

CE Compliance Test Report  
Of  
Commercially Available Amateur Radio

Model: FLEX-3000  
Type: Base Station Transceiver

For

Flex-Radio Systems  
Of Austin, Texas

Tested in Accordance with

ETSI EN 301 489-1, -15 and  
ETSI EN 301 783-1, -2

By

Austin EMC – Austin Texas

Date of Test 28 April 2009  
Date of Report 01 May 2009

## Table of Contents

1. Declaration of Conformity.....	3
2. Notification .....	4
3. Equipment under test (EUT) .....	5
4. EUT Technical Specifications .....	6
5. List of EUT Ports .....	7
6. Ancillary Equipment .....	8
7. Climate Test Conditions .....	9
8. Operational Test Conditions.....	9
9. Modifications Required for Compliance .....	10
10. EUT Photograph Front.....	11
11. CE Mark; S/N Tag Placement.....	11
12. Summary WC Test Results & Meas. Uncertainty..	12
13. Calculation of Test Limits .....	13
14. Mains Conducted Test Setup Diagram .....	14
15. AC Conducted Emission Peak & Average Plots ..	15
16. Setup Diagrams .....	23
17. Radiated Emission, Transmit Peak Plots .....	25
18. Radiated Emission, Receive Peak Plots .....	29
19. Unwanted Emission, Receive, Conducted Plots ...	31
20. Unwanted Emission, Transmit, Conducted Plots .	33
21. Measurement Equipment Utilized .....	39



**European Union Declaration of Conformity**

**Flex-3000 Amateur Radio Transceiver**

Council Directive --- 89/336/33c; EMC Directive  
Standards: EN 301 489-1  
EN 301 489-15  
EN 301 783-1,-2 Essential Radio Test Suite

TYPE OF EQUIPMENT: Base Station  
EQUIPMENT CLASS: B

WE, THE UNDERSIGNED HEREBY DECLARE THAT THE  
EQUIPMENT SPECIFIED ABOVE CONFORMS TO THE  
ABOVE STANDARDS PER 89/336/EEC.

FlexRadio Systems Date of testing: April 28, 2009

FlexRadio Systems  
13091 Pond Springs Rd. suite 250  
Austin, TX 78729

Signature of person Responsible [ **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	78729
Town	Austin, TX
Street	13091 Pond Springs Rd. suite 250
PO box	
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 - 900501
E-mail	Klaus_Lohmann@t-online.de

**Notified radio equipment**

Type number	FLEX-3000
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
Notified body identification number(s)	
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	NA
Transmit power	100W PEP
Type of modulation	CW, SSB, AM, DSB, NBFM
Type of antenna	User supplied
Mode of operation (simplex/duplex)	Simplex
Duty cycle (access protocol, if applicable)	Full duty cycle
Comments	

### Notes:

This notification is in accordance with Article 6.4. of EU Directive 1999/5/EC. I/we am/are aware that the frequencies required for operation of the radio equipment must be assigned prior to usage within the Federal Republic of Germany by the Regulatory Authority for Telecommunications and Posts in accordance with § 47 of the German Telecommunications Act. No legal claim to frequency assignment can be derived from this notification.

## Equipment Under Test (EUT) Information

Brand Name :	FlexRadio
Product Name :	Software Defined Amateur Transceiver
Model Name or Number :	Flex-3000
Serial Number :	1609 - 0024
Type of Equipment :	Amateur Radio Base Station
External Power Supply :	N/A
Power Input Source :	13.8 Volts DC

## EUT Technical Specifications, General

Operating Frequency Range, Receive:	10 kHz – 65 MHz
Performance Frequency Range, Receive:	160 – 6 Meter Amateur Radio Bands
RF Input Impedance (Bypass)	50 Ohms, unbalanced
RF Input Impedance (Tuner)	17 – 150 Ohms, 3:1 SWR
Frequency Stability:	+/- 2.5 ppm 32 – 122 deg F (0 to 50 deg C)

Operating Temperature Range	14 – 122 deg F (-10 - +50 deg C)
Emission Modes:	A1A (CW), A3E (AM), J3E (LSB, USB) F3E (FM), F1B (RTTY), F1D (PACKET) F2D (PACKET)
Frequency Steps:	1 Hz Minimum
Power Consumption:	Rx 1.5A (typ.); Tx (100 W) 25A (max.)
Supply Voltage:	13.8 Volts DC +/- 10% Negative Ground Transmitter output specified at 13.8 VDC

### EUT Technical Specifications, Transmitter

<b>Power Output:</b>	1 – 100 watts PEP CW and SSB at 13.8 VDC input voltage 2-25 Watts Continuous Modes
<b>Emission Modes / Types:</b>	A1A (CWU, CWL), J3E (USB, LSB) A3A (AM), FR3E (FM), Digital
<b>Harmonic Radiation:</b>	Better than -55 dB (160 – 10m) Better than -65 dB (6m)
<b>SSB Carrier Suppression:</b>	At least 55 dB below peak output
<b>Undesired Sideband Suppression:</b>	At least 55 dB below peak output
<b>Audio Response (Voice Modes):</b>	Flat Response 10 Hz to 20 kHz 3 or 10 Band Software Equalizer
<b>3<sup>rd</sup>-order IMD:</b>	Better than -33 dB below 100WPEP @14.2
<b>Microphone Impedance:</b>	600 Ohms Nominal (200 to 10 K Ohms)

### EUT Technical Specifications, Receiver

Circuit Type:	Direct Conversion, low IF
Intermediate Frequency:	SW selectable from DC to 20 kHz
14 MHz PA off/on MDS:	1.3/.3 uV (-123/-133 dBm in 500 Hz)
14 MHz IP3: (S5 method)	>+20 dBm PA off at 2 kHz or less
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:	70 dB or better (160- 6m) Bands

### EUT Technical Specifications, Physical

<b>Dimensions: (WxHxD)</b>	12.25" x 2.15" x 13.5" (311 x 54.6 x 343 mm)
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<b>Weight:</b>	(approx.) 7 lbs. (3.2 kg)
<b>Maximum Interconnect Cable Length</b>	Firewire – 10 feet (3m) DC power cable – 10 feet (3m)

### List of EUT External Ports

Port Number	EUT's Port Descriptions	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-Shielded)
1	ANT1	1	BNC	Shielded
2	Power Connection	1	Molex	Non-Shielded
3	Firewire IEEE 1394a	1	6 pin	Shielded
4	Straight or Paddle Key	1	¼" S. Phone	Shielded
5	AMP RLY TX1	1	RCA	Shielded
6	PWR.SPK/LINE OUT	1	1/8" Stereo	Shielded
7	FLEXWIRE I/O	1	DB9-F	Shielded
8	PTT (Push to Talk)	1	RCA	Shielded
9	GND Terminal	1	#8 Screw	N/A
10	MIC (Microphone in)	1	RJ-45 Modular	Shielded
11	PHONES (Headphone)	1	¼" S. Phone	Shielded

### Ancillary Equipment

<b>Ancillary Equipment # 1</b>	
<b>Description:</b>	<b>Power Supply</b>
<b>Brand Name:</b>	<b>Astron</b>
<b>Model Name or Number:</b>	<b>RS-35M</b>
<b>Serial Number:</b>	<b>N/A</b>
<b>Cable Type:</b>	<b>Non-shielded Two Conductor AWG 10</b>

<b>Ancillary Equipment # 2</b>	<b>Computer</b>
<b>Description:</b>	<b>Laptop</b>
<b>Brand Name:</b>	<b>Toshiba</b>
<b>Model Name or Number:</b>	<b>A135-S4827</b>
<b>Serial Number:</b>	<b>77379265K</b>
<b>Cable Type:</b>	<b>Double Shielded Fire Wire 4 to 6 pin</b>

<b>Ancillary Equipment # 3</b>	<b>Morse Code Key</b>
<b>Description:</b>	<b>Dual Paddle</b>
<b>Brand Name:</b>	<b>Bencher</b>
<b>Model Name or Number:</b>	<b>BY - Brown</b>
<b>Serial Number:</b>	<b>N/A</b>
<b>Cable Type:</b>	<b>Shielded Two Wire 1/4" Phone Plug</b>

<b>Ancillary Equipment # 4</b>	<b>Microphone</b>
<b>Description:</b>	<b>Hand Held</b>
<b>Brand Name:</b>	<b>HighGear</b>
<b>Model Name or Number:</b>	<b>M75</b>
<b>Serial Number:</b>	<b>N/A</b>
<b>Cable Type:</b>	<b>RJ-45 Modular</b>

<b>Ancillary Equipment # 5</b>	<b>Speaker wire terminated</b>
<b>Cable Type:</b>	<b>Shielded</b>

<b>Ancillary Equipment # 6</b>	<b>Flexwire</b>
<b>Description:</b>	<b>Control Cable to future products</b>
<b>Brand Name:</b>	<b>Flex-Radio</b>
<b>Model Name or Number:</b>	<b>N/A</b>
<b>Serial Number:</b>	<b>N/A</b>
<b>Cable Type:</b>	<b>Shielded DB-9 connector</b>

<b>Ancillary Equipment # 7</b>	<b>TX1 Cable</b>
<b>Description:</b>	<b>External Amplifier Keying</b>
<b>Brand Name:</b>	<b>N/A</b>
<b>Model Name or Number:</b>	<b>N/A</b>



<b>Serial Number:</b>	<b>N/A</b>
<b>Cable Type:</b>	<b>Shielded Single wire RCA Plug</b>

### Climate Test Conditions

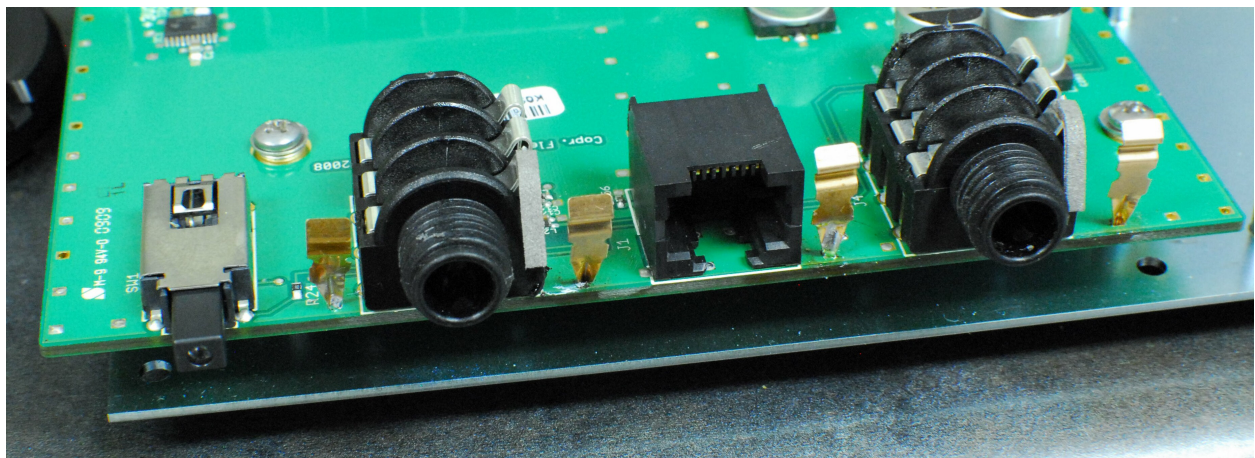
<b>Temperature:</b>	<b>72 Degrees F</b>
<b>Humidity:</b>	<b>50 Percent</b>
<b>Pressure:</b>	<b>29.9" IHG</b>

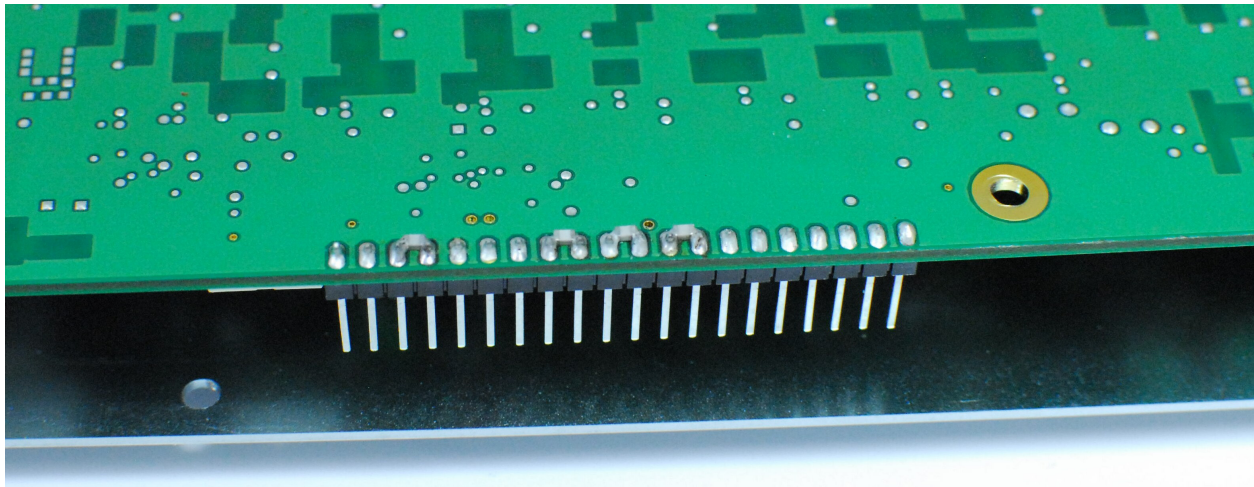
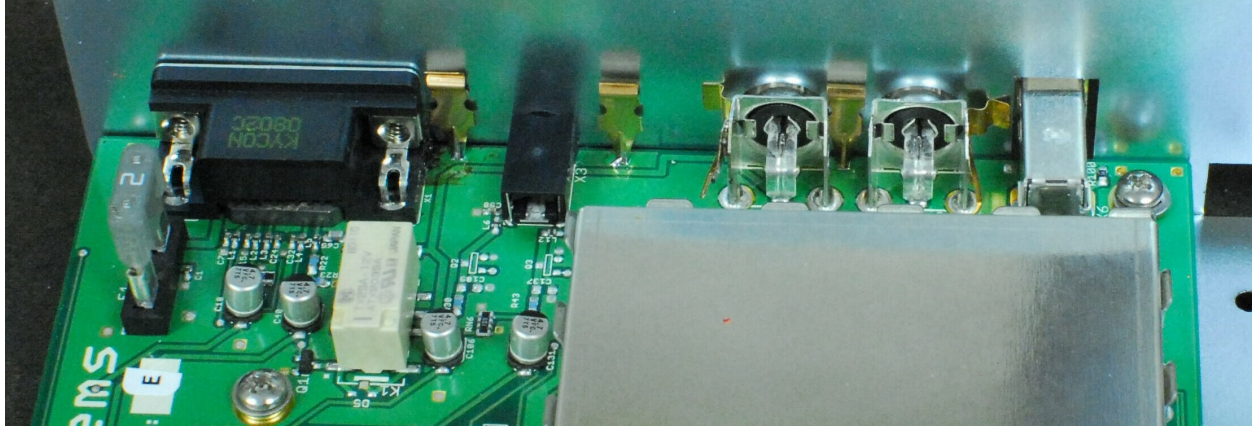
### Operational test conditions and test signals

<b>Operating Mode:</b>	<b>SSB 25 Watts PEP in Transmit</b>
<b>Operational Software:</b>	<b>Power SDR Version 1.18.0</b>
<b>Transmit test signal:</b>	<b>Built in Two Tone 700 Hz, 1700 Hz</b>
<b>Special Hardware:</b>	<b>None</b>
<b>Test Frequencies:</b>	<b>1.9, 14.175, 28.85, 52 Mhz.</b>
<b>Antenna Conducted, Receive:</b>	<b>Terminated in Spectrum Analyzer</b>
<b>Antenna Conducted, Transmit</b>	<b>Terminated in Attenuator, then SA</b>
<b>Radiated Emission, Case</b>	<b>Terminated Antenna Port</b>
<b>Mains Conducted Emission</b>	<b>Terminated Antenna Port</b>

### Modifications Required for Compliance

<b>Attach Finger stock 9 places, 4 ea 200pF caps</b>	<b>As Shown in Photographs</b>
<b>A copper strap from 2 each connectors</b>	<b>Ground from each 1/4 " Phone to Panel</b>





**EUT Photograph**



## Summary of Worse Case EMC Emissions

Standard	Test Description	Margin	Pass
EN 55022 B	AC power in Conducted Emission, Receive	-8	Yes
EN 55022 B	AC power in Conducted Emission, Transmit	-5	Yes
EN 301 783	Radiated Emission, Transmit	-45	Yes
EN 301 783	Radiated Emission, Receive	-9	Yes
EN 301 783	Unwanted Emission, Ant. Conducted, Receive	-12	Yes
EN 301 783	Unwanted Emission, Ant Conducted, Transmit	*-2.5	Yes
EN 301 783	Transmit Harmonics, Conducted, Swept	-60	Yes

\* Peak Detection

## Measurement Uncertainty (Expanded 95% Confidence)

AC Mains Conducted Emission .15 – 30 MHz w/ HP8568B	+/- 2.6 dB
Radiated Emission 30 – 1000MHz R&S	+/- 2.8 dB
Radiated Emission 1-4 GHz HP 8546A	+/- 5.0 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:

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  
 $\text{SQRT}(3.28 \times 30) / 10 = 31.369 \text{ uV/m}$  or 29.9 dBuV/m (30-1000 MHz)  
39.9 dBuV/m (>1000 MHz)

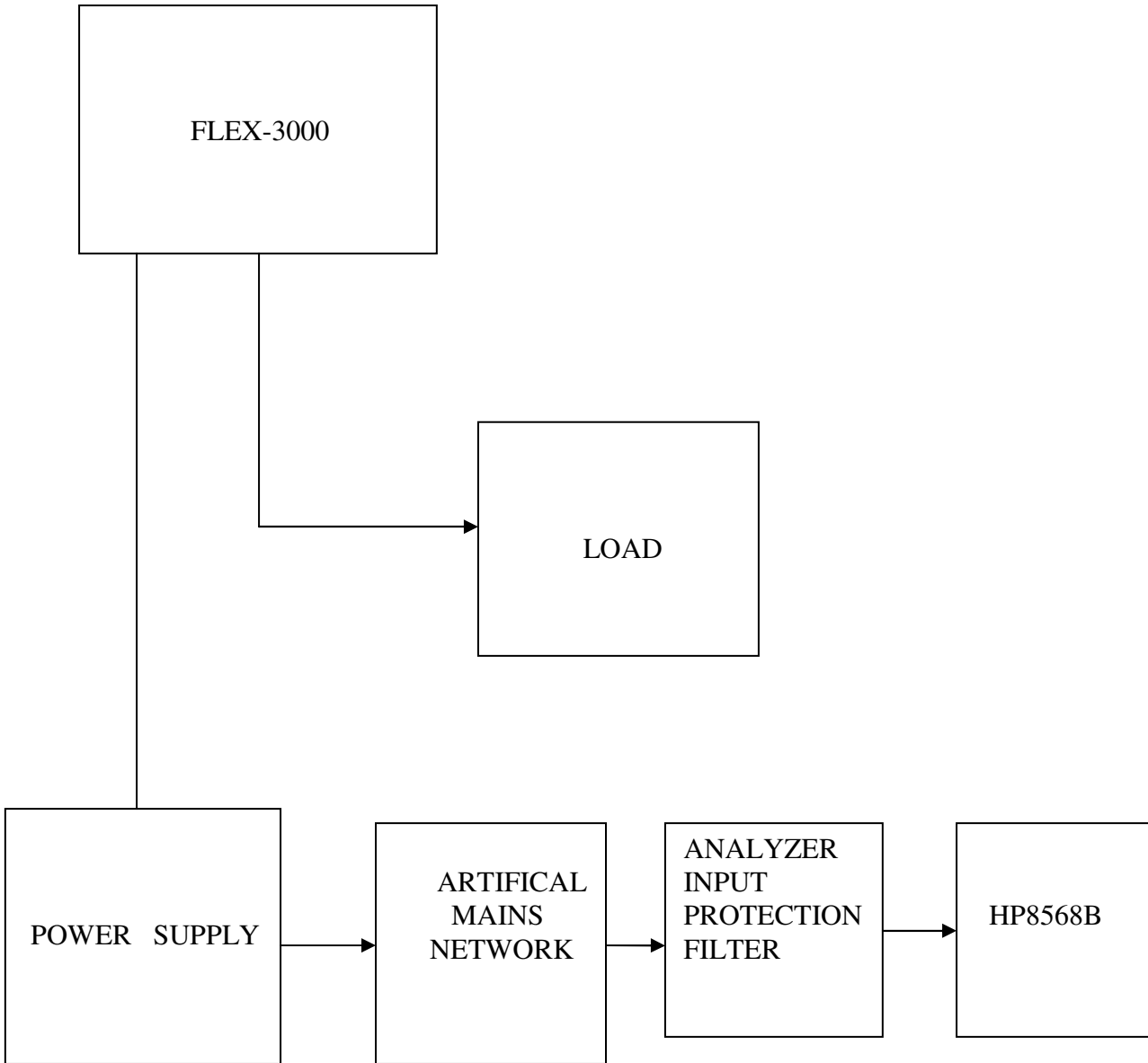
### **Radiated, Transmit Mode: (Enclosure Port)**

Limit by Substitution:

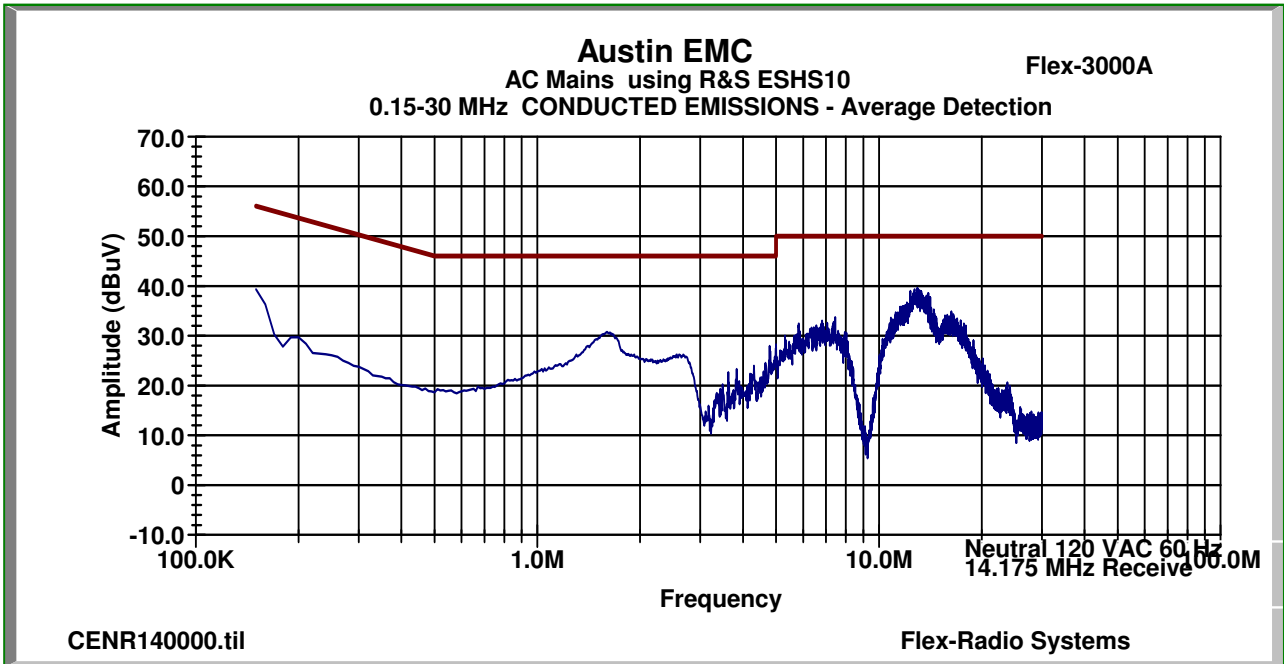
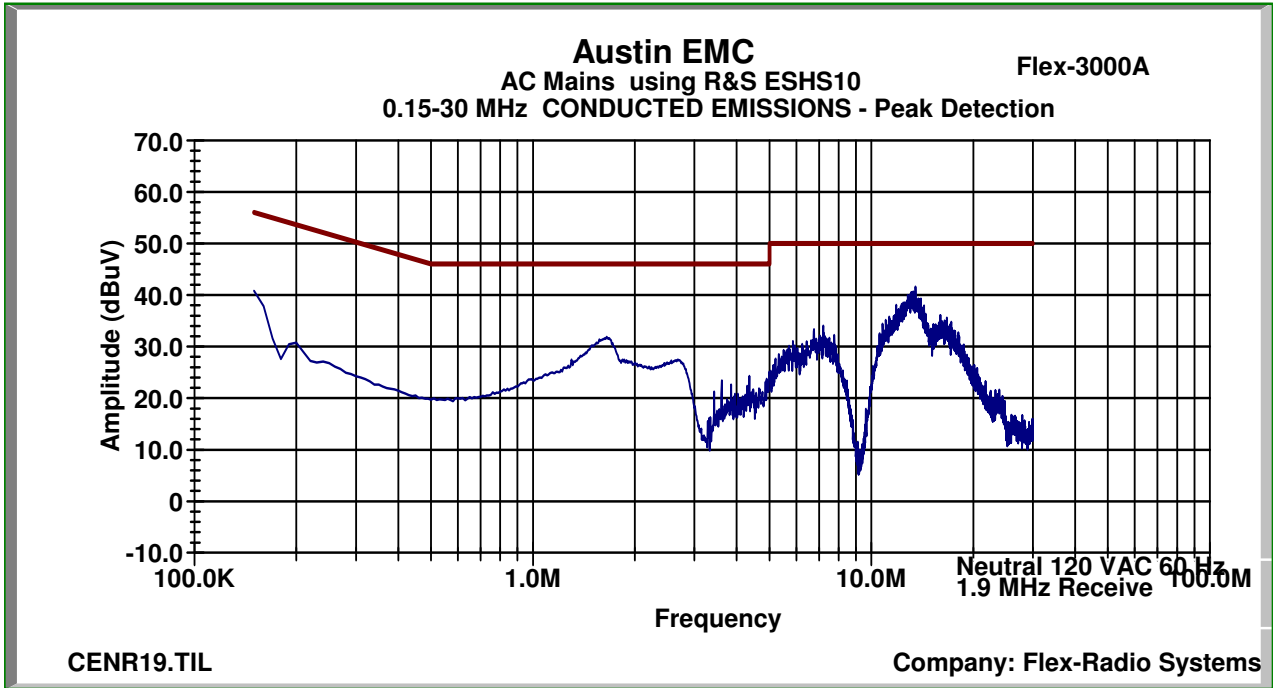
25 watt into a dipole = 41 watts Radiated  
 $\text{SQRT}(41 \times 30) / 10 = 3.5 \text{ V/m} = 130.9 \text{ dBuV/m @ 10 meters}$

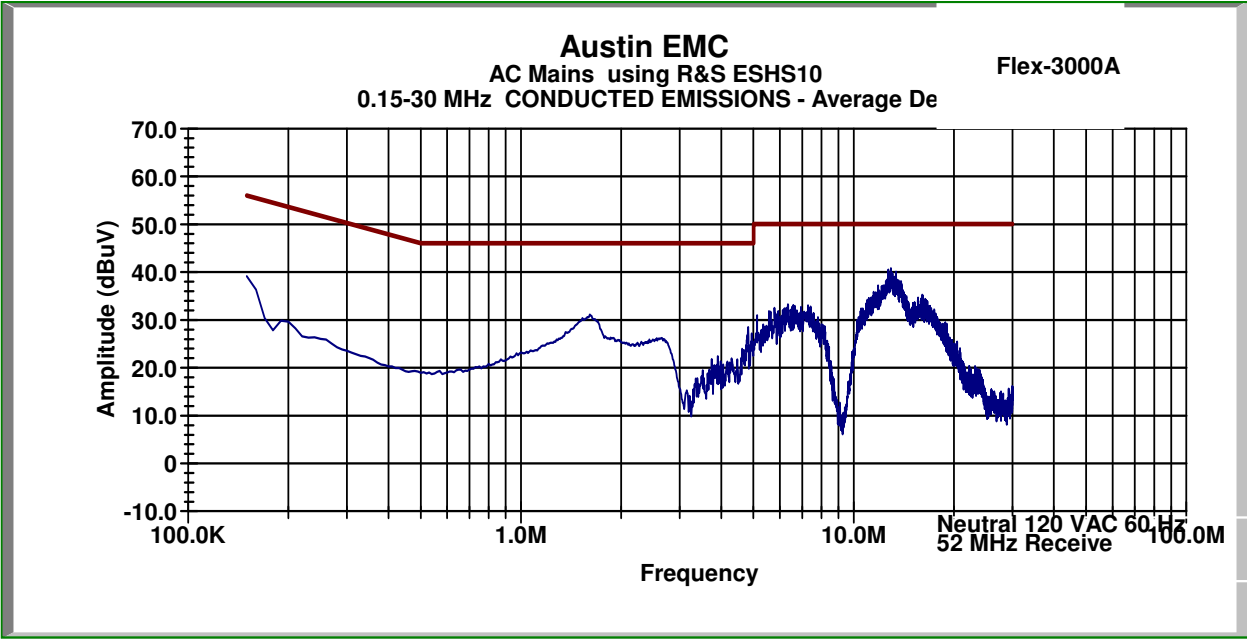
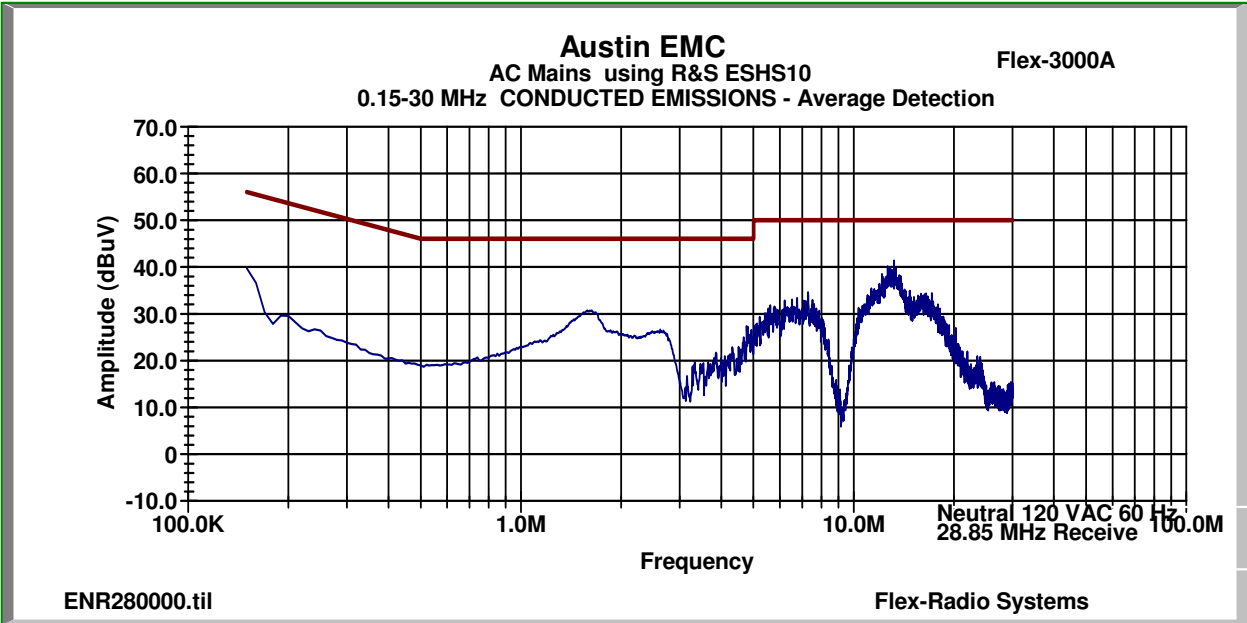
-40 dBc = 130.9 – 40 = 90.9 dBuV/m @ 10 meters (30-35 MHz)  
-50 dBc = 80.9 dBuV/m @ 10 meters (>1000 MHz)  
-60 dBc = 70.9 dBuV/m @ 10 meters (50-1000 MHz)

## **MAINS CONDUCTED TEST SETUP DIAGRAM**

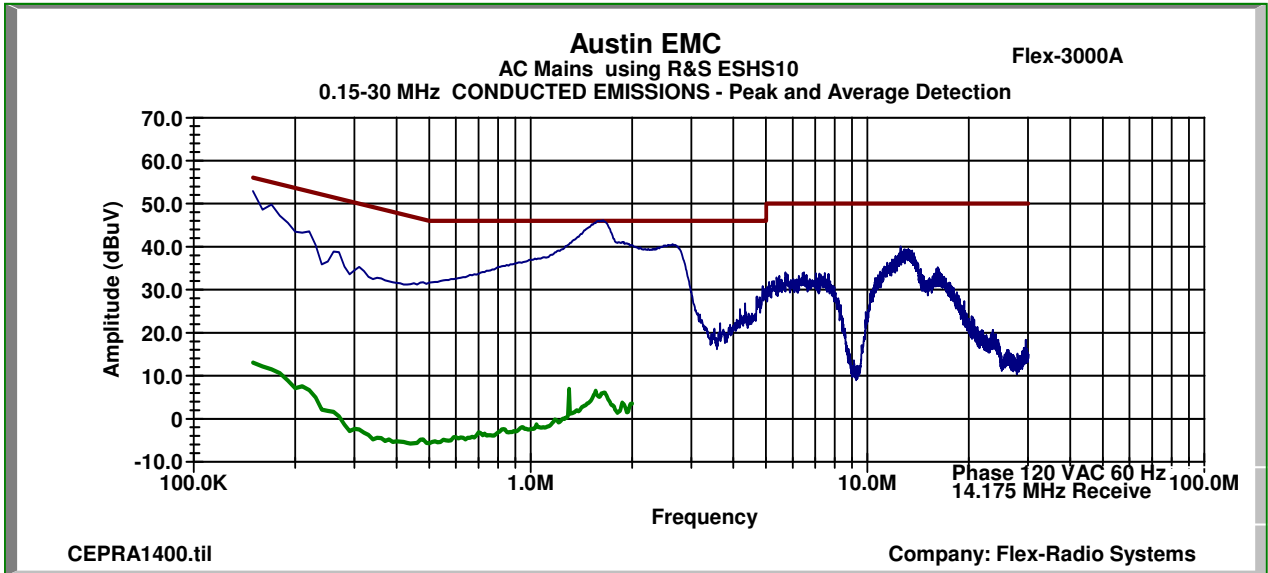
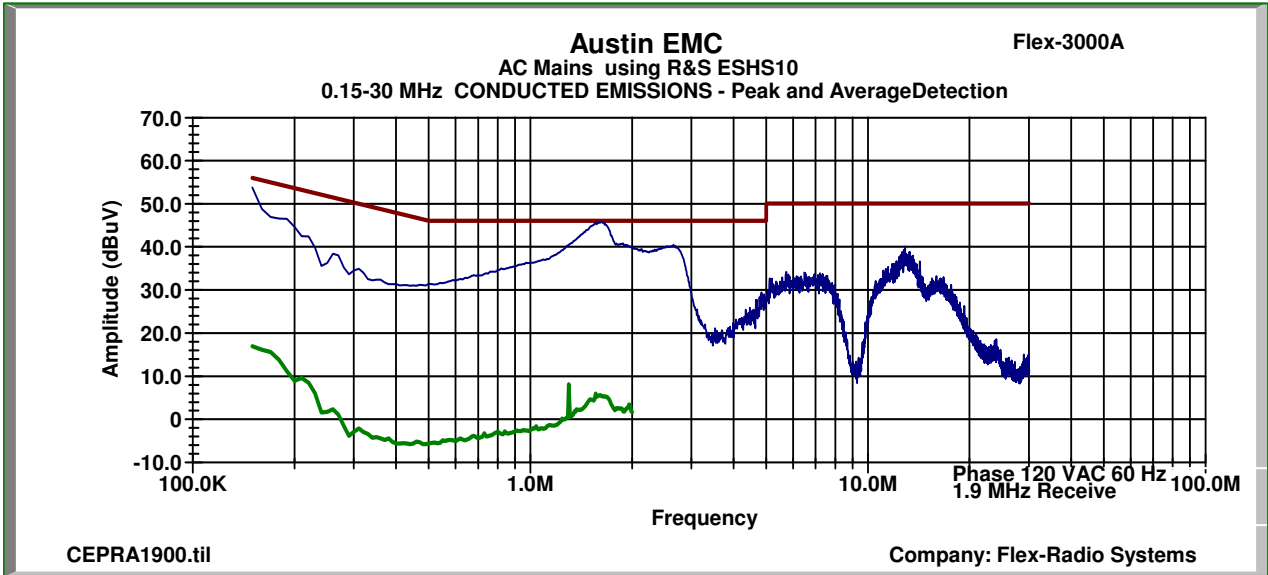


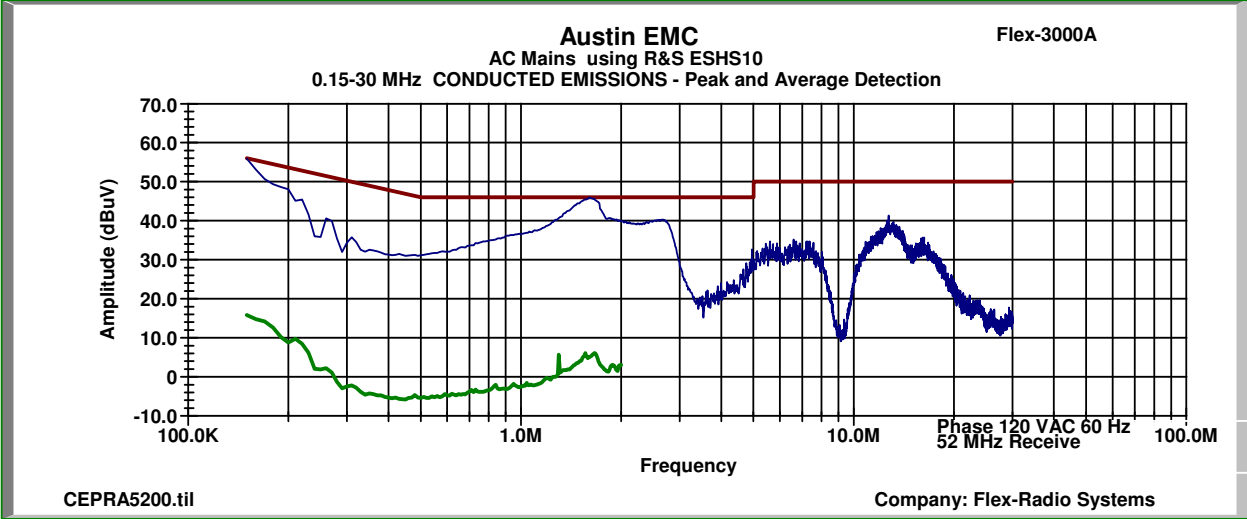
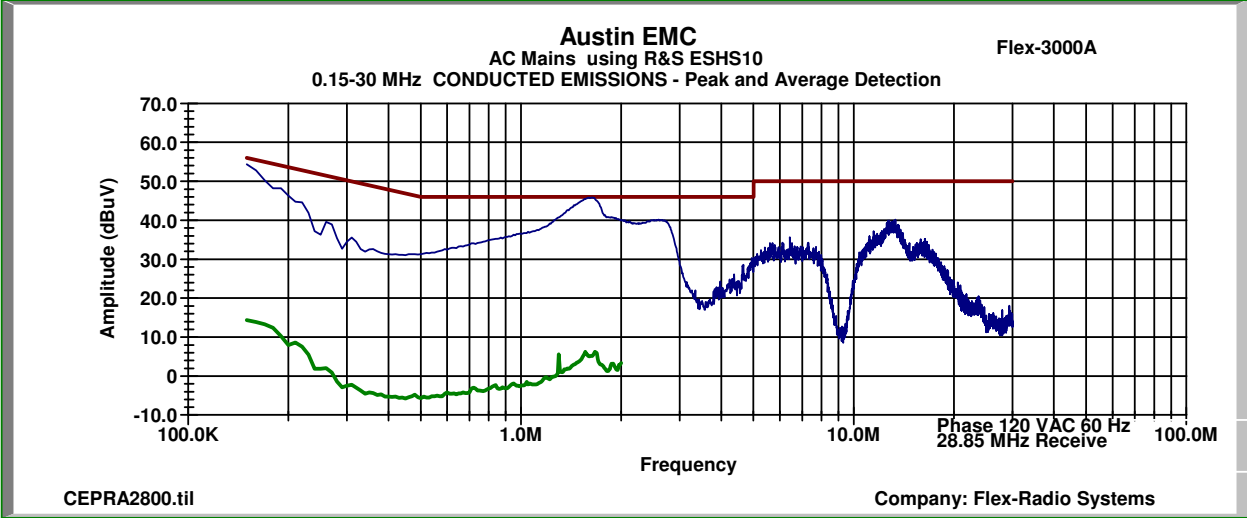
**AC Conducted Emission Peak & Average Plots:**

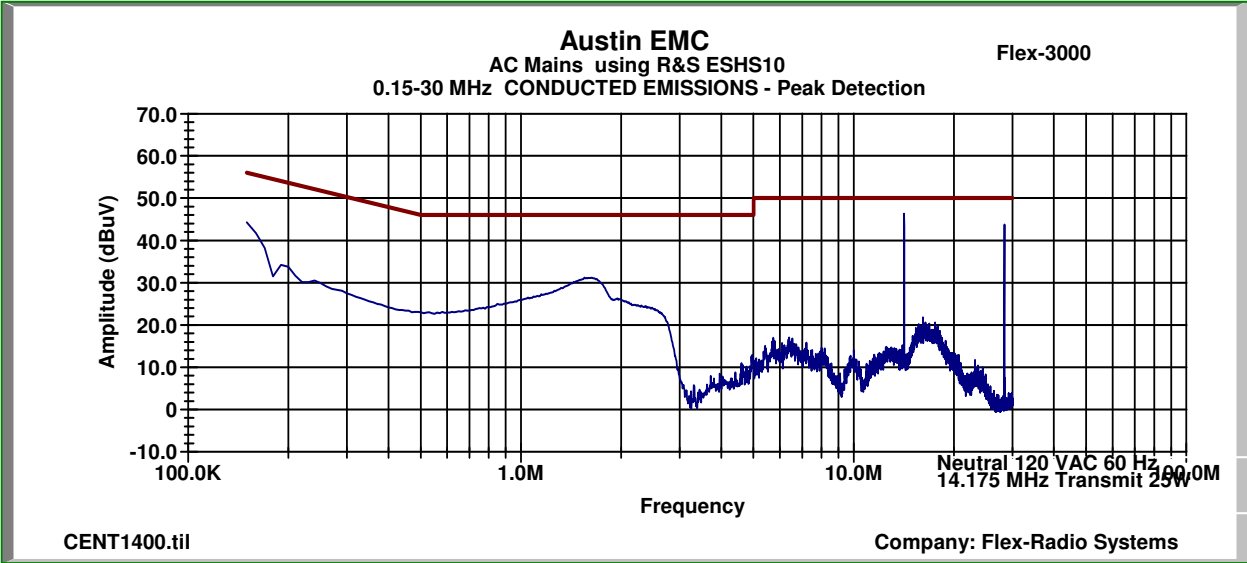
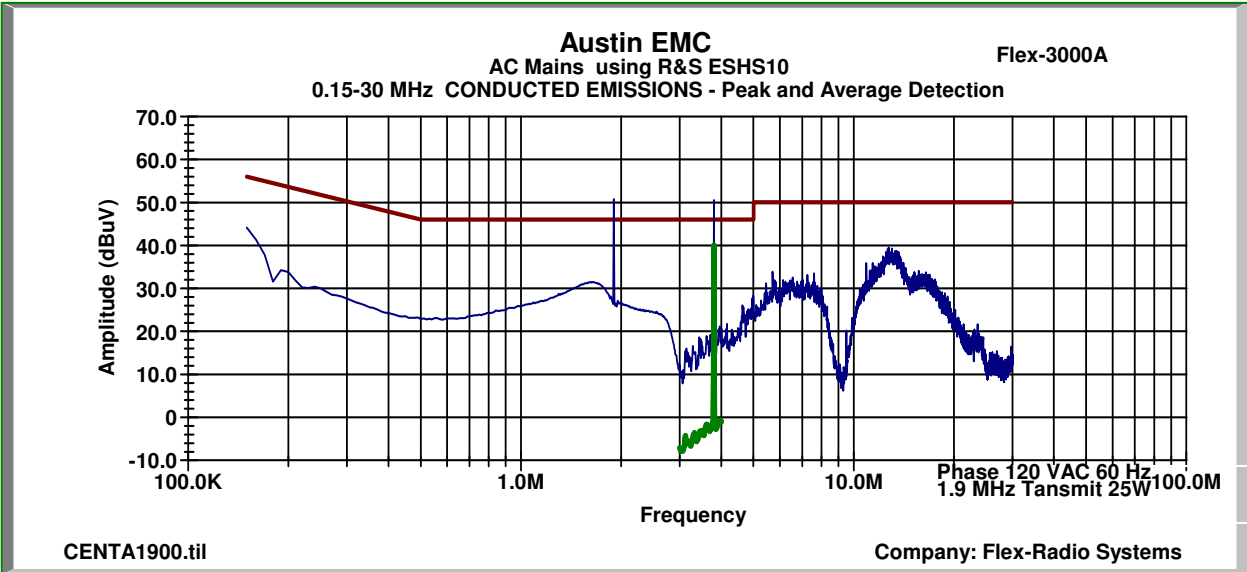


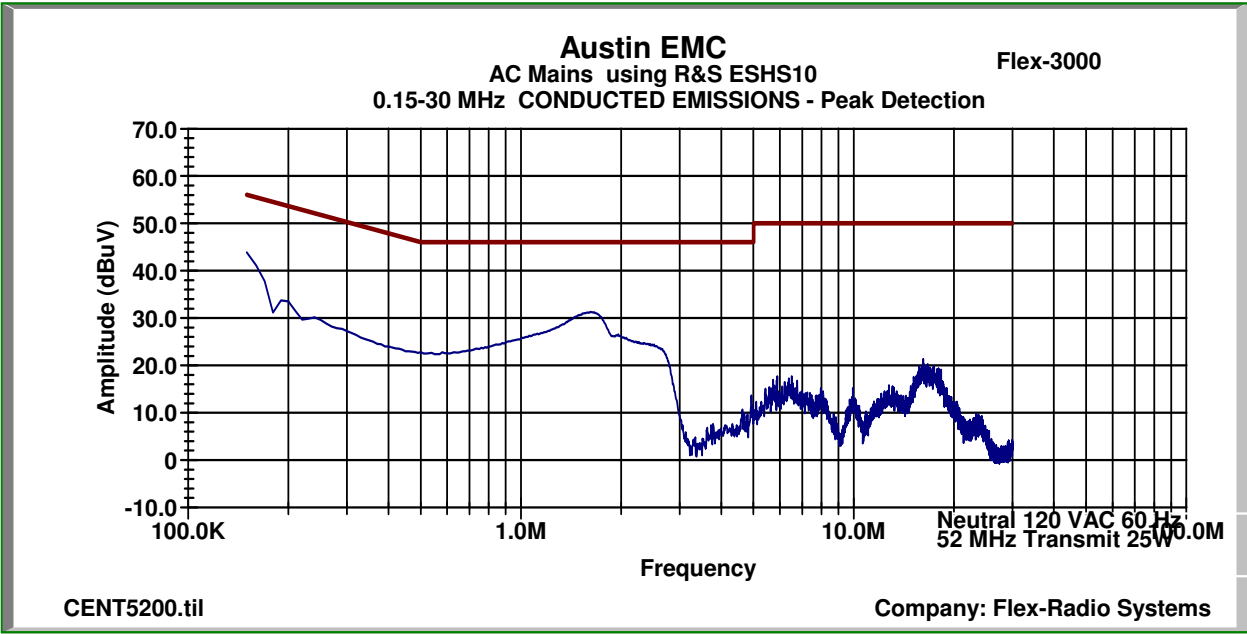
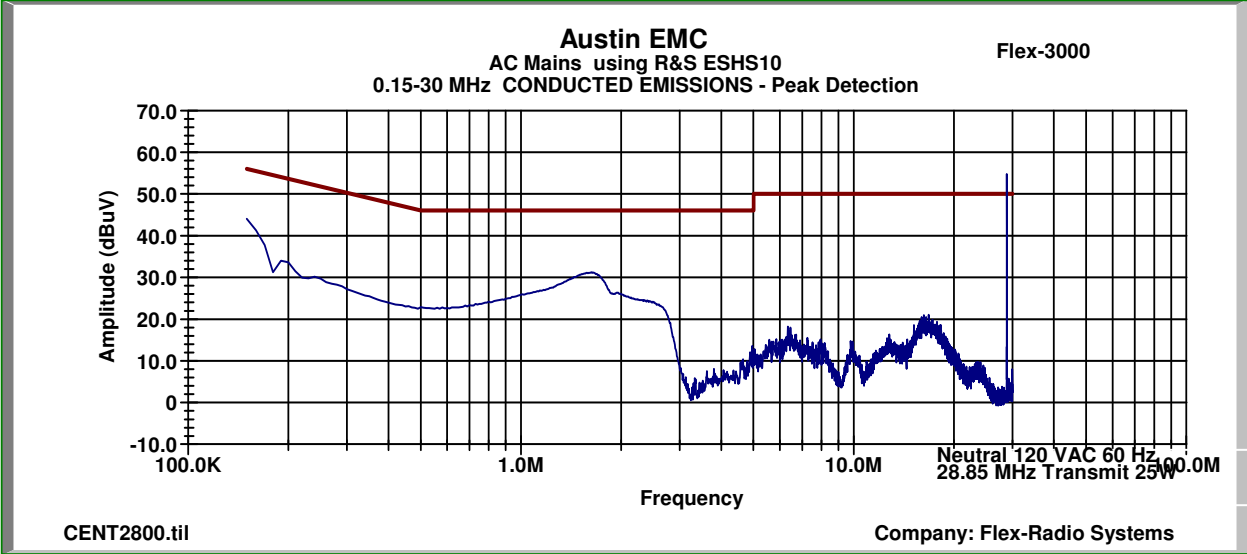


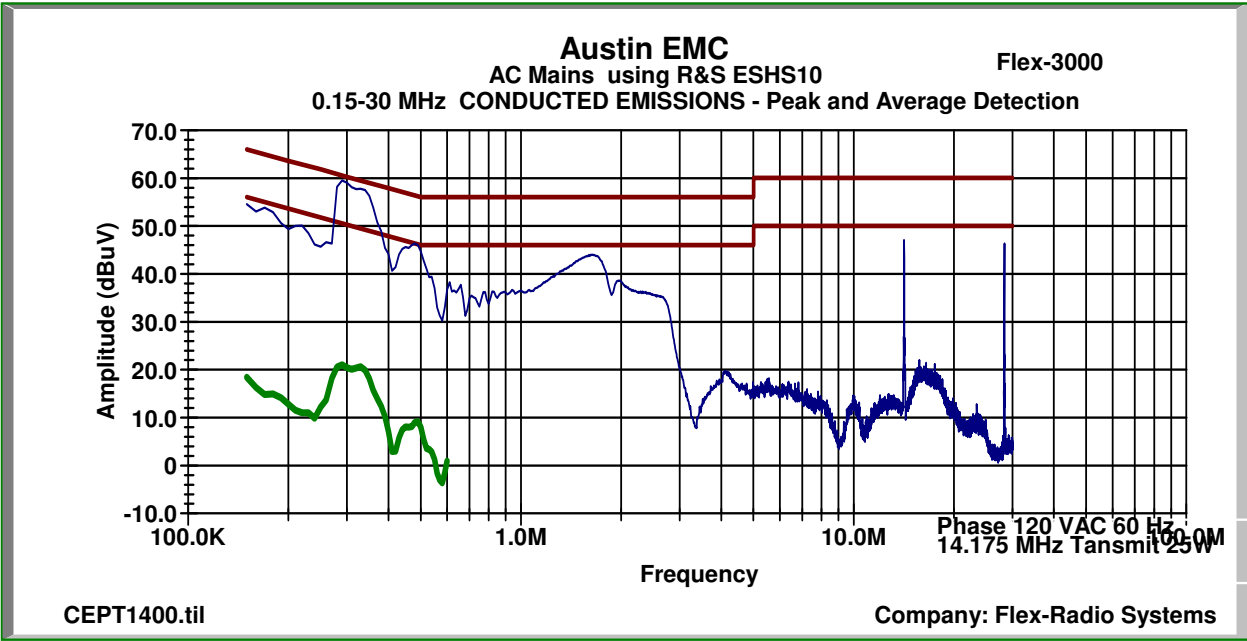
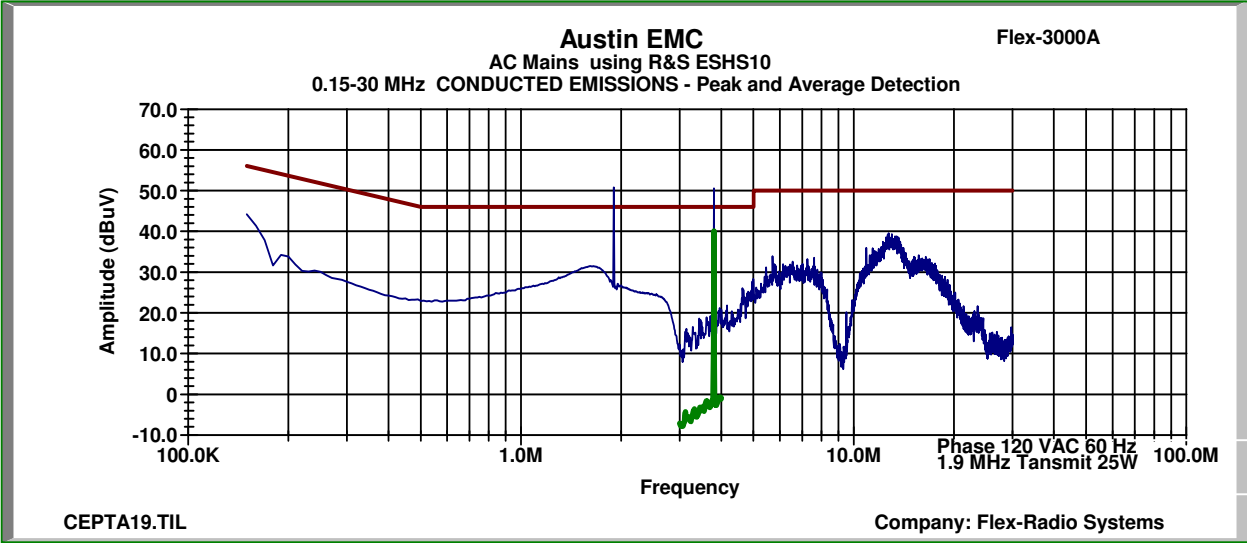


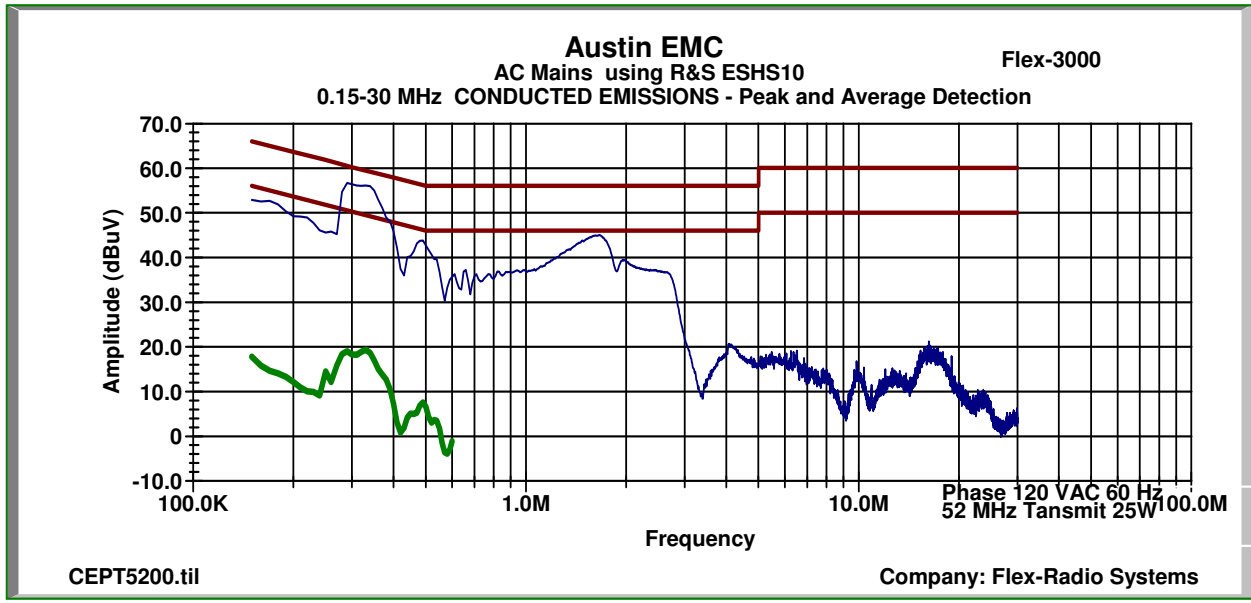
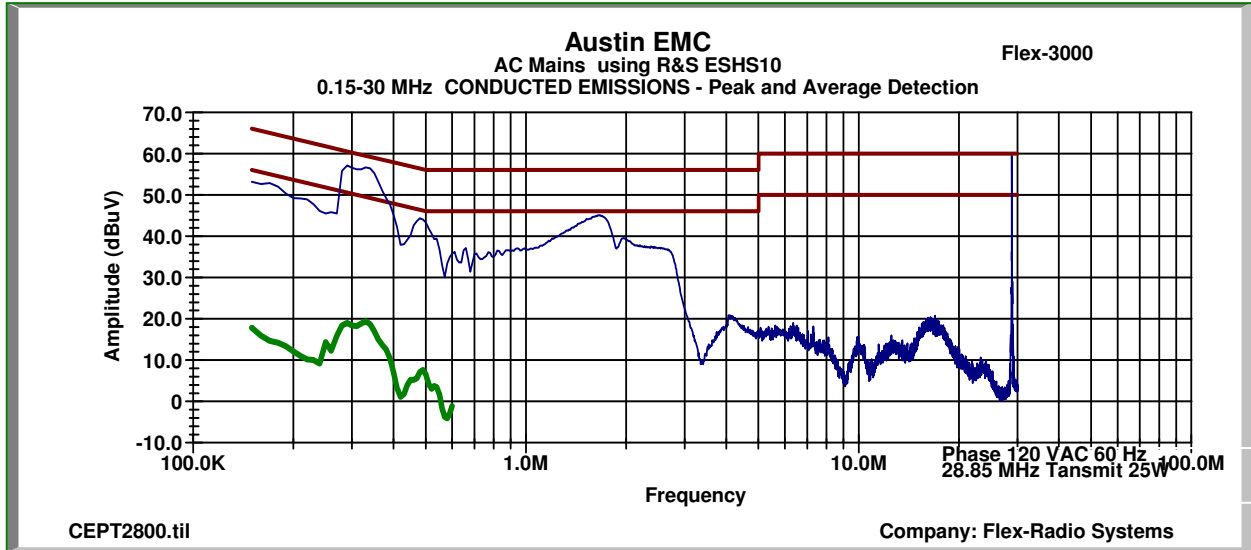




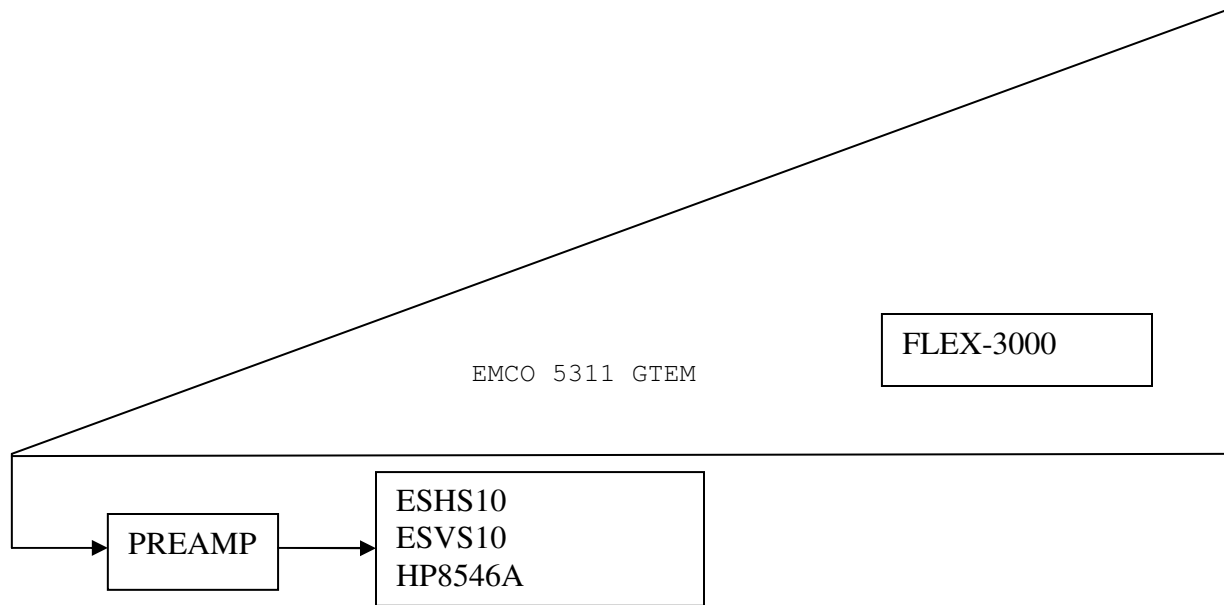




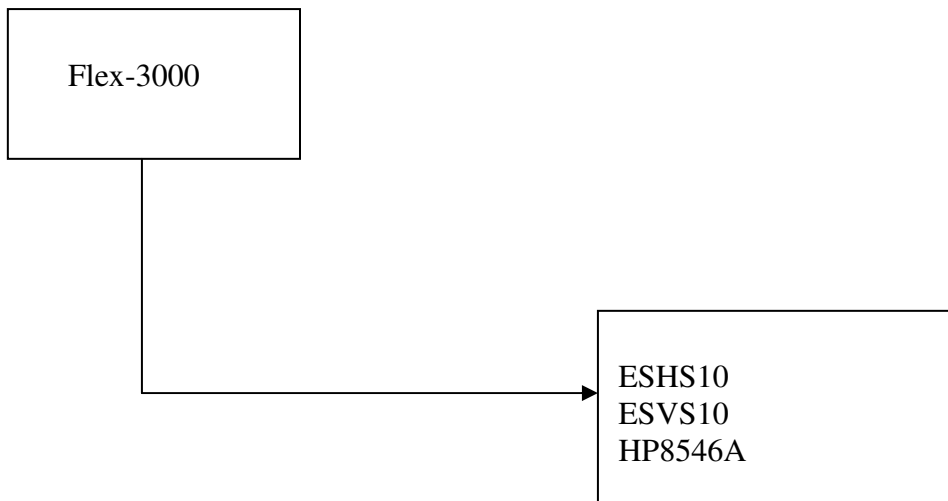




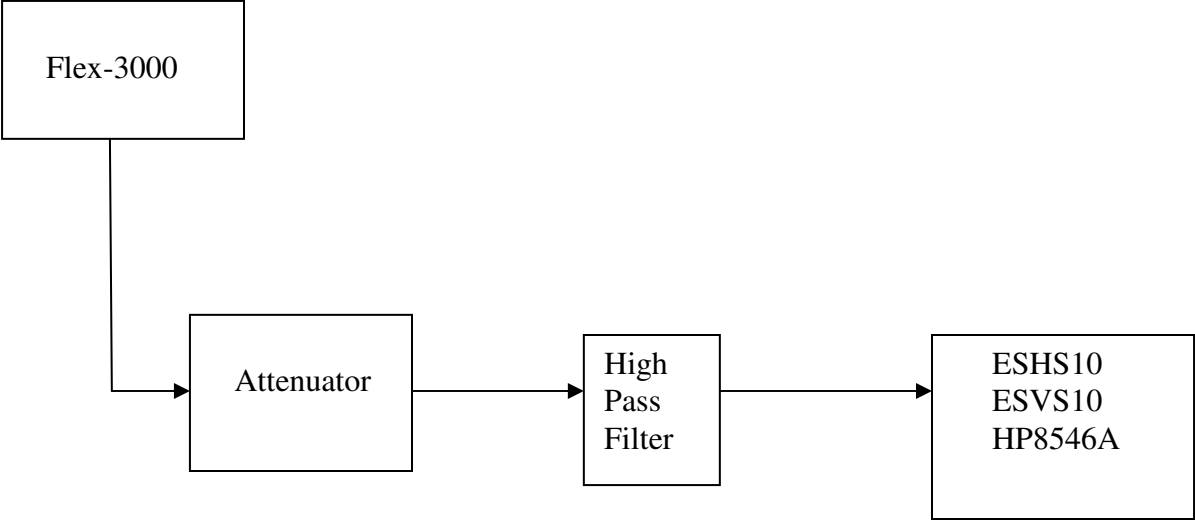
## Radiated Test Setup Diagram



## Antenna Conducted Setup Diagram: Receive

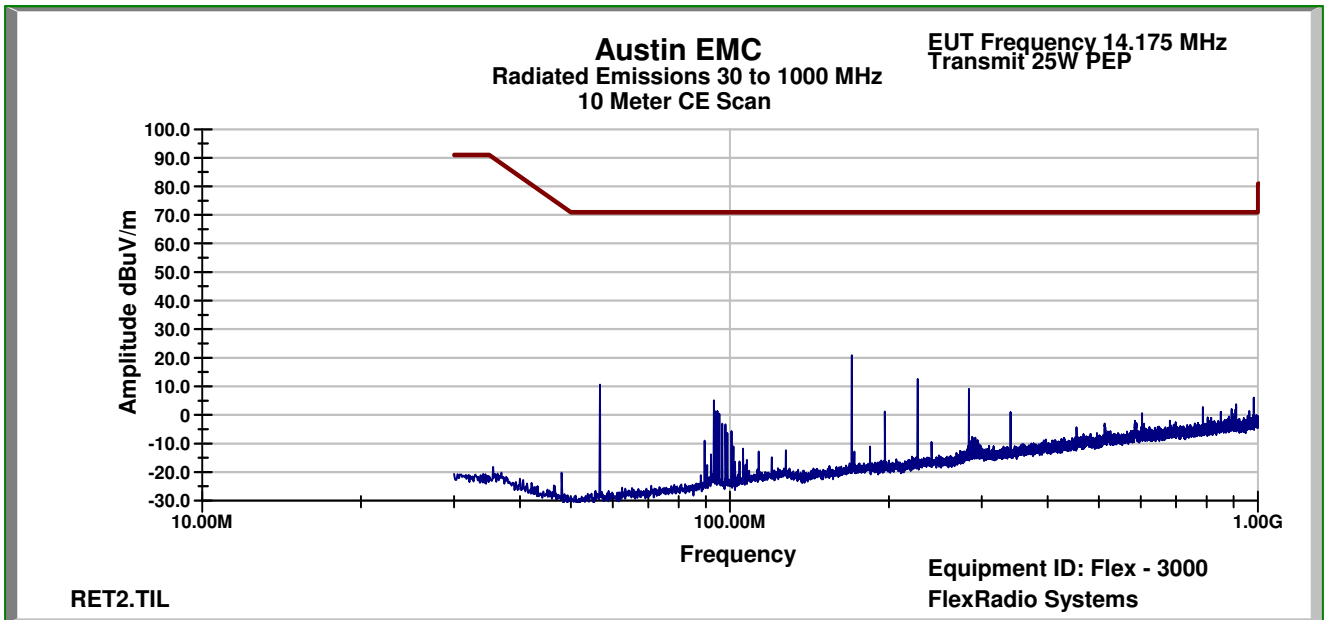
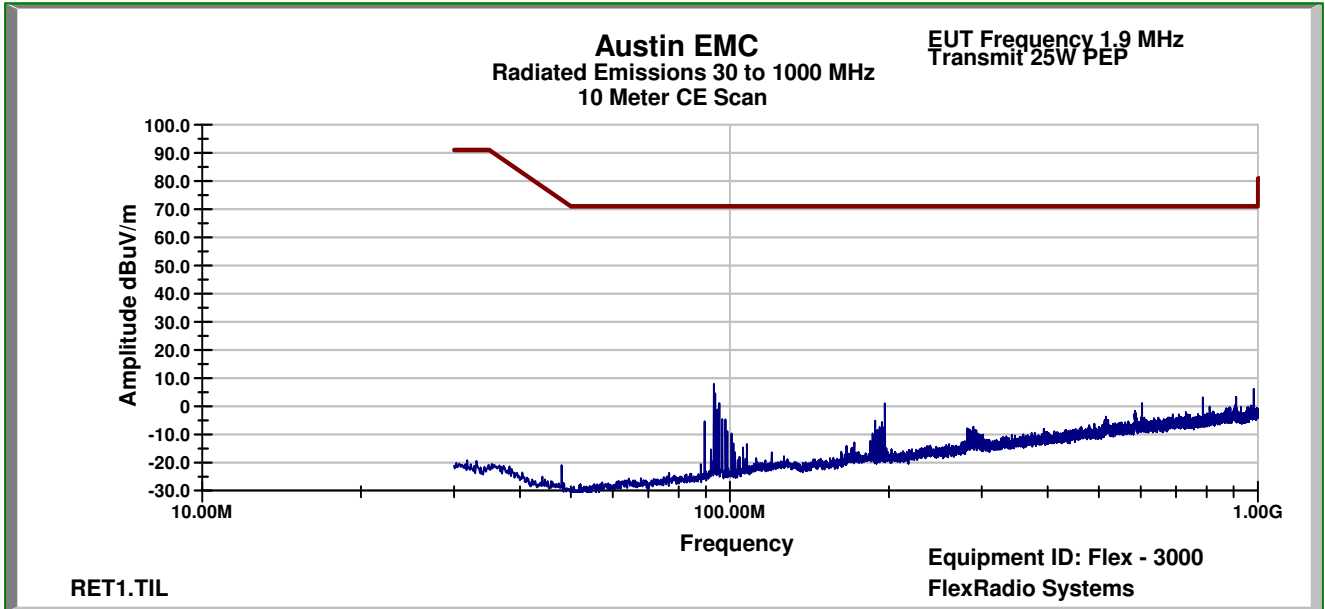


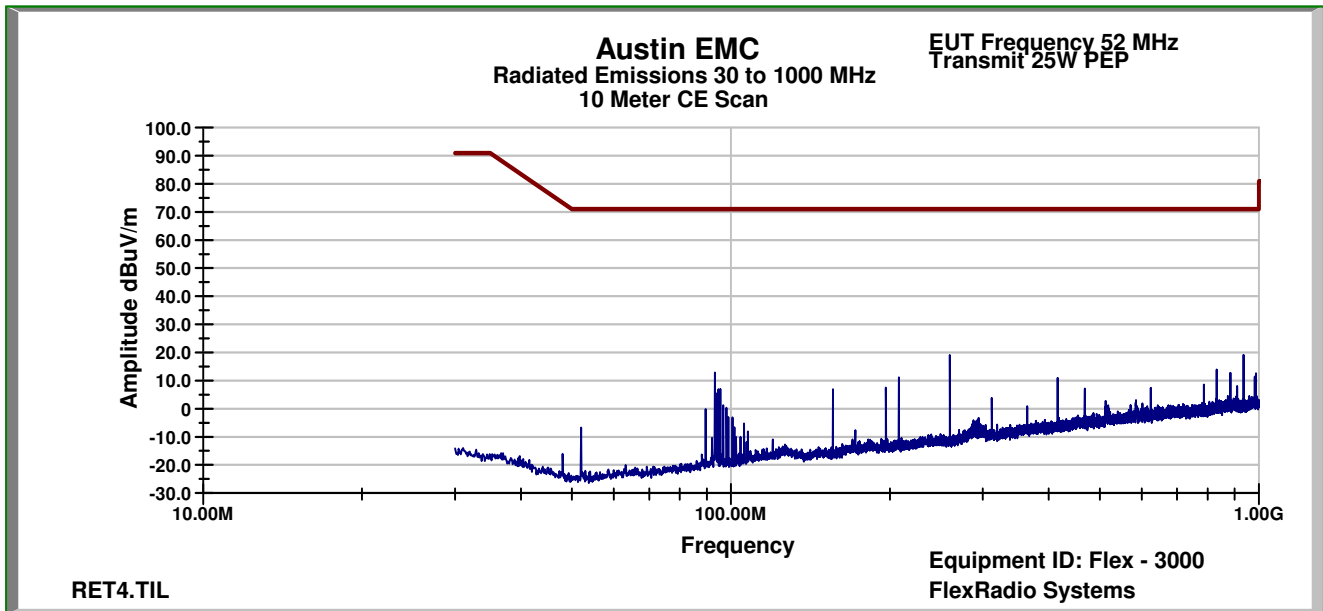
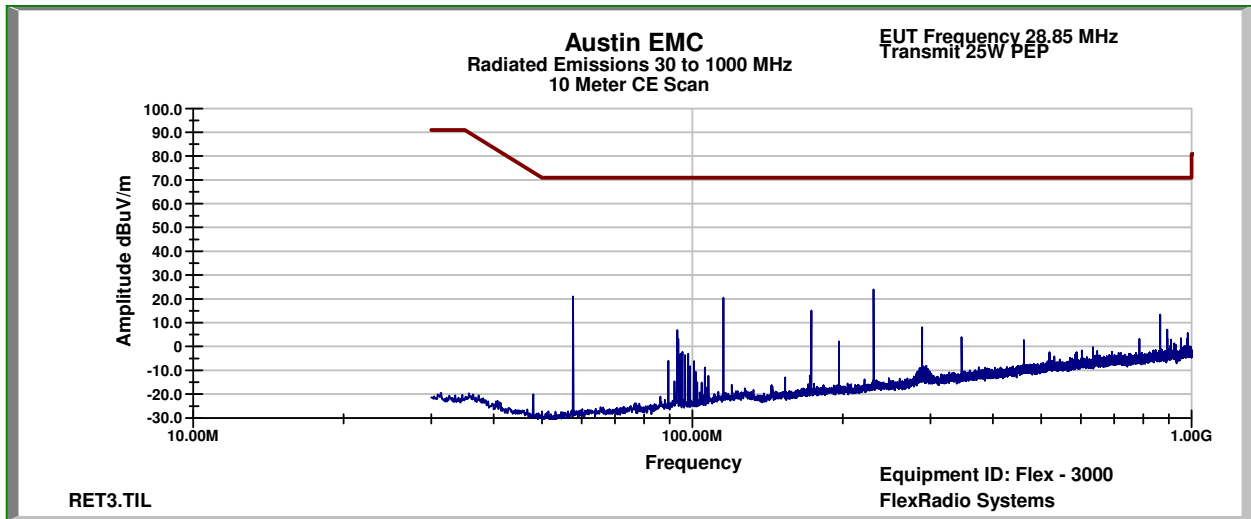
**Antenna Conducted Setup Diagram: Transmit**

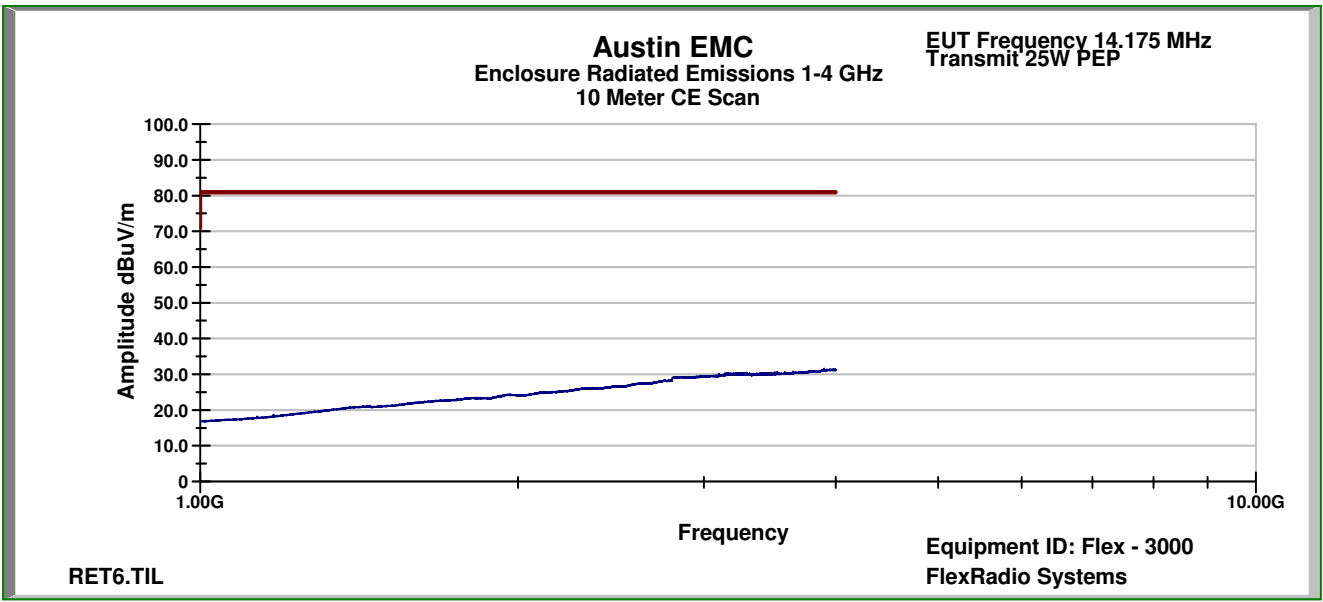
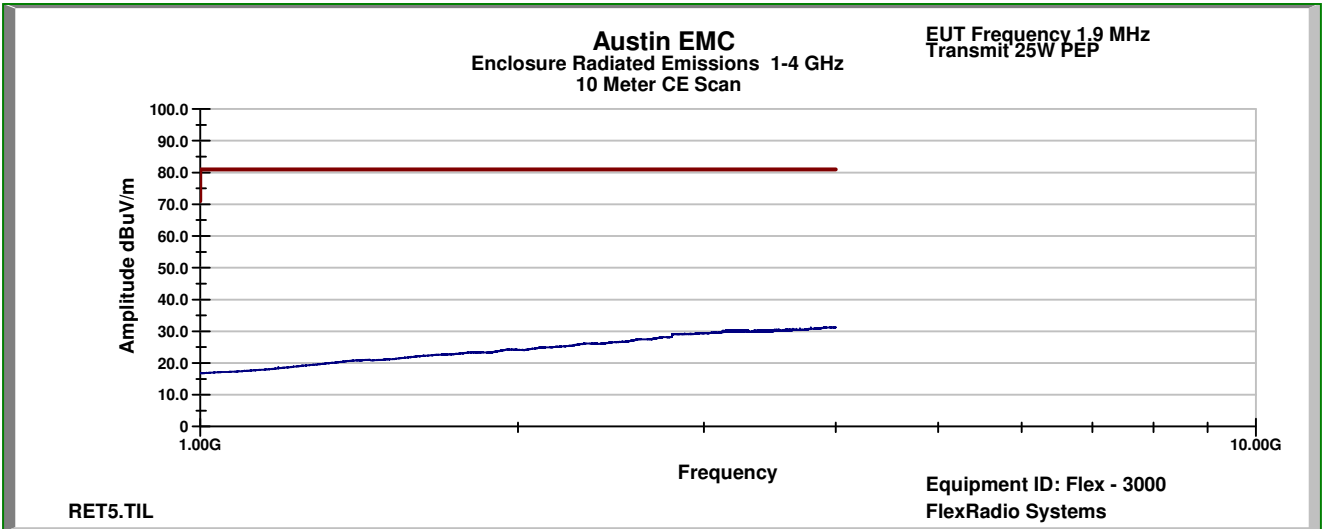


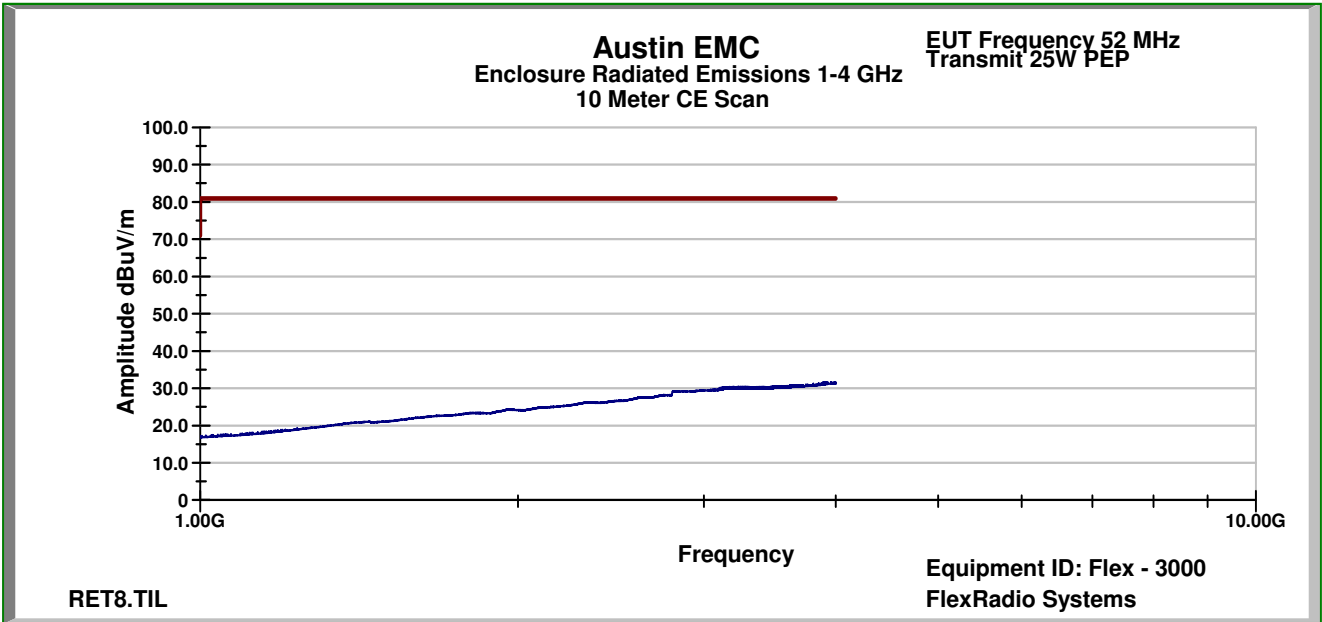
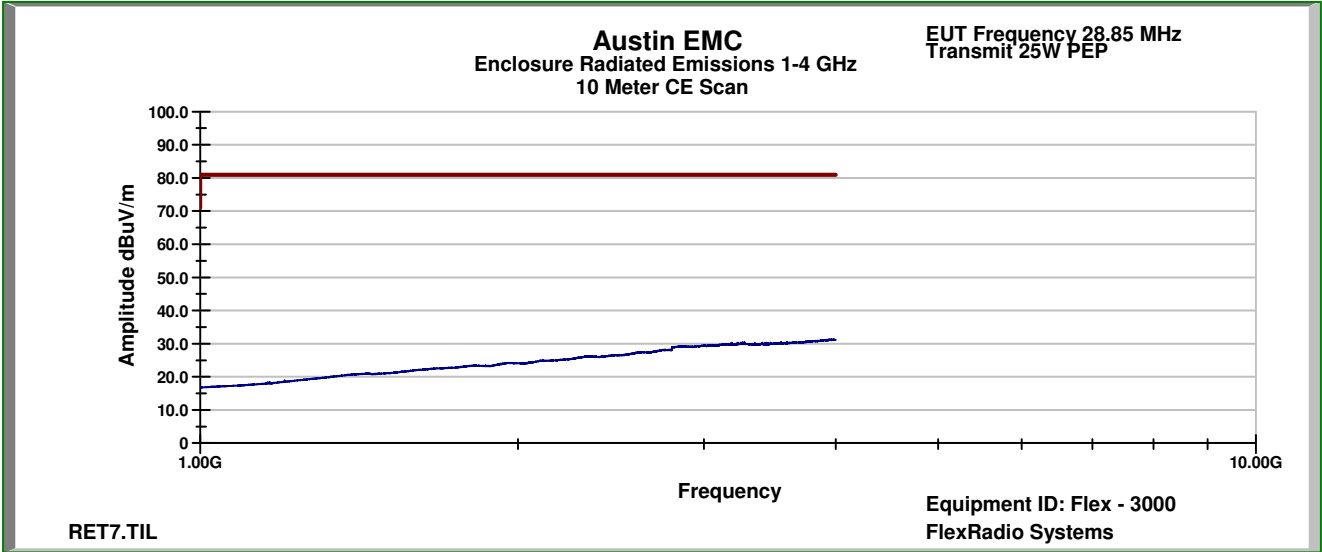


# Radiated Emission, Transmit Peak Plots

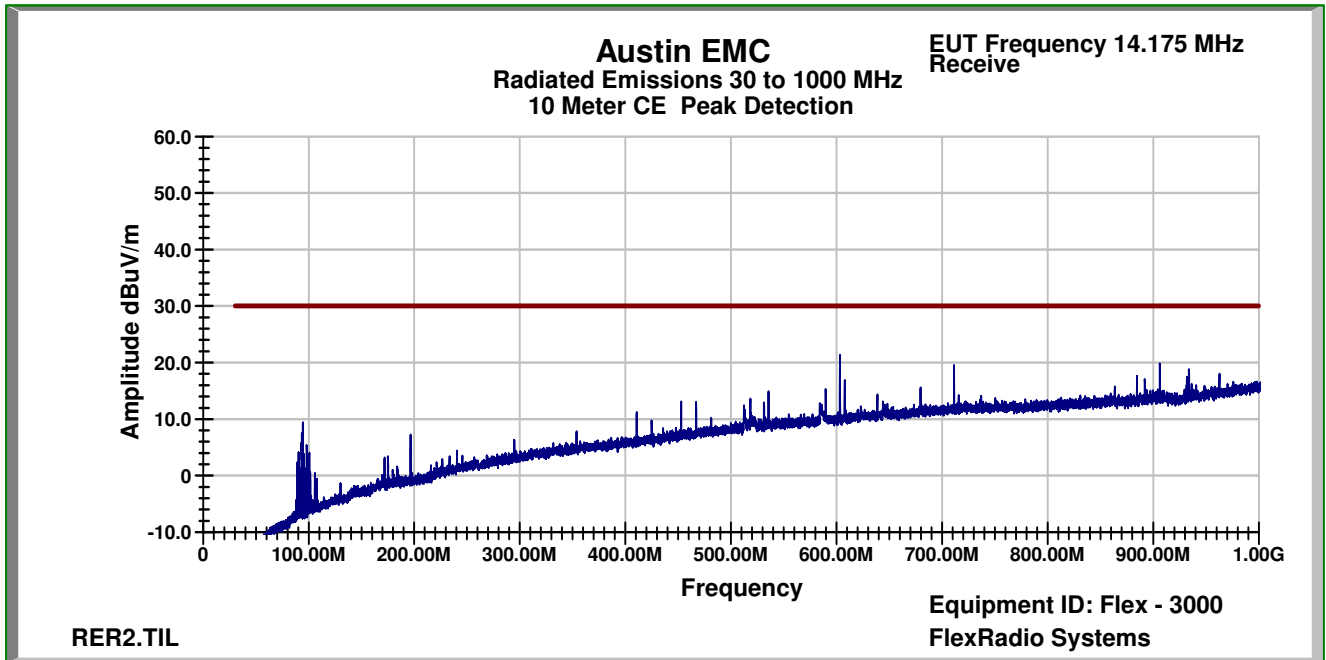
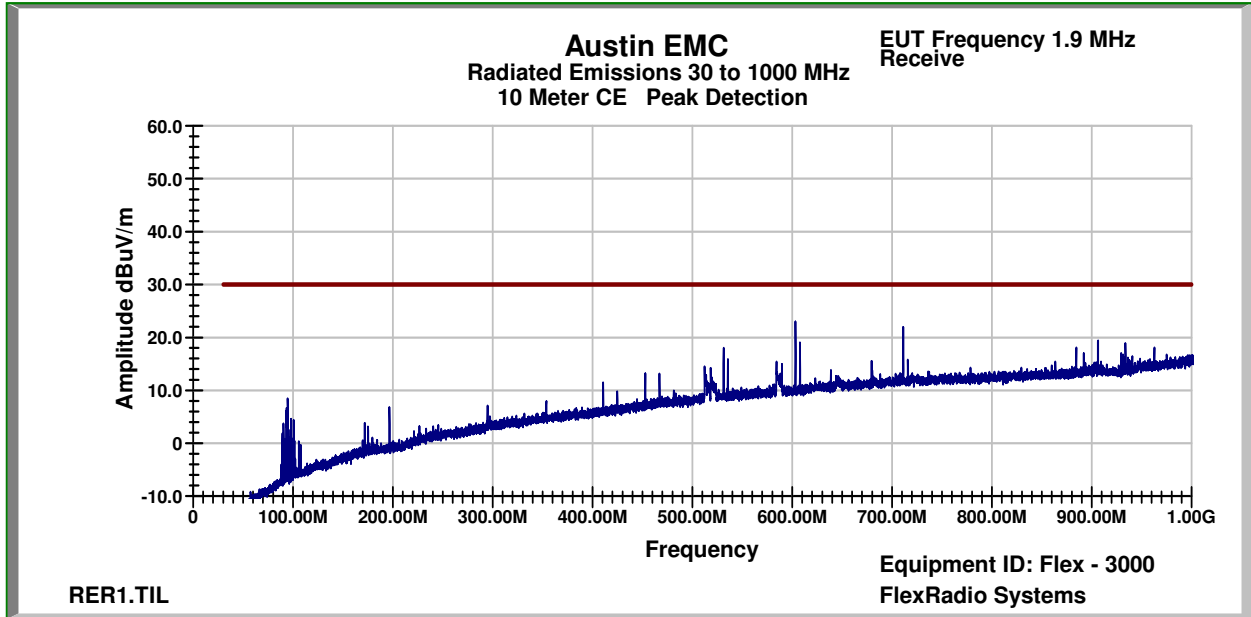


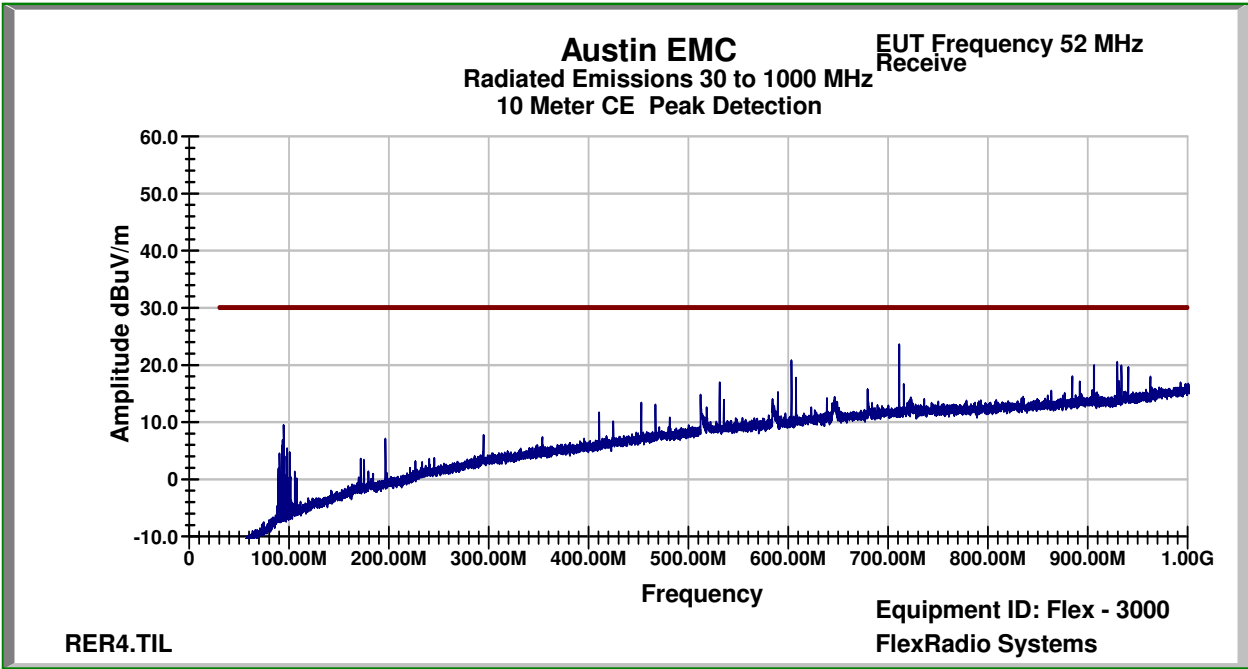
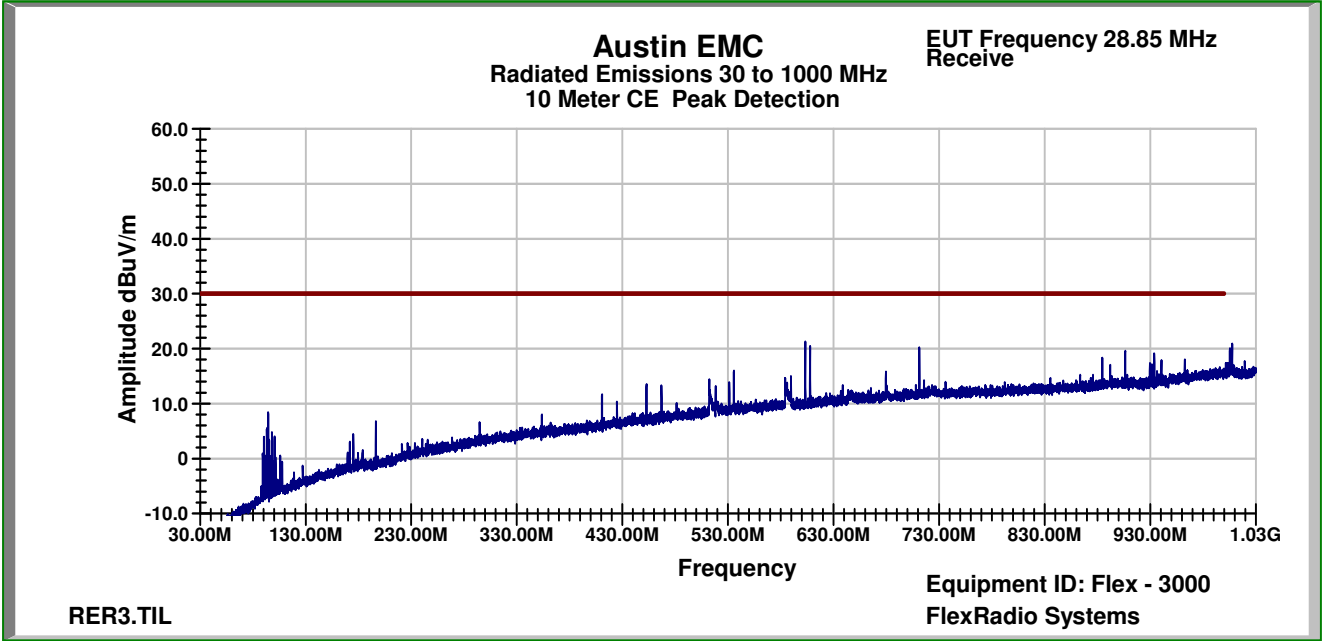




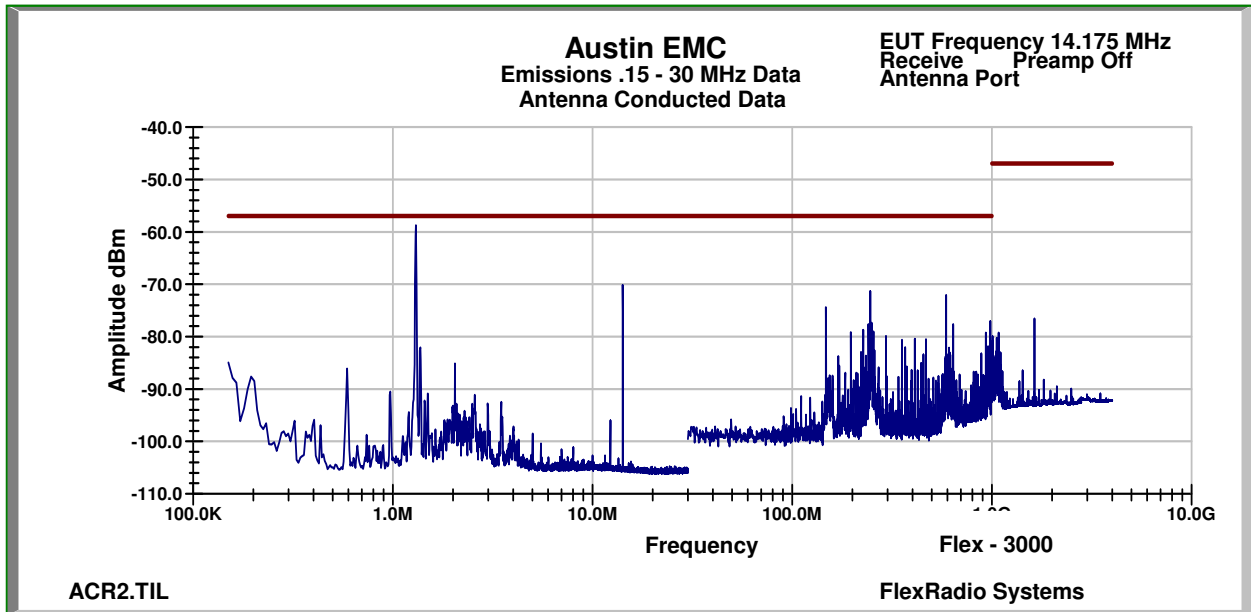
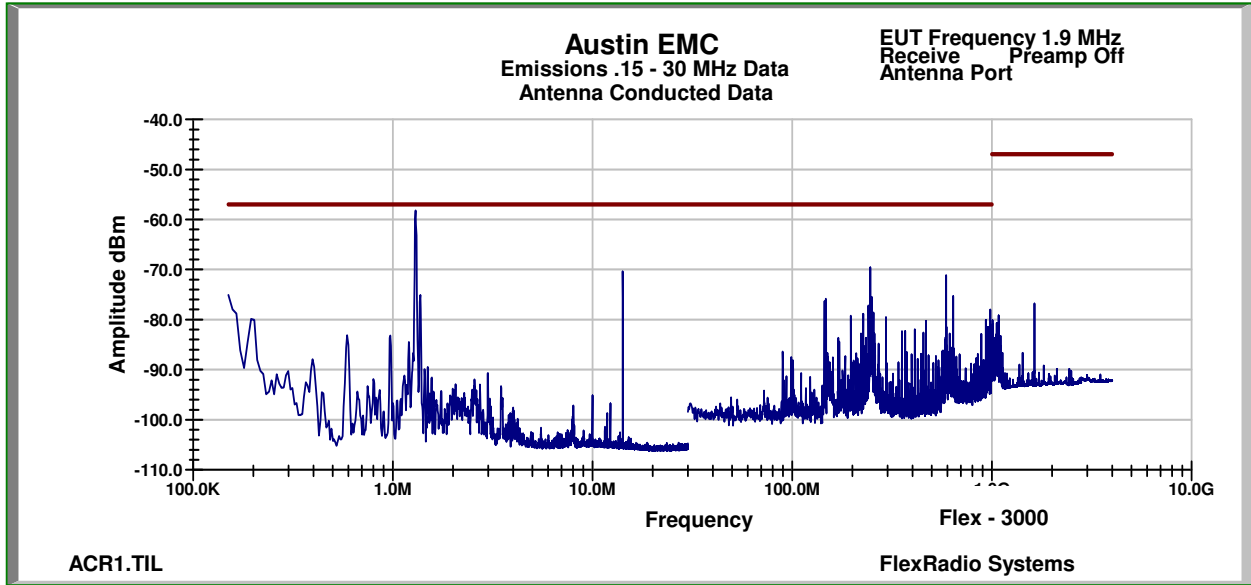


# Radiated Emission, Receive Peak Plots

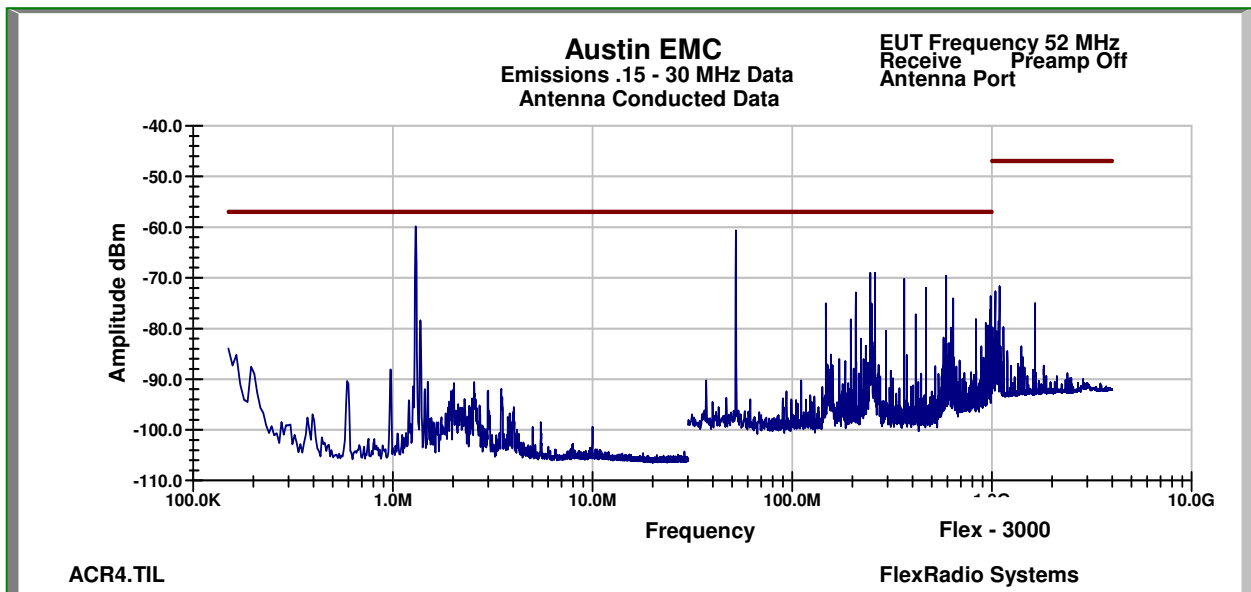
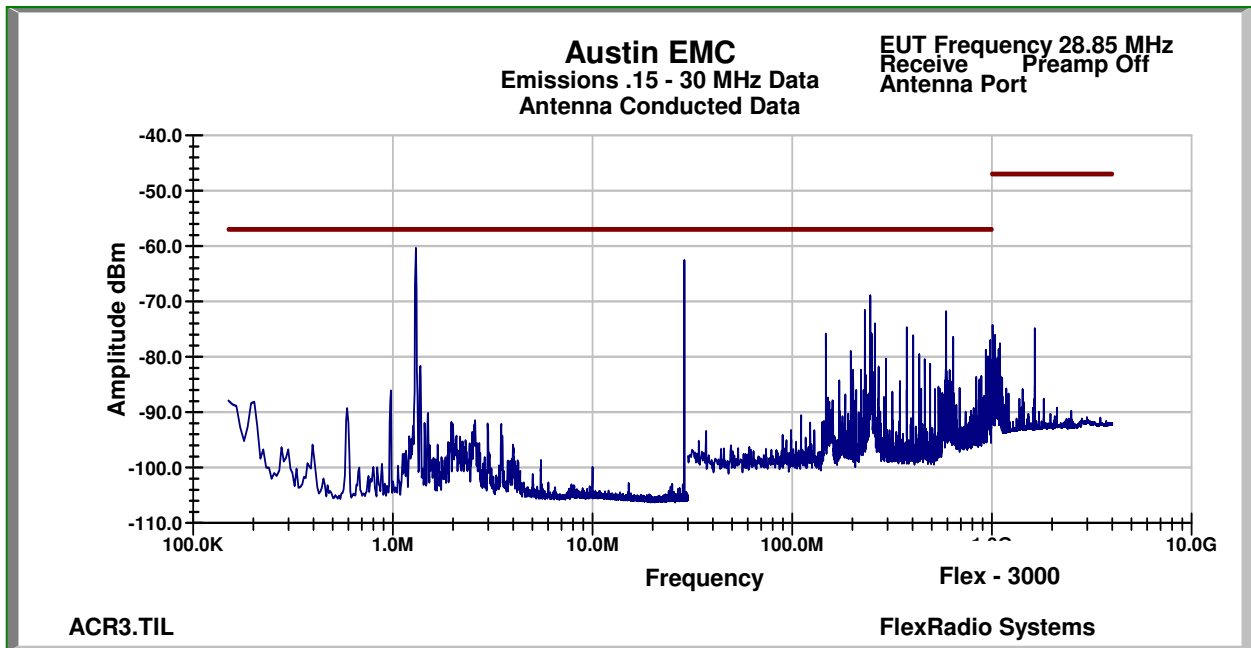




# Unwanted Emission, Antenna Conducted, Receive, Plots



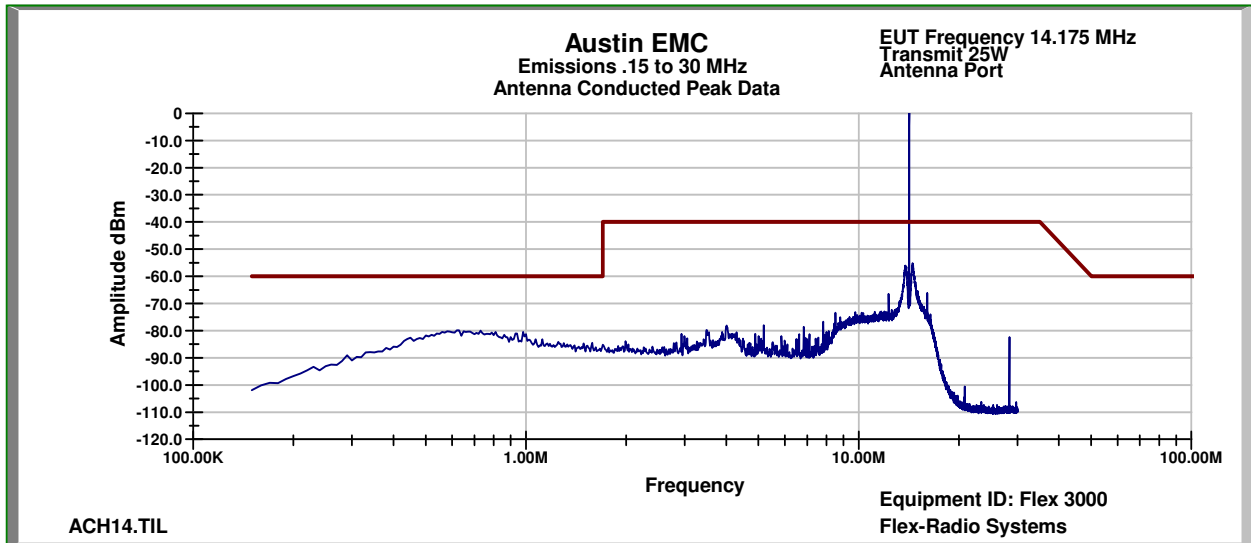
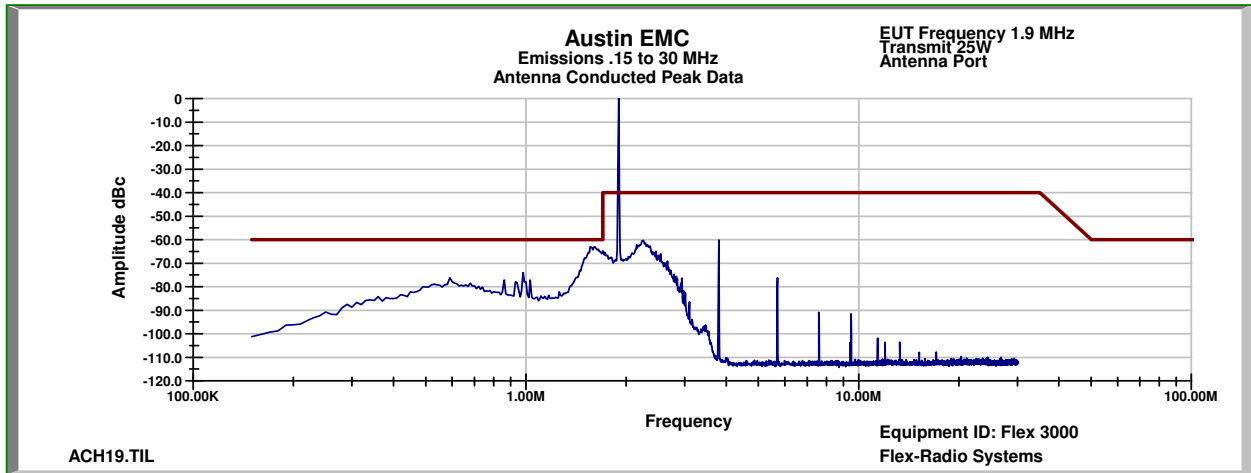
Disregard 1300KHz Signal (Local Broadcast Radio Station)

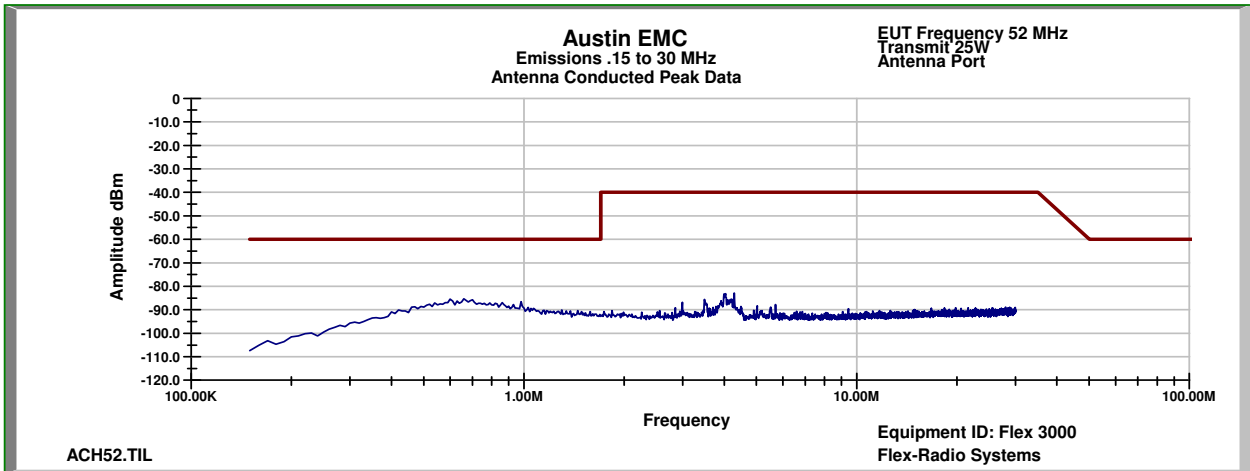
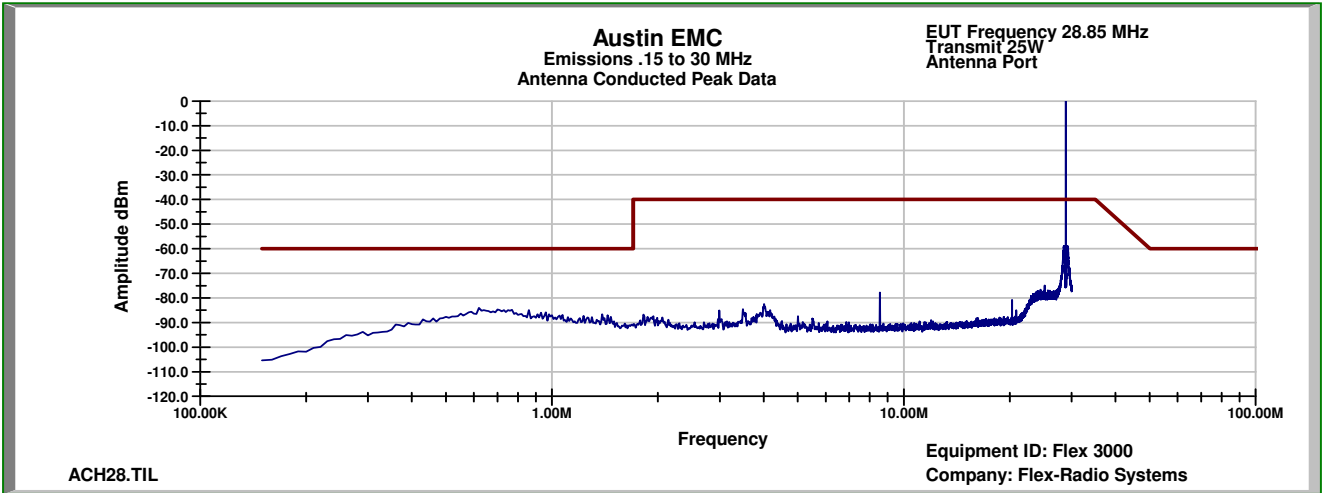


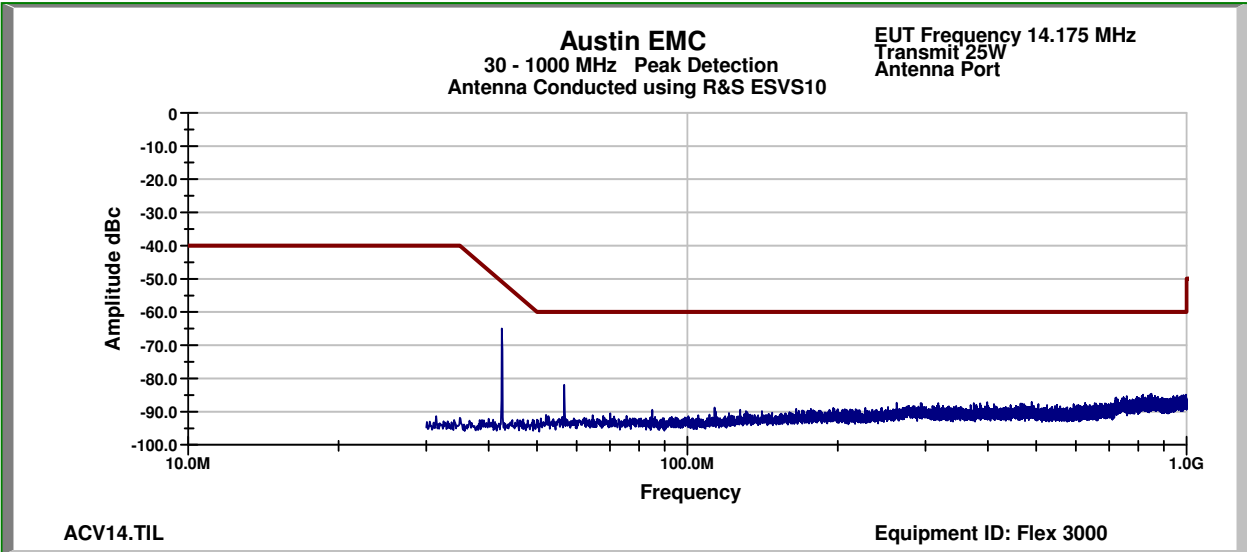
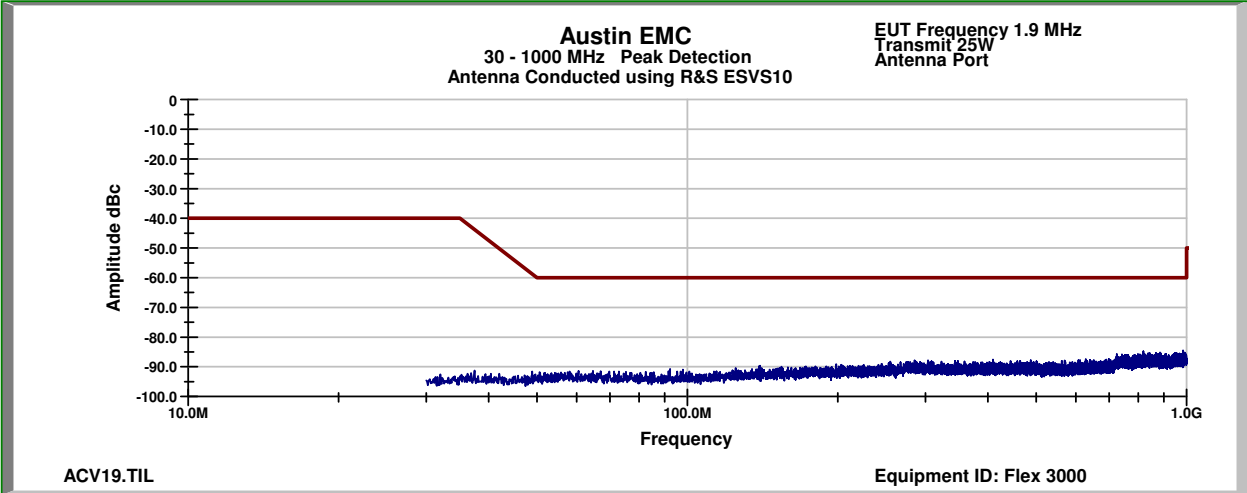
Disregard 1300KHz Signal (Local Broadcast Radio Station)

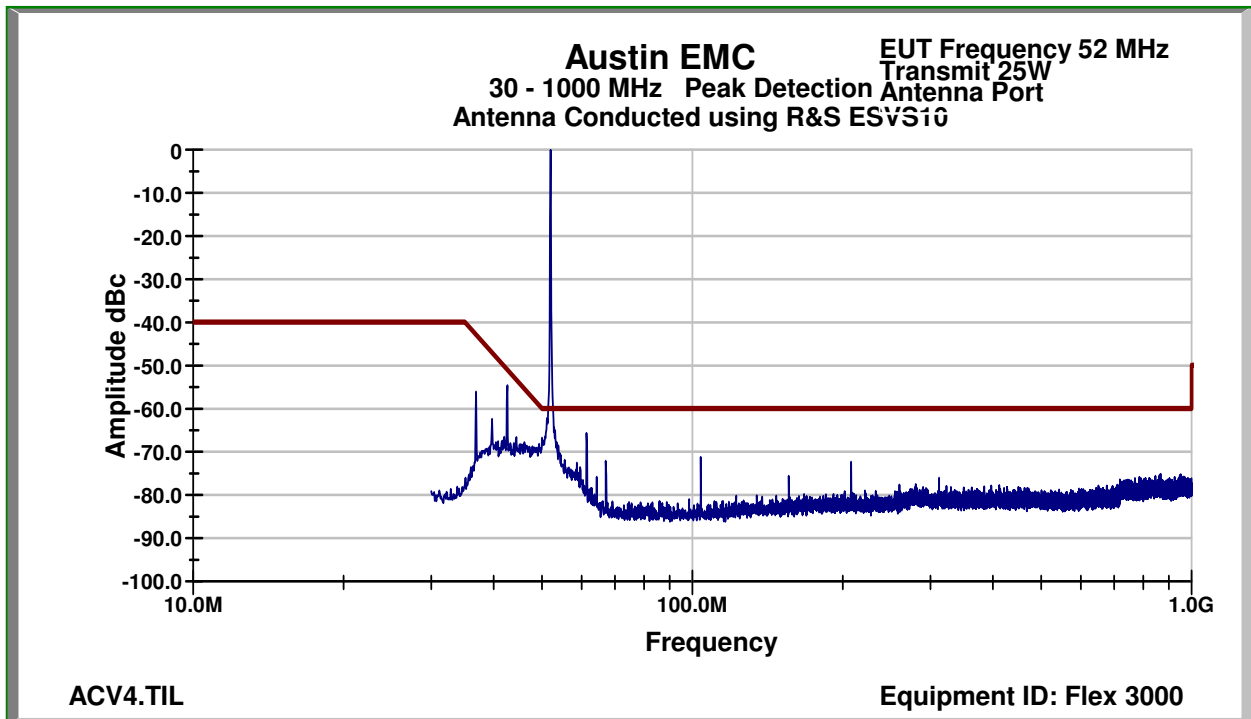
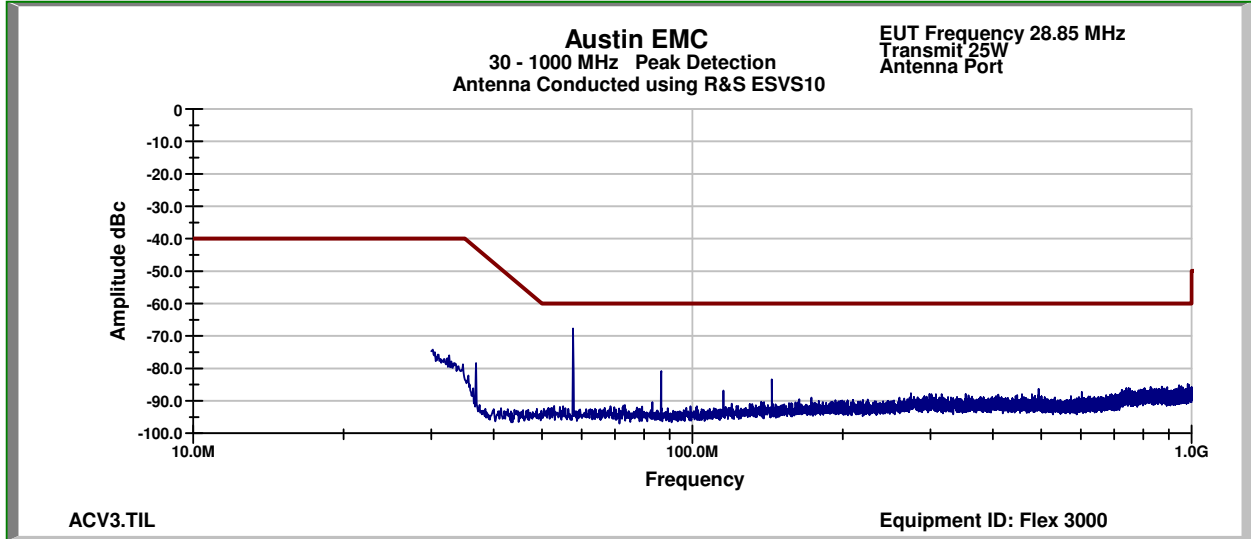


# Unwanted Emission, Antenna Conducted, Transmit, Plots

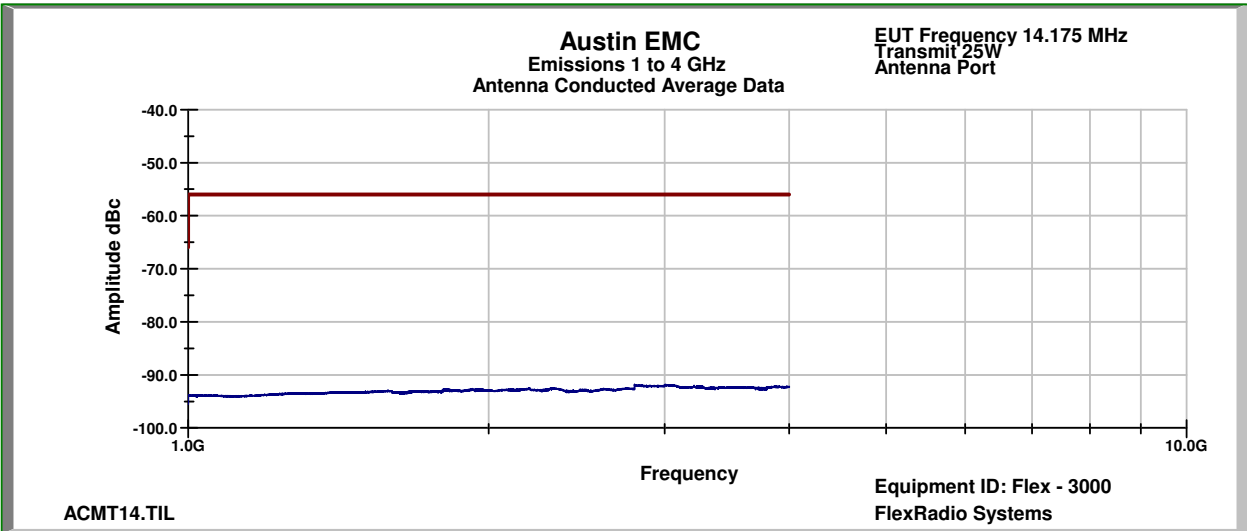
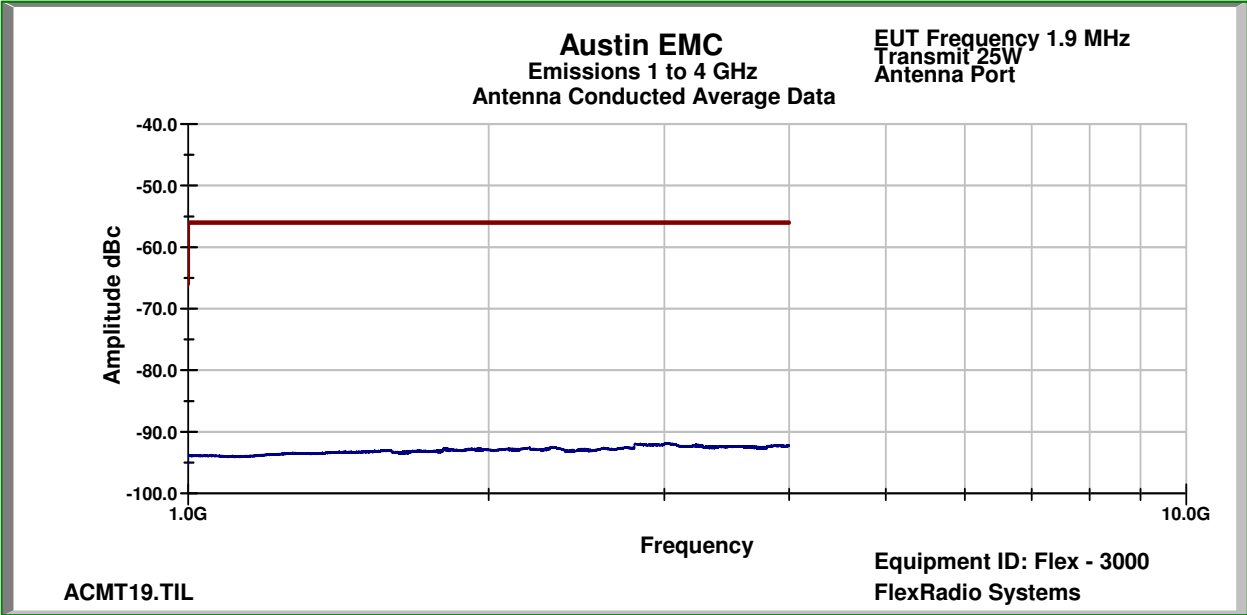


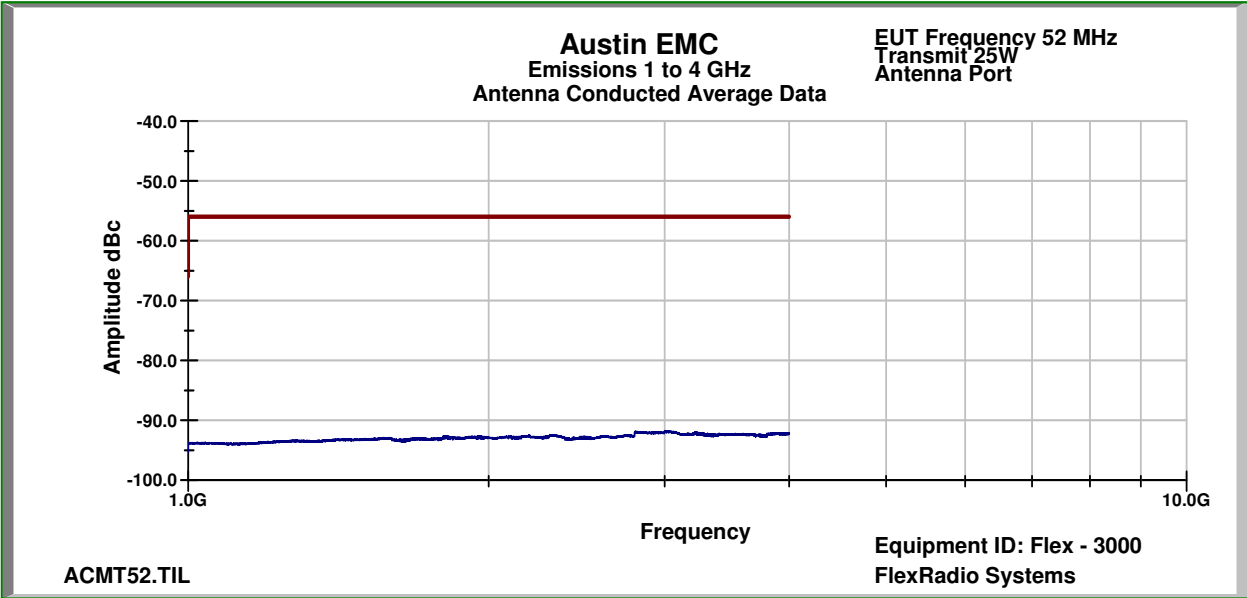
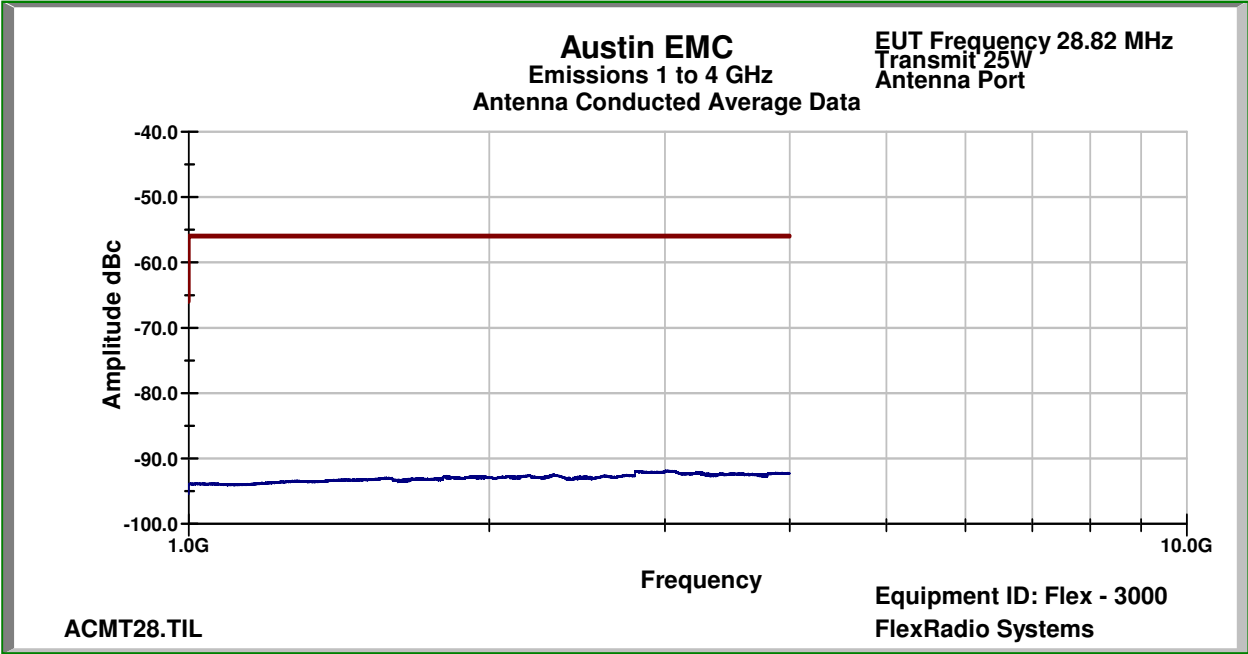






**Fundamental Frequency is excluded from limit**





## Measurement Equipment Utilized @ Austin EMC

Manufacturer	Model #	Description
HP	8568B	Spectrum Analyzer 100 kHz – 1500 MHz
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	N/A	Two Meter Cable from LISN
ARL	Lim1	Signal Limiter 5.4 dB insertion loss
Bird	N/A	100 Watt 50 Ohm Dummy Load
JFW	50FH-30-20	30 dB 20Watt Attenuator
EMCO	A8620N-20	20 dB 50 Watt Attenuator
HP	HP8491A	3 dB 2 Watt Attenuator
Mini-Circuits	NHP-25	High Pass Filter
Mini-Circuits	NHP-150	High Pass Filter
Mitec	N/A	40 dB 0.1 - 1100 MHz 1 dB NF Preamp
Mitec	N/A	33.5 dB 100 to 6000 MHz Preamp
Gore	N/A	10 Meter Armored Cable
Brown	N/A	Cable from Shielded Room
Panashield	N/A	Double Shielded Room
EMCO	5311	Gigahertz Transverse Electric Mode Chamber
Gore	N/A	1.5 Meter Cable from GTEM
Gore	N/A	1.5 Meter Cable from Preamp