NETWORK AND TELECOMMUNICATION

ACADEMIC BACKGROUNDS:

- 1987-1993 Georgia University of Technology (Former USSR) **Specialize: Radio Transmitting Device of Satellite Telecommunication Systems** (Master of Science).
- 1997-1998 Advanced course at the Saint–Petersburg State University of Technology in computer simulation of ground stations Modem for Sputnic communication (Russia).

PREVIOUS EMPLOYMENT:

- 2002-2018 The World Bank Cambodia (IT Analyst, Client Services).
- 1999 -2001 Worked as Systems Engineer at VIRTU International Limited.
- 1995 -1997 Worked as assistant manager in operation and technical department at CAMINTEL.
- 1993 – 1995 Worked as engineer in Operations and Technical Department in HUB-station (ex-UNTAC Networks) at Ministry of Post and Telecommunications of Cambodia.

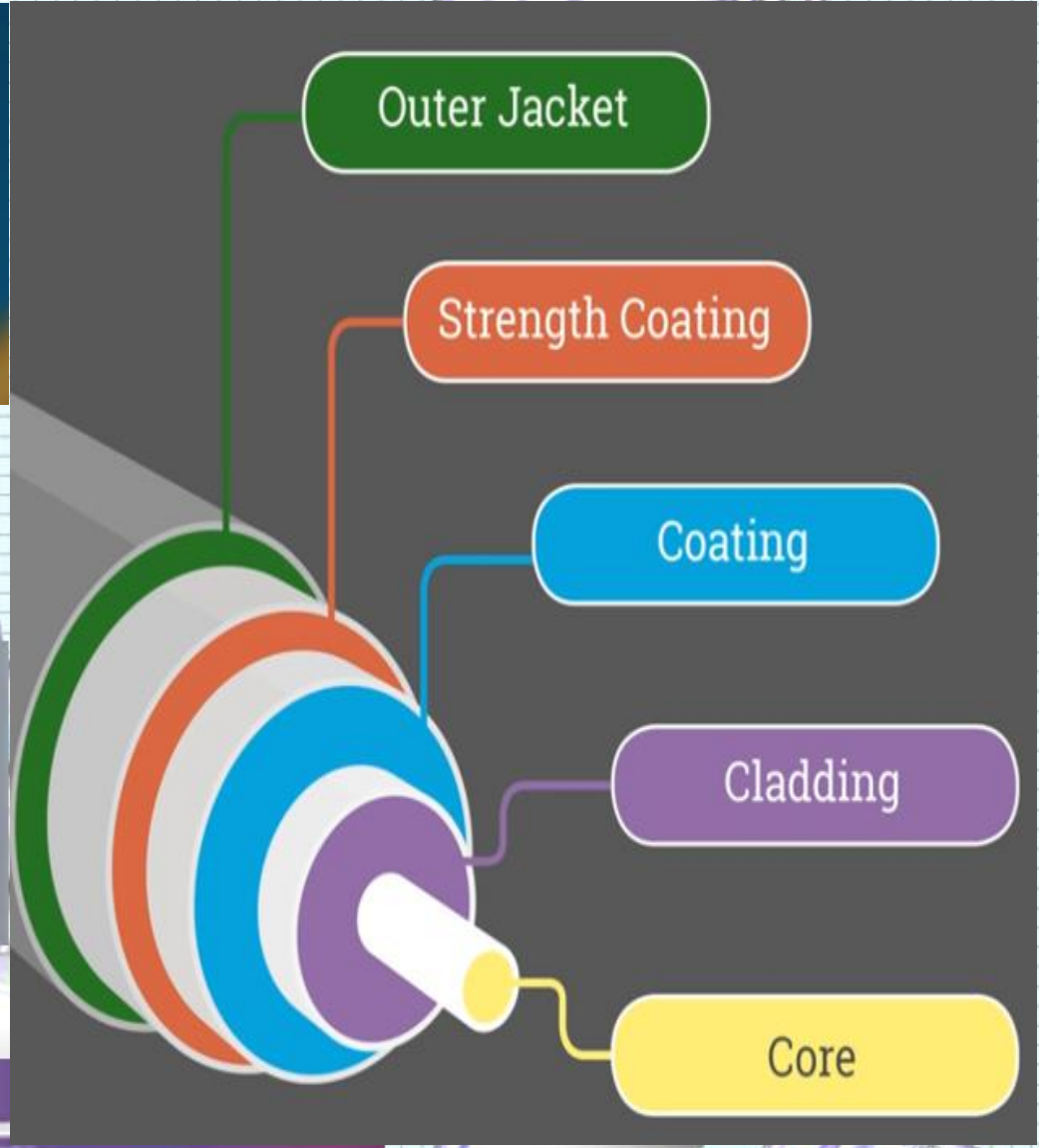
Teaching Experiences:

- 2000 Royal Academy of Cambodia (MSc.IT).
- 2002 Build Bright University (MSc.IT).
- 2019 National Polytechnic Institute of Cambodia (BSc.Telecom).
- 2020 Norton University (BSc.IT)
- 2023 Cambodia Academy of Digital Technology (BSc.Telecom).

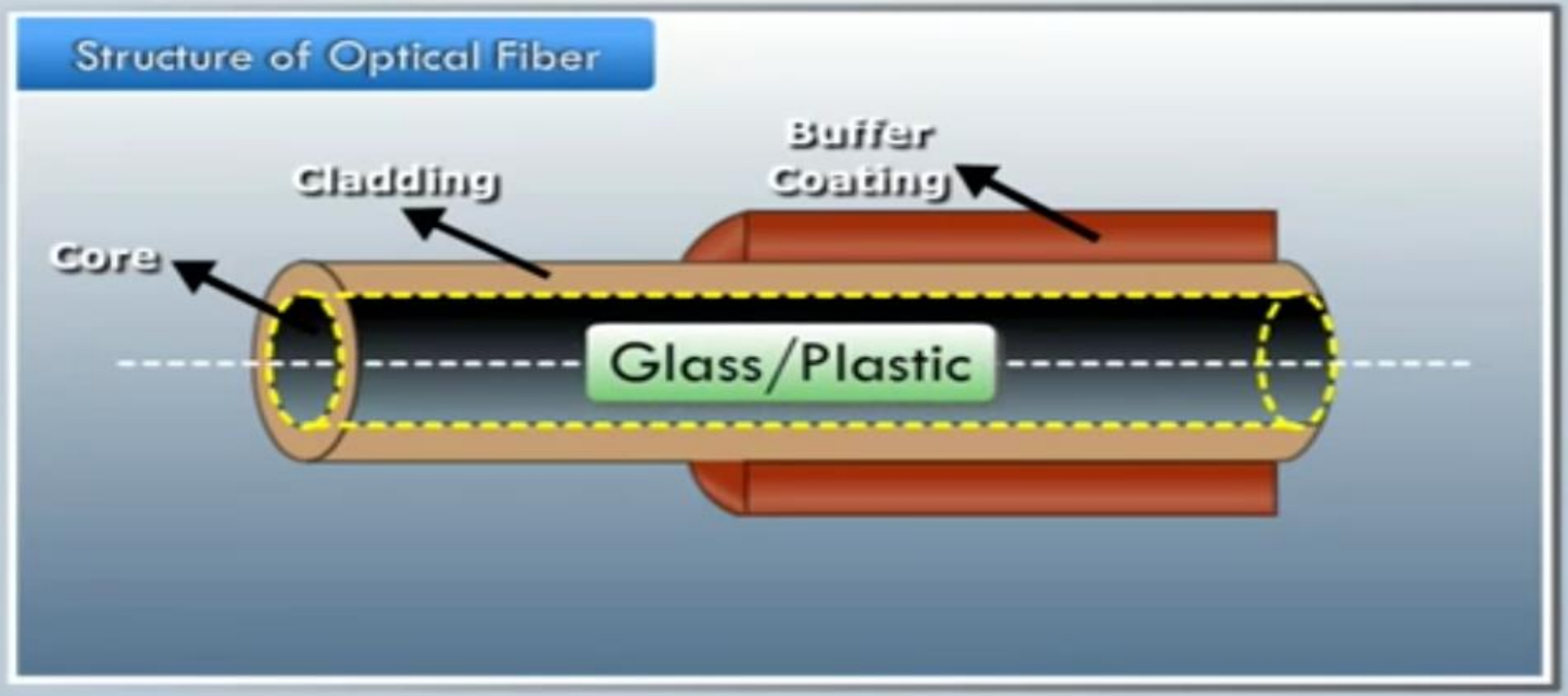
Scope of Fiber Optic Lab:

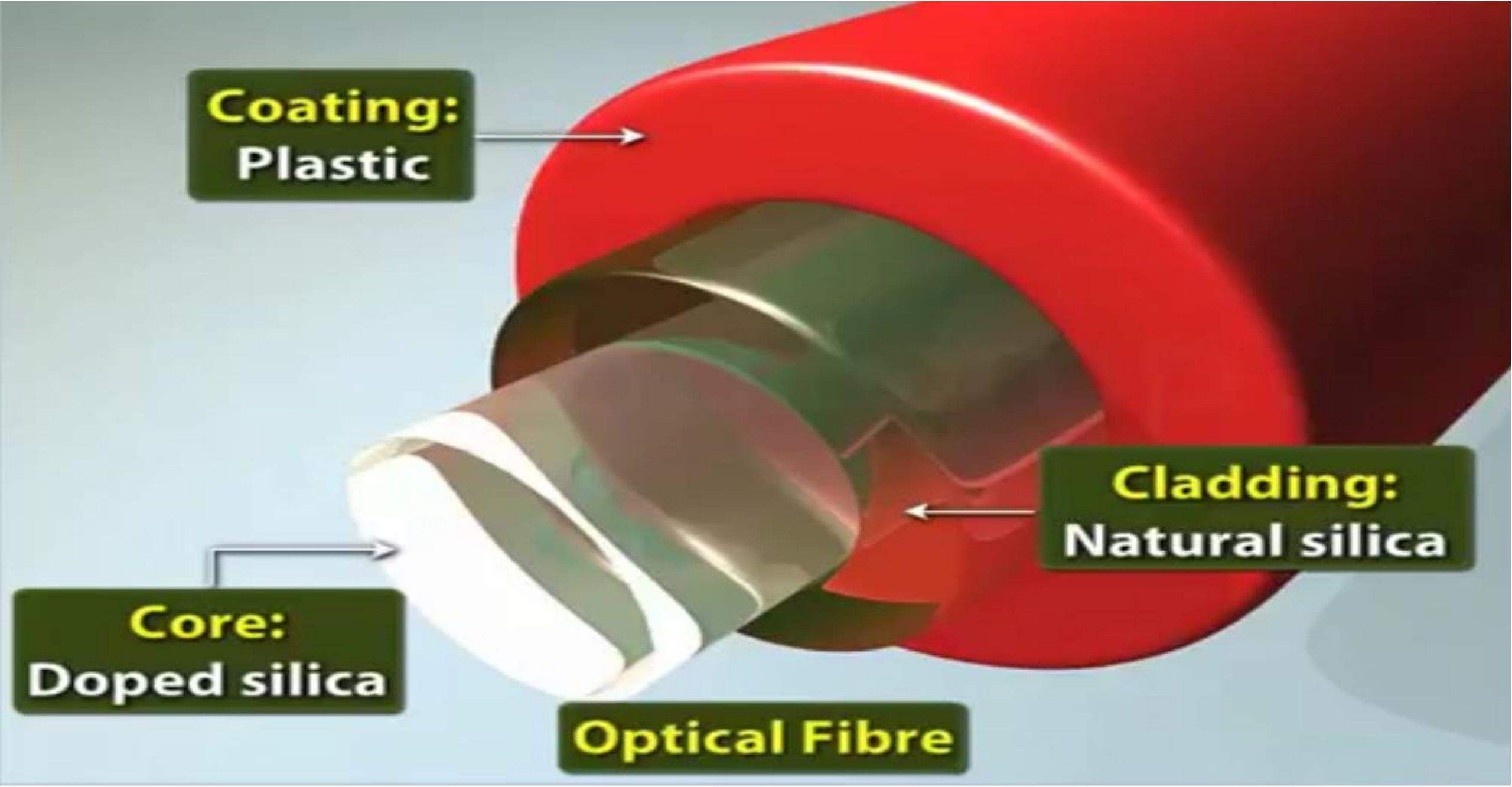
1- Fiber Cable Structure
2- Fiber Mode
3- Fiber Connector and Patch Cable
4- Fiber Converter and ODF
5- Health and Safety
6- Fusion Splicing
7- Mechanical Splicing
8- Fiber Optic Testing
9- Lab

Fibre Optics



Explain the Structure of an Optical Fiber.

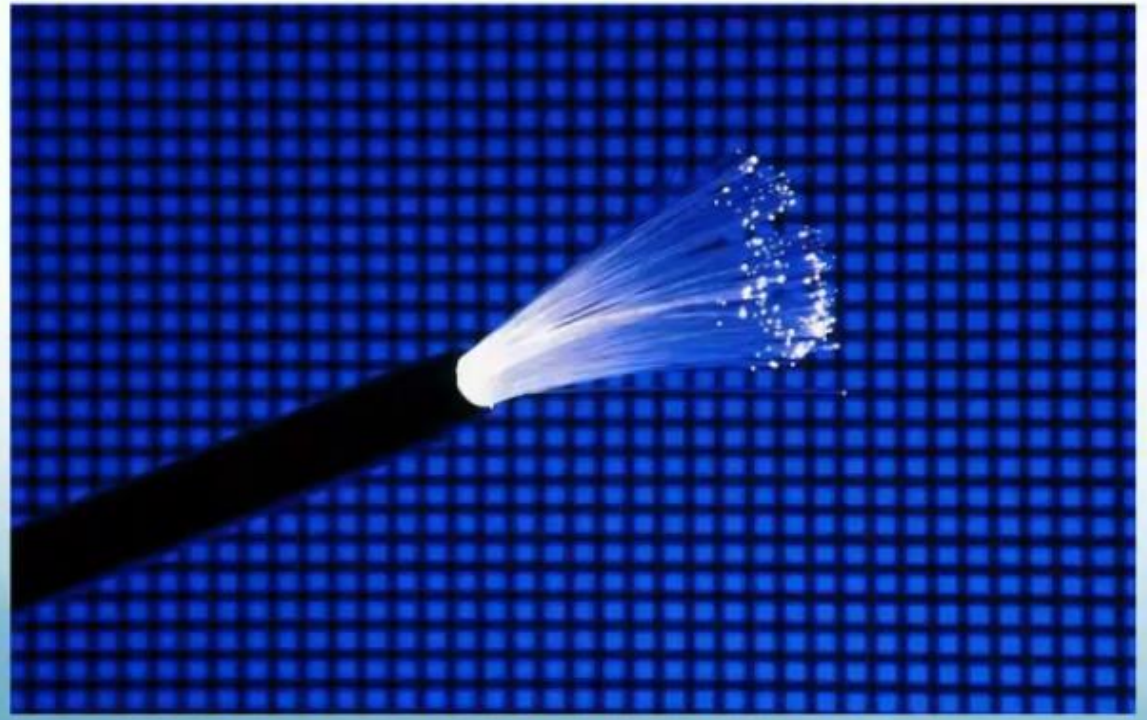


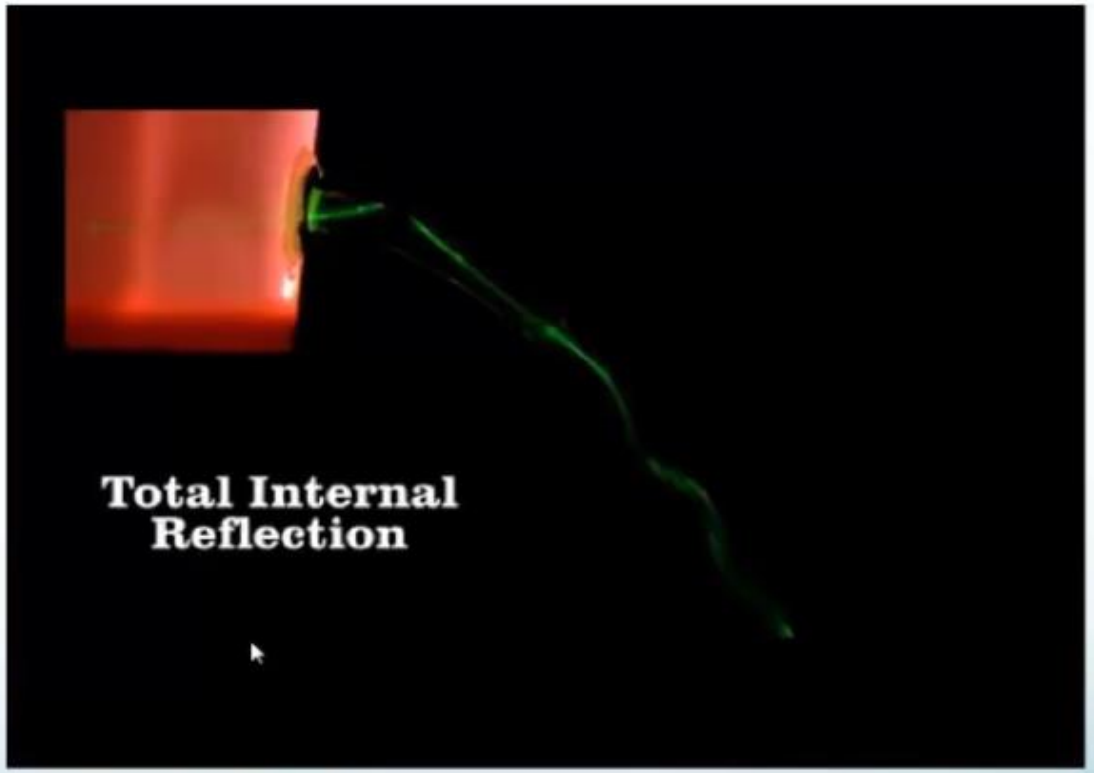

Coating:
Plastic
Cladding:
Natural silica
Core:
Doped silica
Optical Fibre

What is Fiber Optics?

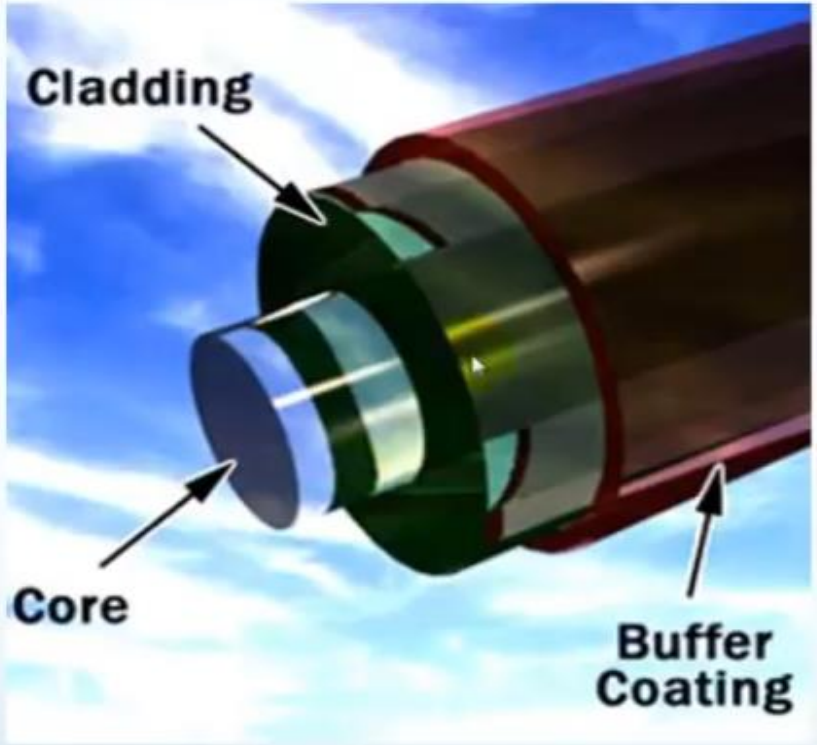
Fiber Optics = Fiber + Optics

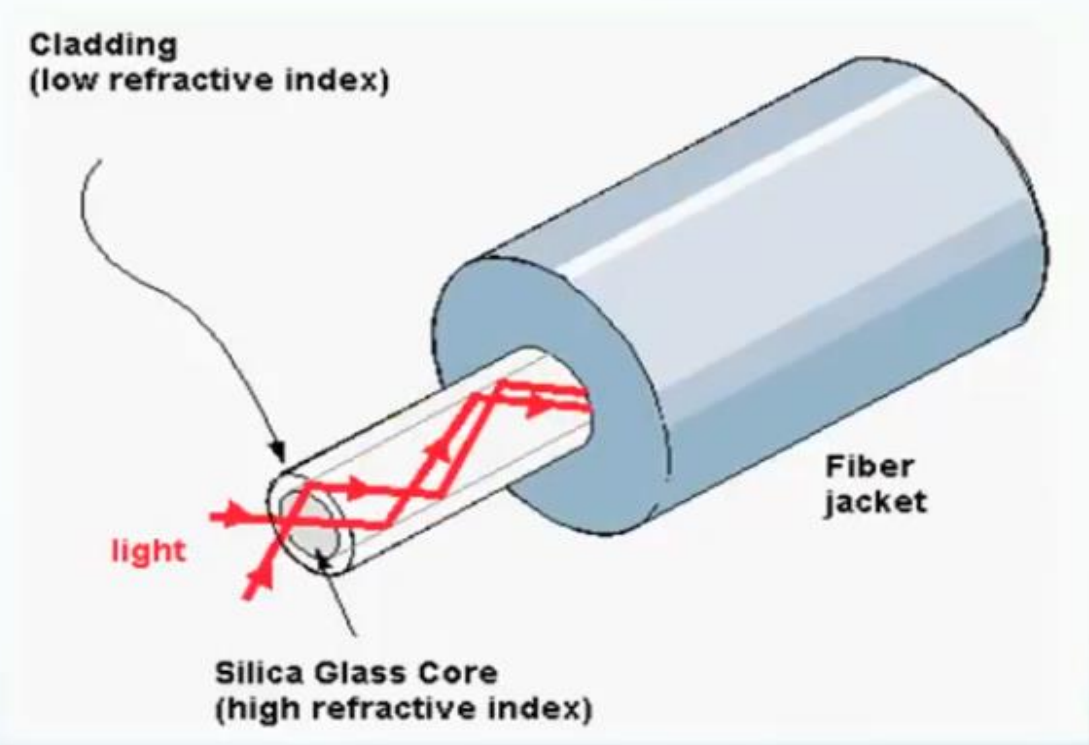
In Essence: Light Guided in Optical Fiber





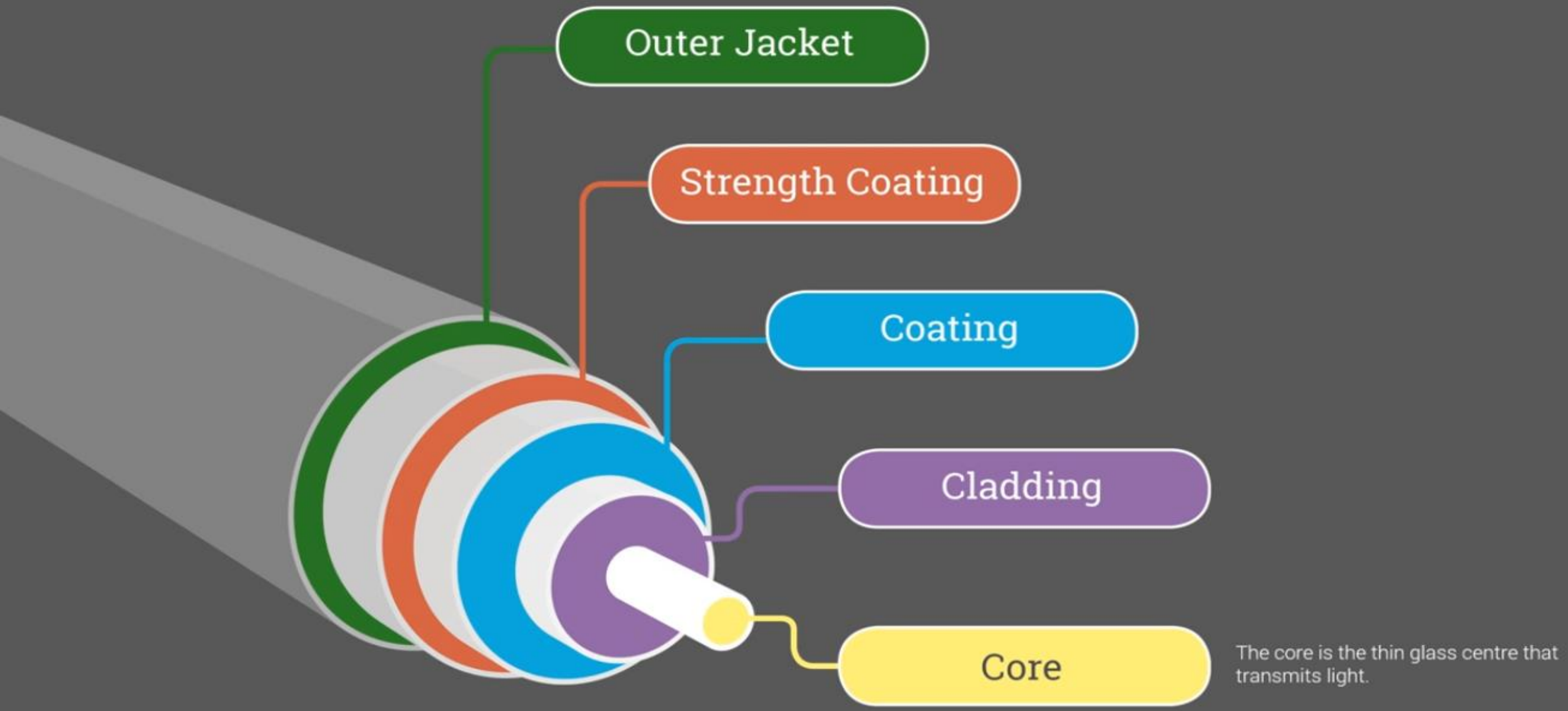
The Structure of Optical Fiber

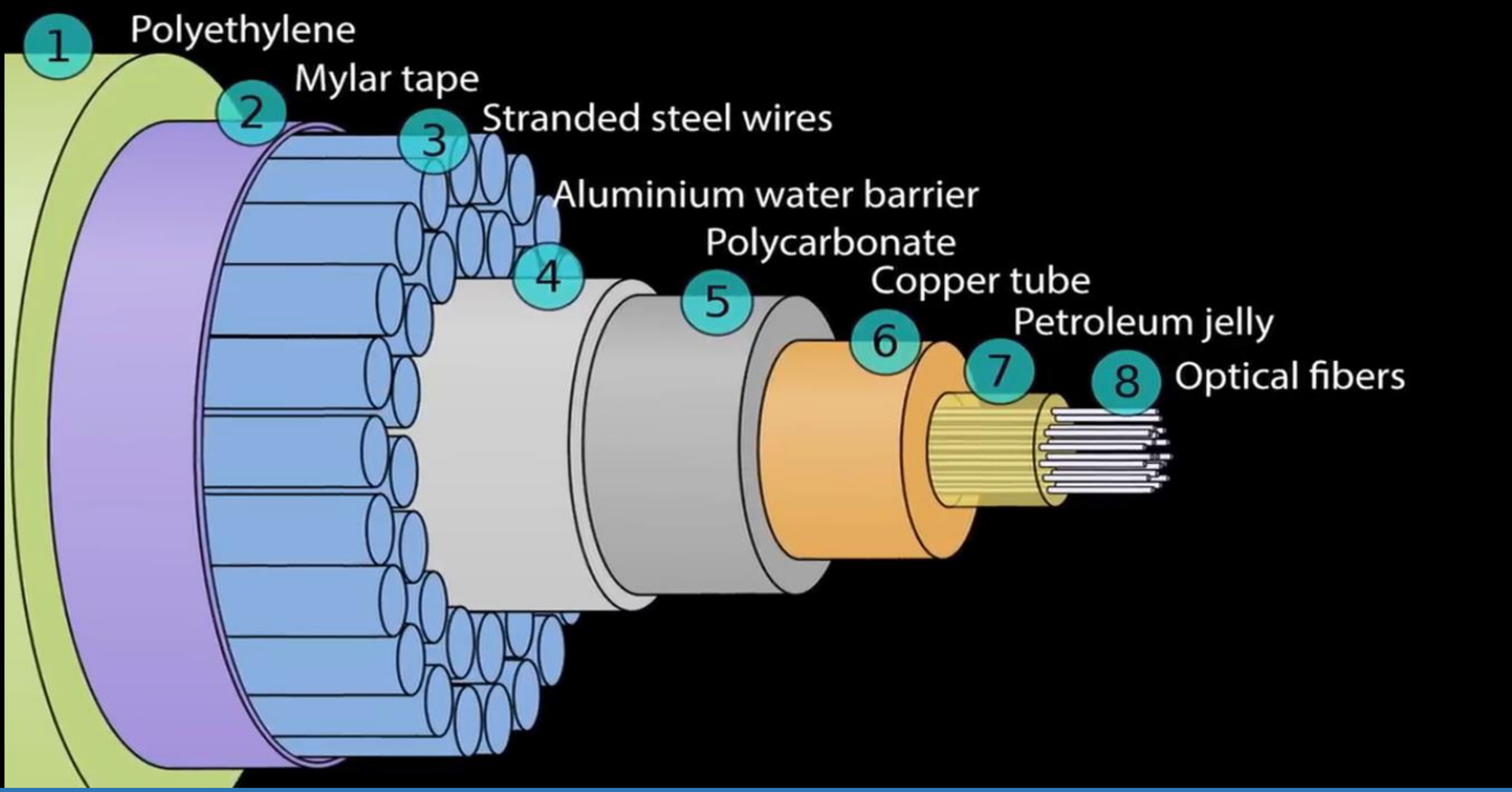


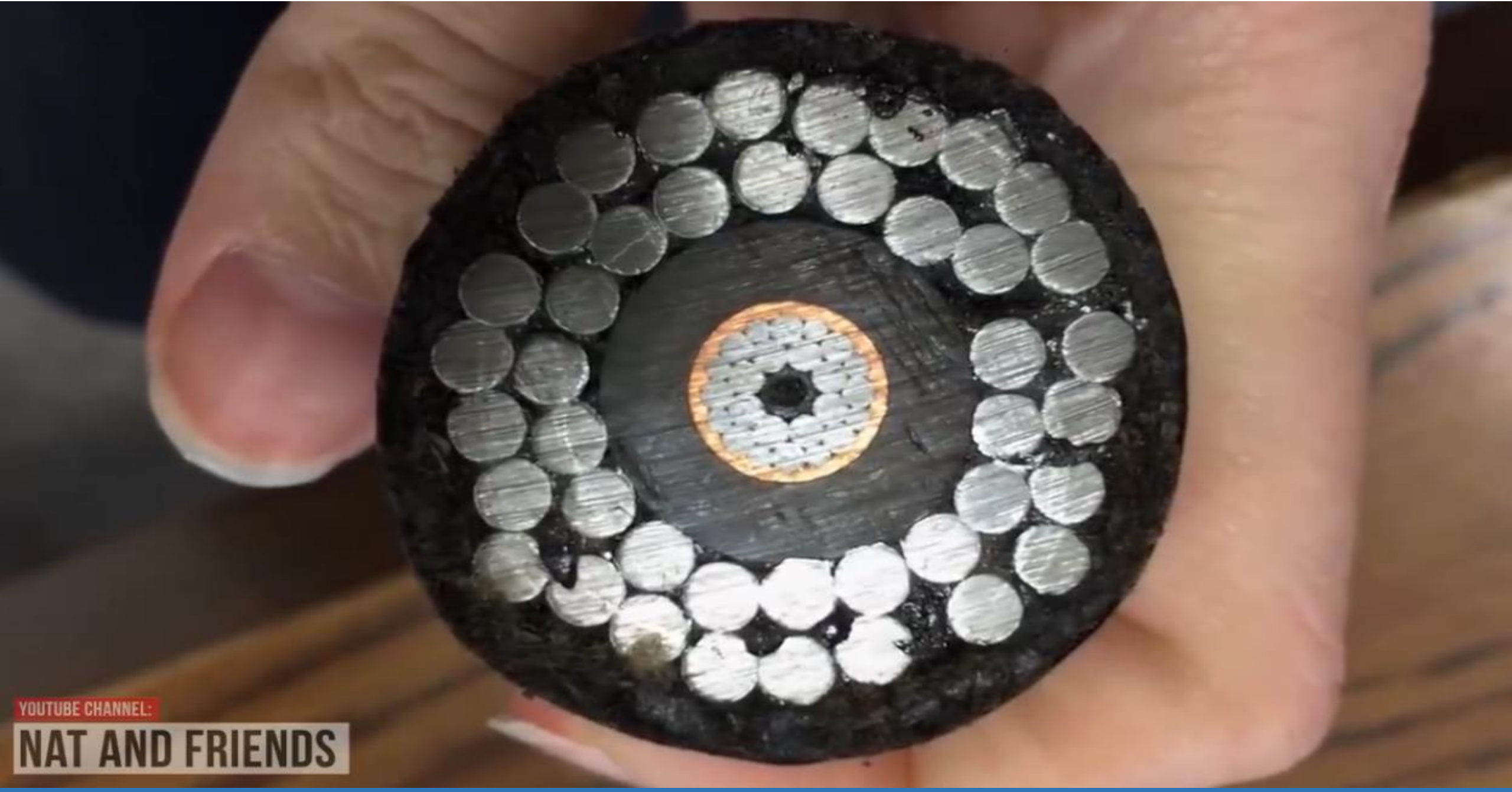


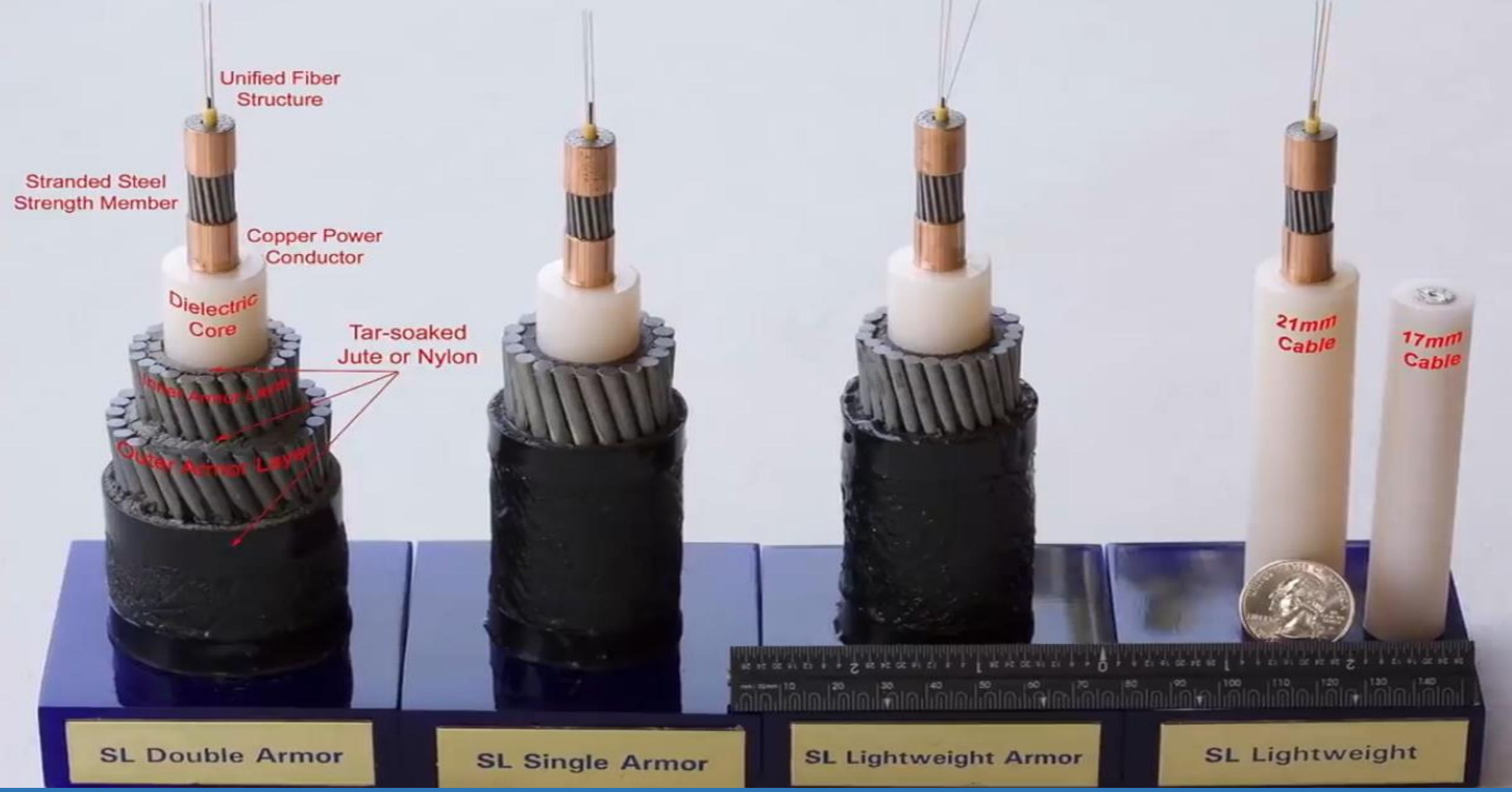
Extremely Pure Fused Silica – Very Low Loss for Long Distance Transmission

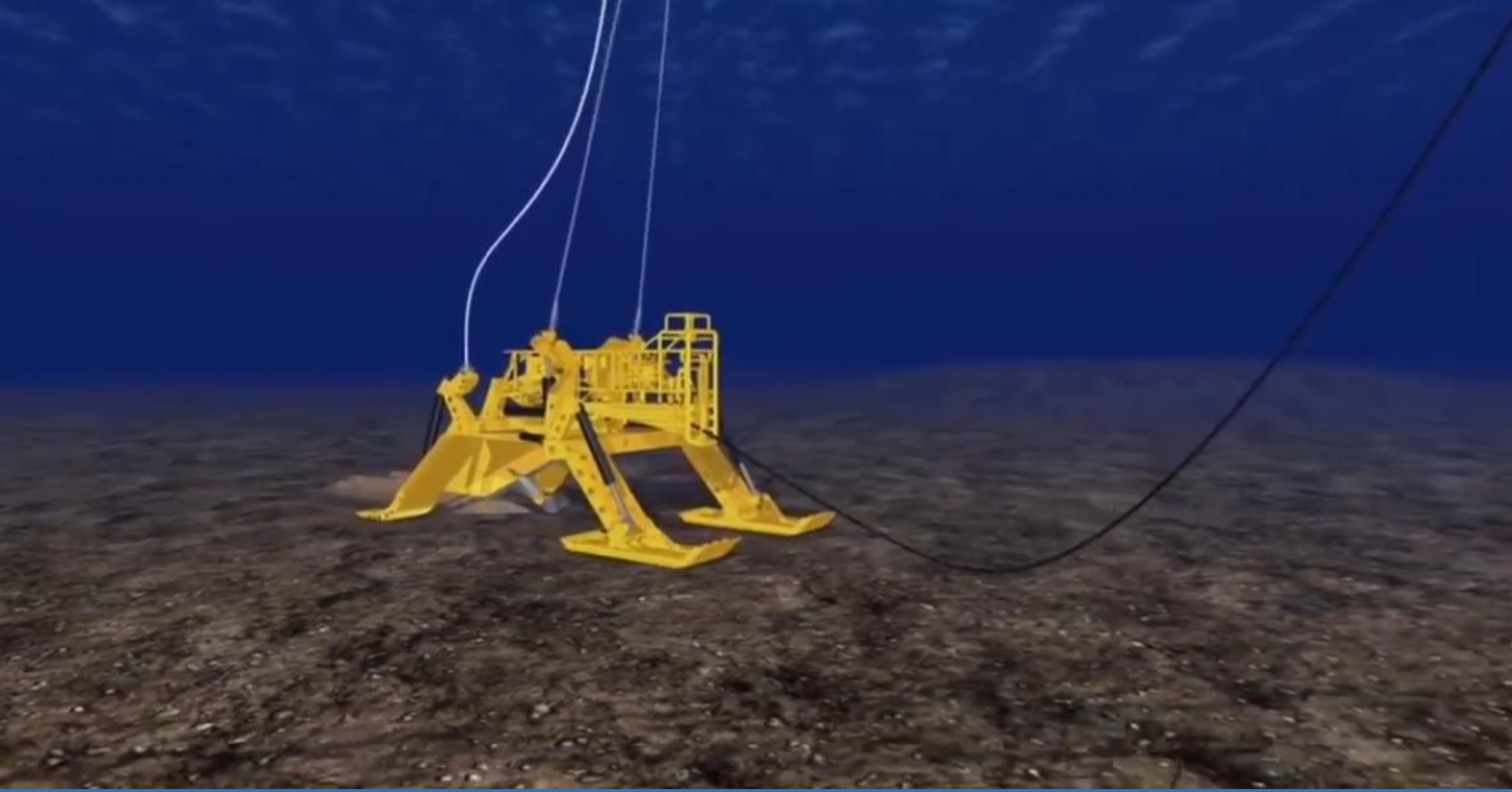
Core – Higher Refractive Index
Cladding – Lower Refractive Index
Buffer Coating: Mechanical Protection


Outer Jacket
Strength Coating
Coating
Cladding
Core
The core is the thin glass centre that transmits light.


1
Polyethylene
2
Mylar tape
3
Stranded steel wires
Aluminium water barrier
4
Polycarbonate
5
Copper tube
6
Petroleum jelly
7
8
Optical fibers


YOUTUBE CHANNEL:
NAT AND FRIENDS


Unified Fiber Structure
Stranded Steel Strength Member
Copper Power Conductor
Dielectric Core
Tar-soaked Jute or Nylon
Inner Armor Layer
Outer Armor Layer
21mm Cable
17mm Cable
SL Double Armor
SL Single Armor
SL Lightweight Armor
SL Lightweight



- Fiber optics connects the world under the seas and over the land
- Virtually all communications travels via fiber

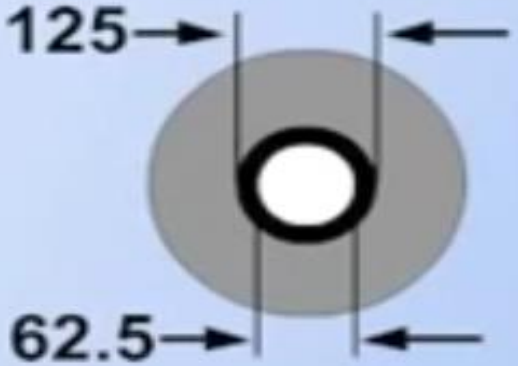
Fiber Optic Applications

- Telecom - telephones, Internet, Fiber to the Home, wireless
- Computer networks and data centers
- CATV - for video, voice and Internet connections
- Utilities - management of power grid, telecom
- Security - CCTV and intrusion sensors
- Entertainment - video and audio
- Intelligent Highways
- Military - everywhere!

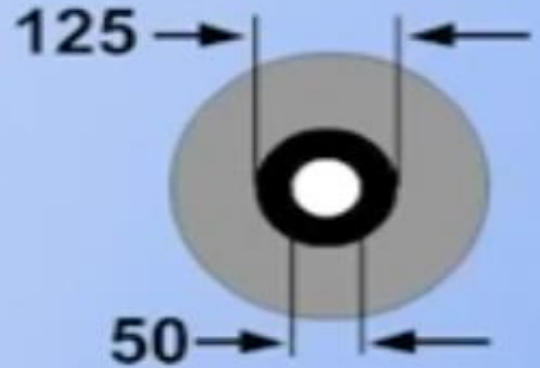
FIBER OPTIC CABLE

COMMON CABLE SIZES

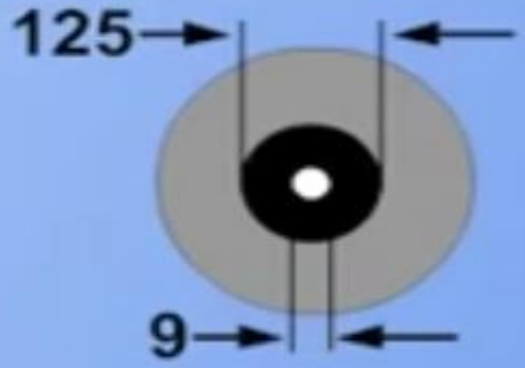
62.5/125 MULTIMODE



50/125 MULTIMODE



9/125 SINGLE MODE

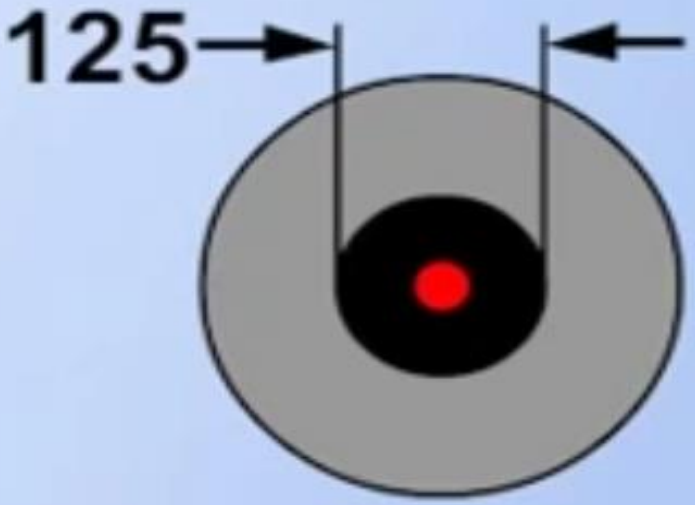


CORE

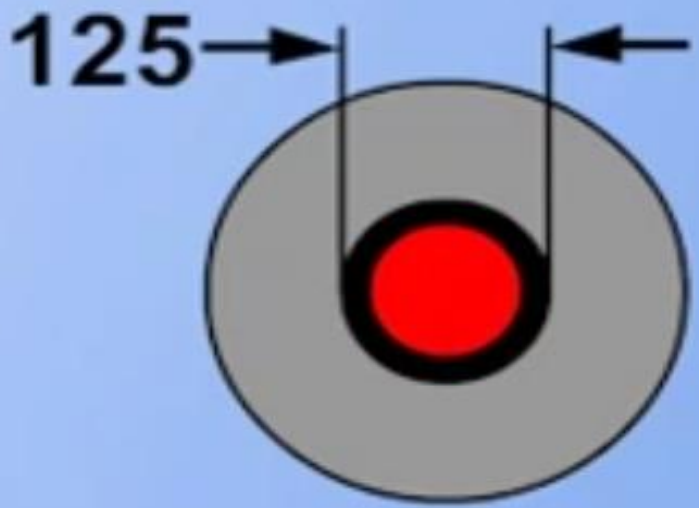
CLADDING

BUFFER COATING
DIAMETERS VARY

FIBER OPTIC COMMUNICATION



SINGLE MODE FIBER



MULTIMODE FIBER

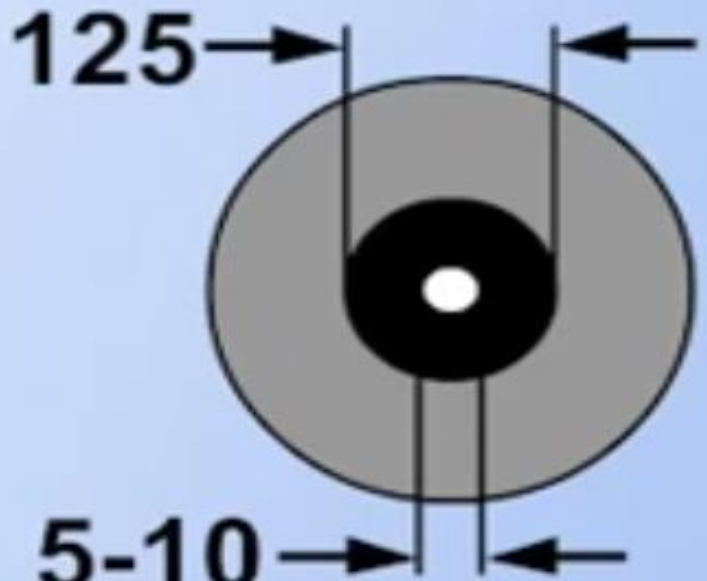
CORE

CLADDING

BUFFER COATING

DIAMETERS VARY

SINGLE MODE FIBER



SINGLE MODE FIBER

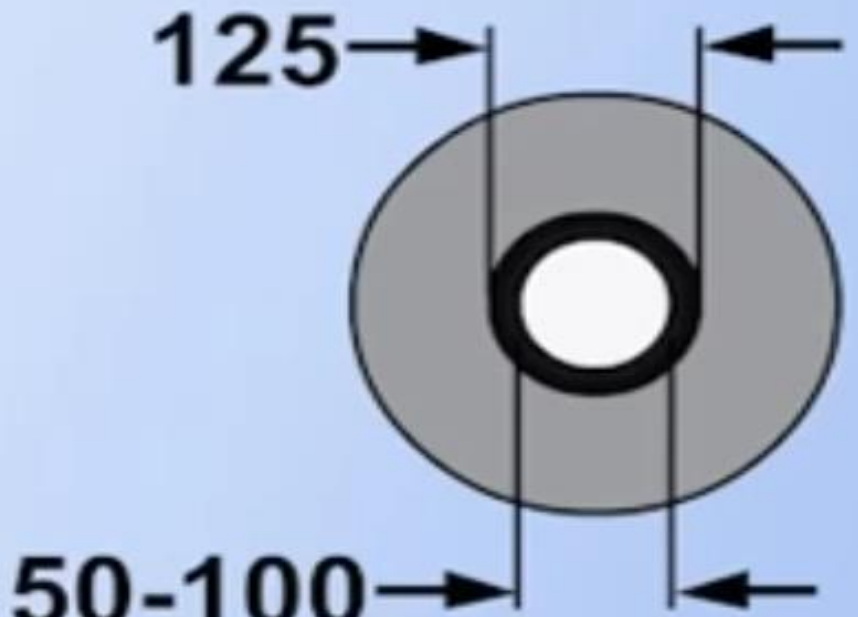
CORE

CLADDING

BUFFER COATING

DIAMETERS VARY

MULTIMODE FIBER

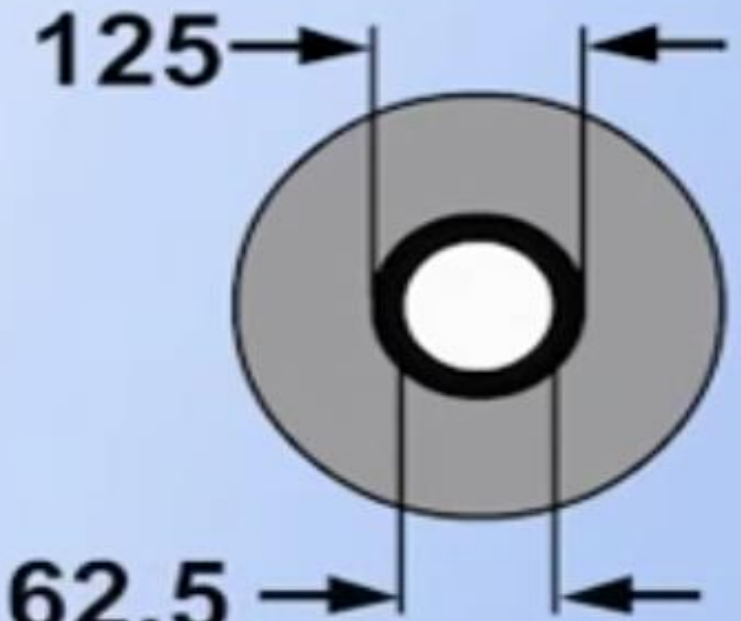


CORE

CLADDING

BUFFER COATING
DIAMETERS VARY

MULTIMODE FIBER

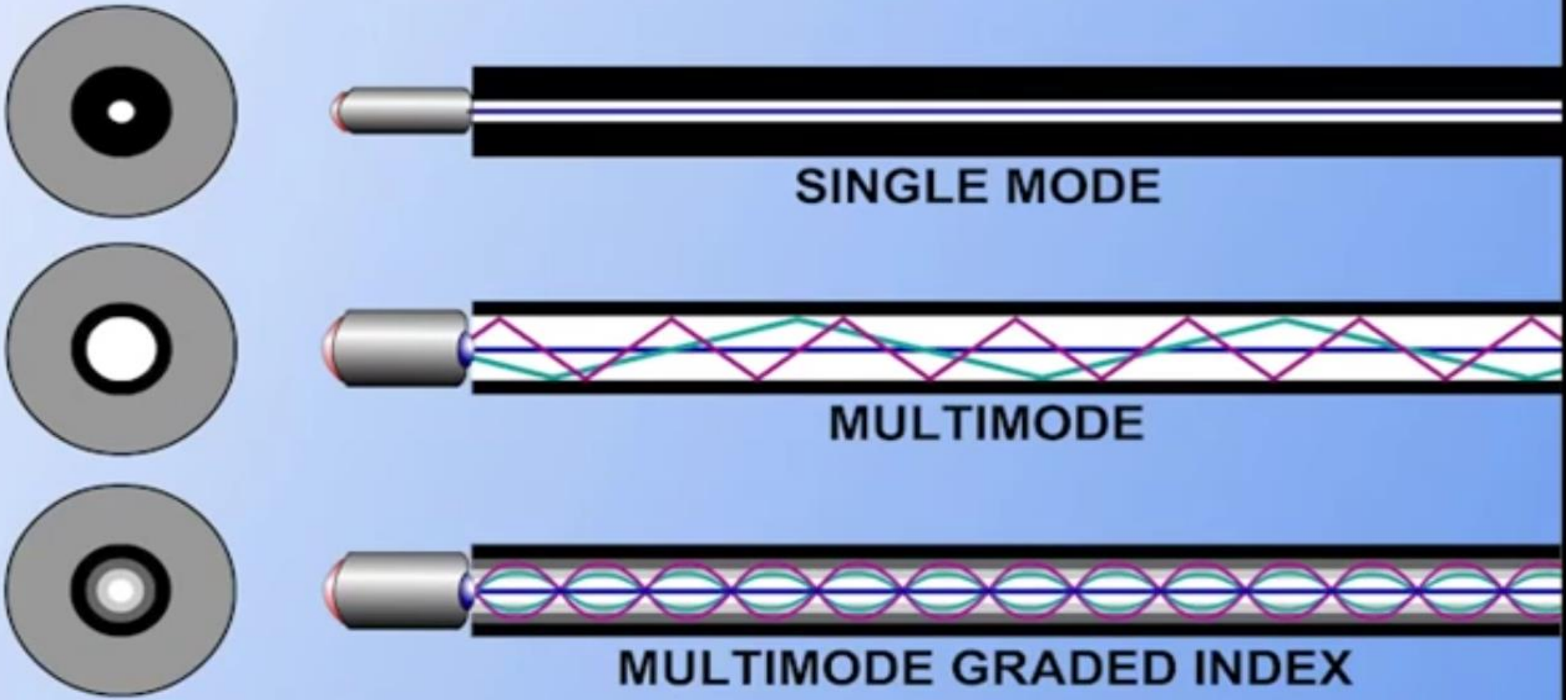


CORE

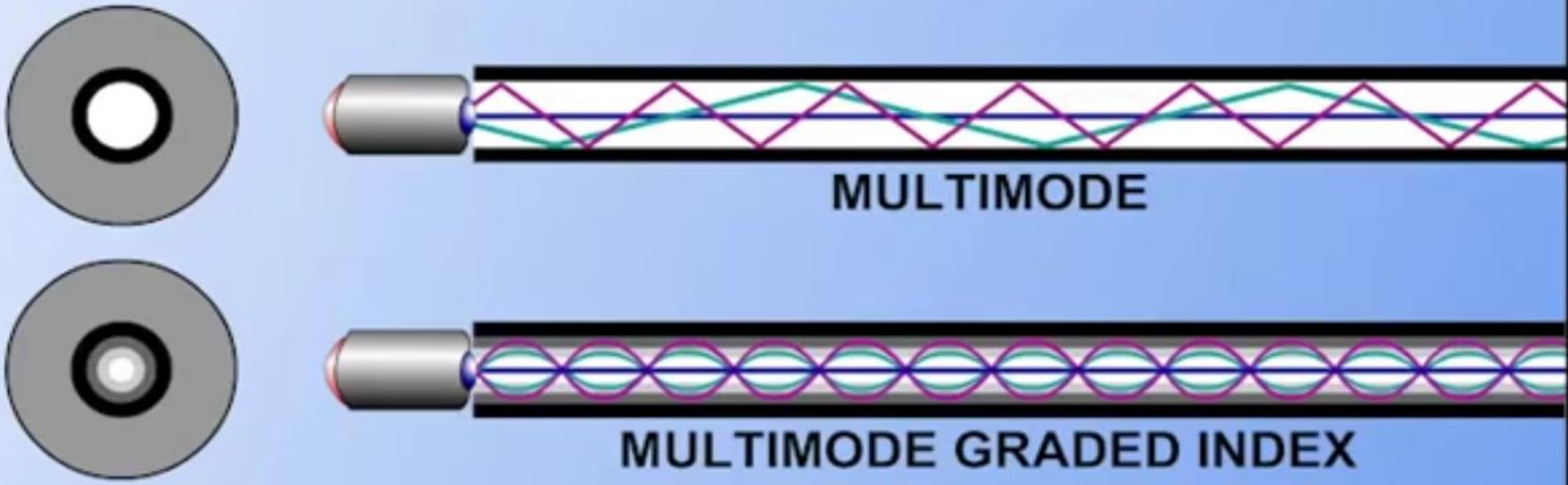
CLADDING

BUFFER COATING
DIAMETERS VARY

FIBER OPTIC COMMUNICATION



PLASTIC OPTICAL FIBER - POF



EASIER INSTALLATION

EASIER UPKEEP

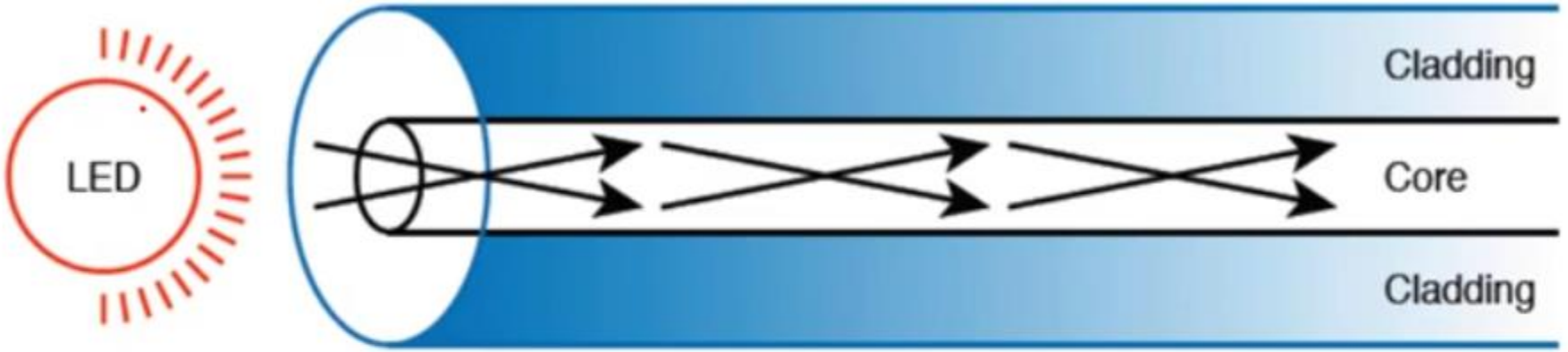
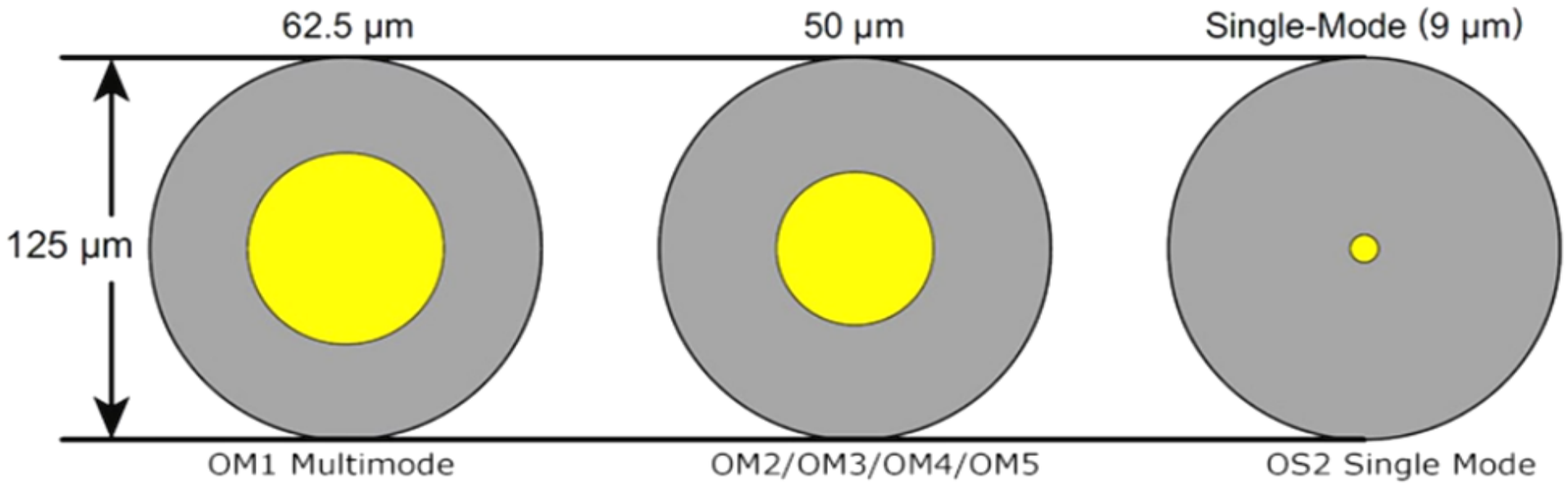


Figure 2-16 *Transmission on Multimode Fiber with Internal Reflection*

Figure 2-17 *Transmission on Single-Mode Fiber with Laser Transmitter*

VIDEO PRODUCTS INCORPORATED

Optical Fiber Core Diameters

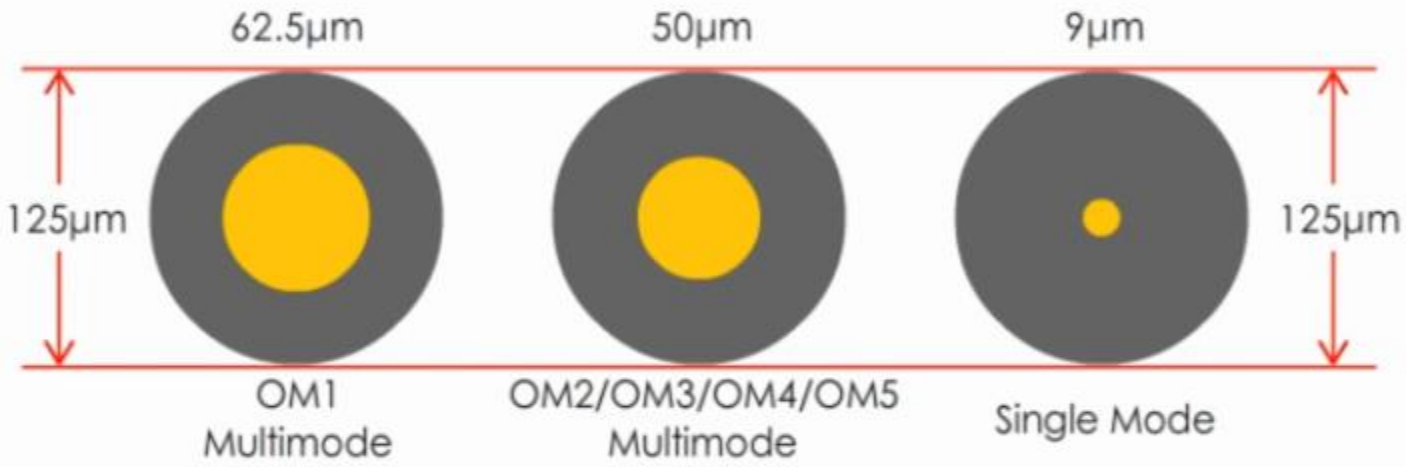


www.vpi.us

sales@vpi.us

Optical Fiber Core Diameters

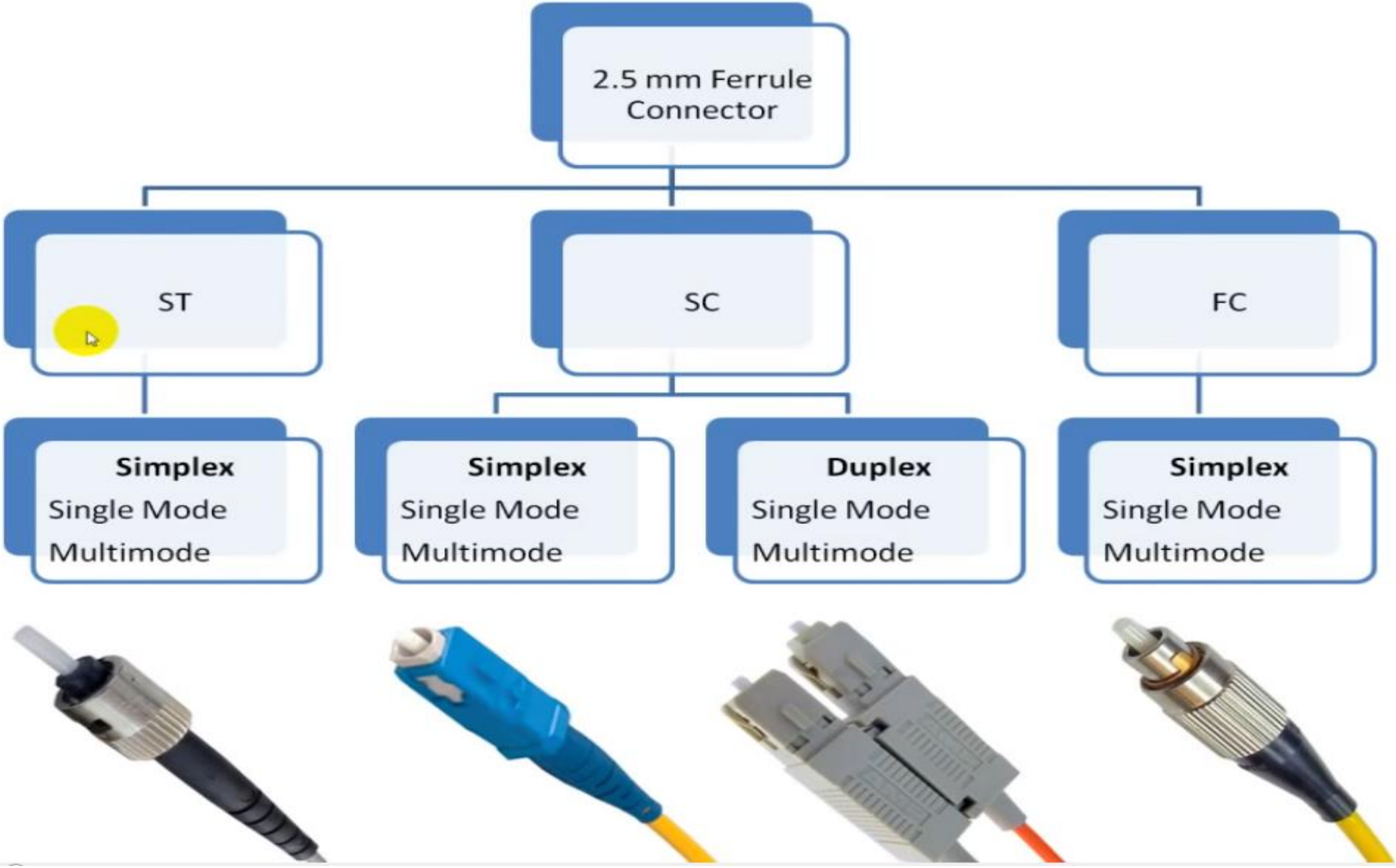
1µm = 1 micrometer/micron = 1×10^{-6} meter

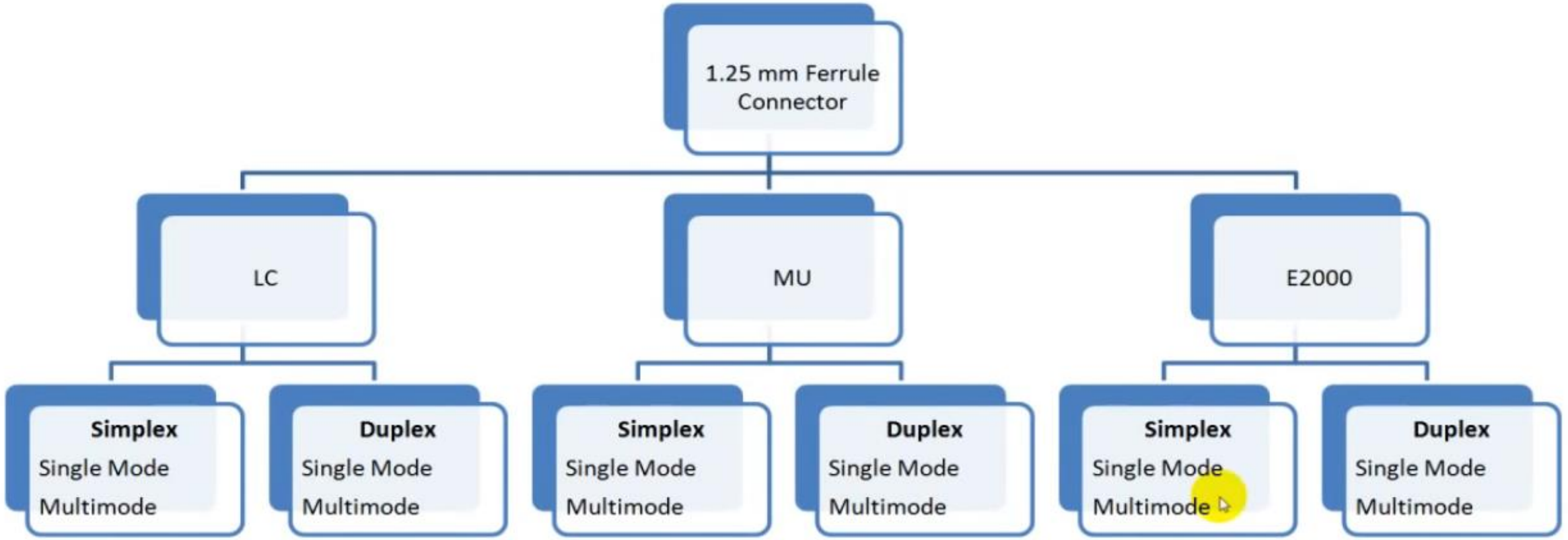


- 1–10 µm – length of a typical bacterium
- 0.125 µm – length of the COVID-19 virus
- 20 to 200 µm – diameter of human hair

Common Fiber Connectors List

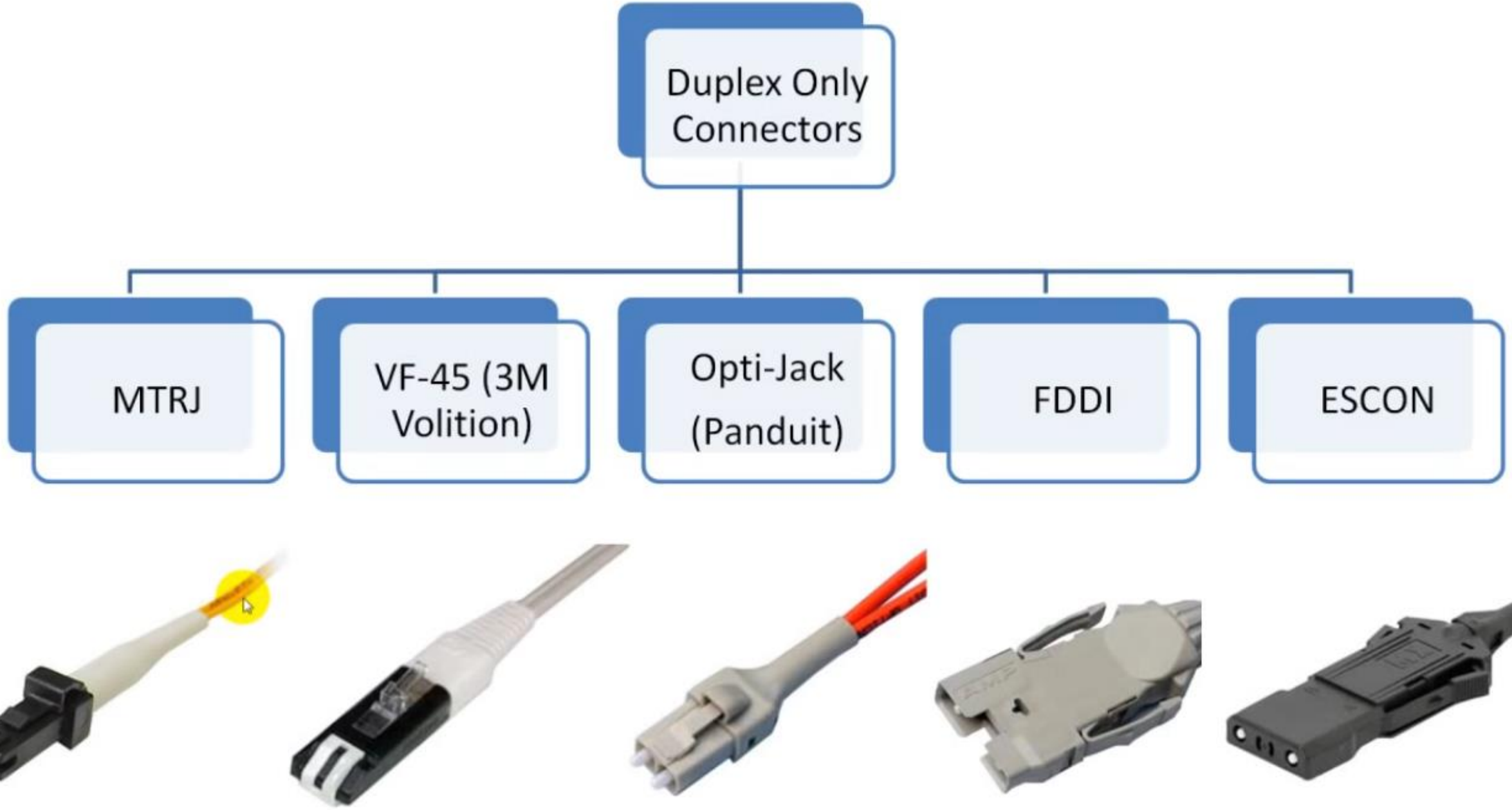
- Fiber Optic Connectors
  - Single Fiber Connector
    - 2.5 mm Ferrule
      - ST
      - SC
      - FC
    - 1.25 mm Ferrule
      - LC
      - MU
      - E2000
    - Other Ferrule Size
      - SMA 905 and 906
      - D4
      - BICONIC
      - DIN
  - Multiple-Fiber Connector
    - Duplex Only (2 Fibers)
      - MTRJ
      - VF-45
      - Opti-Jack
      - FDDI
      - ESCON
    - Ribbon Fiber Connector (4~72 Fibers)
      - MTP/MPO


2.5 mm Ferrule Connector
ST
SC
FC
Simplex
Single Mode
Multimode
Simplex
Single Mode
Multimode
Duplex
Single Mode
Multimode
Simplex
Single Mode
Multimode


1.25 mm Ferrule Connector
LC
MU
E2000
Simplex
Single Mode
Multimode
Duplex
Single Mode
Multimode
Simplex
Single Mode
Multimode
Duplex
Single Mode
Multimode
Simplex
Single Mode
Multimode
Duplex
Single Mode
Multimode

Other Single Fiber Connectors

- SMA 905
  SMA 906
- D4
- BICONIC
- DIN


Duplex Only Connectors
MTRJ
VF-45 (3M Volition)
Opti-Jack (Panduit)
FDDI
ESCON

Ribbon Fiber Connector

MPO/MTP (4~72 fibers)

What is Fiber Optic Patch Cable?

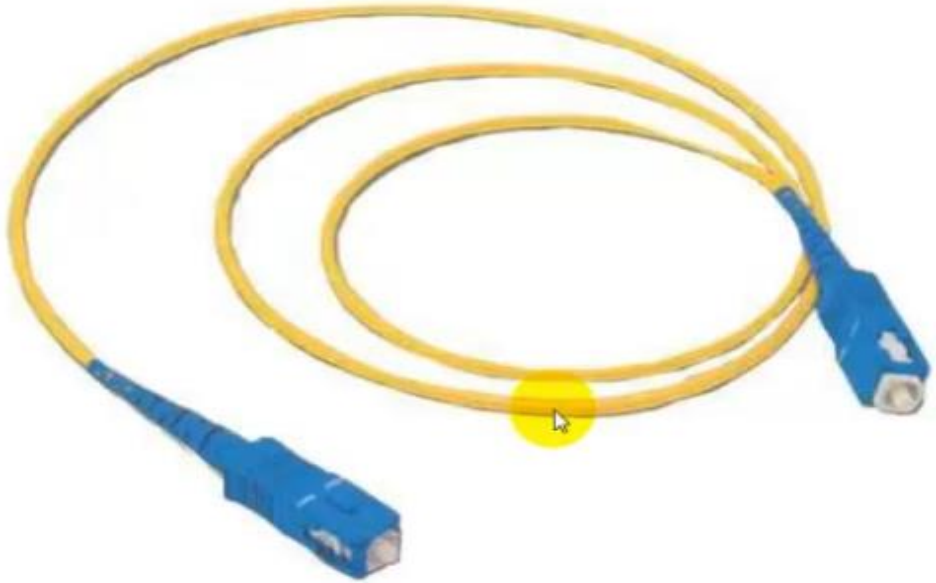
Fiber Optics For Sale Co.
www.fo4sale.com

Fiber Patch Cable – Simplex or Duplex

Simplex Patch Cable

Duplex Patch Cable

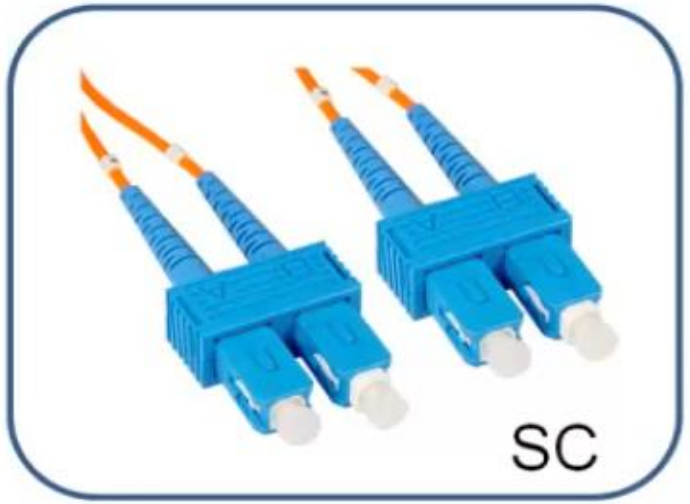
Single Mode or Multimode



Single Mode Cable (Yellow Jacket)

Multimode Cable (Orange Jacket)

Patch Cable Connector Types



Fiber Optics For Sale Co.
www.fo4sale.com

Fiber Connectors

ST

SC

LC

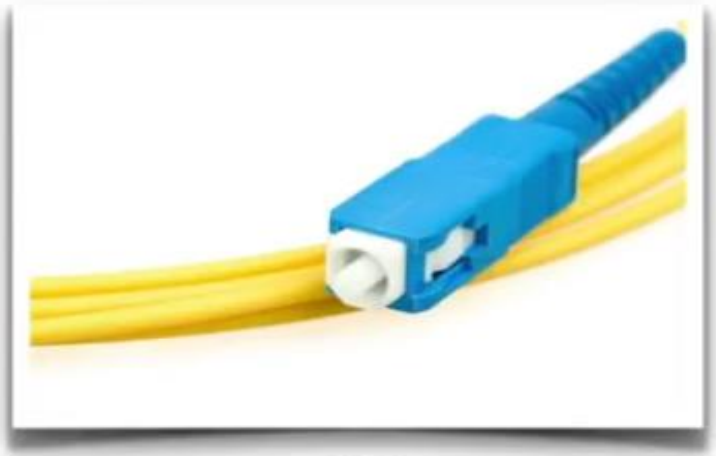
- Subscriber Connector
- Standard Connector
- Square Connector

Fiber Connectors

ST

MTRJ

LC



SC

- Media Termination Recommended Jack
- Mechanical Transfer Registered Jack

Fiber Connectors

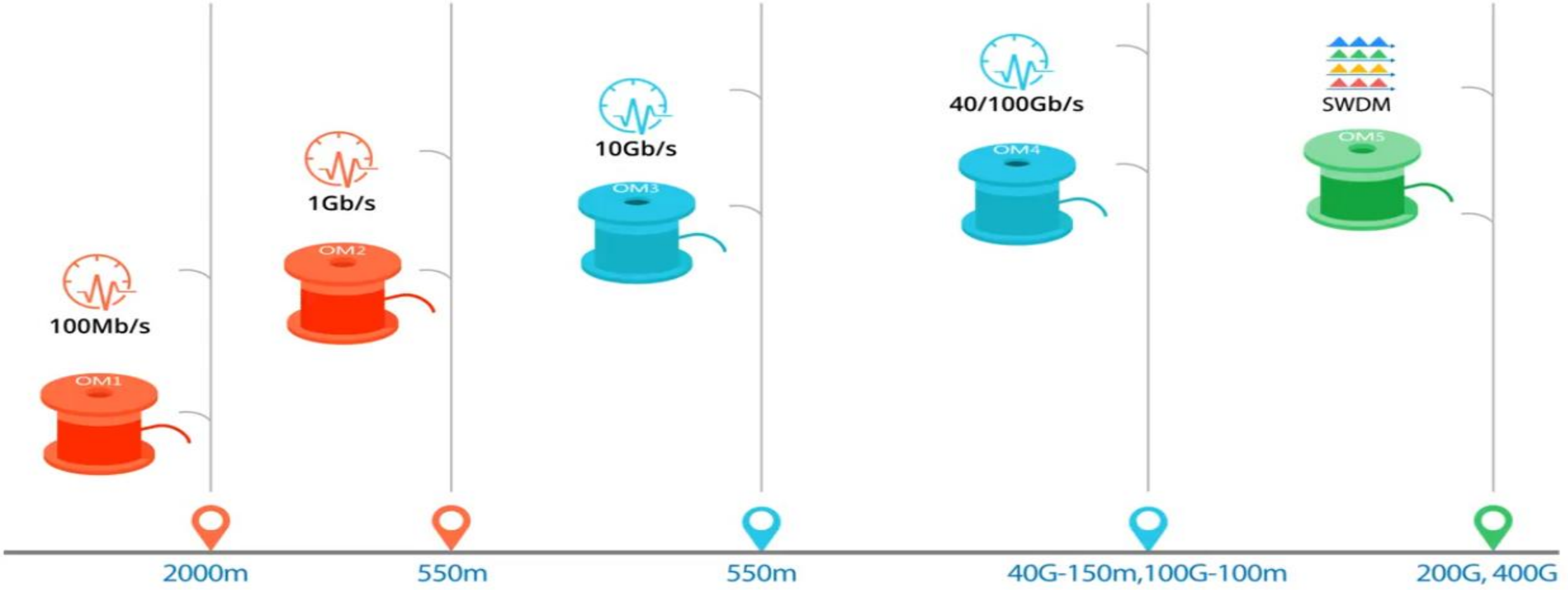
Ultra Physical Contact (UPC)

Ethernet Standards

Ethernet Standard	Media Type	Bandwidth Capacity	Distance Limitation
100BASE-TX	Cat 5 (or higher) UTP	100 Mbps	100 m
1000BASE-T	Cat 5 (or higher) UTP	1 Gbps	100 m
1000BASE-LX	MMF/SMF	1 Gbps/1 Gbps	550 m/5 km
1000BASE-SX	MMF	1 Gbps	220 m (62.5μm)/550 m (50μm)

Multimode Fiber Types: OM1, OM2, OM3, OM4, OM5

Differences and Applications



FS Multiple Fiber Patch Cables

Meet All Your Cabling Needs

Check Fiber mode

#sh int G0/1

Media type: 1000 Base SX SFP..... MM connect to fiber or ODF 200-550 m

100 Base CX SFP ..... MM short cable from switch to switch (Twinaxia Cableing 25 m)

GBIC: SX/SH .... MM 300 m .... Orange

LX/LH ..... SM 2km Yellow

LX.... MM 550 m

LX..... SM 5 km

LX10 ....SM 1.130 nm ..... 10 km

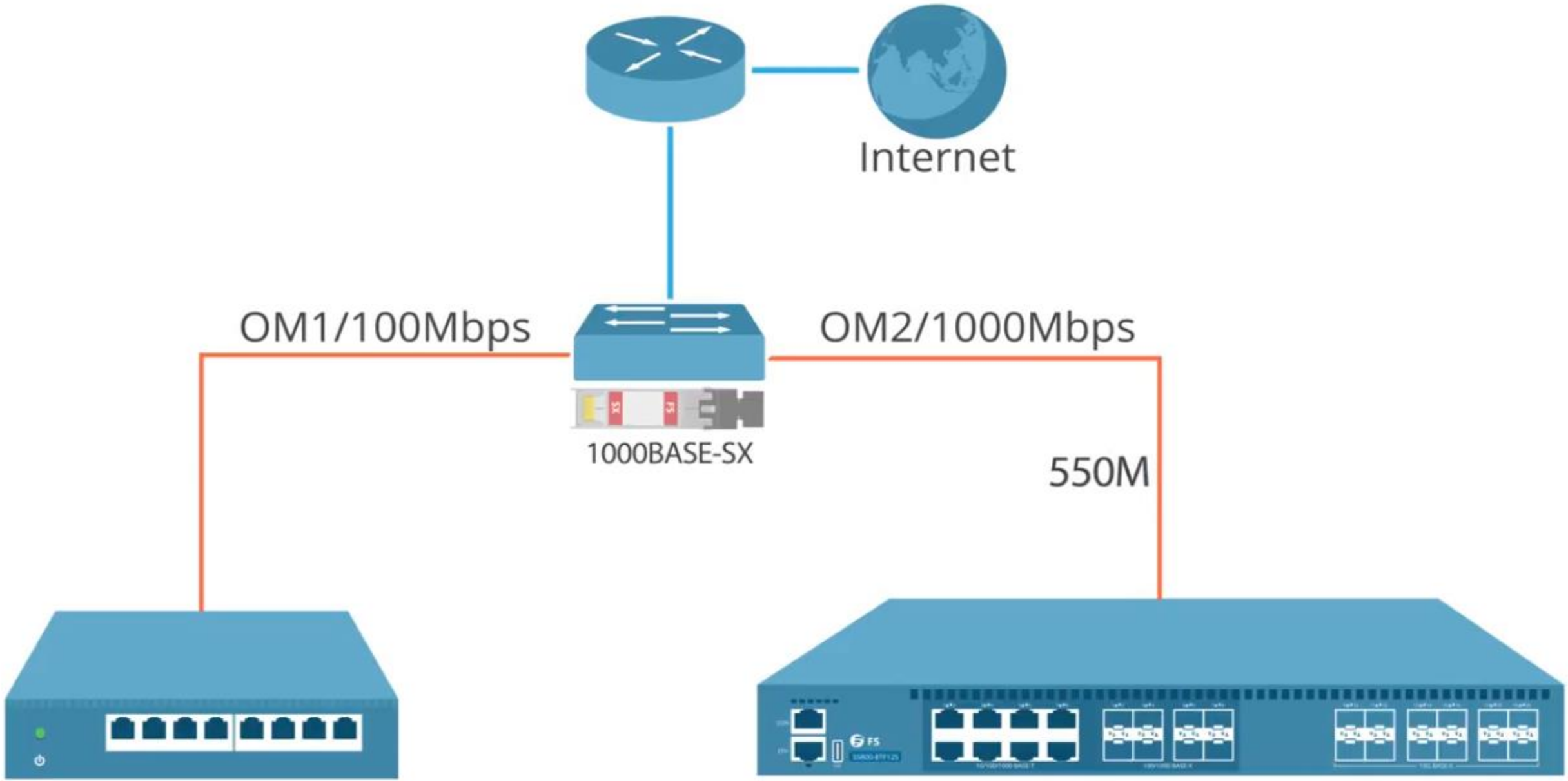
EX ... SM 1.310 nm 40 km

ZX ... SM 1.550 nm 70 km

BX10 .... SM 1.490 downstream and 1310 nm upstream 10 km

sh cdp neighbors

sh int .....

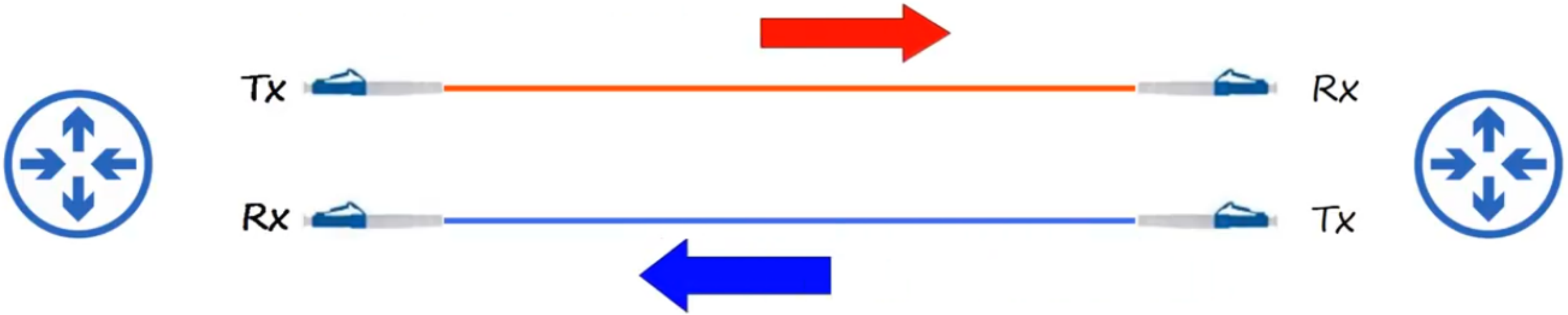

Internet
OM1/100Mbps
OM2/1000Mbps
1000BASE-SX
550M

Fiber-Optic Connections

SFP Transceiver

(Small Form-Factor Pluggable)

Fiber-Optic Connections



Fiber-Optic Cable Standards

Informal Name	IEEE Standard	Speed	Cable Type	Maximum Length
1000BASE-LX	802.3z	1 Gbps	Multimode or Single-Mode	550 m (MM) 5 km (SM)
10GBASE-SR	802.3ae	10 Gbps	Multimode	400 m
10GBASE-LR	802.3ae	10 Gbps	Single-Mode	10 km
10GBASE-ER	802.3ae	10 Gbps	Single-Mode	30 km

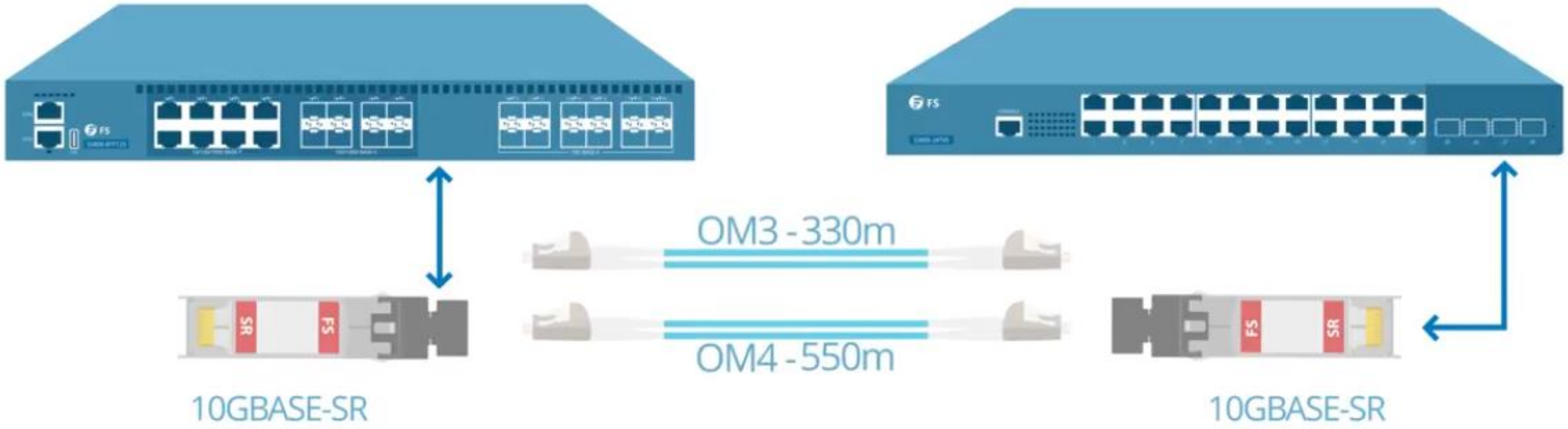
UTP vs Fiber-Optic Cabling

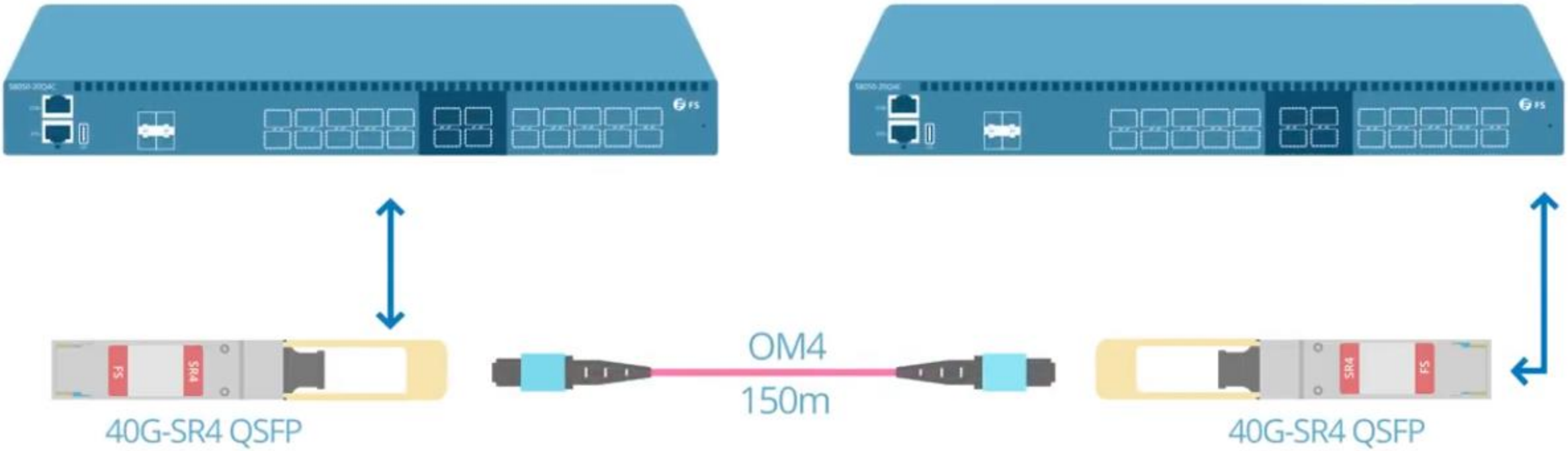
UTP

- Lower cost than fiber-optic.
- Shorter maximum distance than fiber-optic (~100m).
- Can be vulnerable to EMI (Eletromagnetic Interference).
- RJ45 ports used with UTP are cheaper than SFP ports.
- Emit (leak) a faint signal outside of the cable, which can be copied (=security risk)

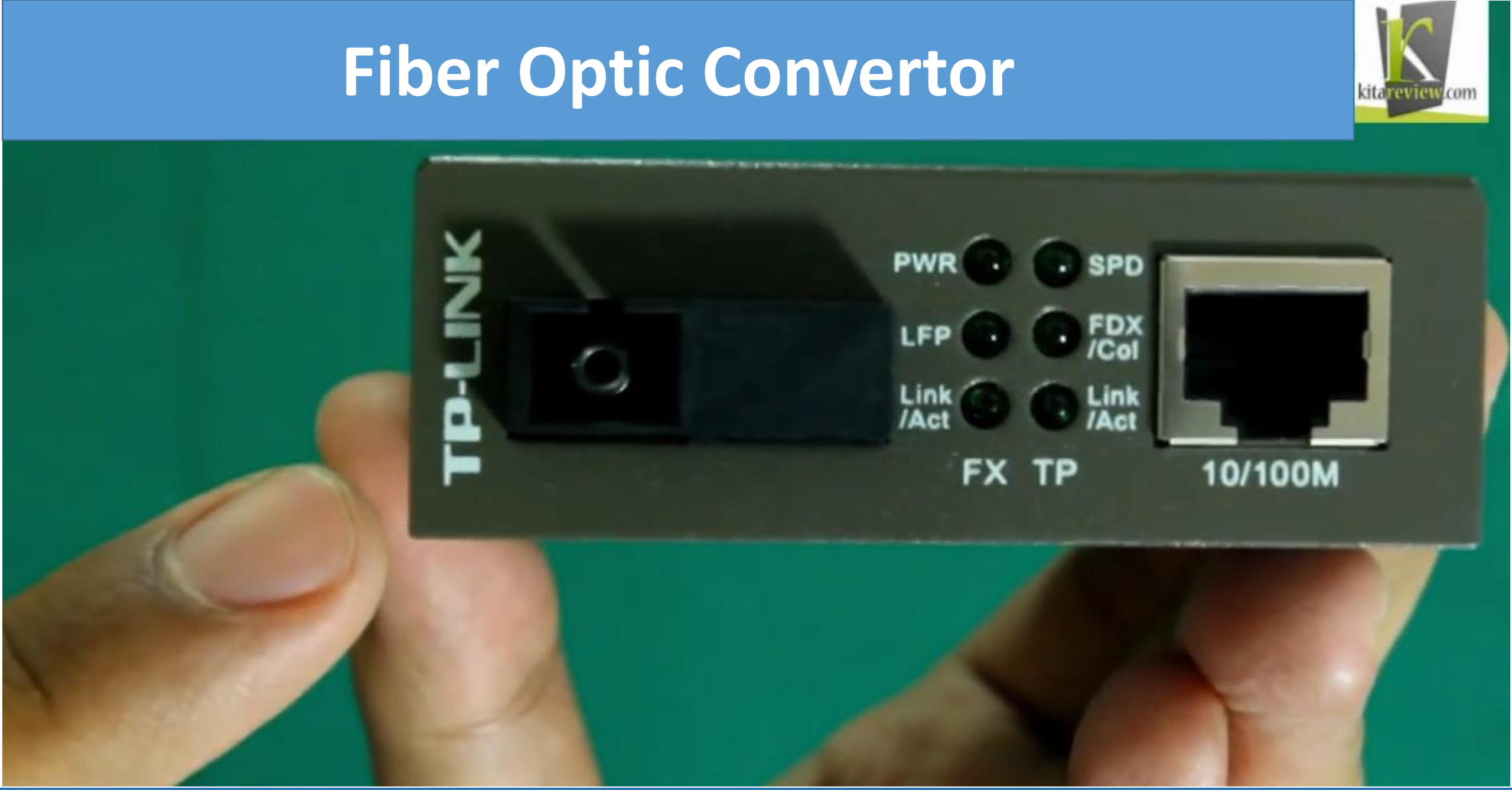
Fiber-Optic

- Higher cost than UTP.
- Longer maximum distance than UTP.
- No vulnerability to EMI.
- SFP ports are more expensive than RJ45 ports (single-mode is more expensive than multimode).
- Does not emit any signal outside of the cable (=no security risk).

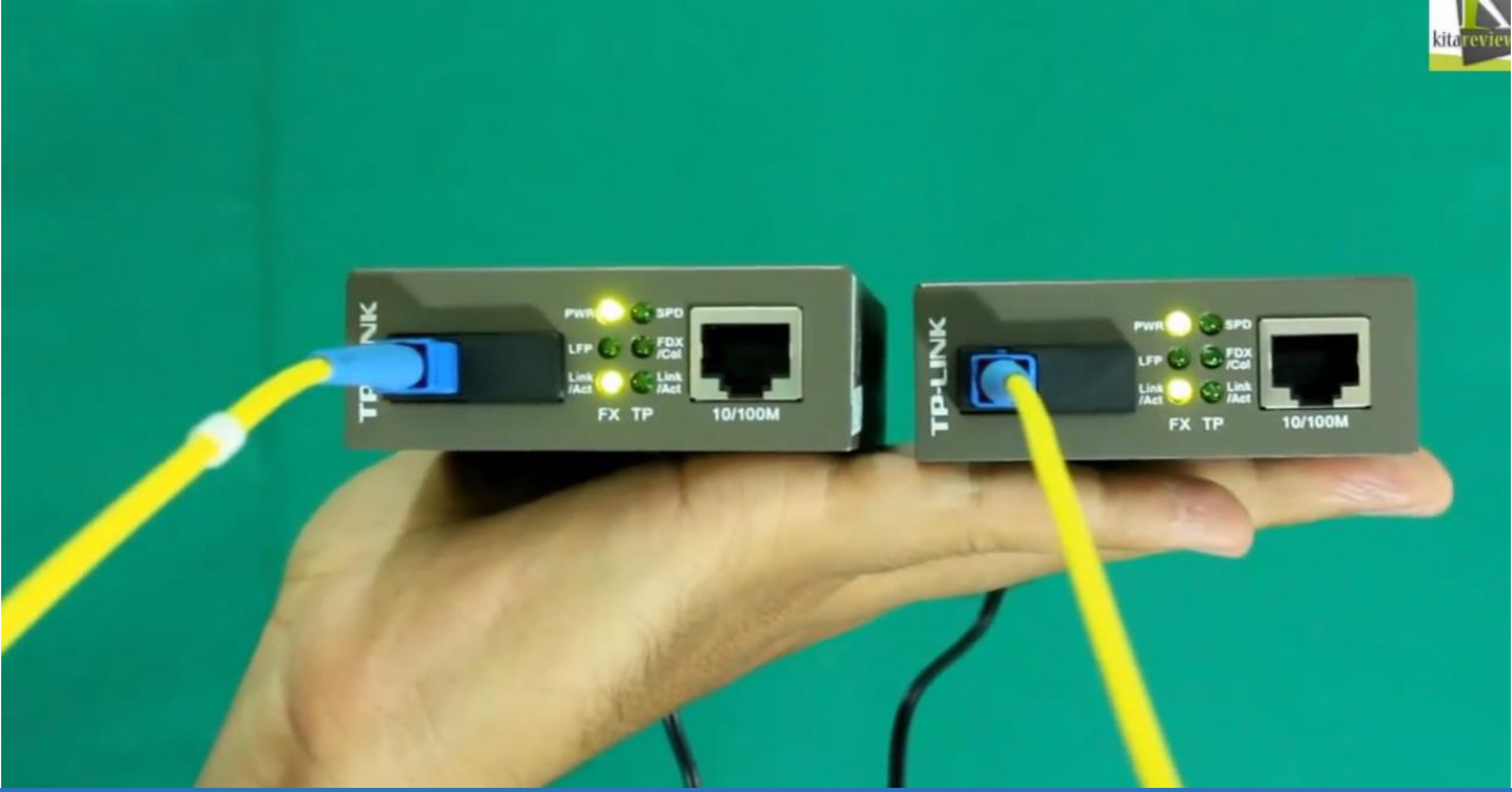

OM3 - 330m
OM4 - 550m
10GBASE-SR
10GBASE-SR

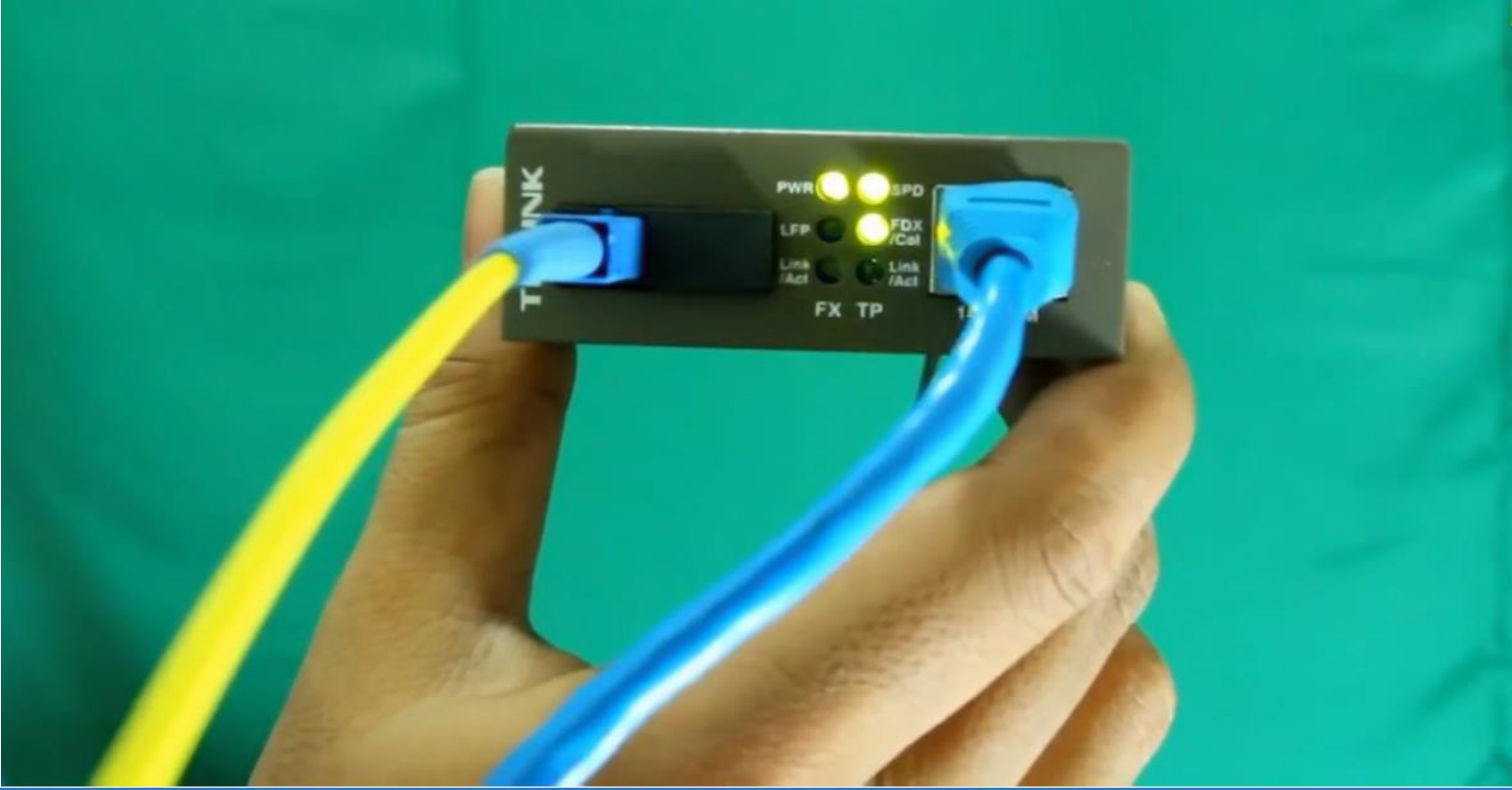

OM4
150m
40G-SR4 QSFP
40G-SR4 QSFP

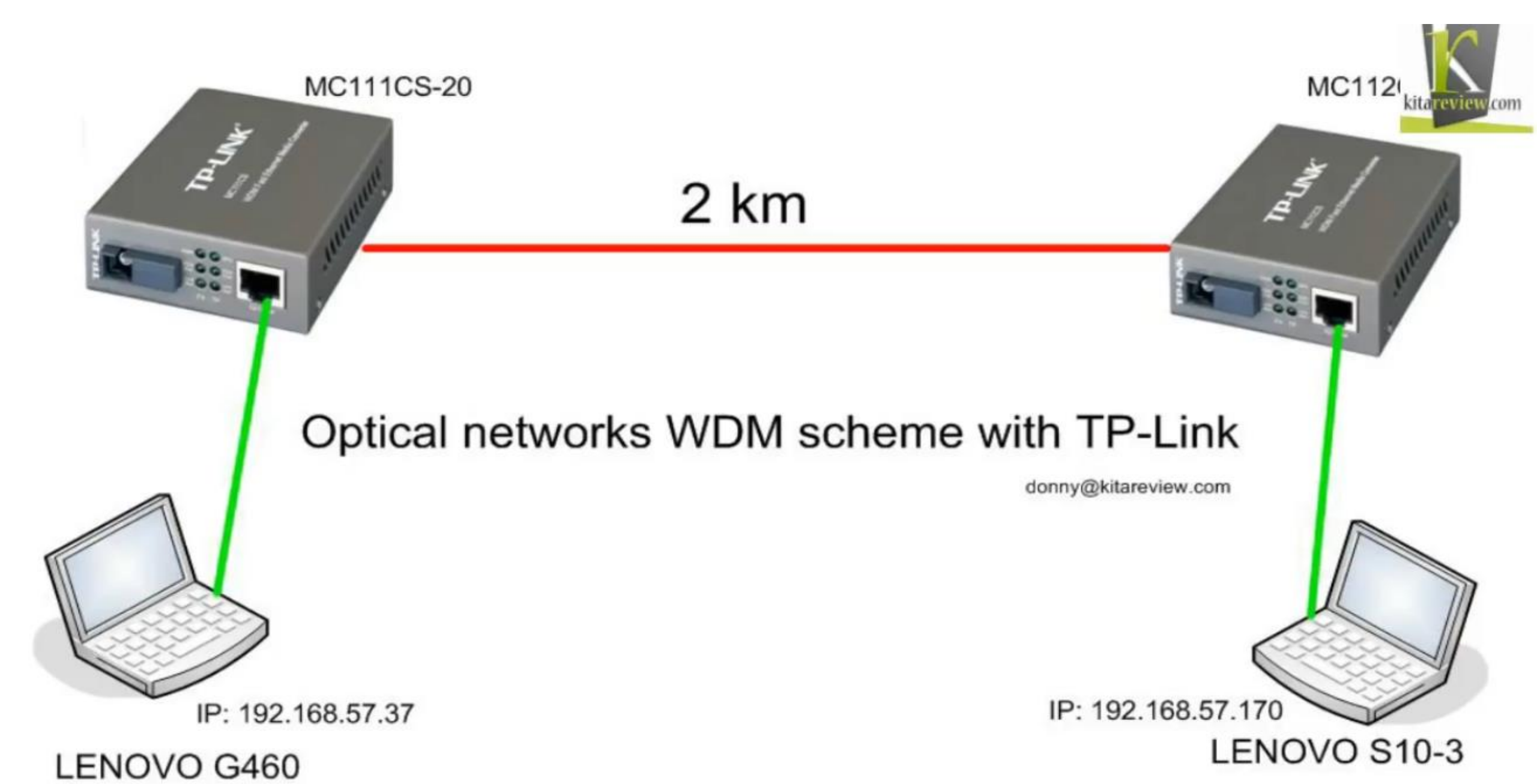
Fiber Optic Convertor




PWR
SPD
LFP
FDX /COL
LINK /ACT
FX TP
10/100M
TP-LINK

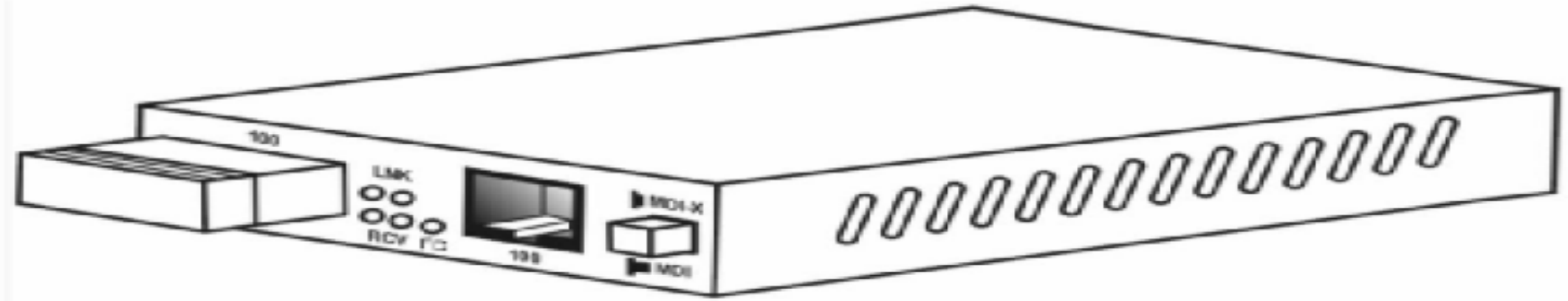

TP-LINK
PWR
SPD
LFP
FDX /Col
Link /Act
Link /Act
FX TP
10/100M
TP-LINK
PWR
SPD
LFP
FDX /Col
Link /Act
Link /Act
FX TP
10/100M


PWR
SPD
LFP
FDX
/Col
Link
/Act
Link
/Act
FX
TP


MC111CS-20
MC112
kitareview.com
2 km
Optical networks WDM scheme with TP-Link
donny@kitareview.com
IP: 192.168.57.37
LENOVO G460
IP: 192.168.57.170
LENOVO S10-3

potential distances of up to 2 kilometers for multi-mode fiber and 60 kilometers for long haul single mode fiber between a LAN switch, hub or a file server.

Note: It is not recommended to use the Converter in half-duplex mode as back-to-back distance for multi-mode fiber will only be 412m.



Front Panel View with SC and RJ-45 Connectors

Single Mode to Multimode Converter Application of SFP to SFP media converter

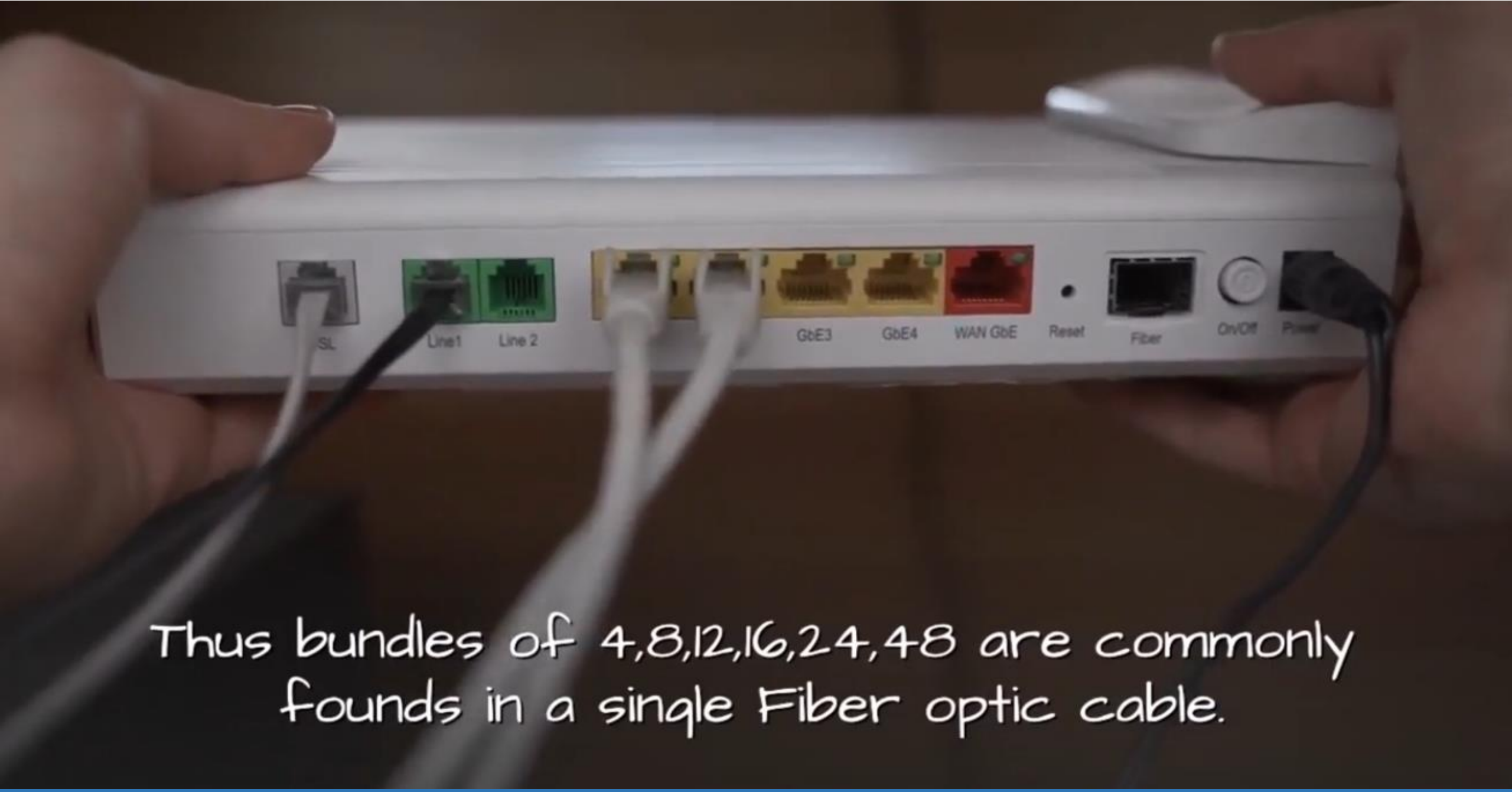

Line1
Line 2
GbE3
GbE4
WAN GbE
Reset
Fiber
On/Off
Thus bundles of 4,8,12,16,24,48 are commonly founds in a single Fiber optic cable.

Table 1 Maximum Operating Distances

Model	Type of Connector		Maximum Operating Distance	
	100Base-FX	100Base-TX	100Base-FX[1]	100Base-TX
AT-MC101XL	ST	RJ-45	2 km (1.2 mi)	100 m (328 ft)
AT-MC102XL	SC	RJ-45	2 km (1.2 mi)	100 m (328 ft)
AT-MC103XL	SC	RJ-45	15 km (9.3 mi)	100 m (328 ft)
AT-MC103LH	SC	RJ-45	40 km (24.8 mi)	100 m (328 ft)
AT-MC103SC/FS3	SC	RJ-45	75 km (46.5 mi)	100 m (328 ft)
AT-MC103ST/FS3	ST	RJ-45	75 km (46.5 mi)	100 m (328 ft)
AT-MC103SC/FS4	SC	RJ-45	100 km (62 mi)	100 m (328 ft)
AT-MC103ST/FS4	ST	RJ-45	100 km (62 mi)	100 m (328 ft)

1. Maximum distance may be less depending on the duplex mode of the end stations and the type of fiber optic cabling used with the port.

Table 4 100Base-FX Fiber Optic Port Specifications (Full-duplex)

Model	Type of Fiber Optic Cable	Maximum Operating Distance	Maximum Allowable Loss Budget
AT-MC101XL	50/125 or 62.5/125 micron multimode	2 km (1.2 mi)	13 dB at 1310 nm
AT-MC102XL	50/125 or 62.5/125 micron multimode	2 km (1.2 mi)	13 dB at 1310 nm
AT-MC103XL	9/125 micron single-mode	15 km (9.3 mi)	16 dB at 1310 nm
AT-MC103LH	9/125 micron single-mode	40 km (24.8 mi)	16 dB at 1310 nm
AT-MC103SC/FS3	9/125 micron single-mode	75 km (46.5 mi)[1]	33 dB at 1310 nm
AT-MC103ST/FS3	9/125 micron single-mode	75 km (46.5 mi)[1]	33 dB at 1310 nm
AT-MC103SC/FS4	9/125 micron single-mode	100 km (62 mi)[2]	34 dB at 1550 nm
AT-MC103ST/FS4	9/125 micron single-mode	100 km (62 mi)[2]	34 dB at 1550 nm

1. The media converter has a minimum operating distance of 15 km (9.4 mi). This is to prevent blinding or burning out of the optical receiver on the far-end-node.
2. The media converter has a minimum operating distance of 40 km (24.8 mi). This is to prevent blinding or burning out of the optical receiver on the far-end-node.

Back-to-Back Topology

Figure 4 illustrates two media converters in a back-to-back configuration.

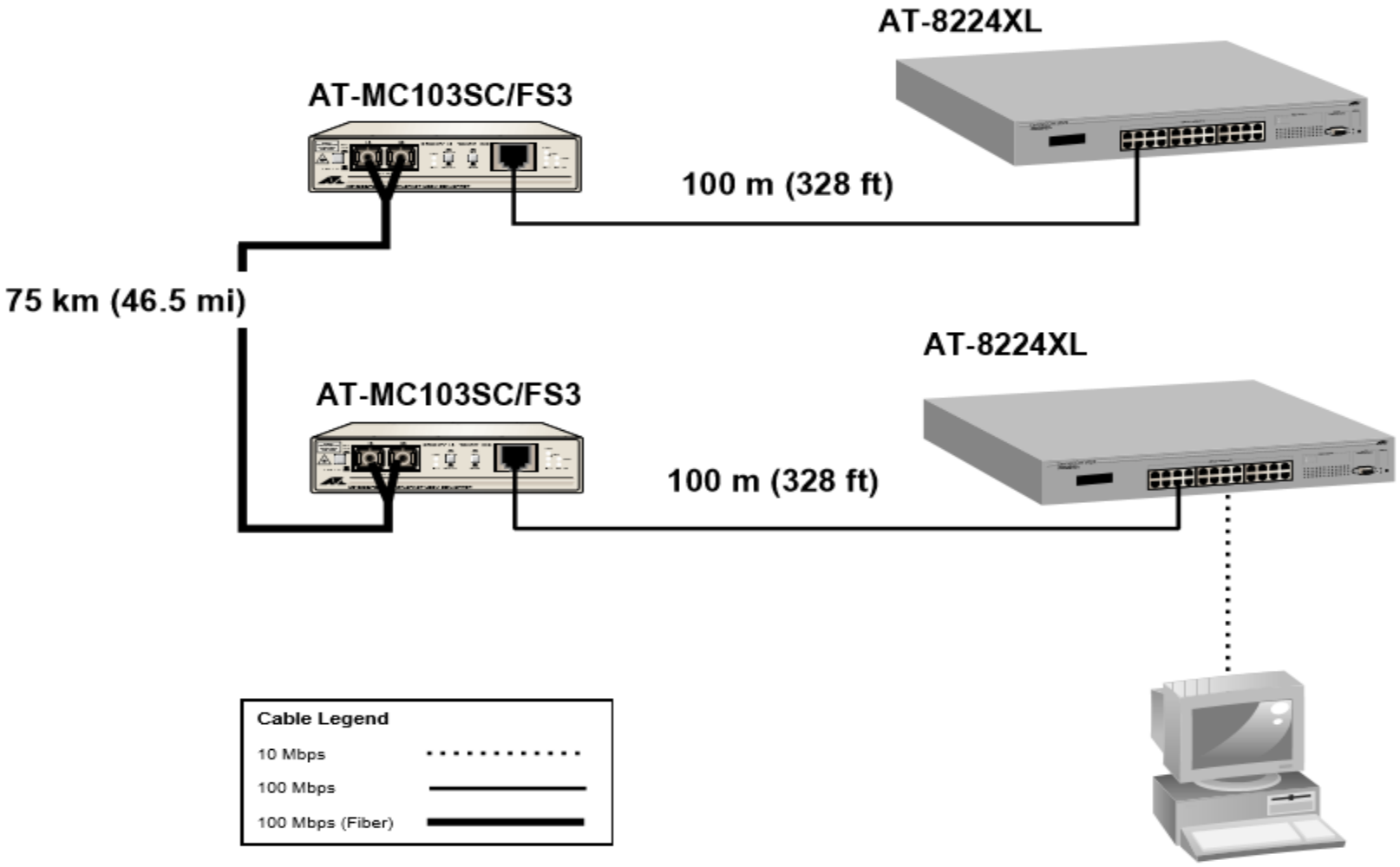
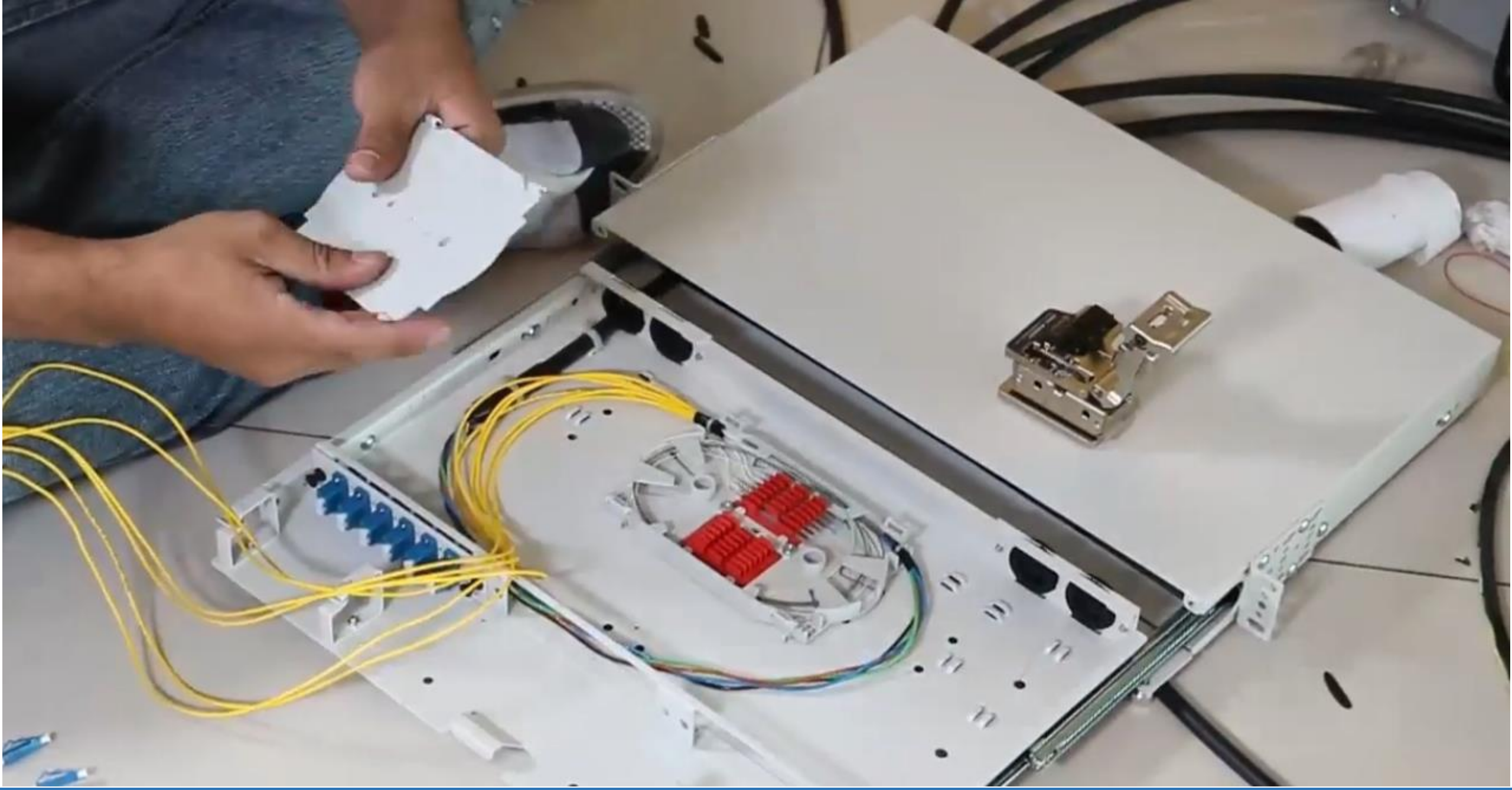


Figure 4 Back-to-Back Topology

What is ODF in fiber optics?

An optical distribution frame (ODF) is a frame used to provide cable interconnections between communication facilities, which can integrate fiber splicing, fiber termination, fiber optic adapters & connectors and cable connections together in a single unit.



Health and Safety

It’s important

Staying safe when working with fiber optics

Health and Safety

In today's video:

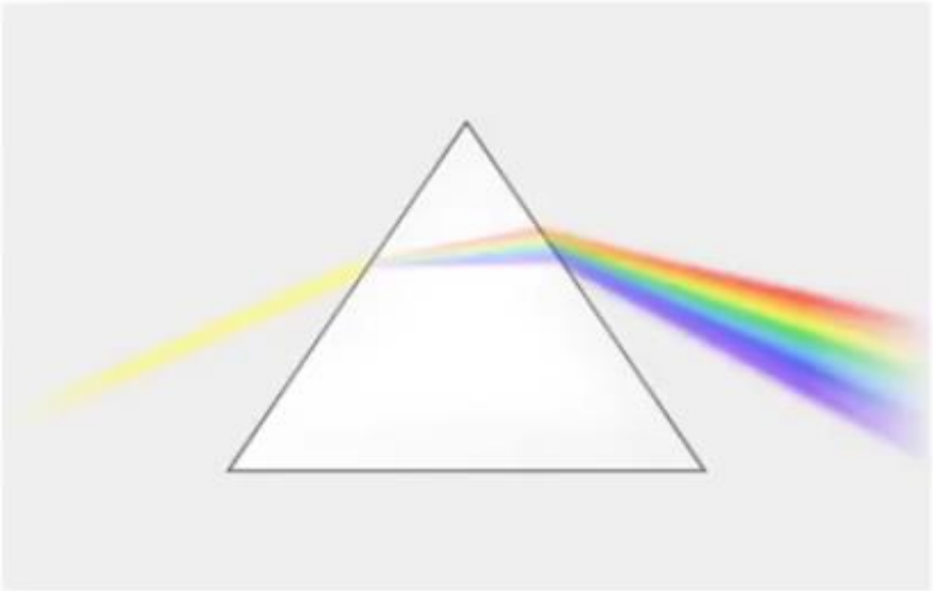
- Eye Safety
- Bare Fiber Fragments and Shards
- Chemical Hazards
- Fire Safety
- Environmental Hazards

Eye Safety

Do and Don't

DO make sure you've turned off the laser before inspecting any connectors or equipment

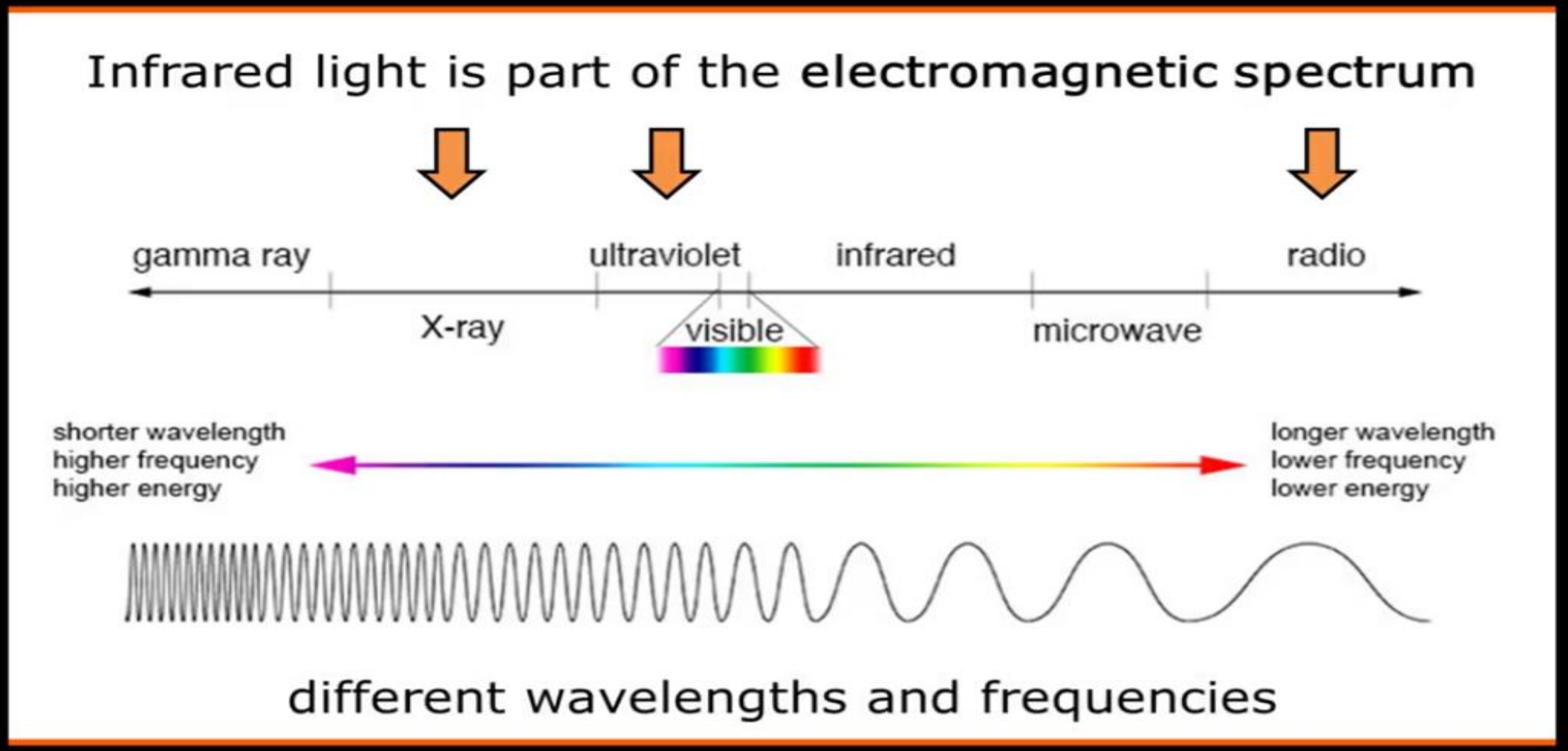
Why?

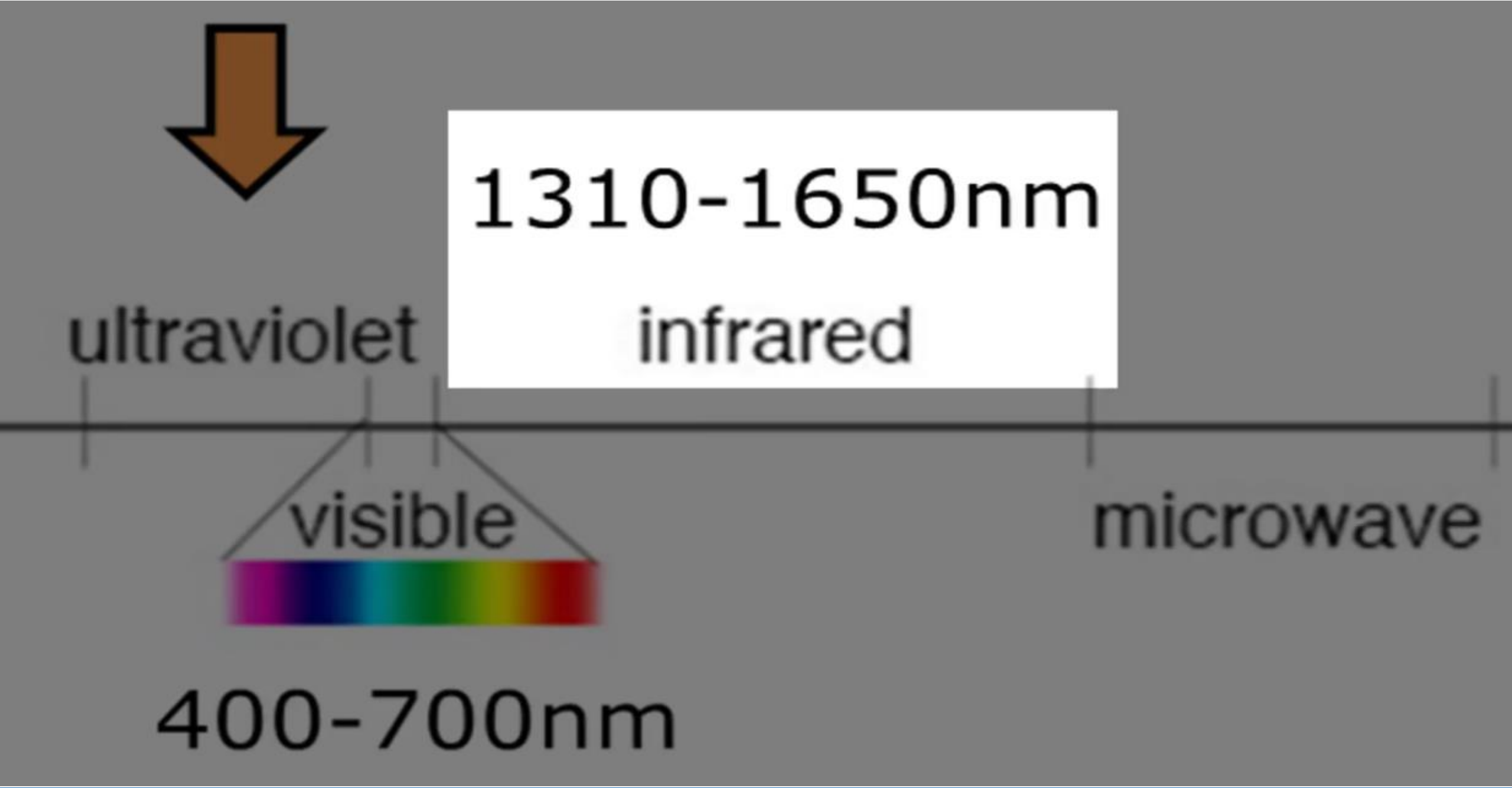


The Science bit

Optical fibers are very thin glass fibers which transmit a beam of Infrared light from a laser to a receiver or photodetector

The Science bit




1310-1650nm
ultraviolet
infrared
visible
microwave
400-700nm

But hang on...

"I've SEEN the light in a fiber optic cable before!"

Visual Tracer

Visual Fault Locator

Laser Safety Classifications

Class 1 - highly unlikely to pose any hazard to health

Class 4 - treat with extreme caution

used in industrial manufacturing

Fiber optics lasers are typically Class 1 or 2

Eye Safety

fiber optics use low-risk lasers emitting invisible infrared light

... DO wear safety glasses with side shields

offer protection from flying fiber fragments

Eye Safety

DON'T look directly into the end of the fiber

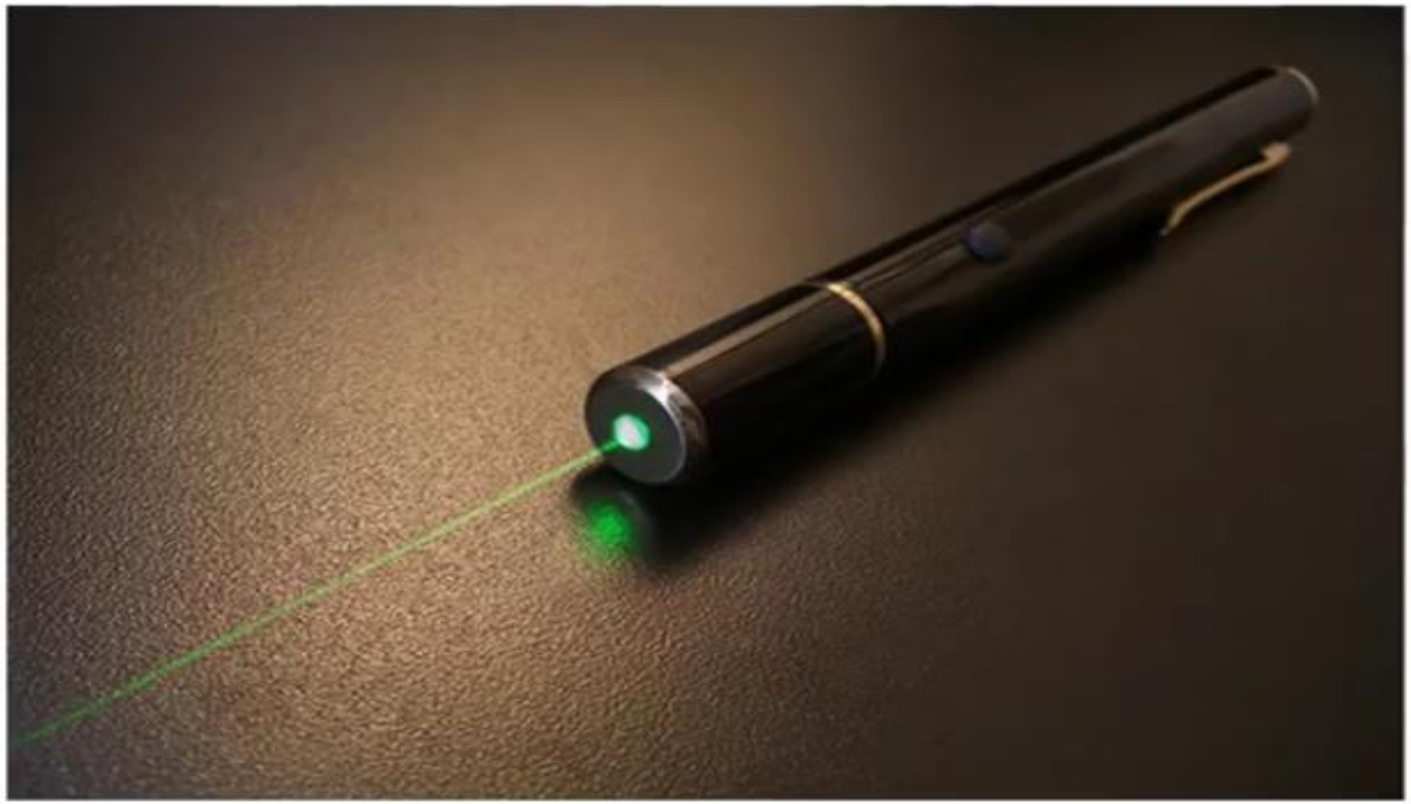
blurry vision, temporary blindness or blind spots

DO replace the protective dustcap on the end of an unmated connector

DO use a power meter or an optical fiber identifier to check if a cable is live or dark

Did you know...?

...a typical laser pointer is probably more dangerous than anything usually found in fiber optics



Eye Safety

DON'T touch your face, particularly your eyes, after working with fiber optics

DO work in a well-lit area

DO only use microscopes with a built-in Infrared filter

DO remember that fiber has a memory

Bare Fiber Fragments and Shards

Stripping, cleaving and cutting bare fiber

DO handle fiber optics with extreme care

- can easily cause cuts
- tiny broken fragments get embedded into your skin
- leading to serious irritations or an infection

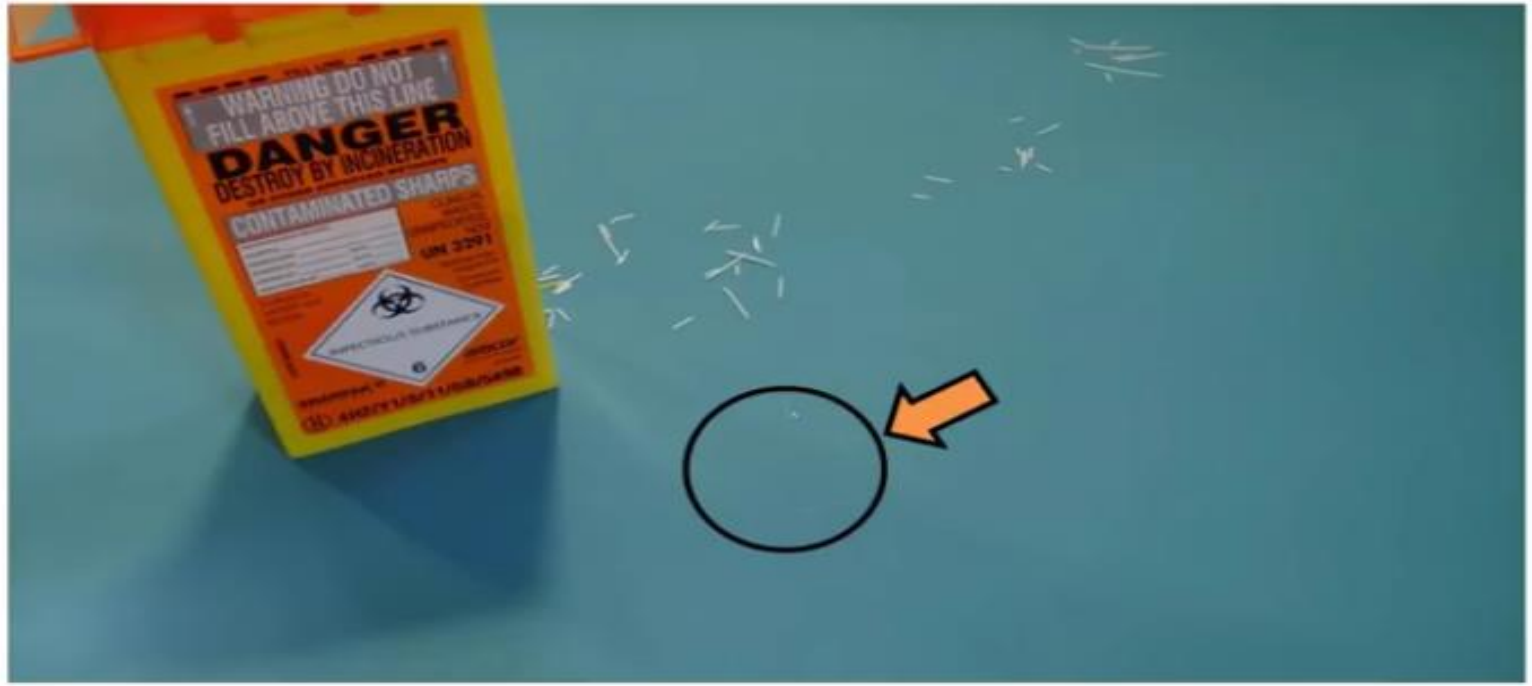
Bare Fiber Fragments and Shards

DO take care when working with blades such as cutters or strippers

DO wear PPE - Personal Protective Equipment

Bare Fiber Fragments and Shards

DO pay careful attention to where any cut fiber fragments go



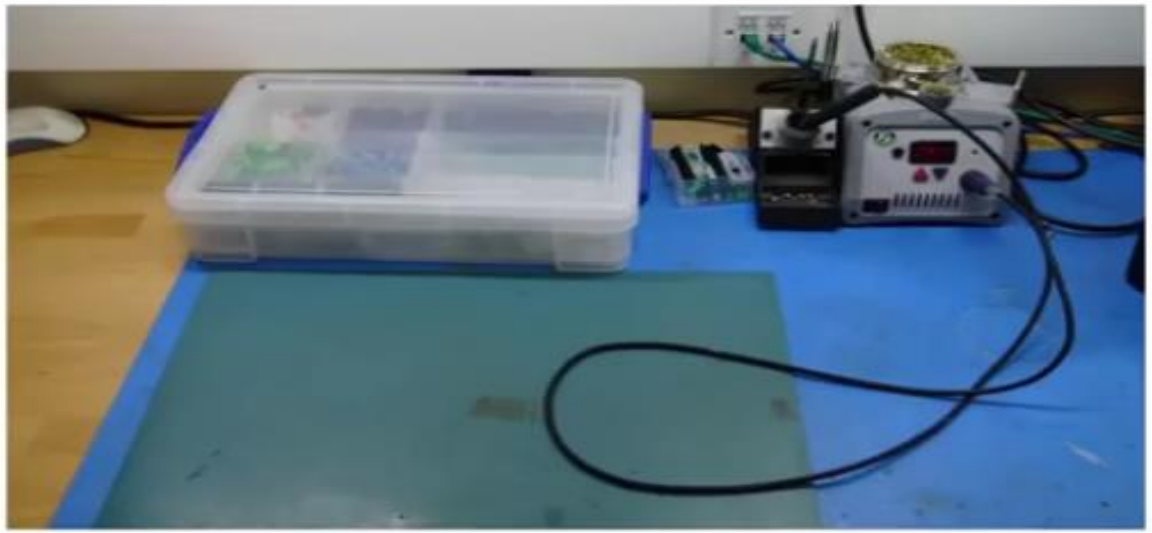
DON'T let cut fragments fall on the floor

Bare Fiber Fragments and Shards

DON'T eat or drink anywhere around fiber optics

Bare Fiber Fragments and Shards

DO work on a dark-coloured, non-reflective chemical-resistant mat



DON'T try to pick up any cut glass fibers by hand - always use tweezers or sticky tape

Bare Fiber Fragments and Shards

DO dispose of any fiber fragments safely in a suitable container such as a sharps bin

Get rid of this container safely

Discard any used sticky tape carefully

DO thoroughly clean your work area at the end of each day including "blotting" it with sticky tape

Chemical Hazards

Cleaning fluids, solvents and adhesives

DO make sure all chemicals are clearly labelled, safely stored and used following the manufacturer's guidance

Read the relevant safety data sheet (SDS)

COSHH - Care of Substances Hazardous to Health

Chemical Hazards

DO handle all chemicals with care

- repeated exposure, however brief, may lead to the development of skin allergies or irritations

DO ensure you work in a well-ventilated area

DON'T ingest them!

Fire Safety

Cleaning liquids and chemicals used in fiber optic processes are flammable

DON'T smoke anywhere near fiber optics

DO keep all flammable and combustible materials safely away from the curing ovens and fusion splicers

Environmental Hazards

DO pride yourself on a safe, clean and tidy work area

DO test all your equipment regularly

DO follow a systematic cleaning routine for your work area and all the equipment in it

Environmental Hazards

DO display all the necessary safety signs and posters

DO respect the safety of others by explaining any dangers to them, especially if they're visitors

Side Note

MASSIVE topic

inside or outside
underground, overground
or on the ground

The working environment of a fiber optics engineer is fraught with hazards and risks

clear company safety guidelines

Summary

Working with Fiber Optics

- DO follow any and all current guidelines for working with fiber optics
- DON'T take any risks
- DO remember: it's not just about you, it's the safety of those around you too
- DO RESPECT THE FIBER

A Step-by-Step Guide to Fusion Splicing

What is a splice?

join the ends of two optical fibers together

a strong, smooth connection

When would you splice?

A cost-effective and time-effective solution when:

- You need to attach a connector onto the end of a pigtail
- You need to make your cable longer
- The cable becomes damaged so rather than replace the whole cable, you want to cut out the damaged part and join the rest back together

Fusion splicing

What is a fusion splice?

the ends of the two fibers are fused together to become one single cable

just as strong as the natural fiber

heat-shrink plastic sleeve

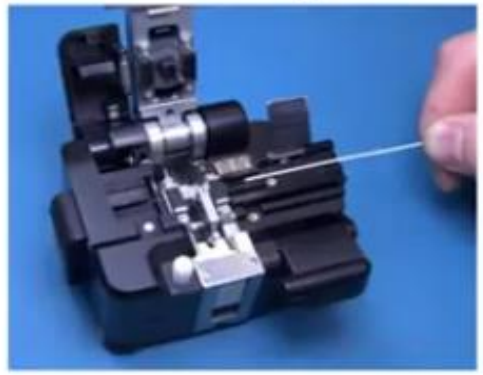
Fusion splicing

How is this done?

fibers are stripped

cleaned

and cleaved precisely



heat

"an electric arc is a device in which an electric current (a flow of electrons) is caused to flow between two points separated by a gas." Source: encyclopedia.com

laser, gas flame or tungsten filament

Fusion splicing

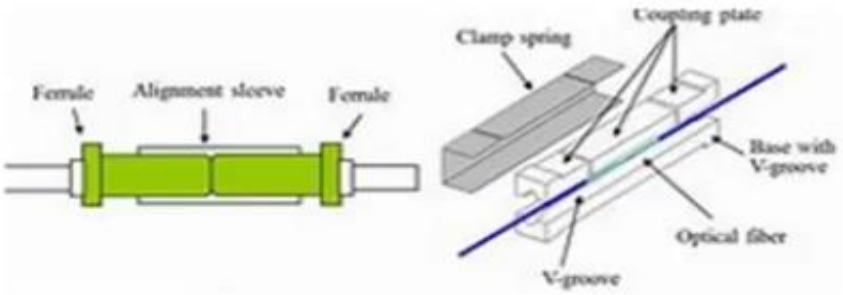
How is this done?

Mechanical splicing

What is a mechanical splice?

aligns the two fibers in the correct position

holds them precisely in place



plastic or glass alignment sleeve just larger than the fibers themselves

index matching gel to reduce loss and reflectance

not permanently joined together

Image: aflglobal.com

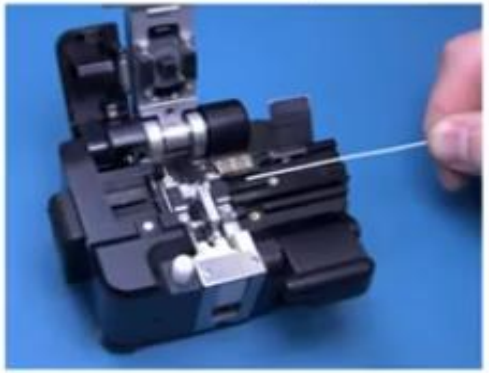
Mechanical splicing

How is this done?

fibers are stripped

cleaned

and cleaved precisely



commercially available mechanical splicing tool kit

follow the manufacturer's guidance

So which is better?

COST USE QUANTITY PERFORMANCE

Fusion splice

PROs:

- Cost per splice cheaper
- Lower insertion loss (less than 0.1dB)
- Lower reflectance
- Very high performance - a stronger signal and better protection against cable failure
- Strong, reliable, weatherproof joint

CONs:

- Machine more expensive, so high initial outlay cost
- Some training required initially

Mechanical splice

PROs:

- No expensive machinery needed - tools required are cheap
- Minimum training required

CONs:

- Cost per splice higher (the plastic alignment sleeve is more expensive than the heat-shrink tube for fusion splicing)
- Higher insertion loss (typically 0.2-0.75dB)
- Higher reflectance

So which is better?

COST USE QUANTITY PERFORMANCE

Fusion splice

- One continuous fiber at the end
- Typically used for singlemode fibers

Mechanical splice

- Two fibers tightly and precisely held together
- Typically used for multimode fibers (apart from aerial or underwater application where a fusion splice is more reliable)

What if I can't do either?

field-fit connector

installed in situ

without the need of any machinery

a degree of skill involved

convenient solution in the field

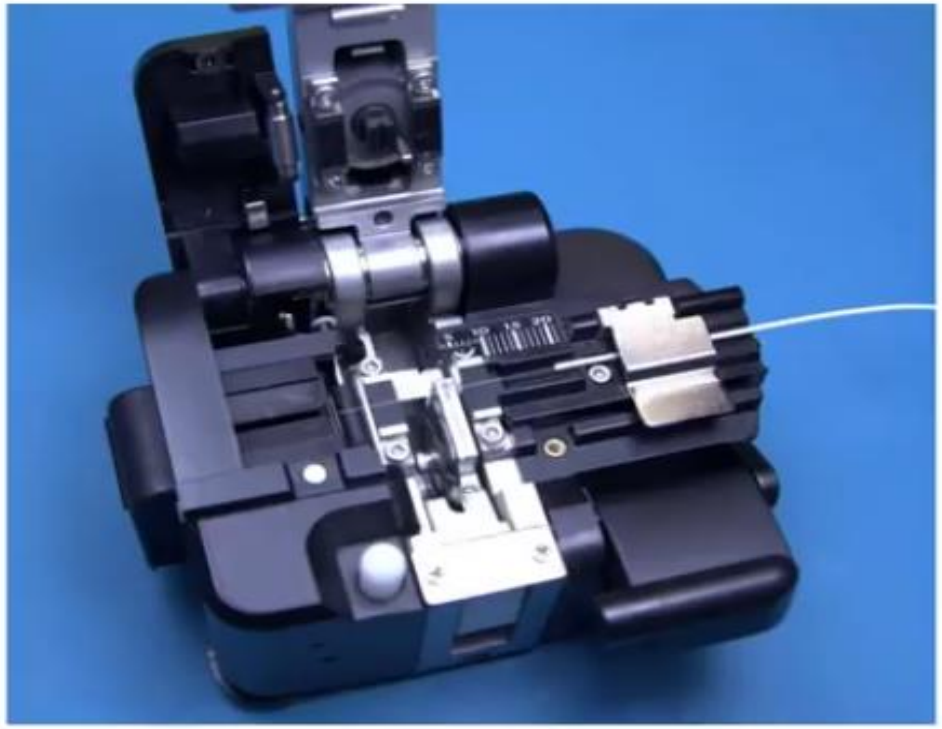
What's the secret?

cleaving

straight cleave on both fibers

clean, well-maintained equipment

learn the proper techniques to use it



How to do a fusion splice

Health and safety priorities

UTEL's *Health and Safety in Fiber Optics* video

splinter and crack

gloves and safety glasses

use of chemicals

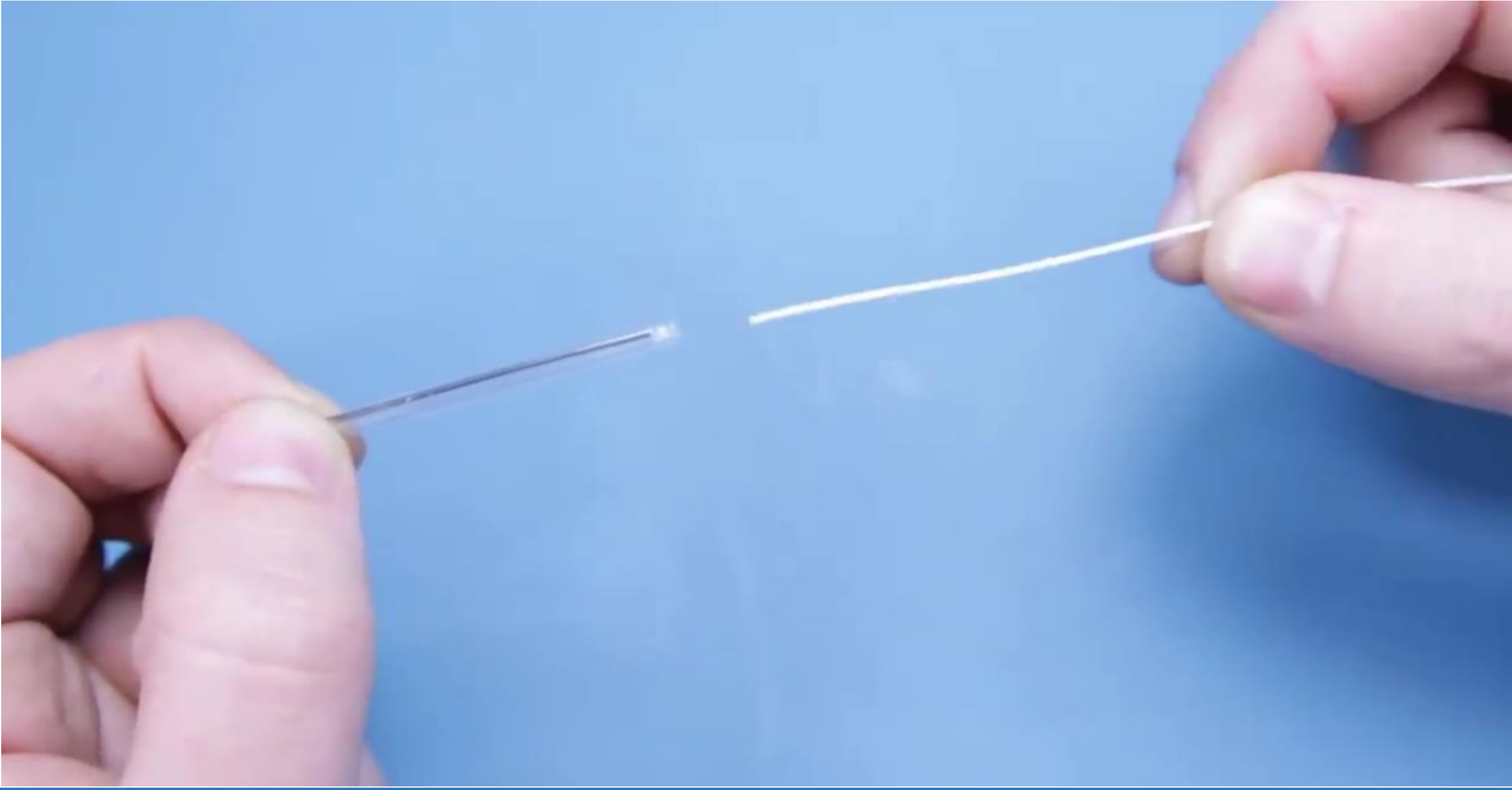
do not eat or drink in the work area

How to do a fusion splice

You will need:

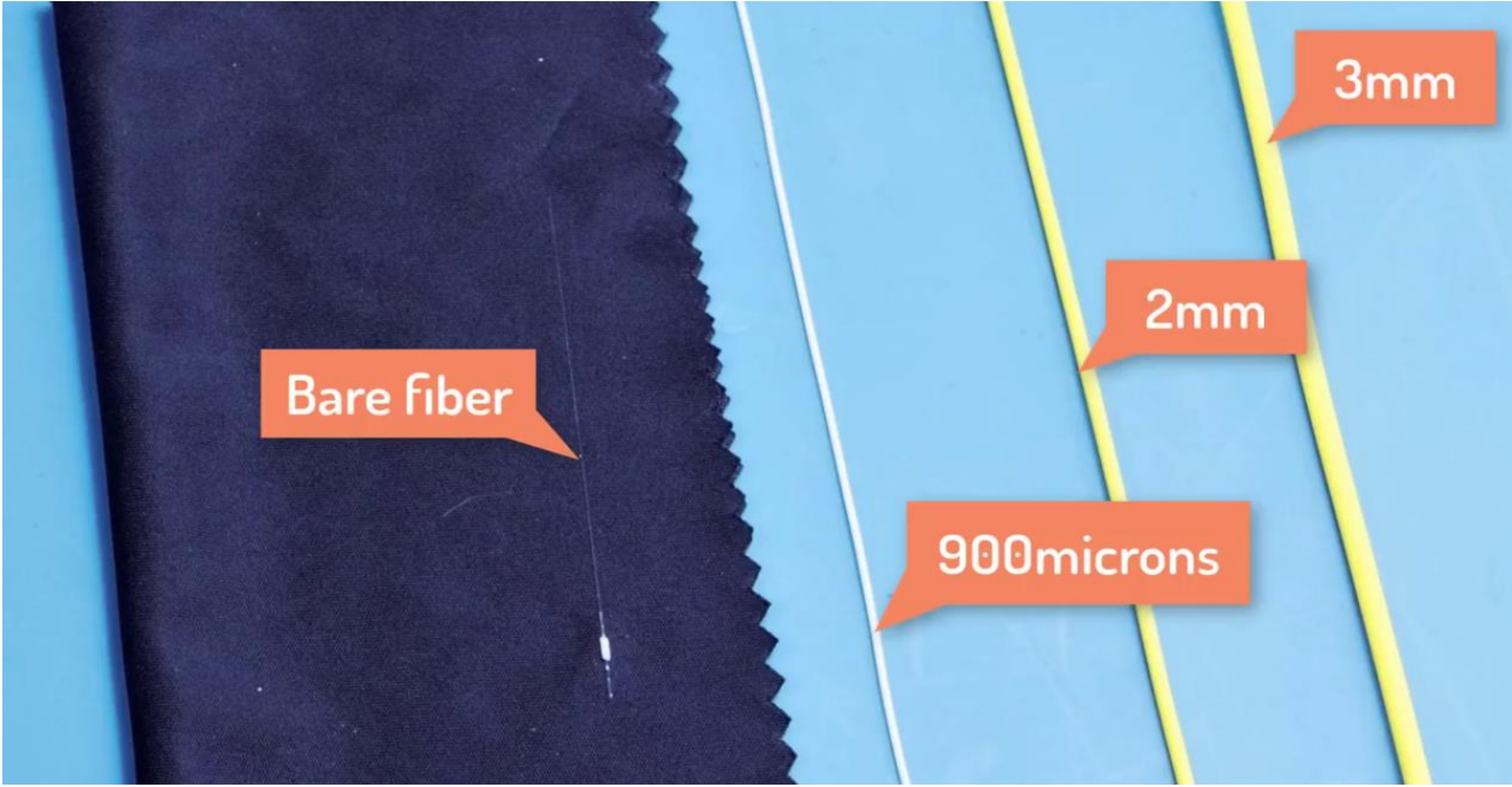
Step One

Adding the Heat-shrink Sleeve



Step Two

Stripping the Fiber

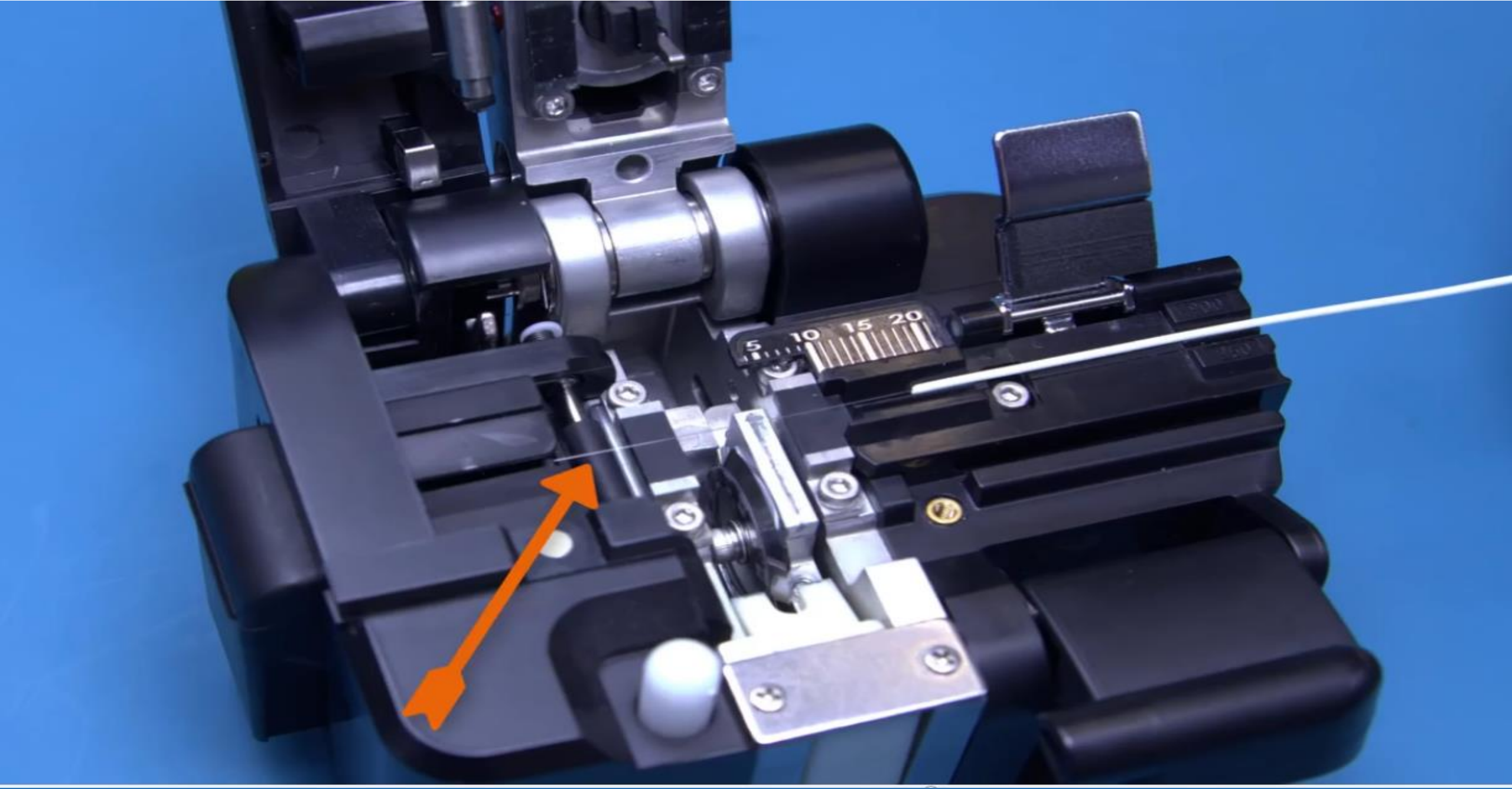

Bare fiber
900microns
2mm
3mm

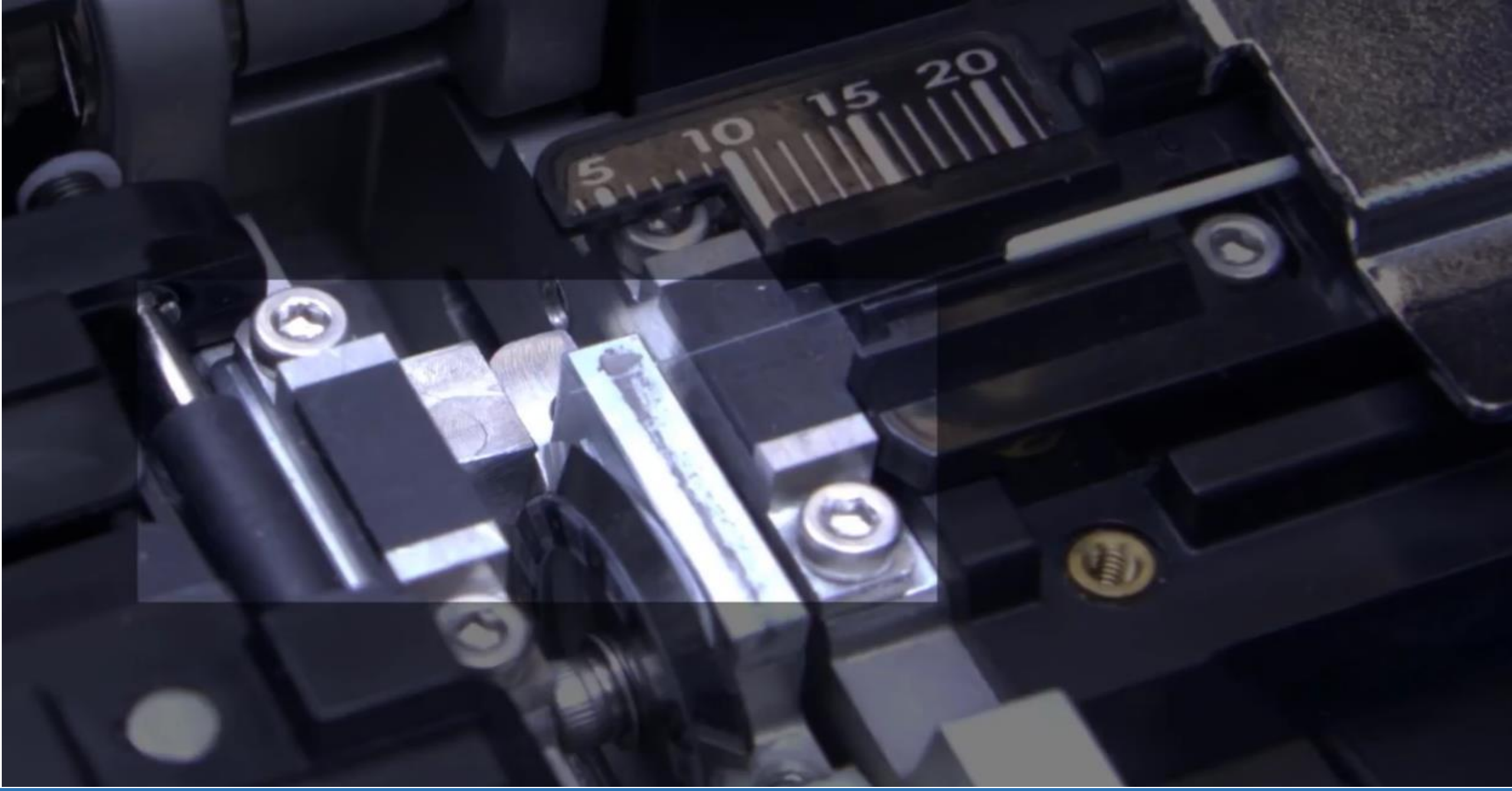
Step Three

Cleaning the Fiber

Step Four

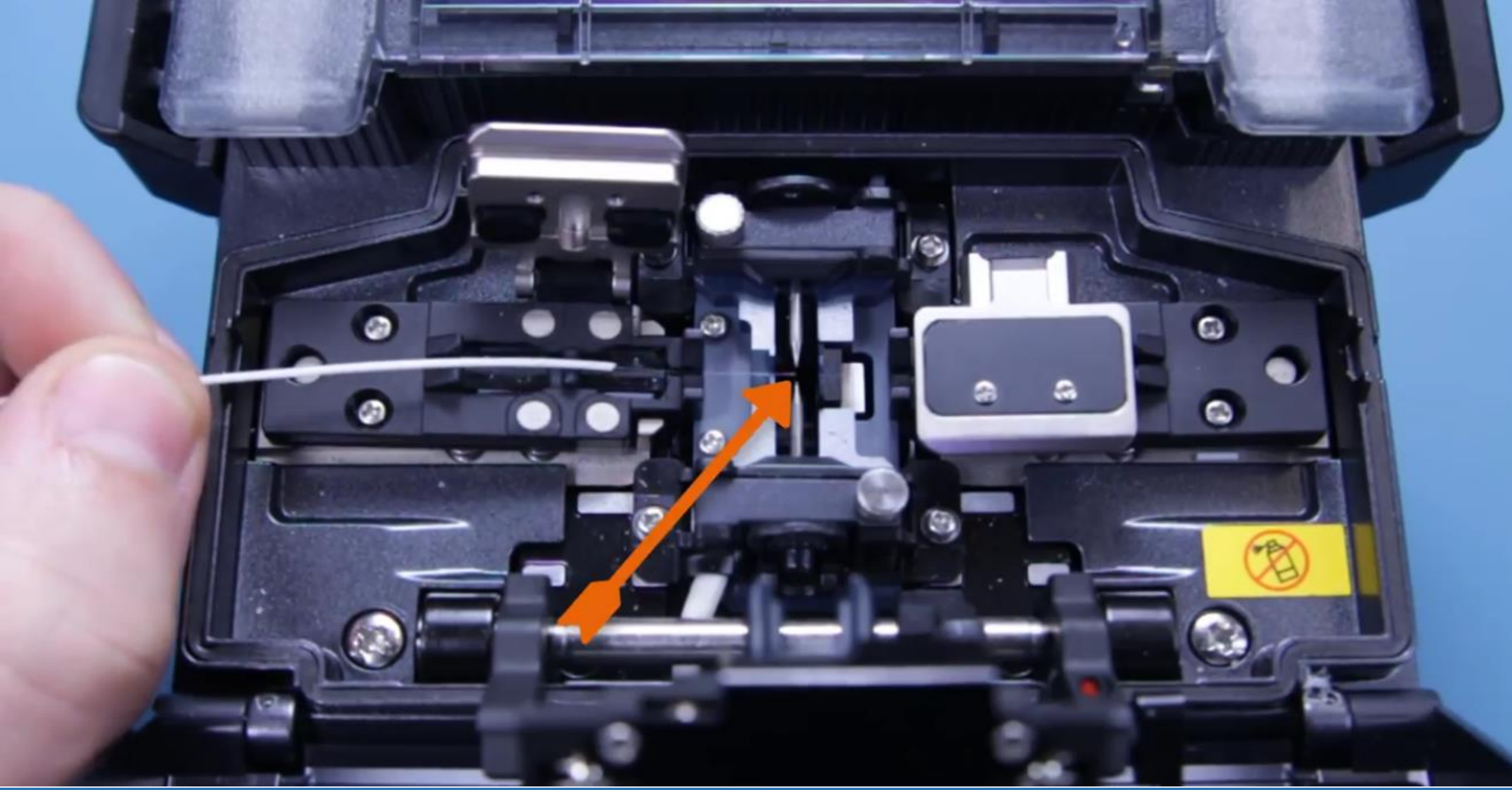
Cleaving the Fiber

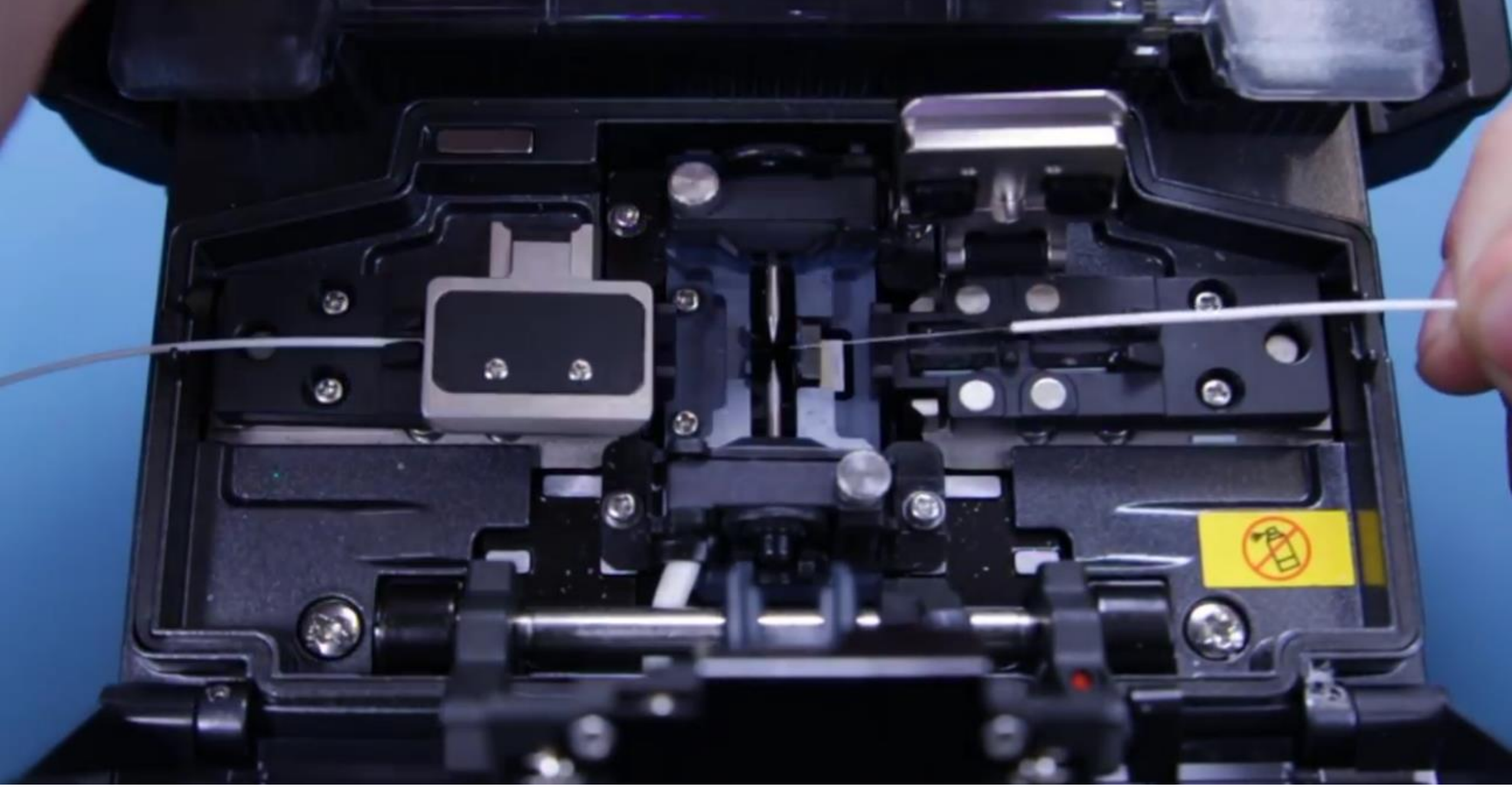

5
10
15
20


5
10
15
20

Step Five

Using the Fusion Splicer






FITEL
S178 A
ver.2


Ready
09/01 11:48
50%
F
60%
001027
001 @1310
SM -SM
SINGLE MODE:
SINGLE MODE:
003 60MM
OTHER
Menu
Shortcut


00.00dB
09/01 11:03
80%
80%
F
001025
X
Y
Menu
Reset


00.30dB
09/01 11:38
50%
60%
F
001026
X
Y
OK
Menu


Ready
09/01 11:48
50%
60%
001027
001 @1310
SM -SM
SINGLE MODE:
SINGLE MODE:
003 60MM
OTHER
Good cleaves
Menu
Shortcut

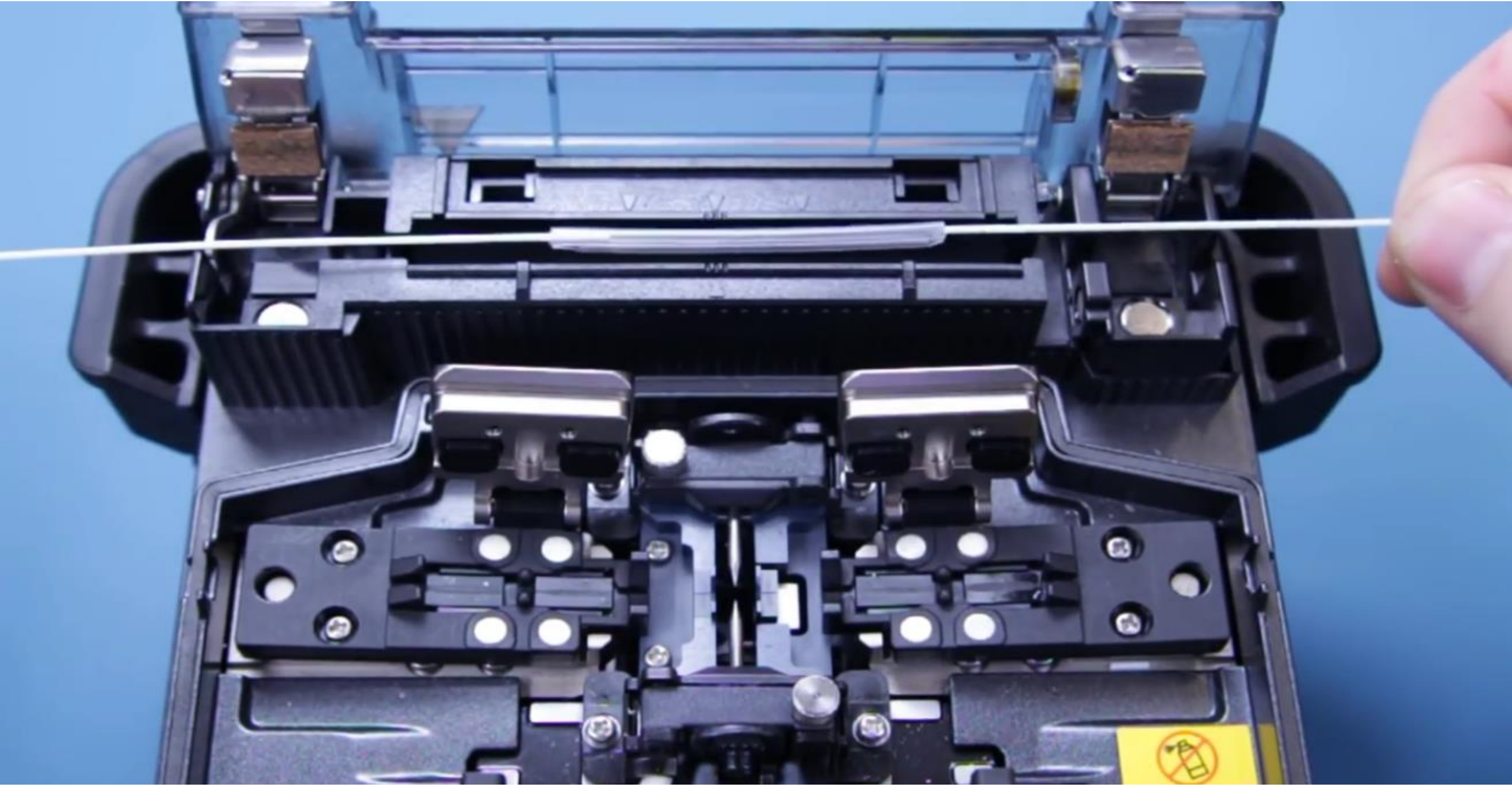

Ready
09/01 11:00
60%
60%
001024
001 @1310
SM -SM
SINGLE MODE:
SINGLE MODE:
003 60MM
OTHER
Bad cleaves
Menu
Shortcut


Ready
09/01 11:40
50%
60%
001026
001 @1310
SM -SM
SINGLE MODE:
SINGLE MODE:
003 60MM
OTHER
Uncleaved
Menu
Shortcut


Ready
09/01 11:32
60%
60%
001025
001 @1310
SM -SM
SINGLE MODE:
SINGLE MODE:
003 60MM
OTHER
Uncleaved
Menu
Shortcut

Step Six

Heat-shrinking the Protective Sleeve over the Splice




FITEL
s178 A
ver. 2

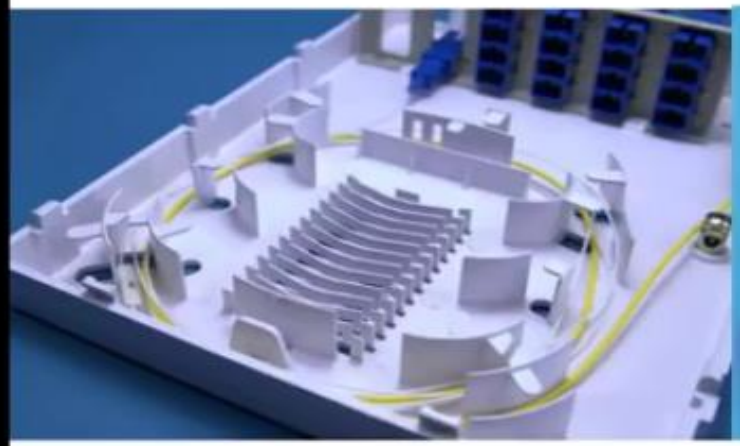
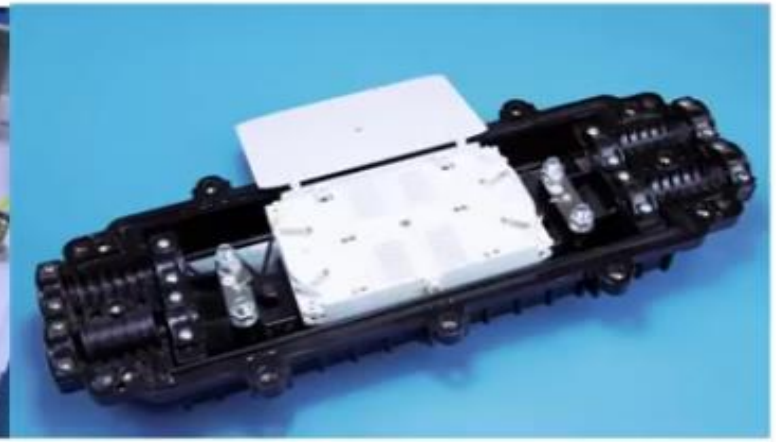
Step Seven

Remove, Inspect and Add to Splice Tray

A completed fusion splice

Splice Trays

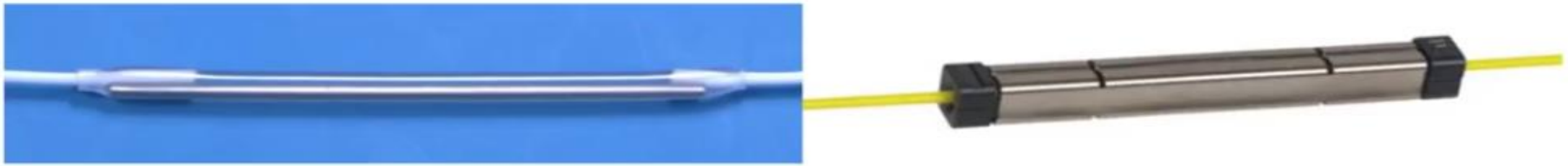



Recap

In today's video, we discovered that:

- splicing can be a cost-effective and efficient way to join two fiber optic cables together to form a strong, smooth connection with minimal loss and high performance



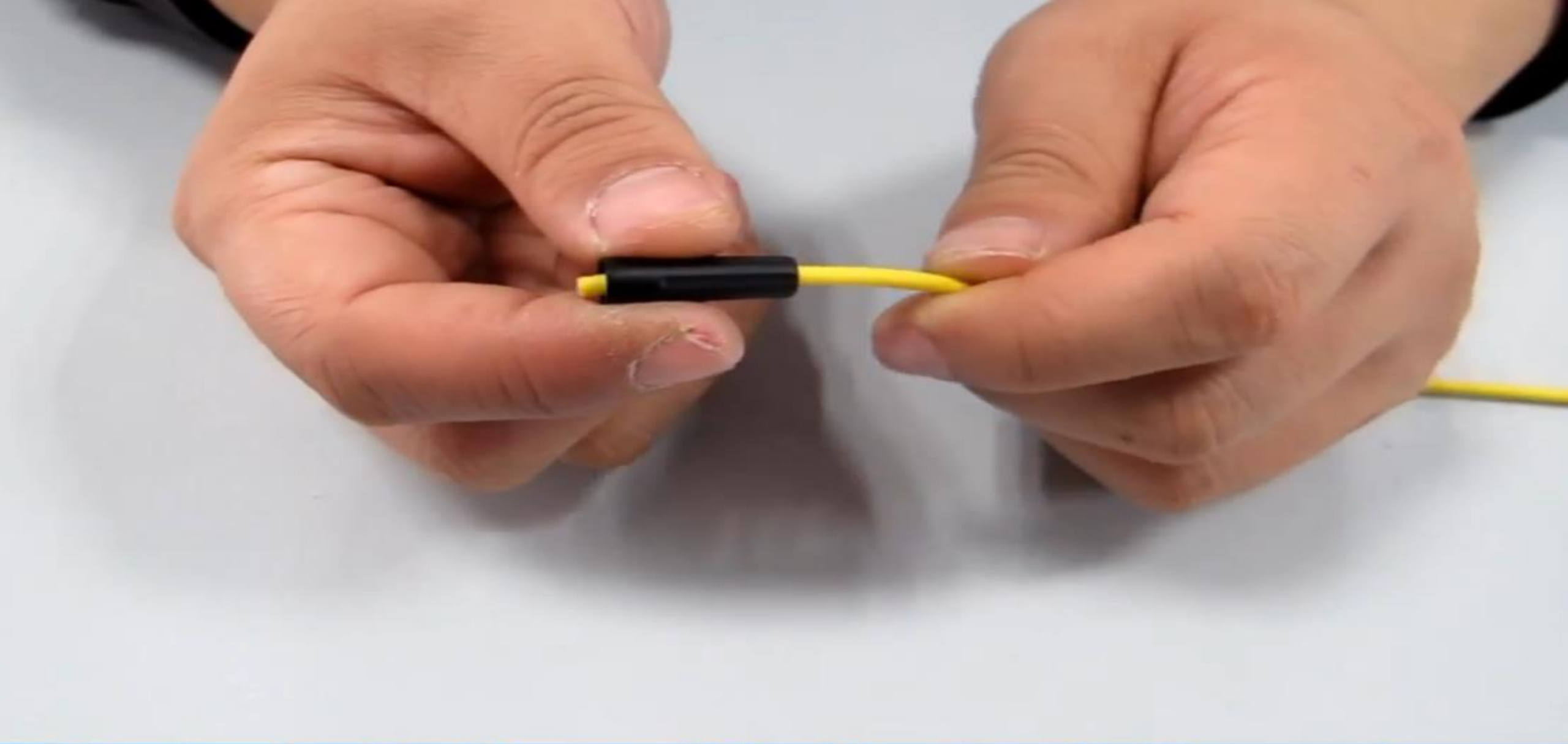
- mechanical splicing and fusion splicing both have their benefits and uses, and with the correct equipment and a small amount of training, you can do this yourselves

H925P
Fiber Mechanical Splice Operation Tutorial (Apple to 2.0/3.0 mm Cable)

For using this product correctly, this operation tutrial must be read carefully before usage.

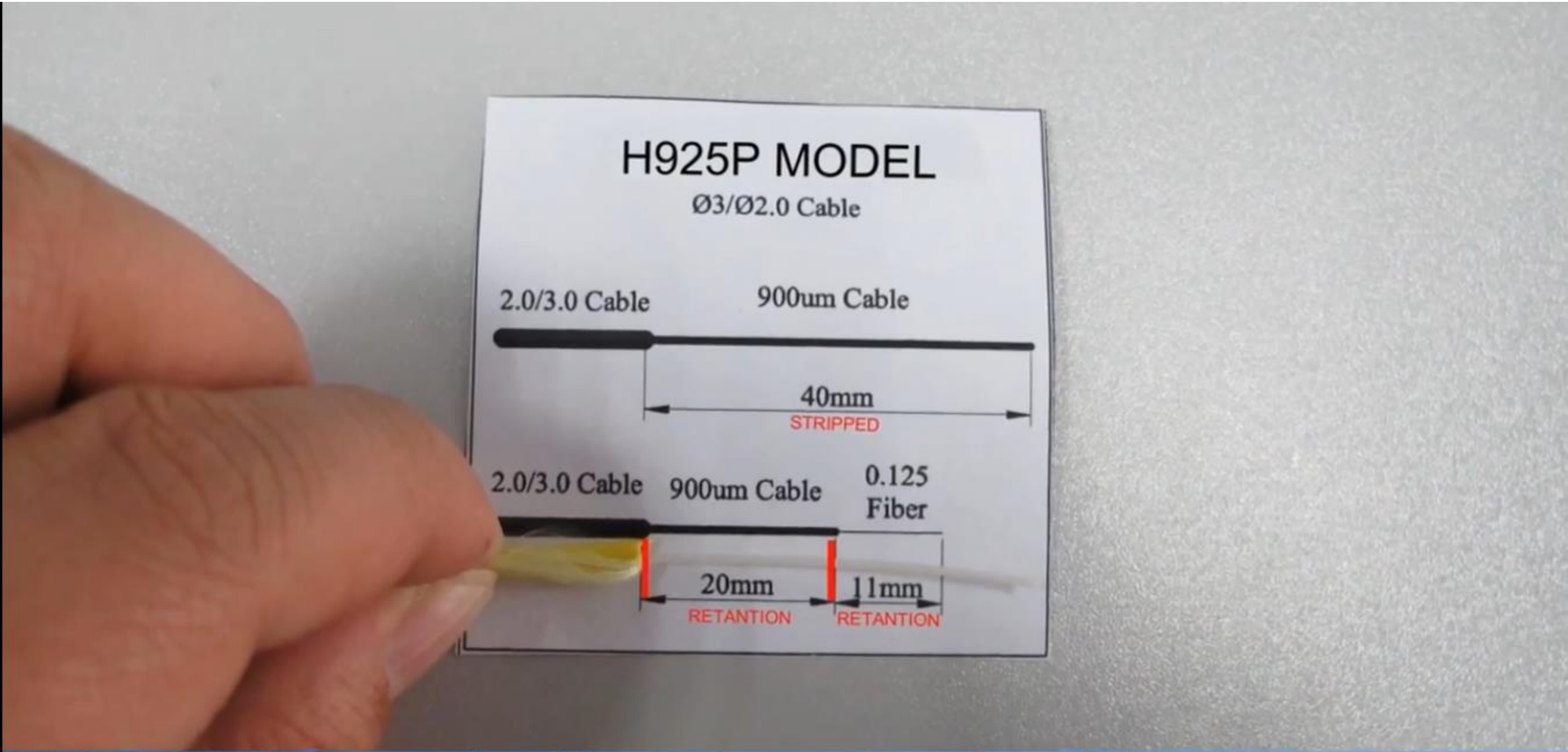
After reading,this operation tutorial must be kept in convenient place for use's reading anytime.

H925P fiber mechanical splice preparation.



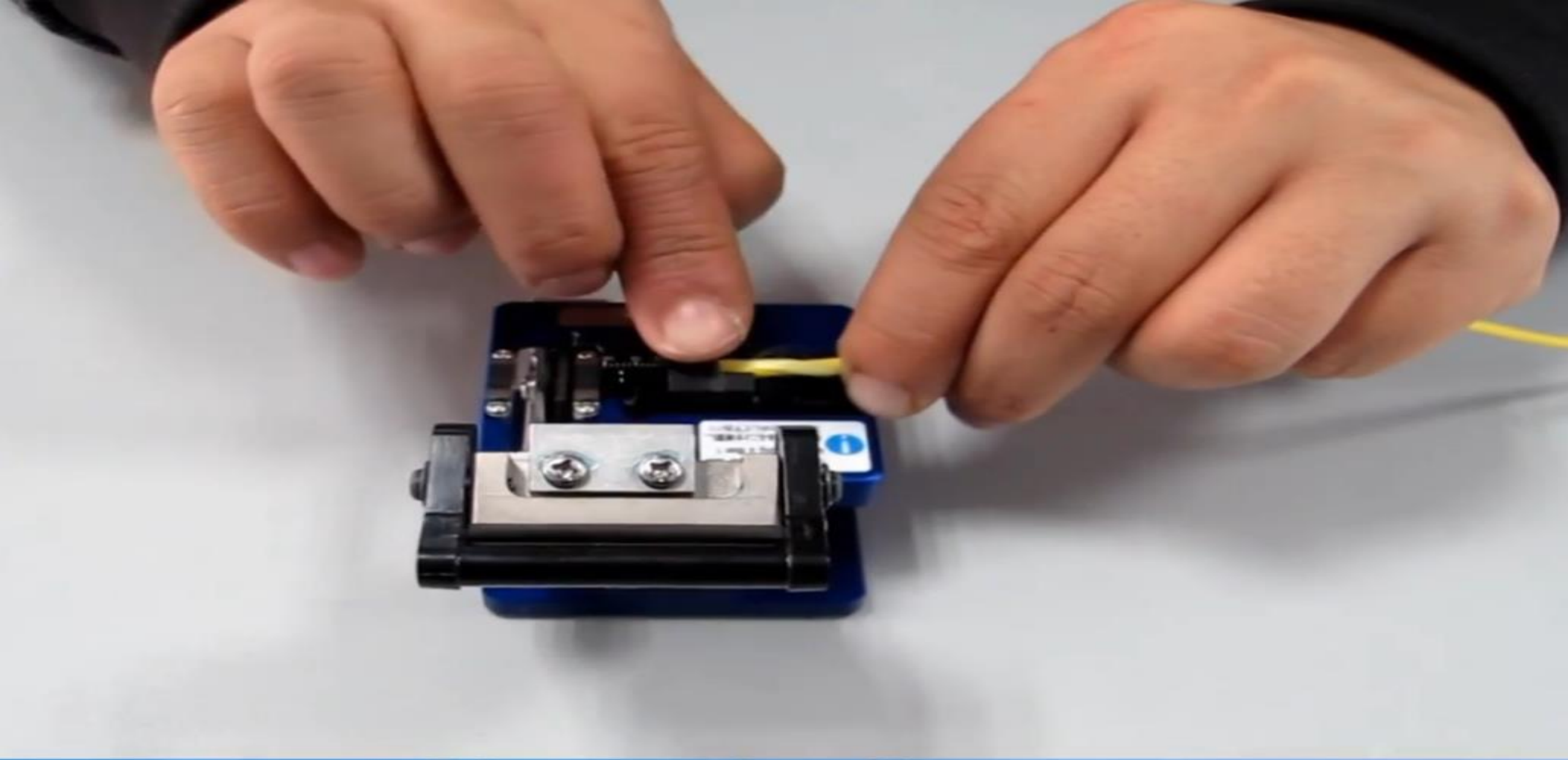
Penertrate the cable through the nut.

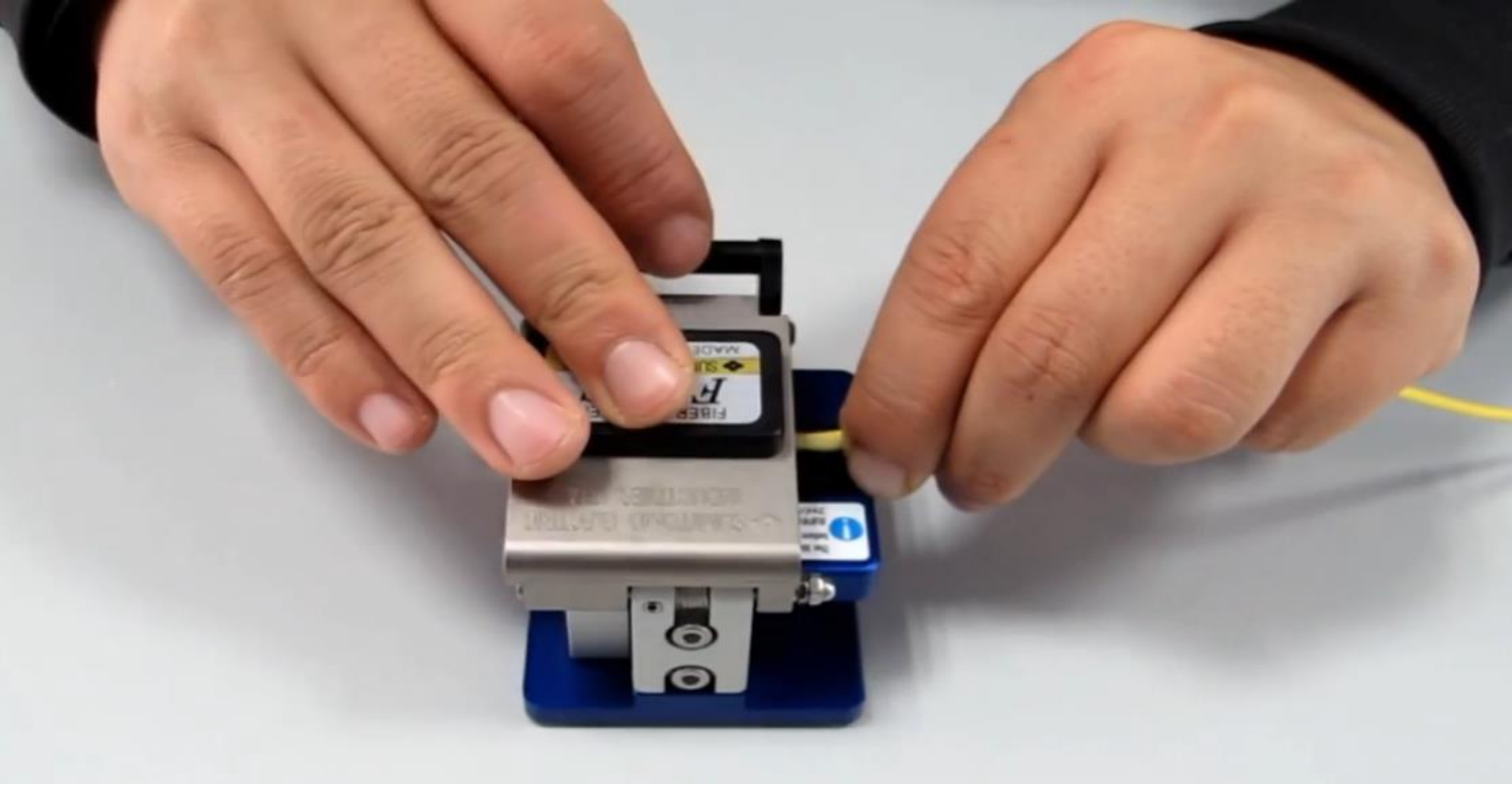

Strip the cable jacket, the stripped length is 40 mm.

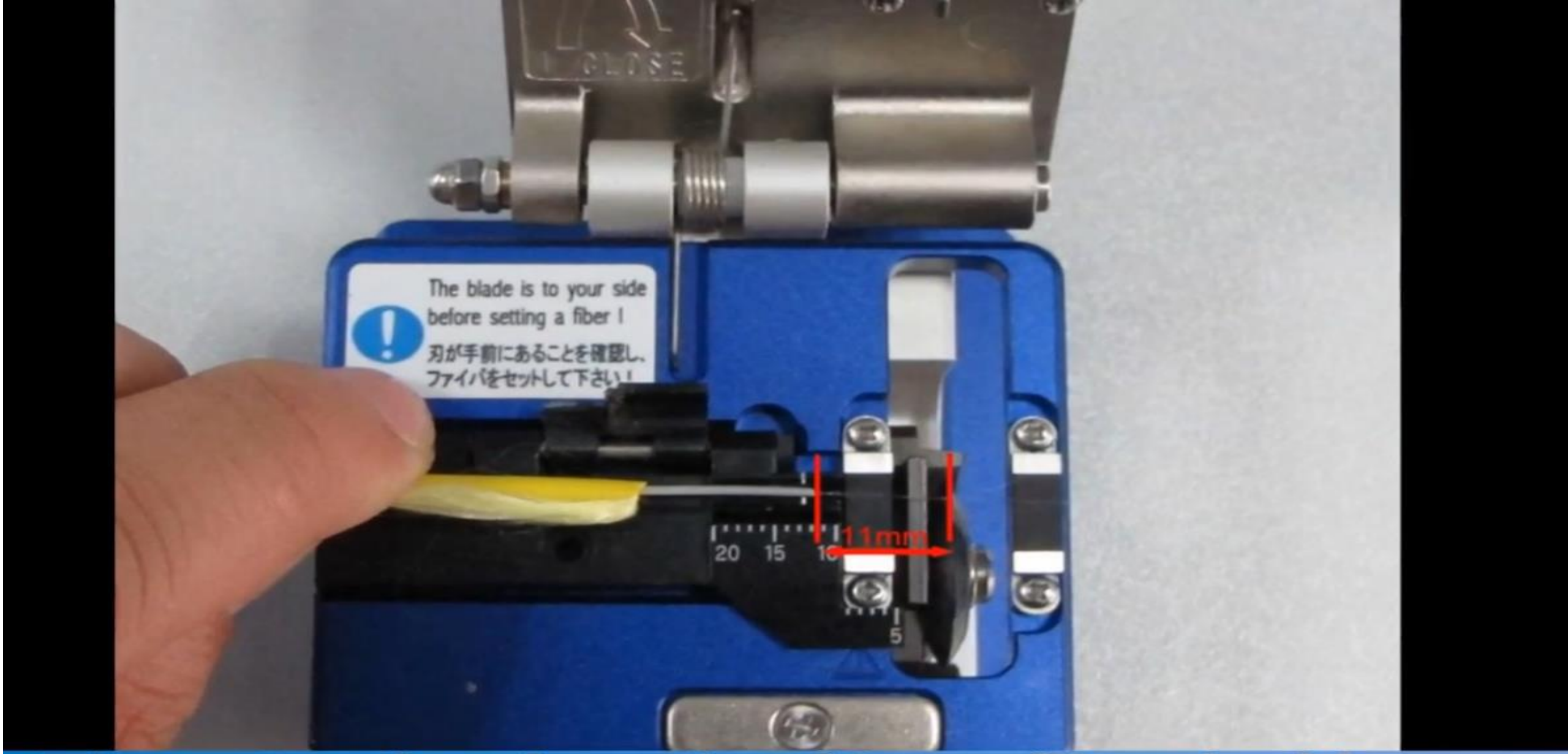


Strip the 0.9mm buffer , the retention length is 20 mm.


Check and clean the fiber .

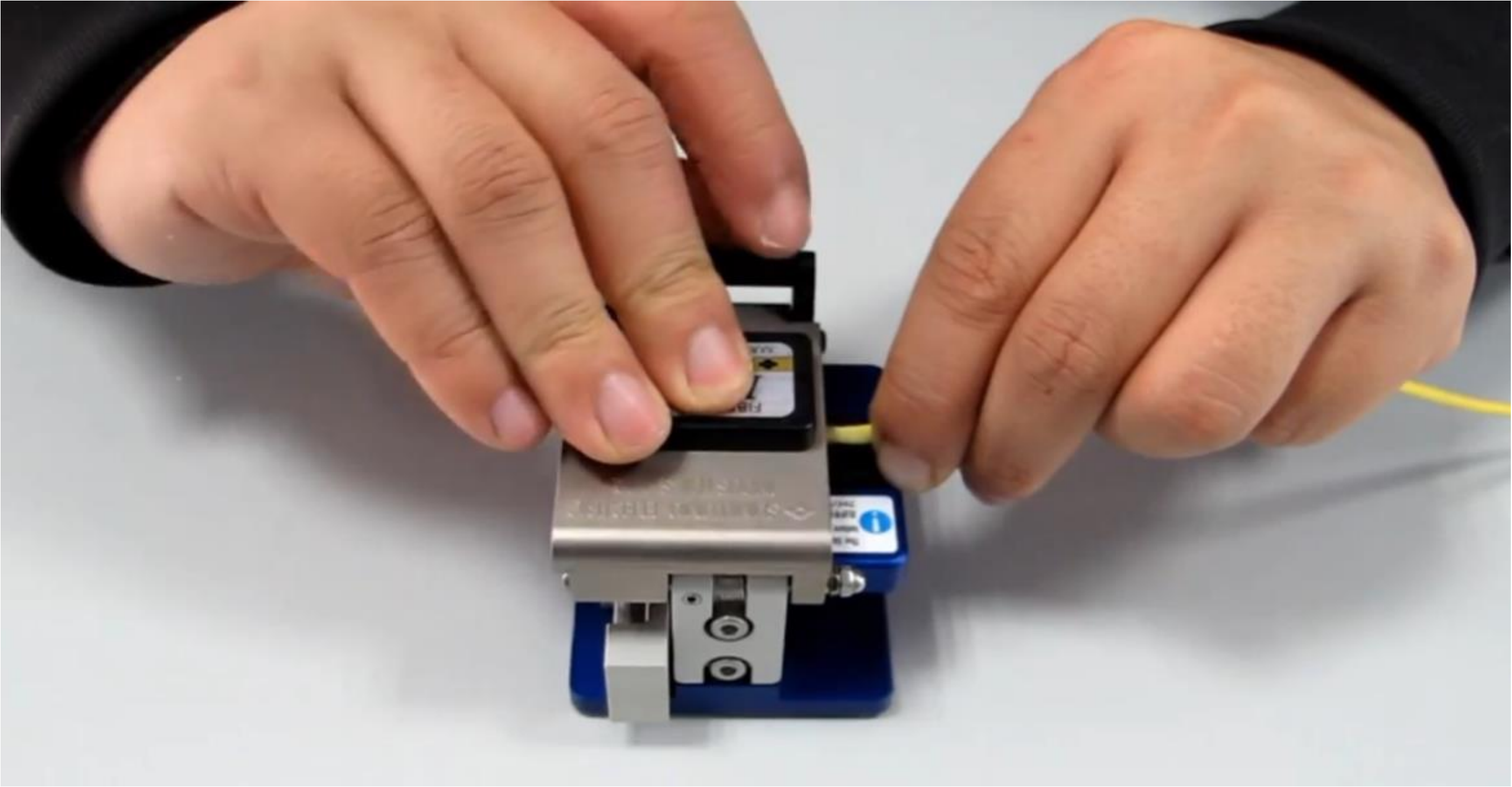

Cleave the fiber.





The retention length of bare fiber is 11 mm.


CLOSE
The blade is to your side before setting a fiber !
刃が手前にあることを確認し、ファイバをセットして下さい！
11mm
20
15
5




Carefully remove the waste fiber.


Insert the fiber into the splicer.

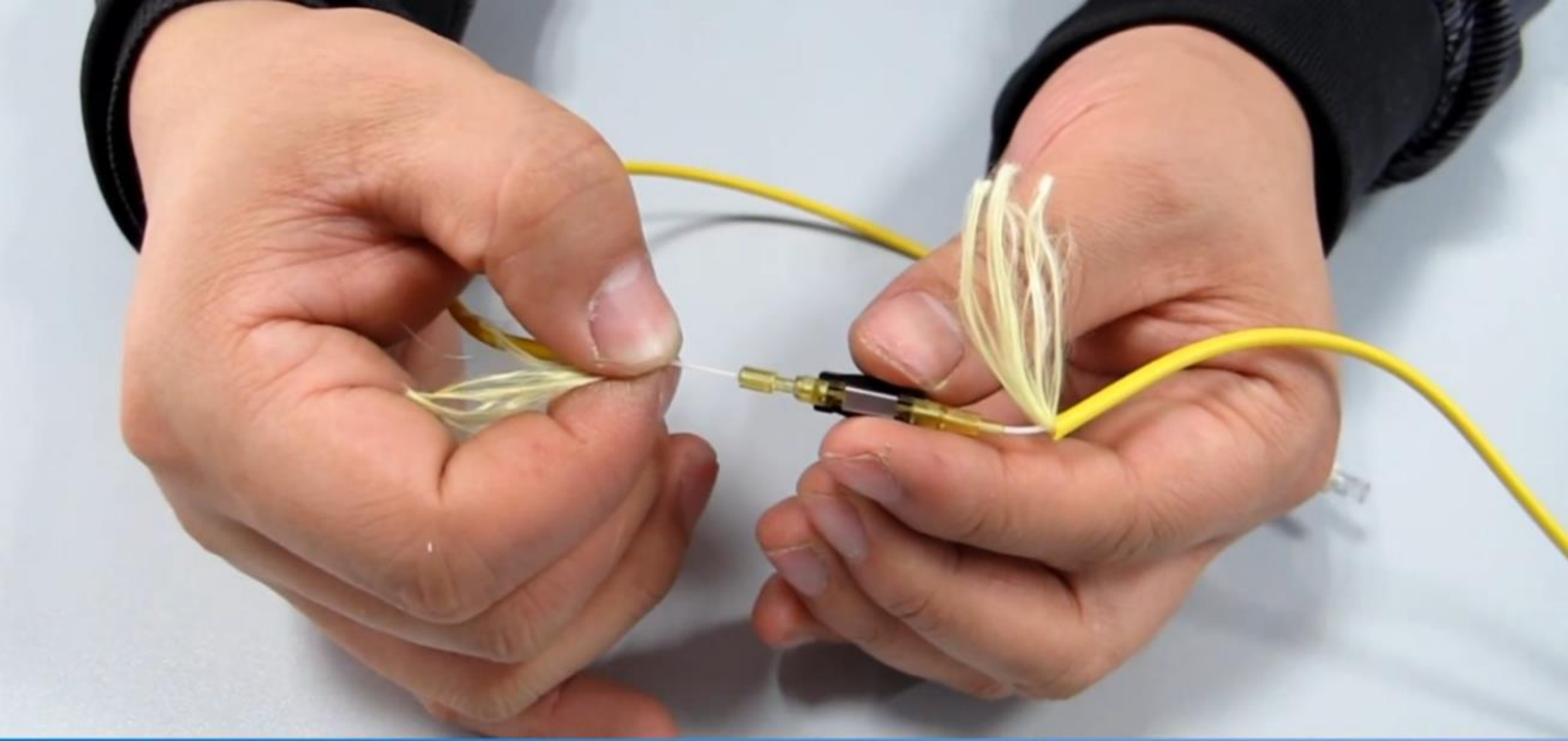

When the fiber touch against the limiter.

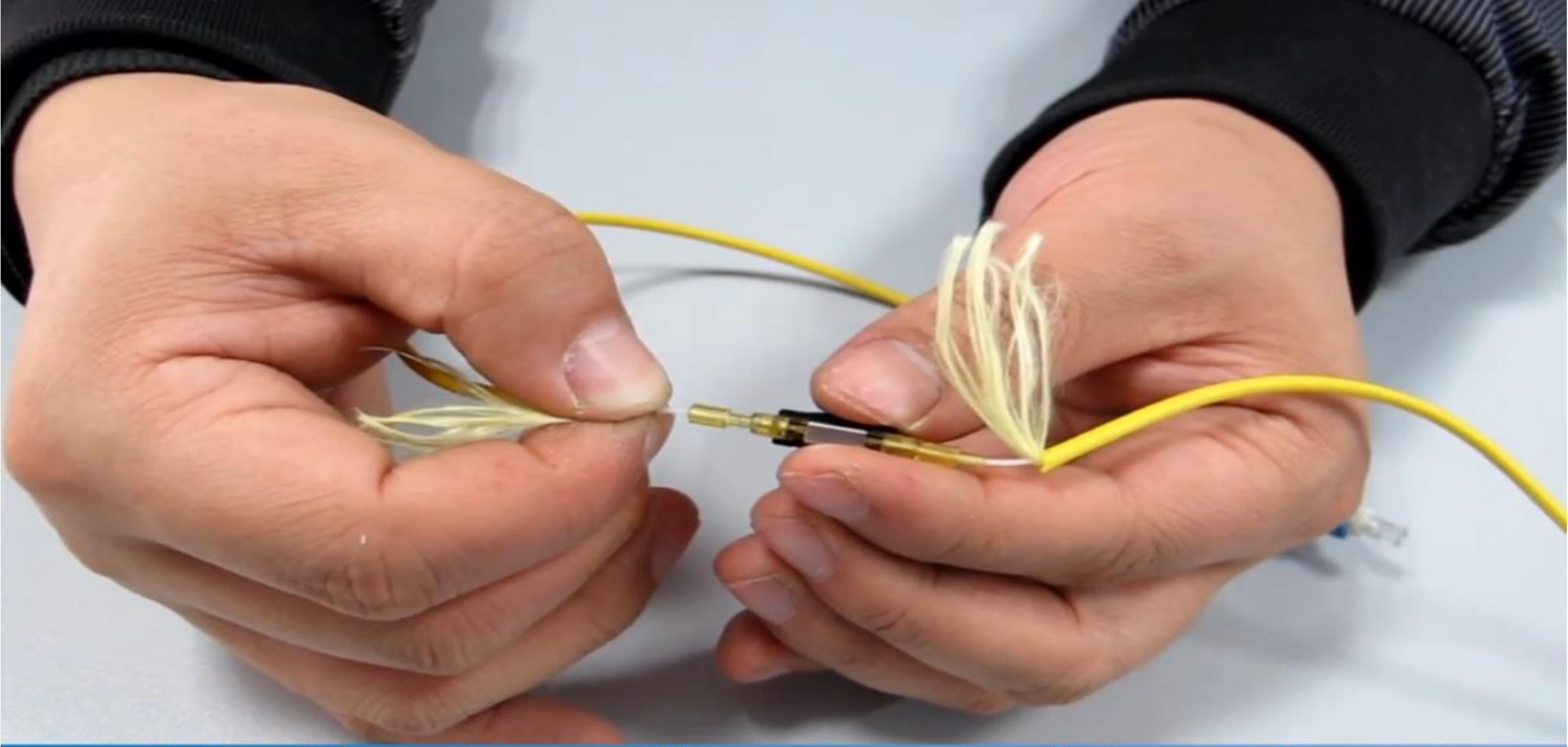

Push forward the tube.


When the tube is in place,rotate it 90° clockwise.

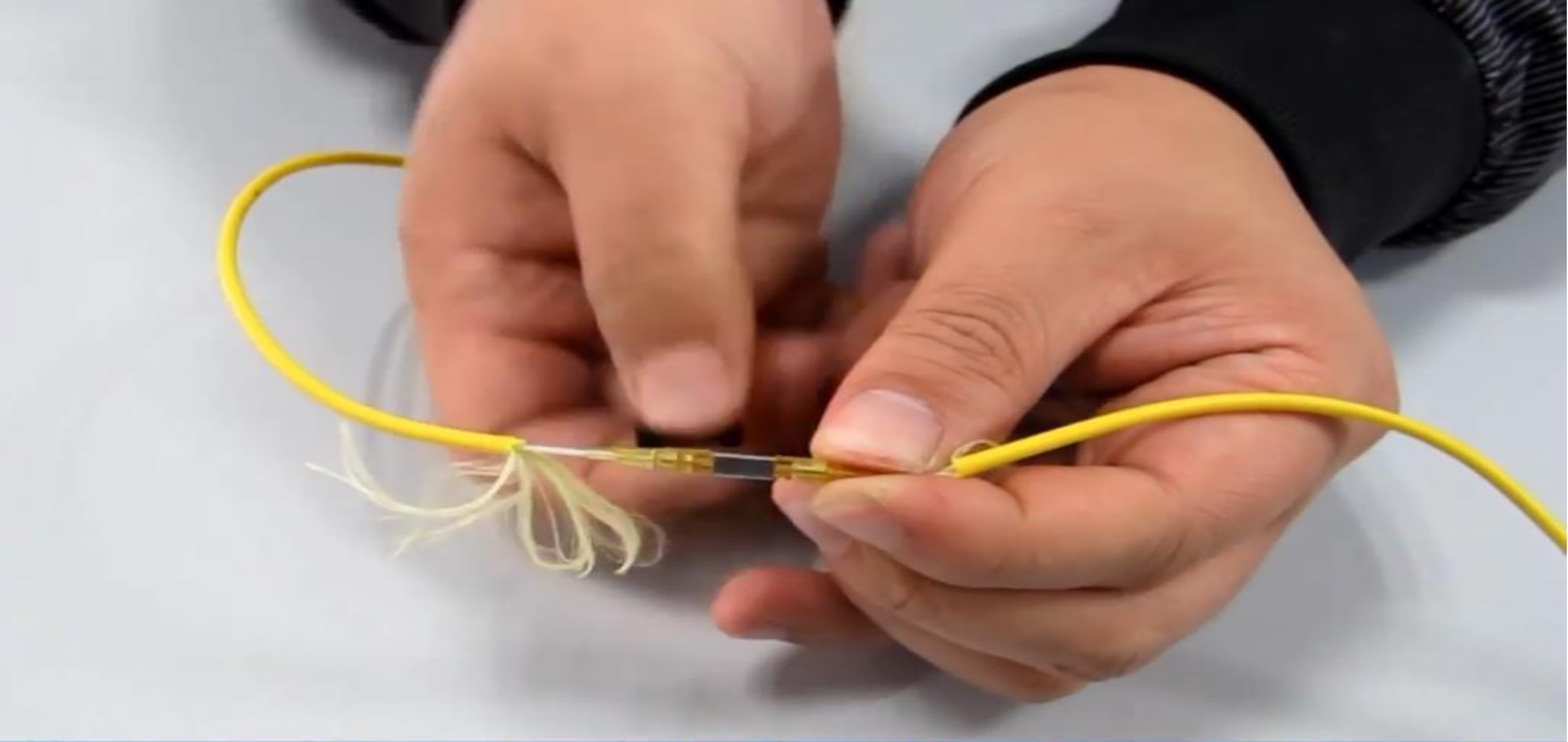

Fasten the buffer.

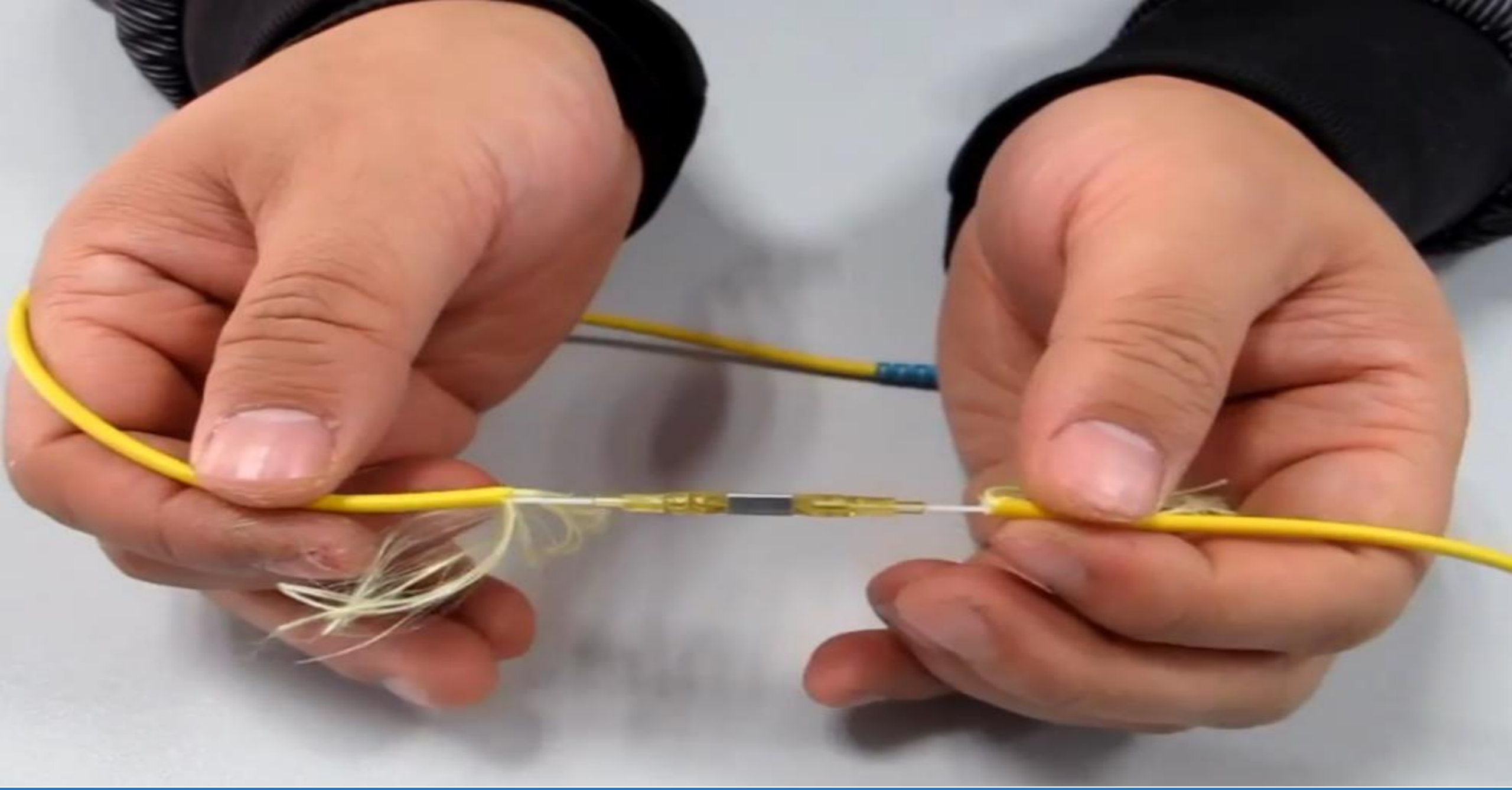

Preparing another fiber as the same way.

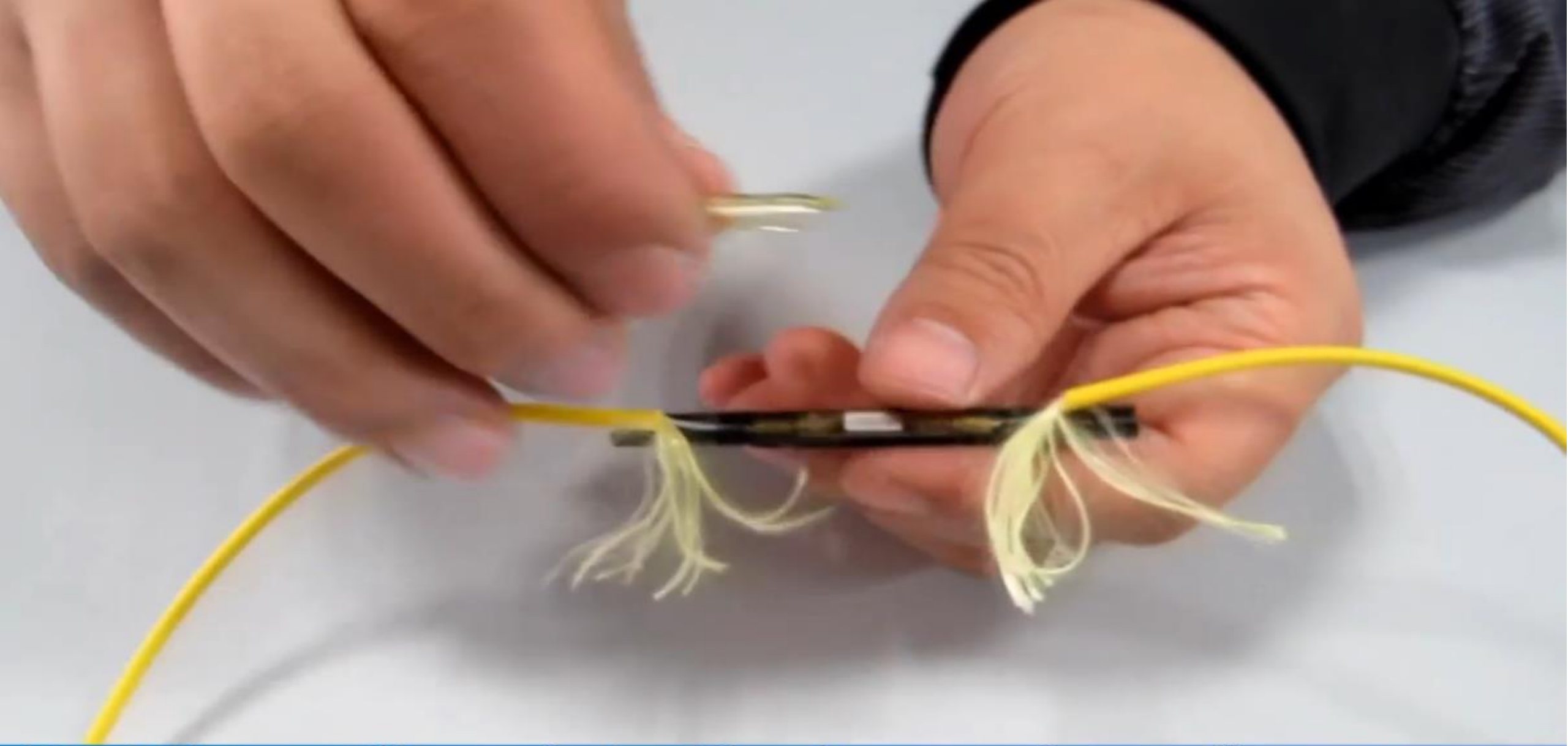

Insert the fiber into the other side of the splicer.

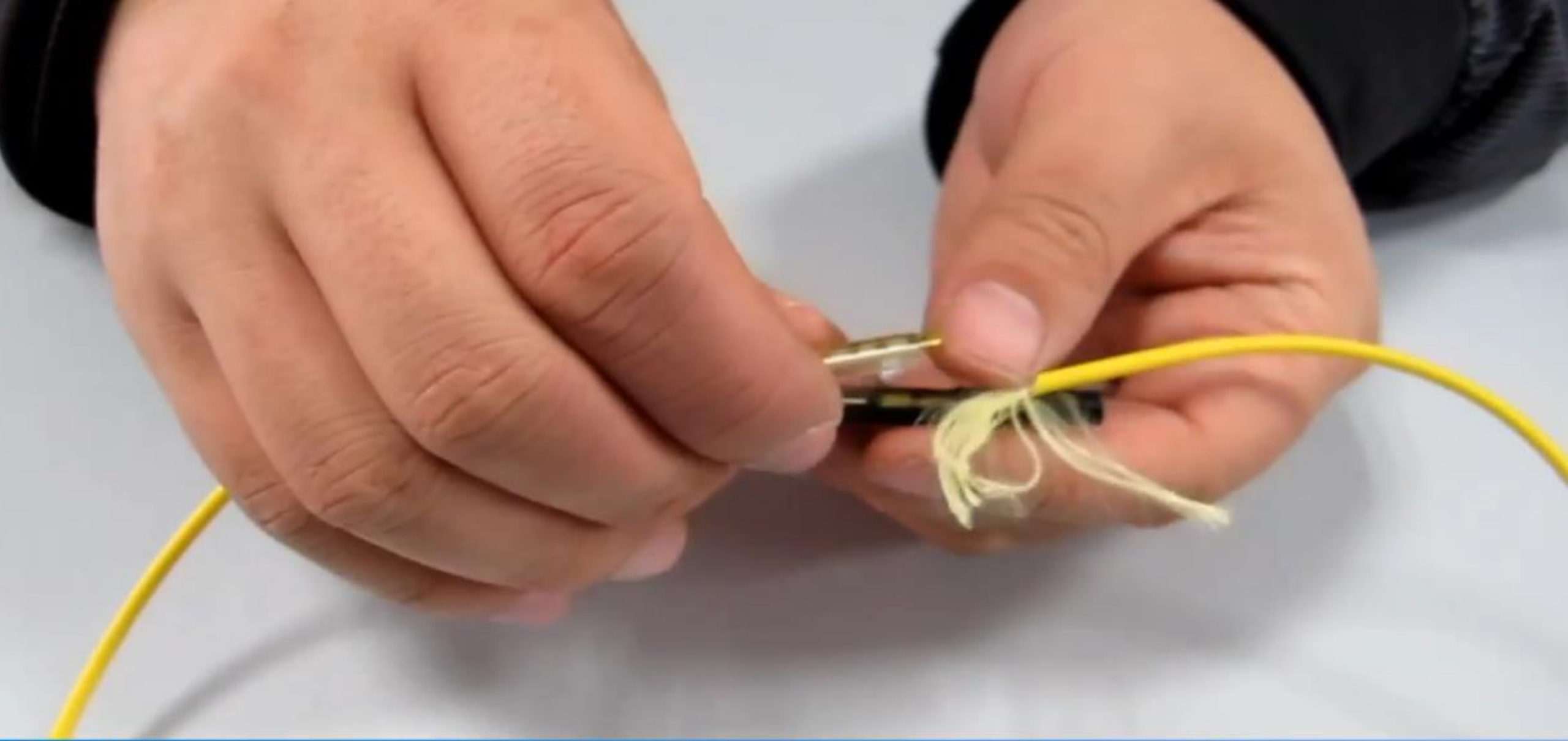

Confirm two fibers mated together.

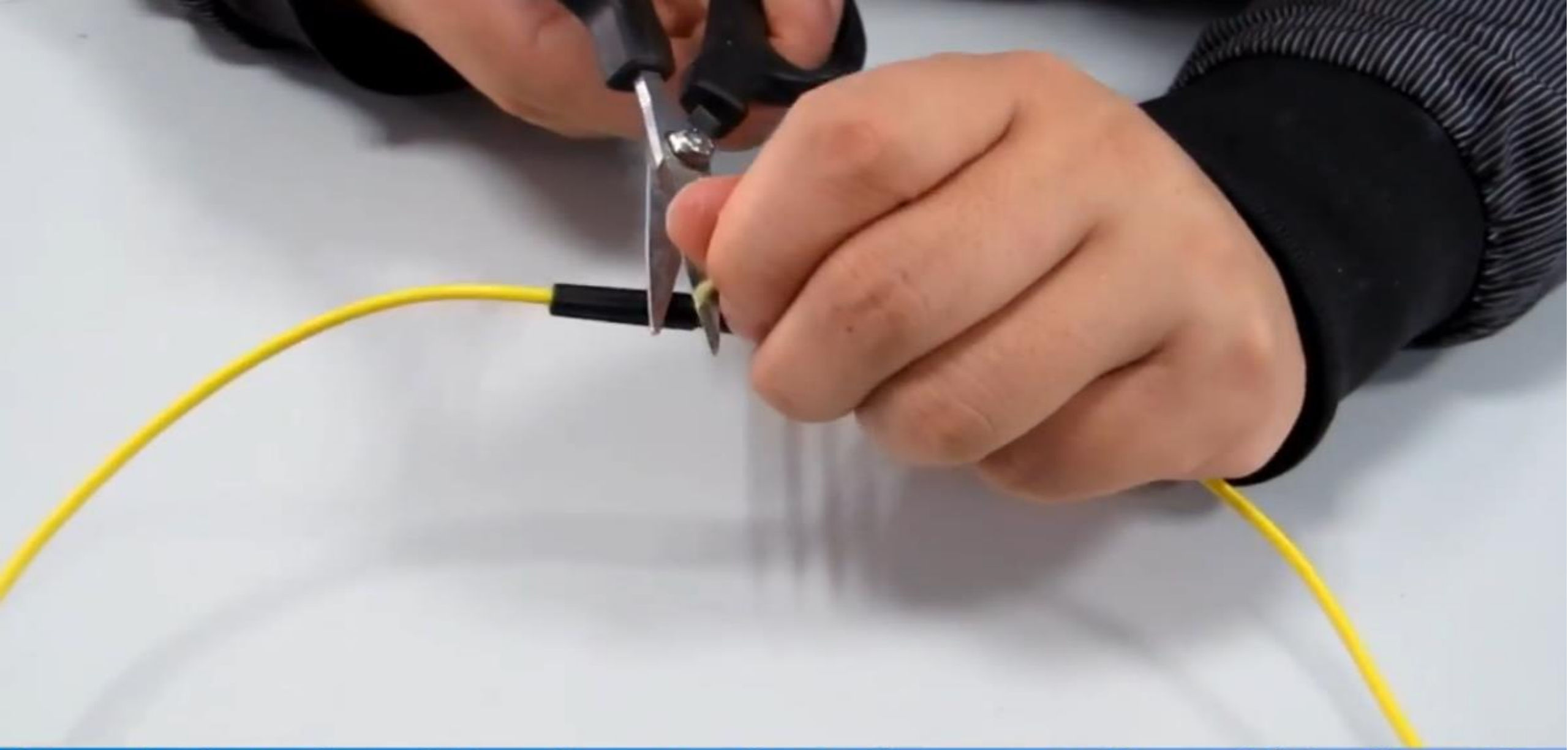

Push forward the tube, rotate it ,fasten the buffer.


Remove the key,fasten the bare fiber.



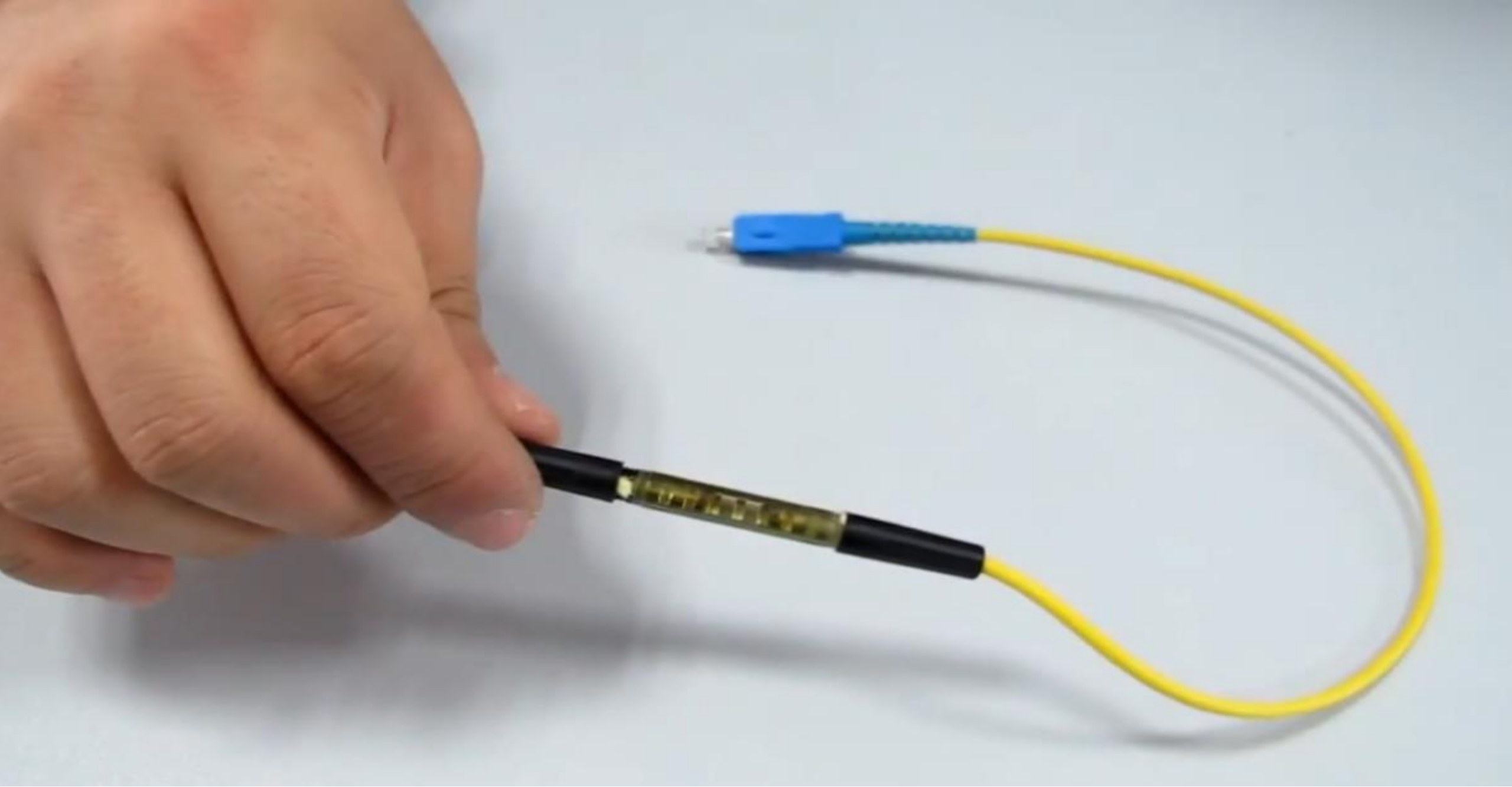

Put the splicer into the base,close the cover.

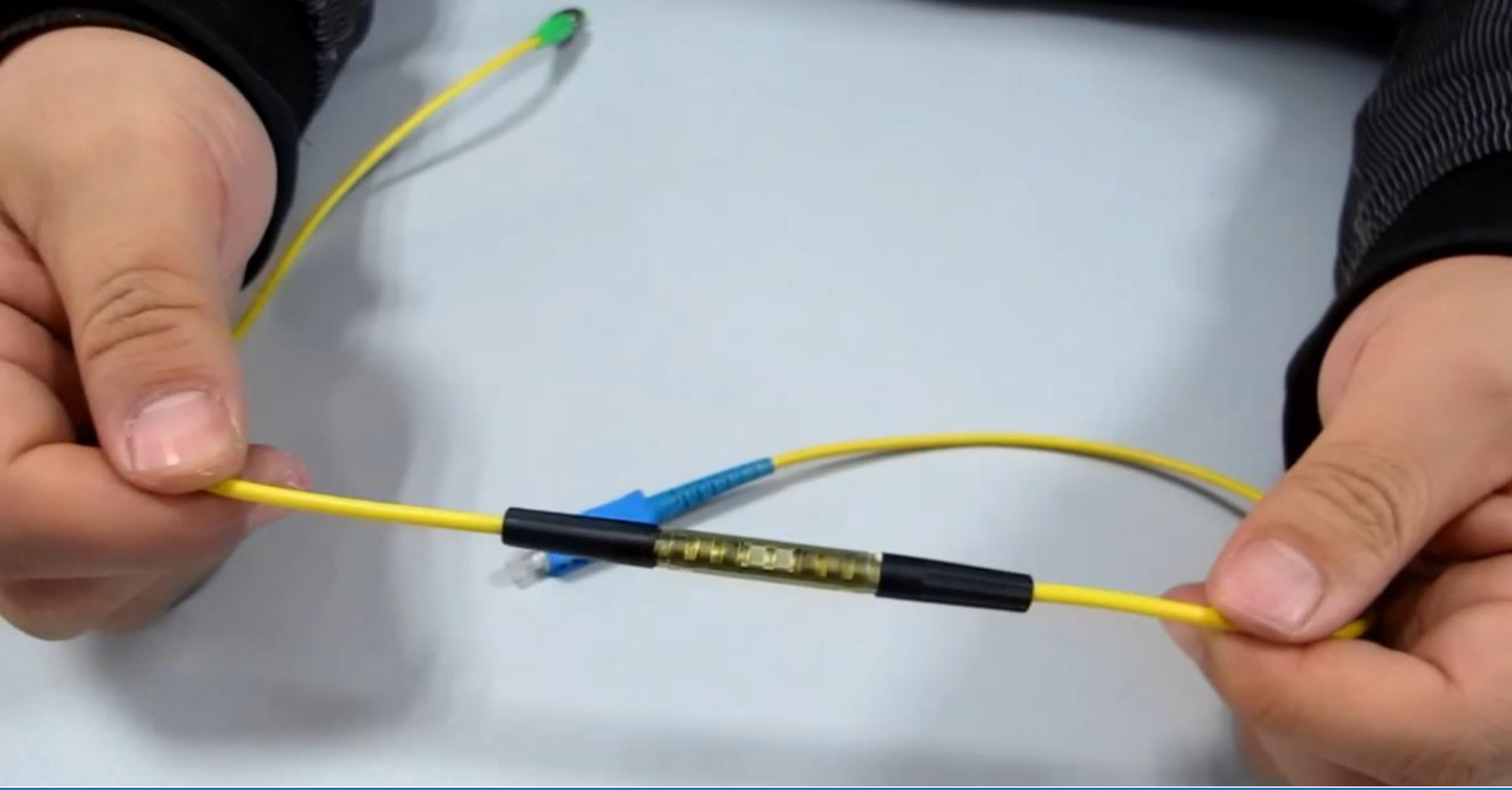

Put the splicer into the base,close the cover.


Straight the Kevlar,twist the nut for 1/2 depth.


Cut the Kevlar,then rotate the nut to the end.

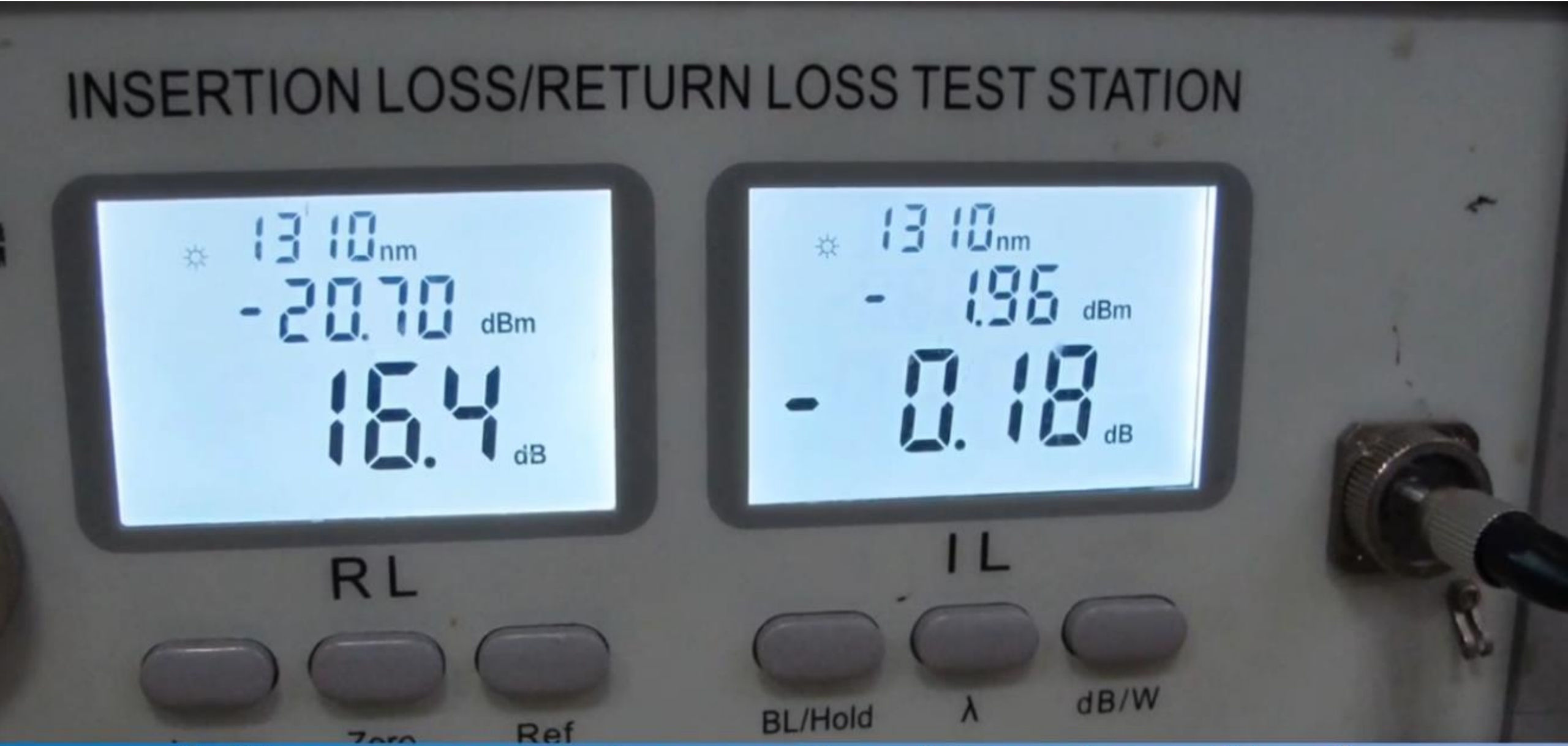

Twist another nut as the same way,fix the cable.





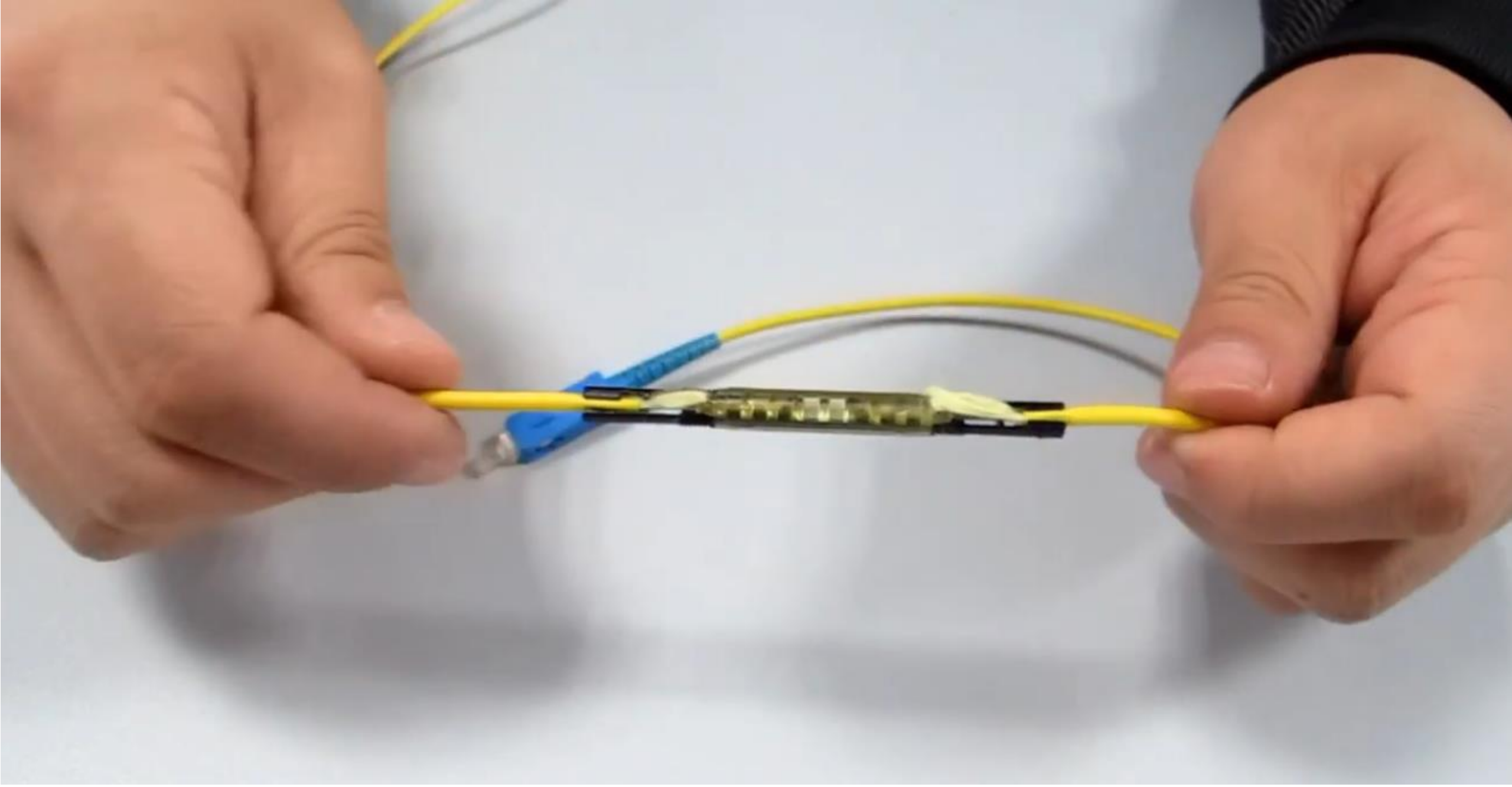
H925P
Fiber Mechanical Splice Testing Result

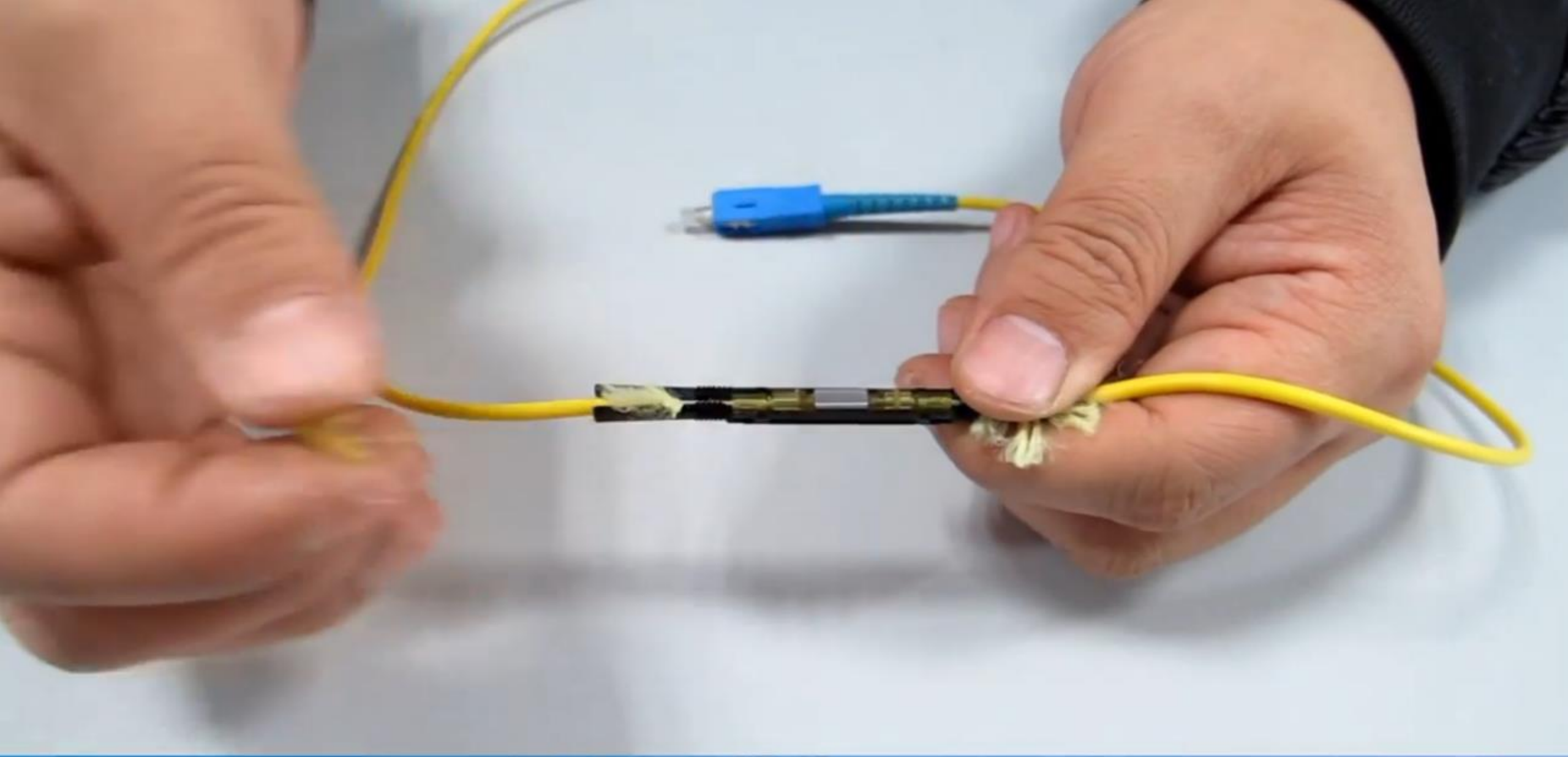
Insertion loss(fiber connector and splicer):0.18dB .

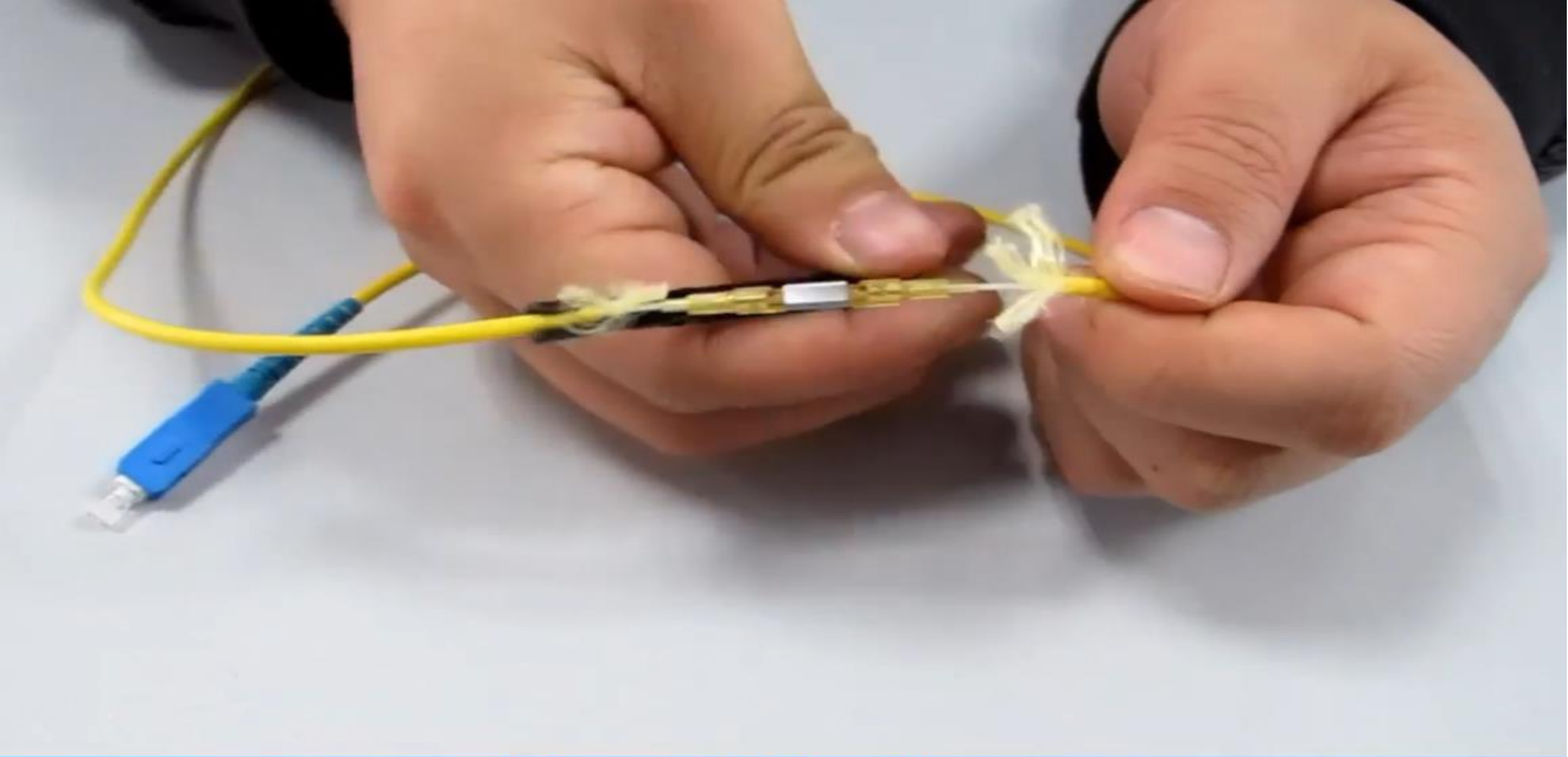


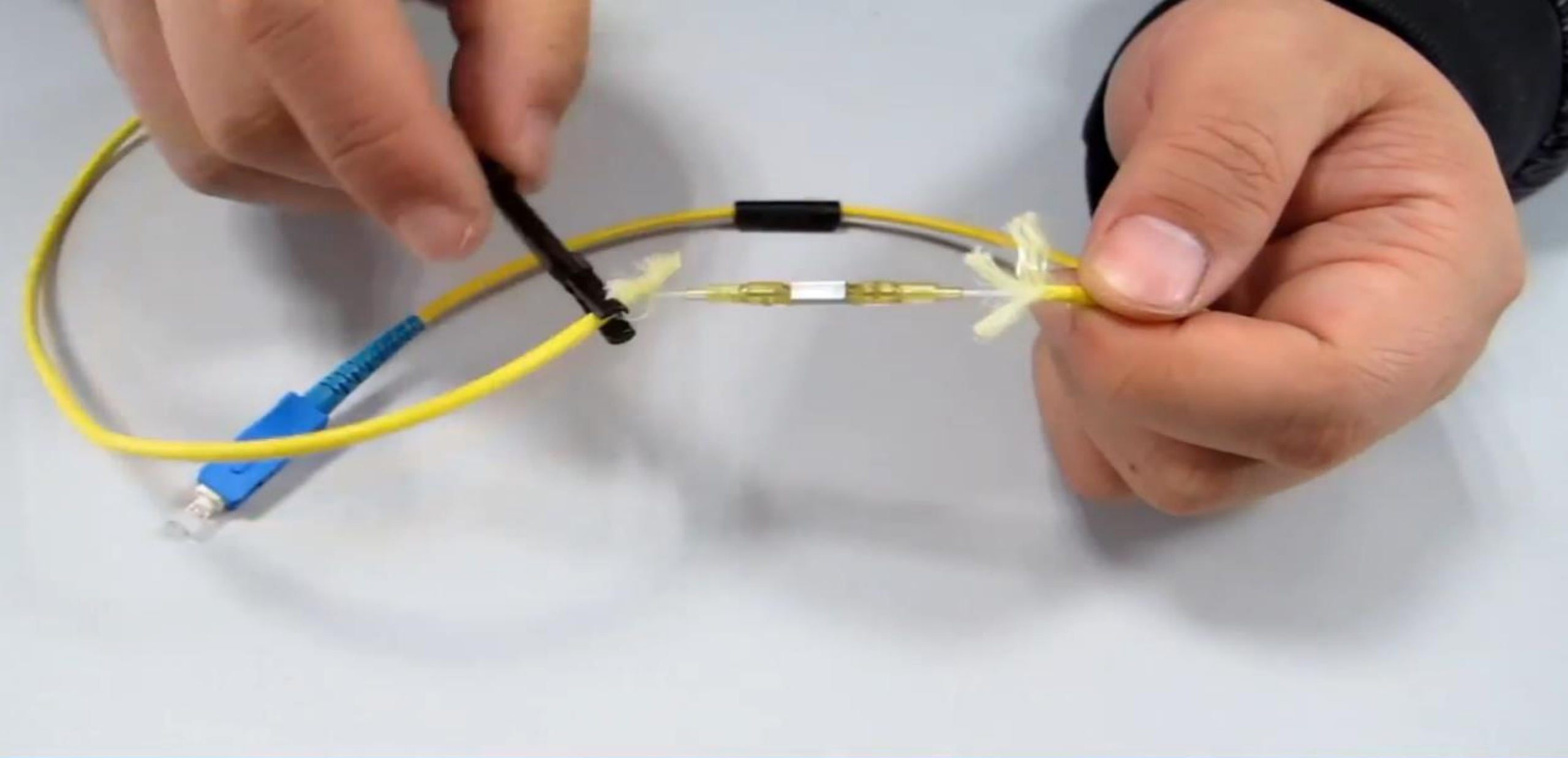
(Fiber connector and splicer together) .

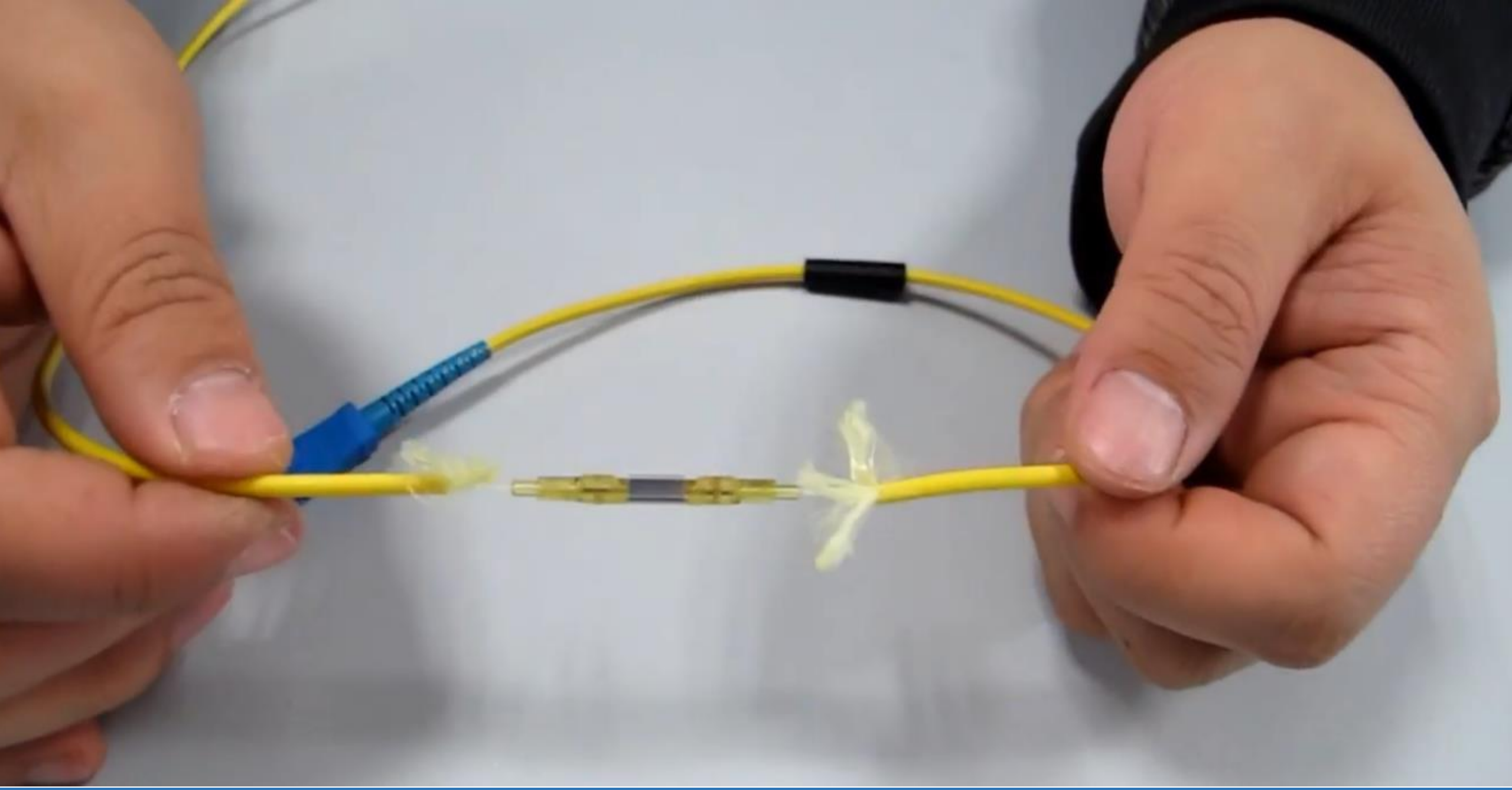
Loose the tail nut .

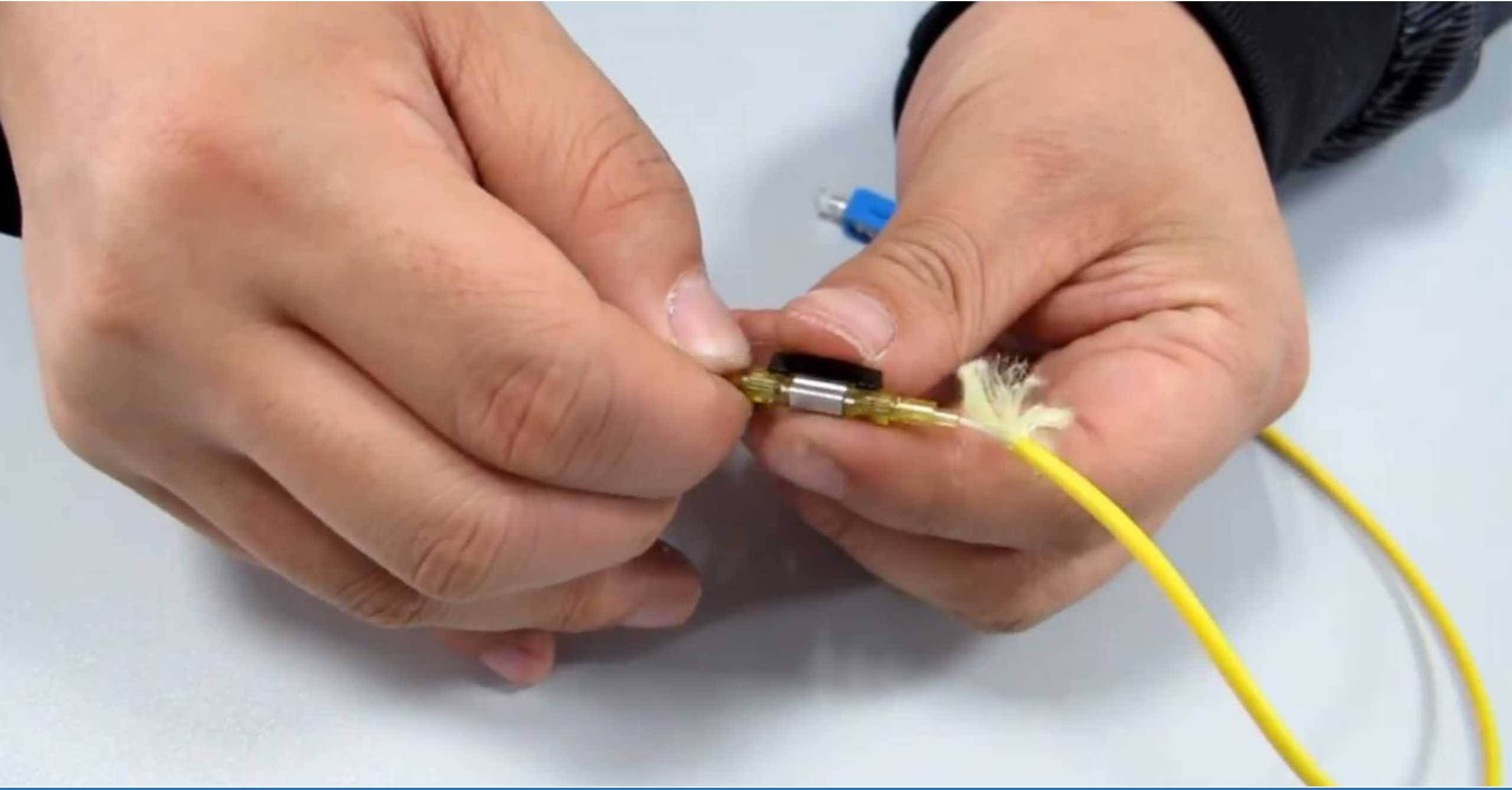


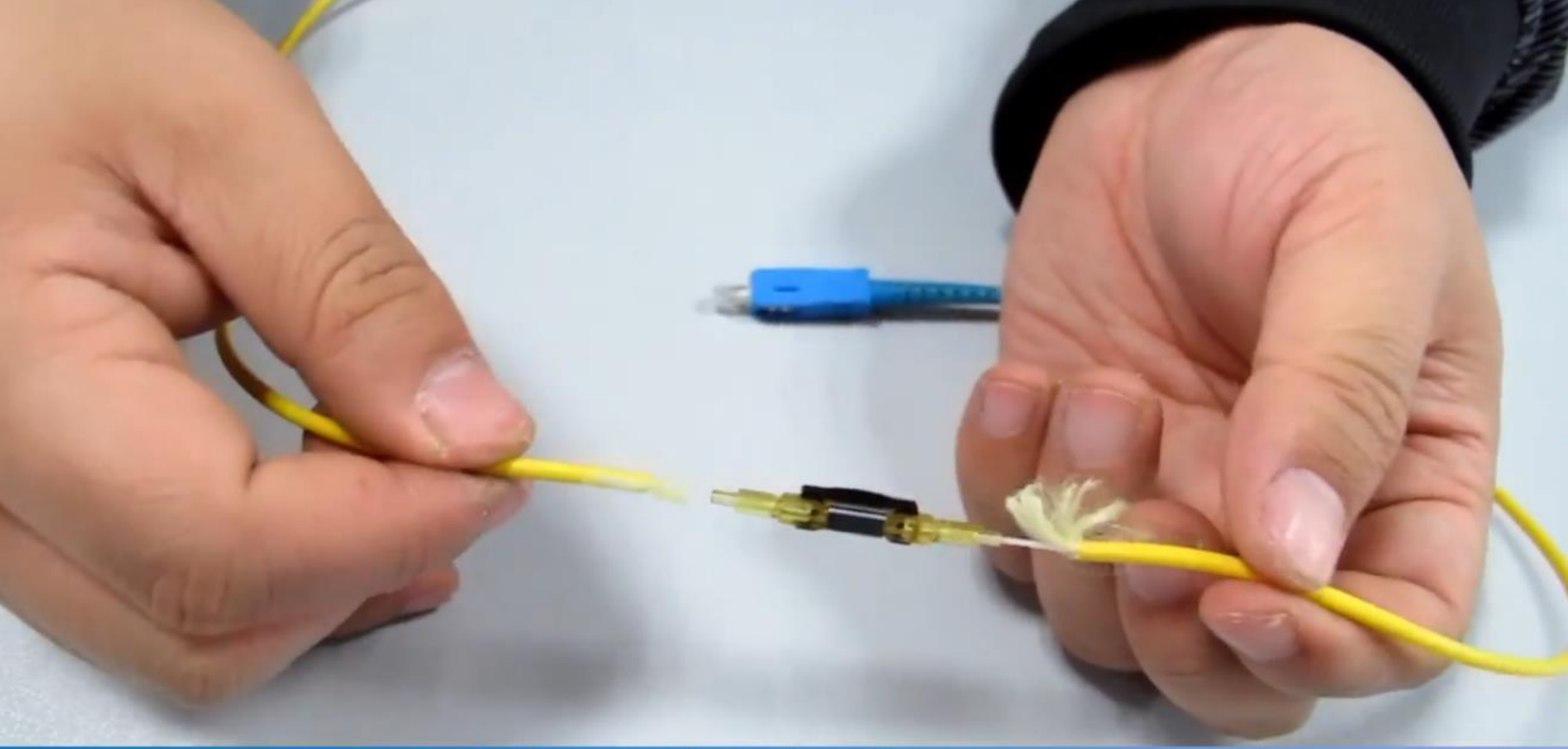

Take off the cover.


Take off the base.


Take off the base.

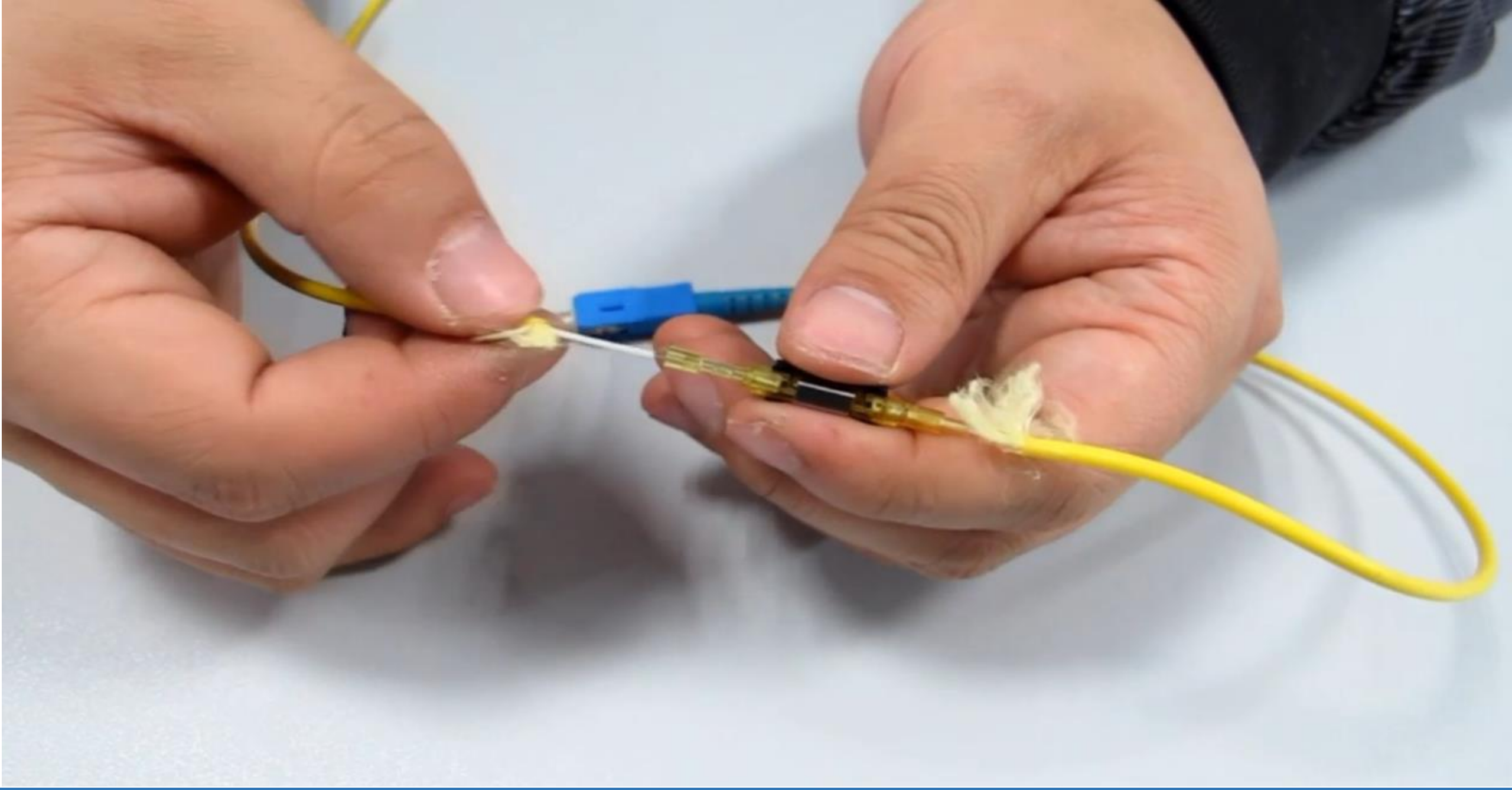





Press in the key.


Rotate the tube 90° anticlockwise.


Pull out the tube to loose the bare fiber.

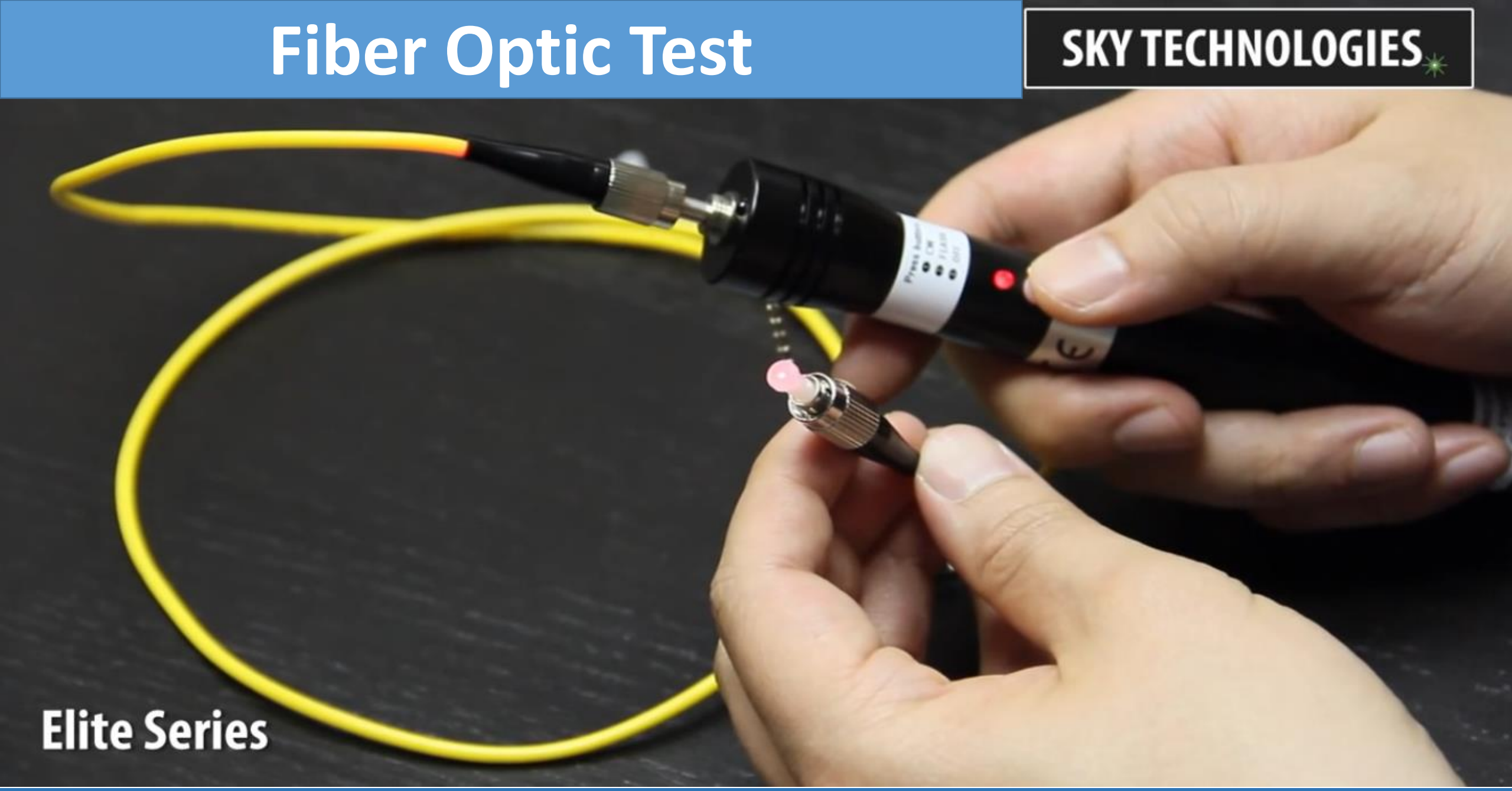


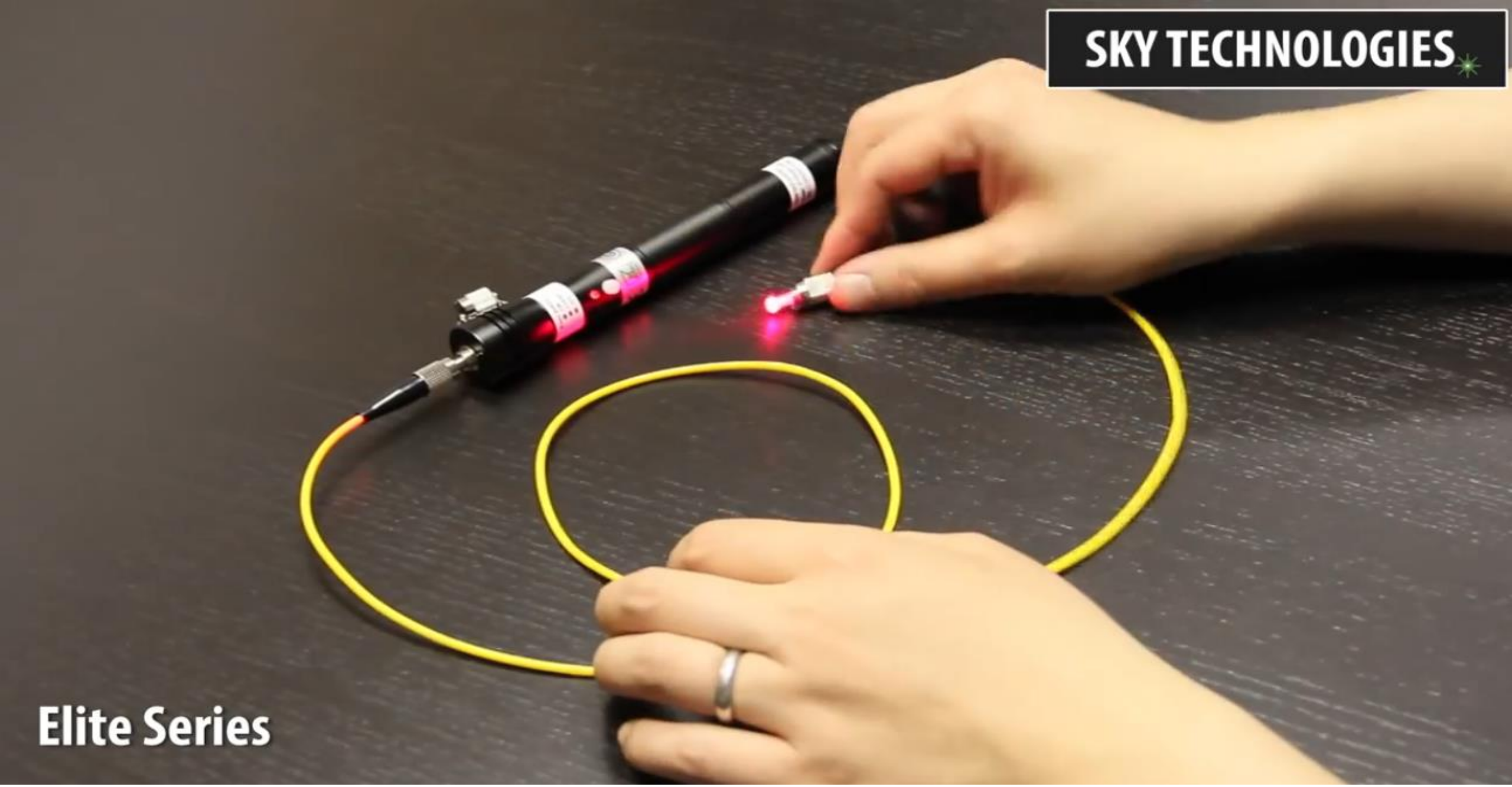

Repeat the steps to pull out the other fibe


Repeat the steps to pull out the other fiber.


Repeat the steps to pull out the other fiber.

Fiber Optic Test



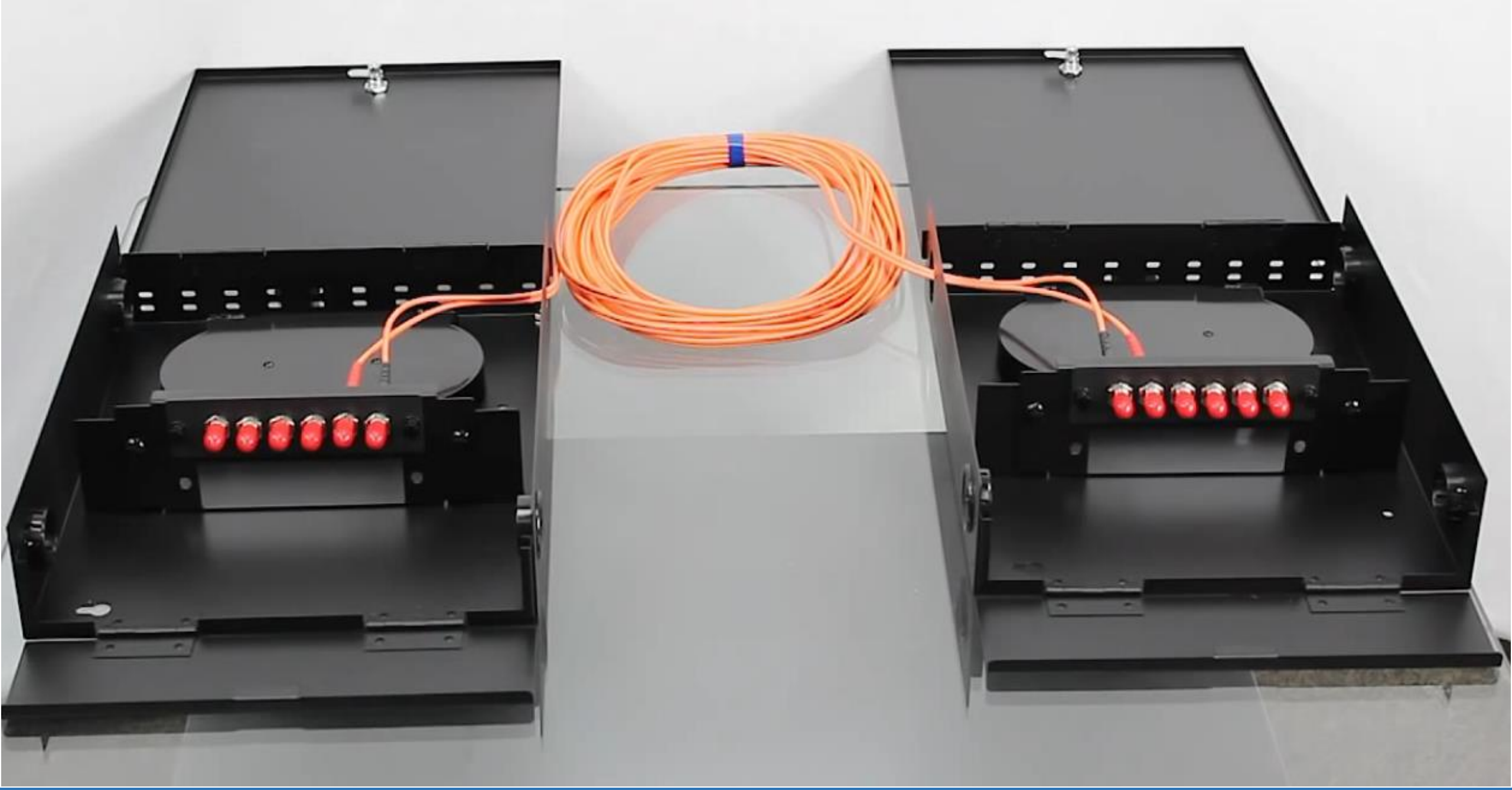

SKY TECHNOLOGIES
Elite Series

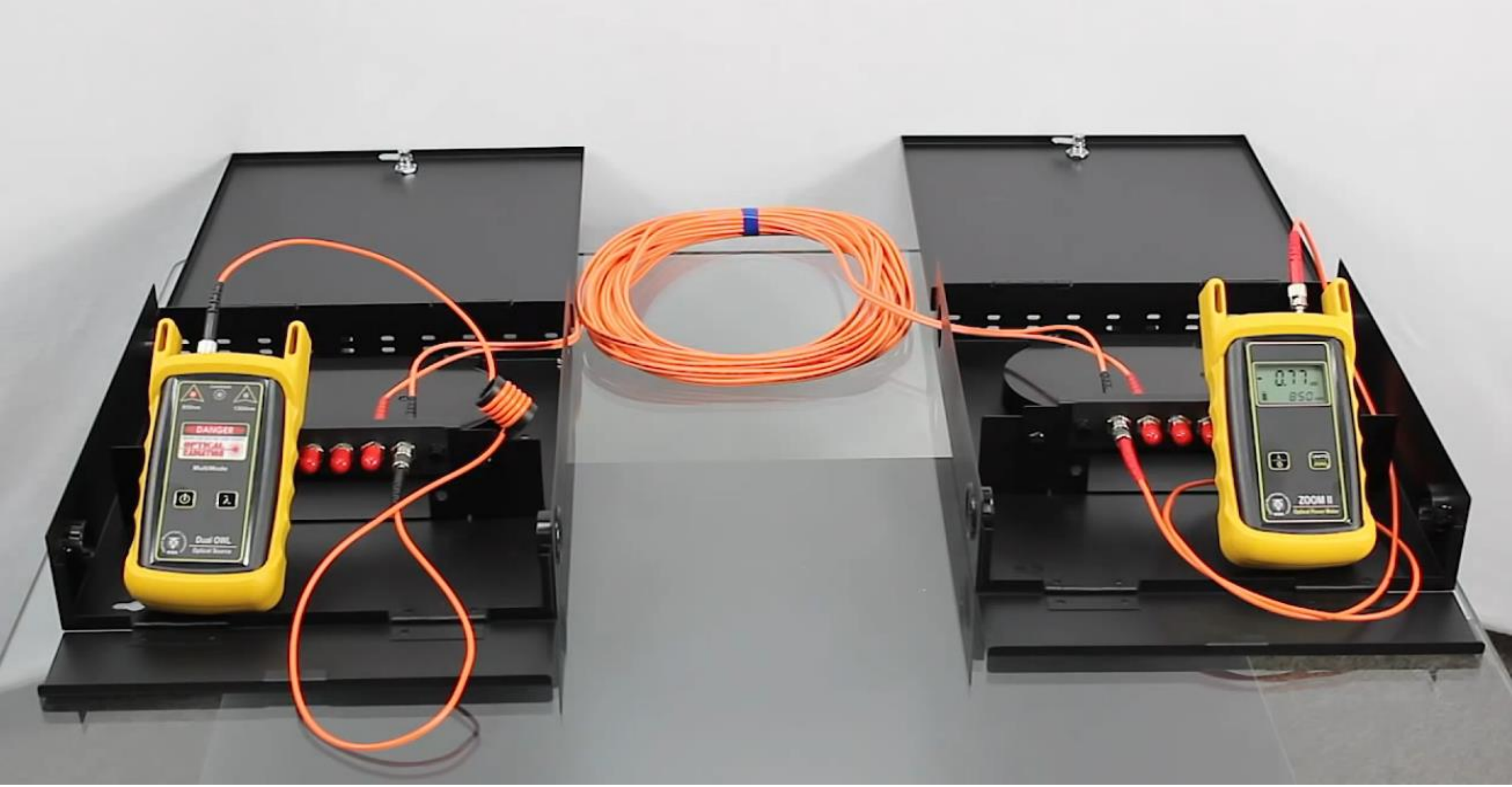
EIA/TIA 568

* MM Loss of -3.00 db per K for 850 source

Light Source + Power Meter

DB Loss of your fiber Link



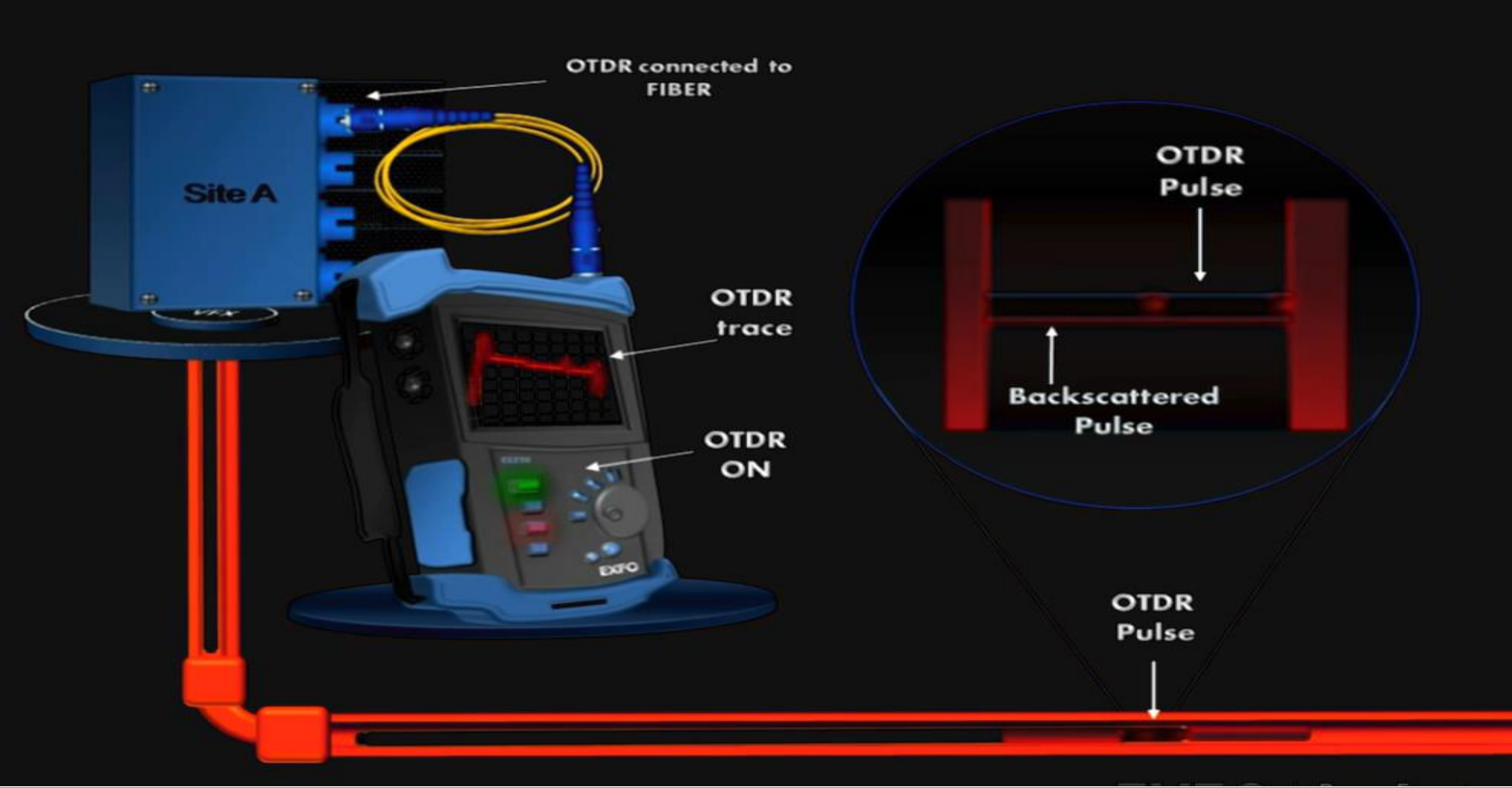

DANGER
Dual OWL
ZOOM II

Optical
Time
Domain
Reflectometer

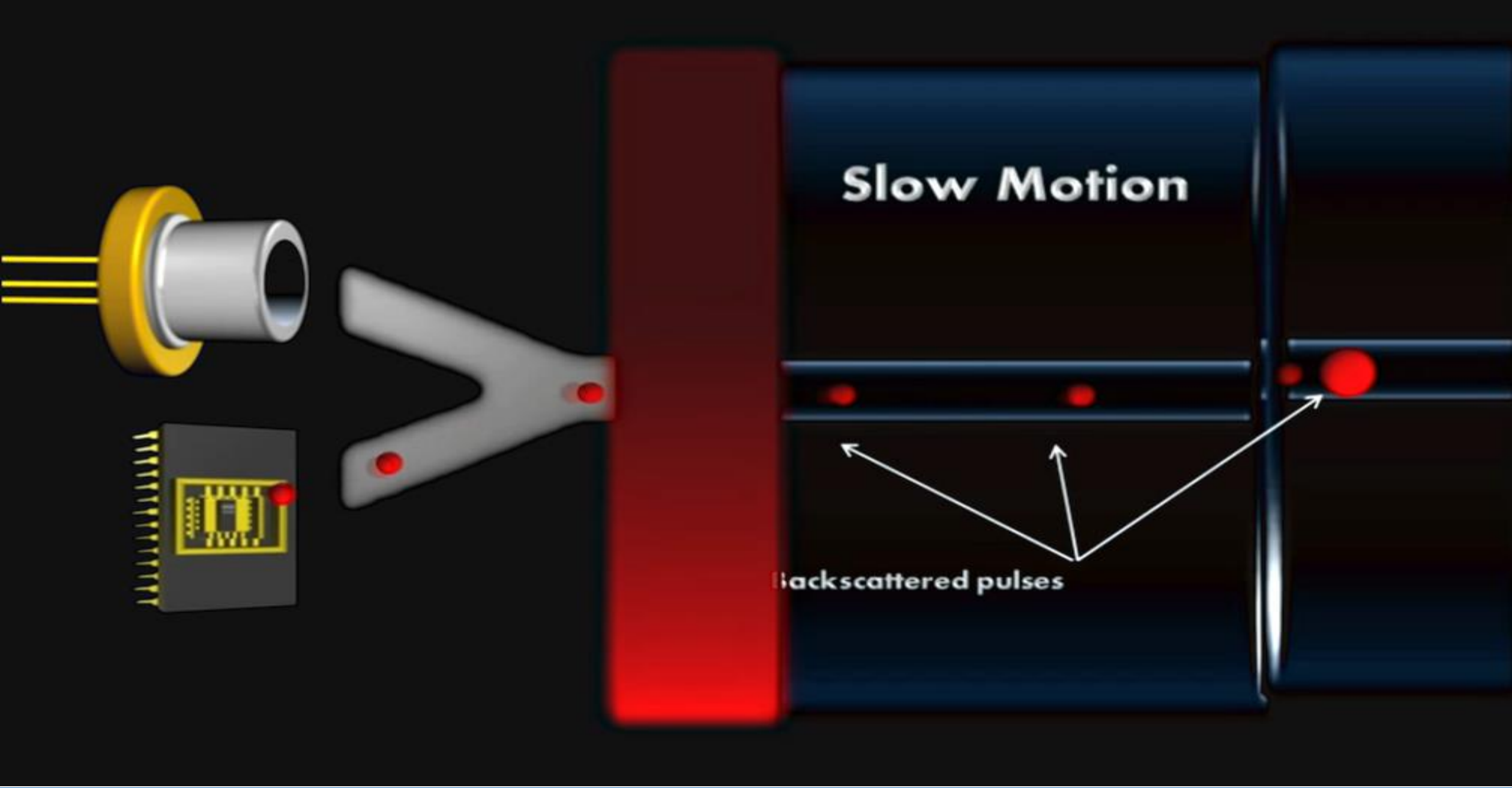
OTDR

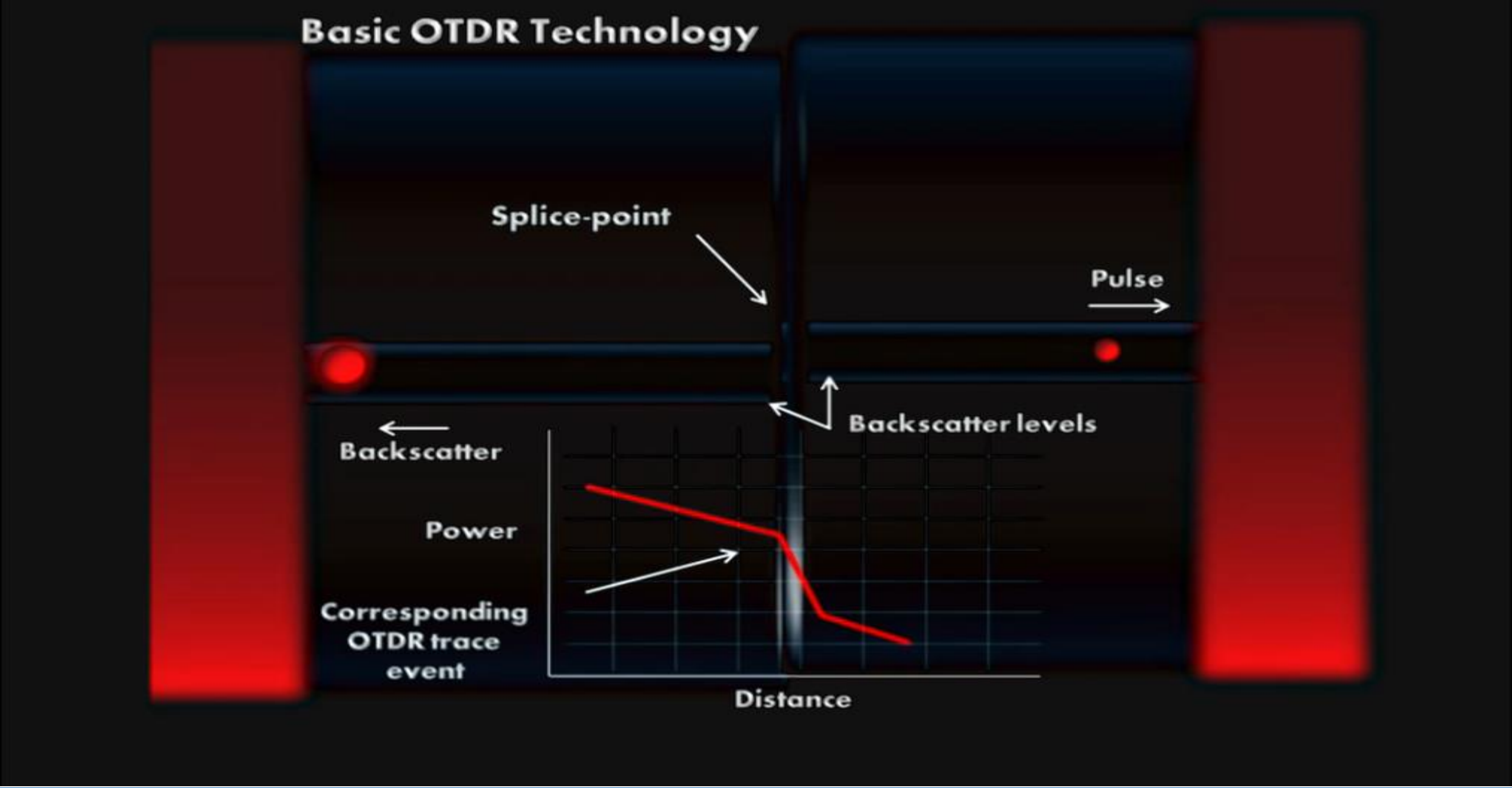
Optical Time Domain Reflectometer (OTDR)

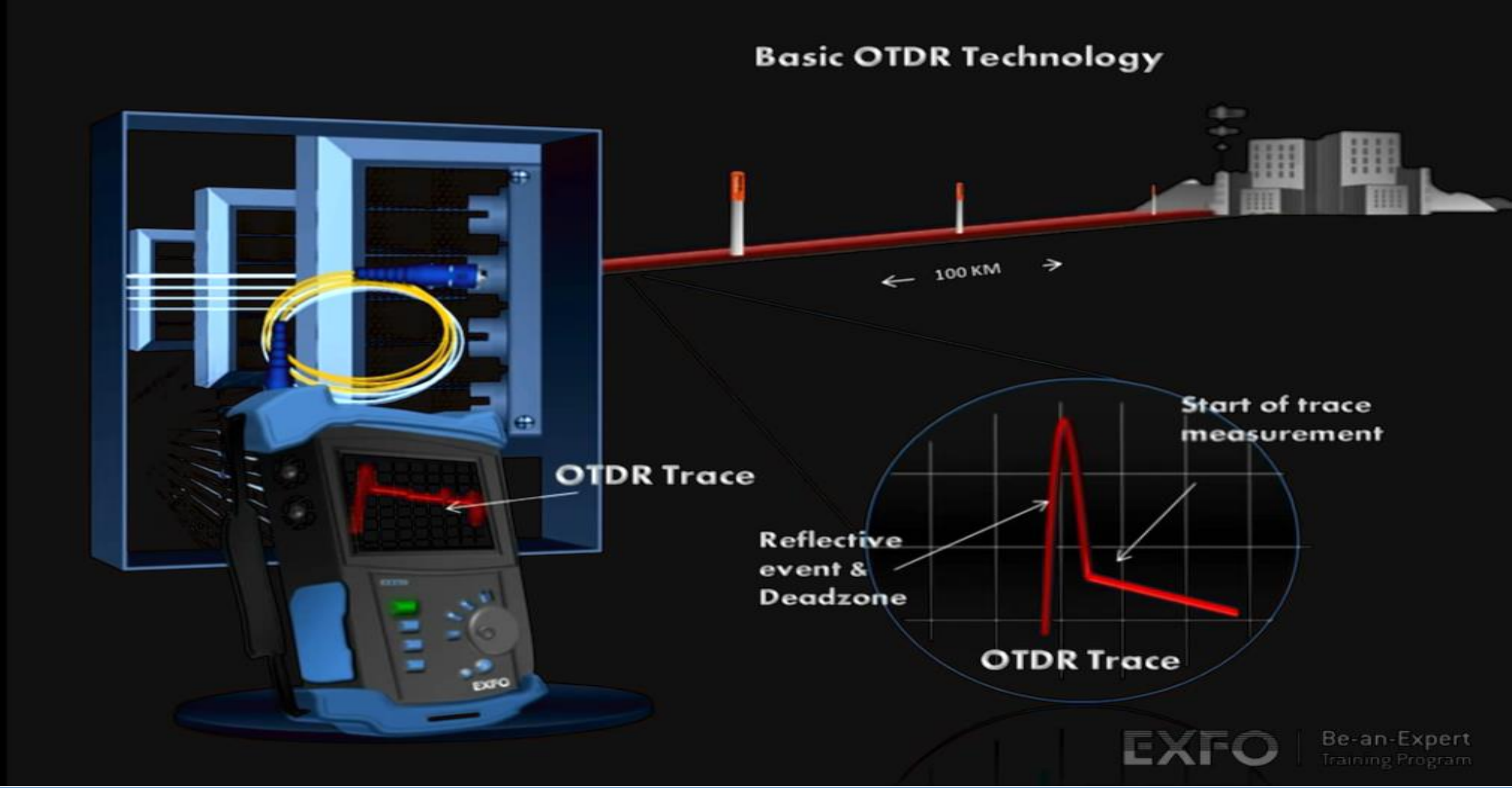
An optical test instrument used to detect light loss in a single fiber by injecting short laser pulses into the core and then measuring the subsequent backscatter level at all points along the fiber.


OTDR connected to FIBER
Site A
OTDR trace
OTDR ON
EXFO
OTDR Pulse
Backscattered Pulse
OTDR Pulse

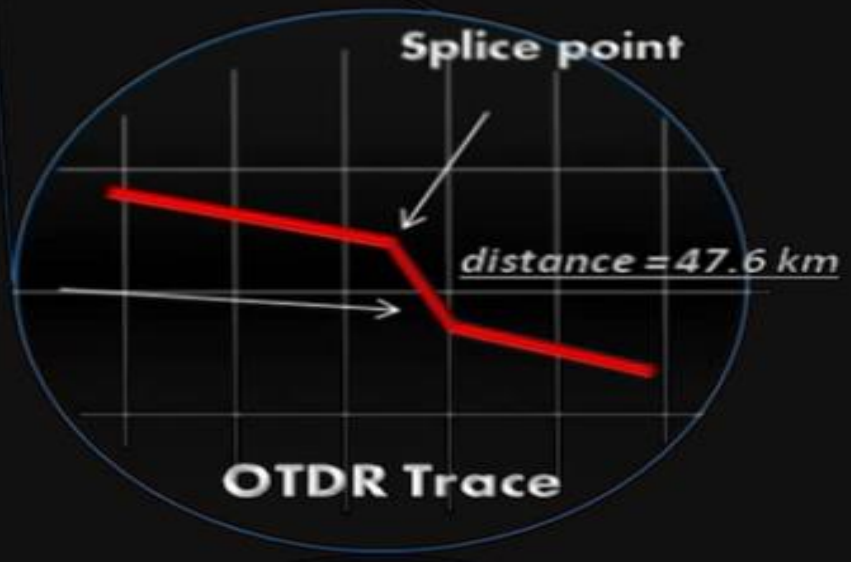

Graphical display of power and distance is called an OTDR trace
EXFO
EXFO
Be-an-Expert
Training Program


Slow Motion
Backscattered pulses


Basic OTDR Technology
Splice-point
Pulse
Backscatter levels
Backscatter
Power
Corresponding OTDR trace event
Distance

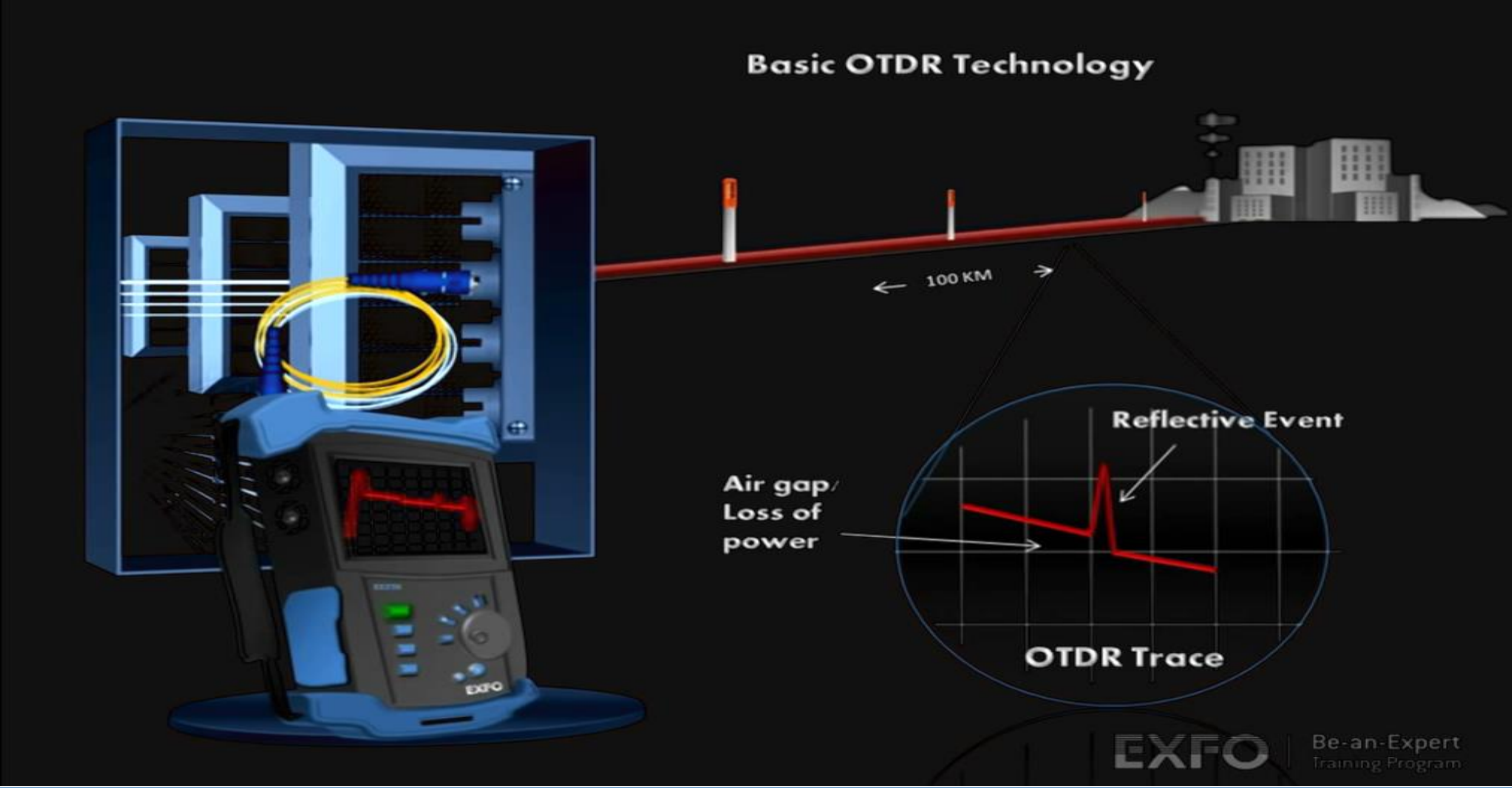

Basic OTDR Technology
100 KM
OTDR Trace
Start of trace measurement
Reflective event & Deadzone
OTDR Trace
EXFO
Be-an-Expert Training Program

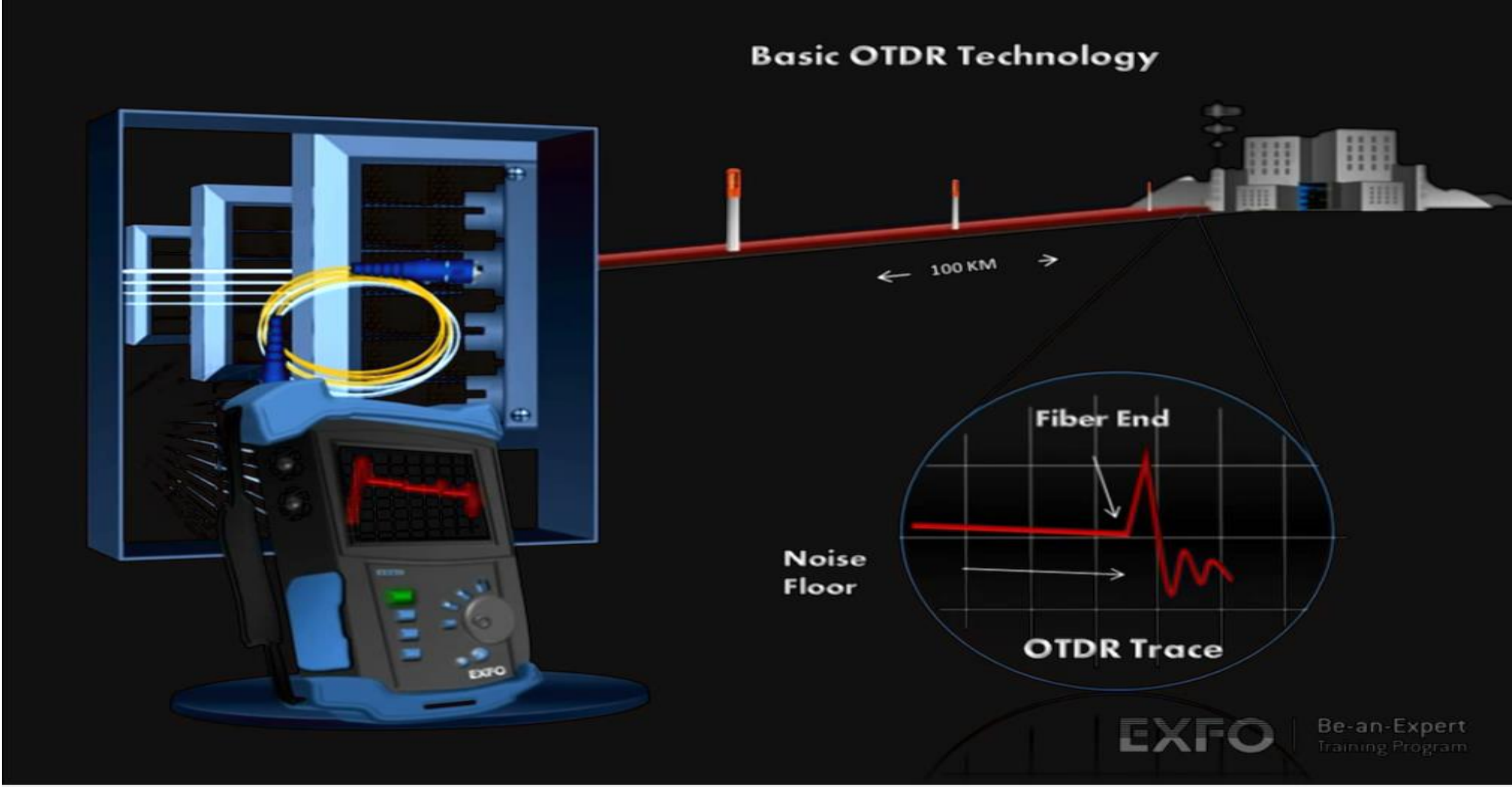
Basic OTDR Technology



Loss of power

EXFO | Be-an-Expert Training Program


Basic OTDR Technology
100 KM
Reflective Event
Air gap/
Loss of
power
OTDR Trace
EXFO
Be-an-Expert
Training Program


Basic OTDR Technology
100 KM
Fiber End
Noise Floor
OTDR Trace
EXFO
Be-an-Expert
Training Program

Basic OTDR Technology

- ✓ Accurately measure the length of a fiber.
- ✓ Accurately identify the distance to a fault
- ✓ Accurately compute loss from most splices
- ✓ Accurately detect bends and high loss events

EXFO | Be-an-Expert Training Program

WORLD BANK "LINK ANNEX BUILDING TO MAIN OFFICE "
F.01
MEASURED FROM ANNEX OFFICE

```
Primary Trace: F.01.SOR
         Date: 09/27/10          Range:          5 km
         Time: 10:36 AM     Resolution:      0.200 m
 Product Type: MT9083A-05   Pulse Width:         50 ns
  Opt. Module:                   Index:   1.467700
   Fiber Type: Singlemode    WaveLength:       1310 nm
FAS Thresholds:             Horz. Shift:     0.0000 km
         Loss:     0.05 dB  Vert. Shift:       0.00 dB
  Reflectance:   -60.00 dB No. Averages:       3584
  Fiber Break:     3.00 dB
  Backscatter:   -79.42       Trace Type: Anr SR4731
  Trace Flags: Analysis
          ORL: N/A

Analysis Results -- F.01.SOR
```

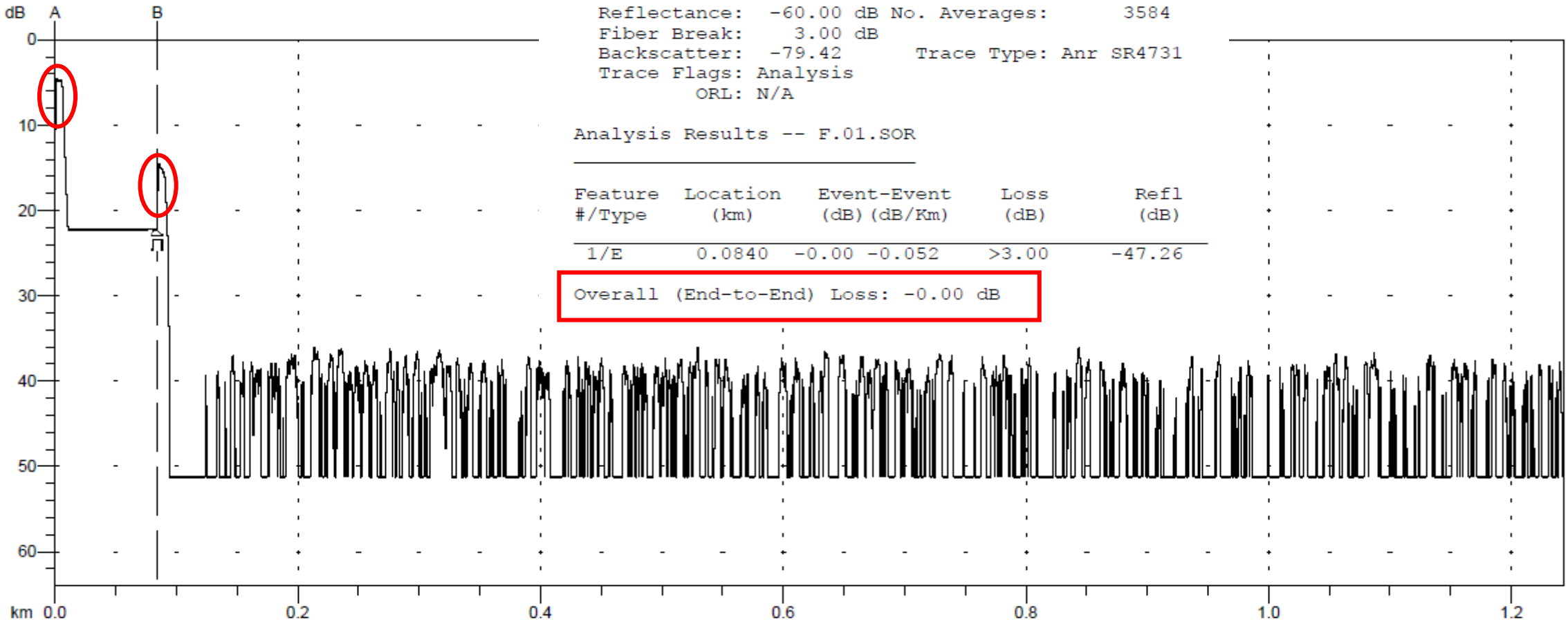
Feature #/Type	Location (km)	Event-Event (dB)	(dB/Km)	Loss (dB)	Refl (dB)
1/E	0.0840	-0.00	-0.052	>3.00	-47.26

Overall (End-to-End) Loss: -0.00 dB

Anritsu NetWorks/OTDR - Version 4.1
Date: 09/30/10 Time: 09:30 AM

F.01.SOR

5 km/0.200 m

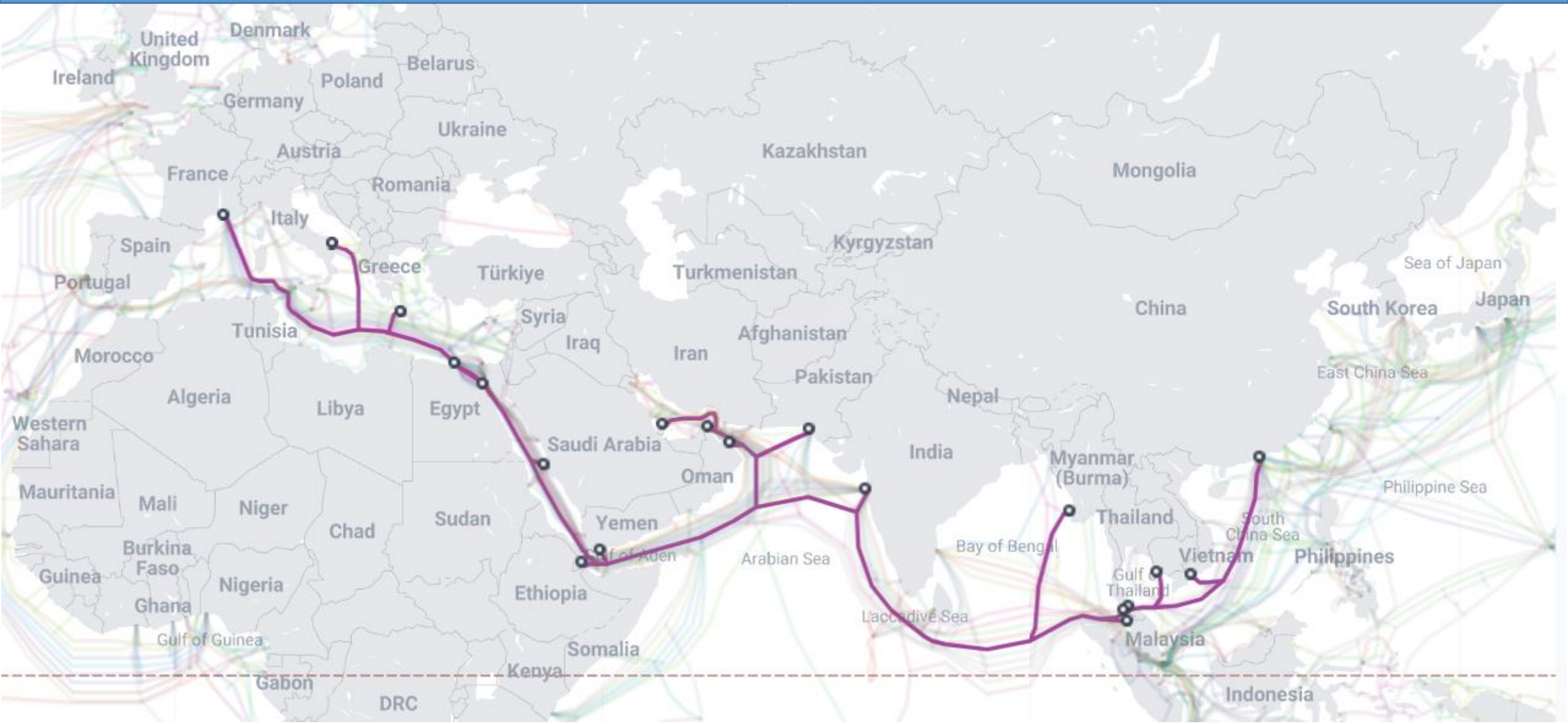



```
      A:    0.0000 km
      B:    0.0845 km
A -> B:    0.0845 km

Index: 1.467700
Splice Loss: N/A
Reflectance: N/A

[H] 50ns / 5.0m
Avg: Fast  3584
/1310 nm/SM
```

Asia Africa Europe-1 (AAE-1)



MCT

Malaysia-Cambodia-Thailand (MCT) cable system connects Malaysia, Cambodia and Thailand, spans approximately 1,300 kilometers, adopts 100 Gbps technology with a system capacity of 30+ Tbps.
The MCT cable system lands at Sihanoukville in Cambodia, Rayong in Thailand and Cherating (near Kuantan, Penang) in Malaysia respectively.
The MCT cable system is jointly built by Telcotech, a subsidiary of EZECOM in Cambodia, Symphony Communication of Thailand and Telekom Malaysia.
The MCT cable system launched for service in March 2017, with an initial capacity of 1.5Tbps.
In Cambodia, the MCT cable system connects to AAG and other submarine cable system. Telcotech is the only Cambodian member of the AAG which links Southeast Asia to the USA.
As the landing party for MCT cable system in Thailand, Symphony is the first private submarine cable operator in Thailand, owns and operates the Maolee Cable Landing Station in Rayong, Thailand.

MPTC

The 2,715-km Hong Kong-Phnom Penh submarine fiber optic cable network ready by 2024.

Hong Kong-Phnom Penh submarine fiber optic cable project worth about 165 million dollars.