PlasmaIndia

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Regarding PLASMA-2004

The 19th National Symposium on Plasma Science and Technology (PLASMA-2004) will be held at Bundelkhand University, Jhansi, Uttar Pradesh during December 07-10, 2004. The proposed symposium is organized to provide a scientific forum for the presentation of new results and to discuss recent developments in various fields of plasma science and technology at many research institutions and universities in India. The focal theme of the symposium is ***"Scope and Challenges in Plasma Science and Technology".*** The following areas will be covered in the symposium:

Basic Plasma Studies, Plasma Processing and Diagnostics, Space & Astrophysical Plasma, Fusion Plasma, Dusty Plasma, Waves & Exotic Plasma, Laser Plasma, Non-thermal Plasma, Computational & Simulation Plasma and Interdisciplinary Plasma

Department of Physics Bundelkhand University, Jhansi is organizing **PLASMA-2004.** The department of Physics is a core department of Bundelkhand University and working on its sacred mission to impart quality academic and vocational knowledge and steadily surging ahead for higher learning, research and professional training. The Co-organizer, Plasma Science Society of

India (PSSI) is a professional All India Body with a large number of members from both academic and R&D organizations. It is a non-profit scientific society providing a common forum for the Scientist, engineers and industrialist to deliberate various activities on plasma and related areas of research. **Established in 1978, the PSSI is celebrating the silver Jubilee year of its inception.**

IMPORTANT DEADLINES

Submission of Abstract	*August 15, 2004*
Acceptance of Abstract	*September 15, 2004*
Submission of Registration form	*October 31, 2004*
Hotel Accommodation	*October 31, 2004*
Submission of Full length paper	*October 31, 2004*

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Announcement

Applications from fresh Ph. Ds and graduate students, along with manuscripts are invited for **"Buti Young Scientist Award"** . Application form must be sent to *Convenor, Plasma-2004 with a copy to* ***Executive committee, PSSI, Institute for Plasma Research, Bhat, Gandhinagar-382428*** on or before September 30, 2004. Selected students will be asked to give an oral presentation during Plasma-2004. Award will be judged by a panel. The award money of Rs. 5000/- will be given for the best presentation.

Buti Foundation

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PLASMA SCIENCE SOCIETY OF INDIA

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Analysis of Electron Inertia induced Acoustic Instability

In presence of drifting ions with drift speed exceeding the acoustic phase speed, electron inertial delay effect facilitates the resonant coupling of the usual fluid acoustic mode with ion beam mode. It is found that the aforesaid instability arises out of linear resonance coupling between the negative and positive energy modes.

Boltzman distribution for the electrons upholds the fact that the electrons offer instantaneous response to any kind of low frequency plasma potential fluctuations. Recently, the universal validity of such consideration has been found for one beam plasma system and has been reviewed [1].

The threshold condition for resonance mode instability demands that the plasma flow velocity should exceed the ion acoustic speed of non-drifting plasmas. Instability triggered by inertial mass of electron is found be applicable in transonic zone of sheath edge, solar wind plasma and astrophysical plasma.

We consider a simple two-component unmagnetized and collisionless plasma system under fluid approximation. The ions are supposed to be drifting with uniform velocity at around the sonic speed. The desired expression of the dispersion relation for our interest (as derived and discussed in Ref. 1) can be directly written as given [1]

$$(\Omega+\kappa.v_0)^2=\frac{\kappa^2 v_{te}^2\left(1+\kappa^2\lambda_{De}^2\right)}{\Omega^2}\left(\Omega_a^2-\Omega^2\right) \qquad \ldots(1)$$

Now, it can be inferred that eq. (1) represents for a resonantly unstable situation at Doppler shifted resonance frequency of $\Omega \approx |\kappa.v_0| \geq \Omega_a$ if and only if $\kappa.v_0 < 0$. The growth rate for this resonant instability [1] is found to be

$$\gamma=\sqrt{\frac{m_i}{m_e}2\Omega_a}\left(1+\kappa^2\lambda_{De}^2\right)\left|\left(\Omega-|\kappa.v_0|\right)^{1/2}\right| \qquad \ldots(2)$$

Laguerre's method [2] is used to solve the polynomials, derived from the dispersion equation to depict the nature of unstable mode (beam frame)

$$a_5\Omega'^4+a_4\Omega'^3+a_3\Omega'^2+a_2\Omega'+a_1=0 \qquad \ldots(3)$$

Real and imaginary parts of the corresponding complex roots with only positive imaginary parts are then found to be responsible to give rise to instability. The average electrostatic field energy stored in a propagating electrostatic wave is given by the relation [3,4] as follows

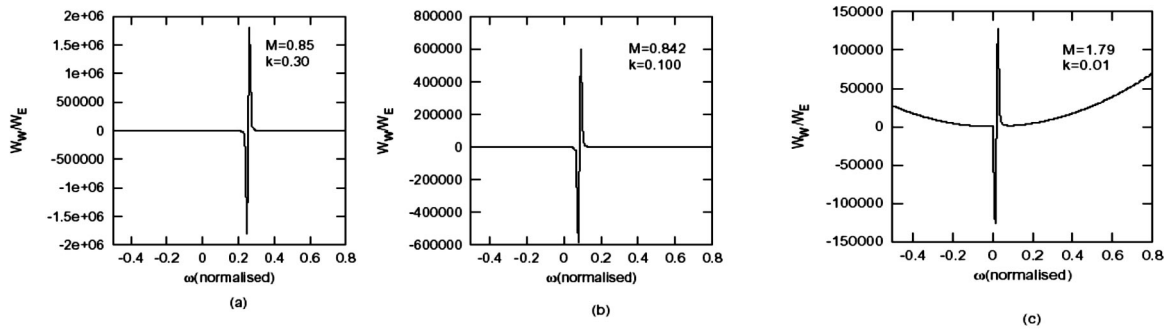
$$\frac{W_\omega}{W_E}=\left[\frac{2\omega^2}{\kappa^2\lambda_{De}^2\kappa^2 v_{te}^2}+\frac{2\omega\,\omega_{pi}^2}{(\omega-\kappa.v_0)^3}\right] \qquad \ldots(4)$$

Now, it is evident that the second term of eq. (3) corresponds to negative energy mode as because the associated energy becomes negative for $\omega<\kappa.v_0$.

Under the cold ion approximation, even the small electrostatic potential will be able to distort the ion particle motion (quenching), affecting the driving source flow velocity of the resonant instability under consideration with the time scale in normalized form in lab-frame as follows

$$\tau=\sqrt{\frac{m_e}{2m_i}}\frac{1}{\kappa\lambda_{De}}\left(|1-M|\right)^{1/2}\ln\left[\frac{1}{4}\left(n\lambda_{De}^3\right)\left(\kappa^2\lambda_{De}^2\right)M^2\frac{1}{|1-M|}\right] \qquad \ldots(5)$$

It is clear that the quenching time sensitively depends upon two factors, the perturbation wavelength and the deviation from the resonance point i.e. $(1-M)$



The resonant values of real part of normalized Doppler shifted frequency (Ω') in M space for different values of $k\lambda_{De}$ come out to be almost the same and is equal to $\Omega' = 0.5$. It is in good agreement with the resonance threshold cond-ition as discussed earlier [1] with analytical method given by

$$\Omega' \sim k\lambda_{De} M \rangle \frac{k\lambda_{De}}{\sqrt{1+k^2\lambda_{De}^2}}$$

The resonance coupling of positive and negative energy modes is responsible for the growing solution of the acoustic fluctuations in plasmas with drift motion. The graphical method of dispersion analysis is a successful one. A more vivid picture of resonant mode-mode coupling of positive and negative energy waves is obtained. Similar situations are likely to occur in stellar wind plasmas, where, the transonic behavior is brought about by deLaval nozzle mechanism of gas flow through a tube of varying cross section.

References

[1] C B Dwivedi and Ram Prakash, J. Appl. Phys., 90 3200 (2001)

[2] W H Press, S A Teukolsky, W T Vetterling and B P Flannery, Numerical Recipes in Fortran (Cambridge University Press, 1st Indian edn., New Delhi, 1993) Chap. 9, p 365

[3] Rudolf A Treumann and Woulfgang Baumjohann, Advanced Space Plasma Physics (Imperial College Press, London, 1997) Ch. 2

[4] Eryk Infeld and George Rowlands, Nonlinear waves, solitons and chaos (Cambridge University Press, Cambridge, 1990) Ch. 2

Contributed by: **Pralay Kumar Karmakar *(IASST, Guwahati)***

Attention all PSSI members: ELECTION NOTICE

This is to bring to your notice that the elections to the Executive Council for the term 2004-2006 as allowed for in the Memorandum of Association of Plasma Science of India (PSSI), is to be held.

As per the Rules and Regulations of the Society, nominations are requested for the following positions of the Executive Council:

President	:	One Post	Vice President	:	One Post
Secretary	:	One Post	Treasurer	:	One Post
Councilors	:	Six Posts			

The relevant rules for nomination are reproduced here [Article II, sub clause 2, 3(b) & 3 (c)]:

2. The President, the Vice President and the Secretary shall not be eligible for immediate re-election for the same post. The Treasurer shall not be eligible for immediate re-election to the same post after serving for two consecutive terms.

3(b) Nominations for the office bearers shall be made over the signatures of at least two members with voting right.

3(c) Written consent of the members being nominated shall be obtained for all nominations.

The following schedule shall be observed for nomination:

Last date for filing nomination : October 1, 2004

Last date for withdrawing nomination : October 8, 2004

We request you to send (mail or fax) nominations for the office bearers so as to reach us positively by October 1, 2004. You may use the attached nomination form or reproduce the format.

S. V. Kulkarni & J. Govindarajan
Returning Officer, PSSI

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PLASMA SOCIETY OF INDIA

NOMINATION FORM 2004-2006

I propose Prof.Dr. /Mr./Ms/——————————————————(name of the nominee with membership no.),——(address of the nominee) for the position of——————————————— ——————— on the Executive Council of the PSSI for the term 2004-2006

Address: ——————————— **Signature** ———————————

——————————— **Name** ———————————

——————————— **Membership No.** ———————————

E-mail: ——————————— **Date:** ———————————

I second the nomination of——————————————————————(name of the nominee), for the position of ——————————————— on the Executive Council of the PSSI for the term 2004-2006

Address: ——————————— **Signature** ———————————

——————————— **Name** ———————————

——————————— **Membership No.** ———————————

E-mail: ——————————— **Date:** ———————————

I agree to accept the office of ——————————————————— if elected and to work on the Executive Council for the term 2004-2006.

Address: ——————————— **Signature** ———————————

——————————— **Name** ———————————

——————————— **Membership No.** ———————————

E-mail: ——————————— **Date:** ———————————

This nomination should be mailed or faxed to:

S. V. Kulkarni / J. Govindarajan, Returning Officers, PSSI, PSSI Election 2004

Institute for Plasma Research, Near Indira Bridge, Bhat, Gandhinagar-382 428 (Gujarat) Fax: (079) 23969017

Last date for filing nomination: October 1, 2004

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