

TEST RESULT SUMMARY

FCC Part 15 Subpart C Section 15.247

Industry Canada RSS-210 Issue 8

Industry Canada RSS-Gen Issue 3

MANUFACTURER	Healthsense 1191 Northland Drive Suite 100 Mendota Heights MN 55120
DESCRIPTION OF EQUIPMENT	Wi Fi 802.11g module
NAME OF EQUIPMENT	Gen 3.5 MSR
MODEL NUMBER(S) TESTED	100057-0001-AJ
SERIAL NUMBER(S) TESTED	00:1C:BA:01:09:E9
TEST REPORT NUMBER	WC1100890
TEST DATE(S)	17 February – 07 March 2011

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable requirements of FCC Part 15, Subpart C, Section 15.247 "Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz", and Industry Canada RSS-210 Issue 8 "Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment" and RSS-Gen Issue 3 "General Requirements and Information for the Certification of Radiocommunication Equipment"

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

Date: 27 April 2011

Tested by:

Approved by:

Location: Taylors Falls MN
USA


Greg S Jakubowski
Senior EMC Technician


Joel T Schneider
Senior EMC Engineer

Not Transferable

EMC TEST REPORT

Test Report No. WC1100890 Date of issue: 27 April 2011

Product Description Wi Fi 802.11g module

Product Name Gen 3.5 MSR

Model No(s) Tested 100057-0001-AJ / 00:1C:BA:01:09:E9

Serial No(s) Tested 00:1C:BA:01:09:E9

Manufacturer Healthsense

Address 1191 Northland Drive Suite 100
Mendota Heights MN 55120

Test Result ☒ **Positive** ☐ **Negative**

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REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	48	27 April 2011	Initial Release



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EMC TEST REGULATIONS:

The tests were performed according to the following regulations:

- FCC Part 15 Subpart C Section 15.247 Paragraphs (a)(2), (b)(3), (d), (e)
- Industry Canada RSS-210 Issue 8, Sections A8.2(a), A8.4(4), A8.5, A8.2(b), A9.2, A9.3
- Industry Canada RSS-Gen Issue 3 Sections 4.6.1

ENVIRONMENTAL CONDITIONS IN THE LAB

	<u>Actual</u>
Temperature:	: 23°C
Atmospheric pressure	: 99 kPa
Relative Humidity	: 12-13%

POWER SUPPLY UTILIZED

Power supply system : 3.0 VDC

TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

SIGN EXPLANATIONS

- ☐ - not applicable
- ☒ - applicable

6 dB Bandwidth

FCC 15.247(a)(2), IC RSS-210 A8.2(a)

Test summary

The requirements are: ■ - MET □ - NOT MET

Testing was performed in accordance with the test procedure of FCC KDB Publication 558074

The minimum 6 dB bandwidth = 16.40 MHz

Test location

□ - Wild River Lab Large Test Site (Open Area Test Site)

□ - Wild River Lab Small Test Site (Open Area Test Site)

■ - Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	09-Aug-11

Test limit

500 kHz minimum

Test data

See following pages

6 dB Bandwidth
Channel 1, 6 Mbps

Agilent 09:06:44 Feb 17, 2011

▲ Mkr2 16.42 MHz
-0.19 dB

Ref 111.5 dBμV

Atten 20 dB

#Peak

Log

2

dB/

Offst

0.5

dB

DI

104.1

dBμV

LgAv

S1 S2

Center 2.412 00 GHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 1.933 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.413 28 GHz	110.10 dBμV
2R	(3)	Freq	2.403 78 GHz	104.47 dBμV
2Δ	(3)	Freq	16.42 MHz	-0.19 dB

6 dB Bandwidth
Channel 1, 54 Mbps

Agilent 09:36:46 Mar 1, 2011

▲ Mkr2 16.44 MHz
0.74 dB

Ref 111.5 dBμV

Atten 20 dB

#Peak

Log

2

dB/

Offst

0.5

dB

DI

104.9

dBμV

LgAv

S1 S2

Center 2.412 00 GHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 1.933 ms (1001 pts)

Span 20 MHz

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.413 32 GHz	110.91 dBμV
2R	(3)	Freq	2.403 80 GHz	104.28 dBμV
2Δ	(3)	Freq	16.44 MHz	0.74 dB

6 dB Bandwidth
Channel 6, 6 Mbps

Agilent 09:43:44 Mar 1, 2011

▲ Mkr2 16.46 MHz
0.15 dB

Ref 114 dBμV

Atten 20 dB

#Peak

Log

2

dB/

Offst

0.5

dB

DI

104.0

dBμV

LgAv

S1 S2

Center 2.437 00 GHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 1.933 ms (1001 pts)

Span 20 MHz

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.438 32 GHz	110.02 dBμV
2R	(3)	Freq	2.428 80 GHz	103.82 dBμV
2Δ	(3)	Freq	16.46 MHz	0.15 dB

6 dB Bandwidth
Channel 6, 54 Mbps

Agilent 09:41:23 Mar 1, 2011

▲ Mkr2 16.44 MHz
-0.12 dB

Ref 114 dBμV

Atten 20 dB

#Peak

Log

2

dB/

Offst

0.5

dB

DI

105.2

dBμV

LgAv

S1 S2

Center 2.437 00 GHz

Span 20 MHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 1.933 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.433 60 GHz	111.15 dBμV
2R	(3)	Freq	2.428 80 GHz	105.50 dBμV
2Δ	(3)	Freq	16.44 MHz	-0.12 dB

6 dB Bandwidth
Channel 11, 6 Mbps

Agilent 09:45:51 Mar 1, 2011

▲ Mkr2 16.42 MHz
0.64 dB

Ref 114 dBμV

Atten 20 dB

#Peak

Log

2

dB/

Offst

0.5

dB

DI

103.5

dBμV

LgAv

S1 S2

Center 2.462 00 GHz

Span 20 MHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 1.933 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.463 28 GHz	109.48 dBμV
2R	(3)	Freq	2.453 80 GHz	102.96 dBμV
2Δ	(3)	Freq	16.42 MHz	0.64 dB

6 dB Bandwidth
Channel 11, 54 Mbps

Agilent 09:48:13 Mar 1, 2011

▲ Mkr2 16.40 MHz
0.02 dB

Ref 114 dBμV

Atten 20 dB

#Peak

Log

2

dB/

Offst

0.5

dB

DI

105.2

dBμV

LgAv

S1 S2

Center 2.462 00 GHz

Span 20 MHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 1.933 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.455 14 GHz	111.20 dBμV
2R	(3)	Freq	2.453 82 GHz	105.39 dBμV
2Δ	(3)	Freq	16.40 MHz	0.02 dB

Maximum peak output power

FCC 15.247(b)(3), IC RSS-210 A8.4(4)

Test summary

The requirements are: ☒ - MET ☐ - NOT MET

Testing was performed in accordance with the test procedure of FCC KDB Publication 558074

Conducted measurements were made using the debug port, an inline RF connector which contains a switch that isolates the antenna when the mating RF connector is plugged in.

Maximum peak output power measured with a power meter is 18.5 dBm or 0.071 W

The antenna gain is 0.5 dBi.

Test location

☐ - Wild River Lab Large Test Site (Open Area Test Site)

☐ - Wild River Lab Small Test Site (Open Area Test Site)

☒ - Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	09-Aug-11
WRLE03334	8542C	Giga-tronics	Peak Power Meter	1831096	18-Mar-12
WRLE03335	80350A	Giga-tronics	Peak Power Sensor	1828549	18-Mar-12

Test limit

1 watt

Test Data

Channel	Data rate (Mbps)	Peak power (dBm)
1	6	18.1
6	6	18.0
11	6	17.9
1	54	17.8
6	54	18.3
11	54	18.5

Spurious emissions

FCC 15.247(d), IC RSS-210 A8.5

Test summary

The requirements are: ■ - MET □ - NOT MET

Testing was performed in accordance with ANSI C63.4 2003, clause 8.3 and FCC KDB Publication 558074

Maximum conducted spurious emission is -2.22 dBc, channel 11, 54 MB

For radiated emissions, the device was positioned on its side which produces the highest fundamental field strength when compared in 3 orthogonal axes.

Maximum radiated spurious emission is 72.75 dBμV/m pk or 4340 μV/m at 3 meters at 1.232 GHz.

Minimum margin of compliance = 1.25 dB.

Test location

■ - Wild River Lab Large Test Site (Open Area Test Site)

□ - Wild River Lab Small Test Site (Open Area Test Site)

■ - Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03229	3115	EMCO	Ridge Guide Antenna	2483	30-Jul-11
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 05-Oct-11
WRLE03997	EWT-14-0066	EWT	2.4 GHz Notch filter	E2	Code B 20-Apr-12
NBLE03196	8566B	Hewlett-Packard	Spectrum Analyzer	2240A01856	19-Oct-11
NBLE03195	85662A	Hewlett-Packard	Analyzer Display	2648A13518	19-Oct-11
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	09-Aug-11
WRLE03978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	Code B 23-Jul-11
WRLE06717	3116	EMCO	Ridge Guide Ant 18-40 GHz	2005	08-Jun-11
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 05-Oct-11
WRLE03933	F551B-1	Acronetics	8 – 12 GHz Bandpass Filter	010	Code B 05-Oct-11
WRLE03934	F549B-1	Acronetics	2 – 4 GHz Bandpass Filter	010	Code B 05-Oct-11
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 05-Oct-11

Cal Code B = Calibration verification performed internally.

Test limit - conducted

-20 dBc

Test limit within restricted bands per 15.205 - radiated

Frequency (MHz)	Field strength (μV/meter)	Field strength (dBμV/meter)
30 - 88	100, QP	40.0
88 - 216	150, QP	43.5
216 - 960	200, QP	46.0
Above 960	500, QP	54.0
> 1000	500, AV 5000, PK	54.0 74.0

Radiated Emissions

The spectrum analyzer uses a quasi-peak detector for frequencies up to and including 1 GHz. For measurements above 1 GHz, peak and average detectors are used. The bandwidths used are equal to or greater than 100 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 100 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz. Video bandwidths are at least three times greater than the IF bandwidth. Average measurements above 1 GHz are also achieved using a peak detector with 1 MHz RBW and 10 Hz VBW.

Test data

See following pages

Conducted spurious emissions
Channel 1, 6 Mbps

Agilent 11:31:37 Feb 17, 2011

Mkr3 3.63 GHz
80.19 dB μ V



S1 S2 Start 30 MHz Stop 25.00 GHz
#Res BW 100 kHz VBW 300 kHz Sweep 2.386 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.43 GHz	108.43 dB μ V
2	(3)	Freq	1.20 GHz	81.52 dB μ V
3	(3)	Freq	3.63 GHz	80.19 dB μ V

Conducted spurious emissions
Channel 1, 54 Mbps

Agilent 10:50:54 Mar 1, 2011

Mkr3 3.63 GHz
79.83 dB μ V



S1 S2 Start 30 MHz Stop 25.00 GHz
#Res BW 100 kHz VBW 300 kHz Sweep 2.386 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.43 GHz	108.73 dB μ V
2	(3)	Freq	1.20 GHz	80.43 dB μ V
3	(3)	Freq	3.63 GHz	79.83 dB μ V

Conducted spurious emissions
Channel 6, 6 Mbps

Agilent 10:45:39 Mar 1, 2011

Mkr3 1.23 GHz
82.10 dB μ V

Ref 115 dB μ V

Atten 20 dB

#Peak

Log

10

dB/

Offst

0.5

dB

DI

87.9

dB μ V

LgAv

S1 S2

Start 30 MHz

Stop 25.00 GHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 2.386 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.43 GHz	107.94 dB μ V
2	(3)	Freq	3.65 GHz	85.25 dB μ V
3	(3)	Freq	1.23 GHz	82.10 dB μ V

Conducted spurious emissions
Channel 6, 54 Mbps

Agilent 10:33:27 Mar 1, 2011

Mkr3 3.65 GHz
74.19 dB μ V



S1 S2
Start 30 MHz Stop 25.00 GHz
#Res BW 100 kHz VBW 300 kHz Sweep 2.386 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.43 GHz	111.26 dB μ V
2	(3)	Freq	1.23 GHz	82.02 dB μ V
3	(3)	Freq	3.65 GHz	74.19 dB μ V

Conducted spurious emissions
Channel 11, 6 Mbps

Agilent 10:02:40 Mar 1, 2011

Mkr3 3.70 GHz
77.71 dB μ V

Ref 115 dB μ V

Atten 20 dB

#Peak

Log

10

dB/

Offst

0.5

dB

DI

87.6

dB μ V

LgAv

S1 S2

Start 30 MHz

Stop 25.00 GHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 2.386 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.45 GHz	107.65 dB μ V
2	(3)	Freq	1.23 GHz	84.88 dB μ V
3	(3)	Freq	3.70 GHz	77.71 dB μ V

Conducted spurious emissions
Channel 11, 54 Mbps

Agilent 09:58:31 Mar 1, 2011

Mkr3 3.70 GHz
80.42 dB μ V

Ref 115 dB μ V

Atten 20 dB

#Peak

Log

10

dB/

Offst

0.5

dB

DI

89.2

dB μ V

LgAv

S1 S2

Start 30 MHz

Stop 25.00 GHz

#Res BW 100 kHz

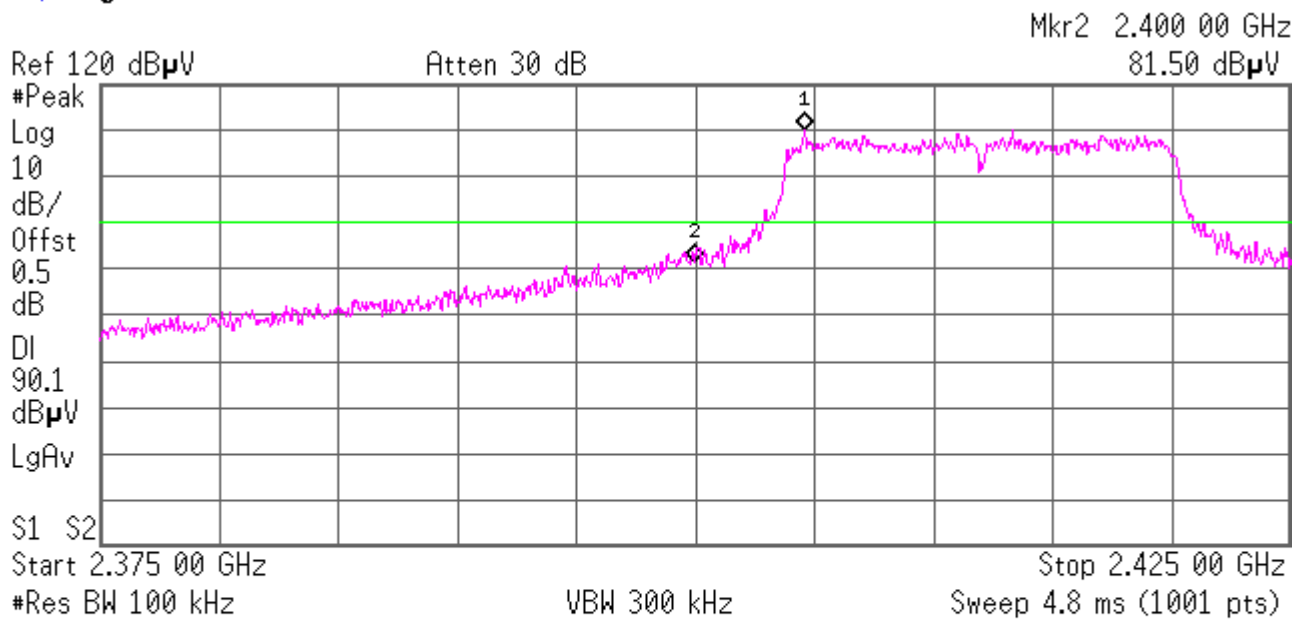
VBW 300 kHz

Sweep 2.386 s (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.48 GHz	109.21 dB μ V
2	(3)	Freq	1.23 GHz	86.98 dB μ V
3	(3)	Freq	3.70 GHz	80.42 dB μ V

Conducted bandedge
Channel 1, 6 Mbps

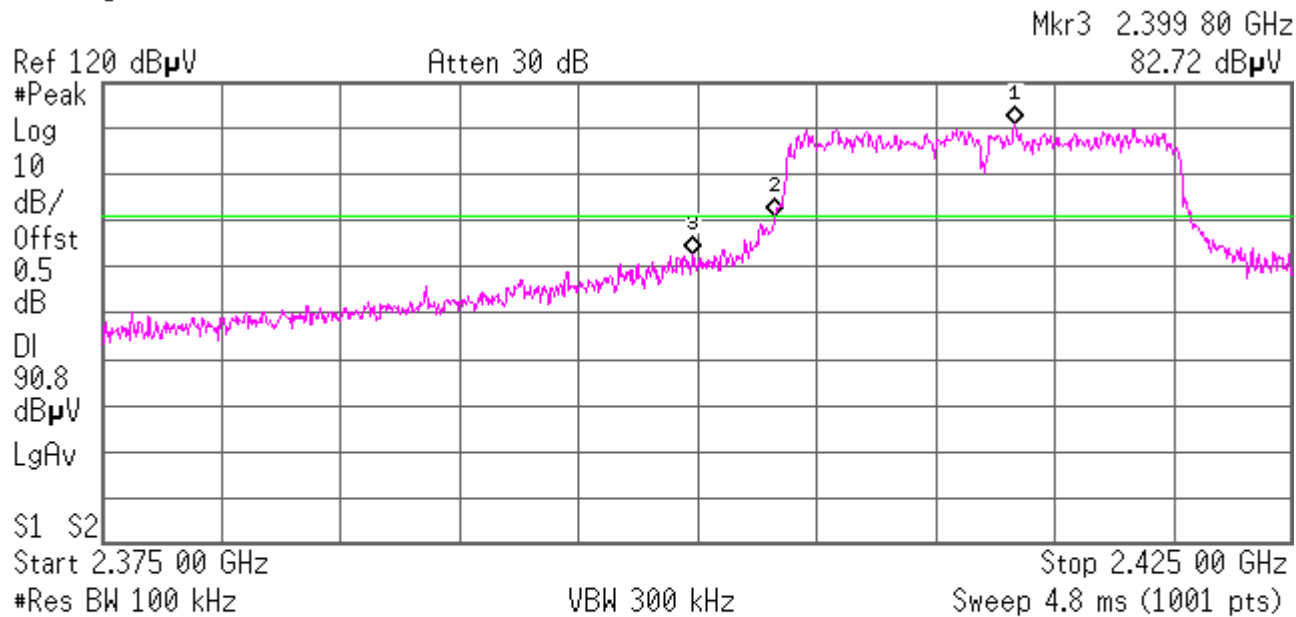
Agilent 11:28:58 Feb 17, 2011



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.404 55 GHz	110.06 dB μ V
2	(3)	Freq	2.400 00 GHz	81.50 dB μ V

Conducted bandedge
Channel 1, 54 Mbps

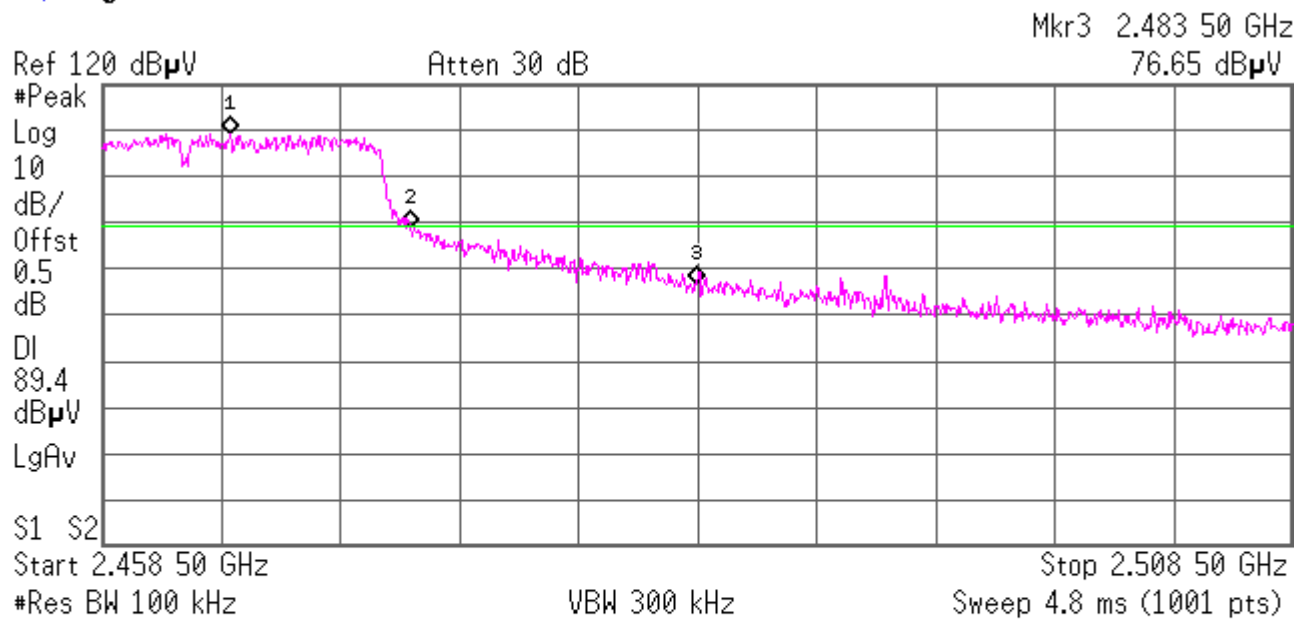
* Agilent 10:58:50 Mar 1, 2011



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.413 35 GHz	110.77 dB μ V
2	(3)	Freq	2.403 25 GHz	91.14 dB μ V
3	(3)	Freq	2.399 80 GHz	82.72 dB μ V

Conducted bandedge
Channel 11, 6 Mbps

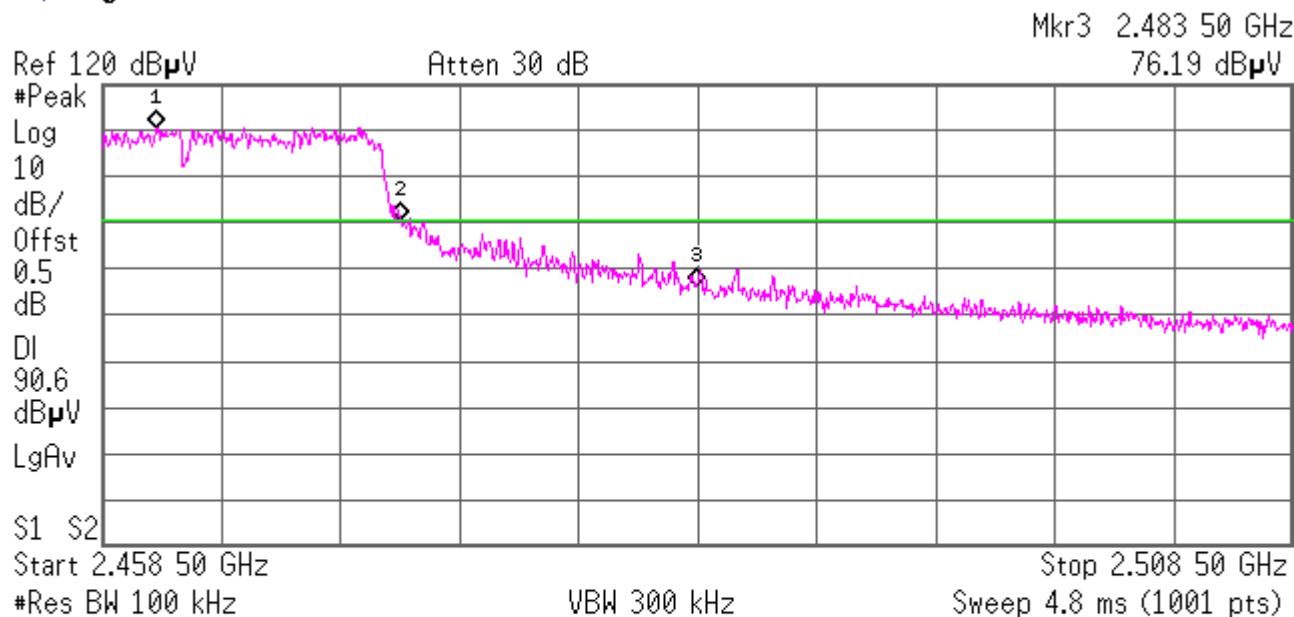
* Agilent 11:04:29 Mar 1, 2011



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.463 90 GHz	109.39 dB μ V
2	(3)	Freq	2.471 40 GHz	88.86 dB μ V
3	(3)	Freq	2.483 50 GHz	76.65 dB μ V

Conducted bandedge
Channel 11, 54 Mbps

Agilent 11:02:15 Mar 1, 2011



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	2.460 80 GHz	110.64 dB μ V
2	(3)	Freq	2.471 00 GHz	90.51 dB μ V
3	(3)	Freq	2.483 50 GHz	76.19 dB μ V

Radiated emissions

Measurement summary for limit1: FCC 15.247 >1GHz 3m av (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av
1.232 GHz	65.6 Av	3.33 / 25.31 / 41.79 / 0.0	52.46	H / 1.30 / 79	-1.54
1.219 GHz	61.56 Av	3.32 / 25.24 / 41.68 / 0.07	48.52	H / 1.10 / 48	-5.48
3.663 GHz	50.86 Av	6.14 / 31.63 / 43.36 / 0.6	45.86	V / 1.50 / 117	-8.14
3.701 GHz	50.88 Av	6.17 / 31.72 / 43.27 / 0.0	45.49	V / 1.00 / 9	-8.51
1.207 GHz	58.04 Av	3.3 / 25.17 / 41.54 / 0.0	44.97	H / 1.40 / 89	-9.03
3.626 GHz	48.87 Av	6.1 / 31.55 / 43.45 / 0.0	43.07	V / 1.00 / 6	-10.93
4.925 GHz	45.94 Av	7.25 / 33.0 / 43.2 / 0.0	43.0	H / 1.60 / 8	-11.0
4.823 GHz	45.96 Av	7.16 / 32.81 / 43.32 / 0.0	42.6	H / 1.10 / 8	-11.4
4.874 GHz	42.54 Av	7.21 / 32.91 / 43.26 / 0.23	39.63	H / 1.39 / 69	-14.37
3.664 GHz	43.71 Av	6.14 / 31.63 / 43.36 / 0.6	38.72	V / 1.54 / 116	-15.28
4.823 GHz	41.84 Av	7.16 / 32.81 / 43.32 / 0.0	38.48	H / 1.13 / 8	-15.52
3.701 GHz	43.67 Av	6.17 / 31.72 / 43.28 / 0.0	38.28	V / 1.14 / 7	-15.72
3.626 GHz	43.58 Av	6.1 / 31.54 / 43.46 / 0.0	37.77	V / 1.00 / 4	-16.23
4.923 GHz	40.68 Av	7.25 / 33.0 / 43.2 / 0.0	37.73	H / 1.76 / 6	-16.27
2.364 GHz	41.6 Av	4.78 / 27.8 / 43.92 / 6.07	36.32	V / 1.00 / 200	-17.68
1.232 GHz	45.81 Av	3.33 / 25.31 / 41.79 / 0.0	32.66	H / 1.28 / 87	-21.34
1.207 GHz	45.55 Av	3.3 / 25.17 / 41.55 / 0.0	32.48	H / 1.30 / 89	-21.52
2.9 GHz	39.07 Av	5.36 / 29.04 / 43.41 / 0.87	30.93	V / 1.00 / 8	-23.07
2.484 GHz	29.9 Av	4.9 / 28.31 / 44.06 / 0.0	19.05	V / 1.10 / 6	-34.95
2.484 GHz	28.5 Av	4.9 / 28.31 / 44.07 / 0.0	17.65	V / 1.10 / 4	-36.35
2.39 GHz	18.45 Av	4.8 / 27.91 / 43.97 / 0.0	7.19	V / 1.10 / 62	-46.81
2.389 GHz	10.25 Av	4.8 / 27.9 / 43.97 / 0.0	-1.01	V / 1.10 / 64	-55.01

Radiated emissions

Measurement summary for limit2: FCC 15.247 >1G 3m pk (Pk)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA2 FCC 15.247 >1G 3m pk
1.232 GHz	85.9 Pk	3.33 / 25.31 / 41.79 / 0.0	72.75	H / 1.28 / 87	-1.25
1.232 GHz	85.45 Pk	3.33 / 25.31 / 41.79 / 0.0	72.31	H / 1.30 / 79	-1.69
1.219 GHz	84.55 Pk	3.32 / 25.24 / 41.68 / 0.07	71.51	H / 1.10 / 48	-2.49
2.484 GHz	81.7 Pk	4.9 / 28.31 / 44.07 / 0.0	70.85	V / 1.10 / 6	-3.15
2.485 GHz	80.3 Pk	4.91 / 28.31 / 44.06 / 0.0	69.45	V / 1.10 / 4	-4.55
3.664 GHz	72.7 Pk	6.14 / 31.63 / 43.36 / 0.6	67.71	V / 1.54 / 116	-6.29
1.207 GHz	80.65 Pk	3.3 / 25.17 / 41.54 / 0.0	67.58	H / 1.40 / 89	-6.42
3.701 GHz	72.2 Pk	6.17 / 31.72 / 43.28 / 0.0	66.81	V / 1.14 / 7	-7.19
3.663 GHz	71.5 Pk	6.14 / 31.63 / 43.36 / 0.6	66.5	V / 1.50 / 117	-7.5
1.207 GHz	78.3 Pk	3.3 / 25.17 / 41.55 / 0.0	65.23	H / 1.30 / 89	-8.77
3.701 GHz	69.9 Pk	6.17 / 31.72 / 43.27 / 0.0	64.51	V / 1.00 / 9	-9.49
3.626 GHz	70.1 Pk	6.1 / 31.55 / 43.45 / 0.0	64.3	V / 1.00 / 6	-9.7
2.931 GHz	70.8 Pk	5.39 / 29.18 / 43.36 / 0.86	62.87	V / 1.00 / 0	-11.13
3.626 GHz	68.65 Pk	6.1 / 31.54 / 43.46 / 0.0	62.84	V / 1.00 / 4	-11.16
2.39 GHz	70.25 Pk	4.8 / 27.91 / 43.97 / 0.0	58.99	V / 1.10 / 62	-15.01
2.364 GHz	63.5 Pk	4.78 / 27.8 / 43.92 / 6.07	58.22	V / 1.00 / 200	-15.78
4.874 GHz	60.2 Pk	7.21 / 32.91 / 43.26 / 0.23	57.29	H / 1.39 / 69	-16.71
4.823 GHz	59.55 Pk	7.16 / 32.81 / 43.32 / 0.0	56.19	H / 1.13 / 8	-17.81
4.925 GHz	56.9 Pk	7.25 / 33.0 / 43.2 / 0.0	53.96	H / 1.60 / 8	-20.04
4.823 GHz	57.05 Pk	7.16 / 32.81 / 43.32 / 0.0	53.69	H / 1.10 / 8	-20.31
4.923 GHz	56.1 Pk	7.25 / 33.0 / 43.2 / 0.0	53.15	H / 1.76 / 6	-20.85
2.389 GHz	62.05 Pk	4.8 / 27.9 / 43.97 / 0.0	50.79	V / 1.10 / 64	-23.21
3.657 GHz	55.55 Pk	6.13 / 31.62 / 43.38 / 0.6	50.52	V / 1.00 / 0	-23.48
2.9 GHz	57.05 Pk	5.36 / 29.04 / 43.41 / 0.87	48.91	V / 1.00 / 8	-25.09
2.439 GHz	66.35 Pk	4.86 / 28.11 / 0.0 / 0.0	99.32	V / 1.00 / 250	-25.88
2.436 GHz	63.6 Pk	4.85 / 28.1 / 0.0 / 0.0	96.56	V / 1.06 / 352	-28.64
2.431 GHz	63.4 Pk	4.85 / 28.08 / 0.0 / 0.0	96.33	V / 1.00 / 336	-28.87
2.419 GHz	63.2 Pk	4.83 / 28.03 / 0.0 / 0.0	96.06	V / 1.00 / 334	-29.14



Power spectral density

FCC 15.247(e), IC RSS-210 A8.2(b)

Test summary

The requirements are: ☒ - MET ☐ - NOT MET

Test was performed in accordance with the test procedure of FCC KDB Publication 558074

Maximum power spectral density is -20.8 dBm / 3 kHz

Test location

☐ - Wild River Lab Large Test Site (Open Area Test Site)

☐ - Wild River Lab Small Test Site (Open Area Test Site)

☒ - Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	09-Aug-11

Test limit

No greater than 8 dBm in any 3 kHz band

Test data

See following pages.

Power spectral density
Channel 1, 6 Mbps

* Agilent 09:33:34 Mar 7, 2011

PSD=dBm/Hz+35=dBm/3kHz=-22.59dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

0.5

dB

LgAv

S1 S2

Center 2.412 00 GHz

#Res BW 1 MHz

#VBW 8 MHz

Span 50 MHz

Sweep 1 ms (1001 pts)

Channel Power

16.44 dBm /25.3000 MHz

Power Spectral Density

-57.59 dBm/Hz



Power spectral density
Channel 1, 54 Mbps

* Agilent 09:30:20 Mar 7, 2011

PSD=dBm/Hz+35=dBm/3kHz=-24.18dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

0.5

dB

LgAv

S1 S2

Center 2.412 00 GHz

#Res BW 1 MHz

#VBW 8 MHz

Span 50.59 MHz

Sweep 1 ms (1001 pts)

Channel Power

14.90 dBm /25.6000 MHz

Power Spectral Density

-59.18 dBm/Hz



Power spectral density
Channel 6, 6 Mbps

* Agilent 09:15:17 Mar 7, 2011

PSD=dBm/Hz+35=dBm/3kHz=-25.22dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

0.5

dB

LgAv

S1 S2

Center 2.437 00 GHz

#Res BW 1 MHz

#VBW 8 MHz

Span 50 MHz

Sweep 1 ms (1001 pts)

Channel Power

13.81 dBm /25.3000 MHz

Power Spectral Density

-60.22 dBm/Hz

Power spectral density
Channel 6, 54 Mbps

* Agilent 09:09:48 Mar 7, 2011

PSD=dBm/Hz+35=dBm/3kHz=-29.48dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

0.5

dB

LgAv

S1 S2

Center 2.437 00 GHz

#Res BW 1 MHz

#VBW 8 MHz

Span 50 MHz

Sweep 1 ms (1001 pts)

Channel Power

9.61 dBm /25.6000 MHz

Power Spectral Density

-64.48 dBm/Hz

Power spectral density
Channel 11, 6 Mbps

Agilent 09:19:13 Mar 7, 2011

PSD=dBm/Hz+35=dBm/3kHz=-20.8dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

0.5

dB

LgAv

S1 S2

Center 2.462 00 GHz

#Res BW 1 MHz

#VBW 8 MHz

Span 50 MHz

Sweep 1 ms (1001 pts)

Channel Power

18.23 dBm /25.3000 MHz

Power Spectral Density

-55.80 dBm/Hz

Power spectral density
Channel 11, 54 Mbps

Agilent 09:25:52 Mar 7, 2011

PSD=dBm/Hz+35=dBm/3kHz=-24.21dBm

Ref 20 dBm

Atten 30 dB

#Peak

Log

10

dB/

Offst

0.5

dB

LgAv

S1 S2

Center 2.462 00 GHz

#Res BW 1 MHz

#VBW 8 MHz

Span 50.59 MHz

Sweep 1 ms (1001 pts)

Channel Power

14.87 dBm /25.6000 MHz

Power Spectral Density

-59.21 dBm/Hz

99% Bandwidth IC RSS-GEN 4.6

Test summary

The requirements are: ☒ - MET ☐ - NOT MET

Test was performed in accordance with the article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau

99% Occupied bandwidth range is from 16.2 MHz to 16.25 MHz.

Test location

☐ - Wild River Lab Large Test Site (Open Area Test Site)

☐ - Wild River Lab Small Test Site (Open Area Test Site)

☒ - Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	09-Aug-11

Test limit

Not applicable

Test data

See following pages

99% Occupied bandwidth
6 Mbps

* Agilent 09:54:26 Mar 7, 2011

REF lvl = Pk with max RBW

▲ Mkr1 16.20 MHz

Ref 18 dBm

Atten 30 dB

-0.29 dB

#Samp

Log

10

dB/

Offst

0.5

dB

DI

-2.0

dBm

LgAv

S1 S2

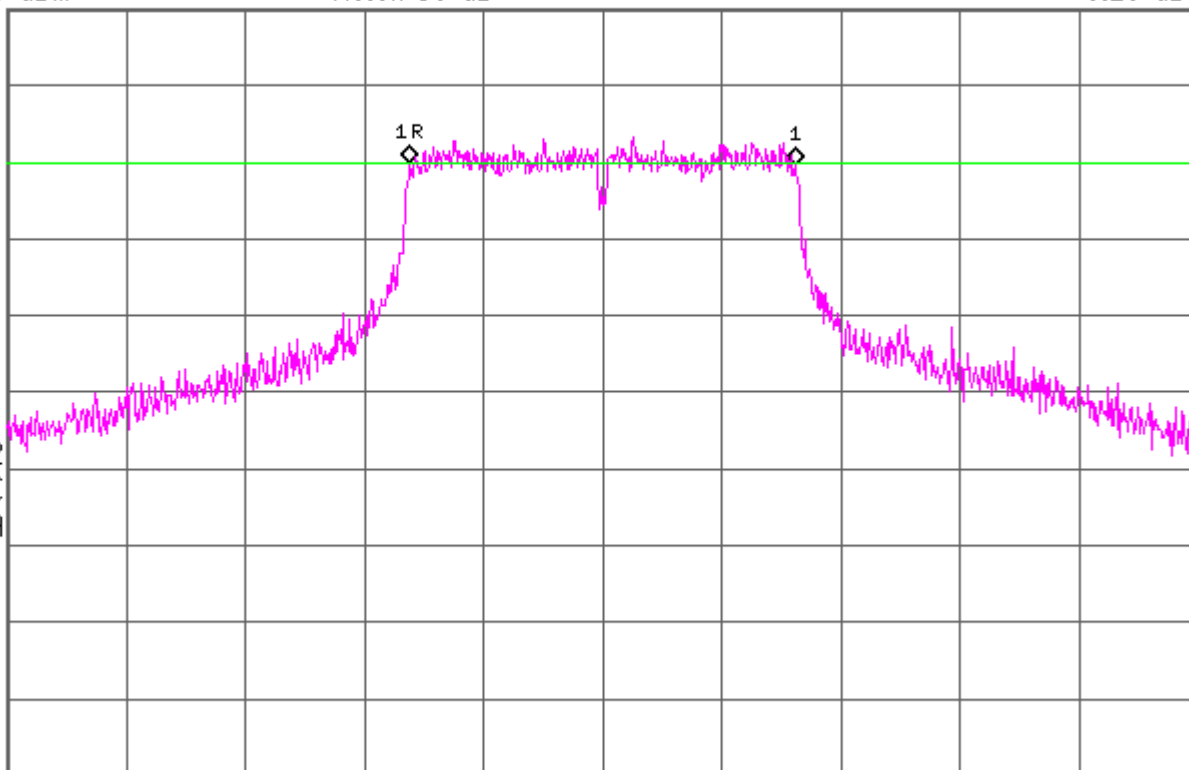
V3 FC

AA

£(f):

FTun

#Swp



Center 2.412 00 GHz

Span 50 MHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 15.13 ms (1001 pts)

99% Occupied bandwidth
54 Mbps

Agilent 09:56:41 Mar 7, 2011

REF lvl = Pk with max RBW

▲ Mkr1 16.25 MHz

Ref 18 dBm

Atten 30 dB

0.82 dB

#Samp

Log

10

dB/

Offst

0.5

dB

DI

-2.0

dBm

LgAv

S1 S2

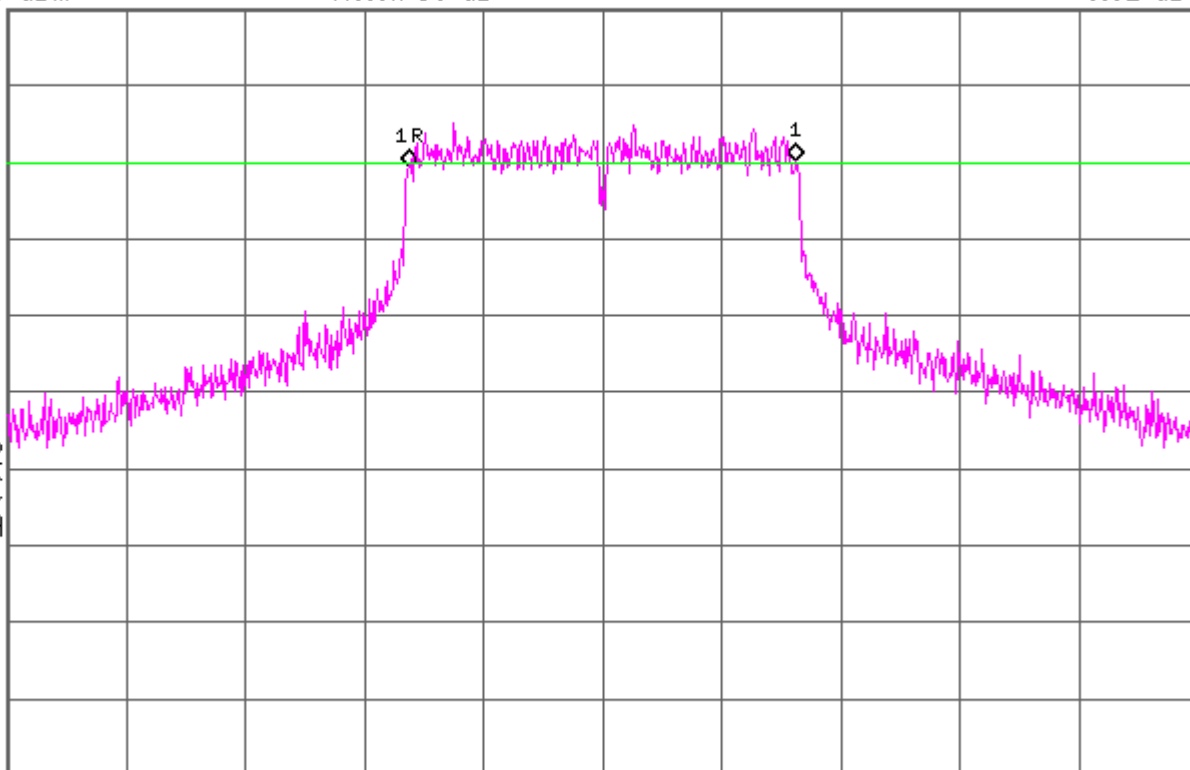
V3 FC

AA

$\mathcal{E}(f)$:

FTun

#Swp



Center 2.412 00 GHz

Span 50 MHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 15.13 ms (1001 pts)

Test-setup photo(s):
Radiated measurements



Test-setup photo(s):
Conducted measurements



Equipment Under Test (EUT) Test Operation Mode:

The device under test was operated under the following conditions during emissions testing:

- ☐ - Standby
 - ☐ - Test program (H - Pattern)
 - ☐ - Test program (color bar)
 - ☐ - Test program (customer specific)
 - ☐ - Practice operation
 - ☐ - Normal Operating Mode
 - ☒ - See Software and/or Operating Modes in Appendix A
-

Configuration of the device under test:

- ☒ - See Constructional Data Form and Block Diagram in Appendix A
- ☐ - See Product Information Form in Appendix B

GENERAL REMARKS:

None

Modifications required to pass:

- ☒ None
- ☐ As indicated on the data sheet(s)

Test Specification Deviations: Additions to or Exclusions from:

- ☒ None
- ☐ As indicated in the Test Plan
- ☐

SUMMARY:

The requirements according to the technical regulations are

- ☒ - met and the equipment under test does fulfill the general approval requirements.
- ☐ - **not** met and the equipment under test does **not** fulfill the general approval requirements.

EUT Received Date: 17 February 2011
Condition of EUT: Normal
Testing Start Date: 17 February 2011
Testing End Date: 7 March 2011

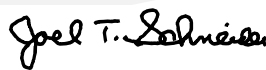
TÜV SÜD AMERICA INC

Tested by:



Greg S Jakubowski
Senior EMC Technician

Approved by:



Joel T Schneider
Senior EMC Engineer

Appendix A

Constructional Data Form





EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.
NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.

Company: Healthsense
 Address: 1191 Northland Drive Suite 100
Mendota Heights, MN 55120
 Contact: Collin LaFave Position: Electronics Engineer
 Phone: 952.400.7328 Fax: 952.400.7299
 E-mail Address: collin.lafave@healthsense.com

General Equipment Description -- NOTE: This information will be input into your test report as shown below.

EUT Description Wi Fi 802.11g module
 EUT Name Gen 3.5 MSR
 Model No.: 100057-0001-AJ Serial No.: 00:1C:BA:01:09:E9
 Product Options: _____
 Configurations to be tested: special firmware load-transmitter always on

Equipment Modification (If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)

Modifications since last test: none
 Modifications made during test: none

Test Objective(s): Please indicate the tests to be performed, entering the applicable standard(s) where noted.

- | | |
|---|---|
| <input type="checkbox"/> EMC Directive 2004/108/EC (EMC)
Std: _____ | <input checked="" type="checkbox"/> FCC: Class <input type="checkbox"/> A <input checked="" type="checkbox"/> B Part <u>C</u> |
| <input type="checkbox"/> Machinery Directive 89/392/EEC (EMC)
Std: _____ | <input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B |
| <input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC)
Std: _____ | <input type="checkbox"/> BSMI: Class <input type="checkbox"/> A <input type="checkbox"/> B (Separate Report) |
| <input type="checkbox"/> Vehicle Directive - 2004/104/EC (EMC)
<input type="checkbox"/> Other Vehicle Std: _____ | <input checked="" type="checkbox"/> Canada: Class <input type="checkbox"/> A <input checked="" type="checkbox"/> B |
| <input type="checkbox"/> FDA Reviewers Guidance for Premarket Notification Submissions (EMC) | <input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B |
| | <input type="checkbox"/> Other: _____ |
| | <input type="checkbox"/> Ag Directive *2009/64/EC (EMC) |

Third Party Certification (contact TÜV for quote), if applicable (*Signature on last page required).

- | | |
|---|--|
| <input type="checkbox"/> Attestation of Compliance (AoC)* | <input type="checkbox"/> EMC Certification (used with Octagon Mark)* |
| <input type="checkbox"/> Statement of Compliance (SoC, previously CoC)* - All aspects of the essential requirements were assessed | |
| Protection Class (Req'd for AoC, SoC, EMC Cert. N/A for vehicles) <input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III
<small>(Press F1 when field is selected to show additional information on Protection Class.)</small> | |
| <input checked="" type="checkbox"/> FCC / TCB Certification | <input type="checkbox"/> Taiwan Certification |
| <input checked="" type="checkbox"/> Industry Canada / FCB Certification | <input type="checkbox"/> Korean Certification |
| <input type="checkbox"/> e-Mark Certification | |



EMC Test Plan and Constructional Data Form

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - Complete this section if testing will not be attended by the customer.

If a failure occurs, TÜV SÜD America should:

- ☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____
- ☐ Continue testing to complete test series.
- ☐ Continue testing to define corrective action.
- ☐ Stop testing.

EUT Specifications and Requirements

Length: 1.4" Width: .9 Height: .150 Weight: 1 ounce

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 3 V DC (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: _____

Current (Amps/phase(max)): 300 mA Current (Amps/phase(nominal)): 30 uA

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Residential and skilled nursing facilities.

EUT Power Cable

☐ Permanent OR ☐ Removable Length (in meters): _____

☐ Shielded OR ☐ Unshielded

☒ Not Applicable

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables														
Type	Analog	Digital	During Test		Qty	Shielding		Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent	
			Active	Passive		Yes	No							Type
EXAMPLE: RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Test Serial Port	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>		surface contact	pogo pin		1'	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>



EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: EPSILON_SDK_0_5_0

Description: TEST/CALIBRATION PROGRAM

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. CONSTANT TRANSMIT, FOR RADIATED AND CONDUCTED MEASUREMENTS
2. 9.0 OPERATION CODE, FOR DUTY CYCLE
- 3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #
GEN 3_5 MSR (ALWAYS ON)	100057-0001-AJ	00:1C:BA:01:09:E 9	VUR100057
GEN 3_5 MSR (OP CODE)	100057-0001-AJ	00:1C:BA:03:12:C C	VUR100057



EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)
This information is required for FCC & Taiwan testing.

<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
LAPTOP COMPUTER	HP PAVILION DV6000	CNF7277B2H	

Oscillator Frequencies

<i>Manufacturer</i>	<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
Y1	40 MHZ	2.4 GHZ	Y2	DIGITAL CLOCK, 2.4 GHZ SYNTH

Power Supply

<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

Power Line Filters

<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>



EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>
BANDPASS FILTER	JOHANSON	2450BP15E010 0E	1	F1
POWER AMP	AVAGO	MGA-412P8	1	U4
ANTENNA	JOHANSON	2450AT18A100	2	ANT1 & ANT2
CAP	VARIOUS	8.2p	8	C2 C18 C20 C26 C44 C45 C47 C51

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

Authorization (Signature Required if a Third Party Certification is checked on pg 1)

Customer authorization to perform tests
according to this test plan.

COLLIN LAFAVE

Test Plan/CDF Prepared By (please print)

Date

4-5-11

Date

Appendix B

Measurement Protocol



MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emissions testing is performed according to the procedures in ANSI C63.4-2003, FCC KDB Publication 558074, the article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau, & FCC Public Notice DA 02-2138.

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of ± 1.8 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of ± 4.8 dB. The equipment comprising the test systems is calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

Conducted Emissions

Final measurement levels are determined by connecting the antenna port of the DUT to a spectrum analyzer input via coaxial adapters, high frequency coax, and attenuators as necessary. The loss created by the interconnect apparatus is offset by settings within the analyzer. Specific analyzer settings are determined by the procedures throughout this report.

Radiated Emissions

The spectrum analyzer uses a quasi-peak detector for frequencies up to and including 1 GHz. For measurements above 1 GHz, peak and average detectors are used. The bandwidths used are equal to or greater than 100 Hz from 9 kHz to 150 kHz, 9 kHz from 150 kHz to 30 MHz, 100 kHz from 30 MHz to 1000 MHz, and 1 MHz from 1 GHz to 40 GHz. Video bandwidths are at least three times greater than the IF bandwidth. Average measurements above 1 GHz are also achieved using a peak detector with 1 MHz RBW and 10 Hz VBW.

The final level, in dB μ V/m, equals the reading from the spectrum analyzer (Level dB μ V), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data. Intentional radiators are rotated through 3 orthogonal axes to determine the test position yielding the maximum emission levels.

Example:

FREQ (MHz)	LEVEL (dB μ V)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL (dB μ V/m)	POL/HGT/AZ (m) (deg)	DELTA1
60.80	42.5Qp +	1.2 + 10.9 - 25.5 =	29.1	V 1.0 0.0	-10.9

Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.