range. The continuous wavelength tuning range was 9.5 nm and displayed a linear dependence with temperature corresponding to a tuning rate $\Delta\lambda/\Delta T$ of 0.1 nm/°C.

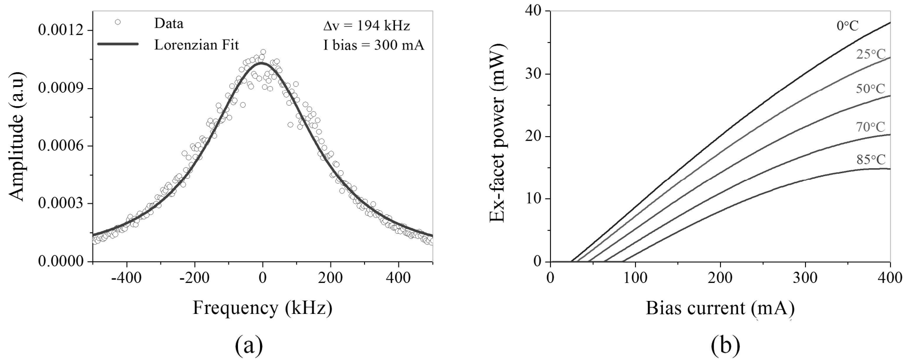

Fig. 5. (a) Measured lineshape at 25 °C with a bias current of 300mA, (b) Overlapped light-current plot measured ex-facet over the temperature range 0 °C < T < 85 °C.

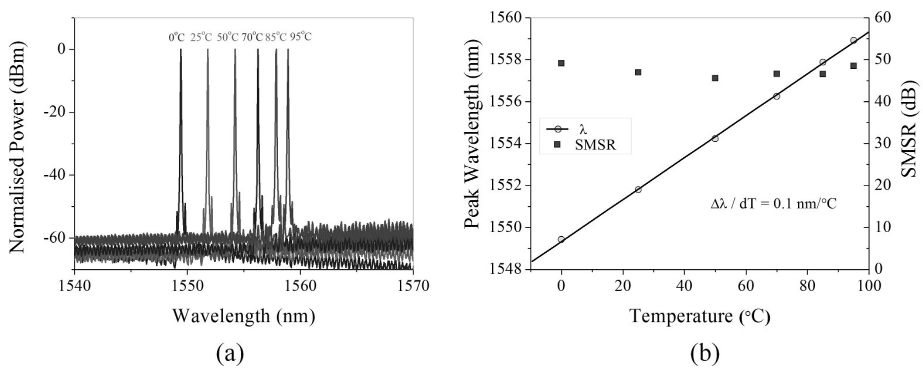

Fig. 6. Spectral characteristics over the temperature range 0 °C < T < 95 °C; (a) overlapped spectra, (b) peak wavelength and SMSR versus temperature.

4. Conclusion

We have demonstrated the characteristics of a Discrete Mode laser diode that make it suitable for applications where narrow linewidth emission is required. Single longitudinal mode operation over a temperature range of −10 °C < T < 110 °C has been demonstrated with an SMSR ratio in excess of 40 dB maintained even at high temperatures. It has been shown that narrow linewidth emission (< 250 kHz) can be maintained over a temperature range of 0 °C < T < 85 °C. We have also demonstrated that a linewidth of less than 200 kHz and ex-facet output power of greater than 30 mW at 25 °C can be achieved using DMLDs. In optical coherent communications DMLDs can be used as a transmitter laser or local oscillator laser. The device is monolithic making it cost effective to produce and it is fabricated using a single step process leading to further cost reduction in comparison with DFB lasers. These devices are also suitable for other applications where narrow linewidth emission is required including ultra-high resolution spectroscopy, sensing applications and atomic clocks.

Acknowledgments

This research has received funding from the European Communities Seventh Framework Programme FP/2007-2013 under grant agreement 224547 (PHASORS), as well as SFI Principal Investigator Programme and HEA PRTLI 4 INSPIRE project.

#155477 - $15.00 USD Received 3 Oct 2011; revised 28 Oct 2011; accepted 28 Oct 2011; published 16 Nov 2011