FCC PART 15.247

TEST REPORT

For

GlobalSat WorldCom Corporation

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FCC ID: RID-LR101H

Report Type:	**Product Type:**
Original Report	LoRa Wireless Module

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Report Number:	RTW150901050-00
Report Date:	2015-10-14
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *GlobalSat WorldCom Corporation*'s product, model number: *LR-101H (FCC ID: RID-LR101H)* (the "EUT") in this report was a *LoRa Wireless Module,* which was measured approximately: 3.0 cm (L) x 1.8 cm (W) x 1.3 cm (H), rated input voltage: DC3.0~6V from system.

All measurement and test data in this report was gathered from production sample serial number: 150901050 (Assigned by BACL, Dongguan). The EUT was received on 2015-09-03.

Objective

This report is prepared on behalf of *GlobalSat WorldCom Corporation.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communications Commission's rules

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

N/A

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in testing mode, which was provided by manufacturer.

Channels list are provided for testing as follows:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	903	20	923
1	904	…	…
…	…	…	…
…	…	…	…
..	…	23	926
12	915	24	927

EUT was tested with channel 0, 12 and 24.

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring power and PSD across all data rates.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

The software “Realterm_2.0.0.70” was used, which was provided by manufacturer and the maximum power (with 100% duty cycle) was setting by the software as following table:

Test Software Version	Realterm_2.0.0.70		
Test Frequency	903 MHz	915 MHz	927 MHz
Data Rate	18.23kbps	18.23kbps	18.23kbps
Power Level Setting	7	7	7

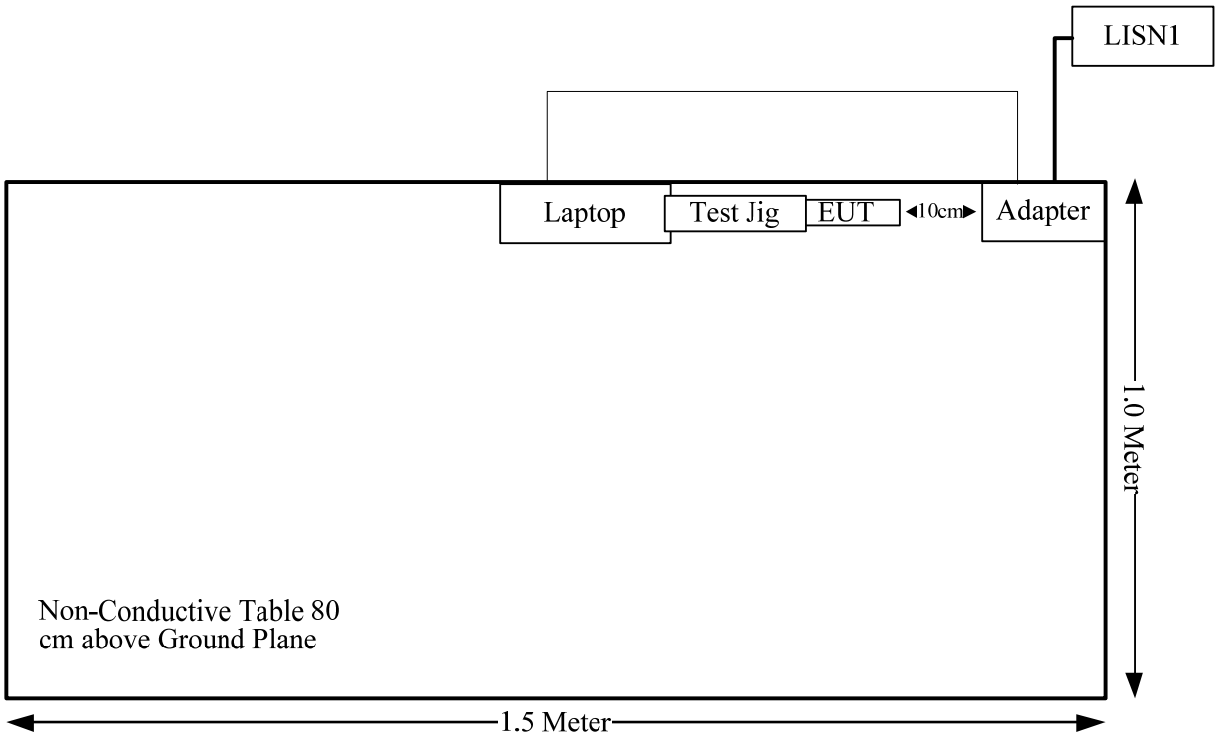
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017
GlobalSat World	Test Jig	/	/

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
/	/	/	/	/	/

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissible Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum conducted output power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (I) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Frequency (MHz)	**Antenna Gain**		**Conducted Power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
903	2.0	1.58	19.06	80.54	20	0.0253	0.60
915	2.0	1.58	19.13	81.85	20	0.0257	0.61
927	2.0	1.58	19.01	79.62	20	0.0250	0.62

Result: The device meet FCC MPE at 20 cm distance.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT used one of two optional antennas with RP-SMA female connector arrangement and the max gain of antenna 1 is -1 dBi, antenna 2 is 2 dBi, which fulfill the requirement of this section. Please refer to the EUT photos.

Antenna information

Antenna	Manufacturer	Model Name	Size	Connector Type	Frequency range	Antenna Gain
1	*GlobalSat*	AN0915-3901BRS	108.5mm* ¢ 10mm	SMA Male Reverse	902-928 MHz	-1.0 dBi
2	*GlobalSat*	98619ZRSX003-715	135.6mm* ¢ 10.1mm	RP SMA PLUG	902-928 MHz	2.0 dBi

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

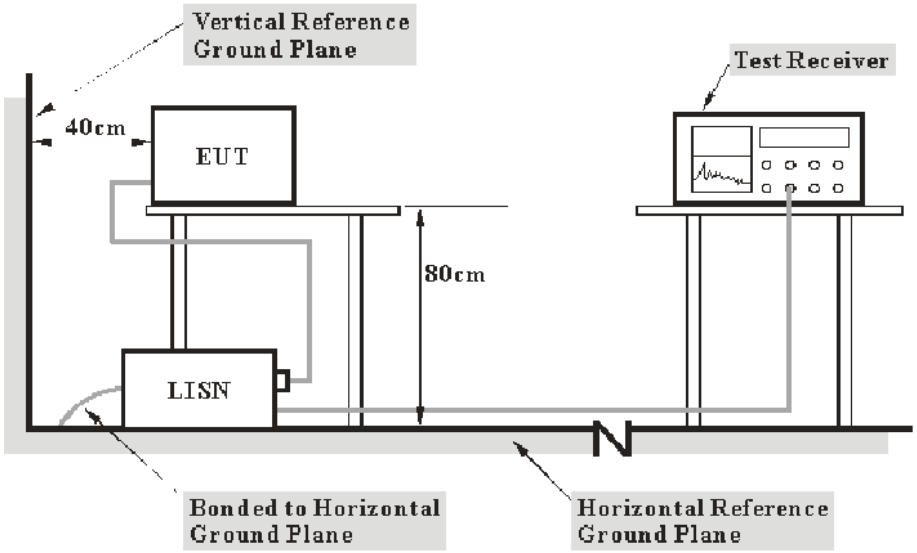
If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
– compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
– non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.46 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2014-10-20	2015-10-20
R&S	L.I.S.N	ESH2-Z5	892107/021	2015-07-16	2016-07-15
R&S	Two-line V-network	ENV 216	3560.6550.12	2014-12-11	2015-12-11
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

12.30 dB at **0.277046 MHz** in the **Line** conducted mode

Test Data

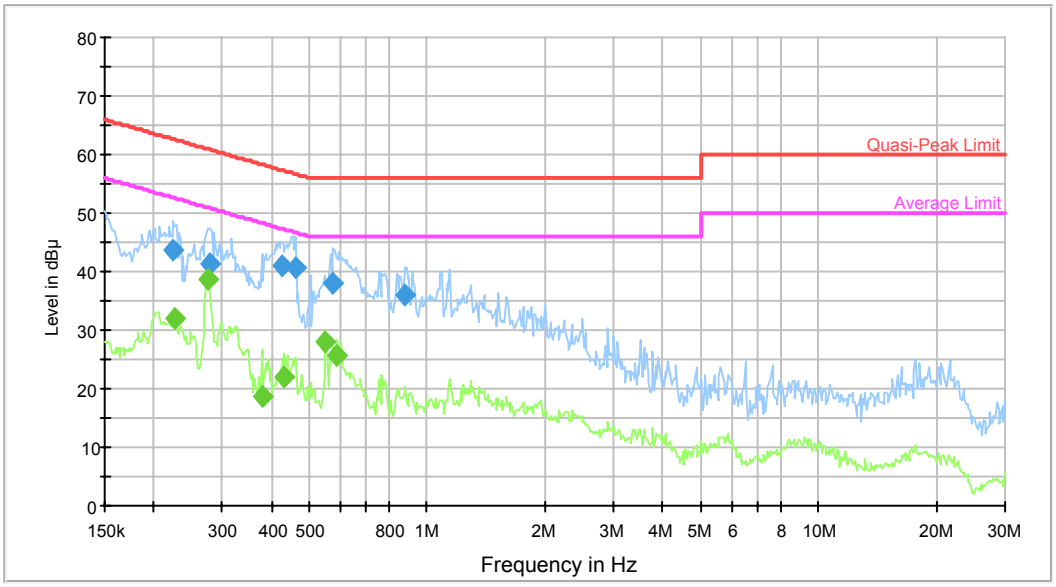
Environmental Conditions

Temperature:	27.1 °C
Relative Humidity:	51 %
ATM Pressure:	100.1 kPa

The testing was performed by Lion Xiao on 2015-09-11.

Test Mode: Transmitting

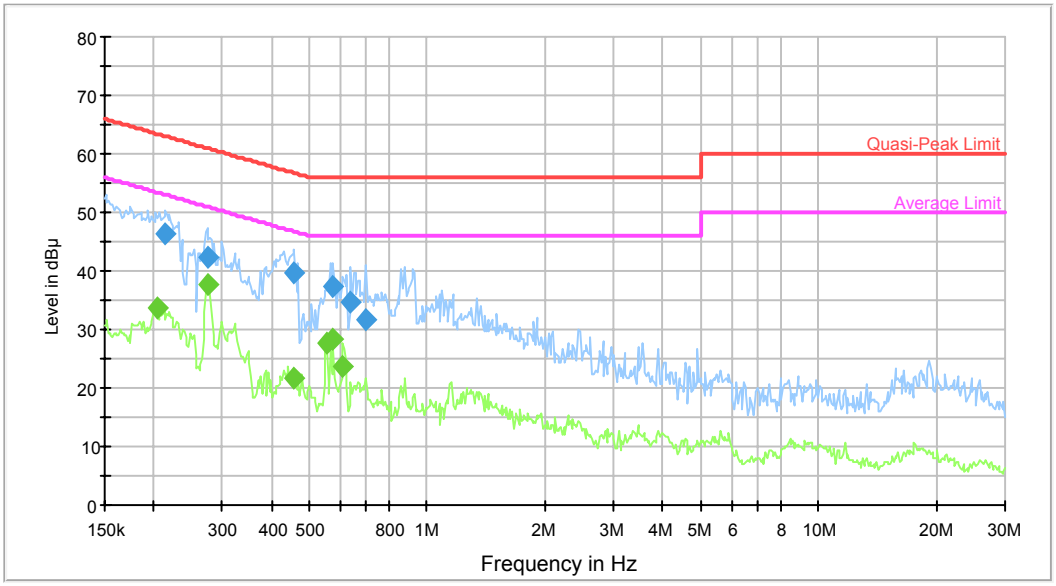
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.225205	43.8	9.000	L1	9.8	18.8	62.6	Compliance
0.279263	41.2	9.000	L1	9.8	19.7	60.8	Compliance
0.426011	41.0	9.000	L1	9.8	16.4	57.3	Compliance
0.461346	40.6	9.000	L1	9.8	16.0	56.7	Compliance
0.576662	38.1	9.000	L1	9.8	17.9	56.0	Compliance
0.879690	35.9	9.000	L1	9.8	20.1	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.227007	32.0	9.000	L1	9.8	20.6	52.6	Compliance
0.277046	38.6	9.000	L1	9.8	12.3	50.9	Compliance
0.378019	18.8	9.000	L1	9.8	29.6	48.3	Compliance
0.429420	21.9	9.000	L1	9.8	25.4	47.3	Compliance
0.549741	28.1	9.000	L1	9.8	17.9	46.0	Compliance
0.585926	25.8	9.000	L1	9.8	20.2	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.214692	46.2	9.000	N	9.8	16.8	63.0	Compliance
0.274848	42.2	9.000	N	9.8	18.7	61.0	Compliance
0.457684	39.7	9.000	N	9.8	17.0	56.7	Compliance
0.576662	37.3	9.000	N	9.8	18.7	56.0	Compliance
0.639600	34.6	9.000	N	9.8	21.4	56.0	Compliance
0.698191	31.7	9.000	N	9.8	24.3	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.204669	33.7	9.000	N	9.8	19.7	53.4	Compliance
0.277046	37.7	9.000	N	9.8	13.2	50.9	Compliance
0.457684	21.6	9.000	N	9.8	25.1	46.7	Compliance
0.554139	27.6	9.000	N	9.8	18.4	46.0	Compliance
0.576662	28.4	9.000	N	9.8	17.6	46.0	Compliance
0.609741	23.7	9.000	N	9.8	22.3	46.0	Compliance

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 2, then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 2, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

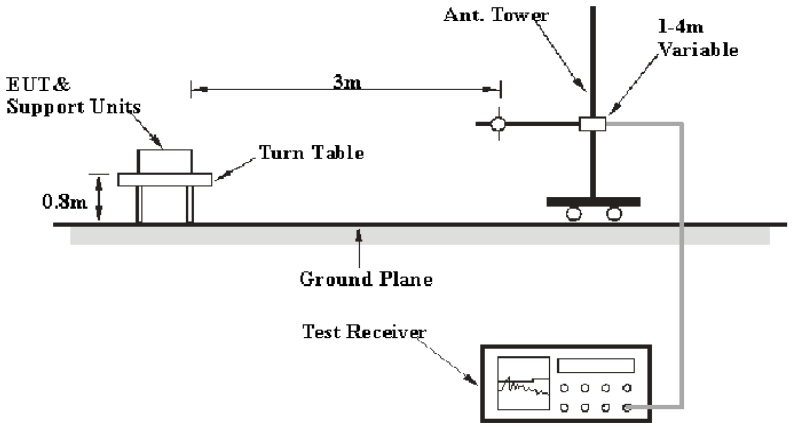
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:
30M~200MHz: 5.0 dB
200M~1GHz: 6.2 dB
1G~6GHz: 4.45 dB
6G~18GHz: 5.23 dB

Table 2 – Values of U_{cispr}

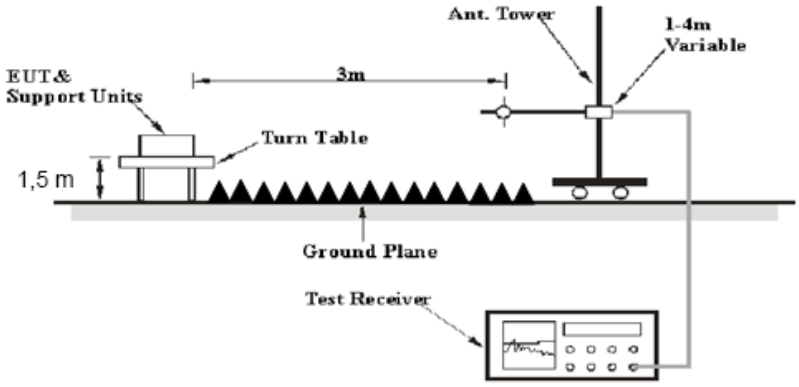
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 10 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Loss + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit –Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2015-08-03	2016-08-02
Sunol Sciences	Antenna	JB3	A060611-3	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2014-12-04	2015-12-04
R&S	Spectrum Analyzer	FSEM	831259/019	2015-07-28	2016-07-27
ETS-Lindgren	Horn Antenna	3115	9808-5557	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2015-02-15	2016-02-19

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

14.24 dB at **165.7 MHz** in the **Vertical** polarization

Test Data

Environmental Conditions

Temperature:	25.1°C
Relative Humidity:	53 %
ATM Pressure:	101.4 kPa

** The testing was performed by Lion Xiao on 2015-10-14.*

Test Mode: Transmitting

Antenna 1:

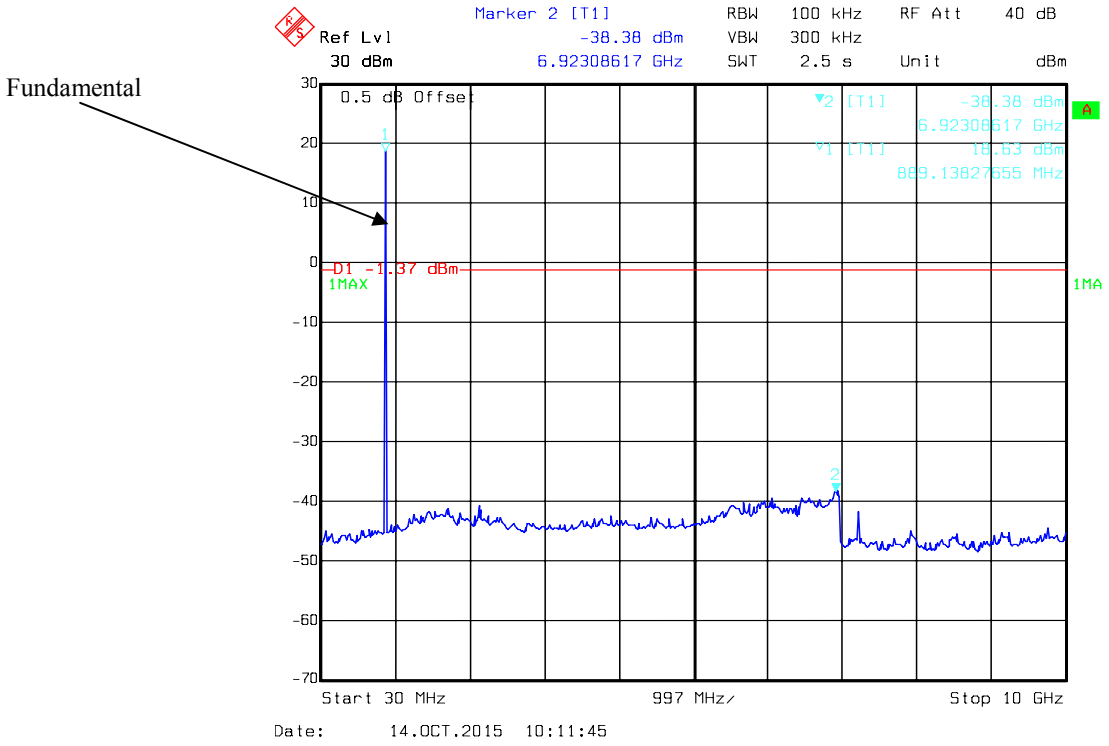
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel:903 MHz									
903	85.46	QP	H	22.95	3.70	0.00	110.11	N/A	N/A
903	89.51	QP	V	22.95	3.70	0.00	114.16	N/A	N/A
902	32.3	QP	V	22.94	3.71	0.00	58.95	94.16	35.21
1806	46.6	PK	V	26.96	2.66	27.53	48.69	74.00	25.31
1806	33.49	AV	V	26.96	2.66	27.53	35.58	54.00	18.42
2709	36.43	PK	V	29.58	4.48	27.50	42.99	74.00	31.01
2709	23.06	AV	V	29.58	4.48	27.50	29.62	54.00	24.38
3612	30.99	PK	V	32.57	4.61	27.28	40.89	74.00	33.11
3612	18.34	AV	V	32.57	4.61	27.28	28.24	54.00	25.76
1995	39.4	PK	V	27.49	3.12	27.48	42.53	74.00	31.47
1995	26.16	AV	V	27.49	3.12	27.48	29.29	54.00	24.71
165.7	36.1	QP	V	12.35	1.55	21.44	28.56	43.50	14.94
Middle Channel: 915 MHz									
915	86.17	QP	H	22.91	3.68	0.00	110.76	N/A	N/A
915	90.03	QP	V	22.91	3.68	0.00	114.62	N/A	N/A
1830	46.78	PK	V	27.02	2.88	27.52	49.16	74.00	24.84
1830	33.64	AV	V	27.02	2.88	27.52	36.02	54.00	17.98
2745	36.62	PK	V	29.73	4.37	27.52	43.20	74.00	30.80
2745	23.28	AV	V	29.73	4.37	27.52	29.86	54.00	24.14
3660	31.47	PK	V	32.51	4.55	27.30	41.23	74.00	32.77
3660	18.51	AV	V	32.51	4.55	27.30	28.27	54.00	25.73
1995	39.73	PK	V	27.49	3.12	27.48	42.86	74.00	31.14
1995	26.41	AV	V	27.49	3.12	27.48	29.54	54.00	24.46
1198	38.49	PK	V	25.38	2.84	26.81	39.90	74.00	34.10
1198	25.67	AV	V	25.38	2.84	26.81	27.08	54.00	26.92
165.7	36.7	QP	V	12.35	1.55	21.44	29.16	43.50	14.34
High Channel: 927 MHz									
927	85.55	QP	H	22.98	3.70	0.00	110.23	N/A	N/A
927	89.67	QP	V	22.98	3.70	0.00	114.35	N/A	N/A
928	34.24	QP	V	23.00	3.70	0.00	60.94	94.35	33.41
1854	47.15	PK	V	27.09	3.07	27.52	49.79	74.00	24.21
1854	34.2	AV	V	27.09	3.07	27.52	36.84	54.00	17.16
2781	36.88	PK	V	29.88	4.44	27.55	43.65	74.00	30.35
2781	23.59	AV	V	29.88	4.44	27.55	30.36	54.00	23.64
3708	31.97	PK	V	32.45	4.62	27.33	41.71	74.00	32.29
3708	18.74	AV	V	32.45	4.62	27.33	28.48	54.00	25.52
1995	39.98	PK	V	27.49	3.12	27.48	43.11	74.00	30.89
1995	26.61	AV	V	27.49	3.12	27.48	29.74	54.00	24.26
163.4	36.4	QP	V	12.54	1.56	21.44	29.06	43.50	14.44

Antenna 2:

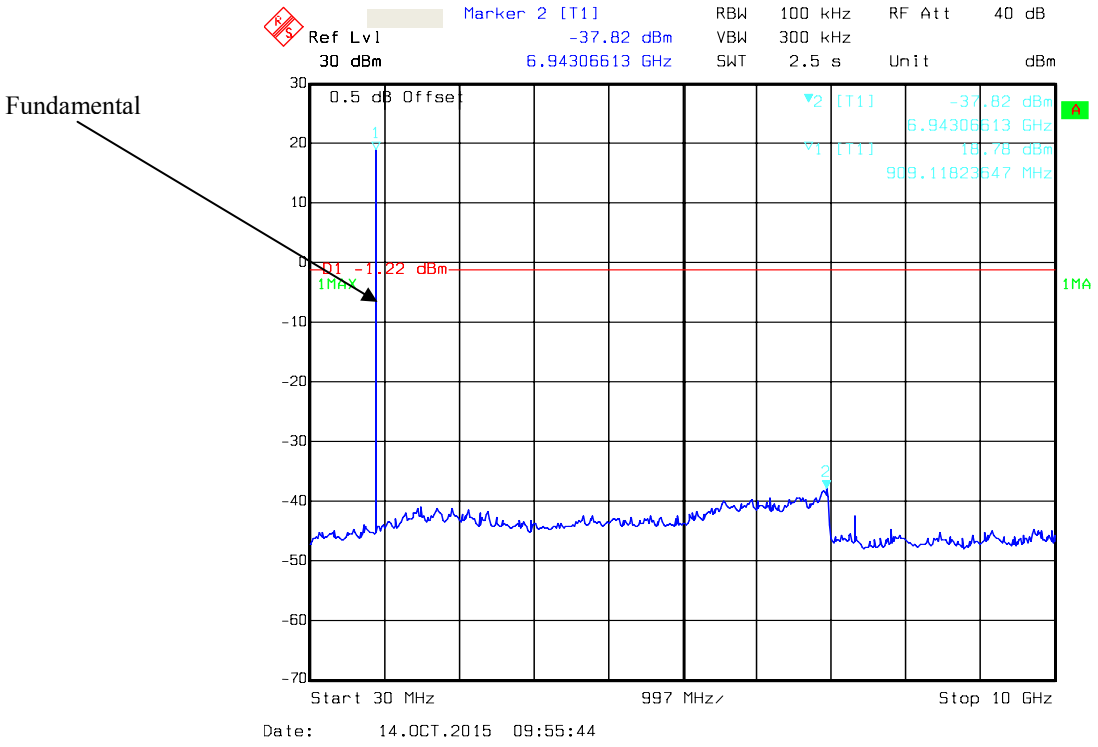
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel:903 MHz									
903	85.8	QP	H	22.95	3.70	0.00	112.45	N/A	N/A
903	89.9	QP	V	22.95	3.70	0.00	116.55	N/A	N/A
902	33.5	QP	V	22.94	3.71	0.00	60.15	96.55	36.40
1806	46.97	PK	V	26.96	2.66	27.53	49.06	74.00	24.94
1806	34.24	AV	V	26.96	2.66	27.53	36.33	54.00	17.67
2709	38.19	PK	V	29.58	4.48	27.50	44.75	74.00	29.25
2709	26.01	AV	V	29.58	4.48	27.50	32.57	54.00	21.43
3612	30.74	PK	V	32.57	4.61	27.28	40.64	74.00	33.36
3612	18.58	AV	V	32.57	4.61	27.28	28.48	54.00	25.52
1995	39.45	PK	V	27.49	3.12	27.48	42.58	74.00	31.42
1995	27.3	AV	V	27.49	3.12	27.48	30.43	54.00	23.57
165.7	36.8	QP	V	12.35	1.55	21.44	29.26	43.50	14.24
Middle Channel: 915 MHz									
915	86.8	QP	H	22.91	3.68	0.00	113.39	N/A	N/A
915	90.4	QP	V	22.91	3.68	0.00	116.99	N/A	N/A
1830	47.09	PK	V	27.02	2.88	27.52	49.47	74.00	24.53
1830	34.82	AV	V	27.02	2.88	27.52	37.20	54.00	16.80
2745	38.56	PK	V	29.73	4.37	27.52	45.14	74.00	28.86
2745	25.33	AV	V	29.73	4.37	27.52	31.91	54.00	22.09
3660	30.48	PK	V	32.51	4.55	27.30	40.24	74.00	33.76
3660	18.23	AV	V	32.51	4.55	27.30	27.99	54.00	26.01
1995	39.45	PK	V	27.49	3.12	27.48	42.58	74.00	31.42
1995	27.61	AV	V	27.49	3.12	27.48	30.74	54.00	23.26
1198	37.22	PK	V	25.38	2.84	26.81	38.63	74.00	35.37
1198	25.17	AV	V	25.38	2.84	26.81	26.58	54.00	27.42
165.7	36.5	QP	V	12.35	1.55	21.44	28.96	43.50	14.54
High Channel: 927 MHz									
927	86.3	QP	H	22.98	3.70	0.00	112.98	N/A	N/A
927	90.1	QP	V	22.98	3.70	0.00	116.78	N/A	N/A
928	35.7	QP	V	23.00	3.70	0.00	62.40	96.78	34.38
1854	47.49	PK	V	27.09	3.07	27.52	50.13	74.00	23.87
1854	35.24	AV	V	27.09	3.07	27.52	37.88	54.00	16.12
2781	38.97	PK	V	29.88	4.44	27.55	45.74	74.00	28.26
2781	26.72	AV	V	29.88	4.44	27.55	33.49	54.00	20.51
3708	30.09	PK	V	32.45	4.62	27.33	39.83	74.00	34.17
3708	18.14	AV	V	32.45	4.62	27.33	27.88	54.00	26.12
1995	39.5	PK	V	27.49	3.12	27.48	42.63	74.00	31.37
1995	27.28	AV	V	27.49	3.12	27.48	30.41	54.00	23.59
163.4	36	QP	V	12.54	1.56	21.44	28.66	43.50	14.84

Conducted Spurious Emissions at Antenna Port

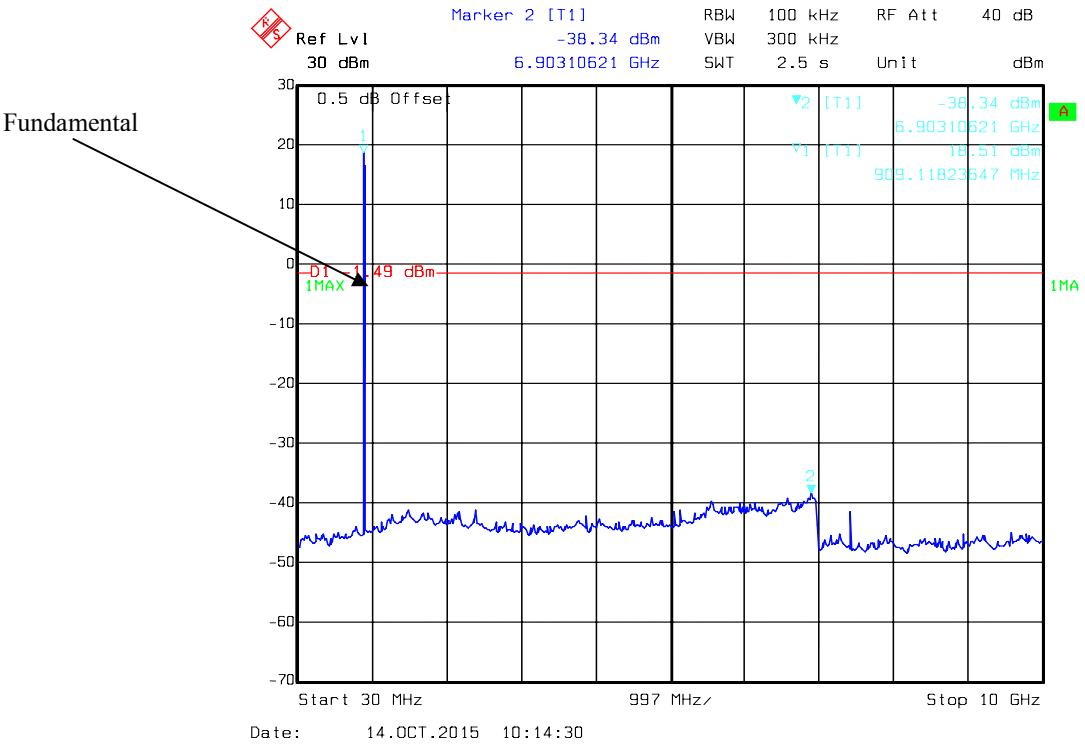
Low Channel



Middle Channel



High Channel



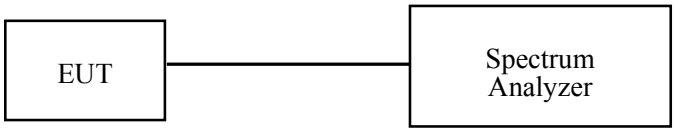
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

According to KDB 558074 D01 DTS Meas Guidance v03r03
a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27.2°C
Relative Humidity:	53 %
ATM Pressure:	100.1 kPa

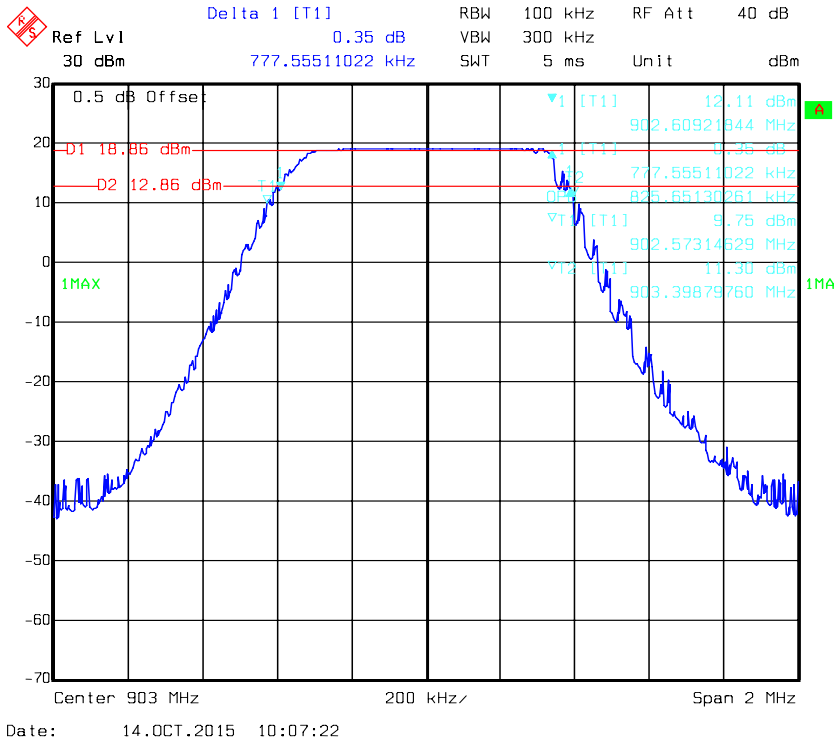
** The testing was performed by Lion Xiao on 2015-10-14.*

Test Mode: Transmitting

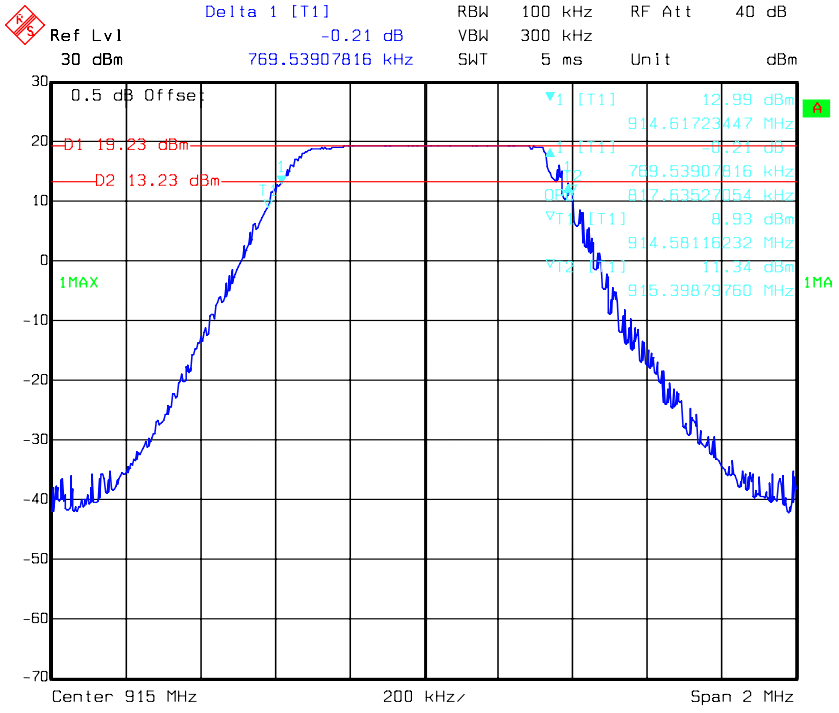
Test Result: Compliant. Please refer to the following table and plots.

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Limit (kHz)
Low	903	778	≥500
Middle	915	770	≥500
High	927	766	≥500

Low Channel



Middle Channel



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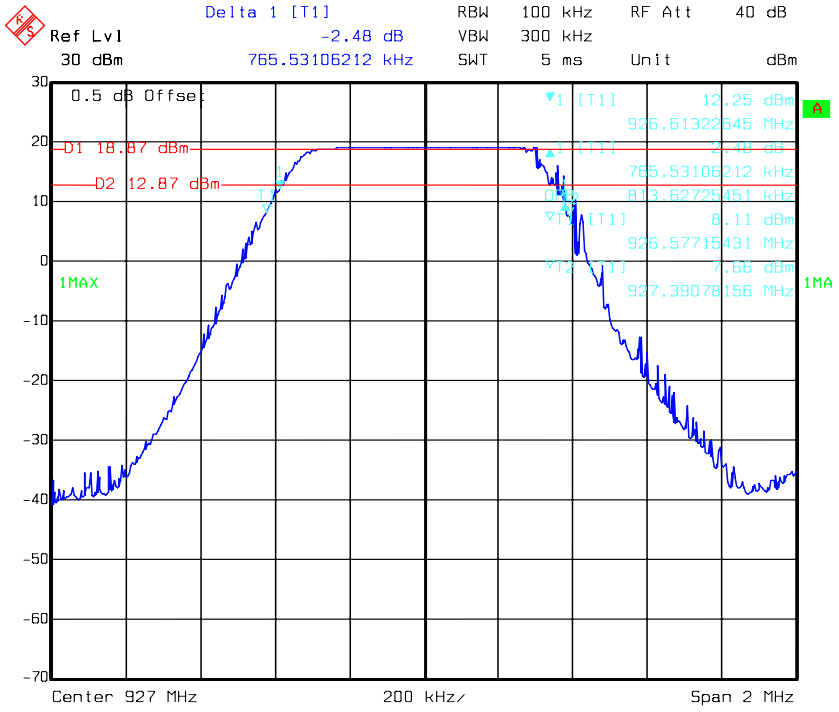
High Channel



Date: 14.OCT.2015 10:17:30

FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

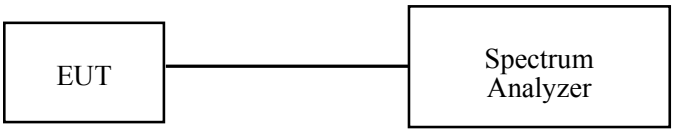
Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

According to KDB 558074 D01 DTS Meas Guidance v03r03

a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ 3×RBW.
c) Set span ≥ 3×RBW
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27.2°C
Relative Humidity:	53 %
ATM Pressure:	100.1 kPa

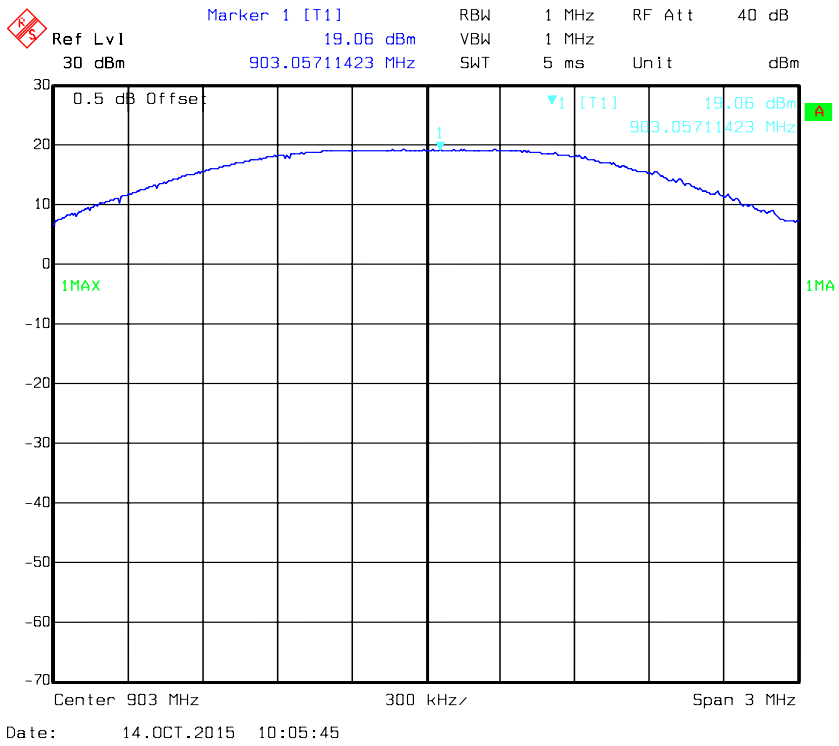
** The testing was performed by Lion Xiao on 2015-10-14.*

Test Mode: Transmitting

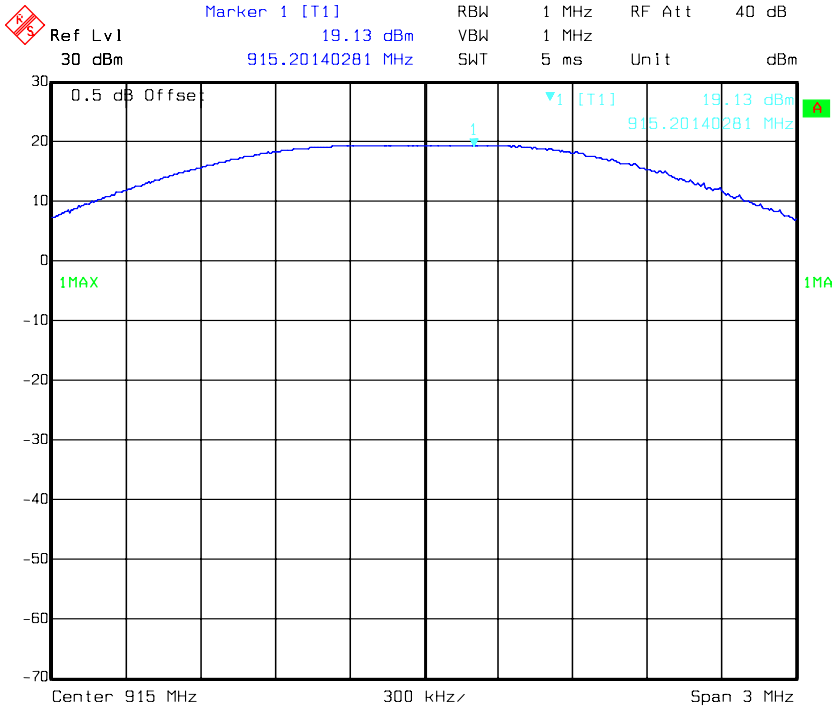
Test Result: Compliant. Please refer to the following table and plots.

Channel	Frequency	Max Peak Conducted Output Power	Limit
	(MHz)	(dBm)	(dBm)
Low	903	19.06	30
Middle	915	19.13	30
High	927	19.01	30

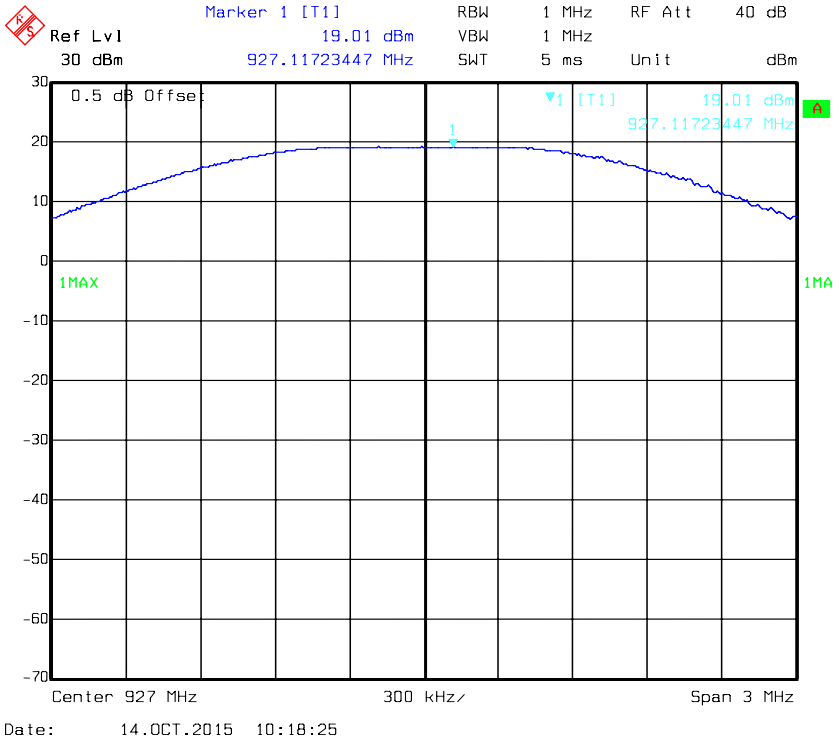
Low Channel



Middle Channel



High Channel



FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

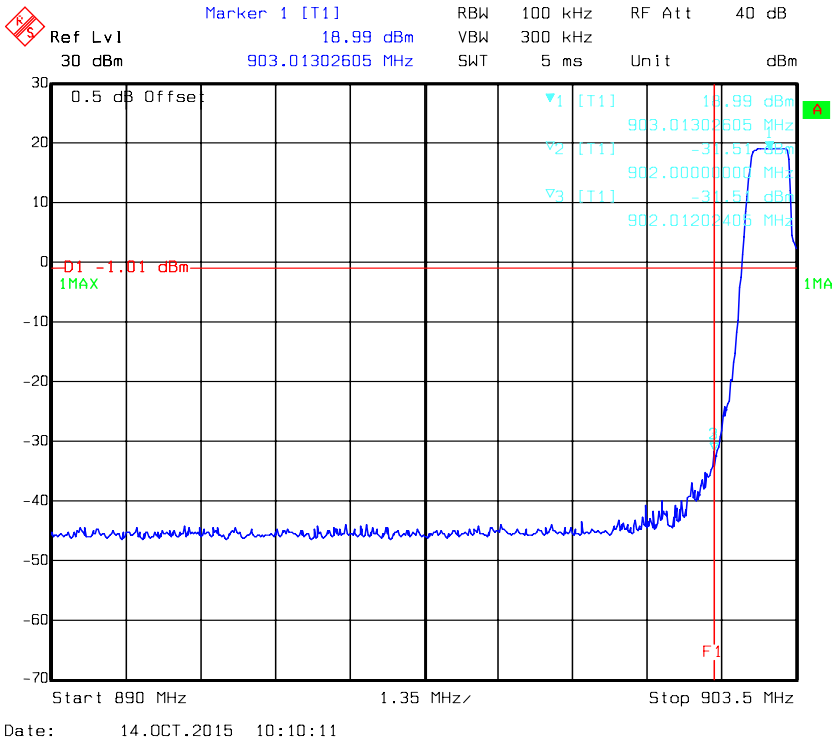
Temperature:	27.2°C
Relative Humidity:	53 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lion Xiao on 2015-10-14.*

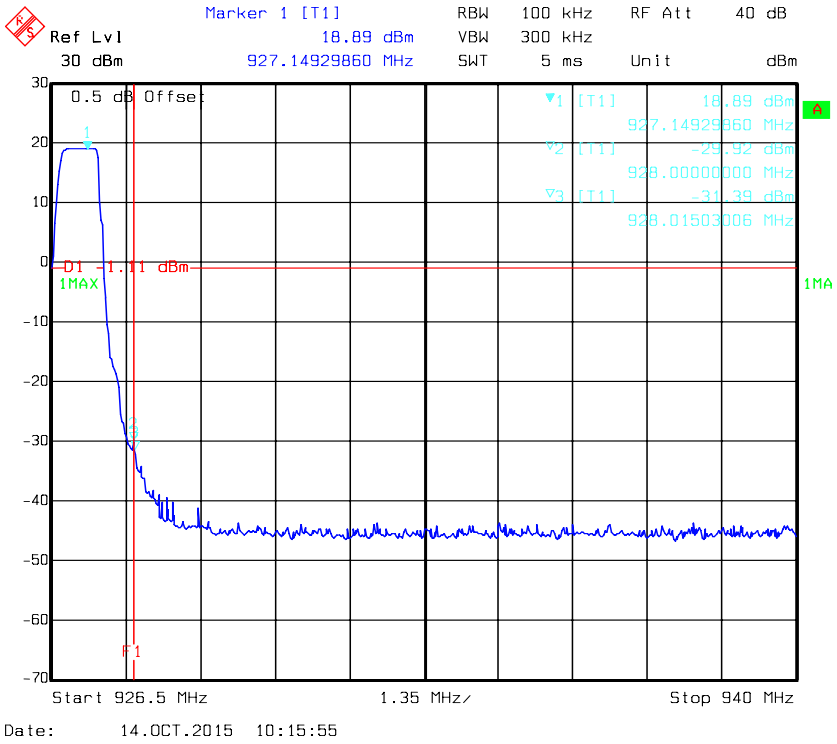
Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

Band Edge， Left Side



Band Edge, Right Side



FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

According to KDB 558074 D01 DTS Meas Guidance v03r03

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3×RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27.2°C
Relative Humidity:	53 %
ATM Pressure:	100.1 kPa

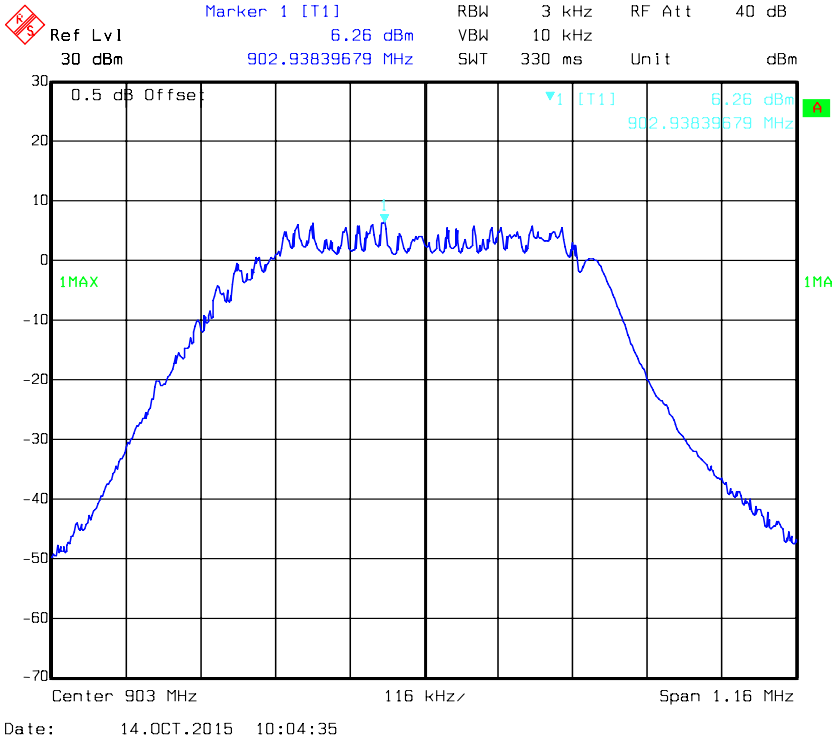
** The testing was performed by Lion Xiao on 2015-10-14.*

Test Mode: Transmitting

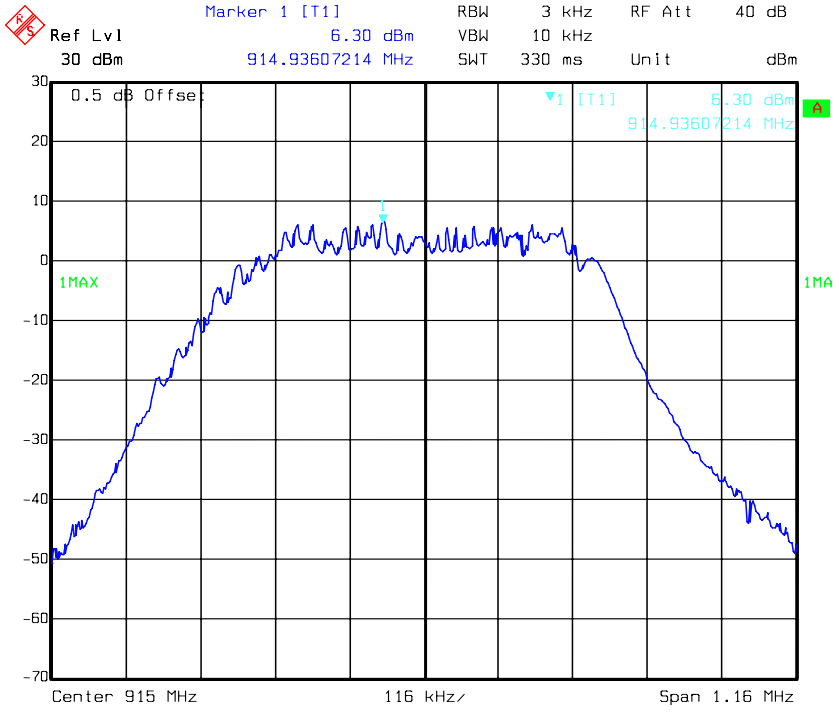
Test Result: Compliant. Please refer to the following table and plots

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	903	6.26	≤8
Middle	915	6.30	≤8
High	927	6.20	≤8

Power Spectral Density, Low Channel



Power Spectral Density, Middle Channel



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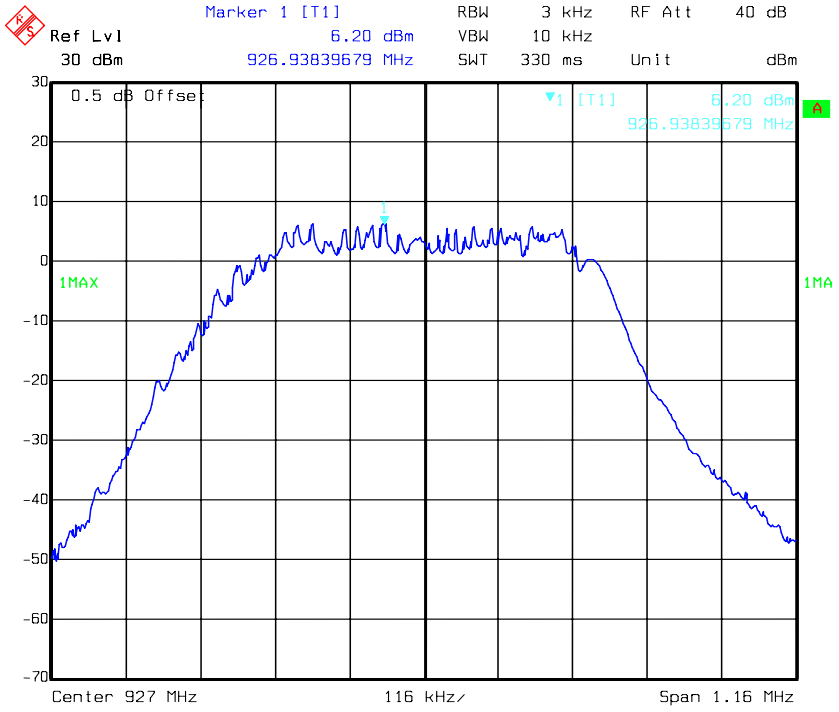
Power Spectral Density, High Channel



Date: 14.OCT.2015 10:20:13

******* END OF REPORT *******