

COMMONWEALTH OF AUSTRALIA
IONOSPHERIC PREDICTION SERVICE

of the

COMMONWEALTH OBSERVATORY

DEPARTMENT OF THE INTERIOR

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Mr. G. Reber,
General Delivery
Wailuku, Maui
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U.S.A.

*Postmarked Hobart
8:30 am 28 March 1954
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Dear Mr. Reber,

Thank you for your letter of the 12th March. Your suggestion is an interesting one. I understand that Bremner is referring to vertical incidence in the equations you mention.

Going by last year's P'f measurements, I expect that the O wave critical frequency of the F layer will frequently fall below one Mc/s at Hobart during the coming Winter. Incoming radiation in the band 0.5 - 1.5 Mc/s should therefore penetrate the layer near vertical incidence without much difficulty.

For strictly longitudinal propagation, vertical magnetic field, vertical incidence, $\omega < \omega_H$, the X mode refractive index will be greater than one at all levels and this mode may penetrate the layer for any value of the maximum electron density. When the magnetic field is not vertical, such penetration may occur if the propagation is oblique with the angle of incidence, such that the X mode arrives at the $\omega = \omega_H$ level in a longitudinal condition, that is:

$$\text{When } \sin \phi_i = \sqrt{\frac{\gamma}{\gamma - 1}} \sin \theta_0$$

$\phi_i = \text{angle of incidence}$
 $\theta_0 = 90^\circ - \text{dip angle}$
 $\gamma = \frac{\omega^2}{\omega_H^2}$

This is analogous to the Z wave penetration of this level, when $\omega > \omega_H$.

An observer would thus see an X mode hole in the layer in the critical direction. The diameter of the hole would probably be only about 1° . I have enclosed a graph giving the direction of this hole measured from the vertical in the plane of the magnetic field for Hobart and Honolulu.

Should you wish to make your measurements here, I would be pleased to assist all I can. I have available a 10 acre site about 11 miles from Hobart. There is a 10' x 10' building with power and telephone, and some aerials, including

a full wave 2.2 Mc/s Berkner dipole. The site is not at present being used and was originally established for the P'f recorder which is now situated nearer Hobart.

Mr. G. Newstead at the University of Tasmania has done some work on galactic radiation in the 90 Mc/s region. He has recently returned from Cambridge, England, and is continuing measurements begun there of ionospheric winds using this radiation.

Yours sincerely,



(G. R. Ellis)