Earthquake Monitoring Station Deploys GPS over Fiber System

Seismology instruments in a signal-denied location benefit from a GPS over fiber link

Based in Vienna, Zentralanstalt für Meteorologie und Geodynamik (ZAMG) offers a broad range of services, including archaeological ground surveys and earthquake monitoring.

Highly sensitive accelerometers are used to detect earthquake and after-shock tremors.

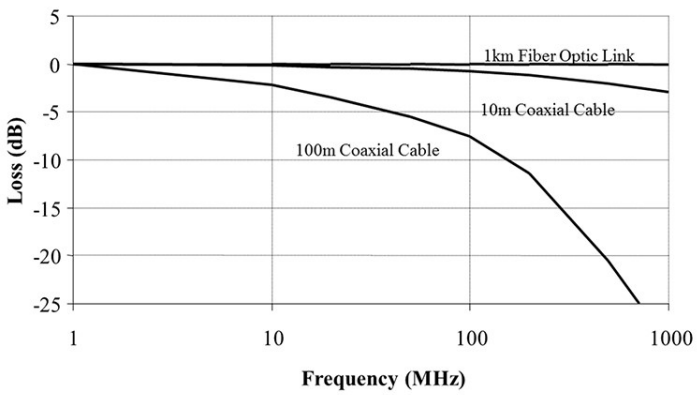
Networks that interconnect accelerometers and other devices are synchronized using the extremely accurate GPS clock. A GPS antenna with a coaxial cable is often used to convey the signal from outside the building to the indoor space in which it is needed.

The Challenge

One of ZAMG's monitoring facilities is located 100 meters below a dam, deep in the heart of the Austrian Alps. The use of coaxial cable for connecting a GPS antenna to the internal network was considered impractical for a number of reasons:

- Low-loss cable can be several mm in diameter and is heavy and difficult to install over long distances.
- The signal can be affected by electromagnetic interference (EMI), especially if it is positioned near power lines.
- Coaxial cable can be adversely affected by temperature changes, severe weather (lightning) and moisture.
- In-line amplifiers can be used to overcome signal losses caused by attenuation but can introduce unwanted noise and distortion.

Loss v Frequency Comparison for Fiber & Coaxial Cable



The Solution

ViaLite Communications worked with FalTech Ltd - a UK-based supplier of GPS Repeater technology - to specify and provide a solution to transport the GPS signal from an antenna located above the dam to the monitoring station below, using existing single-mode optical fiber.

For over 25 years ***ViaLite*** has specialized in providing fiber optic links for many applications for the satcom, broadcast and time and synchronization industries. As such, ***ViaLite***'s expertise in GPS over fiber applications proved a key factor in the success of this project.

*GPS antenna cable extended by a **ViaLite** GPS over fiber link*

At the top of the dam, a short coaxial cable connects the antenna to a ***ViaLiteHD*** optical transmitter (TX) module, located just inside the building. ***ViaLite***'s Blue OEM optical transceivers were selected for use due to their small size, connectivity options and low power consumption.

The optical transmitter module converts the RF signals into light by modulating a high-quality DFB laser light source. The modulated signal is then transported through an optical fiber to a ***ViaLiteHD*** optical receiver (RX) module located 100m below. Here the signal is converted back to its original form and connected to the GPS receiver by another short coaxial cable.

The flexible OEM modules can be configured with extra gain if required, to overcome any losses in the signal power from the antenna through to the "customer equipment" location.

The Result

The ***ViaLite*** Blue OEM modules were supplied with SMA RF connectors and SC/APC optical connectors and were quickly and easily installed at the monitoring site. The optical fiber link provides immunity to EMI and extends the GPS signal to areas where coaxial cable would not be a practical solution.

The network now benefits from a consistent signal from several satellites, ensuring that all devices are synchronized to the GPS clock signal.

Nikolaus Horn, seismologist at ZAMG commented:

> "The ***ViaLiteHD*** solution was specified for us by FalTech Ltd, who supplied all the necessary parts to complete the installation from end-to-end. The system was easy to implement, allowing us to overcome RF losses in a very challenging environment by using existing optical fiber."