# TEST REPORT

**Date: 2011-03-09**
**Report No.: 60.870.10.016.01F**

| | |
|---|---|
| **Applicant:** | Pandachip Ltd.<br>Unit 211, 2/F., IC Development Centre, No.6 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T. Hong Kong |
| **Description of Samples:** | Model name: Skype Video Gateway System (Camera)<br>Brand name: OVIZee<br>Model no.: SC880<br>FCCID: YE7-SC880 |
| **Date Samples Received:** | 2010-12-09 |
| **Date Tested:** | 2010-12-09 to 2011-02-28 |
| **Investigation Requested:** | FCC Part 15 Subpart C, Section 15.247 |
| **Conclusions:** | The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report. |
| **Remarks:** | ---- |

Checked by:

Prudence Poon
Technical Manager
Wireless & Telecom Department

Approved by:-

Jeff Pong
Duty Manager
Wireless & Telecom Department

**CONTENT:**

## 1.0 General Details

### 1.1 Test Laboratory

Hong Kong Standards and Testing Centre
Registration Number: 607756

Tested by:

Joey Leung

### 1.2 Applicant Details

**Applicant**

**Pandachip Ltd.**
Unit 211, 2/F., IC Development Centre, No.6 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T. Hong Kong

**Manufacturer**

**Pandachip Ltd.**
Unit 211, 2/F., IC Development Centre, No.6 Science Park West Avenue, Hong Kong Science Park, Shatin, N.T. Hong Kong

## 1.3 Equipment Under Test [EUT]

**Description of EUT**

| | |
|---|---|
| Product Description: | Skype Video Gateway System (Camera) |
| Model No.: | SC880 |
| Brand Name: | OVIZee |
| FCCID: | YE7-SC880 |
| Rating: | - DC 5.0V, 500mA powered by AC/DC power adaptor or DC 3.7V,"Li-ion rechargeable battery. |
| Operated Frequency: | 2410 - 2469 MHz |
| No. of Operated Channel: | 58 |
| Accessories and Auxiliary Equipments: | - AC/DC power adaptor. |

| | |
|---|---|
| Antenna Type: | Integral |
| Manufacture of Antenna: | Pandachip Ltd. |
| Antenna Gain: | 0dBi |
| Antenna Model: | N/A |

**General Operation of EUT**

The Equipment Under Test (EUT) is a Camera of the Skype Video Gateway System operated at 2.4GHz. The Camera has two set build-in transceivers for communication with the Gateway and each transceiver has own unique channel frequency list.

FHSS Operation Principle:

This module is controlled by microchip to generate Pseudorandom Frequency Hopping Sequence, this module support 58 hopping channels. Refer to section 4.5 of this report to have more detail of Pseudorandom Hopping Algorithm.

## 1.4 Related Submittal(s) Grants

This is a signal application subjected to Certificate Authorization.

## 2.0 Technical Details

### 2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2009 and ANSI C63.4: 2003 for FCC Verification

### 2.2 Test Standards and Results Summary Tables

| Test Condition | Test Requirement | Test Result | |
|---|---|---|---|
| | | Pass | N/A |
| Number of Frequency Hopping | Section 15.247 ( a1 ) | ☒ | ☐ |
| 20dB Bandwidth Measurement | Section 15.247 ( a1 ) | ☒ | ☐ |
| Hopping Channel Carrier Frequency Separation | Section 15.247 ( a1 ) | ☒ | ☐ |
| Average Time of Occupancy | Section 15.247 ( a1 ) | ☒ | ☐ |
| Pseudorandom Hopping Algorithm | Section 15.247 ( a1 ) | ☒ | ☐ |
| Band Edge Measurement | Section 15.247 | ☒ | ☐ |
| Maximum Output Power | Section 15.247 ( b1 ) | ☒ | ☐ |
| Out of Band Emission | Section 15.247 ( d ) | ☒ | ☐ |
| Radiated Emission in Restricted Band | Section 15.247 ( d ) | ☒ | ☐ |
| Conducted Emission on AC Mains | Section 15.207 | ☒ | ☐ |
| RF Exposure | Section 15.247 ( i ) | ☒ | ☐ |
| Antenna Requirement | Section 15.203 | ☒ See note 1 | ☐ |

Note 1 : The EUT uses a permanently attached antenna, which in accordance to Section 15.203, is considered sufficient to comply with the provisions of this section.

Remark: N/A - Not Applicable

## 3.0 Test Methodology

### 3.1 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

### 3.2 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

FS = R + System Factor
System Factor = AF + CF + FA – PA

Where FS = Net Field Strength in dBuV/m at 3 meters.
R = Reading of Spectrum Analyzer / Test Receiver in dBuV.
AF = Antenna Factor in dB.
CF = Cable Attenuation Factor in dB.
FA = Filter Attenuation Factor in dB.
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

### 3.3 Conducted Emissions

The test was performed in accordance with ANSI C63.4: 2003, with the following: initial measurements were performed in peak and average detection modes on the live line of personal computer, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.


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## 4.0 Test Results

### 4.1 Number of Hopping Frequency

| | |
|---|---|
| Test Requirement: | FCC part 15 section 15.247 (a1)(iii) |
| Test Date: | 2011-02-28 |
| Mode of Operation: | Transmitting mode. |
| Detector Function: | Max Hold |

**Result: PASS**

**Measured Result :**

Operating Channel Frequency in sequence (MHz):

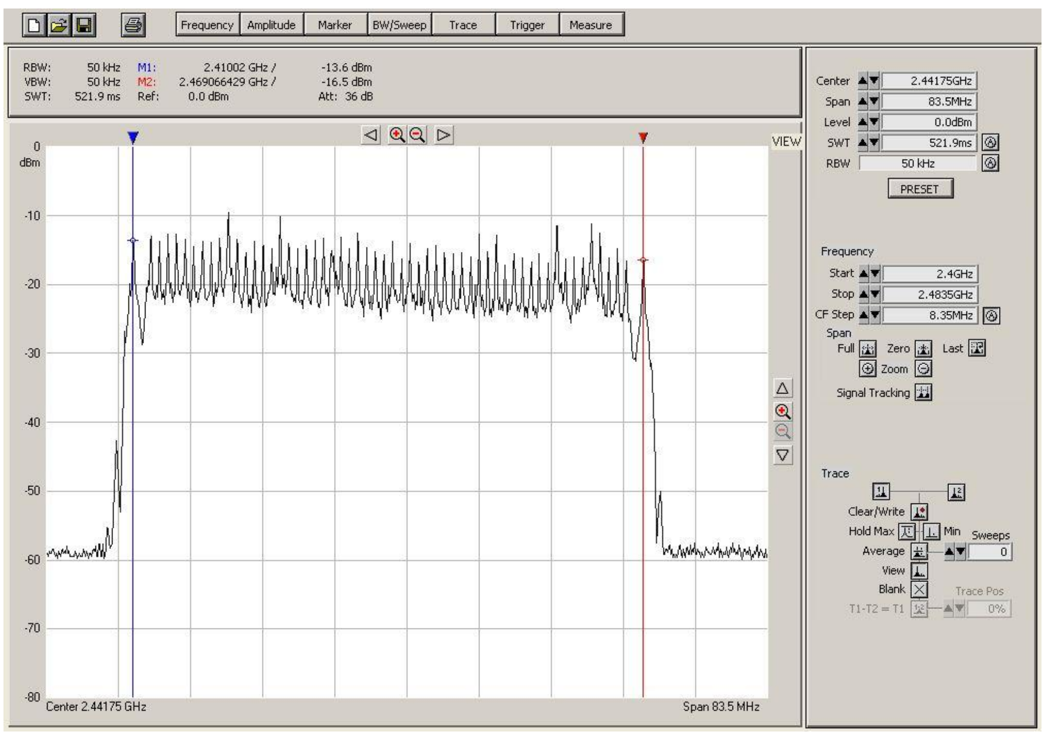
2410 ; 2412 ; 2414 ; 2416 ; 2418 ; 2420; 2422 ; 2424 ; 2426 ; 2428 ; 2430 ; 2432 ; 2434 ; 2436 ; 2438 ; 2440 ; 2442 ; 2444 ; 2446 ; 2448 ; 2450; 2452 ; 2454 ; 2456 ; 2458 ; 2460 ; 2462 ; 2464 ; 2466

2413 ; 2415 ; 2417 ; 2419 ; 2421 ; 2423; 2425 ; 2427 ; 2429 ; 2431 ; 2433 ; 2435 ; 2437 ; 2439 ; 2441 ; 2443 ; 2445 ; 2447 ; 2449 ; 2451 ; 2453; 2455 ; 2457 ; 2459 ; 2461 ; 2463 ; 2465 ; 2467 ; 2469

**Limit for Number of Hopping Channel [ Section 15.247 (a1)(iii) ]**

At least 15 non-overlapping channels for 2400-2483.5MHz.

**Figure 1 – Result data graph shows the number of operation channels:**



## 4.2 20dB Bandwidth Measurement

| | |
|---|---|
| Test Requirement: | FCC part 15 section 15.247 (a1) |
| Test Date: | 2011-02-28 |
| Mode of Operation: | Transmitting mode. |
| Detector Function: | Max Hold |

**Test Setup:**

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

| Transceiver A Channel | Measured frequency (MHz) | 20dB Bandwidth (MHz) |
|---|---|---|
| Lowest | 2410 | 2.04 |
| Middle | 2436 | 2.04 |
| Highest | 2466 | 2.09 |

| Transceiver B Channel | Measured frequency (MHz) | 20dB Bandwidth (MHz) |
|---|---|---|
| Lowest | 2413 | 2.09 |
| Middle | 2441 | 2.09 |
| Highest | 2469 | 2.04 |

This result is used for checking the hopping channel carrier frequencies separation.

**Figure 2 – Result data graph shows 20 dB bandwidth, CF = 2.410GHz, BW = 2.04MHz**

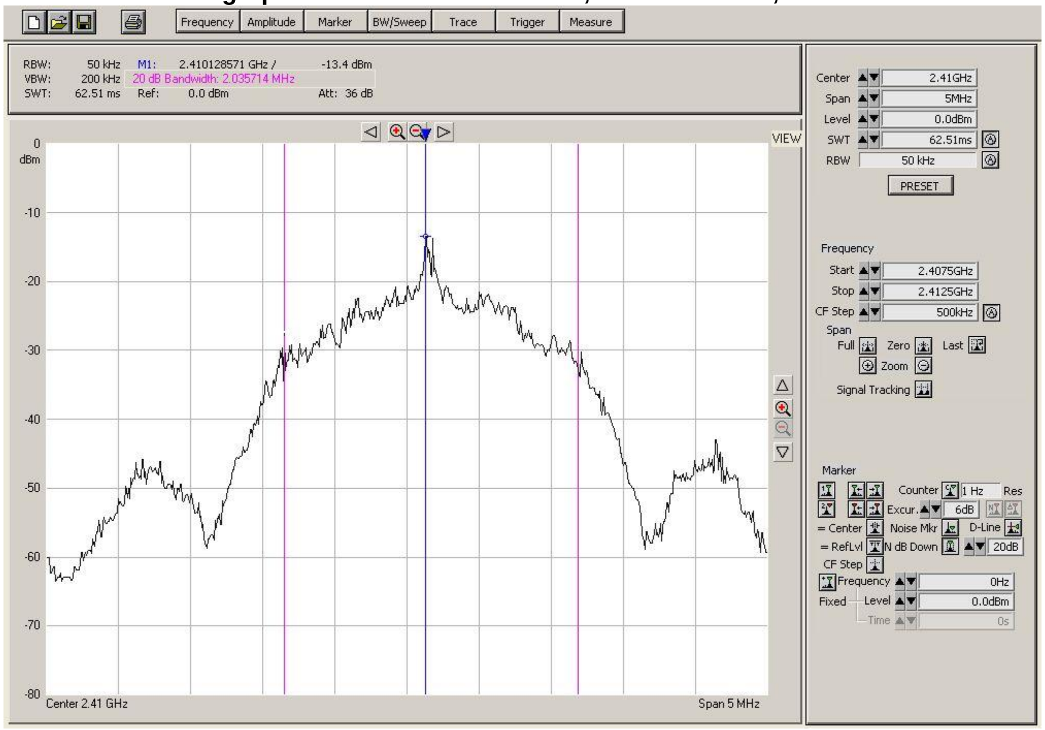



**Figure 2a – Result data graph shows 20 dB bandwidth, CF = 2.436GHz, BW = 2.04MHz**

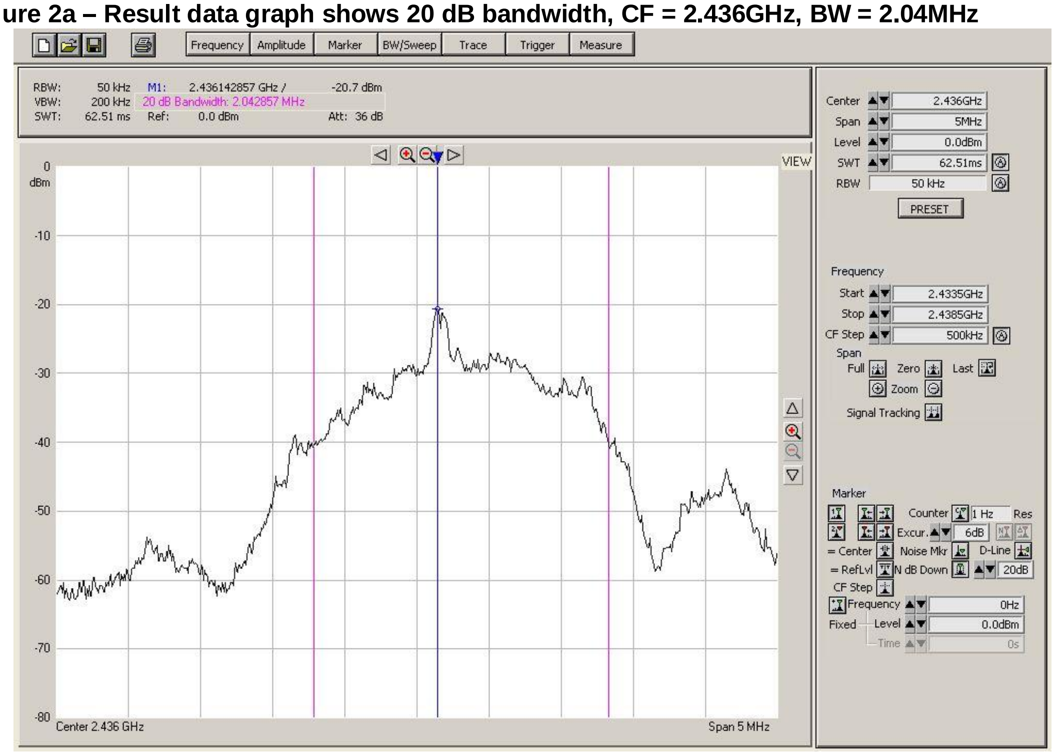


**Figure 2b – Result data graph shows 20 dB bandwidth, CF = 2.466GHz, BW = 2.09MHz**

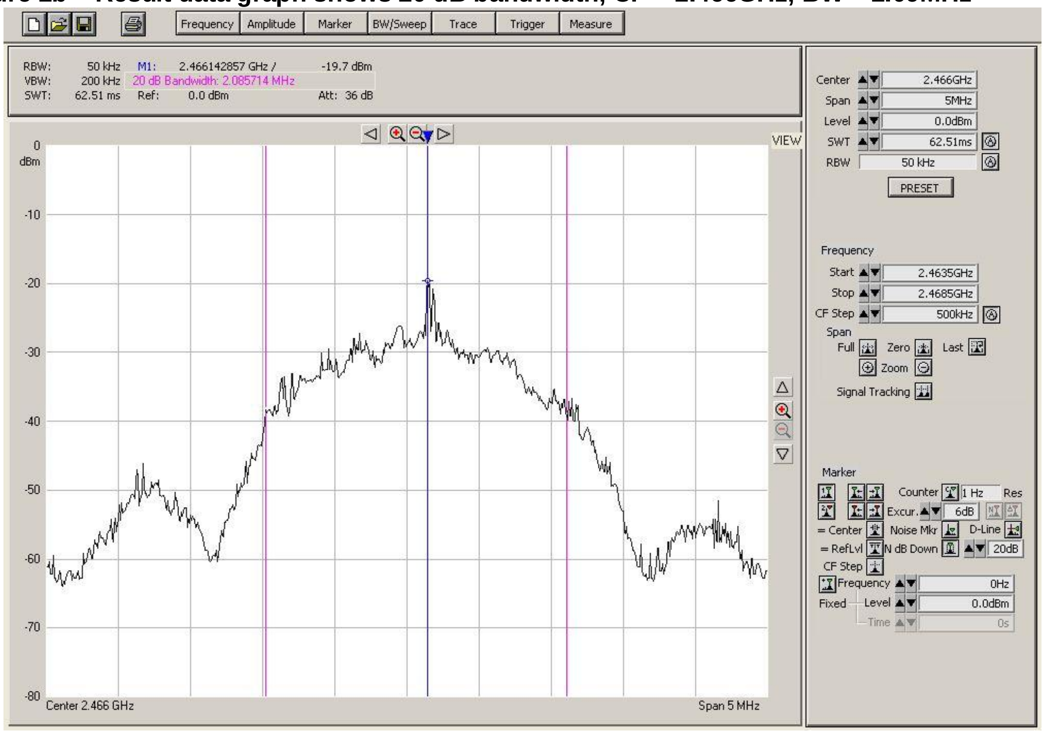



**Figure 3 – Result data graph shows 20 dB bandwidth, CF = 2.413GHz, BW = 2.09MHz**

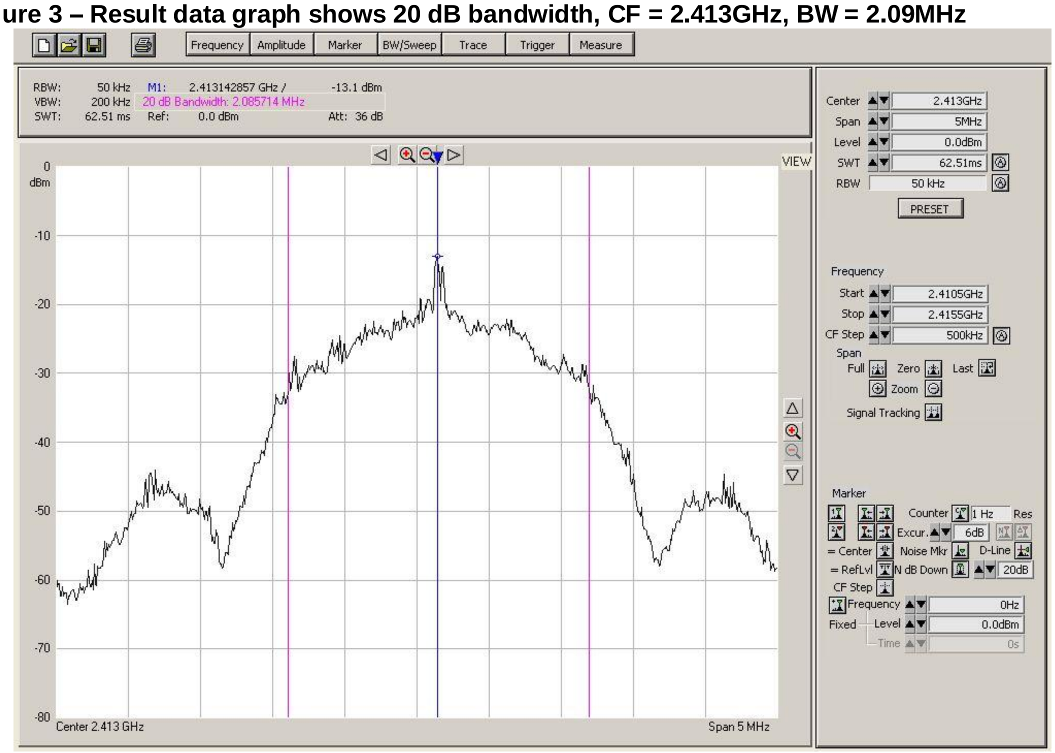


**Figure 3a – Result data graph shows 20 dB bandwidth, CF = 2.441GHz, BW = 2.09MHz**

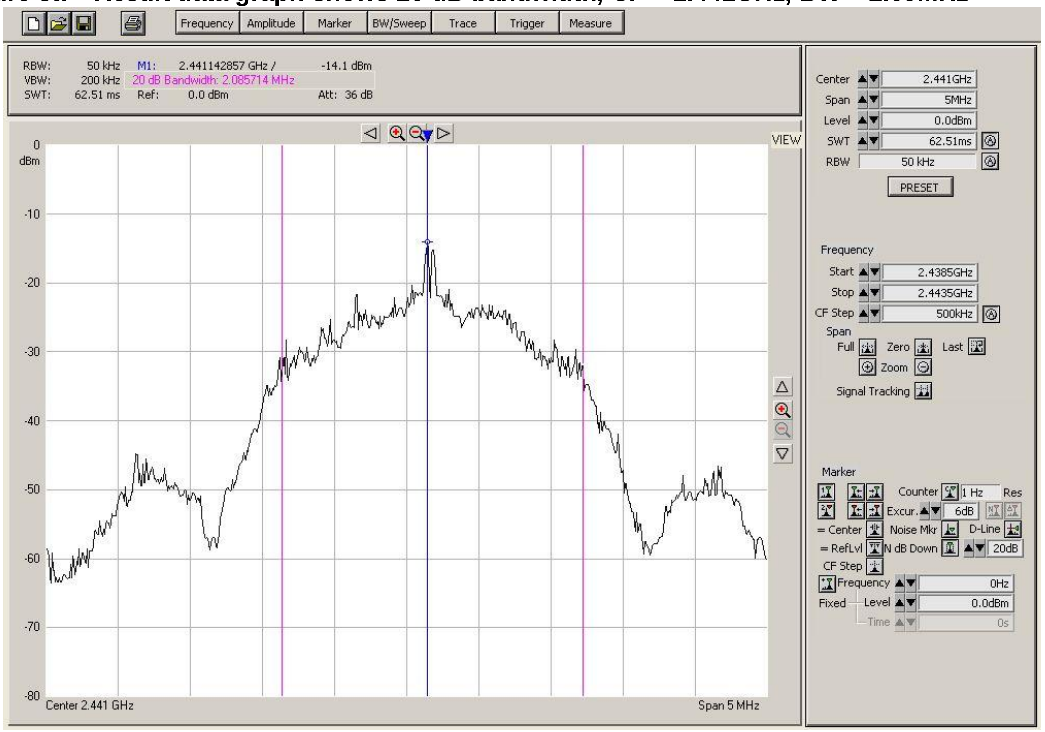
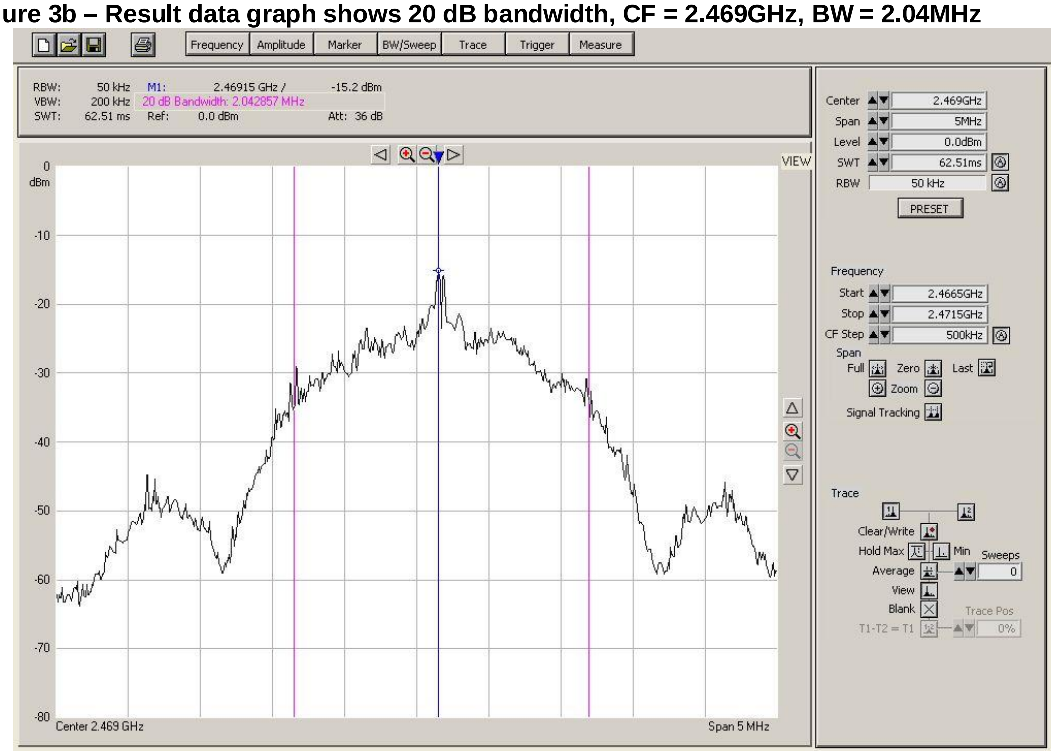



**Figure 3b – Result data graph shows 20 dB bandwidth, CF = 2.469GHz, BW = 2.04MHz**



### 4.3 Hopping Channel Carrier Frequency Separation

| | |
|---|---|
| Test Requirement: | FCC part 15 section 15.247 (a1) |
| Test Date: | 2011-02-28 |
| Mode of Operation: | Transmitting mode. |
| Detector Function: | Max Hold |

**Result: PASS**

**Measured Result :**

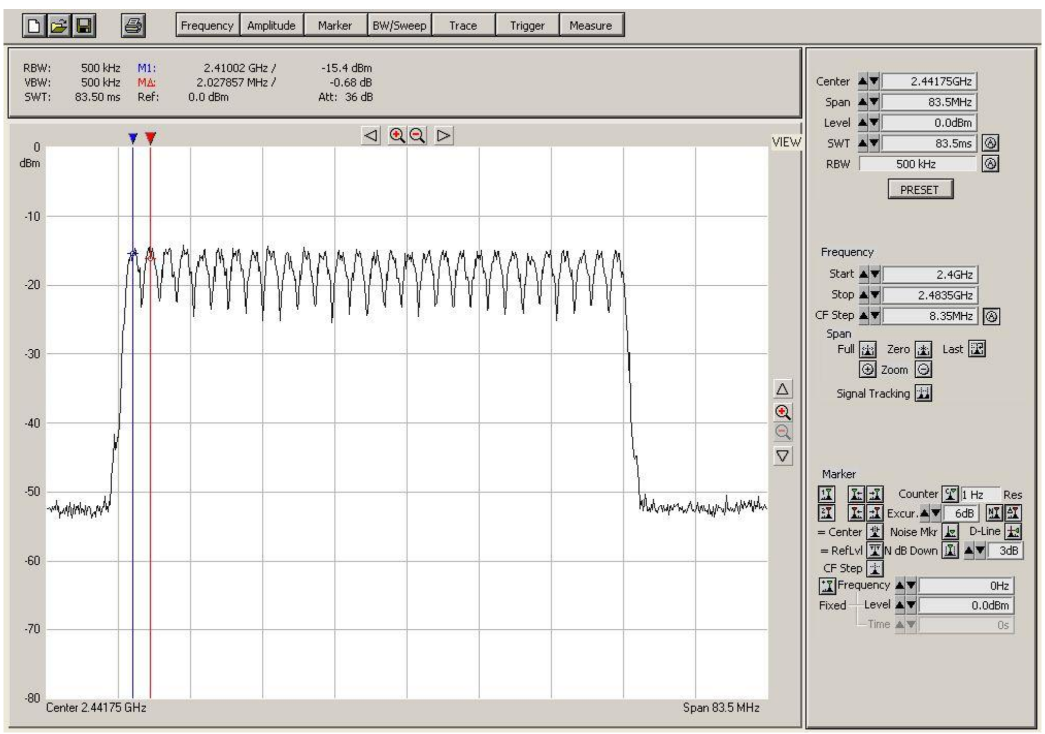
Refer to the delta marker, the frequency separation between two adjacent channels is 2 MHz, therefore, the requirement of channel separated by a two-third of the 20dB bandwidth of the hopping channel is applied.

According to the test result shown in section 4.2, the maximum 20dB bandwidth is 2.09 MHz, so the hopping channel separation of this EUT is found to comply with the requirement.

**Limits for Hopping Channel Separation [ Section 15.247 (a1) ]:**

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

**Figure 4 – Result data graph shows the channel separation:**



### 4.4 Average Time of Channel Occupancy

| | |
|---|---|
| Test Requirement: | FCC part 15 section 15.247 (a1)(iii) |
| Test Date: | 2011-02-24 |
| Mode of Operation: | Transmitting mode. |
| Detector Function: | Zero span, Sweep time 1s |

**Result : PASS**

**Measured Result :**

During each transmission, only 58 channels will be used.

Observe time = 58 channels × 0.4s = 23.2s

Figure 6 shows One set of pulse-train = 160µs x 62 = 9.92 ms

Therefore, the average channel occupancy times (ms)

= (7/15 x 23.2) x (60 x 0.16 ms)

So, total transmitting time is 0.104s. (<0.4s).

**Limits for Average Time of Occupancy [ Section 15.247 (a1)(iii) ]:**

The average time of occupancy on any channel shall not be greater than 0.4 second within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**Figure 5 – Result data graph shows total 7 pulses with 15s.**

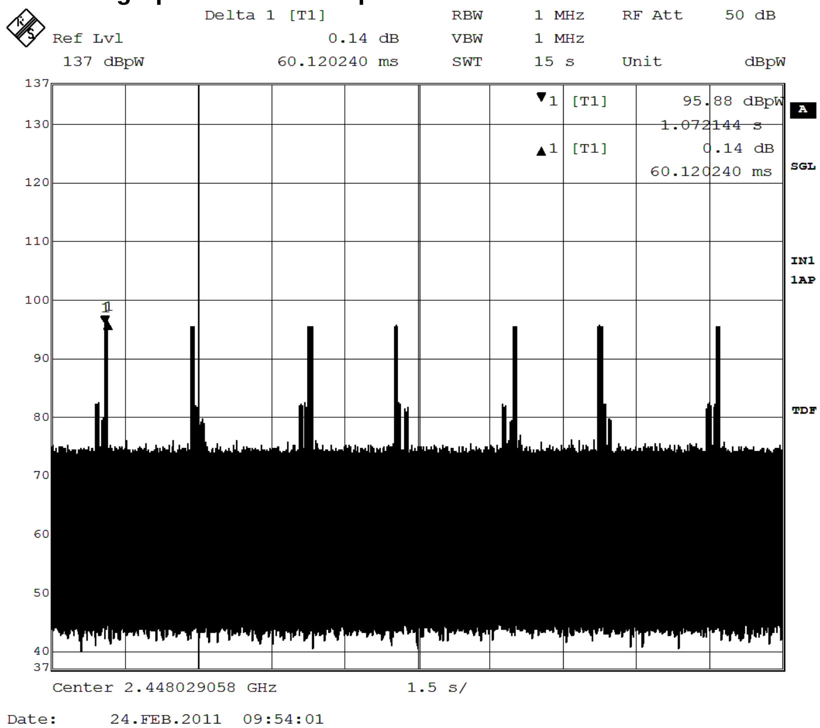



**Figure 6 – Result data graph zooms into detail, 62 pulses with a pulse-train.**

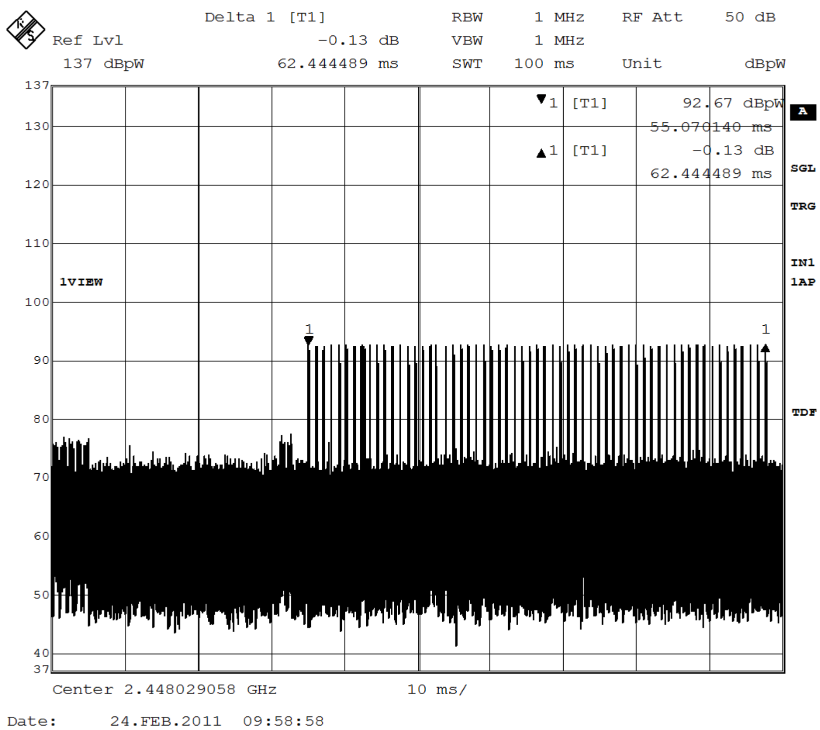
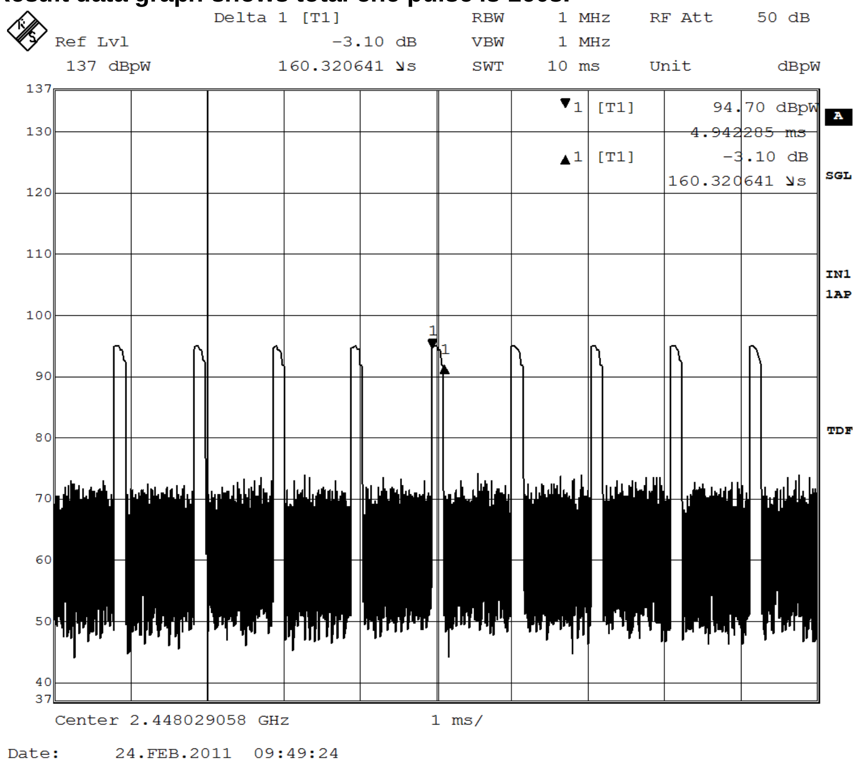


**Figure 7 – Result data graph shows total one pulse is 160s.**



### 4.5 Pseudorandom Hopping Algorithm

**Pseudorandom Frequency Hopping**

SC880 uses FHSS technology with total 58 hopping frequencies of two transceivers. Each transceiver contains unique 29 hopping channels. Each channel frequency is selected from a pseudorandom ordered list of hopping frequencies, from 2410MHz to 2469MHz with separating in 2 MHz apart from each of the channels. A single data frame is transmitted on each frequency location before skipping to the next hopping frequency in the list.

PM202 RF module utilizes dual RF transceivers operating together at highest data throughput. Each transceiver will contain its own packet ID and same data packet format, i.e. 32bit preamble, 32 bit ID, Max. payload 64 byte. On each transceiver, there are 29 non overlapping channels, and will adopt FHSS modulation according to the frequency table below.

Frequency list (in MHz):

| | Transceiver A | Transceiver B |
|---|---|---|
| CH 1 | 2410 | 2413 |
| CH 2 | 2412 | 2415 |
| CH 3 | 2414 | 2417 |
| CH 4 | 2416 | 2419 |
| CH 5 | 2418 | 2421 |
| CH 6 | 2420 | 2423 |
| CH 7 | 2422 | 2425 |
| CH 8 | 2424 | 2427 |
| CH 9 | 2426 | 2429 |
| CH 10 | 2428 | 2431 |
| CH 11 | 2430 | 2433 |
| CH 12 | 2432 | 2435 |
| CH 13 | 2434 | 2437 |
| CH 14 | 2436 | 2439 |
| CH 15 | 2438 | 2441 |
| CH 16 | 2440 | 2443 |
| CH 17 | 2442 | 2445 |
| CH 18 | 2444 | 2447 |
| CH 19 | 2446 | 2449 |
| CH 20 | 2448 | 2451 |
| CH 21 | 2450 | 2453 |
| CH 22 | 2452 | 2455 |
| CH 23 | 2454 | 2457 |
| CH 24 | 2456 | 2459 |
| CH 25 | 2458 | 2461 |
| CH 26 | 2460 | 2463 |
| CH 27 | 2462 | 2465 |
| CH 28 | 2464 | 2467 |
| CH 29 | 2466 | 2469 |

**Requirement for Pseudorandom Hopping Algorithm [ Section 15.247 (a1) ]:**

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on average by the transmitter.

### 4.6 Band Edge Measurement

| | |
|---|---|
| Test Requirement: | FCC part 15 section 15.247 |
| Test Date: | 2011-02-28 |
| Mode of Operation: | Transmitting mode. |
| Detector Function: | Max Hold |

**Result: PASS**

**Measured Result :**

Refer to the figure 8 and 9, it shows the frequency of lower band edge and upper band edge is 2.4075GHz and 2.475GHz separately.

**Limits of Band Edge for Carrier Frequencies Operated within the Bands [ Section 15.247 ]:**

The carrier frequencies should operate within 2400-2483.5MHz.

**Figure 8 – Result data graph shows the frequency of lowest channel.**

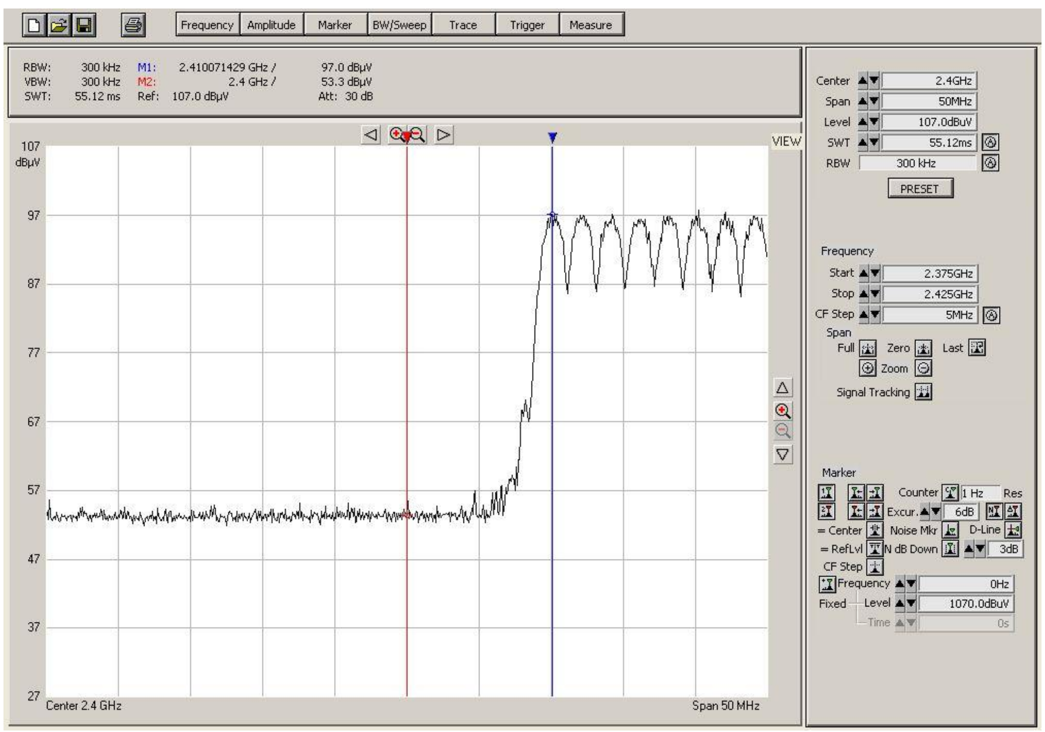
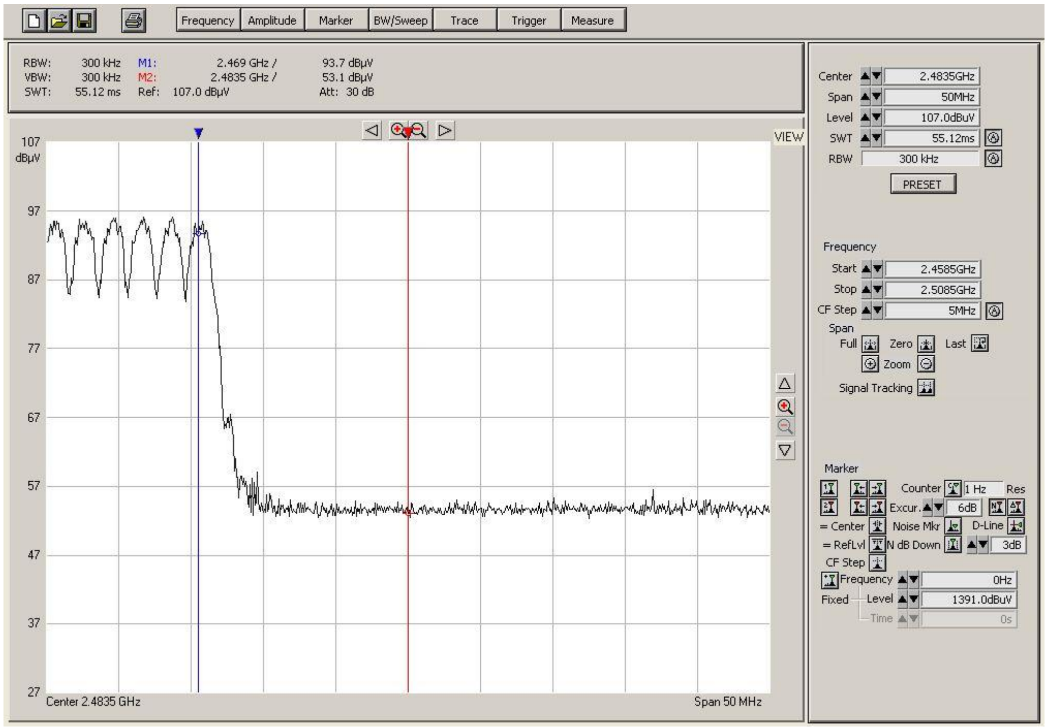


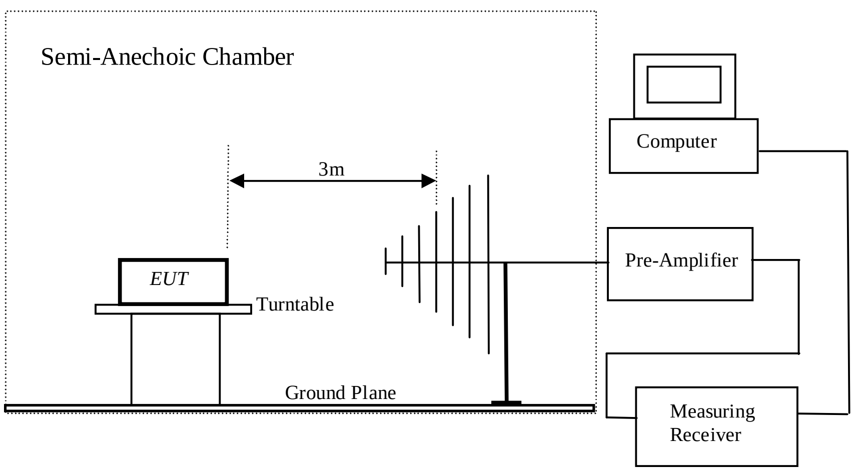
**Figure 9 – Result data graph shows the frequency of highest channel.**



## 4.7 Maximum Output Power

| | |
|---|---|
| Test Requirement: | FCC part 15 section 15.247 (a1) |
| Test Method: | ANSI C63.4:2003 |
| Test Date: | 2011-02-28 |
| Mode of Operation: | Transmitting mode. |
| Detector Function: | Peak |
| Measurement BW: | RBW 3MHz ; VBW 3MHz |

**Test Setup:**



**Result : PASS**

| Transceiver A (MHz) | Output Power | | Max. Output Power (mW) | Max. Average Power (mW) |
|---|---|---|---|---|
| | (dBuV/m) | (V/m) | | |
| Lowest Channel : 2410 | 111.1 | 0.3589 | 38.6 | 6.1 |
| Middle Channel : 2436 | 111.7 | 0.3846 | 44.4 | 7.0 |
| Highest Channel : 2466 | 108.9 | 0.2786 | 23.3 | 3.9 |
| | | | | |
| Limit | 116.20 | 0.645 | 125.0 | --- |

| Transceiver B (MHz) | Output Power | | Max. Output Power (mW) | Max. Average Power (mW) |
|---|---|---|---|---|
| | (dBuV/m) | (V/m) | | |
| Lowest Channel : 2413 | 109.1 | 0.2851 | 24.4 | 4.9 |
| Middle Channel : 2441 | 110.8 | 0.3467 | 36.1 | 4.3 |
| Highest Channel : 2469 | 108.7 | 0.2723 | 22.2 | 4.5 |
| | | | | |
| Limit | 116.20 | 0.645 | 125.0 | --- |

Calculate the transmitter's peak power using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:E is the measured maximum fundamental field strength in V/m, utilizing a RBW ≥ the 20 dB bandwidth of the emission, VBW > RBW, peak detector function. Follow the procedures in C63.4-2003 with respect to maximizing the emission.

G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.
This antenna gain declared by manufacture is 0dBi, antenna is PCB integrated in the actual use. 0dBi logarithmic terms convert to numeric result is nearly 1. So, we apply G =1.0.

d is the distance in meters from which the field strength was measured.

P is the power in watts for which you are solving:

$$P = \frac{(E*d)^2}{30G}$$

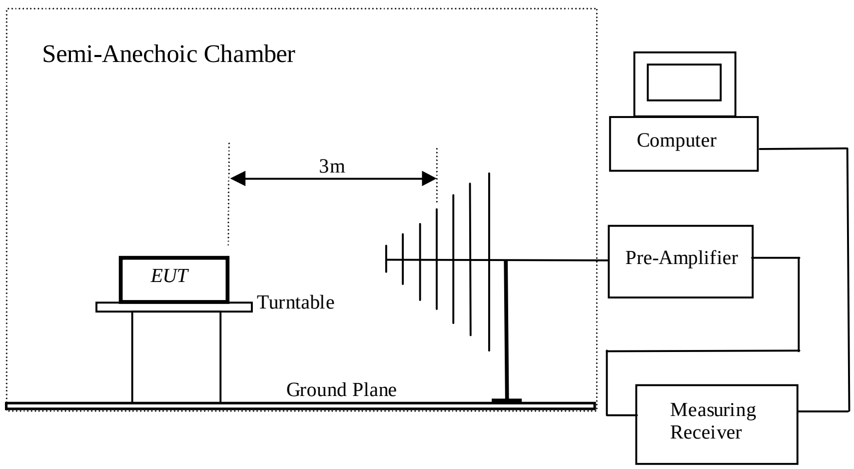
**Limits for Maximum Output Power [ Section 15.247 (a1)(iii) ]:**

For frequency hopping systems employing at least 75 hopping channels: 1 Watt
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts

## 4.8 Out of Band Emissions and Emissions in Restricted Bands

| | |
|---|---|
| Test Requirement: | FCC part 15 section 15.247 (d ) |
| Test Method: | ANSI C63.4:2003 |
| Test Date: | 2011-02-28 |
| Mode of Operation: | Transmitting mode. |
| Detector Function: | Peak |
| Measurement BW: | RBW 100KHz ; VBW 300KHz |

**Test Setup:**



**Result : PASS**

**Out of Frequency Band Emissions:**

For out of band emissions that are close to or exceed 20dB attenuation requirement, and emission falls into restricted band, radiated emission was performed in order to show compliance with the general radiated emission requirement.

**Result Summary:**

Refer to Figure 10 to 11 for the emission data graph, result shows that the significant emissions detected are with more than 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

**Limits for Out of Frequency Band Emission [ Section 15.247 (d) ]:**

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. Attenuation below the general limits specified in Section 15.209(a) is not required.

**Limit for Radiated Emission Falling in Restricted Bands [ Section 15.209 ]:**

| Frequency (MHz) | Field Strength [μV/m] | Field Strength [dBμV/m] |
|---|---|---|
| 30-88 | 100 | 40.0 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

**Result : PASS**

## Transceiver A

**All Emission and Emissions Fall into Restricted Band were recorded as below:**

| Radiated Emissions | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Emissions Frequency** | **E-Field Polarity** | **Reading** | **System Factor** | **Field strength at 3m** | **Limit** | **Delta to Limit** |
| | **MHz** | | **dBuV/m** | **dB** | **dBuV/m** | **dBuV/m** | **dBuV/m** |
| | **Lowest Channel** | | | | | | |
| PK | 1802.00 | V | 27.40 | 27.10 | 54.50 | 74.00 | -19.50 |
| AV | | V | 17.60 | 27.10 | 44.70 | 54.00 | -9.30 |
| PK | *4821.00 | V | 37.70 | 33.90 | 71.60 | 74.00 | -2.40 |
| AV | | V | 9.30 | 33.90 | 43.20 | 54.00 | -10.80 |
| PK | 7232.00 | V | 28.90 | 36.80 | 65.70 | 74.00 | -8.30 |
| AV | | V | 8.10 | 36.80 | 44.90 | 54.00 | -9.10 |
| | | | | | | | |
| | **Middle Channel** | | | | | | |
| PK | 1828.00 | V | 30.50 | 27.10 | 57.60 | 74.00 | -16.40 |
| AV | | V | 20.60 | 27.10 | 47.70 | 54.00 | -6.30 |
| PK | *4872.00 | V | 37.00 | 34.20 | 71.20 | 74.00 | -2.80 |
| AV | | V | 8.90 | 34.20 | 43.10 | 54.00 | -10.90 |
| PK | *7306.00 | V | 27.40 | 36.90 | 64.30 | 74.00 | -9.70 |
| AV | | V | 7.20 | 36.90 | 44.10 | 54.00 | -9.90 |
| | | | | | | | |
| | **Highest Channel** | | | | | | |
| PK | 1858.00 | V | 31.50 | 27.20 | 58.70 | 74.00 | -15.30 |
| AV | | V | 22.00 | 27.20 | 49.20 | 54.00 | -4.80 |
| PK | *4933.00 | V | 36.90 | 35.20 | 72.10 | 74.00 | -1.90 |
| AV | | V | 5.30 | 35.20 | 40.50 | 54.00 | -13.50 |
| PK | *7400.00 | V | 24.60 | 40.50 | 65.10 | 74.00 | -8.90 |
| AV | | V | 4.60 | 40.50 | 45.10 | 54.00 | -8.90 |
| | | | | | | | |
| | **Spurious Emissions** | | | | | | |
| QP | 33.80 | V | 23.40 | 9.40 | 32.80 | 40.00 | -7.20 |
| QP | 40.80 | V | 23.50 | 10.10 | 33.60 | 40.00 | -6.40 |
| QP | 53.10 | V | 20.40 | 12.10 | 32.50 | 40.00 | -7.50 |
| QP | 161.00 | V | 21.60 | 13.00 | 34.60 | 43.50 | -8.90 |
| QP | 217.00 | V | 22.30 | 13.30 | 35.60 | 46.00 | -10.40 |
| QP | 245.00 | V | 27.00 | 13.40 | 40.40 | 46.00 | -5.60 |

Refer to Figure 10 to 13 shows the worst case channel's emission data graph from 30MHz-26GHz.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**Result : PASS**

## Transceiver B

**All Emission and Emissions Fall into Restricted Band were recorded as below:**

| Radiated Emissions | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Emissions Frequency MHz** | **E-Field Polarity** | **Reading dBuV/m** | **System Factor dB** | **Field strength at 3m dBuV/m** | **Limit dBuV/m** | **Delta to Limit dBuV/m** |
| | **Lowest Channel** | | | | | | |
| PK | 1804.00 | V | 27.00 | 27.10 | 54.10 | 74.00 | -19.90 |
| AV | | V | 17.10 | 27.10 | 44.20 | 54.00 | -9.80 |
| PK | *4826.00 | V | 38.80 | 33.90 | 72.70 | 74.00 | -1.30 |
| AV | | V | 7.40 | 33.90 | 41.30 | 54.00 | -12.70 |
| PK | 7238.00 | V | 27.60 | 36.80 | 64.40 | 74.00 | -9.60 |
| AV | | V | 10.50 | 36.80 | 47.30 | 54.00 | -6.70 |
| | | | | | | | |
| | **Middle Channel** | | | | | | |
| PK | 1834.00 | V | 33.80 | 27.10 | 60.90 | 74.00 | -13.10 |
| AV | | V | 23.00 | 27.10 | 50.10 | 54.00 | -3.90 |
| PK | *4883.00 | V | 38.00 | 34.20 | 72.20 | 74.00 | -1.80 |
| AV | | V | 5.20 | 34.20 | 39.40 | 54.00 | -14.60 |
| PK | *7325.00 | V | 24.90 | 36.90 | 61.80 | 74.00 | -12.20 |
| AV | | V | 7.20 | 36.90 | 44.10 | 54.00 | -9.90 |
| | | | | | | | |
| | **Highest Channel** | | | | | | |
| PK | 1860.00 | V | 33.90 | 27.20 | 61.10 | 74.00 | -12.90 |
| AV | | V | 24.10 | 27.20 | 51.30 | 54.00 | -2.70 |
| PK | *4938.00 | V | 35.40 | 35.20 | 70.60 | 74.00 | -3.40 |
| AV | | V | 3.90 | 35.20 | 39.10 | 54.00 | -14.90 |
| PK | *7408.00 | V | 20.90 | 40.50 | 61.40 | 74.00 | -12.60 |
| AV | | V | 5.10 | 40.50 | 45.60 | 54.00 | -8.40 |
| | | | | | | | |
| | **Spurious Emissions** | | | | | | |
| QP | 33.80 | V | 23.40 | 9.40 | 32.80 | 40.00 | -7.20 |
| QP | 40.80 | V | 23.50 | 10.10 | 33.60 | 40.00 | -6.40 |
| QP | 53.10 | V | 20.40 | 12.10 | 32.50 | 40.00 | -7.50 |
| QP | 161.00 | V | 21.60 | 13.00 | 34.60 | 43.50 | -8.90 |
| QP | 217.00 | V | 22.30 | 13.30 | 35.60 | 46.00 | -10.40 |
| QP | 245.00 | V | 27.00 | 13.40 | 40.40 | 46.00 | -5.60 |

Refer to Figure 10 to 13 shows the worst case channel's emission data graph from 30MHz-26GHz.

**Result Summary:**

1) Communication mode: All other emissions are more than 20dB below FCC part 15.209 limit.

2) No further spurious emissions found between 30 MHz and lowest internal used/generated frequency and from 30MHz to 1GHz.

**Remarks:**

1. “ * ” Radiated emissions which fall in the restricted bands as defined in Section 15.205(a).

2. Emission level with more than 20dB below the FCC required limit is not mentioned in table.

3. Delta to Limit = Field strength (dBµV/m) – Limit (dBµV/m).

4. Calculated measurement uncertainty: 9kHz -30MHz: 1.8dB.
30MHz -1GHz: 5.2dB.
1GHz -18GHz: 5.1dB.

**Figure 10 – Radiated emission data graph (Vertical polarization, 30MHz-1GHz)**

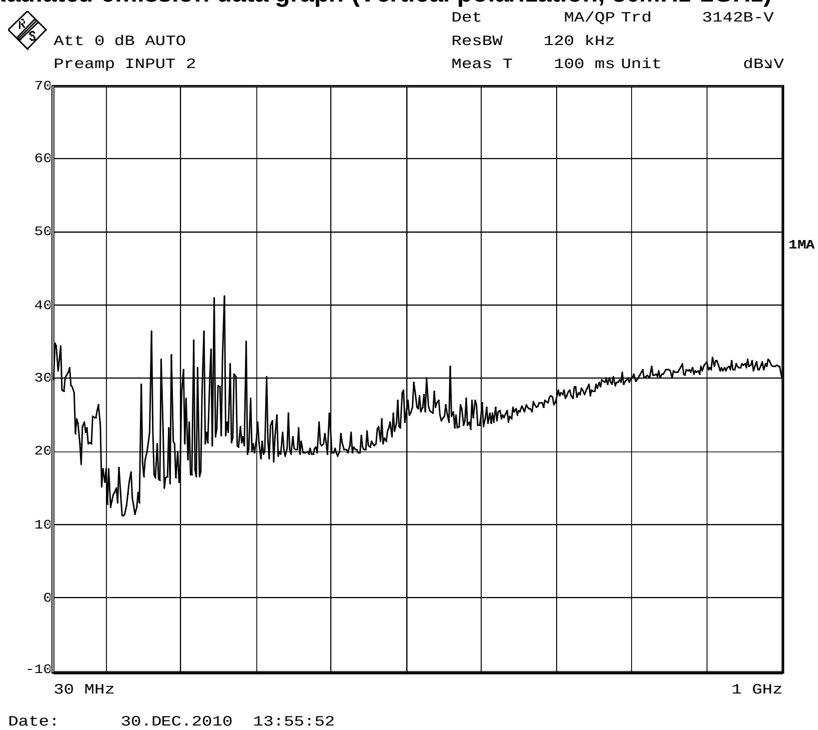
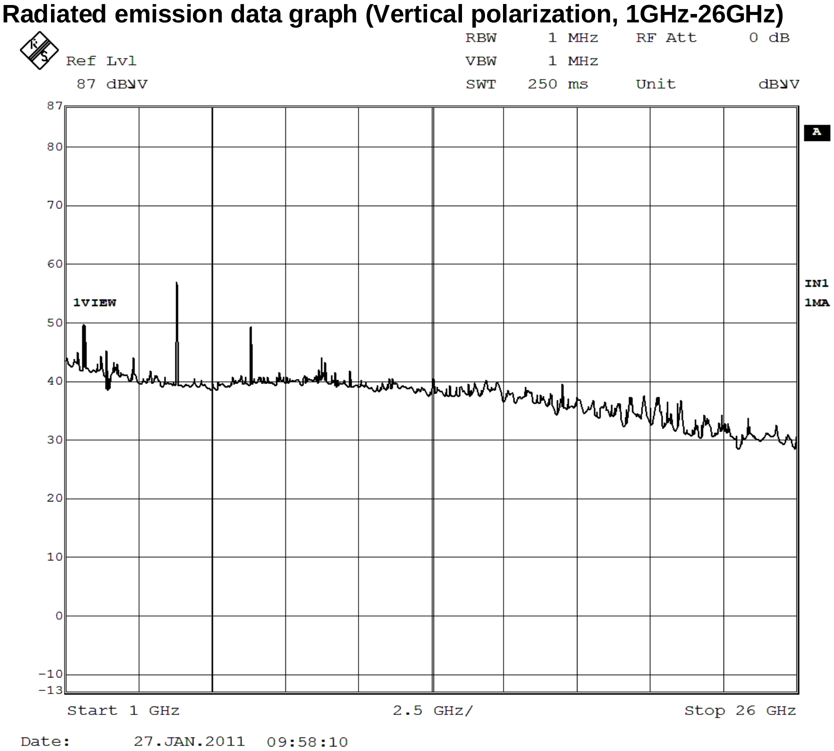



**Figure 11 – Radiated emission data graph (Vertical polarization, 1GHz-26GHz)**




Remark: Only background noise was measured from 18GHz-26GHz.

**Figure 12 – Radiated emission data graph (Horizontal polarization, 30MHz-1GHz)**

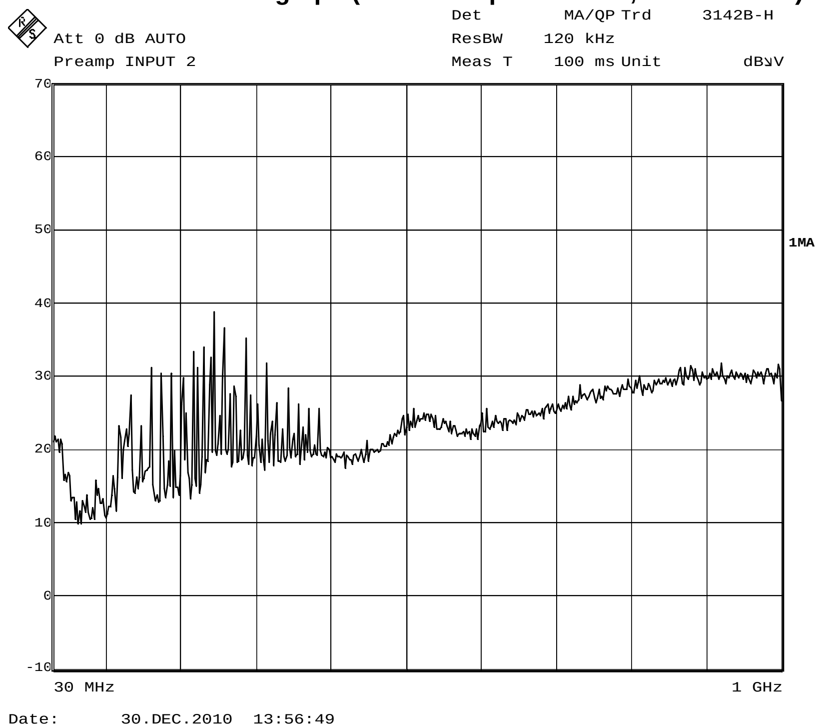
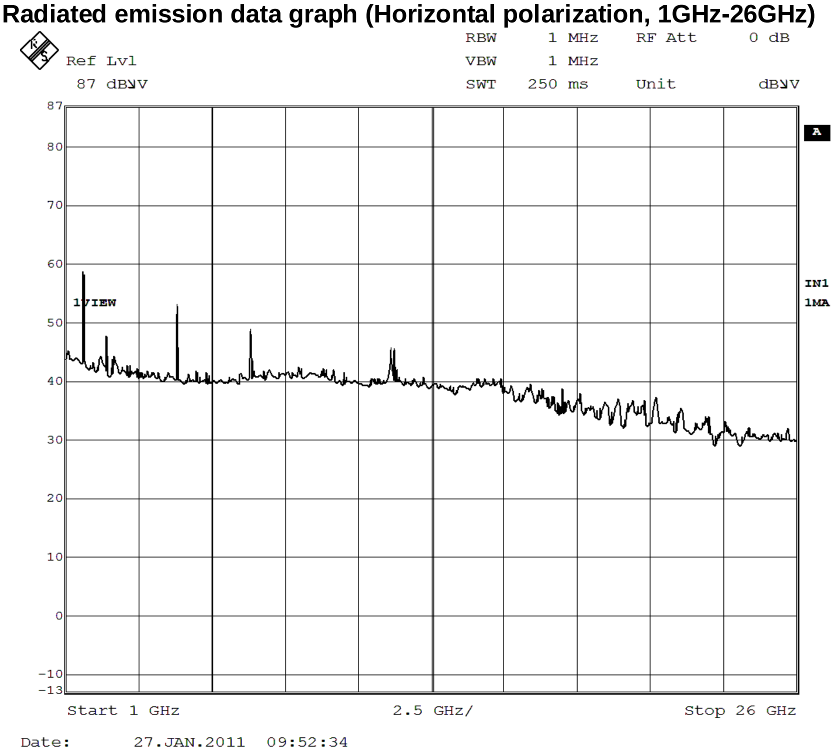



**Figure 13 – Radiated emission data graph (Horizontal polarization, 1GHz-26GHz)**




Remark: Only background noise was measured from 18GHz-26GHz.

## 4.9 Conducted Emissions (0.15MHz to 30MHz)

| | |
|---|---|
| Test Requirement: | FCC part 15 Section 15.207 Class B |
| Test Method: | ANSI C63.4:2003 |
| Test Date: | 2010-12-29 |
| Mode of Operation: | -Transmitting mode |
| Detector Function: | CISPR Quasi Peak |
| Measurement BW: | 9 kHz |
| Worst Case Channel: | 1 |

**Results: PASS**

**- Refer Figure 14 for the result data graph.**

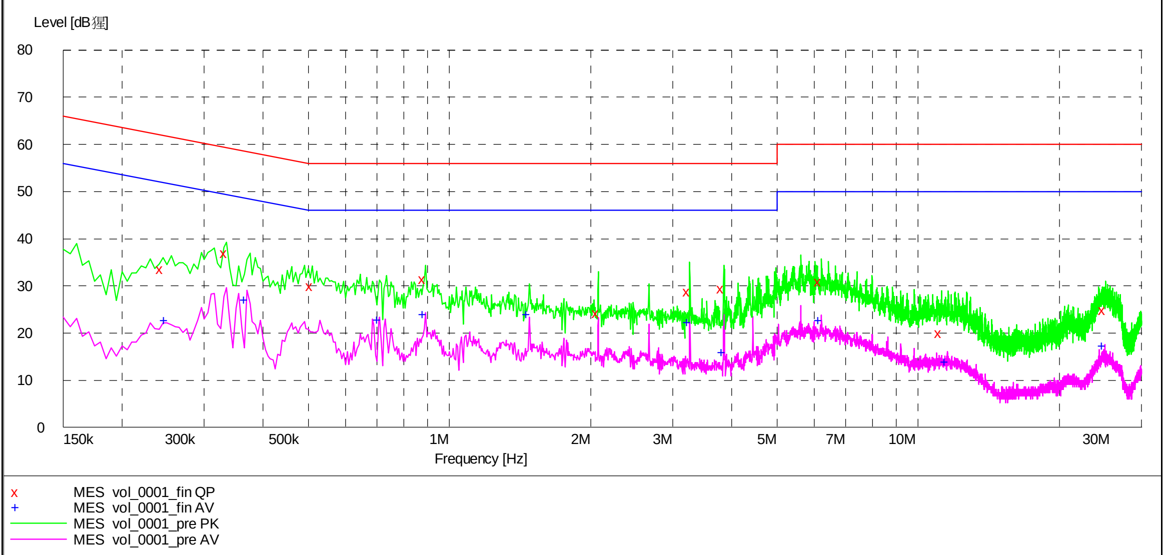
**Limits for Conducted Emission [ Section 15.207]:**

| Frequency Range [MHz] | Quasi-Peak Limit [dBμV] | Average Limit [dBμV] |
|---|---|---|
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5.0 | 56 | 46 |
| 5.0-30.0 | 60 | 50 |

* Decreases with the logarithm of the frequency.

Remarks:
Calculated measurement uncertainty: ±2.8dB

**Figure 14– Result data graph shows the conducted emission (Live and Neutral).**




Refer to the following page for the result details:

| Frequency (MHz) | Detector (QP/AV) | Phase | Result (dBµV) | Limit (dBµV) | Margin |
|---|---|---|---|---|---|
| 0.245 | QP | L | 33.50 | 61.90 | -28.40 |
| 0.335 | QP | L | 36.90 | 59.30 | -22.40 |
| 0.890 | QP | L | 31.50 | 56.00 | -24.50 |
| 2.080 | QP | L | 24.20 | 56.00 | -31.80 |
| 3.260 | QP | L | 28.80 | 56.00 | -27.20 |
| 3.850 | QP | L | 29.40 | 56.00 | -26.60 |
| 6.220 | QP | L | 31.00 | 60.00 | -29.00 |
| 25.170 | QP | L | 24.90 | 60.00 | -35.10 |
| 0.510 | QP | N | 29.90 | 56.00 | -26.10 |
| 11.225 | QP | N | 20.00 | 60.00 | -40.00 |
| 0.370 | AV | L | 27.00 | 48.50 | -21.50 |
| 0.890 | AV | L | 23.80 | 46.00 | -22.20 |
| 1.480 | AV | L | 23.90 | 46.00 | -22.10 |
| 3.860 | AV | L | 15.80 | 46.00 | -30.20 |
| 6.215 | AV | L | 22.60 | 50.00 | -27.40 |
| 11.565 | AV | L | 13.90 | 50.00 | -36.10 |
| 0.250 | AV | N | 22.60 | 51.80 | -29.20 |
| 0.710 | AV | N | 22.80 | 46.00 | -23.20 |
| 3.260 | AV | N | 22.20 | 46.00 | -23.80 |
| 25.060 | AV | N | 17.20 | 50.00 | -32.80 |

## 5.0 RF Exposure Compliance Requirement

| | |
|---|---|
| Test Requirement: | FCC part 15 section 15.247 (i) |
| Test Method: | FCC part 15 section 1.1307 (b1)<br>OET Bulletin 65, Edition 01-01 |

**Results: PASS**

Systems operation under the provision of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the Commission's guideline,

The EUT is considered as a mobile device according to OET Bulletin 65, Edition 01-01, therefore distance to human body of min. 20cm is determined.

| | |
|---|---|
| Frequency Band: | 2.410 GHz ~2.469GHz |
| Device Category: | ☐ Portable (< 20cm separation )<br>☒ Mobile ( >20cm separation )<br>☐ Others : |
| Exposure Classification: | ☐ Occupational/ Controlled exposure<br>☒ General Population / Uncontrolled exposure |
| Max. Average Output Power | 7.0 mW |
| Antenna Gain | 0dBi ( Numeric gain:1) |
| Evaluation Applied: | ☒ MPE Evaluation<br>☐ SAR Evaluation |

MPE calculation:

The radiated (EIRP) = 7.0 mW

The power density at 20cm from the antenna : $= EIRP / 4\pi R^2$
$= 0.0014\ mW / cm^2$

**Limits for General Population/Uncontrolled Exposure [OET Bulletin 65, Edition 01-01]:**

| 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 | $(180/f^2)$* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | -- | -- | f/1500 | 30 |
| 1500-100,000 | -- | -- | 1.0 | 30 |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## 6.0 List of Measurement Equipment

### Radiated Emission

| Test Equipment | Manufacturer | Model No. | S/N | Cal Date | Due Date |
|---|---|---|---|---|---|
| Test Receiver | Rohde & Schwarz | ESIB40 | 100248 | 02 Nov 10 | 02 Nov 11 |
| Test Receiver | Rohde & Schwarz | ESIB7 | 100072 | 01 Jul 10 | 01 Jul 11 |
| Biconilog Antenna | EMCO | 3142B | 1671 | 09 Feb 11 | 09 Feb 12 |
| Horn Antenna | EMCO | 3115 | 4032 | 02 Sep 10 | 02 Sep 11 |
| Horn Antenna | EMCO | 3160-09 | 00045565 | 03 Sep 10 | 03 Sep 11 |
| Loop Antenna | EMCO | 6502 | 1189-2424 | 26 Jul 10 | 26 Jul 11 |
| Anechoic Chamber | ETS-Linggren | FACT-3 | -- | 25 Oct 10 | 25 Oct 11 |

### Line Conducted

| Test Equipment | Manufacturer | Model No. | S/N | Cal Date | Due Date |
|---|---|---|---|---|---|
| Test Receiver | Rohde & Schwarz | ESIB7 | 100072 | 01 Jul 10 | 01 Jul 11 |
| LISN | EMCO | 4825/2 | 1193 | 13 Oct 10 | 13 Oct 11 |

N/A Not Applicable or Not Available