Measuring PON & WDM Signals Using the OWS200 - Application Note

Introduction

Conventional OPM's are calibrated at typically 850nm, 1300nm, 1310nm, 1490nm, 1550nm and 1625nm. An OPM that is set to 1490nm does not only measure optical power at 1490nm but rather the total of all power at all wavelengths present in the fiber. If signals of 1490nm and 1550nm are applied at the same time to the OPM, the OPM will measure the summation of both signals. So, if there is 0.5mW of power at 1490nm and 0.5mW of power at 1550nm the optical power measured will be approximately 1mW (assuming the detector responsivity is approximately the same at the two wavelengths). Setting the OPM to 1490nm ensures that the OPM is calibrated when using a 1490nm laser to measure the insertion loss of a fiber optic cable or device.

GPON Networks

GPON networks have been deployed for many years and as such there is a very large installed base. Wavelengths of 1490nm (data) and 1550nm (video overlay) are simultaneously transmitted from the Central Office to the customer. For technicians to be able to measure each wavelength without the influence of other wavelengths would require an optical power meter that can filter wavelengths. Some technicians are using PON optical power meters which is a costly solution to measure 1490nm and 1550nm independently. The OWS203 is able to split the 1490nm and 1550nm into individual ports and then a basic OPM such as the OPM510 or OPM210 can be used to measure these two individual wavelengths without influence from the other wavelength. Being able to measure the 1490nm (data) and 1550nm (video) allows the technician to be able to determine if each services power level is within the loss budget and why perhaps video or data are not operational.

10G PON Networks (Also referred to as XGPON)

XGPON: 10G Bits/s Asymmetric speed with 2.5G Bits/s for upstream traffic
XGSPON: 10G Bits/s Symmetrical speeds
10G PON networks use 1577nm or 1570nm downstream and 1270nm upstream wavelengths. Many 10G PON networks can have two downstream wavelengths with the addition of 1490nm. The customer premises ONT do not use both wavelengths even though both wavelengths are present on the fiber. The 1490nm may be used at my neighbor's house while my house uses 1577nm. The technician needs to be able to measure the optical power of the wavelength that is used by the network equipment at each premise. This allows the technician to validate they are in fact receiving the correct wavelength within the specified loss budget.

NGPON2 Networks

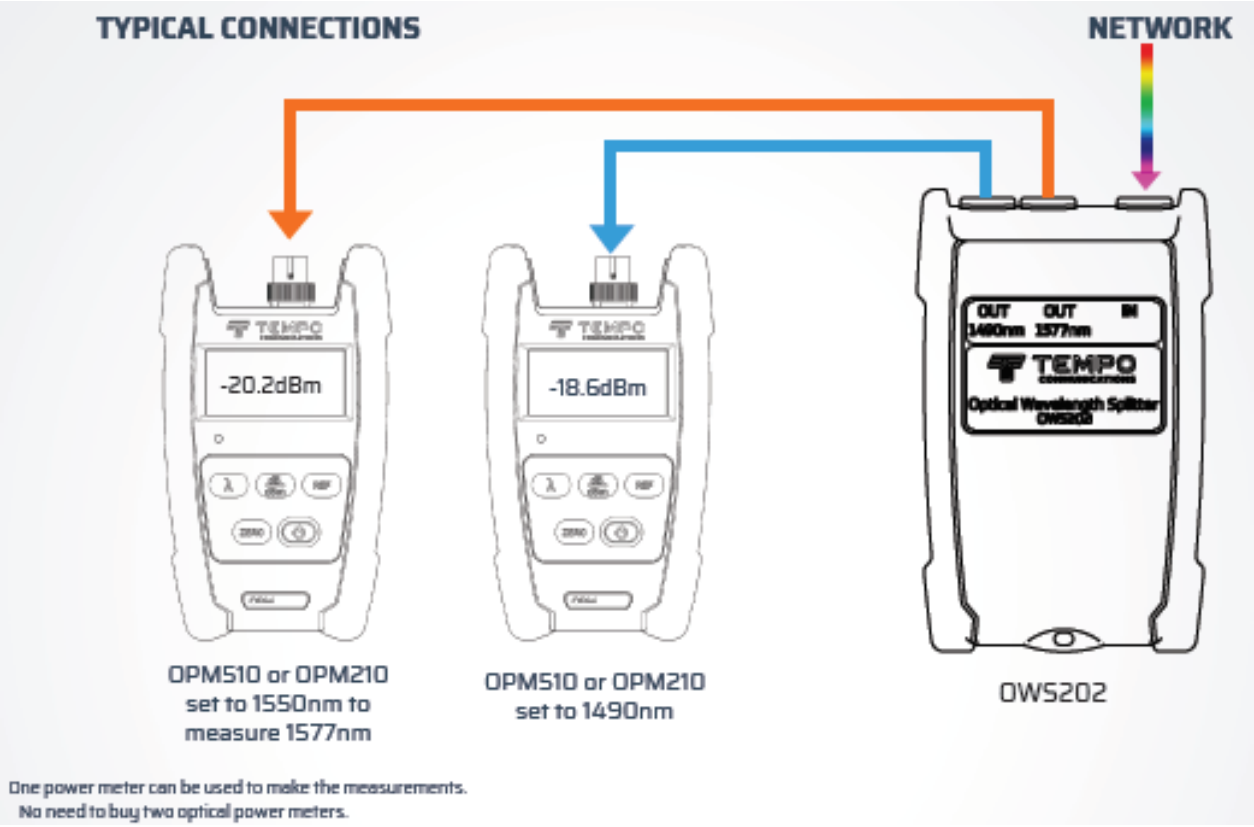
NGPON2 networks are DWDM networks that are used to be able to increase the amount of data that can be transmitted over a given fiber. This is accomplished by simultaneously transmitting multiple wavelengths on one fiber. Each fiber is assigned to a different customer/service, so it is important for the technician to know how much power is transmitted on each fiber at each wavelength.
Typical wavelengths:
Downstream Wavelengths: 1598nm to 1603nm
Upstream Wavelengths: 1524nm to 1544nm
Not all wavelengths from the above are utilized in every architecture.

Conventional Measurement Method for Measuring Multi-Wavelength Networks Power

The conventional method is to use a DWDM/CWDM OPM that are very expensive. The cost of the DWDM/CWDM OPM's prevents the provisioning of most technicians with the equipment necessary to test individual channels power levels in multi-wavelength networks.

A New Solution

The OWS200 is a cost-effective solution that allows all technicians that currently have a standard OPM to be able to measure signal levels in multi-wavelength networks. The OWS200 "splits" the specified wavelengths into individual ports that are then measured by a conventional OPM.



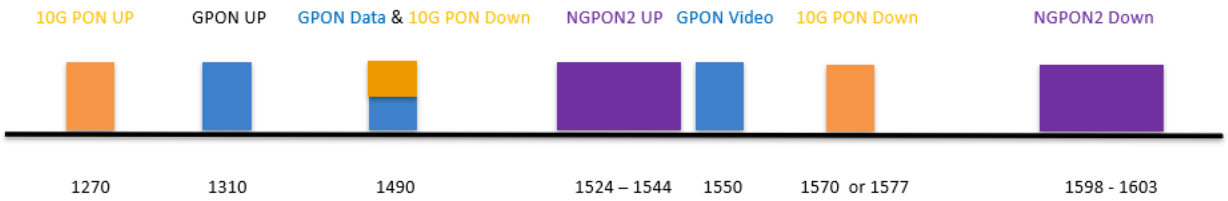
The loss of the OWS200 has negligible effect on the measurements as the OWS loss is typically less than 0.1dB. In the above example the OPM used to measure 1577nm is set to 1550nm. Errors due to not measuring at the exact wavelength are small since the responsivity of an InGaAs OPM is very flat over the 1530 – 1625nm range.

The technician may experience higher losses with inadvertent damage of the optical ports and test cables due to not cleaning or improper cleaning practices.
Make sure:

- Clean and inspect all bulkheads and connector end faces prior to connecting.
- Do not connect UPC or PC connectors to the APC bulkheads of the OWS200.

The user can specify the wavelengths necessary for their particular network and so the OWS can be configured as required. The OWS200 is available for two, four, six and eight wavelength applications. Please consult with your regional sales manager or Tempo Customer Service so we can specify an OWS to meet your specific network requirements.

Wavelength Allocations For GPON, 10G PON and NGPON2



Summary

The OWS200:

- Effectively measures individual wavelength signal levels on GPON, 10G PON and NGPON2 networks.
- Avoids the need to buy expensive PON & DWDM OPM's.
- Allows the provisioning of all front-line technicians with the equipment necessary to test, diagnose and troubleshoot multi-wavelength networks.