

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: LW- Antenna

Marketing Name: Lone Worker Antenna Module

Brand Name: N/A

Model No.: Lone Worker Antenna Module

Model Difference: N/A

FCC ID: PJG-LWANT9

Report No.: E2/2013/C0022

Issue Date: Jan. 06, 2014

FCC Rule Part: §15.249

Prepared for: Dynamco Pty Ltd
10 Brown Street, East Perth, WA 6004 Australia

Prepared by: SGS Taiwan Ltd.
Electronics & Communication Laboratory
No.2, Keji 1st Rd., Guishan Township, Taoyuan
County, Taiwan 333



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VERIFICATION OF COMPLIANCE

Applicant: Dynamco Pty Ltd
 10 Brown Street, East Perth, WA 6004 Australia

Product Name: LW- Antenna

Marketing Name: Lone Worker Antenna Module

Brand Name: N/A

Model No.: Lone Worker Antenna Module

FCC ID: PJG-LWANT9

Model Difference: N/A

File Number: E2/2013/C0022

Date of test: Dec. 12, 2013 ~ Jan. 06, 2014

Date of EUT Received: Dec. 12, 2013

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd., Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.249.

The test results of this report relate only to the tested sample identified in this report.

Test By: *Jazz Huang* **Date:** Jan. 06, 2014

Jazz Huang / Sr. Engineer

Prepared By: *Judy Hsu* **Date:** Jan. 06, 2014

Judy Hsu / Clerk

Approved By: *Jim Chang* **Date:** Jan. 06, 2014

Jim Chang / Supervisor

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Version

Version No.	Date	Description
00	Jan. 06, 2014	Initial creation of document

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1. GENERAL INFORMATION

1.1 Product Description

Product Name:	LW- Antenna
Marketing Name:	Lone Worker Antenna Module
Brand Name:	N/A
Model No.:	Lone Worker Antenna Module
Model Difference:	N/A
Transmit Power:	47.7 dBuV/m
Operation Frequency:	916MHz
Channel number:	1 channel
Modulation Type:	FSK
Hardware Version:	v1.2
Software Version:	N/A
Power Supply:	12V from DC Power supply
Antenna Designation:	Helix Antenna

This report complies with FCC 15.249

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1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: PJG-LWANT9 filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:2009. 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 SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan 333 which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009. FCC Registration Number is: 990257. Canada Registration Number: 4620A-4. The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

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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 which was 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 general criterion in Section 7.1 of ANSI C63.4:2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz, and the measurement procedure 7.3 in ANSI 63.4:2009 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107.

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.

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2.4 Limitation

(1) Conducted Emission

According to section 15.207(a) 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)

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
24.0 – 24.25 GHz	250 mV/m (107.95dBuV/m)	2500 uV/m (67.95dBuV/m)	3

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(3) Radiated Emission 15.249 (d)

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 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)

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 ξ 15.205
 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ 15.205, then the general radiated emission limits in ξ 15.209 apply.

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2.5 Configuration of Tested System

Fig. 2-1 Configuration

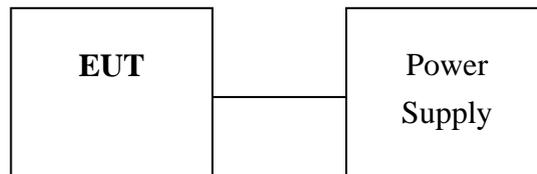


Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	DC Power Supply	Topward	3303A	715856	Shielding	Un-shielding

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.

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3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	Conducted Emission	N/A
§15.249(a)(e)	Radiated Emission	Compliant
§15.249(d)	20dB band width Measurement	Compliant

4. Description of test modes

The EUT has been tested under operating condition.
 The EUT is staying in continuous transmitting mode.

916MHz with highest data rate are chosen for full testing.

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5.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 7	100924	05/10/2013	05/09/2014
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	02/07/2013	02/06/2014
LISN	SCHWARZBECK	NSLK 8127	8127-648	01/17/2013	01/16/2014
LISN	Rolf-Heine	NNB-2/16Z	99012	08/18/2013	08/17/2014
ISN	TESEQ	ISN T800	34384	02/27/2013	02/26/2014
RF Current Probe	FCC	F-35A	139	03/27/2013	03/26/2014
Capacitive Voltage Probe	FCC	F-CVP-1	97	03/27/2013	03/26/2014
DC LISN	SCHWARZBECK	NNBM 8124	8124-564	11/07/2013	11/06/2014
DC LISN	SCHWARZBECK	NNBM 8124	8124-565	11/07/2013	11/06/2014
High Voltage Probe	SCHWARZBECK	TK 9420	TK 9420-5223	03/04/2013	03/03/2014
Test Software	Farad	EZ-EMC	Ver. SGS-03A1	N.C.R.	N.C.R.

5.4 Measurement Result:

N/A. This device is powered by 12V DC Power supply.

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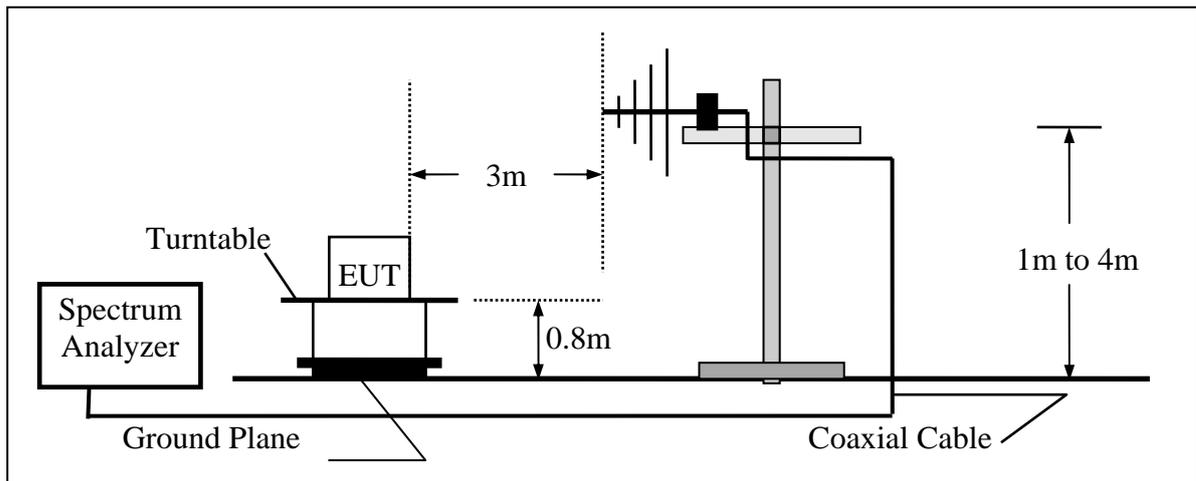
6. Radiated Emission Test

6.1 Measurement Procedure

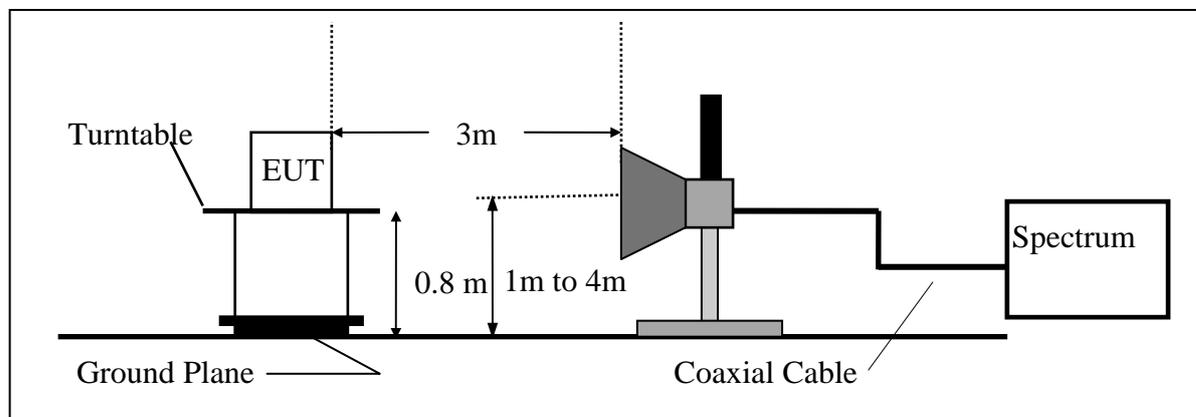
1. The EUT was placed on a turntable that is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above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

6.2 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



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6.3 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESU 40	100363	01/30/2013	01/29/2014
Broadband Antenna	TESEQ	CBL 6112D	35240	02/04/2013	02/03/2014
Horn Antenna	ETS-Lindgren	3117	00143272	01/16/2013	01/15/2014
Horn Antenna	ETS-Lindgren	3160-09	00117911	02/14/2013	02/13/2014
Pre-Amplifier	R&S	SCU-18	10203	01/21/2013	01/20/2014
Pre-Amplifier	EM Electronics Corp.	EMC330	980096	01/04/2014	01/03/2015
Pre-Amplifier	EM Electronics Corp.	EMC184045	980135	01/28/2013	01/27/2014
Coaxial Cable	Huber+Suhner	SAC-C TX-30M-1GHz	TX1	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C TX-1-26.5GHz	TX2	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-150k-30M Hz	RX1	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-30M-1GHz	RX2	04/22/2013	04/21/2014
Coaxial Cable	Huber+Suhner	SAC-C RX-1-26.5GHz	RX3	04/22/2013	04/21/2014
Controller	Chance Most	886	N/A	N.C.R.	N.C.R.
Antenna Master	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Turn Table	Chance Most	N/A	N/A	N.C.R.	N.C.R.
Filter Bank	R&S	TS8996	SCIN.EMC.1023 .12	04/22/2013	04/21/2014
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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6.4 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	

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6.5 Measurement Result

Radiated Spurious Emission Measurement Result

Operation Band	:916 MHz	Test Date	:2014-01-03
Fundamental Frequency	:916 MHz	Temp./Humi.	:22.7 deg_C / 57 RH
Operation Mode	:MAIN	Engineer	:Vito
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
915.98	F	Peak	51.85	-9.12	42.72	114.00	-71.28
915.98	F	Average	50.30	-9.12	41.18	94.00	-52.82

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Operation Band	:916 MHz	Test Date	:2014-01-03
Fundamental Frequency	:916 MHz	Temp./Humi.	:22.7 deg_C / 57 RH
Operation Mode	:MAIN	Engineer	:Vito
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
915.98	F	Peak	56.82	-9.12	47.70	114.00	-66.30
915.98	F	Average	55.70	-9.12	46.58	94.00	-47.42

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Operation Band	:916 MHz	Test Date	:2014-01-03
Fundamental Frequency	:916 MHz	Temp./Humi.	:22.7 deg_C / 57 RH
Operation Mode	:TX	Engineer	:Vito
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Safe Margin dB
31.94	S	Peak	31.89	-16.84	15.06	40.00	-24.94
101.78	S	Peak	49.20	-22.93	26.27	43.50	-17.23
142.52	S	Peak	37.90	-22.27	15.62	43.50	-27.88
159.98	S	Peak	38.06	-23.08	14.99	43.50	-28.51
191.99	S	Peak	36.45	-24.06	12.39	43.50	-31.11
224.00	S	Peak	36.65	-23.69	12.95	46.00	-33.05
1832.00	H	Peak	45.81	-7.37	38.44	74.00	-35.56
1832.00	H	Average	31.50	-7.37	24.13	54.00	-29.87
2748.00	H	Peak	-	-	-	-	-
3664.00	H	Peak	-	-	-	-	-
4580.00	H	Peak	-	-	-	-	-
5496.00	H	Peak	-	-	-	-	-
6412.00	H	Peak	-	-	-	-	-
7328.00	H	Peak	-	-	-	-	-
8244.00	H	Peak	-	-	-	-	-
9160.00	H	Peak	-	-	-	-	-

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Fundamental Frequency	:916 MHz	Temp./Humi.	:22.7 deg_C / 57 RH
Operation Mode	:TX	Engineer	:Vito
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Safe Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
31.94	S	Peak	31.30	-16.84	14.47	40.00	-25.53
101.78	S	Peak	39.41	-22.93	16.48	43.50	-27.02
159.98	S	Peak	42.36	-23.08	19.28	43.50	-24.22
224.00	S	Peak	44.01	-23.69	20.32	46.00	-25.68
288.02	S	Peak	41.90	-19.42	22.48	46.00	-23.52
352.04	S	Peak	38.54	-17.31	21.23	46.00	-24.77
1832.00	H	Peak	44.85	-5.35	39.50	74.00	-34.50
1832.00	H	Average	31.60	-5.35	26.25	54.00	-27.75
2748.00	H	Peak	-	-	-	-	-
3664.00	H	Peak	-	-	-	-	-
4580.00	H	Peak	-	-	-	-	-
5496.00	H	Peak	-	-	-	-	-
6412.00	H	Peak	-	-	-	-	-
7328.00	H	Peak	-	-	-	-	-
8244.00	H	Peak	-	-	-	-	-
9160.00	H	Peak	-	-	-	-	-

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7. 20 dB Band Width Measurement

7.1 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 = 1MHz.
4. Set SPA Max hold. Mark peak, -20dB.

7.2 Test SET-UP (Block Diagram of Configuration)

Same as 4.2 Radiated Emission Measurement.

7.3 Measurement Equipment Used:

Same as 4.2 Radiated Emission Measurement.

7.4 Measurement Results:

916MHz = 291.9 kHz

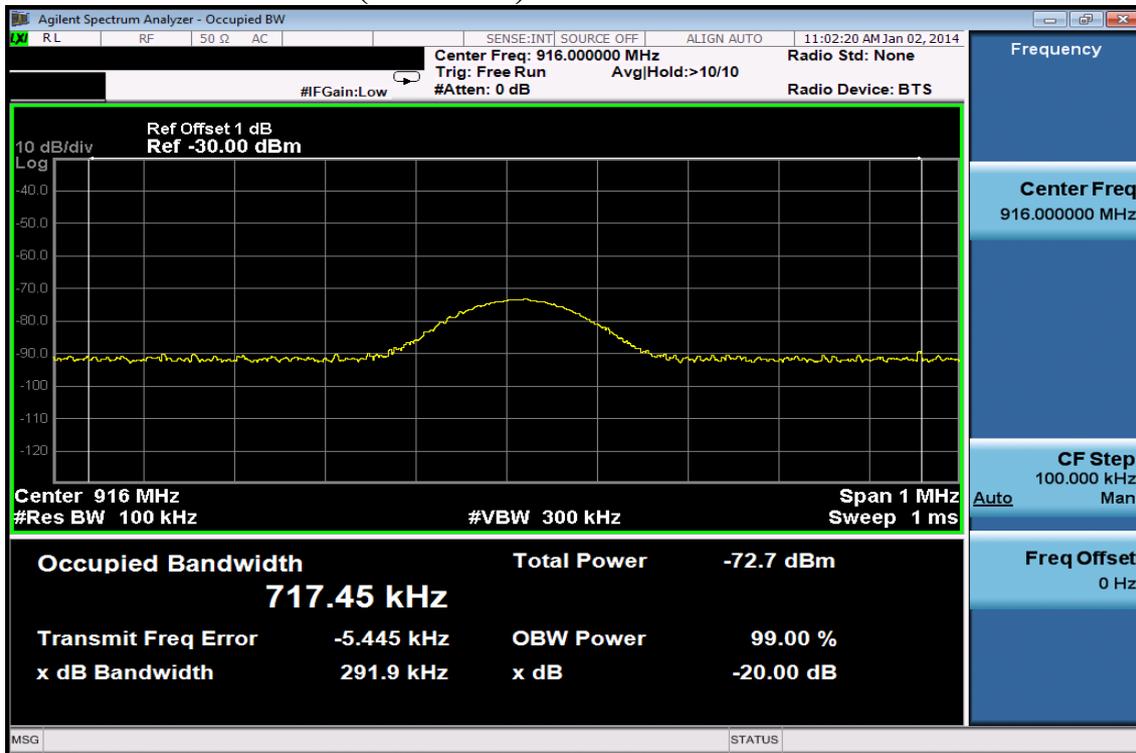
Refer to attached data chart.

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20dB Band Width test Plot (916 MHz)



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