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Antenna arrays for producing plane whistler waves[1] REINER STENZEL, J. MANUEL URRUTIA, Dept. of Physics and Astronomy, UCLA — In a large uniform laboratory plasma helicon modes with mode numbers $m = 1-8$ have been excited. Using a circular phased array it is shown that positive and negative modes can propagate equally well. The phase fronts of helicons form Archimedian screw surfaces. The electromagnetic field carries linear momentum due to the axial propagation and angular momentum due to the azimuthal propagation. Associated with the orbital angular momentum is a transverse Doppler shift. It is demonstrated that a rapidly rotating "receiver" observes a different frequency than the wave. This implies that a rotating electron can undergo cyclotron resonance when moving against the field rotation. Analogous to the axial Doppler shift cyclotron damping and cyclotron instabilities are possible due to the field rotation in helicons. Since helicons exist in unbounded laboratory plasma they should also exist in space plasmas. The angular wave-particle interaction may be an alternate approach for the remedial of energetic electrons.

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