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A 500 kpc HI Tail of the Virgo Pair NGC4532/DDO137 Detected by ALFALFA

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Abstract. HI observations of the Virgo Cluster pair NGC 4532/DDO 137, conducted as part of the Arecibo Legacy Fast ALFA Survey, reveal an HI feature extending ∼500kpc to the southwest. The structure has a total mass of up to 7 x 10^8 $M_\odot$, equivalent to 10% of the pair HI mass. Optical R imaging reveals no counterparts to a level of 26.5 mag arcsec^{-2}. The structure is likely the result of galaxy harassment.

Keywords. galaxies: dwarf, galaxies: evolution, galaxies: formation, galaxies: clusters: Virgo

1. Summary and Results

Cluster environmental interactions (see Boselli & Gavazzi 2006 for a review) can produce tails of gas and stars. The Arecibo Legacy Fast ALFA (ALFALFA) Survey, a sensitive blind survey of the Arecibo sky (Giovanelli *et al.* 2005 and these proceedings), has revealed several HI clouds without optical components (Kent *et al.* 2007 and these proceedings) and a 250 kpc tidal arc emerging from the Sc galaxy NGC 4254 (Haynes *et al.* 2007 and Giovanelli in these proceedings). ALFALFA has recently detected an even larger tidal feature associated with the Virgo Cluster Sm pair NGC 4532/DDO 137. This system was already known to be peculiar: both galaxies have extended HI disks and share a common HI envelope extended over 150 kpc (Hoffman et al. 1993, 1999).

ALFALFA observations of the NGC 4532/DDO 137 tail structure are shown in Figure 1. The HI envelope containing and within the immediate vicinity of the pair (black contour) has an HI mass of 6.2 x 10^9 $M_\odot$, consistent with that of Hoffman *et al.* (1999). All of the emission in the tail is blueshifted with respect to the pair HI envelope. The total mass contained within discrete clumps in the tail is 4.0 x 10^8 $M_\odot$. The total mass of the tail, including an upper limit for emission below the ALFALFA limiting column density, is ∼7 x 10^8 $M_\odot$, or ∼10% of the pair HI mass. R imaging of the tail system was carried out at Wise Observatory and the WIYN 0.9-m telescope in May 2007. No optical counterparts for the main HI clumps have been found to a limiting R magnitude of 26.5 mag arcsec^{-2}. Further results are presented in Koopmann *et al.* (2007, in preparation). VLA syntheis observations of the system are planned.

The observations of NGC 4532/DDO 137 are consistent with several predictions from the simulations of high speed hyperbolic encounters between cluster galaxies by Bekki, Koribalski & Kilborn (2005) and Duc (these proceedings): (a) gas tails that are stretched over several hundred kpc, (b) double tails or tails that span a large spatial area, (c) formation of relatively isolated clumps within the tail, and (d) stellar tails fainter than 30 mag arcsec^{-2}.

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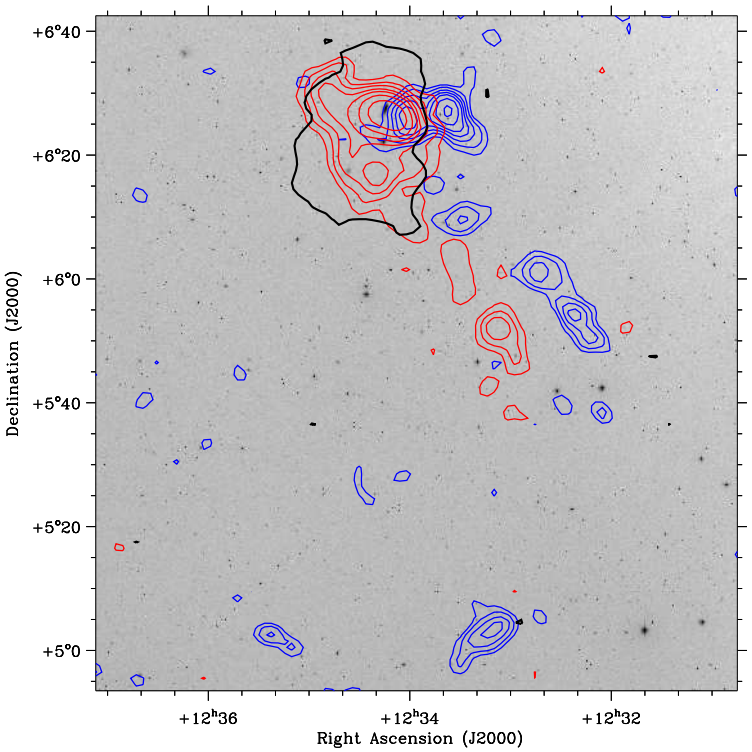

Figure 1. ALFALFA HI flux contours superposed on a DSS2 Blue Image. The black contour at 0.4 Jy beam^{-1} km s^{-1}, integrated over 1956 - 2139 km s^{-1}, encompasses the approximate area of the HI envelope detected by Hoffman *et al.*(1993). Blue contours show tail emission integrated over 1784 - 1836 km s^{-1}, with contours at 0.17, 0.25, 0.35, 0.45, 0.55, 0.7, 0.9 Jy beam^{-1} km s^{-1}. Red contours show tail emission integrated over 1868 and 1930 km^{-1}, with contours at 0.23, 0.4, 0.6, 0.9, 1.2, 1.7, and 2.5 Jy beam^{-1} km s^{-1}.

The discovery of an extended tail with discrete clumps so distant from the parent galaxy suggests a tidal explanation for at least some isolated HI clouds with no optical counterparts, such as those recently discovered in the Virgo Cluster (Kent *et al.* 2007 and these proceedings).

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