

A REPORT ON THE MANUFACTURE OF THE TUCSON  
8-BEAM, 230 GHZ FEED HORN

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This feed horn has no particular one design feature that makes it difficult to manufacture, but rather several little factors that add up to make it quite a task.

In addition to a few deep grooves, it has a long transition and considerable diameter change over its short length. Some of the difficulties encountered are gold stripping of the upper part of the grooves in the finished horn, and pinholing through the gold, allowing undermining of lower layers. Here is the procedure we have used to accomplish a thoroughly satisfactory horn:

First, the horn is thoroughly inspected for defects, including trapped burrs (some spacings are very, very small). Then it is screwed onto a titanium rod. Electrical tape masking right up to the back of the mandrel is used, followed by Vikem Dip vinyl masking, also right up to the mandrel's back surface. It is air-dried, and then later warm air dried at 35°C. The mandrel is then ultrasounded in NRAO General Acid Metal Cleaner for a few seconds, rinsed, ultrasounded in alkaline cleaner, rinsed with water, dried with air, and again examined.

Next, the horn is immersed with occasional swirling for 20 minutes in alkaline electroform etch (44 g. Na<sub>3</sub>PO<sub>4</sub> and 44 g. Na<sub>2</sub>CO<sub>3</sub>\*H<sub>2</sub>O per half-gallon). Water rinsing follows, then 10 seconds in Amchem Nitric Deoxidizer #4. Another water rinsing follows (with caution to remove all traces of deoxidizer), and finally a 10 second zincating in NRAO's standard zincating dip.

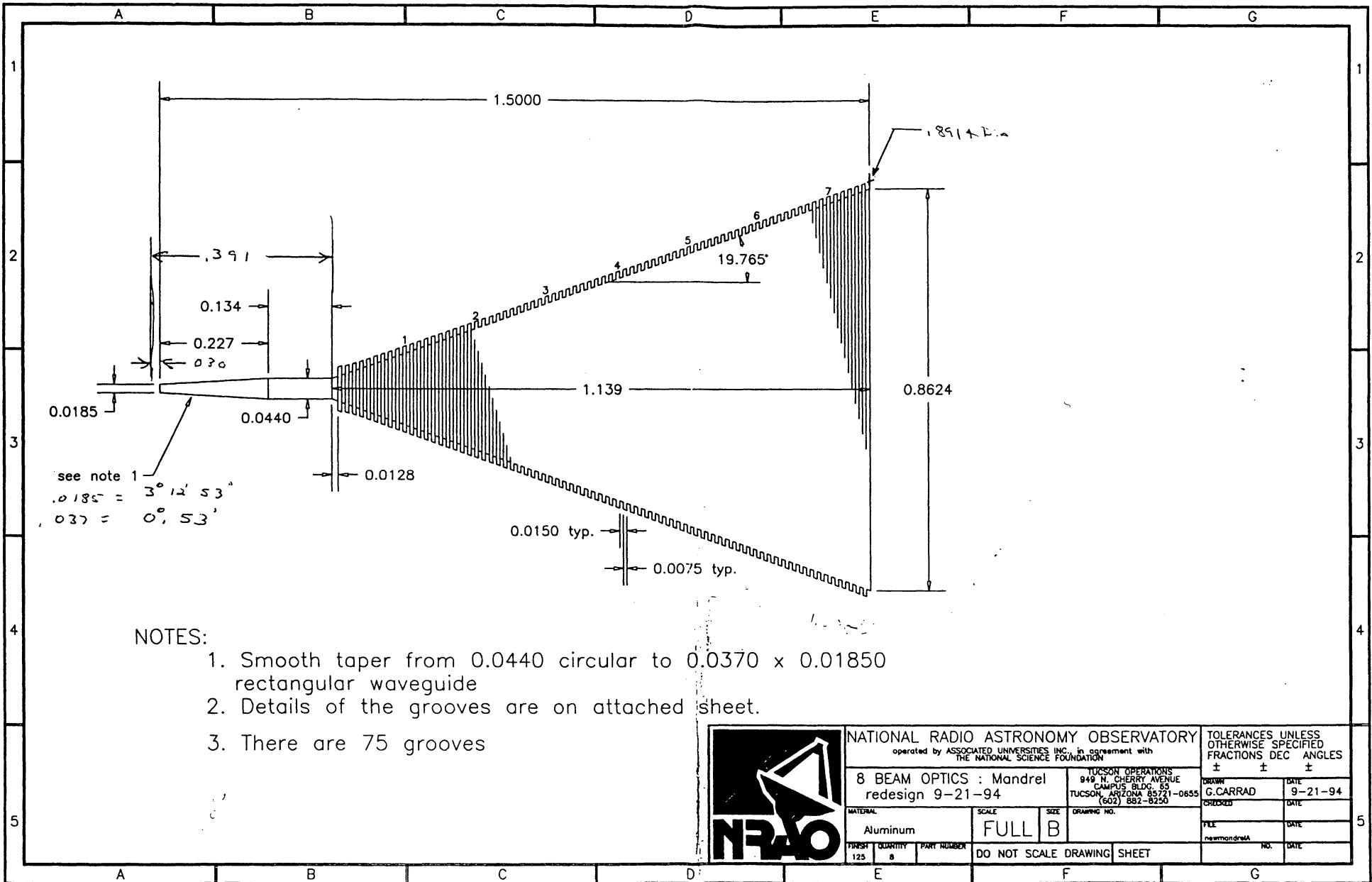
Entering the copper cyanide flash electrically hot at 36°C, with the bath made just yellow with free sodium cyanide previously, and using 275 mA DC for 45-55 seconds, accomplished the initial copper flashing. The remainder of the copper flashing, a smoothing layer, is performed in the acid copper sulfate bath at the same current for two minutes, likewise having a circular anode configuration surrounding the piece. It is water rinsed and quickly inspected before golding.

Three hours of gold are then put on the mandrel. The soft cyanide unalloyed gold, Pur-a-Gold 125 bath, is used. The temperature set is about 40°. 30 mA sharp is used the entire time. Rinsing again follows.

Next, a wood's nickel layer is added, 600 mA for just two minutes to minimize the amount, while at the same time providing some measure of protection against migration when the pieces is later soldered.

An additional cyanide copper layer at about 200 mA maximum current is applied, in case the nickel layer should want to cause some problem by becoming passive. Now copper from the acid bath is grown for about 7-8 hours at 240 mA. This is then removed, rinsed, and thoroughly dried in preparation for 60/40 soldering in a solder pot. It should be noted that some of the parts of the horn are masked using a water soluble maskant before immersion in the solder pot, so that not ALL parts are soldered. It is not desirable to have any exposed solder in later stages of the horn manufacture. Solder time is approximately 12 seconds.

The horn is soaked in the acid cleaner in the ultrasound bath for a few minutes, rinsed, copper cyanide flashed, and grown to size in the acid copper bath. It is machined on the outside, golded in the soft gold for two hours, and the aluminum dissolved out in 50% HCl. The copper flash is removed with 15% nitric acid and 15% acetic acid.



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8 BEAM OPTICS : Mandrel  
 redesign 9-21-94

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MATERIAL Aluminum SCALE FULL B SIZE DRAWING NO.

FINISH 125 QUANTITY 8 PART NUMBER DO NOT SCALE DRAWING SHEET

TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONS	DEC ANGLES
±	±
DRAWN G. CARRAD	DATE 9-21-94
CHECKED	DATE
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