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Supplementary Information

A Comparison of Handgun Shots, Balloon Bursts, and a Compressor Nozzle Hiss as Sound Sources for Reverberation Time Assessment

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Table S1. Frequency characteristics of the sound sources: L in 1/3 octave bands of center frequency from 100 Hz up to 20 kHz (measuring set #1) and 40 kHz (measuring set #2).

f [Hz]	L [dB]			
	Handgun[a]	Balloon[a]	Nozzle[a]	Nozzle[b]
100	115.01	108.44	61.43	79.02
125	115.28	108.50	63.58	79.70
160	115.42	108.56	51.92	81.85
200	115.58	113.86	49.87	76.90
250	113.83	111.58	45.63	73.25
315	119.55	112.60	49.82	72.55
400	120.65	114.62	49.43	67.10
500	117.02	116.06	48.25	69.80
630	112.48	117.40	52.77	68.55
800	117.50	114.10	53.32	66.55
1000	119.78	117.78	60.03	65.70
1250	121.78	115.14	65.42	68.90
1600	123.05	111.42	66.67	73.25
2000	122.93	111.36	71.08	76.25
2500	123.05	114.52	76.52	79.20
3150	122.37	111.94	78.97	81.75
4000	122.85	109.42	80.55	84.10
5000	119.78	105.76	80.75	85.20
6300	116.50	108.50	82.43	88.70
8000	116.78	107.18	84.80	89.55
10000	115.57	104.86	85.85	91.40
12500	115.25	104.62	89.50	96.10
16000	113.37	103.28	90.70	97.80
20000	113.92	100.30	89.50	98.65
25000				100.15
31500				100.85
40000				102.25

[a] measured in the stockroom,

[b] measured in the small room.

Table S2. Reverberation times T and their standard errors for A-weighted sound, calculated from Eq. (1). Figures in parentheses after the measuring set number denote the microphone

No.	Room	Sound source	T [s]				
			meas. set #1(1)	meas. set #1(2)	meas. set #1(3)	meas. set #1(4)	meas. set #2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Small room	Balloon	0.200 ± 0.004	0.181 ± 0.003	0.204 ± 0.007	0.196 ± 0.004	
2.			0.184 ± 0.004	0.174 ± 0.003	0.182 ± 0.004	0.184 ± 0.006	
3.			0.208 ± 0.006	0.176 ± 0.004	0.201 ± 0.007	0.199 ± 0.006	
4.			0.197 ± 0.004	0.188 ± 0.003	0.199 ± 0.007	0.192 ± 0.004	
5.			0.191 ± 0.004	0.172 ± 0.003	0.181 ± 0.004	0.186 ± 0.005	
6.		Handgun	0.206 ± 0.004	0.190 ± 0.003	0.203 ± 0.004	0.208 ± 0.004	
7.			0.198 ± 0.006	0.184 ± 0.005	0.200 ± 0.007	0.195 ± 0.004	
8.			0.220 ± 0.006	0.211 ± 0.008	0.216 ± 0.006	0.221 ± 0.005	
9.			0.223 ± 0.005	0.204 ± 0.006	0.214 ± 0.004	0.223 ± 0.005	
10.			0.207 ± 0.005	0.200 ± 0.003	0.208 ± 0.005	0.209 ± 0.005	
11.		Nozzle	0.143 ± 0.004	0.145 ± 0.005	0.136 ± 0.003	0.148 ± 0.004	
12.			0.150 ± 0.004	0.153 ± 0.006	0.147 ± 0.003	0.157 ± 0.006	
13.			0.151 ± 0.007	0.153 ± 0.004	0.152 ± 0.005	0.147 ± 0.007	
14.			0.150 ± 0.004	0.148 ± 0.005	0.151 ± 0.005	0.145 ± 0.007	
15.			0.148 ± 0.003	0.136 ± 0.003	0.143 ± 0.003	0.146 ± 0.004	
16.			0.148 ± 0.005	0.152 ± 0.006	0.149 ± 0.005	0.147 ± 0.005	
17.	Medium-sized room	Balloon	0.264 ± 0.006	0.261 ± 0.006	0.265 ± 0.005	0.251 ± 0.006	0.287 ± 0.006
18.			0.279 ± 0.006	0.278 ± 0.004	0.285 ± 0.005	0.278 ± 0.004	0.277 ± 0.005
19.			0.274 ± 0.005	0.259 ± 0.003	0.267 ± 0.005	0.271 ± 0.004	0.229 ± 0.004
20.			0.262 ± 0.006	0.260 ± 0.005	0.261 ± 0.006	0.261 ± 0.004	0.304 ± 0.007
21.			0.255 ± 0.007	0.247 ± 0.005	0.247 ± 0.005	0.255 ± 0.006	0.251 ± 0.005
22.			0.281 ± 0.005	0.271 ± 0.004	0.279 ± 0.004	0.275 ± 0.004	0.257 ± 0.006
23.		Handgun	0.272 ± 0.004	0.273 ± 0.004	0.277 ± 0.004	0.280 ± 0.003	0.272 ± 0.004
24.			0.285 ± 0.004	0.282 ± 0.004	0.284 ± 0.005	0.282 ± 0.004	0.266 ± 0.007
25.			0.295 ± 0.003	0.291 ± 0.003	0.301 ± 0.005	0.293 ± 0.004	0.264 ± 0.004
26.			0.282 ± 0.005	0.275 ± 0.003	0.277 ± 0.004	0.279 ± 0.003	0.264 ± 0.003
27.	Stockroom	Balloon	1.154 ± 0.027	1.056 ± 0.026	1.037 ± 0.028	0.948 ± 0.020	
28.			1.298 ± 0.035	1.381 ± 0.030	1.299 ± 0.030	1.147 ± 0.026	
29.			0.923 ± 0.023	0.919 ± 0.022	0.930 ± 0.023	0.836 ± 0.017	
30.			0.978 ± 0.024	0.978 ± 0.028	1.025 ± 0.028	0.908 ± 0.021	
31.			0.909 ± 0.029	0.875 ± 0.029	0.900 ± 0.026	0.804 ± 0.015	
32.		Handgun	0.966 ± 0.016	0.962 ± 0.018	1.003 ± 0.022	0.924 ± 0.014	
33.			0.969 ± 0.020	0.947 ± 0.015	1.019 ± 0.032	0.933 ± 0.015	
34.			0.982 ± 0.024	0.976 ± 0.022	1.048 ± 0.028	0.953 ± 0.021	
35.			0.913 ± 0.026	0.873 ± 0.024	0.903 ± 0.023	0.876 ± 0.018	
36.			1.011 ± 0.026	0.959 ± 0.024	1.044 ± 0.028	0.903 ± 0.019	
37.			0.879 ± 0.029	0.787 ± 0.019	0.865 ± 0.025	0.831 ± 0.020	
38.		Nozzle	0.499 ± 0.004	0.494 ± 0.005	0.497 ± 0.006	0.487 ± 0.003	
39.			0.517 ± 0.006	0.504 ± 0.004	0.502 ± 0.005	0.503 ± 0.003	
40.			0.498 ± 0.007	0.486 ± 0.004	0.488 ± 0.004	0.481 ± 0.005	
41.			0.510 ± 0.006	0.510 ± 0.006	0.514 ± 0.007	0.495 ± 0.005	
42.			0.497 ± 0.005	0.491 ± 0.005	0.502 ± 0.006	0.483 ± 0.005	
43.	Assembly plant	Handgun					3.127 ± 0.075
44.							2.806 ± 0.059
45.							3.120 ± 0.080
46.							3.100 ± 0.050
47.		Balloon					3.179 ± 0.059
48.							2.843 ± 0.059

Table S3. Reverberation times in the stockroom, T, for the 1/3 octave band with center frequency of 2 kHz, and their standard errors, calculated from Eq. (1). Sound pressure levels measured using the four-channel setup #1.

No.	Sound source	T [s]			
		channel 1	channel 2	channel 3	channel 4
1.	Balloon	0.629 ± 0.009	0.629 ± 0.008	0.633 ± 0.010	0.628 ± 0.008
2.		0.713 ± 0.013	0.700 ± 0.014	0.670 ± 0.011	0.694 ± 0.010
3.		0.632 ± 0.013	0.599 ± 0.011	0.639 ± 0.010	0.616 ± 0.011
4.		0.626 ± 0.011	0.649 ± 0.012	0.604 ± 0.009	0.622 ± 0.010
5.		0.627 ± 0.014	0.573 ± 0.014	0.649 ± 0.021	0.638 ± 0.018
6.	Handgun	0.636 ± 0.009	0.636 ± 0.009	0.621 ± 0.009	0.614 ± 0.009
7.		0.625 ± 0.010	0.613 ± 0.013	0.614 ± 0.011	0.637 ± 0.012
8.		0.614 ± 0.012	0.627 ± 0.010	0.605 ± 0.009	0.620 ± 0.012
9.		0.616 ± 0.011	0.605 ± 0.015	0.603 ± 0.016	0.599 ± 0.015
10.		0.625 ± 0.010	0.600 ± 0.011	0.589 ± 0.009	0.597 ± 0.009
11.		0.640 ± 0.020	0.625 ± 0.016	0.637 ± 0.016	0.622 ± 0.019
12.	Nozzle	0.568 ± 0.023	0.606 ± 0.020	0.586 ± 0.020	0.630 ± 0.031
13.		0.631 ± 0.019	0.670 ± 0.020	0.620 ± 0.019	0.595 ± 0.014
14.		0.609 ± 0.022	0.581 ± 0.020	0.578 ± 0.024	0.642 ± 0.029
15.		0.638 ± 0.028	0.584 ± 0.025	0.610 ± 0.031	0.573 ± 0.024
16.		0.632 ± 0.025	0.588 ± 0.020	0.598 ± 0.016	0.576 ± 0.021

Table S4. Reverberation times in the stockroom, T, for 1/3 octave bands, and their standard errors, assessed using party balloons as the sound sources. Sound pressure levels measured using the four-channel setup #1.

f [Hz]	T [s]			
	channel 1	channel 2	channel 3	channel 4
100	1.552 ± 0.101	1.539 ± 0.073	2.606 ± 0.098	2.727 ± 0.154
125	3.005 ± 0.123	1.981 ± 0.117	3.024 ± 0.398	2.371 ± 0.253
160	2.269 ± 0.238	2.380 ± 0.271	1.819 ± 0.181	1.712 ± 0.130
200	1.904 ± 0.128	1.721 ± 0.116	1.712 ± 0.097	2.428 ± 0.199
250	1.538 ± 0.097	1.874 ± 0.147	1.653 ± 0.105	1.821 ± 0.142
315	1.383 ± 0.081	1.400 ± 0.079	1.510 ± 0.081	1.530 ± 0.103
400	1.365 ± 0.060	1.562 ± 0.082	1.266 ± 0.060	1.267 ± 0.069
500	1.105 ± 0.040	1.061 ± 0.031	1.077 ± 0.034	1.059 ± 0.036
630	1.000 ± 0.032	0.931 ± 0.028	0.928 ± 0.028	0.881 ± 0.024
800	0.885 ± 0.024	0.840 ± 0.018	0.850 ± 0.017	0.847 ± 0.020
1000	0.786 ± 0.013	0.825 ± 0.017	0.779 ± 0.014	0.835 ± 0.016
1250	0.726 ± 0.012	0.742 ± 0.012	0.718 ± 0.013	0.738 ± 0.013
1600	0.700 ± 0.013	0.665 ± 0.012	0.701 ± 0.012	0.663 ± 0.010
2000	0.661 ± 0.011	0.622 ± 0.010	0.627 ± 0.008	0.660 ± 0.009
2500	0.615 ± 0.010	0.606 ± 0.010	0.597 ± 0.010	0.588 ± 0.008
3150	0.593 ± 0.009	0.611 ± 0.010	0.582 ± 0.008	0.578 ± 0.008
4000	0.559 ± 0.008	0.581 ± 0.011	0.550 ± 0.008	0.556 ± 0.009
5000	0.525 ± 0.008	0.538 ± 0.009	0.539 ± 0.008	0.530 ± 0.008
6300	0.496 ± 0.007	0.516 ± 0.008	0.494 ± 0.006	0.491 ± 0.008
8000	0.453 ± 0.007	0.460 ± 0.007	0.473 ± 0.006	0.453 ± 0.006
10000	0.413 ± 0.006	0.429 ± 0.007	0.394 ± 0.008	0.410 ± 0.008
12500	0.367 ± 0.007	0.368 ± 0.008	0.352 ± 0.007	0.347 ± 0.007
16000	0.312 ± 0.007	0.319 ± 0.010	0.318 ± 0.008	0.313 ± 0.008
20000	0.254 ± 0.011	0.326 ± 0.016	0.250 ± 0.011	0.285 ± 0.013

Table S5. Reverberation times in the stockroom, T, for 1/3 octave bands, and their standard errors, assessed using the handgun as the sound source. Sound pressure levels measured using the four-channel setup #1.

f [Hz]	T [s]			
	channel 1	channel 2	channel 3	channel 4
100	1.997 ± 0.070	1.891 ± 0.153	2.244 ± 0.206	0.969 ± 0.058
125	1.256 ± 0.077	1.829 ± 0.153	1.813 ± 0.237	1.322 ± 0.104
160	2.366 ± 0.229	2.351 ± 0.329	2.095 ± 0.334	1.564 ± 0.190
200	1.831 ± 0.178	2.189 ± 0.219	2.260 ± 0.250	2.210 ± 0.250
250	2.247 ± 0.234	1.780 ± 0.162	1.956 ± 0.176	1.807 ± 0.173
315	1.859 ± 0.202	1.515 ± 0.106	1.351 ± 0.080	1.234 ± 0.096
400	1.283 ± 0.073	1.234 ± 0.065	1.470 ± 0.092	1.244 ± 0.063
500	1.034 ± 0.044	1.129 ± 0.058	1.108 ± 0.046	1.085 ± 0.049
630	0.996 ± 0.039	0.968 ± 0.036	1.093 ± 0.046	1.004 ± 0.036
800	0.878 ± 0.024	0.860 ± 0.024	0.896 ± 0.028	0.901 ± 0.026
1000	0.832 ± 0.024	0.763 ± 0.020	0.794 ± 0.020	0.856 ± 0.024
1250	0.716 ± 0.016	0.737 ± 0.016	0.712 ± 0.016	0.703 ± 0.015
1600	0.658 ± 0.010	0.662 ± 0.011	0.658 ± 0.009	0.678 ± 0.012
2000	0.636 ± 0.009	0.636 ± 0.009	0.621 ± 0.009	0.614 ± 0.009
2500	0.572 ± 0.006	0.588 ± 0.007	0.585 ± 0.007	0.593 ± 0.008
3150	0.566 ± 0.006	0.569 ± 0.006	0.565 ± 0.006	0.584 ± 0.006
4000	0.558 ± 0.006	0.542 ± 0.004	0.545 ± 0.005	0.547 ± 0.005
5000	0.514 ± 0.004	0.514 ± 0.004	0.521 ± 0.004	0.533 ± 0.004
6300	0.490 ± 0.003	0.489 ± 0.003	0.495 ± 0.003	0.490 ± 0.003
8000	0.454 ± 0.002	0.458 ± 0.003	0.455 ± 0.003	0.463 ± 0.003
10000	0.411 ± 0.003	0.424 ± 0.003	0.418 ± 0.003	0.422 ± 0.003
12500	0.346 ± 0.005	0.335 ± 0.009	0.336 ± 0.007	0.408 ± 0.007
16000	0.291 ± 0.004	0.289 ± 0.003	0.279 ± 0.006	0.287 ± 0.004
20000	0.246 ± 0.005	0.242 ± 0.005	0.238 ± 0.004	0.244 ± 0.004

Table S6. Reverberation times in the stockroom, T, for 1/3 octave bands, and their standard errors, assessed using the nozzle as the sound source. Sound pressure levels measured using the four-channel setup #1.

f [Hz]	T [s]			
	channel 1	channel 2	channel 3	channel 4
100	4.045 ± 1.936		2.789 ± 0.907	2.079 ± 0.300
125	1.231 ± 0.166	1.810 ± 0.516	1.850 ± 0.355	2.776 ± 0.696
160			2.125 ± 0.893	3.551 ± 2.187
200	2.321 ± 0.732	2.453 ± 0.666	3.612 ± 1.411	2.783 ± 1.019
250	3.298 ± 1.215	2.658 ± 0.905		1.658 ± 0.361
315	1.409 ± 0.236	1.419 ± 0.319	1.877 ± 0.416	2.483 ± 0.803
400	1.122 ± 0.142	1.064 ± 0.108	1.675 ± 0.279	1.035 ± 0.119
500	1.185 ± 0.134	1.100 ± 0.099	1.113 ± 0.129	1.179 ± 0.156
630	0.892 ± 0.074	0.890 ± 0.082	0.928 ± 0.068	0.872 ± 0.079
800	0.830 ± 0.054	0.804 ± 0.061	0.741 ± 0.055	1.002 ± 0.100
1000	0.764 ± 0.049	0.728 ± 0.039	0.736 ± 0.042	0.792 ± 0.051
1250	0.665 ± 0.025	0.639 ± 0.035	0.692 ± 0.029	0.668 ± 0.033
1600	0.678 ± 0.030	0.626 ± 0.025	0.631 ± 0.023	0.745 ± 0.038
2000	0.599 ± 0.020	0.626 ± 0.017	0.615 ± 0.020	0.635 ± 0.022
2500	0.566 ± 0.018	0.589 ± 0.018	0.578 ± 0.017	0.569 ± 0.020
3150	0.546 ± 0.012	0.579 ± 0.016	0.562 ± 0.018	0.566 ± 0.015
4000	0.561 ± 0.011	0.553 ± 0.010	0.553 ± 0.014	0.561 ± 0.013
5000	0.541 ± 0.013	0.529 ± 0.009	0.521 ± 0.009	0.510 ± 0.010
6300	0.495 ± 0.008	0.475 ± 0.008	0.489 ± 0.008	0.472 ± 0.005
8000	0.447 ± 0.006	0.446 ± 0.007	0.452 ± 0.006	0.446 ± 0.005
10000	0.395 ± 0.005	0.417 ± 0.007	0.396 ± 0.005	0.396 ± 0.005
12500	0.349 ± 0.005	0.364 ± 0.005	0.349 ± 0.004	0.354 ± 0.004
16000	0.292 ± 0.004	0.296 ± 0.005	0.285 ± 0.004	0.295 ± 0.004
20000	0.243 ± 0.004	0.239 ± 0.004	0.234 ± 0.006	0.235 ± 0.004

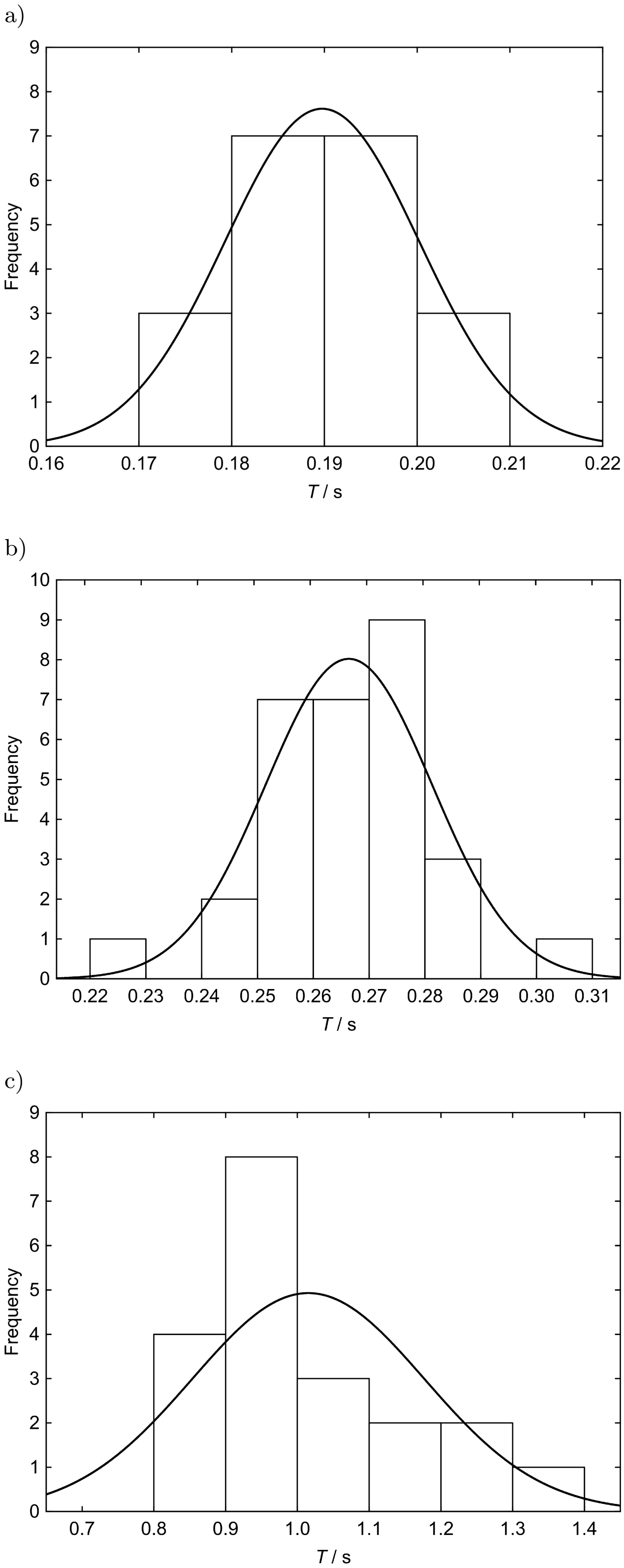

Fig. S1. Distribution of reverberation times due to balloons bursts in various rooms: a) small room, b) medium-sized room, c) stockroom. Histogram – empirical distribution; line – normal distribution fit.

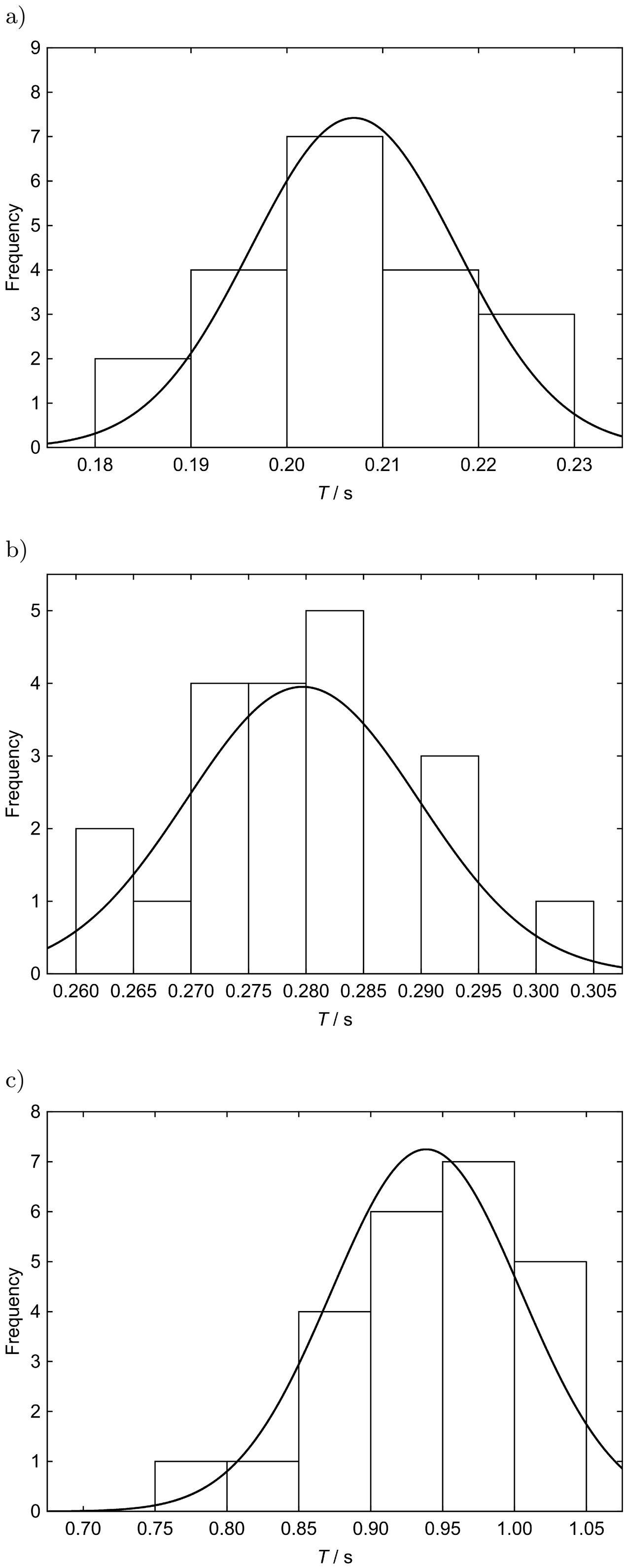

Fig. S2. Distribution of reverberation times due to handgun firings in various rooms: a) small room, b) medium-sized room, c) stockroom. Histogram – empirical distribution; line – normal distribution fit.

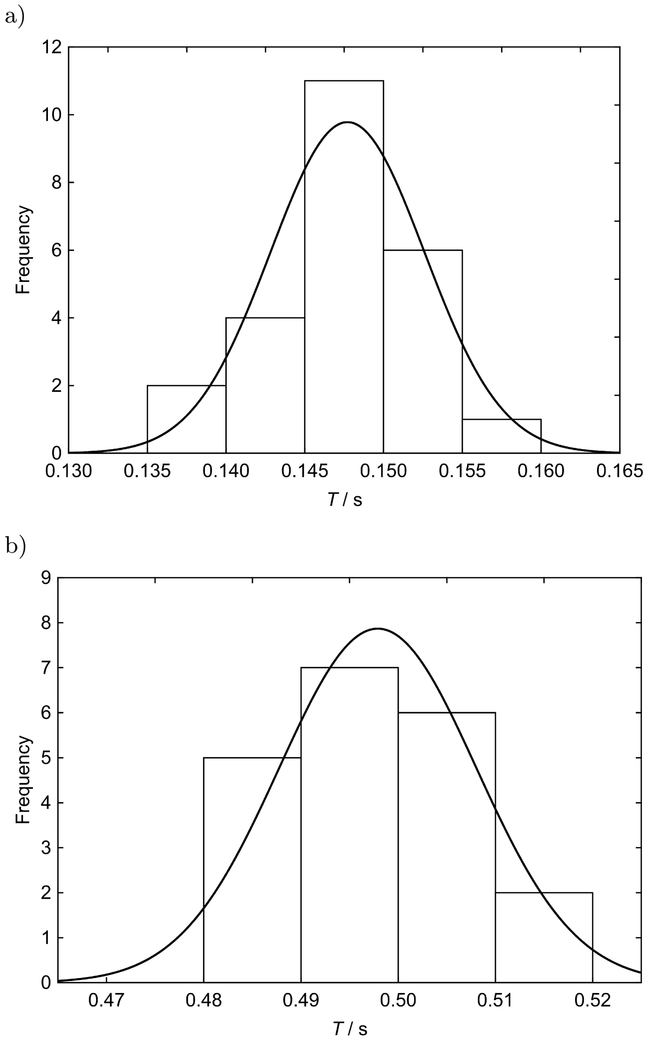

Fig. S3. Distribution of reverberation times after switching off the compressor in various rooms: a) small room, b) stockroom. Histogram – empirical distribution; line – normal distribution fit.