

Estrutura da Matéria e Física Computacional

Grupo de Pesquisa

Líder: Prof. Marco Polo Moreno de Souza
Vice-Líder: Prof. Ricardo de Sousa Costa

Demais Pesquisadores:

Prof. Carlos Mergulhão Júnior

Prof. Quesle da Silva Martins

Prof. Robinson Viana Figueroa Cadillo

Profa. Vanessa Delfino Kegler

Técnico:

Hailton César Alves dos Reis

Estudantes: 12

Linhas de Pesquisa

Ano de formação

2015

Área de atuação

Pesquisa teórica e experimental em diversos campos da física.

Linha de Pesquisa	Estudantes	Pesquisadores
Física de Partículas Elementares e Campos	3	Ricardo
Metrologia	0	Robinson
Modelagem de Sistemas Físicos	2	Carlos e Ricardo
Síntese e Caracterização de Nanomateriais	2	Quesle e Vanessa
Óptica, Física Atômica e Molecular	5	Marco

Seminários do grupo

- Debate científico
- Divulgação de resultados



ESTRUTURA DA MATÉRIA E FÍSICA COMPUTACIONAL



Seminário de Grupo

*Espectroscopia Raman em Óleos Essenciais
e Cálculo de Primeiros Princípios*

Prof. Quesle da Silva Martins
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Observing the optical frequency comb in the blue fluorescence of rubidium vapor

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Abstract

We report on the direct observation of the frequency comb printed in the blue fluorescence excitation spectrum of rubidium vapor induced by the combined action of an ultrashort pulse train and a cw diode laser. Each laser drives one step of the $5S-5P-5D$ two-photon transition in a copropagating configuration and the excitation spectrum is obtained while the cw-laser frequency is scanned over the rubidium D_2 lines. Measurements of the fluorescence as a function of the diode intensity and atomic density allow us to investigate how the effect of power broadening and absorption of the diode laser blur the excitation process. The experimental results and the printing process of the comb on the Doppler profile are described well by numerical integration of the Bloch equations for a cascade three-level system.

Keywords: coherent optical effects, multiphoton processes, atomic spectroscopy

Computational Analysis of 3D Ising Model Using Metropolis Algorithms

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Abstract. We simulate the Ising Model with the Monte Carlo method and use the algorithms of Metropolis to update the distribution of spins. We found that, in the specific case of the three-dimensional Ising Model, methods of Metropolis are efficient. Studying the system near the point of phase transition, we observe that the magnetization goes to zero. In our simulations we analyzed the behavior of the magnetization and magnetic susceptibility to verify the phase transition in a paramagnetic to ferromagnetic material. The behavior of the magnetization and of the magnetic susceptibility as a function of the temperature suggest a phase transition around $KT/J \approx 4.5$ and was evidenced the problem of finite size of the lattice to work with large lattice.

Outras produções científicas

Resumos publicados em congressos:

- **Vanessa Delfino Kegler**, Mário Lúcio Moreira, Cristiane Raubach Ratmann, Tatiane Strelow Lilge. Energy conversion using nano and meso structures of BaHfO₃. *XV Brazil MRS Meeting*, 2016, Campinas.
- J. P. Lopez, H. H. G. Miranda, Sandra S. Vianna, **Marco P. M. de Souza**. Parametric four-wave mixing in atomic vapor induced by a frequency-comb and a cw laser. *XXXIX National Meeting on Condensed Matter Physics*, 2016, Natal.
- Teo Victor Resende da Silva, **Marco P. M. de Souza**. Density matrix calculations of Doppler-broadened atomic systems implemented on GPUs. *XXXIX National Meeting on Condensed Matter Physics*, 2016, Natal.