

Dated: Nov. 1986  
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## **TECHNICAL NOTES FOR EME COMMUNICATION**

These notes were written as a technical aid to radio amateurs involved in EME communication at the UHF and SHF amateur bands. The purpose is to provide information for the understanding, measurement, and construction techniques of EME radio systems in that portion of the spectrum. These notes are not intended to be a primer or text book of EME communication but rather a set of stand-alone advanced reports on specific topics.

The ultimate objective is to provide information leading to a most efficient EME radio system for reliable communication without the use of expensive test equipment. We are fortunate in these times that solid state technology has developed very low noise devices required for reception, and that the space communications industry has honed antenna technology and related techniques which are applicable to EME communication.

Although many of the reports were written in the mid-1960s, much of the information is still applicable today.

The original set of technical notes was prepared while the author was a member of the Crawford Hill VHF Club, WONFA, associated with the Bell Telephone Laboratories at Holmdel, New Jersey, U. S. A.

This particular set of dated notes has been partially revised, updated and supplemented from the original set, which received wide distribution over the years.

The ordering of the subjects remains as in the original notes and represents only the chronological order in which they were written. The table of contents should be consulted to determine both the subject material and an indication of its applicability at this time.

I reserve the right to make corrections, revisions and additions to these notes in future issues. Each set of notes will be dated as of the last revision issue.

Address all correspondence regarding these notes to:

**Dick Turrin W2IMU**  
**P. O. Box 65**  
**Colts Neck,**  
**New Jersey 07722**  
**U. S. A.**

## **TABILE OF CONTENTS**

### **Technical Reports from *The Crawford Hill VHF Club***

September 1986 Issue

#### **1/ Circular Polarization For *EME Communications***

Reasons for using circular polarization for all EME communications. Valid and current good practice.

#### **2/ Quadrature Hybrids**

*Useful* for those who like to construct their *own circuits*. A few designs of 90 degree hybrids useful for circular polarization implementation.

#### **3/ System Consideration for EME Path**

Must reading for all EME enthusiasts. Details how to evaluate system performance. Never obsolete.

#### **4/ A Horn Antenna for EME Communications.**

A tutorial report on simple: large horn design and construction indicating how large a horn is required. Also includes a table of practical Standard Bain Horn dimensions.

#### **5/ A Paraboloidal Reflector Antenna for 1796 mc/s.**

A very useful report on a practical EME antenna of specific design, standard front feed with circularly symmetric reflector. Revised with more information than original.

#### **6/ A Water Cooled Power Amplifier for 1296 mc/s**

A good design using two 2C39/7289 type tube. Pitfalls of water cooling are discussed and biasing methods have been updated from the original design.

#### **7/ Power Measurements at 1296 mc/s**

A useful report for those who must rely on their own ingenuity to make power *measurements* without the aid of calibrated instruments. Thermal methods are used calibrated by d-c measurements.

#### **8/ A Low Noise Preamplifier for 1296 mc/s.**

A good design but uses obsolete devices. Much better transistors are currently available and many good circuits have appeared in the current literature. Obsolete report.

#### **9/ A Circularly Polarized Feed Antenna for 1296 mc/s.**

A phase shifter method of converting to circular polarization in circular waveguide without the use of a quadrature hybrid. The complete design is for a dual-mode small-aperture feed directly

#### **10/ VHF Power Dividers.**

Simple fourway power dividers for 432 and 1296 mc/s originated by W2CCY and W2COH. See also Report # 19.

#### **11/ Use of Solar Noise In EME System Evaluation**

Very useful information for measuring system performance without calibrated

laboratory test equipment. Required reading along with Report #3.

**12/ Slum Tuner for 129A mc/s.**

A necessary device to go with the UPX-4 modification described in Report # 13. Describes a good low loss/noise general purpose r-f matching device which may be scaled to other frequencies.

**13/ A Kilowatt Amplifier For 1296Mhz**

This World War II salvaged UPX-4 pulse amplifier design has been modified for CW service and until recently, duplicated and distributed by 0Z9CR. New construction suggestions are given.

**14/ A High Power Directional Coupler and Power Monitor.**

A simple design for 1296 mc/s which can be used with the kilowatt amplifier in Report M 13 and also for SWR test measurements.

**15/ Spin Casting a Paraboloidal Reflector**

This Report describes • novel fabrication method for relatively small but highly accurate paraboloidal reflectors. Primarily for microwave frequencies but useful into the optical spectrum.

**16/ Libration Fading on the EME Path.**

A description of libration fading and its effects on EME signals is discussed and illustrated with graphic measured data. Necessary reading for the EME enthusiast.

**17/ A Low Noise Converter for 1296 mc/s.**

A remarkably good converter (mixer) design by W2COH is described and analysed. Using interdigital circuitry, this design is still current.

**18/ Off-Set Fed Parabolir Reflector Antenna for 179h mc/s.**

An improved high efficiency reflector antenna system is described which should be considered for all new EME antenna construction. Supersedes Report It 5 in reflector design but still uses the dual-mode feed horn. Very current.

**19/ A Six-Port Ouadrature Power Divider/Combiner.**

A simple design for obtaining 4 output ports with sequential quadrature phase and equal amplitude is described. This design is useful for circular polarization implementation of the the NBS feed at any frequency. Current and useful.

**20/ Methods for Estimating Receiver Noise Temperature**

Methods are discussed to determine the receiver noise temperature which do not involve laboratory calibrated instruments. Useful at 1296 mc/s and higher frequency bands where Universe background noise temperatures are low.