

## Effectiveness of the Phoenix MB72 on the UVC sterilisation of complex geometry microphone heads.

It has been questioned as to how effective UVC is when dealing with the complex geometry of a microphone head where there are multiple angles that can cast shadows.

In theory the use of a diffuse chamber should eliminate the presence of hard shadows but as UVC is invisible to human eyes and surfaces have very different reflection and absorption properties at UVC wavelengths we should further investigate this issue.

### Will UVC pass through a complex mic grille, and if so, will it be adequate to kill the required pathogens?

A typical microphone head from a Sure SM58, the most common vocal microphone was chosen as it was representative of most vocal microphones which are most likely to be highly contaminated with pathogens.

Firstly, UVC transmission through the head without the foam was measured. A lowest level exposure point was found in the chamber and a reading with the UVC sensor pointing away from the light sources

A reading of 83mW/cm<sup>2</sup> was observed.

Then a microphone head was placed over the UVC sensor and the level of UVC passing through the head was measured.



Figure 1 Baseline UVC exposure level



Figure 2 UVC levels inside the microphone grille

A reading of 29mW/cm<sup>2</sup> was observed.

We can conclude that passing freely through the wire grille and reaching the foam we have approximately 35% of the UVC light passing through the open grille exposing the interior.

We can also conclude that at 0.3 mW/cm<sup>2</sup> (chosen at a low exposure part of the chamber) it would require about 60 seconds to achieve a fully sterilising dose to 99.9% certainty to the foam windshield inside the wire grille head of a microphone for most specified pathogens.

### Does UV-C reach the internal foam windshield effectively and evenly?

To see the level of UVC exposure on the surface of the internal foam windshield we used a piece of mask filter paper treated with a UVC active photochromic dye. This dye has no reaction to visible wavelength light or lower band UVA. As the MB72 light sources only emit UV-C and a small visible wavelength we can be assured that the colour change of the photochromatic dye was entirely a function of UV-C exposure.

The microphone head was placed central in the chamber and the photochromatic paper was placed pointing away from the side mounted light sources, at the least exposed part of the head. The paper was mounted against the grille where the pop filter sponge would be mounted. After a short exposure 20 seconds the paper was removed and observed.



It was noted that all of the paper was possessing a slight change in colour while the areas exposed directly to the air and light were deeply coloured, areas where the paper was more shaded were more lightly coloured, but still well exposed. As the grille wire is round and does not fully shade anywhere there was good exposure under the wires. This result far exceeded our expectations.

### Is the grille wire itself fully exposed even in the most hidden areas?

Finally we tested the exposure of the surfaces of the grille wire itself. We chose again to place the microphone head high in the chamber where it would receive a very lateral exposure of direct light creating as many direct light shadows on the upper part as possible so as many diffuse reflections were exposing that area as possible. Exposure was from the sides just as with the filter paper test.



The photochromatic coating was applied. And can be seen to be white in the photograph taken under normal artificial light.

A very strong change of colour was noticed. It was noted that even deep into the recessed areas of the grille we saw a strong change of colour.

### Conclusion.

It can be concluded that in the diffuse reflective light chamber of the Phoenix MB72 there is adequate exposure of a complex geometry microphone head to suggest that pathogens will be killed deep into the grille and at least on exposed surfaces of internal foam windshields. Exposure times of 120 and 240 seconds would seem adequate to treat most microphones to the 99.9% recommended level and far exceed the 95% dose.



Figure 4 Treated grille unexposed to UVC

Figure 3 Treated grille exposed to UVC