

FCC PART SUBPART C 15.209 TEST REPORT

for

TPMS Trigger Tool

Model No.: TT01

FCC ID: HQXTT01

of

Applicant: Sysgration Ltd.

**Address: 5F-1., No.1, Sec.1, Tiding Blvd., Neihu Dist., Taipei City 114
Taiwan**

Tested and Prepared

by

Worldwide Testing Services (Taiwan) Co., Ltd.

FCC Registration No.: TW1477, TW0020, TW1072

Industry Canada filed test laboratory Reg. No.: 20037

A2LA Accredited No.: 2732.01



Report No.: W6M21907-19183-C-9

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.
TEL: 886-2-66068877 FAX: 886-2-66068879 E-mail: wts@wts-lab.com



Registration number: W6M21907-19183-C-9
FCC ID: HQXTT01

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1 General Information

1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.

The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.

Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.

Neither is there any guarantee that such a test sample will interwork with other genuinely open systems. The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that its performance generally conforms to representative cases of communications equipment.

The test results of this test report relate exclusively to the item tested as specified in 1.5.

The test report may only be reproduced or published in full.

Reproduction or publication of extracts from the report requires the prior written approval of the Worldwide Testing Services(Taiwan) Co., Ltd.

Tester:

August 06, 2019

Rick Chen

Rick Chen.

Date

WTS-Lab.

Name

Signature

Technical responsibility for area of testing:

August 06, 2019

Kevin Wang

Kevin Wang

Date

WTS

Name

Signature



Worldwide Testing Services(Taiwan) Co., Ltd.

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1.2 Testing laboratory

1.2.1 Location

OATS

No.5-1, Shuang Sing Village,

LiShuei Rd., Wanli Dist.,

New Taipei City 207, Taiwan (R.O.C.)

Company

Worldwide Testing Services(Taiwan) Co., Ltd.

6F, NO. 58, LANE 188, RUEY-KUANG RD.

NEIHU, TAIPEI 114, TAIWAN R.O.C.

Tel : 886-2-66068877

Fax : 886-2-66068879

1.2.2 Details of accreditation status

Accredited testing laboratory

A2LA accredited number: 2732.01

FCC filed test laboratory Reg. No. TW1477, TW0020, TW1072

Industry Canada filed test laboratory Reg. No. 20037

Test location, where different from Worldwide Testing Services (Taiwan) Co., Ltd. :

Name: ./.

Accredited number: ./.

Street: ./.

Town: ./.

Country: ./.

Telephone: ./.

Fax: ./.

1.3 Details of approval holder

Name: Sysgration Ltd.

Street: 5F-1., No.1, Sec.1, Tiding Blvd., Neihu Dist.,

Town: Taipei City 114

Country: Taiwan

Telephone: +886-2-2790-0088

Fax: +886-2-2790-9265

1.4 Application details

Date of receipt of test item: July 10, 2019

Date of test: from July 11, 2019 to August 06, 2019



Registration number: W6M21907-19183-C-9
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1.5 General information of Test item

Type of test item: TPMS Trigger Tool
Model Number: TT01
Multi-listing model number: ./.
Brand name: SYSGRATION
Photos: ./.
Transmitting Frequency: 125 kHz
Operation modes: Half-duplex
Antenna Type: LF Antenna
Power supply: USB Input: 5 Vd.c., Battery: 7.2 Vd.c., 2.6 Ah, 18.7 Wh

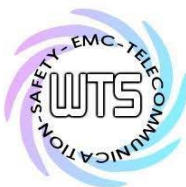
Manufacturer: (if different from Approval Holder)

Name: Sysgration Electronics Technology (HuiZhou) Company,Limited.
Street: YuXin Science Park 3rd Floor, Long Shan 7 Rd.,XiangShuiHe
Industrial Zone, DaYaWan,
Town: HuiZhou City GuangDong Province
Country: China

Additional information: ./.

1.6 Test standards

Technical standard :
FCC RULES 15 SUBPART C § 2.1049, § 15.203, § 15.209 (2018-10)



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2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

or

The deviations were ascertained in the course of the tests performed.

2.2 Test environment

Relative humidity content: 20 ... 75 %

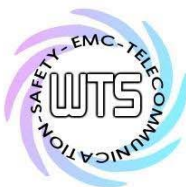
Air pressure: 86 ... 103 kPa

Details of power supply USB Input: 5 Vd.c., Battery: 7.2 Vd.c., 2.6 Ah, 18.7 Wh

Extreme conditions parameters: test voltage : -- extreme
min : -- V
max : -- V

Test item Name	Measurement Uncertainty
Estimation Result of Uncertainty of Conducted Emission	Expanded Uncertainty: AMN:1.30 dB Voltage probe:1.36 dB
Estimation Result of Uncertainty of Radiated Emission(3M)	Expanded Uncertainty: 0.009-30 MHz:2.02 dB 30-1000 MHz:3.49 dB 1-18 GHz:3.01 dB 18-40 GHz:2.43 dB
Estimation Result of Uncertainty of Bandwidth Measurement 20 dB Bandwidth, Occupied bandwidth, Channel bandwidth, Necessary Bandwidth	Expanded Uncertainty:0.45 kHz
Estimation Result of Uncertainty of Frequency Drift Measurement Frequency stability	Expanded Uncertainty:6.11 Hz

The decision rule is: Measurement uncertainty is not taken into account.



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2.3 Test Equipment List

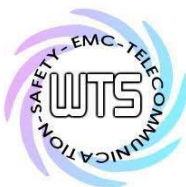
No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-CE 001	EMI TEST RECEIVER	ESHS10	842121/013	R&S	2019/6/4	2020/6/3
ETSTW-CE 003	AC POWER SOURCE	APS-9102	D161137	GW	Function Test	
ETSTW-CE 004	ZWEILEITER-V-NETZACHBILDUNG TWO-LINE V-NETWORK	ESH3-Z5	840731/011	R&S	2018/11/1	2019/10/31
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	2018/8/21	2019/8/20
ETSTW-CE 008	HF-EICHLITUNG RF STEP ATTENUATOR 139dB DPSP	334.6010.02	844581/024	R&S	Function Test	
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2019/7/1	2020/6/30
ETSTW-CE 016	TWO-LINE V-NETWORK	ENV216	100050	R&S	2018/9/25	2019/9/24
ETSTW-CE 028	MXE EMI Receiver	N9038A	MY53220110	Agilent	2019/7/15	2020/7/14
ETSTW-RE 003	EMI TEST RECEIVER	ESI 26	831438/001	R&S	2019/6/4	2020/6/3
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2019/5/29	2020/5/28
ETSTW-RE 012	TUNABLE BANDREJECT FILTER	D.C 0309	146	K&L	Function Test	
ETSTW-RE 013	TUNABLE BANDREJECT FILTER	D.C 0336	397	K&L	Function Test	
ETSTW-RE 018	MICROWAVE HORN ANTENNA	AT4560	27212	AR	2019/7/1	2020/6/30
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	ETS-Lindgren	2019/7/1	2020/6/30
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	ETS-Lindgren	2019/4/2	2020/4/1
ETSTW-RE 042	Biconical Antenna	HK116	100172	R&S	2019/1/29	2020/1/28
ETSTW-RE 043	Log-Periodic Dipole Antenna	HL223	100166	R&S	2019/4/23	2020/4/22
ETSTW-RE 044	Log-Periodic Antenna	HL050	100094	R&S	2019/5/13	2020/5/12
ETSTW-RE 045	ESA-E SERIES SPECTRUM ANALYZER	E4404B	MY45111242	Agilent	Pre-test Use	
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2019/2/27	2020/2/26
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2019/2/27	2020/2/26
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2019/2/27	2020/2/26
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2019/3/5	2020/3/4
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2019/2/27	2020/2/26
ETSTW-RE 062	Amplifier Module	CHC 2	None	KMIC	2019/5/16	2020/5/15
ETSTW-RE 064	Bluetooth Test Set	MT8852B-042	6K00005709	Anritsu	Function Test	
ETSTW-RE 069	Double-Ridged Guide Horn Antenna	3117	00069377	ETS-Lindgren	Function Test	
ETSTW-RE 072	CELL SITE TEST SET	8921A	3339A00375	HP	2018/9/17	2019/9/16
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2018/9/18	2019/9/17
ETSTW-RE 091	Match Pad	MDCS1500	None	WOKEN	2019/5/9	2020/5/8
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2019/2/22	2020/2/21
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	T-0A023536	T-Power	Function test	
ETSTW-RE 115	2.4GHz Notch Filter	N0124411	473874	MICROWAVE CIRCUITS	2019/1/15	2020/1/14



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ETSTW-RE 120	RF Player	MP9200	MP9210-111022	ADIVIC	Function test	
ETSTW-RE 122	SIGNAL GENERATOR	SMF100A	102149	R&S	2019/6/3	2020/6/2
ETSTW-RE 125	5GHz Notch filter	5NSL11-5200/E221.3-O/O	1	K&L Microwave	2018/8/8	2019/8/7
ETSTW-RE 126	5GHz Notch filter	5NSL12-5800/E221.3-O/O	1	K&L Microwave	2018/8/8	2019/8/7
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2019/2/26	2020/2/25
ETSTW-RE 128	5.3GHz Notch filter	N0153001	SN487233	Microwave Circuits	2018/8/8	2019/8/7
ETSTW-RE 129	5.5GHz Notch filter	N0555984	SN487234	Microwave Circuits	2018/8/8	2019/8/7
ETSTW-RE 130	Handheld RF Spectrum Analyzer	N9340A	CN0147000204	Agilent	Pre-test Use	
ETSTW-RE 142	Amplifier	8447D	2805A03378	Agilent	2019/5/16	2020/5/15
ETSTW-RE 147	Bi-log Hybrid Antenna	MCTD 2786B	BLB16M04005	ETC	2019/4/2	2020/4/1
ETSTW-RE 151	Thermohygrometer	608-h1	45104376	TESTO	2018/8/17	2019/8/16
ETSTW-RF 002	Electromagnetic field probe	LF-30	K-0007	STT	2019/5/27	2020/5/26
ETSTW-EMI 011	USB Compact Modulator	SFC-U	101689	R&S	2019/5/16	2020/5/15
ETSTW-GSM 002	Universal Radio Communication Tester	CMU 200	109439	R&S	2019/3/5	2020/3/4
ETSTW-GSM 003	Radio Communication Analyzer	MT8820C	6201342073	Anritsu	2019/3/26	2020/3/25
ETSTW-GSM 004	Wideband Radio Communication Tester	CMW500	128092	R&S	2018/10/19	2019/10/18
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40 /12+9SS	3	WI	2019/1/14	2020/1/13
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2019/1/14	2020/1/13
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2019/1/14	2020/1/13
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2019/1/14	2020/1/13
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2018/9/12	2019/9/11
ETSTW-GSM 024	Radio Communication Analyzer	MT8821C	None	Anritsu	2019/3/5	2020/3/4
ETSTW-GSM 025	Band Reject Filter	BRM19835	001	Micro-Tronics	2018/8/9	2019/8/8
ETSTW-Cable 011	SMA to N type Cable	RGU-400	None	THERMAX	Pre-test Use NCR	
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2019/2/21	2020/2/20
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2019/2/21	2020/2/20
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2019/2/21	2020/2/20
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2019/2/21	2020/2/20
ETSTW-Cable 020	N TYPE Cable	OATS Cable 1	N30N30-L335-15M	JYE BAO CO.,LTD.	2019/7/1	2020/6/30
ETSTW-Cable 026	Microwave Cable	SUCOFLEX 104	279075	HUBER+SUHNER	2019/2/25	2020/2/24
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2019/5/10	2020/5/9
ETSTW-Cable 028	Microwave Cable	FA147A0015M2020	30064-2	UTIFLEX	2018/9/18	2019/9/17
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2018/9/18	2019/9/17
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 (S Cable 9)	279067	HUBER+SUHNER	2019/2/25	2020/2/24
ETSTW-Cable 043	Microwave Cable	SUCOFLEX 104	317576	HUBER+SUHNER	2019/5/16	2020/5/15
ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2019/6/6	2020/6/5



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ETSTW-Cable 064	Microwave Cable	SUCOFLEX 104	MY28891	HUBER+SUHNER	2019/5/16	2020/5/15
ETSTW-Cable 066	SMA type cable	32022	None	ASTROLAB	2019/3/15	2020/3/14
ETSTW-Cable 071	N TYPE CABLE	EMCCFD400-NM- NM-25000	170239	EMCI	2019/6/6	2020/6/5
ETSTW-Cable 072	SMA type cable (8m)	SUCOFLEX 104	805800/4	HUBER+SUHNER	2019/5/16	2020/5/15
ETSTW-Cable 074	SMA type cable (2m)	SUCOFLEX 104	802563/4	HUBER+SUHNER	2019/5/16	2020/5/15
WTSTW-SW 002	EMI TEST SOFTWARE	EZ EMC	None	Farad	Version ETS-03A1	
WTSTW-SW 006	EMI TEST SOFTWARE	e3	None	AUDIX	Version 9.161014	
WTSTW-SW 008	Signal studio	Agilent	None	AUDIX	Version 2.0.0.1	



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2.4 General Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.10-2013 6.2 using a LISN (if necessary). Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

RADIATION INTERFERENCE: The test procedure used was according to ANSI STANDARD C63.10-2013 6.3 employing a spectrum analyzer. For investigated frequency is equal to or below 1GHz, the RBW and VBW of the spectrum analyzer was 100 kHz and 100kHz respectively with an appropriate sweep speed. For investigated frequency is above 1GHz, both of RBW and VBW of the spectrum analyzer were 1 MHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dB μ V) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB.

Example:

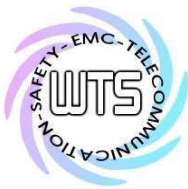
Freq (MHz) METER READING + ACF + CABLE LOSS (to the receiver) = FS
33 20 dB μ V + 10.36 dB + 6 dB = 36.36 dB μ V/m @3m

ANSI STANDARD C63.10-2013 6.2.2 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm height and with dimensions of 1m by 1.5m (non metallic table). The EUT was placed in the centre of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

ANSI STANDARD C63.10-2013 B.2.7: Any measurements that utilize special test software shall be indicated and referenced in the test report. During testing, test software 'EZ EMC' was used for setting up different operation modes.



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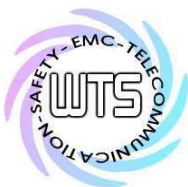
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3 Test results (enclosure)

Test case	Para. Number	Required	Test passed	Test failed
Peak Output Power	15.209	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Spurious Emissions radiated – Transmitter operating	15.209	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Spurious Emissions radiated – Receiver operating	15.109	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Occupied bandwidth	2.1049	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Antenna Requirement	FCC 15.203	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Power Line Conducted Emission	FCC 15.207	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

The following is intentionally left blank.

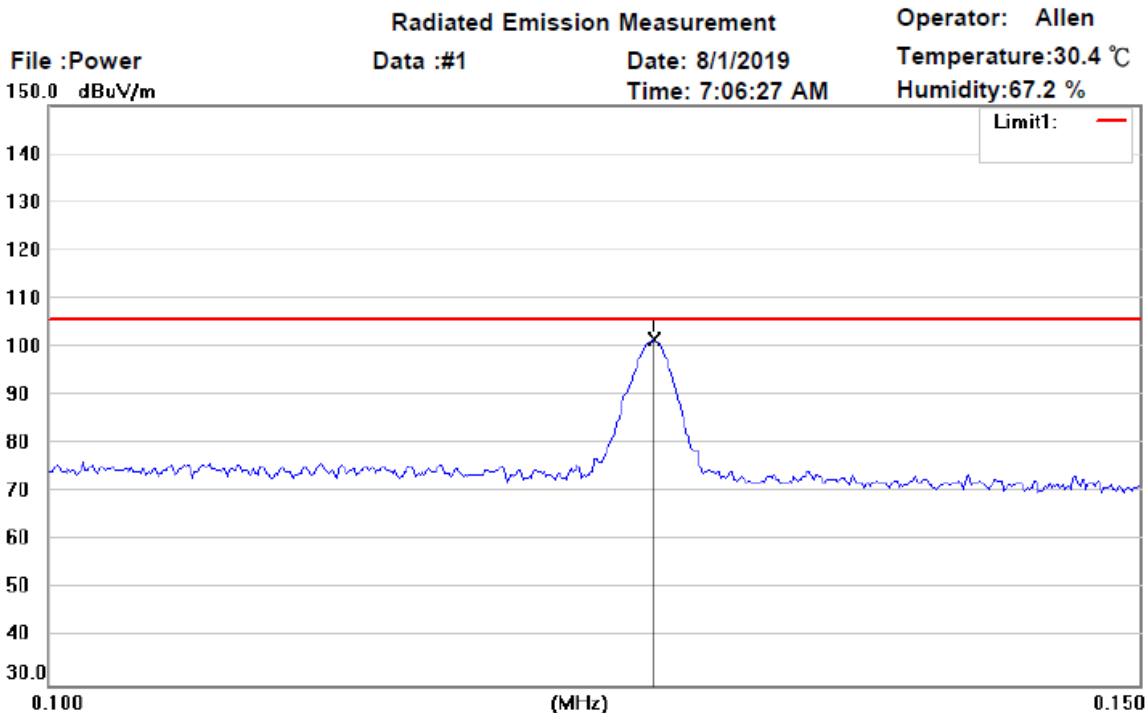


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3.1 Peak Output Power

FCC Rules: 15.209

The power was measured with modulation (declared by the applicant).



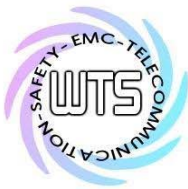
Site : Chamber
 Condition : FCC 15.209 Power (3M) (125kHz)
 EUT : W6M21907-19183
 M/N:
 Test Mode : TX 125kHz
 Note :

Polarization:
 Power : 7.2 Vd.c.
 Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	0.1252	37.51	peak	63.89	101.40	105.66	100	80	-4.26	

Limits: 15.209

Frequency of Emission (MHz)	Field Strength of Fundamental Limit uV/m	Measurement distance
0.009 – 0.490	2400 / f (KHz)	300
0.49 – 1.705	24000 / f (KHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3



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The test was performed in the anechoic chamber at 3 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The results were extrapolated by using the square of an inverse linear distance factor DF:

DF (distance factor) = $40 \log (D_1/D_2) = 80 \text{ dB}$, where

D_1 is the 300 meter specified measurement distance,
 D_2 is the 3 meter test measurement distance.

For 125 kHz frequency the calculated limit is:

$\text{Limit}_{3\text{m}} = \text{Limit}_{300\text{m}} + \text{DF} = 25.66 \text{ dBuV/m} + 80 \text{ dB} = 105.66 \text{ dBuV/m}$

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-RE 055.



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3.2 Spurious Emissions radiated – Transmitter operating

FCC Rules: 15.209

The field strength of any emission appearing outside of the specific band shall not exceed the general radiated emission limits in 15.209.

Model: TT01 Date: --
 Mode: -- Temperature: -- °C Engineer: --
 Polarization: Horizontal Humidity: -- %

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Note

1. Correction Factor = Antenna factor + Cable loss - Preamplifier
2. The formula of measured value as: Test Result = Reading + Correction Factor
3. Detector function in the form : PK = Peak, QP = Quasi Peak, AV = Average
4. All not in the table noted test results are more than 20 dB below the relevant limits.
5. See attached diagrams in the Appendix.

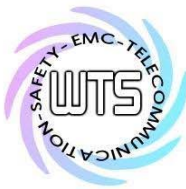
All other not noted test plots do not contain significant test results in relation to the limits.

TEST RESULT (Transmitter): The unit DOES meet the FCC requirements.

Limits: 15.209

Frequency of Emission (MHz)	Field Strength of Fundamental Limit uV/m	Measurement distance
0.009 – 0.490	2400 / f (KHz)	300
0.49 – 1.705	24000 / f (KHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

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



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FCC ID: HQXTT01

The test was performed in the anechoic chamber at 3 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The results were extrapolated by using the square of an inverse linear distance factor DF:

$$DF = 40 \log (D_1/D_2) = 80 \text{ dB, where}$$

For D_1 is the 300 meter specified measurement distance.

D_2 is the 3 meter test measurement distance.

The DF = 80 dB was applied for limit calculation at 3 meter test distance measurements.

For D_1 is the 30 meter specified measurement distance.

D_2 is the 3 meter test measurement distance.

The DF = 40 dB was applied for limit calculation at 3 meter test distance measurements.

If the frequency between 9 – 490 kHz,

$$\text{Limit} = 20\log(2400/f(\text{kHz})) + 80$$

If the frequency between 490 – 1705 kHz,

$$\text{Limit} = 20\log(2400/f(\text{kHz})) + 40$$

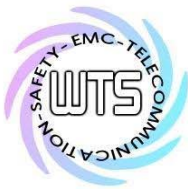
If the frequency between 1705 – 30000 kHz,

$$\text{Limit} = 20\log 30 + 40$$

For 40 kHz frequency the calculated limit is:

$$\text{Limit}_{3\text{m}} = \text{Limit}_{300\text{m}} + DF = 35.5\text{dBuV/m} + 80 \text{ dB} = 115.5 \text{ dBuV/m}$$

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-RE 055,
ETSTW-RE 146, ETSTW-RE 148.



Registration number: W6M21907-19183-C-9
 FCC ID: HQXTT01

3.3 Occupied Bandwidth

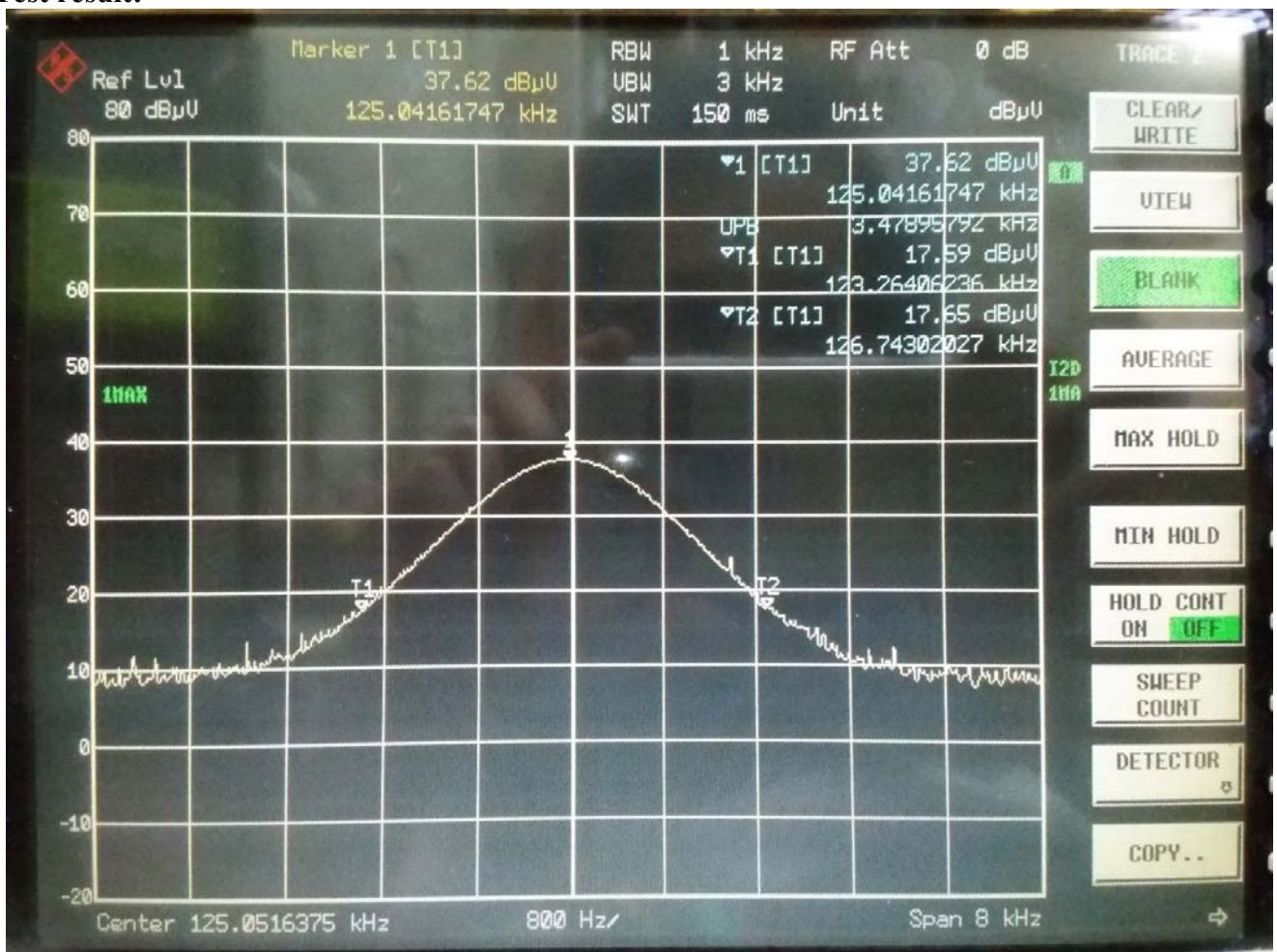
FCC Rules: 2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated are each equal to 0.5% of the total mean power radiated by a given emission.

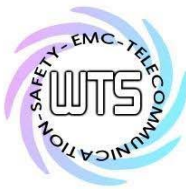
The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth specifications are given, the following guidelines are used:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 MHz to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

Test result:



Test equipment: ETSTW-RE 055



Registration number: W6M21907-19183-C-9
FCC ID: HQXTT01

3.4 Antenna requirement

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. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

Explanation: This antenna is Loop antenna which passes antenna requirement.

The equipment meets the requirements	yes <input checked="" type="checkbox"/>	no <input type="checkbox"/>
--------------------------------------	--	--------------------------------



Registration number: W6M21907-19183-C-9

FCC ID: HQXTT01

3.5 Radiated Emissions from Receiver Section of Receiver Part

For the frequency from 9 kHz to 30 MHz:

FCC Rule: 15.209

The field strength of any emission appearing outside of the specific band shall not exceed the general radiated emission limits in 15.209.

Frequency of Emission (MHz)	Field Strength of Fundamental Limit uV/m	Measurement distance
0.009 – 0.490	2400 / f (KHz)	300
0.49 – 1.705	24000 / f (KHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

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

Note: The above field strength limits are specified at a distance of 3 meters.

The test was performed in the anechoic chamber at 3 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The results were extrapolated by using the square of an inverse linear distance factor DF:

$$DF = 40 \log (D_1/D_2) = 80 \text{ dB, where}$$

For D₁ is the 300 meter specified measurement distance.

D₂ is the 3 meter test measurement distance.

The DF = 80 dB was applied for limit calculation at 3 meter test distance measurements.

For D₁ is the 30 meter specified measurement distance.

D₂ is the 3 meter test measurement distance.

The DF = 40 dB was applied for limit calculation at 3 meter test distance measurements.

If the frequency between 9 – 490 kHz, limit = 20log(2400/f(kHz)) + 80

If the frequency between 490 – 1705 kHz, limit = 20log(2400/f(kHz)) + 40

If the frequency between 1705 – 30000 kHz, limit = 20log30 + 40

For 125 kHz frequency the calculated limit is:

$$\text{Limit}_{3m} = \text{Limit}_{300m} + DF = 35.5\text{dBuV/m} + 80 \text{ dB} = 115.5 \text{ dBuV/m}$$

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-RE 055, ETSTW-RE 146, ETSTW-RE 148

Explanation: See attached diagrams in appendix.



Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21907-19183-C-9

FCC ID: HQXTT01

For the frequency from 30 MHz to 1000 MHz.:

FCC Rule: 15.109

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)	Field Strength (dBmicrovolts/meter)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Model: TT01 Date: --
 Mode: -- Temperature: -- °C Engineer: --
 Polarization: Horizontal Humidity: -- %

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Test equipment used: ETSTW-RE 004, ETSTW-RE 030, ETSTW-RE 062, ETSTW-RE 064, ETSTW-RE 142, ETSTW-RE 147

Note

1. Correction Factor = Antenna factor + Cable loss - Preamplifier
2. The formula of measured value as: Test Result = Reading + Correction Factor
3. Detector function in the form : PK = Peak, QP = Quasi Peak, AV = Average
4. All not in the table noted test results are more than 20 dB below the relevant limits.
5. See attached diagrams in the Appendix.

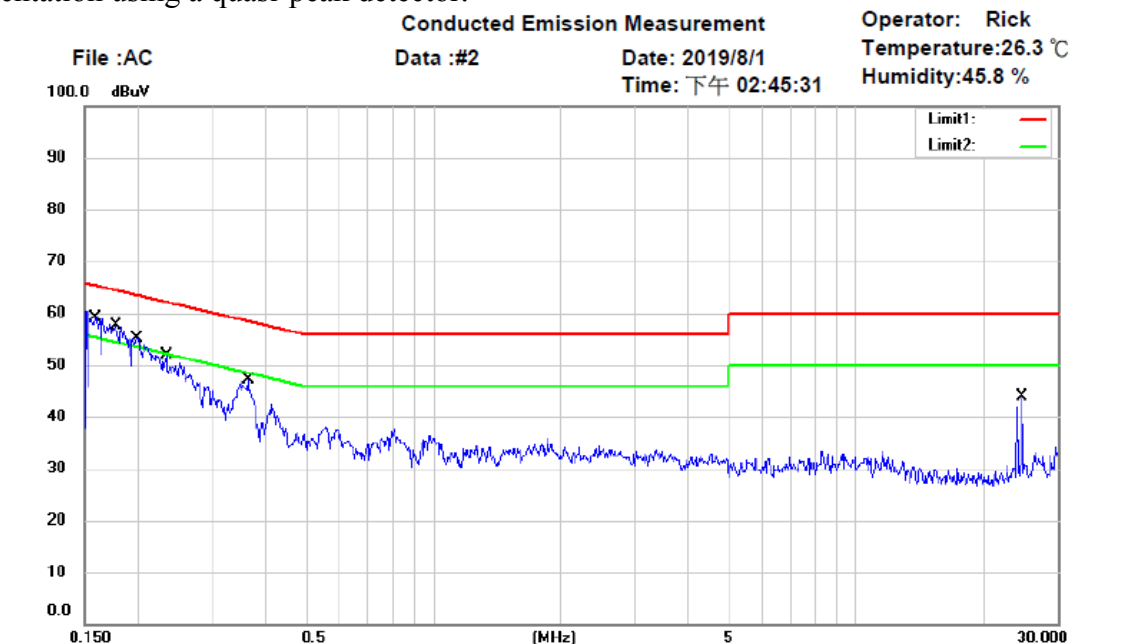


Registration number: W6M21907-19183-C-9
 FCC ID: HQXTT01

3.6 Power Line Conducted Emission

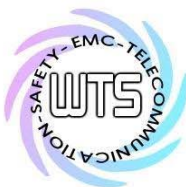
For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the table bellows with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

This measurement was transact first with instrumentation using an average and peak detector and a 10 kHz bandwidth. If the peak detector achieves a calculated level, the measurement is repeated by an instrumentation using a quasi-peak detector.



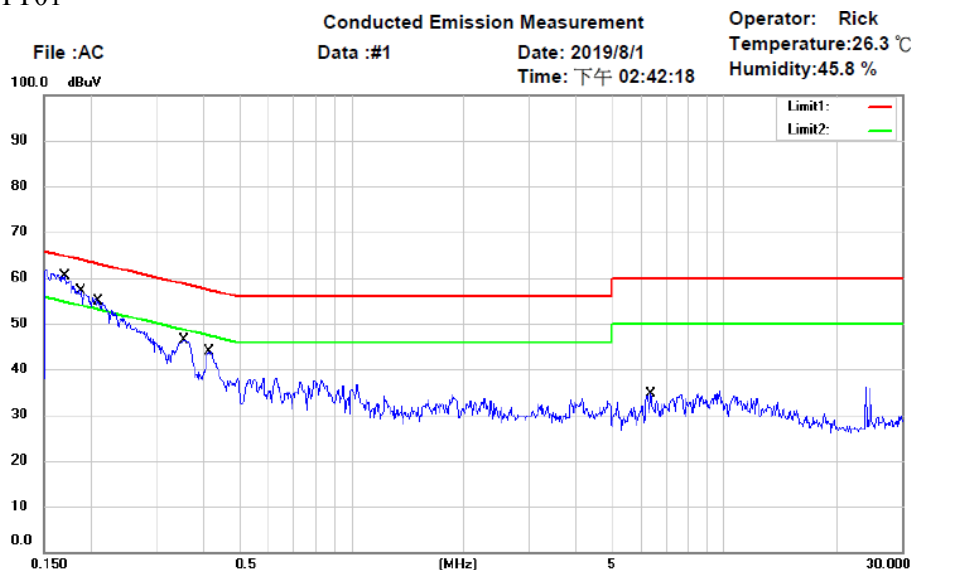
Site : Chamber_03
 Condition : FCC Part 15 Class B Conduction (QP) Phase: N
 EUT : W6M21907-19183 Power : 120 Vac.
 M/N:
 Test Mode : Charger
 Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	0.1590	39.61	QP	9.94	49.55	65.52	-15.97	
	0.1590	21.26	AVG	9.94	31.20	55.52	-24.32	
	0.1778	37.78	QP	9.93	47.71	64.59	-16.88	
	0.1778	23.43	AVG	9.93	33.36	54.59	-21.23	
	0.1997	34.25	QP	9.92	44.17	63.62	-19.45	
	0.1997	11.00	AVG	9.92	20.92	53.62	-32.70	
	0.2331	29.72	QP	9.92	39.64	62.34	-22.70	
	0.2331	12.86	AVG	9.92	22.78	52.34	-29.56	
	0.3650	34.30	QP	9.90	44.20	58.61	-14.41	
	0.3650	21.83	AVG	9.90	31.73	48.61	-16.88	
	24.5750	31.94	QP	10.40	42.34	60.00	-17.66	
*	24.5750	27.89	AVG	10.40	38.29	50.00	-11.71	



Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21907-19183-C-9
 FCC ID: HQXTT01



Site : Chamber_03
 Condition : FCC Part 15 Class B Conduction (QP) Phase: L1
 EUT : W6M21907-19183 Power : 120 Vac.
 M/N:
 Test Mode : Charger
 Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	0.1703	40.07	QP	9.94	50.01	64.95	-14.94	
	0.1703	23.75	AVG	9.94	33.69	54.95	-21.26	
	0.1878	36.01	QP	9.93	45.94	64.13	-18.19	
	0.1878	19.24	AVG	9.93	29.17	54.13	-24.96	
	0.2092	34.41	QP	9.92	44.33	63.24	-18.91	
	0.2092	22.30	AVG	9.92	32.22	53.24	-21.02	
*	0.3558	34.98	QP	9.90	44.88	58.83	-13.95	
	0.3558	19.02	AVG	9.90	28.92	48.83	-19.91	
	0.4150	29.45	QP	9.90	39.35	57.55	-18.20	
	0.4150	20.10	AVG	9.90	30.00	47.55	-17.55	
	6.3500	17.39	QP	9.99	27.38	60.00	-32.62	
	6.3500	6.07	AVG	9.99	16.06	50.00	-33.94	

Note

1. The formula of measured value as: **Test Result = Reading + Correction Factor**
2. The Correction Factor = Cable Loss + LISN Insertion Loss + Pulse Limit Loss
3. Detector function in the form : PK = Peak, QP = Quasi Peak, AV = Average
4. All not in the table noted test results are more than 20 dB below the relevant limits.
5. Up Line: QP Limit Line, Down Line: Ave Limit Line.

Limits:

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

Test equipment used: ETSTW-CE 001, ETSTW-CE 016, ETSTW-RE 045



Registration number: W6M21907-19183-C-9
FCC ID: HQXTT01

Appendix

Measurement diagrams

Spurious Emissions Radiated



Radiated Emission Measurement

Operator: Allen

File :1

Data :#1

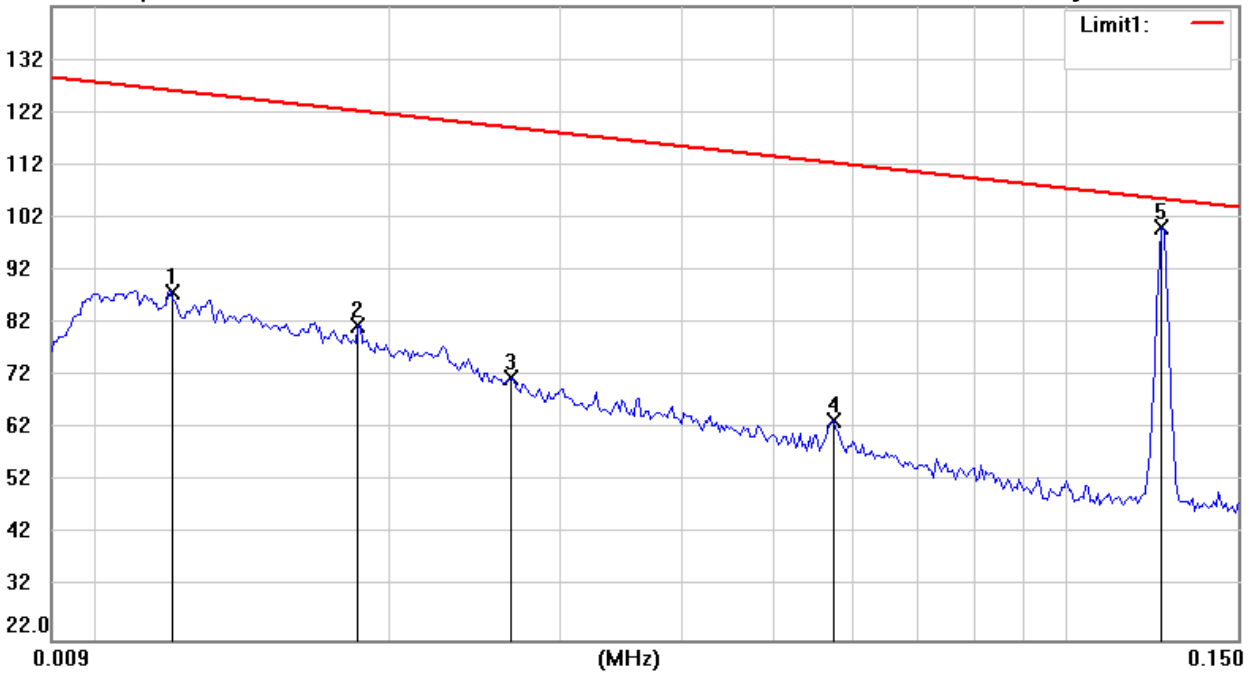
Date: 8/1/2019

Temperature:30.4 °C

142.0 dBuV/m

Time: 7:13:44 AM

Humidity:67.2 %



Site : Chamber

Condition : FCC 15.209 (3m)(<30MHz)

EUT : W6M21907-19183

M/N:

Test Mode : TX 125kHz

Note :

Polarization:

Power : 7.2 Vd.c.

Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	0.0120	-5.07	peak	93.07	88.00	126.01	100	55	-38.01	
	0.0186	-5.34	peak	86.96	81.62	122.21	100	80	-40.59	
	0.0267	-7.79	peak	79.46	71.67	119.07	100	345	-47.40	
	0.0575	-7.37	peak	70.79	63.42	112.41	100	190	-48.99	
*	0.1252	36.23	peak	63.89	100.12	105.65			-5.53	RF Power



Radiated Emission Measurement

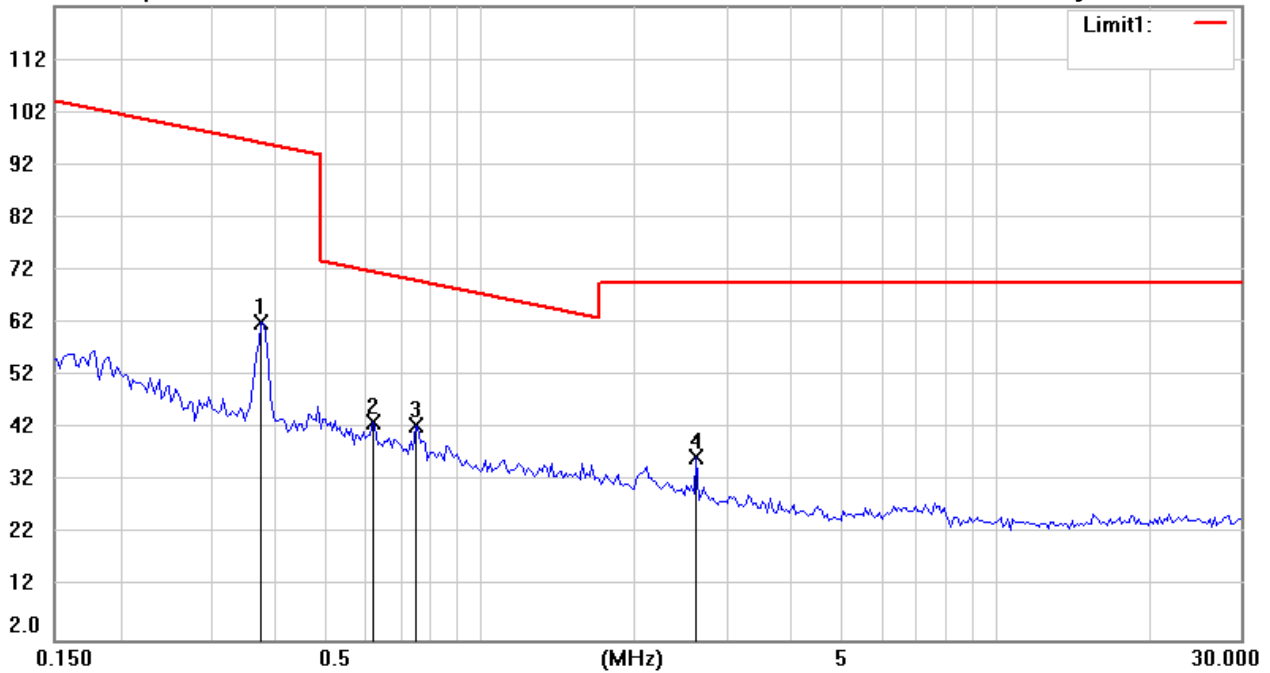
Operator: Allen

File :2
 122.0 dBuV/m

Data :#1

Date: 8/1/2019
 Time: 7:18:12 AM

Temperature:30.4 °C
 Humidity:67.2 %



Site : Chamber

Condition : FCC 15.209 (3m)(<30MHz)

EUT : W6M21907-19183

M/N:

Test Mode : TX 125kHz

Note :

Polarization:

Power : 7.2 Vd.c.

Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	0.3778	7.78	peak	54.46	62.24	96.06	100	145	-33.82	
	0.6223	-7.29	peak	50.48	43.19	71.72	100	295	-28.53	
*	0.7533	-6.35	peak	49.01	42.66	70.06	100	10	-27.40	
	2.6371	-2.48	peak	39.25	36.77	69.54	100	170	-32.77	



Radiated Emission Measurement

Operator: Allen

File :3

Data :#1

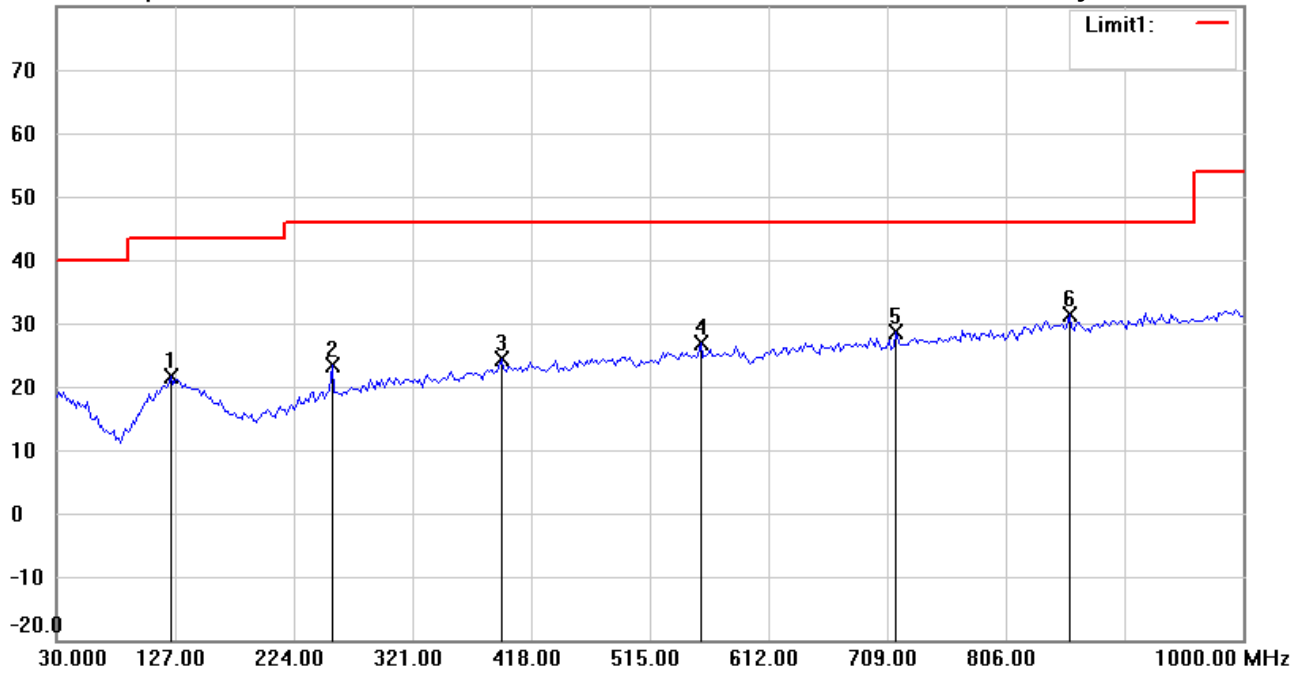
Date: 8/1/2019

Temperature:30.4 °C

80.0 dBuV/m

Time: 7:32:03 AM

Humidity:67.2 %



Site : Chamber

Condition : FCC_part 15 RE-Class C_30-1000MHz

Polarization: *Horizontal*

EUT : W6M21907-19183

Power : 7.2 Vd.c.

M/N:

Distance: 3m

Test Mode : TX 125kHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	123.3066	28.03	peak	-6.48	21.55	43.50	100	37	-21.95	
	255.4910	31.20	peak	-7.70	23.50	46.00	100	140	-22.50	
	393.5070	28.48	peak	-3.99	24.49	46.00	100	335	-21.51	
	556.7936	28.90	peak	-2.13	26.77	46.00	100	10	-19.23	
	716.1924	28.87	peak	-0.25	28.62	46.00	100	260	-17.38	
*	858.0962	28.53	peak	2.73	31.26	46.00	100	95	-14.74	



Radiated Emission Measurement

Operator: Allen

File :3

Data :#2

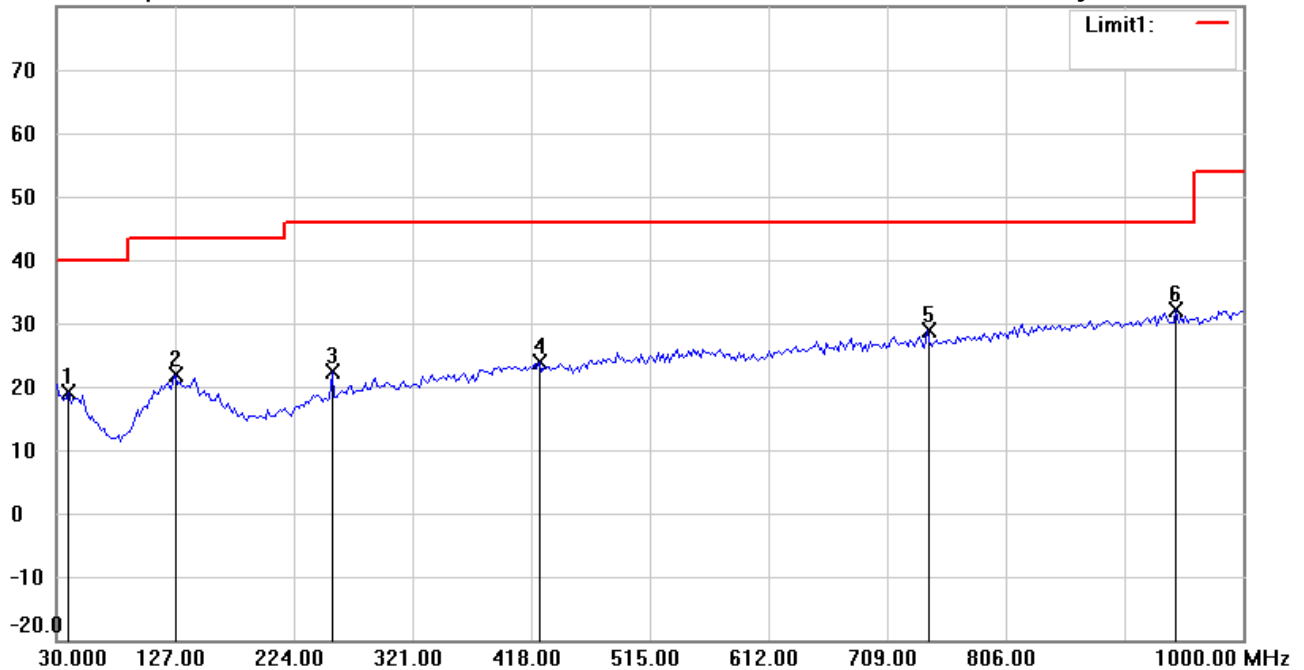
Date: 8/1/2019

Temperature:30.4 °C

80.0 dBuV/m

Time: 7:33:42 AM

Humidity:67.2 %



Site : Chamber

Condition : FCC_part 15 RE-Class C_30-1000MHz

Polarization: *Vertical*

EUT : W6M21907-19183

Power : 7.2 Vd.c.

M/N:

Distance: 3m

Test Mode : TX 125kHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	39.7194	28.37	peak	-9.30	19.07	40.00	100	220	-20.93	
	127.1944	28.32	peak	-6.37	21.95	43.50	100	117	-21.55	
	255.4910	30.11	peak	-7.70	22.41	46.00	100	300	-23.59	
	424.6092	27.73	peak	-3.85	23.88	46.00	100	220	-22.12	
	741.4630	28.84	peak	0.09	28.93	46.00	100	145	-17.07	
*	945.5711	28.05	peak	4.13	32.18	46.00	100	25	-13.82	



Radiated Emission Measurement

Operator: Allen

File :1

Data :#1

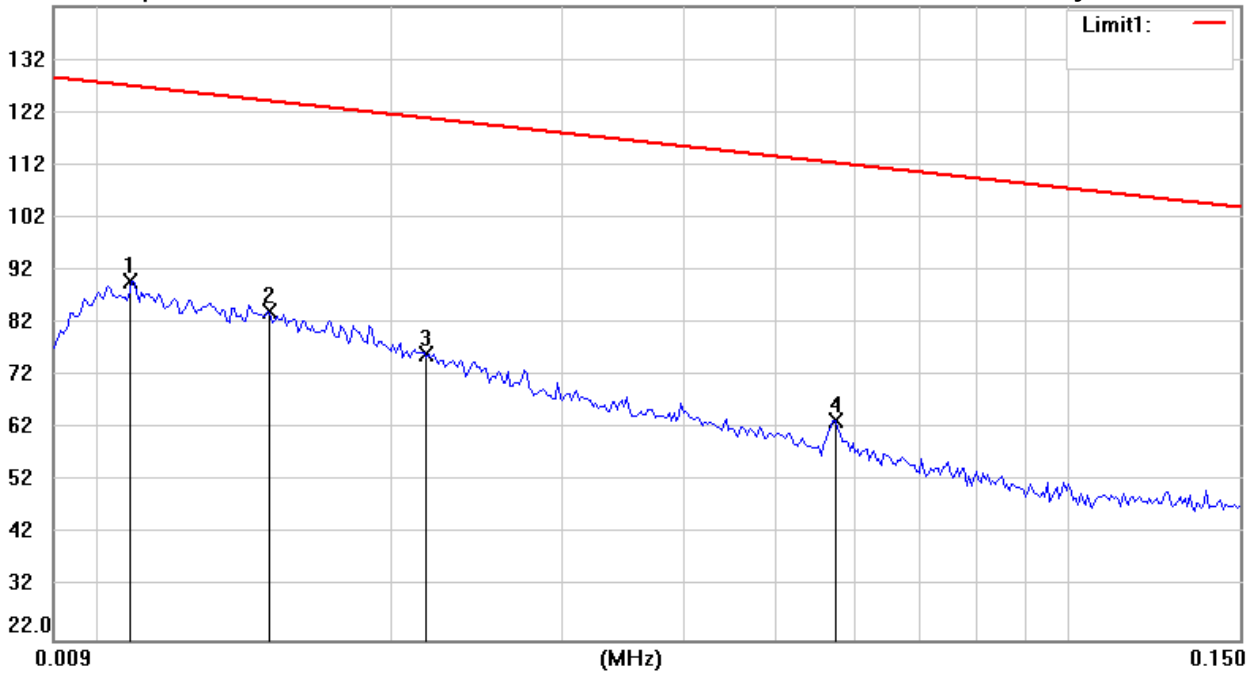
Date: 8/1/2019

Temperature:30.4 °C

142.0 dBuV/m

Time: 7:15:41 AM

Humidity:67.2 %



Site : Chamber

Condition : FCC 15.205 (3m)(<30MHz)

EUT : W6M21907-19183

M/N:

Test Mode : RX 125kHz

Note :

Polarization:

Power : 7.2 Vd.c.

Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	0.0108	-4.34	peak	94.18	89.84	126.93	100	280	-37.09	
	0.0150	-6.11	peak	90.29	84.18	124.07	100	175	-39.89	
	0.0218	-7.86	peak	84.00	76.14	120.83	100	30	-44.69	
	0.0575	-7.27	peak	70.79	63.52	112.41	100	110	-48.89	



Radiated Emission Measurement

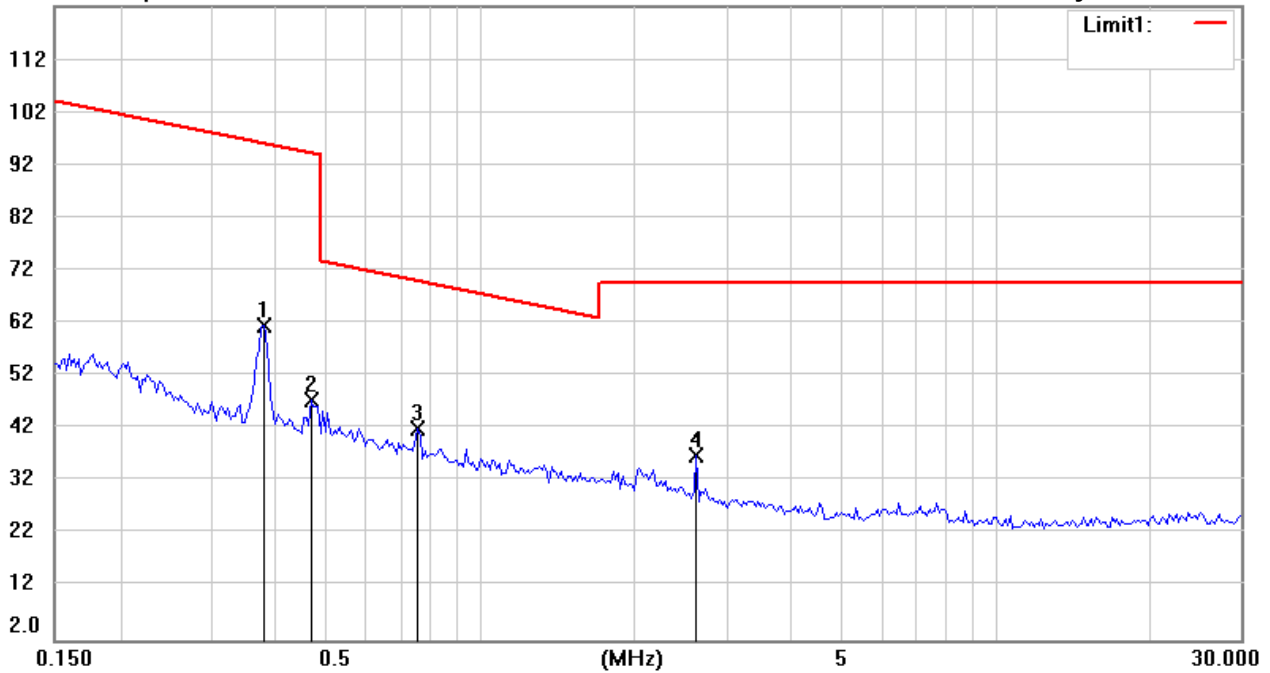
Operator: Allen

File :2
 122.0 dBuV/m

Data :#1

Date: 8/1/2019
 Time: 7:20:04 AM

Temperature:30.4 °C
 Humidity:67.2 %



Site : Chamber

Condition : FCC 15.205 (3m)(<30MHz)

EUT : W6M21907-19183

M/N:

Test Mode : RX 125kHz

Note :

Polarization:

Power : 7.2 Vd.c.

Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	0.3818	7.26	peak	54.38	61.64	95.97	100	210	-34.33	
	0.4722	-5.07	peak	52.44	47.37	94.12	100	65	-46.75	
*	0.7613	-6.80	peak	48.92	42.12	69.97	100	330	-27.85	
	2.6371	-2.34	peak	39.25	36.91	69.54	100	170	-32.63	



Radiated Emission Measurement

Operator: Allen

File :3

Data :#1

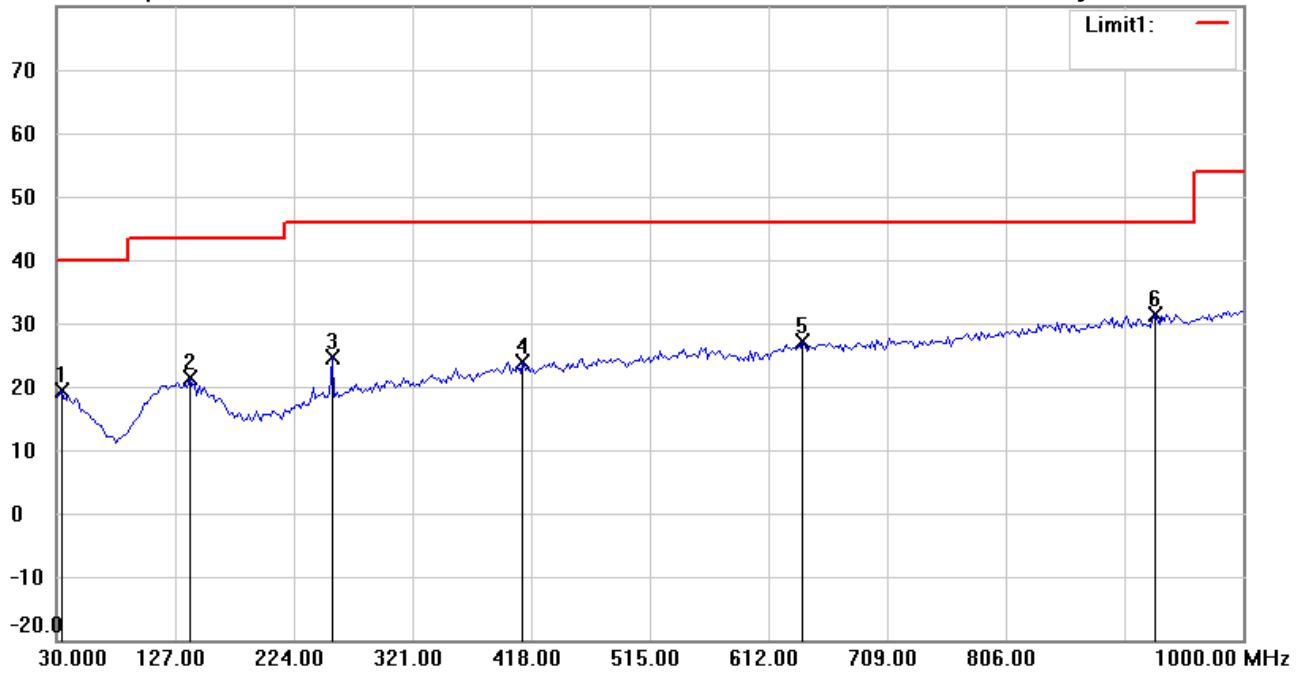
Date: 8/1/2019

Temperature:30.4 °C

80.0 dBuV/m

Time: 7:35:20 AM

Humidity:67.2 %



Site : Chamber

Condition : FCC_part 15 RE-Class B_30-1000MHz

Polarization: *Horizontal*

EUT : W6M21907-19183

Power : 7.2 Vd.c.

M/N:

Distance: 3m

Test Mode : RX 125kHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	33.8877	28.16	peak	-8.70	19.46	40.00	100	319	-20.54	
	138.8576	27.82	peak	-6.48	21.34	43.50	100	55	-22.16	
	255.4910	32.31	peak	-7.70	24.61	46.00	100	80	-21.39	
	411.0020	27.77	peak	-3.90	23.87	46.00	100	175	-22.13	
	640.3808	28.19	peak	-1.08	27.11	46.00	100	20	-18.89	
*	928.0762	27.71	peak	3.78	31.49	46.00	100	310	-14.51	



Radiated Emission Measurement

Operator: Allen

File :3

Data :#2

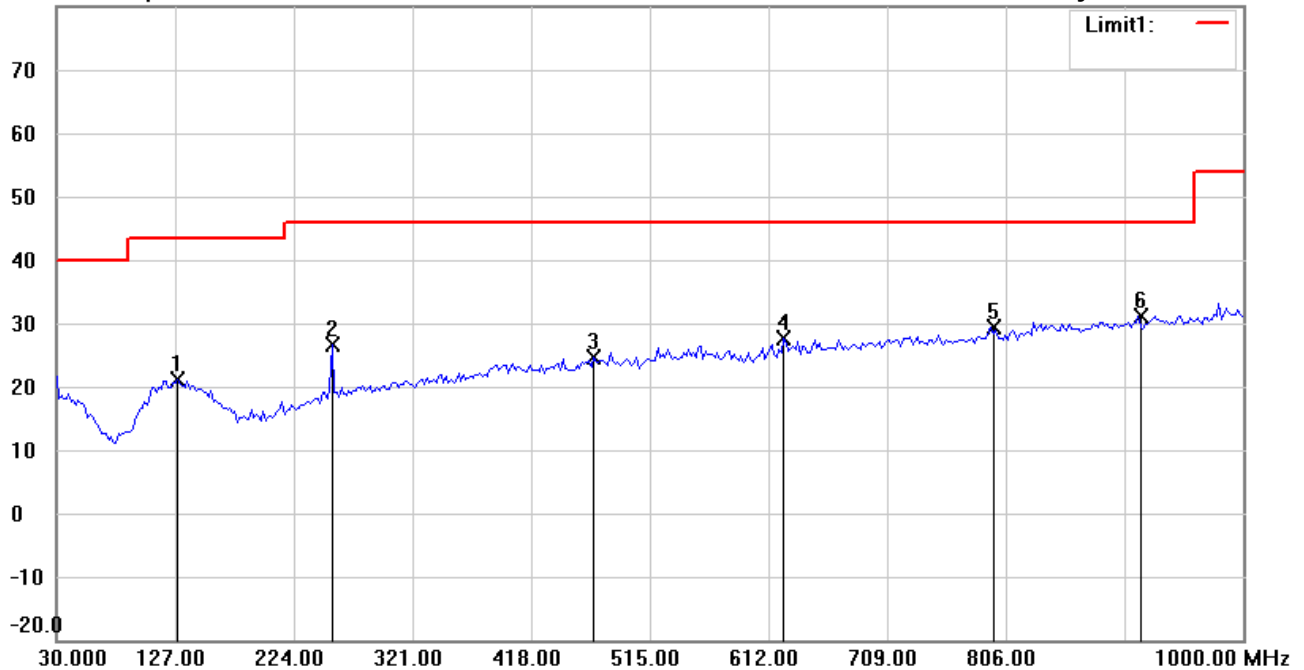
Date: 8/1/2019

Temperature:30.4 °C

80.0 dBuV/m

Time: 7:36:53 AM

Humidity:67.2 %



Site : Chamber

Condition : FCC_part 15 RE-Class B_30-1000MHz

Polarization: **Vertical**

EUT : W6M21907-19183

Power : 7.2 Vd.c.

M/N:

Distance: 3m

Test Mode : RX 125kHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	129.1382	27.53	peak	-6.31	21.22	43.50	100	214	-22.28	
	255.4910	34.37	peak	-7.70	26.67	46.00	100	45	-19.33	
	469.3186	28.04	peak	-3.40	24.64	46.00	100	190	-21.36	
	624.8297	29.06	peak	-1.51	27.55	46.00	100	360	-18.45	
	793.9480	28.42	peak	1.07	29.49	46.00	100	170	-16.51	
*	914.4690	27.58	peak	3.50	31.08	46.00	100	0	-14.92	