PO.297

Electric Fault Detection and Localization in Submarine Power Cables Using Distributed Acoustic Sensing

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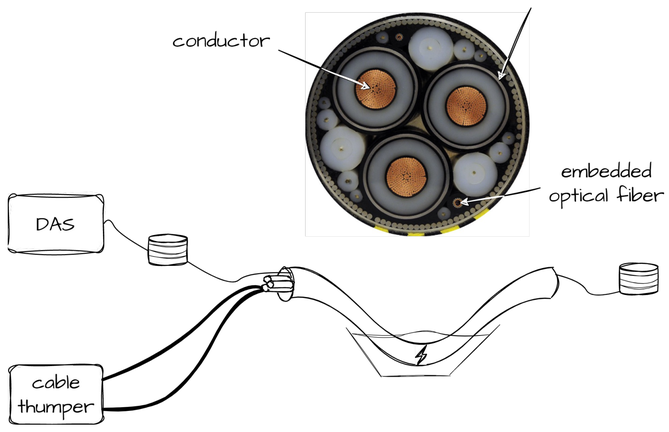
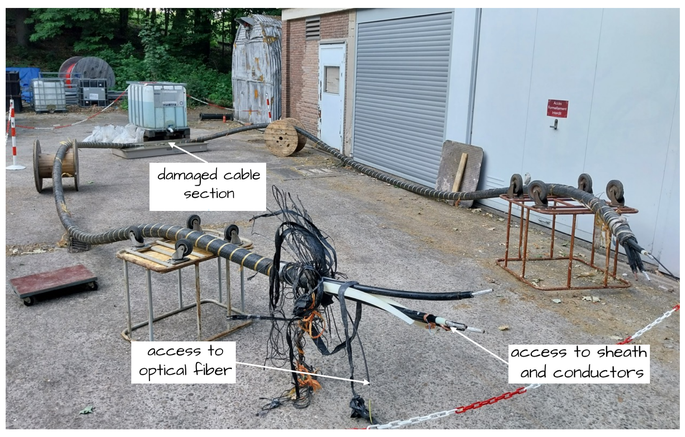
DAS to localize electric faults in a real-time application

Experimental set-up

An **experimental set-up** is created with

- a submarine infield cable sample 3x120mm2 18/36 kV of length 25m
- including an embedded optical fiber connected to a DAS interrogator;
- connected to a cable thumper injecting voltage surges.





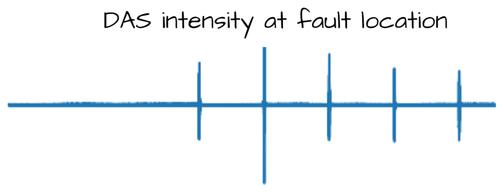
The cable is exposed to two faults. Both faults induce arcing while thumping on the cable

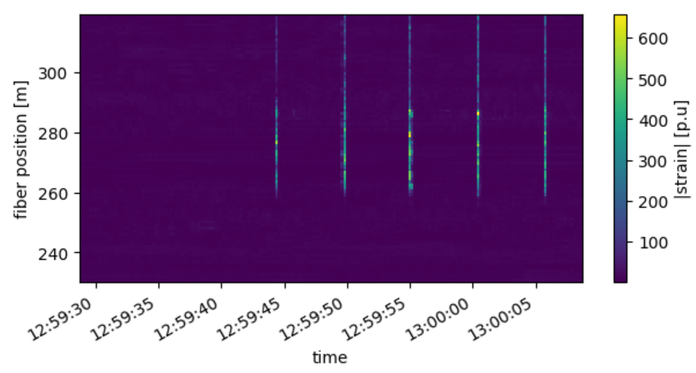
Cable sheath fault

Short-circuit fault

Detection

The cable fault is **detected in time and space** by a significant increase in acoustic intensity.





Environmental conditions

Both the cable sheath fault and the short-circuit fault are detected by sensing arcing acoustics, in all investigated conditions

- **air;**
- **buried in sand;**
- **buried in sand, submerged in water.**

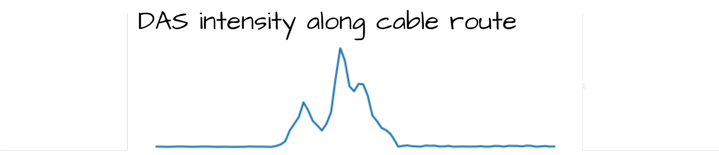
Cable in air

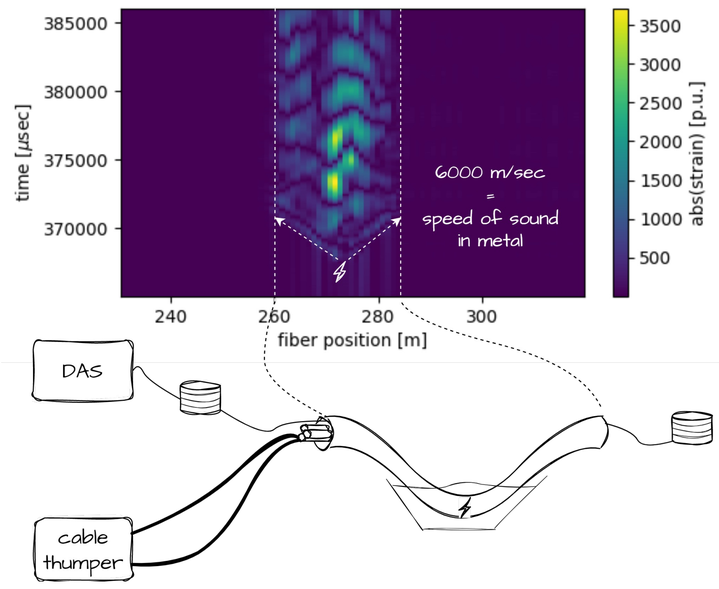
Cable in sand

Cable in sand & water

Localization

Detailed localization of the fault is enabled by analyzing the acoustic intensity from arcing. The sound travels through the cable at a known speed and the intensity is highest at the fault location.





Applicability

DAS monitoring is proven to be effective in detecting and localizing cable faults when arcing is involved.

The **added value is highest for continuous monitoring** combining the following aspects:

- the application provides the cable fault location quasi real-time along the route;
- third party intrusions linked to cable faults are recorded;
- emerging cable sheath faults can be detected while testing the voltage withstand capability as well as the presence of intermittent faults;
- other application objectives can be added using a single DAS measurement set-up, such as cable movement, free-span detection or CPS health monitoring.

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