

# 1. ERP @ FCC 2.1046 & 90.205

## 1.1. LIMITS @ FCC 90.205

Please refer to FCC CFR 47, Part 90, Subpart I, Para. 90.205 for specification details.

## 1.2. METHOD OF MEASUREMENTS

Refer to section 2 of this report.

## 1.3. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Power Meter	Hewlett Packard	436A	1725A02249	10 kHz – 50 GHz, sensor dependent
Power Sensor	Hewlett Packard	8481A	2702A68983	10 MHz – 18 GHz
Attenuator(s)	Bird	...	...	DC – 22 GHz
EMI Receiver/ Spectrum Analyzer	Advantest	R3271	15050203	100 Hz – 26.5 GHz
Attenuator(s)	Weinschel Corp	24-20-34	BJ2357	DC – 8.5 GHz
Dipole Antenna	EMCO	3121C	8907-440	30 MHz – 1 GHz
Dipole Antenna	EMCO	3121C	8907-434	30 MHz – 1 GHz
Synthesized RF Signal Generator	Gigatronic	6061A	5130408	10kHz – 1050 MHz

## 1.4. TEST DATA

### Equipment Under Test Integral Antenna Description

Manufacturer: Tecom  
 Part Number: 703705  
 Frequency Range: 902 – 928 MHz  
 VSWR: 2:0:1  
 Gain: 0dBi nominal, 3dBi Max.  
 Polarization: Linear

### ERP Using Substitution Method

Frequency (MHz)	Peak E-Field @ 3m (dBμV/m)	Antenna Polarization (V/H)	Peak Power From Signal GEN. Ps – Cable loss (dBm)	Substitution Antenna Gain Gd (dBi)	Measured Peak ERP = Ps+Gd-2.15 (dBm)	Measured Peak EIRP = ERP+2.15 (dBm)
896	127.4	V	32.8	1.3	32.0	34.1
<b>896</b>	<b>130.7</b>	<b>H</b>	<b>35.1</b>	<b>1.3</b>	<b>34.3</b>	<b>36.4</b>
901	126.6	V	31.4	1.8	31.1	33.2
901	131.4	H	35.4	1.8	34.3	36.4

The maximum measured ERP is 34.3 dBm (2.7 W), as indicated in the above table.

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## 2. RADIATED POWER MEASUREMENTS (ERP & EIRP) USING SUBSTITUTION METHOD

### 2.1. MAXIMIZING RF EMISSION LEVEL (E-FIELD)

- (a) The measurements were performed with full rf output power and modulation.
- (b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
- (c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
- (d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
- (e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor  
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

- (f) Set the EMI Receiver and #2 as follows:

Center Frequency:	test frequency
Resolution BW:	100 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

- (g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
- (h) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
- (i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
- (j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
- (k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
- (l) Repeat for all different test signal frequencies

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## 2.2. MEASURING THE EIRP OF SPURIOUS/HARMONIC EMISSIONS USING SUBSTITUTION METHOD

- (a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency:	equal to the signal source
Resolution BW:	10 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

- (b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor  
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$

- (c) Select the frequency and E-field levels obtained in the Section 2.1 for ERP/EIRP measurements.  
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):  
♦ DIPOLE antenna for frequency from 30-1000 MHz or  
♦ HORN antenna for frequency above 1 GHz  
(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.  
(f) Use one of the following antenna as a receiving antenna:  
♦ DIPOLE antenna for frequency from 30-1000 MHz or  
♦ HORN antenna for frequency above 1 GHz  
(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.  
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.  
(i) Tune the EMI Receivers to the test frequency.  
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.  
(k) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.  
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.  
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.  
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

$$P = P1 - L1 = (P2 + L2) - L1 = P3 + A + L2 - L1$$

$$EIRP = P + G1 = P3 + L2 - L1 + A + G1$$

$$ERP = EIRP - 2.15 \text{ dB}$$

$$\text{Total Correction factor in EMI Receiver \# 2} = L2 - L1 + G1$$

Where: P: Actual RF Power fed into the substitution antenna port after corrected.  
P1: Power output from the signal generator  
P2: Power measured at attenuator A input  
P3: Power reading on the Average Power Meter  
EIRP: EIRP after correction  
ERP: ERP after correction

- (o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)  
(p) Repeat step (d) to (o) for different test frequency  
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.  
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.:

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Figure 1

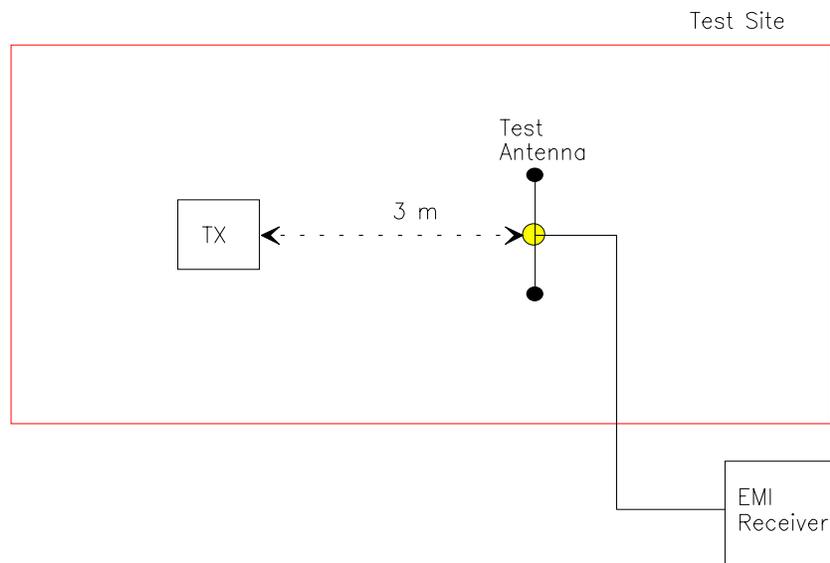
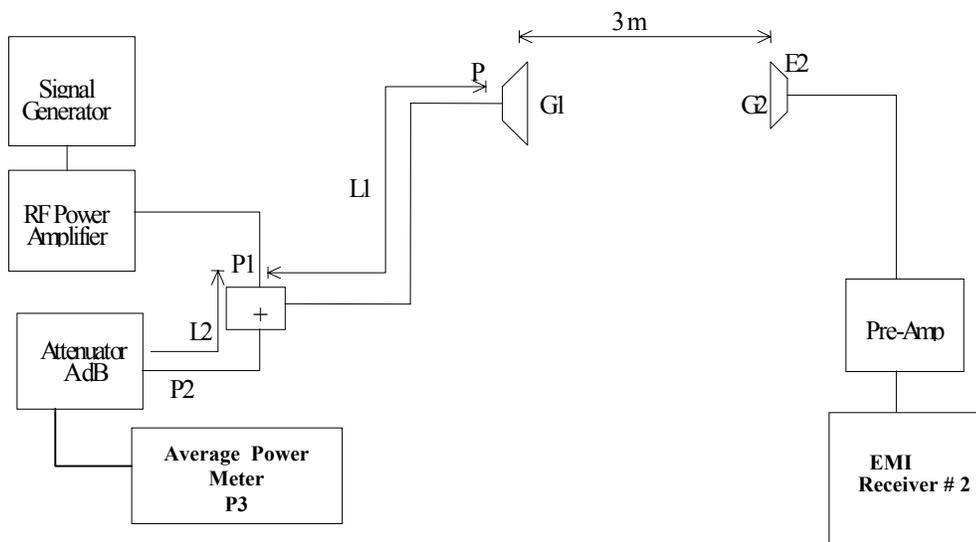


Figure 2



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