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Thermal Light as a Mixture of Sets of Coherent Pulses AGATA BRANCZYK, Perimeter Institute, AURELIA CHENU, Massachusetts Inst of Tech-MIT, JOHN SIPE, University of Toronto — Thermal states are fundamental states in many areas of physics. In quantum optics, the thermal state of the radiation field is often decomposed into delocalized states of light, yet decompositions involving localized pulses would be highly desirable. In previous work, we showed that thermal light cannot be represented as a mixture of single coherent pulses. In this work, we consider whether or not thermal light can be represented as a mixture of sets of coherent pulses.

We consider light propagation in a quasi-1D geometry, such as an optical fiber of length L. We define a set of associated functions $w_s(z)$ which satisfy $\int_{-L/2}^{L/2} w_s^*(z) w_{s'}(z) dz = \delta_{ss'}$ and use these functions to build coherent states. By decomposing thermal light in terms of such coherent states, we can represent it as a mixture of sets of localized pulses.

This decomposition into localized pulses will serve as a useful tool for studying interactions with thermal light in 1D. Its form makes modelling a finite frequency range very natural, while maintaining a representation in terms of localized pulses. This would come up when dealing with filtered thermal light. The decomposition also lends itself to treating thermal light that had been 'chopped' in the spatial domain.

Aurelia Chenu
Massachusetts Inst of Tech-MIT

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