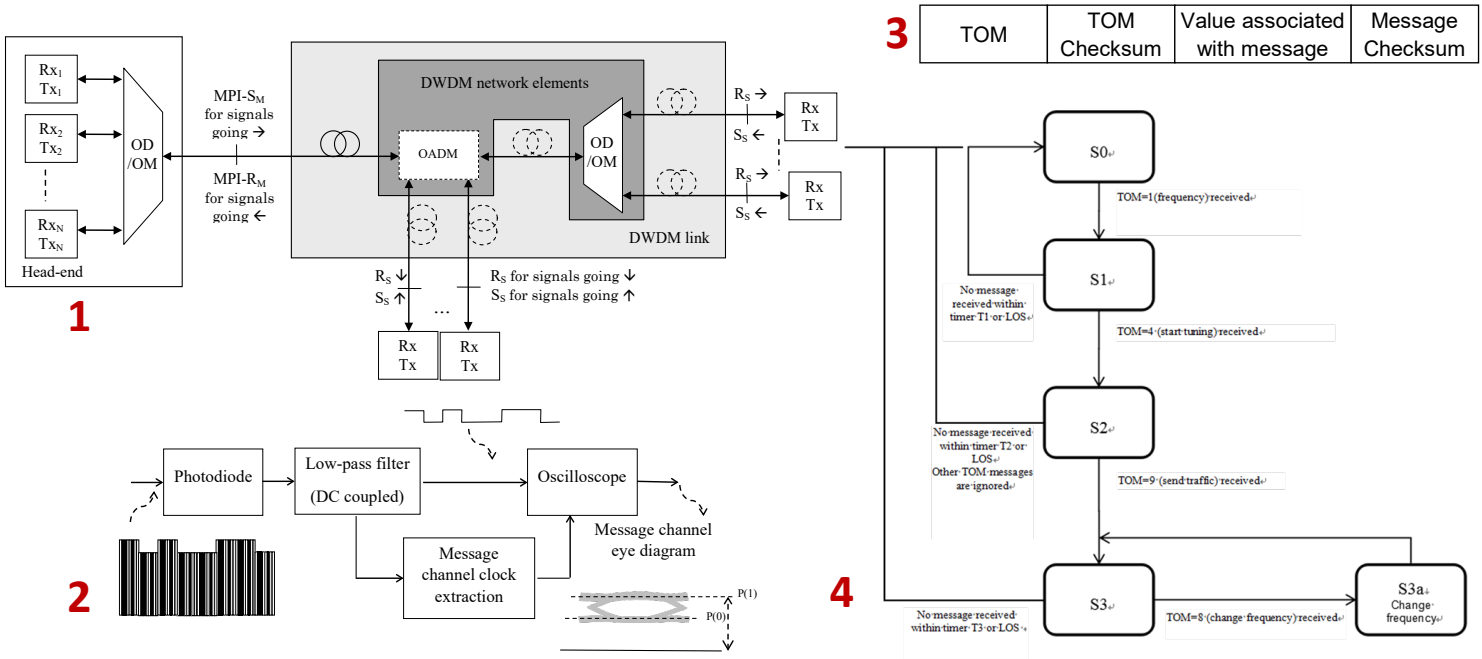
G.698.4 Multichannel bi-directional DWDM applications with port agnostic single-channel optical interfaces

- A DWDM metro system architecture based on a single bidirectional fibre, comprising a head-end (HE), connecting to the tail-end (TE) equipment through a black link including optical add/drop multiplexers (OADM),
- The TE transmitters automatically adapt their DWDM channel frequency to the OADM port they are connected to using feedback from the HE via a head-to-tail message channel (HTMC).
- Maximum capacity is 40 bidirectional channels, 50 GHz spaced, at 10 Gbit/s, and 20 bidirectional channels, 100 GHz spaced, at 25 Gbit/s.
- Each bidirectional channel exploits two paired wavelengths, one per direction
- Maximum transmission distance is 20 km for 10 Gbit/s and 10 km for 25 Gbit/s;



System architecture (1)

The system architecture comprises a HE, connecting to the tail end equipment (TEE) through a black link. The HE houses a set of transmitters and receivers and an optical demultiplexer /multiplexer (OD/OM). A single bidirectional fibre connects the HE to the passive OD/OM as well as to optional OADMs. Connection between OD/OM or OADMs and TEE is also bidirectional. The TEE transmitters have the capability to automatically adapt their DWDM channel frequency to the OD/OM or OADM port they are connected to, using tunable lasers.

Message channel (2)

The TEE transmitters tuning mechanism relies on a low modulation index amplitude modulation of the HEE to TEE channels (HTMC, head-to-tail message channel).. The HTMC is used to provide the information necessary to allow the HEE to automatically set the TEE central frequency (and, possibly, output power) while avoiding traffic disruption on other working channels, due to interferometric or interchannel crosstalk. An index amplitude modulation of the TEE to HEE channels (THMC, tail-to-head message channel) can be used to transmit proprietary information. Both the HTMC and the THMC are Manchester encoded.

Message channel frame structure (3)

The HTMC frame includes a field indicating the type of message (TOM), a checksum field for the TOM, a field communicating the message content and a checksum field for the message content. The TOM checksum and the message checksum are generated based on (16,11) and (32,26) Hamming codes, respectively.

Tail End state machine (4)

The behaviour of the TEE is defined as a state machine operating on the values of the TOM field in the HTMC. Two state machines are defined in the current version of the Recommendation: one for transmitters which do not have the ability to tune to the required TEE central frequency on their own and a second one for transmitters that have this capability. In the first case, the HE will send continuous feedback to the TE transmitter to keep the TEE central frequency locked to the WDM port. In the second case, it is sufficient to set the transmitter central frequency just once, when putting the system in operation. The most common implementations of the 25Gbit/s applications in this Recommendation use pluggable modules and are of this second type.

Application codes

Specifications in this Recommendation are organized according to application codes. The current set of application codes covers bidirectional DWDM systems at 10 Gbit/s and 25 Gbit/s, with a minimum channel frequency spacing of 50 GHz for 10 Gbit/s signals and 100 GHz for 25 Gbit/s signals. Maximum transmission distance is 20 km for 10 Gbit/s and 10 km for 25 Gbit/s. The maximum number of DWDM channels is 40 at 10 Gbit/s and 20 at 25 Gbit/s. Channels are bidirectional, meaning that each channel corresponds to two paired wavelengths, used for HE-to-TE and TE-to-HE directions. The frequency spacing between two paired wavelength is 2.6 THz.