Burst Mode
Wavelength Stabilization

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ONU must be tunable and TDMA

- In order for the ONU’s transmissions to be conducted back to the OLT, it must transmit on the appropriate wavelength.
- The ONU must also operate in burst mode, with relatively long periods of “off” (no light emission).
- When the transmitter turns on, it takes time to warm up.
  - This is mostly a thermal issue.
- Since laser wavelength is typically a function of temperature, this causes wavelength drift.
Measurement of instantaneous wavelength

- Use sharp optical filter to convert wavelength shift into amplitude shift
- The ratio of the PD currents is proportional to wavelength
Result using conventional laser

- Wavelength shift over burst on the order of 23 GHz
- The maximum spectral excursion is 40 GHz
- This presents a problem for maintaining channel
Stabilization with built-in heater

- Solution concept is to overlay a resistive heater over the active region of the laser.
- Bias current goes either to the laser diode or the heater, so the net power dissipation remains constant.
Laser with built-in heater

- Wavelength shift over burst is reduced to 5 GHz
- This is small enough to build a practical system
Conclusion

- TDMA PONs with tunable ONUs have the problem of burst mode wavelength drift
- The addition of a heater to the device is a viable solution for wavelength stabilization
  - The heater is driven opposite to the laser, thereby maintaining constant power to the device
  - This is very simple, but it does increase dissipation
- Alternatively, ‘counter tuning’ is another solution
  - The laser tuning control is intentionally perturbed to counteract the burst mode heating effect
  - This is more efficient, but requires a control circuit that accurately anticipates the wavelength shift