Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

**Visualising heated gas in an RF plasma loudspeaker**[1] Y.C. SUTTON, P.C. JOHNSON, D.B. SHARP, G.V. NAIDIS, N. ST.J. BRAITHWAITE, The Open University, UK, J. MOORE, Bowers & Wilkins Ltd — An ac modulation (here in the audio frequency range) of the electric field in an RF atmospheric pressure air plasma gives rise to a modulation in the temperature and dimensions of the gas volume. As in natural lightning, the gas heating in the ionised column causes external pressure variations. This electro-acoustic transduction has been used to make a loudspeaker. Spatial and temporal measurement of the gas temperature can identify the nature of the thermal expansion and provides a direct approach to understanding its relationship to the sound pressure wave that is generated. Spectroscopic measurement of rotational line emission from nitrogen molecules is limited to the main current channel where there is optical emission from excited nitrogen molecules. The wider picture is revealed through the use of time-resolved Schlieren method where the refractive index gradients caused by gas heating in the plasma are imaged. Results show the gas heating extends far beyond the main current-carrying channel, in line with numerical modelling of the steady state. Convection and diffusion further interact with the modulation in the mechanism of sound generation.

[1]Project support from B & W Group Ltd and a Royal Society travel grant.

Yvonne Sutton
The Open University

Date submitted: 12 Jun 2010 Electronic form version 1.4