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Exact gravitational waves in non-local gravity

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We study exact solutions of infinite derivative gravity within the class of so-called almost universal spacetimes. For such an ansatz, the field equations reduce to a single non-local but linear equation which is exactly solvable with the ghost-free choice $\exp(-\ell^2 \Box)$ of the non-local form factor by eigenfunction expansion or using the heat kernel method. This procedure allows us to obtain non-local analogues of Aichelburg–Sexl and Hotta–Tanaka solutions which represent gravitational waves generated by null sources propagating in Minkowski, de Sitter or anti-de Sitter backgrounds. We discuss properties of these non-local solutions and also point out that the non-locality regularizes curvature singularities at the locations of the sources.

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