Passive WDM Networking
Company Introduction

**SmartOptics** designs and markets all types of fibre optical transmission products. Headquartered in Oslo, Norway, we serve Storage, Data and Telecom Networks worldwide with a unique and cost effective portfolio of optical transmission components & Systems.

Customers are turning to SmartOptics because we have a product portfolio which allows them to build the most cost effective and reliable transmission networks possible. Whilst our customers are experts in their fields, they still appreciate the valuable knowledge and experience that SmartOptics offers for optical transmission solutions.

Optical transmission projects have historically been prohibitively expensive and complicated, but Smartoptics products allow solutions which are simple to design and easy to install.

The T-Series consists of a comprehensive range of active and passive WDM solutions to suit all network requirements in an incredibly compact form factor resulting in low space and power requirements.

SmartOptics products now make optical networking, especially 4G, 8G and 10G connectivity, simple and affordable.

**Product portfolio:**

**C/DWDM transmission systems**
- 32 x 10Gbps Ethernet/SDH/SONET
- 128 x 1G Ethernet connections
- 32 x 4G Fibre Channel connections
- 16 x 8G Fibre Channel connections
- down to 2 Mbps

**Passive WDM network solutions**
- C/DWDM Mux/Demux and OADM units
- 19” or 23” rack mountable
- CWDM and DWDM for indoor and outdoor environments

**Optical & electrical transceivers**
- all bit rates
- all distances
- all form factors

**Storage Networking**
- 32 x 4G Fibre Channel DWDM
- 16 x 4G Fibre Channel CWDM
- 16 x 8G Fibre Channel CWDM

Terje Hallan, CEO
Introduction to WDM

Wavelength Division Multiplexing (WDM) technology multiplies fiber capacity by multiplexing optical light signals of different wavelengths onto a single optical fiber. The technology is well standardized in the ITU G.695 and G.694 recommendations and widely used in datacom and telecom networks.

Due to the physical nature of light, the signals on WDM wavelengths are completely independent from each other and data streams with different line-rates and protocols can be transported on a single fiber or fiber pair. Traditional telecom signals (PDH, SDH/SONET), IP data (Ethernet, Gigabit Ethernet or 10G Ethernet) and storage data (8G/4G/2G/1G Fibre Channel) can therefore be transported over a single infrastructure without complex protocol conversion technologies.

To build a passive WDM system, two types of components are required:

- **Optical Multiplexer Units (OMU’s)** which combine and split light signals of WDM wavelengths
- **WDM transceivers**, which generate light signals of specific WDM wavelengths

**CWDM and DWDM**

WDM comes in two flavours: CWDM and DWDM. Coarse WDM is a robust technology able to create 18 independent channels and was first to adapt a transceiver footprint. The CWDM channel spacing is 20 nm and a specific color coding is used which enables simple industry standard set-up procedures. CWDM is typically used for un-amplified transmission up to 200 km.

Dense WDM uses cooled lasers and can also be amplified. The channel spacing is typically 100 GHz (ca. 0.8 nm) and DWDM channels are usually used in the 1530 - 1560 nm band. Optical amplifiers and dispersion compensation modules allow DWDM transmission to be extended beyond the transceiver characteristics.

SmartOptics WDM filter products are designed and tested to the highest international telecom standards providing unparalleled functionality and reliability.

Passive Filters

**Mux/Demux:** A Mux/Demux unit terminates all wavelengths on the WDM system and is at the heart of point-to-point connections. The optical combining and splitting of wavelengths is a passive technology and a Mux/Demux unit requires neither electrical power nor software resulting in greatly increased reliability.

Figure 1: Illustration of CWDM function with 8 channels.

Figure 2: Wavelength signal paths in a 8 ch. Mux/Demux unit.

**OADM:** An Optical Add/Drop Multiplexer (OADM) unit terminates a limited subset of wavelengths in WDM systems. OADMs typically add/drop 1, 2 or 4 wavelengths and the remaining wavelengths are bypassed (expressed) through the fiber. It is possible to reuse the terminated wavelengths on the remaining span.

Figure 3: Signal paths in a 1ch. OADM with wavelength reuse.

The ability to reuse wavelengths in OADMs enables network designers to build redundant WDM networks. Protection switching is usually taken care of in the client equipment.

Figure 4: Point-to-Point link with two OADMs.

Figure 4 illustrates a point-to-point system with two OADMs. The first OADM creates one wavelength path from (a) to (b). The second OADM generates two wavelength paths from (a) to (c) and (c) to (d). The 8 ch. Mux/Demux units have six remaining wavelength paths from (a) to (d).
**Single fiber applications**
Fiber optic communication commonly uses fiber pairs for bi-directional communication. In WDM applications single fiber solutions are also possible and SmartOptics have developed the T-32xx series of single fibre mux/demux units to accommodate these requirements.

In single fiber applications different wavelengths are used to generate bi-directional connections. In the example below the wavelength pair 1470 nm and 1490 nm generate bidirectional connections. Both wavelength signals are propagating in opposite direction to each other in the same fiber.

**Logical view:**

![Logical view diagram](image)

**Physical connections:**

![Physical connections diagram](image)

Optical receivers for singlemode applications are wavelength insensitive and accept all wavelength signals between 1100 nm and 1630 nm. In the above illustration of the connection scheme, a 1470 nm transceiver is used to transmit at 1470 nm and receive light signals at 1490 nm. A 1490 nm transceiver is used to transmit at 1490 nm and receive signals of 1470 nm.

**Designing WDM Networks**
When comparing design complexity of a WDM and non-WDM network, only the additional WDM filter losses have to be taken into account. All other design parameters remain equal to a non-WDM approach.

**Filter specifications for life-time, indoor and outdoor environments**
In CWDM systems the laser wavelength is dependant on the environmental temperature of the transceiver. To be fully compliant with the CWDM standard and its variants the laser wavelength is allowed to drift by ±6.5 nm and the filter passband bandwidth requires ±7.0 nm around ITU center wavelengths.

In DWDM systems the wavelength is controlled by using a TEC element which maintains stability. However, the filter passband drifts depending on the environmental conditions.

SmartOptics specified values are valid for the worst case and over the filter life-time (calculated for 20 years).

The definition of typical filter values is shown in the illustration below.

**Loss calculation example**
The connector losses for both line and client site are included in the specified parameters. Thus in the example no extra loss has to be taken into account for the fiber patch cord from the WDM transceiver and for the patch cord towards the line fiber.

In this example the long distance fiber has a link loss of 14.0 dB. Additional 4 dB, caused by the Mux/Demux link loss (T-3009), must be added to the fiber link loss. An optical WDM transceiver will therefore experience an 18 dB loss in total.

Please note that this is a worst case calculation and typical values are much better.

In summary, SmartOptics passive WDM solution portfolio is designed for interoperability, reliability and simplicity.
Product Overview

SmartOptics solutions for passive WDM networking
Smartoptics offers the industry’s widest selection of WDM networking components including:

- passive WDM filters
- all types and form factors of WDM transceiver
- active transmission equipment

The passive filters are available in an industry standard LGX building practise for a 1U height 19” and 23” mounting bracket or in filter cassettes for outdoor enclosures. Both building practises are illustrated below.

When using duplex connector interfaces, it is recommended to use duplex patch cables between the transceiver and passive unit. Then there is no risk that the transmit or receive interfaces are swapped with each other and the most probable error source in the installation process is eliminated.

The connector adapters are angled at 30° to the front plate of the passive unit. This reduces the required space for the patch cords and significantly improves fiber handling.

Additionally, the line interfaces have a mechanical shutter to increase eye-safety.

Color coding for CWDM
For CWDM systems an industry standard color coding scheme is used. The latches of the transceivers match the colored port indicators on the passive units therefore guaranteeing simple setup. Following color codes are valid for CWDM:

<table>
<thead>
<tr>
<th>CWDM color coding</th>
<th>1270</th>
<th>1290</th>
<th>1310</th>
<th>1330</th>
<th>1350</th>
<th>1370</th>
<th>1390</th>
<th>1410</th>
<th>1430</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>light purple</td>
<td>sky blue</td>
<td>yellow green</td>
<td>yellow ochre</td>
<td>pink</td>
<td>beige</td>
<td>white</td>
<td>silver</td>
<td>black</td>
</tr>
</tbody>
</table>

Cassettes and enclosure for outdoor environments

Both platforms are available for CWDM and DWDM filters and various configurations exist supporting all applications. The standard temperature range for the outdoor enclosures is -40 °C to +85 °C. Smartoptics also supplies filter modules for sub-marine or CATV installations.

Ease of use
SmartOptic’s products are designed to make the life of its operators simple. Duplex connectors are used as standard fiber optic interconnectors. LC/UPC (UPC = ultra polished physical connector, LC/APC (APC = angle polished physical connector) and SC/UPC and SC/APC versions are available.

19” and 23” mounting platform
The mounting bracket and modules are passive and do not require electrical power for operation. Each mounting bracket offers space for two modules. A special fiber management add-on-bracket is available to give additional protection.

The mounting bracket is available in a 19” and a 23” version therefore addressing most installation requirements. All SmartOptics plug-in modules are compliant with these two versions.
## CWDM Solutions

### T-Series: Mux/Demux and OADM units with 1310 nm expansion port

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Channel Configuration</th>
<th>IL Bypass Channel</th>
<th>IL Add/Drop Channel</th>
<th>IL 1310 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-3009</td>
<td>8 channel + 1310 port, CWDM Mux/Demux</td>
<td>C47, C49, C51, C53, C55, C57, C59, C61 + 1310 nm</td>
<td>&lt;1.8 dB</td>
<td>&lt;1.7 dB</td>
<td>&lt;0.9 dB</td>
</tr>
<tr>
<td>T-3009-LL</td>
<td>Low Loss version of T-3009</td>
<td>C47, C49, C51, C53, C55, C57, C59, C61 + 1310 nm</td>
<td>&lt;2.5 dB</td>
<td>&lt;1.8 dB</td>
<td>&lt;1.8 dB</td>
</tr>
<tr>
<td>T-3005</td>
<td>4 channel + 1310 port, CWDM Mux/Demux</td>
<td>C51, C53, C55, C57 + 1310 nm</td>
<td>&lt;3.0 dB</td>
<td>&lt;1.8 dB</td>
<td>&lt;1.8 dB</td>
</tr>
<tr>
<td>T-3005-LL</td>
<td>4 channel + 1310 port, CWDM Mux/Demux</td>
<td>C51, C53, C55, C57 + 1310 nm</td>
<td>&lt;2.5 dB</td>
<td>&lt;1.8 dB</td>
<td>&lt;1.8 dB</td>
</tr>
<tr>
<td>T-3001</td>
<td>Wideband WDM Mux/Demux</td>
<td>1310 band / 1550 CWDM band</td>
<td>&lt;1.5 dB</td>
<td>Passband @ 1550: 1460 nm - 1630 nm</td>
<td>Passband @ 1310: 1270 nm - 1350 nm</td>
</tr>
</tbody>
</table>

All units can be offered with LC/UPC or LC/APC connector interfaces.
## CWDM Solutions

### T-Series without 1310 nm port

<table>
<thead>
<tr>
<th>Model</th>
<th>Ports</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T-3016</strong></td>
<td>1290, 1310, 1330, 1350, 1370, 1390, 1410, 1430</td>
<td>8 channel port, CWDM Mux/Demux C29, C31, C33, C35, C37, C39, C41 &amp; C43 IL Link: &lt;2.5 dB IL Link @ 1550 nm: &lt;4.0 dB combined with T-3009</td>
</tr>
<tr>
<td><strong>T-3008</strong></td>
<td>1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610</td>
<td>8 channel port, CWDM Mux/Demux C47, C49, C51, C53, C55, C57, C59 &amp; C61 IL Link: &lt;3.5 dB IL Link @ 1550 nm: &lt;1.8 dB</td>
</tr>
<tr>
<td><strong>T-3004</strong></td>
<td>1510, 1530, 1550, 1570</td>
<td>4 channel CWDM Mux/Demux C51, C53, C55, C57 IL Link: &lt;2.5 dB IL Link @ 1550 nm: &lt;1.8 dB</td>
</tr>
</tbody>
</table>

### Application example: 16 channel CWDM system

The T-3009 and T-3016 offer a 16 channel CWDM system. It is possible to seamlessly upgrade a T-3009 by adding a T-3016 on the 1310 nm expansion port.

1 fiber with 16 CWDM channels/services
## CWDM Solutions

**C-Series of Mux/Demux and OADM units with monitoring ports**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Channels</th>
<th>IL Link</th>
<th>IL Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-CWDM-MUX8</td>
<td>8 channel CWDM Mux/Demux C47, C49, C51, C53, C55, C57, C59, C61</td>
<td>8</td>
<td>&lt;4.0 dB</td>
<td>&lt;2.0 dB</td>
</tr>
<tr>
<td>C-CWDM-OADM4-1</td>
<td>4 channel OADM or Mux/Demux with expansion port C47, C49, C51, C53</td>
<td>4</td>
<td>&lt;3.0 dB</td>
<td>&lt;1.5 dB</td>
</tr>
<tr>
<td>C-CWDM-OADM4-2</td>
<td>4 channel OADM or Mux/Demux with expansion port C55, C57, C59, C61</td>
<td>4</td>
<td>&lt;3.0 dB</td>
<td>&lt;1.5 dB</td>
</tr>
<tr>
<td>C-CWDM-OADM4-3</td>
<td>4 channel OADM or Mux/Demux with expansion port C47, C49, C51, C53 1550 band: 1504 nm - 1578 nm</td>
<td>4</td>
<td>&lt;3.0 dB</td>
<td>&lt;1.5 dB</td>
</tr>
</tbody>
</table>

**Application example: 8 channel point-to-point system with linear OADM’s**

The C-CWDM-OADM4-1 and C-CWDM-OADM1-1570 are used to add/drop 4 channels and 1 channel respectively at the interim locations.
Single Fiber CWDM Solutions

T-Series of Single Fiber Mux/Demux and OADM units

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Channels</th>
<th>Wavelengths/Transceiver</th>
<th>IL Link</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-3208A</td>
<td>8 channel CWDM Mux/Demux</td>
<td>8</td>
<td>C29, C33, C37, C41, C47, C51, C55, C59</td>
<td>&lt;4.0 dB</td>
<td>Used together with T-3208B</td>
</tr>
<tr>
<td>T-3208B</td>
<td>8 channel CWDM Mux/Demux</td>
<td>8</td>
<td>C31, C35, C39, C43, C49, C53, C57, C61</td>
<td>&lt;4.0 dB</td>
<td>Used together with T-3208A</td>
</tr>
<tr>
<td>T-3204A</td>
<td>4 channel CWDM Mux/Demux</td>
<td>4</td>
<td>C47, C51, C55, C59</td>
<td>&lt;3.0 dB</td>
<td>Used together with T-3204A</td>
</tr>
<tr>
<td>T-3204B</td>
<td>4 channel CWDM Mux/Demux</td>
<td>4</td>
<td>C49, C53, C57, C61</td>
<td>&lt;3.0 dB</td>
<td>Used together with T-3204A</td>
</tr>
</tbody>
</table>

Application example: 4 channel point-to-point system with linear OADM’s

The T-3204A and T-3204B are used to build a 4 channel CWDM system over a single fiber. The T-OADM1-4749 is used to access the interim location redundantly from both end-points.
DWDM Solutions

T-Series: 32+32 DWDM Mux/Demux and OADM units

**T-3833**
- 32 channel DWDM Mux/Demux, OSC 1510, UPG port
- IL Link: <8.0 dB
- IL Link @ 1510 nm OSC: <1.6 dB
- IL Link @ UPG port: <2.2 dB

**T-3832-LB**
- 32 channel DWDM Mux/Demux - Low Band
- IL Link: <7.2 dB

**T-3832-HB**
- 32 channel DWDM Mux/Demux - High Band
- IL Link: <7.2 dB

**T-OADM4-xxxxyy**
- 4 channel OADM, (EAST and WEST), 1310 nm port
- 4 DWDM channels xxx-yyy
- IL Link: <1.5 dB
- IL Add/drop: <4.5 dB
- IL 1310 nm: <1.5 dB

T-Series: 8+8 DWDM Mux/Demux and 4+4 OADM units

**T-3809**
- 8+1 channel DWDM Mux/Demux
  - 934, 935, 936, 937, 938, 940, 941 + UPG
- IL Link: <5.5 dB
- IL Link @ UPG: <1.0 dB

**T-3808**
- 8 channel DWDM Mux/Demux
  - 925, 926, 927, 928, 929, 930, 931, 932
- IL Link: <4.5 dB

**T-3805-xxxxyy**
- 4+1 channel DWDM Mux/Demux
  - 4 channels from T-3832 band
- IL EXP Link: < 1.6 dB
- IL Link: <4.5 dB

**T-3804-xxxxyy**
- 4 channel DWDM Mux/Demux
  - 4 channels from T-3832 band expansion Mux/Demux for T-3805
- IL Link: <3.5 dB
Hybrid D/CWDM System

The T-3809 and T-3808 can be used to upgrade an existing CWDM system with additional DWDM channels.

Single fiber DWDM Solutions

Optical Single Fiber DWDM Multiplexers

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Channels</th>
<th>Transceiver Wavelengths</th>
<th>IL Link</th>
<th>IL Link @ UPG Port</th>
<th>Used with</th>
</tr>
</thead>
</table>
| C-3909A | 8+1 channel DWDM Mux/Demux | D939, D937, D934, D932, D929, D927, D924 & D922 | <5.0 dB | <3.0 dB | Used together with C-3909B
| C-3909B | 8+1 channel DWDM Mux/Demux | D938, D936, D933, D931, D928, D926, D923 & D921 | <5.0 dB | <3.0 dB | Used together with C-3909A
| C-3908A | 8 channel DWDM Mux/Demux | D959, D957, D954, D952, D949, D947, D944 & D942 | <4.5 dB | | Used together with C-3908B
| C-3908B | 8 channel DWDM Mux/Demux | D958, D956, D953, D951, D948, D946, D943 & D941 | <4.5 dB | | Used together with C-3908A

Application example: 16 channel DWDM system (using 32 lambdas on a single fiber)

The T-3909A&B and T-3908A&B offer a 16 channel single fiber DWDM system. It is possible to seamlessly upgrade a T-3909A&B by adding a T-3908A&B on the “UPG” expansion port. The solution offers TX and RX monitoring ports.
## DWDM Solutions

### C-Series: DWDM Mux/Demux

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Channels</th>
<th>IL Link</th>
<th>IL Add/Drop</th>
<th>Monitoring Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-3832</td>
<td>32+1 channel DWDM Mux/Demux, 1310 nm port</td>
<td>921<del>924, 926</del>929, 931<del>934, 936</del>939, 941<del>944, 946</del>949, 951<del>954, 956</del>959</td>
<td>&lt;8.0 dB</td>
<td>&lt;1.6 dB</td>
<td></td>
</tr>
<tr>
<td>C-3817</td>
<td>16+1 channel DWDM Mux/Demux, 1310 nm port</td>
<td>921<del>924, 926</del>929, 931<del>934, 936</del>939</td>
<td>&lt;8.0 dB</td>
<td>&lt;3.0 dB</td>
<td></td>
</tr>
<tr>
<td>C-3816</td>
<td>16 channel DWDM Mux/Demux, 1310 nm port</td>
<td>941<del>944, 946</del>949, 951<del>954, 956</del>959</td>
<td>&lt;5.0 dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-OADM5-xxxxyy</td>
<td>4 channel OADM, 1310 nm port</td>
<td>4 DWDM channels xxx-yyy</td>
<td>&lt;2.5 dB</td>
<td>&lt;4.5 dB</td>
<td></td>
</tr>
</tbody>
</table>
| C-Series: 8+8 DWDM Mux/Demux

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Channels</th>
<th>IL Link</th>
<th>IL Add/Drop</th>
<th>Monitoring Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-3809</td>
<td>8+1 channel DWDM Mux/Demux</td>
<td>931, 932, 933, 934, 936, 937, 938 + UPG</td>
<td>&lt;0.6 dB</td>
<td>&lt;2.6 dB</td>
<td></td>
</tr>
<tr>
<td>C-3808</td>
<td>8 channel DWDM Mux/Demux</td>
<td>921, 922, 923, 924, 926, 927, 928, 929</td>
<td>&lt;3.5 dB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**CATV Solutions**

**Optical Single Fiber CWDM Multiplexers for CATV**

**T-3001-CATV1**
- Passband @ 1310/1490: 1270 nm - 1500 nm
- Passband @ 1550 nm: 1530 nm - 1570 nm
- Data traffic added to CATV signals at 1310/1490 nm
- IL Link: <1.5 dB
- WDM Mux/Demux: 1310+1490 band / 1550 CATV band
- Passband at 1550 nm: 1270 nm - 1500 nm
- Passband at 1310/1490 nm: 1270 nm - 1500 nm

**T-CATV-2**
- Passband @ 1310/1490: 1270 nm - 1500 nm
- Passband @ 1550 nm: 1530 nm - 1570 nm
- Data traffic added on 4 CWDM channels
- IL Link: <2.5 dB
- WDM Mux/Demux: 1310 band and 1550 CATV band
- Passband at 1550 nm: 1270 nm - 1500 nm
- Passband at 1310/1490 nm: 1270 nm - 1500 nm

**T-CATV-3**
- Passband @ 1310/1490: 1270 nm - 1500 nm
- Passband @ 1550 nm: 1530 nm - 1570 nm
- Data traffic added on 6 CWDM channels
- IL Link: <3.0 dB
- WDM Mux/Demux: 1310 band and 1550 CATV band
- Passband at 1550 nm: 1270 nm - 1500 nm
- Passband at 1310/1490 nm: 1270 nm - 1500 nm

**Multimode Solutions**

**T-3008-MM**
- 8 channel port, CWDM Mux/Demux
- Channels: C47, C49, C51, C53, C55, C57, C59 & C61
- IL Link: <3.5 dB
- IL Link @ 1550 nm: <1.8 dB

**T-3004-MM**
- 4 channel CWDM Mux/Demux
- Channels: C51, C53, C55, C57
- IL Link: <2.5 dB
- IL Link @ 1550 nm: <1.8 dB
SmartOptics, the complete resource for optical transmission networks

SmartOptics has a proven track record in designing optical transmission networks. Our success is based on our expert knowledge in the three key networking disciplines:

- passive WDM,
- optical transceivers,
- active WDM equipment.

This gives us and our customers a unique advantage and results in high performance and cost optimized network solutions.

SmartOptics products now make optical networking, especially 4G, 8G and 10G connectivity, simple and affordable.

Optical transceivers
SmartOptics has a complete portfolio of optical transceivers. Product highlights include:

- C/DWDM 10G Xenpak’s, X2’s and XFP’s
- CWDM 8G/10G SFP+’s
- C/DWDM 4G SFP’s
- 160 km, 200 km & 210 km CWDM 1G SFP’s
- 250 km CWDM 100M SFP’s

Active WDM equipment
SmartOptics offers an extremely compact C/DWDM subsystem completing the portfolio. Key benefits are:

- optical amplification (EDFAs),
- 3R regeneration for all types of protocols
- performance monitoring (optical and bit level)

Thank You,

Your SmartOptics Team
Customer Feedback:

Our philosophy at SmartOptics is that business should be simple. We are proud to be working with some of the biggest names in the storage world:

“Just a quick update message to let you know that the CWDM is installed and working within T-Systems. It was a very smooth and quick installation and within hours we had increased their cross site capacity from 96Gb/s using 24 dark fibres to 192Gb/s using just 4 dark fibres. This solution is far more cost effective than the 2Gb/s solution previously used and other alternative “active” DWDM systems. Now that Brocade have changed their approach to third party SFP usage, and locked out all other third party SFP vendors except for SmartOptics, SmartOptics can potentially be an important supplier for our Brocade applications where distance extensions are required. We already have other possibilities for your equipment which we hope to close soon.”

HP, UK

“I had the CWDM up and running within minutes. I really can’t believe how simple this is. A typical configuration to extend the fabric is to implement a single SAN over distances to provide geographic separation of server and storage. Normally we would do this with a DWDM system, but we used the SmartOptics embedded CWDM solution and are delighted with the results.”

SUN Microsystems, UK

“The SmartOptics Product line is the perfect companion to our own portfolio. We are seeing more and more 4Gbps opportunities and by working with SmartOptics we have been able to satisfy these requirements over long distances using Embedded CWDM solutions. By having a long distance 4Gbps solution, it also means that our customers can now use their switches at the full line rate for which they were originally intended and maximise their investment.”

Acal, UK

“We were amazed at just how simple the SmartOptics system is and also how reliable the solution is as well. Normally we spend a lot of time configuring DWDM channels but with the SmartOptics solution we just plugged the optics in to our switches and we were up and running within minutes. Another reason why we chose the SmartOptics solution was the reliability of the system. There is a completely passive solution so the reliability figures are amazing compared to what we have been used to, and therefore we do not have to worry about expensive Service contracts and software licences.

Integrated Network Solutions, Norway
### CWDM channel wavelengths

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### DWDM channel wavelengths

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