

National Radio Astronomy Observatory  
Charlottesville, Virginia

August 17, 1976

To: Distribution

From: Woon-Yin Wong

*ENGINEERING MEMO # 109*

Subject: 140-foot Deformable Subreflector

The transition time of the tilting mechanism for beam switching is 40 m-second for the subreflector to change from one position to the other. The original specification called for 30m-second. According to C. Brockway, it is advisable to drive the system in the lower speed.

The lowest natural frequency of the existing subreflector, which is one inch in thickness, is 42 Hz. Without the knowledge of the structural damping effect, it is assumed the vibration takes 24 m-second to die out. The time lost due to the combination of these two factors is 47 m-second for each half of beam switching cycle. For the 5 Hz beam switching, 47% of the time is lost. According to the in-house design, the new deformable subreflector is one-half as thick as the existing one. The lowest natural frequency is estimated to be 29 Hz. Combined with the transitional time in beam switching, the total time lost for each half cycle is 52 m-second, meaning a 52% time loss for the 5 Hz beam switching.

These two estimates are based on the assumption that the subreflector connected to a very rigid frame works. Hence, the estimates are not conservative.

The time lost in 5 Hz beam switching technique is high in both cases. On the other hand, the new deformable subreflector is only 11% worse than the existing one.

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Milliflect is a small outfit, presently engaged in making the VLA subreflector. They are well qualified in fabrication; they are not as strong in analysis as W. Blythe or RSI. Prices of various items are negotiable with some indication of price reduction.

ASI is also a small outfit. They are experienced and have our mold (itself a \$2K item) for the first subreflector. Prices quoted seem reasonable but their proposal is too sketchy.

W. Blythe is a high-power consultant in analysis. If we want a thorough analysis with results that we can accept with full confidence, he is the one we should approach.

RSI is a very competent firm in analysis as well as fabrication. However, they rejected the fabrication of the subreflector due to the lack of experience. They are presently producing surface panels for the VLA telescopes. Still, they fall short in comparison with W. Blythe in cost as well as qualifications.

There are two options, as I can see:

1. W. Blythe for the analysis, then either fabrication of the subreflector on the West Coast (Milliflect or ASI) or start searching for other firms on the East Coast. This option might cost us about \$25K. If we are willing to pay, this is the approach!
2. Milliflect to undertake the analysis and fabrication. This approach might require tighter supervision by NRAO and complicates the planning due to the distance between NRAO and this firm. As for the price, this approach could be an attractive one. My estimate is, through negotiation, the price could be reduced to \$15K.

WYW:cb

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