RANDOM LASER APPLICATIONS IN BIOMEDICINE

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Random laser (RL) is produced by the combination of an optical gain medium with a dispersive environment. In conventional lasers, optical feedback is provided by mirrors. However, in a RL the amplified light can be scattered multiple times, resulting in stimulated emission and laser action without the need of external mirrors. Furthermore, since RL phenomenon is based on scattering events, the emission is highly sensitive to the scattering characteristics of its own lasing medium.

In this communication, we present our results in RL obtained in tissues impregnated with different types of dyes. For instance, a chemically modified fluorescent anticancer drugs will be presented as an example of a dye molecule for RL [1]. Further investigations using commercial rhodamine dyes will also be shown. We have studied RL signal from mouse brain slices impregnated with a dye solution [2]. Moreover, a transgenic mouse model of Huntington's disease, which is a neurodegenerative disorder characterized by motor and psychiatric symptoms, has been studied. The RL emission data were explored using a multivariate statistical analysis based on principal component analysis and linear discriminant analysis. This statistical analysis allowed us to correctly classify the emission spectra from healthy and from transgenic mice [3]. Finally, our last results on RL from human blood samples will be presented too and the potential use of this optical tool for medical diagnosis assistance will be discussed. It includes an observational case study, in which a multivariate statistical analysis of the RL spectra allowed to differentiate the blood of Chronic Lymphocytic Leukaemia patients from that of healthy controls [4].

References

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Figures

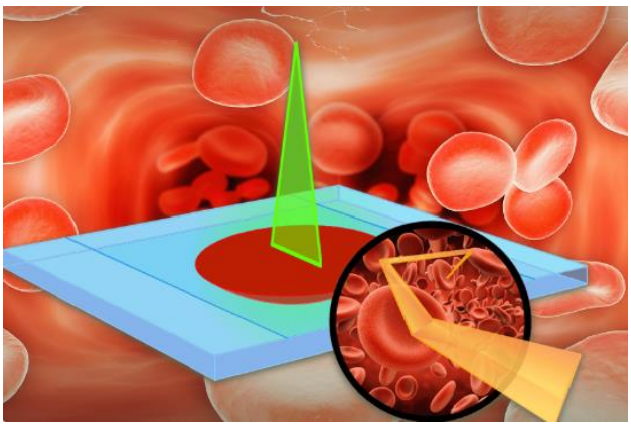

Figure 1. Scheme of the use of RL analysis using a human blood sample.