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ERRATUM: "A RADIO AND OPTICAL POLARIZATION STUDY OF THE MAGNETIC FIELD IN THE SMALL MAGELLANIC CLOUD" (2008, ApJ, 688, 1029)

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The random magnetic field strength expression derived in Appendix B of the published article is incorrect because the filling factor of thermal electrons (*f*) in the SMC was not treated properly. As a consequence, the second paragraph in Section 4.3 should be replaced by the following revised text.

To allow comparison of the random field derived by combining the synchrotron intensity and starlight polarization measurements (see the next paragraph), which has the same assumptions as ionized gas model 2 in Section 3.3.2, we construct the random magnetic field model of the SMC based on the same ionized gas model. We assume that the average electron density along the line of sight ($\overline{n_e}$) and the depth of the SMC (L) is the same through all lines of sight. We decompose the magnetic field along each sight line into coherent and random components such that the coherent component does not vary across the SMC; the differences between the magnetic field strengths along different sight lines are only due to the random component. In Appendix B we show that the corresponding dispersion in RM is

$$\sigma_{\rm RM} = 0.812 n_{\rm cloud} l_o \sqrt{f N [\langle B_{c,\parallel}\rangle^2 (1-f) + {B_r}^2/3]}, \tag{28}$$

where $\sigma_{\rm RM} \sim 40$ rad m^{-2} is the weighted standard deviation in RM for the extragalactic sources that lie behind the SMC; $l_o \sim 90$ pc is the typical cell size along the line of sight, which we take to be similar to that in the LMC (Gaensler et al. 2005); $n_{\rm cloud} = 0.1$ cm^{-3} is the mean cloud electron density in the SMC as derived in Section 3.3.2, $\langle B_{c,\parallel}\rangle \approx 0.16\,\mu$G is the average SMC coherent field strength along the line of sight as obtained using ionized gas model 2; and $N = L/l_o \sim 110$ is the number of cells along a sight line through the SMC. Using the above equation, we find $B_r \sim 1.4\,\mu$G. Therefore, in the SMC, the random component of the magnetic field dominates over the coherent magnetic field along the line of sight.

Because the corrected random magnetic field expression predicts a field strength similar to that derived in the published article, none of our conclusions have changed.

Since the derivation of Equation (28) in the published article is incorrect, the entire Appendix B should be replaced by the following.

We construct this model based on Gaensler et al. (2001, 2005) and ionized gas model 2 (see Section 3.3.2), for which case we assume that the average electron density ($\overline{n_e}$) along different lines of sight is the same. However, unlike model 2 which assumes the depth L through the SMC varies, we assume that L is constant (10 kpc) along different sight lines to enable the derivation of an analytic expression for the random magnetic field. Suppose that lines of sight through the SMC are divided up into cells of linear size l_o. The total number of cells looking through the SMC is

$$N = \frac{L}{l_o}. \tag{B1}$$

Within each cell, we suppose that the magnetic field is composed of a coherent component of strength B_c (same direction and strength from cell to cell), whose strength along the line of sight is $\langle B_{c,\parallel}\rangle \approx 0.16\,\mu$G, and a random component of strength B_r oriented at an angle $\theta_{\rm cell,i}$ with respect to the line of sight. The component of the random field along the line of sight is

$$B_{r,\parallel} = B_r \cos\theta_{\rm cell,i}. \tag{B2}$$

The line-of-sight magnetic field strength in a cell is thus given by

$$B_\parallel = \langle B_{c,\parallel}\rangle + B_{r,\parallel} = \langle B_{c,\parallel}\rangle + B_r \cos\theta_{\rm cell,i}. \tag{B3}$$

In addition, we assume that the random component is coherent within each cell but that $\cos\theta_{\rm cell,i}$ varies randomly from cell to cell. The electron density within each cell $n_{\rm cloud}$ is assumed to be 0.1 cm^{-3} (see Section 3.3.2).

The Faraday rotation through one such cell can either be 0 rad m^{-2} with a probability of $1-f$ or

$$\text{RM}_{\text{1-cell}} = 0.812 n_{\rm cloud} l_o B_\parallel = 0.812 n_{\rm cloud} l_o (\langle B_{c,\parallel}\rangle + B_r \cos\theta_{\rm cell,i}) \tag{B4}$$

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with a probability of f. This is because the filling factor f can be interpreted as the probability of intercepting a cell with electron density $n_{\rm cloud}$. The mean RM through one cell averaged over many sight lines is thus

$$\langle {\rm RM}_{1\text{-cell}} \rangle = 0.812 f n_{\rm cloud} \langle B_{c,\parallel} \rangle l_o, \tag{B5}$$

whereas the mean RM^2 through one cell is given by

$$\left\langle {\rm RM}^2_{1\text{-cell}} \right\rangle = 0.812^2 f n^2_{\rm cloud} \left(\langle B_{c,\parallel} \rangle^2 + {B_r}^2/3 \right) l_o^2. \tag{B6}$$

After passing through N cells, the incident radiation would experience a mean RM of

$$\langle {\rm RM}_{N\text{-cells}} \rangle = 0.812 f N n_{\rm cloud} \langle B_{c,\parallel} \rangle l_o, \tag{B7}$$

whereas the mean-squared RM through N cells is expressed as

$$\left\langle {\rm RM}^2_{N\text{-cells}} \right\rangle = 0.812^2 f N n^2_{\rm cloud} l_o^2 \left[\langle B_{c,\parallel} \rangle^2 (1 - f + fN) + B_r^2/3 \right]. \tag{B8}$$

The standard deviation of RM through the SMC can be expressed as

$$\sigma_{\rm RM} = \sqrt{\left\langle {\rm RM}^2_{N\text{-cells}} \right\rangle - \langle {\rm RM}_{N\text{-cells}} \rangle^2} = 0.812 n_{\rm cloud} l_o \sqrt{fN \left[\langle B_{c,\parallel} \rangle^2 (1 - f) + {B_r}^2/3 \right]}. \tag{B9}$$

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