Analysis Technology of PM2.5 Hot-spots in Large Indoor Spaces

1. **Developing Staff Members** : Analysis Technology of PM2.5 Hot-spots in Large Indoor Spaces

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Department	Name	Position
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3. **Development Idea**

The COVID-19 epidemic that started in 2019 has swept the world and continues to today. The domestic epidemic began in May 2021. For the universities, students come from all over the counties in Taiwan, and mobile is often the key factor for the spread of the epidemic. Therefore, a non-passive epidemic prevention action in large classrooms is particularly important. This technology is to develop PM2.5 hotspots analysis technology in large indoor spaces, and propose a feasible non-passive epidemic prevention action for the clustering effect of large indoor spaces.

4. **Technological Competition and Industrial Application**

This method proposes a feasible non-passive epidemic prevention action for the clustering effect of large indoor spaces. The derivative application market of this technology lies in the markets of environmental protection and public health. For pathogens and germs transmitted through the air, there is a good choice for non-passive epidemic prevention action, and students can be assured to return to physical classrooms. In the future, this method can be applied for relevant intellectual property protection, and cooperate with public and private sectors related to environmental protection or public health. If the pilot area can be selected for medium-term time tracking, it is expected to estimate the reduction of social medical costs. For the analysis of PM2.5 hotspots in large indoor spaces and take necessary precautionary seating arrangements, it is expected to effectively prevent the occurrence of clustering effects in large indoor spaces.

5. **Merchandise Statement of Achievement**

Our team have used six air purifiers with direct-reading PM2.5 sensors, and adopted synchronous array measurement to measure PM2.5 hotspots points in the large indoor space of the EP105 ladder-type teaching classroom of the Department of Environmental Engineering and the flat-type CE305 conference room. Concentration distribution map, it is found that hotspots are

only observed in the stepped classrooms, and outdoor PM2.5 is the main factor affecting the average indoor PM2.5 concentrations. Then select the PM2.5 hotspot change test site for EP105 to conduct physical courses for students, it is found that once the students sat in the lecture hall, the previously found hotspots in the students' seats area was disappeared. This result can also be used as a direct proof of indoor clustering effect of COVID-19. It is worth noting that the original podium position was the lowest concentration, but it became a new hotspot after the students were full.

Fig 1：The Array Testing Method（Left）and the Testing site I EP105（Right）.

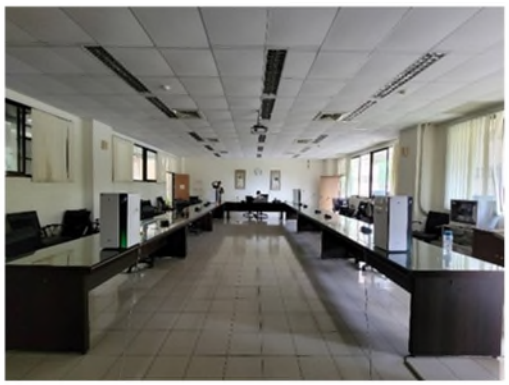

Fig 2：The Testing site II：CE305.

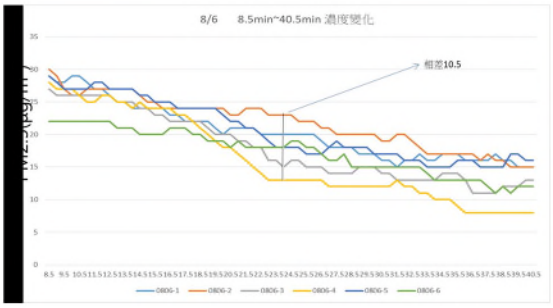

Fig 3：The plot of time-PM2.5 concentrations in EP105 for hotspots analysis.

PM2.5 concentration	#1	#2	#3
empty	20	25	18
Full with students	45	44	44
#4	#5	#6	Outdoor (background data)
15	18	18	30
66	66	45	57

Fig 4：Effect of students were full in the EP105 on the PM2.5 concentrations of each testing spots.