RF TEST REPORT

Test item	:	Industrial Image Processing Unit
Model No.	:	1417WGB
Order No.	:	DEMC1401-00237, DEMC1401-00246
Date of receipt	:	2014-01-20
Test duration	:	2014-01-30 ~ 2014-02-21
Date of issue	:	2014-03-11
Use of report	:	FCC & IC Original Grant

Applicant : Rayence Co., Ltd.
1F, 2F, 3F, #402, 14, Samsung 1ro 1-gil, Hwaseong-si, Gyeonggi-do, 445-170, Korea

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

Test specification	:	FCC Part 15 Subpart C 247 RSS-210 Issue 8: 2010
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:

Engineer
HongHee Lee

Reviewed by:

Technical Director
Harvey Sung

Test Report Version

Test Report No.	Date	Description
DRTFCC1403-0352	Mar. 11, 2014	Initial issue

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1. EUT DESCRIPTION

FCC Equipment Class	Digital Transmission System(DTS)
Product	Industrial Image Processing Unit
Model Name	1417WGB
Add Model Name	N/A
Power Supply	DC 11.1 V
Frequency Range	**2.4 GHz Band** ▪ 802.11b/g/n(HT20): 2412 MHz ~ 2462 MHz ▪ 802.11n(HT40): 2422 MHz ~ 2452 MHz
Modulation Type	▪ 802.11b: CCK, DSSS ▪ 802.11g/n: OFDM
Transmissions category	Completely uncorrelated signal
Antenna Specification	**Antenna type**: PCB Antenna **Antenna gain** ▪ 2.4 GHz Band: ANT 1 : - 0.210 dBi & ANT 2 : - 12.120 dBi **Antenna configuration** ▪ 802.11b/g: Multiple Transmitting (ANT 1 and ANT 2) ▪ 802.11n(MCS0 ~ 7) : Multiple Transmitting (ANT 1 and ANT 2)

2. INFORMATION ABOUT TESTING

2.1 Test mode

Test mode	Worst case data rate	Tested Frequency(MHz)		
		Lowest	Middle	Highest
TM 1	802.11b 1 Mbps	2412	2437	2462
TM 2	802.11g 6 Mbps	2412	2437	2462
TM 3	802.11n(HT20) MCS 0	2412	2437	2462
TM 4	802.11n(HT40) MCS 0	2422	2437	2452

The worst case data rate for each modulation is determined as above test mode. And all tests conducted in this report were made at the worst case data rate of each modulation.

2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Laptop	PP22L	H7R1GBX	DELL	FCC DoC
-	-	-	-	-

2.4 Tested environment

Temperature	:	22 ~ 24 °C
Relative humidity content	:	40 ~ 49 % R.H.
Details of power supply	:	DC 11.1 V

2.5 EMI suppression Device(s) / Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. SUMMARY OF TESTS

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Transmitter Mode (TX)					
15.247(a)	RSS-210 [A8.2]	6 dB Bandwidth	> 500 kHz	Conducted	NT Note3
15.247(b)	RSS-210 [A8.4]	Transmitter Output Power	< 1Watt		C
15.247(d)	RSS-210 [A8.5]	Out of Band Emissions / Band Edge	20dBc in any 100kHz BW		NT Note3
15.247(e)	RSS-210 [A8.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz		NT Note3
-	RSS Gen [4.6.1]	Occupied Bandwidth (99%)	RSS-Gen(4.6.1)		C
15.205 15.209	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209 limits	Radiated	C Note2
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NA Note4
15.203	-	Antenna Requirements	FCC 15.203 limits	-	C

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

Note 2: This test item was performed in each axis and the worst case data was reported.

Note 3: These test items were not performed because this device uses the granted module.
(FCCID: PPD-AR5B116)
Please refer to the test report of the granted module.
The module test report number:
FR080603A(By SPORTON INTERNATIONAL INC.)

Note 4: The EUT use only battery operating.

4. TEST METHODOLOGY

Generally the tests were performed according to the KDB558074 v03r1. And ANSI C63.10-2009 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing

4.1 EUT configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT exercise

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

4.3 General test procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB 558074 v03r1. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10.

The EUT is placed on the turntable, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15MHz and 30MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB 558074 v03r1. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10 as stated on section 12.1 of the KDB 558074 v03r1.

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axis.

4.4 Description of test modes

A test program is used to control the EUT for staying in continuous transmitting mode.

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 Facilities

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 38, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number : 678747

6.2 Equipment

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements. All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7. ANTENNA REQUIREMENTS

7.1 According to FCC 47 CFR §15.203& RSS-Gen [7.1.2]:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 of this section.

The internal antenna is attached on the main PCB using the special spring tension.

(Please refer to the internal photo.)

Therefore this E.U.T Complies with the requirement of §15.203

7.2 Directional antenna gain for MIMO :

Bands	ANT 1 [dBi]	ANT 2 [dBi]	Directional Gain for uncorrelated signals [dBi]
2.4 GHz	- 0.210	- 12.120	-2.949

Directional gain = 10 log[($10^{G1/10}$ + $10^{G2/10}$ + … + $10^{GN/10}$) /N_{ANT}] dBi for MIMO uncorrelated signal

8. TEST RESULT

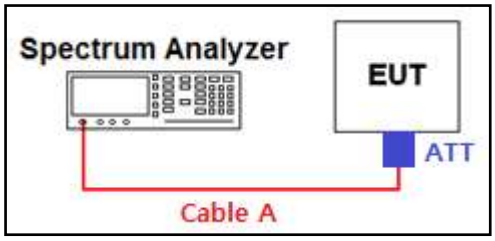
8.1 6dB bandwidth

Test Requirements and limit, §15.247(a) & RSS-210 [A8.2]

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

▣ **TEST CONFIGURATION**



▣ **TEST PROCEDURE**

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB558074 v03r1**.

1. Set resolution bandwidth (RBW) = 100 KHz
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
   (RBW:100KHz/VBW:300KHz)
3. Detector = **Peak**.
4. Trace mode = **max hold**.
5. Sweep = **auto couple**.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

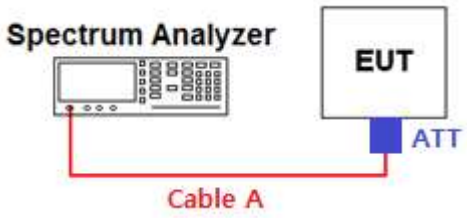
▣ **TEST RESULTS:** N/T

8.2 Maximum peak conducted output power

Test Requirements and limit, §15.247(b) & RSS-210 [A8.4]

The maximum permissible conducted output power is **1 Watt**.

▣ TEST CONFIGURATION

Test Configuration for **PKPM1** and **AVGPM-G**	Test Configuration for **Integrated band power method**
	

▣ TEST PROCEDURE:

1. **PKPM1 Peak power meter method of KDB558074 v03r1**

   The maximum conducted output powers were measured using a broadband peak RF power meter which has greater video bandwidth than DUT's DTS bandwidth and utilize a fast-responding diode detector.

2. **Integrated band power method of KDB558074 v03r1 for maximum peak conducted output power**

   The maximum conducted output powers were measured using a spectrum analyzer as below setting.

   - RBW = 1MHz & VBW ≥ 3 X RBW
   - Span ≥ 1.5 X DTS bandwidth
   - Detector = Peak & Sweep time = auto couple
   - Trace mode = max hold
   - Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges.

3. **Method AVGPM-G (Measurement using a gated RF average power meter) of KDB558074 v03r1**

   The average conducted output powers were measured using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

▣ TEST RESULTS: Comply

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for ***802.11b***			
			Data Rate [Mbps]			
			1	2	5.5	11
ANT 1	2412	PK	19.550	19.410	19.360	19.270
		AV	16.530	16.450	16.410	16.360
	2437	PK	19.710	19.660	19.600	19.510
		AV	16.930	16.860	16.820	16.750
	2462	PK	**20.220**	20.200	20.170	20.120
		AV	17.300	17.260	17.210	17.160
ANT 2	2412	PK	19.330	19.260	19.190	19.110
		AV	16.520	16.460	16.380	16.330
	2437	PK	19.480	19.450	19.410	19.360
		AV	16.680	16.640	16.520	16.470
	2462	PK	**19.990**	19.960	19.920	19.840
		AV	17.250	17.220	17.180	17.130
Sum (ANT 1+2)	2412	PK	22.452	22.346	22.287	22.202
	2437	PK	22.607	22.567	22.517	22.446
	2462	PK	**23.117**	23.092	23.058	22.993

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for ***802.11g***							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
ANT 1	2412	PK	23.600	23.580	23.520	23.470	23.440	23.420	23.360	23.310
		AV	16.420	16.380	16.330	16.250	16.180	16.030	15.820	15.650
	2437	PK	23.720	23.690	23.630	23.610	23.550	23.540	23.510	23.480
		AV	16.640	16.520	16.480	16.330	16.260	16.170	16.050	15.980
	2462	PK	**23.980**	23.940	23.900	23.870	23.820	23.760	23.690	23.620
		AV	16.970	16.860	16.780	16.680	16.600	16.510	16.420	16.330
ANT 2	2412	PK	23.630	23.590	23.570	23.520	23.490	23.460	23.440	23.390
		AV	16.260	16.150	16.040	15.910	15.830	15.720	15.600	15.540
	2437	PK	23.840	23.800	23.770	23.750	23.710	23.670	23.630	23.590
		AV	16.480	16.390	16.300	16.170	16.050	15.960	15.870	15.750
	2462	PK	**24.030**	24.000	23.980	23.940	23.890	23.860	23.820	23.770
		AV	16.730	16.650	16.560	16.440	16.320	16.200	16.120	16.050
Sum (ANT 1+2)	2412	PK	26.626	26.596	26.556	26.506	26.476	26.451	26.411	26.361
	2437	PK	26.791	26.756	26.711	26.691	26.642	26.616	26.581	26.546
	2462	PK	**27.016**	26.981	26.951	26.916	26.866	26.821	26.766	26.706

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for *802.11n(HT20)*							
			Modulation and Coding Scheme [MCS]							
			0	1	2	3	4	5	6	7
ANT 1	2412	PK	23.570	23.520	23.480	23.410	23.360	23.330	23.270	23.240
		AV	15.260	15.150	15.070	15.000	14.890	14.820	14.720	14.630
	2437	PK	23.720	23.690	23.630	23.580	23.540	23.490	23.470	23.430
		AV	15.730	15.660	15.530	15.420	15.340	15.230	15.080	14.960
	2462	PK	**23.880**	23.840	23.800	23.770	23.750	23.690	23.640	23.600
		AV	16.080	15.970	15.860	15.720	15.630	15.500	15.480	15.400
ANT 2	2412	PK	23.530	23.500	23.460	23.390	23.360	23.300	23.260	23.220
		AV	15.120	15.020	14.970	14.850	14.760	14.690	14.550	14.420
	2437	PK	23.650	23.630	23.600	23.560	23.520	23.480	23.450	23.420
		AV	15.580	15.490	15.380	15.250	15.160	15.030	14.920	14.830
	2462	PK	**23.760**	23.710	23.680	23.640	23.610	23.570	23.520	23.490
		AV	15.810	15.730	15.640	15.530	15.400	15.280	15.200	15.090
Sum (ANT 1+2)	2412	PK	26.561	26.521	26.481	26.411	26.371	26.326	26.276	26.241
	2437	PK	26.696	26.671	26.626	26.581	26.541	26.496	26.471	26.436
	2462	PK	**26.831**	26.786	26.751	26.716	26.691	26.641	26.591	26.556

ANT	Freq. (MHz)	Det.	Maximum Peak Conducted Output Power (dBm) for *802.11n(HT40)*							
			Modulation and Coding Scheme [MCS]							
			0	1	2	3	4	5	6	7
ANT 1	2422	PK	21.820	21.780	21.760	21.710	21.680	21.630	21.600	21.550
		AV	12.680	12.560	12.490	12.360	12.270	12.110	12.030	11.920
	2437	PK	21.880	21.830	21.800	21.780	21.720	21.690	21.660	21.620
		AV	12.760	12.690	12.580	12.460	12.370	12.250	12.110	12.010
	2452	PK	**21.920**	21.900	21.840	21.820	21.770	21.740	21.700	21.680
		AV	12.880	12.770	12.680	12.600	12.500	12.380	12.250	12.180
ANT 2	2422	PK	21.220	21.180	21.150	21.110	21.070	21.050	21.020	20.990
		AV	12.550	12.480	12.360	12.270	12.150	12.060	11.950	11.860
	2437	PK	21.310	21.270	21.230	21.200	21.150	21.120	21.080	21.050
		AV	12.690	12.590	12.500	12.380	12.230	12.150	12.030	11.930
	2452	PK	**21.470**	21.440	21.400	21.380	21.350	21.320	21.270	21.250
		AV	12.800	12.690	12.600	12.480	12.330	12.240	12.110	12.020
Sum (ANT 1+2)	2422	PK	24.541	24.501	24.477	24.431	24.397	24.360	24.330	24.290
	2437	PK	24.615	24.570	24.535	24.510	24.455	24.425	24.390	24.355
	2452	PK	**24.712**	24.687	24.636	24.616	24.576	24.546	24.501	24.481

Note: This result of PK was tested using the PKPM1 Peak power meter method.

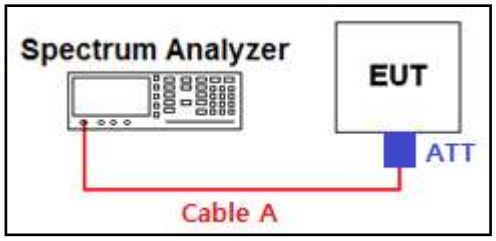
8.3 Maximum power spectral density

Test requirements and limit, §15.247(e) & RSS-210 [A8.2]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard –specifies a conducted power spectral density (PSD) limit of 8 dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE:

The Measurement Procedure **Method PKPSD of KDB558074 v03r1** is used.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to **1.5 times** the DTS bandwidth.
3. Set the RBW to: **3 kHz** ≤ RBW ≤ **100 kHz**
4. Set the VBW ≥ **3 x RBW**
5. Detector = **peak**
6. Sweep time = **auto couple**
7. Trace mode = **max hold.**
8. Allow trace to fully stabilize.
9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

▣ TEST RESULTS: N/T

8.4 Out of band emissions at the band edge / conducted spurious emissions

Test requirements and limit, §15.247(d)

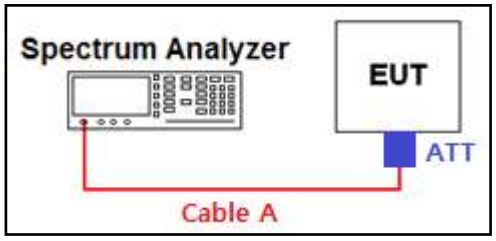
§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

If **the peak output power procedure** is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20 dB** relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in band average PSD level.

In either case, attenuation to levels below the general emission limits specified in **§15.209(a)** is not required.

▣TEST CONFIGURATION



▣TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer.

- Measurement Procedure 1 – Reference Level

1. Set instrument center frequency to DTS channel center frequency.
2. Set the span to ≥ 1.5 times the DTS bandwidth.
3. Set the RBW = 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum PSD level

- Measurement Procedure 2 - Unwanted Emissions

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = **100 kHz for below 1GHz , 1MHz for above 1GHz**
3. Set the VBW ≥ **3 x RBW(Actual 3 MHz, See below note)**
4. Detector = **peak**.
5. Ensure that the number of measurement points ≥ span/RBW
6. Sweep time = **auto couple.**
7. Trace mode = **max hold.**
8. **Allow the trace to stabilize** (this may take some time, depending on the extent of the span).
9. Use the peak marker function to determine the maximum amplitude level.

▣ TEST RESULTS: N/T

8.5 Radiated spurious emissions

Test Requirements and limit,§15.247(d), §15.205, §15.209& RSS-210 [A8.5], RSS-Gen [7.2.2]

In any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

▪ **FCC Part 15.209(a) and (b)**

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

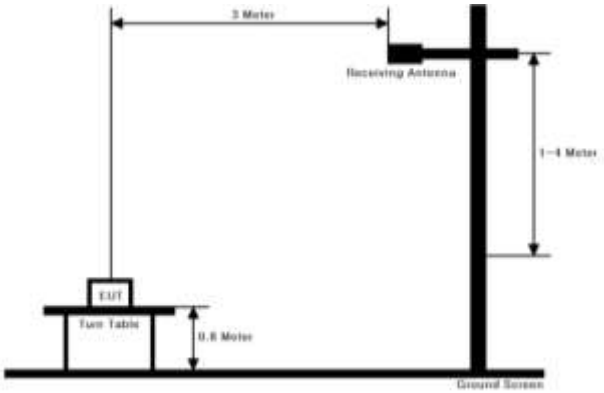
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part,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

▪ **FCC Part 15.205 (a):** 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 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240	3600 ~ 4400		
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

▪ **FCC Part 15.205(b):** 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.

Test Configuration



▣ TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

▣ Measurement Instrument Setting for Radiated Emission Measurements.

Peak Measurement: 12.2.4 of KDB 558074 v03r1

RBW = As specified in below table , VBW ≥ 3 x RBW, Sweep = Auto, Detector = Peak, Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

Average Measurement: 12.2.5.2 of KDB 558074 v03r1

1. RBW = 1MHz(unless otherwise specified)
2. VBW ≥ 3 X RBW
3. Detector = RMS, if span / sweep point ≤ (RBW/2)
4. Averaging type = Power
5. Sweep time = auto
6. Trace average = At least 100 traces
7. A duty cycle correction factor(10log(1/x), where x is the duty cycle) shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.

1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.
2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

Test Mode	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
TM 1	99.49	0.02
TM 2	96.45	0.16
TM 3	96.21	0.17
TM 4	94.20	0.26

Note: Please refer to Appendix I for detailed information.

Radiated Spurious Emissions data(9kHz ~ 25GHz) : *Test Mode 1(TM 1)*

Tested ANT	Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
ANT 1 + ANT 2	Lowest	2343.52	H	Y	PK	52.41	-0.28	N/A	N/A	52.13	74.00	21.87
		2343.84	H	Y	AV	39.68	-0.28	N/A	N/A	39.40	54.00	14.60
		4823.87	H	Y	PK	51.38	6.61	N/A	N/A	57.99	74.00	16.01
		4823.84	H	Y	AV	43.75	6.61	N/A	N/A	50.36	54.00	3.64
		-	-	-	-	-	-	-	-	-	-	-
	Middle	4873.91	H	Y	PK	47.93	6.73	N/A	N/A	54.66	74.00	19.34
		4874.11	H	Y	AV	41.06	6.73	N/A	N/A	47.79	54.00	6.21
		-	-	-	-	-	-	-	-	-	-	-
	Highest	2484.72	H	X	PK	51.17	0.24	N/A	N/A	51.41	74.00	22.59
		2485.15	H	Y	AV	40.85	0.24	N/A	N/A	41.09	54.00	12.91
		4923.99	H	Y	PK	48.97	6.85	N/A	N/A	55.82	74.00	18.18
		4924.02	H	Y	AV	42.42	6.85	N/A	N/A	49.27	54.00	4.73
		-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1m/3m)

Radiated Spurious Emissions data(9kHz ~ 25GHz) : *Test Mode 2(TM 2)*

Tested ANT	Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
ANT 1 + ANT 2	Lowest	2389.44	H	Y	PK	55.57	-0.28	N/A	N/A	55.29	74.00	18.71
		2389.92	H	Y	AV	45.28	-0.28	0.16	N/A	45.16	54.00	8.84
		4823.35	H	Y	PK	48.43	6.61	N/A	N/A	55.04	74.00	18.96
		4823.23	H	Y	AV	37.36	6.61	0.16	N/A	44.13	54.00	9.87
		-	-	-	-	-	-	-	-	-	-	-
	Middle	4873.34	H	Y	PK	47.73	6.73	N/A	N/A	54.46	74.00	19.54
		4873.19	H	Y	AV	36.22	6.73	0.16	N/A	43.11	54.00	10.89
		-	-	-	-	-	-	-	-	-	-	-
	Highest	2484.14	H	X	PK	64.68	0.24	N/A	N/A	64.92	74.00	9.08
		2483.57	H	Y	AV	47.35	0.24	0.16	N/A	47.75	54.00	6.25
		4924.49	H	Y	PK	49.63	6.85	N/A	N/A	56.48	74.00	17.52
		4924.21	H	Y	AV	38.11	6.85	0.16	N/A	45.12	54.00	8.88
		-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1m/3m)

Radiated Spurious Emissions data(9kHz ~ 25GHz) : *Test Mode 3(TM 3)*

Tested ANT	Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
ANT 1 + ANT 2	Lowest	2389.92	H	Y	PK	55.48	-0.28	N/A	N/A	55.20	74.00	18.80
		2389.68	H	Y	AV	44.23	-0.28	0.17	N/A	44.12	54.00	9.88
		4824.68	H	Y	PK	46.14	6.61	N/A	N/A	52.75	74.00	21.25
		4824.28	H	Y	AV	35.89	6.61	0.17	N/A	42.67	54.00	11.33
		-	-	-	-	-	-	-	-	-	-	-
	Middle	4874.63	H	Y	PK	45.59	6.73	N/A	N/A	52.32	74.00	21.68
		4874.12	H	Y	AV	35.13	6.73	0.17	N/A	42.03	54.00	11.97
		-	-	-	-	-	-	-	-	-	-	-
	Highest	2483.56	H	X	PK	58.16	0.24	N/A	N/A	58.40	74.00	15.60
		2483.85	H	Y	AV	45.57	0.24	0.17	N/A	45.98	54.00	8.02
		4924.16	H	Y	PK	46.87	6.85	N/A	N/A	53.72	74.00	20.28
		4924.05	H	Y	AV	35.37	6.85	0.17	N/A	42.39	54.00	11.61
		-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1m/3m)

Radiated Spurious Emissions data(9kHz ~ 25GHz) : *Test Mode 4(TM 4)*

Tested ANT	Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
ANT 1 + ANT 2	Lowest	2389.80	H	Y	PK	55.03	-0.28	N/A	N/A	54.75	74.00	19.25
		2390.00	H	Y	AV	40.44	-0.28	0.26	N/A	40.42	54.00	13.58
		4843.51	H	Y	PK	44.21	6.66	N/A	N/A	50.87	74.00	23.13
		4843.78	H	Y	AV	32.46	6.66	0.26	N/A	39.38	54.00	14.62
		-	-	-	-	-	-	-	-	-	-	-
	Middle	4873.85	H	Y	PK	44.49	6.73	N/A	N/A	51.22	74.00	22.78
		4873.41	H	Y	AV	32.85	6.73	0.26	N/A	39.84	54.00	14.16
		-	-	-	-	-	-	-	-	-	-	-
	Highest	2484.00	H	X	PK	50.08	0.24	N/A	N/A	50.32	74.00	23.68
		2484.75	H	Y	AV	38.20	0.24	0.26	N/A	38.70	54.00	15.30
		4904.57	H	Y	PK	45.02	6.80	N/A	N/A	51.82	74.00	22.18
		4904.42	H	Y	AV	33.06	6.80	0.26	N/A	40.12	54.00	13.88
		-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
   DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
   Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1m/3m)

8.6 Power-line conducted emissions

Test Requirements and limit, §15.207& RSS-Gen [7.2.2]

For an intentional radiator which 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 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

▣ **TEST PROCEDURE**

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to the test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

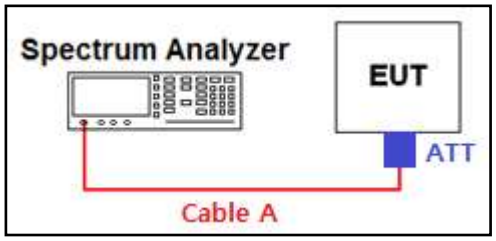
▣ **Test Results: N/A**

8.7 Occupied bandwidth

Test Requirements, RSS-Gen [4.6.1]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%.
The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted.
Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

▣ TEST RESULTS: Comply

Test Mode	Frequency	Test Results[MHz]	
		ANT 1	ANT 2
TM 1	Lowest	14.074	13.982
	Middle	14.175	14.112
	Highest	14.031	13.979
TM 2	Lowest	17.408	17.163
	Middle	17.667	17.340
	Highest	17.614	17.284
TM 3	Lowest	18.314	18.329
	Middle	18.417	18.439
	Highest	18.472	18.294
TM 4	Lowest	37.582	37.321
	Middle	37.350	37.451
	Highest	37.592	37.346

▣ RESULT PLOTS

Occupied Bandwidth

TM 1 & ANT 1 & Lowest

Occupied Bandwidth

TM 1 & ANT 1 & Middle

Occupied Bandwidth TM 1 & ANT 1 & Highest

Occupied Bandwidth TM 1 & ANT 2 & Lowest

Occupied Bandwidth TM 1 & ANT 2 & Middle

Occupied Bandwidth TM 1 & ANT 2 & Highest

Occupied Bandwidth TM 2 & ANT 1 & Lowest

Occupied Bandwidth TM 2 & ANT 1 & Middle

Occupied Bandwidth TM 2 & ANT 1 & Highest

Occupied Bandwidth TM 2 & ANT 2 & Lowest

Occupied Bandwidth TM 2 & ANT 2 & Middle

Occupied Bandwidth TM 2 & ANT 2 & Highest

Occupied Bandwidth TM 3 & ANT 1 & Lowest

Occupied Bandwidth TM 3 & ANT 1 & Middle

Occupied Bandwidth TM 3 & ANT 1 & Highest

Occupied Bandwidth TM 3 & ANT 2 & Lowest

Occupied Bandwidth TM 3 & ANT 2 & Middle

Occupied Bandwidth TM 3 & ANT 2 & Highest

Occupied Bandwidth TM 4 & ANT 1 & Lowest

Occupied Bandwidth TM 4 & ANT 1 & Middle

Occupied Bandwidth TM 4 & ANT 1 & Highest

Occupied Bandwidth TM 4 & ANT 2 & Lowest

Occupied Bandwidth TM 4 & ANT 2 & Middle

Occupied Bandwidth TM 4 & ANT 2 & Highest

9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	N9030A	13/11/05	14/11/05	MY48011075
Spectrum Analyzer	Agilent	N9020A	14/01/07	15/01/07	MY49100833
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2496A	13/10/29	14/10/29	1338004
		MA2411B			1306053
		MA2490A			1249303
Wideband Power Sensor	Rohde Schwarz	NRP-Z81	13/05/27	14/05/27	1137.9009.02-101001
Vector Signal Generator	Rohde Schwarz	SMJ100A	14/01/07	15/01/07	100148
Signal Generator	Rohde Schwarz	SMF100A	13/07/22	14/07/22	102341
Digital Multimeter	H.P	34401A	13/02/27	14/02/27	3146A13475
			14/02/27	15/02/27	
DC Power Supply	Agilent	66332A	13/10/21	14/10/21	US37474353
Thermo hygrometer	BODYCOM	BJ5478	13/06/01	14/06/01	120612-1
Thermo hygrometer	BODYCOM	BJ5478	13/06/01	14/06/01	120612-2
Attenuator(3dB)	SMAJK	SMAJK-2-3	13/10/22	14/10/22	5
High-pass filter	Wainwright	WHKX3.0	13/09/12	14/09/12	12
Amplifier (30dB)	Agilent	8449B	13/02/27	14/02/27	3008A00370
			14/02/27	15/02/27	
LOOP Antenna	Schwarzbeck	FMZB1513	12/09/24	14/09/24	1513-128
BILOG ANTENNA	SCHAFFNER	CBL6112B	12/11/06	14/11/06	2737
Horn Antenna	ETS	3117	13/06/14	15/06/14	00140394
HORN ANT	A.H.Systems	SAS-574	13/03/20	15/03/20	154

APPENDIX I

Duty cycle information

TEST PROCEDURE

Duty cycle measured using **section 6.0 b) of KDB558074 v03r1 :**

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

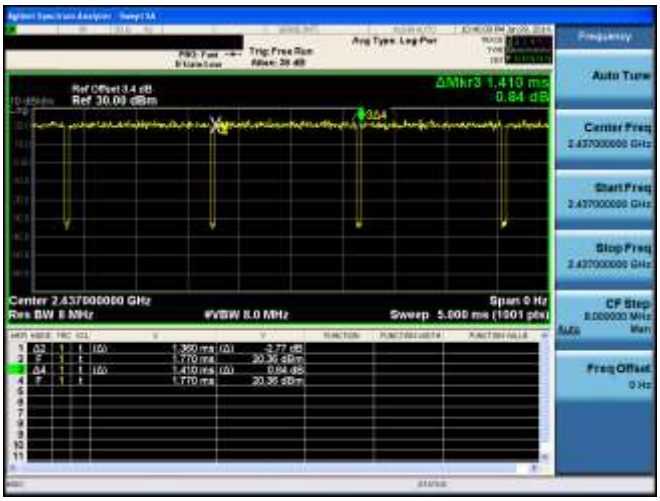
Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

TEST DATA

Test Mode	Tested frequency	T_{ON} (ms)	T_{ON+OFF} (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
TM 1	Lowest	8.190	8.232	99.49	0.02
TM 2	Lowest	1.360	1.410	96.45	0.16
TM 3	Lowest	1.270	1.320	96.21	0.17
TM 4	Lowest	0.633	0.672	94.20	0.26

Please refer to next page for actual test plot.

Duty cycle data : **TM 1** & **Middle**	Duty cycle data : **TM 2** & **Middle**
	

Duty cycle data : **TM 3** & **Middle**	Duty cycle data : **TM 4** & **Middle**