


Scopus

Document details

[< Back to results](#) | 1 of 1[Export](#) [Download](#) [Print](#) [E-mail](#) [Save to PDF](#) [Add to List](#) [More... >](#)[Full Text](#) [View at Publisher](#)

Physics Letters, Section A: General, Atomic and Solid State Physics
Volume 379, Issue 32-33, 31 May 2015, Article number 23226, Pages 1828-1832

Vibration spectrum of a two-soliton molecule in dipolar Bose-Einstein condensates (Article)

Turmanov, B.Kh.^a, Baizakov, B.B.^a, Umarov, B.A.^b, Abdullaev, F.Kh.^b 

^aPhysical-Technical Institute, Uzbek Academy of Sciences, Tashkent, Uzbekistan

^bDepartment of Physics, Kulliyah of Science, International Islamic University Malaysia, Kuantan, Pahang, Malaysia

Abstract

[View references \(38\)](#)

Abstract We study the vibration of soliton molecules in dipolar Bose-Einstein condensates by variational approach and numerical simulations of the nonlocal Gross-Pitaevskii equation. We employ the periodic variation of the strength of dipolar atomic interactions to excite oscillations of solitons near their equilibrium positions. When the parametric perturbation is sufficiently strong the molecule breaks up into individual solitons, like the dissociation of ordinary molecules. The waveform of the molecule and resonance frequency, predicted by the developed model, are confirmed by numerical simulations of the governing equation. © 2015 Elsevier B.V.

Author keywords

[Bound state](#) [Dipolar interaction](#) [Soliton](#) [Vibration spectrum](#)

ISSN: 03759601

CODEN: PYLAA

Source Type: Journal

Original language: English

DOI: 10.1016/j.physleta.2015.05.020

Document Type: Article

Publisher: Elsevier B.V.

References (38)

[View in search results format >](#)

All [Export](#) [Print](#) [E-mail](#) [Save to PDF](#) [Create bibliography](#)

- 1 Abdullaev, F.Kh., Gammal, A., Kamchatnov, A.M., Tomio, L.
Dynamics of bright matter wave solitons in a Bose-Einstein condensate
(2005) *International Journal of Modern Physics B*, 19 (22), pp. 3415-3473. Cited 102 times.
doi: 10.1142/S0217979205032279
[View at Publisher](#)

- 2 Kevrekidis, P.G., Frantzeskakis, D.J., Carretero-González, R.
(2008) *Emergent Nonlinear Phenomena in Bose-Einstein Condensates: Theory and Experiment*. Cited 351 times.
Springer-Verlag Berlin, Heidelberg

Metrics  [View all metrics >](#)

1 Citation in Scopus
30th Percentile

0.22 Field-Weighted
Citation Impact



PlumX Metrics 

Usage, Captures, Mentions,
Social Media and Citations
beyond Scopus.

Cited by 1 document

Scattering of a two-soliton molecule by Gaussian potentials in dipolar Bose-Einstein condensates

Umarov, B.A., Aklan, N.A.B., Baizakov, B.B.
(2016) *Journal of Physics B: Atomic, Molecular and Optical Physics*

[View details of this citation](#)

Inform me when this document is cited in Scopus:

[Set citation alert >](#)

[Set citation feed >](#)

Related documents

Parametric excitation of solitons in dipolar bose-einstein condensates

Benseghir, A., Wan Abdullah, W.A.T., Umarov, B.A.
(2013) *Modern Physics Letters B*

Interaction of solitons in one-dimensional dipolar Bose-Einstein condensates and formation of soliton molecules

Baizakov, B.B., Al-Marzoug, S.M., Bahlouli, H.
(2015) *Physical Review A - Atomic, Molecular, and Optical*

Physics

- 3 Stratmann, M., Pagel, T., Mitschke, F.
Experimental observation of temporal soliton molecules
 (2005) *Physical Review Letters*, 95 (14), art. no. 143902. Cited 173 times.
http://oai.aps.org/oai/?verb=ListRecords&metadataPrefix=oai_apsmeta_2&set=journal:PRL:95
 doi: 10.1103/PhysRevLett.95.143902
[View at Publisher](#)
-
- 4 Rohrmann, P., Hause, A., Mitschke, F.
Solitons beyond binary: Possibility of fibre-optic transmission of two bits per clock period
 (2012) *Scientific Reports*, 2, art. no. 866. Cited 33 times.
 doi: 10.1038/srep00866
[View at Publisher](#)
-
- 5 Hause, A., Mitschke, F.
Higher-order equilibria of temporal soliton molecules in dispersion-managed fibers
 (2013) *Physical Review A - Atomic, Molecular, and Optical Physics*, 88 (6), art. no. 063843. Cited 12 times.
<http://oai.aps.org/filefetch?identifier=10.1103/PhysRevA.88.063843&component=fulltext&description=markup&format=xml>
 doi: 10.1103/PhysRevA.88.063843
[View at Publisher](#)
-
- 6 Hause, A., Hartwig, H., Böhm, M., Mitschke, F.
Binding mechanism of temporal soliton molecules
 (2008) *Phys. Rev. A*, 78, p. 063817. Cited 55 times.
-
- 7 Alamoudi, S.M., Al Khawaja, U., Baizakov, B.B.
Averaged dynamics of soliton molecules in dispersion-managed optical fibers
 (2014) *Physical Review A - Atomic, Molecular, and Optical Physics*, 89 (5), art. no. 053817. Cited 9 times.
<http://harvest.aps.org/bagit/articles/10.1103/PhysRevA.89.053817/apsxml>
 doi: 10.1103/PhysRevA.89.053817
[View at Publisher](#)
-
- 8 Grelu, P., Akhmediev, N.
Dissipative solitons for mode-locked lasers
 (2012) *Nature Photonics*, 6 (2), pp. 84-92. Cited 512 times.
 doi: 10.1038/nphoton2011345
[View at Publisher](#)
-
- 9 Assanto, G.
 (2012) *Nematicons: Spatial Optical Solitons in Nematic Liquid Crystals*. Cited 50 times.
 John Wiley NJ
-
- 10 Rasmussen, P.D., Bang, O., Królikowski, W.
Theory of nonlocal soliton interaction in nematic liquid crystals
 (2005) *Physical Review E - Statistical, Nonlinear, and Soft Matter Physics*, 72 (6), art. no. 066611. Cited 108 times.
http://oai.aps.org/oai/?verb=ListRecords&metadataPrefix=oai_apsmeta_2&set=journal:PRE:71
 doi: 10.1103/PhysRevE.72.066611
[View at Publisher](#)

Antisymmetric soliton in a dispersion-managed fiber laser
 Chong, A. , Buckley, J.R. , Wise, F.W.
 (2006) *Optics InfoBase Conference Papers*

[View all related documents based on references](#)

[Find more related documents in Scopus based on:](#)

[Authors >](#) [Keywords >](#)

-
- 11 Chen, W., Shen, M., Kong, Q., Shi, J., Wang, Q., Krolikowski, W.
Interactions of nonlocal dark solitons under competing cubic-quintic nonlinearities
- (2014) *Optics Letters*, 39 (7), pp. 1764-1767. Cited 18 times.
http://www.opticsinfobase.org/view_article.cfm?gotourl=http%3A%2F%2Fwww%2Eopticsinfobase%2Eorg%2FdirectPDFAccess%2F6EEF451D-9FA9-5D28-AED95ECED51E90A5_281946%2Fol-39-7-1764%2Epdf%3Fda%3D1%26id%3D281946%26seq%3D0%26mobile%3Dno&org=Elsevier%20Inc
doi: 10.1364/OL.39.001764
- View at Publisher
-
- 12 Griesmaier, A., Werner, J., Hensler, S., Stuhler, J., Pfau, T.
Bose-Einstein condensation of chromium
- (2005) *Physical Review Letters*, 94 (16), art. no. 160401. Cited 697 times.
<http://scitation.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=PRLTAO000094000016160401000001&idtype=cvips>
doi: 10.1103/PhysRevLett.94.160401
- View at Publisher
-
- 13 Pedri, P., Santos, L.
Two-dimensional bright solitons in dipolar Bose-Einstein condensates
- (2005) *Physical Review Letters*, 95 (20), art. no. 200404. Cited 195 times.
http://oai.aps.org/oai/?verb=ListRecords&metadataPrefix=oai_apsmeta_2&set=journal:PRL:95
doi: 10.1103/PhysRevLett.95.200404
- View at Publisher
-
- 14 Tikhonenkov, I., Malomed, B.A., Vardi, A.
Anisotropic solitons in dipolar Bose-Einstein condensates
- (2008) *Physical Review Letters*, 100 (9), art. no. 090406. Cited 116 times.
http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:PhysRevLett.100.090406&metadataPrefix=oai_apsmeta_2
doi: 10.1103/PhysRevLett.100.090406
- View at Publisher
-
- 15 Cuevas, J., Malomed, B.A., Kevrekidis, P.G., Frantzeskakis, D.J.
Solitons in quasi-one-dimensional Bose-Einstein condensates with competing dipolar and local interactions
- (2009) *Physical Review A - Atomic, Molecular, and Optical Physics*, 79 (5), art. no. 053608. Cited 58 times.
http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:PhysRevA.79.053608&metadataPrefix=oai_apsmeta_2
doi: 10.1103/PhysRevA.79.053608
- View at Publisher
-
- 16 Abdullaev, F.K., Brazhnyi, V.A.
Solitons in dipolar Bose-Einstein condensates with a trap and barrier potential
- (2012) *Journal of Physics B: Atomic, Molecular and Optical Physics*, 45 (8), art. no. 085301. Cited 8 times.
http://iopscience.iop.org/0953-4075/45/8/085301/pdf/0953-4075_45_8_085301.pdf
doi: 10.1088/0953-4075/45/8/085301
- View at Publisher
-

-
- 17 Benseghir, A., Wan Abdullah, W.A.T., Umarov, B.A., Baizakov, B.B.
Parametric excitation of solitons in dipolar bose-einstein condensates

(2013) *Modern Physics Letters B*, 27 (25), art. no. 1350184.
doi: 10.1142/S0217984913501844

View at Publisher
-
- 18 Anderson, D.
Variational approach to nonlinear pulse propagation in optical fibers

(1983) *Physical Review A*, 27 (6), pp. 3135-3145. Cited 787 times.
doi: 10.1103/PhysRevA.27.3135

View at Publisher
-
- 19 Malomed, B.A.
Chapter 2 Variational methods in nonlinear fiber optics and related fields

(2002) *Progress in Optics*, 43 (C), pp. 71-193. Cited 244 times.
doi: 10.1016/S0079-6638(02)80026-9

View at Publisher
-
- 20 Gruebele, M., Wolynes, P.G.
Vibrational Energy Flow and Chemical Reactions

(2004) *Accounts of Chemical Research*, 37 (4), pp. 261-267. Cited 120 times.
doi: 10.1021/ar030230t

View at Publisher
-
- 21 Abdullaev, F.K., Gammal, A., Malomed, B.A., Tomio, L.
Bright solitons in Bose-Einstein condensates with field-induced dipole moments

(2014) *Journal of Physics B: Atomic, Molecular and Optical Physics*, 47 (7), art. no. 075301.
http://iopscience.iop.org/0953-4075/47/7/075301/pdf/0953-4075_47_7_075301.pdf
doi: 10.1088/0953-4075/47/7/075301

View at Publisher
-
- 22 Nath, R., Santos, L.
Faraday patterns in two-dimensional dipolar Bose-Einstein condensates

(2010) *Physical Review A - Atomic, Molecular, and Optical Physics*, 81 (3), art. no. 033626. Cited 31 times.
http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:PhysRevA.81.033626&metadataPrefix=oai_apsmeta_2
doi: 10.1103/PhysRevA.81.033626

View at Publisher
-
- 23 Abdullaev, F.K., Gammal, A., Malomed, B.A., Tomio, L.
Bright solitons in quasi-one-dimensional dipolar condensates with spatially modulated interactions

(2013) *Physical Review A - Atomic, Molecular, and Optical Physics*, 87 (6), art. no. 063621. Cited 9 times.
<http://oai.aps.org/filefetch?identifier=10.1103/PhysRevA.87.063621&component=fulltext&description=markup&format=xml>
doi: 10.1103/PhysRevA.87.063621

View at Publisher
-

-
- 24 Köhler, T., Góral, K., Julienne, P.S.
Production of cold molecules via magnetically tunable Feshbach resonances
(2006) *Reviews of Modern Physics*, 78 (4), pp. 1311-1361. Cited 629 times.
[http://oai.aps.org/oai?](http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:RevModPhys.78.1311&metadataPrefix=oai_apsmeta_2)
[verb=GetRecord&Identifier=oai:aps.org:RevModPhys.78.1311&metadataPrefix=oai_apsmeta_2](http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:RevModPhys.78.1311&metadataPrefix=oai_apsmeta_2)
doi: 10.1103/RevModPhys.78.1311
View at Publisher
-
- 25 Chin, C., Grimm, R., Julienne, P., Tiesinga, E.
Feshbach resonances in ultracold gases
(2010) *Reviews of Modern Physics*, 82 (2), pp. 1225-1286. Cited 1296 times.
[http://oai.aps.org/oai?](http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:RevModPhys.82.1225&metadataPrefix=oai_apsmeta_2)
[verb=GetRecord&Identifier=oai:aps.org:RevModPhys.82.1225&metadataPrefix=oai_apsmeta_2](http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:RevModPhys.82.1225&metadataPrefix=oai_apsmeta_2)
doi: 10.1103/RevModPhys.82.1225
View at Publisher
-
- 26 Lu, M., Burdick, N.Q., Youn, S.H., Lev, B.L.
Strongly dipolar Bose-Einstein condensate of dysprosium
(2011) *Physical Review Letters*, 107 (19), art. no. 190401. Cited 367 times.
[http://oai.aps.org/filefetch?](http://oai.aps.org/filefetch?identifier=10.1103/PhysRevLett.107.190401&component=fulltext&description=markup&format=xml)
[identifier=10.1103/PhysRevLett.107.190401&component=fulltext&description=markup&format=xml](http://oai.aps.org/filefetch?identifier=10.1103/PhysRevLett.107.190401&component=fulltext&description=markup&format=xml)
doi: 10.1103/PhysRevLett.107.190401
View at Publisher
-
- 27 Aikawa, K., Frisch, A., Mark, M., Baier, S., Rietzler, A., Grimm, R., Ferlaino, F.
Bose-Einstein condensation of erbium
(2012) *Physical Review Letters*, 108 (21), art. no. 210401. Cited 319 times.
[http://oai.aps.org/filefetch?](http://oai.aps.org/filefetch?identifier=10.1103/PhysRevLett.108.210401&component=fulltext&description=markup&format=xml)
[identifier=10.1103/PhysRevLett.108.210401&component=fulltext&description=markup&format=xml](http://oai.aps.org/filefetch?identifier=10.1103/PhysRevLett.108.210401&component=fulltext&description=markup&format=xml)
doi: 10.1103/PhysRevLett.108.210401
View at Publisher
-
- 28 Sinha, S., Santos, L.
Cold dipolar gases in quasi-one-dimensional geometries
(2007) *Physical Review Letters*, 99 (14), art. no. 140406. Cited 66 times.
[http://oai.aps.org/oai?](http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:PhysRevLett.99.140406&metadataPrefix=oai_apsmeta_2)
[verb=GetRecord&Identifier=oai:aps.org:PhysRevLett.99.140406&metadataPrefix=oai_apsmeta_2](http://oai.aps.org/oai?verb=GetRecord&Identifier=oai:aps.org:PhysRevLett.99.140406&metadataPrefix=oai_apsmeta_2)
doi: 10.1103/PhysRevLett.99.140406
View at Publisher
-
- 29 Paré, C., Bélanger, P.-A.
Antisymmetric soliton in a dispersion-managed system
(1999) *Optics Communications*, 168 (1), pp. 103-109. Cited 57 times.
doi: 10.1016/S0030-4018(99)00337-5
View at Publisher
-
- 30 Feng, B.-F., Malomed, B.A.
Antisymmetric solitons and their interactions in strongly dispersion-managed fiber-optic systems
(2004) *Optics Communications*, 229 (1-6), pp. 173-185. Cited 25 times.
doi: 10.1016/j.optcom.2003.10.025
View at Publisher
-

-
- 31 Uzer, T., Miller, W.H.
Theories of intramolecular vibrational energy transfer
(1991) *Physics Reports*, 199 (2), pp. 73-146. Cited 251 times.
doi: 10.1016/0370-1573(91)90140-H
[View at Publisher](#)
-
- 32 Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flennary, B.P.
(1996) *Numerical Recipes. The Art of Scientific Computing*. Cited 22511 times.
Cambridge University Press Cambridge
-
- 33 Agrawal, G.P.
(1995) *Nonlinear Fiber Optics*. Cited 13803 times.
Academic Press New York
-
- 34 Landau, L.D., Lifshitz, E.M.
(1988) *Mechanics*. Cited 111 times.
Nauka Moscow
-
- 35 Atkins, P., Friedman, R.
(2005) *Molecular Quantum Mechanics*. Cited 1302 times.
Oxford University Press New York
-
- 36 García-Ripoll, J.J., Pérez-García, V.M., Torres, P.
Extended parametric resonances in nonlinear Schrödinger systems
(1999) *Physical Review Letters*, 83 (9), pp. 1715-1718. Cited 123 times.
[View at Publisher](#)
-
- 37 Rajendran, S., Muruganandam, P., Lakshmanan, M.
Nonstationary excitations in Bose-Einstein condensates under the action of periodically varying scattering length with time dependent frequencies
(2007) *Physica D: Nonlinear Phenomena*, 227 (1), pp. 1-7. Cited 7 times.
doi: 10.1016/j.physd.2007.01.001
[View at Publisher](#)
-
- 38 Kevrekidis, P.G., Drossinos, Y.
Nonlinearity from linearity: The Ermakov-Pinney equation revisited
(2007) *Mathematics and Computers in Simulation*, 74 (2-3), pp. 196-202. Cited 14 times.
doi: 10.1016/j.matcom.2006.10.005
[View at Publisher](#)
-

👤 Baizakov, B.B.; Physical-Technical Institute, Uzbek Academy of Sciences, Tashkent, Uzbekistan;

email:baizakov@uzsci.net

© Copyright 2017 Elsevier B.V., All rights reserved.

About Scopus

- What is Scopus
- Content coverage
- Scopus blog
- Scopus API
- Privacy matters

Language

- 日本語に切り替える
- 切换到简体中文
- 切换到繁體中文
- Русский язык

Customer Service

- Help
- Contact us

ELSEVIER

[Terms and conditions](#) [Privacy policy](#)

Copyright © 2017 Elsevier B.V. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

Cookies are set by this site. To decline them or learn more, visit our [Cookies page](#).

