

FCC PART 90 TEST REPORT

for

Transmitter Module

Model No.: TX0400P10

FCC ID: 2ADKH-TXM1U10

of

Applicant: ARCT Inc.

Address: 8F., No.788, Zhongzheng Rd., Zhonghe Dist.,
New Taipei City 235, Taiwan (R.O.C.)

Tested and Prepared

by

Worldwide Testing Services (Taiwan) Co., Ltd.

FCC Registration No.: 930600

Industry Canada filed test laboratory Reg. No. IC 5679A-1, IC 5107A-1

A2LA Accredited No.: 2732.01



Report No.: W6M21411-14611-C-1

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: wtst@wtst-lab.com

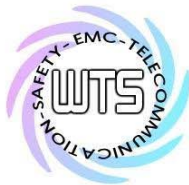
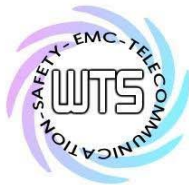


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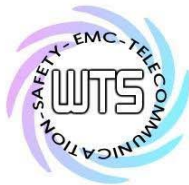
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1. General Information

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.

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Tester:

January 05, 2015

Mark Cheng

Mark Cheng.

Date

WTS-Lab.

Name

Signature

Technical responsibility for area of testing:

January 05, 2015

Kevin Wang

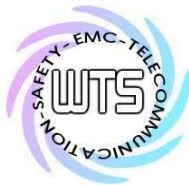
Kevin Wang

Date

WTS

Name

Signature



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1.2 Testing laboratory

1.2.1 Location

OATS

No.5-1, Lishui, Shuang Sing Village,
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

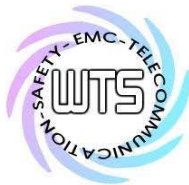
FCC filed test laboratory Reg. No. 930600

Industry Canada filed test laboratory Reg. No. IC 5679A-1



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

Name:	./.
Accredited number:	./.
Street:	./.
Town:	./.
Country:	./.
Telephone:	./.
Fax:	./.



Registration number: W6M21411-14611-C-1
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1.3 Details of approval holder

Name: ARCT Inc.
Street: 8F., No.788, Zhongzheng Rd., Zhonghe Dist.,
City: New Taipei City 235,
Country: Taiwan (R.O.C.)
Telephone: +886-2-82275579
Fax: +886-2-82275576

1.4 Application details

Date of receipt of test item: November 17, 2014
Date of test: from November 18, 2014 to January 05, 2015

1.5 General information of Test item

Type of test item: Transmitter Module
Model Number: TX0400P10
Brand Name: arct
Multi-listing model number: TX0400P10R
Photos: See appendix

Technical data

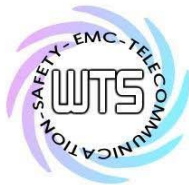
Operating frequency band:

Frequency(MHz)	Used Band
450~470	<input checked="" type="checkbox"/>

Sample tested frequency: Low channel: 450.0125 MHz
Middle channel: 460 MHz
High channel: 469.9875 MHz

Type of modulation: FSK
Designation of emission: 7K6F7D
Channel spacing: 12.5 kHz
Antenna Type: Dipole antenna
Antenna Gain: 2.15 dBi

Connection of Antenna: ☐ detachable ☒ not detachable



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Power Rating: 3.3Vdc

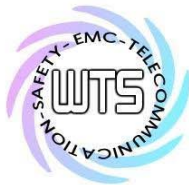
Operation modes: simplex

Manufacturer: (if applicable)

Name: ./.
Street: ./.
City: ./.
Country: ./.
Telephone: ./.
Fax: ./.

1.6 Test standards

Technical standard: FCC RULES PART 90 (2013-10)



Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10

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 as specified in 3 were ascertained in the course of the tests performed.



2.2 Test environment

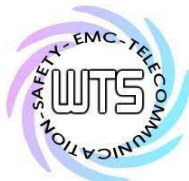
Temperature: 23 °C
Relative humidity content: 20 ... 75 %
Air pressure: 86-103 KPa

2.3 Description of Tested System

The EUT was tested with the Accessories or Peripherals Listed below:

Equipment	Model No.	Series No.	Software	Cable information	Note
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--

Explanation: The EUT was configured as stand alone device, and there are no accessories or peripherals during the test.



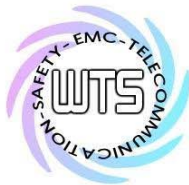
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2.4 Test Equipment List

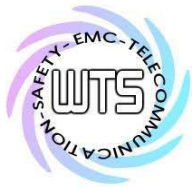
No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-CE 001	EMI TEST RECEIVER	ESHS10	842121/013	R&S	2014/9/2	2015/9/1
ETSTW-CE 003	AC POWER SOURCE	APS-9102	D161137	GW	Function Test	
ETSTW-CE 008	HF-EICHLITUNG RF STEP ATTENUATOR 139dB DPSP	334.6010.02	844581/024	R&S	Function Test	
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2014/7/8	2015/7/7
ETSTW-CE 016	TWO-LINE V-NETWORK	ENV216	100050	R&S	2014/10/13	2015/10/12
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2014/9/2	2015/9/1
ETSTW-RE 005	EMI TEST RECEIVER	ESVS10	843207/020	R&S	2014/9/2	2015/9/1
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	2014/10/15	2015/10/14
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	ETS-Lindgren	2014/7/01	2015/6/30
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	ETS-Lindgren	2014/2/25	2015/2/24
ETSTW-RE 045	ESA-E SERIES SPECTRUM ANALYZER	E4404B	MY45111242	Agilent	Pre-test Use	
ETSTW-RE 049	TRILOG Super Broadband test Antenna	VULB 9160	9160-3185	Schwarzbeck	2014/2/18	2015/2/17
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2014/3/3	2015/3/2
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2014/3/3	2015/3/2
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2014/3/3	2015/3/2
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2014/6/05	2015/6/04
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2014/3/3	2015/3/2
ETSTW-RE 062	Amplifier Module	CHC 2	None	KMIC	2014/11/26	2015/11/25
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	2014/10/9	2015/10/8
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2014/9/22	2015/9/21
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2014/3/3	2015/3/2
ETSTW-RE 106	Humidity Temperature Meter	TES-1366	091011113	TES	2014/11/7	2015/11/6
ETSTW-RE 111	TRILOG Super Broadband test Antenna	VULB 9160	9160-3309	Schwarz beck	2013/12/27	2014/12/26
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	None	T-Power	Function test	
ETSTW-RE 115	2.4GHz Notch Filter	N0124411	473874	MICROWAVE CIRCUITS	2014/1/10	2015/1/09
ETSTW-RE 120	RF Player	MP9200	MP9210-111022	ADIVIC	Function test	
ETSTW-RE 122	SIGNAL GENERATOR	SMF100A	102149	R&S	2014/6/11	2015/6/10
ETSTW-RE 125	5GHz Notch filter	5NSL11-5200/E221.3-O/O	1	K&L Microwave	2014/8/12	2015/8/11
ETSTW-RE 126	5GHz Notch filter	5NSL11-5800/E221.3-O/O	1	K&L Microwave	2014/8/12	2015/8/11



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ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2014/3/3	2015/3/2
ETSTW-RE 128	5.3GHz Notch filter	N0153001	SN487233	Microwave Circits	2014/8/12	2015/8/11
ETSTW-RE 129	5.5GHz Notch filter	N0555984	SN487234	Microwave Circits	2014/8/12	2015/8/11
ETSTW-RE 130	Handheld RF Spectrum Analyzer	N9340A	CN0147000204	Agilent	Pre-test Use	
ETSTW-GSM 002	Universal Radio Communication Tester	CMU 200	109439	R&S	2014/10/20	2015/10/19
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40 /12+9SS	3	WI	2014/1/10	2015/1/09
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2014/1/10	2015/1/09
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2014/1/10	2015/1/09
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2014/1/10	2015/1/09
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2014/9/17	2015/9/16
ETSTW-Cable 010	BNC Cable	5 M BNC Cable	None	JYE BAO CO.,LTD.	2014/10/15	2015/10/14
ETSTW-Cable 011	BNC Cable	BNC Cable 1	None	JYE BAO CO.,LTD.	Pre-test Use NCR	
ETSTW-Cable 012	N TYPE To SMA Cable	Cable 012	None	JYE BAO CO.,LTD.	2014/10/15	2015/10/14
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2014/2/27	2015/2/26
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2014/2/27	2015/2/26
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2014/2/27	2015/2/26
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2014/2/27	2015/2/26
ETSTW-Cable 022	N TYPE Cable	5006	0002	JYE BAO CO.,LTD.	2014/2/19	2015/2/18
ETSTW-Cable 026	Microwave Cable	SUCOFLEX 104	279075	HUBER+SUHNER	2014/3/3	2015/3/2
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2014/3/3	2015/3/2
ETSTW-Cable 028	Microwave Cable	FA147A0015M2020	30064-2	UTIFLEX	2014/9/22	2015/9/21
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2014/9/22	2015/9/21
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 (S_Cable 9)	279067	HUBER+SUHNER	2014/3/3	2015/3/2
ETSTW-Cable 031	Microwave Cable	SUCOFLEX 104 (S_Cable 10)	238092	HUBER+SUHNER	2014/11/26	2015/11/25
ETSTW-Cable 043	Microwave Cable	SUCOFLEX 104	317576	HUBER+SUHNER	2014/11/26	2015/11/25
ETSTW-Cable 047	Microwave Cable	SUCOFLEX 104	325518	HUBER+SUHNER	2014/11/26	2015/11/25
ETSTW-Cable 053	N TYPE To SMA Cable	RG142	None	JYE BAO CO.,LTD.	2014/2/19	2015/2/18
ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2014/2/19	2015/2/18
WTSTW-SW 002	EMI TEST SOFTWARE	EZ EMC	None	Farad	Version ETS-03A1	



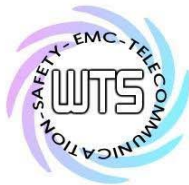
2.5 General Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-2003 using a 50 μ H 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 C63.4-2003 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 100 kHz 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.

For hand-held devices, an exploratory test was performed with three (3) orthogonal planes to determine the highest emissions.

Measurements were made by at the registered open field test site located at The Registration Number: 930600. 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.

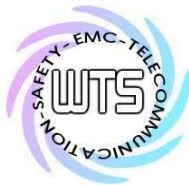


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3. Test results (enclosure)

TEST CASE	Para. Number	Required	Test passed	Test failed
Modulation Characteristics	2.1047(a) (b); 2.1033(c)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Frequency stability.	90.213	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Transmitter Output Power	90.205	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Emission masks	90.210	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Transmitter Spurious Radiated Emission	90.210	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Transmitter Spurious Conducted Emission	90.210	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Transient frequency behavior	90.214	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Power Line Conducted Emission	15.207(a)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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4. Modulation Characteristics

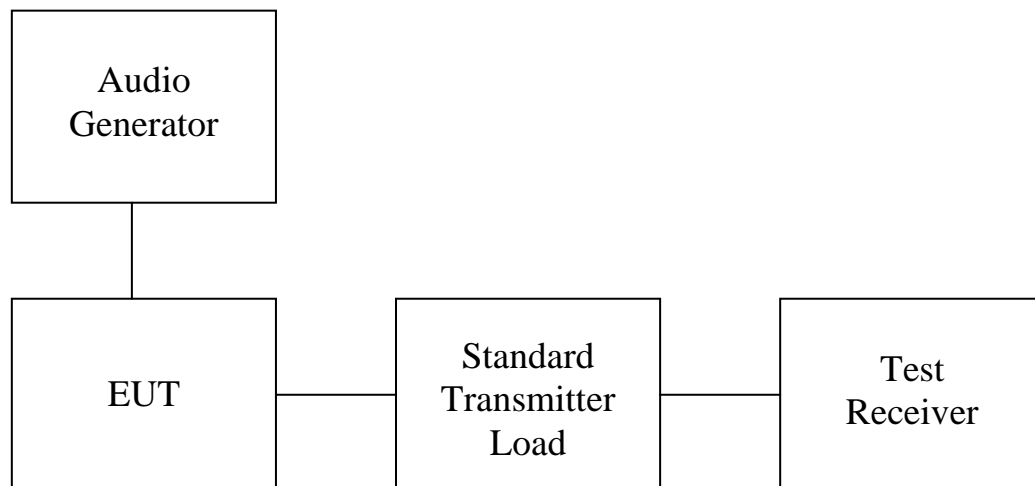
4.1 Test procedure

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of rated system deviation.

The audio signal generator is connected to the audio input of the EUT with its full rating.

The modulation response is measured at certain modulation frequencies, related to 1000Hz reference signal. Tests are performed for positive and negative modulation.

4.2 Test Setup



4.3 Test results

4.3.1 Audio Frequency Response

Rule Part No.: Part 2.1047(a)(b) Method of Measurement: The audio frequency response was measured in accordance with TIA/EIA Specification 603 with no exception. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 300 – 3000Hz shall be submitted. The audio frequency response curve is shown below.

Test Audio level (1kHz and 20% max. deviation): 25mV

Explanation: This test item is not required, due to the device does not have audio input port.

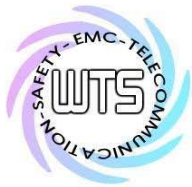
Test equipment used: ETSTW-RE 072

4.3.2 AUDIO INPUT VERSUS MODULATION

Rule Part No.: Part 2.1047(b) & 90

Test Requirements: Modulation cannot exceed 100%

Method of Measurement: The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are



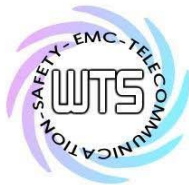
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shown below. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.
EUT Max deviation: 5kHz 60% EUT Max deviation: 3kHz

Explanation: This test item is not required, due to the device does not have audio input port.

Test equipment used: ETSTW-RE 072



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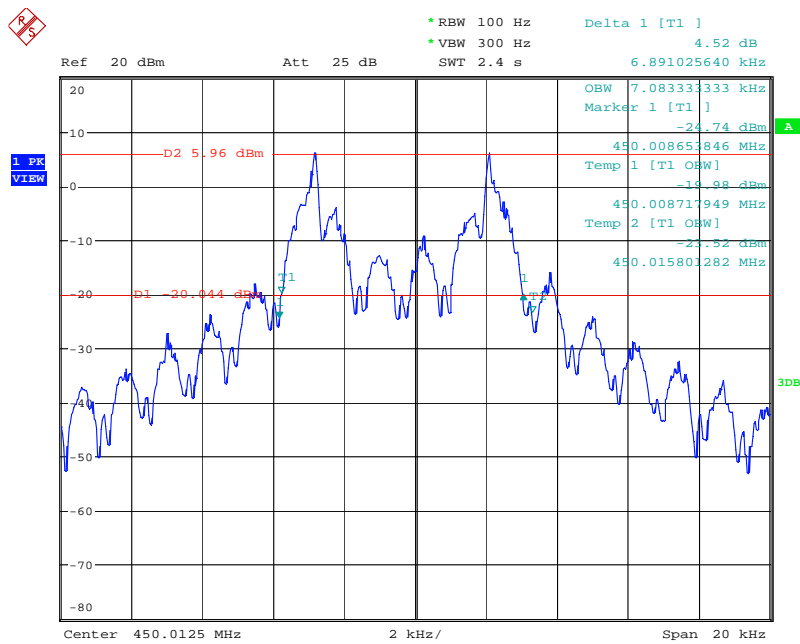
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4.3.3 Necessary Bandwidth

12.5 kHz

Frequency (MHz)	26dB Bandwidth (kHz)	99% Occupied Bandwidth (kHz)	Max. Limit (kHz)
450.0125	6.89103	7.08333	11.25
460	7.05128	7.62820	11.25
469.9875	6.82692	7.01923	11.25



Necessary Bandwidth 450.0125MHz

Date: 1.DEC.2014 15:57:03



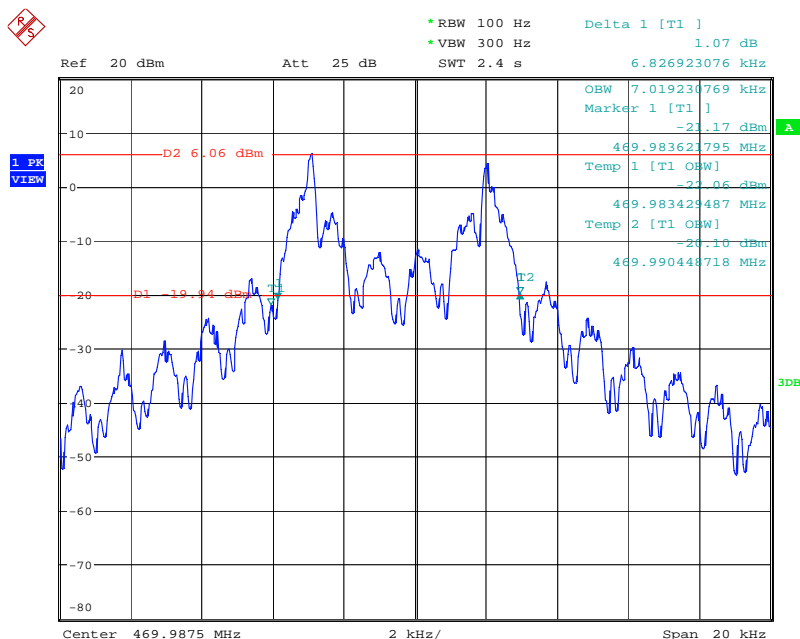
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Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXMIU10



Necessary Bandwidth 460MHz
Date: 1.DEC.2014 15:59:47



Necessary Bandwidth 469.9875MHz
Date: 1.DEC.2014 16:03:15

Measurement uncertainty = ± 0.8024 kHz ; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

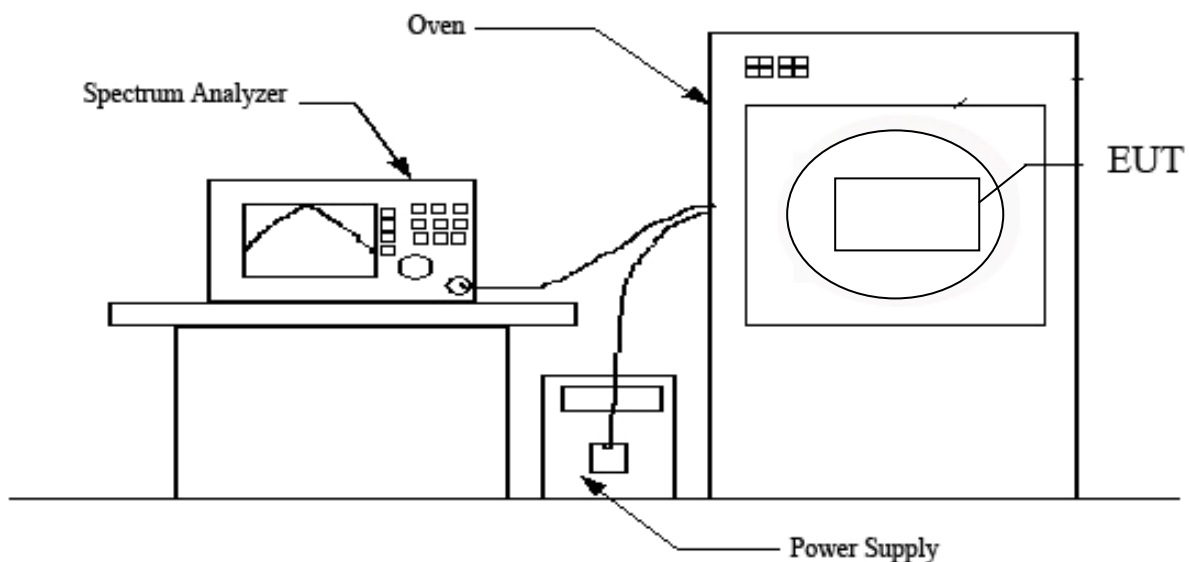
Test equipment used: ETSTW-RE 055, ETSTW-RE 060

5. Frequency stability

5.1 Test Procedures

1. The transmitter output is connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 1kHz and VBW to 1kHz.
3. Use peak detector mode, Max-hold and search the peak of trace 1.
4. According to the part 2.1055(d)(1), the supply voltage has to be changed from 85 to 115 percent of the nominal value.
5. According to the part 2.1055(a)(1), extreme temperature has to be changed from -20°C to 50°C.
6. Read the frequency of the carrier and calculate the deviation.

5.2 Test Setup





Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXMIU10

5.3 Test Result

Nominal Frequency(MHz)	450.0125	460	469.9875
Voltage V.S. Frequency Stability			
Voltage	Result		
V _{nor} 120V a.c.	450.011886	459.999538	469.986998
V _{min} 108V a.c.	450.011883	459.999223	469.986882
V _{max} 132V a.c.	450.011839	459.999538	469.986882
Max deviation(MHz)	-0.000617	-0.000462	-0.000618
Max deviation(ppm)	-1.371073026	-1.004347826	-1.314928589
Limit(ppm)	1.5		
Temperature V.S. Frequency Stability			
Temperature (°C)	Result		
-20	450.012168	459.999563	469.987118
-10	450.011975	459.999515	469.987138
0	450.012066	459.999568	469.98707
10	450.012039	459.999643	469.987123
20	450.011954	459.999563	469.987198
30	450.011954	459.999563	469.987198
40	450.01208	459.999499	469.987054
50	450.012098	459.999499	469.987054
Max deviation(MHz)	0.000332	-0.000437	-0.000446
Max deviation(ppm)	0.737757285	-0.95	-0.948961409
Limit(ppm)	1.5		

Measurement uncertainty = ± 6.06 Hz ; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Test equipment used: ETSTW-RE 055, ETSTW-RE 060, ETSTW-CE 009

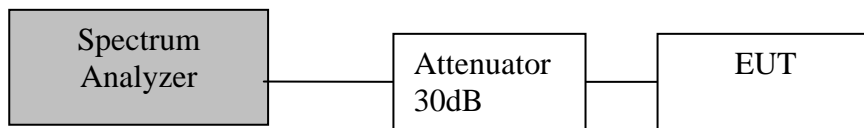
Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10

6. Transmitter Output Power

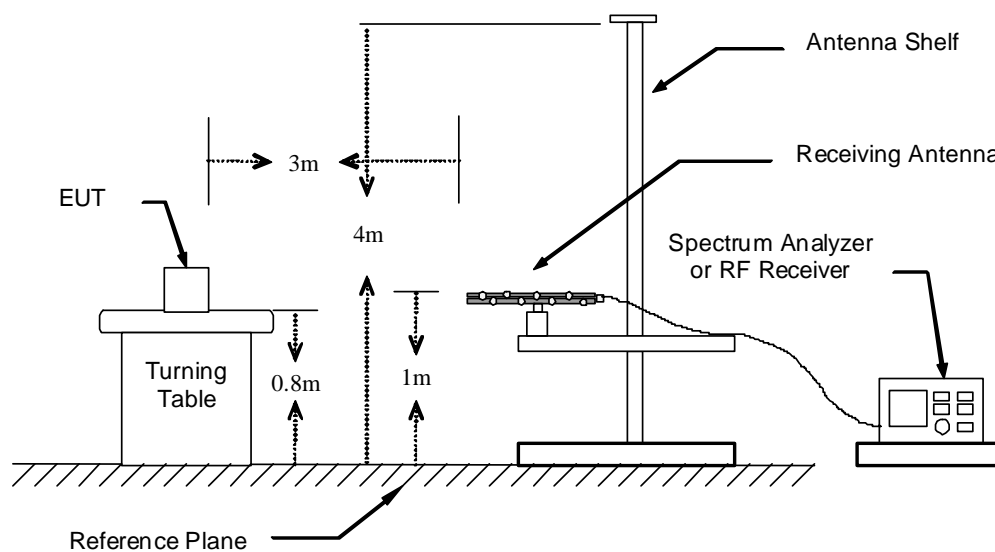
6.1 Test Procedures

1. The EUT was placed on the top of the turntable in semi-anechoic chamber.
2. The test shall be made in the transmitting mode. Antenna tower was scan (from 1 M to 4 M) and the turn table was rotated by 360 degrees to determine the position of the highest radiation.
3. The receiving Horn antenna was placed 0.5 meters far away from the turntable.
4. The receiving antenna was fixed on the same height with the EUT to find maximum suspected emissions. Recorded suspected value is indicated as Read Level (Raw).
5. Replace the EUT by standard antenna and feed the RF port by signal generator.
6. Adjust the frequency of the signal generator to the suspected emission and slightly rotate the turntable to locate the position with maximum reading.
7. Adjust the power level of the signal generator to reach the same reading with Read Level (Raw).
8. The level of the spurious emission is the power level of (7) plus the gain of the standard antenna in dBd and minus the loss of the cable used between the signal generator and the standard antenna.

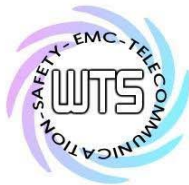
6.2 Test Setup



Setup for Conducted Power



Setup for Radiated Power

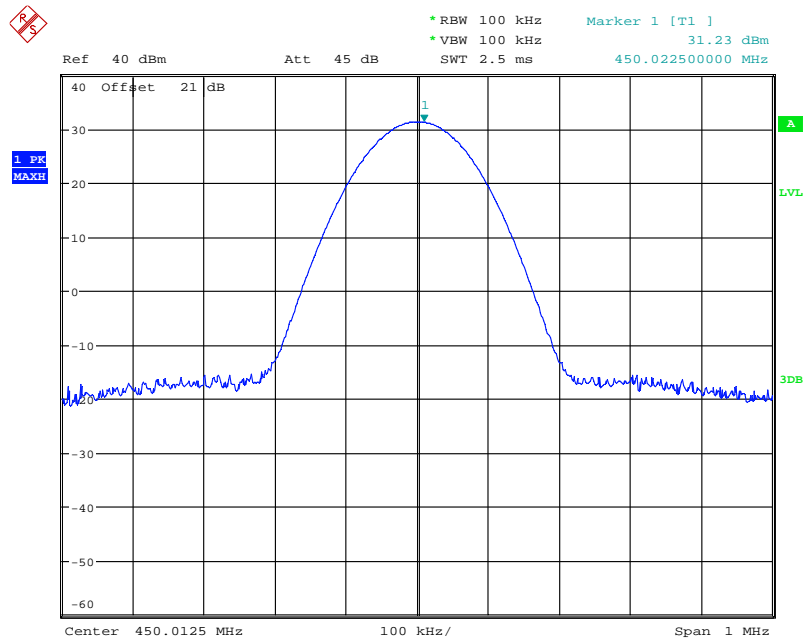


Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXM1U10

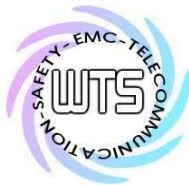
6.3 Test Result

6.3.1 Conducted Power

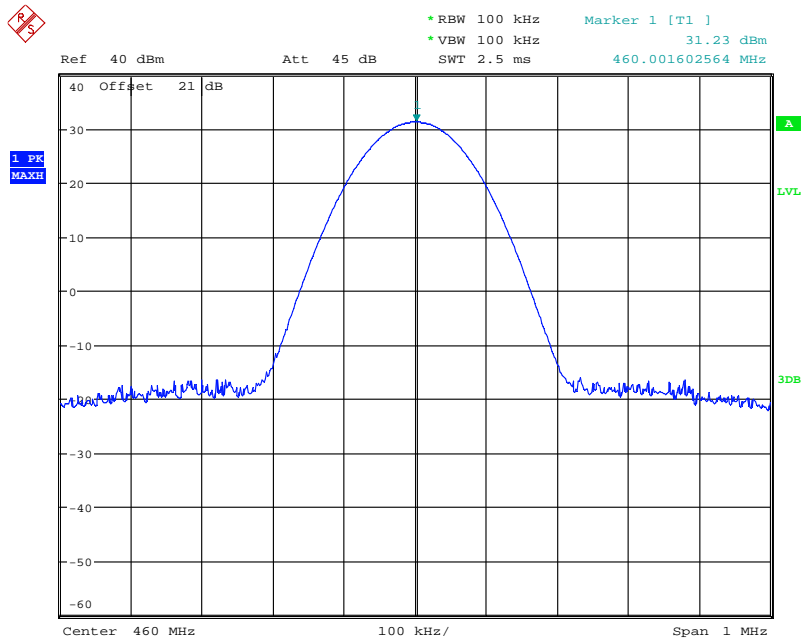


CONDUCTED POWER 450.0125MHZ

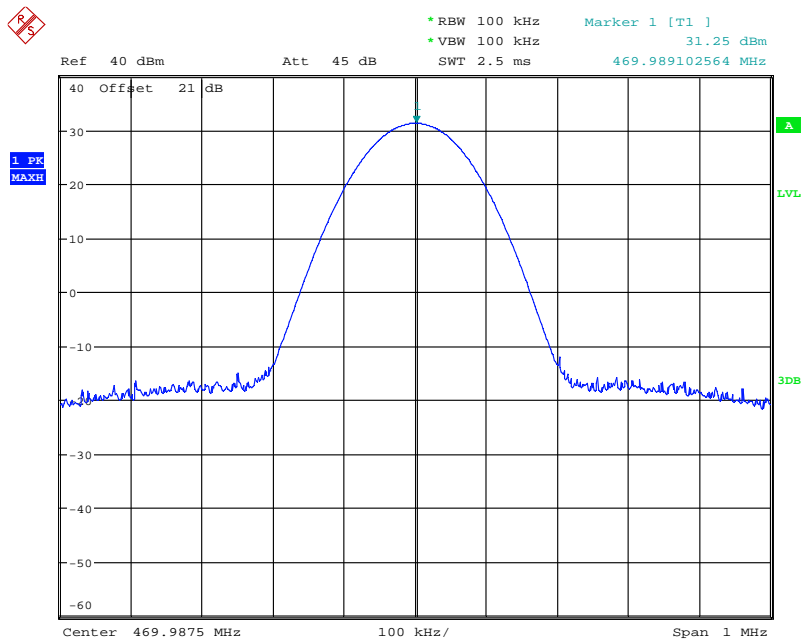
Date: 20.NOV.2014 13:58:23



Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10



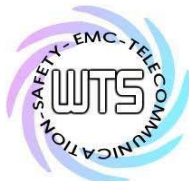
CONDUCTED POWER 460MHZ
Date: 20.NOV.2014 12:30:02



CONDUCTED POWER 469.9875MHZ
Date: 20.NOV.2014 12:32:51

Measurement uncertainty = ± 1.80 dB ; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

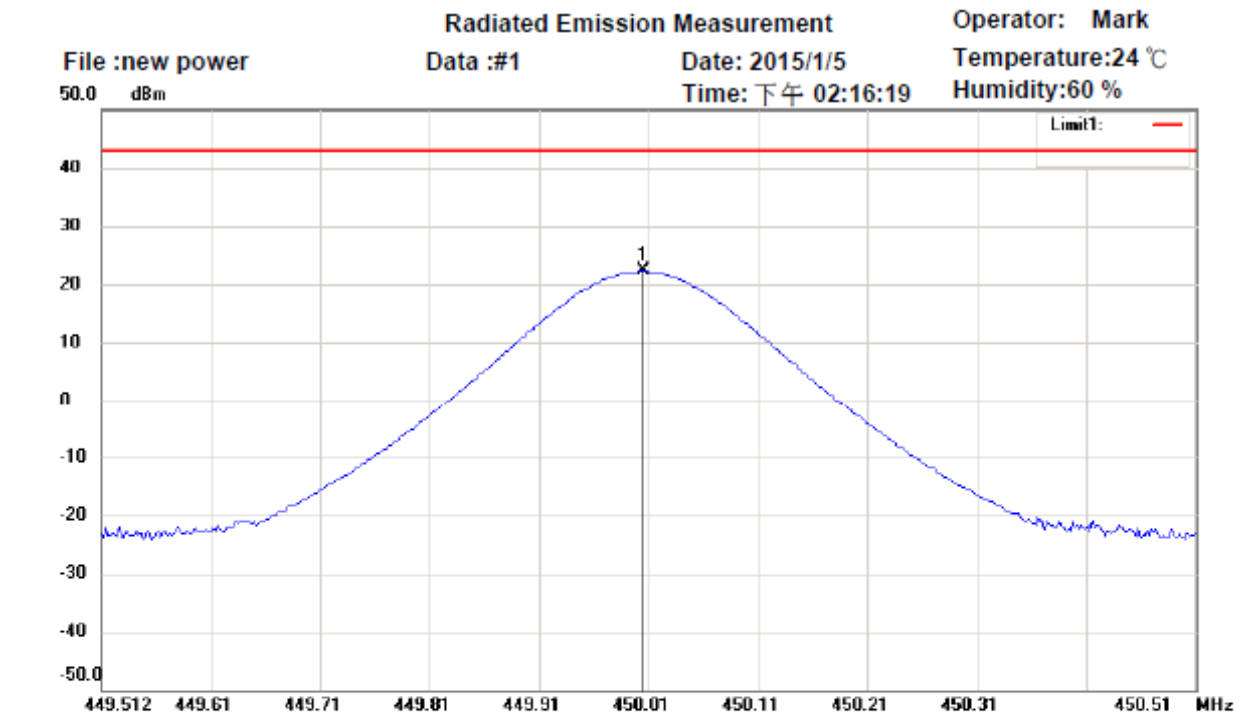
Test equipment used: ETSTW-RE 055, ETSTW-RE 060



Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXM1U10

6.3.2 Radiated Power



Site : Chamber

Condition : FCC_part 90 POWER

EUT : W6M21411-14611

M/N:

Test Mode : 450.0125MHz

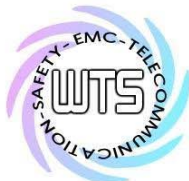
Note :

Polarization: *Horizontal*

Power : 120 V.a.c.

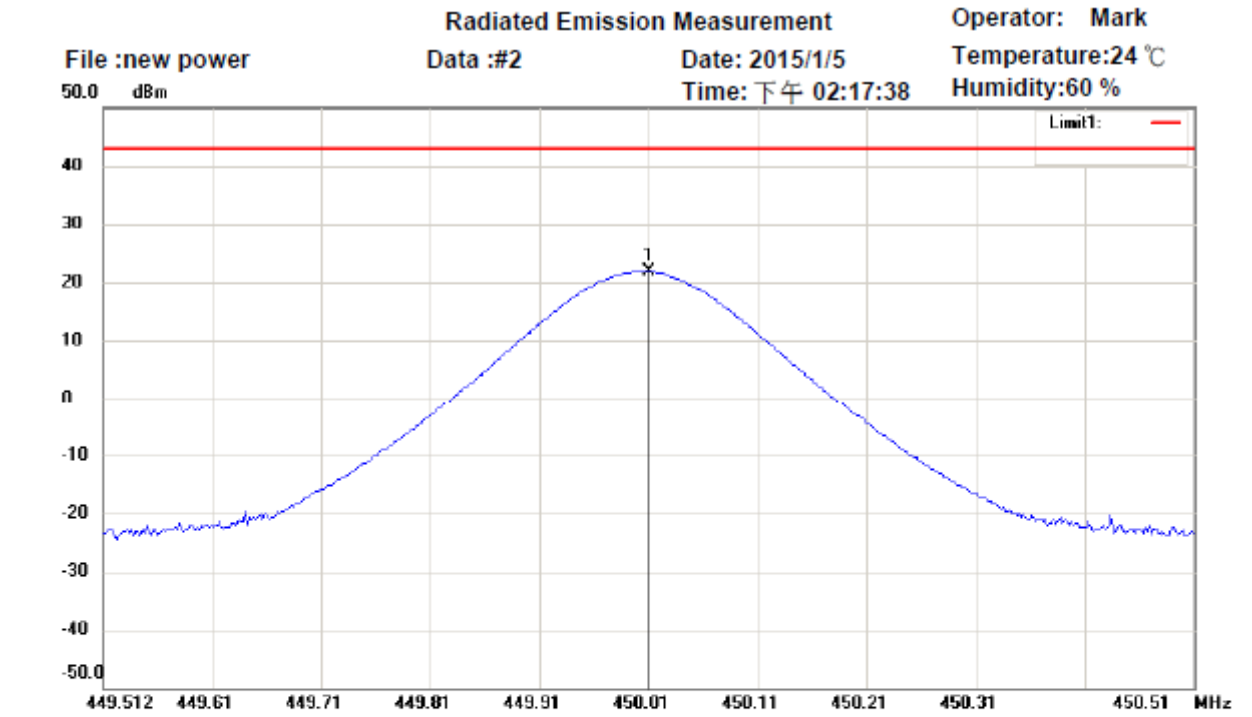
Distance: 3m

Mk.	Frequency (MHz)	Reading (dBm)	Detector	Corr. factor (dB)	Result (dBm)	Limit (dBm)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	450.0055	-4.65	peak	26.94	22.29	43.00	150	100	-20.71	



Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10



Site : Chamber

Condition : FCC_part 90 POWER

EUT : W6M21411-14611

M/N:

Test Mode : 450.0125MHz

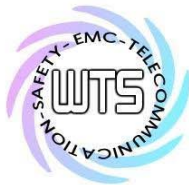
Note :

Polarization: *Vertical*

Power : 120 V.a.c.

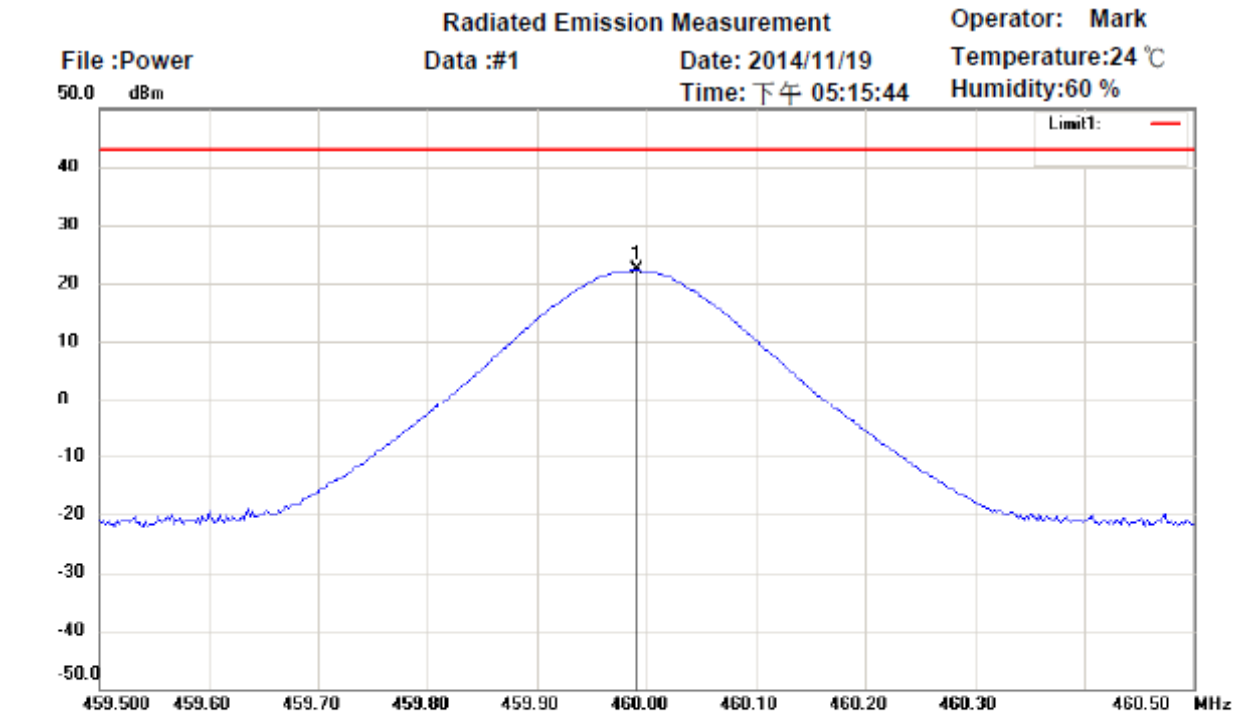
Distance: 3m

Mk.	Frequency (MHz)	Reading (dBm)	Detector	Corr. factor (dB)	Result (dBm)	Limit (dBm)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	450.0115	-4.53	peak	26.41	21.88	43.00	150	210	-21.12	

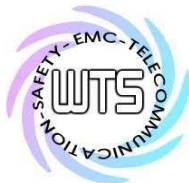


Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10



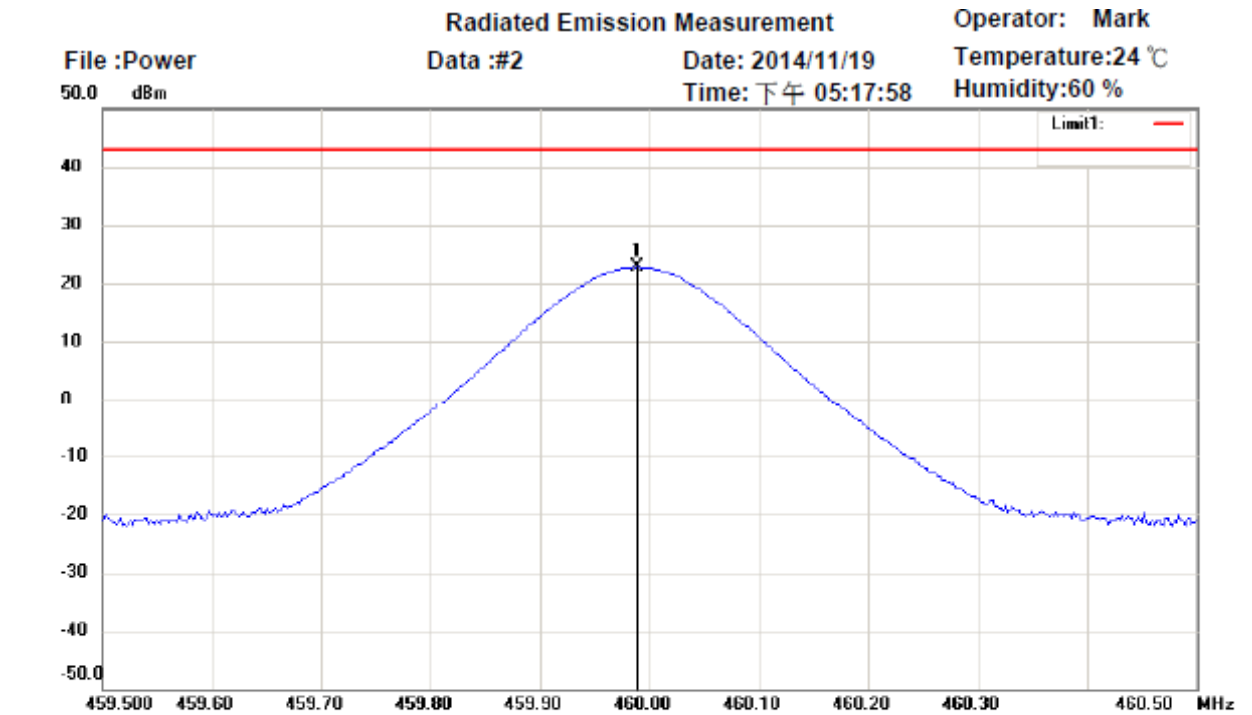
Mk.	Frequency (MHz)	Reading (dBm)	Detector	Corr. factor (dB)	Result (dBm)	Limit (dBm)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	459.9910	-4.86	peak	27.19	22.33	43.00	150	140	-20.67	



Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXM1U10



Site : Chamber

Condition : FCC_part 90 POWER

EUT : W6M21411-14611

M/N:

Test Mode : 460MHz

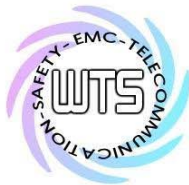
Note :

Polarization: *Vertical*

Power : 3.3 Vd.c.

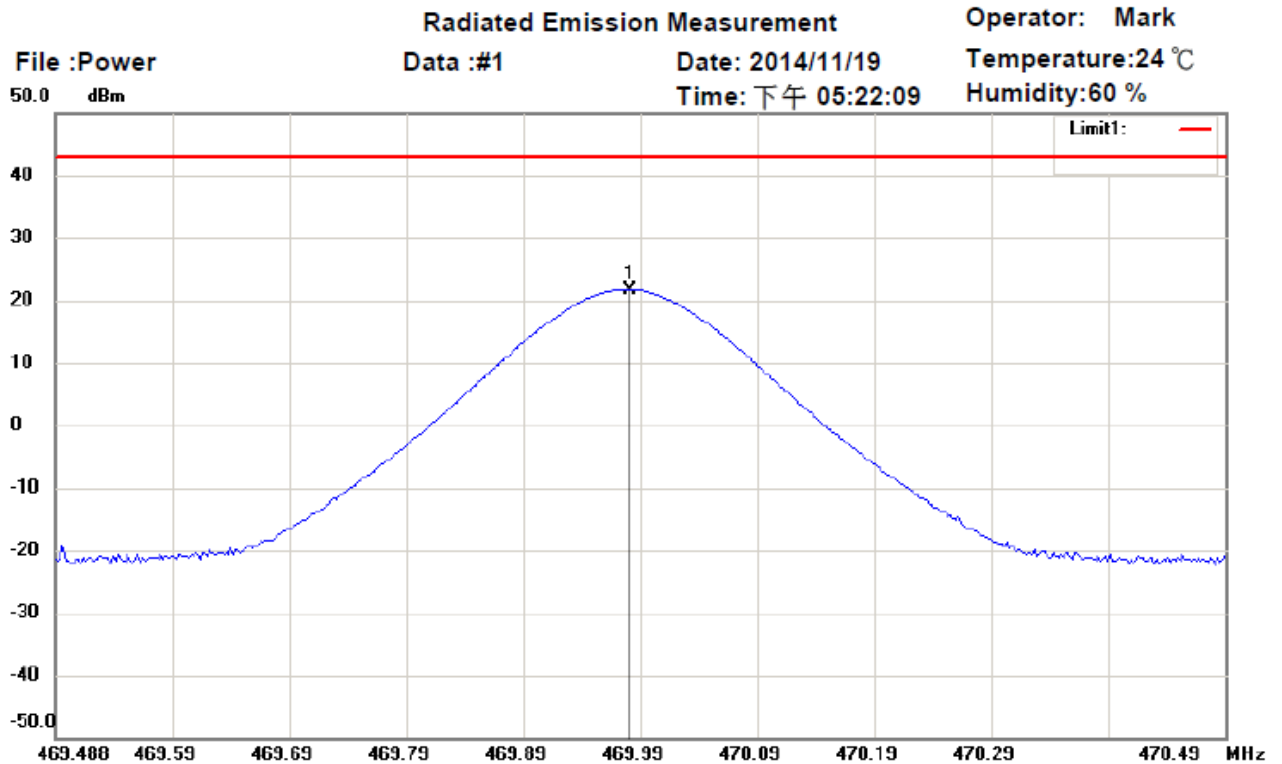
Distance: 3m

Mk.	Frequency (MHz)	Reading (dBm)	Detector	Corr. factor (dB)	Result (dBm)	Limit (dBm)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	459.9890	-4.42	peak	27.18	22.76	43.00	150	210	-20.24	



Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10



Site : Chamber

Condition : FCC_part 90 POWER

EUT : W6M21411-14611

M/N:

Test Mode : 469.9875MHz

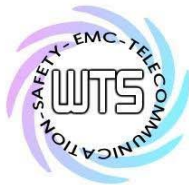
Note :

Polarization: *Horizontal*

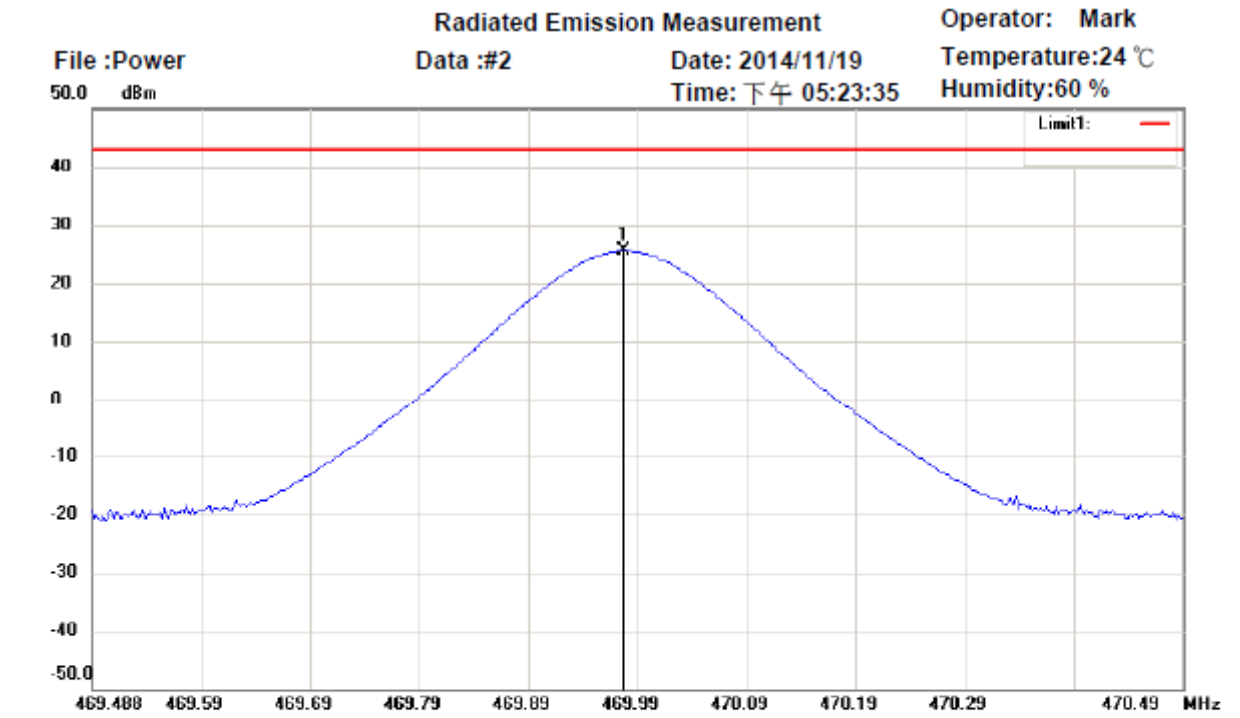
Power : 3.3 Vd.c.

Distance: 3m

Mk.	Frequency (MHz)	Reading (dBm)	Detector	Corr. factor (dB)	Result (dBm)	Limit (dBm)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	469.9785	-5.26	peak	26.98	21.72	43.00	150	270	-21.28	



Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10



Site : Chamber

Condition : FCC_part 90 POWER

EUT : W6M21411-14611

M/N:

Test Mode : 469.9875MHz

Note :

Polarization: *Vertical*

Power : 3.3 Vd.c.

Distance: 3m

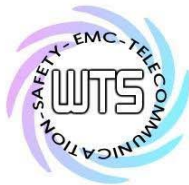
Mk.	Frequency (MHz)	Reading (dBm)	Detector	Corr. factor (dB)	Result (dBm)	Limit (dBm)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	469.9745	-1.98	peak	27.53	25.55	43.00	150	210	-17.45	

Test equipment used: ETSTW-RE 004, ETSTW-RE 030, ETSTW-RE 062, ETSTW-RE 111

Measurement uncertainty = 30-200MHz : ± 2.11 dB, 200-1000MHz : ± 2.09 dB, ± 1 -18GHz : 2.71 dB, 18-40GHz : ± 2.71 dB; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

6.4 Limit

Power limit according to FCC § 90.261: 20 watts (43 dBm)



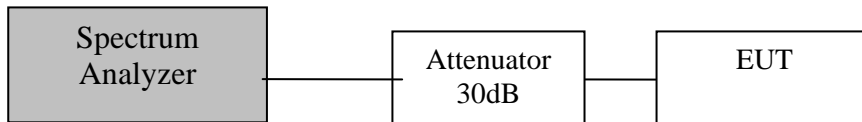
Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10

7. Emission masks

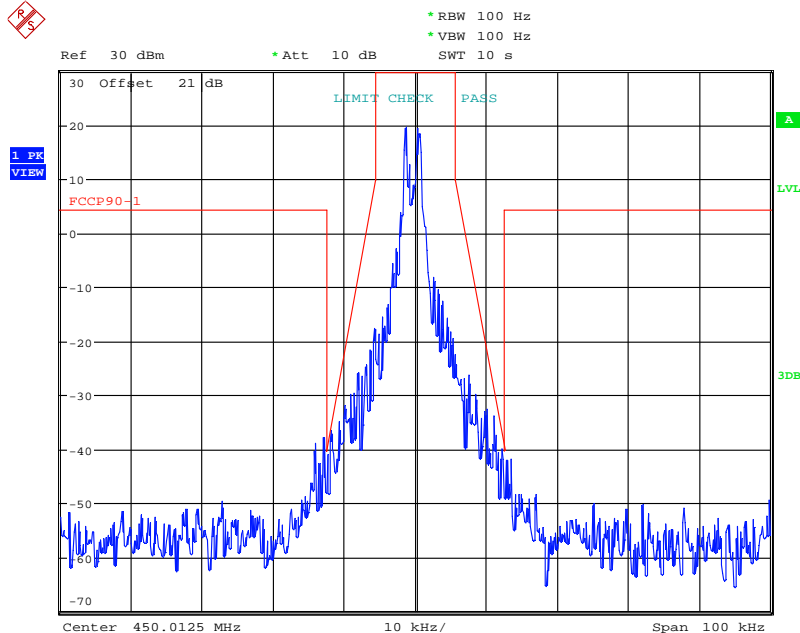
7.1 Test Procedures

1. The transmitter output is connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 300Hz and VBW to 1 kHz.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum
4. Set the span to 120 kHz and the sweep time to Auto.
5. Record the power spectral and compare to the Mask.

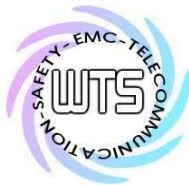
7.2 Test Setup



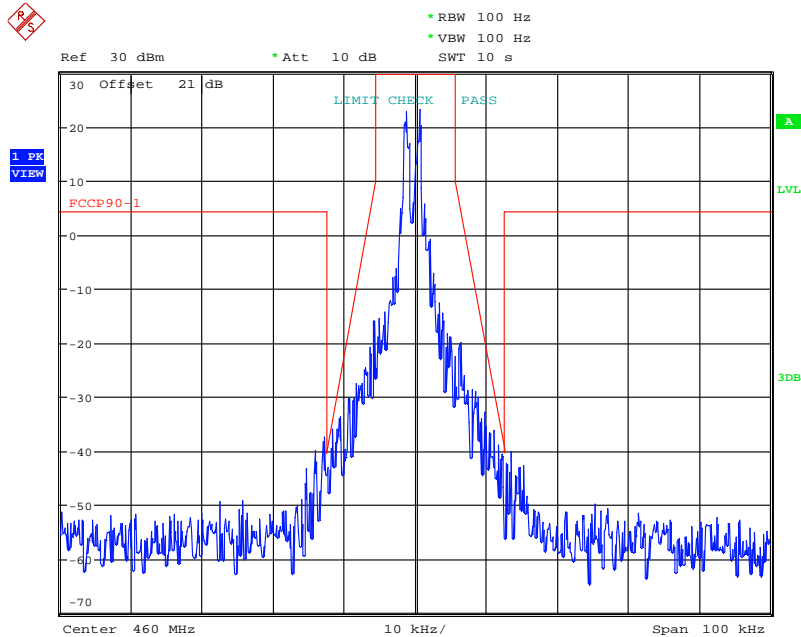
7.3 Test Result



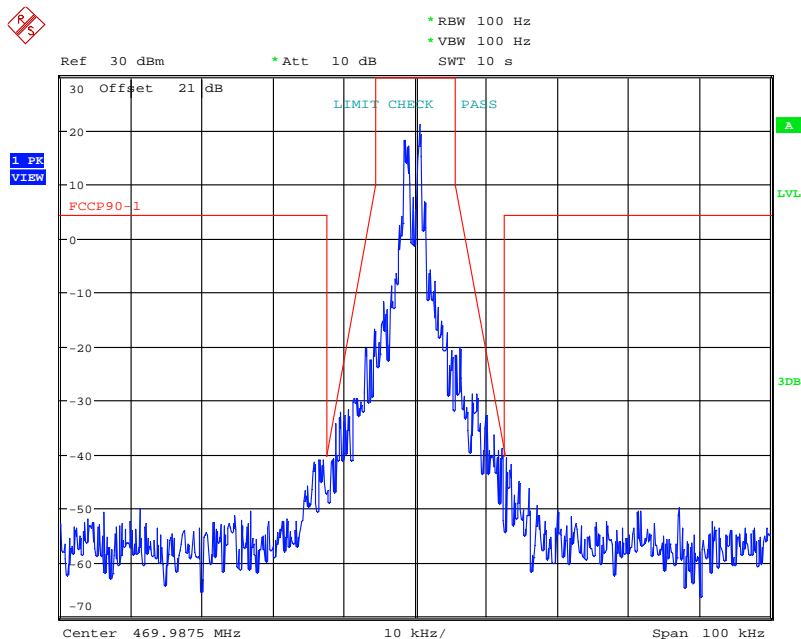
EMISSION MASK 450.0125MHZ
Date: 29.NOV.2014 09:54:45



Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10



EMISSION MASK 460MHZ
Date: 29.NOV.2014 09:58:51



EMISSION MASK 469.9875MHZ
Date: 29.NOV.2014 10:10:12

Measurement uncertainty = ± 1.84 dB ; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Test equipment used: ETSTW-RE 055, ETSTW-RE 060
Limit according to FCC § 90.210: 12.5 kHz: Emission Mask D.

Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10

8. Transmitter Spurious Radiated Emission

8.1 Test Procedures

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane.

The radiated emission at the fundamental frequency was measured at 3 m distance with a test antenna and spectrum analyzer.

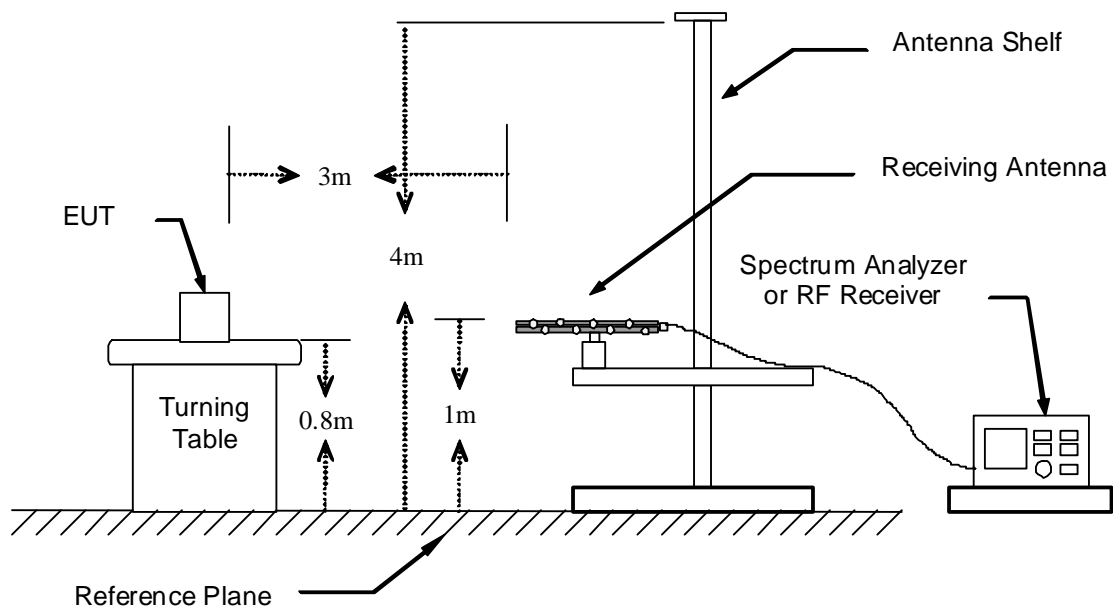
Worst case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna.

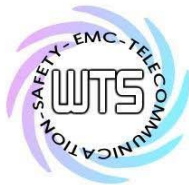
ERP was measured using a substitution method. The EUT was replaced by reference antenna connected to a signal generator.

The test of spurious radiated emission has been carried out with the validated test software. The measurements below 1GHz were performed with a measurement bandwidth of 100 kHz, above 1GHz with a bandwidth of 1MHz.

Spurious emission limits near the carrier are defined by a emission mask.

8.2 Test Setup





Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXMIU10

8.3 Test Result

Model: TX0400P10 Date: --
Mode: Temperature: -- °C Engineer: --
Polarization: Horizontal Humidity: -- %

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--

Polarization: Vertical

Frequency (MHz)	Reading (dBm) Peak	Factor (dB) Corr.	Result (dBm)	Limit (dBm)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--

Measurement uncertainty = 30-200MHz : ± 2.11 dB, 200-1000MHz : ± 2.09 dB, ± 1 -18GHz : 2.71 dB, 18-40GHz : ± 2.71 dB; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Test equipment used: ETSTW-RE 004, ETSTW-RE 030, ETSTW-RE 062, ETSTW-RE 111

Note: See attached diagrams in appendix.

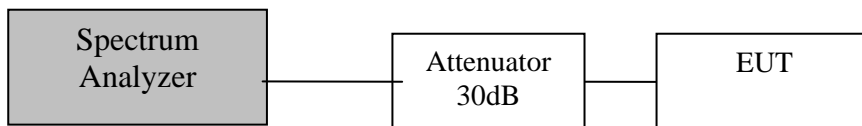
Registration number: W6M21411-14611-C-1
FCC ID: 2ADKH-TXM1U10

9. Transmitter Spurious Conducted Emission

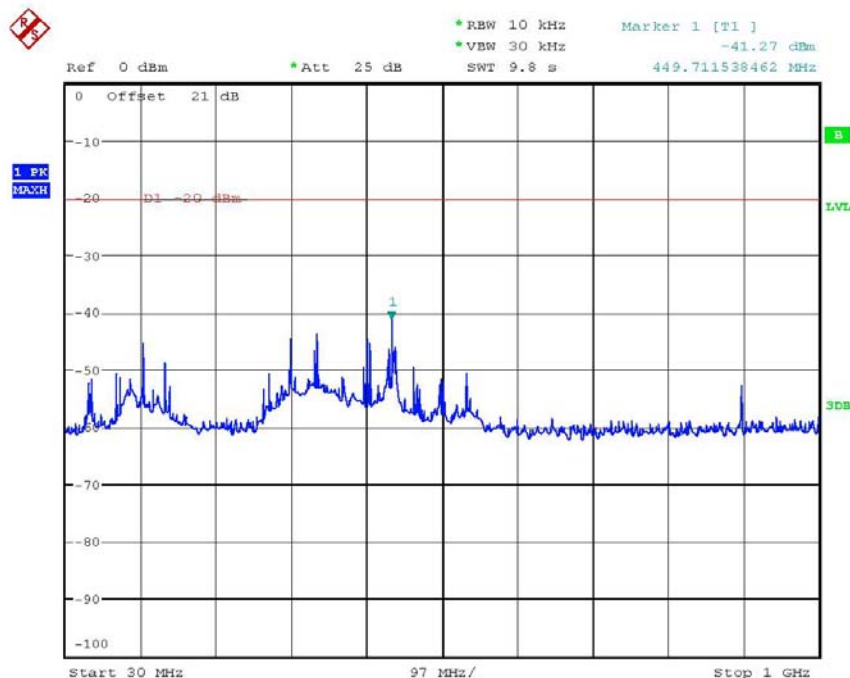
9.1 Test Procedures

1. The transmitter output is connected to the spectrum analyzer through an attenuator.
2. Adjust the spectrum analyzer for the following settings:
 - Resolution Bandwidth = 100 kHz for spurious emissions below 1 GHz and 1 MHz for spurious emissions above 1GHz.
 - Video Bandwidth = 100 kHz for spurious emissions below 1 GHz, and 1 MHz for spurious emissions above 1 GHz.
 - Sweep Speed slow enough to maintain measurement calibration. Detector Mode = Positive Peak.
3. Limits= $P \text{ (dBm)} + 10\log(P(W)) = -13\text{dBm}$

9.2 Test Setup



9.3 Test Result



Conducted Spurious Emission Below 1G 450.0125MHz
Date: 1.DEC.2014 15:34:23



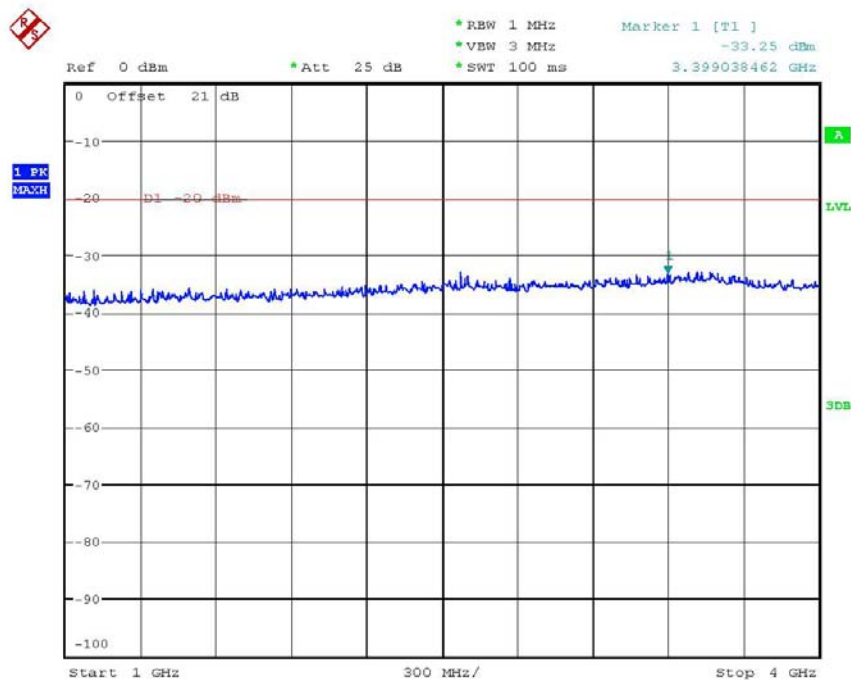
FCC ID: 2ADKH-TXM1U10



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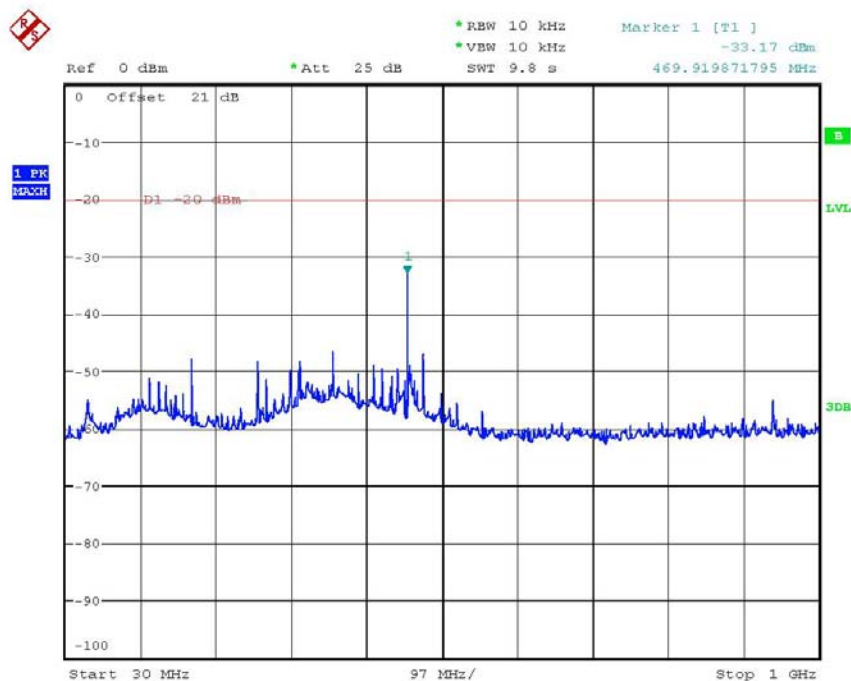
Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXM1U10



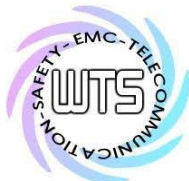
Conducted Spurious Emission Above 1G 460MHz

Date: 1.DEC.2014 15:31:50



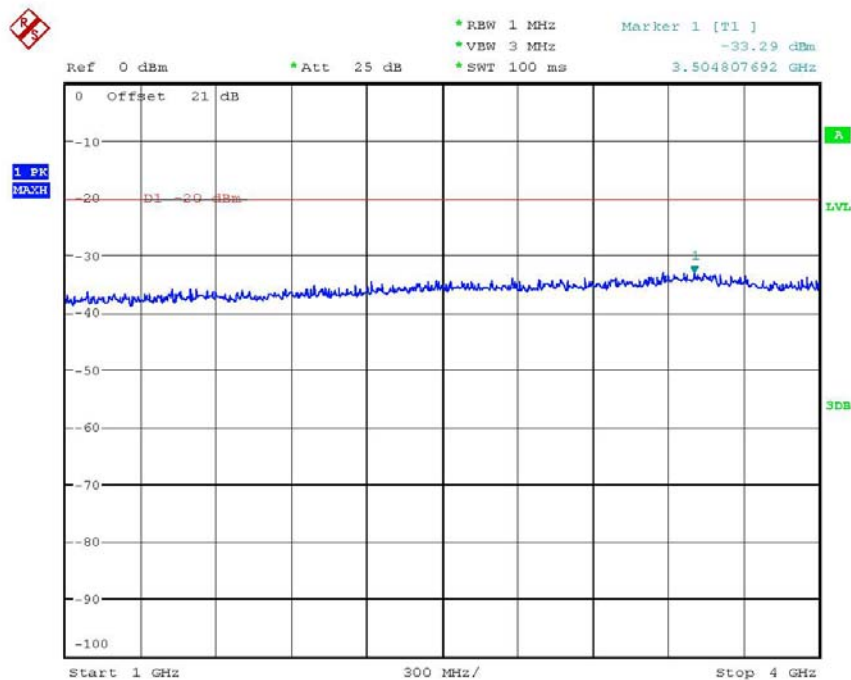
Conducted Spurious Emission Below 1G 469.9875MHz

Date: 1.DEC.2014 15:27:56



Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXM1U10



Conducted Spurious Emission Above 1G 469.9875MHz
Date: 1.DEC.2014 15:32:12

Measurement uncertainty = ± 1.84 dB ; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

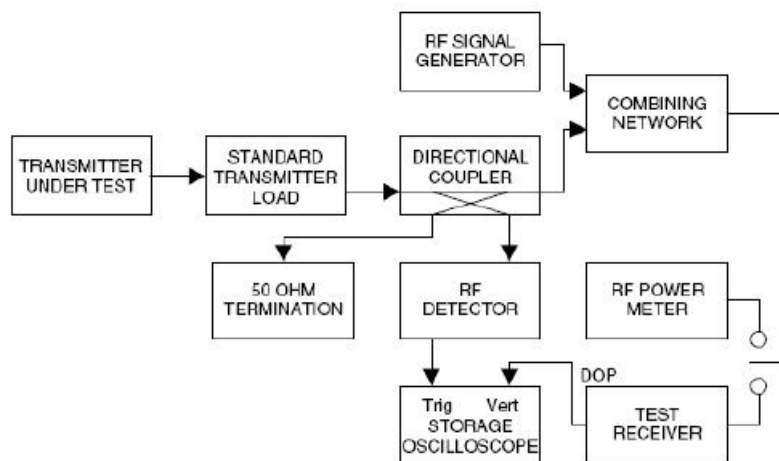
Test equipment used: ETSTW-RE 055, ETSTW-RE 060

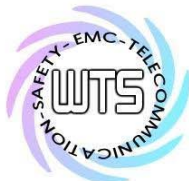
10. Transient frequency behavior

10.1 Test Procedures

1. SG to the assigned transmitter frequency and modulate it with a 1 kHz tone at ± 25 kHz deviation and set its output level to below 30dB of EUT signal level to receiver.
2. Set the horizontal sweep rate on the storage oscilloscope to 10 ms per division and adjust the display to continuously view the 1000 Hz tone from the DOP. Adjust the vertical amplitude control of the oscilloscope to display the 1000 Hz at ± 4 divisions vertically centered on the display.
3. Transmitter on and observe the stored display. The output at the DOP, due to the change in the ratio of power between the signal generator input power and the transmitter output power will, because of the capture effect of the test receiver, produce a change in display: For the first part of the sweep it will show the 1 kHz test signal. Then once the receiver's demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the 1 kHz test signal is completely suppressed (including any capture time due to phasing) is considered to be t_0 . The trace should be maintained within the allowed divisions during the period t_1 and t_2 . See the figure in the appropriate standards section.
4. During the time from the end of t_2 to the beginning of t_3 the frequency difference should not exceed the limits set by the FCC in 47 CFR 90.214 and outlined in 3.2.2. The allowed limit is equal to the transmitter frequency times its FCC frequency tolerance times ± 4 display divisions divided by 25 kHz. For example, at a transmitter assigned frequency of 500 MHz and a frequency tolerance of 5 ppm. This would be 500 MHz times 5 ppm times ± 4 divisions divided by 25 kHz. This equals ± 0.4 divisions in this example. Greater vertical sensitivity may be required to view this accurately
5. Adjust the oscilloscope trigger controls so it will trigger on a decreasing magnitude from the RF peak detector, at 1 division from the right side of the display, when the transmitter is turned off. Set the controls to store the display. The moment when the 1 kHz test signal starts to rise is considered to provide t_{off} .

10.2 Test Setup





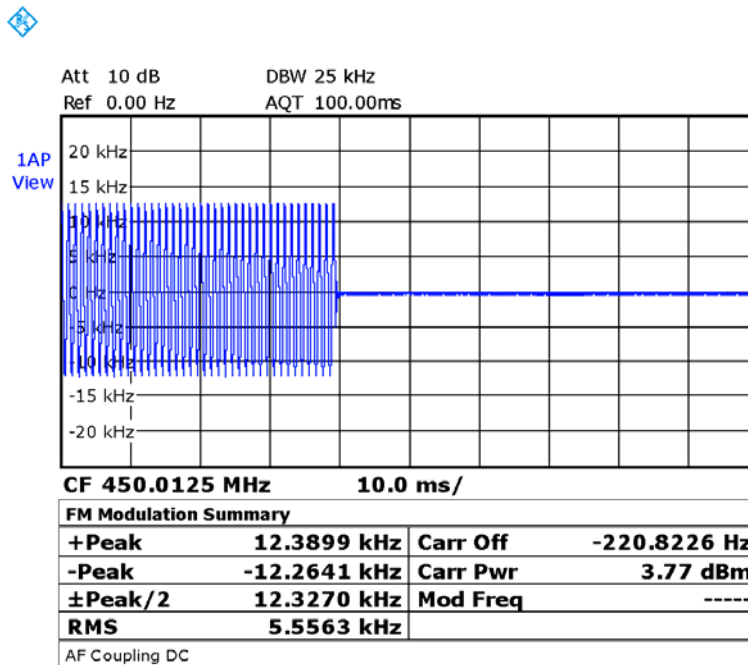
Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXM1U10

10.3 Test Result

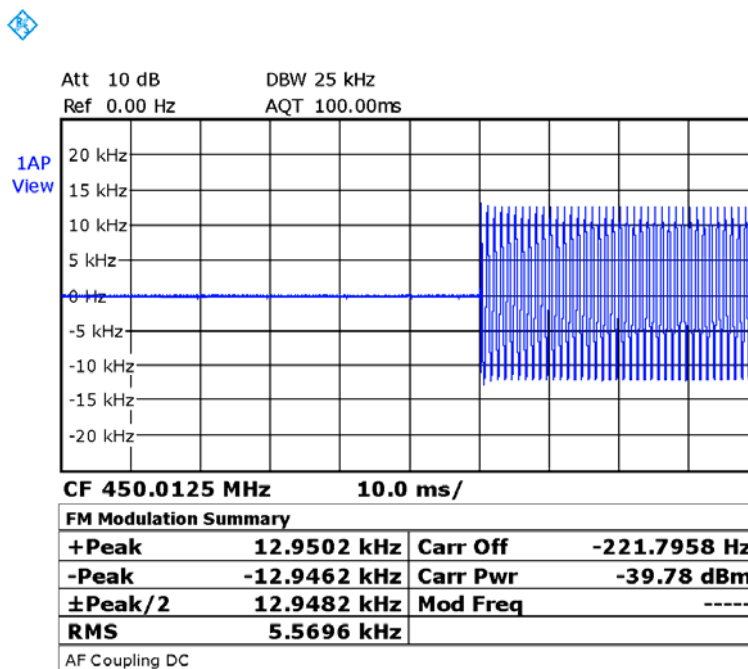
12.5 kHz

450 MHz On

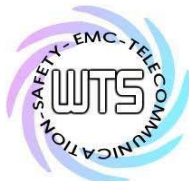


Date: 9.DEC.2014 07:00:27

450 MHz Off



Date: 9.DEC.2014 07:01:21

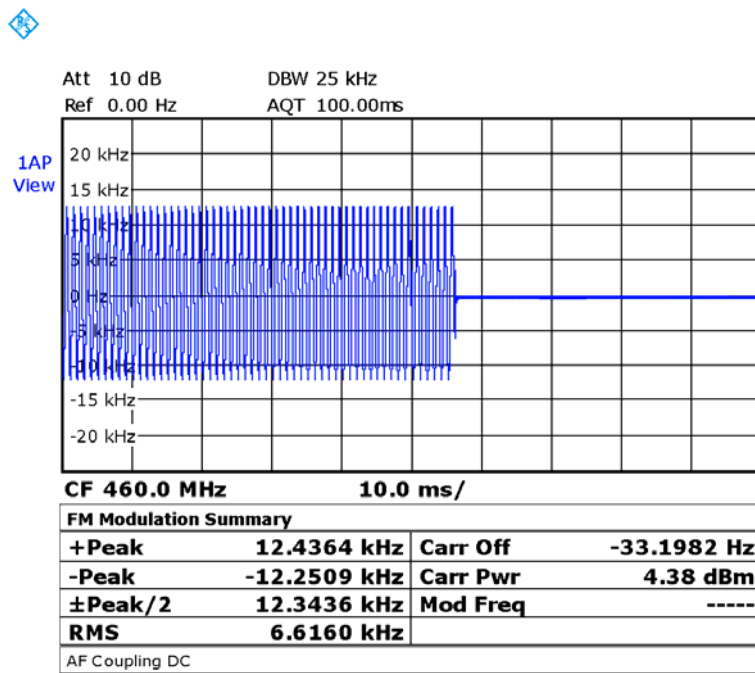


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Registration number: W6M21411-14611-C-1

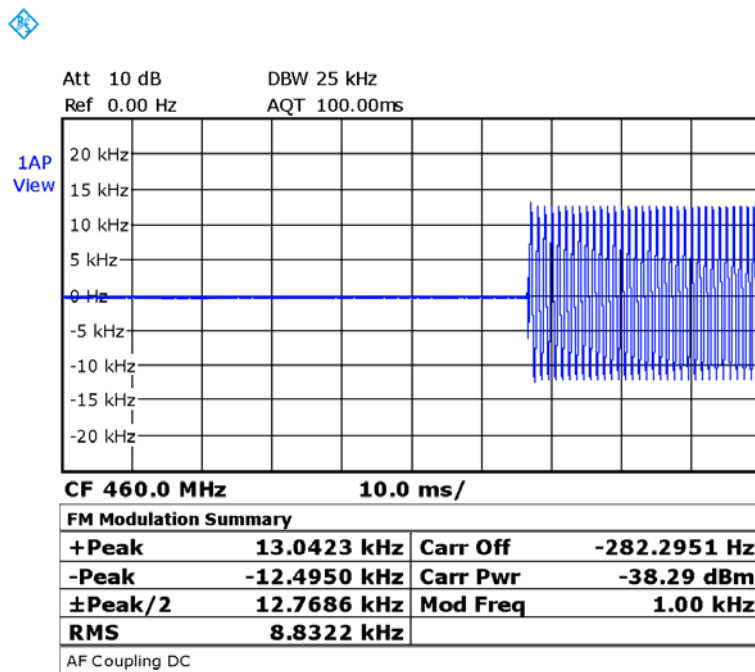
FCC ID: 2ADKH-TXM1U10

460 MHz On

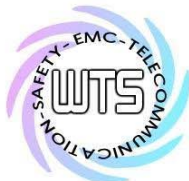


Date: 9.DEC.2014 06:56:57

460 MHz Off



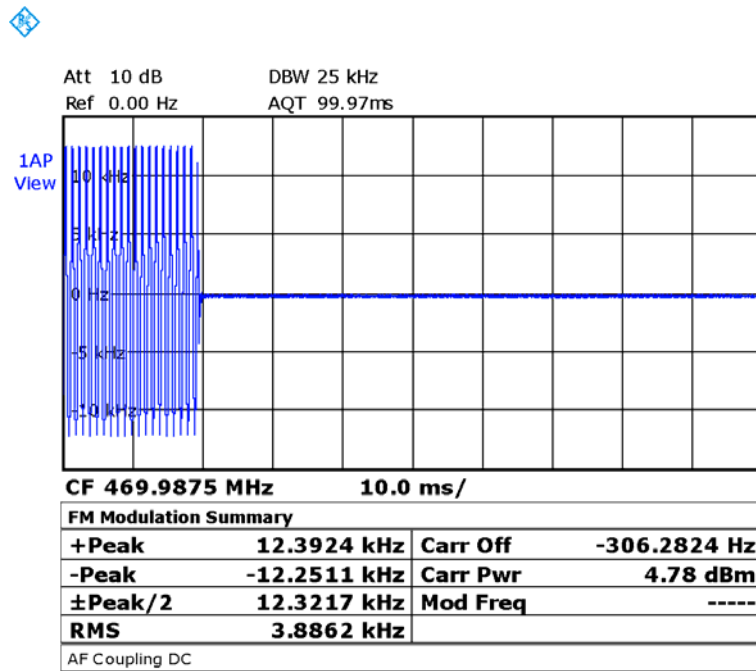
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Registration number: W6M21411-14611-C-1

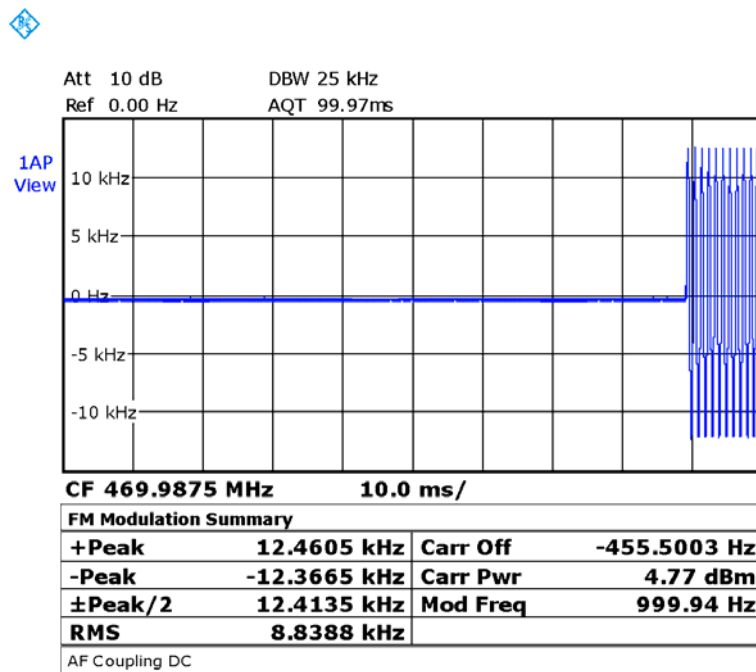
FCC ID: 2ADKH-TXM1U10

469 MHz On



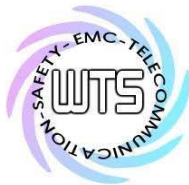
Date: 9.DEC.2014 04:56:42

469 MHz Off



Date: 9.DEC.2014 04:58:20

Test equipment used: ETSTW-RE 033, ETSTW-RE 072



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11. 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.

Model: TX0400P10 Date: --
Mode: Temperature: -- °C Engineer: --
Polarization: N Humidity: -- %

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
--	--	--	--	--	--	--	--	--

Polarization: L1

Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
--	--	--	--	--	--	--	--	--

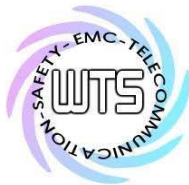
Note

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. Measurement uncertainty = ± 1.41 dB; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.
6. This test is not required because there is no AC power line or signal line for this EUT.

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-CE 006, ETSTW-RE 045



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12. Maximum Permissible Exposure

12.1 Applicable Standard

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 levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.65 m normally can be maintained between the user and the device.

12.2 MPE Calculation Method

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	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

$$E \text{ (V/m)} \cdot \frac{\sqrt{30 \times P \times G}}{d}$$

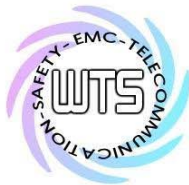
$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} \cdot \frac{E^2}{377}$$

E = Electric field (V/m) P = output power (W) G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd \cdot \frac{30 \times P \times G}{377 \times d^2}$$



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Max output power (W)	Antenna numeric Gain	Power Density(S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
1.334	2.15	0.04	0.3	Complies

From the peak EUT RF output power, the minimum mobile separation distance, $d=0.65$ m, as well as the gain of the used antenna, the RF power density can be obtained.



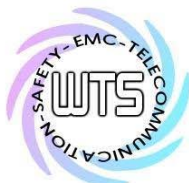
Appendix

A Photos

1. EUT Photos
2. Set Up Photo of Radiated Emission

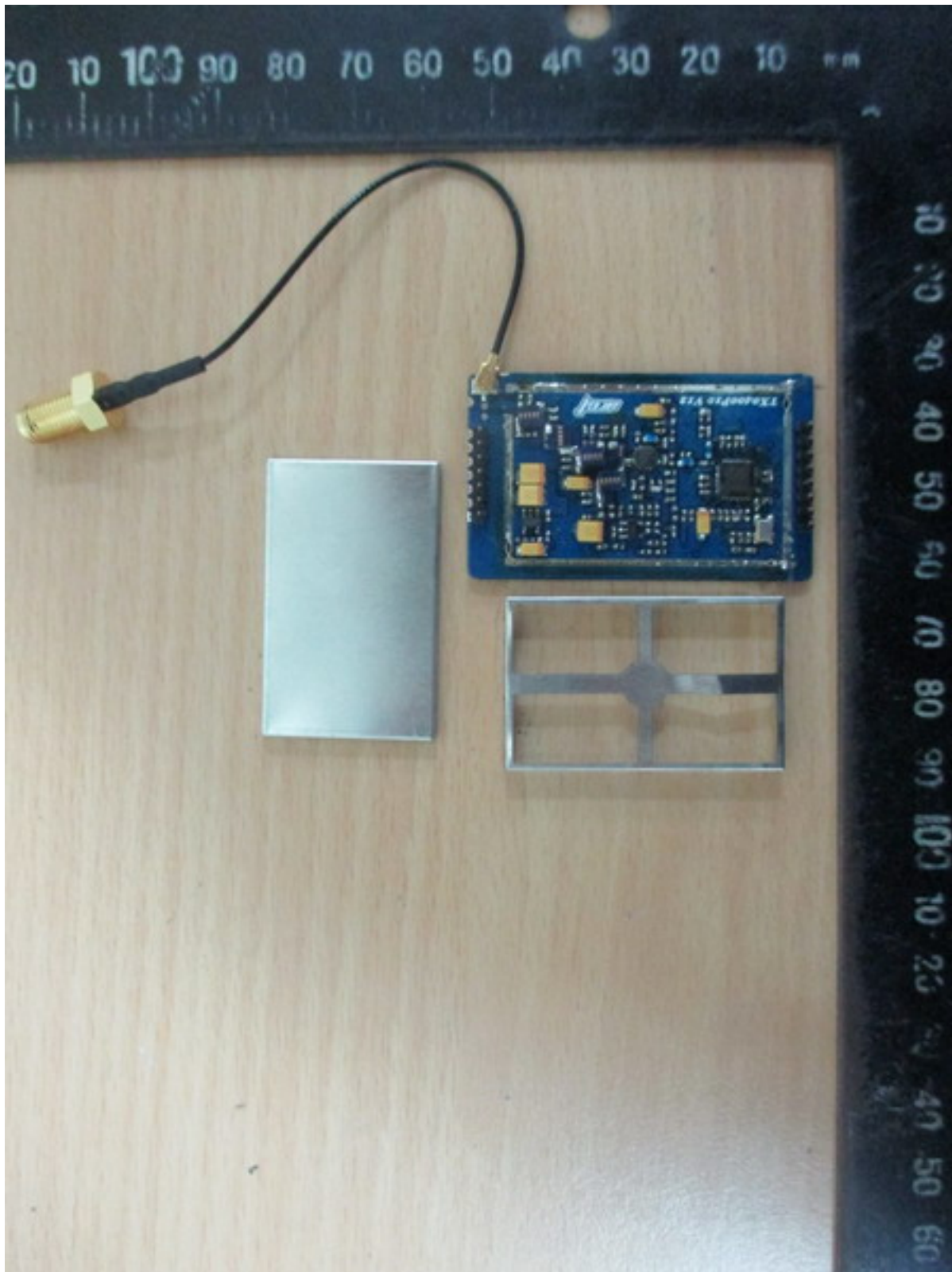
B Measurement diagrams

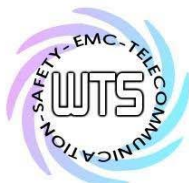
Radiated Spurious Emission



Registration number: W6M21411-14611-C-1
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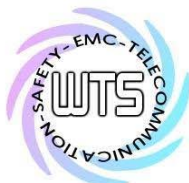
EUT Photos



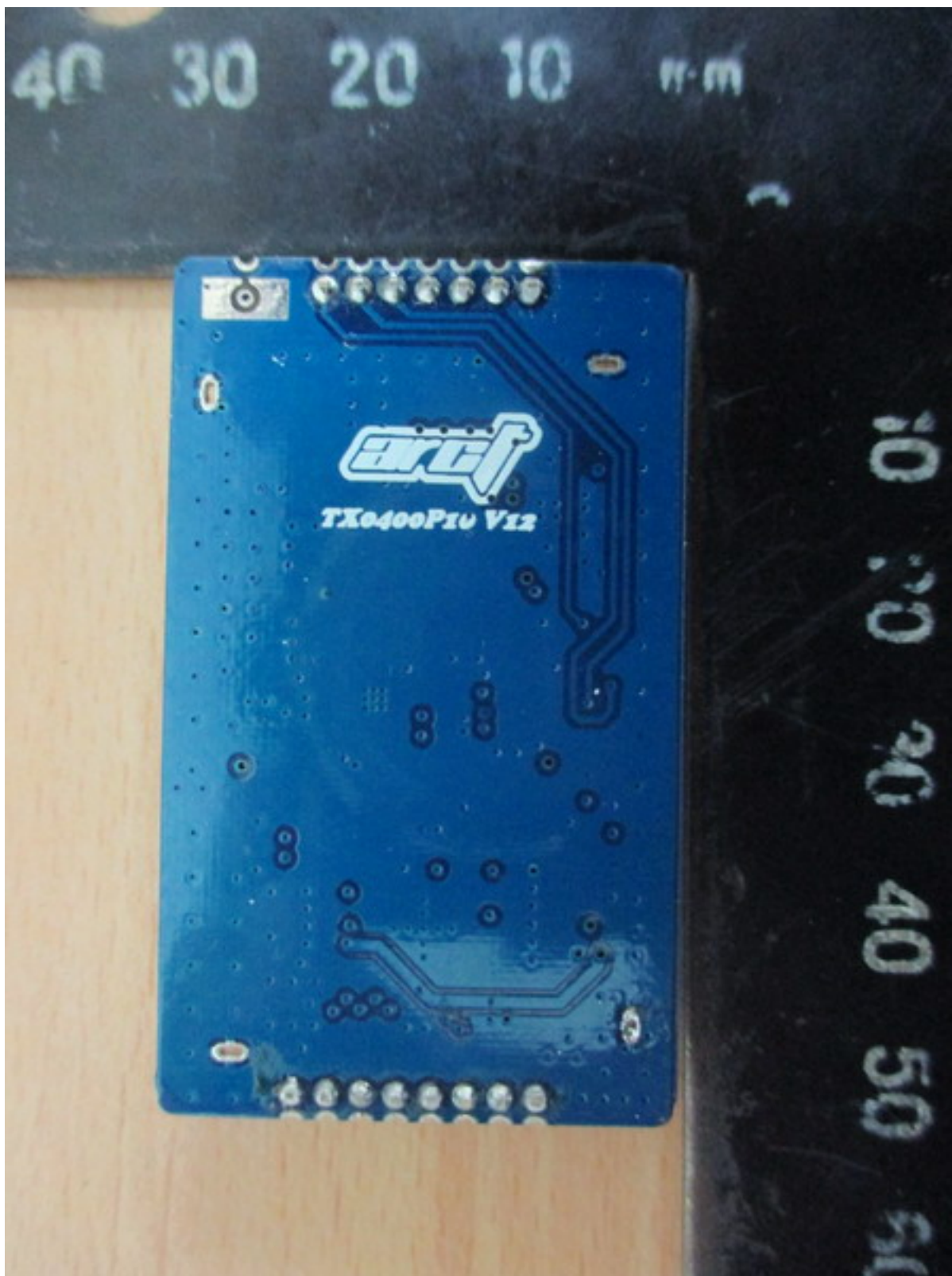


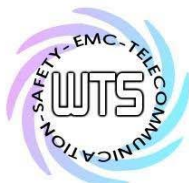
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FCC ID: 2ADKH-TXM1U10





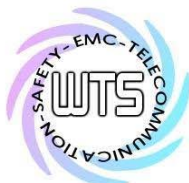
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FCC ID: 2ADKH-TXM1U10





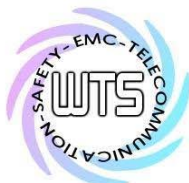
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Registration number: W6M21411-14611-C-1
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Registration number: W6M21411-14611-C-1
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Registration number: W6M21411-14611-C-1

FCC ID: 2ADKH-TXM1U10

Set Up Photo of Radiated Emission

