TEST RESULT SUMMARY

FCC Part 90

MANUFACTURER'S NAME	Deere and Company d.b.a. Intellegent Solutions Group 4140 NW 114th Street Urbandale IA 50322
PRODUCT NAME	450 MHz RTK amplifier
MODEL NUMBER(S) TESTED	PF81443
SERIAL NUMBER(S) TESTED	PCSR60A003030
PRODUCT DESCRIPTION	450-470 MHz amplifier
TEST REPORT NUMBER	WC909605 Rev D
TEST DATE(S)	15 December 2009 – 19 June 2010

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable EMC requirements of FCC Part 90.

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

Date: 25 June 2010

Location: Taylors Falls MN
USA

Greg S Jakubowski
Senior EMC Technician

Joel T Schneider
Senior EMC Engineer

Not Transferable

EMC TEST REPORT

Test Report No.	**WC909605 Rev D**	Date of issue:	25 June 2010
Product Name	450 MHz RTK amplifier		
Model(s) Tested	PF81443		
Serial No(s) Tested	PCSR60A003030		
Product Description	450-470 MHz amplifier		
Manufacturer	Deere and Company d.b.a. Intellegent Solutions Group		
	4140 NW 114th Street		
	Urbandale IA 50322		

Test Result ■ **Positive** ☐ **Negative**

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.

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REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	30	26 April 2010	Initial Release
A	32	25 May 2010	Revisions include: ▪ Adding new output power readings with the newest amp.
B	40	15 June 2010	▪ Adding 14 June 2010 test data.
C	39	21 June 2010	▪ Adding 19 June 2010 test data.
D	39	25 June 2010	Updated pages 15 and 21 to more clearly reflect the substitution method.

DIRECTORY

Contents

EMC TEST REGULATIONS:
The tests were performed according to the following regulations:
FCC Part 90

ENVIRONMENTAL CONDITIONS IN THE LAB

	Actual
Temperature:	: 21-24° C
Atmospheric pressure	: 98-99 kPa
Relative Humidity	: 19-52%

POWER SUPPLY UTILIZED

Power supply system	: 12 VDC

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

SIGN EXPLANATIONS
☐ - not applicable
■ - applicable

Output Power
FCC Section 90.205

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C, clause 2.2.1
Maximum peak conducted output power of the fundamental is 46.88 dBm, 48.8 W
Maximum peak ERP of the fundamental is 46.88 dBm + 7 dBi (max antenna gain) = 53.88 dBm, 245 W.
Maximum peak conducted output power into the amplifier is 33 dBm, 2 W.
The gain of the amplifier is 16 dB.

Test location
■ - Aero Antenna Technology
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test distance
☐ - 3 meters

Test limit
The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2.

Test Data
See AeroAntenna Technology Inc document AMP460-1 SN:3120 on following pages

AeroAntenna Technology, Inc.
an AS9100 Certified Company
20732 Lassen Street, Chatsworth, CA 91311
Phone: (818) 993-3842 Fax: (818) 993-4525

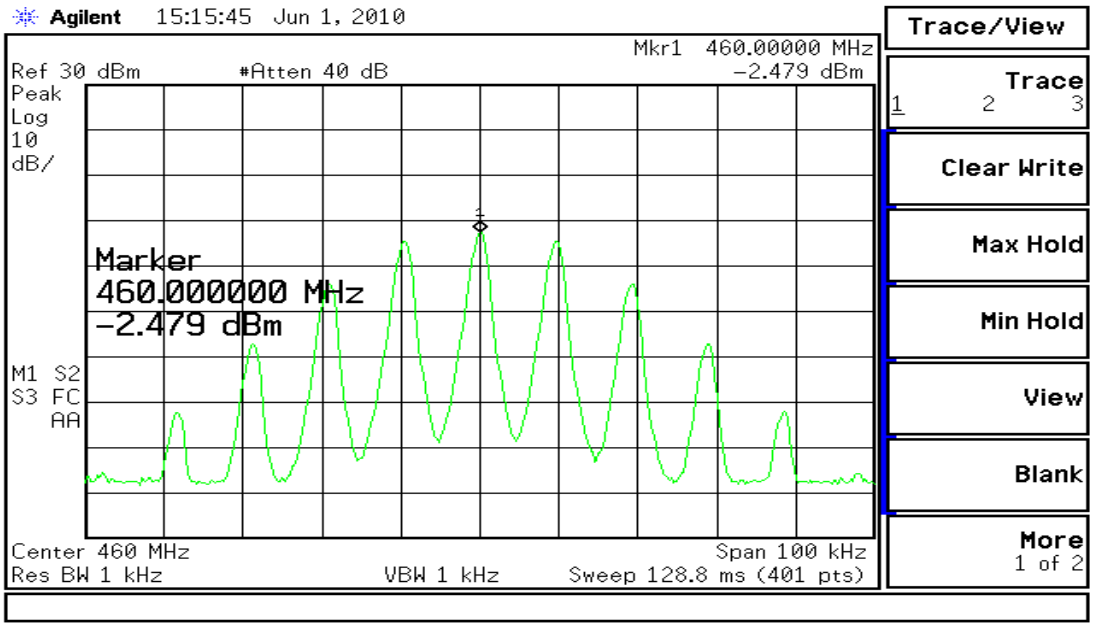
AMP460-1 SN:3120

SIMULATED FSK STIMULUS TEST RESULTS

FSK Source

Source:	Agilent N5181A
Conditioning:	Variable Gain Amplifier (VGA)/2W
Baseband Bit Rate:	9600 bps
Passband modulation:	GFSK, 12kHz spacing

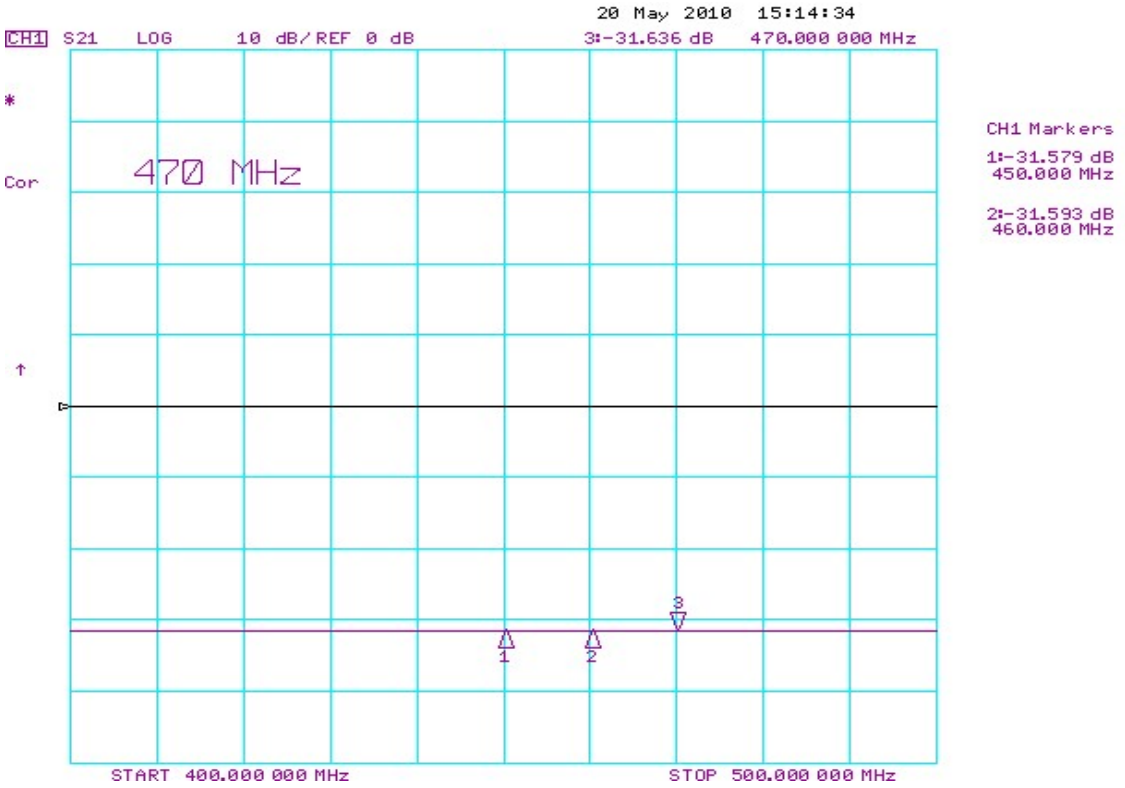
Agilent N5181A analog signal generator was used as a source. The signal generator output was connected into the input of a variable gain amplifier (VGA) in order to provide required power. The VGA gain was adjusted while monitored with an Agilent E4407B spectrum analyzer. The modulated stimulus signal spectral components are presented on the figure below:



Attenuation Characterization

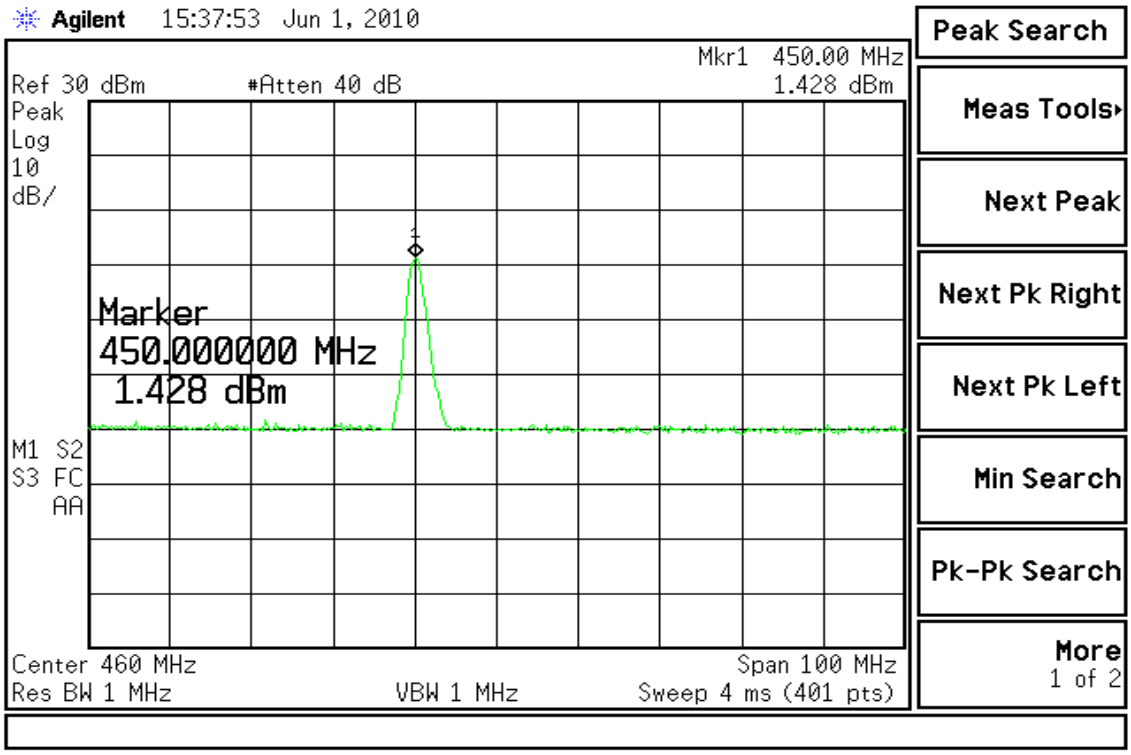
The attenuator/cable/connector assembly is characterized by the AeroAntenna Technology, Inc. Radio Frequency laboratory using an RF Network Analyzer yielding the following attenuation factors:

- 31.58 dB @ 450 MHz
- 31.59 dB @ 460 MHz
- 31.64 dB @ 470 MHz



450 MHz Results

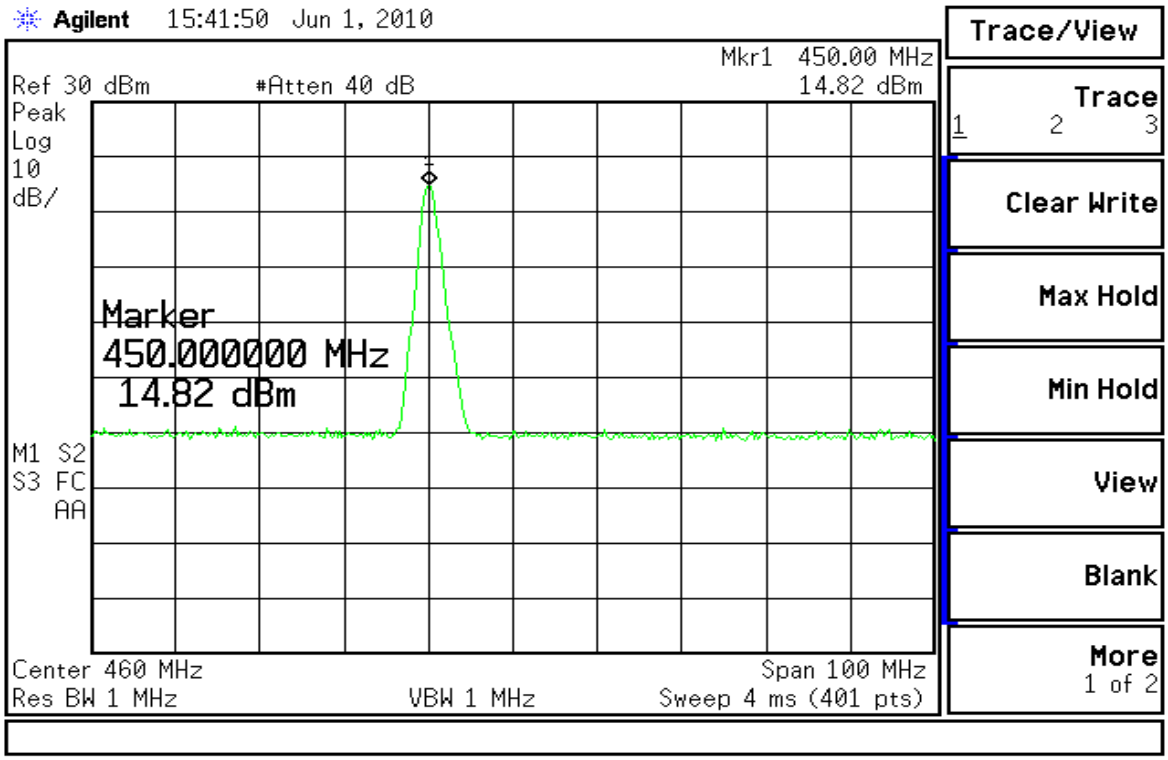
The input stimulus was adjusted using the VGA. The spectrum is presented on the figure below:



Using the attenuation factor at 450 MHz frequency:

$$P_{STIM} = 1.43\text{dBm} + 31.58\text{dBm} = 33.01\text{dBm} = 2\text{W}$$

With this stimulus signal, the spectrum analyzer was placed into a Max Hold mode. The spectrum is presented on the figure below:

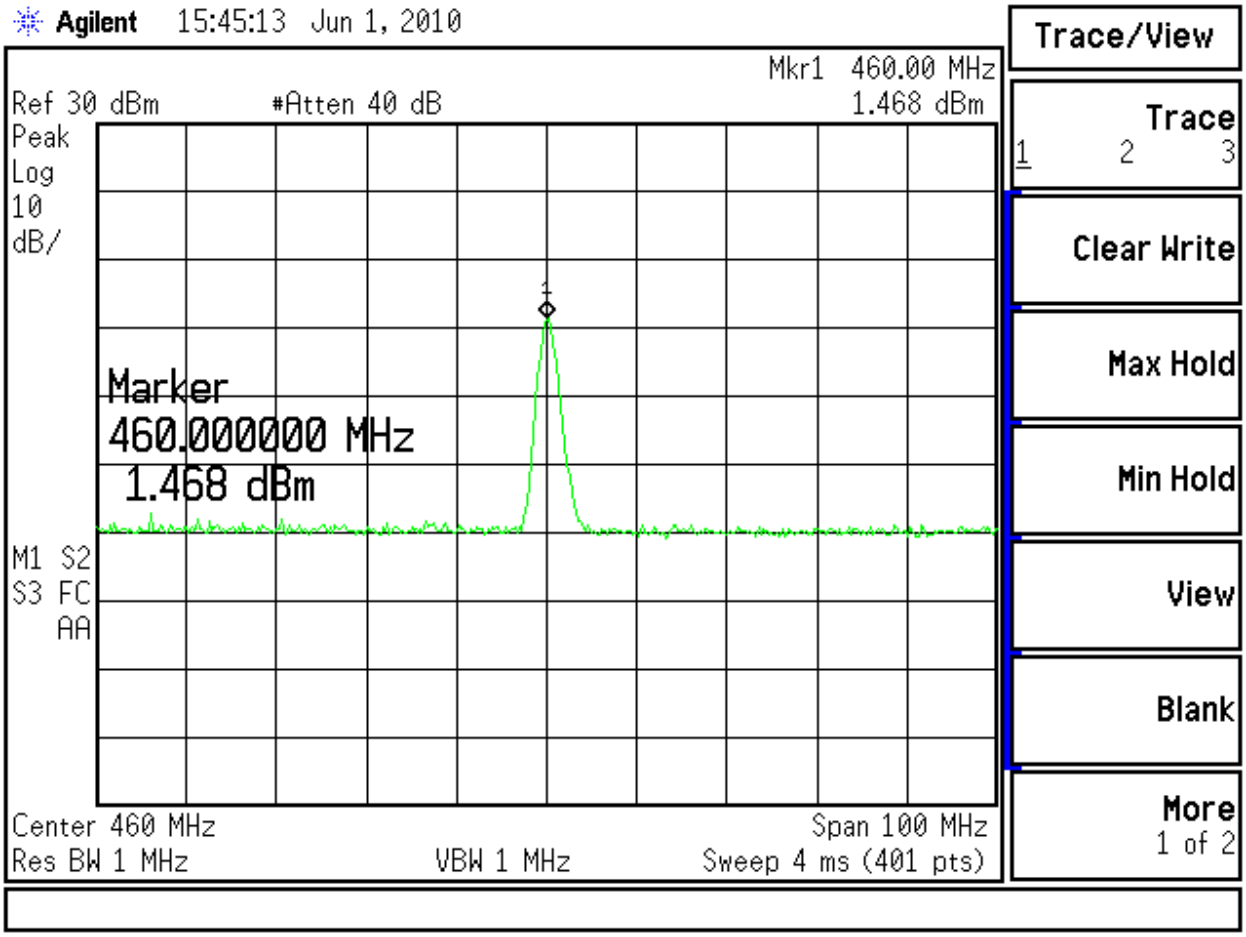


Using the attenuation factor at 450 MHz frequency:

$$P_{OUT} = 14.82\text{dBm} + 31.58\text{dBm} = 46.40\text{dBm} = 43.7\text{W}$$

460 MHz Results

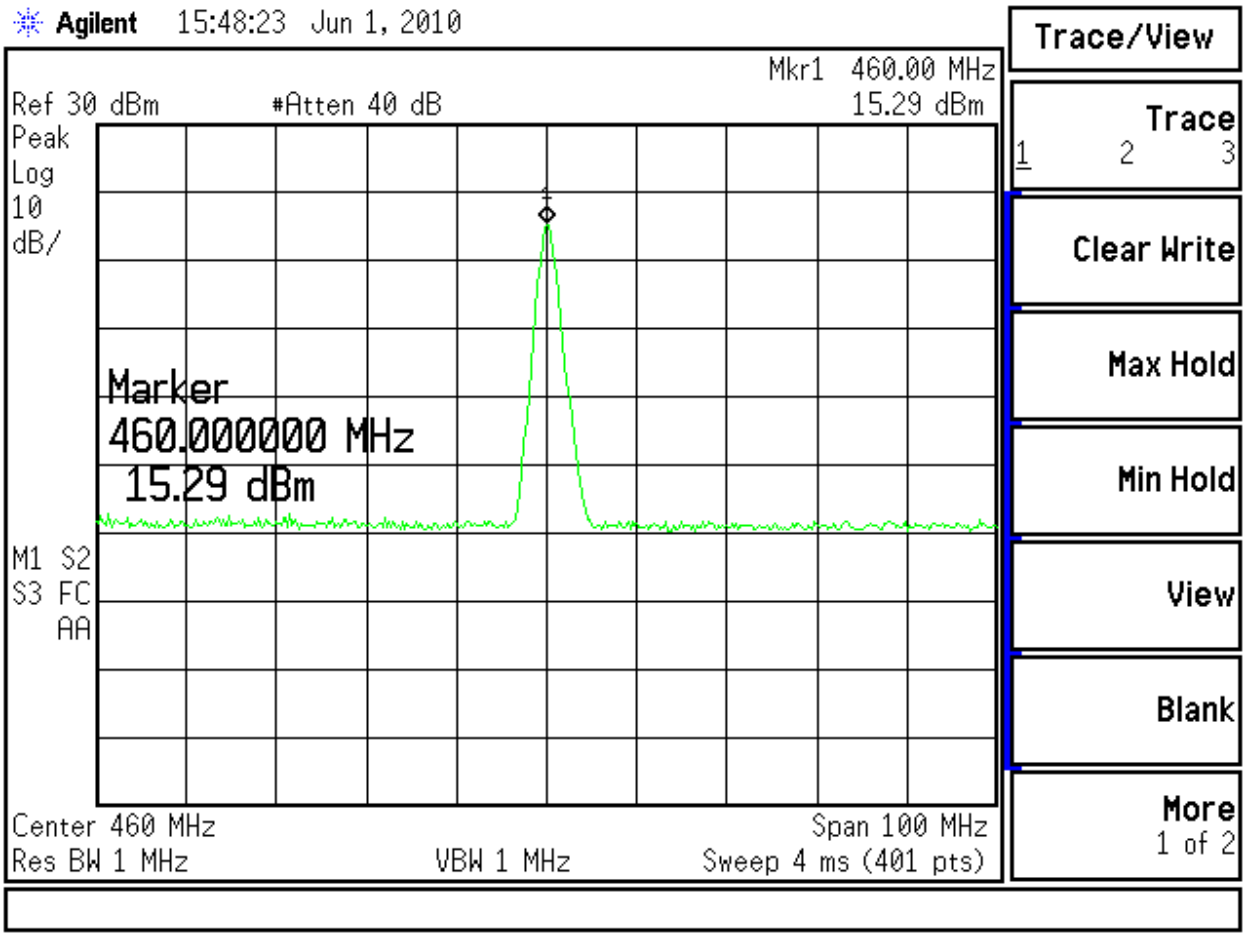
The input stimulus was adjusted using the VGA. The spectrum is presented on the figure below:



Using the attenuation factor at 460 MHz frequency:

$$P_{STIM} = 1.47\text{dBm} + 31.59\text{dBm} = 33.06\text{dBm} = 2\text{W}$$

With this stimulus signal, the spectrum analyzer was placed into a Max Hold mode. The spectrum is presented on the figure below:

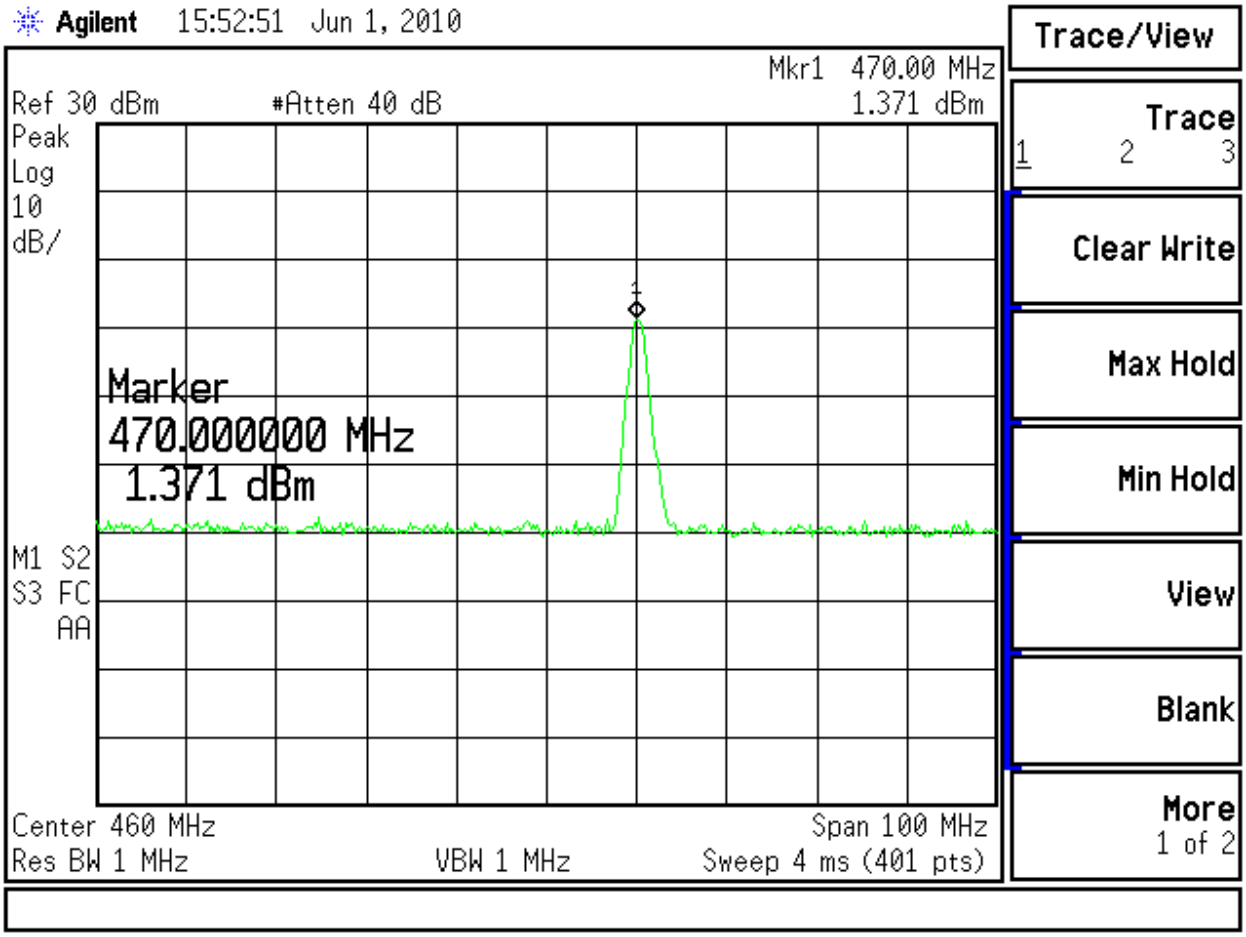


Using the attenuation factor at 460 MHz frequency:

$$P_{OUT} = 15.29\text{dBm} + 31.59\text{dBm} = 46.88\text{dBm} = 48.8\text{W}$$

470 MHz Results

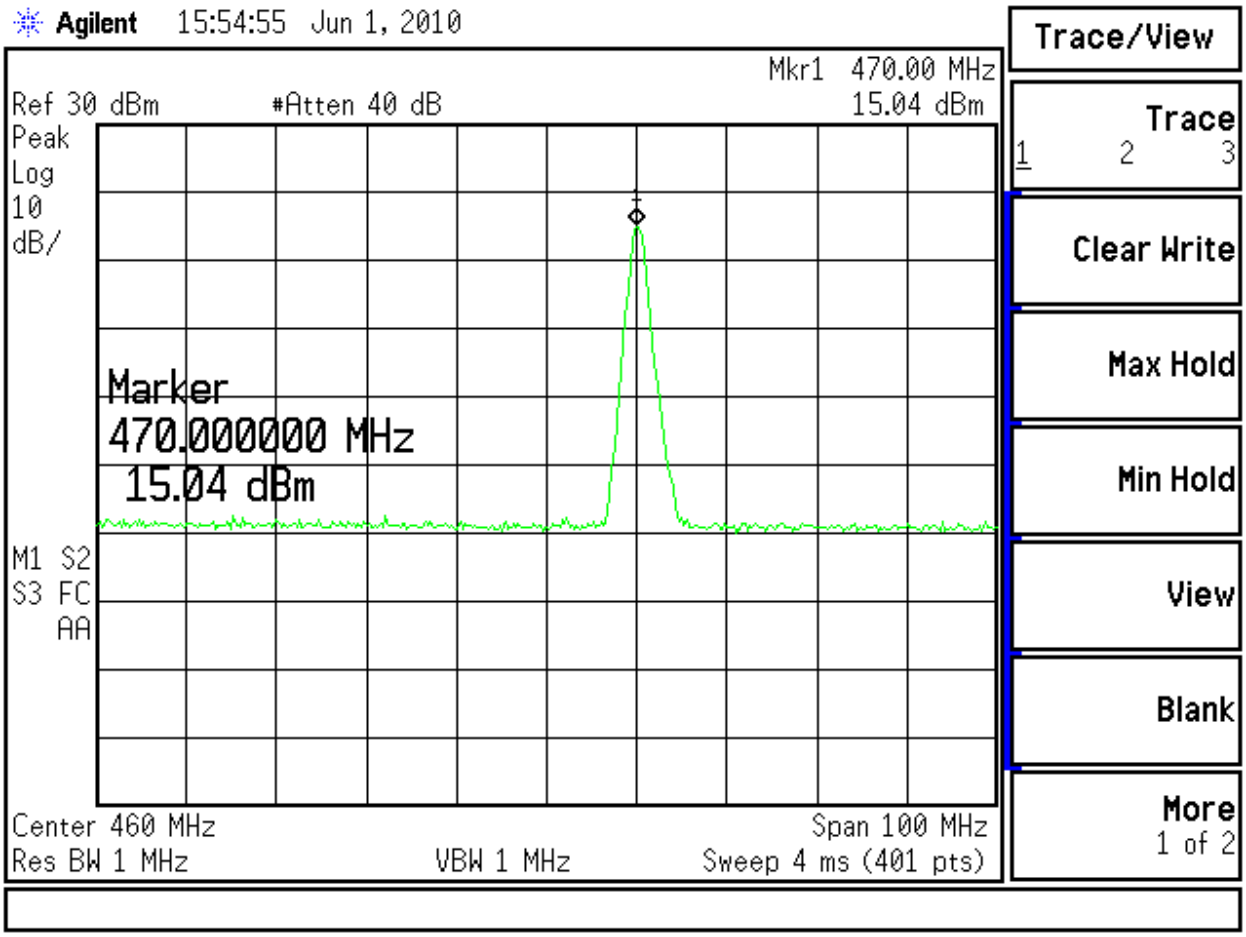
The input stimulus was adjusted using the VGA. The spectrum is presented on the figure below:



Using the attenuation factor at 470 MHz frequency:

$$P_{STIM} = 1.37\text{dBm} + 31.64\text{dBm} = 33.01\text{dBm} = 2\text{W}$$

With this stimulus signal, the spectrum analyzer was placed into a Max Hold mode. The spectrum is presented on the figure below:



Using the attenuation factor at 470 MHz frequency:

$$P_{OUT} = 15.04\text{dBm} + 31.64\text{dBm} = 46.68\text{dBm} = 46.6\text{W}$$

Emission Bandwidth
Section 90.209

Test summary
The requirements are: ■ - NOT APPLICABLE ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C.

The amplifier does not generate any carriers.

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

Test distance
☐ - 3 meters
☐ - 10 meters

Emission Mask/Spurious Emissions
FCC Section 90.210

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C, clause 2.2.13 and 2.2.17

The radiated case spurious emissions were measured using a substitution method. A sample calculation is given below:

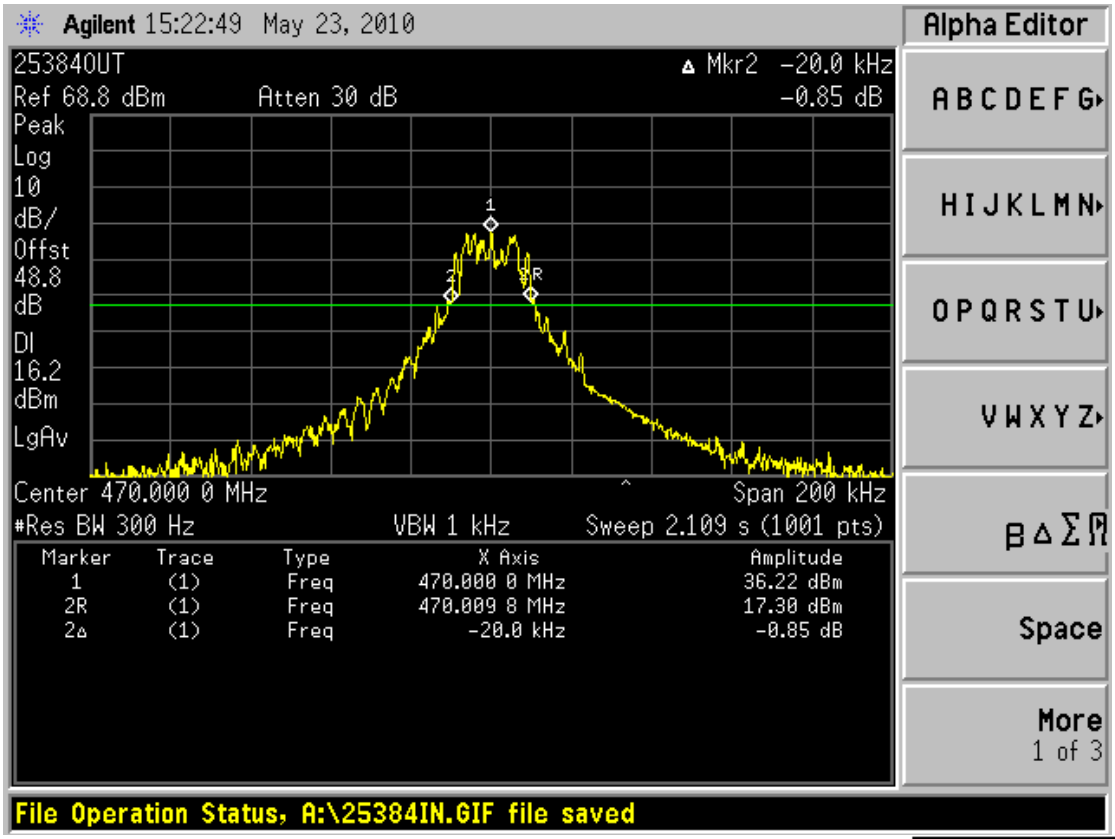
49.8 dBuV/m @ 3 m @ 2.25 GHz= -47 dBm erp (signal generator+ cable loss = -56.7 dBm + antenna gain of 9.7 dBi)

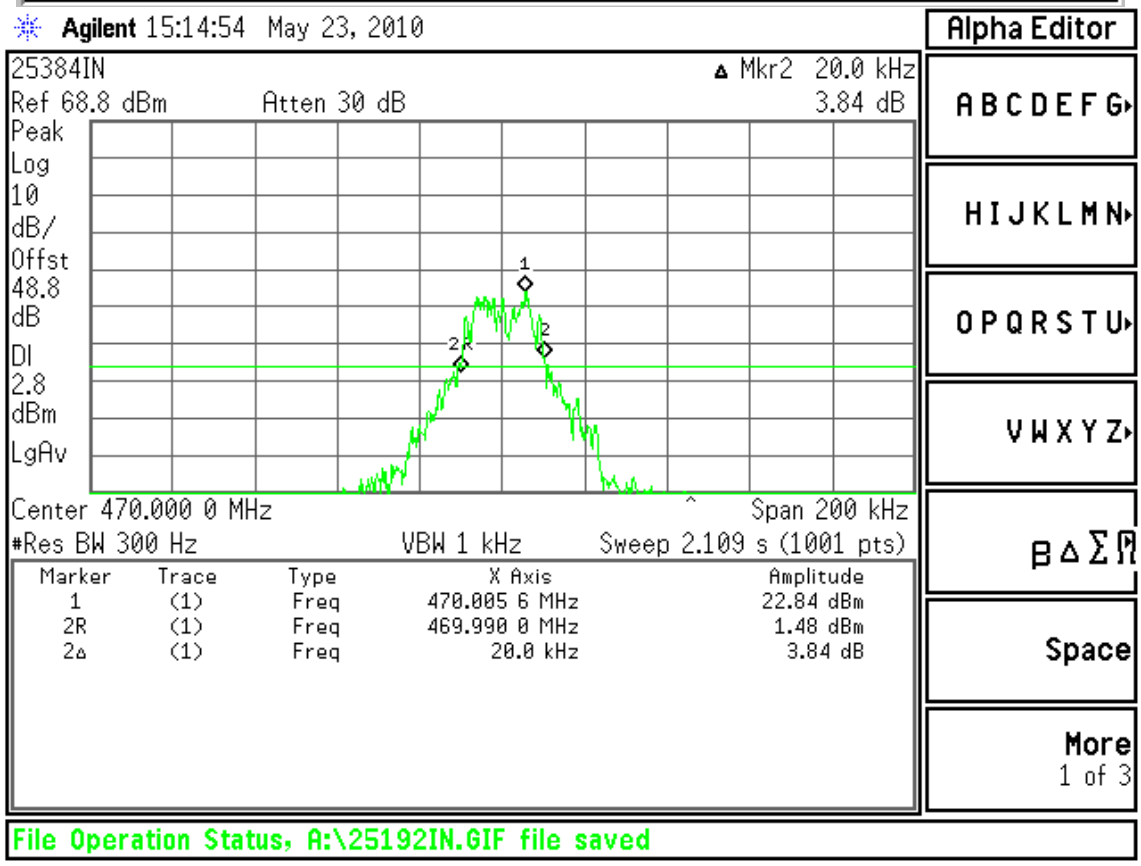
Test location
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)

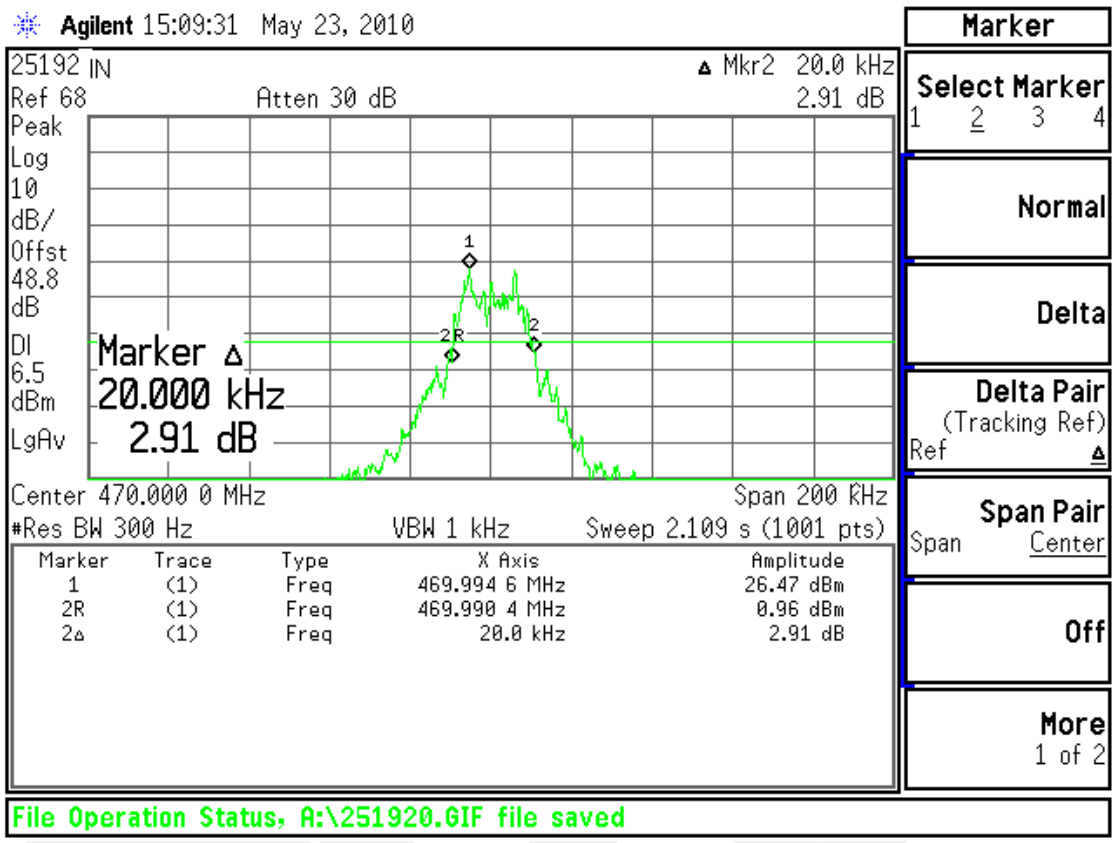
Test Equipment

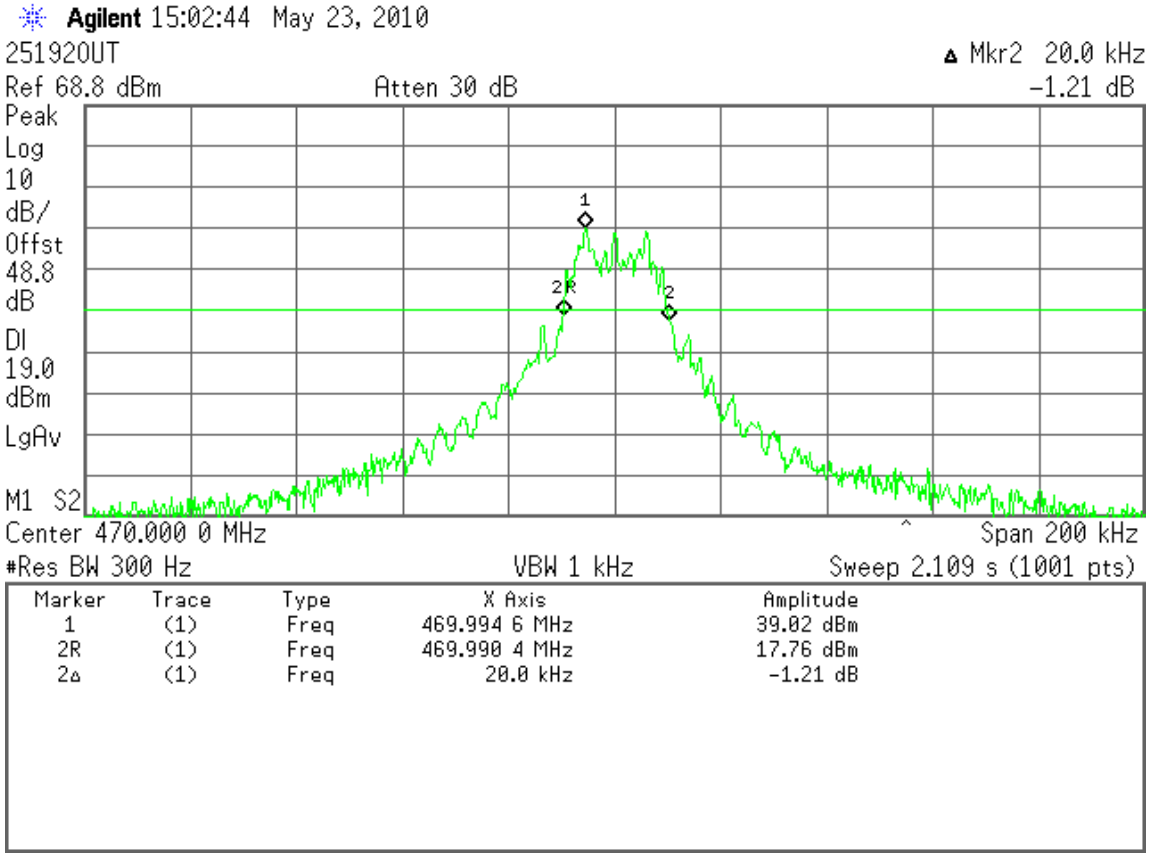
TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03058	2	Inmet	20 dB Attenuator	18N20W-20dB	Code B 11-Dec-10
WRLE03333	SME03	Rohde & Schwarz	Signal Generator	100003	01-Oct-10
WRLE03229	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2483	15-Jul-10
NBLE02683	85650A	Hewlett-Packard	Quasi-peak Adapter	2430A00495	04-Mar-11
WRLE02673	85662A	Hewlett-Packard	Analyzer Display	2152A03687	25-Mar-11
WRLE03294	8566B	Hewlett-Packard	Spectrum Analyzer	2349A03098	25-Mar-11
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 28-Sep-10
WRLE10616	ZHL-1042J	Mini-Circuits	Preamplifier 10 - 3000 MHz	QA0746005	Code B 23-Oct-10
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	18-Jan-11
WRLE03203	EM-6917B	Electro-Metrics	Biconicalog Periodic	106	04-Jun-10
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 02-Nov-10
WRLE03934	F549B-1	Acronetics	2 – 4 GHz Bandpass Filter	010	Code B 30-Sep-10
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 25-Sep-10
WRLE03894	NHP-600	Mini-Circuits	30-600 MHz Stopband Filter	2	Code B 11-Dec-10
NBLE10436	10436	Inmet	20dB Attenuator 50W	18N20W-50dB	Code B 04-May-10
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10
WRLE03333	SME03	Rohde & Schwarz	Signal Generator	100003	01-Oct-10
WRLE03981	SMX100	IFI	Wideband Amplifier	B018-0298	Code Y
WRLE10454	C6021-10	Werlatone	Coupler 40 dB .01-1000	18437	Code B 22-Jun-10
NBLE10447	8482A	HP	Power Sensor	3318A26753	18-Mar-11
WRLE02693	436A	HP	Power Meter	1918A05203	18-Mar-11

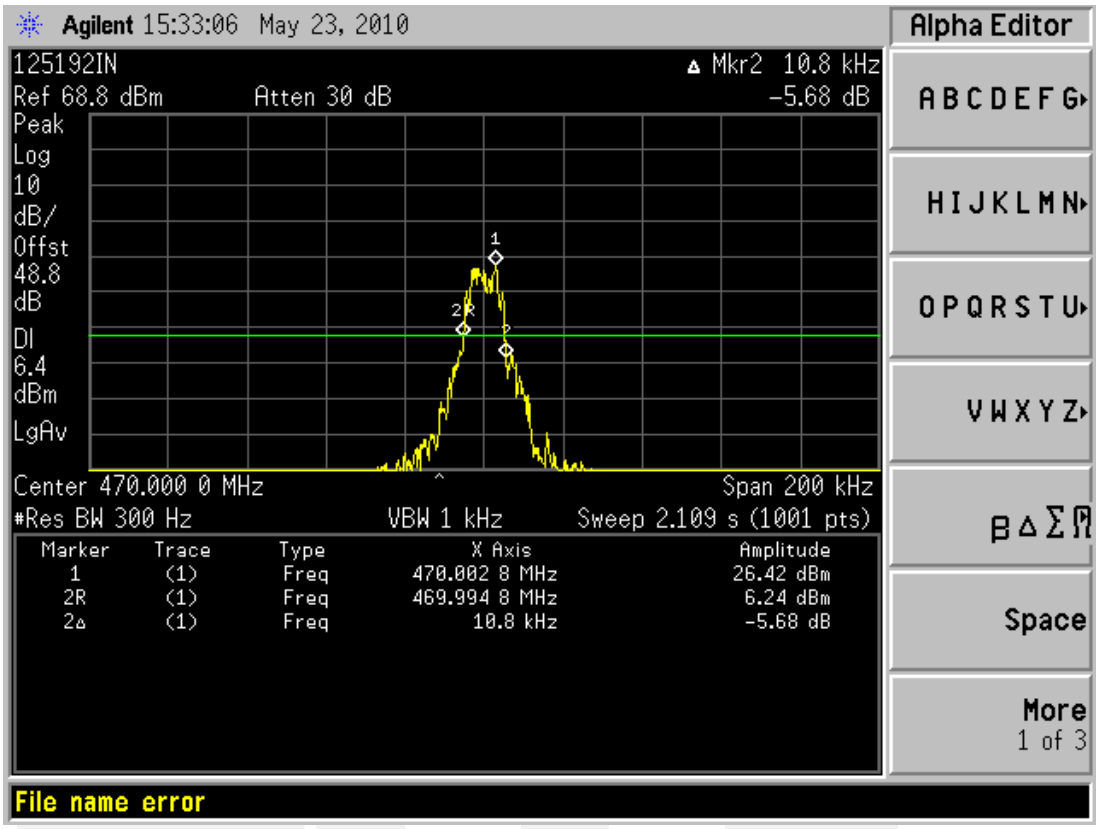
Test data
See following pages

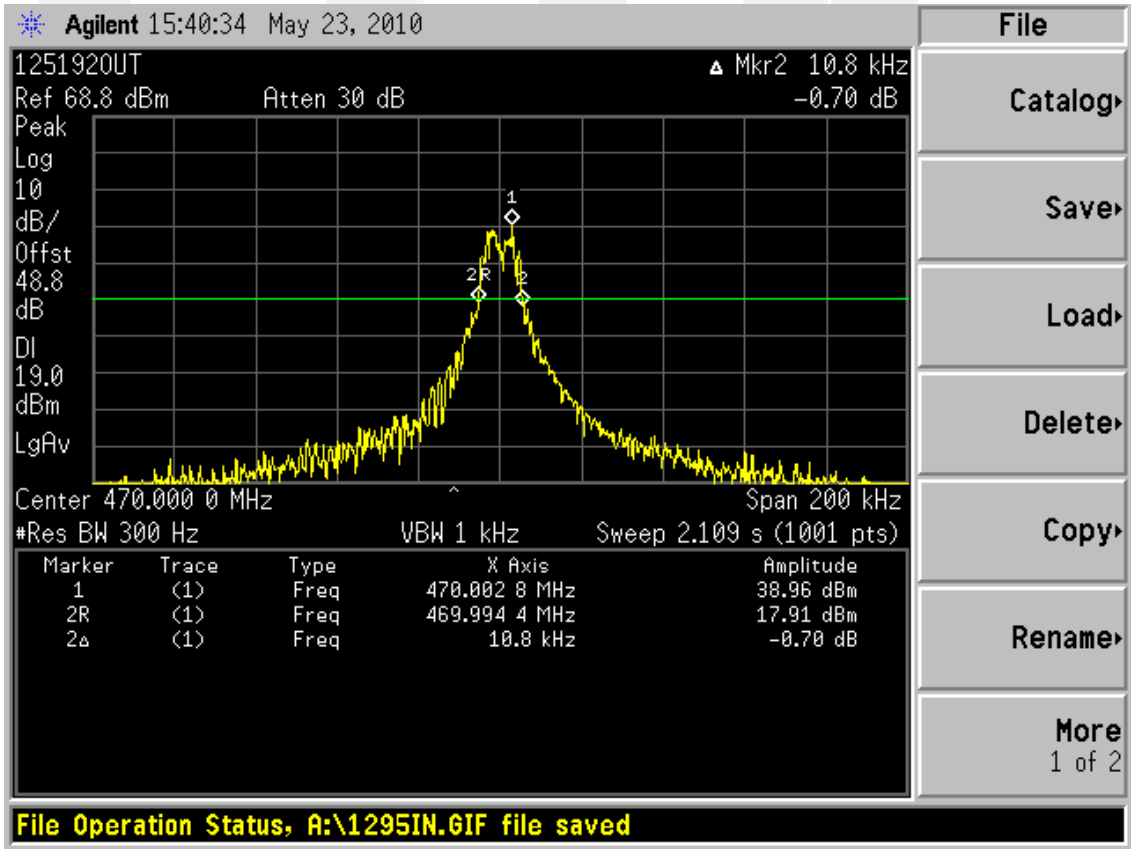

Agilent 15:22:49 May 23, 2010
253840UT
Ref 68.8 dBm
Atten 30 dB
Mkr2 -20.0 kHz
-0.85 dB
Peak
Log
10
dB/
Offst
48.8
dB
Dl
16.2
dBm
LgAv
Center 470.000 0 MHz
Span 200 kHz
#Res BW 300 Hz
VBW 1 kHz
Sweep 2.109 s (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 470.000 0 MHz 36.22 dBm
2R (1) Freq 470.009 8 MHz 17.30 dBm
2Δ (1) Freq -20.0 kHz -0.85 dB
Alpha Editor
A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z
Space
More
1 of 3
File Operation Status, A:\25384IN.GIF file saved

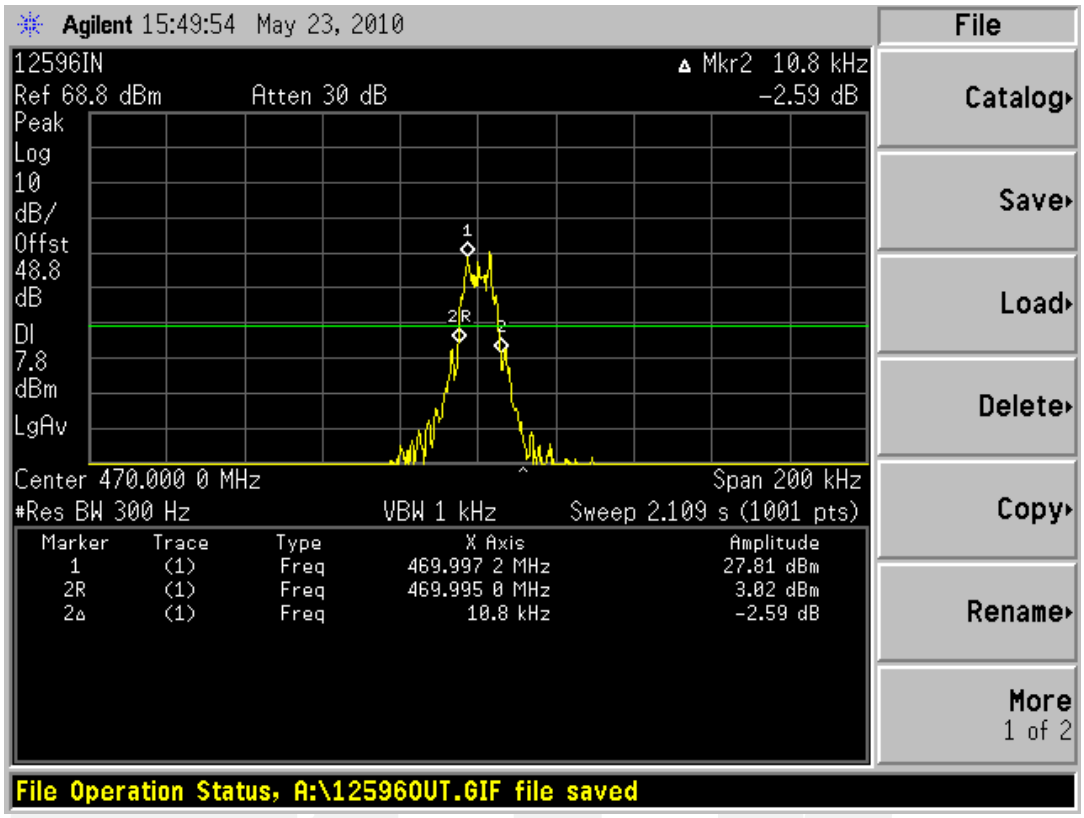

Agilent 15:14:54 May 23, 2010
25384IN
Ref 68.8 dBm
Atten 30 dB
Mkr2 20.0 kHz
3.84 dB
Peak
Log
10
dB/
Offst
48.8
dB
Dl
2.8
dBm
LgAv
Center 470.000 0 MHz
Span 200 kHz
#Res BW 300 Hz
VBW 1 kHz
Sweep 2.109 s (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 470.005 6 MHz 22.84 dBm
2R (1) Freq 469.990 0 MHz 1.48 dBm
2Δ (1) Freq 20.0 kHz 3.84 dB
Alpha Editor
A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z
Space
More
1 of 3
File Operation Status, A:\25192IN.GIF file saved

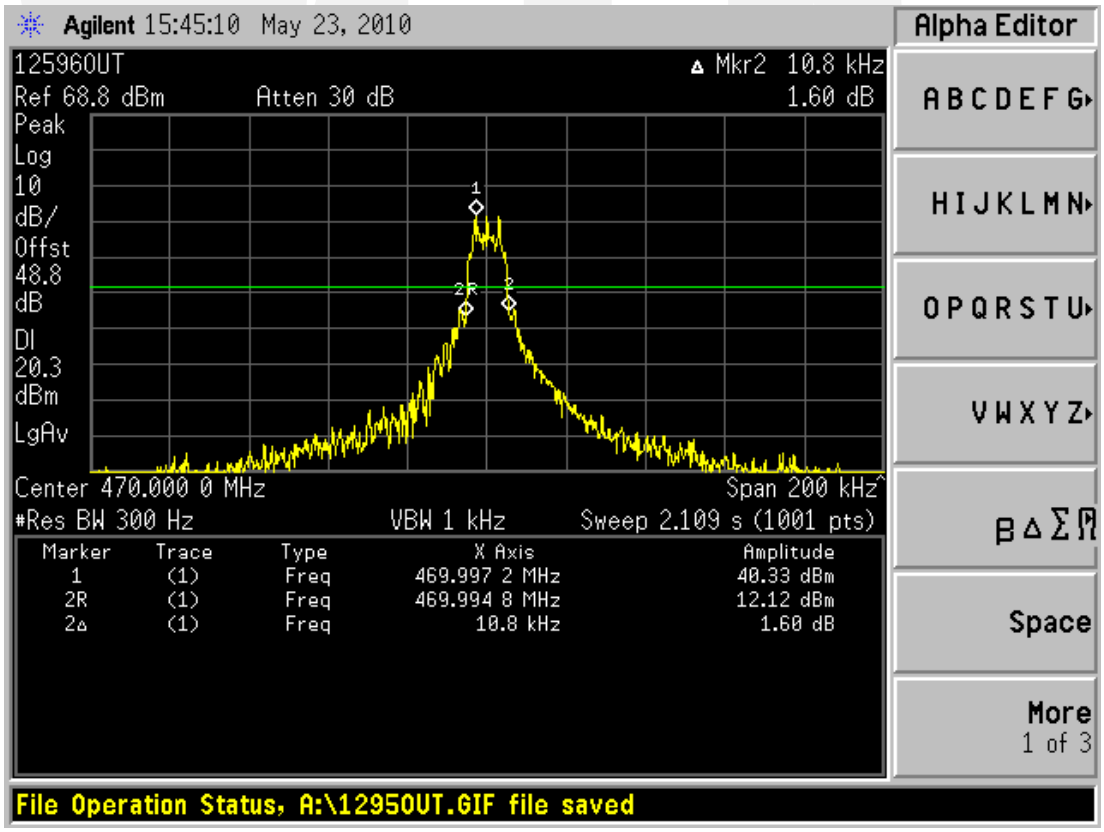

Agilent 15:09:31 May 23, 2010
25192 IN
Ref 68
Atten 30 dB
Mkr2 20.0 kHz
2.91 dB
Peak
Log
10
dB/
Offst
48.8
dB
Dl
6.5
dBm
LgAv
Marker Δ
20.000 kHz
2.91 dB
Center 470.000 0 MHz
Span 200 kHz
#Res BW 300 Hz
VBW 1 kHz
Sweep 2.109 s (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 469.994 6 MHz 26.47 dBm
2R (1) Freq 469.990 4 MHz 0.96 dBm
2Δ (1) Freq 20.0 kHz 2.91 dB
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\251920.GIF file saved


Agilent 15:02:44 May 23, 2010
251920UT
Ref 68.8 dBm
Atten 30 dB
Mkr2 20.0 kHz
-1.21 dB
Peak
Log
10
dB/
Offst
48.8
dB
Dl
19.0
dBm
LgAv
M1 S2
Center 470.000 0 MHz
Span 200 kHz
#Res BW 300 Hz
VBW 1 kHz
Sweep 2.109 s (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 469.994 6 MHz 39.02 dBm
2R (1) Freq 469.990 4 MHz 17.76 dBm
2Δ (1) Freq 20.0 kHz -1.21 dB


Agilent 15:33:06 May 23, 2010
Alpha Editor
125192IN
Mkr2 10.8 kHz
Ref 68.8 dBm
Atten 30 dB
-5.68 dB
Peak
Log
10
dB/
Offst
48.8
dB
Dl
6.4
dBm
LgAv
A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z
Space
More
1 of 3
Center 470.000 0 MHz
Span 200 kHz
#Res BW 300 Hz
VBW 1 kHz
Sweep 2.109 s (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 470.002 8 MHz 26.42 dBm
2R (1) Freq 469.994 8 MHz 6.24 dBm
2Δ (1) Freq 10.8 kHz -5.68 dB
File name error


Agilent 15:40:34 May 23, 2010
File
1251920UT
Mkr2 10.8 kHz
Ref 68.8 dBm
Atten 30 dB
-0.70 dB
Peak
Log
10
dB/
Offst
48.8
dB
Dl
19.0
dBm
LgAv
Catalog
Save
Load
Delete
Copy
Rename
More
1 of 2
Center 470.000 0 MHz
Span 200 kHz
#Res BW 300 Hz
VBW 1 kHz
Sweep 2.109 s (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 470.002 8 MHz 38.96 dBm
2R (1) Freq 469.994 4 MHz 17.91 dBm
2Δ (1) Freq 10.8 kHz -0.70 dB
File Operation Status, A:\1295IN.GIF file saved


Agilent 15:49:54 May 23, 2010
File
12596IN
Mkr2 10.8 kHz
Ref 68.8 dBm
Atten 30 dB
-2.59 dB
Peak
Log
10
dB/
Offst
48.8
dB
Dl
7.8
dBm
LgAv
Center 470.000 0 MHz
Span 200 kHz
#Res BW 300 Hz
VBW 1 kHz
Sweep 2.109 s (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 469.997 2 MHz 27.81 dBm
2R (1) Freq 469.995 0 MHz 3.02 dBm
2Δ (1) Freq 10.8 kHz -2.59 dB
Catalog
Save
Load
Delete
Copy
Rename
More
1 of 2
File Operation Status, A:\12596OUT.GIF file saved


Agilent 15:45:10 May 23, 2010
Alpha Editor
125960UT
Mkr2 10.8 kHz
Ref 68.8 dBm
Atten 30 dB
1.60 dB
Peak
Log
10
dB/
Offst
48.8
dB
Dl
20.3
dBm
LgAv
Center 470.000 0 MHz
Span 200 kHz
#Res BW 300 Hz
VBW 1 kHz
Sweep 2.109 s (1001 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 469.997 2 MHz 40.33 dBm
2R (1) Freq 469.994 8 MHz 12.12 dBm
2Δ (1) Freq 10.8 kHz 1.60 dB
A B C D E F G
H I J K L M N
O P Q R S T U
V W X Y Z
Space
More
1 of 3
File Operation Status, A:\12950UT.GIF file saved

Conducted Spurious Emissions

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
900	-29.9 dBm (-20)	-28.6 dBm (-20)	-28.6 dBm (-13)	-29.5 dBm (-13)
920	-30.8 dBm (-20)	-30.2 dBm (-20)	-29.8 dBm (-13)	-29.8 dBm (-13)
940	-34.8 dBm (-20)	-34.0 dBm (-20)	-33.7 dBm (-13)	-33.7 dBm (-13)

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
1350	-40 dBm (-20)	-40 dBm (-20)	-38.1 dBm (-13)	-38.1 dBm (-13)
1380	-37.9 dBm (-20)	-38.1 dBm (-20)	-37.2 dBm (-13)	-37.2 dBm (-13)
1410	-36.3 dBm (-20)	-35.3 dBm (-20)	-35.3 dBm (-13)	-35.7 dBm (-13)

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
1800	-36.3 dBm (-20)	-36.6 dBm (-20)	-34.9 dBm (-13)	-34.9 dBm (-13)
1840	-33.0 dBm (-20)	-33.5 dBm (-20)	-33.0 dBm (-13)	-33.1 dBm (-13)
1880	-34.5 dBm (-20)	-33.8 dBm (-20)	-33.8 dBm (-13)	-34.7 dBm (-13)

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
2250	-27.1 dBm (-20)	-26.6 dBm (-20)	-26.4 dBm (-13)	-26.4 dBm (-13)
2300	-33.9 dBm (-20)	-34.1 dBm (-20)	-33.0 dBm (-13)	-33.0 dBm (-13)
2350	-27.3 dBm (-20)	-26.7 dBm (-20)	-26.7 dBm (-13)	-27.2 dBm (-13)

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
2700	-25.9 dBm (-20)	-26.1 dBm (-20)	-25.8 dBm (-13)	-25.8 dBm (-13)
2760	-29.4 dBm (-20)	-29.1 dBm (-20)	-28.9 dBm (-13)	-28.9 dBm (-13)
2820	-22.4 dBm (-20)	-22.7 dBm (-20)	-22.4 dBm (-13)	-22.4 dBm (-13)

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
3150	-36.0 dBm (-20)	-36.5 dBm (-20)	-35.8 dBm (-13)	-35.8 dBm (-13)
3220	-35.0 dBm (-20)	-35.3 dBm (-20)	-34.2 dBm (-13)	-34.2 dBm (-13)
3290	-35.4 dBm (-20)	-35.6 dBm (-20)	-35.4 dBm (-13)	-35.6 dBm (-13)

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
3600	-26.1 dBm (-20)	-26.6 dBm (-20)	-25.7 dBm (-13)	-25.7 dBm (-13)
3680	-25.8 dBm (-20)	-25.7 dBm (-20)	-25.5 dBm (-13)	-25.5 dBm (-13)
3760	-27.4 dBm (-20)	-27.1 dBm (-20)	-27.1 dBm (-13)	-27.4 dBm (-13)

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
4050	-28.3 dBm (-20)	-28.1 dBm (-20)	-27.8 dBm (-13)	-27.8 dBm (-13)
4140	-27.0 dBm (-20)	-27.0 dBm (-20)	-27.0 dBm (-13)	-27.0 dBm (-13)
4230	-20.6 dBm (-20)	-20.5 dBm (-20)	-20.8 dBm (-13)	-20.5 dBm (-13)

Freq – MHz	12.5kHz/9.6kbps	12.5kHz/19.2kbps	25kHz/19.2kbps	25kHz/38.4kbps
4500	-21.6 dBm (-20)	-21.1 dBm (-20)	-21.1 dBm (-13)	-21.1 dBm (-13)
4600	-40.0 dBm (-20)	-40.0 dBm (-20)	-40.0 dBm (-13)	-40.0 dBm (-13)
4700	-29.2 dBm (-20)	-29.2 dBm (-20)	-29.2 dBm (-13)	-29.2 dBm (-13)

Case Radiation

RADIATED EMISSIONS

Test Report #:	WC909605 Run 6	Test Area:	LTS			
EUT Model #:	AMP460-1	Date:	6/19/2010			
EUT Serial #:	3021	EUT Power:	12VDC	Temperature:	24.0	°C
Test Method:	FCC			Air Pressure:	98.0	kPa
Customer:	AeroAntenna Technology Inc			Rel. Humidity:	52.0	%
EUT Description:	Amplifier					
Notes:						
Data File Name:	9605.dat			Page:	13 of 25	

List of measurements for run #: 6

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	dBm	DELTA2
470 MHz - 2W - 12.5 kHz - 9.6 kb/s - 1-2 GHz						
1.41 GHz	53.0 Pk	3.47 / 25.66 / 41.64 / 0.49	40.97	V / 1.00 / 0	-56	n/a
1.88 GHz	51.5 Pk	3.81 / 27.52 / 43.0 / 0.64	40.47	H / 1.00 / 270	-56	n/a
no higher levels at other 3 modulations						
no higher levels at low and mid channels						
460 MHz - 2W - 12.5 kHz - 9.6 kb/s - 2-4 GHz						
3.22 GHz	51.1 Pk	4.95 / 30.48 / 43.7 / 0.34	43.17	V / 1.00 / 0	-53	n/a
3.22 GHz	52.4 Pk	4.95 / 30.48 / 43.7 / 0.34	44.47	V / 1.00 / 270	-52	n/a
2.76 GHz	52.8 Pk	4.5 / 29.18 / 43.6 / 0.32	43.19	V / 1.00 / 270	-53	n/a
2.3 GHz	48.4 Pk	4.11 / 27.88 / 43.42 / 0.18	37.15	V / 1.00 / 270	-59	n/a
2.3 GHz	53.0 Pk	4.11 / 27.88 / 43.42 / 0.18	41.75	V / 1.00 / 180	-55	n/a
3.22 GHz	53.8 Pk	4.95 / 30.48 / 43.7 / 0.34	45.87	V / 1.00 / 300	-51	n/a
2.3 GHz	54.7 Pk	4.11 / 27.88 / 43.42 / 0.18	43.45	H / 1.00 / 180	-53	n/a
2.3 GHz	57.4 Pk	4.11 / 27.88 / 43.42 / 0.18	46.15	H / 1.00 / 200	-50	n/a
450 MHz - 2W - 25 kHz - 38.4 kb/s						
2.25 GHz	61.2 Pk	4.08 / 27.74 / 43.4 / 0.19	49.81	H / 1.00 / 200	-47	n/a
2.7 GHz	53.1 Pk	4.44 / 29.01 / 43.58 / 0.28	43.25	V / 1.00 / 300	-53	n/a
460 MHz - 2W - 25 kHz - 38.4 kb/s						
2.76 GHz	53.1 Pk	4.5 / 29.18 / 43.6 / 0.32	43.49	V / 1.00 / 300	n/a	n/a
49.8 dBuV/m @ 3 m @ 2.25 GHz= -47 dBm erp (signal generator+ cable loss = -56.7 dBm + antenna gain of 9.7 dBi)						
scanned 1-5 GHz.						
470 MHz - 2W - 25 kHz - 38.4 kb/s						
940.0 MHz	41.5 Pk	2.73 / 23.0 / 29.2 / 0.0	38.03	V / 1.00 / 0	-58	n/a
940.0 MHz	43.6 Pk	2.73 / 23.0 / 29.2 / 0.0	40.13	V / 1.00 / 270	-56	n/a
940.0 MHz	45.7 Pk	2.73 / 23.0 / 29.2 / 0.0	42.23	V / 1.00 / 310	-54	n/a
no higher levels at other 3 modulations						
no higher levels and low and mid channels						
scanned 30-1000 MHz						

Frequency Stability
FCC 90.213

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C, clause 2.2.2

Test location
■ - New Brighton Environmental Lab
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test Equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
NBLE02241	SM-8C	TH	8CuF temperature/Humidity	11754-S	06 Aug 10
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10

Test limits
±1.5 ppm (worst case)

Test data

-30 degrees	449.99985 MHz	
-20	449.99990 MHz	
-10	449.99990 MHz	
0	449.99980 MHz	-0.2 ppm
10	449.99985 MHz	
20	449.99990 MHz	
30	449.99995 MHz	
40	449.99990 MHz	
50	449.99990 MHz	
85% voltage	449.99990 MHz	
115% voltage	449.99995 MHz	+0.1 ppm

Transient Frequency Behavior
FCC 90.214

Test summary
The requirements are: ■ - NOT APPLICABLE ☐ - NOT MET
Testing was performed in accordance with the test procedure of ANSI TIA-603-C, clause 2.2.19.3

Test location
☐ - New Brighton Environmental Lab
☐ - Wild River Lab Small Test Site (Open Area Test Site)

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.

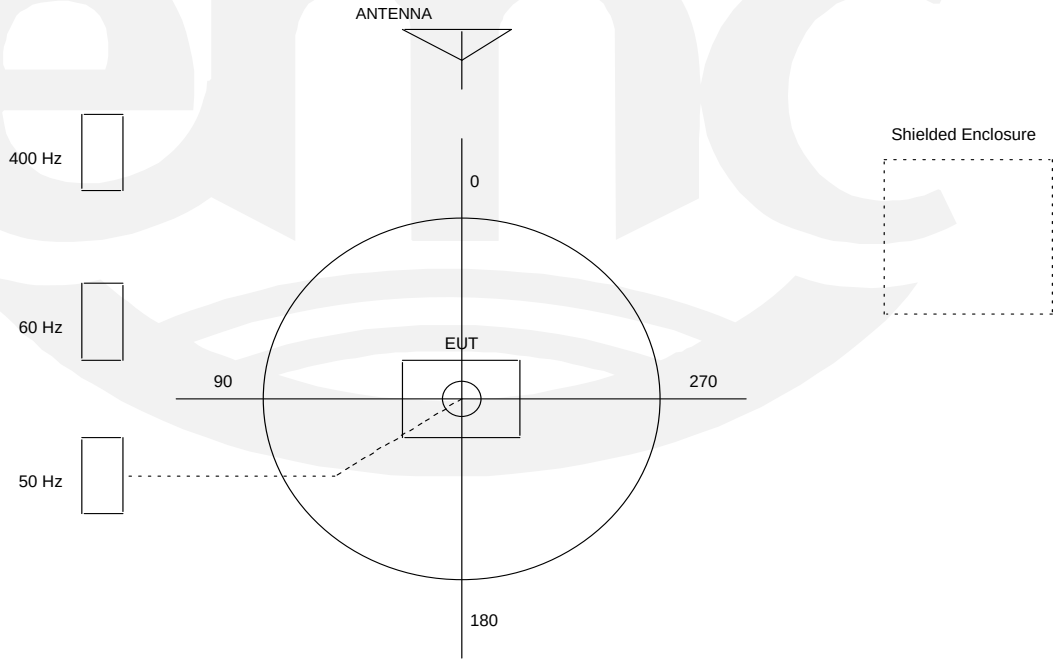
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.

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

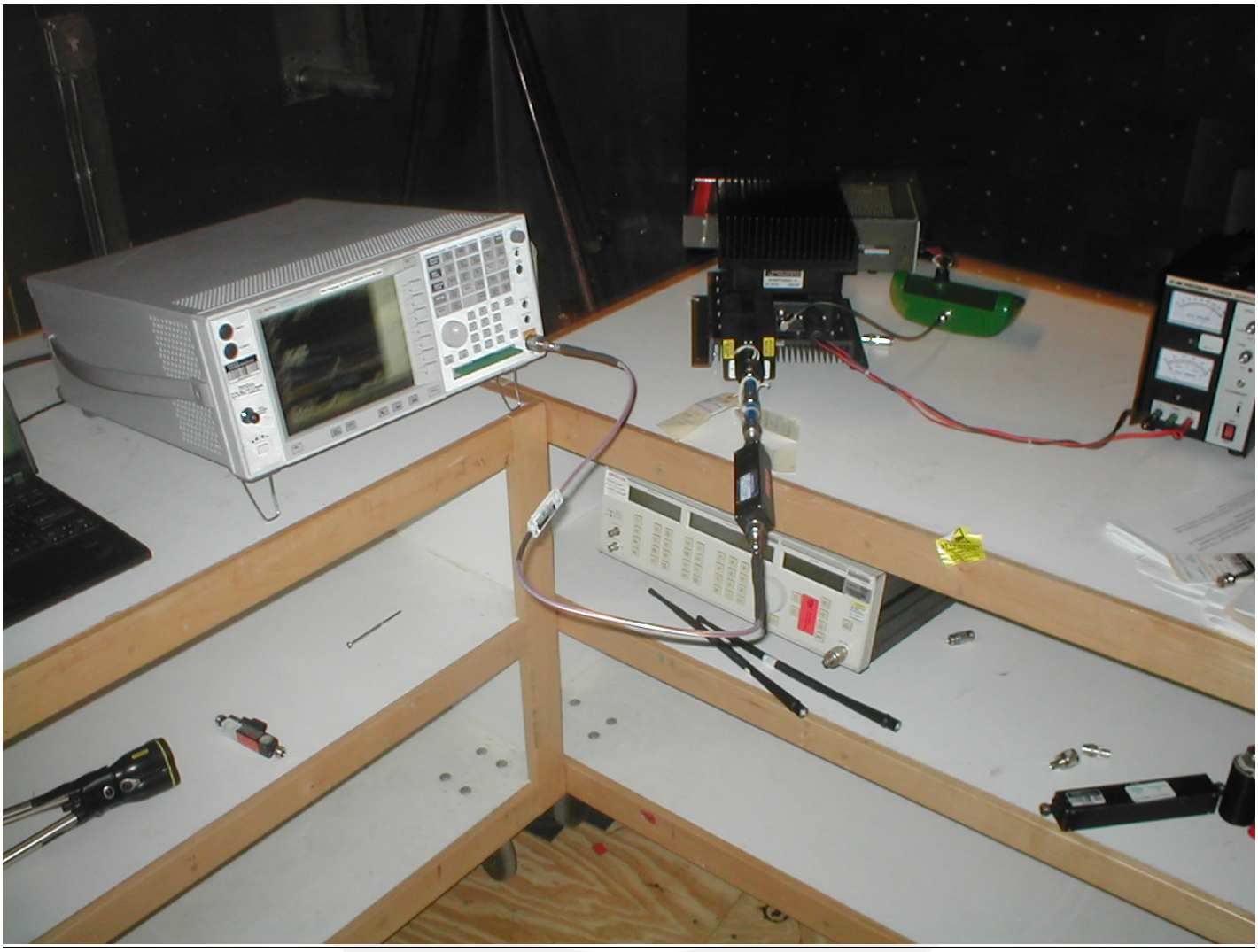
4. The circle is a 6.7 meter diameter turntable.

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

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



Test-setup photo(s):



Test-setup photo(s):

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

Configuration of the device under test:

■ - See Appendix A and test setup photos

☐ - 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 AMP460-1, Serial Number 3120. Notification of a change in equipment identification to Model Number PF81443, Serial Number PCSR60A003030 was received from John Deere 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:	18 December 2009
Condition of EUT:	Normal
Testing Start Date:	15 April 2010
Testing End Date:	19 June 2010

TÜV SÜD AMERICA INC

Tested by:

Joel T Schneider
Senior EMC Engineer

Approved by:

Greg S Jakubowski
Senior EMC Technician

Appendix A

Constructional Data Form

Form

America

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:	Deere and Company d.b.a. Intellegent Solutions Group		
Address:	4140 NW 114th St.		
	Urbandale, IA 50322		
Contact:	Michael Schlax	Position:	Sr. Systems Engineer
Phone:	515-331-9746	Fax:	515-331-4705
E-mail Address:	SchlaxMichaelP@JohnDeere.com		

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

EUT Description	RF Power Amplifier		
EUT Name	450-470MHZ AMPLIFIER		
Model No.:	PF81443	Serial No.:	PCSR60A003030
Product Options:	Marketed for use at fixed base station with base station transmitter		
Configurations to be tested:	EUT tested with Base Station Transmitter		

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:	No Modifications since PCSR60A003030.
Modifications made during test:	None

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

- ☐ EMC Directive 2004/108/EC (EMC) Std: _____
- ☐ 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 90
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B (Separate Report)
- ☒ Canada: Class ☒ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☒ Other: Testing appropriate for Industry Canadian Type Approval submission.

America

EMC Test Plan and Constructional Data Form

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

- ☐ Attestation of Conformity (AoC)*
- ☐ Statement of Compliance (previously CoC)*
- Protection Class (N/A for vehicles)
  (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*
- ☐ Class I ☐ Class II ☐ Class III
- ☒ Industry Canada / FCB Certification
- ☐ Taiwan Certification

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): 515-333-2829
- ☐ Continue testing to complete test series.
- ☐ Continue testing to define corrective action.
- ☐ Stop testing.

EUT Specifications and Requirements

Length: 21 cm Width: 24 cm Height: 25.4 cm Weight: 6.8 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: DC 12-15 (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: NA

Current (Amps/phase(max)): 10A

Current (Amps/phase(nominal)): 5-7 during Tx

Other

Other Special Requirements

EUT tested with 450 MHz RTK radio. This is the radio marketed with the EUT.

Typical Installation and/or Operating Environment

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

EUT Power Cable

- ☐ Permanent OR ☒ Removable
- ☐ Shielded OR ☒ Unshielded
- ☐ Not Applicable

Length (in meters): Nominal 1 m

TÜV SÜD America

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*	☒	☐
DC Power	☒	☐	☒	☐	1	☐	☒		Coaxial	AMPHENOL PART# C016 20D003 110 12	Characteristic Impedance	1	☒	☐
RF IN	☒	☒	☒	☐		☒	☐		Coaxial	TNC-TNC	50 Ohm Impedance	0.3	☒	☐
RF OUT	☒	☒	☒	☐		☒	☐		Coaxial	NType-NType	50 Ohm Impedance	2	☒	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
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	☐	☐	☐	☐		☐	☐						☐	☐

America

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: Aero Amp Firmware Rev B

Description: Initial production release firmware. Unit can not be reprogrammed without disassembly.

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. Transmission - EUT amplifiying and transmitting RF input from the base station transmitter.

   RF Input comes from the 450 MHz RTK radio (FreeWave LRS-455 board). The firmware in the radio is 1.67i. An RS232 terminal program (for example: HyperTerminal) is used to configure the radio parameters (Frequency, bandwidth and power) via a menu provided by the radio firmware with a Control+Break command. The EUT has AeroAmp Rev B firmware.

2. Idle Mode - EUT tested without an RF input while powered.

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 #
RF Power Amplifier	PF81443	PCSR60A003030	OV5PCSRAMP450A
DC power cable providing power to AMP	PFP10065	NA	NA

America

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 #*
TNC-TNC RF cable for RF IN Connecting Radio RF OUT to AMP RF IN	NA	NA	NA
N-Type RF cable for RF OUT Connecting RF OUT to measurement device	NA	NA	NA
RTK Radio Harness - RS232 and DC power into RF source radio	NA	NA	NA
12 Power supply	NA	NA	NA
John Deere: 450 MHz RTK Radio FreeWave Board: LRS-455	PF81428 LRS455-C-MS	PCSR45A550369 455-0369	KNY821191151819

Oscillator Frequencies

Manufacturer	*Frequency*	*Derived Frequency*	*Component # / Location*	*Description of Use*
Provided by Aero Technologies				

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
Generic 12-15 V DC power supply to be used.			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

America

EMC Test Plan and Constructional Data Form

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*
Provide by Aero Technologies		

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*
Provided by Aero Technologies				

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

Provided by Aero Technologies

PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

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

Michael Schlax – Senior SysEng IVS — 4/26/10

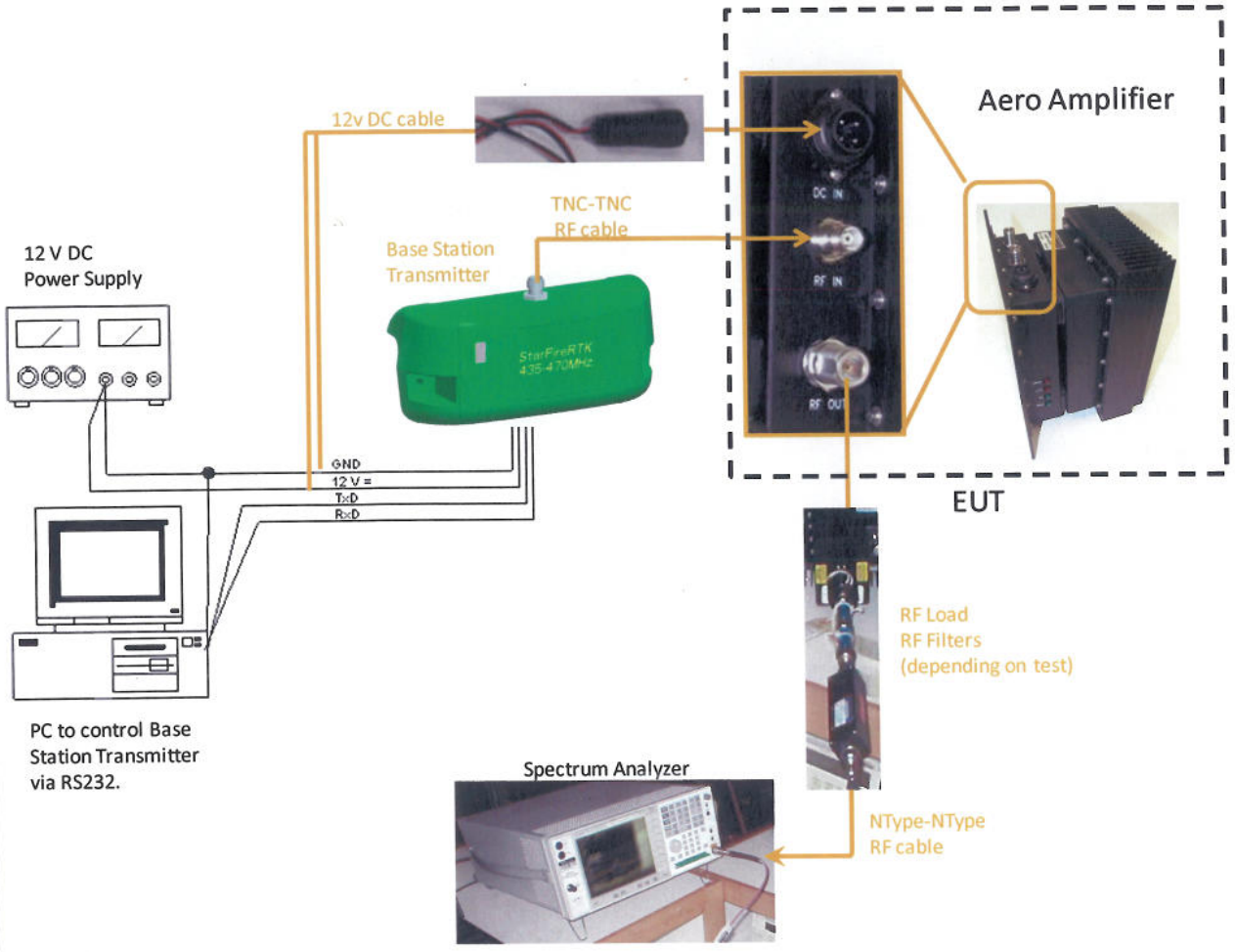
Customer authorization to perform tests according to this test plan. — Date

Test Plan/CDF Prepared By (please print) — Date

America

EMC Block Diagram Form

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.



Authorization Signatures

Michael Schlax — 4/26/10

Customer authorization to perform tests according to this test plan. — Date

Test Plan/CDF Prepared By (please print) — Date

Appendix B

Measurement Protocol

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emission testing is performed according to the procedures in ANSI TIA-603-C.

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.

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.

DETAILS OF TEST PROCEDURES

Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions.

Radiated Emissions

Radiated emissions in the frequency range of 10 kHz 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. 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.