# Application Note
# Understanding OTDR Deadzones

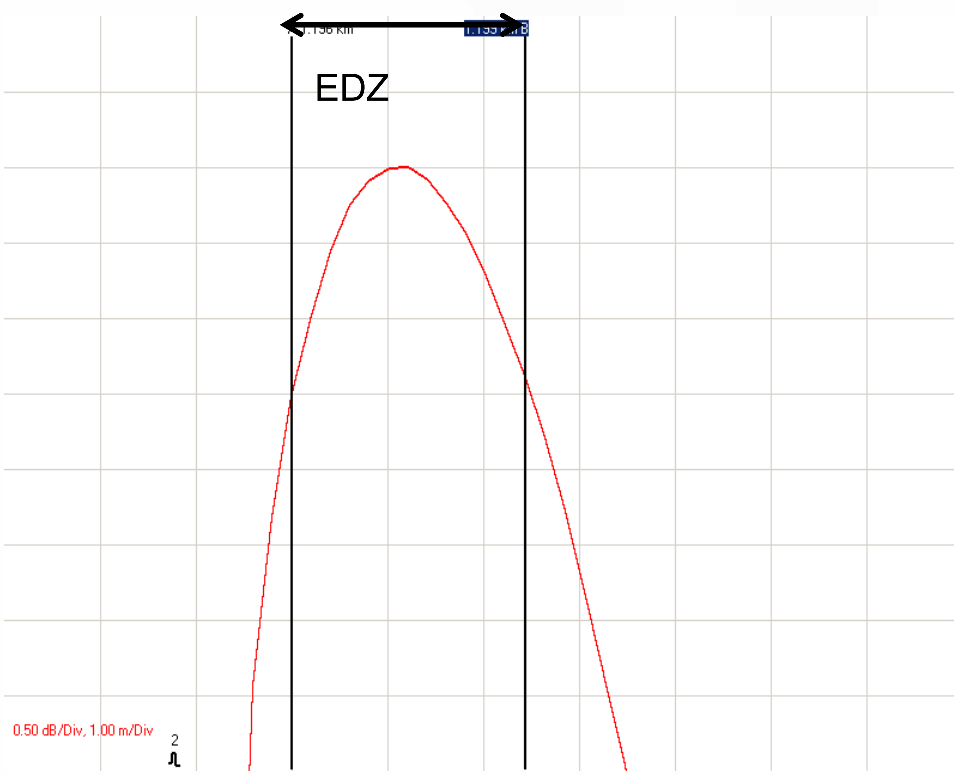
OTDR deadzones are due to:

- The probe pulse determines the deadzone. As the pulse width is set wider the deadzone gets wider.
- The nature of the reflectivity of the internal components of the OTDR.
- Crosstalk from the laser to the detector through the splitter.
- The deadzone is the result of light hitting the detector diode and temporarily blinding the detector from seeing any other reflections after the incident energy. The more intense the light energy the longer it will take for the detector to recover.
- Contaminated connectors are inherently reflective and will cause a reflection. The deadzone caused by this reflection will be proportional to the intensity of the reflection. Proper cleaning and inspection of connectors and bulkheads is imperative.

OTDR's have a event deadzone and a attenuation deadzone. The event deadzone is typically 1m and the attenuation deadzone 4.5m.

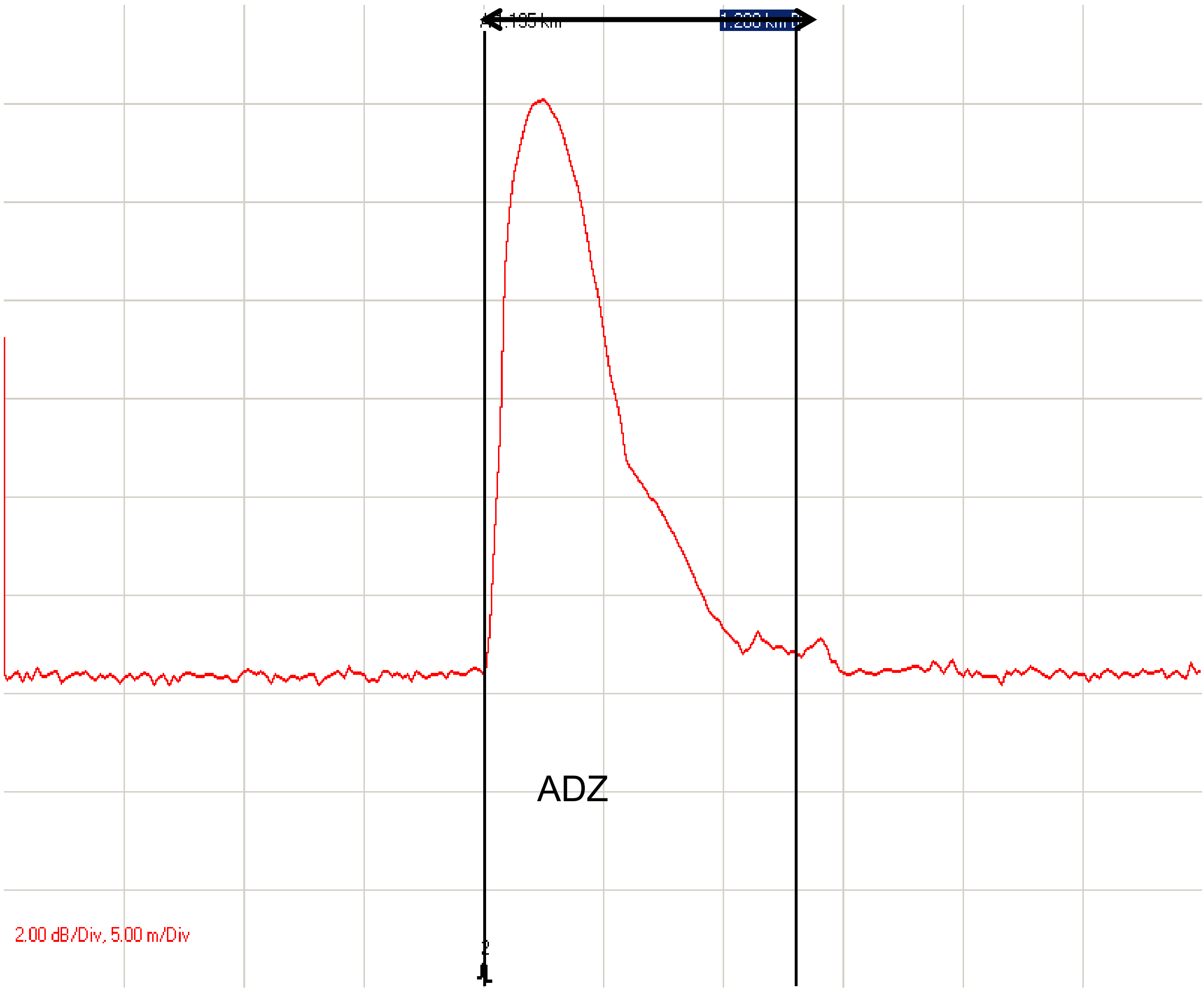
**Event Deadzone**

- The ability of the OTDR to resolve between two reflective events (contaminated or damaged connectors).
- Measured at 1.5dB from the peak of the -45dB pulse.



**Attenuation Deadzone**

- The ability of the OTDR to measure a non-reflective event (bad fusion splice) after a reflective event (contaminated or damaged connectors).
- Measured at 0.5dB from the noise floor of the -45dB pulse




**Deadzone Measurement Standards**

- IEC specification states that the deadzones are to be measured with a pulse of 5ns and a pulse intensity of -45dB.
- Most manufacturers specify at 5ns pulse width and a -45dB intensity. Some manufacturers actually specify using a pulse width with a FWHM of 3ns. This will make the deadzone shorter.
- Some manufacturers state that the pulse intensity is a non-saturating pulse rather than the -45dB standard. This will allow the detector to be able to recover faster because the detector diode was exposed to less light energy, thus yield a shorter deadzone specification.
- When less light hits the detector diode, less current flows and the diode is able to recover faster.

Remember: Very seldom is the OTDR used at the smallest pulse width!

**Using a 1m Jumper at the OTDR Bulkhead**

Using a 1m jumper at bulkhead will protect the OTDR bulkhead from excessive connect/reconnect cycles and limit the possibility of damaging the surface of the bulkhead connector.

The two reflections from the 1m jumper will be resolved with a OTDR that has a 1m deadzone specification if the pulse width is set to 5ns. If the pulse width is longer than 5ns the two pulses will appear as one pulse.

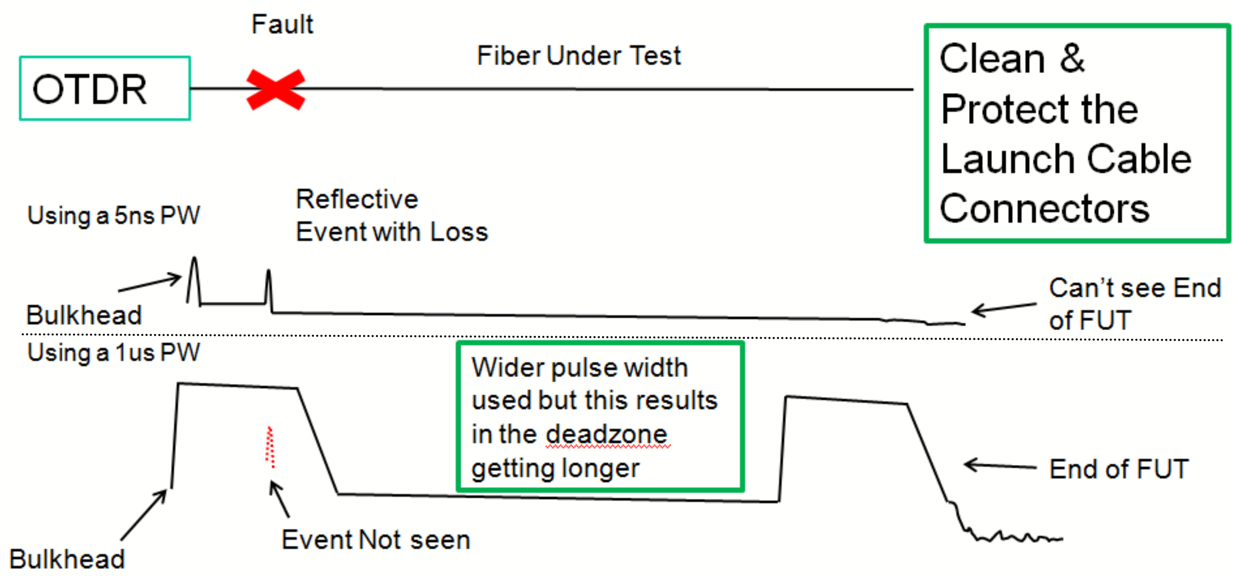
Refer to the application note "**Using a one meter Bulkhead Jumper with the 930XC".**

This same phenomenon happens as a longer pulse widths are used. Pulses that are closer together than the event deadzone will appear as one pulse.

The 930XC with an APC bulkhead and an APC to UPC 1m jumper


Mated UPC connections have high reflectivity (~45dB)
An open (not connected) UPC will have a very high reflectivity (~14dB)

**Measurements with a short Pulse Width and a Long Pulse Width**




Here you can see that with a 5ns pulse width the fault can be easily measured but the end of the fiber can't be seen. If a wider pulse width is used (1us) the fault can no longer be measured. This is because the event deadzone has become too long and the bulkhead and fault are now represented as one pulse.

**Launch Cables**

- Using a launch cable minimizes the effect of the OTDR deadzone.
- Refer to the application note **"Use of the LC-500 Launch Cables".**

**Summary**

- The OTDR deadzones are quoted at the shortest pulse width and when measuring a standard -45dB reflector.
- The event deadzone is a measure of how well the OTDR can resolve between two reflective events.
- The attenuation deadzone is a measure of how well the OTDR can measure a non-reflective event after a reflective event.
- Make sure to clean and inspect all connections to minimize deadzones.
- Use a launch cable to minimize the effects of the OTDR deadzone.