TABLE 2

NEW DISTANCES

PN G	Name	θ (arcsec)	F (mJy)	τ	d (kpc)
002.0–02.0	H1-45	0.8	20	2	15.1
005.5–02.5	M3-24	5.1	4.9	4.3	6.7
006.1+08.3	M1-20	0.8	50	1.7	8.1
006.4-04.6	Pe2-13	6.6	3.4	4.7	6.2
006.8–03.4	H2-45	4.6	9.7	3.9	6.2
007.0+06.3	M1-24	3.2	6.2	3.8	8.5
007.2+01.8	Hb6	2.5	240	2	4.3
008.2+06.8	Hen 2-260	0.5	10	1.9	20.4
008.3–07.3	NGC6644	1.3	100	1.8	6.1
010.7+07.4	Sa2-230	5	4	4.4	7.1
350.5–05.0	H1-28	3.9	1.5	4.6	9.9
351.6–06.2	H1-37	4.3	1.3	4.7	9.7
355.7–03.4	H1-35	1	90	1.7	5.9
355.9+03.6	H1-9	3.5	30	3.2	5.9
356.3–06.2	M3-49	4.9	0.2	5.7	13.2
356.8–05.4	H2-35	5.4	0.9	5.1	9.1
358.3+03.0	H1-17	0.5	40	1.4	7.9
358.5–04.2	H1-46	0.6	40	1.5	8.5
358.7–05.2	H1-50	0.7	30	1.8	10.9
358.9+03.3	H1-19	0.7	30	1.9	10.9

used in the determination are shown in Table 2. In this table, Column 1 gives the PN G number, Column 2, the name, Column 3, the angular diameter, Column 4, the 5 GHz flux, Column 5, the optical thickness parameter, and Column 6 lists the new distances derived for these objects.

2.3. *Galactocentric distances and distribution*

Heliocentric distances were converted into galactocentric distances using equation 1, where d is the heliocentric distance, b and ℓ the galactic latitude and longitude, respectively, and R_0 the solar distance to the galactic center. In this work we adopted $R_0 = 8$ kpc, as suggested by recent studies (Gillessen et al. 2009; Nishiyama et al. 2006).

$$R = \sqrt{R_0^2 + (d\cos\ b)^2 - 2\ R_0\ d\cos\ b\cos\ \ell}, \quad (1)$$

In order to check the distribution of distances for the PNe in our database, Figure 1 shows the distribution of the PNe with respect to the galactocentric distance for both distance scales used in this work, Z95 (left) and SSV08 (right), including the new distances derived in this work. The figure also shows a Gaussian fit to each histogram. The mean and standard deviation are (0.6 ± 0.3) kpc and (2.6 ± 0.3) kpc for the SSV08 scale, and (0.6 ± 0.2) kpc and (2.5 ± 0.2) kpc for the Z95 scale. For both scales, the mean is consistent with the most recent determinations of the solar distance to the galactic center, which are all near 8 kpc, while the widths are larger than the standard deviation expected of 1.2 kpc for the bulge. As discussed by Z95, this dispersion is a convolution of the probably real Gaussian distribution of the bulge, with the extra spread introduced by the mass-radius relationship.

3. DETERMINATION OF THE BULGE-DISK INTERFACE

3.1. *Abundance differences between bulge and inner-disk PNe*

In order to study the chemical abundance distribution in the inner Galaxy and to determine the bulge-disk interface, we made use of a method similar to that suggested by Maciel et al. (2006). First, a galactocentric distance (R_L) is chosen, which defines a limit for the sample. Then the sample is divided into two groups: Group I is composed by PNe with galactocentric distances smaller than the limit previously settled, and Group II, is composed by PNe with galactocentric distances larger than this limit. For each group, the average abundances and the standard error of the mean are calculated for the available elements, namely He, O, N, S, and Ne. Then, the limiting radius R_L is varied, considering distances in the interval from 0.1 to 3.6 kpc, in 0.7 kpc steps for each distance scale.

The results are shown in Figures 2 and 3 for the SSV08 and Z95 distance scales, respectively. In each figure, Group I is represented by filled circles joined by continuous lines and Group II by squares joined by dashed lines. Each pair of circle/square points in each plot represents the average abundance for that element adopting a given limit for the bulge-disk interface, as a function of the limiting distance. Therefore, each plot shows how the differences between the groups evolve adopting distinct limits to define them. Considering elements heavier than He, it can be seen that, on average, abundances of Group I are lower than those of Group II objects for both distance scales. That is, in most cases the objects of Group I, which are closer to the galactic center, have systematically lower abundances compared with the objects of Group II, for all chosen values of the limiting radius (R_L). The main exceptions are the helium abundances for both distance scales and argon for the Z95 scale, which present similar distributions for both groups. In the case of helium, these results are not surprising, as (a) this element is equally contaminated by the PN progenitor stars, both in the bulge