

Radio Test Report

FCC ID: 2ADZVCMPTWLTX

This report concerns (check one) : ☒ Original Grant ☐ Class II Change

Project No. : 1412C180
Equipment : Cycle Computer
Model Name : CMPT WL-TX
Applicant : Pending System GmbH & Co. KG
Address : Ludwig-Hüttner-Str.5-7 D-95679 Waldershof
GERMANY

Date of Receipt : Dec. 23, 2014
Date of Test : Dec. 23, 2014~ Jan. 05, 2015
Issued Date : Jan. 06, 2015
Tested by : BTL Inc.

Testing Engineer

:



(David Mao)

Technical Manager

:



(Leo Hung)

Authorized Signatory

:



(Steven Lu)

B T L I N C .

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Issue No.	Description	Issued Date
BTL-FCCP-1-1412C180	Original Issue.	Jan. 06, 2015

1 CERTIFICATION

Equipment : Cycle Computer
Brand Name : CUBE; RFR
Model Name : CMPT WL-TX
Applicant : Pending System GmbH & Co. KG
Manufacturer : DONGGUAN RESOURCEFUL MIND ELECTRONICS LTD.
Address : NO. 7 DONG HUAN ROAD, HUANGNIU PU IND. ZONE, DONG GUAN,
CHINA
Factory : DONGGUAN RESOURCEFUL MIND ELECTRONICS LTD.
Address : NO. 7 DONG HUAN ROAD, HUANGNIU PU IND. ZONE, DONG GUAN,
CHINA
Date of Test : Dec. 23, 2014~ Jan. 05, 2015
Standards : FCC Part 15, Subpart C(15.209): 2013
ANSI C63.4: 2009

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc..

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1406175) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Standard Section	Test Item	Result
15.207	Conducted emission	N/A
15.209	Radiated Emission	PASS

NOTE:

1. **N/A**: denotes test is not applicable in this Test Report

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-CB03** at the location of No.3,Jinshagang 1st Road, Shixia, Dalang Town, Dong Guan, Guangdong, China.523792
BTL's test firm number for FCC: 319330

2.2 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:

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

A. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U , (dB)	Note
DG-CB03	CISPR	9KHz~30MHz	V	3.79	
		9KHz~30MHz	H	3.57	
		30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	H	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	H	3.94	

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Cycle Computer	
Brand Name	CUBE; RFR	
Model Name	CMPT WL-TX	
Model Difference	N/A	
Product Description	Operation Frequency	120 kHz
	Antenna Designation	LOOP Antenna
Power Source	Supplied from battery	
Power Rating	DC 3V	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

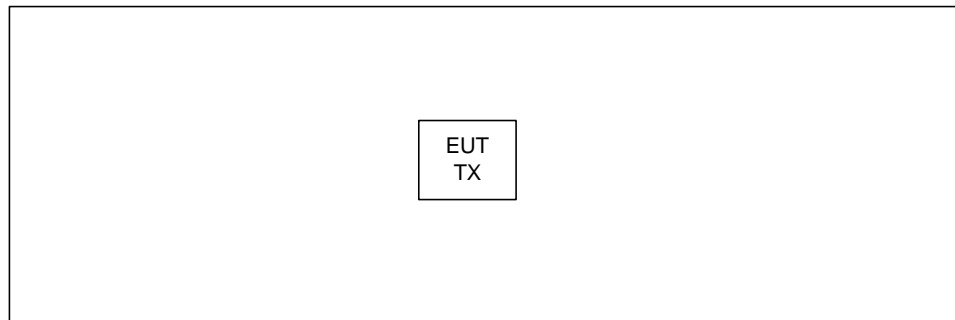
3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Test Mode	Description
Mode 1	120 KHz Transmit

Radiated emission test	
Final Test Mode	Description
Mode 1	120 KHz Transmit

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
-	-	-	-	--	-	-

Item	Shielded Type	Ferrite Core	Length	Note
-		-	-	-

Note:

- (1) The support equipment was authorized by Declaration of Conformity (DOC).

4 CONDUCTED EMISSION

4.1 LIMITS

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 - 5.0	73.00	60.00	56.00	46.00
5.0 - 30.0	73.00	60.00	60.00	50.00

NOTE:

1. The tighter limit applies at the band edges.
2. The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
3. The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value – Limit Value

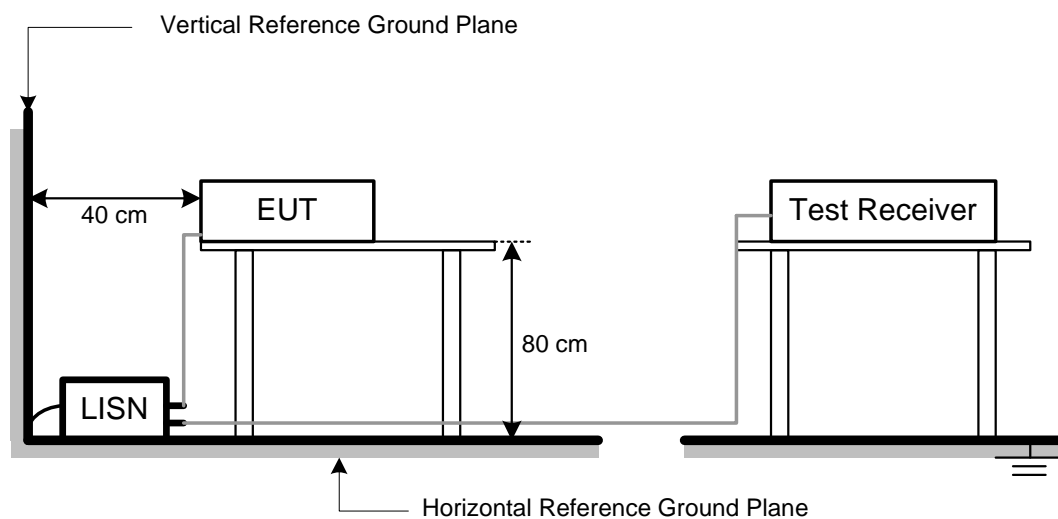
4.2 TEST PROCEDURES

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE:

- a. Reading in which marked as Peak, QP or AVG means measurements by using are Quasi-Peak or Average Mode with Detector BW=9 kHz (6 dB Bandwidth).
- b. All readings are Peak Mode value unless otherwise stated QP or AVG in column of Note. If the Peak or QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only Peak or QP Mode was measured, but AVG Mode didn't perform.

4.3 TEST SETUP LAYOUT



4.4 DEVIATION FROM TEST STANDARD

No deviation

4.5 EUT OPERATING CONDITIONS

The EUT used during radiated and/or conducted emission measurement was designed to exercise in a manner similar to a typical use.

Temperature: 24°C Relative Humidity: 59%

4.6 TEST RESULTS

Please refer to the Attachment A.

5 RADIATED EMISSION

5.1 LIMITS

FCC Part 15.209				
Frequency (MHz)	Field Strength Limitation		Field Strength Limitation at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
0.009 – 0.490	2400 / F(KHz)	300m	10000 * 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 – 1.705	24000 / F(KHz)	30m	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40
1.705 – 30.00	30	30m	100* 30	20log 30 + 40
30.0 – 88.0	100	3m	100	20log 100
88.0 – 216.0	150	3m	150	20log 150
216.0 – 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

NOTE:

- (1) The tighter limit shall apply at the boundary between two frequency range.
- (2) Limitation expressed in dBuV/m is calculated by 20log Emission Level (uV/m).
- (3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d_2/d_1)^2$.
 Example:
 F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 3m distance is adjusted as $L_{d1} = L_1 = 30uV/m * (10)^2 = 100 * 30 uV/m$
- (4) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value – Limit Value

5.2 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m or 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

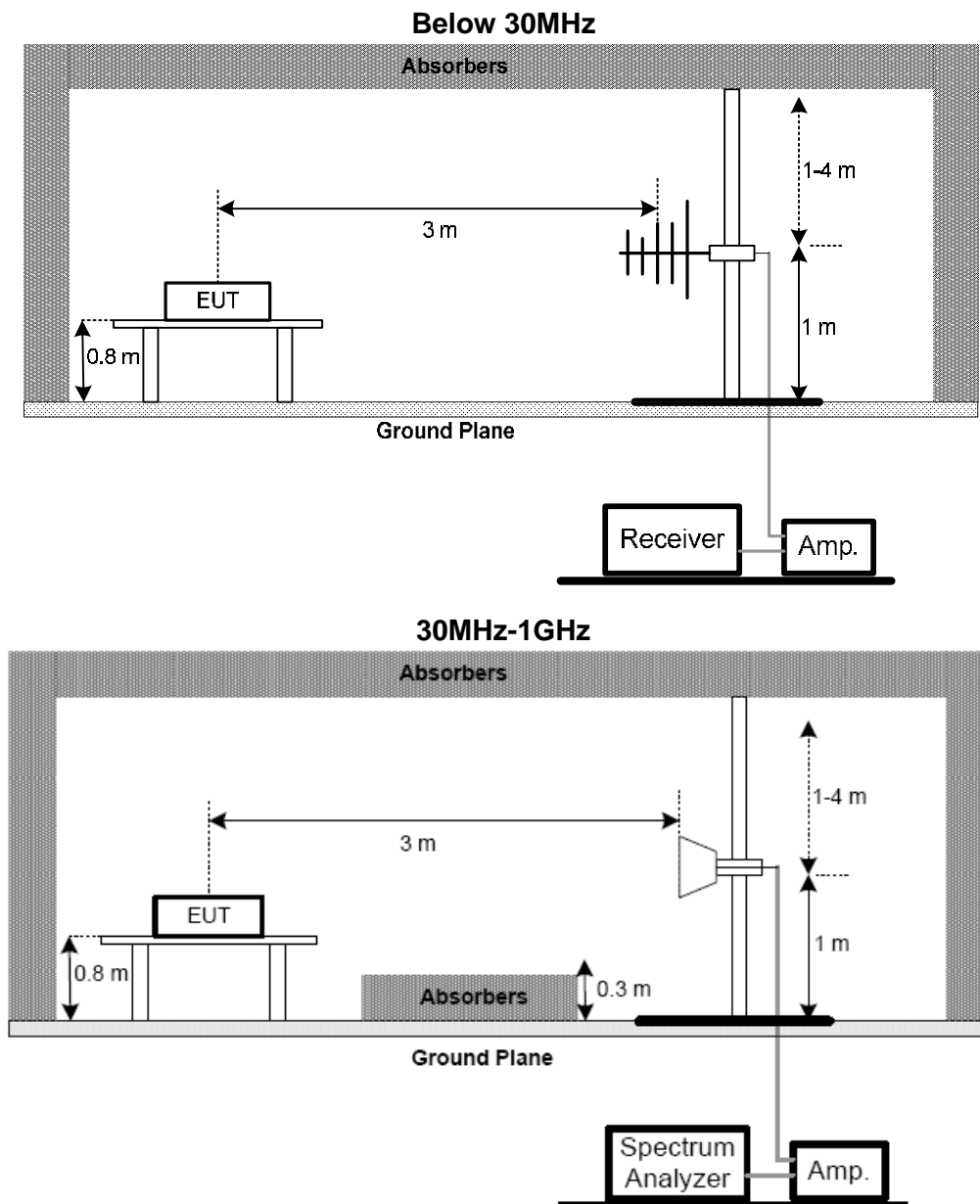
NOTE:

- a. Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode with Detector BW=120 kHz.
- b. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
- c. new battery is used during all test
- d. The EUT was pre-tested on positioned of each 3 axis. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.

5.3 DEVIATION FROM TEST STANDARD

No deviation

5.4 TEST SETUP



5.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.1.5 Unless otherwise a special operating condition is specified in the follows during the testing.

Below 30MHz:

Temperature: 22°C Relative Humidity: 61%

30MHz-1GHz:

Temperature: 25°C Relative Humidity: 54%

5.6 TEST RESULTS (BELOW 30MHz)

Please refer to the Attachment B.

5.7 TEST RESULTS (30MHz-1GHz)

Please refer to the Attachment C.

6. 20dB SPECTRUM BANDWIDTH MEASUREMENT

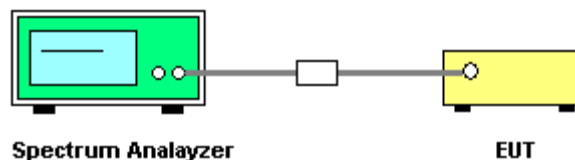
6.1. LIMIT OF 20DB BANDWIDTH MEASUREMENT

The 20dB bandwidth shall be specified in operating frequency band.

6.2. TEST PROCEDURES

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 10kHz RBW and 10kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

6.3. TEST SETUP LAYOUT



6.4. TEST DEVIATION

There is no deviation with the original standard.

6.5. EUT OPERATION DURING TEST

The EUT was programmed to be in continuously transmitting mode.

6.6. TEST RESULT

Please refer to the Attachment D.

7 MEASUREMENT INSTRUMENTS LIST

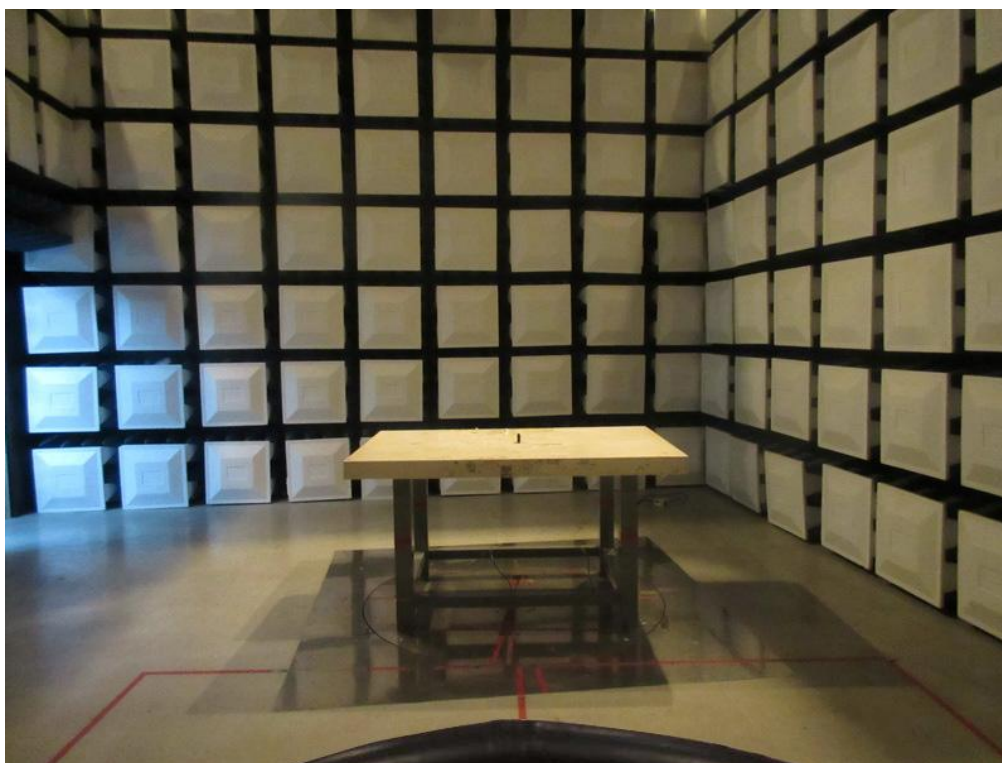
Radiated Emission Measurement Instruments List					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 29, 2015
2	Amplifier	HP	8447D	2944A09673	Mar. 29, 2015
3	Receiver	AGILENT	N9038A	MY52130039	Sep. 30, 2015
4	Test Cable	N/A	C-01_CB03	N/A	Jul. 01, 2015
5	Controller	CT	SC100	N/A	N/A
6	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Mar. 29, 2015
7	EMI Test Receiver	R&S	ESCI	100895	Mar. 29, 2015
8	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-0 1	N/A	N/A

20dB Bandwidth Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Oct. 22, 2015

8 EUT TEST PHOTO

Radiated emission test photos

Below 30MHz



Radiated emission test photos

30MHz-1G



ATTACHMENT A - CONDUCTED EMISSION

Test Mode: N/A

Note: "N/A" denotes test is not applicable to this device.

ATTACHMENT B - RADIATED EMISSION (BELOW 30MHz)

Test Voltage:	DC 3V
Test Mode:	TX Mode

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Note
0.0135	0°	1.35	24.30	25.65	125.00	-99.35	AVG
0.0135	0°	7.15	24.30	31.45	145.00	-113.55	PEAK
0.1200	0°	20.26	21.08	41.34	106.02	-64.68	AVG
0.1200	0°	27.61	21.08	48.69	126.02	-77.33	PEAK
0.2400	0°	10.28	20.42	30.70	100.00	-69.30	AVG
0.2400	0°	15.37	20.42	35.79	120.00	-84.21	PEAK
0.1100	0°	3.99	21.24	25.23	106.78	-81.55	AVG
0.1100	0°	9.02	21.24	30.26	126.78	-96.52	PEAK
0.4986	0°	17.36	19.80	37.16	73.65	-36.49	QP
1.7367	0°	19.87	19.53	39.40	69.54	-30.14	QP

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Note
0.0112	90°	2.53	24.30	26.83	126.62	-99.79	AVG
0.0112	90°	8.01	24.30	32.31	146.62	-114.31	PEAK
0.1203	90°	19.35	21.08	40.43	106.00	-65.57	AVG
0.1203	90°	25.64	21.08	46.72	126.00	-79.28	PEAK
0.2420	90°	8.53	20.42	28.95	99.93	-70.98	AVG
0.2420	90°	14.16	20.42	34.58	119.93	-85.35	PEAK
0.1100	90°	2.36	21.24	23.60	106.78	-83.18	AVG
0.1100	90°	8.12	21.24	29.36	126.78	-97.42	PEAK
0.4974	90°	17.45	19.81	37.26	73.67	-36.41	QP
1.7685	90°	18.63	19.52	38.15	69.54	-31.39	QP

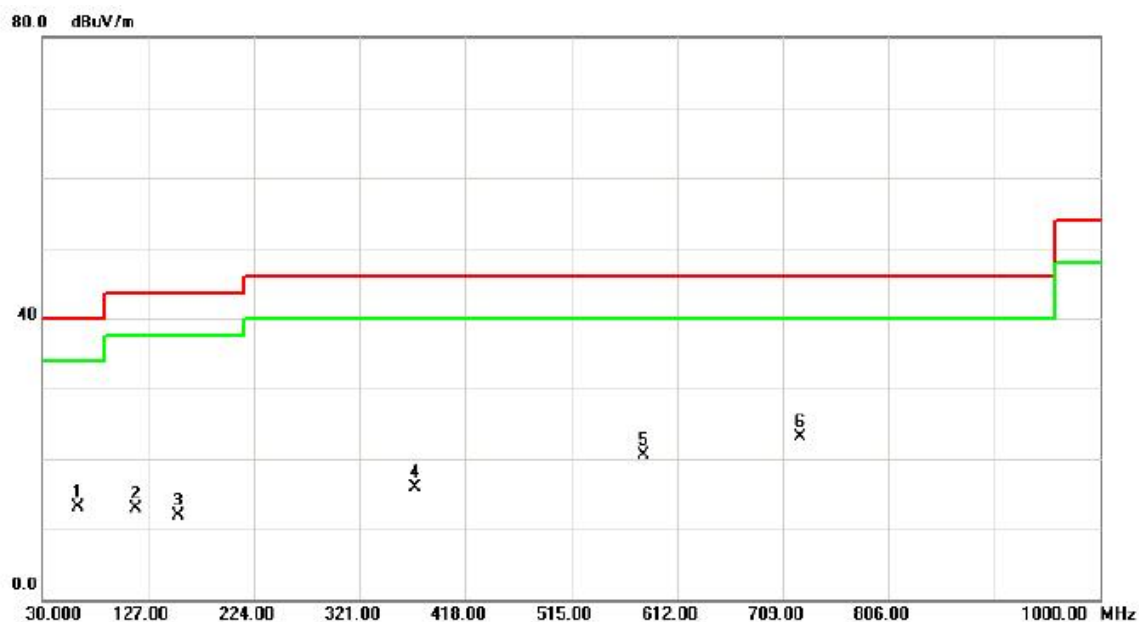
Remark

- (1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
- (2) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);.
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor..

ATTACHMENT C - RADIATED EMISSION (30 MHz TO 1 GHz)

Test Voltage	DC 3V
Test Mode	120 KHz Transmit

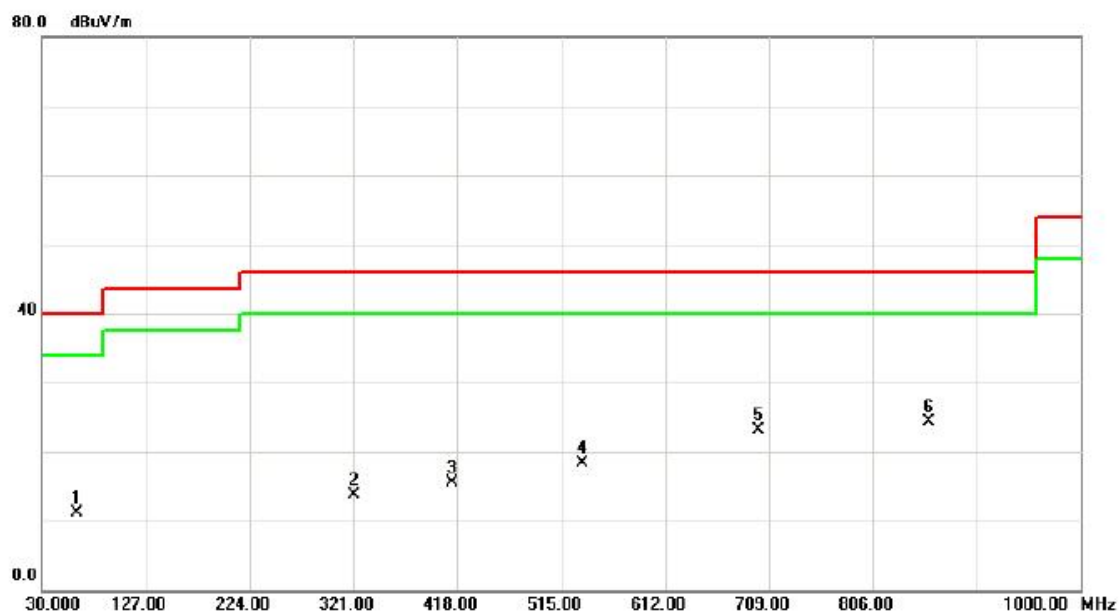
Polarization: Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		62.9800	36.30	-23.17	13.13	40.00	-26.87	peak	
2		115.3600	35.04	-22.19	12.85	43.50	-30.65	peak	
3		155.1300	33.91	-21.94	11.97	43.50	-31.53	peak	
4		371.4400	29.21	-13.31	15.90	46.00	-30.10	peak	
5		580.9600	29.71	-9.24	20.47	46.00	-25.53	peak	
6	*	725.4900	29.41	-6.30	23.11	46.00	-22.89	peak	

Test Voltage	DC 3V
Test Mode	120 KHz Transmit

Polarization: Horizontal



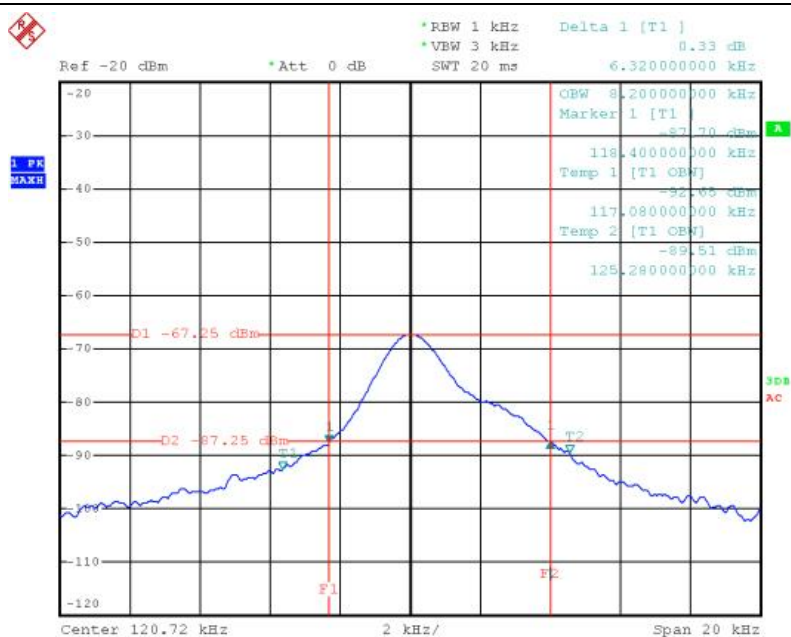
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		62.9800	34.25	-23.17	11.08	40.00	-28.92	peak	
2		321.9700	29.02	-15.23	13.79	46.00	-32.21	peak	
3		413.1500	28.69	-13.22	15.47	46.00	-30.53	peak	
4		534.4000	28.97	-10.65	18.32	46.00	-27.68	peak	
5		699.3000	29.46	-6.31	23.15	46.00	-22.85	peak	
6	*	858.3800	29.06	-4.84	24.22	46.00	-21.78	peak	

ATTACHMENT D - 20dB SPECTRUM BANDWIDTH MEASUREMENT

Test Mode : TX Mode

Frequency (kHz)	20dB Bandwidth (kHz)	99% OBW (kHz)	Test Result
120	6.320	8.200	Complies

TX CH 01



Date: 5.JAN.2015 12:19:58