COMBINING MUELLER MATRIX IMAGING WITH SPATIAL FREQUENCY DOMAIN IMAGING

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Mueller matrix imaging has shown promise for sensing tissue alignment, and spatial frequency domain imaging (SFDI) is touted for adding depth sensitivity in turbid media. Combining the two techniques would seem to be straightforward. It is found that the spatial frequency domain Mueller matrix does not have the same behavior as a real-space Mueller matrix: it can be complex-valued, and it is not a convex sum of non-depolarizing Mueller matrices. In this presentation, the theory of polarized spatial frequency imaging will be reviewed and results from measurements will be presented.

In the graph below, we show the real and imaginary parts of the complex-valued spatial frequency domain (SFD) Mueller matrix of part of a caprine cerebellum measured at a spatial frequency $f = 5\ \mathrm{cm}^{-1}$ (lines horizontal).[1] The contrast in the real part is significantly higher than that shown in normal Mueller matrix imaging ($f = 0\ \mathrm{cm}^{-1}$, not shown). In addition, there are features in the imaginary part that highlight horizontal edges of features. It is believed that the real part of the SFD Mueller matrix filters multiple scattering and that the imaginary part of the SFD Mueller matrix highlights two-scatter events.

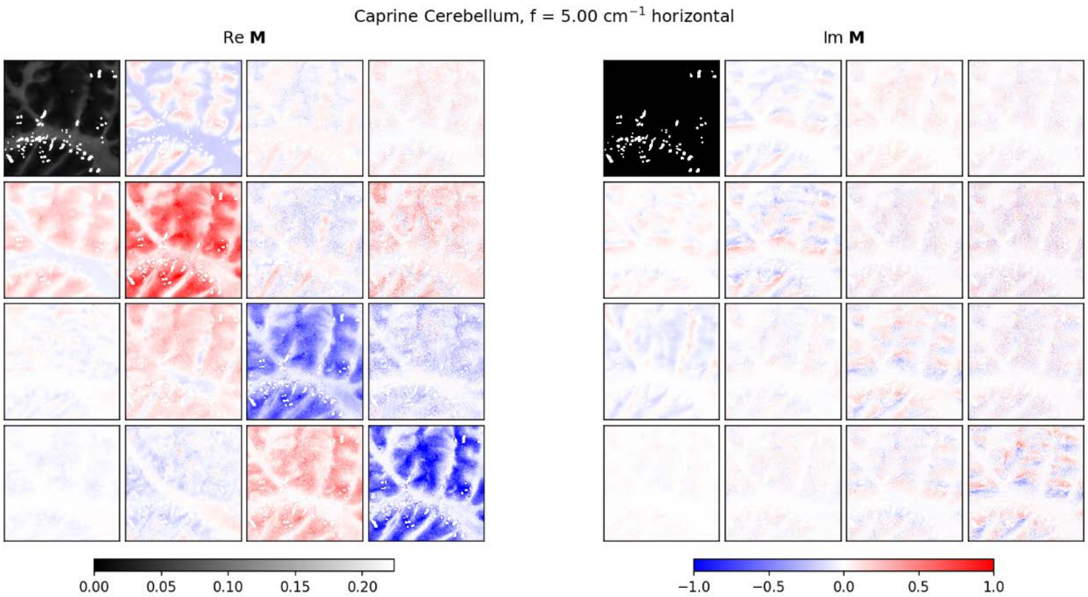

Fig. 1: Real (left) and imaginary (right) parts of the spatial frequency domain Mueller matrix measured from a section of caprine cerebellum.

[1]. J. Chue-Sang, M. Litorja, A.M. Goldfain, and T.A. Germer, J. Biomed. Opt. **27**, 126003 (2022)