

DWDM NETWORK TRANSMISSION TEST OF OPTICAL WAVELENGTH REFERENCES

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In a Nordic collaborative effort three different schemes for realising optical communication wavelength references have been studied. The developed references have been tested in two different DWDM network with the aim of determining the accuracy and limitations of the three schemes. The influence of data carrying channels on an ITU-channel carrying an optical wavelength reference was investigated. All channels were sent through a fibre system, developed at CTH, consisting of 550 km fibres including dispersionshifted fibres and seven amplifications.

SP in collaboration with an SME had characterised an Optical Layer Supervisor, an instrument based on a series of fibre Bragg gratings and dedicated to wavelength measurements in the optical telecom region. At DFM molecular absorption lines were used as reference materials. The molecules were characterised [1] and glass cells containing the molecules were mounted for easy use in calibration. The network tests of the molecular based references were done on a commercial 550 km, 2,5 Gb/s, 0,8 nm channel spacing DWDM system covering the wavelength range from 1545 to 1560 nm. A laser locked to a molecular absorption line and an amplified broadband source used to generate multiple absorption lines were used as the references. Within the accuracy of our measurement systems no measurable change in wavelength of the reference channel could be seen.

At HUT a wavelength reference based on a tuneable silicon etalon [2] was tested in a WDM access network testbed. A channel spacing of 200 GHz was applied and sinusoidal ~50 kHz pilot tones with 2 kHz spacing were used to mark the channels. At the receiver-end, the reference was scanned across the channels measuring the amplitude of the pilot tone in intervals of 5 pm. It was observed that the neighbouring pilot tones and the 10 GHz data did not affect the measurement results. The accuracy of the derived channel wavelength was about 3 pm.

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- [1] J. C. Petersen and J. Henningsen, "Molecules as Absolute Standards for Optical Telecommunication. Requirements and Characterization", in *URSI 2002*, paper 1777.
- [2] J. Tuominen *et al.*, "Compact wavelength reference for optical telecommunication based on a tuneable silicon etalon", in *URSI 2002* paper p1512.