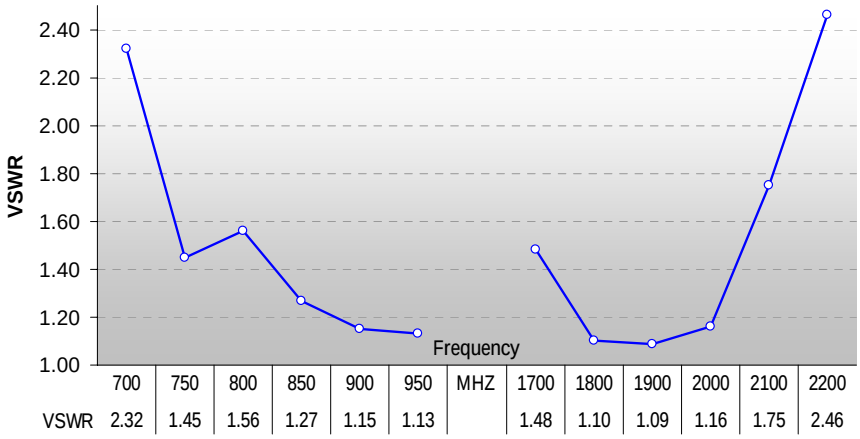
Introduction:

360°RF has been retained to test and compare the performance of the below pictured 6" Panel Antenna atop a 18" sheet rock slab, and in free space. What follows are the findings from our independent analysis:

Type: 6" Panel Antenna[1]

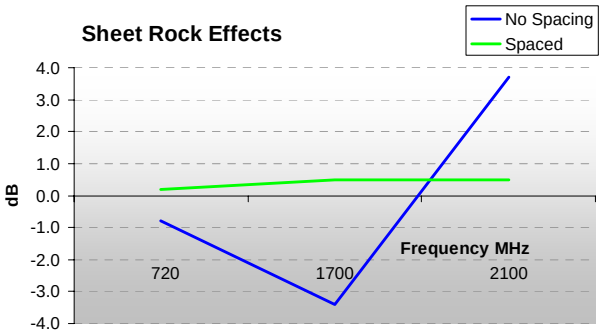


TESTING NOTES:

Much like a TV Camera looking though a thick pane of glass, the sheet rock distorted the elevation and azimuth patterns. The losses observed are attributable to the sheet rock de-tuning the antenna, not from "lossy" sheet rock material. When the antenna was set back from the sheet rock about an inch, the effects on the panel antenna were negligible.

The first number is when the antenna was in intimate contact with the sheet rock. The second number is when the antenna is set back from the sheet rock.

Frequency MHz	Forward Loss dB		
	No Spacing	Spaced	
720	-0.8	0.2	> 1/4"
1700	-3.4	0.5	> 1"
2100	3.7[2]	0.5	> 1"



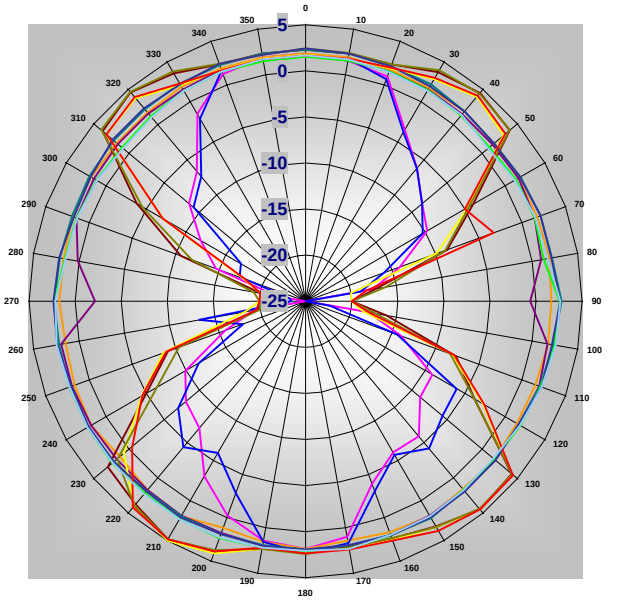
[1] Antenna is a fat ¼ wave over a ground plane, mounted sideways.

[2] There appeared to be some reverse gain as signal reflected off the wallboard and back to the antenna. However, this is not a realistic condition since the antenna would be within a wall, rather than placed on an 18" piece of sheet rock.

	dBi Gain											
	720 MHz		720 MHz w/ SR		1700 MHz		1700 MHz w/ SR		2100 MHz		2100 MHz w/ SR	
Angle°	Elevation	Azimuth	Elevation	Azimuth	Elevation	Azimuth	Elevation	Azimuth	Elevation	Azimuth	Elevation	Azimuth
0	1.8	1.8	1.6	1.6	2.2	2.2	1.7	1.5	2.4	2.4	1.6	1.6
10	1.5	1.8	1.7	1.5	2.2	2.2	1.7	1.5	2.3	2.2	1.7	1.6
20	0.9	1.7	0.6	1.5	2.3	2.1	1.8	1.5	2.3	2.1	1.9	1.4
30	-3.6	1.7	-3.9	1.5	3.6	2.1	2.8	1.4	3.9	1.9	2.9	1.3
40	-6.2	1.8	-6.3	1.4	4.4	1.8	3.9	1.2	4.3	1.8	4.0	1.3
50	-8.5	1.6	-8.5	1.4	3.8	1.6	3.0	1.0	3.9	1.6	3.2	0.8
60	-9.8	1.6	-10.4	1.6	-4.0	1.9	-4.7	1.3	-4.6	1.8	-5.1	1.2
70	-14.2	1.7	-15.9	1.4	-8.7	2.1	-9.9	1.4	-8.9	2.1	-3.3	1.5
80	-17.6	1.8	-19.0	0.9	-17.3	2.1	-20.0	1.2	-16.2	2.0	-18.4	1.6
90	-25.0	1.6	-25.0	-0.7	-20.0	2.7	-20.0	2.5	-20.0	2.6	-20.0	2.6
100	-18.1	1.7	-22.3	1.6	-16.1	2.2	-18.7	2.4	-17.3	2.1	-17.9	2.5
110	-14.0	1.5	-14.5	1.9	-7.7	2.0	-8.1	2.1	-8.3	2.2	-7.9	2.2
120	-9.1	1.4	-6.1	1.7	-3.9	1.7	-2.8	1.9	-3.9	1.6	-2.7	1.8
130	-8.8	1.7	-5.7	1.8	4.1	1.7	4.2	1.7	4.2	1.8	4.3	1.5
140	-5.9	1.5	-4.2	1.7	4.4	1.7	4.4	1.6	4.3	1.9	4.4	1.7
150	-6.1	1.9	-5.8	1.8	3.1	2.1	3.3	2.0	3.3	2.0	3.7	1.9
160	-4.0	1.6	-3.1	1.9	2.4	1.9	2.5	2.0	2.3	2.0	2.6	1.9
170	0.9	1.3	1.6	2.0	2.0	1.9	2.2	2.2	2.1	1.8	2.3	2.2
180	1.8	1.8	2.3	2.2	2.2	1.9	2.3	2.1	2.4	1.9	2.3	2.0
190	1.3	1.5	1.5	1.9	2.2	1.8	2.2	2.1	2.2	1.9	2.1	2.1
200	-0.3	1.1	-2.9	1.7	3.8	1.8	4.0	2.3	3.7	1.8	3.8	2.2
210	-3.1	1.9	-6.0	1.8	4.7	1.9	4.9	2.2	4.8	2.0	4.7	2.3
220	-7.1	1.7	-4.4	1.7	3.7	1.8	3.9	2.1	3.9	1.9	4.1	2.2
230	-8.1	1.2	-7.0	1.7	2.9	2.0	0.7	2.3	1.6	2.1	-0.5	2.2
240	-10.0	1.8	-11.6	1.8	-5.1	2.2	-4.5	2.3	-6.4	2.1	-4.6	2.3
250	-15.7	1.6	-17.8	1.9	-9.1	2.2	-8.6	2.2	-10.4	2.0	-8.9	2.2
260	-19.4	1.4	-13.3	1.9	-19.8	2.1	-18.4	2.3	-20.0	2.3	-19.6	2.4
270	-25.0	1.7	-23.5	-2.2	-20.0	2.2	-20.0	2.2	-20.0	2.3	-20.0	2.1
280	-21.8	1.6	-23.2	0.1	-20.0	2.0	-20.0	1.5	-19.3	2.1	-20.0	1.4
290	-14.7	1.8	-17.4	1.4	-10.6	1.9	-17.8	1.4	-11.9	1.7	-18.0	1.3
300	-11.9	1.8	-16.9	1.5	-3.9	2.0	-7.2	1.2	-4.6	1.9	-7.1	1.1
310	-8.5	1.7	-9.1	1.5	3.7	2.1	3.1	0.9	3.9	2.2	3.1	0.8
320	-6.7	1.7	-7.4	1.5	4.5	2.1	3.7	1.1	4.6	2.2	3.8	1.0
330	-1.6	1.8	-2.2	1.5	3.5	2.2	2.0	1.3	3.7	2.1	2.2	1.3
340	1.2	1.8	1.6	1.7	2.3	2.2	1.7	1.5	2.4	2.4	1.6	1.5
350	1.8	1.8	1.6	1.6	2.2	2.2	1.7	1.4	2.1	2.1	1.6	1.6

6" Panel Antenna

720, 1700 & 2100 MHz Patterns



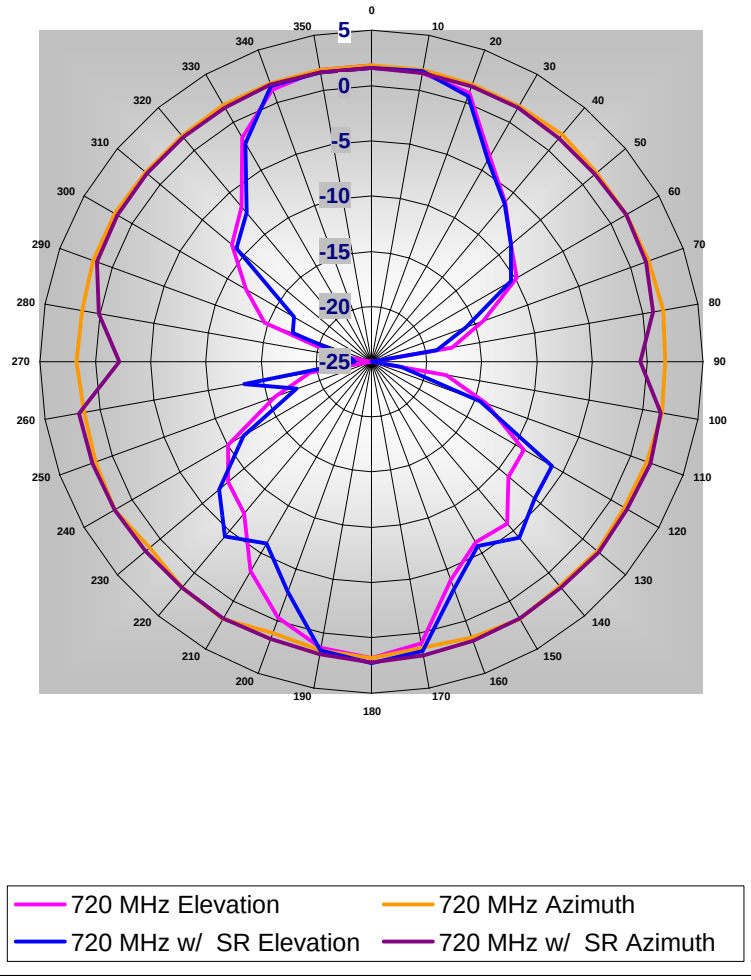
Notes:

* Yellow shaded data cells denote that dBi reading was below the listed measurement.
* Some of the readings towards the back of the antenna were affected by the coax.
* Pattern readings were taken with the wallboard sample 1" from the antenna.
* 0° is with the flat side of the antenna towards the signal source.
* There appeared to be some reverse gain as signal reflected off the wallboard and back to the antenna. However, this is not a realistic condition since the antenna would be within a wall, rather than place on an 18" piece of sheet rock.

Angle°	dBi Gain			
	720 MHz		720 MHz w/ SR	
	Elevation	Azimuth	Elevation	Azimuth
0	1.8	1.8	1.6	1.6
10	1.5	1.8	1.7	1.5
20	0.9	1.7	0.6	1.5
30	-3.6	1.7	-3.9	1.5
40	-6.2	1.8	-6.3	1.4
50	-8.5	1.6	-8.5	1.4
60	-9.8	1.6	-10.4	1.6
70	-14.2	1.7	-15.9	1.4
80	-17.6	1.8	-19.0	0.9
90	-25.0	1.6	-25.0	-0.7
100	-18.1	1.7	-22.3	1.6
110	-14.0	1.5	-14.5	1.9
120	-9.1	1.4	-6.1	1.7
130	-8.8	1.7	-5.7	1.8
140	-5.9	1.5	-4.2	1.7
150	-6.1	1.9	-5.8	1.8
160	-4.0	1.6	-3.1	1.9
170	0.9	1.3	1.6	2.0
180	1.8	1.8	2.3	2.2
190	1.3	1.5	1.5	1.9
200	-0.3	1.1	-2.9	1.7
210	-3.1	1.9	-6.0	1.8
220	-7.1	1.7	-4.4	1.7
230	-8.1	1.2	-7.0	1.7
240	-10.0	1.8	-11.6	1.8
250	-15.7	1.6	-17.8	1.9
260	-19.4	1.4	-13.3	1.9
270	-25.0	1.7	-23.5	-2.2
280	-21.8	1.6	-23.2	0.1
290	-14.7	1.8	-17.4	1.4
300	-11.9	1.8	-16.9	1.5
310	-8.5	1.7	-9.1	1.5
320	-6.7	1.7	-7.4	1.5
330	-1.6	1.8	-2.2	1.5
340	1.2	1.8	1.6	1.7
350	1.8	1.8	1.6	1.6

6" Panel Antenna

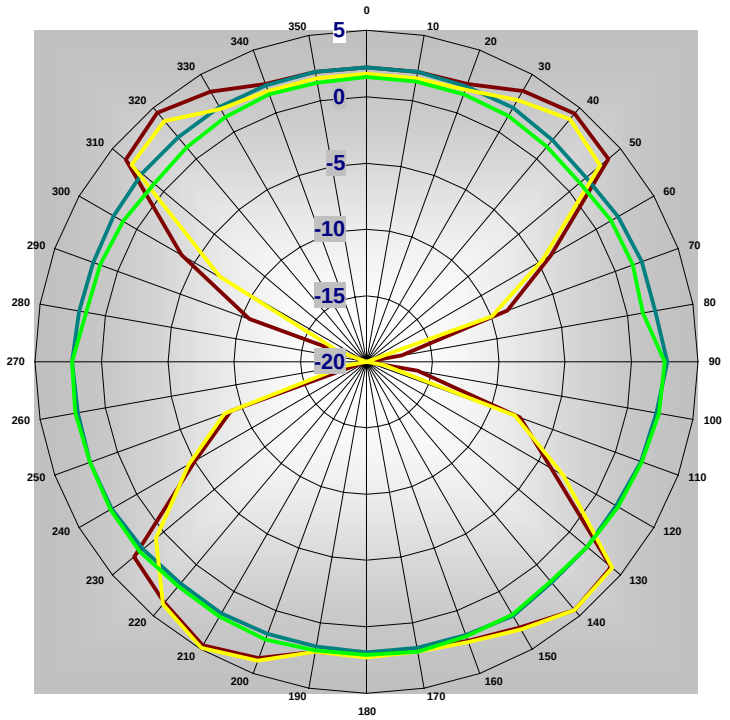
720 MHz Patterns



Angle°	dBi Gain			
	1700 MHz		1700 MHz w/ SR	
	Elevation	Azimuth	Elevation	Azimuth
0	2.2	2.2	1.7	1.5
10	2.2	2.2	1.7	1.5
20	2.3	2.1	1.8	1.5
30	3.6	2.1	2.8	1.4
40	4.4	1.8	3.9	1.2
50	3.8	1.6	3.0	1.0
60	-4.0	1.9	-4.7	1.3
70	-8.7	2.1	-9.9	1.4
80	-17.3	2.1	-20.0	1.2
90	-20.0	2.7	-20.0	2.5
100	-16.1	2.2	-18.7	2.4
110	-7.7	2.0	-8.1	2.1
120	-3.9	1.7	-2.8	1.9
130	4.1	1.7	4.2	1.7
140	4.4	1.7	4.4	1.6
150	3.1	2.1	3.3	2.0
160	2.4	1.9	2.5	2.0
170	2.0	1.9	2.2	2.2
180	2.2	1.9	2.3	2.1
190	2.2	1.8	2.2	2.1
200	3.8	1.8	4.0	2.3
210	4.7	1.9	4.9	2.2
220	3.7	1.8	3.9	2.1
230	2.9	2.0	0.7	2.3
240	-5.1	2.2	-4.5	2.3
250	-9.1	2.2	-8.6	2.2
260	-19.8	2.1	-18.4	2.3
270	-20.0	2.2	-20.0	2.2
280	-20.0	2.0	-20.0	1.5
290	-10.6	1.9	-17.8	1.4
300	-3.9	2.0	-7.2	1.2
310	3.7	2.1	3.1	0.9
320	4.5	2.1	3.7	1.1
330	3.5	2.2	2.0	1.3
340	2.3	2.2	1.7	1.5
350	2.2	2.2	1.7	1.4

6" Panel Antenna

1700 MHz Patterns



Angle°	dBi Gain			
	2100 MHz		2100 MHz w/ SR	
	Elevation	Azimuth	Elevation	Azimuth
0	2.4	2.4	1.6	1.6
10	2.3	2.2	1.7	1.6
20	2.3	2.1	1.9	1.4
30	3.9	1.9	2.9	1.3
40	4.3	1.8	4.0	1.3
50	3.9	1.6	3.2	0.8
60	-4.6	1.8	-5.1	1.2
70	-8.9	2.1	-3.3	1.5
80	-16.2	2.0	-18.4	1.6
90	-20.0	2.6	-20.0	2.6
100	-17.3	2.1	-17.9	2.5
110	-8.3	2.2	-7.9	2.2
120	-3.9	1.6	-2.7	1.8
130	4.2	1.8	4.3	1.5
140	4.3	1.9	4.4	1.7
150	3.3	2.0	3.7	1.9
160	2.3	2.0	2.6	1.9
170	2.1	1.8	2.3	2.2
180	2.4	1.9	2.3	2.0
190	2.2	1.9	2.1	2.1
200	3.7	1.8	3.8	2.2
210	4.8	2.0	4.7	2.3
220	3.9	1.9	4.1	2.2
230	1.6	2.1	-0.5	2.2
240	-6.4	2.1	-4.6	2.3
250	-10.4	2.0	-8.9	2.2
260	-20.0	2.3	-19.6	2.4
270	-20.0	2.3	-20.0	2.1
280	-19.3	2.1	-20.0	1.4
290	-11.9	1.7	-18.0	1.3
300	-4.6	1.9	-7.1	1.1
310	3.9	2.2	3.1	0.8
320	4.6	2.2	3.8	1.0
330	3.7	2.1	2.2	1.3
340	2.4	2.4	1.6	1.5
350	2.1	2.1	1.6	1.6

6" Panel Antenna

2100 MHz Patterns