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2dF Spectroscopy of Globular Clusters in M104

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Abstract. We have found 56 new globular clusters in M104 from 2dF multi-fiber spectroscopy, doubling the number of confirmed clusters, and extending the spatial coverage to 50 kpc radius. We find no significant rotation in the total sample, or for subsets split by color or radius. However, there are hints that the blue clusters have a higher rotation than the red clusters, and for counter-rotation of clusters at large radius. We find a total mass of M $\sim 1\times10^{12}$M$_\odot$ and a (M/L)$_B$ =30 out to 50 kpc radius, which is strong evidence for a dark matter halo in M104.

1. Data

Globular cluster (GC) candidates were selected from KPNO mosaic BVR imaging (Rhode & Zepf 2003, AJ, 126, 2307). We obtained a sample of 585 candidates with $19 < V < 21.5$, after color cuts and image classification. In April 2002, we used the 2dF multi-fiber spectrograph on the AAT to obtain spectra for 200 candidates, which yielded 56 confirmed GCs.

2. Globular Cluster Kinematics and Dark Matter in M104

The velocity dispersion of the total sample is $\sim$ 200 km/s, with no significant difference between the blue and red GCs. A smoothed velocity dispersion profile shows that σ decreases from $\sim$ 225 km/s near the galaxy center to $\sim$ 125 km/s at 50 kpc radius.

The smoothed velocity profile shows rotation of $\sim$ 50 kpc; this is not statistically significant, however, and we place a 95% upper limit on rotation of 110 km/s for the total sample. We have looked for rotation amongst the blue and red GCs separately, and also for GCs at small and large radius (separated at 10′= 25 kpc). There is no significant rotation for any subsample. However, there are hints that the blue GCs have higher rotation than the red GCs, and that there is more rotation at large radius. Interestingly, the GCs at large radius may be counter-rotating with respect to the GCs and stars at smaller radius, but again this is not significant.

We have used the Projected Mass Estimator, assuming isotropic orbits, to find a total mass of 1.2×10^{12} M$_\odot$ and a (M/L)$_B$ = 30 at 50 kpc radius. This is strong evidence for a dark matter halo in M104.