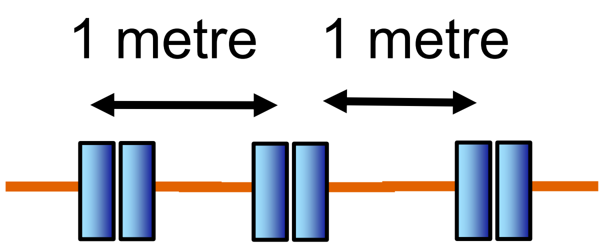
Using Loss and Return loss and height of OTDR peaks to identify faulty components that are close together.

An OTDR is an excellent tool for measuring the loss and return loss of optical components. However the instruments can have problems where events are close together. In these cases the OTDR operator can use other facilities of the OTDR such as return loss measurement and a few simple techniques to deduce the issues in the optical network. As an example consider 3 reflective events which are 1 metre apart.



(A) First look at the loss of the combined events. If they are expected to be 0.1dB each then the overall expected loss will be 0.1dB +0.1dB + 0.1dB = 0.3dB
If the actual loss is much higher then there is a problem with one or more of the components. Either way you then go on to measure the combined return loss of the components using the OTDR (return loss facility) and observe the relative heights of each reflective peak.

Assume that properly working components have an individual return loss of 40dB.

(B) If one component has an air gap (= 14.5dB return loss)
Overall measured return loss is 40dB +14.5dB +40dB = 14.47dB
The air gap dominates and the highest peak will be the faulty component.

(C) If two components have air gaps then the overall return loss is
14.5dB +14.5dB +40dB = 11.5dB again the high peaks will show which is faulty.

(D) If all components have airgaps then the overall return loss is
14.5dB +14.5dB +14.5dB = 9.7dB

(E) If all the components are good with 40dB individual return loss then the combined return loss will be 40dB +40dB +40dB = 35.23dB

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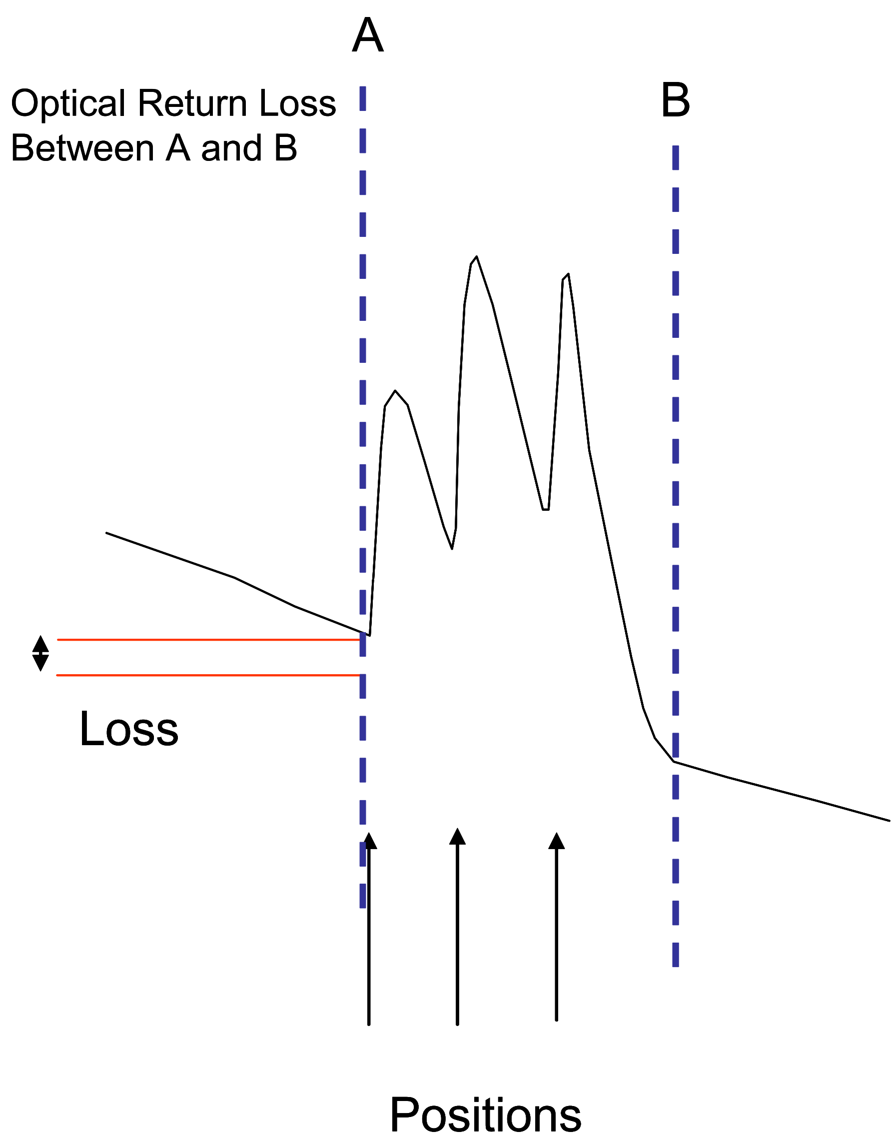
If the loss is good and the return loss is good or as expected then the system passes.

If the loss is not good and the return loss is good then you have a faulty component but you can't deduce which one. Testing at 1310nm and 1550nm will probably show if there is a bend in the system as the 1550nm loss will be higher than expected.

More information can be derived by putting a tight bend in between the events, this will eliminate reflection components beyond the tight bend and allow you to deduce the individual return losses.

Where events can be clearly distinguished.



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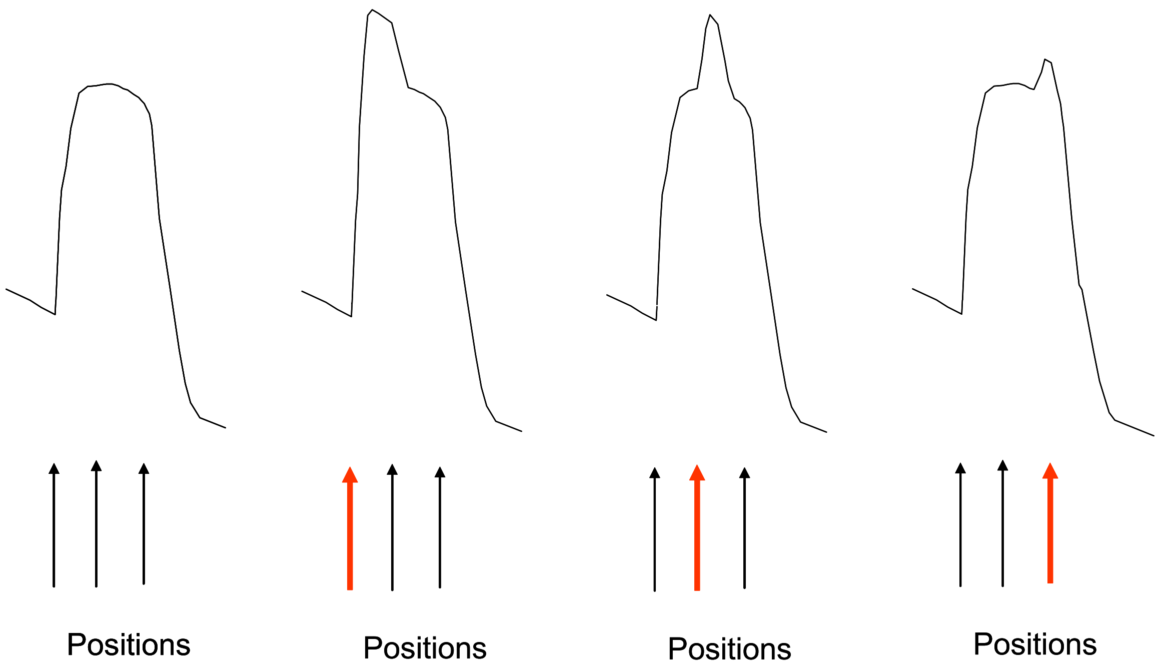
Where events cannot be clearly distinguished.

The peak of the problem event will be higher than the others.



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