TABLE 7

PROPER MOTION AND SPACE VELOCITY RESULTS FOR THE LMC
JLK94 PARAMETERS AND $V_{\rm rot} = 50$ km s^{-1}

Parameter	Q0459-6427	Q0557-6713	Q0558-6707	Q0615-6615
$\Delta\mu_\alpha \cos\delta$, rotation correction (mas yr^{-1})	−0.17	−0.11	−0.11	−0.12
$\Delta\mu_\delta$, rotation correction (mas yr^{-1})	−0.09	0.18	0.18	0.18
$\mu_\alpha^{\rm Field} \cos\delta$, LMC centered (mas yr^{-1})	1.5 ± 0.2	1.3 ± 0.2	1.4 ± 0.2	2.2 ± 0.2
$\mu_\delta^{\rm Field}$, LMC centered (mas yr^{-1})	0.2 ± 0.2	1.6 ± 0.1	0.7 ± 0.2	1.4 ± 0.2
$\mu_\alpha^{\rm CM} \cos\delta$, LMC centered (mas yr^{-1})	1.5 ± 0.2	1.5 ± 0.1	1.5 ± 0.2	2.4 ± 0.2
$\mu_\delta^{\rm CM}$, LMC centered (mas yr^{-1})	0.4 ± 0.2	1.3 ± 0.1	0.5 ± 0.2	0.9 ± 0.1
$\mu_\alpha^{\rm GRF} \cos\delta$ (mas yr^{-1})	1.0 ± 0.1	1.0 ± 0.1	1.0 ± 0.1	1.9 ± 0.1
$\mu_\delta^{\rm GRF}$ (mas yr^{-1})	0.3 ± 0.2	1.2 ± 0.1	0.4 ± 0.2	0.7 ± 0.2
$\mu_l^{\rm GRF} \cos b$ (mas yr^{-1})	−0.4 ± 0.2	−1.4 ± 0.1	−0.6 ± 0.2	−1.1 ± 0.2
$\mu_b^{\rm GRF}$ (mas yr^{-1})	0.9 ± 0.1	0.8 ± 0.1	0.9 ± 0.1	1.7 ± 0.1
Π, velocity component (km s^{-1})	189 ± 30	218 ± 21	195 ± 26	325 ± 27
Θ, velocity component (km s^{-1})	70 ± 53	291 ± 29	105 ± 46	193 ± 37
Z, velocity component (km s^{-1})	148 ± 30	124 ± 22	147 ± 26	313 ± 28
$V_{\rm gc,r}$, radial velocity (km s^{-1})	76 ± 27	114 ± 20	81 ± 24	97 ± 25
$V_{\rm gc,t}$, transverse velocity (km s^{-1})	239 ± 33	367 ± 27	253 ± 31	481 ± 30

applied the previous procedure to the radial velocity of each field (V_r), whose values were adopted in such a way as to reproduce the nominal radial velocity of the LMC center adopted from the literature. The transverse and radial components are finally combined to obtain the spatial velocity vector of the LMC center. The reader is referred to ALP00, PAM02 and PCM06 for more details of the procedure. The results from these calculations are listed in Tables 6 and 7. These two tables also show the equatorial and galactic coordinate components of the PM relative to the GRF (representing the motion of the cloud as seen from a reference point that is stationary with respect to the Galactic center and which is located at the instantaneous solar position), and the Π, Θ and Z galactocentric space velocity components of the LMC in a rectangular Cartesian coordinate system centered on the LMC (as defined by Schweitzer et al. (1995) for the Sculptor dwarf spheroidal galaxy and described by PCM06 for the LMC).

If we assume that the LMC is gravitationally bound to, and in an elliptical orbit, around the Galaxy, and that the mass of the Galaxy is contained within 50 kpc of the galactic center, we can calculate its lower mass limit through the following expression for a point-mass galactic potential:

$$M_{\rm G} = (r_{\rm LMC}/2G)[V_{\rm gc,r} + V_{\rm gc,\ t}(1 - r_{\rm LMC}^2/r_a^2)]/(1 - r_{\rm LMC}/r_a)\,,$$

where r_a is the LMC apogalacticon distance and $r_{\rm LMC}$ its present distance.

For $r_a = 300$ kpc (Galaxy's tidal radius), the two sets of LMC input parameters quoted above, respectively, and rotation velocities of 50 and 120 km s^{-1}, we obtain the results shown in Tables 8 and 9,

Values in Table 8 (for the vDM02 LMC input parameters) result in weighted averages of: $\langle M_{\rm G}\rangle = (6.6 \pm 0.7) \times 10^{11}\ M_\odot$ and $\langle M_{\rm G}\rangle = (8.8 \pm 0.8) \times 10^{11}\ M_\odot$, for the mass of our Galaxy enclosed within 50 kpc, for the two mentioned rotation velocities, respectively. Likewise, values shown in Table 9 (for the JKL94 LMC input parameters) resulted in weighted averages of: $\langle M_{\rm G}\rangle = (6.4 \pm 0.6) \times 10^{11}\ M_\odot$ and $\langle M_{\rm G}\rangle = (7.1 \pm 0.6) \times 10^{11}\ M_\odot$, respectively.

One of the reasons why there are a couple of velocities (mainly tangential velocities) and masses of the Galaxy, derived from our four QSO fields, whose differences are greater than 2σ in Tables 8 and 9, may be due to local internal motions in that area of the LMC, as those suggested by Piatek et al. (2008), especially considering that our four fields are located at the northern side of the LMC bar, albeit at twice the distance from the center of mass of the LMC as those used by the latter authors. This is the area on the LMC,