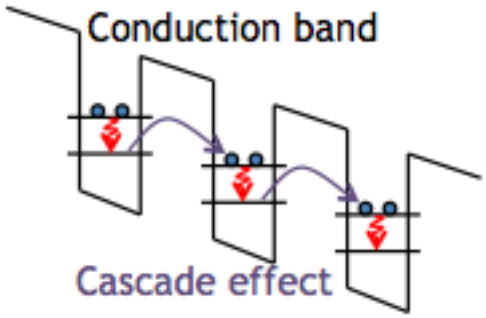
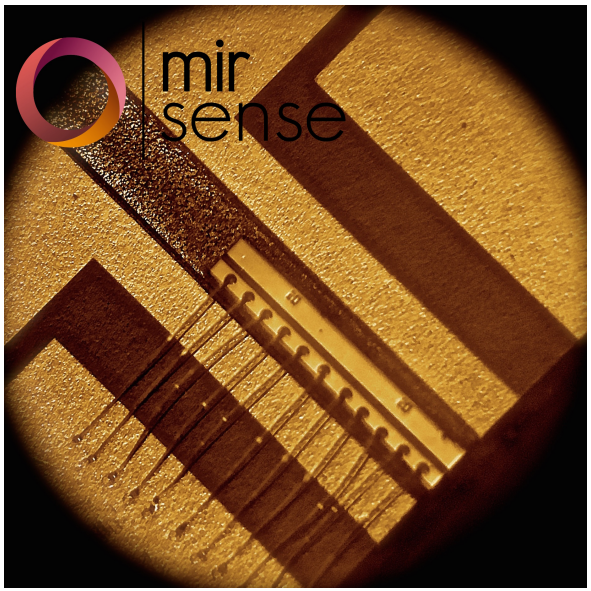
Optical feedback dynamics of a mid-infrared quantum cascade laser

L. Jumpertz, K. Schires, O. Spitz, M. Sciamanna, & F. Grillot



Intersubband laser (QCL)



Intersubband transitions

Quantum engineering: wavelength from 3 µm to 250 µm

Ultrafast carrier lifetime τ_p ~ 1 ps

Investigating the optical feedback dynamics for applications in optical countermeasures, mid-IR chaotic communications, based on chaos modulation

Ref : L. Jumpertz, K. Schires, M. Carras, M. Sciamanna & F. Grillot, Light Sci. Appl., 5, e16088, (2016)

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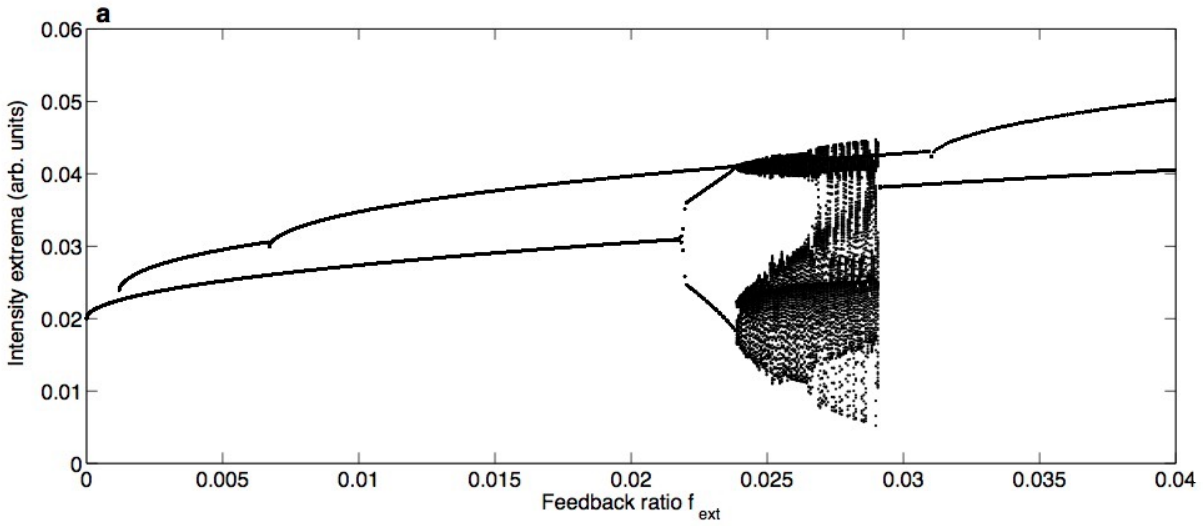
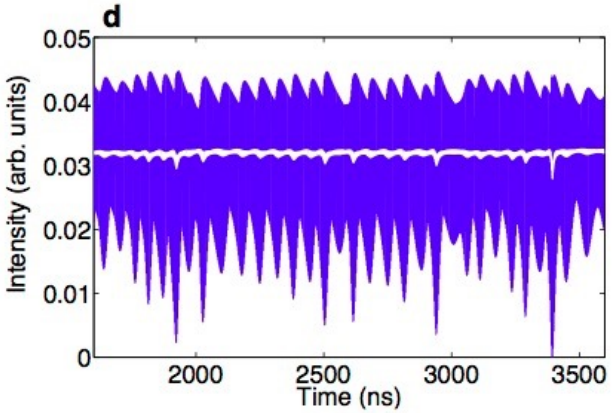
Optical feedback dynamics investigated from Lang & Kobayashi model





- → Class A behavior with a destabilization at the ECF and deterministic chaos
- → The chaotic bubble occurs for smaller feedback rate when increasing the cavity length while the Hopf bifurcation increases at larger pump currents
- → For lower α-factor values, the feedback ratio corresponding to the Hopf point is much higher, while the amplitude of the chaotic regions is reduced

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