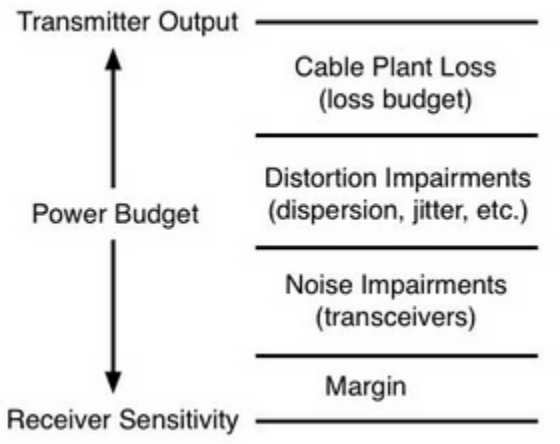
Which TAP split ratio is right for you?

Choosing the proper split ratio may seem complicated, but it's relatively easy. A loss (power) budget should be calculated to determine the correct split ratio.

The link budget accounts for all the gains and losses from the transmitter's output to the receiver's input. These gains and losses include gains from all optical amplifiers, propagation loss due to the physical media, insertion loss due to the connectors and loss through any optical attenuator and/or optical splitters. Therefore, you should consider the impact on the calculation of parameters such as link distance, fibre type, launch power and the number of interconnections.



WHAT YOU SHOULD KNOW BEFORE YOU START

- Before starting your fibre optic link loss budget calculation, you need to know the minimum acceptable loss values. These can be found in ANSI/TIA/EIA-568-C.3 and ISO/IEC 11801:2002.

Typical Loss Values	
Fiber Attenuation (dB/km)	
MM,850nm	3
MM, 1300nm	0.8
SM 1310nm	0.4
SM, 1550nm	0.2
Splice Loss (dB)	
SM	0.15
MM	0.3
Connection Loss (dB)	
MM, 1 fibre	0.5
MM, array (12/24)	0.75
SM	0.5

- Most multimode installations are typically 62.5/125-micron fibre, the performance of which must be 3.75 decibels/kilometre at 850 nm and 1.5 dB/km at 1300 nm to meet or exceed the specification.
- For singlemode fibre, performance should be at least 0.5 dB/km at 1310 and 1550 nm for outside-plant applications and 1.0 dB/km for inside-plant applications at both 1310 and 1550 nm.
- The loss for a connector pair typically runs from 0.3 to 1.0 dB, depending on the manufacturer.
- It's also essential to differentiate between Single Mode (SM) optical and Multi-Mode (MM) receivers. SM optical receivers have higher sensitivity so that they can tolerate greater attenuation. However, pay close attention to the cable length between the two endpoints because if the distance is too long, the monitoring side can suffer lower power as a result of higher attenuation due to the longer distance.
- The Multi-Mode (MM) transceivers are less sensitive ; therefore, lower split ratios are recommended to avoid too many errors on the monitoring side due to lower power.
- it's essential to consider the transmitted power and the minimum power required at the receiving side. The transmitters at both ends are sending light with a specific optical power, which varies from the transceiver to the transceiver. The receiving side can reconstruct the information transmitted if it receives sufficient power.

- Table below indicates the power loss (insertion loss) caused by the tap along with additional factors such as connectors.

TAP with LC connectors

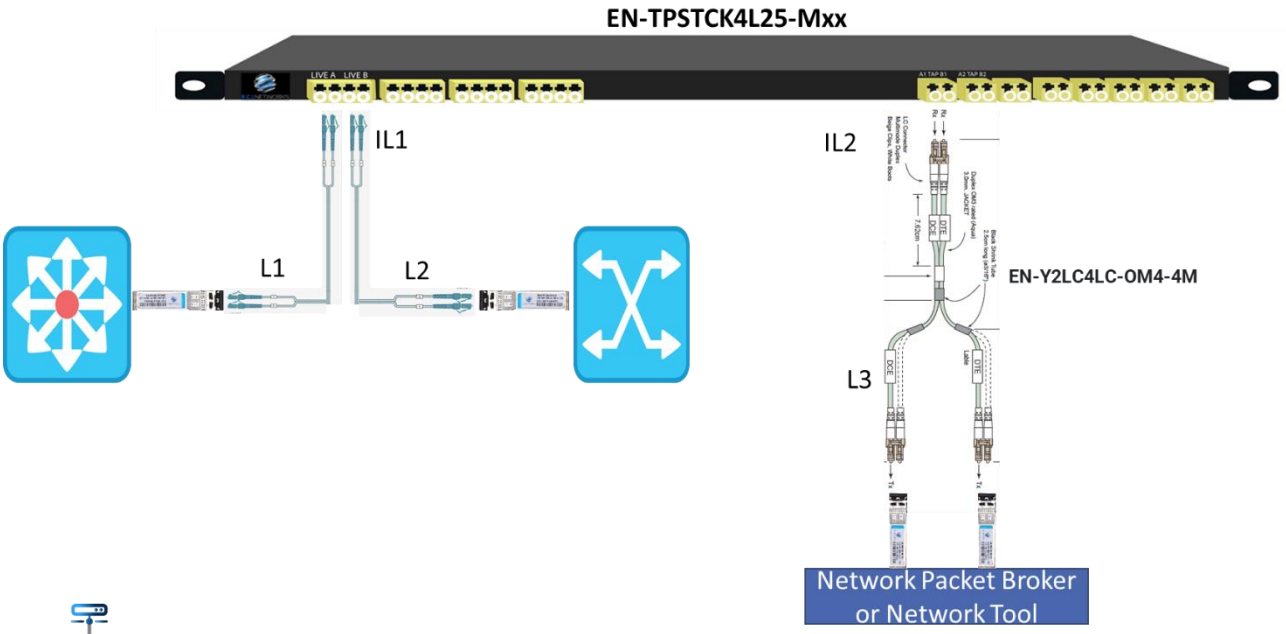
Multimode TAP 1G/10G/25G SR			
Split Ratio	50/50	60/40	70/30
Max Network Loss	3.7dB	2.7dB	2.1dB
Max Monitor Loss	3.7dB	4.7dB	6.0dB
Singlemode Passive TAP 1G/10G/25G/40G/50G/100G LR			
Split Ratio	50/50	60/40	70/30
Max Network Loss	3.4dB	2.4dB	1.9dB
Max Monitor Loss	3.4dB	4.4dB	5.7dB

40G/100G TAP with MPO/MTP connectors

Multimode 40Gbps/100Gbps SR-4			
Split Ratio	50/50	60/40	70/30
Max Network Loss	3.7dB	2.7dB	2.1dB
Max Monitor Loss	3.7dB	4.7dB	6.0dB
Multimode 40Gbps/100Gbps SR-10			
Split Ratio	50/50	60/40	70/30
Max Network Loss	3.9dB	3.15dB	2.2dB
Max Monitor Loss	3.9dB	5.15dB	6.2dB

CALCULATING THE LINK/LOSS POWER BUDGET

The budget calculation is fairly straightforward as each of the components in this calculation is affecting the original power by dividing it from its initial 100% and subtracting it from the initial total transmitted power. If you know Connector Loss, Propagation Loss (due to the fibre and proportional to the cable length) and Insertion Loss (which is the sum of the loss due to the splitter, dispersion and the connectors inside the TAP), all you need to do is subtract each contribution from the initial transmitted power. The resulting value must be greater than the sensitivity of the receiver.



P0 = initial transmitted power

L1, L2, L3 = power loss due to the fibre, which is expressed in dB/Km (characteristic of the fibre) and multiplied by the length of the fibre

C1 = connector loss (if any)

S1= splice loss (if any)

IL1, IL2 = insertion loss

Then the two endpoints will receive respectively:

Power Network= P0-L1-C1-S1-IL1-L2

Power Tool= P0-L1-C1-S1-L2-IL2-L3

CONCLUSION

Ultimately, your choices depend on how sufficient the power budget is in order to satisfy the power requirements of both ends (network and monitoring) with any split ratio. Once this has been determined, we have several options to choose from: attempt to minimize the number of connections and/or length of the cables or choose more performing transceivers that have higher sensitivity.

As a rule of thumb, we recommend evaluating a 70/30 split ratio for the SM and 50/50 or 60/40 for the multimode.

Whatever choice you make, we recommend understanding your network needs, the location of where the taps will be, desired split ratio and light budget requirements.

Notice:

E.C.I. Networks reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only.

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