# Novel Finite-Energy Spatiotemporally Confined Waves in Free Space and in the Presence of Temporal Dispersion

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Most of the well-known spatiotemporally localized waves, such as the focus wave mode, the splash mode, the modified power spectrum pulse, the focus X wave and the modified focus X wave are based on the Courant-Hilbert ansatz, whereby a solution to the scalar wave equation is given as a product of an appropriate "attenuation" factor and a function obeying a nonlinear characteristic (eikonal) equation. However, the derivation of more general finite-energy localized waves, e.g., the Bessel-Gauss focus wave mode, requires a superposition of more elementary Courant-Hilbert-type ones. In the first part of the talk, this technique will be extended in order to derive a novel class of luminal splash mode solutions to the Klein-Gordon equation based on superpositions of Gauss-Laguerre focus wave modes.

The bidirectional spectral representation has been developed in order to address the problem of deriving finite-energy localized waves by superposing more elementary ones. But, even within its framework, one must choose among a very large number of spectra those that can lead to interesting solutions. In the second part of the talk, a conformal transformation method due to Bateman and Cunningham will be used to derive more directly a novel class of luminal spatiotemporally confined waves to the scalar wave equation.