

# TEST REPORT

of

## FCC Part 15 Subpart C and CANADA RSS-210

### Full Modular Approval

New Application;  Class I PC;  Class II PC

**Product :** 915MHz radio module

**Brand:** Datalogic ADC

**Model:** MIZAR RADIO MODULE 915MH

**Model Difference:** N/A

**FCC ID:** U4F0022

**IC:** 3862D-006

**FCC Rule Part:** §15.249

**IC Rule Part:** RSS-210 issue 8:2010, Annex 2.9

**Applicant:** Datalogic ADC S.r.l.

**Address:** Via San Vitalino 13 – 40012 Lippo di Calderara di Reno (BO) - Italy

#### Test Performed by:

#### International Standards Laboratory

<Lung-Tan LAB>

\*Site Registration No.

BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;

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Report No.: **ISL-13LR276FC**

Issue Date : **2014/02/07**



Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

This report MUST not be used to claim product endorsement by TAF, NVLAP or any agency of the Government.

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### VERIFICATION OF COMPLIANCE

**Applicant:** Datalogic ADC S.r.l.  
**Product Description:** 915MHz radio module  
**Brand Name:** Datalogic ADC  
**Model No.:** MIZAR RADIO MODULE 915MH  
**Model Difference:** N/A  
**FCC ID:** U4F0022  
**IC:** 3862D-006  
**FCC Rule Part:** §15.249  
**IC Rule Part:** RSS-210 issue 8:2010, Annex 2.9  
**Date of test:** 2013/12/19 ~ 2014/01/29  
**Date of EUT Received:** 2013/12/18

**We hereby certify that:**

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

**Test By:** Dion Chen **Date:** 2014/02/06  
*Dion Chang / Engineer*

**Prepared By:** Gigi yeh **Date:** 2014/02/06  
*Gigi Yeh / Specialist*

**Approved By:** Vincent Su **Date:** 2014/02/06  
*Vincent Su / Technical Manager*

## Version

Version No.	Date	Description
00	2014/02/06	Initial creation of document

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## 1. General Information

### 1.1. Product Description

General:

Product Name	915MHz radio module
Brand Name	Datalogic ADC
Model Name	MIZAR RADIO MODULE 915MHz
Model Difference	N/A
Power Supply	3.3Vdc
Antenna Designation:	Printing Antenna: 1. 1 dBi,P/N: 663316020 with I-PEX type connector Rubber Antenna(Dipole): 1. 1dBi, P/N: G-RA0K14155047-BON with revised SMA connector 2. 3dBi, P/N: ANT-916-CW-QW with revised SMA connector

High Speed mode (DTS):

Frequency Range:	903.64900 MHz ~ 926.93600 MHz
Channel number:	12 channels
Transmit Power:	14.64 dBm Peak
Modulation type:	NRZ
Transition Rate:	500000 bit/s
Type of Emission:	1M1G1D

Low Speed High Power mode (DSS) : Frequency Hopping

Frequency Range:	902.80050 MHz ~ 927.48450 MHz
Channel number:	25 channels
Modulation type:	RZ Manchester
Data rate:	36864 bit/s
Transmit Power:	16.60 dBm Peak
Dwell Time:	<= 0.4s
Type of Emission:	388KF1D

Low Speed low Power mode (DXX) :

Frequency Range:	902.80050 MHz ~ 927.48450 MHz
Channel number:	25 channels
Modulation type:	RZ Manchester
Data rate:	36864 bit/s
Transmit Power:	93.35 dBuV/m
Type of Emission:	388KF1D

**Remark:** The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

The test report is for Low Speed Low power Mode.

#### 1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: U4F0022** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules and **IC: 3862D-006** filing to comply with Industry Canada RSS-210 issue 8:2010 Annex 2.9.

#### 1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4-2009 and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

#### 1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd., Lung-Tan Hsiang, Tao Yuan County 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4-2009. FCC Registration Number is: TW1036, Canada Registration Number: 4067B-3.

#### 1.5. Special Accessories

Not available for this EUT intended for grant.

#### 1.6. Equipment Modifications

Not available for this EUT intended for grant.

## **2. System Test Configuration**

### **2.1. EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### **2.2. EUT Exercise**

The Transmitter was operated in the engineering operating mode. the Tx frequency was fixed at Lowest, Mid, and Highest which were for the purpose of the measurements.

### **2.3. Test Procedure**

#### **2.3.1 Conducted Emissions**

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2009 and RSS-Gen: 2010. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

#### **2.3.2 Radiated Emissions**

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4-2009 and RSS-Gen:2010.

**2.4. Limitation**

**(1) Conducted Emission**

According to section 15.207(a) and RSS-Gen §7.2.2 Conducted Emission Limits is as following.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 - 56	56 - 46
0.5 – 5	56	46
5 - 30	60	50

**(2) Radiated Emission 15.249(a) and RSS-210 issue 8,§A2.9(a)**

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following.

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3



**(3) Radiated Emission 15.249 (d) and RSS-210 issue 8, §A2.9(b)**

Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209 and RSS-210 issue 8, §A2.9(a) as below, whichever is the lesser attenuation.

Frequency (MHz)	Field strength $\mu\text{V/m}$	Distance (m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

**(4) Radiated Emission 15.249(e) and RSS-210 issue 8**

For frequencies above 1000MHz, the above field strength limits are based on average limits. The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

- Remark:
1. Emission level in  $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$
  2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
  3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205
  4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of § 15.205, then the general radiated emission limits in § 15.209 apply.

2.5. Configuration of Tested System

Fig. 2-1 Configuration

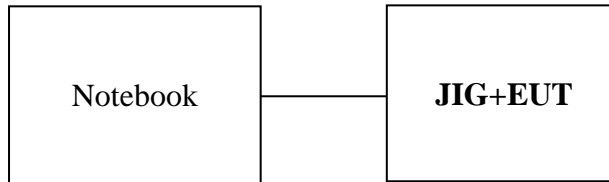


Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	Notebook	Lenovo	X220i	N/A	Shield	Non-shield

**Note:** All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

**Grounding:** Grounding was in accordance with the manufacturer’s requirements and conditions for the intended use.

### 3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207/ RSS-Gen §7.2.2	AC Conducted Emission	Compliant
§15.249(a)(d)(e) RSS-210 issue 8, §A2.9(a)(b)	Field Strength Measurement	Compliant
§15.215(c)	20dB band width Measurement	Compliant
RSS-Gen §4.6.1	99% Power Bandwidth	Compliant

#### Description of test modes

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receive mode is programmed.

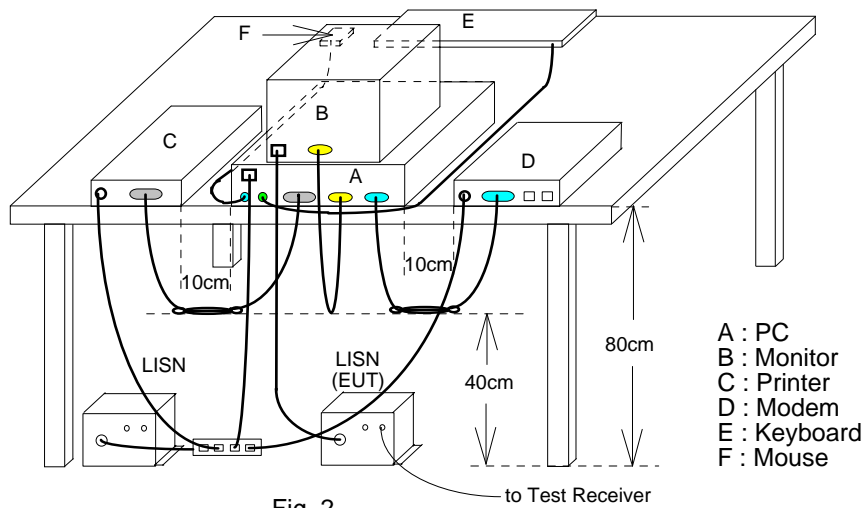
Low Speed Low Power mode: Channel lowest (902,8005MHz), mid (915.1425MHz) and highest (927.4845MHz). For Radiated emission, both dipole and printing antenna were tested.

#### 4. AC Conducted Emissions Test

##### 4.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

##### 4.2 Test SET-UP (Block Diagram of Configuration)



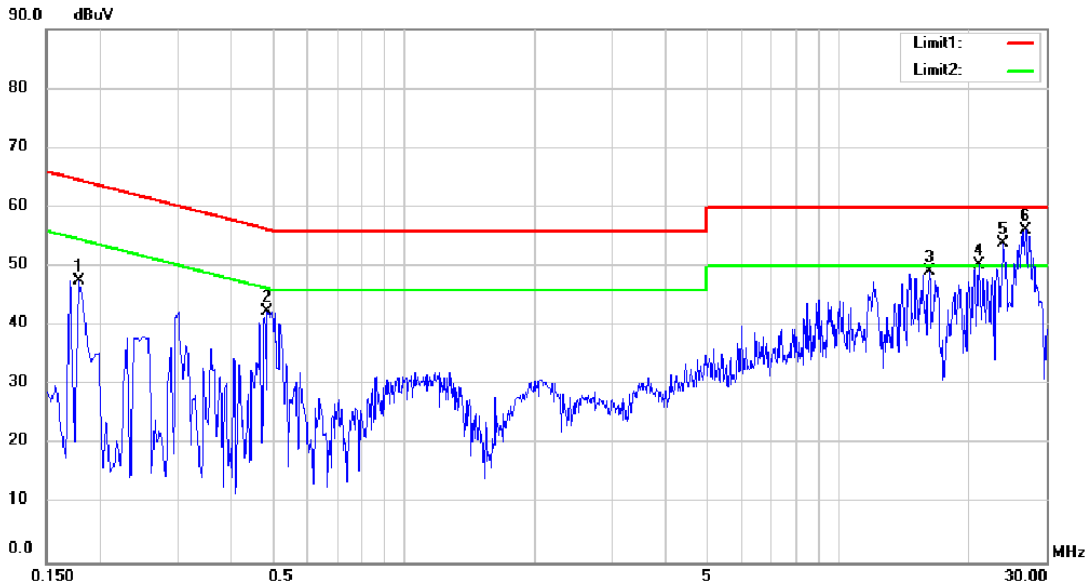
##### 4.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Conduction 04-1 Cable	WOKEN	CFD 300-NL	Conduction 04-1	09/24/2013	09/23/2014
EMI Receiver 16	Rohde & Schwarz	ESCI	101221	06/13/2013	06/12/2014
LISN 18	ROHDE & SCHWARZ	ENV216	101424	03/13/2013	03/12/2014
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/13/2013	03/12/2014

##### 4.4 Measurement Result:

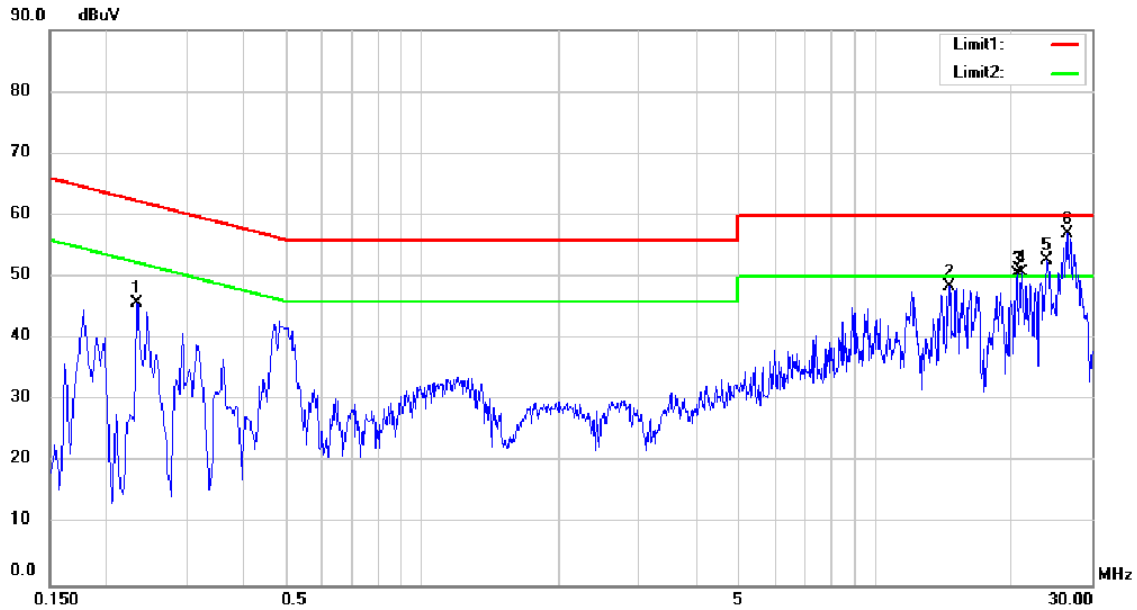
Note: Refer to next page for measurement data and plots.

Operation Mode:	Operation Mode	Test Date:	2014/01/27
Test By:	Dino		
Antenna type:	Dipole Antenna		



Site Conduction 04 Phase: *L1* Temperature: 26 °C  
Condition : Conduction Humidity: 54 %

No.	Freq. MHz	Reading_Level (dBuV)			Correct Factor (dB)	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		
		Peak	QP	AVG		peak	QP	AVG	P/Q	AVG	P/Q	AVG	P/F
1	0.1780	38.07	36.27	20.33	9.62	47.69	45.89	29.95	64.58	54.58	-18.69	-24.63	
2	0.4860	32.70	31.23	19.19	9.63	42.33	40.86	28.82	56.24	46.24	-15.38	-17.42	
3	16.1740	39.25	37.56	32.82	9.81	49.06	47.37	42.63	60.00	50.00	-12.63	-7.37	
4	20.9780	40.57	39.28	34.05	9.81	50.38	49.09	43.86	60.00	50.00	-10.91	-6.14	
5	24.0100	44.02	39.76	32.51	9.81	53.83	49.57	42.32	60.00	50.00	-10.43	-7.68	
6 *	26.9540	46.29	44.34	37.58	9.81	56.10	54.15	47.39	60.00	50.00	-5.85	-2.61	

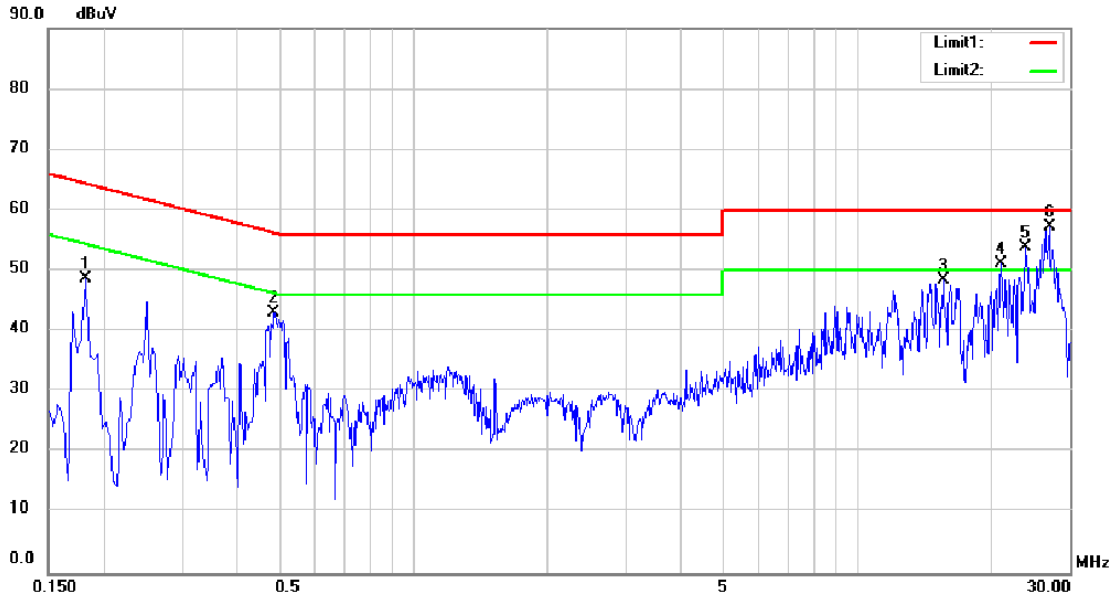


Site Conduction 04 Phase: **N** Temperature: 26 °C  
Condition : Conduction Humidity: 54 %

No.	Freq. MHz	Reading_Level (dBuV)			Correct Factor (dB)	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			P/F	Comment
		Peak	QP	AVG		peak	QP	AVG	P/Q	AVG	P/Q	AVG			
1	0.2340	36.30	30.87	14.15	9.59	45.89	40.46	23.74	62.31	52.31	-21.85	-28.57			
2	14.5340	38.55	37.40	32.80	9.86	48.41	47.26	42.66	60.00	50.00	-12.74	-7.34			
3	20.5060	40.66	39.12	33.58	9.92	50.58	49.04	43.50	60.00	50.00	-10.96	-6.50			
4	20.9740	40.80	40.17	34.73	9.92	50.72	50.09	44.65	60.00	50.00	-9.91	-5.35			
5	23.9060	42.79	38.22	31.92	9.93	52.72	48.15	41.85	60.00	50.00	-11.85	-8.15			
6 *	26.4860	47.20	40.33	34.96	9.94	57.14	50.27	44.90	60.00	50.00	-9.73	-5.10			

### AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode	Test Date:	2014/01/27
Test By:	Dino		
Antenna type:	Printing Antenna		



Site Conduction 04 Phase: **L1** Temperature: 26 °C  
Condition : Conduction Humidity: 54 %

No.	Freq. MHz	Reading_Level (dBuV)			Correct Factor (dB)	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			P/F	Comment
		Peak	QP	AVG		peak	QP	AVG	P/Q	AVG	P/Q	AVG			
1	0.1820	39.03	35.73	19.32	9.62	48.65	45.35	28.94	64.39	54.39	-19.04	-25.45			
2	0.4860	33.47	31.20	18.58	9.63	43.10	40.83	28.21	56.24	46.24	-15.41	-18.03			
3	15.5860	38.67	36.10	27.39	9.81	48.48	45.91	37.20	60.00	50.00	-14.09	-12.80			
4	20.9820	41.35	39.07	31.57	9.81	51.16	48.88	41.38	60.00	50.00	-11.12	-8.62			
5	23.8900	44.11	39.75	34.49	9.81	53.92	49.56	44.30	60.00	50.00	-10.44	-5.70			
6 *	27.0700	47.54	42.82	35.19	9.81	57.35	52.63	45.00	60.00	50.00	-7.37	-5.00			





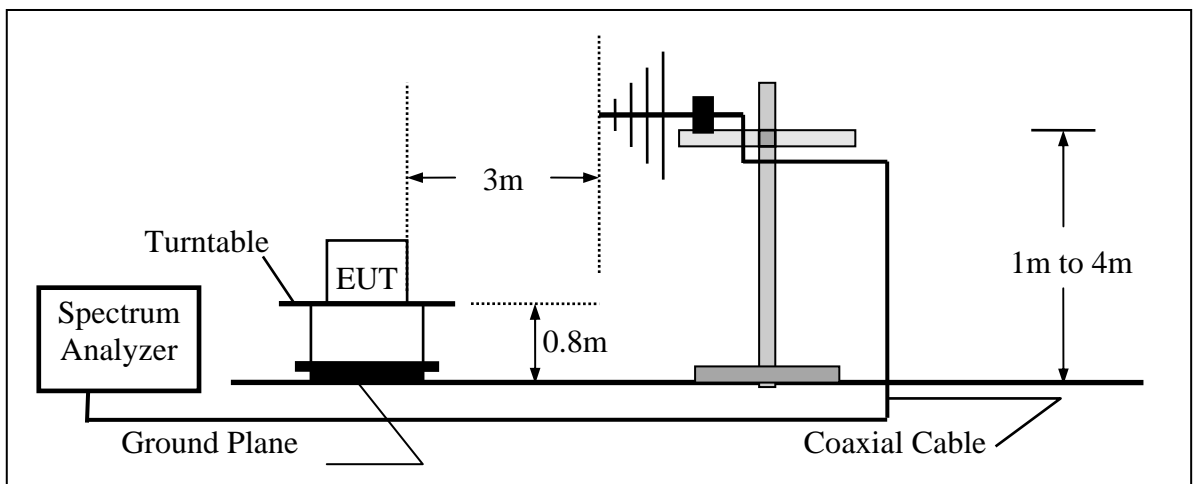
## 5. Radiated Emission Test

### 5.1 Measurement Procedure

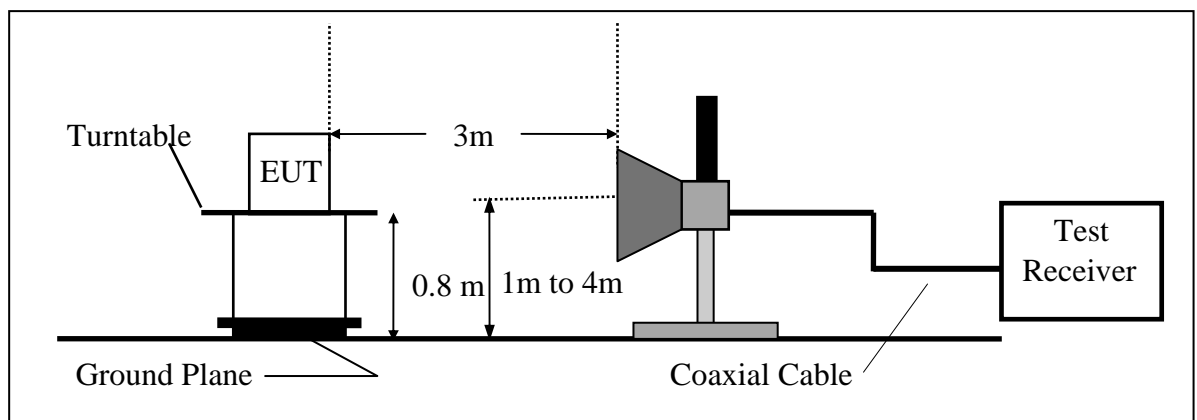
1. The EUT was placed on a turntable that is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

### 5.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



**5.3 Measurement Equipment Used:**

Chamber 14(966)					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/18/2013	07/17/2014
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/26/2013	05/25/2014
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/03/2013	05/02/2014
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	03/07/2013	03/06/2015
Bilog Antenna30-1G	Schaffner	CBL 6112B	2756	01/15/2014	01/14/2015
Horn antenna1-18G(06)	EMCO	3117	0006665	11/04/2013	11/03/2014
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/09/2013	01/08/2015
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/15/2013	05/14/2015
Preamplifier9-1000M	HP	8447D	NA	02/19/2013	02/18/2014
Preamplifier1-18G	MITEQ	AFS44-001018 00-25-10P-44	1329256	07/18/2013	07/17/2014
Preamplifier1-26G	EM	EM01M26G	NA	02/26/2013	02/25/2014
Preamplifier26-40G	MITEQ	JS-26004000-2 7-5A	818471	05/08/2013	05/07/2015
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	02/06/2013	02/05/2014
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/08/2013	10/07/2014
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&3742 1/2	10/03/2013	10/02/2015
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2013	12/26/2014

**5.4 Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

**5.5 Measurement Result**

**5.5.1 Fundamental Emission Measurement Result (Dipole Antenna)**

Operation Mode : TX mode Test Date : 2014/01/14  
 Fundamental Frequency : 902.8005 MHz, 915.1425 MHz, 927.4845MHz Test By : Dino  
 Temp : 25 Hum. : 60%

CH Low:

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	902,8005	87.07	-0.72	86.35	94.00	-7.65	Average	VERTICAL
2	902,8005	94.07	-0.72	93.35	114.00	-20.65	Peak	VERTICAL
1	902.87	87.39	-0.72	86.67	114.00	-27.33	Peak	HORIZONTAL

CH Mid:

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	915.22	86.46	-0.49	85.97	94.00	-8.03	Average	VERTICAL
2	915.22	93.43	-0.49	92.94	114.00	-21.06	Peak	VERTICAL
1	915.1425	85.29	-0.49	84.80	114.00	-29.20	Peak	HORIZONTAL

CH High:

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	927.4845	85.07	-0.25	84.82	94.00	-9.18	Average	VERTICAL
2	927.4845	92.04	-0.25	91.79	114.00	-22.21	Peak	VERTICAL
1	927.40	82.24	-0.25	81.99	114.00	-32.01	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 AV level = Peak reading – Duty Cycle Correction factor..

**5.5.2 Fundamental Emission Measurement Result (Printing Antenna)**

Operation Mode : TX mode Test Date : 2014/01/14  
 Fundamental Frequency : 902.8005 MHz, 915.1425 MHz, 927.4845MHz Test By : Dino  
 Temp : 25 Hum. : 60%

CH Low:

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	902.73	87.36	-0.72	86.64	114.00	-27.36	Peak	VERTICAL
1	902.73	80.00	-0.72	79.28	114.00	-34.72	Peak	HORIZONTAL

CH Mid:

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	915.07	84.24	-0.49	83.75	114.00	-30.25	Peak	VERTICAL
1	915.07	77.38	-0.49	76.89	114.00	-37.11	Peak	HORIZONTAL

CH High:

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	927.4845	82.19	-0.25	81.94	114.00	-32.06	Peak	VERTICAL
1	927.4845	75.56	-0.25	75.31	114.00	-38.69	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 AV level = Peak reading – Duty Cycle Correction factor..

**5.5.3 Radiated Spurious Emission Measurement Result (below 1GHz) (Dipole Antenna)**

Operation Mode	TX CH Low	Test Date	2014/01/14
Fundamental Frequency	902.8005 MHz	Test By	Dino
Temperature	25	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	64.92	42.57	-13.68	28.89	40.00	-11.11	Peak	VERTICAL
2	132.82	51.06	-13.33	37.73	43.50	-5.77	Peak	VERTICAL
3	280.26	34.11	-11.57	22.54	46.00	-23.46	Peak	VERTICAL
4	312.27	31.21	-10.85	20.36	46.00	-25.64	Peak	VERTICAL
5	384.05	29.87	-9.52	20.35	46.00	-25.65	Peak	VERTICAL
6	778.84	25.67	-2.64	23.03	46.00	-22.97	Peak	VERTICAL
1	83.35	46.97	-17.54	29.43	40.00	-10.57	Peak	HORIZONTAL
2	132.82	51.39	-13.33	38.06	43.50	-5.44	Peak	HORIZONTAL
3	151.25	43.77	-12.04	31.73	43.50	-11.77	Peak	HORIZONTAL
4	288.02	36.77	-11.45	25.32	46.00	-20.68	Peak	HORIZONTAL
5	384.05	28.92	-9.52	19.40	46.00	-26.60	Peak	HORIZONTAL
6	480.08	30.32	-7.84	22.48	46.00	-23.52	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Spurious Emission Measurement Result (below 1GHz)**

Operation Mode	TX CH Mid	Test Date	2014/01/14
Fundamental Frequency	915.1425 MHz	Test By	Dino
Temperature	25	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	64.92	42.63	-13.68	28.95	40.00	-11.05	Peak	VERTICAL
2	83.35	45.34	-17.54	27.80	40.00	-12.20	Peak	VERTICAL
3	132.82	51.92	-13.33	38.59	43.50	-4.91	Peak	VERTICAL
4	280.26	32.56	-11.57	20.99	46.00	-25.01	Peak	VERTICAL
5	384.05	28.59	-9.52	19.07	46.00	-26.93	Peak	VERTICAL
6	557.68	26.32	-6.69	19.63	46.00	-26.37	Peak	VERTICAL
1	83.35	43.65	-17.54	26.11	40.00	-13.89	Peak	HORIZONTAL
2	113.42	46.47	-15.17	31.30	43.50	-12.20	Peak	HORIZONTAL
3	132.82	51.43	-13.33	38.10	43.50	-5.40	Peak	HORIZONTAL
4	151.25	44.13	-12.04	32.09	43.50	-11.41	Peak	HORIZONTAL
5	288.02	36.45	-11.45	25.00	46.00	-21.00	Peak	HORIZONTAL
6	480.08	29.93	-7.84	22.09	46.00	-23.91	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Spurious Emission Measurement Result (below 1GHz)**

Operation Mode	TX CH High	Test Date	2014/01/14
Fundamental Frequency	927.4845 MHz	Test By	Dino
Temperature	25	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	64.92	42.94	-13.68	29.26	40.00	-10.74	Peak	VERTICAL
2	82.38	45.37	-17.39	27.98	40.00	-12.02	Peak	VERTICAL
3	132.82	51.27	-13.33	37.94	43.50	-5.56	Peak	VERTICAL
4	168.71	35.25	-12.56	22.69	43.50	-20.81	Peak	VERTICAL
5	280.26	33.06	-11.57	21.49	46.00	-24.51	Peak	VERTICAL
6	452.92	28.59	-8.14	20.45	46.00	-25.55	Peak	VERTICAL
1	83.35	43.91	-17.54	26.37	40.00	-13.63	Peak	HORIZONTAL
2	114.39	46.94	-15.07	31.87	43.50	-11.63	Peak	HORIZONTAL
3	132.82	51.64	-13.33	38.31	43.50	-5.19	Peak	HORIZONTAL
4	151.25	44.41	-12.04	32.37	43.50	-11.13	Peak	HORIZONTAL
5	288.02	36.24	-11.45	24.79	46.00	-21.21	Peak	HORIZONTAL
6	480.08	30.00	-7.84	22.16	46.00	-23.84	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Spurious Emission Measurement Result (above 1GHz) (Dipole Antenna)**

Operation Mode : TX CH Low Test Date : 2014/01/14  
 Fundamental Frequency : 902.8005 MHz Test By : Dino  
 Temp : 25 Hum. : 60%

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1540.00	61.36	-10.69	50.67	74.00	-23.33	Peak	VERTICAL
2	1805.60	60.25	-9.06	51.19	74.00	-22.81	Peak	VERTICAL
3	2708.16	35.07	9.03	44.10	74.00	-29.90	Peak	VERTICAL
4	3610.88	---						VERTICAL
5	4513.60	---						VERTICAL
6	5416.32	---						VERTICAL
1	4804.00	51.04	-9.06	41.98	74.00	-32.02	Peak	HORIZONTAL
2	1990.00	53.00	-7.96	45.04	74.00	-28.96	Peak	HORIZONTAL
4	2708.16	---						HORIZONTAL
5	3610.88	---						HORIZONTAL
6	4513.60	---						HORIZONTAL
7	5416.32	---						HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 AV level = Peak reading – Duty Cycle Correction factor..



**Radiated Spurious Emission Measurement Result (above 1GHz)**

Operation Mode : TX CH Mid Test Date : 2014/01/14  
 Fundamental Frequency : 915.1425 MHz Test By : Dino  
 Temp : 25 Hum. : 60%

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1540.00	61.59	-10.69	50.90	74.00	-23.10	Peak	VERTICAL
2	1830.20	60.59	-8.92	51.67	74.00	-22.33	Peak	VERTICAL
3	2745.18	---						VERTICAL
4	3660.24	---						VERTICAL
5	4575.30	---						VERTICAL
6	5490.36	---						VERTICAL
1	1540.00	60.26	-10.69	49.57	74.00	-24.43	Peak	HORIZONTAL
2	1830.20	49.09	-8.92	40.17	74.00	-33.83	Peak	HORIZONTAL
3	2745.18	---						HORIZONTAL
4	3660.24	---						HORIZONTAL
5	4575.30	---						HORIZONTAL
6	5490.36	---						HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 AV level = Peak reading – Duty Cycle Correction factor..

**Radiated Spurious Emission Measurement Result (above 1GHz)**

Operation Mode	: TX CH High	Test Date	: 2014/01/14
Fundamental Frequency	: 927.4845 MHz	Test By	: Dino
Temp	: 25	Hum.	: 60%

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1540.00	59.91	-10.69	49.22	74.00	-24.78	Peak	VERTICAL
2	1855.00	59.01	-8.77	50.24	74.00	-23.76	Peak	VERTICAL
3	2782.23	---						VERTICAL
4	3709.64	---						VERTICAL
5	4637.05	---						VERTICAL
6	5564.46	---						VERTICAL
1	1540.00	61.49	-10.69	50.80	74.00	-23.20	Peak	HORIZONTAL
2	1855.00	48.40	-8.77	39.63	74.00	-34.37	Peak	HORIZONTAL
3	2782.23	---						HORIZONTAL
4	3709.64	---						HORIZONTAL
5	4637.05	---						HORIZONTAL
6	5564.46	---						HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 AV level = Peak reading – Duty Cycle Correction factor..

**5.5.4 Radiated Spurious Emission Measurement Result (below 1GHz) (Printing Antenna)**

Operation Mode	TX CH Low	Test Date	2014/01/14
Fundamental Frequency	902,8005MHz	Test By	Dino
Temperature	25	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	64.92	42.30	-13.68	28.62	40.00	-11.38	Peak	VERTICAL
2	81.41	45.44	-17.25	28.19	40.00	-11.81	Peak	VERTICAL
3	122.15	49.40	-14.35	35.05	43.50	-8.45	Peak	VERTICAL
4	132.82	52.55	-13.33	39.22	43.50	-4.28	Peak	VERTICAL
5	280.26	33.40	-11.57	21.83	46.00	-24.17	Peak	VERTICAL
6	384.05	29.88	-9.52	20.36	46.00	-25.64	Peak	VERTICAL
1	83.35	43.45	-17.54	25.91	40.00	-14.09	Peak	HORIZONTAL
2	123.12	49.52	-14.26	35.26	43.50	-8.24	Peak	HORIZONTAL
3	132.82	51.95	-13.33	38.62	43.50	-4.88	Peak	HORIZONTAL
4	151.25	44.35	-12.04	32.31	43.50	-11.19	Peak	HORIZONTAL
5	288.02	36.84	-11.45	25.39	46.00	-20.61	Peak	HORIZONTAL
6	480.08	28.59	-7.84	20.75	46.00	-25.25	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Spurious Emission Measurement Result (below 1GHz)**

Operation Mode	TX CH Mid	Test Date	2014/01/14
Fundamental Frequency	915.1425 MHz	Test By	Dino
Temperature	25	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	64.92	42.94	-13.68	29.26	40.00	-10.74	Peak	VERTICAL
2	124.09	49.65	-14.17	35.48	43.50	-8.02	Peak	VERTICAL
3	132.82	51.46	-13.33	38.13	43.50	-5.37	Peak	VERTICAL
4	280.26	32.99	-11.57	21.42	46.00	-24.58	Peak	VERTICAL
5	384.05	28.51	-9.52	18.99	46.00	-27.01	Peak	VERTICAL
6	768.17	26.50	-2.74	23.76	46.00	-22.24	Peak	VERTICAL
1	83.35	43.34	-17.54	25.80	40.00	-14.20	Peak	HORIZONTAL
2	123.12	48.11	-14.26	33.85	43.50	-9.65	Peak	HORIZONTAL
3	132.82	51.64	-13.33	38.31	43.50	-5.19	Peak	HORIZONTAL
4	151.25	44.27	-12.04	32.23	43.50	-11.27	Peak	HORIZONTAL
5	288.02	36.31	-11.45	24.86	46.00	-21.14	Peak	HORIZONTAL
6	480.08	28.94	-7.84	21.10	46.00	-24.90	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Spurious Emission Measurement Result (below 1GHz)**

Operation Mode	TX CH High	Test Date	2014/01/14
Fundamental Frequency	927.4845 MHz	Test By	Dino
Temperature	25	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	65.89	43.79	-13.88	29.91	40.00	-10.09	Peak	VERTICAL
2	81.41	47.06	-17.25	29.81	40.00	-10.19	Peak	VERTICAL
3	122.15	49.50	-14.35	35.15	43.50	-8.35	Peak	VERTICAL
4	132.82	51.63	-13.33	38.30	43.50	-5.20	Peak	VERTICAL
5	280.26	33.04	-11.57	21.47	46.00	-24.53	Peak	VERTICAL
6	384.05	29.25	-9.52	19.73	46.00	-26.27	Peak	VERTICAL
1	83.35	43.71	-17.54	26.17	40.00	-13.83	Peak	HORIZONTAL
2	122.15	48.06	-14.35	33.71	43.50	-9.79	Peak	HORIZONTAL
3	132.82	51.53	-13.33	38.20	43.50	-5.30	Peak	HORIZONTAL
4	151.25	44.41	-12.04	32.37	43.50	-11.13	Peak	HORIZONTAL
5	288.02	36.46	-11.45	25.01	46.00	-20.99	Peak	HORIZONTAL
6	480.08	30.37	-7.84	22.53	46.00	-23.47	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Spurious Emission Measurement Result (above 1GHz)**

Operation Mode : TX CH Low Test Date : 2014/01/14  
 Fundamental Frequency : 902.8005 MHz Test By : Dino  
 Temp : 25 Hum. : 60%

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1540.00	60.98	-10.69	50.29	74.00	-23.71	Peak	VERTICAL
2	1805.60	48.40	-9.06	39.34	74.00	-34.66	Peak	VERTICAL
3	2708.16	---						VERTICAL
4	3610.88	---						VERTICAL
5	4513.60	---						VERTICAL
6	5416.32							VERTICAL
1	1540.00	60.23	-10.69	49.54	74.00	-24.46	Peak	HORIZONTAL
2	1805.60	47.26	-9.06	38.20	74.00	-35.80	Peak	HORIZONTAL
3	2708.16	---						HORIZONTAL
4	3610.88	---						HORIZONTAL
5	4513.60	---						HORIZONTAL
6	5416.32	---						HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 AV level = Peak reading – Duty Cycle Correction factor..

**Radiated Spurious Emission Measurement Result (above 1GHz)**

Operation Mode : TX CH Mid Test Date : 2014/01/14  
 Fundamental Frequency : 915.1425 MHz Test By : Dino  
 Temp : 25 Hum. : 60%

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1830.20	47.15	-8.92	38.23	74.00	-35.77	Peak	VERTICAL
2	1990.00	58.30	-7.96	50.34	74.00	-23.66	Peak	VERTICAL
3	2745.18	---						VERTICAL
4	3660.24	---						VERTICAL
5	4575.30	---						VERTICAL
6	5490.36	---						VERTICAL
1	1540.00	60.42	-10.69	49.73	74.00	-24.27	Peak	HORIZONTAL
2	1830.20	46.54	-8.92	37.62	74.00	-36.38	Peak	HORIZONTAL
3	2745.18	---						HORIZONTAL
4	3660.24	---						HORIZONTAL
5	4575.30	---						HORIZONTAL
6	5490.36	---						HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 AV level = Peak reading – Duty Cycle Correction factor..





## 6. 20 dB Band Width Measurement For FCC

### 6.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span =500kHz.
4. Set SPA Max hold. Mark peak, -20dB.

### 6.2 Test SET-UP (Block Diagram of Configuration)

Same as 4.2 Radiated Emission Measurement.

### 6.3 Measurement Equipment Used:

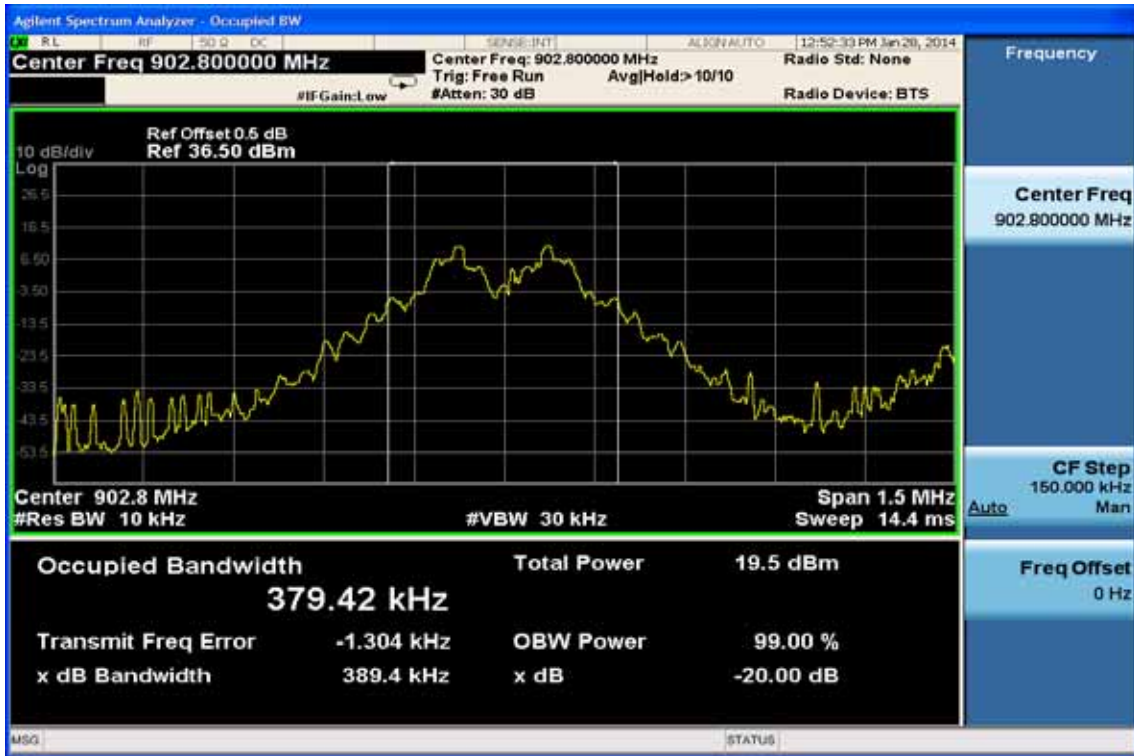
Same as 4.2 Radiated Emission Measurement.

### 6.4 Measurement Results:

CH	20dB Bandwidth
	(MHz)
Lower	0.3894
Mid	0.3786
Higher	0.3813

Refer to attached data chart.

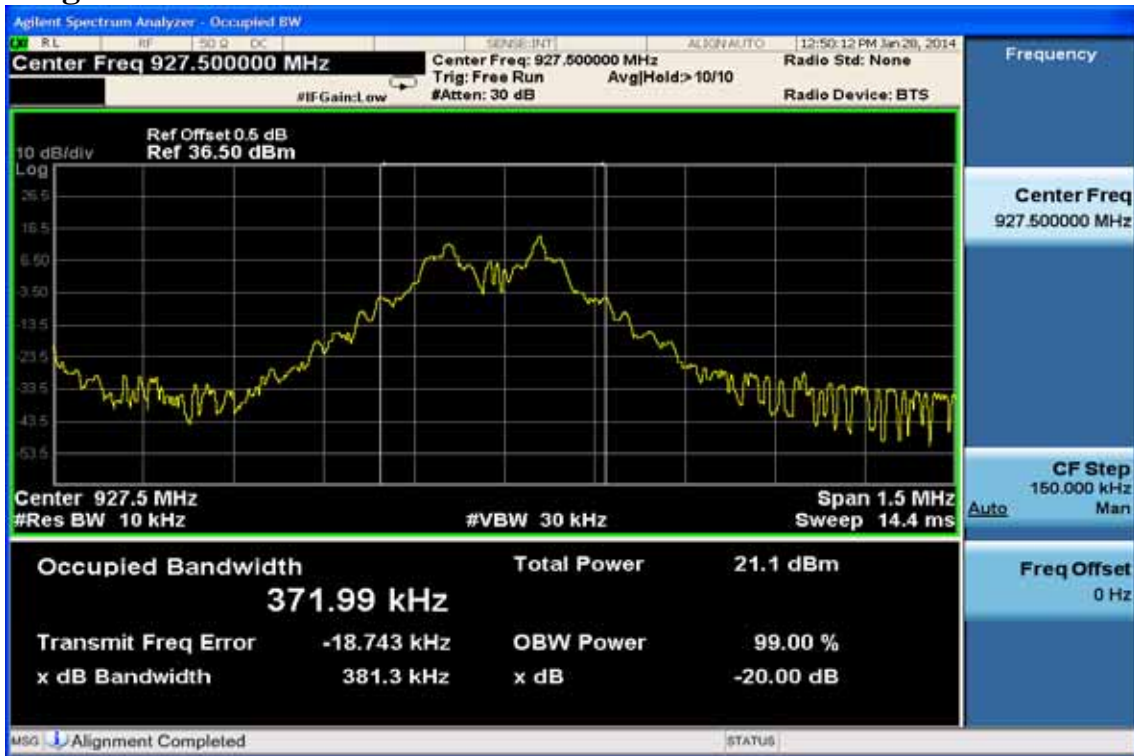
### 20dB Band Width test Plot CH Low



### CH Mid



CH High



## 7.1 20 dB /99% Band Width Measurement For IC

### 7.2 Measurement Procedure

- 1 Place the EUT on the table and set it in transmitting mode.
- 2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3 Set the spectrum analyzer as RBW=1% of the approximate emission bandwidth, VBW = 3 times RBW, Span= approximately 20dB below the peak level. Sweep=auto
- 4 Turn on the 99% bandwidth function, max reading.
- 5 Repeat above procedures until all frequency measured were complete.

### 7.3 Test SET-UP (Block Diagram of Configuration)

Same as 4.2 Radiated Emission Measurement.

### 7.4 Measurement Equipment Used:

Same as 4.2 Radiated Emission Measurement.

### 7.5 Measurement Results:

CH	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Lower	0.37620	0.3861
Mid	0.37565	0.3883
Higher	0.36794	0.3818

Refer to attached data chart.

### 99% Band Width test Plot CH Low



### CH Mid



CH High

