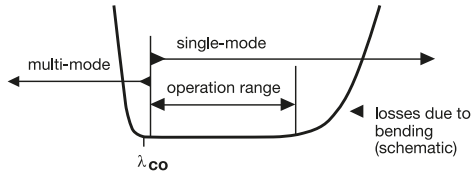


**CUT-OFF WAVELENGTH OF SINGLE-MODE OR PM FIBERS**



**CUT-OFF WAVELENGTH**

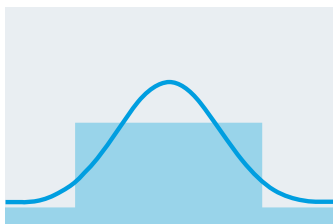
The cut-off wavelength  $\lambda_{co}$  is defined as the shortest wavelength for which the fiber is single-mode. The mode field can only have a Gaussian intensity distribution and rotational symmetry at wavelengths above  $\lambda_{co}$ .

If the wavelength of the guided radiation is shorter than the cut-off wavelength, two or more modes are guided. The beam and intensity profile then differ significantly from a Gaussian distribution. The mode field distribution depends on bending or temperature variations (butterfly effect).

The wavelength range which the fiber can operate (operation range) depends on the fiber. Outside the operating range, even a slight bending of the fiber (as well as micro-bends) result in attenuation of the guided radiation (increased bending loss).

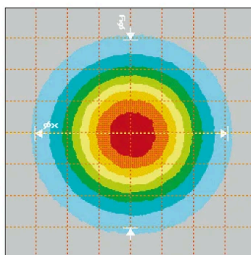
When more than one fiber can be used for a particular wavelength, the fiber with a cut-off wavelength closer to the operation wavelength should be chosen.

The measured cut-off wavelength  $\lambda_{co}$  of a fiber may be 10% less than the nominal value because of manufacturing tolerances. Carefully selected fibers with characterized values are available on request.



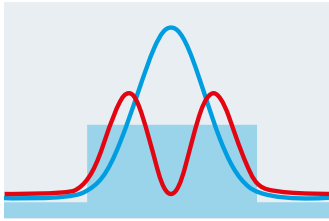
**MODE FIELD OF A SINGLEMODE FIBER USED WITHIN THE OPERATION RANGE**

Gaussian mode field within a step index single-mode. The transmitted wavelength lies within the operation range of the fiber.



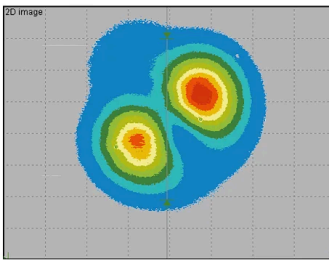
**RESULTING INTENSITY DISTRIBUTION AT FIBER EXIT**

The resulting intensity distribution at the fiber exit is Gaussian.



### MODE FIELD OF A SINGLEMODE FIBER USED BELOW CUT-OFF

For a transmitted wavelength below cut-off the mode field within the step index fiber shows multiple modes (butterfly effect).



### RESULTING BUTTERFLY EFFECT

The resulting intensity profile at the fiber exit is also non-Gaussian.

This is a printout of the page <https://sukhamburg.com/support/technotes/fiberoptics/cablebasics/cutoff.html> from 5/21/2026

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