galaxies with $L > 2–3\ L^*$, resulting in very few spectroscopically confirmed detections. Nevertheless, the different pieces of evidence that we have obtained allow us to be very confident in the assertion that we have detected the bright-end of the population of normal galaxies during their early phase of star formation. While we do not yet know whether or not these are the *primeval galaxies*, namely the very first galaxies to form, we are confident that follow-up work with the ESO telescopes and the HST will allow us to build a more meaningful picture for the evolution of galaxies in the early Universe.

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Discovery of a Supernova (SN 1995K) at a Redshift of 0.478

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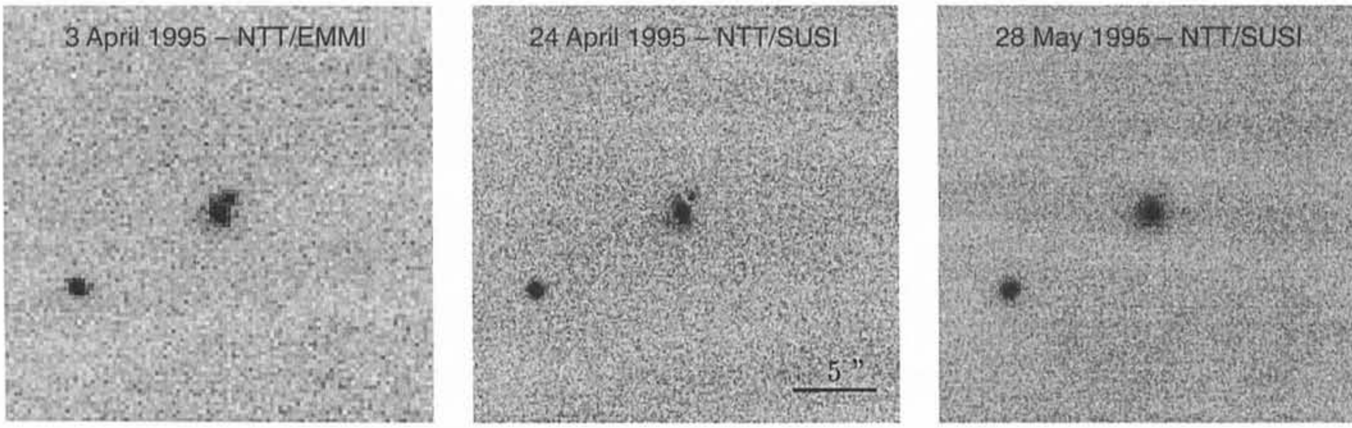
Three main cosmological parameters govern all models of an expanding Universe. They are the current expansion rate, the Hubble constant H_0, the derivative of this rate, the deceleration parameter q_0, and the vacuum energy density, the cosmological constant Λ_0. Measuring these parameters has been one of the main goals of observational cosmology for the last few decades. As more accurate values of the Hubble constant become available, attention is shifting to the second measurable q_0 which, in a Universe with negligible Λ_0, is directly linked to the mean density of the Universe (Ω_0).

Reliable distances are needed for a plausible determination of both q_0 and H_0. While there are now several independent distance indicators which give reliable relative distances out to about the distance of the Coma Cluster, most of these will not work at distances required to measure q_0 primarily due to their limited intrinsic brightness. Type Ia supernovae (SNe Ia) are amongst the more promising distance indicators out to redshifts of about 0.5. SNe Ia exhibit a remarkable uniformity in their light curves and spectra, which, combined with their extremely high luminosities make them ideal standard candles. Recent, accurate observations of the SN light curves, however, show that the intrinsic scatter of the absolute magnitude of Ia supernovae exceeds 0.4 magnitudes. This is probably due to variations in the explosion energy and masses of the progenitors. Such a scatter would make supernovae only mediocre standard candles. It has been shown, however, that the absolute magnitude of a SN Ia is correlated with its light curve shape. This makes it possible to correct supernova magnitudes as long as a well-observed light curve is available. A sample of SNe Ia with redshifts of less than 0.1 follows the expansion relation in the zc vs. m_{max} diagram extremely well and, after the aforementioned correction is applied, with a very small scatter (< 0.2 mag; Hamuy et al., 1995).

We have started a project to search for supernovae at redshifts between 0.3 $< z <$ 0.5 combining several 4-m-class telescopes around the world. The search is conducted with the CTIO 4-m prime focus camera which provides a field of view of 15 arcmin on a side. Short exposures (5 minutes) reach a limiting magnitude of about 23.5 in a special redshifted B filter (almost equivalent to a regular Kron-Cousin R filter). We can observe around 55 fields in one night. Specially designed search software is employed in real time to find suitable candidate objects by comparing the newly acquired frames with reference images obtained on previous runs. Spectroscopic follow up time has been scheduled at the AAT, the MMT, and the NTT at ESO. These nights have been requested to follow shortly after the search nights making it possible to obtain a spectrum of any supernova discovered near maximum. We expect to find most supernovae slightly before peak light due to special spacing of the search nights.

Reference images of the fields were established last February followed by three search nights in February and March. Unfortunately, the weather was clear only during two half nights in March. A good candidate was established during our last search night at CTIO and was followed up two nights later with the NTT. The possibility to use the various modes of EMMI and the high spatial resolution of SUSI during a single observing night allowed us to confirm the existence of the supernova, now designated SN 1995K (Schmidt et al., 1995), in a distant galaxy

[1]now at ESO.



A sequence of images of SN 1995K taken with the NTT. The first image (left) shows the supernova near maximum light. Three weeks later the object has faded considerably (middle) and is not detected two months after discovery. The stretch of the images is comparable to show the brightness decline of the supernova. The seeing measured from stars in the images was 0.8, 0.5 and 0.7 arcseconds from left to right.

and to obtain a spectrum of both the supernova and its galaxy.

The galaxy spectrum shows emission lines of Hα, [N II], weak [O III], and Hβ lines corresponding to a Sbc galaxy spectrum at a redshift of 0.478. An additional spectrum obtained at CTIO one month later confirms this conclusion.

An essential ingredient for the use of a high-redshift supernova as a distance indicator is its classification. The current classification scheme of supernovae is based on spectra around the maximum brightness of the event. For a meaningful and secure distance determination it is of paramount importance to classify the supernova by obtaining a spectrum. Since a supernova at a redshift of 0.4 reaches a peak brightness of $m_R \approx 22.3$–23.3 (depending on q_0) this is not a simple task.

The spectrum of SN 1995K is heavily contaminated by the galaxy (the supernova is located only 1.1 arcseconds from the galaxy nucleus). Nevertheless, it appears consistent with a regular SN Ia at maximum. The defining absorption line of [Si II] near 6100 Å can be seen near 9000 Å in our spectrum, a region severely affected by night sky lines.

Preliminary photometry indicates a peak magnitude of about 22.7 in R which explains some of the difficulties in obtaining a decent spectrum. The light curve of SN 1995K has been established through observations at the NTT, the 3.6-m and the Danish 1.5-m at ESO, and the 2.5-m DuPont telescope on Las Campanas. Whenever possible, we observed SN 1995K through special filters which correspond to B and V filters redshifted to 0.45. This technique makes uncertainties due to K-corrections (due to the redshifts) minimal. Since the regular R filter is almost identical to B redshifted to 0.47, we have included observations using this filter as well. The decline rate should be easily measurable from our photometry, and the possibility to measure a reliable distance is promising. Only modern image-processing techniques allow us to extract accurate magnitudes from an object which is deeply embedded in its host galaxy like SN 1995K. The available SUSI images (see Figure) obtained under very good seeing conditions will play an important role as templates for the extraction of the supernova magnitudes.

SN 1995K is the most distant star observed to date. It is among the half dozen supernovae at $z > 0.3$ known so far (Nørgaard-Nielsen et al., 1989, Perlmutter et al., 1994, 1995). The discovery of this supernova is proof that our programme is working. We were predicting one or two supernovae for our trial period. The next step is the establishment of reference images for the second half of the year (October/November) with the CTIO telescope and a continuation of the search early next year. With an improved version of the search software and several lessons learned from the pilot project we are well-prepared for more distant supernovae to be discovered.

For a reliable measurement of q_0 we will need more supernovae. We estimate that about 20 supernovae with accurate peak magnitudes are needed to put significant constraints on the deceleration of the Universe. Combining our results with similar projects under way at the Lawrence Berkeley Laboratory we should be able to reach this goal in the next few years. One of the main obstacles right now is the availability of good spectroscopic data. More photons would greatly enhance our ability to take spectra of these objects.

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The Magellanic Catalogue of Stars – MACS

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Introduction

The Magellanic Clouds harbour a vast number of objects of interest for the observer. In many cases it is, however, difficult to find accurate coordinates for stars in crowded fields of the Clouds. A first step to solve this problem was made by Périé et al. (1991), who published a catalogue of almost 1000 stars in the direction of the Magellanic Clouds with typical *V* magnitudes between 9 and 11. The positions are based on ESO Schmidt plates and have a positional accuracy of 0.5″. This catalogue can be used as