LTA
Laboratory for Test & Approval Co.,Ltd.

243 Jubug-Ri,Yangji-Myeon, Yongin-Si, Gyeonggi-Do, Korea 449-822
Tel: +82-31-323-6008 Fax: +82-31-323-6010
http://www.ltalab.com

PHYCHIPS

Dates of Tests: December 1~9, 2010
Test Report S/N: LR500111012G
Test Site : LTA CO., LTD.

# CERTIFICATION OF COMPLIANCE

FCC ID. **Y3DPRM90U10A**

APPLICANT **Phychips Inc.**

| | | |
|---|---|---|
| **FCC Classification** | **:** | **FHSS Sequence Spread Spectrum (FHSS)** |
| **Manufacturing Description** | **:** | **UHF RFID Reader hybrid module** |
| **Manufacturer** | **:** | **Phychips Inc.** |
| **Model name** | **:** | **PRM90U10A** |
| **Test Device Serial No.:** | **:** | **Identification** |
| **Rule Part(s)** | **:** | **FCC Part 15.247 Subpart C; ANSI C-63.4-2003** |
| **Frequency Range** | **:** | **902.75 ~ 927.25MHz** |
| **RF power** | **:** | **0.23W - Conducted** |
| **Data of issue** | **:** | **December 9, 2010** |

This test report is issued under the authority of:

Kyung-Taek LEE, Technical Manager

The test was supervised by:

Hyun-Chae You, Test Engineer

**This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.**

NVLAP LAB Code.: 200723-0

# TABLE OF CONTENTS



# 1. General information's

## 1-1 Test Performed


Company name : LTA Co., Ltd.

Address : 243, Jubug-ri,Yangji-Myeon,Youngin-Si, Kyunggi-Do, Korea. 449-822

Web site : http://www.ltalab.com

E-mail : chahn@ltalab.com

Telephone : +82-31-323-6008

Facsimile +82-31-323-6010


Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".

## 1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

| Agency | Country | Accreditation No. | Validity | Reference |
|---|---|---|---|---|
| NVLAP | U.S.A | 200723-0 | 2011-09-30 | ECT accredited Lab. |
| RRL | KOREA | KR0049 | 2011-06-20 | EMC accredited Lab. |
| FCC | U.S.A | 610755 | 2011-04-22 | FCC filing |
| VCCI | JAPAN | R2133, C2307 | 2011-06-21 | VCCI registration |
| IC | CANADA | IC5799 | 2012-05-14 | IC filing |

# 2. Information's about test item

## 2-1 Applicant & Manufacturer

| | | |
|---|---|---|
| Company name | : | Phychips Inc. |
| Address | : | #205 Migun Technoworld 1, 533, Yongsan-dong, Yuseong-gu, Daejeon, Korea, 305-500 |
| Tel / Fax | : | + 82-42-864-2402/ + 82-42-864-2403 |

## 2-2 Equipment Under Test (EUT)

| | | |
|---|---|---|
| Trade name | : | UHF RFID Reader hybrid module |
| FCC ID | : | Y3DPRM90U10A |
| Model name | : | PRM90U10A |
| Serial number | : | Identification |
| Date of receipt | : | December 1, 2010 |
| EUT condition | : | Pre-production, not damaged |
| Antenna type | : | Quadrifilar Spiral Antenna Max Gain 2.5dBi |
| Frequency Range | : | 902.75 ~ 927.25MHz |
| RF output power | : | 0.23 W- Conducted |
| Number of channels | : | 50 |
| Channel spacing | : | 500KHz |
| Channel Access Protocol | : | Frequency Hopping |
| Power Source | : | 3.6VDC |

## 2-3 Tested frequency

| | LOW | MID | HIGH |
|---|---|---|---|
| **Frequency (MHz)** | 902.75 | 914.75 | 927.25 |

## 2-4 Ancillary Equipment

| Equipment | Model No. | Serial No. | Manufacturer |
|---|---|---|---|
| Notebook | SENS P28 | N/A | Samsung |
| PRINTER | STYLUS C65 | N/A | EPSON |

# 3. Test Report

## 3.1 Summary of tests

| FCC Part Section(s) | Parameter | Limit | Test Condition | Status (note 1) |
|---|---|---|---|---|
| 15.247(a) | Carrier Frequency Separation | > 25 kHz | Conducted | C |
| 15.247(a) | Number of Hopping Frequencies | ≥ 50 hops | | C |
| 15.247(a) | 20 dB Bandwidth | - | | C |
| 15.247 | Dwell Time | < 0.4 seconds | | C |
| 15.247(b) | Transmitter Output Power | < 1Watt | | C |
| 15.247(d) | Conducted Spurious emission | > 20 dBc | | C |
| 15.247(d) | Band Edge | > 20 dBc | | C |
| 15.249 / 15.209 | Field Strength of Harmonics | Emission | Radiated | C |
| 15.207 | AC Conducted Emissions | Emissions | Conducted | NA note3 |

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

*Note 2*: The data in this test report are traceable to the national or international standards.

*Note 3*: This device is only operated by DC

The sample was tested according to the following specification:

FCC Parts 15.247; ANSI C-63.4-2003

**→ Antenna Requirement**

The **Phychips Inc. PRM90U10A** unit complies with the requirement of §15.203.

The Antenna type is Reversed Type ; Refer to the External photo

## 3.2 Transmitter requirements

### 3.2.1 Carrier Frequency Separation

**Procedure:**

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:

Span = 1 MHz (wide enough to capture the peaks of two adjacent channels)

RBW = 10 kHz (1% of the span or more) Sweep = auto

VBW = 10 kHz Detector function = peak

Trace = max hold

**Measurement Data:**

| Test Results | |
|---|---|
| **Carrier Frequency Separation (KHz)** | **Result** |
| **500.7** | Complies |

- See next pages for actual measured spectrum plots.

**Minimum Standard:**

The EUT shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

**Measurement Setup**

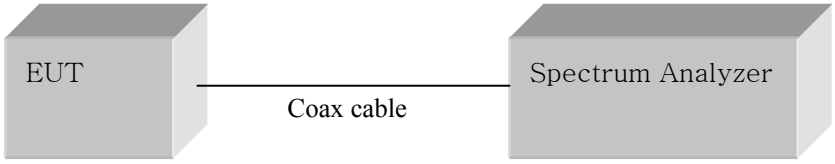
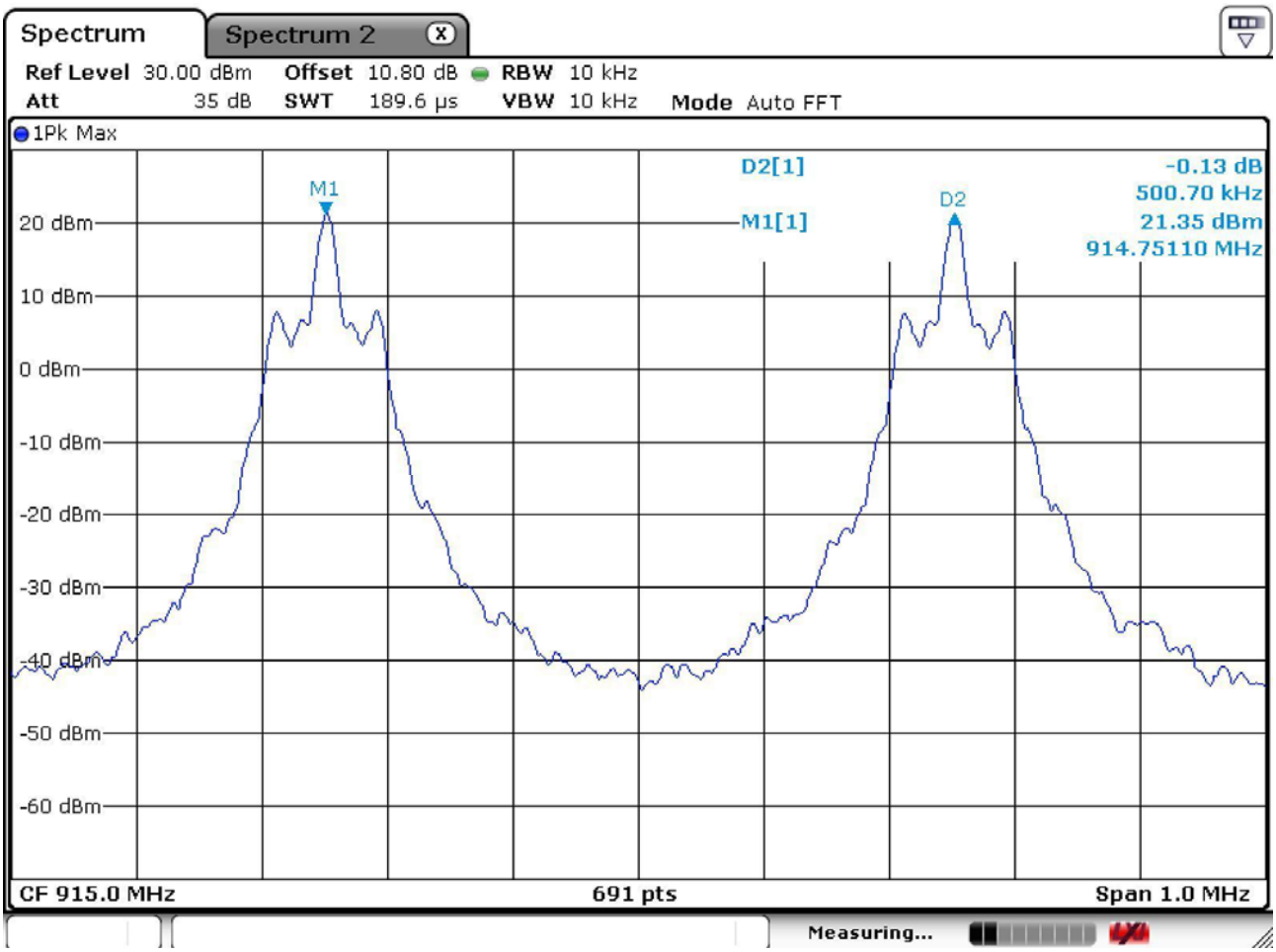



Figure 1: Measurement setup for the carrier frequency separation

## Carrier Frequency Separation



## 3.2.2 Number of Hopping Frequencies

**Procedure:**

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, four frequency ranges within the 902 ~ 928 MHz FH band were examined.

The spectrum analyzer is set to:

Frequency range 1: Start = 900 MHz, Stop = 930 MHz

RBW = 100 kHz (1% of the span or more) Sweep = auto

VBW = 100 kHz (VBW ≥ RBW) Detector function = peak

Trace = max hold Span = 30MHz

**Measurement Data: Complies**

| **Total number of Hopping Channels** | 50 |
|---|---|

- See next pages for actual measured spectrum plots.

**Minimum Standard:**

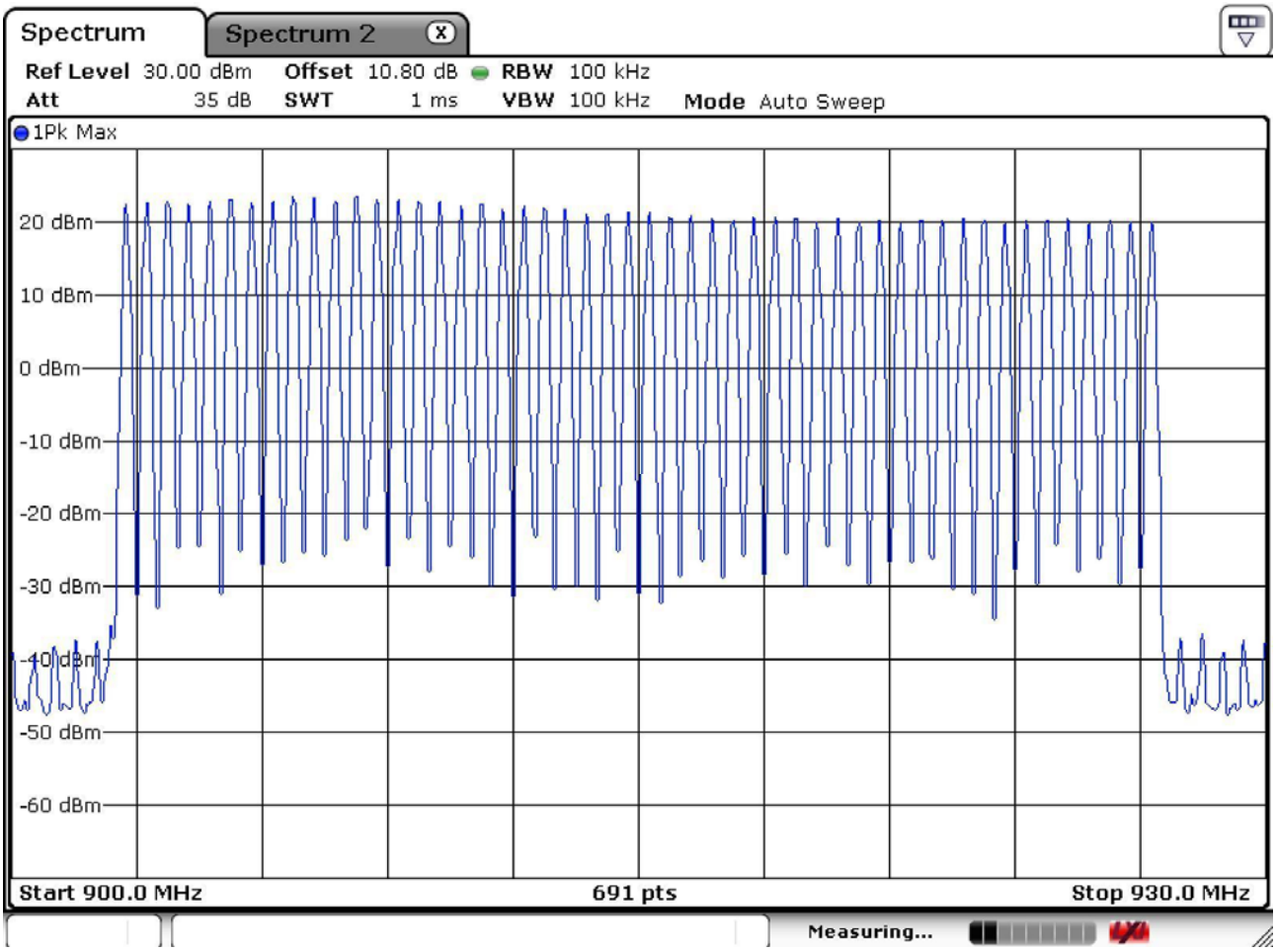
| At least 50 hopes |
|---|

**Measurement Setup**

Same as the Chapter 3.2.1 (Figure 1)

## Number of Hopping Frequencies



### 3.2.3 20 dB Bandwidth

**Procedure:**

The bandwidth at 20 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is ( as close as possible to ) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 200 KHz (approximately 2 or 3 times of the 20 dB bandwidth)

RBW = 3 kHz

Sweep = auto

VBW = 3 kHz (VBW ≥ RBW)

Detector function = peak

Trace = max hold

**Measurement Data:**

| Frequency (MHz) | Test Results | |
|---|---|---|
| | Measured Bandwidth (kHz) | Result |
| **902.75** | **84.52** | Complies |
| **914.75** | **84.23** | Complies |
| **927.25** | **84.52** | Complies |

- See next pages for actual measured spectrum plots.

**Minimum Standard:**

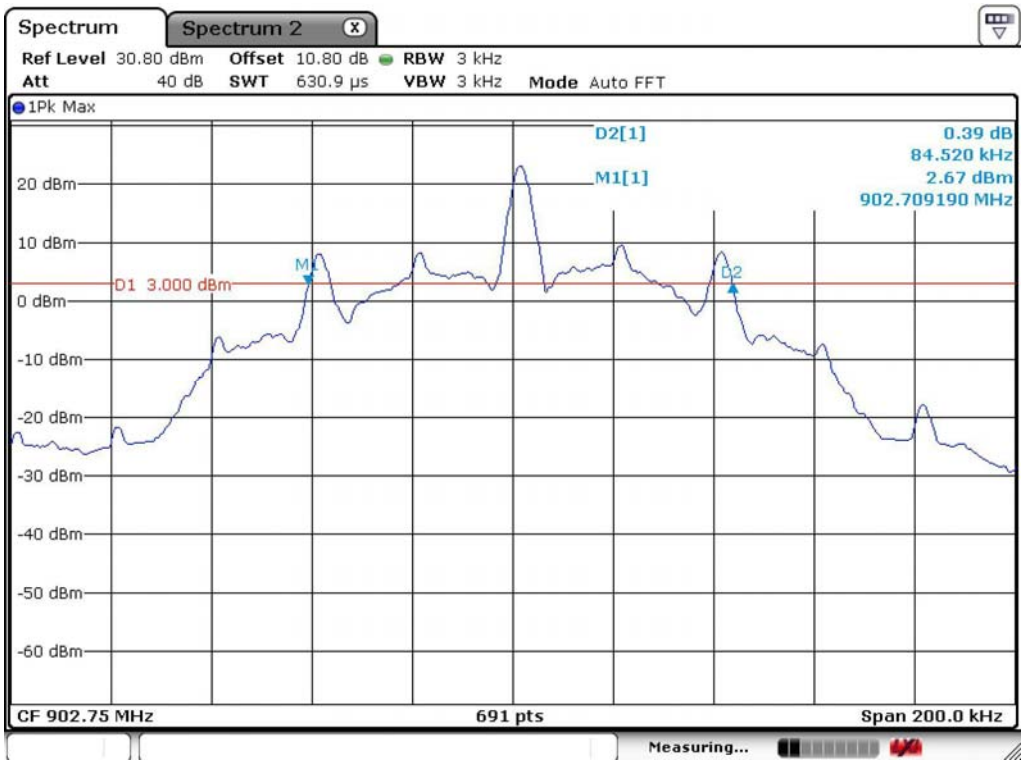
-

**Measurement Setup**

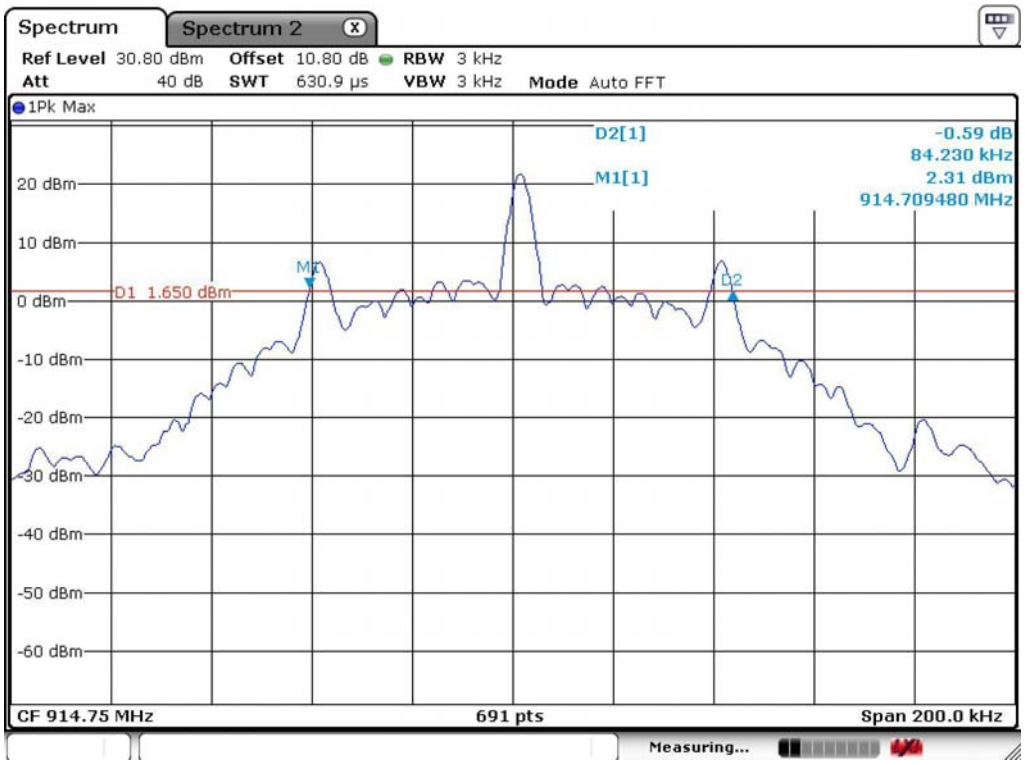
Same as the Chapter 3.2.1 (Figure 1)

# 20 dB Bandwidth

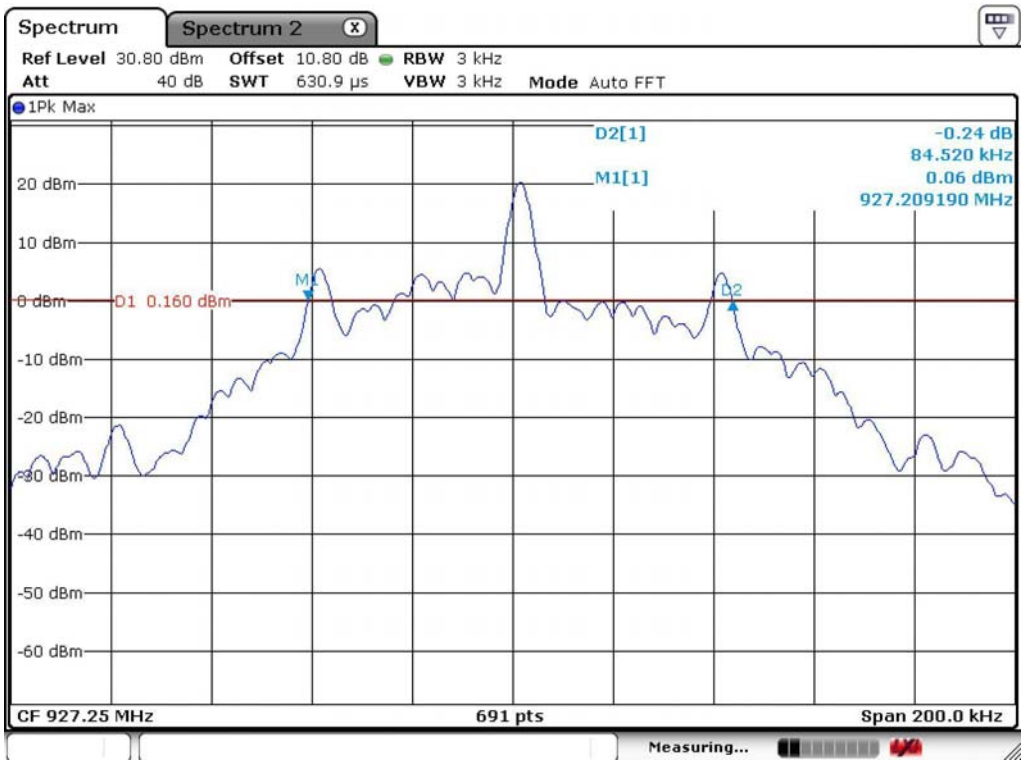
## Low Channel




## Mid Channel



## High Channel



## 3.2.4 Time of Occupancy (Dwell Time)

**Procedure:**

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to:

Center frequency =914.75 MHz  Span = zero

RBW = 100KHz  VBW = 100KHz (VBW ≥ RBW)

Trace = Single SWEEP  Detector function = peak

**Measurement Data:**

| Channel Frequency (MHz) | Test Results | | | |
|---|---|---|---|---|
| | Length (ms) | number | Dwell Time (ms) | Result |
| **914.75** | **352.17** | **1** | **352.17** | Complies |

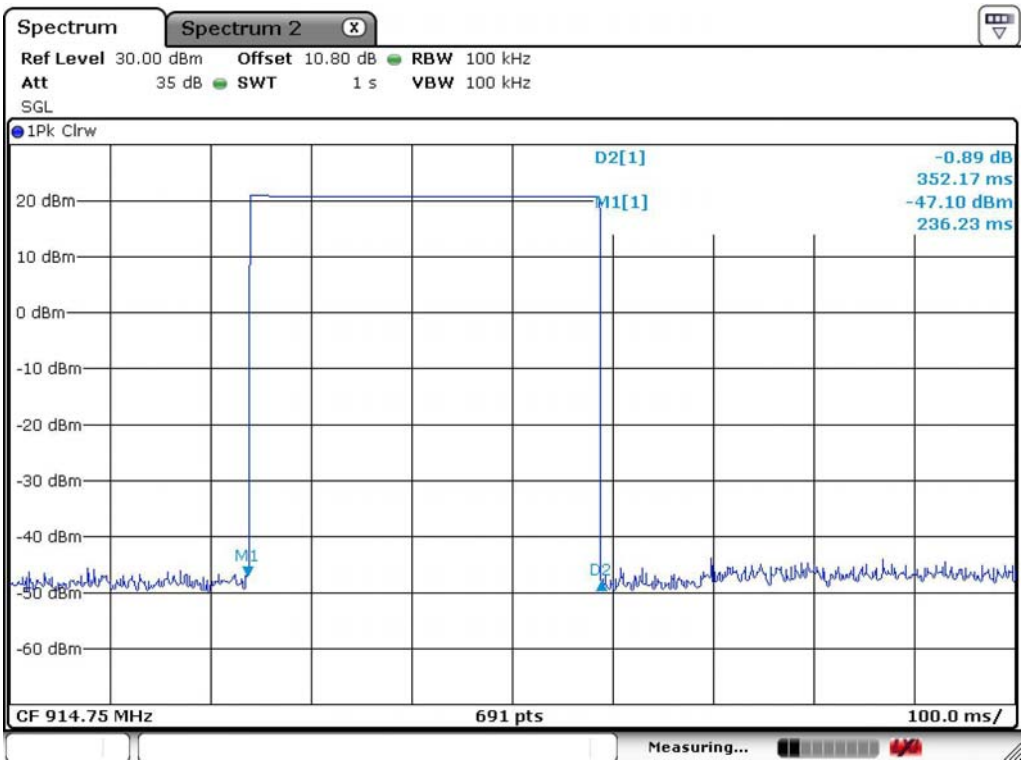
- See next pages for actual measured spectrum plots.

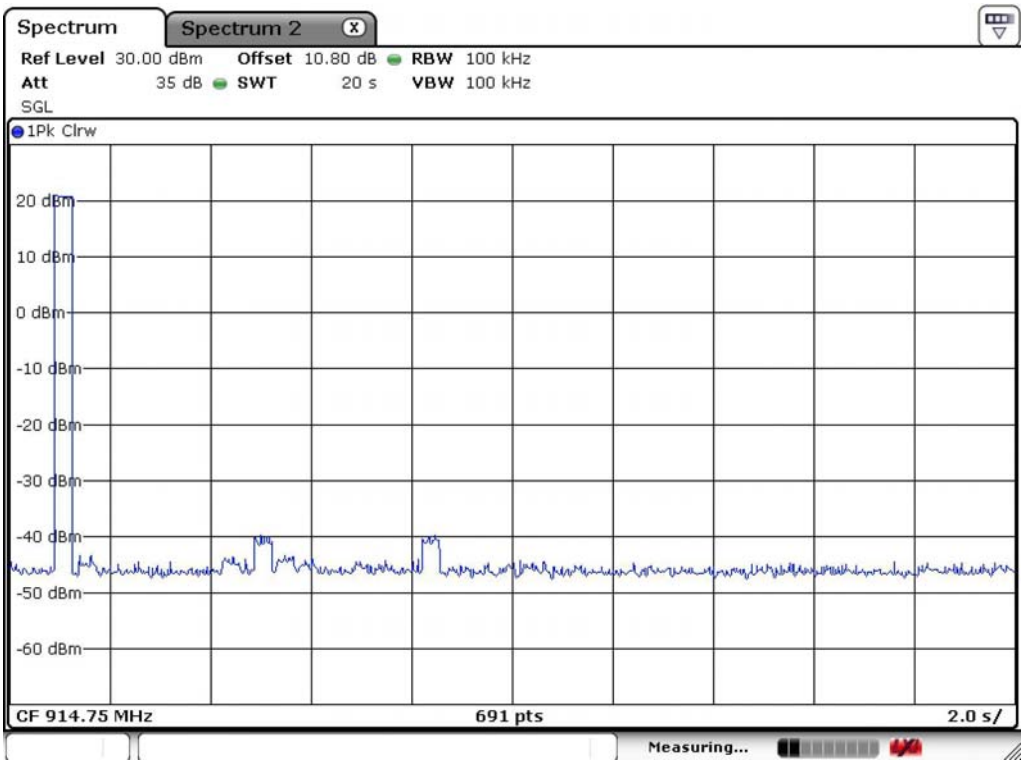
**Minimum Standard:**

0.4 seconds within a 20 second period per any frequency

**Measurement Setup**

Same as the Chapter 3.2.1 (Figure 1)



### 3.2.5 Transmitter Output Power

**Procedure:**

The peak output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels..

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 5 MHz (approximately 5 times of the 20 dB bandwidth)

RBW = 1 MHz (greater than the 20dB bandwidth of the emission being measured)

VBW = 1 MHz (VBW ≥ RBW) Detector function = peak

Trace = max hold Sweep = auto

**Measurement Data:**

| Frequency (MHz) | Test Results | | |
|---|---|---|---|
| | dBm | W | Result |
| **902.75** | **23.58** | **0.23** | Complies |
| **914.75** | **22.04** | **0.16** | Complies |
| **927.25** | **20.78** | **0.12** | Complies |

- See next pages for actual measured spectrum plots.

| | |
|---|---|
| **Minimum Standard:** | < 1W |

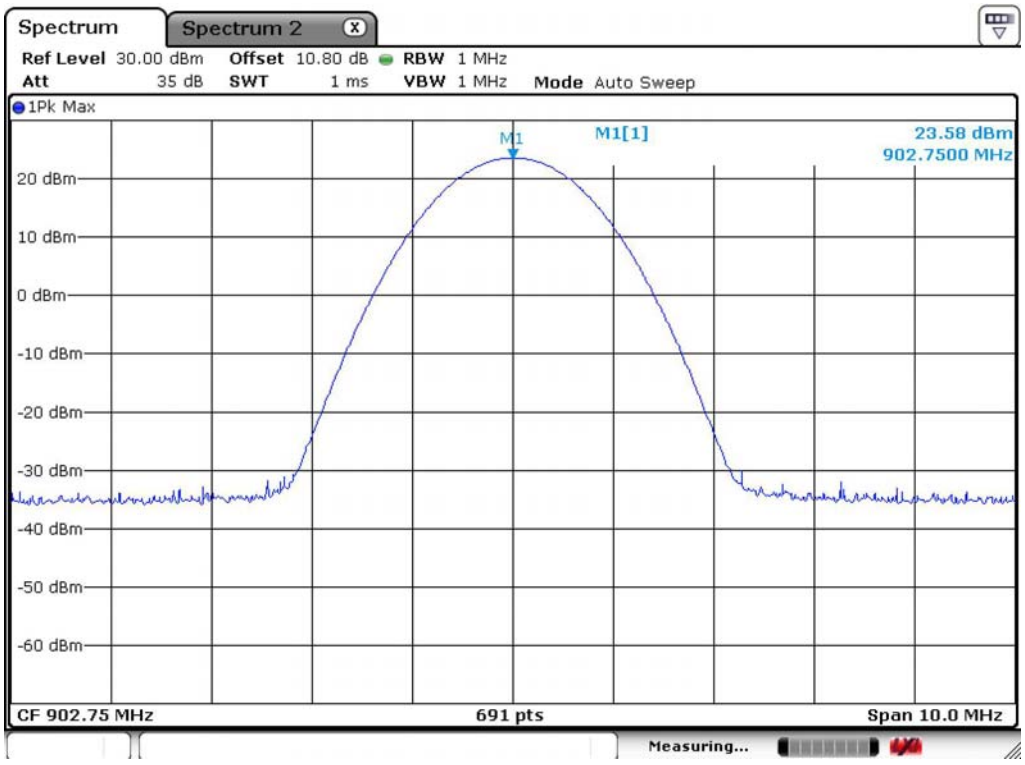
**Measurement Setup**

Same as the Chapter 3.2.1 (Figure 1)

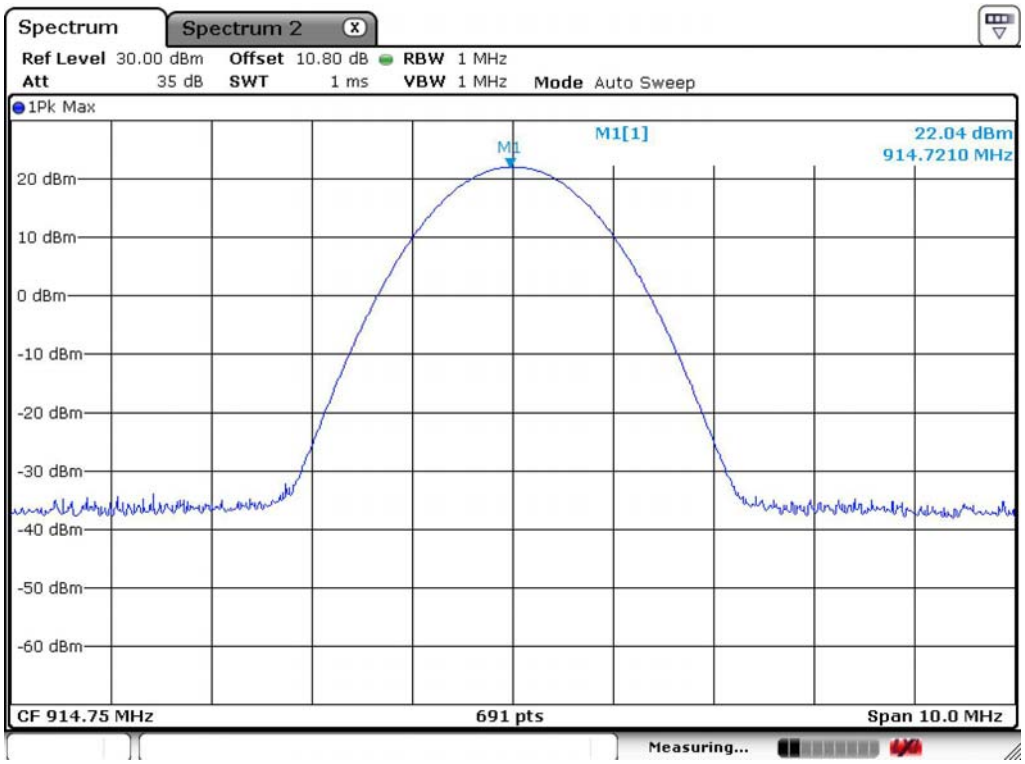
 

## Peak Output Power

### Low Channel

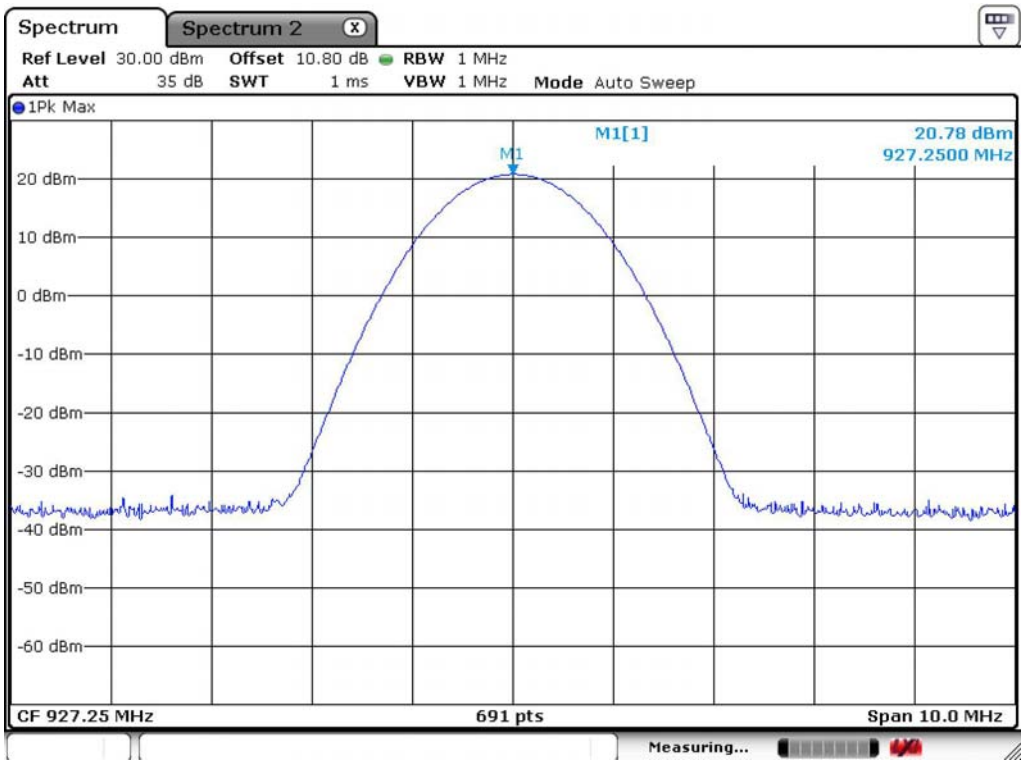



### Mid Channel



## High Channel



### 3.2.6 Band Edge

**Procedure:**

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

| | |
|---|---|
| RBW = 100 kHz | VBW = 100 kHz |
| Span = 2 MHz | Detector function = peak |
| Trace = max hold | Sweep = auto |

**Measurement Data: Complies**

- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

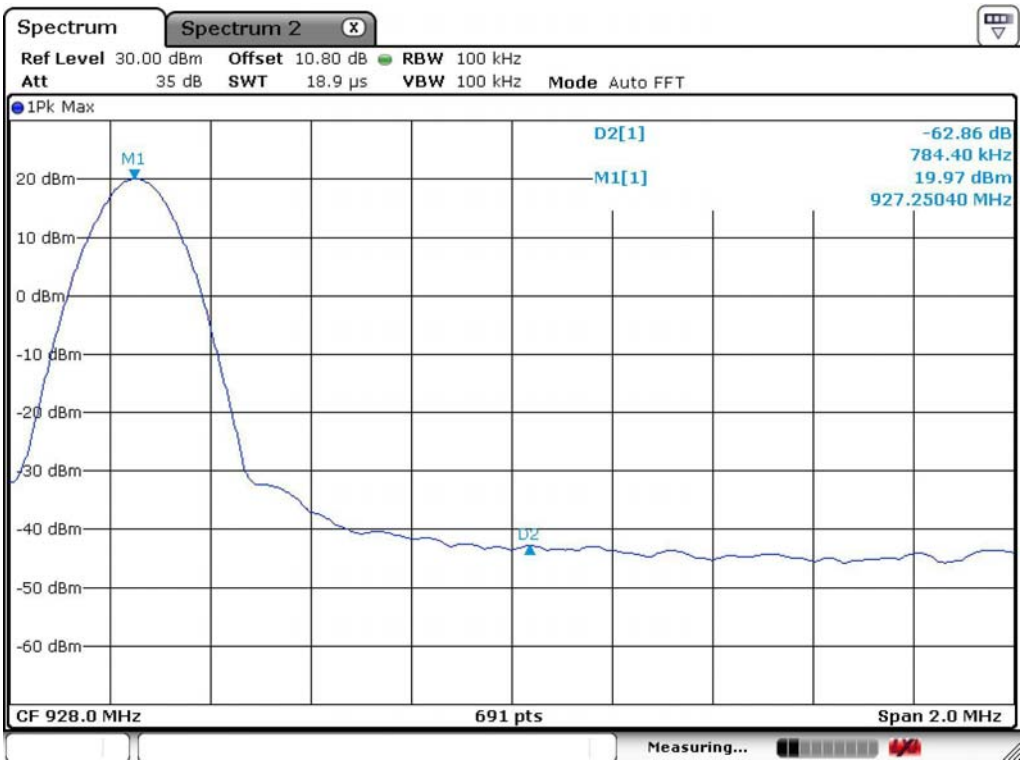
| | |
|---|---|
| **Minimum Standard:** | > 20 dBc |

**Measurement Setup**

Same as the Chapter 3.2.1 (Figure 1)

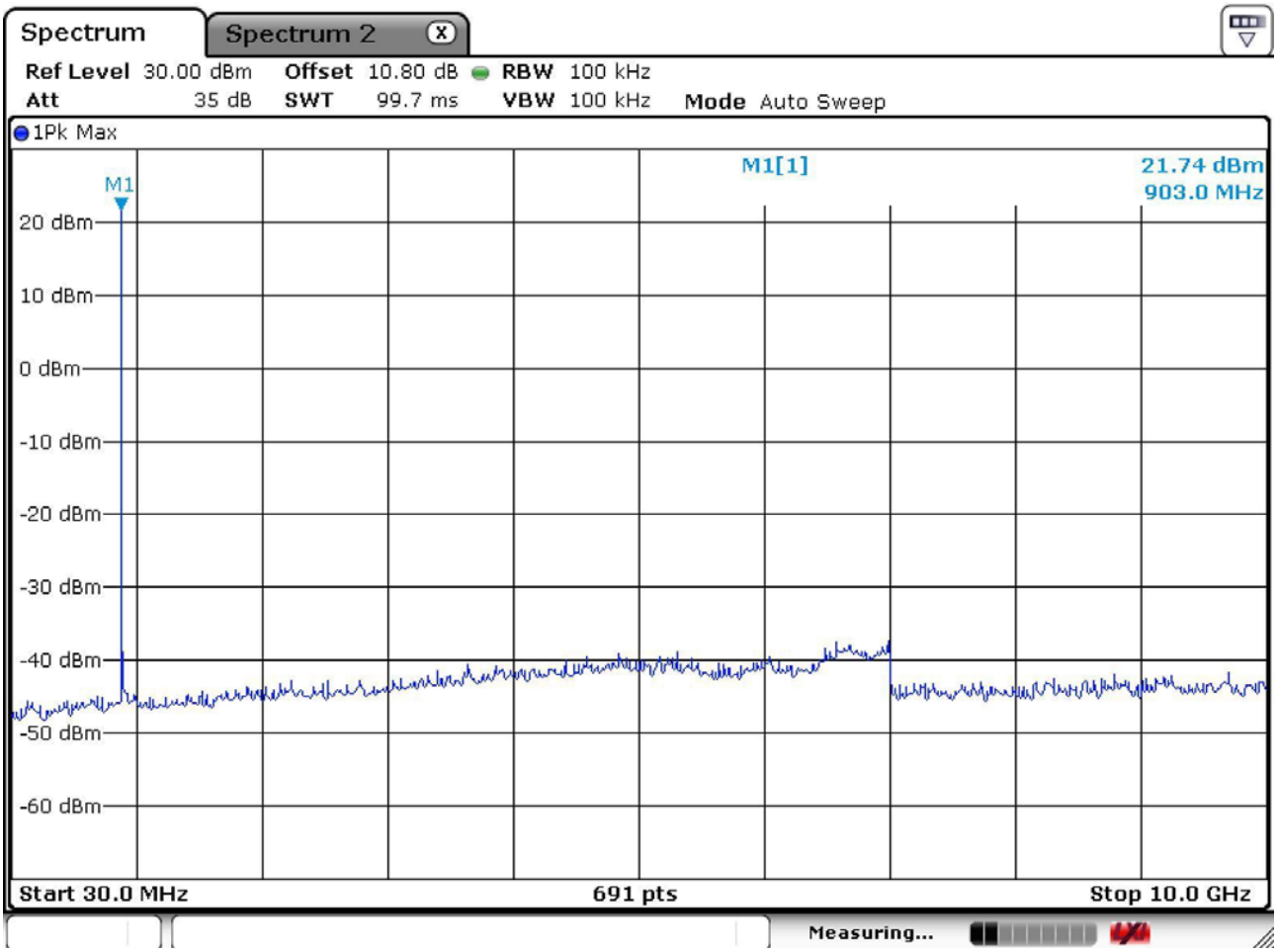
 

## Band - edge

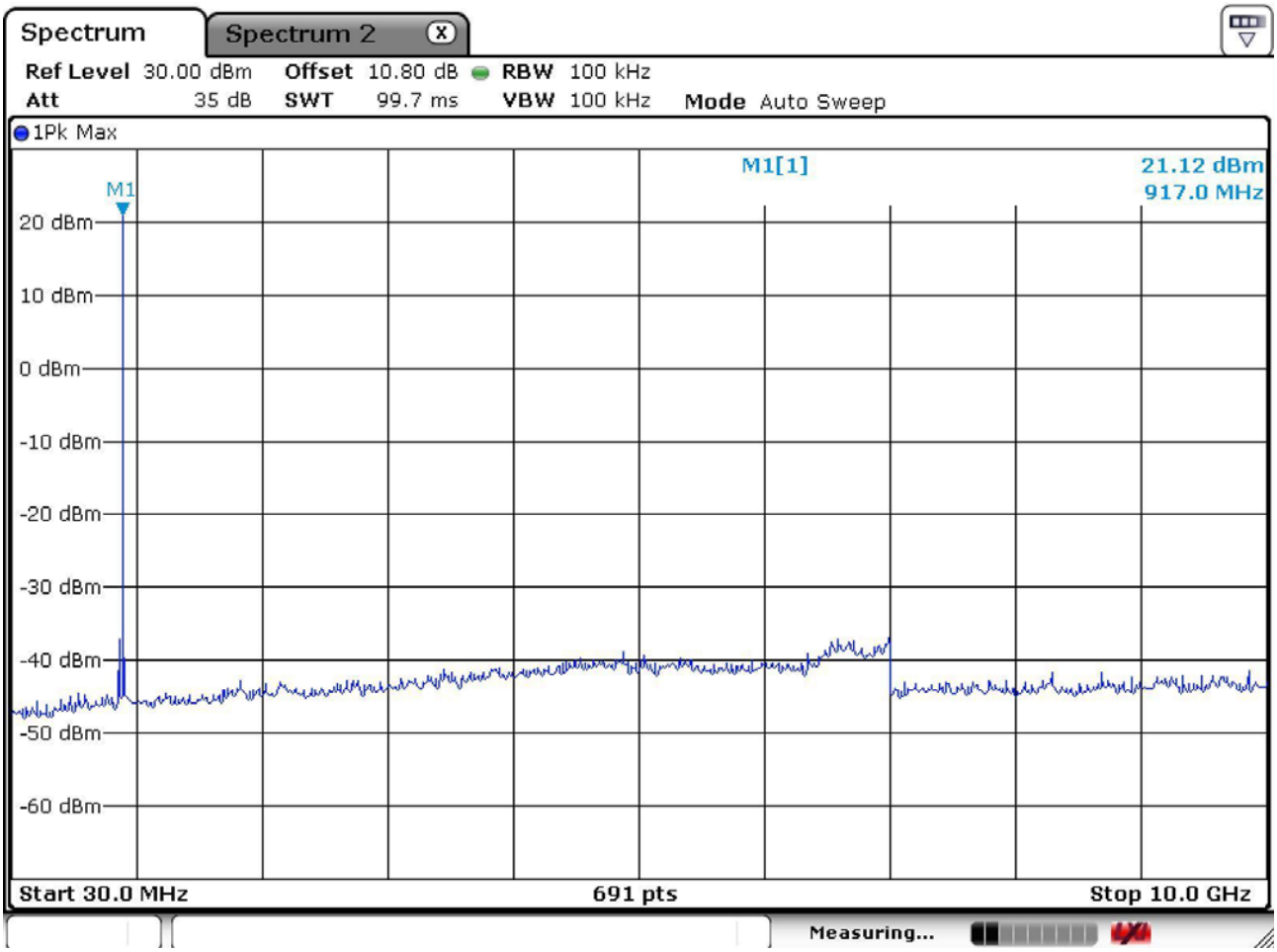
**Band - edge (at 20 dB blow) – Low channel**

**Frequency Range = 30 MHz ~ 10th harmonic.**



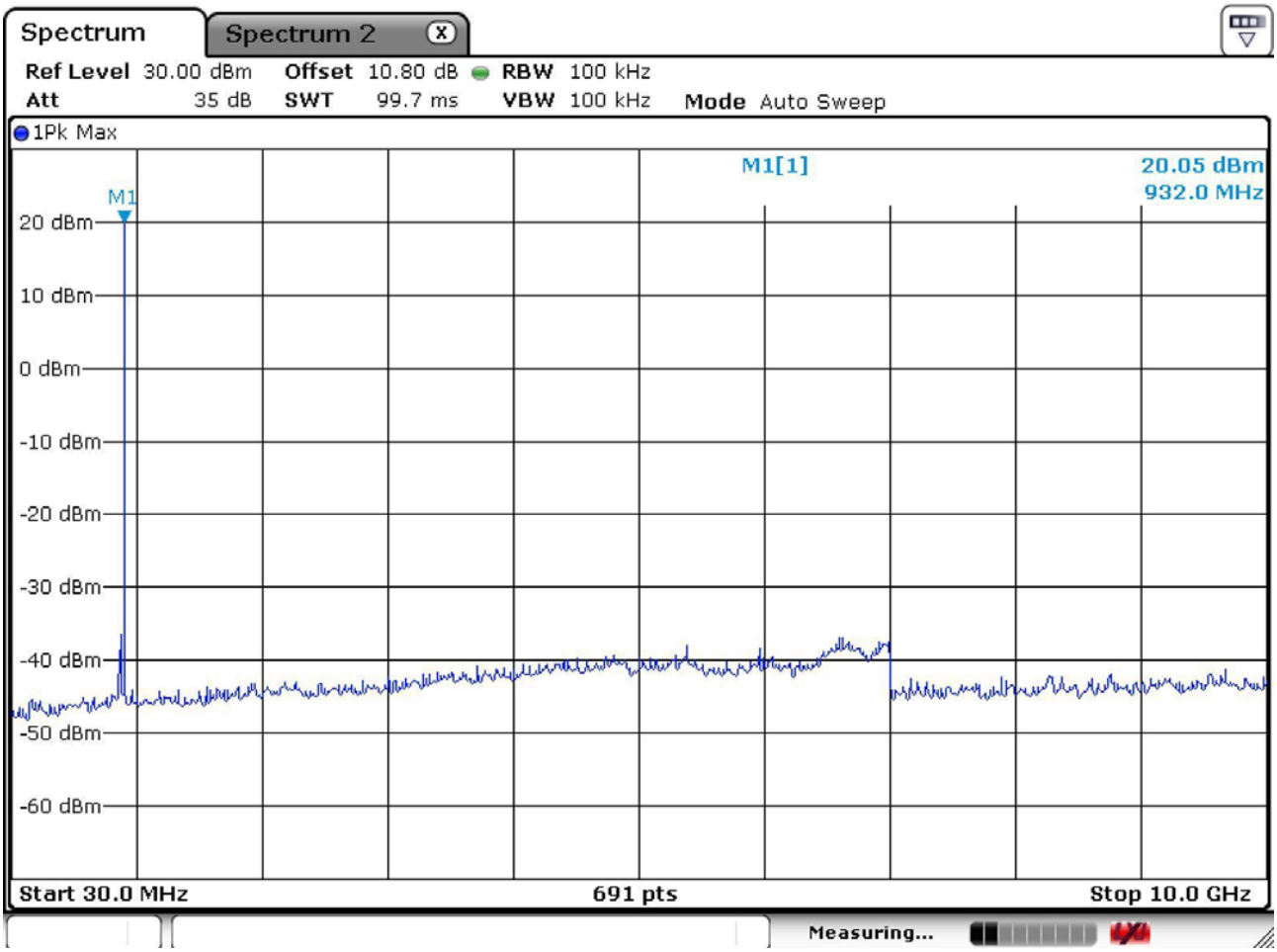
**Band - edge (at 20 dB blow) – Mid channel**

**Frequency Range = 30 MHz ~ 10th harmonic.**



**Band - edge (at 20 dB blow) – High channel**

**Frequency Range = 30 MHz ~ 10th harmonic.**



### 3.2.7 Field Strength of Harmonics

**Procedure:**

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 30 MHz ~ 10$^{th}$ harmonic.

RBW = 100 kHz ( 30MHz ~ 1 GHz) Peak mode: VBW = 1 MHz

= 1 MHz (1 GHz ~ 10$^{th}$ harmonic ) Average mode: VBW = 10Hz

Span = 100 MHz Detector function = Peak & average

Trace = max hold Sweep = auto

**Measurement Data: Complies**

- See next pages for actual measured data.

**Minimum Standard: FCC Part 15.209(a)**

| Frequency (MHz) | Limit (uV/m) @ 3m |
|---|---|
| 30 ~ 88 | 100 ** |
| 88 ~ 216 | 150 ** |
| 216 ~ 960 | 200 ** |
| Above 960 | 500 |

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

**Measurement Data :**

| Frequency [MHz] | Reading [dBuV/m] AV | Reading [dBuV/m] Peak | Pol. | Correction Factor Antenna | Correction Factor Amp.Gain | Correction Factor Cable | Limits [dBuV/m] AV | Limits [dBuV/m] Peak | Result [dBuV/m] AV | Result [dBuV/m] Peak | Margin [dB] AV | Margin [dB] Peak |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1805.5 | 60.5 | 66.4 | V | 26.0 | 38.2 | 3.5 | 54.0 | 74.0 | 51.8 | 57.7 | 2.2 | 16.3 |
| - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - |

| Frequency [MHz] | Reading [dBuV/m] AV | Reading [dBuV/m] Peak | Pol. | Correction Factor Antenna | Correction Factor Amp.Gain | Correction Factor Cable | Limits [dBuV/m] AV | Limits [dBuV/m] Peak | Result [dBuV/m] AV | Result [dBuV/m] Peak | Margin [dB] AV | Margin [dB] Peak |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1829.5 | 59.8 | 66.0 | V | 26.0 | 38.2 | 3.5 | 54.0 | 74.0 | 51.1 | 57.3 | 2.9 | 16.7 |
| - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - |

| Frequency [MHz] | Reading [dBuV/m] AV | Reading [dBuV/m] Peak | Pol. | Correction Factor Antenna | Correction Factor Amp.Gain | Correction Factor Cable | Limits [dBuV/m] AV | Limits [dBuV/m] Peak | Result [dBuV/m] AV | Result [dBuV/m] Peak | Margin [dB] AV | Margin [dB] Peak |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1854.50 | 59.7 | 65.8 | V | 26.0 | 38.2 | 3.5 | 54.0 | 74.0 | 51.0 | 57.1 | 3.0 | 16.9 |
| - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - |

No other emissions were detected at a level greater than 20dB below limit.

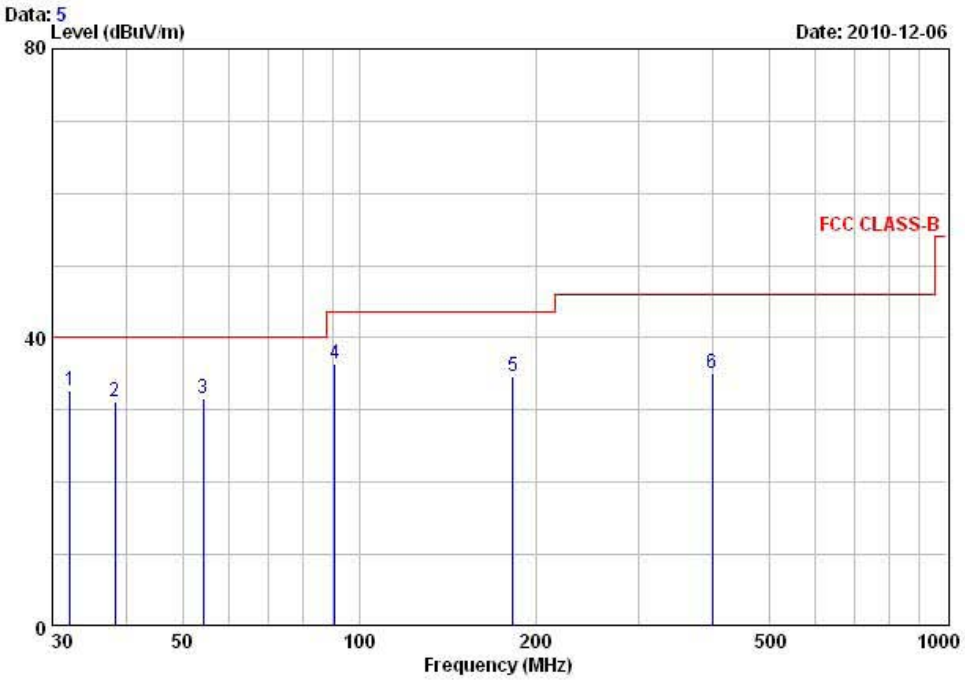
# Radiated Emissions – RFID mode

LTA
Laboratory for Test & Approval Co.,Ltd.

243 Jubug-ri, yangji-Myeon, Youngin-si,
Gyeonggi-do 449-822 Korea
Tel :+82-31-3236008,9
Fax:+82-31-3236010

EUT/Model No.: PRM90U10A  TEST MODE: RFID mode

Temp Humi : 7 / 31  Tested by: KIM.K.I




| | Freq | Reading | C.F | Result | Limit QP | Margin | Height | Angle | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB/m | dBuV/m | dBuV/m | dB | cm | deg | |
| 1 | 32.12 | 48.20 | -15.55 | 32.65 | 40.00 | 7.35 | 100 | 128 | VERTICAL |
| 2 | 38.32 | 46.20 | -14.92 | 31.28 | 40.00 | 8.72 | 100 | 160 | VERTICAL |
| 3 | 54.26 | 45.30 | -13.66 | 31.64 | 40.00 | 8.36 | 100 | 263 | VERTICAL |
| 4 | 90.94 | 53.60 | -17.23 | 36.37 | 43.50 | 7.13 | 210 | 132 | HORIZONTAL |
| 5 | 182.86 | 46.70 | -11.96 | 34.74 | 43.50 | 8.76 | 100 | 261 | VERTICAL |
| 6 | 400.00 | 41.80 | -6.73 | 35.07 | 46.00 | 10.93 | 241 | 165 | HORIZONTAL |

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain



### 3.2.8 AC Conducted Emissions

**Procedure:**

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

**Measurement Data:**

**Not Applicable (-This product is operated by DC)**

**Minimum Standard: FCC Part 15.207(a)/EN 55022**

| Frequency Range (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-Peak | Average |
| 0.15 ~ 0.5 | 66 to 56 * | 56 to 46 * |
| 0.5 ~ 5 | 56 | 46 |
| 5 ~ 30 | 60 | 50 |

* Decreases with the logarithm of the frequency

# APPENDIX

## TEST EQUIPMENT USED FOR TESTS

| | Description | Model No. | Serial No. | Manufacturer | Next Cal. Date |
|---|---|---|---|---|---|
| 1 | Spectrum Analyzer | FSV-30 | 100757 | R&S | Feb-11 |
| 2 | Spectrum Analyzer | 8563E | 3425A02505 | HP | Mar-11 |
| 3 | Spectrum Analyzer | 8594E | 3710A04074 | HP | Oct-11 |
| 4 | Signal Generator | 8648C | 3623A02597 | HP | Mar-11 |
| 5 | Signal Generator | 83711B | US34490456 | HP | Mar-11 |
| 6 | Attenuator (3dB) | 8491A | 37822 | HP | Oct-11 |
| 7 | Attenuator (10dB) | 8491A | 63196 | HP | Oct-11 |
| 8 | EMI Test Receiver | ESCI7 | 100722 | R&S | Jun-11 |
| 9 | Horn Antenna(18 ~ 40GHz) | SAS-574 | 154 | Schwarzbeck | Nov-12 |
| 10 | Horn Antenna(18 ~ 40GHz) | SAS-574 | 155 | Schwarzbeck | Nov-12 |
| 11 | RF Amplifier | 8447D | 2949A02670 | HP | Oct-11 |
| 12 | RF Amplifier | 8449B | 3008A02126 | HP | Mar-11 |
| 13 | Test Receiver | ESHS10 | 828404/009 | R&S | Mar-11 |
| 14 | TRILOG Antenna | VULB 9160 | 9160-3212 | SCHWARZBECK | Apr-11 |
| 15 | Log.-Per. Antenna | VULP 9118 | 9118 A 401 | SCHWARZBECK | Apr-11 |
| 16 | Biconical Antenna | BBA 9106 | VHA 9103-2315 | SCHWARZBECK | Apr-11 |
| 17 | Horn Antenna | 3115 | 00055005 | ETS LINDGREN | Mar-11 |
| 18 | Horn Antenna | BBHA 9120D | 9120D122 | SCHWARZBECK | Dec-10 |
| 19 | Dipole Antenna | VHA9103 | 2116 | SCHWARZBECK | Nov-12 |
| 20 | Dipole Antenna | VHA9103 | 2117 | SCHWARZBECK | Nov-12 |
| 21 | Dipole Antenna | VHA9105 | 2261 | SCHWARZBECK | Nov-12 |
| 22 | Dipole Antenna | VHA9105 | 2262 | SCHWARZBECK | Nov-12 |
| 23 | Hygro-Thermograph | THB-36 | 0041557-01 | ISUZU | Mar-11 |
| 24 | Splitter (SMA) | ZFSC-2-2500 | SF617800326 | Mini-Circuits | - |
| 25 | RF Switch | MP59B | 6200414971 | ANRITSU | - |
| 26 | Power Divider | 11636A | 6243 | HP | Oct-11 |
| 27 | DC Power Supply | 6622A | 3448A03079 | HP | Oct-11 |
| 28 | Frequency Counter | 5342A | 2826A12411 | HP | Mar-11 |
| 29 | Power Meter | EPM-441A | GB32481702 | HP | Mar-11 |
| 30 | Power Sensor | 8481A | US41030291 | HP | Oct-11 |
| 31 | Audio Analyzer | 8903B | 3729A18901 | HP | Oct-11 |
| 32 | Modulation Analyzer | 8901B | 3749A05878 | HP | Oct-11 |
| 33 | TEMP & HUMIDITY Chamber | YJ-500 | LTAS06041 | JinYoung Tech | Oct-11 |
| 34 | LOOP-ANTENNA | FMZB 1516 | 151602/94 | SCHWARZBECK | Mar-11 |
| 35 | Stop Watch | HS-3 | 601Q09R | CASIO | Mar-11 |
| 36 | LISN | ENV216 | 100408 | R&S | Oct-11 |