MAGNETOHYDRODYNAMIC EFFECT ON THE ACOUSTIC FIELD OF ELECTRIC SPARKS

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Magnetohydrodynamics (MHD) studies interactions between magnetic fields (B-field) and electrically conducting fluids. If a B-field is applied to a current-carrying fluid, the fluid experiences a Lorentz force. The effect of Lorentz force in the acoustic field of electric sparks remains unclear. Plasma sparks are accompanied by high current spikes through confined low-impedance channels. Previously, we demonstrated that an external B-field can alter the acoustic field generated by plasma sparks because of the MHD effect [1]. In that study, we measured the particle displacement induced by electric sparks in one location within the acoustic field. In the present study, we use Schlieren imaging and high-speed photography to describe the effect of MHD in a 9 cm^2 region of interest within the acoustic field. Further research on this topic could facilitate enhancement and control of acoustic pressure induced by electric sparks in different industrial and medical applications, such as lithotripsy.

[1] García Pérez, A., Nieminen, H.J., and Hæggström, E., (2016) "Magnetohydrodynamics-enhanced acoustic pressure", 2016 IEEE International Ultrasonics Symposium (IUS). DOI: 10.1109/ULTSYM.2016.7728783