Reflectance and Deadzone

By Anritsu Sales Engineers

Introduction

This white paper can be used by a broad spectrum of field technicians. It helps them choose the appropriate pulsewidth on any Anritsu OTDR, by reducing deadzones and improving the accuracy of fault locations.

Pulsewidths and Reflectance

The attenuation deadzone found on the trace of an OTDR is normally thought to be dependent upon one main factor: The length of the pulse (pulsewidth) of light sent down the fiber. With each pulsewidth that is selected, there is a corresponding pulsewidth-related attenuation deadzone. The longer the pulse in seconds, the wider the attenuation deadzone in meters.

However, once the preferred pulsewidth for viewing the fiber is established, other factors become apparent. With one selected pulsewidth, there may be a varying attenuation deadzone for reflective events – varying with the distance that the event is located from the OTDR and with the intensity (amplitude) of the reflective event.

The detector in the OTDR minutely measures the levels of returned light. Normally, the return levels are of very low intensity and recorded by an extremely sensitive detector. However, when the light strikes a highly reflective connector, the level of returned light may jump almost instantaneously.

Factors That Affect Amplitude

The factors that determine the level (amplitude) of this returned light are:

- The distance from the OTDR to the event. This is due to its attenuating affect on the amplitude of light returning to the OTDR. The further out the event, the more attenuated the amplitude of light that returns to strike the OTDR's detector.

- The reflectance of the event. The greater the reflectance of the event, the greater the amplitude of returned light. If the event is very reflective and close, it may increase the attenuation deadzone. If the event is less reflective and farther away, it may or may not increase the attenuation deadzone.

Receiver Saturation

The reason that attenuation deadzone increases without an increase in pulsewidth is due to receiver saturation. The longer the pulsewidth, the longer the saturation of the detector in the OTDR's receiver. *Figure 1* shows the characteristics of a Fresnel reflection. As the actual pulsewidth increases, so does the receiver saturation and, hence, the attenuation deadzone. It is still possible to change the attenuation deadzone of an event – without changing the pulsewidth – through the amplitude rather than the pulsewidth of returned light. Increased amplitude of the returned light will drive the OTDR’s detector harder, increasing the level of saturation, thereby lengthening the time it takes for the detector to recover. The longer it takes for the detector to recover, no matter what the cause, the longer the attenuation deadzone.

FRESNEL CHARACTERISTICS

Fresnel equations describe the behavior of light when moving between media of differing refractive indices. The reflection of light that these equations predict is known as Fresnel reflection.

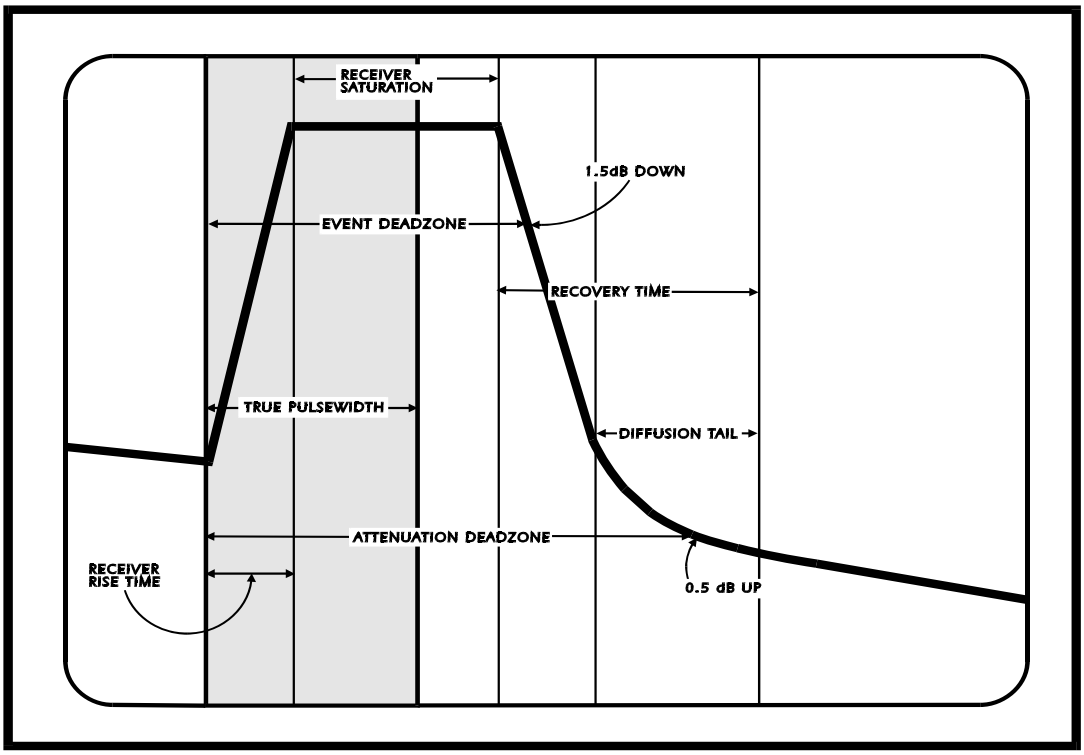

Figure 1.

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Conclusion

This paper helps a spectrum of field technicians to choose the appropriate pulsewidth on any Anritsu OTDR, by reducing deadzones and improving the accuracy of fault locations. It can be summed up as follows: Once the pulsewidth is selected and locked in, the amplitude of returned light can change the attenuation deadzone. Anything that affects this amplitude, the level of the reflective event and its distance from the OTDR, can also affect the attenuation deadzone.

Anritsu

Specifications are subject to change without notice.

Anritsu Corporation
5-1-1 Onna, Atsugi-shi, Kanagawa, 243-8555 Japan
Phone: +81-46-223-1111
Fax: +81-46-296-1264

• **U.S.A.**
Anritsu Company
1155 East Collins Blvd., Suite 100, Richardson,
TX 75081, U.S.A.
Toll Free: 1-800-267-4878
Phone: +1-972-644-1777
Fax: +1-972-671-1877

• **Canada**
Anritsu Electronics Ltd.
700 Silver Seven Road, Suite 120, Kanata,
Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

• **Brazil**
Anritsu Eletrônica Ltda.
Praca Amadeu Amaral, 27 - 1 Andar
01327-010-Paraiso-São Paulo-Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

• **Mexico**
Anritsu Company, S.A. de C.V.
Av. Ejército Nacional No. 579 Piso 9, Col. Granada
11520 México, D.F., México
Phone: +52-55-1101-2370
Fax: +52-55-5254-3147

• **U.K.**
Anritsu EMEA Ltd.
200 Capability Green, Luton, Bedfordshire, LU1 3LU, U.K.
Phone: +44-1582-433200
Fax: +44-1582-731303

• **France**
Anritsu S.A.
16/18 avenue du Québec-SILIC 720
91961 COURTABOEUF CEDEX, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

• **Germany**
Anritsu GmbH
Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49-89-442308-0
Fax: +49-89-442308-55

• **Italy**
Anritsu S.p.A.
Via Elio Vittorini 129, 00144 Roma, Italy
Phone: +39-6-509-9711
Fax: +39-6-502-2425

• **Sweden**
Anritsu AB
Borgafjordsgatan 13, 164 40 KISTA, Sweden
Phone: +46-8-534-707-00
Fax: +46-8-534-707-30

• **Finland**
Anritsu AB
Teknobulevardi 3-5, FI-01530 VANTAA, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

• **Denmark**
Anritsu A/S
Kirkebjerg Allé 90, DK-2605 Brøndby, Denmark
Phone: +45-72112200
Fax: +45-72112210

• **Spain**
Anritsu EMEA Ltd.
Oficina de Representación en España
Edificio Veganova
Avda de la Vega, n° 1 (edf 8, pl 1, of 8)
28108 ALCOBENDAS - Madrid, Spain
Phone: +34-914905761
Fax: +34-914905762

• **Russia**
Anritsu EMEA Ltd.
Representation Office in Russia
Tverskaya str. 16/2, bld. 1, 7th floor.
Russia, 125009, Moscow
Phone: +7-495-363-1694
Fax: +7-495-935-8962

• **United Arab Emirates**
Anritsu EMEA Ltd.
Dubai Liaison Office
P O Box 500413 - Dubai Internet City
Al Thuraya Building, Tower 1, Suit 701, 7th Floor
Dubai, United Arab Emirates
Phone: +971-4-3670352
Fax: +971-4-3688460

• **Singapore**
Anritsu Pte. Ltd.
60 Alexandra Terrace, #02-08, The Comtech (Lobby A)
Singapore 118502
Phone: +65-6282-2400
Fax: +65-6282-2533

• **India**
Anritsu Pte. Ltd.
India Branch Office
Unit No. S-3, Second Floor, Esteem Red Cross Bhavan,
No. 26, Race Course Road, Bangalore 560 001, India
Phone: +91-80-32944707
Fax: +91-80-22356648

• **P.R. China (Hong Kong)**
Anritsu Company Ltd.
Units 4 & 5, 28th Floor, Greenfield Tower, Concordia Plaza,
No. 1 Science Museum Road, Tsim Sha Tsui East,
Kowloon, Hong Kong
Phone: +852-2301-4980
Fax: +852-2301-3545

• **P.R. China (Beijing)**
Anritsu Company Ltd.
Beijing Representative Office
Room 1515, Beijing Fortune Building,
No. 5, Dong-San-Huan Bei Road,
Chao-Yang District, Beijing 10004, P.R. China
Phone: +86-10-6590-9230
Fax: +86-10-6590-9235

• **Korea**
Anritsu Corporation, Ltd.
8F Hyunjuk Building, 832-41, Yeoksam Dong,
Kangnam-ku, Seoul, 135-080, Korea
Phone: +82-2-553-6603
Fax: +82-2-553-6604

• **Australia**
Anritsu Pty. Ltd.
Unit 21/270 Ferntree Gully Road, Notting Hill,
Victoria 3168, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

• **Taiwan**
Anritsu Company Inc.
7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817