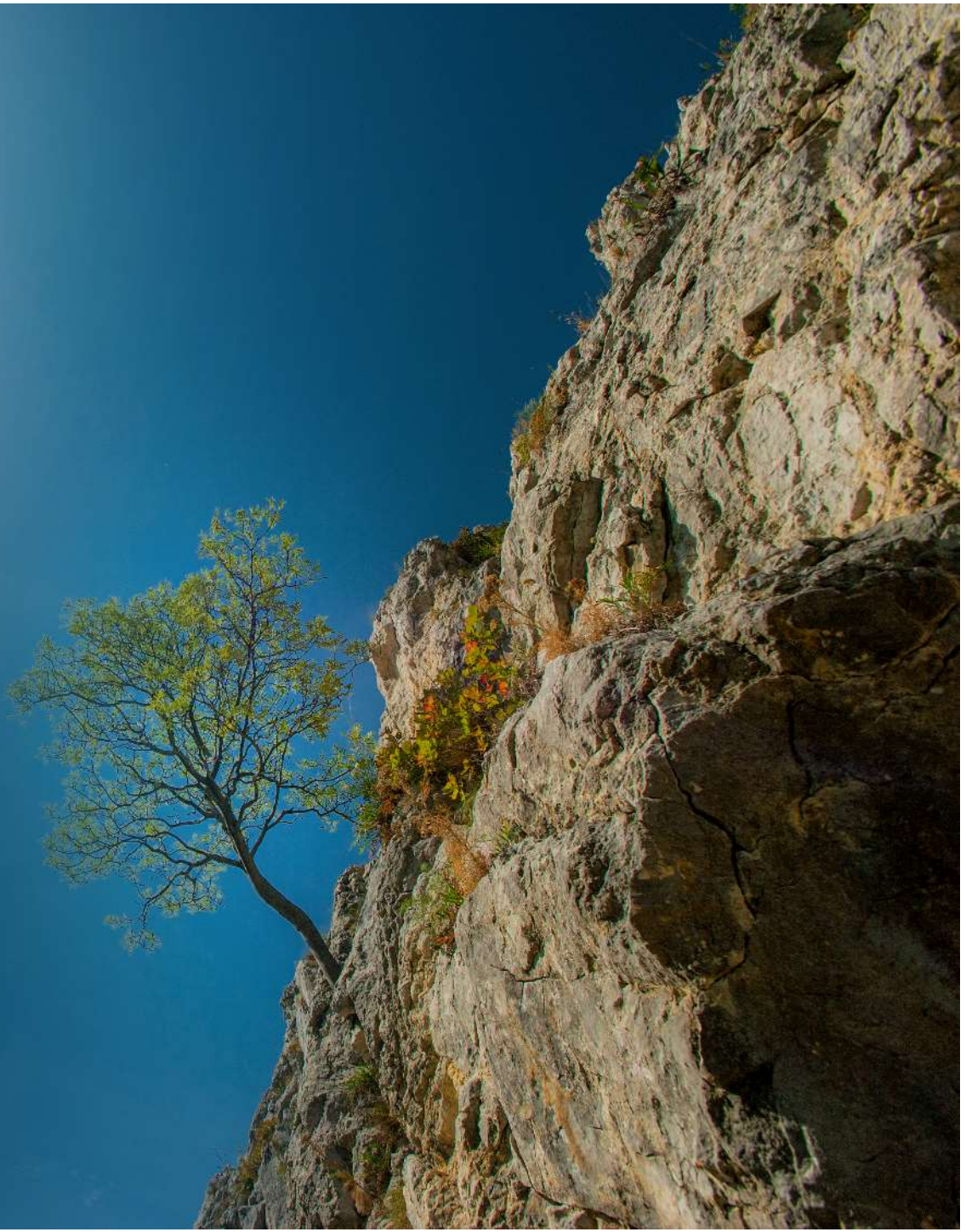
CORNING

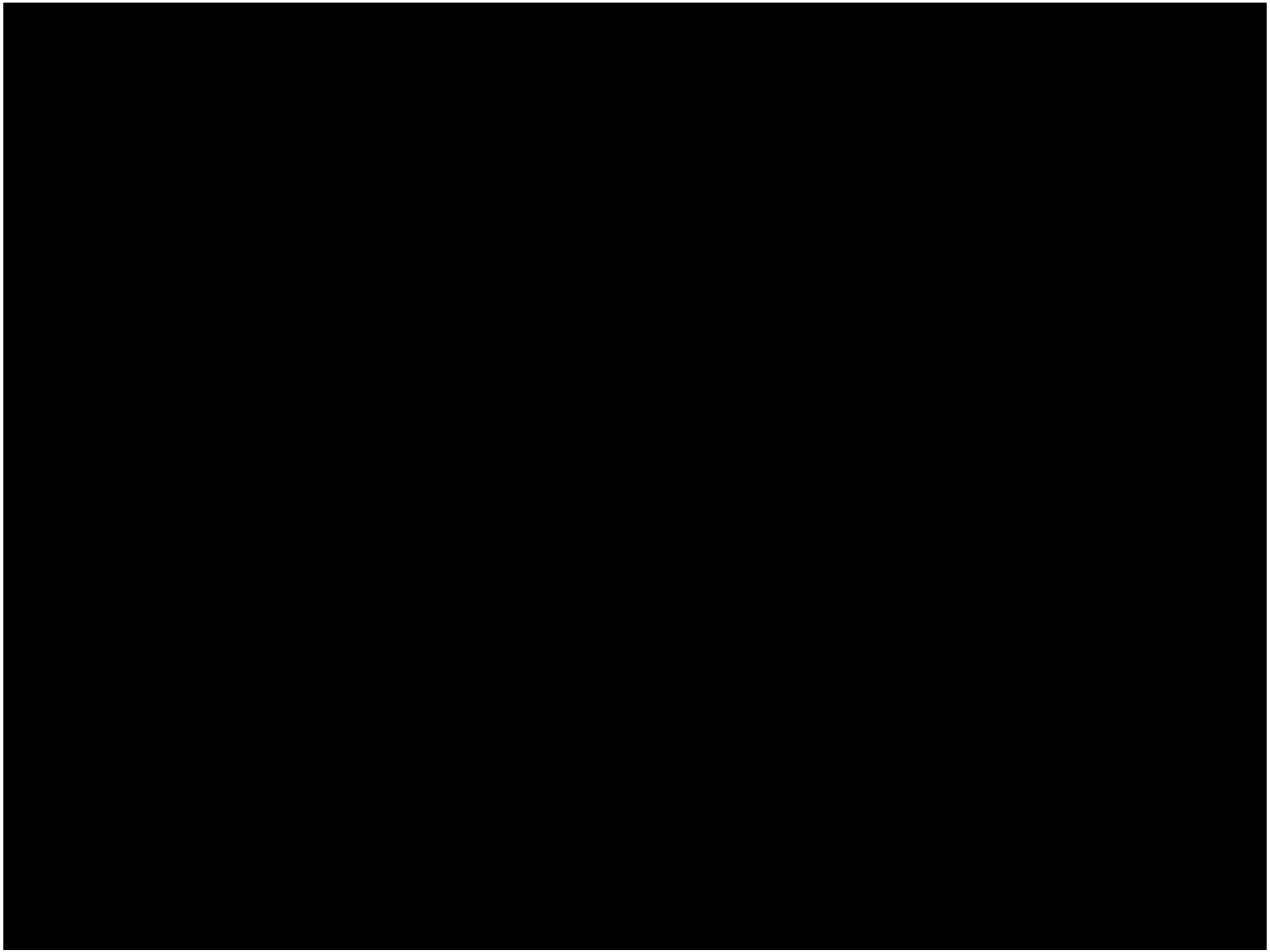
Corning Seminar
Kiev

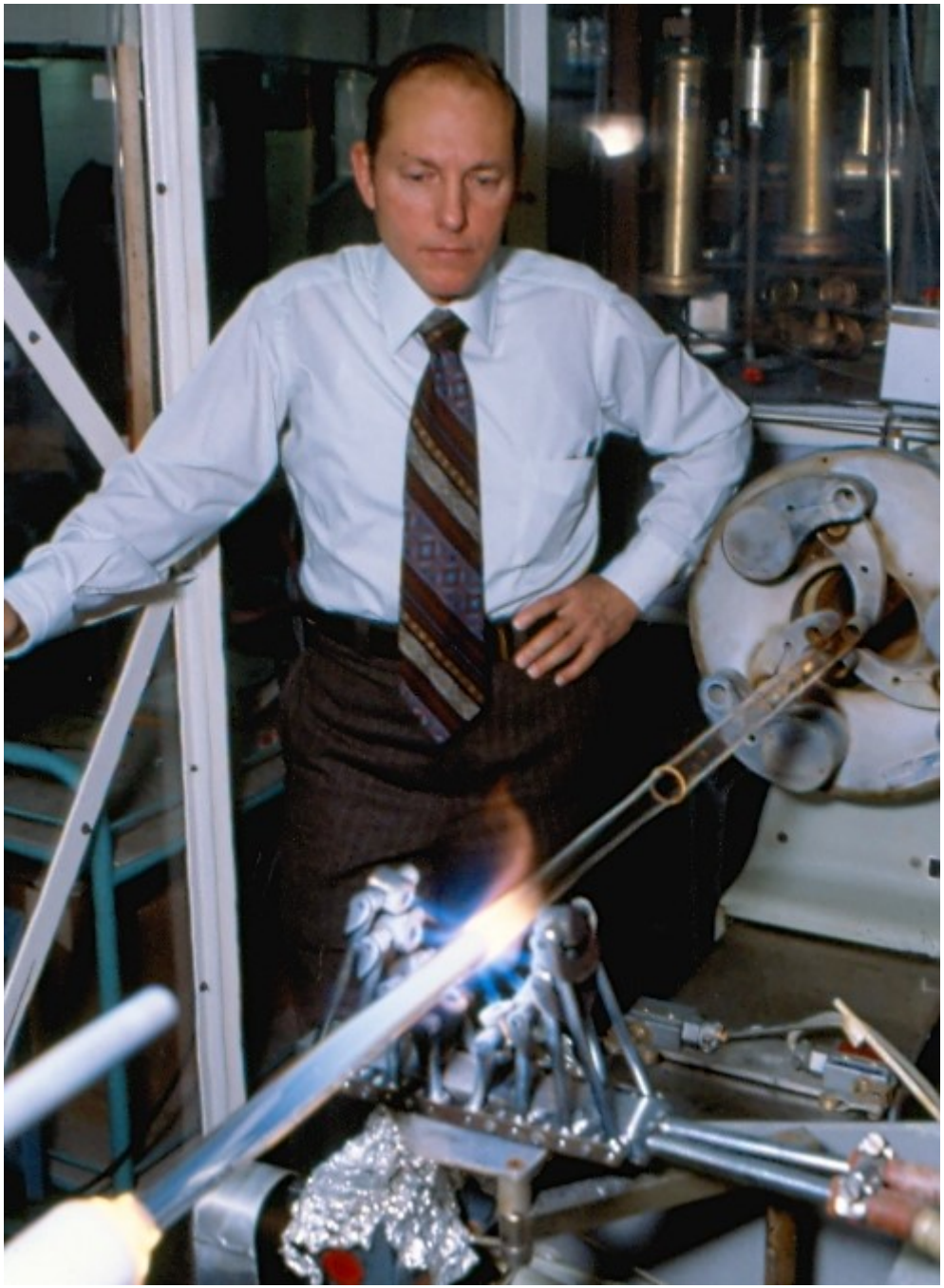
30.05.2018



CORNING

Corning Introduction





Who is Corning?

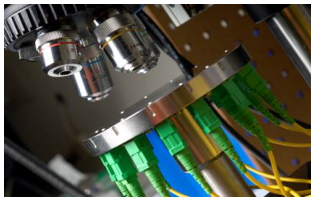
Corning Incorporated

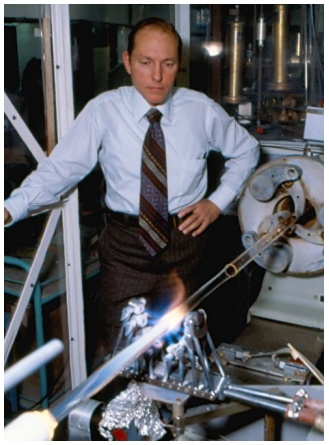
Headquarters:
Corning, New York

Founded:
1851

Employees:
34,800 worldwide

- Corning is one of the world's leading innovators in materials science f**or more than160 years**





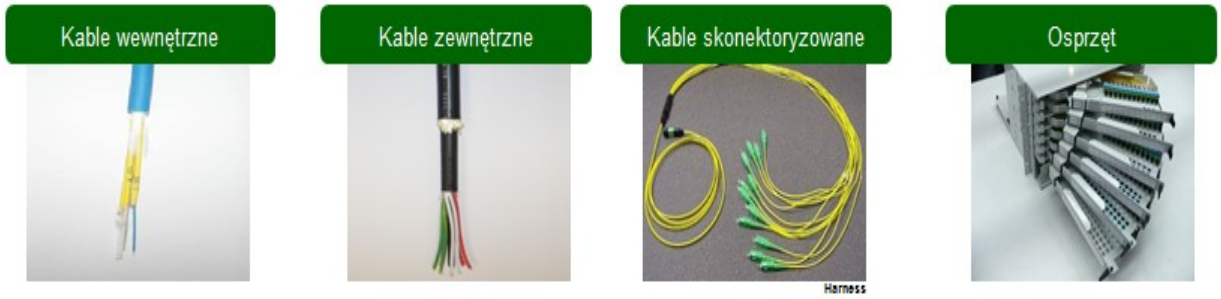
Where? Stryków, Smolice 1E

- **Foundation date in Poland 2001**
- **In Stryków from 2007**

- **Employment:**
  currently around 2500 employees

- **Surface:**
  43.000 m^2

- **Certificates:**
  ISO 9001 and 14001



Where is the second location? Stryków, Smolice 1E+

- **In S**
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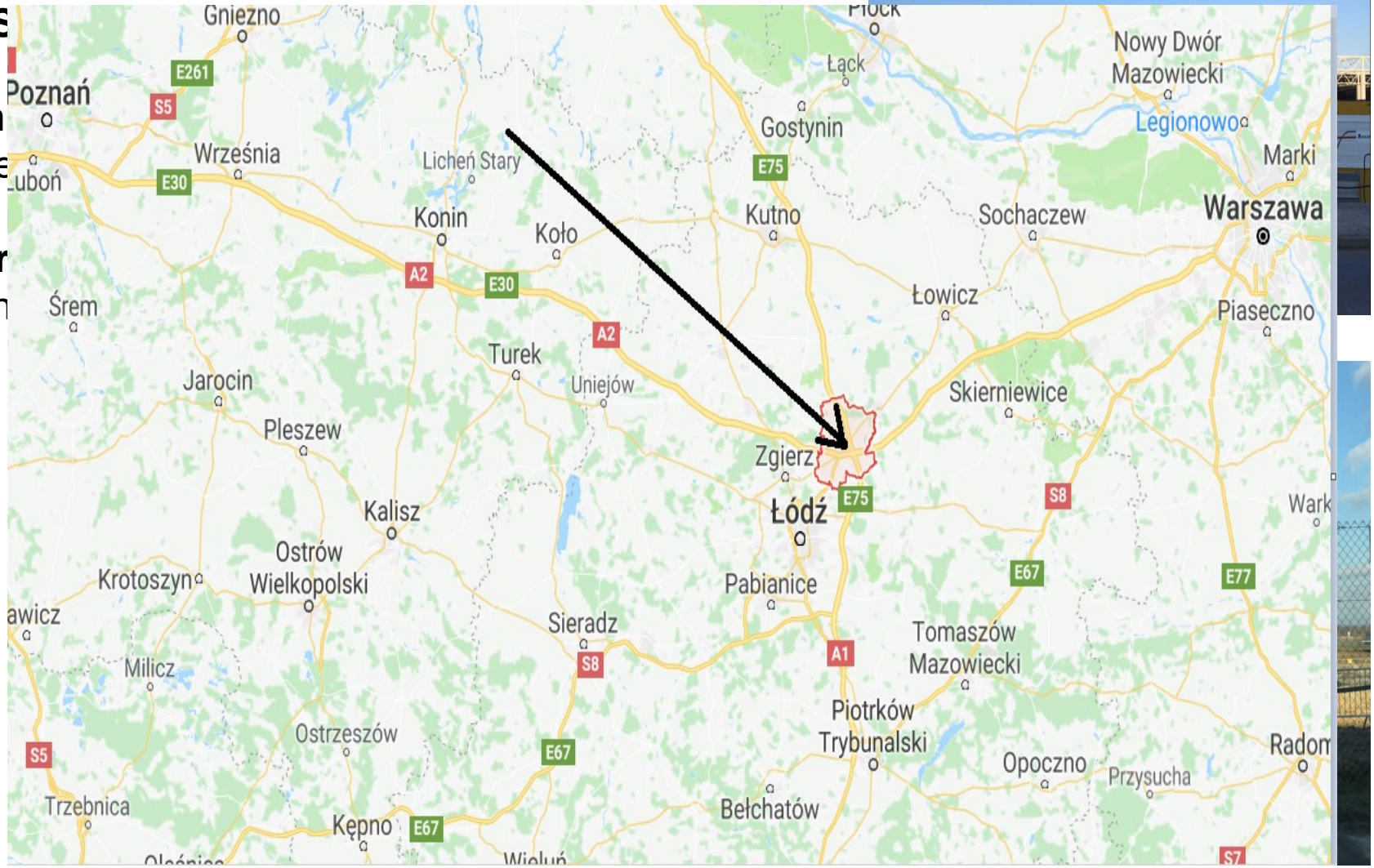
- **Sur**
  plan



Who is Corning ?

Key Technologies

Fusion Draw Process

Precision Glass

Consumer Electronics

Outside Vapor Deposition

Optical Fibre

Optical Cable and Connectivity

Who is Corning ?

Breadth of Corning's Capabilities – Optical Fibre

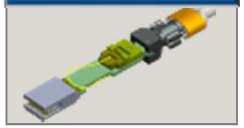
Fiber

Cable

Connector

Enclosure

Active



Integration of optical components through fundamental understanding of application, material & process scaled globally at speed

People

Process

Tech

Optical Solutions

LAN

DC/CO

DAS

Thunderbolt

Who is Corning?

Operations in more than 30 locations around the world

CORNING

Maciej Szumacher- Application Engineer
Michał Najmrocki- Sales Manager
Andrzej Basiński- Customer service specialist

Agenda

1) Corning Introduction

2) Fiber Introduction

3) PNP- Corning EDGE/EDGE8 Solutions

Preterminated Optical Fiber Cabling for Datacenters

Structured Cabling
Story of EDGE
Technology Roadmap
Story of EDGE8

4) Copper Solutions

5) Order tracker

6) Workshop- hands on

7) MTP PRO

A1

Glass Fibre Basics

Fibre Basic Training

Slajd 15

A1 Videos missing

Autor; 25.04.2018

A2

Glass Fibre Basics

- Fibre Anatomy and the Difference Between Single- and Multimode Fibres
- The Making of an Optical Fibre
- Glass fibre physics
- Fibre parameters

Slajd 16

A2 Sicherheit würde ich an das Ende stellen oder ein eigenes Kapitel erzeugen.
Autor; 04.03.2018

Introduction to Fibre Optics

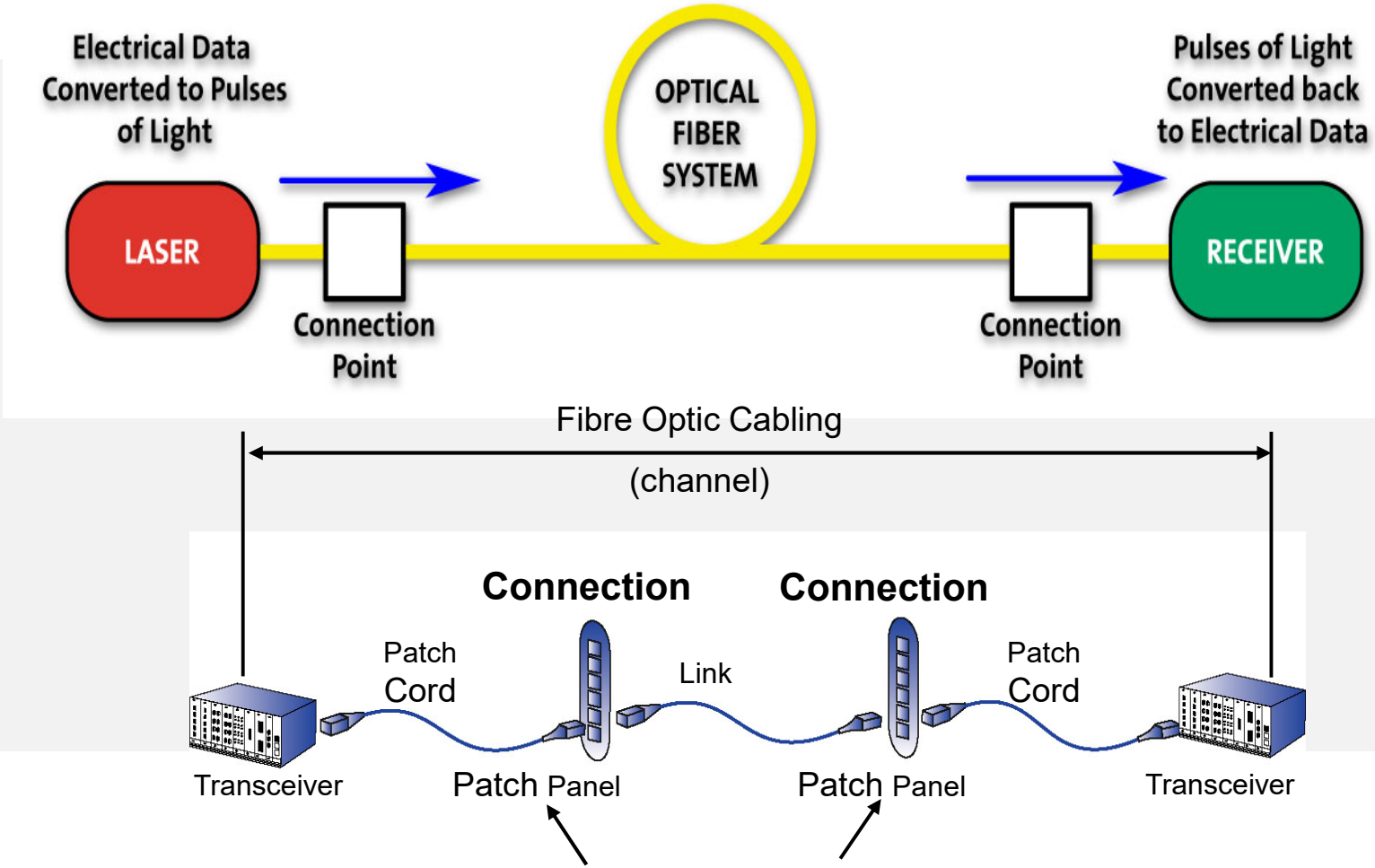
- Why we should care

Understanding basic fibre theory will help you understand your role in the system's short-term and long-term reliability and performance.

Fibre Optic Systems

What it is

A1
A2



Slajd 18

A1	New Design Autor; 21.02.2018
A2	Multilanguage Autor; 01.03.2018

Structure of an Optical Fibre

CORE

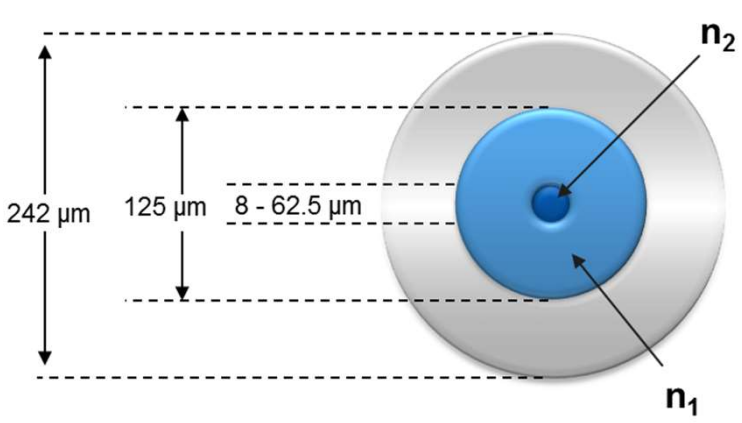
- Carries the light signals
- Silica and a dopant to raise index of refraction

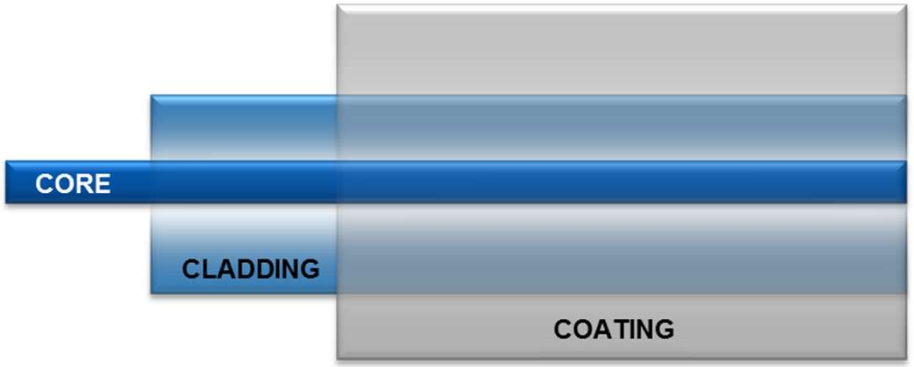
CLADDING

- Keeps the light in the core
- Pure silica

COATING

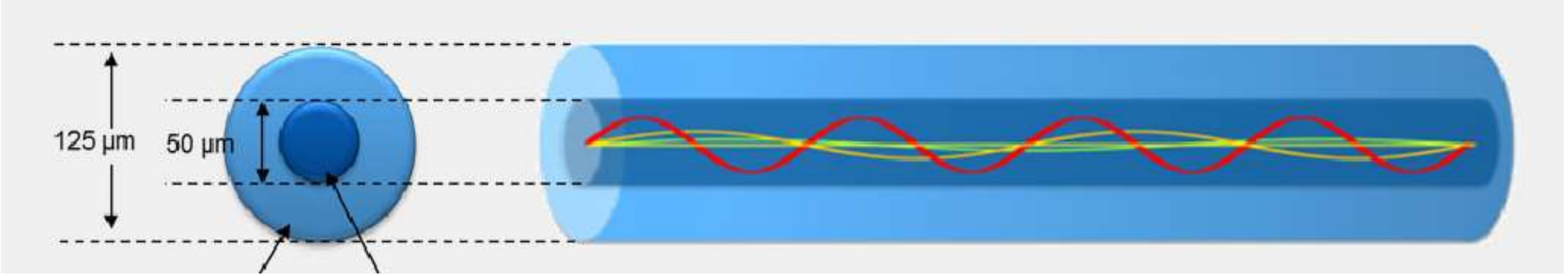
- Protects the glass
- Color coding
- Acrylate (plastic)



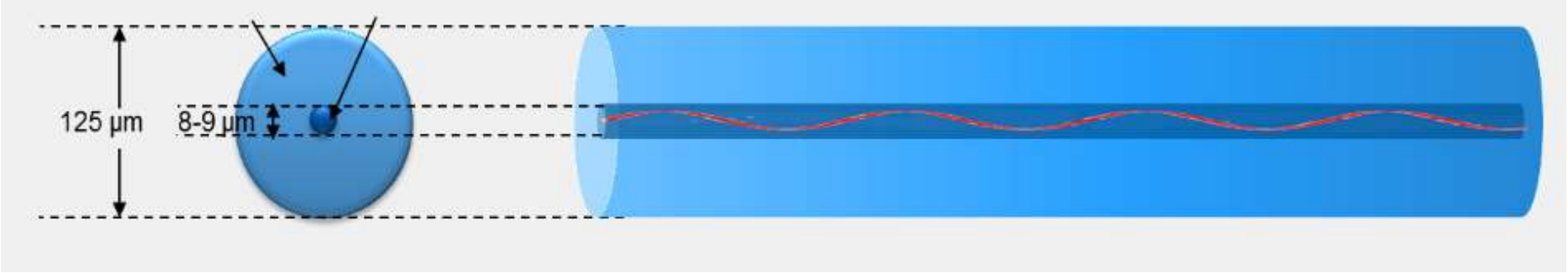


Light guiding - Modes

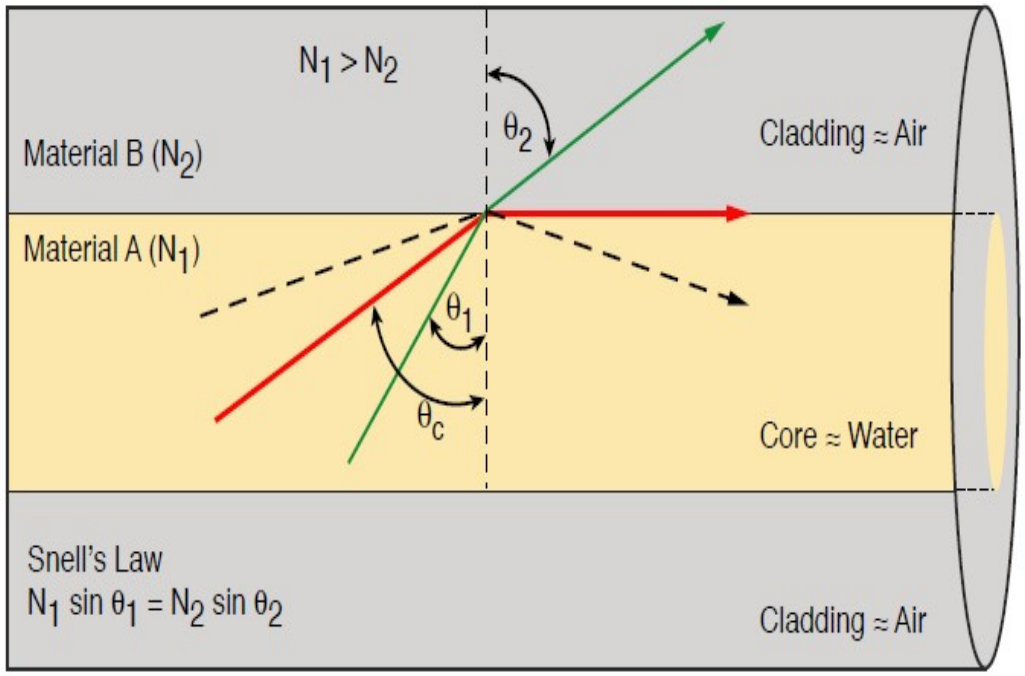
Multimode



Single-Mode



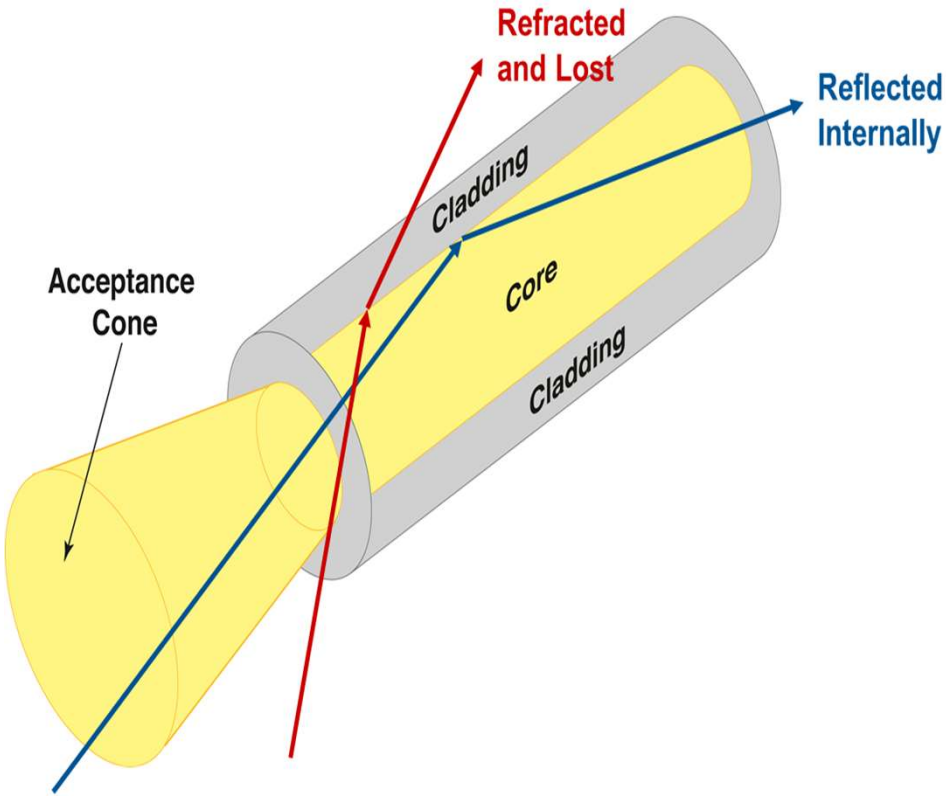
Requirement for Light Guiding



Total internal reflection @ Core-Cladding Interface

- The refrative index (N) of the core is greater than cladding
- The light will reflect inward or refract outward in the core

Total Internal Reflection



$$\sin\theta_C = \frac{n_{core}}{n_{cladding}}$$

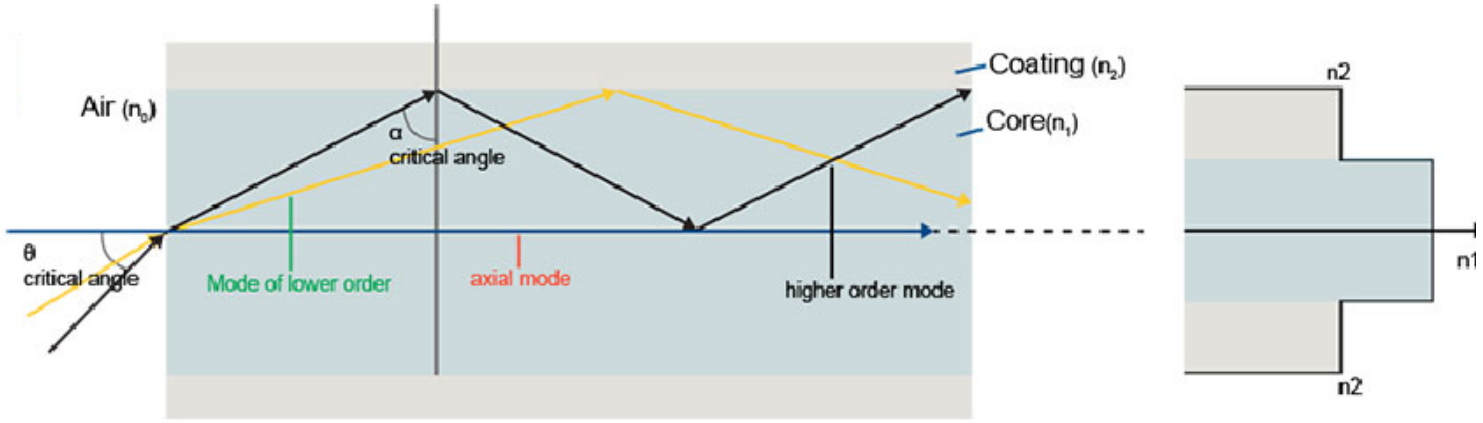
For an optical fibre the following applies: n(core) > n(cladding) if the critical angle is not exceeded then there will be total internal reflection.

A3

Multimode Fibres

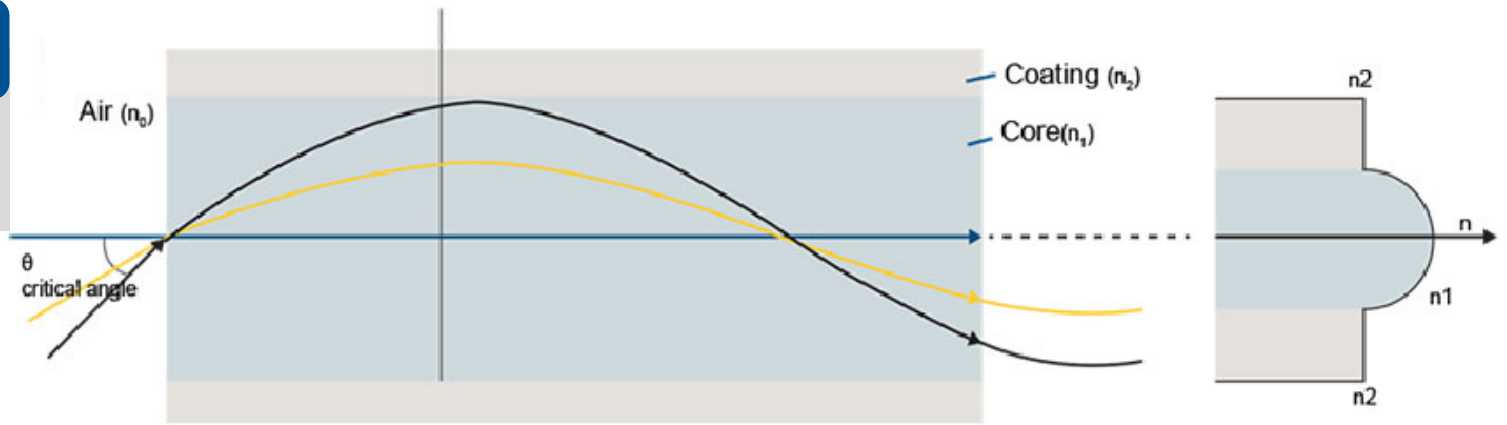
Step-index profile fibre

„Special Industry Fibres“



Graded-index profile fibre

LAN & DC Fibres
OM1,2,3,4 & 5



Slajd 23

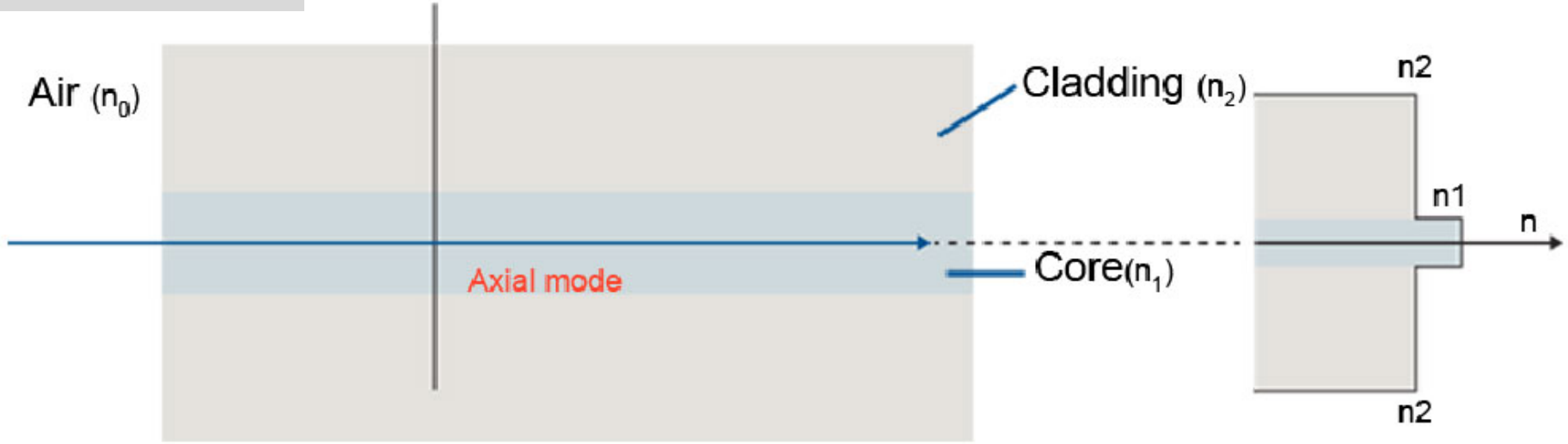
A3 Erklärung aktualisert. Bandwidth length product. Application LAN / DC

Autor; 03.03.2018

Single-Mode Fibre

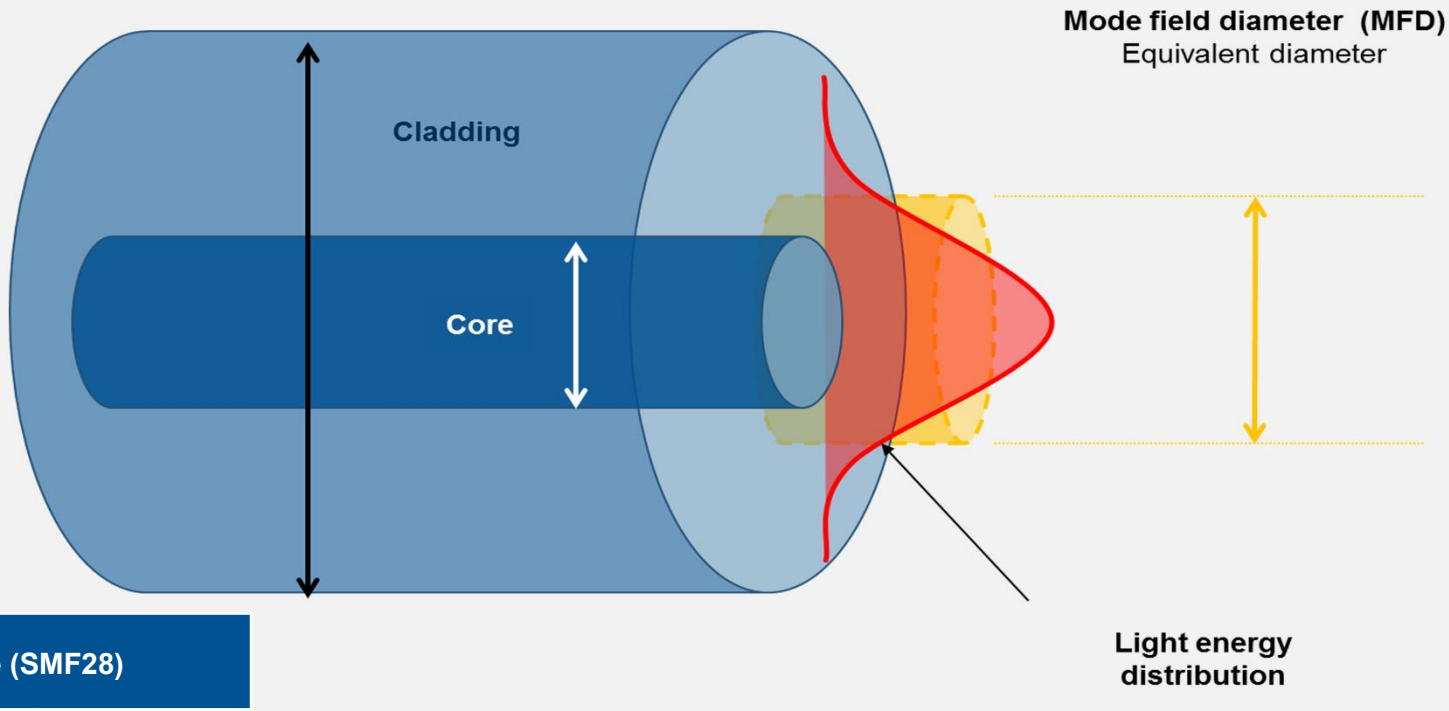
Single-Mode Fibre

OS1, OS2
ITU G.652A,B,C,D
ITU G.657A/B



Mode-Field Diameter (MFD)

A Significant Single-Mode Fibre Parameter



Example (SMF28)	
MFD	Core Diameter
1310 nm: 9,2 +/- 0,4 µm 1550 nm: 10,4 +/- 0,5 µm	8,2 µm

Best coupling of SMF if MFD is identical otherwise insertion loss occurs

Mode field diameter of ITU G.xxx singlemode fibers

ITU fiber standards		MFD [µm]				Wavelength
		Absolute Values		Nominal		
		min	max	min	max	[nm]
ITU G.	652A	8,00	10,10	8,6	9,5	1310
ITU G.	652B	8,00	10,10	8,6	9,5	1310
ITU G.	652C	8,00	10,10	8,6	9,5	1310
ITU G.	652D	8,00	10,10	8,6	9,5	1310
ITU G.	654	9,45	11,55	10,5	10,5	1550
ITU G.	655	7,20	12,10	8	11	1550
ITU G.	657-A	8,20	9,90	8,6	9,5	1310

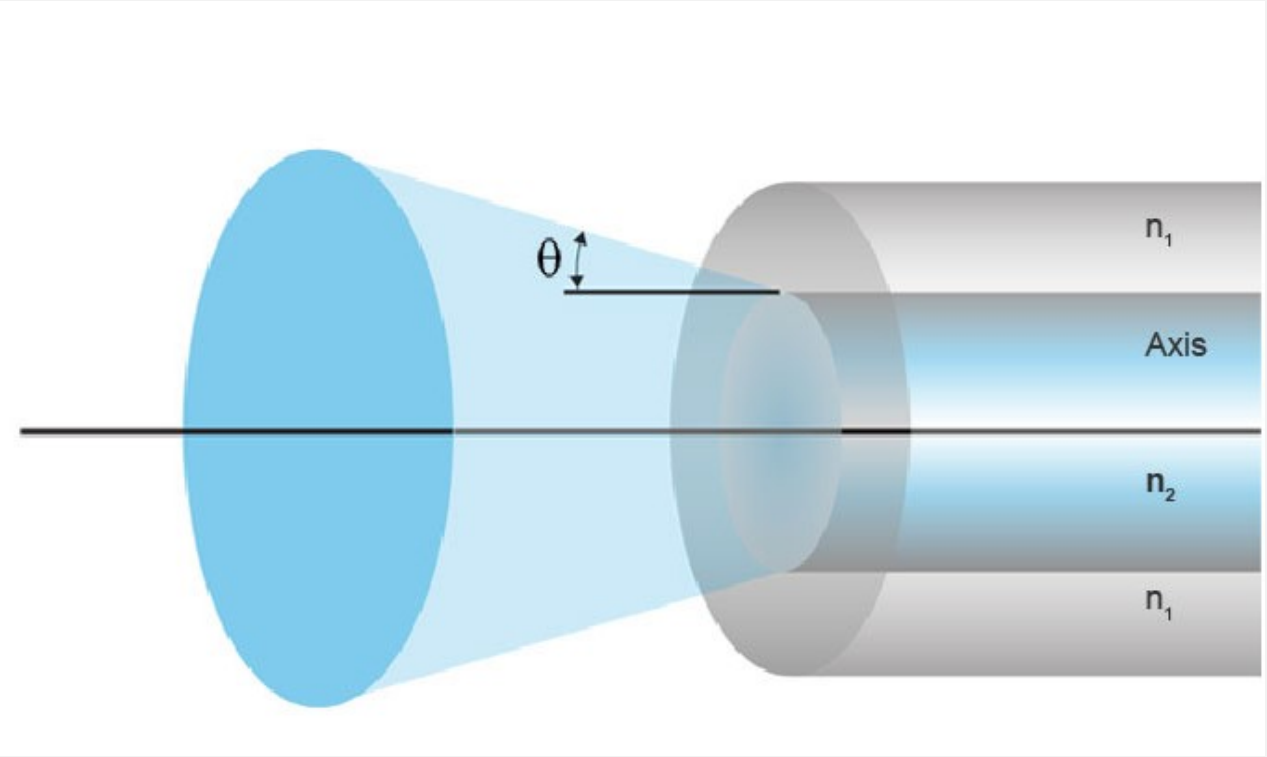
Source: ITU G.65X

Numerical Aperture (NA)

n_1 = Refractive index of the core
n_2 = Refractive index of the cladding
Θ = Angle of acceptance

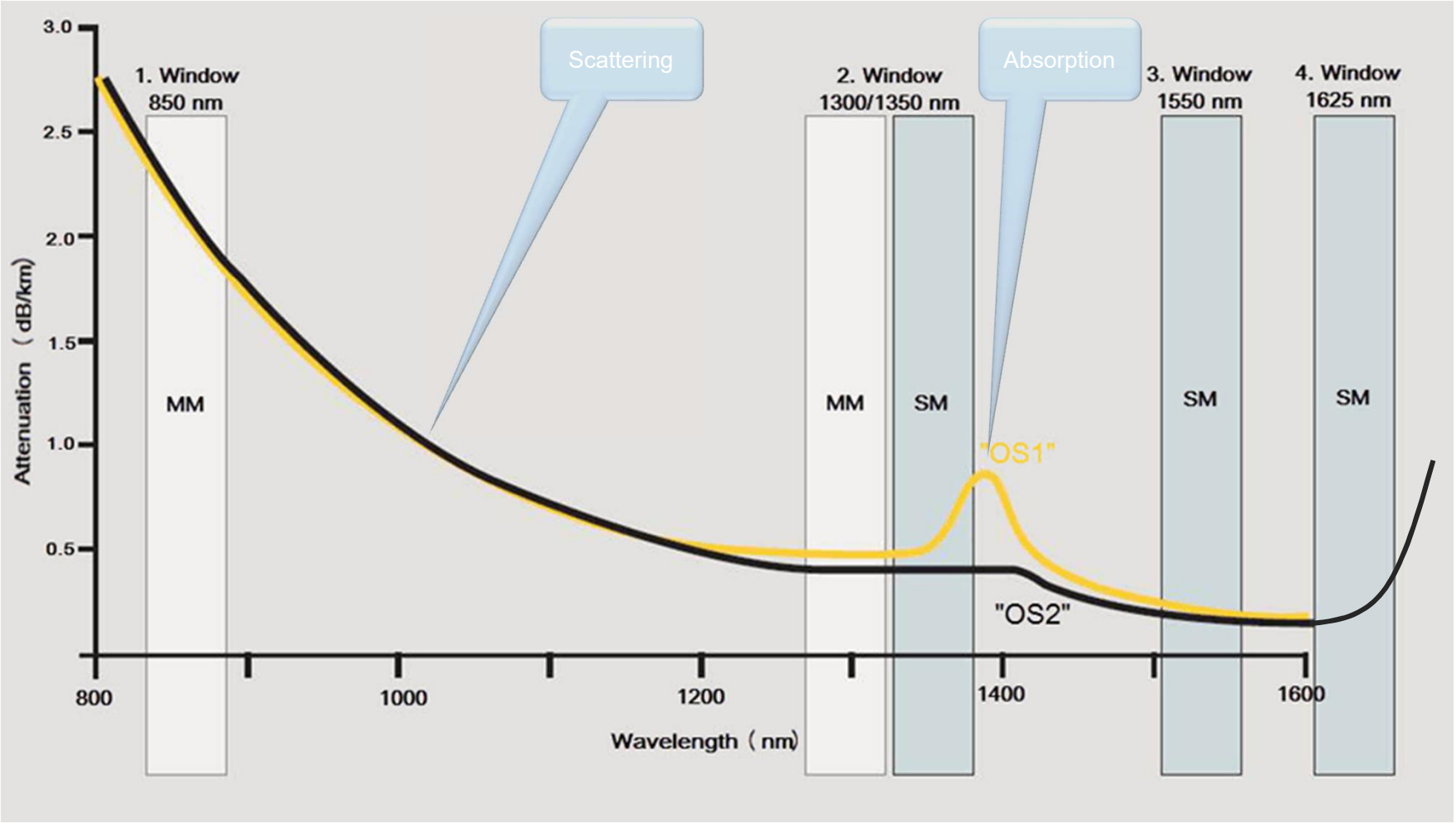
$$NA = \sin\theta = \sqrt{n2^2 - n1^2}$$

Examples:
OS1&2: NA 0,14 → ~ 8°
OM3&4: NA 0,2 → ~ 11,5°



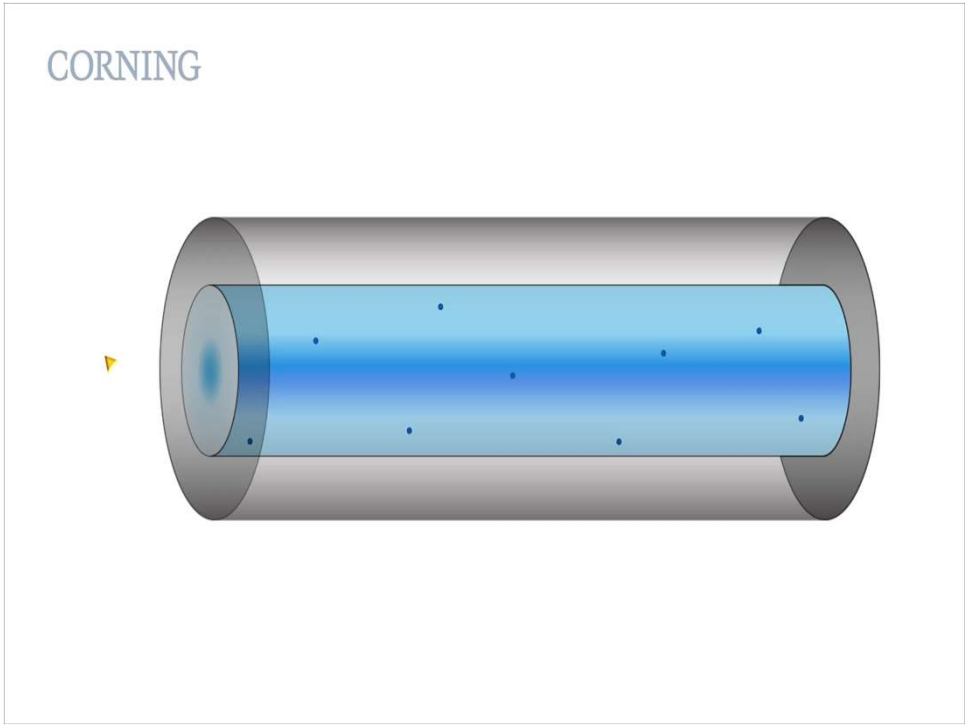
NA measures the range of angles of the rays that are injected into the fibre in a way that they will be totally internally reflected.

Spectral Attenuation Curve



Sources of Attenuation or Loss

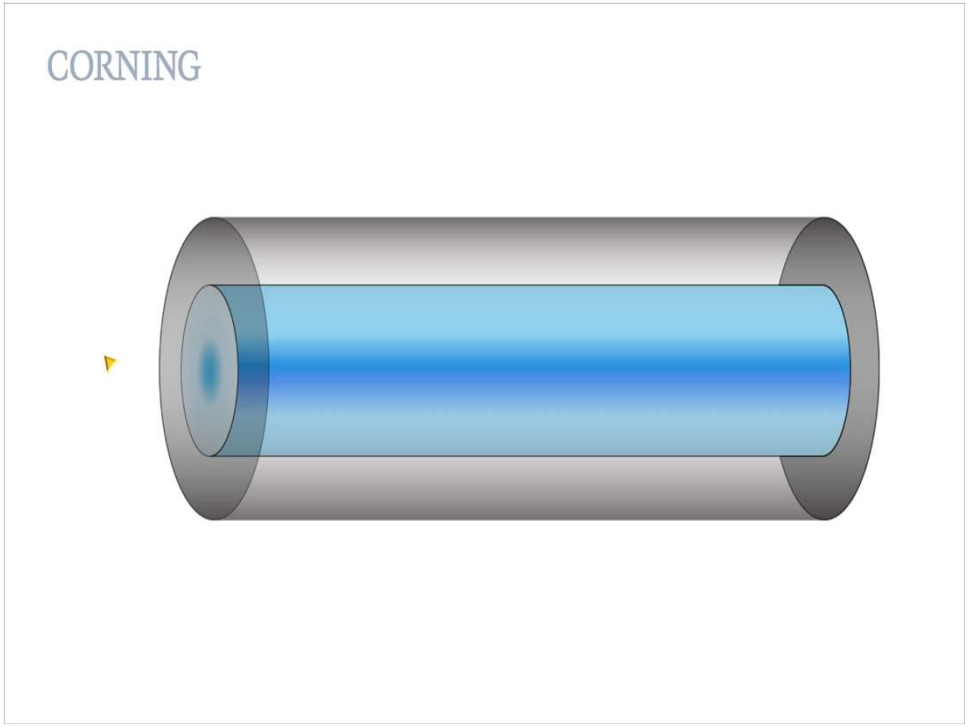
Scattering



In fibre optic transmissions, scattering is the loss of signal caused by the diffusion of a light beam, where the diffusion itself is caused by microscopic variations in the transmission medium. Scattering typically happens when a light signal hits an impurity in the fibre

Sources of Attenuation or Loss

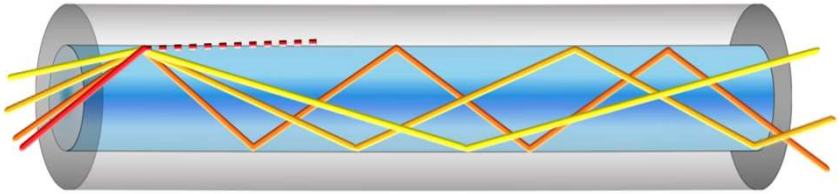
Absorption



Since light is a form of energy and since each form of energy interacts with matter, a certain portion of the energy is transferred to the material through which the light propagates

Sources of Attenuation or Loss

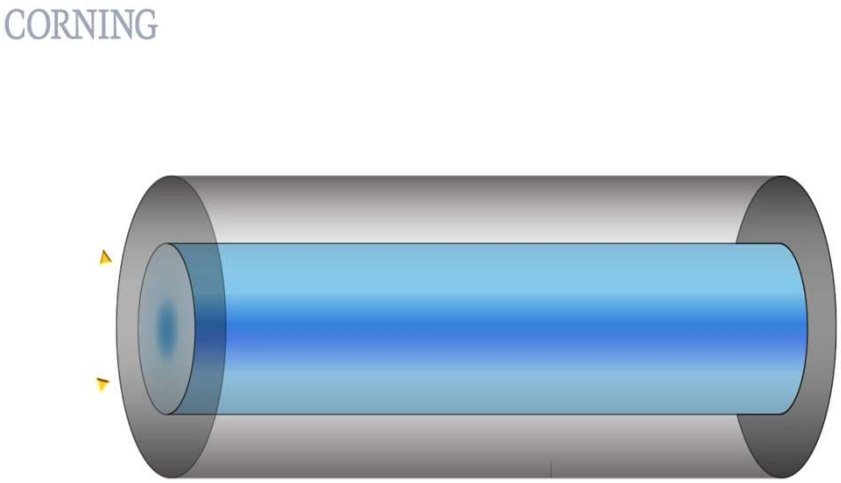
Macrobend



Macrobend is a large visible bend in the optical fibre that can cause extrinsic attenuation, a reduction of optical power in the glass.

Sources of Attenuation or Loss

Microbending



Microbend is an imperfection in the optical Fibre which was created during manufacturing. Microbending can cause extrinsic attenuation, a reduction of optical power in the glass. Unlike macrobending, the imperfection may not always be visible.

ClearCurve Demo Video

Principles of Transmission

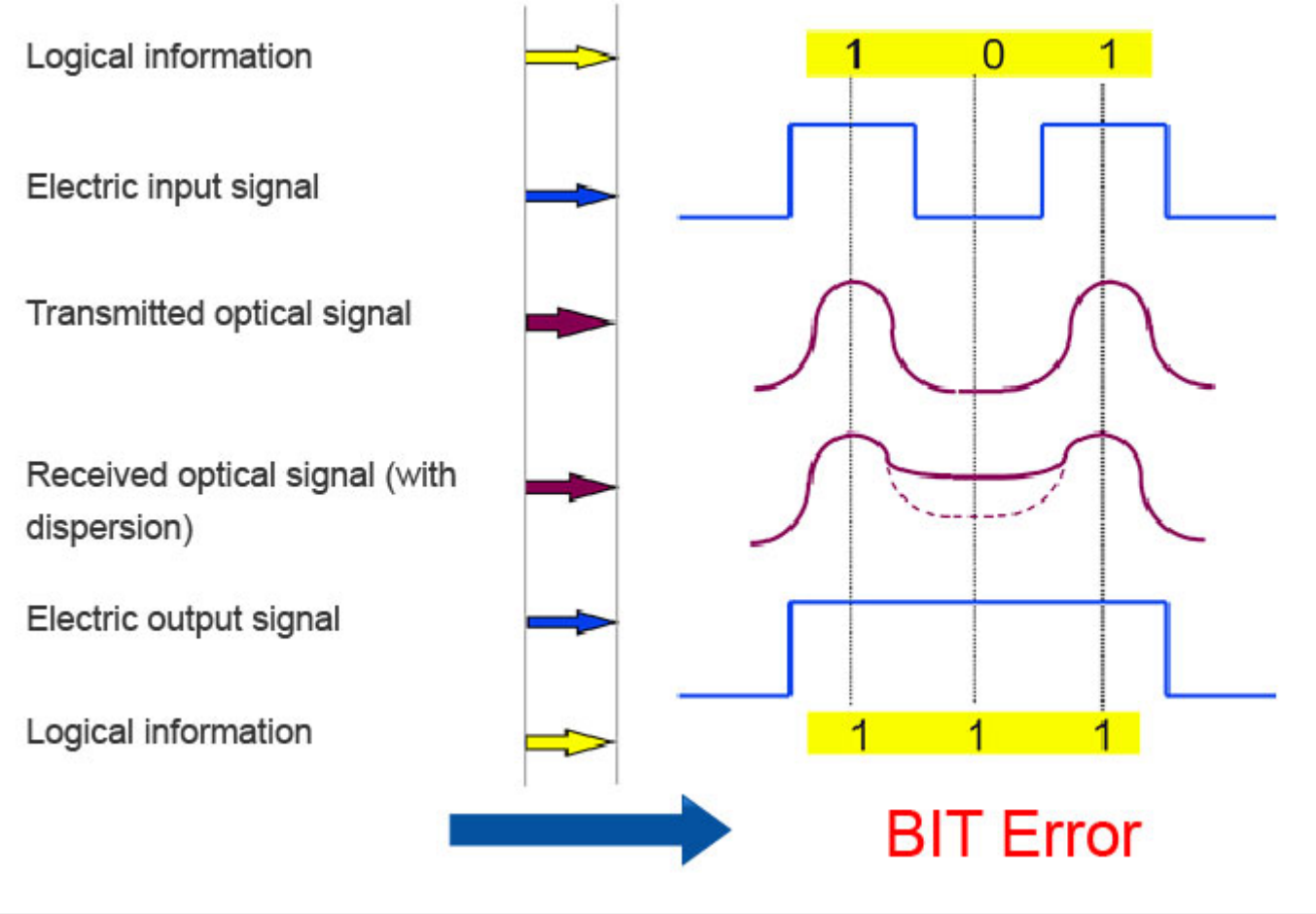
Refractive Index

Medium	Refractive index	Speed of Light
Vacuum	1.0	300 km/s
Air	1.0003	299,70 km/s
Water	1.33	225,41 km/s
Cladding	1.46	205,34 km/s
Core	1.48	202,56 km/s

$$\text{Refractive index “n”} = \frac{\text{Speed of light in vacuum “c”}}{\text{Speed in medium “v”}}$$

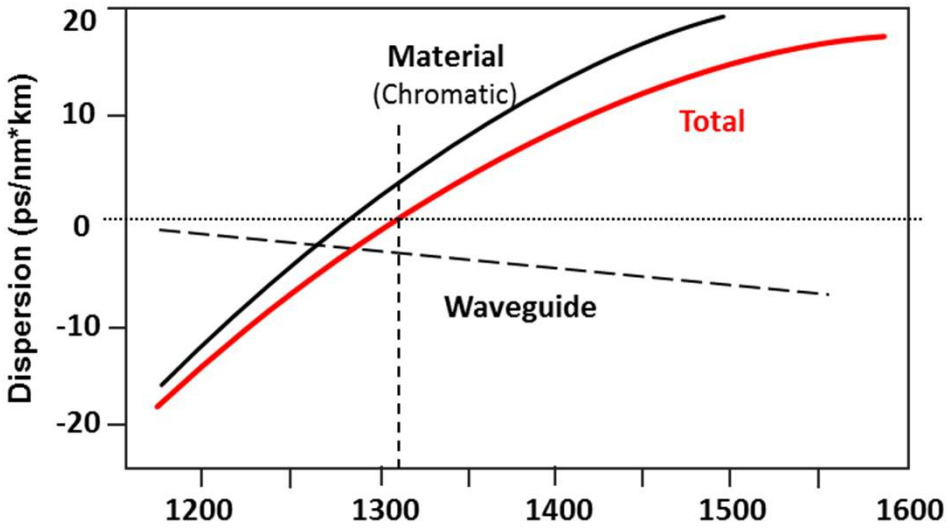
Dispersion – Effects on the signal

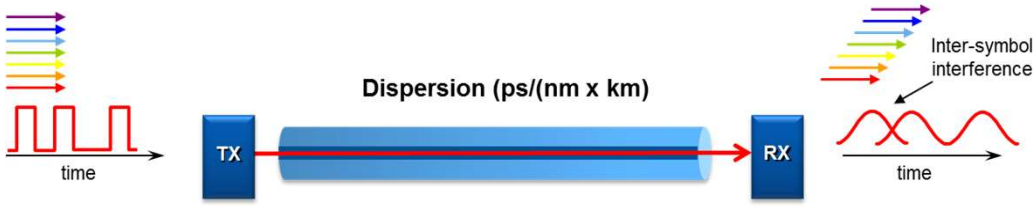
Affect the Transmission Bandwidth Quality



A3

Dispersion





Dispersion is the broadening of a signal pulse over distance.

- It limits the speed or carrying capacity of the Fibre over a given distance before it has to be compensated for or regenerated
- It is expressed in ps/(nm*km)
- There are 3 types of dispersion:
  - Material (Chromatic) dispersion
  - Waveguide dispersion
  - Polarization Mode Dispersion (PMD)

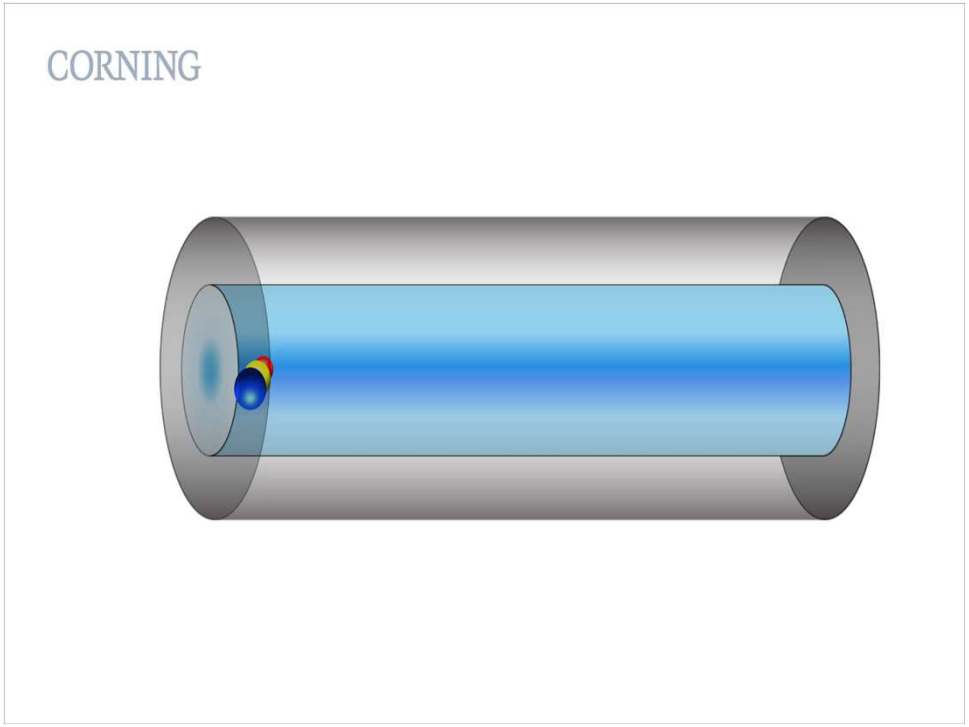
Slajd 35

A3 Some

Autor; 01.03.2018

Dispersion Types

Modal dispersion



- Modal dispersion occurs when the rays travel along multiple paths and have multiple path lengths. Since the rays do not travel the same distance, different rays will arrive at the end of the fibre at different times.
- Modal dispersion can therefore be described as path length dispersion.
- Modal dispersion is the biggest cause of dispersion. This type of dispersion occurs in multi-mode fibres, but not in single mode fibres.

A4

System Performance Parameters

WAVELENGTH

- The Wavelength of light characterises its behaviour at the entry of a fibre and across a fibre
- Wavelength determined by the source (LASER)

ATTENUATION

- When light is transmitted through the fibre, attenuation occurs
- Attenuation changes with wavelength

DISPERSION

- When light is transmitted through the fibre, dispersion occurs, which determines the bandwidth of the fibre
- Dispersion changes with wavelength

Slajd 37

A4 Wellenlängenabhängigkeite eingefügt
Autor; 03.03.2018

Comparison single-mode versus multi-mode fibres

	Single-Mode Optical Fibre	Multi-Mode Optical Fibre
Application	✓ Campus Backbones ✓ WAN, MAN, subsea ✓ DWDM ✓ Amplfied fibre links ✓ FTTx ✓ DAS Networks	✓ Data Centers ✓ Local Area Networks ✓ Industrial Networks
Advantages	✓ Large bandwidth length product ✓ Highest communication bandwidth ✓ Lowest attenuation ✓ Lowest dispersion ✓ Many upgrade options ✓ Lowest fibre manufacturing cost	✓ Smaller bandwidth length product ✓ Lowest port cost ✓ Larger core size
Disadvantages	✓ Higher port cost ✓ Small core size	✓ Lengths limited by modal bandwidth ✓ Limited options for future upgrades ✓ Higher fibre manufacturing cost

Fibre Nomenclature – ISO/IEC 11801, EN 50173, TIA/EIA 568

Fibres with the following standards and dimensions are used in telecommunication technology:

Fibre Type / Core Dimensions	Core*	Cladding
Single-Mode, OS1 and OS2	9 µm	125 µm
Multimode OM1	62.5 µm	125 µm
Multimode OM2, OM3, OM4 and OM5	50 µm	125 µm

* For Single-Mode fibres, usually the MFD value at 1310 nm is used instead of the actual core diameter.

Fibre Nomenclature – Cross Reference

Fiber Core/Cladding size [µm]	Standard Overview Multimode Fibers			
	ITU	TIA/EIA	IEC 60793-2-10	ISO/IEC 11801
62.5/125	-	492AAAA	A1b	OM1
50/125	G651.1	492AAAC-A	A1a.1	OM2
50/125	G651.1	492AAAC-B	A1a.2	OM3
50/125	G651.1	492AAAD	A1a.3	OM4
50/125	G651.1	492AAAE	A1a.4	OM5

Type	IEC 60793-50	ITU	ISO/IEC 11801
Standard	B1.1	G.652.A/B	OS1
	B1.3	G.652.C/D	OS2
Bend insensitive	B6_a1	G.657.A1	OS1/2
	B6_a2	G.657.A2	
	B6_b2	G.657.B2	
	B6_b3	G.657.B3	

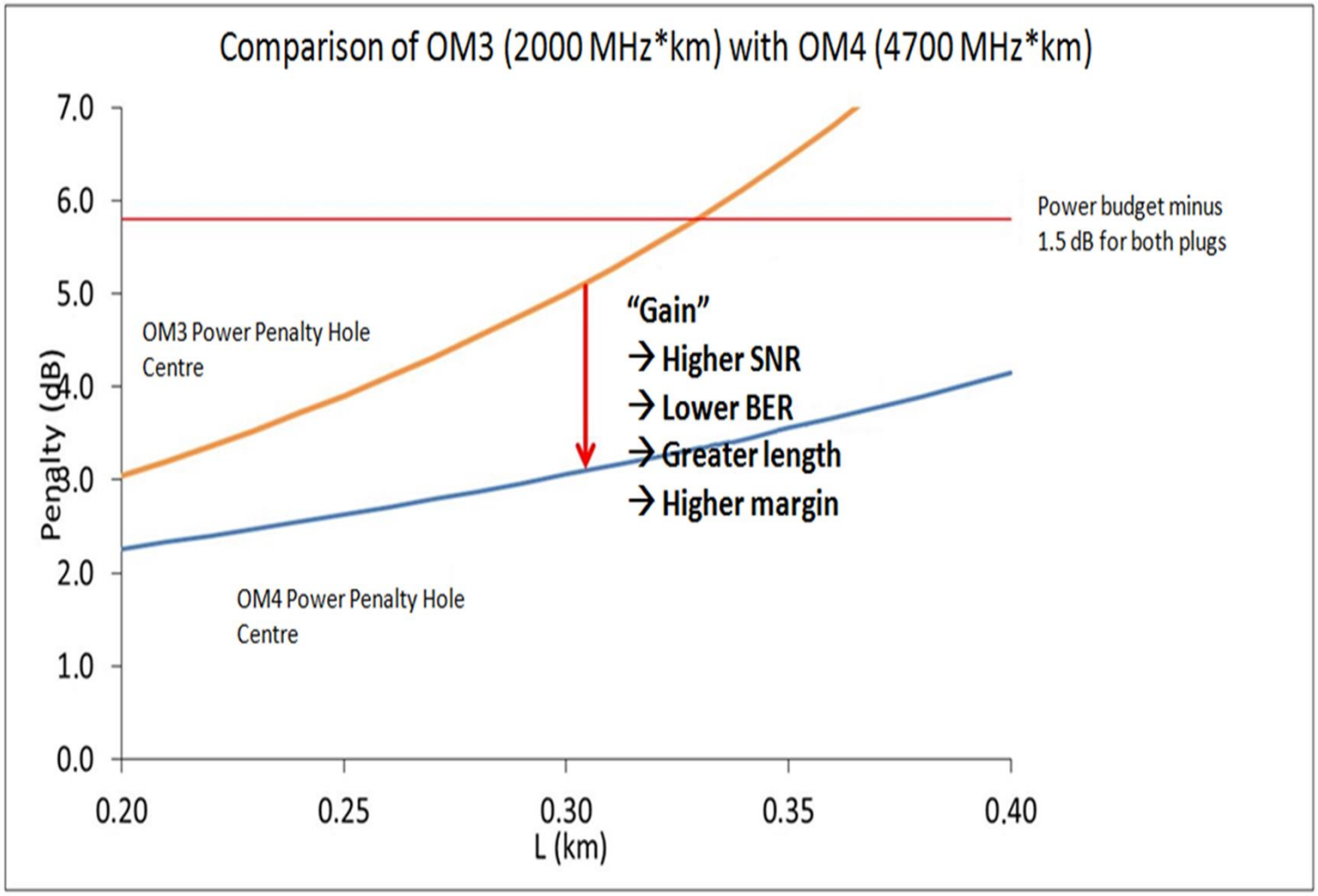
MM fibers characteristic

Corning Brand Name	OM1 InfiniCor300	OM2 ClearCurve OM2 Pretium 150	OM3 ClearCurve OM3 Pretium 300	OM4 ClearCurve OM4 Pretium 550
ITU Fiber type	N/A	G651.1	G651.1	G651.1
Cladding [um]	125.0 +/-2.0	125.0 +/-2.0	125.0 +/-2.0	125.0 +/-2.0
Core [um]	62.5 +/-2.5	50 +/-2.5	50 +/-2.5	50 +/-2.5
Atten @ 850nm [dB/km] (max)	≤3.1	≤2.8	≤2.8	≤2.8
Atten @ 1300nm [dB/km] (max)	≤0.8	≤1.0	≤1.0	≤1.0
10Gbps@850nm [m]	33	150	300	550 (with SFP+)
Macrobend Loss @850nm[dB] (7.5mm Dia)	N/A	≤0.2	≤0.2	≤0.2

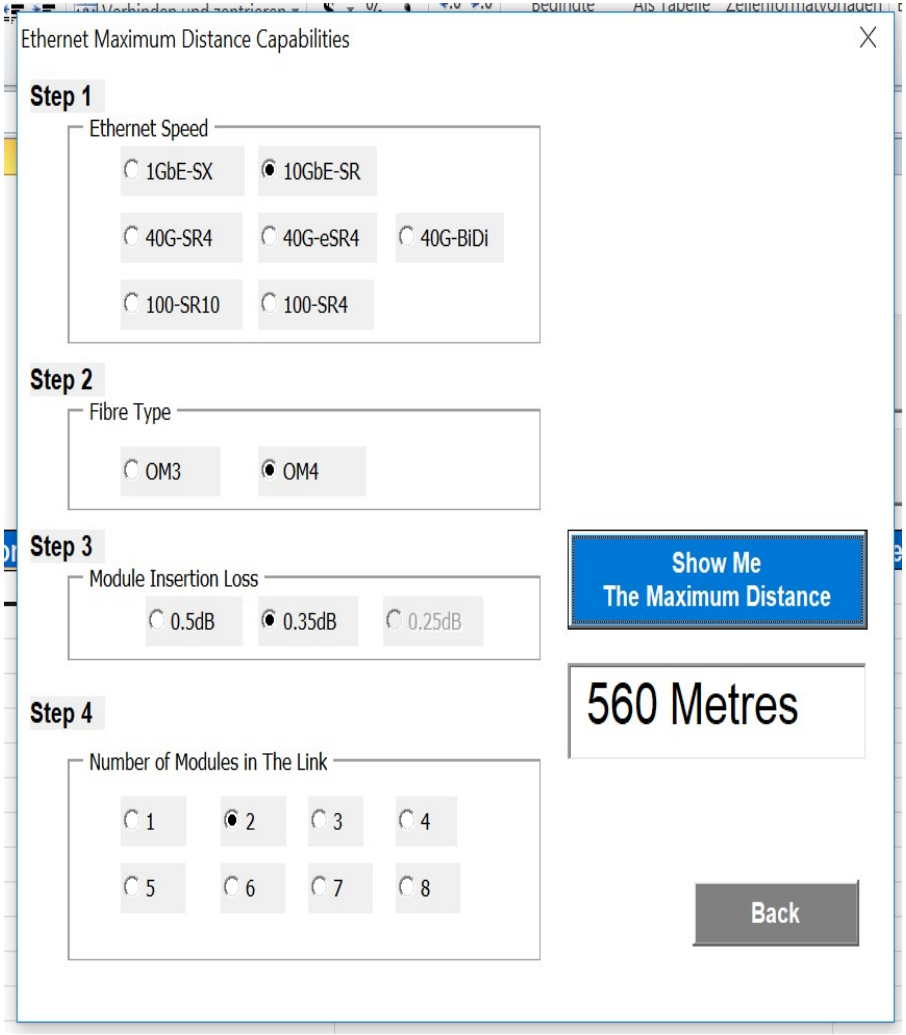
SM fibers characteristic

Corning Brand Name	OS2 SMF 28e+ E9	OS2 SMF 28e+ LL E9 LL	OS2 SMF 28e+ LL E9 ULL	LEAF E10	Ultra E9U	ClearCurve LBL E9CCR7.5	Clear Curve ZBL E9CCR5
ITU Fiber type	G652.(A,B,C,D)	G652.(A,B,C,D)	G652.(A,B,C,D)	G655.(A,B,C,D)	G657.A1	G657.A2/B2	G657.B3
Cladding [um]	125.0 +/-0.7	125.0 +/-0.7	125.0 +/-0.7	125.0 +/-0.7	125.0 +/-0.7	125.0 +/-0.7	125.0 +/-0.7
Core [um]	8.2	8.2	8.2	N/A	N/A	N/A	N/A
MFD @1310nm [um]	9.2 +/-0.4	9.2 +/-0.4	9.2 +/-0.4		9.2 +/-0.4	8.6 +/-0.4	8.6 +/-0.4
MFD @1550nm [um]	10.4 +/-0.5	10.4 +/-0.5	10.4 +/-0.5	9.2 to 10.0	10.4 +/-0.5	9.6+/-0.5	9.6+/-0.5
Atten @ 1310nm [dB/km] (max)	≤0.34	≤0.32	≤0.31	≤0.4	≤0.32	≤0.35	≤0.35
Atten @ 1550nm [dB/km] (max)	≤0.20	≤0.18	≤0.17	≤0.19	≤0.18	≤0.20	≤0.20
Atten @ 1625nm [dB/km] (max)	≤0.23	≤0.20	≤0.20	≤0.21	≤0.20	≤0.23	≤0.23
Dispersion @1550nm [ps/(nm*km)]	≤18.0	≤18.0	≤18.0	2.0 - 6.0 (@1530-1565nm)	≤18.0	≤18.0	≤18.0
Macrobend Loss @1550nm[dB] (5mm Dia)	N/A	N/A	N/A	N/A	N/A	N/A	≤0.1
Macrobend Loss @1550nm[dB] (7.5mm Dia)	N/A	N/A	N/A	N/A	N/A	≤0.4	N/A
Macrobend Loss @1550nm[dB] (10mm Dia)	N/A	N/A	N/A	N/A	≤0.5	N/A	N/A
Macrobend Loss @1550nm[dB] (32mm Dia)	≤0.03	≤0.03	≤0.03	≤0.5	≤0.03	≤0.03	≤0.03

Comparison of OM3 with OM4 (10GBASE-SR)



Corning De-rating Tables & BOM tool Derating Calculation



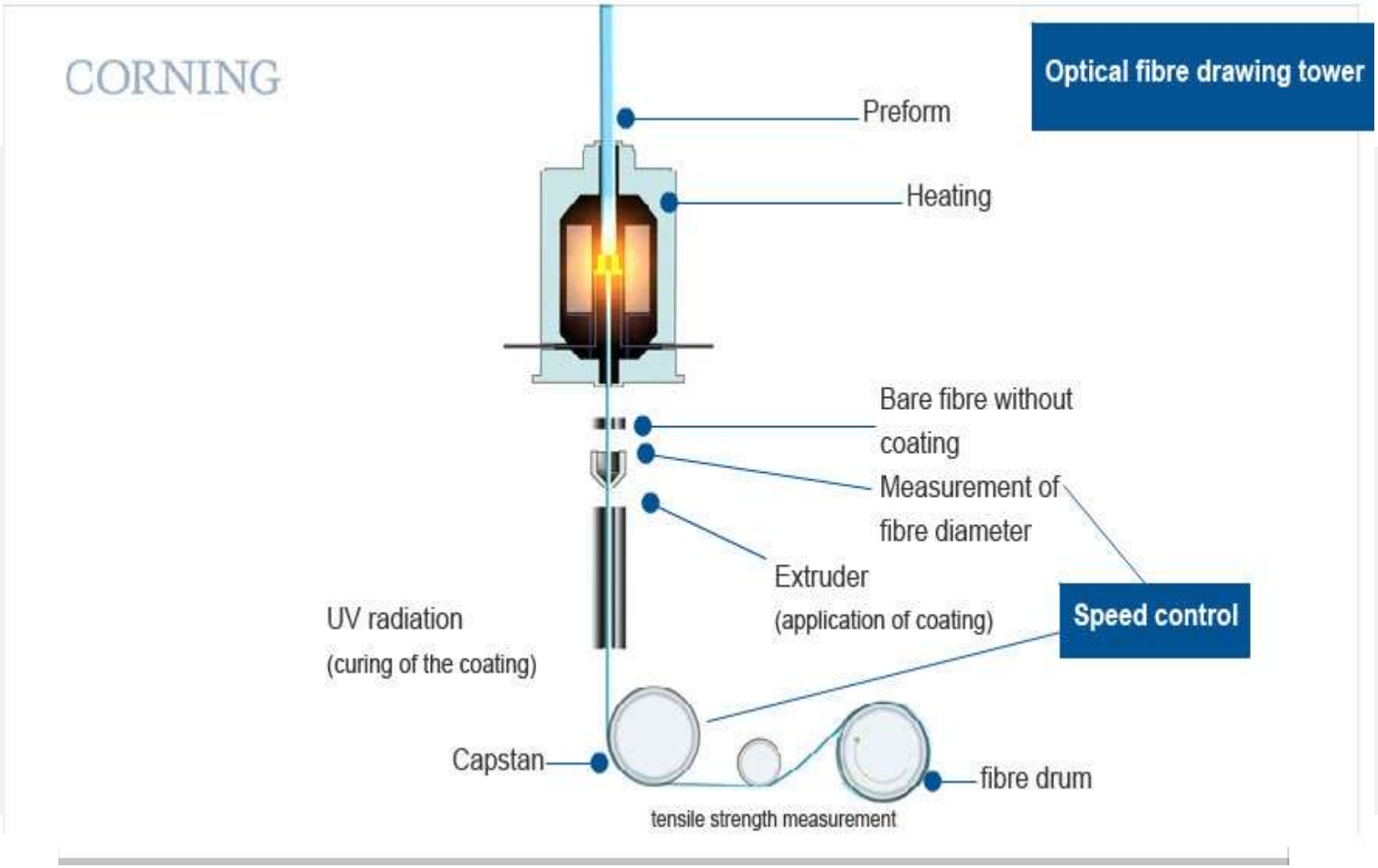
Distance Capabilities for Corning's EDGE8™, EDGE™ and Plug & Play™ Pre-Terminated Connectivity Solutions

AEN162, Revision 1

Table 1.2: Ethernet Duplex - Maximum Distance Capability for Systems with Multimode / Single mode Ultra Low Loss MTP/LC Modules (0.35/0.6) dB

Ethernet - Duplex - Maximum Distance Capability (All Distances in Meters)										
Fiber Type	Data Rate Protocol	Speed	Number of (MM/SM) Ultra Low Loss MTP/LC Modules (0.35/0.6) dB in the System							
			1	2	3	4	5	6	7	8
OM3-ULL	1000Base-SX	1 GbE	1155	1135	1115	1095	1070	1045	1020	1000
	10GBase-SR	10 GbE	325	325	325	325	325	325	325	325
	40GBase-BiDi	40GbE	110	110	110	110	110	110	105	105
OM4-ULL	1000Base-SX	1 GbE	1190	1170	1150	1130	1110	1085	1060	1030
	10GBase-SR	10 GbE	565	560	555	550	540	535	525	520
	40GBase-BiDi	40GbE	200	200	200	200	195	185	180	175
OS2-ULL	100G CWDM4	100G	2000	2000	2000	2000	2000	2000	2000	2000

The Making of Optical Fibre



Agenda

1) Corning Introduction
2) Fiber Introduction
3) PNP- Corning EDGE/EDGE8 Solutions
Preterminated Optical Fiber Cabling for Datacenters

Structured Cabling
Story of EDGE
Technology Roadmap
Story of EDGE8

4) Copper Solutions
5) Order tracker
6) Workshop- hands on

7) MTP PRO

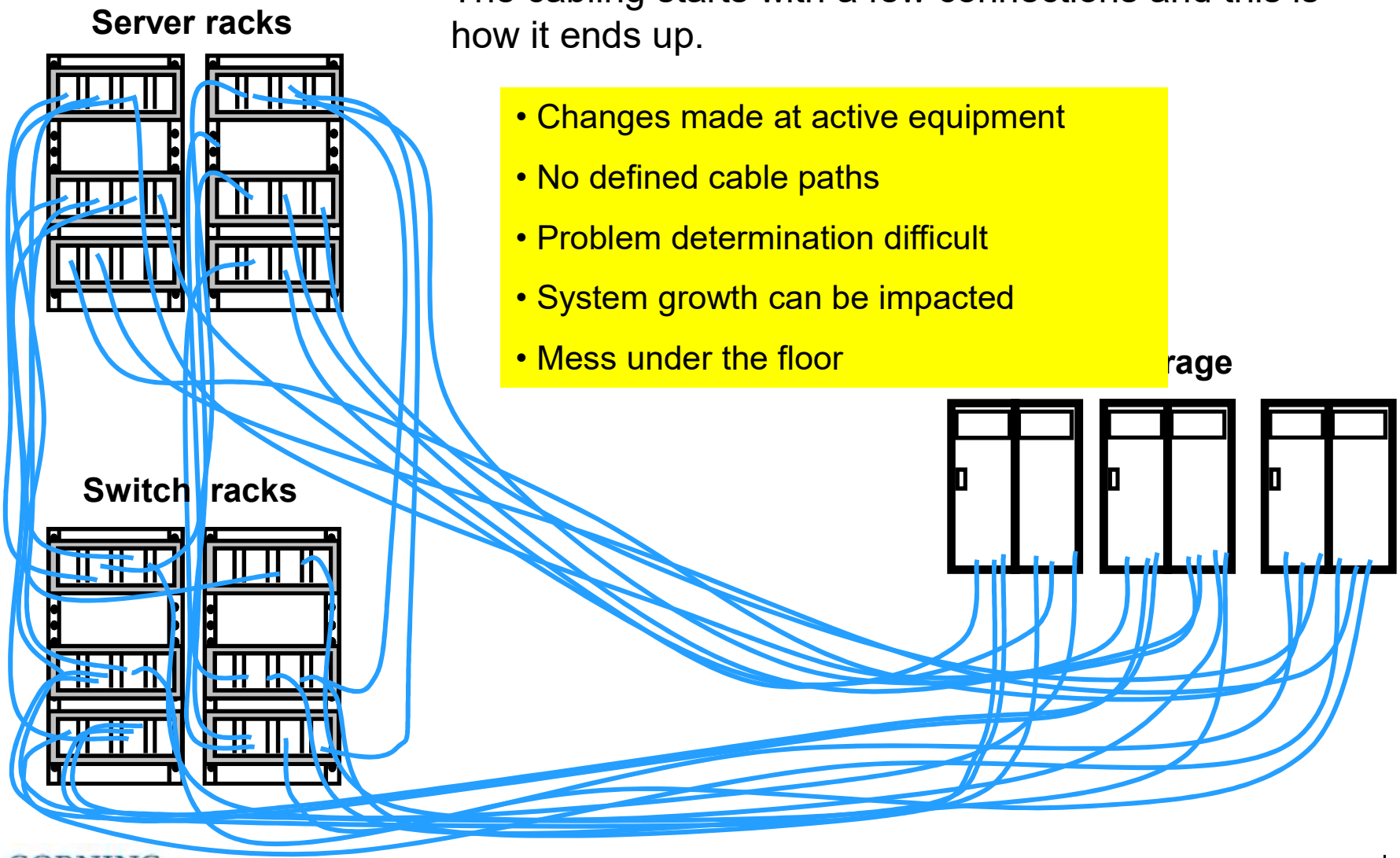
Structured Cabling and Corning EDGE Solutions

Background

Number of 10G SFPs Exploded – 2009

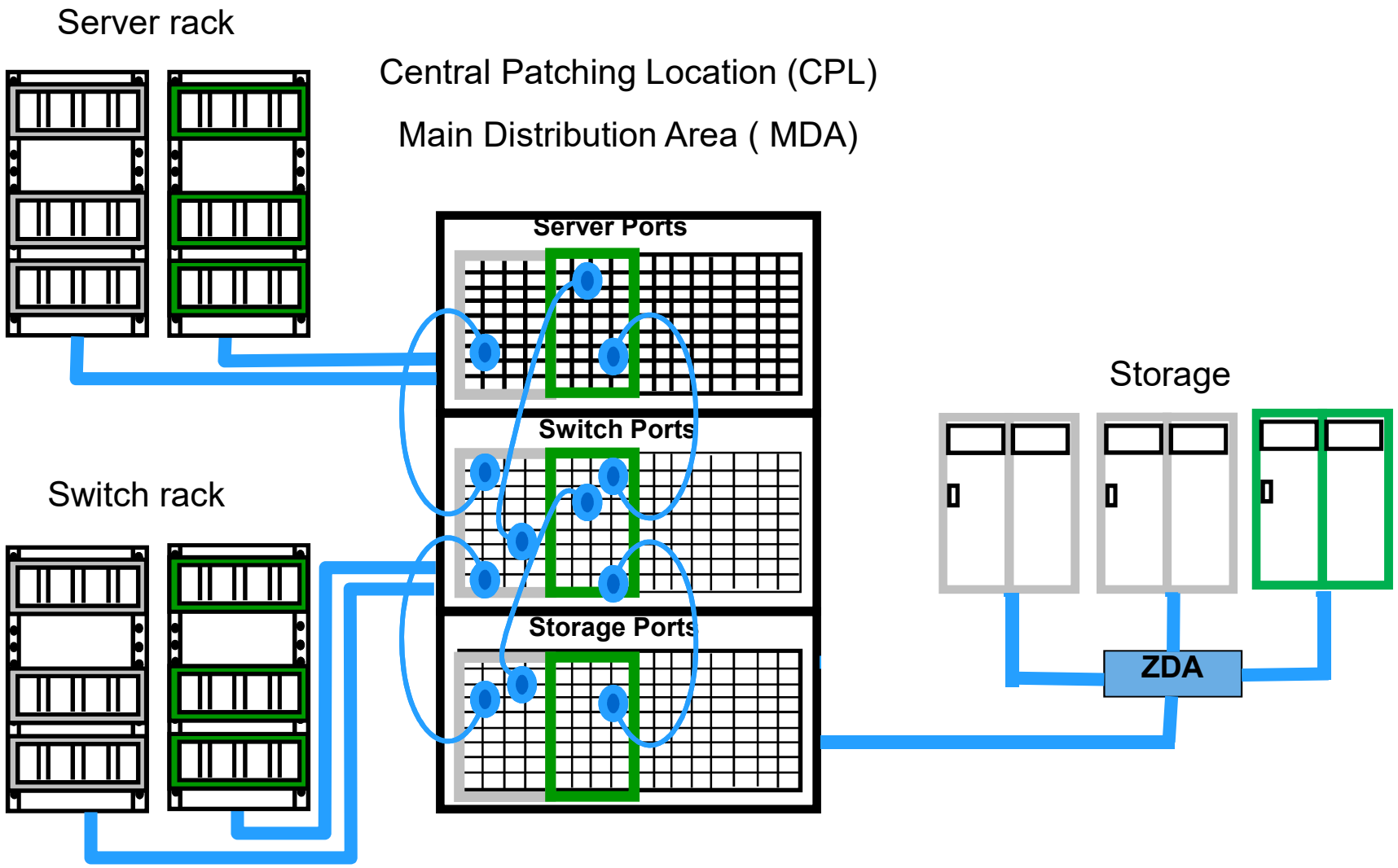
Unstructured Cabling

The cabling starts with a few connections and this is how it ends up.



- Changes made at active equipment
- No defined cable paths
- Problem determination difficult
- System growth can be impacted
- Mess under the floor

Structured Cabling

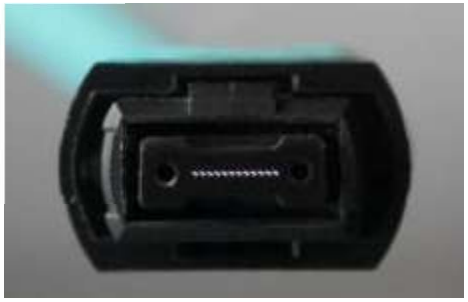


Problem and Solution

-Ability to add optical links as many as we need.
-Do this very fast (when we need)
-Make it manageable
-Maintain end to end polarity TR goes to RX

PROBLEM

12 Fiber MTP/MPO Connector



EDGE Solutions

2009 – End to End Innovation

Bend insensitive MM Fiber

Smaller diameter cable with tighter bend radius

Low Loss MTP Connector

High Fiber Count Trunks (12f-144f)

Shuttered LC Adaptors

Reduced size of components with universal polarity

Hardware with greater density Easy finger access

Less space in the DC, More organized cable management

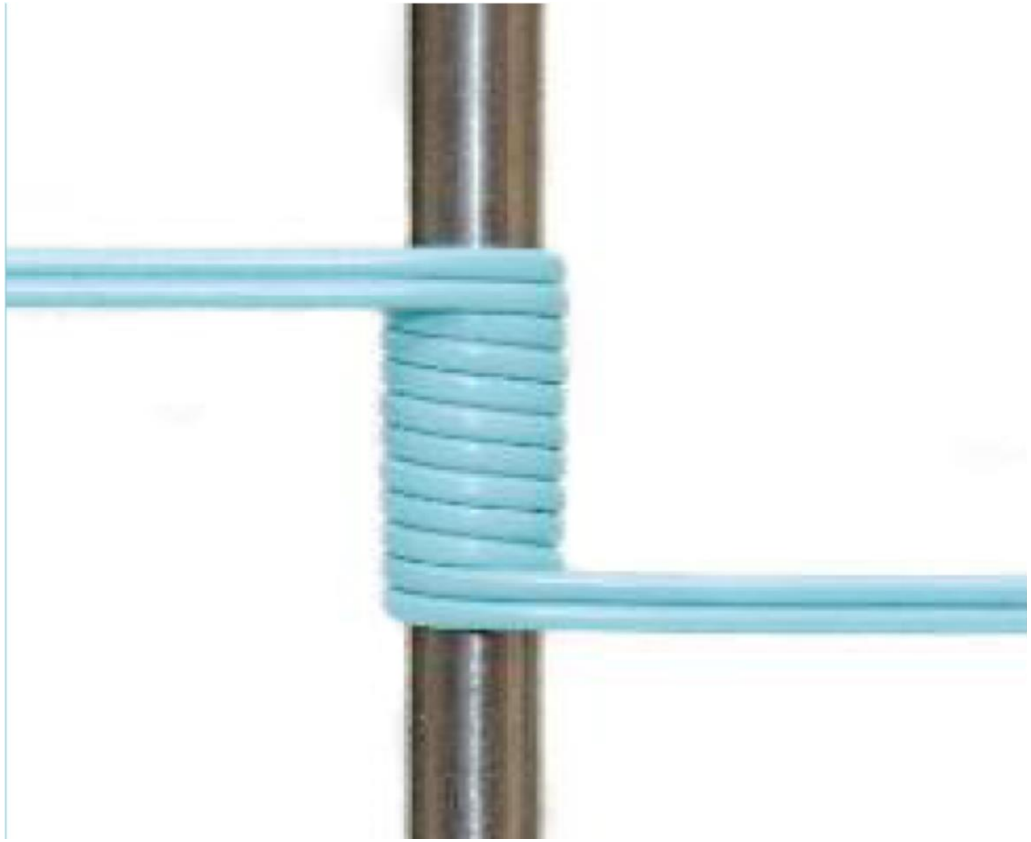
EDGE Solutions

The world's first bend optimised OM3/OM4 fiber

Key Corning Value

- ✓ Up to 10x better bend performance than standard 50 µm fiber
- ✓ High bandwidth OM3 and OM4 capability
- ✓ Improved optical performance

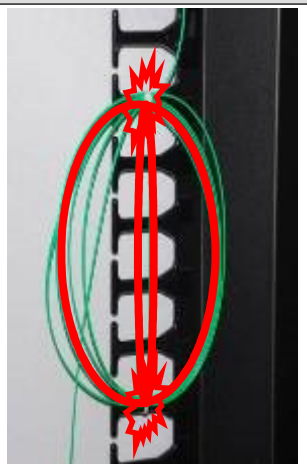
ClearCurve® OM3/OM4 Multimode Fiber



Bending

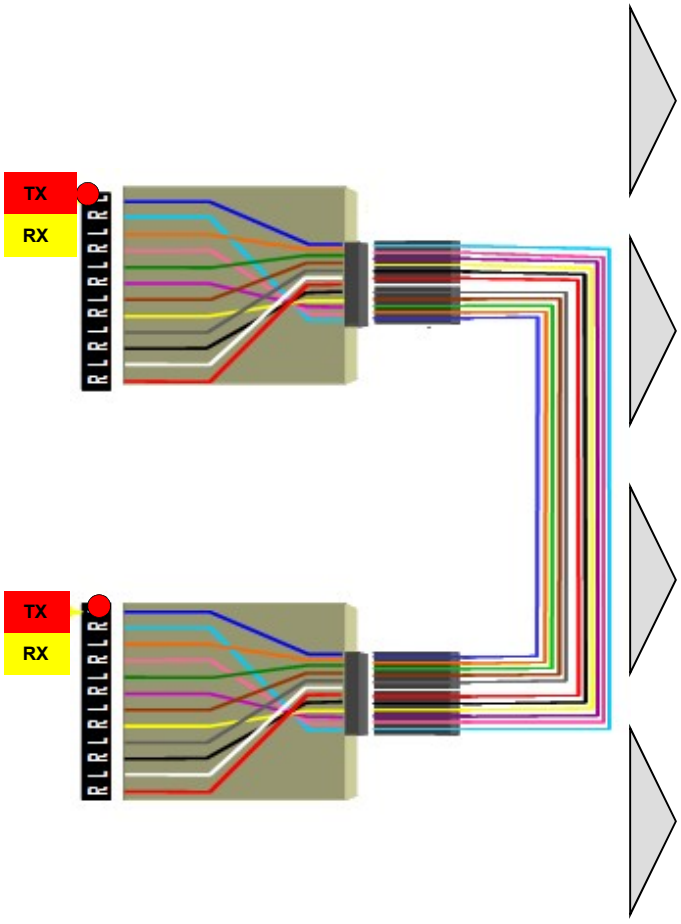
Improved Cabling Bend Performance Lower Optical Loss

Key Corning Value

Patch Cable Management Practice			Impact		Loss
Standard 50 µm		A common practice today is to store slack in a tie-wrapped loop		When a Patch Cable is re-positioned, a tight loop can result	> 5 dB
Pretium Plug & Play™ 50 µm					0.5 dB

Universal Polarity
Simplified Polarity Management

Key Corning Value

Universal Polarity	Value
	• The same module at both ends 
	• Use of standard patch cords 
	• Same trunk without affecting polarity 

EDGE Solutions

Extensions Since 2009

Low Loss Modules

EDGE Splice Module

EDGE Tap Module

RP MTP Adaptors

Base-12 to Base-8 Conversion Module

Base-12 to Base-8 Conversion Harness

Base-8 MTP –LC Harness

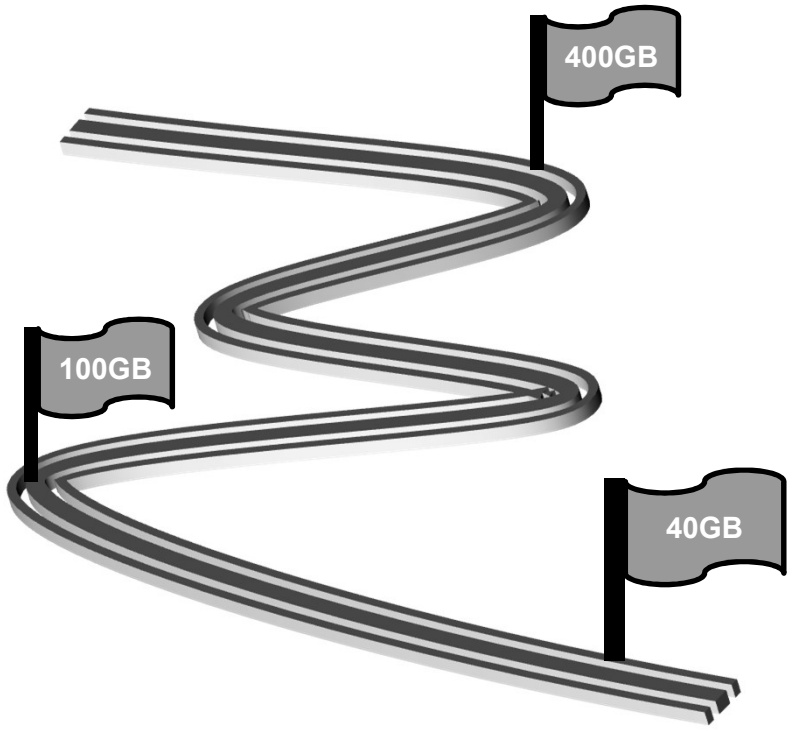
Background

2014 - Arrival of 40 Gig

- Arrival of 40Gig brought some questions with it

Technology Roadmap

Transceiver Technologies



2015 - Voice of Technology(VOT)

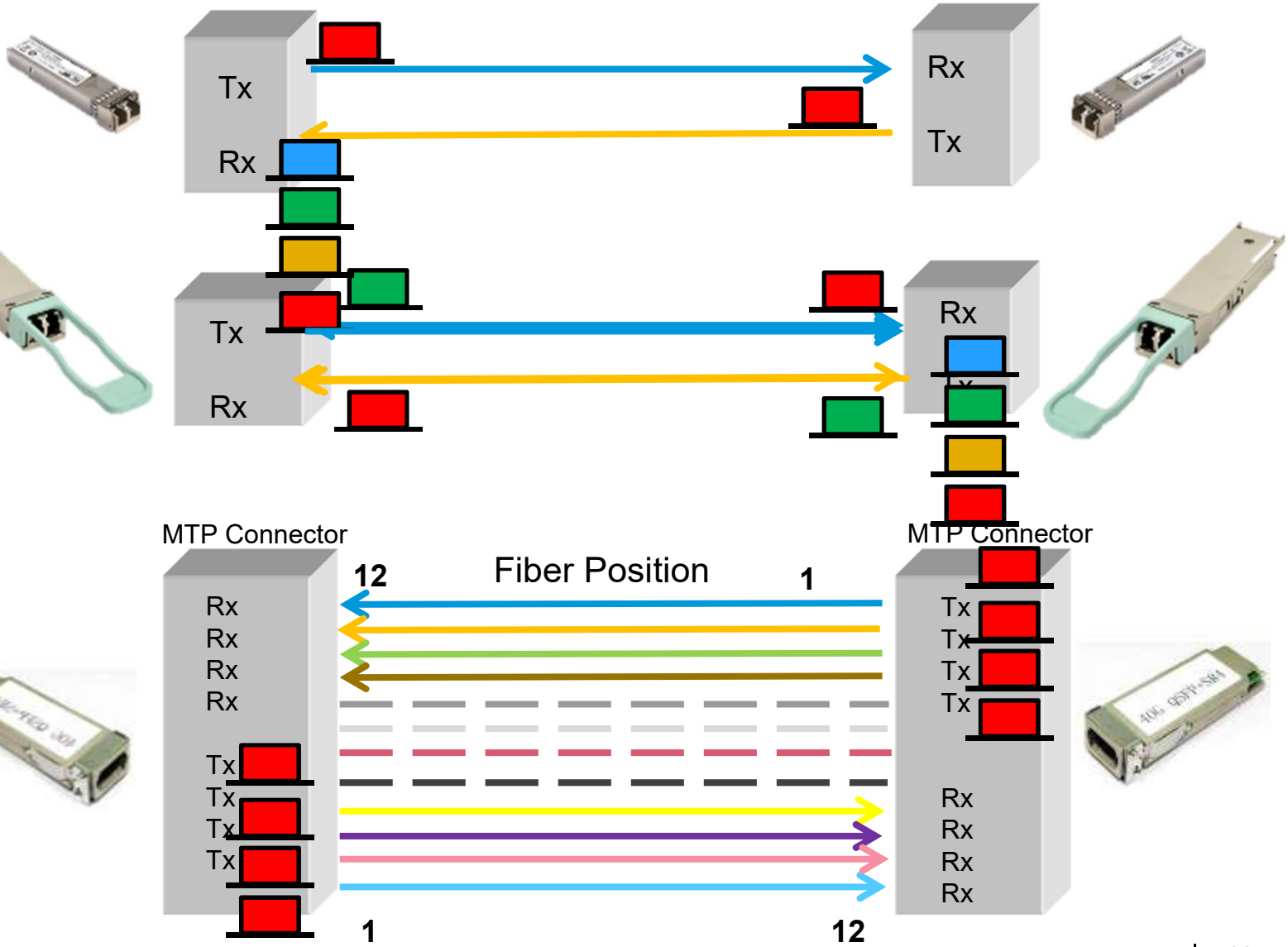
What does Serial vs. WDM vs. Parallel Transmission look like?

Duplex
Serial uses two fibers

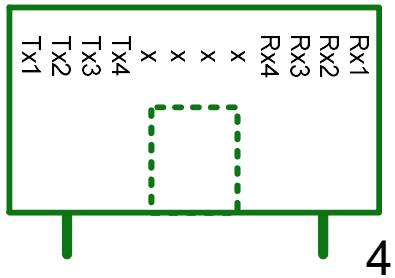
WDM
Wavelength Division Multiplexing

BiDi – 2λ
SWDM-4λ
CWDM-4λ

Parallel
uses 8 fibers



40G/100G-SR4 Transceivers Use MTP/MPO Connectors



4 fibre Transmit

4 fibre Receive

4 x 10G or 4 x 25G

12 Fibre MTP Connector

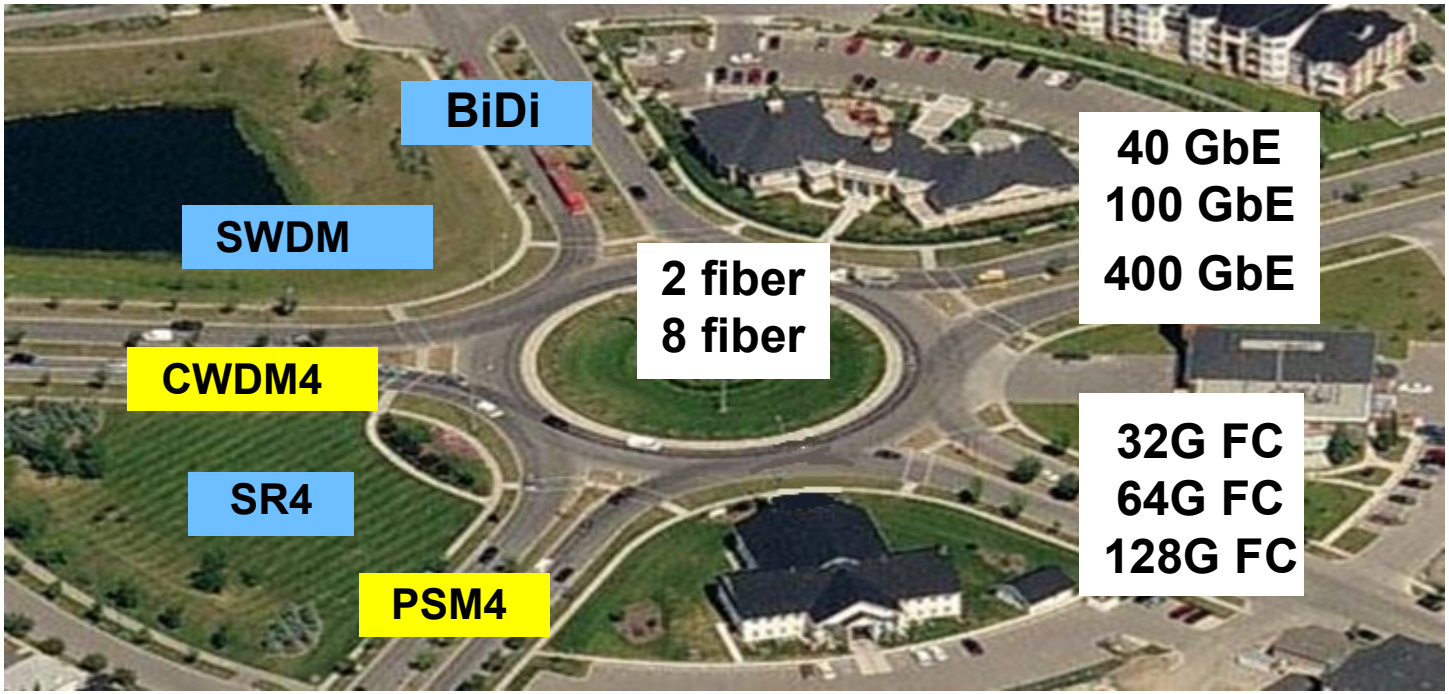
8 Fibre MTP Connector

Impact on Structured Cabling

Reach	40G	100G/200G	400G
Short and Mid	SR4/eSR4 4x10G Tx Rx **1x12 or 1x 8 format** 	*Gen1:* SR10 10x10G Tx Rx  *Gen2:* SR4 4x25G Tx Rx **1x12 or 1x 8 format** 	*Gen1:* SR16 16x25G Tx Rx **2x16 format**  *Gen2:* SR8 8x50G Tx Rx **1x16 format** 
Short	BiDi 2 x 20G Tx Rx SWDM 4Λ x 10G Tx Rx	BiDi 2 x 50G Tx Rx WDM 4Λ x 25G/50G Tx Rx	*Gen3:* SR4, SWDM 4 x 4Λ x 25G Tx Rx

Ethernet and Fiber Channel Roadmaps

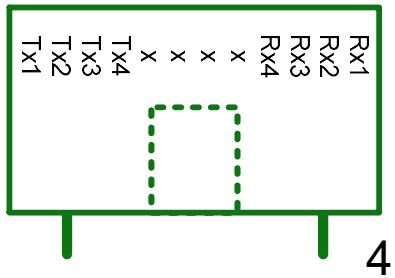
In Short



- Transceiver technologies for both Ethernet and Fibre Channel have clear roadmaps to duplex (2f) and parallel (8f) solutions.
- “All Roads Lead to 2F and 8F Technologies”

EDGE8 System Components

40G/100G-SR4 Transceivers Use MTP/MPO Connectors



4 fibre Transmit

4 fibre Receive

4 x 10G or 4 x 25G

12 Fibre MTP Connector

8 Fibre MTP Connector

EDGE8 Solutions

A Complete Solution That Enables a Base-8 Cabling System

Product Family	Product
EDGE8™ Trunks	
EDGE8™ Modules & Panels	*8F Module*  *8F Pigtail Module*  *4-port MTP Panel* 
EDGE8™ Harness	*8F Harness* 
EDGE8™ Jumpers	*LC UniBoot Jumper*  *8F MTP Jumper* 
EDGE8™ Housings	 

EDGE8™ Solutions
EDGE8 **Modules**

Product Family	Description	Product
EDGE8 Modules	• 8f MTP-LC Module, SM/MM	

Ultra Low Loss
MM IL = 0.35dB
SM IL = 0.6dB

Universal Polarity
Single Module in duplex links.

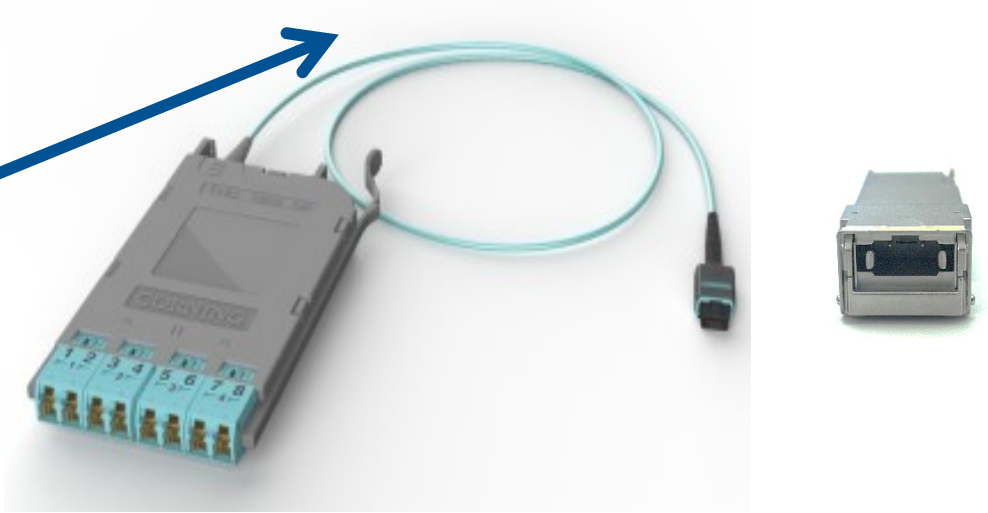
Shuttered LC Duplex Adaptors

EDGE8™ Solutions

EDGE8 Port Breakout Modules

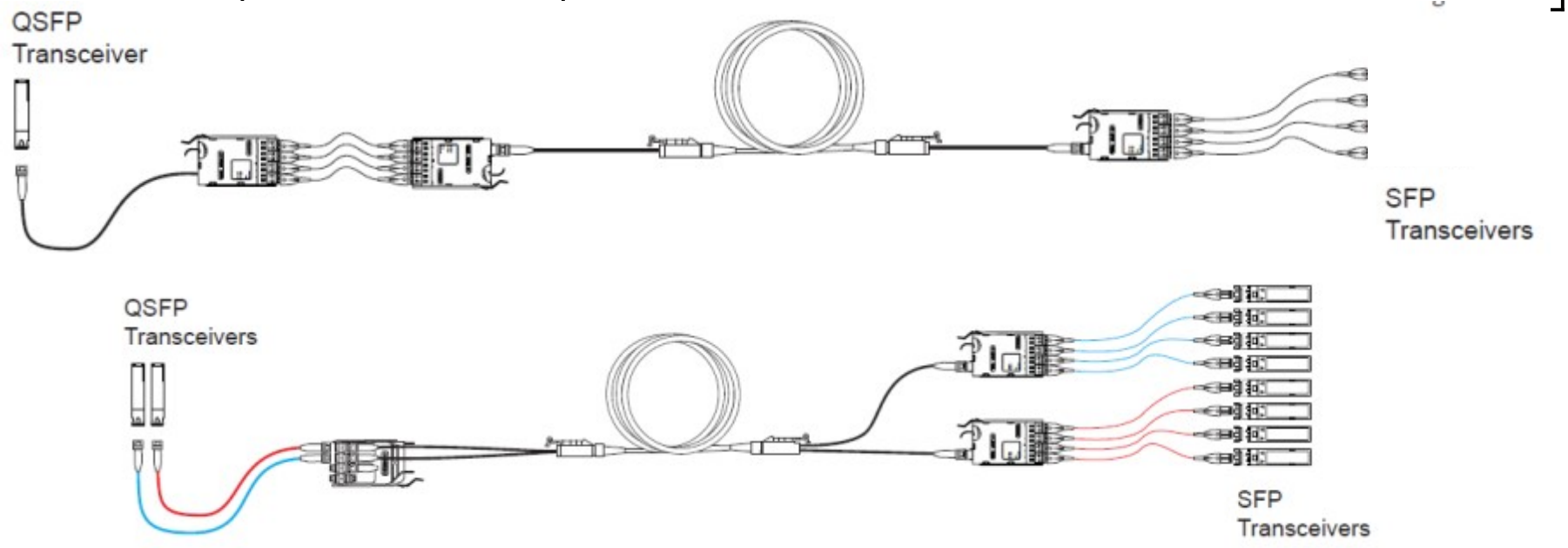
Product Family	Description	Product
EDGE8 Port Breakout Modules	• 8f MTP-LC Port Breakout Module, SM/MM	

MTP leg for easy connectivity in Port **Break-out applications**
40G → 4x10G
100G→ 4x25G



Port Breakout Module Value Proposition

Area	Value	Comments
Port Mapping	Optimised Port Breakout	With 8f breakout modules all 4-channel parallel protocols (SR4, PSM4, etc) are now mapped cleanly to a single element.



Port break up allows up to 46% cost savings per 10G port

EDGE8™ Solutions
EDGE8 Tap Modules

Product Family	Description	Product
EDGE8 Tap Modules	• LC-LC, MTP-LC, MTP-MTP, BiDi • MM Split Ratio : 50/50, 70/30, 80/20 • SM Split Ration : 50/50, 70/30, 80/20, 90/10	

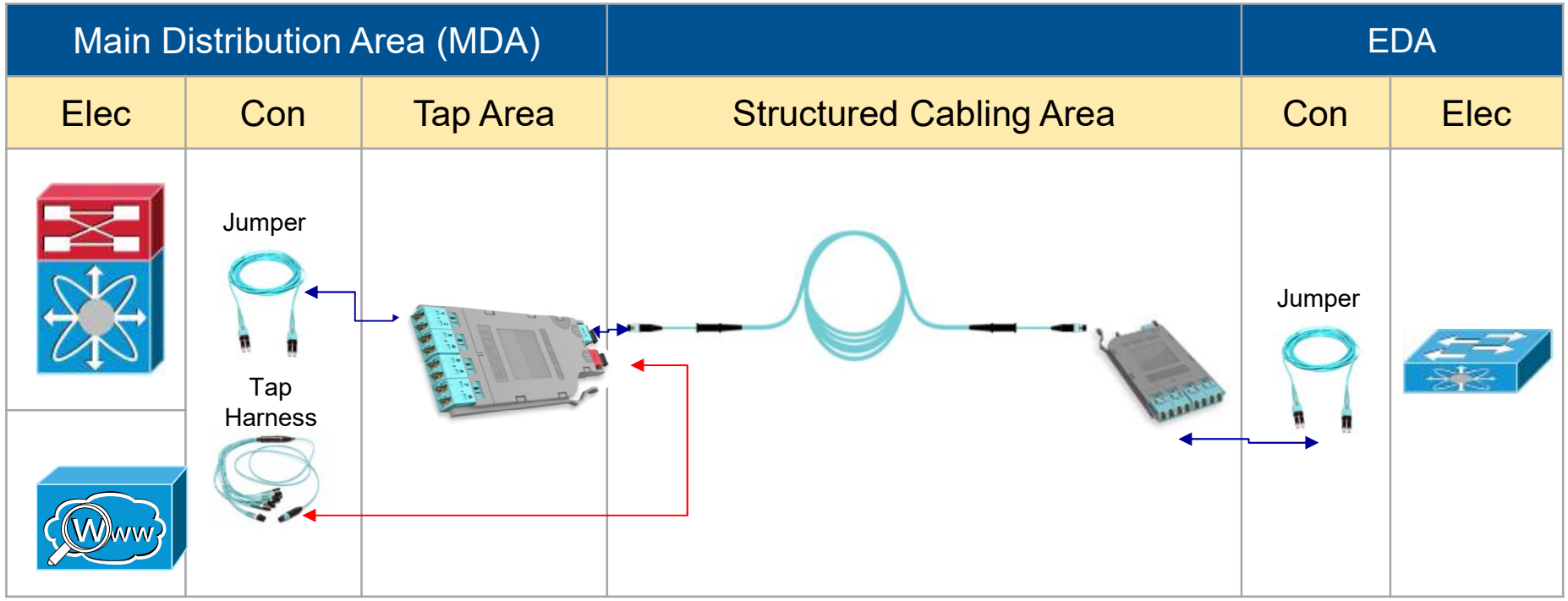
LC-LC 6f Tap Module
1 x 10G MM port
1 x 40G SM port

MTP-LC 8f Tap Module
4 x 10G MM ports
4 x 40G SM ports

MTP-MTP 8f Tap Module
1 x 40G Parallel MM port
4 x 10G MM
4 x 40G SM

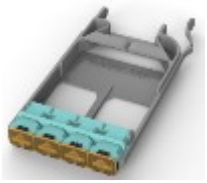
BiDi 8f Tap Module
1 x 40G port

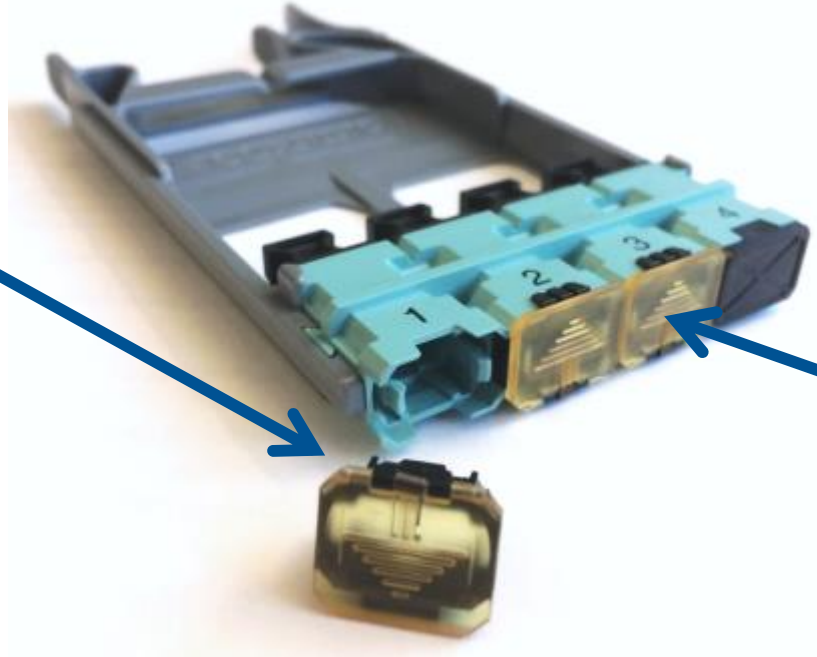
MTP/MTP/LC Port Tap Module Application



Corning integrated MTP-LC Tap modules allows network admins to monitor their networks without causing any disruption in their operational network

EDGE8™ Solutions
EDGE8 Panels

Product Family	Description	Product
EDGE8 MTP Panels	• 1, 2, 3 & 4-port MTP panels	



EDGE8™ Solutions

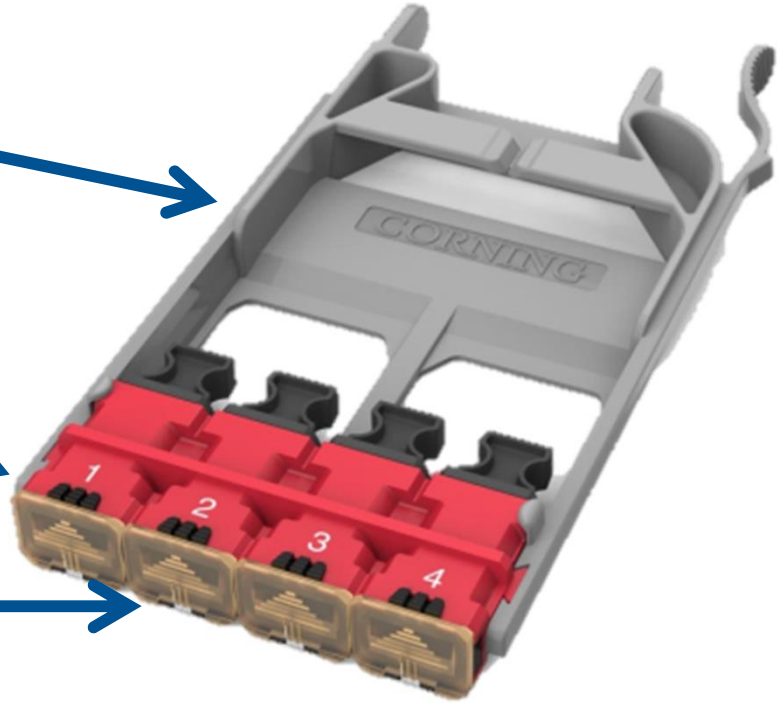
New EDGE8 Secure Panels

Product Family	Description	Product
EDGE8 MTP Secure Panels	• 1, 2, 3 & 4-port MTP panels with coloured Adapters • Available in 12 different colours	

Enables network segmentation by colour

Reverse Polarity MTP Adaptor

Shuttered MTP Adaptors

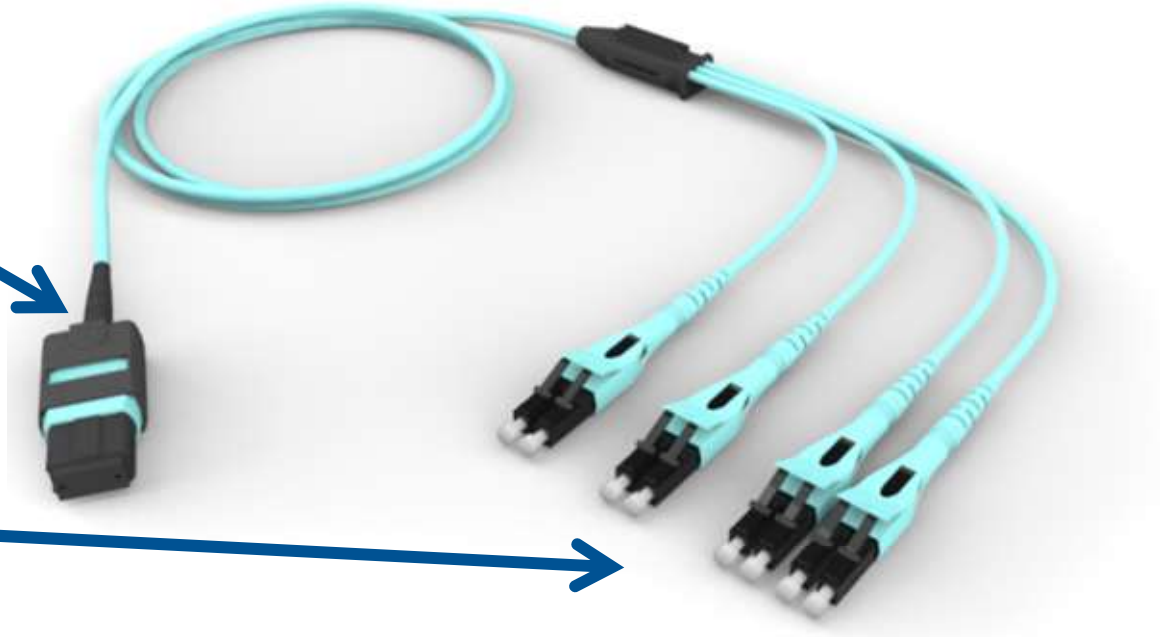


EDGE8™ Solutions
EDGE8 Harness

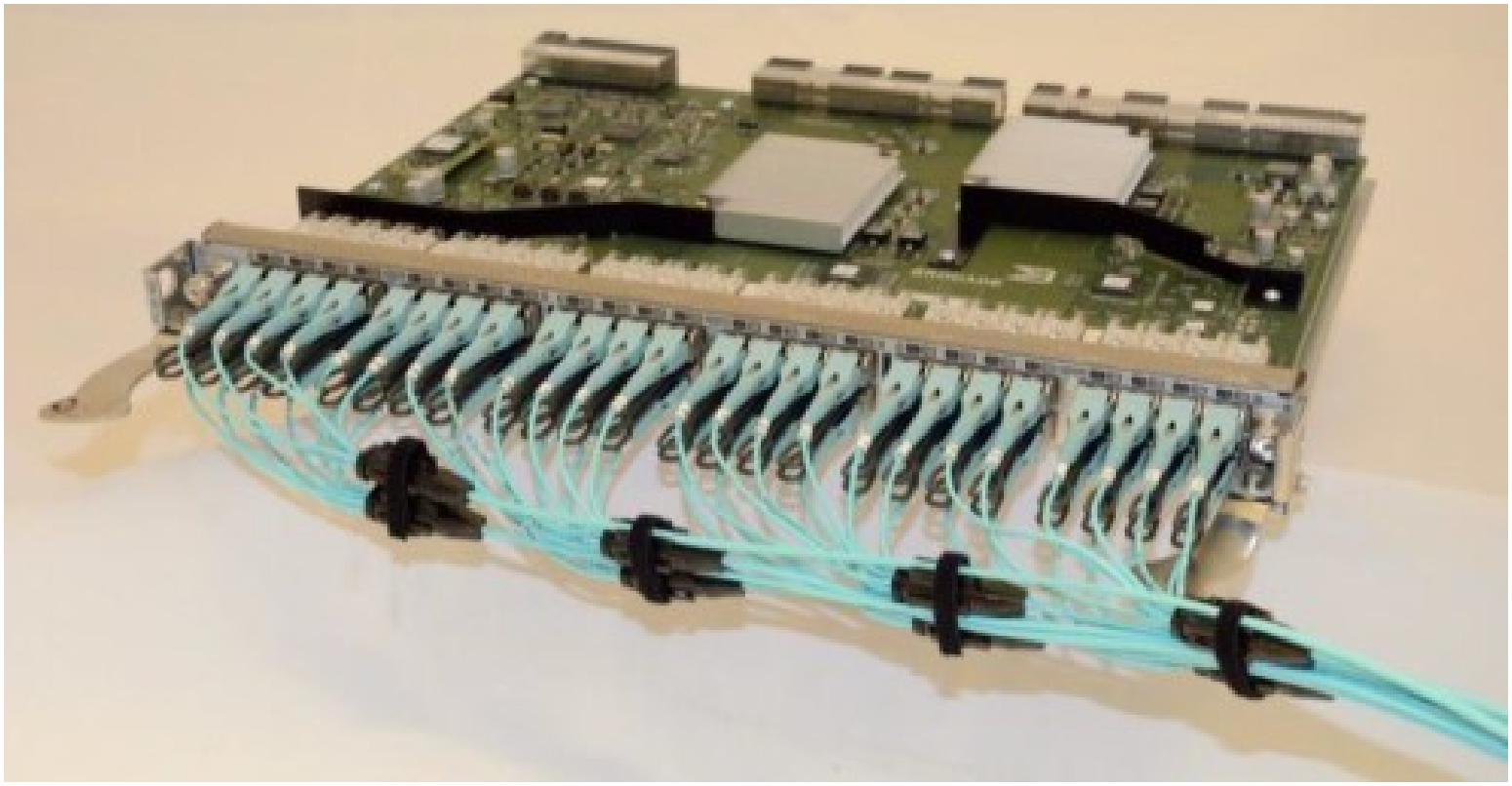
Product Family	Description	Product
EDGE8 Harness	• 8f MTP-LC Harness (Staggered and Non-Staggered)	

MTP-Pro Connector

4 port design matches all switch blades

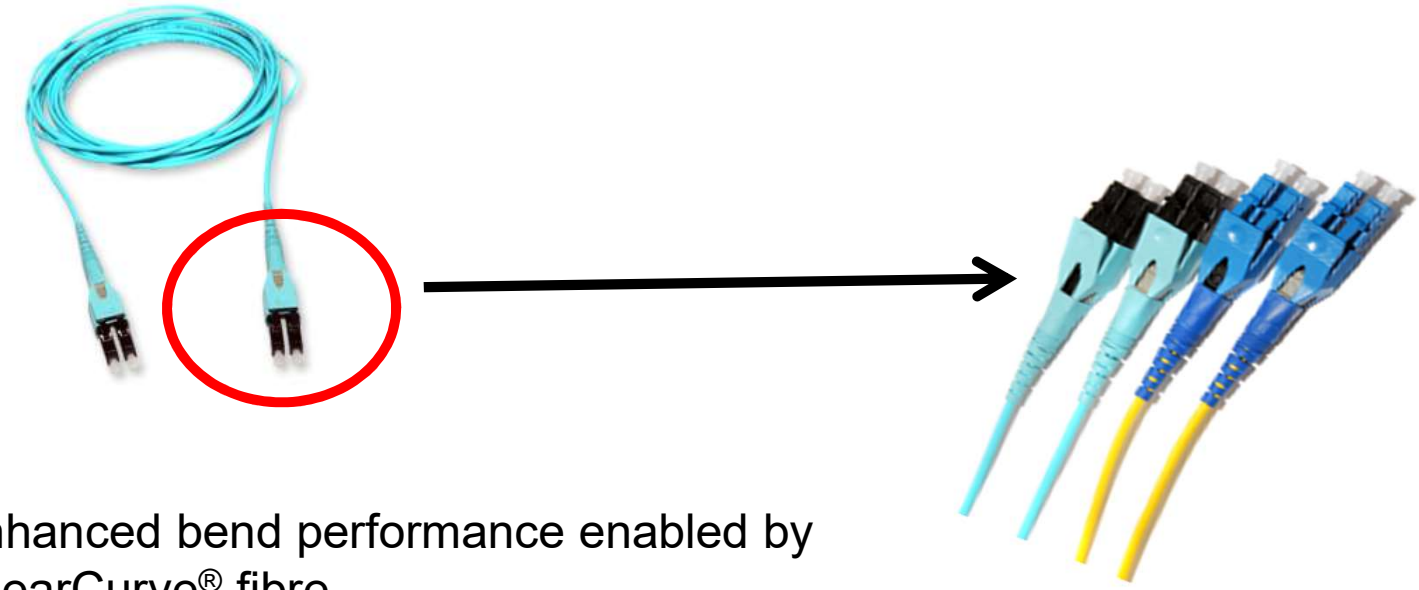


Optimized Harness Mapping



Uniboot LC Patch Cables

Product Family	Description
LC Uniboot patch cable	• Uniboot LC patch cable with polarity correction feature



- Enhanced bend performance enabled by ClearCurve® fibre
- Round 2.0 mm cable with no preferential bend
- Uniboot design that allows easy field polarity change

EDGE8™ Solutions

EDGE8 MTP Patch Cables

Product Family	Description	Product
EDGE8 Patch Cables	• **8f MTP Patch Cables**	

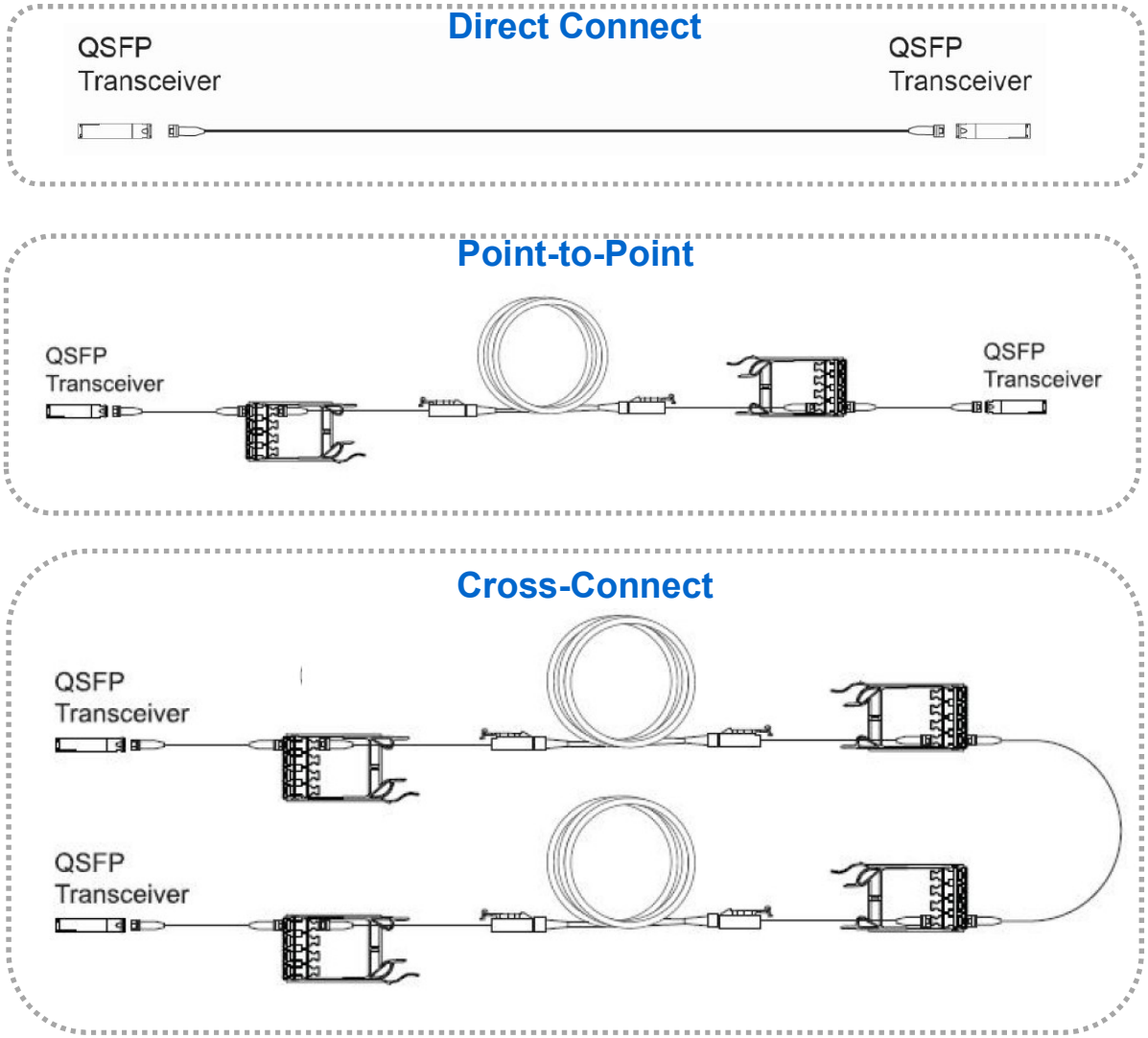
MTP-Pro Connector

Non Pinned MTP Connectors

2.0mm diameter
8 fibre design

Use same patch cable for **direct connect**, **point to point** and **cross connect** patching

Network Scenarios for MTP Patch Cable Usage

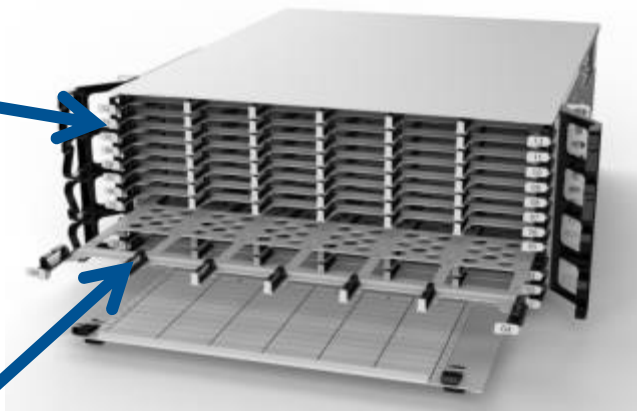


EDGE8™ Solutions
EDGE8 HD Housings

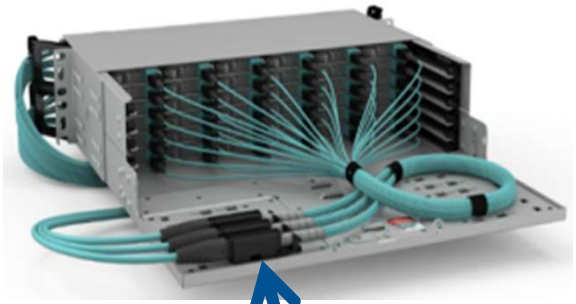
Product Family	Description	Product
EDGE8 Housings	• **1U, 2U, 4U**	 EDGE8™

288 port density
(LC or MTP)

6 slot design for 4-port modules
-Slide able trays allows easy finger access to individual port



576 duplex fibres
2,304 parallel fibres



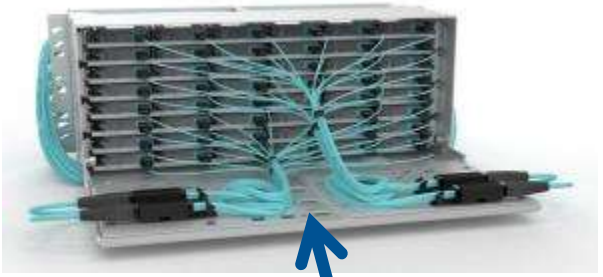
Retained EDGE Trunk mounting plate

EDGE8™ Solutions

New EDGE8 FX Housings

Product Family	Description	Product
EDGE8 Housings	• EDGE8 Fixed Housings • 1U, 2U, 4U	 EDGE8™

192 port density
(LC or MTP)



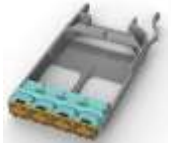
6 slot design for 4-port modules
-**Fixed Tray format**
- Reduced depth footprint

384 duplex fibres
1,536 parallel fibres

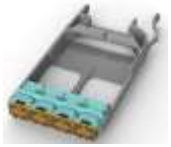
Retained EDGE Trunk mounting plate

Connectivity between two 40Gig QSFP Ports

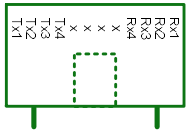
EDGE8 MTP
Adaptor Panel



EDGE8
Trunk

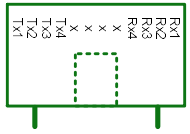


EDGE8 MTP
Adaptor Panel



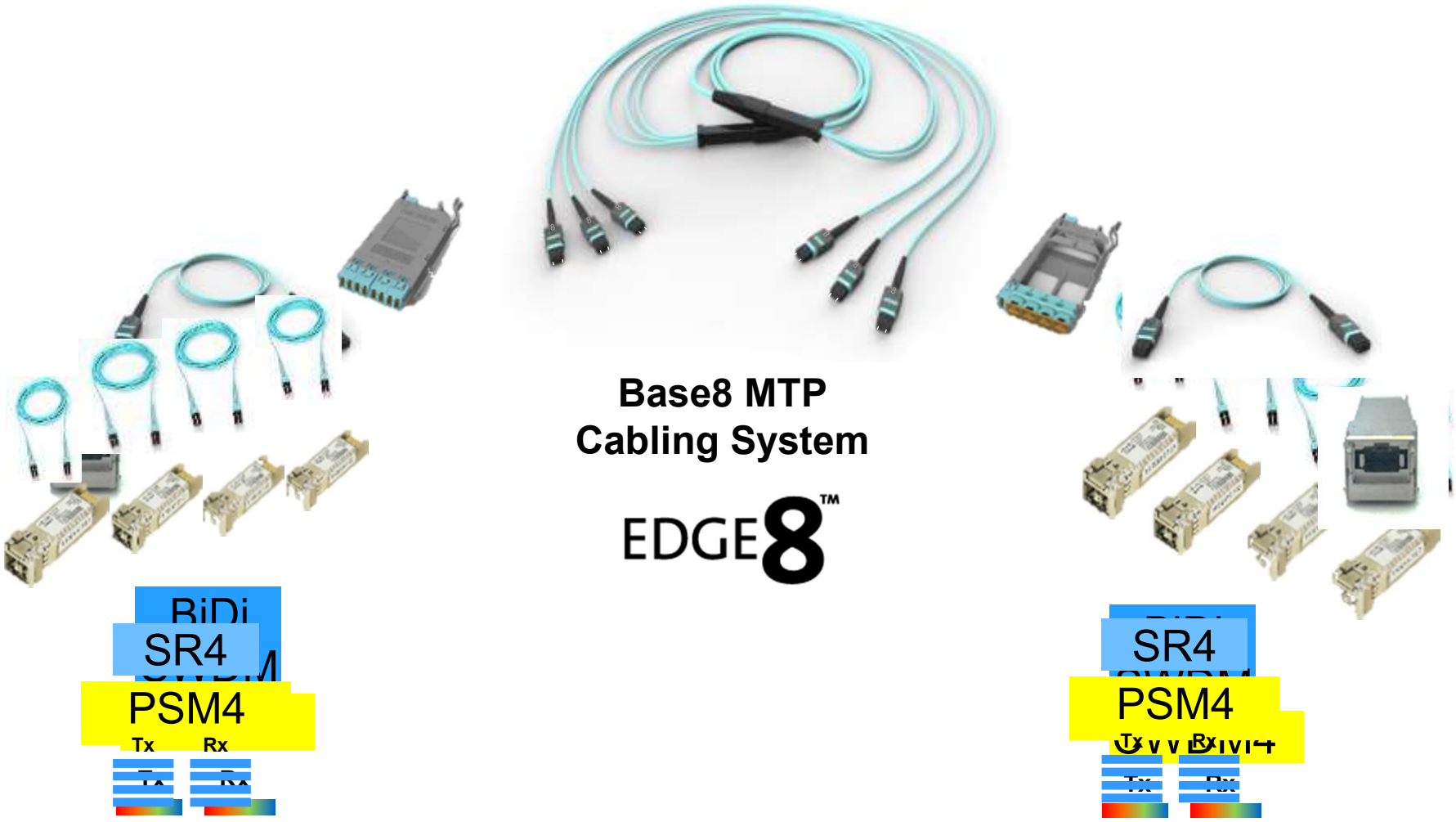
EDGE8 MTP
Patch Cable

EDGE8 MTP
Patch Cable



Summary

Duplex and Parallel Transceivers Offer Various Possibilities



EDGE8™ Solutions

Outstanding value in all areas of structured cabling

	Benefit	Value
Link Cost Savings	15-25% Savings	100% fibre utilisation without the need for conversion modules, result in 30% less MTPs in the link
Reduced Link Attenuation	50% Reduction in Parallel Link	By eliminating the Conversion Modules, we cut the link attenuation in half resulting in longer SR4 link distances
	30% Reduction in Duplex Link	Standard MTP-LC EDGE8 module has a loss of 0.35dB as compared to 0.5dB for standard MTP-LC EDGE modules.
Migration	100% fibre utilisation	Allows 100% fibre utilisation for 4-channel (SR4, PSM4, etc) and 8-channel (SR8, LR8)
Patch Cable Complexity	67% Reduction in Inventory	Pinning the trunks allows for a single pinless patch cable deployment for all installations, reducing stocking and deployment complexity.
Port Mapping	Optimised Port Breakout	With 8f pigtailed modules all 4-channel parallel protocols (SR4, PSM4, etc) are now mapped cleanly to a single port
	Optimised Harness Mapping	Allows for 24, 32, 36, 48-port blades on large chassis switches to be cabled with 8f harnesses without having to deal with unutilised fibre/connectors.
Passive Optical Tapping	Performance Monitoring	Allows integration of network performance monitoring of SAN and LAN networks for greater system uptime and simplified trouble-shooting

Agenda

1) Corning Introduction
2) Fiber Introduction
3) PNP- Corning EDGE/EDGE8 Solutions
Preterminated Optical Fiber Cabling for Datacenters

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Story of EDGE
Technology Roadmap
Story of EDGE8

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5) Order tracker
6) Workshop- hands on

7) MTP PRO

CORNING

Optical Communications

Copper Cables and system components

Cable Classes & Cable Constructions: Nomenclature to ISO/IEC 11801 Ed. 2 (2002)

U/UTP (UTP)
Unshielded core/Unshielded Twisted Pair

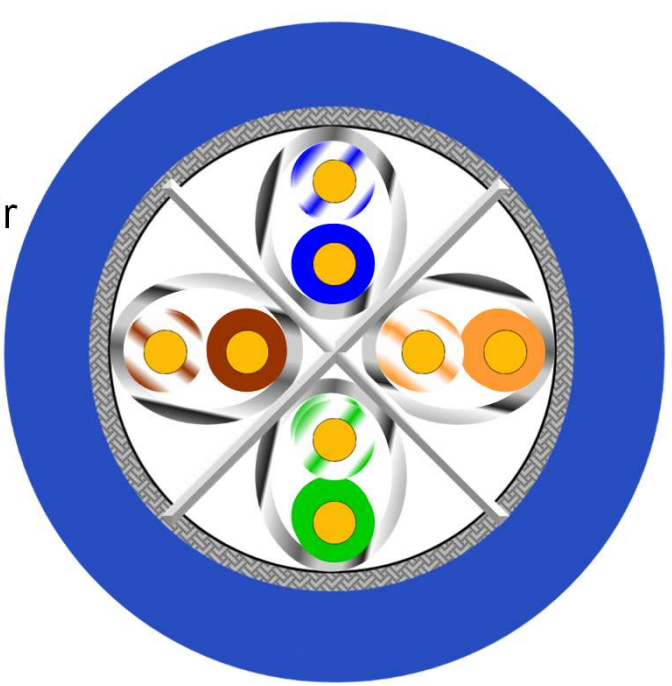
F/UTP (FTP)
Foiled core/Unshielded Twisted Pair

SF/UTP (S-FTP)
Shielded Foiled core/Unshielded Twisted Pair

U/FTP (STP)
Unshielded core/Foiled Twisted Pair

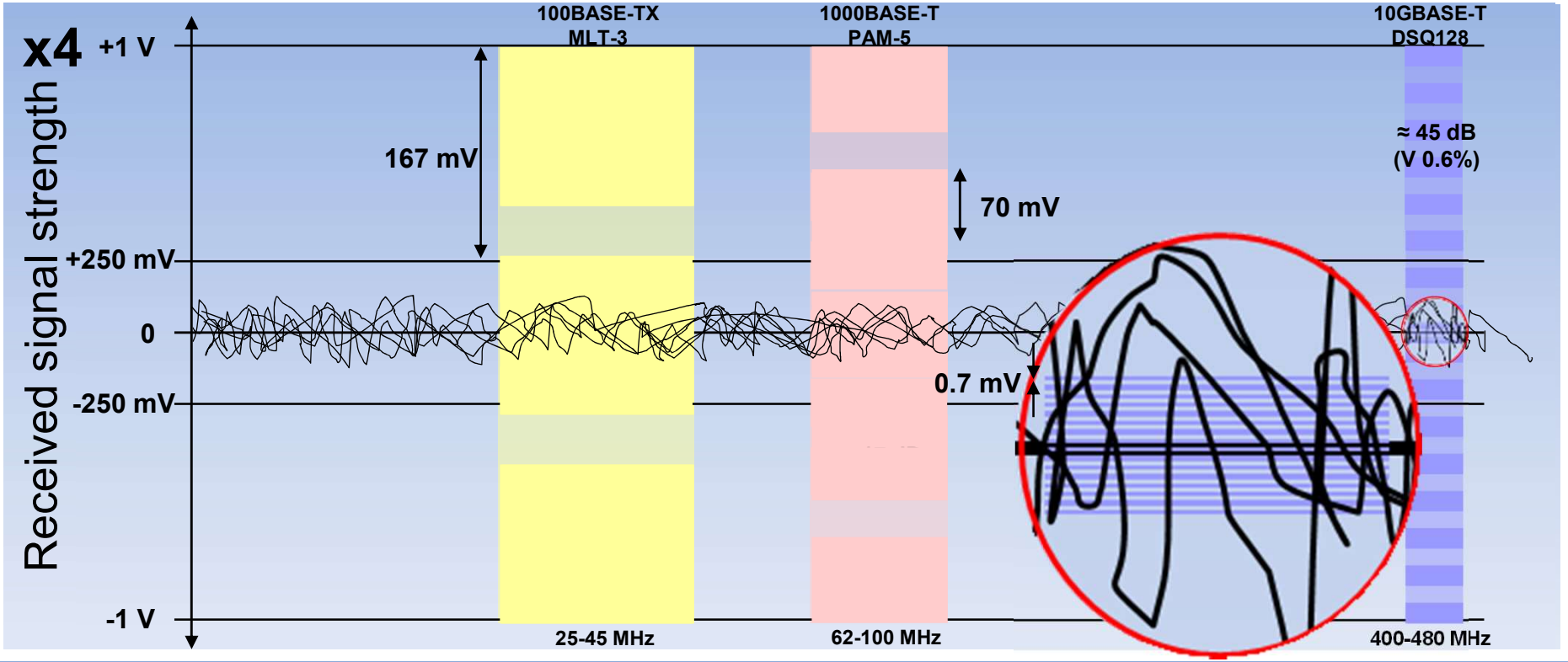
F/FTP (STP)
Foiled core/Foiled Twisted Pair

S/FTP (S-STP)
Shielded core/Foiled Twisted Pair

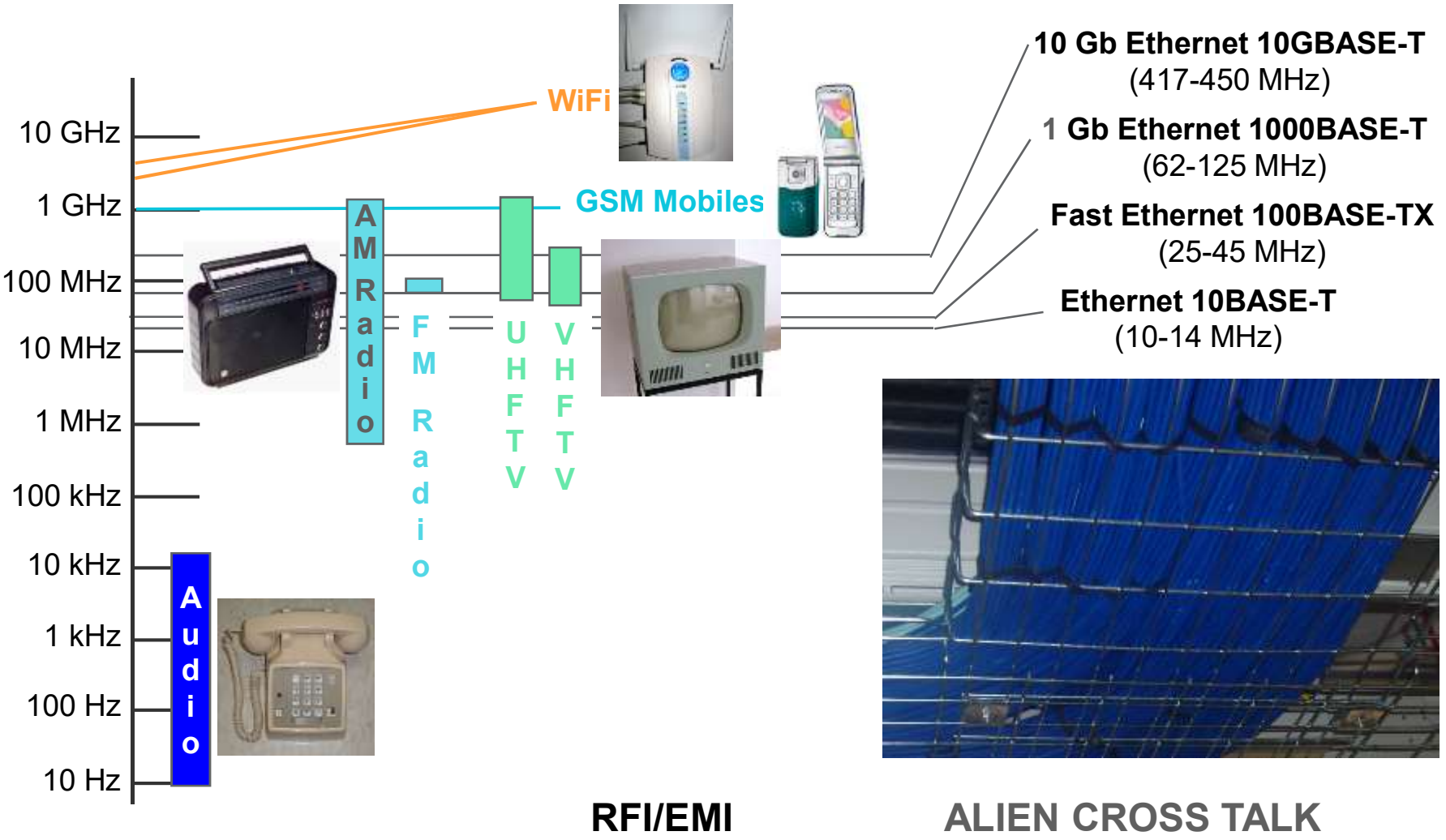


Advantages of S/FTP Cables: Noise Immunity
10GBASE-T & Noise

- Noise from pairs in the same cable (PSNEXT), (PSACR-F) and echo combine with received signal (can be removed by advanced DSP – technique)
- Aliens from adjacent cables (alien crosstalk) and from sources of Radio-Frequency and Electro-Magnetic Interference – RFI/EMI



Advantages of S/FTP Cables: Noise Immunity
Noise Sources



Advantages of S/FTP Cables: Noise Immunity Aliens and 10GBASE-T Transmission

- Alien Crosstalk (AXT) = undesired coupling from adjacent channels
  - In cables, cords and connectors
  - Cannot be electronically compensated

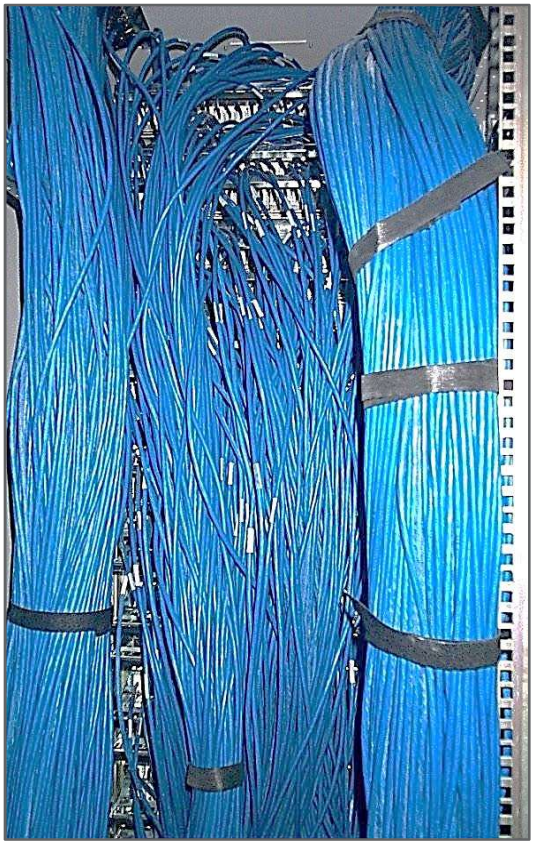
- RFI/EMI are caused by RF sources, power cables, electrical surges (industrial machines/lifts)

- Aliens overlays the signal ⇒ bit error

ONLY SHIELDED CABLES CAN ENSURE NOISE IMMUNITY

Data Centers and Alien Cross-Talk

Where you have no problem with shielded cabling ...



... count on them with unshielded!

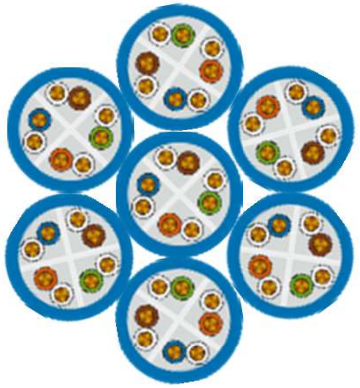
ANEXT makes the Difference

(ANEXT = Alien Near End X-Talk)

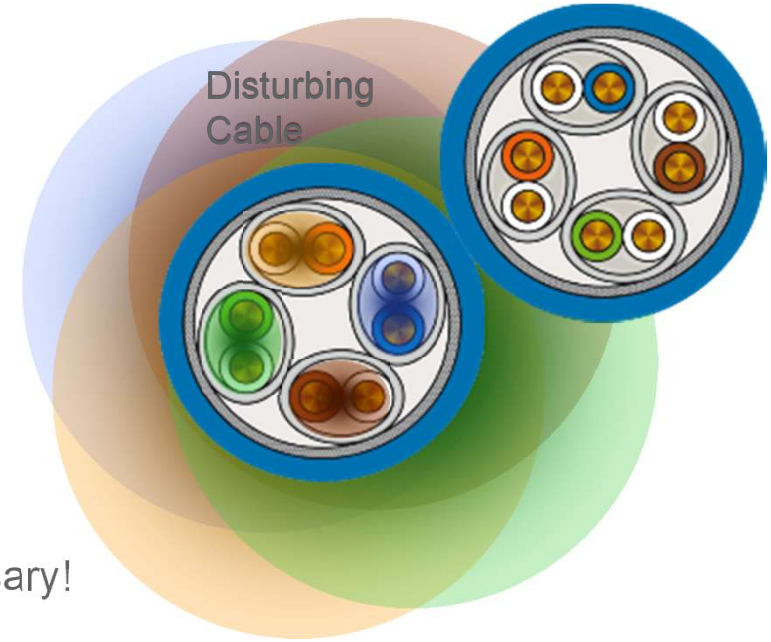
Measurement “6-around-1” Method: 6 disturbing cables around 1 victim cable

(Measurement of the influence of each pair of the disturbing cables on each pair of the victim cable)

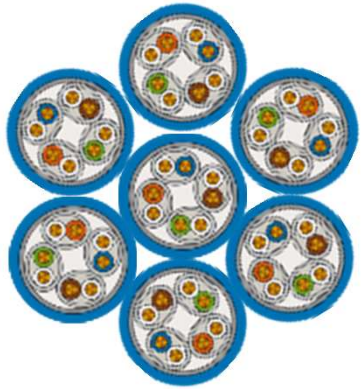
Unshielded Bundle (U/UTP)



Measurements necessary!



Shielded Bundle (S/FTP)



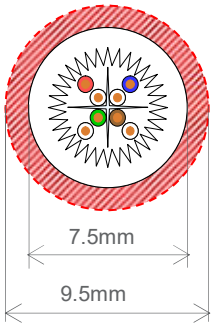
No measurements necessary!

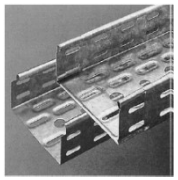
And all other ALIEN sources are not taken into account!!!

50% more S/FTP$_{CAT.6_A}$ in same space as U/UTP$_{CAT.6_A}$

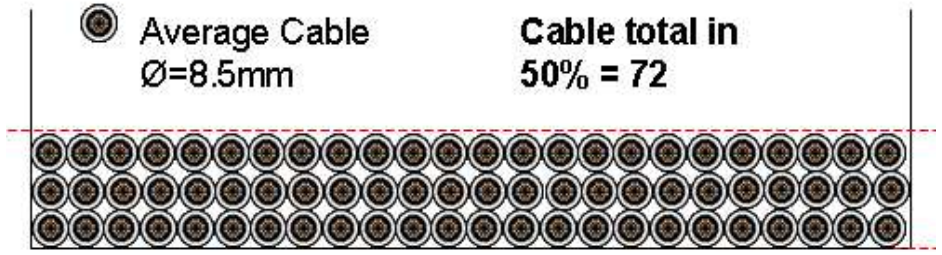
U/UTP
CAT.6_A

Cable Ø
7.5 up to 9.5mm



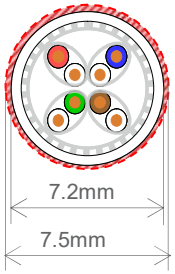


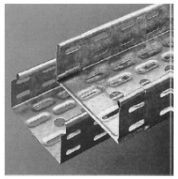
Cable tray
200x60 mm



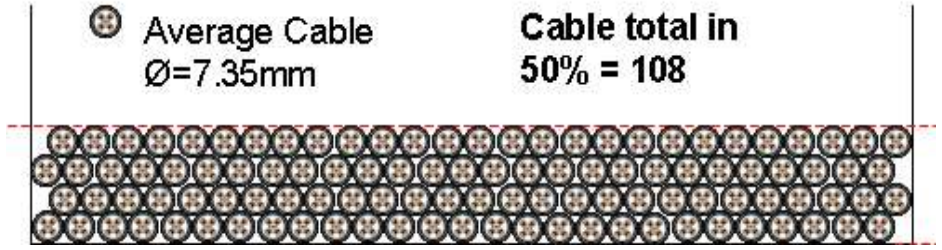
STP
CAT.6_A

Cable Ø
7.2 up to 7.5mm





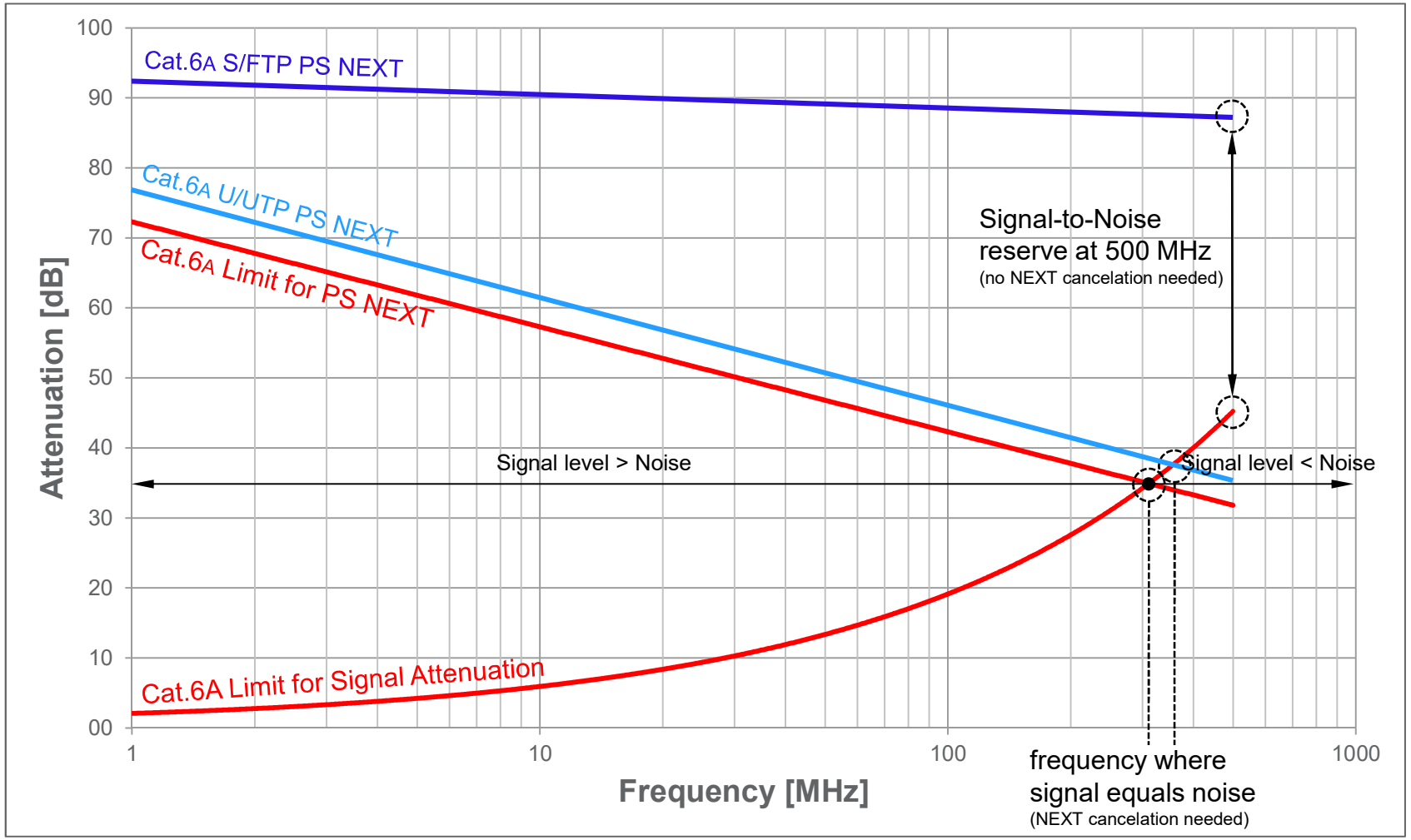
Cable tray
200x60 mm



Category 6_A S/FTP cable is smarter than a Category 6_A U/UTP cable!

The Performance Triangle

defined by **Frequency**, **Signal Attenuation** and **PS NEXT**(PowerSum Near End X-Talk)



Interference Immunity in 10GBit operation mode

tested by GHMT AG

Parameter	U/UTP	S/FTP
Immunity to Electrostatic discharge IEC/EN 61000-4-2	✗	✓
Immunity to Radiated RF, EMF IEC/EN 61000-4-3	✗	✓
Immunity to Electric fast transient / burst IEC/EN 61000-4-4	✗	✓
Immunity to Conducted disturbances induced by RFF IEC/EN 61000-4-6	✗	✓

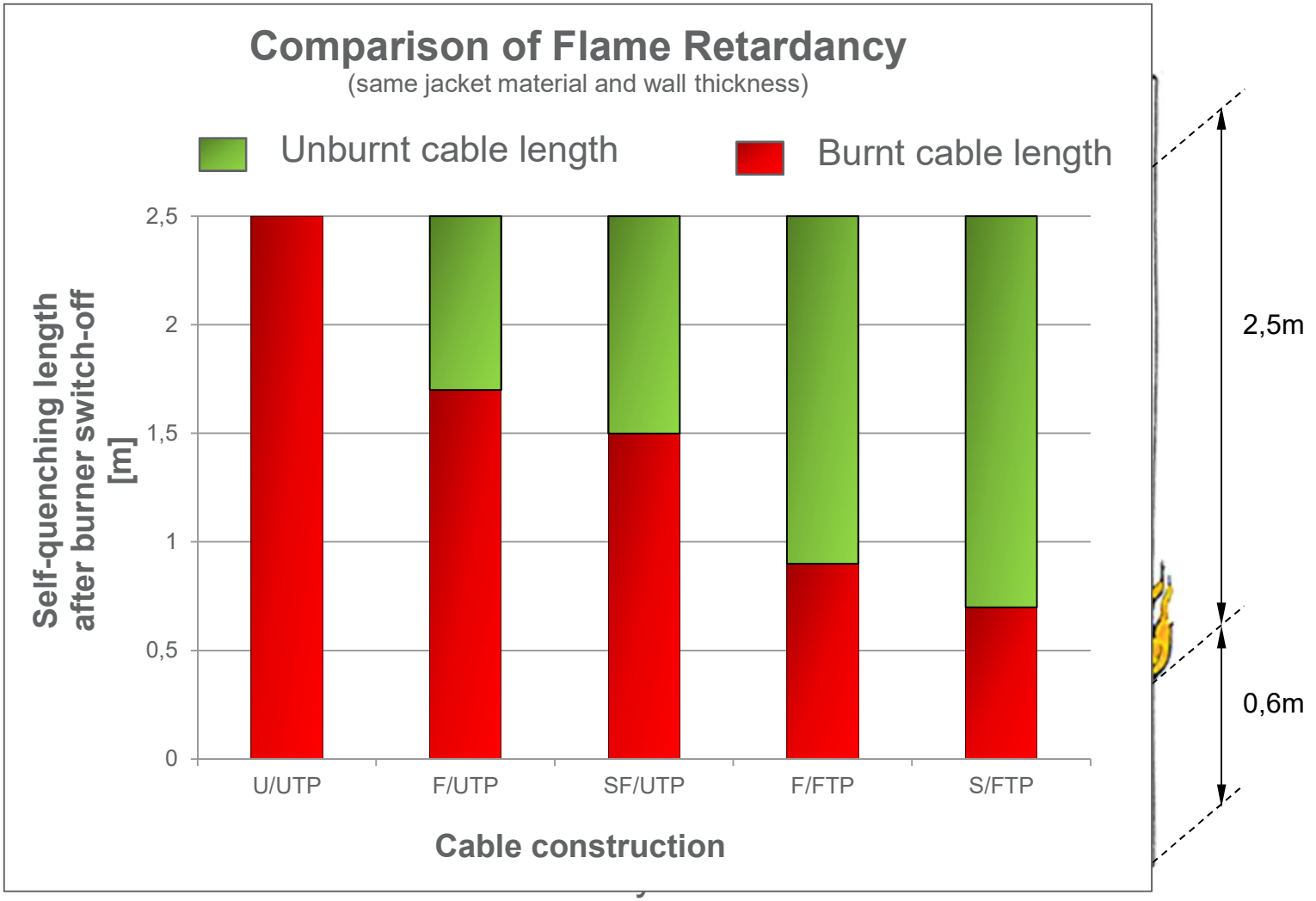
✗ Influence on the system (break in data transmission) ✓ No influence on the system

Practical Tests during 10GBit data transmission

performed by GHMT lab

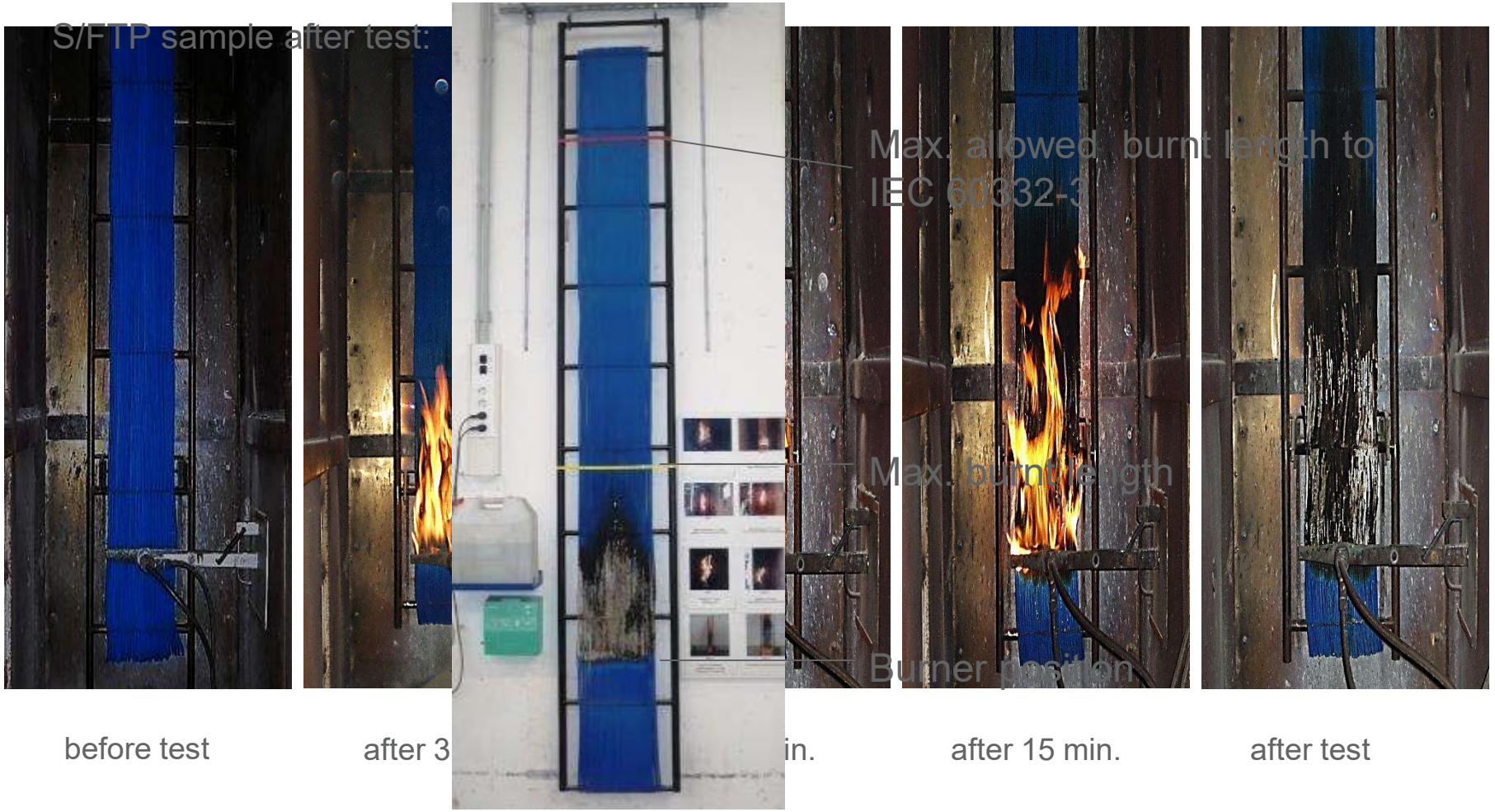
Practical Test	U/UTP	S/FTP	
	✗	✓	Walkie-Talkie Pressing „Talk“ button @ 3m distance
	✗	✓	Mobile Telephone Use of GSM card @ 3m distance
	✗	✓	Power Cable Power cable directly along Data cabling
	✗	✓	Fluorecent Tube Active neon tube @ 0,5 m distance

Flame Retardant Characteristics



Flame Retardance Test in Reality

S/FTP sample after test:



before test | after 3 | in. | after 15 min. | after test

Summary of Copper Cabling

S/FTP cables: clear advantages over U/UTP or F/UTP solutions in today's 10 G Data Center applications:

- Best NEXT and ANEXT margins provides safety margins "to the edge of the cliff": **Future Proofed and Upgradeable**
- S/FTP cables - the best Alien Crosstalk performance, almost **Immune to Any Disturbance**
- No ANEXT measurements at installation site necessary, general handling similar to other cabling solutions, more robust materials: **Quick and Less Complex Installation**
- Best performance in fire resistance; EMC and Data Extraction Tests: **Highest Level of Safety and IT Security**

Future*Com* E
S250 Modules, Category 6

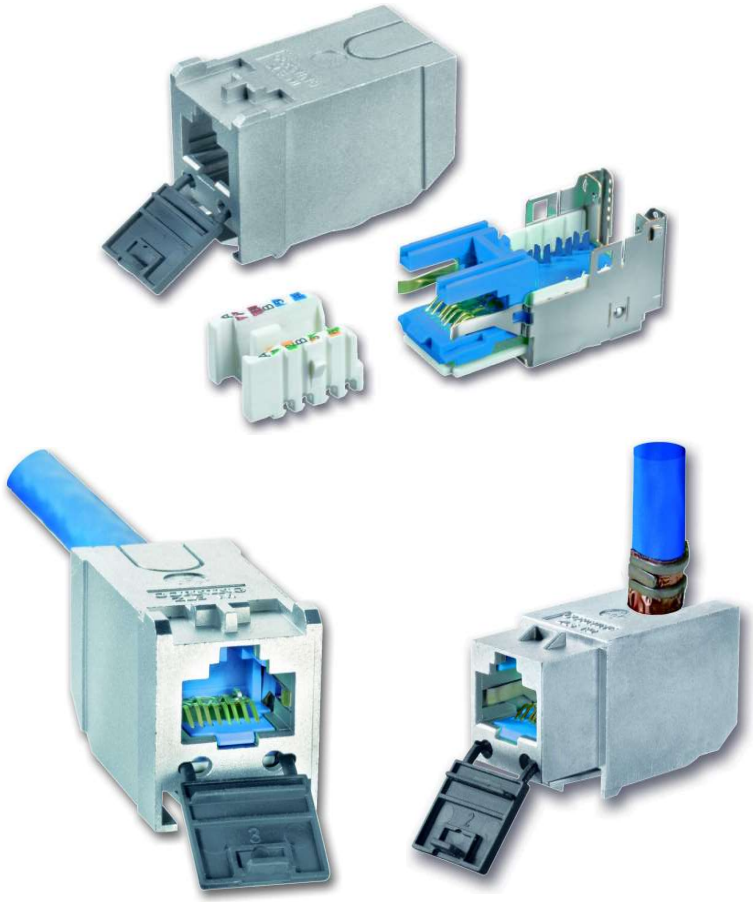
- Fully compatible with the modular LANscape outlets and patch panels
- Low parts count
- No special tools required
- High density package
- Low noise susceptibility due to individual shielding of the modules
- Compatible with all Future*Com* E and F cables

Future*Com* EA
xs500 Module, to Cat.6_A ISO/IEC 11801 Ed. 2.2

- Fully compatible with the keystone outlets and patch panels
- Only 2 parts (Cu tape separately)
- Available with Keystone footprint
- Additional LANscape adapter available
- Low noise susceptibility due to individual shielding of the modules
- Compatible with all Future*Com* Cat.6_A up to Cat.7_A cables (AWG23 to AWG22)

Future*Com* EA
S500 Module, to Cat.6_A ISO/IEC 11801 AMD:2 (2010)

- Fully compatible with the modular LAN*scape* outlets and patch panels
- Only 3 parts (Cu tape separately)
- Available with LAN*scape* modular footprint or with Keystone footprint
- Additional 90° strain relief available
- Low noise susceptibility due to individual shielding of the modules
- Compatible with all Future*Com* Cat.6_A up to Cat.7_A cables

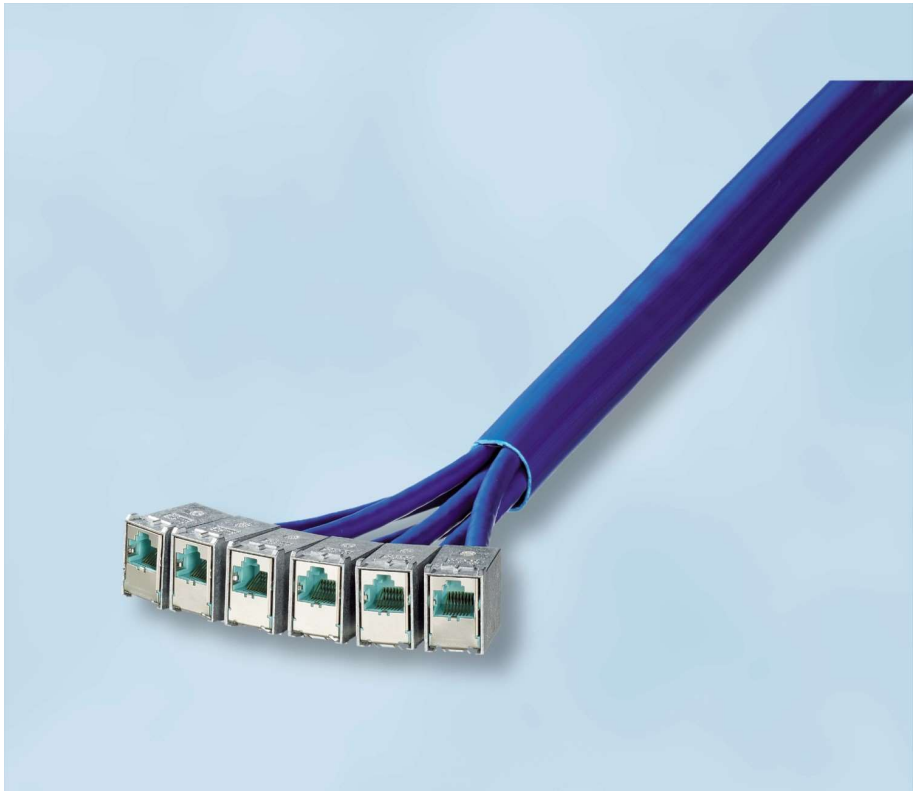


Future*Com*
„Plug & Play“ Solutions

- Pre-assembled at the factory- reduce the time to install
  (“Plug & Play“)
- Prevention of assembly errors on site by 100% quality testing in the factory
- Specified according to the system’s Class
- Length in 5 m - steps from
  10 m up to 95 m available
- Additional cable strain relief pre-assembled (only S250 & S10^{TEN})

Future*Com*
Plug & Play Solutions

- Pre-assembled at the factory- reduce the time to install
  ("Plug & Play")
- Prevention of assembly errors on site by 100% quality testing in the factory
- Specified according to the system's Class
- Available overjacketed or sewn
- Length in 5 m - steps from
  10 m up to 95 m available
- Additional cable strain relief pre-assembled (only S250 & S10^{TEN})



Future*Com*
Plug & Play Solutions Consolidation Point Cable

- Pre-assembled at the factory- reduce the time to install ("Plug & Play")
- Prevention of assembly errors on site by 100% quality testing in the factory
- Specified according to the system's Class
- Available in different lengths
- Additional cable strain relief pre-assembled (only S250 & S10^{TEN})

FutureCom Modular: a complete Solution

Outlets
WAXWSE-S0201-C001

Patch panels
WAXWSV-02400-C001

Floor boxes mounting plates
CAXXSU-01200-C012

Consolidation point housings
WAXWSW-00008-C015

Future*Com*
RJ45 Patch Cords

- Outstanding transmission performance
- RJ45 fully assigned for 1GbE or 10GbE according to the system Class
- S/FTP Patch cord cable, with high-performed RJ45 connector
- Specified according to the system Class
- Full range of colors, and different length available

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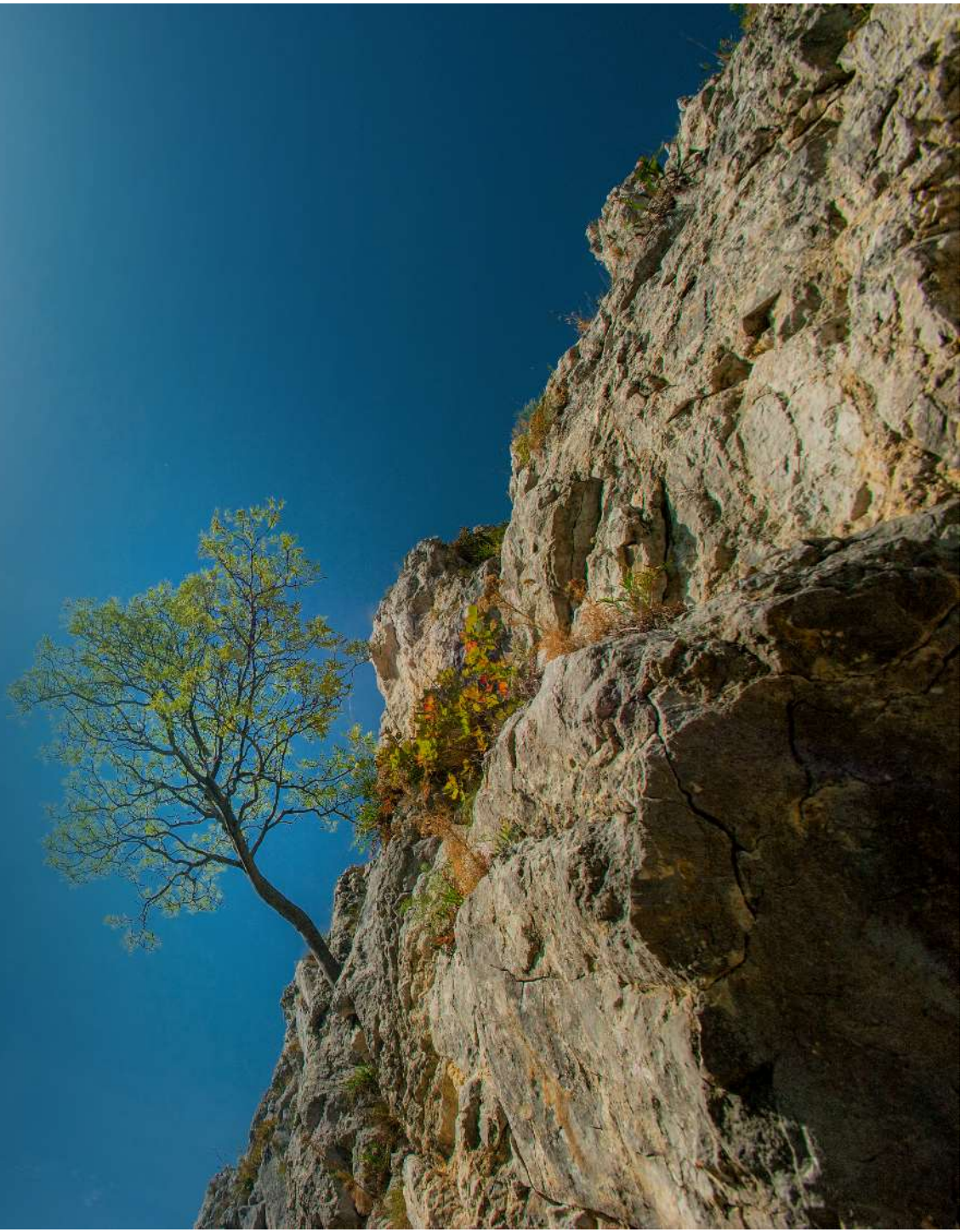
Hands on!



Agenda

1) Corning Introduction
2) Fiber Introduction
3) PNP- Corning EDGE/EDGE8 Solutions
Preterminated Optical Fiber Cabling for Datacenters

Structured Cabling
Story of EDGE
Technology Roadmap
Story of EDGE8

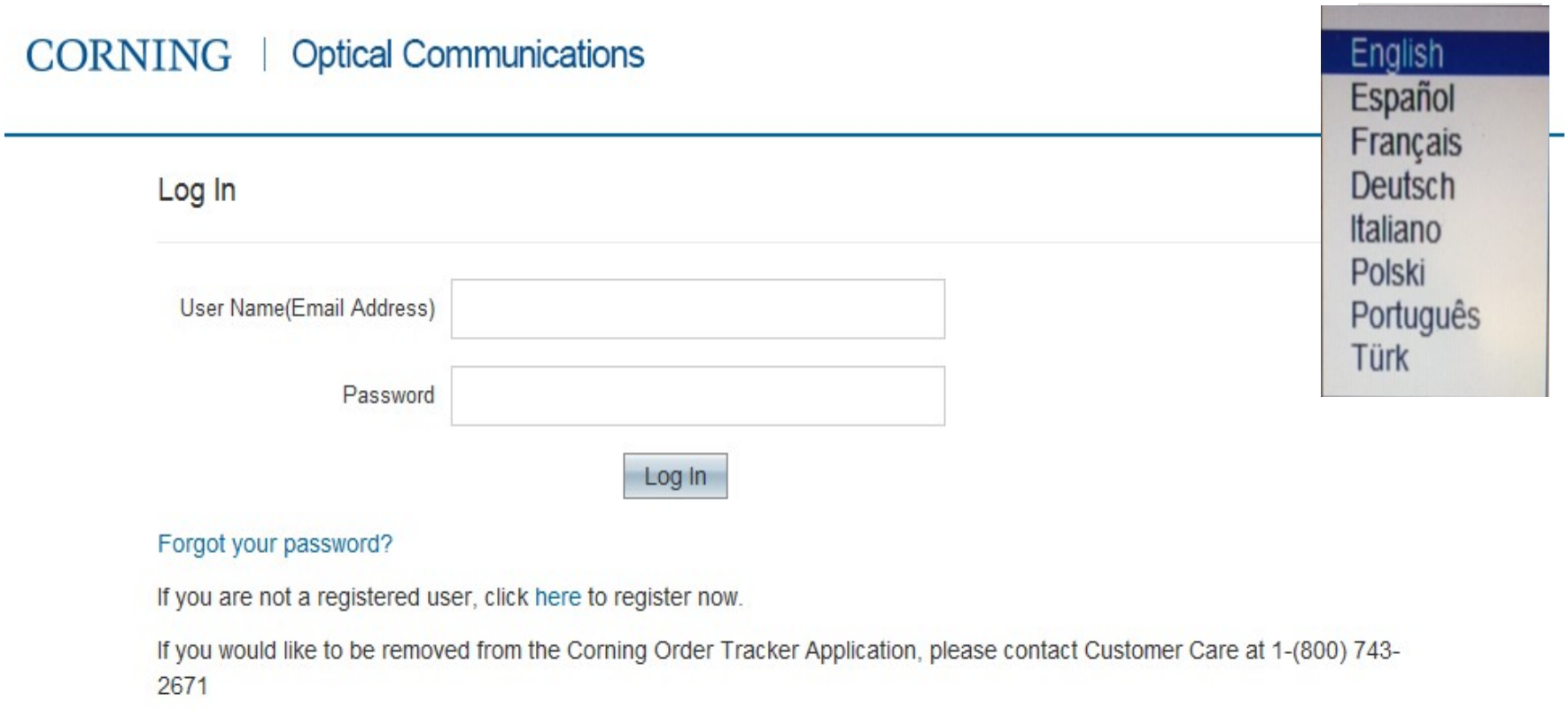
4) Copper Solutions
5) Order tracker
6) Workshop- hands on

7) MTP PRO

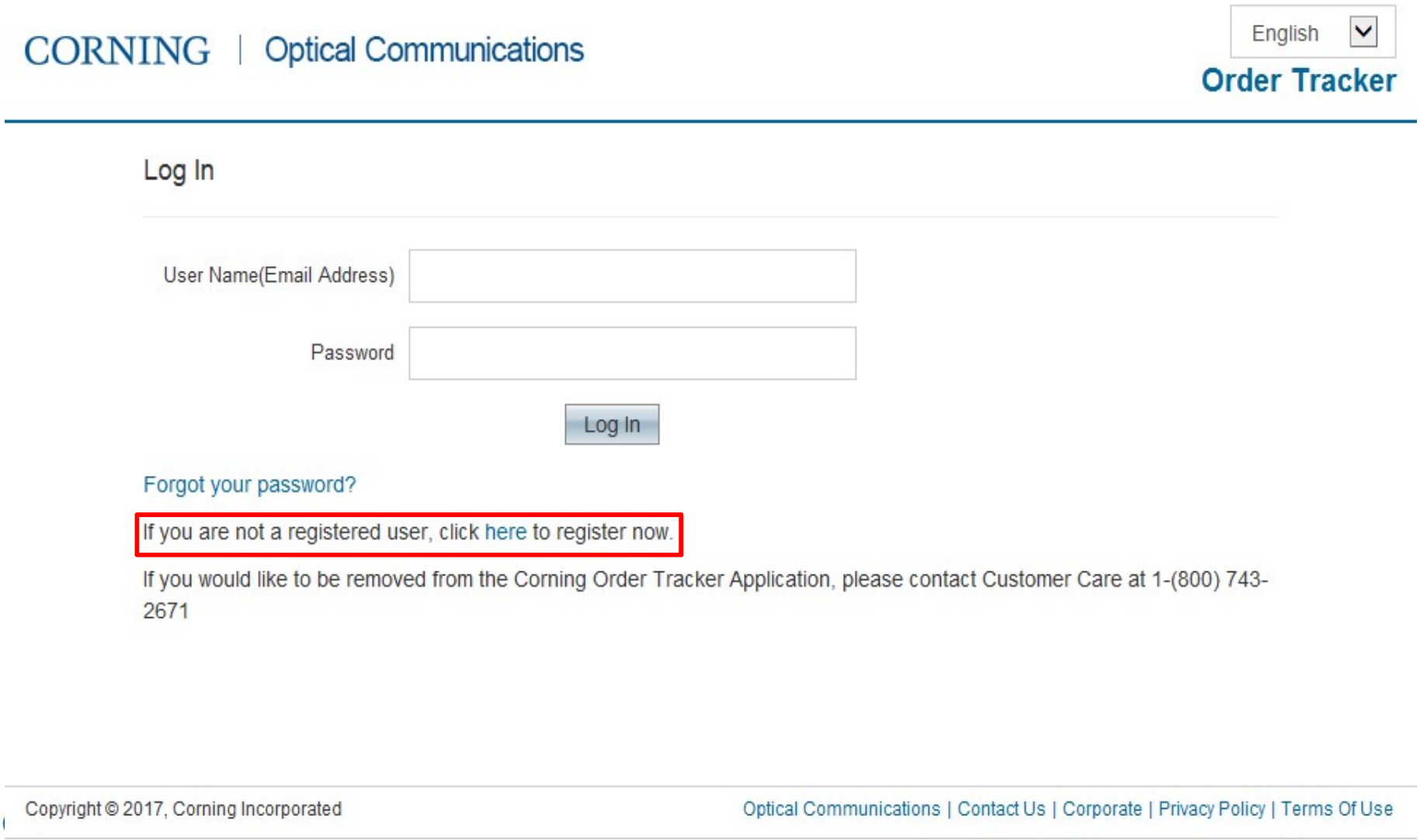
CORNING

Corning Order Tracker

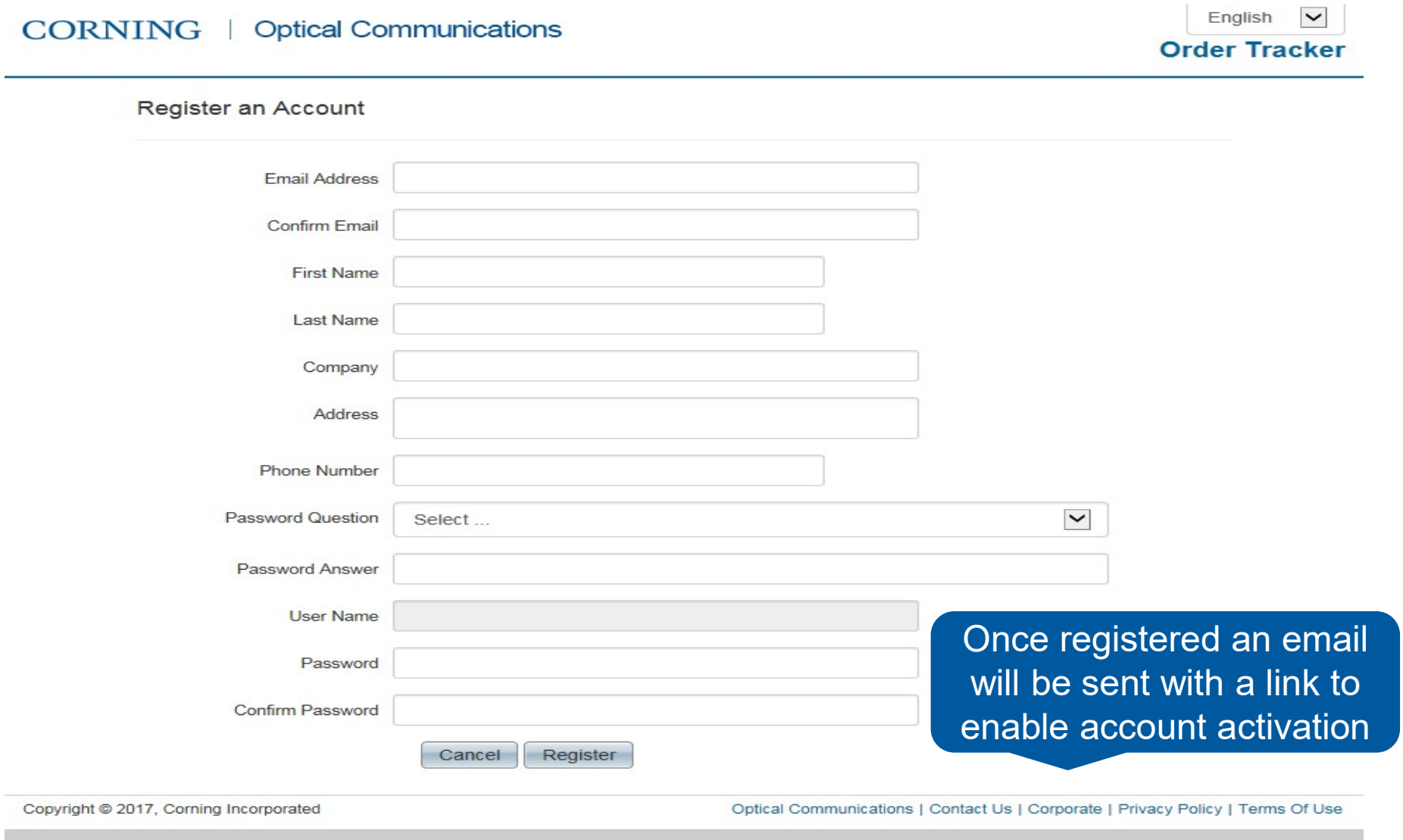
Order Tracker – Login in



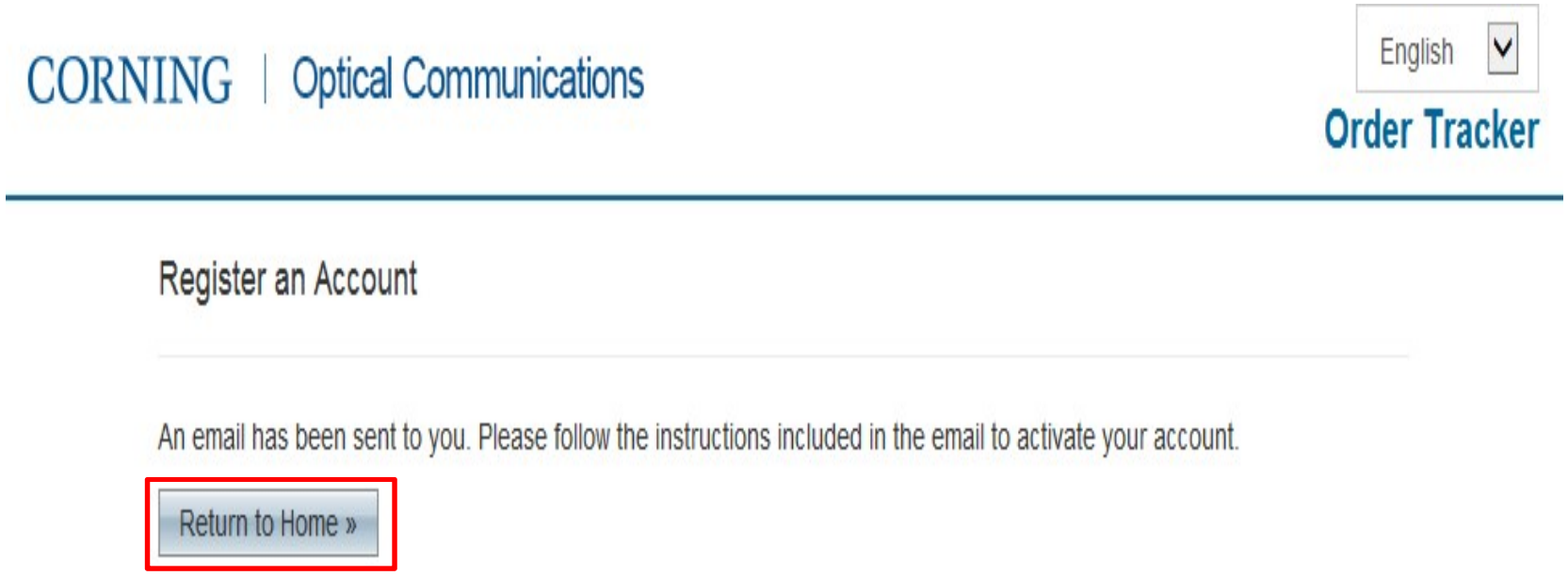
Order Tracker – First time User - Registering



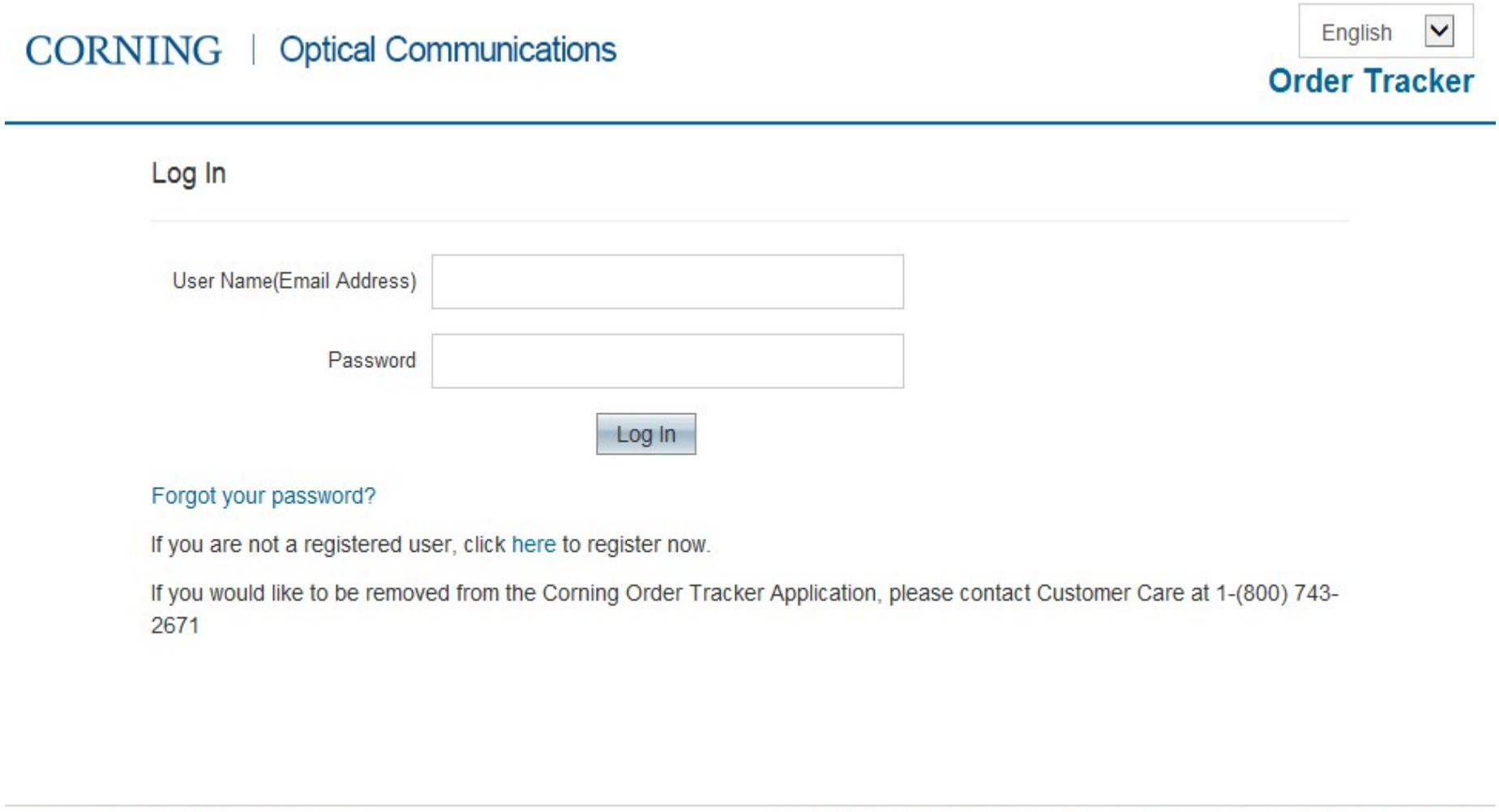
Order Tracker - First time user - Registering



Order Tracker – Account Registered



Order Tracker – Remember to check “activate account” email



Order Tracker – Activate account email

From: WMO <emailclerk@corning.com>
Date: 16 November 2017 at 10:32:58 CET
To:
Subject: Please activate your account.

Please activate your account.!

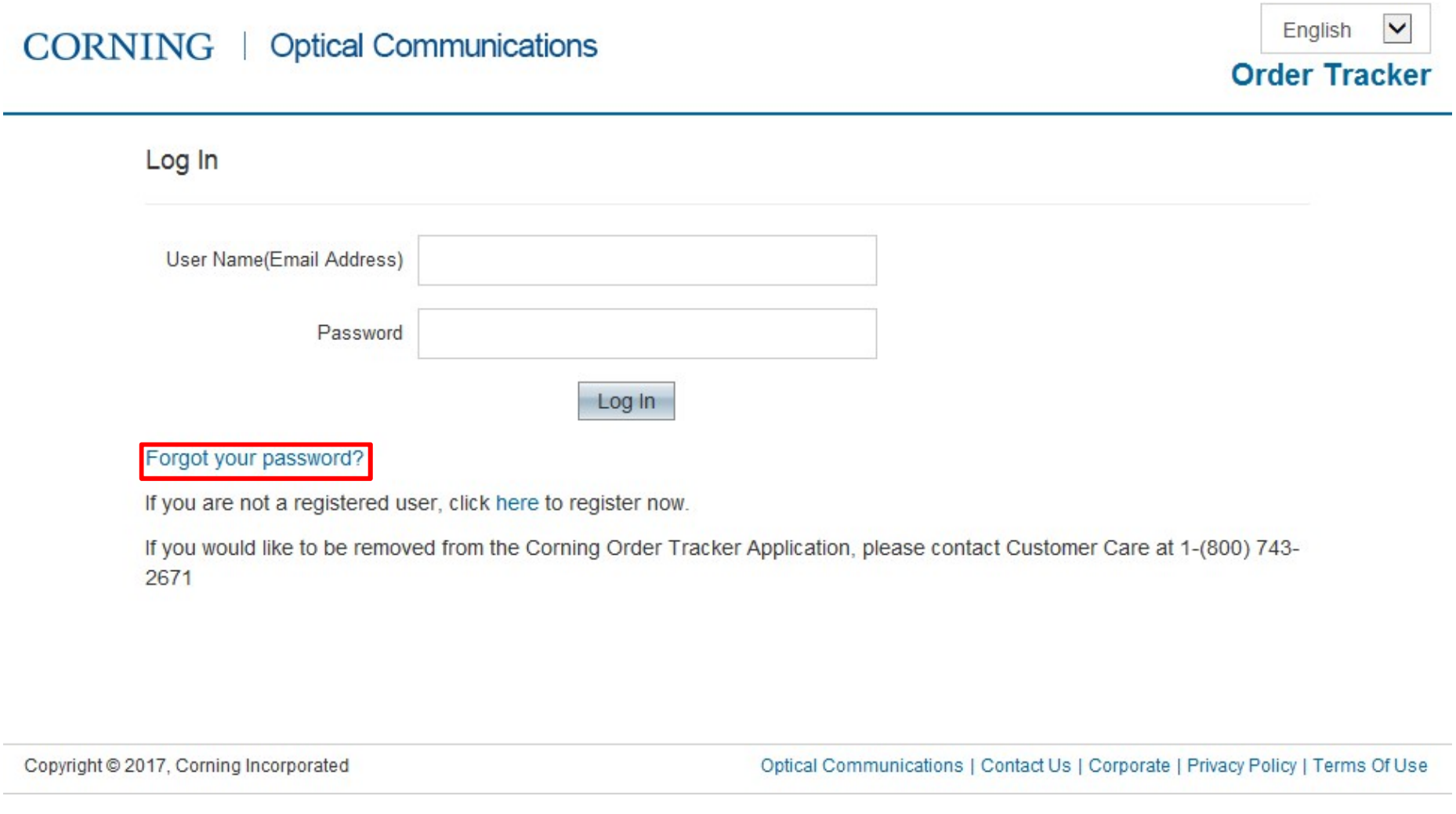
This email confirms that you have registered an account with *Order Tracker*.

You must activate your account to access the site. Activate your account by clicking here.

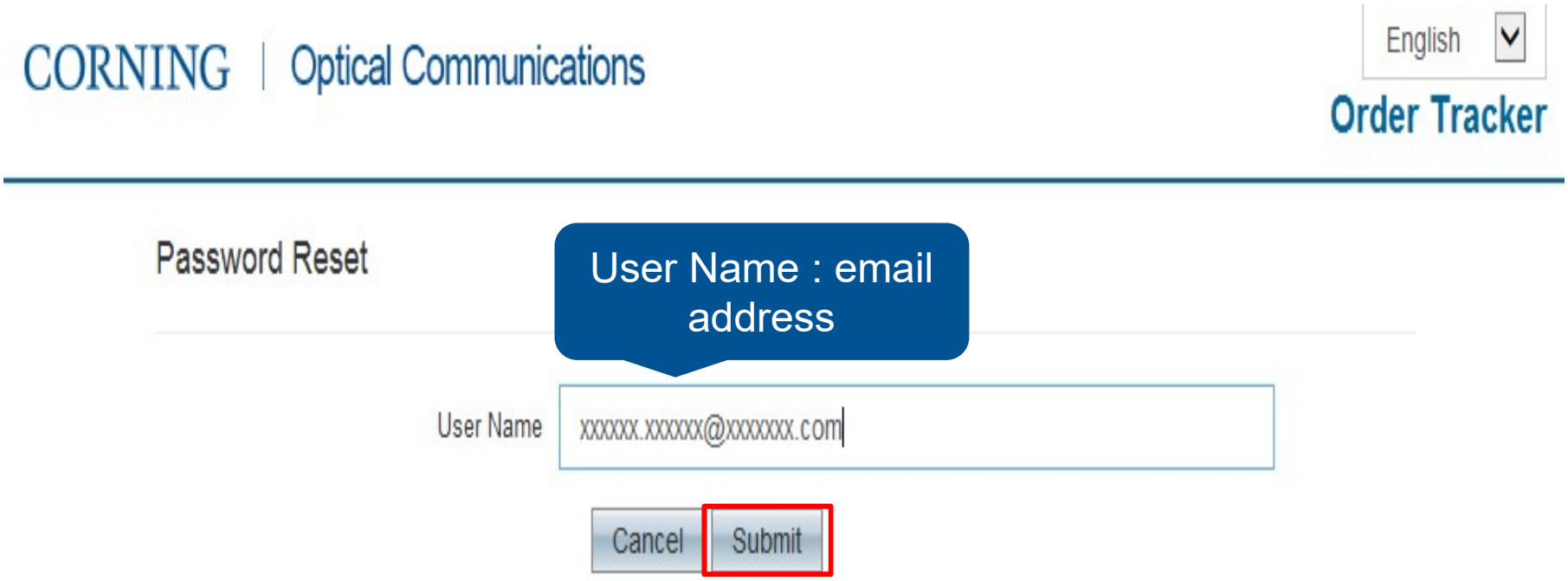
This email was auto generated by Order Tracker. Please do not reply to this email.

Order Tracker – Account activated

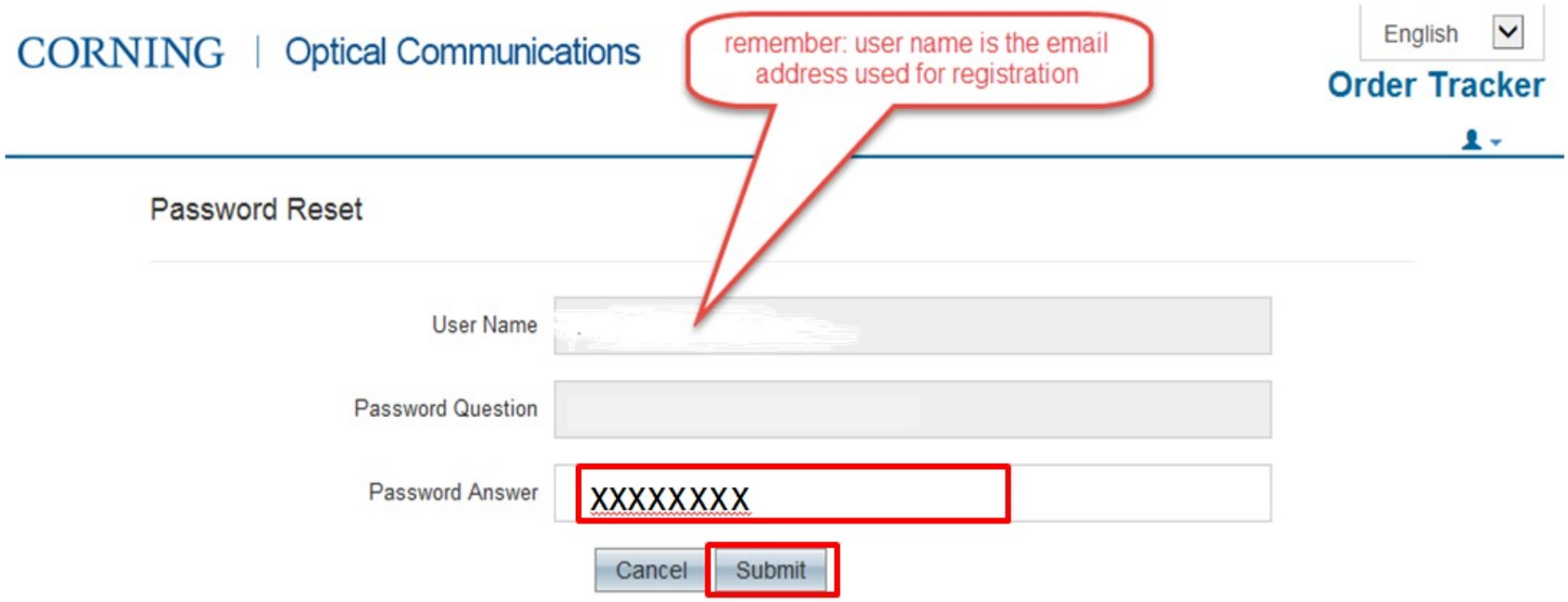
Order Tracker – Forgot password?



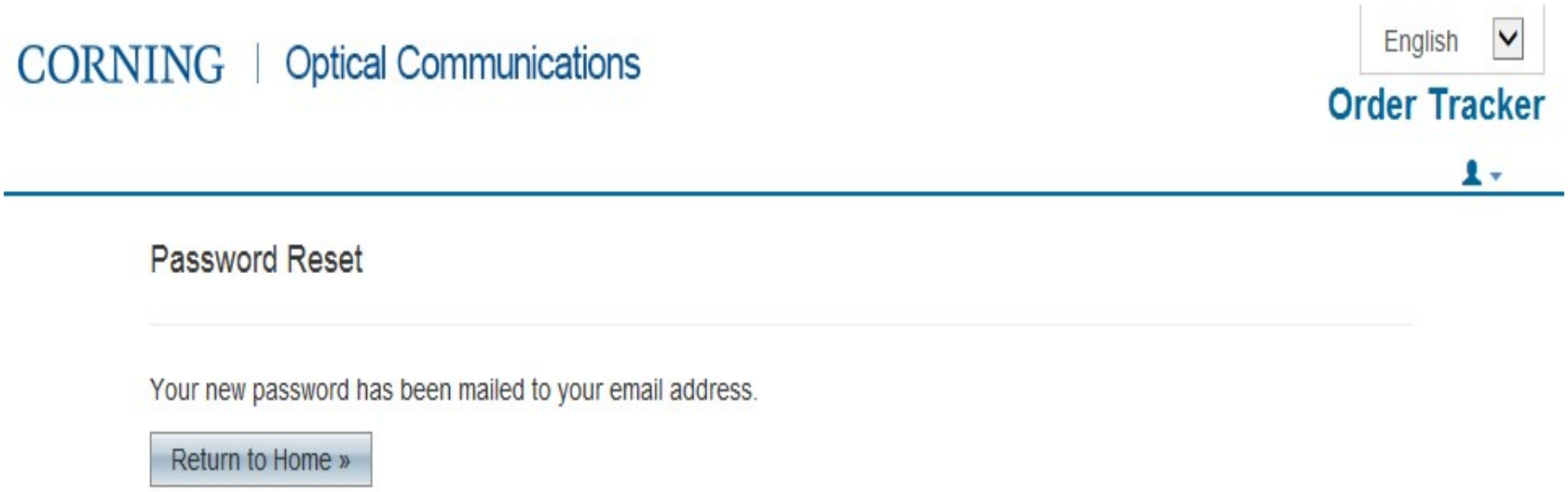
Order Tracker – Password Reset



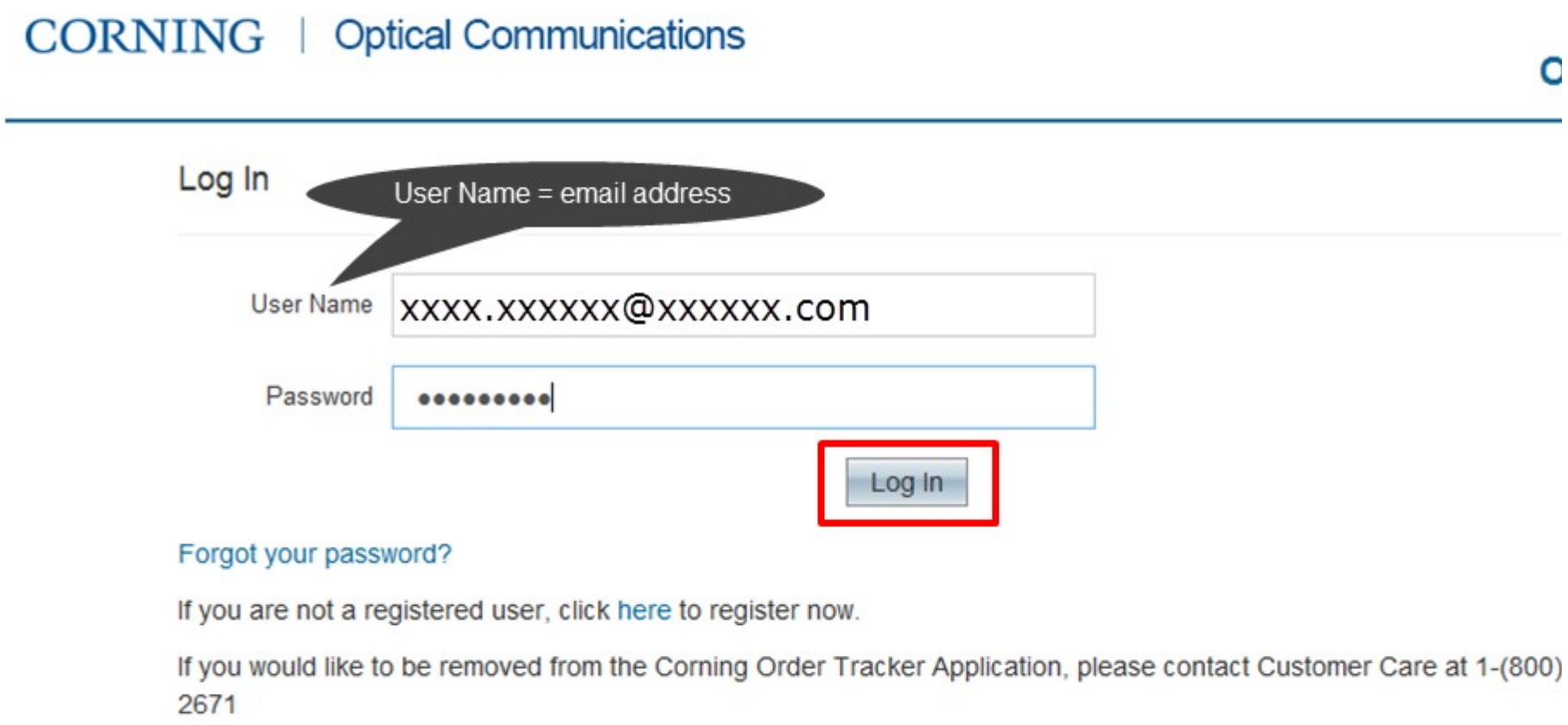
Order Tracker – Resetting password



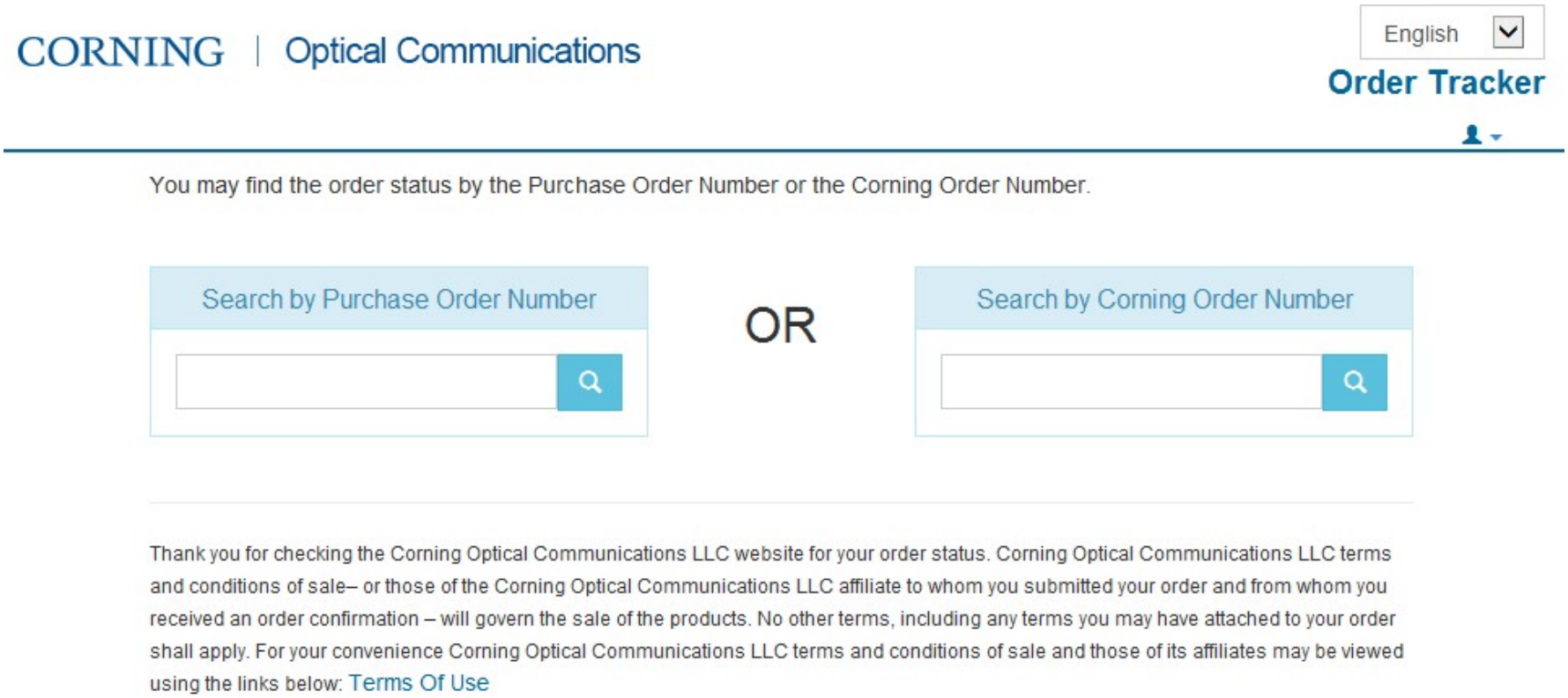
Order Tracker – Password Reset



Order tracker – Log in



Order Tracker – Search via PO number or Corning Order Confirmation number



Order Tracker – Information available

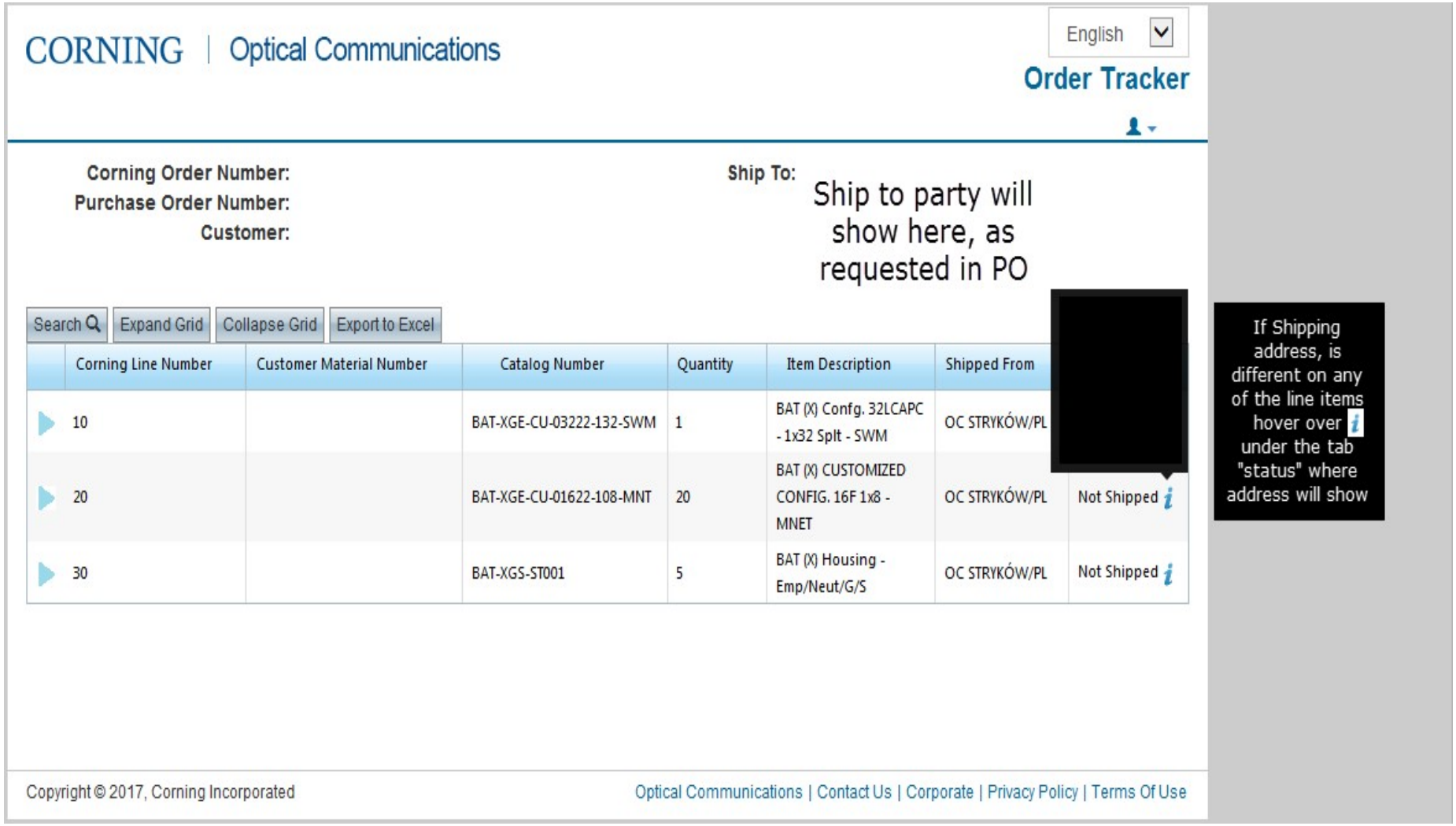
Search | Expand Grid | Collapse Grid | Export to Excel

	Corning Line Number	Customer Material Number	Catalog Number	Quantity	Item Description	Shipped From	Status
▶	10		ECM-UM12-05-93T	18	EDGE UNIV MOD 12F LCDUP/MTP OM3	OpComm STRYKÓW/PL	Shipped
	20		CCAAGB-G1002-A010-C0	10	S/FTP flex/26,Cat.6A,gy,2xRJ45 ,4P,1m	OpComm HAGEN/D	Partially Shipped

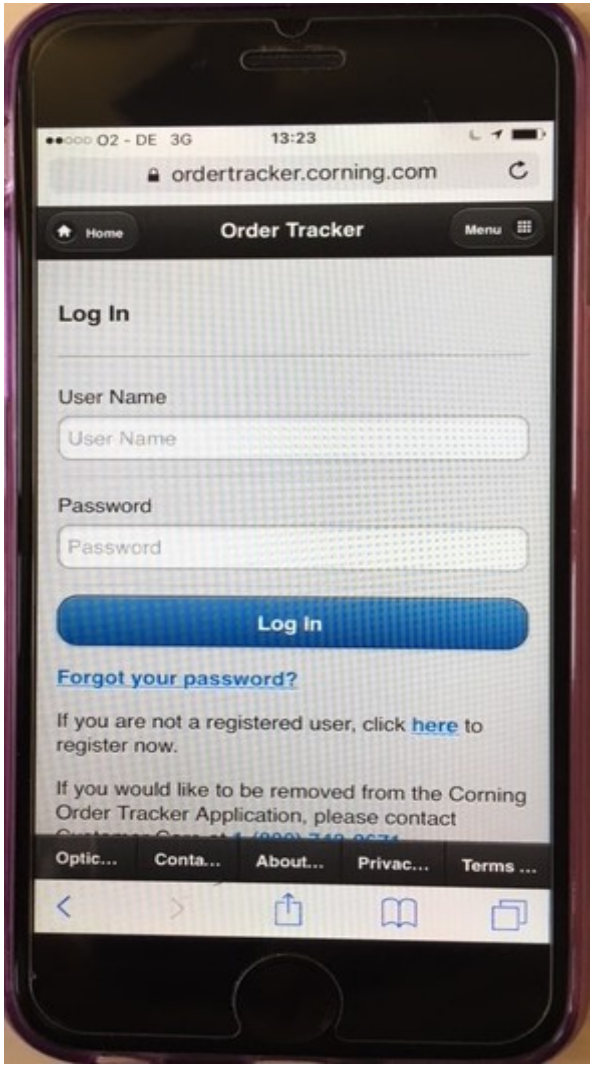
Quantity	Status	Scheduled Ship Date	Actual Ship Date	Estimated Delivery Date	INCO Terms	Freight Carrier	Tracking Number
5	Shipped	OCT/20/2017	OCT/13/2017	OCT/19/2017	DDP Warehouse UK	Kuehne & Nagel (AG & Co) KG	Contact Cust. Care
5	Not Shipped	OCT/24/2017		OCT/31/2017	DDP Warehouse UK		

- Order Tracker will now show in the case of split shipments, status information, as well as information on when will other items ship.
- If tracking is available, it will be visible under tracking number, or in the case of no tracking information it will show “Contact Customer Care”

Order Tracker – Different shipping addresses



Order Tracker – On the go? - Mobile devices



- No access to a computer?
- When on the go, with no access to a desk top, Order Tracker is also available to use on mobile devices:

ordertracker.corning.com

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MTP PRO

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MTP®Pro

MTP®Pro

And dc

CORNING

CORNIN

MTP® PRO Field Tc

P/N 006-407-AEN
Issue 1

related literature | Search w

006-407-QSG-AEN MTP® P

1. General

This document describes the sta
(multimode and single-mode) cl

Pictures shown in this procedur
enhancements.

2. Tools and Mat

- MTP PRO Field Tool
- MTP connector clea

3. Precautions

CAUTION: Fiber optic ca
cable specification shee
minimum recommend
not crush the cable or a
characteristics of the ca

CAUTION:

1. Always keep a
2. Never touch t
3. Good houseke

4. Tool Overview

TPA-5891

Front View

CORNING

MTP™ PRO connector

Integrated push-pull sleeve
Robust push-pull insertion and extraction housing design for ease of use and access

Field polarity change
Simple one-step, colour-coded polarity change feature without removing connector housing

Environmentally friendly
REACH compliant without exemptions

Field pin change
Field-friendly configuration with safe handling of pins and easy colour identification while maintaining product integrity

Debris reduction system
Latch-lock geometry and material optimised to reduce debris generation

Our industry-leading MTP® connector family has a new addition – the MTP™ PRO connector.

Now, with no special skills or training required, you can easily perform polarity and pin reconfiguration in the field without removing the connector housing or exposing fibres. Featuring a large integrated insertion and extraction sleeve, the MTP PRO offers true push-pull functionality without compromising the connector footprint. In addition, enhanced latching and alignment features reduce debris generation, resulting in trouble-free installations.

The MTP PRO connector offers simplified and robust field configurability, ease of use, and enhanced performance combined with the MTP connector you know and trust.

Corning Optical Communications LLC • PO Box 489 • Hickory, NC 28603-0489 USA
800-743-2675 • FAX: 828-325-5060 • International: +1-828-901-5000 • www.corning.com/opcomm

t Guide

GE:

onnector in the pin change
Do not compress the black

e pins attached on the
nge port.

e opposite end of the pin
CLICK"

verify insertion of the pins
ot.

POLARITY CHANGE:

1

TPA-5914

Align key on the MTP PRO connector with "KEY UP" on the polarity change port.

2

TPA-5917

Insert the MTP PRO connector in the polarity change port until audible "CLICK."

3

TPA-5920

Remove the MTP PRO connector from the polarity change port. Verify completion of polarity change.

TPA-5923

Scan QR Code to view MTP PRO field tool in action!

opcomm

MTP PRO

MTP Pro Field Tool Benefits.mp4

EDGE8™ Website

EDGE8 Solutions

EDGE8 Catalogue Detailed product information for your EDGE8 installation	**EDGE8 Overview Video** Celebr8 your new data center deployment	**EDGE8 Benefits Video** Bringing the value of EDGE8 to your network	**EDGE8 Standard Recommended Procedure** Installing the EDGE8 solution
EDGE8 Generic Specification Build your network around EDGE8	**EDGE8 Solution Components** Building your data centre solution	**EDGE8 Solution Value Overview** Outstanding value in your structured cabling network	**EDGE8 AE Notes** View our application engineering notes about EDGE 8 products.

Multi-Award Winning EDGE™ Solution

Multi-Award Winning EDGE8™ Solution


Q&A
ASK-Box
NOW ACCEPTING
PERSONAL QUESTIONS
RANDOM QUESTIONS
ODD QUESTIONS
CREEPY QUESTIONS
ANY KIND OF ASK :)

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