Experimental studies of particle removal and probability of COVID-19 infection in passenger railcars – Supplemental Material

Supplementary Information

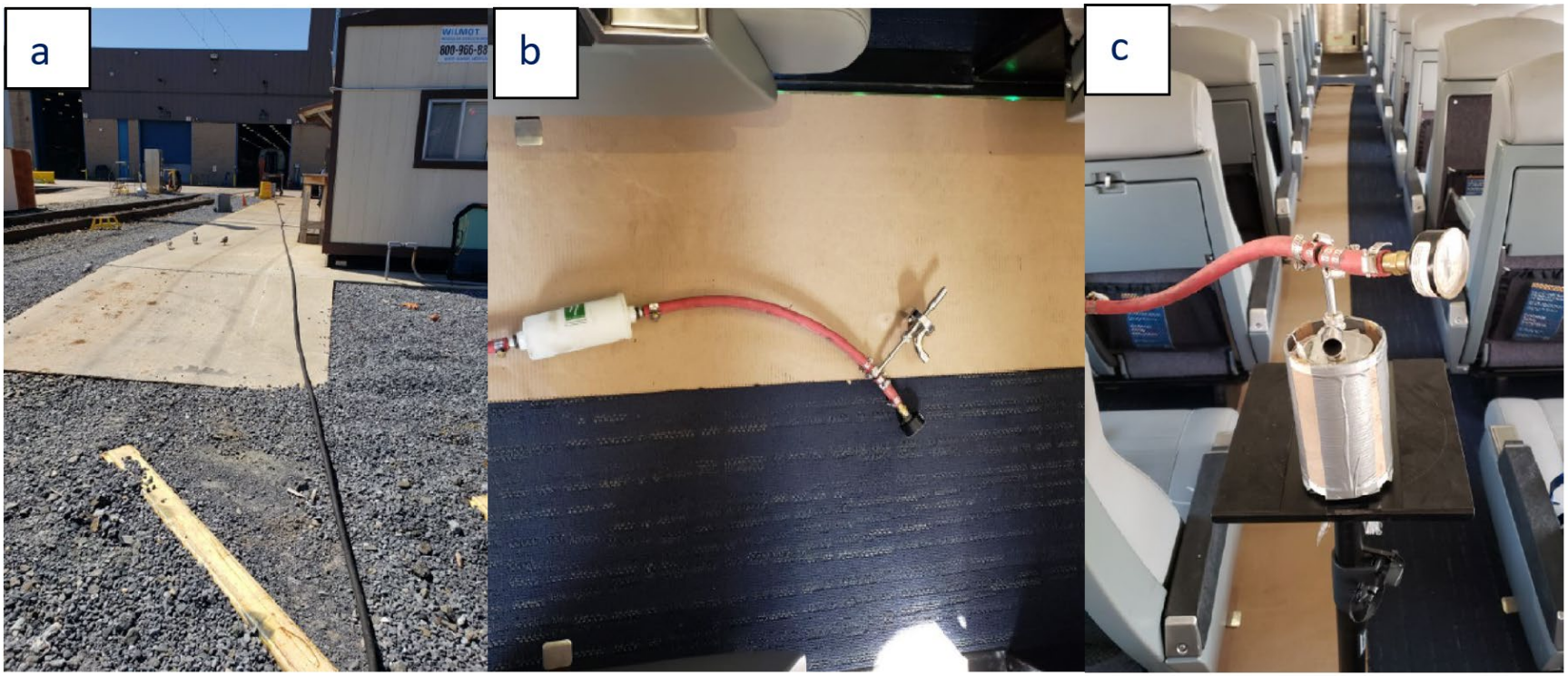

Figure S-1. (a) High pressure air line from maintenance shop, (b) in-line HEPA filter to clean supply air, and (c) Collison nebulizer in rail car.

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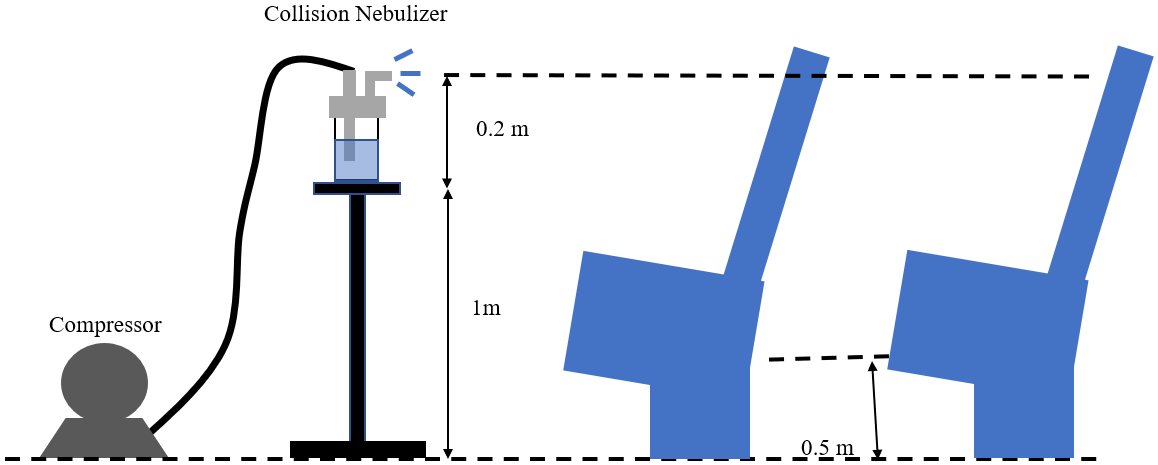

Figure S-2. Schematic of the source setup used for the generation of aerosol in a railcar.

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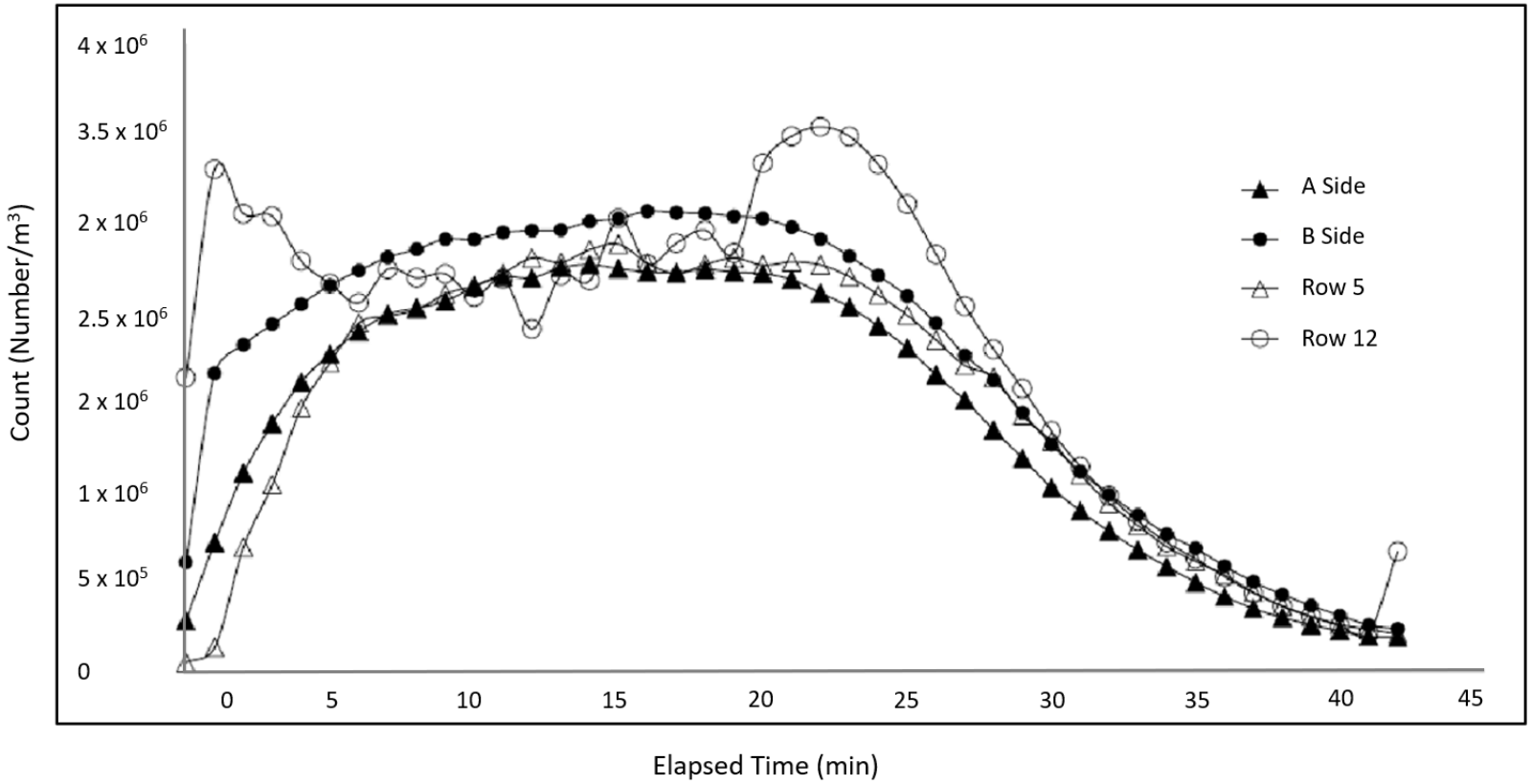

Figure S-3. Example plot of number concentration data from four Aerotrak instruments placed at different locations in the railcar for particles 0.3-0.5 µm, for Condition 1: MERV-8, damper in position 1, with no air purifier.

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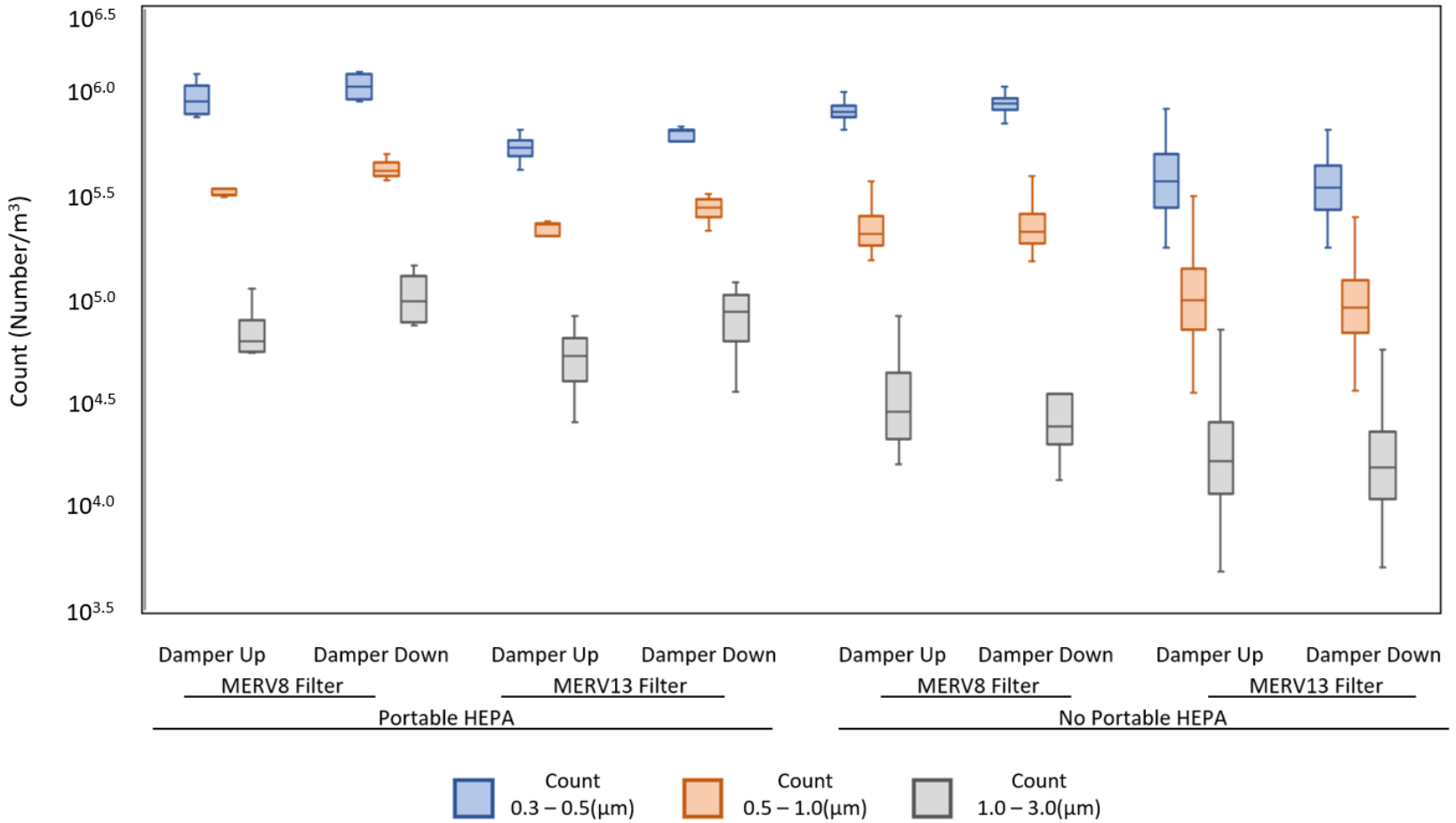

Figure S-4. Comparison of aerosol concentrations of smaller particles (0.3-0.5 µm, 0.5-1.0 µm, and 1.0-3.0 µm) across different experimental conditions during static testing.

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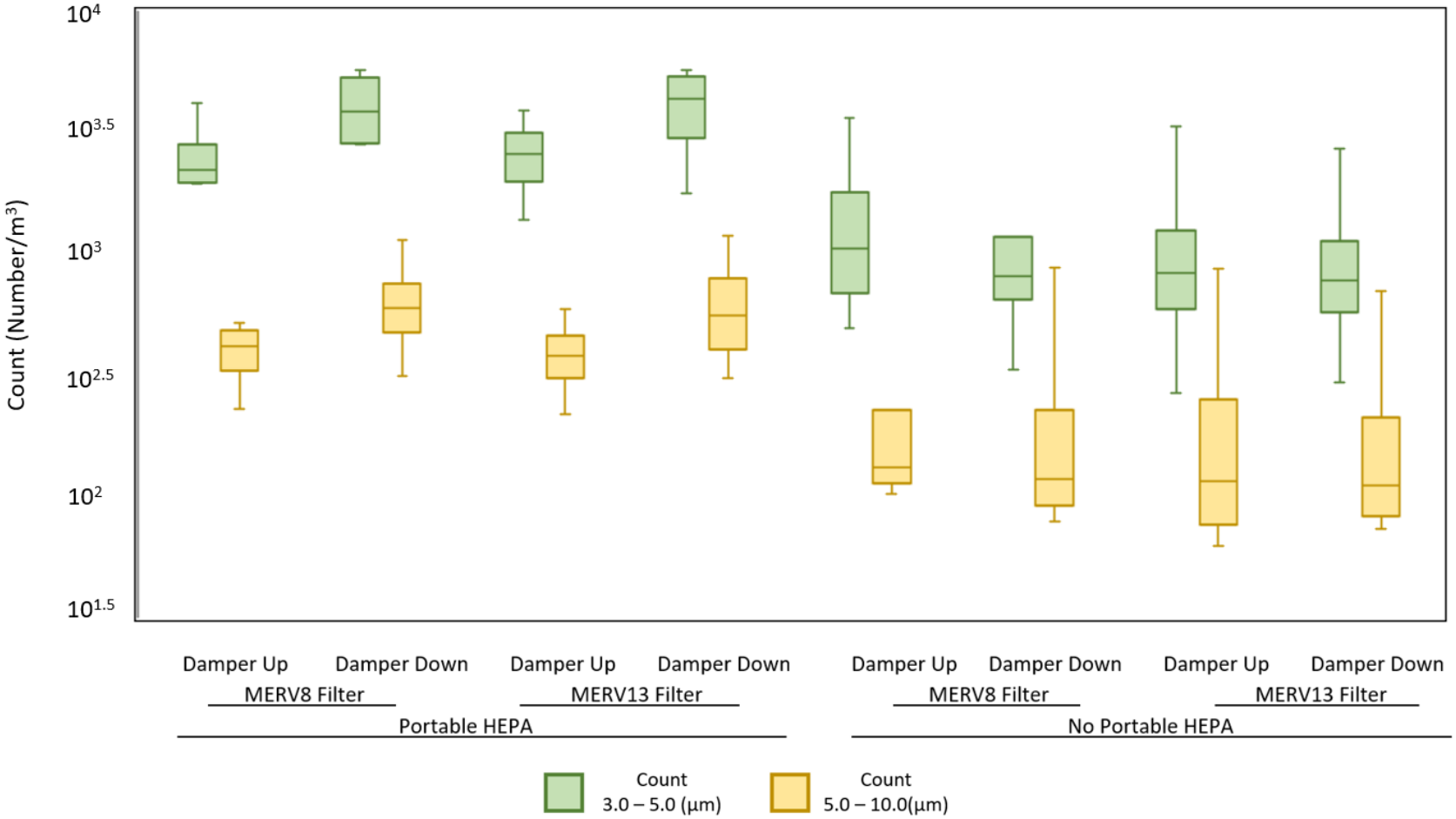

Figure S-5. Comparison of aerosol concentrations for larger particles (3.0-5.0 µm, 5.0-10.0 µm) across different experimental conditions for static testing.

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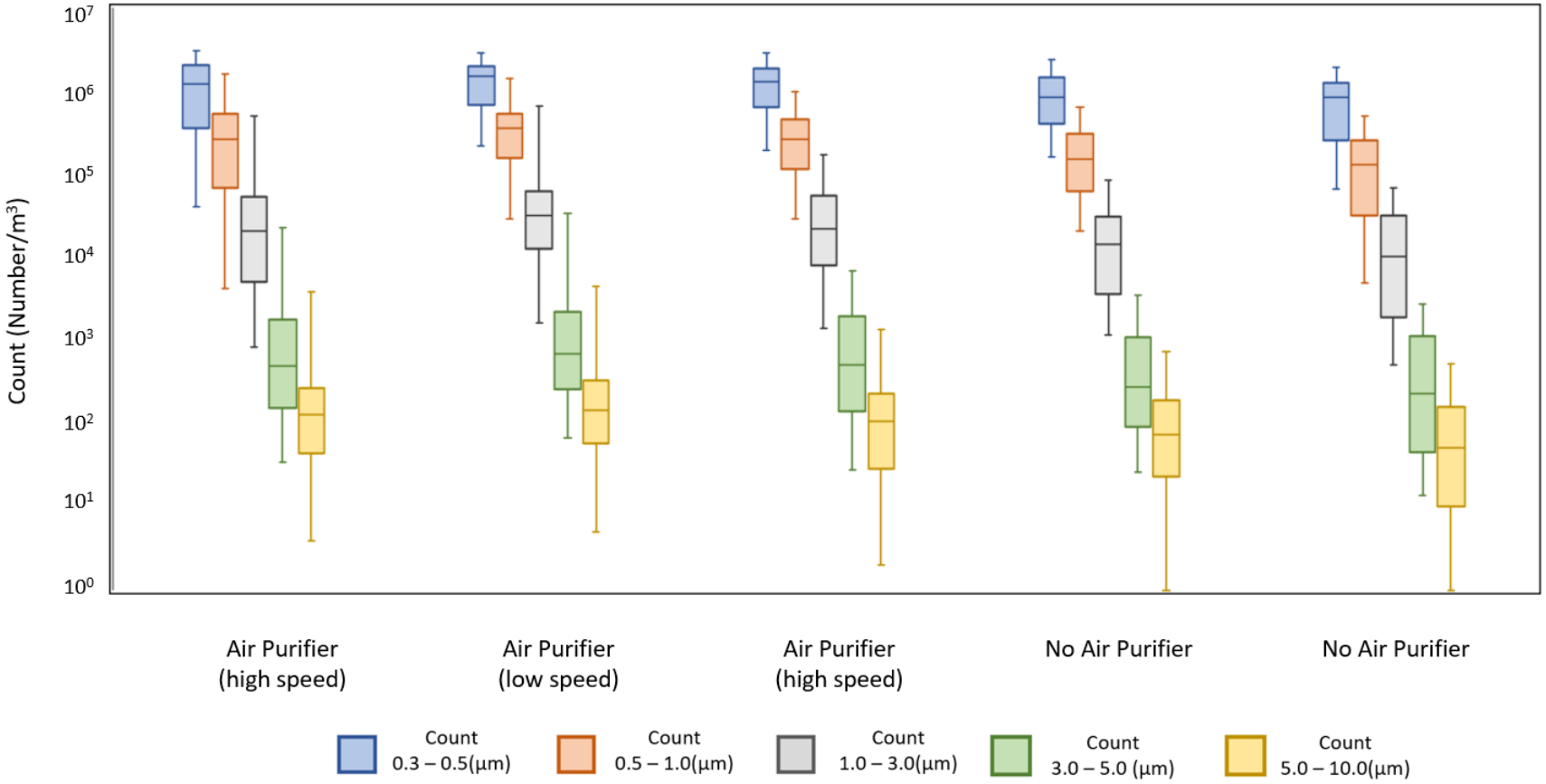

Figure S-6. Comparison of aerosol concentrations of particles in different size ranges (0.3-0.5 µm, 0.5-1.0 µm, 1.0-3.0 µm, and 3.0-5.0 µm, and 5.0-10.0 µm) across different experimental conditions for dynamic testing.

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Table S-1. Average particle removal rate (hr-1) by cut size under static and dynamic conditions

	No. of Observations	No. of Conditions	Mean	R^2	Standard Deviation		
					Overall	Between Condition	Within Condition
					Removal Rate (hr-1) Under Static Conditions		
0.3 - 0.5µm	196	8	8.79	0.95	3.89	3.52	2.70
0.5 - 1.0µm			11.11	0.96	5.49	4.76	4.02
1.0 - 3.0µm			13.27	0.93	5.50	4.18	4.38
3.0 - 5.0µm			13.29	0.80	7.59	4.01	6.95
5.0 - 10.0µm			12.86	0.75	8.29	3.13	7.96
					Removal Rate (hr-1) Under Dynamic Conditions		
0.3 - 0.5µm	12	3	9.04	0.99	1.41	1.26	0.90
0.5 - 1.0µm			10.88	0.99	1.89	1.89	0.98
1.0 - 3.0µm			13.08	0.95	2.64	2.04	1.99
3.0 - 5.0µm			17.57	0.85	5.13	1.22	5.02
5.0 - 10.0µm			17.56	0.83	6.08	1.24	5.99

R^2: coefficient of determination, used to assess goodness-of-fit

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Table S-2. F-test results of single, two-way, and three-way ANOVA for ACH by cut size under static conditions

	Aerosol Size (number of observations)				
Control Type	**0.3-0.5µm** (192)	**0.5 – 1.0µm** (192)	**1.0 - 3.0µm** (192)	**3.0 - 5.0µm** (192)	**5.0 - 10.0µm** (192)
Damper	0.39	0.35	0.84	0.22	0.08*
Filter	0.00***	0.00***	0.00***	0.00***	0.00***
Air Purifier	0.84	0.51	0.64	0.30	0.54
Damper and Filter	0.07*	0.01**	0.07*	0.01**	0.12
Damper and Air Purifier	0.28	0.42	0.57	0.77	0.24
Filter and Air Purifier	0.56	0.27	0.82	0.60	0.39
Damper and Filter and Air Purifier	0.56	0.16	0.68	0.67	0.67

*** p<0.01, ** p<0.05, * p<0.1