

Abstract:
Heavy wind may tear cables down, damaging infrastructure, triggering outage in data-communication networks. We demonstrate local observations of wind in the access-network, monitoring State of Polarisation (SoP) in a live Fiber-To-The-Home air-cable.

Severe weather ahead ...

**Air-cables are exposed to weather and other events!
How to detect problems quickly and inexpensively?**

■ **State of Polarisation (SoP) Monitoring!**

- Impact on the cable visible as SoP changes
- SoP monitoring is possible with inexpensive, off-the-shelf components

■ **Our idea:**

- Revealing availability threats to fibre cable infrastructures
- Monitoring environmental parameters (e.g. weather)
- Develop a **scalable, larger-scale, inexpensive measurement infrastructure**

■ **Goals:**

- A **low-cost framework** to monitor many (or all) cables for a fibre operator
- Particularly: also monitor cables to **Fibre-to-the-Home (FTTH)** customers

More reliable services at low costs!

Our Scalable Collection Infrastructure

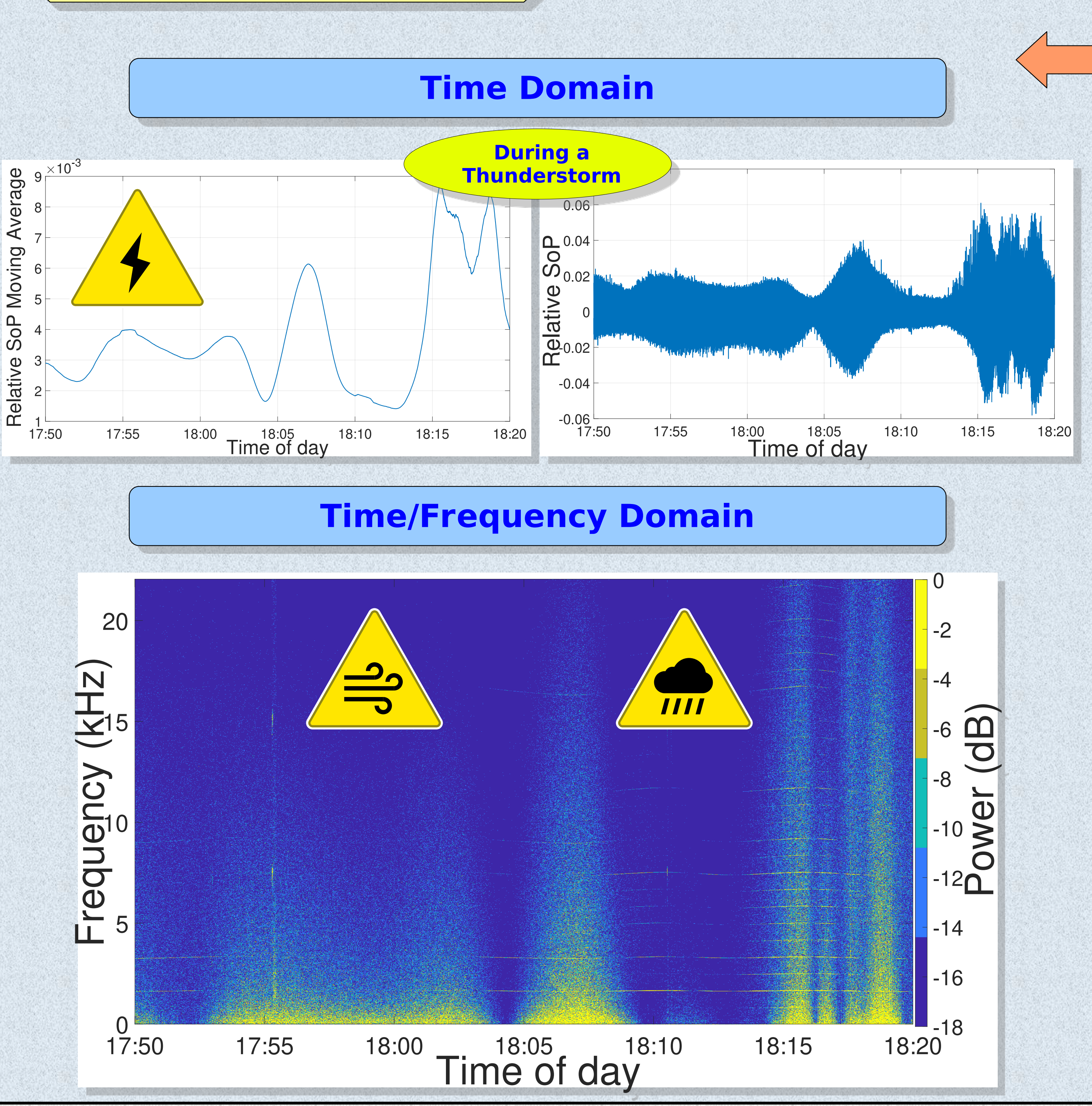
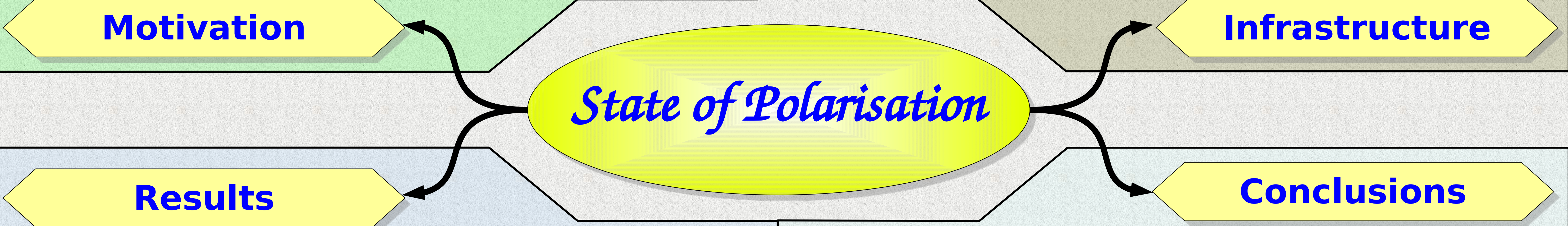
■ **Novelty:** n measurement nodes, collecting to central site

- **Low per-node costs** (small storage/compute power, low power usage)
- Usage of **inexpensive data centre resources** for storage and analysis
- Based on **open source components**
- Designed with **security** in mind!

Our FTTH Evaluation Setup

■ Home-user FTTH air-cable in Bekkestua, Akershus, Norway

■ Air-cable length: ca. 1.5 km



Results Highlights

- Heavy wind gusts and rain during thunderstorm
- Wind and rain cause mechanical vibrations and swaying of the cable
- Strong variations below 100 Hz and variations up to 20 kHz

Ongoing Work

- Further analysis may focus on:
 - Discrete frequencies causes
 - Further analysis of different types of weather impacts
 - Identifying patterns for alerts (i.e. imminent cable break, etc.)

Further Application Scenarios

Our system has a big potential for both, research as well as commercial deployment!

Our Projects

SimulaMet Oslo, Norway

5G-VINNI

- **5G Testbeds**
 - Fibre infrastructure in fronthaul
 - Emergency services
 - Performance evaluation
 - Telemetry
- Website: <https://www.5g-vinni.eu>

NorNet

- **NorNet Core**
 - Including fibre connectivity
- **NorNet Edge**
 - Mobile networks measurement platform
 - Fibre backbones
- Website: <https://www.nntb.no>

GAIA

- **Cyber Sovereignty**
 - Availability threats
 - Security threats
 - Physical Layer (fibre)
 - Higher layer Internet routing
- Website: <https://gaia.nntb.no>