Power-over-fiber energy transmission in extreme environments

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Summary/Characteristics

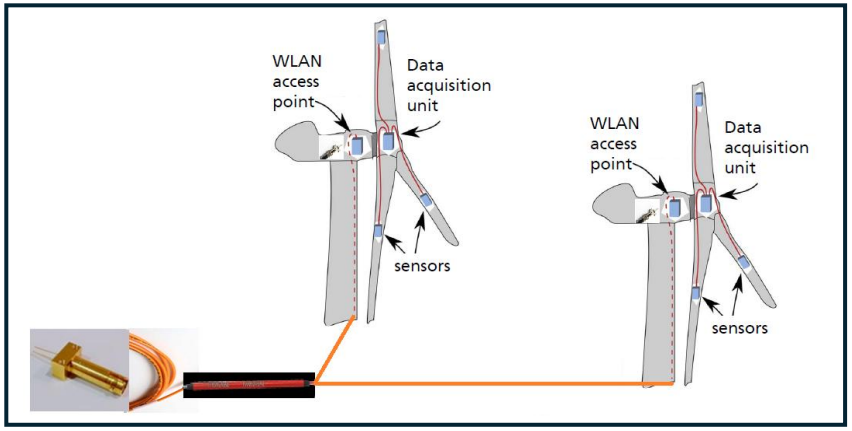
Technology developed by Universidad Carlos III de Madrid that integrates both data transmission and remote power supply through a single optical fiber. This system is designed for use in areas exposed to strong magnetic fields—avoiding electromagnetic interference—or environments with risks of electrical discharges (lightning) or explosions (flammable atmospheres).

It is also suitable for applications where weight reduction is essential by using existing or lighter optical fibers instead of heavier power cables (e.g. wind turbines, nuclear power plants, etc.).

Technical collaboration agreements are sought to apply and further develop the technology.

Innovative Aspects

- Unique integration of data transmission and remote power supply within a single optical fiber, reducing the need for additional cabling.
- Safe operation in critical environments thanks to immunity to electromagnetic interference, electrical discharges (lightning), and explosive/inflammable atmospheres.
- Remote powering over long distances.
- Compatible with low-power and pulsed operation techniques, as well as potential integration with ambient energy harvesting systems, optimizing energy efficiency and enhancing autonomy capabilities.
- Multiplexing capacity that allows the optimization of a single fiber infrastructure.



Remote powering in structural monitoring protected against lightning and interferences

Competitive Advantages

- Higher operational safety compared to conventional electrical systems, eliminating risks of short circuits, sparks, or explosions.
- Reduced installation and maintenance costs by using existing optical fibers or thinner fibers compared to power cabling.
- High reliability in environments with strong magnetic fields, where traditional systems fail.
- Energy and structural optimization, reducing weight in critical infrastructures such as wind turbines, satellites, nuclear power plants, etc.

Technology readiness level:

Development stage – Laboratory tests performed. TRL 5.

Intellectual and Industrial Property Status:

Trade secret – know-how

Type of collaboration sought:

Technical Cooperation Agreements or funding are sought from companies interested in developing a prototype for application of the technology in their sector of interest.

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