The University of Chicago

Yerkes Observatory
WILLIAMS BAY, WIS.

January 22, 1940

Dear Reber:

I suppose you must have concluded that I had lost your paper or thrown it away long ago, but actually I have not been quite so careless as that. Mr. Struve has put it on the list for publication as soon as feasible, but it looks as though it may be as late as the June number, which is unfortunate but can't be helped. The reason that I have been so slow in acknowledging it is that I wanted to tell you the final results that Henyey and I have worked out for our paper to follow yours, and the problem has become more and more involved as we worked on it. After we thought that the thing was satisfactory Henyey decided to try to include also the radiation from interaction of the free electrons with one another. The equations for this process had never been developed explicitly, so he has carried out a solution which indicates that it probably contributes even more to the long-wave radiation than the ordinary free-free transitions. However, his final numerical results have yet to be checked.

Another surprising result appeared when I extended the computations to the visual region. It looks as though these same processes involving the free electrons account for a comsiderable part of the visual light of the Milky Way, which had apparently never occurred to anyone, perhaps because the electron density in space had until recently been considered smaller than at present. All of this is highly interesting and I am certainly glad that you got us interested in the radio measures.

There is only one difficulty now. The intensity measured by Jansky at 14 meters is still higher than the theory by a factor of about 100, and there is no way to remove the discrepancy by increasing the density, for the optical depth is so great at that frequency that it is only the black-body intensity itself that is at fault, and it would require a source with a temperature of 1,000,000 degrees to remove the difficulty.

The computations predict that the intensity should remain almost constant for a long distance on the short-wave side of 2 meters, so that you should get about the same intensity as before when you measure at 720 mgc. Your previous negative results at the higher frequencies are consistent with the theory. Incidentally, since the sun is a black-body source at 6000°, its intensity should be less than your previous maximum by about 0.6 x the ratio

of its area to that of your cone of acceptance, or 0.017. If you could increase the ratio of incoming signal strength to thermal noise by a factor of fifty you should be able to get deflections from the sun, in fact, you may be able to do so anyway by going to higher frequencies.

I hope that things are well with you and that you like the work at Armour. I drove to Chicago once this month and had so much trouble getting out again through a blizzard that I am going to stay home for a while.

Sincerely,

Philip C. Keenan