

GAMMA OTDR

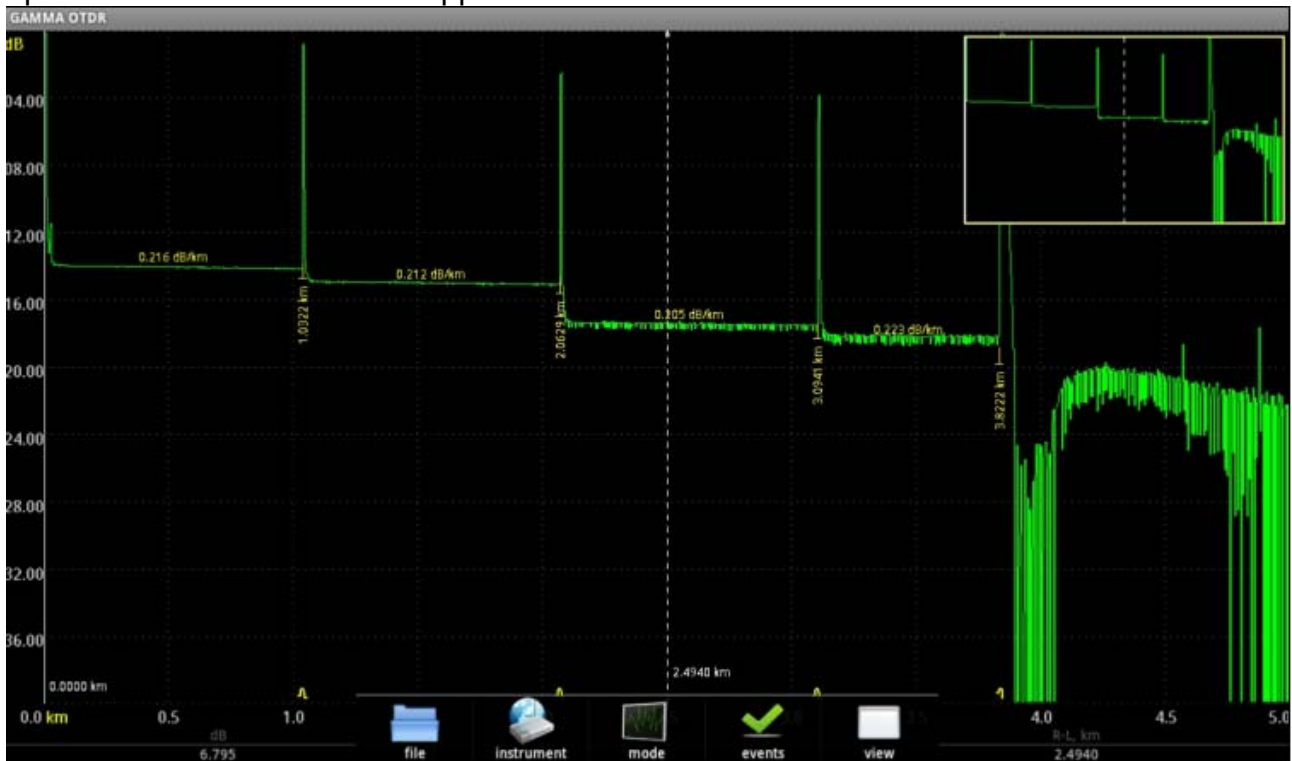
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Introduction

GAMMA OTDR – is the first Android application for working with real OTDR traces (stored in GR-196-CORE OTDR (SR-4731) data format). This software can be used for measuring OTDR traces (using SVPRIBOR™ OTDR series GAMMA) as well as for trace analyzing, editing and report creation.

Using GAMMA OTDR

GAMMA OTDR application consists of main window and menu. Using menu user can operate in different modes of application.



Application main window

Generally, application main window consists of following parts: OTDR trace view, vertical and horizontal scale, measurement results information panel and full trace map (in the right top corner of OTDR trace view).

Using trace view user can perform main operations on the current traces: zooming (using multi-touch feature of user device), scrolling, moving cursors, etc. This allows user to perform measurements on selected trace according with current measure mode and read measured values from measurement results information panel.

As usual in all trace viewers vertical and horizontal scales represents the attenuation in dB and distance in km units correspondingly.

Below horizontal scale located measurement results information panel. This panel contains three text fields. Each field represents some measured value depending on current measuring mode.

Menu description

Main menu organized for best user interaction with modes of application.

file

Menu file consists of following elements:

- open... - show open dialog and allows open existing trace file at the current trace slot (see menu [view/trace list...](#));
- save - saving current trace;
- save as... - saving current trace under new name;
- report... - generate report depending on current view;
- help... - show this window;
- about... - show about dialog;
- quit - quit from application;

instrument

As mentioned above user can perform remote measurements using SVPRIBOR™ OTDR series GAMMA. This menu allows user to perform all operations with remote OTDR using Wi-Fi or other Ethernet connection.

- connect... - shows connection parameters dialog, which allow to connect to remote instrument;



Using connection parameters dialog user can enter remote instrument IP address and its port number according with instrument settings and after pressing “OK” button starts connection process. After connecting instrument all other fields of instrument menu will be available. So user can set measurement parameters by using measuring parameters dialog and perform measuring.

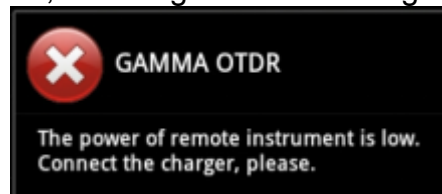
- disconnect – disconnect already connected instrument;
- start averaging measuring – start measuring with averaging using current measurement parameters;
- start live measuring - start measuring without averaging (live) using current measurement parameters;
- stop measuring – stop current measuring process (averaging will be incomplete);
- information... - show information about connected OTDR:

about instrument	
OTDR module ID:	SMART_BOX_M1
OTDR module serial number:	000001
battery level, %:	74
OTDR daemon software version:	4.030
OTDR daemon protocol version:	3
OTDR daemon protocol revision:	20.09.2012

Fields description:

1. OTDR module ID – ID of the OTDR measuring module;
2. OTDR module serial number – unique factory serial number of the instrument (n/a if not supported by OTDR);
3. battery level, % - percentage of the battery level (n/a if not supported by OTDR);
4. OTDR daemon software version– version of the remote OTDR module software;
5. OTDR daemon protocol version – service field;
6. OTDR daemon protocol revision – service field;

Application performs monitoring of the power supply of connected instrument (if supported by device). In case of low power, following service message will appear:



- parameters... - shows measuring parameters dialog

The image shows a 'measuring parameters' dialog box with the following settings:

- auto measurement:
- wave length, nm: 1310
- range, km: 100.0
- resolution, m: 6.53
- pulse width, ns: 5000
- backscatter coefficient, dB: -80.0
- refractive index (n): 1.4681
- number of averages: 4096
- averaging time: 02-00
- low power:
- high resolution:
- filter used:

Buttons: OK, Cancel, default

Measuring parameters dialog provide user interface for setting all accessible measurement parameters:

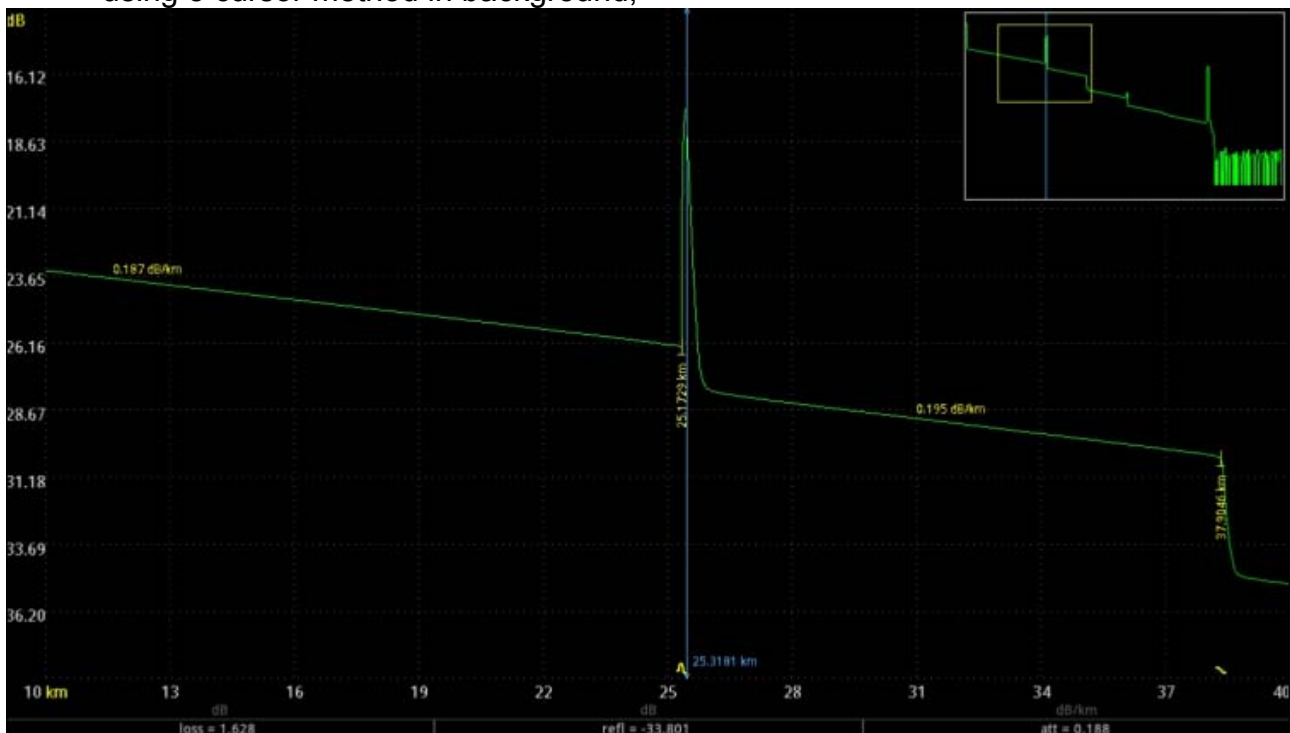
1. auto measurement – if checked software will automatically select some measuring parameters such as range, resolution, pulse width and averaging time. This allows user perform measurements more simply. Trace analysis started automatically just after finishing averaging process;
2. wave length, nm –wave length in nm;
3. range, km – measuring range in km. Note that measuring range must be about twice greater real optical fiber (OF) length;
4. resolution, m - the distance between the two readings of OTDR (sampling interval) in meters;
5. pulse width, ns – the duration in nanoseconds of the probe pulse;
6. backscatter coefficient, dB - part of the power of an optical pulse in dB dissipated in the OF and extending to its beginning. In the software supplied to the user usually, the following values are set :
 - minus 81 dB for single-mode fiber and wavelength 1550 nm;
 - minus 80 dB for single-mode fiber and wavelength 1310 nm.
The backscattering coefficient can be set in increments of 0.1 dB;
7. refractive index (n) – The value of the refractive index of OF; changes in increments of 0.00001;
8. number of averages – if selected the total number of trace averages is specified in the mode with averaging;
9. averaging time – if selected time averaging is enabled. If it is disabled – the averaging according to measurement number;
10. low power - the trace measurement mode with a reduced capacity of the laser radiation is enabled. This mode is reasonable for measuring high reflectivity values from the heterogeneities;
11. high resolution - in this mode, the bandwidth of the optical receiver is increased what allows to reduce the deadzone and better to distinguish between the close

12. filter user - the digital filtering of acquired trace is enabled/disabled.

After setting the measurement parameters user can perform measurement using live or averaging methods.

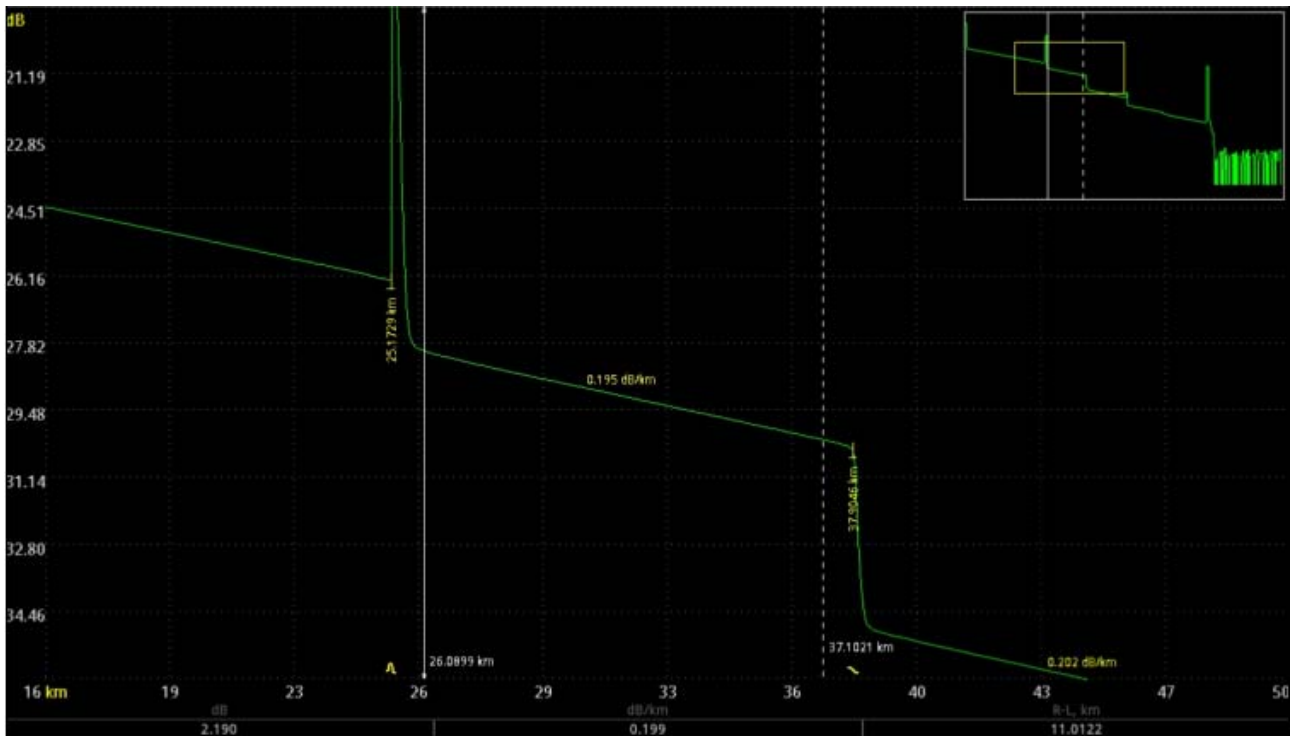
mode

- marker – “smart marker” is the semi-automatic event analysis mode. Only one cursor available in this mode – “smart marker”. User sets “smart marker” in the surrounding of the event and after few milliseconds can see readings from the measurement results information panel. Event being analyzed in its surrounding using 5 cursor method in background;



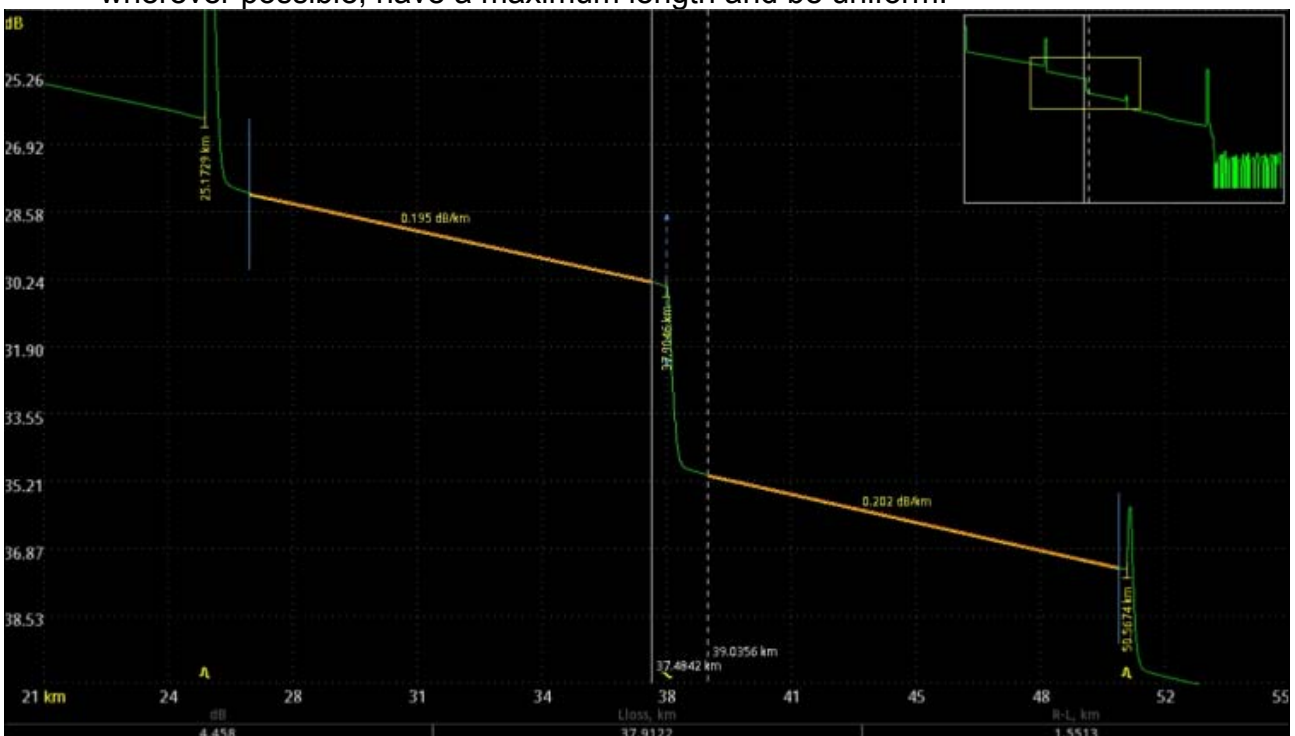
In this mode measurement results information panel contains three following fields (from left to right):

1. [loss = 1.628 dB] – loss of the event in dB;
 2. [refl = -33.801 dB] – reflectance of the event in dB (for reflected events only);
 3. [att = 0.188 dB/km] – attenuation coefficient, measured in dB/km.
- 2 point loss – two point method to measure event loss or attenuation coefficient in the fiber. This method usually used for distance measurement between cursors as well as loss measurement between two cursors. This method is not applicable for loss measurements on noisy areas of the trace.



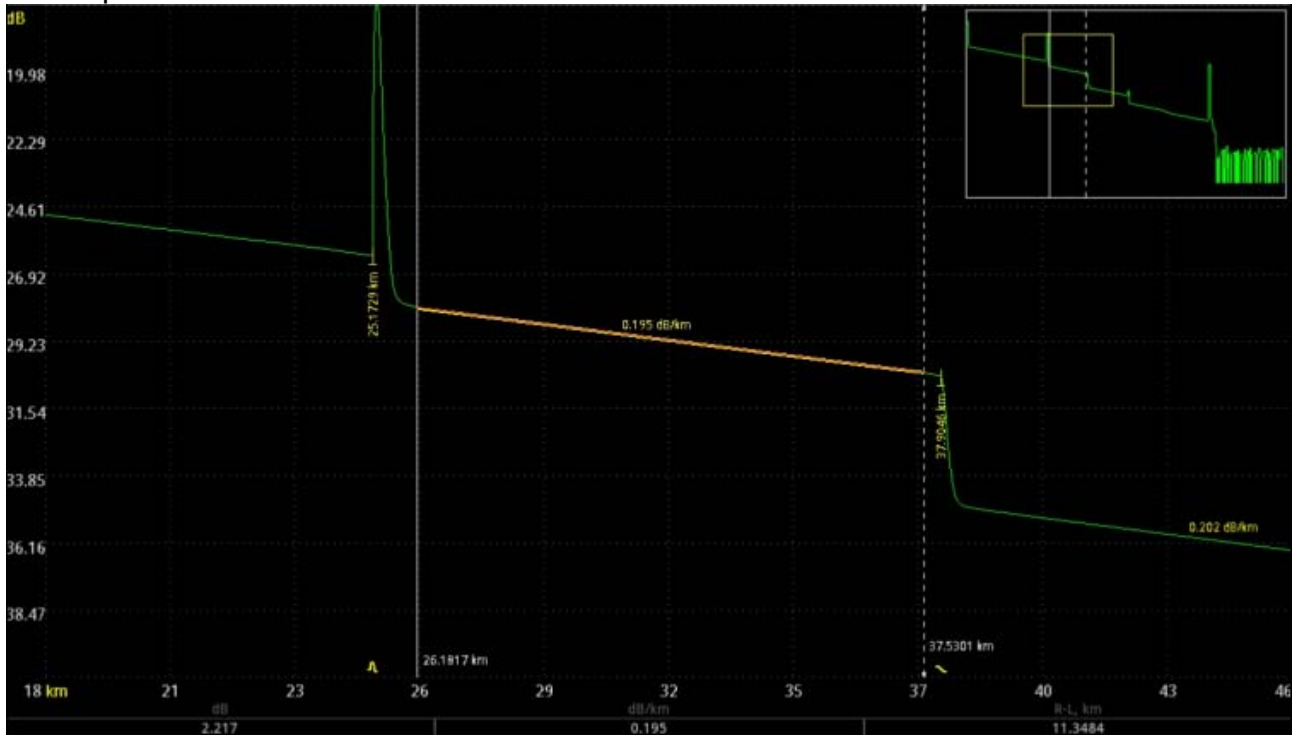
In this mode measurement results information panel contains three following fields (from left to right):

1. [2.190 dB] – total loss between cursors dB;
 2. [0.199 dB/km] – attenuation coefficient calculated for trace area between cursors in dB/km;
 3. [11.0122 km] – distance between cursors in km.
- 5 cursors loss – is the most accurate loss measurement method. Before reading results user have to set five markers (or cursors). Central cursor should be set at the left edge of the connection (at the beginning of the event). Left pair of cursors (relative central cursor) determines the left approximation span as well as right pair of cursors determines the right approximation span. Approximation spans should, wherever possible, have a maximum length and be uniform.



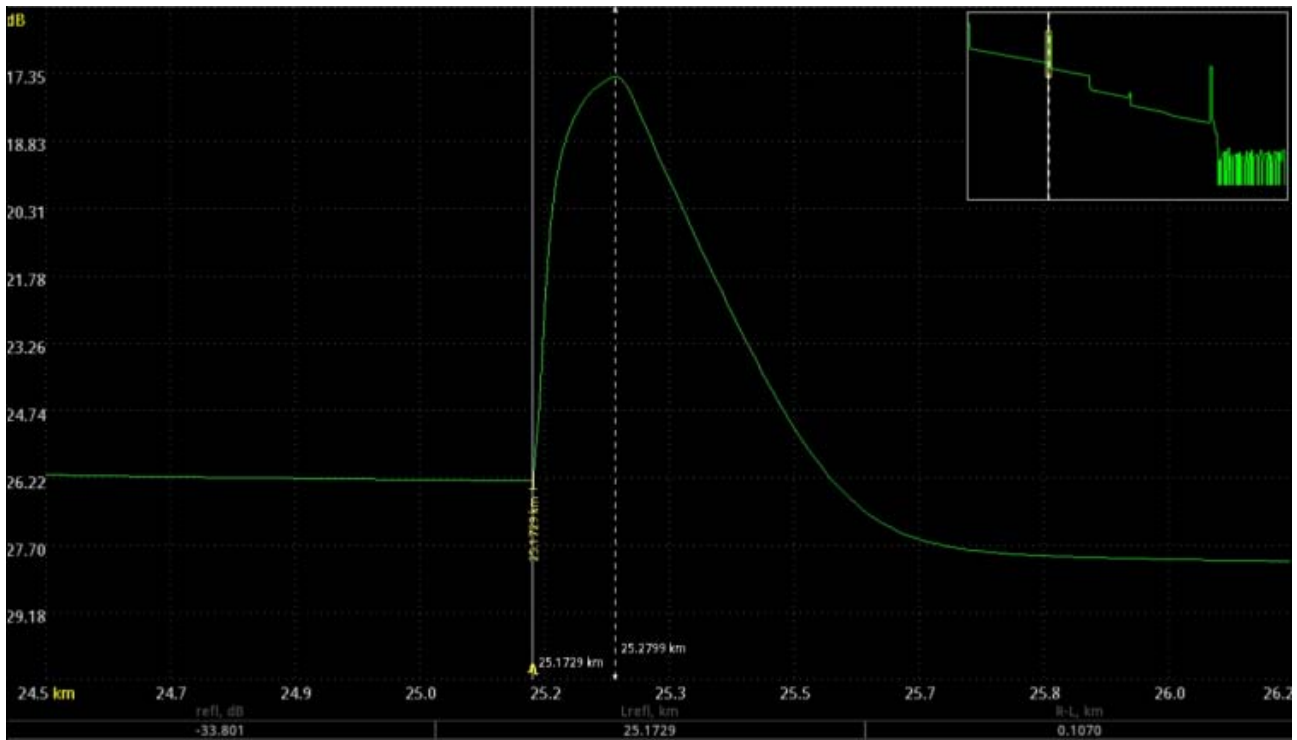
In this mode measurement results information panel contains three following fields (from left to right):

1. [4.458 dB] – event loss in dB;
 2. [37.9122 km] – distance to the event (central cursor) in km;
 3. [1.5513 km] – distance between main cursors in km.
- LSA line loss - measure the long attenuation by two points. In contrast to the mode of "[2 point loss](#)" here a straight line approximation of the trace span between the cursors is performed using the least squares method. The so calculated value of the long attenuation is more correct, provided that the cursors are on a homogeneous part of the line.



To measure the attenuation in a span of the optic fiber and its length set the markers at the ends of this span and read its data in the line of the information panel:

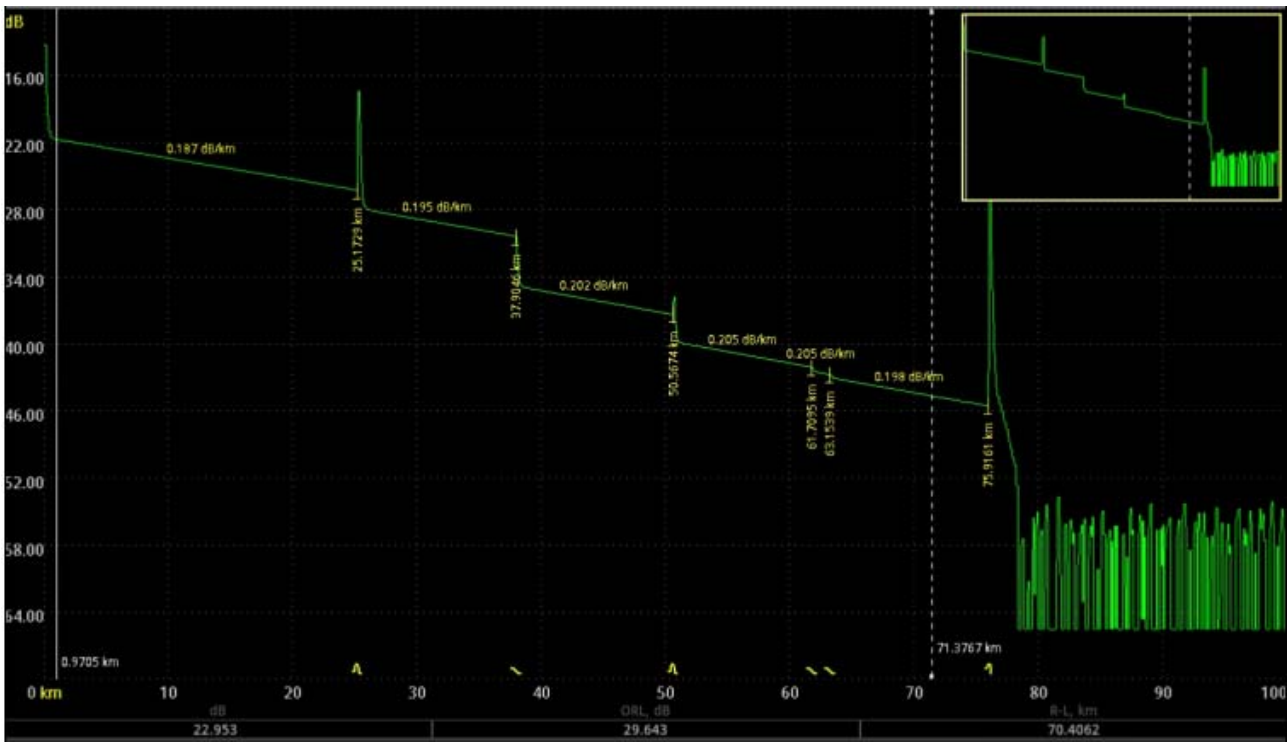
1. [2.217 dB] – attenuation between points where cursors cross the trace in dB;
 2. [0.195 dB/km] – attenuation coefficient value in dB/km;
 3. [11.3484 km] – span length R-L, km.
- reflectance - The device can determine the reflectance from the plug connection of the two optical fibers or from the end of the OF. Set the right cursor on the top of the reflected pulse, the left cursor – on the traces span directly in front of it:



If the cursors are outside of the screen, you can bring them into the working area using the “view/[show cursors](#)” menu item.

In this mode measurement results information panel contains three following fields (from left to right):

1. [-33.801 dB] – reflectance value in dB;
 2. [25.1729 km] – distance to the reflectance in km;
 3. [0.1070 km] – distance between cursors in km.
- ORL - the application allows to estimate the value of Optical Return Loss (ORL) of the fiber line span or of the entire fiber line. ORL is the ratio of power supplied into the optic fiber, to the power coming back to the fiber start from the specified fiber line span or of the entire fiber line. Position the cursors at the ends of the measured span.



In this mode measurement results information panel contains three following fields (from left to right):

1. [22.953 dB] – difference between signal levels at points labeled by markers in dB;
 2. [29.643 dB] – ORL value in dB;
 3. [0.1070 km] – the span length between the cursors R-L, km.
- refractive index... - this dialog allows using known distances on the trace solve reverse task - determine refractive index with high accuracy

correction of refractive index

L, km

R, km

R-L, km

n

Pressing “+” or “-” button user can change refractive index by ± 0.00001 or simply enter refractive index value into the corresponding text field. So we can tune refractive index according with known distance (L, km; R, km or R-L, km).

events

- fix event – fix event and add them into [events table](#) using current measure mode and cursor location;
- delete between cursors – delete all events between two main cursors;
- display events – if selected then events will be displayed in other case no;

- events table – determines whether or not displayed events table (list all events in the trace). On the screen a window will appear with a list of events corresponding to inhomogeneities in the measured lines, ordered by distance from the line beginning:

type	#	location, km	loss, dB	reflectance, dB	attenuation, dB/km	full loss, dB	comment
A	1	0.0000		-35.049			begin of fiber
A	2	25.1729	1.612	-33.801	0.188	4.771	reflectance found by software
N	3	37.9122	1.222		0.198	8.983	loss found by software
A	4	50.5751	2.406	-51.496	0.202	15.853	reflectance found by software
N	5	61.7477	0.307		0.207	20.663	loss found by software
N	6	63.2303	0.243		0.260	21.327	loss found by software
A	7	75.9237	19.957	-14.966	0.199	24.012	end of fiber

The row of table contains full event information:

1. event type (reflective, non-reflective (may be gain) or end of fiber);
 2. serial number of the event;
 3. distance from the origin in km;
 4. attenuation in the event if it exceeds the threshold value, dB;
 5. reflectance in the event (if it exceeds the threshold value), dB;
 6. attenuation coefficient of the span between this event and previous one, dB/km;
 7. total attenuation from the start of fiber to the current event, dB.
- auto analysis – automatic trace analysis with filling the events table (all previous events will be deleted);
 - analysis parameters... - threshold values are specified for the automatic trace analysis:

analysis parameters

loss threshold, dB

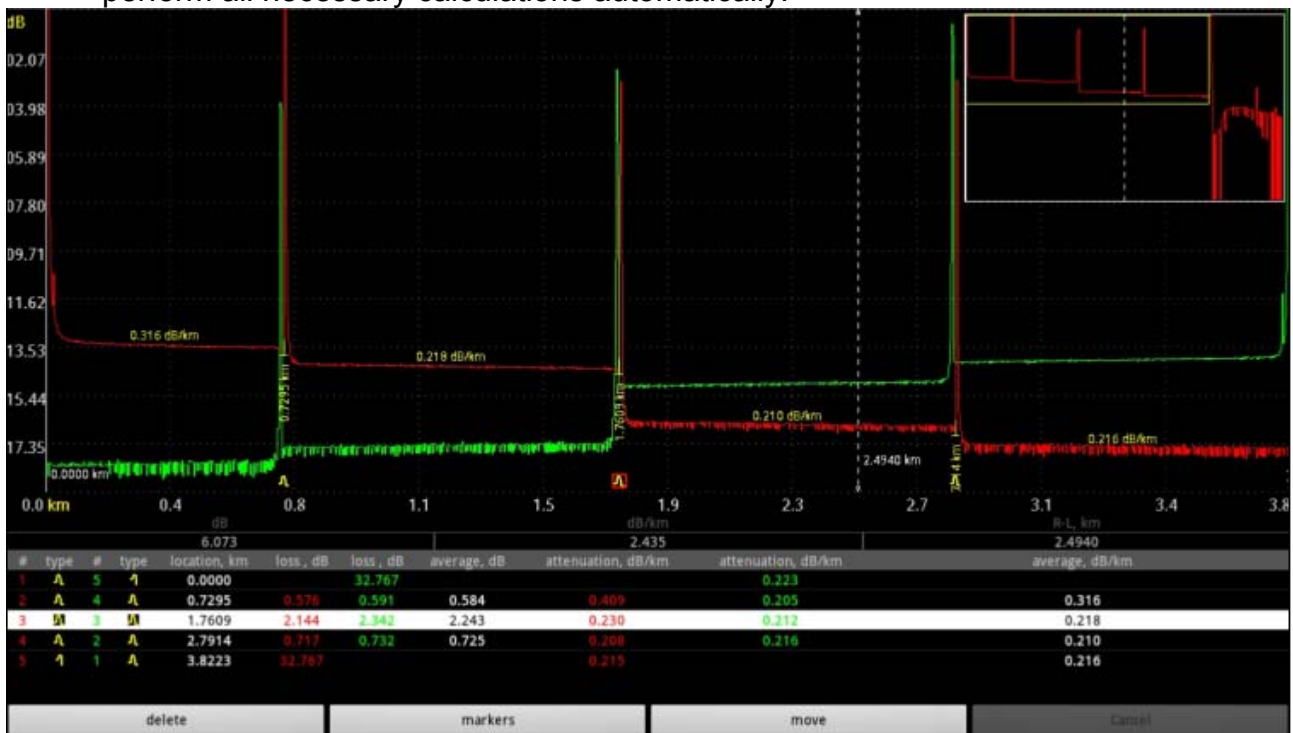
reflectance threshold, dB

end of fiber threshold, dB

backscatter coefficient, dB

1. Loss threshold (LT) - loss threshold in heterogeneities, dB. Heterogeneities, in which the attenuation exceeds a given threshold, are displayed in the table of landmarks during trace analysis.
 2. Reflectance threshold (RT) - reflectance threshold value, dB. Heterogeneities with reflectance above this threshold are displayed in the table of landmarks during analysis.
 3. End-of-fiber threshold (ET) - attenuation threshold value, dB, to determine end of fiber. The first heterogeneity with attenuation greater than a threshold value ET, is determined during trace analysis as the end of OF, all subsequent heterogeneity are ignored.
 4. Backscatter coefficient (BC)- part of the power of an optical pulse in dB dissipated in the OF and extending to its beginning. The backscattering coefficient can be set in increments of 0.1 dB.
- two-way analysis (2W) - bidirectional trace analysis. Provides the method of measuring real values of losses in the optical fiber. This method is based on analysis of two OTDR traces (direct and reverse). Each trace must measured using the same measurement parameters. After measuring user have to analyze each trace and save each trace in its own SOR file. After that user should open two

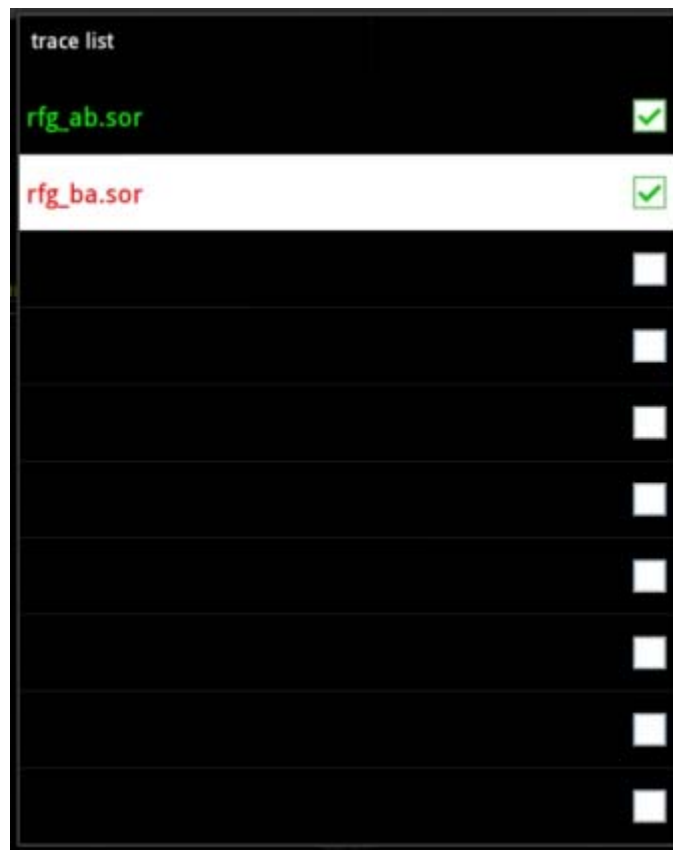
analyzed traces (direct and reverse) on the different trace slots using [trace list](#). Next, user must to choose "two-way analysis (2W)" menu item and software will perform all necessary calculations automatically:



Fields with averaged values contains the real values of attenuations and attenuation coefficients with corresponding units of measure.

view

- trace list... - shows trace list dialog:



Trace list dialog contains 10 trace slots. User can select each slot to open or measure trace into it. So, up to 10 traces may be shown at same time. User can compare traces measured in different time, can perform [bidirectional trace analysis](#) and so on.

- map – enable/disable displaying of trace map;
- full screen - enable/disable full screen mode.
- trace auto search - enable/disable the algorithm of automatic trace vertical scrolling. That allows automatically align OTDR trace vertically on the screen;
- keep screen on - enable/disable automatic display brightness control (in main OTDR view only). So if this menu item is selected screen will be always turned ON.
- show cursors – shows invisible cursors without any scrolling and changing of zoom;
- zoom – turns ON zoom mode. This mode is a specially designed for devices without multi-touch function. So user can perform zooming using only one finger by selecting rectangle area. After releasing the finger selected area will zoomed and normal operation mode will set automatically.
- scale 1:1 – return to view of the entire trace.