# Plate Scale and the Size of a Quasar

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## 1. Plate Scale

### 1.1. Introduction

The goal of this project is to determine the number of arcsec/pixel of the CCD. An exposure was taken of the star $\delta$ Cephei, which is a binary star system with separation of 41.0 arcsec. Data was taken with the Leuschner telescope[2], and a 512x512 CCD.

### 1.2. Data and Interpretations

Two images were taken for 1/10 second each. After an image was taken, the pixel with highest DN in each star was taken to be approximately the center of the star, the row and column distances counted, and the direct distance computed using Pythagorus' equation. Then we computed the plate scale of the CCD using this equation: $PlateScale = arcsec/pixel$. The plate scale for Image 1 was found to be .645 arcsec/pixel. The plate scale for Image 2 was found to be .667 arcsec/pixel.

## 2. Size of a Quasar

### 2.1. Introduction

An image was taken of PKS 2145+06 for 600 seconds and with the same equipment as above. The image was analyzed for the radius though the use of a Gaussian.

### 2.2. Data and Interpretations

A 2-D Gaussian was fit to the image in order to find $\sigma$, which was taken to be the angular size of the quasar. The $\sigma$ was found to be 3.40721, giving a diameter of $\approx$ 6.8 pixels across. Taking arcsec/pixel to be .667, the diameter of PKS 2145+0 is 4.55 arcsec across or less.

The redshift is $z = 0.99$, so $v = .99c = 2.97 * 10^{10}$ cm/s, where $v$ is the velocity of the quasar. The distance to the quasar was found using to be $d = 3960$ Mpc. To determine this, the Hubble Equation, $v = H_o d$,was used, taking $H_o = 75$ km/s per Mpc.

The upper limit on the radius of the quasar is 9009 Mpc or $9.01 * 10^{10}$pc.

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