

Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Negative energy modes and the quantum two-stream instability¹

PADMA KANT SHUKLA, FERNANDO HAAS, Ruhr University Bochum, Bochum, Germany, ANTOINE CLAUDE BRET, ETSI Industriales, Universidad de Castilla-La Mancha, Ciudad Real, Spain — The quantum two-stream instability is a benchmark displaying many of the particularities of quantum plasmas, including a new unstable branch of the dispersion relation for large wave-numbers and almost stationary, quasineutral, nonlinear oscillations without analog in classical plasmas. The unexpected features of the two-stream instability in electrostatic quantum plasmas are interpreted in terms of the coupling of approximate fast and slow waves. This is accomplished thanks to the factorization of the dispersion relation into different sectors carrying positive or negative energy. The concept of negative and positive energy waves, therefore, is shown to be useful not only for classical, but for quantum plasmas as well. The analysis can in principle be carried on in similar problems, like for the quantum beam-plasma instability or the case of parallel propagating quantum beams.

¹This research was financially supported by the Alexander von Humboldt Foundation, and by the Spanish Ministerio de Educacion y Ciencia and PAI-05-045 of the Consejeria de Educacion y Ciencia de la Junta de Comunidades de Castilla-la Mancha.

Bengt Eliasson
Ruhr University Bochum

Date submitted: 14 Jul 2009

Electronic form version 1.4