

Hyperfunction Solutions of the Zero-Rest-Mass Field Equations

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Abstract. In this paper it is shown how the Penrose transform maps tangential hyperfunction Dolbeault groups with coefficients in a power of the hyperplane section bundle on the hyperquadric of null twistors in projective twistor space isomorphically to all hyperfunction solutions of the massless field equations of nonnegative helicity on compactified Minkowski space. This is an extension of the Penrose transform which generated real-analytic solutions of the same field equations on the same space (cf. Eastwood, M., Penrose, R., Wells, R.O., [10]). In additions, one obtains the result that each hyperfunction solution of the massless field equations of nonnegative helicity is the sum of massless fields of positive and negative frequency, a generalization of the usual Fourier decomposition for solutions with appropriate growth conditions.

Table of Contents

0. Introduction	567
1. Real-Analytic and Hyperfunction Forms on the Null-Twistor Hyperquadric	573
2. Relative Cohomology, Hyperfunction Forms, and the Pullback Mapping	578
3. A Generalized Leray Spectral Sequence for Relative Cohomology	580
4. Pulling Back Hyperfunction Forms by Fibre-Integration	586
5. Comparison of the Abstract and Fibre-Integral Pullbacks	591
6. The Penrose Transform Acting on Hyperfunction Data	593
7. Penrose Transform Representations of Hyperfunction Massless Fields	597
References	599

0. Introduction

It was shown some time ago by Penrose that solutions of the zero-rest-mass field equations could be generated by transforming holomorphic functions defined on open subsets of 3-dimensional complex projective space $\mathbb{P}_3(\mathbb{C})$ to spinor fields on

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