

Accepted Manuscript

Group approach to the paraxial propagation of Hermite-Gaussian modes
in a parabolic medium

S. Cruz y Cruz, Z. Gress

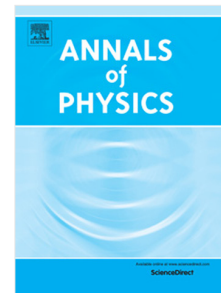
PII: S0003-4916(17)30154-9
DOI: <http://dx.doi.org/10.1016/j.aop.2017.05.020>
Reference: YAPHY 67403

To appear in: *Annals of Physics*

Received date : 3 March 2017
Accepted date : 30 May 2017

Please cite this article as: S. Cruz y Cruz, Z. Gress, Group approach to the paraxial propagation of Hermite-Gaussian modes in a parabolic medium, *Annals of Physics* (2017), <http://dx.doi.org/10.1016/j.aop.2017.05.020>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Group approach to the paraxial propagation of Hermite-Gaussian modes in a parabolic medium

S. Cruz y Cruz and Z. Gress

Instituto Politécnico Nacional, UPIITA, Av. Instituto Politécnico Nacional 2580, Col. La Laguna Ticomán, C.P. 07360, Ciudad de México, Mexico

Abstract

A group-theoretical approach to the paraxial propagation of Hermite-Gaussian modes based on the factorization method is presented. It is shown that the $su(1,1)$ and the $su(2)$ algebras generate the spectrum of propagation constants at any fixed transversal plane. The complete set of HG modes is decomposed into hierarchies that are used to establish the representation spaces of $SU(1,1)$ and $SU(2)$. The corresponding families of generalized coherent states are constructed and the variances of the quadratures and canonical variables are determined.

Keywords:

Hermite-Gaussian modes, dynamical algebras, coherent states

PACS: 02.20.Qs, 03.65.Fd, 42.25.Kb

1. Introduction

The set of Hermite-Gaussian (HG) modes has been one of the most studied families of paraxial beams. They play an important role in the study of laser resonators and optical waveguides [1] and have a number of applications in particle trapping [2], communications and signal processing [3], micro- and nano-manipulation of matter [4, 5] and high resolution imaging [6] among other areas (see also [7] and references quoted therein). Yet, the study of HG modes is far from being completely exhausted. New developments about their properties, generation and applications are currently addressed [8, 9, 10, 11]. In the paraxial approximation, where the directions of the normals to the wavefronts are close to the optical axis, the exact wave equation can be reduced to a parabolic-type one, the paraxial wave equation,

Download English Version:

<https://daneshyari.com/en/article/5495784>

Download Persian Version:

<https://daneshyari.com/article/5495784>

[Daneshyari.com](https://daneshyari.com)