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Superradiance in self-absorbed emission lines from high intensity discharge lamps DIMITRIOS KARABOURNIOTIS, Institute of Plasma Physics, University of Crete, Physics Department, Heraklion-Greece, EMMANOUEL DRAKAKIS, Technological Educational Institute, Department of Electrical Engineering, Heraklion, Greece, INSTITUTE OF PLASMA PHYSICS, CRETE TEAM, DEPARTMENT OF ELECTRICAL ENGINEERING TEAM — For most high intensity discharge (HID) arc lamps much of the radiation comes from reversal regions of self-absorbed spectral lines. In these lines an enhancement of the spectral radiance was observed at the vicinity of the transition frequency using high resolution spectroscopy and the measured values are much higher than those calculated assuming a source function that decreases monotonically with the distance to the arc axis. This superradiance within the central wavelength region of the line was successfully simulated by a local increase of the source function within the arc plasma mantle. Self-reversed lines emitted from metal halide discharge (MHD) lamps as well as from high pressure pure mercury lamps were investigated. The numerical results of the spectral line radiance are in good agreement with the experimental spectroscopic results. The origin of the superradiance can be justified by the presence of an additional source of radiation caused by non-equilibrium plasma effects such as nonradiative excitation transfer and photodissociation of metal halide molecules.

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