



588 West Jindu Road, Songjiang District, Shanghai, China

Telephone: +86 (0) 21 6191 5666
Fax: +86 (0) 21 6191 5655
ee.shanghai@sgs.com

Report No.: SHEM120800118401
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TEST REPORT

Application No. : SHEM1208001184RF
Applicant: Hopkins Manufacturing Corporation
FCC ID: TJJ-IL001
Fundamental Frequency : 433.92MHz
Equipment Under Test (EUT):
Name: LED Remote
Model No.: AUTOLED
Standards: FCC 47 CFR PART 15 SUBPART C
Date of Receipt: Aug. 17, 2012
Date of Test: Aug. 23, 2012 to Sep 2, 2012
Date of Issue: Sep 9, 2012
Test Result : **PASS ***

* In the configuration tested, the EUT complied with the standards specified above.

Jim Xu
E&E Section Head
SGS-CSTC(Shanghai) Co., Ltd.

Neil Zhang
E&E Project Engineer
SGS-CSTC(Shanghai) Co., Ltd.

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2 Test Summary

TEST ITEM	FCC REFERANCE	Test Method	RESULT
Powerline Conductived Emissions	15.207	ANSI C63.10: 2009	N/A
20dB Bandwidth	15.231(c)	ANSI C63.10: 2009	Pass
Limit of Transmission	15.231(a)(1)	ANSI C63.10: 2009	Pass
Radiated Emissions	FCC Part15 209(a) and FCC Part15 205	ANSI C63.10: 2009	Pass

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4 General Information

4.1 Client Information

Applicant : Hopkins Manufacturing Corporation
 Applicant Address: 428 Peyton Emporia, Emporia, KS 66801
 Manufacturer: Genimex Jersey Limited
 Manufacturer Address: Room A, 9F, 212 Jiangning Road, Jing An District, Shanghai

4.2 Details of E.U.T.

Name: LED Remote
 Model No.: AUTOLED
 Antenna Type: Interior antenna
 Power Supply: 12VDC form Battery
 Modulation Technique: ASK
 Frequency Band : 433.92MHz

4.3 Description of Support Units

Name	Model No.	Remark
N/A	N/A	N/A

4.4 Test Location

Tests were performed at:
 SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.
 No.588 West Jindu Road, Songjiang District, Shanghai, China. 201612.
 Tel: +86 21 6191 5666 Fax: +86 21 6191 5655
 No tests were sub-contracted.

4.5 Other Information Requested by the Customer

None.



4.6 Test Facility

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. Date of expiry: 2014-07-26.

- **FCC – Registration No.: 402683**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683, Expiry Date: 2015-02-22.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A. Expiry Date: 2014-09-20.



4.7 Test Instruments

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	EMI test receiver	Rohde & Schwarz	ESU40	100109	2012-6-3	2013-6-1
2	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-679	2012-6-3	2013-6-1
3	Horn Antenna	Rohde & Schwarz	HF906	100284	2012-3-12	2013-3-10
4	ANTENNA	SCHWARZBECK	VULB9168	9168-313	2012-6-3	2013-6-1
5	Ultra broadband antenna	Rohde & Schwarz	HL562	100227	2011-10-9	2012-10-8
6	Atmosphere pressure meter	Shanghai ZhongXuan Electronic Co;Ltd	BY—2003P	--	2011-10-15	2012-10-14
7	CLAMP METER	FLUKE	316	86080010	2012-04-22	2013-04-20
8	Thermo-Hygrometer	ZHICHEN	ZC1-2	01050033	2011-10-15	2012-10-14
9	High-low temperature cabinet	Shanghai YuanZhen	GW2050	--	2012-6-17	2013-6-16
11	Tunable Notch Filter	Wainwright instruments Gmbh	WRCT1800.0/ 2000.0-0.2/40- 5SSK	11	2012-1-26	2013-1-25
12	Tunable Notch Filter	Wainwright instruments Gmbh	WRCT800.0/88 0.0-0.2/40-5SSK	9	2012-1-26	2013-1-25
13	High pass Filter	FSCW	HP 12/2800- 5AA2	19A45-02	2012-4-8	2013-4-7
14	Low noise amplifier	TESEQ	LNA6900	70133	2012-7-5	2013-7-4
15	EMI test receiver	Rohde & Schwarz	ESCS30	100086	2012-06-04	2013-06-03
16	Line impedance stabilization network	SCHWARZBECK	NSLK8127	8127-490	2012-05-07	2013-05-06

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4.8 E.U.T. Operation

Input voltage: 12VDC (AA Battery X1)

Operating Environment:

Temperature: 23.0 °C

Humidity: 59 % RH

Atmospheric Pressure: 1007 mbar

EUT Operation: The EUT has been tested under RF Model .

Test program was used to control the EUT for staying in continuous transmitting mode.

To determine the worst-position of the highest emissions, the EUT's antenna was investigated for X, Y, Z positions, and the worst position was turned out to be a Y-position.

RF operation Frequency : 433.92MHz

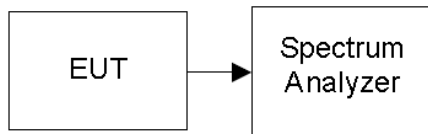
5 Test Procedure & Measurement Data

5.1 20 dB Bandwidth

Test Requirement: FCC Part 15 15.231(c)
Test date Aug. 23, 2012
Limit The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Measurement Procedure The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW is set to 10KHz and VBW is set 30KHz.

Test Configuration:



Measurement Result:

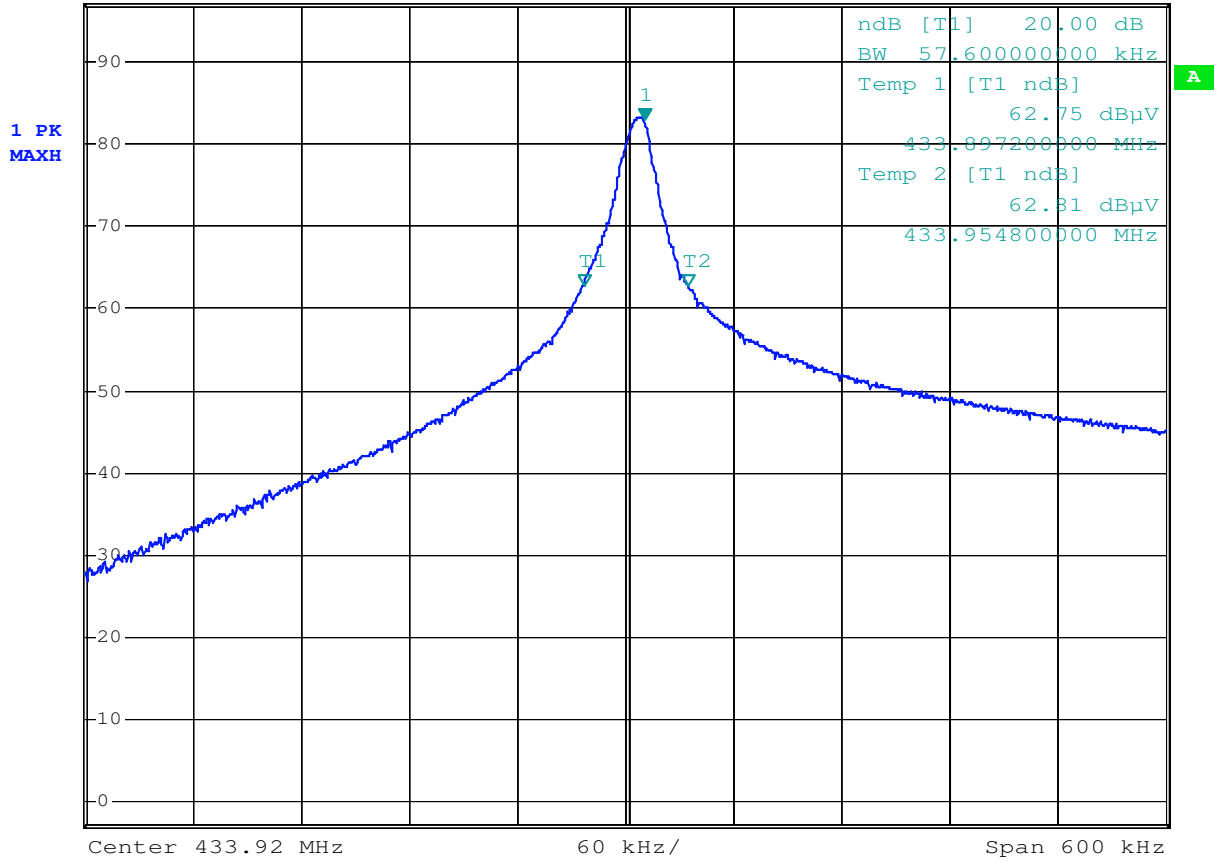
Frequency (MHz)	20 dB Bandwidth (kHz)	Limit (MHz)	Result
433.92	57.6	1.0848	PASS



20dB Bandwidth Test Plot



Ref 97 dB μ V *Att 10 dB *RBW 10 kHz Marker 1 [T1] VBW 30 kHz 82.88 dB μ V SWT 10 ms 433.930200000 MHz



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5.2 Limit of Transmission Time

Test Requirement: FCC Part15 231(a)(1)

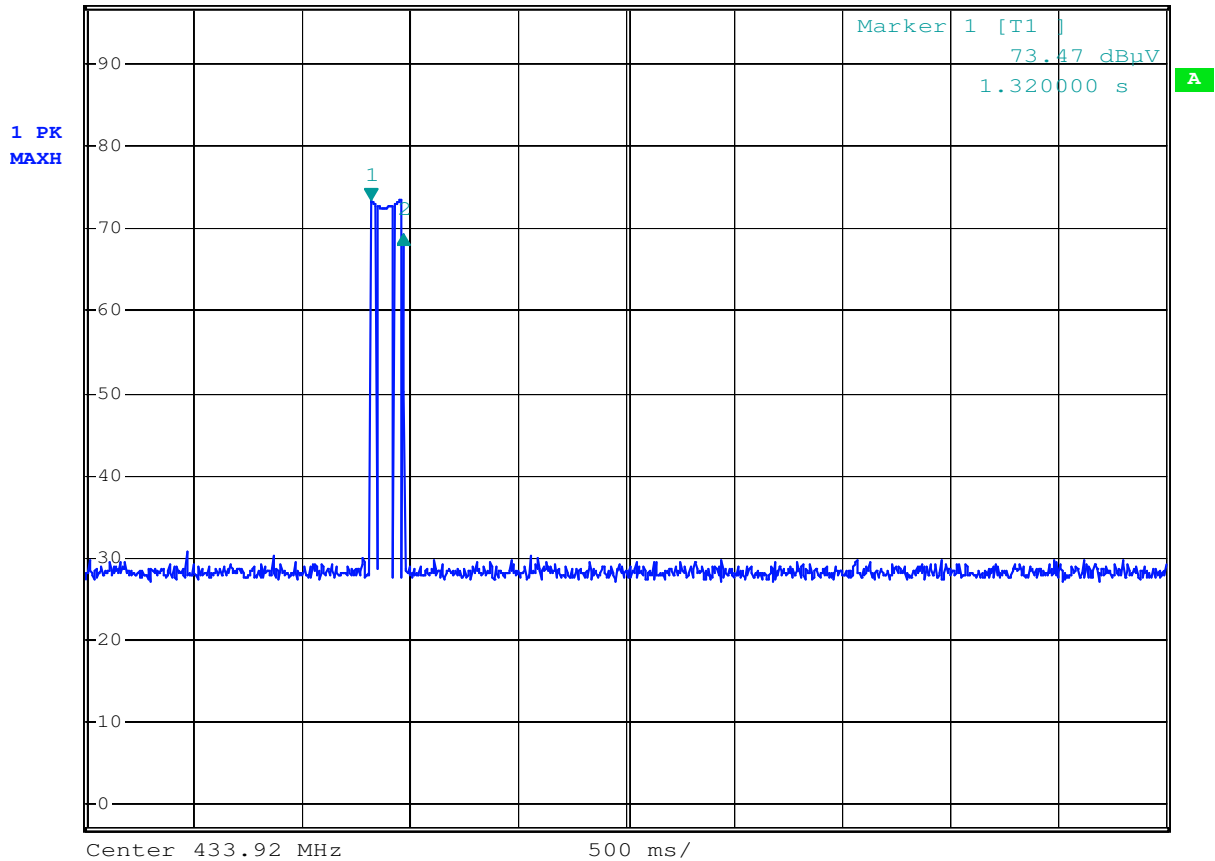
Test date: Aug. 23.2012

Limit According to 15.231(a)(1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Measurement Procedure: The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW and VBW are set to 100kHz, Span=0Hz.



Ref 97 dB μ V *Att 10 dB RBW 100 kHz Delta 2 [T1]
 *VBW 100 kHz -4.22 dB
 SWT 5 s 150.000000 ms



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5.3 Radiated Emission Test

Test Requirement: FCC Part15 209(a) and FCC Part15 15.205
Test date: Aug. 26.2012
Limit: 1.In the section 15.231(b): In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2250	225
70 - 130	1250	125
130 - 174	1250 to 3750*	125 to 375*
174 - 260	3750	375
260 - 470	3750 to 12500*	375 to 1250*
Above 470	12500	1250

2. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

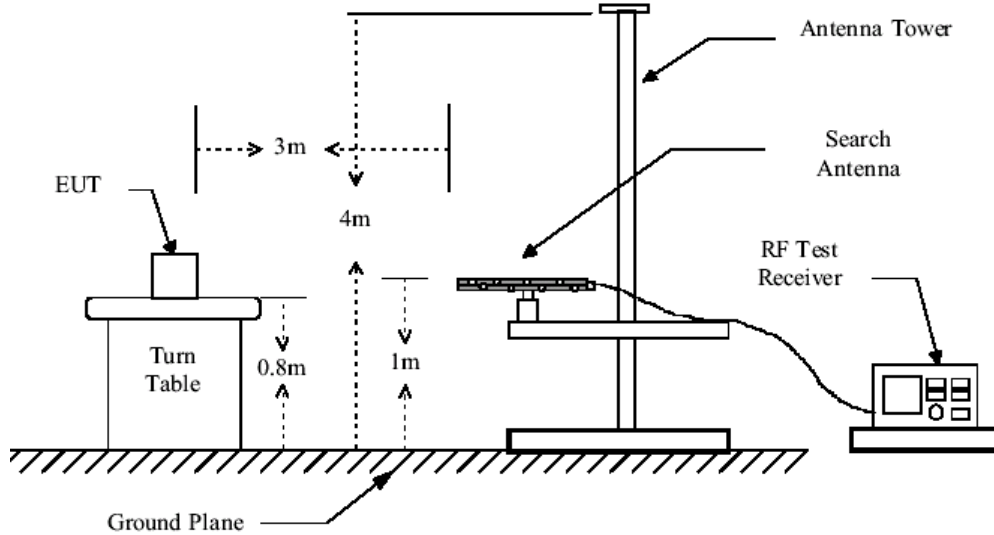
3. In the emission table above, the tighter limit applies at the band edges.

Measurement Procedure:

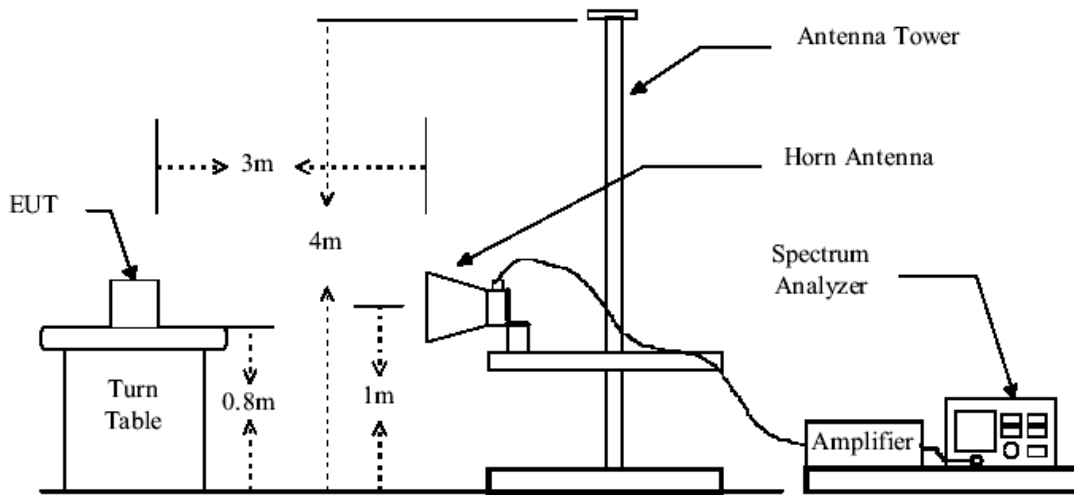
- The EUT was placed on a turn table which is 0.8m above ground plane.
- The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
Test instrumentation resolution bandwidth 120 kHz and Peak detector applies (30 MHz - 1000 MHz). 1MHz resolution bandwidth and Peak detector apply (1000 MHz – 25GHz)
Above 1GHz
PEAK: RBW=VBW=1MHz / Sweep=AUTO
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.
- Repeat above procedures until all frequency measured are complete.

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**Radiated Test Set-up:
Radiated Emission Test Set-up, Frequency Below 1000MHz**



Radiated Emission Test Set-up Frequency Over 1GHz





Test Result:

FCC 15.205

Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	QP Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
434.07	85.35	15.69	24.40	2.40	79.04	80.80	-1.76	Peak	HORIZONTAL
434.07	84.34	15.69	24.40	2.40	78.03	80.80	-2.77	Peak	VERTICAL

The field strength is calculated by adding the Antenna Factor, Cable Factor & Pre-amplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Pre-amplifier Factor

The formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(Frequency) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(Frequency) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

For that the EUT use fundamental frequency of 433.92MHz, after calculation, the limit is: Fundamental limit = 41.6667 * 433.92 - 7083.3333 = 10996.68 uV/m = 80.80dBuV/m

Spurious limit = 81 – 20 = 60.80dBuV/m



Duty cycle

Measurement Result:

Test Mode: Transmitting

Test Result: Compliance, please refer to following plots.

Duty cycle= T_{on}/T_p

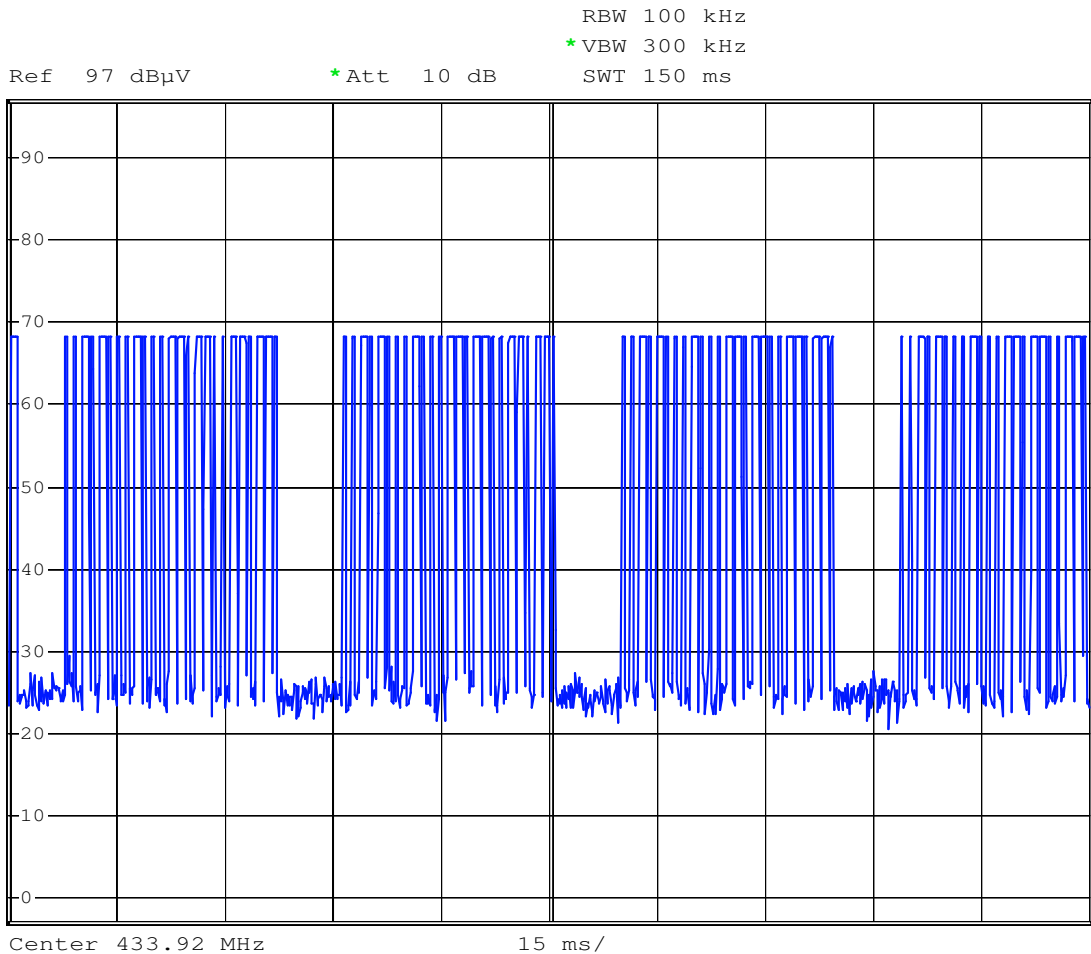
$T_{on}=T_{on1}N_1+T_{on2}N_2+\dots+T_{onn}N_n$

$=0.85ms *11+0.24ms*14= ms$

$T_p =42.30ms$

Duty cycle factor $=20Log(T_{on}/T_p)=20*log(12.71/42.30)= - 10.44$

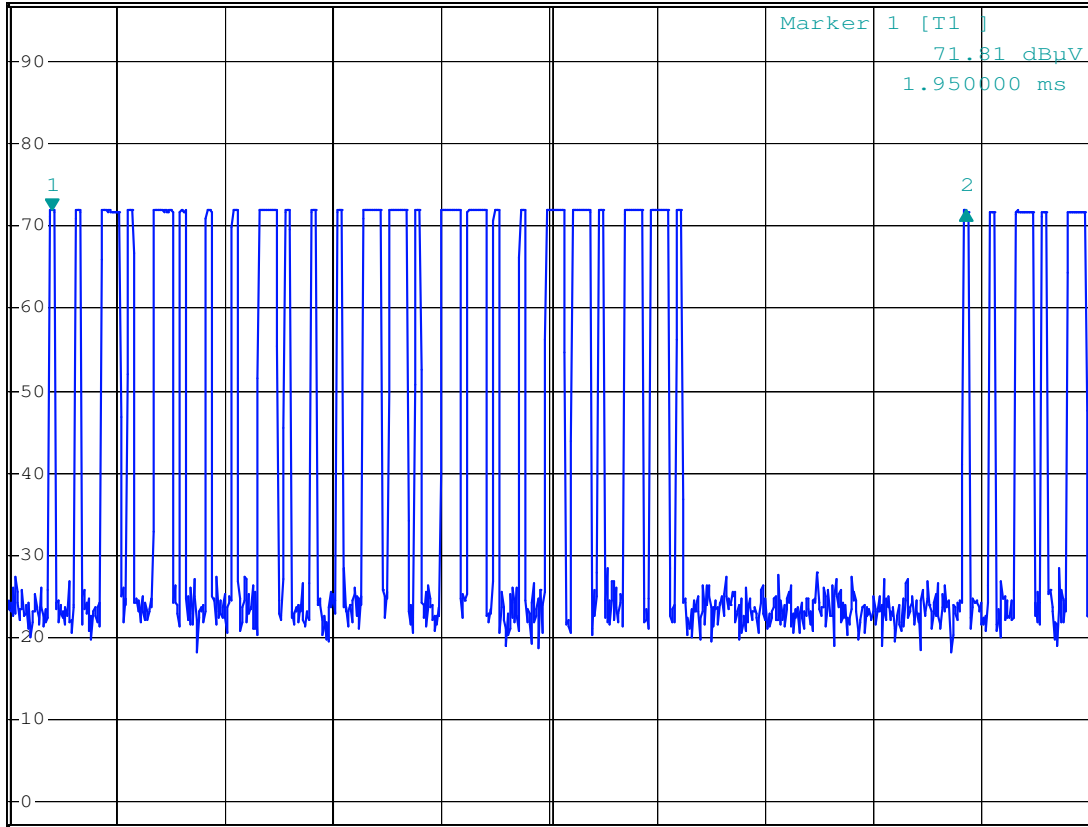
Test Plot:





Ref 97 dBµV *Att 10 dB RBW 100 kHz Delta 2 [T1]
 *VEW 300 kHz 0.01 dB
 SWT 50 ms 42.300000 ms

1 AP
VIEW

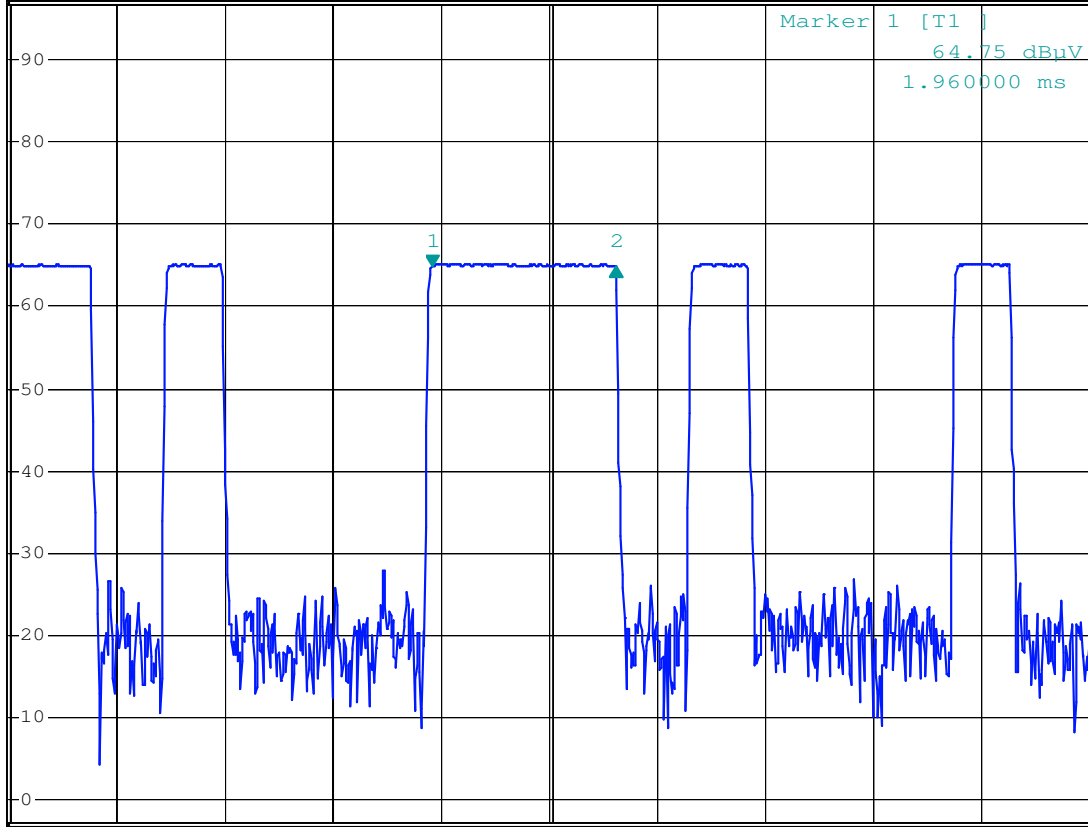


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Ref 97 dB μ V *Att 10 dB RBW 100 kHz Delta 2 [T1]
 *VEW 300 kHz 0.09 dB
 SWT 5 ms 850.000000 μ s

1 AP
VIEW



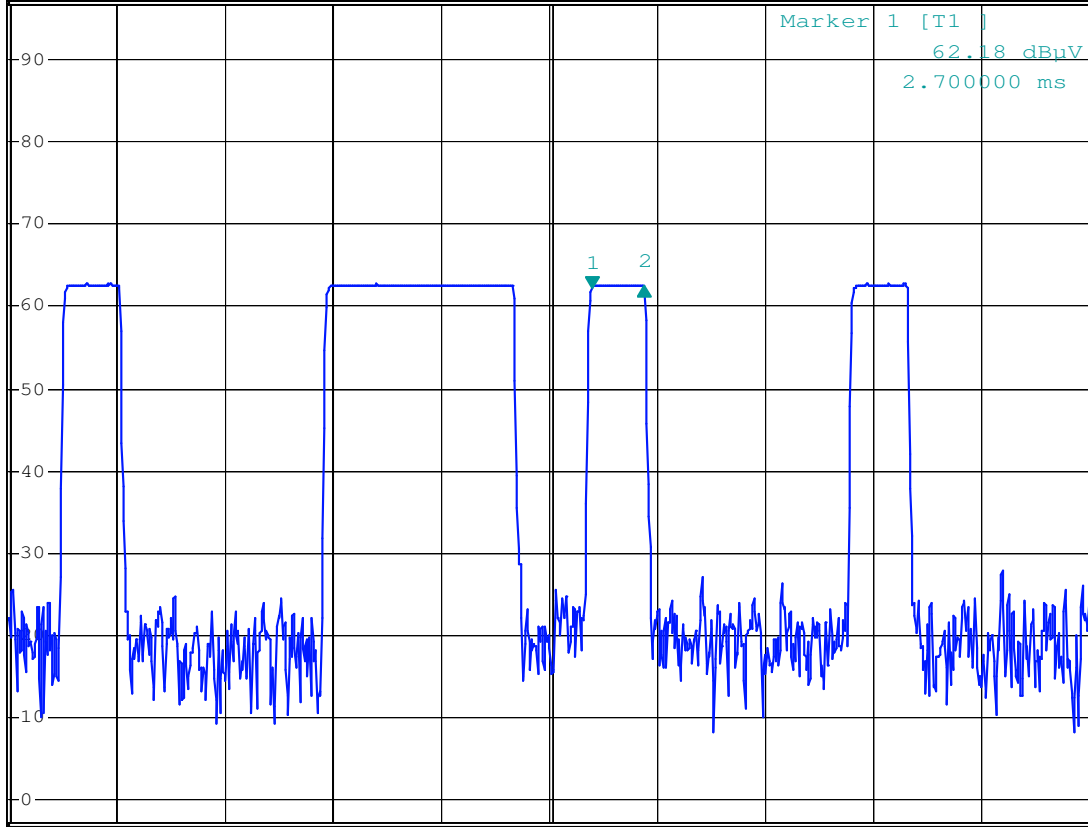
Center 433.92 MHz 500 μ s/

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Ref 97 dB μ V *Att 10 dB RBW 100 kHz Delta 2 [T1]
 *VEW 300 kHz 0.29 dB
 SWT 5 ms 240.000000 μ s

1 AP
VIEW



Center 433.92 MHz 500 μ s/

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FCC 15.209(a)

Below 1GHz

Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
33.45	22.78	12.31	24.70	0.47	10.86	40.00	-29.14	QP	HORIZONTAL
42.90	22.54	13.18	24.70	0.58	11.60	40.00	-28.40	QP	HORIZONTAL
50.41	22.48	12.78	24.70	0.65	11.21	40.00	-28.79	QP	HORIZONTAL
62.65	22.81	11.83	24.70	0.75	10.69	40.00	-29.31	QP	HORIZONTAL
157.56	22.71	12.62	24.70	1.31	11.94	43.50	-31.56	QP	HORIZONTAL
869.13	57.98	22.68	23.90	3.59	60.35	60.80	-0.45	PK	HORIZONTAL

Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
40.70	25.67	13.27	24.70	0.57	14.81	40.00	-25.19	QP	VERTICAL
44.28	24.67	13.13	24.70	0.59	13.69	40.00	-26.31	QP	VERTICAL
50.06	23.68	12.80	24.70	0.65	12.43	40.00	-27.57	QP	VERTICAL
63.98	22.82	11.64	24.70	0.76	10.52	40.00	-29.48	QP	VERTICAL
160.91	22.48	12.57	24.69	1.32	11.68	43.50	-31.82	QP	VERTICAL
869.13	57.26	22.68	23.90	3.59	59.63	60.80	-1.17	PK	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - Preamp Factor

2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit

Remark:

1. No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)
2. Measuring frequencies from 30 MHz to the 1GHz.
3. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak detector mode.
- 4..The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.
5. If PK reading is less than AV limit, the AV test can be elided.

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Above 1GHz

Above 1GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1317.76	70.03	25.04	42.20	4.76	57.63	74.00	-16.37	Peak	HORIZONTAL
1736.48	69.97	25.58	42.25	6.23	59.53	80.80	-21.27	Peak	HORIZONTAL
2168.51	57.18	26.41	42.37	7.36	48.58	80.80	-32.22	Peak	HORIZONTAL
2603.35	62.34	27.57	42.50	7.20	54.61	80.80	-26.19	Peak	HORIZONTAL
3037.06	60.38	28.21	42.52	6.90	52.97	80.80	-27.83	Peak	HORIZONTAL
3473.88	59.40	28.39	42.78	8.27	53.28	80.80	-27.52	Peak	HORIZONTAL
3909.97	60.31	29.30	42.88	8.56	55.29	74.00	-18.71	Peak	HORIZONTAL
4338.16	58.83	30.04	42.83	9.40	55.44	74.00	-18.56	Peak	HORIZONTAL

Freq.	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Result Level	Limit Line	Over Limit	Detector	Polarization
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
1315.40	70.02	25.01	42.20	4.76	57.59	74.00	-16.41	Peak	VERTICAL
1736.48	70.87	25.56	42.25	6.23	60.41	80.80	-20.39	Peak	VERTICAL
2168.51	64.88	26.41	42.37	7.36	56.28	80.80	-24.52	Peak	VERTICAL
2603.35	65.00	27.57	42.50	7.20	57.27	80.80	-23.53	Peak	VERTICAL
3037.06	67.14	28.21	42.52	6.90	59.73	80.80	-21.07	Peak	VERTICAL
3473.88	56.75	28.39	42.78	8.27	50.63	80.80	-30.17	Peak	VERTICAL
3909.97	55.77	29.30	42.88	8.56	50.75	74.00	-23.25	Peak	VERTICAL
4338.16	62.75	30.04	42.83	9.40	59.36	74.00	-14.64	Peak	VERTICAL

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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) –Average Limit (dBuV/m).
6. If PK reading is less than AV limit, the AV test can be elided.

Calculating the AV value according to the duty cycle

Freq. (MHz)	PK Reading (dBuV/m) (dBμV)	Correct Factor (dB) (dB/m)	AV Reading (dBuV/m) (dB)	AV Limit (dBuV/m)	Over Limit (dB)	Polarization
1317.76	57.63	-10.44	47.19	54.00	-6.81	HORIZONTAL
1736.48	59.53		49.09	60.80	-11.71	HORIZONTAL
2168.51	48.58		38.14	60.80	-22.66	HORIZONTAL
2603.35	54.61		44.17	60.80	-16.63	HORIZONTAL
3037.06	52.97		42.53	60.80	-18.27	HORIZONTAL
3473.88	53.28		42.84	60.80	-17.96	HORIZONTAL
3909.97	55.29		44.85	54.00	-9.15	HORIZONTAL
4338.16	55.44		45.00	54.00	-9.00	HORIZONTAL
1315.40	57.59		47.15	54.00	-6.85	VERTICAL
1736.48	60.41		49.97	60.80	-10.83	VERTICAL
2168.51	56.28		45.84	60.80	-14.96	VERTICAL
2603.35	57.27		46.83	60.80	-13.97	VERTICAL
3037.06	59.73		49.29	60.80	-11.51	VERTICAL
3473.88	50.63		40.19	60.80	-20.61	VERTICAL
3909.97	50.75		40.31	54.00	-13.69	VERTICAL
4338.16	59.36		48.92	54.00	-5.08	VERTICAL

Remark: 1. Correct Factor = $20 \lg(\text{duty cycle}) = 20 \lg(12.71/42.30) = -10.44$

2. AV Reading = PK Reading + Correct Factor

3. Margin = Limit - AV Reading

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5.4 FCC Part 15.205 Restricted Bands of Operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	(²)
13.36 - 13.41	322 - 335.4		

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

End of the Report