

Optoelectronică, structuri și tehnologii

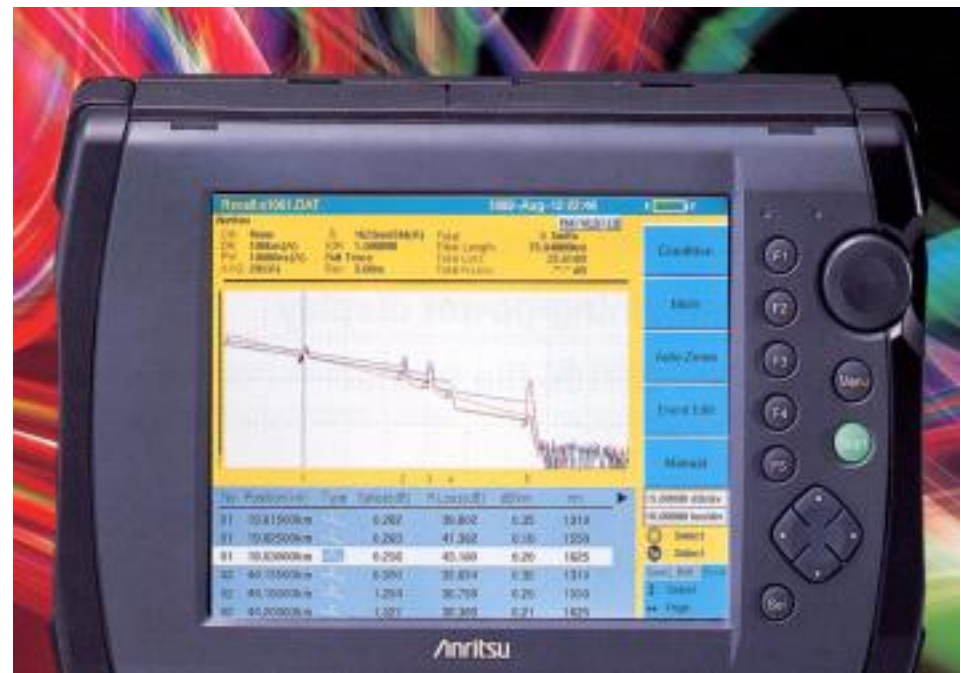
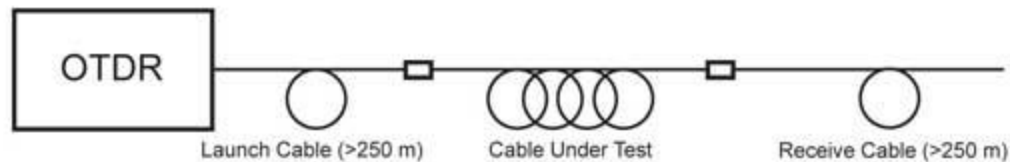
Curs 5

Fibra optică

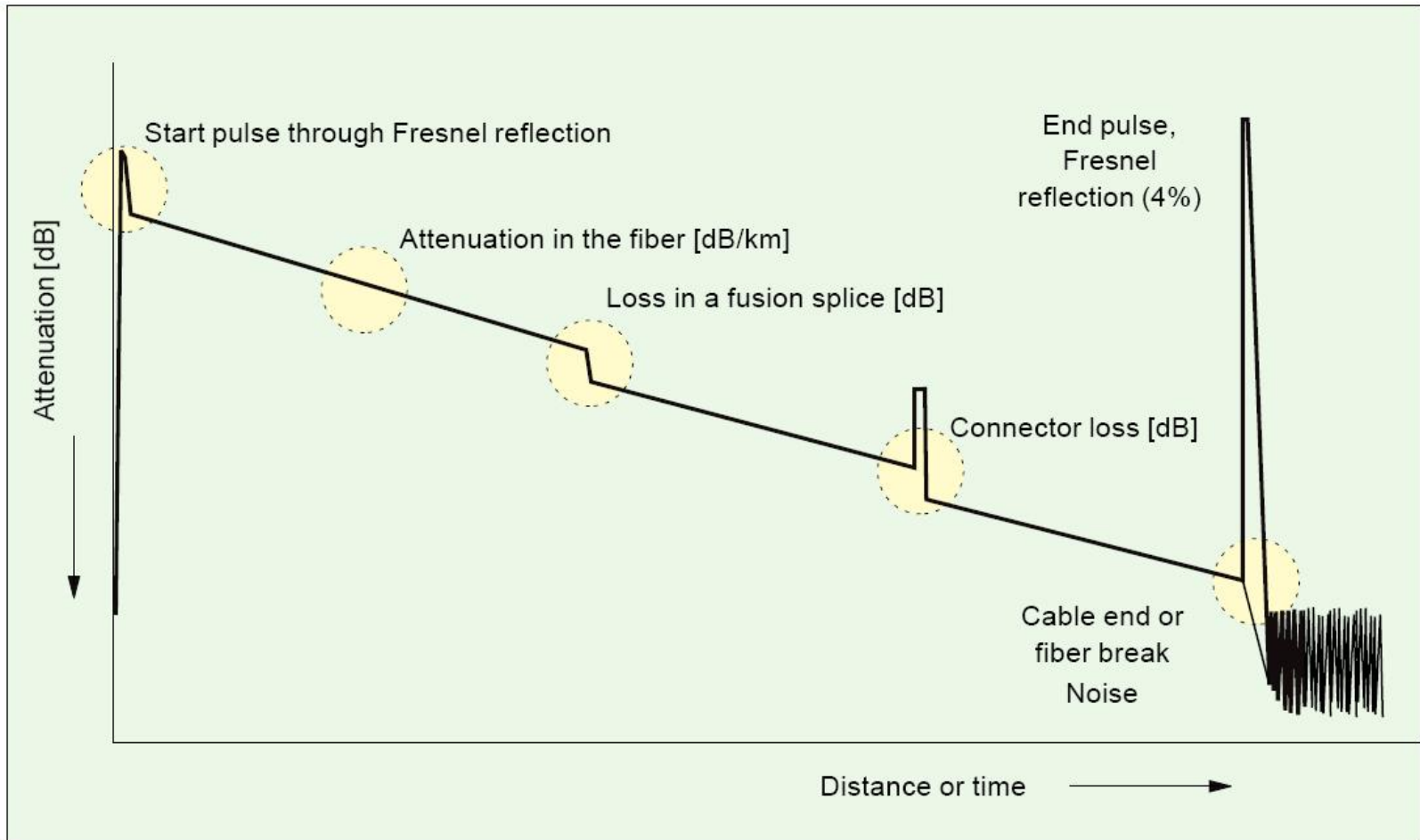
Capitolul 4

OTDR

- ▶ Optical time-domain reflectometer
- ▶ Localizarea defectelor



Rezultat grafic al OTDR



Effect visible OTDR

reflections show OTDR pulse width and resolution

connectors show both loss and reflections

splices are usually not reflective

slope of trace shows fiber attenuation coefficient

splice loss

a. same fiber spliced

error caused by fiber characteristics

b. high loss fiber spliced to low loss fiber

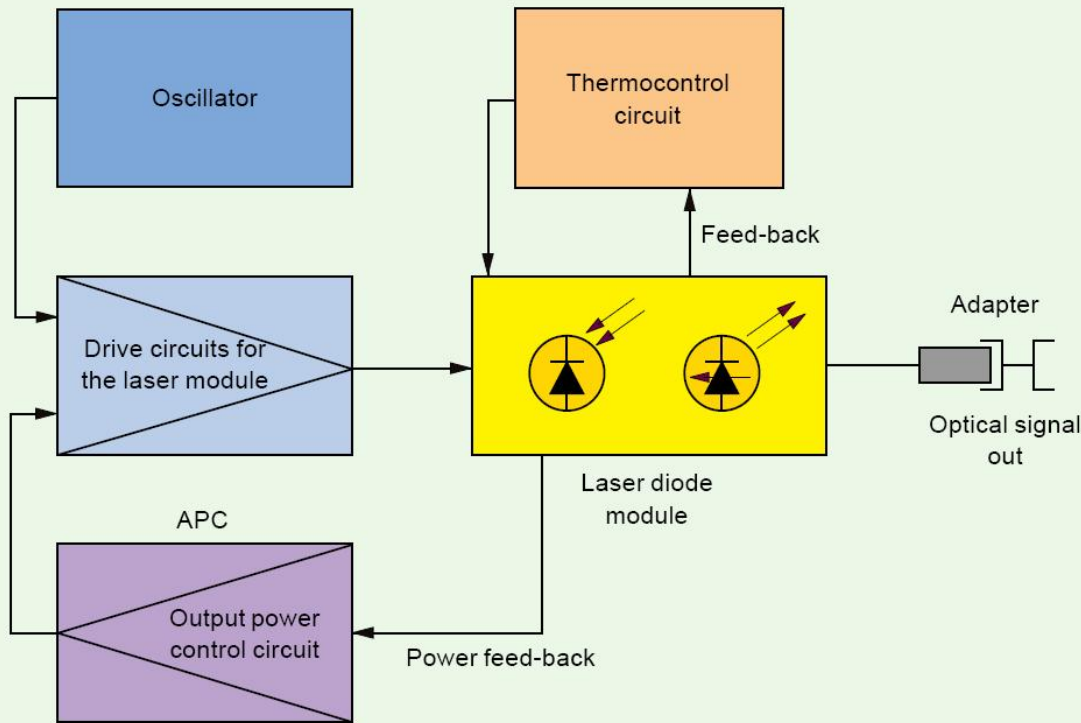
c. low loss fiber spliced to high loss fiber can cause an apparent gain at a splice

$$Splice\ loss = \frac{Splice\ loss_{A \rightarrow B} + Splice\ loss_{B \rightarrow A}}{2}$$

Stabilized light source

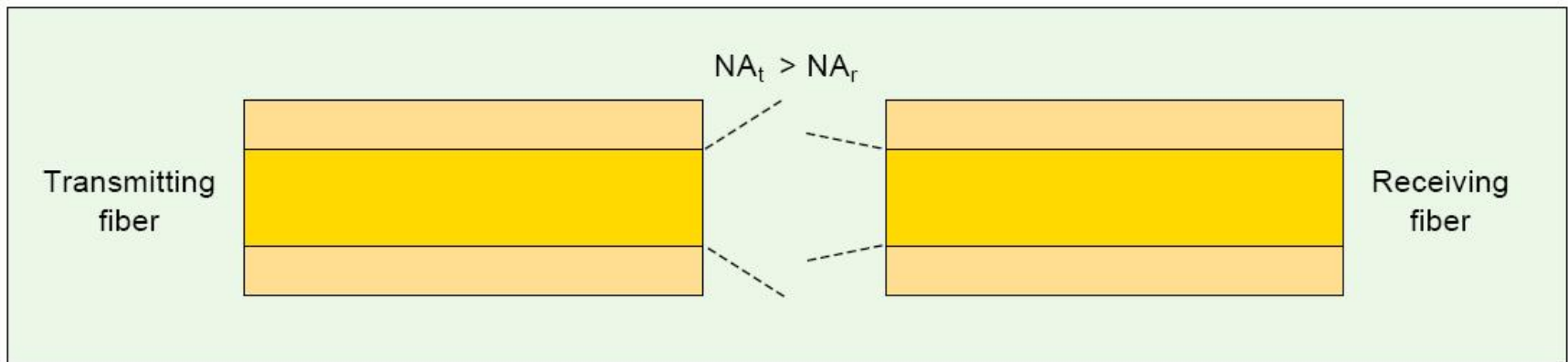
Optical power meter

- ▶ Masurarea puterii si atenuarii



Pierderi – Apertura numerica

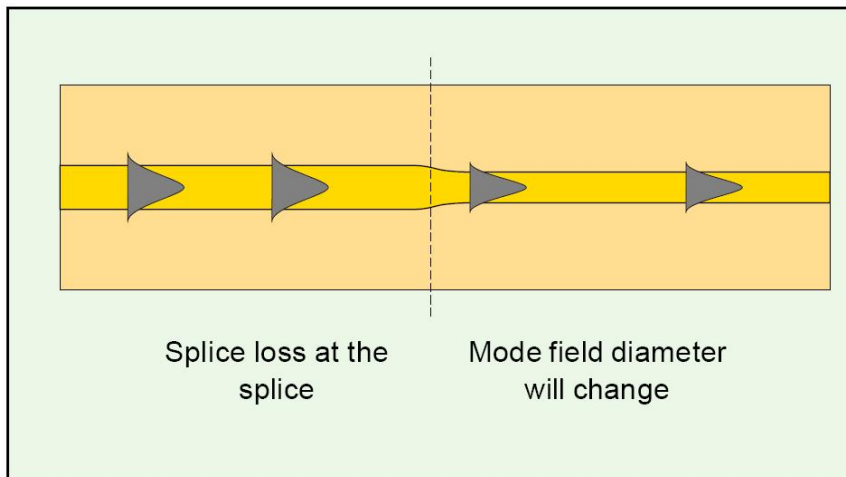
- ▶ Numai la trecerea de la apertura numerica mai mare la apertura numerica mai mica



$$\text{Attenuation}_{NA} = 10 \log_{10} \left(\frac{NA_r}{NA_t} \right)^2$$

Pierderi – Diametrul miezului

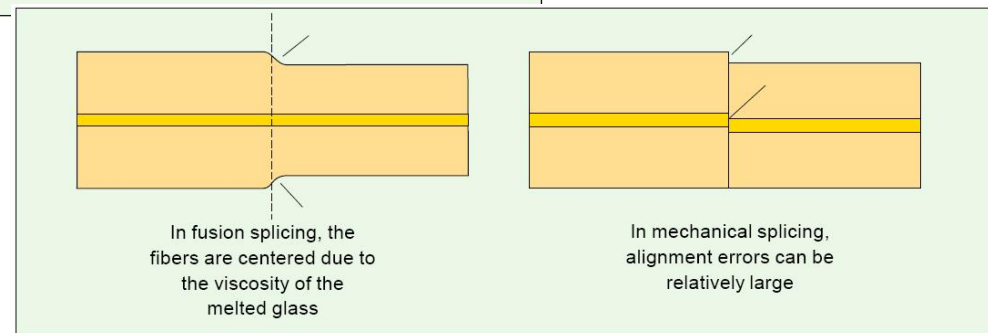
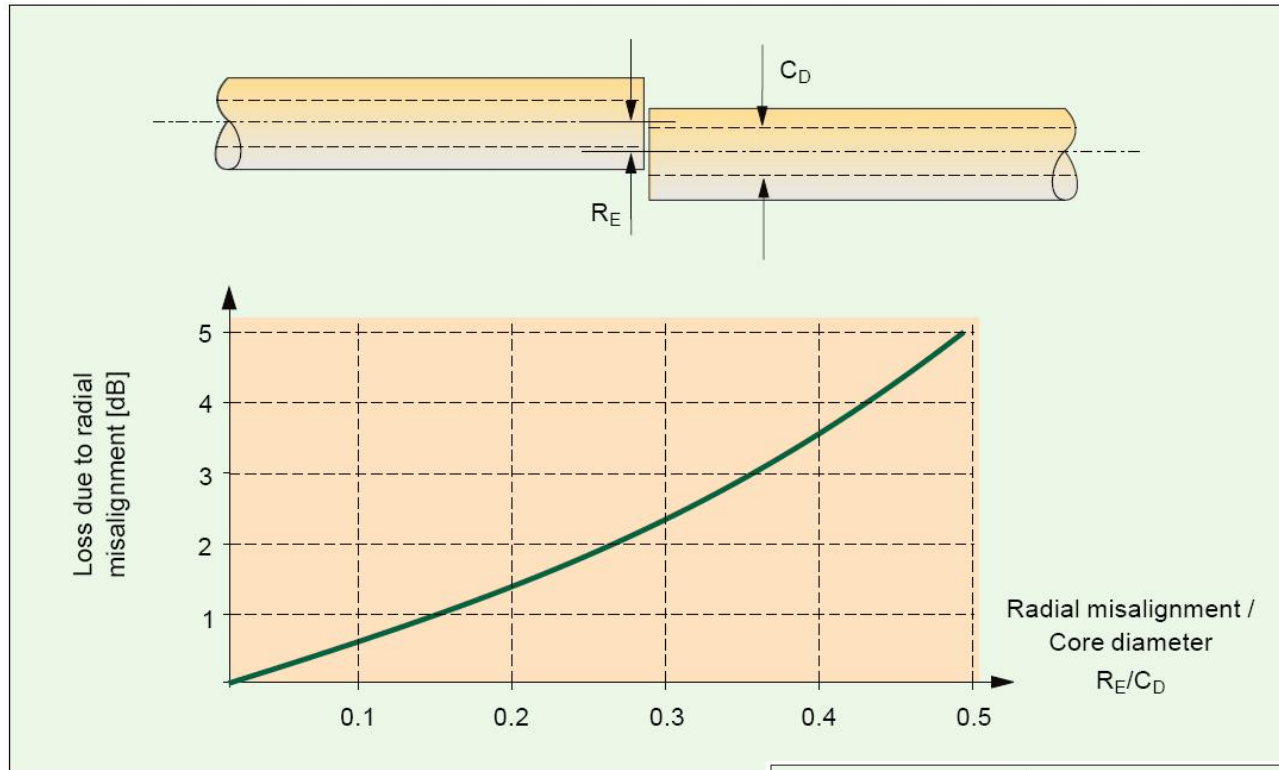
- ▶ Numai la trecerea de la diametru mai mare la diametru mai mic



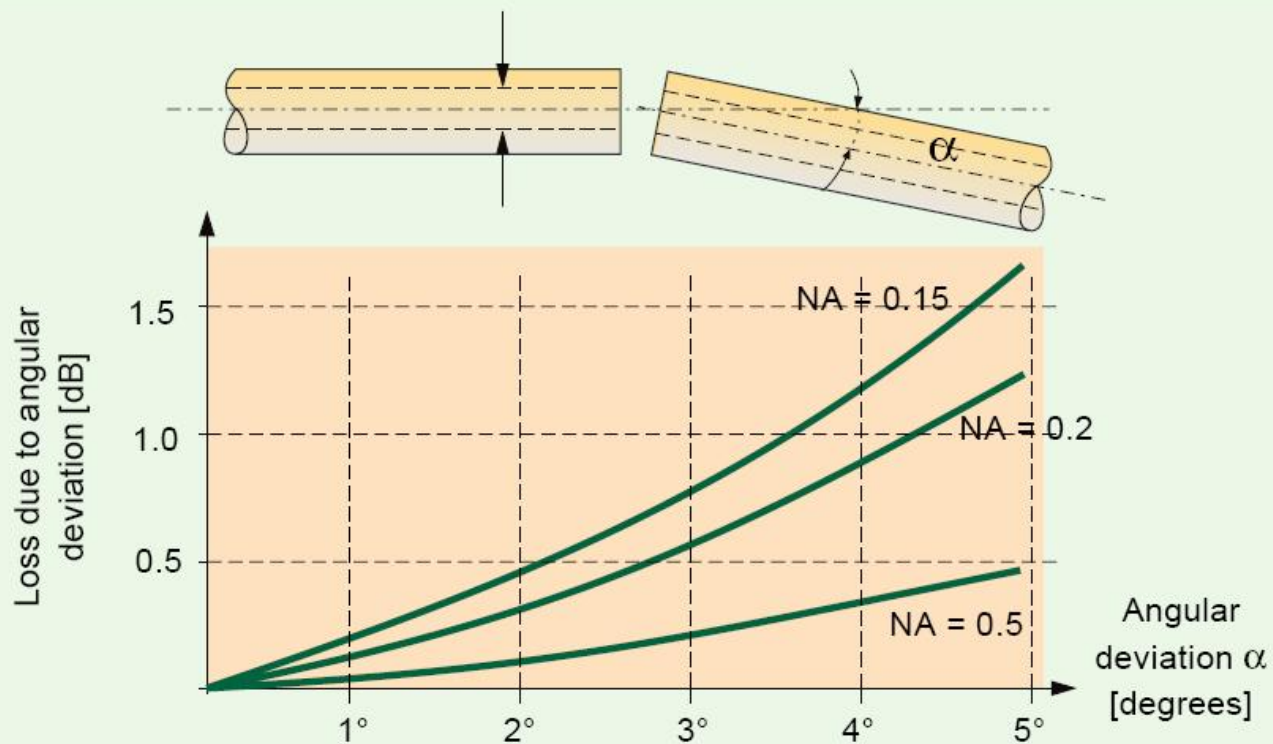
$$\text{Attenuation}_{\varnothing} (\text{multimode}) = -10 \log_{10} \left(\frac{\varnothing_r}{\varnothing_t} \right)^2$$

$$\text{Attenuation}_{\varnothing} (\text{single-mode}) = -20 \log \left(\frac{2 w_1 w_2}{w_1^2 + w_2^2} \right)$$

Pierderi – Nealinierarea axelor

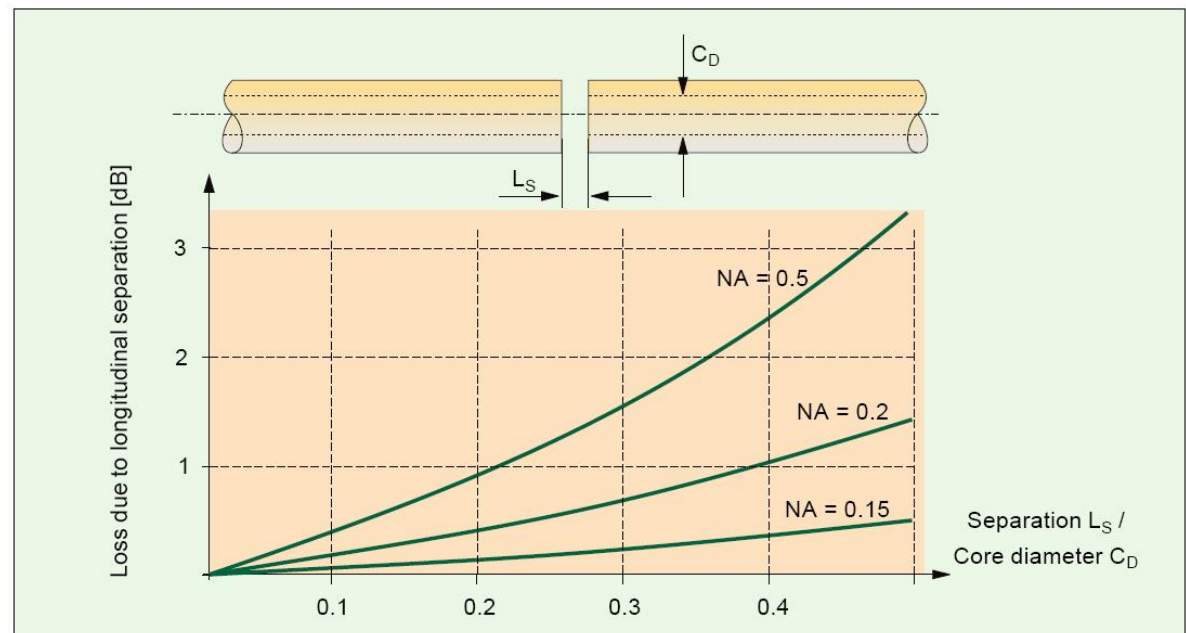


Pierderi – unghi



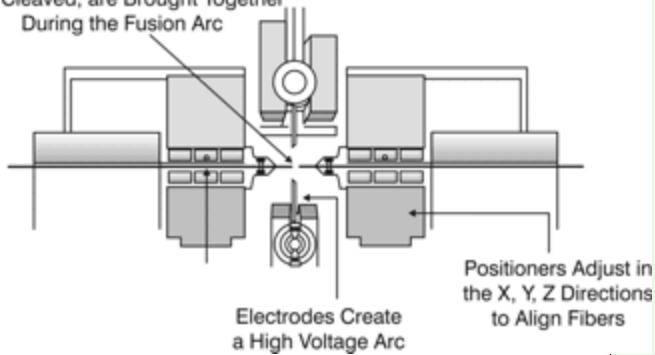
Pierderi – distanta

- ▶ Se foloseste un gel cu indice de refractie egal cu al fibrelor
- ▶ Se aduna pierderile generate de reflexie pe o lamela (pana la 16%)

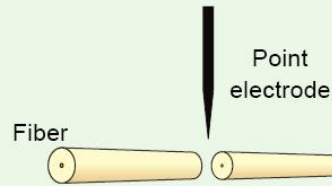


Splice prin fuziune

Fibers Stripped of Coating, Cleaned, and Cleaved, are Brought Together During the Fusion Arc

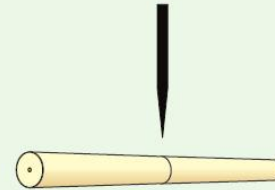


Step 1
Alignment,
control of
cutting angle
and cleanness



Horizontal and vertical
alignment with an
accuracy of better than
1 μm

Step 2
Prefusion

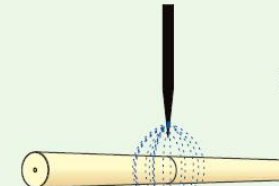


Arc between the
electrodes burns off
small particles of dirt,
etc, and rounds the
cut edges slightly

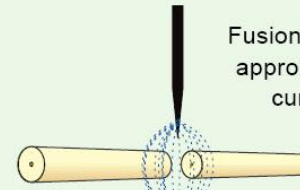
The finished fusion-
spliced fiber



Step 3
Final adjustment
and fiber check

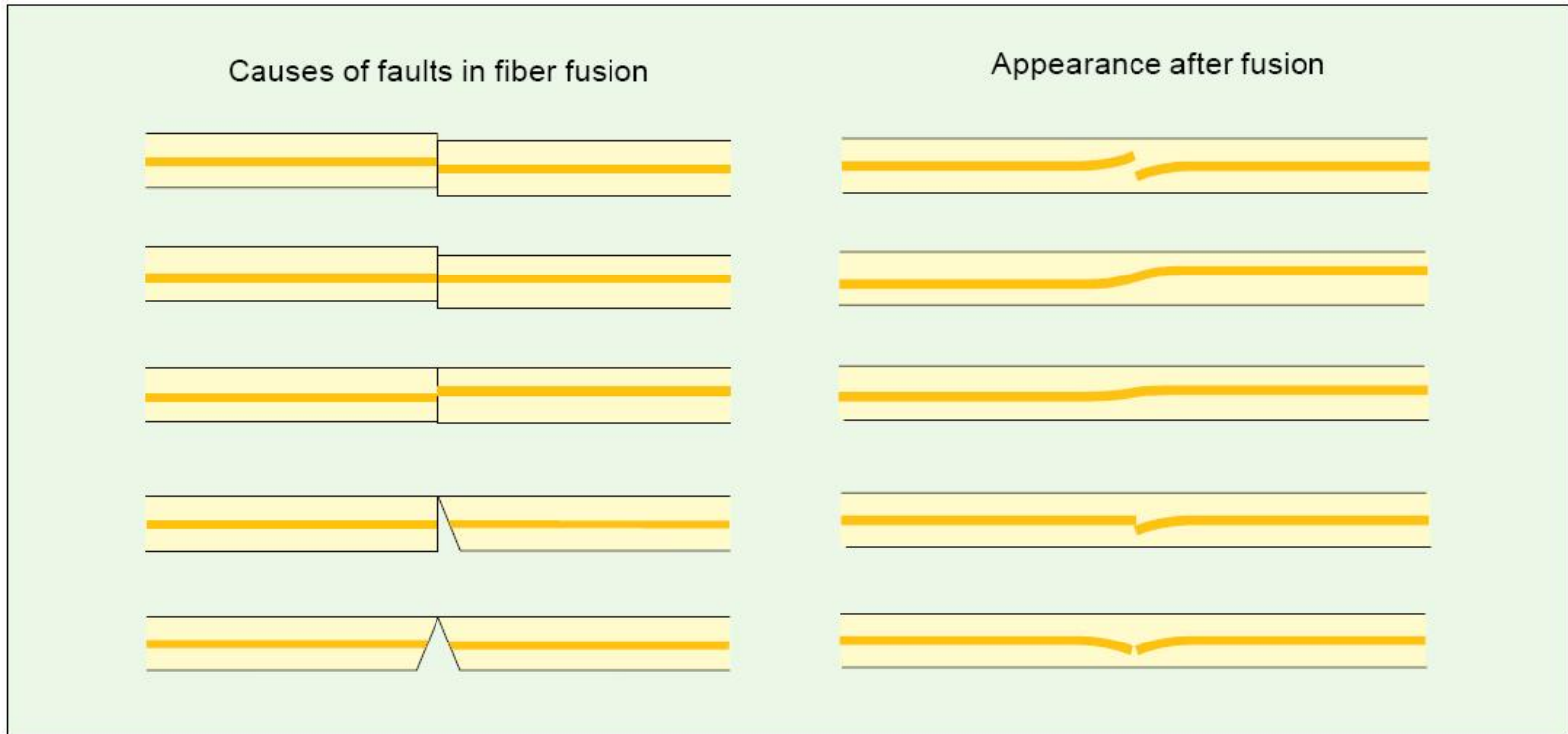


Step 4
Fusion in sequential process,
approx. 5 secs with a fusion
current of 10 - 20 mA

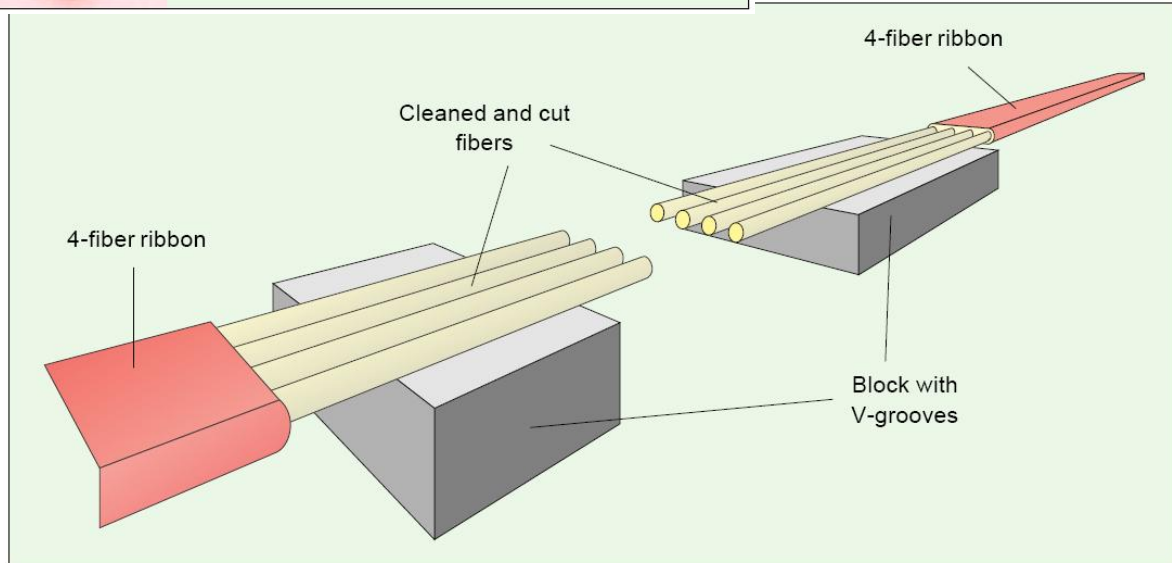
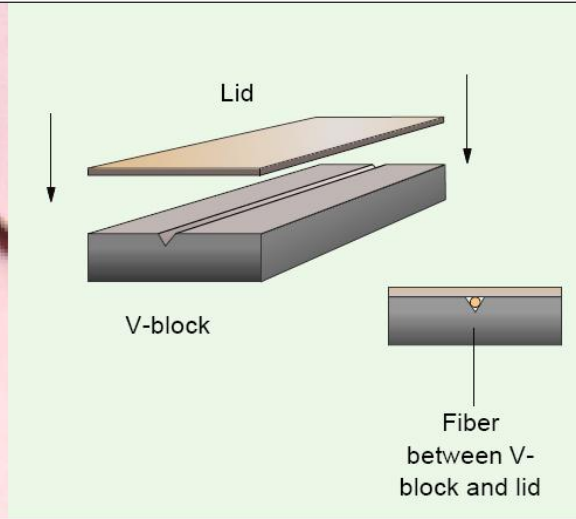
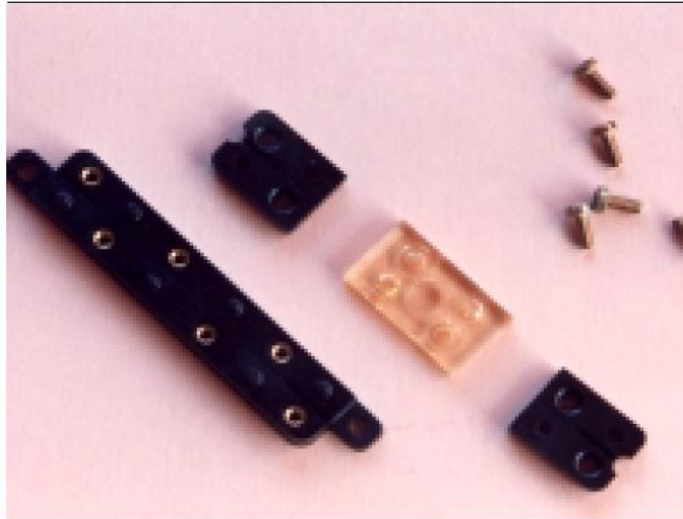


Fibers are pushed
toward each other to
compensate for the
consumption of a
certain amount of
glass

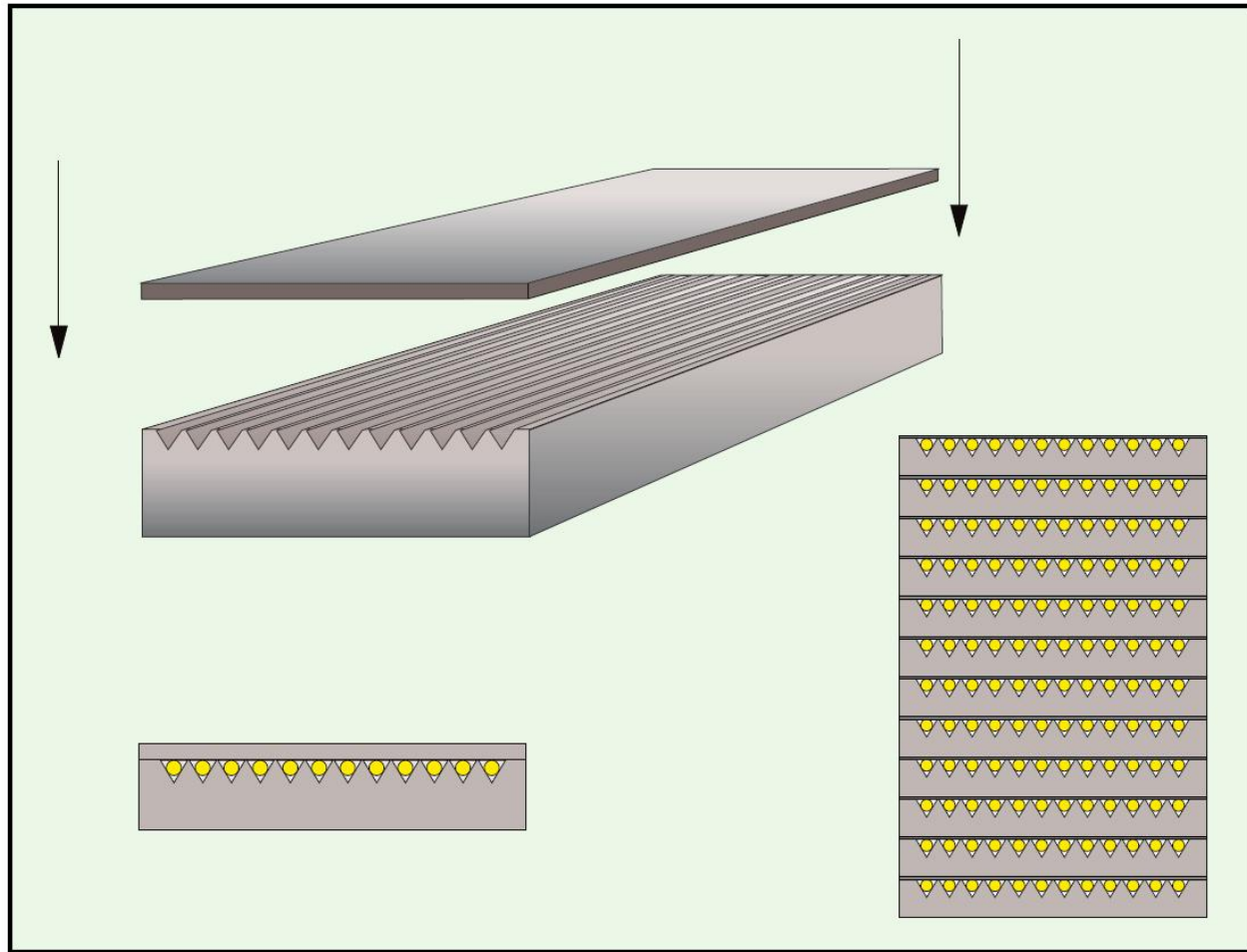
Splice prin fuziune



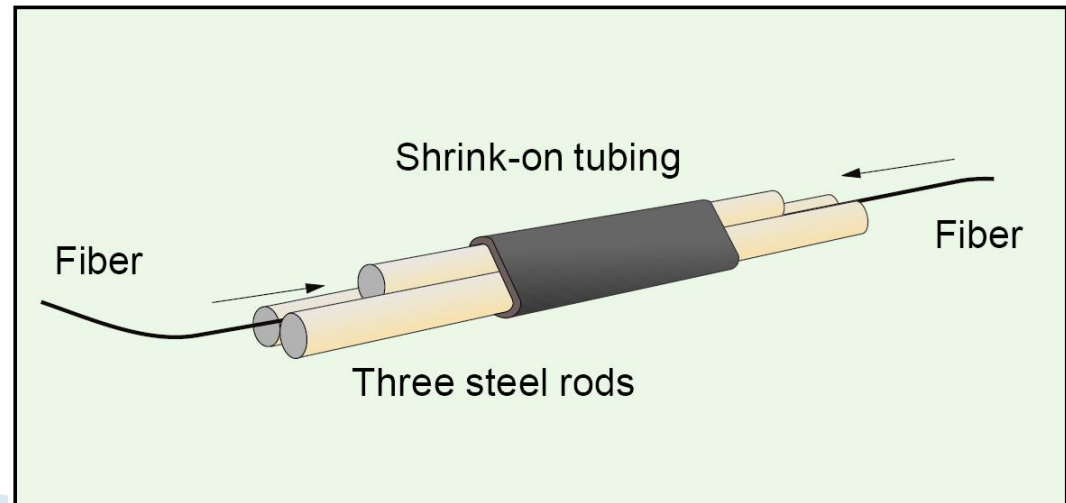
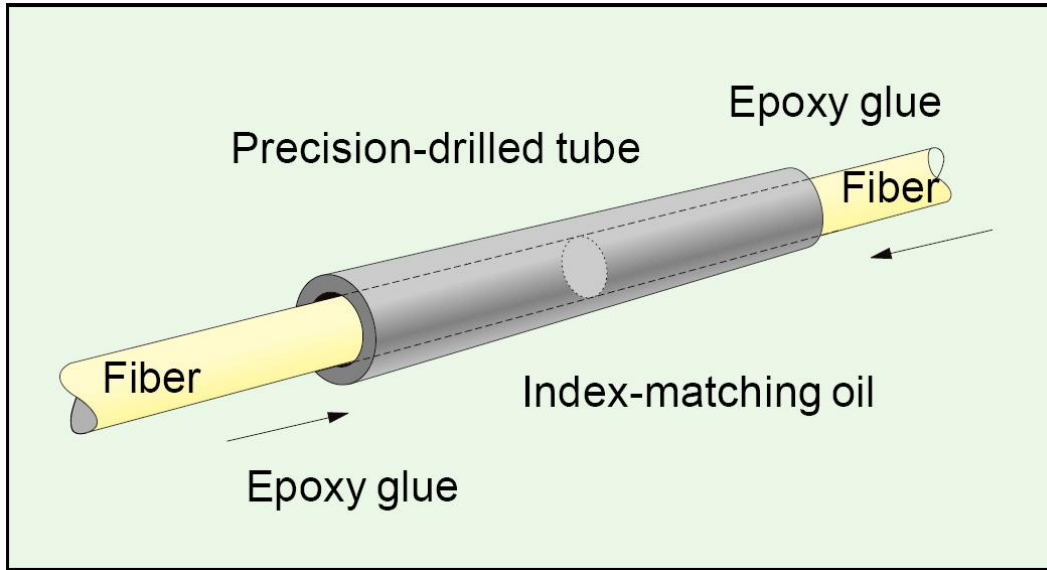
Splice mechanic – bloc V



Splice mechanic - bloc V

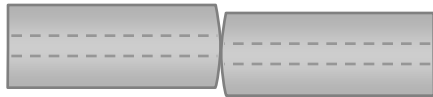


Splice mechanic

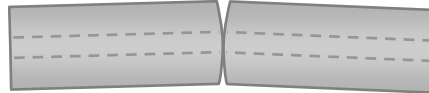


Probleme Fibre/Conectori

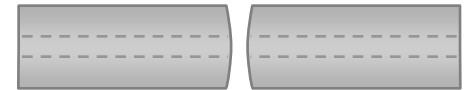
Offset



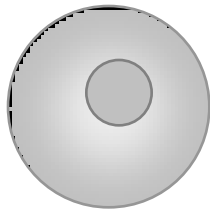
Angular Misalignment



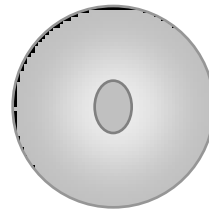
Separation



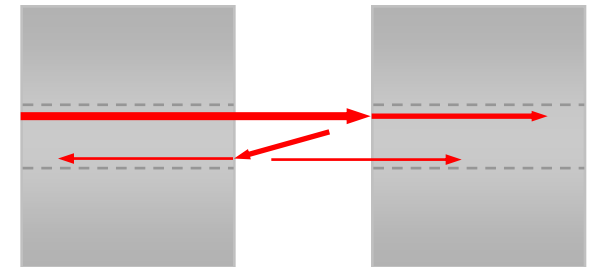
Core Eccentricity



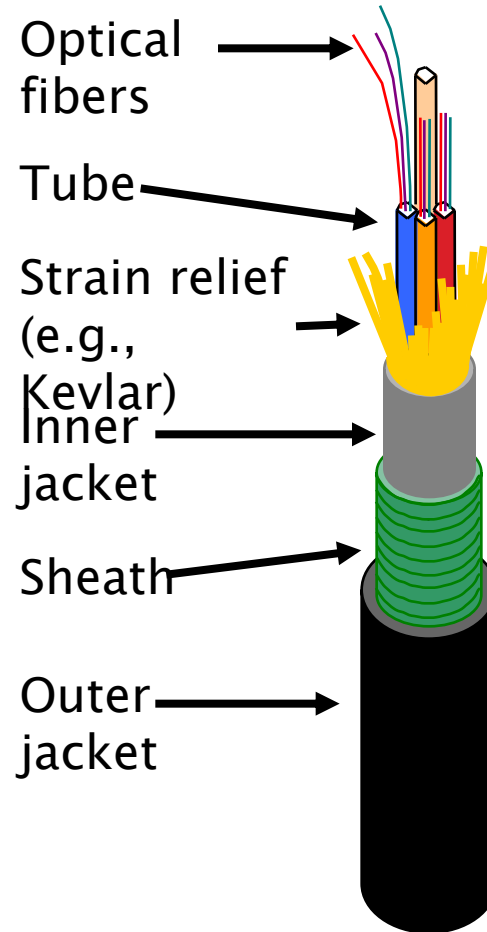
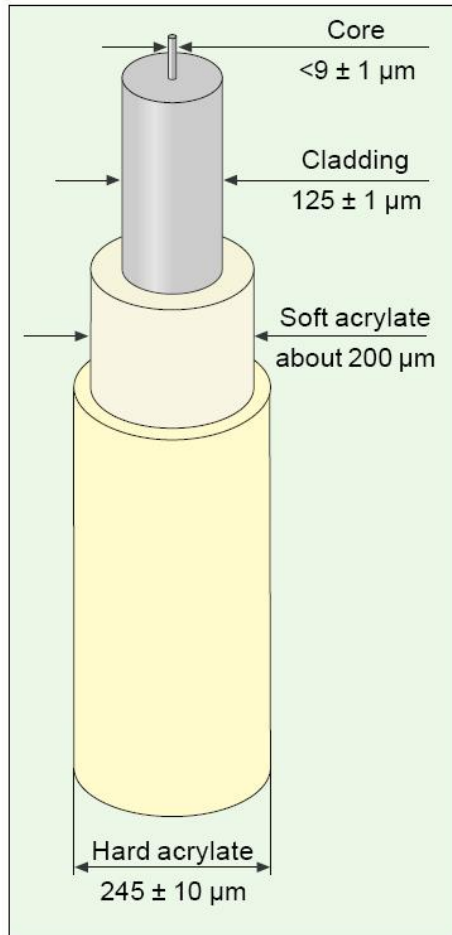
Core Ellipticity



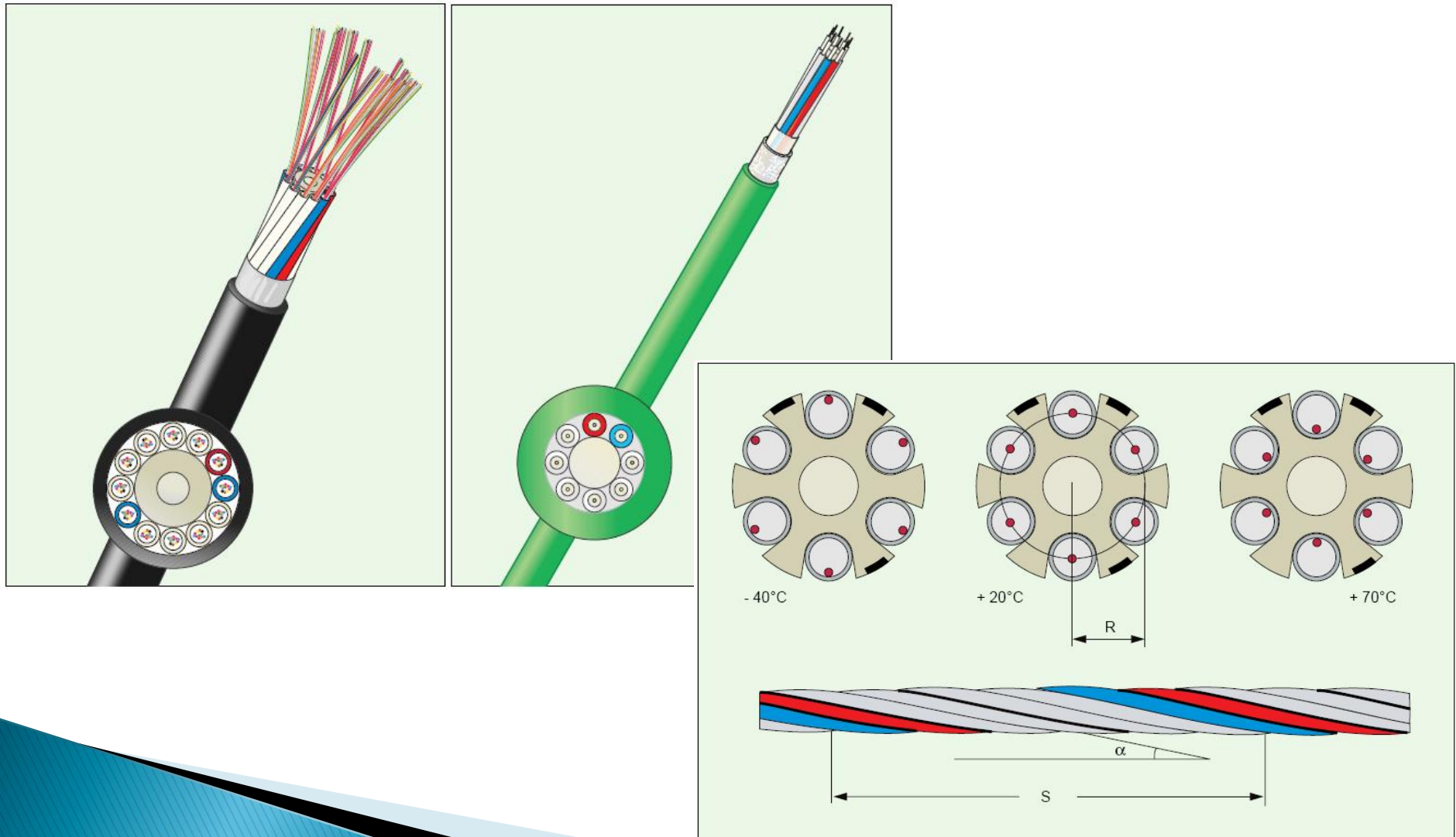
Reflections & Interference



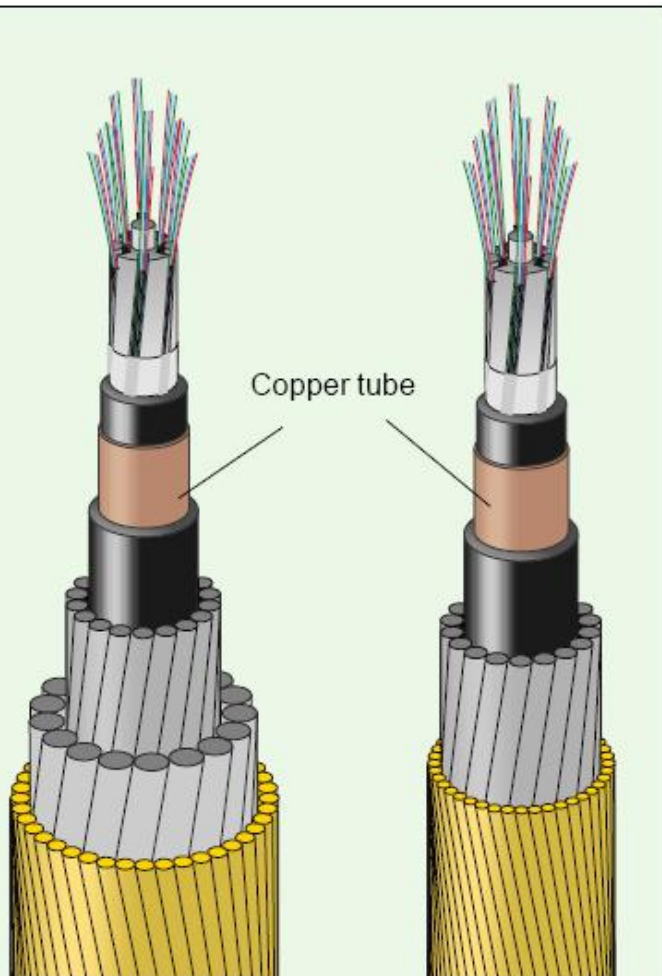
Cabluri



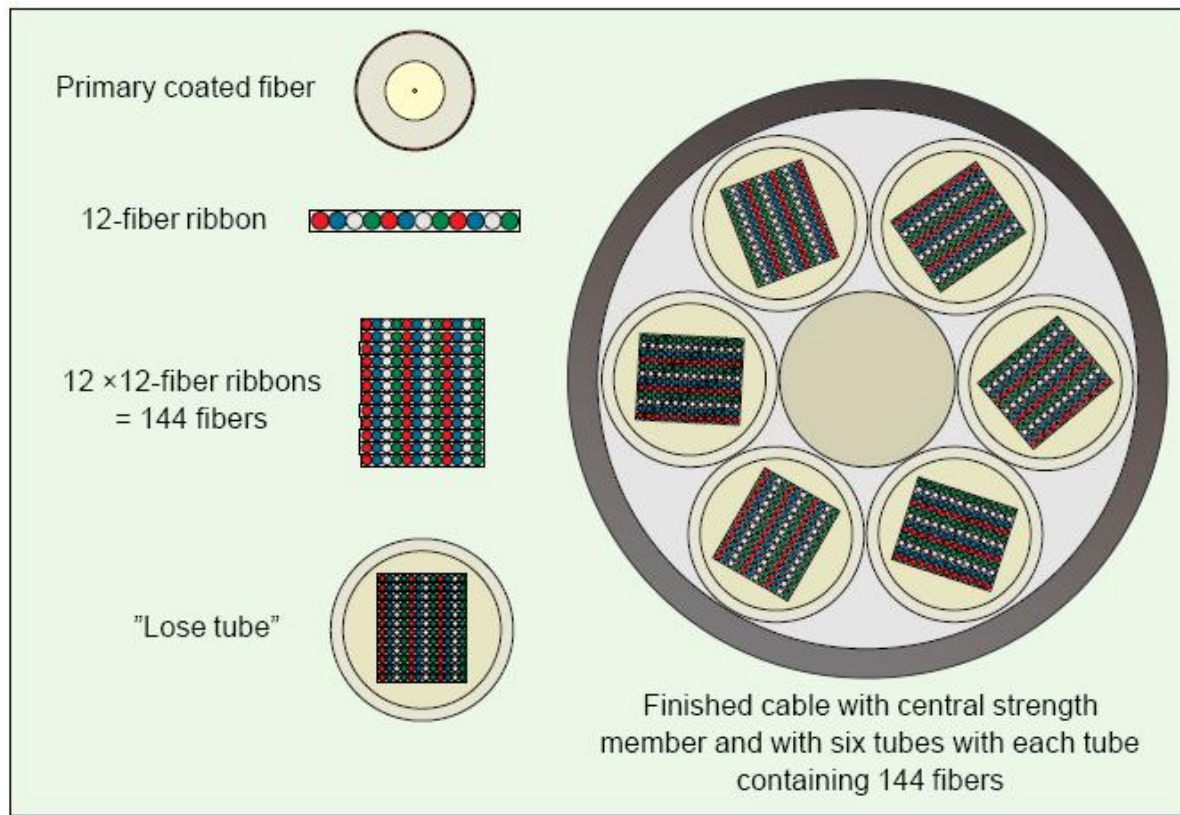
Cabluri



Cabluri



Copper tube



Conettori



Conectori

- ▶ Verificati <http://rf-opto.etc.tuiasi.ro>