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Cold hydrogen EOS / phase diagram from DAC experiments to 300 GPa¹

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Two new phases of hydrogen have been discovered at room temperature[1]: phase IV above 220 GPa and phase V above ~280 GPa. In the present work we studied these phases in a wide temperature range with the aid of Raman, infrared absorption, and electrical measurements at pressures up to 340 GPa. Also, we revised the I-III phase boundary and thus have built a new phase diagram of hydrogen. In particular, we established a new triple point at the phase diagram at 208 GPa and T=308 K. Our new data further support the previous work[1] that hydrogen is semiconductor in phase IV and most likely semimetal in phase V. 1. Eremets, M.I. and I.A. Troyan, Conductive dense hydrogen. Nature Materials, 2011. 10: p. 927-931.

¹M. I. Eremets, I.A. Troyan, A. Drozdov, Ph. Lerch, P. Naumov, Paul Scherrer Institute, CH 5232 VILLIGEN-PSI, Switzerland