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The distribution of disks in the μ_0-$\log h$ plane and the inclination correction

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Abstract. A further fundamental modification needs to be made to the Freeman (1970) law, such that not only do LSB galaxies possess fainter central surface brightnesses than the canonical Freeman value, but the upper limit is in fact an upper (bright) 'envelope' of points in the central disk surface-brightness - log(scale-length) diagram, with slope ∼2.

Additionally, there is a morphological-type dependence in the μ_0–$\log h$ plane of spiral galaxy disks, such that the upper bright envelope (with slope ∼2) is predominantly defined by early-type (<Sc) spirals while the late-type spirals have, in general, smaller and fainter disks (Graham & de Blok 2001).

The above realization enables a novel new approach to determine the (statistically averaged) opacity of early-type disks in various passbands. Transparent disks inclined from face-on will appear brighter than they would if they were face-on; this is due to the greater line-of-sight depth through the disk – the more inclined they are the brighter they will appear. One can statistically determine the optimal value of 'C' (a measure of opacity) from the standard inclination correction $2.5C\log(a/b)$ – where a/b is the observed axis ratio of each disk – required to bring the high-inclination disks in align with the low-inclination disks in the μ_0–$\log h$ diagram. The statistically-complete, diameter-limited samples of 86 spiral galaxies from de Jong & van der Kruit (1994) and 30 spiral galaxies from Balcells & Peletier (1994) have been used. Preliminary results suggest C=0.3, 0.6, 0.7, and 1.0 in the B, R, I, and K-bands respectively. A thorough analysis of the K-band data is given in Graham (2001), and the optical data will be analyzed in Graham, Balcells, & Peletier (2002).

References

Balcells, M., & Peletier, R.F. 1994, AJ, 107, 135
de Jong, R.S., & van der Kruit, P.C. 1994, A&AS, 106, 451
Freeman, K.C. 1970, ApJ, 160, 811
Graham, A.W. 2001, MNRAS, 326, 543
Graham, A.W., Balcells, M., & Peletier, R.F. 2002, in prep
Graham, A.W., & de Blok, W.J.G. 2001, ApJ, 556, 177