

OPEN-WIRE IMPEDANCE, ATTENUATION, PHASE  
080, 104, 128, 165-Mil Copper-Steel (40%)-12" Spacing - S and P

080-Mil Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	$\alpha$	db/ml	$\beta$	B
200	1554	1385	2081	41.7	.0141	.122	.0158	.0050
300	1380	1098	1763	38.5	.0168	.146	.0197	.0063
500	1068	806	1338	37.0	.0205	.179	.0271	.0086
1000	859	502	995	30.3	.0255	.222	.0436	.0139
1500	785	367	867	25.1	.0280	.243	.0594	.0189
2000	749	289	803	21.1	.0294	.256	.0760	.0242
2500	728	239	767	18.2	.0304	.264	.0924	.0294
3000	715	204	744	15.9	.0311	.270	.1090	.0347

104-Mil Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	$\alpha$	db/ml	$\beta$	B
200	1189	988	1546	39.7	.0105	.0914	.0134	.0043
300	1015	772	1276	37.2	.0125	.1090	.0172	.0055
500	860	550	1021	32.6	.0146	.1270	.0238	.0076
1000	736	328	806	24.0	.0175	.1520	.0402	.0128
1500	697	233	735	18.5	.0187	.1620	.0566	.0180
2000	681	181	705	14.9	.0193	.1680	.0732	.0233
2500	671	148	687	12.4	.0198	.1720	.0900	.0287
3000	666	124	677	10.6	.0200	.1740	.1070	.0341

104-Mil Phantom

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	$\alpha$	db/ml	$\beta$	B
200	676	540	865	38.6	.0092	.0800	.0120	.0038
300	585	423	722	35.9	.0109	.0945	.0148	.0047
500	501	294	581	30.4	.0125	.1090	.0210	.0067
1000	440	171	472	21.2	.0146	.1270	.0380	.0121
1500	422	120	439	15.9	.0154	.1340	.0540	.0172
2000	414	92	424	12.5	.0159	.1380	.0710	.0226
2500	410	75	417	10.4	.0162	.1410	.0880	.0280
3000	408	63	413	8.8	.0163	.1420	.1050	.0334

128-Mil Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	$\alpha$	db/ml	$\beta$	B
200	991	759	1248	37.4	.0084	.0729	.0115	.0037
300	865	565	1032	33.1	.0098	.0855	.0148	.0047
500	752	405	855	28.3	.0112	.0972	.0215	.0068
1000	674	232	712	19.0	.0129	.1120	.0379	.0121
1500	651	163	671	14.0	.0136	.1180	.0552	.0176
2000	642	125	654	11.0	.0138	.1200	.0711	.0227
2500	637	102	645	9.1	.0140	.1220	.0884	.0282
3000	634	86	640	7.7	.0143	.1240	.1060	.0338

128-Mil Phantom

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	$\alpha$	db/ml	$\beta$	B
200	570	442	703	35.9	.0073	.0630	.0100	.0032
300	505	315	596	32.0	.0083	.0725	.0135	.0043
500	447	213	495	25.5	.0094	.0820	.0200	.0064
1000	410	119	427	16.2	.0106	.0920	.0360	.0115
1500	400	83	409	11.7	.0111	.0960	.0530	.0169
2000	396	63	401	9.0	.0113	.0980	.0700	.0223
2500	394	51	397	7.4	.0114	.0990	.0870	.0277
3000	392	43	394	6.3	.0115	.1000	.1040	.0331

165-Mil Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	$\alpha$	db/ml	$\beta$	B
200	793	542	961	34.4	.0062	.0536	.0098	.0031
300	724	395	825	28.6	.0069	.0599	.0125	.0040
500	655	261	705	21.7	.0077	.0665	.0195	.0062
1000	615	143	631	13.1	.0084	.0729	.0361	.0115
1500	605	99	613	9.3	.0087	.0756	.0532	.0169
2000	601	75	606	7.1	.0088	.0768	.0703	.0224
2500	598	61	601	5.8	.0090	.0780	.0874	.0278
3000	597	51	599	4.9	.0091	.0790	.1050	.0334

165-Mil Phantom

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	$\alpha$	db/ml	$\beta$	B
200	474	285	553	31.0	.0052	.0450	.0090	.0029
300	440	210	487	25.5	.0056	.0490	.0135	.0043
500	401	136	423	18.7	.0062	.0540	.0180	.0057
1000	383	73	390	10.8	.0068	.0590	.0350	.0111
1500	379	50	382	7.5	.0069	.0600	.0520	.0166
2000	377	38	379	5.8	.0070	.0610	.0690	.0220
2500	376	31	377	4.7	.0071	.0620	.0860	.0274
3000	375	26	376	4.0	.0073	.0630	.1030	.0328

Note: All reactances are negative. Angles are in degrees and negative. Values based on dry weather, average temperature conditions.

$\beta$  = Phase shift in radians per circuit mile.

B = Phase shift in cycles per circuit mile, out and back =  $\frac{2\beta}{2\pi}$