

14.6 EXPERIMENTAL MICROWAVE RESEARCH SECTION14.6/2. Cosmic Noise Directivity

Fairly good surveys of the sky are available at frequencies of 64, 160 and 480 Mc/s. The present state of the electronic art does not indicate that surveys at higher frequencies will be practicable in the near future. Consultation with theoreticians indicate wide discrepancies between the theoretical intensity of galactic radiation below 40 Mc/s and the few measurements now available in this region. In view of the above it appears that a substantial effort should be made to get detailed information upon intensity versus direction at low frequencies.

Since mechanically movable collectors will be of extreme size it was decided to use a steerable array. The design of this collector for a frequency of 10 Mc/s is now in progress. Initial plans call for 8 colinear dipoles spaced $\frac{1}{2}$ wavelength above ground in an east-west direction. This will give a collector 4 wavelengths wide with a resolving power of approximately 15 degrees in right ascension. Sixteen parallel lines of these dipoles will be spaced $\frac{1}{2}$ wavelength apart in the north-south direction. This will give a collector 8 wavelengths long, producing a resolving power of approximately 8 degrees in declination. All dipoles in each line will remain in phase at all times; however, steering will be done by progressively increasing and retarding the phase between successive lines. Thus the main lobe of the acceptance pattern may be swung plus or minus 60 degrees from the zenith along the north-south meridian. A suitable place for this large array of approximately 400 feet by 800 feet is now being secured at the Sterling Laboratory.

14.6/4. Rehabilitation of Wurzburg Equipment

The top bearing cap for the third Wurzburg was found to be missing. A new cap is in the process of being made and when finished this machine will be erected. A fourth Wurzburg mirror made of aluminum was secured some time ago. It was found to be of slightly different design than the previous ones, inasmuch as special clamps were incorporated to facilitate the attachment and removal of the side sections to and from the center section. A large underslung trailer was also secured which originally supported a Mannheim radar. In view of the light weight of the large aluminum dish and the availability of this trailer it was decided to strip the trailer and build a light yoke to support the center section of the dish. This work is now in progress and it is expected that a readily transportable dish 25 feet in diameter on an alt-azimuth mounting will result.

14.6/11. UHF Radiometer

The drive and tracking mechanism along the setting circles have been installed upon the second Wurzburg scheduled for 160 Mc/s

14.5/13. Effects of Meteors on Radio Wave Propagation

During this period the meteor-recording transmitter on 27.2 Mc/s was operated almost continuously and the one on 40.98 Mc/s much of the time. In the period December 10-13 during the Geminids shower several types of records were made and coincidences between visually observed and radar-observed meteors were noted. One type of recorder in use was a recording milliammeter on both frequencies; a range-time film recording of an oscilloscope was also used on 27.2 Mc/s. The visual observers were able to record their observations on all recorders by pressing a button which actuated a phantom echo; the circuit also caused a buzzer to sound, informing an operator at the 10-inch oscilloscope to make a complete log record of time, range and intensity of any simultaneously observed echoes. At times as many as 50% of the meteors seen coincided with reflections. A maximum rate of observation of meteors by radar means occurred on the night of Dec. 12-13 and was 650 per hour. On the previous night the rate was only 130 per hour.

Simultaneous records were made on the multifrequency ionosphere recorder and on the meteor equipment. Distinguishing characteristics of meteor echoes in or near the E region which might previously have been associated with sporadic-E were noted.

solar observations. A low-noise preamplifier for the 160 Mc/s receiver was constructed using a cross-neutralized 6J6 tube. Considerable difficulty was encountered in the form of multiple resonance modes within the shield case. In view of this difficulty it was decided to redesign the preamplifier using light house tubes in a Wallman circuit. When this device has been completed it is expected that solar radiation intensity at a frequency of 160 Mc/s will be secured regularly.

Solar radiation intensity at a frequency of 480 Mc/s continues to be observed regularly.

The motors for driving the 32-ft solid dish in azimuth have been installed. Temporary buildings in knock-down condition have been delivered. When these buildings have been erected and electricity made available, it is expected to operate this dish at a frequency of 53 Mc/s.

14.6/8. Electric Hygrometer Research

Studies were continued on the type of electric hygrometer made by stamping a gold-comb shaped figure on polystyrene. This type of unit is cheap and easy to make. Measurements on such a unit held at 32% RH over a period of ten months with a current of 50 μ amperes flowing continuously through it, showed a drift of only 1% in indicated RH over the ten-month period.

Many gold-comb unit shapes and sizes in combination with various acids of phosphor, were tried in an attempt to obtain an improved hygrometer for use in low-level sounding and in the radiosonde. The best element obtained to date has a range of from 5% to 100% RH at 27°C and 15% to 100% at 20°C. The standard radiosonde unit now in use has a range from 17% to 100% RH at 27°C and only 40% to 100% at -20°C. The speed of response of the new unit is somewhat faster than the present element and the polarization error in the radiosonde circuit is negligible. Units have been sealed dry in order to study their behavior when stored for long periods.

Beryllium bromide was tried as the hygroscopic salt in the electric hygrometer active film. A unit made with a 3% solution of this salt in the film was insensitive below 20% RH.

Tests were continued over a period of 2 months on the type of hygrometer in which the movement of a hygroscopic film is a measure of the relative humidity. Over this period the limit of accuracy was about $\pm 12\%$ at a fixed temperature.

In order to study the effect of gases on the electric hygrometer, three special units were made on "Teflon" coil forms. These will be tested in an atmosphere of natural gas.

Twelve radiosonde type gold-comb hygrometer units of the fastest type were made and bottled dry for future tests by the Weather Bureau.

14.6/10. 403-Mc Radiosonde Conversion

One of the engineers from this group supervised the installation of 403-Mc radiosonde equipment at Point Mugu and Monterey, Calif., and at the Naval Air Station in Seattle, Wash. Considerable time was given to repairing and adjusting the RAU recorders at the sounding stations and instructing personnel in the use and maintenance of the new equipment. A check of a previous installation made at San Diego, Calif., revealed a faulty antenna connector, as an intermittent source of trouble. The subject of automatic weather stations was discussed with the engineers of N.E.L. located in San Diego.