



Center for
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Observation of Metallic Hydrogen

Abstract: Producing metallic hydrogen has been a great challenge in condensed matter physics. Metallic hydrogen may be a room-temperature superconductor and metastable when the pressure is released and could have an important impact on energy and rocketry. We have studied solid molecular hydrogen under pressure at low temperatures. At a pressure of 495 gigapascals, hydrogen becomes metallic, with reflectivity as high as 0.91. We fit the reflectance using a Drude free-electron model to determine the plasma frequency of 32.5 ± 2.1 electron volts at a temperature of 5.5 kelvin, with a corresponding electron carrier density of $7.7 \pm 1.1 \times 10^{23}$ particles per cubic centimeter, which is consistent with theoretical estimates of the atomic density. The properties are those of an atomic metal. We have produced the Wigner-Huntington dissociative transition to atomic metallic hydrogen in the laboratory.

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