

FCC Test Report

EQUIPMEN : Microwave Module

BRAND NAME : OPTEX

MODEL NO. : OPMW-WL10525

FCC ID : DC9OPMWWL

STANDARD : 47 CFR FCC Part 15.245

APPLICANT : OPTEX CO., LTD.
5-8-12 Ogoto Otsu Shiga 520-0101 Japan

MANUFACTURER : OPTEX CO., LTD.
5-8-12 Ogoto Otsu Shiga 520-0101 Japan

The product sample received on Oct. 28, 2011 and completely tested on Dec. 27, 2011. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.


Reviewed by: Jordan Hsiao

251658240



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TABLE OF CONTENTS

1 General Description5

1.1 Information.....5

1.2 Additional Information Provided by the Submitter8

1.3 Ancillary and/or Support Equipment.....9

1.4 EUT Setups9

1.5 Testing Applied Standards12

1.6 Testing Location12

1.7 Abbreviations Used for the Test Report12

2 Test Configuration of Equipment under Test.....13

2.1 Test Channel Frequencies13

2.2 Conformance Tests and Related Test Frequencies13

3 Transmitter Test Result14

3.1 AC Power Conducted Emissions14

3.2 Occupied Bandwidth19

3.3 Field Strength of Fundamental22

3.4 Transmitter Spurious Emissions.....27

3.5 Antenna Requirements.....40

4 List of Measuring Equipments41

5 Certification of TAF Accreditation.....42

APPENDIX A. TEST PHOTOS.....A1 ~ A6



SUMMARY OF TEST RESULT

FCC Standard Requirements and Conformance Test Specifications				
Report Clause	Ref. Std. Clause	Description	Result	Remark
3.1	15.207	AC Power Conducted Emissions	Complied	-
3.2	15.215(c)	Occupied Bandwidth	Complied	-
3.3	15.245(b)	Field Strength of Fundamental	Complied	-
3.4	15.245(b)	Transmitter Spurious Emissions	Complied	-
3.5	15.203	Antenna Requirements	Complied	-
3.6	2.1091	Maximum Permissible Exposure	Complied	-

Note: The EUT only supports TX function, and it does not support pure RX function.



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR1O2801	Rev. 01	Initial issue of report	Jan. 03, 2012



1 General Description

1.1 Information

1.1.1 Operating Frequency Range(s)

Operating Frequency Range(s)	
Range 1:	<input type="checkbox"/> 902 – 928 MHz
Range 2:	<input type="checkbox"/> 2435 – 2465 MHz
Range 3:	<input type="checkbox"/> 5785 – 5815 MHz
Range 4:	<input checked="" type="checkbox"/> 10.5 – 10.55 GHz
Range 5:	<input type="checkbox"/> 24.075 – 24.175 GHz

1.1.2 The Channel Plan(s)

The Channel Plan(s)	
Channel Plan 1:	10.5 – 10.55 GHz Band
Nominal Channel Bandwidth 1:	5 MHz, 10.525 GHz
Channel Plan 2:	N/A
Nominal Channel Bandwidth 2:	N/A

1.1.3 Transmit Operating Modes

The Different Transmit Operating Modes	
<input checked="" type="checkbox"/> Operating mode 1: Single Antenna Equipment	
<input type="checkbox"/> Operating mode 2: Smart Antenna Systems - without beam forming	
<input type="checkbox"/> Operating mode 3: Smart Antenna Systems - with beam forming	

1.1.4 Smart Antenna Systems

In Case of Smart Antenna Systems	
Smart Antenna Systems:	N/A
The number of Receive chains:	N/A
The number of Transmit chains:	N/A
Equal power distribution among the transmit chains:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<input type="checkbox"/> In case of beam forming, the maximum beam forming gain:	dB



1.1.5 Antenna Information

Antenna Information	
<input type="checkbox"/> Equipment placed on the market without antennas	
<input checked="" type="checkbox"/> Integral antenna (Antenna permanently attached)	
Integral antenna gain:	6.38 dBi
	<input type="checkbox"/> Temporary RF connector provided
	<input checked="" type="checkbox"/> No temporary RF connector provided
<input type="checkbox"/> External antenna (dedicated antennas)	
	<input type="checkbox"/> Single power level with corresponding antenna(s)
	<input type="checkbox"/> Multiple power settings and corresponding antenna(s)
	<input type="checkbox"/> Professional Install
	<input type="checkbox"/> Unique antenna connector
	<input type="checkbox"/> BIOS lock.
NOTE: EUT antenna complied with FCC 15.203, antenna requirements.	

1.1.6 Type of Equipment

Type of Equipment
<input checked="" type="checkbox"/> Stand-alone
<input type="checkbox"/> Combined Equipment (The radio part is fully integrated within another type of equipment)
<input type="checkbox"/> Plug-in radio device (Equipment intended for a variety of host systems)
<input type="checkbox"/> Other:

1.1.7 Transmit Power Control (TPC)

Worst Power Levels for TPC Range 1 (Integrated Antenna)								
Applicable power levels:		<input type="checkbox"/> Conducted	<input type="checkbox"/> EIRP	<input checked="" type="checkbox"/> Field Strength at 3m				
Integral antenna gain:		6.38 dBi						
Channel Plan:		1						
Nominal Channel Bandwidth:		1						
Operating Mode # & Frequency (GHz)		Highest setting (P _{high}): (dBuV/m)						
		Power Setting	Modulation	Data Rate (Mb/s)	Average Level	Peak Level	Average Level Limit	Peak Level Limit
#1	10.525	N/A	CW	N/A	110.97	110.81	128	148



Worst Power Levels for TPC Range 1 (External (Dedicated) Antenna Assemblies)						
Applicable power levels:		<input type="checkbox"/> Conducted	<input type="checkbox"/> EIRP	<input checked="" type="checkbox"/> Field Strength at 3m		
Beam forming possible:		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
External antenna assemblies:		-				
Maximum Antenna Gain (dBi):		-	Beam forming gain (dB):		-	
Ant #	Antenna Assembly Name					
	Brand	Model	Antenna Type	Ant. Gain (dBi)	Beam Gain (dB)	
1	-	-	-	-	-	
Channel Plan:		-				
Nominal Channel Bandwidth:		-				
Operating Mode # & Frequency (GHz)	Highest setting (P_{high}): (dBuV/m)					
	Power Setting	Modulation	Data Rate (Mb/s)	Average Level	Peak Level	Average Level Limit
#1	-	-	-	-	-	-



1.2 Additional Information Provided by the Submitter

1.2.1 Modulation

Modulation	
ITU Class of emission - Mode 1	N0N, CW
Can the transmitter operate un-modulated:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

1.2.2 Duty Cycle

Duty Cycle	
The transmitter is intended for:	<input checked="" type="checkbox"/> Continuous Duty 100 %
	<input type="checkbox"/> Intermittent Duty: %
	<input type="checkbox"/> Continuous operation possible for testing purposes

1.2.3 About the EUT

About the EUT	
<input checked="" type="checkbox"/>	The equipment submitted are representative production models.
<input type="checkbox"/>	If not, the equipment submitted are pre-production models
<input type="checkbox"/>	If pre-production equipment is submitted, the final production equipment will be identical in all respects with the equipment tested.
<input type="checkbox"/>	If not, supply full details:



1.3 Ancillary and/or Support Equipment

Ancillary Equipment (AE)				
Item	Equipment	Brand Name	Model Name	Serial No.
-	-	-	-	-

Support Equipment (SE)				
Item	Equipment	Brand Name	Model Name	Serial No.
SE01	POWER SUPPLY	GWINSTEK	GPC-60300	-

1.4 EUT Setups

For the purposes of this test report, EUT's ancillary equipment (AE) or testing support equipment (SE) is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless EUT's ancillary equipment (AE) or testing support equipment (SE) could possible influence the test results. EUT setups describe the combination of EUT's and EUT's ancillary equipment (AE) or testing support equipment (SE) used for testing.



Setup No.	Combination of EUT with AE or SE	Description
Setup_01	EUT + SE01	Setup for radiated emission

AC Main


2

DC Power Supply

1

EUT

1.DC POWER LINE 100CM, NON-SHIELDED
2.AC POWER LINE 180CM, NON-SHIELDED

Setup No.	Combination of EUT with AE or SE	Description
Setup_02	EUT +SE01	Setup for AC power conducted emission
<div style="text-align: center;"> <p>AC MAIN</p>  </div> <p>1. POWER CABLE 180CM ,NON-SHIELDED 2. CROCODILE CLIP CABLE 100 CM, SHIELDED</p>		



1.5 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 15.245
- ♦ ANSI C63.10-2009

1.6 Testing Location

Testing Location			
<input type="checkbox"/>	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-318-0055	
<input checked="" type="checkbox"/>	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085	
Testing Site No.			
05CH01-CB	03CH03-CB	-	-

1.7 Abbreviations Used for the Test Report

- ♦ Test Channel: B (Bottom Channel), M (Middle Channel), and T (Top Channel).
- ♦ EUT: Equipment under Test.
- ♦ AE: EUT's Ancillary Equipment
- ♦ SE: Testing Support Equipment
- ♦ N/A: Not-applicable
- ♦ TPC: Transmit Power Control

2 Test Configuration of Equipment under Test

2.1 Test Channel Frequencies

Nominal Channel Bandwidth 1				
Frequency Band (see note 1)	Channel Plan (see note 2)	B (Bottom Channel)	M (Middle Channel)	T (Top Channel)
10.5 – 10.55 GHz	1	N/A	10.525 GHz (F2)	N/A
NOTE 1: see test report clause 1.1.1.				
NOTE 2: see test report clause 1.1.2.				

2.2 Conformance Tests and Related Test Frequencies

Test	Test Frequencies (MHz)
	Channel Plan 1 (10.5 GHz to 10.55 GHz)
AC Power Conducted Emissions	F2
Emission Bandwidth	F2
Field Strength of Fundamental	F2
Transmitter Spurious Emissions	F2
<p>F1: The centre frequency of the lowest declared channel for every declared nominal bandwidth within this band.</p> <p>F2: The centre frequency of the middle declared channel for every declared nominal bandwidth within this band.</p> <p>F3: The centre frequency of the highest declared channel for every declared nominal bandwidth within this band.</p>	

3 Transmitter Test Result

3.1 AC Power Conducted Emissions

3.1.1 Limit of AC Power Conducted Emissions

AC Power Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note: * Decreases with the logarithm of the frequency.

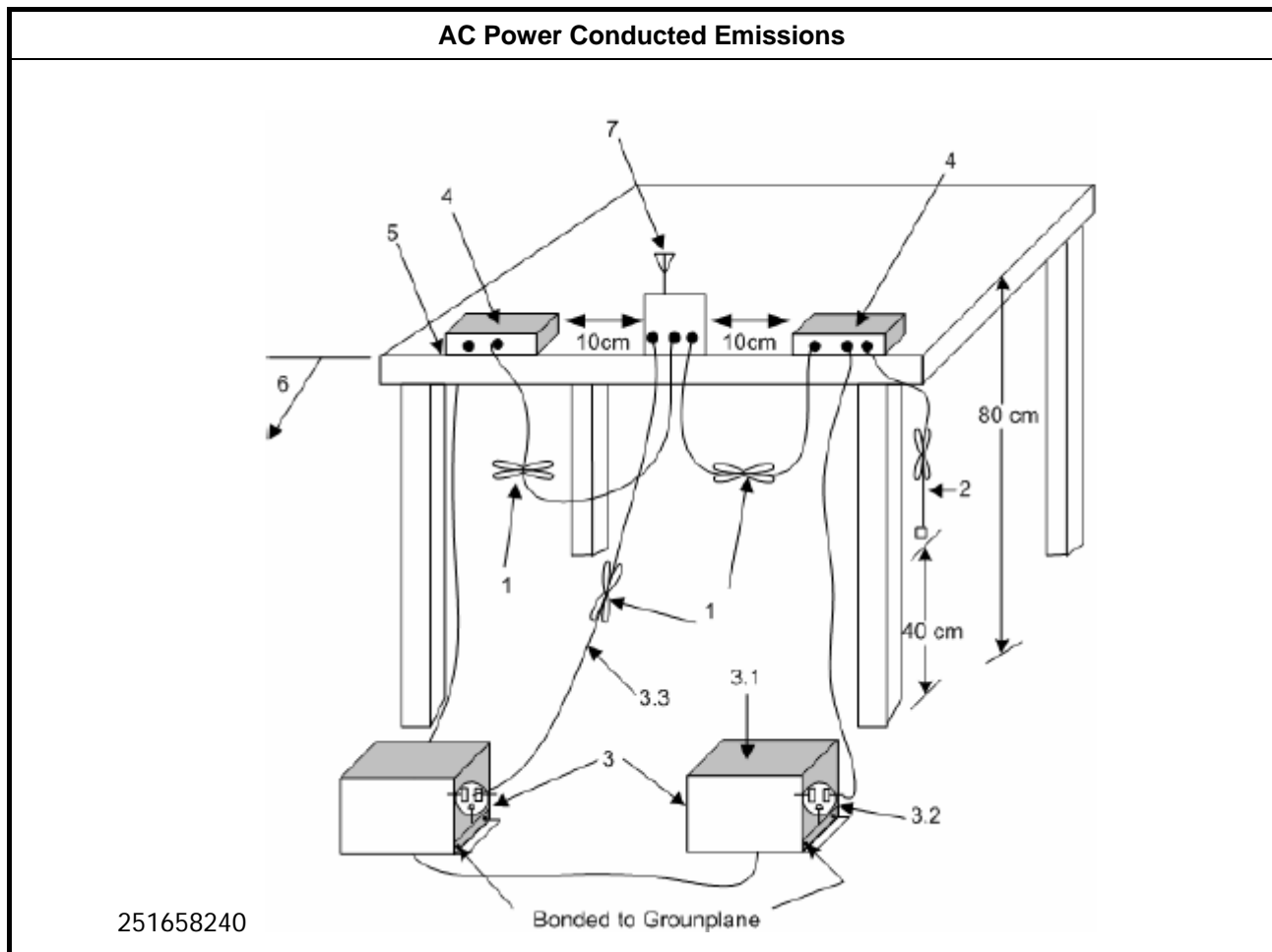
3.1.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.1.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2009, clause 6.2.

3.1.4 Test Setup





AC Power Conducted Emissions

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long (see ANSI C63.10, clause 6.2.3.1).
2. I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 3m (see ANSI C63.10, clause 6.2.2).
3. EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 ohm loads. LISN can be placed on top of, or immediately beneath, reference ground plane (see ANSI C63.10, clauses 6.2.2 and 6.2.3).
 - 3.1. All other equipment powered from additional LISN(s).
 - 3.2. A multiple-outlet strip can be used for multiple power cords of non-EUT equipment.
 - 3.3. LISN at least 80 cm from nearest part of EUT chassis.
4. Non-EUT components of EUT system being tested.
5. Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop (see ANSI C63.10, clause 6.2.3.1).
6. Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane (see ANSI C63.10, clause 6.2.2 for options).
7. Antenna may be integral or detachable. If detachable, the antenna shall be attached for this test.

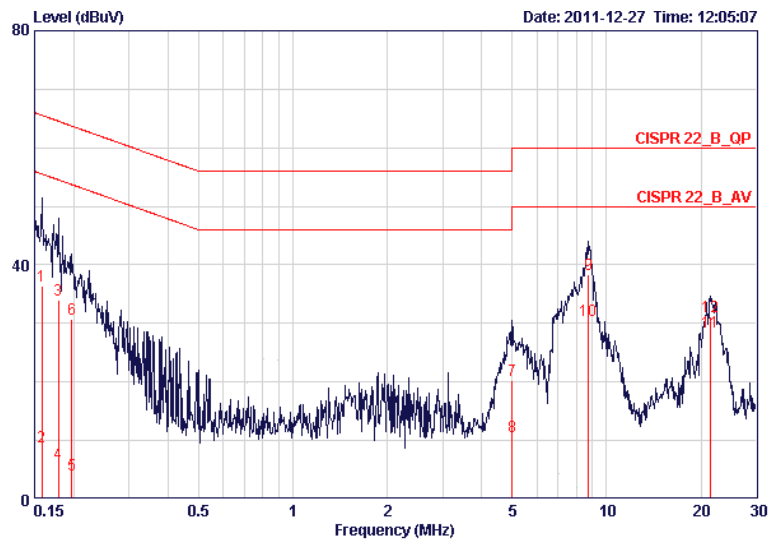


3.1.5 Test Result of AC Power Conducted Emissions

Test Conditions:	see ANSI C63.10, clause 5.11		
Test Setup:	see ANSI C63.10, clause 6.2.3		
Frequency Band:	10.5 – 10.55 GHz Band		
TPC Range:	1 (see test report clause 1.1.7)		
Operating Mode #:	1	Nominal Channel Bandwidth #:	1
<p>NOTE 1: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.2), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes. If equipment having different transmit operating modes (see test report clause 1.1.3), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing.</p> <p>NOTE 2: “>20dB” means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.1.</p>			



Test Configure: Continuous Transmission	
Power Phase: Line	Operating Mode #: 1
Test Engineer: Kane Liu	Nominal Channel Bandwidth #: 1
Rel. Humidity: 23 %	Test Results
Ambient Temp.: 64 °C	
Test Frequency (GHz): F2, 10.525	



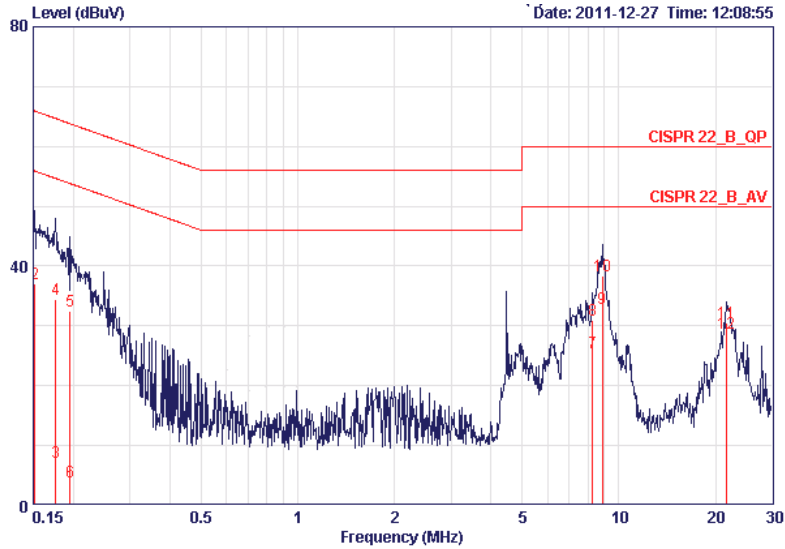
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15816	36.38	-29.18	65.56	36.11	0.07	0.20	QP
2	0.15816	8.89	-46.67	55.56	8.62	0.07	0.20	AVERAGE
3	0.17866	33.93	-30.62	64.55	33.67	0.06	0.20	QP
4	0.17866	6.01	-48.54	54.55	5.75	0.06	0.20	AVERAGE
5	0.19758	4.22	-49.49	53.71	3.97	0.05	0.20	AVERAGE
6	0.19758	30.65	-33.06	63.71	30.40	0.05	0.20	QP
7	5.005	20.37	-39.63	60.00	19.91	0.16	0.30	QP
8	5.005	10.77	-39.23	50.00	10.31	0.16	0.30	AVERAGE
9	8.776	38.43	-21.57	60.00	37.82	0.31	0.30	QP
10	8.776	30.46	-19.54	50.00	29.85	0.31	0.30	AVERAGE
11	21.486	28.56	-21.44	50.00	27.14	0.92	0.50	AVERAGE
12	21.486	31.28	-28.72	60.00	29.86	0.92	0.50	QP

Measurement uncertainty: ± 2.26 dB



Test Configure: Continuous Transmission	
Power Phase: Neutral	Operating Mode #: 1
Test Engineer: Kane Liu	Nominal Channel Bandwidth #: 1
Rel. Humidity: 23 %	Test Results
Ambient Temp.: 64 °C	

Test Frequency (GHz): F2, 10.525



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	dB	dBuV	dBuV	dB	Loss	Remark
1	0.15160	6.14	-49.77	55.91	5.84	0.10	0.20	AVERAGE
2	0.15160	37.15	-28.76	65.91	36.85	0.10	0.20	QP
3	0.17584	7.15	-47.53	54.68	6.86	0.09	0.20	AVERAGE
4	0.17584	34.38	-30.30	64.68	34.09	0.09	0.20	QP
5	0.19550	32.38	-31.42	63.80	32.10	0.08	0.20	QP
6	0.19550	3.93	-49.87	53.80	3.65	0.08	0.20	AVERAGE
7	8.279	25.55	-24.45	50.00	24.86	0.34	0.35	AVERAGE
8	8.279	31.02	-28.98	60.00	30.33	0.34	0.35	QP
9	8.869	32.84	-17.16	50.00	32.18	0.36	0.30	AVERAGE
10	8.869	38.39	-21.61	60.00	37.73	0.36	0.30	QP
11	21.715	30.63	-29.37	60.00	29.18	0.95	0.50	QP
12	21.715	28.73	-21.27	50.00	27.28	0.95	0.50	AVERAGE

Measurement uncertainty: ± 2.26 dB

3.2 Occupied Bandwidth

3.2.1 Limit of Occupied Bandwidth

20Bc Bandwidth (see Note 1)	None
99% Occupied Bandwidth (see Note 2)	None

NOTE 1: Refer as FCC 15.215(c). Ensure that the 20 dB occupied bandwidth shall be fall in the specified operating frequency range.

NOTE 2: The 99% occupied bandwidth is the frequency bandwidth of the signal power at the 99% channel power of occupied bandwidth when resolution bandwidth should be approximately 1 % to 5 % of the occupied bandwidth (OBW). These measurements shall also be performed at normal test conditions.

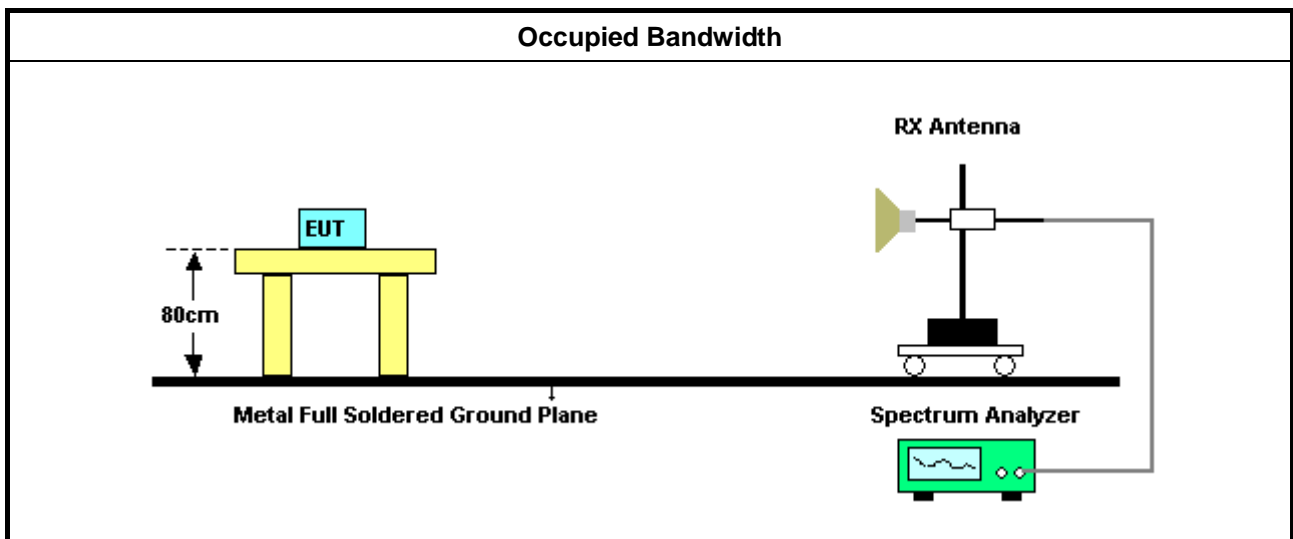
3.2.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.2.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2009, clauses 6.6 and 6.9.1.

3.2.4 Test Setup





3.2.5 Test Result of Occupied Bandwidth

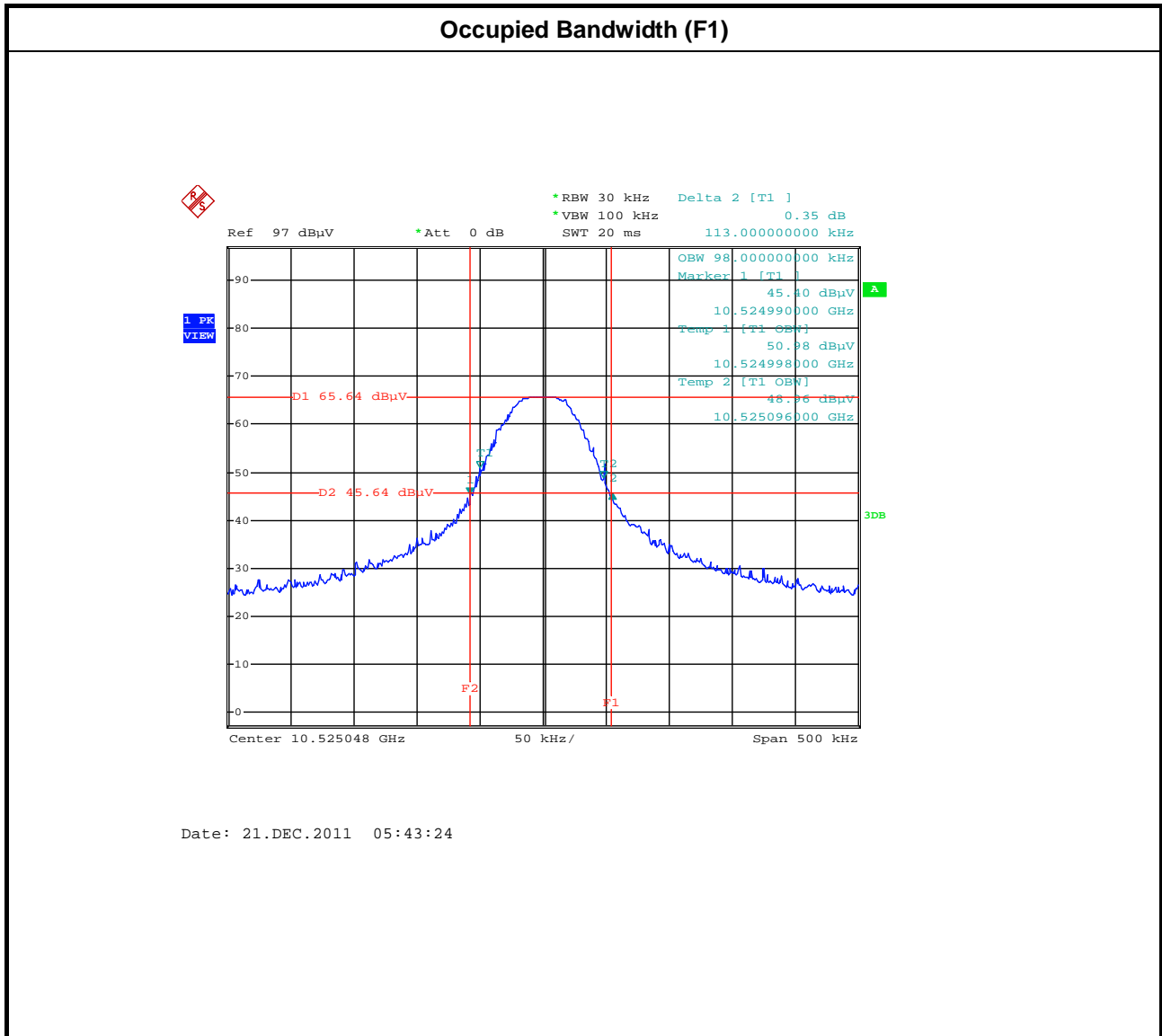
Test Conditions:	see ANSI C63.10, clause 5.11		
Test Setup:	see ANSI C63.10, clause 6.6		
Frequency Band:	10.5 – 10.55 GHz Band		
TPC Range:	1 (see test report clause 1.1.7)		
Operating Mode #:	1	Nominal Channel Bandwidth #:	1
<p>NOTE: If equipment having different transmit operating modes (see test report clause 1.1.3), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing. Refer as ANSI C63.10, clause 6.9.1, observe and record with plotted graphs or photographs the worst-case (i.e., widest) occupied bandwidth produced by these different modulation sources.</p>			

Operating Mode #:	1 (see test report clause 1.1.3)		
Worse case modulation for this operating mode:	CW		
Worse case data rate for this operating mode:	N/A		
Number of transmit chains present:	1		
Number of active transmit chains in this mode:	1		

10.5 – 10.55 GHz Band						
Test Conditions:	see ANSI C63.10, clause 5.12		Operating Mode #:	1		
Test Engineer:	Serway Li		Nominal Channel Bandwidth #:	1		
Duty Cycle:	100	%	Test Results			
Rel. Humidity:	22	%	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Frequency range (GHz) f _L > 10.5 GHz	Frequency range (GHz) f _H < 10.55 GHz
Ambient Temp.:	63	°C				
Test Frequency: (GHz)						
	F2,	10.525	113	98	10.525648	10.52592
Measurement uncertainty:	±8.5×10 ⁻⁸		Hz			



3.2.5.1 Bandwidth Plots for 10.5 – 10.55 GHz Band



3.3 Field Strength of Fundamental

3.3.1 Limit of Field Strength of Fundamental

Frequencies (MHz)	Field Strength (mV/meter)	Field Strength (dBµgV/m) at 3m
902~928 MHz	500 at 3m	114 (Average)
902~928 MHz	5000 at 3m	134 (Peak)
2435~2465MHz	500 at 3m	114 (Average)
2435~2465MHz	5000 at 3m	134 (Peak)
5785~5815 MHz	500 at 3m	114 (Average)
5785~5815 MHz	5000 at 3m	134 (Peak)
10.5~10.55 GHz	2500 at 3m	128 (Average)
10.5~10.55 GHz	25000 at 3m	148 (Peak)
24.075~24.175 GHz	2500 at 3m	128 (Average)
24.075~24.175 GHz	25000 at 3m	148 (Peak)

NOTE: For the applicable limit, see FCC 15.245(b)

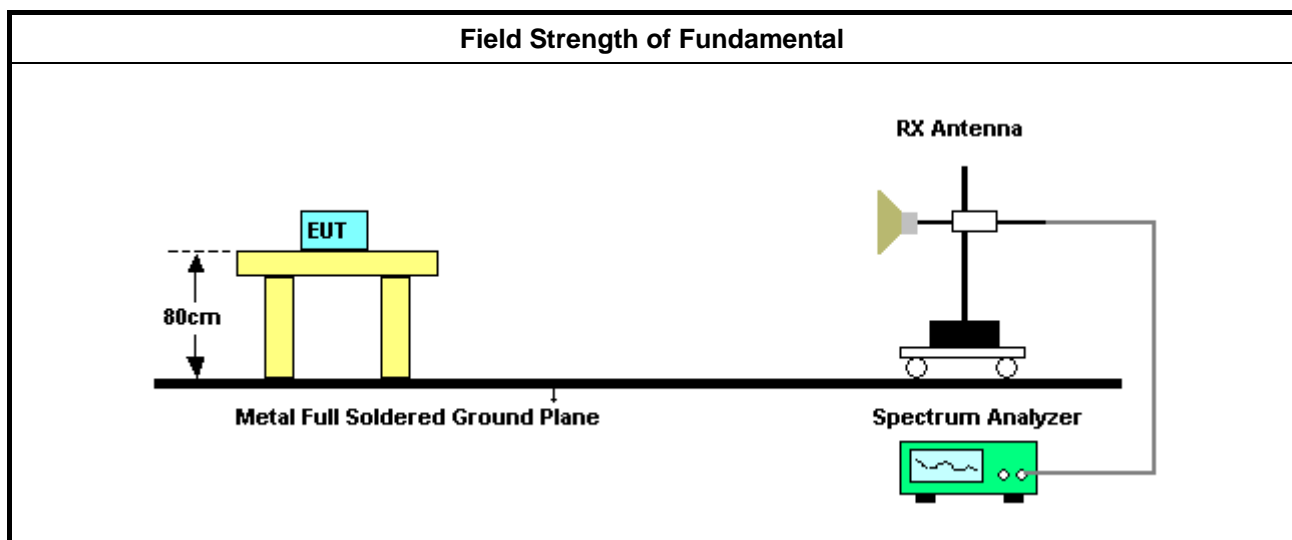
3.3.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.3.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2009, clause 6.6.

3.3.4 Test Setup





3.3.5 Test Result of Field Strength of Fundamental

Test Conditions:	see ANSI C63.10, clause 5.11	
Test Setup:	see ANSI C63.10, clause 6.6	
Frequency Band:	10.5 – 10.55 GHz Band	
TPC Range:	1 (see test report clause 1.1.7)	
Operating Mode #:	1	Nominal Channel Bandwidth #: 1
NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing.		

3.3.5.1 TPC Range 1

TPC range:	1 (see test report clause 1.1.7)
NOTE: Conformance tests have to be performed over the frequency range(s) that has been declared with this TPC range (see test report clause 1.1.7) and using the antenna gain of the antenna with the highest gain among those that have been declared with this TPC range. For smart antenna systems, the antenna beam forming gain may have to be taken into account as well.	

3.3.5.1.1 Operating Mode 1

Operating Mode #:	1 (see test report clause 1.1.3)
Worse case modulation for this operating mode:	CW
Worse case data rate for this operating mode:	N/A
Number of transmit chains present:	1
Number of active transmit chains in this mode:	1

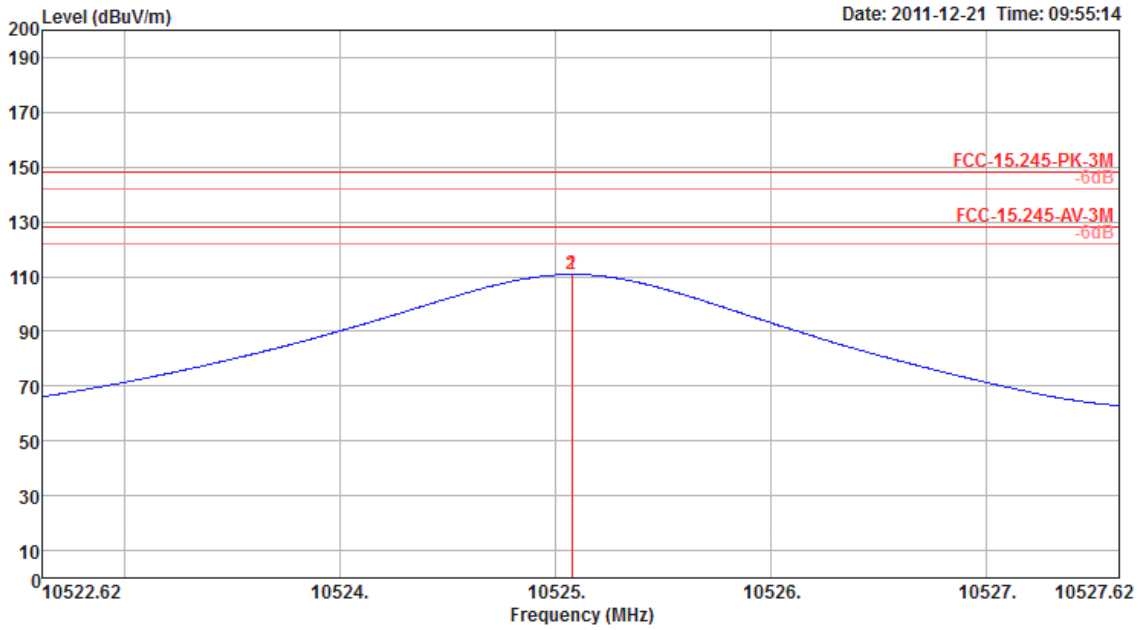


3.3.5.1.1.1 Test Result of Field Strength of Fundamental

10.5 – 10.55 GHz Band						
Maximum Antenna Gain: 6.38 dBi						
TPC Range: 1			Operating Mode #: 1			
Test Engineer: Serway Li			Nominal Channel Bandwidth #: 1			
Duty Cycle: 100 %	Test Results					
Duty Factor: 0 dB	Field Strength (dBuV/m) (note 1)		Field Strength Limit (dBm)		Margin (dB)	
Rel. Humidity: 51 %						
Test Distance: 3 m						
Test Frequency: (GHz)	AV	Peak	AV	Peak	AV	Peak
F2, 10.525	110.81	110.97	128	148	-17.19	-37.03
Measurement uncertainty: ±2.7 DB						
NOTE 1: If EUT is the pulsed transmitters, the average value shall be considered the peak value plus the duty cycle factor using as following as equation: Average = Peak + 20 log (Duty Cycle).						
NOTE 2: For the applicable limit, see FCC 15.255(b)						
NOTE 3: AV is average EIRP power.						



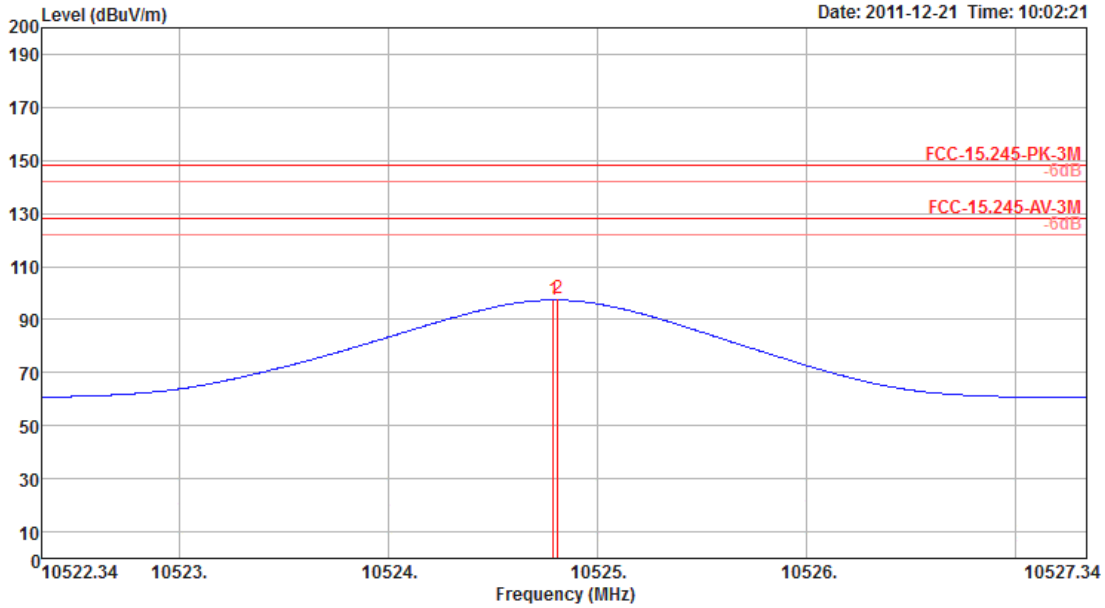
TPC range:	1	Operating Mode #:	1
Test Engineer:	Serway Li	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Field Strength of Fundamental Plots	
Rel. Humidity:	56 %	Polarization:	Vertical
Ambient Temp.:	21 °C	Test Distance:	3 m
Test Frequency: F2, 10.525 GHz			



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase	Aux
	MHz	dBuV/m	Line	Limit	Level	Loss	Factor	Factor	deg	cm			dB
1 p	10525.08	110.97	148.00	-37.03	66.06	6.32	0.00	38.59	2	108	Peak	VERTICAL	0.00
2 a	10525.08	110.81	128.00	-17.19	65.90	6.32	0.00	38.59	2	108	Average	VERTICAL	0.00



TPC range:	1	Operating Mode #:	1
Test Engineer:	Serway Li	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Field Strength of Fundamental Plots	
Rel. Humidity:	56 %	Polarization:	Horizontal
Ambient Temp.:	21 °C	Test Distance:	3 m
Test Frequency: F2, 10.525 GHz			



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase	Aux
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm			dB
1 a	10524.79	97.37	128.00	-30.63	52.46	6.32	0.00	38.59	42	154	Average	HORIZONTAL	0.00
2 p	10524.81	97.87	148.00	-50.13	52.96	6.32	0.00	38.59	42	154	Peak	HORIZONTAL	0.00

3.4 Transmitter Spurious Emissions

3.4.1 Limit of Transmitter Spurious Emissions

Transmitter Spurious Emissions	
1.	902 - 928MHz, Field disturbance sensors
	<ul style="list-style-type: none"> ♦ Harmonic emissions in the restricted bands: FCC 15.209 limit ♦ Harmonic emissions in the non-restricted bands: 1.6mV/m ♦ Except harmonic emissions, spurious emissions: FCC 15.209 limit or 50 dB below the fundamental, whichever is the lesser attenuation.
2.	2435 - 2465MHz, 5785 - 5815MHz, Field disturbance sensors
	<ul style="list-style-type: none"> ♦ Harmonic emissions in the restricted bands at and below 17.7 GHz: FCC 15.209 limit ♦ Harmonic emissions in the restricted bands at and above 17.7 GHz: 7.5mV/m ♦ Harmonic emissions in the non-restricted bands: 1.6mV/m ♦ Except harmonic emissions, spurious emissions: FCC 15.209 limit or 50 dB below the fundamental, whichever is the lesser attenuation.
3.	10500 – 10550MHz, Field disturbance sensors
	<ul style="list-style-type: none"> ♦ Harmonic emissions in the restricted bands at and above 17.7 GHz: 7.5mV/m ♦ Harmonic emissions in the non-restricted bands: 25mV/m ♦ Except harmonic emissions, spurious emissions: FCC 15.209 limit or 50 dB below the fundamental, whichever is the lesser attenuation.
4.	24075-24175 MHz, Field disturbance sensors
	<ul style="list-style-type: none"> ♦ Second and third harmonics: 25 mV/m ♦ Except harmonic emissions, spurious emissions: FCC 15.209 limit or 50 dB below the fundamental, whichever is the lesser attenuation.

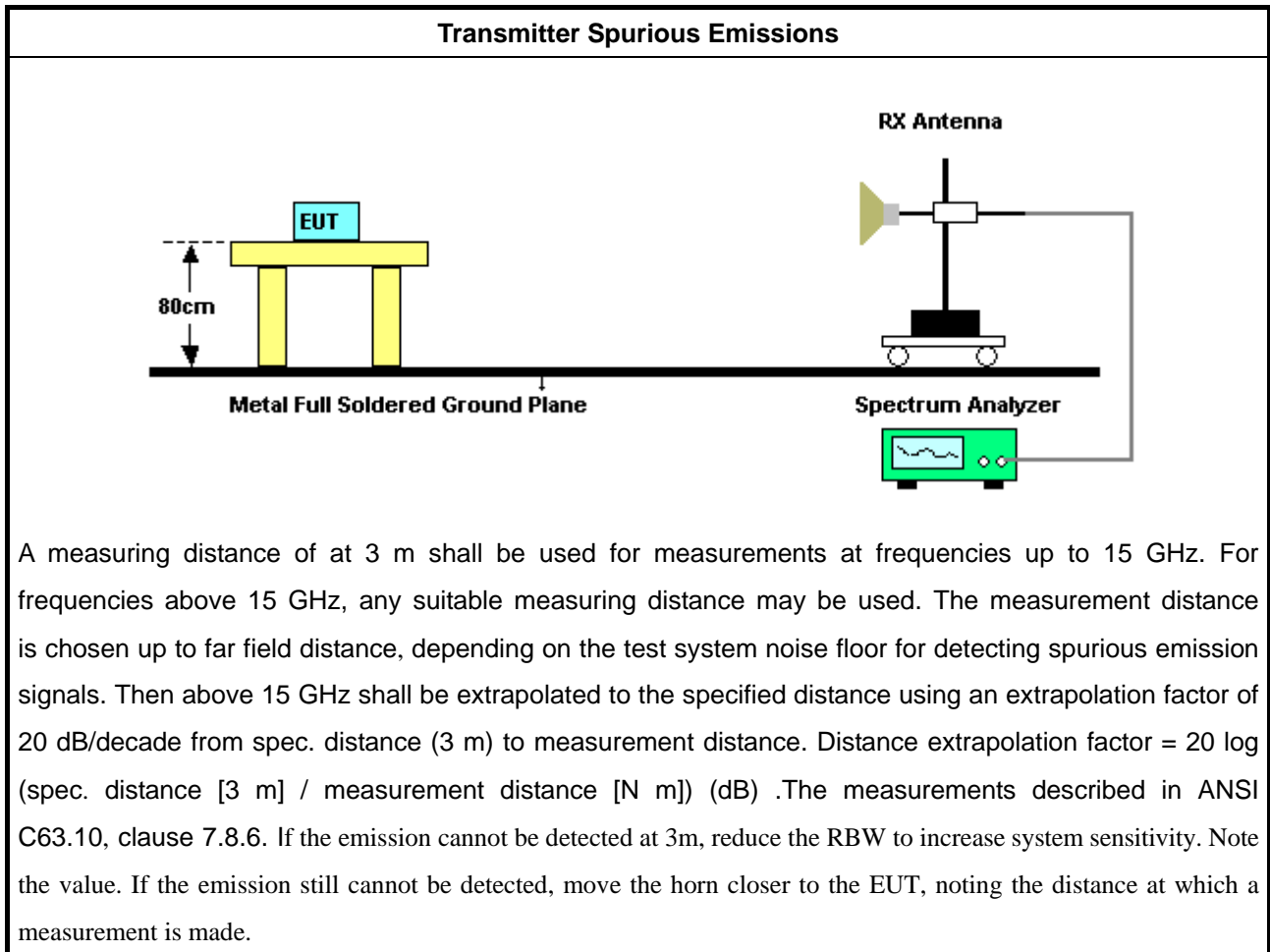
3.4.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.4.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2009, clauses 6.3, 6.4, 6.5, 6.6 and 7.8.6.

3.4.4 Test Setup





3.4.5 Test Result of Transmitter Spurious Emissions

Test Conditions:	see ANSI C63.10, clause 5.11
Test Setup:	see ANSI C63.10, clauses 6.3, 6.4, 6.5, 6.6 and 7.8.6
Frequency Band:	10.5 – 10.55 GHz Band
TPC Range:	1 (see test report clause 1.1.7)
Operating Mode #: 1	Nominal Channel Bandwidth #: 1
NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.2), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes.	

3.4.5.1 TPC Range 1

TPC Range:	1 (see test report clause 1.1.7)
NOTE: Conformance tests have to be performed over the frequency range(s) that has been declared with this TPC range (see test report clause 1.1.7) and using the antenna gain of the antenna with the highest gain among those that have been declared with this TPC range. For smart antenna systems, the antenna beam forming gain may have to be taken into account as well.	

3.4.5.1.1 Operating Mode 1

Operating Mode #:	1 (see test report clause 1.1.3)
Worse case modulation for this operating mode:	CW
Worse case data rate for this operating mode:	N/A
Number of transmit chains present:	1
Number of active transmit chains in this mode:	1

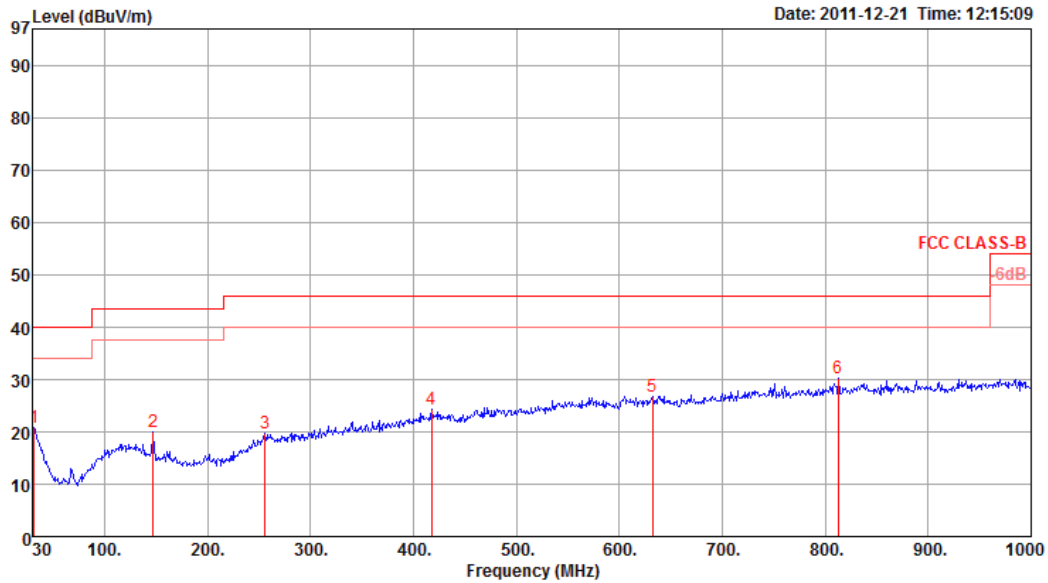


3.4.5.1.2 10.5 – 10.55 GHz Band, Test Frequency FX, Radiated Testing

TPC Range: 1		Operating Mode #: 1			
Test Engineer: Serway Li		Nominal Channel Bandwidth #: 1			
Duty Cycle: 100 %	Test Range: 9 kHz – 15 GHz				
Rel. Humidity: 22 %	Test Results				
Ambient Temp.: 24 °C					
Test Frequency: F2, 10.525 GHz					
Test Range	Emission Frequency (MHz)	Emission Observed (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
9 kHz - 30 MHz	N/F	N/F	-	-	Peak
Measurement uncertainty: ±2.7 dB					
NOTE 1: ">20dB" means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.2.					
NOTE 2: "N/F" means Nothing Found (No spurious emissions were detected.)					



TPC range: 1			Operating Mode #: 1		
Test Engineer: Serway Li			Nominal Channel Bandwidth #: 1		
Duty Cycle: 50 %		Test Range: 30 MHz – 1000 MHz			
Rel. Humidity: 22 %		Polarization: Vertical			
Ambient Temp.: 63 °C		Test Distance: 3m			
Test Frequency: F2, 10.525 GHz			Test Results		

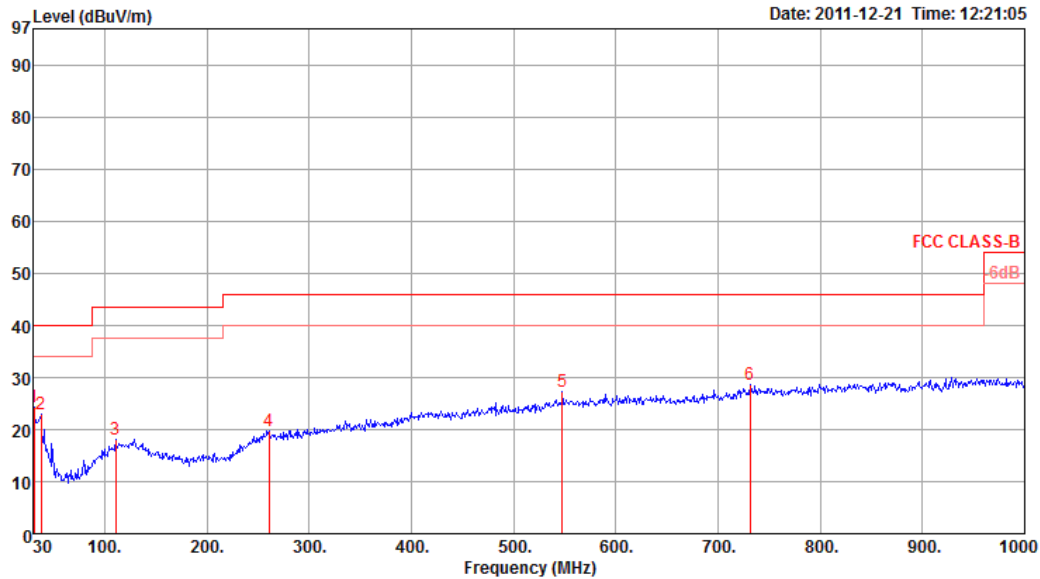


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase	Aux
	MHz	dBuV/m	dBuV/m	dB	dBuV	Loss	Factor	Factor	deg	cm			dB
1	31.94	20.81	40.00	-19.19	30.49	0.87	27.80	17.25	0	400	Peak	HORIZONTAL	0.00
2	147.37	19.94	43.50	-23.56	34.90	1.78	27.36	10.62	0	400	Peak	HORIZONTAL	0.00
3	256.01	19.86	46.00	-26.14	31.08	2.41	26.99	13.36	0	400	Peak	HORIZONTAL	0.00
4	418.00	24.30	46.00	-21.70	31.68	3.08	27.69	17.23	0	400	Peak	HORIZONTAL	0.00
5	632.37	26.82	46.00	-19.18	31.36	3.84	28.07	19.69	0	400	Peak	HORIZONTAL	0.00
6 p	812.79	30.20	46.00	-15.80	32.51	4.38	27.57	20.88	0	400	Peak	HORIZONTAL	0.00

Measurement uncertainty: ±2.7 dB



TPC range: 1			Operating Mode #: 1		
Test Engineer: Serway Li			Nominal Channel Bandwidth #: 1		
Duty Cycle: 50 %		Test Range: 30 MHz – 1000 MHz			
Rel. Humidity: 61 %		Polarization: Horizontal			
Ambient Temp.: 22.10 °C		Test Distance: 3m			
Test Frequency: F2, 10.525 GHz			Test Results		

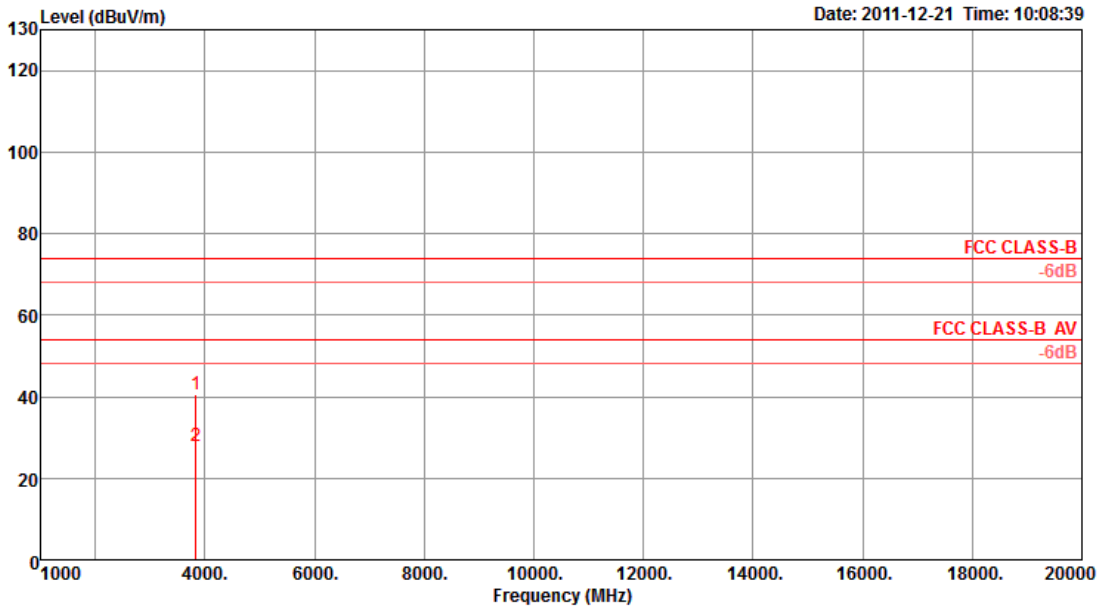


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase	Aux
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm			dB
1 p	30.97	24.26	40.00	-15.74	33.96	0.85	27.80	17.25	0	100	Peak	VERTICAL	0.00
2	37.76	23.09	40.00	-16.91	36.23	0.96	27.80	13.70	0	100	Peak	VERTICAL	0.00
3	110.51	18.09	43.50	-25.41	31.67	1.57	27.55	12.40	0	100	Peak	VERTICAL	0.00
4	260.86	19.84	46.00	-26.16	30.70	2.44	26.98	13.68	0	100	Peak	VERTICAL	0.00
5	547.98	27.39	46.00	-18.61	32.69	3.53	28.10	19.27	0	100	Peak	VERTICAL	0.00
6	731.31	28.72	46.00	-17.28	31.72	4.19	27.87	20.68	0	100	Peak	VERTICAL	0.00

Measurement uncertainty: ±2.7 dB



TPC range:	1	Operating Mode #:	1
Test Engineer:	Serway Li	Nominal Channel Bandwidth #:	1
Duty Cycle:	50 %	Test Range:	1 GHz – 20 GHz
Rel. Humidity:	61 %	Polarization:	Vertical
Ambient Temp.:	22.10 °C	Test Distance:	3m
Test Frequency: F2,	10.525 GHz	Test Results	

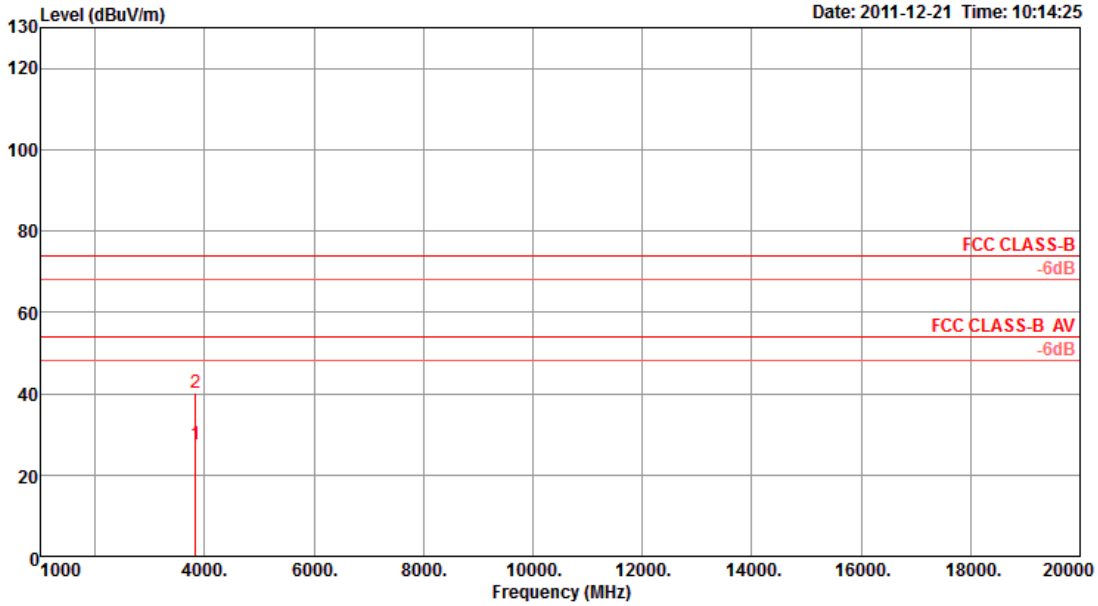


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	3833.64	40.38	74.00	-33.62	40.74	3.36	35.02	31.30	41	100	Peak	VERTICAL
2 a	3834.00	27.95	54.00	-26.05	28.31	3.36	35.02	31.30	41	100	Average	VERTICAL

Measurement uncertainty: ±2.7 dB



TPC range:	1	Operating Mode #:	1
Test Engineer:	Serway Li	Nominal Channel Bandwidth #:	1
Duty Cycle:	50 %	Test Range:	1 GHz – 20 GHz
Rel. Humidity:	61 %	Polarization:	Horizontal
Ambient Temp.:	22.10 °C	Test Distance:	3m
Test Frequency: F2,	10.525 GHz	Test Results	

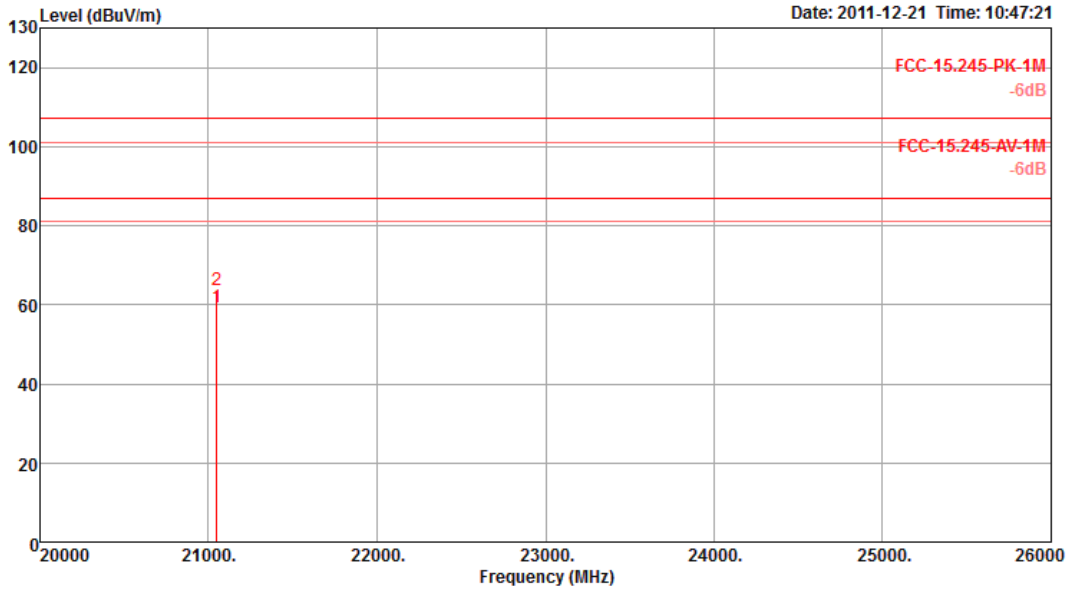


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	Loss	Factor	Factor	deg	cm		
1 a	3833.88	27.63	54.00	-26.37	27.99	3.36	35.02	31.30	139	100	Average	HORIZONTAL
2 p	3834.36	40.28	74.00	-33.72	40.64	3.36	35.02	31.30	139	100	Peak	HORIZONTAL

Measurement uncertainty: ±2.7 dB



TPC range:	1	Operating Mode #:	1
Test Engineer:	Serway Li	Nominal Channel Bandwidth #:	1
Duty Cycle:	50 %	Test Range:	20 GHz – 26 GHz
Rel. Humidity:	61 %	Polarization:	Vertical
Ambient Temp.:	22.10 °C	Test Distance:	1m
Test Frequency: F2,	10.525 GHz	Test Results	



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 a	21049.82	59.40	87.04	-27.64	42.51	13.48	34.34	37.75	82	100	Average	VERTICAL
2 p	21049.84	63.85	107.04	-43.19	46.96	13.48	34.34	37.75	82	100	Peak	VERTICAL

Measurement uncertainty: ±2.7 dB

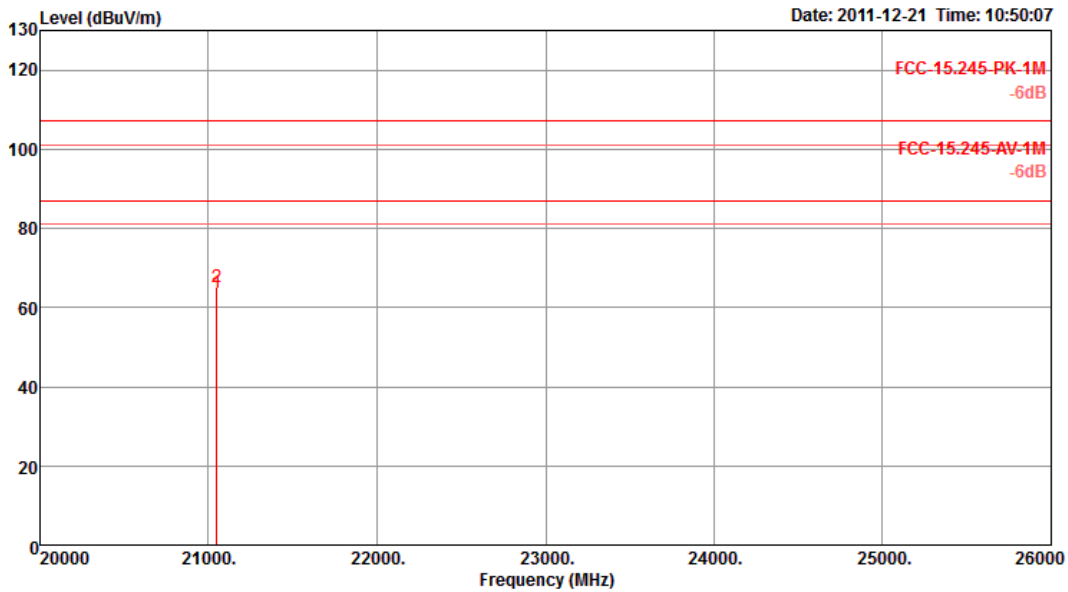
Test Distance: 1 m ; Limit = 7.5mV + Distance factor 20log(3/1)

AV = 77.5dBuV/m + 9.54dB = 87.04dBuV/m

PK = 87.04dBuV/m + 20dB = 107.04dBuV/m



TPC range:	1	Operating Mode #:	1
Test Engineer:	Serway Li	Nominal Channel Bandwidth #:	1
Duty Cycle:	50 %	Test Range:	20 GHz – 26 GHz
Rel. Humidity:	61 %	Polarization:	Horizontal
Ambient Temp.:	22.10 °C	Test Distance:	1m
Test Frequency: F2,	10.525 GHz	Test Results	



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 a	21049.92	63.86	87.04	-23.18	46.97	13.48	34.34	37.75	134	100	Average	HORIZONTAL
2 p	21050.00	65.31	107.04	-41.73	48.42	13.48	34.34	37.75	134	100	Peak	HORIZONTAL

Measurement uncertainty: ±2.7 dB

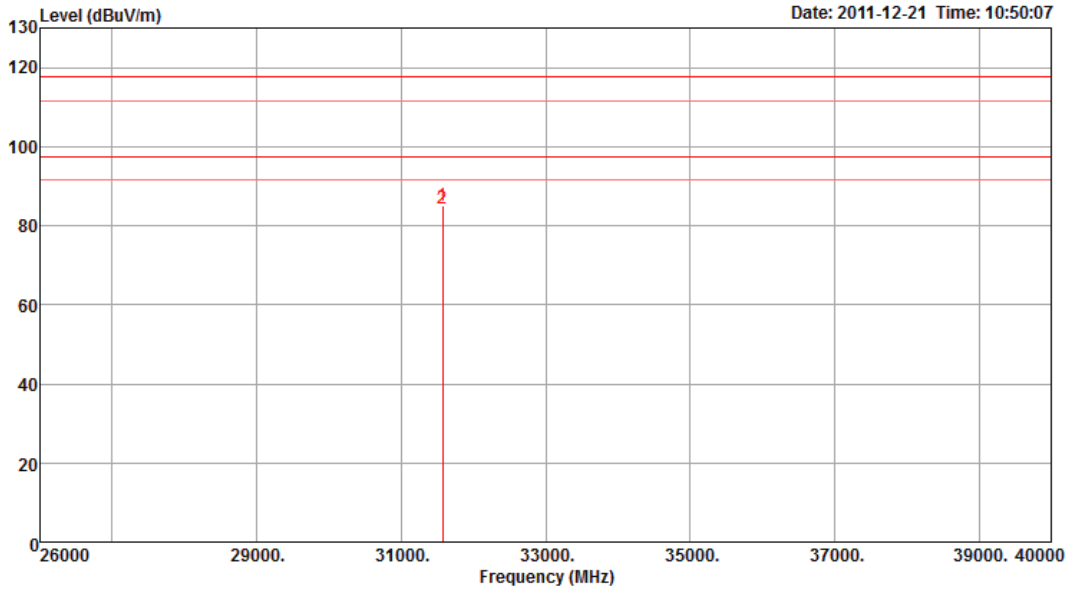
Test Distance: 1m ; Limit = 7.5mV + Distance factor 20log(3/1)

AV = 77.5dBuV/m + 9.54dB = 87.04dBuV/m

PK = 87.04dBuV/m + 20dB = 107.04dBuV/m



TPC range:	1	Operating Mode #:	1
Test Engineer:	Serway Li	Nominal Channel Bandwidth #:	1
Duty Cycle:	50 %	Test Range:	26 GHz – 40GHz
Rel. Humidity:	61 %	Polarization:	Vertical
Ambient Temp.:	22.10 °C	Test Distance:	1m
Test Frequency: F2,	10.525 GHz	Test Results	



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	31575.18	85.08	117.54	-32.46	63.12	16.97	35.30	40.29	350	100	Peak	HORIZONTAL
2 a	31575.34	84.44	97.54	-13.10	62.48	16.97	35.30	40.29	350	100	Average	HORIZONTAL

Measurement uncertainty: ±2.7 dB

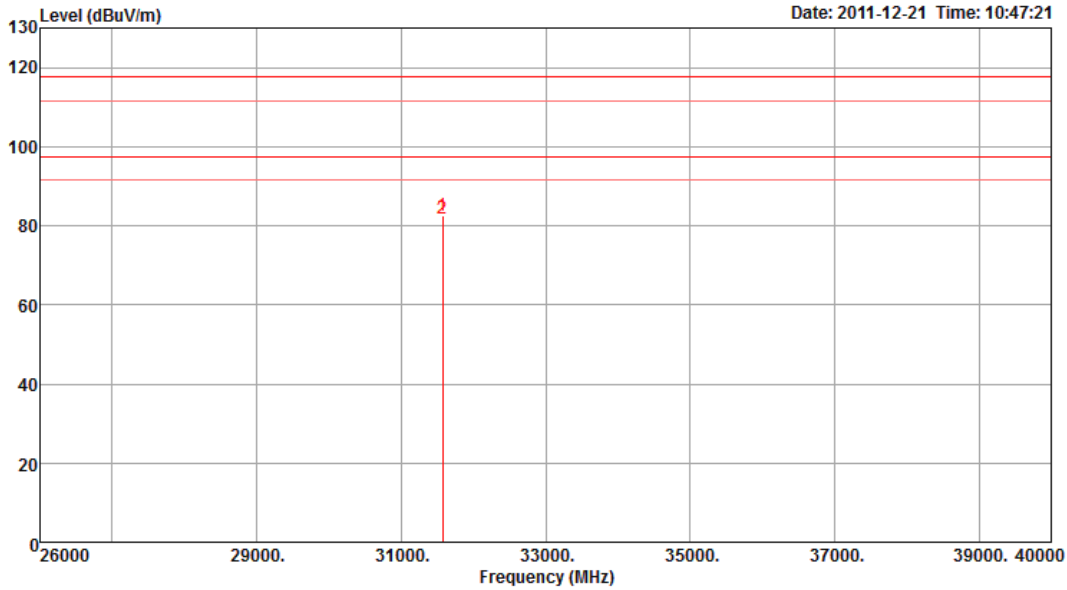
Test Distance: 1m ; Limit = 25mV + Distance factor 20log(3/1)

AV = 88dBuV/m + 9.54dB = 97.54dBuV/m

PK = 97.54dBuV/m + 20dB = 117.54dBuV/m



TPC range:	1	Operating Mode #:	1
Test Engineer:	Serway Li	Nominal Channel Bandwidth #:	1
Duty Cycle:	50 %	Test Range:	26 GHz – 40GHz
Rel. Humidity:	61 %	Polarization:	Horizontal
Ambient Temp.:	22.10 °C	Test Distance:	1m
Test Frequency: F2,	10.525 GHz	Test Results	



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	31575.32	82.71	117.54	-34.83	60.75	16.97	35.30	40.29	26	100	Peak	VERTICAL
2 a	31575.43	81.88	97.54	-15.66	59.92	16.97	35.30	40.29	26	100	Average	VERTICAL

Measurement uncertainty: ±2.7 dB

Test Distance: 1m ; Limit = 25mV + Distance factor 20log(3/1)

AV = 88dBuV/m + 9.54dB = 97.54dBuV/m

PK = 97.54dBuV/m + 20dB = 117.54dBuV/m



TPC Range: 1		Operating Mode #: 1			
Test Engineer: Serway Li		Nominal Channel Bandwidth #: 1			
Duty Cycle: 100 %	Test Range: 40 GHz – 60 GHz				
Rel. Humidity: 22 %	Test Distance: 1m				
Ambient Temp.: 63 °C	Test Results				
Test Frequency: F2, 10.525 GHz					
Test Range	Frequency (MHz)	Peak Level (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Remark
40 GHz – 60 GHz	41.968	100.99	117.54	-16.55	Peak
	Frequency (MHz)	Average Level (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Remark
	41.968	88.16	97.54	-9.38	Average
Measurement uncertainty: ±2.7 dB					
NOTE 1: ">20dB" means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.2.					
NOTE 2: "N/F" means Nothing Found (No spurious emissions were detected.)					

Test Distance: 1m ; Limit = 25mV + Distance factor 20log(3/1)

AV = 88dBuV/m + 9.54dB = 97.54dBuV/m

PK = 97.54dBuV/m + 20dB = 117.54dBuV/m



3.5 Antenna Requirements

3.5.1 Limit of Antenna Requirements

Limits for Antenna Requirements
The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator. 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
NOTE 1: For the applicable limit, see FCC 15.203

3.5.2 EUT Antenna

See test report clause 1.1.5, EUT antenna complied with antenna requirements.

4 List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Oct. 29, 2011	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 25, 2011	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Nov. 22, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.3mHz ~ 1.3GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 29, 2011	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Jul. 29, 2011	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100056	9KHz~40GHz	Nov. 03, 2011	Radiation (05CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 22, 2011	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Sep. 09, 2010*	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N/A	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	3m - 4 m	N/A	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100304	9kHz ~ 40GHz	Dec. 14, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02121	1GHz~26.5GHz	Jul. 29, 2011	Radiation (05CH01-CB)
Pre-Amplifier	Wireless	FPA-6592G	060027	30MHz – 1GHz	Aug. 11, 2011	Radiation (05CH01-CB)

5 Certification of TAF Accreditation



Certificate No. : L1190-110702

財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Road, Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,
Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria	: ISO/IEC 17025:2005
Accreditation Number	: 1190
Originally Accredited	: December 15, 2003
Effective Period	: January 10, 2010 to January 09, 2013
Accredited Scope	: Testing Field, see described in the Appendix
Specific Accreditation Program	: Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities


Jay-San Chen
President, Taiwan Accreditation Foundation
Date : July 02, 2011

P1, total 22 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix