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Microscopic instability and density limit in neutral magnetized plasmas MATTEO ZUIN, Consorzio RFX, Associazione EURATOM-ENEA sulla Fusione, Padova, Italy, MASSIMO MARINO, ANDREA CARATI, Dipartimento di Matematica, Università degli Studi di Milano, Milano, Italy, EMILIO MARTINES, Consorzio RFX, Associazione EURATOM-ENEA sulla Fusione, Padova, Italy, LUIGI GALGANI, Dipartimento di Matematica, Università degli Studi di Milano, Milano, Italy — A microscopic model of a neutral magnetized plasma is proposed, which is a linearization of the classical one, where the electrons are considered to be subjected to Coulomb interactions among themselves and with a uniform positive neutralizing background. As no averaging over the individual particles is introduced, the model is dealt with as an actual many-body problem. Microscopic oscillatory modes are found, with wavelengths comparable to the mean interparticle distance. Such modes become unstable when the electron density exceeds a limit value proportional to the square of the magnetic field. When the full electromagnetic interactions are introduced in the model, dispersion relations are obtained which for long wavelengths reproduce the familiar ones of MHD while, for short wavelengths, reduce to those obtained in the purely Coulomb case. The density limit here found is of the same order of magnitude of the well known empirical Greenwald limit found in tokamaks.

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