

# Certifikace kabeláží

Měření strukturované kabeláže, certifikace optické kabeláže pomocí EXFO iOLM

Brno, 12.3.2015

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## Certifikace?

- Certifikace je odkaz na testování schody výrobku/služby s jejich výrobními procesy ve vztahu k odpovídajícímu standardu.
- Obecně je certifikace potvrzena vystavením odpovídajícího certifikátu.
- V síťových technologiích musí být tato certifikace realizována ve shodě s EN50173 nebo ISO/IEC11801 (topologie/limity), EN50174 (řízení kvality), EN50436 (měřicí technika) což typicky požaduje využití měřícího přístroje ve vyšší cenové hladině.

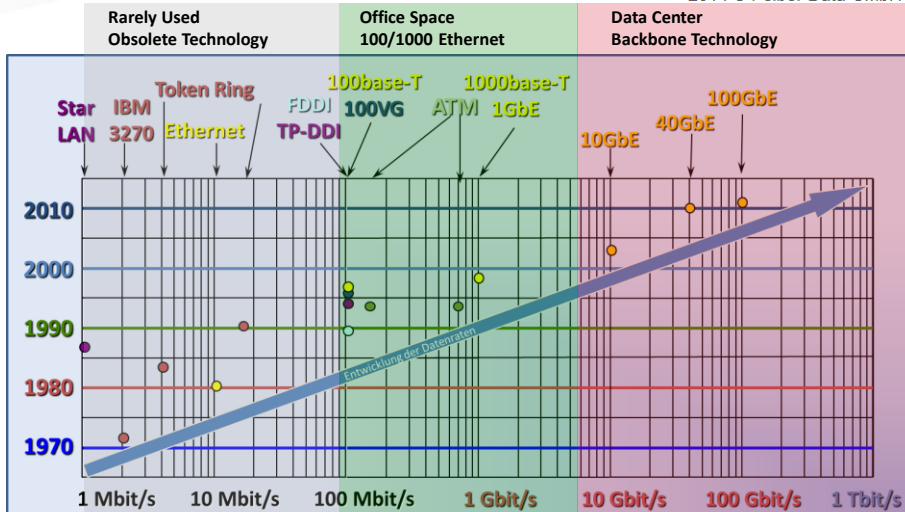
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## Co přináší nové standardy (40/100 GBASE-T)

Nové požadavky na měřící techniku?

- Vyšší frekvence ?
- Lepší přesnost ?
- Nová rozhraní ?
- Více funkcí ?
- Možnost testovat metalické i optické sítě ?

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## Standardy pro metalické síť

Bandwidth/ Region	100 MHz	250 MHz	500 MHz	600 MHz	1000 MHz	1600/2000 MHz
<b>USA</b>	TIA/EIA 568-C Category 5e	TIA/EIA 568-C Category 6	TIA/EIA 568-C Category 6A			TIA/EIA Category 8
<b>International</b>	ISO/IEC11801 2nd Edition Class D	ISO/IEC11801 2nd Edition Class E	ISO/IEC11801 2nd Edition A1/2 Class E <sub>A</sub>	ISO/IEC11801 2nd Edition Class F	ISO/IEC11801 2nd Edition A1/2 Class F <sub>A</sub>	ISO/IEC Class I & II
<b>Europa</b>	CENELEC EN50173-1 Class D	CENELEC EN50173-1 Class E	CENELEC EN50173-1 Class E <sub>A</sub>	CENELEC EN 50173-1 Class F	CENELEC EN 50173-1 Class F <sub>A</sub>	Drafts
<b>Deutschland</b>	DKE DIN EN50173-1 Klasse D	DKE DIN EN50173-1 Klasse E	DKE DIN-EN 50173-1 Klasse E <sub>A</sub>	DKE DIN EN50173-1 Klasse F	DKE DIN EN50173-1 Klasse F <sub>A</sub>	

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## TIA Category 8

- Frequency from 1 to 2000 MHz
- Support of Next Gen BASE-T (40GBASE-T)
- Insertion Loss (IL) is critical parameter, therefore ...
  - 30m Channel Length
  - App. 55% of all channels <30m
- Improved Cat 6A components
  - RJ45 plug / jack
  - F/UTP or S/FTP cable
  - 2 Connector model
- Increasing the Cat 6A limits to 2000 MHz
- TIA 568-C.2-1 Draft 0.7. (Planned to be ready by end of 2015)

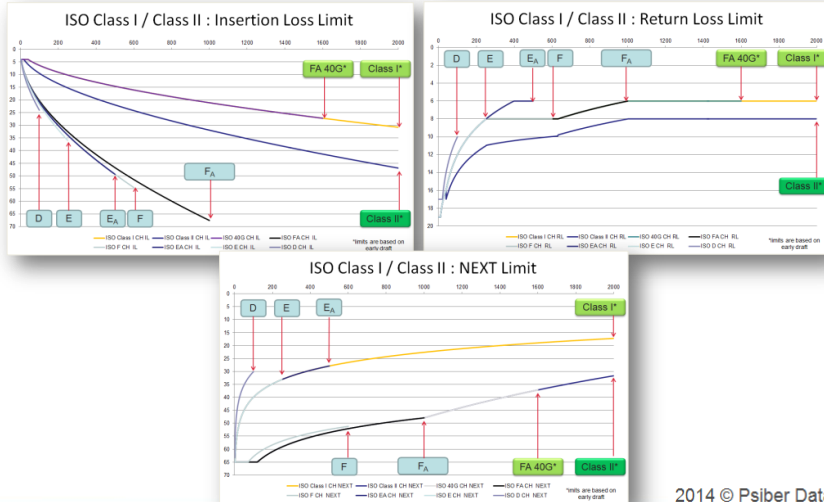
## TIA



## ISO Class I & II

- Frequency from 1 to 2000 MHz
- Support of Next Gen BASE-T (40GBASE-T)
- Insertion Loss (IL) is critical parameter, therefore ...
  - 30m (50m) Channel Length
- Improved Cat 6A and Cat 7A components
  - F/UTP or S/FTP cable
  - 2 Connector model
- Class I:  
Increasing the EA limits to 2000 MHz
- Class II:  
Increasing the FA limits to 2000 MHz

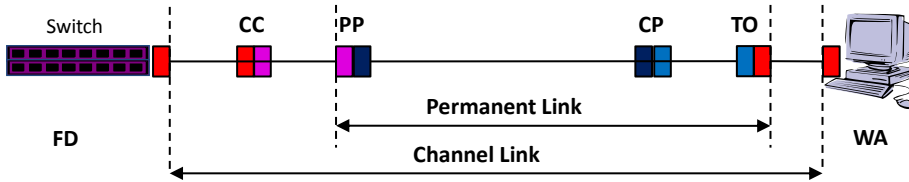
# ISO



## Cabling for IEEE 802.3 40GBASE-T (draft)

<p><b>CAT 7<sub>A</sub></b> <b>1600 MHz</b></p> <p style="background-color: #00a0e3; color: white; padding: 5px; border-radius: 10px;">improved Cat7<sub>A</sub> Components</p> <p style="background-color: #00c090; color: white; padding: 5px; border-radius: 10px;">30m 2 Connectors</p>	<p><b>Class I</b> <b>2000 MHz</b></p> <p style="background-color: #00c090; color: white; padding: 5px; border-radius: 10px;">New &amp; Improved Cat6<sub>A</sub> Components</p> <p style="background-color: #00c090; color: white; padding: 5px; border-radius: 10px;">30m 2 Connectors</p>	<p><b>Class II</b> <b>2000 MHz</b></p> <p style="background-color: #00c090; color: white; padding: 5px; border-radius: 10px;">New &amp; Improved Cat7<sub>A</sub> Components</p> <p style="background-color: #ffff00; color: black; padding: 5px; border-radius: 10px;">30m 2 Connectors</p>	<p><b>CAT 8</b> <b>2000 MHz</b></p> <p style="background-color: #c00000; color: white; padding: 5px; border-radius: 10px;">New &amp; Improved Cat6<sub>A</sub> Components</p> <p style="background-color: #c00000; color: white; padding: 5px; border-radius: 10px;">30m 2 Connectors</p>
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## Topologie kabeláže



- FD = Floor Distributor**
- CC = Cross Connect**
- PP = Patch Panel**
- CP = Consolidation Point (Optional)**
- TO = Telecommunications Outlet**
- WA = Work Area**

## Evoluce ISO standardu

Class	Freq (MHz)	IL	Delay	NEXT	PS NEXT	RL	ACR-N PSACR-N ACR-F PSACR-F	PS ANEXT PS AACRF
Class C	1-16	✓	✓	✓		✓		
Class D	1-100	✓	✓	✓	✓	✓	✓	
Class E	1-250	✓	✓	✓	✓	✓	✓	
Class E <sub>A</sub>	1-500	✓	✓	✓	✓	✓	✓	✓
Class F	1-600	✓	✓	✓	✓	✓	✓	
Class F <sub>A</sub>	1-1000	✓	✓	✓	✓	✓	✓	✓
Class I *draft 2012-11-08	1-2000	✓	✓	✓	✓	✓	✓	✓
Class II *draft 2012-11-08	1-2000	✓	✓	✓	✓	✓	✓	✓

## Kabelážní standardy a přesnost měření

Frequency Bandwidth	TIA 568-C.2 (Components)	TIA 568-C (Link)	ISO/IEC 11801 (Components)	ISO/IEC 11801 (Link)	Required Accuracy
1-100 MHz	Cat 5e	Cat 5e	Cat 5 (new)	Class D	Level IIe
1-250 MHz	Cat 6	Cat 6	Cat 6	Class E	Level III
1-500 MHz	Cat 6A	Cat 6A	Cat 6 <sub>A</sub>	Class E <sub>A</sub>	Level IIIe
1-600 MHz			Cat 7	Class F	Level IV
1-1000 MHz			Cat7 <sub>A</sub>	Class F <sub>A</sub>	Level V
1-1600 MHz			impr. Cat 7 <sub>A</sub>	FA40G	Level VI/2G ?
1-2000 MHz	Cat 8	Cat 8 (Class II)	Cat 8.1 Cat 8.2	Class I (30m) Class II (30m)	Level 2G ?



## LAN – Strukturované kabeláže (Certifikační měření)

### WireXpert



## WireXpert



### Matrix Cable Certifier WireXpert

Feature	WireXpert 500	WireXpert 4500
Test CAT 5e, 6, 6 <sub>A</sub> , Class D, E, E <sub>A</sub> cables	✓	✓
9 second CAT 6 <sub>A</sub> autotest	✓	✓
M12 Industrial Ethernet adapter option	✓	✓
CAT 5e, CAT 6, CAT 6 <sub>A</sub> patch-cord test adapter option	✓	✓
Maximum measurement frequency	500 MHz	2.500 MHz
Test Class F, F <sub>A</sub> cables	-	✓
Test CAT 8/ 40GBASE-T cables	-	✓
MM and SM fiber test adapter option	-	✓
MPO test adapter option	-	✓

M12 průmyslové ETH adaptéry



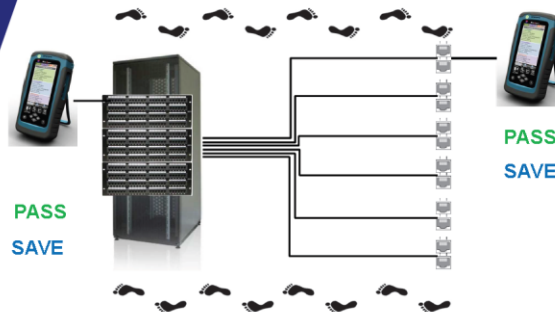
MM and SM fiber test adapter



## WireXpert



### Dual Control System (DCS™)





# Certifikace optické kabeláže EXFO iOLM

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## iOLM – inteligent Optical Link Mapper

Reálné měření na  
pozadí  
Výsledné  
Zobrazení



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# iOLM – inteligent Optical Link Mapper

The screenshot shows the iOLM software interface. At the top, there are tabs for 'Power Meter' and 'Link View'. The main area displays a fiber link diagram with a total length of 3.1643 km. The link is divided into segments with positions at 0.0000, 0.0030, 1.0246, 1.1235, and 3.1643 km. A 1:4 splitter is highlighted at the 1.0246 km position. Below the diagram, the 'iOLM' section shows a wavelength of 1550 nm, a link loss of 12.092 dB, and a link ORL of 41.30 dB. The 'Global pass/fail status' is 'Fail'. A table below shows test parameters for the selected element:

Position (km)	Type	Wavelength (nm)	Loss (dB)	Reflectance (dB)
1.0246	Splitter 1:4*	1550	7.628	-59.8

At the bottom, a status bar shows 'splitter ruckwaerts mit Makrobending1 auf 4 mit 1550nm...'. The interface includes a 'Start' button, 'Open', 'Save', and 'Config.' options, and a 'Main Menu' with 'File', 'Back', 'Home', 'Open...', 'Save', 'Save As...', and 'Report...' options.

The screenshot shows the iOLM software interface with a detailed table of fiber link measurements. The table has columns for 'Type', 'Pos./Len. (km)', 'Loss (dB)' (1310 nm, 1550 nm), 'Reflectance (dB)' (1310 nm, 1550 nm), and 'Attenuation (dB/km)' (1310 nm, 1550 nm). A red box highlights the 'Attenuation (dB/km)' columns. Below the table, a yellow box contains a warning message:

• Make sure that the fiber is properly spliced.  
The loss could be due to a low-reflectance (APC) connector.

The interface includes a 'Start' button, 'Open', 'Save', and 'Config.' options, and a 'Main Menu' with 'File', 'User Preferences...', 'Test Config.', and 'Split Screen' options. The status bar at the bottom shows '1\_iolm box - Copy'.

## Sloučené události

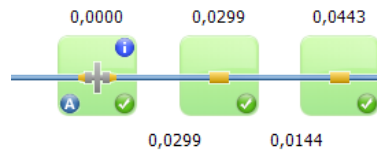
### OTDR - standardní

- Sloučené události neoddělím



### OTDR - iOLM

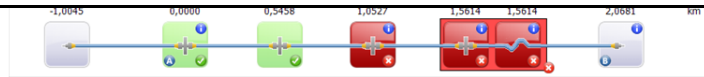
- Sloučené události jsou rozlišitelné



### iOLM

### Linear view

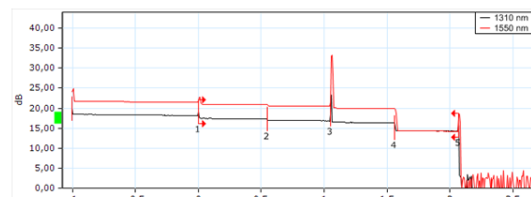




### Element Table

Type	No.	Pos. (km)	Loss (dB)		Refl. (dB)		Diagnostic	
			1310 nm	1550 nm	1310 nm	1550 nm		
Connector		-1,0045		0,217	0,125	-60,1	-55,3	
Connector	1	0,0000	0,674	0,488	-61,6	-60,9		• The specified launch fiber length is longer than the tested link. Make sure that the specified length corresponds to the launch fiber used. Unselect the launch fiber item if no launch fiber is used to test the link.
Connector*	2	0,5458	0,278	0,367	---	---		
Connector	3	1,0527	0,333	0,383	-36,9	-35,1		• The connector or bulkhead is damaged, dirty or not well connected. Inspect and clean as needed.
Group	4	---	1,902	5,608	---	---	-75,5	
+ Connector		1,5614	1,902	5,608	---	---	-75,5	• The connector or bulkhead is damaged, dirty or not well connected. Inspect and clean as needed. The excess loss could be due to an element not identified as a splitter.
+ Macrobend		1,5614	---	---	---	---	---	• Inspect the fiber in this area to search for excessive bending or cable compression.
Connector	5	2,0681	---	---	-52,1	-52,2		• To characterize loss and include the element in link loss and ORL, a receive fiber is required.

### OTDR Graphic



## Tier-1 / Tier-2 Certification

### Tier-1

Certification tests

#### Mesurements

- ✓ Polarity (VFL)
- ✓ Insertion Loss
- ✓ ORL

#### Recommended Method

- ✓ LS/PM
- ✓ OLTS

### Tier-2

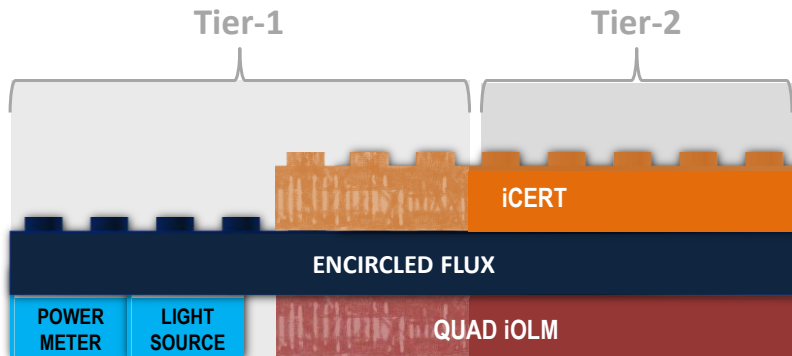
Extended tests/Troubleshooting

#### Mesurements

- ✓ Polarity (VFL)
- ✓ Insertion Loss
- ✓ ORL
- ✓ Connector and splice loss
- ✓ Connector reflectance

#### Recommended Method

- ✓ OTDR



## iCERT Software Option

- › Additional Option available for iOLM-MM/SM (on FTB-720-MM/QUAD)
- › Pass/Fail based on international standard (TIA-568, ISO11801) for IL, ORL, length and each link element as required for the Data Center cable certification
- › Key Benefits:
  - › Already built-in the unit, no-misinterpretation
  - › Ensure you always use the latest standard update
  - › Improves accuracy and repeatability – iOLM-MM / EF / iCERT
  - › Plus all iOLM key benefits

### iOLM+iCERT

**Intelligent and Automated Cable Certifier for Data Centers.**

## iOLM Tier-2 Certification option



Certified configurations

Preset test configs

- ISO\_IEC 11801-2002 Fiber Link
- ISO\_IEC 11801-2002 OF-2000 CH
- ISO\_IEC 11801-2002 OF-300 CH
- ISO\_IEC 11801-2002 OF-500 CH
- ISO\_IEC 11801-2010\_ISP
- ISO\_IEC 11801-2010\_OS1\_OMx
- ISO\_IEC 11801-2010\_OS2\_OMx
- ISO\_IEC 11801-2010\_OSP
- ISO\_IEC 14763-3\_2011\_OS1\_OMx
- ISO\_IEC 14763-3\_2011\_OS2\_OMx

Complete report with selected standard

### iOLM Report

Pass

#### Element Table

Type	No.	Pos. Len. (km)	Loss (dB)		Ref. (dB)		Att. (dB/km)		Diagnostic
			1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	
Connector		-0.5061	0.548	0.952					
Section		0.5061	0.190	0.103			0.375	0.203	
Connector (A)	1	0.0000	0.333	0.342	45.2	45.8			
Section		0.1572	0.049	0.003			0.311	0.020	
Connector (B)	2	0.1572			-66.2	-47.8			* To characterize loss and include the element on link loss and ORL, a receive fiber is required.

#### iOLM Pass/Fail Thresholds

ANSI\_TIA-568-C3\_ISP

#### iOLM Parameters and Settings

Test configuration: ANSI\_TIA-568-C3\_ISP

Launch fiber: 0.5099 km

Receive fiber: 0.0000 km

Fiber core size: 9 µm

IOR (1550 nm): 1.473000

Backscatter (1550 nm): -81.87 dB

## iOLM as a Tier-1 certifier

1

Launch fiber length: 0.1500 km

Receive fiber length: 0.1500 km

Measure...



Receive

## iOLM as a Tier-1 certifier

2

Launch fiber length: 0.1500 km

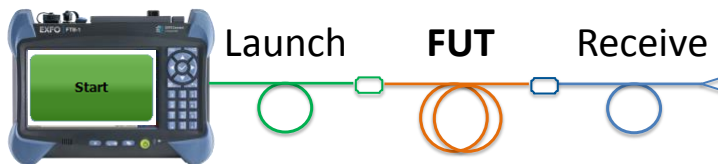
Receive fiber length: 0.1500 km

Measure...

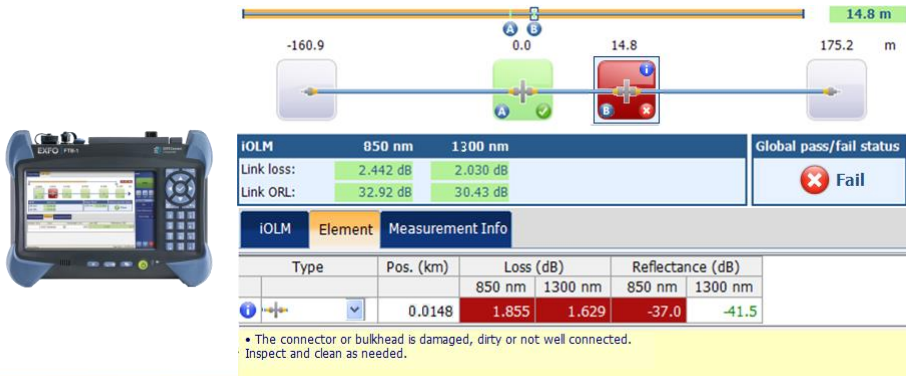


## iOLM as a Tier-1 certifier

- 3 Connect Launch and Receive cables to FUT and Press START



- 4** In less than 1 minute
- 1- Continuity
  - 2- Get IL and ORL with Pass/Fail
  - 3- Get Fiber Length
  - 4- Locate all faults
  - 5- Provide diagnostics to fix



- Tier-1/2 combined tester, no need for another tech/tool
- Locates problems during construction, save turp up failures (\$\$)
- Suitable for customers accepting iOLM results as a certifier





Děkujeme

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