

Interoffice

NATIONAL RADIO ASTRONOMY OBSERVATORY
TUCSON, ARIZONA

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To: Bill Horne

From: John Payne

12 METER MILLIMETER WAVE TELESCOPE

MEMO No. 27

Subject: Errors in Encoders

It seems time to resolve our differences of opinion about the accuracy of the encoder system on the present 11 M telescope.

The encoders used are 20 bits (LSB = 1.24 arc sec) and the manufacturer claims an absolute accuracy of 1 bit when the unit leaves the factory. The encoders are checked using an autocollimator and an optically ground 16 sided reflector. This appears to be similar to the familiar pentaprism in that it comes from the manufacturer calibrated to better than 1 arc sec. To put the pattern on the disc, a Divided Circle Machine is used and the absolute accuracy is claimed to be better than 0.3 arc secs.

Bits 13 - 20 on the encoder are synthesized from sine and cosine tracks on the encoder and it is my belief that after a time, repeatable periodic errors could appear as a result in the synthesising electronics. John Davis, at Texas has measured such an effect on identical encoders. Note that such an effect is repeatable and is very simply compensated for in the software.

At the telescope at the present time, we have about 5 arc sec RMS random pointing errors after one week of operation and we believe that the encoders contribute very little.

I do not believe that the present encoders will limit the performance of the upgraded telescope.