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TO: Joe Salah

FROM: Alan E.E. Rogers $A \in \mathbb{ZP}_{2}^{2}$

SUBJECT: Recent investigations of upgrade problems

1] Astigmatism from holography and radiometry

With holography feed astigmatism correction there is \underline{no} significant difference between astigmatism measured by holography and that inferred from tuning the subreflector - see memo.

2] Diffraction of ring "C" deformation

My comment that the lack of improvement in efficiency at 43 GHz with ring "C" deformation of the subreflector might be due to diffraction is <u>not</u> supported by calculations. I have checked my earlier calculations that show diffraction is not significant at 43 GHz - see memo of 22 May 1992.

3] Elevation dependence of rms

The large rms variation with elevation reported by JAB and the small improvement with ring "C" deformation is consistent with holography and both are inconsistent with the SGH model - see memo.

I am very concerned that the deformation of Haystack with elevation may contain modes which cannot be adequately corrected by available subreflector motions and deformation. Perhaps thermal can do it - let's hope so. 4] Poor rms inferred by radiometry

a] 43 GHz

The estimates from 43 GHz have, in my opinion, rather large errors due to uncertainty in atmosphere, antenna, losses, calibration, etc.

b] 86 GHz

The measurements at 86 GHz have probably overestimated the rms due to lack of an accurate measure of the feed performance. The feed was designed for 112 GHz and operation at 86 GHz is significantly far away from the design center for which we have good feed efficiency calculations.

With better measurements the radiometry results may improve to 11-12 mils (for a 10 mil holography result). The remaining discrepancy is a mystery but could partly be the result of small scale roughness not seen by the holography and possibly underestimated by the sun scans. The sun scan data are not inconsistent with a small scale contribution as large as 6 mils rms. (I would hope we could break through the current barrier and get the large scale down to 6 mils to give us some margin.) Another possible contributor to the discrepancy could be excessive radome panel loss. The ESCO report (Joe Sangilio) has no accurate loss measurements - but those presented are consistent with a material loss tangent as high as 0.1 which is enough to account for an added effective rms of 7 mils at 43 GHz.