COMMONWEALTH OF AUSTRALIA

IONOSPHERIC PREDICTION SERVICE

of the

COMMONWEALTH OBSERVATORY

DEPARTMENT OF THE INTERIOR

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Box 801 H,
G.P.O.,
HOBART.

6th July, 1954.

Dr. G. Reber,
Wailuku, Maui
Territory of Hawaii
U.S.A.

Dear Dr. Reber,

I enclose a diagram shewing details of existing aerials at the field station and also typical f^0F_2 figures.

A Berkner dipole is the name given here to a cage aerial of the type shown in the diagram.

To save confusion I think it would be a good idea to refer to the hole below the gyro frequency as the X-hole. The one above the gyro frequency which makes the Z level of reflection accessible from the ground would then be called the Z-hole. It is this latter one which I am spending most time on at present. However, I have looked into the conditions for propagation through the X-hole since last writing to you.

For an X wave to penetrate right through the layer it will have to become longitudinal at the two levels of electron density given by $p_0^2 = p^2$. One will be below the maximum density of the layer and the other above it. The angle of incidence required to pass a ray through the upper hole will not in general be that necessary for transmission through the lower one as the value of H and inclination will be different.

At night, with the lower coupling level at about 200 Km. and a low collision frequency, misalignment of the top and bottom holes will be the limiting factor. Assuming a height interval of 400 Km. and a dipole field, there is about 10° difference between the critical angles of incidence for penetration of the upper and lower holes ($y = \sqrt{2}$, zero collision frequency). The difference becomes less as the wave frequency is reduced and the collision frequency increased

The effect of such a misalignment in attenuating the wave cannot be assessed even approximately since there is no magneto-ionic theory capable of dealing with a situation like this.

The whole question can only be settled experimentally.

In the day time the lower hole will be in the vicinity of 90 Km. and the high collision frequency at this level will make the angular side of the hole large ($\sim 10^{0}$). In this case it is easy to find an angle of incidence which will pass a ray through both holes, but doubtful if any source except the sun could be observed because of the high attenuation in the E and D regions.

I will be very pleased to see you in November and will make arrangements for someone to meet you in Sydney if you wish.

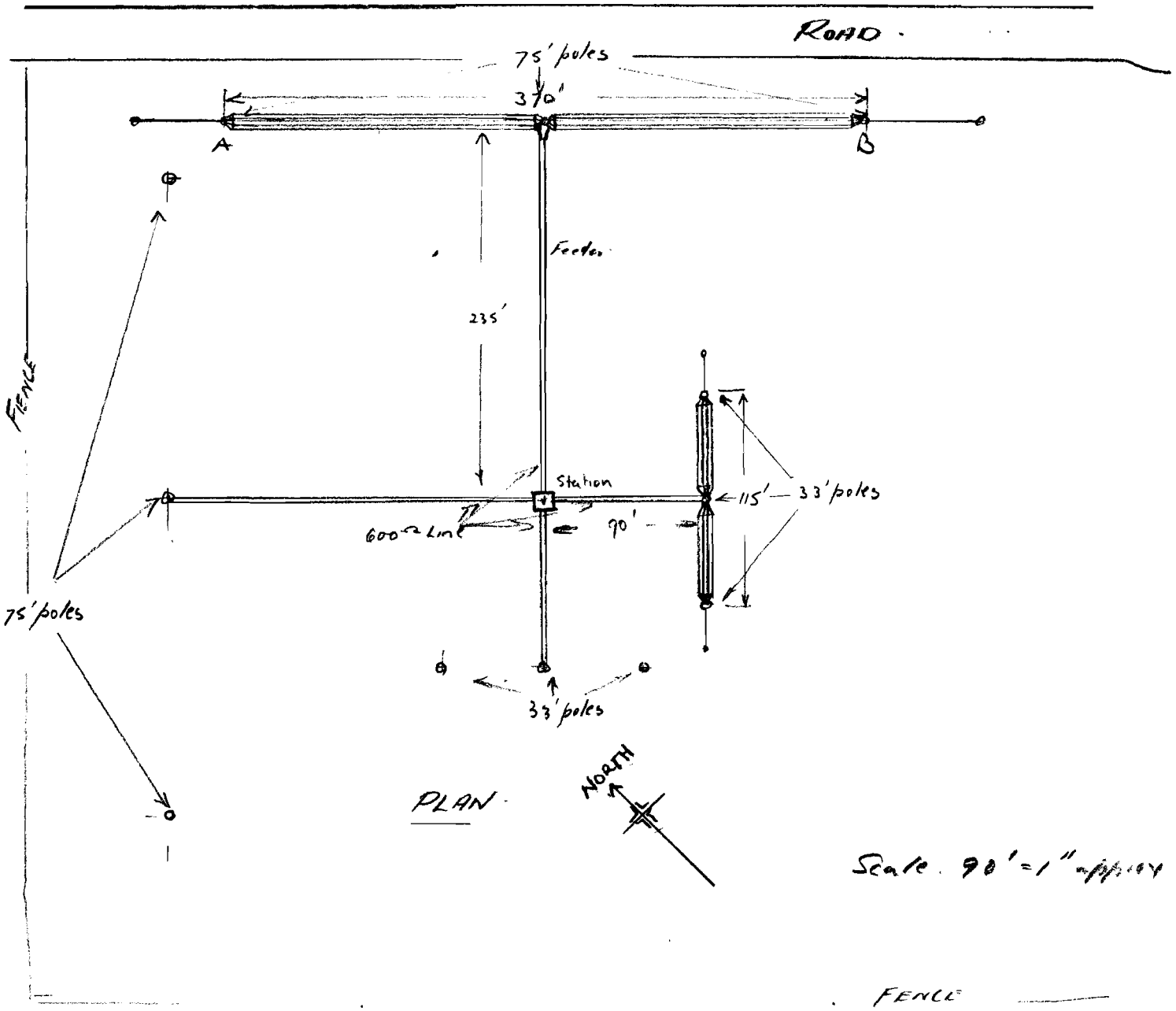
Yours sincerely,

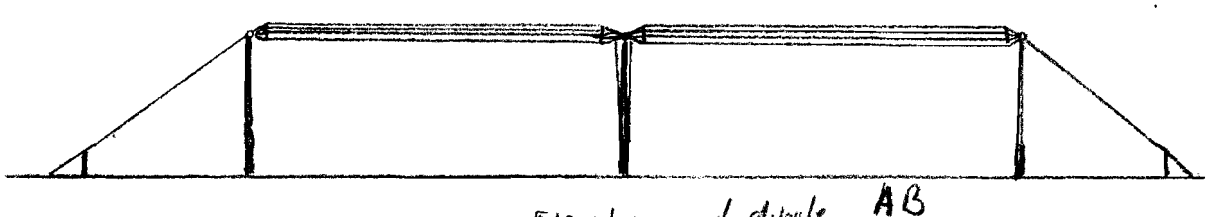
(G. H. Ellis)

$f_0 F_2$.

Hour. Local Time

	DATE	21	22	23	00	01	02	03	04	05	06	07
1953	May 12-13	2·0	1·8	1·9	2·0	2·0	2·0	2·0	1·9	1·7	1·5	1·9
	16-17	2·0	a	a	2·0	2·0	2·0	2·0	1·9	1·8	1·7	1·7
	22-23	3·0	2·4	2·0	2·0	2·0	2·0	1·8	2·0	2·0	2·0	1·7
	23-24	2·0	2·0	2·0	2·0	2·0	1·7	1·6	1·6	1·6	1·7	2·5
	26-27	2·5	2·3	2·3	2·5	2·5	2·5	2·3	2·5	2·5	2·5	3·0
	mean	2.3	2.1	2.1	2.1	2.1	2.0	1.9	2.0	1.9	1.9	2.2
	JUNE 1-2	a	2·1	2·0	a	2·1	2·3	2·1	2·0	e	2·3	2·0
	10-11	2·2	2·0	2·1	2·5	2·6	2·5	2·5	2·5	a	2·1	2·0
	13-14	2·0	2·0	2·0	2·0	a	a	2·1	2·0	a	a	a
	17-18	2·0	2·0	2·1	2·0	2·0	2·5	2·8	3·0	3·1	3·1	3·0
	23-24	c	2·3	2·0	2·0	2·0	2·0	2·0	1·9	2·0	1·9	2·0
	mean	2.1	2.1	2.0	2.1	2.2	2.3	2.3	2.3	2.5	2.4	2.3
1954	May 5-6	2·5	2·4	2·0	2·0	2·0	1·8	2·6	2·4	2·0	1·8	2·5
	16-17	2·1	2·0	2·1	2·0	2·1	2·2	2·1	2·0	2·5	2·5	2·5
	20-21	2·1	2·0	1·9	1·8	1·7	2·0	2·5	2·8	3·0	2·9	2·4
	23-24	2·6	2·5	2·2	2·0	2·0	1·9	1·8	2·0	2·0	1·7	2·1
	25-26	2·0 2.3	2·0 2.2	2·0 2.0	1·9 1.9	1·9 1.9	2·0 2.0	2·4 2.2	2·5 2.3	2·3 2.3	2·2 2.2	2·1 2.3
	June 2-3	2·1	1·9	2·0	2·0	2·0	2·1	2·3	2·1	2·0	1·8	2·0
	4-5	2·1	2·3	2·5	2·5	2·3	2·2	2·0	1·6	1·5	1·5	1·6
	9-10	2·1	2·0	2·0	1·9	1·9	1·7	2·0	2·0	a	2·4	2·0
	15-16	2·0	2·0	2·1	2·2	2·0	2·1	2·7	2·8	2·5	2·1	2·0
	17-18	2·3	2·0	2·0	2·0	1·9	1·6	1·7	1·9	2·2	2·5	2·1
	mean	2.1	2.0	2.1	2.1	2.0	1.9	2.1	2.1	2.1	2.2	1.9
	May & June average											
	1953	2.2	2.1	2.1	2.1	2.2	2.2	2.1	2.4	2.2	2.2	2.3
	1954	2.2	2.1	2.1	2.0	2.0	2.0	2.2	2.2	2.2	2.2	2.1





Elevation of dipole AB