TEST REPORT

Applicant	TCL Technoly Electronics(Huizhou) Co., Ltd
Address	Section 37, Zhongkai High-tech Development Zone, Huizhou City, Guang Dong Province, China 516006

Manufacturer or Supplier	TCL Technoly Electronics(Huizhou) Co., Ltd
Address	Section 37, Zhongkai High-tech Development Zone, Huizhou City, Guang Dong Province, China 516006
Product	Wireless Module
Brand Name	N/A
Model	TWM-CC8520
Additional Model & Model Difference	N/A
Date of tests	Sep. 09, 2019 ~ Sep. 30, 2019

The submitted sample of the above equipment has been tested partially for according to the requirements of the following standards:

☒ **FCC Part 15, Subpart C, Section 15.247**	**Radiated Emission Test**

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

Tested by Andy Zhu Project Engineer / EMC Department	Approved by Glyn He Assistant Manager / EMC Department
	 Date: Oct. 28, 2019

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF190909N038	Original release	Sep. 30, 2019
RF190909N038-1	Based on the original report RF190909N038, changed the antenna type of module, it needed to be retested radiated spurious emission.	Oct. 28, 2019

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**	**RESULT**	**REMARK**
15.247(d), 15.209	Radiated Emissions	PASS	Meet the requirement of limit.
Note: Other RF test data refer to the module report RF190909N038.			

2 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
Radiated emissions	9KHz ~ 30MHz	2.90dB
	30MHz ~ 1GMHz	3.76dB
	1GHz ~ 18GHz	4.84dB
	18GHz ~ 40GHz	4.96dB

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

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless Module
MODEL NO.	TWM-CC8520
ADDITIONAL MODEL	N/A
FCC ID	ZVA15
POWER SUPPLY	DC 3.3V
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	FSK
OPERATING FREQUENCY	2406MHz~2474MHz
NUMBER OF CHANNEL	18
PEAK OUTPUT POWER	35.727mW (Max. Measured)
ANTENNA TYPE	PCB Antenna, 3.62dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 190909N038-1) for detailed product photo.

3.2 DESCRIPTION OF TEST MODES

18 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
1	2406	6	2426	11	2446	16	2466
2	2410	7	2430	12	2450	17	2470
3	2414	8	2434	13	2454	18	2474
4	2418	9	2438	14	2458		
5	2422	10	2442	15	2462		

Based on the original report RF190909N038, the antenna 1 type of module changed from FPC to PCB and antenna 2 is cancelled, it need to be retested Radiated emission test after engineer evaluated.

3.2.1. CONFIGURATION OF SYSTEM UNDER TEST

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

3.2.2. 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 X axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
A	√	√	-	-	Powered By DC 3.3V

Where **RE<1G:** Radiated Emission below 1GHz **RE≥1G:** Radiated Emission above 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

RADIATED EMISSION TEST (BELOW 1 GHz): ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
A	1 to 18	1	FHSS	FSK

For the test results, only the worst case was shown in test report.

RADIATED EMISSION TEST (ABOVE 1 GHz):

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

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
A	1 to 18	1, 9, 18	FHSS	FSK

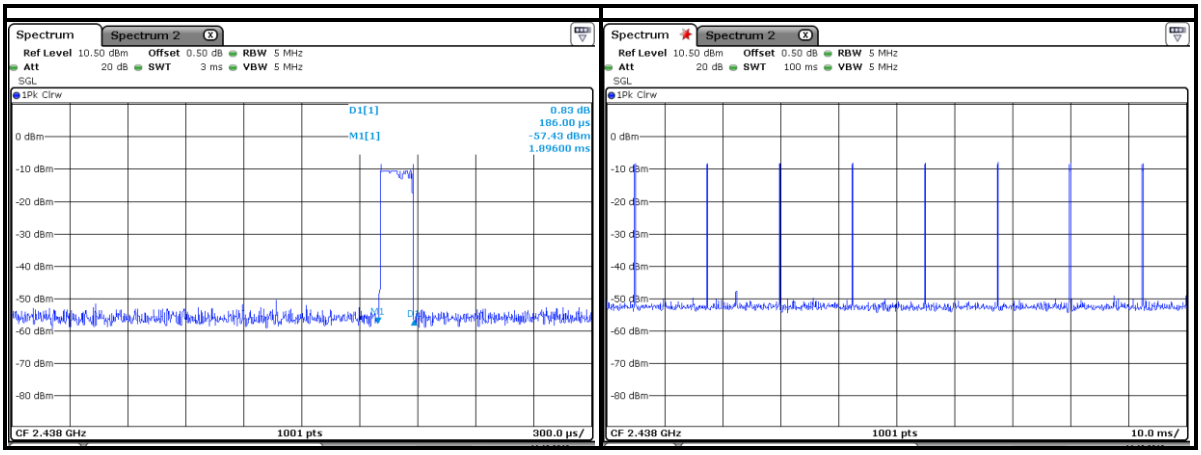
TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE (SYSTEM)	TESTED BY
RE<1G	25deg. C, 55%RH	DC 3.3V	Hu
RE≥1G	25deg. C, 55%RH	DC 3.3V	Hu
PLC	-	-	-
APCM	-	-	-

3.3 DUTY CYCLE COORRECTION FACTOR (DB)

DUTY CYCLE COORRECTION FACTOR (dB)

DCCF = 20*LOG((0.186*8)/100)=-36.55 dB



3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 15, Subpart C. Section 15.247

KDB 558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10-2013

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

3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit without any other necessary accessory or support units.

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, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). 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

NOTES:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESU40	100449	Mar. 12,19	Mar. 11,20
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	May 22,19	May 21,20
Active Loop Antenna (9KHz -30MHz)	SCHWARZBECK	FMZB 1519B	1519B-045	May 04,19	May 03,20
Amplifier (9KHz -1GHz)	Burgeon	BPA-530	100210	Apr. 21,19	Apr. 20,20
Bilog Antenna (20MHz -2GHz)	Teseq	CBL 6111D	30643	Aug. 11, 19	Aug. 10, 20
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Jul. 21, 19	Jul. 20, 20
Horn Antenna (18GHz -40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	May 05,19	May 04,20
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Apr. 21,19	Apr. 20,20
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A
Broadband Preamplifier (1GHz~18GHz)	SCHWARZBECK	BBV9718	305	Apr. 21,19	Apr. 20,20
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 09,18	Nov. 08,19
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A

NOTES:

1. The test was performed in 966 Chamber.
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. The horn antenna is used only for the measurement of emission frequency above1GHz if tested.
4. The FCC Site Registration No. is 749762.

4.1.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 1.5 meters(above 1GHz) and 0.8 meters(below 1GHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. For below 1GHz was used bilog antenna, and above 1GHz was used horn 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. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.

g. 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.

NOTES:

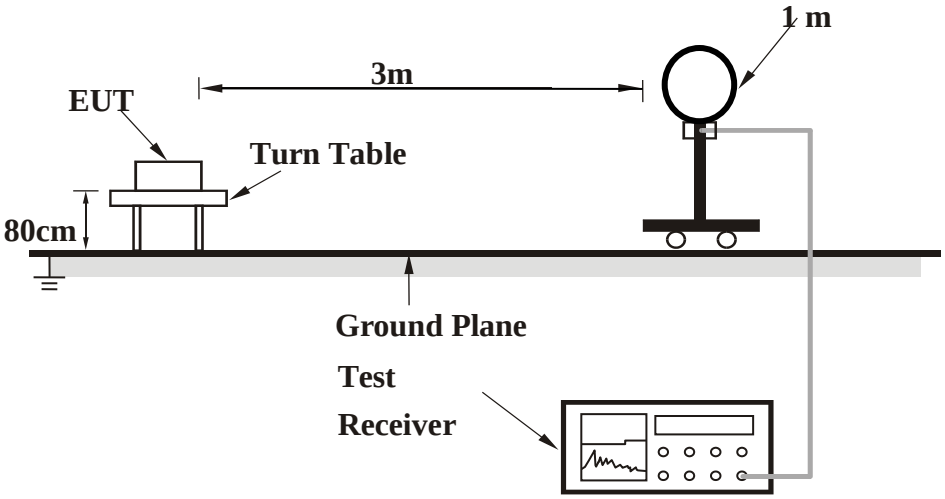
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The average value of fundamental and harmonic frequency is: Average= Peak value + DCCF (DCCF=20log(Duty cycle)
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

4.1.4 DEVIATION FROM TEST STANDARD

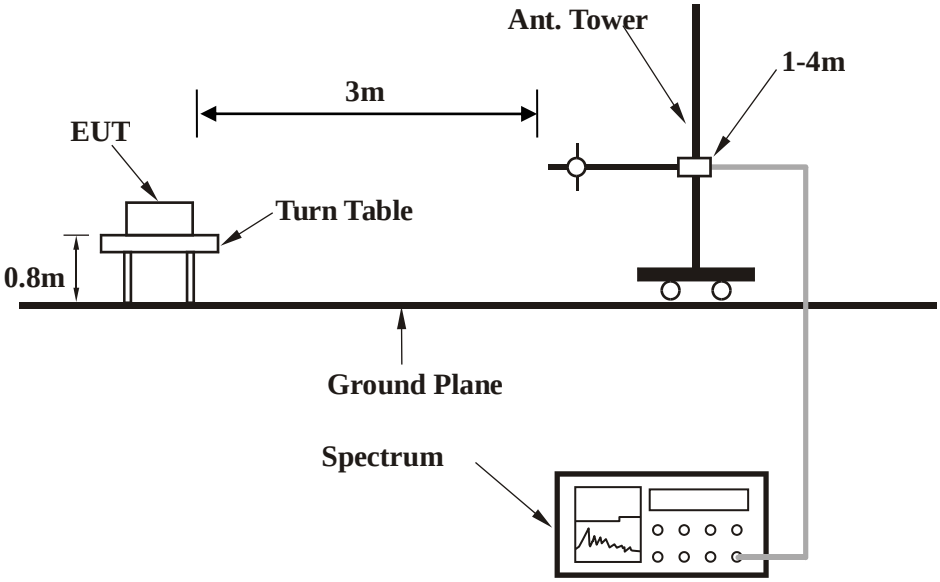
No deviation.

4.1.5 TEST SETUP

Below 30MHz test setup

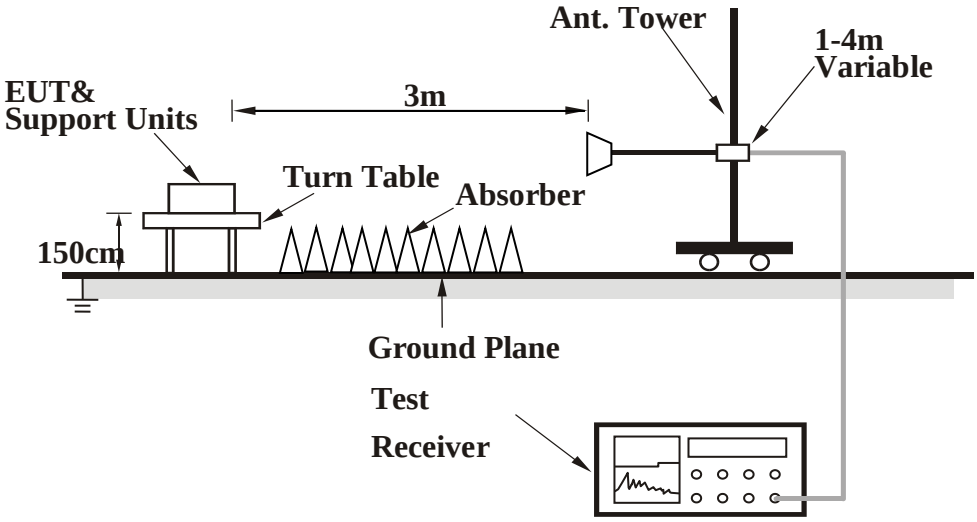


Below 1GHz test setup



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

Above 1GHz test setup



Note: 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 full load condition and placed them on a testing table.

b. Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.

c. The necessary accessories enable the EUT in full functions.

4.1.7 TEST RESULTS

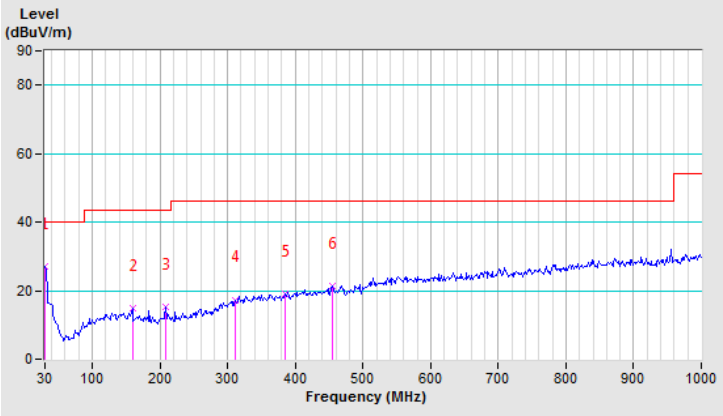
BELOW 1GHz WORST-CASE DATA:

CHANNEL	Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	27.05 QP	40.00	-12.95	1.00 H	235	38.25	-11.20
2	159.02	14.69 QP	43.50	-28.81	1.00 H	48	31.20	-16.51
3	208.77	15.39 QP	43.50	-28.11	1.00 H	125	32.23	-16.84
4	311.36	17.34 QP	46.00	-28.66	1.00 H	85	29.34	-12.00
5	385.98	19.11 QP	46.00	-26.89	1.00 H	325	28.85	-9.74
6	454.37	21.50 QP	46.00	-24.50	1.00 H	178	29.92	-8.42

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.

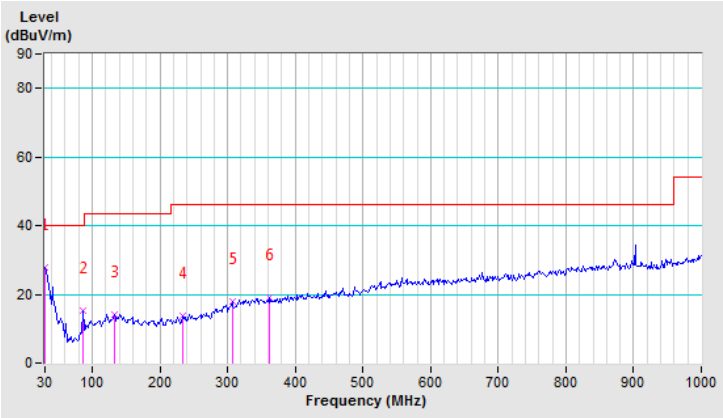


CHANNEL	Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9KHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	**30.00**	**27.90 QP**	**40.00**	**-12.10**	**2.00 V**	**77**	**39.10**	**-11.20**
2	85.96	15.25 QP	40.00	-24.75	2.00 V	69	35.63	-20.38
3	132.60	13.96 QP	43.50	-29.54	2.00 V	125	30.12	-16.16
4	233.64	13.64 QP	46.00	-32.36	2.00 V	158	29.89	-16.25
5	306.70	17.88 QP	46.00	-28.12	2.00 V	226	30.14	-12.26
6	362.66	19.10 QP	46.00	-26.90	2.00 V	234	29.37	-10.27

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.



ABOVE 1GHz DATA

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

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	2390.00	52.34 PK	74.00	-21.66	1.00 H	350	49.50	2.84
2	2390.00	15.79 AV	54.00	-38.21	1.00 H	350	12.95	2.84
3	*2406.00	110.00 PK			1.00 H	350	107.09	2.91
4	*2406.00	73.45 AV			1.00 H	350	70.54	2.91
5	4812.00	53.45 PK	74.00	-20.55	1.00 H	0	48.17	5.28
6	4812.00	16.9 AV	54.00	-37.10	1.00 H	0	11.62	5.28
7	#7218.00	55.37 PK	74.00	-18.63	1.00 H	0	46.08	9.29
8	#7218.00	18.820 AV	54.00	-35.18	1.00 H	0	9.53	9.29
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	2390.00	47.92 PK	74.00	-26.08	1.00 V	130	45.08	2.84
2	2390.00	21.25 AV	54.00	-32.75	1.00 V	130	18.41	2.84
3	*2406.00	103.87 PK			1.00 V	130	100.96	2.91
4	*2406.00	77.20 AV			1.00 V	130	74.29	2.91
5	4812.00	52.64 PK	74.00	-21.36	1.00 V	0	47.36	5.28
6	4812.00	25.97 AV	54.00	-28.03	1.00 V	0	20.69	5.28
7	#7218.00	54.41 PK	74.00	-19.59	1.00 V	0	45.12	9.29
8	#7218.00	27.74 AV	54.00	-26.26	1.00 V	0	18.45	9.29

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2438.00	107.95 PK			1.00 H	235	104.93	3.02
2	*2438.00	71.4 AV			1.00 H	235	68.38	3.02
3	4876.00	52.67 PK	74.00	-21.33	1.00 H	0	47.29	5.38
4	4876.00	16.12.00 AV	54.00	-37.88	1.00 H	0	10.74	5.38
5	7314.00	54.13 PK	74.00	-19.87	1.00 H	0	44.78	9.35
6	7314.00	17.58 AV	54.00	-36.42	1.00 H	0	8.23	9.35
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	*2438.00	103.67 PK			1.00 V	238	100.65	3.02
2	*2438.00	77.00 AV			1.00 V	238	73.98	3.02
3	4948.00	52.15 PK	74.00	-21.85	1.00 V	0	46.67	5.48
4	4948.00	25.48 AV	54.00	-28.52	1.00 V	0	20.00	5.48
5	7314.00	54.06 PK	74.00	-19.94	1.00 V	0	44.71	9.35
6	7314.00	27.39 AV	54.00	-26.61	1.00 V	0	18.04	9.35

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

CHANNEL	TX Channel 18	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2474.00	109.46 PK			1.00 H	36	106.31	3.15
2	*2474.00	72.91 AV			1.00 H	36	69.76	3.15
3	**2483.50**	67.22 PK	**74.00**	-6.78	**1.00 H**	**36**	64.03	**3.19**
4	2483.50	30.67 AV	54.00	-23.33	1.00 H	36	27.48	3.19
5	4948.00	52.31 PK	74.00	-21.69	1.00 H	0	46.83	5.48
6	4948.00	15.76 AV	54.00	-38.24	1.00 H	0	10.28	5.48
7	7422.00	53.80 PK	74.00	-20.20	1.00 H	0	44.39	9.41
8	7422.00	17.25 AV	54.00	-36.75	1.00 H	0	7.84	9.41
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2474.00	102.61 PK			1.00 V	0	99.46	3.15
2	*2474.00	75.94 AV			1.00 V	0	72.79	3.15
3	2483.50	60.52 PK	74.00	-13.48	1.00 V	0	57.33	3.19
4	2483.50	33.85 AV	54.00	-20.15	1.00 V	0	30.66	3.19
5	4948.00	51.40 PK	74.00	-22.60	1.00 V	0	45.92	5.48
6	4948.00	24.73 AV	54.00	-29.27	1.00 V	0	19.25	5.48
7	7422.00	53.14 PK	74.00	-20.86	1.00 V	0	43.73	9.41
8	7422.00	26.47 AV	54.00	-27.53	1.00 V	0	17.06	9.41

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

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.

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