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Helicon mode formation and rf power deposition in a helicon source MICHAEL KRAEMER, KARI NIEMI, Ruhr University Bochum — The nonlinear nature of the rf absorption in a helicon-produced plasma was investigated on the helicon device HE-L [1] with the aid of a double pulse technique providing high and low amplitude helicon propagation under nearly identical conditions. Time- and space-resolved (2D) measurements of the rf magnetic field (amplitude and phase of all components) were carried out by means of a B-dot probe array. For high rf power, a small narrow peak arises on top of the density profile close to the axis leading to focusing of the rf field energy and the rf power deposition. Nevertheless, in accordance with the linear helicon theory for a non-uniform plasma, the axial wavenumber remains nearly the same as for low power. The rf power deposition in the core of the helicon discharge deduced from the energy flux balance was compared with that obtained from the rf field distribution assuming collisional absorption. It turns out that collisions are by far not sufficient to account for the absorption of helicon modes, particularly for high rf power. Nonlinear processes, most likely associated with the parametric excitation of electrostatic fluctuations [2], are thus involved.- This work was supported by the Deutsche Forschungsgemeinschaft (Sonderforschungsbereich 591, Project A7).- [1] M. Krämer, B. Lorenz, B. Clarenbach, Plasma Sources Sci. Technol. 11A (2002) 120. [2] B. Lorenz, M. Krämer, V.L. Selenin, Yu.M. Aliev, Plasma Sources Sci. Technol. 14, 623 (2005).

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