

Report of antenna coupling measurements
02/18/08

The following coupling measurements were made on a pair of HyperLink Technologies RE14P-RSP patch antennas. These antennas are rated at 14 dBi gain and come with a 4 foot coax feedline of HyperLink Technologies CA195RW coax rated at 19 dB loss per 100 ft at 2500 MHz. The total of 8 feet of coax adds 1.52 dB loss in the system. The feedlines were terminated with reverse-polarity SMA connectors and adapters were used to connect to the test equipment. The two antennas were mounted about 4 feet above a tile floor and the feedlines were routed perpendicular to the antennas for a distance of 1 foot. These antennas are about 8 1/2 inches square with a flat back ending in a flange surrounding the antenna. The antenna is enclosed in a plastic cover making the total antenna thickness about 1-1/8 inches. Antenna spacings are between the backs of the two antennas since these are the antenna mounting surfaces. Front-to-front spacings are about 2-3/16 less than the back-to-back spacing. Measurements were made at 2.492 GHz using a Wiltron sweep generator and Wiltron model 561 scalar network analyzer. Return loss measurements were also made on the transmit antenna for reference.

Front-to-front Spacing (Inches)	Back-to-back Spacing (Inches)	Return loss (dB)	Total coupling loss (dB)	Coupling loss less coax loss (dB)	Coupling efficiency (%)
0	2 3/16	-34.00	-7.04	-5.52	28.05%
5/16	2 1/2	-13.20	-12.05	-10.53	8.85%
13/16	3	-13.77	-6.92	-5.40	28.84%
1 5/16	3 1/2	-14.15	-6.91	-5.39	28.91%
1 13/16	4	-14.77	-7.10	-5.58	27.67%
2 13/16	5	-12.82	-7.69	-6.17	24.15%
3 13/16	6	-17.48	-7.58	-6.06	24.77%
4 13/16	7	-12.55	-8.00	-6.48	22.49%
5 13/16	8	-13.28	-8.40	-6.88	20.51%
6 13/16	9	-16.50	-8.90	-7.38	18.28%
7 13/16	10	-11.50	-9.58	-8.06	15.63%
8 13/16	11	-17.10	-9.52	-8.00	15.85%
9 13/16	12	-13.10	-10.70	-9.18	12.08%
12 13/16	15	-12.40	-12.24	-10.72	8.47%
15 13/16	18	-13.91	-12.94	-11.42	7.21%
18 13/16	21	-15.80	-13.92	-12.40	5.75%
21 13/16	24	-14.50	-15.40	-13.88	4.09%

After reviewing the above data, it was felt that coupling efficiency would be enhanced by using a larger receive antenna since the beam is spreading to occupy a larger area than the 14 dBi antenna. A 19 dBi gain antenna measuring 15 inches square (Teletronics 15-206) was obtained and the measurements were repeated using the 14dBi antenna for transmit and the 19 dBi antenna for receive. The 19 dBi antenna does not include a feedline so the correction for coax loss is for 4 feet of coax = 0.76 dB. Equipment setup was otherwise identical. Back-to-back spacing with the fronts in contact was 2-1/4 inches. Return loss was not measured.

14 dBi to 19 dBi coupling measurements
3/26/2008

Front-to-front Spacing (Inches)	Back-to-back Spacing (Inches)	Total coupling loss (dB)	Coupling loss less coax loss (dB)	Coupling efficiency (%)
0	2 1/4	-10.30	-9.54	11.12%
1	3 1/4	-13.70	-12.94	5.08%
1 3/4	4	-9.70	-8.94	12.76%
3 3/4	6	-12.10	-11.34	7.35%
5 3/4	8	-9.30	-8.54	14.00%
7 3/4	10	-8.70	-7.94	16.07%
9 3/4	12	-7.80	-7.04	19.77%
11 3/4	14	-8.00	-7.24	18.88%
13 3/4	16	-7.50	-6.74	21.18%
15 3/4	18	-7.20	-6.44	22.70%
17 3/4	20	-7.20	-6.44	22.70%
19 3/4	22	-7.70	-6.94	20.23%
21 3/4	24	-8.00	-7.24	18.88%
25 3/4	28	-8.30	-7.54	17.62%
29 3/4	32	-10.10	-9.34	11.64%
33 3/4	36	-10.80	-10.04	9.91%

