mumstemperatur und Restwiderstand besteht [8], und zwar in dem Sinne, daß mit abnehmendem Restwiderstand auch das Minimum zurückgeht. So läßt unsere frühere Beobachtung [1] eines durch Wasserstoffbeladung von weniger reinem Nickel (mit [9] 0,2% Fe, 0,5% Cu, 0,3% Mn, 0,06% Co) verursachten vergleichsweise großen Restwiderstandes einen Zusammenhang zwischen diesem und der Minimumstemperatur auch beim vorliegenden System vermuten.

[9] Für die Analyse nach der RÖNTGEN-Fluoreszenzmethode haben wir Herrn Dipl.-Phys. H. HANSMEIER zu danken.

Zum vollen Verständnis der beobachteten Widerstandsanomalie sind weitere Untersuchungen erforderlich.

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Frequency Range of the Microwave Emission from InSb [1]

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Experimental studies on the radio frequency emission from InSb under the influence of electric and magnetic fields in the range of 10 MHz to 10 GHz are presented.

Studies were made of the frequency spectrum of the low field microwave emission from indium antimonide [4, 5] in a frequency range from a few megahertz up to ten gigahertz, showing that the emission is much broader than had earlier been assumed [6]. Samples of indium antimonide were mounted as center conductor of a coaxial transmission line which was connected to a spectrum analyzer used as a microwave receiver, and pulsed electric and magnetic fields were applied to the samples in an ambient temperature of 77 °K.

The broadband emission occurs first at lower frequencies for lower values of the applied fields than for higher frequencies; that is, the threshold for emission is lower for lower output frequencies. Concurrently, the emission is considerably stronger at the lower frequencies for constant applied fields. The spectrum of the emission from InSb for frequencies in the range of 10 MHz to 10 GHz is shown in Fig. 1. There appears to be a primary peak in the emission near 11 MHz, with the output decreasing rapidly at higher frequencies. The output power at the microwave frequencies is almost three orders of magnitude weaker than this low frequency peak. The decrease of output with frequency does not appear to be monotonic, as there is considerable structure to the curve. It is of considerable interest to note that the data at X-band agrees quantitatively with that obtained earlier using a microwave receiver [5].

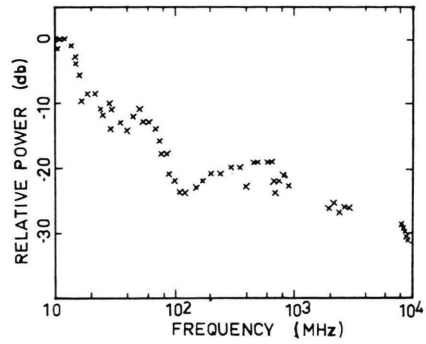

Fig. 1. Frequency spectrum of the microwave emission from indium antimonide, taken with a spectrum analyzer used as a microwave receiver. The curve was taken with an applied transverse magnetic field of 5 kG and an electric field of 100 volts/cm.

In studying the microwave radiation from InSb, it was observed that for certain samples, weak emission was detected over a range of electric fields in the absence of any magnetic field [7]. For a typical sample the emission would occur for a range of electric field from 6 – 8 volts/cm to 50 volts/cm with a peak near 20 volts/cm. In samples which exhibited this behavior, the more usual microwave emission for both electric and magnetic fields was also observed. The fields involved and broadbandedness of the emission categorize the emission as similar to the low field emission under study, but it is not clear at this time how this magnetic field independent emission is connected to the field dependent emission.

The microwave emission observed previously appears to be only a portion of the total spectrum of a very broadband emission from InSb. This broadband spectrum and the emission without a magnetic field shed new insight on the requirements for an adequate theoretical basis.

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