Title: Experimental optimization of the speckle contrast

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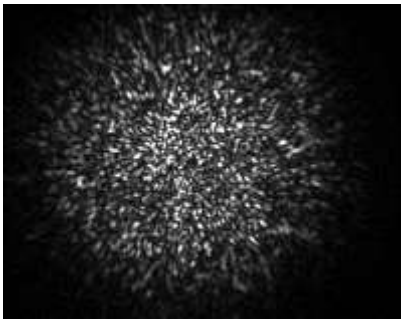
Keywords: diode lasers, speckle contrast

Description:
Speckle is an interference pattern generated when a diffusive surface is illuminated with coherent laser light. Speckle is undesirable in imaging systems because it degrades the image quality. On the other hand, speckle contains information that can be used to recover, after calibration, the spectrum of light, or statistical properties of the diffusive surface. Therefore, for imaging applications speckle needs to be mitigated, while for many other applications, speckle needs to me maximized. The figure shows an example of a speckle pattern from the output of a multimode optical fibre [1].



The goal of this project, which can be a Bachelor or a Master thesis, is to implement an experimental setup with an optical attenuator and a micrometric linear stage, both remotely controllable, that will allow to find suitable physical parameters (the optical feedback strength and external cavity length) that optimize (maximize or minimize) the speckle contrast.

The project requires experimental work in our lab, which is doable in present COVID situation because we have a large, well-equipped and well-ventilated lab, where only one or two persons work simultaneously.

References:
[1] D. Halpaap, J. Tiana-Alsina, M. Vilaseca, C. Masoller, “Experimental characterization of the speckle pattern at the output of a multimode optical fiber”, Opt. Express 27, 27738 (2019).

Required skills: The student should be familiar with Matlab or python; additional knowledge of LabVIEW, machine learning, etc. is desirable but not mandatory.

Additional information: A scholarship is possible depending on the skills of the candidate.