Open-Wire Impedance, Attenuation, Phase

80-MIL COPPER, 109 AND 134-MIL STEEL - 12" SPACING - S AND P

080-Mil Copper Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	B
200	1064	809	1337	37.3	.0083	.0720	.0108	.0034
300	926	619	1114	33.8	.0097	.0840	.0140	.0045
500	812	426	917	27.7	.0108	.0940	.0205	.0065
1000	729	236	766	17.9	.0120	.1040	.0369	.0118
1500	708	152	726	12.9	.0123	.1070	.0538	.0171
2000	700	123	711	10.0	.0125	.1090	.0710	.0226
2500	696	100	703	8.2	.0127	.1100	.0882	.0281
3000	694	84	699	6.9	.0127	.1100	.1060	.0338

080-Mil Copper Phantom

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	B
200	607	437	748	35.8	.0071	.0620	.0100	.0032
300	535	330	628	31.6	.0082	.0710	.0133	.0042
500	476	223	526	25.1	.0092	.0800	.0196	.0062
1000	438	121	454	15.5	.0100	.0870	.0360	.0115
1500	429	81	437	10.7	.0102	.0890	.0530	.0169
2000	425	62	429	8.3	.0104	.0900	.0700	.0223
2500	424	50	427	6.7	.0104	.0900	.0875	.0279
3000	423	42	425	5.7	.0105	.0910	.1050	.0334

109-Mil High Strength Steel Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	B
200	2040	1671	2638	39.3	.0177	.1540	.0210	.0067
300	1754	1314	2192	36.8	.0208	.1810	.0280	.0089
500	1540	940	1804	31.4	.0250	.2170	.0394	.0125
1000	1279	629	1425	26.2	.0333	.2890	.0670	.0213
1500	1200	515	1306	23.2	.0406	.3530	.0945	.0301
2000	1142	443	1225	21.2	.0469	.4070	.1210	.0385
2500	1100	408	1173	20.4	.0541	.4700	.1445	.0460
3000	1054	383	1121	20.0	.0608	.5280	.1670	.0532

109-Mil High Strength Steel Phantom

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	B
200	1040	800	1313	37.6	.0173	.1500	.0186	.0059
300	969	713	1203	36.4	.0191	.1660	.0260	.0083
500	860	570	1031	33.5	.0227	.1970	.0375	.0119
1000	721	334	795	24.9	.0298	.2590	.0640	.0204
1500	678	265	728	21.4	.0363	.3150	.0898	.0286
2000	642	237	684	20.3	.0421	.3660	.1150	.0366
2500	620	220	658	19.6	.0480	.4170	.1387	.0442
3000	598	200	631	18.5	.0537	.4660	.1600	.0510

134-Mil Steel Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	B
200	1726	1178	2090	34.3	.0134	.1160	.0190	.0061
300	1563	945	1826	31.2	.0157	.1360	.0260	.0083
500	1460	730	1632	26.6	.0196	.1700	.0395	.0126
1000	1252	520	1356	22.6	.0288	.2500	.0690	.0220
1500	1158	460	1246	21.7	.0371	.3220	.0950	.0303
2000	1084	404	1157	20.4	.0448	.3890	.1200	.0382
2500	1040	380	1107	20.1	.0512	.4450	.1435	.0457
3000	1004	348	1063	19.1	.0578	.5020	.1670	.0532

134-Mil Steel Phantom

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	P
200	920	580	1087	32.2	.0127	.1100	.0165	.0053
300	883	524	1027	30.7	.0142	.1230	.0240	.0076
500	820	430	927	27.7	.0176	.1530	.0359	.0114
1000	711	281	765	21.6	.0253	.2200	.0640	.0204
1500	660	250	706	20.7	.0327	.2840	.0887	.0282
2000	625	219	662	19.3	.0393	.3410	.1120	.0357
2500	600	200	632	18.4	.0451	.3920	.1345	.0428
3000	579	185	608	17.7	.0502	.4360	.1560	.0497

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

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