

## **FIRST TESTS OF A QUADRANT DETECTOR**

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### **ABSTRACT**

First tests of a quadrant detector system suitable for use on the GBT are given in this report. At the limited range used in these tests, it is shown that atmospheric effects will not be a limitation.

### **INTRODUCTION**

GBT Memo #127 recommended the accelerated development of a system to monitor movement of the GBT feed arm. GBT Memo #144 outlines a development program which calls for tests of a simple system during March 1996. This report gives the first results of these tests.

### **THE SYSTEM**

The quadrant detector system used in these tests is described by M. Valente in a document that is an appendix to Memo #143. A laser diode is used to generate a collimated laser beam that is projected over a certain range and is intercepted by a quadrant detector. Small movements in two orthogonal directions, each perpendicular to the direction of propagation, are sensed by the quadrant detector, along with its associated electronics. The frequency response of the system is from DC to around 100 Hz. The system has been set up as shown in Figure 1. The laser transmitter was set up on the ground in a heavy metal stand under the Green Bank water tower. The quadrant detector was positioned on the service platform at a height of 33.5 meters above the transmitter. The two outputs from the quadrant detector were sampled 2700 times over the course of one minute. Five minutes later a similar measurement was made. The average and rms values of each sample was recorded.

## **THE RESULTS**

Typical results for a few hours of measurement are shown in Figures 2 and 3. The scale of the measurement is 1.5 microns per millivolt. The predicted use for the quadrant detector is to sense arm vibration so DC shifts over a period of several hours are not important. Figure 2 shows a shift in average position of around 2 mm over the measurement period. The significant result is shown in Figure 3, which is a plot of the rms of each one minutes measurement period. Apart from the large, unexplained spike in the data, the rms values of the fluctuations range from around 20 microns to 110 microns.

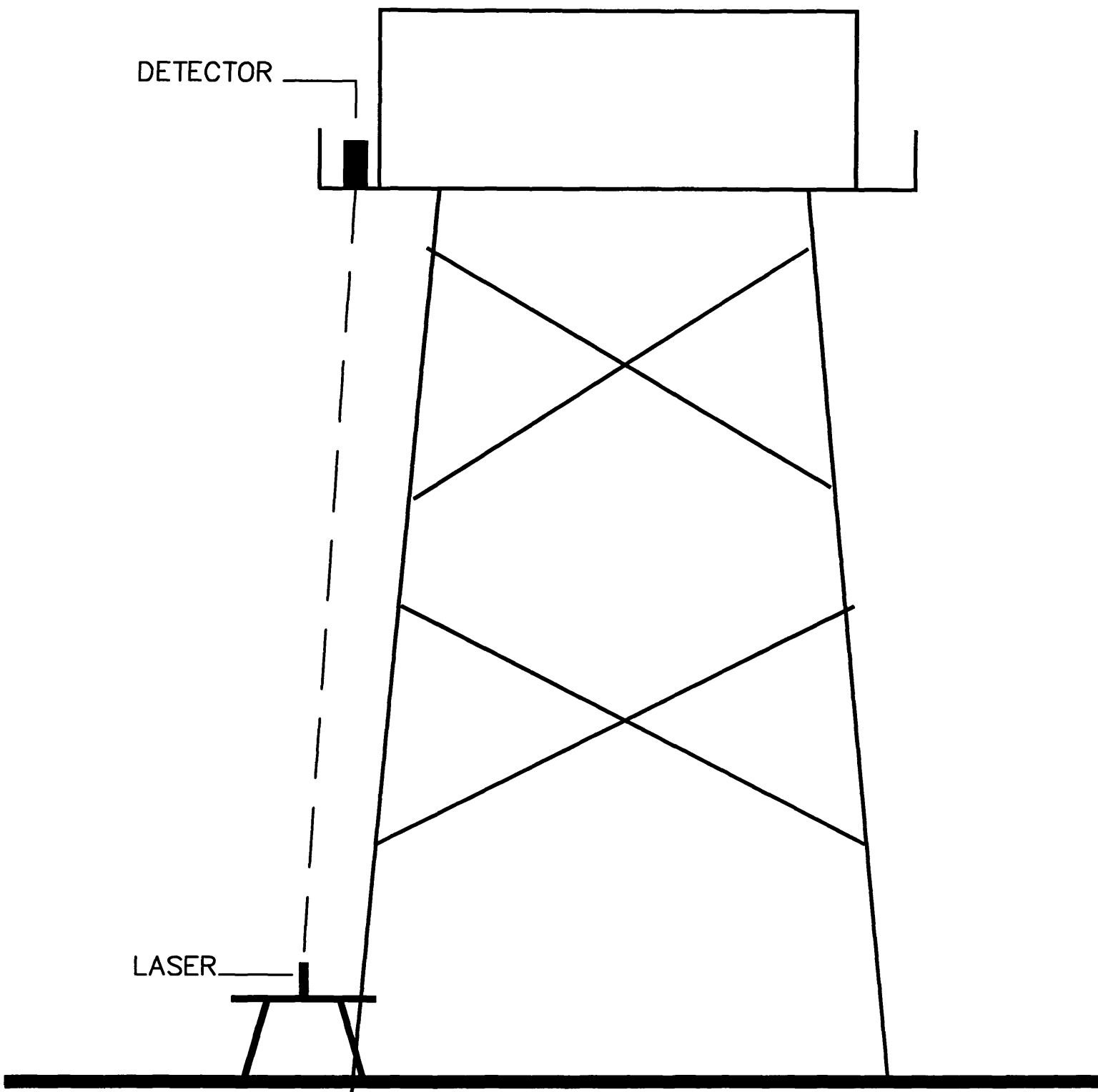
Our tests are unable to distinguish between atmospheric effects and mechanical movements, but we are able to state that, at this limited range, the system is sufficiently accurate for its intended purpose on the GBT.

A further series of tests at a range of 72 m is now planned. Results from these measurements will be reported in the next several months.

DETECTOR

LASER

FIG. 1



# OUT1 AVERAGE 4:30-12 MIDNIGHT 3/27/96

PARTLY CLOUDY - CLOUDY

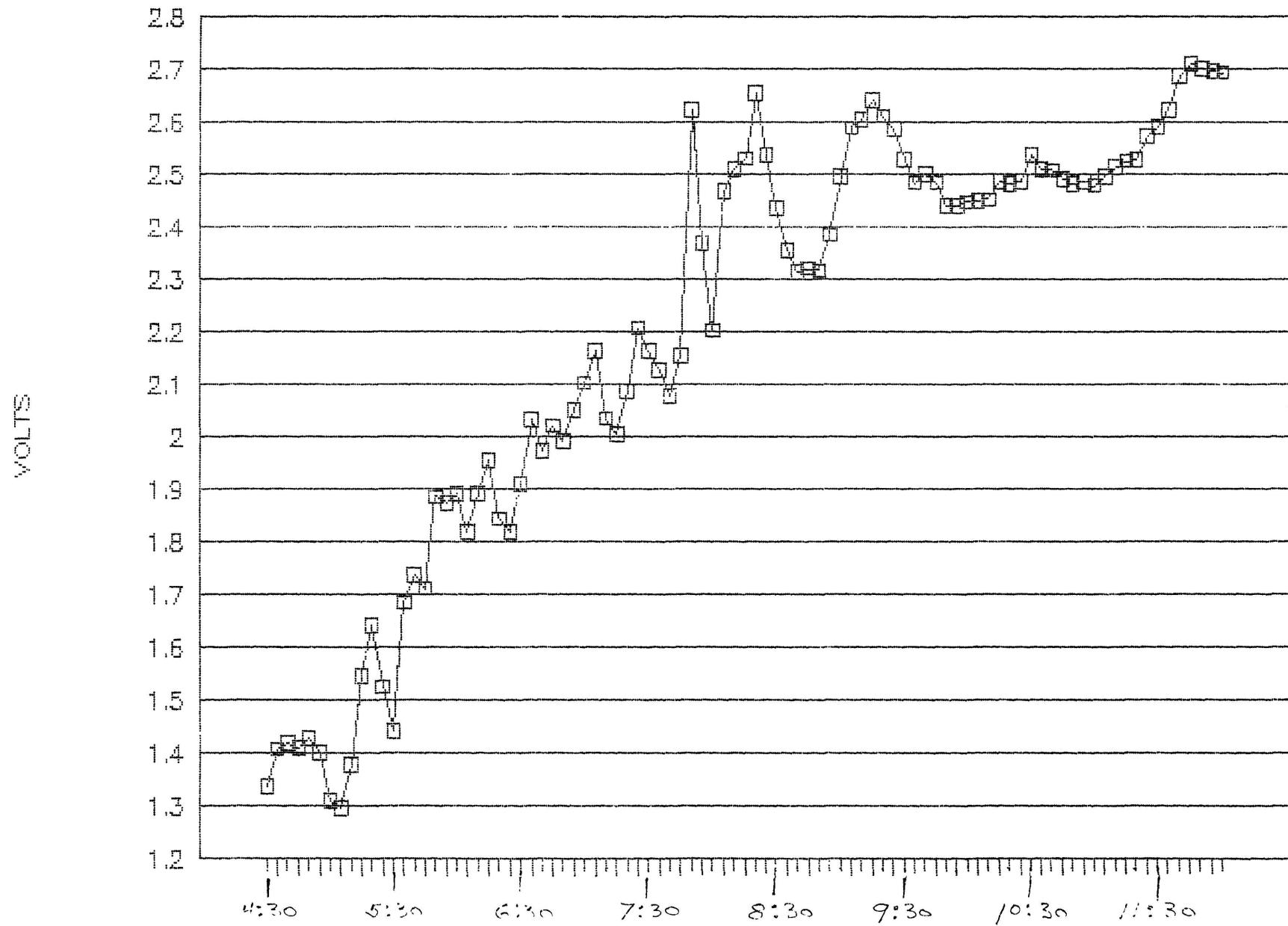


FIGURE 2

OUT1 RMS 4:30-12 MIDNIGHT 3/27/96

PARTLY CLOUDY - CLOUDY

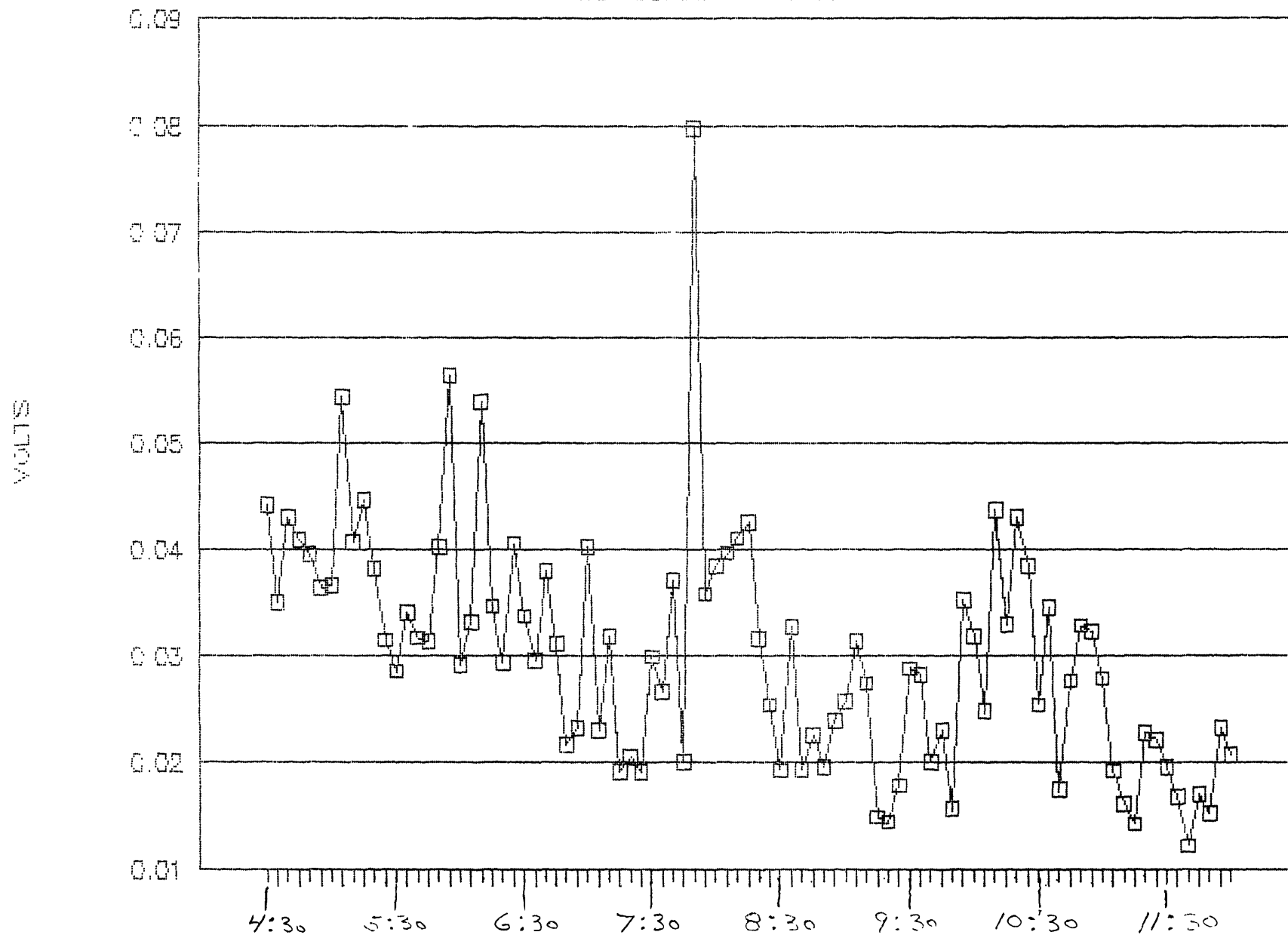


FIGURE 3