Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Quantifying the influence of flow asymmetries on glottal sound sources in speech[1] BYRON ERATH, MICHAEL PLESNIAK, Purdue University — Human speech is made possible by the air flow interaction with the vocal folds. During phonation, asymmetries in the glottal flow field may arise from flow phenomena (e.g. the Coanda effect) as well as from pathological vocal fold motion (e.g. unilateral paralysis). In this study, the effects of flow asymmetries on glottal sound sources were investigated. Dynamically-programmable 7.5 times life-size vocal fold models with 2 degrees-of-freedom (linear and rotational) were constructed to provide a first-order approximation of vocal fold motion. Important parameters (Reynolds, Strouhal, and Euler numbers) were scaled to physiological values. Normal and abnormal vocal fold motions were synthesized, and the velocity field and instantaneous transglottal pressure drop were measured. Variability in the glottal jet trajectory necessitated sorting of the data according to the resulting flow configuration. The dipole sound source is related to the transglottal pressure drop via acoustic analogies. Variations in the transglottal pressure drop (and subsequently the dipole sound source) arising from flow asymmetries are discussed.

[1]Supported by the National Science Foundation under Grant No. CBET-0828903.

Michael Plesniak
Purdue University

Date submitted: 01 Aug 2008 Electronic form version 1.4