JPL D-14738

Welcome to

A TOUR OF THE GAVRT ANTENNA

October 1997

Jet Propulsion Laboratory
California Institute of Technology

A TOUR OF THE GOLDSTONE-APPLE VALLEY RADIO TELESCOPE

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PREFACE

This module introduces learners to the size and scale of the Goldstone-Apple Valley Radio Telescope (GAVRT) antenna structure.

In a collaborative effort, the Apple Valley (California) Science and Technology Center (AVSTC), the Apple Valley Unified School District, the Jet Propulsion Laboratory (JPL), and NASA have converted a 34-meter antenna at NASA's Deep Space Network's (DSN) Goldstone Complex into a unique interactive and teaching instrument available to classrooms throughout the United States, via the internet.

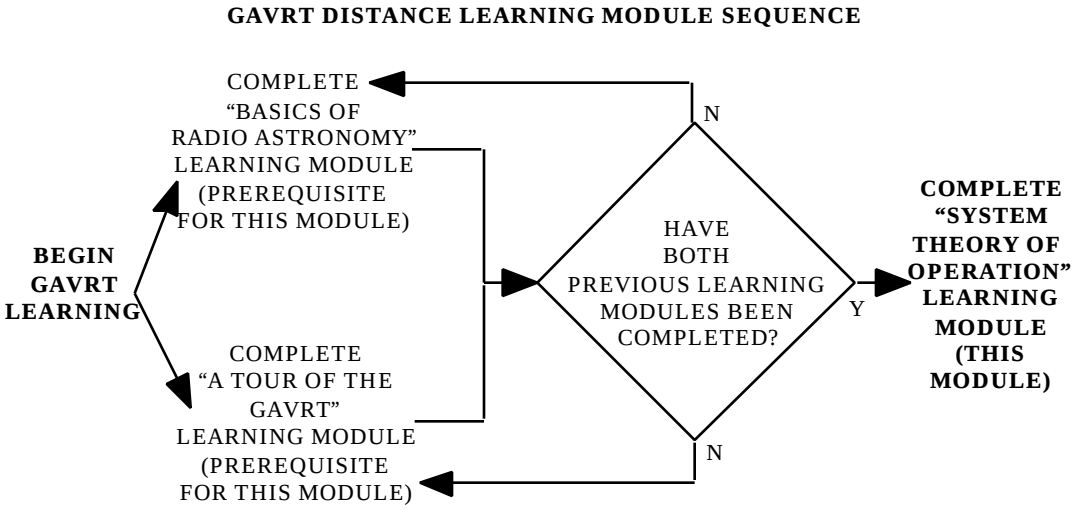
The Goldstone-Apple Valley Radio Telescope (GAVRT) is located in a remote area of the Mojave Desert, 40 miles north of Barstow, California. The antenna, identified as DSS-12, is a 34-meter diameter dish, 11 times the diameter of a ten-foot microwave dish used for satellite television. DSS-12 has been used by NASA to communicate with robotic space probes for more than thirty years. In 1994, when NASA decided to decommission DSS-12, a group of professional scientists, educators, engineers, and several community volunteers envisioned a use for this antenna and began work on what has become the GAVRT Project.

The GAVRT Project is jointly managed by the Apple Valley Science and Technology Center (AVSTC) and the Telecommunications and Mission Operations Directorate (TMOD) at the California Institute of Technology's Jet Propulsion Laboratory.

Students and teachers in potentially 10,000 classrooms across the country will be able to register with the center's internet site and operate the telescope from their own classrooms using personal computers, under the oversight of AVSTC GAVRT system operators.

MODULE OVERVIEW

There are no prerequisites to this module.



If you have not already completed the "Basics of Radio Astronomy" learning module, that module complements this module and should be completed before beginning the "System Theory of Operation" learning module, the next module in this series. The "Basics of Radio Astronomy" learning module may be downloaded without charge from URL:

http://www.jpl.nasa.gov/radioastronomy/

The "Basics of Radio Astronomy" describes how electromagnetic signals are naturally created in outer space and how they are propagated through space to the GAVRT antenna.

"A Tour of the GAVRT Antenna" provides a pictorial tour of the antenna and is especially designed to give a "feel" for the size and scale of the antenna.

DOCUMENT LOG

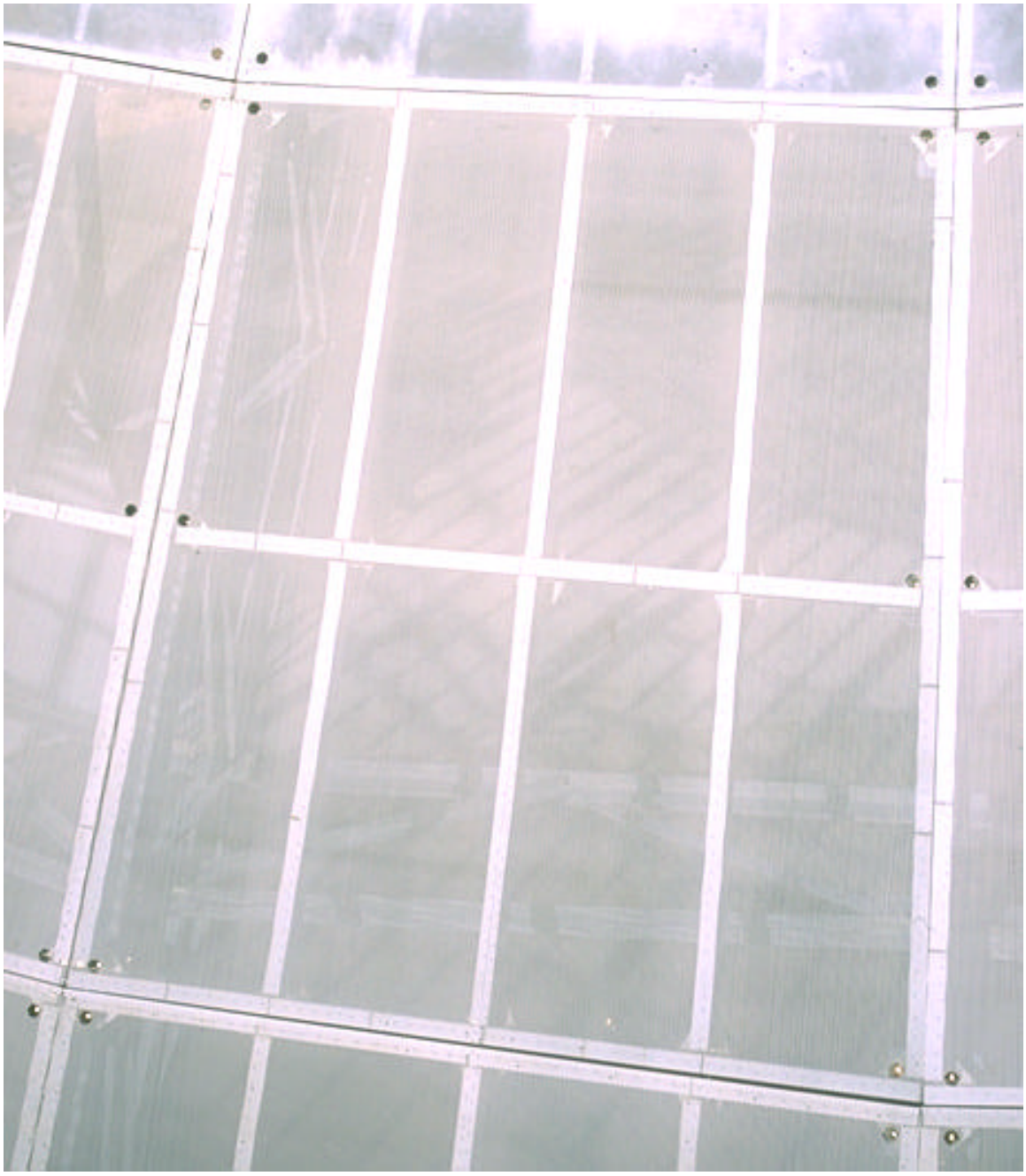
A Tour of the Goldstone-Apple Valley Radio Telescope Antenna

Document Identifier	Date	Description
D-14738	10/1/97	Provides a tour of the GAVRT Antenna for internet learners.

ACKNOWLEDGMENTS

Linda Patterson, AVSTC Assistant Photographer, made significant contributions in time and expertise toward the development of this module. Without her efforts this module could not have been developed.

Hello. I'm Brooke Ardenski and I would like to take you on a walking tour of the Goldstone-Apple Valley Radio Telescope antenna.



This is a close-up of a primary reflector dish panel. Each panel has six adjusting screws for aligning the panel. It is made of aluminum and is perforated, which means you can see through it. Imagine standing on one of these panels, 9 stories up in the air, looking down through it and seeing the ground below. That's what I'm going to do.

Here I am pointing to one of the dish panel alignment adjusting screws. Notice the camera has moved further and further away for each picture. Can you find me in the pictures above? That dish is huge!

You're looking at a full view of the GAVRT antenna in early morning light. In the foreground, you can see the interlocked chain link perimeter fence. That is for safety, of course, and you can only enter the area while wearing a hard hat. The primary reflector is 34 meters in diameter. The south ladder, on the left of the antenna, is for personnel access to the declination drive equipment. On the right side of the antenna is the north personnel access ladder to the hour angle(skid (drive equipment). where we'll be going next.

Here I am measuring the width of the hour angle pinion gear. As you can see, it measures 8 inches. Just above the pinion gear is the hour angle bull gear. It's big!

I'm touching the manual brake actuator on the hour angle brake!

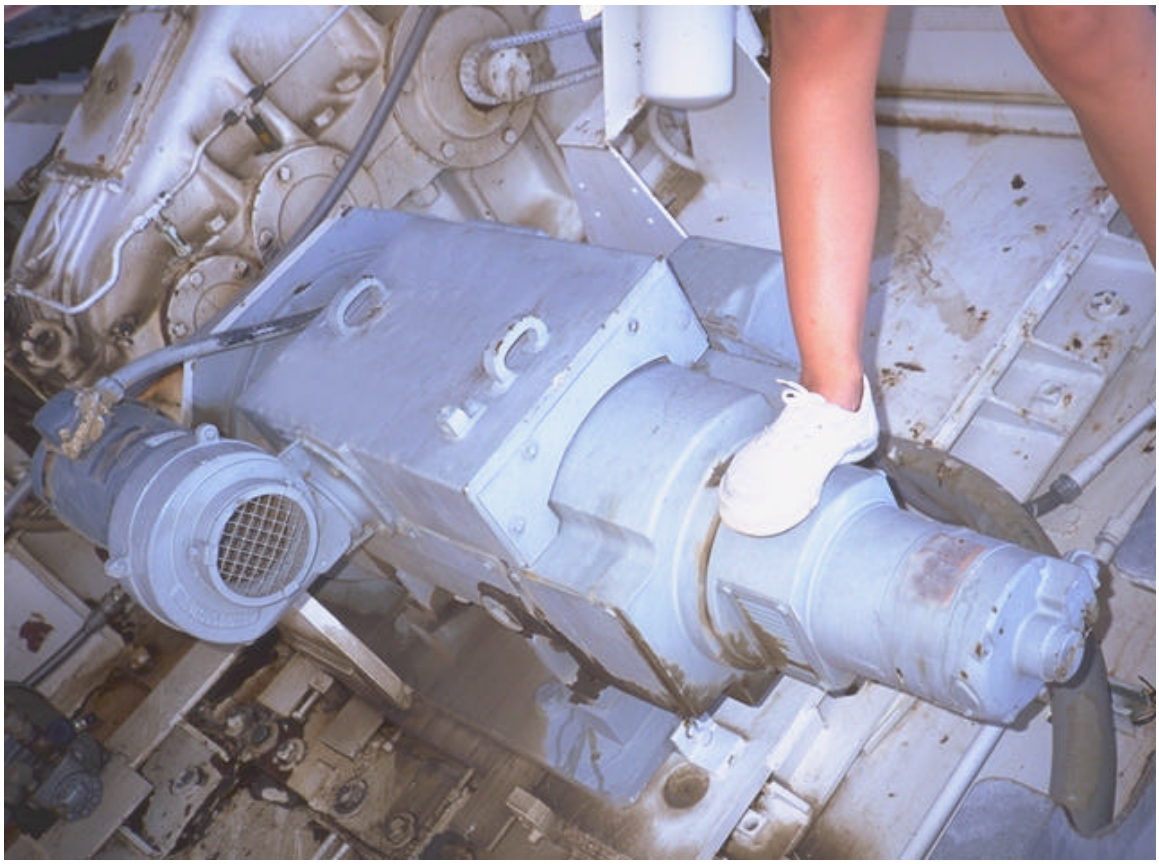
Here I'm taking a break and sitting on the hour angle skid. Behind me are the hour angle gear boxes. Big, huh? At the top of the picture is the hour angle bull gear.

To climb higher on the antenna than the hour angle skid, we must first return to the ground and use the south personnel access ladder

Well, here I go, starting up the south ladder, heading for the declination skid. Maybe now is a good time to press the emergency "Stop" button, which is next to my right hand!

I've reached the top of the south ladder. Yeah! I can't turn back now. Notice how high up I am by looking at the Hi-ranger (personnel lift) parked on the service pad below. It looks like a Tonka truck from here.

I am now on the declination skid, standing on the declination limit switch box. A nylon chain connects the declination switch box to one of the declination gear boxes. The white canister houses the filter for the declination gearbox lubrication system. The big white tube running behind me is the polar shaft, or hour angle axis. I'm about half way up the antenna now.



Here I'm resting my foot on one of the two declination drive motors. You can see the declination gear box in the background.

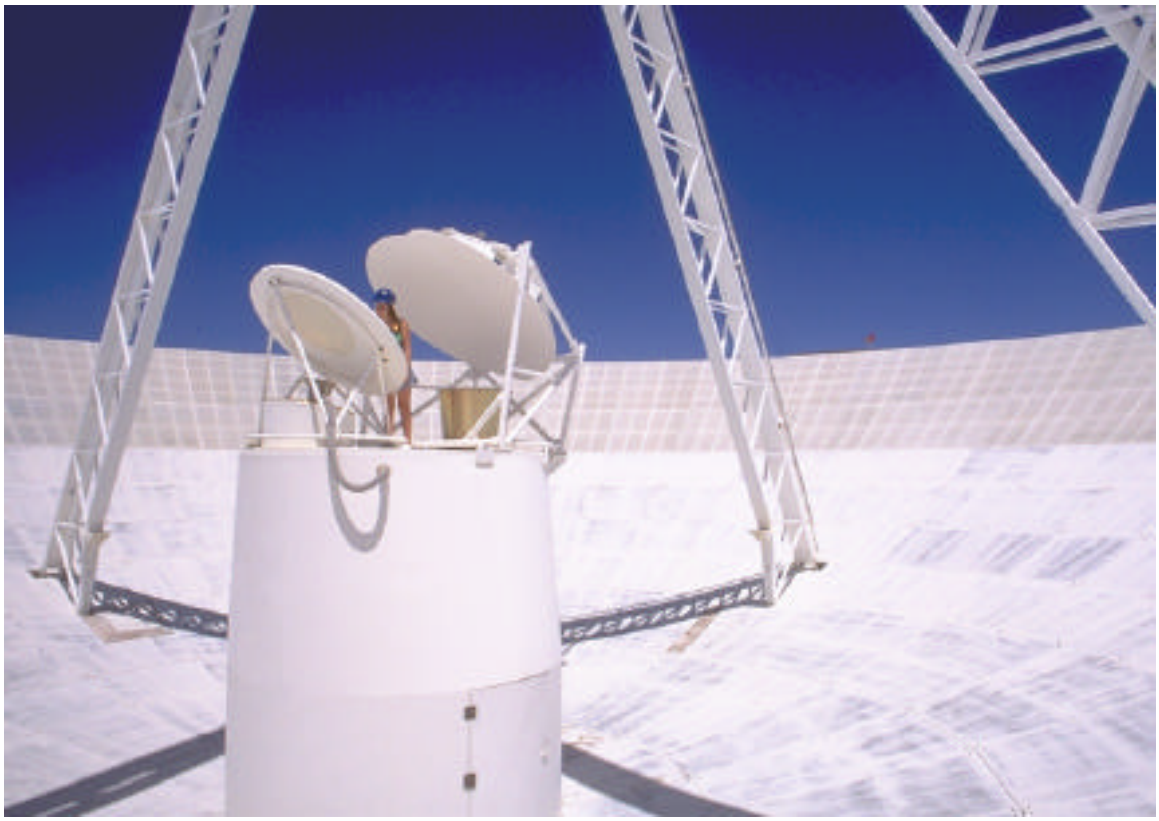
Another rest stop! I'm sitting on the declination drive motor. To the left is the declination gear box, and the declination carriage counter weights are in the upper left of the picture. Wouldn't want those to fall on me!

I'm measuring the width of the declination pinion gear. It measures 6 inches. Can you see the polished teeth of the declination bull gear? Don't bite me!

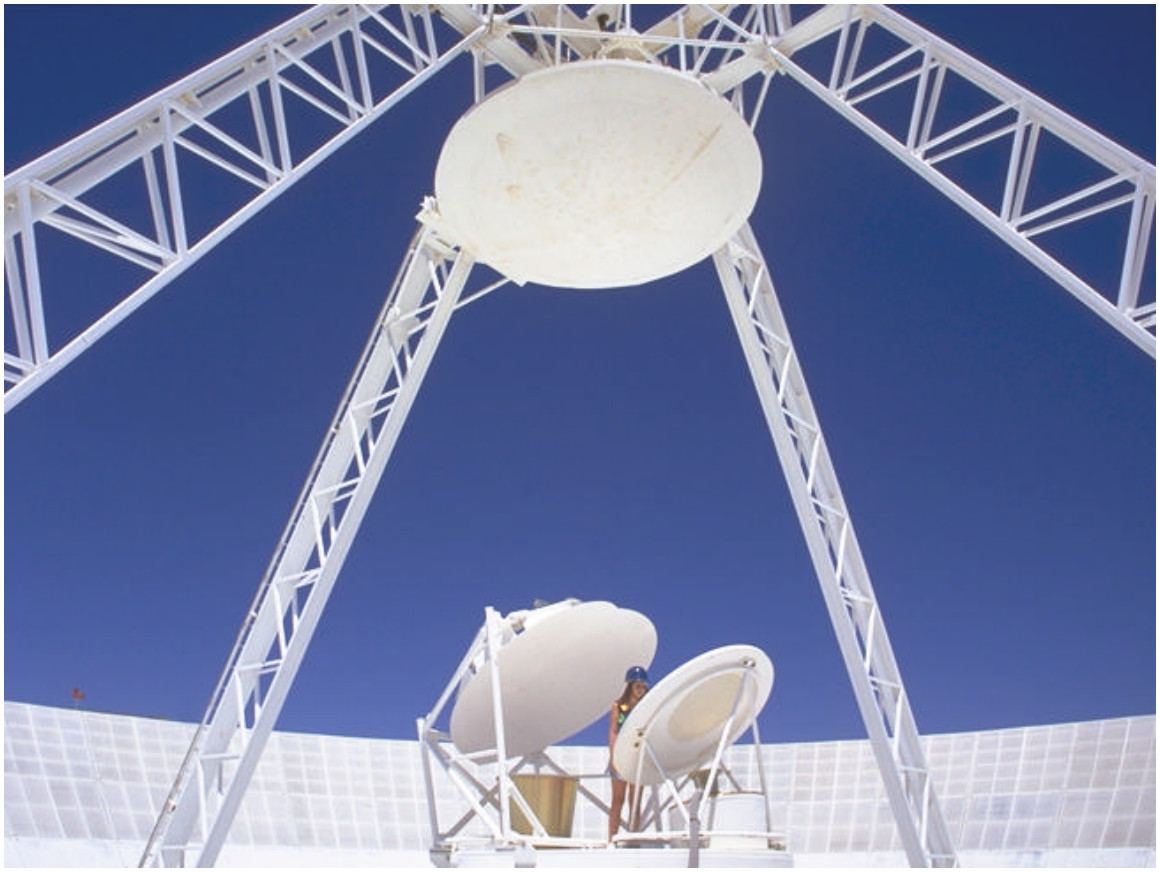
I'm pointing out the declination carriage counter weights. Each one weighs approximately 100 pounds.

Well, I've made it to the dish! I'm climbing through the dish access door. Thank goodness the hand holds are welded to the side of the cone. See the perforations in the reflector surface in the foreground. Remember, you can see through these holes all the way to the ground. Pretty scary, but pretty exciting, too!

I'm inside the reflector dish and pausing on my climb to the top of the cone. Should I continue? See the clearance light on the rim of the primary reflector?



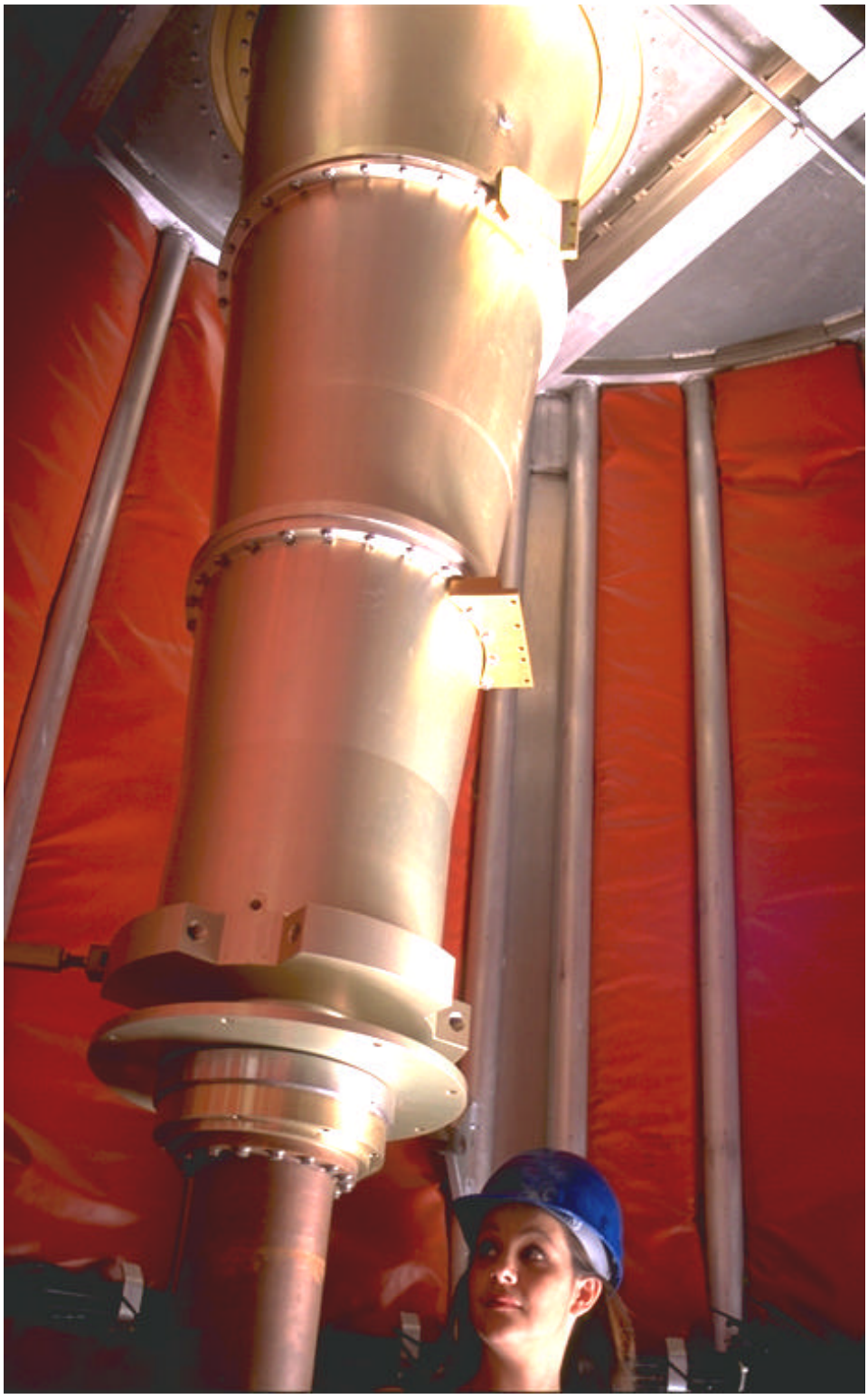
Can you see me at the top of the cone examining the dichroic? The top of the X-band feed horn is just below the dichroic plate. See the RF mirror behind me and to the right? The top of the S-band feed horn is just below the mirror. You can see three of the four legs of the quadrapod assembly that support the secondary reflector, which you cannot see in this picture. (No, I won't be climbing to the secondary reflector!) Can you find the cone access door?



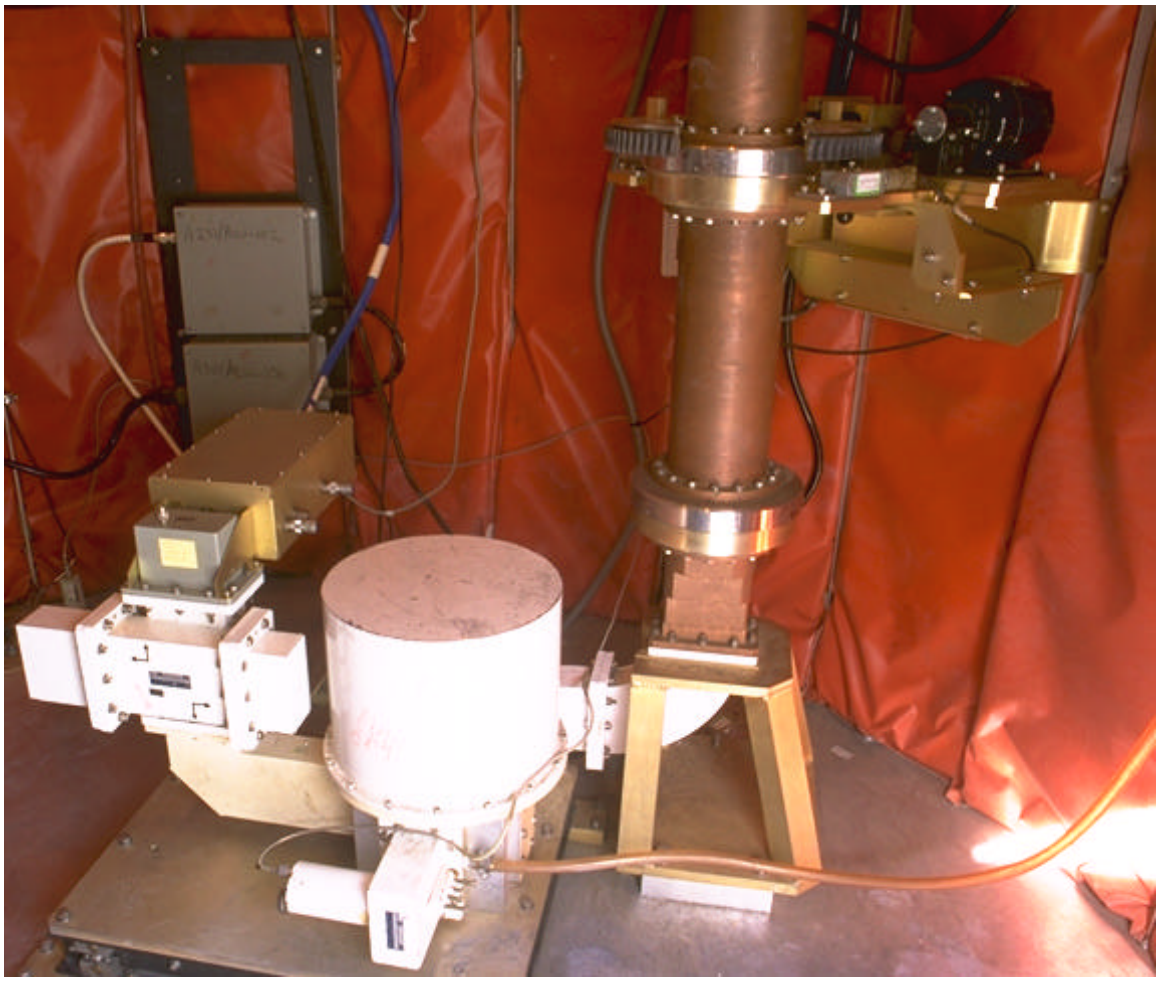
I'm still at the top of the cone examining the dichroic, but the camera is shooting from a different angle so you can see the secondary reflector, or subreflector, at the top of the picture. Remember, that's the one I'm not climbing!

In the center of the picture is the top of the X-band feed horn. To the right, is the S-band feed horn. The "J" shaped hose coming out of the cone and running to the top of the feed is the X-band rain blower hose.

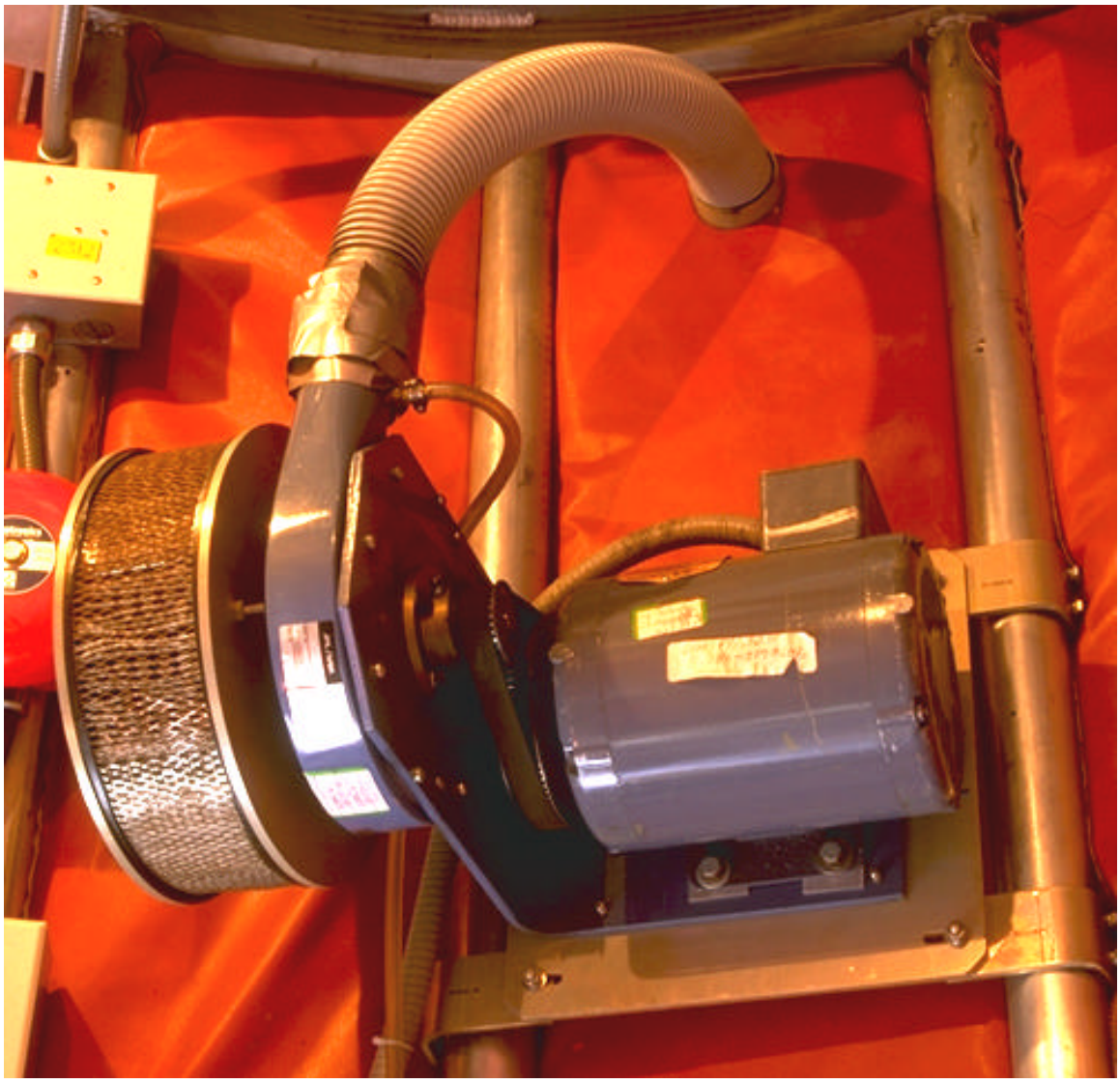
Peek-a-boo! I'm actually inside the cone by way of the cone access door. Can you find another door in the background? That's the dish service hoist access door.



What we're looking at now is the S-band feed inside of the cone. With all this talk about cones and feed, I sure am getting hungry! Did anyone bring lunch?



The white drum-shaped object is the S-band waveguide switch. The S-band polarizer assembly is in the upper right of the picture and the S-band ambient load is the white rectangle to the left of the waveguide switch. (Drums, bands, do you hear music?)



Who can tell me what this is? Well, it's the X-band rain blower and hose inside of the cone, of course. Actually, a rain blower sounds pretty good right now, considering it is about 110 degrees up here today.

The upper part of the picture is the X-band feed horn. Below is the X-band polarizer. Interesting, huh?

Here is a complete view of the antenna as seen from a Hi-Ranger(Remember the Tonka truck?) The surveillance TV and meteorology station mast is in the foreground. The car under the antenna is an intermediate-sized Mercury Sable. Do you see me standing at the car door. Look at the dish--you can see through it! And I was up there! It was really fun!

I hope you enjoyed this tour as much as I did! Thank you so much for coming along with me on this tour! I recommend that you also visit the AVSTC web site to download the "GAVRT System Theory of Operation" learning module to learn how the whole system works together to deliver observational radio astronomy data to system users. Bye for now! I think it's time for lunch, and definitely a cool drink!

Thanks again for coming along.

Brooke Ardenski

LIST OF FIGURES

FEEDBACK ABOUT THIS MODULE

As new capabilities are added to the GAVRT system and feedback is received from users of this module, this module will updated and/or upgraded as appropriate. Sustaining and improving the quality of this module in response to feedback from actual users of this module is an important goal of the GAVRT project. Please forward your comments about this module to:

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Thank you for participating in this learning experience.

GRS