Designing optimal states of light with the Wigner-Smith operator

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Abstract: In my presentation, I will speak about how to design wave fronts that are optimal for various purposes such as for maximising or minimising the time-delay in scattering [1], for reducing dispersion [2], for focusing on a target [3], for optical micro-manipulation [4], or for precision measurements [5]. The theoretical concept enabling the optimal solutions for all of these diverse applications turns out to be the Wigner-Smith operator that is constructed based on a system's scattering matrix. I will provide a review of this concept and shall illustrate how experimental access to the Wigner-Smith operator enables wave-front shaping protocols at the optimal level of efficiency.

[1] S. Rotter, P. Ambichl, and F. Libisch, Phys. Rev. Lett. 106, 120602 (2011)
[2] W. Xiong, P. Ambichl, Y. Bromberg, B. Redding, S. Rotter, and H. Cao, Phys. Rev. Lett. 117, 053901 (2016)
[3] P. Ambichl, A. Brandstötter, J. Böhm, M. Kühmayer, U. Kuhl, and S. Rotter, Phys. Rev. Lett. 119, 033903 (2017)
[4] M. Horodynski, M. Kühmayer, A. Brandstötter, K. Pichler, Y. V. Fyodorov, U. Kuhl, and S. Rotter, Nature Photonics (advance online publication, 2019)
[5] D. F. Bouchet, S. Rotter, A. P. Mosk (in preparation)