LTA
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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

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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

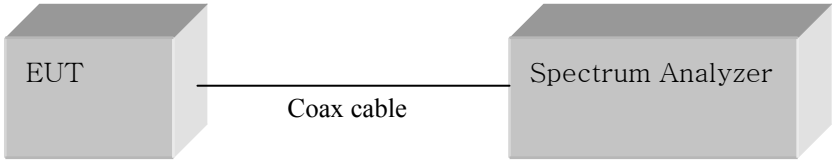
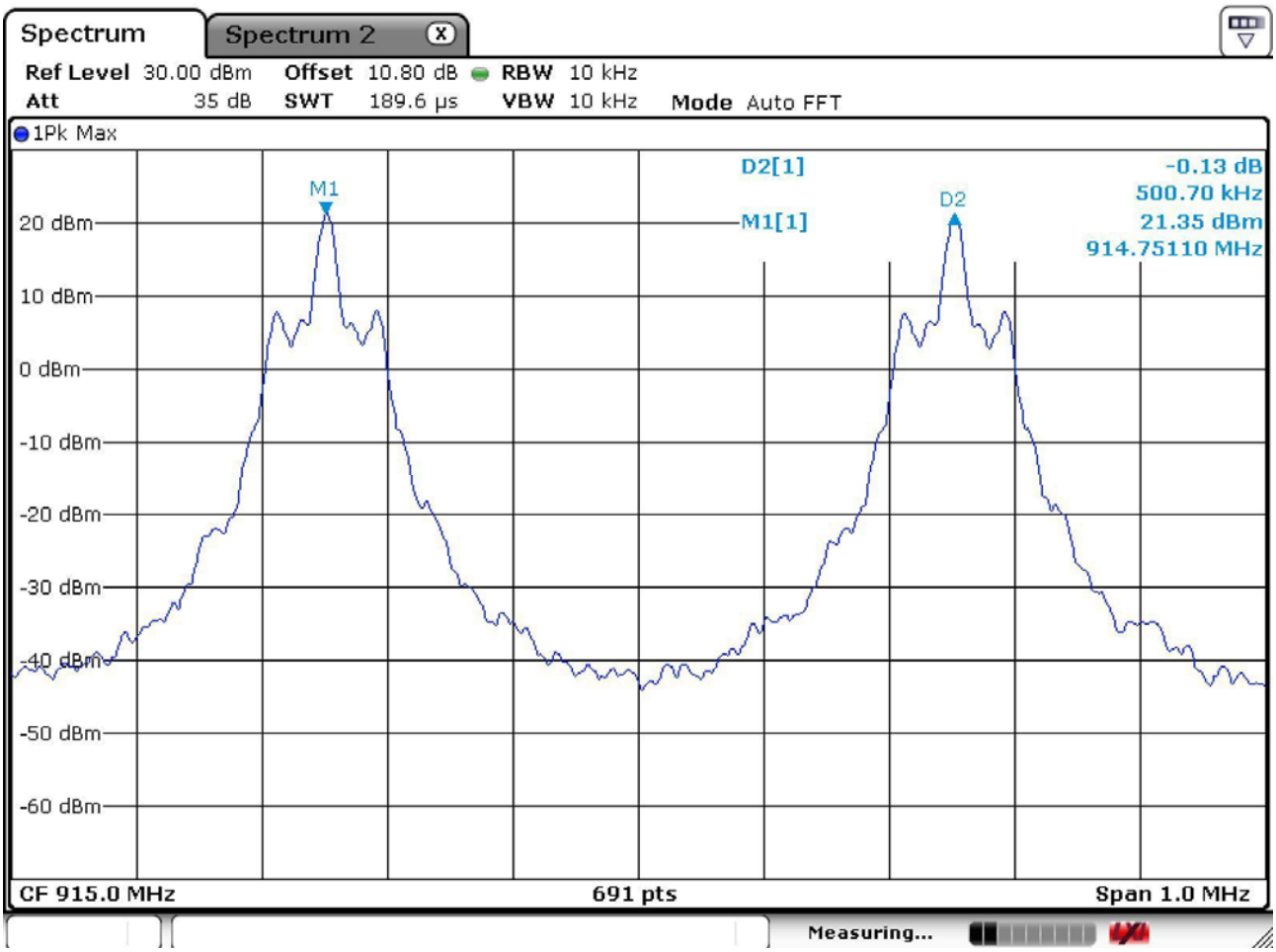


Figure 1: Measurement setup for the carrier frequency separation

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.

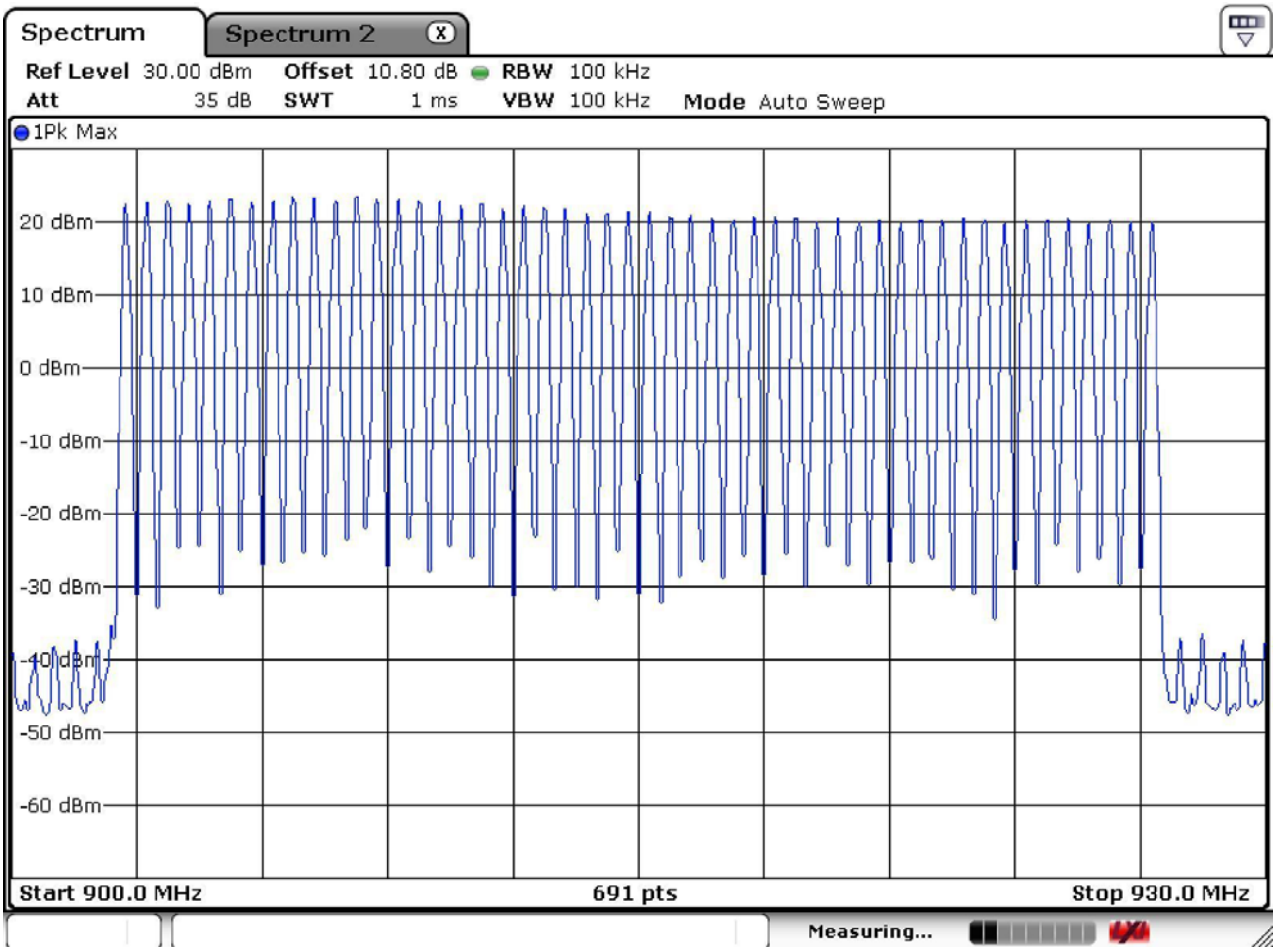
Minimum Standard:

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:

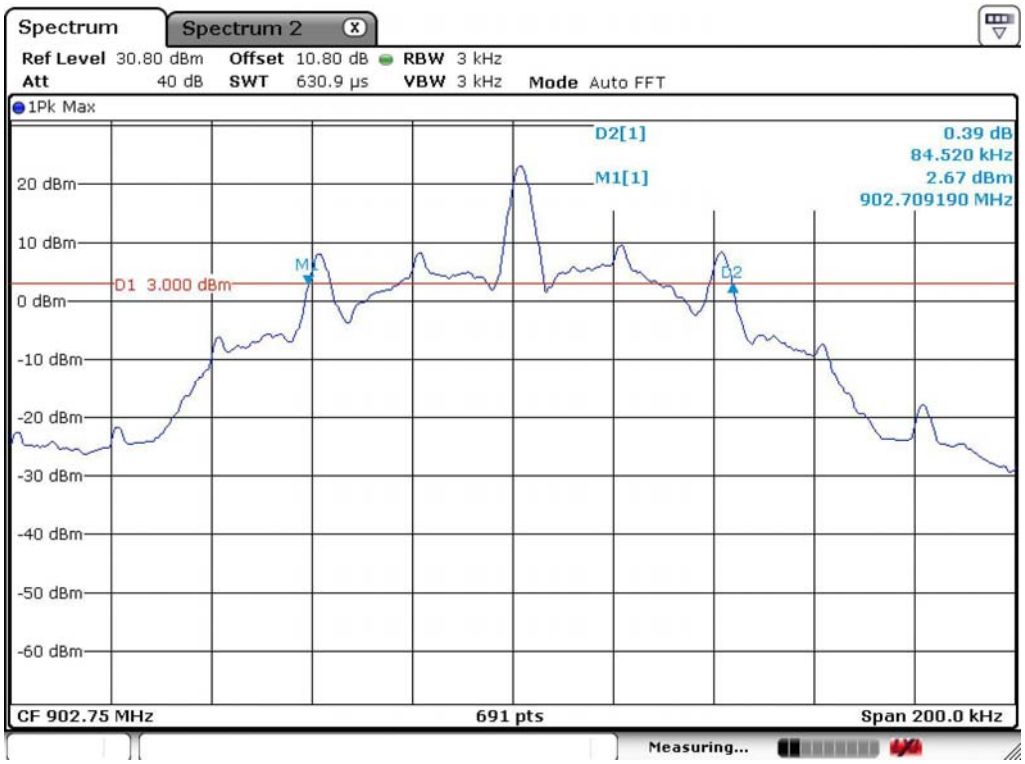
-

Measurement Setup

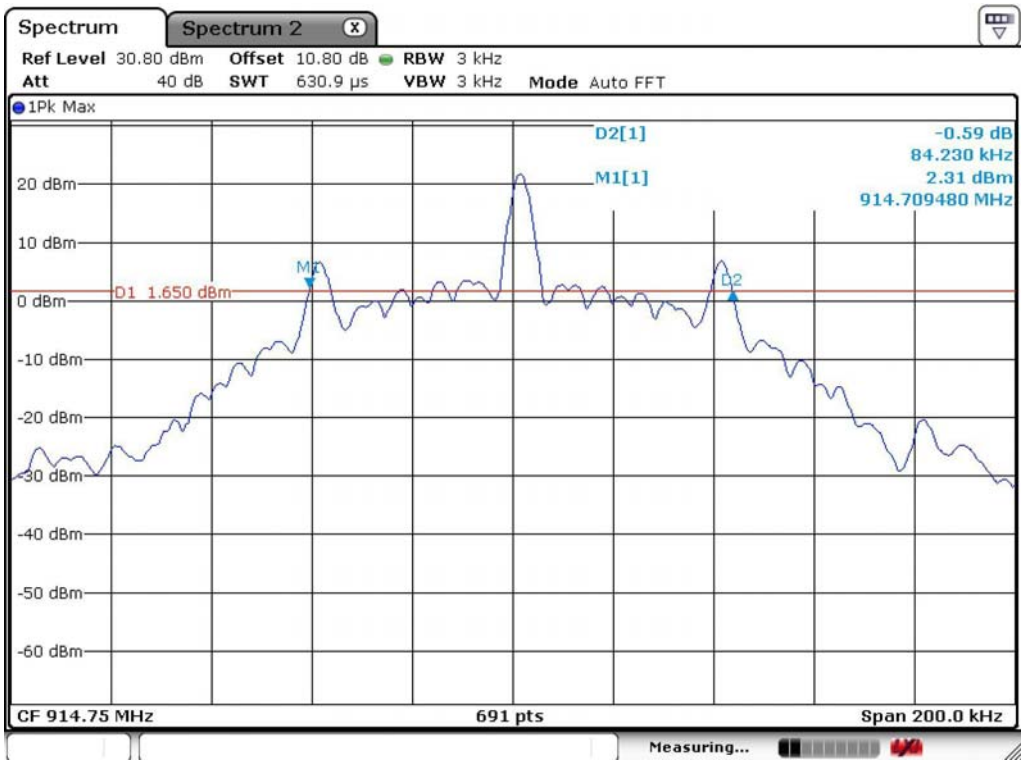
Same as the Chapter 3.2.1 (Figure 1)

20 dB Bandwidth

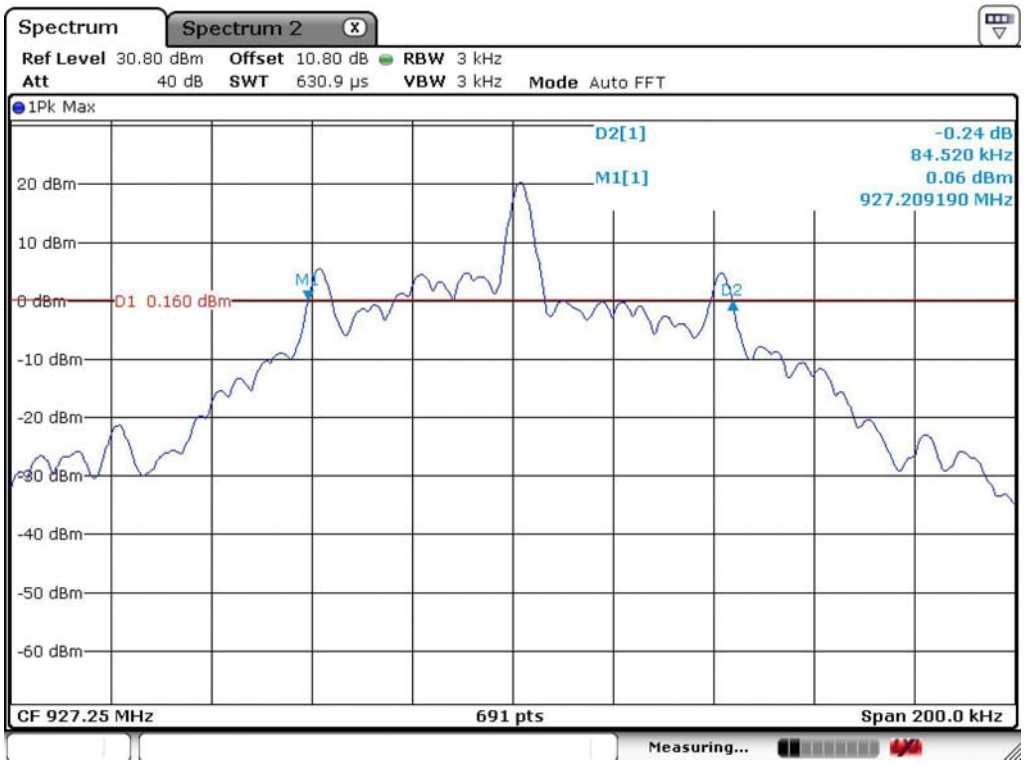
Low Channel



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

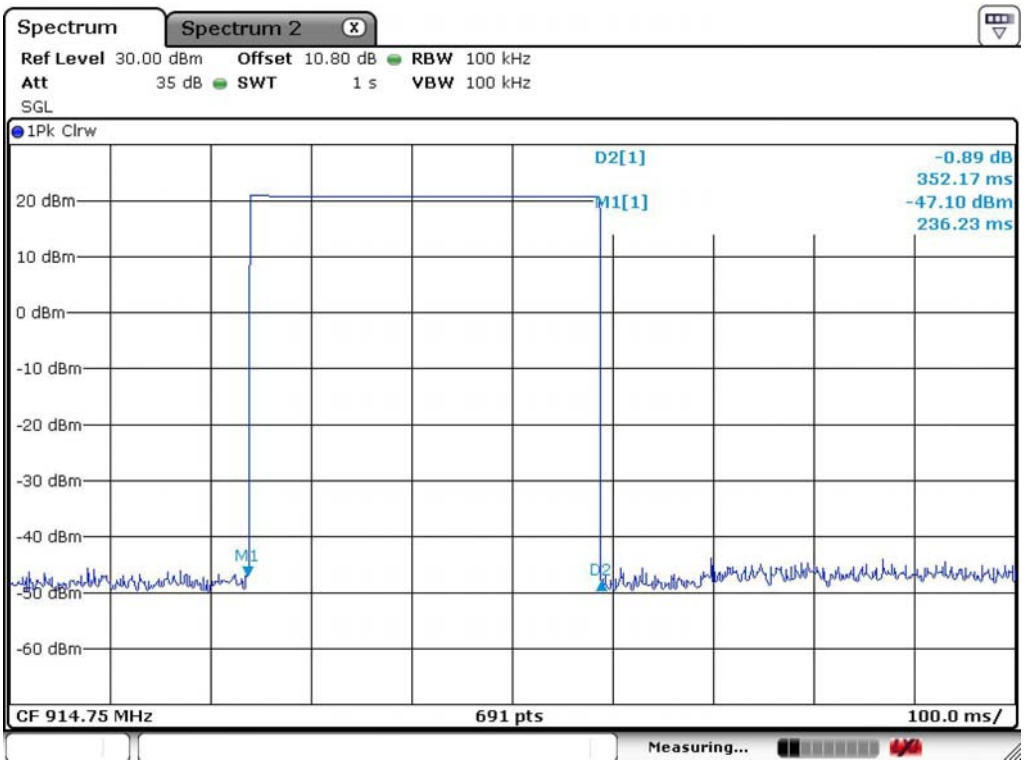
- See next pages for actual measured spectrum plots.

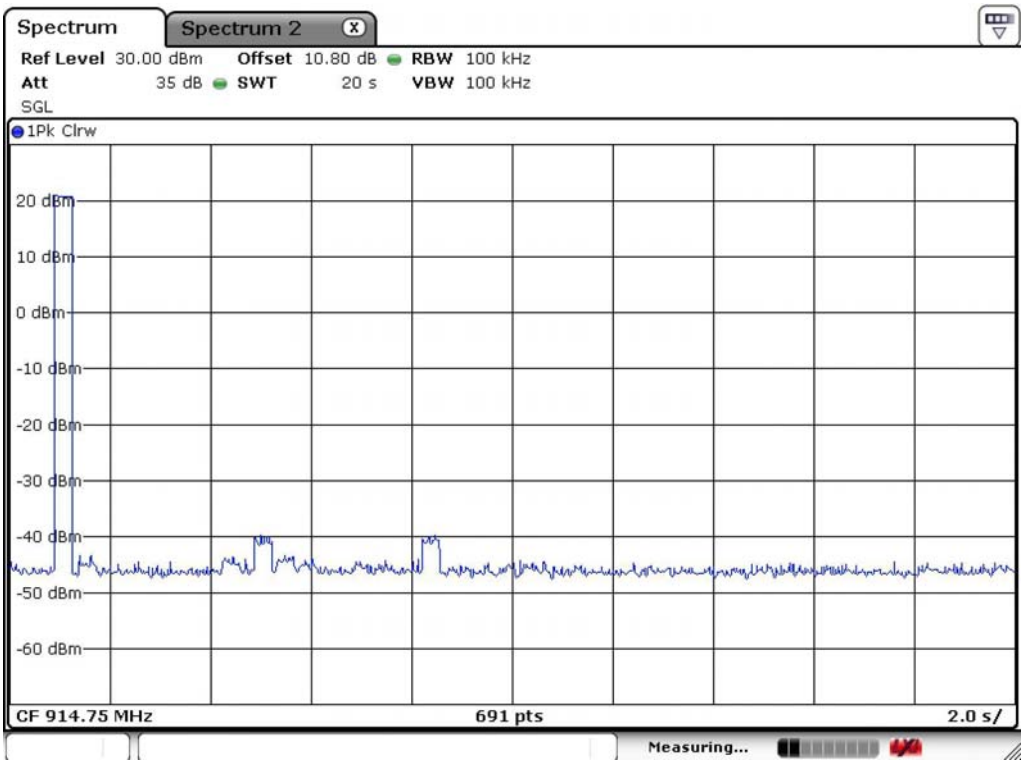
Minimum Standard:

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.

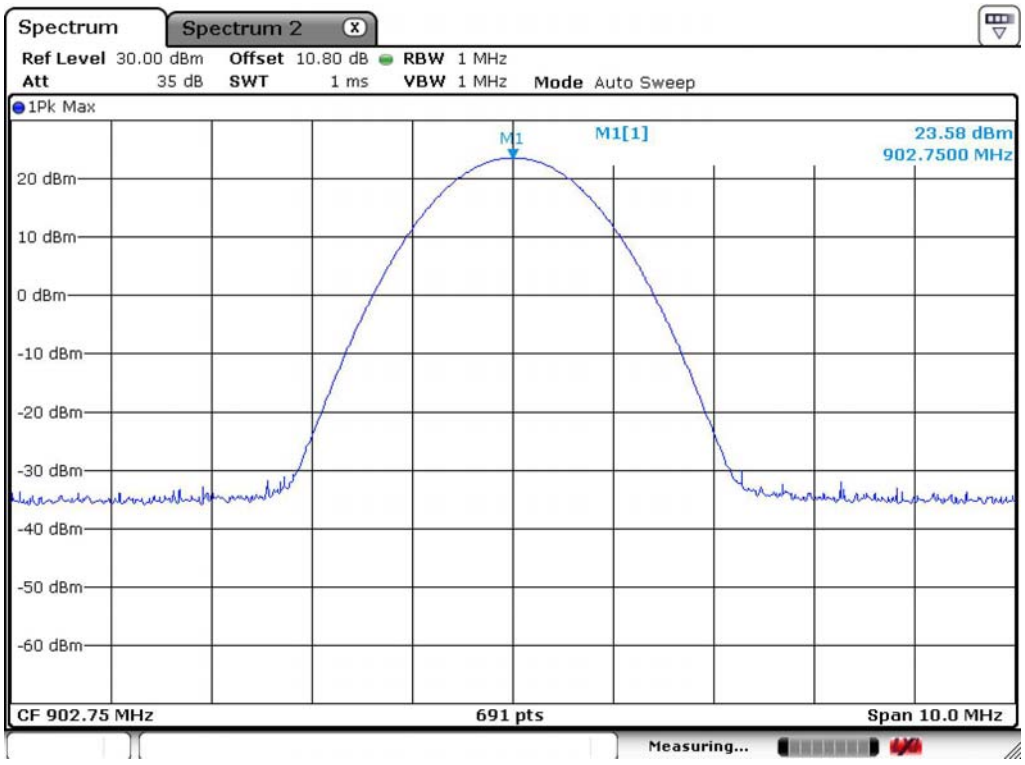
Minimum Standard:	< 1W

Measurement Setup

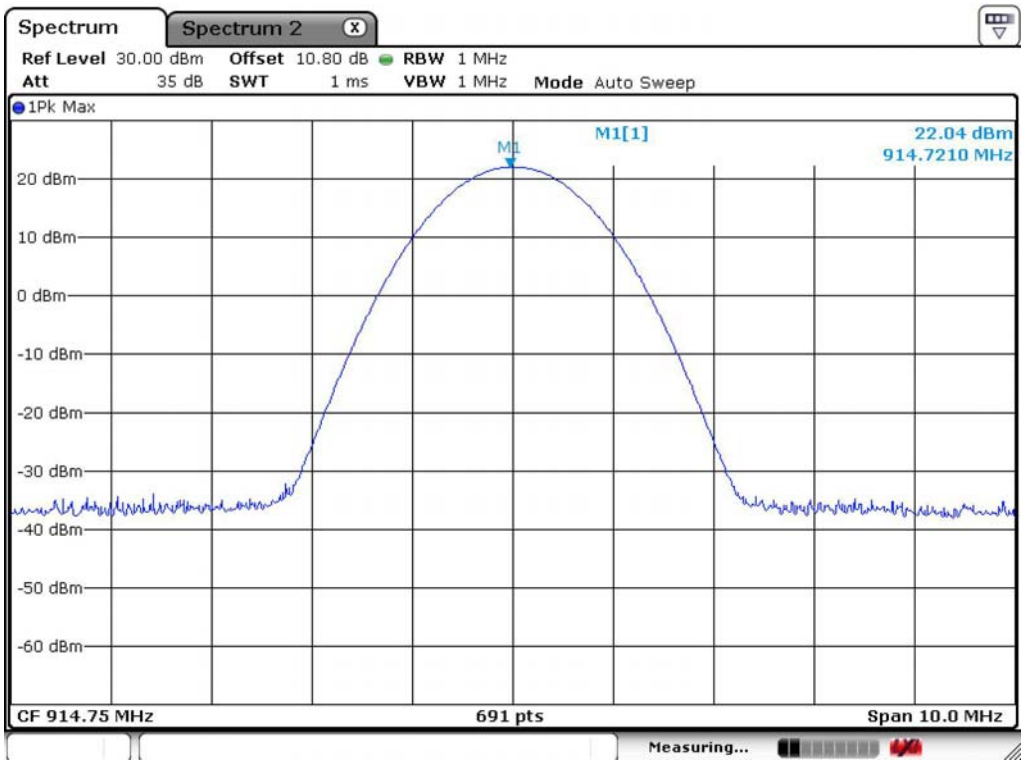
Same as the Chapter 3.2.1 (Figure 1)

Peak Output Power

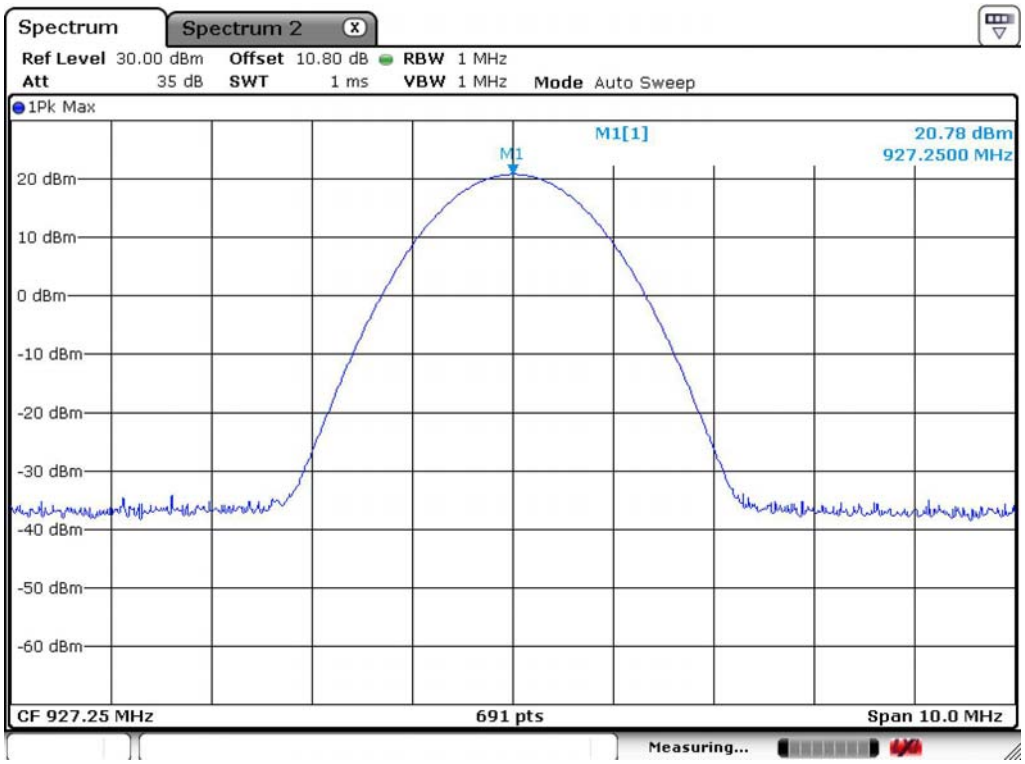
Low Channel



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

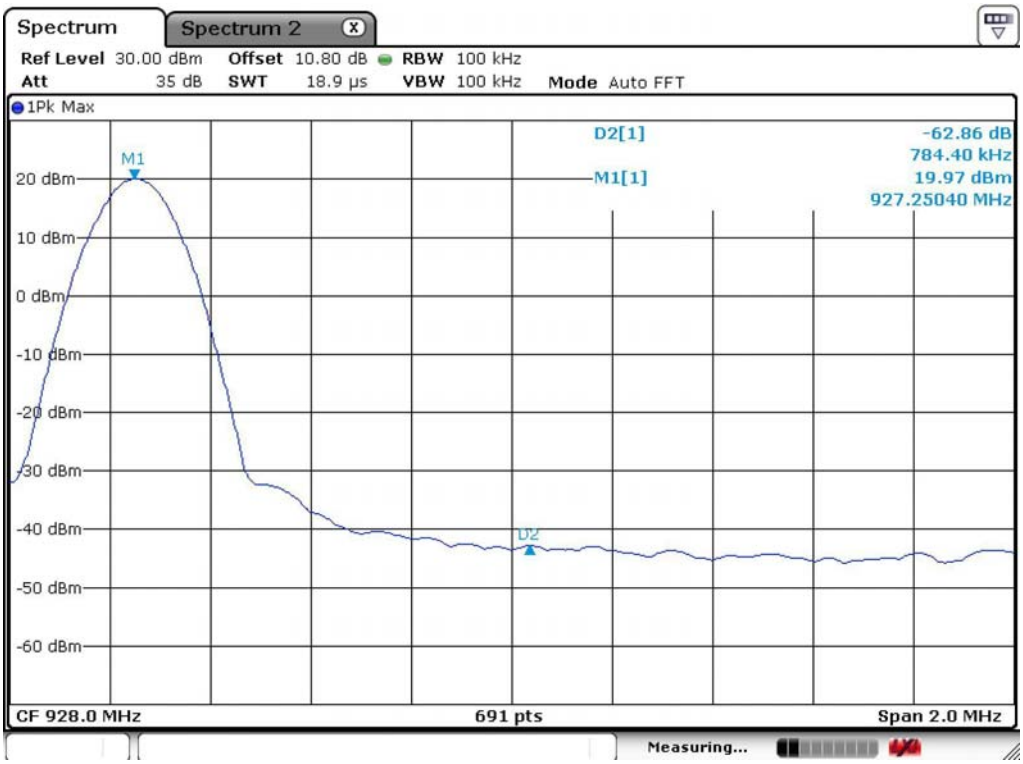
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

Minimum Standard:	> 20 dBc

Measurement Setup

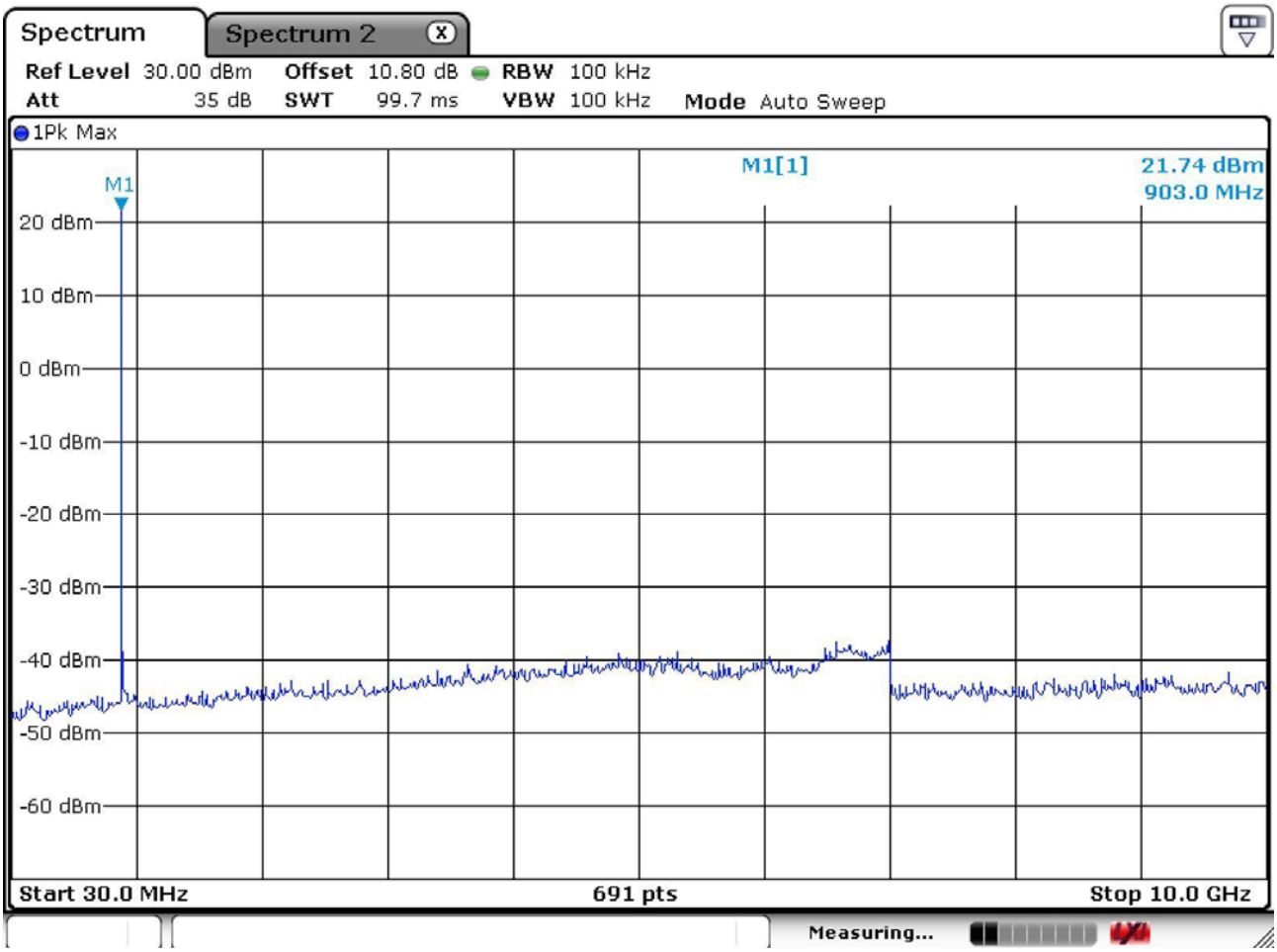
Same as the Chapter 3.2.1 (Figure 1)

Band - edge



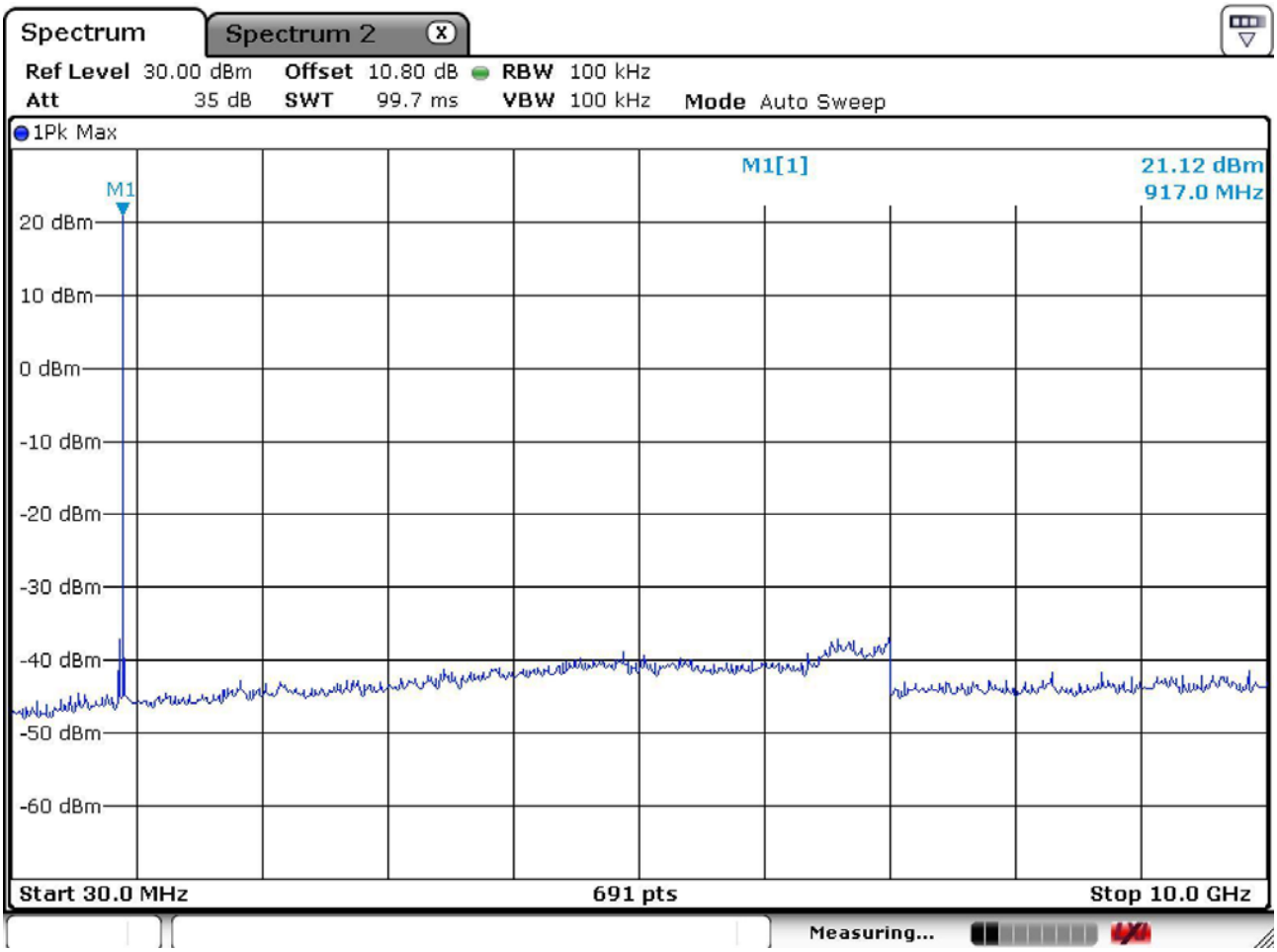
Band - edge (at 20 dB blow) – Low channel

Frequency Range = 30 MHz ~ 10th harmonic.



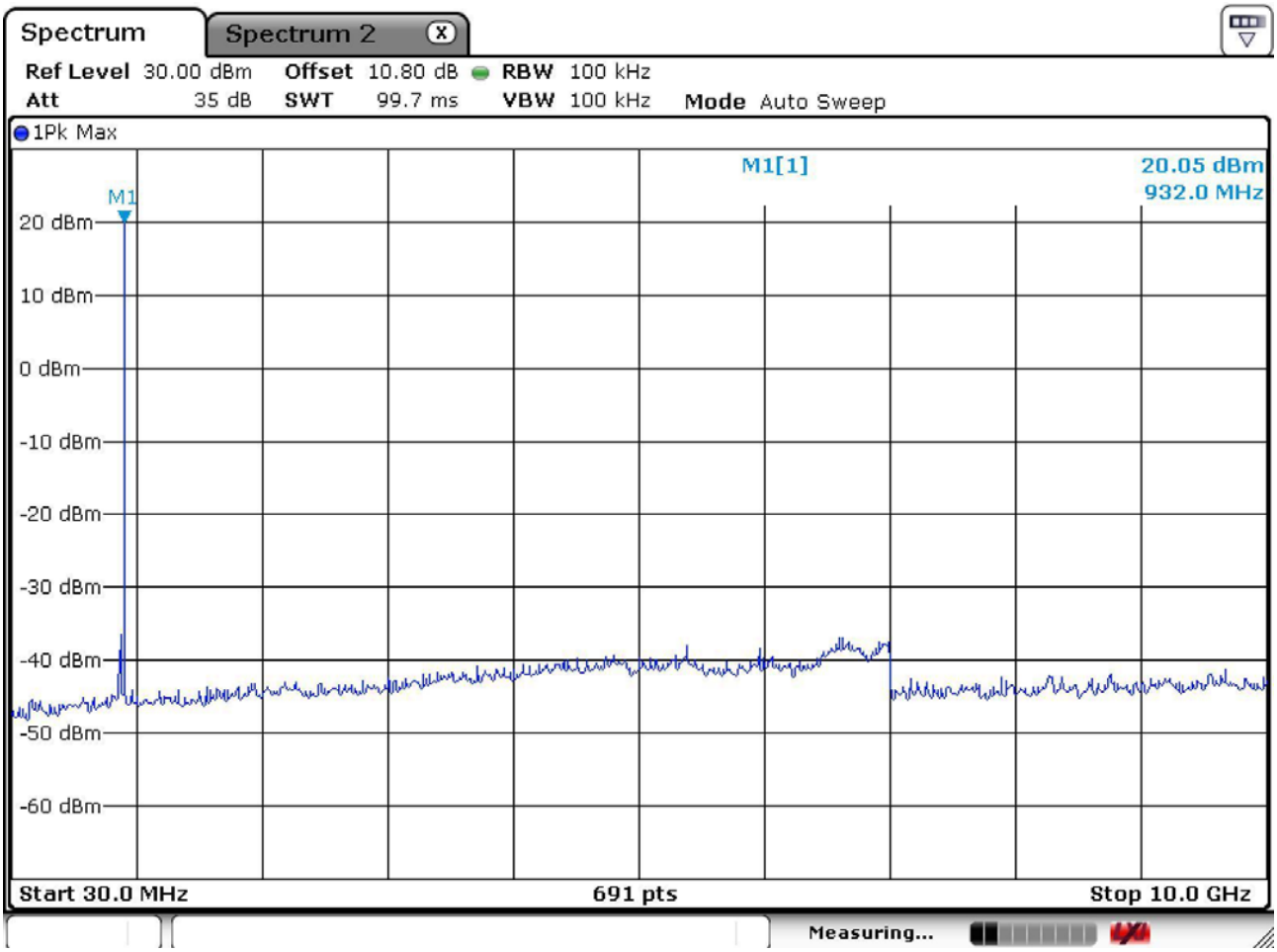
Band - edge (at 20 dB blow) – Mid channel

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 ~ 10th harmonic.

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

= 1 MHz (1 GHz ~ 10th 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 / Peak		Pol.	Correction Factor Antenna	Amp.Gain	Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / 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 / Peak		Pol.	Correction Factor Antenna	Amp.Gain	Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / 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 / Peak		Pol.	Correction Factor Antenna	Amp.Gain	Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / 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
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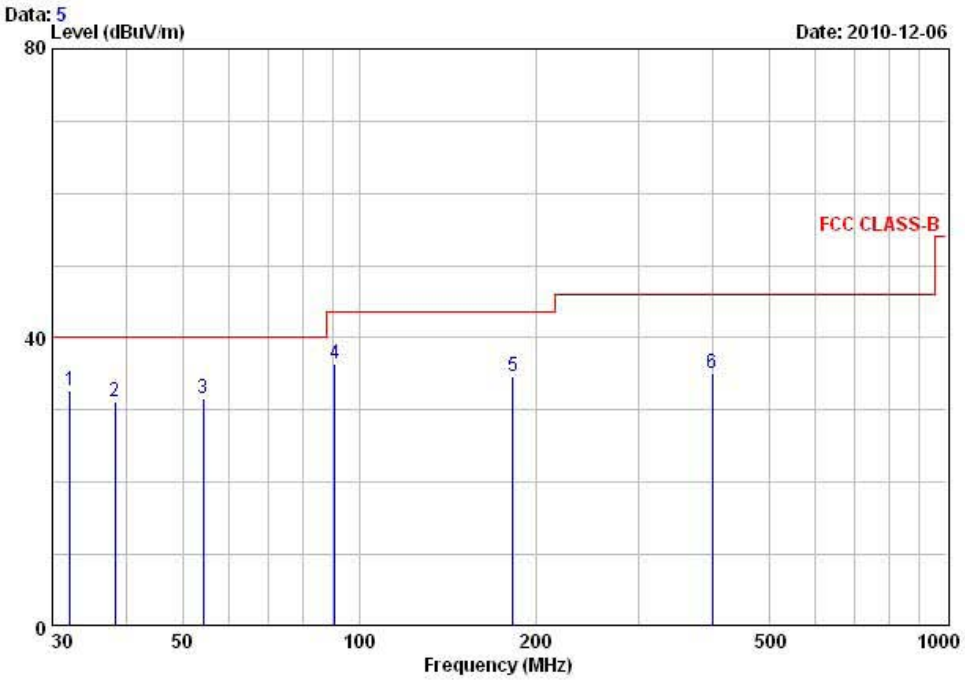
Fax:+82-31-3236010

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