can be done with this instrument: the 3 mm mixers are very easy to tune at nearly any frequency between 80 and 115 GHz and are stable, permitting long integration times on the same position. In the beam switching mode, the baselines are very flat over the whole frequency range; this observing mode is the best to use in the line search. Finally the southern position of the La Silla observatory allows one to track these molecular sources 10 hours per day above 30° elevation. The elevation of SgrB2 rises to more than 80°, where we had to stop the tracking (this is the telescope limit), while from the northern hemisphere we can observe it only 4 hours per day at elevations between 20° and 28°!

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The Arc in Cl 0500-24

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In 1986, luminous arcs in two clusters of galaxies were detected; their highly elongated unusual morphology posed a problem to the nature of their origin. Whereas several interpretations have been suggested, it soon became clear that they may be the result of gravitational lensing of a background galaxy by the cluster. The gravitational lens hypothesis was confirmed for the arc in A 370 when its spectrum was measured; the redshift is about 0.724, i.e. roughly twice that of the cluster, which also is close to the ideal redshift for efficient lensing. The nature of the arc in Cl 2244 is less clear, but from the similarity of the morphology and colour of

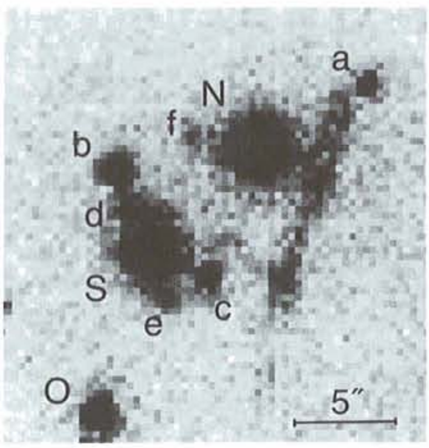

Figure 1: *A section of a CCD frame in the B-band showing the arc-like feature in Cl 0500-24 (exposure time: 56 min). North is up and east is to the left. On this image, taken with a seeing of 0.9 arcsec, the arc-like feature and galaxy N are well separated. Contrary to other arcs it appears nearly straight. However, its shape and the varying width can be well explained by a lens model. On the other hand, galaxies N and S have the same redshift. Thus we cannot exclude the hypothesis of tidal interaction.*

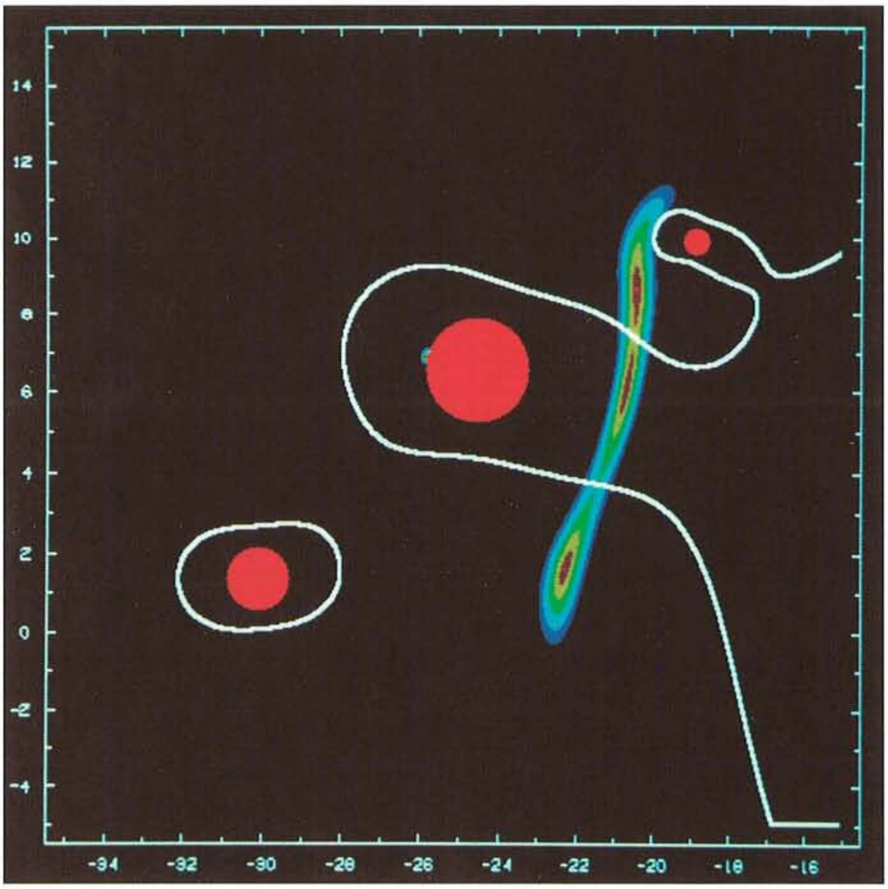

Figure 2: *A gravitational lens model of the observed arc in Figure 1. In this model we used an isothermal sphere for the cluster potential and three point masses for the three galaxies N, S, and a. We used a circular source of radius 0.6 arcsec. The different colours of the arc correspond to images of concentric rings of the extended circular source. The white lines are "critical lines" of the lens. The scale is in arcsec.*

this arc, it is usually assumed that this is also due to lensing of a background galaxy.

The arc-like feature detected in Cl 0500-24, a rich and compact southern cluster at z = 0.32 (Giraud, 1988), is different from the two other cases in several respects. First it is nearly straight, whereas the others are clearly curved toward the centre of the cluster. Secondly, the arc is shorter than in the other cases. Finally, the arc lies very close to a pair of bright galaxies which have the same redshift (z = 0.328). It is thus not clear whether this arc is also due to lensing or the result of the tidal interaction of the two interacting galaxies.

In a recent paper, we pointed out the attractiveness of the lensing hypothesis (Wambsganss et al., 1989). In particular, using a simple lensing model which incorporates only the cluster mass and the two interacting galaxies close to the arc, we were able to show that at the observed position it is reasonable to expect an arc. In other words: if a background source (with redshift in excess of 0.5) is seen at this position in the cluster, it is unavoidable, given the richness and compactness of the cluster as observed, that the image will be highly distorted. In addition, the distorsion will act in such a way that the image must be elongated in the direction perpendicular to that of the centre of the cluster.

New images have been obtained in January 1989 with the 2.2 m ESO-MPI telescope at La Silla under very good seeing conditions (0.9 arcsec). We used CCD No. 8 which has low noise (30 e^{-1} rms) and high quantum efficiency. These observations have revealed that the arc-like feature has three components, which are seen as varying width and surface brightness along the arc (Fig. 1). When we tried to understand these new observations with a simple lens model, we were unexpectedly successful. An image of one of our models is shown in Figure 2. Not only are we able to understand the multicomponent nature of the arc, but also their relative size and orientation. These models, however, have shown that the arc is of a different nature concerning its lensing origin. The two other arcs are well understood as a source being close to the cusp point on the caustic of the lens. In the present case, the critical line intersects the arc twice, namely there where the arc is thinnest. In order to achieve this kind of configuration, the mass parameter of the cluster must be very well tuned. If it varies, either the arc becomes too short, or its multiple nature vanishes. If the redshift of the arc can be measured, the mass parameter of the cluster can be rather well determined.

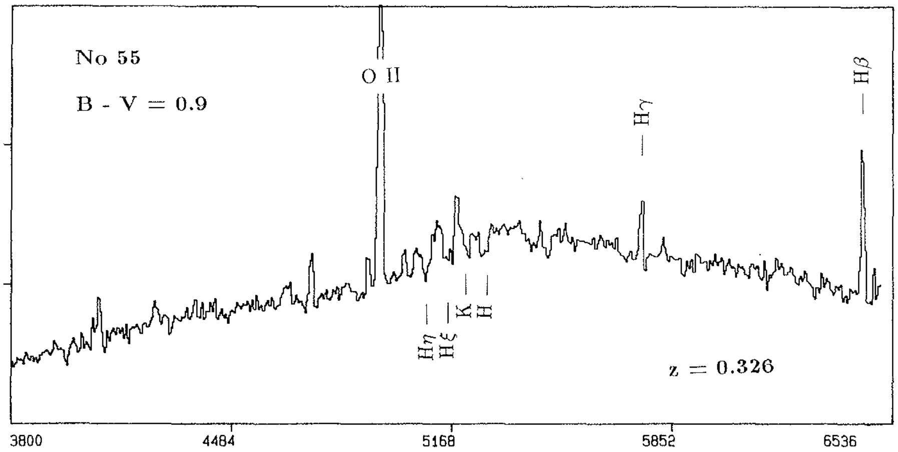

Figure 3: *A spectrum of a galaxy in Cl 0500-24 having colours similar to those of the arc. This spectrum was obtained in multislit spectroscopy with EFOSC at the 3.6 m telescope at La Silla (Giraud, 1989).*

On the other hand, while our photometry (in B, V, R, I) has shown that the arc is very blue and may have the colours of a very distant object, its colours are also compatible with those of intrinsically blue galaxies, at the redshift of the cluster, for which we have spectra. These very blue objects are emission-line galaxies (Fig. 3). Thus the presence of a blue population in the cluster did not allow us to prove without ambiguity that the arc-like feature is the image of a distant galaxy. Finally if we look at the photometry without theoretical prejudice, we cannot even be sure that the object is not foreground. If the arc is the result of the tidal interaction of the two galaxies, and the arc-like feature is a star-forming region, it seems reasonable to expect a well visible O II emission as in blue galaxies. A measurement of the arc spectrum may confirm the lensing nature of this object, and in that case will provide an independent measurement of the mass parameter of the cluster.

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A First Glimpse of the Spectrum of 3C 255

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The radio source 3C 255 was identified by Spinrad et al. (1988) with a faint object having a complex, multimodal structure. The object was resolved in four components on CCD frames taken in good seeing conditions with the 2.2 m ESO-MPI telescope on La Silla (Giraud, *The Messenger* **55,** 60). This image also suggested that the main object itself, which is probably the radio source, might be multiple (on 1 arcsec scale).

The radio source and fainter components may constitute a distant aggregate of galaxies, the radio galaxy being the first ranked object. Obtaining a low resolution spectrum of a 23rd magnitude object such as 3C 255, in a reasonable amount of telescope time, is still a rather uncertain adventure which requires very good observing conditions. Fortunately, distant radio galaxies are known to show moderately strong emission-line spectra. It was thus assumed that our task would be greatly simplified by the presence of these emission features. The exposure time was estimated from two 90-min exposures of a 21st magnitude emission-line galaxy, obtained with EFOSC, which was degraded down to a level that still permits distinguishing emission from noise. It was found that an acceptable spectrum would be obtained in