



COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION

DIVISION OF RADIOPHYSICS

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UNIVERSITY GROUNDS,
SYDNEY, N.S.W.

REFER TO

5th April, 1960.

Mr. Grote Reber,
General Delivery,
Wailuka, Maui,
HAWAII.

Dear Grote,

I have had a look at the 19.7 Mc/s records at high latitudes and compared them with mine in the same region. It appears that their sensitivity is too low for any really useful work. The estimated sensitivity ratio of the two instruments on theoretical grounds is nearly 10:1 for point sources and 5:1 for extended structural features. In practice the ratio appears to be higher because of interference and ionospheric troubles at 19.7 Mc/s. One can therefore observe only general trends at this frequency and the resolution of the cross is in effect wasted. You will understand that here I am referring to regions not investigated already by Alex Shain. My own impression is that he has got out about as much as can be got from the instrument. The only possibility of useful results seems to come in the detection of high latitude HII regions. I did not see any in the records I examined; anyway it seems likely that a 2 Mc/s cross will be very much more effective for this sort of thing. For comparisons you would always have our set of 85.5 Mc/s data which at high latitudes gives the distribution of non-thermal radiation unaffected by HII. I conclude therefore that the main purpose to be achieved by the observing programme you were considering would be to familiarise yourself with the operation of a cross.

Incidentally a difficulty associated with a low frequency cross has just come to mind. Unfortunately I had forgotten about it when discussing things with you and Ellis. A cross essentially balances the signal in the pencil beam against wide angle responses of the fan beams; just how this is done depends on the arrangements at the centre of the cross. To obtain absolute temperatures, corrections are needed and these may be obtained in various ways, such as by adding one or both of the array outputs (see our P.I.R.E. paper January 1958 for a brief discussion). Whichever way this is done there will be low-amplitude spurious responses extending over wide angles. If the

transparency of the ionosphere is a function of zenith angle these wide angle responses may cause serious trouble and make it impossible to measure absolute temperatures, in addition to producing a time varying output which may reduce sensitivity. The answer is to make the arms of the cross sufficiently wide to confine these responses to a region over which the ionospheric transparency is constant. This may mean that a simple array is needed, rather than a cross, for the sort of observations you are interested in; I haven't put any actual figures down so I don't know the answer.

If you should decide that, despite these gloomy forebodings, you would like to continue with your plan of observations with the 19.7 Mc/s cross, you may be sure that you would be very welcome here.

With best wishes,

Yours sincerely,



(B. Y. Mills)