



## *Summary*

According to the National Lightning Safety Institute, the total annual cost of lightning damage to the United States is \$4 billion to \$5 billion. The ever-increasing reliance on microelectronics for critical business and governmental activity amplifies the potential damage that lightning can cause. A new technology developed by researchers at Florida Institute of Technology and the University of Florida can help mitigate that risk: a novel method for accurate lightning strike warning and after-the-fact strike location determination. An on-site instrument provides a 1 millisecond warning of an impending lightning strike to the site and after-the-fact evidence that lightning has struck within 100 meters of the instrument. Better accuracy can be obtained if multiple instruments spaced about 100 meters apart are used. After-the-fact strike location determination is essential in insurance issues such as determining whether a given structure fire was lightning-caused and in searching for potential lightning-caused damage such as on power transmission lines where an instrument could be placed on each transmission-line tower.

## **Applications**

- A trigger for proactive lightning protection
- After-the-fact proof of the occurrence of lightning

## **Advantages**

- Provides a warning signal up to 1 millisecond prior to any lightning strike within a 100-meter radius, enabling protection systems to be proactive
- Provides an improvement over present location determination methods that have an accuracy of 500 meters but detect only 80 to 90 percent of the cloud-to-ground lightning discharges; an accuracy of 100 meters can be achieved with a single instrument, and that accuracy can be further improved with multiple instruments while recording every cloud-to-ground lightning within its range

## *The Technology*

Current lightning forecasting and recording technologies employ sensors that record the electric and magnetic fields radiated by lightning after it has struck the ground, with a location accuracy of about 500 meters and a detection efficiency of 80 to 90 percent. Researchers at Florida Institute of Technology and the University of Florida have found that there are unique and characteristic co-incident x-ray and electromagnetic signals prior to a lightning strike observed at very close range, and that the presence of these signals signifies an imminent strike within 1 millisecond and 100 meters. The effects are only measurable over a range of 100 meters and just before lightning strikes an object on the ground, yielding the capability to pinpoint the lightning strike within a radius of 100 meters of a single instrument. Using the sensors in a networked array can further reduce the location error, increasing the accuracy.

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