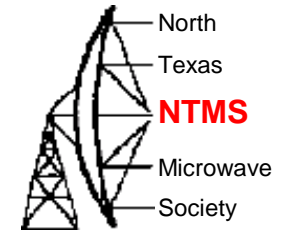


W5HN



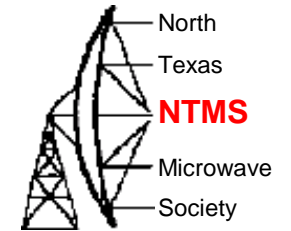
Building Equipment and Operating on 10 GHz

Bob Gormley WA5YWC

and

Al Webb W5RLG

A Little History



Dishing Out the Milliwatts on 10 KMc.

Equipment Used in the First 3-Cm. Amateur Work

BY JAMES A. MCGREGOR,* W6RM, EX-W1LKV/2

Since the lifting of security regulations on most radar systems and devices, many interesting and revealing articles have been published concerning this new art. The radio amateur has been given due credit for his part in the development of this great weapon, and in addition has received official recognition of potential future contributions by the assignment of several microwave bands for amateur work. Articles have already been published describing the accomplishments of amateurs in using the newly-allocated bands at 13, 2.5 and 1.4 centimeters.

The remaining microwave band, that at 3 centimeters, provides a band of frequencies from 10,000 to 10,600 megacycles, where components such as wave-guides and reflectors are moderately sized, and where at least one tube is available which requires only a very modest power supply and associated equipment for communication use.

The author, in cooperation with C. K. Alwater, W4JN, set up and operated, on May 5, 1948, the

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† 141 N. Pelham Ave., Upper Merionide, N. J.

• We are prone to think of microwave work as a field for scientists working in laboratories equipped with vast quantities of costly apparatus. The equipment developed during the war was in this category; it is true, but here is proof that anyone who is willing to dig around in the surplus markets and exercise a bit of that well-known know-how can come up with workable gear for exploration of the amateur band at 3 centimeters.

equipment described herein, comprising what is believed to be the first contact made by amateurs on 3 centimeters. The operating frequency was about 10,300 Mc., and the distance was 2 miles. The author operated W1LKV/2 from his home location, and W4JN was operated portable from an opposite hill, with the aid of a gasoline-driven generator. Since a minimum of equipment is required for operation at these frequencies, others are encouraged to experiment with similar methods. Results of the May tests indicated that,

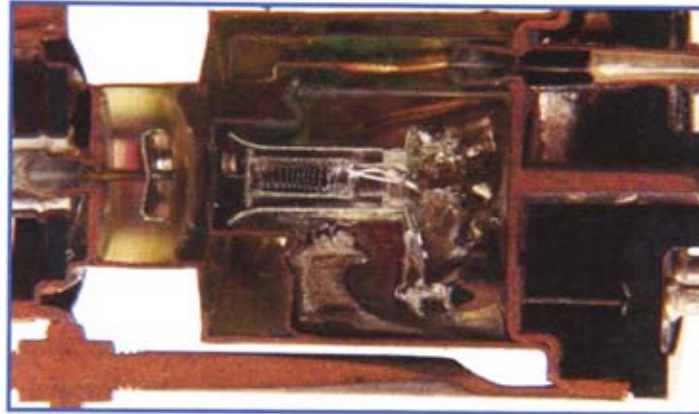
with proper selection of sites, ranges may be extended easily. Experimenters can well afford to be optimistic about possible results as signals over the two-mile path were very strong.

Equipment Details

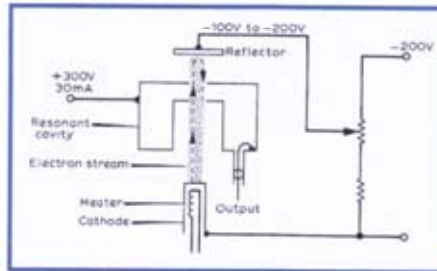
The gear used for the initial contact is shown in the accompanying photographs. A thirty-inch paraboloid may be seen mounted on a tripod. This dish is fed by means of a section of wave-guide, terminating in a dipole and reflector, in the manner commonly used in 3-cm. radar equipment. Details of the antenna assembly are shown in Fig. 1. Immediately behind the dish is the preamplifier unit which feeds the



James A. McGregor, W6RM, and Charles K. Alwater, W4JN, operating the 3-cm. communication equipment. Directly in back of the dish is the transmitter-preamplifier unit. The portable receiver is used as a 20-Mc. LC oscillator and audio system. At the right are the power supply and modulator.



In this close-up sectional view the spiral heater can clearly be seen inside the cathode cylinder. The main emitting surface is the flat circular plate. The cavity contains a hairpin pick-up loop, and this can be seen exiting as the probe. The top-cap leads to a stout rod, and in turn leads to the concave top of the cavity. This is the element that is moved by the adjusting screw.



This diagram shows the components of the klystron in outline view and can be directly related to the physical structures seen above.

The thin metal tube envelope is 25 mm in diameter and, excluding the IO base pins, is 56 mm tall.

This exhibit was last updated on 06 August 2008





Ar² Communications Products

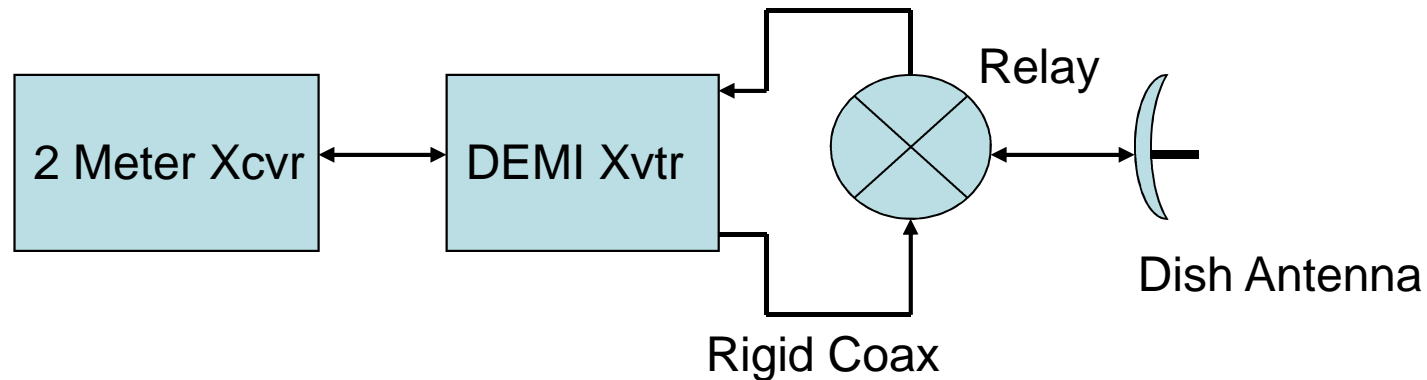
TR10GA & Gunnplexer® T



Features:

- TR10GA covers 10.235 - 10.295 GHz
- TR24GA covers 24.110 - 24.160 GHz
- Internal Gunnplexer® for portability
- Gunnplexer® removable for tower mounting
- Powered by 13 Vdc
- Standard 30 MHz i-f
- Dual polarity afc
- Supplied with frequency/tuning chart

Basic Components



- **Down East Microwave 10 GHz Transverter Kit**
- **2 meter I/F transceiver**
- **Relay and rigid coax**
- **Dish or Horn antenna**

2 Meter Multimode I/F Radio



- FT-817
- FT-857
- IC-202
- FT-290
- IC-251
- TS-700A

- My choice is the ICOM IC-706. Affordable and readily available
- 10 Watts out on 2 meters, adjustable to 0.5 watts out
- Built-in keyer, Accessory jack for transceiver interface

DEMI Transverter Kit

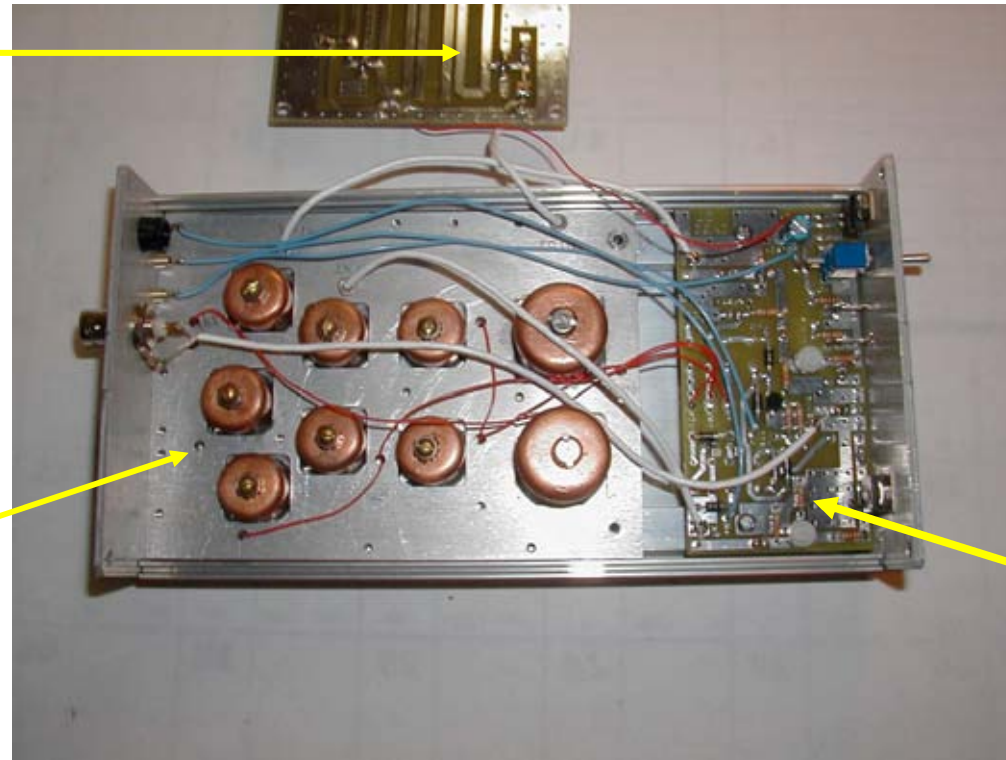
Osc/multiplier



Pipe Cap Filters



DC Control Board



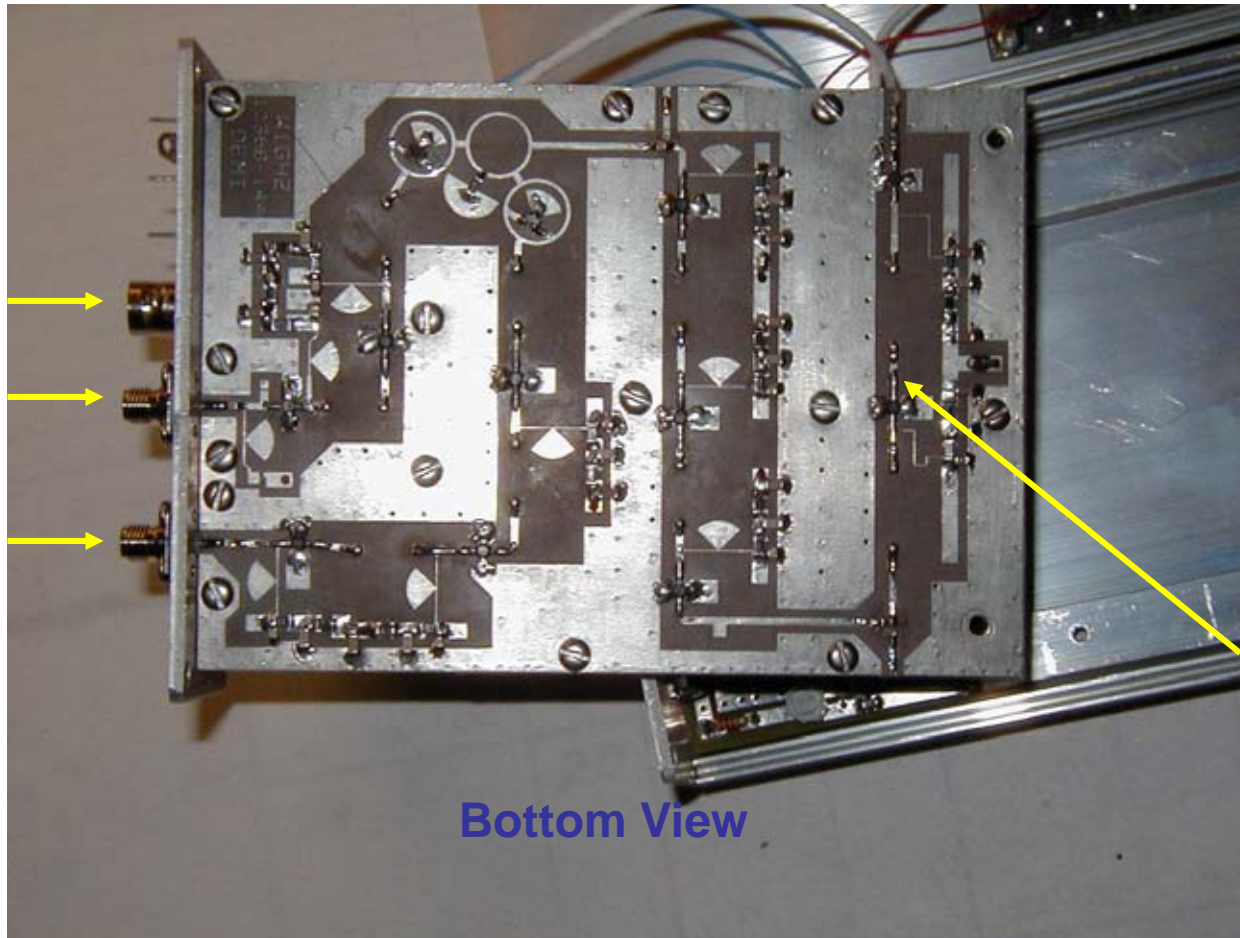
Top View

DEMI Transverter Kit

144 MHz in/out

10 GHz in

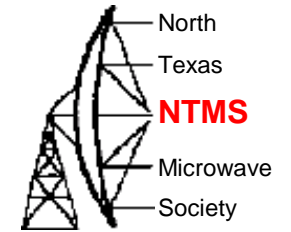
10 GHz out
(10 mW)



Surface mount
construction

Bottom View

Dish Antenna

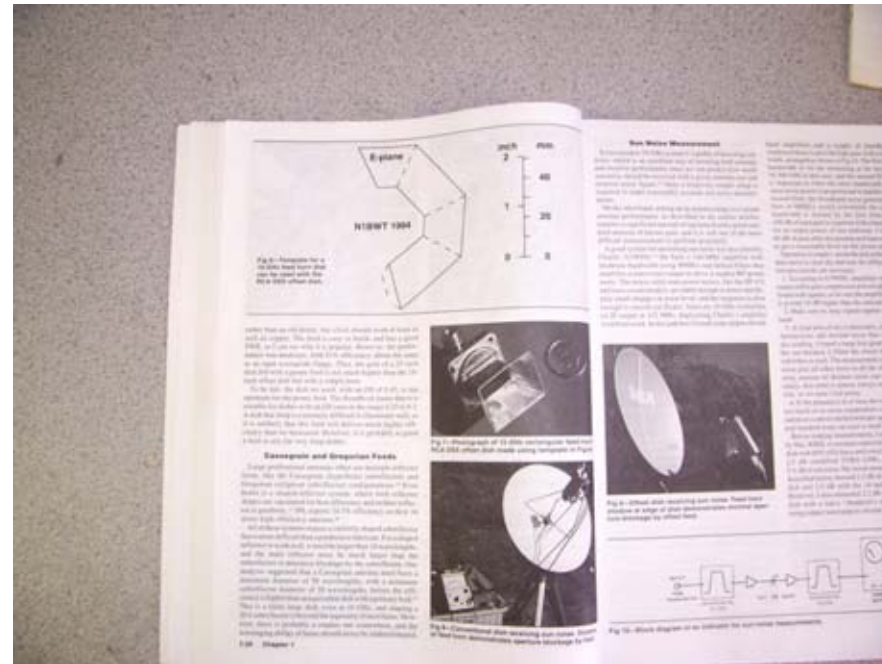
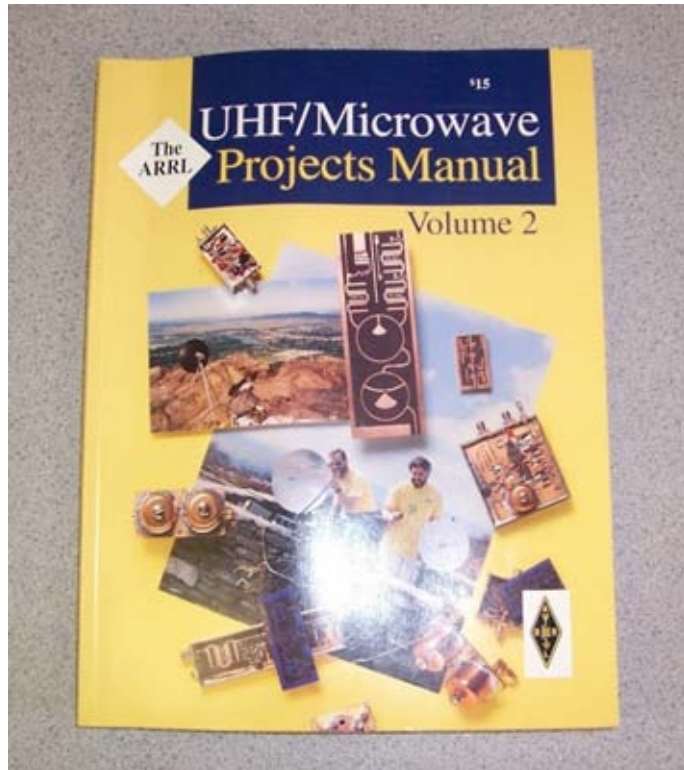
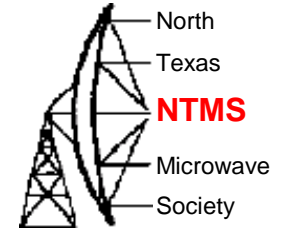


- 18 inch offset dish
- Readily available
- High gain typically 30 dB

Low Noise Block Converter with integral Feedhorn (LNBF)



Designing the New Feed

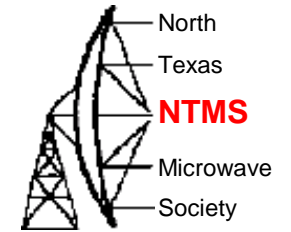


Template for a 10 GHz feed horn for DSS offset dish.

WR90 Waveguide to Coax Transition

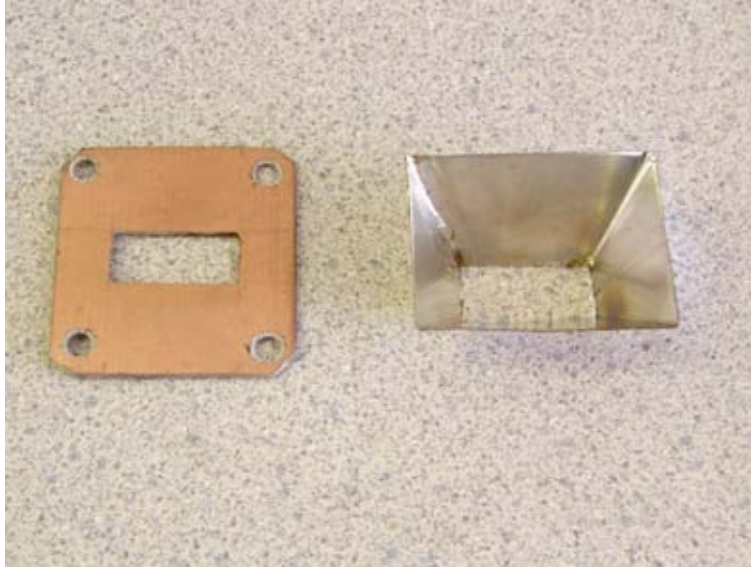


Building the Feed Horn



Shielding from inside of an old computer monitor. Also could use K&S Metals, Altoids tin.

Solder it all together



New Horn and Waveguide Transition



Setting Correct Angle

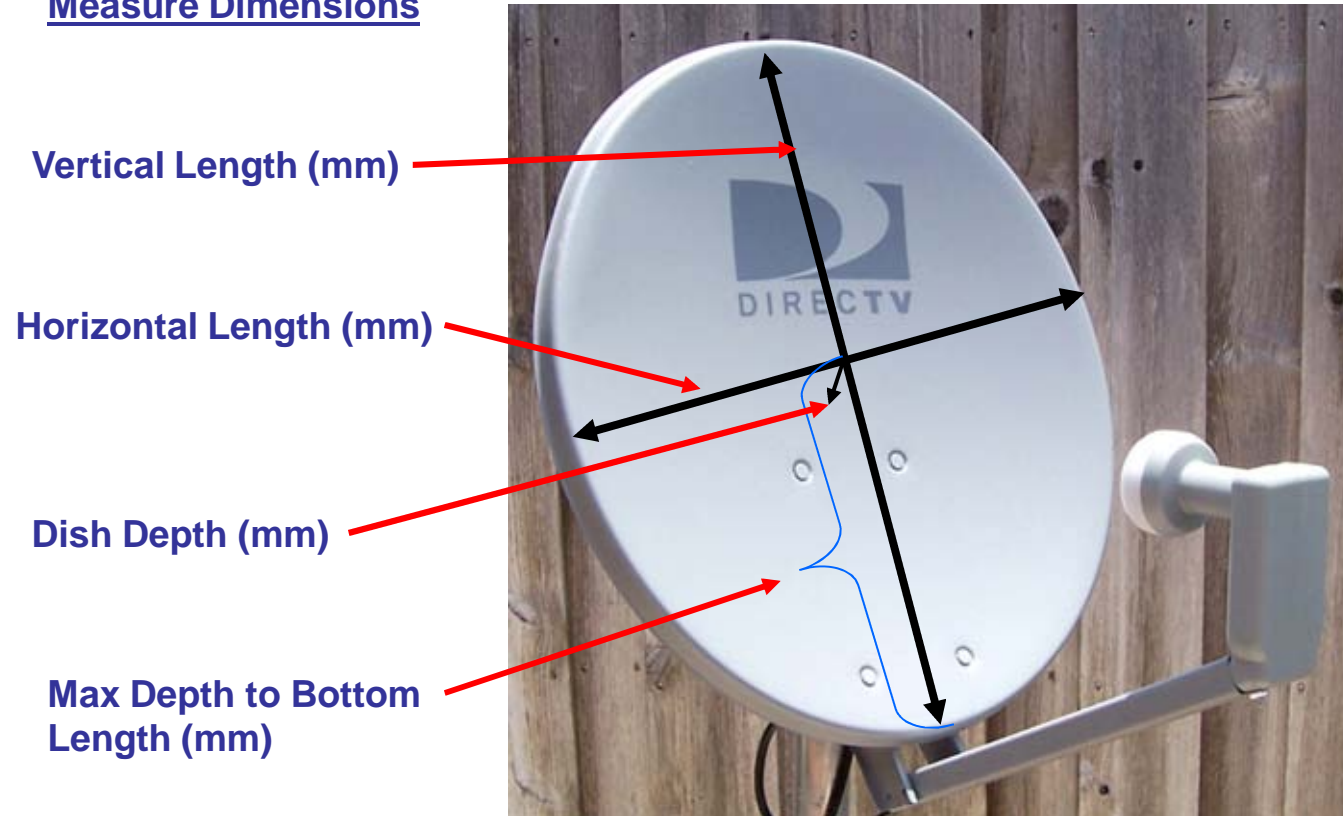


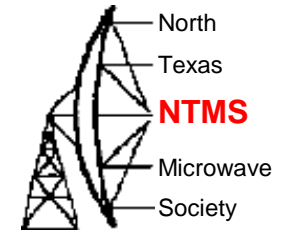
Adjustability



Finding the Focal Point

Measure Dimensions





W1GHZ Online Microwave Antenna Book

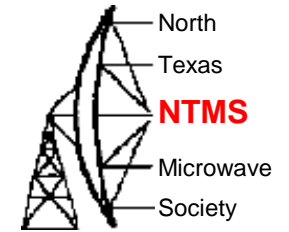
<http://www.w1ghz.org/antbook/contents.htm>

Software Page:

Run HDL_ANT.exe

Select “Offset Dish Calculations”

Enter measured dish dimension data



Enter Dimensions

Frequency in MHz: 10368.1

Diameter of Large axis of dish in mm: 490

Diameter of small axis of dish in mm: 452

Depth of dish at deepest point in mm: 45

Distance from deepest point to bottom edge along large axis in mm: 218

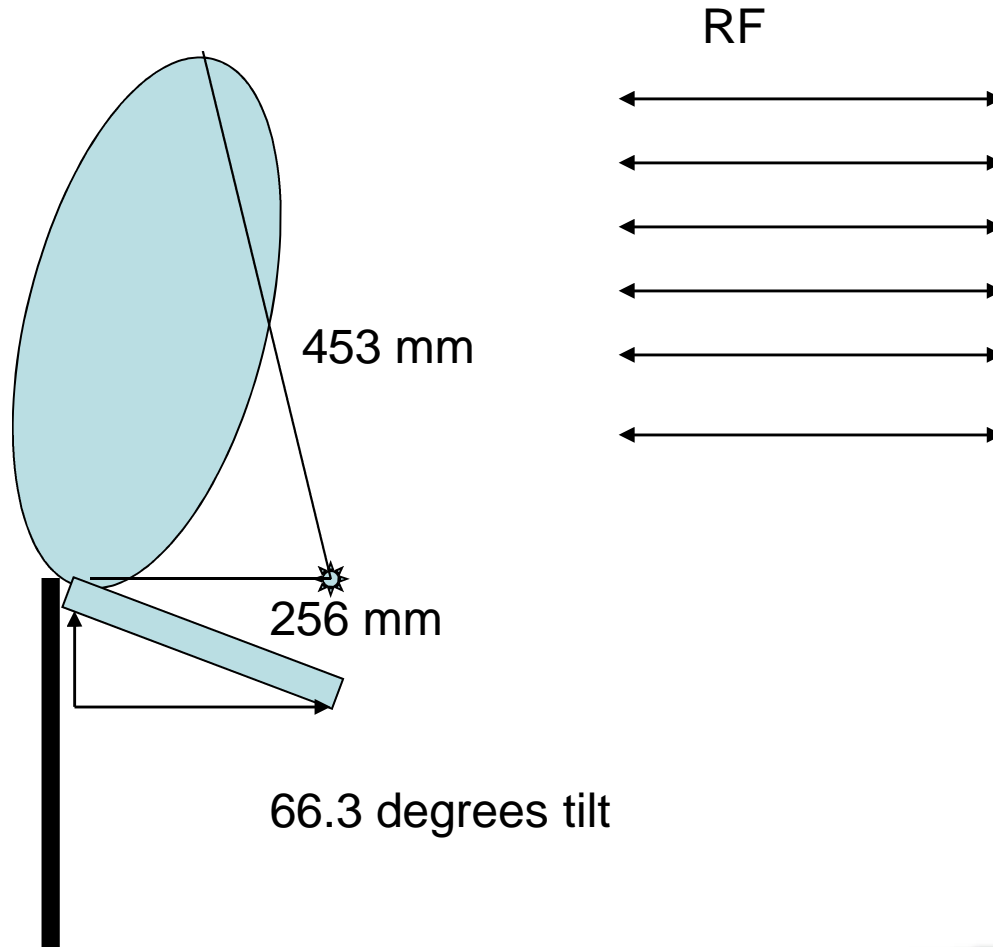
Results

Focal length = 256 mm

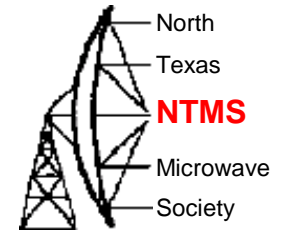
The focal point of the dish is 255.98 mm from the bottom edge of the reflector and 452.68 mm from the top edge of the reflector.

The large axis is tilted forward 66.3 degrees above the horizontal.

String and knot method to find phase center



October 2007

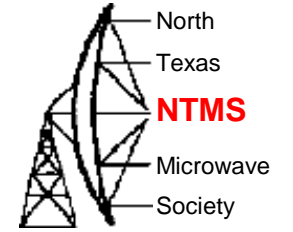


May 2011

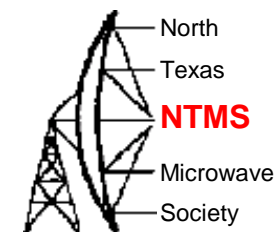


Douglass, KA2UPW Sun Umbrella Antenna

W5RLG 10 GHz Rig

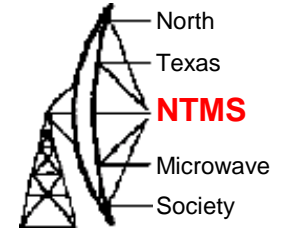


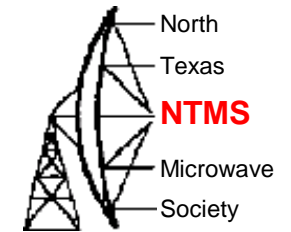
W5RLG at Pikes Peak, CO



2010 ARRL 10 GHz and Above Contest

I-20 near Ranger, TX looking east (EM02ni)
Contact with W5LUA at 227 km (141 miles) on SSB 59+





Conclusion

- Building a 10 GHz station is not difficult
- Parts are readily available online or at hamfests.
- 10 GHz is one of the fastest growing microwave bands.
- North Texas Microwave Society offers support and welcomes newcomers to the microwave amateur community.