



FCC Radio Test Report

FCC ID: XW3DR9022RL

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

Issued Date : Nov. 23, 2009
Project No. : 0911C082
Equipment : 2.4G WIRELESS Transceiver
Model Name : DR-9022RL
Applicant : Dongguan Siliten Electronics CO.,LTD
Address : Sijia Yewu Industrial estate, Shijie Town, Dongguan City, Guangdong Province,China
Manufacturer : Dongguan Siliten Electronics CO.,LTD
Address : Sijia Yewu Industrial estate, Shijie Town, Dongguan City, Guangdong Province,China

Tested by:
 Neutron Engineering Inc. EMC Laboratory

Date of Test:
 Nov. 15, 2009 ~ Nov. 18, 2009

Testing Engineer : Jeff Yang
 (Jeff Yang)

Technical Manager : Vic Chiu
 (Vic Chiu)

Authorized Signatory : Steven Lu
 (Steven Lu)

NEUTRON ENGINEERING INC.

No. 132-1, Lane 329, Sec. 2, Palain Rd.,
 Shijr City, Taipei, Taiwan
 TEL : (02) 2646-5426 FAX : (02) 2646-6815





Declaration

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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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1. CERTIFICATION

Equipment: 2.4G WIRELESS Transceiver
Brand Name: N/A
Model Name: DR-9022RL
Applicant: Dongguan Siliten Electronics CO.,LTD
Factory: Dongguan Siliten Electronics CO.,LTD
Address: Sijia Yewu Industrial estate, Shijie Town, Dongguan City, Guangdong
Province,China
Test Item: ENGINEERING SAMPLE
Date of Test: Nov. 15, 2009 ~ Nov. 18, 2009
Standards: FCC Part15, Subpart C(15.247) / ANSI C63.4 : 2003

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-0911C082) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP and 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:

| FCC Part15 (15.247) , Subpart C | | | |
|--|-------------------------------------|-----------------|---------------|
| Standard Section | Test Item | Judgment | Remark |
| 15.207 | Conducted Emission | PASS | |
| 15.209 | Radiated Spurious Emission | PASS | |
| 15.247 (c) | Antenna conducted Spurious Emission | PASS | |
| 15.247 (a)(1) | Hopping Channel Separation | PASS | |
| 15.247 (b)(1) | Peak Output Power | PASS | |
| 15.247 (c) | Radiated Spurious Emission | PASS | |
| 15.247 (b)(1) | Number of Hopping Frequency | PASS | |
| 15.247 (a)(1) | Dwell Time | PASS | |
| 15.205 | Restricted Bands | PASS | |
| 15.203 | Antenna Requirement | PASS | |
| 1.1307 1.1310 2.1091 2.1093 | RF Exposure Compliance | 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 **C01/OS02** at the location of No.132-1, Lane 329, Sec. 2, Palain Road, Shijr City, Taipei, Taiwan.
Neutron's test firm number is 95335

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended 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. Conducted Measurement :

| Test Site | Method | Measurement Frequency Range | U , (dB) | NOTE |
|-----------|--------|-----------------------------|----------|------|
| C01 | ANSI | 150 KHz ~ 30MHz | 1.94 | |

B. Radiated Measurement :

| Test Site | Method | Measurement Frequency Range | Ant. H / V | U , (dB) | NOTE |
|-----------|--------|-----------------------------|------------|----------|------|
| OS-01 | ANSI | 30MHz ~ 200MHz | V | 3.82 | |
| | | 30MHz ~ 200MHz | H | 3.60 | |
| | | 200MHz ~ 1,000MHz | V | 3.86 | |
| | | 200MHz ~ 1,000MHz | H | 3.94 | |
| OS-02 | ANSI | 30MHz ~ 200MHz | V | 2.48 | |
| | | 30MHz ~ 200MHz | H | 2.16 | |
| | | 200MHz ~ 1,000MHz | V | 2.50 | |
| | | 200MHz ~ 1,000MHz | H | 2.66 | |



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

| | | |
|--|--|--------------------|
| Equipment | 2.4G WIRELESS Transceiver | |
| Brand Name | N/A | |
| Model Name | DR-9022RL | |
| OEM Brand/Model Name | N/A | |
| Model Difference | N/A | |
| Product Description | The EUT is a 2.4G WIRELESS Transceiver | |
| | Operation Frequency: | 2405~2476 MHz |
| | Modulation Type: | FHSS |
| | Bit Rate of Transmitter | GFSK(1Mbps) |
| | Number Of Channel | 64 CH |
| | Antenna Designation: | Please see Note 3. |
| | Antenna Gain(Peak) | Please see Note 3. |
| | Output Power: | -4.46dBm |
| Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual. | | |
| Channel List | Please refer to the Note 2. | |
| Power Source | DC voltage supplied from host system. | |
| Power Rating | I/P AC 120V/60Hz O/P DC 5V | |
| Connecting I/O Port(s) | Please refer to the User's Manual | |
| Products Covered | N/A | |
| EUT Modification(s) | N/A | |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Example of 64 hopping sequence in data mode:

```

11 27 33 25 17 49 01 60
56 31 26 45 39 16 44 34
48 61 41 15 47 50 09 20
12 08 52 28 00 35 19 36
30 53 22 51 38 21 57 04
05 62 46 03 54 07 37 40
59 24 06 63 18 58 32 55
10 13 23 42 14 29 02 43

```



3.

| Group 1 | | Group 2 | |
|---------|-----------------|-----------|-----------------|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 1 | 2405 | 33 | 2407 |
| 2 | 2406 | 34 | 2408 |
| 3 | 2409 | 35 | 2412 |
| 4 | 2410 | 36 | 2414 |
| 5 | 2411 | 37 | 2417 |
| 6 | 2412 | 38 | 2420 |
| 7 | 2415 | 39 | 2421 |
| 8 | 2416 | 40 | 2422 |
| 9 | 2418 | 41 | 2427 |
| 10 | 2419 | 42 | 2428 |
| 11 | 2423 | 43 | 2431 |
| 12 | 2425 | 44 | 2435 |
| 13 | 2429 | 45 | 2436 |
| 14 | 2430 | 46 | 2437 |
| 15 | 2432 | 47 | 2438 |
| 16 | 2434 | 48 | 2439 |
| 17 | 2443 | 49 | 2442 |
| 18 | 2444 | 50 | 2447 |
| 19 | 2446 | 51 | 2451 |
| 20 | 2448 | 52 | 2452 |
| 21 | 2449 | 53 | 2457 |
| 22 | 2453 | 54 | 2458 |
| 23 | 2455 | 55 | 2459 |
| 24 | 2456 | 56 | 2460 |
| 25 | 2462 | 57 | 2461 |
| 26 | 2463 | 58 | 2465 |
| 27 | 2464 | 59 | 2468 |
| 28 | 2466 | 60 | 2469 |
| 29 | 2467 | 61 | 2472 |
| 30 | 2470 | 62 | 2473 |
| 31 | 2471 | 63 | 2475 |
| 32 | 2474 | 64 | 2476 |

4. Table for Filed Antenna

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) |
|------|-------|------------|-----------------|-----------|------------|
| 1 | N/A | N/A | Printed Antenna | N/A | -0.46 |



3.2 DESCRIPTION OF TEST MODES

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

| Pretest Mode | Description |
|--------------|-------------|
| Mode 1 | TX CH01 |
| Mode 2 | TX CH48 |
| Mode 3 | TX CH64 |
| Mode 4 | Normal Link |

| For Conducted Emission | |
|------------------------|-------------|
| Final Test Mode | Description |
| Mode 4 | Normal Link |

| For Radiated Emission | |
|-----------------------|-------------|
| Final Test Mode | Description |
| Mode 1 | TX CH01 |
| Mode 2 | TX CH48 |
| Mode 3 | TX CH64 |

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.

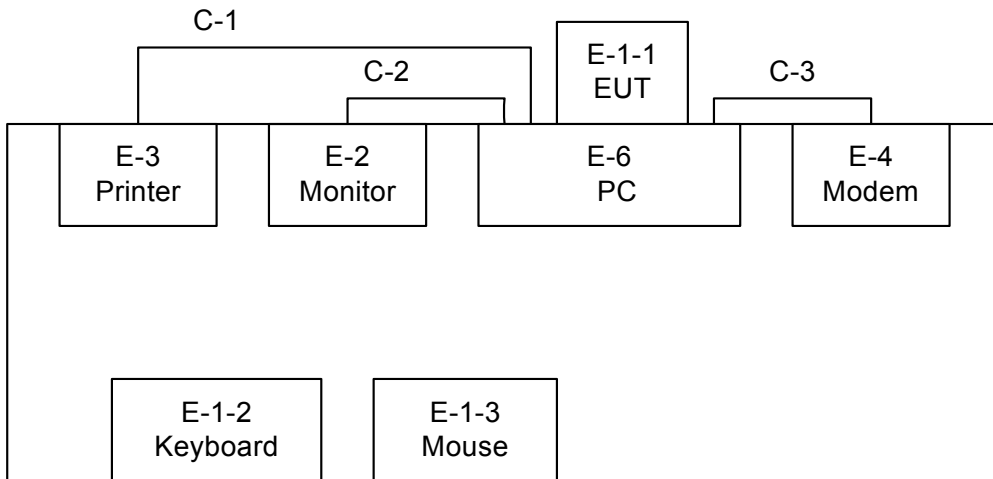
3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

| Test software Version | Test program: Hardware control | | |
|-----------------------|--------------------------------|----------|----------|
| Frequency | 2405 MHz | 2439 MHz | 2476 MHz |
| Parameters(1Mbps) | N/A | N/A | N/A |

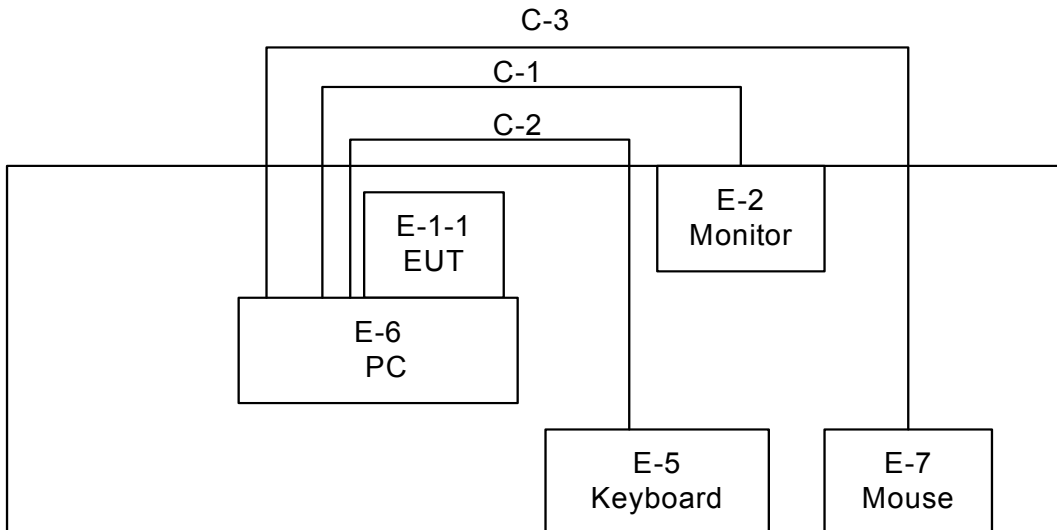
3.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted



C-1: Parel Cable
 C-2: D-SUB Cable
 C-3: RS232 Cable

Radiated



C-1: Parel Cable
 C-2: D-SUB Cable
 C-3: RS232 Cable



3.5 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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 |
|-------|---------------------------|--------------------------------------|----------------|-----------------|-----------------------------|------|
| E-1 | 2.4G WIRELESS Transceiver | N/A | DR-9022RL | XW3DR9022R L | N/A | EUT |
| E-1-2 | KEYBOARD | Dongguan Siliten Electronics CO.,LTD | DK-9023RL | XW3DK9023RL | N/A | |
| E-1-3 | MOUSE | Dongguan Siliten Electronics CO.,LTD | DM-9022RL | XW3DM9022R L | N/A | |
| E-2 | LCD monitor | Dell | E177FPc | DOC | CNOFJ179-64180-6A G-1WNS | |
| E-3 | Printer | SII | DPU-414 | DOC | 3018507 B | |
| E-4 | Modem | ACEEX | DM-1414V | IFAXDm1414 | 0603002131 | |
| E-5 | USB Keyboard | Dell | L100 | DOC | CNORH6596589071T0 8NE | |
| E-6 | PC | IBM | 8705 | DOC | L3G4741 | |
| E-7 | USB Mouse | Dell | MO56UOA | DOC | FQJ000BS | |
| | | | | | | |

| Item | Shielded Type | Ferrite Core | Length | Note |
|------|---------------|--------------|--------|------|
| C-1 | YES | NO | 1.5M | |
| C-2 | YES | YES | 1.5M | |
| C-3 | YES | NO | 1.5M | |
| | | | | |
| | | | | |

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

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

| | | | | | |
|-----------|-------|-------|-----------|-----------|-----|
| 0.15 -0.5 | 79.00 | 66.00 | 66 - 56 * | 56 - 46 * | FCC |
| 0.50 -5.0 | 73.00 | 60.00 | 56.00 | 46.00 | FCC |
| 5.0 -30.0 | 73.00 | 60.00 | 60.00 | 50.00 | FCC |

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.

4.1.2 MEASUREMENT INSTRUMENTS LIST AND SETTING

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|-----------------|----------|------------|------------------|
| 1 | LISN | EMCO | 3816/2 | 00042991 | Jan. 23, 2010 |
| 2 | LISN | EMCO | 3816/2 | 00042990 | Jan. 23, 2010 |
| 3 | Pulse Limiter | Electro-Metrics | EM-7600 | 112644 | Nov. 26, 2009 |
| 4 | 50Ω Terminator | N/A | N/A | N/A | May.11, 2010 |
| 5 | Test Cable | N/A | C01 | N/A | Nov. 26, 2009 |
| 6 | EMI Test Receiver | R&S | ESCI | 100082 | Mar. 06, 2010 |

Remark: " N/A" denotes No Model No. , Serial No. or No Calibration specified.

The following table is the setting of the receiver

| Receiver Parameters | Setting |
|---------------------|----------|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

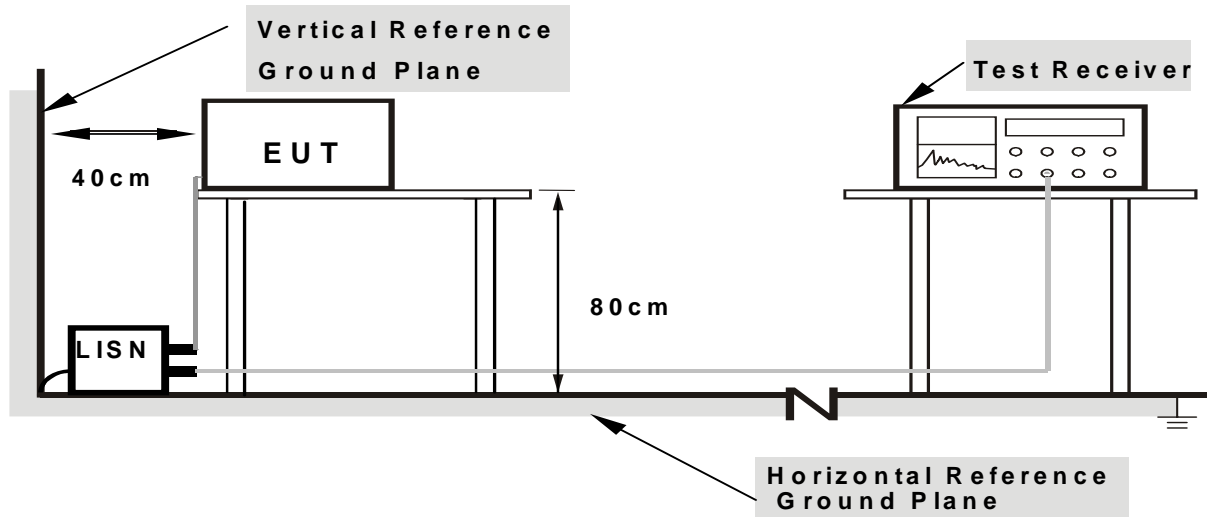
4.1.3 TEST PROCEDURE

- The EUT was placed 0.4 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.
- 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.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes



4.1.6 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.



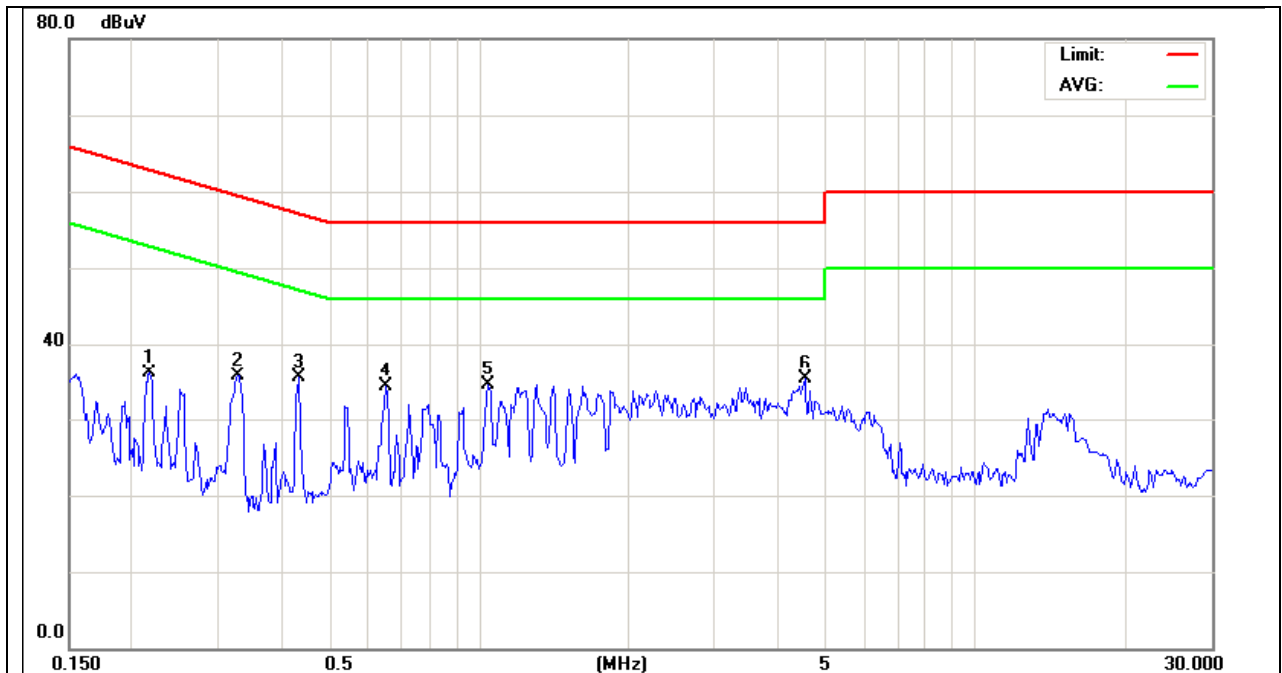
4.1.7 TEST RESULTS

| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 26 °C | Relative Humidity : | 44% |
| Pressure : | 1010hPa | Test Power : | AC 120V/60Hz |
| Test Mode : | Normal Link | | |

| Freq. (MHz) | Terminal L/N | Measured(dBuV) | | Limits(dBuV) | | Margin (dB) | Note |
|-------------|--------------|----------------|---------|--------------|---------|-------------|------|
| | | QP-Mode | AV-Mode | QP-Mode | AV-Mode | | |
| 0.22 | Line | 36.15 | * | 62.92 | 52.92 | -26.77 | (QP) |
| 0.33 | Line | 35.72 | * | 59.54 | 49.54 | -23.82 | (QP) |
| 0.44 | Line | 35.59 | * | 57.16 | 47.16 | -21.57 | (QP) |
| 0.65 | Line | 34.32 | * | 56.00 | 46.00 | -21.68 | (QP) |
| 1.05 | Line | 34.47 | * | 56.00 | 46.00 | -21.53 | (QP) |
| 4.56 | Line | 35.31 | * | 56.00 | 46.00 | -20.69 | (QP) |

Remark

- (1) All readings are QP Mode value unless otherwise stated AVG in column of Note. If the 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 QP Mode was measured, but AVG Mode didn't perform. In this case, a " * " marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150KHz to 30MHz.



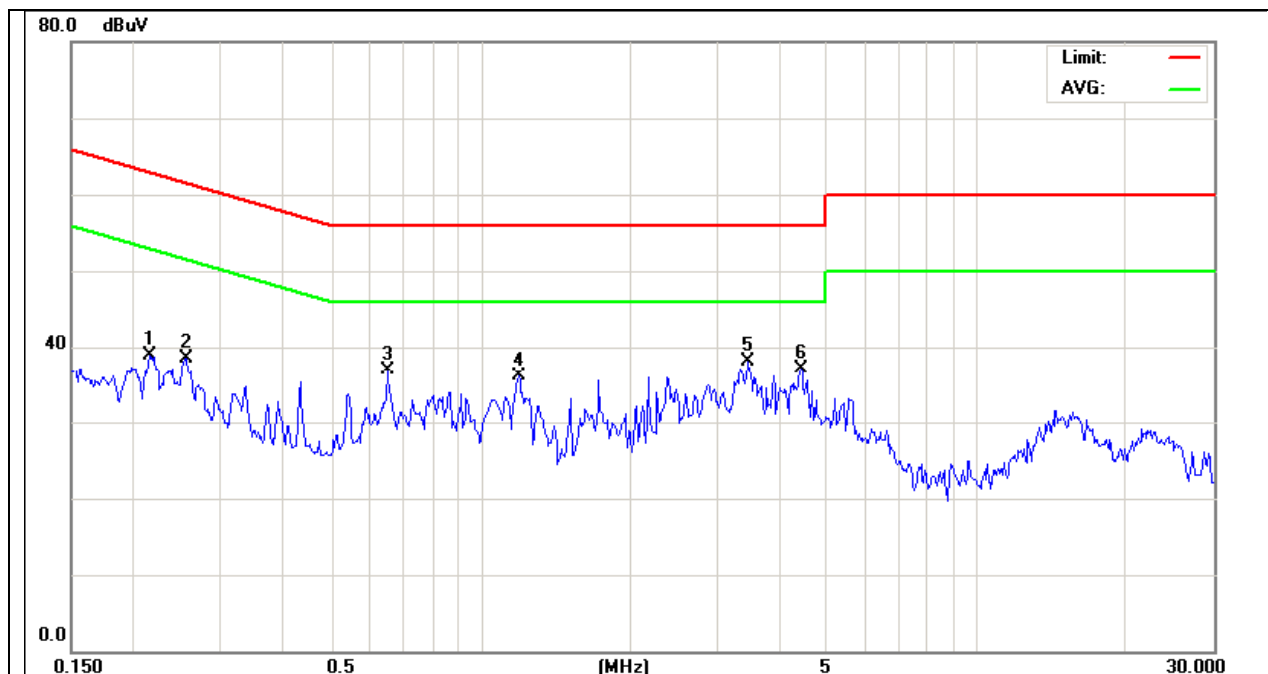


| | | | |
|---------------|---------------------------|---------------------|--------------|
| E.U.T : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 26 °C | Relative Humidity : | 44% |
| Pressure : | 1010hPa | Test Power : | AC 120V/60Hz |
| Test Mode : | Normal Link | | |

| Freq. (MHz) | Terminal L/N | Measured(dBuV) | | Limits(dBuV) | | Margin (dB) | Note |
|-------------|--------------|----------------|---------|--------------|---------|-------------|------|
| | | QP-Mode | AV-Mode | QP-Mode | AV-Mode | | |
| 0.25 | Neutral | 38.93 | * | 63.01 | 53.01 | -24.08 | (QP) |
| 0.26 | Neutral | 38.56 | * | 61.56 | 51.56 | -23.00 | (QP) |
| 0.65 | Neutral | 36.88 | * | 56.00 | 46.00 | -19.12 | (QP) |
| 1.19 | Neutral | 36.14 | * | 56.00 | 46.00 | -19.86 | (QP) |
| 3.47 | Neutral | 38.03 | * | 56.00 | 46.00 | -17.97 | (QP) |
| 4.44 | Neutral | 37.12 | * | 56.00 | 46.00 | -18.88 | (QP) |

Remark

- (1) All readings are QP Mode value unless otherwise stated AVG in column of Note. If the 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 QP Mode was measured, but AVG Mode didn't perform. In this case, a "*" marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150KHz to 30MHz.





4.2 RADIATED EMISSION MEASUREMENT

4.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (micorvolts/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 |

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Class A (dBuV/m) (at 3M) | | Class B (dBuV/m) (at 3M) | |
|-----------------|--------------------------|---------|--------------------------|---------|
| | PEAK | AVERAGE | PEAK | AVERAGE |
| Above 1000 | 80 | 60 | 74 | 54 |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

| Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz) | Range (MHz) |
|---|---|
| Below 1.705 | 30 |
| 1.705 – 108 | 1000 |
| 108 – 500 | 2000 |
| 500 – 1000 | 5000 |
| Above 1000 | 5 th harmonic of the highest frequency or 40 GHz, whichever is lower |



4.2.2 MEASUREMENT INSTRUMENTS LIST AND SETTING

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------------|------------------|--------------|------------|------------------|
| 1 | Log-Bicon Antenna | Schwarzbeck | VULB 9160 | 3058 | Nov. 26, 2009 |
| 2 | Test Cable | N/A | 10M_OS02 | N/A | Nov. 26, 2009 |
| 3 | Test Cable | N/A | OS02-1/-2/-3 | N/A | Nov. 26, 2009 |
| 4 | Pre-Amplifier | Anritsu | MH648A | M09961 | Nov. 26, 2009 |
| 5 | EMI Test Receiver | R&S | ESCI | 100082 | Jan. 29, 2010 |
| 6 | Antenna Mast | Chance Most | CMTB-1.5 | N/A | N/A |
| 7 | Turn Table | Chance Most | CMTB-1.5 | N/A | N/A |
| 8 | Spectrum Analyzer | R&S | FSP_40 | 100129 | Jan. 06, 2010 |
| 9 | Horn Antenna | Schwarzbeck | BBHA9120D | 9120D-325 | Oct. 22, 2010 |
| 10 | Horn Antenna | Schwarzbeck | BBHA9170 | 9170187 | Oct. 22, 2010 |
| 11 | Microwave Pre amplifier | Agilent | 8449B | 3008A01714 | Mar. 08, 2010 |
| 12 | Microflex Cable | United Microwave | 57793 | 1M | Mar. 08, 2010 |
| 13 | Microflex Cable | United Microwave | A30A30-5006 | 10M | Jul. 05, 2010 |

Remark: " N/A" denotes No Model Name / Serial No. and No Calibration specified.

| Spectrum Parameter | Setting |
|---------------------------------------|--|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, Average=PK-dycty cycle |

| Receiver Parameter | Setting |
|------------------------|----------------------------------|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |



DUTY CYCLE : TX 2476MHz (1Mbps)

Dwell time=ON/ON+OFF

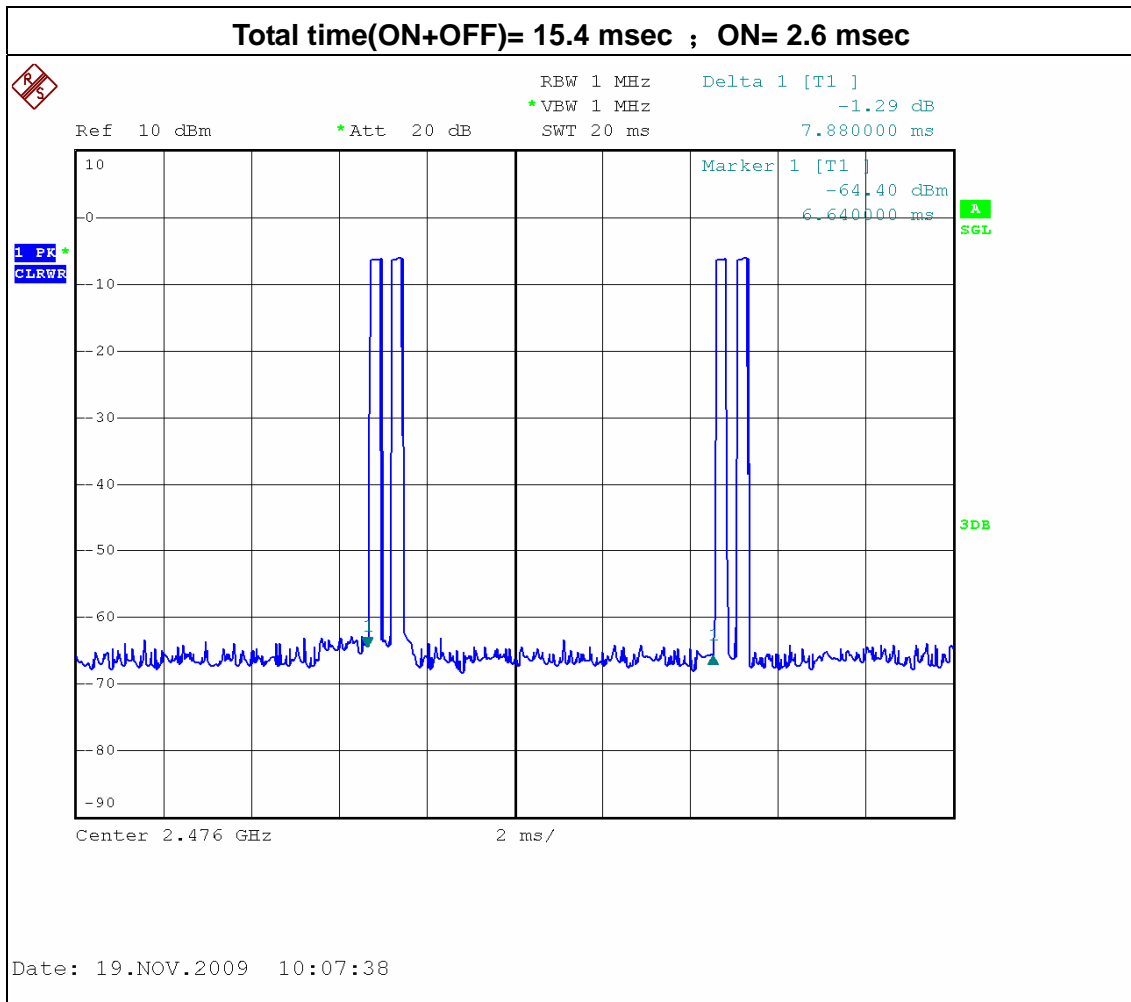
ON:0.36+0.56msec

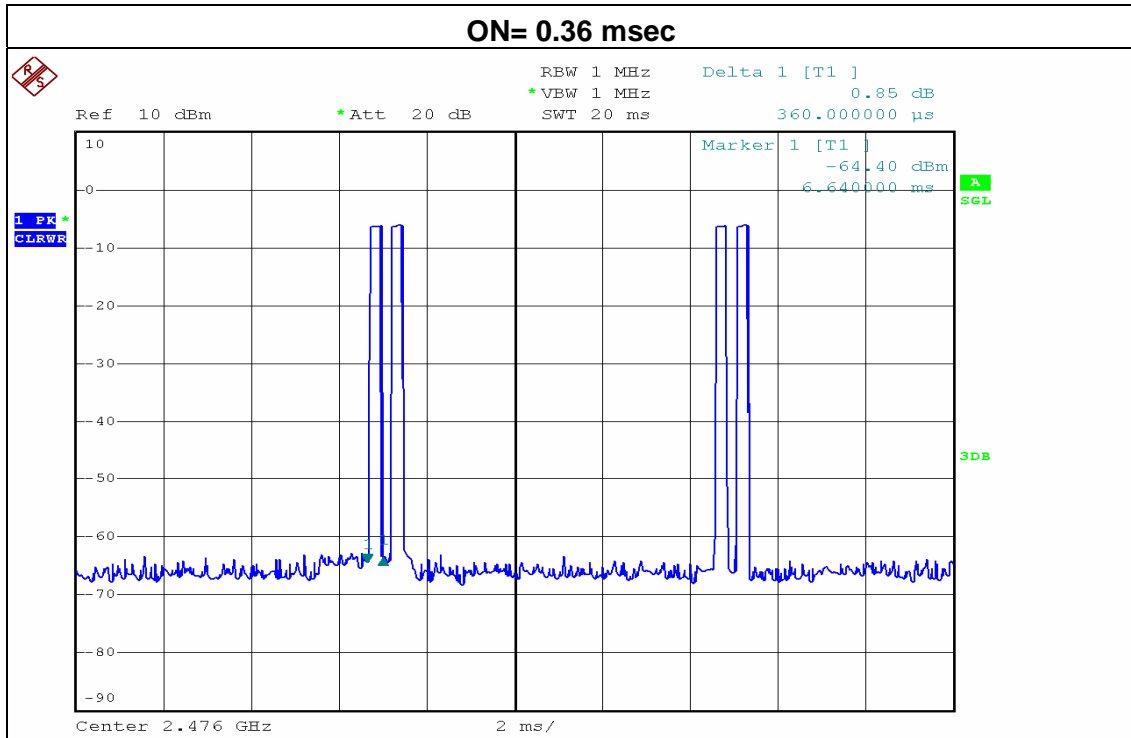
ON+OFF:(total time):7.88msec

Dwell time:11.6%

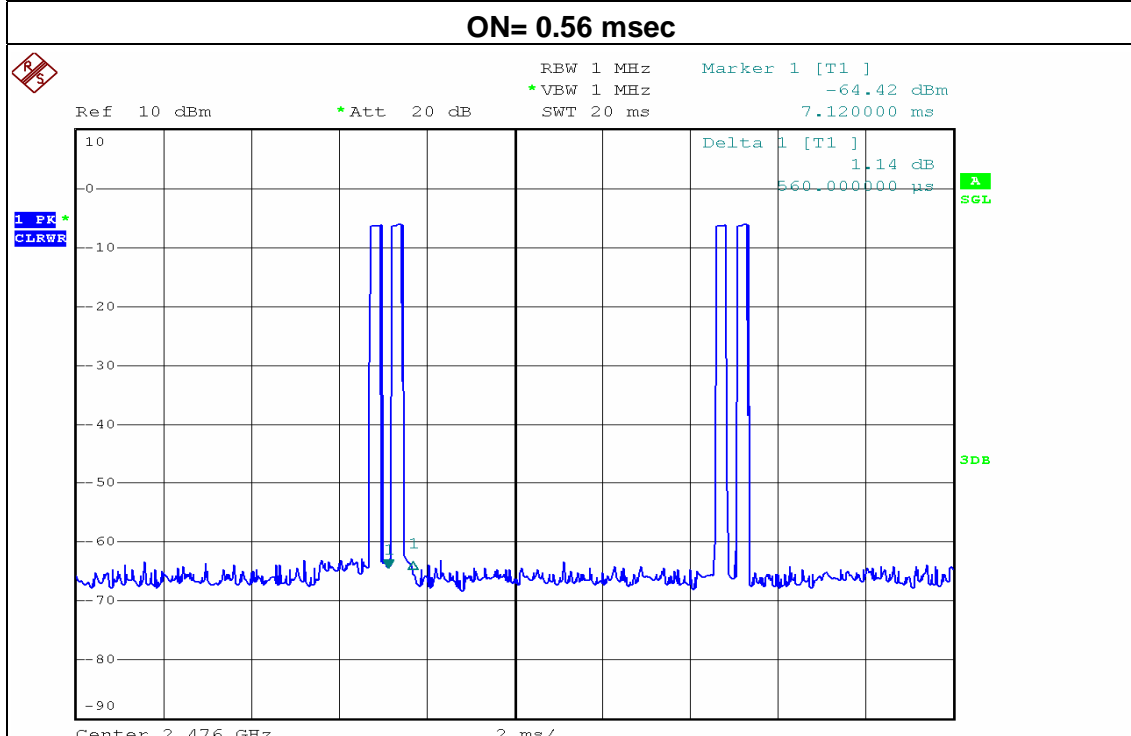
AV=PK+20 log(Dwell time)

AV=PK-18.71





Date: 19.NOV.2009 10:08:01



Date: 19.NOV.2009 10:08:19



4.2.3 TEST PROCEDURE

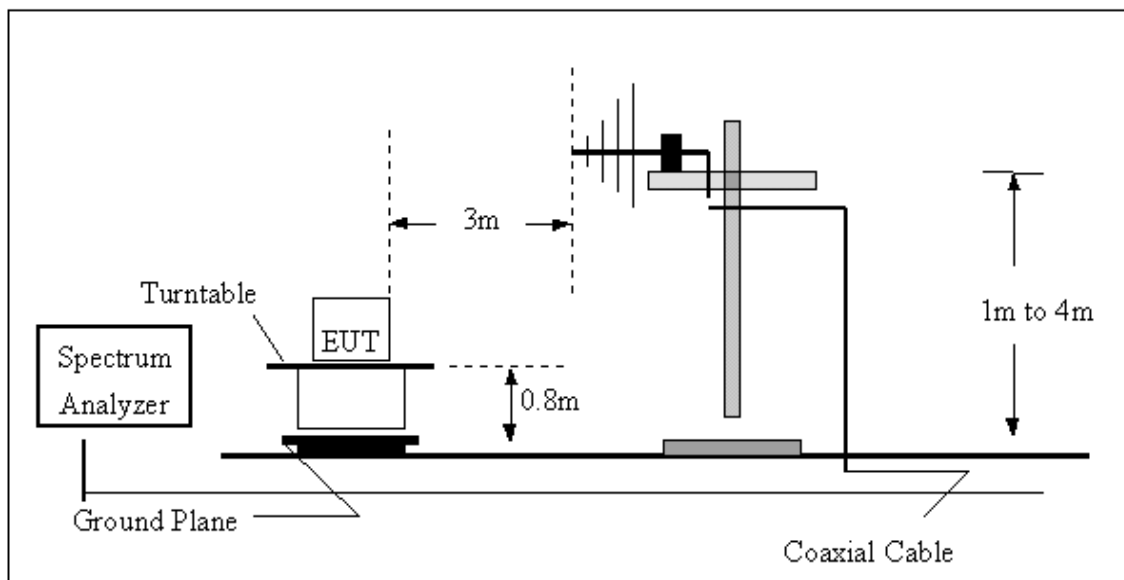
- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 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 conducted 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.

4.2.4 DEVIATION FROM TEST STANDARD

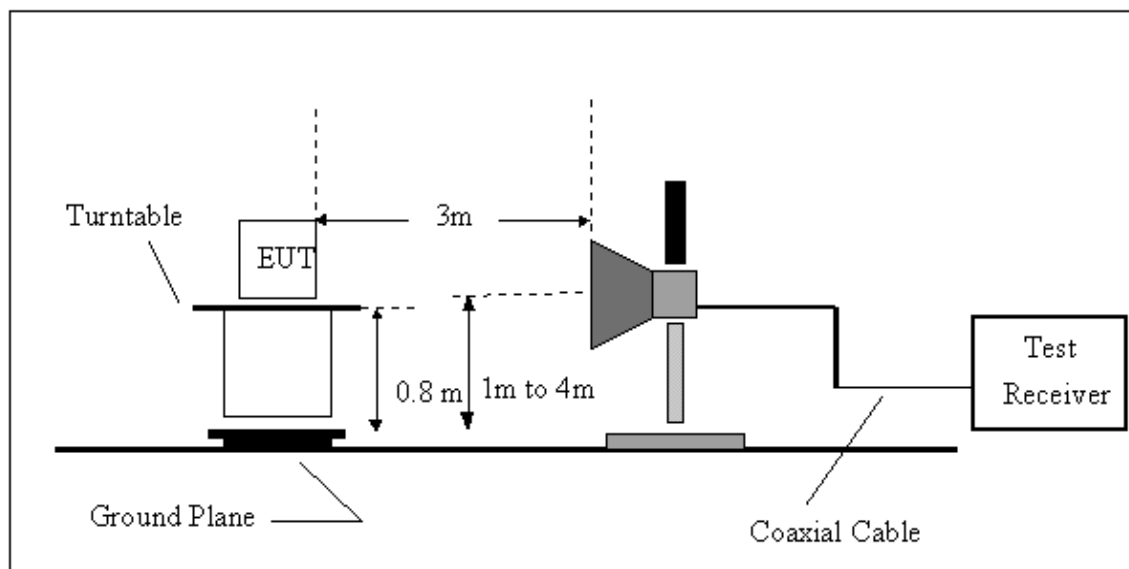
No deviation

4.2.5 TEST SETUP

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



4.2.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



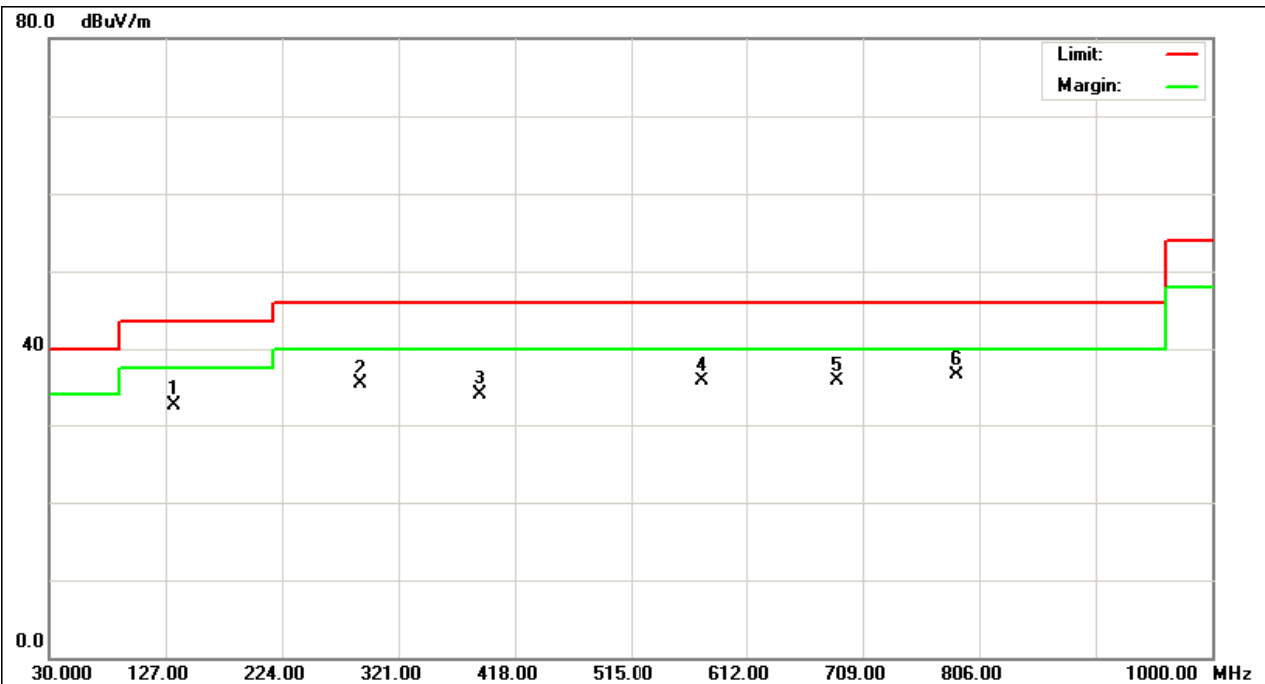
4.2.7 TEST RESULTS (BETWEEN 30 – 1000 MHZ)

| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX Mode 2439MHz | | |

| Freq. (MHz) | Ant. H/V | Reading(RA) (dBuV) | Corr.Factor(CF) (dB) | Measured(FS) (dBuV/m) | Limits(QP) (dBuV/m) | Margin (dB) | Note |
|-------------|----------|--------------------|----------------------|-----------------------|---------------------|-------------|------|
| 132.85 | V | 53.32 | -20.86 | 32.46 | 43.50 | - 11.04 | |
| 287.54 | V | 49.65 | -14.26 | 35.39 | 46.00 | - 10.61 | |
| 386.54 | V | 44.72 | -10.88 | 33.84 | 46.00 | - 12.16 | |
| 573.51 | V | 42.84 | -7.04 | 35.80 | 46.00 | - 10.20 | |
| 685.32 | V | 39.72 | -3.92 | 35.80 | 46.00 | - 10.20 | |
| 786.43 | V | 39.28 | -2.87 | 36.41 | 46.00 | - 9.59 | |

Remark :

- (1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz ; SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz ◦
- (2) 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 ◦
- (3) Measuring frequency range from 30MHz to 1000MHz ◦
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table ◦



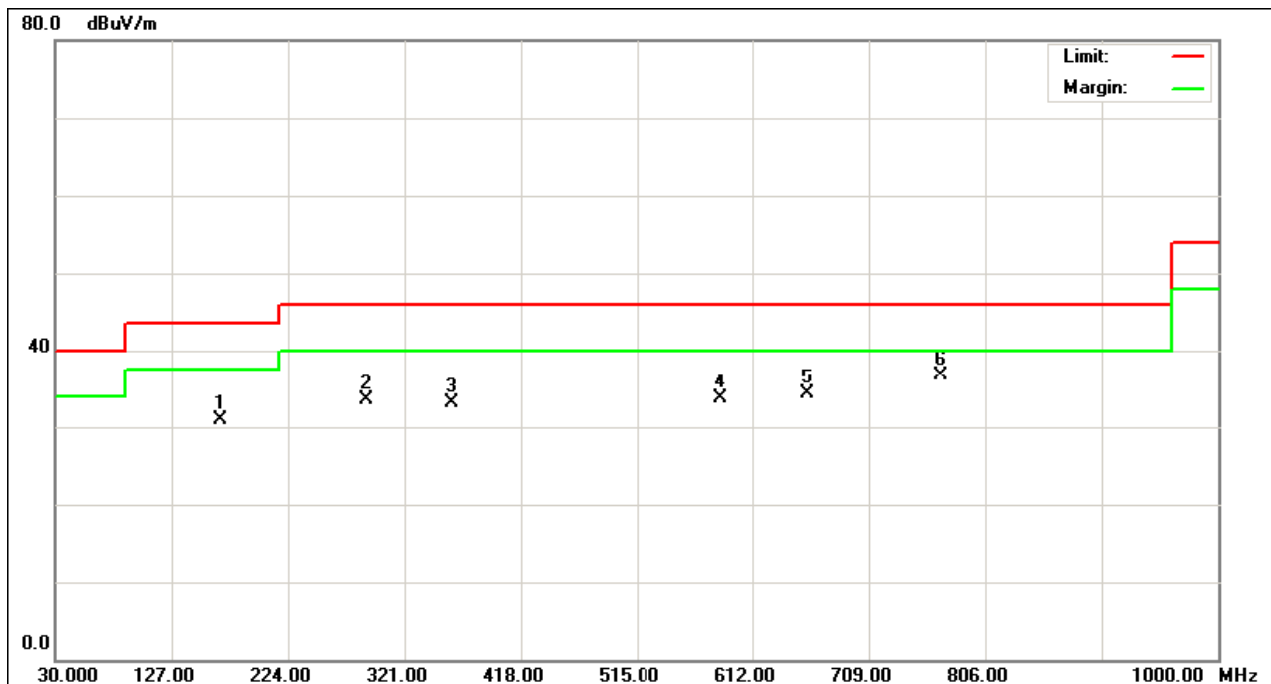


| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX Mode 2439MHz | | |

| Freq. (MHz) | Ant. H/V | Reading(RA) (dBuV) | Corr.Factor(CF) (dB) | Measured(FS) (dBuV/m) | Limits(QP) (dBuV/m) | Margin (dB) | Note |
|-------------|----------|--------------------|----------------------|-----------------------|---------------------|-------------|------|
| 167.83 | H | 49.73 | -18.84 | 30.89 | 43.50 | - 12.61 | |
| 287.56 | H | 47.85 | -14.26 | 33.59 | 46.00 | - 12.41 | |
| 357.58 | H | 44.85 | -11.70 | 33.15 | 46.00 | - 12.85 | |
| 584.29 | H | 40.32 | -6.66 | 33.66 | 46.00 | - 12.34 | |
| 657.93 | H | 38.89 | -4.50 | 34.39 | 46.00 | - 11.61 | |
| 769.43 | H | 39.67 | -2.98 | 36.69 | 46.00 | - 9.31 | |

Remark :

- (1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz ; SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz .
- (2) 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 .
- (3) Measuring frequency range from 30MHz to 1000MHz .
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table .





4.2.8 TEST RESULTS (ABOVE 1000 MHZ)

| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX 2405MHz | | |

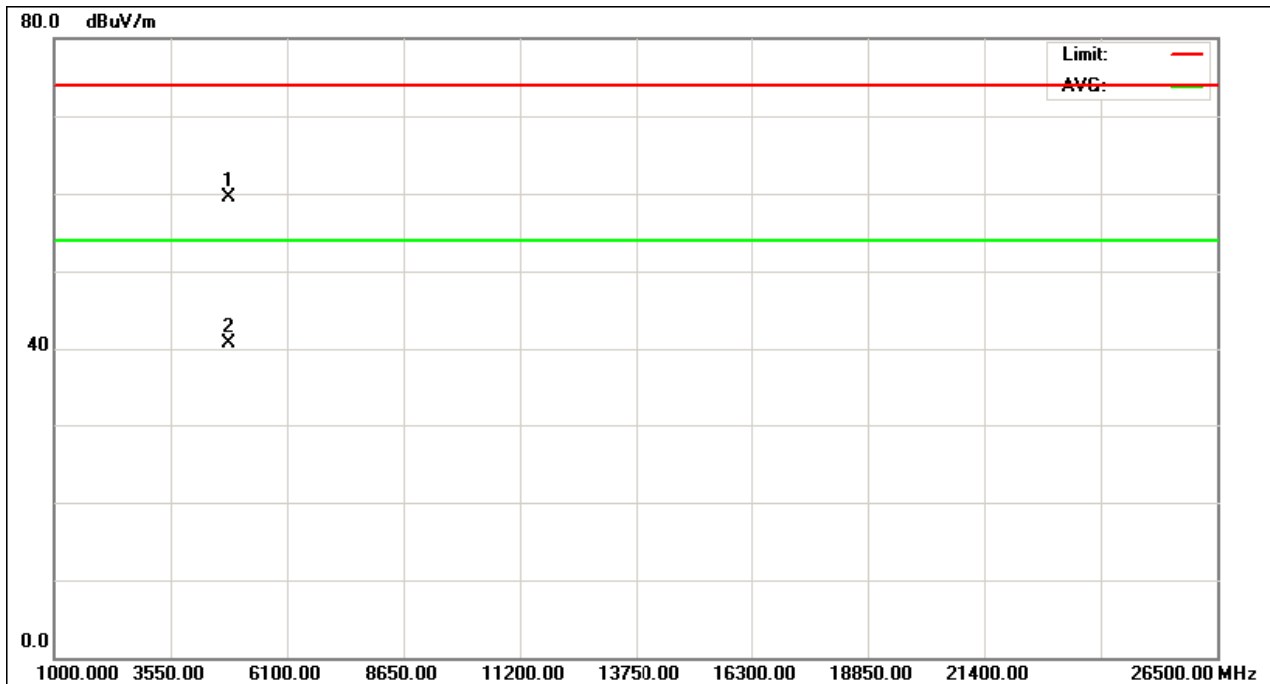
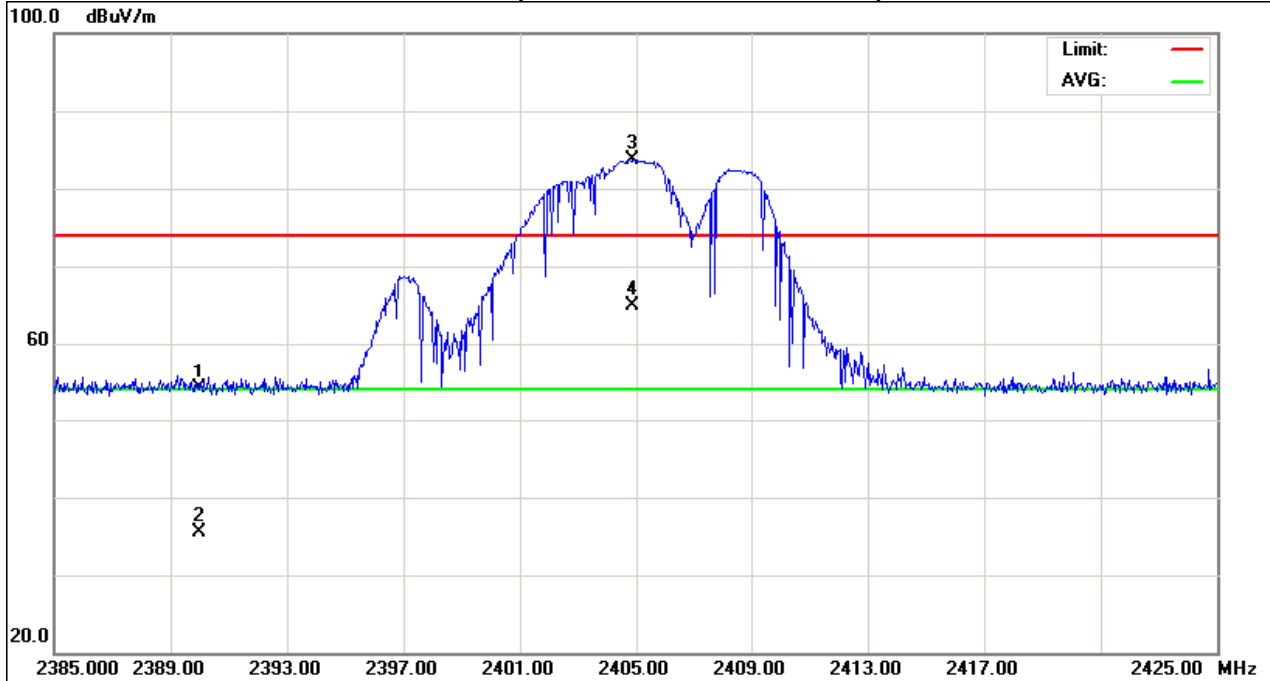
| Freq. (MHz) | Ant.Pol. H/V | Reading | | Ant./CF CF(dB) | Act. | | Limit | | Note |
|----------------|-----------------|----------------|--------------|-------------------|------------------|----------------|------------------|----------------|------------|
| | | Peak (dBuV) | AV (dBuV) | | Peak (dBuV/m) | AV (dBuV/m) | Peak (dBuV/m) | AV (dBuV/m) | |
| 2390.00 | V | 21.85 | 3.14 | 32.32 | 54.17 | 35.46 | 74.00 | 54.00 | X/E |
| 2404.84 | V | 51.27 | 32.56 | 32.36 | 83.63 | 64.92 | | | X/F |
| 4810.23 | V | 54.97 | 36.26 | 4.46 | 59.43 | 40.72 | 74.00 | 54.00 | X/H |

Remark :

- (1) 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 .
- (2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency .“F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (4) Data of measurement within this frequency range shown “ * ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
“X” - denotes Laid on Table ; “Y” - denotes Vertical Stand ; “Z” - denotes Side Stand
- (7) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) · Final AV=PK-18.71



TX CH01(Above 1000 MHz, Vertical)





| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX 2405MHz | | |

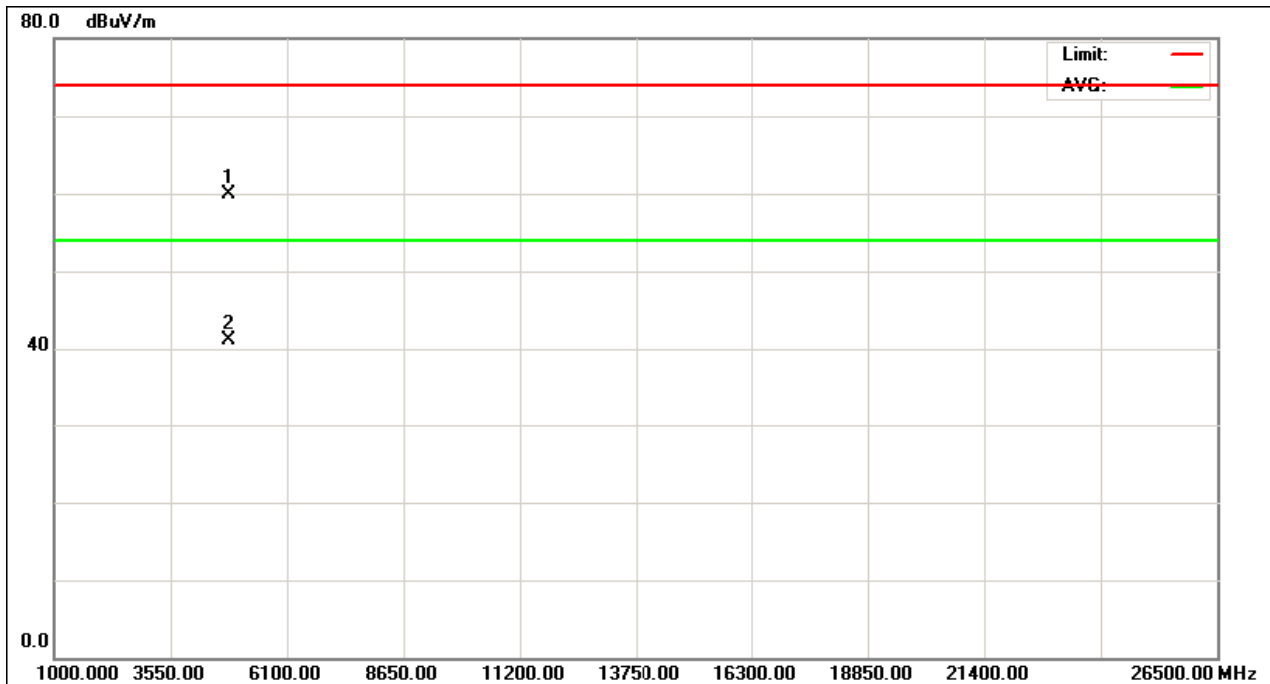
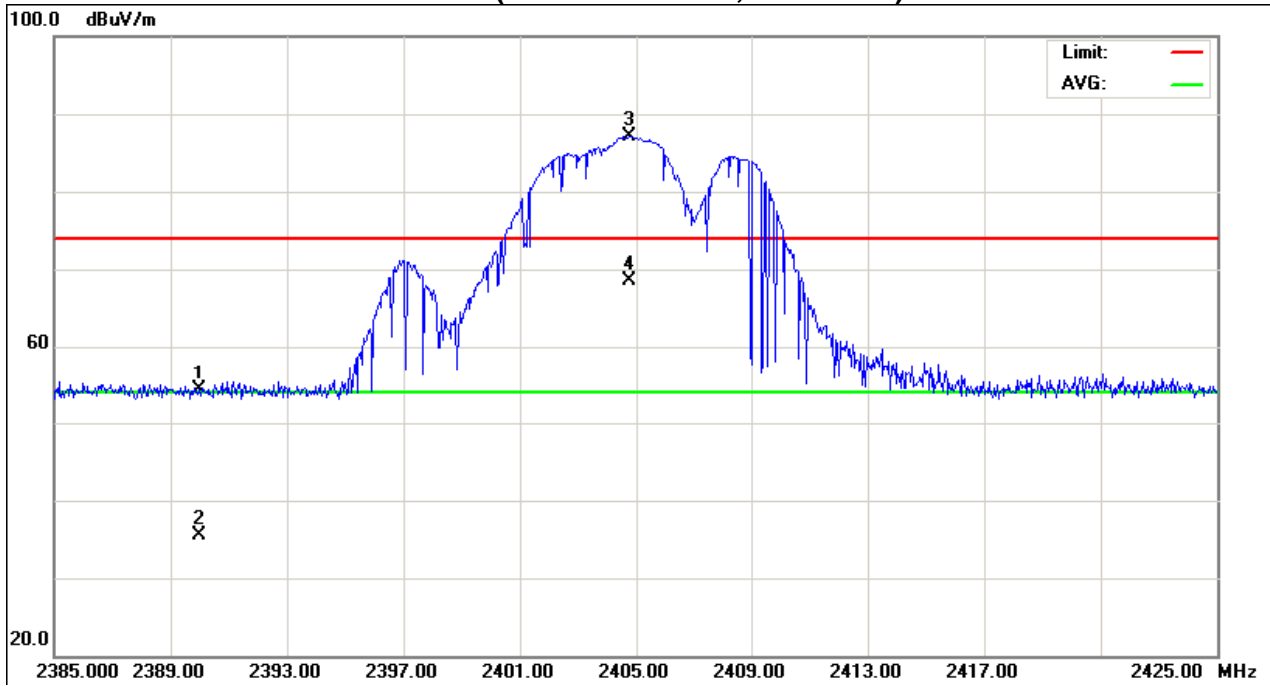
| Freq. (MHz) | Ant.Pol. H/V | Reading | | Ant./CF CF(dB) | Act. | | Limit | | Note |
|----------------|-----------------|----------------|--------------|-------------------|------------------|----------------|------------------|----------------|------------|
| | | Peak (dBuV) | AV (dBuV) | | Peak (dBuV/m) | AV (dBuV/m) | Peak (dBuV/m) | AV (dBuV/m) | |
| 2390.00 | H | 21.92 | 3.21 | 32.32 | 54.24 | 35.53 | 74.00 | 54.00 | X/E |
| 2404.76 | H | 54.81 | 36.10 | 32.36 | 87.17 | 68.46 | | | X/F |
| 4810.13 | H | 55.45 | 36.74 | 4.46 | 59.91 | 41.20 | 74.00 | 54.00 | X/H |

Remark :

- (1) 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 .
- (2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency .“F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (4) Data of measurement within this frequency range shown “ * ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
“X” - denotes Laid on Table ; “Y” - denotes Vertical Stand ; “Z” - denotes Side Stand
- (7) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) · Final AV=PK-18.71



TX CH01(Above 1000 MHz, Horizontal)





| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX 2439MHz | | |

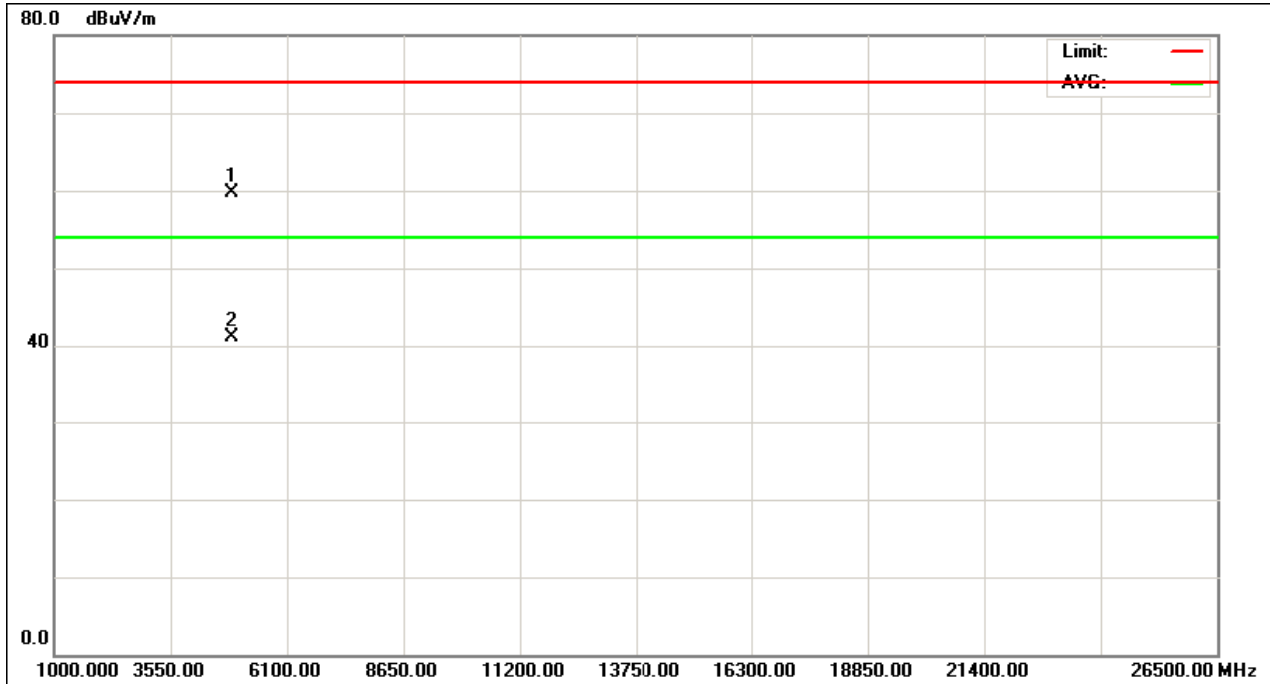
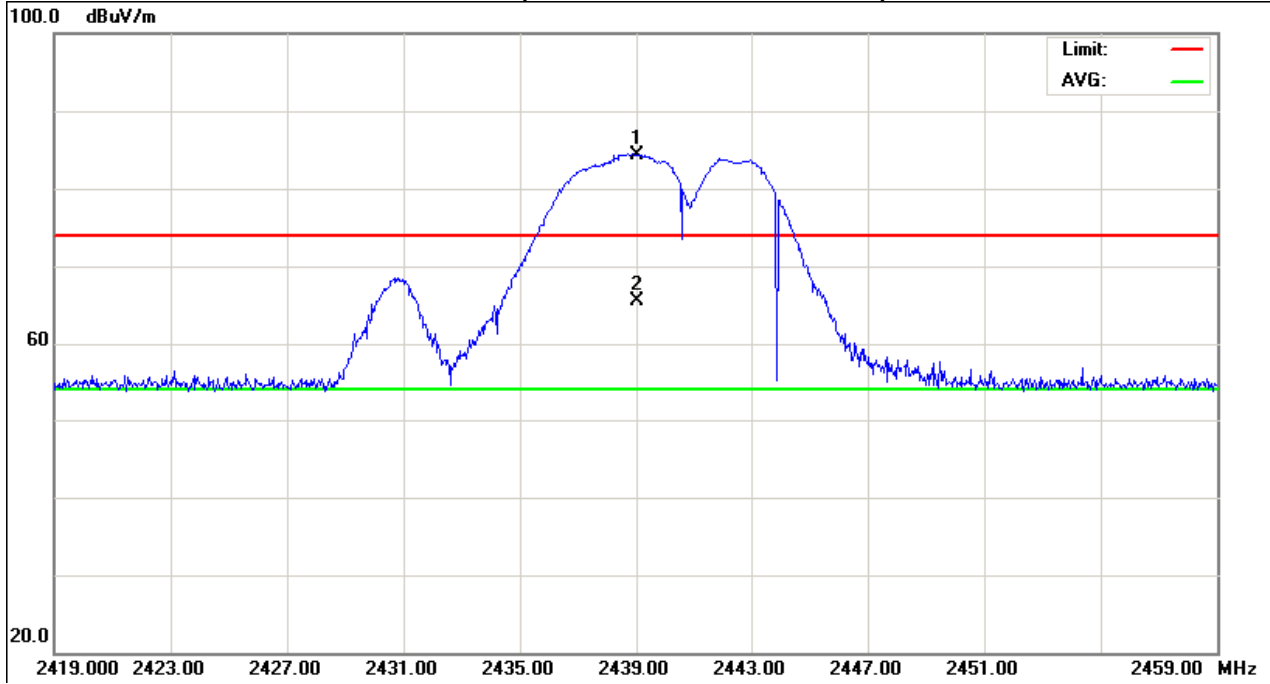
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|----------------|----------|--------------|--------------|--------------|--------------|--------------|----------|----------|------------|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| 2439.00 | V | 51.80 | 33.09 | 32.49 | 84.29 | 65.58 | | | X/F |
| 4878.18 | V | 55.07 | 36.36 | 4.69 | 59.76 | 41.05 | 74.00 | 54.00 | X/H |

Remark :

- (1) 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 .
- (2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency .“F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (4) Data of measurement within this frequency range shown “ * ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
 “X” - denotes Laid on Table ; “Y” - denotes Vertical Stand ; “Z” - denotes Side Stand
- (7) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (8) The average value of fundamental frequency is:
 Average = Peak value + 20log(Duty cycle) · Final AV=PK-18.71



TX CH48 (Above 1000 MHz, Vertical)





| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX 2439MHz | | |

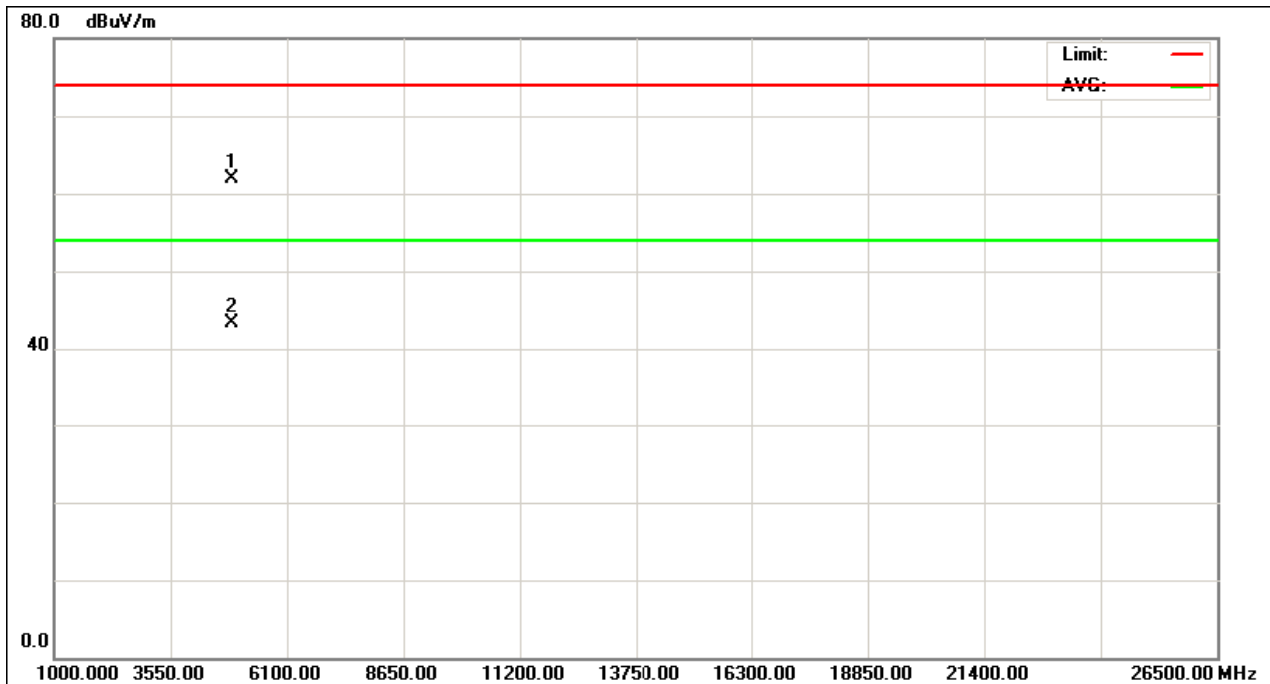
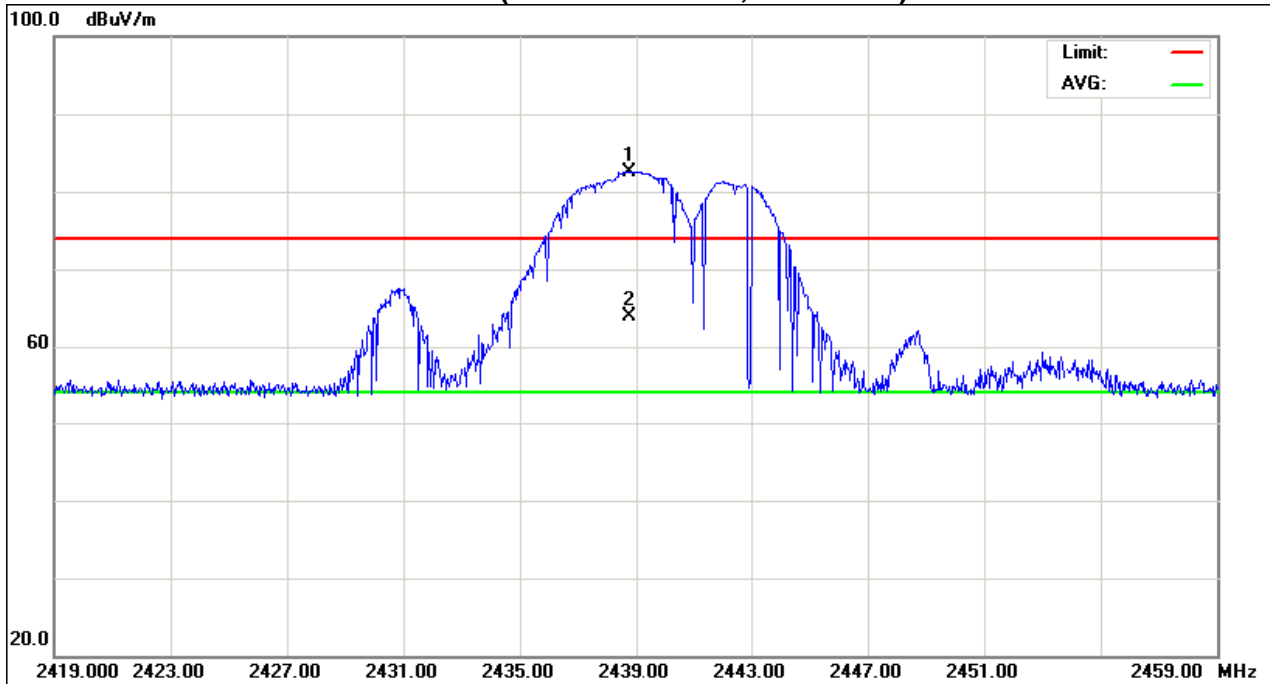
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|----------------|----------|--------------|--------------|--------------|--------------|--------------|----------|----------|------------|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| 2438.76 | H | 50.05 | 31.34 | 32.49 | 82.54 | 63.83 | | | X/F |
| 4877.58 | H | 57.25 | 38.54 | 4.69 | 61.94 | 43.23 | 74.00 | 54.00 | X/H |

Remark :

- (1) 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 ◦
- (2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency ◦ "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission ◦
- (4) Data of measurement within this frequency range shown " * " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
 "X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (7) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (8) The average value of fundamental frequency is:
 Average = Peak value + 20log(Duty cycle) ◦ Final AV=PK-18.71



TX CH48 (Above 1000 MHz, Horizontal)





| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX 2476MHz | | |

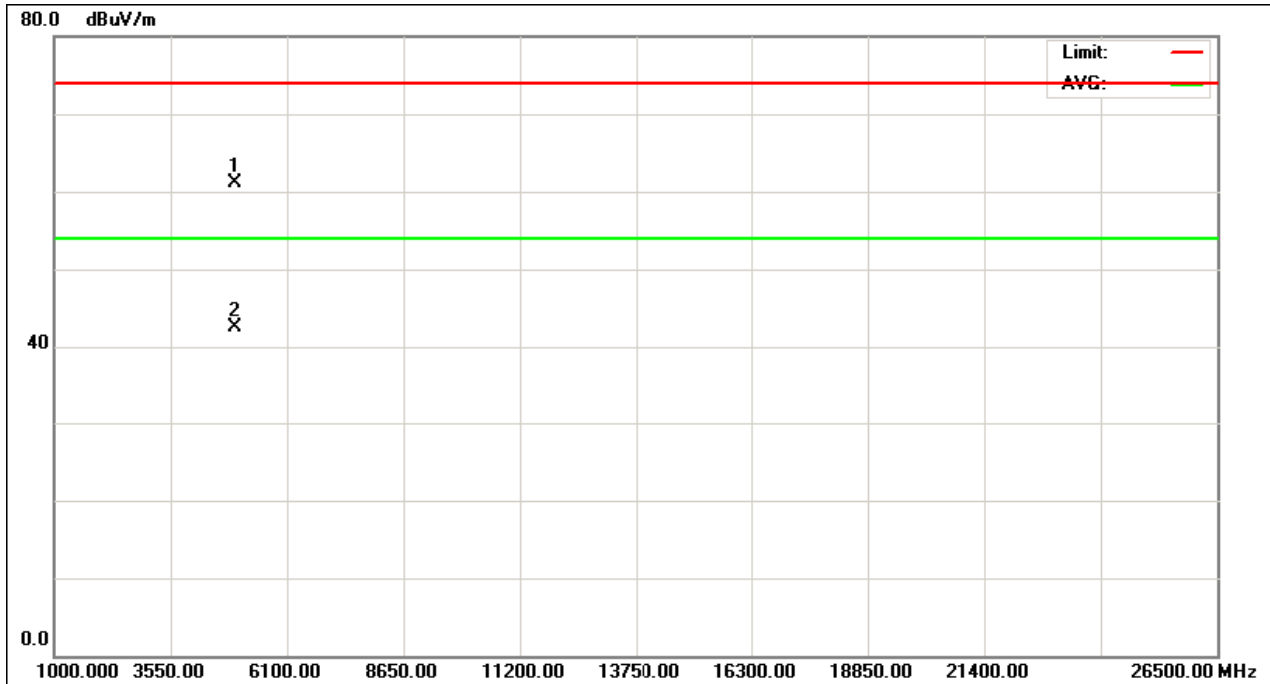
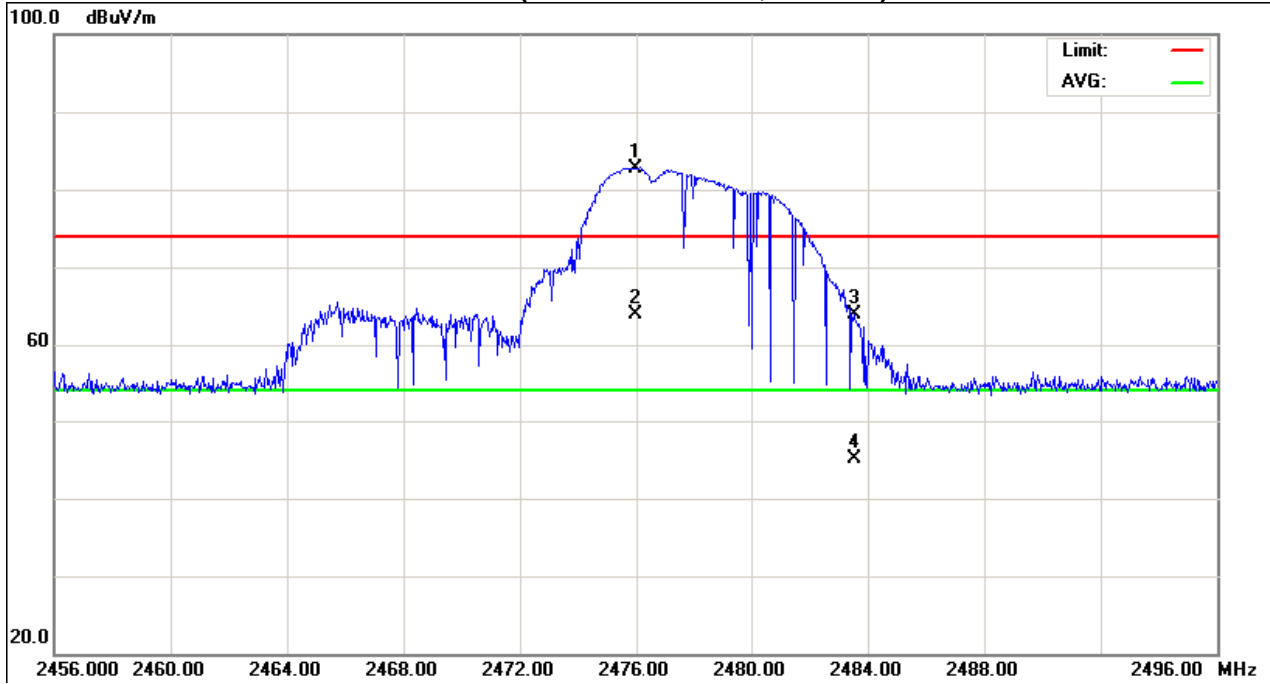
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|----------------|----------|--------------|--------------|--------------|--------------|--------------|----------|----------|------------|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| 2475.96 | V | 50.07 | 31.36 | 32.61 | 82.68 | 63.97 | | | X/F |
| 2483.50 | V | 31.25 | 12.54 | 32.63 | 63.88 | 45.17 | 74.00 | 54.00 | X/E |
| 4951.83 | V | 56.20 | 37.49 | 4.92 | 61.12 | 42.41 | 74.00 | 54.00 | X/H |

Remark :

- (1) 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 .
- (2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency .“F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (4) Data of measurement within this frequency range shown “ * ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
“X” - denotes Laid on Table ; “Y” - denotes Vertical Stand ; “Z” - denotes Side Stand
- (7) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) · Final AV=PK-18.71



TX CH64 (Above 1000 MHz, Vertical)





| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX 2476MHz | | |

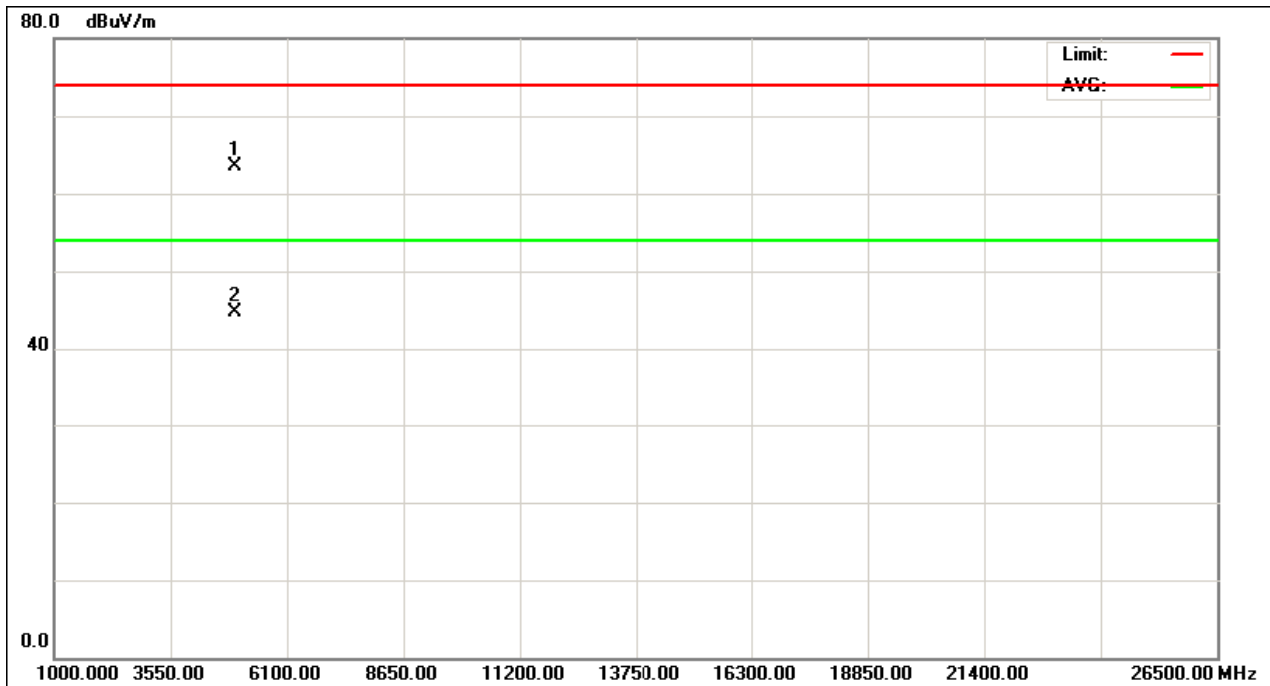
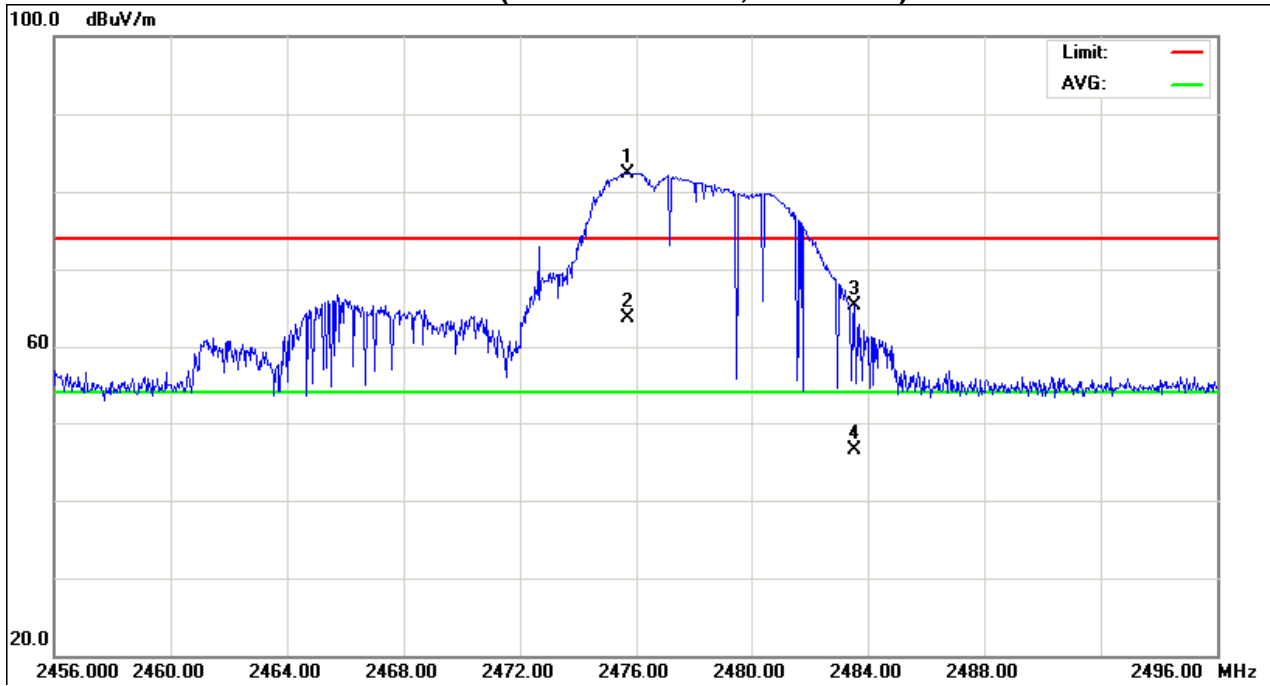
| Freq. (MHz) | Ant.Pol. H/V | Reading | | Ant./CF CF(dB) | Act. | | Limit | | Note |
|----------------|-----------------|----------------|--------------|-------------------|------------------|----------------|------------------|----------------|------------|
| | | Peak (dBuV) | AV (dBuV) | | Peak (dBuV/m) | AV (dBuV/m) | Peak (dBuV/m) | AV (dBuV/m) | |
| 2475.72 | H | 49.73 | 31.02 | 32.61 | 82.34 | 63.63 | | | X/F |
| 2483.50 | H | 32.68 | 13.97 | 32.63 | 65.31 | 46.60 | 74.00 | 54.00 | X/E |
| 4952.08 | H | 58.51 | 39.80 | 4.92 | 63.43 | 44.72 | 74.00 | 54.00 | X/H |

Remark :

- (1) 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 .
- (2) Measuring frequency range from 30MHz to 1000MHz or the 10th harmonic of highest fundamental frequency .“F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency. (This judgment method includes the Band Edge Requirement.)
- (3) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (4) Data of measurement within this frequency range shown “ * ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (6) EUT Orthogonal Axis :
“X” - denotes Laid on Table ; “Y” - denotes Vertical Stand ; “Z” - denotes Side Stand
- (7) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (8) The average value of fundamental frequency is:
Average = Peak value + 20log(Duty cycle) · Final AV=PK-18.71



TX CH64 (Above 1000 MHz, Horizontal)





4.2.9 TEST RESULTS (RESTRICTED BANDS REQUIREMENTS)

| | | | |
|---------------|--|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX 2405MHz/2476MHz | | |
| Note : | 1. The transmitter was setup to transmit at the lowest channel (CH01). Then the field strength was measured at 2310-2390 MHz. 2. The transmitter was setup to transmit at the highest channel (CH64). Then the field strength was measured at 2483.5-2500 MHz. | | |

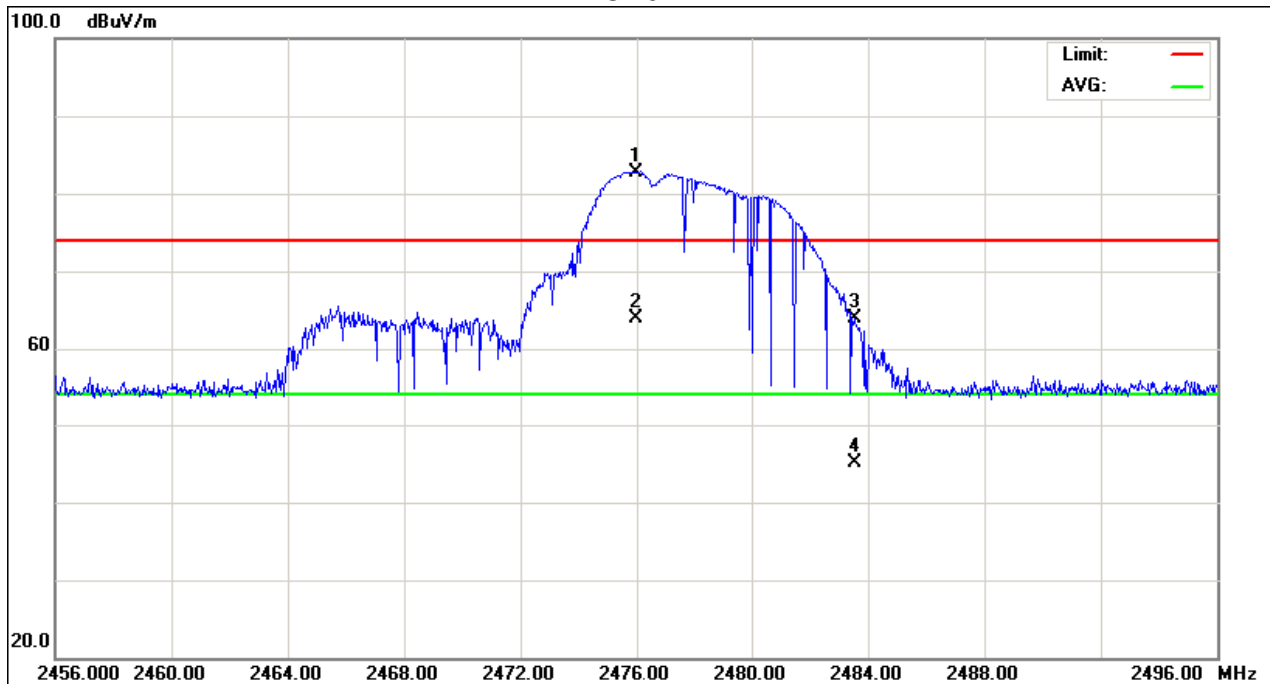
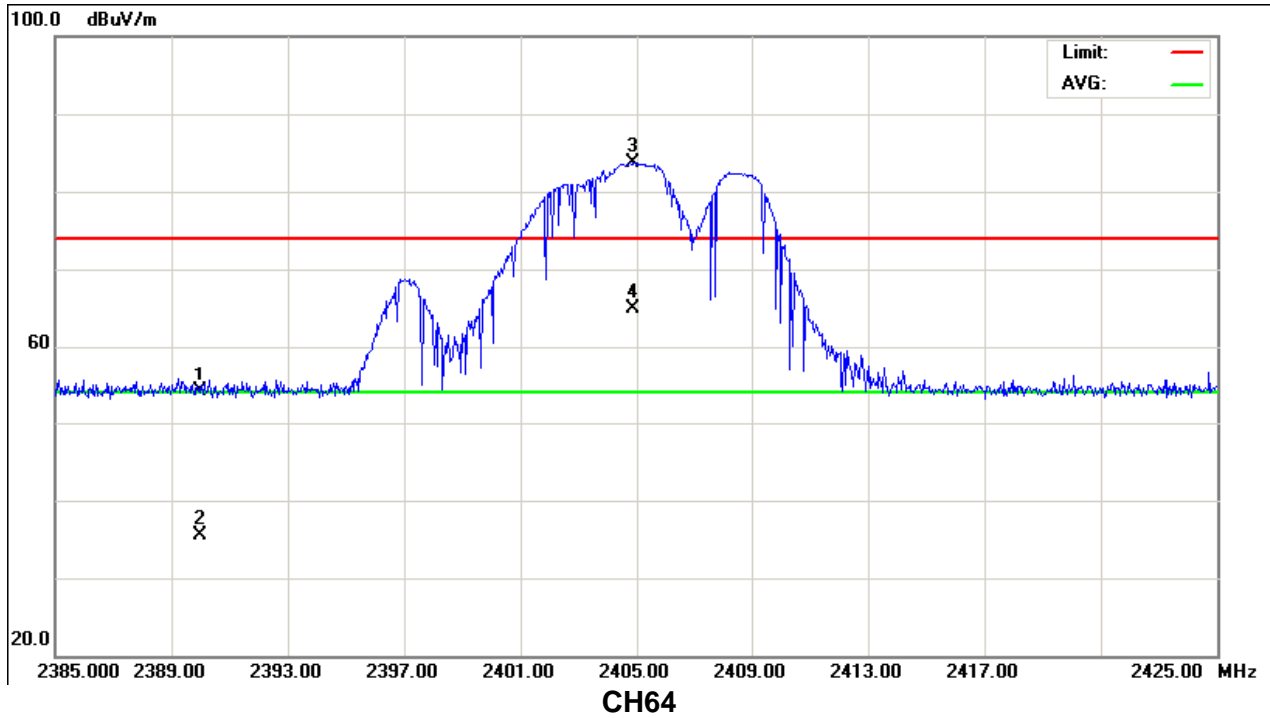
| Freq. (MHz) | Ant.Pol. H/V | Reading | | Ant./CF CF(dB) | Act. | | Limit | | Note |
|----------------|-----------------|----------------|--------------|-------------------|------------------|----------------|------------------|----------------|------|
| | | Peak (dBuV) | AV (dBuV) | | Peak (dBuV/m) | AV (dBuV/m) | Peak (dBuV/m) | AV (dBuV/m) | |
| 2390.00 | V | 21.85 | 3.14 | 32.32 | 54.17 | 35.46 | 74.00 | 54.00 | CH01 |
| 2483.50 | V | 31.25 | 12.54 | 32.63 | 63.88 | 45.17 | 74.00 | 54.00 | CH64 |

Remark :

- (1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (2) EUT Orthogonal Axis :
 "X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (3) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (4) The average value of fundamental frequency is:
 Average = Peak value + 20log(Duty cycle) · Final AV=PK-18.71



Restricted Bands Requirements, Vertical CH01





| | | | |
|---------------|--|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 27 °C | Relative Humidity : | 51 % |
| Pressure : | 1010 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | TX 2405MHz/2476MHz | | |
| Note : | 1. The transmitter was setup to transmit at the lowest channel (CH01). Then the field strength was measured at 2310-2390 MHz. 2. The transmitter was setup to transmit at the highest channel (CH64). Then the field strength was measured at 2483.5-2500 MHz. | | |

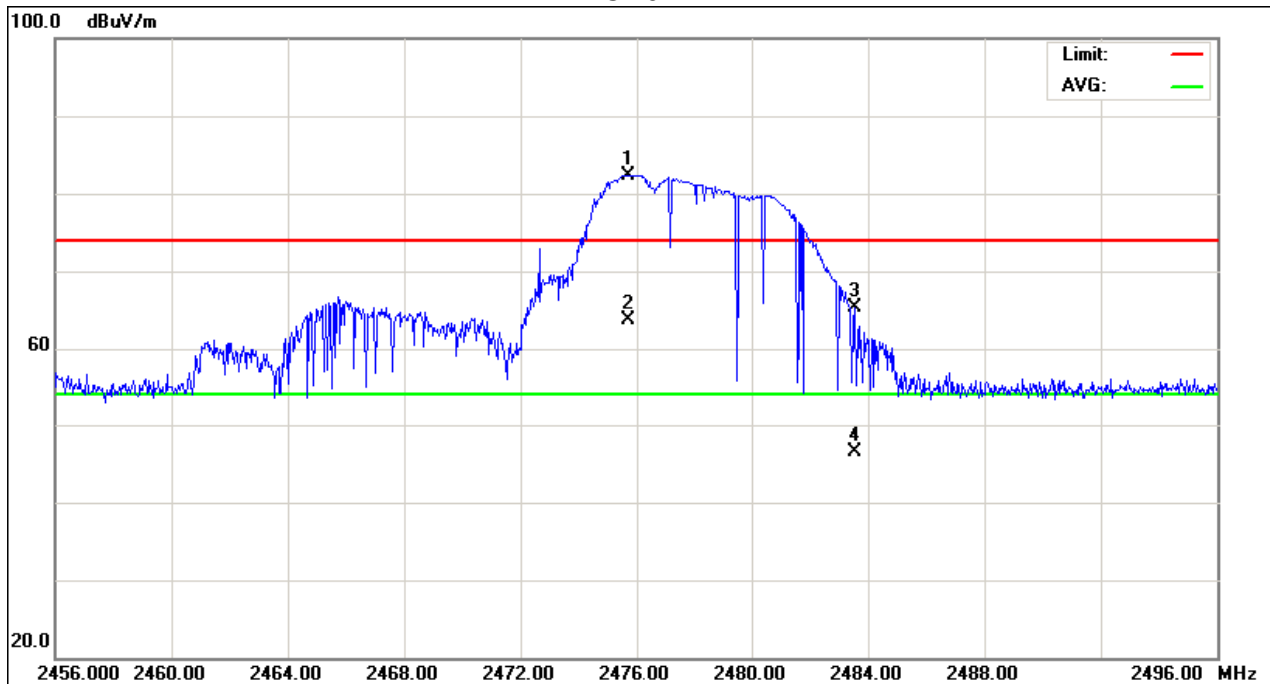
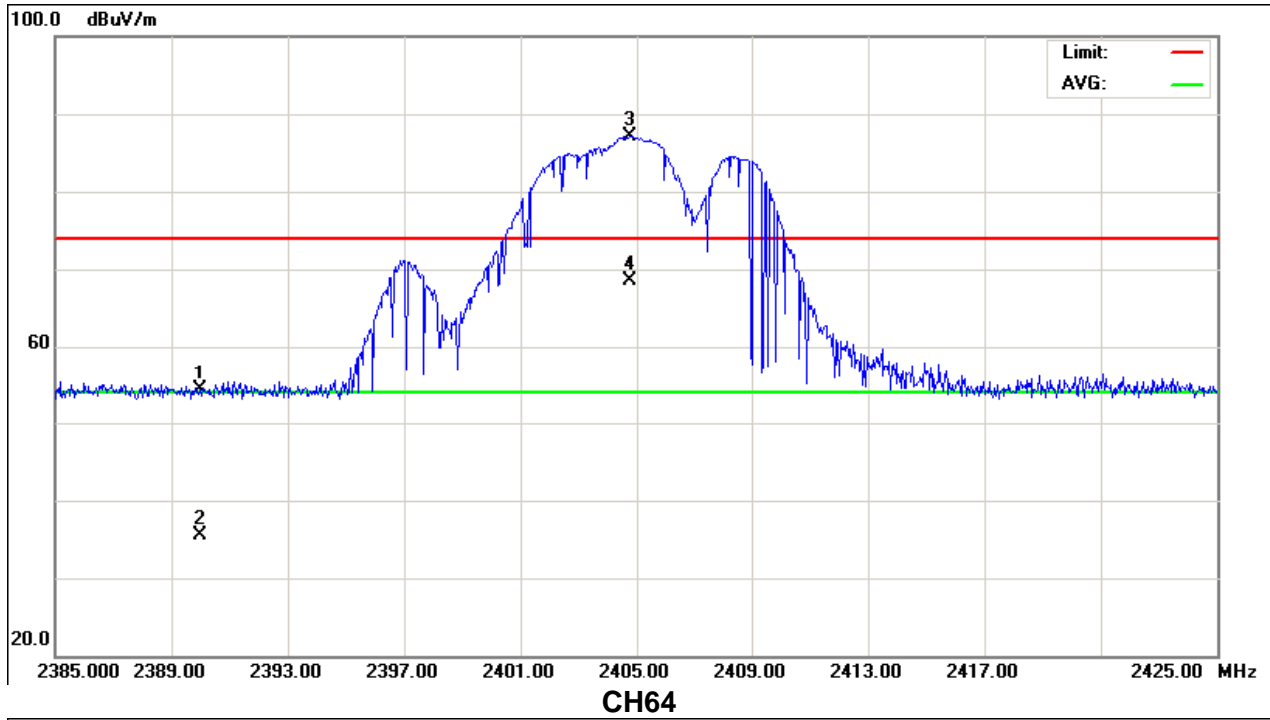
| Freq. | Ant.Pol. | Reading | | Ant./CF | Act. | | Limit | | Note |
|---------|----------|---------|--------|---------|----------|----------|----------|----------|------|
| | | Peak | AV | | Peak | AV | Peak | AV | |
| (MHz) | H/V | (dBuV) | (dBuV) | CF(dB) | (dBuV/m) | (dBuV/m) | (dBuV/m) | (dBuV/m) | |
| 2390.00 | H | 92.00 | 3.21 | 32.32 | 54.24 | 35.53 | 74.00 | 54.00 | CH01 |
| 2483.50 | H | 32.68 | 13.97 | 32.63 | 65.31 | 46.60 | 74.00 | 54.00 | CH64 |

Remark :

- (1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission .
- (2) EUT Orthogonal Axis :
 "X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (3) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (4) The average value of fundamental frequency is:
 Average = Peak value + 20log(Duty cycle) · Final AV=PK-18.71



Restricted Bands Requirements, Horizontal
CH01





5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C | | | |
|---------------------------------|---------------------------|-----------------------|--------|
| Section | Test Item | Frequency Range (MHz) | Result |
| 15.247 (a)(1)(ii) | Number of Hopping Channel | 2400-2483.5 | PASS |

5.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|
| 1 | Spectrum Analyzer | R&S | FSP_40 | 100129 | Jan. 06, 2010 |

Remark: " N/A" denotes No Model Name , Serial No. or No Calibration specified.

| Spectrum Parameters | Setting |
|---------------------|-----------------------------|
| Attenuation | Auto |
| Span Frequency | > Operating Frequency Range |
| RB | 100 kHz |
| VB | 100 kHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

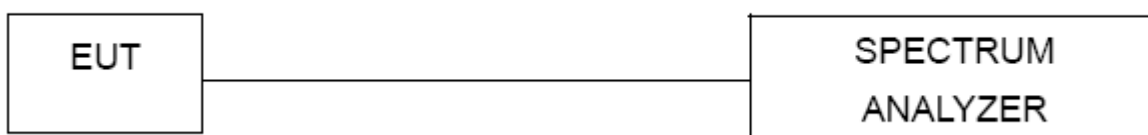
5.1.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = Auto.

5.1.3 DEVIATION FROM STANDARD

No deviation.

5.1.4 TEST SETUP



5.1.5 EUT OPERATION CONDITIONS

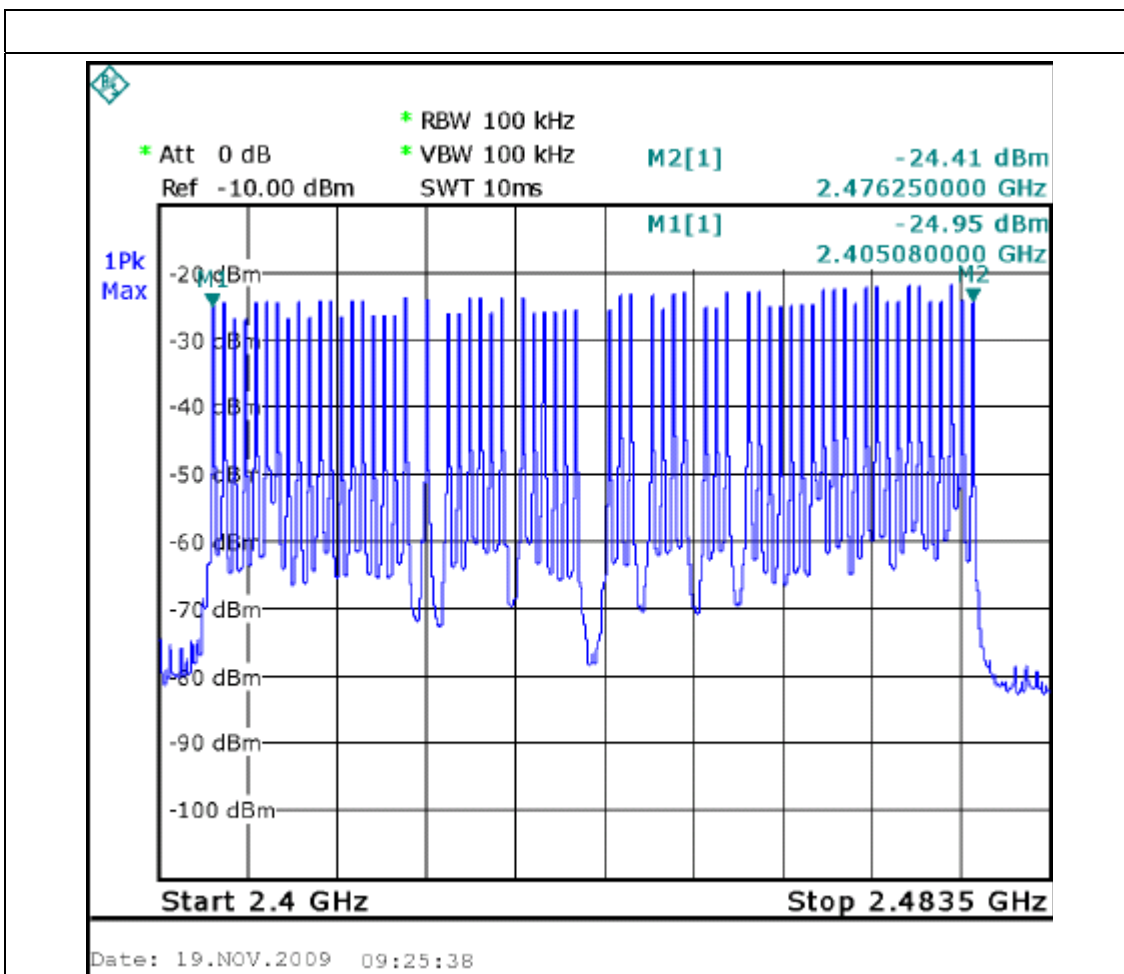
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



5.1.6 TEST RESULTS

| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 25 °C | Relative Humidity : | 60% |
| Pressure : | 1015 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | Hopping Mode | | |

| | |
|---------------------------|----|
| Number of Hopping Channel | 64 |
|---------------------------|----|



6. AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C | | | | |
|---------------------------------|---------------------------|--------|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (a)(1)(ii) | Average Time of Occupancy | 0.4sec | 2400-2483.5 | PASS |

6.1.1 MEASUREMENT INSTRUMENTS LIST

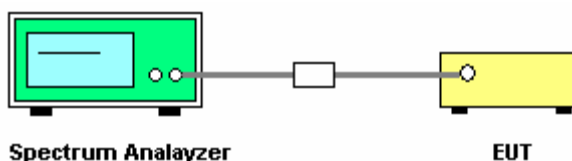
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|
| 1 | Spectrum Analyzer | R&S | FSP_40 | 100129 | Jan. 06, 2010 |

Remark: " N/A" denotes No Model Name , Serial No. or No Calibration specified.

6.1.2. TEST PROCEDURES

- a. The transmitter output (antenna port) was connected to the spectrum analyzer
- b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
- c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- d. Sweep Time is more than once pulse time.
- e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- f. Measure the maximum time duration of one single pulse.
- g. Set the EUT for packet transmitting.
- h. Measure the maximum time duration of one single pulse.

6.1.3. TEST SETUP LAYOUT



6.1.4. TEST DEVIATION

There is no deviation with the original standard.

6.1.5. EUT OPERATION DURING TEST

The EUT was programmed to be in continuously transmitting/Hopping mode.



6.1.6. RESULTS OF OCCUPIED BANDWIDTH AND SPREAD-SPECTRUM BANDWIDTH

| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 25 °C | Relative Humidity : | 60% |
| Pressure : | 1015 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | Hopping Mode | | |

| Mode | Number of transmission in a 12.8 (32Hopping*0.4) | Length of transmission time (msec) | Result (msec) | Limit (msec) |
|----------|--|------------------------------------|---------------|--------------|
| 2476 MHz | $(256/2/64) * 25.6 = 51.2$ times Note1 | 0.320 | 16.384 | 400 |

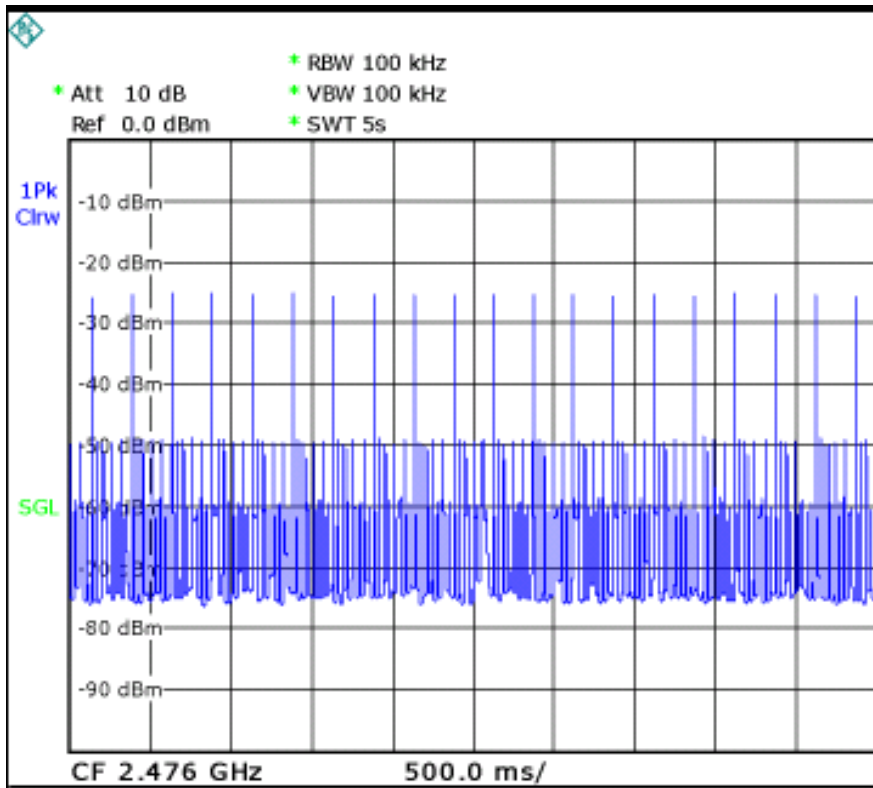
Note1: 20 times of occupied channels per 5.0 second

| | Results |
|--|-------------------------------|
| Measured cycle (sec) | $64 \text{ CH} * 0.4 = 25.6$ |
| The total number of frequency-hopping per second | $((20/5) * 64) = 256$ |
| The number of occupied channels per second (Note1) | $(256/2)/64 = 2$ (number/sec) |
| occupied time for each channel(1) | 0.32ms |
| The total number of channels occupied within one cycle (2) | $(2 * 25.6) = 51.2$ times |
| The average time of occupancy within one cycle(1)*(2) | 16.384msec |
| LIMIT (msec) | 400msec |

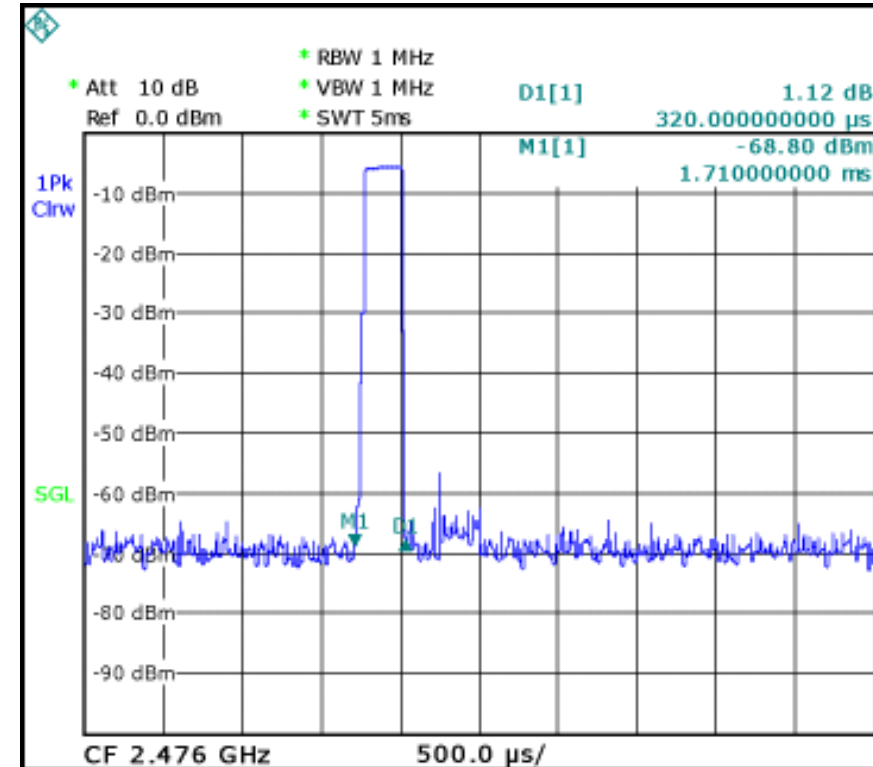
Note1: Time of transmission compared to time of receiving is 1 to 1



Hopping Mode : 13(times/5sec)



Date: 20.NOV.2009 03:54:06



Date: 20.NOV.2009 04:05:30

7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

7.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|
| 1 | Spectrum Analyzer | R&S | FSP_40 | 100129 | Jan. 06, 2010 |

Remark: " N/A" denotes No Model Name , Serial No. or No Calibration specified.

| Spectrum Parameter | Setting |
|--------------------|---|
| Attenuation | Auto |
| Span Frequency | > Measurement Bandwidth or Channel Separation |
| RB | 30 kHz (20dB Bandwidth) / 100 kHz (Channel Separation) |
| VB | 100 kHz (20dB Bandwidth) / 300 kHz (Channel Separation) |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

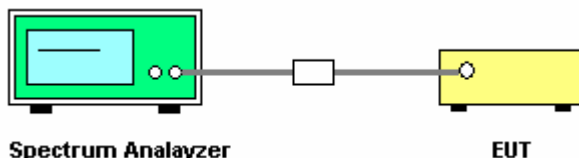
7.1.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised for channel separation measurement.

7.1.3 DEVIATION FROM STANDARD

No deviation.

7.1.4 TEST SETUP



7.1.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

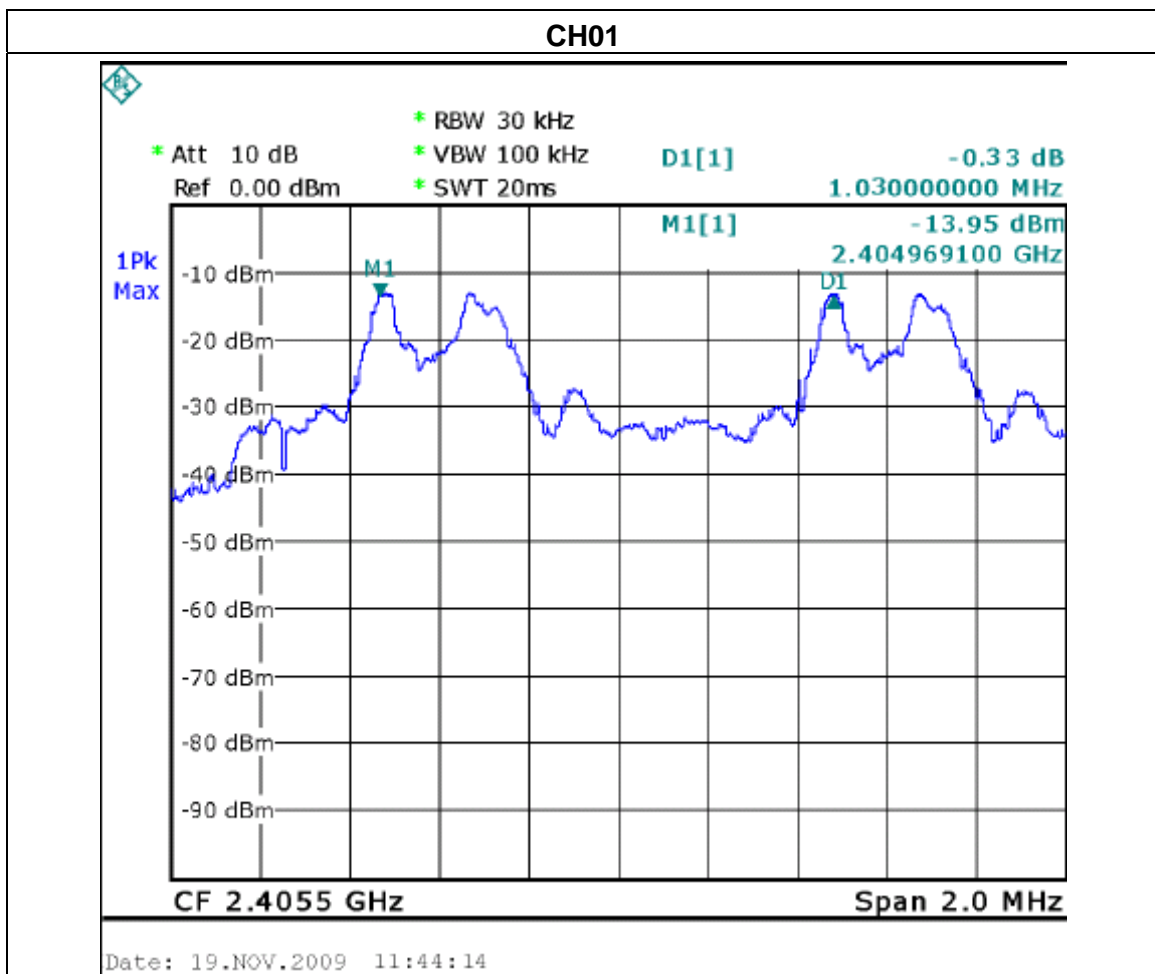


7.1.6 TEST RESULTS

| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 25 °C | Relative Humidity : | 60% |
| Pressure : | 1012 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | CH01 / CH48 / CH64 | | |

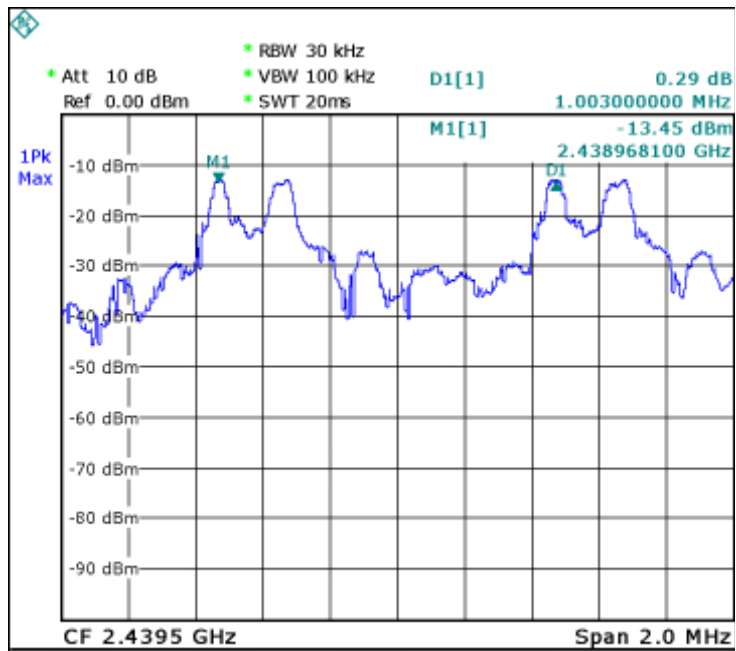
| Frequency | Ch. Separation (MHz) | 20d Bandwidth B (MHz) | Result |
|-----------|----------------------|-----------------------|-----------------|
| 2405 MHz | 1 | 0.609 | Complies |
| 2439 MHz | 1 | 0.569 | Complies |
| 2476 MHz | 1 | 0.569 | Complies |

Ch. Separation Limits: >20dB bandwidth or >2/3 of 20dB bandwidth



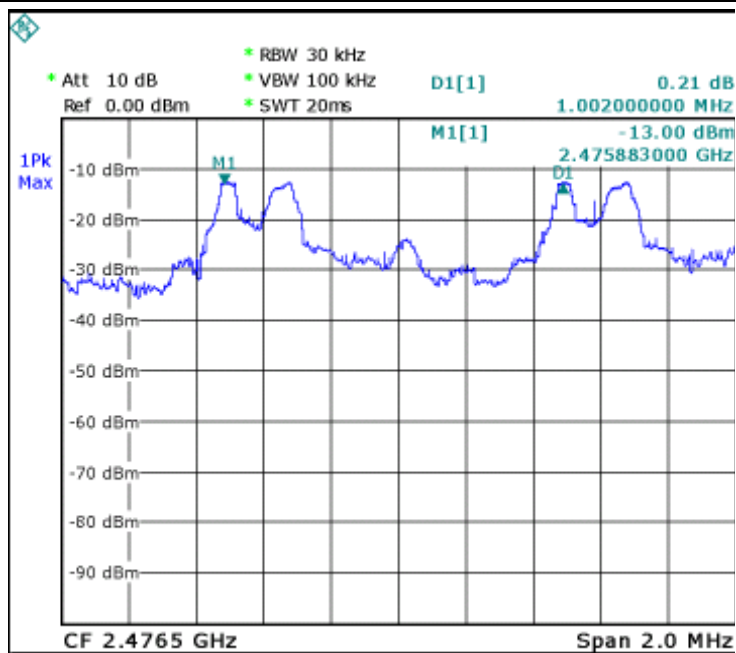


CH48



Date: 19.NOV.2009 11:50:20

CH64



Date: 19.NOV.2009 14:43:48



8. BANDWIDTH TEST

8.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C | | | | |
|---------------------------------|-----------|------------------------------|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (a)(2) | Bandwidth | <= 1 MHz (20dB bandwidth) | 2400-2483.5 | PASS |

8.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|
| 1 | Spectrum Analyzer | R&S | FSP_40 | 100129 | Jan. 06, 2010 |

Remark: " N/A" denotes No Model Name , Serial No. or No Calibration specified.

| Spectrum Parameter | Setting |
|--------------------|---|
| Attenuation | Auto |
| Span Frequency | > Measurement Bandwidth or Channel Separation |
| RB | 30 kHz (20dB Bandwidth) / 100 kHz (Channel Separation) |
| VB | 100 kHz (20dB Bandwidth) / 300 kHz (Channel Separation) |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

8.1.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW= 10KHz, VBW=100KHz, Sweep time = Auto.

8.1.3 DEVIATION FROM STANDARD

No deviation.

8.1.4 TEST SETUP



8.1.5 EUT OPERATION CONDITIONS

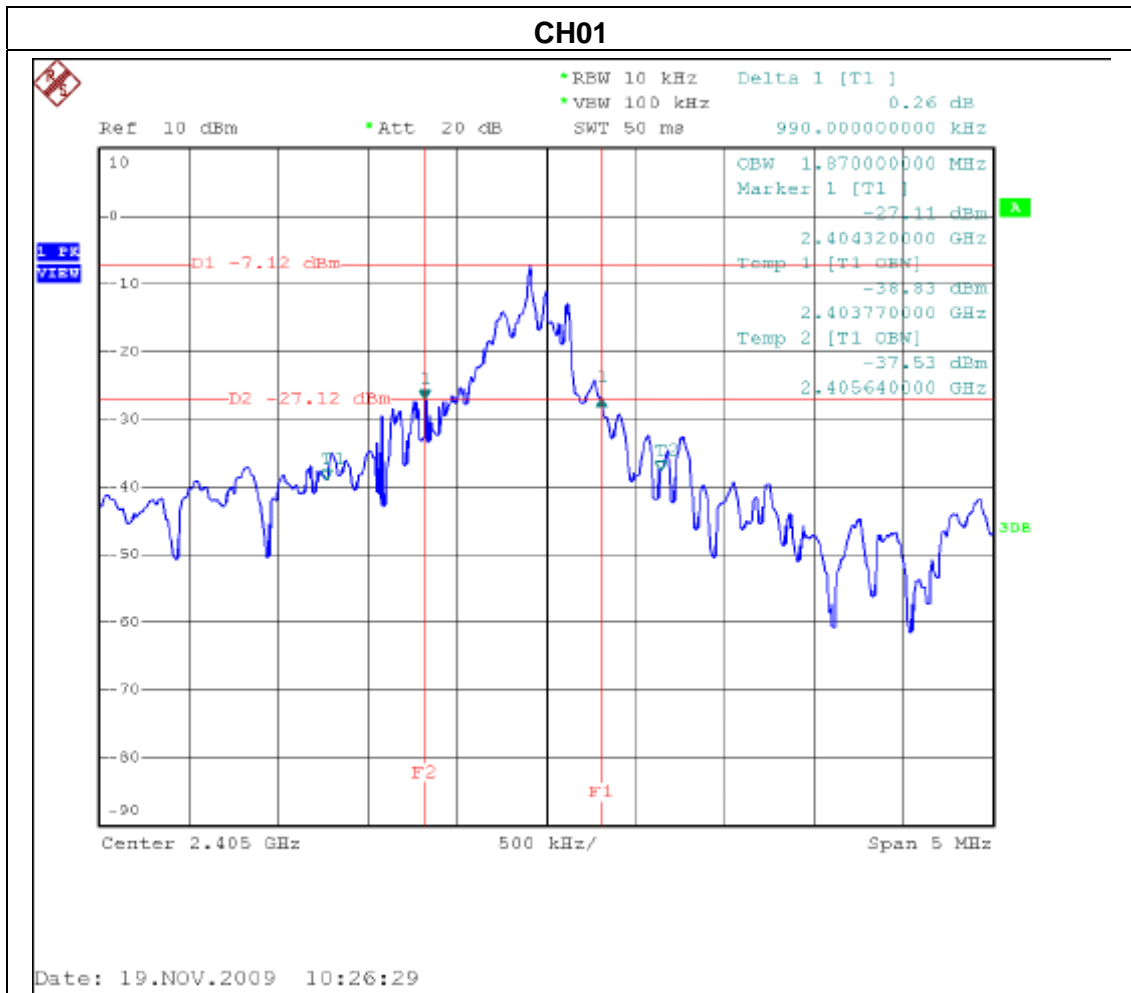
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



8.1.6 TEST RESULTS

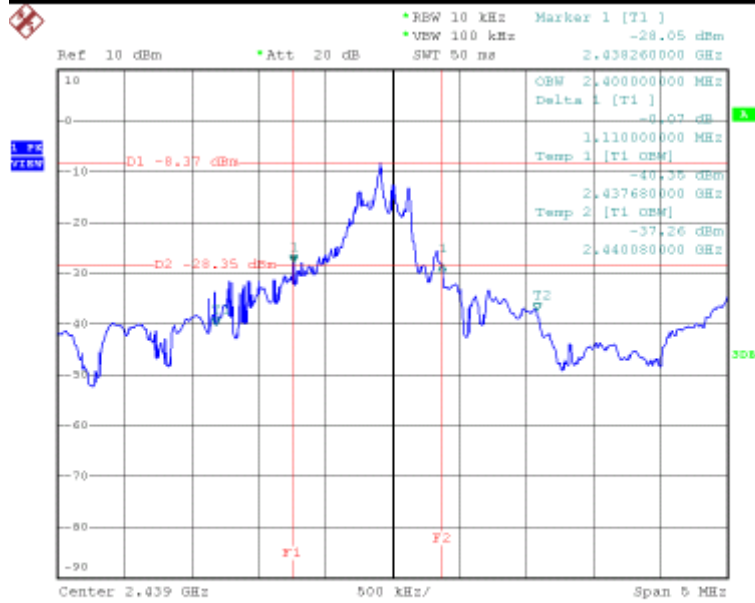
| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 25 °C | Relative Humidity : | 60% |
| Pressure : | 1012 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | CH01 / CH48 /CH64 | | |

| Frequency | 20dB Bandwidth (MHz) | Channel Separation (MHz) | Result |
|-----------|----------------------|--------------------------|-------------|
| 2405 MHz | 0.570 | <= 1MHz | PASS |
| 2439 MHz | 0.570 | <= 1MHz | PASS |
| 2476 MHz | 0.560 | <= 1MHz | PASS |



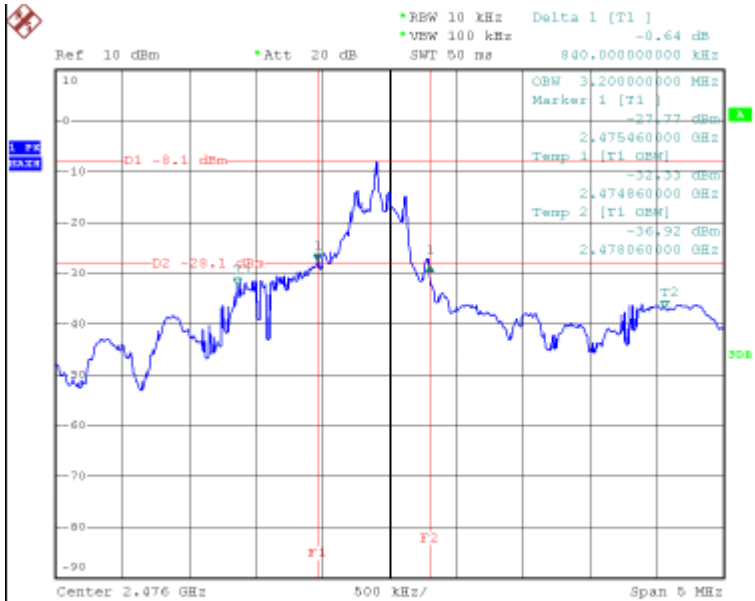


CH48



Date: 19.NOV.2009 09:59:00

CH64



Date: 19.NOV.2009 10:12:53



9. PEAK OUTPUT POWER TEST

9.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C | | | | |
|---------------------------------|-------------------|-----------------|-----------------------|--------|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (b)(1) | Peak Output Power | 1 watt or 30dBm | 2400-2483.5 | PASS |

9.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|
| 1 | Spectrum Analyzer | R&S | FSP_40 | 100129 | Jan. 06, 2010 |

Remark: " N/A" denotes No Model Name , Serial No. or No Calibration specified.

9.1.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW= 1MHz, VBW= 1MHz, Sweep time = Auto.

9.1.3 DEVIATION FROM STANDARD

No deviation.

9.1.4 TEST SETUP



9.1.5 EUT OPERATION CONDITIONS

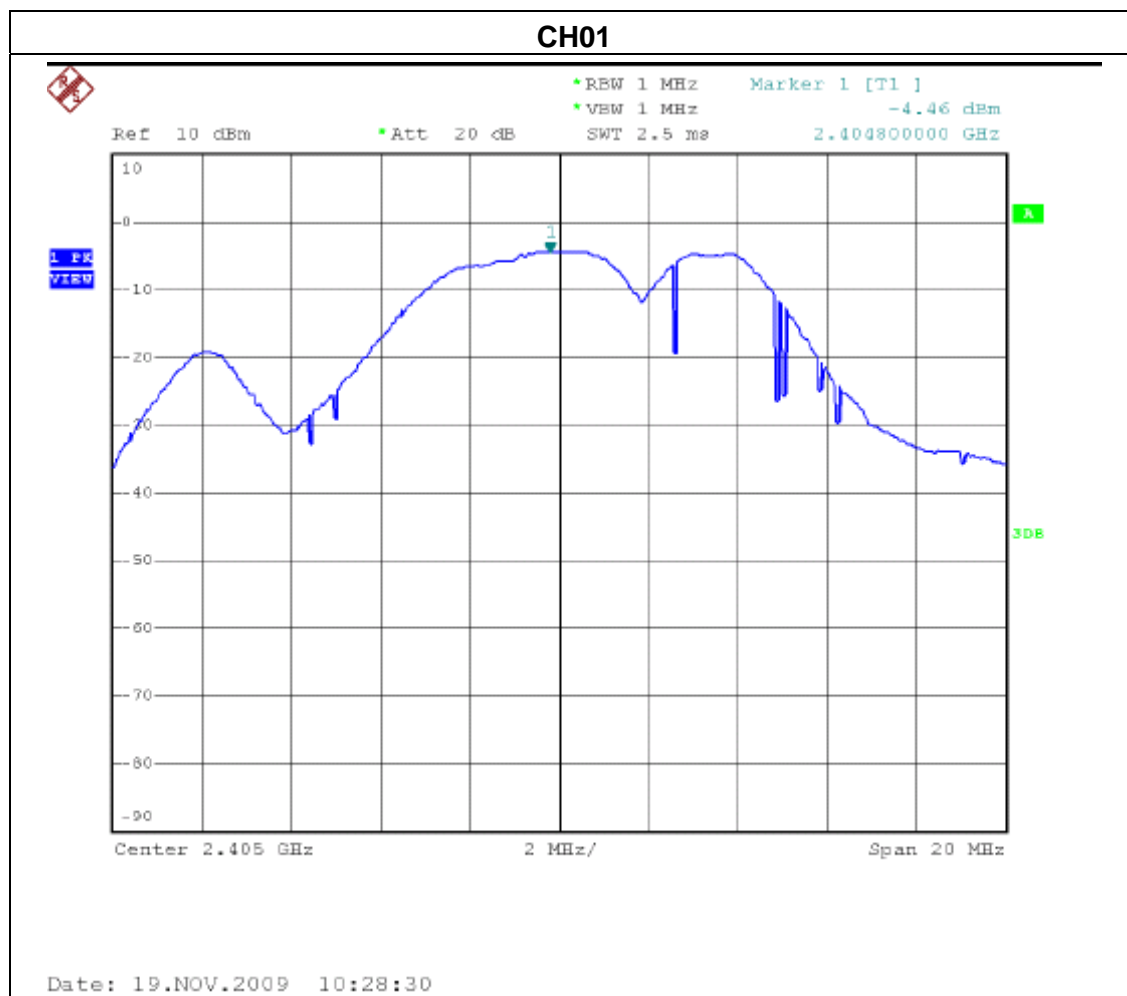
The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



9.1.6 TEST RESULTS

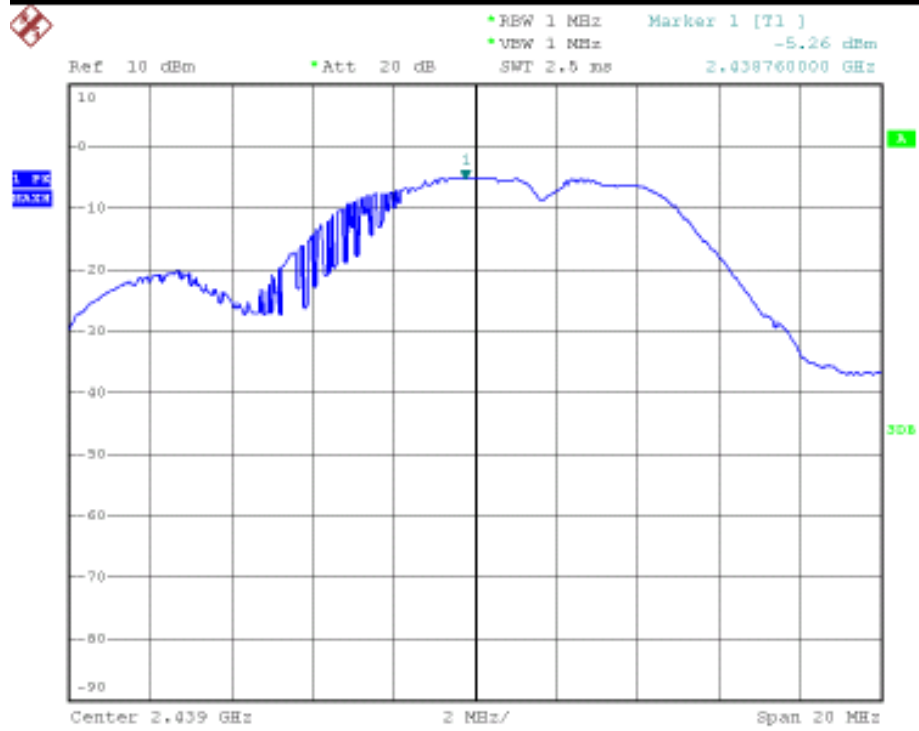
| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 25 °C | Relative Humidity : | 60% |
| Pressure : | 1012 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | CH01/ CH48 /CH64 | | |

| Test Channel | Frequency (MHz) | Peak Output Power (dBm) | LIMIT (dBm) | LIMIT (W) |
|--------------|-----------------|-------------------------|-------------|-----------|
| CH01 | 2405 | -4.46 | 30 | 1 |
| CH48 | 2439 | -5.26 | 30 | 1 |
| CH64 | 2476 | -6.15 | 30 | 1 |



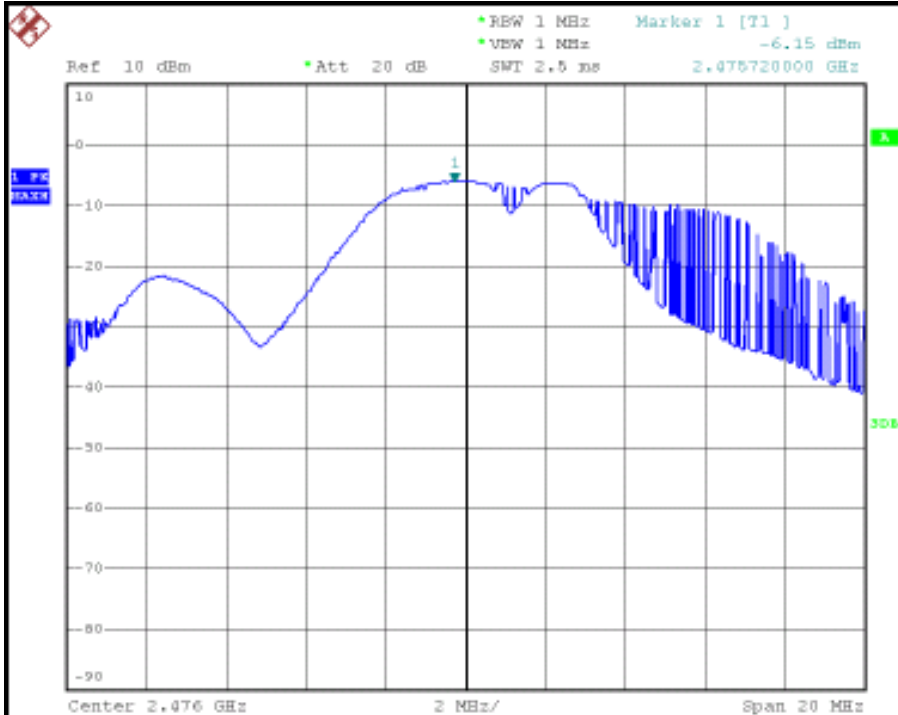


CH48



Date: 19.NOV.2009 10:01:23

CH64



Date: 19.NOV.2009 10:10:37



10. ANTENNA CONDUCTED SPURIOUS EMISSION

10.1 APPLIED PROCEDURES / LIMIT

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (micorvolts/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 |

10.1.1 MEASUREMENT INSTRUMENTS LIST AND SETTING

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|
| 1 | Spectrum Analyzer | R&S | FSP_40 | 100129 | Jan. 06, 2010 |

Remark: " N/A" denotes No Model Name , Serial No. or No Calibration specified.

The following table is the setting of the spectrum analyzer.

| Spectrum Parameter | Setting |
|---------------------------------------|--|
| Attenuation | Auto |
| Span Frequency | 100 MHz |
| RB / VB (emission in restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |
| RB / VB (other emission) | 100 KHz /100 KHz for Peak |

10.1.2 TEST PROCEDURE

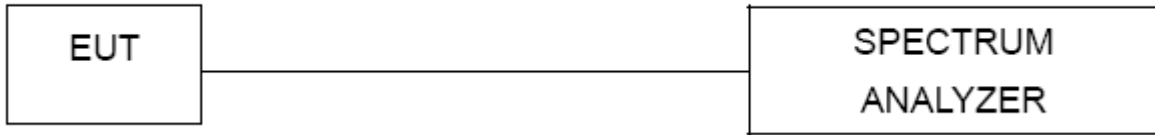
- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = Auto.

10.1.3 DEVIATION FROM STANDARD

No deviation.



10.1.4 TEST SETUP



10.1.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



10.1.6 TEST RESULTS

| | | | |
|---------------|---------------------------|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 25 °C | Relative Humidity : | 60% |
| Pressure : | 1012 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | CH01 / CH64 | | |

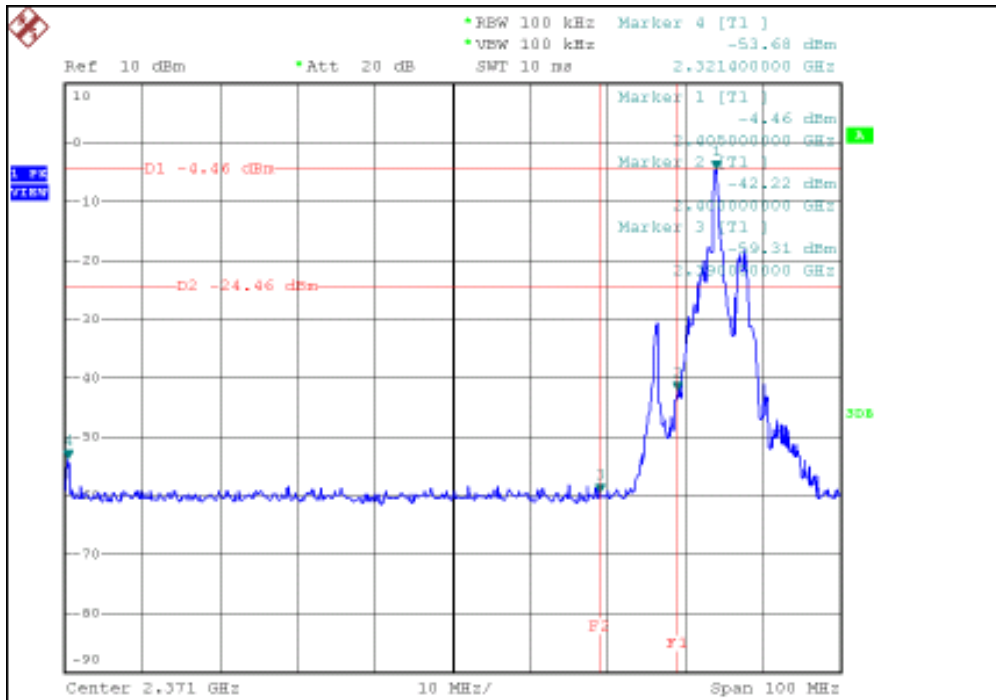
| | | | |
|---|------------|--|------------|
| The max. radio frequency power in any 100kHz bandwidth outside the frequency band | | The max. radio frequency power in any 100 kHz bandwidth within the frequency band. | |
| FREQUENCY(MHz) | POWER(dBm) | FREQUENCY(MHz) | POWER(dBm) |
| 2321.40 | -53.68 | 2483.50 | -38.21 |

Result

In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

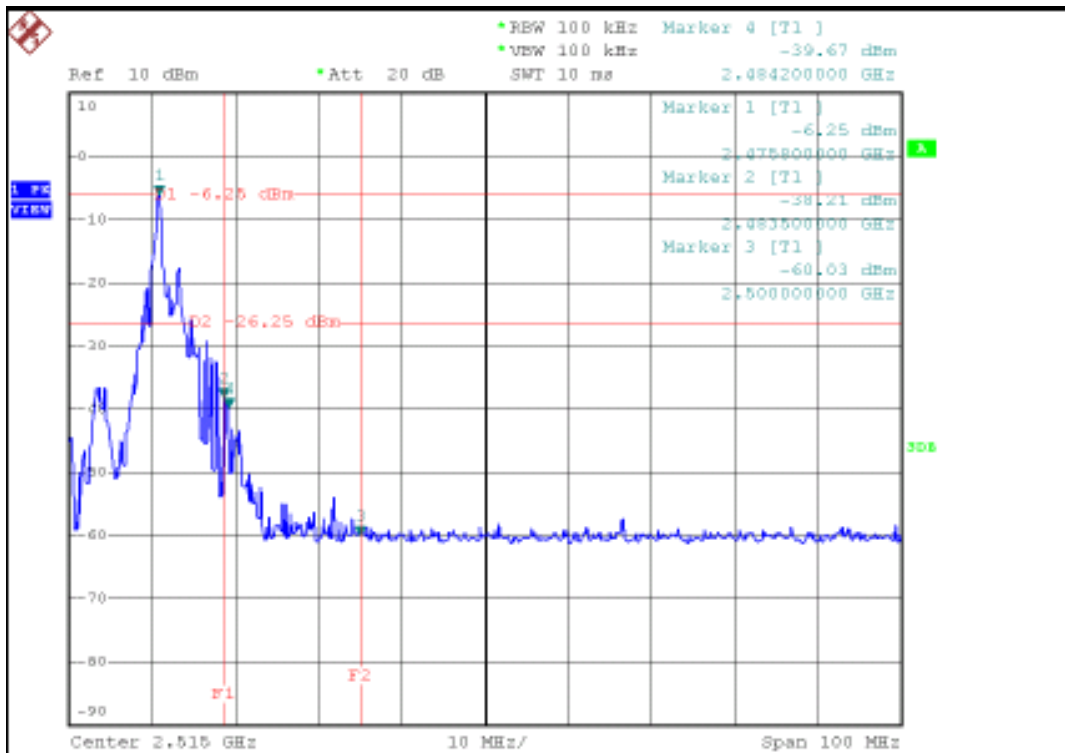


CH01 (Lower)



Date: 19.NOV.2009 10:21:49

CH 78 (Upper)



Date: 19.NOV.2009 10:19:42



11. RF EXPOSURE TEST

11.1 APPLIED PROCEDURES / LIMIT

These devices are not exempted from compliance does not exceed the Commission’s RF exposure guidelines. Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

In order to demonstrate compliance with MPE requirement (see Section 2.1091), the following information is typically needed:

Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.

Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits Any other RF exposure related issues that may affect MPE compliance.

FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

(A) Limits for Occupational / Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm ²) | Averaging Time E ² , H ² or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|--|---|
| 0.3-3.0 | 614 | 1.63 | (100)* | 6 |
| 3.0-30 | 1842 / f | 4.89 / f | (900 / f)* | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | | | F/300 | 6 |
| 1500-100,000 | | | 5 | 6 |

(B) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm ²) | Averaging Time E ² , H ² or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|--|---|
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | | | F/1500 | 30 |
| 1500-100,000 | | | 1.0 | 30 |

Note: f = frequency in MHz ; *Plane-wave equivalent power density

11.1.1 MEASUREMENT INSTRUMENTS LIST

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|
| 1 | Spectrum Analyzer | R&S | FSP_40 | 100129 | Jan. 06, 2010 |

Remark: " N/A" denotes No Model Name , Serial No. or No Calibration specified.



11.1.2 MPE CALCULATION METHOD

Calculation Method of RF Safety Distance:

$$S = \frac{PG}{4\pi r^2} = \frac{EIRP}{4\pi r^2}$$

- P :power input to the antenna in Mw
EIRP :Equivalent(effective) isotropic radiated power.
S :power density mW/ cm²
G ;numeric gain of antenna relative to isotropic radiator
R :distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{EIRP}{4\pi S}}$$

Note:

1. s=1.0 mW /cm² for limits for General Population/Uncontrolled Exposures.
 2. The time averaged power over 30 minutes will be equaled Output Power.
 3. Minimum calculated separation distance between antenna and persons required:0.53 cm
 4. The Power Density at a distance of 20cm calculated from the formula is far below the limit of 1MW/ cm²
 5. For portable device,the power limit is 60/f(in GHz) mW
 6. For limit 60/f is equal:
60/2.402=24.98mW
60/2.441=24.58 mW
60/2.480=24.19mW
 7. The max.output power E.I.R.P is 0.1279 mW
- So it is complied with the limit,SAR report is not required.



11.1.3 DEVIATION FROM STANDARD

No deviation.

11.1.4 TEST SETUP



11.1.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



11.1.6 TEST RESULTS

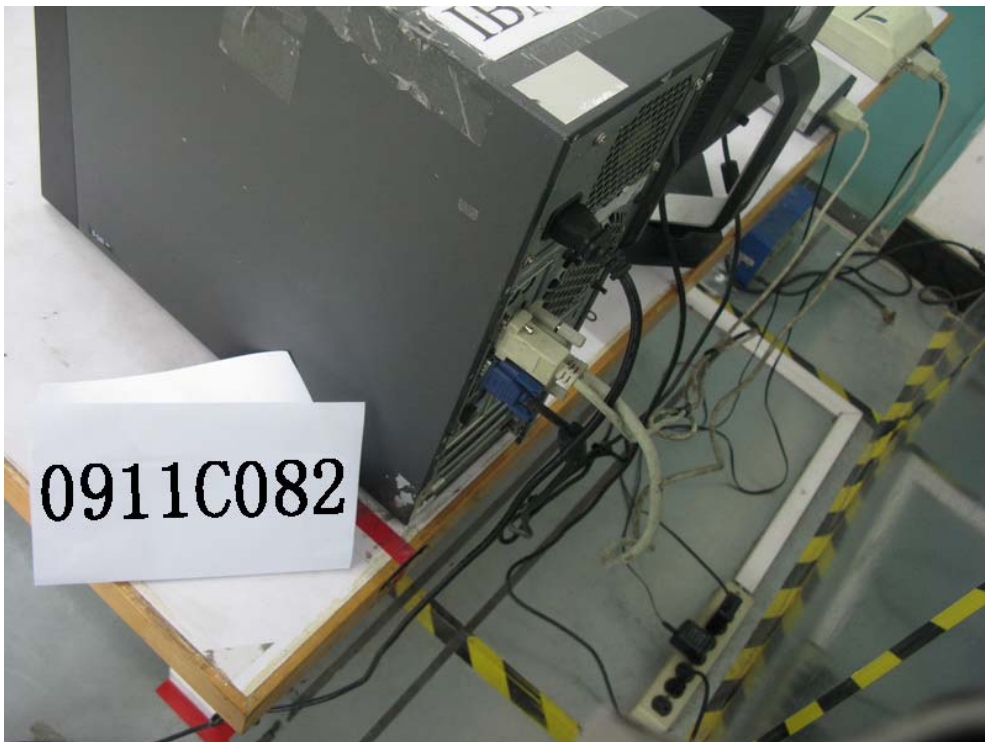
| | | | |
|---------------|---|---------------------|--------------|
| EUT : | 2.4G WIRELESS Transceiver | Model Name : | DR-9022RL |
| Temperature : | 25 °C | Relative Humidity : | 60% |
| Pressure : | 1012 hPa | Test Voltage : | AC 120V/60Hz |
| Test Mode : | CH01 (2405 MHz), CH48(2439 MHz), CH64 (2476 MHz) | | |

| Frequency (MHz) | Antenna Gain (dBi) | Peak Output Power (dBm) | Calculated EIRP (mW) | Power Density (S) (mW/cm ²) | FCC Threshold (mW) | Test Result |
|-----------------|--------------------|-------------------------|----------------------|---|--------------------|-----------------|
| 2405 | -0.46 | -11.63 | 0.0687 | 0.00001230 | 24.98 | Complies |
| 2439 | -0.46 | -10.44 | 0.0904 | 0.00001618 | 24.58 | Complies |
| 2476 | -0.46 | -8.93 | 0.1279 | 0.00002291 | 24.19 | Complies |



12. EUT TEST PHOTO

Conducted Measurement Photos





Radiated Measurement Photos

