Book of abstracts –Program

الجمهورية الجزائرية الديمقراطية الشعبية
The ministry of higher education and scientific research
University of Batna 1
The faculty of matter sciences in collaboration with PRIMALAB laboratory
Organize

THE 1 st WORKSHOP ON MATTER AND RADIATION
APRIL 10-11 , 2016 BATNA UNIVERSITY 1

wmr16

الورشة الاولى للمادة و الاشعاع 11-10 افريل 2016 جامعة باتنة ١

University of Batna 1 , Faculty of Matter sciences

CONTACT US

workshopmr16@gmail.com; /a_sid@univ-batna.dz Tel: (+213) 0555593740/Fax: (+213) 033868975

The 1 st WORKSHOP ON MATTER AND RADIATION

WMR 2016

10-11 Avril 2016

Cette conférence adresse toute les problématiques liée à la physique des rayonnements de la matière à l'échelle atomique et nucléaire ainsi que celles de l'interaction rayonnement-matière. Nous visons à rassembler les experts du domaine dans un cadre naturel exceptionnel et convivial propice à des échanges scientifique nombreux et riches.

Les axes principaux de la conférence représentent des domaines de recherche du département des sciences de la matière de Batna. Ce sont aussi des domaines de recherche d'actualité dans le monde avec des retombés industrielles importants : énergie, médecine, télécommunications, etc..

Objectifs de la manifestation scientifique :

- Etablir une collaboration nationale et internationale entre chercheurs et entre laboratoires de recherches
- Echange d'idées
- La formation par la recherche de nos étudiants de post-graduation.

Les axes principaux de la conférence :

1-Théorie des plasmas

2-Fusion thermonucléaire (inertielle et magnétique)

3- Plasma astrophysique

4-Physique des lasers

5-Physique atomique et nucléaire

6- Interaction rayonnement-matière

Worshop site:

Faculty of matter sciences, university of Batna 1, Road of Biskra, BATNA

Location de la conférence

Département Sciences de la Matière,

Faculté des Sciences

Université de Batna 1

La faculté des sciences de la matière : regroupe deux départements physiques et chimie

Les spécialités enseignées dans le département de physique sont

Licence :

- Physique des rayonnements
- Physique théorique
- Physique énergétique
- Physique des matériaux

Master

- Master Energie et Développement Durable
- Master Matériaux Optoélectronique
- Master Matériaux Thermodynamique des Matériaux
- Master Matière et Rayonnements
- Master Thermo Fluide

Le département comporte 3 laboratoires de recherche

- Laboratoire de physique des rayonnements et de leurs interactions avec la matière-*PRIMALAB*-
- Laboratoire physique énergétique appliquée-*LPEA*-
- Laboratoire de physique des matériaux-*LEPCM*-

Président du Workshop : Pr. Abdelaziz SID

Secrétariat du workshop : Imane Ghiloubi ; Hanane Azoui

Comité scientifique

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8	Bouldjedri Abdelhamid	Membre	Prof.	Enseignant-chercheur	UHLB
9	Benchikh Kamel	Membre	Prof.	Enseignant-chercheur	Univ. Sétif
10	Tobbeche Said	Membre	Prof.	Enseignant-chercheur	UHLB
11	Ayache Rachid	Membre	Prof.	Enseignant-chercheur	UHLB

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N°	Nom & Prénoms	Qualité	Grade	Fonction	Etablissement
1-	Bouldjedri Abdelhamid	Président	Prof.	Enseignant-chercheur	UHLB
2-	Sid Abdelaziz	Membre	Prof.	Enseignant-chercheur	UHLB
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4-	Boultif Ossama	Membre	MAA	Enseignant-chercheur	UHLB
5-	Benahmed Amel	Membre	MAB	Enseignant-chercheur	UHLB
6-	Aissaoui Lamia	Membre	MAA	Enseignant-chercheur	UHLB
7-	Soudani Azzeddine	Membre	Prof.	Enseignant-chercheur	UHLB
8-	Bougoul Saadi	Membre	Prof.	Enseignant-chercheur	UHLB
9-	Ghiloubi Saada Imane	Membre	Ingénieur d'état en informatique	Informaticienne lab. PRIMALAB	UHLB
10-	Azoui Hanane	Membre	Doctorante	Etudiante	UHLB
11-	Mekentichi Ahlam	Membre	Doctorante	Etudiante	UHLB
12-	Ahmane Zoubida	Membre	Doctorante	Etudiante	UHLB

Les invités

Dr. Khoudja Bouhila Zohra ; COMENA, Alger.

Dr. Nedjar Arezki ; COMENA, Alger.

Dr. Azli Tarek ; COMENA, Alger.

Dr. Ghezal Abdenasser; COMENA, Alger.

Pr. Mikhail Shmatov ; IOFFEE Institute, St. Petersburg, Russia.

Liste des Participants

Participants	E-mail	Poster/Orale	Organisation
khedidja DJEHA	khedidja_djeha@yahoo.fr	Poster	Université de Blida
bencherif fatma	ra.bia1465@gmail.com	Poster	Université des Sciences et de la technologie d'Oran Mohamed Boudiaf,
Saber Saad Essaoud	Saber-ss1986@hotmail.com	Poster	Ecole Normale Supérieure Alger, Algérie
Yazid Delenda	yazid.delenda@gmail.com	Poster	Université de Batna 1
aouati houssem eddine	aouati77@gmail.com	Poster	Université de Batna1
Abdelkader KHALFALLAH	kada28000@gmail.com	Poster	Centre de Recherche Nucléaire de Birine (CRNB)
Siham AZIEZ	aziez_siham@hotmail.fr	Poster	Development Unit and Thin Film Applications-Setif/ research center in industrial technologies CRTI

Fahim TIGHEMINE	fahimlmdsm@yahoo.fr	Poster	Université de Ferhat Abbas, Setif1.
Adil BOUHOUS	adelbouhous@gmail.com	Poster	Université de Jijel
Mohamed Laid YAHIAOUI	laidastro@hotmail.fr	Poster	Centre de Recherche Nucléaire de Birine
Wassila ISSAADI	milissa.kate@yahoo.fr	Poster	Université de Bejaia, 06000 Bejaia, Algeria.
Mohamed DOUICI	douici2005@yahoo.fr	Poster	Université Djilali Bounaama- Khemis-Miliana
Hanane AZOUI	anhanane@gmail.com	Poster	Université de Batna1
Rima REKIK	Rrimaaaa@Gmail.com	Poster	Université de Batna1.
Hichem CHORFI	chorfihichemopa2@gmail.com	Poster	Université de Ferhat Abbas Sétif
Mikhail SHMATOV	M.Shmatov@mail.ioffe.ru	Orale	Ioffe Institute –Russie-
slimen BELGHIT	belghit.slimen@gmail.com	Poster	Université de Batna1
manel MAHMOUDI	manelmahmoudi2012@gmail.com	Poster	Université de Kasdi merbah Ouargla.
Yazid BENBOUZID	ybenbouzid@usthb.dz	Poster	Laboratoire de Physique Théorique, Faculté de Physique, USTHB, Alger
Khadidja MOHAMMED CHERIF	cherifkhadidja_dz@yahoo.fr	poster	Université de Batna1
Abdelatif TAHRAOUI	alatif_tahraoui@yahoo.fr	Orale	Université des Sciences et de la Technologie Houari Boumediene
Nassim SEGHOUANI	nseghouani@yahoo.com	Poster	CRAAG
Rachid FERMOUS	rfermous@usthb.dz	Orale	Université Houari Boumediene

Djamil BESSEGHIER	besseghierdjamil@gmail.com	Poster	Université d'Oran USTO-MB
Halima DEROUICHE	derouichehalima83@gmail.com	Poster	Université des Sciences et de la technologie d'Oran Mohamed Boudiaf USTO-MB
Amel BENAHMED	amel_benahmed@yahoo.fr	Poster	Université de Batna 1
Esma ZOUAOUI	esma.zouaoui@gmail.com	Poster	Université des frères Mentouri Constantine 1
tawfiq ATTOUI	tafikattoui@gmail.com	Orale	Université de Constantine
Houda MANSOUR	mansourhouda48@gmail.com	poster	Université de Blida 1
Amina LEGHMOUCHE	aminastro14@gmail.com	Orale	Université des frères Mentouri Constantine 1
Ibtissem HANNACHI	ibtissem.hannachi@yahoo.fr	Orale	Université de Batna 1
saliha KARFAF	karfaf.saliha@gmail.com	Poster	Université de 8 mai 1945 Guelma
Souhair FNIDES	souhir.fnides@gmail.com	Poster	Université de 8 Mai 1945 Guelma
Houria TRIKI	houriatriki@yahoo.fr	Poster	Université de Badji Mokhtar, Annaba
Samir CHEKOUR	che-samir@hotmail.com	Poster	Université des Sciences et de la Technologie Houari Boumediene
Naima FOUIAL	nfouial@yahoo.fr	poster	Université des Sciences et de la Technologie Houari Boumediene
Djamila BENLEMDJALDI	dbenlemdjaldi@gmail.com	poster	Ecole Normale Supérieure Vieux-Kouba , Alger

PROGRAM

Day Time	Saturday	Sunday	Monday
09H, 10H		Opening	**Plenary** N.Segouani Gravitational waves and the Aures Observatory **/P3**
10H,10H30		**Plenary** Mikhail Shmatov	T31, MiKhail Shmatov Structure, formation and the danger of ball lightning **/P3**
10H30,11H		On the fusion sciences and technologies **/P1**	Coffee Break/**P3**
11H,11H30		Coffee Break/**P1**	Closing
11H30,12H		T11,T.Houria Propagation of soliton pulses in optical fibers /P1	Lunch
12H30,13H			Tour (City tour, visit to Timgad)
13H,13H30		LUNCH	
13H30,14H			
14H,14H30		T22, A. Benahmed Temperature Anisotropy in Magnetized Fusion Plasma **/P2**	
14H30,15H		T23, I. Hannachi Diagnostic Spectroscopy of Turbulence Plasma **/P2**	
15H,15H30		T25, Samir Chekour Effets de la densité des ions sur la structure de la gaine électrostatique dans un plasma magnétisé contaminé par des impuretés multi-tailles **/P2**	
15H30,16H	Registration		
1H,16H30	at	COFEE BREACK	
16H30,17H	Hotel		

Sessions Posters

Ses.	Poster	Author	Title	Topic
P1	P11	khedidja DJEHA	The cosmic microwave background radiation	AP
	P12	Saber Saad Essaoud	Investigation and applications of laser-induced plasma spectroscopy technique	LP
	P13	aouati houssem eddine	La thÃ©orie du plasma et son application en biomédical	PT
	P14	Bouhous Adil	Control of chaos in laser plasma interaction	PT/ LP
	P15	Wassila Issaadi	Evolution of a laser hybrid welding map.	LP
	P16	Azoui Hanane	Etude Numérique d'un Laser à Fibre Optique Dopé à Erbium Fonctionnant En Régime Pulsé	LP
	P17	Belghit Slimen	WEIBEL INSTABILITY IN LOW TEMPERATURE PLASMA	PT
	P18	Belghit Slimen	Relativistic Weibel instability in Weakly Laser Fusion Plasma	TF
	P19	Tahraoui Abdellatif	ETUDE THEORQUE DE L'INTERACTION D'UN PLASMA AVEC UNE SURFACE SOLIDE	PT
	P110	Naima Fouial	CALCUL DE LA VITESSE DE BOHM POUR UN PLASMA COMPLEXE CONTENANT DEUX ESPECES D'IONS	PT
	P111	Djamila Benlemdjaldi	Model of electrostatic sheath in cylindrical geometry for unmagnetized plasma	PT
P2	P21	Delenda Yazid	Soft gluon radiation at finite Nc beyond leading order	RMI
	P22	Fnides Souhair	Ab initio calculations of vibrational and thermodynamic properties of polymorphs of CuI	RMI
	P23	saliha karfaf	Elastic and lattice dynamical properties of perovskite type hydrides alloys	RMI
	P24	Amina LEGHMOUCHE	The propagation of the Ultra High Energy Cosmic Rays in the universe	RMI/ AP
	P25	Esma ZOUAOUI	JEM-EUSO mission to unveil the UHECRs	RMI/ AP
	P26	Halima DEROUICHE	Analysis of Silicon by laser- induced breakdown spectroscopy	RMI
	P27	Djamil BESSEGHIER	Laser- induced breakdown spectroscopy applied to material analysis	RMI
	P28	Mohammed cherif Khadidja	Analytical evaluation of critical radius in RZ9 reactor	ANP /RMI
	P29	manel mahmoudi	study of the electronic broadening for small values of collision medium in plasma	PT/RMI
	P210	Hichem Chorfi	Study of biological media by light scattering (to an Optical Biopsy)	RMI
	P211	Rima Rekik	Rabi Oscillations in a Two-Level Atomic System with a Pseudo-Hermitian Hamiltonian: A Path Integral Approach	RMI
	P212	AZIEZ Siham	Propagation caracteristics of chirped Vector Soliton in birefringent optical fibers with variable coefficients in the presence of third order dispersion	RMI
	P31	Saber Saad Essaoud	Etude de la structure des noyaux 56Ni et 68Se Ã l'aide de l'approximation HTDA	ANP
	P32	Fahim TIGHEMINE	Evaluation of Iodine Transmutation Rate in the BR2 High Flux reactor	ANP /RMI

P3	P33	Abdelkader KHALFALLAH	Utilisation du code système Scale pour un calcul de criticité sur Lâ€™assemblage sous critique AURES-01 & Comparaison des résultats obtenus à ceux de CITATION, MCNP et les mesures expérimentales	ANP
	P34	Mohamed Laid YAHIAOUI	Préparation des sections efficaces neutronique pour l'hydrogène dans l'eau légère par le code de calcul NJOY	ANP
	P35	Mohamed DOUICI	Particle-number fluctuations effect on the electric quadrupole moments of odd-mass nuclei, in the isovector pairing case	ANP
	P36	Benbouzid Yazid	Effect of the neutron-proton isovector pairing on the spectroscopic factor for one pair	ANP
	P37	Ahlem Mekentichi	Coexistence of multi-cluster states in the interacting boson model	ANP
	P38	Rachid FERMOUS	ACCELERATION OF A RELATIVISTIC DENSE ASTROHYSICAL PLASMA	AP
	P39	Tawfiq ATTOUI	The study of cosmic rays in the high-energy and the possibility monitored with telescope JEM EUSO	AP
	P310	Houda MANSOUR	CHARGED COMPACT STARS IN f(R) GRAVITY	AP
	P311	Omar Cherbal	PT-Symetry in optical systems	LP

Sessions Orales

Session	Talk	Authors	Title	Topic
T1	T1,1	T.Houria	Propagation of soliton pulses in optical fibers	RMI
	T2 ,2	A.Benahmed	Temperature Anisotropy in Magnetized Fusion Plasma	PT
	T2,3	I. Hannachi	Diagnostic Spectroscopy of Turbulence Plasma	RMI
	T2,5	Samir Chekour	Effets de la densité des ions sur la structure de la gaine électrostatique dans un plasma magnétisé contaminé par des impuretés multi-tailles	PT
T3	T3,1	M. Shmatov	Structure, formation and the danger of ball lightning	PT

Partie 1 :

Les communications

Posters

The cosmic microwave background radiation

K. Djeha[1].

[1] Département de Physique, Université de Blida1, BP 270 Blida 09000, Alegria.

Abstract: Study the cosmic microwave background: polarization and anisotropy.

The inflationary models have been proposed to address the shortcomings of the standard models of cosmology. This cosmological model offers both a solution to the horizon problem and the flatness problem. The idea of inflation guess just after the Big Bang, the observable universe has experienced a violent expansion phase that would allow him to grow a significant factor: at least 10^{26}

The European satellite Planck its collected data reinforces the scenario of inflation. Launched in 2009, the satellite was analyzed for 15 months the "cosmic microwave background: CMB". The analysis focused on the CMB temperature fluctuations.

The theory of inflation also provides the polarization of this radiation. Planck was designed to also measure the polarization parameter. It is proposed in this thesis to study the cosmic microwave background, the anisotropy of its temperature and its polarization.

Investigation and applications of laser-induced plasma spectroscopy technique LIBS

F. Bencherif, S. A. Beldjilali, D. Besseghier, T. Baba-Hamed, A. Belasri

LPPMCA, USTOMB- Université des Sciences et de la technologie d'Oran Mohamed Boudiaf, El M'Naoeur, B.P. 1505, 31000 Oran, Algeria

E-mail : ra.bia1465@gmail.com

Abstract:

Laser-induced breakdown spectroscopy (LIBS) is an emerging technique for fast multielemental analysis of gaseous, liquid, and solid samples. LIBS has several advantages, it allows for real-time and stand-off analysis of multielemental samples and does not require any sample preparation. This makes LIBS a promising technique for quality control of food that needs fast analysis of large amounts of samples. In this work we investigate the applications of this technique on solid and organic materials. The calibration-free model is also investigated.

Keywords: Laser plasma, LIBS, Spectroscopy.

Étude de la structure des noyaux ^{56}Ni et ^{68}Se à l'aide de l'approximation HTDA

S. SAAD ESSAOUD[1]. D.E. MEDJADI [1]et M. IMADALOU[1]

Laboratoire N-corps et structure de la matière, Ecole Normale Supérieure

BP 92 Vieux-Kouba, 16050 Alger, Algérie.

Saber-ss1986@hotmail.com

(address: wilaya Bordj bouariridj)

Résumé :

Dans ce travail nous avons appliqué plusieurs méthodes (HF+BCS et HTDA) pour étudier la structure des deux noyaux (^{56}Ni et ^{68}Se).On a principalement abordé l'effet des corrélations dans les systèmes fermioniques finis en brisant la symétrie axiale. Dans la première partie, nous présentons les différents résultats obtenus pour les noyaux légers ^{56}Ni et ^{68}Se en utilisant l'approche HTDA axial et en les comparant avec ceux obtenus en brisant l'axialité(i.e. à l'aide de HTDA triaxial).Dans la seconde partie, nous traitons les corrélations d'appariement en s'appuyant sur la méthode HTDA sans et avec corrélations d'appariement neutrons- protons. Ces dernières sont habituellement négligées. Les résultats obtenus sont comparés aux résultats expérimentaux.

MOTS-CLÉS : Hartree-Fock , BCS, HTDA, corrélations d'appariement.

Soft gluon radiation at finite N_c beyond leading order

Yazid Delenda and Kamel Khelifa-Kerfa

Département de Physique, Faculté des Sciences de la Matière

Université Batna 1, Algeria

Email:yazid.delenda@gmail.com

Département de Physique, Faculté des Sciences

Université Hassiba Benbouali de Chlef - Chlef, Algeria

Email:kamel.kkhelifa@gmail.com

Abstract

We present a general method for calculating squared amplitudes for the emission of an arbitrary number of soft energy-ordered gluons in e+ e- annihilation to QCD jets using the eikonal approximation. We apply this formalism for explicit evaluation of the squared amplitudes up to five orders in perturbation theory.

Keywords: QCD, Eikonal approximation

La théorie du plasma et son application en biomédical

Aouati Houssem eddine

aouati77@gmail.com

Départementd'électronique, université de Batna, Avenue Chahid Boukhlouf Mohammed Elhadi05000 Batna – Algérie

Traditionnellementon classe l'état de la matière en trois états : l'état solide, l'état liquide, et l'étatgaz.Le plasma représente le quatrième état de la matière: quand on chauffe un élément solide, il devient liquide; si on le chauffe davantage, il deviendra gazeux; et si on le chauffe davantage encore, il deviendra plasma.

Donc le plasma est un gaz partiellement ionisé et macroscopiquement neutre électriquement, c'est à dire composé d'atomes, de molécules, d'ions et d'´électrons. C'est un milieu énergétique avec des propriétés réactives, thermiques et radiatives que l'on rencontre aussi bien à l'´état naturelque dans l'industrie.

Les grandeurs caractéristiques dans les plasmas sont :la densité des différentes espèces, le degré d'ionisation, la température, la vitesse des particules, les dimensions caractéristiques (longueur de Landau, de Debye, distance moyenne entre deux électrons) et les fréquences caractéristiques (fréquence de collision entre espèces, fréquence des oscillations collectives).

Éventuellement le plasma est classéen trois grandes catégories :

_ Les plasmas chauds: ce sont les plus répandus dans lanature, on les trouve dans le soleil, les étoiles (le plasma constitue 99% de la matière de l'univers).

_ Les plasmas thermiques: assez répondus on les trouve dans les flammes, le tonnerre.

_ Les plasmas froids : sont généralement crées sous l'effet d'application d'un signal électrique ou radiation lumineuse par exemple la décharge électrique dans une lampe a néon.

Les gaz ionisés produits par décharge plasma appelés plus communément « plasmas froids » présentent un énorme intérêt scientifique et applicatif dans le domaine biomédical. Au-delà des travaux sur la stérilisation, l'ingénierie de surface et les biomatériaux, les recherches sur les applications thérapeutiques des plasmas froids connaissent, un développement extraordinaire sous l'intitulé « Médecine Plasma ».

Utilisation du code système Scale pour un calcul de criticité sur L'assemblage sous critique AURES-01 &Comparaison des résultats obtenus à ceux de *CITATION, MCNP* et les mesures expérimentales

Mr A. KHALFALLAH &Mr M.L. YAHIAOUI
COMMISSARIAT A L4ENERGIE ATOMIQUE
CENTRE DE RECHERCHE NUCLEAIRE DE BIRIN
B.P. 180 Ain-ouassara 17200 Djelfa
Tél : 027.87.29.21 Telex : 027.87.29.52

Résume

Le présent travail a pour but de Mettre en œuvre le code système *SCALE 6.1*pour le calcul du facteur de multiplication effectif d'un réseau sous critiquemoyennant le code *KINO-VI/CSAS6,* basé sur la méthode probabiliste Monté Carlo à trois dimensions.

Dans ce travail, on a utilisé le code système *SCALE6.1* pour un calcul de criticité sur l'assemblage sous critique. Un modèle à trois dimensions a été réalisé par le code basé sur la méthode Monte Carlo *KINO-VI/SCALE6.1*. Différentes bibliothèques des sections efficaces avec spectre d'énergie continue (CE) et discret (MG) ont été utilisées. Le résultat du facteur de multiplication effectif a été comparé à celui d'un autre code Monte Carlo (*MCNP5*), et à celui d'un calcul de diffusion (*WIMS-D4 & CITATION*) ainsi qu'une mesure expérimentale.

Propagation caracteristics of chirped Vector Soliton in birefringent optical fibers with variable coefficients in the presence of third order dispersion

Siham AZIEZ[1*] and Derradji BAHLOUL[2]

[1] *Research Center in Industrial Technologies CRTI, P. O. Box 64, Cheraga 16014, Algiers/ Thin Films and Applications Unit - (UDCMA) -Setif- Algeria*

[2] *Département de physique, Faculté des Sciences,Université Hadj-Lakhdar de Batna, 1 Avenue Boukhlouf Mohamed El Hadi, Batna 05000, Algeria*

aziez_siham@hotmail.f

Abstract

We study in this work, the propagation characteristics of chirped vector solitons in optical fiber systems using the compact split step Padé scheme (CSSPS). This study is done in the case of variable coefficients and the presence of third order dispersion. A negative chirp makes the soliton broadening, while; a positive chirp leads to a soliton compression. The effect of chirp on the soliton temporal width of an amplification system ($\sigma>0$) is greater than that in a loss system ($\sigma<0$). In the presence of third order dispersion, we note an increase of the pulse width with an asymmetric oscillation on the trailing edge. In the same time, we note a shift of the center of the two components of the one managed chirped vector soliton along the propagation distance.

Keywords: Vector soliton, Chirped soliton, Optical fibers, compact split step Padé scheme, Coupled higher-order nonlinear Schrodinger equations, Dispersion management, nonlinearity management, temporal waveform.

References:

[1] -GovindAgrawal, '*Nonlinear Fiber Optics*', Academic Press, 2007.

[2] A. Hasegawa, Y. Kodama, "*Solitons in Optical Communications"*, Clarendon Press,Oxford, 1995.

[3] A. Hasegawa, "*Theory of information transfer in optical fibers: a tutorial review"*,Optical Fiber Technology 10 (2004) 50–170

[4] - MoussaSmadi, Derradji Bahloul "*A compact split step Padé scheme for higher-order nonlinear Schrödinger equation (HNLS) with power law nonlinearity and fourth order dispersion.",* Comput. Phys. Commun. 182 (2011) 366–371

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Evaluation of Iodine transmutation rate in the BR2 High Flux Reactor

Fahim TIGHEMINE*,Naima AMRANI and Ahmed BOUCENNA

DAC Laboratory, Physics Department, Faculty of Sciences,

Ferhat ABBAS University, Sétif-1, Sétif19000, Algeria

Abstract

Iodine-129 is one of the nuclear long lived fission products. It offersan important contribution to the radiological risk of nuclear fuel was tein the long-term. Transmutation of ^{129}I to the stable Xenon isotope ^{130}Xe is a mean to reduce the radiological risk. In this study, the results of both transmutation rate of iodine and mass evolution of Xenon product in the high flux reactor BR2 were numerically simulated using Chain Solver 2.34 code. These results were compared with those found experimentally and those found with MCNP code.

Control of chaos in laser plasma interaction

A. Bouhous, N. Kemache, H. Sadou

Laboratoire d'Etude des matériaux ‘‘LEM’’

Département d'électronique, Université de Jijel

adelbouhous@gmail.com

Abstract

The subject of laser plasma interaction holds an important place in the analysis of different plasma processes. In this paper the chaotic dynamics originating from the equation governing the laser plasma interaction is studied. We showed how the chaotic aspects of the equations describing laser plasma interaction can be controlled and also how this chaotic nature can be synchronized. We use nonlinear state observer design for establishing the synchronization. The observations can be of practical use in secure communications and Cryptography.

Index Terms- laser plasma interaction, chaotic dynamics, observer design.

Préparation des sections efficaces neutronique pour l'hydrogène dans l'eau légère par le code de calcul NJOY.

M.L. YAHIAOUI[1]et A. KHALFALLAH[1].

1 : Centre de Recherche Nucléaire de Birine, Ain Oussera – Djelfa, Algérie

Résumé :

Dans ce travail, nous nous intéressons aux données de modérateur utilisées dans les réacteurs de puissance les plus fréquents dans le monde qui est l'eau légère. Dans cette partie on va voir les calculs des sections efficaces de diffusion thermique des neutrons dans l'hydrogène par le code NJOY. Et comme les liaisons chimiques entre les atomes dans la molécule de l'eau influent sur la section efficace, elles doivent être prisent en compte.

Mot clé : Traitement des données nucléaires, NJOY, Modérateur, l'eau légère, section efficace.

Evolution of a laser hybrid welding map

Wassila Issaadi

Electrical Engineering laboratory, Faculty of Technology, University of BejaÃ¯a, 06000 Bejaia, Algeria.

Abstract

Laser arc hybrid welding combines the advantages but also the complex physical mechanisms of gas metal arc welding and laser keyhole welding. From manifold mainly experimental but also theoretical research results a map with versatile functions was initiated for the first time. The purpose is to survey the overall context and to facilitate navigation to the various phenomena that are shown through case studies accompanied by theoretical explanations and guidelines for optimization. Though not complete, the map enables systematic and graphical navigation to relevant publications. Based on a fundamental structure of the map, which was decided early, it is inherently extendable in the future by adding existing and new knowledge, also from other research groups, enabling evolution. The fundament of the map structure comprises gouge thickness, joint type and metal grade, in coherence with product and weld designers' starting points. The next hierarchy level of the map offers options in the joint type as well as in hybrid welding techniques. The latter contains techniques like double-sided welding, pulse shaping management of the arc or laser, CMT arcs, tandem arcs, or remelting of undercuts. In addition to laser-arc hybrid welding, other hybrid laser techniques like multilayer hot-wire laser welding of narrow gaps or hybrid laser friction stir welding can be taken into account. At the other end of the hierarchy, the map offers via a database-like archive electronic navigation to research results like weld macrographs, high speed imaging or numerical simulation results of the welding process.

Particle-number fluctuations effect on the electric quadrupole moments of odd-mass nuclei, in the isovector pairing case

M. Douici[(1,2)], N.H. Allal[(2)], M. Fellah[(2)] and M.R. Oudih[(2)]

[(1)]Faculté des Sciences et de la Technologie, Université Djilali Bounaama,

Route de Theniet-El-Had, 44225, Khemis-Miliana, Algeria

douici2005@yahoo.fr

[(2)]Laboratoire de Physique Théorique, Faculté de Physique, USTHB

BP32, El-Alia, 16111 Bab-Ezzouar, Alger, ALGERIA

Abstract

The particle-number fluctuations effect on the electric quadrupole moments (Q_2) of odd-mass nuclei is studied in the neutron-proton isovector pairing case.

First, an expression of Q_2 is derived using the BCS approximation. Another expression which strictly conserves the particle-number is then derived using the Sharp-BCS (SBCS) number-projection method.

Afterwards, the quadrupole moments of some odd-mass proton-rich nuclei (i.e. such as (N-Z)=1,3) are numerically evaluated using the single-particle energies of a Woods-Saxon mean-field. The obtained results are compared to experimental data, when available, as well as the results obtained when only the like-particles pairing is considered.

Etude Numérique D'un Laser à Fibre Optique Dopé Erbium Fonctionnant En Régime Pulsé.

Zineb benkaouha, **Hanane. Azoui**, Nouara Soltani et Derradji. Bahloul.

Département de Sciences de la Matière, Facultés des Sciences, Université de Batna1.

1 rue Chahid Boukhlouf Mohamed El-Hadi, 05000 Batna, Algérie.

Email: anhanane@gmail.com

Dans ce travail nous avons étudié numériquement un laser à fibre optique dopé à l'erbium placé dans une configuration de cavité en anneau et fonctionnant en régime pulsé. Nous avons tout d'abord procédé la dérivation des équations de base gouvernant la dynamique des lasers à savoir les équations de Maxwell Bloch. Le calcul et fais à partir des équations de Maxwell et du formalisme de l'opérateur densité. Notre approche est donc l'approche semi-classique : on étudie le milieu atomique de façon quantique lais en étudie le rayonnement dans le cadre classique. Cette approche et justifié car dans un laser il y'un très grand nombre de phonons et l'étude quantique du rayonnement n'est pas nécessaire. La propagation d'une onde d'un milieu transparent, linéaire et non linéaire est aussi présentée ; d'après quelque hypothèse de simplification nous avons trouvé l'équation de propagation permet de donnée l'équation de Ginzburg – Landau.

Numerical Simulation of Yb-doped $Lu_3Al_5O_{12}$ fibers Grown by the µ-PD Technique for laser application

Hanane Azoui, Nouara Soltani, Derradji Bahloul and Abdellah Laidoune.

Département de Sciences de la Matière, Facultés des Sciences, Université de Batna1.

1 rue Chahid Boukhlouf Mohamed El-Hadi, 05000 Batna, Algeria.

Email: anhanane@gmail.com

In this work we have studied the growth of Yb-doped $Lu_3Al_5O_{12}$ fibers single crystals drawn by the micro-pulling down (µ-PD) growing technique for laser application. The growth of Yb-doped $Lu_3Al_5O_{12}$ is performed using a relatively recent growing technique that is the (µ-PD). This method presents several advantages over other growing methods and allows a stable growth of shaped crystal fibers with very good optical quality for laser application. In this study we established a numerical, two-dimensional finite volume model in cylindrical coordinates with an axisymmetric configuration. The flow, the heat and mass transfer are modeled by the differential equations of conservation of the mass, of quantity of the movement, energy and the species. This problem, which takes into account the convection-diffusion coupling, is discretized using the Finite Volumes Method (FVM). We focus on the radial and axial distribution of Yb^{+3} in the $Lu_3Al_5O_{12}$ crystal fiber. Our model is in good agreement with experimental results.

Keywords: Laser, Yb-doped $Lu_3Al_5O_{12}$, Micro-pulling down technique, Crystal growth.

Rabi Oscillations in a Two-Level Atomic System with a Pseudo-Hermitian Hamiltonian: A Path Integral Approach

Rima Rekik

University of Batna1 .

E-mail: Rrimaaaa@Gmail.com

Abstract

The time development of a two-level system with a pseudo-Hermitian Hamiltonian is studied using the spin coherent state path integral. The propagator is first written in the standard form by replacing the spin by a unit vector aligned along the polar and azimuthal directions. Then it is determined exactly using perturbation methods. The metric of the pseudo-Hermitian Hamiltonian and its bi-orthonormal basis of system states are deduced.

Study of biological media by light scattering (to an Optical Biopsy)

Chorfi Hichem [1*], *Pr. Ayadi Khaled* [1]

[1]Applied Optics Laboratory, Institute of Optics and Precision Mechanics, Ferhat Abbas University, Sétif19000, Algeria.

Email: chorfihichemopa2@gmail.com, ayadi.khaled@hotmail.com

*Corresponding author. Tel: 06.97.46.39.51

Abstract

This work is devoted to the study of light scattering in biological tissues. It aims to determine indicators that permit to differentiate between cancerous and normal tissues of a human organ and to seek a mean of therapy transport. For this, we analyzed the intensity and the spectral variation of the scattered light as a function of its scattering direction.

This study gives some main results of the experiment and the simulation. We stepped impressive to discriminate between cancerous and normal tissues of a human organ, such as: breast, vesicle and lymph node.

Weibel instability in Weakly Relativistic Laser Fusion Plasma

A. Sid and S. Belghit

Laboratoire de Physique des rayonnements et de leurs interactions

avec la matière (PRIMALAB), department des sciences de la matière, faculté des sciences,

université de Batna 05000DZ. Algeria.

Belghit.slimen@gmail.com

Sid_abdelaziz@hotmail.com

ABSTRACT

In this work, the Weibel instability due to inverse bremsstrahlung (IB) absorption in laser fusion plasma has been investigated. The stabilization effect due to the coupling of the self-generated magnetic field by Weibel instability with the laser wave field is explicitly showed. In this study, the relativistic effects are taken into account here the basic equation is the relativistic Fokker-Planck (F-P) equation. The main obtained result is that the coupling of self-generated magnetic field with the laser wave causes a stabilizing effect of excited Weibel modes. We found a decrease in the spectral range of Weibel unstable modes. This decreasing is accompanied by a reduction of two orders in the growth rate of instability or even stabilization of these modes. It has been shown that the previous analysis of the Weibel instability due to IB have overestimated the values of the generated magnetic fields. Therefore, the generation of magnetic fields by the Weibel instability due to IB should not affect the experiences of inertial confinement fusion.

Kywords: relativistic Weibel instability, laser fusion plasma, static magnetic field, stabilization, Relativistic laser plasma interaction.

STUDY OF THE ELECTRONIC BROADENING FOR SMALL VALUES OF THE IMPACT PARAMETER IN PLASMA

M. Mahmoudi* , M. Difallah and M.T. Meftah
Department of Physics, University Kasdi Merbah Ouargla
Department of Physics, LRPPS, UKMOuargla
April 10-11,2016

Abstract:

In this work, we were consented with the study of a N-body system, namely, a hydrogen plasma. The main property studied is radiation. Since the latter originates from quantum transitions of all ions and atoms constituting the plasma, we used the principles of quantum mechanics and statistical mechanics to simulate this radiation.

Effect of the neutron-proton isovector pairing on the spectroscopic factor for one pair of like-nucleons transfer reaction within the one-level model

Y. Benbouzid*, N.H. Allal and M. Fellah

Laboratoire de Physique Théorique, Faculté de Physique, USTHB
BP32, El-Alia, 16111 Bab-Ezzouar, Alger, Algeria
* ybenbouzid@usthb.dz

Abstract

The neutron-proton isovector pairing effect on the Spectroscopic Factor (SF) for one pair of like-nucleons transfer reaction is studied.

As first step, an expression of the SF has been established within the framework of the generalized BCS theory using the definition of Chasman.

It has been checked that this expression does generalize that of the conventional BCS theory (i.e. in the paring between like-particles case) at the limit when the Δ_{np} paring gap parameter goes to zero.

As a second step, the formalism has been numerically tested in the framework of the schematic one-level model. It has been shown that the isovector pairing effect on the SF is significant.

ANALYTICAL EVALUATION OF CRITICAL RADIUS IN RZ9 REACTOR

Khadidja MOHAMMED CHERIF[1*], Abdeslam SEGHOUR[2].

[1]*Laboratoire de physique des rayonnements et leurs interactions avec la matière, 05 Avenue Chahid Boukhlouf Batna 05000, Algérie,*Cherifkhadidja_dz@yahoo.fr

[2]*Centre de Recherche Nucléaire d'Alger CRNA, 2Bvd Frantz Fanon16002 Alger, Algérie,*seghour@crna.dz

ABSTRACT:

The OKLO phenomenon since its discovery in 1972 remains an exceptional and unique in its kinds, from that time to date about fifteen natural fission reactors ,named Reactor Zone "RZ", have been discovered in two deposits in Gabon which are Oklo and Bangombé.

Tow billion years ago , fission reactions have occurred in these zones without any human contribution, in this period the concentration of uranium 235 was significantly higher ($^{235}U/^{238}U = 3.7\%$) in which nuclear chain reactions was possible . the operation of Oklo reactors depends upon the existence of conditions suitable to sustain fission, the research about these conditions is still continuing and the possibility offered by the Monte Carlo code to deal any geometry of reactor allowed to explain the occurrence of criticality especially in the smallest reactor RZ9.

The aim of the present work is to study the influence of thickness and porosity on critical radius for a reflected reactor RZ9 in order to find the minimum size necessary for criticality, for this an analytical method based on the two group diffusion theory, which is widely used to estimate the properties of reactors, is used. For make the reactor model more realistic as possible, the calculations are carried out taking into account the core geometry, reflector contribution, uranium content and porosity which is filled by water under (P, T) Oklo conditions.

ETUDE THEORQUE DE L'INTERACTION D'UN PLASMA AVEC UNE SURFACE SOLIDE

A. Tahraoui and N. Fouial

Laboratoire d'Electronique Quantique, Faculté de Physique, USTHB
BP 32 El-Alia Bab-Ezzouar 16111 Alger, Algérie

alatif_tahraoui@yahoo.fr

Résumé :

Les plasmas industriels sont confinés entre des surfaces solides et entretenus par application de champs électromagnétiques extérieurs. Même dans le fonctionnement des réacteurs à fusion nucléaire par confinement magnétique, l'interaction entre un plasma et une surface solide joue un rôle primordial dans la conception et la réalisation de la réaction de fusion thermonucléaire contrôlée. Cette interaction se traduit par la formation d'une région non neutre qui tend à masquer la surface solide vis-à-vis le plasma globalement neutre. Cette région est appelée gaine électrostatique.

Dans cette communication, nous avons établi un modèle théorique unidimensionnel, stationnaire et non magnétisé qui décrit la formation des gaines électrostatiques en présence des impuretés créées par pulvérisation des surfaces solides ou introduites de façon volontaire selon les besoins. Toutes les espèces de particules sont décrites par les équations fluides. Les impuretés sont considérées de forme sphérique et mono-taille. Leur charge est décrite par le modèle du mouvement de l'orbite limitée. Les résultats numériques montrent que l'épaisseur de la gaine électronique est très sensible au changement des paramètres physiques tels que la densité et la température des particules, la pression du gaz utilisé, etc. De plus, la présence des impuretés élargie l'épaisseur de la gaine électrostatique et rend la structure du potentiel électrostatique ainsi que le champ électrique oscillatoire.

ACCELERATION OF A RELATIVISTIC DENSE ASTROHYSICAL PLASMA

Rachid FERMOUS[1,2] and Mourad DJEBLI[1]

([1]) Laboratoire de Physique Théorique, Faculté de physique, Université de Babezzouar, U.S.T.H.B, B.P El- Alia, Alger 16111.

([2]) Faculté des Sciences, Université de Djillali Bounaama Khemis-Miliana, UDBKM.

Email: rfermous@usthb.dz , r.fermous@univ-dbkm.dz

Abstract:

Plasma expansion is an important physical process that takes place in laser interactions with solid targets. Within a self-similar model for the hydrodynamical multi-fluid equations, we investigated the expansion of dense plasma. The weakly relativistic electrons are produced by ultra-intense laser pulses while ions are supposed to be in a non-relativistic regime. Numerical investigations have shown that dense plasma expansion is found to be governed mainly by quantum contributions in the fluid equations that originate from the degenerate pressure in addition to the nonlinear contributions from exchange and correlation potentials. The quantum degeneracy parameter profile provides clues to set the limit between under-dense and dense relativistic plasma expansions at a given density and temperature.

JEM-EUSO mission to unveil the UHECRs

Esma ZOUAOUI[1] Noureddine MEBARKI[2] Amina LEGHMOUCHE[3]

LPMPS, Université des frères Mentouri Constantine 1, Ain el bey, Street, Constantine.

[1]esma.zouaoui@gmail.com

[2]nnmebarki@yahoo.fr

[3]aminaastro14@gmail.com

Abstract:

The cosmic rays around of 10^{20} eV are a big enigma in their source and nature. The main goal of JEM-EUSO (JEM "Japanese Experiment Module" and EUSO for "Extreme Universe Space Observatory") is identify these kinds of UHECRs (Ultra-High Energy Cosmic Rays), by using the earth as a huge detector, to increase the statistical Data and more information about them as well. In this contribution a short review on the scientific objectives of this mission.

The study of cosmic rays in the high-energyand thepossibility monitored with telescope JEM EUSO

TAWFIQ.ATTOUI[a], *Dr.S.KALLI*[C,b]

[a]*Laboratoire Physique theorique, University of Constantine (Algeria)*
[C]*Laboratoire Physique Mathematique et Subatomique,University of Constantine (Algeria)*
[b]*Physics Department, Faculty of Science, University of M'sila (Algeria)*

Corresponding author : e-mail *tafikattoui@yahoo.fr*

Abstract

Ever since the discovery of cosmic rays by Victor Hess [Hes12] in 1912 great efforts have been undertaken to understand the origin of cosmic rays up to the highest energies of 10^{21}eV. A common detection method utilizes the fluorescence light produced in the atmosphere during extensive air showers induced by cosmic rays. Due to the extremely low flux of particles in the ultra high energy domain vast volumes of atmosphere have to be monitored. The largest fluorescence telescope, the Pierre Auger Observatory, is located in Argentina and covers over 3000km^2. The space based JEM-EUSO mission is a proposed pathfinder mission to further increase the amount of observed atmosphere. The Extreme Universe Space Telescope (EUSO) will be attached to the Japanese Experiment Module (JEM) of the International Space Station (ISS) and provides a high resolution sensor and a wide field of view (±30◦).

We have discussed this in the simulated light fluorescence and fluorescence study Output FY_{λ}^{L} US to take the standard model of the atmosphere,we came through the simulation process to know that synthetic atmosphere and physical characteristics of the structure, temperature, density and pressure changing in terms of height h and even the wavelength λ of photons fluorination all affect the output of fluorination FY_{λ}^{L} .

Kay words: cosmic rays; air showers; telescopes JEM-EUSO ; fluorescence.

CHARGED COMPACT STARS IN $f(R)$ GRAVITY

Mansour Houda[a] and Dr. Si Lakhal Bahia[a a]

Blida 1 University(Algeria)

Corresponding author : e-mail *mansourhouda48@gmail.com*

Abstract

Latest cosmological observations show that the universe is undergoing an accelerating expansion. Several theories were proposed to explain that acceleration: ΛCDM (Λ accounts for dark energy and CDM is the cold dark matter), inflationary models. Despite their success, these theories fail in describing some other phenomenon emerging in astrophysics cosmology, and high energy physics.

So, several extensions to the theory of gravitation were proposed aiming to preserve the undoubtedly positive results of Einstein's Theory of general relativity. The simplest extension is the so called $f(R)$ gravity which consists in replacing the Ricci scalar R by a function f of it.

We study the effect of electric charge in compact stars assuming that the charge distribution is proportional to the mass density. We perform a detailed numerical study of the effect of electric charge using a polytropic equation of state. We first try to find the numerical results given in a paper of S. Ray et al. and then apply $f(R)$ gravity to study the effect of the correction terms given.

Keywords: General Relativity, Extended theory of gravity, charged stars, Tolman-Oppenheimer Volkoff equation.

The propagation of the Ultra High Energy Cosmic Rays in the universe

Amina LEGHMOUCHE[1] *Noureddine MEBARKI*[2]

LPMPS, Université des frères Mentouri Constantine 1, Ain el bey, Street, Constantine.

[1]aminaastro14@gmail.com

2nnmebarki@yahoo.fr

Abstract:

Ultra-High Energy Cosmic Rays (UHECRs; E > 10^17 eV) are the most energetic particles in the Universe of which origin still remain a mystery in astrophysics today. They interact with cosmic background photons, losing their energies and producing their secondaries, Furthermore, propagating UHECRs are also affected by cosmic magnetic fields and then their arrival directions are not exactly the same as the directions of their sources, which provides difficulty of identifying their origine.In this work, we review the main physical phenomena connected with the production and propagation of these highest energetic particles in the universe.

CALCUL DE LA VITESSE DE BOHM POUR UN PLASMA COMPLEXE CONTENANT DEUX ESPECES D'IONS

N. Fouial[1], A. Tahraoui[1] et D. Benlemdjaldi[1,2]
[1]*Laboratoire d'Electronique Quantique, Faculté de Physique, USTHB*
BP 32 El-Alia Bab-Ezzouar Alger 16111 Algérie
[1, 2]*Département de Physique, Ecole Normale Supérieure*
BP 92 Vieux-Kouba 16050 Alger, Algérie
nfouial@yahoo.fr

RESUME :

L'interaction d'un plasma avec une surface solide donne naissance à une région non neutre appelée gaine électrostatique. Les ions se déplaçant en direction de la gaine sont accélérés et leur vitesse doit être supérieure à une vitesse seuil pour assurer la stabilité de la gaine. Cette condition est communément appelée critère de Bohm.

Dans ce travail, nous nous intéressons au calcul de la vitesse de Bohm dans le cas d'un plasma complexe formé de deux espèces d'ions positifs et des électrons énergétiques. Ces derniers sont décrits par la fonction de distribution des vitesses de Cairns et *al*.[1]. Les ions et les grains de poussière sont décrits par les équations fluides. La charge des grains de poussière est décrite par le modèle du mouvement de l'orbite limitée OML[2] (Orbit Motion Limited Model).

Les résultats numériques montrent que la vitesse de Bohm pour les ions légers est nettement supérieure à celle des ions lourds. De plus, le comportement de la vitesse de Bohm généralisée normalisée par rapport à la densité des grains de poussière est pratiquement indépendant de la fraction des ions légers.

Mots clés: Gaine électrostatique, Critère de Bohm, Plasma poussiéreux.

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MODEL OF ELECTROSTATIC SHEATH IN CYLINDRICAL GEOMETRY FOR UNMAGNETIZED PLASMA

[1,2]D. Benlemdjaldi, [2]A. Tahraoui et [2]N. Fouial

[1]*Département de Physique, Ecole Normale Supérieure BP 92 Vieux-Kouba 16050 Alger, Algérie*

[2]*Laboratoire d'Electronique Quantique, Faculté de Physique, USTHB BP 32 El-Alia Bab-Ezzouar 16111 Alger, Algérie*

dbenlemdjaldi@gmail.com

Abstract

When plasma is in contact with a solid wall, such as an electrode in discharge plasmas, it acquires a negative potential with respect to the bulk plasma, due to the high mobility of the electrons. An electrostatic sheath that is a boundary layer where the plasma departs from quasi-neutrality gets formed. The problem of sheath formation is of fundamental importance in many applications including plasma probes, low-temperature plasma-aided material processing, as well as fusion research. The typical sheath thickness is a few electron Debye lengths, which is usually small compared with the characteristic length of the plasma defined by the typical size of the system.

In this paper, we present a theoretical model to describe the sheath structure in a cylindrical unmagnetized low-pressure plasma. For this, a set of coupled equations are formulated including the steady-state fluid equations of continuity and motion for the positive ion and Poisson's equation with Boltzmann electrons. The geometry considered is one dimensional with all variables are functions of the radial direction in cylindrical coordinates. We have solved numerically the basic equations of our model and investigated the effect of collision on the sheath region. The effect of others parameters was also analyzed.

Keywords: electrostatic sheath, cylindrical coordinates, Discharge plasma

Laser- induced breakdown spectroscopy applied to material analysis

***D. Besseghier*[*], S. A. Beldjilali, F. Bencherif, H. Derouiche, A. Belasri**

LPPMCA, USTO-MB- Université des Sciences et de la technologie d'Oran Mohamed Boudiaf, El M'Naoeur, B.P. 1505, 31000 Oran, Algeria.

[*]*E-mail :* besseghierdjamil@gmail.com

Abstract:

We investigate the capability of laser- induced plasma spectroscopy technique called LIBS on the analysis of solid materials used in the manufacturing of photovoltaic cells. In the present work, we report on diagnostic of the plasma produced by laser ablation on Si wafer, based on the analysis of the atomic and ionic spectral lines in the UV and visible ranges. A detection of trace elements in this sample was also investigated and the plasma temperature and electronic density were measured in the condition of a plasma in local thermodynamic equilibrium.

Keywords: Laser plasma, LIBS, spectroscopy, Silicon.

Analysis of Silicon by laser- induced breakdown spectroscopy

H. Derouiche*[*], *S. A. Beldjilali, D. Besseghier, A. Belasri

LPPMCA, USTO-MB- Université des Sciences et de la technologie d'Oran Mohamed Boudiaf, El M'Naoeur, B.P. 1505, 31000 Oran, Algeria.

[*]*E-mail :* derouichehalima83@gmail.com

Abstract:

Laser-induced breakdown spectroscopy LIBS is a promising technique for a quantitative analysis of materials. Indeed, it allows a real time analysis of the elemental composition without contact and without sample preparation. Silicon is the main component used in the manufacture of photovoltaic solar cells, giving it the first place in the field of renewable energy. Due to the technological and economic importance of this material, a full qualitative analysis of silicon by LIBS is presented in this work. Atomic and ionic Emission lines are analyzed using spectroscopic databases. The ablation plume is also investigated by measuring the excitation temperature and electron density of the plasma in local thermodynamic equilibrium.

Keywords: Laser plasma, LIBS, spectroscopy, Silicon.

Elastic and lattice dynamical properties of perovskite type hydrides alloys

S. Karfaf[1], *B. Bennecer* [*], *F. Kalarasse*[2].

[1]*Karfaf.saliha@gmail.com*.

[2]*fateh.kalarasse@gmail.com*

[*]*b_bennacer@hotmail.com*

[*]*Physics Laboratory at Guelma, University of Guelma P.O Box 401 Guelma 24000, Algeria*

Abstract

Using density functional perturbation theory (DFPT) and the virtual crystal approximation (VCA), we have investigated the structural and elastic properties, and lattice dynamics of $Ba_xSr_{1-x}LiH3$. The variation of the structural parameters, the elastic constants, the optical and acoustic phonon frequencies at the high symmetry points Γ, X and R, the electronic and static dielectric constants ,the Born effective charge are studied as a function of the concentration(x). In addition, we have also used the calculated phonon dispersions in conjunction with the quasi-harmonic approximation to predict temperature and pressure dependence of various quantities such as the heat capacity.

Ab initio calculations of vibrational and thermodynamic properties of polymorphs of CuI

S. Fnides[1], *B. Bennecer**, *S. Karfaf*[2]

[1]souhir.fnides@gmail.com

[2]Karfaf.saliha@gmail.com

*b_bennacer@hotmail.com

**Physics Laboratory at Guelma, University of Guelma P.O Box 401 Guelma 24000 Algeria*

Abstract

We present an ab initio calculations of lattice dynamics and thermodynamic properties of copper iodide (CuI) in the zinc blend, tetragonal and rocksalt structured phases by means of the pseudo-potential plane waves method within generalized gradient approximation (GGA). We find that CuI follows the high pressure transition path from the zinc blend (B3) phase to rocksalt (B1) phase via the tetragonal phase. The phonon dispersion curves and phonon density of states are calculated by using density-functional perturbation theory (DFPT). Using the quasi-harmonic approximation the thermodynamic functions: free energy, enthalpy and specific heat are evaluated

Coexistence of multi-cluster states in the interacting boson model

A. Mekentichi and A. Bouldjedri,

PRIMALAB Laboratory, Department of Physics, University of Batna,

Avenue Boukhlouf M El Hadi, 05000 Batna, Algeria

Abstract:

The interacting boson model is very successful in describing collective nuclear motion. In the original version, the model does not account for all observed structural features. Negative Parity states usually are believed to be due to the asymmetric shape of the nucleus. Negative Parity states in the nuclear spectrum are studied in several extensions of the IBM model as sdf and spdf IBM (describing octupole excitations).

A second mechanism of collectivity leading to reflection symmetry breaking is the nuclear clustering.

In our work, we present a phenomenological approach to clustering in nuclei in the framework of the algebraic models called the nuclear vibron model. We discuss a heavy deformed nucleus as a three-body system consisting of a heavy core considered with axial symmetry and two alpha particles (clusters). Hence, our model is a generalization of the nuclear vibron model of Daley and Iachello.

We showed the existence of two dynamical symmetries describing harmonic motion of two clusters in axially deformed nuclei. We applied the model to two nuclei ^{236}U and ^{240}Pu in the actinide mass region.

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PT-symmetry in Optical Systems

Omar Cherbal, Fatima Zohra Ighezou and Malek Zenad.

Faculty of Physics, Theoretical Physics Laboratory,

USTHB, B.P. 32, El Alia, Algiers 16111, Algeria.

Abstract:

Quantum physics is an indispensable tool for describing many physical phenomena, especially those that take place on a microscopic scale. All measurable quantities are represented by Hermitian operators (called observables) and one of the postulates of quantum mechanics states that the values of these observables are real. In 1998, Bender and Boettcher [1] show that one can find non-Hermitian Hamiltonians which possesses real spectrum. The reality of this spectrum is a consequence of the PT-invariance of the Hamiltonian H i.e. its symmetry property of space-time reflection (P and T are respectively the parity and time-reversal operators).

PT-symmetry has been a subject of new developments in a large area of quantum physics [2,3]. The concept of PT-symmetry was quite recently applied in the framework of optics [4]. It was suggested that complex PT-symmetric structures could be realized within an optical framework by involving symmetric index guiding and an antisymmetric gain/loss profile [4,5]. The purpose of this communication is to present the ideas of PT-symmetry in the framework of optical systems.

Key words: PT-symmetry, optical systems.

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Partie 2 :

Les communications Orales

STRUCTURE, FORMATION AND THE DANGER OF BALL LIGHTNING

M.L. Shmatov

Ioffe Institute, 194021 St. Petersburg, Russia

e-mail: M.Shmatov@mail.ioffe.ru

The problem of ball lightning is one of the oldest problems of plasma physics. This problem is important, in particular, for optimizing both the safety measures at the rendezvous of humans and aircraft with ball lightning and treatment of humans influenced by it.

Ball lightning model proposed by the author of this abstract will be presented. According to it, ball lightning has a core consisting of oscillating clouds of electrons, almost totally ionized ions of N and O and the ions of Ar with the typical ionization stage of 16 to 18; the maximum electron kinetic energy, corresponding to the oscillatory motion, is usually of the order of 10^4–10^7 eV. The stability of ball lightning core is provided by the oscillation of its particles and the atmospheric pressure that compensates for the outward forces arising mainly due to the three-dimensional geometry of the oscillation and random motion of particles. The core is isolated from the atmosphere by the depleted layer. The maximum volume density of ball lightning energy is of the order of 1 kJ/cm^3. The ball lightning lifetime of the order of 1–10 s is explained.

Ball lightning arises due to the formation of converging flux of runaway electrons. The acceleration of these electrons is supposed to occur due to their attraction to positive charges injected into the atmosphere. This assumption is in agreement with a number of the reports about the observed formation of ball lightning. Several possible scenarios of the formation of the converging electron fluxes will be considered. The possibility to check the model in the experiments with lightning will also be considered.

It is worth noting that the initial acceleration of electrons of terrestrial gamma-ray flashes with a hard spectrum has been explained within the framework of the model that is similar to the model of the initial acceleration of electrons of ball lightning.

The model corresponds to almost the worst assumptions about the danger of ball lightning with high energies. First of all, it corresponds to the assumption about the ability of some ball lightning to cause radiation sickness. The additional danger of the ionizing radiation from ball lightning results from the fact that it can cause progressive dementia. The danger of ball lightning with low energies is relatively low.

"Gravitational waves and the Aures Observatory"

Nassim Seghouani

nseghouani@yahoo.com

CRAAG

Abstract:

The recent detection of gravitational waves has confirmed Einstein's predictions and opened new horizons in our understanding of the universe. This kind of detection is done by means of gravitational wave detectors such as adLIGO and adVIRGO. However, these detectors cannot accurately detect the source of these waves, and provide an error box of a hundred square degrees in the sky. Nevertheless these gravitational waves due to the coalescence of compact objects are often followed by GRBs emission, and therefore it is possible to look for the optical counterpart of these waves by a quick scan of the error box provided by VIRGO & the LIGO detectors and find the source of these gravitationnal waves. This is the main objective of the RAMSES project in the future Observatory Aures. In this intervention, I will speak about gravitational waves, the RAMSES project and the future Observatory Aures.

Investigation of Temperature Anisotropy in Tokamak Plasma

A.Benahmed and A. Sid

Laboratoire de physique des rayonnements et de leurs interactions avec la matière, LRPRIM, Faculté des sciences de la matière, Département de physique,, Université Batna 1, Algeria

e-mail : sid_abdelaziz@hotmail.com

Abstract

In the present work, the electronic distribution function for high magnetized hot plasma, taking into account the electron ion collisions is explicitly calculated. The basic equation in this investigation is the Fokker-Planck equation where some justified approximations for Tokamak plasmas are used. The distribution function is explicitly computed. By computing the second moment of the distribution we have expressed the electrons temperatures in the parallel direction and in the perpendicular plane to the magnetic field. It has been shown that this temperature is anisotropic and this anisotropy is due to competition between magnetic field effect and collisions effect.

Keywords: magnetized plasma, plasma kinetic theory, collisions in plasma

Spectroscopic diagnostic of equilibrium and turbulent plasmas

Ibtissem HANNACHI, Roland STAMM

Ibtissem.hannachi@yahoo.fr

PRIMALAB, university of Batna 1, Algeria
PIIM, Aix Marseille University, France

Abstract : Plasma diagnostic obtained from spectral lines broadening in equilibrium plasmas and turbulent plasmas. Such lines may then provide a diagnostic of the plasma microfield dynamics in the region of emission in equilibrium plasmas. We use a stochastic renewal process for the plasma microfield being the cause of Stark broadening. The accuracy and improvement possibilities of Lyman profiles calculations with a renewal process are analyzed by comparing to ab-initio simulations for ion broadening only. Stochastic processes may also be applied to out of equilibrium plasmas. We present our first results for the effect of Langmuir waves on a line broadened by electrons only, and for the changes of atomic populations submitted to strong temperature fluctuations.

The problem of plasma turbulence is of interest both from a theoretical point of view and from an experimental one for laboratory, fusion, and astrophysical plasmas. An atom immersed in a plasma affected by strong Langmuir turbulence may be perturbed by a sequence of wave packets with a maximum electric field magnitude large compared to the equilibrium plasma microfield. For such conditions, we propose to calculate the shape of the hydrogen Lyman-α line with a numerical integration of the Schrödinger equation coupled to a simulation of a sequence of electric fields modeling the effects of the wave packets. Several line profiles are presented and discussed for different average values of the wave packets electric field magnitude.

Propagation of soliton pulses in optical fibers

Houria Triki

Laboratoire de Physique des Rayonnements, Département de Physique, Faculté des Sciences, Université Badji Mokhtar, P. O. Box 12, 2300, Annaba- Algérie-

Abstract

Solitons are particularly desirable for ultra-long-distance communication systems and high-bit-rate fiber communications. Physically, soliton pulses are localized electromagnetic waves that propagate in nonlinear media with dispersion and/or diffraction without any change in shape or intensity due to the delicate balance between the dispersion (or diffraction) and the nonlinearity effects. Optical solitons in Kerr nonlinear media have been the subject of intense current research motivated by their important applications to high-capacity fibers. The model equation, which describes the light wave envelope, is the well-known nonlinear Schrödinger equation. This equation is completely integrable by the inverse scattering transform. This means that it is possible to find both solitary wave and multi-soliton solutions. However, as one increases the intensity of the incident light power to produce shorter (femtosecond) pulses, non-Kerr nonlinearity effects become important and the dynamics of pulses should be described by the NLS family of equations with higher order nonlinear terms.

In this work, the existence and stability of soliton pulses propagating in highly nonlinear optical fibers are studied. The obtained propagating pulses characteristically exist due to a balance among group velocit y dispersion and nonlinear effects of different nature. Such solutions are helpful for recognizing physical phenomena described by the governing envelope wave equation and for realizing its properties.

Effets de la densité des ions sur la structure de la gaine électrostatique d'un plasma magnétisé contaminé par des impuretés multi-tailles

S. CHEKOUR et A. TAHRAOUI

Laboratoire d'Electronique Quantique, Faculté de Physique, USTHB
BP 32 El-Alia Bab-Ezzouar 16111 Alger, Algérie
Tél : 21247344, Fax : 21247344, E-mail : che-samir@hotmail.com

RESUME

Les gaines électrostatiques sont des régions non neutres qui se forment lorsqu'un plasma est en contact avec une surface solide. La présence des impuretés, appelées dans la littérature grains de poussière, rend ces gaines électrostatiques plus complexes, où ces derniers étaient considérés comme étant des sphères mono-taille. Les observations expérimentales récentes ont montré que la taille des grains de poussière varie du nanomètre jusqu'au micromètre.

Dans cette communication, nous avons établi un modèle théorique stationnaire qui décrit la structure des gaines électrostatiques d'un plasma magnétisé en présence des impuretés multi-tailles. Pour cela, nous avons considéré les électrons en équilibre thermodynamique. Cependant les ions et les grains de poussière sont décrits par les équations fluides. Pour tenir compte de la taille des grains de poussière, nous avons considéré une fonction de distribution Gaussienne.

Les résultats numériques montrent que l'augmentation de la densité des ionsse traduit par une augmentation de la densité des électrons. Par conséquent, la probabilité d'attachement des électrons et des ions augmente. Ce qui induit un élargissement considérable de la gaine électrostatique. Les effets des autres paramètres ont été analysés et discutés.

Mots clés: Plasma poussiéreux, Gaine électrostatique, Distribution de taille.