

February 17, 1945
212 W. Seminary Ave.
Wheaton, Illinois

Mr. G. C. Southworth
Bell Telephone Laboratories
Box 107, Red Bank, New Jersey

Ref: 1630-GCS-MGM

Dear Mr. Southworth:

Thank you for your letter of the 9th and manuscript attached. In my opinion you have worked up a fine paper and the data and presentation are excellent. Your results in the centimeter region on solar radiation are very important to both radio engineers and astronomers. I have read it several times and list below five minor points for your consideration. Since the manuscript is in mimeograph and blue print form I presume it will be satisfactory for me to keep it. If not, please let me know.

1. My value of 10×10^{-22} watt/sq.cm., MC.Bd at 160MC (187cm) falls very close to calculated curve of radiation from the sun and this point might be included as a matter of interest in figure 2.

2. The next to last sentence of the introduction states that more energy is absorbed than radiated when apparatus is pointed at sun. While I don't know the details of your equipment, I have a hunch that even when pointed at the sun the receiver is losing energy but at a slower rate than when pointed to space. I have investigated this thoroly for my apparatus and found it to be true at 160MC.

3. Page 7, second paragraph, line 7; I would suggest wording: "His observations published in 1944 appear to locate the source more definitely in the regions of Cygnus and Sagittarius".

4. Page 8, third paragraph, line 12; I would suggest wording: "This tends to support Reber's 1940 view that...".

5. Last reference under (6); I would suggest adding, November 1944, to identify easily with text. Change second reference to August 1942. Under (7) correct 1st reference to December 1932. Page 8, sixth line from last, change second 'that' of pair to 'which'.

The problem of intensity vs frequency of Cosmic Static is outside the subject matter of your paper. However I have been taken severely to task for my 1940 inverse-frequency idea by the quantum mechanics boys. They cooked up a scheme which to them is very much better and it was published as a note by Henyey and Keenan in the June 1940 Astrophysical Journal page 625-630. My present ideas are still along the line presented in August 1942 Proc. IRE page 377 to end of paper. Some evidence for this may be had from figure 1 of note in June 1940 Ap.J. My theory requires a horizontal line. If such line is drawn thru my point at 160MC it will fall between Jansky's two points at 16 and 20MC. This is a far better approximation than the curve the quantum mechanics boys produced.

In regard to your negative results on Cosmic Static at high frequencies I believe it may be traced to two factors. First, I estimate from your data that you used a mirror 42" diameter having an area of 8.8×10^5 sq. cm. This is far less than my mirror of 7.2×10^6 sq. cm. area and hence much less energy is intercepted. Second, your resolving power is much greater than mine. At 9500MC on a 3DB down basis your acceptance cone has an area of 2.0 circular degree compared to my acceptance cone of 48 circular degrees at 160MC. Consequently from an extended source like the milkyway very much less energy is picked up.

This whole subject of Cosmic Static intrigues me greatly. If I can be of any assistance or offer any suggestions for the new apparatus contemplated in the last paragraph of your paper please call on me. In the mean time I hope to complete a receiver for 480MC operation and test it next spring as soon as the weather ameliorates.

Very truly yours,

Grote Reber

From diffraction curves

$$D = .260 \text{ at } -6 \text{ dB and } r = D\lambda / \sin \theta$$

$$\lambda = 10 \text{ cm, } \theta = 3^\circ, r = 2.6 / .0521 = 50 \text{ cm.}$$

$$\lambda = 3.16 \text{ cm, } \theta = .97^\circ, r = .815 / .0169 = 48 \text{ cm.}$$

$$\lambda = 1.225 \text{ cm, } \theta = .287^\circ, r = .318 / .005 = 63 \text{ cm}$$

Total	161
average radius	54 cm

$$\text{Diameter of mirror} = 2 \cdot 54 / 2.54 = 42''$$

$$\text{Area} = 8.8 \cdot 10^3 \text{ sq cm.}$$