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Plasmas created by UV illumination rather than electron impact

RAOUL FRANKLIN, The OpenUniversity — Some of the early experimental work in fusion concerned itself with problems of current limitation and neutral gas depletion, and so was carried out in mercury gas discharges at very low pressures. We return to such a situation and examine it where the plasma is generated by ultraviolet illumination in mercury and develop equations to describe it. The cases of full illumination and partial illumination are considered. These equations are not very different from those conventionally used to describe low pressure gas discharges, but when examined in different geometries throw up problems not necessarily anticipated. So we have examined the situation in different geometries, stimulated by the fact that in the unilluminated region in the quasi-neutral approximation gives rise to a plasma of undefined extent with uniform density and constant drift speeds. We have obtained results in cylindrical geometry, which we believe are asymptotically correct and describe such plasmas.

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