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REFLECTION-INDUCED SOURCE CORRELATION IN SPONTANEOUS EMISSION

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Drabe *et al.* Reply: In his Comment¹ on our Letter,² James questions the quasihomogeneity and the violation of Wolf's scaling law of the light source we discuss.

In Wolf's³ analysis the source is defined in the usual way, and is taken to be a plane close to, but not inside, the physical source, which consists in our case of the fluorescent film and its reflection from the mirror. The plane in which our source will be proven to be quasihomogeneous is parallel to the fluorescent film but at a distance at least an optical wavelength away from it. To prove the quasihomogeneous character of our light source consider an infinitely large monolayer of fluorescing molecules parallel to the mirror. In a plane parallel and close to this monolayer the ensemble average of the cross-spectral density $W_{\text{ens}}(\mathbf{r}_1, \mathbf{r}_1 + \Delta\mathbf{r}, \omega)$ is basically the sum over all cross-spectral densities of each emitter. Given the infinite extension of the fluorescing monolayer, $W_{\text{ens}}(\mathbf{r}_1, \mathbf{r}_1 + \Delta\mathbf{r}, \omega)$ cannot be dependent on the absolute position $\mathbf{r}_1$ in the source plane, simply because all points $\mathbf{r}_1$ are equivalent. Therefore W_{ens} is only dependent on $\Delta\mathbf{r}$. Similarly, the spectrum $W_{\text{ens}}(\mathbf{r}_1, \mathbf{r}_1, \omega)$ is independent of $\mathbf{r}_1$, again simply because all points $\mathbf{r}_1$ in the infinitely large source plane are equivalent. Neither the finite thickness of the fluorescent film nor the distance of the film to the mirror will affect this conclusion. In other words, the source is quasihomogeneous.

In the above arguments, the source plane is taken to be infinitely large, which physically means that edge effects due to the finite spatial extent of excitation can be neglected. This requires that the diameter of the source plane should be considered to be much less than the diameter of the exciting HeNe laser beam. The experimental spectrum shown² in our Fig. 2 (upper spectrum) is taken under these conditions and shows that the spec-

trum in the vicinity of the fluorescent film is different from the spectrum in the far field. We emphasize that the argument for the violation of Wolf's scaling law in our Letter is not based upon Eq. (11) only; we also discuss qualitatively the relevance of the spectra taken close to the fluorescent film.

Finally, we agree with James that it may be relevant to a further analysis of our light source to investigate its cross-spectral purity.

In summary, a quasihomogeneous source can be defined for our system which shows an optical spectrum that is variant with propagation through free space.

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¹D. F. V. James, preceding Comment, Phys. Rev. Lett. **66**, 675 (1991).

²K. E. Drabe *et al.*, Phys. Rev. Lett. **65**, 1427 (1990).

³E. Wolf, Phys. Rev. Lett. **56**, 1370 (1986).