FIBRAIN®

OSC

OTDR STARTER CUBE

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OTDR STARTER CUBE

COMPACT HOUSING AND SMALL WEIGHT
(86x107 mm / 0.4 kg)

CONNECTOR TYPE COLOR FOR CLEAR IDENTIFICATION

SHOULDER STRAP FOR EASY MEASUREMENT AND TRANSPORT

HOUSING REINFORCED WITH 30% FIBER GLASS
(good protection against mechanical damages and weather conditions)

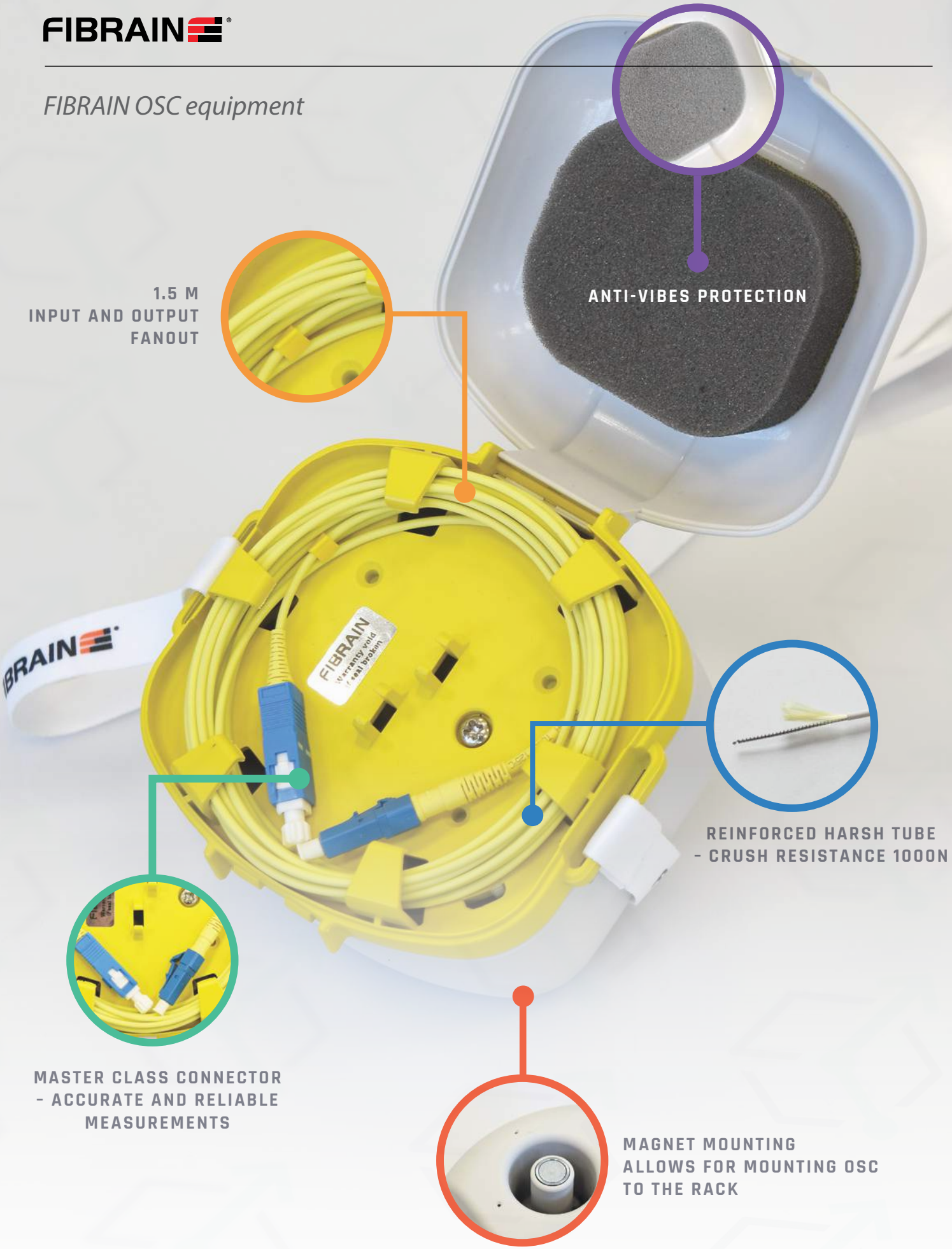
FIBER COLOUR CODE FOR EASY IDENTIFICATION

FIBRAIN
OTDR Starter Cube

Our response to growing market and installers needs

FIBRAIN

FIBRAIN OSC equipment



FIBRAIN OTDR STARTER CUBE

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FIBRAIN OSC main features

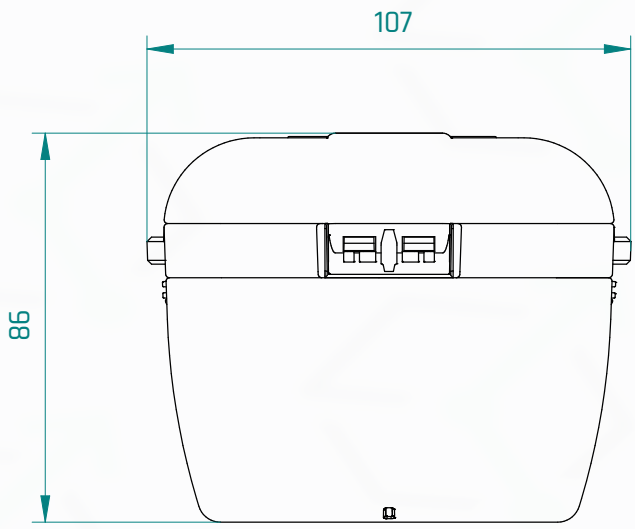
First of all, launch fiber should be easy to transport, in other words occupy minimum space and be easy to move, and if our hands are free at this time it would be perfect. This aspect will also interest us especially during the measurements, therefore, a possibility to mount a starter cube on a rack or fiber optic module would be an advantage. What else is worth mentioning? Since we are at the stage of performing measurements, the length of fibers terminated with fiber optic connectors that are taken out, it's also highly important. Too short launch fiber fanouts limit the range, but also time that is necessary to perform the measurements. Therefore, fanouts should be characterized by suitable crush resistance - as it may happen that we pull or press them too tight. Accordingly, the crush and tear resistance should be higher.

Another thing that is also worth mentioning is the housing itself. We have already discussed the need of its compact size and the possibility to mount it on a rack to have free hands. Undoubtedly, the material itself of which the housing is made is also highly important as it will influence the durability, resistance to damages and bumps.

These features, in turn, affect the security of what is the most important and located in the starter cube – that is our fiber.

FIBRAIN OTDR Starter Cube meets all the requirements mentioned above. The OSC box is our response to growing market and installers needs. A compact housing, which can store up to 1000 m of fiber makes it easy to transport. In addition, the housing has been equipped with a magnet, so it can be easily mounted on a rack. Certainly, this gives us freedom of movement during performing the measurements, because we do not have to hold a starter cube in our hand or look for a place to leave it. At this point, our shoulder strap will be also a very useful solution, as thanks to it the cube will be easy to transport or move.

Housing of the OSC box is made of polipropylene strengthened with 30% fiber glass. Perfectly chosen material of the outer housing makes the heart of the OSC – namely the fiber - is well protected against mechanical damage and weather conditions.



Pic.1. *The OSC dimensions*

Why the OTDR Starter Cube?

- ***Compact housing (86x107 mm) and small weight (0.4 kg)***
- ***Master-class connector***
- ***Housing made of polyprolyen strengthened with 30% fiber glass - sturdy construction resistant to mechanical damages***
- ***Magnet mounting - allows for mounting OSC to the rack***
- ***Shoulder strap***
- ***Fanouts made of reinforced harsh tube***
- ***Fiber and connector type colour code for easy identificataion***

FIBRAIN OTDR STARTER CUBE

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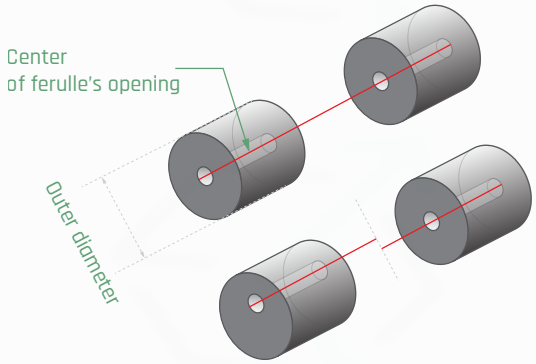
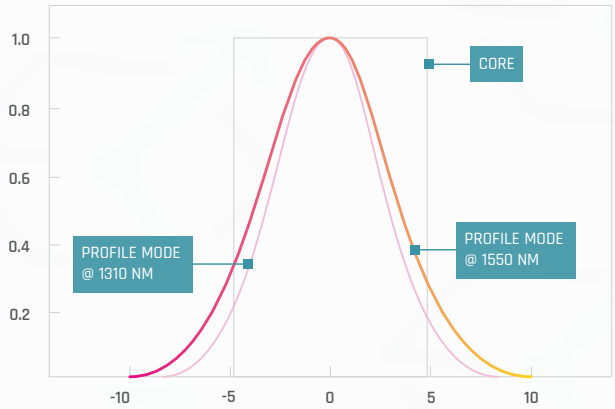
Master Class Connector

Therefore, we shouldn't forget about one more important aspect.
A launch fiber is terminated with fiber optic connector on both ends, thus their quality needs to be high. Why? Because in the worst case for us, poor quality of the connectors results in unreliable measurements. Thus, connectors must be well polished and have proven geometry based on ferrules with very high concentricity, resulting in low losses of IL.
Launch fiber is terminated with reference connectors in accordane with IEC 14763-3 standards. These connectors guarantee maximum concentricity relative to the center of the ferrule, which has direct impact on reducing insertion loss with a measured link, thus measurements are accurate and reliable.
The quality of optical connector (primarily its IL and RL) depends on the semi-finished products in which a class as well as a quality of the ferrule play the key role. In the Picture 2A, various connections of two optical - fiber ferrules are presented.

At the top part of a scheme, a situation in which high quality ferrules and their openings are characterized by prime centricity, which make axes to cover each other, then light goes from one connector to another without any loss. Such connectors are characterized by low and repeated insertion loss (especially in the random connections). In the other case (bottom part of Picture 2A) low-quality with poor concentricity ferrules were used. When two fiber optic connectors with such non-centric ferrules are linked together, their cores do not cover each other, which therefore results in a very low insertion loss, especially in shorter waves. It is connected with the fact that, the diameter of the module field (MFD) depends on the wavelength for example for the G.652 fiber, MFD@1310 nm it amounts to approx. 9.2 µm and for MFD@ 1550nm to approx. 10.4 µm (Picture 2B).



Pic.2a. *The influence of fiber optic ferrule's concentricity on connectors*



Pic.2b. *MFD dependence on wavelenght*

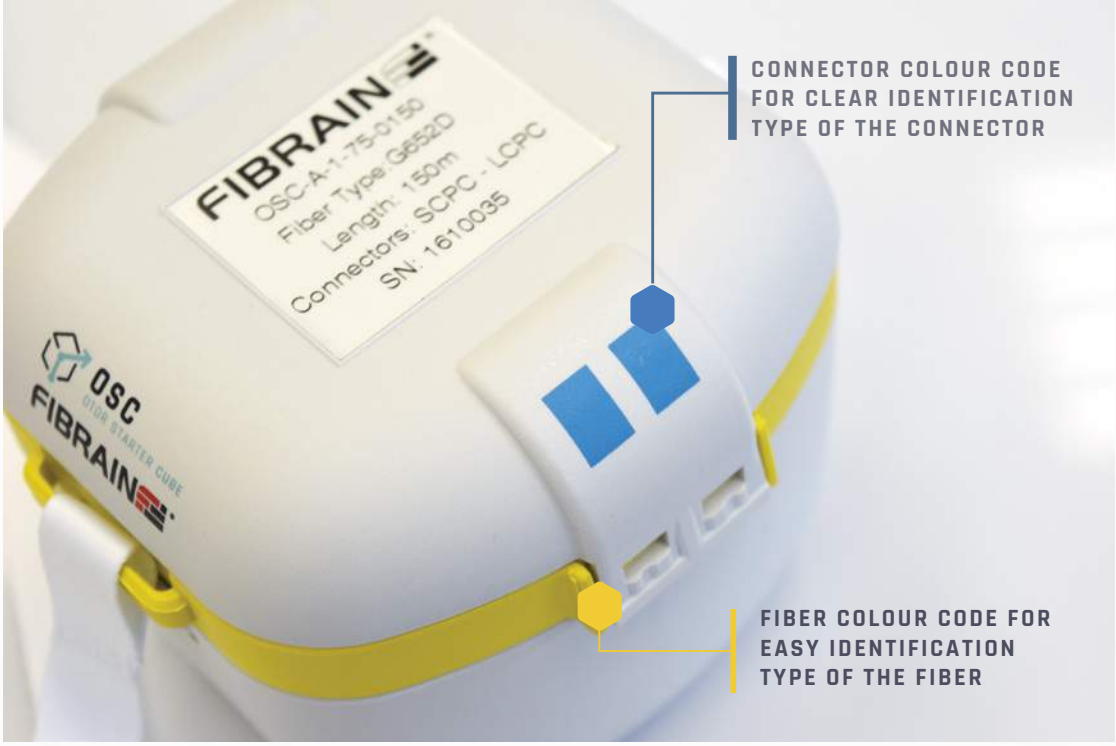
Why *standard connectors are not the good idea?*

- ***We lose the ability of the receiver to the correct diagnosis of events***
- ***First connector, if it's not of high quality ferrules, burdens our measurement result of error***
- ***So we can ask: we see, but what? Is this the correct result of reflectogram?***

Due to the large range of available connectors, we can't measure everything with the use of only one starter cube. Then, a right decision will be buying a package of OTDR starter cubes.

If we get a set of starter cubes, we will be prepared for any eventuality and challenge, which we will need to face during performing optical measurement.

COLOUR IDENTIFICATION



Pic.3. *Color and marking ports of FIBRAIN OTDR Starter Cube*

Pic.4. *Fiber color code of FIBRAIN OTDR Starter Cube*

Fiber	Housing color code
G.652D	yellow
G.657	ivory
G.655	red
OM1	blue
OM2	orange
OM3	aqua
OM4	violet magenta

Table 1. *Housing color code depending on fiber type*

LAUNCH FIBER

A correct measurement by a reflectometry method requires the use of the same type of a launch fiber as the one which was used in the measured network. Thus, by measuring a singlemode network, you can't be limited to order only one type of an OTDR starter cube with singlemode fiber, because as you know, there are various types of singlemode fibers according to ITU-T standard. Today, more and more singlemode networks are being implemented which are based on G.657A standard (G.657B standard is also becoming more popular) - in this case the measurement performed with the use of starter cube on a different type of singlemode fiber for example G.652D will be unfortunately incorrect, so simply what is the reason of making extra useless effort?

It is much better to have a few different types of starter cubes with the most popular fibers used in our networks. Therefore, the situation looks the same in case of multimode fibers – you need to bear it in mind too.
Certainly, FIBRAIN OTDR Starter Cube is a full range of optical fibers. You determine what you need, and we do it. You can easily choose from all fibers available in the market- from singlemode fiber of G.652D type to G.657 - both A1, A2, and B standard, or G.655 standard and multimode fiber of OM1, OM2, OM3 and OM4 types. In addition, in order to facilitate the identification of optical fiber we introduced the color coding on the housing. The table below shows the identification of fiber colors commonly used.

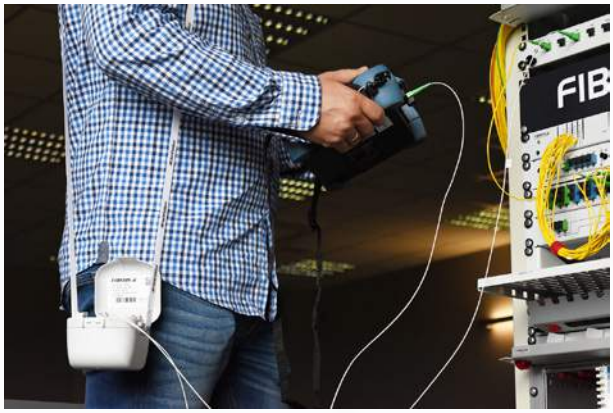
FIBRAIN OSC IN A NUTSHELL

FIBRAIN OTDR Starter Cube is certainly the product which you need to perform correct measurements. Thanks to its numerous advantages, you will perform the measurements easily and in a comfortable way- as the shoulder strap or the magnet facilitate free movement of your hands. Therefore, the fiber color coding eliminates the risk of making a mistake while choosing the appropriate starter cube as well as input and output fanout performed on a reinforced tubes even while accidental close of the cover.
Small and light- thus easy to transport or move. It has to be admitted that it's a huge advantage, taking into account that tool suitcases of the installers usually weigh a bit, but thanks to our starter cube it won't be a problem anymore.

Summing up: *It can be clearly stated that our starter cube is a response to growing market and installers needs*

FIBRAIN OTDR STARTER CUBE IN PRACTICE

Pic 5. *Mounting the FIBRAIN starter cube on a magnet and to a fiber optic cabinet*



Pic 6. *Shoulder strap facilitates the movement of the FIBRAIN OSC starter cube*

Pic 7. *Reinforced harsh tube – as the extra protection in case of accidental close*

Pic 8. *Reinforced harsh tube – as the extra protection in case of accidental close*

A LITTLE THEORY

As the optical reflectometer has a number of advantages, comparing to OLTS set, thus it is very often used as a measuring equipment in optical networks both during installation and operation of the network.
Therefore, the unquestionable advantage of reflectometric measurement is the possibility to present the results in a graphic way - using reflectogram that is a profile of return and attenuation loss as a function of distance.

In the OTDR all events occurring within the measured path are clearly visible- we can "look inside" into our network, and then avoid getting „a pig in a poke". OTDR can detect "ticking bombs" in optical paths like for instance poor quality of welds and connectors, cracks in fibers or points with high return loss. Reflectometric measurements are based on the analysis of backscattered power as a function of time.

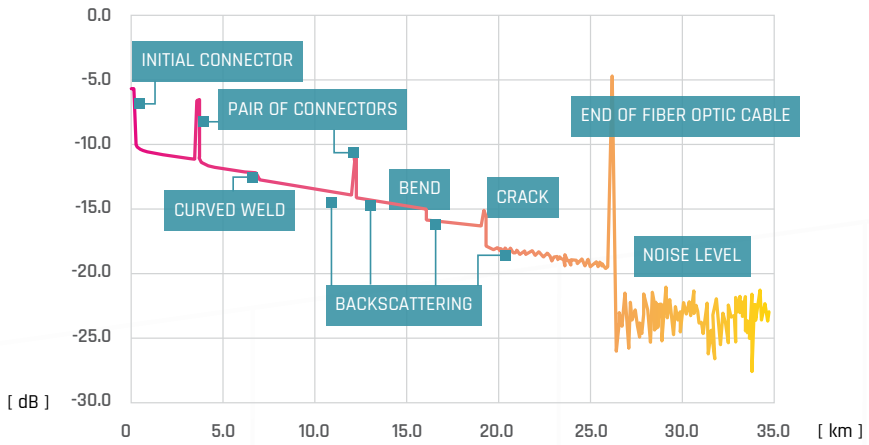


Fig. 1. *Reflectogram presenting the events in a measured path*

DEADZONE

The beginning of the optical path is characterized by a strong backscattering of measuring pulse which causes that embedded in the OTDR detector remains in the state of saturation, or for a short time remains insensitive to keep a record of all events.

Increasing the Deadzone is the result of increasing the length of the transmitted pulse or power.
At this point it is worth clarifying what the Event Deadzone and Attenuation Deadzone are.

- ***Event Deadzone***
  – the minimum distance of the event, after which the occurrence of the second event can be detected (usually 1.5 dB power loss)
- ***Attenuation Deadzone***
  – the minimum distance of the event, after which the loss of the second event can be measured (usually with 0.5 dB accuracy)

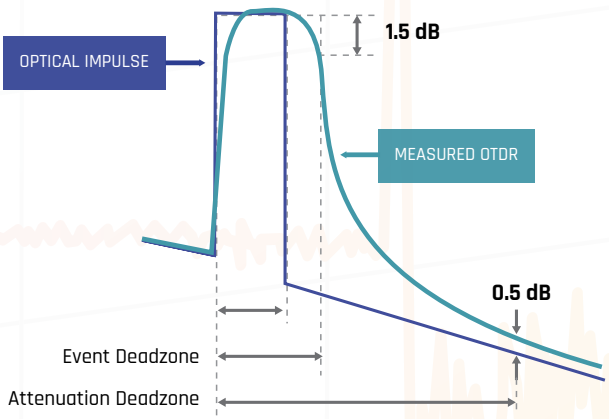


Fig. 2. *Deadzone*

LAUNCH FIBER

The negative effects of the Deadzone need to be eliminated, thus thinking of reflectometric measurements we should also bear in mind launch fibers. Launch fibers enable performing reflectometric measurements with the use OTDR (Optical Time Domain Reflectometer). These fibers eliminate the Deadzone of the reflectometer, and minimize the effects of the launch pulse causing measurement uncertainty. Since launch fibers are an integral part of reflectometric measurements, thus everyone should pay careful attention to a few practical aspects before purchasing them.

LAUNCH FIBERS – MAIN FEATURES

- *Necessary for the proper measurement of the first and last connector (IL and RL)*
- *Secure the OTDR port against wear and dirt*
- *Ensure that dectetor has enough time to get out of saturation*
- *Provide measuring different types of connectors*
- *They should be of the same type as measured optical fiber*
- *Length should be selected due to resolution and OTDR Deadzone*

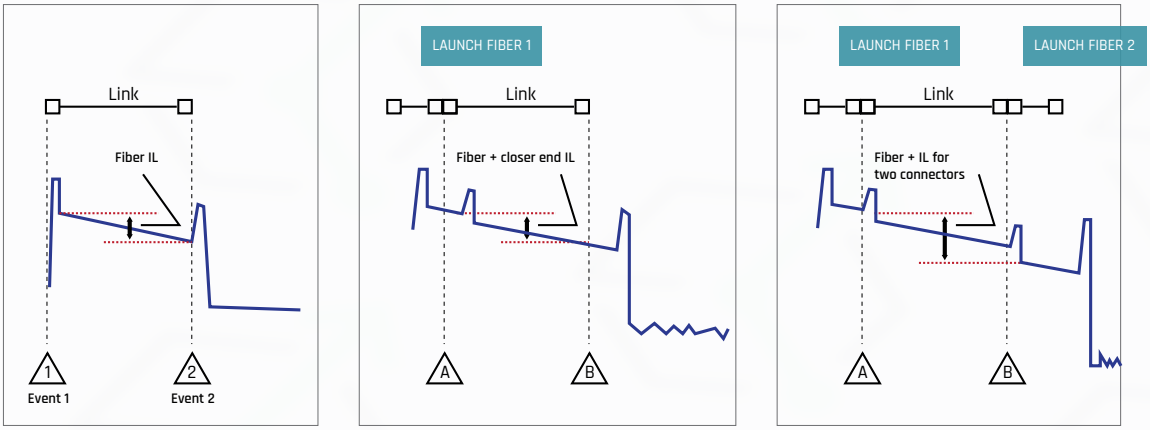


Fig. 3. *Proper measurement of the first and the last connector (IL and RL with the use of launch fiber)*

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