# GRAVITATIONAL LENSING : COSMOLOGICAL IMPLICATIONS

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*Abstract* : In the present poster, we first address theoretically the problem of gravitational amplification by extended density fluctuations and then compare statistically our new predictions to actual samples of galaxies and QSOs.

We choose to work in the most general frame of the relativistic theory of light beam propagation. The Optical Scalar Equations have been written in a new form by Nottale and Chauvineau(1986), using new variables in terms of which the law of propagation of a light beam is *linear* in any Friedmann Universe, even of non zero density. This allows to derive analytical energy-conserving solutions for the amplification, (i) by any number of lenses lying on the line of sight from the observer to a distant source; (ii) by large scale density fluctuations : e.g. reconvergence of a light beam is predicted at redshift z~4 on lines of sight of density twice the mean Universe density.

These results are applied to the statistical study of lensing effects by foreground clusters of galaxies on (i) Brightest Cluster Galaxies; (ii) distant 3C radiogalaxies; (iii) absorption line QSOs.The evidence for an effect of magnification (significant at more than $3\sigma$ level) by foreground clusters on Kristian et al. BCGs was pointed out by Hammer and Nottale (1986). Moreover one finds that this sample is strongly affected by a selection effect precisely due to the amplification: the brightest objects in the sample lie systematically behind foreground clusters which are ~4 times richer than the mean, themselves belonging to fields having a cluster number density ~2 times larger than the mean. The extrapolation of this selection effect to distant 3C radiogalaxies (z>1) leads to the suggestion that a significant fraction of them could be subjected to large amplifications, with possible multiple imaging by galaxies in some cases (Hammer, Nottale and Le Fèvre, 1986). This proposal recently found a first confirmation by the discovery that 3C324 is a RG at z=1.206 lensed into at least 3 images by a foreground galaxy at z=0.845 (Le Fèvre et al., 1987). We finally indicate how our new explicit formula of amplification by multiple lensing (Nottale and Chauvineau, 1986) allows to predict the mean amplification effect on absorption-line QSOs by matter lying at the absorption redshifts. A correlation significant at the $5\sigma$ level is found between the absolute magnitudes of absorption line QSOs from the Asiago catalog and the theoretical prediction for amplification.

*References.*

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