

THE UNIVERSITY OF CHICAGO

YERKES OBSERVATORY
WILLIAMS BAY, WIS.

July 22, 1950.

Dear Mr. Peber:

Many thanks for your sending me the nice and handy isophotes. They helped me a lot. Unfortunately I had very little time to spend for "radio astronomy", because my solar equipment for measuring the general magnetic field of the sun is just getting ready.

Just a few things I should like to let you know before I leave for the Penzance Atmospheric Meeting (Perhaps you are there):

- 1) Emission of radio waves by cosmic ray electrons can only occur inside the interstellar gas clouds, which have dimensions of the order of 10 light years. Our galaxy contains about 10^8 of them (and 10^{10} stars). These clouds are very probable identical with the clouds absorbing continuous light and blackening parts of the milky way. Therefore the fact, that your isophotes - especially those for the higher frequencies - fit better with the dark regions than with the luminous

is very much in favor to this result.

2) It therefore seems not impossible, to identify the few "radio stars" with clouds nearby, say some 100 light years away. They would then have diameters of the order of 1° . The more distant clouds would then - because of their smaller diameters and also higher number and smaller intensities, form a more general pattern. But this hypothesis needs still just a bit of discussion.

3) According to a discussion I had with a very good expert in turbulence theory, the magnetic field H in the interstellar clouds can not vary more than $\Delta H/H \lesssim 0.1$. Therefore the spectral distribution of the emitted radiations mostly depends on the energy distribution of the electrons and not on the variation of the magnetic field!

By making the most simple assumptions a radio spectrum seems to be very probable of the form $I_\nu \sim \nu^n$, where n is near 1 and negative.

I will try to come to more definite conclusions as soon as possible. You understand that the expected relation between cloud-structure and microwave could be studied experimentally and would be a very exciting job.

With best regards

W. O. Kiepenheuer

P.S. I ~~was~~ also have been computing the free free absorption of this radiation in interstellar space and found it perhaps existing but not important - except for the longest observable wave lengths.