

Technical article

Aerials | Dishes | Set-top boxes | Headends | Fibre optic | Multi switches | Amplifiers | Outlets | Home accessories | Fibre cabinets | Enclosures

Optical fibre cables replace coax

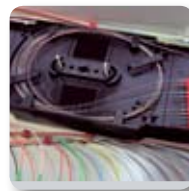
Compared to coax, optical fibre cables have substantial benefits in distribution of satellite TV signals. However there are – or rather have been – barriers for use of fibre technology in multi dwelling and single- family home installations:

Optical transmitters have been excessively expensive and handling of fibre cables has required complicated and expensive tools. As these barriers are now removed, the advantages of fibre will save installers of both time and material costs. Additionally fibre technology allows signals from one LNB to be distributed to a much larger number of outlets and at almost unlimited distances.

The properties of coax cables add challenges, work hours and sometimes tough technical problems to the everyday life of TV installers. It is only habit – and of course the lack of an alternative – that leads installers to accept the time and trouble needed to cope with high cable loss, electromagnetic interference and restrictive limits to the number of outlets and the distance that can be covered from one LNB and in one multiswitch installation.

The limitations of coax become more and more evident, as set-top boxes include more than one tuner, and the number of set-top boxes in each household increases. Suddenly an ordinary single home installation requires a bundle of coax cables from LNB to outlets. And in multi dwellings the capacity of existing head-end or multiswitch systems can not meet the needs of an expanding number of advanced satellite receivers.

Satellite signals are high frequency signals (950 – 2.150 MHz) and cable loss in this frequency area is much higher than in the frequency area of terrestrial signals. For each 100 meter of coax cable, satellite signals loose 18-32 dB. Cable loss of course can be compensated by amplifiers, but amplification magnifies both signal and noise and so, there are tight limits to the number of outlets and the distance you can reach in coax cables and with usable satellite signals.



“We now strongly recommend TV-installers to gain experience with fibre, as this technology offers both cost savings and new opportunities. Fibre widely expands the number of outlets and the area covered from one LNB. Furthermore fibre saves lots of cable meters, eliminates the need of amplifiers and saves at least 20% of the work hours needed to design and install a typical multi-dwelling network”.



Article by Jan Nymand
product manager, Triax

What has kept you from fibre technology

The physical laws that apply to fibre cables are very different from those of coax cables. In fibre you have practically no cable loss (0,03 dB compared to 18-32 dB per 100 meter in coax) and you have absolutely no electromagnetic interference. Furthermore fibre cables are much less expensive than coax and with increasing prices on the copper used in coax cables, the price difference will continue to grow.

But of course there are reasons why coax and not fibre until now has been used in TV distribution networks. First of all optical transmitters have been excessively expensive. Furthermore technology to work with fibre and especially splicing of cables has been complicated and expensive. We believe these days are over.

- continue on page 2

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- continued from page 1

Triax Optical LNB Transmitter converts 4 polarities to one signal, converts it to a digital signal and laser beams the signal through an optical fibre cable



New Optical LNB transmitter clears the way

Transmitting satellite signals from an LNB into fibre cables will logically require 4 laser transmitters and 4 fibre cables, one for each polarity: Horizontal and vertical, high and low band. Such a solution would however be excessively expensive and hardly practical.

The answer is a frequency stacking process, where the 4 polarities are stacked in only one signal and down converted to the frequency range 950 to 5.450 MHz.

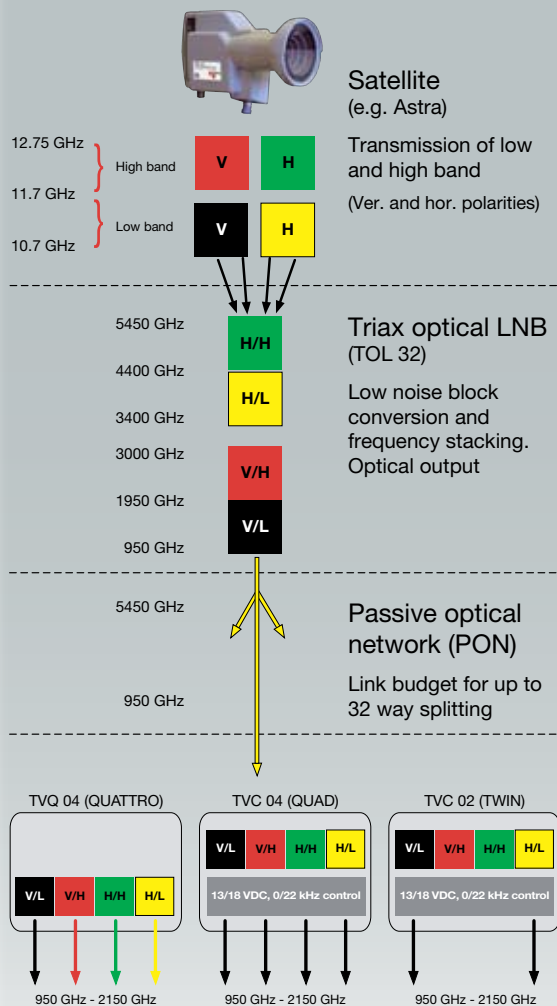
This process (see illustration) is handled in a new LNB, where only one laser transmitter is needed to transmit all 4 polarities and in only one fibre cable.

The stacked signal can be distributed in a network with passive components only and at an almost unlimited distance with practically no cable loss and no electromagnetic interference. No amplifiers, active distribution switches or other power supply driven components are needed to distribute the signal.

At the receiving end, signals are destacked and reconverted by an optical receiver that can supply a multiswitch with all 4 polarities in four separate coax cables or can deliver coax output through two or four lines directly to the same number of set-top boxes.

How it works

High frequency down conversion and stacking/de-stacking



Triax virtual converters (TVQ 04 - TVC 04 - TVC 02)

Optical Receivers with de-stacking. Universal output via coax controlled by receiver (13/18 VDC, 0/22kHz), or direct for multi switch (QUATTRO)

One LNB, thousands of outlets

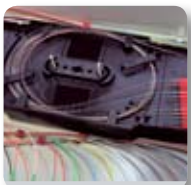
The fibre cable signal can not only be distributed for kilometres with only an insignificant cable loss. Signals can be split into 32 signals and still maintain a signal level that is absolutely sufficient. So, one Optical LNB can supply 32 multiswitches. If each multiswitch is used to serve 128 outlets, you can supply up to 4.096 outlets or tuners from one LNB.

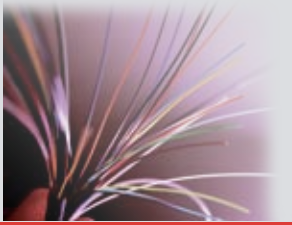
Optical splitter

A 2-, 4- or 8-way optical splitters can be placed anywhere in the distribution network. Splitters are passive and require no power supply and so, the installer can place the splitters where it is convenient and with a minimum of work. Splitting does however cost a small signal loss, for example 3,2 dB in a 2-way splitter.



Triax 2, 4 or 8-way optical splitters can be placed anywhere in the network and can split the signal in up to 32 ways.

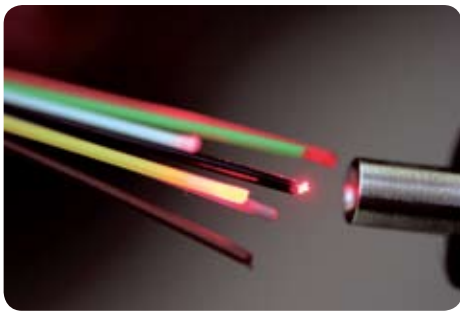




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All professionals can now handle fibre

Until recently the technology for handling fibre cables and especially for splicing cables was extremely sensitive and required special and quite expensive tools. Also these days are over.

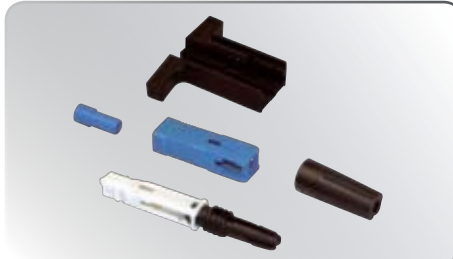


Optical fibre for sat-TV networks.

The thin cable has a diameter of only 3 mm and the glass core a diameter of only 9,2 µm (micron = thousands of a millimetre). The cable has a max. bend radius of 30 mm.

Handling fibre is at least in some ways different from handling coax, especially because the installer needs to be very cautious to avoid dust at fibre ends. Extreme cleanliness is needed. Any professional TV-installer will however quickly become familiar with the work process and tools needed to handle fibre cables.

If you do not want to bother with splicing, you can order fibre cables in the exact length you need: 5, 10 or 15 and all the way up to 100, 200 and 500 metres, fully equipped with connectors. For on-site splicing you use an easy-to-use fibre cleaver to cut the fibre and you use fast-fit connectors to mount at cable ends. After a few hours, the installer is completely familiar and trained in the work process.



Fibre cleaver for on-site cutting of fibre cables.

Fewer components, cheaper cables and faster installation

Fibre technology enables you to widely increase the capacity and geographic reach of the satellite networks you design and build. Think of the vacation resort, where apartments are scattered on several acres of land. Think of the large luxury apartment house, where the network is to supply 4 or 8 satellite receivers/tuners in each apartment. With fibre technology these networks can be served from one LNB, without amplifiers or other power requiring, active components – and without all the calculations needed in a coax based network to assure sufficient signal level and quality at all outlets.

Fibre will replace coax also in the average multi dwelling and in future-proof single home installations – and for one reason: It is cheaper in material costs and more importantly: Fibre saves work hours in design and installation.

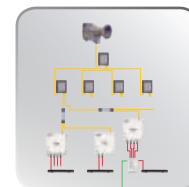
Cabling work is reduced and most significantly in multiswitch installations, where only 1 fibre cable instead of 4 coax cables are needed from LNB to a single multiswitch - or from LNB via optical splitters and to a number of multiswitches.

The time needed to install amplifiers, add power supply and calibrate them correctly is of course also saved completely. Furthermore the risk of wasting hours on unexpected trouble-shooting is reduced to a minimum. Because cable loss is practically non-existing signals are never “just sufficient”, but are at a high level everywhere in the network. As fibre systems provide 100% galvanic isolation, the installer will also not have to cope with electromagnetic interference or interference from power surges or lightning – and he does not have to spend time on earthing or bond bars.

Total cost savings of 30-40%

On average it is estimated that fibre cables compared to coax save 20% of the work hours needed to design and install a multi dwelling network. On top of these savings, you can add the costs saved on active components such as amplifiers and especially on cables: You use substantially less cable meters and use fibre instead of the more expensive coax cables.

Of course an Optical LNB is more expensive than an ordinary LNB, and with fibre you also have to add the cost of optical converters at the receiving end. On the average multi dwelling you can apply the following rule-of-thumb: With 20% savings in installation time you reach the point, where fibre break-even with a coax based installation. The trained fibre installer can however expect total cost savings of 30-40%, and in installations with long cable distances or many outlets, savings will be even greater. At the same time you provide the customer with a network with capacity for future expansions and with high quality signals at even the most remote outlets.



- continue on page 4

Technical article

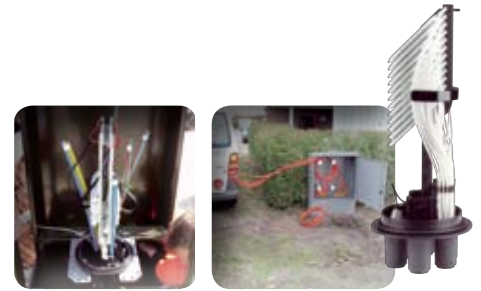
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New application of proven technology.

The idea of transmitting TV-signals through mikron thin optical fibres is not a new idea. It has worked for years in cable networks and it is just the application to sat-TV networks that is new.

Real news is the Optical LNB transmitter and the stacking of 4 polarities to only one transmission signal. Simplicity is the strength of the idea. There is nothing especially complicated in the idea and it is easy to demonstrate, how well it works.

The real challenge for Triax as well as for installers is to break many years of habit in working with coax cables. So, please do us and especially yourself a favour: Compare the costs of a fibre-based solution with those of a coax-based, next time you are asked for a network proposal. In your first and second fibre network, you may save on material cost, but might not realize all the potential savings in installation time. But once you are familiar with fibre, the new technology will add profit and competitive edge to your business.



Triax customised fibre cabinets
 – we can also offer you customised enclosure solutions designed to meet your specific needs and requirements. Our manufacturing lines are designed to combine flexibility with the economic advantages of a highly automated production.

