modulator served as cell excitation. In this arrangement, application of the gated 30-mc output to the center of the transformer winding avoids (by phase balancing) overloading and delayed blocking of the cascode low-noise coupling stage in the receiving channel.

The same gate-keying and IF-blanking pulser closes the 30-mc gate, and actuates the IF amplifier during receiving intervals $t=t_0$ to $t=t_1$. Hence, the sideband intensity (excitation field E_D) becomes zero and spontaneous coherent emission from the cell and continutinuously applied K-band carrier output impinge on the diodes attached to the magic-T. During these intervals this unit operates as a superheterodyne mixer, supplying output to the input transformer preceding the cascode low-noise coupling stage. The push-pull to single-ended connection of the transformer in conjunction with the $\pi/2$ differential path length in the similar arms of the magic-T, insures complete uncoupling of the cascode-input circuit and gate-input circuit; hence none of the small intensity signal output is wasted in the gate-output circuit. Reference phase from the 30-mc modulating oscillator and 30-mc signal phase are compared in the phase sensitive detector, yielding output signals of the types shown in Figs. 3 and 4. To attain a favorable signal-to-noise ratio with the small signal intensity available, the signal bandwidth imposed by the integration circuit following the phase sensitive detector was made about 0.1 cycle. This required that the frequency sweep rate of the cell excitation unit be very slow; it was usually made about 1/40 cps.

Because of the nature of the primary-excitation unit and of the components available when the experiment was performed, available peak drive in the 10^{-6} second excitation periods was small. It was in the range from 10^{-4} to 10^{-5} watts, and usually was nearer the latter. Neglecting field position dependency in the cell, by assuming the mean field to prevail throughout the cube, the corresponding E_D was about 2×10^{-2} volts/cm and $\mu E_D/\hbar\cdot t_0$ was only 8.6×10^{-2}. From (4), the departure from thermal equilibrium conditions and the energy storage in the molecular system by the small perturbing resonance excitation, were slight. Unavoidably, and due only to the inadequacy of the primary excitation intensity, the initial spontaneous coherent emission, P_0, as given in (8) was small. For $E_D=2\times10^{-2}$ volts/cm, P_0 was 4.4×10^{-18} watts. Taking into account the "molecular effectiveness" in the reduced Doppler bandwidth signal,[1] even if the initial emission were completely monochromatic, and neglecting collisions, the time required for the self-induced emissive power to fall to half its initial value would be about 2.8×10^{-2} seconds. This is about 2800 ties the 10^{-5} second listening period, and therefore the change in P from P_0 was insignificant in the listening period for E_D as indicated. For a receiver noise figure of 10 and the previously mentioned 0.1-cycle signal bandwidth due to the integration circuit following the phase sensitive detector, the room temperature signal-to-noise ratio was calculated to be about 1×10^3, at best. For a variety of reasons, including the space dependency of the field in the cell, and utilization of only some of the discrete Stark components, the actual signal-to-noise ratio was always less. Assuming a worsening of the ratio, due to these causes, of somewhat less than an order of magitude, the actual signal-to-noise values as observed in Figs. 3 and 4 appear quite reasonable.

By using the received signal as a reference frequency, and assuming that the primary excitation source is servocontrolled to 1/1000 of the 5-kc spectral bandwidth (a fairly severe but reasonable assumption), by long time-averaging servoaction, the frequency stability of the excitation source is 2×10^{-10}.

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Corrections

Karle S. Packard, author of "Planar Transmission Lines—Part III," a correspondence which appeared on page 163 of the April, 1957 issue of these TRANSACTIONS, wishes to make the following correction to his paper.

The quantity $\sqrt{k}$ should be replaced by $\sqrt{K}$, where K is the relative dielectric constant.

Leonard Sweet, co-author with M. Sucher of the correspondence, "The Available Power of a Matched Generator from the Measured Load Power in the Presence of Small Dissipation and Mismatch of the Connecting Network," which appeared on pages 167–168 of the April, 1957 issue of these TRANSACTIONS, has brought the following correction to the attention of the editors.

Eq. (6) on page 168 should be

$$(1-|S_{22}|^2)^2-|S_{22}|^2-|S_{11}|^2+|S_{11}S_{22}|^2 \geq 2\ \mathrm{Re}\ S_{12}^{*2}S_{11}S_{22}.$$