Subject: Re: s-band transmit horn
From: Lynn Baker <lab5@cornell.edu>
Date: 11/14/2012 12:40 PM
To: Mike Nolan <nolan@naic.edu>
CC: Phil Perillat <phil@naic.edu>, Don Campbell <campbell@astro.cornell.edu>, Denis Urbain <durbain@naic.edu>

Hi Mike,

Sorry about the silent delay. Back to being focused on the alignment and horns. First , a word about the horns.

It is clear that the new horns are slightly different in gain and even more different from the old horns. This can be seen just from the outline of the adaptor plate which shows the mouth ID of each horn. The new horns have smaller openings which gives a wider, lower gain beam than the old horns which clearly under illuminate the tertiary. The transmit horn has the wider beam. The receive horn has the narrower beam to reduce spillover / noise pickup. I assume the plots you mention below are from a four plot report in a file named horn.report.pdf. At the time I generated that little report I referred to both horns as two possible choices for the transmit horns. I am fairly sure what finally happened is that the -15 db. taper horn was built as the transmit horn and the -16 db. horn was built as the receive horn. What I lack is confirmed linkage between design / construction drawings and plots of simulated performance. That information is contained in Ansoft HFSS files where the geometry was input and the simulations were performed. I do not have an operational copy of HFSS so I cannot directly access the files and results. The scripting files which run the software are ASCII and nominally readable but are thousands of lines of cryptic, internal code. If it becomes necessary to confirm the exact origin of the simulation plots I could parse those files but it would be a laborious effort for a modest increase in knowledge. The present pair of horns are going to be used for the foreseeable future so alignment is the only thing we can adjust. So on to alignment issues.

I have reviewed the data analysis of the videogrammetry done on June 28, 2004. This was the last measurement of the secondary targets after two iterations of adjustments and three rounds of video. I have started on modifying the code and improving the documentation so the single Mathematica script will run the analysis and document both the process and results. The original code used some external Fortran to do some of the processing and I am eliminating that. I will provide the native version and a pdf version as a report on the videogrammetry. One significant addition to the data reduction will be an amplitude weighted best fit to the measured data to best define the global coordinate system. However, that is a final polish since the RMS of the errors between the data file from V-Stars, the video data reduction software, and the secondary fiducial file is .038". Tossing a few obvious bad points out near the edge of the secondary reduces that to ~.030". The coordinate system defined by this data set will be close to absolute best obtained from the amplitude weighted fit. The present fit from V-Stars is this good because the drive file to V-Stars is the fiducial file. Of course all of this is assuming the secondary has not changed in the last eight years but we have no better data.

To move forward expeditiously, my plan is to used the existing video measurement file to reduce the recent survey work. This will give very close results for the correct position of the horns. Once I finish the rewrite of the video data reduction I will substitute the new target data file and rerun the horn survey reduction. The result will only be slightly different, perhaps negligibly so. I have started writing this code and should finish in a couple of days.

For future survey work I will generate an expected target circle location for each horn. Right now the software uses the target geometry to calculate the location of the phase center after the survey finishes. Having the nominally correct position of the target circle center for each horn will allow immediate evaluation of survey results. Right now we can only evaluate the y value because symmetry requires it to be zero. This combined with a survey drive file drawn from the most recent videogrammetry will make the survey work pretty much self contained as to horn adjustments.

Regards,
Lynn

On Nov 9, 2012, at 5:05 PM, Mike Nolan wrote:

> Excavating, the new rx horn is intended to have a substantially
> wider illumination than the old one.
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> -Mike
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> On Wed, Apr 06, 2005 at 11:33:36AM -0400, Lynn A. Baker wrote:
> > All,
> >
> > Attached are pattern plots of two horns proposed for the new
> > transmit feed. They are quite similar but have slightly different
> > edge tapers of approximately -15 db. and -16 db. The present horn
> > has an edge taper of about -20 db. The present horn has a peak