Dynamics of Yb^{3+} doped Al_2O_3 microlasers

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Optical microresonators have shown potential for integrated biosensing. By doping Al_2O_3 with a rare-earth ion such as ytterbium, it is possible to create an on-chip laser. This makes it possible to do active sensing, which can simplify the detection scheme and lower the limit of detection.

Due to the small size of these lasers, they are very sensitive to fabrication tolerances. Currently produced lasers show unpredictable behavior. We measure changes in output power, spectrum and mode splitting over time. This can be from fast dynamics on the order of microseconds, up to day-to-day repeatability. Furthermore, some ring lasers show self-pulsation or switching behavior between CW and pulsing. We aim to identify possible reasons for these dynamics, and ultimately have more control over the behavior of the lasers.

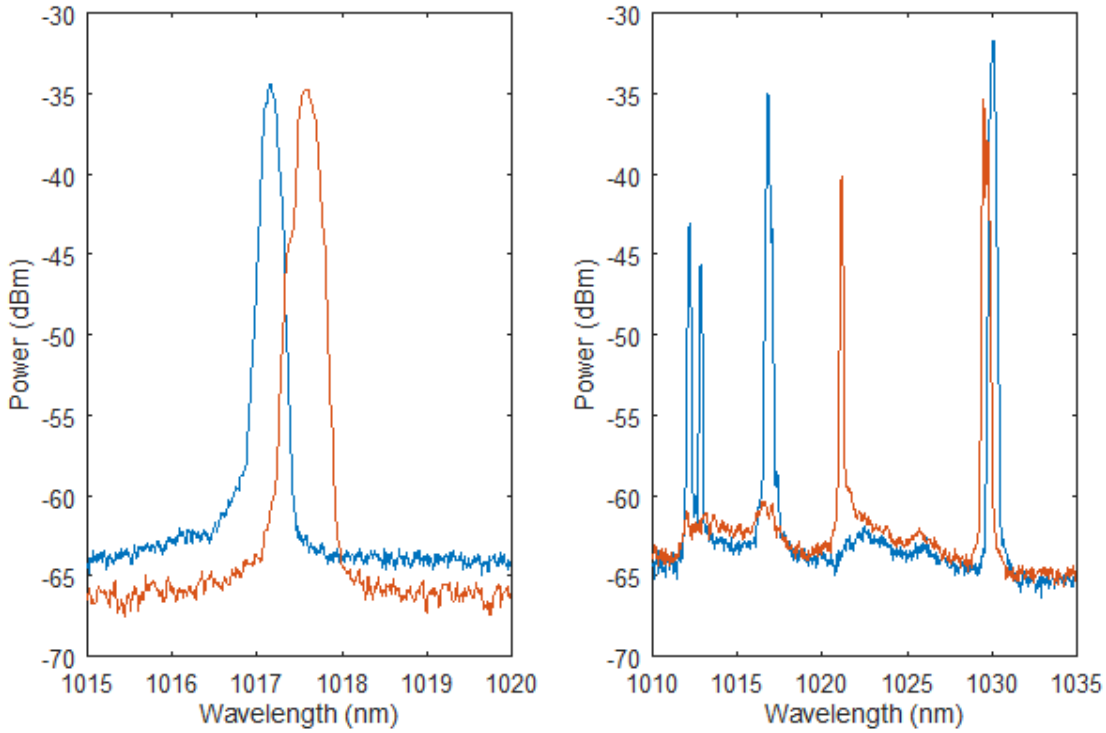

Figure: examples of the overnight change in lasing spectrum of two samples.