

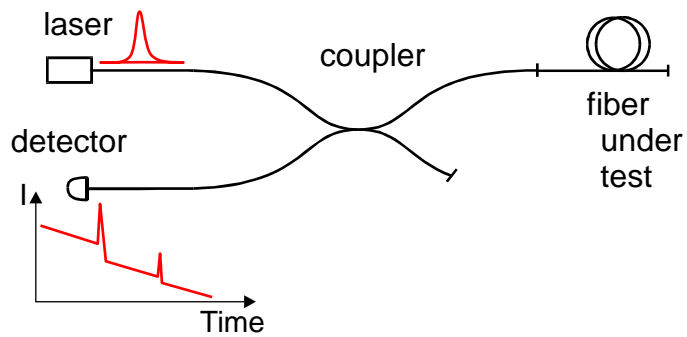
The LOR-200 family of High Resolution OTDRs

New Testing Solutions for Fiber Assemblies and Passive Optical Networks

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Principle of an OTDR: schematic



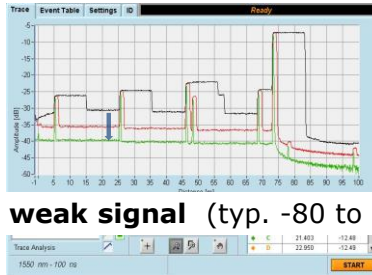
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Why is it hard to make a High Resolution OTDR?

1. Speed of light is **huge!** In fiber: 10 cm \Leftrightarrow 1 ns
 \Rightarrow Use short optical pulses (e.g. 1ns)
 Need **fast detection** (e.g. GHz)

2. RBS signal is **tiny!**

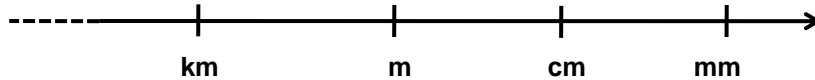


- \Rightarrow
- Need to detect
- very weak signal**
- (typ. -80 to -100 dB)

- \Rightarrow
- Need special technology:
- Photon counting**

What type of instrument do you need?

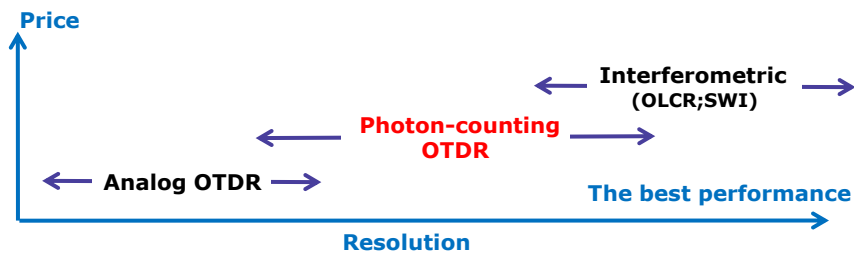
Distance range:



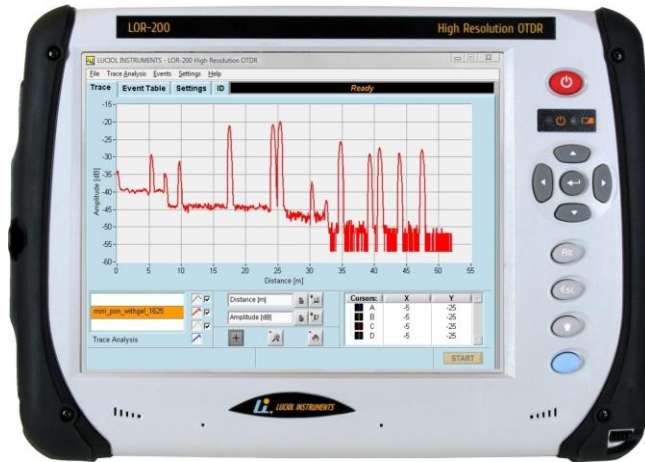
Application:

Optical Networks PONs, FTTH Fiber assemblies; Harnesses; Sensors Components

Instrument:



The LOR-200 family from Luciol: Scanning Photon-Counting OTDR

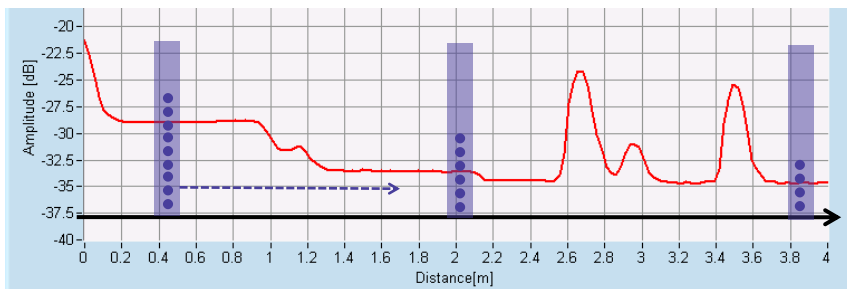


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Principle of Scanning Photon-Counting OTDR (US patent #7,593,098)



- Generate short detection window
- Scan the detection window one step at a time
- Add variable attenuation at each step to get:
One pulse → one count max.
- Trace is a histogram with different # of counts

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Main applications

1. Tests of MMF assemblies (650/850 nm)
 - Aerospace and aviation
 - Military
2. Tests of SMF assemblies (Telecom wavelengths)
 - Backplane analysis and troubleshooting
 - Sensors and sensor assemblies
3. Installation/Maintenance/ Monitoring of PONs
4. Custom applications
 - SMF@650 nm
 - Large core MMF
 - POFs
 - ...

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LOR-200 family: Highlights

- Fully portable instrument
 - OTDR type of format
- Can separate events with unprecedented resolution
 - Shortest optical pulses in the industry: 1 ns !
matched with high-speed detection;
Event deadzone as small as **10 cm**
- Can see any event, even after large reflections
 - Attenuation deadzone: **40 cm** (1 ns pulses, ORL= 45 dB)
- Can see very weak reflections, even at short pulse lengths
 - High sensitivity: can see signals down to -110 dB

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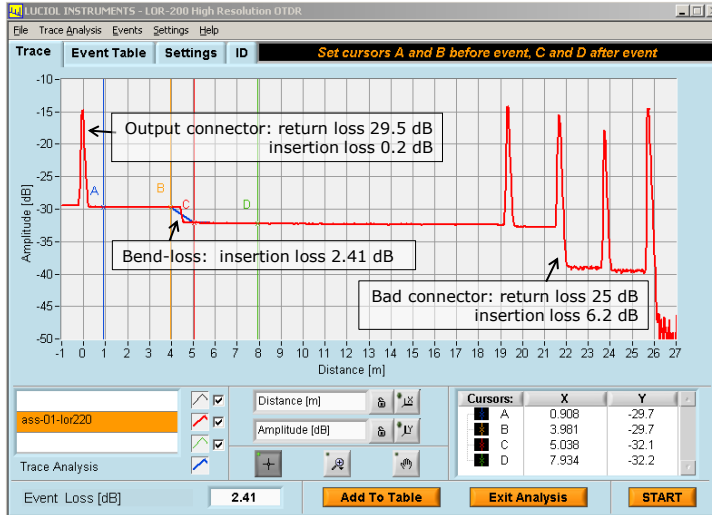
Some specifications: LOR-200

- Wavelengths : 1310 nm, 1550 nm, 1625 nm (for live mode PONs supervision)
- Optical power of the laser: \approx up to +13 dBm output (peak power)
- **User-selectable optical pulses lengths:**
2 ns – 5 ns – 10 ns – 30 ns – 100 ns – 300 ns - 1000 ns
- Maximum length of network: variable between 1.25 and 160 km
- Width of measurement window: variable, user-selectable
- Minimum spatial resolution (minimum distance between measurement points): \approx 2.5 cm (0.25 ns)
- **Event deadzone: 20 cm (2 ns pulses)**
- **Attenuation deadzone: 50 cm (2 ns pulses, ORL= 45 dB)**
- **DR : 18 dB for 2 ns pulses ;
20 dB for 10 ns pulses.**
- Number of measurement points: variable according to resolution
- Measurement time: \approx 0.1 sec for each measurement point

Some specifications: LOR-220

- Wavelengths : 650 nm, 850 nm
- Optical power of the laser: \approx several dBm output (peak power)
- **Fixed optical pulses length : 1 ns**
- Maximum length of network: variable (several kms)
- Width of measurement window: variable, user-selectable
- Minimum spatial resolution (minimum distance between measurement points): \approx 2.5 cm (0.25 ns)
- **Event deadzone: 10 cm**
- **Attenuation deadzone: 40 cm (ORL= 45 dB)**
- **DR : > 20 dB**
- Number of measurement points: variable according to resolution
- Measurement time: \approx 0.1 sec for each measurement point

First example: Fiber assembly with bend-loss and a bad connector

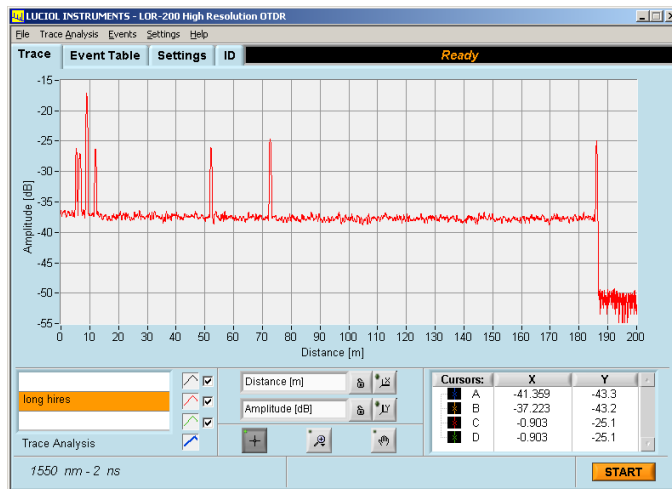


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SMF applications A long SMF, with several connectors

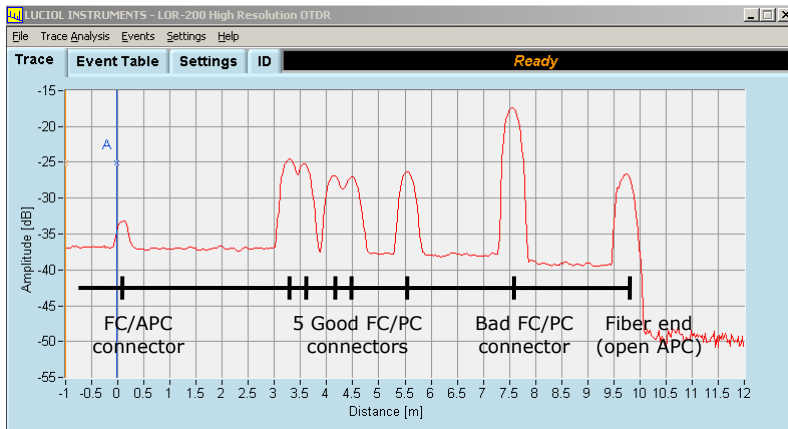


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SMF applications Analysis of a short SMF assembly at 1310 nm

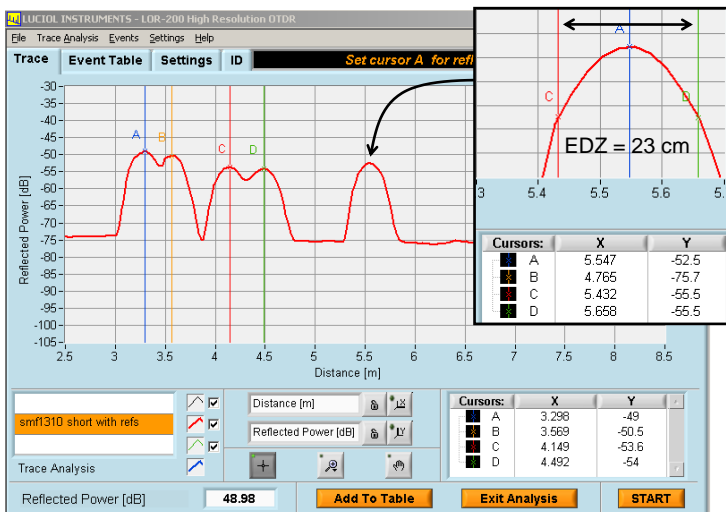


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SMF applications SMF@1310 nm: Event DeadZone

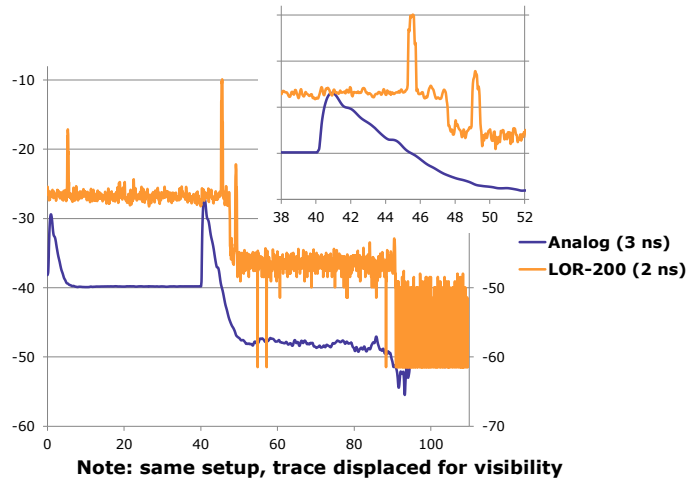


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SMF applications Comparison: Analog OTDR vs. LOR-200

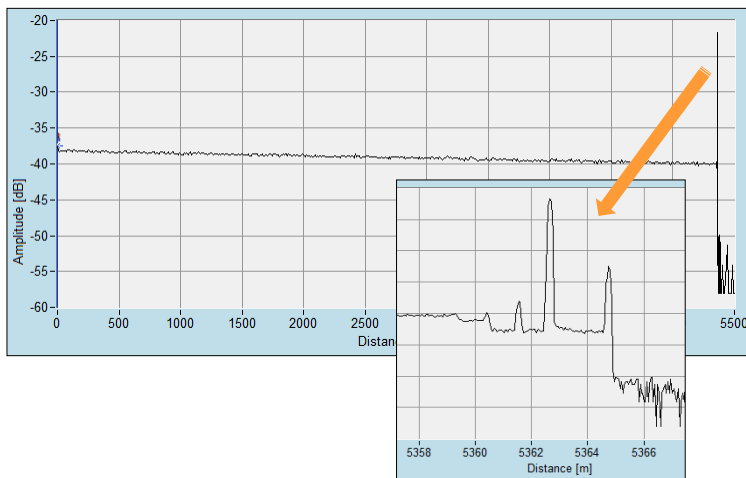


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SMF applications: Zoom at the end of a long fiber

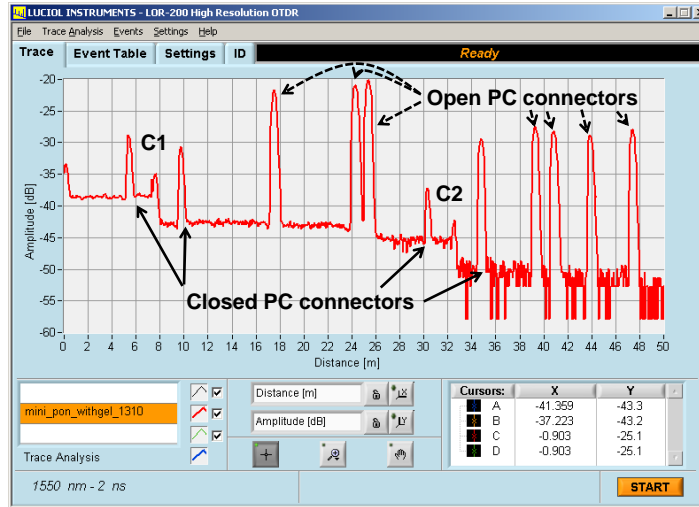


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One example for PON applications : mini-PON with 2 1X4 couplers



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Summary

- High resolution system (typical: cm range)
- Measures IL and RL of multiple events, even on short leads (m range)
- Can have
 - either variable pulse widths (from 2 ns) for extended network characterization (LOR-200);
 - or highest resolution with 1 ns pulses (LOR-220).
- Accurate zooming on far-away events
- SMF system specially designed for PON (point-to-multipoint)
- MMF system specially designed for Aviation, Defence, Sensors...
- Available for most fiber types and wavelengths

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Thank you!

Any question?

For more information,

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Or visit: www.luciol.com