

April 30th, 1950
P.O. Box 4868
Cleveland Park Station
Washington, D.C., U.S.A.

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Dear Ralph:

You will recall our discussion about the origin of Cosmic Static. I tried to explain this phenomenon in terms of Johnson noise. Enclosed is an old reprint. The idea is mentioned at bottom of page 377 and top of page 378. I suggest that you get out references 4 and 13. The former is particularly good.

Apparently the whole trouble revolves around the fact that attempts such as Keenan & Henyey in Ap.J. involve a fundamental error. This error is brought about by an artificial concept of energy in terms of temperature. For instance, the temperature of a body is a function of the velocities of the Brownian motions. This line of thinking leads right off down the path of temperature and thermodynamics. Thus, something new has been added which is entirely beside the point.

The processes in question do not involve any thermodynamic mechanism. We start with the mechanical energy of motion of a free electron in space and then convert directly to electromagnetic energy without any hot bodies. The process is almost exactly like an Alexanderson alternator which derives its energy from the mechanical motion of its driving shaft and converts directly into electromagnetic waves.

At the receiving end we handle the energy in a simple fashion. The electromagnetic energy is available via an antenna in a form which can be used to drive an electric motor. No boilers, adiabatic expansions, condensers, etc. are necessary. The process does not involve any thermodynamic cycle. Consequently there is no flow of heat thru a system with a small part being converted out into mechanical energy. There is no heat. All the mechanical energy put into the system by the electrons can be extracted as mechanical energy at the shaft of the motor. Consequently, by two simple transformations we go from mechanical energy, to electromagnetic energy, to mechanical energy on a 100% efficient basis.

The proper attack on the general problem will have to be along the following line of thought. The process must be investigated from a microscopic view of the individual transition. This involves setting up equations of motion of the electron relative to the positive charge. The path deviation, deceleration, transit time, closest approach, etc. must be worked out. When the above are fixed for any given transition a spectral distribution of the energy due to this transition may be secured. The energy will be in the form of a pip having finite duration and finite bandwidth. The analysis may then be expanded to cover a wide variety of approaches, transit times, etc. and these formed into groups. The material of space may then be distributed, by postulate or otherwise, to comprise transitions over these groups. An integration of the radiation energy over all groups will produce the observed spectrum which I believe will turn out to be I proportional to f^0 . This will only hold as long as the distance of the closest approach is small compared to the wavelength and the time of transit small compared to the period of the wavelength. In deference to the thermodynamics boys, I believe that this is another way of saying $h\nu$ must be small compared to kT . However please try to forget this line of thought.

I hope the above elaborates my ideas in a homely fashion.

Cordially yours,

Grote Reber

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P.S. You will also need to know the radiation pattern of the transition. That is, what part of the energy goes off in which directions. The final integration will need to consider this matter.