

Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Helicon Sources: Why they work ROD BOSWELL, Australian National University, SPACE PLASMA POWER AND PROPULSION TEAM — A helicon source is a cylindrical ceramic tube containing a gas in the milliTorr region immersed in an axial magnet field surrounded at some region by an antenna fed with rf around 10 MHz. As the power is increased it will show a variety of modes characterised by changes in the plasma density. Low power produces a spatially uniform capacitive discharge with the electric field heating the electrons: at higher power the discharge can show a jump (with hysteresis) into an inductive mode when the skin depth enters the plasma that produces an annular plasma: powers around a kilowatt produce centrally peaked plasmas of densities $\sim 10^{12} \text{ cm}^{-3}$ where optical measurements show bursts of electrons traveling with the helicon velocity, consistent with acceleration by the E_z fields of the $m=1$ mode. At higher densities, when the plasma enters the “blue mode”, the coulomb mean free path becomes sufficiently small that the plasma becomes resistive and the helicon damps linearly. Other electron heating proposals are discussed and compared to experiment.

Rod Boswell
Australian National University

Date submitted: 25 Jul 2007

Electronic form version 1.4