

Fiber Optic Coupler Definitions

Center Wavelength and Bandpass

The performance of all couplers varies with wavelength. Couplers are usually specified over a wavelength window, or in some cases, multiple windows. The center wavelength is the nominal wavelength of operation of the coupler, while the bandpass is the range of wavelengths over which the specifications are guaranteed. In many cases, couplers will perform adequately over a range outside their bandpass, but adherence to specifications is not guaranteed in this region.

Coupling Ratio

Coupling ratio or splitting ratio is defined as the ratio of the optical power from one output port of the coupler to the sum of the total power from all output ports. The coupling ratio is measured at the specified center wavelength and is normally expressed as a percentage.

Excess Loss

Excess loss is the ratio of the optical power launched at the input port of the coupler to the total optical power measured from all output ports, expressed in dB. Typical excess loss is the expected value of the excess loss measured at the specified center wavelength.

Insertion Loss

Insertion loss is the ratio of the optical power launched at the input port of the coupler to the optical power from any single output port, expressed in dB. The insertion loss includes the coupler splitting loss and excess loss and is the most useful parameter for system design. The maximum and minimum insertion loss is the upper and lower limit, respectively, of the insertion loss of the coupler and applies over the entire wavelength range specified in the bandpass. The typical insertion loss is the expected value of the insertion loss measured at the specified center wavelength. Multimode couplers are measured with an equilibrium mode fill.

Uniformity

Uniformity is a measure of how evenly power is distributed between the output ports of the coupler. Uniformity applies to couplers with a nominally equal coupling ratio and is defined as the difference between the highest and lowest insertion loss between all of the coupler output ports, expressed in dB. Uniformity is a typical value across the entire bandpass.

Directivity, Return Loss and Reflectance

Directivity is the ratio of the optical power launched into an input port to the optical power returning to any other input port. Directivity has been referred to as near-end isolation or near-end crosstalk. Return loss is the ratio of optical power launched into an input port to the optical power returning to the same input port. Both directivity and return loss are expressed as positive dB and are measured with all output ports optically terminated. Reflectance is the negative of return loss. In many instances, reflectance and return loss are used synonymously. Minimum directivity and return loss are the lower limits which apply over the entire wavelength range specified in the bandpass.

Wavelength Isolation

Wavelength isolation is a measure of how well different wavelengths are separated at the output of a wavelength division demultiplexer. It is defined as the ratio of the optical power at the two output ports of the demultiplexer at a given wavelength, expressed in dB. The minimum wavelength isolation is the lower limit to the wavelength isolation measured over the entire wavelength range of the specified bandpass. Wavelength isolation has also been referred to as far-end crosstalk.

