

The Northern HIPASS Optical/IR Catalogue (NOIRCAT)

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Abstract. We present the Northern HIPASS Optical/Infrared Catalogue (NOIRCAT), an optical/near-infrared counterpart catalogue for the Northern HIPASS catalogue (NHICAT). Of the 1002 sources in NHICAT, 655 (66%) have optical counterparts with matching optical velocities. A further 87 sources have optical counterparts with matching velocities from previous radio emission line surveys. Assuming a dark galaxy to be an isolated HI source with no detectable stars, no candidate dark galaxies have been confirmed.

Keywords. observational, catalogues, surveys, radio lines, galaxies.

1. Northern HIPASS

The HI Parkes All-Sky Survey (HIPASS) survey is the largest blind HI survey, covering 71% of the total sky using the 21-cm multibeam receiver (Staveley-Smith *et al.* 1996) on the Parkes Radio Telescope†. Northern HIPASS surveys the entire sky within the declination range $+2^\circ < \delta < +25.5^\circ$ whereas Southern HIPASS covers the entire Southern sky below a declination of $+2^\circ$ (Meyer *et al.* 2004). The Northern HIPASS catalogue (NHICAT; Wong *et al.* 2006) detected 1002 galaxies based solely on the HI content. The observation and reduction methods are exactly the same as Southern HIPASS and can be found in detail in Barnes *et al.* (2001). NHICAT has been found to be 95% complete at peak flux 95 mJy and at an integrated flux 15 Jy km s⁻¹ (NHICAT; Wong *et al.* 2006). The reliability of this catalogue at a 95% level is at peak flux 36 mJy (NHICAT; Wong *et al.* 2006).

Here, we present the Northern HIPASS optical and near-IR catalogue (NOIRCAT)—a catalogue of optical and near-infrared counterparts to the HI galaxies in NHICAT. NOIRCAT is analogous to the HIPASS Optical Catalogue (HOPCAT; Doyle *et al.* 2005) which is a catalogue of optical counterparts for HICAT.

2. NOIRCAT

The large Southern sky surveys used to generate HOPCAT, such as 6dF and SUPER-COSMOS, are not available for constructing NOIRCAT. Northern analogues of 6dF and SUPER-COSMOS do not exist—most large, recent optical surveys such as SDSS do not cover the entire Northern sky. Hence, NED is used as our source catalogue for optically

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Table 1. Description and tally of the NOIRCAT match categories (flags).

Flag	Description	Number
1	Single optical velocity match with 2MASS counterpart	414
2	Single optical velocity match without 2MASS counterpart	126
3	Multiple optical velocity matches where all matches have 2MASS counterparts	63
4	Multiple optical velocity matches where 1 or more matches are without 2MASS counterpart(s)	52
5a	Match with higher angular resolution HI velocity and optically visible galaxy	87
5b	Only positional matches available to NED galaxies	219
5c	Neither velocity nor positional matches to any galaxies listed in NED	41

matching the Northern HIPASS detections. It should be noted that we used the October 2006 version of NED. To improve optical detection limits, we also used the 2MASS near-infrared catalogue.

For NOIRCAT, the primary method for determining the optical/near-infrared matches was by “interactive” cataloguing, after an automated search of the NED and 2MASS catalogues. The four criteria used for determining a match during the interactive process are:

- (a) Optical sources must be within $7.5'$ of the HIPASS centre.
- (b) Where there are multiple source names referring to the same source (e.g. SDSS and APM nomenclatures), the non-SDSS/APM reference is preferred.
- (c) Optical velocity matches are made when the optical velocity (including errors) and the HIPASS heliocentric velocity (including errors) agreed to within 100 km s^{-1} .
- (d) For optical velocities without published errors in NED, a match is recorded when the published optical velocity is within 150 km s^{-1} of the HIPASS velocity profile.

Table 1 describes the match categories into which the resulting matches are classified. A tally of the NHICAT sources in each match category is also provided.

3. Summary

A thorough description and analysis of NOIRCAT can be found in Wong *et al.* 2007. This catalogue will be submitted to the NASA/IPAC Extragalactic Database and will also be made publicly available online at <http://hipass.aus-vo.org>.

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References

- Barnes, D. G. *et al.* 2001, *MNRAS* 322, 486
 Doyle, M. T. *et al.* 2005, *MNRAS* 361, 34
 Meyer, M. J. *et al.* 2004, *MNRAS* 350, 1195
 Staveley-Smith, L. *et al.* 1996, *PASA* 13, 243
 Wong, O. I. *et al.* 2006, *MNRAS* 371, 1855
 Wong, O. I., Webster, R. L., Kilborn, V. A., Waugh, M. & Staveley-Smith, L. 2007, *in preparation*