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# Newman-Penrose-Debye formalism for fields of various spins in pp-wave backgrounds

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Using Newman-Penrose formalism in tetrad and spinor notation, we perform separation of variables in the wave equations for massless fields of various spins s=1/2, 1, 3/2, 2 on the background of exact plane-fronted gravitational wave metrics. Then, applying Wald's method of adjoint operators, we derive equations for Debye potentials generating these fields and find inverse projection operators expressing multicomponet fields in terms of scalar potentials. For a number of shock wave backgrounds, as a special case of non-vacuum pp-waves, the exact solutions for Debye potentials are constructed explicitly. The possibility of generalization to the case of massive fields, in particular, construction of exact solutions to the Dirac and Proca equations are discussed. These results can be used in supergravity models on pp-wave backgrounds.

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