Excellence in Compliance Testing

Certification Test Report

FCC ID: DXX512ANM
IC: 3547A-512ANM

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Report Number: 11-0070.W04.11.A

Manufacturer: Mindray DS USA, Inc.

Models: 512AN_MMW

Test Begin Date: May 31, 2011
Test End Date: July 27, 2011

Report Issue Date: December 21, 2011

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Reviewed by:
Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 18 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210 for a class II permissive change.

The purpose of this class II permissive change is the addition of a specific host configuration with new antenna type.

1.2 Product description

Model 512AN_MMW is a 1x2 MISO 802.11a/b/g/n radio module. The 512AN_MMW supports 802.11b, 802.11g and 802.11n modes in the 2400 – 2483.5 MHz band and 802.11a and 802.11n modes in the 5150 – 5250 MHz, 5250 – 5350 MHz, 5470 – 5725 MHz and 5725 – 5850 MHz bands. The 512AN_MMW supports both 20 MHz and 40 MHz channels in 802.11n mode.

For the purpose of showing compliance for the specific host configuration and new antenna, the 512AN_MMW was evaluated in the Mindray DS USA, Inc. V12 and V21 patient monitoring platforms. The Mindray DS USA, Inc. V12 and V21 monitoring platforms are modular patient monitoring systems. The systems architecture allows users to customize, by removal or addition of modules, monitored parameters based on a patient's monitoring need or acuity level.

Antenna Technical Information:

Antenna Type:	PCB Internal Embedded Antenna
Frequency Band:	2.4 GHz
Impedance:	50 Ω
Mindray Part Number:	0012-00-1730-01
Manufacturer:	Laird Technologies
Laird Part Number:	MAF95113-B1
PCB length	L = 44.5 ± 0.8mm, W = 12.6 ± 0.8mm; thickness T = 0.80 ± 0.18mm
Gain	2 dBi

Applicant Information:
Mindray DS USA, Inc.
800 MacArthur Blvd
Mahwah, NJ 07430

Test Sample Serial Number(s): E6058801

Test Sample Condition: Test samples were provided in working order with no visible defects.

1.3 Test Methodology and Considerations

As integrated into the Mindray DS USA, Inc. V12 and V21 hosts, the 512AN_MMW only operates using 802.11b/g/n in the 2400 – 2483.5 MHz frequency band and does not utilize 802.11a/n in the 5GHz frequency bands. For the purpose of this class II permissive change, testing was performed only for 802.11b/g/n modes.

The EUT was pre-scanned in all modes of operation and for all data rates. The following modes/data rates were determined to be worst case and therefore used for final measurements:

802.11b: 1 Mbps
802.11g: 6 Mbps
802.11n20: 6.5 Mbps (MCS0)
802.11n40: 13.5Mbps (MCS0)

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 511277
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

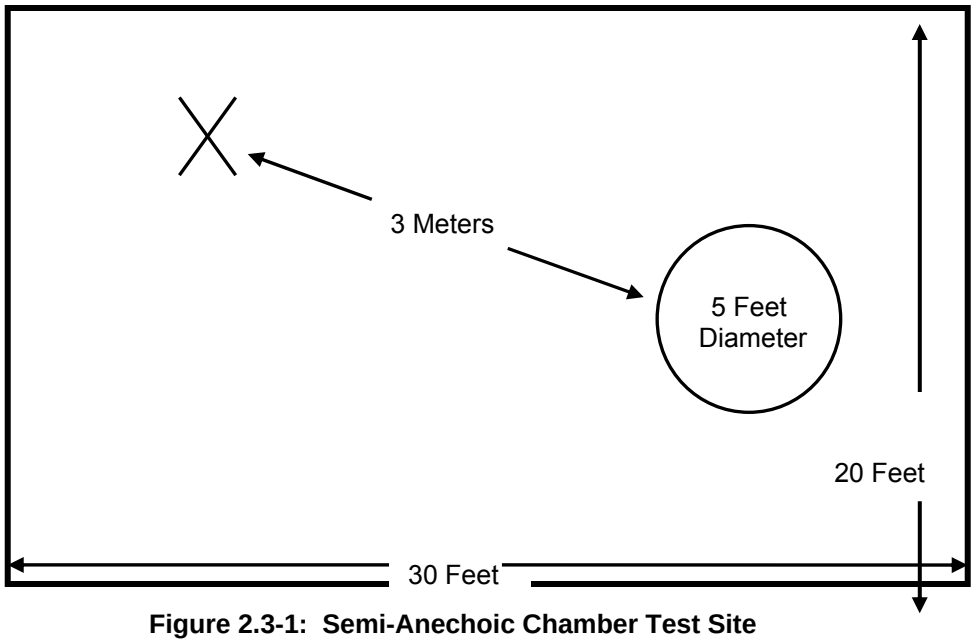

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

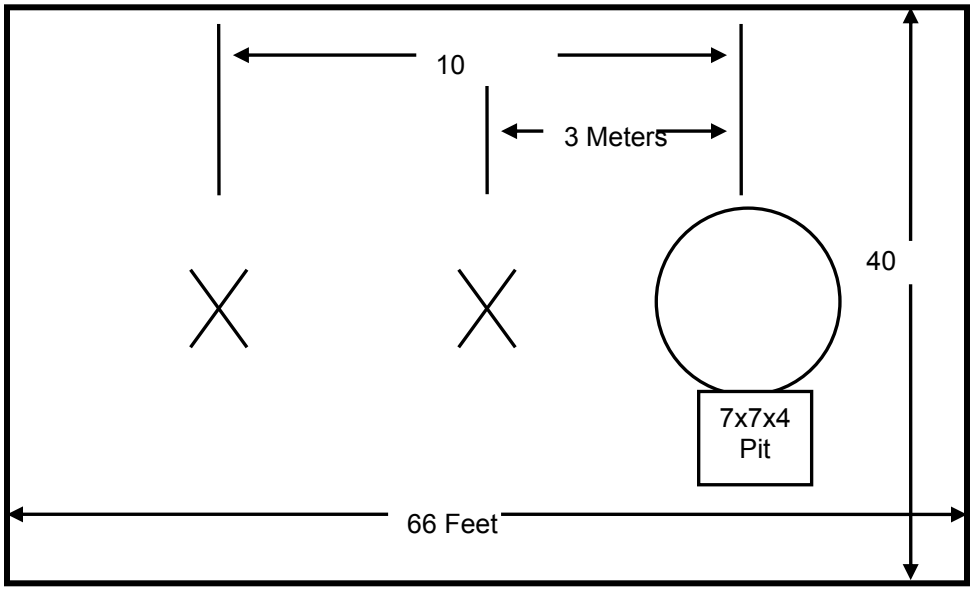

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

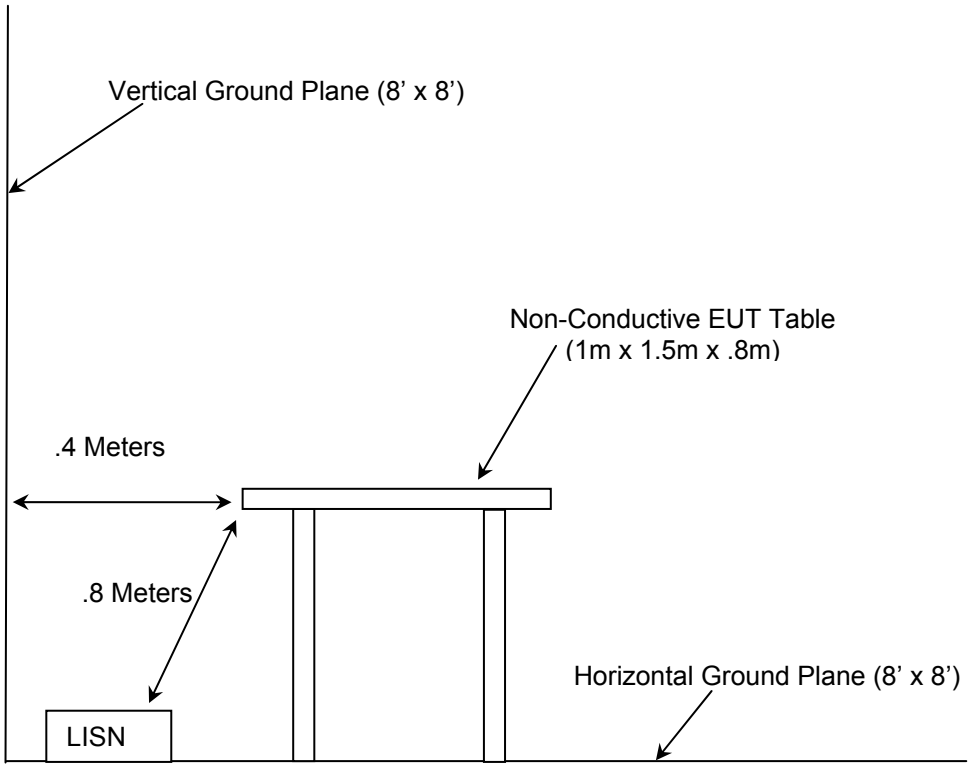

Figure 2.4-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2011
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2011
- FCC KDB Publication No. 558074 - Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), March 2005
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands):Category I Equipment, Issue 8, Dec 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, Dec 2010.

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
1	Rohde & Schwarz	ESMI - Display	Spectrum Analyzers	833771/007	9/23/2010	9/23/2012
2	Rohde & Schwarz	ESMI-Receiver	Spectrum Analyzers	839587/003	9/23/2010	9/23/2012
30	Spectrum Technologies	DRH-0118	Antennas	970102	4/27/2011	4/27/2013
41	Electro-Metrics	BIA-25	Antennas	2925	12/21/2010	12/21/2012
73	Agilent	8447D	Amplifiers	2727A05624	3/21/2011	3/21/2012
152	EMCO	3825/2	LISN	9111-1905	11/2/2010	11/2/2012
153	EMCO	3825/2	LISN	9411-2268	1/13/2011	1/13/2012
167	ACS	Chamber EMI Cable Set	Cable Set	167	1/26/2011	1/26/2012
168	Hewlett Packard	11947A	Attenuators	44829	2/4/2011	2/4/2012
291	Florida RF Cables	SMRE-200W-12.0-SMRE	Cables	None	12/7/2010	12/7/2011
292	Florida RF Cables	SMR-290AW-480.0-SMR	Cables	None	4/11/2011	4/11/2012
334	Rohde&Schwarz	3160-10	Antennas	45576	11/4/2010	NCR
335	Suhner	SF-102A	Cables	882/2A	10/29/2010	10/29/2011
338	Hewlett Packard	8449B	Amplifiers	3008A01111	3/24/2011	3/24/2012
345	Suhner Sucoflex	102A	Cables	1077/2A	10/29/2010	10/29/2011
412	Electro Metrics	LPA-25	Antennas	1241	7/28/2010	7/28/2012
422	Florida RF	SMS-200AW-72.0-SMR	Cables	805	12/29/2010	12/29/2011
432	Microwave Circuits	H3G020G4	Filters	264066	7/16/2010	7/16/2011
432	Microwave Circuits	H3G020G4	Filters	264066	7/11/2011	7/11/2012
RE40 *	Agilent Technologies	E7405A	Spectrum Analyzers	US39150132	7/20/2010	7/20/2011

* Testing performed prior to calibration due date.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment – V12

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	EUT Host Computer	Mindray DS USA, Inc.	0998-00-1800-101 (V12)	EG-05000020
2	V-Dock	Mindray DS USA, Inc.	0998-00-1801-01	EG-08000873
3	V-Hub	Mindray DS USA, Inc.	0998-00-1803-101	EG-05000103
4	VPS	Mindray DS USA, Inc.	0998-00-1802-0101A	EGE13004060
5	Temp	Mindray DS USA, Inc.	0998-00-1802-0401A	DA6K-MR-TEMP-022
6	CO2	Mindray DS USA, Inc.	0998-00-1802-0301A	DA6K-MR-CO-028
7	Temperature Sensor	Mindray DS USA, Inc.	N/A	N/A
8	Patient Simulator	Mindray DS USA, Inc.	medSim 300B	9663

Table 5-2: Support Equipment – V21

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	EUT Host Computer	Mindray DS USA, Inc.	0998-00-1800-201 (V21)	EG-05000005
2	V-Dock	Mindray DS USA, Inc.	0998-00-1801-01	EG-08000873
3	V-Hub	Mindray DS USA, Inc.	0998-00-1803-101	EG-05000103
4	VPS	Mindray DS USA, Inc.	0998-00-1802-0101A	EGE13004060
5	Temp	Mindray DS USA, Inc.	0998-00-1802-0401A	DA6K-MR-TEMP-022
6	CO2	Mindray DS USA, Inc.	0998-00-1802-0301A	DA6K-MR-CO-028
7	Temperature Sensor	Mindray DS USA, Inc.	N/A	N/A
8	Patient Simulator	Mindray DS USA, Inc.	medSim 300B	9663

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

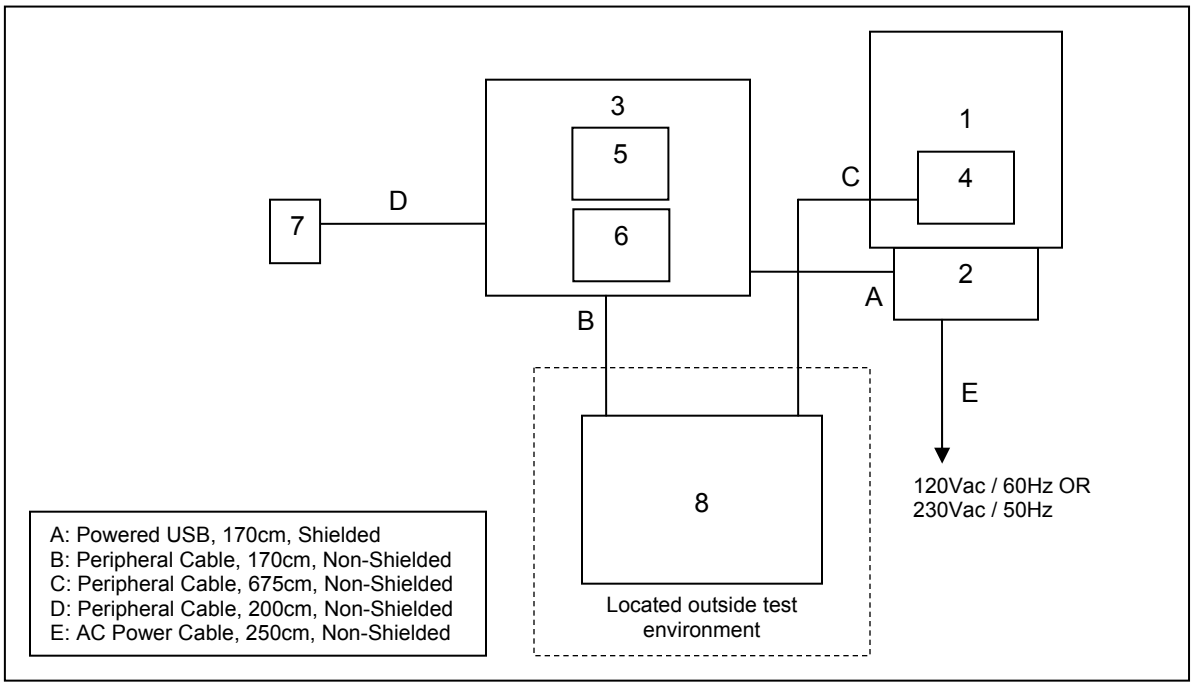

Figure 6-2: V12 Block Diagram

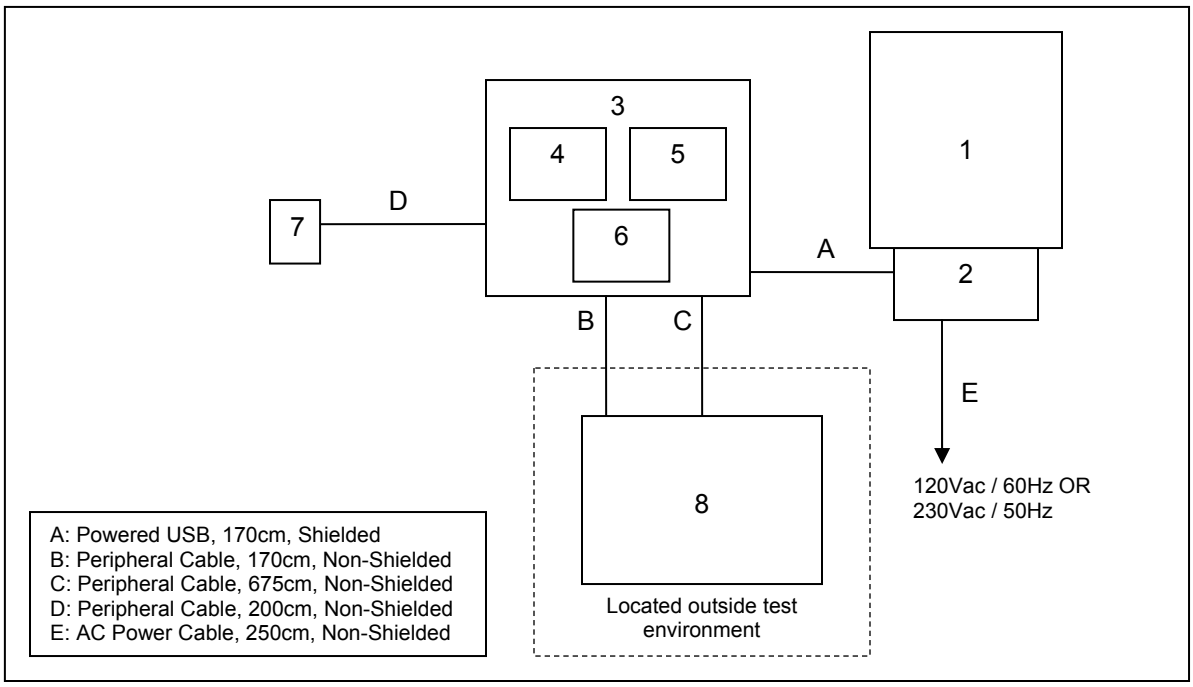

Figure 6-2: V21 Block Diagram

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The antenna is an integral chip antenna with 2 dBi gain and thus meets the antenna requirements in Section 15.203.

7.2 Power Line Conducted Emissions – FCC: CFR 47 Part 15.207/ IC: RSS-GEN 7.2.4

7.2.1 Measurement Procedure

Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Measurement Results

Results of the test are shown below in and Tables 7.2.2-1 to 7.2.2-4.

Table 7.2.2-1: Line 1 Conducted EMI Results – V12

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.156	51.96	35.61	10.09	62.05	45.70	79.00	66.00	17.0	20.3
159.5	51.11	34.83	11.23	62.34	46.06	73.00	60.00	10.7	13.9
0.19	39.33	20.63	10.08	49.41	30.71	79.00	66.00	29.6	35.3
0.227	40.45	37.47	10.02	50.47	47.49	79.00	66.00	28.5	18.5
0.341	40.77	35.01	10.16	50.93	45.17	79.00	66.00	28.1	20.8
4.09	39.09	32.33	10.13	49.22	42.46	73.00	60.00	23.8	17.5

Table 7.2.2-2: Line 2 Conducted EMI Results – V12

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.151	52.78	36.82	10.09	62.87	46.91	79.00	66.00	16.1	19.1
0.181	38.82	24.02	10.08	48.90	34.10	79.00	66.00	30.1	31.9
0.34	46.79	41.83	10.16	56.95	51.99	79.00	66.00	22.1	14.0
0.566	41.52	34.46	10.00	51.52	44.46	73.00	60.00	21.5	15.5
0.768	37.32	27.02	10.00	47.32	37.02	73.00	60.00	25.7	23.0
4.047	32.17	27.32	10.13	42.30	37.45	73.00	60.00	30.7	22.6

Table 7.2.2-3: Line 1 Conducted EMI Results – V21

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.227	39.61	36.68	10.02	49.63	46.70	79.00	66.00	29.4	19.3
0.338	39.15	36.1	10.15	49.30	46.25	79.00	66.00	29.7	19.7
0.567	33.49	28.52	10.00	43.49	38.52	73.00	60.00	29.5	21.5
1.46	32.64	22.16	10.00	42.64	32.16	73.00	60.00	30.4	27.8
2.38	33.21	19.8	10.11	43.32	29.91	73.00	60.00	29.7	30.1
4.41	33.79	25.97	10.13	43.92	36.10	73.00	60.00	29.1	23.9

Table 7.2.2-4: Line 2 Conducted EMI Results – V21

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.341	46.31	44.03	10.16	56.47	54.19	79.00	66.00	22.5	11.8
0.547	40.91	33.2	10.00	50.91	43.20	73.00	60.00	22.1	16.8
1.91	34.65	23.83	10.00	44.65	33.83	73.00	60.00	28.4	26.2
2.61	33.53	18.15	10.11	43.64	28.26	73.00	60.00	29.4	31.7
3.28	35.47	18.78	10.12	45.59	28.90	73.00	60.00	27.4	31.1
3.95	38.26	28.48	10.12	48.38	38.60	73.00	60.00	24.6	21.4

7.3 Band-Edge Compliance - FCC 15.205, 15.209; IC: RSS-210 2.2, 2.5

7.3.1 Measurement Procedure

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. Band-edge compliance for the upper and lower band-edges was determined based on the absolute radiated emissions measurements.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively.

7.3.2 Measurement Results

Band-edge compliance is displayed in Tables 7.3.2-1 to 7.3.2-8.

Table 7.3.2-1: Band-edge Radiated Emissions – V12 – 802.11b

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2390	73.46	58.85	H	-5.46	68.00	53.31	74.0	54.0	6.0	0.7
2390	65.33	51.33	V	-5.46	59.87	45.79	74.0	54.0	14.1	8.2
2483.5	55.70	48.39	H	-5.04	50.66	43.26	74.0	54.0	23.3	10.7
2483.5	55.99	48.97	V	-5.04	50.95	43.84	74.0	54.0	23.1	10.2

Table 7.3.2-2: Band-edge Radiated Emissions – V12 – 802.11g

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2390	73.52	58.77	H	-5.46	68.06	53.23	74.0	54.0	5.9	0.8
2390	65.11	50.98	V	-5.46	59.65	45.44	74.0	54.0	14.3	8.6
2483.5	66.22	46.78	H	-5.04	61.18	41.65	74.0	54.0	12.8	12.4
2483.5	62.46	43.28	V	-5.04	57.42	38.15	74.0	54.0	16.6	15.9

Table 7.3.2-3: Band-edge Radiated Emissions – V12 – 802.11n 20MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2390	73.27	59.21	H	-5.46	67.81	53.75	74.0	54.0	6.20	0.20
2390	65.86	51.41	V	-5.46	60.40	45.95	74.0	54.0	13.60	8.00
2483.5	65.36	49.12	H	-5.04	60.32	44.08	74.0	54.0	13.70	9.90
2483.5	54.06	38.33	V	-5.04	49.02	33.29	74.0	54.0	25.00	20.70

Table 7.3.2-4: Band-edge Radiated Emissions – V12 – 802.11n 40MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2388	71.38	57.24	H	-5.46	65.92	51.78	74.0	54.0	8.10	2.20
2388	65.79	51.68	V	-5.46	60.33	46.22	74.0	54.0	13.70	7.80
2483.5	66.57	54.88	H	-5.04	61.53	49.84	74.0	54.0	12.50	4.20
2483.5	61.15	50.11	V	-5.04	56.11	45.07	74.0	54.0	17.90	8.90

Table 7.3.2-5: Band-edge Radiated Emissions – V21 – 802.11b

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2390	65.13	56.33	H	-5.46	59.67	50.87	74.0	54.0	14.30	3.10
2390	60.43	51.92	V	-5.46	54.97	46.46	74.0	54.0	19.00	7.50
2483.5	51.62	42.49	H	-5.04	46.58	37.45	74.0	54.0	27.40	16.60
2483.5	51.14	41.66	V	-5.04	46.10	36.62	74.0	54.0	27.90	17.40

Table 7.3.2-6: Band-edge Radiated Emissions – V21 – 802.11g

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2390	70.72	56.11	H	-5.46	65.26	50.65	74.0	54.0	8.70	3.30
2390	64.71	50.39	V	-5.46	59.25	44.93	74.0	54.0	14.70	9.10
2483.5	64.04	45.95	H	-5.04	59.00	40.91	74.0	54.0	15.00	13.10
2483.5	61.26	42.19	V	-5.04	56.22	37.15	74.0	54.0	17.80	16.90

Table 7.3.2-7: Band-edge Radiated Emissions – V21 – 802.11n 20MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2390	70.22	55.75	H	-5.46	64.76	50.29	74.0	54.0	9.20	3.70
2390	64.87	50.44	V	-5.46	59.41	44.98	74.0	54.0	14.60	9.00
2483.5	64.09	47.83	H	-5.04	59.05	42.79	74.0	54.0	15.00	11.20
2483.5	60.71	44.12	V	-5.04	55.67	39.08	74.0	54.0	18.30	14.90

Table 7.3.2-8: Band-edge Radiated Emissions – V21 – 802.11n 40MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2390	70.22	55.75	H	-5.46	64.76	50.29	74.0	54.0	9.20	3.70
2390	64.87	50.44	V	-5.46	59.41	44.98	74.0	54.0	14.60	9.00
2487.8	65.57	50.97	H	-5.02	60.55	45.95	74.0	54.0	13.50	8.10
2483.5	62.28	49.65	V	-5.04	57.24	44.61	74.0	54.0	16.80	9.40

7.4 Radiated Spurious Emissions - FCC 15.205, 15.209; IC: RSS-210 2.2, 2.5

7.4.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30MHz to 25GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively.

Each emission found to be in a restricted band as defined by section 15.205 was compared to the radiated emission limits as defined in section 15.209.

7.4.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 25GHz are reported in tables 7.4.2-1 to 7.4.2-8 below.

Table 7.4.2-1: Radiated Spurious Emissions Tabulated Data – V12 – 802.11b

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel - 2412MHz										
4824	50.90	45.62	H	2.09	52.99	47.71	74.0	54.0	21.0	6.3
4824	51.07	45.04	V	2.09	53.16	47.13	74.0	54.0	20.8	6.9
Middle Channel - 2437MHz										
4874	48.78	40.82	H	2.20	50.98	43.02	74.0	54.0	23.0	11.0
High Channel - 2462MHz										
4924	48.12	39.14	H	2.32	50.44	41.46	74.0	54.0	23.6	12.5
4924	48.59	41.68	V	2.32	50.91	44.00	74.0	54.0	23.1	10.0

Table 7.4.2-2: Radiated Spurious Emissions Tabulated Data – V12 – 802.11g

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
All emissions were attenuated below the noise floor of the measurement system.										

Table 7.4.2-3: Radiated Spurious Emissions Tabulated Data – V12 – 802.11n 20MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
All emissions were attenuated below the noise floor of the measurement system.										

Table 7.4.2-4: Radiated Spurious Emissions Tabulated Data – V12 – 802.11n 40MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Middle Channel - 2437MHz										
4874	58.11	44.70	H	2.20	60.31	46.90	74.0	54.0	13.70	7.10
7311	49.19	35.03	H	7.81	57.00	42.84	74.0	54.0	17.00	11.20

Table 7.4.2-5: Radiated Spurious Emissions Tabulated Data – V21 – 802.11b

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel - 2412MHz										
4824	52.13	47.83	H	1.96	54.09	49.79	74.0	54.0	19.9	4.2
4824	52.03	47.42	V	1.96	53.99	49.38	74.0	54.0	20.0	4.6
14472	47.24	38.28	H	18.46	65.70	56.74	83.5	63.5	17.80	6.80
14472	47.35	36.93	V	18.46	65.81	55.39	83.5	63.5	17.70	8.10
Middle Channel - 2437MHz										
4874	49.98	43.13	H	2.08	52.06	45.21	74.0	54.0	21.9	8.8
4874	48.63	40.46	V	2.08	50.71	42.54	74.0	54.0	23.3	11.5
7311	49.08	40.82	H	7.57	56.65	48.39	74.0	54.0	17.40	5.60
7311	48.29	39.19	V	7.57	55.86	46.76	74.0	54.0	18.10	7.20
High Channel - 2462MHz										
4924	51.77	46.41	H	2.19	53.96	48.60	74.0	54.0	20.0	5.4
4924	51.75	45.78	V	2.19	53.94	47.97	74.0	54.0	20.1	6.0
7386	49.27	41.30	H	7.57	56.84	48.87	74.0	54.0	17.2	5.1
7386	49.15	41.30	V	7.57	56.72	48.87	74.0	54.0	17.3	5.1

Table 7.4.2-6: Radiated Spurious Emissions Tabulated Data – V21 – 802.11g

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel - 2412MHz										
4824	48.03	37.21	H	1.96	49.99	39.17	74.0	54.0	24.0	14.8
4824	47.33	35.94	V	1.96	49.29	37.90	74.0	54.0	24.70	16.10
Middle Channel - 2437MHz										
4874	47.60	37.34	H	2.08	49.68	39.42	74.0	54.0	24.3	14.6
4874	47.29	36.42	V	2.08	49.37	38.50	74.0	54.0	24.60	15.50
7311	47.14	35.28	H	7.57	54.71	42.85	74.0	54.0	19.30	11.20
7311	47.15	34.88	V	7.57	54.72	42.45	74.0	54.0	19.30	11.60
High Channel - 2462MHz										
4924	47.17	36.25	H	2.19	49.36	38.44	74.0	54.0	24.6	15.6
4924	46.25	35.28	V	2.19	48.44	37.47	74.0	54.0	25.6	16.5

Table 7.4.2-7: Radiated Spurious Emissions Tabulated Data – V21 – 802.11n 20MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel - 2412MHz										
4824	48.17	36.68	H	1.96	50.13	38.64	74.0	54.0	23.9	15.4
Middle Channel - 2437MHz										
4874	48.14	37.19	H	2.08	50.22	39.27	74.0	54.0	23.8	14.7
4874	46.28	35.26	V	2.08	48.36	37.34	74.0	54.0	25.60	16.70
7311	50.33	37.65	H	7.57	57.90	45.22	74.0	54.0	16.10	8.80
High Channel - 2462MHz										
4924	46.67	36.53	H	2.19	48.86	38.72	74.0	54.0	25.1	15.3
4924	46.71	36.07	V	2.19	48.90	38.26	74.0	54.0	25.1	15.7

Table 7.4.2-8: Radiated Spurious Emissions Tabulated Data – V21 – 802.11n 40MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
4824	48.17	36.68	H	1.96	50.13	38.64	74.0	54.0	23.90	15.40
Middle Channel										
4874	47.14	36.95	H	2.08	49.22	39.03	74.0	54.0	24.80	15.00
4874	47.15	37.06	V	2.08	49.23	39.14	74.0	54.0	24.80	14.90
High Channel										
4904	46.54	35.74	H	2.15	48.69	37.89	74.0	54.0	25.30	16.10

7.4.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: 802.11b – 2412MHz – V21 Second Harmonic – Peak

Corrected Level: 52.13 + 1.96 = 54.09dBuV/m
Margin: 74dBuV/m – 54.09dBuV/m = 19.9dB

Example Calculation: 802.11b – 2412 MHz – V21 Second Harmonic – Average

Corrected Level: 47.83 + 1.96 – 0 = 49.79dBuV
Margin: 54dBuV – 49.79dBuV = 4.2dB

8 CONCLUSION

In the opinion of ACS, Inc. the 512AN_MMW, manufactured by Mindray DS USA, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210 as applicable to this class ii permissive change.

END REPORT