

# Particles and Noise in Rooms 175 & 110, Ford Hall

Will Barford & Neil Carlson

# Recommendations:

In room 175 Ford Hall, use both the Austin air purifier Healthmate and the Medify 112 A HEPA filter. Run the fans speeds at level 2 for both units. This will optimize filtration efficiency with lower fan speed noise. Higher fan speeds will lower the particle counts further but the noise is much more noticeable. Do not turn on the ionizer for the Medify 112 A HEPA filter.

Particle counts in room 175 were much lower than room 110 when the HEPA filters were operating.

Please review the study below for more details.

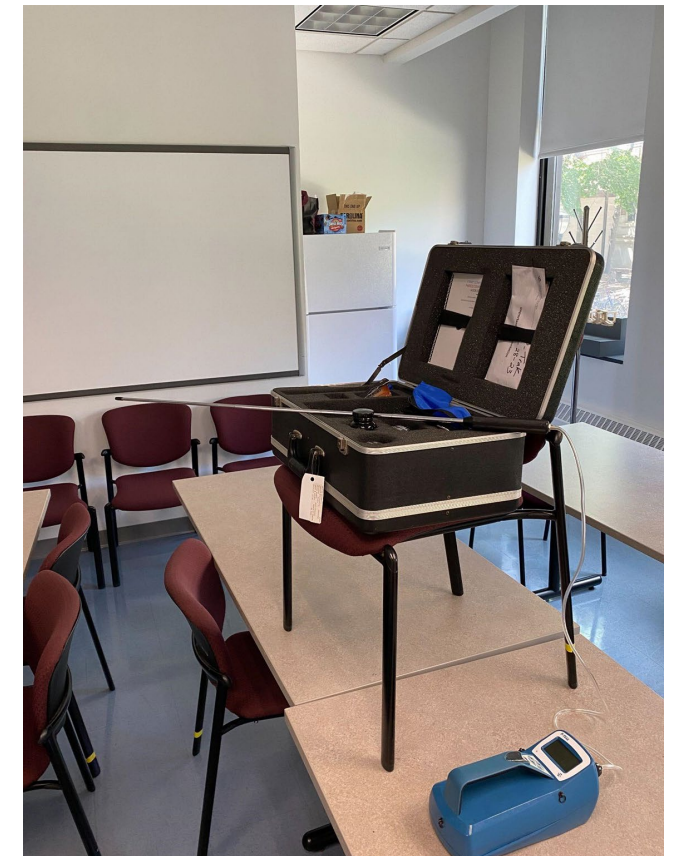
# Project Description

Rooms 175, and 110 in Ford Hall were measured to find their particle count and noise level. Room 175 contained a Austin air purifier Healthmate, and a Medify 112 A HEPA filter. These were tested at varying fan speeds, both individually and simultaneously, to see their effects on particle count and noise level in room 175. Particle count measurements were taken at the center of the room with a TSI P-TRAK, and for individual HEPA filter tests, measurements were taken at the fan intake, and fan discharge as well. Noise levels were record in the center of the room with a Brüel & Kjær 2238 Mediator.

# Room 175

Dimensions: main space 18' x 19', entryway 5'x12'

Hardfloor, High ventilation





# Room 175 HEPA Filters



Austin air purifier Healthmate  
Speeds 1-3



Medify 112A  
Speeds 1-4



# Room 110

Dimensions: 39'x 20' Carpeted classroom, ceiling ventilation, no HEPA filters

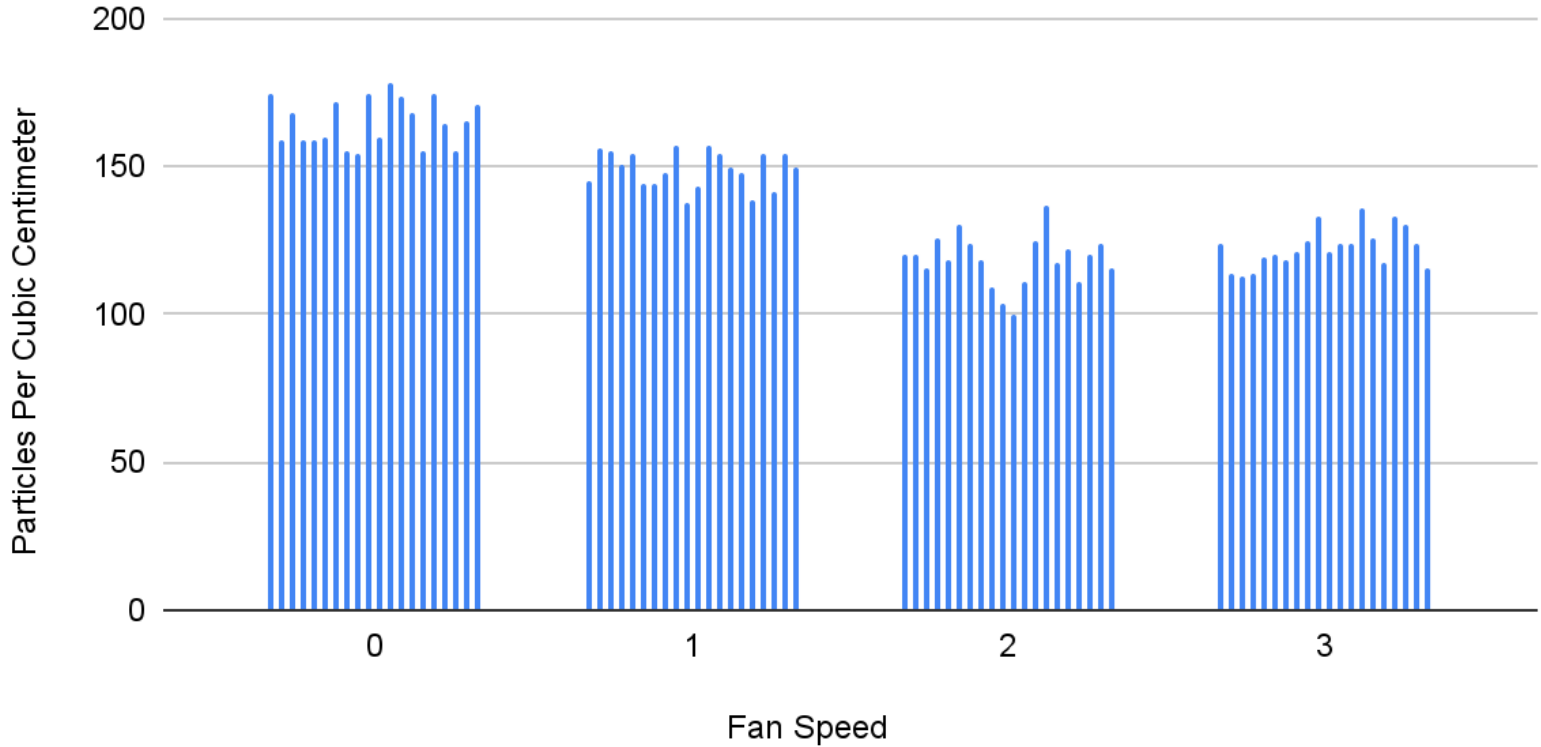


# Room 175



## Center of Room Austin Air Filter

Pt/cc vs Fan Speeds 6/6/24



Averages:	165.05	149.1	118.4	122.6
Change:		-15.95	-30.7	+4.2
% Change:		-9.7%	-20.6%	+3.5%

## Noise

Fan Speed: Off      LAeq change: Off

LAeq: 46.2 dB  
 Min: 45.8 dB  
 Max: 48.2 dB

### Speed 1

LAeq: 45.3 dB      -0.9 dB    -1.9%  
 Min: 44.9 dB  
 Max: 50 dB

### Speed 2

LAeq: 47.5 dB      +2.2 dB    +4.9%  
 Min: 47.2 dB  
 Max: 48.8 dB

### Speed 3

LAeq: 56.6 dB      +9.1 dB  
 +19.2%  
 Min: 56.1 dB  
 Max: 57 dB

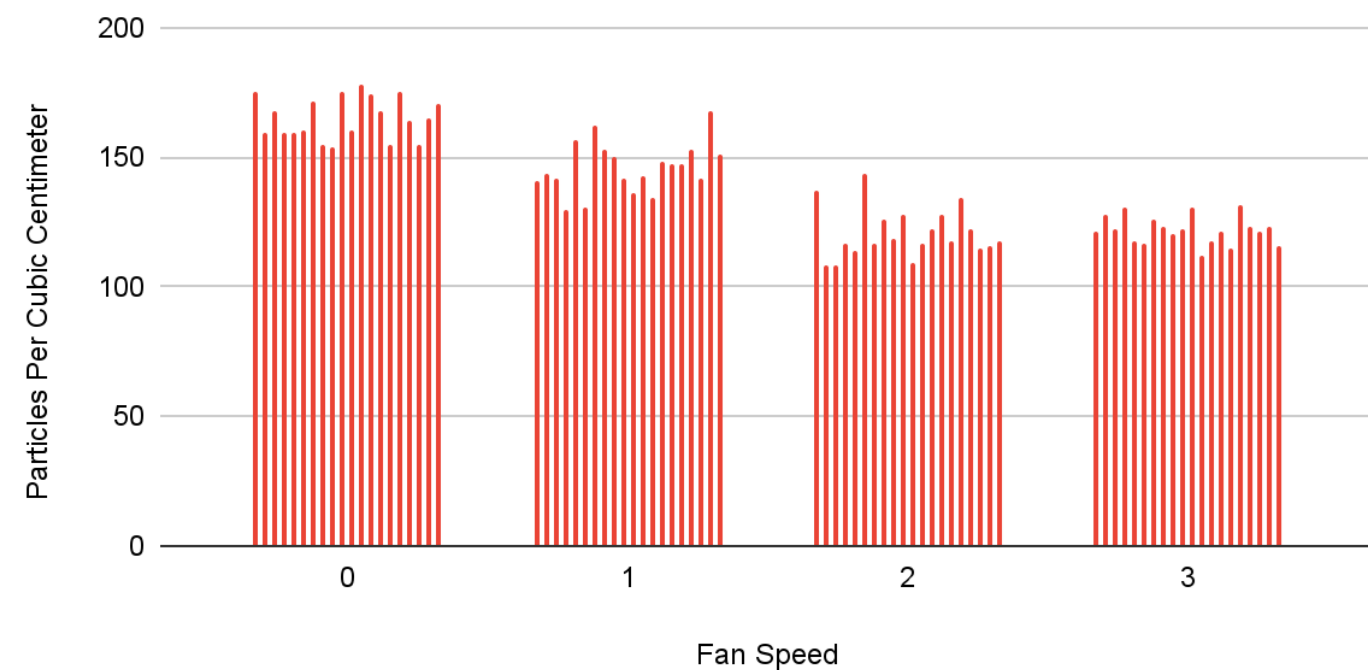


# Room 175



## Fan Intake Austin Air Filter

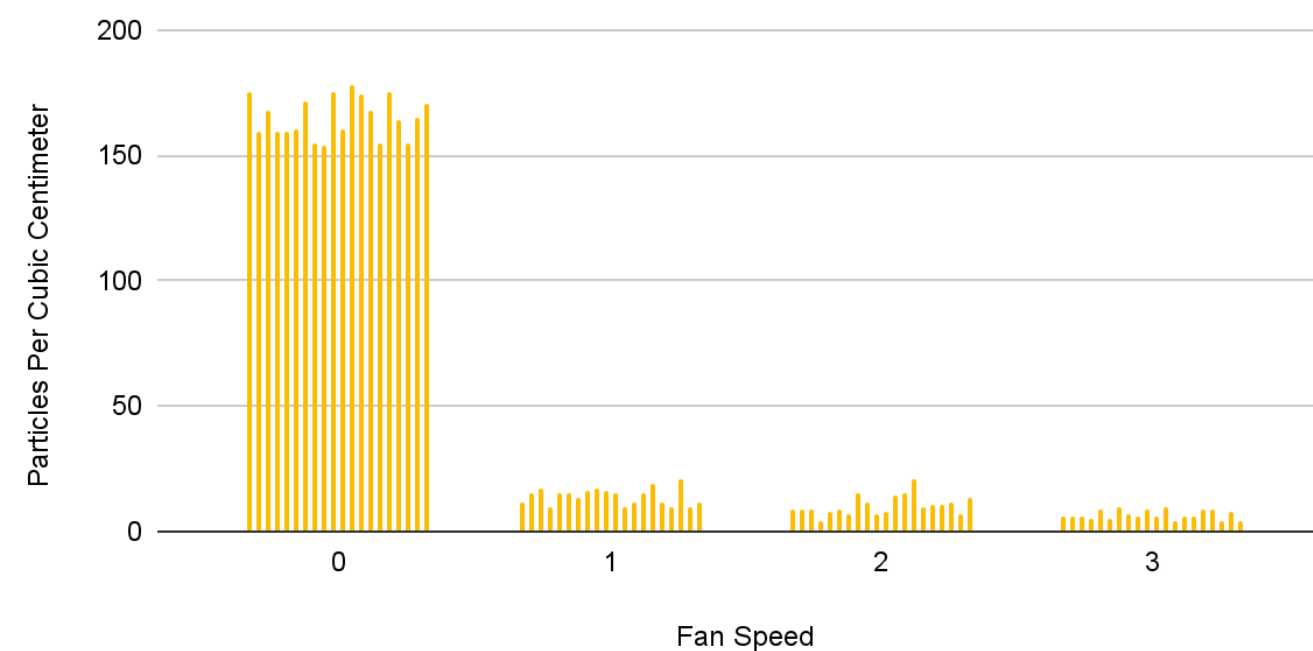
Pt/cc vs Fan Speeds 6/6/24



Averages:	165.05	146.1	120.9	122.0
Change:		-18.95	-25.2	+1.1
% Change:		-11.5%	-17.2%	+0.9%

## Fan Discharge Austin Air Filter

Pt/cc vs Fan Speed 6/6/24



Averages:	165.05	14.1	10.55	6.75
Change:		-150.9	-3.55	-3.8
% Change:		-91.5%	-25.2%	-36%



# Room 175 Statistical Significance



Center of Room: Changing the fan speed from 0 to 1 had a statistically significant impact on particle count in the room. Changing fan speed from 1 to 2 was also significant, but 2 to 3 was not significant. There was a statistically significant change from fan speeds 1 to 3.

Fan Intake: Changing the fan speed from 0 to 1 had a statistically significant impact on particle count in the room. Changing fan speed from 1 to 2 was also significant, but 2 to 3 was not significant. There was a statistically significant change from fan speeds 1 to 3.

Fan Discharge: Changing the fan speed from 0 to 1 had a statistically significant impact on particle count in the room. Changing fan speed from 1 to 2 was not significant, but 2 to 3 was significant. There was a statistically significant change from fan speeds 1 to 3.

Noise: Fan speed 1 cannot be heard over the ambient noise in room. Fan speed 2 could be heard, but is not loud or distracting. Fan speed 3 was loud and could be distracting.

	0 to 1	1 to 2	2 to 3	1 to 3
Center of Room	yes	yes	no	yes
Fan Intake	yes	yes	no	yes
Fan Discharge	yes	no	yes	yes

# Recommendation for use of Austin air purifier Healthmate

Due to the lack of significant change between fan speeds two and three, and the increased noise from fan speed three, the Austin air purifier should be used at fan speed two.

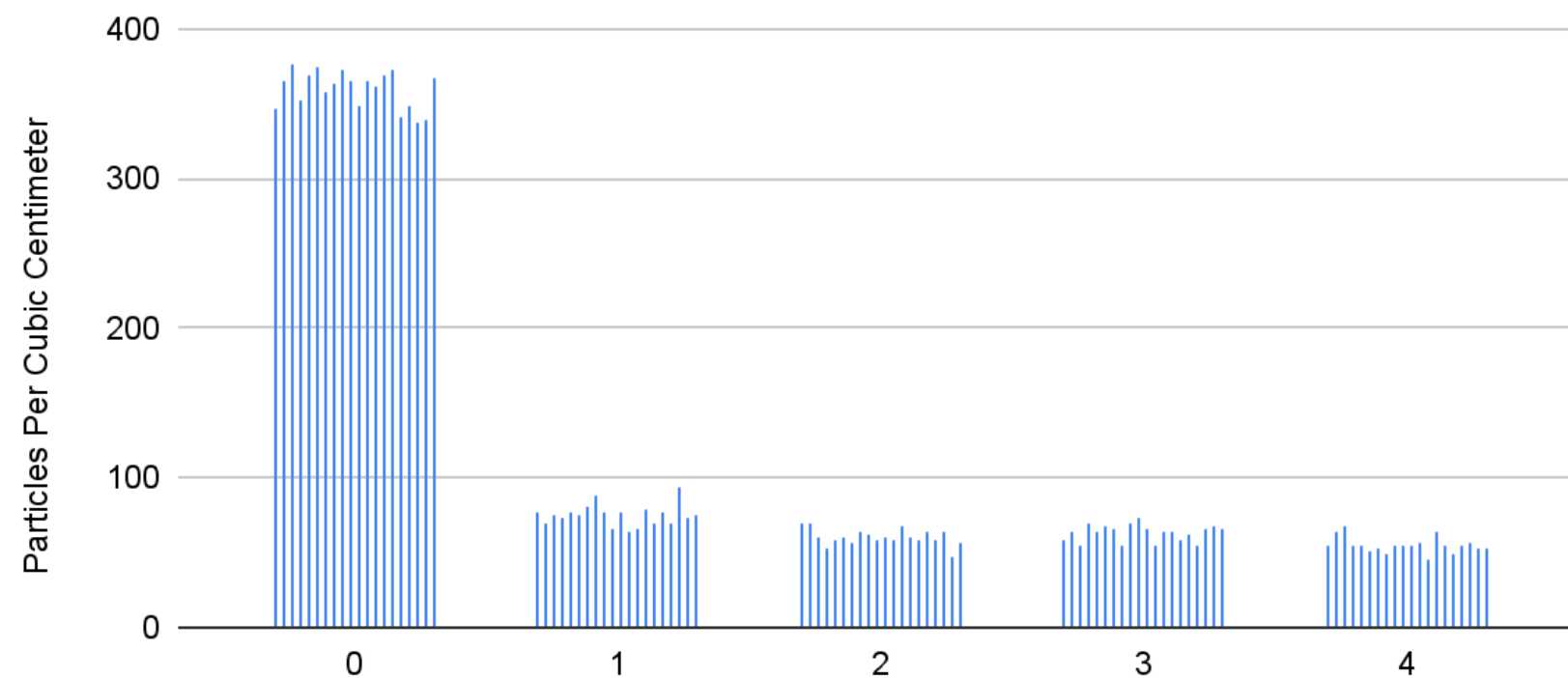


# Room 175



## Center of Room Medify Filter

Pt/cc vs Fan Speed 6/5/24



	0	1	2	3	4
Averages:	359.6	75.6	60.4	63.4	54.8
Change:		-284.0	-15.2	+3.0	-8.6
% Change:		-79.0%	-20.1%	+5.0%	-13.6%

## Noise

Fan Speed: Off  
L<sub>Aeq</sub> change: Off

L<sub>Aeq</sub>: 45.6 dB  
Min: 45.3 dB  
Max: 48.5 dB

### Speed 1

L<sub>Aeq</sub>: 45.6 dB      +0.0 dB    +0.0%  
Min: 45.3 dB  
Max: 53.2 dB

### Speed 2

L<sub>Aeq</sub>: 46.2 dB      +0.6 dB    +1.3%  
Min: 45.9 dB  
Max: 47.4 dB

### Speed 3

L<sub>Aeq</sub>: 48.7 dB      +2.5 dB  
+5.4%  
Min: 48.1 dB  
Max: 50.3 dB

### Speed 4

L<sub>Aeq</sub>: 53.2 dB      +4.5 dB  
+9.2%  
Min: 52.5 dB  
Max: 53.7 dB

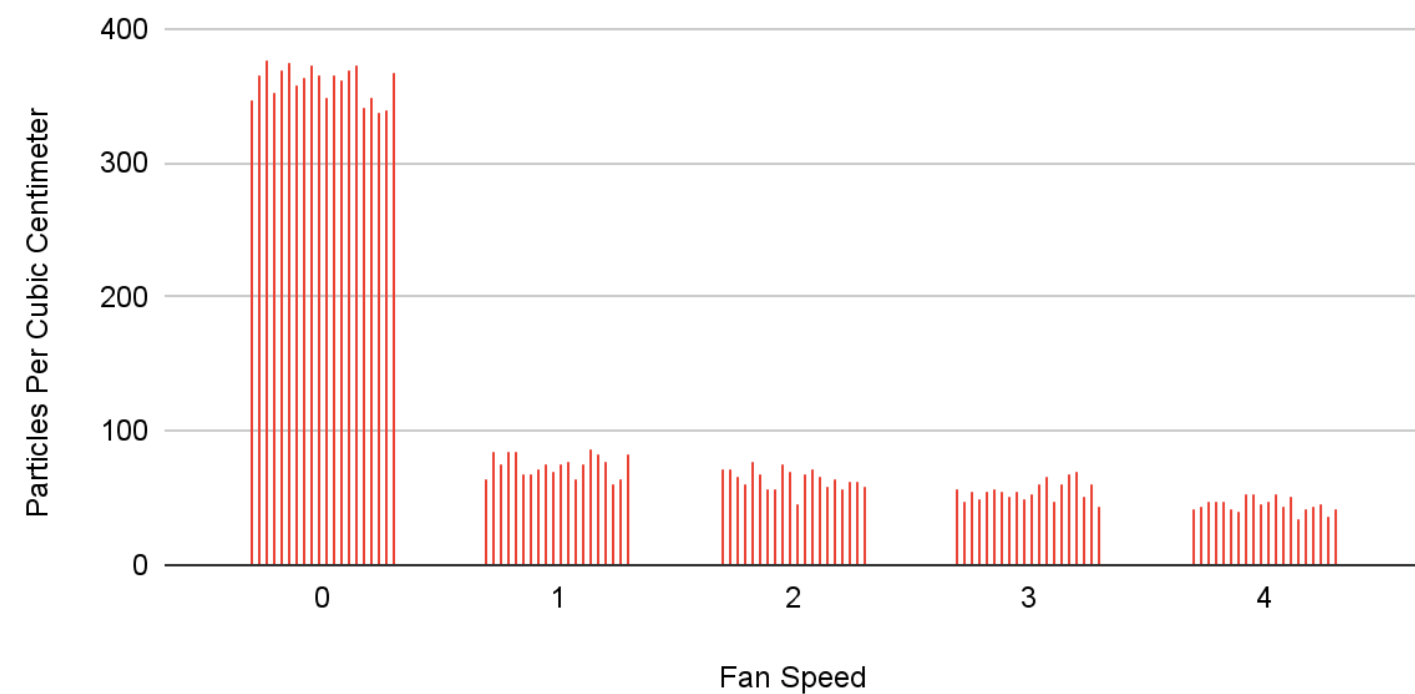


# Room 175



## Fan Intake Medify Filter

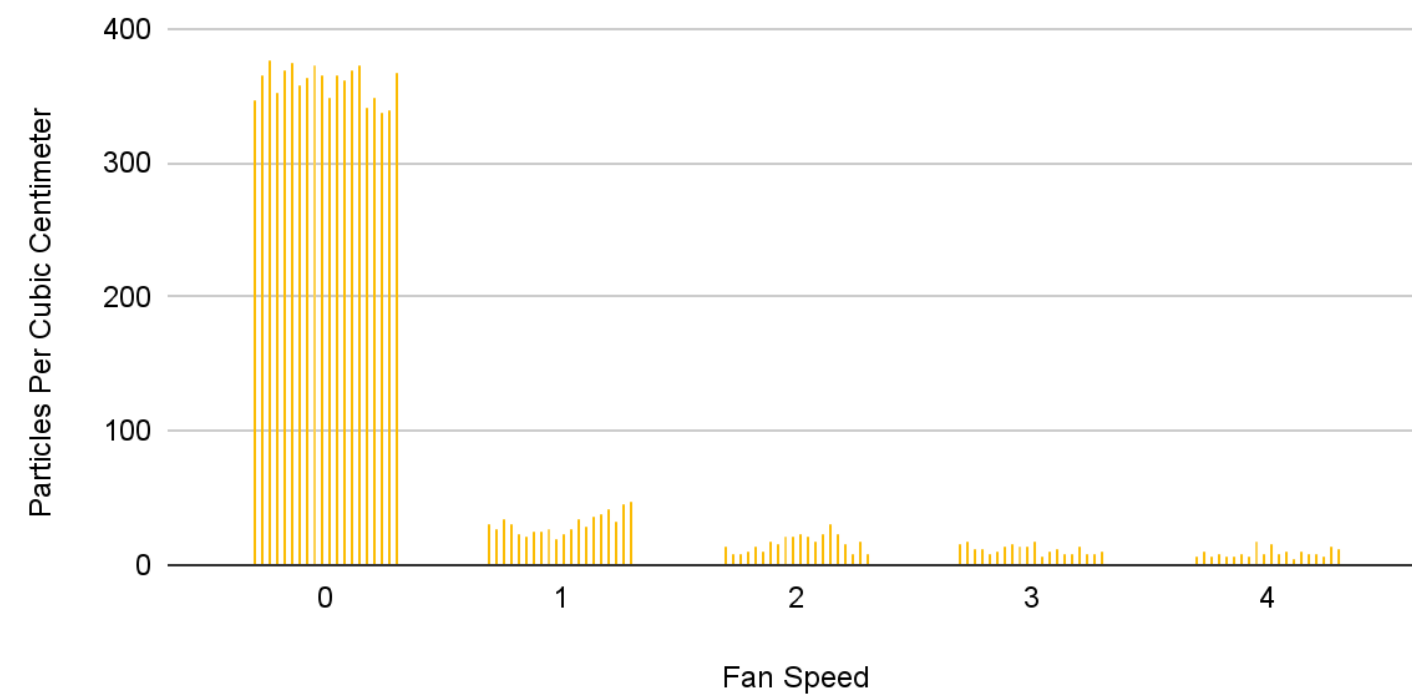
Pt/cc vs Fan Speed 6/5/24



Averages:	359.6	74.7	64.3	55.4	45.0
Change:		-284.9	-10.4	-8.9	-10.4
% Change:		-79.2%	-14.0%	-13.8%	-18.8%

## Fan Discharge Medify Filter

Pt/cc vs Fan Speed 6/5/24



Averages:	359.6	30.7	16.4	11.9	9.3
Change:		-328.9	-14.3	-4.5	-2.6
% Change:		-91.5%	-46.6%	-27.4%	-21.8%

# Room 175 Statistical Significance



Center of room: Changing the fan speed from 0 to 1 had a statistically significant impact on particle count in the room. Changing from speeds 1 to 2 was also significant, 2 to 3 was not significant, 3 to 4 was not significant, 1 to 3 was significant, 1 to 4 was significant, and 2 to 4 was not significant.

Fan Intake: Changing the fan speed from 0 to 1 had a statistically significant impact on particle count in the room. Changing from speeds 1 to 2 was not significant, 2 to 3 was not significant, 3 to 4 was significant, 1 to 3 was significant, 1 to 4 was significant, and 2 to 4 was significant.

Fan Discharge: Changing the fan speed from 0 to 1 had a statistically significant impact on particle count in the room. Changing from speeds 1 to 2 was significant, 2 to 3 was not significant, 3 to 4 was not significant, 1 to 3 was significant, 1 to 4 was significant, 2 to 4 was significant.

Noise: Fan speed 1 cannot be heard over the ambient noise in room. Fan speed 2 is very quiet but audible. Fan speed 3 is not distracting yet. Fan speed 4 is loud.

	0 to 1	1 to 2	2 to 3	3 to 4	1 to 3	1 to 4	2 to 4
Center of Room	yes	yes	no	no	yes	yes	no
Fan Intake	yes	no	no	yes	yes	yes	yes
Fan Discharge	yes	yes	no	no	yes	yes	yes

# Recommendation for use of Medify 112A

The Medify 112A filter should be used at fan speed two or three if the additional noise is tolerated.

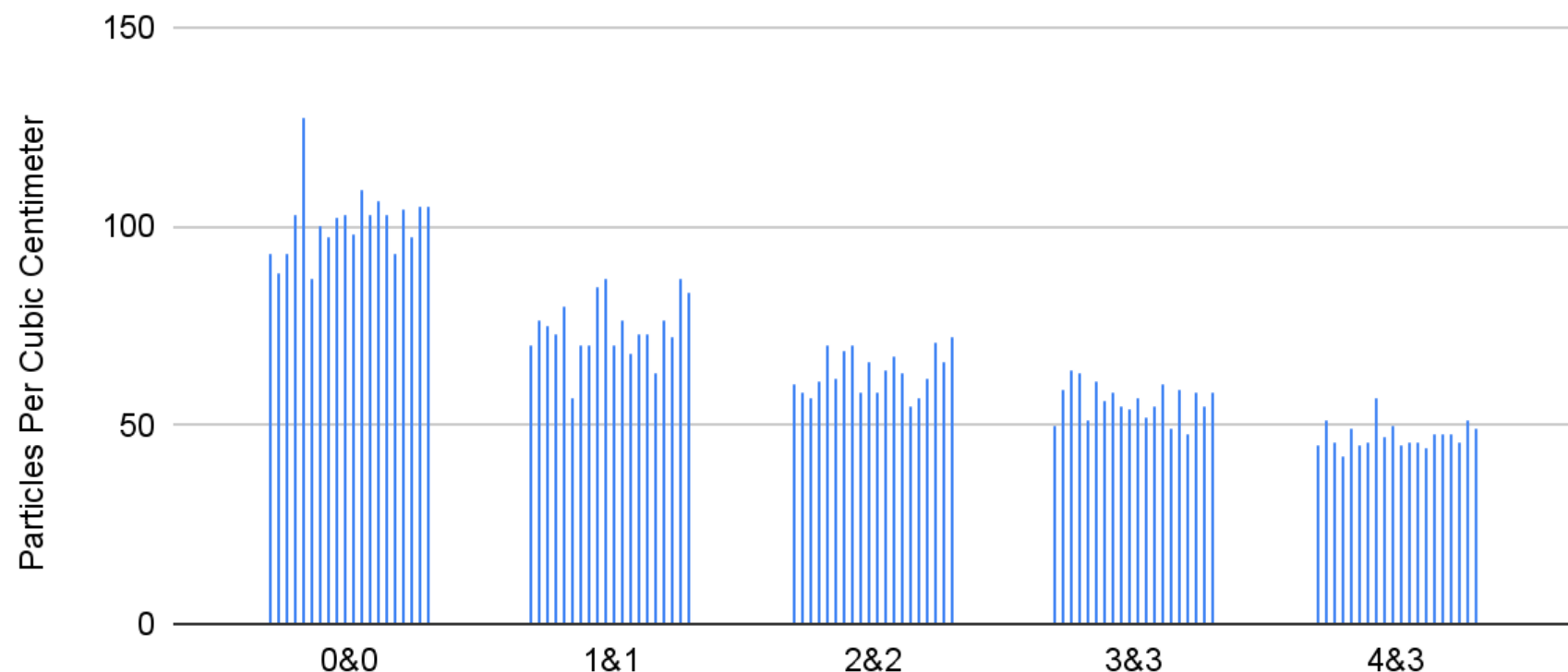




# Room 175

## Center of Room Austin & Medify Filters

Pt/cc vs Fan Speed 6/11/24



	Fan Speed				
	0&0	1&1	2&2	3&3	4&3
Averages:	100.8	74.2	63.3	56.1	47.5
Change:	-	-26.6	-10.9	-7.2	-8.6
% Change:	-	-26.4%	-14.7%	-11.4%	-15.3%



## Noise

Fan Speed: L<sub>Aeq</sub> change:  
Off

L<sub>Aeq</sub>: 47.0 dB  
Min: 45.8 dB  
Max: 54.1 dB

Speed 1&1

L<sub>Aeq</sub>: 46.1 dB      -0.9 dB    -1.9%  
Min: 45.8 dB  
Max: 47.2 dB

Speed 2&2

L<sub>Aeq</sub>: 47.7 dB      +1.6 dB    +3.5%  
Min: 47.5 dB  
Max: 48.5 dB

Speed 3&3

L<sub>Aeq</sub>: 56.4 dB      +8.7 dB    +18.2%  
Min: 55.7 dB  
Max: 56.7 dB

Speed 4&3

L<sub>Aeq</sub>: 57.7 dB      +1.3 dB    +2.3%  
Min: 56.9 dB  
Max: 58.2 dB

# Room 175 Statistical Significance



Center of Room: Changing the fan speed from 0 to 1&1 had a statistically significant impact on particle count in the room. Changing the fan speed from 1&1 to 2&2 was significant, 2&2 to 3&3 was not significant, 3&3 to 4&3 was significant, 1&1 to 3&3 was significant, 1&1 to 4&3 was significant, 2&2 to 4&3 was significant.

Noise: Fan speed 1&1 cannot be heard over the ambient noise in room. Fan speed 2&2 can be heard but is not loud. Fan speed 3&3 was loud. Fan speed 4&3 was loud.

	0 to 1&1	1&1 to 2&2	2&2 to 3&3	3&3 to 4&3	1&1 to 3&3	1&1 to 4&3	2&2 to 4&3
Center of Room	yes	yes	no	yes	yes	yes	yes

# Room #175: Recommendation for use simultaneous of Austin air purifier Healthmate & Medify 112 A

Effective particle filtration and low noise levels are best achieved on fan speeds 2 & 2.

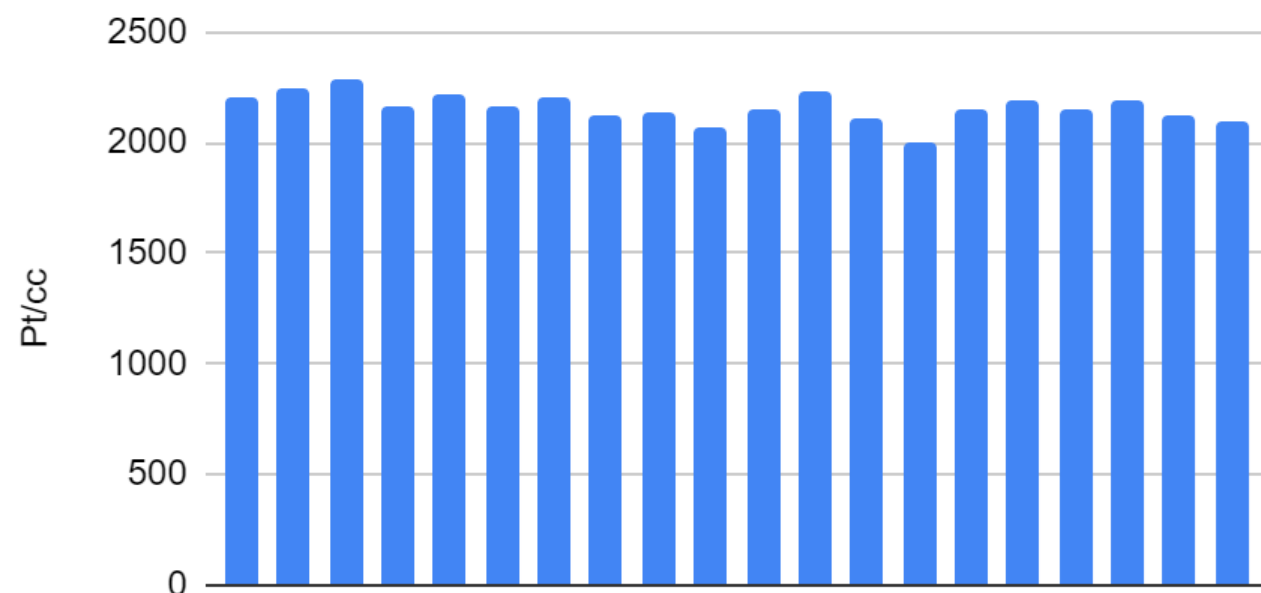




# Room 110

## Particles per Cubic Centimeter

Center of Room 6/5/24

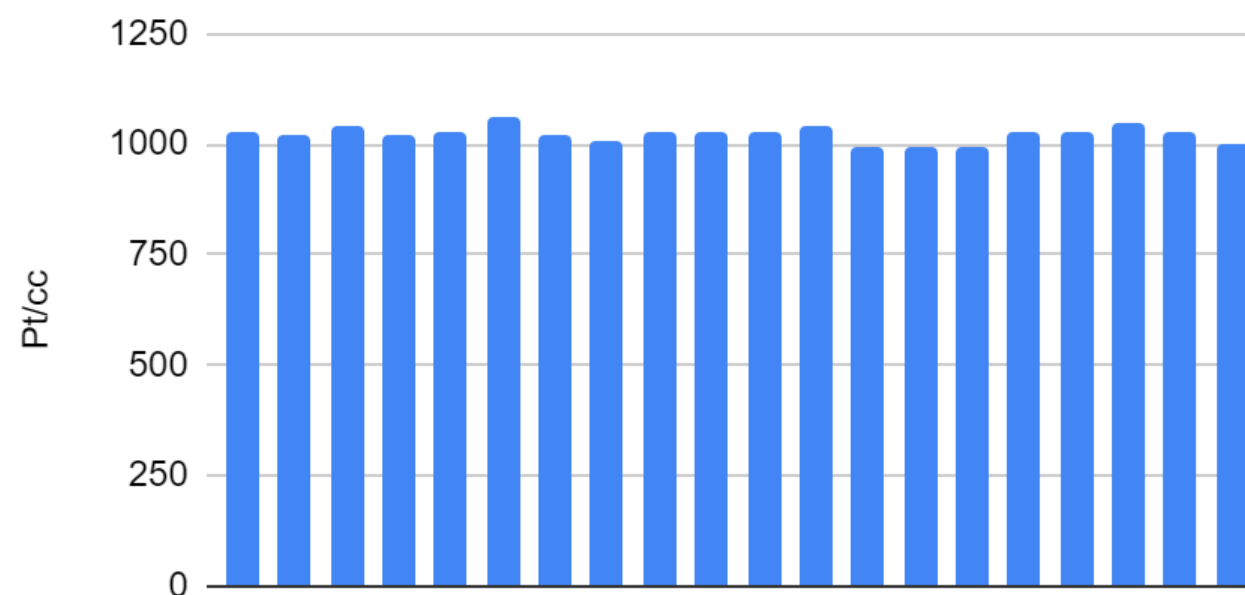


Average: 2161

Noise LAeq: 40.6 dB  
Min: 37.9 dB  
Max: 42.5 dB

## Particles per Cubic Centimeter

Center of room 6/6/24



Average: 1024

Noise LAeq: 38.0  
Min: 36.2  
Max: 43.9

# Room 175 had lower counts than room 110

When the HEPA filters are on in room 175. Particle counts are lower in room 175 than in room 110

.

