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A generalized electro-acoustic model for laboratory scale and industrial scale atmospheric pressure plasma jets VICTOR LAW, STEPEN DANIELS, Dublin City University, DENIS DOWLING, University College Dublin, PRECISION TEAM — The use of acoustic measurement provides a low cost and effective diagnostic measurement of atmospheric plasmas. This paper reports upon the application of an electro-acoustic model to atmospheric pressure plasma (APP) jets. The model is based upon a closed-end air and/or helium column model to predict the fundamental sound pressure and its overtones, where even harmonic overtones are absent [1]. A simple 5 element electrical equivalent transmission-line model is shown to predict the sound pressure response of the plasma plume as it interacts with a target surface, including the plasma-to-surface gap distance. The model is evaluated on three jet systems: a laboratory scale dielectric barrier plasma jet with a helium flow of 1-3 slm; and two industrial scale APP jets, these are the Dow Corning PlasmaStream that operates with a helium flow 10 l/m and the Plasmatreat PFW10 jet which operates with an air flow of 40 l/m. We found a good correlation between model predictions and acoustic data acquired from all three systems.

[1] Acoustic emission within an atmospheric helium corona discharge Jet. V J Law, C E Nwankire, D P Dowling and S Daniels. Chaos2010, 1-5th June. Chania, Crete, Greece 2010.

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