

FCC Test Report

EQUIPMEN : **Microwave Module**
BRAND NAME : **OPTEX**
MODEL NO. : **OPMW-WW10525(V1.0)**
FCC ID : **DC9OPMW**
STANDARD : **47 CFR FCC Part 15.245**
APPLICANT : **OPTEX CO., LTD.**
5-8-12 Ogoto Otsu Shiga 520-0101 Japan
MANUFACTURER : **OPTEX CO., LTD.**

The product sample received on Apr. 13, 2010 and completely tested on May 04, 2010. 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.

Jordan Hsiao 2010.5.12
Reviewed by: Jordan Hsiao





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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	-



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR041334	Rev. 01	Initial issue of report	May 05, 2010

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 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:	7.36 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)

(a) 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:		7.36 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	109.95	110.27	128	148



(b) Worst Power Levels for TPC Range 1 (External (Dedicated) Antenna Assemblies)						
Applicable power levels:		<input type="checkbox"/> Conducted	<input type="checkbox"/> EIRP	<input type="checkbox"/> Field Strength at 3m		
Beam forming possible:		<input type="checkbox"/> Yes	<input 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
#1	-	-	-	-	-	-

1.2 Additional Information Provided by the Submitter

1.2.1 Modulation

Modulation	
ITU Class of emission - Mode 1	NON, 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:

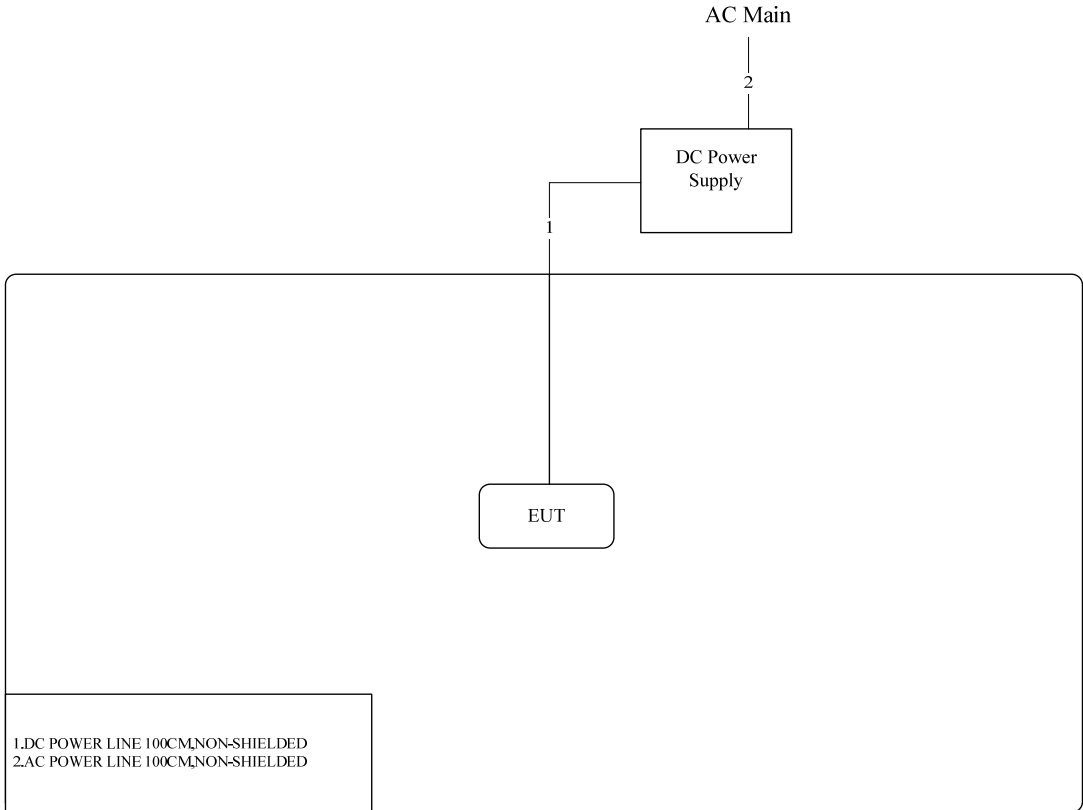
1.3 Ancillary and/or Support Equipment

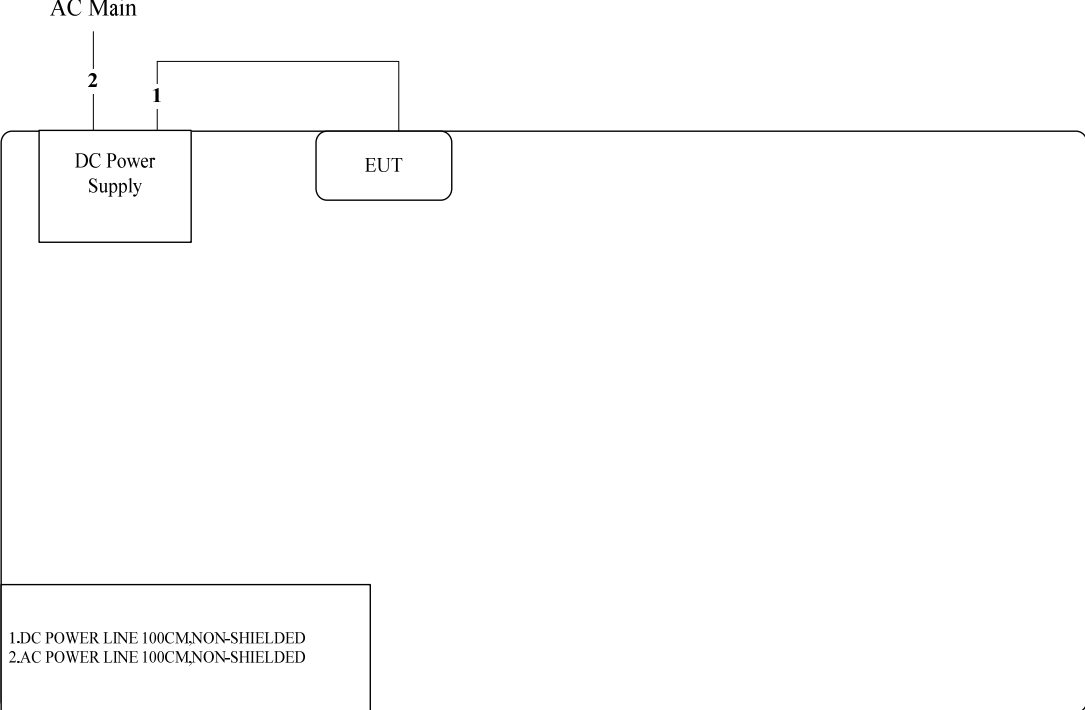
Ancillary Equipment (AE)				
Item	Equipment	Brand Name	Model Name	Serial No.
-	-	-	-	-

Support Equipment (SE)				
Item	Equipment	Brand Name	Model Name	Serial No.
SE01	DC Power Supply	GW	GPC-6030D	NA

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
 <p>1.DC POWER LINE 100CM, NON-SHIELDED 2.AC POWER LINE 100CM, NON-SHIELDED</p>		

Setup No.	Combination of EUT with AE or SE	Description
Setup_02	EUT + SE01	Setup for AC power conducted emission
 <p>AC Main</p> <p>2</p> <p>1</p> <p>DC Power Supply</p> <p>EUT</p> <p>1.DC POWER LINE 100CM, NON-SHIELDED 2.AC POWER LINE 100CM, NON-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.			
03CH03-CB	CO01-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.

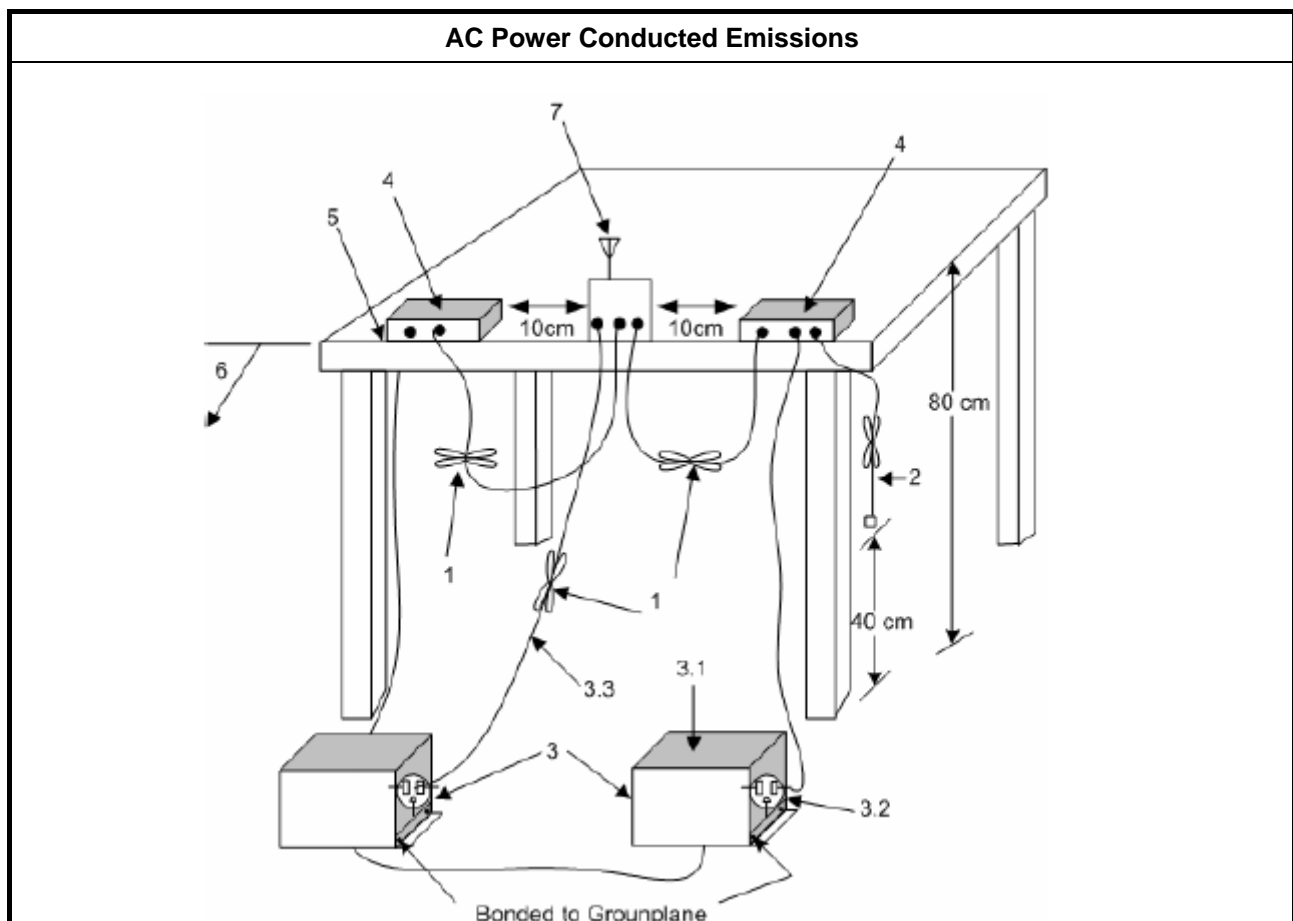
3.1.2 Measuring Instruments

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 1 m (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.

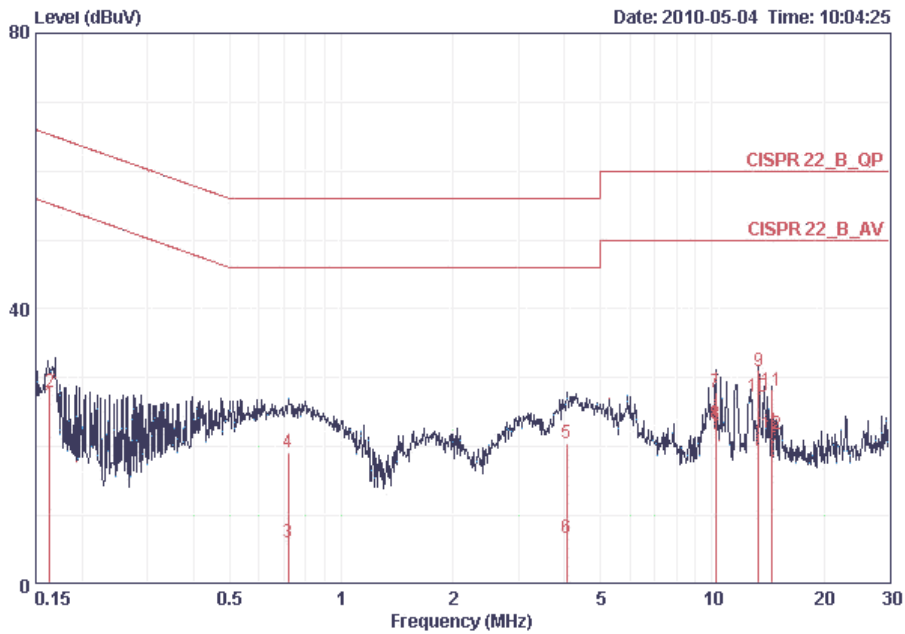
3.1.5 Test Result of AC Power Conducted Emissions

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: Peter Wu	Nominal Channel Bandwidth #: 1
Duty Cycle: 100 %	Test Results
Rel. Humidity: 49 %	
Ambient Temp.: 26 °C	

Test Frequency (GHz): F2, 10.525

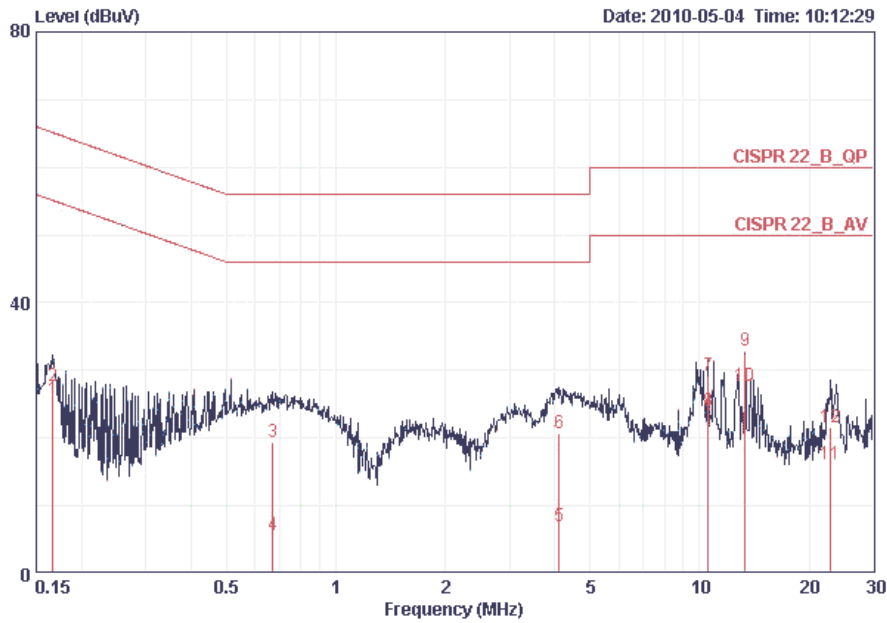


	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16344	26.15	-29.14	55.29	25.88	0.07	0.20	AVERAGE
2	0.16344	28.00	-37.29	65.29	27.73	0.07	0.20	QP
3	0.71977	6.08	-39.92	46.00	5.85	0.03	0.20	AVERAGE
4	0.71977	19.22	-36.78	56.00	18.99	0.03	0.20	QP
5	4.049	20.49	-35.51	56.00	20.09	0.10	0.30	QP
6	4.049	6.79	-39.21	46.00	6.39	0.10	0.30	AVERAGE
7	10.239	27.87	-32.13	60.00	27.16	0.36	0.34	QP
8	10.239	23.34	-26.66	50.00	22.63	0.36	0.34	AVERAGE
9	13.330	31.01	-28.99	60.00	30.12	0.49	0.40	QP
10	13.330	27.14	-22.86	50.00	26.25	0.49	0.40	AVERAGE
11	14.540	28.08	-31.92	60.00	27.14	0.54	0.40	QP
12	14.540	21.83	-28.17	50.00	20.89	0.54	0.40	AVERAGE

Measurement uncertainty: ±2.26 dB



Test Configure: Continuous Transmission	
Power Phase: Neutral	Operating Mode #: 1
Test Engineer: Peter Wu	Nominal Channel Bandwidth #: 1
Duty Cycle: 100 %	Test Results
Rel. Humidity: 49 %	
Ambient Temp.: 26 °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	0.16677	25.71	-29.41	55.12	25.41	0.10	0.20	AVERAGE
2	0.16677	27.65	-37.47	65.12	27.35	0.10	0.20	QP
3	0.67187	19.46	-36.54	56.00	19.19	0.07	0.20	QP
4	0.67187	5.75	-40.25	46.00	5.48	0.07	0.20	AVERAGE
5	4.114	6.87	-39.13	46.00	6.42	0.15	0.30	AVERAGE
6	4.114	20.81	-35.19	56.00	20.36	0.15	0.30	QP
7	10.577	29.12	-30.88	60.00	28.31	0.42	0.39	QP
8	10.577	23.88	-26.12	50.00	23.07	0.42	0.39	AVERAGE
9	13.330	32.89	-27.11	60.00	31.97	0.52	0.40	QP
10	13.330	27.72	-22.28	50.00	26.80	0.52	0.40	AVERAGE
11	22.896	16.21	-33.79	50.00	14.69	1.02	0.50	AVERAGE
12	22.896	21.56	-38.44	60.00	20.04	1.02	0.50	QP

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.

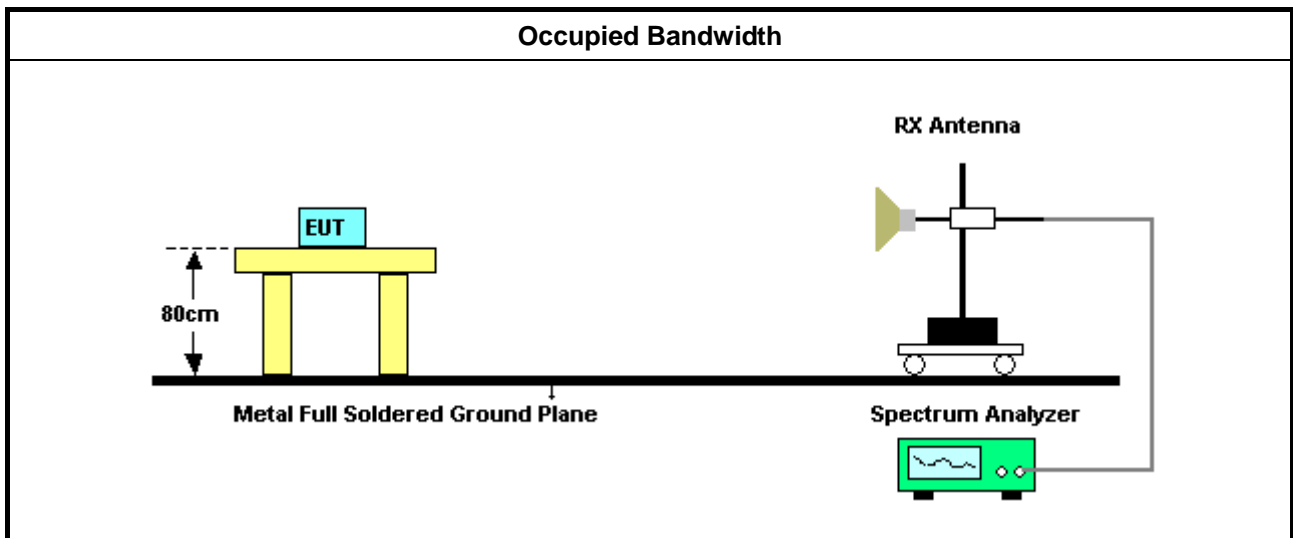
3.2.2 Measuring Instruments

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

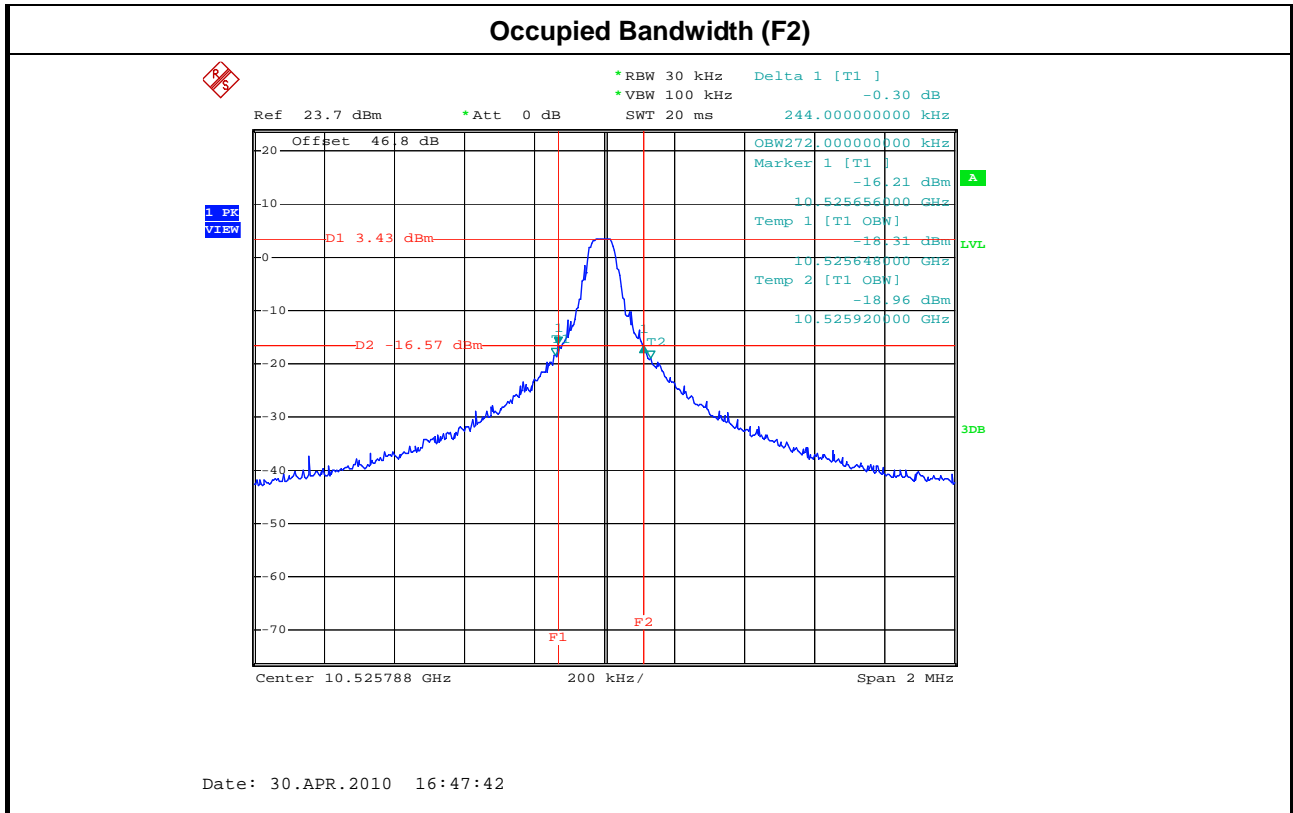
Test Conditions:	see ANSI C63.10, clause 5.11
Test Setup:	see ANSI C63.10, clause 6.6
Frequency Band:	10.5 – 10.55 GHz Band
TPC Range:	1 (see test report clause 1.1.7)
Operating Mode #:	1
Nominal Channel Bandwidth #:	1
<p>NOTE: If equipment having different transmit operating modes (see test report clause 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:	Sam Chen	Nominal Channel Bandwidth #:	1	
Duty Cycle:	100 %	Test Results		
Rel. Humidity:	56 %	Occupied Bandwidth (KHz)	20 dBc Bandwidth (KHz)	Frequency range (GHz) f _L > 10.5 GHz
Ambient Temp.:	21 °C			Frequency range (GHz) f _H < 10.55 GHz
Test Frequency: (GHz)				
	F2, 10.525	272	244	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 (dBµV/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)

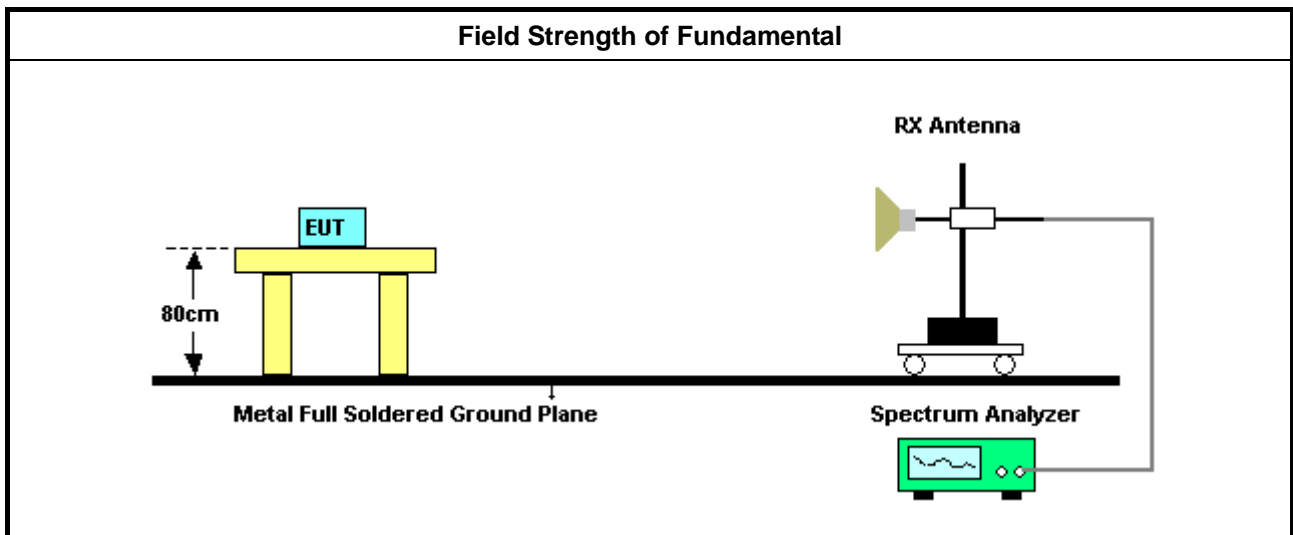
3.3.2 Measuring Instruments

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

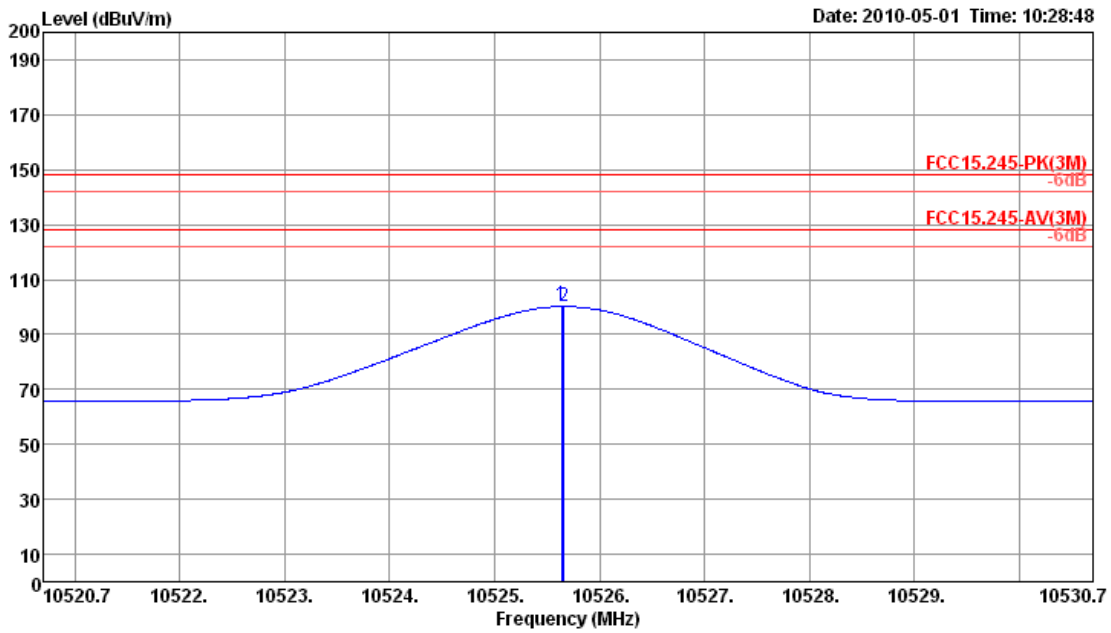


3.3.5.1.1.1 Test Result of Field Strength of Fundamental

10.5 – 10.55 GHz Band						
Maximum Antenna Gain: 7.36 dBi						
TPC Range: 1			Operating Mode #: 1			
Test Engineer: Sam Chen			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: 56 %						
Ambient Temp.: 21 °C						
Test Distance: 3 m						
Test Frequency: (GHz)	AV	Peak	AV	Peak	AV	Peak
F2, 10.525	109.95	110.27	128	148	-18.05	-37.73
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.						



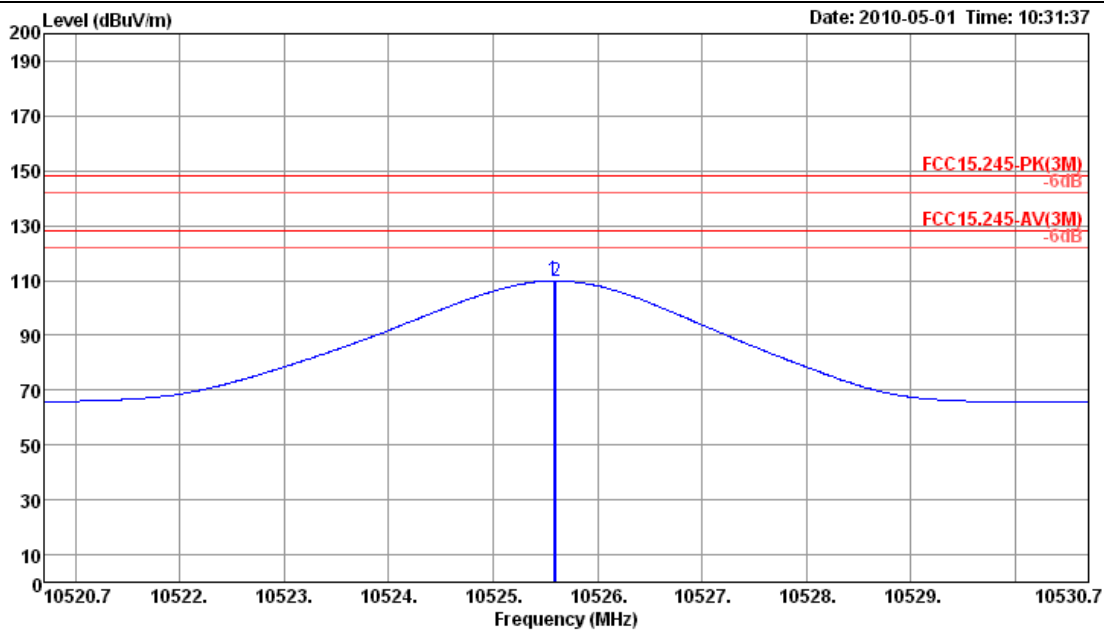
TPC range:	1	Operating Mode #:	1
Test Engineer:	Sam Chen	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Field Strength of Fundamental Plots	
Rel. Humidity:	56 %	Polarization:	Vertical
Ambient Temp.:	21 °C	Test Distance:	3 m
Test Frequency: F2, 10.525 GHz			



	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	10525.64	100.86	148.00	-47.14	54.04	6.84	0.00	39.98	330	182	Peak	VERTICAL
2 a	10525.66	100.20	128.00	-27.80	53.38	6.84	0.00	39.98	330	182	Average	VERTICAL



TPC range: 1		Operating Mode #: 1	
Test Engineer: Sam Chen		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 Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	10525.58	110.27	148.00	-37.73	63.45	6.84	0.00	39.98	61	134	Peak	HORIZONTAL
2 a	10525.60	109.95	128.00	-18.05	63.13	6.84	0.00	39.98	61	134	Average	HORIZONTAL

3.4 Transmitter Spurious Emissions

3.4.1 Limit of Transmitter Spurious Emissions

Transmitter Spurious Emissions	
1.	902 - 928MHz, Field disturbance sensors
♦	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
♦	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
♦	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
♦	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.

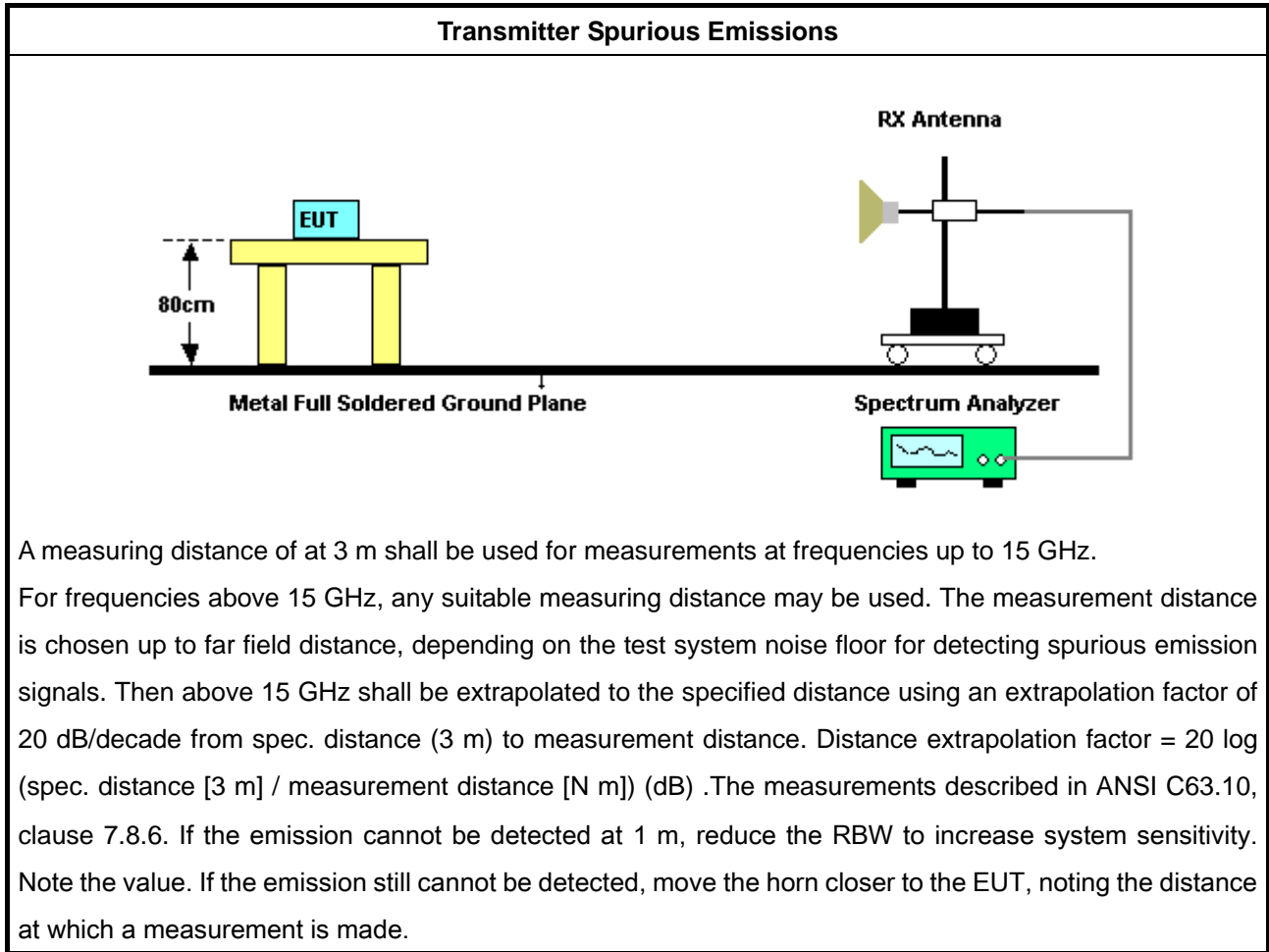
3.4.2 Measuring Instruments

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

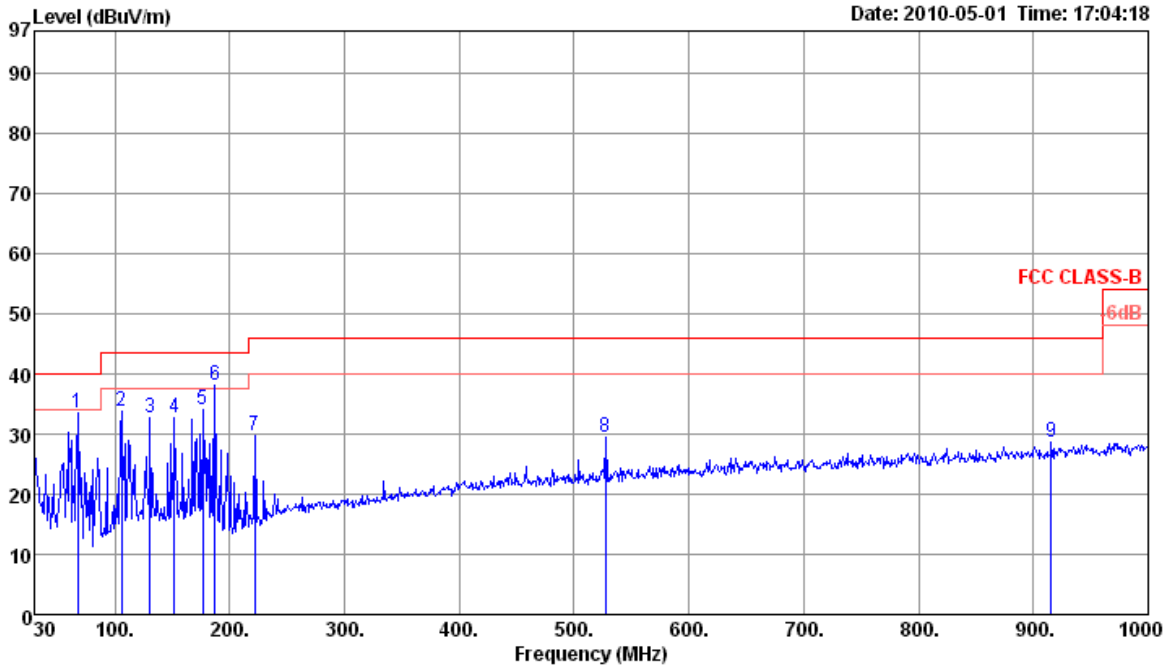


3.4.5.1.2 10.5 – 10.55 GHz Band, Test Frequency FX, Radiated Testing

TPC Range: 1		Operating Mode #: 1			
Test Engineer: Sam Chen		Nominal Channel Bandwidth #: 1			
Duty Cycle: 100 %	Test Range: 9 kHz – 30 MHz				
Rel. Humidity: 56 %	Test Results				
Ambient Temp.: 21 °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	-	-	-
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:	Sam Chen	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Test Range:	30 MHz – 1000 MHz
Rel. Humidity:	56 %	Polarization:	Vertical
Ambient Temp.:	21 °C	Test Distance:	3 m
Test Frequency: F2,	10.525 GHz	Test Results	

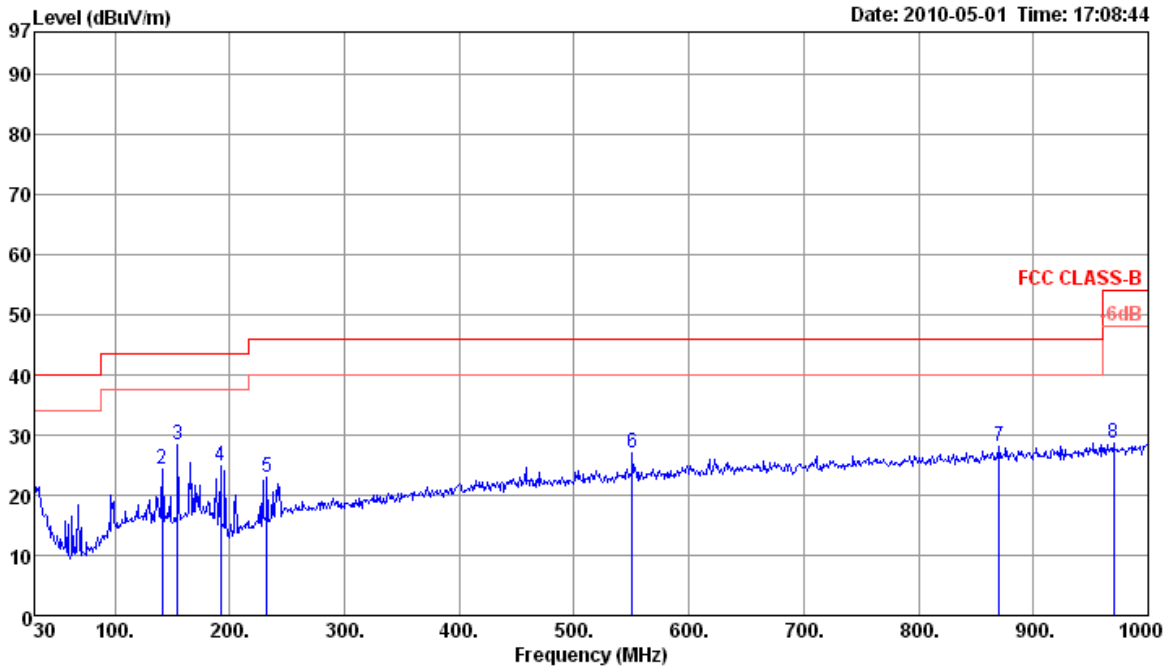


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	67.83	33.43	40.00	-6.57	53.65	0.84	27.73	6.67	0	400	Peak	VERTICAL
2	105.66	33.69	43.50	-9.81	48.63	1.20	27.57	11.43	0	400	Peak	VERTICAL
3	130.88	32.67	43.50	-10.83	46.54	1.31	27.45	12.27	0	400	Peak	VERTICAL
4	152.22	32.71	43.50	-10.79	46.70	1.46	27.34	11.89	0	400	Peak	VERTICAL
5	176.47	34.12	43.50	-9.38	46.63	1.58	27.22	13.13	0	400	Peak	VERTICAL
6 P	187.14	38.03	43.50	-5.47	51.85	1.63	27.16	11.71	0	400	Peak	VERTICAL
7	222.06	29.81	46.00	-16.19	44.37	1.79	27.05	10.70	0	400	Peak	VERTICAL
8	527.61	29.35	46.00	-16.65	36.76	2.75	28.10	17.94	0	400	Peak	VERTICAL
9	915.61	28.68	46.00	-17.32	31.76	3.60	27.33	20.65	0	400	Peak	VERTICAL

Measurement uncertainty: ±2.7 dB



TPC range:	1	Operating Mode #:	1
Test Engineer:	Sam Chen	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Test Range:	30 MHz – 1000 MHz
Rel. Humidity:	56 %	Polarization:	Horizontal
Ambient Temp.:	21 °C	Test Distance:	3 m
Test Frequency: F2,	10.525 GHz	Test Results	

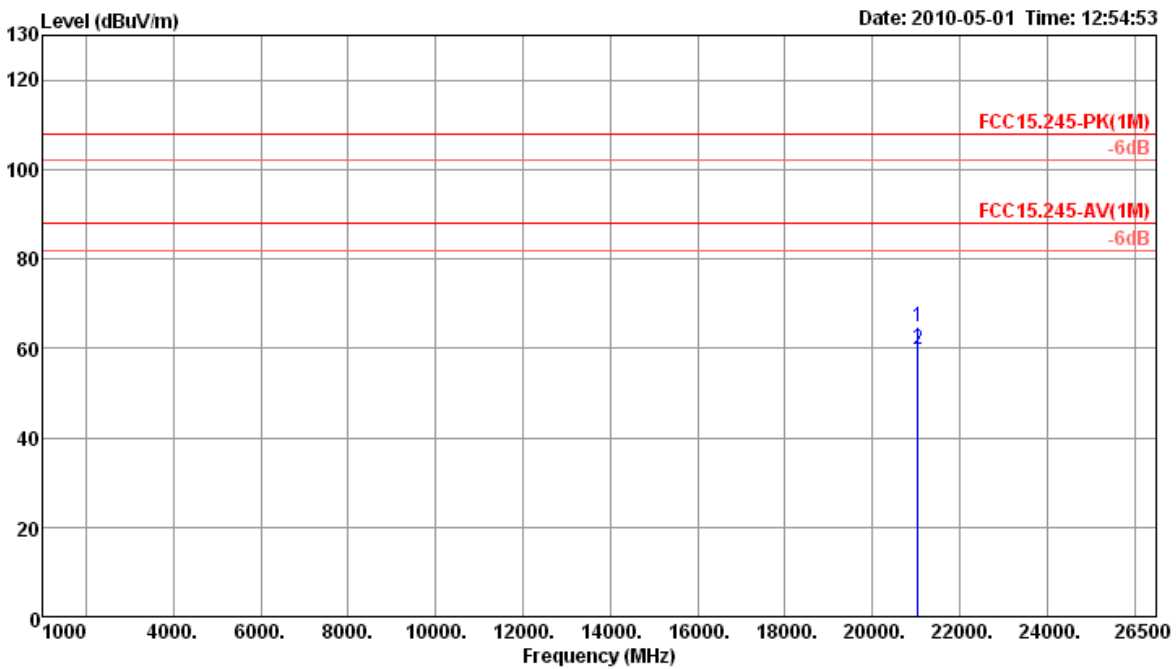


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	30.00	22.01	40.00	-17.99	30.55	0.50	27.80	18.76	0	100	Peak	HORIZONTAL
2	141.55	24.45	43.50	-19.05	38.17	1.41	27.39	12.26	0	100	Peak	HORIZONTAL
3	155.13	28.29	43.50	-15.21	42.19	1.48	27.32	11.94	0	100	Peak	HORIZONTAL
4	191.99	24.86	43.50	-18.64	39.65	1.66	27.14	10.69	0	100	Peak	HORIZONTAL
5	232.73	23.00	46.00	-23.00	36.72	1.83	27.03	11.48	0	100	Peak	HORIZONTAL
6	550.89	26.93	46.00	-19.07	34.02	2.80	28.10	18.21	0	100	Peak	HORIZONTAL
7	870.02	28.10	46.00	-17.90	31.78	3.48	27.46	20.30	0	100	Peak	HORIZONTAL
8	969.93	28.77	54.00	-25.23	31.19	3.64	27.12	21.06	0	100	Peak	HORIZONTAL

Measurement uncertainty: ±2.7 dB



TPC range:	1	Operating Mode #:	1
Test Engineer:	Sam Chen	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Test Range:	18GHz – 26.5GHz
Rel. Humidity:	56 %	Polarization:	Vertical
Ambient Temp.:	21 °C	Test Distance:	1 m
Test Frequency: F2,	10.525 GHz	Test Results	

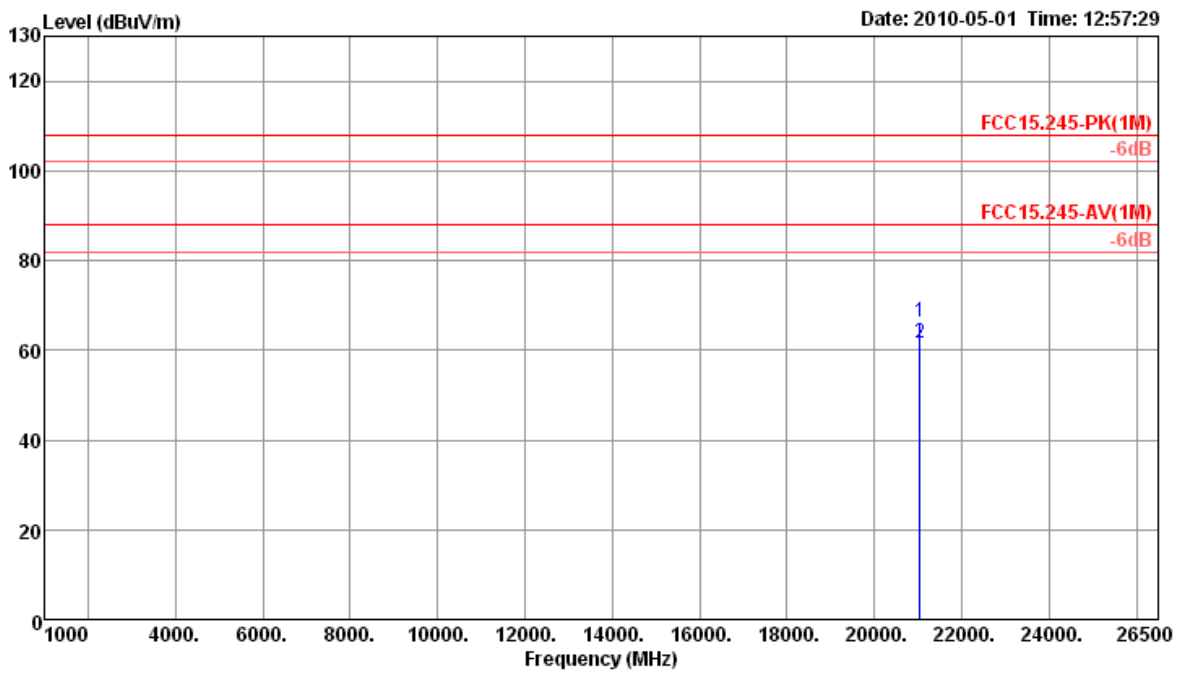


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	21050.26	64.75	108.00	-43.25	51.29	11.25	35.71	37.92	7	107	Peak	VERTICAL
2 a	21050.27	59.59	88.00	-28.41	46.13	11.25	35.71	37.92	7	107	Average	VERTICAL

Measurement uncertainty: ±2.7 dB



TPC range:	1	Operating Mode #:	1
Test Engineer:	Sam Chen	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Test Range:	18GHz – 26.5GHz
Rel. Humidity:	56 %	Polarization:	Horizontal
Ambient Temp.:	21 °C	Test Distance:	1 m
Test Frequency: F2,	10.525 GHz	Test Results	

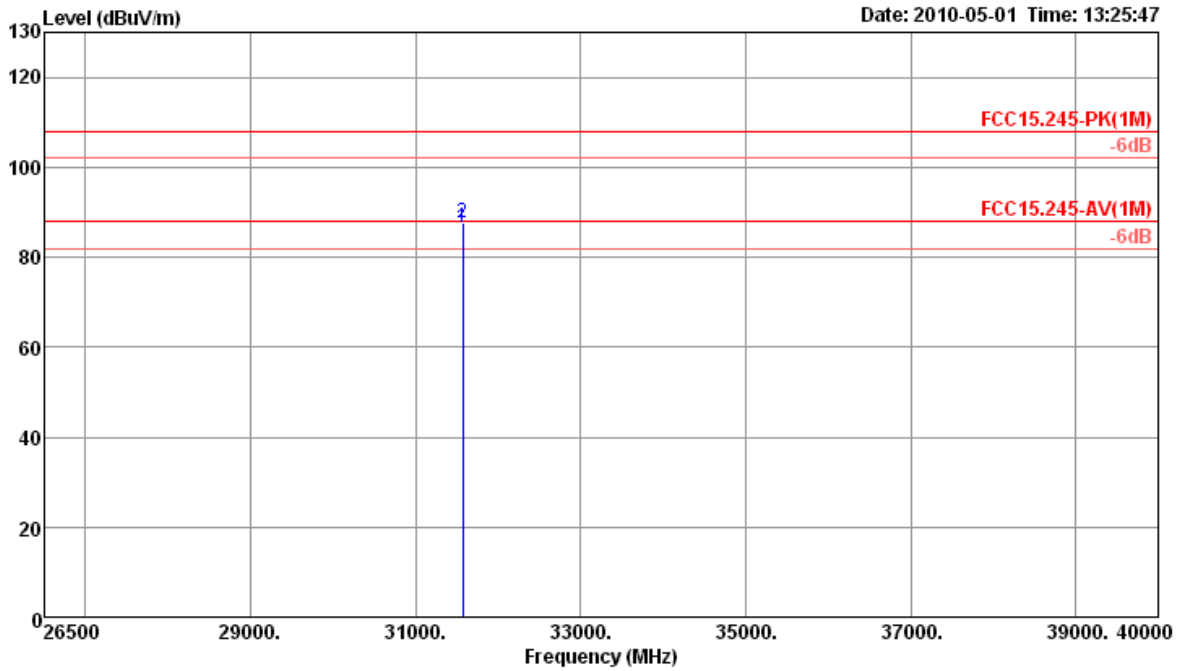


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 p	21050.29	66.39	108.00	-41.61	52.93	11.25	35.71	37.92	331	100	Peak	HORIZONTAL
2 a	21050.35	61.46	88.00	-26.54	48.00	11.25	35.71	37.92	331	100	Average	HORIZONTAL

Measurement uncertainty: ±2.7 dB



TPC range:	1	Operating Mode #:	1
Test Engineer:	Sam Chen	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Test Range:	26.5GHz – 40GHz
Rel. Humidity:	56 %	Polarization:	Vertical
Ambient Temp.:	21 °C	Test Distance:	1 m
Test Frequency: F2,	10.525 GHz	Test Results	

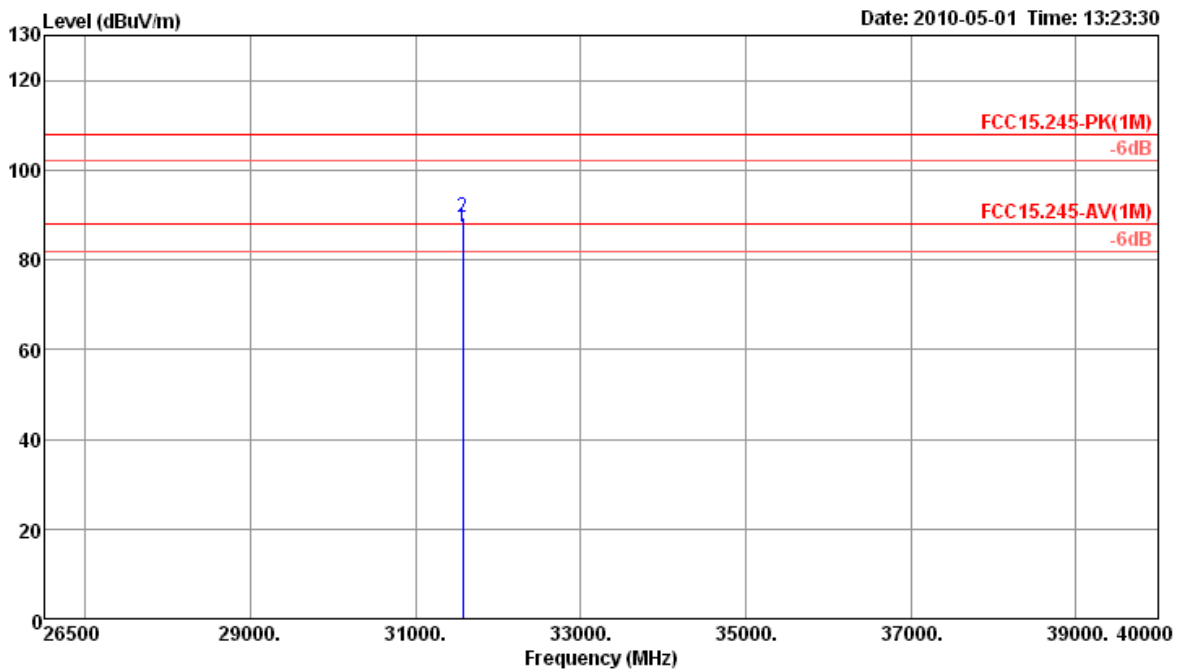


	Freq	Level	Limit	Over	Read	Cable	Preamp	Antenna	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1 a	31575.27	86.54	88.00	-1.46	68.26	11.85	34.54	40.97	343	103	Average	VERTICAL
2 p	31575.33	87.60	108.00	-20.40	69.32	11.85	34.54	40.97	343	103	Peak	VERTICAL

Measurement uncertainty: ±2.7 dB



TPC range:	1	Operating Mode #:	1
Test Engineer:	Sam Chen	Nominal Channel Bandwidth #:	1
Duty Cycle:	100 %	Test Range:	26.5GHz – 40GHz
Rel. Humidity:	56 %	Polarization:	Horizontal
Ambient Temp.:	21 °C	Test Distance:	1 m
Test Frequency: F2,	10.525 GHz	Test Results	



Line	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	31575.34	87.14	88.00	-0.86	68.86	11.85	34.54	40.97	51	100	Average	HORIZONTAL
2 p	31575.47	89.34	108.00	-18.66	71.06	11.85	34.54	40.97	51	100	Peak	HORIZONTAL

Measurement uncertainty: ±2.7 dB



TPC Range: 1		Operating Mode #: 1			
Test Engineer: Sam Chen		Nominal Channel Bandwidth #: 1			
Duty Cycle: 100 %	Test Range: 40 GHz – 60 GHz				
Rel. Humidity: 5 %	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
40 GHz – 60 GHz	41969.88	98.93	117.5	-18.57	PK
40 GHz – 60 GHz	41969.88	91.78	97.5	-5.72	AV
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.)					



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.

3.6 Maximum Permissible Exposure

3.6.1 Limit of Maximum Permissible Exposure

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)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6
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)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30
NOTE 1: f = frequency in MHz ; *Plane-wave equivalent power density				
NOTE 2: For the applicable limit, see FCC 1.1310 and 2.1091				

3.6.2 MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = RF output power (W)

G = EUT Antenna numeric gain (numeric)

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

The formula can be changed to

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



3.6.3 Result of Maximum Permissible Exposure

3.6.3.1 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.	

3.6.3.1.1 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

3.6.3.1.1.1 Maximum Permissible Exposure

Exposure Environment: General Population / Uncontrolled Exposure								
TPC range: 1			Operating Mode #: 1					
Test Engineer: Sam Chen			Nominal Channel Bandwidth #:					
Duty Cycle: 100 %		Test Results						
Rel. Humidity: 56 %		Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S)	Limit of Power Density (S)	
Ambient Temp.: 21 °C				Maximum EIPR Power of Test Frequency: (GHz)				
				F2 10.525 GHz	7.36	5.4450	7.7100	5.9020
NOTE: For the applicable limit, see FCC 1.1310 and 2.1091								

4 List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Spec.	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Apr. 15, 2010	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99079	9kHz – 30MHz	Mar. 23, 2010	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Apr. 29, 2010	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2010	Conduction (CO04-HY)
ISN	SCHAFFNER	ISN T400	21653	9kHz – 30MHz	Jun. 11, 2009	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 07, 2009	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	COA9231A	18667	9 kHz - 2 GHz	Jan. 24, 2010	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	Jul. 21, 2009	Radiation (03CH03-HY)
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5 GHz - 40 GHz	Apr. 06, 2009*	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100004	9 kHz - 40 GHz	Oct. 03, 2009	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	Jul. 28, 2008*	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30 MHz – 1 GHz	Sep. 26, 2009	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	Apr. 28, 2010	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	Jan. 11, 2010	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Jan. 05, 2010	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Jan. 05, 2010	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 – 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)

Note: Calibration Interval of instruments listed above is one year.

Note: *Calibration Interval of instruments listed above is two year.

5 Certification of TAF Accreditation



Certificate No. : L1190-100319

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 Rd., 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 : March 19, 2010

PI, total 22 pages

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