

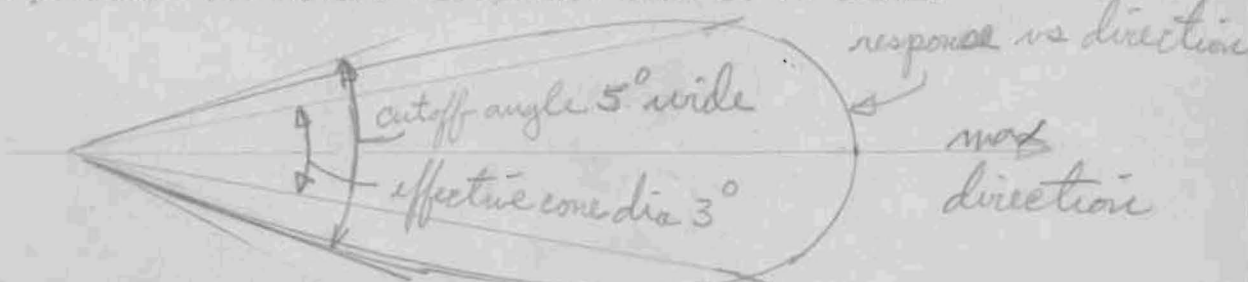
June 16, 1939
313 W. Seminary Ave.
Wheaton, Illinois

Dr. F. L. Whipple
Harvard College Observatory
Cambridge, Mass.

Dear Dr. Whipple:

Shortly after my last letter I accepted a position with Belmont Radio Corp. Consequently there has been little constructional work since then. As explained in my last letter I have increased the receiver sensitivity at 180mc and since then considerable data has been obtained from Dec. -32 $\frac{1}{2}$ to Dec. +54 as around 180ORA.

I am sorry to say the previous information on point sources etc. is incorrect. These spurious results were introduced by difficulties with the equipment and were not caught in time because of insufficient checking and winter weather. The estimated $\frac{1}{2}^{\circ}$ resolving power was also over optimistic, as later quantitative experiments with models proved. The actual acceptance cone is as shown.



Improved equipment produced results more within reason, namely a broad belt of radiation which follows the milky way over the above mentioned range. The width varies somewhat but is about an hour wide and the maximum is always within a few minutes of the accepted plane of the galaxy. The intensity varies in a regular fashion decreasing each way from Dec. -25.

The maximum radiation from this direction is 4.5×10^{-25} watt/sq.cm./cir.deg./kc.band which corresponds to the bolometric intensity of a 22.1 magnitude star. You can appreciate the technical difficulties involved in measuring this small amount of energy. Since the intensity of the radiation varies with galactic longitude I deduced the position of the earth as about $2/3$ the radius of the galaxy from the center.

Going back to the theory in my previous letter eqn (3) points out that I is proportional to distance. Calculation of distance required to produce the above measured intensity gives 12600 parsecs as the radius of the galaxy and the thickness about 3000 parsecs thru the center. Due to interference from auto ignition noise (and it is much worse with new equipment) the only time possible to take readings is in early morning; consequently some time will elapse before data on the rest of way around galaxy can be obtained.

Since work has been abandoned for the time being on equipment to operate at 720mc the only other data amenable to calculation is Jansky's original. Thore analysis taking into consideration the shape of acceptance cone of his antenna and flattened shape of milky way gives a radius of 13100 parsecs and an eccentricity of $3/4$ radius for the earth. This seems to be a good check on the inverse frequency function of ρ' . It is also worthy of note that Plaskett in recent paper in Popular Astronomy deduces a radius of 15000 parsecs for milky way so these figures are in fair agreement.

A number of runs were taken on bright stars such as Vega, Antares etc. to see if any point sources might exist but all showed nothing. Several tries were had at Mars but also to no avail. As soon as the andromeda nebula is in a good position every effort will be made to check it thoroly. Some fine structure to the radiation pattern seems to exist but the present equipment is not good enough to accurately resolve it.

In regard to your work I suggest choosing as low a frequency as possible due to the apparent inverse frequency-intensity relation. A very convenient reference level for calibration purposes is the thermal noise of electricity in receiver 8×10^{-18} watt per kc band. Pick a wide band amplifier with as much gain as possible and use a linear detector. A quiet location is of great importance. I wish you luck and if I can be of any assistance please write.

I consider the free-free transition theory the weakest link in the whole chain. While my derivation seems to explain the phenomena it is not very satisfying and the references are rather old. I would appreciate you finding out what the physicists have deduced and passing on their results to me. Any information will be held confidential if you request it.

Best regards,

Grote Reber