WWDM Measurement Methodology - Update

David Dolfi
Agilent Technologies
dave_dolfi@agilent.com

- Group formed to deal with measurement methodology specific to Tx, Rx measurements in 4 channel WWDM systems.

- Specific to Clause 54 of Draft Standard

Group Membership (so far) -

Agilent Technologies

Dave Dolfi
Lisa Buckman
Brian Lemoff

Molex

John Dallesasse
David Hinzel
Jay Malin

We welcome participation!!

Contact me (Dave Dolfi) if you are interested in joining!

Focus is on those areas of measurement methodology which are specific to the presence of the other wavelength channels

- Specify the channel selection process

- Specify the state of the other channels during testing

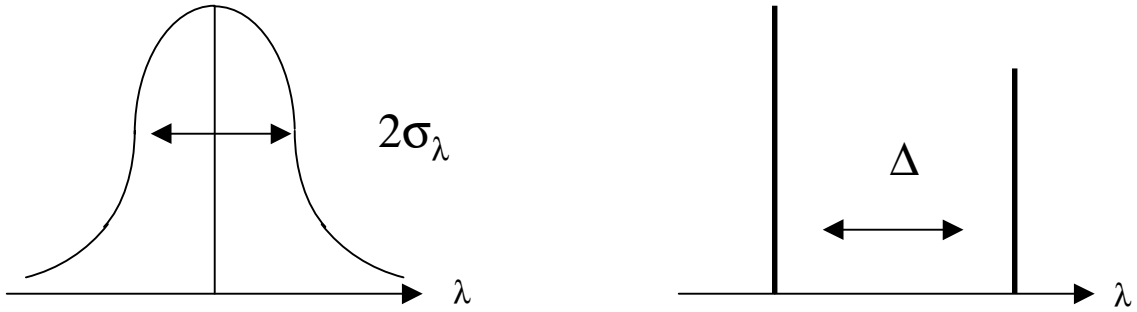
Assume the test procedure on the channel under test is similar, if not identical, to procedure on an equivalent serial channel.

Issues - 1

Current RMS spectral width is good spec for some laser types (VCSELs, DBR)

BUT

NOT for other types (DFB with poor SMSR)



Posssible Solution -

Replace RMS spectral width with "spectral width containing p_1 per cent of power" in the band being measured:

Δ_1, which contains some large percentage p_1 (~ 90%) of the power in the band - enables us to use single spec for both laser types:

* For Gaussian lineshape, the ratio of $\sigma_\lambda / \Delta_1$ is fixed for a given p_1, so RMS spectral width of continuum mode laser is specified.

* For discrete mode spectrum, Δ_1 specifies maximum separation between significant modes.

Exact numbers for p_1, Δ_1 still under study - Need to examine link penalties and verify link budget for particular choice.

Posssible Solution - (con't)

Also specify,
Another wavelength interval, Δ_2, which contains essentially all (p_2 ~ 99%) of the power in the band. This deals with two potential problems:

* Sources which meet the Δ_1,p_1 criteria but have enough power outside Δ_1 to create link penalty problems (MPN)

* Sources from adjacent bands which have peaks in the band being measured that are more than Δ_1 away from the peaks which belong in the band.

Exact specification of p_2, Δ_2 still under study - Need to examine link penalties and verify link budget for particular choice.

Issues - 2

Tx Testing -

Need to demultiplex wavelength channels from the Tx in order to do per-channel testing -

- Want to avoid requiring a special in-line wavelength filter for Tx testing

- Would like to specify testing which is compatible with an OSA

NOTE: ALL channels simultaneously modulated for Tx testing

Possible Solution -

For wavelength and linewidth measurements:

Look at total spectrum:

- Reject if too much power in any guard band

- Reject if Δ_1,p_1 criteria is not met for any band

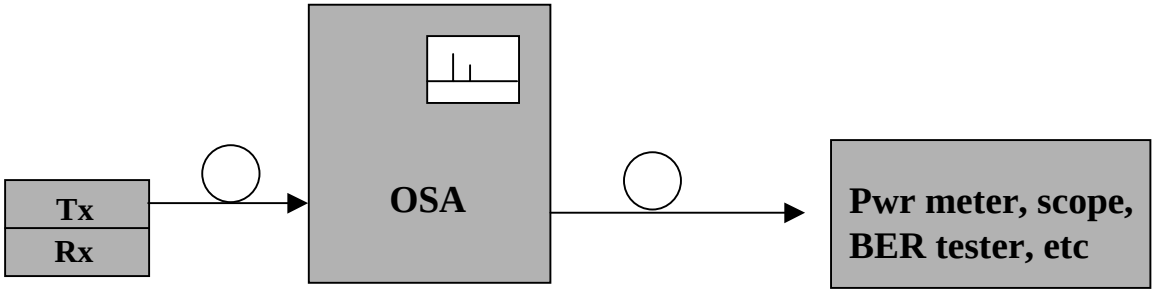
- Reject if Δ_2,p_2 criteria is not met for any band

For absolute power, high speed measurements (per channel):

Can use OSA (or in-line filter) as monochrometer between source and measurement system. (Relatively easy to calibrate the insertion loss of either in this mode of operation):

- Set wavelength window to include previous % (p_2) of the power in given channel for power measurement
- Use same monochrometer setting for high speed Tx measurements.

NOTE: These tests may be done with SM patch cord, since some OSA's have only SM input



However, while Tx measurements should be OSA compatible, they should not *require* an OSA

* Can specify above tests to be compatible with series of in-line filters as well as an OSA

* Standards exist for such filters which can be used as guideline (ITU-T G.959.1)

* Can specify measurements so as to yield consistent results for either choice

Issues - 3

Rx Testing -

- Specification of Source for generating the Rx Conformance Test Signal.

  How many lasers? Tunable? Externally modulated?

- Minimum set of Rx tests for each channel

NOTE: ALL channels simultaneously modulated for Rx testing

Possible Solution -

Rather than specify the sources, we propose the following procedure be done on a per-channel basis:

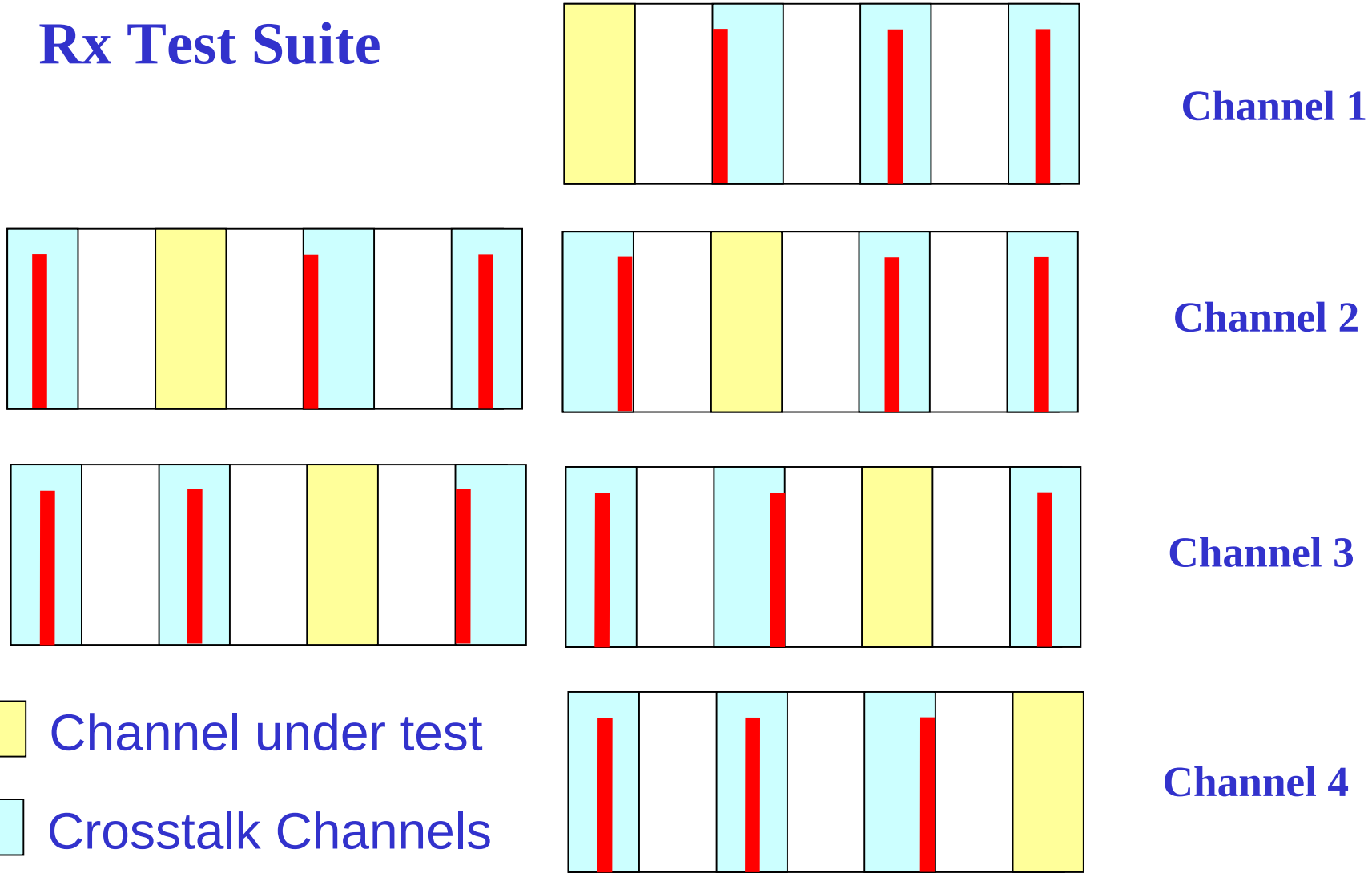
* Source for channel under test set at -5 dB power level with respect to other channels

* Each channel tested with its adjacent channels set at near end of its wavelength range (sequentially, NOT at the same time)

* Channel under test scanned over its wavelength range during measurement to account for wavelength dependent loss within the channel.

Two sets of tests for each interior channel
One set of tests for each exterior channel

Rx Test Suite



Can be done with set of fixed wavelength sources OR fewer, tunable sources.

Other Issues -

* Rx 3 dB electrical cut-off frequency -
  Assume that Rx frequency response is independent of the presence of other channels
  → Measure individually on each channel using a laser within the wavelength spec of that channel

* Extinction Ratio vs OMA
  Wait for results from the OMA Study Group and modify tables, relevant measurements accordingly

* Jitter measurements
  Wait until other measurement issues are resolved and more general jitter issues have been settled

Motion

Move that we adopt the methodology proposed in Dolfi_11/00 in principle with respect to WWDM Tx, Rx measurements and wavelength and linewidth specifications, as the basis for the next Draft of Clause 54.

Moved: David Dolfi
Second:
Technical (> 75%)

Y: _____ N: _____ A: _____