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Plasma Efficiency and Losses for pulsed Xe Excimer DBDs at high Power Densities MARK PARAVIA, MICHAEL MEISSER, WOLFGANG HEERING, Light Technology Institute, University Karlsruhe — The UV water disinfection for example needs efficient lamps with high power densities. Xe_2^* dielectric barrier discharges (DBDs) with phosphor coating can be used due to plasma efficiencies up to 60 % at pulsed electrical power densities of 0.04 W/cm^2 [1]. The power density can be increased by pressure or (operation) frequency. However, the plasma efficiency declines with frequency. We present measurements of the radiant flux for pulsed DBDs made of fused silica as function of pressure and frequency. By calculation of optical losses the plasma efficiency is estimated to be 52 % at 0.07 W/cm^2 but decreases to 34 % at 0.8 W/cm^2. The maximum frequency is pressure dependent and limited due to change-over from homogeneous into filamented mode. In comparison we measured the gas gap voltage and internal plasma current of a pulsed planar DBD for general lighting [2]. This comparison makes it possible to explain the frequency dependence of plasma efficiency and radiant flux. Due to the high frequency the remaining charge density is increased and the discharge becomes a glow discharge. For that reason the typical peak current during ignition drops and explains the declined efficiency by glow phase losses.

[1] Beleznai, S., et al., JPhysD, 41 (2008)
[2] Paravia, M., et al., GEC, Dallas, 2008

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