EMC TEST REPORT

Test Report No.	**WC907821 Rev B**	Date of issue:	08 December 2009

Manufacturer	NovAtel Incorporated
Address	1120-68th Avenue N.E.
	Calgary, Alberta
	Canada T2E 8S5
Description of Equipment	GPS Receiver
Name of Equipment	Smart AG
Model No(s) Tested	01018495
Serial No(s) Tested	n/a
Test Result	■ **Compliant** ☐ **Non-compliant**

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REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	61	20 November 2009	Initial Release
A	61	01 December 2009	▪ Page 1 (and corresponding Test Result Summary) - updated Model from "01018498" to "01018477" per client. ▪ Appendix B - Replaced CDF and Block Diagram with updated forms from client.
B	60	08 December 2009	▪ Page 1 (and corresponding Test Result Summary) - updated Model from "01018477" to “01018495”per client. ▪ Appendix B – deleted Block Diagram which should be held confidential per client.

TEST REPORT CONTENTS **Page(s)**

Sign Explanations:
☐ - not applicable
■ - applicable

EMC TEST REGULATIONS

The tests were performed according to the following regulations:

FCC Part 15 Subpart C Section 15.247

IC RSS-210 Issue 7

ENVIRONMENTAL CONDITIONS IN THE LAB

	Actual
Temperature:	: 23°C
Atmospheric pressure	: 98 kPa
Relative Humidity	: 28-32 %

POWER SUPPLY UTILIZED

Power supply system : 12 VDC

Carrier Frequency Separation
FCC 15.247(a)(1), IC RSS-210 A8.1(b)

Test summary
The requirements are: ■ - MET ☐ - NOT MET

Carrier Frequency Separation = 1.0 MHz

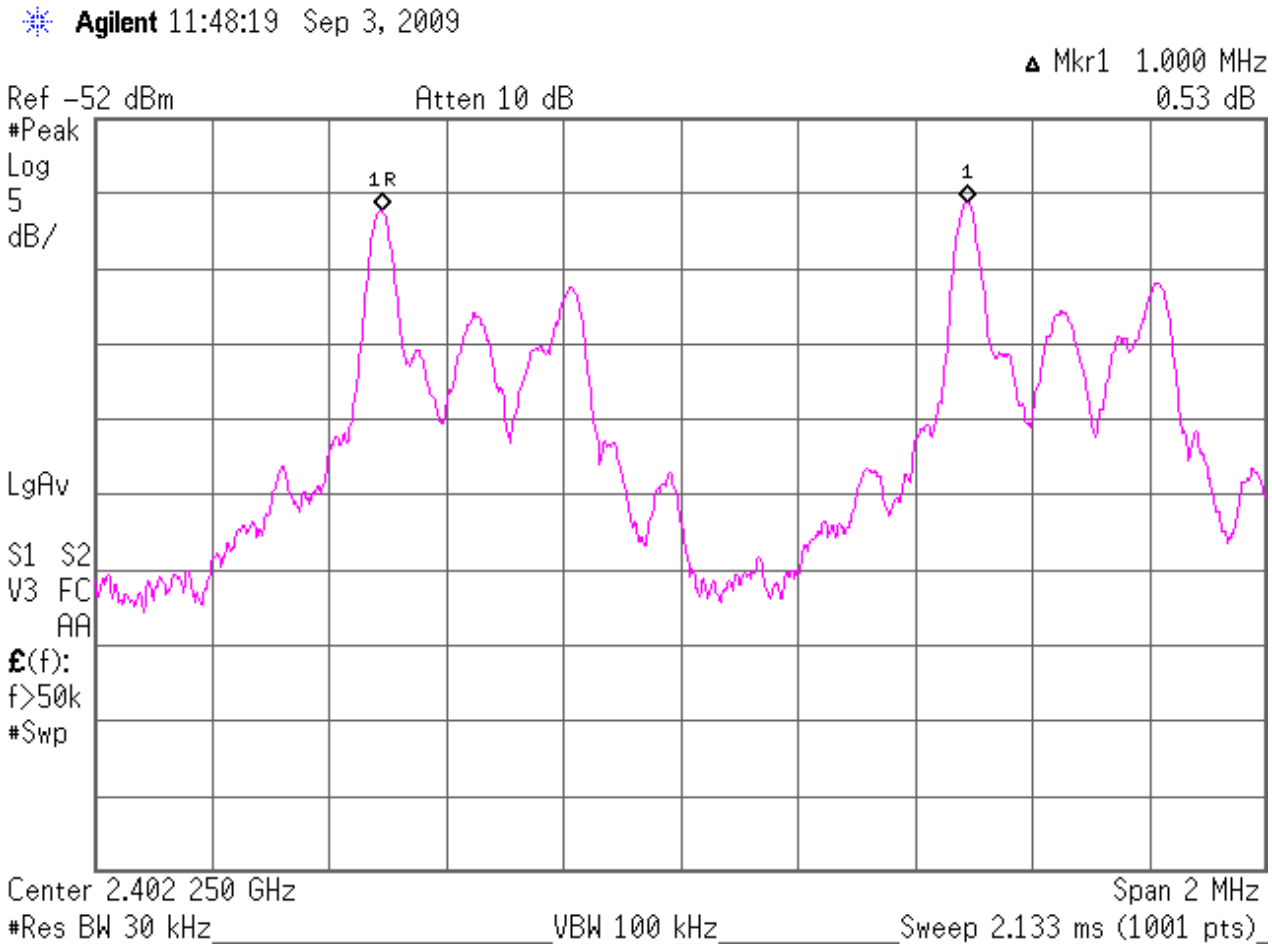
Test location
☐ - Wild River Lab Large Test Site (Open Area Test Site)
■ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	28 Jul 10

Test Limit
666 kHz (20 dB bandwidth) minimum

Test data



Number of Hopping Frequencies
FCC 15.247(a)(1)(iii), IC RSS-210 A8.1(d)

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Number of hopping frequencies = 79

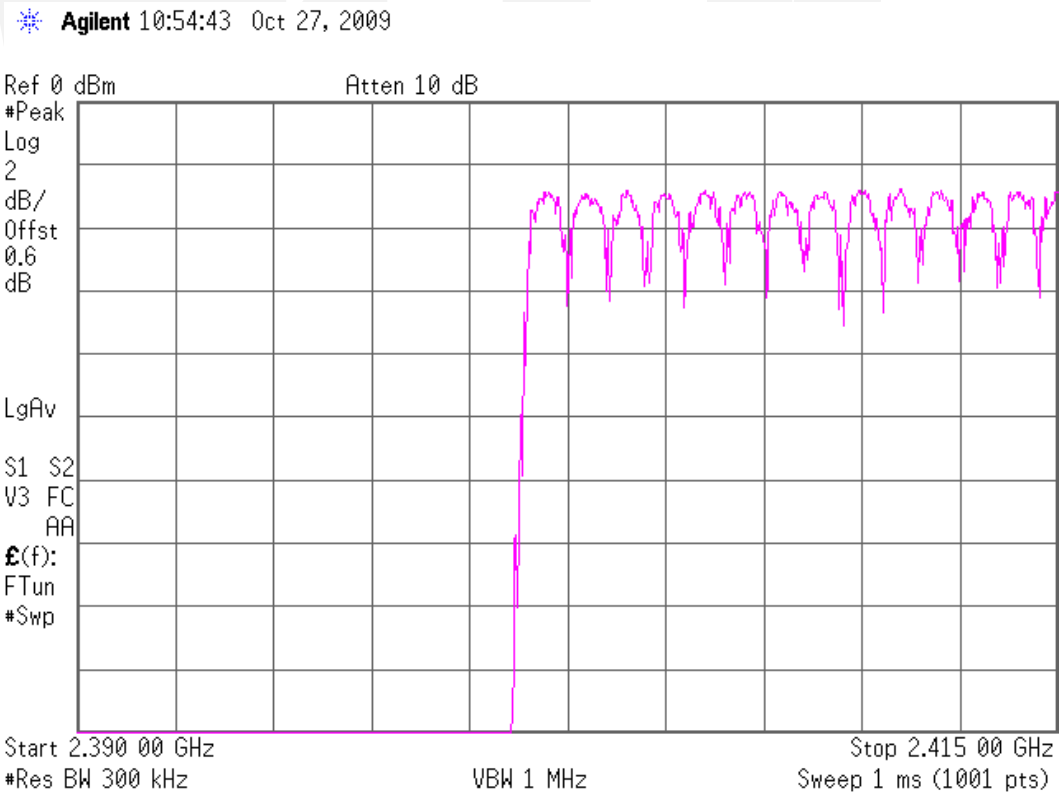
Test location
☐ - Wild River Lab Large Test Site (Open Area Test Site)
■ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

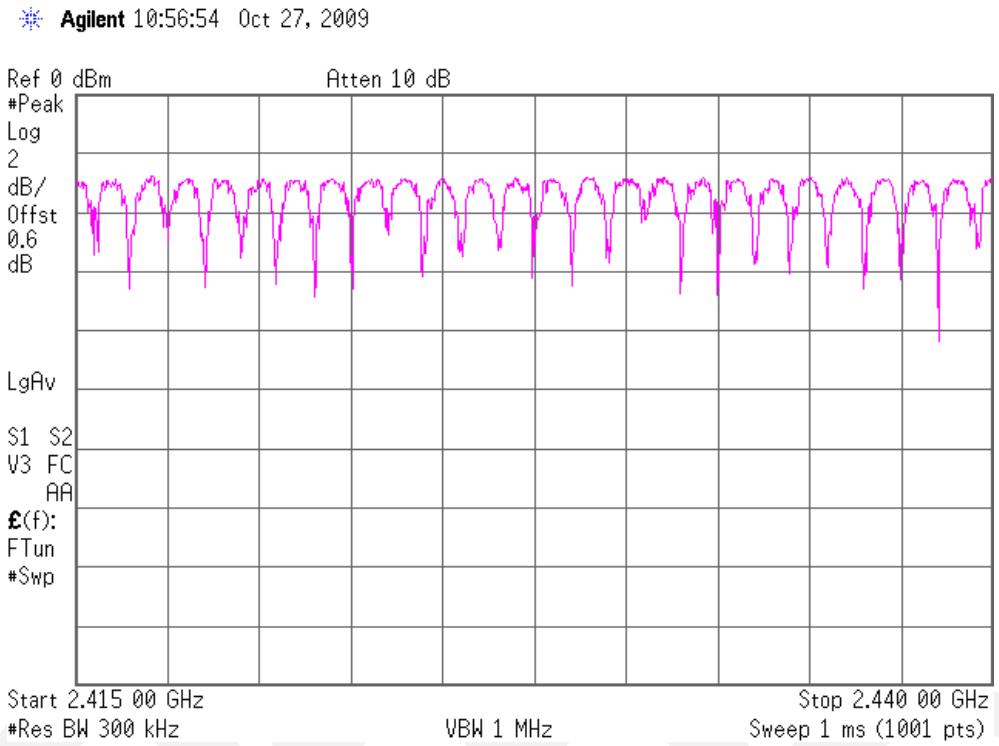
Test equipment

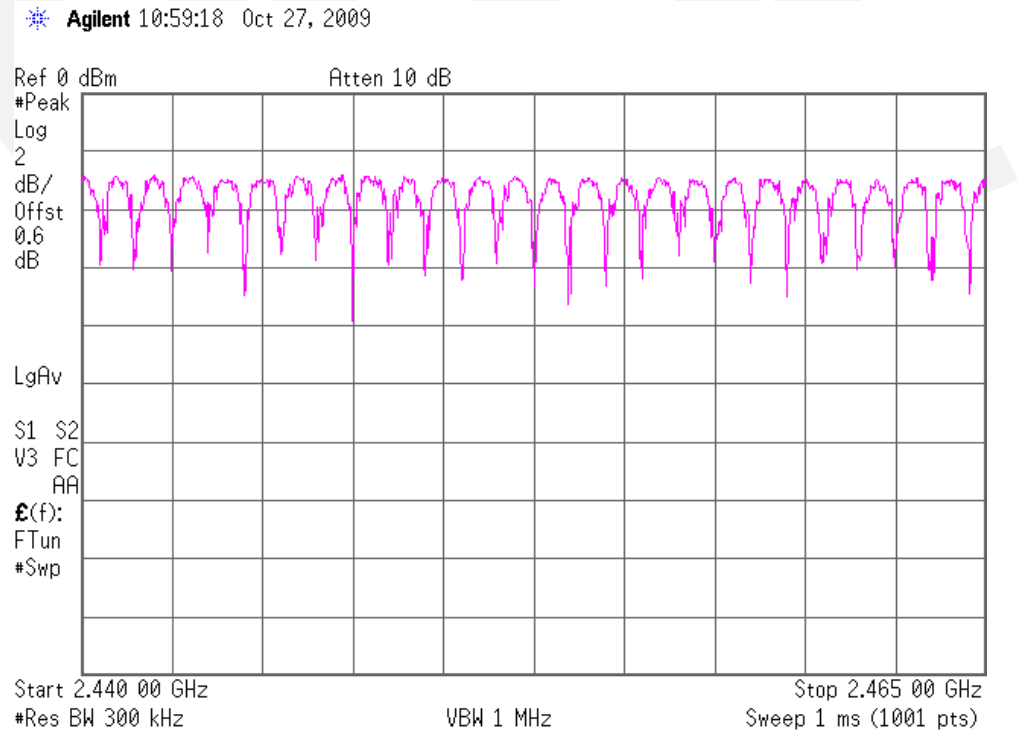
TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	28 Jul 10

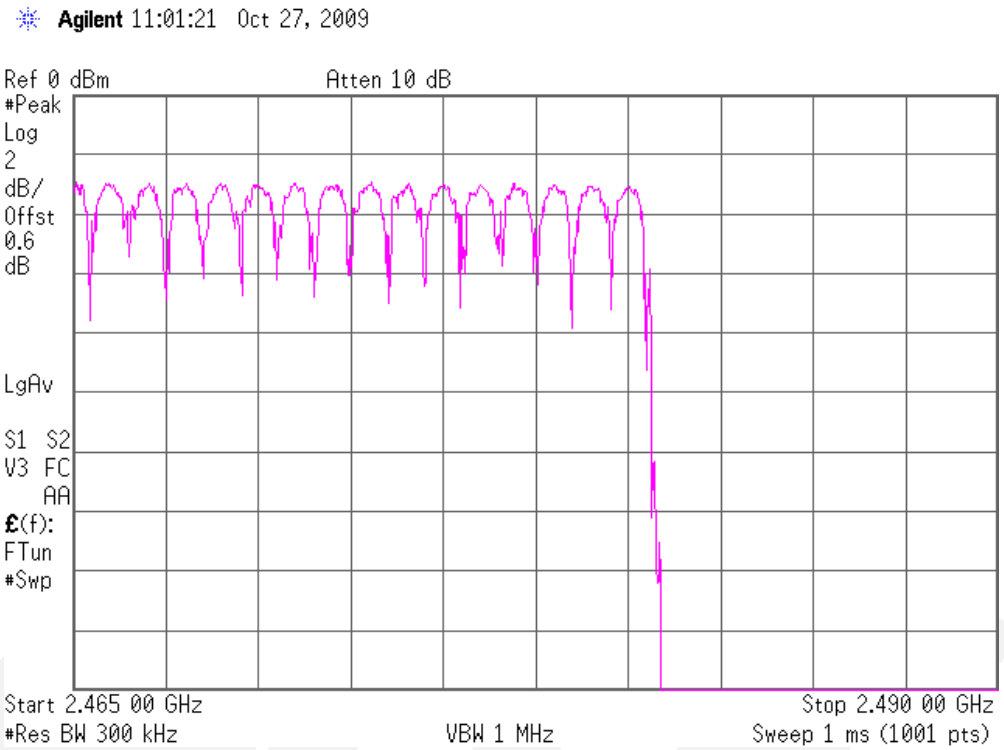
Test limit
At least 15 channels

Test data




Agilent 10:56:54 Oct 27, 2009
Ref 0 dBm
Atten 10 dB
#Peak
Log
2
dB/
Offst
0.6
dB
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Start 2.415 00 GHz
#Res BW 300 kHz
VBW 1 MHz
Stop 2.440 00 GHz
Sweep 1 ms (1001 pts)


Agilent 10:59:18 Oct 27, 2009
Ref 0 dBm
Atten 10 dB
#Peak
Log
2
dB/
Offst
0.6
dB
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Start 2.440 00 GHz
#Res BW 300 kHz
VBW 1 MHz
Stop 2.465 00 GHz
Sweep 1 ms (1001 pts)


Agilent 11:01:21 Oct 27, 2009
Ref 0 dBm
Atten 10 dB
#Peak
Log
2
dB/
Offst
0.6
dB
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Start 2.465 00 GHz
#Res BW 300 kHz
VBW 1 MHz
Stop 2.490 00 GHz
Sweep 1 ms (1001 pts)

Time of Occupancy
FCC 15.247(a)(1)(iii), IC RSS-210 A8.1(d)

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Time of occupancy < 0.349 seconds
Given:
2.905 millisecond pulses
Less than 120 pulses within a 31.6 second time period
79 channels

Test location
☐ - Wild River Lab Large Test Site (Open Area Test Site)
■ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

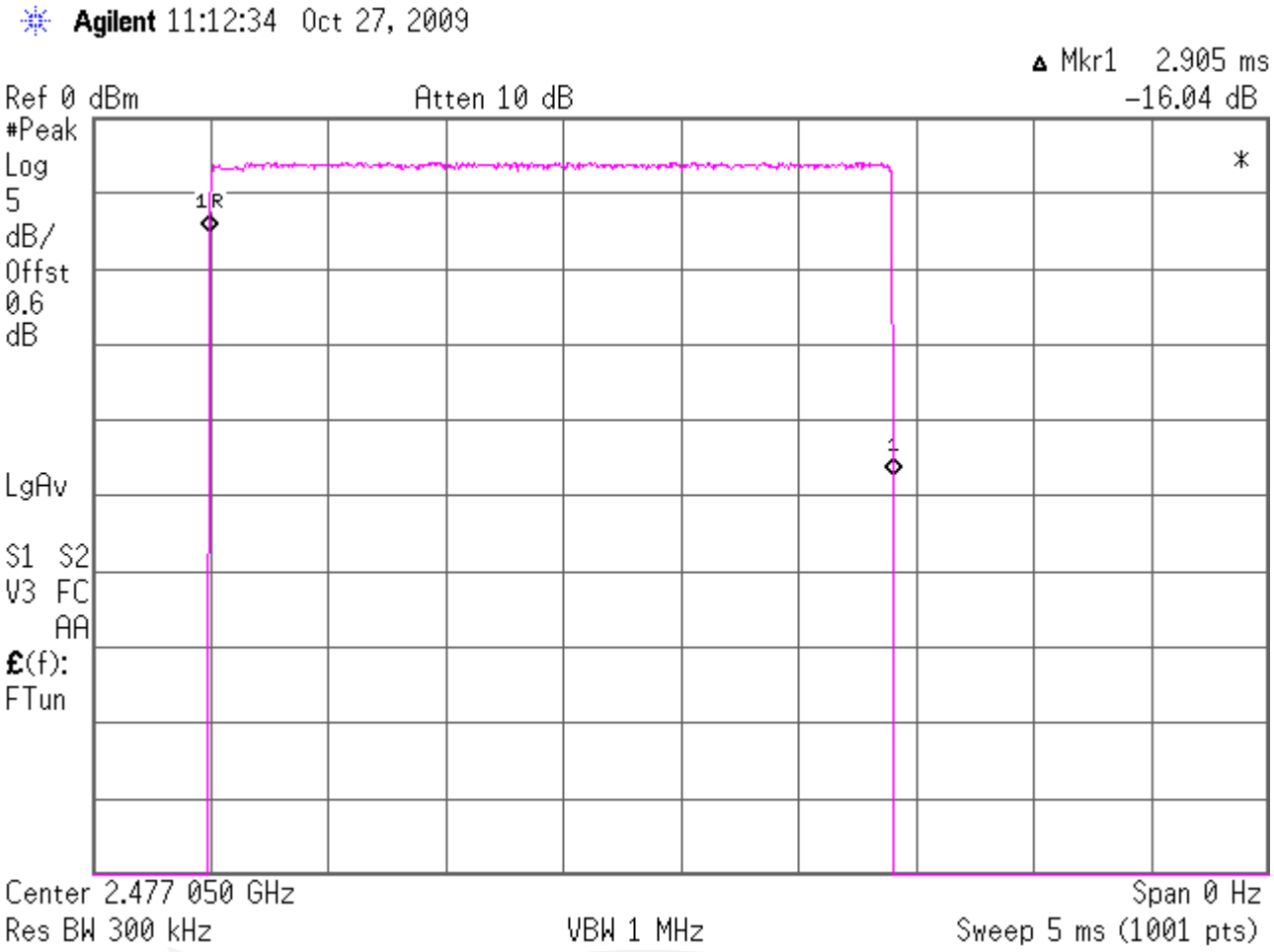
Test equipment

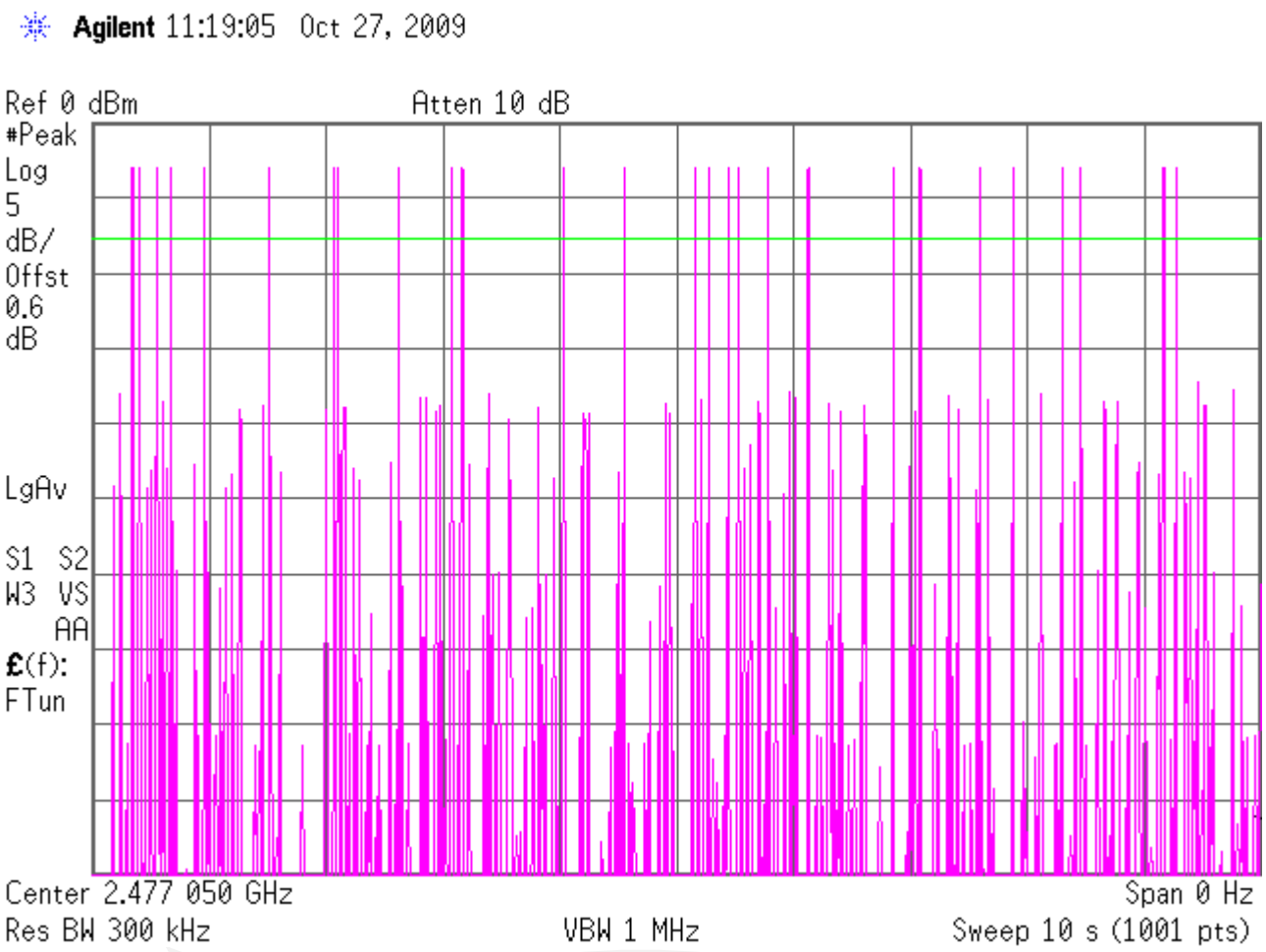
TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	28 Jul 10

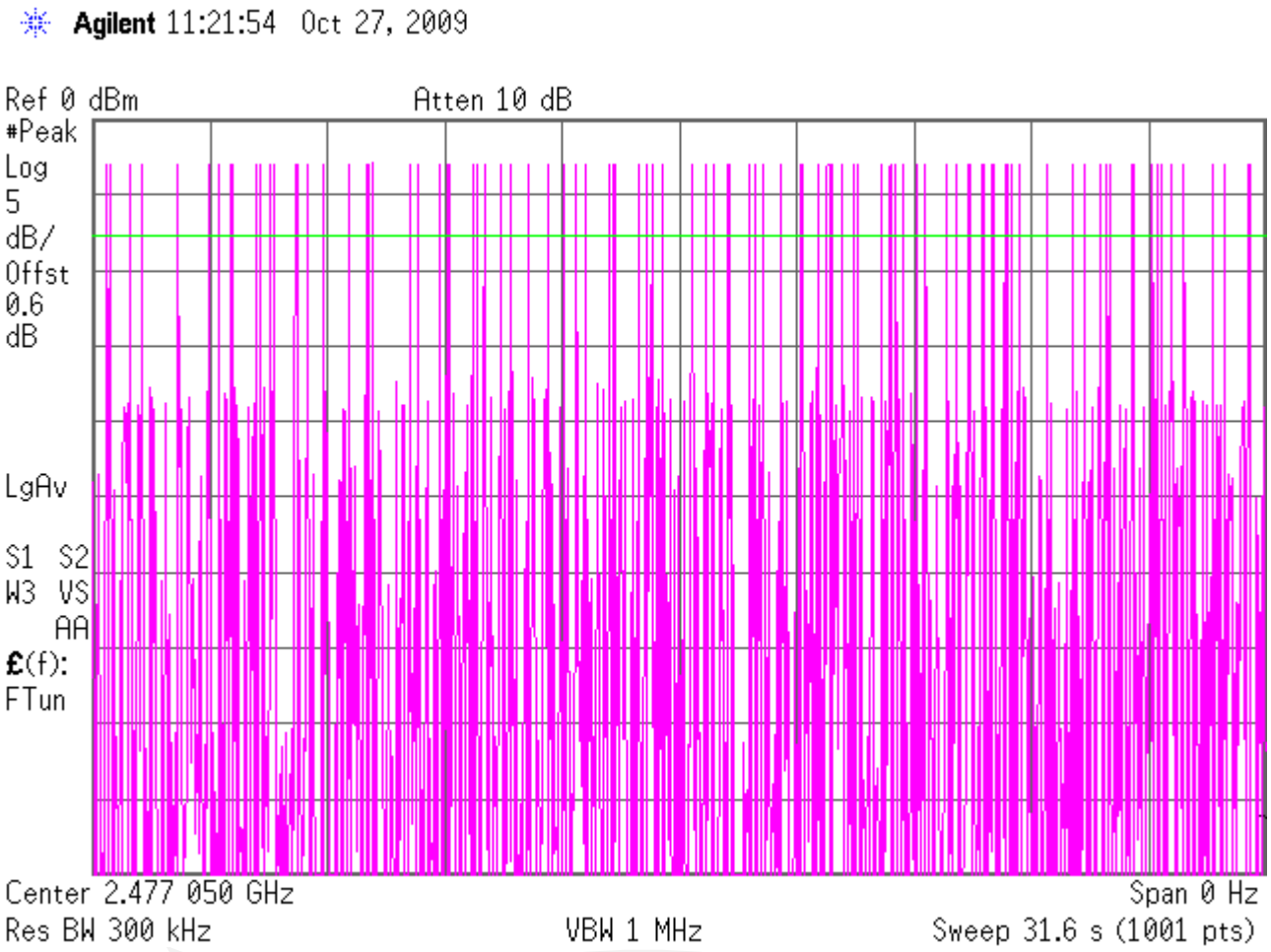
Cal Code B = Calibration verification performed internally.

Test limit
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test data
See following pages


Agilent 11:12:34 Oct 27, 2009
Mkr1 2.905 ms
-16.04 dB
Ref 0 dBm
Atten 10 dB
#Peak
Log
5
dB/
Offst
0.6
dB
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
1R
1
Center 2.477 050 GHz
Span 0 Hz
Res BW 300 kHz
VBW 1 MHz
Sweep 5 ms (1001 pts)


Agilent 11:19:05 Oct 27, 2009
Ref 0 dBm
Atten 10 dB
#Peak
Log
5
dB/
Offst
0.6
dB
LgAv
S1 S2
W3 VS
AA
£(f):
FTun
Center 2.477 050 GHz
Span 0 Hz
Res BW 300 kHz
VBW 1 MHz
Sweep 10 s (1001 pts)


Agilent 11:21:54 Oct 27, 2009
Ref 0 dBm
Atten 10 dB
#Peak
Log
5
dB/
Offst
0.6
dB
LgAv
S1 S2
W3 VS
AA
£(f):
FTun
Center 2.477 050 GHz
Span 0 Hz
Res BW 300 kHz
VBW 1 MHz
Sweep 31.6 s (1001 pts)

20 dB Bandwidth
FCC 15.247(a), IC RSS-210 A8.1

Test summary
The requirements are: ■ - MET ☐ - NOT MET
The 20 dB bandwidth ranges from 664 kHz to 666 kHz
Compared three different packet sizes. DH1, DH3, & DH5

Test location
☐ - Wild River Lab Large Test Site (Open Area Test Site)
■ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

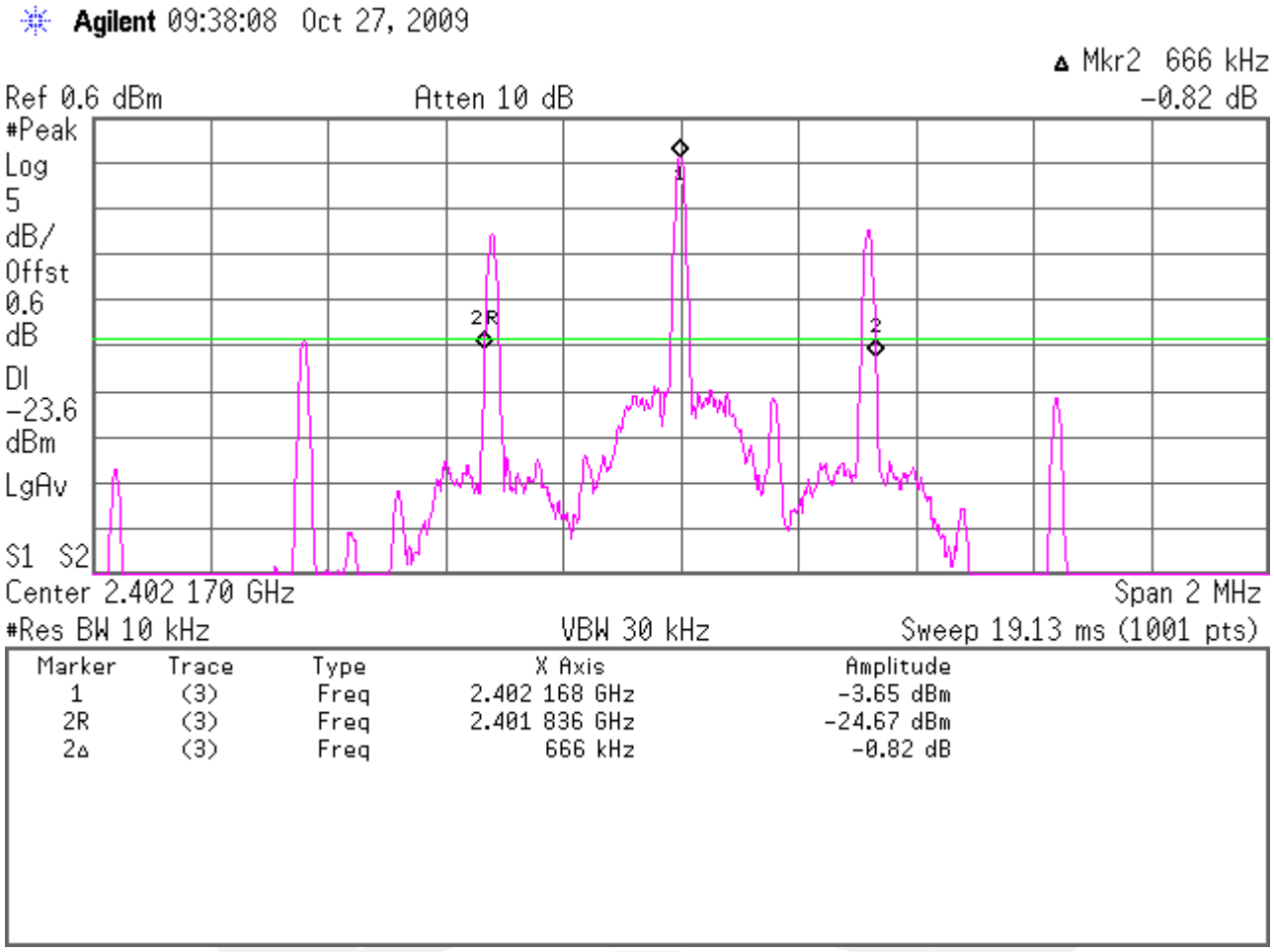
TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	28 Jul 10

Cal Code B = Calibration verification performed internally.

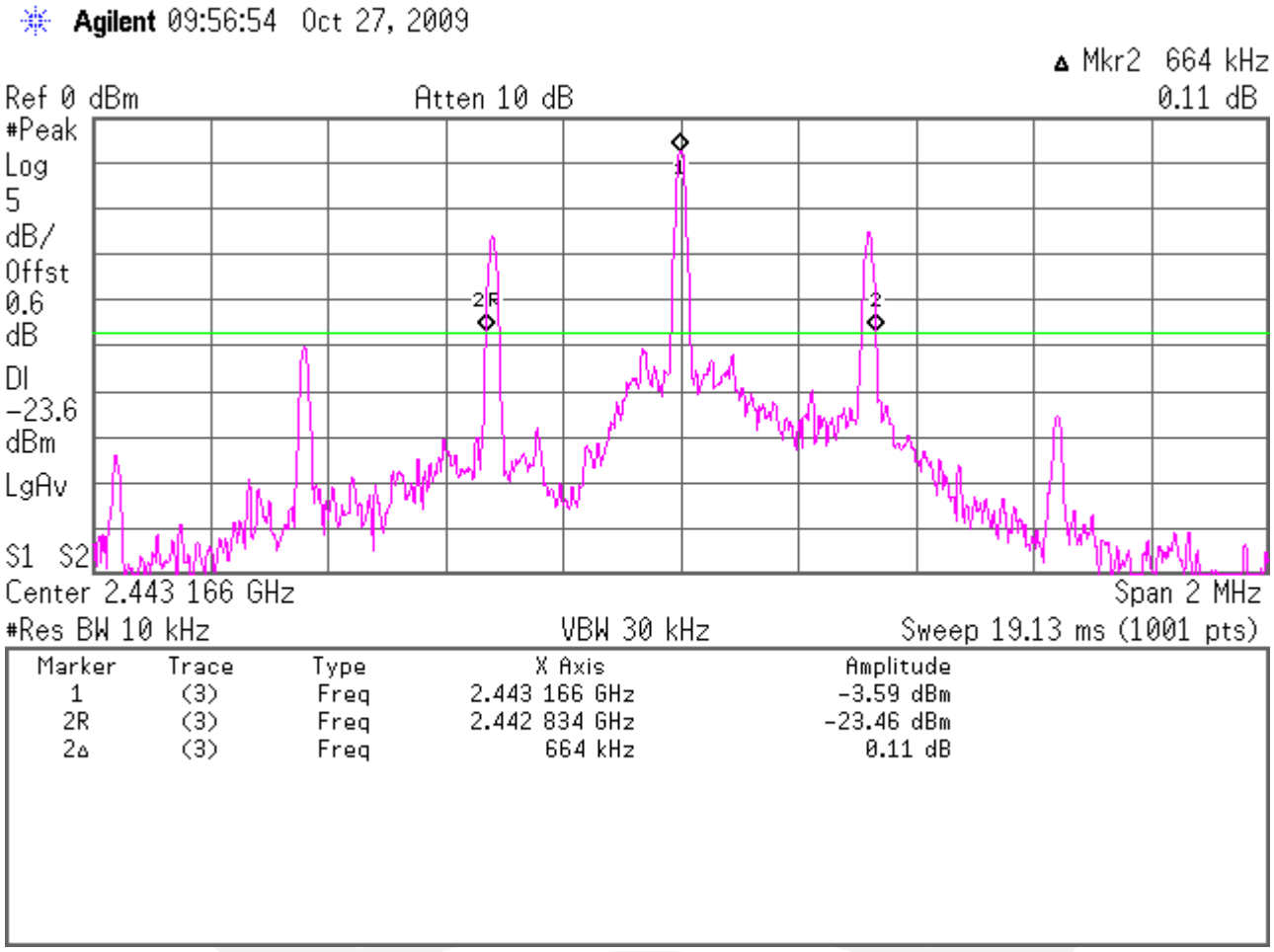
Test limit
No limit specified

Test data
See following pages

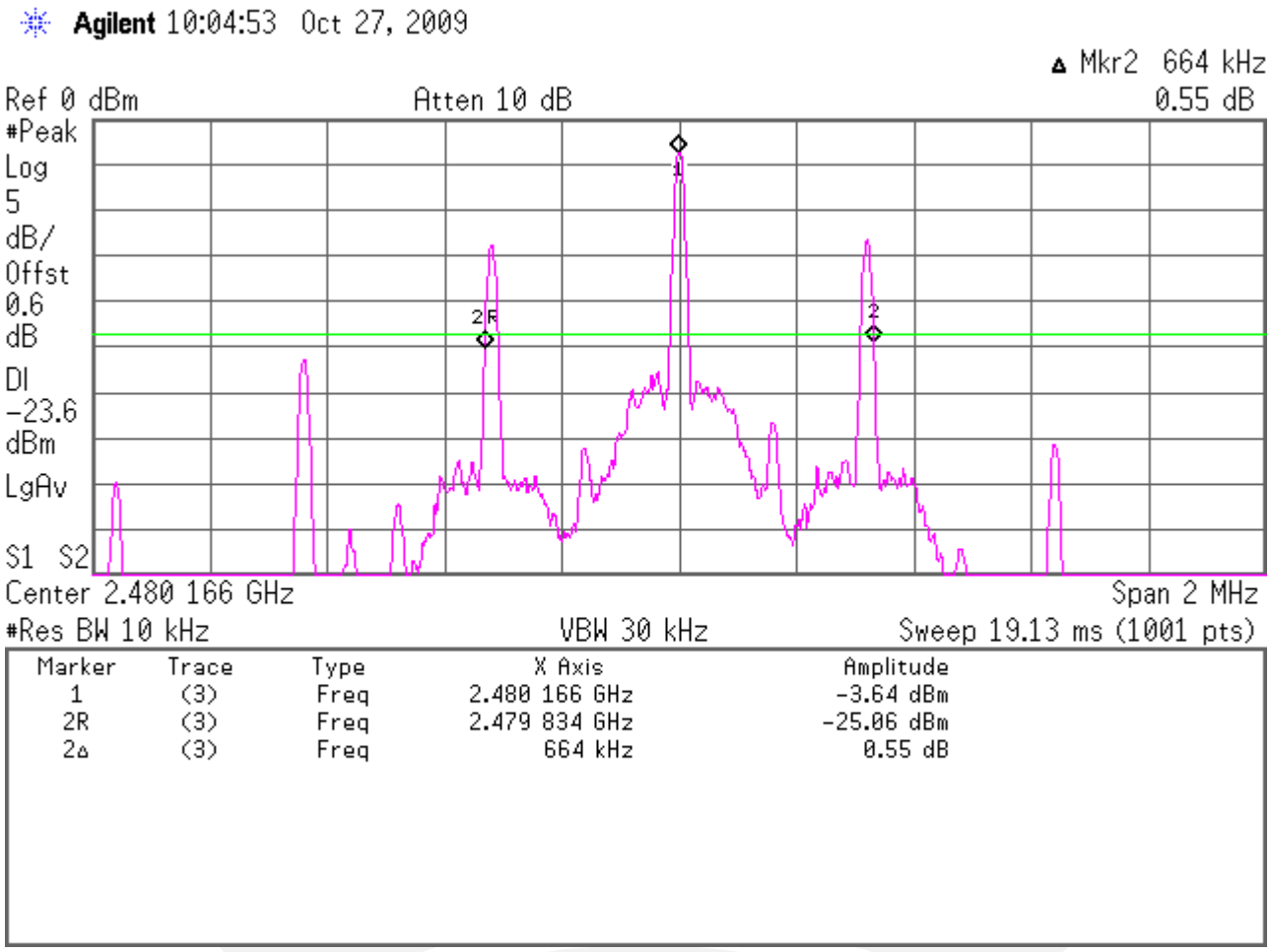
DH5, low channel



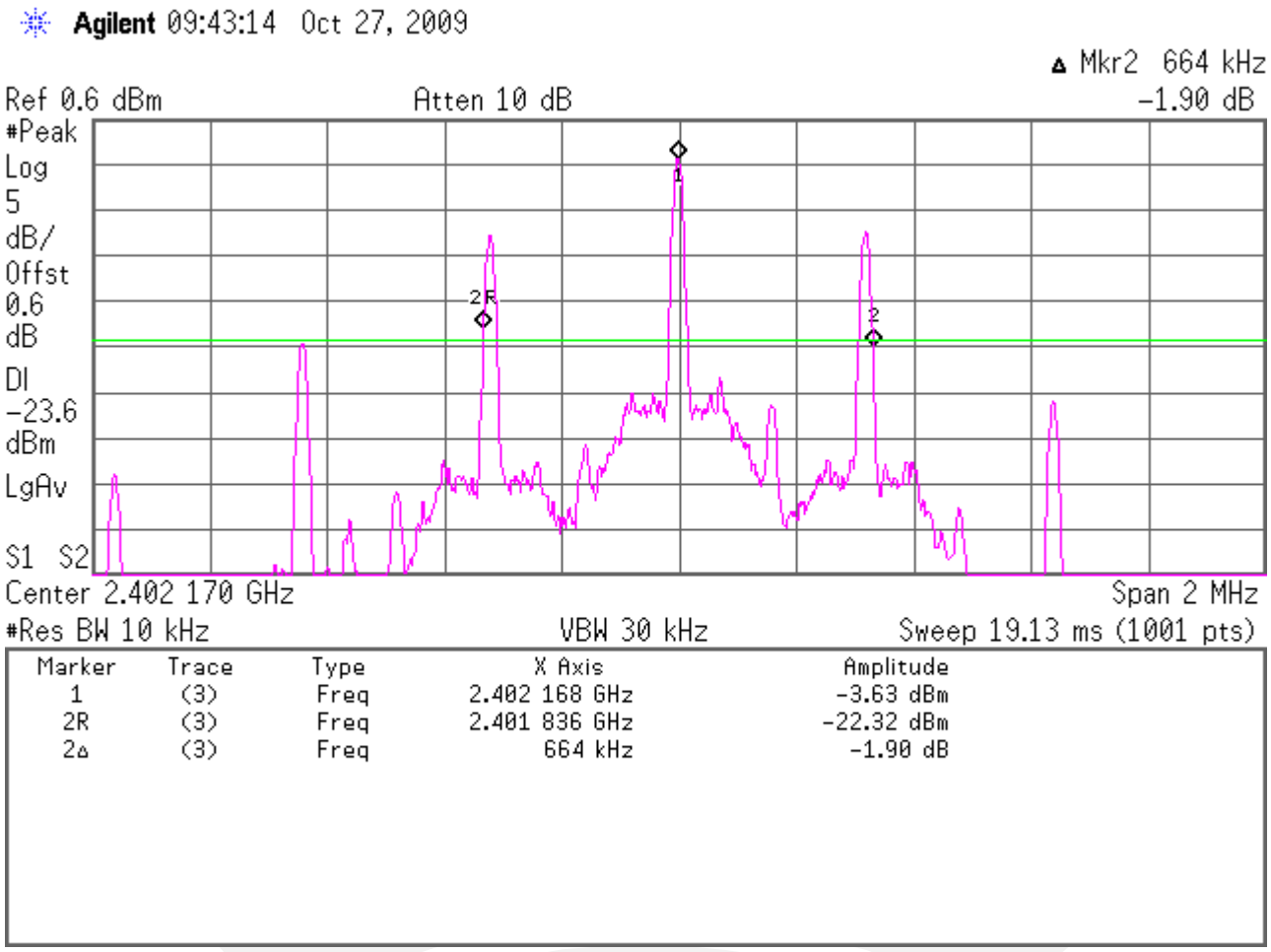
DH5, mid channel



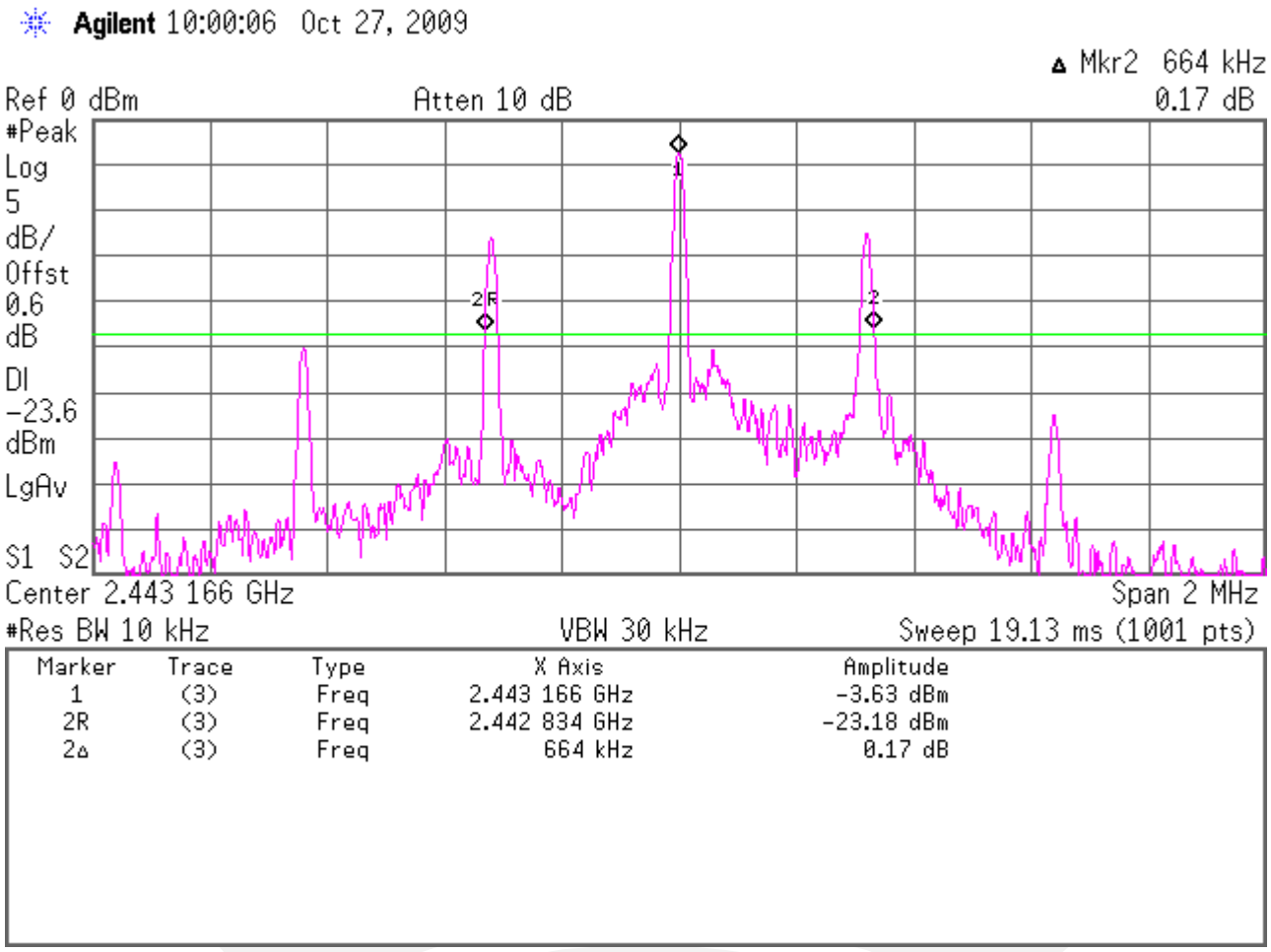
DH5, high channel



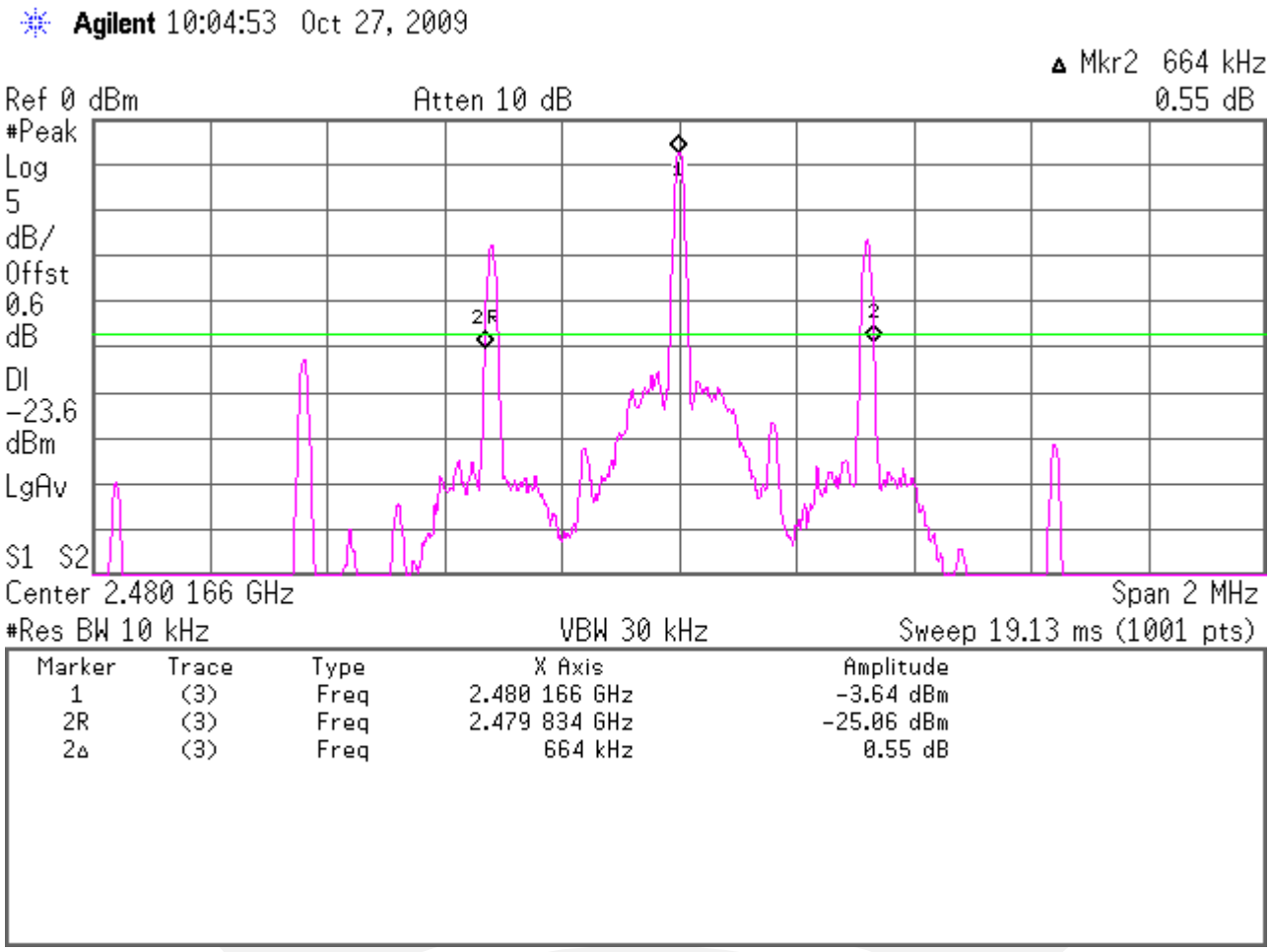
DH3, low channel



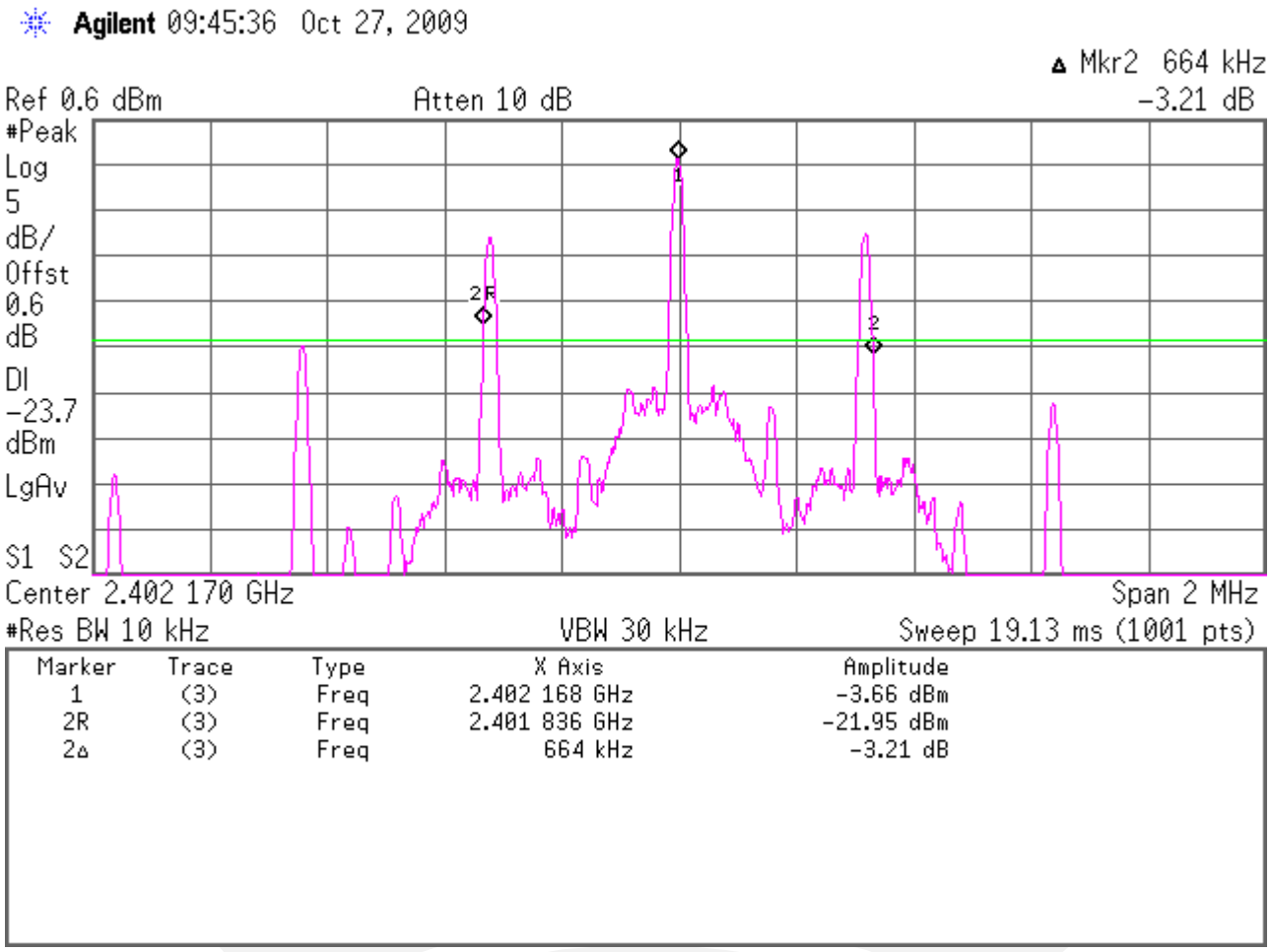
DH3, mid channel



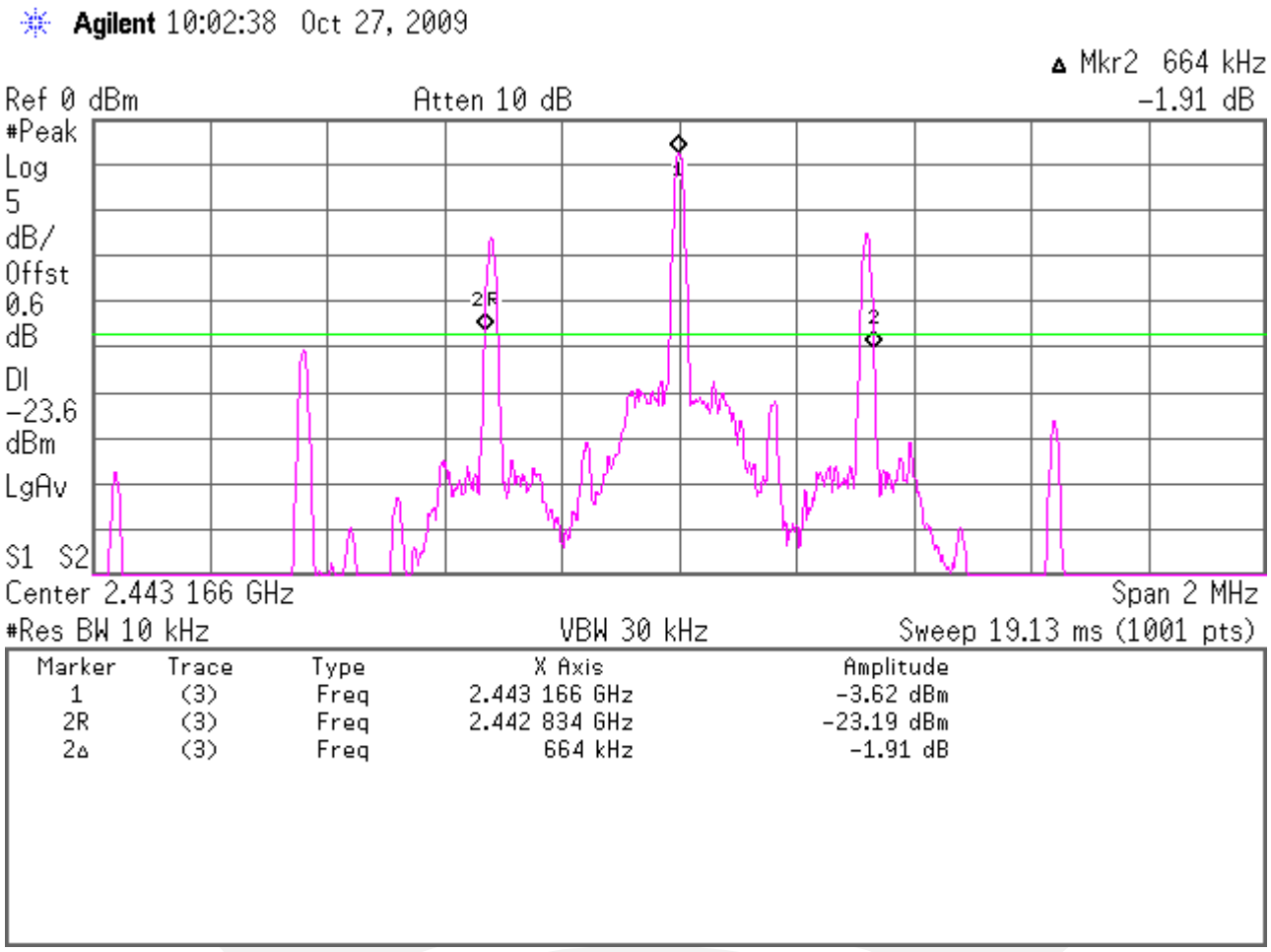
DH3, high channel



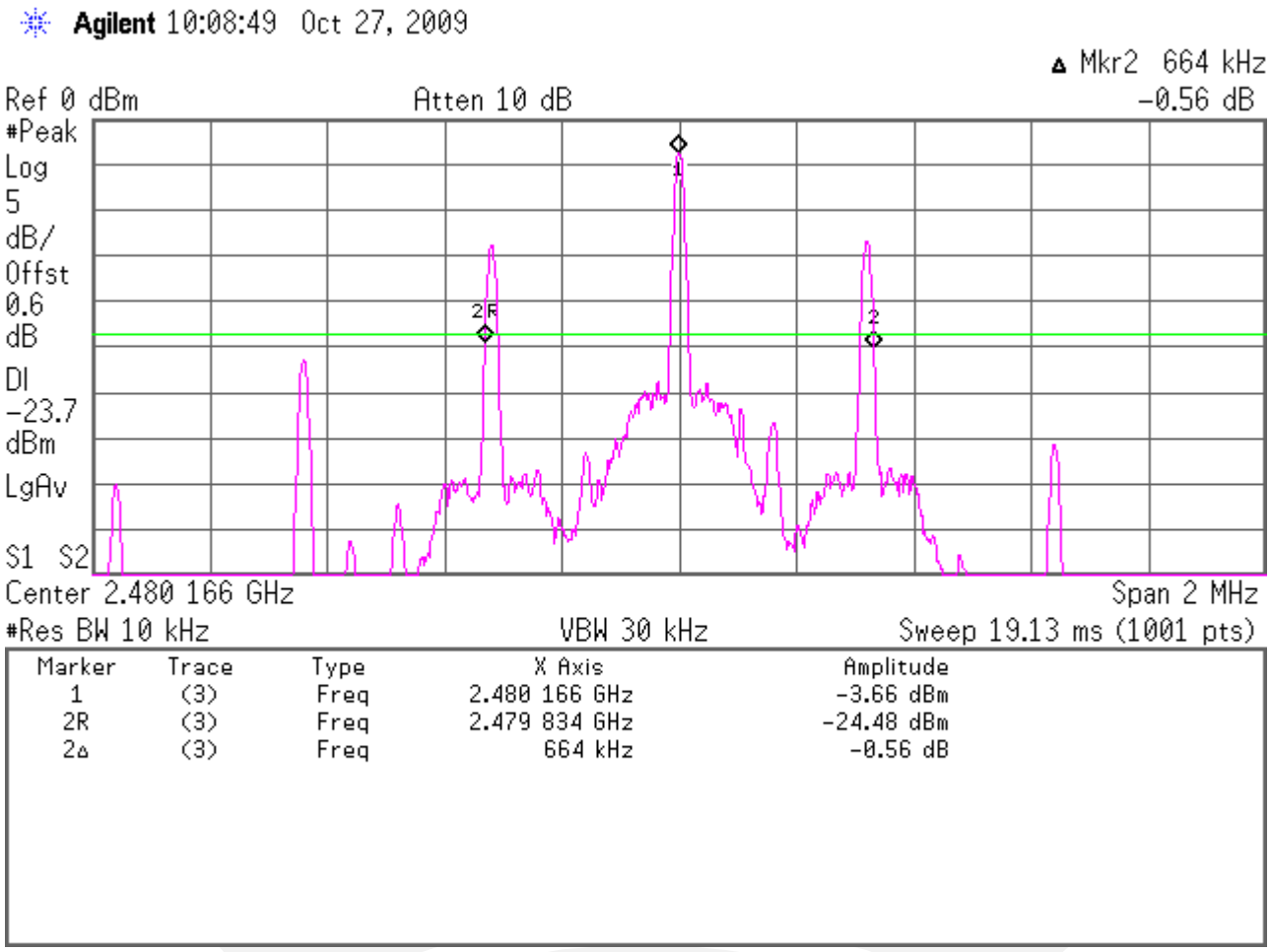
DH1, low channel



DH1, mid channel



DH1, high channel



Maximum peak output power
FCC 15.247(b)(1), IC RSS-210 A8.4 (2)

Test summary
The requirements are: ■ - MET ☐ - NOT MET
The maximum conducted peak output power is -2.30 dBm or 590 μW

Test location
☐ - Wild River Lab Large Test Site (Open Area Test Site)
■ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

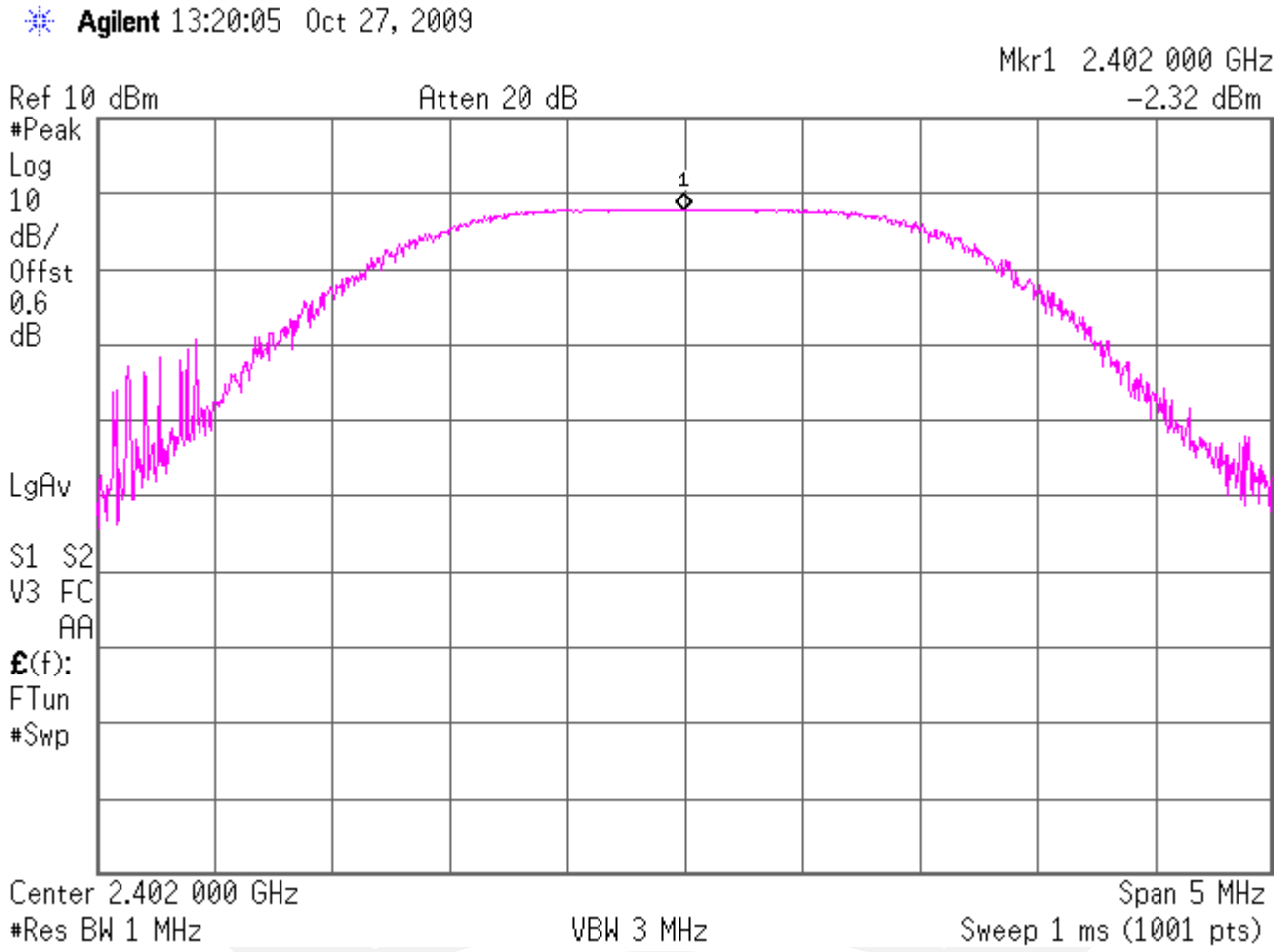
Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	28 Jul 10

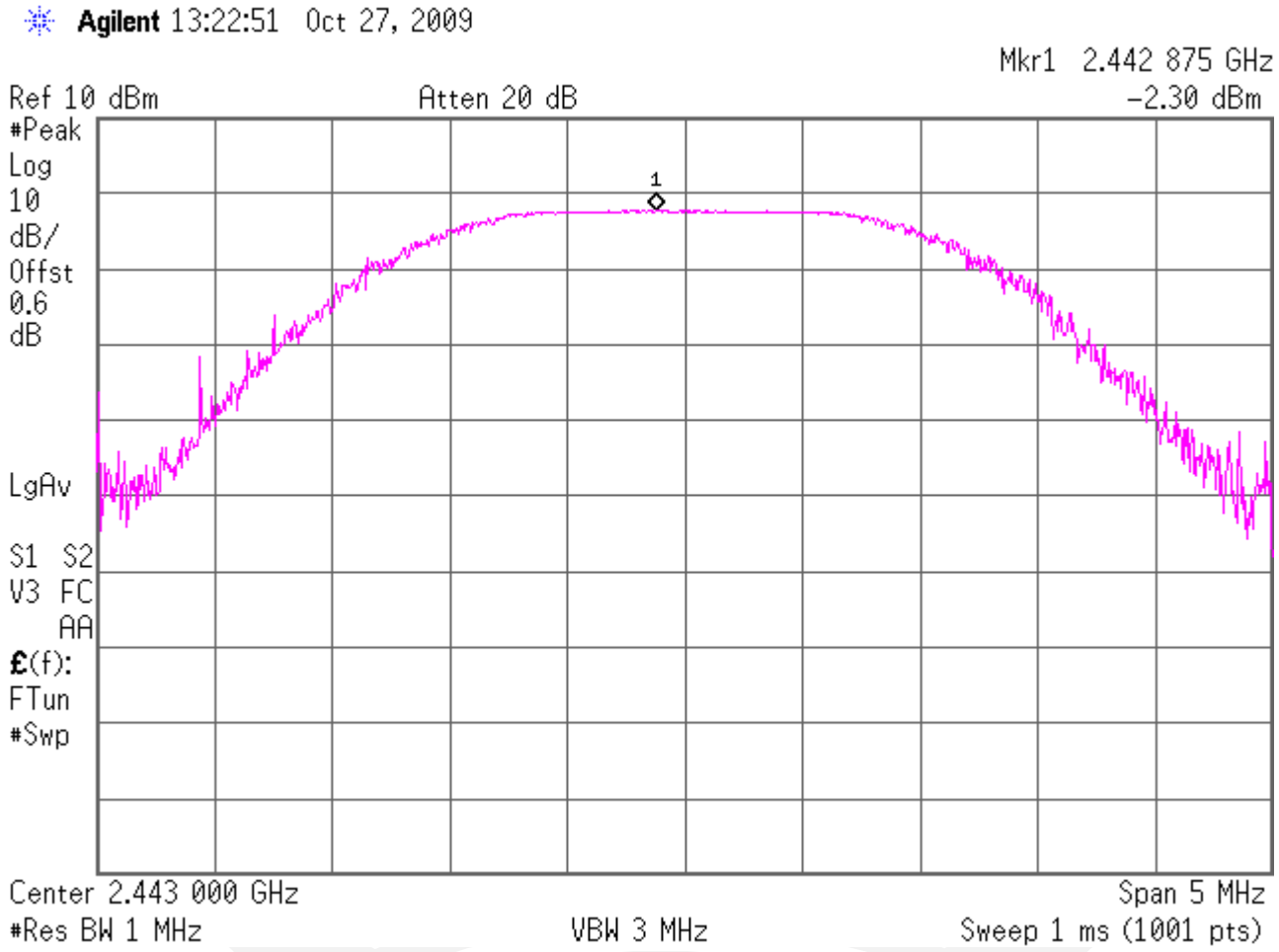
Test limit
1 watt

Test data
See following pages

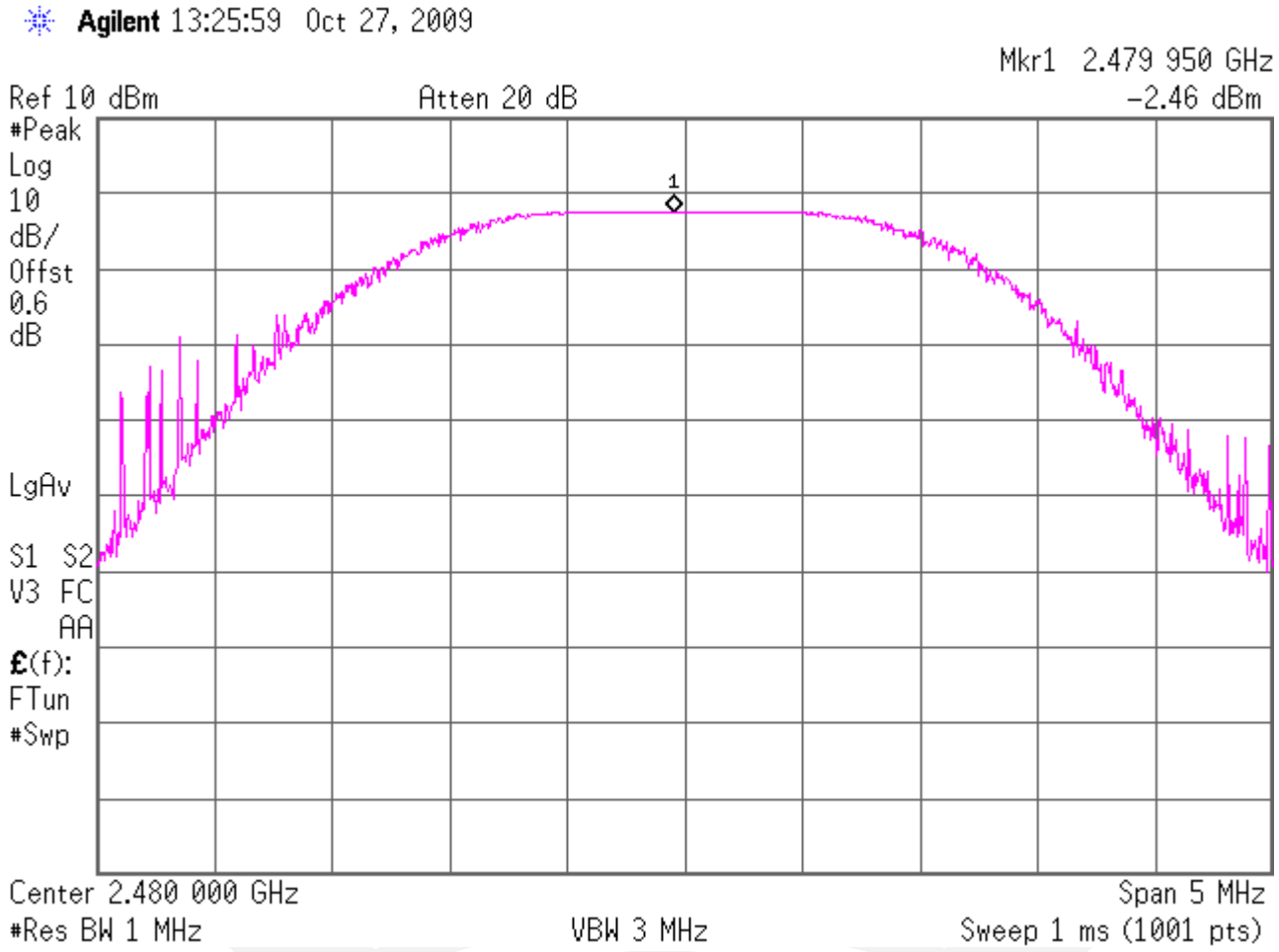
Low channel


Agilent 13:20:05 Oct 27, 2009
Mkr1 2.402 000 GHz
Ref 10 dBm
Atten 20 dB
-2.32 dBm
#Peak
Log
10
dB/
Offst
0.6
dB
1
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Center 2.402 000 GHz
Span 5 MHz
#Res BW 1 MHz
VBW 3 MHz
Sweep 1 ms (1001 pts)

mid channel


Agilent 13:22:51 Oct 27, 2009
Mkr1 2.442 875 GHz
Ref 10 dBm
Atten 20 dB
-2.30 dBm
#Peak
Log
10
dB/
Offst
0.6
dB
1
LgAv
S1 S2
V3 FC
AA
£(f):
FTun
#Swp
Center 2.443 000 GHz
Span 5 MHz
#Res BW 1 MHz
VBW 3 MHz
Sweep 1 ms (1001 pts)

high channel



Radiated Band Edge Compliance Measurement
FCC 15.247(d), RSS-210 A8.5

Test summary
The requirements are: ■ - MET ☐ - NOT MET

Test location
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE02673	85662A	Hewlett-Packard	Analyzer Display	2152A03687	19-Mar-10
WRLE03294	8566B	Hewlett-Packard	Spectrum Analyzer	2349A03098	19-Mar-10
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	13-Jan-10
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 28-Sep-10

Cal Code B = Calibration verification performed internally.

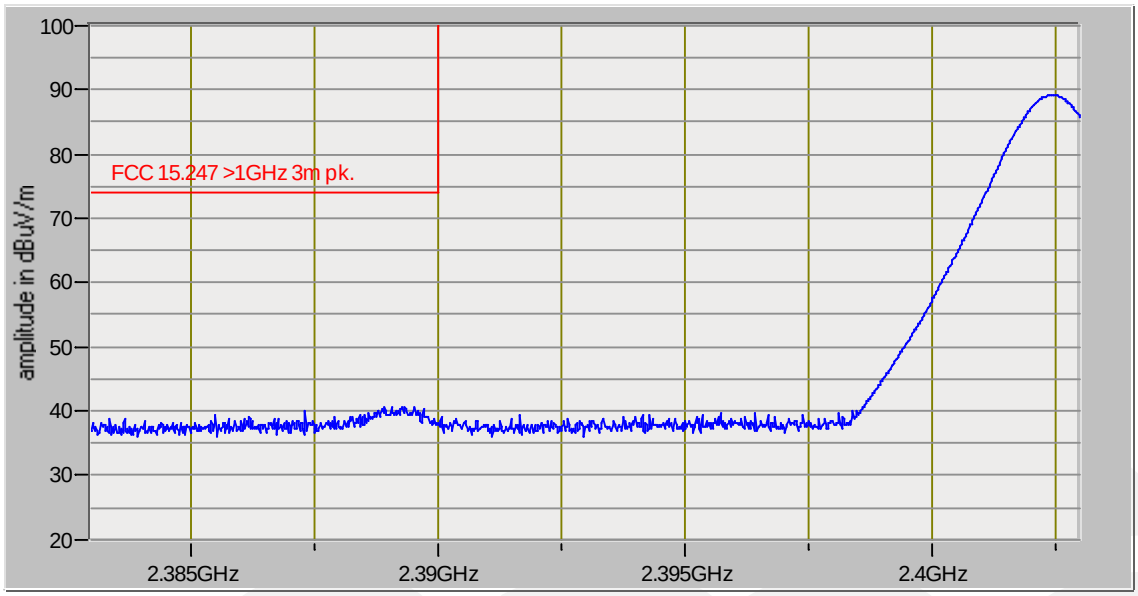
Test limit (in restricted bands)

Frequncy (MHz)	Field strength (μV/meter)	Field strength (dBμV/meter)
< 2390 MHz or > 2483.5MHz	500 – AV 5000 – PK	54.0 74.0

Test data
See following pages.

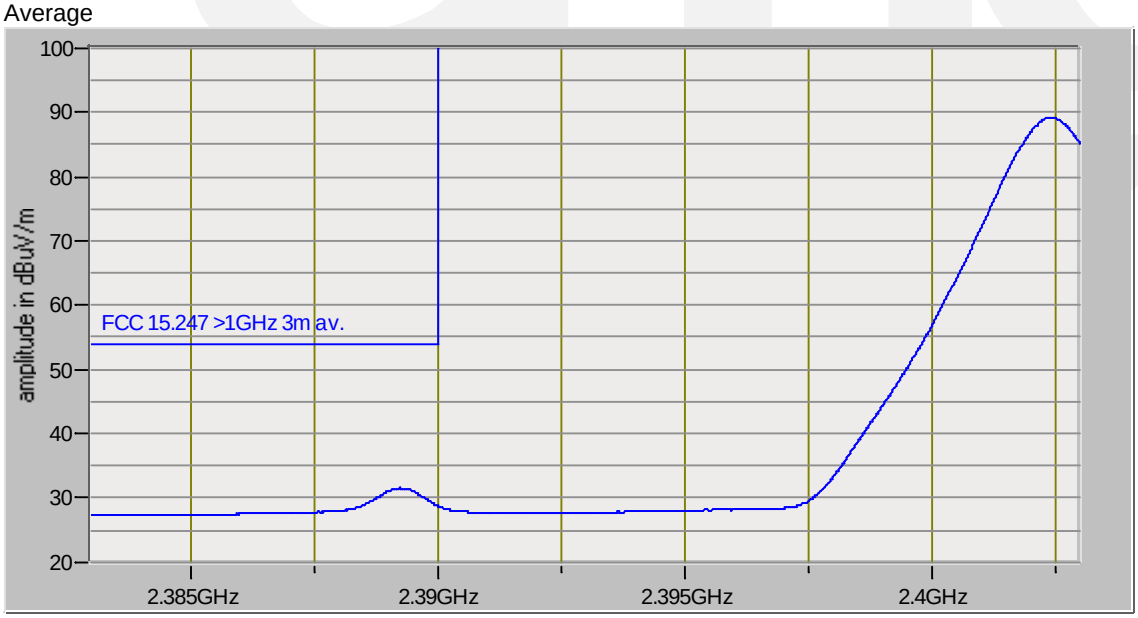
Band edge, low channel, carrier maximized

Peak



RBW 1 MHz VBW 1 MHz

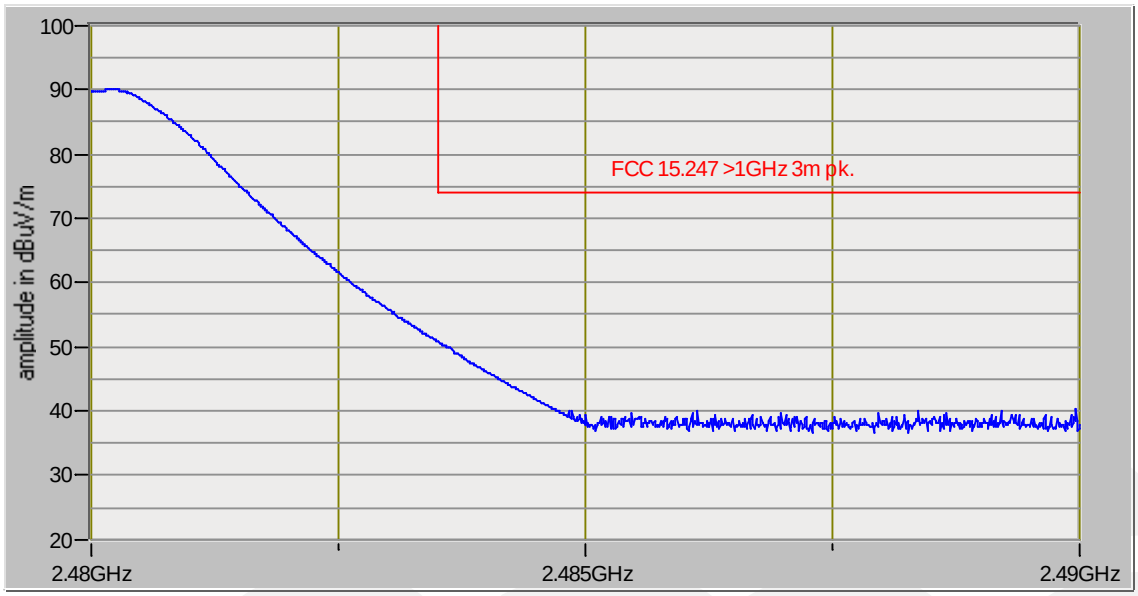
Average



RBW 1 MHz VBW 10 Hz

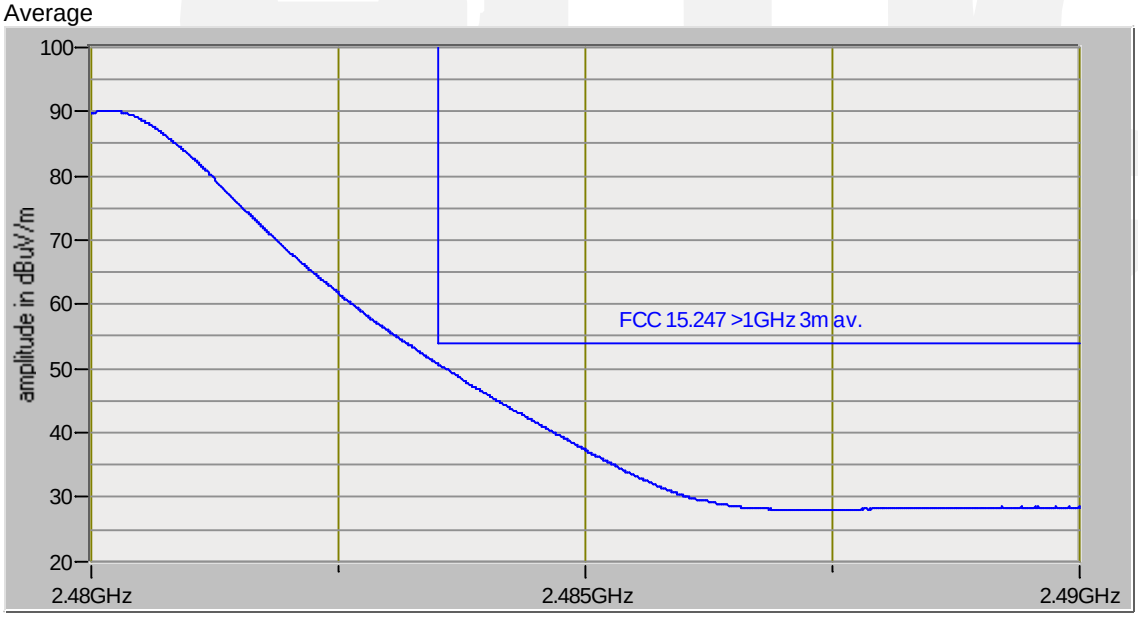
Band edge, high channel, carrier maximized

Peak



RBW 1 MHz VBW 1 MHz

Average



RBW 1 MHz VBW 10 Hz

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

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Minimum margin of compliance is 13.92 dB at 300 MHz, frequency hopping

Test location
☐ - Wild River Lab Large Test Site (Open Area Test Site)
■ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

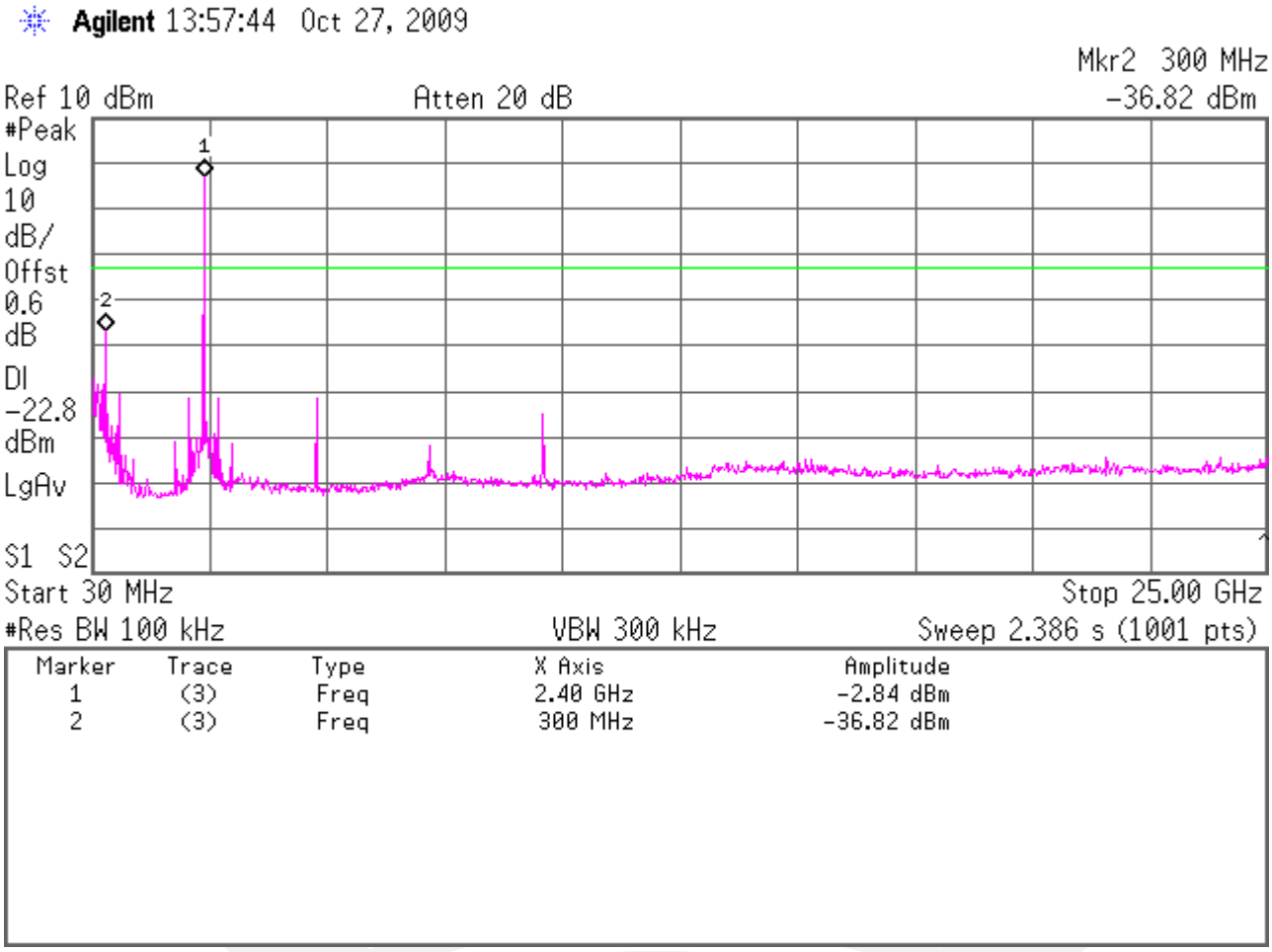
Test equipment

TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	28 Jul 10

Test limit
-20 dBc

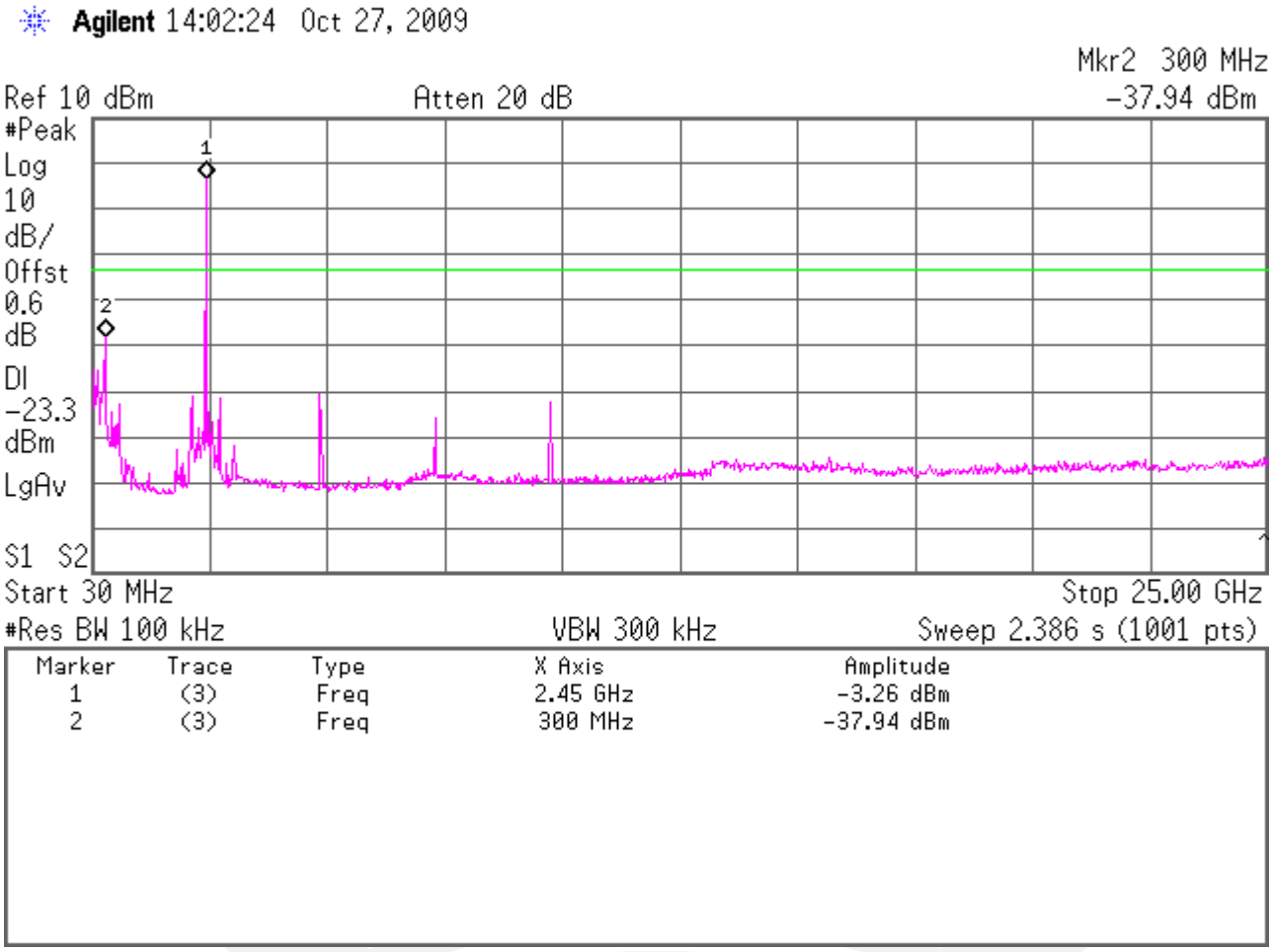
Test data
See following pages.

low channel



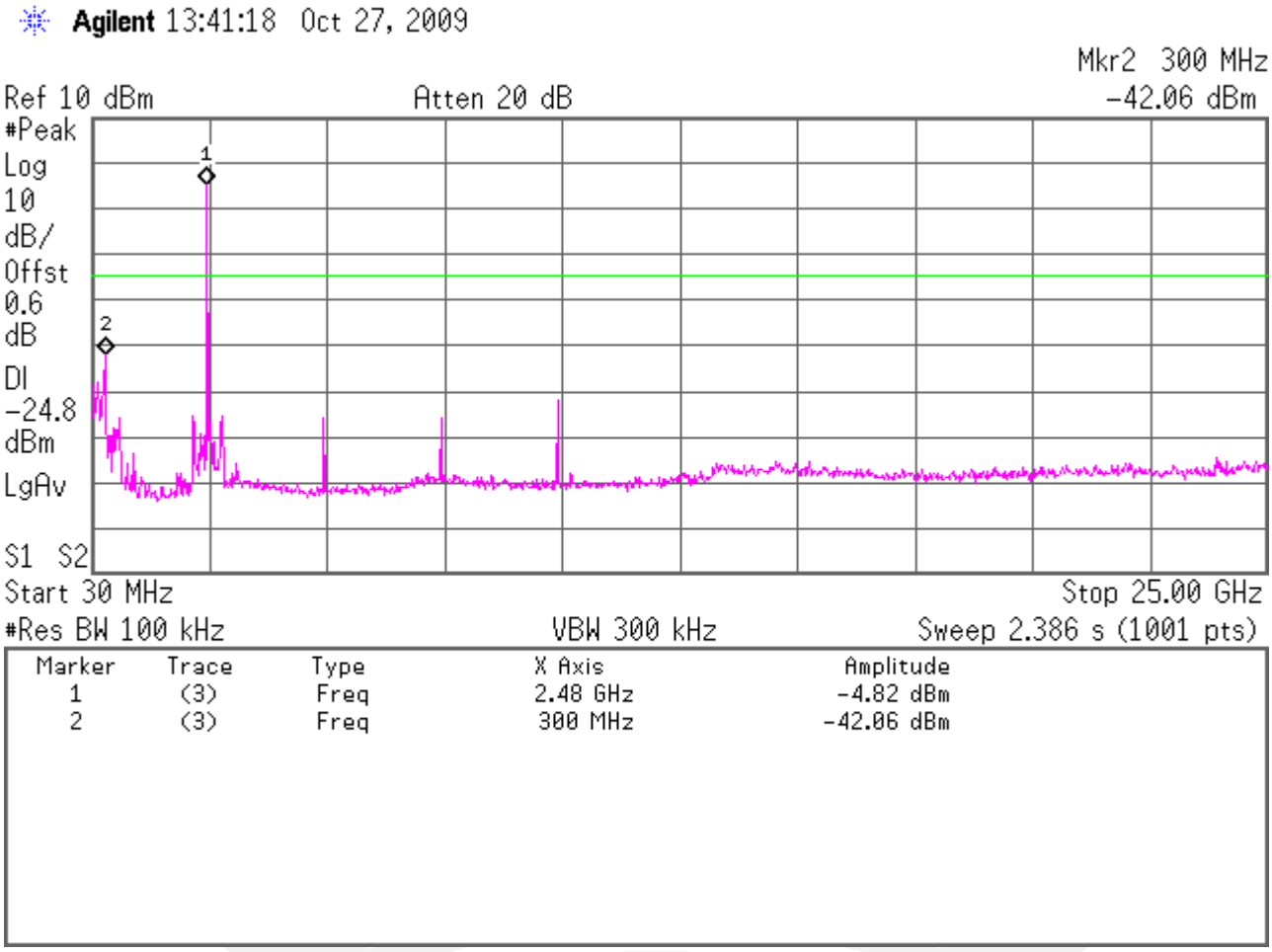
14.02

mid channel



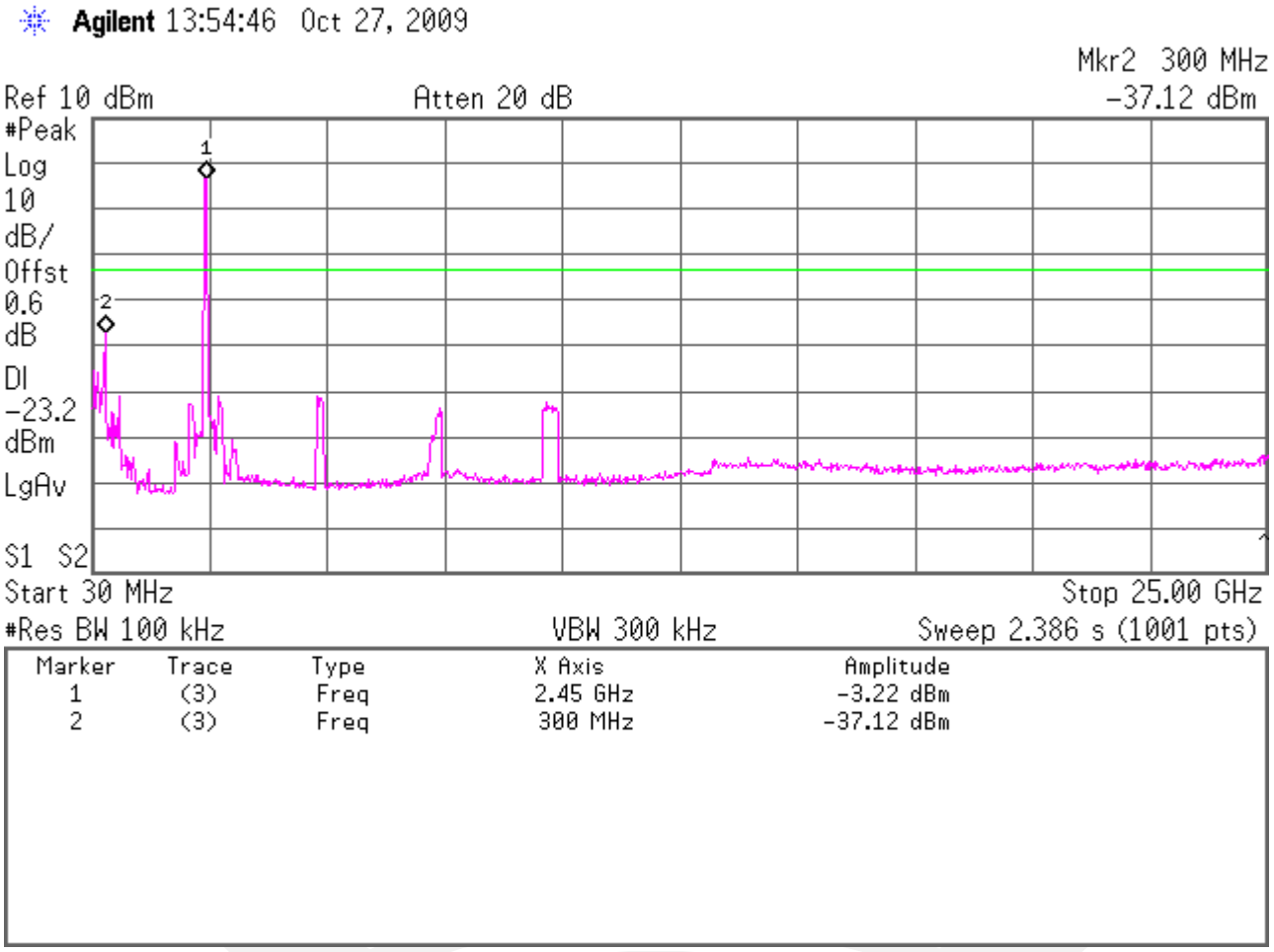
14.64

high channel



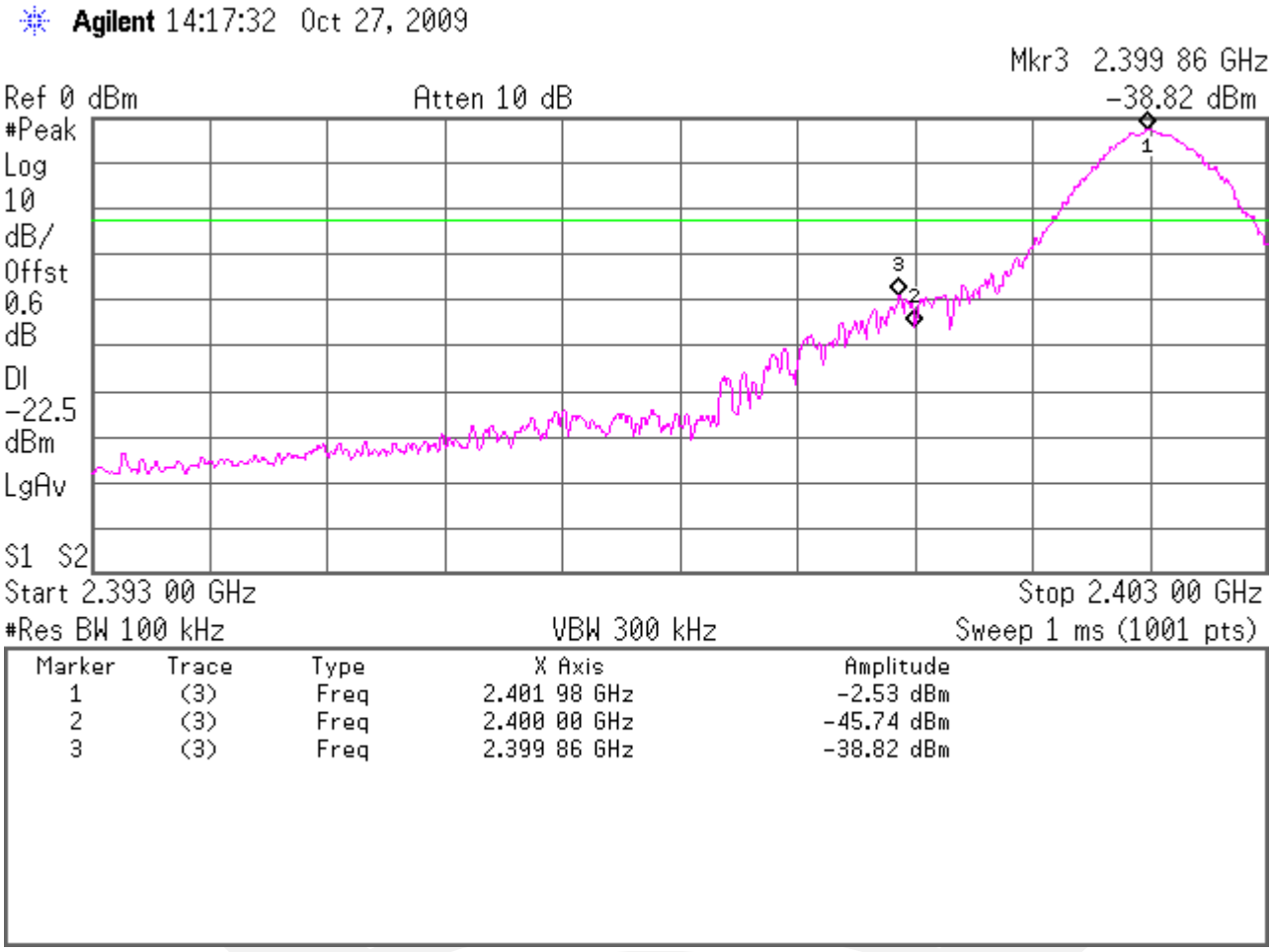
17.26

channel hopping



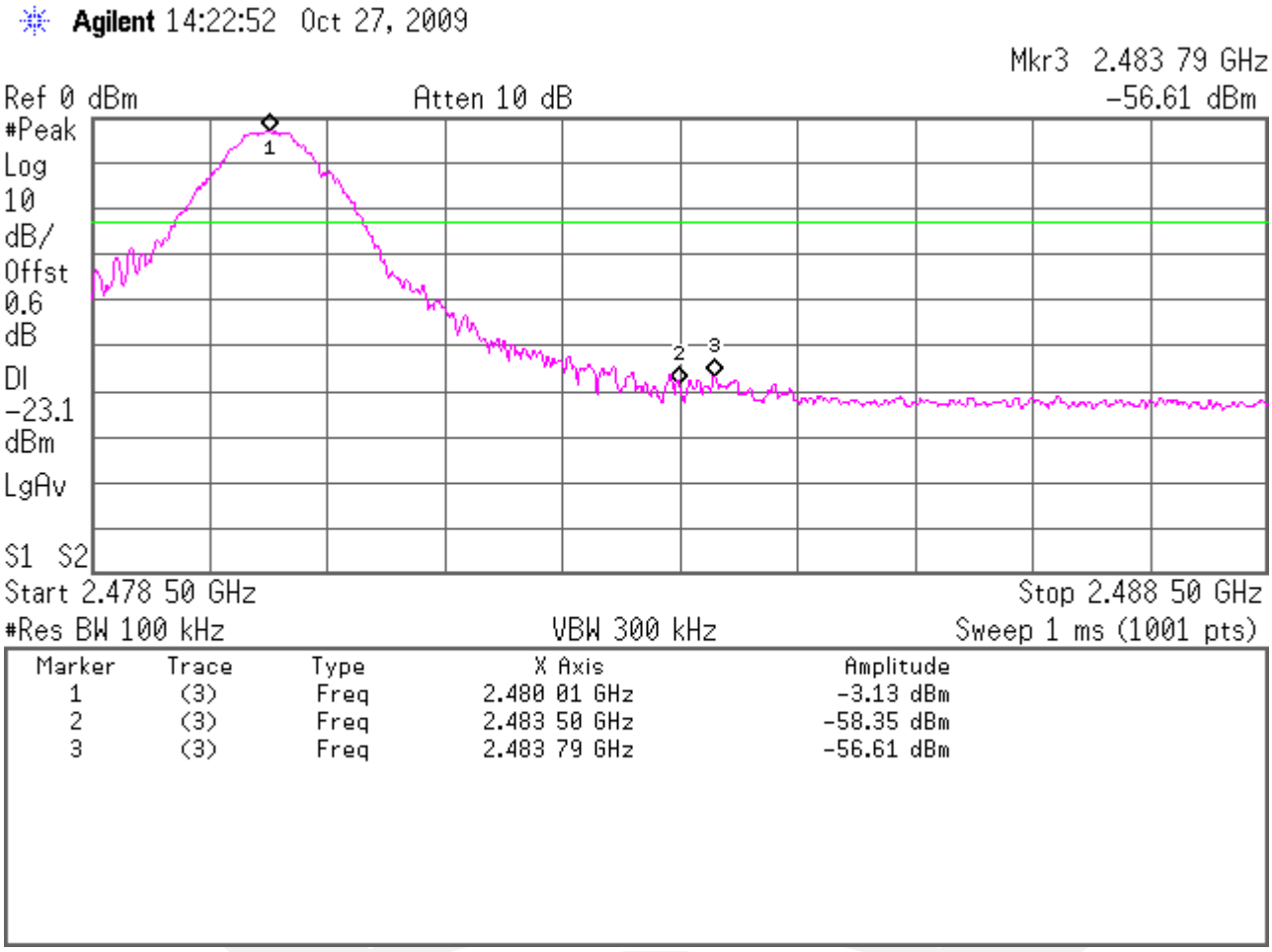
13.92

Bandedge low



16.32

Bandedge high



33.51

Spurious emissions - Radiated in restricted bands
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
Minimum margin of compliance is 12.05 dB at 73.136 MHz

Test location
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test distance
■ - 3 meters
☐ - 10 meters

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03204	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	17-Dec-09
NBLE02683	85650A	Hewlett-Packard	Quasi-peak Adapter	2430A00495	23-Feb-10
WRLE02673	85662A	Hewlett-Packard	Analyzer Display	2152A03687	19-Mar-10
WRLE03294	8566B	Hewlett-Packard	Spectrum Analyzer	2349A03098	19-Mar-10
WRLE03847	ZHL-1042J	Mini-Circuits	Preamplifier 10 - 3000 MHz	0607	Code B 14-May-10
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	13-Jan-10
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 28-Sep-10
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY42510439	28 Jul 10

Cal Code B = Calibration verification performed internally.

Test limit (in restricted bands)

Frequncy (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
960-1000	500 – QP	54.0
>1000	500 – AV 5000 – PK	54.0 74.0

Test data
See following pages.

RADIATED EMISSIONS

Test Report #:	WC907821 Run 1	Test Area:	LTS		
EUT Model #:	01018477 Rev A	Date:	10/28/2009		
EUT Serial #:	DHC09401013	EUT Power:	12 VDC	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	NovAtel Inc.			Rel. Humidity:	28.0 %
EUT Description:	GPS receiver with Bluetooth				
Notes:	Determine worst case position				
Data File Name:				Page:	1 of 1

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1	DELTA2
maximized fundamental carriers in 3 orthoganal angles						
device lying flat						
low ch						
2.402 GHz	92.15 Pk	4.19 / 28.7 / 43.46 / 0.0	81.58	V / 1.00 / 292	n/a	n/a
mid ch						
2.44 GHz	93.4 Pk	4.21 / 28.79 / 43.48 / 0.0	82.93	V / 1.00 / 290	n/a	n/a
high ch						
2.48 GHz	92.7 Pk	4.24 / 28.88 / 43.49 / 0.0	82.33	V / 1.00 / 289	n/a	n/a
device on its side, connector on the side						
low ch						
2.402 GHz	98.55 Pk	4.19 / 28.7 / 43.46 / 0.0	87.98	H / 1.78 / 83	n/a	n/a
mid ch						
2.44 GHz	99.0 Pk	4.21 / 28.79 / 43.48 / 0.0	88.53	H / 1.72 / 80	n/a	n/a
high ch						
2.48 GHz	99.2 Pk	4.24 / 28.88 / 43.49 / 0.0	88.83	H / 1.71 / 82	n/a	n/a
device on its side, connector up						
high ch						
2.48 GHz	97.3 Pk	4.24 / 28.88 / 43.49 / 0.0	86.93	H / 1.66 / 216	n/a	n/a
mid ch						
2.44 GHz	96.6 Pk	4.21 / 28.79 / 43.48 / 0.0	86.13	V / 1.71 / 219	n/a	n/a
low ch						
2.402 GHz	96.3 Pk	4.19 / 28.7 / 43.46 / 0.0	85.73	V / 1.73 / 218	n/a	n/a
device back to worst case position, on its side, connector on the side						

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

Reviewed by: Joel T Schneider (Printed) _____ (Signature)

RADIATED EMISSIONS

Test Report #:	WC907821 Run 3	Test Area:	LTS		
EUT Model #:	01018477 Rev A	Date:	10/28/2009		
EUT Serial #:	DHC09401030	EUT Power:	12 VDC	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	NovAtel Inc.			Rel. Humidity:	28.0 %
EUT Description:	GPS receiver with Bluetooth				
Notes:	Spurious / harmonics scan for emissions in the restricted bands of FCC 15.205				
Data File Name:	7821.dat			Page:	1 of 3

List of measurements for run #: 3

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av.	DELTA2 FCC 15.247 >1GHz 3m pk.
begin scan 1 - 25 GHz in restricted bands						
low channel						
4.804 GHz	39.48 Av	6.49 / 32.78 / 43.16 / 0.0	35.59	V / 1.00 / 0	-18.41	n/a
4.804 GHz	48.8 Pk	6.49 / 32.78 / 43.16 / 0.0	44.91	V / 1.00 / 0	n/a	-29.09
2.739 GHz	40.32 Av	4.48 / 29.46 / 43.6 / 0.0	30.66	V / 1.00 / 0	-23.34	n/a
2.739 GHz	47.8 Pk	4.48 / 29.46 / 43.6 / 0.0	38.14	V / 1.00 / 0	n/a	-35.86
maximized						
2.739 GHz	47.24 Av	4.48 / 29.46 / 43.6 / 0.0	37.58	H / 1.55 / 71	-16.42	n/a
2.739 GHz	54.4 Pk	4.48 / 29.46 / 43.6 / 0.0	44.74	H / 1.55 / 71	n/a	-29.26
mid channel						
maximized						
4.88 GHz	39.37 Av	6.57 / 32.92 / 43.1 / 0.0	35.76	V / 1.55 / 71	-18.24	n/a
4.88 GHz	47.6 Pk	6.57 / 32.92 / 43.1 / 0.0	43.99	V / 1.55 / 71	n/a	-30.01
high channel						
maximized						
4.96 GHz	39.26 Av	6.64 / 33.07 / 43.03 / 0.0	35.95	V / 1.10 / 54	-18.05	n/a
4.96 GHz	47.9 Pk	6.64 / 33.07 / 43.03 / 0.0	44.59	V / 1.10 / 54	n/a	-29.41
no other significant emission detected						
end scan 1 - 25 GHz						

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

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

RADIATED EMISSIONS

Test Report #:	WC907821 Run 3	Test Area:	LTS			
EUT Model #:	01018477 Rev A	Date:	10/28/2009			
EUT Serial #:	DHC09401030	EUT Power:	12 VDC	Temperature:	23.0	°C
Test Method:	FCC 15.247			Air Pressure:	98.0	kPa
Customer:	NovAtel Inc.			Rel. Humidity:	28.0	%
EUT Description:	GPS receiver with Bluetooth					
Notes:	Spurious / harmonics scan for emissions in the restricted bands of FCC 15.205					
Data File Name:	7821.dat			Page:	2 of 3	

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.
2.739 GHz	47.24 Av	4.48 / 29.46 / 43.6 / 0.0	37.58	H / 1.55 / 71	-16.42
4.96 GHz	39.26 Av	6.64 / 33.07 / 43.03 / 0.0	35.95	V / 1.10 / 54	-18.05
4.88 GHz	39.37 Av	6.57 / 32.92 / 43.1 / 0.0	35.76	V / 1.55 / 71	-18.24
4.804 GHz	39.48 Av	6.49 / 32.78 / 43.16 / 0.0	35.59	V / 1.00 / 0	-18.41

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

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA2 FCC 15.247 >1GHz 3m pk.
4.804 GHz	48.8 Pk	6.49 / 32.78 / 43.16 / 0.0	44.91	V / 1.00 / 0	-29.09
2.739 GHz	54.4 Pk	4.48 / 29.46 / 43.6 / 0.0	44.74	H / 1.55 / 71	-29.26
4.96 GHz	47.9 Pk	6.64 / 33.07 / 43.03 / 0.0	44.59	V / 1.10 / 54	-29.41
4.88 GHz	47.6 Pk	6.57 / 32.92 / 43.1 / 0.0	43.99	V / 1.55 / 71	-30.01

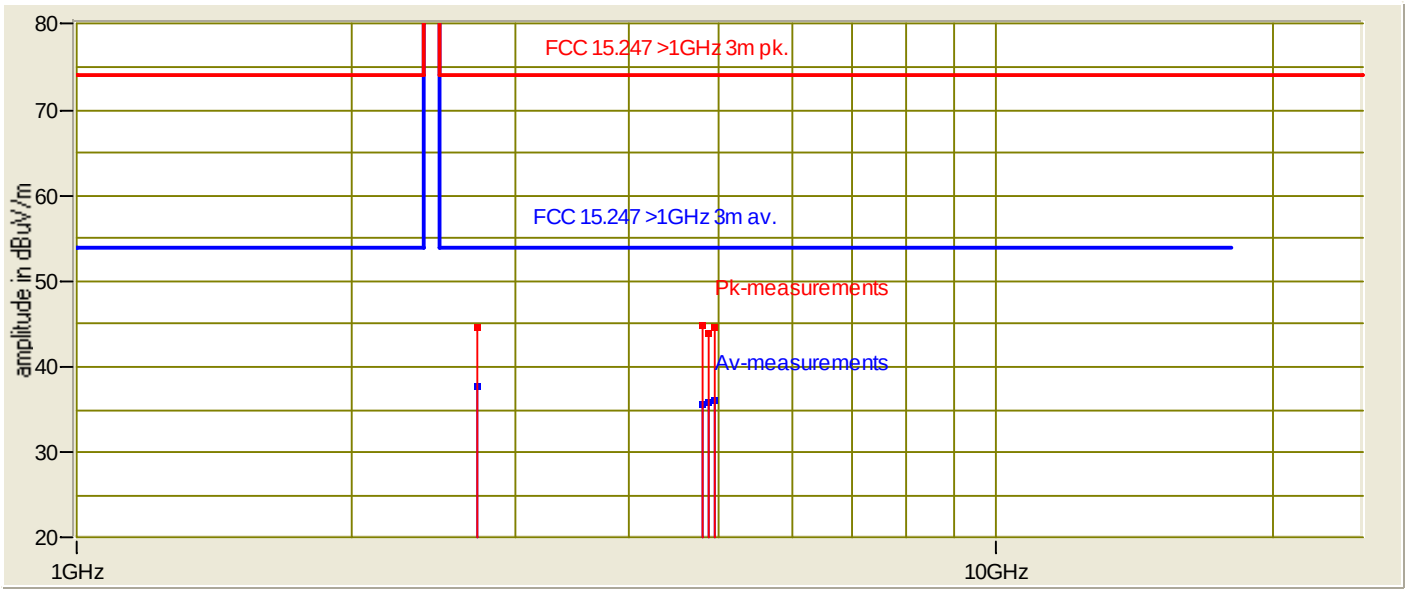
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

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

RADIATED EMISSIONS

Test Report #:	WC907821 Run 3	Test Area:	LTS		
EUT Model #:	01018477 Rev A	Date:	10/28/2009		
EUT Serial #:	DHC09401030	EUT Power:	12 VDC	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	NovAtel Inc.			Rel. Humidity:	28.0 %
EUT Description:	GPS receiver with Bluetooth				
Notes:	Spurious / harmonics scan for emissions in the restricted bands of FCC 15.205				
Data File Name:	7821.dat			Page:	3 of 3

Graph:



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

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

RADIATED EMISSIONS

Test Report #:	WC907821 Run 4	Test Area:	LTS		
EUT Model #:	01018477 Rev A	Date:	10/29/2009		
EUT Serial #:	DHC09401030	EUT Power:	12 VDC	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	NovAtel Inc.			Rel. Humidity:	32.0 %
EUT Description:	GPS receiver with Bluetooth				
Notes:	Spurious scan for emissions in the restricted bands of FCC 15.205				
Data File Name:	7821.dat			Page:	1 of 3

List of measurements for run #: 4

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m	DELTA2
high channel						
73.136 MHz	43.2 Qp	0.54 / 9.2 / 29.63 / 0.0	23.32	V / 1.00 / 0	-16.68	n/a
120.008 MHz	46.1 Qp	0.84 / 9.55 / 29.62 / 0.0	26.86	V / 1.00 / 0	-16.64	n/a
240.008 MHz	36.65 Qp	1.15 / 11.85 / 29.43 / 0.0	20.22	V / 1.00 / 0	-25.78	n/a
408.032 MHz	33.45 Qp	1.37 / 16.14 / 29.3 / 0.0	21.66	V / 1.00 / 0	-24.34	n/a
170.86 MHz	35.2 Qp	0.97 / 9.48 / 29.6 / 0.0	16.05	H / 1.00 / 90	-27.45	n/a
73.136 MHz	45.5 Qp	0.54 / 9.2 / 29.63 / 0.0	25.62	V / 1.00 / 180	-14.38	n/a
170.86 MHz	36.2 Qp	0.97 / 9.48 / 29.6 / 0.0	17.05	V / 1.00 / 180	-26.45	n/a
maximized						
73.136 MHz	47.83 Qp	0.54 / 9.2 / 29.63 / 0.0	27.95	V / 1.00 / 159	-12.05	n/a
mid channel						
No new or higher emissions detected						
high channel						
No new or higher emissions detected						
End scan 30-1000 MHz						

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

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

RADIATED EMISSIONS

Test Report #:	WC907821 Run 4	Test Area:	LTS		
EUT Model #:	01018477 Rev A	Date:	10/29/2009		
EUT Serial #:	DHC09401030	EUT Power:	12 VDC	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	NovAtel Inc.			Rel. Humidity:	32.0 %
EUT Description:	GPS receiver with Bluetooth				
Notes:	Spurious scan for emissions in the restricted bands of FCC 15.205				
Data File Name:	7821.dat			Page:	2 of 3

Measurement summary for limit1: FCC 15.247 <1GHz 3m (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m
73.136 MHz	47.83 Qp	0.54 / 9.2 / 29.63 / 0.0	27.95	V / 1.00 / 159	-12.05
120.008 MHz	46.1 Qp	0.84 / 9.55 / 29.62 / 0.0	26.86	V / 1.00 / 0	-16.64
408.032 MHz	33.45 Qp	1.37 / 16.14 / 29.3 / 0.0	21.66	V / 1.00 / 0	-24.34
240.008 MHz	36.65 Qp	1.15 / 11.85 / 29.43 / 0.0	20.22	V / 1.00 / 0	-25.78
170.86 MHz	36.2 Qp	0.97 / 9.48 / 29.6 / 0.0	17.05	V / 1.00 / 180	-26.45

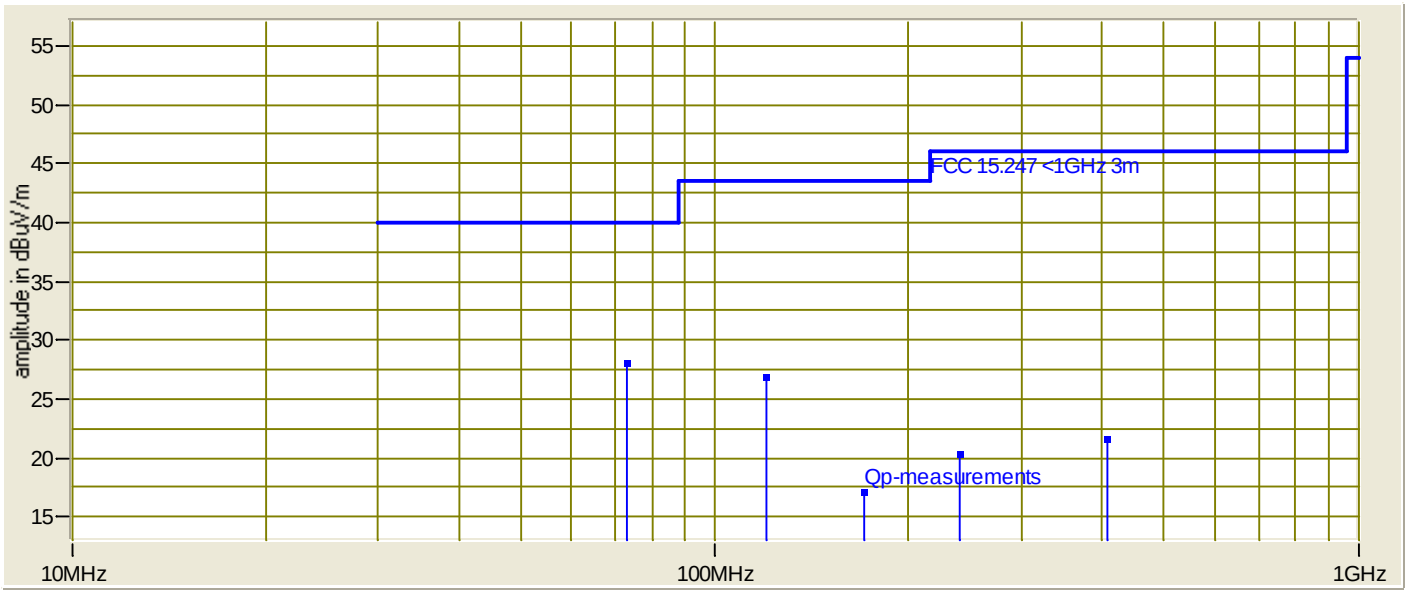
Tested by: Greg Jakubowski (Printed) _____ (Signature)

Reviewed by: Joel T Schneider (Printed) _____ (Signature)

RADIATED EMISSIONS

Test Report #:	WC907821 Run 4	Test Area:	LTS		
EUT Model #:	01018477 Rev A	Date:	10/29/2009		
EUT Serial #:	DHC09401030	EUT Power:	12 VDC	Temperature:	23.0 °C
Test Method:	FCC 15.247			Air Pressure:	98.0 kPa
Customer:	NovAtel Inc.			Rel. Humidity:	32.0 %
EUT Description:	GPS receiver with Bluetooth				
Notes:	Spurious scan for emissions in the restricted bands of FCC 15.205				
Data File Name:	7821.dat			Page:	3 of 3

Graph:



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

Reviewed by: Joel 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.

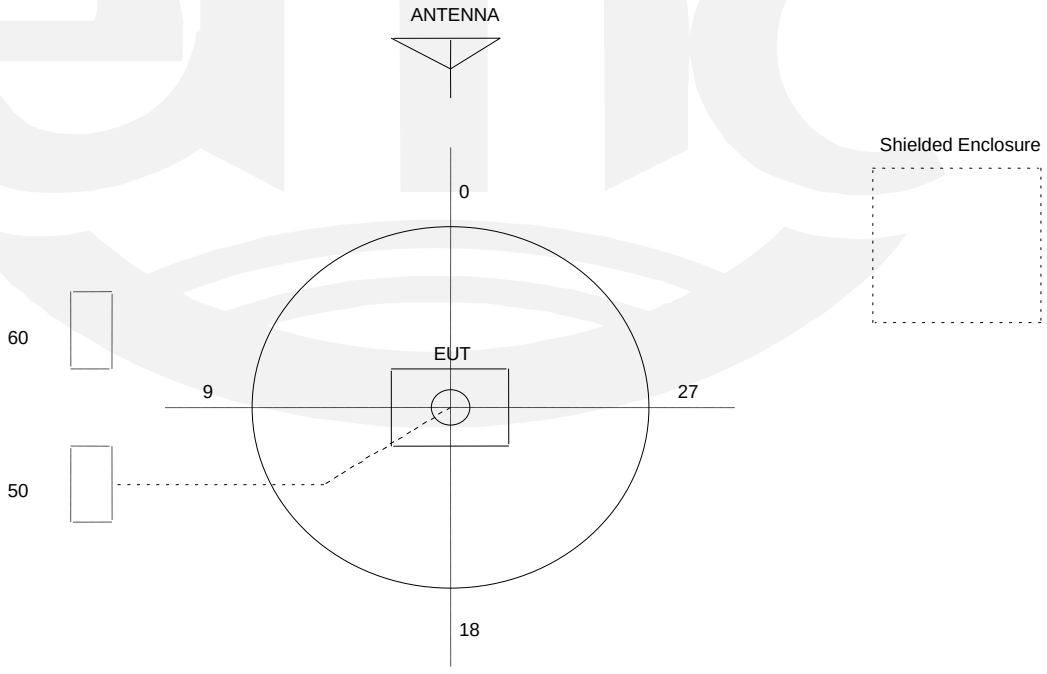
2. 50 Hz and 60 Hz are power panels for alternating current.

3. The antenna may be positioned horizontally 3 and 10 meters from the center of the turntable.

4. The circle is either a 6.7 meter or 1.2 meter diameter turntable.

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

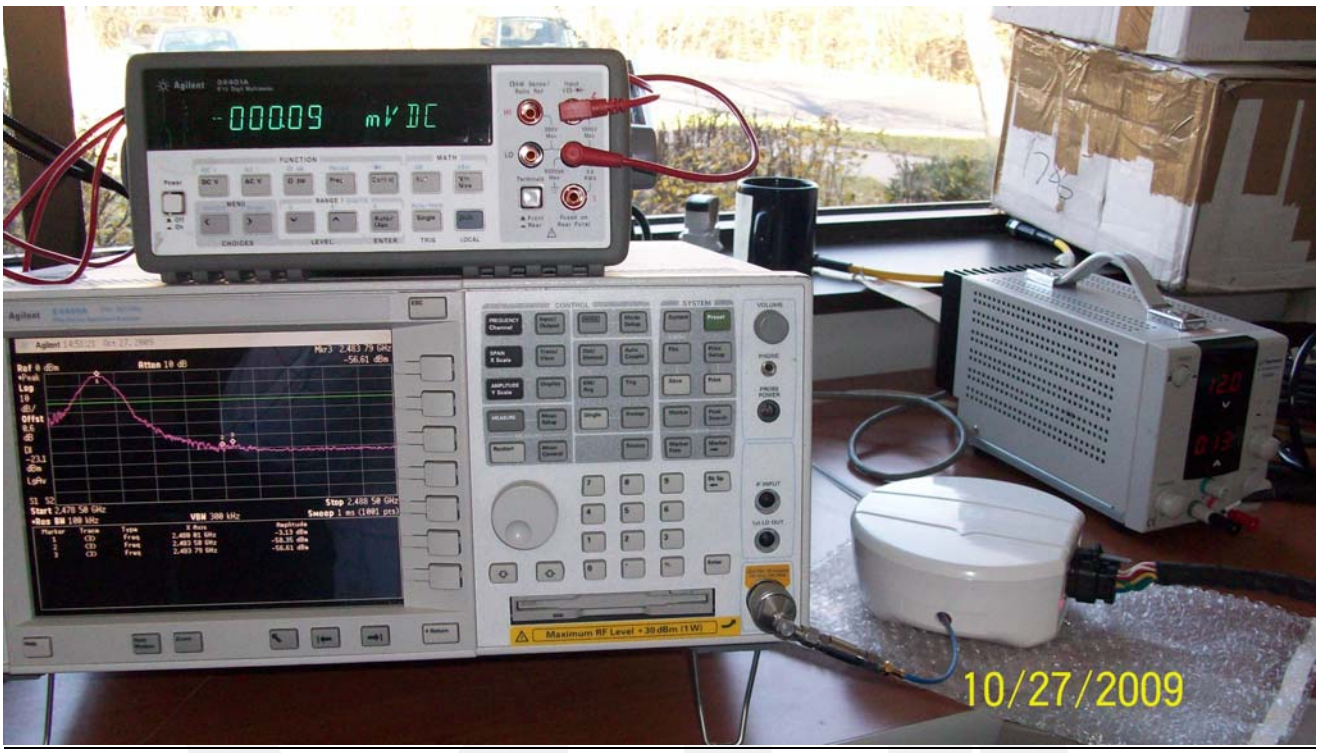
6. The test sample is shown in the azimuthal position representing zero degrees.



Test-setup photo(s):
Radiated emissions

Test-setup photo(s):
Radiated emissions

Test-setup photo(s):
Conducted emissions



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

■ - Transmit frequency locked at low, mid or high channel as needed

■ - Both unmodulated & modulated as needed

Configuration of the device under test:

■ - See Appendix A and test setup photo(s)

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

DEVIATIONS FROM STANDARD:
None.

GENERAL REMARKS:
At the time of test, the EUT was identified as Model Number 01018498. Notification of a correction in the equipment identification to Model 01018495 was received from the manufacturer and is on file with TÜV SÜD America.

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

EUT Received Date:	27 October 2009
Condition of EUT:	Normal
Testing Start Date:	27 October 2009
Testing End Date:	30 October 2009

TÜV SÜD AMERICA INC

Greg S Jakubowski
Senior EMC Technician

Joel T Schneider
Senior EMC Engineer

Appendix A

Constructional Data Form

and

Block Diagram

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:	NovAtel Inc.		
Address:	1120-68th ave N.E		
	Calgary, Alberta		
	Canada T2E 8S5		
Contact:	Roland Jackman	Position:	Verification Team Lead
Phone:	403-295-4940	Fax:	
E-mail Address:	Roland.Jackman@novatel.ca		

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

EUT Description	GPS Receiver		
EUT Name	Smart AG		
Model No.:	01018495	Serial No.:	
Product Options:	GPS GLONASS L1, BT		
Configurations to be tested:	GPS GLONASS L1, BT		

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: EN55022, EN55024, CISPR25
- ☐ 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	(Separate Report)	
☒ Canada:	Class	☐ A	☒ B		
☐ Australia:	Class	☐ A	☐ B		
☐ Other:					

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

- ☐ Attestation of Conformity (AoC)*
- ☐ Statement of Compliance (previously CoC)*
- ☐ EMC Certification (used with Octagon Mark)*
- ☐ Compliance Document*
- 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
- ☒ 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 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: 155mm diameter Width: _____ Height: 68mm Weight: 500g

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: +8 to +36V (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): 2.5W (max) Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

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

EUT Power Cable

☐ Permanent OR ☒ Removable Length (in meters): 4.6m to 7.6m

☒ Shielded OR ☒ Unshielded

☐ Not Applicable

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables

Type	During Test: Analog	During Test: 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*	☒ ☐	
COM1 (RS232)	☐	☒	☒	☐	1	☒	☐					4.6m	☒	☐
COM2 (RS232)	☐	☒	☒	☐	1	☒	☐					4.6m	☒	☐
MARK	☐	☒	☒	☐	1	☒	☐					4.6m	☒	☐
ER	☒	☐	☒	☐	1	☒	☐					4.6m	☒	☐
CAN+	☐	☒	☒	☐	1	☒	☐					4.6m	☒	☐
CAN-	☐	☒	☒	☐	1	☒	☐					4.6m	☒	☐
PPS	☐	☒	☒	☐	1	☒	☐					4.6m	☒	☐
Power IN	☐	☐	☐	☐		☐	☒					7.2m	☒	☐
GND	☐	☐	☐	☐		☐	☒					7.2m	☒	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: 1.000S19

Description: Engineering Version

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. GPS with BT - Transmit mode

2. GPS with BT - Stanby mode

3. GPS with BT

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 #

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 #*
Laptop Computer	PTS52C-MH309C	28015095H	
GPS-704-X Antenna	01017637	NAR07270007	
Power Amplifier	ZHL-1217-HLN	D061599-21	
FlexPak OEM-V1G	01017941	NCN07410012	
Spectrum Analyzer	FSH6	103715	
USB – 8 Port	(1P)50001314-01	I64387117	

Oscillator Frequencies

Manufacturer	*Frequency*	*Derived Frequency*	*Component # / Location*	*Description of Use*

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
Topward	3303D	793285	☐ Switched-mode: (Frequency) _____ ☒ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*

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.	Date
Roland Jackman & Myung Jin (MJ) Jung	Nov 30, 2009
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

A coax cable was mounted to the PCB instead of the antenna. Measurements were made by connecting directly to a spectrum analyzer. Coax loss was corrected for by applying a 0.6 dB offset to the analyzer.

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

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Test Equipment

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

DETAILS OF TEST PROCEDURES

Radiated Emissions

Radiated emissions in the frequency range of 10kHz to 30 MHz, including the fundamental transmit signal, are measured using a receiver capable of quasi-peak and average measurements and a magnetic loop antenna. The transmitter is rotated through 3 orthogonal axes in order to determine the maximum emission levels. If the signal cannot be measured at the specified limit distance, measurements are recorded at multiple distances nearer to the device and the final level mathematically extrapolated. Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.