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Gravitational microlensing as a probe for dark matter

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We study effects due to a possible presence of putative dark matter mini-halos (DM clumps) in the light curves of source images of the extragalactic gravitational lens systems. The extended clumps are described by means of a simplified model of the lens mapping. Every microlens consists of a central point mass surrounded by a concentric extended mini-halo; this is characterized by the ratio q of the extended mass to the point one, the typical size R and the total mass M. We consider the microlensing of a remote source by a stochastic system of such microlenses. The spatial distribution of microlenses is assumed to be uniform; the distribution of M have been chosen according to the Salpeter law for different fixed values of R and q. To have a significant effect we have chosen the size R to be comparable with the radius of the Einstein-Chwolson ring of a microlens. The motion of a source with respect to the microlenses induces a dependence of the amplification of the source image upon the time (amplification curve). We obtain an ensemble of the amplification curves for a number of realizations of the microlensing field. This is used to derive autocorrelation functions of the light curves by means of an averaging procedure. The derivation is fulfilled for different values of the microlensing optical depth and the external shear, as well as for different values of q and R.

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