Acoustic

1-Acoustic metamaterials for sound absorption and insulation in buildings

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By Arjunan, A (Arjunan, Arun) [1] , [4] ; Baroutaji, A (Baroutaji, Ahmad) [2] ; Robinson, J (Robinson, John) [1] , [3] ; Vance, A (Vance, Aaron) [1] ; Arafat, A (Arafat, Abul) [1] (provided by Clarivate)
Source BUILDING AND ENVIRONMENT Volume 251 DOI 10.1016/j.buildenv.2024.111250 Article Number 111250 Published MAR 1 2024 Early Access JAN 2024 Indexed 2024-03-06 Document Type Article

Abstract
Despite the emergence of acoustic metamaterials with superior sound absorption and transmission loss, their adoption for building sound insulation has been limited. Sound insulation design in buildings is still informed by the acoustic performance of conventional materials, where the mass law contradicts light weighting when it comes to acoustic design. In any case buildings close to noisy environments such as motorways, railway lines and airports still suffer from significant low frequency noise pollution. Although the limited working bandwidth of acoustic metamaterials is a major issue limiting its application, combining meta-units that interact at various frequencies alongside multi-layer conventional solutions can deliver superior sound insulation in buildings. The review put forwards acoustic metamaterials, specifically emphasising superior sound absorption and transmission/insertion loss as critical properties for effective building sound insulation. The paper reveals a variety of acoustic metamaterials that can be adopted to compliment conventional sound insulation approaches for acoustically efficient building design. The performance of these metamaterials is then explained through their characteristic negative mass density, bulk modulus or repeating or locally resonating microstructure. The review is also extended to air transparent acoustic metamaterials that can be used for sound insulation of building ventilation. Lastly the prospects and challenges regarding the adoption of acoustic metamaterials in building insulation are also discussed. Overall, tuneable, and multifunctional acoustic metamaterials when thoughtfully integrated to building sound insulation can lead to significant acoustic comfort, space-saving and lightweighting.

Keywords
Author Keywords
Acoustic metamaterialsSound insulationSound reductionVentilationBuilding design
Keywords Plus
NOISE-CONTROLDESIGNMETASURFACEMODELATTENUATIONINDEX

Acoustic

2-Interacting Dark Energy after DESI Baryon Acoustic Oscillation Measurements

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By Giarè, W (Giare, William) [1] ; Sabogal, MA (Sabogal, Miguel A.) [2] ; Nunes, RC (Nunes, Rafael C.) [2] , [3] ; Di Valentino, E (Di Valentino, Eleonora) [1] **(provided by Clarivate) Source PHYSICAL REVIEW LETTERS Volume 133 Issue 25 DOI 10.1103/PhysRevLett.133.251003 Article Number 251003 Published DEC 18 2024 Indexed 2025-01-05 Document Type Article**

Abstract

We investigate the implications of the baryon acoustic oscillations measurement released by the Dark Energy Spectroscopic Instrument for interacting dark energy (IDE) models characterized by an energy-momentum flow from dark matter to dark energy. By combining Planck-2018 and Dark Energy Spectroscopic Instrument data, we observe a preference for interactions, leading to a nonvanishing interaction rate xi = -0.32 & thorn;0.18 -0.14, which results in a present-day expansion rate H 0 = 70.8 & thorn;1.4 -1.7 km/s/Mpc, reducing the tension with the value provided by the SH0ES Collaboration to less than similar to 1.36. The preference for interactions remains robust when including measurements of the expansion rate H (z) obtained from the relative ages of massive, early-time, and passively evolving galaxies, as well as when considering distance moduli measurements from Type Ia supernovae sourced from the Pantheon-plus catalog using the SH0ES Cepheid host distances as calibrators. Overall, the IDE framework provides an equally good, or better, explanation of both high- and low-redshift background observations compared to the lambda cold dark matter model, while also yielding higher H 0 values that align more closely with the local distance ladder estimates. However, a limitation of the IDE model is that it predicts lower Omega m and higher 68 values, which may not be fully consistent with large-scale structure data at the perturbation level.

Acoustic

3-DESI 2024 III: baryon acoustic oscillations from galaxies and quasars

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By Adame, AG (Adame, A. G.) [1] ; Aguilar, J (Aguilar, J.) [2] ; Ahlen, S (Ahlen, S.) [3] ; Alam, S (Alam, S.) [4] ; Alexander, DM (Alexander, D. M.) [5] , [6] ; Alvarez, M (Alvarez, M.) [2] ; Alves, O (Alves, O.) [7] ; Anand, A (Anand, A.) [2] ; Andrade, U (Andrade, U.) [7] , [8] ; Armengaud, E (Armengaud, E.) [9] ; **(provided by Clarivate) Source JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS Issue 4 DOI 10.1088/1475-7516/2025/04/012 Article Number 012 Published APR 2025 Indexed 2025-08-02 Document Type Article**

Abstract

We present the DESI 2024 galaxy and quasar baryon acoustic oscillations (BAO) measurements using over 5.7 million unique galaxy and quasar redshifts in the range $0.1 < z < 2.1$. Divided by tracer type, we utilize 300,017 galaxies from the magnitude-limited Bright Galaxy Survey with $0.1 < z < 0.4$, 2,138,600 Luminous Red Galaxies with $0.4 < z < 1.1$, 2,432,022 Emission Line Galaxies with $0.8 < z < 1.6$, and 856,652 quasars with $0.8 < z < 2.1$, over a similar to 7, 500 square degree footprint. The analysis was blinded at the catalog-level to avoid confirmation bias. All fiducial choices of the BAO fitting and reconstruction methodology, as well as the size of the systematic errors, were determined on the basis of the tests with mock catalogs and the blinded data catalogs. We present several improvements to the BAO analysis pipeline, including enhancing the BAO fitting and reconstruction methods in a more physically-motivated direction, and also present results using combinations of tracers. We employ a unified BAO analysis method across all tracers. We present a re-analysis of SDSS BOSS and eBOSS results applying the improved DESI methodology and find scatter consistent with the level of the quoted SDSS theoretical systematic uncertainties. With the total effective survey volume of similar to 18 Gpc(3), the combined precision of the BAO measurements across the six different redshift bins is similar to 0.52%, marking a 1.2-fold improvement over the previous state-of-the-art results using only first-year data. We detect the BAO in all of these six redshift bins. The highest significance of BAO detection is 9.1 sigma at the effective redshift of 0.93, with a constraint of 0.86% placed on the BAO scale. We find that our observed BAO scales are systematically larger than the prediction of the Planck 2018-Lambda CDM at $z < 0.8$. We translate the results into transverse comoving distance and radial Hubble distance measurements, which are used to constrain cosmological models in our companion paper.

Keywords

Author Keywords

baryon acoustic oscillationscosmological parameters from LSSpower spectrum

Keywords Plus

DARK ENERGYTARGET-SELECTIONPOWER-SPECTRUMCOVARIANCE MATRICESDISTANCE MEASUREMENTSRECONSTRUCTIONSCALEVALIDATIONEVOLUTIONMODELS

Acoustic

4-DESI 2024 IV: Baryon Acoustic Oscillations from the Lyman alpha forest

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By Adame, AG (Adame, A. G.) [1] ; Aguilar, J (Aguilar, J.) [2] ; Ahlen, S (Ahlen, S.) [3] ; Alam, S (Alam, S.) [4] ; Alexander, DM (Alexander, D. M.) [5] , [6] ; Alvarez, M (Alvarez, M.) [2] ; Alves, O (Alves, O.) [7] ; Anand, A (Anand, A.) [2] , [13] ; Andrade, U (Andrade, U.) [7] , [8] ; Armengaud, E (Armengaud, E.) [9] ; Group Author DESI Collaboration (DESI Collaboration) (provided by Clarivate) **Source JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS Issue 1 DOI 10.1088/1475-7516/2025/01/124 Article Number 124 Published JAN 2025 Indexed 2025-03-07 Document Type Article**

Abstract

We present the measurement of Baryon Acoustic Oscillations (BAO) from the Lyman- a (Lya) forest of high-redshift quasars with the first-year dataset of the Dark Energy Spectroscopic Instrument (DESI). Our analysis uses over 420 000 Lya forest spectra and their correlation with the spatial distribution of more than 700 000 quasars. An essential facet of this work is the development of a new analysis methodology on a blinded dataset. We conducted rigorous tests using synthetic data to ensure the reliability of our methodology and findings before unblinding. Additionally, we conducted multiple data splits to assess the consistency of the results and scrutinized various analysis approaches to confirm their robustness. For a given value of the sound horizon (rd), we measure the expansion at zeff = 2.33 with 2% precision, H(zeff) = (239.2 +/- 4.8) (147.09Mpc/ rd) km/s/Mpc. Similarly, we present a 2.4% measurement of the transverse comoving distance to the same redshift, DM (zeff) = (5.84 +/- 0.14) (rd/147.09Mpc) Gpc. Together with other DESI BAO measurements at lower redshifts, these results are used in a companion paper to constrain cosmological parameters.

Keywords

Author Keywords

baryon acoustic oscillationscosmological parameters from LSSLyman alpha forestredshift surveys

Keywords Plus

BROAD-ABSORPTION-LINEPOWER SPECTRUMCIRCUMGALACTIC MEDIUMCROSS-CORRELATIONREDSHIFTVALIDATIONEVOLUTIONQUASARSIMPACTERRORS

Acoustic

5-Hints of Nonminimally Coupled Gravity in DESI 2024 Baryon Acoustic Oscillation Measurements

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By Ye, G (Ye, Gen) [1] ; Martinelli, M (Martinelli, Matteo) [2] , [3] ; Hu, B (Hu, Bin) [4] ; Silvestri, A (Silvestri, Alessandra) [1] (provided by Clarivate) **Source PHYSICAL REVIEW LETTERS Volume 134 Issue 18 DOI 10.1103/PhysRevLett.134.181002 Article Number 181002 Published MAY 8 2025 Indexed 2025-05-25 Document Type Article**

Abstract

The cosmic microwave background (CMB) and baryon acoustic oscillations (BAO) are two of the most robust observations in cosmology. The recent BAO measurements from the DESI collaboration have presented, for the first time, inconsistency between BAO and CMB within the standard cosmological model ACDM, indicating a preference for dynamical dark energy over a cosmological constant. We analyze the theoretical implication of the DESI BAO observation for dark energy and gravity employing a nonparametric reconstruction approach for both the dark energy equation of state wDE(a) and the effective field theory coefficients. We find that the DESI data can rule out quintessence dark energy by indicating a crossing of the phantom divide at z less than or similar to 1. Furthermore, when analyzed within the broad context of Horndeski gravity which includes general relativity and many known modified gravity theories such as generalized Galileons, f(R), and Brans-Dicke, our result implies that gravity should be nonminimally coupled to explain the observations, establishing the DESI result as the first hint of modified gravity. Based on these insights, we propose the thawing gravity model to explain the nonminimal coupling and phantom crossing indicated by observation, which also fits better to DESI BAO, CMB, and type Ia Supernovae data than ACDM.

Acoustic

6-Path planning and topology-aided acoustic emission damage localization in high-strength bolt connections of bridges

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By Li, D (Li, Dan) [1] , [2] ; Nie, JH (Nie, Jia-Hao) [1] , [2] ; Wang, H (Wang, Hao) [1] , [2] ; Yu, T (Yu, Tao) [1] , [2] ; Kuang, KSC (Kuang, Kevin Sze Chiang) [3] (provided by Clarivate) **Source ENGINEERING STRUCTURES Volume 332 DOI 10.1016/j.engstruct.2025.120103 Article Number 120103 Published JUN 1 2025 Early Access MAR 2025 Indexed 2025-03-26 Document Type Article**

Abstract

As the high-strength bolt loosening, corrosion, fracture, falling off, and plate cracking problems become increasingly severe, real-time monitoring of critical bolt connections in bridges is in great demand. Considering the complex geometry of large-scale bolt connections with multiple holes, a path planning and topology-aided method was presented for damage localization using acoustic emission (AE). The path planning algorithm, artificial potential field-guided rapidly-exploring random tree* (APF-RRT*), was introduced to adaptively estimate the shortest distances from the source to sensors while avoiding bolt holes, which were characterized as the actual propagation paths of AE waves. The topology was constructed to represent the geometric relationship between potential source locations and sensors. The shortest distances corresponded to the edges in the topology that connected the vertices of the structure and sensors. The vertex that minimized the error function of arrival times and distances was the predicted damage location. With the help of path planning and topology, it eliminates the straight-line wave propagation assumption, the time-consuming iterative optimization process, and the need for extensive training data. Through the experiment on a full-scale high-strength bolt connection plate, the proposed method was demonstrated to achieve real-time damage localization with higher accuracy and robustness than the time-of-arrival (TOA) method, delta-T mapping method, Gaussian process (GP)-based method, artificial neural network (ANN)-based method, and the counterpart method without topology.

Keywords

Author Keywords

BridgesLarge-scale bolt connectionsDamage localizationAcoustic emissionPath planningTopology

Keywords Plus

SOURCE LOCATIONJOINTSASTERISK

Acoustic

7-Constraints on Interacting Dark Energy Models from the DESI Baryon Acoustic Oscillation and DES Supernovae Data

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By Li, TN (Li, Tian-Nuo) [1] ; Wu, PJ (Wu, Peng-Ju) [1] ; Du, GH (Du, Guo-Hong) [1] ; Jin, SJ (Jin, Shang-Jie) [1] , [2] ; Li, HL (Li, Hai-Li) [3] ; Zhang, JF (Zhang, Jing-Fei) [1] ; Zhang, X (Zhang, Xin) [1] , [4] , [5]
(provided by Clarivate) Source ASTROPHYSICAL JOURNAL Volume 976 Issue 1 DOI 10.3847/1538-4357/ad87f0 Article Number 1 Published NOV 1 2024 Indexed 2024-11-17Document Type Article

Abstract

The recent results from the first-year baryon acoustic oscillations (BAO) data released by the Dark Energy Spectroscopic Instrument (DESI), combined with cosmic microwave background (CMB) and Type Ia supernova (SN) data, have shown a detection of significant deviation from a cosmological constant for dark energy. In this work, we utilize the latest DESI BAO data in combination with the SN data from the full 5 yr observations of the Dark Energy Survey and the CMB data from the Planck satellite to explore potential interactions between dark energy and dark matter. We consider four typical forms of the interaction term Q. Our findings suggest that interacting dark energy (IDE) models with Q proportional to rho de support the presence of an interaction where dark energy decays into dark matter. Specifically, the deviation from Lambda CDM for the IDE model with Q = beta H 0 rho de reaches the 3 sigma level. These models yield a lower value of Akaike information criterion than the Lambda CDM model, indicating a preference for these IDE models based on the current observational data. For IDE models with Q proportional to rho c, the existence of interaction depends on the form of the proportionality coefficient Gamma. The IDE model with Q = beta H rho c yields beta = 0.0003 +/- 0.0011, which essentially does not support the presence of the interaction. In general, whether the observational data support the existence of interaction is closely related to the model. Our analysis helps to elucidate which type of IDE model can better explain the current observational data.

Keywords

Keywords Plus

PROBE WMAP OBSERVATIONSSTERILE NEUTRINOSHUBBLE CONSTANTMATTERPROSPECTSUNCERTAINTYUNIVERSELAMBDASIRENS

Acoustic

8-Deep learning-based acoustic emission data clustering for crack evaluation of welded joints in field bridges

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By Li, D (Li, Dan) [1] , [2] ; Chen, QF (Chen, Qingfeng) [1] , [2] ; Wang, H (Wang, Hao) [1] , [2] ; Shen, P (Shen, Peng) [3] ; Li, ZB (Li, Zibing) [4] ; He, WY (He, Wenyu) [3] (provided by Clarivate)
Source AUTOMATION IN CONSTRUCTION Volume 165 DOI 10.1016/j.autcon.2024.105540 Article Number 105540 Published SEP 2024 Early Access JUN 2024 Indexed 2024-06-30 Document Type Article

Abstract

To advance the intelligent operation and maintenance of bridges, a deep learning-based acoustic emission (AE) data clustering framework was developed for evaluating fatigue cracks in welded joints under conditions of operational noise interference and complex damage mechanisms. Specifically, a convolutional autoencoder (CAE) model was implemented to extract damage-sensitive features from AE wavelet images. Additionally, a physics-guided single-and-cross-case strategy using Gaussian mixture models (GMMs) was presented to diagnose overlapping microscopic noise and damage mechanisms across different cases with various crack lengths. Field tests demonstrated the efficiency of the proposed framework to distinguish AE data induced by noise, crack propagation, surface fretting, and impact, enabling accurate identification of no-damage, minor-damage, and serious-damage cases according to their characteristic mechanisms. Future work will incorporate long-term monitoring data from additional cases to further refine the damage quantification and enhance the overall robustness.

Keywords

Author Keywords

Crack evaluationAcoustic emissionDeep learningData clusteringOperational noiseDamage mechanisms

Keywords Plus

ROTATING MACHINERYFAULT-DIAGNOSISSIGNALSCLOSUREGROWTHMODE

Acoustic

9-Dynamic detection mechanism model of acoustic emission for high-speed train axle box bearings with local defects

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By Han, DF (Han, Defu) [1] ; Qi, HY (Qi, Hongyuan) [1] ; Hou, DM (Hou, Dongming) [2] , [3] ; Wang, SX (Wang, Shuangxin) [1] ; Kong, JZ (Kong, Jinzhen) [2] , [3] ; Xu, XN (Xu, Xining) [1] ; Wang, CP (Wang, Cuiping) [1] **(provided by Clarivate) Source MECHANICAL SYSTEMS AND SIGNAL PROCESSING Volume 235 DOI 10.1016/j.ymssp.2025.112943 Article Number 112943 Published JUL 15 2025 Early Access JUN 2025 Indexed 2025-06-13 Document Type Article**

Abstract

Acoustic emission (AE), as a promising technology, is suitable for the fault diagnosis and state monitoring of high-speed train axle box bearings (HSTABs). However, the mechanism of the correlation between bearing states and dynamic AE signals remains unclear. Existing studies have failed to explain the relationship between contact deformation energy and dynamic root-mean-square (RMS) of the AE signals generated by HSTABs, while also neglecting the asperity-induced dynamic displacement and local defect-induced transient elastic waves. Moreover, there is no study on the attenuation behavior of AE waves in complete HSTAB. This paper presents an AE dynamic detection mechanism model of the HSTAB state, revealing the generation mechanism of AE waves by rough contact and local defect impact and their propagation characteristics. First, based on the load pattern of the HSTAB, a dynamic model was established considering asperity contact, local defect impact, and lubrication oil, and the dynamic contact force of the rollers was determined. Second, a mathematical model of the rough contact with RMS was established jointly with the contact force. Further, the attenuation features of the AE waves in the HSTAB and its housing were investigated, and an AE dynamic mechanism model was established. The model not only resolves the dynamic RMS characterization of the AE signals from moving bearings but also describes the relationship between the dynamic RMS and running speed, bearing state, and time scale. Finally, with different defective HSTABs as examples, the correctness of the model was verified by performing experiments on a full-size high-speed train test rig, providing a theoretical basis for the application of the AE technology in the diagnosis and quantitative analysis of bearing faults.

Keywords

Author Keywords

High-speed train bearingsLocal defectsAcoustic emissionDynamic detection mechanismAsperities

Keywords Plus

VIBRATION ANALYSISCONTACT

Acoustic

10-Adaptive stepsize forward-backward pursuit and acoustic emission-based health state assessment of high-speed train bearings

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By Han, DF (Han, Defu) [1] , [2] ; Qi, HY (Qi, Hongyuan) [1] , [2] ; Wang, SX (Wang, Shuangxin) [1] ; Hou, DM (Hou, Dongming) [3] , [4] ; Wang, CP (Wang, Cuiping) [1] , [2] (provided by Clarivate) **Source STRUCTURAL HEALTH MONITORING-AN INTERNATIONAL JOURNAL Volume 24 Issue 6 Page 3523-3542 DOI 10.1177/14759217241271036 Published NOV 2025 Early Access SEP 2024 Indexed 2024-09-21 Document Type Article**

Abstract

Compressed sensing (CS) is a promising tool for data compression reconstruction. However, fault diagnosis methods for high-speed train bearings based on CS and acoustic emission (AE) technologies have not been reported yet. Notably, the accuracy and speed of CS two-stage reconstruction methods are affected and restricted by prior initial conditions. Therefore, this article proposes adaptive dynamic thresholds applicable to adaptive stepsize forward-backward pursuit (ASFBP), and bearing health state assessment method. First, the adaptive dynamic thresholds for atom selection and deletion are constructed based on the residual feedback mechanism and the atom quality distribution law, which enables ASFBP to realize high-precision rapid reconstruction of signal without any atom priori initial conditions. Second, the initial dictionary length is improved based on the AE hit characteristics. Furthermore, a damage state comprehensive evaluation index (DSCEI) is established using principal component analysis based on AE time-domain hit parameters and compression-domain energy parameter. Compared with the kurtosis index and permutation entropy index, the DSCEI demonstrates better monotonicity and stability in the quantitative evaluation of high-speed train bearing condition. Finally, the validity and stability of the method are verified by testing under complex test conditions resembling actual high-speed train lines, providing valuable insights for the CS-based data-driven bearing fault diagnosis.

Keywords
Author Keywords
Compressive sensinghigh-speed train bearingsASFBPadaptive thresholdsstate assessment
Keywords Plus
SIGNAL RECOVERYALGORITHMOPTIMIZATION

Acoustic

11-CDTFAFN: A novel coarse-to-fine dual-scale time-frequency attention fusion network for machinery vibro-acoustic fault diagnosis

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By Yan, XA (Yan, Xiaoan) [1] ; Jiang, D (Jiang, Dong) [1] ; Xiang, L (Xiang, Ling) [2] ; Xu, YD (Xu, Yadong) [3] ; Wang, YL (Wang, Yulin) [3] (provided by Clarivate) **Source INFORMATION FUSION Volume 112 DOI 10.1016/j.inffus.2024.102554 Article Number 102554 Published DEC 2024 Early Access JUL 2024 Indexed 2024-07-16 Document Type Article**

Abstract

When the machinery device operates abnormally, it is not sufficient for fault detection only via extracting fault features from a single sensor due to the latent fault information may be scattered across multiple sensors. Multisensory fusion techniques with deep learning framework have attracted increasing attention from researchers due to the exploiting and integration of fault information between multiple sensors. Nevertheless, there are two remaining shortcomings in most existing multi-sensory fusion technologies. (1) Most existing fusion methods merely concentrate on conducting multi-sensory information fusion from time-domain or frequency-domain to achieve fault diagnosis, which are often unsatisfactory in the face of strong noise environments. (2) The collaborative fusion between several vibration sensors is generally considered in the past works, whereas the complementary information fusion between multi-sensory vibro-acoustic heterogeneous data are rarely studied. To address these deficiencies, this paper proposes a novel coarse-to-fine dual-scale time-frequency attention fusion network (CDTFAFN) for machinery fault diagnosis, which not only adequately considers the complementary information fusion of vibro-acoustic signal, but also has robust feature learning capabilities in a noisy scenario. Firstly, the signal-to-image encoding unit (SIEU) containing the improved constant-Q non-stationary Gabor transform (ICQ-NSGT) is introduced to convert the collected raw vibro-acoustic heterogeneous signal into time-frequency representation (TFR) and achieve the coarse-grained feature fusion. Secondly, the time-frequency attention feature fusion unit (TFA-FFU) is designed to concurrently learn the fine-grained features at two scales from the low-level fused features which are meaningful for fault diagnosis. Finally, the coarse-to-fine features are sequentially concatenated and fed into softmax classifier to preferably promote the network learning performance and automatically implement fault classification. The performance of the proposed approach is validated against those state-of-the-art results on two groups of multi-sensory vibro-acoustic data in different experimental platforms. Experiment results show that the proposed method with the diagnosis accuracy of 99 % above outperforms other several representative fusion technologies (i.e., 2MNet, MFF-GBFD, MSCNN-BiLSTM, MFAN-VAF, 1D-CNN-VAF, MI-CNN-TFT and TFFN-VAF) in the raw noise-free addition scenario. Moreover, the average testing accuracy of the proposed method can still reach 97 % above in the noisy scenarios with Gaussian white noises, which shows its competitive superiority and strong robustness against noises in machinery fault diagnosis. According to the five ensemble macro-average performance evaluation metrics (i.e., accuracy, precision, sensitivity, specificity and F1-score) and the receiver operator characteristic (ROC) analysis, our findings also emphasize the superiority of applying our method for machinery fault diagnosis under the colored noises compared with other fusion technologies (i.e., 2MNet, MFF-GBFD, MSCNN-BiLSTM, MFAN-VAF, 1D-CNN-VAF, MI-CNN-TFT and TFFN-VAF) reported in this paper.

Acoustic

Keywords
Author Keywords
Multi -sensory information fusionTime -frequency transformationTime -frequency attention feature fusionVibro-acoustic dataFault diagnosis
Keywords Plus
SUPPORT VECTOR MACHINESYSTEM

Acoustic

12-Application of the Tantawy Technique for Modeling Fractional Ion-Acoustic Waves in Electronegative Nonthermal Plasmas, Part (II): Fractional Modified KdV-Solitary Waves

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By El-Tantawy, SA (El-Tantawy, Samir A.) [1] , [2] ; Alhejaili, W (Alhejaili, Weaam) [3] ; Khalid, M (Khalid, Muhammad) [4] ; Al-Johani, AS (Al-Johani, Amnah S.) [5] (provided by Clarivate) **Source BRAZILIAN JOURNAL OF PHYSICS Volume 55 Issue DOI 10.1007/s13538-025-01800-2 Article Number 176 Published AUG 2025 Indexed 2025-06-12 Document Type Article**

Abstract

Building on our previous analysis of the planar fractional Korteweg-de Vries (FKdV) solitary waves [Part (I)] (El-Tantawy et al., Braz. J. Phys. 55, 123, 2025), this research tackles the more complex realm of fractional modified KdV (mKdV) wave propagation in non-Maxwellian unmagnetized electronegative plasmas (ENPs) composed of inertial positive and negative ions and Cairns-distributed inertialess electrons. Our study has two main objectives: The first one is to derive the cubic nonlinearity mKdV equation, which governs solitary wave (SW) propagation in this plasma model, using the reductive perturbation technique (RPT). The second objective, notable for its novelty and significance, entails utilizing the "Tantawy technique" to analyze the fractional planar mKdV (FmKdV) equation. Thus, highly accurate and stable approximations will be generated to clarify the properties of fractional mKdV solitary waves (SWs) and enable a deeper understanding of the dynamic behavior of these complex phenomena during propagation. Additionally, the Laplace transform iterative method (LTIM) is applied to examine and analyze the FmKdV equation and derive analytical approximations, facilitating a comparative analysis with the results of the Tantawy technique. To evaluate the accuracy of all generated approximations using the two proposed techniques, the absolute error of all generated approximations is estimated compared to the exact solution for the integer case. The influence of various plasma parameters on the characteristic behavior of the profile of the FmKdV-SWs is numerically investigated. This research offers valuable insights into laboratory, space, and astrophysical plasma systems.

Keywords

Author Keywords

Fractional ion-acoustic solitary wavesPlanar fractional mKdV equationElectronegative non-Maxwellian plasmasThe Tantawy techniqueLaplace transform iterative method

Keywords Plus

NEGATIVE-IONSDOUBLE-LAYERSPROPAGATIONSOLITONSEQUATION

Acoustic

13-A Novel Approximation to the Fractional KdV Equation Using the Tantawy Technique and Modeling Fractional Electron-Acoustic Cnoidal Waves in a Nonthermal Plasma

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By El-Tantawy, SA (El-Tantawy, Samir A.) [1] , [2] ; Khan, D (Khan, Daud) [3] ; Khan, W (Khan, Wilayat) [3] ; Khalid, M (Khalid, Muhammad) [4] ; Alhejaili, W (Alhejaili, Weaam) [5] (provided by Clarivate) **Source BRAZILIAN JOURNAL OF PHYSICS Volume 55 Issue 4 DOI 10.1007/s13538-025-01780-3 Article Number 163 Published AUG 2025 Indexed 2025-05-23 Document Type Article**

Abstract

In this neoteric study, the fractional and non-fractional electron-acoustic (EA) cnoidal waves (CWs) are investigated in an unmagnetized homogeneous non-Maxwellian plasma composed of hot nonthermal electrons following Cairns distribution, cold electrons, and immobile positive ions. To do this, an evolution wave equation (Korteweg-de Vries (KdV) equation) that governs the propagation of these waves in the current model is generated by using the reductive perturbation technique. Analysis of the KdV equation's nonlinearity coefficient, which dictates the polarity of nonlinear waves that may emerge and propagate in the current model, reveals that this model only supports rarefactive waves. The impact of various plasma parameters, like the nonthermal parameter and the density ratio of hot-to-cold electrons (hot electron concentration), on the essential features of the EACWs is numerically examined. The second objective of this investigation is to explore the fractional-order parameter's effect on the dynamics of periodic wave propagation within the current model. This is achieved by transforming the non-fractional planar KdV equation into its fractional counterpart and analyzing it using contemporary methods, such as the Tantawy technique, which has proven its efficacy and precision in numerous prior studies.

Keywords

Author Keywords

Electron-acoustic wavesCnoidal wavesCairns distributionFractional Korteweg-de Vries equationThe Tantawy technique

Keywords Plus

SOLITARY STRUCTURESIONPROPAGATIONSOLITONS

Acoustic

14-Application of the Tantawy Technique for Modeling Fractional Ion-Acoustic Waves in Electronegative Plasmas having Cairns Distributed-Electrons, Part (I): Fractional KdV Solitary Waves

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By El-Tantawy, SA (El-Tantawy, Samir A.) [1] , [2] ; Bacha, SIH (Bacha, Sahibzada I. H.) [3] ; Khalid, M (Khalid, Muhammad) [4] ; Alhejaili, W (Alhejaili, Weaam) [5] (provided by Clarivate)
Source BRAZILIAN JOURNAL OF PHYSICS Volume 55 Issue 3 DOI 10.1007/s13538-025-01741-w Article Number 123 Published JUN 2025 Indexed 2025-04-05 Document Type Article

Abstract

This work examines both non-fractional and fractional ion-acoustic solitary waves (IASWs) in non-Maxwellian unmagnetized electronegative plasmas (ENPs) consisting of inertial positive and negative ions, as well as inertialess electrons adhering to the Cairns distribution. Our study comprises two primary objectives: the first objective is to utilize the reductive perturbation technique (RPT) to derive an evolutionary wave equation, specifically the quadratic nonlinearity planar Korteweg-de Vries (KdV) equation, which governs the propagation of solitary waves (SWs) in the current model. The secondary objective of this study, which is the core of the subject due to its novelty and importance, is to utilize the "Tantawy technique" for analyzing the fractional planar KdV (FKdV) equation and construct high accuracy and more stable approximations to deeply understand the characteristics of fractional KdV solitary waves (SWs) in the current model. Also, the Laplace new iterative approach (LNIM) is utilized to examine the FKdV equation and derive analytical approximations for the fractional SWs. Subsequently, the results are compared with those produced by the Tantawy technique to assess the effectiveness of each method. Additionally, the absolute error of the generated approximations using the two proposed techniques is quantitatively assessed, followed by comparing these results to evaluate the accuracy, efficiency, stability, fast computations, and low-cost computations of the Tantawy technique relative to the LNIM. The effect of plasma parameters like ion mass ratio, nonthermal, negative ion concentration, and fractional parameters on the characteristics of the KdV-SW profile is numerically investigated. The present investigation could be helpful to in space and astrophysical plasma systems.

Keywords

Author Keywords

Ion-acoustic solitary wavesCairns distributionFractional planar KdV equationElectronegative plasmas

Keywords Plus

NEGATIVE-IONSDOUBLE-LAYERSEQUATIONPROPAGATION