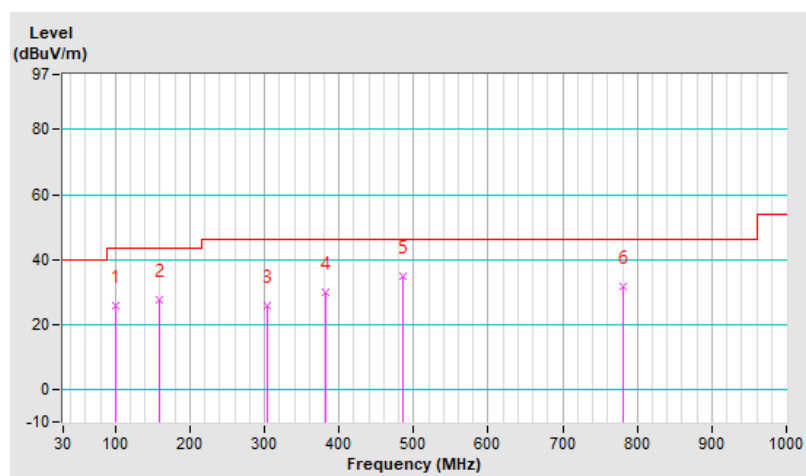


CHANNEL	TX Channel 25	DATA RATE	80kbps
FREQUENCY RANGE	9kHz ~ 1GHz	DETECTOR FUNCTION	Quasi-Peak (QP)

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	99.84	25.8 QP	43.5	-17.7	1.50 V	264	39.5	-13.7
2	159.98	27.5 QP	43.5	-16.0	1.00 V	109	36.5	-9.0
3	303.54	26.0 QP	46.0	-20.0	1.00 V	347	33.6	-7.6
4	381.14	29.7 QP	46.0	-16.3	1.50 V	253	35.9	-6.2
5	485.90	34.9 QP	46.0	-11.1	1.00 V	264	39.2	-4.3
6	781.75	31.7 QP	46.0	-14.3	1.00 V	18	29.6	2.1

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. The other emission levels were very low against the limit of frequency range 30MHz ~ 1000MHz.
4. Margin value = Emission Level – Limit value.
5. The frequency range 9 kHz ~ 30 MHz: all emissions are more than 20 dB below the limit, therefore do not be recorded in this report.

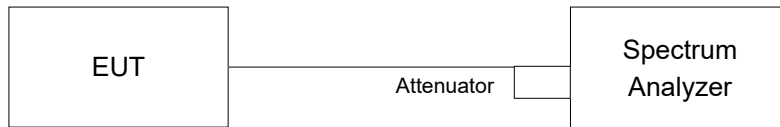


4.2 6dB Bandwidth Measurement

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

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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

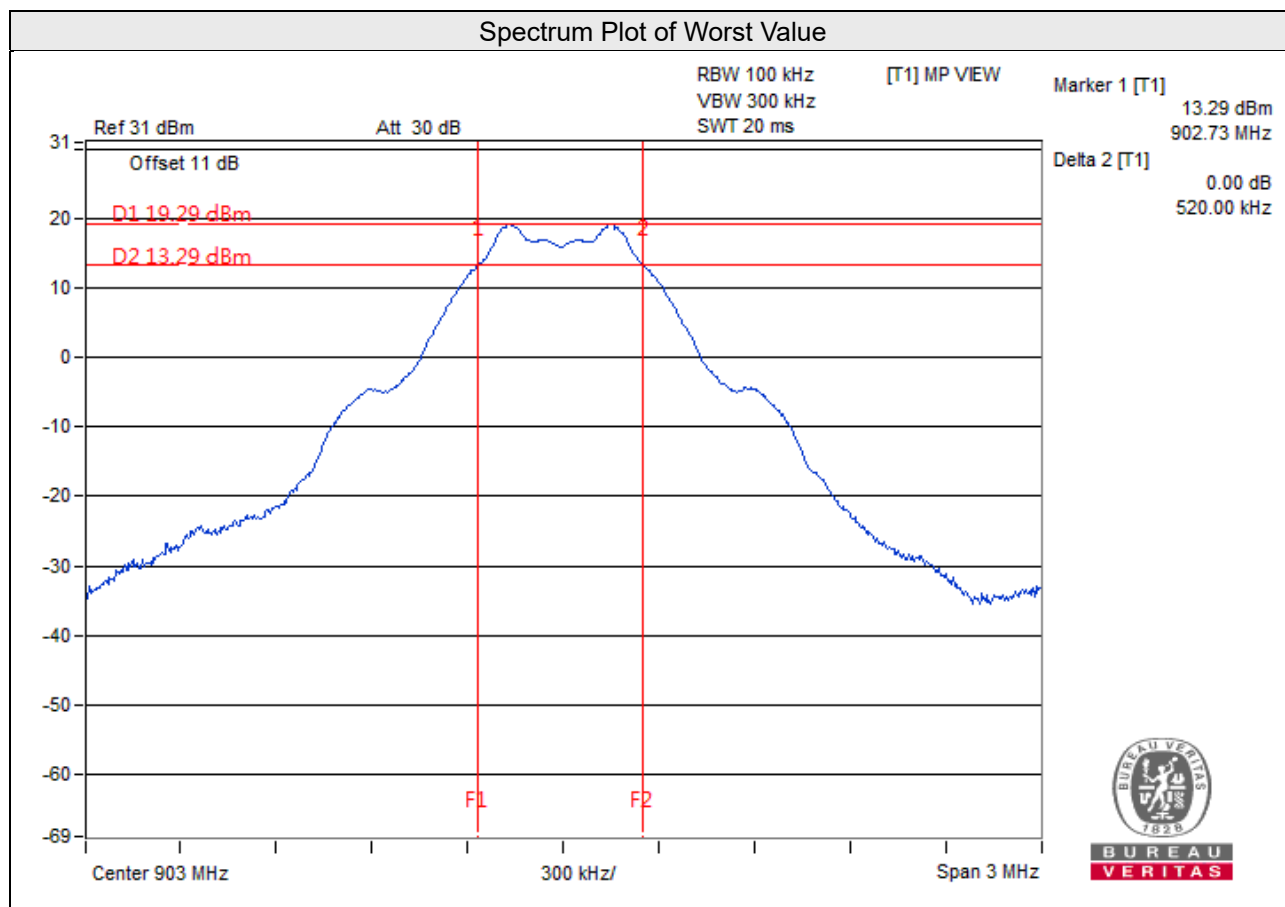
No deviation.

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.

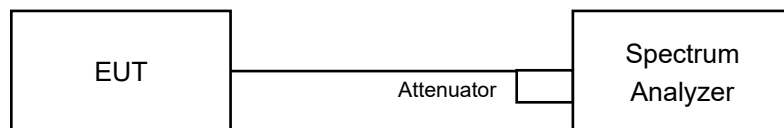
4.2.7 Test Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	903	0.52	0.5	Pass
13	915	0.52	0.5	Pass
25	927	0.52	0.5	Pass



4.3 Occupied Bandwidth Measurement

4.3.1 Test Setup



4.3.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.3.4 Deviation from Test Standard

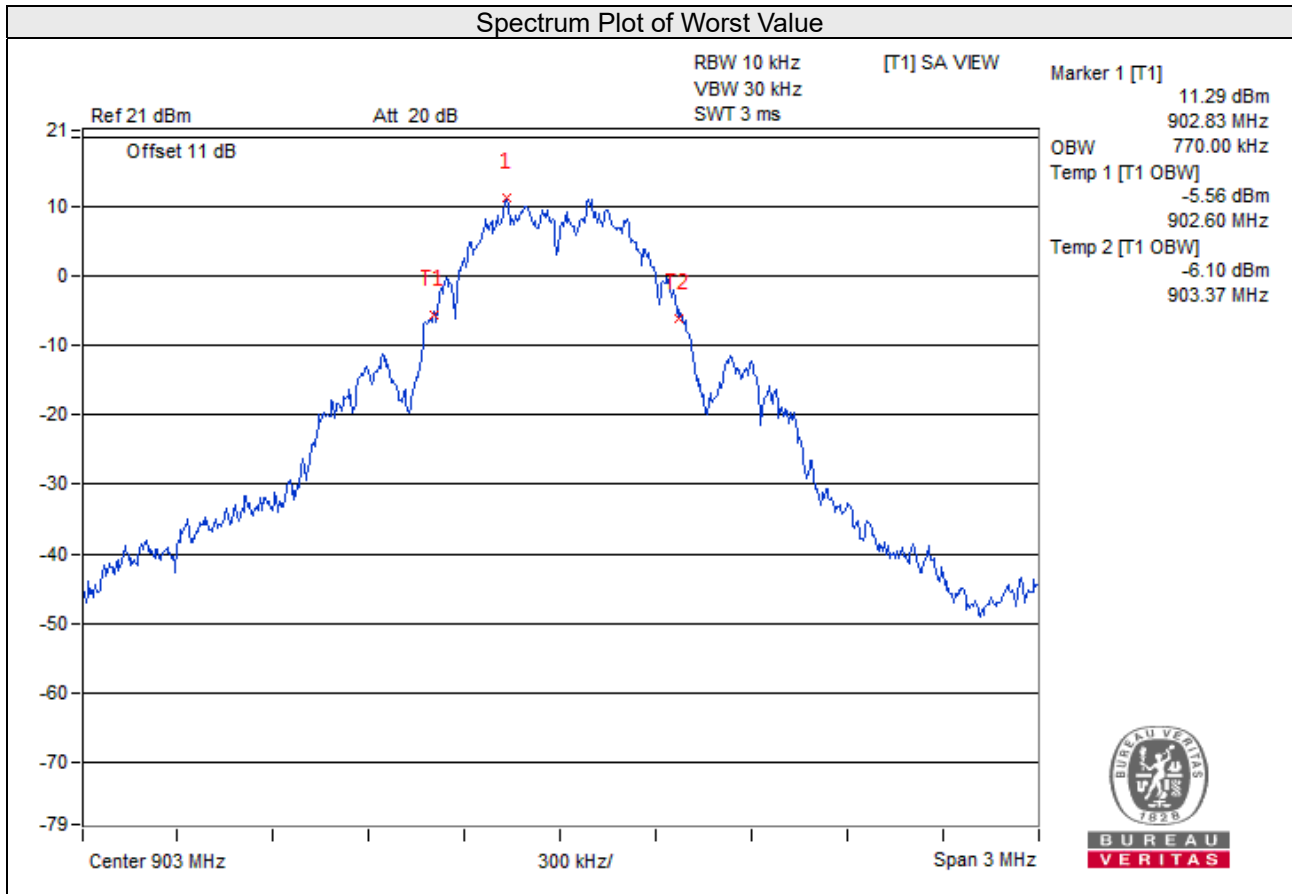
No deviation.

4.3.5 EUT Operating Conditions

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

4.3.6 Test Results

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
1	903	0.77
13	915	0.77
25	927	0.76

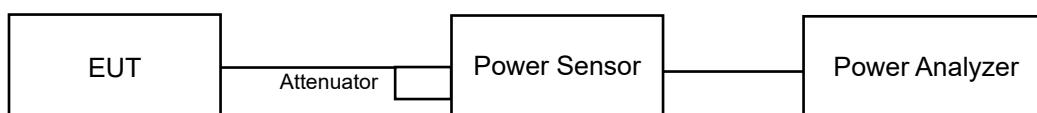


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

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 Procedures

For Average Power

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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as item 4.2.6.

4.4.7 Test Results

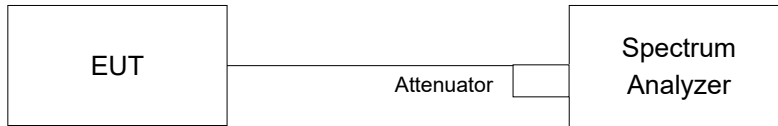
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass/Fail
1	903	84.140	19.25	30.00	Pass
13	915	83.753	19.23	30.00	Pass
25	927	83.176	19.20	30.00	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

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

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.

4.5.5 Deviation from Test Standard

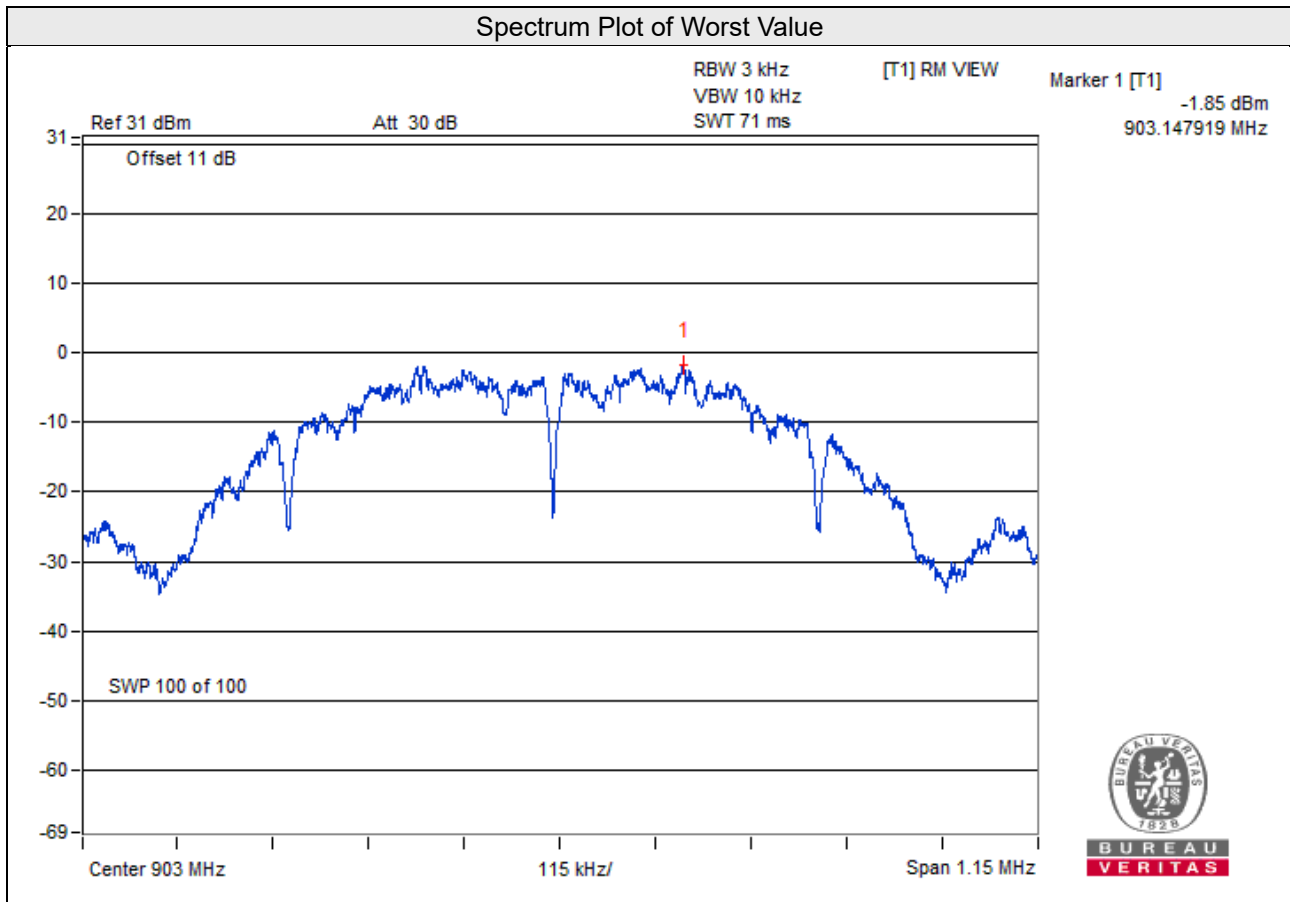
No deviation.

4.5.6 EUT Operating Condition

Same as item 4.2.6

4.5.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	903	-1.85	8.00	Pass
13	915	-1.87	8.00	Pass
25	927	-1.91	8.00	Pass

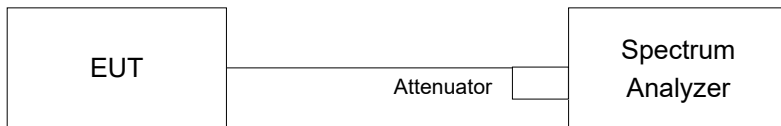


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

- Set the RBW = 100 kHz.
- Set the VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

- Set RBW = 100 kHz.
- Set VBW $\geq$ 300 kHz.
- Detector = peak.
- Sweep = auto couple.
- Trace Mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

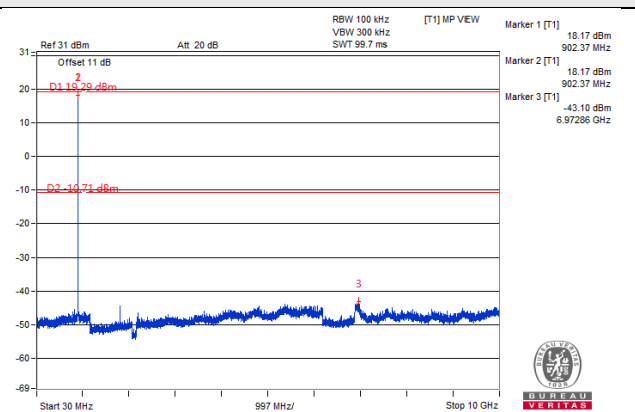
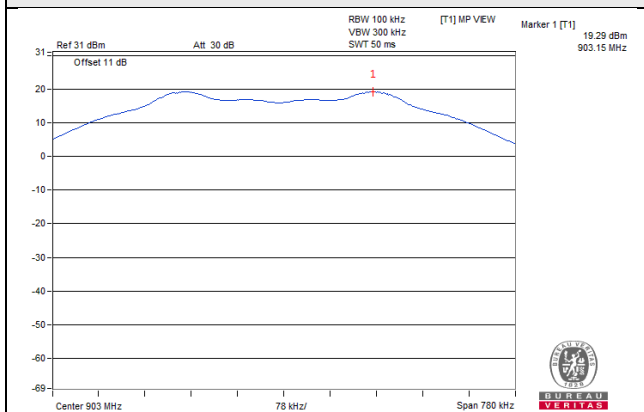
Same as item 4.2.6

4.6.7 Test Results

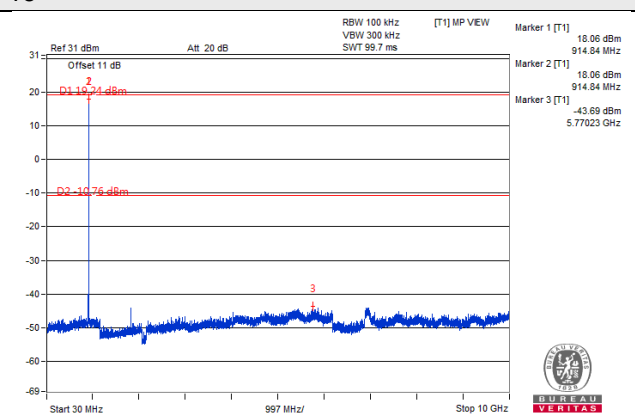
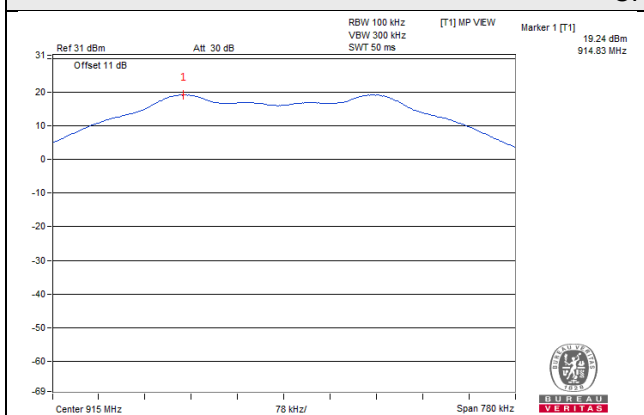
The conducted emission test is performed on each TX port of operating mode without summing or adding $10\log(N)$ since the limit is relative emission limit.

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

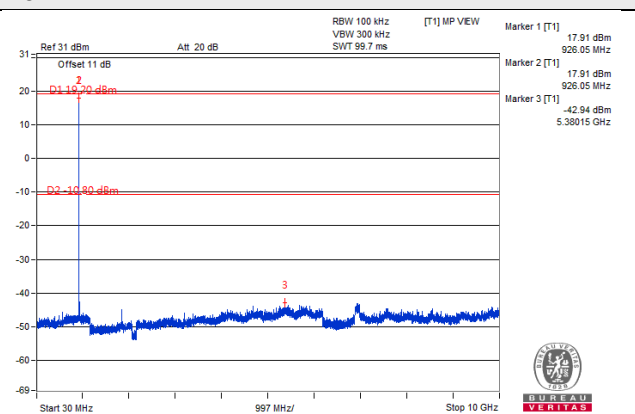
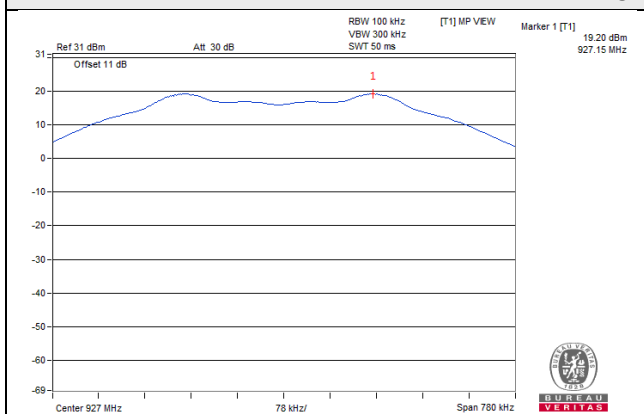
CH 1



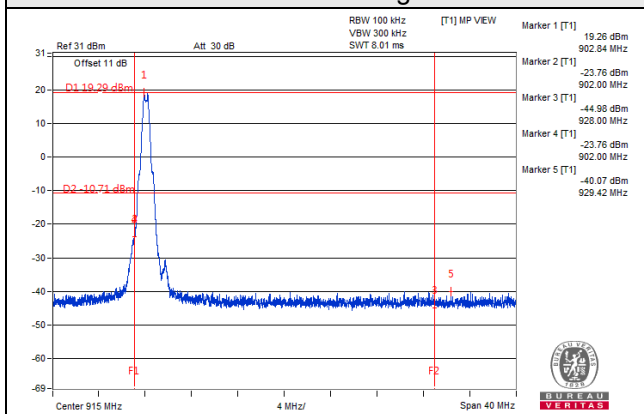
CH 13



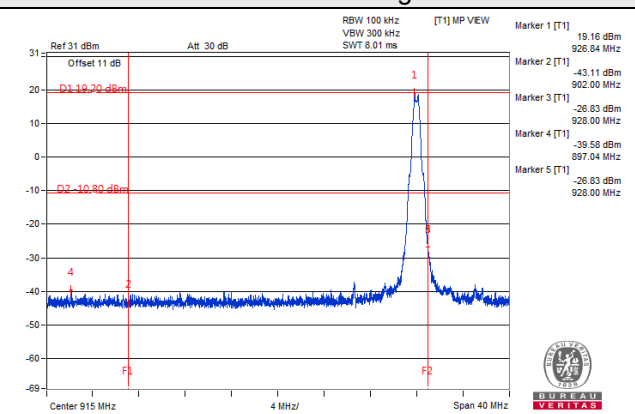
CH 25



CH 1 Band edge



CH 25 Band edge



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 and approved according to ISO/IEC 17025.

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

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Web Site: <http://ee.bureauveritas.com.tw>

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

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