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Open channels are peculiar incidents modes of the optical field that are transmitted by a highly diffusing medium with high efficiency (100 % in the ideal case). The existence of these modes has been predicted by Dorokhov et al. [1] more than 25 years ago. Although many experiments were made to prepare these modes [2,3], the maxima of transmission obtained in experiments, are ever much lower than 100 %. To test the theory, we have considered here another Dorokhov's prediction: the average transmission of the modes that sustain the transmitted field must be T_T=66%, where T_T is defined by $N_2\, T_T = N_1\, T$ (where T is the averaged transmission of energy, and N_1 and N_2 the number of incident and transmitted modes i.e. the size of the incident and transmitted mode basis).

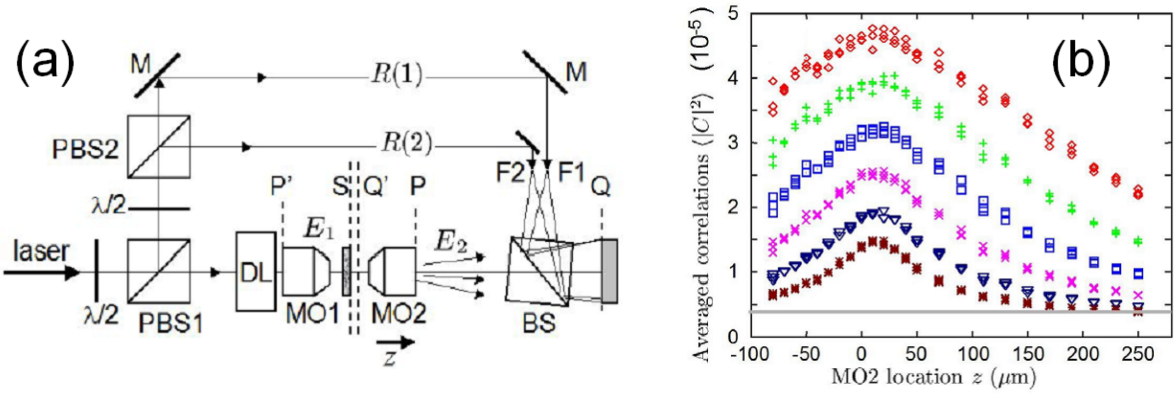

Fig.1 (a) Holographic experimental setup. (b) Residual correlation of the transmitted field. The horizonal axis is SQ'. The sample transverse size is L=70 μm red, 50 μm green, 35 μm blue.... The horizontal grey line is the residual correlation expected for $N_1 = N_2$.

To verify this prediction, we have measured N_2 on a slab sample of Z_NO powder (transverse size L<=70 μm, thickness 20 μm) [4], by assuming that N_1 is given by the sample geometry. The experimental setup is seen in Fig. 1(a). The incident fields are random (there are scrambled by a diffusing liquid DL) and digital holography is used to measure the complex transmitted field $E(x,y)$ for the two polarisations. N_2 is measured by analysing the residual correlations of the transmitted field measured for uncorrelated incident fields.

Since the average transmission is T=1/25, we expect $N_2 = N_1/16$. To get this optimal result, the transverse size of sample L must be infinite and the defocusing SQ' of the microscope objective MO2 must be zero (where S is the sample outgoing surface and Q' the plane imaged by MO2). Figure 1 (b) shows the residual correlation (which is proportional to $1/N2$) as a function these two parameters. We get $N_2 = N_1/12$ without extrapolation, and $N_2 = N_1/16$ with extrapolation to L infinite. Here, the open channel effect is huge (factor 16) and the aggreement with the Dorokhov's prediction is excellent.

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