intermittency and scaling in a semiconductor laser with time-delayed optical feedback

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Simulation

Intensity (arb. units)

Time (ns)

$\tau_1$

$\tau_2$

1.7e5

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Average Residence Time vs. Injection Current

- Experiment
- Rsp = 1e-4
- Rsp = 5e-5
- Rsp = 1e-5
- Rsp = 3e-6
- Rsp = 1e-6
- Rsp = 1e-7
- Rsp = 1e-8

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Average Residence Time vs. Rescaled Pump Current

\[ \log_{10} \left( \frac{\langle T \rangle}{\langle T \rangle} \right) \]

\[ \log_{10} \left[ \frac{(p-p_c)/p_c}{(p-p_c)/p_c} \right] \]

\( \gamma = -1.75 \)

Legend:
- Red: Experiment
- Black: Rsp = 1e-4
- Green: Rsp = 5e-5
- Red: Rsp = 1e-5
- Blue: Rsp = 3e-6
- Purple: Rsp = 1e-6
- Cyan: Rsp = 1e-7
- Yellow: Rsp = 1e-8

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conclusions

* average residence time in LFF decreases algebraically for increasing injection current

* increasing additive noise extends LFF regime over a wider range of injection currents

* normalization of injection currents to $p_c$ shows collapse of data for different noise strengths with scaling exponent -1.75