The University of Chicago

Yerkes Observatory
WILLIAMS BAY, WIS.

April 29, 1946

MIDWEST GROUP OF ASTRONOMERS

MEETING AT THE DEARBORN OBSERVATORY

Northwestern University
Evanston, Ill.

SATURDAY, MAY 18 at NOON

Dr. Oliver J. Lee has kindly invited us to hold the next meeting at the Dearborn Observatory. There will be a luncheon for which we will assemble at noon at the Observatory. The session for papers will start at about 2 P.M.

The subject of the papers will be new astronomical applications of electronics devices. After lunch, Mr. Grote Reber will describe his work on the detection of short wave radio disturbances from the Milky Way, and the sun. The formal papers so far arranged will include:

Dr. R. J. Cashman, Dept. of Physics, Northwestern University --"Infra-red Techniques"

Dr. G. P. Kuiper, Yerkes Observatory - - - - - - "Infra-red Applications in Astronomy"

Dr. A. E. Whitford, Washburn Observatory - - - - - - - - - - "Photo-Multiplier Tubes"

The Secretary will be glad to hear from anyone who wishes to present papers on allied subjects.

Will you please inform Dr. Lee at once of the number in your party, and make reservations for the luncheon.

Jesse L. Greenstein, Sec'y
Yerkes Observatory
Williams Bay, Wis.

abstract published in Popular Astronomy, June 1946 p 323

Evans Ice Talk History 5-17-46 ①

Radio Engineer not Astronomer,
Amateur Radio, DX + Cards.

"Long Delay Echoes", Pedersen, IRE, Oct 1929, pp 1750-1785

"Atmospherics at High Freq", Jansky, IRE, Dec 1937, pp 1920-32 (also other papers.) (20 mc, 30°x 37° 20 min rotation)

"MUSA", Friis, IRE, July 1937, pp 478 & 488 (Cygnus) 9.5 mc (5°x16°)

Potapenko 1936, 20 mc (Letter from Langer, Cal. Tech)

"Cosmic Static", Reber, IRE Feb 40, ap J. June 40, (early data 1938) 160 mc

"Receiver Sensitivity" K. Franz, Hochfrenztechnik & Elektroakustik, May 1942, Vol 59, pp 143-144, 30 mc
Ha "amplitude of noise ± 1 hr, Antenna Temp 400 x Room Temp max or $1.2 \cdot 10^5$ degrees abs (very doubtful) (17° wide 40° high)

"Cosmic Static", Reber, IRE, Aug 1942, ap. J. Nov. 44, 160 mc (6°x8°)

"Microwaves from the Sun", Southworth, J.F.I., 3000, 10000 ± 2500 mc April 1945

"Bursts of Energy from Sun", Appleton, Nature, Nov. 3, 1945
Sun 10^9 x 6000° abs in region 10-40 mc at times during 1936

"Solar Energy", Hey & Stratton, Nature, Jan 12, 1946, pp 47 & 48.
Temp 10^5 x 6000° abs on Feb 26, 27, 28, 1942 only 60 mc

"Solar Energy", Pawsey, Payne-Scott & Mc Cready, Nature, Feb 9th, 1946, pp 158 & 159. Noise at 200 mc, 2×10^3 x 6000° abs max on Oct 4th 1945. Correlation good from Oct 2-25th with sunspot areas. On Oct 4th the nothing found at 600 mc so temp less than 50,000°. at 1200 mc temp 6000° abs.

"Cosmic Noise", Hey, Phillips & Parsons, Nature, March 9th 1946,
Max 3.16×10^{-22} watt/sq cm, cir deg, mc bd. = 28% my figure from Sagittarius & 56% from Cygnus at 64 mc

"Project Diana", Webb, Sky & Telescope, April 1946, pp 3-6. 111 mc
No Cosmic Static, At times solar noise 15-20 DB (30-40 times) 300° abs.

(9)

Show and Pass Around.

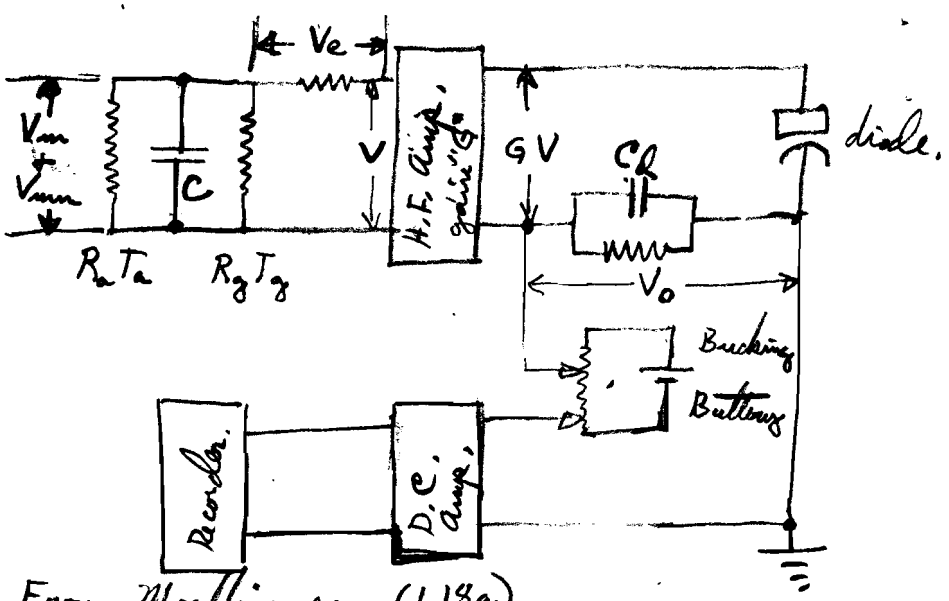
1. 1942 IRE article. (correct g)
2. 1944 Ap. J. article,
3. Plot of intensity vs galactic longitude,
4. Photos of receiver

A Discuss Hey Phillips & Parsons

B. Discuss Pawsey et al + implications.

C. Discuss I as a function of freq.

1. f^2 (Rayleigh-Jeans)
2. f^0 (random voltage) $\frac{V^2}{R} = 4KT\Delta f$ Woodlin pp 66+67
3. f^{-1} (1940 IRE) probably wrong, see Keenan & Henyey June 40 Ap. J.
4. f^{-2} by C. H. Townes Phys. Rev?



From Woodbric eqn (1.18a)

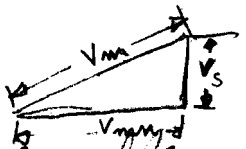
$$V_m^2 = 4 R_g k T_g f_w \left(\frac{R_a}{R_a + R_g}\right)^2 \left(1 + \frac{T_a R_g}{T_g R_a}\right) \quad (1)$$

V_e is function of tube + operating condition (cont.)

when $T_a = 0$ (toward galactic pole)

$$V_{mn}^2 = 4 R_g k T_g f_w \left(\frac{R_a}{R_a + R_g}\right)^2 \quad (2)$$

Signal voltage $V_s^2 = V_m^2 - V_{mn}^2 =$



$$V_s^2 = 4 R_a k T_a f_w \left(\frac{R_g}{R_a + R_g}\right)^2 \quad (3)$$

after going three amplifier and rectifier

$$V_{os} = G S V_s \quad \text{where } S \text{ closely equals } 1 \quad (4)$$

Ripple voltage across C_2

$$V_n = G\left(\frac{S_g}{2C_2}\right)^{1/2} V^{1/2} \quad (5)$$

where q = electron charge

Signal to ripple ratio

$$\frac{V_{os}}{V_n} = \left(\frac{2SC_2}{q}\right)^{1/2} \frac{V_s}{V^{1/2}} \quad (6)$$

Improved by reducing V (mostly V_c); also making output full wave takes the numeral 2 from inside to outside parentheses; also by $(1/c)^{1/4}$ which is insignificant.

Now define

$$\delta = \frac{V_s}{V_{mm}} = \frac{V_m - V_{mm}}{V_{mm}} \quad \text{or } V_m = (1+\delta)V_{mm} \quad (7)$$
$$\text{or } V_m^2 = (1+2\delta)V_{mm}^2$$

from ohms law

$$R = \frac{R_a R_g}{R_a + R_g} \quad (8)$$

The energy gain of input system will be

$$U = \frac{V_m^2}{R} - \frac{V_{mm}^2}{R} = \frac{2\delta V_{mm}^2}{R} = \frac{8\delta kT_g f_w R_a}{R_a + R_g} \quad (9)$$

Likewise; squaring (7), inserting values from (3) + (2) and solving for T_a

$$T_a = \delta^2 \frac{T_g R_a}{R_g} \quad (10)$$

δ varies from a few tenths to perhaps .01

The University of Chicago
CHICAGO 37, ILLINOIS

Yerkes Observatory
WILLIAMS BAY, WIS.

April 23, 1946

Mr. Grote Reber

Wheaton, Ill.

Dear Mr. Reber:

We haven't seen you for some time at Yerkes, and many of us are becoming interested in various electronics devices in astrophysics. We have an organization (of which I'm secretary) called the Midwest Group of Astronomers, and now plan a meeting at the Dearborn Observatory, Northwestern University, Evanston. The date is May 25, Saturday afternoon. There will be a lunch (around noon) and a session for papers about 2-4:30 P.M. The general subject is electronics in astronomy, and I wondered if you could possibly come to the meeting and give a talk. There are two possibilities: an after-lunch, informal talk, or a regular paper in the afternoon. Time about 20 minutes or so.

I think there would be considerable interest in having you at the meeting. You may have seen some recent work (just de-classified) by English radar observers who confirm beautifully your measures of "cosmic-noise". (Hey, Phillips and Parsons in "Nature".) Henyey, Keenan and I just wrote a letter to "Nature" about these observations and about other points in connection with the origin of the signals. If you can give us a talk, we will perhaps arrange to have another speaker on the subject.

Please let me hear from you as soon as possible as to whether you can come. With best regards,

Sincerely,

Jesse L. Greenstein

JLG:mp