Imaging Survey of 38 Galaxy Clusters from the EMSS Sample

There are now more than 20 giant luminous arcs (B= 22.5 or R=21.5 and axis ratio > 10) known today. These arcs are among the best tools to study the dark matter in very massive lensing clusters. We have begun to observe a complete sample of X-ray luminous and distant clusters ($L_x > 2 \times 10^{44}$ erg/s and $0.15 < z < 0.5$) extracted from the Einstein satellite data (Gioia et al, 1990). The expected number of arcs in this sample can be derived from the statistical study of Wu and Hammer (1992), and strongly depends on the mass distribution assumed for the lensing clusters. The expected number of arc occurrence ranges from one for every 2 clusters (very compact clusters) to less than one per 15 clusters (100 kpc core clusters). Moreover, the distribution of the arc axis ratio (at a given magnitude limit), is also found to be critically dependent of the lensing mass distribution, while virtually independent on the assumed distribution of arc-sources. By observing arcs in a statistically complete sample of clusters, we will put strong constraints on the matter distribution in rich clusters of galaxies, and hence on galaxy formation scenario. It will also be a database to study the mass function of cluster of galaxies.

We report here the first observations of 20 clusters of galaxies in the EMSS sample. Our aim is to identify new arc-like structures down to a uniform detection level of V=26.5 mag/arcsec^2. Observations were performed with FOCAM, MOS-SIS and HRCam at CFHT and the UH88" telescope in a period from March to October 1992. From our observations we have identified 6 new arcs or arc systems (2 of which have been published by Luppino et al., 1992), in addition to the clusters MS0302.7+1658 and MS2137.3—2353 already known to have arc(s) (Mathez et al., 1992; Fort et al., 1992), we have new arc candidates in MS1006.0+1202, MS1455.0+2232, MS1621.5+2640 (Luppino et al., 1992), MS1910.5+6736, MS2053.7—0449 (Luppino et al., 1992) and MS2318.7—2328. The occurrence of large arcs and mini-bright arcs seems therefore to be very high in this sample. One open question is whether all the arc-like structures are genuine gravitationally distorted images of galaxies behind the clusters; we plan to address this question in a first step by obtaining K band images of the arc candidates, and then try spectroscopic identification for the brightest ones. Figures 18a and 18b show two new examples of arc systems in MS0440.5+0204 and MS1006.0+1202.

M.C. Angonin, Annis, I. Gioia, F. Hammer, O. Le Fèvre, G. Luppino

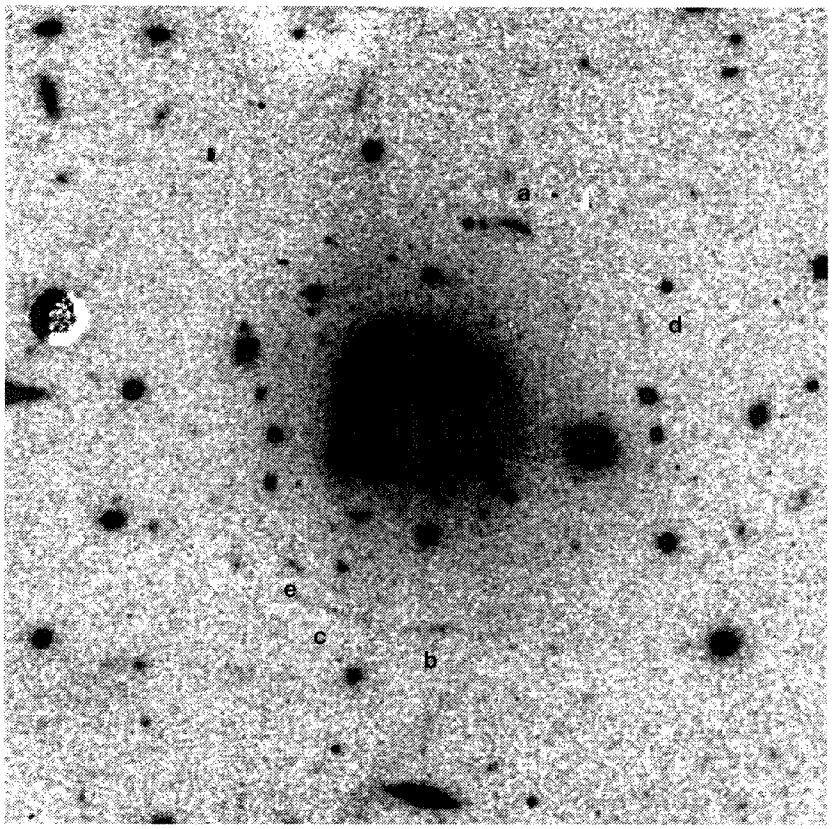

Figure 18a: arc system in MS0440.5+0204. This image has been obtained with HRCam at the CFHT prime focus and stars have FWHM=0.47 arcsec.

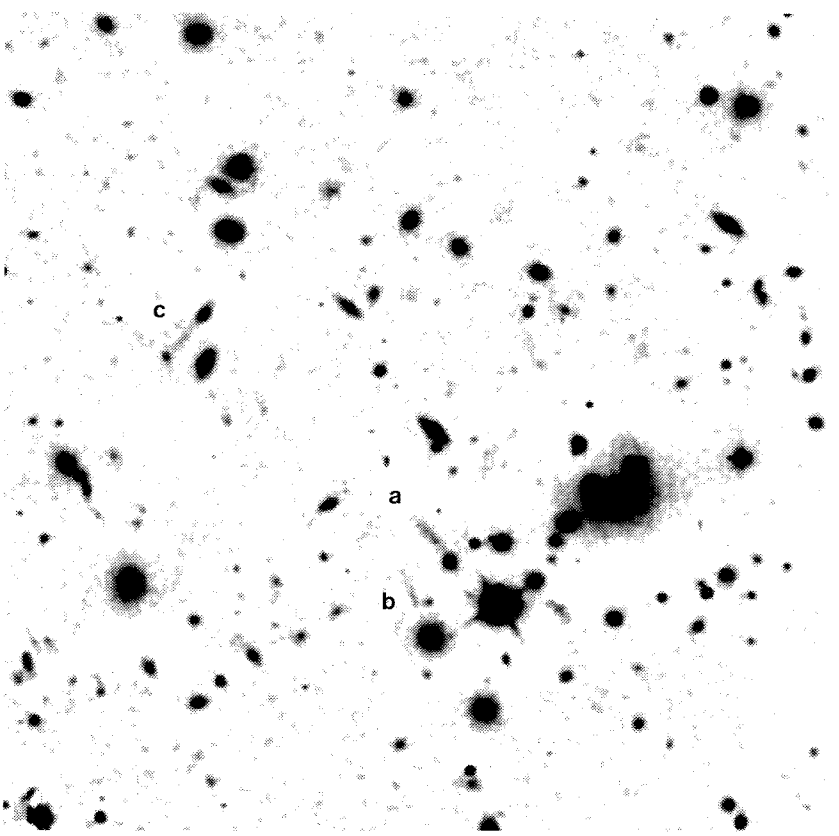

Figure 18b: arc system in MS1006.0+1202. This image has been obtained with FOCAM at the CFHT prime focus (stars FWHM=0.9 arcsec).