

## First try at imaging cloud with the Pixelink Camera: Data Captured Feb. 3, 2006

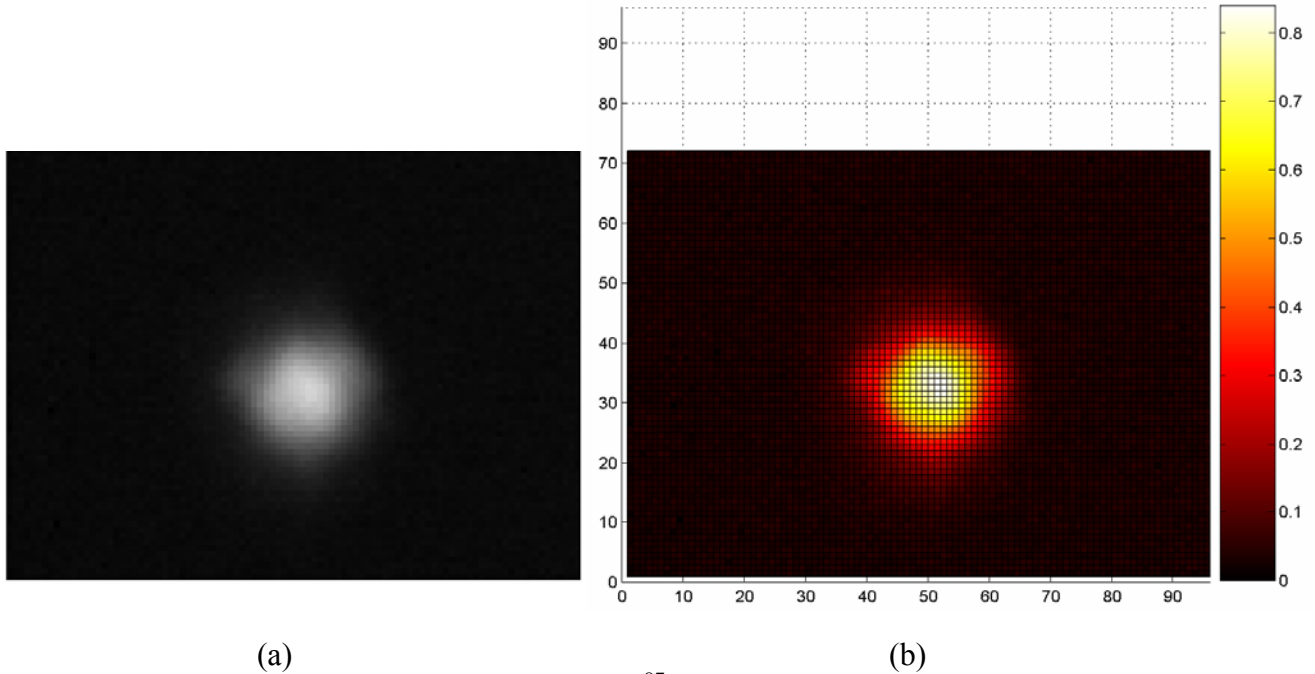


Figure 1. The Pixelink Camera image of an  $^{87}\text{Rb}$  atom cloud in the BCIT MOT, February 3, 2006. (a) Is the original .bmp formatted gray scale image. (b) shows the image processed using MATLAB v 6.5 showing the different intensities in a false colour map.

The image was captured with the pixelink software, the image was stored as a .bmp file and then imported to MATLAB for further analysis.

```
(import image:                                     T1 = imread('test1.bmp')
convert image to double precision format:         dT1 = im2double(T1);
plot up raw image:                               imshow(T1);
plot contour map of image in false colour:       surf(dT1); (colormap "hot") ).
```

### Image Processing: Assessing the cloud size and shape (in pixels)

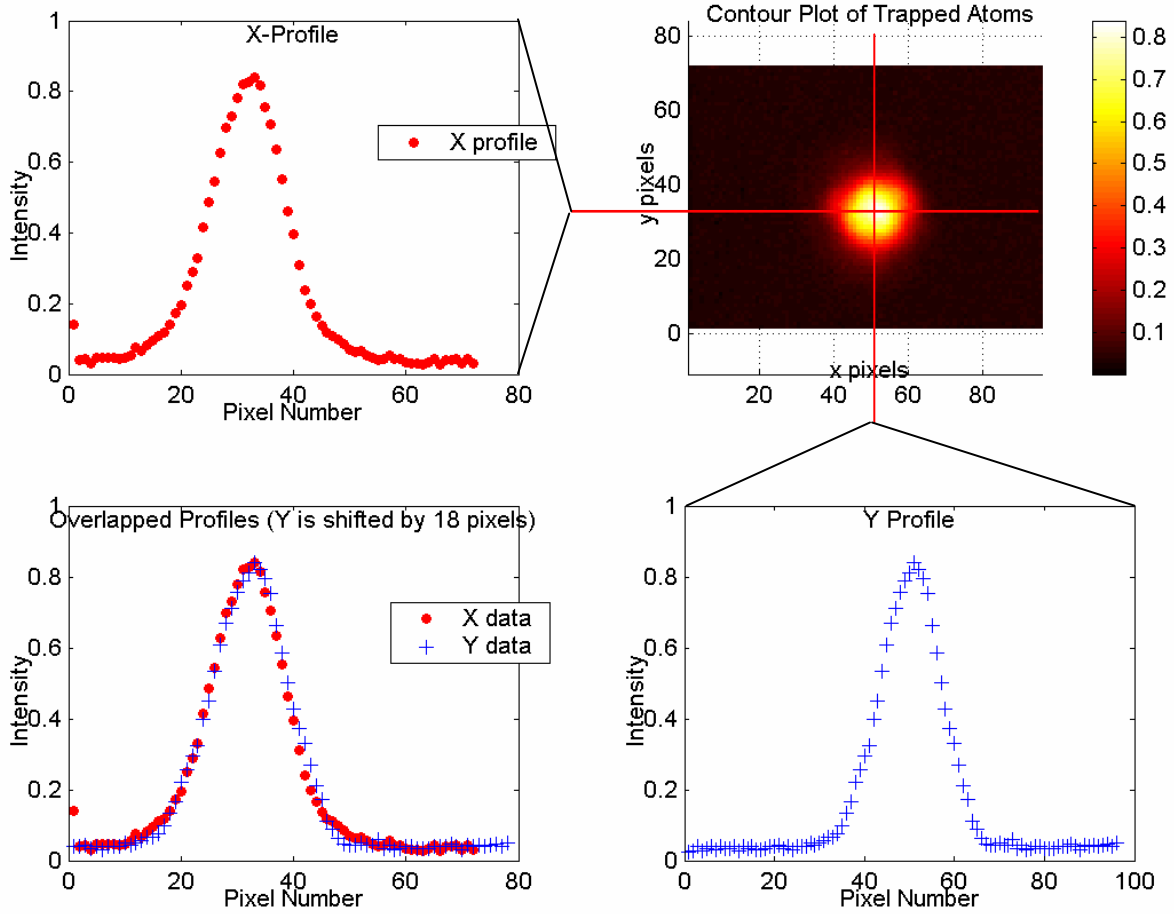


Figure 1.  $^{87}\text{Rb}$  atoms trapped in BCIT MOT. Preliminary tests of the image capture and processing using the Pixelink CMOS camera and exporting .bmp image to MATLAB.

The camera seems very capable of capturing the images.

NOTE: I need to determine the number of gray levels in the image, and the spatial dimensions corresponding to each pixel.

Fitting the X profile in Excel produces:

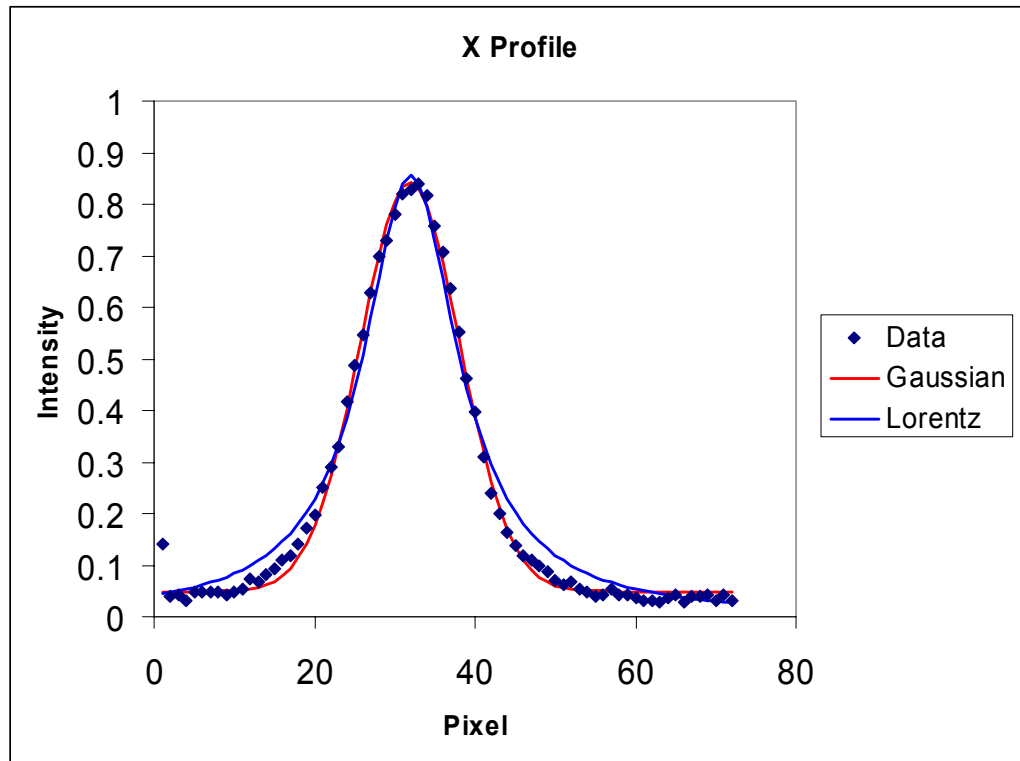


Figure 2. Test fits to the x direction profile of the atom cloud using both a Gaussian and a Lorentzian fit.

The Gaussian fit provides a better model for the data. The fit models were:  
Gaussian:

$$I = B + H \cdot e^{-\left[\frac{(x-x_c)^2}{w^2}\right]}$$

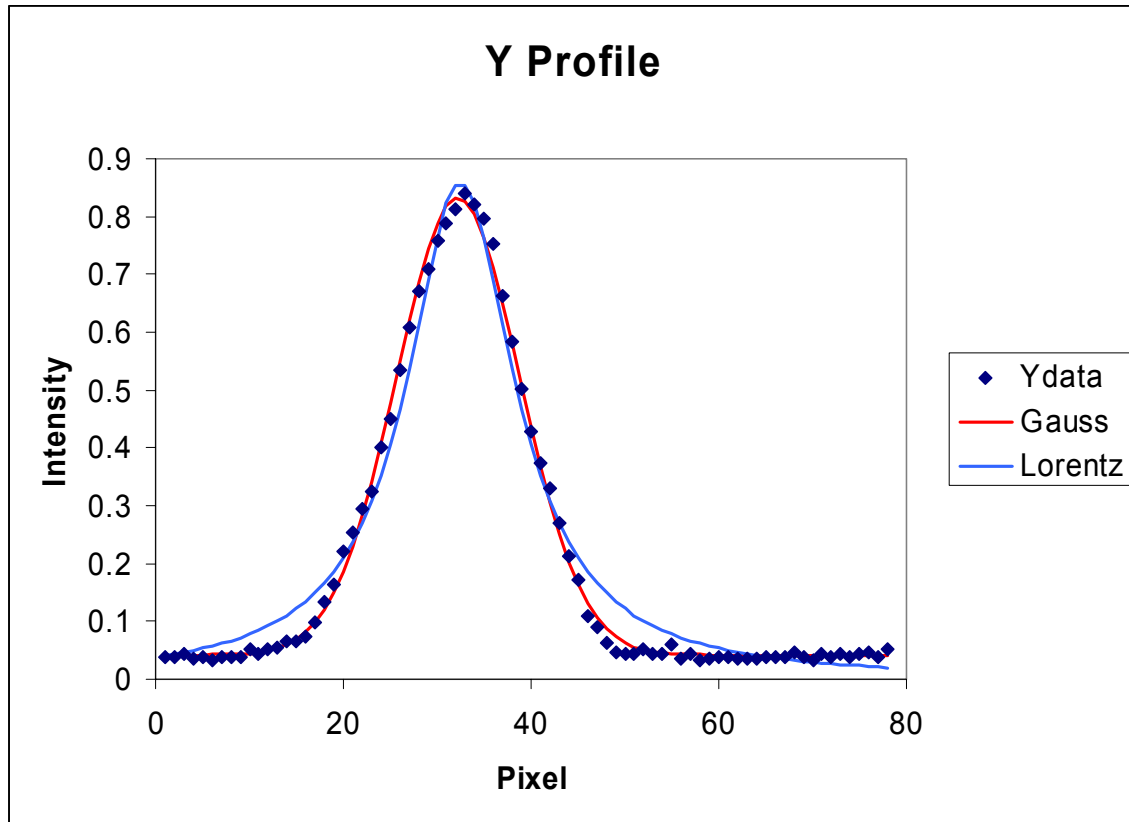
Lorentzian:

$$I = B + \frac{H \cdot \left(\frac{w}{2}\right)}{\left[(x-x_c)^2 + \left(\frac{w}{2}\right)^2\right]}$$

Table T1. Fit Parameters for  $^{87}\text{Rb}$  Cloud X Profile

Model	B	H	$X_c$	W	Sum of Diff <sup>2</sup>
Gaussian	0.049	0.794	31.9	8.8	0.02467
Lorentzian	0	6.2	32	14.5	0.08589

## Fitting the Y-Profile

Table T2. Fit Parameters for  $^{87}\text{Rb}$  Cloud Y Profile

Model	B	H	$X_c$	W	Sum of Diff <sup>2</sup>
Gaussian	0.42	0.79	32.2	9.35	0.03488946
Lorentzian	0	6.1	32.5	14.2	0.10435077

## Comparison of X and Y direction profiles:

Table T3. Gaussian Fit Parameters Comparison

Profile	B	H	$X_c$	W	Sum of Diff <sup>2</sup>
X	0.049	0.794	31.9	8.8	0.02467
Y	0.042	0.79	32.2	9.35	0.03489