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Digital ultrasonic pulse-echo overlap system and algorithm for unambiguous determination of pulse transit time CRISTIAN PANTEA, DWIGHT RICKEL, ALBERT MIGLIORI, Los Alamos National Laboratory, Materials Science and Technology (MST)-National High Magnetic Field Laboratory (NHMFL), Los Alamos, New Mexico 87545, JIANZHONG ZHANG, YUSHENG ZHAO, Los Alamos National Laboratory, Los Alamos Neutron Scattering Center (LANSCE)-12, Los Alamos, New Mexico 87545, SAMI EL-KHATIB, Physics Department, New Mexico State University, Las Cruces, New Mexico 88003, ROBERT LEISURE, Colorado State University, Department of Physics, Fort Collins, Colorado 80523, BAOSHENG LI, Mineral Physics Institute, State University of New York (SUNY) at Stony Brook, Stony Brook, New York 11794 — We report an evolution of an all-digital ultrasonic pulse technique for measurements of elastic constants of solids. An unambiguous analytical procedure is described for determining the correct time delay of echoes without any need for actual echo overlap. We also provide a simple procedure for making corrections for transducer-bond-induced phase shifts. The precision of a measurement made with this system at ambient temperature exceeds one part in 10^7 without the use of mixers, gates, time delays, and other complications normally associated with such measurements.

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