# Nonlinear optical specifications of the Mathieu quantum dot with screw dislocation

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**Source** EUROPEAN PHYSICAL JOURNAL PLUS

Volume: 138 Issue: 8

DOI: 10.1140/epjp/s13360-023-04362-x

**Article Number** 724

**Published** AUG 17 2023

**Indexed** 2023-09-01

**Document Type** Article

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**Abstract** In this study, the nonlinear optical properties of screw dislocation Inx Ga1-x As/GaAs Mathieu quantum dots (MQDs) are theoretically investigated for the first time, focusing on the optical rectification (NOR),

second harmonic generation (SHG), and third harmonic generation (THG). In addition to the screw dislocation in the structure, external electric and magnetic fields, as well as the Aharonov-Bohm (AB) flux, are applied to the system. The aim of the study is to interpret how the characteristics of the NOR, SHG, and THG of MQDs change depending on the screw dislocation defect, external fields, AB flux, and structural factors such as indium concentration (In) and quantum dot width. The wave equation of the system is solved using the effective mass approximation and the Runge-Kutta-Fehlberg method in cylindrical coordinates, taking into account the direction of twist and the symmetry of the structure. The influence of all parameters on the nonlinear optical properties of the MQD with screw dislocation and their alternatives are discussed in detail. Furthermore, the optimality of the structure is discussed for a certain amount of screw dislocation, which can be important for experimental applications and device designs.

**Keywords**

**Keywords Plus:** LOW-NOISE; SYSTEM; ABSORPTION; GENERATION; ELECTRONS; EFFICIENT; GROWTH; STATES

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**Categories/ Classification**

Research Areas: Physics

Citation Topics: 5 Physics › 5.56 Quantum Mechanics › 5.56.1673 Geometric Phase

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## Journal information

EUROPEAN PHYSICAL JOURNAL PLUS 3.4

| | |
|---|---|
| **ISSN** | 2190-5444 |
| **Current Publisher** | SPRINGER HEIDELBERG, TIERGARTENSTRASSE 17, D-69121 HEIDELBERG, GERMANY |
| **Journal Impact Factor** | Journal Citation Reports ™ |
| **Research Areas** | Physics |
| **Web of Science Categories** | Physics, Multidisciplinary |

**Journal Impact Factor ™ (2022)**

**0.89**

**Journal Citation Indicator ™ (2022)**


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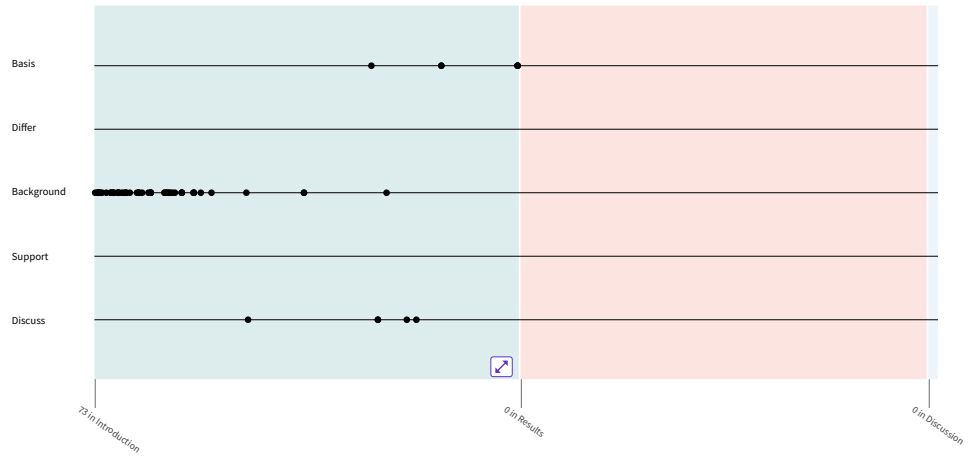


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