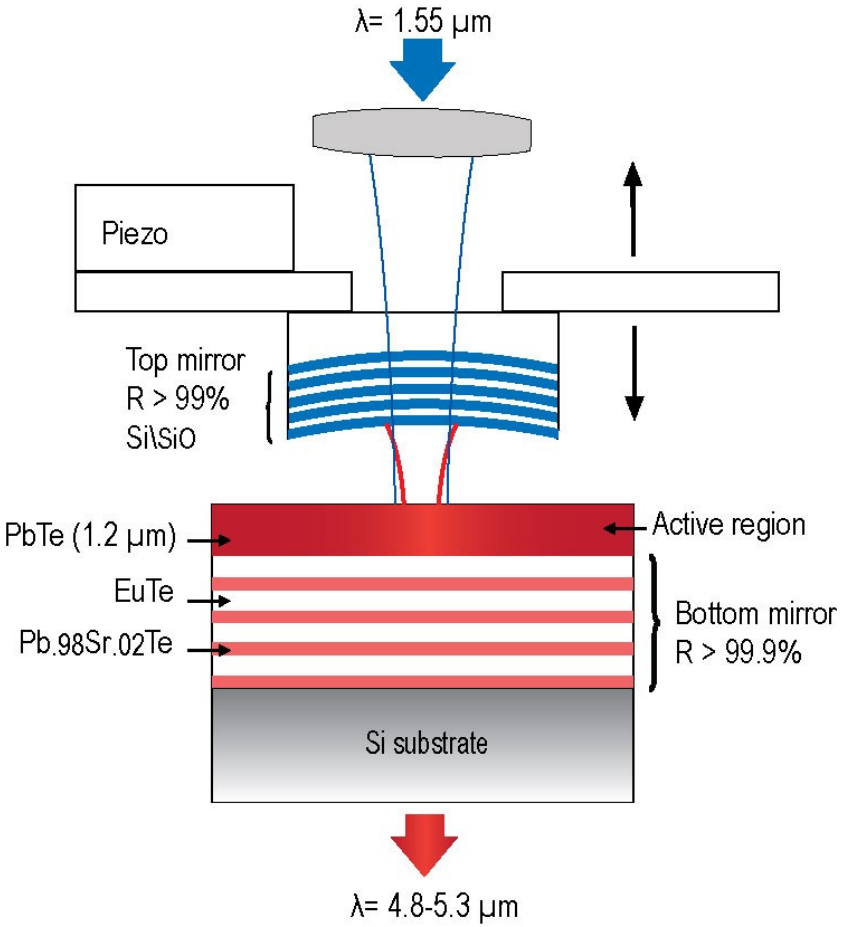
Continuously tunable single mode VECSEL

- Design



L ~ 100 µm

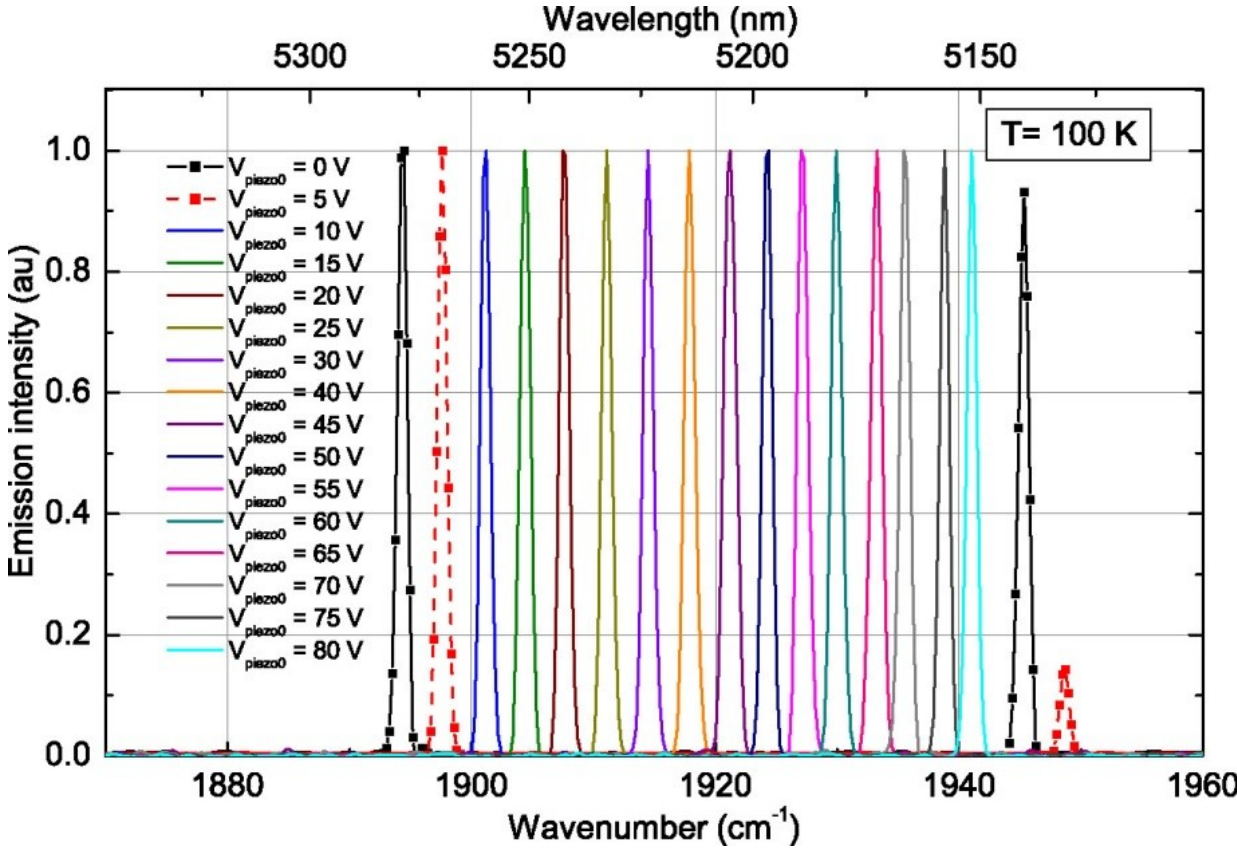
Continuously tunable single mode VECSEL

- Cavity length tuning

$\Delta\lambda = 138\ nm$
10 V <-> 17 nm

Tuning by alterning the cavity length using the piezo-driver

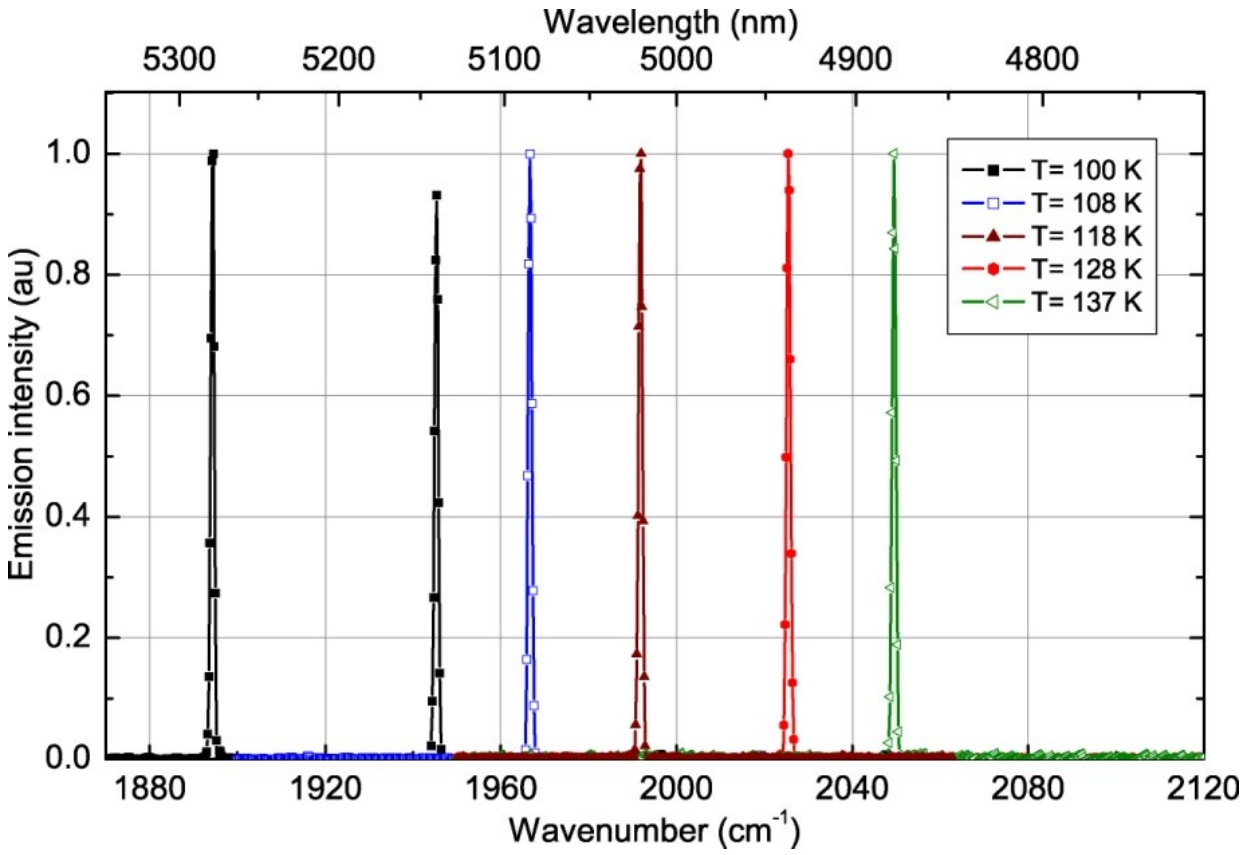
Total cavity length L ~ 98 µm



Continuously tunable single mode VECSEL

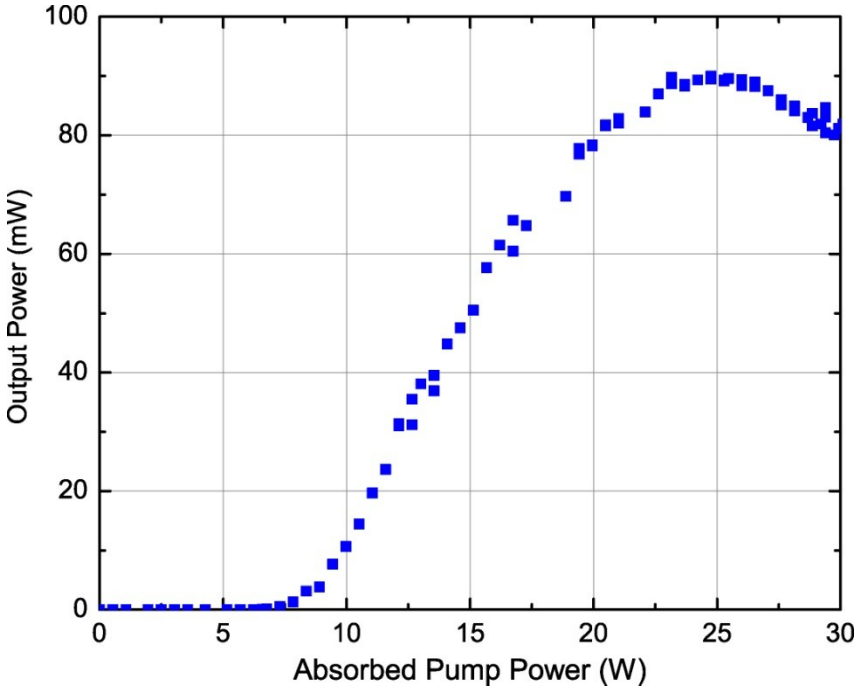
- Temperature tuning

More than 400 nm
continuous wavelength tuning



Continuously tunable single mode VECSEL

- Output power



P_{max} = 90 mW_p

100 ns pulse

10 kHz repetition frequency

L = ~125 µm

Continuously tunable single mode VECSEL

- Beam Quality

Divergence Limit

$$\theta = M^2 \frac{\lambda}{\pi w_0}$$

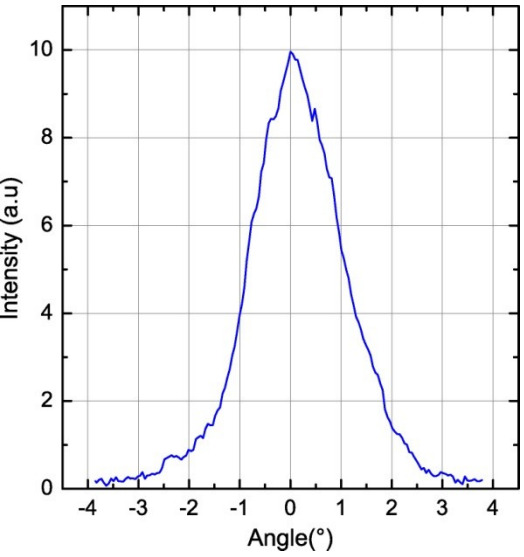
$$FSR = 40\ cm^{-1}$$

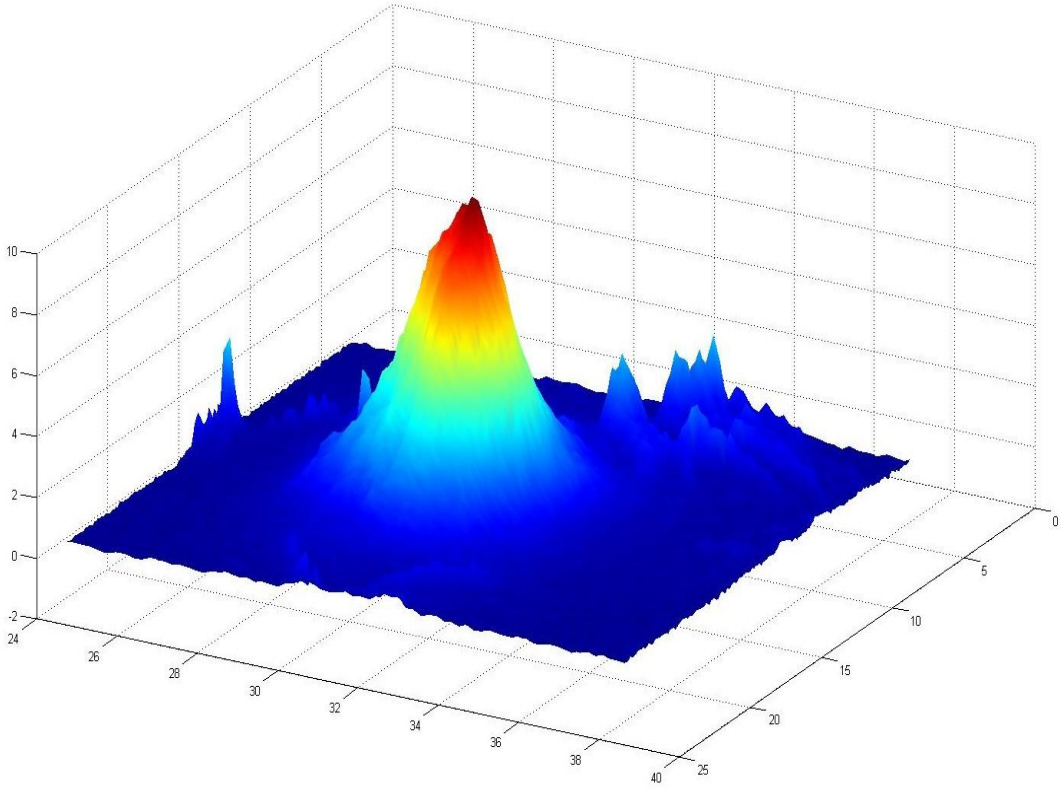
$$L = 125\ \mu m$$

$$w_0 = 66\ \mu m$$

$$\theta_{\perp,P} = 1.73\ \square$$

$$M^2 = 1.14$$





TEM_{00}

Summary

- Continuously tunable single mode VECSEL
- VECSEL and DBR grown on Si
  - Up to ~ 300 nm Continuous tuning using piezo-driver
  - Up to ~ 800 nm Continuous tuning combining temperature and piezo-driver
  - Lasing was observed up to 183 K
  - Output power : P_{max} = 90 mW_p , 100 ns,
  - End pumped VECSEL using Si/SiO DBR
- Excellent beam quality: M^2 = 1.14, θ = 1.73°