

CCD IMAGING OF PLANETARY NEBULA HALOS

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We have obtained deep CCD images of 14 PN to search for and examine faint halos. These images were obtained with $H\beta$, [OIII], $H\alpha$, and [NII] narrowband interference filters on the Burrell Schmidt at Kitt Peak. Table 1 summarizes the observations. We have found interesting features around NGC 1360, NGC 3587 (The Owl), and NGC 6853 (The Dumbbell), and we have obtained new images of the very faint outer halo of NGC 7293 (The Helix). Two CCDs were used: TI6, an 800x800 chip, with 1.45"/pix and a 19.3 arcmin square field., and ST2K, a 2048x2048 chip, of which only 1200x1200 pixels were read out, yielding 2.07"/pix and a 40 arcmin square field.

TABLE 1. Planetary Nebulae Observed

Nebula	Chip	Filters	Nebula	Chip	Filters
NGC 40	TI6	$H\beta$, [OIII], $H\alpha$, [NII]	NGC 6309	ST2K	[OIII], $H\alpha$, [NII]
NGC 246	ST2K	$H\alpha$	NGC 6543	ST2K	[OIII], $H\alpha$, [NII]
NGC 650-1	ST2K	$H\alpha$, [OIII]	NGC 6853	TI6	$H\beta$, [OIII], $H\alpha$, [NII]
NGC 1360	ST2K	[OIII], $H\alpha$, [NII]	NGC 6720	ST2K	[OIII], $H\alpha$, [NII]
NGC 1514	TI6	$H\beta$, [OIII], $H\alpha$, [NII]	NGC 7293	ST2K	[OIII], $H\alpha$, [NII]
NGC 2022	TI6	$H\beta$, [OIII], $H\alpha$, [NII]	NGC 7354	TI6	[OIII]
NGC 3587	ST2K	[OIII], $H\alpha$, [NII]	NGC 7662	TI6/ST2K	[OIII]/ $H\beta$, $H\alpha$, [NII]

Figure 1 is NGC 1360 in [OIII]; the lobes projecting to the northeast and southwest are also visible in $H\alpha$ and [NII]. Figure 2 is NGC 3587 in [OIII]; the off-center, round halo seen here is also visible, though not nearly as prominent, in $H\alpha$ and [NII]. Figure 3 is NGC 6853 in [OIII]; the extended, almost bipolar halo is also evident, though clumpier, in $H\alpha$ and [NII] (Kwitter et al. 1991). Figure 4 is NGC 7293 in $H\alpha$; the scalloped projections to the east and the diffuse clump to the northeast were first noticed by Malin (1982). The clump is also bright in [NII]. More detailed analysis of these halos is in progress (Kwitter et al. 1992).

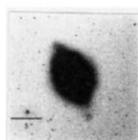


Fig. 1 NGC1360-[OIII]

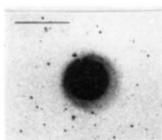


Fig. 2 NGC3587-[OIII]

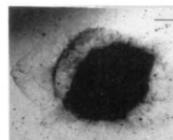


Fig. 3 NGC 7293- $H\alpha$

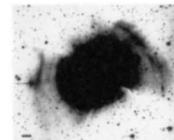


Fig. 4 NGC6853-[OIII]

References

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- Malin, D.F. 1982, "A Look at Some Unstable Stars," *Sky and Telescope*, 63, 22.