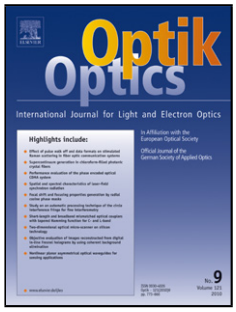

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PII: S0030-4026(16)31088-9
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2016.09.069
Reference: IJLEO 58212

To appear in:

Received date: 15-7-2016
Accepted date: 19-9-2016

Please cite this article as: R. ROOPKUMAR, Quaternionic One-dimensional Fractional Fourier Transform, *<![CDATA[Optik - International Journal for Light and Electron Optics]]>* (2016), http://dx.doi.org/10.1016/j.ijleo.2016.09.069

Quaternionic One-dimensional Fractional Fourier Transform

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Abstract

In this paper, we introduce quaternionic fractional Fourier transform of integrable (and square integrable) functions on $\mathbb{R}$ and prove that it is satisfying all the expected properties like linearity, inversion formula, Parseval's formula, convolution theorem and product theorem.

Keywords: Fractional Fourier transform, Convolution, Quaternion valued functions

2010 MSC: 44A15, 44A35, 46S10

1. Introduction

The fractional Fourier transform was introduced in [20] and the explicit definition of the kernel $K_\alpha(t,u)$ of this transform is given from [5] as follows. For $\alpha \in \mathbb{R}$, let

$$K_\alpha(t,u) = \begin{cases} \sqrt{\frac{1-i\cot\alpha}{2\pi}}\, e^{i\frac{t^2+u^2}{2}\cot\alpha - iut\csc\alpha}, & \alpha \notin \pi\mathbb{Z} \\ \delta(t-u), & \alpha \in 2\pi\mathbb{Z} \\ \delta(t+u), & \alpha+\pi \in 2\pi\mathbb{Z}. \end{cases}$$

Subsequently, many research works have been done on fractional Fourier transform. See [7, 8, 14, 15, 16, 20, 25, 30].

In view of signal processing,

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