TEST RESULT SUMMARY

FCC Part 15 Subpart C Section 15.247
FCC Part 15 Subpart C Section 15.207
Industry Canada RSS-210 Issue 7
Industry Canada RSS-Gen Issue 2

MANUFACTURER'S NAME	Winland Electronics Incorporated
MANUFACTURER'S ADDRESS	1950 Excel Drive Mankato MN 56001
NAME OF EQUIPMENT	Wireless Temperature Sensor, Wireless Humidity Sensor, & Wireless Multi-Function Sensor
MODEL NUMBER(S) TESTED	EA-WTS, EA-WHS, & EA-WMFS
TEST REPORT NUMBER	WC800944
TEST DATE(S)	13 February - 19 March 2008

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the electromagnetic compatibility requirements of FCC Part 15 Subpart C Sections 15.247 *"Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz"* and 15.207 *"Conducted limits"* and Industry Canada's RSS-210 Issue 7 *"Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"* and RSS-Gen Issue 2 *"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.

		Tested by:	Approved by:
Date:	10 April 2008		
Location:	Taylors Falls MN USA	Greg Jakubowski Senior EMC Technician	Joel T Schneider Senior EMC Engineer

Not Transferable

EMC TEST REPORT

Test Report No.	**WC800944**	Date of issue:	10 April 2008
Model / Serial No(s) Tested	EA-WTS, EA-WHS, & EA-WMFS / ---		
Product Type	Wireless Temperature Sensor, Wireless Humidity Sensor, & Wireless Multi-Function Sensor		
Manufacturer	Winland Electronics Incorporated		
Address	1950 Excel Drive		
	Mankato MN 56001		
Test Result	■ **Positive** ☐ **Negative**		
Total pages including Appendices	**71**		

TÜV SÜD America Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV SÜD America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America Inc issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP, NIST, or any agency of the US government.

TÜV SÜD America Inc and its professional staff hold government and Professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NARTE, and VCCI.

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	71	10 April 2008	Initial Release

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TEST REPORT CONTENTS **Page(s)**

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are accurate. The reader is cautioned that there is some measurement variability due to the tolerances of the test equipment that can contribute to a nominal product measurement uncertainty. Furthermore, component differences and manufacturing process variability of production units similar to that tested may result in additional product uncertainty. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests.

TEST EQUIPMENT

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

EMC TEST REGULATIONS:
The tests were performed according to the following regulations:

- FCC Part 15 Subpart C Section 15.247
- FCC Part 15 Subpart C Section 15.207
- Industry Canada RSS-210 Issue 7
- Industry Canada RSS-Gen Issue 2

ENVIRONMENTAL CONDITIONS IN THE LAB

	Actual
Temperature:	: 21 - 24 °C
Relative Humidity	: 18 - 22 %
Atmospheric pressure	: 97 - 99 kPa

POWER SUPPLY UTILIZED

Power supply system	: 110 V / 60 Hz / 1ϕ

SIGN EXPLANATIONS

☐ - not applicable
■ - applicable

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

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

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Test was performed in accordance with the test procedure of FCC KDB Publication 558074
The minimum 6 dB bandwidth = 1.45 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	19-Dec-08

Test limit
500 kHz minimum

Test data
See following pages

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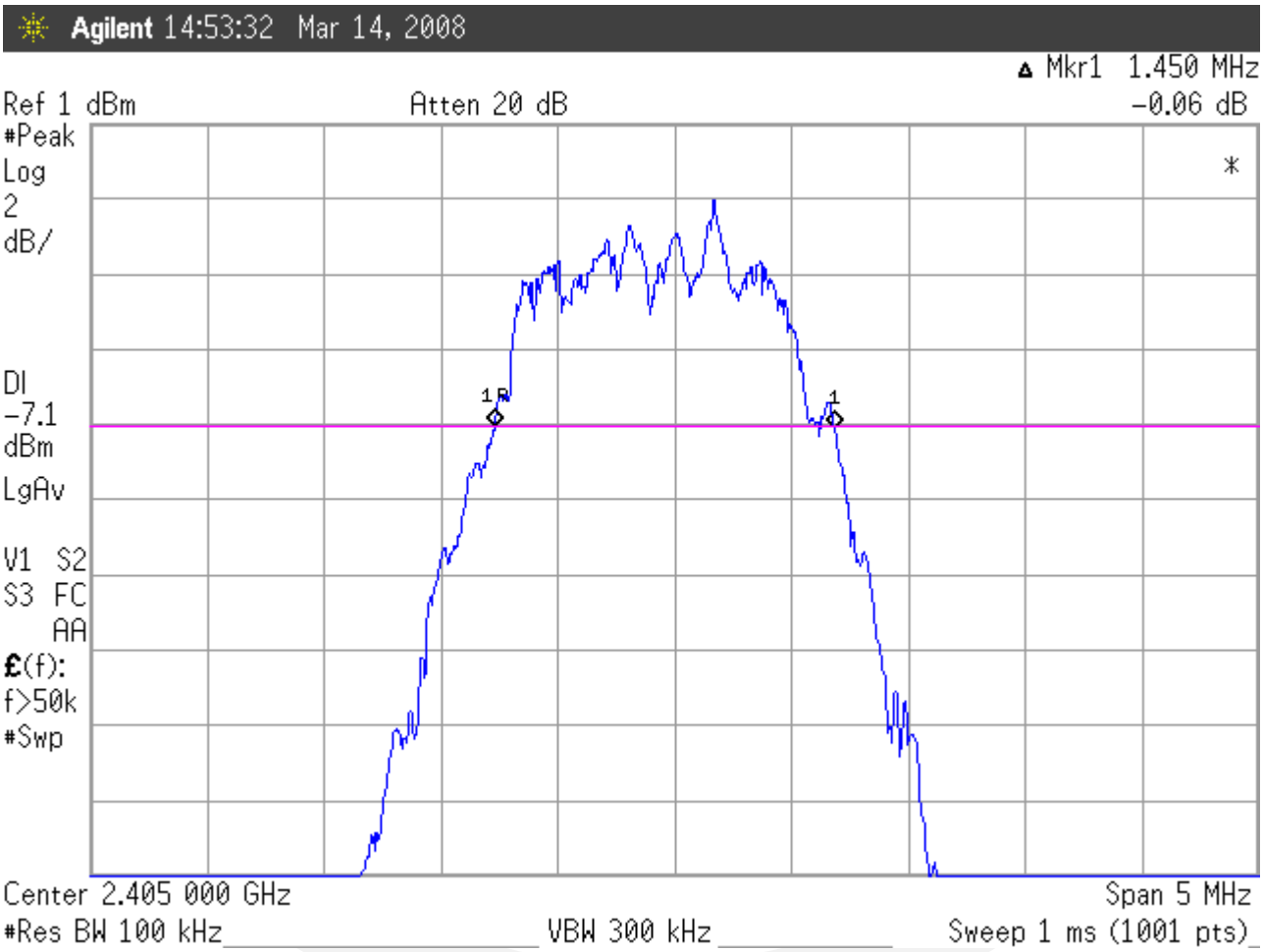
6 dB Bandwidth
Model EA-WHS (typical of all 3 models)

Low channel



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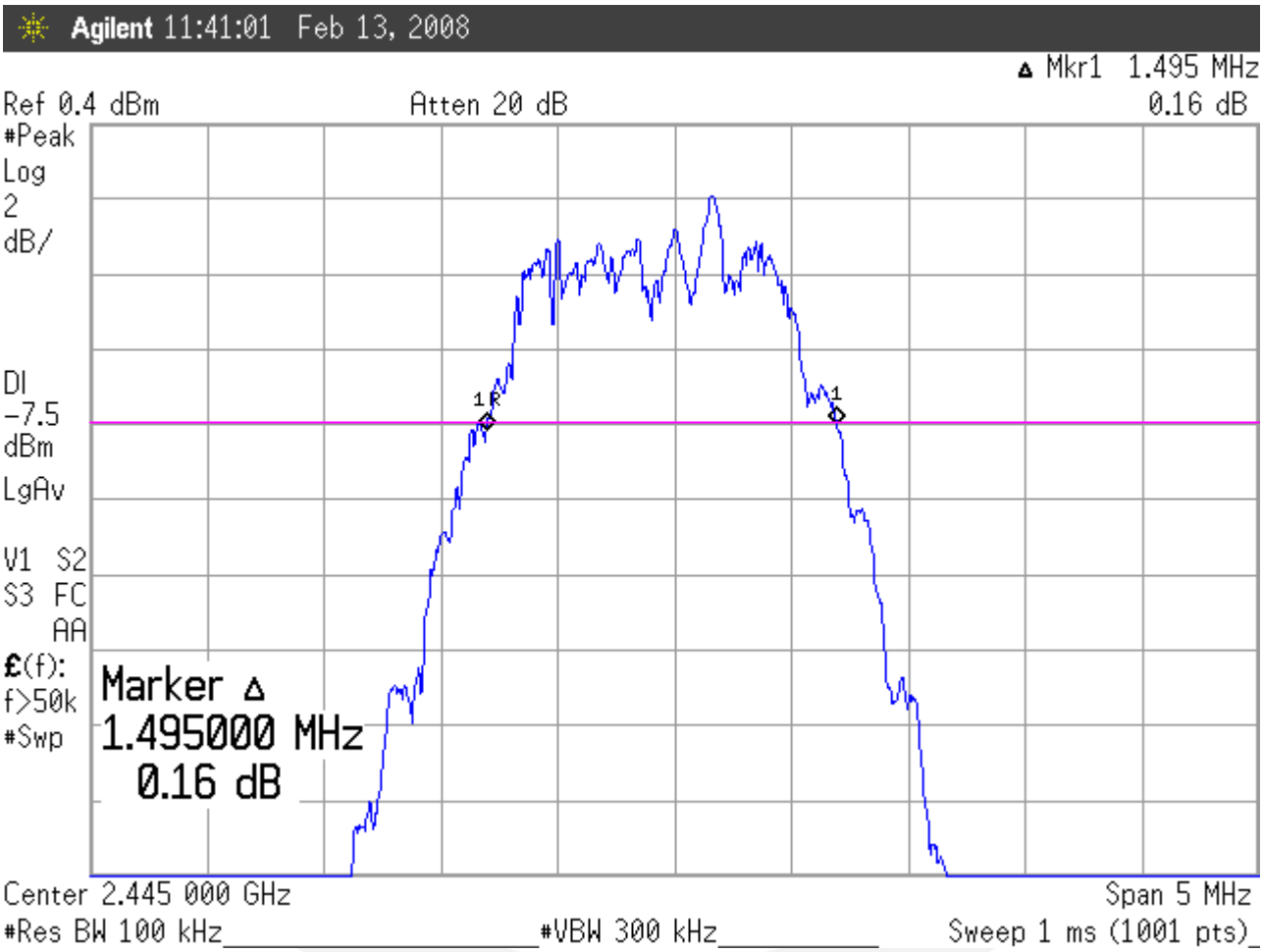
6 dB Bandwidth
Model EA-WHS (typical of all 3 models)

Mid channel



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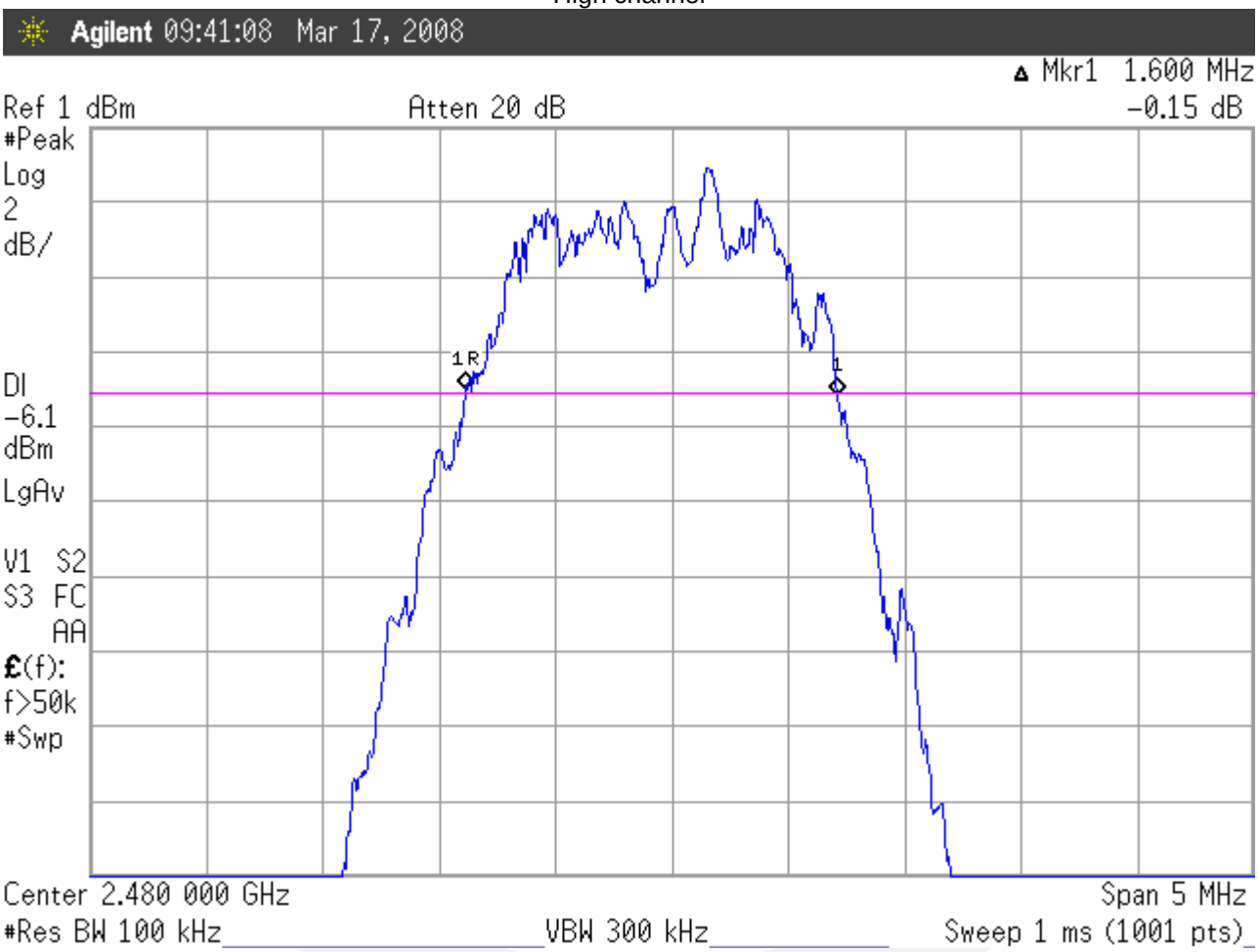
6 dB Bandwidth
Model EA-WHS (typical of all 3 models)

High channel



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Maximum peak output power
FCC 15.247(b)(3), IC RSS-210 A8.4(4)

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Test was performed in accordance with the test procedure of FCC KDB Publication 558074
Maximum peak output power is 3.37 dBm or 2.17 mW

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

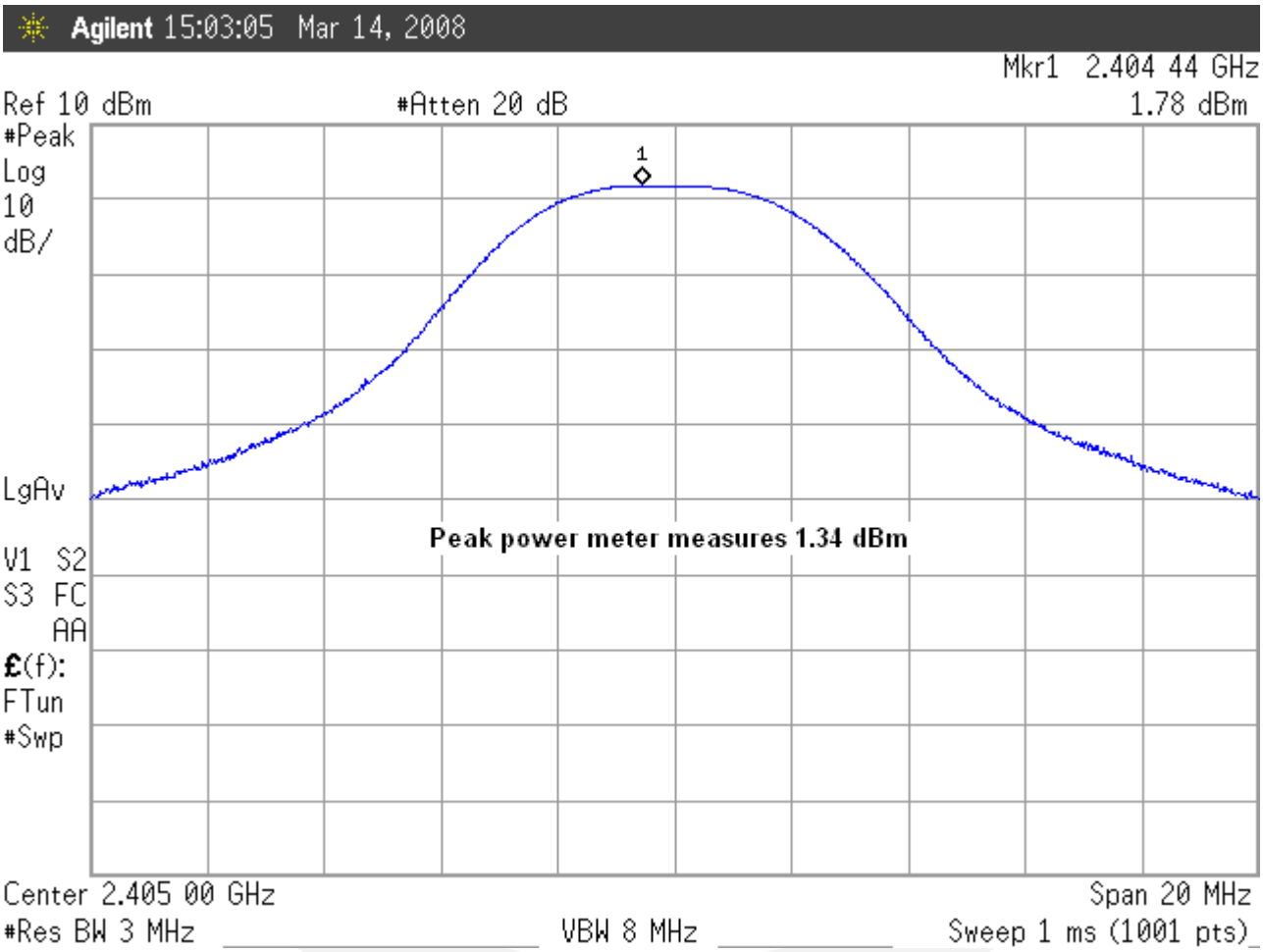
TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	19-Dec-08

Test limit
1 watt

Test data
See following pages

Peak output power
Model EA-WHS

Low channel



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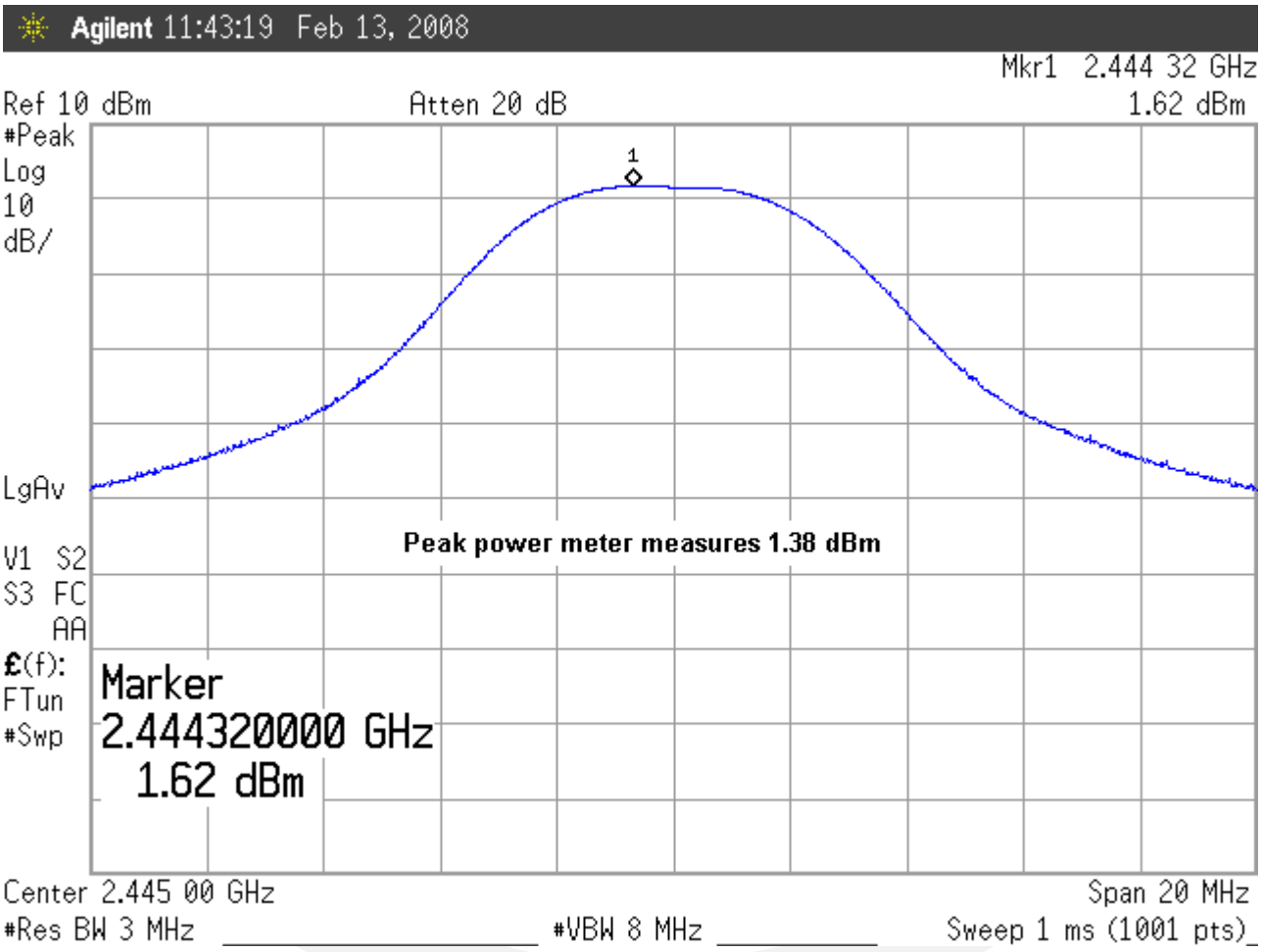
Peak output power
Model EA-WHS

Mid channel



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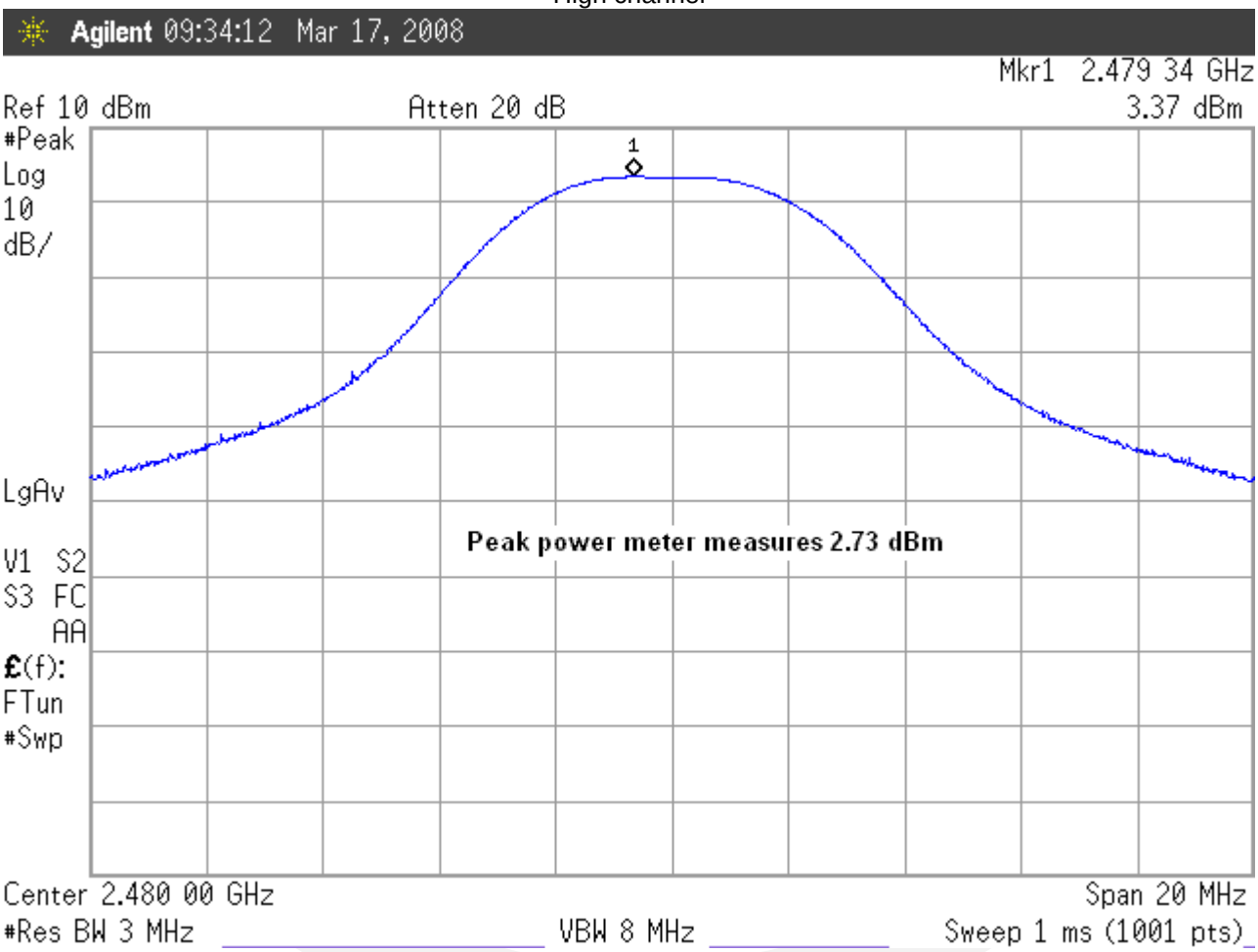
Peak output power
Model EA-WHS

High channel



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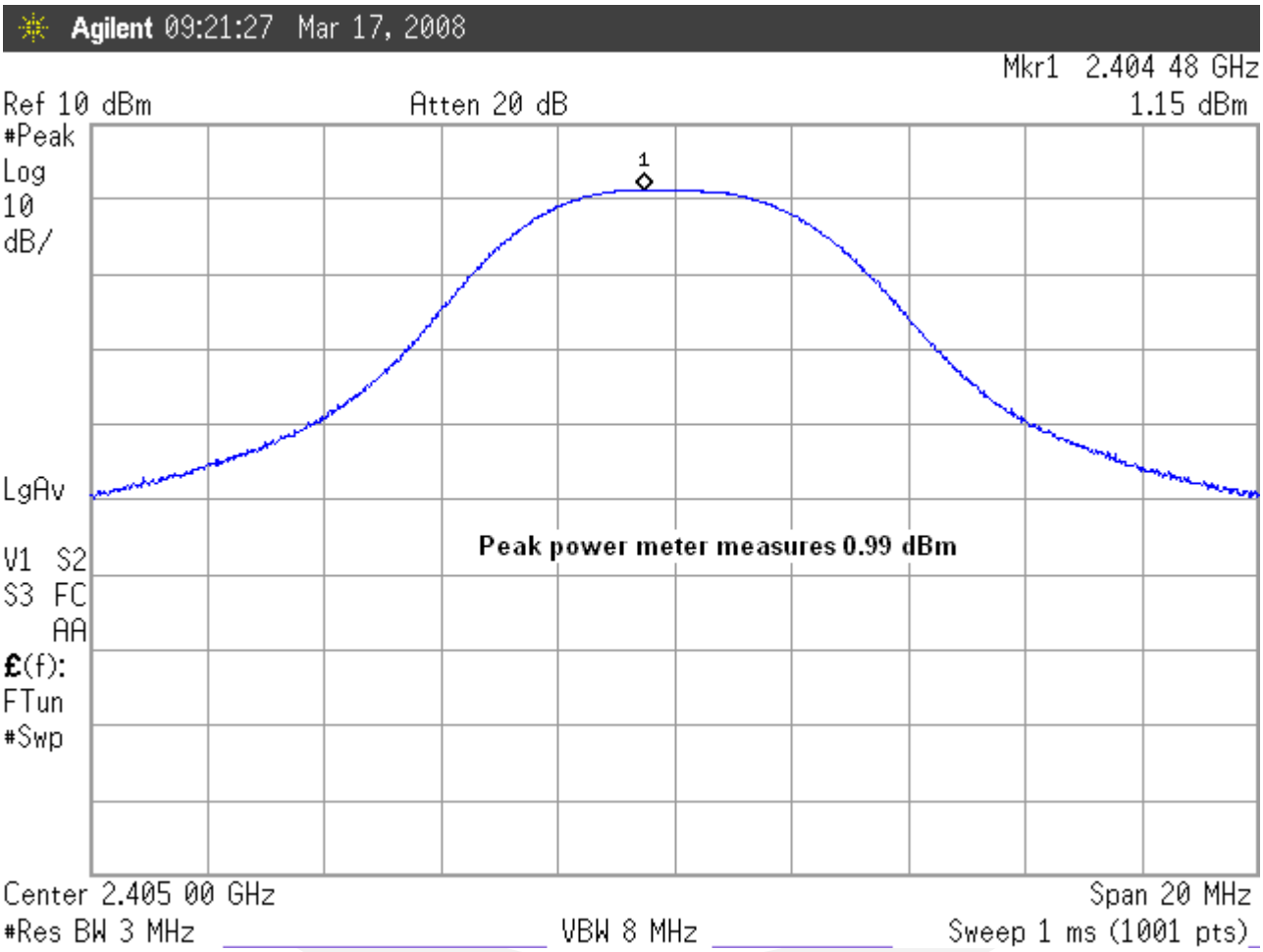
Peak output power
Model EA-WMFS

Low channel



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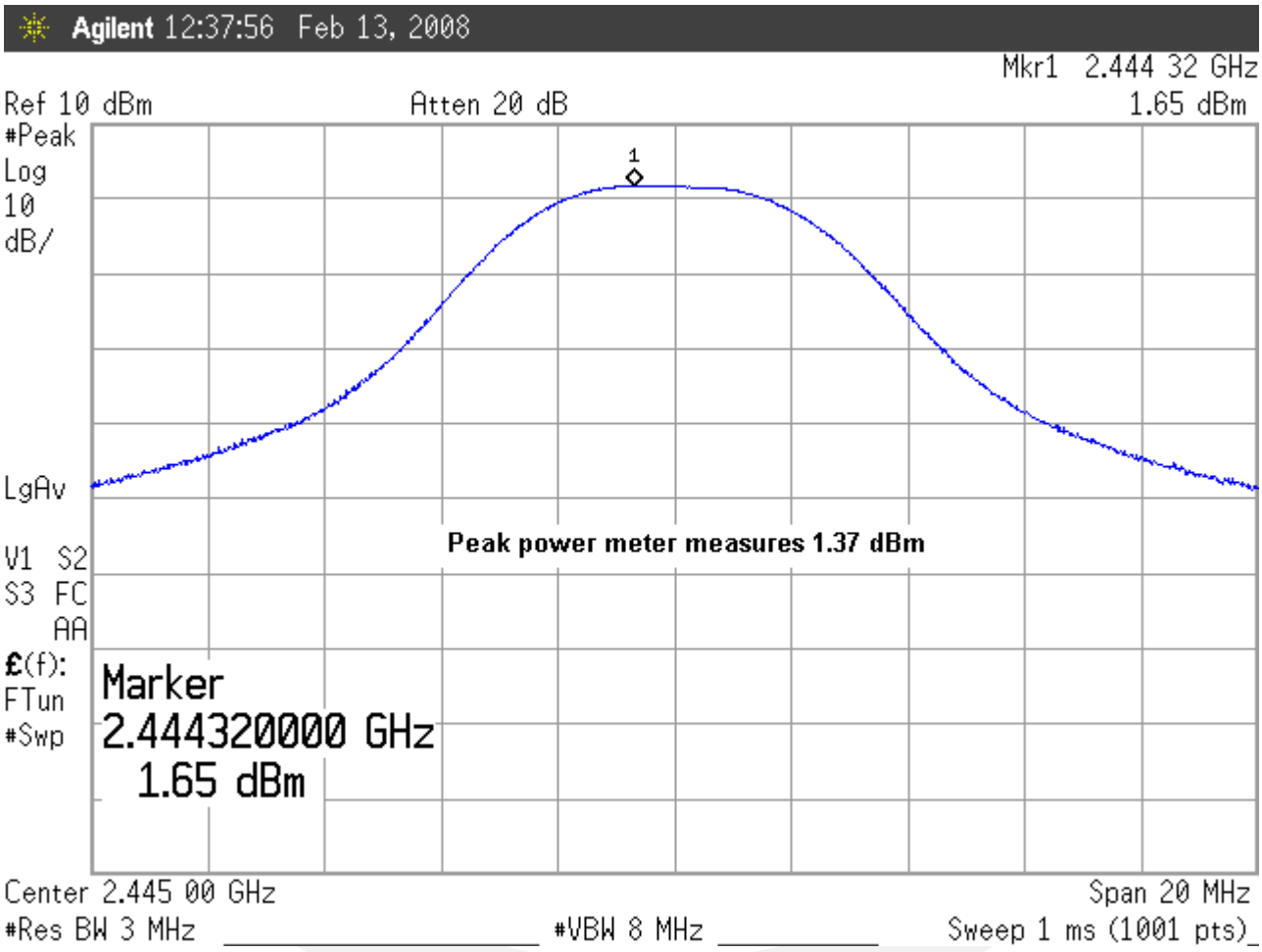
Peak output power
Model EA-WMFS

Mid channel



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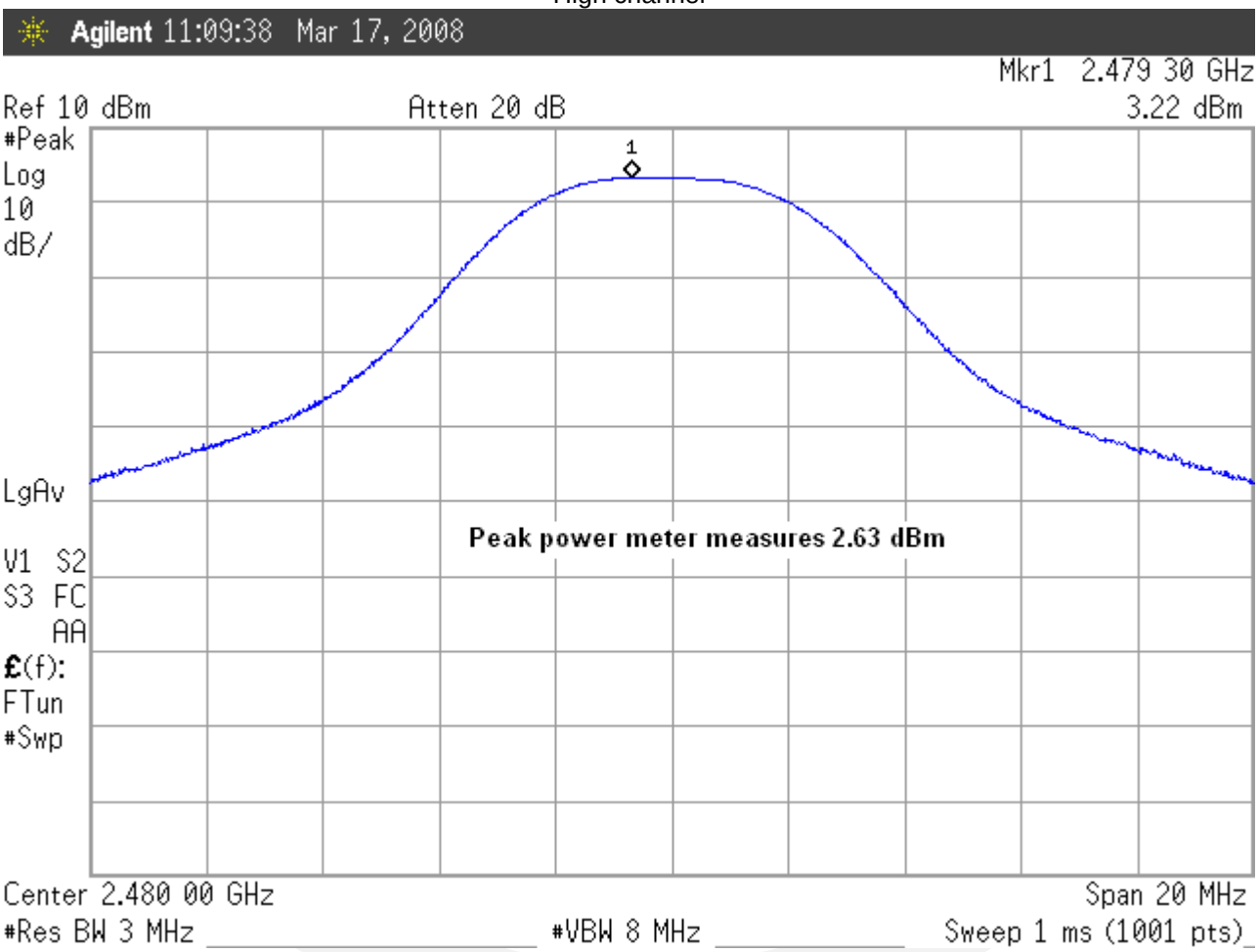
Peak output power
Model EA-WMFS

High channel



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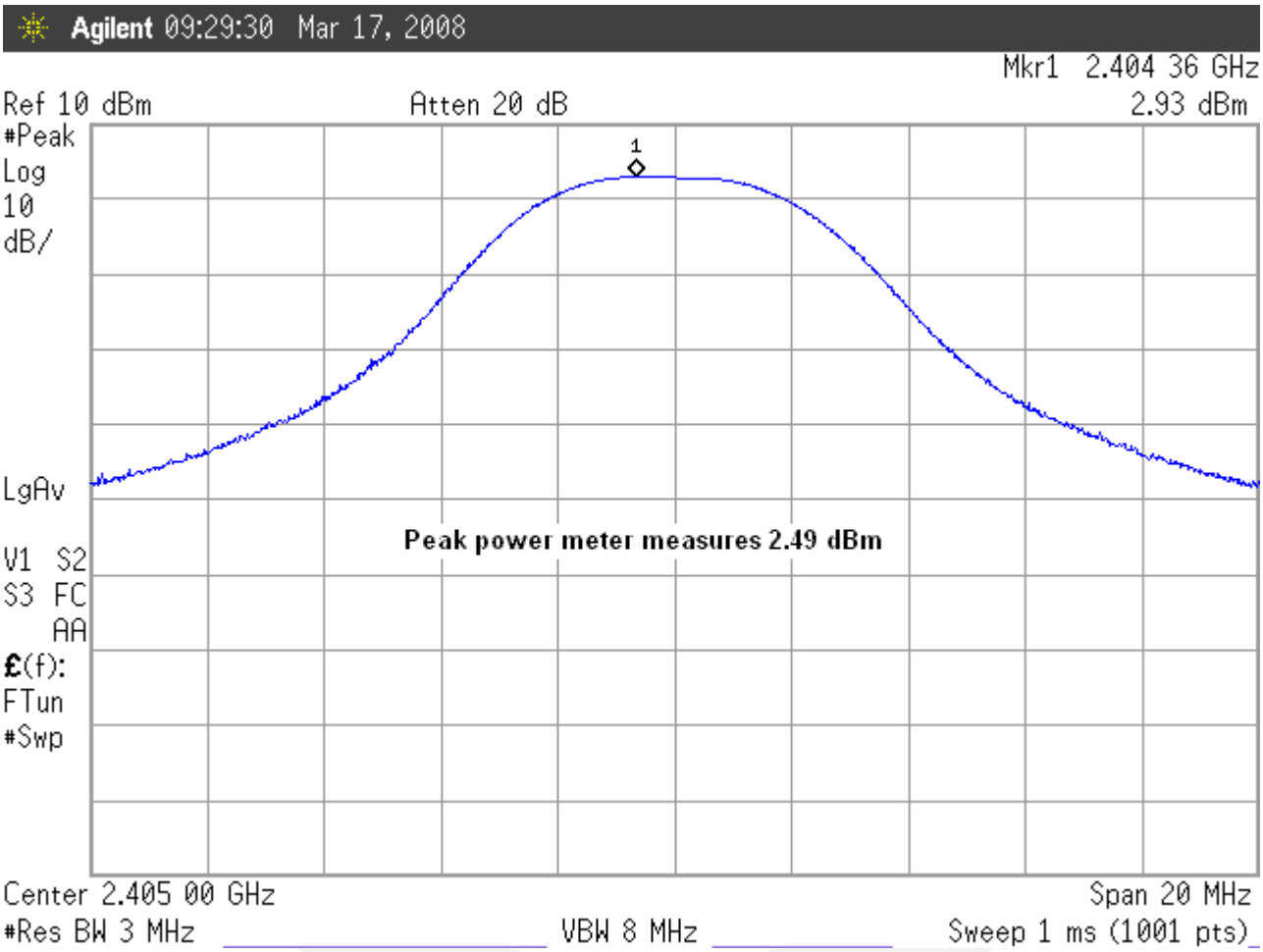
Peak output power
Model EA-WTS

Low channel



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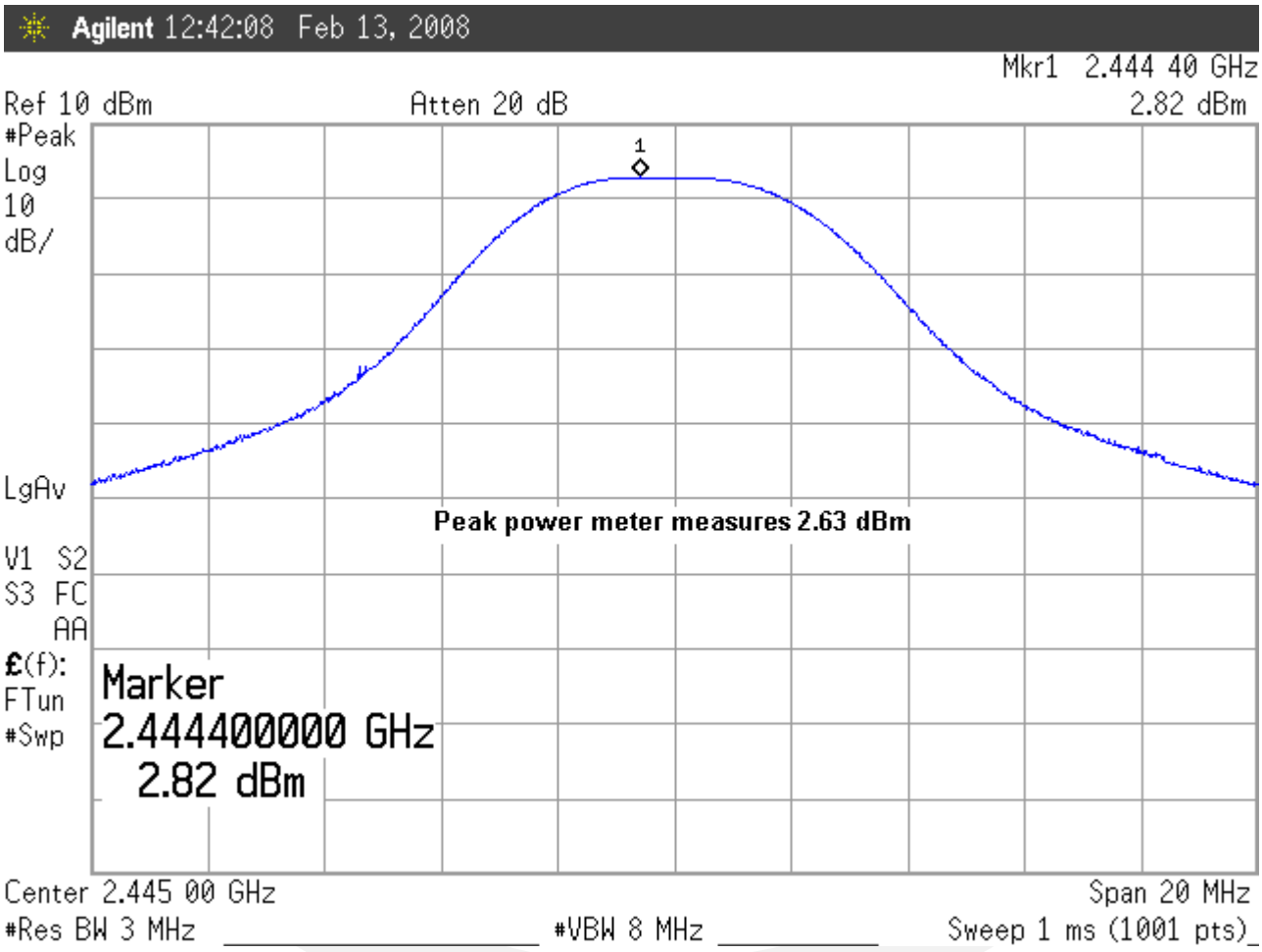
Peak output power
Model EA-WTS

Mid channel



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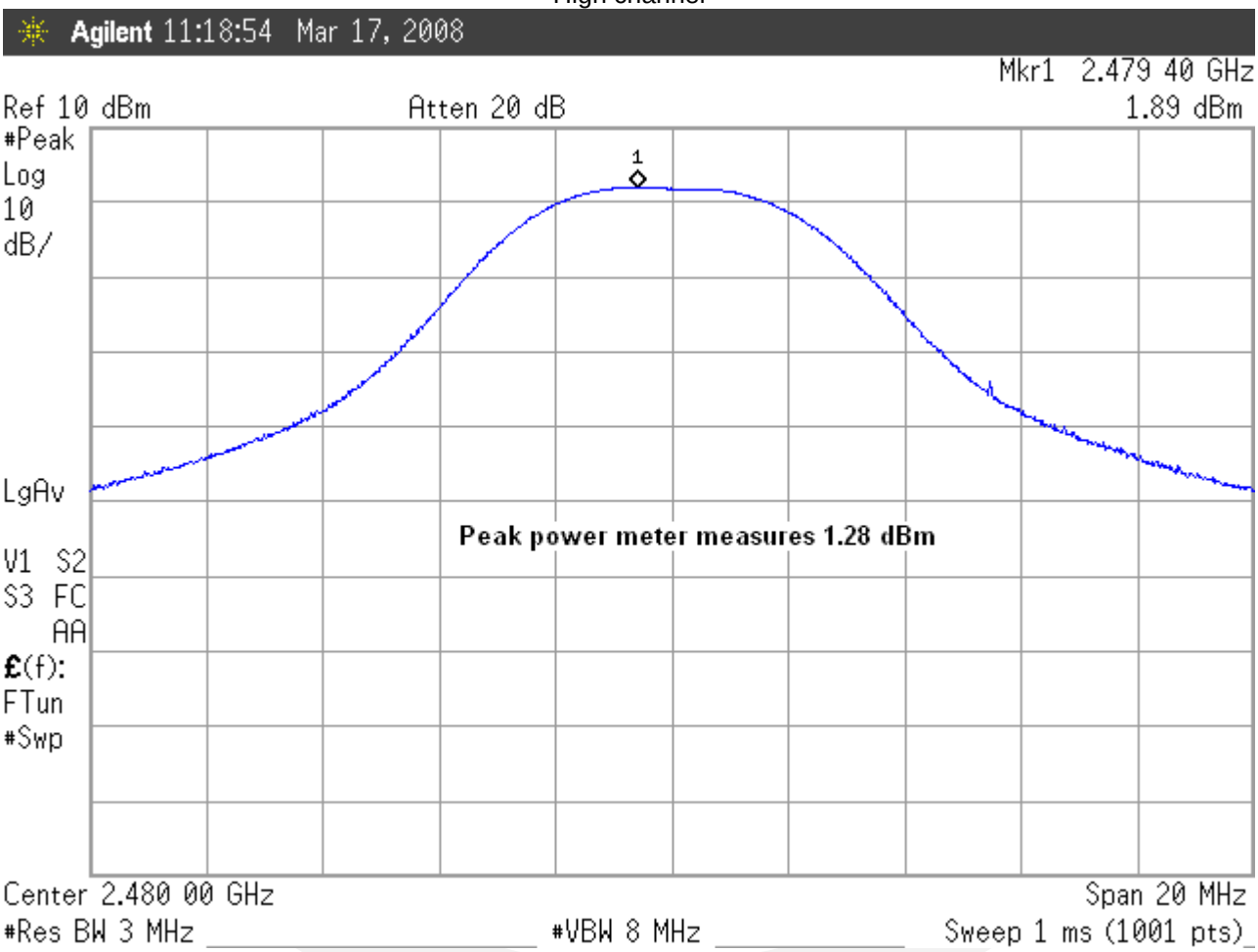
Peak output power
Model EA-WTS

High channel



TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

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

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Test was performed in accordance with ANSI C63.4 2003, clause 8.3 and FCC KDB Publication 558074
Maximum conducted spurious emission is –27.4 dBc (-28.86 dBm) at 4.96 GHz
Maximum radiated spurious emission is 31.07 dBµV/m avg or 35.8 µV/m at 3 meters at 4.961 GHz
Minimum margin of compliance = 22.9 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
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	19-Dec-08
WREL03202	EM-6917B	Electro-Metrics	Biconicalog Periodic	101	10-May-08
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	16-Jan-09
WRLE03847	ZHL-1042J	Mini-Circuits	Preamplifier 10 - 3000 MHz	0607	Code B 08 May 08
WRLE010527	SL18B4020	Phase 1 Microwave	Preamplifier 1 – 18 GHz	0001	Code B 20-Aug-08
WRLE03294	8566B	Hewlett-Packard	Spectrum Analyzer	2349A03098	16-May-08
WRLE03295	85662A	Hewlett-Packard	Analyzer Display	2349A06144	16-May-08
WRLE02681	85650A	Hewlett-Packard	Quasi-Peak Adapter	2430A00562	31-Mar-09
WRLE03997	EWT-14-0066	EWT	2.4 GHz Notch filter	E2	Code B 23-Jan-09
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 01-Oct-08
WRLE03933	F551B-1	Acronetics	8 – 12 GHz Bandpass Filter	010	Code B 01-Oct-08
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 01-Oct-08

Cal Code B = Calibration verification performed internally.

Test limit - conducted
-20 dBc

Test limit within restricted bands per 15.205 - radiated

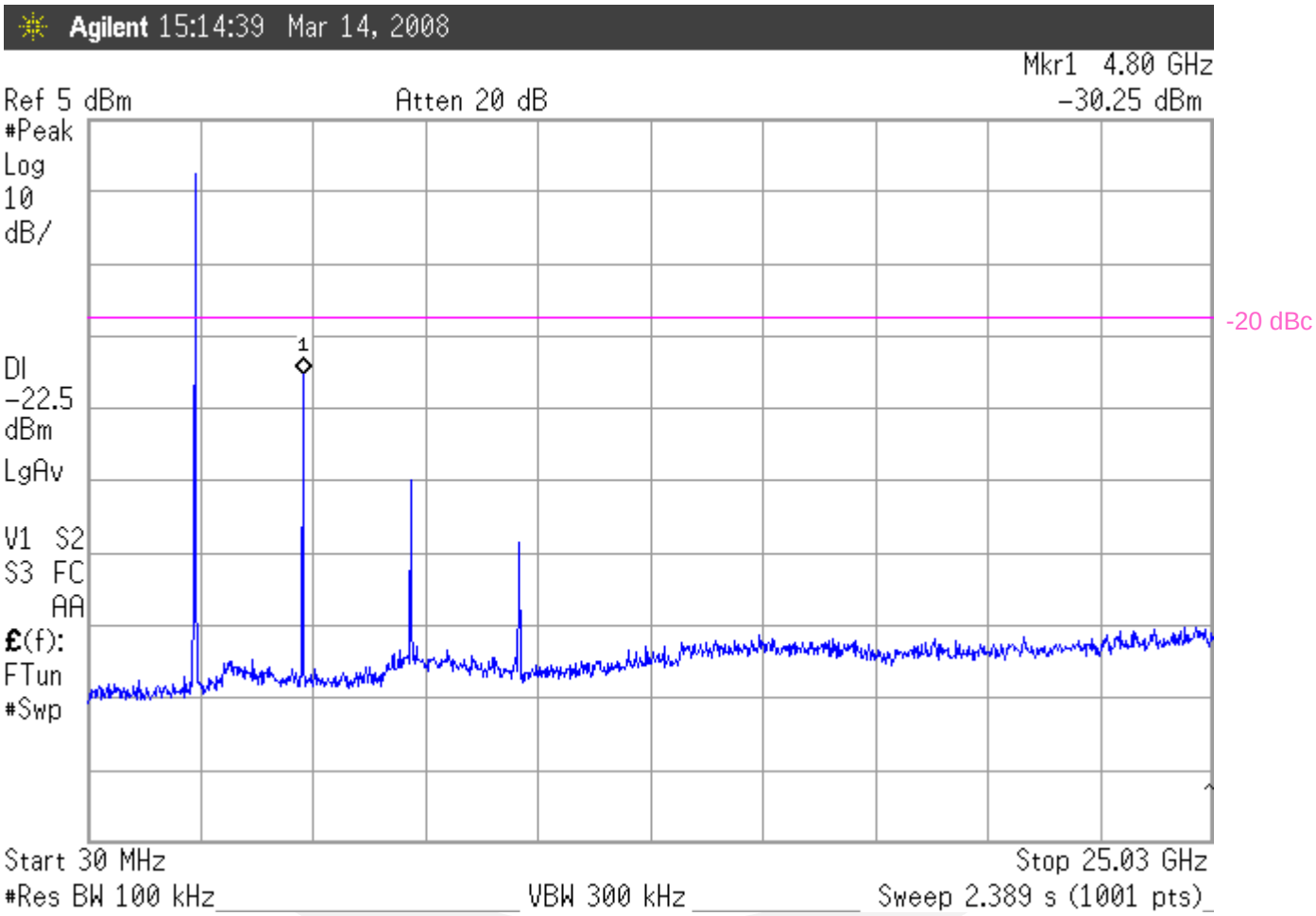
Frequency (MHz)	Field strength (µV/meter)	Field strength (dBµV/meter)
30 - 88	100, QP	40.0
88 - 216	150, QP	43.5
216 - 960	200, QP	46.0
Above 960	500, QP	54.0
> 1000	500, AV 5000, PK	54.0 74.0

Test data
See following pages

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

Conducted spurious emissions
Model EA-WHS (typical of all 3 models)

Low channel



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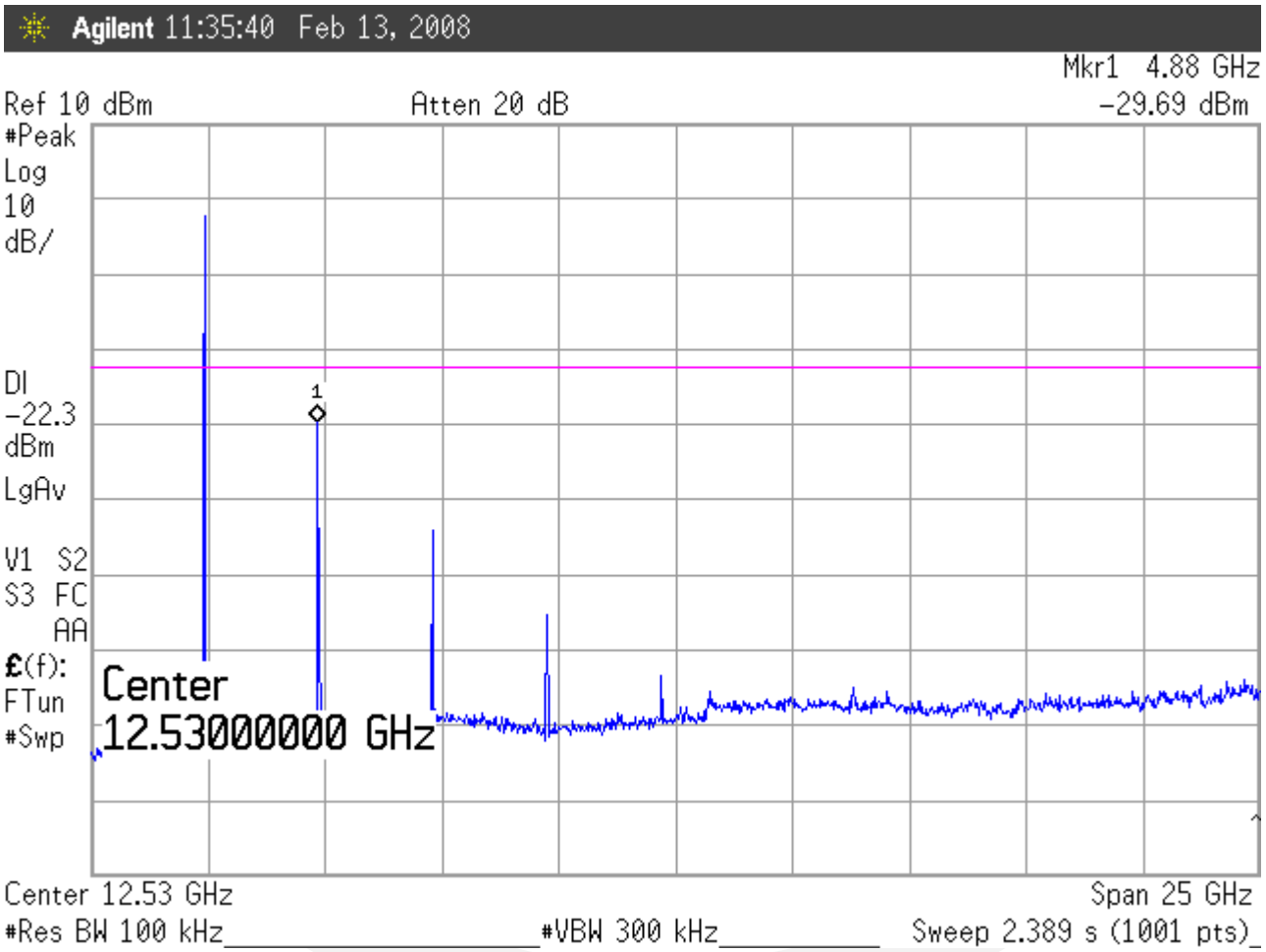
Conducted spurious emissions
Model EA-WHS (typical of all 3 models)

Mid channel



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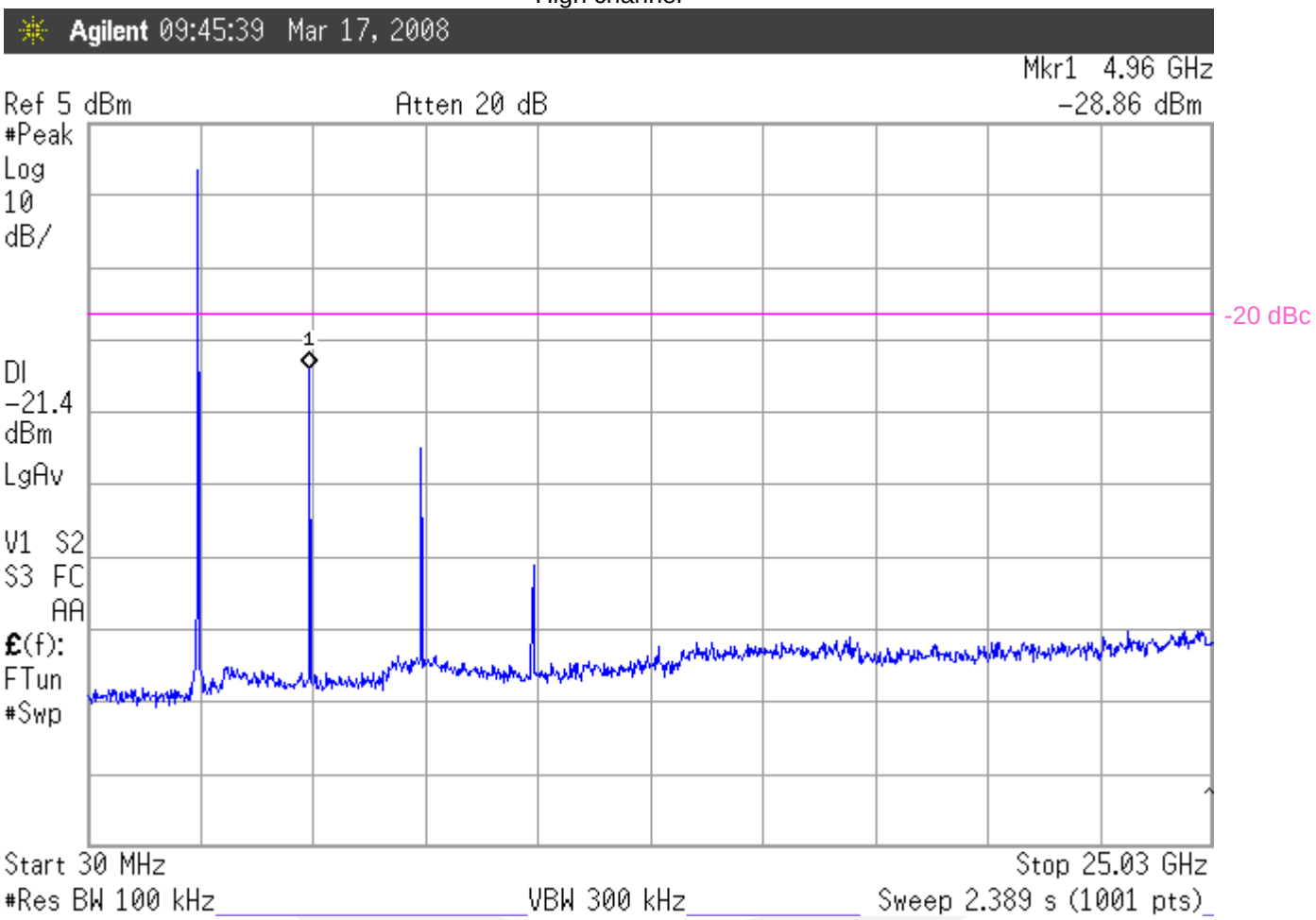
Conducted spurious emissions
Model EA-WHS (typical of all 3 models)

High channel



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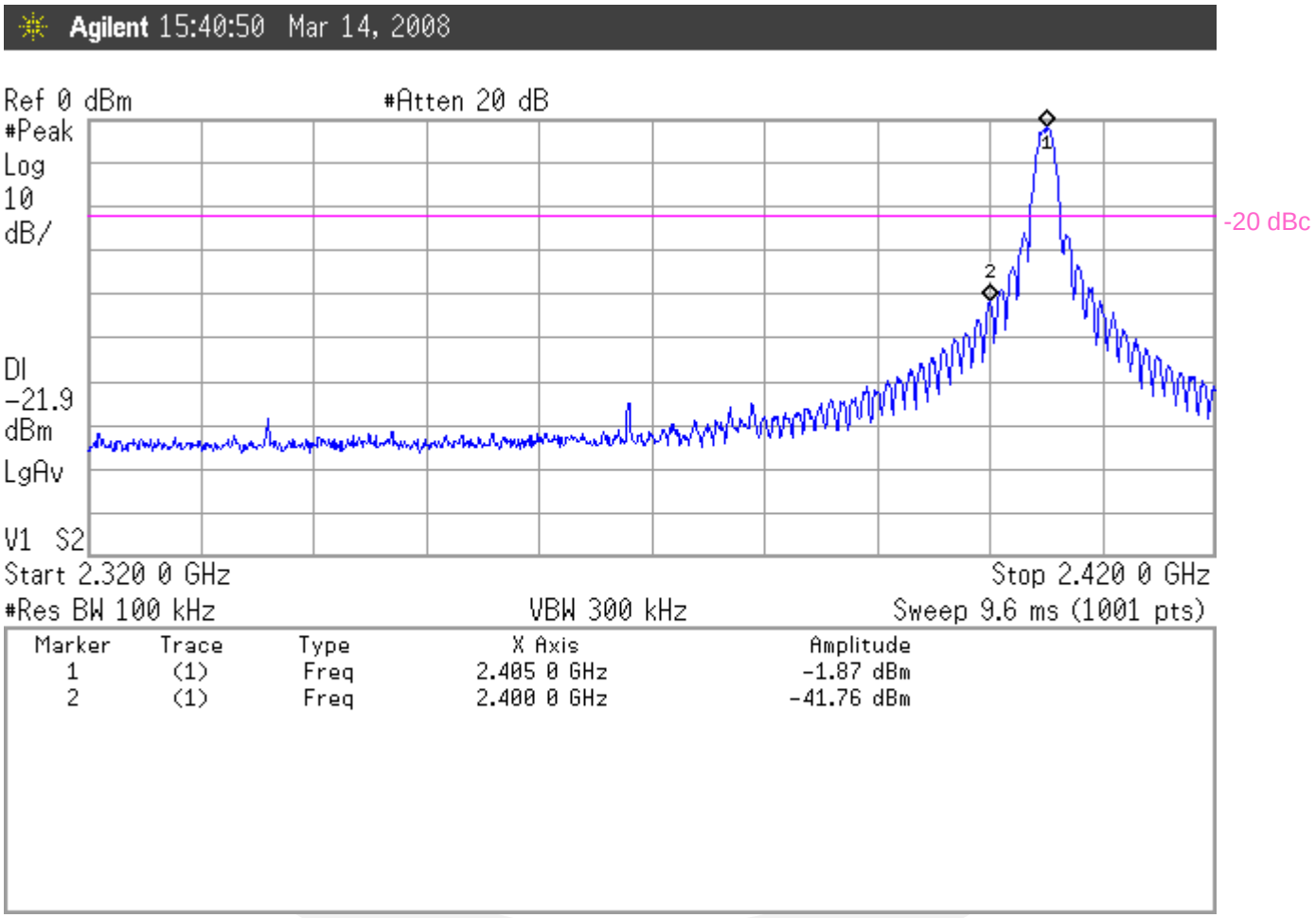
Conducted band edge
Model EA-WHS (typical of all 3 models)

Low channel



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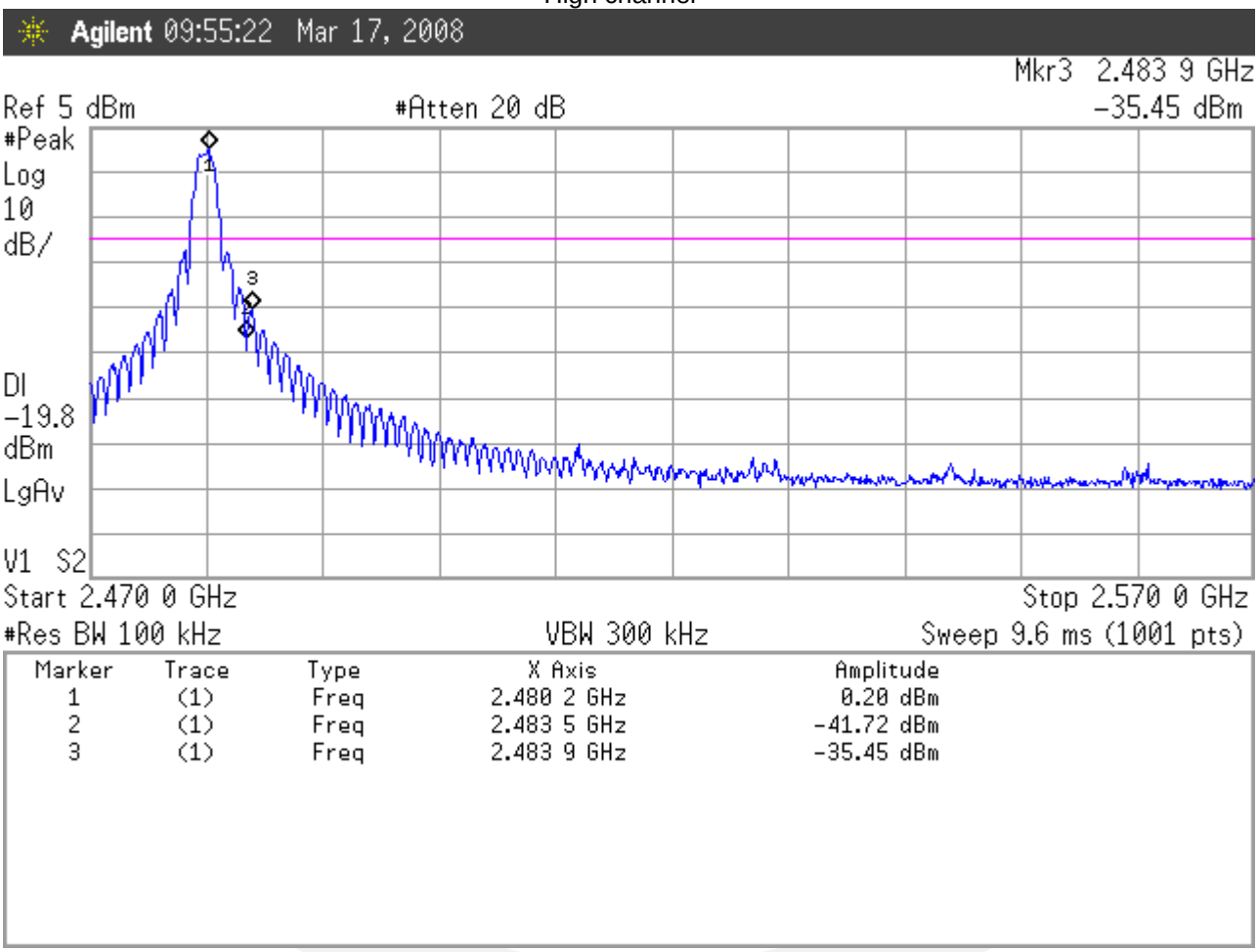
Conducted band edge
Model EA-WHS (typical of all 3 models)

High channel



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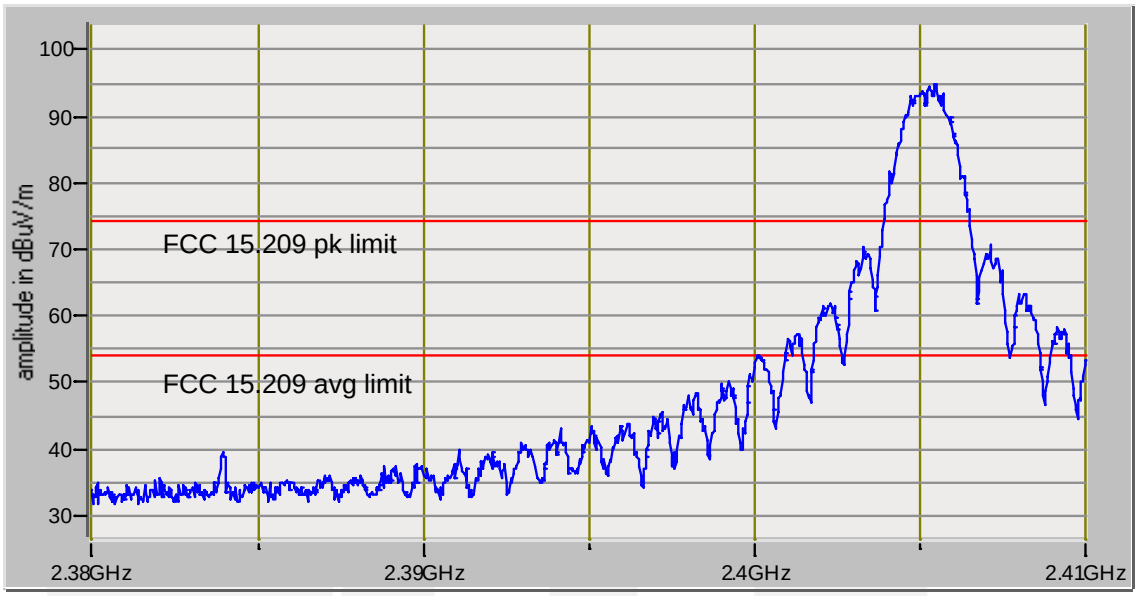
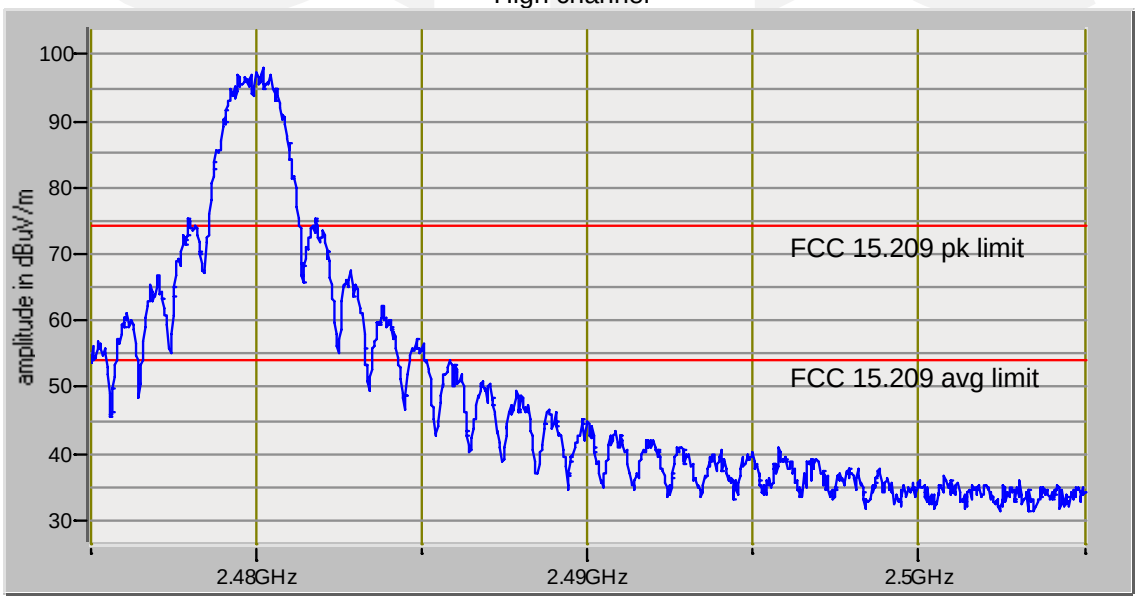
Radiated band edge
Peak detector max hold scan without relaxation
Actual trace data is 40 dB less than indicated when corrected using duty cycle relaxation
Bandedges are more than 35 dB below the limit
Model EA-WHS (typical of all 3 models)

Low channel



RBW 1MHz VBW 1MHz

High channel



RBW 1MHz VBW 1MHz

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RADIATED EMISSIONS

Test Report #:	WC800944 Run 8	Test Area:	LTS		
EUT Model #:	EA-WHS, EA-WMFS, EA-WTS	Date:	3/13/2008		
EUT Serial #:	na	EUT Power:	110V / 60Hz	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	97.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	22.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Low, mid, and high channels. Restricted Bands. 30 - 1000 MHz				
Data File Name:	0944.dat			Page:	1 of 2

List of measurements for run #: 8

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m	DELTA2
Mid channel 19						
Begin scan 30 - 1000 MHz						
EUT rotated 0 - 360 degrees, measurement antenna 1 - 4 meters high, both vertical & horizontal						
No significant emissions detected						
No higher emissions detected with low or high frequency versions, channels 11 & 26, all 3 models						
end scan 30 - 1000 MHz						

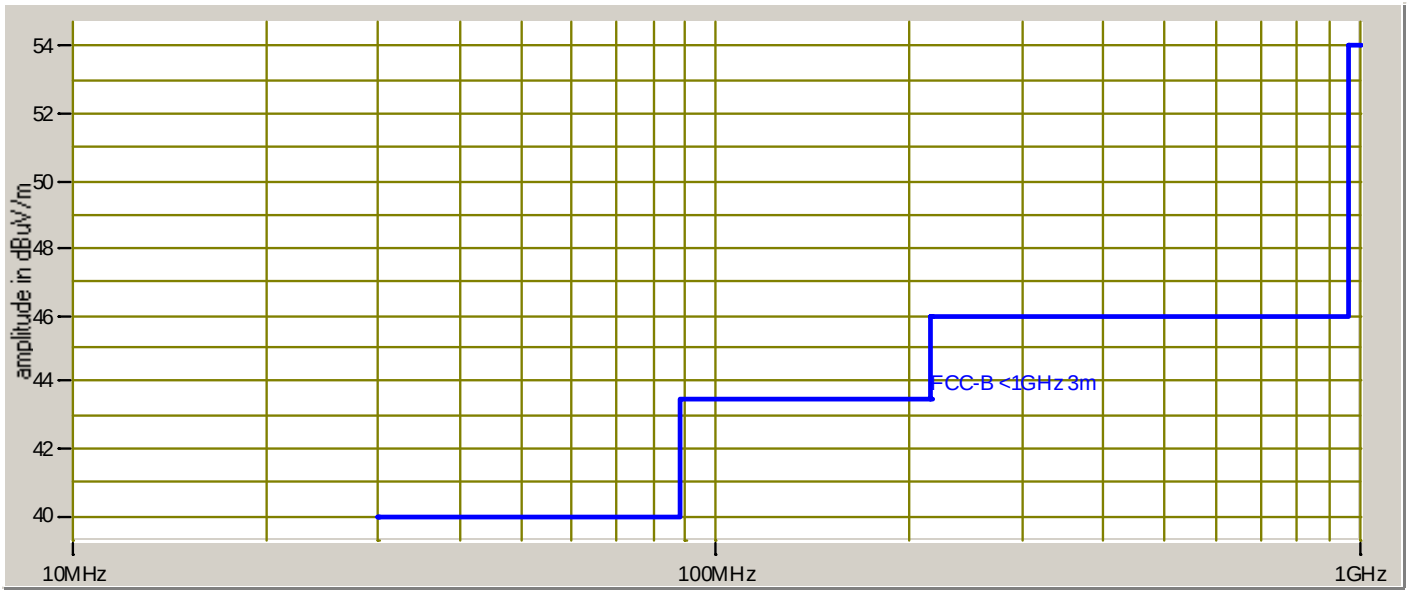
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: J. T. Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC800944 Run 8	Test Area:	LTS		
EUT Model #:	EA-WHS, EA-WMFS, EA-WTS	Date:	3/13/2008		
EUT Serial #:	na	EUT Power:	110V / 60Hz	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	97.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	22.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Low, mid, and high channels. Restricted Bands. 30 - 1000 MHz				
Data File Name:	0944.dat			Page:	2 of 2

Graph:



Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: J. T. Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS		
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008		
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Restricted Bands. > 1GHz				
Data File Name:	0944.dat			Page:	1 of 9

List of measurements for run #: 7

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / DUTY CYCLE RELAX (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av	DELTA2 FCC 15.247 >1G 3 M pk
model EA-WMFS						
Low channel 11						
Maximized						
4.811 GHz	60.98 Av	8.65 / 32.78 / 43.55 / 0.0	58.86	V / 1.06 / 311	4.86	n/a
4.811 GHz	66.35 Pk	8.65 / 32.78 / 43.55 / 0.0	64.23	V / 1.06 / 311	n/a	-9.77
Using duty cycle correction						
Max on time per 100 mS < 1 mS						
20 log(1/100) = -40						
Corrected average measurement (peak -40 dB correction)						
4.811 GHz	66.35 Pk	8.65 / 32.78 / 43.55 / 40.0	24.23	V / 1.06 / 311	-29.77	n/a
High channel 26						
maxed						
4.961 GHz	64.61 Av	8.87 / 33.11 / 43.66 / 0.0	62.93	V / 1.00 / 0	8.93	n/a
4.961 GHz	70.55 Pk	8.87 / 33.11 / 43.66 / 0.0	68.87	V / 1.00 / 0	n/a	-5.13
Corrected average measurement (peak -40 dB correction)						
4.961 GHz	70.55 Pk	8.87 / 33.11 / 43.66 / 40.0	28.87	V / 1.00 / 0	-25.13	n/a
Mid channel 19						
maxed						
4.891 GHz	60.92 Av	8.77 / 32.96 / 43.62 / 0.0	59.02	V / 1.36 / 0	5.02	n/a
4.891 GHz	67.15 Pk	8.77 / 32.96 / 43.62 / 0.0	65.25	V / 1.36 / 0	n/a	-8.75
Corrected average measurement (peak -40 dB correction)						

Tested by: Greg Jakubowski — Printed — Signature

Reviewed by: J. T. Schneider — Printed — Signature

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS		
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008		
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Restricted Bands. > 1GHz				
Data File Name:	0944.dat			Page:	2 of 9

List of measurements for run #: 7

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / DUTY CYCLE RELAX (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av	DELTA2 FCC 15.247 >1G 3 M pk
4.891 GHz	67.15 Pk	8.77 / 32.96 / 43.62 / 40.0	25.25	V / 1.36 / 0	-28.75	n/a
model EA-WHS						
Low channel 11						
4.811 GHz	62.66 Av	8.65 / 32.78 / 43.55 / 0.0	60.54	V / 1.15 / 256	6.54	n/a
4.811 GHz	68.15 Pk	8.65 / 32.78 / 43.55 / 0.0	66.03	V / 1.15 / 256	n/a	-7.97
corrected (pk -40dB)						
4.811 GHz	68.15 Pk	8.65 / 32.78 / 43.55 / 40.0	26.03	V / 1.15 / 256	-27.97	n/a
mid channel 19						
4.891 GHz	62.56 Av	8.77 / 32.96 / 43.62 / 0.0	60.66	V / 1.78 / 256	6.66	n/a
4.891 GHz	67.4 Pk	8.77 / 32.96 / 43.62 / 0.0	65.5	V / 1.78 / 256	n/a	-8.5
corrected (pk -40dB)						
4.891 GHz	67.4 Pk	8.77 / 32.96 / 43.62 / 40.0	25.5	V / 1.78 / 256	-28.5	n/a
high channel 26						
4.961 GHz	67.44 Av	8.87 / 33.11 / 43.66 / 0.0	65.76	V / 1.09 / 110	11.76	n/a
4.961 GHz	72.75 Pk	8.87 / 33.11 / 43.66 / 0.0	71.07	V / 1.09 / 110	n/a	-2.93
corrected (pk -40dB)						
4.961 GHz	72.75 Pk	8.87 / 33.11 / 43.66 / 40.0	31.07	V / 1.09 / 110	-22.93	n/a
model EA-WTS						
low channel 11						
4.811 GHz	63.73 Av	8.65 / 32.78 / 43.55 / 0.0	61.61	V / 1.11 / 110	7.61	n/a
4.811 GHz	69.1 Pk	8.65 / 32.78 / 43.55 / 0.0	66.98	V / 1.11 / 110	n/a	-7.02
corrected (pk -40dB)						
4.811 GHz	69.1 Pk	8.65 / 32.78 / 43.55 / 40.0	26.98	V / 1.11 / 110	-27.02	n/a

Tested by: Greg Jakubowski

Printed | Signature

Reviewed by: J. T. Schneider

Printed | Signature

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS		
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008		
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Restricted Bands. > 1GHz				
Data File Name:	0944.dat			Page:	3 of 9

List of measurements for run #: 7

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / DUTY CYCLE RELAX (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av	DELTA2 FCC 15.247 >1G 3 M pk
mid channel 19						
4.891 GHz	63.83 Av	8.77 / 32.96 / 43.62 / 0.0	61.93	V / 1.10 / 110	7.93	n/a
4.891 GHz	68.7 Pk	8.77 / 32.96 / 43.62 / 0.0	66.8	V / 1.10 / 110	n/a	-7.2
corrected (pk -40dB)						
4.891 GHz	68.7 Pk	8.77 / 32.96 / 43.62 / 40.0	26.8	V / 1.10 / 110	-27.2	n/a
high channel 26						
4.961 GHz	66.24 Av	8.87 / 33.11 / 43.66 / 0.0	64.56	V / 1.10 / 110	10.56	n/a
4.961 GHz	71.6 Pk	8.87 / 33.11 / 43.66 / 0.0	69.92	V / 1.10 / 110	n/a	-4.08
corrected (pk -40dB)						
4.961 GHz	71.6 Pk	8.87 / 33.11 / 43.66 / 40.0	29.92	V / 1.10 / 110	-24.08	n/a
End scan 1 - 25 GHz						

Tested by: Greg Jakubowski — Printed — Signature

Reviewed by: J. T. Schneider — Printed — Signature

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS			
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008			
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0	°C
Test Method:	FCC 15.247			Air Pressure:	98.0	kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0	%
EUT Description:	Wireless sensors (temp, humidity, multi-function)					
Notes:	Restricted Bands. > 1GHz					
Data File Name:	0944.dat			Page:	4 of 9	

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

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / DUTY CYCLE RELAX (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av
4.961 GHz	72.75 Pk	8.87 / 33.11 / 43.66 / 40.0	31.07	V / 1.09 / 110	-22.93
4.961 GHz	71.6 Pk	8.87 / 33.11 / 43.66 / 40.0	29.92	V / 1.10 / 110	-24.08
4.961 GHz	70.55 Pk	8.87 / 33.11 / 43.66 / 40.0	28.87	V / 1.00 / 0	-25.13
4.811 GHz	69.1 Pk	8.65 / 32.78 / 43.55 / 40.0	26.98	V / 1.11 / 110	-27.02
4.891 GHz	68.7 Pk	8.77 / 32.96 / 43.62 / 40.0	26.8	V / 1.10 / 110	-27.2
4.811 GHz	68.15 Pk	8.65 / 32.78 / 43.55 / 40.0	26.03	V / 1.15 / 256	-27.97
4.891 GHz	67.4 Pk	8.77 / 32.96 / 43.62 / 40.0	25.5	V / 1.78 / 256	-28.5
4.891 GHz	67.15 Pk	8.77 / 32.96 / 43.62 / 40.0	25.25	V / 1.36 / 0	-28.75
4.811 GHz	66.35 Pk	8.65 / 32.78 / 43.55 / 40.0	24.23	V / 1.06 / 311	-29.77

Tested by: Greg Jakubowski — Printed — Signature

Reviewed by: J. T. Schneider — Printed — Signature

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS			
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008			
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0	°C
Test Method:	FCC 15.247			Air Pressure:	98.0	kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0	%
EUT Description:	Wireless sensors (temp, humidity, multi-function)					
Notes:	Restricted Bands. > 1GHz					
Data File Name:	0944.dat			Page:	5 of 9	

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

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA2 FCC 15.247 >1G 3 M pk
4.961 GHz	72.75 Pk	8.87 / 33.11 / 43.66 / 0.0	71.07	V / 1.09 / 110	-2.93
4.961 GHz	71.6 Pk	8.87 / 33.11 / 43.66 / 0.0	69.92	V / 1.10 / 110	-4.08
4.961 GHz	70.55 Pk	8.87 / 33.11 / 43.66 / 0.0	68.87	V / 1.00 / 0	-5.13
4.811 GHz	69.1 Pk	8.65 / 32.78 / 43.55 / 0.0	66.98	V / 1.11 / 110	-7.02
4.891 GHz	68.7 Pk	8.77 / 32.96 / 43.62 / 0.0	66.8	V / 1.10 / 110	-7.2
4.811 GHz	68.15 Pk	8.65 / 32.78 / 43.55 / 0.0	66.03	V / 1.15 / 256	-7.97
4.891 GHz	67.4 Pk	8.77 / 32.96 / 43.62 / 0.0	65.5	V / 1.78 / 256	-8.5
4.891 GHz	67.15 Pk	8.77 / 32.96 / 43.62 / 0.0	65.25	V / 1.36 / 0	-8.75
4.811 GHz	66.35 Pk	8.65 / 32.78 / 43.55 / 0.0	64.23	V / 1.06 / 311	-9.77

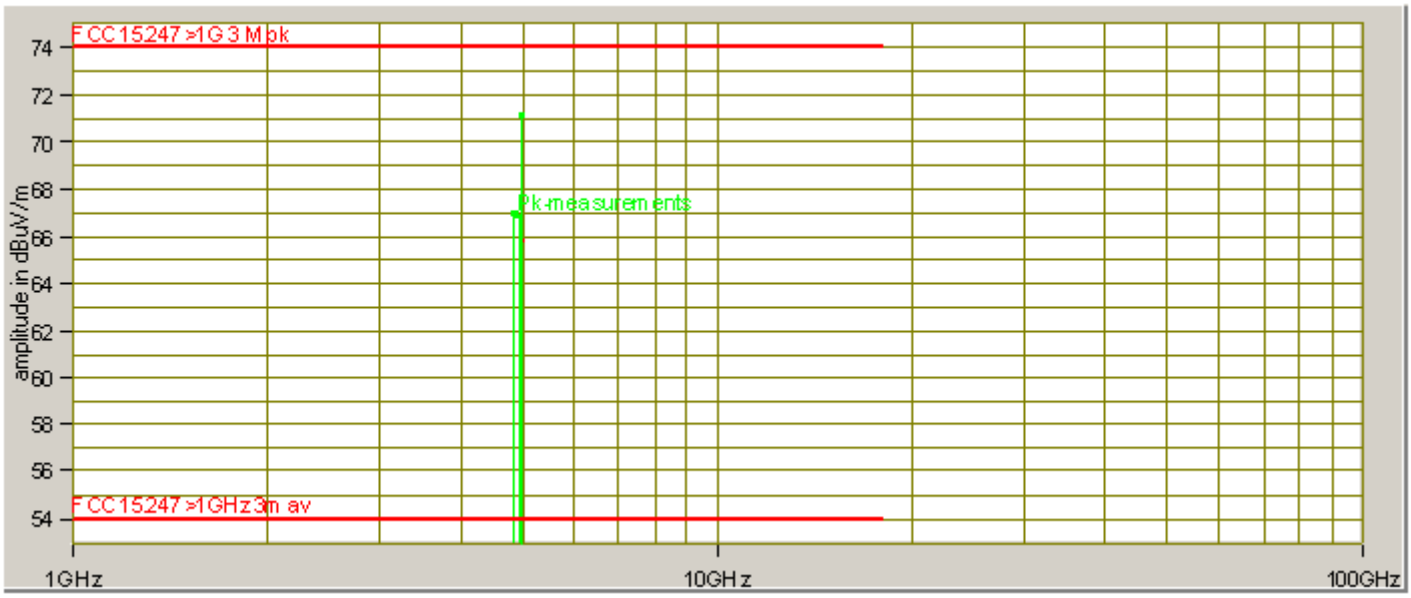
Tested by: Greg Jakubowski — Printed — Signature

Reviewed by: J. T. Schneider — Printed — Signature

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS		
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008		
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Restricted Bands. > 1GHz				
Data File Name:	0944.dat			Page:	6 of 9

Graph:



Tested by: Greg Jakubowski

Printed Signature

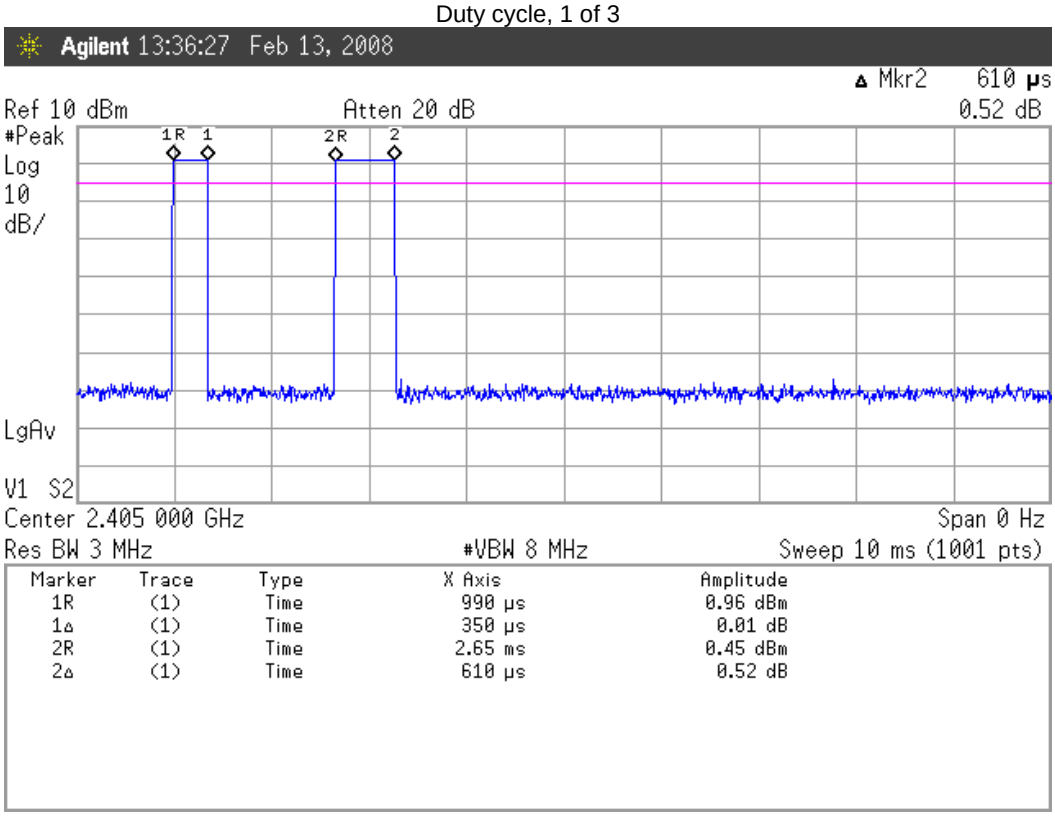
Reviewed by: J. T. Schneider

Printed Signature

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS		
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008		
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Restricted Bands. > 1GHz				
Data File Name:	0944.dat			Page:	7 of 9

Duty cycle, 1 of 3



Tested by: Greg Jakubowski

Printed

Signature

Reviewed by: J. T. Schneider

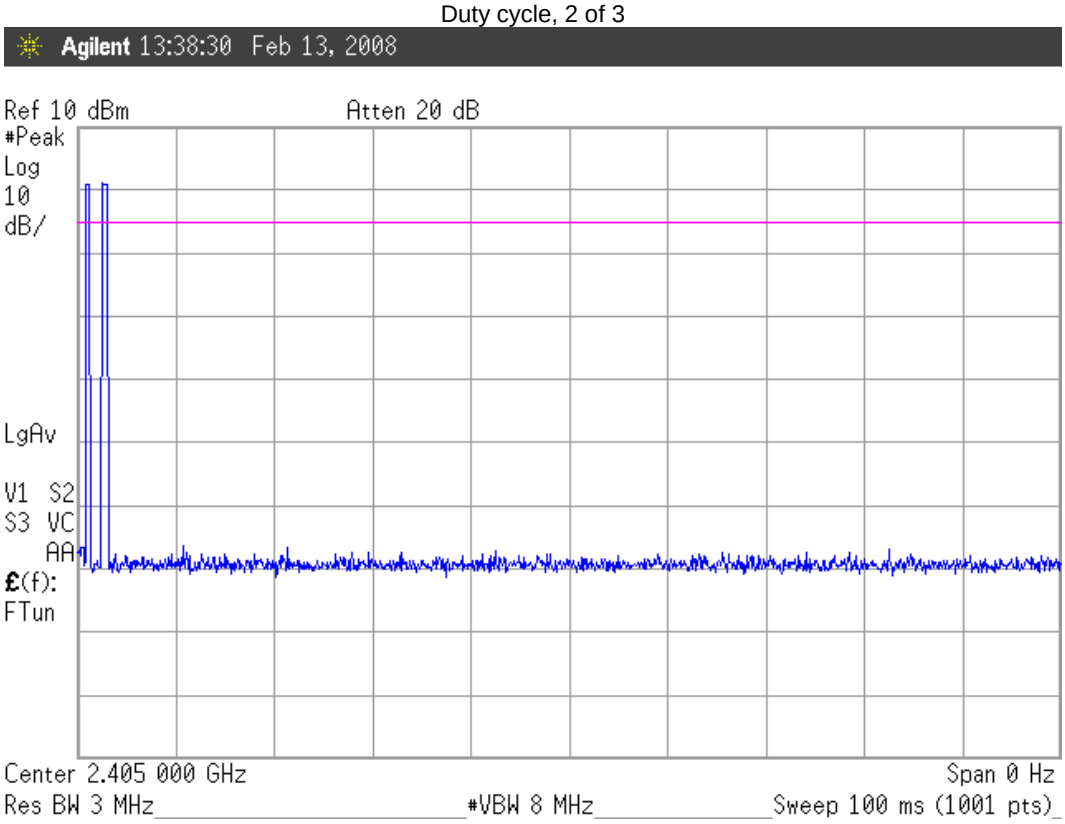
Printed

Signature

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS		
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008		
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Restricted Bands. > 1GHz				
Data File Name:	0944.dat			Page:	8 of 9

Duty cycle, 2 of 3



Tested by: Greg Jakubowski

Printed Signature

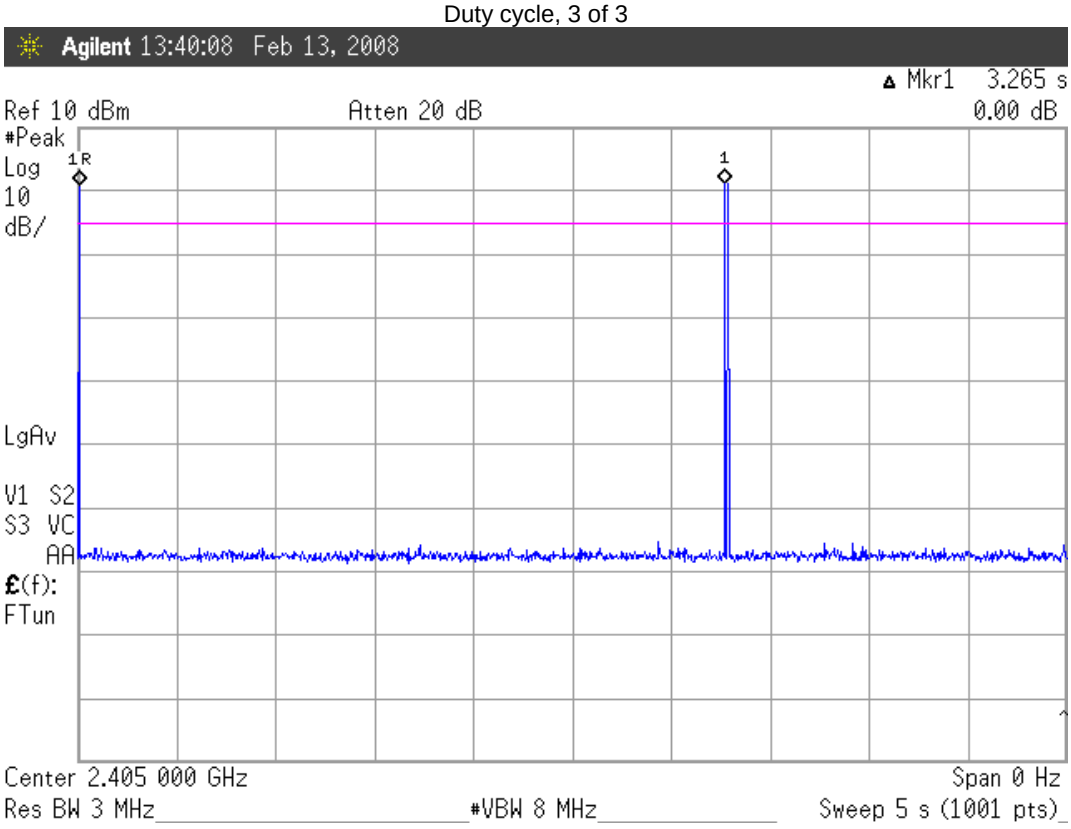
Reviewed by: J. T. Schneider

Printed Signature

RADIATED EMISSIONS

Test Report #:	WC800944 Run 7	Test Area:	LTS		
EUT Model #:	EA-WMFS, EA-WHS, EA-WTS	Date:	3/12/2008		
EUT Serial #:	N/A	EUT Power:	60Hz/120VAC	Temperature:	24.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	Restricted Bands. > 1GHz				
Data File Name:	0944.dat			Page:	9 of 9

Duty cycle, 3 of 3



Tested by: Greg Jakubowski

Printed

Signature

Reviewed by: J. T. Schneider

Printed

Signature

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 –12.32 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	19-Dec-08

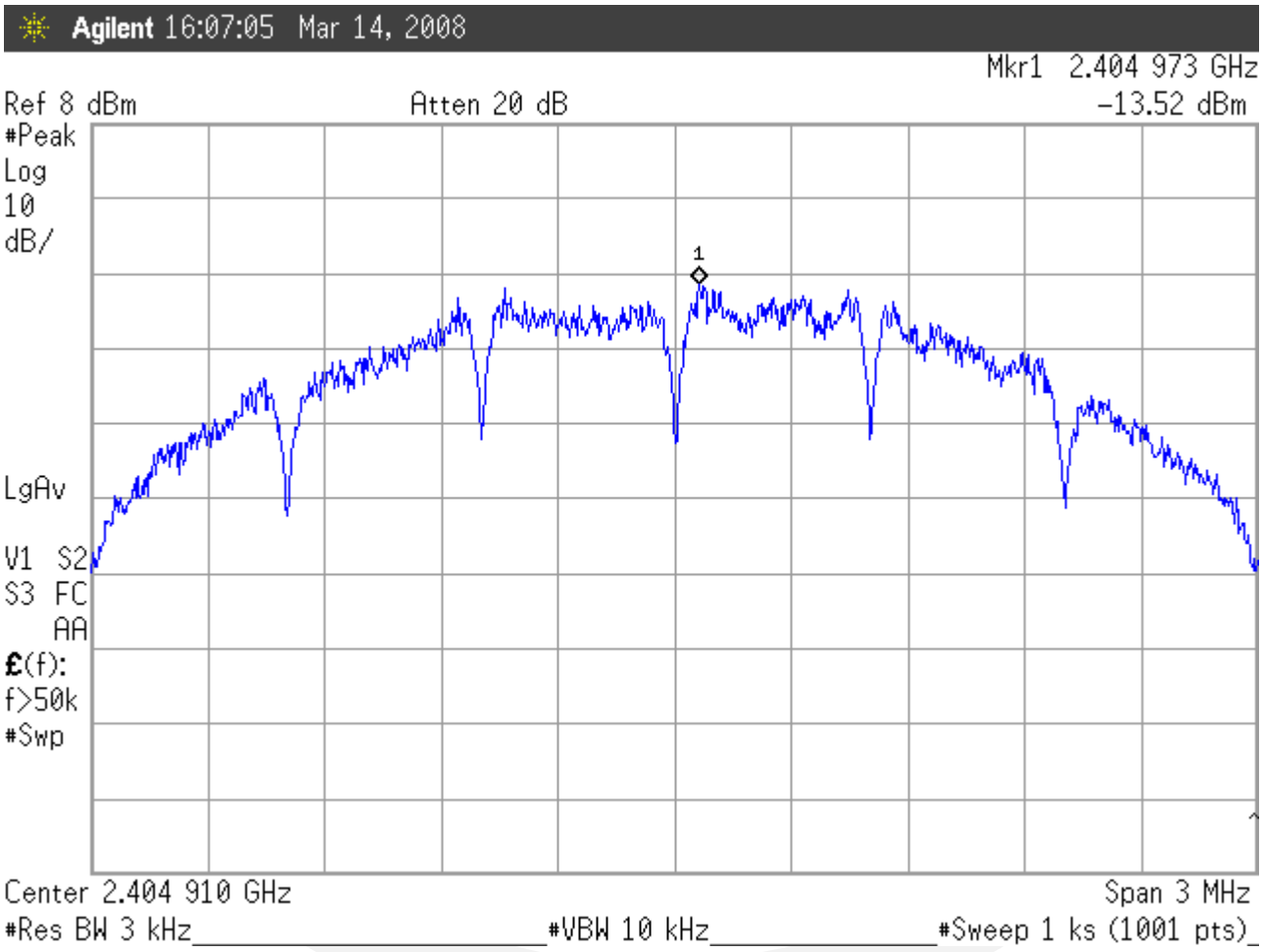
Test limit
No greater than 8 dBm in any 3 kHz band

Test data
See following pages.

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

Power spectral density
Model EA-WHS (typical of all 3 models)

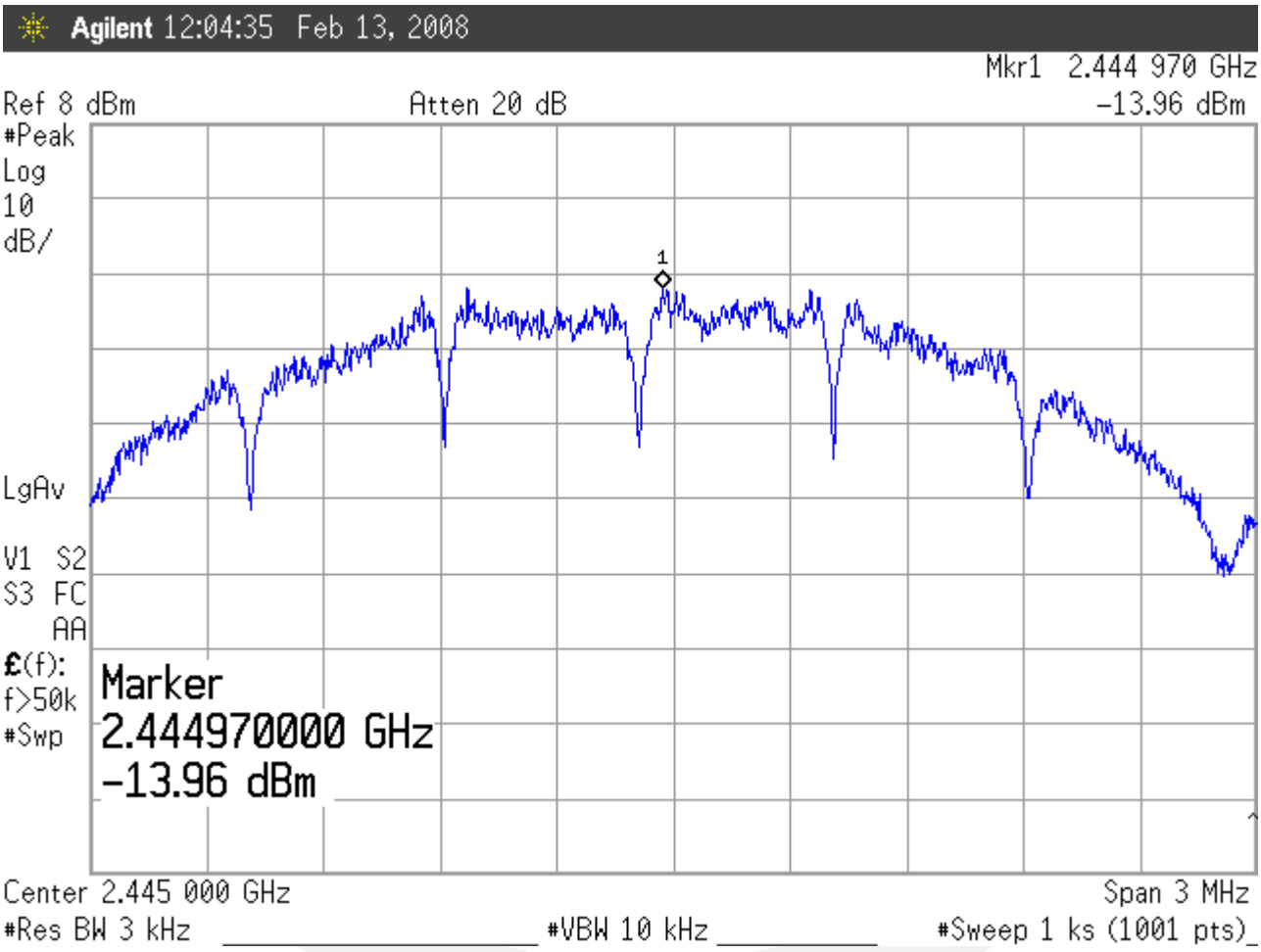
Low channel



TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

Power spectral density
Model EA-WHS (typical of all 3 models)

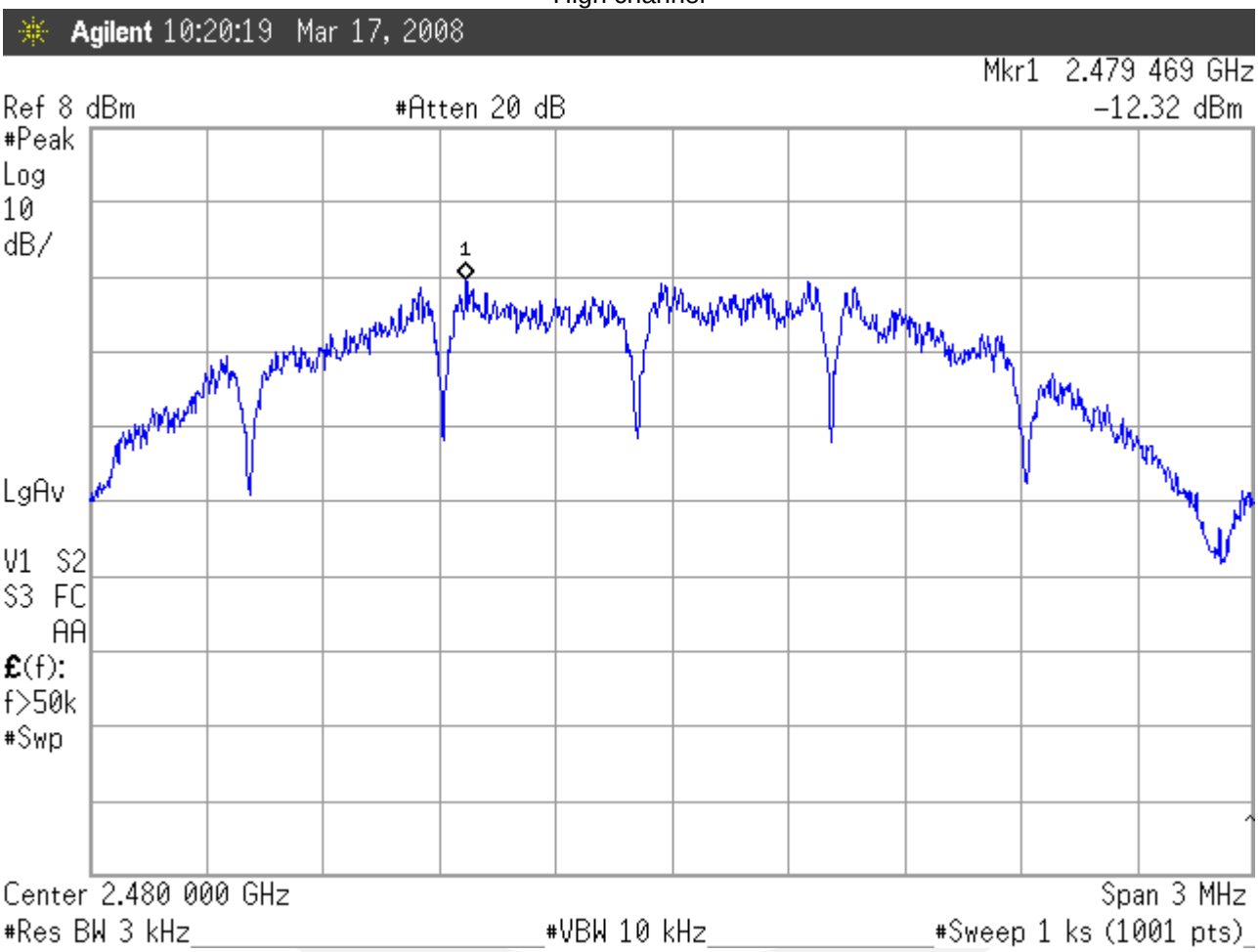
Mid channel



TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

Power spectral density
Model EA-WHS (typical of all 3 models)

High channel



TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

99% Bandwidth
IC RSS-GEN 4.6

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Test was performed in accordance with the article “A discussion on the measurement of occupied bandwidth” by Brian Kasper
99% Occupied bandwidth range is from 2.21 MHz to 2.24 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

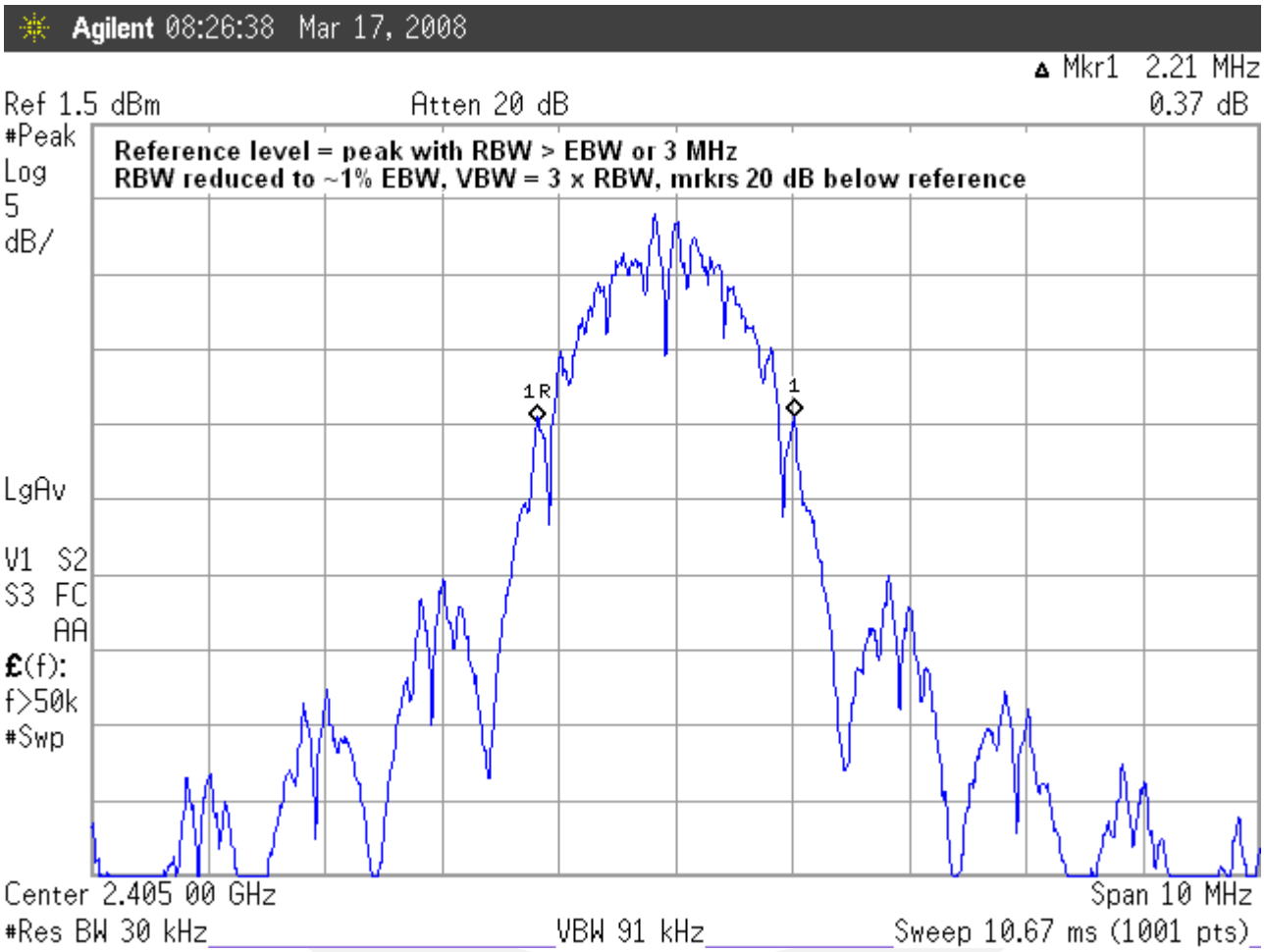
TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	19-Dec-08

Test limit
Not applicable

Test data
See following pages.

99% Occupied bandwidth
Model EA-WHS (typical of all 3 models)

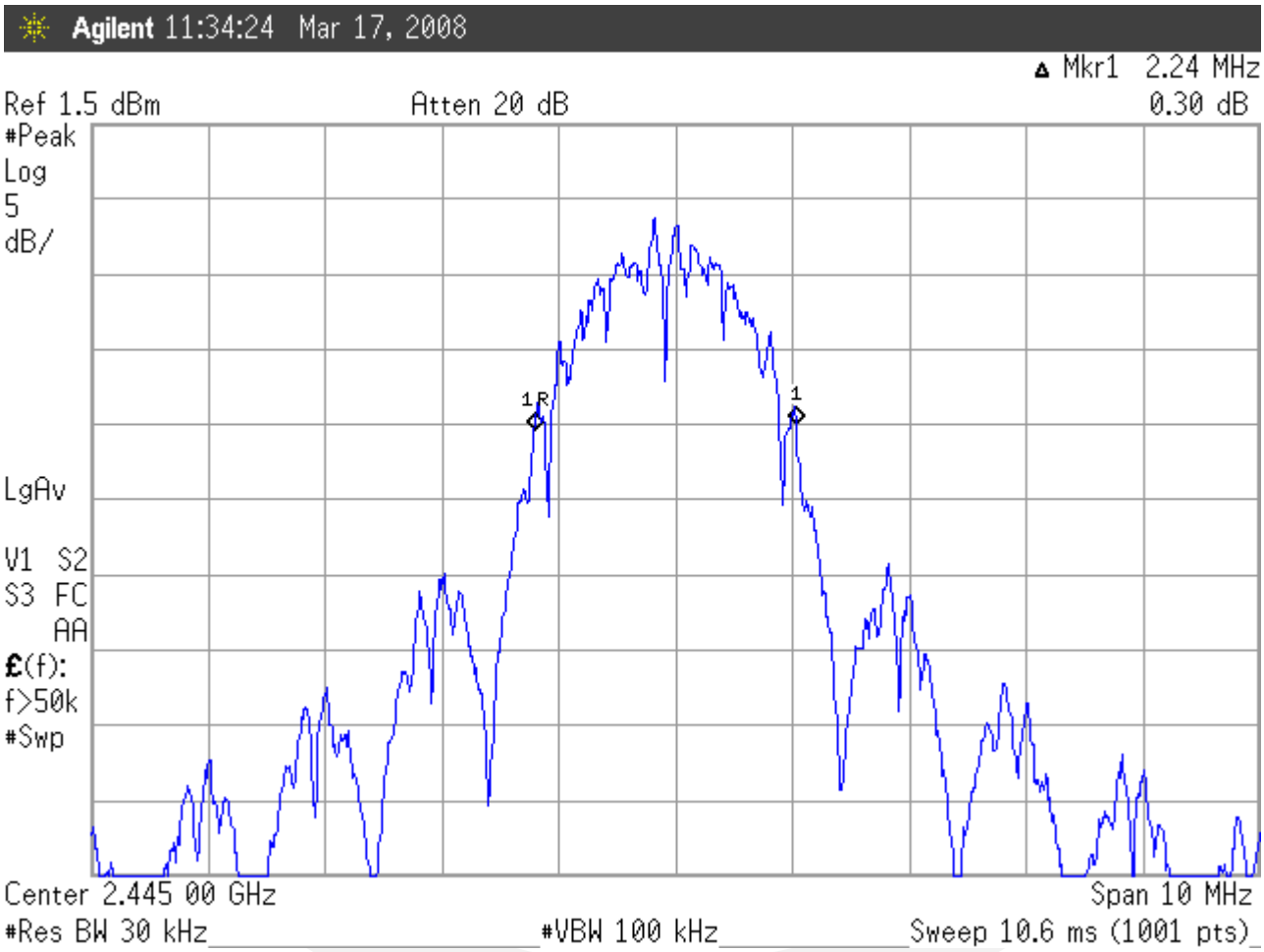
Low channel



TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

99% Occupied bandwidth
Model EA-WHS (typical of all 3 models)

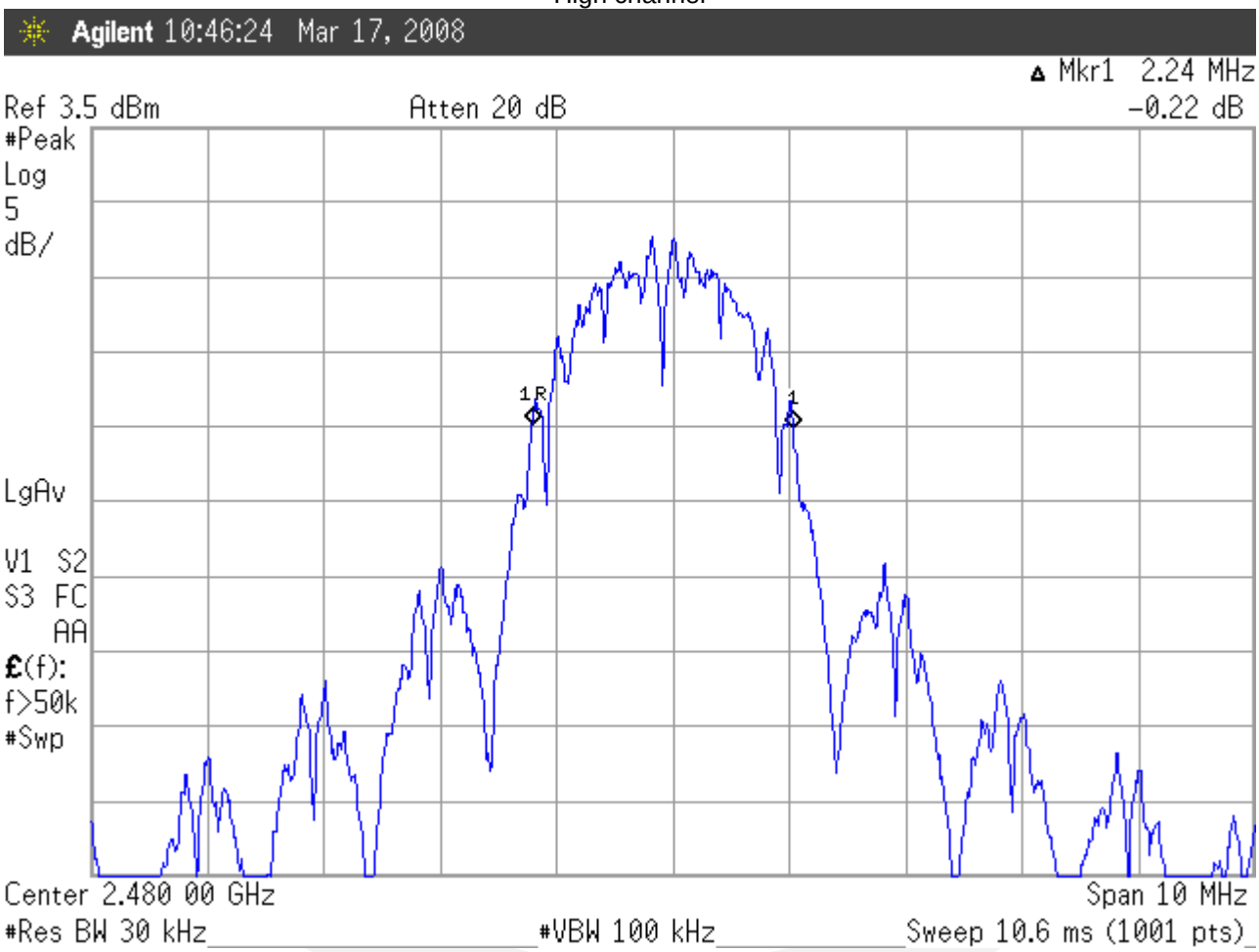
Mid channel



TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

99% Occupied bandwidth
Model EA-WHS (typical of all 3 models)

High channel



TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

Conducted emissions – AC power lines
FCC 15.207, IC RSS-Gen 7.2.2

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Test was performed in accordance with the test procedures of ANSI C63.4 2003, clause 7.2

Minimum margin of compliance = 12 dB at 394.2 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
WRLE02417	3825/2	Electro-Mechanics (EMCO)	50 Ω LISN	8812-1439	Code B 25-Feb-09
WRLE03294	8566B	Hewlett-Packard	Spectrum Analyzer	2349A03098	16-May-08
OWLE02532	ESHS-10	Rhode & Schwarz	EMI Receiver	828178/006	02-Aug-08

Cal Code B = Calibration verification performed internally.

Test limit

Frequncy (MHz)	Quasi-peak (dBμV)	Average (dBμV)
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

Test data
See following pages

CONDUCTED EMISSIONS

Test Report #:	WC800944 Run 9	Test Area:	LTS		
EUT Model #:	EA-WMFS	Date:	3/19/2008		
EUT Serial #:	na	EUT Power:	110V/60Hz, 230V/50Hz	Temperature:	23.0 °C
Test Method:	EN55022 B, FCC 15.207			Air Pressure:	99.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	typical of models EA-WHS & EA-WTS				
Data File Name:	0944.dat			Page:	1 of 7

List of measurements for run #: 9

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA1 15.207 Qp	DELTA2 15.207 Avg
110V / 60Hz						
151.85 kHz	23.04 Qp	0.12 / 0.2 / 0.0 / 0.0	23.36	N	-42.54	n/a
198.1 kHz	20.06 Qp	0.13 / 0.14 / 0.0 / 0.0	20.33	N	-43.36	n/a
394.2 kHz	37.6 Qp	0.17 / 0.1 / 0.0 / 0.0	37.87	N	-20.1	n/a
501.5 kHz	36.32 Qp	0.2 / 0.12 / 0.0 / 0.0	36.63	N	-19.37	n/a
745.7 kHz	32.04 Qp	0.22 / 0.2 / 0.0 / 0.0	32.46	N	-23.54	n/a
949.2 kHz	29.12 Qp	0.25 / 0.2 / 0.0 / 0.0	29.57	N	-26.43	n/a
2.728 MHz	20.48 Qp	0.4 / 0.1 / 0.0 / 0.0	20.98	N	-35.02	n/a
10.792 MHz	22.18 Qp	0.79 / 0.34 / 0.0 / 0.0	23.31	N	-36.69	n/a
16.728 MHz	20.04 Qp	0.97 / 0.64 / 0.0 / 0.0	21.64	N	-38.36	n/a
29.552 MHz	9.14 Qp	1.31 / 0.91 / 0.0 / 0.0	11.36	N	-48.64	n/a
151.85 kHz	4.96 Av	0.12 / 0.2 / 0.0 / 0.0	5.28	N	n/a	-50.62
198.1 kHz	3.94 Av	0.13 / 0.14 / 0.0 / 0.0	4.21	N	n/a	-49.48
394.2 kHz	21.02 Av	0.17 / 0.1 / 0.0 / 0.0	21.29	N	n/a	-26.68
501.5 kHz	11.33 Av	0.2 / 0.12 / 0.0 / 0.0	11.64	N	n/a	-34.36
745.7 kHz	6.45 Av	0.22 / 0.2 / 0.0 / 0.0	6.87	N	n/a	-39.13
949.2 kHz	8.73 Av	0.25 / 0.2 / 0.0 / 0.0	9.18	N	n/a	-36.82
2.728 MHz	4.07 Av	0.4 / 0.1 / 0.0 / 0.0	4.57	N	n/a	-41.43
10.792 MHz	12.57 Av	0.79 / 0.34 / 0.0 / 0.0	13.7	N	n/a	-36.3
16.728 MHz	9.62 Av	0.97 / 0.64 / 0.0 / 0.0	11.22	N	n/a	-38.78
29.552 MHz	3.14 Av	1.31 / 0.91 / 0.0 / 0.0	5.36	N	n/a	-44.64
151.85 kHz	22.9 Qp	0.12 / 0.2 / 0.0 / 0.0	23.22	L1	-42.68	n/a
198.1 kHz	21.4 Qp	0.13 / 0.14 / 0.0 / 0.0	21.67	L1	-42.02	n/a
394.2 kHz	41.28 Qp	0.17 / 0.1 / 0.0 / 0.0	41.55	L1	-16.42	n/a
501.5 kHz	39.42 Qp	0.2 / 0.12 / 0.0 / 0.0	39.73	L1	-16.27	n/a
745.7 kHz	36.08 Qp	0.22 / 0.2 / 0.0 / 0.0	36.5	L1	-19.5	n/a

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: J. T. Schneider (Printed) — Joel T. Schneider (Signature)

CONDUCTED EMISSIONS

Test Report #:	WC800944 Run 9	Test Area:	LTS		
EUT Model #:	EA-WMFS	Date:	3/19/2008		
EUT Serial #:	na	EUT Power:	110V/60Hz, 230V/50Hz	Temperature:	23.0 °C
Test Method:	EN55022 B, FCC 15.207			Air Pressure:	99.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	typical of models EA-WHS & EA-WTS				
Data File Name:	0944.dat			Page:	2 of 7

List of measurements for run #: 9

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA1 15.207 Qp	DELTA2 15.207 Avg
949.2 kHz	29.6 Qp	0.25 / 0.2 / 0.0 / 0.0	30.05	L1	-25.95	n/a
2.728 MHz	23.62 Qp	0.4 / 0.1 / 0.0 / 0.0	24.12	L1	-31.88	n/a
10.792 MHz	21.22 Qp	0.79 / 0.34 / 0.0 / 0.0	22.35	L1	-37.65	n/a
16.728 MHz	17.3 Qp	0.97 / 0.64 / 0.0 / 0.0	18.9	L1	-41.1	n/a
29.552 MHz	10.92 Qp	1.31 / 0.91 / 0.0 / 0.0	13.14	L1	-46.86	n/a
151.85 kHz	9.42 Av	0.12 / 0.2 / 0.0 / 0.0	9.74	L1	n/a	-46.16
198.1 kHz	7.6 Av	0.13 / 0.14 / 0.0 / 0.0	7.87	L1	n/a	-45.82
394.2 kHz	25.67 Av	0.17 / 0.1 / 0.0 / 0.0	25.94	L1	n/a	-22.03
501.5 kHz	14.5 Av	0.2 / 0.12 / 0.0 / 0.0	14.81	L1	n/a	-31.19
745.7 kHz	9.86 Av	0.22 / 0.2 / 0.0 / 0.0	10.28	L1	n/a	-35.72
949.2 kHz	18.37 Av	0.25 / 0.2 / 0.0 / 0.0	18.82	L1	n/a	-27.18
2.728 MHz	11.26 Av	0.4 / 0.1 / 0.0 / 0.0	11.76	L1	n/a	-34.24
10.792 MHz	12.5 Av	0.79 / 0.34 / 0.0 / 0.0	13.63	L1	n/a	-36.37
16.728 MHz	8.54 Av	0.97 / 0.64 / 0.0 / 0.0	10.14	L1	n/a	-39.86
29.552 MHz	-0.79 Av	1.31 / 0.91 / 0.0 / 0.0	1.43	L1	n/a	-48.57
230V / 50Hz						
151.85 kHz	22.26 Qp	0.12 / 0.2 / 0.0 / 0.0	22.58	L1	-43.32	n/a
198.1 kHz	27.78 Qp	0.13 / 0.14 / 0.0 / 0.0	28.05	L1	-35.64	n/a
394.2 kHz	44.88 Qp	0.17 / 0.1 / 0.0 / 0.0	45.15	L1	-12.82	n/a
501.5 kHz	30.3 Qp	0.2 / 0.12 / 0.0 / 0.0	30.61	L1	-25.39	n/a
745.7 kHz	29.12 Qp	0.22 / 0.2 / 0.0 / 0.0	29.54	L1	-26.46	n/a
949.2 kHz	28.68 Qp	0.25 / 0.2 / 0.0 / 0.0	29.13	L1	-26.87	n/a
2.728 MHz	25.84 Qp	0.4 / 0.1 / 0.0 / 0.0	26.34	L1	-29.66	n/a
3.932 MHz	21.42 Qp	0.48 / 0.1 / 0.0 / 0.0	22.0	L1	-34.0	n/a
7.824 MHz	17.12 Qp	0.68 / 0.19 / 0.0 / 0.0	17.99	L1	-42.01	n/a
9.532 MHz	17.08 Qp	0.75 / 0.28 / 0.0 / 0.0	18.1	L1	-41.9	n/a

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: J. T. Schneider (Printed) — Joel T. Schneider (Signature)

CONDUCTED EMISSIONS

Test Report #:	WC800944 Run 9	Test Area:	LTS		
EUT Model #:	EA-WMFS	Date:	3/19/2008		
EUT Serial #:	na	EUT Power:	110V/60Hz, 230V/50Hz	Temperature:	23.0 °C
Test Method:	EN55022 B, FCC 15.207			Air Pressure:	99.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	typical of models EA-WHS & EA-WTS				
Data File Name:	0944.dat			Page:	3 of 7

List of measurements for run #: 9

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA1 15.207 Qp	DELTA2 15.207 Avg
10.792 MHz	19.26 Qp	0.79 / 0.34 / 0.0 / 0.0	20.39	L1	-39.61	n/a
16.728 MHz	17.44 Qp	0.97 / 0.64 / 0.0 / 0.0	19.04	L1	-40.96	n/a
29.552 MHz	8.2 Qp	1.31 / 0.91 / 0.0 / 0.0	10.42	L1	-49.58	n/a
151.85 kHz	12.08 Av	0.12 / 0.2 / 0.0 / 0.0	12.4	L1	n/a	-43.5
198.1 kHz	15.95 Av	0.13 / 0.14 / 0.0 / 0.0	16.22	L1	n/a	-37.47
394.2 kHz	35.58 Av	0.17 / 0.1 / 0.0 / 0.0	35.85	L1	n/a	-12.12
501.5 kHz	22.57 Av	0.2 / 0.12 / 0.0 / 0.0	22.88	L1	n/a	-23.12
745.7 kHz	20.87 Av	0.22 / 0.2 / 0.0 / 0.0	21.29	L1	n/a	-24.71
949.2 kHz	12.28 Av	0.25 / 0.2 / 0.0 / 0.0	12.73	L1	n/a	-33.27
2.728 MHz	7.57 Av	0.4 / 0.1 / 0.0 / 0.0	8.07	L1	n/a	-37.93
3.932 MHz	7.24 Av	0.48 / 0.1 / 0.0 / 0.0	7.82	L1	n/a	-38.18
7.824 MHz	4.01 Av	0.68 / 0.19 / 0.0 / 0.0	4.88	L1	n/a	-45.12
9.532 MHz	4.3 Av	0.75 / 0.28 / 0.0 / 0.0	5.32	L1	n/a	-44.68
10.792 MHz	6.44 Av	0.79 / 0.34 / 0.0 / 0.0	7.57	L1	n/a	-42.43
16.728 MHz	3.75 Av	0.97 / 0.64 / 0.0 / 0.0	5.35	L1	n/a	-44.65
29.552 MHz	-1.35 Av	1.31 / 0.91 / 0.0 / 0.0	0.87	L1	n/a	-49.13
151.85 kHz	18.52 Qp	0.12 / 0.2 / 0.0 / 0.0	18.84	N	-47.06	n/a
198.1 kHz	18.1 Qp	0.13 / 0.14 / 0.0 / 0.0	18.37	N	-45.32	n/a
394.2 kHz	41.24 Qp	0.17 / 0.1 / 0.0 / 0.0	41.51	N	-16.46	n/a
501.5 kHz	28.62 Qp	0.2 / 0.12 / 0.0 / 0.0	28.93	N	-27.07	n/a
745.7 kHz	22.84 Qp	0.22 / 0.2 / 0.0 / 0.0	23.26	N	-32.74	n/a
949.2 kHz	22.0 Qp	0.25 / 0.2 / 0.0 / 0.0	22.45	N	-33.55	n/a
2.728 MHz	17.78 Qp	0.4 / 0.1 / 0.0 / 0.0	18.28	N	-37.72	n/a
3.932 MHz	16.06 Qp	0.48 / 0.1 / 0.0 / 0.0	16.64	N	-39.36	n/a
7.824 MHz	16.18 Qp	0.68 / 0.19 / 0.0 / 0.0	17.05	N	-42.95	n/a
9.532 MHz	16.28 Qp	0.75 / 0.28 / 0.0 / 0.0	17.3	N	-42.7	n/a

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: J. T. Schneider (Printed) — Joel T. Schneider (Signature)

CONDUCTED EMISSIONS

Test Report #:	WC800944 Run 9	Test Area:	LTS			
EUT Model #:	EA-WMFS	Date:	3/19/2008			
EUT Serial #:	na	EUT Power:	110V/60Hz, 230V/50Hz	Temperature:	23.0	°C
Test Method:	EN55022 B, FCC 15.207			Air Pressure:	99.0	kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0	%
EUT Description:	Wireless sensors (temp, humidity, multi-function)					
Notes:	typical of models EA-WHS & EA-WTS					
Data File Name:	0944.dat			Page:	4 of 7	

List of measurements for run #: 9

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA1 15.207 Qp	DELTA2 15.207 Avg
10.792 MHz	19.16 Qp	0.79 / 0.34 / 0.0 / 0.0	20.29	N	-39.71	n/a
16.728 MHz	17.42 Qp	0.97 / 0.64 / 0.0 / 0.0	19.02	N	-40.98	n/a
29.552 MHz	8.22 Qp	1.31 / 0.91 / 0.0 / 0.0	10.44	N	-49.56	n/a
151.85 kHz	4.78 Av	0.12 / 0.2 / 0.0 / 0.0	5.1	N	n/a	-50.8
198.1 kHz	8.24 Av	0.13 / 0.14 / 0.0 / 0.0	8.51	N	n/a	-45.18
394.2 kHz	28.61 Av	0.17 / 0.1 / 0.0 / 0.0	28.88	N	n/a	-19.09
501.5 kHz	8.29 Av	0.2 / 0.12 / 0.0 / 0.0	8.6	N	n/a	-37.4
745.7 kHz	6.79 Av	0.22 / 0.2 / 0.0 / 0.0	7.21	N	n/a	-38.79
949.2 kHz	5.89 Av	0.25 / 0.2 / 0.0 / 0.0	6.34	N	n/a	-39.66
2.728 MHz	2.93 Av	0.4 / 0.1 / 0.0 / 0.0	3.43	N	n/a	-42.57
3.932 MHz	2.45 Av	0.48 / 0.1 / 0.0 / 0.0	3.03	N	n/a	-42.97
7.824 MHz	2.63 Av	0.68 / 0.19 / 0.0 / 0.0	3.5	N	n/a	-46.5
9.532 MHz	3.79 Av	0.75 / 0.28 / 0.0 / 0.0	4.81	N	n/a	-45.19
10.792 MHz	6.25 Av	0.79 / 0.34 / 0.0 / 0.0	7.38	N	n/a	-42.62
16.728 MHz	9.35 Av	0.97 / 0.64 / 0.0 / 0.0	10.95	N	n/a	-39.05
29.552 MHz	1.07 Av	1.31 / 0.91 / 0.0 / 0.0	3.29	N	n/a	-46.71

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: J. T. Schneider (Printed) — Joel T. Schneider (Signature)

CONDUCTED EMISSIONS

Test Report #:	WC800944 Run 9	Test Area:	LTS			
EUT Model #:	EA-WMFS	Date:	3/19/2008			
EUT Serial #:	na	EUT Power:	110V/60Hz, 230V/50Hz	Temperature:	23.0	°C
Test Method:	EN55022 B, FCC 15.207			Air Pressure:	99.0	kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0	%
EUT Description:	Wireless sensors (temp, humidity, multi-function)					
Notes:	typical of models EA-WHS & EA-WTS					
Data File Name:	0944.dat			Page:	5 of 7	

Measurement summary for limit1: 15.207 (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA1 15.207 Qp
394.2 kHz	44.88 Qp	0.17 / 0.1 / 0.0 / 0.0	45.15	L1	-12.82
501.5 kHz	39.42 Qp	0.2 / 0.12 / 0.0 / 0.0	39.73	L1	-16.27
745.7 kHz	36.08 Qp	0.22 / 0.2 / 0.0 / 0.0	36.5	L1	-19.5
949.2 kHz	29.6 Qp	0.25 / 0.2 / 0.0 / 0.0	30.05	L1	-25.95
2.728 MHz	25.84 Qp	0.4 / 0.1 / 0.0 / 0.0	26.34	L1	-29.66
3.932 MHz	21.42 Qp	0.48 / 0.1 / 0.0 / 0.0	22.0	L1	-34.0
198.1 kHz	27.78 Qp	0.13 / 0.14 / 0.0 / 0.0	28.05	L1	-35.64
10.792 MHz	22.18 Qp	0.79 / 0.34 / 0.0 / 0.0	23.31	N	-36.69
16.728 MHz	20.04 Qp	0.97 / 0.64 / 0.0 / 0.0	21.64	N	-38.36
9.532 MHz	17.08 Qp	0.75 / 0.28 / 0.0 / 0.0	18.1	L1	-41.9
7.824 MHz	17.12 Qp	0.68 / 0.19 / 0.0 / 0.0	17.99	L1	-42.01
151.85 kHz	23.04 Qp	0.12 / 0.2 / 0.0 / 0.0	23.36	N	-42.54
29.552 MHz	10.92 Qp	1.31 / 0.91 / 0.0 / 0.0	13.14	L1	-46.86

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: J. T. Schneider (Printed) — Joel T. Schneider (Signature)

CONDUCTED EMISSIONS

Test Report #:	WC800944 Run 9	Test Area:	LTS			
EUT Model #:	EA-WMFS	Date:	3/19/2008			
EUT Serial #:	na	EUT Power:	110V/60Hz, 230V/50Hz	Temperature:	23.0	°C
Test Method:	EN55022 B, FCC 15.207			Air Pressure:	99.0	kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0	%
EUT Description:	Wireless sensors (temp, humidity, multi-function)					
Notes:	typical of models EA-WHS & EA-WTS					
Data File Name:	0944.dat			Page:	6 of 7	

Measurement summary for limit2: 15.207 (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	EUT Lead	DELTA2 15.207 Avg
394.2 kHz	35.58 Av	0.17 / 0.1 / 0.0 / 0.0	35.85	L1	-12.12
501.5 kHz	22.57 Av	0.2 / 0.12 / 0.0 / 0.0	22.88	L1	-23.12
745.7 kHz	20.87 Av	0.22 / 0.2 / 0.0 / 0.0	21.29	L1	-24.71
949.2 kHz	18.37 Av	0.25 / 0.2 / 0.0 / 0.0	18.82	L1	-27.18
2.728 MHz	11.26 Av	0.4 / 0.1 / 0.0 / 0.0	11.76	L1	-34.24
10.792 MHz	12.57 Av	0.79 / 0.34 / 0.0 / 0.0	13.7	N	-36.3
198.1 kHz	15.95 Av	0.13 / 0.14 / 0.0 / 0.0	16.22	L1	-37.47
3.932 MHz	7.24 Av	0.48 / 0.1 / 0.0 / 0.0	7.82	L1	-38.18
16.728 MHz	9.62 Av	0.97 / 0.64 / 0.0 / 0.0	11.22	N	-38.78
151.85 kHz	12.08 Av	0.12 / 0.2 / 0.0 / 0.0	12.4	L1	-43.5
29.552 MHz	3.14 Av	1.31 / 0.91 / 0.0 / 0.0	5.36	N	-44.64
9.532 MHz	4.3 Av	0.75 / 0.28 / 0.0 / 0.0	5.32	L1	-44.68
7.824 MHz	4.01 Av	0.68 / 0.19 / 0.0 / 0.0	4.88	L1	-45.12

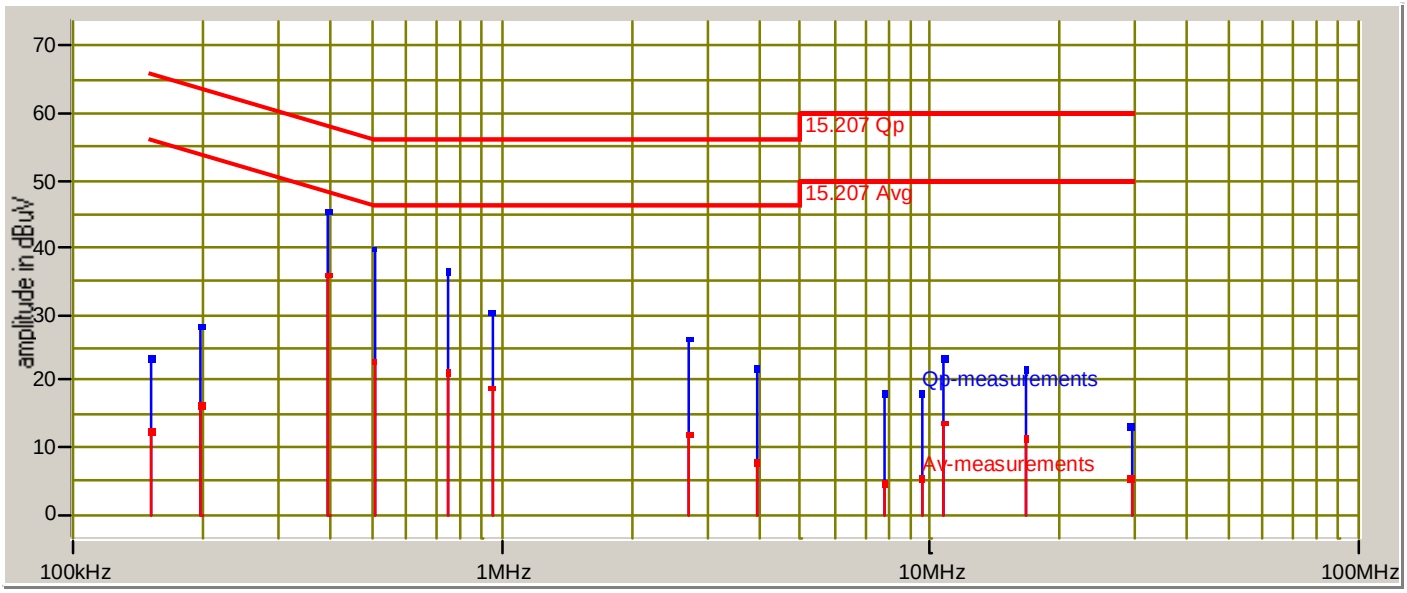
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: J. T. Schneider (Printed) — Joel T. Schneider (Signature)

CONDUCTED EMISSIONS

Test Report #:	WC800944 Run 9	Test Area:	LTS		
EUT Model #:	EA-WMFS	Date:	3/19/2008		
EUT Serial #:	na	EUT Power:	110V/60Hz, 230V/50Hz	Temperature:	23.0 °C
Test Method:	EN55022 B, FCC 15.207			Air Pressure:	99.0 kPa
Customer:	Winland Electronics			Rel. Humidity:	21.0 %
EUT Description:	Wireless sensors (temp, humidity, multi-function)				
Notes:	typical of models EA-WHS & EA-WTS				
Data File Name:	0944.dat			Page:	7 of 7

Graph:



Tested by: Greg Jakubowski (Printed) _____ (Signature)

Reviewed by: J. T. Schneider (Printed) _____ (Signature)

TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.

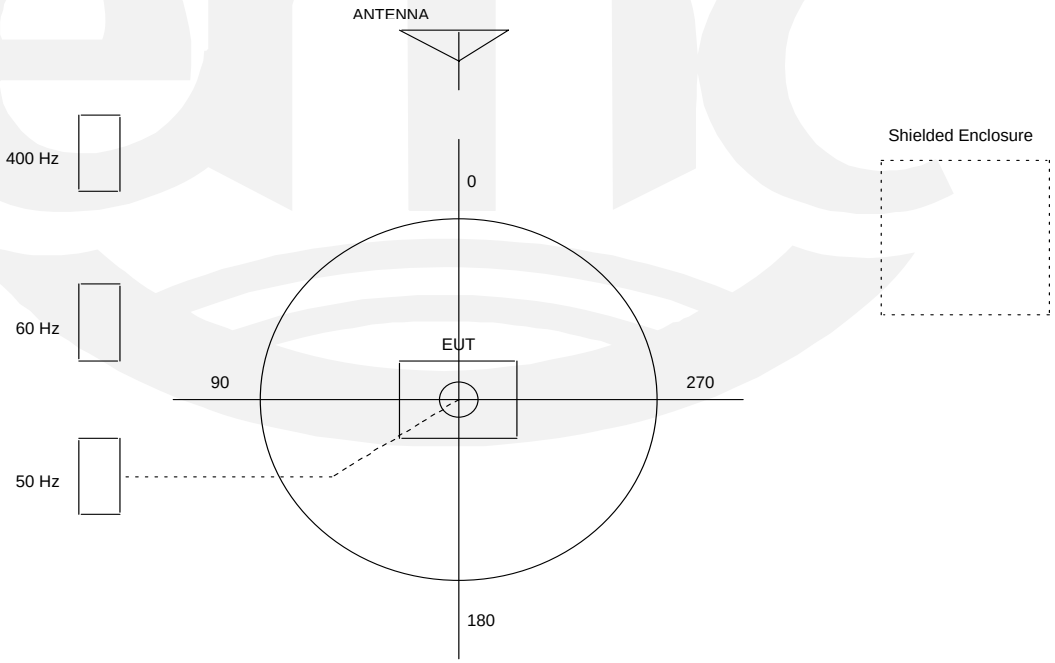
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.

3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.

4. The circle is a 6.7 meter diameter turntable.

5. A ground plane is in the plane of this sheet.

6. The test sample is shown in the azimuthal position representing zero degrees.



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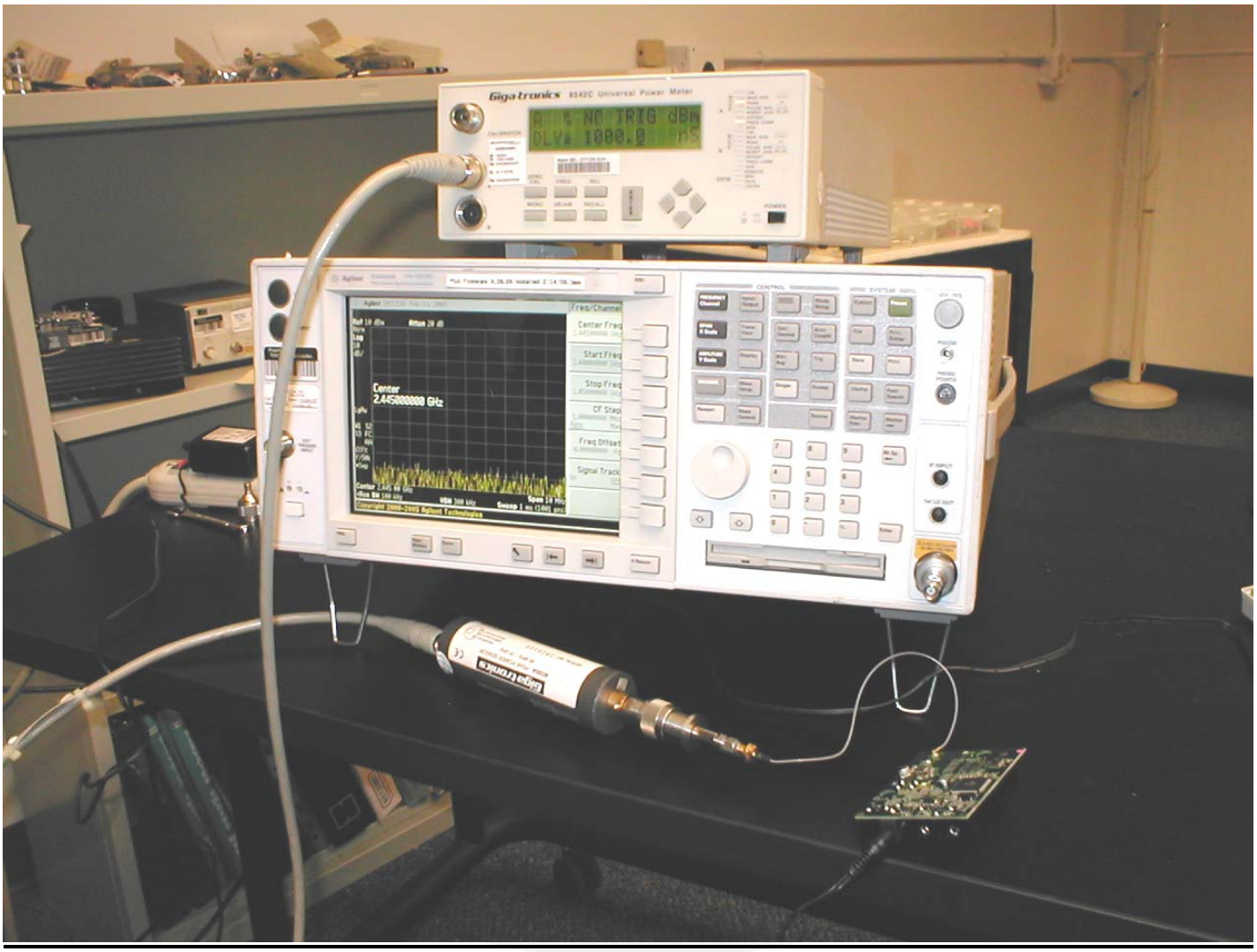
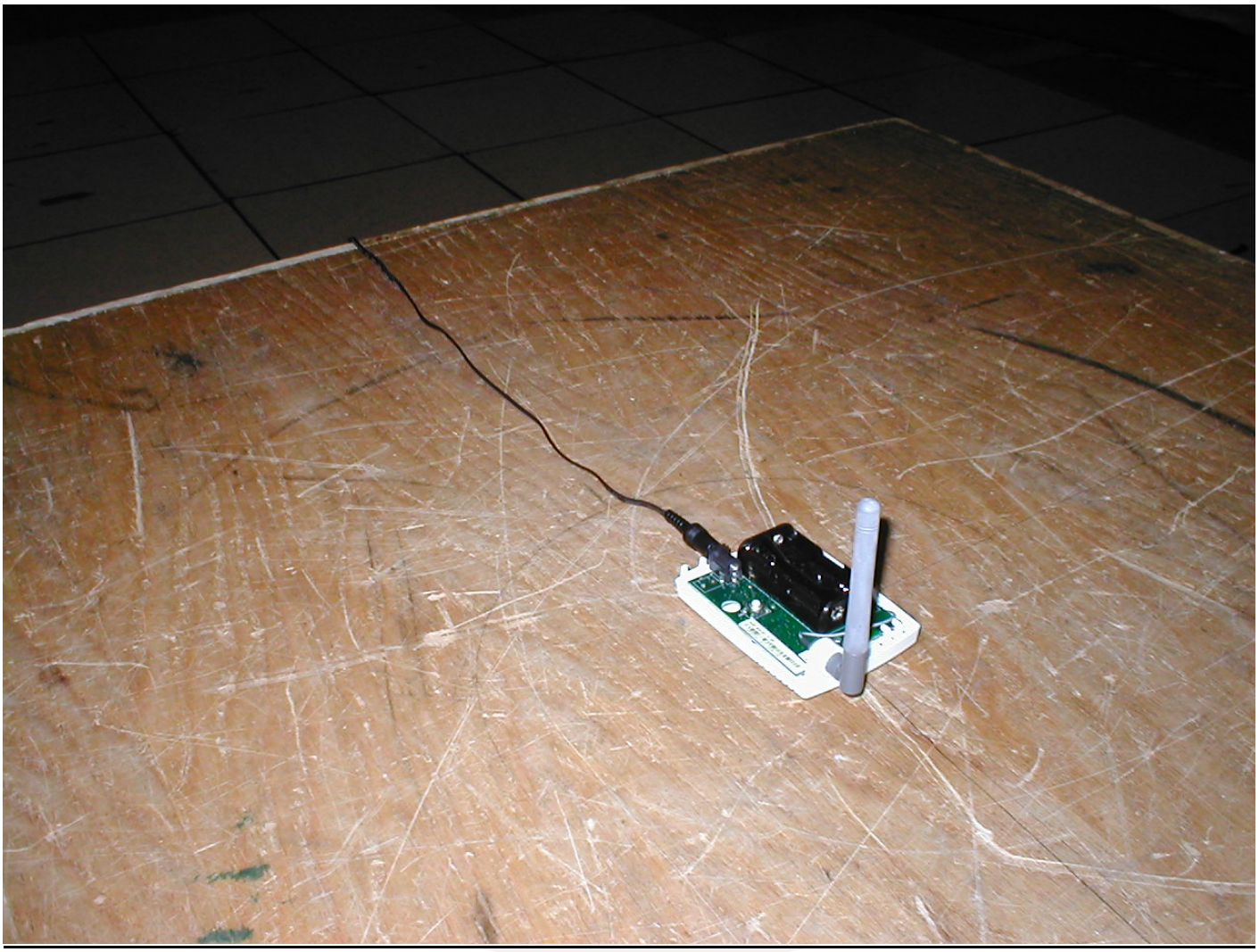
Test-setup photo(s):
Conducted measurements



Test-setup photo(s):
Radiated measurements



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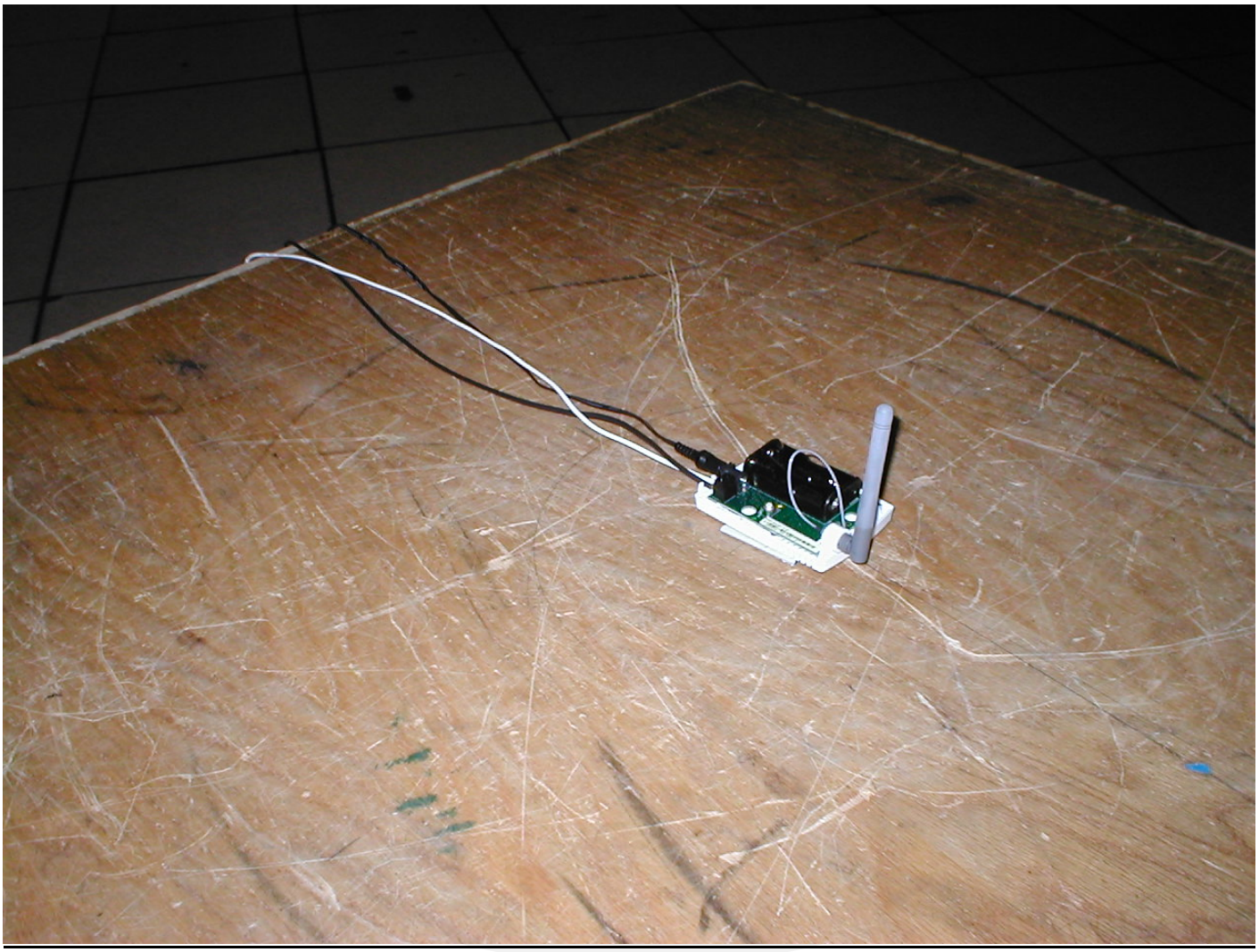
Test-setup photo(s):
Radiated measurements

Test-setup photo(s):
Radiated measurements



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Test-setup photo(s):
Radiated measurements

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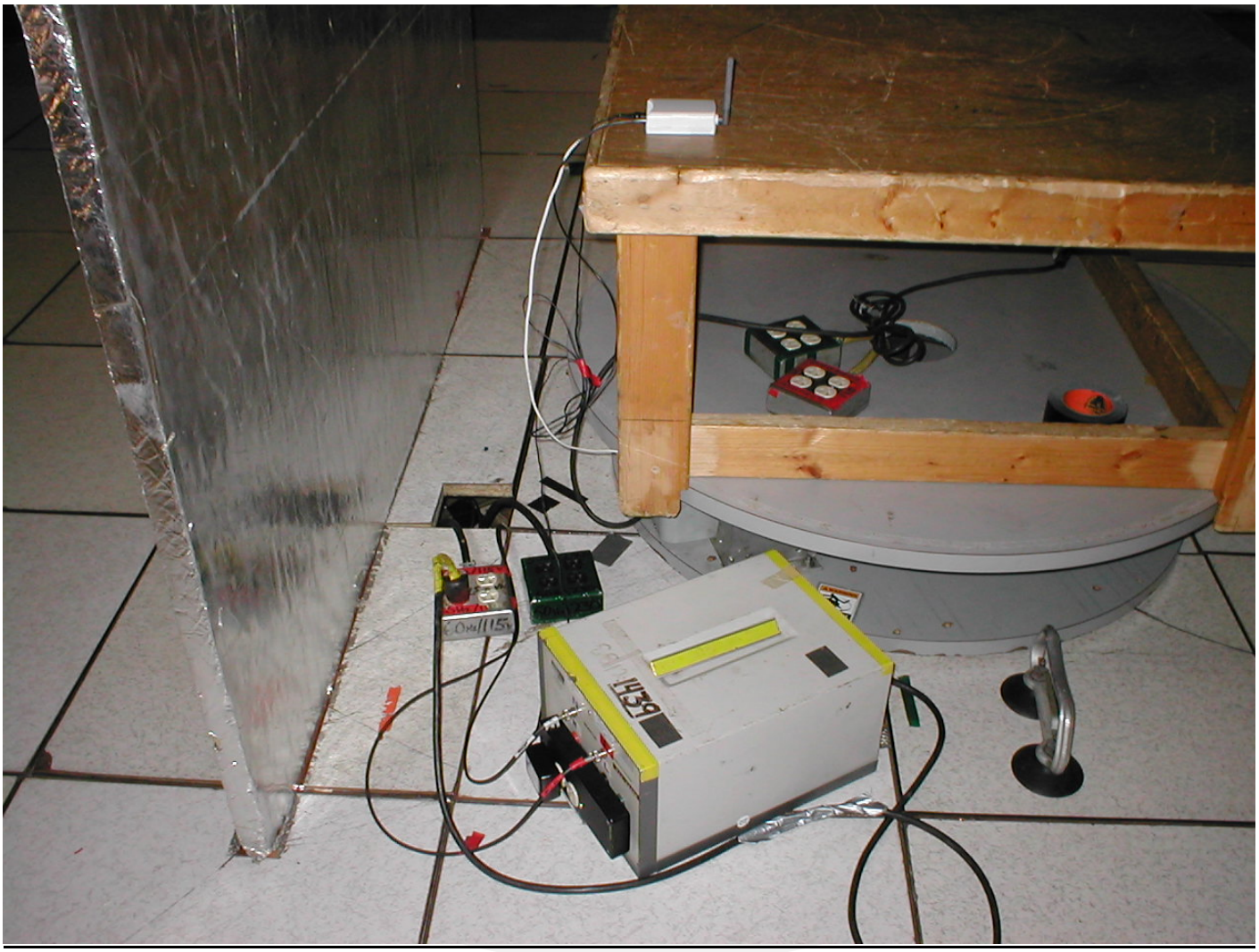
Test-setup photo(s):
Conducted measurements – AC power lines



Equipment Under Test (EUT) Test Operation Mode:

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

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

■ - Normal operating mode

■ - Fixed frequencies, channels 11, 19, & 26 (low, mid, high)

Configuration of the device under test:

■ - See Constructional Data Form in Appendix B

☐ - See Product Information Form(s) in Appendix B

The following peripheral devices and interface cables were connected during the measurement:

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - unshielded power cable

☐ - unshielded cables

☐ - shielded cables MPS.No.: _____

☐ - customer specific cables

☐ - _____

☐ - _____

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298 Rev. 071107

GENERAL REMARKS:

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:	13 February 2008
Condition of EUT:	Normal
Testing Start Date:	13 February 2008
Testing End Date:	17 March 2008

TÜV SÜD AMERICA INC

Tested by:

Greg Jakubowski
Senior EMC Technician

Approved by:

Joel T Schneider
Senior EMC Engineer

Appendix A

Constructional Data Form

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:	Winland Electronics, Inc.		
Address:	1950 Excel Drive		
	Mankato, MN 56001		
Contact:	Ross Loven	Position:	Project Engineer
Phone:	507-386-4266	Fax:	507-387-2488
E-mail Address:	rmloven@winland.com		

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

EUT Description	Wireless Sensors - 3 Variations (Temp, Humidity, Multi-Function)
EUT Name	Wireless Temperature Sensor, Wireless Humidity Sensor, & Wireless Multi-Function Sensor
Model No.:	EA-WTS, EA-WHS, & EA-WMFS Serial No.: N/A
Product Options:	N/A
Configurations to be tested:	Battery Powered, Wall Powered (for applicable tests)

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:	N/A
Modifications made during test:	N/A

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

- ☒ EMC Directive 2004/108/EC (EMC)
  - Std: EN 61326 Table 1
- ☐ Machinery Directive 89/392/EEC (EMC)
  - Std:
- ☐ Medical Device Directive 93/42/EEC (EMC)
  - Std:
- ☐ Vehicle Directive: ☐ 2001/3/EC (EMC) ☐ 2004/104/EC (EMC)
  - ☐ Other Vehicle Std:
- ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

- ☒ FCC: Class ☐ A ☒ B Part 15
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B
- ☐ Canada: Class ☐ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☒ Other: ICES-003, Issue 4, 2004, Class B

Third Party Certification, if applicable (*Signature on Page 6 Required)

- ☐ Attestation of Conformity (AoC)*
- ☐ Certificate of Conformity (CoC)*
- Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III
  (Press **F1** when field is selected to show additional information on Protection Class.)
- ☒ FCC / TCB Certification
- ☐ E-Mark Certification
- ☐ EMC Certification (used with Octagon Mark)*
- ☐ Compliance Document*
- ☒ Industry Canada / FCB Certification
- ☐ Taiwan 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 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: 9.3 cm Width: 6.7 cm Height: 2.9 cm Weight: 0.11 kg

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: +12VDC (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: -

Current (Amps/phase(max)): 0.1 A Current (Amps/phase(nominal)): 0.05 A

Other Wireless input voltage requirement is +5 to +24VDC @ < 0.1A, testing w/ +12VDC

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Commercial, Residential, Light Industrial

EUT Power Cable

☐ Permanent OR ☒ Removable Length (in meters): 1.5

☐ Shielded OR ☒ Unshielded

☐ Not Applicable

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables

Type	Analog	Digital	During Test: Active	During Test: Passive	Qty	Shielding: Yes	Shielding: No	Shielding: Type	Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent
EXAMPLE:														
RS232	☐	☒	☒	☐	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
Wired Sensor Inputs (2-conductor)	☒	☐	☒	☐	1	☐	☒		Screw Terminal Block	Screw Terminal Block		3	☒	☐
Power Input (2-conductor)	☒	☐	☒	☐	1	☐	☒		Coaxial	Center Positive Plug		1	☒	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
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	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: Rev 3.6

Description: Firmware used to control wireless communication, power modes and analog sensor sampling.

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. FCC Mode (Intentional Radiator Tests); Normal Operating Mode (Unintentional Emissions and Immunity Tests)
2.
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 #
BLUE Thermistor Probe (Passive)	M-001-0082, M-001-0086		N/A
EA800	EA-800 (M-001-0124)		Being Tested Now

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.

Description	*Model #*	*Serial #*	*FCC ID #*
N/A			N/A

Oscillator Frequencies

Manufacturer	*Frequency*	*Derived Frequency*	*Component # / Location*	*Description of Use*
Pletronics P/N: SM11T-8-16.0M-20E1LKT250	16.000 MHz	1.00 MHz (MCLK)	Y3	RF Transceiver IC (U6) Clock Source
Atmel	8.0 MHz		U3	Internal RC Oscillator - Clock Source for U3
ECS P/N: ECS-.327-12.5-17IX	32.768 kHz		Y2	Microcontroller (U3) Timer Source

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
Salom	SSW-1636	N/A	☒ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*
N/A		

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*
Common Mode Choke	TDK	ZJYS81R5-2PL51-G01	1	L12 (Only on EA-WMFS)

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

(PLEASE INSERT "**ELECTRONIC SIGNATURE**" BELOW IF POSSIBLE)

Authorization Signatures (Signature Required for Certifications checked on pg 1)

Customer authorization to perform tests according to this test plan.	Date
Ross Loven	2/12/2008
Test Plan/CDF Prepared By (please print)	Date

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.

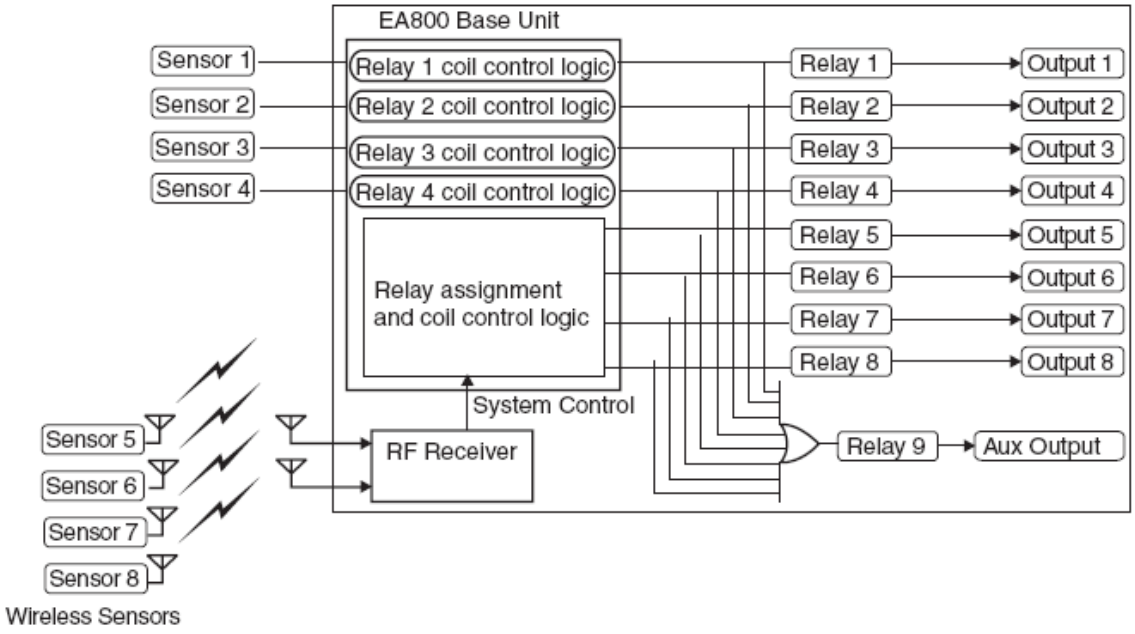

Figure 2 EA800 Environmental Alarm System Block Diagram

Authorization Signatures

Customer authorization to perform tests according to this test plan.	Date
Ross Loven	2/12/2008
Test Plan/CDF Prepared By (please print)	Date

Appendix B

Measurement Protocol

MEASUREMENT PROTOCOL
GENERAL INFORMATION

Test Methodology
Emissions testing is performed according to the procedures in ANSI C63.4-2003.

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
The final level, in dBμV, equals the EMI receiver level plus the cable loss and LISN factor.

Radiated Emissions
The final level, in dBμV/m, equals the reading from the spectrum analyzer (Level dBμV), 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 sheets in Attachment A. Intentional radiators are rotated through 3 orthogonal axes to determine the test position yielding the maximum emission levels.

Example:

FREQ (MHz)	LEVEL (dBuV)		CABLE/ANT/PREAMP (dB)	(dB/m)	(dB)	FINAL (dBuV/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.