Eq. (14) has a minimum as

$$\widetilde{\chi}^2_{sn} = \chi^2_{sn,min} = A - B^2/C$$

which is independent of μ_0. In fact, it is equivalent to performing an uniform marginalization over μ_0, the difference between $\widetilde{\chi}^2_{sn}$ and the marginalized χ^2_{sn} is just a constant [25]. We will adopt $\widetilde{\chi}^2_{sn}$ as the chi-square between theoretical model and SnIa data.

We will also use the Baryon Acoustic Oscillations (BAO) data from SDSS DR7 [19], the datapoints are

$$\frac{r_s(z_d)}{D_V(0.275)} = 0.1390 \pm 0.0037 \tag{16}$$

and

$$\frac{D_V(0.35)}{D_V(0.2)} = 1.736 \pm 0.065 \tag{17}$$

where $r_s(z_d)$ is the comoving sound horizon at the baryon drag epoch [26], and

$$D_V(z) = \left[\left(\int_0^z \frac{dx}{H(x)}\right)^2 \frac{z}{H(z)}\right]^{1/3} \tag{18}$$

encodes the visual distortion of a spherical object due to the non Euclidianity of a FRW space-time.

The CMB datapoints we will use are (R, l_a, z_*) from WMAP5 [20]. z_* is the redshift of recombination [28], R is the scaled distance to recombination

$$R = \sqrt{\Omega_m^{(0)}} \int_0^{z_*} \frac{dz}{E(z)}, \tag{19}$$

and l_a is the angular scale of the sound horizon at recombination

$$l_a = \pi \frac{r(a_*)}{r_s(a_*)}, \tag{20}$$

where $r(z) = \int_0^z dx/H(x)$ is the comoving distance and $r_s(a_*)$ is the comoving sound horizon at recombination

$$r_s(a_*) = \int_0^{a_*} \frac{c_s(a)}{a^2 H(a)} da, \quad a_* = \frac{1}{1+z_*} \tag{21}$$

where the sound speed $c_s(a) = 1/\sqrt{3(1+\overline{R}_b a)}$ and $\overline{R}_b = 3\Omega_b^{(0)}/4\Omega_\gamma^{(0)}$ is the photon-baryon energy density ratio.

The χ^2 of the CMB data is constructed as:

$$\chi^2_{cmb} = X^T C_M^{-1} X \tag{22}$$