



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

FCC Rules and Regulations / Intentional Radiators

Unlicensed National Information Infrastructure Devices

Part 15, Subpart E, Section 15.407

THE FOLLOWING MEETS THE ABOVE TEST SPECIFICATION

Formal Name: Canopy 5200 DUSAL
Kind of Equipment: Digital Transmission Transceiver
Frequency Range: 1 - 40 GHz
Test Configuration: Phihong 29.5V power Supply PSA 15R (Tested at 29.5 vdc)
Model Number(s): 5200SMG, 5200APG, 5200BHG
Model(s) Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Serial Number(s): Patch: 0A003E049DA1;Connectorized:0A003E04A46A
Date of Tests: July 24 & 31, 2009
Test Conducted For: Motorola
1299 E. Algonquin Road
Schaumburg, IL 60193

NOTICE: "This report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government". Please see the "Additional Description of Equipment Under Test" page listed inside of this report.

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United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100276-0

D.L.S. Electronic Systems, Inc.
Wheeling, IL

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO/ILAC/IAF Communique dated 18 June 2005).



2008-10-01 through 2009-09-30

Effective dates

Dally S. Bruce
For the National Institute of Standards and Technology

NVLAP-01C (REV. 2006-09-13)



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1.0 SUMMARY OF TEST REPORT

It was found that the Canopy 5200 DUSAL, Model Number(s) 5200XLG connectorized, 5200XLG (single patch with Dish) **meets** the radio interference radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart E, Section 15.407 Unlicensed National Information Infrastructure devices for operational in the 5250 – 5350 MHz Band. The AC Power Line conducted emissions test was not required because the Canopy 5200 DUSAL is powered from a D.C. power source. It does not have a line cord to plug into the A.C. power line.

2.0 INTRODUCTION

On July 24 & 31, 2009, a series of radio frequency interference measurements was performed on Canopy 5200 DUSAL, Model Number(s) 5200XLG connectorized, 5200XLG (single patch with Dish), Serial Number: Patch: 0A003E049DA1;Connectorized:0A003E04A46A. The tests were performed according to the procedures of the FCC as stated in the "Methods of Measurement of Radio-Noise Emissions for Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" found in the American National Standards Institute, ANSI C63.4-2003. Tests were performed by personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

D.L.S. Electronic Systems, Inc. is a full service EMC/Safety Testing Laboratory accredited to ISO 17025. NVLAP Certificate and Scope can be viewed at <http://www.dlsemc.com/certificate>. Our facilities are registered with the FCC, Industry Canada, and VCCI.

Main Test Facility:

D.L.S. Electronic Systems, Inc.
1250 Peterson Drive
Wheeling, Illinois 60090

O.A.T.S. Test Facility:

D.L.S. Electronic Systems, Inc.
166 S. Carter Street
Genoa City, Wisconsin 53128
FCC Registration Number: 334127

3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency interference emission requirements of the FCC "Rules and Regulations", Part 15, Subpart E, Sections 15.407 (a-2), 15.407 (b-3), (b-5), (b-6), (b-7) & (b-8) for Unlicensed National Information Infrastructure Devices operating in the Band 5250 – 5350 MHz.



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4.0 TEST SET-UP

All emission tests were performed at D.L.S. Electronic Systems, Inc. and set up according to the ANSI C63.4-2003, Annex H. The conducted tests were performed with the test item placed on a non-conductive table (table top equipment), located in the test room. Equipment normally operated on the floor was tested by placing it on the metal ground plane. The ground plane has an electrical isolation layer over its surface approximately 7mm thick. The power line supplied was connected to a dual line impedance stabilization network electrically bonded to the ground plane, located on the floor. The networks were constructed per the requirements of the ANSI C63.4-2003, Annex H.

All radiated emissions tests were performed with the test item placed on a 80 cm high rotating non-conductive table, located in the test room. Equipment normally operated on the floor was placed on a metal covered turntable which is flush with the surrounding conducting ground plane. The ground plane has an electrical isolation layer over its surface approximately 7 mm thick. The EUT is separated from the turntable ground plane by a non-conductive layer. The equipment under test was set up according to ANSI C63.4-2003, Sections 6 and 8.

5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All preliminary data below 1000 MHz was automatically plotted using the ESI 26/40 Fixed Tuned Receiver. The data was taken using Peak, Quasi-Peak or the Average Detector Functions as required. This information was then used to determine the frequencies of maximum emissions. Above 1000 MHz, final data was taken using the Average Detector.

Below 1000 MHz, final data was taken using the ESI 26/40 Fixed Tuned Receiver. These plots were made using the Peak or Quasi-Peak Detector functions, with manual measurements performed on the questionable frequencies using the Quasi-Peak or the Average Detector Function of the ESI 26/40 Fixed Tuned Receiver as required. Above 1000 MHz, final data was taken using the Average Detector on the Spectrum Analyzer.

The bandwidths shown below are specified by ANSI C63.4-2003, Section 4.2.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

A list of the equipment used can be found in Table 1. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.



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6.0 AMBIENT MEASUREMENTS

For emissions measurements, broadband antennas and an EMI Test Receiver with a panoramic spectrum display are used. First the frequency range is scanned and displayed on the test receiver display. Next the scanned frequency range is divided into smaller ranges, and then it is manually tuned through to determine the emissions from the EUT. A headset or loudspeaker is connected to the test receiver's AM/FM demodulated output as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT. If there is any doubt as to the source of the emission, it is further investigated by rotating the EUT, or by disconnecting the power from the EUT.

The EUT is set up in its typical configuration and operated in its various modes. For tabletop systems, cables are manipulated within the range of likely configurations. For floor-standing equipment, the cables are located in the same manner as the user would install them and no further manipulation is made. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions. For each mode of operation, the frequency spectrum is monitored. Variations in antenna height, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) are explored to produce the emissions that have the highest amplitude relative to the limit. These methods are performed to the specifications in ANSI C63.4-2003.



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7.0 DESCRIPTION OF TEST SAMPLE: (See also Paragraph 8.0)

7.1 Description:

5.2 GHz UNII transceiver Canopy FSK Radio

7.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST

Length: 12 x Width: 3 x Height: 1

7.3 LINE FILTER USED:

N/A

7.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies:

200 KHz

Clock Frequencies:

20 MHz , 25MHz

7.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

1. DUSAL 5200 w/ Integrated Patch Antenna	PN: 8415505A01 iss B
2. DUSAL 5200 w/ Connector	PN: 8415505A01 iss B
3. Cable for Connectorized Antenna	PN: 3089544D01
4. Reflector Dish Antenna (18dBi)	PN: 27RD



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8.0 ADDITIONAL DESCRIPTION OF TEST SAMPLE:

(See also Paragraph 7.0)

1: Changed output power setting to 88 (power control setting).

NOTE:

Continuous Transmit. Low, Mid, and High channels.

Tested at 10 meter test distance due to 18 dBi Dish Antenna characteristics.

9.0 PHOTO INFORMATION AND TEST SET-UP

Item 0 Canopy 5200 DUSAL

Model Number: 5200XLG connectorized, 5200XLG (single patch with Dish)

Serial Number: Patch: 0A003E049DA1;Connectorized:0A003E04A46A

Item 1 Shielded CAT 5 Ethernet Cable with Metal Connectors, 100 Feet.



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10.0 RADIATED PHOTOS TAKEN DURING TESTING



RADIATED FRONT



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10.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



RADIATED SIDE



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10.0 CONDUCTED PHOTOS TAKEN DURING TESTING

The AC Power Line conducted emissions test was not required because the Canopy 5200 DUSAL is powered from a D.C. power source. It does not have a line cord to plug into the A.C. power line.

11.0 RESULTS OF TESTS

The radio interference emission charts can be seen on the pages at the end of this report. Data sheets indicating the test measurements taken during testing can also be found at the end of this report.

12.0 CONCLUSION

It was found that the Canopy 5200 DUSAL, Model Number(s) 5200XLG connectorized, 5200XLG (single patch with Dish) **meets** the radio interference radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart E, Section 15.407 Unlicensed National Information Infrastructure devices for operational in the 5250 – 5350 MHz Band. The conducted emissions test was not required because the Canopy 5200 DUSAL is powered from a D.C. power source. It does not have a line cord to plug into the A.C. power line.



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TABLE 1 – EQUIPMENT LIST

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	7/10
Preamplifier	Rohde & Schwarz	TS-PR10	032001/005	9 kHz – 1 GHz	3/10
Antenna	EMCO	3104C	97014785	20 MHz – 200 MHz	5/10
Antenna	EMCO	3146	97024895	200 MHz – 1 GHz	5/10
Preamp	Planar	PTB-60-120-5R0-10-115VAC-SFF	PL3291	1 GHz-20 GHz	9/09
Horn Antenna	EMCO	3115	9502-4451	1-18 GHz	4/11
Horn Antenna	EMCO	3115	6204	1-18 GHz	5/11
Signal Generator	Rhode & Schwarz	SMR40	100092	1-40 GHz	12/09
High Pass Filter	Planar	HP8G-7G8-CD-SFF	PF1225/0728	7-26 GHz	7/10
Preamp	Planar	PTB-60-2040-5R0-10-115VAC-292FF	PL3292	20 GHz-40 GHz	9/09
Horn Antenna	EMCO	3116	2549	18 – 40 GHz	8/10
Horn Antenna	ETS Lindgren	3116	00062917	18 – 40 GHz	11/09
High Pass Filter	Planar	CL22500-9000-CD-SS	PF1230/0728	15-40 GHz	7/10

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.



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APPENDIX A

TEST PROCEDURE

PART 15, SUBPART E, SECTION 15.407 a(2),

b(2), b(5), b(6), b(7) & b(8)

OPERATION WITHIN THE BAND 5250 – 5350 MHz



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1.0 AC POWER LINE CONDUCTED EMISSION MEASUREMENTS 15.407 b(6)

The AC Power Line Conducted emissions were measured over the frequency range from 150 kHz to 30 MHz in accordance with the power line measurements as specified in FCC Part 15, Subpart C, Section 15.207 & ANSI C63.4-2003. Since the device is operated from the public utility lines, the 120 Vac, 60 Hz power leads, high (hot) and low (neutral) sides, were measured by connecting the measuring equipment to the appropriate meter terminal of the LISN. During the test, the cables were placed and items moved (when appropriate) to maximize emissions. All signals were then recorded. The allowed levels for Intentional Radiators which is designed to connected to the public utility (AC) power line cannot exceed the following:

Frequency of Emissions (MHz)	Conducted Limits (dBuV)	
	Quasi Peak	Average
.15 to .5	66 to 56	56 to 46
.5 to 5	56	46
5 to 30	60	50

NOTE:

The conducted emissions test was not required because the Canopy 5200 DUSAL is powered from a D.C. power source. It does not have a line cord to plug into the A.C. power line.



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APPENDIX A

2.0 ANTENNA CONNECTOR – 15.203

As stated in 15.203 the Canopy 5200 DUSAL was designed to ensure that no antenna other than that furnished by Motorola Inc will be used with the EUT. The use of a permanently attached antenna or antenna that uses an unique coupling to the intentional radiator was considered to comply with section 15.203.

3.0 CONDUCTED OUTPUT POWER AT ANTENNA TERMINALS – PART 15.407 a(2)

Conducted Output Power emissions were measured at the antenna terminals with a wide band power meter. Measurements were made at low, mid and high of the 5250 – 5350 MHz frequency band.

The allowed emissions for transmitters operating in the 5250 – 5350 MHz band for Canopy 5200 DUSAL equipment are found under Part 15, Section 15.407 a(2).

NOTE: See the following pages for the data taken:



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E.I.R.P. SUBSTITUTION METHOD DATA

PART 15.407 a(2)



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DLS Electronic Systems, Inc.

Company: Motorola
Operator: Craig B
Date of test: 07-24-2009
Temperature: 70 deg. F
Humidity: 56% R.H.

Power set to 8C

Limit = 24 dBm + 6dBi for antenna gain = 30 dBm

EIRP - Substitution Method

Model: Canopy 5200								
Channel: Low								
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 10 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)	Strength of emission [EIRP] (mW)
5275 vertical	121.74	23.14	4.45	10.83	29.52	30.00	0.48	895.36
5275 horizontal	112.15	13.42	4.45	10.83	19.80	30.00	10.20	95.50

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



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DLS Electronic Systems, Inc.

Company: Motorola
Operator: Craig B
Date of test: 07-24-2009
Temperature: 70 deg. F
Humidity: 56% R.H.

Power set to 8C

Limit = 24 dBm + 6dBi for antenna gain = 30 dBm

EIRP - Substitution Method

Model: Canopy 5200								
Channel: Mid								
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 10 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)	Strength of emission [EIRP] (mW)
5300 vertical	122.09	23.29	4.47	10.82	29.64	30.00	0.36	920.45
5300 horizontal	112.50	14.09	4.47	10.82	20.44	30.00	9.56	110.66

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



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DLS Electronic Systems, Inc.

Company: Motorola
Operator: Craig B
Date of test: 07-24-2009
Temperature: 70 deg. F
Humidity: 56% R.H.

Power set to 8C

Limit = 24 dBm + 6dBi for antenna gain = 30 dBm

EIRP - Substitution Method

Model: Canopy 5200								
Channel: High								
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 10 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)	Strength of emission [EIRP] (mW)
5325 vertical	122.02	22.63	4.50	10.82	28.95	30.00	1.05	785.24
5325 horizontal	111.47	12.86	4.50	10.82	19.18	30.00	10.82	82.79

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



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APPENDIX A

4.0 RESTRICTED BAND COMPLIANCE Part 15.407 b(7)

The field strength of any emissions appearing outside the 5250 – 5350 MHz band shall not exceed the general radiated emissions limits as stated Section 15.209. The fundamental from the Canopy 5200 DUSAL transmitter shall not fall inside the restricted bands 4500 to 5250 MHz and 5350 to 5450 MHz.

As stated in Section 15.205a, the fundamental emission from the Canopy 5200 DUSAL shall not fall within any of the bands listed below:

Frequency in MHz	Frequency in MHz	Frequency in MHz	Frequency in GHz
.0900 to .1100	162.0125 to 167.17	2310.0 to 2390	9.30 to 9.50
.4900 to .5100	167.7200 to 173.20	2483.5 to 2500	10.60 to 12.70
2.1735 to 2.1905	240.000 to 285.00	2655.0 to 2900	13.25 to 13.40
8.362 to 8.3660	322.200 to 335.40	3260.0 to 3267	14.47 to 14.50
13.36 to 13.410	399.900 to 410.00	3332.0 to 3339	15.35 to 16.20
25.50 to 25.670	608.000 to 614.00	3345.8 to 3358	17.70 to 21.40
37.50 to 38.250	960.000 to 1240.00	3600.0 to 4400	22.01 to 23.13
73.00 to 75.500	1300.000 to 1427.00	4500.0 to 5250	23.60 to 24.00
108.00 to 121.94	1435.000 to 1626.50	5350.0 to 5450	31.20 to 31.80
123.00 to 138.00	1660.000 to 1710.00	7250.0 to 7750	36.43 to 36.50
149.90 to 150.00	1718.800 to 1722.20	8025.0 to 8500	ABOVE 38.60
156.70 to 156.90	2200.000 to 2300.00	9000.0 to 9200	

NOTE:

The noise floor within the Restricted Bands for the EMC Receiver and HP Spectrum Analyzer will typically lay 20 dB below the limit.

See the following page (s) for the graph (s) made showing compliance for Restricted Band. Also see the table of measurements made for the Fundamental and Spurious emissions in paragraph 3 of this section.



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DATA AND GRAPH(S) TAKEN SHOWING THE
RESTRICTED BAND COMPLIANCE

PART 15.407 b(7)



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Radiated Spurious Emissions in Restricted Bands

Tested at a 10 Meter Distance – 1 GHz to 40 GHz

EUT: Canopy 5200
Manufacturer: Motorola
Operating Condition: 75 deg F; 56% R.H.
Test Site: Site 3 **Operator:** Craig B
Test Specification: FCC Part 15 Subpart E; FCC Part 15.205
Comment: Continuous Transmit Power set to 88
Date: 07/24/2009

Notes: 1 to 18 GHz used 2-Level modulation
18 to 40 GHz used unmodulated carrier
All other restricted band emissions at least 20 dB under the limit.

Channel: **Low** (5275 MHz)

Frequency (GHz)	Measurement Type	Ant. Pol.	Level (dBuV)	Antenn a Factor (dB/m)	Syste m Loss (dB)	Total Level (dBuV/m)	Duty Cycle Correction (dB)	Final Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Height (m)	EUT Angle (deg)	Comment
15.825	Average	Vert	47.08	37.44	-49.1	35.4	---	35.4	43.54	8.1	1.0	0	Res. Band
15.825	Max Peak	Vert	54.68	37.44	-49.1	43.0	---	43.0	63.54	20.5	1.0	0	Res. Band
15.825	Average	Horz	54.68	37.44	-49.1	43.0	---	43.0	43.54	0.5	1.3	0	Res. Band
15.825	Max Peak	Horz	59.11	37.44	-49.1	47.5	---	47.5	63.54	16.1	1.3	0	Res. Band
21.100	Average	Vert	34.72	47.06	-45.8	36.0	---	36.0	43.54	7.6	1.4	0	Res. Band
21.100	Max Peak	Vert	46.35	47.06	-45.8	47.6	---	47.6	63.54	15.9	1.4	0	Res. Band
21.100	Average	Horz	38.08	47.06	-45.8	39.3	---	39.3	43.54	4.2	1.5	0	Res. Band
21.100	Max Peak	Horz	48.48	47.06	-45.8	49.7	---	49.7	63.54	13.8	1.5	0	Res. Band
31.650	Average	Vert	noise floor										
31.650	Max Peak	Vert	noise floor										
31.650	Average	Horz	noise floor										
31.650	Max Peak	Horz	noise floor										



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Radiated Spurious Emissions in Restricted Bands

Tested at a 10 Meter Distance – 1 GHz to 40 GHz

EUT: Canopy 5200
Manufacturer: Motorola
Operating Condition: 75 deg F; 56% R.H
Test Site: Site 3 **Operator:** Craig B
Test Specification: FCC Part 15 Subpart E; FCC Part 15.205
Comment: Continuous Transmit Power set to 88 **Date:** 07/24/2009
Notes: 1 to 18 GHz used 2-Level modulation 18 to 40 GHz used unmodulated carrier
All other restricted band emissions at least 20 dB under the limit.

Channel: **Mid** (5300 MHz)

Frequency (GHz)	Measurement Type	Ant. Pol.	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Total Level (dBuV/m)	Duty Cycle Correction (dB)	Final Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Height (m)	EUT Angle (deg)	Comment
10.600	Average	Vert	53.02	38.07	-51.4	39.7	---	39.7	43.54	3.9	1.0	0	Res. Band
10.600	Max Peak	Vert	59.48	38.07	-51.4	46.2	---	46.2	63.54	17.4	1.0	0	Res. Band
10.600	Average	Horz	51.72	38.07	-51.4	38.4	---	38.4	43.54	5.2	1.0	0	Res. Band
10.600	Max Peak	Horz	59.36	38.07	-51.4	46.0	---	46.0	63.54	17.5	1.0	0	Res. Band
15.900	Average	Vert	46.56	37.39	-49.0	35.0	---	35.0	43.54	8.6	1.0	0	Res. Band
15.900	Max Peak	Vert	55.13	37.39	-49.0	43.5	---	43.5	63.54	20.0	1.0	0	Res. Band
15.900	Average	Horz	54.83	37.39	-49.0	43.2	---	43.2	43.54	0.3	1.2	0	Res. Band
15.900	Max Peak	Horz	59.16	37.39	-49.0	47.6	---	47.6	63.54	16.0	1.2	0	Res. Band
21.200	Average	Vert	33.18	47.02	-45.9	34.3	---	34.3	43.54	9.2	1.2	0	Res. Band
21.200	Max Peak	Vert	45.60	47.02	-45.9	46.7	---	46.7	63.54	16.8	1.2	0	Res. Band
21.200	Average	Horz	36.61	47.02	-45.9	37.7	---	37.7	43.54	5.8	1.0	0	Res. Band
21.200	Max Peak	Horz	47.74	47.02	-45.9	48.9	---	48.9	63.54	14.7	1.0	0	Res. Band
31.800	Average	Vert	noise floor	floor									
31.800	Max Peak	Vert	noise floor										
31.800	Average	Horz	noise floor										
31.800	Max Peak	Horz	noise floor										



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

Radiated Spurious Emissions in Restricted Bands

Tested at a 10 Meter Distance – 1 GHz to 40 GHz

EUT: Canopy 5200
Manufacturer: Motorola
Operating Condition: 75 deg F; 56% R.H.
Test Site: Site 3 **Operator:** Craig B
Test Specification: FCC Part 15 Subpart E; FCC Part 15.205
Comment: Continuous Transmit
Power set to 88
Date: 07/24/2009

Notes: 1 to 18 GHz used 2-Level modulation
18 to 40 GHz used unmodulated carrier
All other restricted band emissions at least 20 dB under the limit.

Channel: **High (5325 MHz)**

Frequency (GHz)	Measurement Type	Ant. Pol.	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Total Level (dBuV/m)	Duty Cycle Correction (dB)	Final Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Height (m)	EUT Angle (deg)	Comment
10.650	Average	Vert	45.83	38.09	-51.3	32.6	---	32.6	43.54	10.9	1.0	0	Res. Band
10.650	Max Peak	Vert	56.81	38.09	-51.3	43.6	---	43.6	63.54	19.9	1.0	0	Res. Band
10.650	Average	Horz	46.04	38.09	-51.3	32.8	---	32.8	43.54	10.7	1.1	0	Res. Band
10.650	Max Peak	Horz	56.55	38.09	-51.3	43.3	---	43.3	63.54	20.2	1.1	0	Res. Band
15.975	Average	Vert	49.09	37.32	-48.8	37.6	---	37.6	43.54	5.9	1.0	0	Res. Band
15.975	Max Peak	Vert	55.81	37.32	-48.8	44.3	---	44.3	63.54	19.2	1.0	0	Res. Band
15.975	Average	Horz	54.59	37.32	-48.8	43.1	---	43.1	43.54	0.4	1.2	0	Res. Band
15.975	Max Peak	Horz	58.67	37.32	-48.8	47.2	---	47.2	63.54	16.4	1.2	0	Res. Band
21.300	Average	Vert	36.08	46.98	-45.8	37.3	---	37.3	43.54	6.3	1.5	0	Res. Band
21.300	Max Peak	Vert	47.66	46.98	-45.8	48.8	---	48.8	63.54	14.7	1.5	0	Res. Band
21.300	Average	Horz	36.52	46.98	-45.8	37.7	---	37.7	43.54	5.8	1.4	0	Res. Band
21.300	Max Peak	Horz	47.52	46.98	-45.8	48.7	---	48.7	63.54	14.8	1.4	0	Res. Band



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

5.0 FIELD STRENGTH OF FUNDAMENTAL AND SPURIOUS EMISSION MEASUREMENTS (SECTIONS 15.407 a (2) and b(6))

The radiated measurements made at D.L.S. Electronic Systems, Inc., for the Canopy 5200 DUSAL, Model Number: 5200XLG connectorized, 5200XLG (single patch with Dish), are shown in tabulated and graph form. Preliminary radiation measurements were performed at a 3 meter test distance with the limits adjusted linearly when required. The frequency range from 30 MHz to over 960 MHz, depending upon the fundamental frequency as stated in Part 15.33a, was automatically scanned and plotted at various angles.

Measurements for the Canopy 5200 DUSAL were made up to 40000 MHz, in accordance with Section 15.33a for Intentional Radiators with a fundamental frequency of 5275 - 5325 MHz. For intentional radiators, the frequency range to be investigated is determined by the lowest radio frequency generated by the device without going below 30 MHz, up to at least the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. At those frequencies where significant signals were detected, measurements were made over the entire frequency range specified in FCC Part 15, Subpart C, Section 15.407 at the open field test site, located at Genoa City, Wisconsin, FCC file number **31040/SIT**. When required, levels were extrapolated from 10 meters to 3 meters using a linear extrapolation.

All signals in the frequency range of 30 MHz to 2000 MHz were measured with a Biconical Antenna or tuned dipoles and from 200 MHz to 1000 MHz, a Log Periodic or Tuned Dipoles were used. From 1000 MHz to 40 GHz Horn Antennas were used. During the test the equipment was rotated and the antenna was raised and lowered from 1 meter to 4 meters to find the maximum level of emissions. In order to find maximum emissions, the cables were moved through all the positions the equipment would be expected to experience in the field. The EUT, peripheral equipment and cables were configured to meet the conditions in ANSI C63.4-2003, Clauses 6 & 8. Tests were made with the receive antenna(s) in both the horizontal and vertical planes of polarization. In each case, the table was rotated to find the maximum emissions.



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

APPENDIX A

5.0 FIELD STRENGTH OF FUNDAMENTAL AND SPURIOUS EMISSION MEASUREMENTS (CON'T)

For operation in the bands 5250 – 5350 MHz the field strength of any emissions within this band shall not exceed the field strength levels specified in the following table as stated in FCC, Part 15, Section 15.407 a(2). All emissions outside the 5250 – 5350 MHz band shall not exceed -27 dBm/MHz as stated in FCC, Part 15, Section 15.407 b(2).

Frequency range in MHz	Field Strength of Fundamental mWatts	Field Strength of Spurious Emissions dBm/MHz
30 -5470		-27
5470-5725	250	
5725-40000		-27

Field strength limits are at a distance of 3 meters. The emission limits shown are based on measurement instrumentation employing an average detector.

Emissions radiated below 1 GHz must comply to the general radiated emission limits in Section 15.209.

Preliminary radiated emission measurements were performed at a 3 meter or 1 meter test distance. The frequency range from 30 MHz to 40 GHz was automatically scanned and plotted at various angles.

NOTE:

All radiated emissions measurements were made at a test room temperature of 75°F at 56% relative humidity.



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

**RADIATED DATA TAKEN FOR FUNDAMENTAL
EIRP EMISSION MEASUREMENTS**

PART 15.407 b(2)



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Motorola
Operator: Craig B
Date of test: 07-24-2009
Temperature: 70 deg. F
Humidity: 56% R.H.

Power set to 8C

Limit = 24 dBm + 6dBi for antenna gain = 30 dBm

EIRP - Substitution Method

Model: Canopy 5200								
Channel: Low								
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 10 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)	Strength of emission [EIRP] (mW)
5275 vertical	121.74	23.14	4.45	10.83	29.52	30.00	0.48	895.36
5275 horizontal	112.15	13.42	4.45	10.83	19.80	30.00	10.20	95.50

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Motorola
Operator: Craig B
Date of test: 07-24-2009
Temperature: 70 deg. F
Humidity: 56% R.H.

Power set to 8C

Limit = 24 dBm + 6dBi for antenna gain = 30 dBm

EIRP - Substitution Method

Model: Canopy 5200								
Channel: Mid								
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 10 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)	Strength of emission [EIRP] (mW)
5300 vertical	122.09	23.29	4.47	10.82	29.64	30.00	0.36	920.45
5300 horizontal	112.50	14.09	4.47	10.82	20.44	30.00	9.56	110.66

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

DLS Electronic Systems, Inc.

Company: Motorola
Operator: Craig B
Date of test: 07-24-2009
Temperature: 70 deg. F
Humidity: 56% R.H.

Power set to 8C

Limit = 24 dBm + 6dBi for antenna gain = 30 dBm

EIRP - Substitution Method

Model: Canopy 5200								
Channel: High								
Frequency and Polarization (MHz)	Max. Field Strength of EUT @ 10 meters (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)	Strength of emission [EIRP] (mW)
5325 vertical	122.02	22.63	4.50	10.82	28.95	30.00	1.05	785.24
5325 horizontal	111.47	12.86	4.50	10.82	19.18	30.00	10.82	82.79

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

1250 Peterson Dr., Wheeling, IL 60090

RADIATED DATA TAKEN FOR
SPURIOUS EMISSION MEASUREMENTS
PART 15.407 b(6)
UNWANTED EMISSIONS BELOW 1 GHz



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

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1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

**RADIATED DATA TAKEN FOR
FIELD STRENGTH
EIRP SPURIOUS EMISSION MEASUREMENTS**

PART 15.407 b(3)



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

DLS Electronic Systems, Inc.

Company: Motorola
Operator: Craig B
Date of test: 07-24-2009
Temperature: 75 deg. F
Humidity: 56% R.H.
Test Distance: 10 meters from 1 to 40 GHz

Average Detector Power set to 8C
Unmodulated FCC Pt. 15.407(b)(2)
Spurious Emissions - EIRP - Substitution Method

Model: **Canopy 5200**

Channel: Low - 5275 MHz

Frequency and Polarization (GHz)	Max. Field Strength of EUT (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)
7.9125 vertical	47.0	-57.4	5.3	11.3	-51.4	-27.0	24.4
7.9125 horizontal	45.2	-55.7	5.3	11.3	-49.7	-27.0	22.7
10.550 vertical	44.6	-56.2	5.7	12.3	-49.6	-27.0	22.6
10.550 horizontal	42.6	-59.7	5.7	12.3	-53.1	-27.0	26.1
15.825 vertical	42.7	-53.2	7.2	16.3	-44.1	-27.0	17.1
15.825 horizontal	51.1	-46.0	7.2	16.3	-36.9	-27.0	9.9
21.100 vertical	36.2	-55.6	8.5	10.6	-53.5	-27.0	26.5
21.100 horizontal	39.0	-55.2	8.5	10.6	-53.1	-27.0	26.1
26.375 vertical	44.0	-52.3	9.7	11.2	-50.8	-27.0	23.8
26.375 horizontal	47.2	-48.0	9.7	11.2	-46.5	-27.0	19.5
31.650 vertical	Noise Floor						
31.650 horizontal	Noise Floor						
36.925 vertical	Noise Floor						
36.925 horizontal	Noise Floor						

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
Report Number: 15581

DLS Electronic Systems, Inc.

Company: Motorola
Operator: Craig B
Date of test: 07-24-2009
Temperature: 75 deg. F
Humidity: 56% R.H.
Test Distance: 10 meters from 1 to 40 GHz

Average Detector Power set to 8C
Unmodulated FCC Pt. 15.407(b)(2)
Spurious Emissions - EIRP - Substitution Method

Model: Canopy 5200

Channel: Mid - 5300 MHz

Frequency and Polarization (GHz)	Max. Field Strength of EUT (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)
7.950 vertical	46.9	-56.0	5.3	11.3	-50.0	-27.0	23.0
7.950 horizontal	44.6	-54.8	5.3	11.3	-48.8	-27.0	21.8
10.600 vertical	45.5	-57.0	5.7	12.4	-50.3	-27.0	23.3
10.600 horizontal	45.0	-54.6	5.7	12.4	-48.0	-27.0	21.0
15.900 vertical	42.3	-54.6	7.2	16.3	-45.4	-27.0	18.4
15.900 horizontal	50.8	-45.6	7.2	16.3	-36.5	-27.0	9.5
21.200 vertical	34.2	-59.7	8.5	10.7	-57.6	-27.0	30.6
21.200 horizontal	37.7	-56.2	8.5	10.7	-54.1	-27.0	27.1
26.500 vertical	41.8	-53.5	9.7	11.3	-51.9	-27.0	24.9
26.500 horizontal	40.5	-53.9	9.7	11.3	-52.3	-27.0	25.3
31.800 vertical	Noise Floor						
31.800 horizontal	Noise Floor						
37.100 vertical	Noise Floor						
37.100 horizontal	Noise Floor						

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15



1250 Peterson Dr., Wheeling, IL 60090

Company: Motorola
 Model Tested: 5200XLG connectorized, 5200XLG (single patch with Dish)
 Report Number: 15581

DLS Electronic Systems, Inc.

Company: Motorola
 Operator: Craig B
 Date of test: 07-24-2009
 Temperature: 75 deg. F
 Humidity: 56% R.H.
 Test Distance: 10 meters from 1 to 40 GHz

Average Detector

Power set to 8C

Unmodulated

FCC Pt. 15.407(b)(2)

Spurious Emissions - EIRP - Substitution Method

Model: **Canopy 5200**

Channel: High - 5325 MHz

Frequency and Polarization (GHz)	Max. Field Strength of EUT (dBuV/m)	Output of Signal Generator when field strength equals that of EUT (dBm)	Correction factor for cable between Signal Gen. and subst. antenna (dB)	Gain of subst. antenna (dBi)	Strength of emission [EIRP] (dBm)	Limit (dBm)	Margin (dB)
7.9875 vertical	48.0	-54.5	5.3	11.3	-48.5	-27.0	21.5
7.9875 horizontal	44.4	-55.5	5.3	11.3	-49.4	-27.0	22.4
10.650 vertical	39.3	-62.6	5.7	12.4	-56.0	-27.0	29.0
10.650 horizontal	39.6	-61.6	5.7	12.4	-54.9	-27.0	27.9
15.975 vertical	45.1	-51.3	7.2	16.4	-42.1	-27.0	15.1
15.975 horizontal	50.5	-47.2	7.2	16.4	-38.0	-27.0	11.0
21.300 vertical	37.2	-55.8	8.5	10.8	-53.6	-27.0	26.6
21.300 horizontal	37.6	-55.5	8.5	10.8	-53.2	-27.0	26.2
26.625 vertical	45.9	-49.6	9.7	11.4	-47.9	-27.0	20.9
26.625 horizontal	42.9	-51.7	9.7	11.4	-50.0	-27.0	23.0
31.950 vertical	Noise Floor						
31.950 horizontal	Noise Floor						
37.275 vertical	Noise Floor						
37.275 horizontal	Noise Floor						

EIRP = Signal generator output - cable loss + antenna gain

ERP_(ref. to 1/2λ dipole) = Signal generator output - cable loss + antenna gain - 2.15