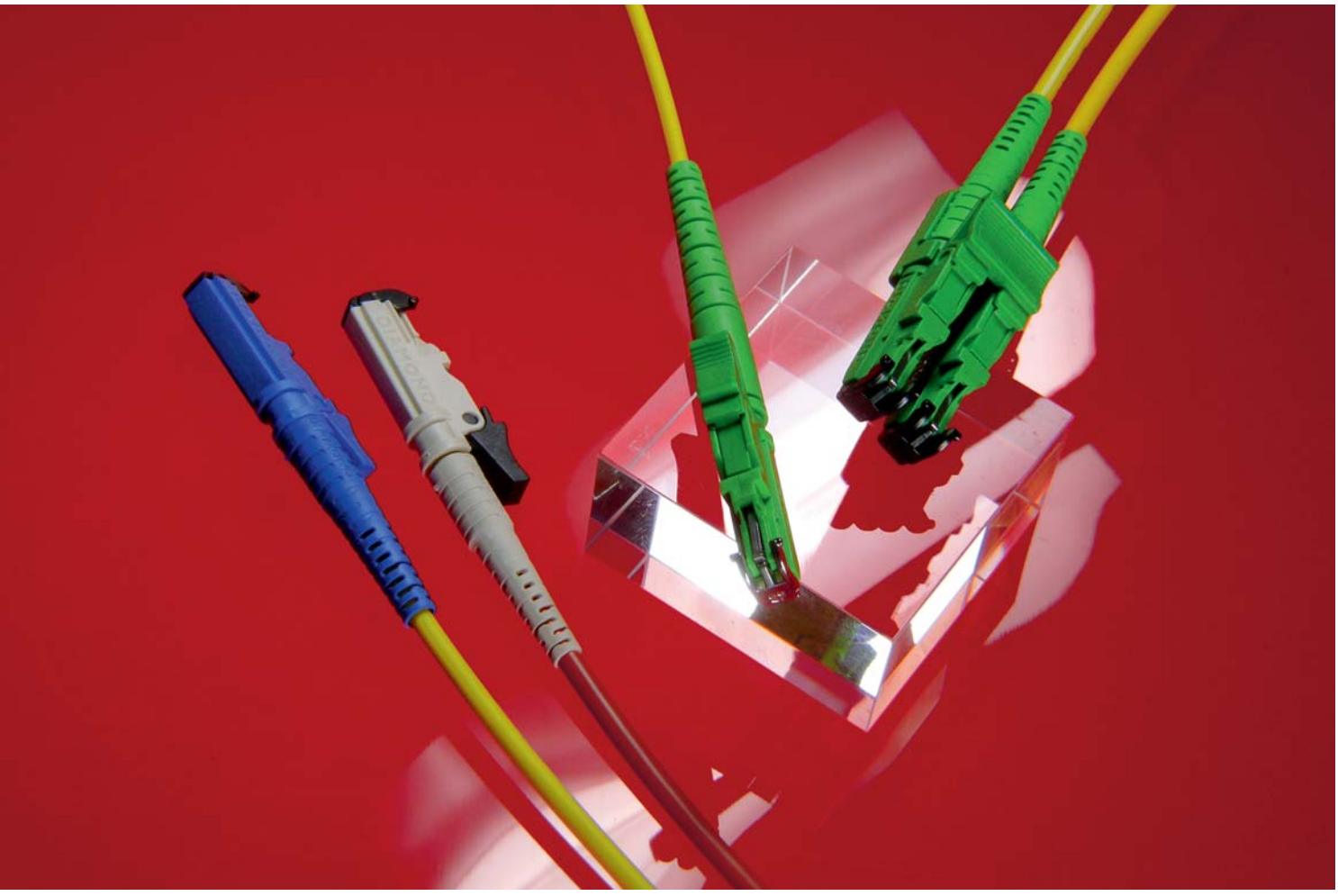
fibre optical components GmbH **At the speed of light into the future.**



foc flash-light

March 2011

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Editorial

Photo: Stephanie Eißig

The ideas and commitments from yesterday are of no use for the business of tomorrow. This simple truth painfully applies to the FTTx situation in Germany. According to statistics from the FTTH Council less than 200,000 households are directly connected to the fibre-optical network, the equipment is generally obsolete and investors do not have long-term plans. The only sustainable aspect of this situation is the damage profile for the business location of Germany also in terms of the quality of life.

But Europe also has ground-breaking examples, such as the I5 concept of Portugal Telecom, the WDM-PON for 1.2 Gbps in the development of Nokia Siemens Networks, or Altibox, the Norwegian Internet provider, which builds its business model on customer satisfaction and develops and offers new products. Thus the company records sales of about 100$ per satisfied customer. These exemplary steps made by players in the FTTx arena here in Europe required new ideas and the courage to work for their consistent realisation.

Our current issue shows examples of stakeholders in the field of broadband development in Germany. Particular attention is attached to the efficient operation of such networks, which is the precondition for customer satisfaction and trust in new, network-based services. Here, too, new technical monitoring procedures are required. The future will not be shaped by reducing the offer, but by understanding the needs of the customers and by their practical implementation and further development to provide new products. We are looking forward to this dialogue with you.

Christian Kutza, General Manager

FOC Sales

strengthens its customer support

Photos: Camilla Christ

FOC Sales
(from left)
Stefan Nier
Michael Riecke
Frank Sommerfeld
Tilo Kuehnel

Three new colleagues to support our customers from January. **Stefan Nier** is the new Head of Sales. Stefan is born in Hamburg, in the north of Germany, and has been active in the IT and telecommunications sector for more than 20 years. Following his training to become an industrial business management assistant Stefan pursued his career in the field of distribution. Since 1997 he has held leading positions at various ICT companies in the areas of sales, business development and general management. In the past five years Stefan has been responsible for the installation and operation of telecommunication networks in Slovakia and the Ukraine. He worked for Telecom, Nortel Networks, DeTeWe, Colt Telecom, Versatel and Swisscom. After his return to Germany Stefan assumed responsibility as Head of Sales at FOC in January 2011.

Michael Riecke, our new sales representative for the western region of Germany, has long years of experience in communications engineering. As a qualified communications engineer he first held several positions in the fields of service, training and approval at Danish and Japanese mobile radio manufacturers. For more than 20 years Michael has been active in optical communications engineering. First at the instrument manufacturer Anritsu where he was responsible for high-speed transmission technologies up to 40 Gbps. Then he went to Rhode & Schwarz and supported the EXFO measurement instruments at the sales offices in Cologne.

Another station in his career was his change to Sunrise-Telecom Germany. There Michael was Customer Care Manager and Key Account Manager and supported not only the key accounts such as Deutsche Telekom and Vodafone but also a number of regional network operators and network element manufacturers. For his new activity at FOC GmbH in the sales area of Western Germany Michael benefits from his comprehensive knowledge gained in optical communications engineering.

In the south of Germany **Frank Sommerfeld** will be at your disposal. Frank strengthens our office in Stuttgart as Head of the Branch Office. He will both intensify and expand our business relations with existing customers in the Southern German region, in Austria and Switzerland, and be the main coordinator of our sales activities in the international arena.Within this framework the successful expansion of our location in the Stuttgart region will be another aim. Prior to his start at FOC Frank was active in leading positions in international sales and business development in the field of telecommunications.

This included long-term stays in Arabia and Asia, where he acquired cross-functional leadership skills in the telecommunications sector and comprehensive global business practice.
Professional experience:

- For more than 15 years active in the telecommunications industry
- Director Sales & Business Development at leading telecommunications suppliers and fuel cell manufacturers – EMEA & South America
- General Manager for processor technologies of the company Siegle und Epple - Europe, UAE & Asia
- Manager Engineering at Saudi Telecom
- Project Manager at Alcatel / SEL AG – Europe & Asia

For the northern region **Tilo Kuehnel** continues to be your usual contact. Tilo Kuehnel is a qualified communications engineer. In the mid-80s he also studied optical communications engineering. In his career he has gained 30 years of market and technol-ogy know-how on the German market.
His competences:

- Advising the customer on the selection of available technologies focussing on future migration scenarios
- Product development (specifications)
- Resulting from the above: business development / key account management (Deutsche Telekom, municipal utility companies, special-purpose associations)
- Analysis / inventory taking of existing infrastructures
- Network planning and project work
- Development of business models and operator concepts
- Preparation of migration strategies based on existing infrastructures
- Determination of requirements and cost estimation
- Support of strategy concepts up to commissioning
- Preparation of operator concepts

His professional history:

- DeTeWe AG & Co. in Berlin: project planning, network planning, network product management, strategic marketing for public telecom networks
- T-Systems: project manager of strategic planning for access networks
- DeTeWe: UMS platform project manager
- Arthur D. Little/TIMES2C AG in Berlin: senior consultant telecom networks and services
- exper-MEDIA GbR: managing director Technology/Strategy
- DIAMOND GmbH: head of Berlin branch office, passive optical systems

We are pleased that we have been able to expand the FOC Sales staff so that we can ensure an on-site service across all of Germany again.

Communities take charge in the interest of their citizens and businesses

The Leuna industrial location shall become more attractive through a genuine, future-proof broadband infrastructure

Technologies and infrastructures currently used in Germany for supplying industry, commerce and private households with broadband connectivity all have one decisive disadvantage: They are not future-proof.

This applies both to the currently most-popular DSL technologies and to all known wireless technologies such as WIMAX, UMTS and, in the future, LTE (Long Term Evolution).

That's why it is indispensable to establish an access network infrastructure which can easily fulfil all future requirements (time window of three years or later). This new access network which has to be installed up to the end customer, i. e. into the homes, is based on optical fibres. An optical fibre is fully future-proof since it can transmit an unlimited amount of bandwidth. For this reason the investments, which currently have to be made to cover the "white spots" on the broadband map and which are subsidized by public funds, should actually be exclusively spent on the fibre-optical infrastructure.

With this aim the German Federal Ministry of Economics and Technology has initiated an innovation competition where the winners shall establish a future-proof innovative broadband infrastructure for cities and communities.

Under the project management of CFS, an FOC subsidiary, the Leuna districts of Guenthersdorf, Horburg-Masslau, Rodden and Zweimen, Koetschlitz, the local sewage disposal company of Luppe-Aue and the company KABELCOM Stolle as the operators and EWE Netz GmbH with headquarters in Oldenburg have started a project and participated in this innovation competition.

Basic network topology requirements

P2MP (PON): PON (EPON, GPON) is principally used in densely populated regions (metropolis) for the supply of residential customers with broadband connectivity. It has to be noted that this is an infrastructure which, depending on the splitting ratio of the optical fibre's splitter, distributes the overall power to up to 32 end customers per PON link. In this cost calculation a network connection of the overall system (Central Office per location) to one feeder line and a 1:32 splitting ratio at a rate of STM-1 (155 Mbps) was used. A combination with P2P access ports for the supply of business customers is possible and can make sense in the individual case.

- Guenthersdorf community
  per customer, symmetric: approx. 39 Mbps
- Horburg-Masslau community
  per customer, symmetric: approx. 52 Mbps
- Koetschlitz, Rodden and Zweimen communities,
  symmetric: approx. 32 Mbps

P2P: The use of P2P technologies principally requires up to 20% more investments (active components, including cooling, fibre management) and is also more expensive in operation (more than 2.5 time the electricity consumption versus PON).

P2P network technologies are mostly used in thinner populated regions and for the supply of business customers. P2P networks guarantee to continuously provide the customer with the paid-for bandwidth. A "fixed wiring" with an Ethernet switch connected to the STM-1 link ensures 15.5 Mbps symmetric for 10 end customers.

Marginal conditions for project planning

The current condition of the backbone networks, which each Point of Presence (PoP, OLT) is connected to, does not guarantee these data rates any longer. IP networks are basically shared media (except peer-to-peer).

It is principally possible to combine P2P networks with PON networks. This will allow you to save CAPEX, because the infrastructure in the access network guarantees a quasi-P2P connection, while the splitters are installed in the Central Office and thus no fibre management and no active components are needed. This will ensure that the network is fully future-proof.

Project planning and implementation

For the calculation of the project we took the following specifications into consideration:

· From the point of view of network planning the Leuna districts to be connected are characterised by their dispersed building development.

This requires setting up a PoP at a central site. This OLT site should be selected to concentrate several communities and/or

District	Coverage	Area	Inhabi-tants	Housing units, approx.	Postal code
Günthersdorf	In the old village max. DSL-Light, new housing development not connected	3,26 km²	1.245	500	06237
Horburg-Maßlau	Wireless solutions, partly DSL-Light	3,97 km²	543	190	06237
Kötschlitz (including Möritzsch, Zschöchergen)	Via CATV, no DSL, 25% not connected	5,40 km²	927	370	06237
Rodden (including Pissen)	Wireless solutions with partly just under 2 Mbps, no DSL	3,61 km²	248	150	06237
Zweimen (including Göhren, Dökau)	Relatively well covered, Telekom up to 3 Mbps	7,31 km²	305	145	06237

Fig. 1: Marginal conditions of the project

districts. The OLT site can be implemented at the site of the previous cable distributor/transfer cabinet. A precondition is that the OLT/PoP site can be set up on premises owned by the community. As a preparation for the supply of optical fibres to each home we recommend setting up a prefabricated container building (see illustration). Furthermore it is assumed that the later

FTTH distributor station
Up to 3,000 optical fibres (customers)/site
Station size: 3200 x 6200 mm
Turnkey delivery (ventilation, guidance system, system cabinets, etc.)
Station for up to about 3,000 customers

FTTH street cabinet
Up to 600 optical fibres (customers)/site
Size: 2200 x 600 mm
Street cabinet for about 500 customers

Fig. 2: PoP site

coverage of all communities in the planning area shall be achieved. That is why we recommend setting up a sufficiently sized container building at the PoP site. With a maximum of 1,200 fibres this site should offer enough capacity up to final completion of the network. A second POP site may be taken into consideration. This second site would not require any additional active or passive components in the actual network to the end customer.

The prefabricated container building is delivered pre-assembled on a low-bed trailer and simply placed on the ready-cast foundation trough, where the fibre-optic cables are already installed (see illustration). From here the optical fibres are routed to the households which conclude a contract with the future operator. This type of development is based on the actual needs. After setting up the prefabricated container the active components are installed, the fibres terminated and the customers put into service. However, prior to installing the optical fibres comprehensive civil engineering work cannot be avoided. But this work was not part of the project calculation. However, the optical fibre has to be routed to each home just once. According to today's state of technology we expect that the optical fibre provides unlimited bandwidth and will not be replaced by a comparable or better technology for at least the next 70 years to come.

In order to reduce the planning time and effort in the current phase we assumed hypothetically that all communities in a 20 km radius (to the last customer) can be reached from this OLT site.

The network has been configured in such a way that all potential end customers (all homes along the connected streets, also passed homes) can be connected without any problem. To do so a house junction box specially developed by EWE Netz GmbH is used, if needed, from where one optical fibre from the main cable (cut) leads to the respective home. This connecting method is cost-saving and requires e. g. an interruption of pedestrian traffic for a short time only in the form of a one-day building site.

Additionally it may be possible to employ a new house connection method using existing gas service connections. This method has been patented by EWE Netz GmbH.

Furthermore the calculation takes into consideration that the network construction can be performed in the two described ways (PON, PTP).

Both network topologies can be used to implement the well-known triple-play services (phone, Internet, TV). Also the supply of business customers (e. g. w/o TV and/or telephony) in a PON is easily possible (Fig. 3).

Operation of the network

A central network management system for constructing and commissioning the network and for later monitoring and customer management is included in the project.

First the fibre-optical ring infrastructure for connecting the households and companies in the respective communities needs to be established. Apart from the tenants of the local shopping centre, several tradesmen, tourism facilities, in particular the Holiday Inn in Guenthersdorf with planned interactive connectivity of the hotel rooms, the local medical practice, the inhabitants of the new housing development in Guenthersdorf, which has considerably grown after the fall of the wall in 1989, are particularly interested. So far their connections offered data rates of under 1 Mbps only. Since recently more and more home workers, who vitally depend on a good data connection, have been moving into the area, there is at least a strong need for action on the side of the local politicians.

Moreover the improved Internet connectivity shall also improve medical care in the area and help meeting the requirements of a modified primary care in the suburban region.

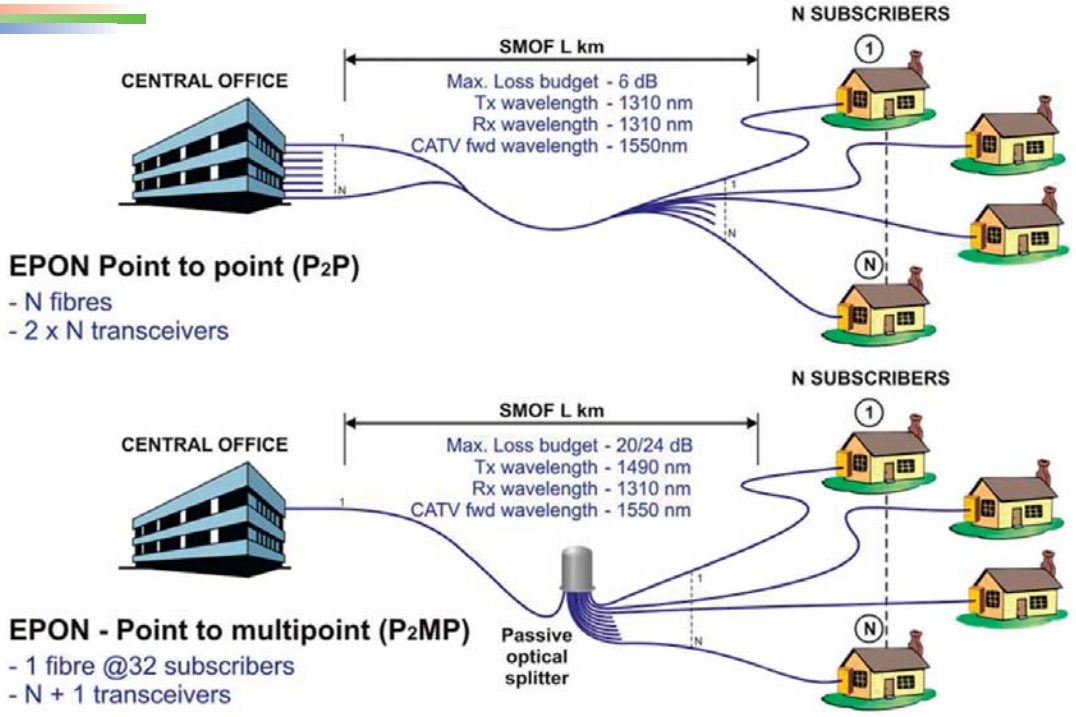


Fig. 3: Network topology (*source: PBN)*

Highly consistent networks.

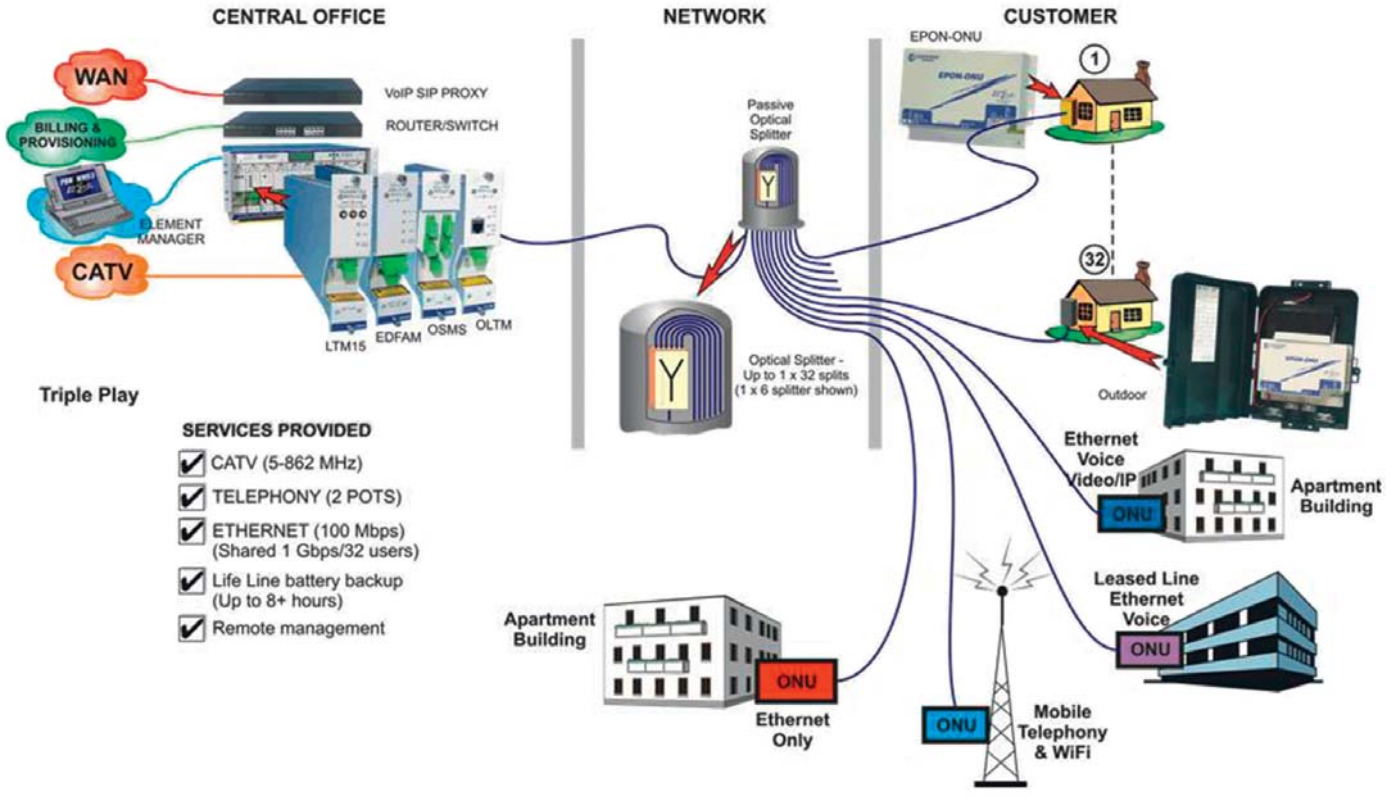


Fig. 4: Central network management system (*source: PBN)*

This is particularly meant to counteract the loss of doctors in the area. The online care of several long-term patients (= chronically ill and old people) living at remote places but also the expansion of the diagnostic tools via a data connection to individual institutes of the Leipzig university clinic and to other institutions are the next aims.

Assumption/initial conditions

The new fibre-optical network is a fail-proof network similar to the copper-based telephone network. Its yearly availability is about 99.89 per cent, i. e. statistically about 0.4 days of failure per year.

Each end customer can decide which TV and radio stations he / she wants to book and use from a total of 150 available stations. Each service provider, who wants to feed a service into the network, may do so based on its own investment at the PoP.

Through the use of an innovative network monitoring system on the physical layer each end customer link can be permanently monitored from the central office. This system is provided by FOC GmbH and by Lancier Monitoring GmbH in Muenster, Germany.

The local network remains in the ownership of the community which makes it available to the network operator in the form of an operating company or an association.

Technical parameters

All installed fibre-optical house connections can use, depending on the data rates ordered, up to 40 Mbps in the downstream and upstream (symmetric bandwidth distribution). Since each wavelength range transmits just one service, the full bandwidth can be made available for each service (Fig. 5).

An increase or upgrade of the bandwidths is possible any time. This can be done by leasing a bigger feeder bandwidth (from STM-1 to STM-4 or STM-16) or e. g. by implementing P2P connections for business customers.

Contrary to the transmission method of TV cable networks, where Internet and telephony and TV share the same bandwidth, so that less bandwidth is available for each service, with the optical transmission method the full bandwidth can be used by each service.

Fig. 6: Customer terminal for the provision of TV, Internet and telephony services

The customer terminal is directly connected to the optical fibre installed in the home. On the other side the device provides ports for all three services, such as TV, Internet and telephony. The existing customer devices such as phone, TV-set and PCs can be directly connected to the terminal (Fig. 6).

Tilo Kuehnel, FOC

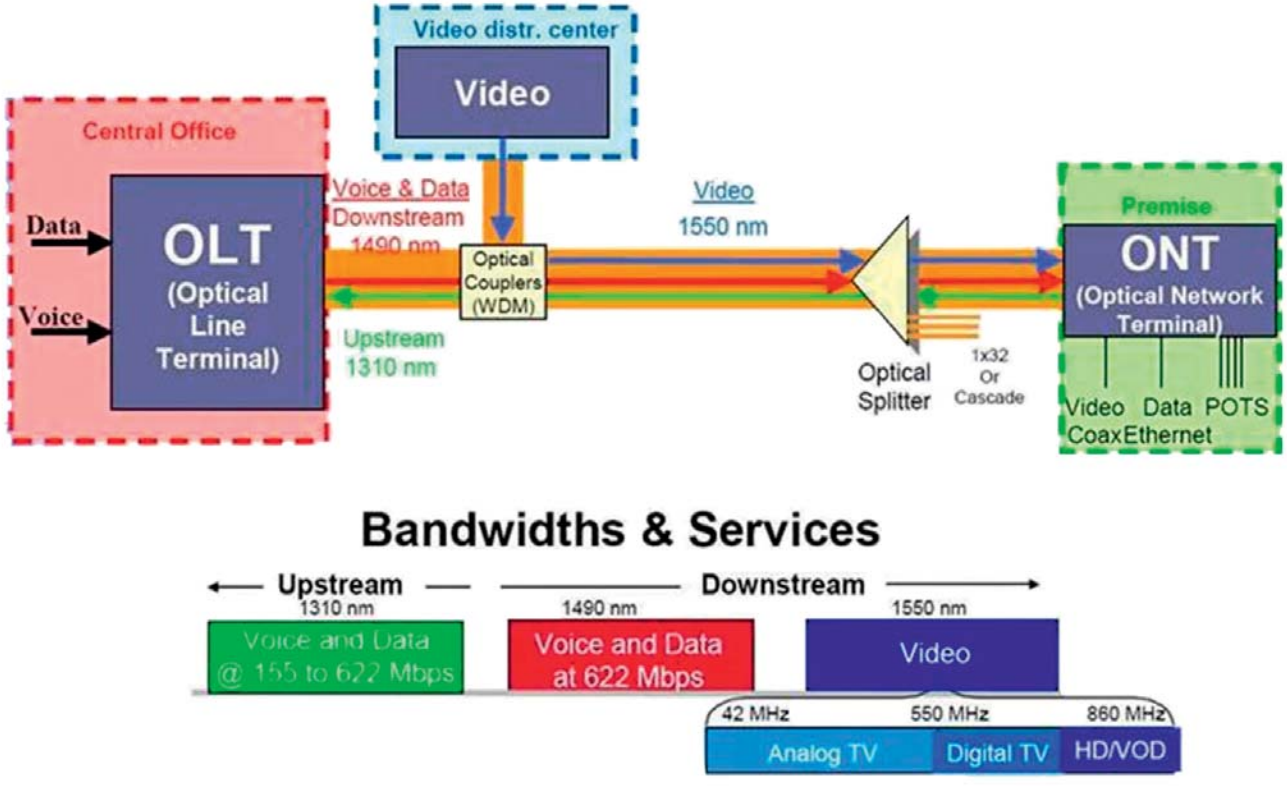


Fig. 5: Technical principle of the overall system

New methods for monitoring FTTx networks

The long term experience made by the network operators has shown: Contrary to initial expectations fibre-optic cables need to be monitored, too. Environmental influences, such as water penetrating the cable, have an impact on transmission quality. Ruptures due to land slides, construction work or even theft may result in total loss.

In addition to these problems, sufficiently known from the fibre-optic backbone and from long-haul links, technical risks associated with the residential customer's premises have to be considered for FTTx. Frequently the network operator does not have the direct and required access to the line termination, but has to rely on the help provided by the end customer for measurements and checks. Here you will see, that the vast majority of reported failures does not occur in the network area but in customer's configuration or in the customer's ONT (Optical Network Termination). If the customer reports a problem, the network operator is obliged first to check the proper functioning of the network, before demanding from the customer to check / have checked his / her own configuration. This will frequently cause considerable delays and additional cost for the restoration of the connection.

Moreover, the mere number of connections to the end customer alone renders a periodic manual measurement—as often done on the backbone today—impossible in the FTTx network.

All these reasons almost inevitably result in the implementation of an automatic monitoring system of the physical PON network in order to permanently and cost-efficiently maintain the reliability of the network. Such an automatic monitoring may be performed in an optimum way by a fixed optical backscatter instrument (OTDR, Optical Time Domain Reflectometer) in combination with special reflectors. Figure 1 shows the measurement principle: Each customer termination is fitted with a special reflector reflecting the portions of light used for monitoring purposes while not influencing the light needed for data transmission. For this task special reserved wavelength channels at 1625 nm or 1650 nm are available.

In the backscatter trace each reflector provides a characteristic signal peak, whose position is determined by the length of the link between reflector and OTDR. In PON structures the overlay of the individual reflections produces a characteristic overall picture, similar to a fingerprint, which is recorded at the initial

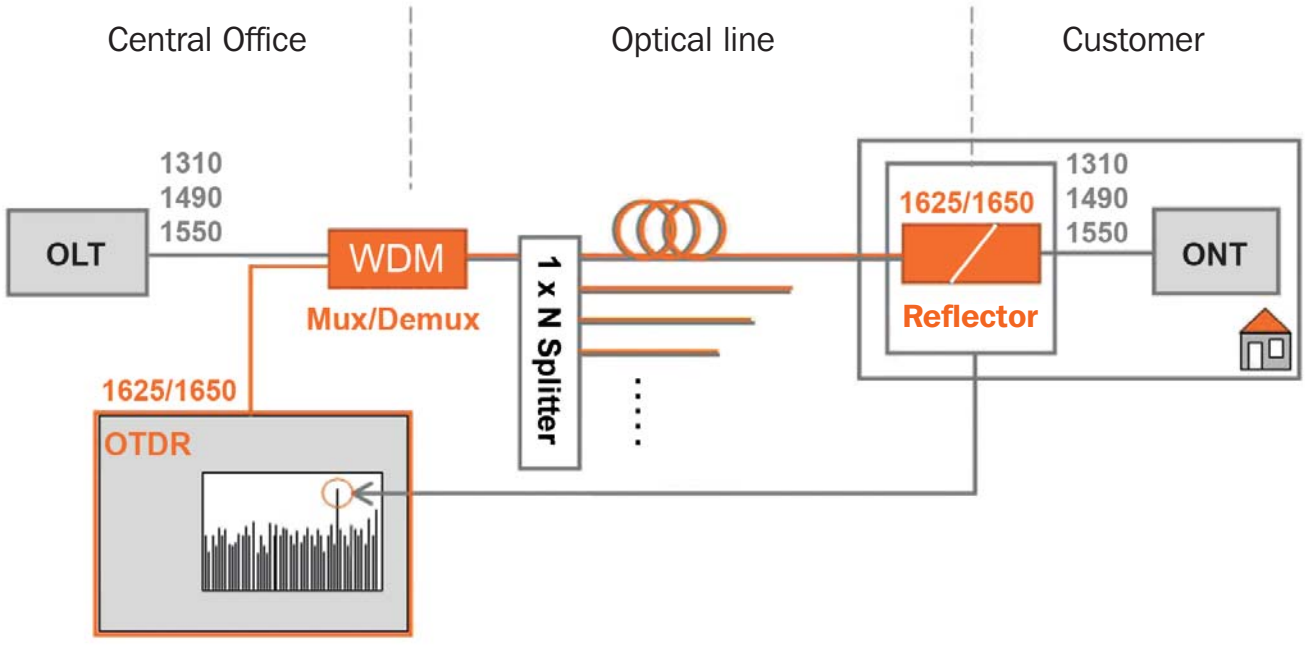


Fig. 1: Measurement principle used for monitoring

commissioning of the network and later used as a reference (see Figure 2). Now the monitoring essentially consists in permanently performing backscatter measurements and in drawing the right conclusions from possible deviations, if any.

A fibre break between OLT and splitter, for instance, can quickly be identified in the backscatter trace and easily be localised. A fibre break between splitter and customer interface (ONT) is somewhat more complex. First, it can easily be identified due to the missing end reflection in the affected PON branch. In many cases it will be possible to see the new reflection produced by the break so that the fault can be localised, as well. However, the reflection of the fibre break may happen to coincide with the end reflection of another PON branch. In this case the position of the fibre break may sometimes only be localised by another measurement performed at one of the signal wavelengths, because then the reflection of the break can be distinguished in the backscatter trace from the reflectors' reflections. Such and similar analyses helping to save much time during troubleshooting are triggered and controlled by the Remote Testing Unit (RTU).

The RTU is installed in the Central Office (CO). The related high-quality OTDR offers three measurement wavelengths (1310 nm, 1550 nm and 1625 or 1650 nm) and uses the currently smallest possible dead zones which are necessary to allow a correct monitoring in the PON to be made in the first place. The fibre links to be monitored are sequentially connected to the OTDR using an optical switch. Additionally wavelength division multiplexers (WDM) are required to inject the monitoring signal into the monitored links. Then the OTDR performs the measurement through the passive splitter into to the customer's ONT. It assesses the end reflection in order to determine whether the link between splitter and ONT is functioning properly. In order to obtain perfect measurement results a wavelength-selective reflector with a high reflectivity should be used at the ONT. The lilix FTTx reflectors made by FOC, which offer a reflectivity of more than 90% in the monitoring channel with less than 0,5dB of additional insertion loss for the traffic wavelengths, have proved to be highly effective here. Figure 3 shows an example of the filter characteristics of these reflectors.

In future the customer will attach more attention to service.

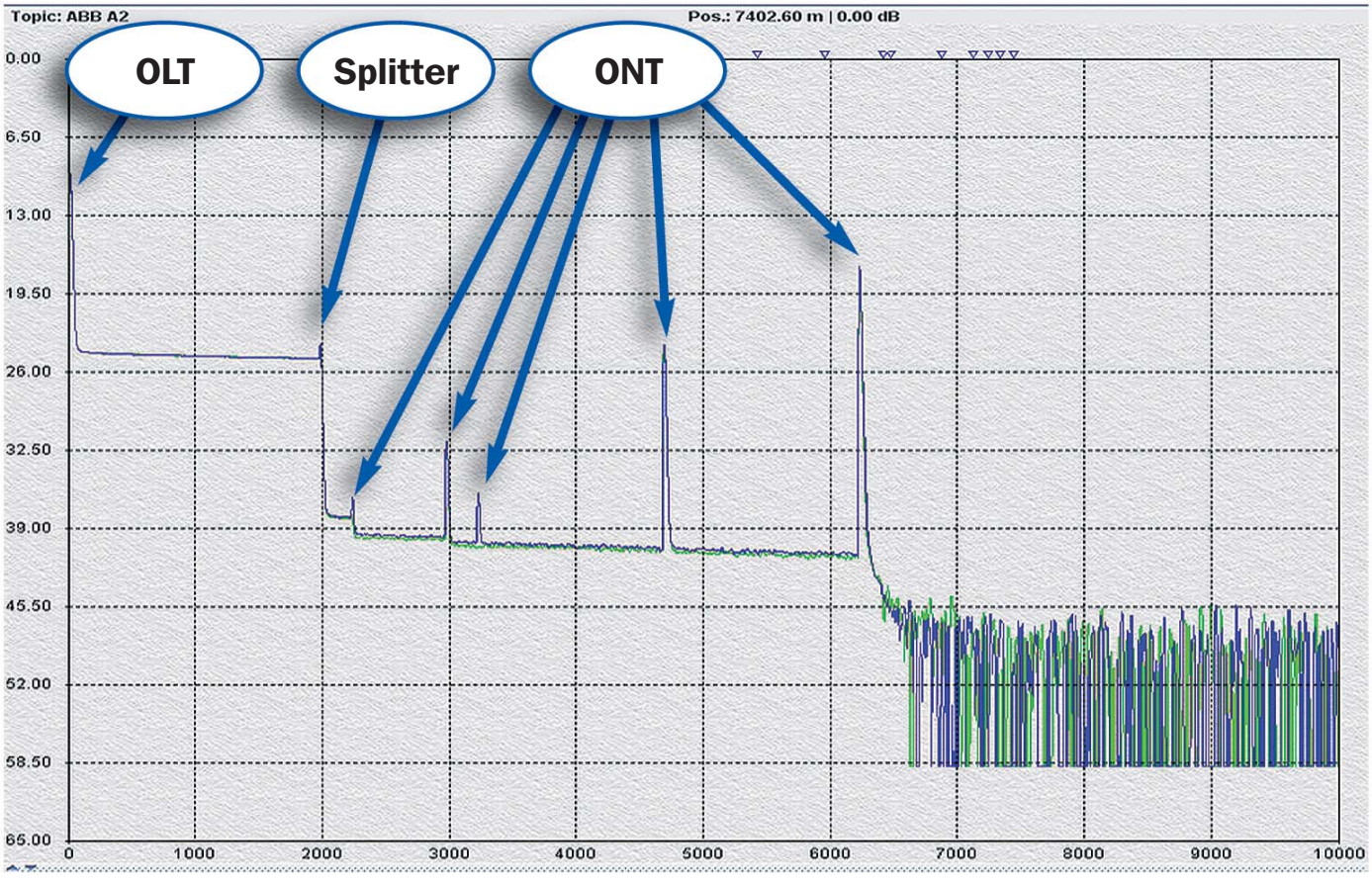


Fig. 2: "Fingerprint" of a PON with 1x32 splitter and 5 customer interfaces (ONT)

The special PON-optimized OTDR will exactly measure the reflections, and the RTU then performs the required assessment. If one of the reflections is weaker than expected or even has disappeared due to a cable rupture, the RTU will send the corresponding message to the central server, which will then inform

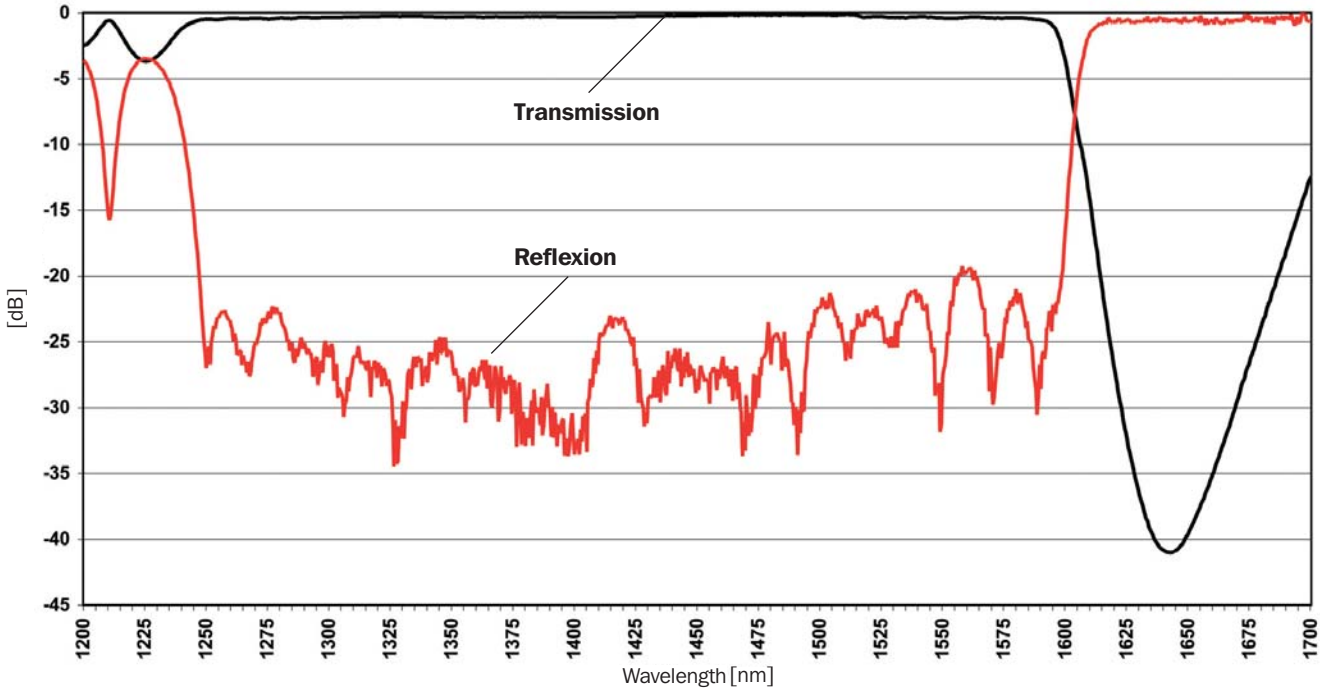


Fig. 3: Filter characteristics of a lilix FTTx reflector

the relevant engineers by SMS or e-mail. All available measurement data are saved in a central data base and will be available for later analyses, e. g. for statistical purposes.
Of course, the integration with other systems, frequently existing at the network operator, such as cable management systems or geographic information systems (GIS, mapping) is possible.

The parameterization of the system as well the visualization of the measurement data (see Figure 4) can be conveniently performed from any client computer in the network via an Internet browser. No special software is required.

The company Lancier Monitoring GmbH from Muenster, Germany, has been developing and distributing monitoring systems for cable networks for more than 40 years. Since the mid-90s the focus is on fibre-optic cables. Their systems are used by national and international cable network operators, electric utility companies and the large-scale industry.

Torsten Angerhausen, Lancier Monitoring
Dr. Martina Vitt, FOC

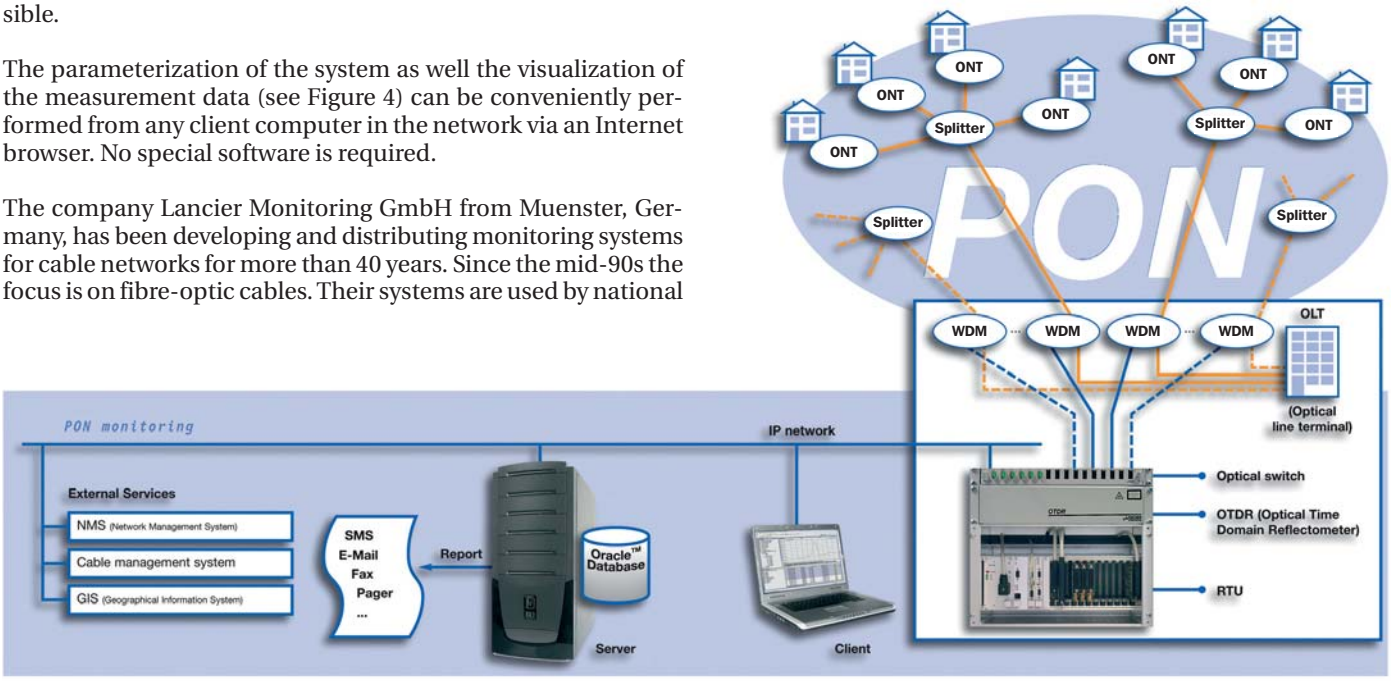


Fig. 4: PON monitoring system from Lancier Monitoring

Compatibility of E-2000® connectors according to IEC 61755-1 (Grade A)

This article shows that it is well possible to achieve and guarantee a compatibility within the range of "0.1dB" independent of the connector's ferrule technology and thus of the connector set manufacturer.

1. Introduction: connectors and standardisation

Both the geometry of optical connectors and their optical parameters are standardized. This standardization ensures the quality of the connectors on the one hand and the compatibility between connectors from different manufacturers and assemblers on the other hand.

The geometry of different connector types, such as E-2000®, SC or LC, is guaranteed through the standardization of their so-called connecting interfaces (IEC61754 series).

This ensures that e. g. an LC connector from manufacturer "A" can be connected via an adaptor from manufacturer "B" with an LC connector from manufacturer "C".

However, the standardization of the connecting interfaces alone is not sufficient to predict, assess or guarantee the quality of a mated connection.

In order to offer the customers an easier comparison of the quality of the optical parameters, classes have been introduced for the key optical parameters of return loss and insertion loss (see Table 1).

Loss class	Attenuation (≧97%)	Average	Comment
A			reserved
B	≦ 0.25 dB	≦ 0.12 dB	
C	≦ 0.50 dB	≦ 0.25 dB	
D	≦ 1.00 dB	≦ 0.50 dB	

Table 1: Singlemode fibre loss classes at 1310 nm and 1550 nm *(source: EN 61755-1)*

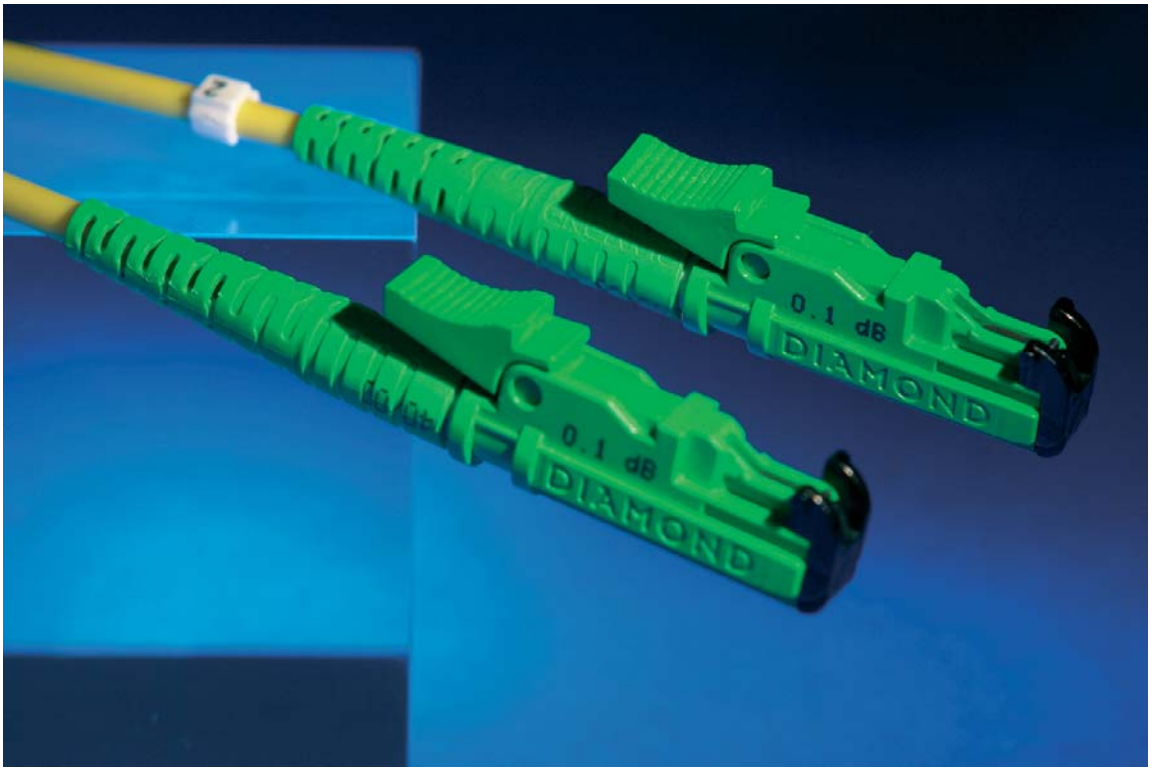


Fig 1: E-2000® connector system

Here we should note that, on the one hand, these classes apply to mated connections between connectors of identical fibre types (e. g. G.652.D or G.657.A) and that, on the other hand, the (loss) limit values for the measurement apply to reference connectors only.

While the return loss classes essentially depend on the type of polishing (PC or APC), the insertion loss classes have a more complex background.

The loss classes are primarily based on the parameters of the optical interface, or more simply, on the junction between the mating connectors. Here the decisive parameters are apex offset, polishing radius, fibre protrusion, fibre undercut, and tilt angle. However, these shall not be discussed in this article.

Table 1 shows that (although competitors make different suggestions) neither in this table nor in any other standard a "0.1dB class" ("Grade A") is defined.

The reason for the absence of such a "Grade A", which actually should be defined analogue to Table 1, is the fact, that the representatives of the different connector ferrule technologies (multi-component ferrules and full-ceramic ferrules) have not yet managed to agree on a uniform approach, uniform parameters and limits for defining a "Grade A".

Eventually the definition of a "0.1dB class" or "premium class", to mention just two examples of possible descriptions, always is vendor-specific for the time being. However, a statement on the attenuation of the mated connectors based on different connector ferrule technologies is in the interest of the customer. If the customer wants to decide or already has decided in favour of 0.1dB connectors, he does not want to depend on just one connector set manufacturer, on the one hand, and on the other hand he wants that his decision is future-proof.

The basic differences between connector technologies are mostly known.

When using the multi-component ferrules with core alignment from the company Diamond the fibre core is exactly positioned in the centre of the ferrule. Thus a residual eccentricity of the fibre core of less than 0.125 µm can be achieved.

Of course, with full-ceramic ferrules no core alignment is possible. Here an optimum position of the fibre core can be achieved either by carefully selecting the ferrules (and fibres) or by systematically placing the residual eccentricity into a standardized sector.

But also for multi-component ferrules loss values in the range of 0.1dB cannot be achieved by core alignment, residual eccentricity values of less than 0.125 µm and by complying with the geometry parameters of the connector surface, alone. The assembly process of the multi-component ferrule also has some impact on the quality:

I Tight tolerances for tilt angles (<0.4°)

II Strain-free glue curing process for avoiding (wavelength-dependent) attenuation caused by microbendings in the fibre

III Optimized polishing processes for avoiding the generation of polymorphic intermediate layers on the connector surface

Additionally a 100% final visual inspection of the connector surface is required, in order to deliver only those connectors whose surface does not show any scratches, measurement impressions or pollutions.

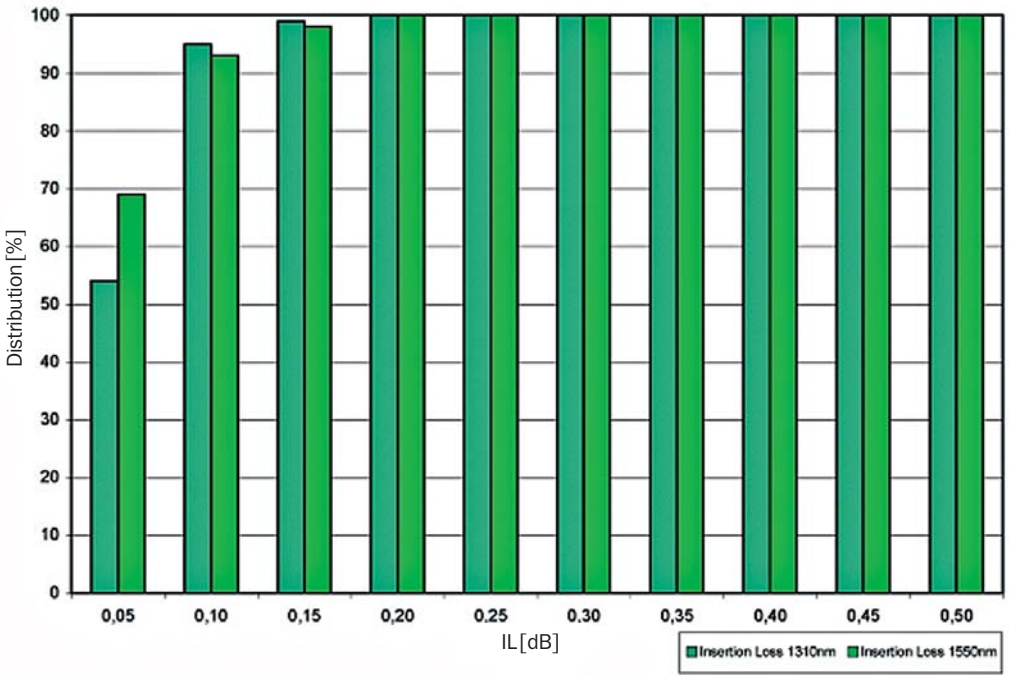


Fig 2: Insertion loss distribution of LC-APC connectors

3.
Challenge: 0.1dB for random mated connectors independent of ferrule technology

Already in 2007, when FOC was expanding its connector portfolio to include LC-PC and LC-APC connectors, we gained comprehensive experience as to how connectors with loss values in the range of 0.1dB can be manufactured using full-ceramic ferrules.

At that time it proved decisive to combine the qualification of the connector set supplier with high-quality and tight-tolerance ferrules, and to transfer the above mentioned technological experience gained from the assembly of E-2000® connectors based on multi-component ferrules with nickel silver to the full-ceramic ferrules.

Apart from this experience, in mid-2010 we set ourselves the task of being able to assemble E-2000® connectors also on the basis of full-ceramic ferrules, for which we can guarantee loss values in the range of 0.1dB.

V Optimized semi-automatic fibre cutting process for repeatable fibre protrusion as a precondition for homogenous polishing patterns.

VI Development of proprietary polishing processes, in order to achieve the best possible compatibility by optimum polishing radii on the one hand, and to minimize fibre undercut and fibre protrusion on the other hand.

From the beginning all these improvement measures were taken with the aim of a later series manufacture under normal production conditions.

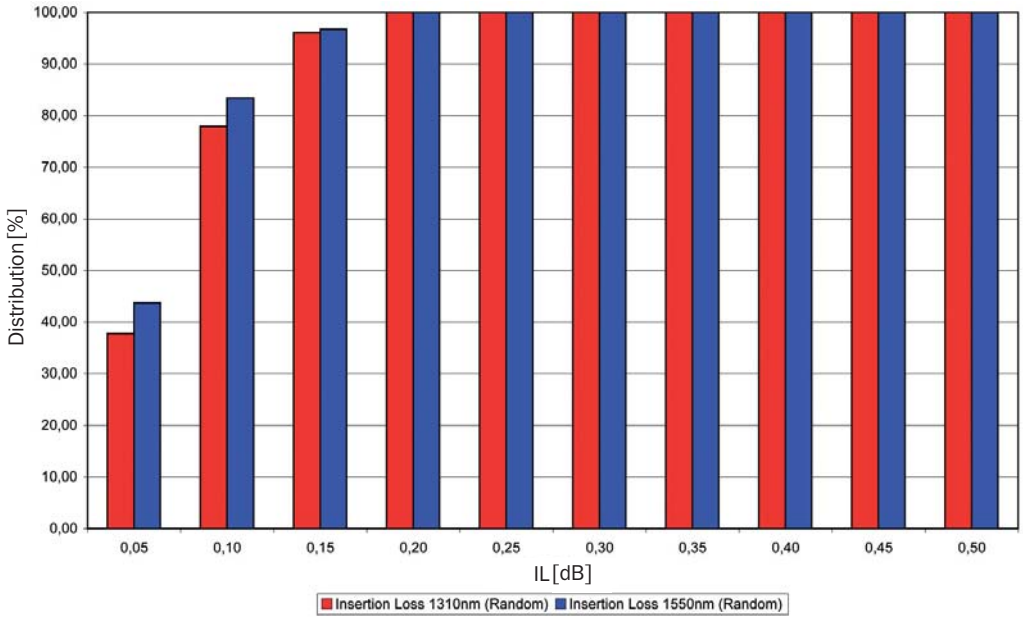


Fig 3: Insertion loss distribution of E-2000® APC connectors based on 100 connectors with multi-component ferrule and full-ceramic ferrule respectively

However, this time the additional challenges were to ensure 0.1dB on the one hand without selection and on the other hand not only against reference connectors but against any E-2000® connector assembled at FOC. To be more specific, the aim was to manufacture E-2000® connectors based on full-ceramic ferrules which are fully compatible to E-2000® connectors based on multi-component ferrules, as FOC has delivered them will continue to deliver.

Of course, apart from the decision for one supplier of the connector sets in the required quality and from our experience gained in the many years of assembly of LC connectors, further measures were required. Without going too much into technical detail here, I'd like to mention just some of them:

IV Identification of fibre manufacturers with the best fibre geometry tolerances for minimizing eccentricity and glue joints.

4.
The results prove us right

The results in Figure 3 support our claim. With an appropriate combination of material and technology FOC is able to manufacture E-2000® connectors in series, for which we can guarantee measured loss values of 0.1dB and better independent of the underlying ferrule technology of random mated connectors (according to IEC 61300-3-34).

Dipl. Ing. Axel Thiel
Head of Development Department
FOC

FOC workshop talks 2011




Topics and dates

1.
lilix Kit—components for optical reflectors to permanently monitor passive optical network infrastructures

Today optical networks are and will continue to be the backbone of our economy and of individual communication. For this reason these networks must be protected from failures. To do so, faults should be identified as soon as possible.

The FOC monitoring concept using wavelength-selective reflectors consists in localising the optical reflection generated by the reflector at the customer-side end "B" by means of unilateral backscatter measurements from the central location (end "A"), and in properly assigning this reflection to the corresponding end "B". In this way the individual fingerprint of the network is recorded already in the installation phase of the network. During later network operation follow-up measurements of this fingerprint simplify troubleshooting and allow you to monitor long-term deviations of critical network parameters.

We will explain the basic idea behind this type of network monitoring and use practical examples to show how to streamline fault identification and analysis eventually saving OPEX.

2.
Compatibility of connectors according to IEC 61755-1 (Grade A)

The currently available components according to IL Class A, be it "0.1dB Class" or "Premium", just to mention two examples, are based on manufacturer-specific descriptions.

However the customer is interested in a statement on the attenuation of the mated connectors based on an international standard, in particular when mating different connector ferrule technologies.

Anyone who wants to decide in favour of a 0.1dB connector or has already done so, must see some sustainability in his decision and implement it.

During assembly the challenge is to technically fulfil the requirements of IEC 61755-1 in such a way that the optical values of "Grade A" can be achieved for the mated connection in the network independent of the technology and the assembler.
FOC has met this challenge. We want to present this technology to you and discuss our initial experience gained in the manufacture of connectorized patchcords with you.

3.
Video-microscopes—what for?

Frequently fibre-optical links are terminated on pigtails and in splice boxes on adapters, without putting them into service. If these links are connected and patched later, baseline measurements often show considerable increases in attenuation up to complete "malfunction". Troubleshooting is difficult, because "dirty" connectors cannot be exactly identified.

One possibility to do just this is inspecting the connector endfaces with a video microscope.

As mentioned above in the short introduction this year we would like to discuss the following topics with you:

1. lilix Kit—components for optical reflectors to permanently monitor passive optical network infrastructures
2. IEC 61755-1 in practical test
3. Video-microscopes – what for?

We would be pleased to welcome you and/or your colleagues in our house.
Please select a date and register via
fax (+49 30 565507-19) or e-mail (info@foc-fo.de).

The FOC workshop talks will be held from 11 hrs to 15 hrs on:

· Thursday, 24 February, at the Berlin central office ☐
· Thursday, 07 April, at the Berlin central office ☐
· Thursday, 19 May, at the Stuttgart branch office ☐
· Thursday, 26 May, at Park Inn Hotel, Duesseldorf Sued ☐
· Thursday, 06 October, at the Stuttgart branch office ☐

We look forward to interesting talks with you.
Yours sincerely,

Christian Kutza, Managing Director

Fibre-optic joint seminars

20 years in the service of optical technologies

In the past we still were quite well off in Germany. But the first weaknesses appear. I speak of vocational education and qualification. For many years vocational training leading to a skilled worker's certificate was a usual step in the career of many of us.

With amazement we have had to note a certain loss of quality and quantity also in Germany for some years now. This applies in particular to practical, vocational training. 20 years ago we had apprenticed trades in the area of communications and telecommunications industries linked with a high portion of opportunities for theoretical learning and practical, manual training.

During vocational training to become a skilled communications engineer specialised in communications lines the apprentices in Germany used to learn how to splice copper wires, including the subsequent restoration of the cable sheath by soldering lead sleeves, to mention just one example.

Is this still the case today? Or are we moving more and more towards a situation—as has been the case in other EU countries for long—that the highly qualified technical trades degenerate to "semiskilled" activities. If this is the case, this development is bound to have impacts on quality, in particular of telecommunications and data networks. But don't we risk losing some of the few competitive advantages which we still enjoy, i. e. to install and operate fail-proof quality networks? Does the cost pressure in all areas inevitably result in a situation where we reach the same low-quality level as our competitor nations through a lack of qualification among the staff in the future? Should quality not be a German virtue and thus a competitive advantage, which is linked to the term of "Made in Germany" and which thus should be preserved? There is much room for discussion and philosophical talk here.

In fact: The better the qualification of those working on optical networks, the better the quality of their work.

This is the aim the organisers of the joint seminars are committed to. By improving the theoretical and practical competence the quality level of the work done in these operators' networks shall be increased.

Rework, often caused by ignorance and technical errors, has become a daily routine today. Also the reporting of final and acceptance measurements for handing over the network to the customer (network operator) frequently is not sufficiently meaningful or even wrong.

In order to counteract an expected training emergency in the practical fields in this industry the organisers of the Joint Seminars, where FOC is part of, have prepared and launched a training programme at the manufacturers of passive and active systems and components. In this connection FOC and other partner manufacturers have fitted 100 sqm of space with the required equipment. (Fotos Technikraum) Thus practical training as well as later practical use of the newly acquired knowledge is guaranteed. Qualified specialists who have many years of experience will work as instructors.

Together with TÜV Rheinland training and examinations concepts have been prepared containing several practical and theoretical questions, tasks and contents.

As a result, the participants leave the training sessions as specialists, on request, also certified, for fibre installation and assembly. They will thus have more chances on the labour market and a lead over their employers in terms of knowledge and practice.

Christian Kutza and Fritz Schwarz had the idea for this training and qualification concept 20 years ago. Since then, over 300 seminars with more than 4,500 participants have been held. 70 top-class lecturers from science and industry have passed on their knowledge and skills.

Now there is another branch of qualification available: Practical work and training on different products. The products have been made available by many partners. The basic idea is that the seminar and training participants need not go from company to company in order to familiarize themselves with the different products in the market.

Of course, FOC GmbH will continue to actively participate in the qualification seminars and also make an appropriate contribution at this year's BEL 2 fair from 08 to 09 June 2011 in Berlin-Adlershof, Germany.

»An investment in the future« or training does good.

Here Comes the Second Hit

BEL··2·is approaching

Broadband + Energy Efficiency = Fibre Optic Technology

When?
· 08 June and 09 June 2011

Where?
· Berlin-Adlershof Science Park, Germany

What?
· Broadband in Germany—Interim results and prospects
· Optical networks—Infrastructure of a new generation
· Energy efficiency—Road into the future
· Optical fibres—Measuring technology
· Wavelength-division multiplex: WDM, CWDM, DWDM
· FTTH: The gigabit society
· New dimensions of data centres
· Internet—the new (in)security

How?
· Exhibition
· Plenum
· Workshop

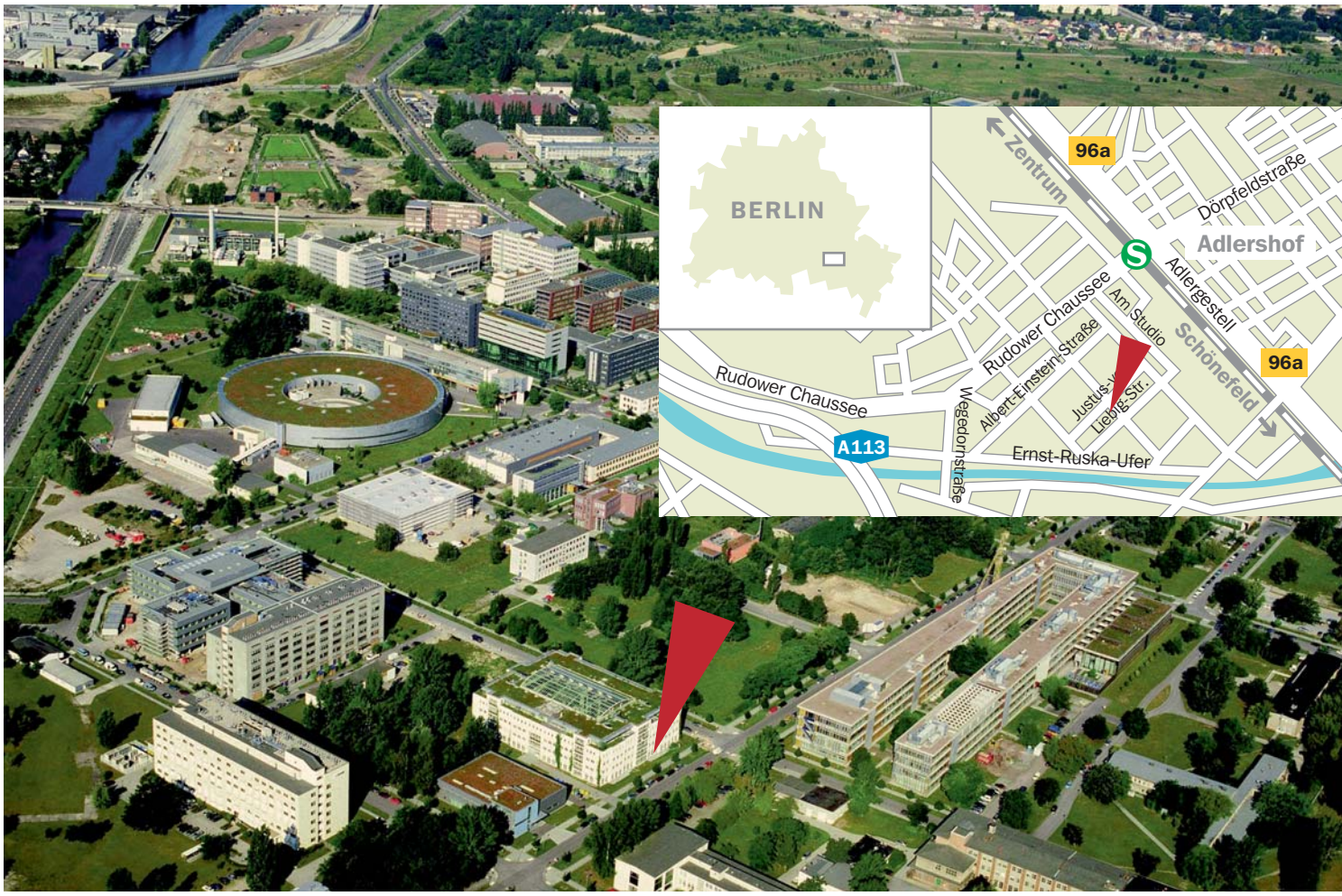
Who should attend?
· Local administrations, city utility companies, data centres, housing societies, network operators and owners
· Manufacturer, planning agencies, installers and technical management
· Universities and colleges

BEL··2·

Let's take a Quantum Leap!

fibre optical components GmbH

In the Berlin-Adlershof Technology Park.



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