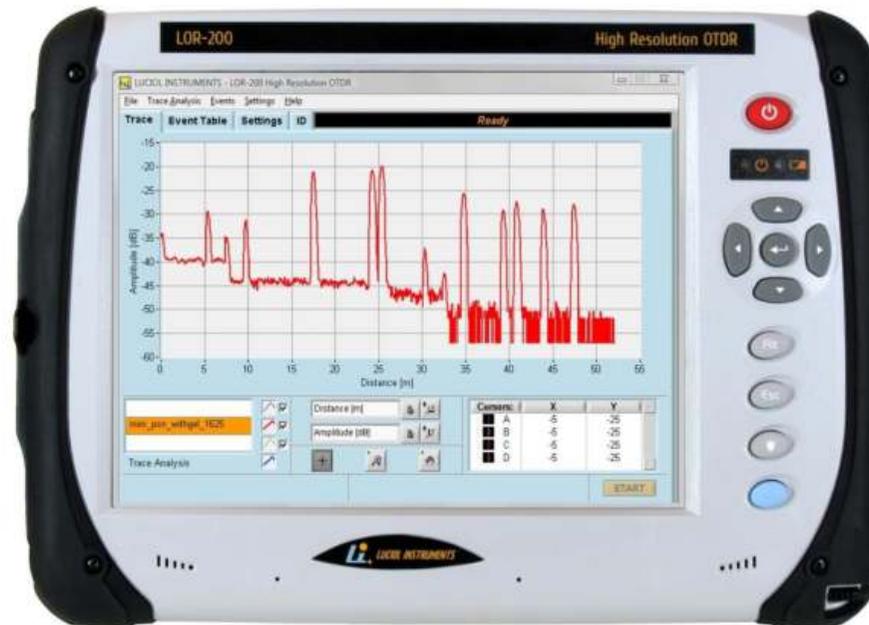




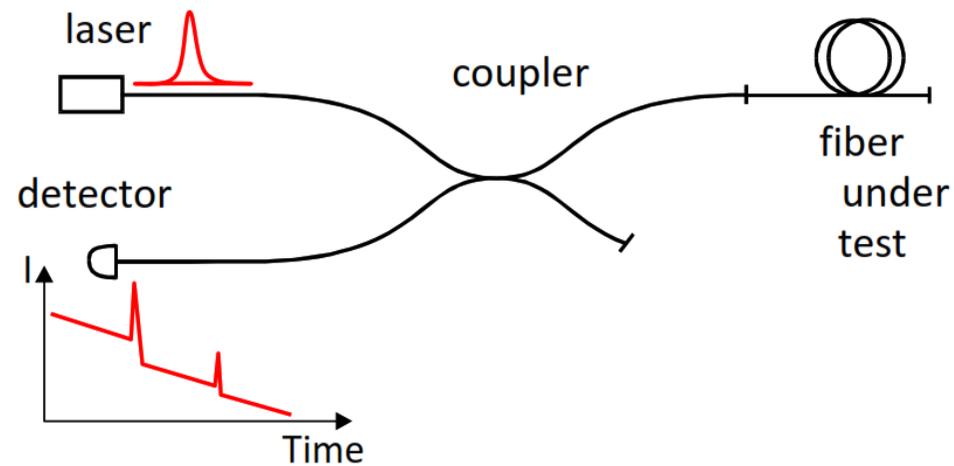
## Optical reflectometer

# Characterization and Troubleshooting of Optical Fiber Cables with a LOR-220



# Généralité de fonctionnement

Principle of an OTDR: schematic



$$\text{Distance} = [c/n] \times \text{Time}$$

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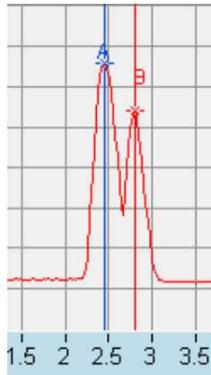
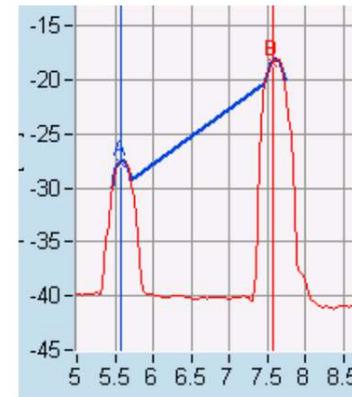
## specifications: LOR-220

- Wavelengths : 650 nm, 850 nm (1310nm, 1550nm)
- Optical power of the laser:  $\approx$ several dBm output (peak power)
- **Fixed optical pulses length : 1 ns**
- Maximum length of network: variable (several 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: 10 cm (ORL= 45 dB)**
- **Attenuation deadzone: 40 cm (ORL= 45 dB)**
- **DR : > 20 dB (12 db typical for 1310 and 1550nm)**
- Number of measurement points: variable according to resolution
- Measurement time:  $\approx$  0.1 sec for each measurement point

## OTDR parameters: Resolution

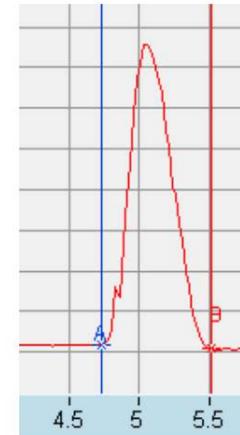
### Three different concepts:

1. **Precision of length measurement**  
(also known as one-point resolution)  
**From  $\pm 1\text{cm}$  for the LOR-220**



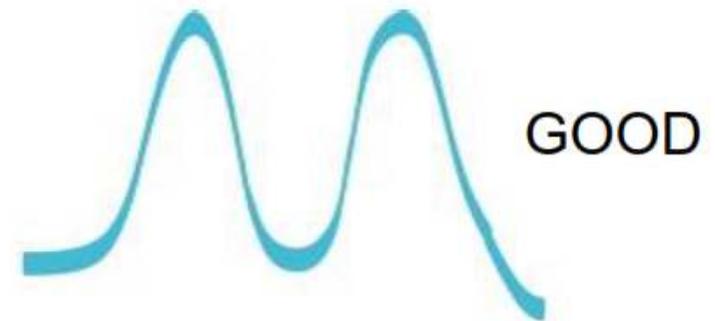
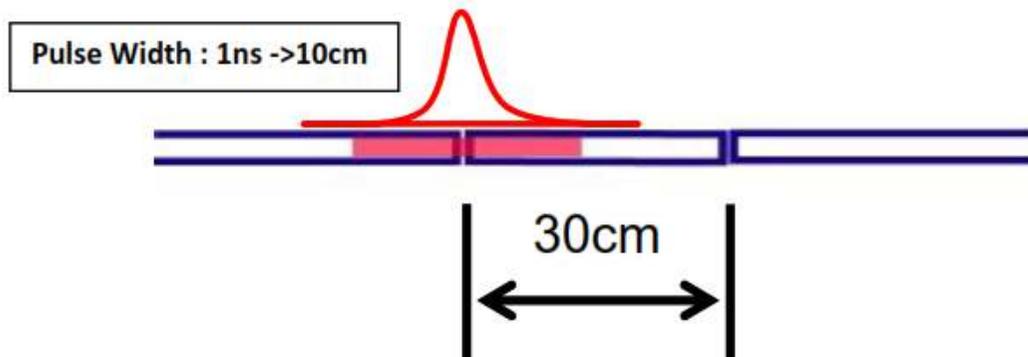
2. **Event deadzone (EDZ)**  
(also known as two-point resolution)  
Minimum distance needed in order to separate events  
**10 cm for the LOR-220**

3. **Attenuation deadzone (ADZ)**  
Minimum distance needed in order to measure IL after a reflective event  
**40 cm for the LOR-220**



## High-resolution OTDR

Small pulse (LOR-220: 1ns)



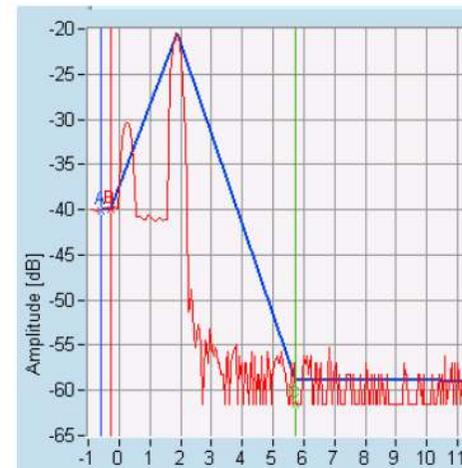
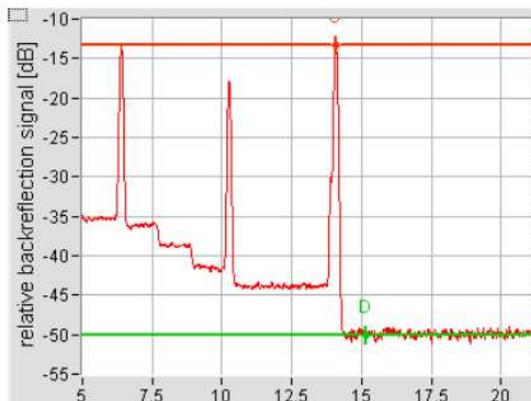
## OTDR parameters: Dynamic Range

Two different concepts:

### 1. IL dynamic range

- “Usual” Dynamic Range
- Distance between RBS and noise floor
- $\approx$  Total loss acceptable in link
- Often specified for longest optical pulses...
- ...But should also be specified for shorter pulses.

**> 20 dB for the LOR-220 (for 670 and 850nm)**



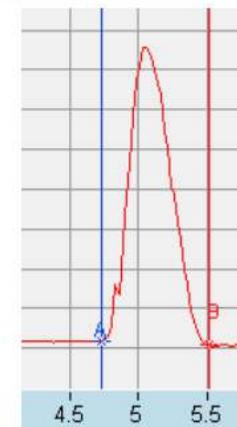
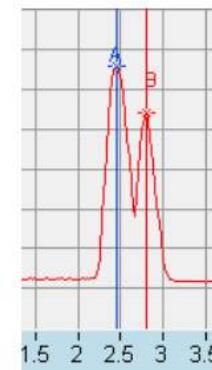
### 2. RL dynamic range

- Maximum reflectance above noise floor
- May be limiting factor for traces with high reflections and high resolution

**98 dB for the LOR-220**

## Parameters for High Resolution reflectometers

- 1. Resolution**
  - Precision of length measurement *1-10 cm*
  - Separate events (EDZ):  $\leq 20\text{ cm}$
  - Measure IL (ADZ):  $\leq 1\text{ m}$
- 2. IL dynamic range**
  - Need to specify DR *for shortest pulses*
  - Total loss acceptable in link  $\leq 10\text{ dB}$
  - IL dynamic range  $\approx 15\text{ dB}$
- 3. RL dynamic range**
  - High reflections may occur (up to  $-14\text{ dB}$ )
  - Need to see both RBS and reflections
  - Need *60 dB to 80 dB min.*
- 4. Wavelength(s)**
  - Use MMF at 850, 1310 nm...
  - Similar results at different wavelengths
  - *Shorter is better* (higher RBS)
- 5. Modal distribution**
  - Consistent with transmission systems
  - Consistent with other test methods



**LOR  
portable**

**LOR  
Portable  
double sortie**

**LOR  
Portable  
double sortie**

**LOR-UD  
version « de table »  
double détection**



**Configurations possibles**

Lors de l'achat il faut choisir :  
520/670/850/1064 nm  
(Jusqu'à 4 longueurs d'onde au total)

où

1310/1550/1625/ nm\*  
(Jusqu'à 4 longueurs d'onde au total)

Lors de l'achat il faut choisir le type de fibres SMF  
où MMF

Appareil fonctionnant à 1310/1550/1625 nm  
(Jusqu'à 4 longueurs d'onde au total)

Sortie A : SMF - Sortie B : MMF

Appareil fonctionnant à 520/670/850/1064 nm  
(Jusqu'à 4 longueurs d'onde au total)

Sortie A MMF62 - Sortie B MMF50

Dans ce boîtier il y a assez de volume pour  
intégrer deux détecteurs différents

Cet appareil gère les deux familles de  
longueurs d'ondes 650 nm et 1310 nm.

Connecteur A : 520/670/850/1064 nm  
Connecteur B : 1310/1550/1625 nm

(Jusqu'à 4 longueurs d'onde au total)

Lors de l'achat il faut choisir le type de  
fibres SMF ou MMF

Un appareil peut gérer jusqu'à 4 longueurs d'ondes. 650/670/850/1064 nm où 1310/1550/1625 nm  
D'autres longueurs d'ondes disponibles sur demande spécifiques

Version de table disponible



Version de table disponible



Version de table disponible



Pas de version portable disponible avec les deux  
familles de longueurs d'ondes.

## LOR Portable ou version de table



## LOR double sortie Portable ou Boitier de table



## LOR-UD double Détection version « de table » uniquement



Fiber type	Source Type	Source Wavelength	Product reference
SMF	FP (LED option)	1310	LOR-221-SMF-1310
		1550	LOR-221-SMF-1550
		1625	LOR-221-SMF-1625
	FP	520	LOR-221-SMF-520
		670	LOR-221-SMF-670
		850	LOR-221-SMF-850
MMF62	FP Laser	670	LOR-221-MMF62-670
		850	LOR-221-MMF62-850
	FP (LED option)	1310	LOR-221-MMF62-1310
		1550	LOR-221-MMF62-1550
MMF50	FP Laser	670	LOR-221-MMF50-670
		850	LOR-221-MMF50-850
	FP (LED option)	1310	LOR-221-MMF50-1310
		1550	LOR-221-MMF50-1550
Price per extra Wavelength (up to 3)			
POF (1mm PMMA)	FP Laser	650	LOR-221-POF-650
		520	LOR-221-POF-520
Other types of fiber and wavelength available upon request.			

### Options

- 1 port / 2 Wavelength:
- 1 port / 3 Wavelength:
- 1 Port / 4 Wavelength:

Fiber Type	Source Type	Source Wavelength
MMF62		1310
MMF50	FP	1310
SMF	FP (LED option)	1310, 1550, 1625
Other fiber type available upon request		
Other wavelength available upon request.		

OU

Fiber Type	Source Type	Source Wavelength
MMF62	FP	670/850
MMF50	FP	670/850
SMF	FP (LED option)	520/670/850
POF (1mm PMMA)	FP	520/650

### Options

- 2 ports / 2 Wavelength:
- 2 ports / 3 Wavelength:
- 2 Ports / 4 Wavelength:

Detector	Fiber type	Source Wavelength
Si Det (1st port)	SMF or MMF	670, 850, 1064
InGaAs Det (2nd port)	SMF or MMF	1310, 1550, 1625
Other fiber type available upon request		
Other wavelength available upon request.		

### Options

- 2 ports / 2 Wavelength:
- 2 ports / 3 Wavelength:
- 2 Ports / 4 Wavelength:

Pour les faisceaux multifibres, Luciol a développé des commutateurs externes pilotés directement par le réflectomètre.



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