was made. $\nu(0)$ was determined to be 58.096 Mc/sec, corresponding to a field at the nucleus of 241 460 oersteds. a was $(2.544 \pm 0.067) \times 10^{-3}\,°K^{-3/2}$, b was $(3.03 \pm 1.04) \times 10^{-5}\,°K^{-5/2}$, and the mean square square deviation of the data points from the fit was 0.0016 Mc/sec. Inclusion of $T^{7/2}$ and T^4 terms does not significantly improve the fit. From a and b we calculate that $J_t = 5.44°K$ and $J_l = 0.88°K$. The smallness of J_l relative to J_t, inferred from inspection of the superexchange "paths," is thus confirmed, and manifests itself in the magnetization curve as an unusually large $T^{5/2}$ term.

We wish to thank R. J. Blume for the circuit of the Robinson-type spectrometer, J. L. Davis for experimental assistance, E. M. Kelley for aid in growing the crystals, and Dr. L. R. Walker for theoretical counsel.

[1]F. Bloch, Z. Physik 74, 295 (1932).
[2]Ichiro Tsubokawa, J. Phys. Soc. Japan 15, 1664 (1960).
[3]Å. Braekken, Kgl. Norske Videnskab. Selskab, Forh. 5, No. 11 (1932).
[4]V. Heine, Phys. Rev. 107, 1002 (1957).
[5]F. N. H. Robinson, J. Sci. Instr. 36, 481 (1959); R. J. Blume (to be published).
[6]A. M. Portis, A. C. Gossard, R. H. Lindquist, and M. Rubinstein (to be published).
[7]R. G. Barnes and S. L. Segel have observed Br^{81} nuclear quadrupole resonance in the paramagnetic state of $CrBr_3$. R. G. Barnes and S. L. Segel, Phys. Rev. Letters 3, 462 (1959).
[8]G. B. Benedek and J. Armstrong, J. Appl. Phys. 32, 106S (1961); V. Jaccarino and L. R. Walker (to be published).
[9]Freeman J. Dyson, Phys. Rev. 102, 1230 (1956).
[10]We are indebted to J. F. Dillon for communication of this result before publication.

PHASE TRANSITION IN MERCURY TELLURIDE*

J. Blair and A. C. Smith
Department of Electrical Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts
(Received July 17, 1961)

An abrupt change in the resistivity of mercury telluride has been observed at a pressure of about 15 000 kg/cm² at room temperature. This change is ascribed to a transition between two polymorphic phases of HgTe. The resistivity changes essentially reversibly by a factor of 10^4 to 10^5 at this transition. No information about the structure of the high-pressure phase has been obtained.

Figure 1 shows the variation of the resistivity of a sample of HgTe as a function of pressure. The resistivity was measured with a four-probe method using a precision potentiometer. At 16 000 kg/cm², the resistivity increases by a factor greater than 10^4. The transition takes place very slowly and the points above 16 000 kg/cm² do not represent an equilibrium situation. The time that elapsed while the sample was in the high-pressure phase was several hours and the resistivity drifted upward consistently. As the pressure was decreased, the reverse transition occurred at 12 000 kg/cm². The resistivity decreased by a factor of 10^4, but did not quite return to its original value.

When the sample was examined, several cracks were found. These cracks presumably account for the difference in the atmospheric pressure values of the resistivity before and after the application of pressure. The sample was initially a single crystal and if the transition nucleated at a number of points, the sample would be polycrystalline after the transition. The strains arising from misorientation of the crystallites would produce the observed cracks.

The resistivity of this sample before the pressure experiment was 1.5×10^{-3} ohm cm. Meas-

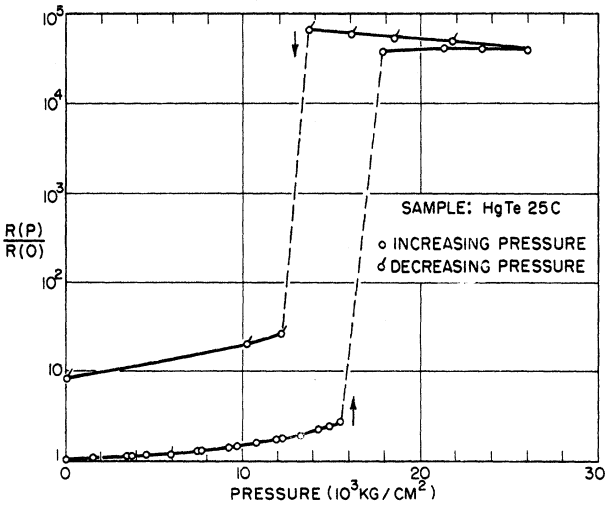

FIG. 1. Normalized resistance of HgTe vs pressure. Arrows show pressures at which transition occurred.

urements by Nelson[1] on adjacent samples from the same ingot yield an acceptor concentration of 3.7×10^{18} cm^{-3}, and an electron mobility of 2.3×10^{4} cm^2/volt sec. The change in resistivity below the transition pressure is quite reproducible and is essentially the same for samples from different ingots. A detailed explanation of this behavior is planned for a later paper.

The phase transition was observed in another sample of HgTe and an effort was made to determine the transition pressure more accurately. The limits of the transition pressure were again found to be 16 000 kg/cm^2 with increasing pressure and 12 000 kg/cm^2 with decreasing pressure.

The authors wish to express their thanks to Professor William Paul and the High Pressure Group at Harvard University for the use of the pressure equipment. We also thank Dr. R. E. Nelson for supplying the HgTe samples.

*This work was partially supported by the Air Force Cambridge Research Laboratories (Air Research and Development Command), U. S. Air Force.

[1]R. E. Nelson, Sc.D. thesis, Department of Electrical Engineering, Massachusetts Institute of Technology (unpublished).

NEGATIVE PION-PROTON ELASTIC SCATTERING AT 1.51, 2.01, AND 2.53 Bev/c OUTSIDE THE DIFFRACTION PEAK*

Kwan W. Lai,† Lawrence W. Jones, and Martin L. Perl
The University of Michigan, Ann Arbor, Michigan
(Received July 27, 1961)

The differential elastic scattering cross sections for negative pions on protons have been measured at incident pion momenta of 1.51, 2.01, and 2.53 Bev/c with emphasis on the angular region outside the diffraction peak. The purpose of the experiment was to examine the behavior of the large angle differential elastic cross section as a function of energy from the energy of the highest known resonance in the pion-nucleon system into the region where the total cross sections appear to be approaching an asymptotic value.[1]

The experiment was performed at the Bevatron using a luminescent chamber system to photograph the tracks of the scattered pion and the recoil proton from a liquid hydrogen target. The chamber configuration used is shown in Fig. 1, where the plane of the figure is normal to the optic axis of the image intensifier tube system. Lenses focused this image of the sodium iodide scintillators onto the first image tube cathode, and the gain of the system was sufficient to record single photoelectrons from this cathode. A coincidence between the coplanarity counters, which subtended $\Delta\Phi=\pm7.15°$ from the vertical plane, triggered the system on probable elastic events. This post-event triggering enabled the tracks to be subsequently recorded on film with a time resolution of a few microseconds. A description of the apparatus has been reported elsewhere in detail.[2] The film was double scanned, and angles for elastic scattering events were recorded with suitable corrections for distortions in the image tube system. The angles and ionization of the two tracks were used to identify an event as elastic, and subsequent correlations of the track angles with kinematics were consistent

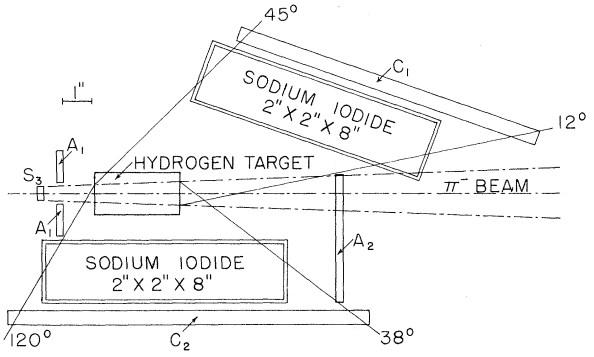

FIG. 1. Geometry of liquid hydrogen target, scintillation counters, and sodium iodide luminescent chambers. The coplanarity scintillation counters C_1 and C_2 subtended ±7.15° from the vertical plane (the plane of the drawing) for scatterings on the beam axis. Besides anticoincidence counters A_1 and A_2, two other anticoincidence counters flanked the target parallel to the plane of the figure to bias against inelastic events. S_3 is the final beam defining counter. The sodium iodide crystals were imaged by lenses onto the image tube system which was oriented perpendicularly to the plane of the figure.