

Optical Splitter Tuning Techniques



Overview

This work demonstrated the core cavity fabrication of a polymer optical power splitter by CO2 laser engraving.

Key Takeaways

Optical splitter adjustments focus on maintaining proper power distribution, minimizing insertion loss, and ensuring the network meets the engineered optical power budget. Key Considerations for Adjustment

1. Split Ratios and Power Distribution Optical splitters divide a single input signal into multiple outputs.

The split ratio (e.g., 1: 2, 1: 4, 1: 32) determines how optical power is distributed among output ports. Each split reduces the signal power, and higher split ratios result in greater loss. For example, a 1: 32 splitter introduces approximately 15 dB of ideal loss, not including excess loss from the device itself.

Adjustments must ensure that each output still meets the receive sensitivity of the Optical Network Terminal (ONT) or Optical Network Unit (ONU).

2. Insertion Loss and Excess Loss Insertion loss measures the reduction in optical power due to the splitter.

Excess loss accounts for imperfections beyond the ideal split. Technicians must measure input and output power using optical power meters to verify that the actual loss aligns with network design specifications. Adjustments may involve selecting splitters with lower excess loss or reconfiguring the network to balance power across outputs.

3. Splitter Placement and Architecture Splitters can be deployed in centralized or distributed architectures. Centralized splitters are located in a central office or cabinet, allowing flexible customer-to-splitter assignments via jumpers.

Distributed splitters are placed in closures or pedestals, with fixed assignments. Adjustment requirements differ: centralized setups allow easier reconfiguration, while distributed setups require careful initial planning to ensure adequate power at all endpoints. 4.

Optical Power Budget Compliance Every PO

N network has an engineered optical power budget, which defines the acceptable range of optical power from the OLT to the ONT. Adjustments to splitters must ensure that the cumulative loss from splitting, fiber attenuation, and connectors does not exceed this budget. This may involve recalculating power requirements for each link and, if necessary, using unbalanced splitters or optical taps to optimize power distribution.

5. Testing and Maintenance Regular testing is essential. Technicians should measure optical power at both input and output ports, verify split ratios, and check for wavelength-dependent losses.

Adjustments may include replacing faulty splitters, re-routing fibers, or fine-tuning connections to maintain network performance.

Practical Tips

Use PL

C splitters for large splits (1: 32, 1: 64) due to their uniformity and low excess loss, and FBT splitters for smaller splits (1: 2, 1: 4) for cost efficiency. Always account for cumulative loss when multiple splitters are cascaded. Maintain documentation of splitter locations, ratios, and measured power levels for troubleshooting and future network expansion.

Ensure technicians are trained in dB, dBm, and mW measurements to accurately adjust and monitor optical power. By carefully managing split ratios, insertion loss, and placement, optical splitter adjustments ensure reliable signal delivery, optimal bandwidth distribution, and compliance with the network's optical power budget.

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