



## Meet PolyPhaser's new TSX Surge Arrestors with 4.3-10 Connectors

The new RF coaxial 4.3-10 connector is quickly becoming the de facto standard coaxial connection for cellular radios, especially small cells, due to its small foot print and increased PIM performance. These new connectors are helping operators improve network efficiency, while boosting capacity and controlling costs. Non-cellular applications, such as LMR and WLAN, are also considering 4.3-10 connectors due to its compact size and ease of installation.

These 4.3-10 connectors require a new class of surge protectors to ensure reliable performance, no matter what nature decides to throw at a network. This is why PolyPhaser developed the highly reliable TSX-4310 (DC block) and TSXDC-4310 (DC pass) surge arrestors.

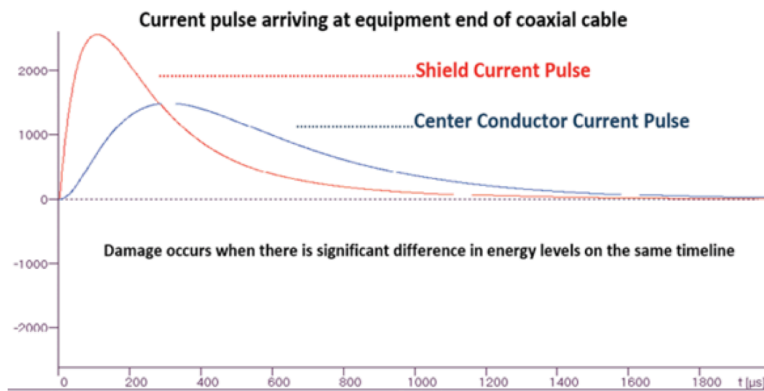
Using PolyPhaser's patented spiral filter inductor technology, these arrestors respond almost instantaneously to a lightning surge. By incorporating the 4.3-10 connectors, the new surge arrestors are more compact and lighter in weight than quarter wave stubs (QWS), an alternate technology. The lower weight and size are both important features in DAS and small cell deployments.

### Why are surge arrestors so important for your network?

A lightning strike, even indirect, can damage and destroy expensive and critical equipment.

A lightning strike looks like a double exponential curve (see Figure 1). The curves will be longer or shorter depending on the transmission properties of the system. These induced currents flow at different rates down the shield and the center pin causing a differential voltage at the end, which may lead to transients traversing through the cable causing damage to the equipment.

Figure 1



### A Key Question to Ask: What is the Voltage Let-Through?

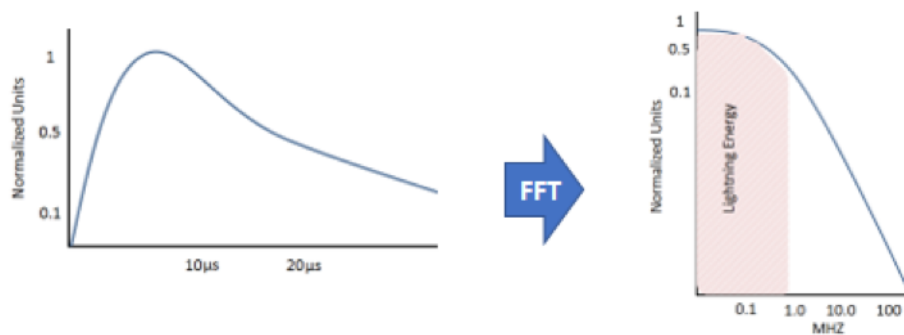
When considering a surge arrester for your network, you want to evaluate the voltage let-through that passes through the lightning surge protection device during a lightning strike. In other words, how successful a surge arrester is at reducing unwanted lightning voltages is a good way to determine how effective it is in protecting equipment.

There are two main types of technology used to protect RF coaxial lines: PolyPhaser's spiral inductor lightning protection technology and QWS technology.

PolyPhaser engineers conducted voltage let-through tests on both types of technology. Testing was done at 2kA and 3kA 8/20μs simulated lightning waveforms on 4.3-10 connected RF lightning arrestors. The result shows the QWS technology passed at least 150 times more let-through voltage than the PolyPhaser spiral inductor technology. Note that the PolyPhaser SX product reduced lightning voltages to millivolts, whereas the QWS allowed more than 50V to pass through.

### PolyPhaser's Spiral Inductor Lightning Filter

Figure 2



A typical profile of a lightning surge is shown in Figure 2. If we were to consider this lightning surge as an electrical signal, we will find the frequencies that make up this signal are mostly 10MHz or less. Figure 3 shows the construction behind PolyPhaser's spiral inductor technology, which is designed to remove the frequencies that make up most of the energy in a lightning surge. This design responds almost instantaneously, increasing the protection level on the coaxial line.

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Figure 3

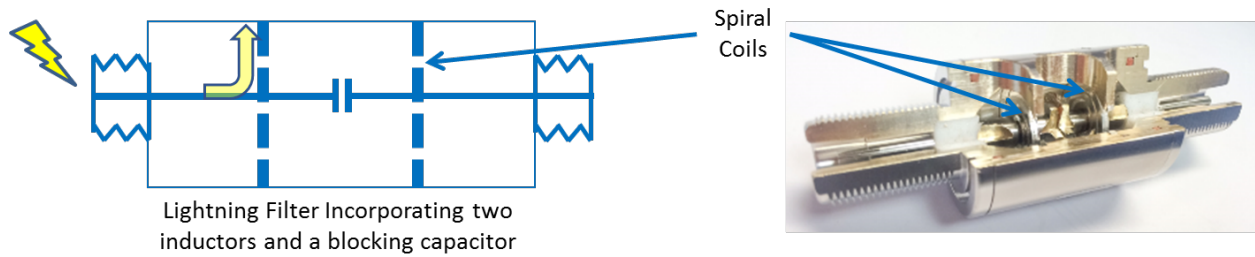
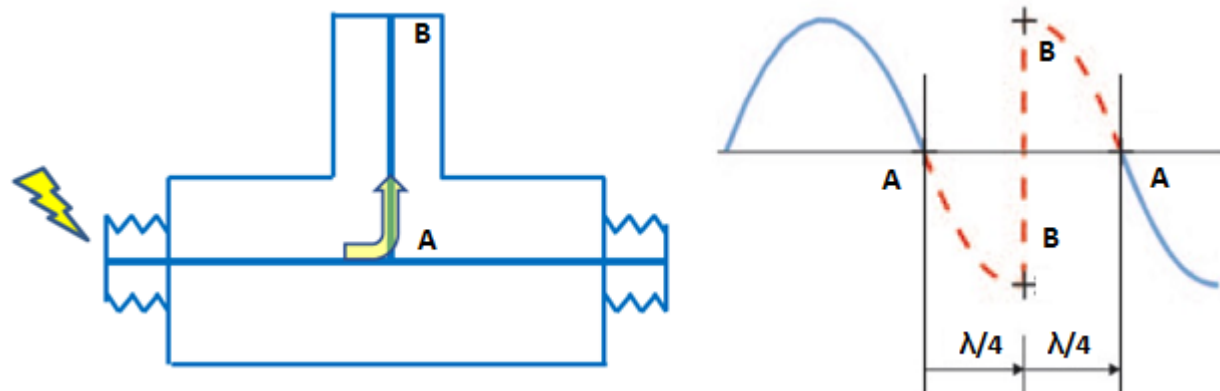


Figure 4



## Quarter Wave Stub – Taking Advantage of an RF Phenomenon

QWS is a short on the coaxial line that is designed to create a phase shift in a specific range of frequencies (for example, around 850MHz for cellular signals) that can pass through unchanged (see Figure 4). Any frequencies that are outside of this specific frequency range for the QWS will be out of phase and reduced in strength. In this case, the QWS is used as a filter for lightning surges. Unfortunately, the QWS isn't specifically designed to remove lightning surges. Rather it is designed to allow wanted frequencies to pass through. This limitation in design means the QWS will always have a higher voltage let-through (and therefore higher energy let-through) when compared to PolyPhaser's spiral inductor lightning technology.

## PolyPhaser TSX-4310 Surge Arrestors

The new PolyPhaser 4.3-10 connected lightning filters come in two categories –DC Block with a 40kA rating, when no DC current is required on the coaxial line, and DC Pass that allows for AISG and pre-amp signals to pass through. They operate in the 698 MHz to 2700MHz frequency ranges making them ideal for cellular networks and co-located small cells. These new filters offer ultra-low PIM, with a typical rating of -130dBm (-173 dBc, 2 x 20 W). The 4.3-10 connectors allows for a forgiving ease of installation, which means good RF performance, even if they aren't torqued properly.

The small investment of selecting the right RF lightning surge arrestor will pay off by reducing the likelihood of equipment failing and network downtime, not to mention the cost of the crew's time to make any repairs. Talk to your Primus sales representative today to see which TSX-4.3-10 PolyPhaser surge arrestor is right for your project.

