

# CFR 47 FCC Part 15.247

## TEST REPORT

Product : **Transmitter**

Trade Name : N/A

Model Number : SS2PBL; REC-2N900

FCC ID : ELVATRKB

Prepared for

**Nutek Corporation**

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Prepared by

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**Remark :**

The test report consists of **46** pages in total. It shall not be reproduced except in full, without the written approval of IETC. This document may be altered or revised by IETC only, and shall be noted in the revision section of the document.

The test results in the report only to the tested sample.

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# Statement of Compliance

**Applicant:** Nutek Corporation  
**Manufacturer:** Nutek Corporation  
**Product:** Transmitter  
**Model No.:** SS2PBL; REC-2N900  
**Tested Power Supply:** DC12V from battery  
**Date of Final Test:** Apr. 20, 2011  
**Revision of Report:** Rev. 00

**Configuration of Measurements and Standards Used :**

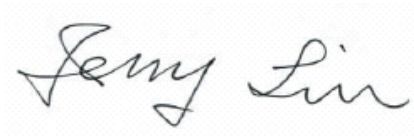
FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

- Note:** 1. The result of the testing report relate only to the item tested.  
2. The testing report shall not be reproduced expect in full, without the written approval of IETC

Report Issued: 2011/04/29

Project Engineer:   
Elli Chang

Approved:   
Jerry Liu

## 1 General Information

### 1.1 Description of Equipment Under Test

- Product** : Transmitter
- Model Number** : SS2PBL; REC-2N900
- Applicant** : **Nutek Corporation**  
NO.167, Lane 235, Bauchiau Rd., Shindian City, Taipei County  
23145, Taiwan
- Manufacturer** : **Nutek Corporation**  
NO.167, Lane 235, Bauchiau Rd., Shindian City, Taipei County  
23145, Taiwan
- Power Supply** : DC12V from battery
- Operating Frequency** : 909.5MHz ~ 919.024MHz
- Channel Number** : 25 channels
- Type of Modulation** : FSK
- Antenna Description** : This device uses Helix antenna.  
The antenna is integral to the device, thereby meeting the  
requirement of FCC 15.203.
- Date of Test** : Mar. 30~Apr. 20, 2011
- Additional Description** : 1) The Model Number “**SS2PBL**” is representative selected in the  
test and included in this report.  
2) The difference between those series are the color of LED  
indicator limiting resistor and connector.  
3) For more detail specification about EUT, please refer to the  
user’s manual.

## 1.2 Table for Carrier Frequencies

Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH0	909.5000	CH13	915.1110
CH1	909.9570	CH14	915.4590
CH2	910.2860	CH15	915.8100
CH3	910.6380	CH16	916.1900
CH4	911.0000	CH17	916.5280
CH5	911.3600	CH18	916.8890
CH6	912.6270	CH19	917.2310
CH7	912.9800	CH20	917.5810
CH8	913.3620	CH21	917.9430
CH9	913.7140	CH22	918.3030
CH10	914.0650	CH23	918.6670
CH11	914.4000	CH24	919.0240
CH12	914.7430		

## 1.3 Details of Tested Supporting System

Battery

Manufacturer : YUASA

Model No. : ST-CLN126

Power Cable : Non-shielded, Detachable, 2.5m, without core

:

## 1.4 Test Facility

- Site Description** : ☑OATS 2 ☑RF Test Room
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Site 1, 2, 3 Location** : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang,  
Taipei County, Taiwan, R.O.C.
- Site Filing** :
- Federal Communication Commissions – USA  
Registration No.: 96399 (OATS 1 & 2)  
Registration No.: 518958 (OATS 3)  
Designation No.: TW1020
  - Voluntary Control Council for Interference by Information  
Technology Equipment (VCCI) – Japan  
Member No.: 1349  
Registration No. (Conducted Room): C-1094  
Registration No. (Conducted Room): T-1562  
Registration No. (OATS 1): R-1040; G-274  
Registration No. (OATS 2): R-1041
  - Industry Canada (IC)  
OUR FILE: 46405-4437 Submission: 145171  
Registration No. (OATS 1): Site# 4437A-1  
Registration No. (OATS 2): Site# 4437A-2  
Registration No. (OATS 3): Site# 4437A-3
- Site Accreditation** :
- Bureau of Standards and Metrology and Inspection (BSMI) –  
Taiwan, R.O.C.  
Accreditation No.:  
SL2-IN-E-0026 for CNS13438 / CISPR22  
SL2-R1-E-0026 for CNS13439 / CISPR13  
SL2-R2-E-0026 for CNS13439 / CISPR13  
SL2-A1-E-0026 for CNS13783-1 / CISPR14-1  
SL2-L1-E-0026 for CNS 14115 / CISPR 15
  - Taiwan Accreditation Foundation (TAF)  
Accrditation No.: 1113
  - TÜV NORD  
Certificate No: TNTW0801R-03



## 1.5 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSP30	100002	2012/01/02
Spectrum Analyzer	R&S	FSP40	100478	2011/04/20
Preamplifier	Agilent	8449B	3008A01434	2011/04/20
Preamplifier	Agilent	83050A	3950A00225	2012/09/07
Preamplifier	SCHAFFNER	CA30100	2	2011/10/28
Horn Antenna	COM-POWER	AH-118	10081	2012/05/19
Horn Antenna	Schwarzbeck	BBHA 9170	213	2012/07/19
Wide Bandwidth Sensor	Anritsu	MA2491A	728133	2011/11/13
Power Meter	Anritsu	ML2495A	736010	2011/11/13
Temp & Humidity chamber	GIAN FORCE	GTH-150-40-2P-U	MAA0305-012	2011/05/07

Note: The above equipments are within the valid calibration period.



### 1.6 Summary of Measurement

Report Clause	Test Parameter	Reference Document CFR47 Part15	Results
3	20dB Bandwidth test	§15.247(a)(1)	Pass
4	Carrier Frequency Separation test	§15.247(a)(1)	Pass
5	Number of hopping frequencies test	§15.247(a)(1)	Pass
6	Time of Occupancy (dwell time) test	§15.247(a)(1)	Pass
7	Maximum Peak output power test	§15.247(b)	Pass
8	RF Conducted spurious emission	§15.247(c)	Pass
9	RF Radiated spurious emission test	§15.205, 15.209	Pass
	Emission on the Band Edge test	§15.247(d)	Not Applicable
	AC Power Line Conducted Emission test	§15.247(b)	Not Applicable

## **1.7 Justification**

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of the frequency band were all arrive limit requirement, thus we evaluate the EUT pass the specified test.

## 2 Test specifications

### 2.1 Test standard

The EUT was performed according to FCC Part 15 Subpart C Section 15.247 procedure and setup followed by ANSI C63.4, 2003 requirements.

### 2.2 Operation mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report

The EUT was operated in continuous transmission mode during all of the tests.



**X axis mode**



**Y axis mode**



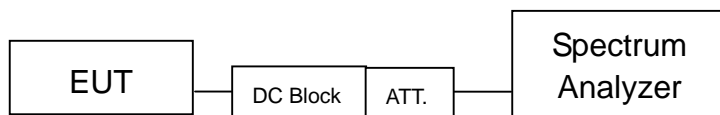
**Z axis mode**

### 3 20dB Bandwidth test

#### 3.1 Limit

No regulation limit, for reference purpose.

#### 3.2 Configuration of Measurement



#### 3.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

The 20dB bandwidth per FCC §15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100 kHz, the video bandwidth  $\geq$  RBW, and the SPAN may equal to approximately 2 to 3 time the 20dB bandwidth.

#### 3.4 Test Result

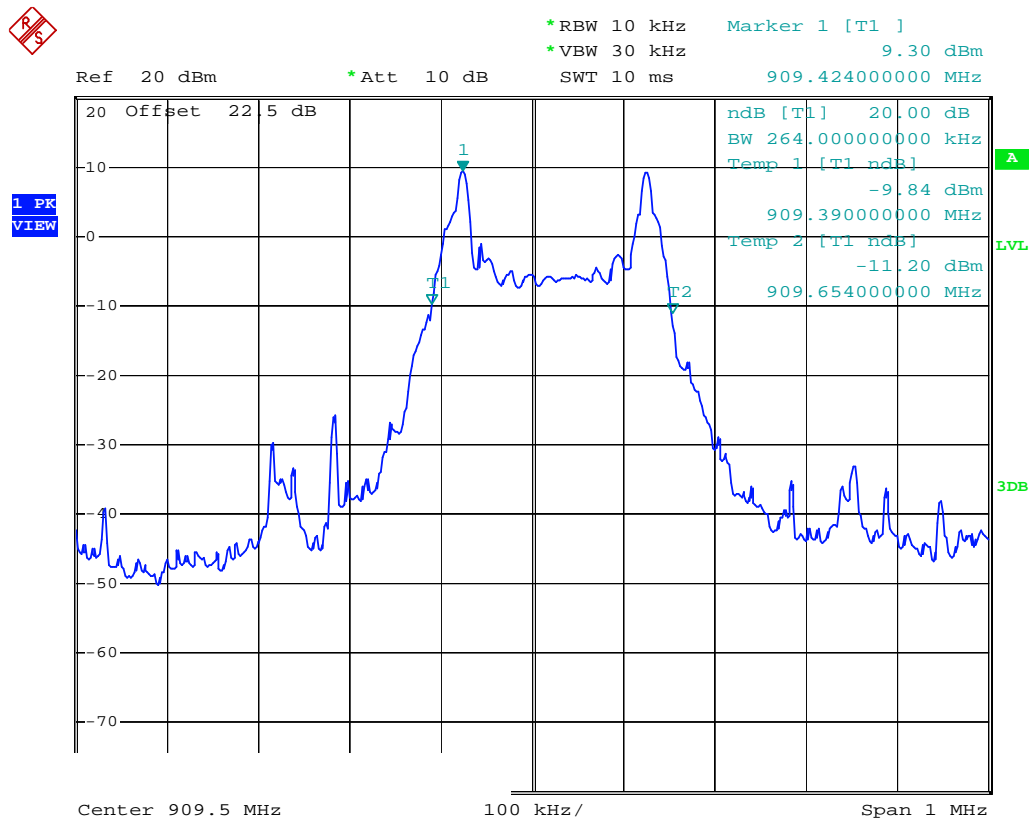
**PASS.**

The final test data is shown as following pages.

## 20dB bandwidth

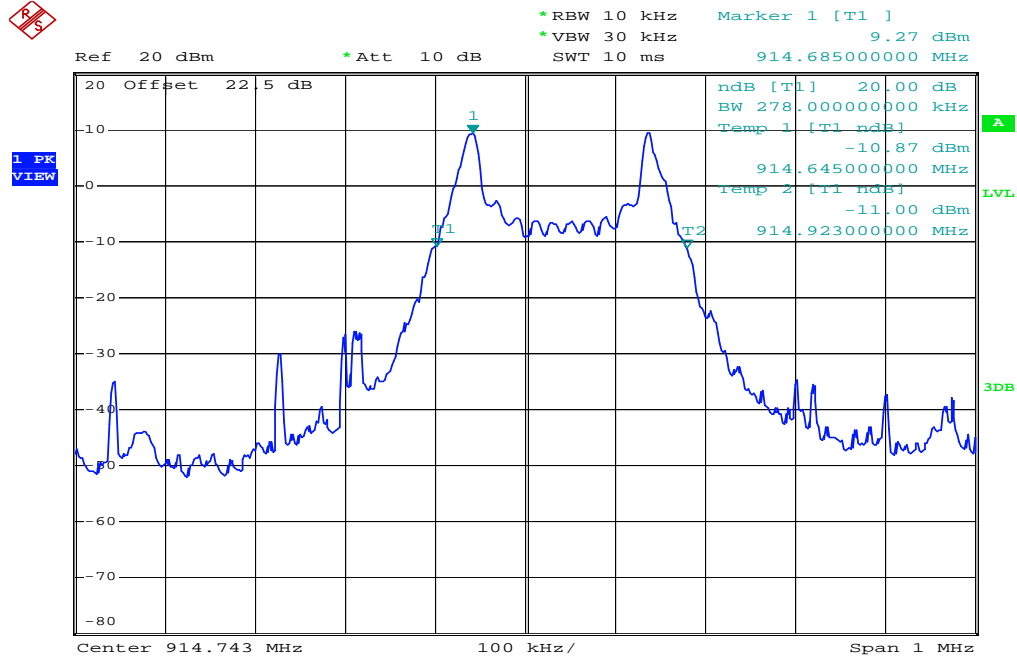
Modulation	CH No.	Freq. (MHz)	20dB Bandwidth (MHz)	Limit (kHz)
FSK	0	909.5	264.00	250 - 500
	12	914.743	278.00	250 - 500
	24	919.024	268.00	250 - 500

### CH0 909.5MHz

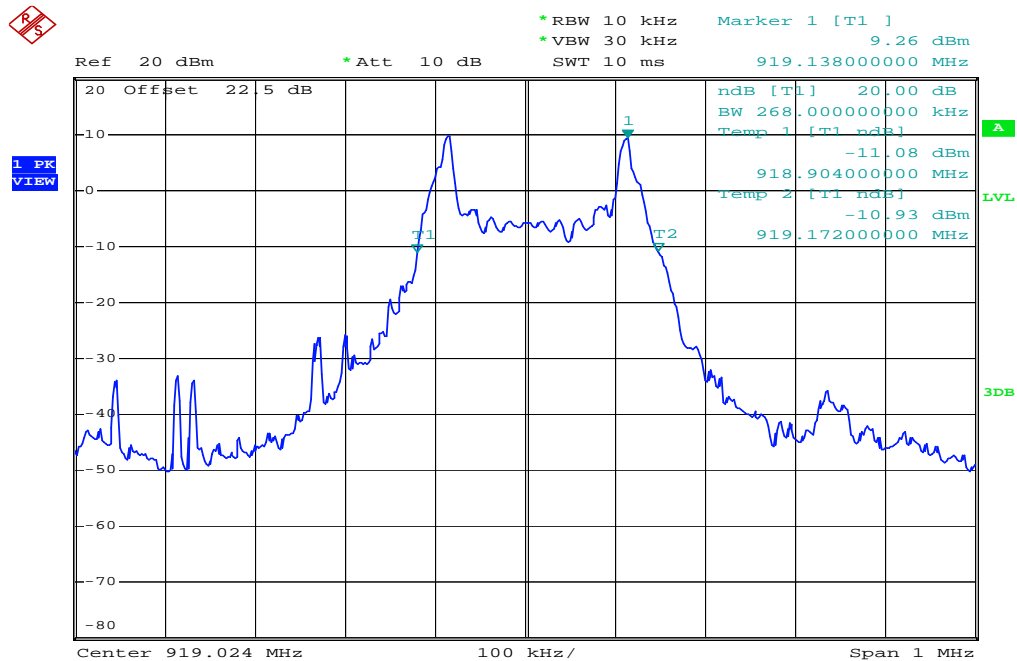


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### CH12 914.743MHz



### CH24 919.024MHz

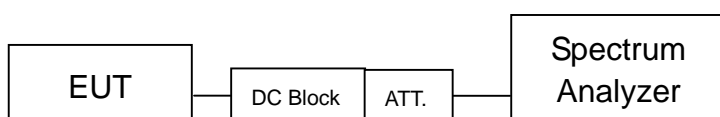


## 4 Carrier Frequency Separation test

### 4.1 Limit

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. For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

### 4.2 Configuration of Measurement



### 4.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

The carrier frequency separation per FCC Part15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at  $\geq 1\%$  of the span, the video bandwidth  $\geq$  RBW, and the SPAN was wide enough to capture the peaks of two adjacent channels.

### 4.4 Test Result

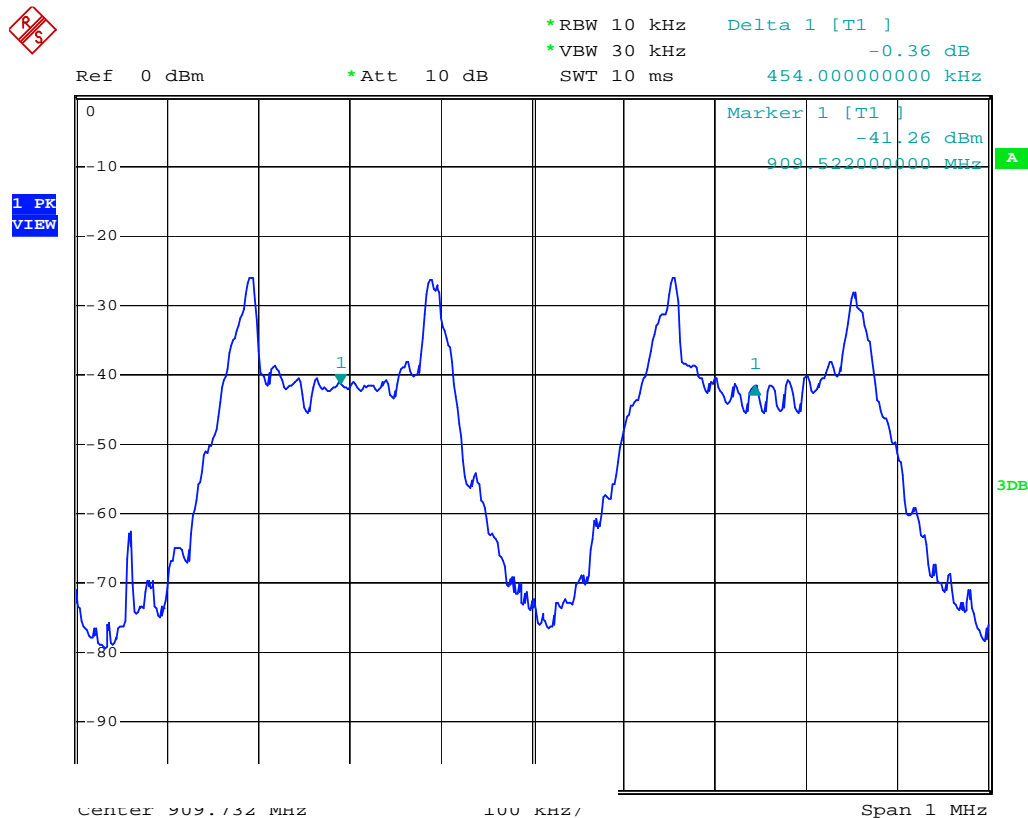
**PASS.**

The final test data is shown as following pages.

## Carrier Frequency Separation test

Modulation type	Frequency (MHz)	Separation (kHz)
FSK	909.5-909.957	454

### Channel Separation

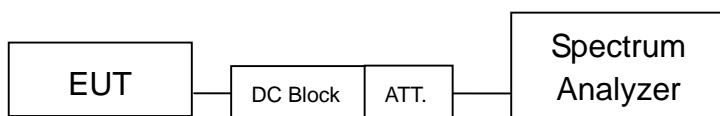


Date: 18.APR.2011 11:22:53



## 5 Number of hopping frequencies test

### 5.1 Configuration of Measurement



### 5.2 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

The number of hopping frequencies per FCC Part15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at  $\geq 1\%$  of the span, the video bandwidth  $\geq$  RBW, and the SPAN was the frequency band of operation.

### 5.3 Test Result

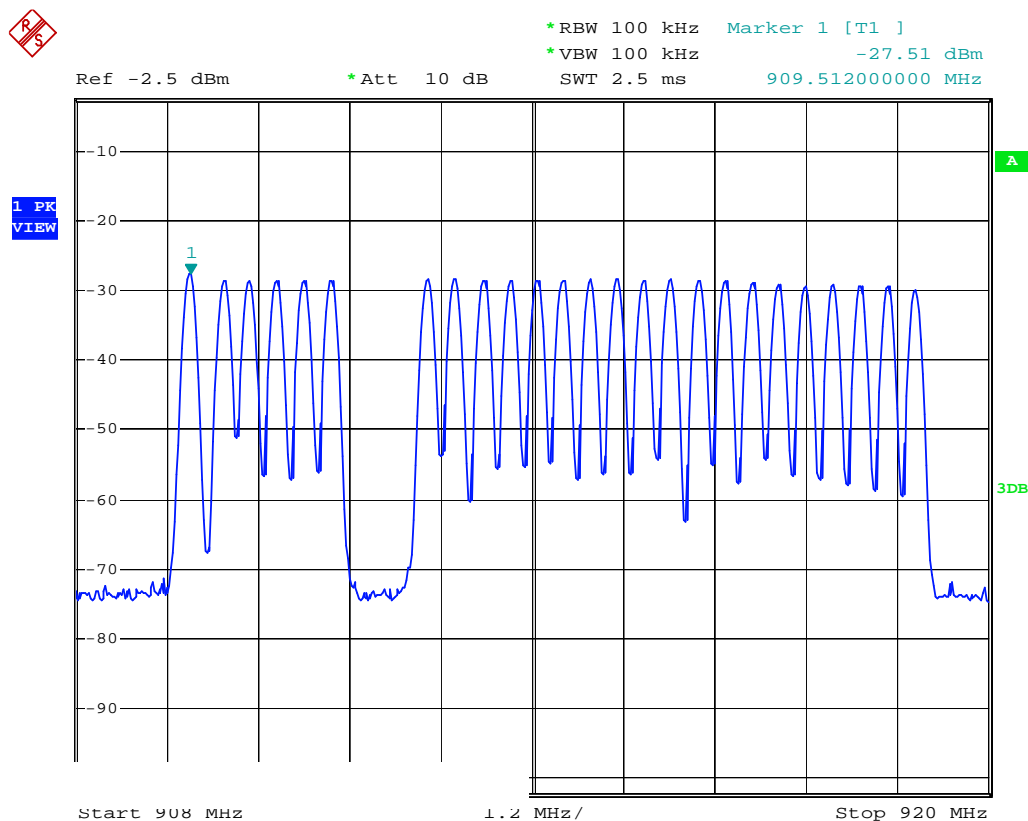
**PASS.**

The final test data is shown as following pages.

## Number of hopping frequencies test

Modulation	No. of Hopping CH.
FSK	25

### Channel Number



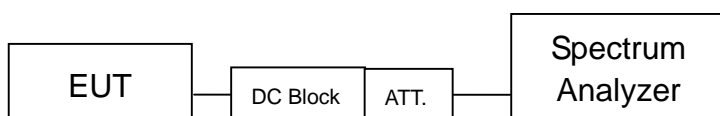
Date: 18.APR.2011 10:50:47

## 6 Time of Occupancy (dwell time) test

### 6.1 Limit

For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

### 6.2 Configuration of Measurement



### 6.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

According to FCC Part15.247(a)(1) the time of occupancy (dwell time) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth  $\geq$  RBW and the zero span function of spectrum analyzer was enable. The EUT has its hopping function enable.

### 6.4 Test Result

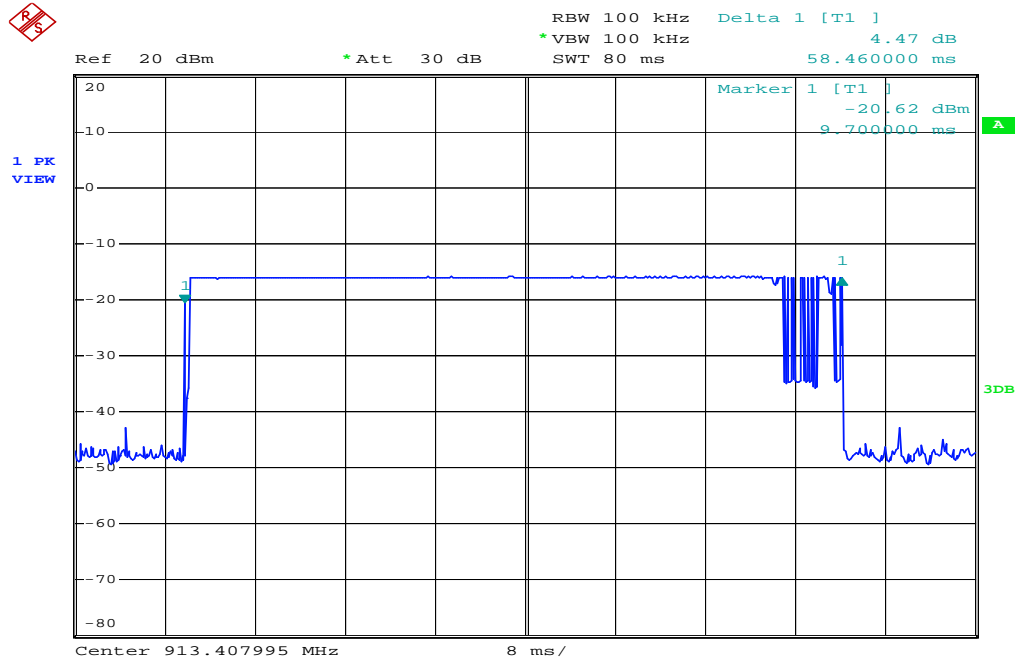
**PASS.**

The final test data is shown as following pages.

## Time of Occupancy (dwell time) test

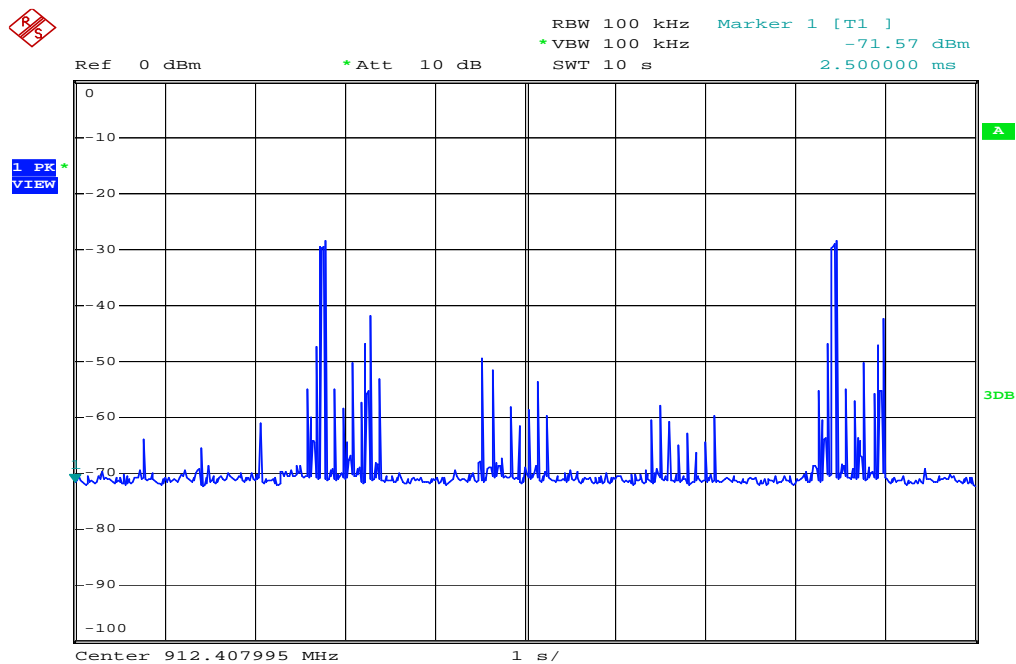
2 occurrences in 10 seconds x 58.46 ms = 116.92 ms which is less than 400 ms.

### Dwell time-1



Date: 20.APR.2011 17:23:31

### Dwell time-2



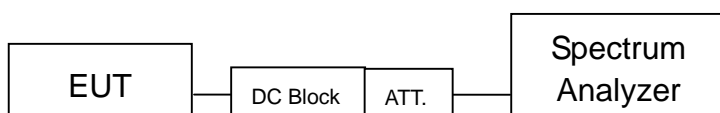
Date: 20.APR.2011 17:45:14

## 7 Maximum Output Power test

### 7.1 Limit

For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

### 7.2 Configuration of Measurement



### 7.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

For FCC Part 15.247(b) the power output per was measured on the EUT using a 50 ohm SMA cable connected to peak power meter via power sensor. Peak output power was read directly from power meter. The test was performed at 3 channels (lowest, middle and highest).

### 7.4 Test Result

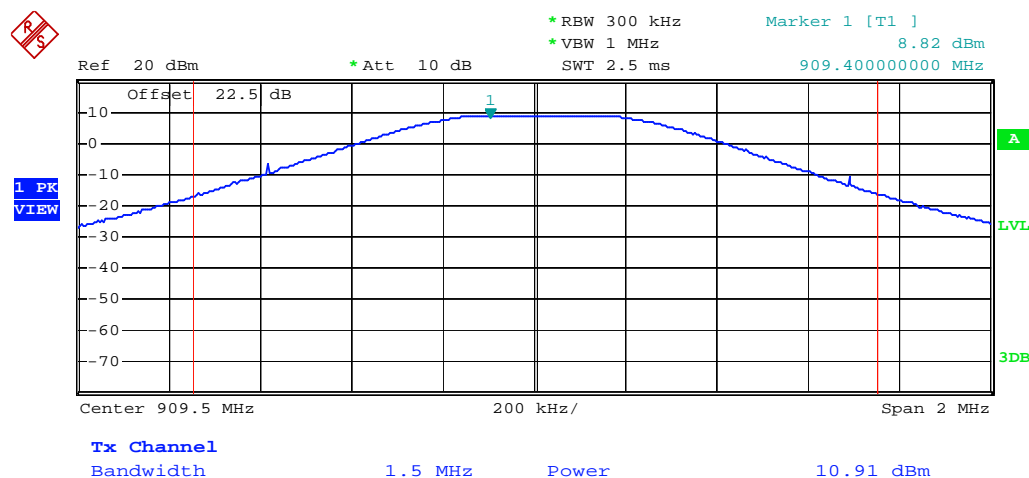
**PASS.**

The final test data is shown as following pages.

## Maximum output power

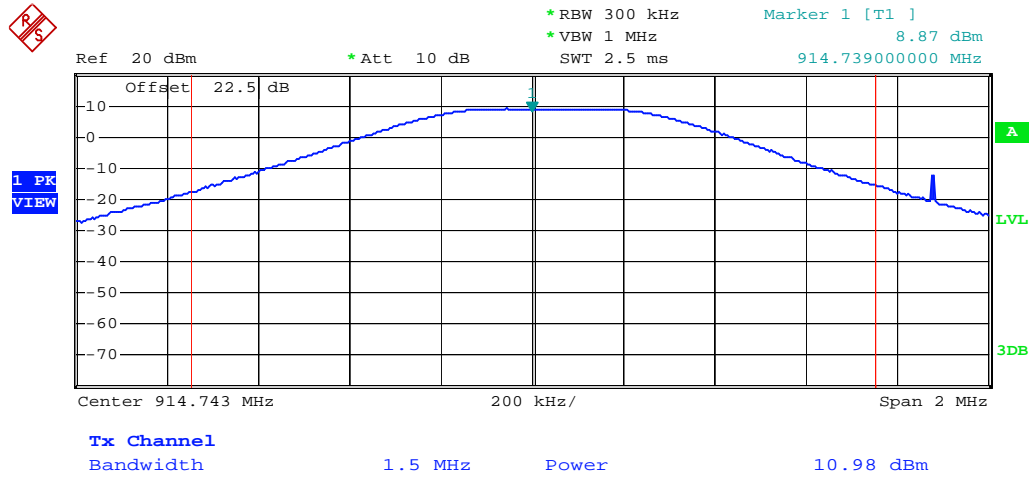
CH	Freq. (MHz)	Temp. (°C)	Maximum transmit power		Limit (dBm)	Margin (dB)
			(dBm)	(watts)		
0	909.5	20.5	10.91	0.012331	24	-13.09
12	914.743	20.5	10.98	0.012531	24	-13.02
24	919.024	20.5	11.05	0.012735	24	-12.95

### CH0 909.5MHz



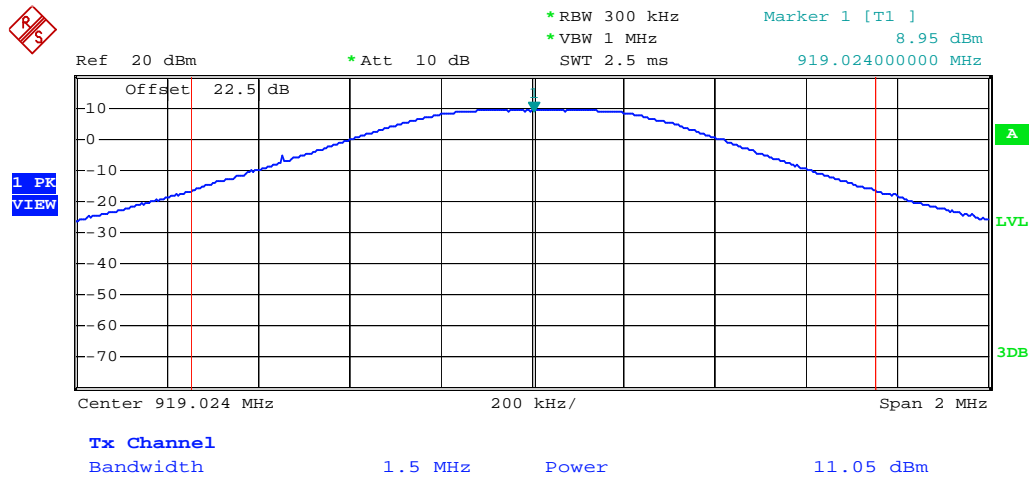
Date: 15.APR.2011 17:43:07

### CH12 914.743MHz



Date: 15.APR.2011 17:45:07

### CH24 919.024MHz



Date: 15.APR.2011 17:45:56



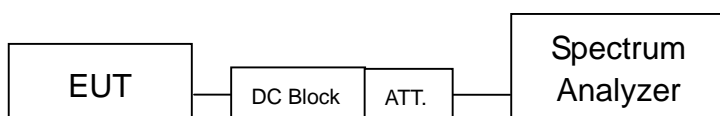
## 8 RF Conducted spurious emission

### 8.1 Limit

According to FCC Part 15.247(d) requirement :

In any 100 kHz 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 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

### 8.2 Configuration of Measurement



### 8.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

RF antenna conducted spurious emissions was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz.

The measurements were performed from 30MHz to 10GHz.

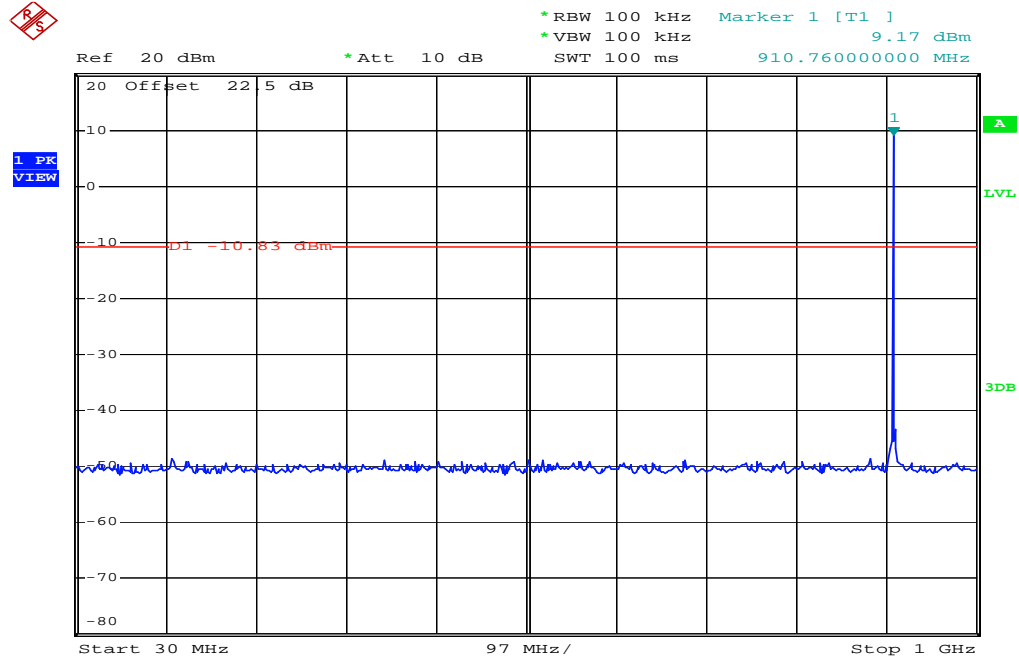
### 8.4 Test Result

**PASS.**

The final test data is shown as following pages.

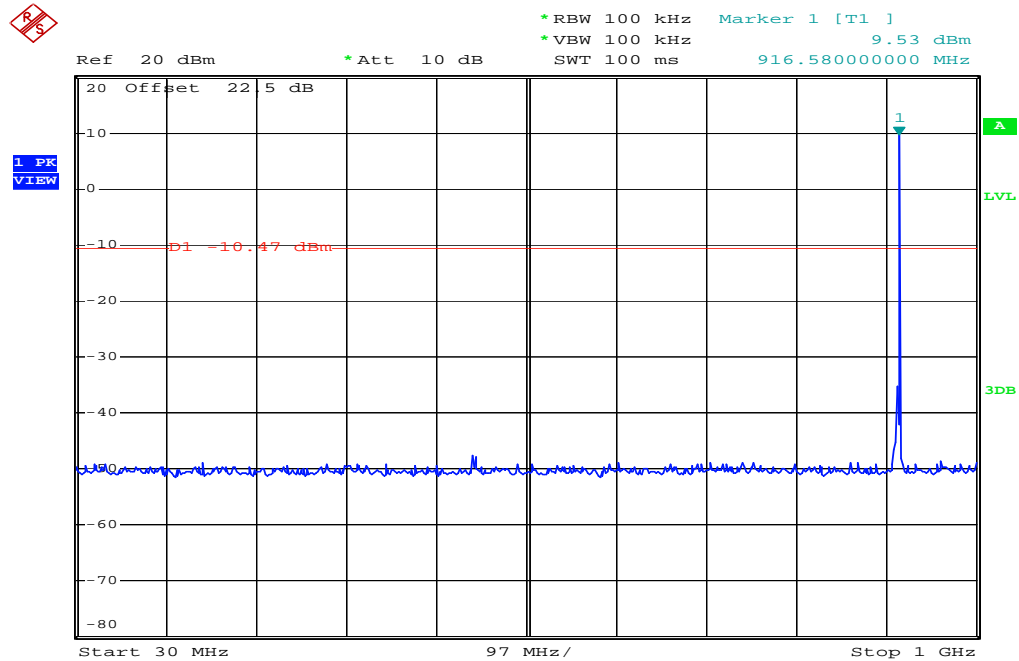
# Conducted spurious emission

## CH0 909.5MHz



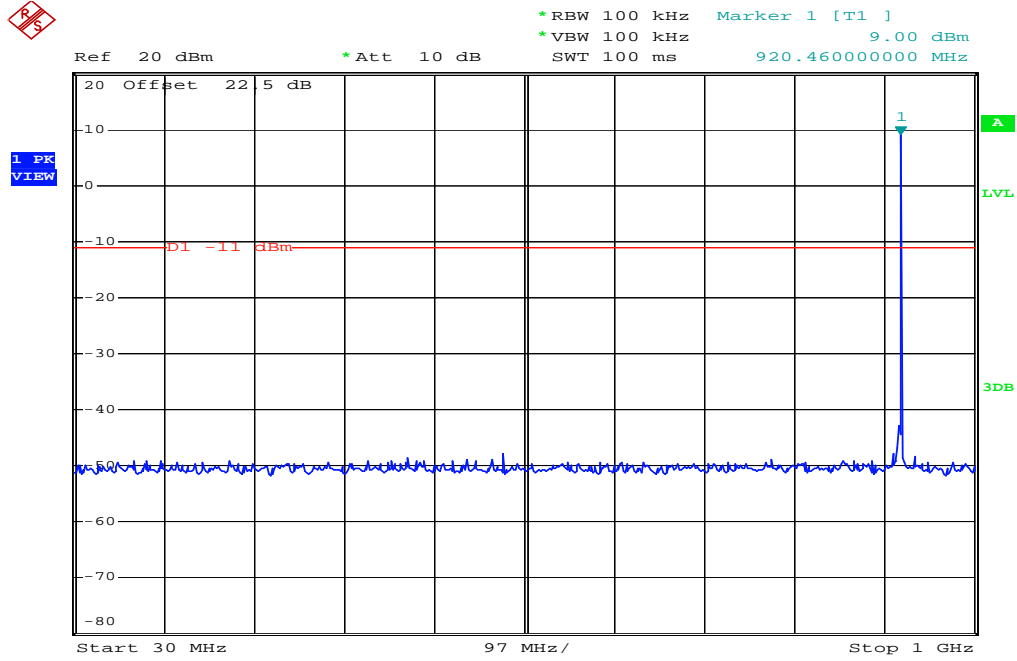
Date: 15.APR.2011 18:06:02

## CH12 914.743MHz



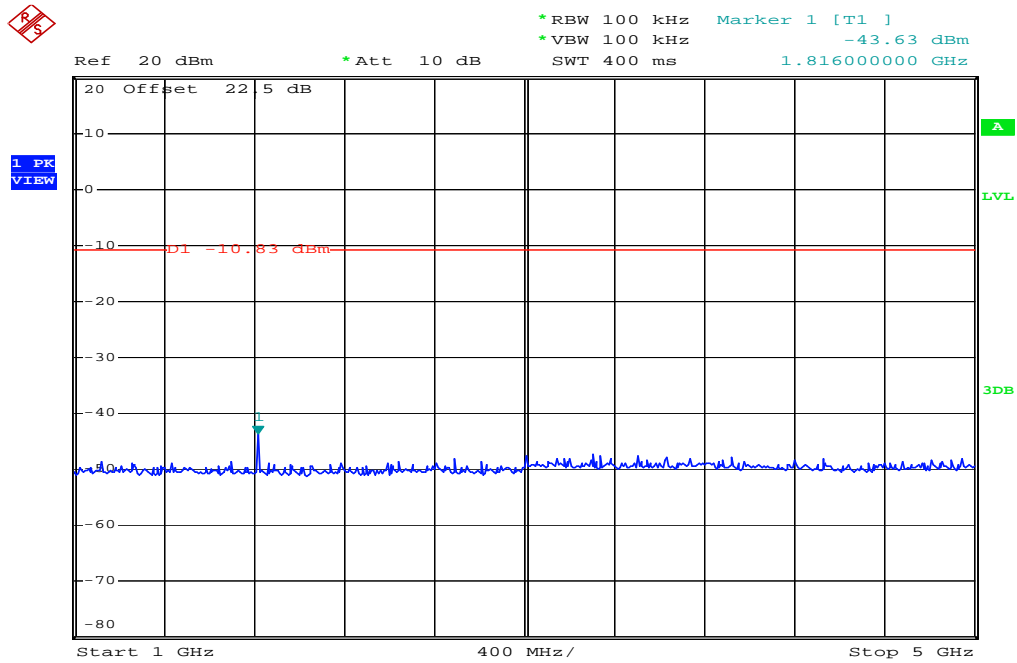
Date: 15.APR.2011 18:01:04

### CH24 919.024MHz



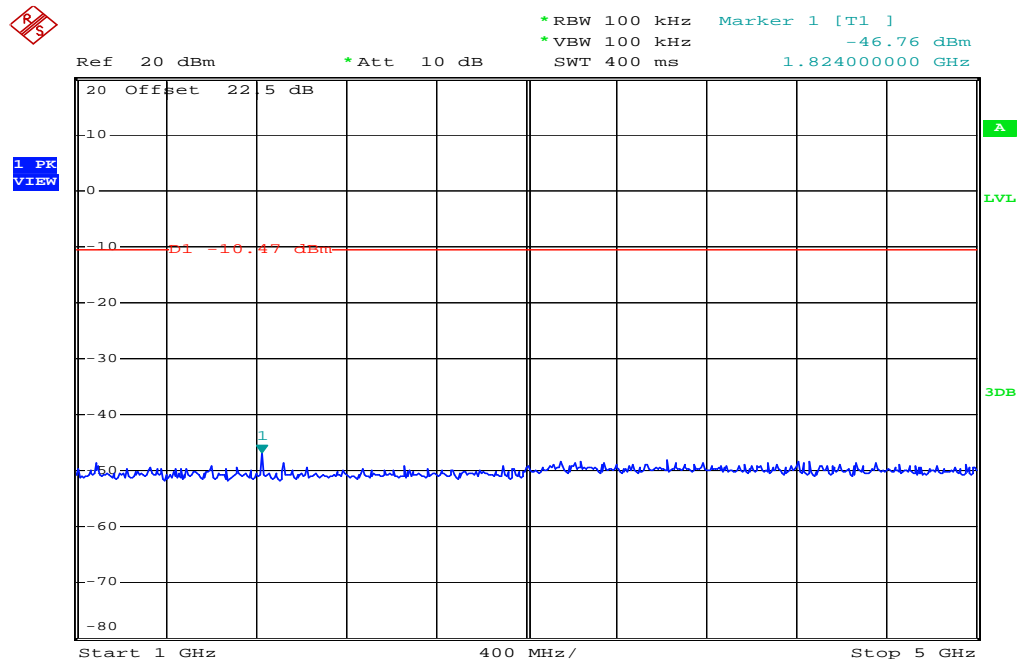
Date: 15.APR.2011 18:16:43

### CH0 909.5MHz



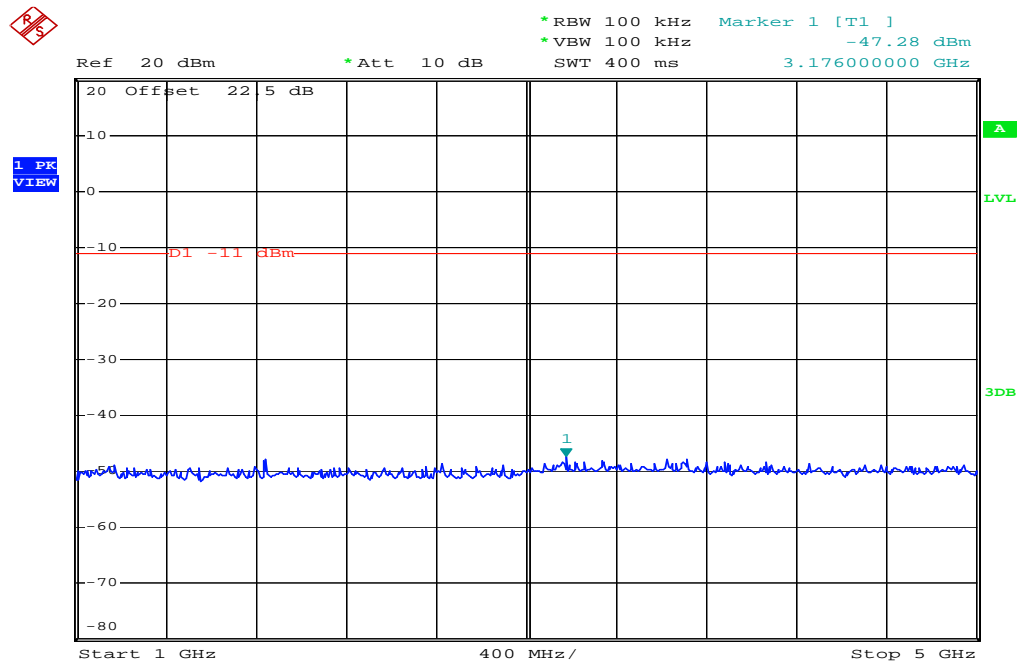
Date: 15.APR.2011 18:08:25

### CH12 914.743MHz



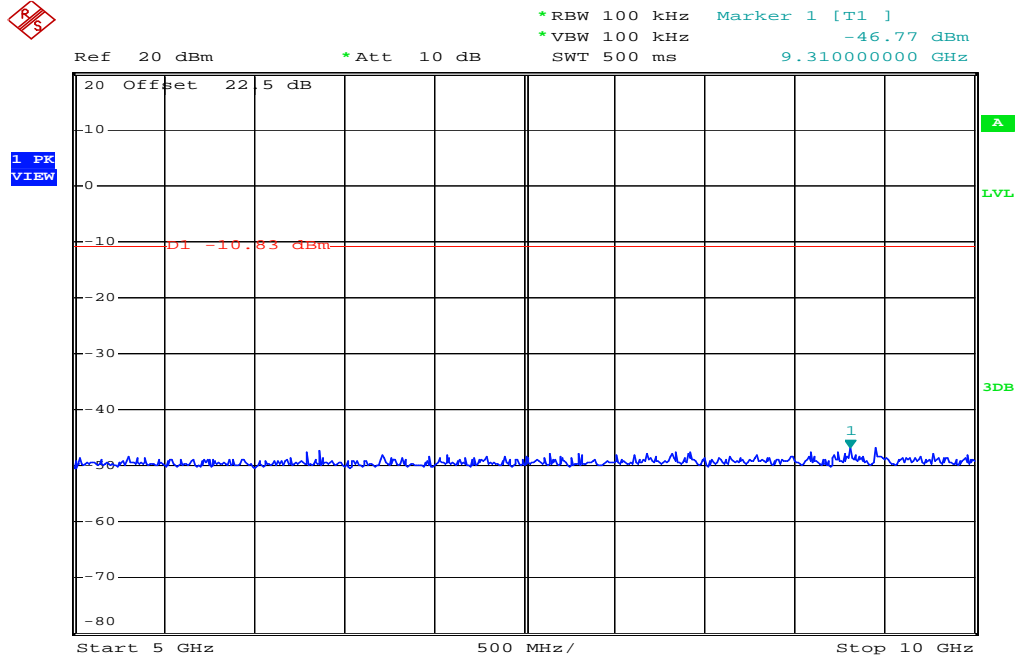
Date: 15.APR.2011 18:02:43

### CH24 919.024MHz



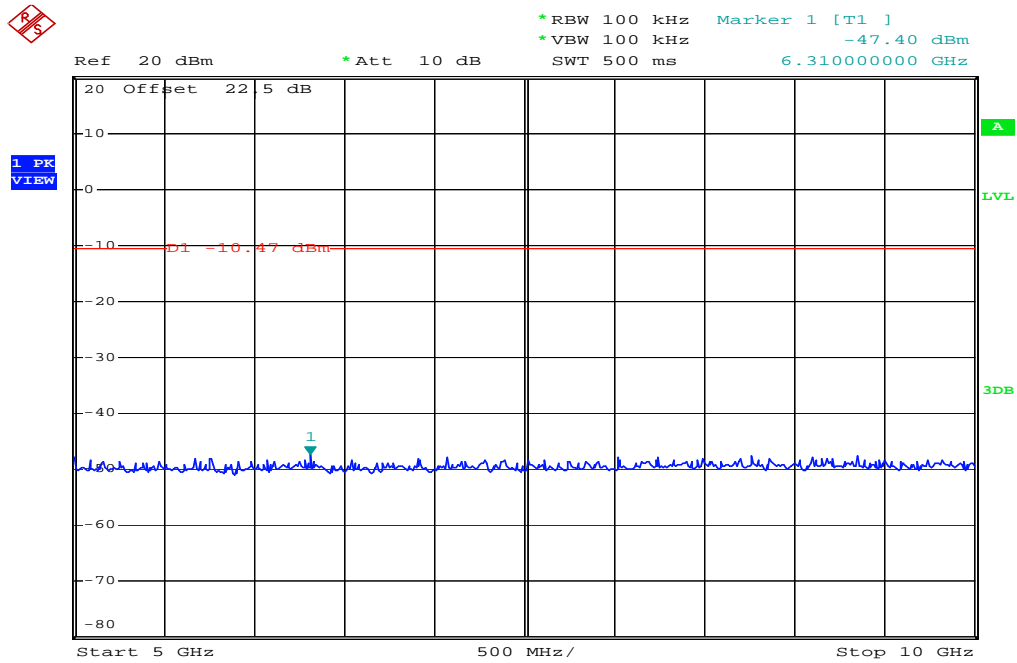
Date: 15.APR.2011 18:18:06

### CH0 909.5MHz



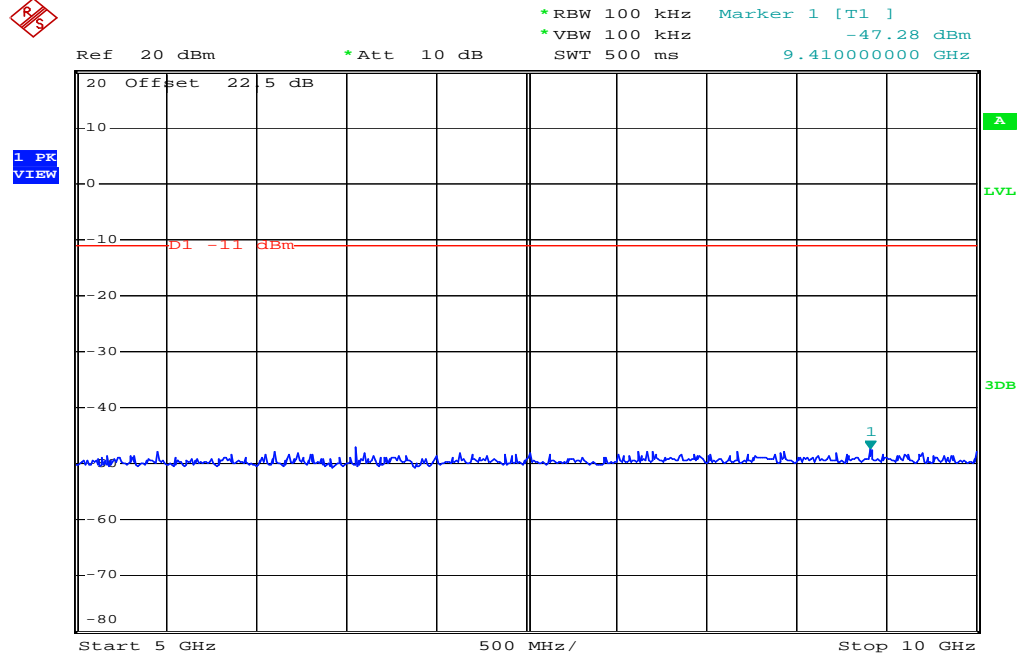
Date: 15.APR.2011 18:09:50

### CH12 914.743MHz



Date: 15.APR.2011 18:03:54

### CH24 919.024MHz



Date: 15.APR.2011 18:19:19

## 9 RF Radiated spurious emission test

### 9.1 Limit

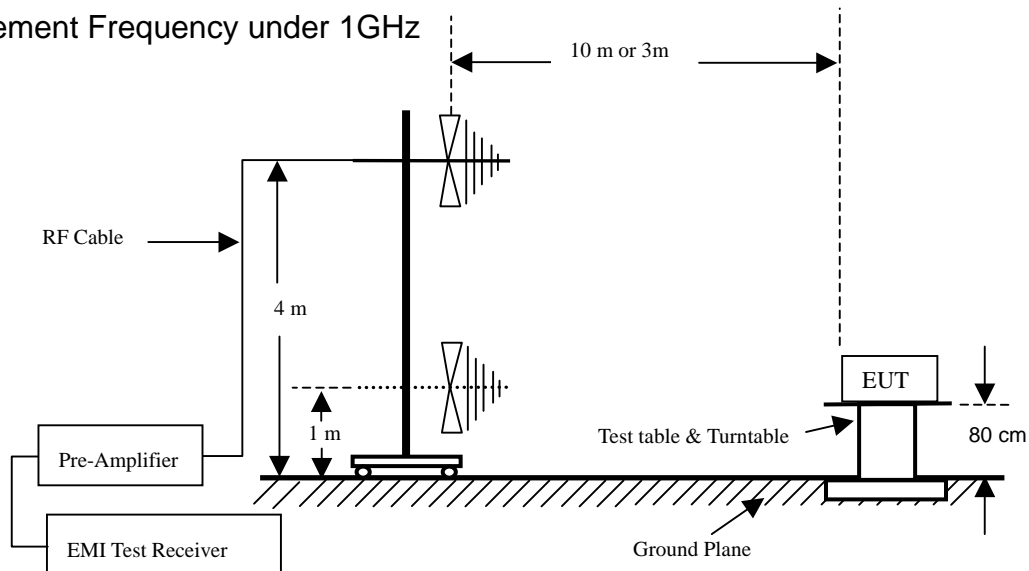
For intentional radiator, the radiated emission shall comply with FCC Part 15.209(a).

For intentional radiators, according to FCC Part 15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with FCC Part 15.247 (c)

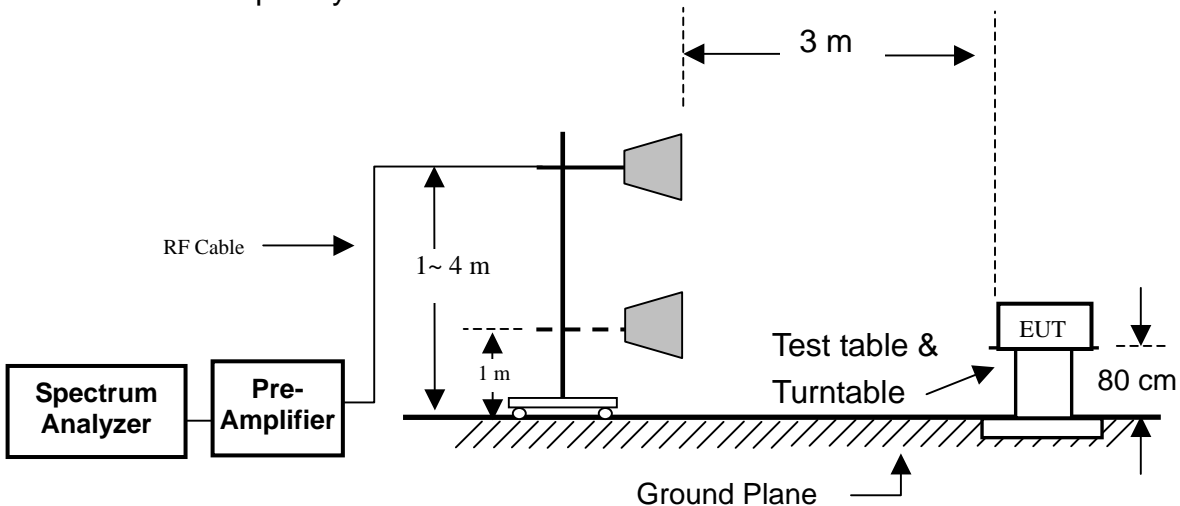
Frequency (MHz)	Field strength dB( $\mu$ V/m)	Measurement distance (meters)
1.705~30.0	29.5	30
30 ~ 88	40	3
88~216	43.5	3
216~960	46	3
Above 960	54	3

### 9.2 Configuration of Measurement

Measurement Frequency under 1GHz



Measurement Frequency above 1GHz



### **9.3 Test Procedure**

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

Radiated emission measurements were performed from 30MHz to 10GHz. Spectrum Analyzer set as below: For frequency range from 30MHz to 1GHz: RBW=100kHz or greater. For frequencies above 1GHz: set RBW=VBW=1MHz for peak detector and RBW=1MHz, VBW=10Hz for average detector.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and whole system. During the test, all cables were arranged to present worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meter and down to 1 meter.

### **9.4 Test Result**

**PASS.**

The final test data is shown as following pages.



## Radiated spurious emission

### Test Environment

Ambient temperature : 20.2°C

Relative humidity : 58%

### Radiated Emission below 1GHz

After verifying low, middle and high channel (909.05MHz, 914.743MHz and 919.024MHz) the worst case

Worst case was found at High channel								
Frequency (MHz)	Antenna Polarization	Reading (dB $\mu$ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Det. Mode
65.000	H	49.12	33.30	7.58	23.40	40.00	-16.60	QP
116.630	H	46.95	33.00	13.26	27.21	43.52	-16.31	QP
156.630	H	45.85	33.27	16.36	28.94	43.52	-14.58	QP
183.540	H	45.45	33.40	17.99	30.04	43.52	-13.48	QP
225.300	H	44.15	33.35	19.21	30.01	46.02	-16.01	QP
276.320	H	43.30	33.56	21.20	30.94	46.02	-15.08	QP
48.230	V	48.21	33.20	11.76	26.77	40.00	-13.23	QP
66.560	V	51.69	33.30	7.31	25.70	40.00	-14.30	QP
124.520	V	48.75	33.05	14.89	30.59	43.52	-12.93	QP
186.600	V	44.95	33.40	18.82	30.37	43.52	-13.15	QP
225.360	V	43.90	33.35	19.72	30.27	46.02	-15.75	QP
259.870	V	44.96	33.50	21.02	32.48	46.02	-13.54	QP

Remark : Corrected Level = Reading + Correction Factor – Preamp

Correction Factor = Antenna Factor + Cable Loss

The present spurious only show those points are above noise level and the frequency range test from 30MHz to 1GHz.

## Radiated spurious emission

### Radiated Emission above 1GHz

CH0								
Frequency (MHz)	Antenna Polarization	Reading (dB $\mu$ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Det. Mode
1819.00	H	49.23	26.16	29.69	52.76	54	-1.24	PK
2728.50	H	47.20	26.25	31.79	52.74	54	-1.26	PK
3638.00	H	47.65	26.17	33.61	55.09	74	-18.91	PK
3638.00	H	44.58	26.17	33.61	52.02	54	-1.98	AV
4547.50	H	40.32	26.09	36.04	50.27	54	-3.73	PK
*5457.00	H	36.23	25.91	38.41	48.73	54	-5.27	PK
1819.00	V	51.61	26.16	29.69	55.14	74	-18.86	PK
1819.00	V	47.41	26.16	29.69	50.94	54	-3.06	AV
2728.50	V	50.88	26.25	31.79	56.42	74	-17.58	PK
2728.50	V	47.00	26.25	31.79	52.54	54	-1.46	AV
3638.00	V	47.10	26.17	33.61	54.54	74	-19.46	PK
3638.00	V	43.75	26.17	33.61	51.19	54	-2.81	AV
4547.50	V	37.98	26.09	36.04	47.93	54	-6.07	PK
*5457.00	V	35.14	25.91	38.41	47.64	74	-26.36	PK

Remark : Corrected Level = Reading + Correction Factor – Preamp

Correction Factor = Antenna Factor + Cable Loss

\* Mark indicated background noise level.

CH12								
Frequency (MHz)	Antenna Polarization	Reading (dB $\mu$ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Det. Mode
1829.49	H	48.98	26.17	29.72	52.53	54	-1.47	PK
2744.25	H	45.23	26.25	31.84	50.82	54	-3.18	PK
3658.97	H	47.69	26.17	33.68	55.20	74	-18.80	PK
3658.97	H	42.45	26.17	33.68	49.96	54	-4.04	AV
4573.72	H	43.86	26.09	36.12	53.89	54	-0.11	PK
*5488.46	H	39.91	25.90	38.48	52.49	54	-1.51	PK
1829.49	V	50.53	26.17	29.72	54.08	74	-19.92	PK
1829.49	V	45.63	26.17	29.72	49.18	54	-4.82	AV
2744.25	V	48.85	26.25	31.84	54.44	74	-19.56	PK
2744.25	V	44.77	26.25	31.84	50.36	54	-3.64	AV
3658.97	V	47.19	26.17	33.68	54.70	74	-19.30	PK
3658.97	V	42.32	26.17	33.68	49.83	54	-4.17	AV
4573.72	V	39.65	26.09	36.12	49.68	54	-4.32	PK
*5488.46	V	39.48	25.90	38.48	52.06	54	-1.94	PK

Remark : Corrected Level = Reading + Correction Factor – Preamp

Correction Factor = Antenna Factor + Cable Loss

\* Mark indicated background noise level.

<b>CH24</b>								
Frequency (MHz)	Antenna Polarization	Reading (dB $\mu$ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Det. Mode
1838.05	H	49.32	26.17	29.75	52.90	54	-1.10	PK
2757.07	H	45.65	26.25	31.87	51.27	54	-2.73	PK
3676.10	H	46.68	26.16	33.73	54.25	74	-19.75	PK
3676.10	H	42.23	26.16	33.73	49.80	54	-4.20	AV
4595.12	H	43.23	26.08	36.19	53.34	54	-0.66	PK
*5514.14	H	40.22	25.90	38.52	52.84	54	-1.16	PK
1838.05	V	51.23	26.17	29.75	54.81	74	-19.19	PK
1838.05	V	46.65	26.17	29.75	50.23	54	-3.77	AV
2757.07	V	50.52	26.25	31.87	56.14	74	-17.86	PK
2757.07	V	46.85	26.25	31.87	52.47	54	-1.53	AV
3676.10	V	45.20	26.16	33.73	52.77	54	-1.23	PK
4595.12	V	41.30	26.08	36.19	51.41	54	-2.59	PK
*5514.14	V	40.23	25.90	38.52	52.85	54	-1.15	PK

Remark : Corrected Level = Reading + Correction Factor – Preamp  
 Correction Factor = Antenna Factor + Cable Loss  
 \* Mark indicated background noise level.