4.1   The Effects Introduced by the Gravitational Redshift into the Redshift-Apparent Magnitude Relationship in Cosmology

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ABSTRACT

The redshift-apparent magnitude relationship [1] for nearby objects is concerned with the cosmological redshift. In the derivations of this relationship the gravitational redshift is not considered yet in depth. But for objects which are having very strong gravitational fields, the gravitational redshift ought to be considered. Then, the redshift-apparent magnitude relationship could be affected due to the gravitational redshift. In this study, the redshift-apparent magnitude relationship is derived for combined cosmological and gravitational redshifts.

The quasars have considerably large redshifts and they are very distant objects. However the logarithm of the cosmological redshift verses apparent magnitude curves do not fit with observations in the case of the quasars. Therefore, it is important to find a cosmological model which fits with the observed properties of quasars. We have attempted to find such cosmological model, assuming that the redshift of the source has a gravitational component as well. With this assumption, the logarithm value of the redshifts against the apparent magnitudes for different values of the gravitational redshift and for different values of the deceleration parameter have been plotted for different zero pressure cosmological models.

According to the present study, the effect of gravitational redshift on the redshift-apparent magnitude relationship is very small. Within this limitation, the cosmological model with the parameters, $q_0' > +1$, $\sigma_0 = 0$, $k = +1$, $\Lambda > 0$ and $q_0' = 75$ fits best with the quasars having taken into consideration the acceleration of the Universe predicted by the supernovae observations [2], [3]. Here q_0' is the acceleration parameter, σ_0 is the density parameter, k is the space curvature constant and Λ is the cosmological constant.

Keywords: gravitational redshift, cosmological redshift, apparent magnitude, quasars, deceleration parameter

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