HOW TRANSPARENT ARE SPIRAL GALAXIES?
An analysis from a near-infrared perspective

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Until recently is was commonly thought that most spiral galaxies were transparent or contained only modest amounts of absorbing dust, making them optically thin in the B-band (Holmberg 1958). However Disney *et al.* (1989) showed that there was very little evidence for this. Using a very large optical database Valentijn (1990) showed that surface brightness in B is almost independent of inclination, implying that spiral galaxies in general are optically thick in B.

In an effort to find out what the distribution of the obscuring component is, we have investigated the inclination dependence of surface brightness of surface brightness in the H-band, where the effects of extinction are much less important than in B. We have taken a large sample of H-band aperture photometry from the literature (Aaronson *et al.* 1982), together with H-band images of a few edge-on galaxies. The selection criteria for this sample were independent of inclination. For each galaxy the surface brightness inside an isophote containing a fixed fraction of the galaxy light was determined by converting magnitudes in circular apertures to magnitudes in elliptical apertures, removing the surface brightness — mass dependence using the HI velocity width, and correcting for the fact that the fraction of the light of a galaxy inside an isophote of fixed surface brightness changes with inclination (see Peletier & Willner 1991 for details).

We have found a C-value (see Valentijn 1990) in H between 0.6 and 0.8, which impies that spiral galaxies in H behave in a semi-transparent way. Re-analyzing the optical data, after removing the most edge-on galaxies (5 %), C_B is found to be around 0.5. Using sandwich models (Disney *et al.* 1989) these numbers imply that the ratio of the scale height of the dust and stars has to be ≈ 0.6. For two nearly edge-on galaxies we find from near-infrared images that this is indeed the case, while in B this ratio is ≈ 0.3. This shows that dust with similar properties as in our galaxy is responsible for the obscuration in B. The sandwich models also show that for an average spiral galaxy within 0.3 D_{25} the optical depth in $B \approx 0.95$, and the face-on absorption ≈ 0.46 mag, almost $3 \times$ as high as previously assumed in the RC2.

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