Erratum: "Simulation of ultrasonic pulse propagation through the abdominal wall" [J. Acoust. Soc. Am. 102, 1177–1190 (1997)]

T. Douglas Mast,[a] Laura M. Hinkelman,[b] and Michael J. Orr
Department of Electrical Engineering, University of Rochester, Rochester, New York 14627

Victor W. Sparrow
Graduate Program in Acoustics, The Pennsylvania State University, University Park, Pennsylvania 16802

Robert C. Waag
Departments of Electrical Engineering and Radiology, University of Rochester, Rochester, New York 14627

(Received 21 February 1998; accepted for publication 19 May 1998)
[S0001-4966(98)06708-3]
PACS numbers: 43.80.Cs, 43.20.Fn, 43.58.Ta, 43.10.Vx [FD]

Some incorrect values were included in the paper ''Simulation of ultrasonic pulse propagation through the abdominal wall'' due to minor programming errors. Corrected versions of Tables II and III are shown here and the impact of the errors on the results are discussed below.

The correlation lengths calculated for the arrival time fluctuations produced by the finite-difference time-domain (FDTD) simulation and shown in Table II were incorrect

TABLE II. Statistics of wavefront distortion from measurements (Exp.), finite-difference simulations (FDTD) and straight-ray simulations (S-R).

			Arrival time fluctuations		Energy level fluctuations		
Specimen number	Specimen thickness (mm)	Data source	rms value (ns)	Correlation length (mm)	rms value (dB)	Correlation length (mm)	Waveform similarity factor
75hi	31–34	Exp.	92.7	4.10	3.85	2.99	0.873
		FDTD	53.0	4.70	3.29	1.25	0.957
		S-R	62.3	2.40	0.42	1.92	1.000
77ba	22–29	Exp.	102.7	3.61	3.98	2.38	0.841
		FDTD	59.9	4.05	4.44	1.17	0.951
		S-R	61.6	2.00	0.46	2.09	1.000
87de	26–30	Exp.	73.7	4.74	3.47	2.75	0.866
		FDTD	60.9	8.68	4.18	1.46	0.948
		S-R	66.4	6.89	0.60	10.76	1.000
102gh	17–21	Exp.	38.7	5.56	3.89	3.22	0.943
		FDTD	28.4	3.72	3.10	1.37	0.986
		S-R	31.9	2.44	0.25	2.83	1.000
120de	25–29	Exp.	59.5	5.76	3.07	2.35	0.958
		FDTD	43.6	4.88	3.28	1.38	0.980
		S-R	47.3	3.43	0.38	4.65	1.000
120fe	28–30	Exp.	73.8	8.66	3.66	3.71	0.914
		FDTD	67.1	8.19	3.41	1.30	0.983
		S-R	71.3	8.72	0.51	6.11	1.000

[a]Current affiliation: Applied Research Laboratory, The Pennsylvania State University, University Park, PA 16802.
[b]Current affiliation: Department of Meteorology, The Pennsylvania State University, University Park, PA 16802.

TABLE III. Correlation coefficients between arrival time surfaces and energy level surfaces from FDTD and straight-ray simulations.

Specimen number	Arrival time correlation	Energy level correlation
75hi	0.666	0.363
77ba	0.501	0.572
87de	0.783	0.190
102gh	0.810	0.498
120de	0.787	0.489
120fe	0.872	0.444

because of an arithmetic error. Correct values are given below. These values do not negate any of the conclusions drawn in the original paper. Indeed, they indicate that the results of the finite-difference time-domain simulation are in better agreement with the measurements than previously thought.

The results for the straight-ray simulation were incorrect due to an error in the positioning of the simulated receiving aperture. This error had little impact on the distortion magnitudes and correlation lengths but significantly reduced the level of correlation between the FDTD and straight-ray results. Corrected values for the straight-ray distortion statistics are given here in Table II, while corrected correlation coefficients between the FDTD and straight-ray results are given in Table III.

The increased correlation between the arrival time fluctuations produced by the two simulations for the corrected results strengthens the previous conclusion that ''time-shift aberration in the abdominal wall is, in many cases, principally associated with large-scale variations in sound speed.'' Variations in energy level produced by the two simulations, which correlated poorly before, now correlate significantly in most cases, but the magnitudes of the energy level distortion produced by the two simulation methods still differ greatly. This result affirms that variations in absorption throughout abdominal wall specimens cannot explain the energy level fluctuations observed in the FDTD or measurement results. Instead, it is more likely that the same tissues produce amplitude variations by different mechanisms in each case. Absorption causes the energy fluctuations in the straight-ray simulations, while scattering effects appear to dominate in the FDTD simulations and measurements. This statement is consistent with the conclusions drawn in the original paper.