TEST REPORT

Report Number		**RAPA11-O-089**
Type of Equipment		**Wireless Remote Control**
Model Name		**GMR-FW**
FCC ID		**U88-GMR-FW**
Applicant	**Name**	**GS Instruments Co., Ltd.**
	Logo	GSI
	Address	**1385-14, Juan-dong, Nam-gu, Incheon, Korea, 402-200**
Manufacturer	**Name**	**GS Instruments Co., Ltd.**
	Address	**1385-14, Juan-dong, Nam-gu, Incheon, Korea, 402-200**
Date of reception		**March 14, 2011**
Date of test		**March 28, 2011 to April 14, 2011**
Date of issue		**April 15, 2011**
Total Page		**16 pages (including this page)**

SUMMARY

The equipment complies with FCC Part 15.231 : Periodic operation in the band 40.66 - 40.70 MHz and above 70 MHz

This test report contains only the results of a single test of the sample supplied for the examination.
It is not a general valid assessment of the features of the respective products of the mass-production.

Date : April 15, 2011

Tested by **Chang Young, Choi**
Duputy General Manager

Date : April 15, 2011

Reviewed by **Sukil, Park**
Executive Managing Director

CONTENTS

1. General description of EUT

1.1 Applicant

- Company name : GS Instruments Co., Ltd.
- Address : 1385-14, Juan-dong, Nam-gu, Incheon, Korea, 402-200
- Contact person : Chul Kwon
- Phone/Fax : 82-32-870-5579 / 82-32-870-5842

1.2 Manufacturer

- Company name : GS Instruments Co., Ltd.
- Address : 1385-14, Juan-dong, Nam-gu, Incheon, Korea, 402-200
- Contact person : Chul Kwon
- Phone / Fax : 82-32-870-5579 / 82-32-870-5842

1.3 Basic description of EUT

- Product name : Wireless Remote Control
- Model name : GMR-FW
- Serial number : Not available(Proto Type)
- Frequency : 315.1 MHz
- Channel number : 1 Channel
- Modulation method : FSK
- FCC Rule Part(s) : FCC Part 15 Subpart C Section 15.231
- FCC classification : DSC / Part 15 Security/Remote control Transmitter
- Date of test : March 28, 2011 to April 14, 2011
- Date of issue : April 15, 2011
- Place of test : Head office

  C-3601, Dongil Technotown, 889-1, Gwanyang-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea, 483-060

  Open area test site

  80, Jeil-ri, Yangji-myun, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-825

  (FCC Registration Number : 337229)

  (IC Submission Number : 143881)

  (KCC Designation Number : KR0027)

1.4 Technical specification of EUT

Product Name	Wireless Remote Control
Origin	Korea
Size	377 x 87 x 48 mm (L x W x H)
Material	PC + ABS
Outlet	4 Outlets (1 Master / 3 Slaves)
Power Rate	110 V / 10 A @ 60 Hz
Maxim Standby Power SET Range	5 mA ~ 10 A
Outlet Power Consumption	0.3 W (Outlet ON/OFF)
Cable Cord Length	5 ft

2. General information of test

2.1 Standard for measurement methods

Applied Standard : 47 CFR Part 15, Subpart C			
FCC Rule	**Description of Test**	**Limit**	**Result**
15.207	Conducted Emission(dBμV/m)	Various	N/A[note 1]
15.231(a)	Transmission Time(s)	5	Pass
15.231(b)	Field Strength of Fundamental(dBμV/m)	95.63(Peak) / 75.63(AV)	Pass
15.231(b) and 15.209	Radiated Emission(dBμV/m)	75.63(Peak) / 55.63(AV)	Pass
15.231(c)	20 dB Bandwidth(kHz)	787.75	Pass

Note1 : This equipment is battery operated.

2.2 Description of EUT modification

During the test, there was no mechanical or circuitry modification to improve RF and spurious characteristic, and any RF and spurious suppression device(s) was not added against the device tested.

2.3 Description of test system

• Type of peripheral equipment used

Description	Model Name	Serial No.	Manufacturer	FCC ID
EUT	GMR-FW	N/A	GS Instruments	U88-GMR-FW

• Type of cable used

Device from	Device to	Type of Cable	Cable Number	Length
-	-	-	-	-

3. Measurement data

3.1 Transmission time

3.1.1 Definitions

A transmission time is a switching time that will automatically deactivate the transmission of transmitter of EUT.

3.1.2 Specification

FCC Rules Part 15, Subpart C, Section 15.231(a)(1)

3.1.3 Measurement method

The device output is connected to the spectrum analyzer.

3.1.4 Set-Up

3.1.5 Test equipment list

Equipment	Model Name	Manufacture
EUT	GMR-FW	GS Instruments
Spectrum Analyzer	ESPI7	Rohde & Schwarz

3.1.6 Test procedure

Spectrum analyzer setting;

Center Frequency : 315.1 MHz
Span : Zero
RBW : 30 kHz
VBW : 100 kHz
Sweep time : 10 s
Detect Mode : Peak

3.1.7 Test condition

Test place : Shield Room
Test mode : Normal Operation
Test environment : 22 ℃, 53 %R.H.

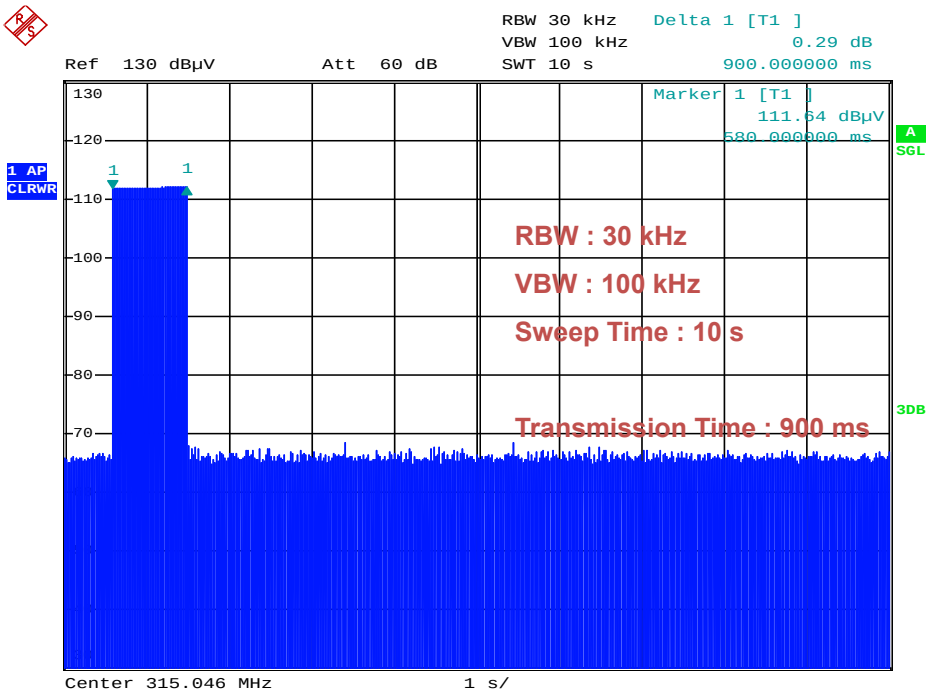
3.1.8 Test result

Frequency (MHz)	Transmission Time (s)	Limit (s)
315.1	0.9	5.0

3.1.9 Limit

Less than 5 seconds.

3.1.10 Plots of transmission time



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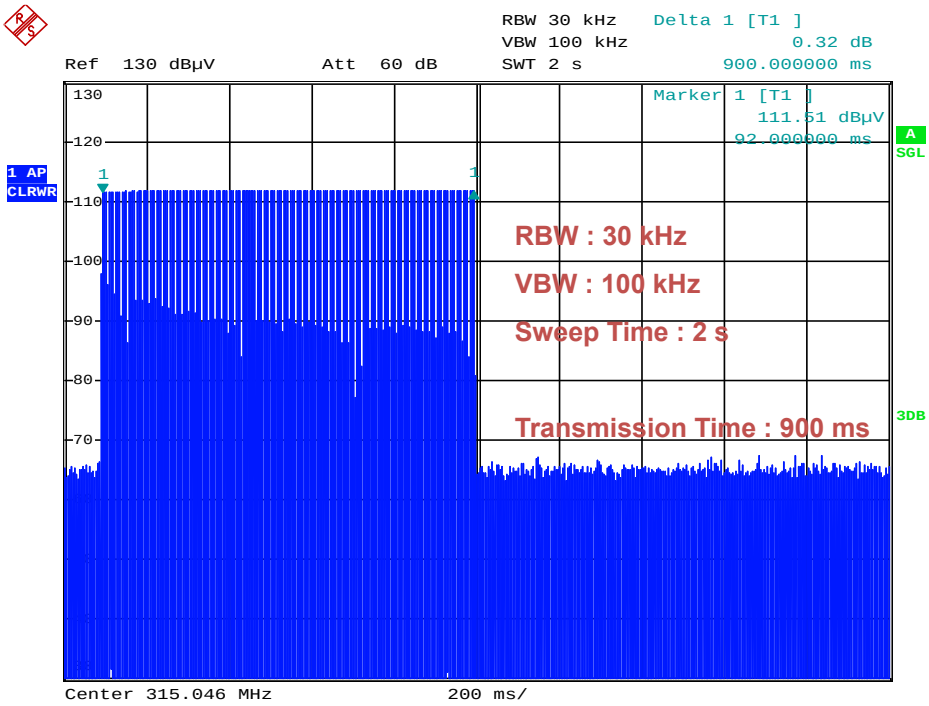

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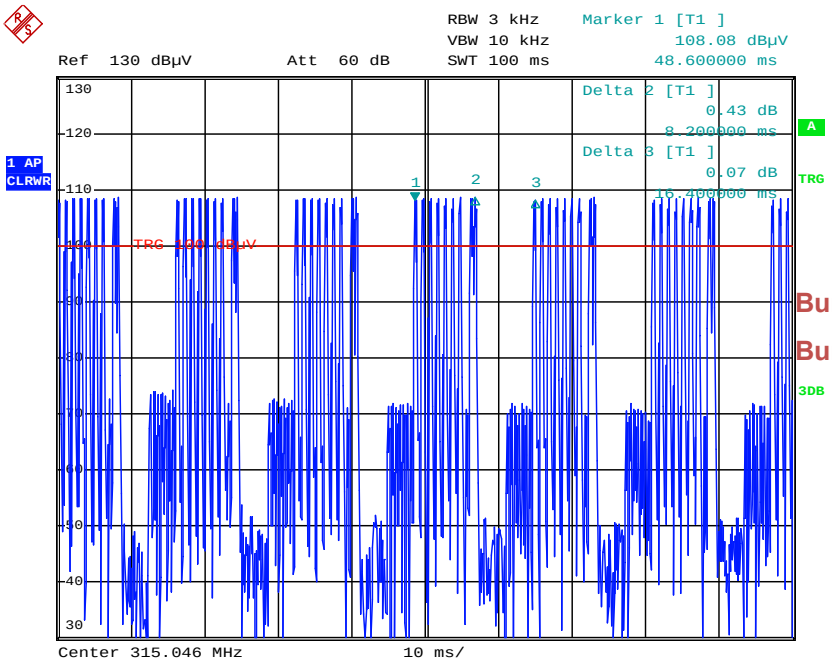
3.1.11 Average correction factor



Burst Width : 8.2 ms

Burst Repetition Period : 16.4 ms

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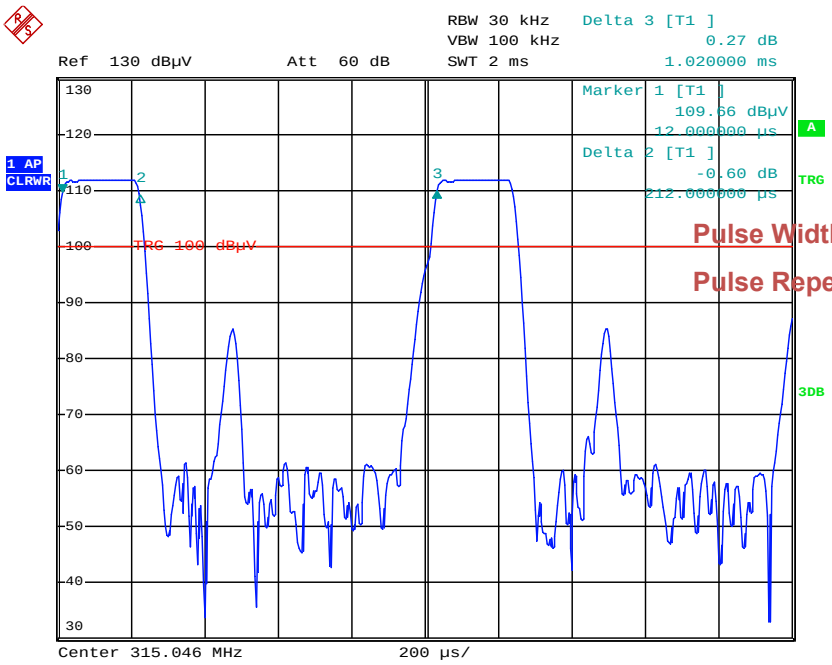

Pulse Width : 0.212 ms

Pulse Repetition Period : 1.020 ms

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$$\text{Average Factor} = 20\log\left[\frac{\text{Burst Duration}}{\text{Burst Period}} \times \frac{\text{Pulse Duration}}{\text{Pulse Period}}\right]\text{dB}$$

$$\text{Average Factor} = 20\log\left[\frac{0.212\ \text{ms}}{1.020\ \text{ms}} \times \frac{8.2\ \text{ms}}{16.4\ \text{ms}}\right]\text{dB} = -19.67\ \text{dB}$$

3.2 Field strength of fundamental

3.2.1 Definitions

A field strength of fundamental is a emission from the equipment when transmitting into a non-radiating load on frequency that fundamental of equipment.

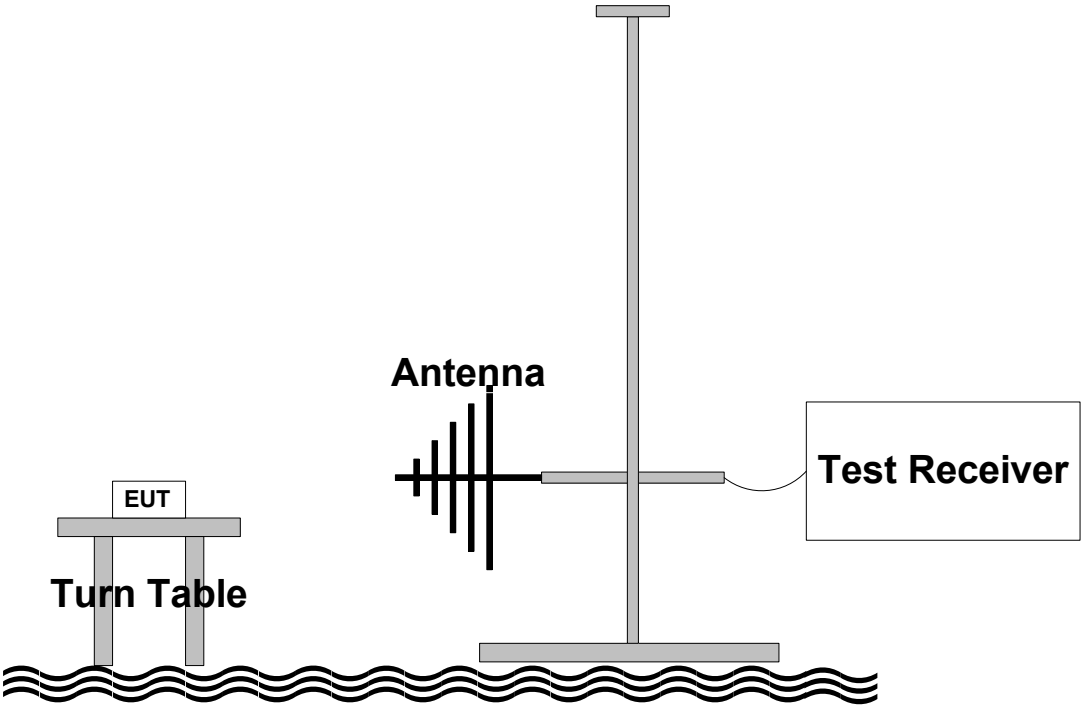
3.2.2 Specification

FCC Rules Part 15, Subpart C, Section 15.231(b)

3.2.3 Measurement method

ANSI/TIA-603-D-2010 Section 2.2.17

3.2.4 Set-Up



3.2.5 Test equipment list

Equipment	Model Name	Manufacturer
EUT	GMR-FW	GS Instruments
Test Receiver	ESPI7	Rohde & Schwarz
Log Periodic Antenna	VULP9118A	Schwarzbeck
Pre-Amplifier	SCU01	Rohde & Schwarz

3.2.6 Test procedure

The EUT is placed on a turntable, which is 0.8 meter high above ground.
The turntable rotates 360 degrees to determine the position of the maximum emission level.
EUT is set 3.0 meters away from the receiving antenna, broadband antenna, which is mounted on an antenna mast.
The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level form the EUT. Both horizontal and vertical polarizations of the antenna are set on measurement.
In order to find out the maximum emission levels, all of the EUT location were manipulated according to ANSI 63.4 during the radiated emission measurement.
The EUT was tested in 3 orthogonal planes.

3.2.7 Test condition

Test place : Open area test site
Test mode : Normal operation
Test environment : 18 ℃, 59 % R.H.

3.2.8 Test result

Frequency [MHz]	Polarization [H/V]	Detect Mode [Peak/AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	AVG Factor [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
315.10	H	Peak	96.48	13.33	3.44	-	21.94	91.31	95.63	4.32
		*AVG	47.81			19.67		71.64	75.63	3.99
	V	Peak	84.88			-		79.71	95.63	15.92
		*AVG	37.01			19.67		60.04	75.63	15.59

Here, * : all the average value are applied with average factor.

3.2.9 Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental (μV/m)	Field Strength of Fundamental (dBμV/m)
40.66 – 40.70	2 250	67.04
70 – 130	1 250	61.94
130 – 174	1 250 to 3 750	61.94 to 71.48
174 – 260	3 750	71.48
260 – 470	3 750 to 12 500	71.48 to 81.94
Above 470	12 500	81.94

Here, Average value is less than 6 045.8 μV/m(75.63 dBμV/m) at 315.1 MHz and
Peak is less than 60 458 μV/m(95.63 dBμV/m) at 315.1 MHz.

3.3 Radiation emission of spurious

3.3.1 Definitions

A field strength of fundamental is a emission from the equipment when transmitting into a non-radiating load on frequency or frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

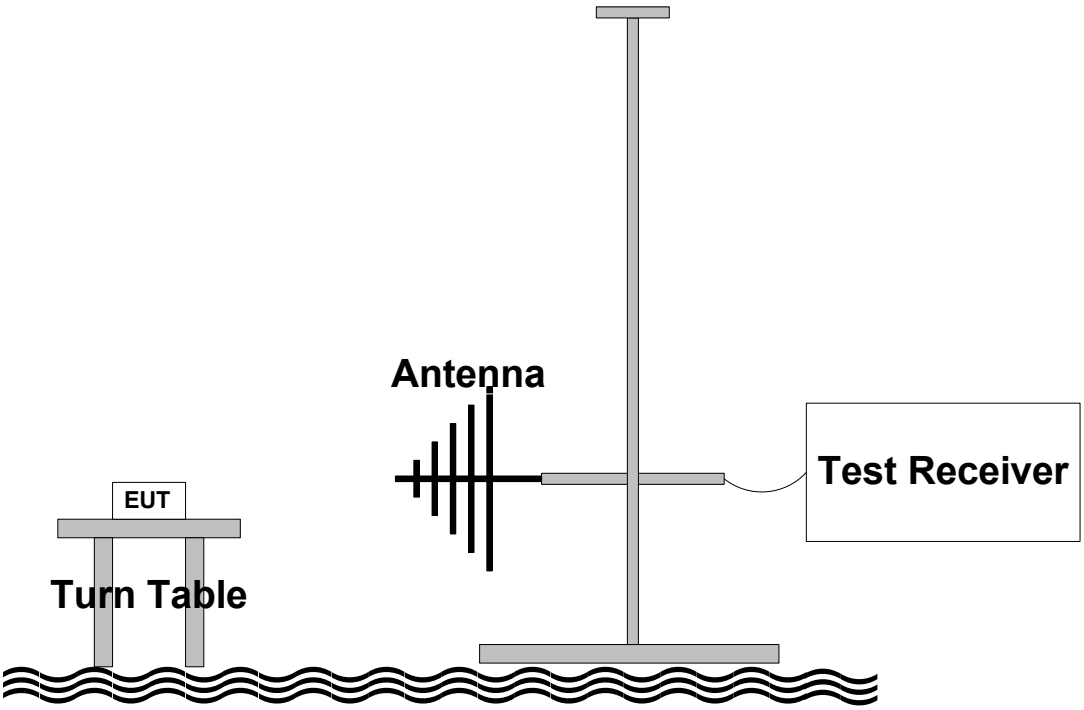
3.3.2 Specification

FCC Rules Part 15, Subpart C, Section 15.231(b)

3.3.3 Measurement method

ANSI/TIA-603-D-2010 Section 2.2.17

3.3.4 Set-Up



3.3.5 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	GMR-FW	GS Instruments
Test Receiver	ESPI7	Rohde & Schwarz
Loop Antenna	EMCO 6502	EMCO
Bi-conical Antenna	VHA9103	Schwarzbeck
Log Periodic Antenna	VULP9118A	Schwarzbeck
Horn Antenna	BBHA-9120D	Schwarzbeck
Pre-Amplifier	SCU01	Rohde & Schwarz

3.3.6 Test procedure

The EUT is placed on a turntable, which is 0.8 meter high above ground.
The turntable rotates 360 degrees to determine the position of the maximum emission level.
EUT is set 3.0 meters away from the receiving antenna, broadband antenna, which is mounted on an antenna mast.
The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level form the EUT. Both horizontal and vertical polarizations of the antenna are set on measurement.
In order to find out the maximum emission levels, all of the EUT location were manipulated according to ANSI 63.4 during the radiated emission measurement.
The EUT was tested in 3 orthogonal planes.
The bandwidth of test receiver is set at 120 kHz between 30 to 1 000 MHz, and 1 MHz between 1 to 4 GHz.

3.3.7 Test condition

Test place : Open area test site
Test mode : Normal operation
Test environment : 18 ℃, 59 % R.H.

3.3.8 Test result

Frequency [MHz]	Polarization [H/V]	Detect Mode [Peak/QP/ AVG]	Reading [dBμV]	Antenna Factor [dB/m]	Cable Loss [dB]	AVG Factor [dB]	Pre-Amp Gain [dB]	Emission Level [dBμV]	Limit [dBμV]	Margin [dB]
≤ 30 MHz / The emissions are attenuated more than more than 40 dB below the permissible limits the field strength is too small to be measured.										
48.36	H	Peak	35.45	10.30	1.47	-	22.09	25.13	75.63	50.50
		***AVG	20.15			-		9.83	55.63	45.80
	V	Peak	42.25			-		31.93	75.63	43.70
		***AVG	26.65			-		16.33	55.63	39.30
*125.10	H	QP	39.65	11.02	2.41	-	22.15	30.93	43.52	12.59
	V	QP	38.55			-		29.83	43.52	13.69
**630.20	H	Peak	37.90	19.35	6.30	-	21.48	42.07	75.63	33.56
		***AVG	18.23			19.67		22.40	55.63	33.23
	V	Peak	59.20			-		63.37	75.63	12.26
		***AVG	39.53			19.67		43.70	55.63	11.93
**945.30	H	Peak	26.24	23.12	8.24	-	20.93	36.67	75.63	38.96
		***AVG	6.57			19.67		17.00	55.63	38.63
	V	Peak	30.24			-		40.67	75.63	34.96
		***AVG	10.57			19.67		21.00	55.63	34.63
≥ 1 GHz / The emissions are attenuated more than more than 40 dB below the permissible limits the field strength is too small to be measured.										

Here, * is restricted frequency, ** is harmonic frequency and *** is the average value applied with average factor.

3.3.9 Limit

For intentional device, according to § 15.231(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following table.

Fundamental Frequency (MHz)	Field Strength of Spurious Emission (μV/m)	Field Strength of Spurious Emission (dBμV/m)
40.66 – 40.70	225	47.04
70 – 130	125	41.94
130 – 174	125 to 375	41.94 to 51.48
174 – 260	375	51.48
260 – 470	375 to 1 250	51.48 to 61.94
Above 470	1 250	61.94

Here, Average value is less than 604.58 μV/m(55.63 dBμV/m) at spurious emissions and
Peak is less than 6 045.8 μV/m(75.63 dBμV/m) at spurious emissions.

Except as provided elsewhere in this Subpart, in restricted bands, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	48.52 to 13.80	300
0.490 – 1.705	24000/F(kHz)	33.80 to 22.97	30
1.705 – 30.0	30	29.54	30
30 – 88	100	40.00	3
88 – 216	150	43.52	3
216 – 960	200	46.02	3
Above 470	500	53.98	3

Here, Restricted band is 123 – 138 MHz

3.4 20 dB Bandwidth

3.4.1 Definitions

A 20 dB Bandwidth is width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each lower 20 dB of the total mean power of a given emission

3.4.2 Specification

FCC Rules Part 15, Subpart C, Section 15.231(c)

3.4.3 Measurement methods

ANSI/TIA-603-B-2002 Section 2.2.11

3.4.4 Set-Up

3.4.5 Test equipment list

Equipment	Model Name	Manufacturer
EUT	GMR-FW	GS Instruments
Spectrum Analyzer	ESPI7	Rohde & Schwarz

3.4.6 Test procedure

Spectrum Analyzer setting

Center Frequency : 315.1 MHz
Span : 0.5 MHz / 1 MHz
RBW : 9 kHz / 120 kHz
VBW : 30 kHz / 300 kHz
Detect Mode : Peak

3.4.7 Test condition

Test Place : Shield Room
Test Mode : Normal Operation
Test Environment : 22 ℃, 53 %R.H.

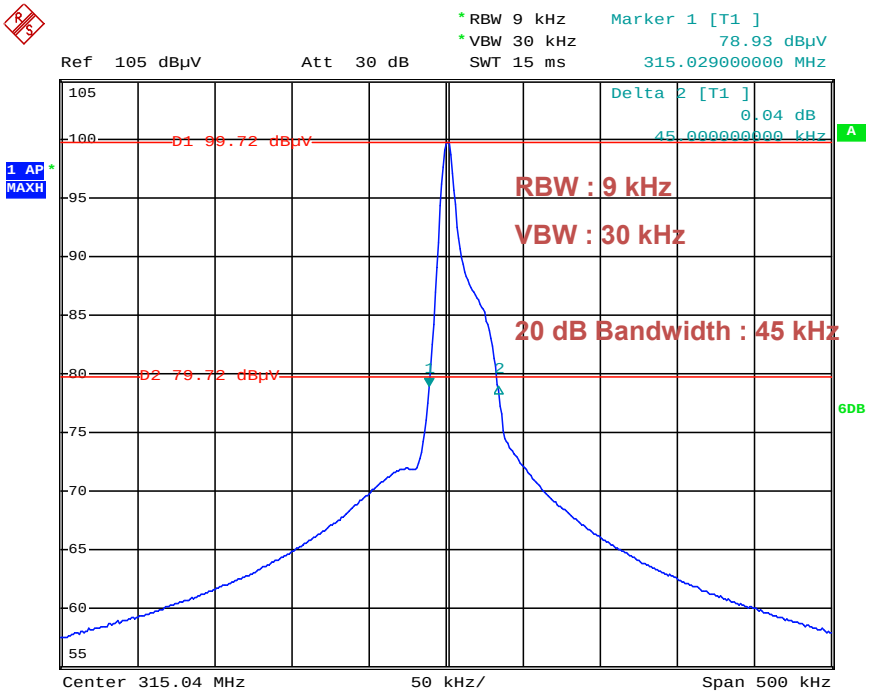
3.4.8 Test result

Frequency (MHz)	RBW (kHz)	Bandwidth (kHz)	Limit (kHz)	Limit (%)
315.1	9 kH	45	787.75	0.25
	120 kHz	560		

3.4.9 Limit

Less than 0.25 % (787.75 kHz).

3.4.10 plots of 20 dB bandwidth



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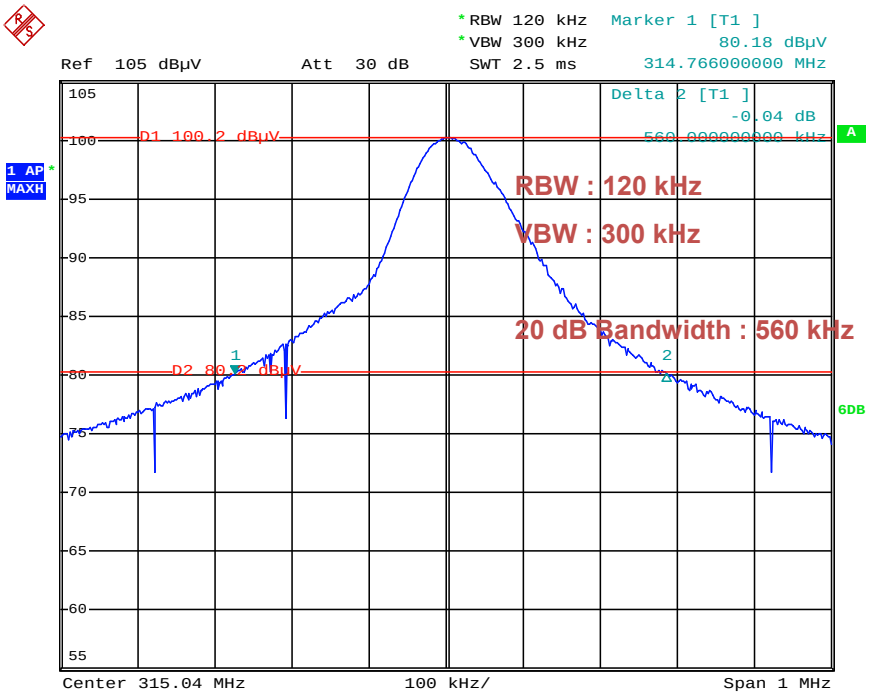

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4. Test equipments list

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

No.	Equipment	Model	Manufacturer	Serial Number	Calibration Due date
1	Receiver	ESPI7	Rohde & Schwarz	101002	07/02/11
2	Power Supply	E3633A	Agilent	SG400022272	10/02/11
3	Loop Antenna	6502	EMCO	9609-9087	03/03/12
4	Biconical Antenna	BBAK9137	Schwarzbeck	2217	02/23/12
5	Log-Periodic Antenna	VULP9118A	Schwarzbeck	382	02/23/12
6	Horn Antenna	BBHA 9120 D	Schwarzbeck	395	08/13/12
7	Pre-Amplifier	SCU01	Rohde & Schwarz	10020	09/28/12
8	Turn Table	N/A	Daeil EMC	N/A	N/A
9	Antenna Mast	EAM4.5	Daeil EMC	N/A	N/A
10	Controller	DE200	Daeil EMC	AAA69813111	N/A