CE Compliance Test Report

Commercially Available Amateur Radio

Model: FLEX-6500 & FLEX-6700
Type: Base Station Transceiver

For

Flex-Radio Systems
Of Austin, Texas

By

Austin EMC – Austin Texas
Date of Test 1 May 2013
Date of Report 02 May 2013

Tested in Accordance with

ETSI EN 301 489-1 V1.8.1 (2008-04) (harmonized)
ETSI EN 301 489-15 V1.2.1 (2002-08)
(Harmonization candidate)
ETSI EN 301 783-1 V1.2.1 (2009-07) (draft)
ETSI EN 301 783-2 V1.2.1 (2010-07) (harmonized)

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"CE" marked devices meet the essential requirements of Directive 1999/5/EC

The exclamation point warning symbol means that the system is to be operated in a non-hamonized frequency band and/or according to the laws of the telecommunications authority in the country of use.

Please ensure that you have acquired the device for the use land approved operation, and that the respective national frequency allocations are respected. See also the warning on page 3 of this guide.

Waste Disposal
The device may not be disposed of with household waste! This device complies with EU Directive on Electronic and electrical equipment (WEEE regulation) and will therefore not be disposed of with household waste. Dispose of the device at your local collection points for electronic equipment!

CE European Union Declaration of Conformity

FLEX-6000 Amateur Radio Transceiver Series (FLEX-6500 / FLEX-6700 / FLEX-6700R)

According to Radio and Telecommunications Terminal Equipment Directive, (R&TTE) 1999/5/EC - using the Standards:

EN 301 489-1 v1.8.1 (2008-04)
EN 301 489-15 v1.2.1 (2002-08)
EN 301 783-1 v1.2.1 (2009-07)
EN 301 783-2 v1.2.1 (2010-07)
EN 60950-1 : (2011)

Type of Equipment: Base Station
Equipment Class: B

WE THE UNDERSIGNED HEREBY DECLARE THAT THE EQUIPMENT SPECIFIED ABOVE CONFORMS TO THE ABOVE STANDARDS.

FlexRadio Systems Date of Testing: April 24, 2013

FlexRadio Systems, 4616 W. Howard Lane, Ste. 1-150, Austin, Texas 78728 U.S.A.

Person Responsible: Gerald Youngblood (Signature on file)

Notification of the placing on the market of radio equipment using not harmonized frequency bands
(Article 6.4. of the R&TTE Directive)

Person placing equipment on the market

Company/name	Bronze Bear Communications, Inc. DBA FlexRadio Systems
Country	USA
Postcode	78728
Town	Austin, TX
Street	4616 W. Howard Lane Building 1,Suite150
Telephone	512-535-4713
Fax	512-233-5143
E-mail	gerald@flex-radio.com

Contact person

Name Klaus Lehmann, FlexRadio Systems Representative for EU	
Telephone	04751 - 900501
Fax	04751 - 998569
E-mail Klaus_Lohmann [FlexRadio-EU@t-online.de]	

Notified radio equipment

Type number	FLEX-6500, FLEX-6700
Manufacturer	FlexRadio Systems
Intended use	Amateur Radio Equipment
EU Member States in which operation is planned	All
EU Member States in which placing on the market is planned	All
Standards/test suites applied	EN 301 489-1 and EN 301 489-15

Radio equipment characteristics

Frequency band(s)	All amateur radio bands from 160m through 6m
Operating frequency/ Frequencies	Amateur radio bands from 1.8 MHz through 54 MHz
Channel spacing/ bandwidth	N/A
Transmit power	100W PEP
Type of modulation	CW, SSB, AM, FSK, NBFM
Type of antenna	User supplied
Mode of operation	Simplex
Duty cycle	Full duty cycle

Equipment Under Test (EUT) Information

Brand Name :	FlexRadio
Product Name :	Amateur Transceiver
Model Name or Number :	Flex-6700 (6500 and 6700R are subset)
Serial Number :	1713-3011-6700-9829 with GPSDO Installed
Type of Equipment :	Amateur Radio Base Station
External Power Supply :	User supplied
Power Input Source :	13.8 Volts DC

EUT Technical Specifications, General

Operating Frequency Range, Receive:	30 kHz – 77 MHz (6500 & 6700); 135 – 165 MHz (6700 only)
Performance Frequency Range, Receive:	160m – 6m Bands (6500 & 6700), 2m (6700 only)
RF Input Impedance (Bypass)	50 Ohms, unbalanced
Frequency Stability:	+/- 0.5 ppm (6500), +/- 0.02 ppm (6700), GPSDO Option: 5X10^-12 24 hours
Operating Temperature Range	0 – 50 Deg. C, 32 – 122 Deg. F
Emission Modes:	A1A (CW), A3E (AM), J3E (LSB, USB) F3E (FM), F1B (RTTY)
Frequency Steps:	1 Hz Minimum
Power Consumption:	Rx 1.5A (typ.); Tx (100 W) 23A (max.)
Supply Voltage:	13.8 Volts DC +/- 15% Negative Ground Transmitter output specified at 13.8 VDC

EUT Technical Specifications, Transmitter

Power Output:	1 – 100 watts PEP CW and SSB at 13.8 VDC input voltage 2-25 Watts Continuous Modes
Frequency Range	Ham Bands 160m – 6m
Frequency Transverter Port	100 kHz – 77 MHz & 135 – 165 MHz
Power Transverter Port	0 – 10 dBm
Emission Modes / Types:	A1A (CWU, CWL), J3E (USB, LSB) A3A (AM), FR3E (FM), Digital
Modulator:	DAC 16 Bits, 491.52 Msps
Harmonic Radiation:	Better than -60 dB (160 – 10m) Better than -70 dB (6m)
SSB Carrier Suppression:	At least 80 dB below peak output
Undesired Sideband Suppression:	At least 80 dB below peak output
Audio Response (Voice Modes):	Default 300-2700 Hz., Var. 50 – 10000 Hz.
3rd-order IMD:	Better than -33 dB below 100WPEP @14.2
Microphone Impedance:	600 Ohms Nominal (200 to 10 K Ohms)
Antenna Matching 160- 10m	5 – 500 Ohms Real and Reactance
Antenna Matching 6m	16.7 – 150 Ohms Real and Reactive

EUT Technical Specifications, Receiver

Circuit Type:	ADC 16 Bit 245.76 Msps
Intermediate Frequency:	N/A
14 MHz Preamp off/on MDS:	-121 dBm/-141 dBm in 500 Hz
Selectivity	(-6 to 60 dB): CW 500Hz 500/640
SSB	2,4 kHz 2.39/2.54
AM	6.6 kHz 6.6/6.74
Image Rejection:	100 dB or better (160 - 6m) Bands

EUT Technical Specifications, Physical

Dimensions: (WxHxD)	13” x 4” x 12” (33 x 10.2 x 30.5 cm)
Weight: (approx.)	13 lbs. (5.9 kg)
Maximum Interconnect Cable Length	Ethernet – 10 feet (3m)
DC power cable	10 feet (3m)

List of EUT External Ports

Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-Shielded)
13.8 Volt DC Power In	1	PowerPole	Non-Shielded
Ant	2	SO-239	Shielded
SCU RX In	2	BNC	Shielded
RX Out	2	BNC	Shielded
10 MHz GPSDO Out Opt.	2	SMA-F	Shielded
USB 2.0	2	USB=AF	Shielded
Ethernet 1 Gb	1	Ethernet-F	Non-Shielded
Balanced Mic Line In	1	XLR/1/4”	Shielded
Audio Line Out Stereo	1	3.5mm-F	Shielded
Accessory	1	DB-15-F	Shielded
GPS Ant in Opt.	1	SMA-F	Shielded
Transmit Relay Control	8	RCA-F	Shielded
Transverter IF	1	BNC	Shielded
Mic In Unbalanced	1	8-Pin Cir	Shielded
Headphones Stereo	1	¼”	Shielded
CW Key/Paddle Stereo	1	¼”	Shielded

Ancillary Equipment

Astron Power Supply RS-35M
Astron Power Supply RS-35R
Bencher CW Paddle
Hand Microphone
Headphones
Gateway Desktop Computer
Display
Keyboard
GPS Dummy Antenna
GPS Out Cable 1m Terminated
Accessory Cable 1m
Ethernet Cat-5 Cable Non-Shielded 3m
7 RCA Cables 1m ea. Shielded
4 RX BNC Terminators 50 Ohm
2 SO-239 Terminators 50 Ohm
Accessory Cable DB-15 1m
PTT Cable 1m w/Switch

Climate Test Conditions

Temperature: Degrees 70F
Humidity: 50 Percent
Pressure: 29.9” IHG

Operational test conditions and test signals

Operating Power:	**25 Watts Carrier in Transmit**
Operational Software:	**Smart SDR Version 0.12**
Special Hardware:	**None**
Test Frequencies:	**1.9, 14.175, 28.85, 52 Mhz.**
Antenna Conducted, Receive:	**Terminated in Spectrum Analyzer**
Antenna Conducted, Transmit:	**Terminated in Attenuator, then SA**
Radiated Emission, Case,	**Terminated Antenna Port**
Mains Conducted Emission,	**Terminated Antenna Port**

Modifications Required for Compliance

No Modifications were required.

EUT Front View FLEX-6700

EUT Rear View FLEX-6700 with Optional GPSDO Installed

EUT Rear View FLEX-6500

Summary of EMC Compliance

Standard Test Description	Pass?
EN 55022 B DC power in Conducted Emission, Receive	Yes
EN 55022 B DC power in Conducted Emission, Transmit	Yes
EN 301 783 Radiated Emission, Transmit	Yes
EN 301 783 Radiated Emission, Receive	Yes
EN 301 783 Unwanted Emission, Ant. Conducted, Receive	Yes
EN 301 783 Unwanted Emission, Ant Conducted, Transmit	Yes
EN 301 783 Transmit Harmonics, Conducted, Swept	Yes

Measurement Uncertainty (Expanded 95% Confidence)

AC Mains Conducted Emission .15 – 30 MHz HP8546A +- 2.6 dB
Radiated Emission 30 – 1000MHz R&S +- 2.8 dB
Radiated Emission 1-4 GHz HP 8546A +- 3.5 dB
Antenna Conducted .15 – 1000 MHz R&S +- 2.1 dB
Antenna Conducted 1-4 GHz HP 8546A +- 3.5 dB

Calculation of Test Limits

Conducted Transmit: (Antenna port)
25 Watt = 44 dBm
As measured thru 44 dB attenuator = 0 dBm
-40 dBc = -40 dBm, -50 dBc = -50 dBm, -60 dBc = -60 dBm
(plots reference 0 dBc = 0 dBm)

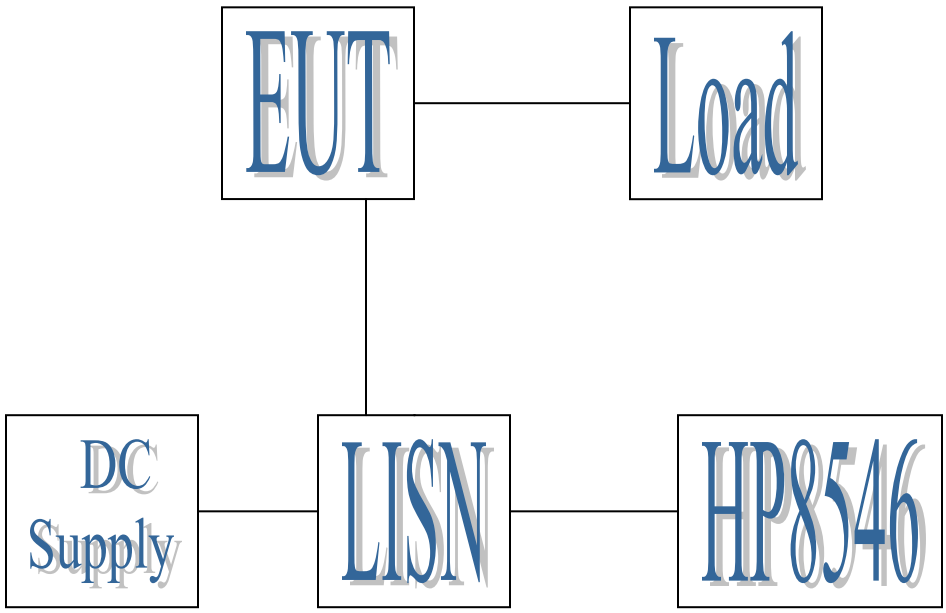
Radiated, Receive Mode: (Enclosure Port)

Limit by Substitution: -57 dBm on Dipole = (2 nanowatt X 1.64 (gain of dipole)
Radiated Power is 3.28 nanowatt at 10 meter test distance
SQRT (3.28 x 30) / 10 = 31.369 uV/m or 29.9 dBuV/m (30-1000 MHz)
Add 10 dB above 1 GHz 39.9 dBuV/m

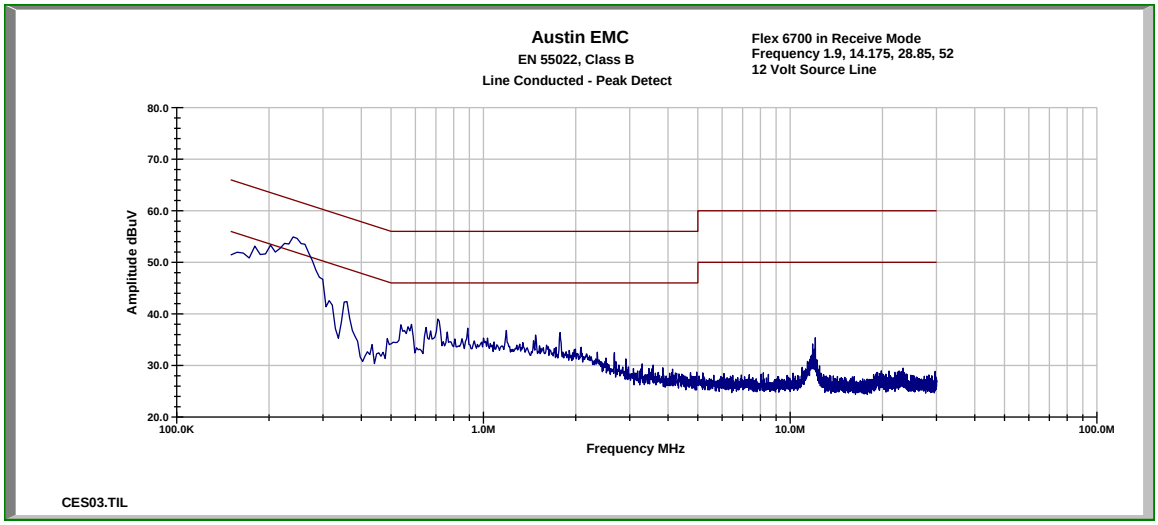
Transmit Mode: (Enclosure Port)

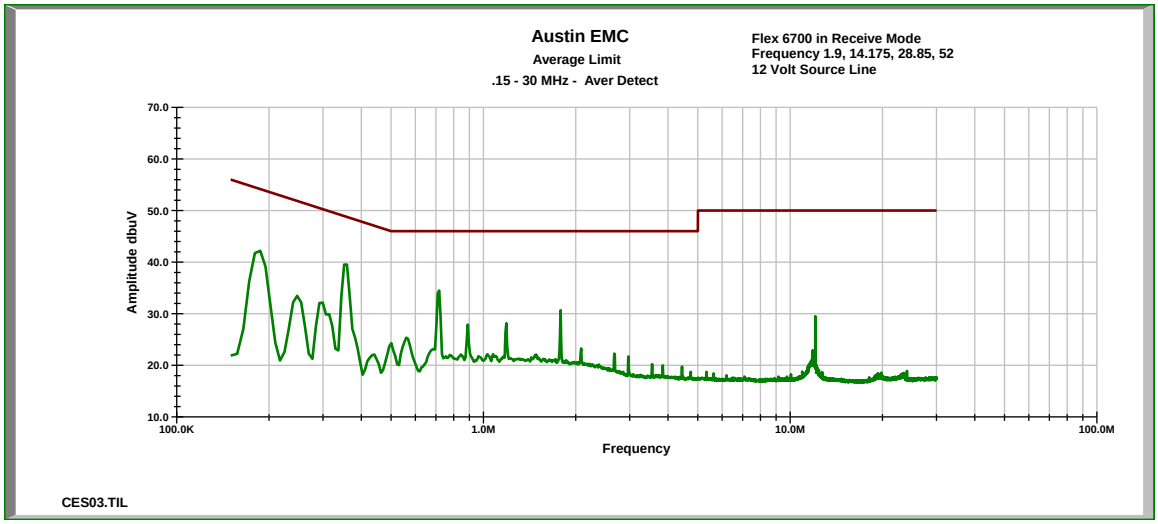
25 watts into a dipole = 25 X 1.64 = 41 watts ERP
SQRT (41 X 30) / 10 = 3.5 V/m = 130.9 dBuV/m @ 10 m
43+10 Log(25w)=-57 dBc
For <30 Mhz limit is 130.9 -57 = 73.9 dBuV/m
For >30 MHz limit is 130.9 -70 = 60.9 dBuV/m
Note: Whichever is higher was translated as whichever is more stringent.

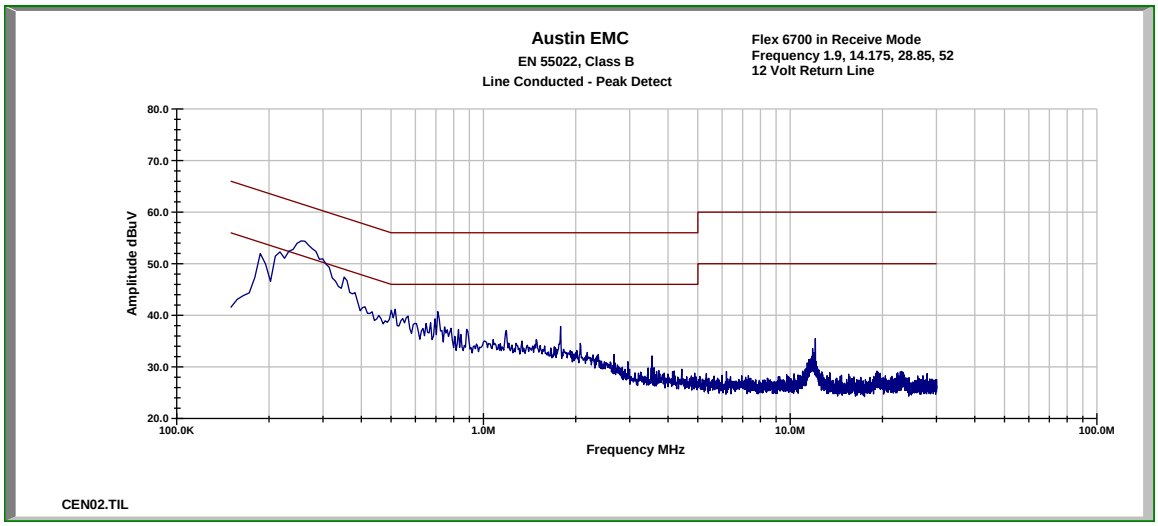
MAINS CONDUCTED TEST SETUP DIAGRAM

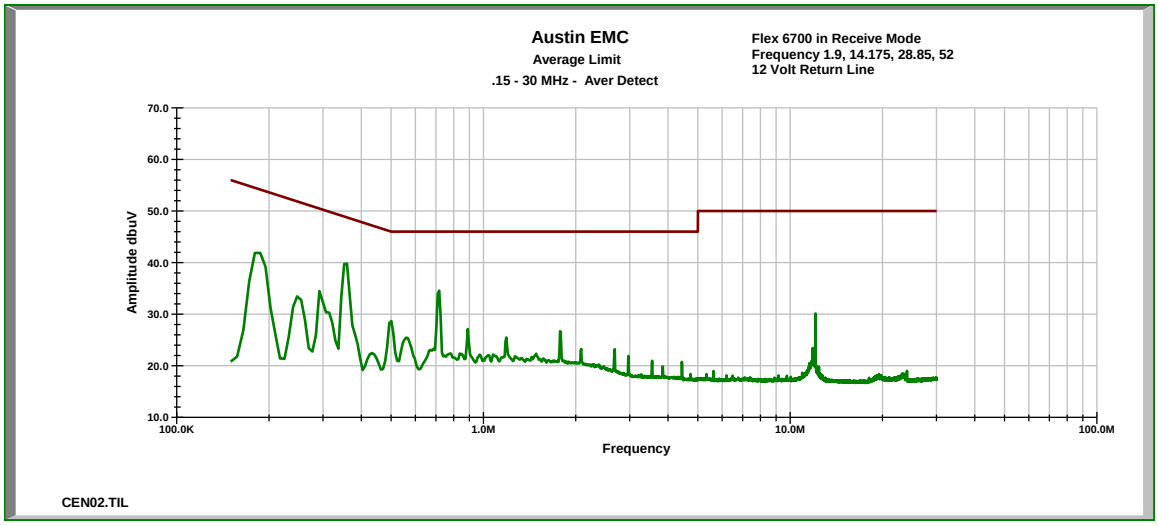


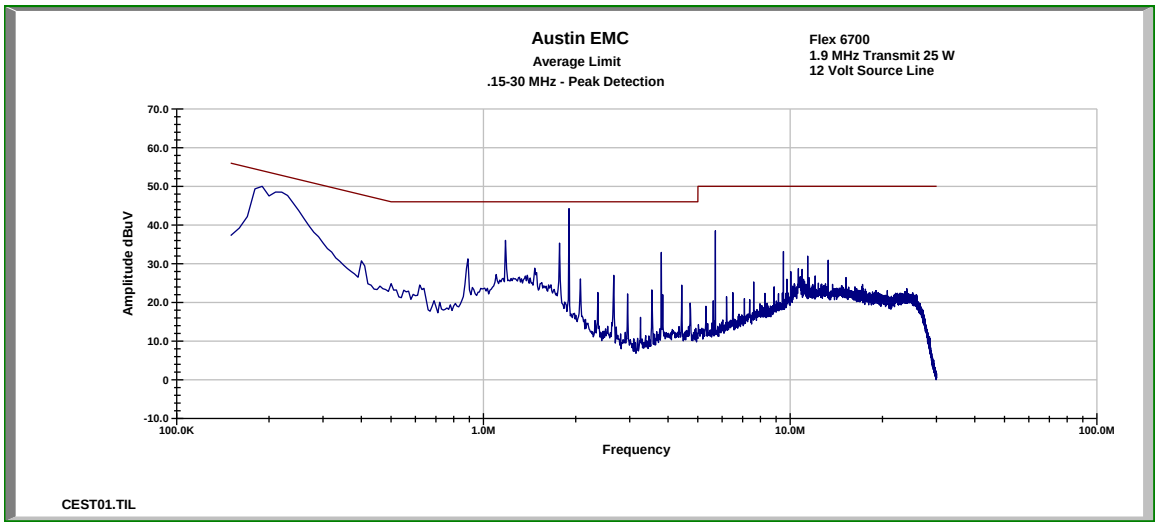
AC Conducted Emission Peak & Average Plots:

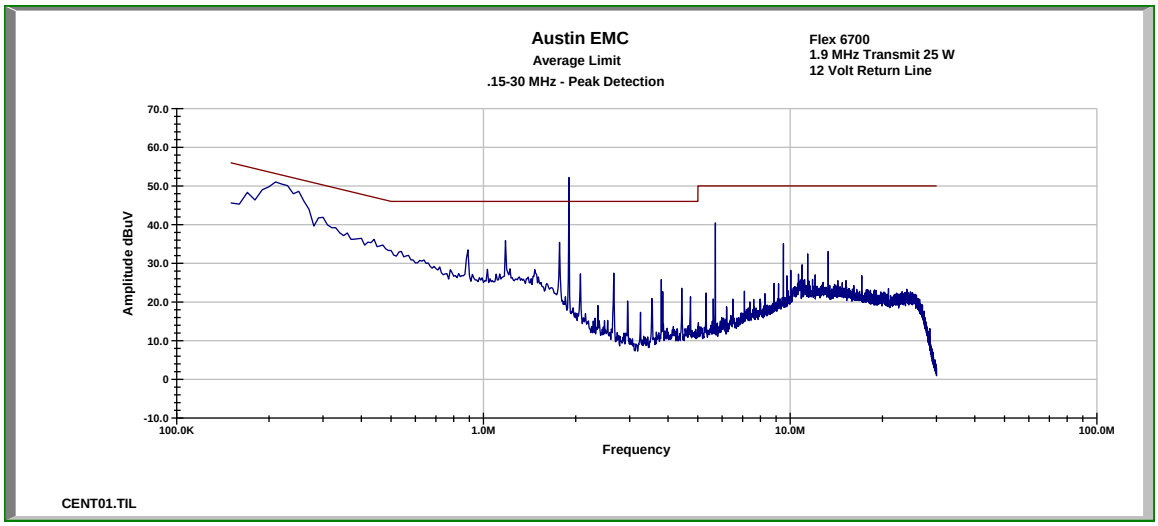


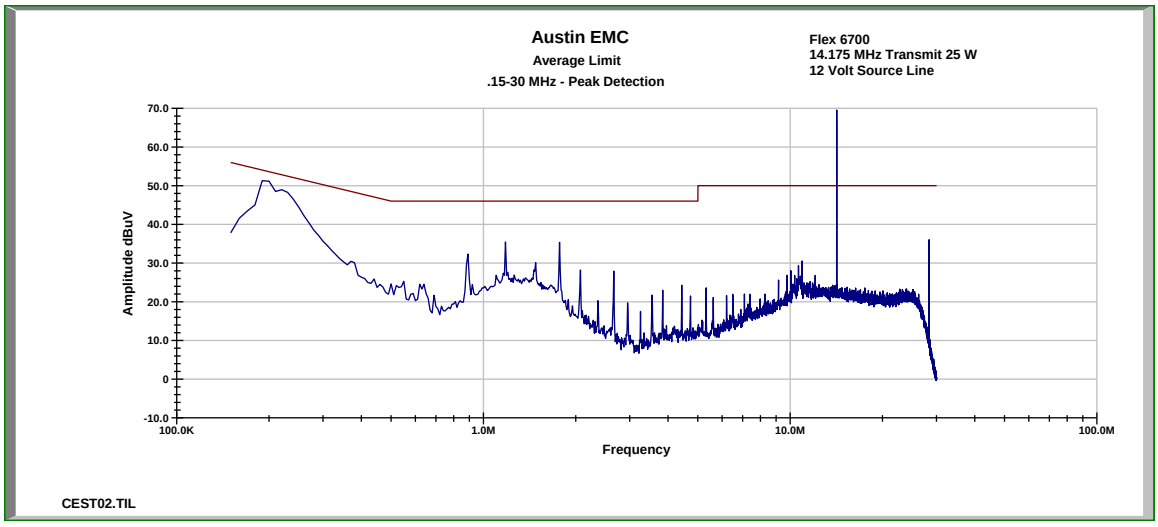


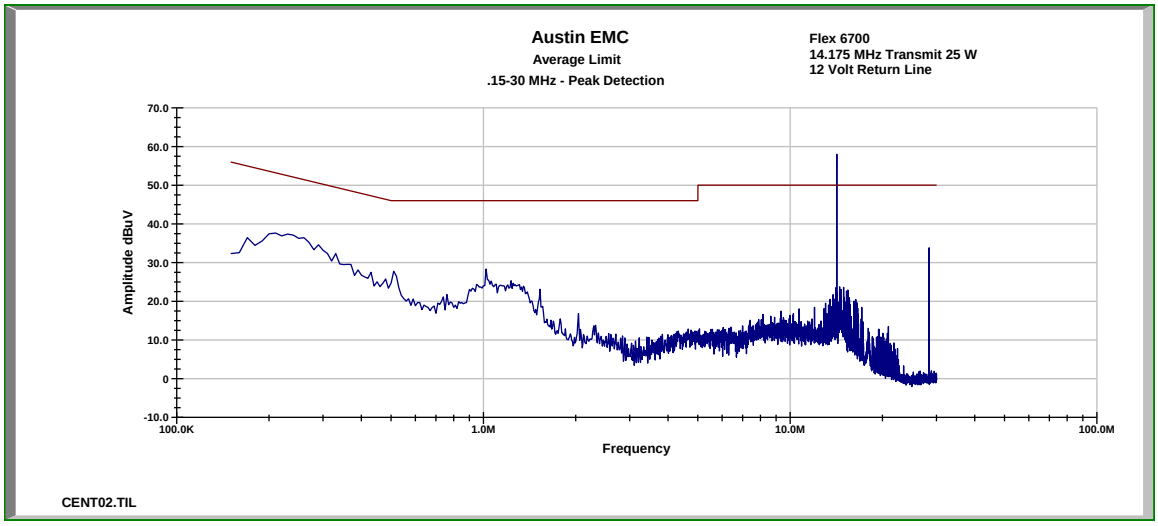

Austin EMC
EN 55022, Class B
Line Conducted - Peak Detect
Flex 6700 in Receive Mode
Frequency 1.9, 14.175, 28.85, 52
12 Volt Return Line
Amplitude dBuV
80.0
70.0
60.0
50.0
40.0
30.0
20.0
100.0K
1.0M
10.0M
100.0M
Frequency MHz
CEN02.TIL

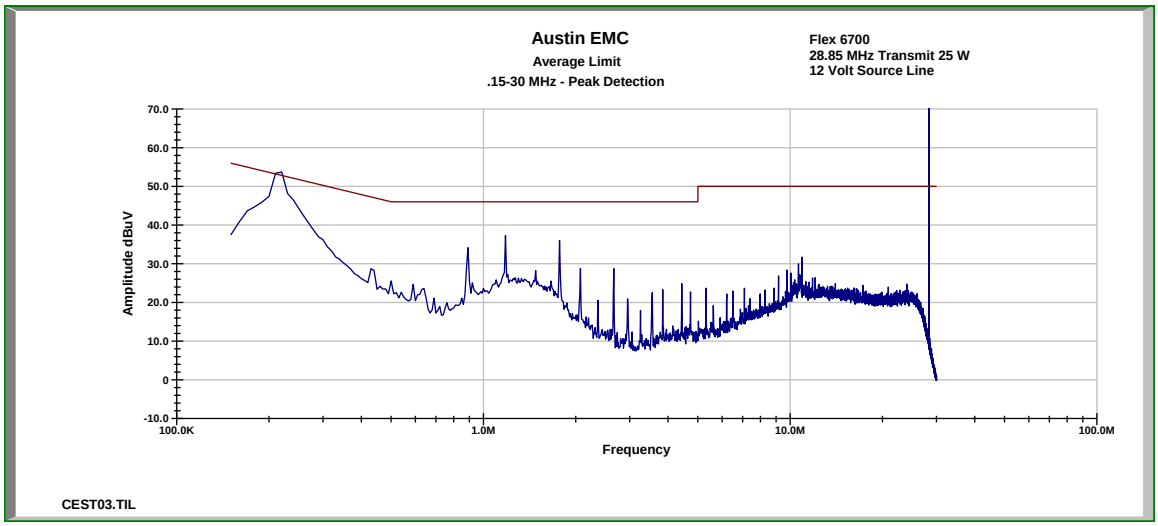

Austin EMC
Average Limit
.15 - 30 MHz - Aver Detect
Flex 6700 in Receive Mode
Frequency 1.9, 14.175, 28.85, 52
12 Volt Return Line
Amplitude dbuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
100.0K
1.0M
10.0M
100.0M
Frequency
CEN02.TIL

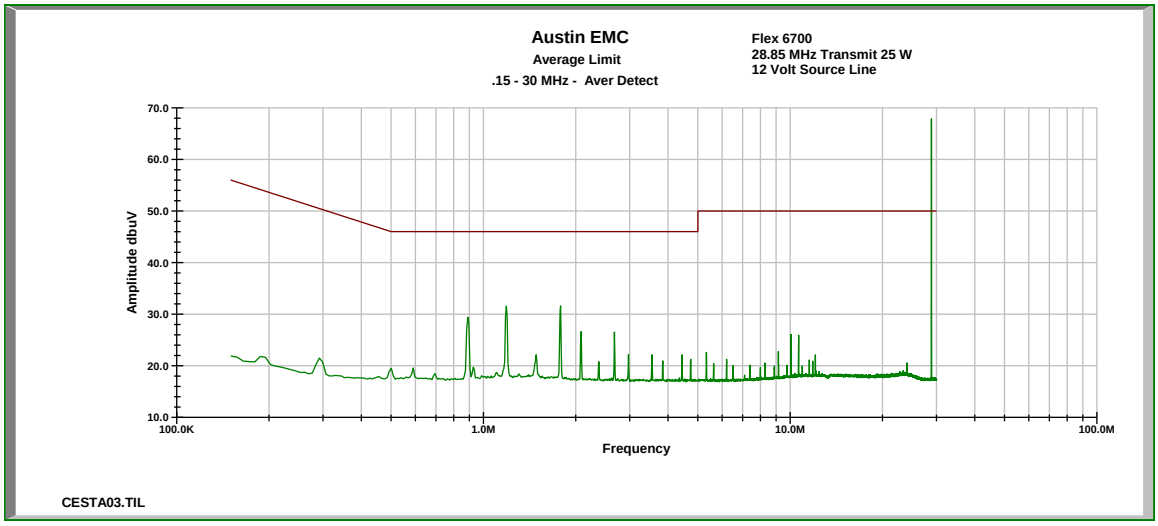

Austin EMC
Average Limit
.15-30 MHz - Peak Detection
Flex 6700
1.9 MHz Transmit 25 W
12 Volt Source Line
Amplitude dBuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
100.0K
1.0M
10.0M
100.0M
Frequency
CEST01.TIL

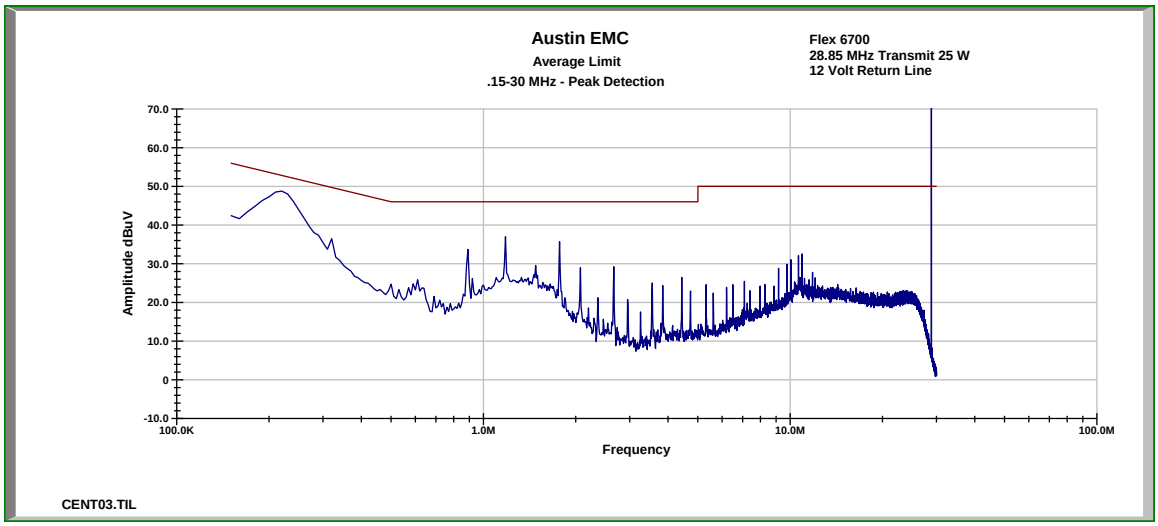

Austin EMC
Average Limit
.15-30 MHz - Peak Detection
Flex 6700
1.9 MHz Transmit 25 W
12 Volt Return Line
Amplitude dBuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
100.0K
1.0M
10.0M
100.0M
Frequency
CENT01.TIL

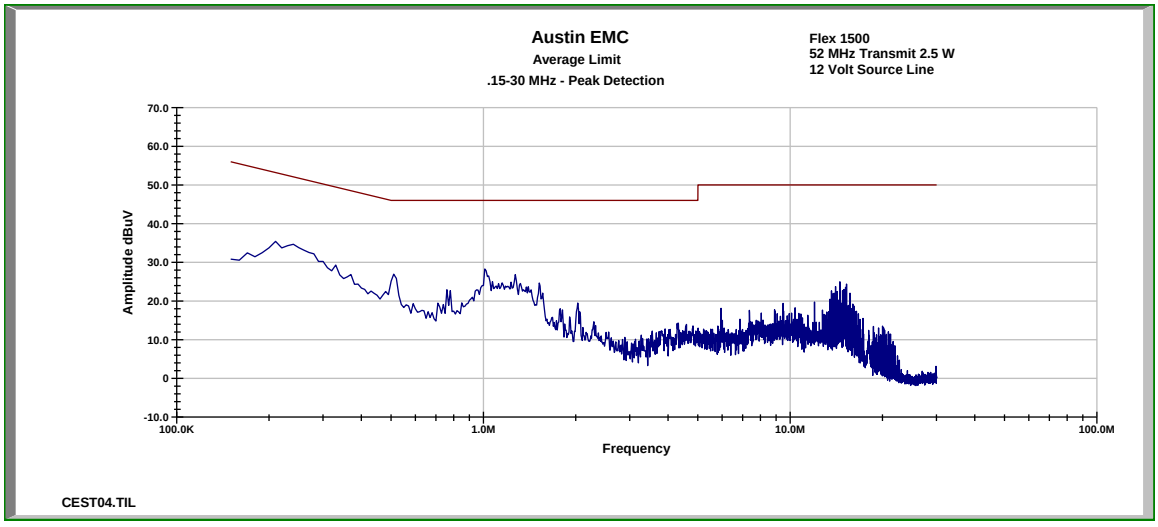

Austin EMC
Average Limit
.15-30 MHz - Peak Detection
Flex 6700
14.175 MHz Transmit 25 W
12 Volt Source Line
Amplitude dBuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
100.0K
1.0M
10.0M
100.0M
Frequency
CEST02.TIL


Austin EMC
Average Limit
.15-30 MHz - Peak Detection
Flex 6700
14.175 MHz Transmit 25 W
12 Volt Return Line
Amplitude dBuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
100.0K
1.0M
10.0M
100.0M
Frequency
CENT02.TIL


Austin EMC
Average Limit
.15-30 MHz - Peak Detection
Flex 6700
28.85 MHz Transmit 25 W
12 Volt Source Line
Amplitude dBuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
100.0K
1.0M
10.0M
100.0M
Frequency
CEST03.TIL


Austin EMC
Average Limit
.15 - 30 MHz - Aver Detect
Flex 6700
28.85 MHz Transmit 25 W
12 Volt Source Line
Amplitude dbuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
100.0K
1.0M
10.0M
100.0M
Frequency
CESTA03.TIL


Austin EMC
Average Limit
.15-30 MHz - Peak Detection
Flex 6700
28.85 MHz Transmit 25 W
12 Volt Return Line
Amplitude dBuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
100.0K
1.0M
10.0M
100.0M
Frequency
CENT03.TIL


Austin EMC
Average Limit
.15-30 MHz - Peak Detection
Flex 1500
52 MHz Transmit 2.5 W
12 Volt Source Line
Amplitude dBuV
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
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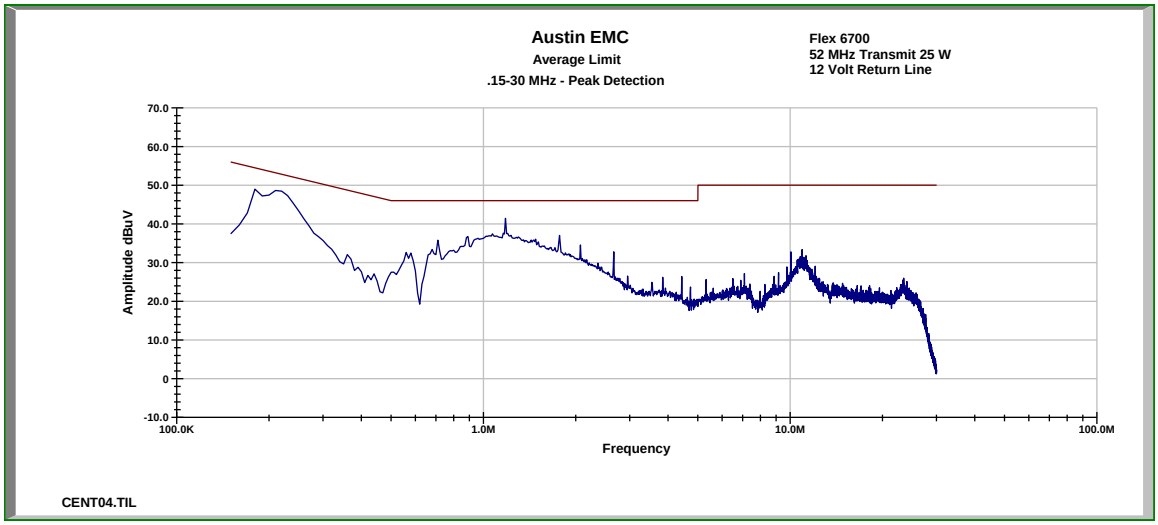
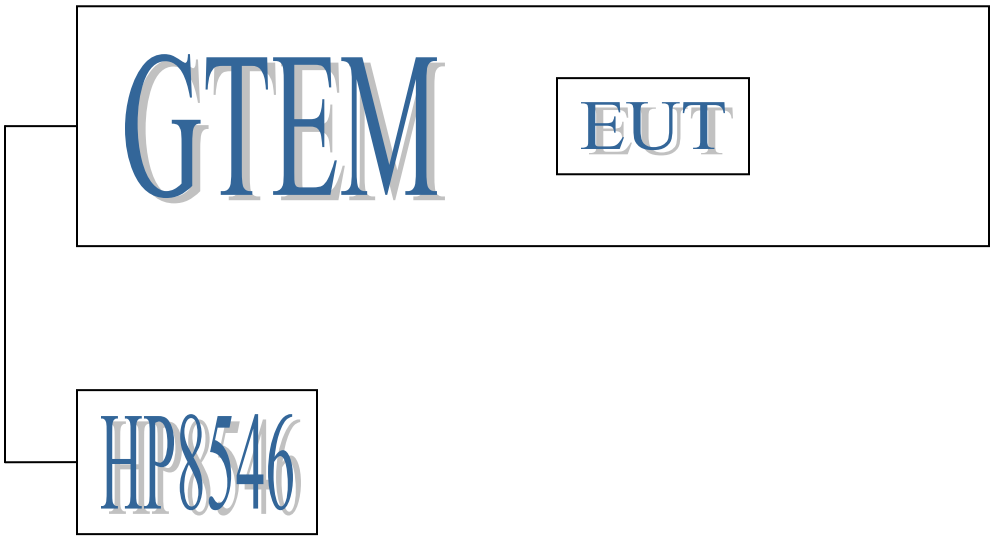
100.0K
1.0M
10.0M
100.0M
Frequency
CEST04.TIL


Austin EMC
Average Limit
.15-30 MHz - Peak Detection
Flex 6700
52 MHz Transmit 25 W
12 Volt Return Line
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
Amplitude dBuV
100.0K
1.0M
10.0M
100.0M
Frequency
CENT04.TIL

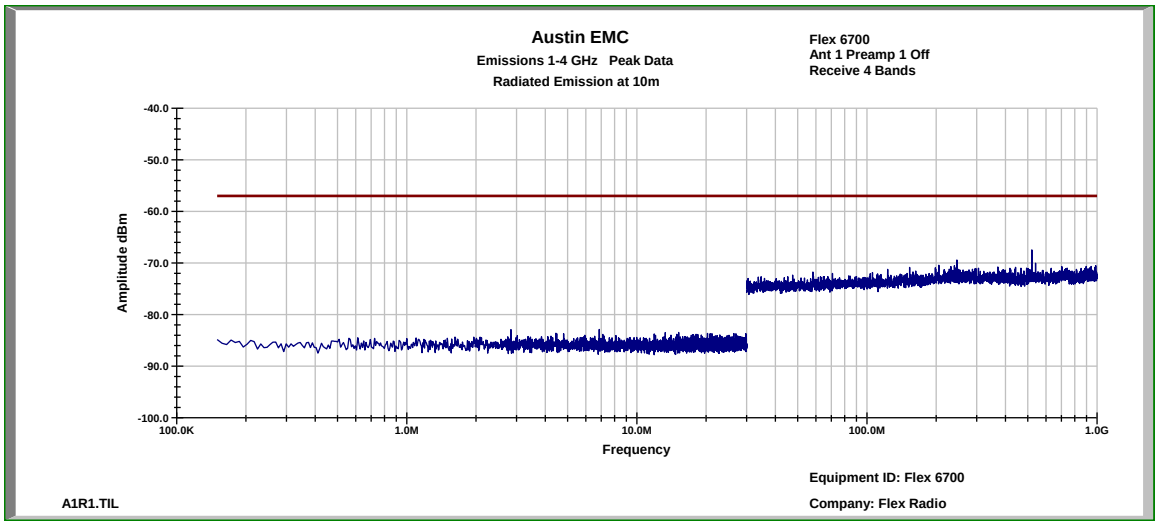
Radiated Test Setup Diagram

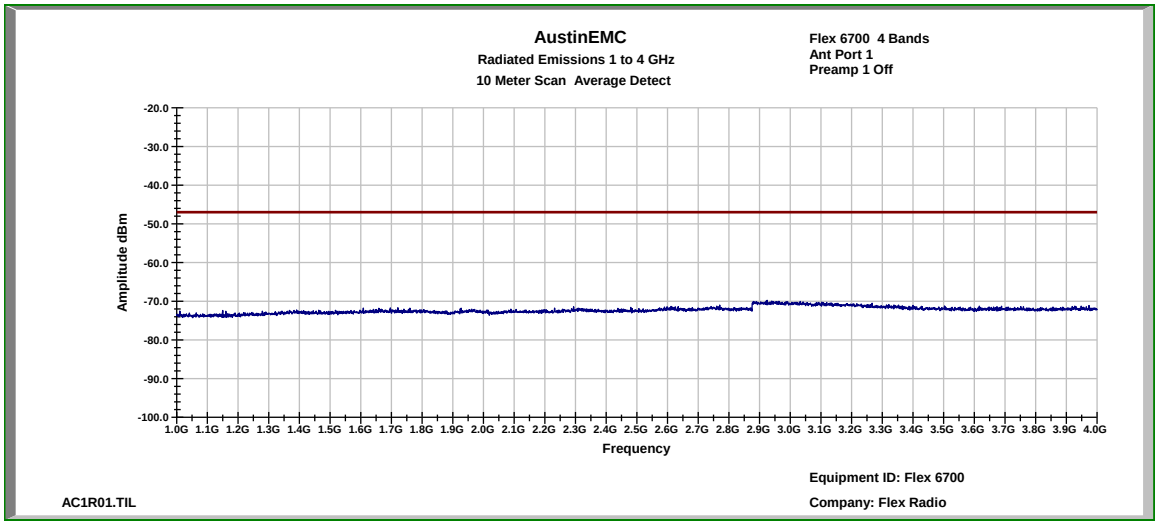


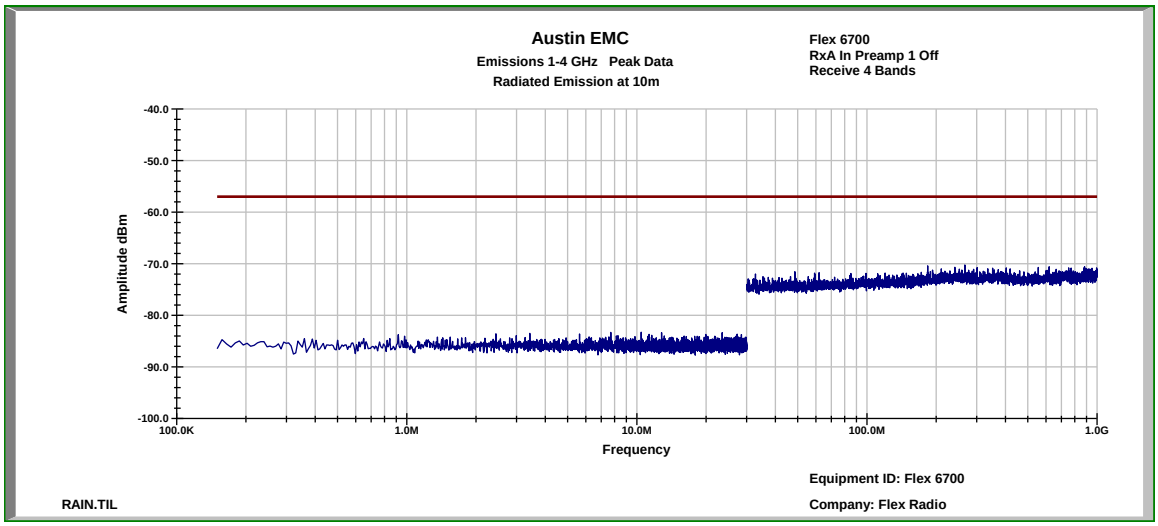
Antenna Conducted Setup Diagram: Receive

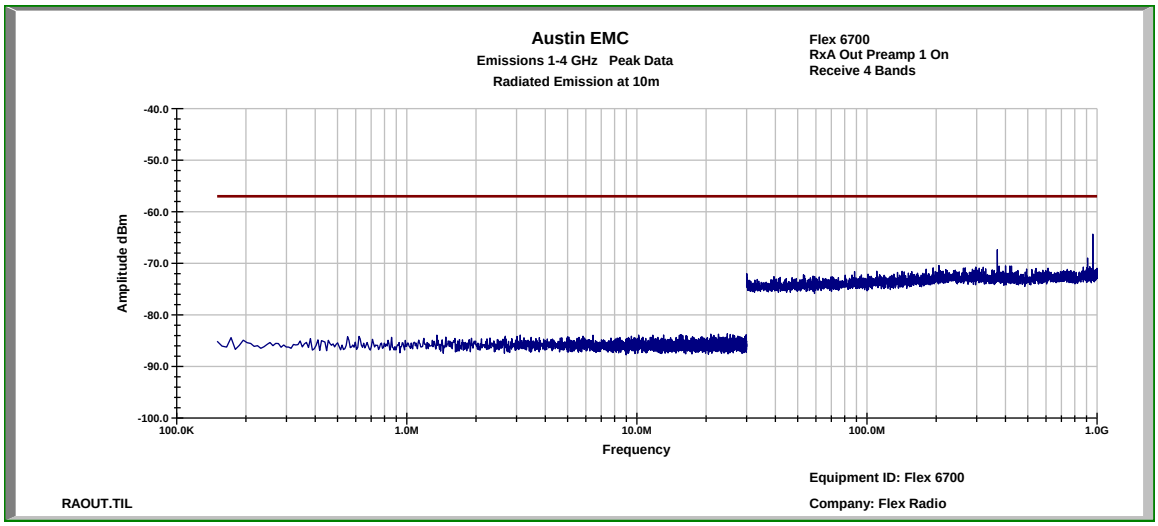
Antenna Conducted Setup Diagram: Transmit

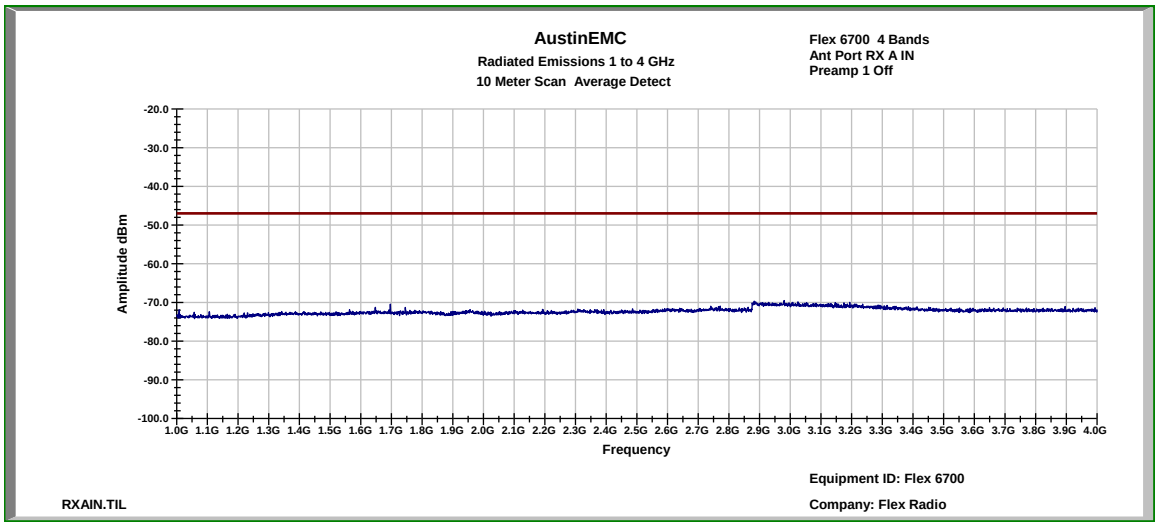
Unwanted Emission, Antenna Conducted, Receive, Plots

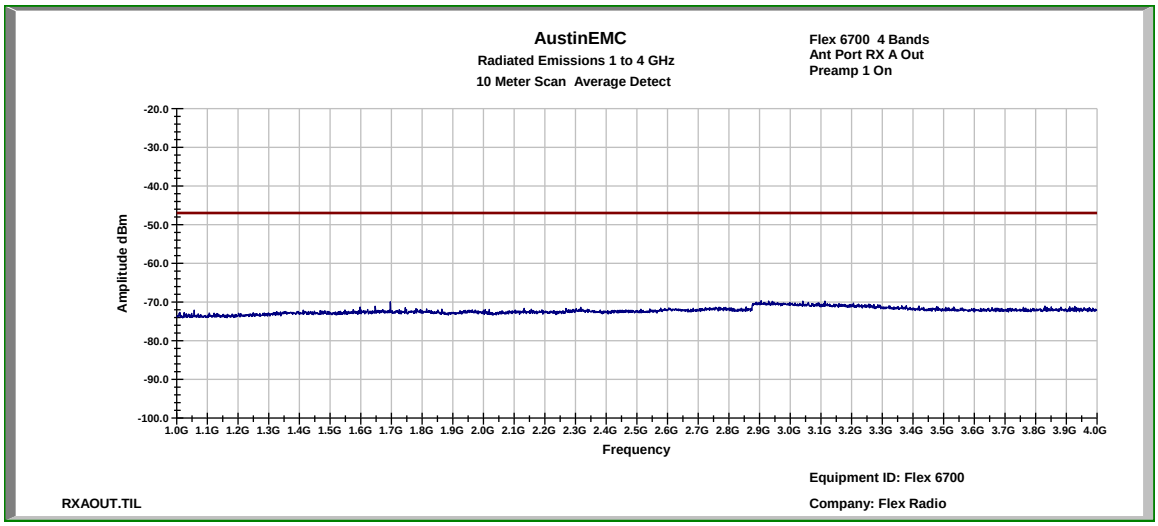





Austin EMC
Emissions 1-4 GHz Peak Data
Radiated Emission at 10m
Flex 6700
RxA In Preamp 1 Off
Receive 4 Bands
Amplitude dBm
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
100.0K
1.0M
10.0M
100.0M
1.0G
Frequency
Equipment ID: Flex 6700
Company: Flex Radio
RAIN.TIL

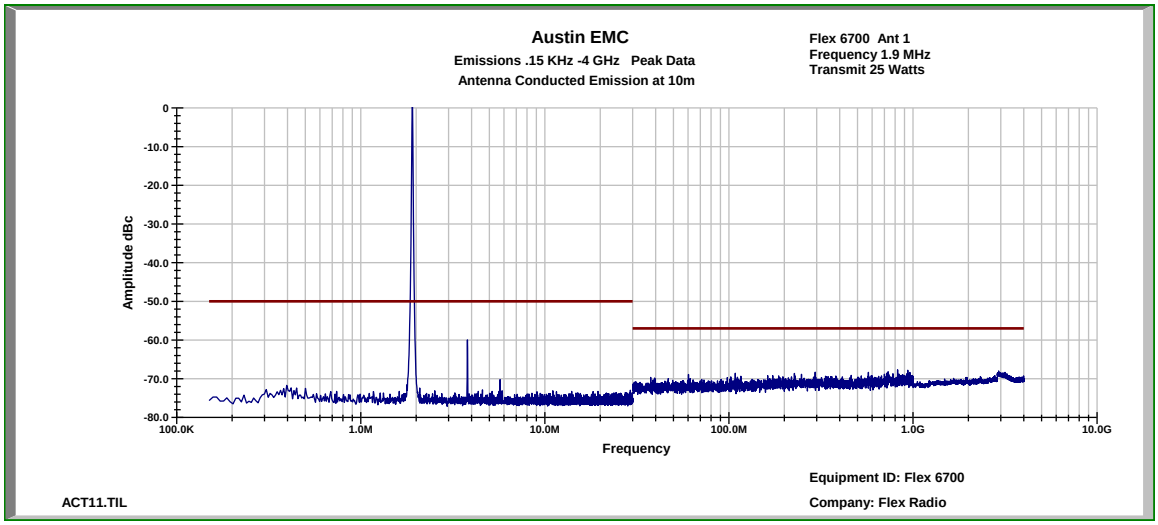

Austin EMC
Emissions 1-4 GHz Peak Data
Radiated Emission at 10m
Flex 6700
RxA Out Preamp 1 On
Receive 4 Bands
Amplitude dBm
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
-100.0
100.0K
1.0M
10.0M
100.0M
1.0G
Frequency
Equipment ID: Flex 6700
Company: Flex Radio
RAOUT.TIL

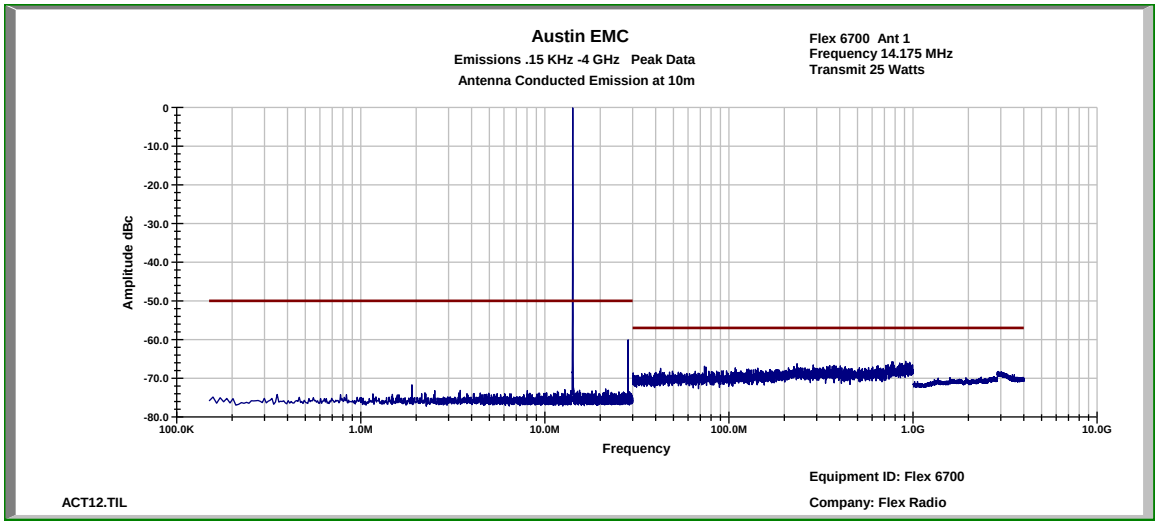


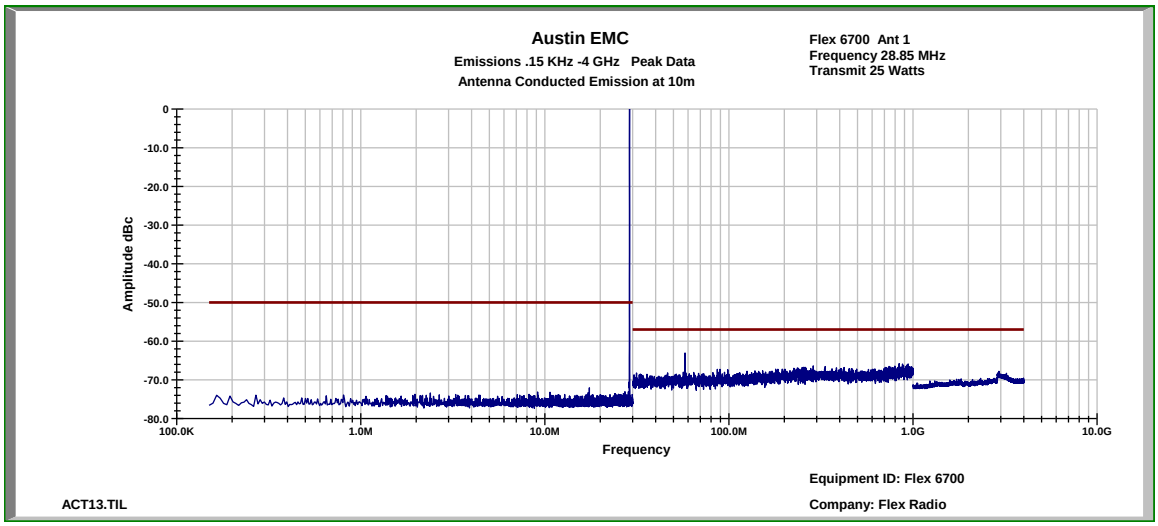


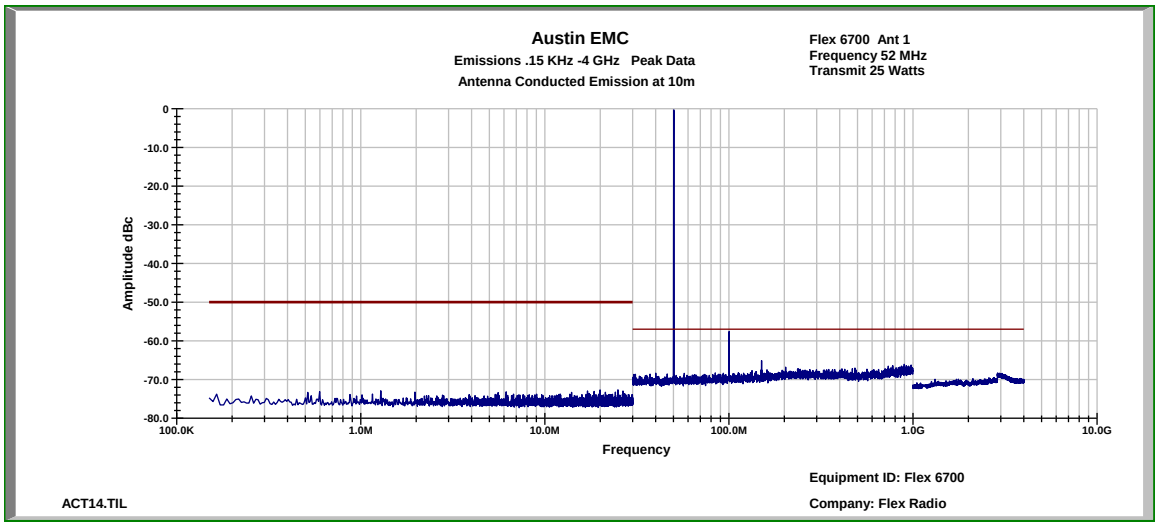
Above plots are typical for all antenna ports, relay switched to same internal circuitry.

Unwanted Emission, Antenna Conducted, Transmit, Plots



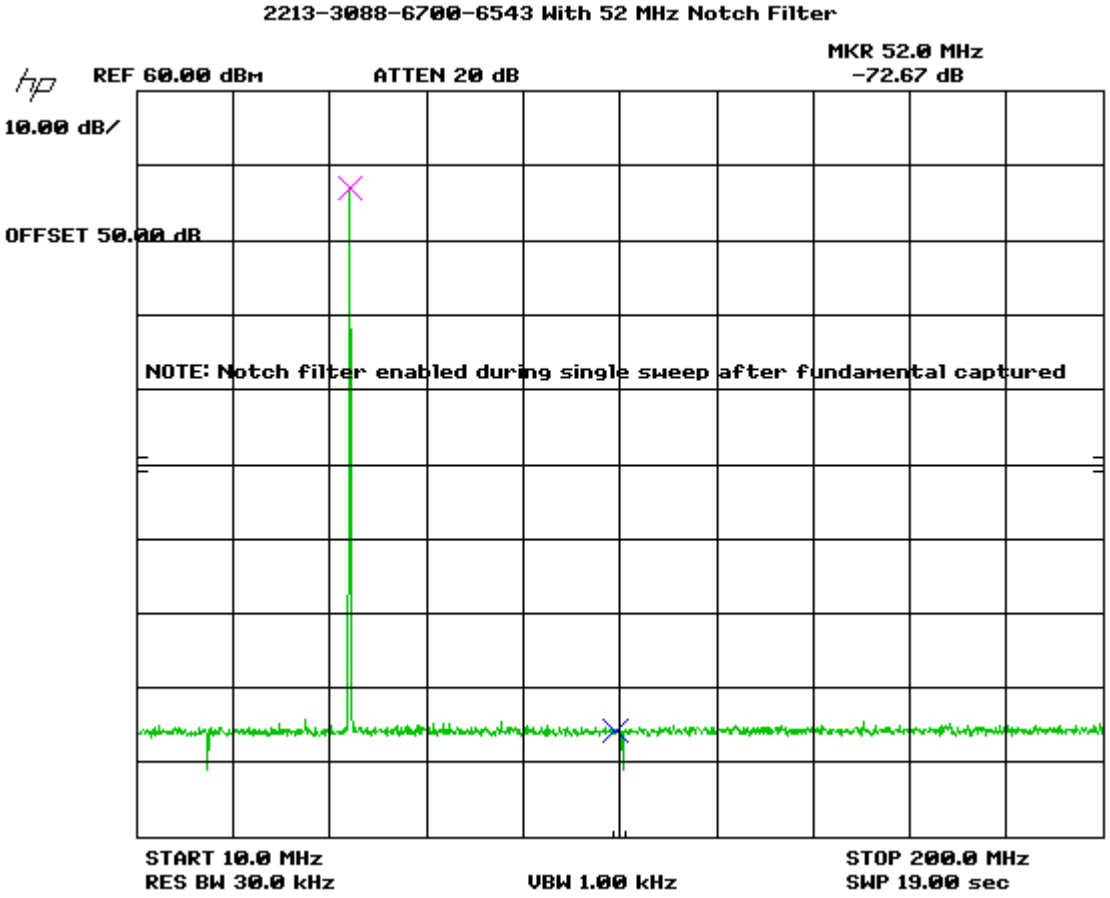






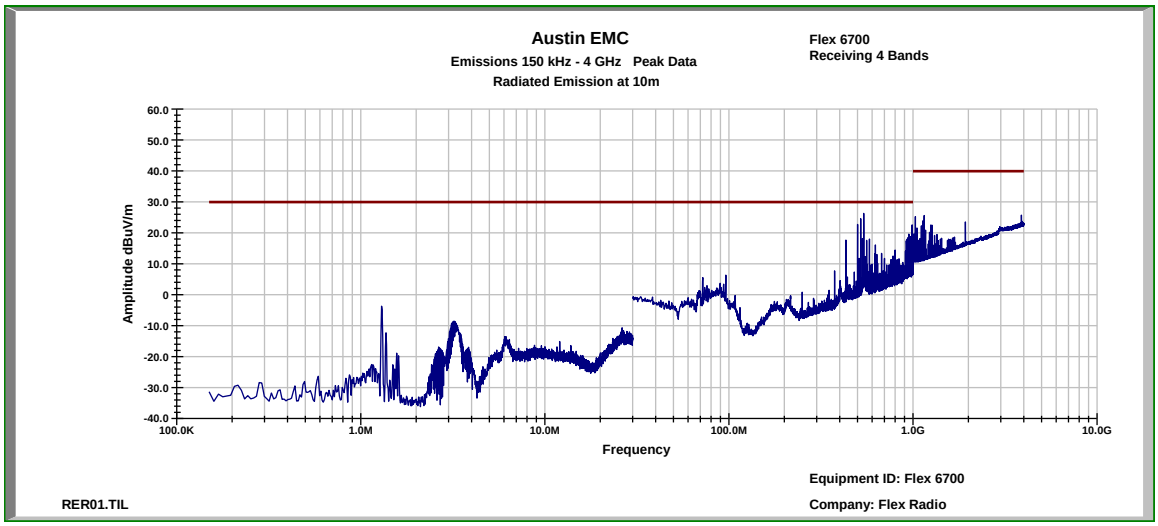
NOTE: See the following Page for higher dynamic range measurement of second and third harmonics using a notch filter at the fundamental frequency.

The HP 8546A spectrum analyzer used in the above test does not have sufficient dynamic range to accurately measure the second harmonic at 104 MHz at the specified power levels. A quarter wave coaxial filter was used in the following test to insert a 20 dB notch at the 52 MHz fundamental with 0.1 dB insertion loss at 104 MHz. This test uses a HP 70004A spectrum analyzer with a Bird 100-A-MFN-30 30dB Power Attenuator and MECA 612-10-1 10 dB Attenuator. The second and third harmonics are shown to be below the noise floor of the analyzer at greater than -72 dBc.

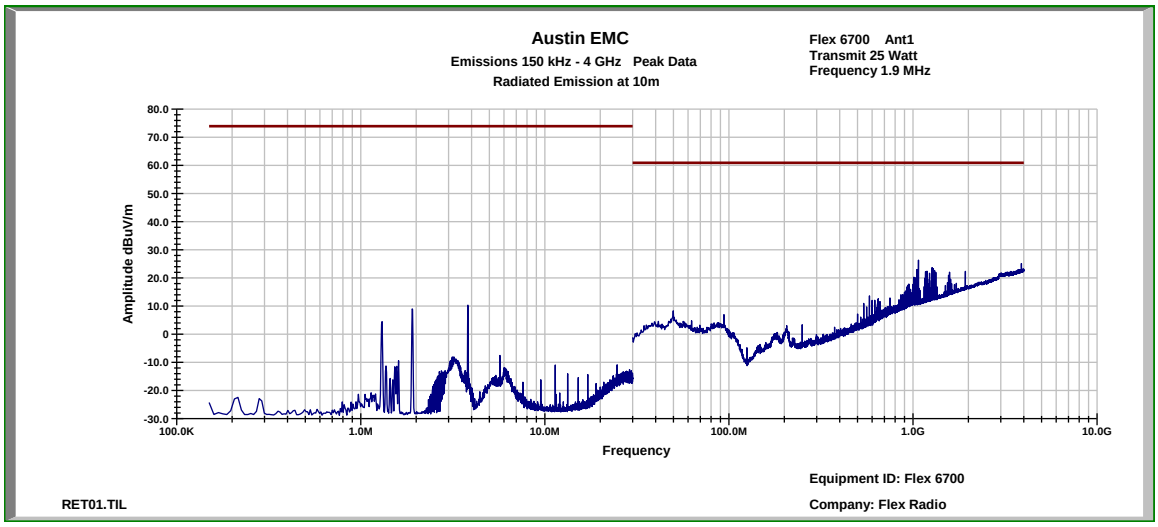


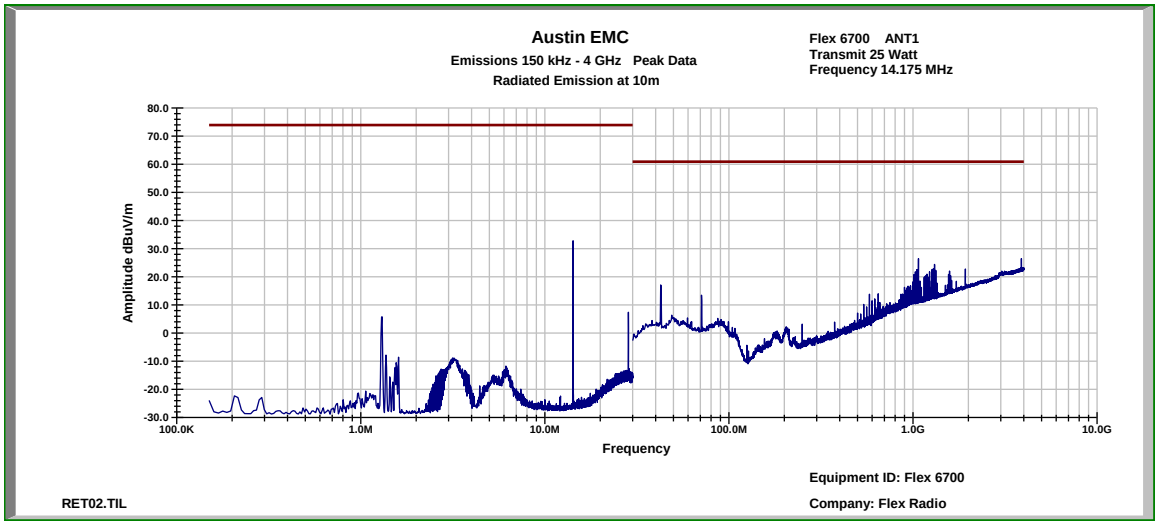
Note: Fundamental Frequency is excluded from limit

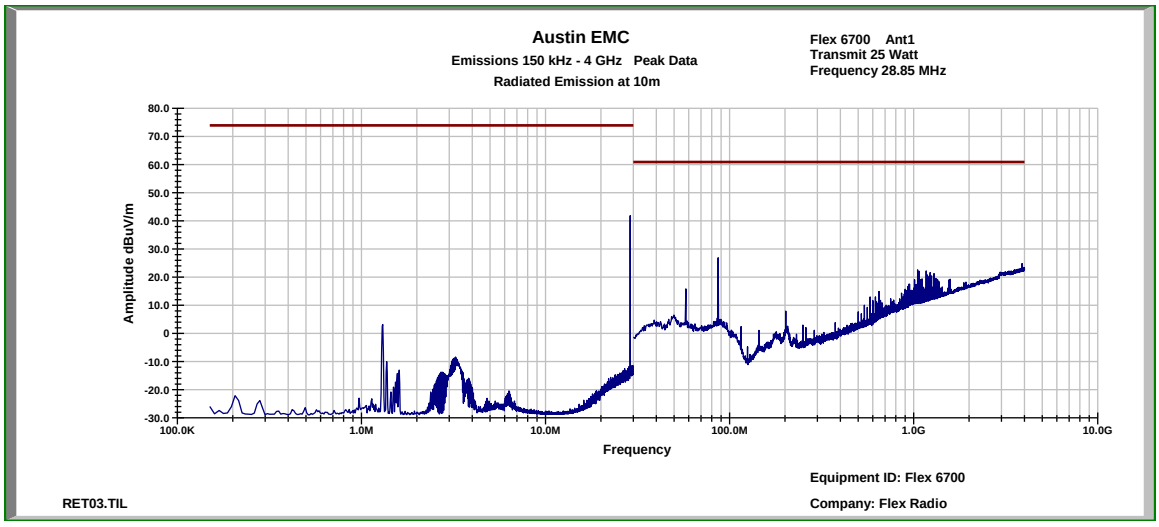
Radiated Emission, Receive Peak Plot

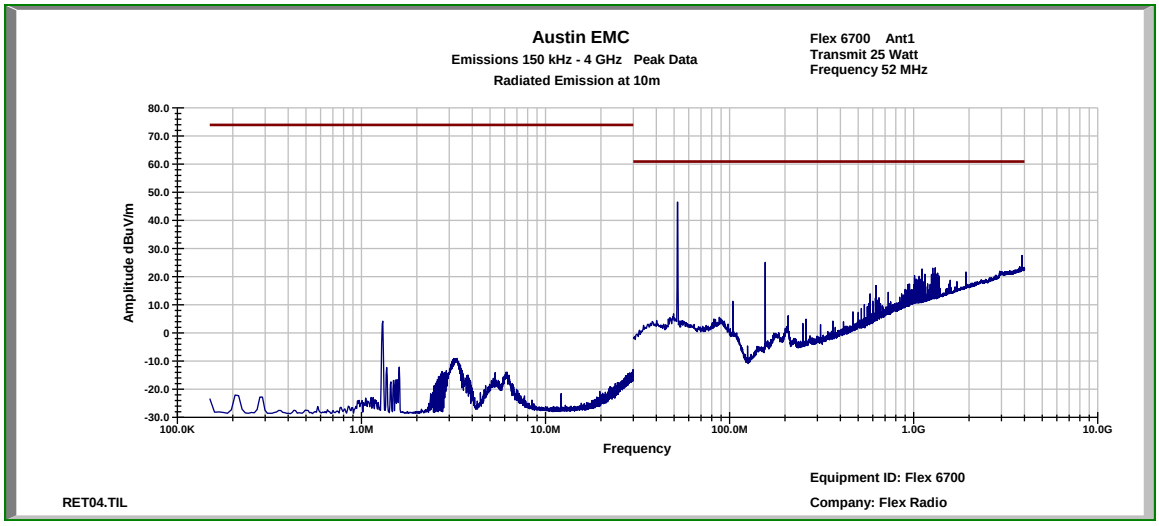


Radiated Emission, Transmit Peak Plots






Austin EMC
Emissions 150 kHz - 4 GHz Peak Data
Radiated Emission at 10m
Flex 6700 Ant1
Transmit 25 Watt
Frequency 28.85 MHz
Amplitude dBuV/m
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
100.0K
1.0M
10.0M
100.0M
1.0G
10.0G
Frequency
Equipment ID: Flex 6700
Company: Flex Radio
RET03.TIL


Austin EMC
Emissions 150 kHz - 4 GHz Peak Data
Radiated Emission at 10m
Flex 6700 Ant1
Transmit 25 Watt
Frequency 52 MHz
Amplitude dBuV/m
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
-10.0
-20.0
-30.0
100.0K
1.0M
10.0M
100.0M
1.0G
10.0G
Frequency
Equipment ID: Flex 6700
Company: Flex Radio
RET04.TIL

Measurement Equipment Utilized at Austin EMC

Manufacturer Model # Description
R&S ESVS10 Measurement Receiver 20 – 1000 MHz
R&S ESHS10 Measurement Receiver .009 – 30 MHz
HP 8546 A Spectrum Analyzer .009 – 6500 MHz
Solar 801250R24 50 uH LISN (Artificial Mains Network)
Gray Two Meter Cable from LISN
ARL Lim1 Signal Limiter 5.4 dB insertion loss
Bird 100 Watt 50 Ohm Dummy Load
HP HP8491A 3 dB 2 Watt Attenuator
Mitec N/A 40 dB 0.1 - 1100 MHz 1 dB NF Preamp
Brown N/A Cable from Shielded Room
Panashield N/A Double Shielded Room
EMCO 5311 Gigahertz Transverse Electric Mode Chamber
Gore 1.5 Meter Cable from GTEM
Gore 1.5 Meter Cable from Preamp
HP 30dB power attenuator