

# Calculation of Budget Loss in a Fiber Optic System Design

While designing a Fiber Optic System, there are 2 major factors to consider. The System Loss Budget and the Overall Attenuation Lost of Components.

The System Loss Budget refers to the tolerance of the Fiber Optic Equipment between the Transmit Power and the Receive Sensitivity.

E.g. Transmit Power = -9dB

Receive Sensitivity = -33dB

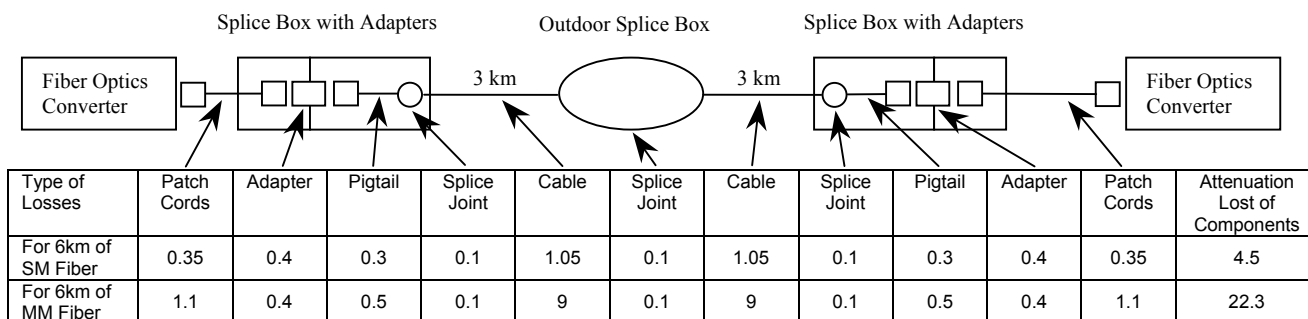
**The System Loss Budget = -9dB – (-33dB) = 24dB**

The Overall Attenuation Lost of Components refers to the combined losses of individual component that links the transmitting and receiving equipment.

The following is a show of the typical Attenuation Loss for each component.

Component	Loss Value
Adapter	0.40 dB
Splice Joint	0.10 dB
Singlemode Fiber Cable @ 1330nm	0.35 dB/km
Multimode Fiber Cable @ 850nm	3.00 dB/km
Singlemode Pigtail	0.30 dB
Multimode Pigtail	0.50 dB
Singlemode Patch Cord	0.35 dB
Multimode Patch Cord	1.10 dB

Below is a diagram showing a typical Fiber Optic Cable System with their typical losses.



In order for the Fiber Optic System to work, Attenuation Lost of Components must be lower than System Loss Budget.

If in case the System Loss Budget is lower, the following design change or improvement to the system may be considered:

- 1) To minimize losses at splice joints, connector joints.
- 2) To reduce the number of connectors and joints.
- 3) To use Singlemode fiber optic cable instead of Multimode fiber optic cable.
- 4) To use a higher wavelength equipment.  
E.g. Multimode - from 850nm (3.0 dB/km loss) to 1300nm (1.0 dB/km loss); or  
Singlemode - from 1330nm (0.35 dB/km loss) to 1510nm (0.25 dB/km loss).
- 5) To place Fiber Optic Repeaters where necessary.