Open-Wire Impedance, Attenuation, Phase

104, 128, 165-MIL COPPER-12" SPACING - S AND P

104-Mil Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	B
200	865	562	1031	33.0	.0060	.0520	.0092	.0029
300	790	400	886	26.9	.0066	.0569	.0121	.0039
500	712	273	762	21.0	.0073	.0630	.0189	.0060
1000	674	144	689	12.0	.0077	.0670	.0358	.0114
1500	665	98	672	8.4	.0078	.0680	.0530	.0169
2000	662	74	666	6.4	.0079	.0690	.0703	.0224
2200	661	67	664	5.8	.0080	.0691	.0773	.0246
2500	661	60	664	5.2	.0081	.0700	.0877	.0279
2600	661	57	664	4.9	.0081	.0700	.0912	.0290
2750	660	55	663	4.8	.0081	.0700	.0967	.0308
3000	660	50	662	4.4	.0081	.0700	.1050	.0334
3200	659	47	661	4.1	.0081	.0702	.1120	.0357
3400	659	46	660	3.9	.0081	.0705	.1190	.0379

104-Mil Phantom

Freq.	Impedance				Attenuation		Phase Shift*	
	R	X	Z	Angle	α	db/mi	β	B
200	506	296	586	30.3	.0051	.0440	.0092	.0029
300	465	220	514	25.3	.0055	.0480	.0121	.0039
500	432	138	454	17.7	.0060	.0520	.0189	.0060
1000	415	71	421	9.7	.0062	.0540	.0358	.0114
1500	411	48	414	6.7	.0063	.0560	.0530	.0169
2000	410	36	412	5.0	.0064	.0560	.0703	.0224
2200	410	32	411	4.5	.0065	.0565	.0773	.0246
2500	410	29	411	4.1	.0066	.0570	.0877	.0279
2600	409	27	410	3.8	.0066	.0573	.0912	.0290
2750	409	26	410	3.6	.0066	.0576	.0967	.0308
3000	409	24	410	3.4	.0067	.0580	.1050	.0334
3200	409	23	410	3.2	.0067	.0584	.1120	.0357
3400	409	21	410	2.9	.0068	.0588	.1190	.0379

128-Mil Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	B
200	754	410	858	28.5	.0045	.0390	.0083	.0026
300	707	297	767	22.8	.0048	.0419	.0118	.0038
500	661	187	687	15.8	.0052	.0450	.0182	.0058
1000	641	97	648	8.6	.0054	.0470	.0353	.0112
1500	637	65	640	5.8	.0055	.0480	.0527	.0168
2000	635	50	637	4.5	.0055	.0480	.0701	.0223
2200	634	46	636	4.1	.0056	.0485	.0770	.0245
2500	634	40	635	3.6	.0056	.0490	.0875	.0279
2600	634	39	635	3.5	.0057	.0492	.0908	.0289
2750	634	36	636	3.3	.0057	.0495	.0959	.0305
3000	634	34	635	3.1	.0058	.0500	.1050	.0334
3200	633	32	634	2.9	.0058	.0502	.1120	.0357
3400	633	31	634	2.8	.0058	.0505	.1190	.0379

128-Mil Phantom

Freq.	Impedance				Attenuation		Phase Shift*	
	R	X	Z	Angle	α	db/mi	β	B
200	451	212	498	25.2	.0038	.0330	.0083	.0026
300	425	157	453	20.3	.0039	.0340	.0118	.0038
500	407	93	417	12.9	.0041	.0360	.0182	.0058
1000	398	47	401	6.7	.0044	.0380	.0353	.0112
1500	397	32	398	4.6	.0045	.0390	.0527	.0168
2000	396	24	397	3.5	.0046	.0400	.0701	.0223
2200	396	22	397	3.2	.0047	.0405	.0770	.0245
2500	396	19	396	2.8	.0047	.0410	.0875	.0279
2600	396	18	396	2.6	.0047	.0411	.0908	.0289
2750	396	17	396	2.5	.0048	.0415	.0959	.0305
3000	396	16	396	2.3	.0048	.0420	.1050	.0334
3200	396	15	396	2.2	.0049	.0424	.1120	.0357
3400	396	14	396	2.0	.0049	.0428	.1190	.0379

165-Mil Side

Freq.	Impedance				Attenuation		Phase Shift	
	R	X	Z	Angle	α	db/mi	β	B
200	661	268	713	22.1	.0031	.0270	.0076	.0024
300	638	190	666	16.6	.0032	.0280	.0110	.0035
500	615	116	626	10.7	.0033	.0290	.0178	.0057
1000	607	59	610	5.6	.0035	.0300	.0351	.0112
1500	605	41	606	3.9	.0036	.0310	.0526	.0168
2000	605	31	605	2.8	.0037	.0320	.0700	.0222
2200	604	30	605	2.8	.0037	.0321	.0770	.0245
2500	604	26	604	2.5	.0038	.0330	.0875	.0279
2600	604	24	604	2.3	.0038	.0331	.0910	.0290
2750	604	23	604	2.2	.0039	.0335	.0963	.0307
3000	604	22	604	2.1	.0039	.0340	.1050	.0334
3200	603	20	604	1.9	.0040	.0349	.1120	.0357
3400	603	19	604	1.8	.0041	.0355	.1190	.0379

165-Mil Phantom

Freq.	Impedance				Attenuation		Phase Shift*	
	R	X	Z	Angle	α	db/mi	β	B
200	395	133	417	18.6	.0025	.0220	.0076	.0024
300	380	92	391	13.6	.0026	.0230	.0110	.0035
500	375	55	379	8.4	.0028	.0240	.0178	.0057
1000	372	28	373	4.3	.0029	.0250	.0351	.0112
1500	371	19	371	2.9	.0030	.0260	.0526	.0168
2000	371	15	371	2.3	.0031	.0270	.0700	.0222
2200	371	15	371	2.3	.0032	.0279	.0770	.0245
2500	371	12	371	1.9	.0033	.0290	.0875	.0279
2600	370	12	371	1.9	.0033	.0290	.0910	.0290
2750	370	11	370	1.7	.0034	.0295	.0963	.0307
3000	370	10	370	1.5	.0034	.0300	.1050	.0334
3200	370	10	370	1.5	.0035	.0305	.1120	.0357
3400	370	9	370	1.4	.0036	.0311	.1190	.0379

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

* Approximate values. Assumed to be same as for side circuits.

β = Phase shift in radians per circuit mile.

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