

22nd April 1960
General Delivery
Wailuku, Maui
Hawaii

Dear Bernard:

Many thanks for your good and informative letter of the 5th. I agree the difficulties and uncertainties are large. However, if there were no problems the experiment would likely have been done long ago. The view of the larger picture is, during the next few years circumstances will be increasingly auspicious for low frequency observations. I think an attempt should be made to exploit these circumstances as they will not reoccur for a long time.

A simple array would be very nice but the outlay in time, money and effort to secure any reasonable resolving power would be many times that of a cross. During 1955 near Hobart, I used an antenna consisting of two half waves in phase, one seventh wave above ground at a frequency of 2130kc. When f_oF_2 dropped below 1700kc the ionospheric hole overhead was so large that it completely covered the acceptance pattern of the antenna. Further decrease in f_oF_2 did not cause any further increase in output. Apparently, if the proposed 2mc array is composed of full wave elements on north south leg and two lines of elements on east-west leg (very similar to your 85.5mc cross), then the cross should be useful near the zenith at $f_oF_2 < 1700kc$ and probably to 45° from zenith at $f_oF_2 < 1200kc$. Actually f_oF_2 dropped below 1000kc for several hours on many nights during winters of 1954 & 5.

Now suppose we have a condition where the pencil beam passes over an absorption region (low temperature) and f_oF_2 gradually rises from 1700kc to 1900kc. The hole will close a bit and reference background will decrease a bit. The difference in switched outputs will decrease and the output curve will be distorted in slope. The true situation can be found by making several runs over the particular place. When f_oF_2 approaches 2130kc, the ionospheric hole overhead may be same size as pencil beam. In this case the switched output will be zero. Perhaps quite a lot of interesting ionospheric information might be obtained as a byproduct of the experiment.

I have worked out a design using 34 parallel full wave elements spaced a half wave apart in N-S arm. The E-W arm uses two parallel lines spaced a half wave apart, each of 16 full wave colinear elements. A gap of two full wave elements exists in each E-W line where it crosses the N-S arm. This gives about a five degree beam with 6 DB taper of illumination. The whole affair is to be supported on 106 poles each 70 feet high. The feed lines are to be open wire overhead, but the details of attaching each antenna have not been worked out. I believe the entire cross could be built for about fifteen thousand pounds.

Before anything as ambitious as the above is undertaken, it would be well for me to spend a few months working with the 19.7mc cross to gain experience and probably new ideas. For this reason I'd like to have it kept intact, operating and unaltered for a while yet. If possible, I'd appreciate having Higging take a lot of observations covering the south galactic pole during June and July when f_oF_2 is lowest. I'm about finished here and will leave for Los Angeles on 11th May. A couple of months at Green Bank should close up my affairs there so that I can return to Australia late in July. Thanks again for your kind offer. I hope to make the most of it by gaining experience with the 19.7mc cross.

Best regards & Aloha,

Grote Grote Reber