RF TEST REPORT

Test item	:	UHF RFID Module
Model No.	:	PRM92K20CE
Order No.	:	DTNC1502-00711
Date of receipt	:	2015-02-13
Test duration	:	2015-02-16 ~ 2015-03-11
Date of issue	:	2015-03-11
Use of report	:	FCC Class II Permissive Change

Applicant : Phychips Inc.
#205 Migun Technoworld 1, 533, Yongsan-dong, Yuseo, Daejeon, 305-500
South Korea

Test laboratory : DT&C Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935

Test specification	:	FCC Part 15 Subpart C 247
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

Tested by:
Engineer
HyunSu Son

Reviewed by:
Technical Manager
HongHee Lee

Test Report Version

Test Report No.	Date	Description
DRTFCC1503-0034	Mar. 09, 2015	Initial issue
DRTFCC1503-0034(1)	Mar. 11, 2015	Add transmitter Output Power

Copyright © 2015, DT&C Co., Ltd.

Table of Contents

Copyright © 2015, DT&C Co., Ltd.

Copyright © 2015, DT&C Co., Ltd.

1.General Information

1.1 Testing Laboratory

DT&C Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-935
www.dtnc.net
Telephone : + 82-31-321-2664
FAX : + 82-31-321-1664

1.2 Details of Applicant

Applicant : Phychips Inc.
Address : #205 Migun Technoworld 1, 533, Yongsan-dong, Yuseo, Daejeon, 305-500 South Korea
Contact person : Laekyu Chang
Phone No. : +82-42-864-2402

1.3 Description of EUT

Product	UHF RFID Module
Model Name	PRM92K20CE
Serial Number	Identical prototype
Power Supply	DC 3.6 V
Frequency Range	917.10 ~ 926.90 MHz
Modulation Technique	A1D
Number of Channels	50 (Channel Spacing 200 kHz)
Antenna Type	Quadrifilar Spiral Antenna

1.4 Test mode

Test mode 1 (TM 1)	ANT 1 (SUOA-0332, Antenna Gain: -18 dBi)
Test mode 2 (TM 2)	ANT 2 (SUOA-0316, Antenna Gain: -23 dBi)
Test mode 3 (TM 3)	ANT 3 (SUOA-0232, Antenna Gain: -18 dBi)
Test mode 4 (TM 4)	ANT 4 (SUOA-0216, Antenna Gain: -22 dBi)
Test mode 5 (TM 5)	ANT 5 (SUOA-0132, Antenna Gain: -19 dBi)
Test mode 6 (TM 6)	ANT 6 (SUOA-0116, Antenna Gain: -22 dBi)

1.5. Declaration by the manufacturer

- N/A

Copyright © 2015, DT&C Co., Ltd.

1.6. Test Equipment List

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	N9020A	14/09/03	15/09/03	MY46471622
DIGITAL MULTIMETER	Agilent	34401A	15/01/06	16/01/06	US36099541
Vector Signal Generator	Rohde Schwarz	SMBV100A	15/01/06	16/01/06	255571
Signal Generator	Rohde Schwarz	SMF100A	14/07/01	15/07/01	102341
Thermohygrometer	BODYCOM	BJ5478	14/05/13	15/05/13	120612-2
PreAmplifier	Agilent	8449B	14/02/27	15/02/27	3008A00370
			15/02/26	16/02/26	
LOOP Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
Double-Ridged Guide Antenna	ETS	3117	14/05/12	16/05/12	140394
TRILOG Broadband Test-Antenna	Schwarzbeck	VULB 9160	14/04/30	16/04/30	3358
EMI TEST RECEIVER	R&S	ESU 8	14/10/21	15/10/21	100348
Highpass Filter	Wainwright Instruments	WHKX12-935-1000-15000-40SS	14/10/17	15/10/17	7
EMI TEST RECEIVER	R&S	ESCI	14/02/27	15/02/27	100364
			15/02/25	16/02/25	
FREQUENCY CONVERTER	Taejin Electronic	CVCF	14/09/11	15/09/11	ZU0033
ARTIFICIAL MAINS NETWORK	R&S	ESH2-Z5	14/09/11	15/09/11	828739/006

Copyright © 2015, DT&C Co., Ltd.

1.7. Summary of Test Results

FCC Part Section(s)	Parameter	Limit (Using in 2400~ 2483.5MHz)	Test Condition	Status Note 1
15.247(a)	Carrier Frequency Separation	>= 20dB BW or >= Two-Thirds of the 20dB BW	Conducted	NT Note2
	Number of Hopping Frequencies	>= 15 hops		NT Note2
	20 dB Bandwidth	None		NT Note2
	Dwell Time	=< 0.4 seconds		NT Note2
15.247(b)	Transmitter Output Power	=< 1Watt , if CHs >= 75 Others =<0.125W		C
15.247(d)	Band-edge /Conducted	The radiated emission to any 100 kHz of out-band shall be at least 20dB below the highest in-band spectral density.		NT Note2
	Conducted Spurious Emissions			NT Note2
15.205, 15.209	Radiated Spurious Emissions	FCC 15.209 Limits	Radiated	C Note.3
15.207	AC Conducted Emissions	FCC 15.207 Limits	AC Line Conducted	C
15.203	Antenna Requirements	FCC 15.203	-	C

Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable

Note 2: These test items were not performed because this device uses the granted module. (FCCID: Y3DPRM92K20CE)
Please refer to the test report of the granted module. The module test report number: DRTFCC1212-0909(By Digital EMC Co., Ltd.)

Note 3: This test item was performed in each axis. And the worst case data were reported.

Semi anechoic chamber registration Number : 165783

Copyright © 2015, DT&C Co., Ltd.

1.8 Conclusion of worst-case and operation mode

The field strength of spurious emission was measured in three orthogonal EUT positions(X-axis, Y-axis and Z-axis).

Tested frequency information,

- Hopping Function: Enable

	TX Frequency(MHz)	RX Frequency(MHz)
Hopping Band	902.75 ~ 927.25	902.75 ~ 927.25

- Hopping Function: Disable

	TX Frequency(MHz)	RX Frequency(MHz)
Lowest Channel	902.75	902.75
Middle Channel	915.25	915.25
Highest Channel	927.25	927.25

Note: EUT was operated at modulated signal of 100% duty cycle.

Copyright © 2015, DT&C Co., Ltd.

2. Radiated Spurious Emissions and Conducted Spurious Emission

2.1. Test Setup

Refer to the APPENDIX I.

2.2. Limit

According to §15.247(d), in any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement , provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
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

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

According to § 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	608 ~ 614	3345.8 ~ 3358		
		960 ~ 1240	3600 ~ 4400		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

Copyright © 2015, DT&C Co., Ltd.

2.3. Test Procedures

Radiated emissions from the EUT were measured according to the DA 00-705 and ANSI C63.10:2009

2.3.1. Test Procedures for Radiated Spurious Emissions

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. 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 table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 ㏈lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE ;
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 ㎑for Quasi-peak detection (QP) at frequency below 1 ㎓.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1㎒for Peak detection and frequency above 1 ㎓.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 ㎓.

2.3.2. Test Procedures for Conducted Spurious Emissions

1.The transmitter output was connected to the spectrum analyzer.
2.The **reference level** of the fundamental frequency was measured with the spectrum analyzer using RBW=100 ㎑, VBW=300 ㎑.
3. The conducted spurious emission was tested each ranges were set as below.

Frequency range: 9 kHz ~ 30 MHz
RBW= 100kHz, VBW= 300kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 10001

Frequency range: 30 MHz ~ 10 GHz
RBW= 100kHz, VBW= 300kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 10001

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)

Copyright © 2015, DT&C Co., Ltd.

2.4. Test Results

Ambient temperature : 26 °C
Relative humidity : 41 %

2.4.1. Radiated Emission

9kHz ~ 10GHz Data & TM 1

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2751.330	H	X	PK	47.41	3.33	N/A	50.74	74.00	23.26
2751.370	H	X	AV	38.88	3.33	N/A	42.21	54.00	11.79
3668.250	H	X	PK	49.16	6.93	N/A	56.09	74.00	17.91
3668.130	H	X	AV	42.67	6.93	N/A	49.60	54.00	4.40
4585.390	V	X	PK	50.33	8.77	N/A	59.10	74.00	14.90
4585.490	V	X	AV	43.74	8.77	N/A	52.51	54.00	1.49

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2765.620	H	X	PK	49.60	3.84	N/A	53.44	74.00	20.56
2765.630	H	X	AV	40.04	3.84	N/A	43.88	54.00	10.12
3687.610	H	X	PK	51.18	7.07	N/A	58.25	74.00	15.75
3687.610	H	X	AV	43.73	7.07	N/A	50.80	54.00	3.20
4609.510	V	X	PK	49.84	8.83	N/A	58.67	74.00	15.33
4609.620	V	X	AV	43.56	8.83	N/A	52.39	54.00	1.61

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2780.730	H	X	PK	50.56	4.38	N/A	54.94	74.00	19.06
2780.500	H	X	AV	42.24	4.38	N/A	46.62	54.00	7.38
3707.620	H	X	PK	53.88	7.21	N/A	61.09	74.00	12.91
3707.580	H	X	AV	45.30	7.21	N/A	52.51	54.00	1.49
4634.520	V	X	PK	49.73	8.89	N/A	58.62	74.00	15.38
4634.530	V	X	AV	43.18	8.89	N/A	52.07	54.00	1.93

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor
4. EUT had its hopping function disabled at the highest, middle and the lowest available channels.

Copyright © 2015, DT&C Co., Ltd.

9kHz ~ 10GHz Data & TM 2

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2751.990	H	X	PK	46.02	3.33	N/A	49.35	74.00	24.65
2750.960	H	X	AV	37.62	3.33	N/A	40.95	54.00	13.05
3668.440	H	X	PK	49.42	6.93	N/A	56.35	74.00	17.65
3668.640	H	X	AV	42.93	6.93	N/A	49.86	54.00	4.14
4585.400	V	X	PK	48.95	8.77	N/A	57.72	74.00	16.28
4585.610	V	X	AV	42.83	8.77	N/A	51.60	54.00	2.40

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2765.780	H	X	PK	47.45	3.84	N/A	51.29	74.00	22.71
2765.650	H	X	AV	39.48	3.84	N/A	43.32	54.00	10.68
3687.640	H	X	PK	50.86	7.07	N/A	57.93	74.00	16.07
3687.660	H	X	AV	45.21	7.07	N/A	52.28	54.00	1.72
4609.580	V	X	PK	47.45	8.83	N/A	56.28	74.00	17.72
4609.570	V	X	AV	42.44	8.83	N/A	51.27	54.00	2.73

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2780.450	H	X	PK	48.72	4.38	N/A	53.10	74.00	20.90
2780.670	H	X	AV	40.03	4.38	N/A	44.41	54.00	9.59
3707.650	H	X	PK	52.64	7.21	N/A	59.85	74.00	14.15
3707.740	H	X	AV	45.82	7.21	N/A	53.03	54.00	0.97
4634.390	V	X	PK	46.73	8.89	N/A	55.62	74.00	18.38
4634.460	V	X	AV	41.91	8.89	N/A	50.80	54.00	3.20

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor
4. EUT had its hopping function disabled at the highest, middle and the lowest available channels.

Copyright © 2015, DT&C Co., Ltd.

9kHz ~ 10GHz Data & TM 3

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2751.400	H	X	PK	47.84	3.33	N/A	51.17	74.00	22.83
2751.490	H	X	AV	39.21	3.33	N/A	42.54	54.00	11.46
3668.230	H	X	PK	49.58	6.93	N/A	56.51	74.00	17.49
3668.280	H	X	AV	42.69	6.93	N/A	49.62	54.00	4.38
4585.650	V	X	PK	49.84	8.77	N/A	58.61	74.00	15.39
4585.590	V	X	AV	43.84	8.77	N/A	52.61	54.00	1.39

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2765.720	H	X	PK	49.41	3.84	N/A	53.25	74.00	20.75
2765.720	H	X	AV	40.45	3.84	N/A	44.29	54.00	9.71
3687.690	H	X	PK	50.44	7.07	N/A	57.51	74.00	16.49
3687.640	H	X	AV	44.27	7.07	N/A	51.34	54.00	2.66
4609.420	V	X	PK	48.53	8.83	N/A	57.36	74.00	16.64
4609.440	V	X	AV	43.10	8.83	N/A	51.93	54.00	2.07

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2780.650	H	X	PK	51.52	4.38	N/A	55.90	74.00	18.10
2780.560	H	X	AV	43.96	4.38	N/A	48.34	54.00	5.66
3707.710	H	X	PK	51.94	7.21	N/A	59.15	74.00	14.85
3707.620	H	X	AV	45.44	7.21	N/A	52.65	54.00	1.35
4634.520	V	X	PK	47.81	8.89	N/A	56.70	74.00	17.30
4634.920	V	X	AV	42.84	8.89	N/A	51.73	54.00	2.27

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor
4. EUT had its hopping function disabled at the highest, middle and the lowest available channels.

Copyright © 2015, DT&C Co., Ltd.

9kHz ~ 10GHz Data & TM 4

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2751.220	H	X	PK	46.53	3.33	N/A	49.86	74.00	24.14
2751.290	H	X	AV	37.48	3.33	N/A	40.81	54.00	13.19
3668.370	H	X	PK	49.07	6.93	N/A	56.00	74.00	18.00
3668.480	H	X	AV	42.62	6.93	N/A	49.55	54.00	4.45
4585.520	V	X	PK	48.98	8.77	N/A	57.75	74.00	16.25
4585.590	V	X	AV	43.15	8.77	N/A	51.92	54.00	2.08

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2765.490	H	X	PK	48.01	3.84	N/A	51.85	74.00	22.15
2765.430	H	X	AV	38.98	3.84	N/A	42.82	54.00	11.18
3687.820	H	X	PK	50.51	7.07	N/A	57.58	74.00	16.42
3687.840	H	X	AV	44.18	7.07	N/A	51.25	54.00	2.75
4609.540	V	X	PK	48.32	8.83	N/A	57.15	74.00	16.85
4609.570	V	X	AV	42.94	8.83	N/A	51.77	54.00	2.23

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2780.550	H	X	PK	48.02	4.38	N/A	52.40	74.00	21.60
2780.560	H	X	AV	40.32	4.38	N/A	44.70	54.00	9.30
3707.580	H	X	PK	51.48	7.21	N/A	58.69	74.00	15.31
3707.770	H	X	AV	45.61	7.21	N/A	52.82	54.00	1.18
4634.580	V	X	PK	47.95	8.89	N/A	56.84	74.00	17.16
4634.560	V	X	AV	42.48	8.89	N/A	51.37	54.00	2.63

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor
4. EUT had its hopping function disabled at the highest, middle and the lowest available channels.

Copyright © 2015, DT&C Co., Ltd.

9kHz ~ 10GHz Data & TM 5

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2751.280	H	X	PK	47.71	3.33	N/A	51.04	74.00	22.96
2751.310	H	X	AV	38.86	3.33	N/A	42.19	54.00	11.81
3668.360	H	X	PK	50.09	6.93	N/A	57.02	74.00	16.98
3668.350	H	X	AV	43.23	6.93	N/A	50.16	54.00	3.84
4585.580	V	X	PK	50.02	8.77	N/A	58.79	74.00	15.21
4585.510	V	X	AV	43.54	8.77	N/A	52.31	54.00	1.69

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2765.760	H	X	PK	49.15	3.84	N/A	52.99	74.00	21.01
2765.790	H	X	AV	39.92	3.84	N/A	43.76	54.00	10.24
3687.650	H	X	PK	51.04	7.07	N/A	58.11	74.00	15.89
3687.680	H	X	AV	45.52	7.07	N/A	52.59	54.00	1.41
4609.720	V	X	PK	48.95	8.83	N/A	57.78	74.00	16.22
4609.660	V	X	AV	43.26	8.83	N/A	52.09	54.00	1.91

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2780.730	H	X	PK	51.27	4.38	N/A	55.65	74.00	18.35
2780.700	H	X	AV	43.89	4.38	N/A	48.27	54.00	5.73
3707.710	H	X	PK	52.55	7.21	N/A	59.76	74.00	14.24
3707.650	H	X	AV	45.59	7.21	N/A	52.80	54.00	1.20
4634.360	V	X	PK	48.36	8.89	N/A	57.25	74.00	16.75
4634.410	V	X	AV	43.02	8.89	N/A	51.91	54.00	2.09

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor
4. EUT had its hopping function disabled at the highest, middle and the lowest available channels.

Copyright © 2015, DT&C Co., Ltd.

9kHz ~ 10GHz Data & TM 6

▪ Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2751.380	H	X	PK	46.29	3.33	N/A	49.62	74.00	24.38
2751.330	H	X	AV	37.29	3.33	N/A	40.62	54.00	13.38
3668.210	H	X	PK	49.12	6.93	N/A	56.05	74.00	17.95
3668.160	H	X	AV	42.79	6.93	N/A	49.72	54.00	4.28
4585.650	V	X	PK	49.48	8.77	N/A	58.25	74.00	15.75
4585.530	V	X	AV	43.08	8.77	N/A	51.85	54.00	2.15

▪ Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2765.410	H	X	PK	47.50	3.84	N/A	51.34	74.00	22.66
2765.530	H	X	AV	39.26	3.84	N/A	43.10	54.00	10.90
3687.430	H	X	PK	50.98	7.07	N/A	58.05	74.00	15.95
3687.520	H	X	AV	44.48	7.07	N/A	52.18	54.00	1.82
4609.420	V	X	PK	48.14	8.83	N/A	56.97	74.00	17.03
4609.430	V	X	AV	42.75	8.83	N/A	51.58	54.00	2.42

▪ Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F. (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2780.620	H	X	PK	48.91	4.38	N/A	53.29	74.00	20.71
2780.660	H	X	AV	40.74	4.38	N/A	45.12	54.00	8.88
3707.790	H	X	PK	52.02	7.21	N/A	59.23	74.00	14.77
3707.710	H	X	AV	45.51	7.21	N/A	52.72	54.00	1.28
4634.410	V	X	PK	47.80	8.89	N/A	56.69	74.00	17.31
4634.420	V	X	AV	42.61	8.89	N/A	51.50	54.00	2.50

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCF = Duty Cycle Correction Factor
4. EUT had its hopping function disabled at the highest, middle and the lowest available channels.

Copyright © 2015, DT&C Co., Ltd.

2.4.2. Conducted Spurious Emissions

- Measurement Data: NT

Note: Refer to the test report.

- The report number: DRTFCC1212-0909

Copyright © 2015, DT&C Co., Ltd.

3. Carrier Frequency Separation

3.1. Test Setup

Refer to the APPENDIX I.

3.2. Limit

The EUT shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

3.3 Test Procedure:

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.
After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:

Span = wide enough to capture the peaks of two adjacent channels

RBW = 1% of the span

Sweep = auto

VBW = ≥ RBW

Detector function = peak

Trace = max hold

3.4 Test Results:

-NT

Note: Refer to the test report.

- The report number: DRTFCC1212-0909

Copyright © 2015, DT&C Co., Ltd.

4. Number of Hopping Frequencies

4.1. Test Setup

Refer to the APPENDIX I.

4.2. Limit

Limit: >= 50 hops

4.3 Test Procedure:

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to:

Span = 15 MHz(Start Frequency = 907.6 MHz / Stop Frequency = 922.6 MHz)
RBW = 1% of the span or more
Sweep = auto
VBW = ≥ RBW
Detector function = peak
Trace = max hold

4.4 Test Results

-NT
Note: Refer to the test report.
- The report number: DRTFCC1212-0909

Copyright © 2015, DT&C Co., Ltd.

5. 20dBc BW

5.1. Test Setup

Refer to the APPENDIX I.

5.2. Limit

Limit: < 250 kHz for applying the hopping frequencies and the average time of occupancy

5.3. Test Procedure

The bandwidth at 20 dB below the highest in band spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels
Span = 500 kHz
RBW = 1 kHz
VBW = ≥ RBW
Trace = max hold
Sweep = auto
Detector function = peak

5.4. Test Results

-NT
Note: Refer to the test report.
- The report number: DRTFCC1212-0909

Copyright © 2015, DT&C Co., Ltd.

6. Time of Occupancy (Dwell Time)

6.1. Test Setup

Refer to the APPENDIX I.

6.2. Limit

Limit: < 0.4 seconds within a 20 second period

6.3. Test Procedure

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to:

RBW = 100kHz
VBW = ≥ RBW
Span = zero
Detector function = peak
Trace max hold

6.4. Test Results

-NT

Note: Refer to the test report.

- The report number: DRTFCC1212-0909

Copyright © 2015, DT&C Co., Ltd.

7. Maximum Peak Output Power Measurement

7.1. Test Setup

Refer to the APPENDIX I.

7.2. Limit

The maximum peak output power of the intentional radiator shall not exceed the following :
1. §15.247(b)(2), For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels,

7.3. Test Procedure

1. The RF power output was measured with a Spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal.

2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using ;
   RBW ≥ 20dBBW
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

7.4. Test Results

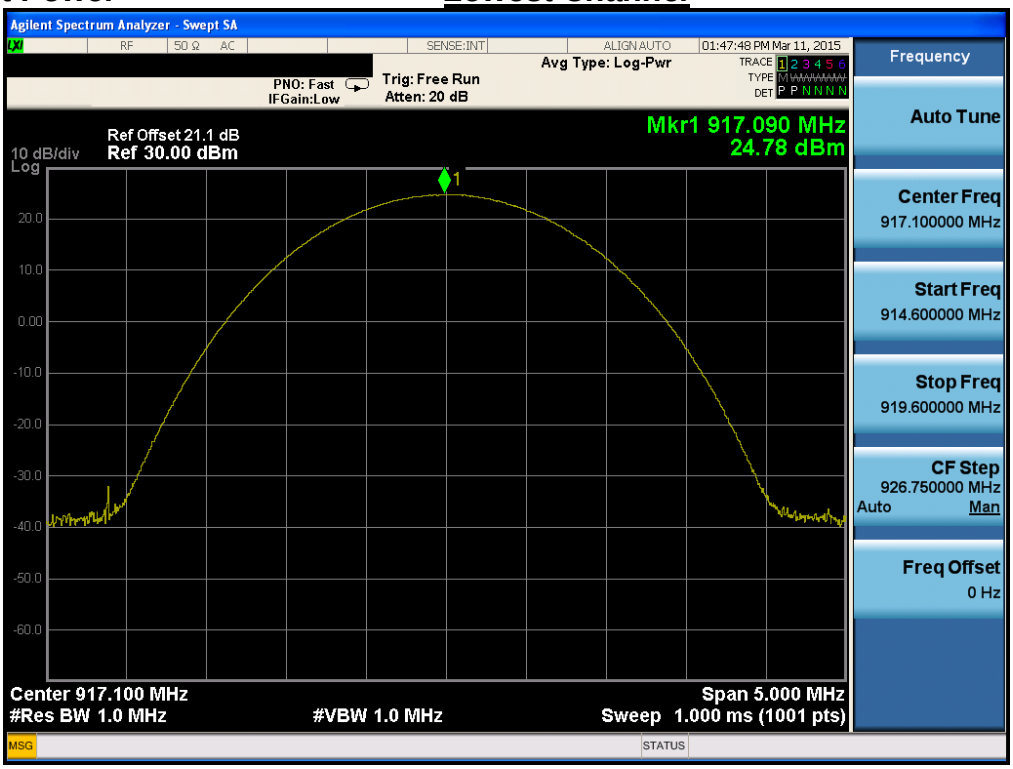
Ambient temperature : 24 °C
Relative humidity : 51 %

Tested Channel	Peak Output Power	
	dBm	mW
Lowest	24.780	300.608
Middle	24.750	298.538
Highest	**24.780**	**300.608**

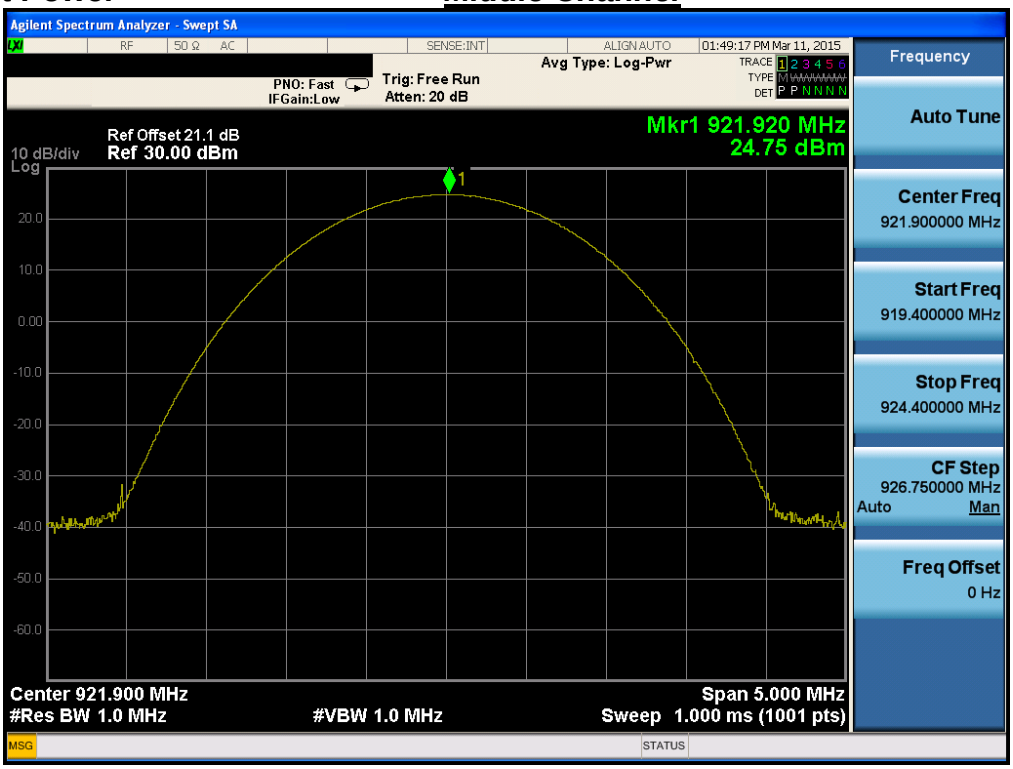
Note 1: See next pages for actual measured spectrum plots.

Copyright © 2015, DT&C Co., Ltd.

Peak Output Power ***Lowest Channel***

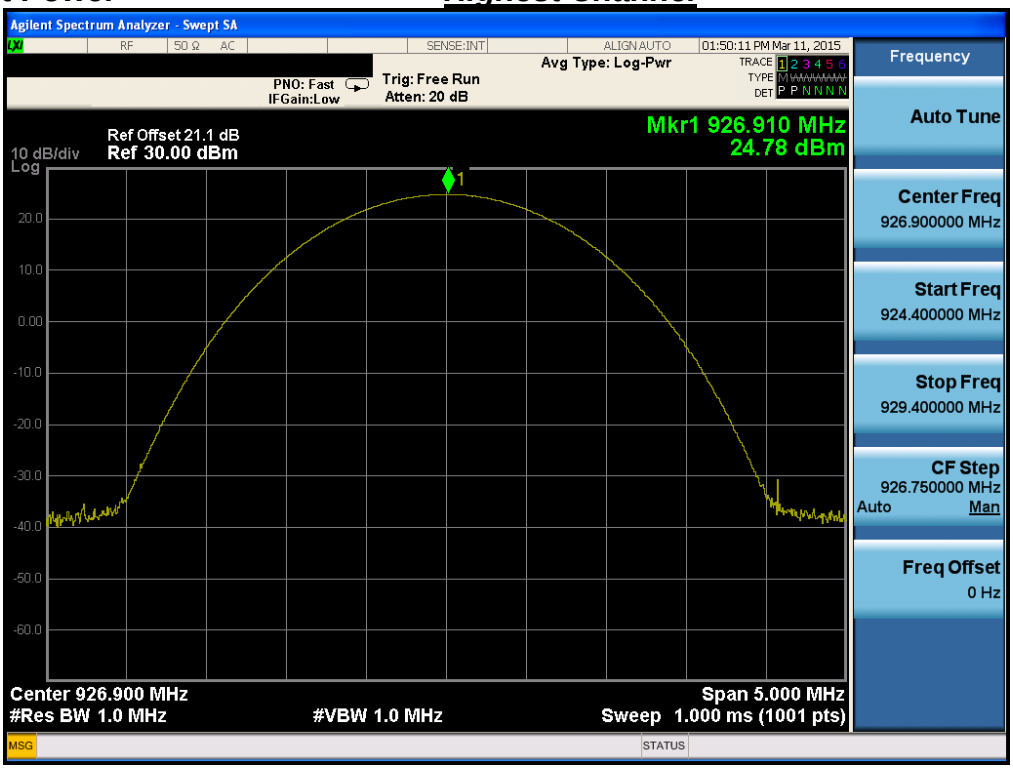


Peak Output Power ***Middle Channel***



Copyright © 2015, DT&C Co., Ltd.

Peak Output Power ***Highest Channel***



Copyright © 2015, DT&C Co., Ltd.

8. Transmitter AC Power Line Conducted Emission

8.1. Test Setup

N/A

8.2. Limit

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network(LISN).
Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

8.3. Test Procedures

Conducted emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

Copyright © 2015, DT&C Co., Ltd.

8.4. Test Results

Measurement Data

Results of Conducted Emission

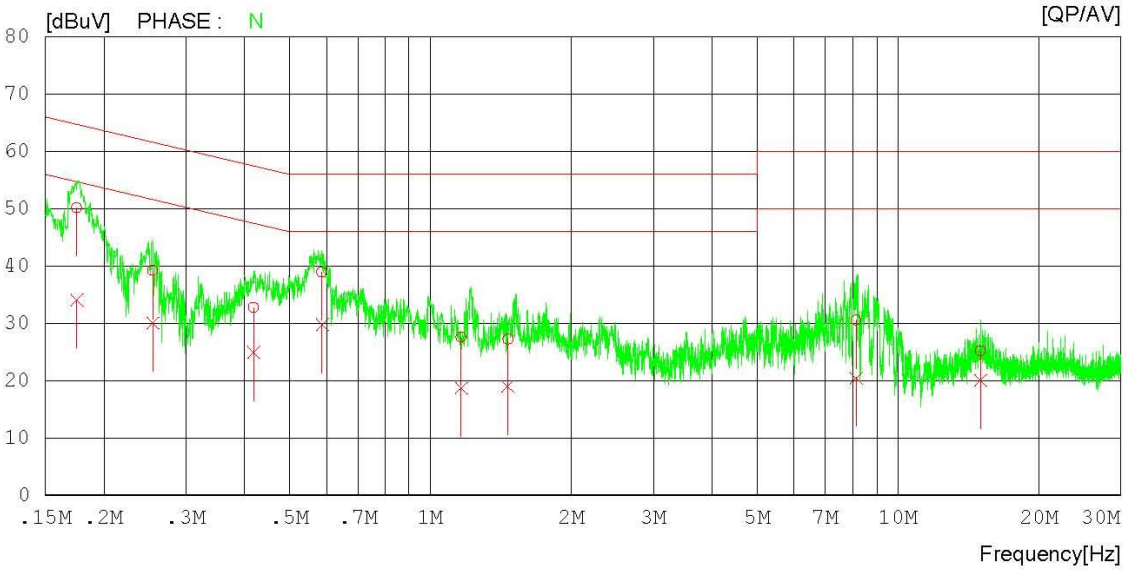
DT&C

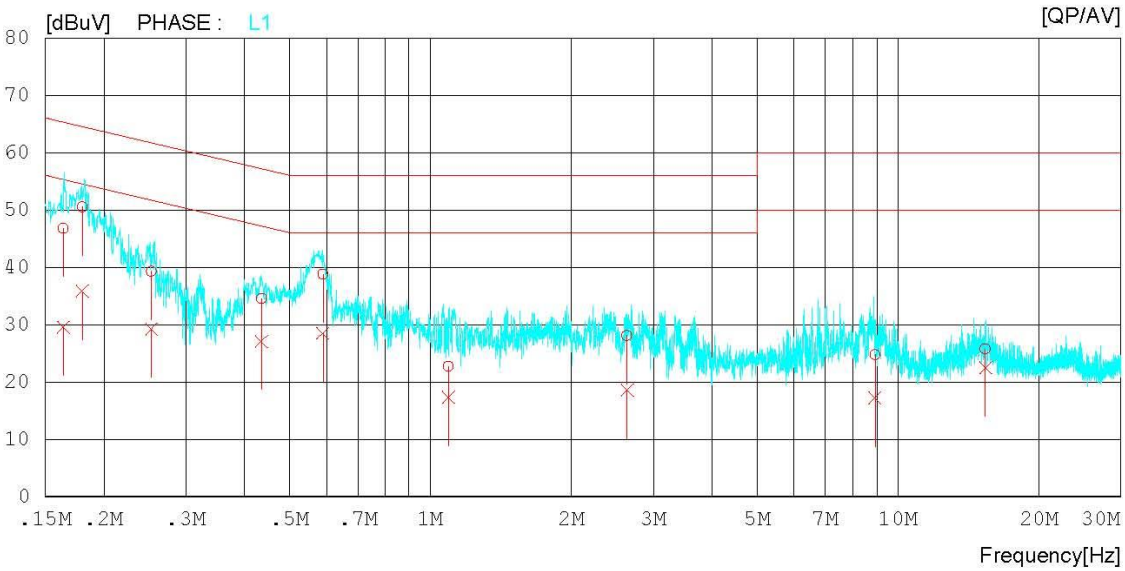
Date : 2015-03-03

Order No.	:		Referrence No.	:	
Model No.	:	PRM92K20CE	Power Supply	:	120 V 60 Hz
Serial No.	:		Temp/Humi.	:	20 'C 41 % R.H.
Test Condition	:		Operator	:	H.S.SON

Memo : RFID

LIMIT : FCC P15.207 QP
FCC P15.207 AV





Copyright © 2015, DT&C Co., Ltd.

Measurement Data

Results of Conducted Emission

DT&C

Date : 2015-03-06

Order No.	:		Referrence No.	:	
Model No.	:	PRM92K20CE	Power Supply	:	120 V 60 Hz
Serial No.	:		Temp/Humi.	:	20 'C 41 % R.H.
Test Condition	:		Operator	:	H.S.SON

Memo : RFID

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.17513	48.5	32.4	1.6	50.1	34.0	64.7	54.7	14.6	20.7	N
2	0.25464	38.1	28.9	1.1	39.2	30.0	61.6	51.6	22.4	21.6	N
3	0.41872	31.9	24.0	0.9	32.8	24.9	57.5	47.5	24.7	22.6	N
4	0.58630	38.2	29.0	0.7	38.9	29.7	56.0	46.0	17.1	16.3	N
5	1.16280	27.1	18.2	0.5	27.6	18.7	56.0	46.0	28.4	27.3	N
6	1.46320	26.8	18.6	0.4	27.2	19.0	56.0	46.0	28.8	27.0	N
7	8.13860	30.0	19.9	0.5	30.5	20.4	60.0	50.0	29.5	29.6	N
8	15.02620	24.5	19.4	0.6	25.1	20.0	60.0	50.0	34.9	30.0	N
9	0.16412	44.9	27.7	1.8	46.7	29.5	65.3	55.3	18.6	25.8	L1
10	0.17985	48.9	34.2	1.6	50.5	35.8	64.5	54.5	14.0	18.7	L1
11	0.25292	38.2	28.1	1.1	39.3	29.2	61.7	51.7	22.4	22.5	L1
12	0.43481	33.6	26.1	0.9	34.5	27.0	57.2	47.2	22.7	20.2	L1
13	0.58851	38.1	27.7	0.7	38.8	28.4	56.0	46.0	17.2	17.6	L1
14	1.09300	22.2	16.8	0.5	22.7	17.3	56.0	46.0	33.3	28.7	L1
15	2.63480	27.6	18.0	0.5	28.1	18.5	56.0	46.0	27.9	27.5	L1
16	8.93200	24.2	16.7	0.5	24.7	17.2	60.0	50.0	35.3	32.8	L1
17	15.40000	25.1	21.8	0.6	25.7	22.4	60.0	50.0	34.3	27.6	L1

Copyright © 2015, DT&C Co., Ltd.

9. Antenna Requirement

9.1 Procedure

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

9.2 Conclusion:

The internal antenna is attached on the main PCB using the special connector. (Refer to Internal Photo file.)

Minimum Standard:

> An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions.

Copyright © 2015, DT&C Co., Ltd.