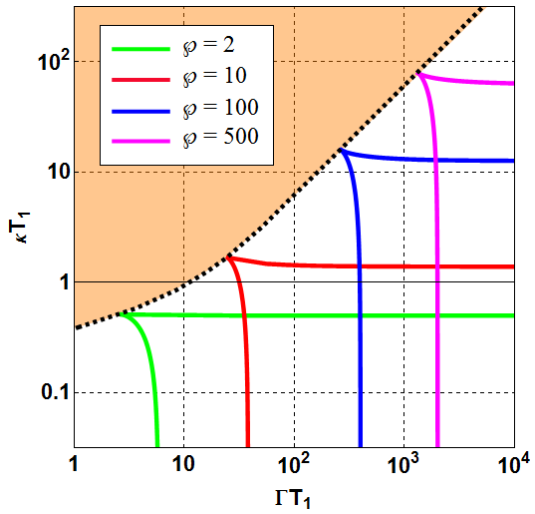

Fig. 3. The "phase diagram" contained information about oscillations in $g_{>}^{(2)}(\tau)$, for different pump-parameters $\wp$. The area below and to the right to the corresponding curves responds to the non-oscillating regime. The painted area above the dotted line corresponds to the bad-cavity lasers.

7. Conclusion

To summarize, the quantum theory of a spaser-based nanolaser was presented. We found that the average number of plasmons in the cavity mode near the generation threshold can be less than unity both in our theory and experiments [4]. Despite this fact, the spectral line width narrows sufficiently, when passing through the threshold. We argued that it is possible behaviour since the coherence is preserved by the active atoms, which relax slowly than the damping of cavity mode occurs. We also studied the amplitude fluctuations of the generation and concluded that they change the shape of the spectrum and lead to the damped oscillations in the second-order correlation function $g^{(2)}(\tau)$ above the generation threshold. It is unusual behaviour for the good-cavity lasers, and we investigated in detail what relationship between cavity decay rate κ and homogeneous broadening of active atoms Γ corresponds to the bad-cavity damped oscillations and non-oscillating regime.

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