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Title	**Novel Correlated Coding Technique for Fiber Fault-Surveillance in Existing and Next-Generation Fiber-to-the-home Networks.**
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Funding Organization	Research Center, College of Engineering, King Saud University.
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Summary:

Fibre-to-the-home (FTTH) is the evolving solution for the last/first mile telecom bottleneck. Extensive FTTH deployments have been carried out in North America and Japan over recent years. The demand for FTTH services is growing at 80% per year compared to 3% for DSL in Japan. The number of customers sharing the same fibre currently ranges from 16 to 32, and near term industry forecast predict ranges from 64 to 128. Industrial and academic laboratories already report 1024 customers sharing the same fibre by means of time division multiplexing together with wavelength division multiplexing of passive optical networks (TDM/WDM-PON). The need remains for centralized monitoring of these complex optical network infrastructures, and many technologic challenges remain. Indeed, no known product, nor technology, offers a serious solution for high capacity PONs supporting more than 20 to 30 customers per fibre.

We expect this new proposal will extend the capacity of previous monitoring system 4 to 8 times, hence allowing the monitoring of 128 to 256 customers in an FTTH network. Our new technique exploits a new coding/decoding concept that combines our previous coding proposals with correlation technique that is popular in standard optical-time-domain-reflectrometry (OTDR). This involves more advanced processing of the monitoring signal at the network central office (CO).

Key features of our optical coding solution include its simplicity, the maturity of the components (exploits of the shelf components), low cost components, and its inherent ability to allow centralized monitoring, thus giving telecom service providers full information and control of their networking infrastructure. Alternative solutions have only achieved a very early research state, are impractical, and lack supervisory and troubleshooting information that is crucial to service providers. These solutions, based on placing supervisory modules in customers' equipment, do not provide the service providers full control of their network.

Objectives:

The primary objective of this project is to develop a simulator and architecture of advanced and intelligent COME. This is a central part in future monitoring system based on coding. Our new principle combines mature traditional OTDR technology, the so-called correlated OTDR, together with our low-cost one-dimensional coding principle. Our new COME principle targets the capability to monitor a 128 to 256 customer's network all using one-dimensional coding and electronic decoding.

The technical goals of this project are:

- Develop a simulation program of a high-speed pseudo-noise pulse generation in the transmitter side in a way that takes into account a whole network parameters: distances, repetition rate, correlation distances, code lengths etc,
- Develop a simulation routine that represents a high-speed analog to digital conversion (ADC) at the receiver side that would be responsible of digitalizing the receive network responses,
- Generate randomly very high number of network distributions.
- Store successive network responses, and
- Develop a software that includes all required processing functions and intelligent algorithms including the averaging, correlation, decoding, and then extraction of the network state information and alarm generation.