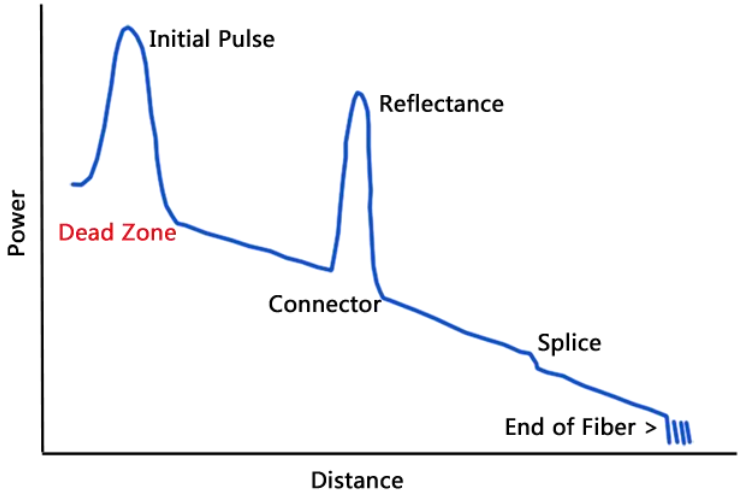
OTDR (Optical Time Domain Reflectometer) Dead Zone Tutorial

OTDR (Optical Time Domain Reflectometer) is a familiar fiber test instrument for technicians or installers to characterize an optical fiber. To understand the specifications which may affect the performance of OTDR can help users get maximum performance from their OTDRs. This tutorial will introduce one of the key specifications—Dead Zone.

What Is Dead Zone?

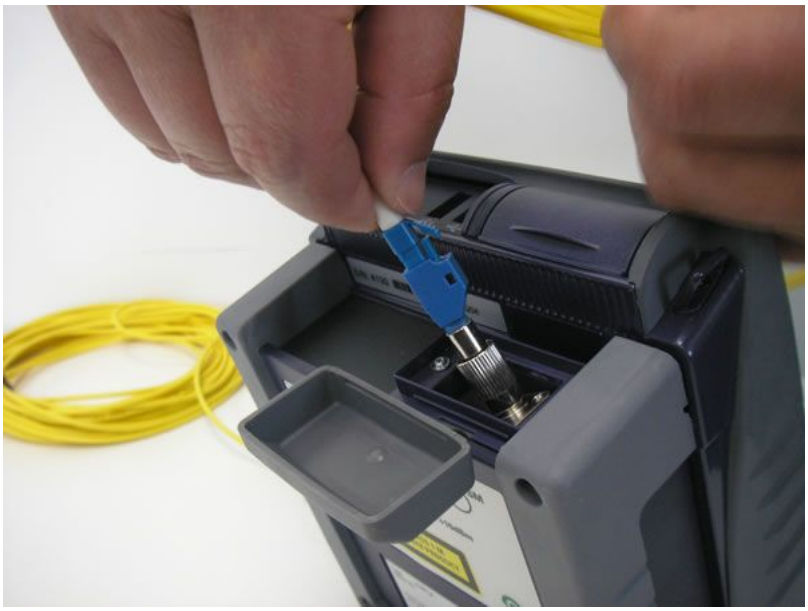
The OTDR dead zone refers to the distance (or time) where the OTDR cannot detect or precisely localize any event or artifact on the fiber link. It is always prominent at the very beginning of a trace or at any other high reflectance event.



Why Occur a Dead Zone?

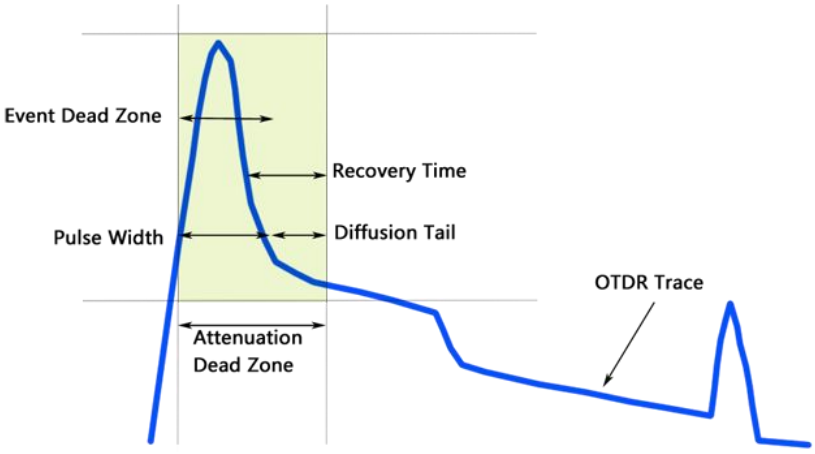
OTDR dead zone is caused by a Fresnel reflection (mainly caused by air gap at OTDR connection) and the subsequent recovery time of the OTDR detector. When a strong reflection occurs, the power received by the photodiode can be more than 4,000 times higher than the backscattered power, which causes detector inside of OTDR to become saturated with reflected light. Thus, it needs time to recover from its saturated condition. During the recovering time, it can not detect the backscattered signal accurately which results in corresponding dead zone on OTDR trace. This is like

when your eyes need to recover from looking at the bright sun or the flash of a camera. In general, the higher the reflectance, the longer the dead zone is. Additionally, dead zone is also influenced by the pulse width. A longer pulse width can increase the dynamic range which results in a longer dead zone.



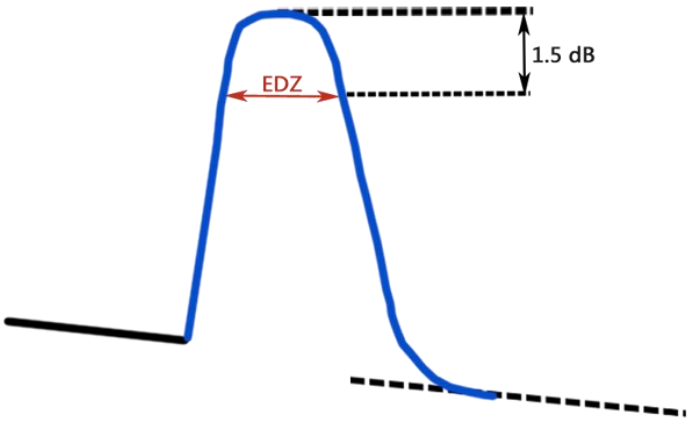
Event Dead Zones & Attenuation Dead Zone

In general, dead zones on an OTDR trace can be divided into event dead zone and attenuation dead zone.



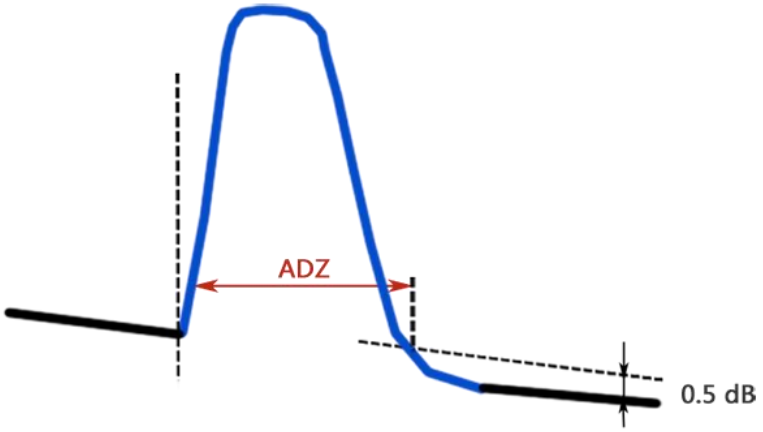
■ Event Dead Zone

The event dead zone is the minimum distance between the beginning of one reflective event and the point where a consecutive reflective event can be detected. According to the Telcordia definition, event dead zone is the location where the falling edge of the first reflection is 1.5 dB down from the top of the first reflection.



■ **Attenuation Dead Zone**

The attenuation dead zone is the minimum distance after which a consecutive non-reflective event can be detected and measured. According to the Telcordia definition, it is the location where the signal is within 0.5 dB above or below the backscatter line that follows the first pulse. Thus, the attenuation dead zone specification is always larger than the event dead zone specification.



Note: In general, to avoid problems caused by the dead zone, a launch cable of sufficient length is always used when testing cables which allows the OTDR trace to settle down after the test pulse is sent into the fiber so that users can analyze the beginning of the cable they are testing.

The Importance of Dead Zones

There is always at least one dead zone in every fiber—where it is connected to the OTDR. The existence of dead zones is an important drawback for OTDR, specially in short-haul applications with a large number of fiber optic components. Thus, it is important to minimize the effects of dead zones wherever possible.

As mentioned above, dead zones can be reduced by using a lower pulse width, but it will decrease the dynamic range. Thus, it is important to select the right pulse width for the link under test when characterizing a network or a fiber. In general, short pulse width, short dead zone and low power are used for premises fiber testing and troubleshooting to test short links where events are closely spaced, while a long pulse width, long dead zone and high power are used for long-haul fiber testing and communication to reach further distances for longer networks or high-loss networks.

The shortest-possible event dead zone allows the OTDR to detect closely spaced events in the link. For instance, testing fibers in premises networks (particularly in data centers) requires an OTDR with short event dead zones since the patch cords of the fiber link are often very short. If the dead zones are too long, some connectors may be missed and will not be identified by the technicians, which makes it harder to locate a potential problem.

Short attenuation dead zones enable the OTDR not only to detect a consecutive event but also to return the loss of closely spaced events. For instance, the loss of a short patch cord within a network can now be known, which helps technicians to have a clear picture of what is actually inside the link.

Summary

OTDR is one of the most versatile and widely used fiber optic test equipment which offers users a quick, accurate way to measure insertion loss and shows the overview of the whole system you test. Dead zone, with two general types, is an important specification of OTDR. It is necessary for users to understand dead zone and select the right configuration in order to get maximum OTDR performance during test. In addition, OTDRs of different brands are designed with different minimum dead zone parameters since manufacturers use different testing conditions to measure the dead zones. Users should choose the suitable one according to the requirements and pay particular attention to the pulse width and the reflection value. Fiberstore offers various OTDRs of the major brands, such as JDSU, EXFO, YOKOGAWA etc., as well as other portable and handheld OTDRs with wide options. For more information, please contact us via sales@fs.com.

Contact Us

Manufacturing R & D (China)

Eastern Side, Second Floor, Science & Technology Park, No.6, Keyuan Road, Nanshan District, Shenzhen 518057, China
Tel: +86 (755) 8300 3611
Fax: +86 (755) 8326 9395
Email: sales@fs.com

North America (United States)

331 Andover Park East Ste330, Tukwila, WA 98188,United States
Tel: +1-425-226-2035
Fax: +1-253-246-7881
Email: sales@fs.com

APAC Office (Hong Kong)

1220 Tung Chun Commercial Centre, 438-444 Shanghai Street, Kowloon, Hong Kong
Tel: +852 81763606
Fax: +852 81763606
Email: sales@fs.com

London Office (United Kingdom)

Third Floor 207 Regent Street, London, W1B 3HH, United Kingdom
Tel: +44 2081441980

Follow us

LinkedIn
Twitter
Facebook
G+
Pinterest
Youtube
Blog

Notice: This document is for informational purposes only and does not set forth any warranty, expressed or implied, concerning any equipment, equipment features, or service offered or to be offered by Fiberstore. Fiberstore reserves the right to make changes to this document at any time, without notice, and assumes no responsibility for its use. This information document describes features that may not be currently available. Contact a Fiberstore sales team for information on feature and product availability.