2. Conclusion

We have described above a multiplex method in super-resolved imaging that offers large signals on short timescales and thus may be used to image dynamic systems. The technique described here is not tied to specific molecular transitions and may be scaled to spectral ranges convenient for specific applications. Nanoprobes may be distributed in prepared samples and may be attached to specific regions of interest. Functionalized nanoprobes find more and more biological applications [25]. Nanoprobes may be actively conjugated to specific molecular species in a manner similar to PALM/STORM or may be passively present along the contours of the imaged domain.

This coherent, spectral-domain method makes use of ideas developed in super-resolved fluorescent imaging in the time domain. The key idea across these modalities is the conversion of imaging into mapping of isolated probes. It can be seen here that isolating signals in the time domain is just one example in a much broader class of methods. We have presented a method to isolate signals from individual probes in the spectral domain. The examples given make use of nonoverlapping spectra, but a more general approach could accommodate identification of signals from probes with overlapping spectra by projective methods. Our analysis also suggests the possibility of using other channels, such as coherence or lifetime, to provide a means to identify the signals needed to map discrete probes. We have made use of absorbance images, but since the signals are coherently scattered, phase images could be obtained and used as well. In summary, our development of spectral domain super-resolution imaging can be easily generalized and will prove useful for a variety of imaging modalities.

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