August 21st, 1948
213 W. Seminary Ave.
Wheaton, Illinois

Dr. Chas. H. Townes
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Murray Hill, New Jersey

Dear Dr. Townes:

Thanks for your letter of the 18th, and enclosure. I have no criticism to make of what you say as it sounds good to me.

In regard to my figures on beam width; I might say it is an unresolved headache. Yes, it is quite true that diffraction theory indicates a beam width of 11.5° at the half power points at 160mc for my mirror. If this figure be used and reference is made to figure 4 of my last Ap. J. article it will be found that the true width of the milkyway in Sagittarius is only a couple of degrees. This might be so; however inspection of the curves at high declination gives only 10 or 11 degrees at two to one down. Thus the width of the milkyway is more or less up in the region of Cassiopeia.

The same difficulty has been run into at 480mc where more precise measures of the suns width are possible. This I mentioned in my last letter. Obviously something is the matter. If the acceptance cone of the antenna isn't reduced a bit, to my estimated values; then there must be some nonlinear phenomenon in my apparatus which hasn't been accounted for yet.

Off hand it seems to me immaterial whether the apparent resolving power is secured in the mirror or by other means as long as the discrimination is secured. Incidentally, these values of 6° x 6° were obtained by scaled down models at 5100mc and it is quite possible the same difficulty has followed thru all my experiments. It is a kind of systematic error which only is serious when an absolute calibration is attempted. Minor lobes are below detection in both the model experiments and solar work at 480mc which would be best places to observe this kind of trouble. To get a true figure for the beam width, experiments must be made with balloons or kites. Such is not feasible at this location.

I wouldn't want to argue strongly for my 6° x 6°. Perhaps it would be a good idea to put in a statement that if my resolving power is reduced to the theoretical cone 11.5° diameter the computed temperature will be (6x6/11.5x11.5)5100 = 1950° which is much closer to the theoretical 1370°..

Very truly yours,

Grote Reber