

# *The 6th European Fusion Theory Conference*

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2 - 4 October 1995

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## Poster Session 3 (Wednesday 4 October 11.00 hrs)

- Zh.N. Andrushchenko, O.K. Cheremnykh P3-1  
Ballooning vortices in a plasma with hot particles
- A. Ardelea, W.A. Cooper, F. Troyon, M. Ballabio, R. Gruber P3-2  
Toroidal current limits in large-A tokamaks with helical windings
- P.J. Eecen, T.J. Schep, A.V. Tulupov P3-3  
Spectral dynamics of a free electron maser for plasma heating
- S.V. Bulanov, D. Farina P3-4  
Stochastic properties of the magnetic field lines in the presence of current sheets
- J.A. Jiménez, A. Varias, A.L. Fraguas, C. Alejaldre P3-5  
Local stability in heliac-type stellarators
- W. Kerner, O. Pogutse, R. Van der Linden P3-6  
MHD interchange instabilities in tokamak SOL plasmas
- D. Lortz, G.O. Spies P3-7  
Resistive interface localized modes
- E.K. Maschke, R.E. Denton, G. Urquijo P3-8  
A flexible code based on a scalar representation of toroidal MHD
- A. Montvai P3-9  
Degree of destruction of magnetic surfaces and plasma transport in a tokamak
- A. Pletzer P3-10  
Pressure gradient effects on the saturation of the  $m=2$  tearing mode
- G. Penn, B. Coppi, C. Riconda P3-11  
The interaction of energetic particles with modes characteristic of inhomogeneous plasmas
- M.A.M. Santiago, K.-H. Tsui, M. Tavares, R.Y. Honda, P3-12  
P.H. Sakanaka, M. Machida, E. Aramaki, L.A. Berni, D.O. Campos  
Non resistive analysis of rotational instabilities in FRC and the UNICAMP TC-1  $m=4$  results
- A.S. de Assis, V.S. Tsypin, A.G. Elfimov, F.M. Nekrasov, C.A. de Azevedo P3-13  
Alfvén and fast wave current drive in weakly collisional plasmas of elongated cross-section tokamaks
- B.Ph. van Milligen, V. Tribaldos, J.A. Jiménez P3-14  
Solving differential equations with a neural network and application to ideal MHD equilibria

- V.S. Mikhailenko, K.N. Stepanov, D.I. Maslennikov** P3-15  
**Ion cyclotron decay instabilities of single and two ion species  
plasma excited by strong alternating electric field of a finite wavelength**
- A. Yu. Pan'kin, T.A. Davydova** P3-16  
**Spatial-temporal evolution of ion temperature gradient-driven explosive  
instability near marginal stability boundary in tokamaks**
- T.A. Davydova, A.I. Fishchuk** P3-17  
**Two-dimensional upper hybrid solitons and their stability**

**Spatial-temporal evolution of  
ion temperature gradient-driven explosive instability  
near marginal stability boundary in tokamaks.**

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One of the most easily excited modes in tokamaks is an ion temperature gradient driven mode which is thought to be responsible for anomalous transport up and below marginal stability boundary [1, 2]. High turbulence level of this mode below marginal stability boundary may be connected with nonlinear explosive instability due to interaction between drift modes with negative and positive energy. This mechanism was proposed in [2] as an explanation of "subcritical turbulence". However usual three-wave interaction theory fails to describe the most interesting case of waves interacting near marginal stability boundary where nonlinear matrix elements tend to infinity. In this case mode energy exchange during nonlinear interaction greatly exceeds "own" energy of modes so they can be considered as "zero" energy waves.

The character of nonlinear wave interaction remains of explosive type in this case but the law of amplitude growth in time changes [3, 4].

In this report we consider spatial-temporal evolution of explosive drift wave instability when all interacting waves can be considered as "zero energy" waves. The conditions of nonlinear saturation due to convective nature of instability have been found. The possibility of nonlinear wave structure formation due to spatial-temporal nonlinear wave interaction of explosive type near marginal stability boundary is shown. Such structures and their interactions may constitute subcritical turbulence and determine transport properties of plasma near the marginal stability boundary.

#### REFERENCES

- [1] OTTAVIANI M., ROMANOLLI F., BENZI R., BRISCOLINI M., SANTAGELO P., SUCCI S., *Phys. Fl.* B2 (1990) 67.
- [2] NORDMAN H., PAVLENKO V.P., WEILAND J., *Phys. Fl.* B5 (1993) 402
- [3] DAVYDOVA T.A., PAVLENKO V.P., TARANOV V.P., SHAMRAY K.P., *Plasma Phys.* 20 (1978) 373
- [4] DAVYDOVA T.A. *Proc. Int. Conf. on Plasma Phys. Göteborg, 1982, p. 192.*