In$_{0.75}$Ga$_{0.25}$As/InP Multiple Quantum Well Discrete Mode Laser Diode Emitting at 2 μm

R.Phelan*, J.O’Carroll, D.Byrne, C.Herbert, J.Somers and B.Kelly
Eblana Photonics Ltd, Unit 32 Trinity Technology and Enterprise Campus, Pearse St, Dublin 2, Ireland
richard.phelan@eblanaphotonics.com
Discrete Mode Laser Diode Overview

Etched features select 1 Fabry Perot mode

![Etched features image]
2μm InP Laser Design

- Measured PL wavelength peak at 1983 nm
- PL intensity indicates high quality structure with low defects
- 7 x 2-inch wafers grown by MOCVD

\[ ds = \frac{n\lambda}{4n_{\text{eff}}} \]
\[ n = 2, 4, 6, \ldots \]
\[ n_{\text{eff}} = 3.21 \]
Static/Dynamic Characterisation

Power (dBm) vs. Wavelength (nm)
- Various currents (39mA, 75mA, 100mA, 125mA, 150mA, 175mA)

Wavelength (nm) vs. Bias current (mA)
- Linear trend with λp = 0.01 nm/mA
- SMSR (Signal-to-Monitor-Signal Ratio) plotted

Power (dBm) vs. Wavelength (nm)
- Various temperatures (0°C, 10°C, 20°C, 35°C, 45°C, 55°C, -5°C)

Wavelength (nm) vs. Bias current (mA)
- Temperatures: 5°C, -5°C, 10°C, 20°C, 40°C, 55°C
Static/Dynamic Characterisation

High speed package

Modulation bandwidth ~5GHz

$S_{21}$ (dB)

Frequency (GHz)

50mA

T=25°C

2.5GHz

4GHz
Conclusions

- Single mode 2μm laser on InP demonstrated with high SMSR
- Output powers > 5mW
- Butterfly packaging of 2μm lasers developed with $\eta = 60\%$, isolators (30dB)
- Lasers suitable for direct modulation ~ 5GHz

Acknowledgements: Tyndall institute cork for Spectral, modulation measurements. This work was supported in part by the European project MODEGAP (FP/2007-2013 under grant agreement 258033)