

6.8 Effective Radiated Power (ERP)

A) As described in more detail in Exhibit 7.1.b. the radiated power received at a spectrum analyzer was measured from the radio specimen with integral antenna at 2 degree increments as the specimen was rotated. These recorded power readings are uncalibrated ERP measurements. To convert these readings to ERP values a reference reading was obtained from a calibrated (to an ideal dipole) antenna to which was applied the same power level as the measured output power of the radio specimen. The reading at the spectrum analyzer from this calibrated reference antenna served to calibrate the spectrum analyzer readings for ERP measurements. By comparing the readings between the reference antenna and the radio specimen, and with a measurement of the output power of the radio specimen, this measurement also serves to determine the radio specimen antenna gain. The following calculation shows how ERP was determined from these measurements at 250 and 264 degrees rotation.

- a. Analyzer reading for radio specimen, as tested at 28.4 dBm (686 mW) output power: -15.7 dBm
- b. Analyzer reading for a substitution ideal dipole antenna, at 28.3 dBm (670 mW) applied power: -14.45 dBm
- c. Antenna gain (logarithmic) compared to an ideal dipole: $(-15.7) - (-14.45) - (28.4 - 28.3) = -1.35$ dBd
- d. Measured ERP: $(28.4) + (-1.35) = 27.05$ dBm
- e. Measured ERP: 502.4 milliwatts

However, the measured ERP value above was not determined at the production controlled maximum output power of the radio product so it is necessary to scale this number. The antenna gain permits the ERP to be calculated for any output power value in a manner similar to steps c and d above. The following calculations were used to determine the Maximum ERP rating of the radio product (512.7 milliwatts), as stated in Exhibit 12.1.C, based upon the maximum output power rating (700 milliwatts) stated in Exhibit 12.1.A.

- f. Maximum output power rated: 700 milliwatts
- g. Output power, measured: 686 milliwatts.
- h. Maximum calculated ERP: $502.4 \times (700/686) = 512.7$ milliwatts

The method above was used for all information provided in the data table which follows that, for brevity, only lists values of items a, e and h as a function of rotational angle. The following graph of item h. is provided to serve as a simplified summary of that tabulated data and permits observation of the maximum calculated ERP at the 250 and 264 degree azimuthal positions.

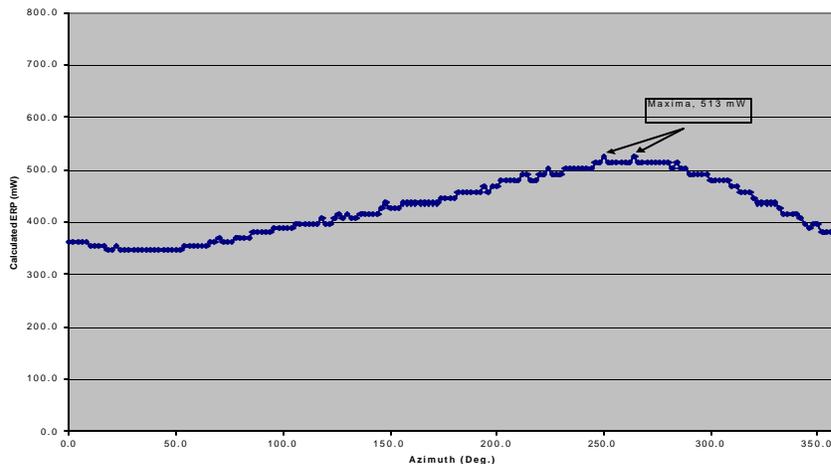


Figure 6-49: Maximum ERP vs. Azimuth

Angle	SA Reading	Measured	Maximum Calculated	Notes
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		ERP	ERP	
(deg)	(dBm)	(mW)	(mW)	
0.0	-41.4	1.78	402.8	Front
2.0	-41.5	1.74	393.6	
4.0	-41.5	1.74	393.6	
6.0	-41.6	1.70	384.7	
8.0	-41.5	1.74	393.6	
10.0	-41.6	1.70	384.7	
12.0	-41.7	1.66	375.9	
14.0	-41.8	1.62	367.4	
16.0	-41.7	1.66	375.9	
18.0	-41.8	1.62	367.4	
20.0	-41.8	1.62	367.4	
22.0	-41.9	1.58	359.0	
24.0	-41.9	1.58	359.0	
26.0	-41.9	1.58	359.0	
28.0	-41.8	1.62	367.4	
30.0	-41.9	1.58	359.0	
32.0	-41.9	1.58	359.0	
34.0	-41.9	1.58	359.0	
36.0	-42.0	1.55	350.8	
38.0	-41.9	1.58	359.0	
40.0	-42.1	1.51	342.8	
42.0	-42.1	1.51	342.8	
44.0	-42.1	1.51	342.8	
46.0	-42.1	1.51	342.8	
48.0	-42.1	1.51	342.8	
50.0	-42.1	1.51	342.8	
52.0	-42.0	1.55	350.8	
54.0	-42.0	1.55	350.8	
56.0	-41.9	1.58	359.0	
58.0	-42.0	1.55	350.8	
60.0	-42.0	1.55	350.8	
62.0	-41.9	1.58	359.0	
64.0	-41.9	1.58	359.0	
66.0	-42.1	1.51	342.8	
68.0	-41.9	1.58	359.0	
70.0	-41.9	1.58	359.0	
72.0	-41.8	1.62	367.4	
74.0	-41.7	1.66	375.9	
76.0	-41.7	1.66	375.9	
78.0	-41.7	1.66	375.9	
80.0	-41.6	1.70	384.7	
82.0	-41.6	1.70	384.7	

84.0	-41.5	1.74	393.6
86.0	-41.6	1.70	384.7
88.0	-41.5	1.74	393.6
90.0	-41.6	1.70	384.7
92.0	-41.5	1.74	393.6
94.0	-41.4	1.78	402.8
96.0	-41.5	1.74	393.6
98.0	-41.4	1.78	402.8
100.0	-41.4	1.78	402.8
102.0	-41.4	1.78	402.8
104.0	-41.3	1.82	412.2
106.0	-41.3	1.82	412.2
108.0	-41.3	1.82	412.2
110.0	-41.2	1.86	421.8
112.0	-41.2	1.86	421.8
114.0	-41.2	1.86	421.8
116.0	-41.2	1.86	421.8
118.0	-41.1	1.91	431.6
120.0	-41.1	1.91	431.6
122.0	-41.1	1.91	431.6
124.0	-41.0	1.95	441.7
126.0	-41.1	1.91	431.6
128.0	-40.9	2.00	452.0
130.0	-40.9	2.00	452.0
132.0	-40.9	2.00	452.0
134.0	-40.8	2.04	462.5
136.0	-40.9	2.00	452.0
138.0	-40.8	2.04	462.5
140.0	-40.9	2.00	452.0
142.0	-40.9	2.00	452.0
144.0	-40.8	2.04	462.5
146.0	-40.7	2.09	473.3
148.0	-40.7	2.09	473.3
150.0	-40.8	2.04	462.5
152.0	-40.8	2.04	462.5
154.0	-40.9	2.00	452.0
156.0	-40.9	2.00	452.0
158.0	-40.7	2.09	473.3
160.0	-40.8	2.04	462.5
162.0	-40.7	2.09	473.3
164.0	-40.8	2.04	462.5
166.0	-40.8	2.04	462.5
168.0	-40.7	2.09	473.3
170.0	-40.8	2.04	462.5

172.0	-40.9	2.00	452.0	
174.0	-40.7	2.09	473.3	
176.0	-40.7	2.09	473.3	
178.0	-40.8	2.04	462.5	
180.0	-40.7	2.09	473.3	Back
182.0	-40.6	2.14	484.3	
184.0	-40.6	2.14	484.3	
186.0	-40.6	2.14	484.3	
188.0	-40.5	2.19	495.6	
190.0	-40.6	2.14	484.3	
192.0	-40.5	2.19	495.6	
194.0	-40.5	2.00	495.6	
196.0	-40.6	1.95	484.3	
198.0	-40.6	1.95	484.3	
200.0	-40.5	2.00	495.6	
202.0	-40.6	1.95	484.3	
204.0	-40.5	2.00	495.6	
206.0	-40.3	2.09	518.9	
208.0	-40.4	2.04	507.1	
210.0	-40.3	2.09	518.9	
212.0	-40.4	2.04	507.1	
214.0	-40.4	2.04	507.1	
216.0	-40.3	2.09	518.9	
218.0	-40.3	2.09	518.9	
220.0	-40.3	2.09	518.9	
222.0	-40.4	2.04	507.1	
224.0	-40.3	2.09	518.9	
226.0	-40.3	2.09	518.9	
228.0	-40.3	2.09	518.9	
230.0	-40.2	2.14	531.0	
232.0	-40.1	2.19	543.4	
234.0	-40.3	2.09	518.9	
236.0	-40.1	2.19	543.4	
238.0	-40.2	2.14	531.0	
240.0	-40.1	2.19	543.4	
242.0	-40.1	2.19	543.4	
244.0	-40.1	2.19	543.4	
246.0	-40.1	2.19	543.4	
248.0	-40.1	2.19	543.4	
250.0	-40.1	2.19	543.4	
252.0	-40.0	2.24	555.8	Maximum
254.0	-40.2	2.14	531.0	
256.0	-40.1	2.19	543.4	
258.0	-40.2	2.14	531.0	

260.0	-40.0	2.24	555.8	Maximum
262.0	-40.1	2.19	543.4	
264.0	-40.1	2.19	543.4	
266.0	-40.1	2.19	543.4	
268.0	-40.2	2.14	531.0	
270.0	-40.2	2.14	531.0	
272.0	-40.0	2.24	555.8	Maximum
274.0	-40.3	2.09	518.9	
276.0	-40.2	2.14	531.0	
278.0	-40.2	2.14	531.0	
280.0	-40.2	2.14	531.0	
282.0	-40.2	2.14	531.0	
284.0	-40.1	2.19	543.4	
286.0	-40.4	2.04	507.1	
288.0	-40.4	2.04	507.1	
290.0	-40.4	2.04	507.1	
292.0	-40.4	2.04	507.1	
294.0	-40.4	2.04	507.1	
296.0	-40.4	2.04	507.1	
298.0	-40.4	2.04	507.1	
300.0	-40.5	2.00	495.6	
302.0	-40.5	2.00	495.6	
304.0	-40.5	2.00	495.6	
306.0	-40.6	1.95	484.3	
308.0	-40.5	2.00	495.6	
310.0	-40.6	1.95	484.3	
312.0	-40.4	2.04	507.1	
314.0	-40.5	2.00	495.6	
316.0	-40.5	2.00	495.6	
318.0	-40.7	1.91	473.3	
320.0	-40.7	1.91	473.3	
322.0	-40.6	1.95	484.3	
324.0	-40.8	1.86	462.5	
326.0	-40.9	1.82	452.0	
328.0	-40.8	1.86	462.5	
330.0	-40.9	1.82	452.0	
332.0	-40.8	1.86	462.5	
334.0	-40.8	1.86	462.5	
336.0	-41.0	1.78	441.7	
338.0	-41.0	1.78	441.7	
340.0	-41.0	1.78	441.7	
342.0	-41.1	1.74	431.6	
344.0	-41.2	1.70	421.8	
346.0	-41.1	1.74	431.6	

348.0	-41.2	1.70	421.8
350.0	-41.2	1.70	421.8
352.0	-41.2	1.70	421.8
354.0	-41.4	1.62	402.8
356.0	-41.3	1.66	412.2

Figure 6-50: ERP Data vs. Azimuth

B) To verify the ability to linearly scale ERP as done in preceding equation h, measurements at the azimuthal maximum were performed across the entire linear transmitter output power operating range, and the results plotted in Figure 6-51 and used in calculation step c in Exhibit 6.8A. The antenna gain factor is equal to the slope of the line and is the value reported in Exhibit 12.1. Data is provided for both versions of the U500 power amplifier using the part number nomenclature listed in Exhibit 10.

ERP at Azimuth Maxima vs. U500 Output Power

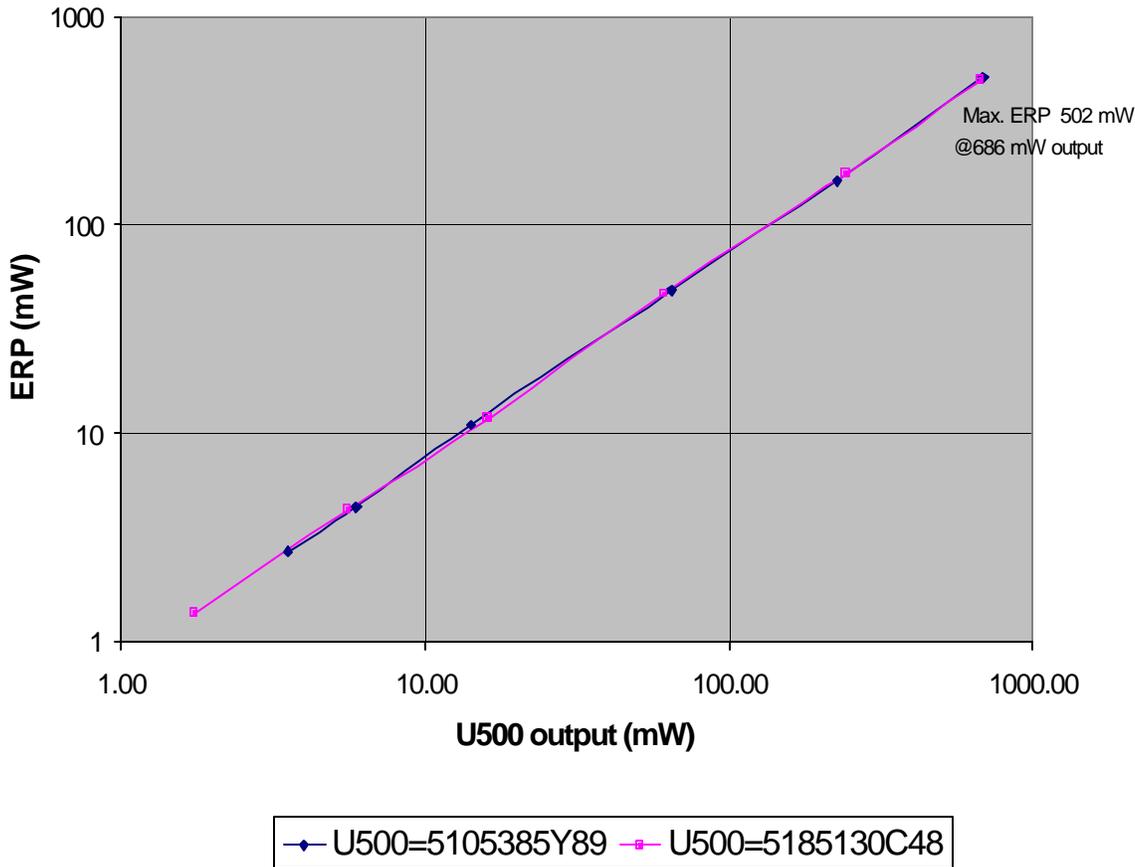


Figure 6-51: Maximum ERP vs. U500 Output Power