



# Electromagnetic Emission

## FCC MEASUREMENT REPORT

### CERTIFICATION OF COMPLIANCE FCC PART15 CERTIFICATION

|                           |          |                                                                                                                                          |
|---------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PRODUCT</b>            | <b>:</b> | <b>Digital Wireless Communicator</b>                                                                                                     |
| <b>MODEL/TYPE NO</b>      | <b>:</b> | <b>DICO XA-1000</b>                                                                                                                      |
| <b>FCC ID</b>             | <b>:</b> | <b>RQSXA1000</b>                                                                                                                         |
| <b>TRADE NAME</b>         | <b>:</b> | <b>SayU Co., Ltd.</b>                                                                                                                    |
| <b>APPLICANT</b>          | <b>:</b> | <b>SayU Co. Ltd.<br/>2F Koominsekwon Bldg., 257-3<br/>Gongduk-Dong, Mapo-gu, Seoul, Korea<br/>Attn. : Si Ho Nam / Mannaging director</b> |
| <b>FCC CLASSIFICATION</b> | <b>:</b> | <b>DSS Part 15 Spread Spectrum Transmitter</b>                                                                                           |
| <b>FCC RULE PART(S)</b>   | <b>:</b> | <b>FCC Part 15 Subpart C Section 15.247</b>                                                                                              |
| <b>FCC PROCEDURE</b>      | <b>:</b> | <b>Certification</b>                                                                                                                     |
| <b>DATES OF TEST</b>      | <b>:</b> | <b>December 18, 2003</b>                                                                                                                 |
| <b>DATES OF ISSUE</b>     | <b>:</b> | <b>December 24, 2003</b>                                                                                                                 |
| <b>TEST REPORT No.</b>    | <b>:</b> | <b>BWS-03-RF-0005</b>                                                                                                                    |
| <b>TEST LAB.</b>          | <b>:</b> | <b>BWS Tech., Inc. (Registration No. : 553281)</b>                                                                                       |

This Digital Wireless Communicator DICO XA-1000 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2000 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart C Section15.247

I attest to the accuracy of data. All measurement herein was performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system, which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tae Hyun, Nam  
Chief of Laboratory Division  
BWS TECH Inc.

**BWS TECH Inc.**

[www.bws.co.kr](http://www.bws.co.kr)

294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do, 464-080, Korea

TEL: +82 31 762 0124 FAX: +82 31 762 0126

## TABLE OF CONTENTS

|                                              | Pages |
|----------------------------------------------|-------|
| <b>1. General Information</b>                | 3     |
| <b>2. Description of Test Facility</b>       | 4     |
| <b>3. Product Information</b>                | 5     |
| <b>4. Description of Tests</b>               | 6~7   |
| <b>5. Summary of Test Results</b>            | 8     |
| <b>6. Test Data</b>                          | 9~20  |
| <b>7. Test Equipment List</b>                | 21    |
| <br>                                         |       |
| <b>Appendix 1. Test Setup Photos</b>         |       |
| <b>Appendix 2. FCC ID Label and location</b> |       |
| <b>Appendix 3. External Photos of EUT</b>    |       |
| <b>Appendix 4. Internal Photos of EUT</b>    |       |
| <b>Appendix 5. Block Diagram</b>             |       |
| <b>Appendix 6. Schematics</b>                |       |
| <b>Appendix 7. Operational Description</b>   |       |
| <b>Appendix 8. User Manual</b>               |       |

# FCC TEST REPORT

**Scope** – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

## 1. General Information

### Applicant

|                          |                                                                     |
|--------------------------|---------------------------------------------------------------------|
| <b>Company Name :</b>    | SayU Co., Ltd.                                                      |
| <b>Company Address :</b> | 2F Koominsekwan Bldg., 257-3<br>Gongduk-Dong, Mapo-gu, Seoul, Korea |
| <b>Phone/Fax :</b>       | Phone : 82-2-719-4985 (Ext. 203)      Fax : 82-2-719-4986           |

### Manufacturer

|                               |                                                                                                                                                                                    |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Company Name :</b>         | SayU Co., Ltd.                                                                                                                                                                     |
| <b>Company Address :</b>      | 2F Koominsekwan Bldg., 257-3<br>Gongduk-Dong, Mapo-gu, Seoul, Korea                                                                                                                |
| <b>Phone/Fax :</b>            | Phone : +82-32-673-1671 Fax : +82-32-673-0868                                                                                                                                      |
| ● <b>EUT Type :</b>           | Digital Wireless Communicator                                                                                                                                                      |
| ● <b>Model Number :</b>       | DICO XA-1000                                                                                                                                                                       |
| ● <b>FCC Identifier :</b>     | RQSXA1000                                                                                                                                                                          |
| ● <b>S/N :</b>                | Prototype                                                                                                                                                                          |
| ● <b>Freq. Range :</b>        | 902 MHz ~ 928 MHz                                                                                                                                                                  |
| ● <b>Channel Spacing:</b>     | 1 MHz                                                                                                                                                                              |
| ● <b>Modulation Method :</b>  | FSK                                                                                                                                                                                |
| ● <b>RF Power Output :</b>    | 150 mW                                                                                                                                                                             |
| ● <b>FCC Classification :</b> | DSS : Part 15 Spread Spectrum Transmitter                                                                                                                                          |
| ● <b>FCC Rule Part(s) :</b>   | Part 15 Subpart C Section 15.247                                                                                                                                                   |
| ● <b>Test Procedure :</b>     | ANSI C63.4-2000                                                                                                                                                                    |
| ● <b>Dates of Tests :</b>     | December 18, 2003                                                                                                                                                                  |
| ● <b>Place of Tests :</b>     | BWS TECH Inc.<br>EMC Testing Lab (FCC Registration Number : 553281)<br>294-9, Jungdae-Dong, Kwangju-Si,<br>Kyunggi-Do, 464-080, Korea<br>TEL: +82 31 762 0124 FAX: +82 31 762 0126 |
| ● <b>Test Report No. :</b>    | BWS-03-RF-0005                                                                                                                                                                     |

## 2. Description of Test Facility

---

The measurement test for radiated and conducted emission test were conducted at the open area test site of BWS TECH Inc. facility located at 294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2000 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10-meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission (Registration Number : 553281 ).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2000) was used in determining radiated and conducted emissions from the SayU Co. Ltd. 900MHz Digital Wireless Communicator model: DICO XA-1000

### 3. Product Information

---

#### 3.1 Equipment Description

The Equipment Under Test (EUT) is the SayU Co. Ltd. 900MHz Digital Wireless Communicator model: DICO XA-1000 (FCC ID: RQSXA1000).

This Equipment, DICO (Digital Communicator) is called digital two-way portable radios. The Frequency Range is American ISM Band 902~928MHz And 26 operating channels according to FCC Rule.

This Equipment used Frequency Hopping Spread Spectrum. This Equipment can make modulation and non-modulation automatically. And, FSK modulation signal is created independently of voice input.

The power is supplied from the internal battery(3.6 Vdc Li-ion Rechargeable Battery).

#### 3.2 General Specification

|                     |                                                          |
|---------------------|----------------------------------------------------------|
| - TX Carrier Freq.  | 902 MHz ~ 928 MHz                                        |
| - No. of Channel    | 26 Ch                                                    |
| - Channel Spacing   | 1 MHz                                                    |
| - RF Output Power   | 150 mW                                                   |
| - Freq. Stability   | $\pm 10\text{ppm}(-20 \sim +60 \text{ } ^\circ\text{C})$ |
| - Modulation method | FSK                                                      |
| - Power Requirement | DC 3.6V (Li-ion Rechargeable Battery)                    |

## 4. Description of Tests

---

### 4.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2000. The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50 $\Omega$  /50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1m x 1.5m x 0.8m wooden table, which is placed 40cm away from the vertical wall, and 1.5m away from the sidewall of the chamber room. Two LISNs are bonded to the shielded room. The EUT is powered from the PMM LISN and the support equipment is powered from the another Koritsu LISN. Power to the LISNs is filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner  $\phi$  1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the EMCO LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling (serpentine fashion) to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the R3261A Spectrum Analyzer to determine the frequency producing the max. Emission from the EUT. The frequency producing the max. Level was reexamined using the detector function set to the CISPR Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.45 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if applicable, whichever determined the worst-case emission. Each emission reported was calibrated using self-calibrating mode.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup.

## 4.2 Radiated Emission Measurement

Preliminary measurements were made at indoors 3-meter semi EMC Anechoic Chamber using broadband antennas, broadband amplifier, and spectrum analyzer to determine the emission frequencies producing the maximum EME.

Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configurations, mode of operation, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using biconilog antenna and above 1000MHz, linearly polarized double ridge horn antennas were used. Above 1GHz, linearly polarized double ridge horn antennas were used. The measurements were performed with three frequencies, which were selected as bottom, middle, and top frequency in the operating band. Emission level from the EUT with various configurations was examined on the spectrum analyzer connected with the RF amplifier and plotted graphically.

Final measurements were made outdoors open site at 3-meter test range using biconical and log periodic, Horn antenna. The output from the antenna was connected, via a preselector or a preamplifier, to the input of the EMI Measuring Receiver and Spectrum analyzer (for above 25GHz). The detector function was set to the quasi-peak or peak mode as appropriate. The measurement bandwidth on the Field strength receiver was set to at least 120kHz (1MHz for measurement above 1GHz), with all post-detector filtering no less than 10 times the measurement bandwidth. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during preliminary measurement was examined and investigated as the same set up and configuration which produced the maximum emission. The EUT, support equipment and interconnecting cables were configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1m x 1.5 meter table. The turntable containing the system was rotated and the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.

Varying the mode of operating frequencies of the EUT maximized each emission. The system was tested in all the three orthogonal planes and changing the polarity of the antenna. The worst-case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor (20dB/decade) as per section 15.31(f).

Photographs of the worst-case emission test setup can be seen in Appendix A.

## 5. Summary of Test Results

| TEST REQUIREMENTS                       | FCC Paragraph                  | Spec.             | Meas. | Result |
|-----------------------------------------|--------------------------------|-------------------|-------|--------|
| Occupied Bandwidth                      | 15.247(a)                      | 250kHz ~ 500kHz   | 490   | Pass   |
| Channel Separation                      | 15.247(a)                      | More than 25      | 26    | Pass   |
| Time of Occupancy                       | 15.247(a)                      | Less than 0.4Sec. | 0.2   | Pass   |
| RF Power Output at Antenna Terminals    | 15.247(b)                      | 0.25Watt          | 0.15  | Pass   |
| Spurious Emissions at Antenna Terminals | 15.247(c)                      | -20dBc            | Plot  | Pass   |
| Field Strength of Spurious Radiation    | 15.247(c)                      | 15.205 & 15.209   | -     | Pass   |
| RF Exposure (MPE)                       | 1.1310,<br>2.1091<br>15.247(b) | -                 | 3.98  | Pass   |

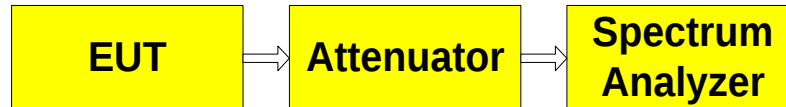
### Note.

The conducted emission test was not performed because the EUT has no provisions for connection to the public utility ac power lines to operate the EUT. The EUT is just operated from the internal battery.

## 6. TEST DATA

### 6.1 Occupied Bandwidth : FCC Rules Part 15 §15.247(a)

#### 6.1.1 Method of Measurement



| Equipment         | Model Name   | Manufacture |
|-------------------|--------------|-------------|
| EUT               | DICO XA-1000 | SayU        |
| Attenuator        | 33-30-33     | Weinschel   |
| Spectrum Analyzer | 8563E        | Agilent     |

**Note.**

Measure 20 dB bandwidth of relevant channel using Spectrum Analyzer.

#### 6.1.2 Result

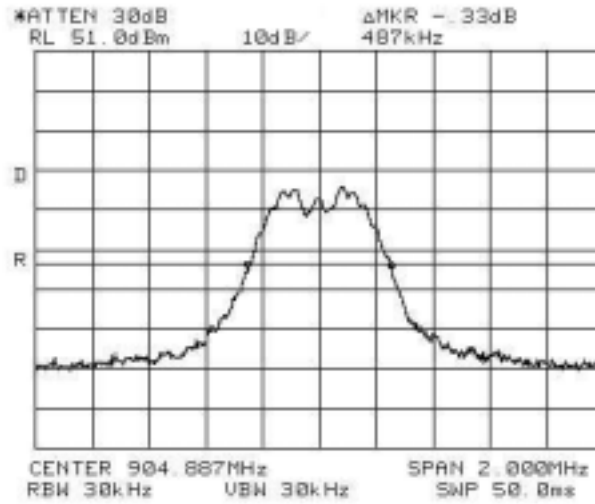
| Transmitter Channel Setting | Frequency Tuned (MHz) | 20 dB Bandwidth (kHz) |
|-----------------------------|-----------------------|-----------------------|
| Lowest                      | 905                   | 487                   |
| Middle                      | 915                   | 487                   |
| Highest                     | 925                   | 490                   |

**Note.**

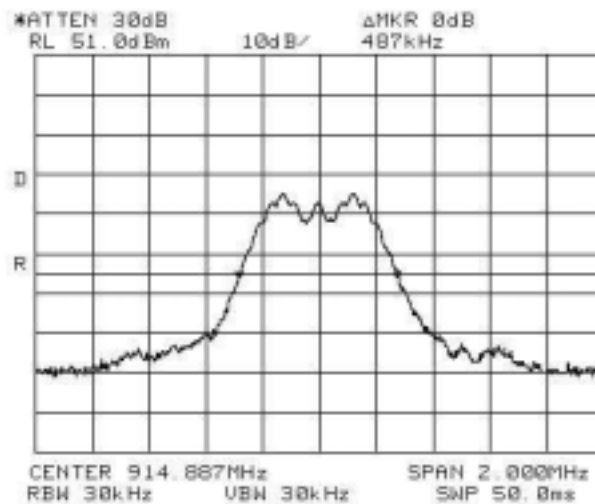
20dB bandwidth's results of measurements is more than 250kHz and less than 500kHz.

### 6.1.3 Plot

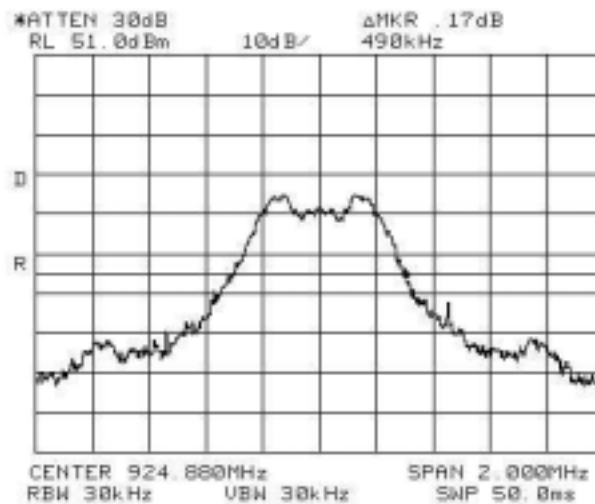
#### 6.1.3.1 Lowest Channel (904.5 MHz)



#### 6.1.3.2 Middle Channel (914.5 MHz)



#### 6.1.3.2 Highest Channel (924.5 MHz)



## 6.2 Channel Separation : FCC Rules Part 15 §15.247(a)

### 6.2.1 Method of Measurement

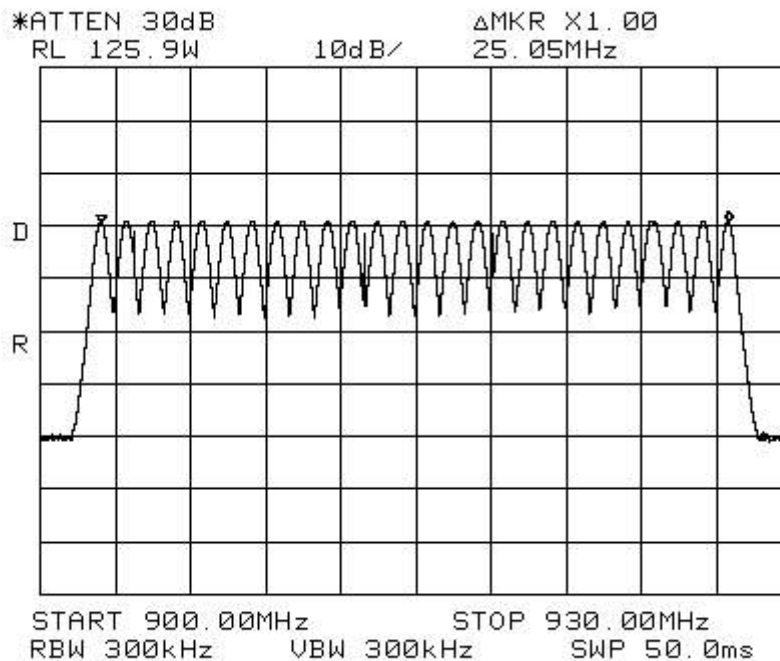


| Equipment         | Model Name   | Manufacture |
|-------------------|--------------|-------------|
| EUT               | DICO XA-1000 | SayU        |
| Attenuator        | 33-30-33     | Weinschel   |
| Spectrum Analyzer | 8563E        | Agilent     |

**Note.**

When all hopping channels are acted, confirm Channel number using Spectrum Analyzer's Max Hold function.

### 6.2.2 Plot



**Note.**

The system shall use at least 25 hopping frequencies, because 20dB bandwidth is more than 250kHz and less than 500kHz.

## 6.3 Time of Occupancy : FCC Rules Part 15 §15.247(a)

### 6.3.1 Method of Measurement



| Equipment         | Model Name   | Manufacture |
|-------------------|--------------|-------------|
| EUT               | DICO XA-1000 | SayU        |
| Attenuator        | 33-30-33     | Weinschel   |
| Spectrum Analyzer | 8563E        | Agilent     |

**Note.**

When only one channel is acted, confirm dwell time and interval time when set span by "0" in Spectrum Analyzer.

When all hopping channels are acted, confirm one channel's period.

### 6.3.2 Result

| Item           | Time (Sec.) | Time (Sec.) |
|----------------|-------------|-------------|
| One Packet     | 0.02        | N/A         |
| Occupancy Time | 0.17        | 0.4         |
| Period         | 5.37        | 10.0        |

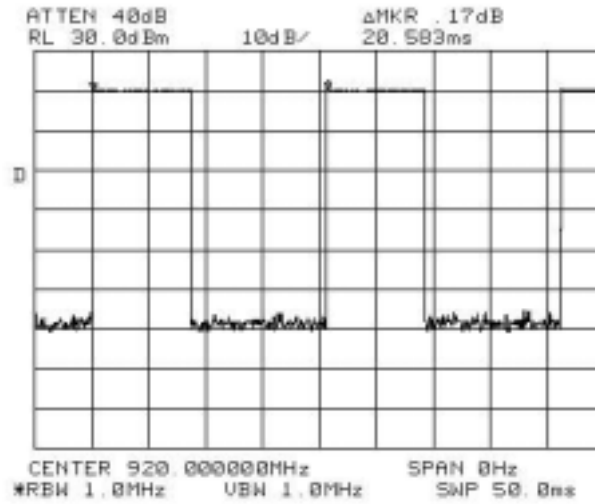
**Note.**

Each Channel's signal does Hopping by other Channel that is random after repeat TX and RX 9 times.

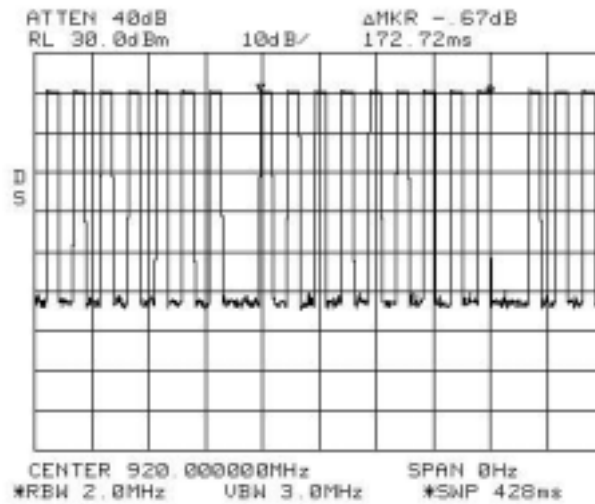
The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period, because 20dB bandwidth is more than 250kHz and less than 500kHz.

### 6.3.3 Plot

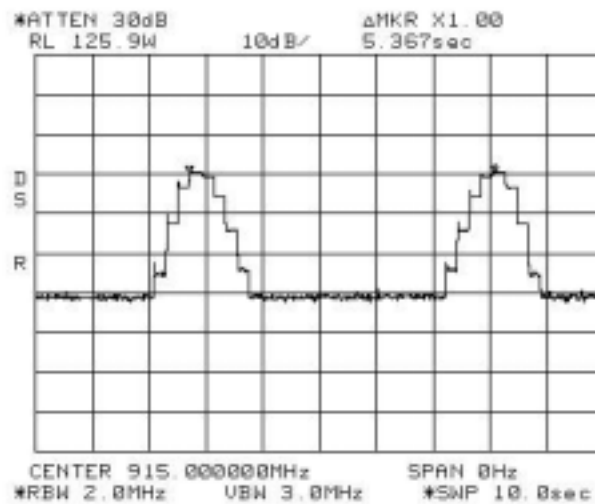
#### 6.3.3.1 One Packet (TX + RX)



#### 6.3.3.2 Occupancy Time

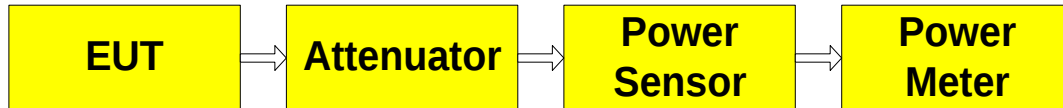


#### 6.3.3.3 Period



## 6.4 RF Power Output at Antenna Terminals : FCC Rules Part 15 §15.247(b)

### 6.4.1 Method of Measurement



| Equipment    | Model Name   | Manufacture |
|--------------|--------------|-------------|
| EUT          | DICO XA-1000 | SayU        |
| Attenuator   | 33-30-33     | Weinschel   |
| Power Sensor | 8481A        | Agilent     |
| Power Meter  | E4481A       | Agilent     |

**Note.**

Measure power output at antenna terminals of relevant channel using Spectrum Analyzer.

### 6.4.2 Result

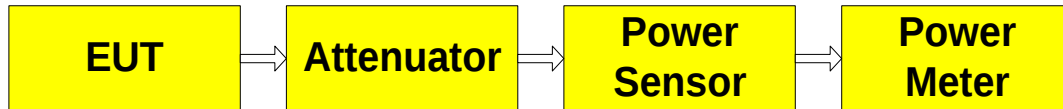
| Transmitter Channel Setting | Frequency Tuned (MHz) | Measured Power (dBm) | Rated Power (mW) |
|-----------------------------|-----------------------|----------------------|------------------|
| Lowest                      | 904.5                 | 21.8                 | 151.4            |
| Middle                      | 914.5                 | 21.7                 | 147.9            |
| Highest                     | 924.5                 | 21.7                 | 147.9            |

**Note.**

Power output at antenna terminals shall be less than 250mW, because have Hopping Channel number is more then 25 Channel and less than 50 Channel.

## 6.5 Spurious Emissions at Antenna Terminals : FCC Rules Part 15 §15.247(c)

### 6.5.1 Method of Measurement



| Equipment    | Model Name   | Manufacture |
|--------------|--------------|-------------|
| EUT          | DICO XA-1000 | SayU        |
| Attenuator   | 33-30-33     | Weinschel   |
| Power Sensor | 8481A        | Agilent     |
| Power Meter  | E4481A       | Agilent     |

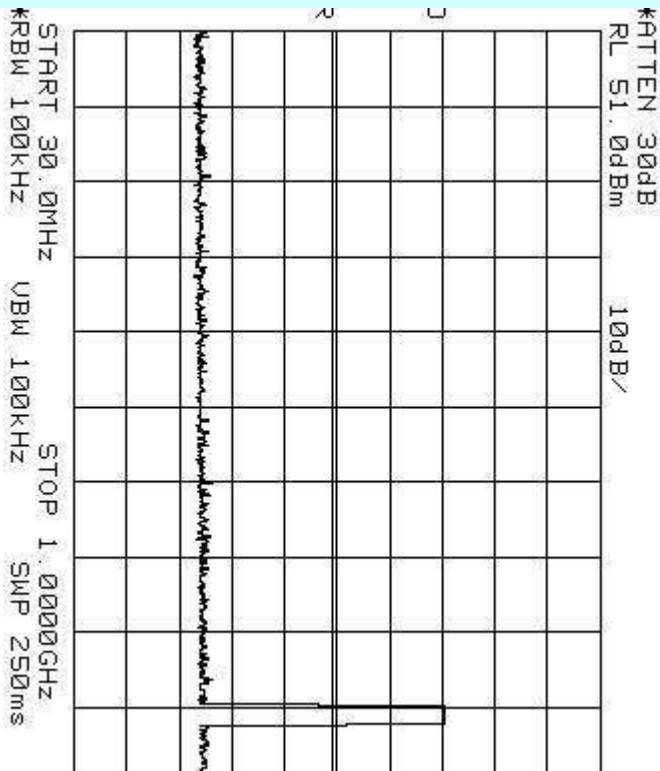
**Note.**

Measure spurious emissions at antenna terminals of relevant channel using Spectrum Analyzer.

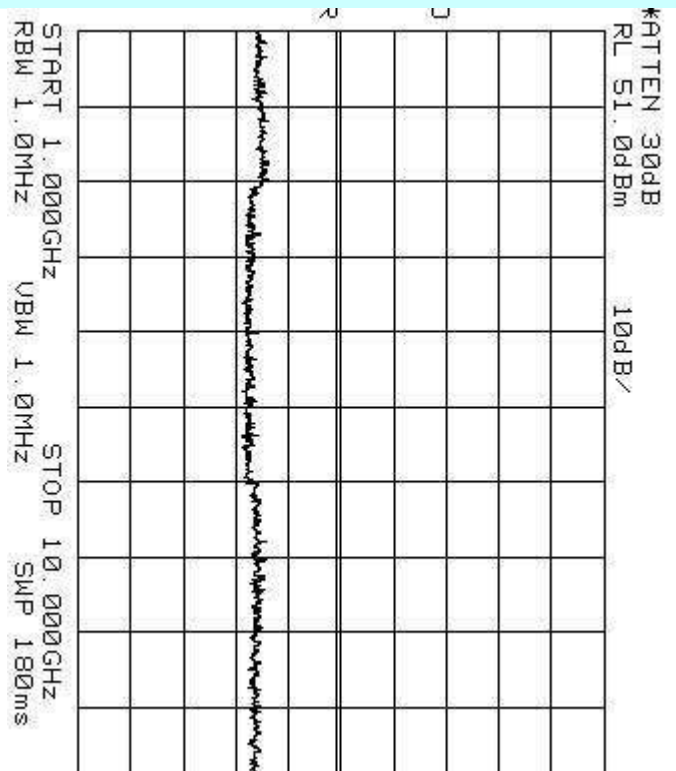
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

## 6.5.2 Plot

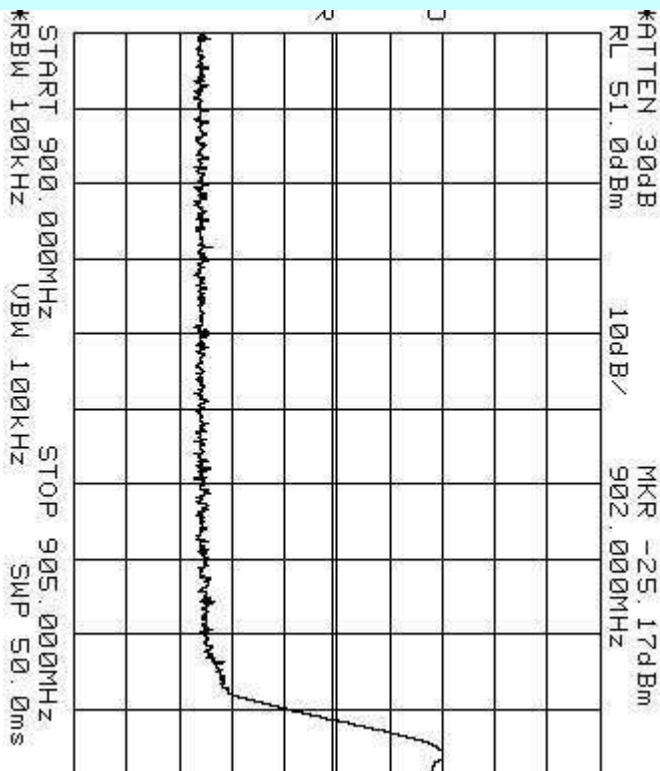
### 6.5.2.1 30 MHz ~ 1 GHz



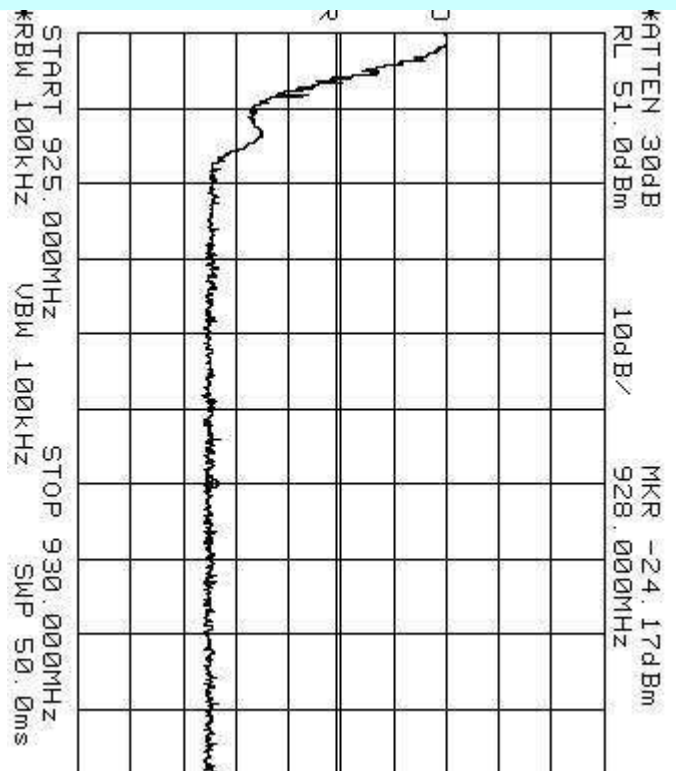
### 6.5.2.2 1 GHz ~ 10 GHz



### 6.5.2.3 Inside 902 MHz

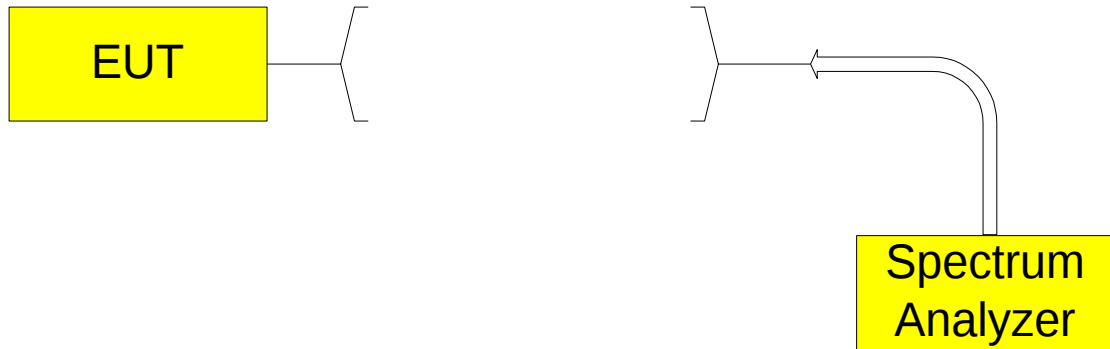


### 6.5.2.4 Outside 928 MHz



## 6.6 Field Strength of Spurious Radiation : FCC Rules Part 15 §15.247(c)

### 6.6.1 Method of Measurement



| Equipment            | Model Name       | Manufacture |
|----------------------|------------------|-------------|
| EUT                  | DICO XA-1000     | SayU        |
| Spectrum Analyzer    | E7403A           | Agilent     |
| Spectrum Analyzer    | 8563E            | Agilent     |
| Biconical Antenna    | VHA9103(BBA9106) | SWALZBECK   |
| Log Periodic Antenna | LP01             | PMM         |
| Horn Antenna         | BBHA 9120 D      | SWALZBECK   |
| Amplifier            | 8447E            | Agilent     |
| Amplifier            | 8449B            | Agilent     |

**Note.**

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

## 6.6.2 Test Result

| Frequency [MHz] | Reading [dBμV] | Polarization (*H/**V) | Ant. Factor [dB] | Cable Loss [dB] | Pre-amp. [dB] | Emission Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] |
|-----------------|----------------|-----------------------|------------------|-----------------|---------------|-------------------------|----------------|-------------|
| 30.0            | -              | -                     | -                | -               | -             | -                       | 40.0           | -           |
| -               | -              | -                     | -                | -               | -             | -                       | -              | -           |
| 88.0            | -              | -                     | -                | -               | -             | -                       | 43.5           | -           |
| -               | -              | -                     | -                | -               | -             | -                       | -              | -           |
| 216.0           | -              | -                     | -                | -               | -             | -                       | 46.0           | -           |
| 824.5           | 37.3           | V                     | 22.9             | 5.4             | 22.0          | 43.6                    | 46.0           | 2.4         |
| 901.5           | 32.4           | V                     | 25.3             | 5.7             | 22.0          | 41.4                    | 46.0           | 4.6         |
| 928.5           | 34.0           | V                     | 25.7             | 5.7             | 22.0          | 43.4                    | 46.0           | 2.6         |
| 960.0           | -              | -                     | -                | -               | -             | -                       | 54.0           | -           |
| 1800            | 57.6           | V                     | 25.1             | 0.5             | 35.0          | 48.2                    | 54.0           | 5.8         |
| 2700            | 45.3           | V                     | 27.9             | 4.0             | 35.0          | 42.2                    | 54.0           | 11.8        |
| 3600            | 31.0           | V                     | 28.8             | 6.8             | 35.0          | 31.6                    | 54.0           | 22.4        |
| 4500            | 29.7           | V                     | 30.5             | 7.9             | 35.0          | 33.1                    | 54.0           | 20.9        |
| 5400            | 28.0           | V                     | 31.7             | 8.8             | 35.0          | 33.5                    | 54.0           | 20.5        |

### Note.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

The out of band emissions have been shown to fall within the restricted bands of operation as defined in section 15.205.

Radiated emission measurements are required to be carried out with the limits as per section 15.209 applied.

Section 15.205 need not to confirm, because section 15.209 requirement is suitable.

## 6.7 RF Exposure Requirements : FCC Rules Part 1 §1.1310, §2.1091, §15.247(b)

### 6.7.1 Method of Measurement

Spread spectrum transmitters operating under section 15.247 are categorically from routine environmental evaluation to demonstrating RF exposure compliance with respect to MPE and/or SAR limits.

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 requirements (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.

### 6.7.2 Limits

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).

#### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range (MHz)                                   | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Average Time (minutes) |
|---------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|------------------------|
| (A) Limits for Occupational/Control Exposures           |                               |                               |                                     |                        |
| 300-1500                                                | -                             | -                             | f/300                               | 6                      |
| (B) Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                        |
| 300-1500                                                | -                             | -                             | f/1500                              | 30                     |

### 6.7.3 Test Result

| Frequency (MHz) | Measured Conducted Power (dBm) | Antenna Gain (dBi) | Calculated EIRP (Watt) | Duty cycle (%) | The time averaged power over 30 minutes (Watt) | Laboratory's Recommended Minimum RF Safety Distance r (Cm) |
|-----------------|--------------------------------|--------------------|------------------------|----------------|------------------------------------------------|------------------------------------------------------------|
| 904.5           | 21.8                           | 2.0                | 0.24                   | 50             | 0.12                                           | 3.98                                                       |
| 914.5           | 21.7                           | 2.0                | 0.23                   | 50             | 0.12                                           | 3.98                                                       |
| 924.5           | 21.7                           | 2.0                | 0.23                   | 50             | 0.12                                           | 3.98                                                       |

#### 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/cm<sup>2</sup>  
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.  $S = f/1500$  mW/cm<sup>2</sup> for Limits for General Population/Uncontrolled Exposures.
2. This Equipment assume a typical transceiver duty cycle with 50% transmit time.
3. The time averaged power over 30 minutes will be calculated from 15 minutes TX on time and 15 minutes TX off time .
4. Minimum calculated separation distance between antenna and persons required : 3.98Cm

## 7. TEST EQUIPMENTS LIST

The listing below denotes the test equipments utilized for the test(s).

| <u>Test Equipment</u> | <u>Manufacture<br/>Model Number</u> | <u>Serial Number</u> | <u>Calibrated<br/>Date</u> | <u>Calibration<br/>Due date</u> |
|-----------------------|-------------------------------------|----------------------|----------------------------|---------------------------------|
| Attenuator            | 33-30-33                            | Weinschel            | 2003-05-14                 | 2004-05-14                      |
| Spectrum Analyzer     | 8563E                               | Agilent              | 2003-05-14                 | 2004-05-14                      |
| Spectrum Analyzer     | E7403A                              | Agilent              | 2003-02-19                 | 2004-02-19                      |
| Power Sensor          | 8481A                               | Agilent              | 2003-04-25                 | 2004-04-25                      |
| Power Meter           | E4418A                              | Agilent              | 2003-04-25                 | 2004-04-25                      |
| Biconical Antenna     | VHA9103(BBA9106)                    | SWALZBECK            | 2003-09-12                 | 2004-09-12                      |
| Log Periodic Antenna  | LP01                                | PMM                  | 2003-10-30                 | 2004-10-30                      |
| Horn Antenna          | BBHA 9120 D                         | SWALZBECK            | 2003-06-20                 | 2004-06.20                      |
| Amplifier             | 8447E                               | Agilent              | 2003-08-15                 | 2004-08-15                      |