



Optical Time Domain Reflectometer (OTDR)

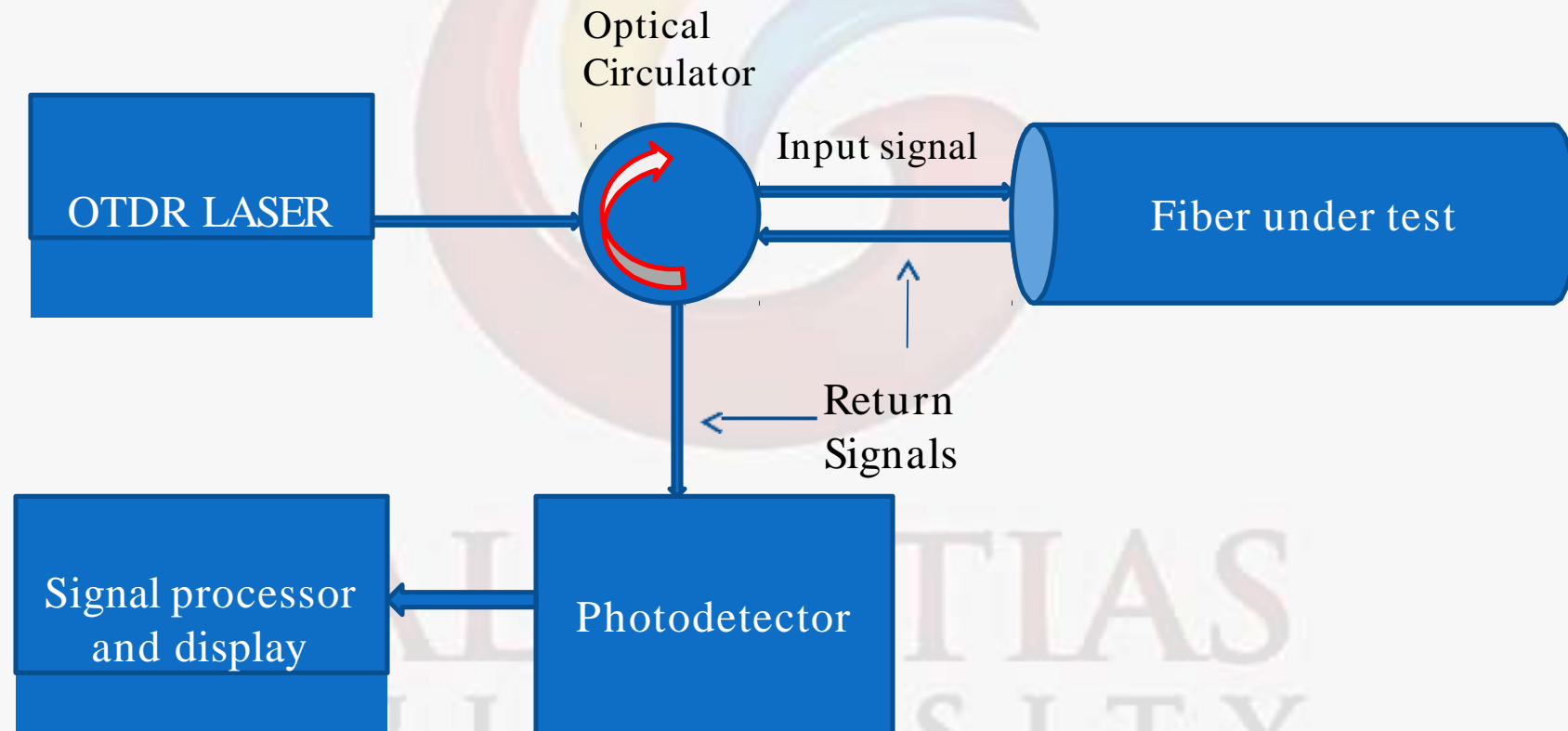
GALGOTIAS
UNIVERSITY

What is OTDR?

- OTDR (Optical Time Domain Reflectometer) is a versatile portable instrument that is used widely to evaluate the characteristics of an installed fiber optic link.
- It also measures optical fiber parameters such as attenuation, length, optical connector and splices loss.
- OTDR technology is designed to provide a single ended test of any cable.
- OTDR fundamentally is an Optical RADAR.

GALGOTIAS
UNIVERSITY

Basic operational principle





Topic:

Optical Time Domain Reflectometer (OTDR)

GALGOTIAS
UNIVERSITY

OTDR Setup



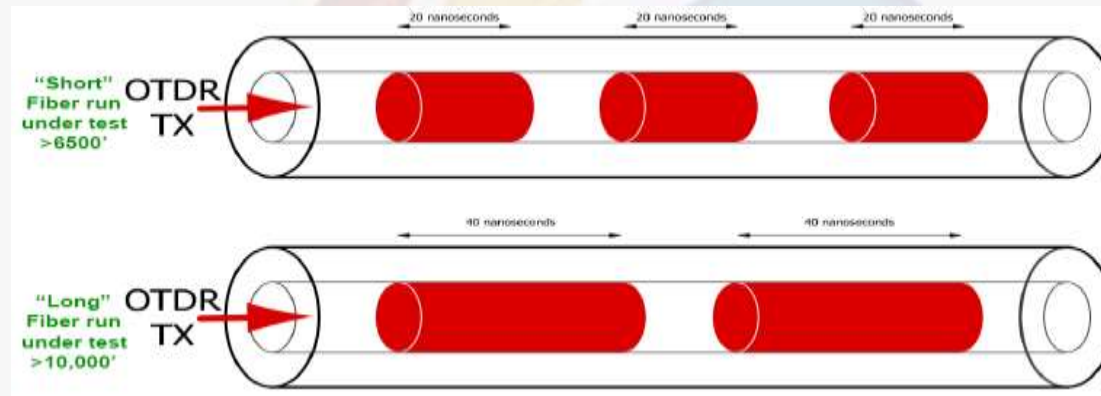
OTDR Setup- RANGE

The first one to consider is “Range” or distance of fiber to test.

Many OTDRs have automatic length detection functions, but if the length is known, the user can set the range manually. The range setting should be adjusted to no less than 1.5 to 2x the fiber span under test.



OTDR Setup- Pulse Width



- Longer pulse widths are used for longer range tests. As distance increases, pulse width must go up, otherwise traces will appear “noisy” and rough.
- Similarly, short traces will be inconclusive if long pulse widths are used (events may be missed or clipped).

GALGOTIAS
UNIVERSITY

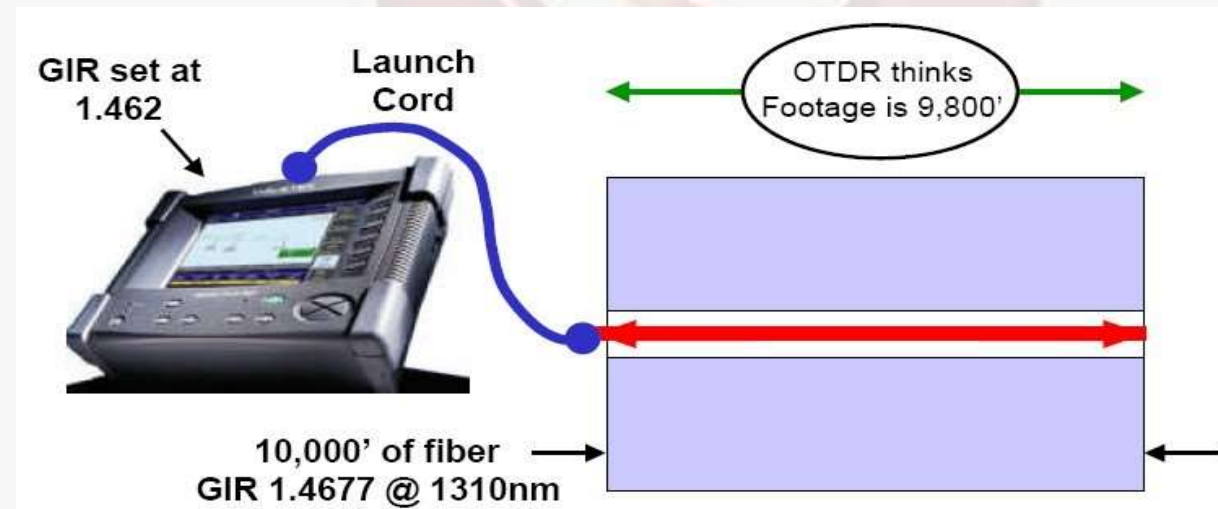
OTDR Setup- Index of Refraction

- In review, the Index of Refraction is a way of measuring the speed of light in a material. Light travels fastest in a vacuum, such as outer space. The actual speed of light in a vacuum is 300,000 kilometers per second, or 186,000 miles per second. Index of Refraction is calculated by dividing the speed of light in a vacuum by the speed of light in some other medium.
- **Index of Refraction = $\frac{\text{Speed of Light in a Vacuum}}{\text{Speed of Light in a Medium}}$**

GALGOTIAS
UNIVERSITY

Index of Refraction

If the Group Index of Refraction (GIR) setting in the OTDR does not match that of the fiber under test, the results will show incorrect distances as a result.



OTDR Setup- Averaging Time

Averaging time refers to how long the user allows the device to take samples (how long the test “runs”). The longer the testing/averaging time allowed, the better the result. Eventually, enough data is averaged for a good test and continuing to test won’t yield any more of an accurate result.



OTDR Types



- Most common OTDRs use a “console” design allowing the user to upgrade or swap between MM and SM modules.
- These offer similar analytical features to the lab quality OTDRs, but are more rugged and field portable.
- Files can be saved to various media and later downloaded to a PC.



GALGOTIAS
UNIVERSITY

Micro OTDRs

Noyes M200
OTDR



Noyes M100
OTDR



Noyes OFL200
OTDR



- Micro-OTDRs are the next generation of fast, economical test sets for field use.
- These models offer fewer features than the larger console design and are currently not upgradeable.

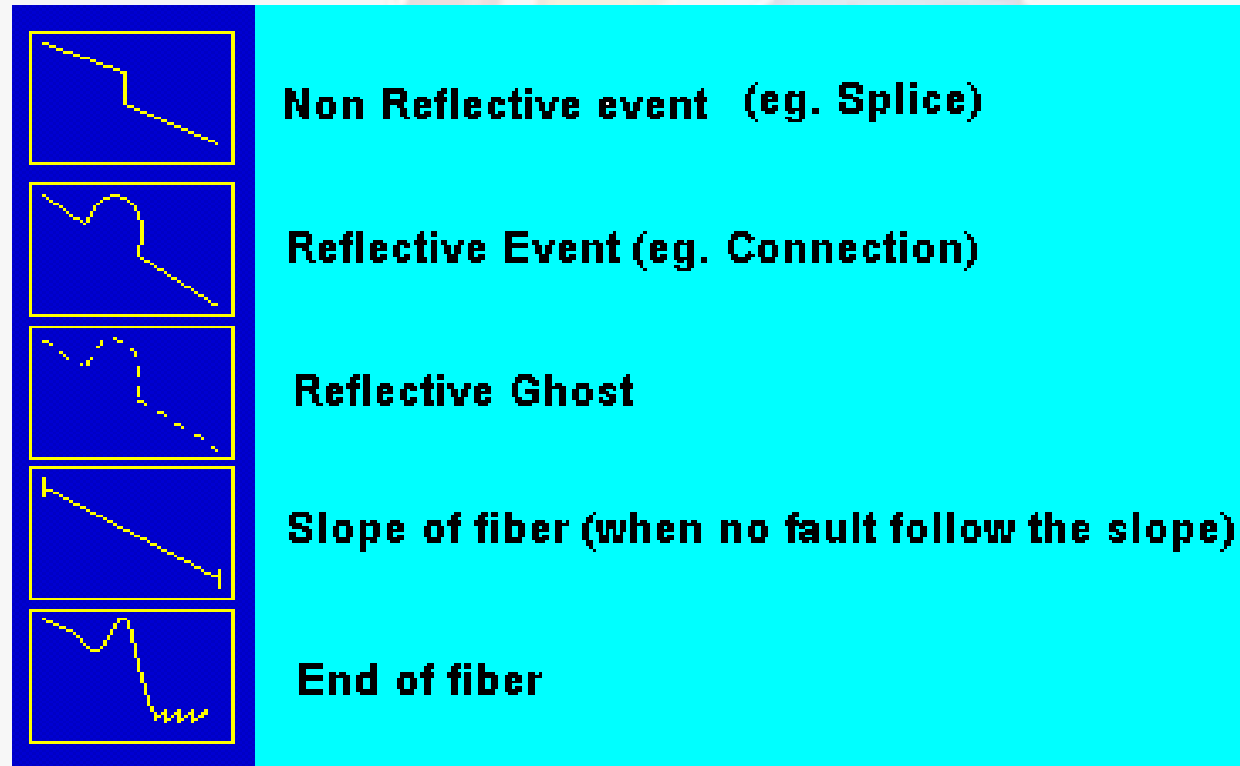
GALVAST
UNIVERSITY

OTDR Testing

- Generates a baseline trace: A “visual” of the link.
- Can identify and evaluate specific events in the link.
- Cable acceptance tool.
- Fault location tool.
- Excellent documentation capabilities.

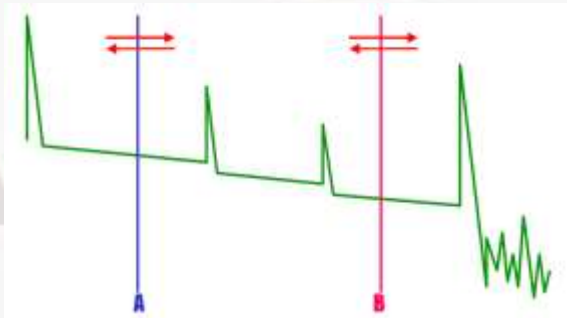
GALGOTIAS
UNIVERSITY

Observations on display



Trace Analysis

- Most commonly, users manipulate two cursors, “A” and “B”, to illustrate what is referred to as “two point loss” on an OTDR result.
- This can be used to show loss in a single event or in a group of events. These cursors can be individually moved left and right to specific points on the result.



Advantages

- A number of optical time domain reflectometers are commercially available for operation over the entire wavelength range.
- These instruments are capable of carrying out tests over single or dual wavelengths for multimode and for single-mode optical fiber links.
- Although the OTDR functionality is provided, these instruments are also often capable of performing a number of other optical system and network tests (e.g. optical loss, dispersion measurement etc.).
- Such instruments are usually referred as universal or optical network test systems rather than simply optical time domain reflectometers.

GALGOTIAS
UNIVERSITY

OTDR Limitations

- The limited distance resolution of the OTDR makes it very hard to use in a LAN or building environment where cables are usually only a few hundred meters long.
- The OTDR has a great deal of difficulty resolving features in the short cables of a LAN and is likely to show "ghosts" from reflections at connectors, which confuses the user.

GALGOTIAS
UNIVERSITY

Applications

- OTDR is an important instrument used by organizations to certify the performance of new fiber optics links and detect problems with existing fiber links.
- OTDRs are also used for maintaining fiber plant performance.
- An OTDR allows to see more detail impacted by the cabling installation.
- An OTDR maps the cabling and can illustrate termination quality, location of faults.
- An OTDR provides advanced diagnostics to isolate a point of failure that may hinder network performance.

GALGOTTIAS
UNIVERSITY

School of Electrical, Electronics and Communication Engineering

Course Code : BECE3016

Course Name: OPTICAL COMMUNICATION



Thank
You!

GALGOTIAS
UNIVERSITY

Name of the Faculty: Dr. Yogesh Kumar

Program Name: B.Tech