Lightning Protector Surge Current Ratings

Technical Note

PolyPhaser

Lightning Protector Surge Current Ratings

Since the purpose of any coax protector is to equalize the center conductor potential with the shield potential to minimize current flow through the equipment input, how much lightning current will actually be on the center conductor of your coax cable? To answer this often asked question, we need to determine two things:

· How much current is available from the lightning strike?

· In to how many paths will the current divide as it travels towards the site MGB?

The total current available from a direct strike is a given amount. Typically, the 50% occurrence strike will have 18kA or less, and only 10% will have 65kA or more. We will use the 65kA figure for this discussion.

For a tower with one antenna and one coax cable, the amount of current delivered to the master ground bar (MGB) or bulkhead is a function of how low the cable shield is bonded the tower, and the length of the run to the MGB. The higher the grounding kit is on the tower and the closer the MGB and cable entrance is to the tower, the more current will travel toward the equipment. If more than one coax cable is on the tower, the inductive path between the tower and the MGB will be less (inductances in parallel divide) and the strike current to the MGB will increase. Even though the total strike current to the MGB is increased, the amount on each coax cable will be less (divided).

For example: If there were 10 coax cables and a 65 kA strike, approximately 40 kA will go directly down the tower to earth ground. Ten coax cables will conduct the remaining 25 kA current towards the MGB. The MGB and outside grounding conductors will further lower the current caused shield potential by carrying the current down to the grounding system.

The total strike current for each coax will be divided between the shield and the center conductor. The shield has a much larger surface area, therefore less inductance, so the higher frequency components of the strike will easily travel on it. This means the shield will have a higher peak current with a shorter duration while the smaller and more inductive center conductor will have less current, but longer duration. The amount of energy will be approximately the same on both conductors, but the waveforms will be different.

Typically, the center conductor will have ≤ half the shield peak current. With 25kA strike on 10 cables, the divided coax cable current is 1/10 of 25 kA. The real value is going to be about 2.5kA on each coax cable. For a cell site with 10 coax feeders, the center conductor peak current might be about 1kA each! Since the protector equalizes the differential between center conductor and shield, the protector would equalize the 1.5kA difference. In this example the protector might handle about 1.5kA current. Protectors that are properly installed and rated at 20kA will have an easy life, even with a 65kA 10% probability strike! One manufacturer claims their protector will survive at 50kA, but fails to specify how much energy will be let through to the equipment. It is better to know how well your equipment is protected than to know when the protector will destruct. Ask for test results at the 50kA level.

In general:

· The more coax lines there are, the more the current is divided and the less there will be on any given cable.

· The lower the coax cable shields are bonded back to the tower, the less current will be on each coax cable.

· The lower the inductance path to ground from the MGB or bulkhead, the less shield current will enter the building.

· The further the tower is spaced from the MGB at the building entrance, the more series inductance will be added by the coax cables, further reducing the current on each coax cable. We do not recommend adding loops to increase inductance. These can couple more energy, like a transformer depending on orientation to the tower, instead of reducing it.