

IIT MADRAS Technology Transfer Office TTO - IPM Cell



Industrial Consultancy & Sponsored Research (IC&SR)

# METHOD AND RECIRCULATING LOOP SYSTEM FOR LONG HAUL TRANSMISSION IN OPTIC COMMUNICATION

# IITM Technology Available for Licensing

## **Problem Statement**

Indian Institute of Technology Madras

- Generally, back-haul data transport of wireless and cloud services completely relies on use of fiber-optic cables due to low loss property over very large bandwidths and for distances up to several tens of thousands of kilometers.
- In order to study performance of data transmission over such large distances can be achieved by an alternative system where output of one span of fiber is fed back to an input of the same span of fiber and signal is allowed to circulate in the same span until a desired length of fiber transmission is achieved.
- This recirculating loop can then be used to emulate long-haul transmission in the laboratory and simplify test-bed cost and space effectively.
- All the demonstrations of the recirculating loop employ two optical switches which makes the recirculating loop consume large amount of space and also expensive.
- Further, the procedure for operating the two optical switches is a time cumbersome process. Thus, the present invention proposes an alternative using single optical switch to address the above shortcomings.

### **Technology Category/ Market**

**Telecommunication, Data & Optic communication** Applications - Optical memories, fast data buffer applications, microwave photonic filters.

Market - The global optical communication and networking market grew from \$22.1 billion in 2022 to \$23.81 billion in 2023 at a CAGR of 7.7%, and is expected to grow to \$29.51 billion in 2027 at a CAGR of 5.5%.

### **Key Features / Value Proposition**

- The recirculating loop for single mode fibers uses a 1. single optical switch, thus reducing overall design cost.
- 2. Can support all types of modulation
- 3. Programmable method to increase in number of spans.
- 4. The same design can also be extended to recirculating loops of specialty fibers.

# **CONTACT US**

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IITM TTO Website: https://ipm.icsr.in/ipm/

#### Intellectual Property

- IITM IDF Ref. 2275
- IN 428828 Patent Granted

#### Technology

The principal object of the invention is to provide a recirculating loop system for long haul transmission in optic communication (refer Fig. 1, 2). The recirculating loop system includes:

> An optical transmitter for generating optical signal, wherein the optical signal is at least one of an in-phase (I) optical signal and a quadrature phase (Q) optical signal and a first channel system for providing a specific signal power to the optical signal.

- An optical switch connected to an optical controller, for loading the optical signal comprising the specific signal power into a recirculating loop, wherein the optical switch is an acousto-optic modulator (AOM).
- •The recirculating loop system uses a single fiber spool through which the optical signal is recirculated back to the loop through the optical switch for a specific number of times.
- Further, an electronic controller for providing timing information related to loading and looping of the optical pulses through the optical switch, and
- An optical receiver for converting the re-circulated optical signal to an electrical signal after recirculation for the specific number of times and
- ·A real-time oscilloscope for digitizing and the recirculated optical signal based on a trigger pulse provided to oscilloscope by the electronic controller.

### TRL (Technology Readiness Level)

TRL - 3, Proof of concept stage

#### Research Lab

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Fig. 1. is a block diagram of a recirculating loop system for long haul transmission in optic communication



Fig. 2. is a flow chart illustrating a method for long haul transmission in the optic communication using the recirculating loop system



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