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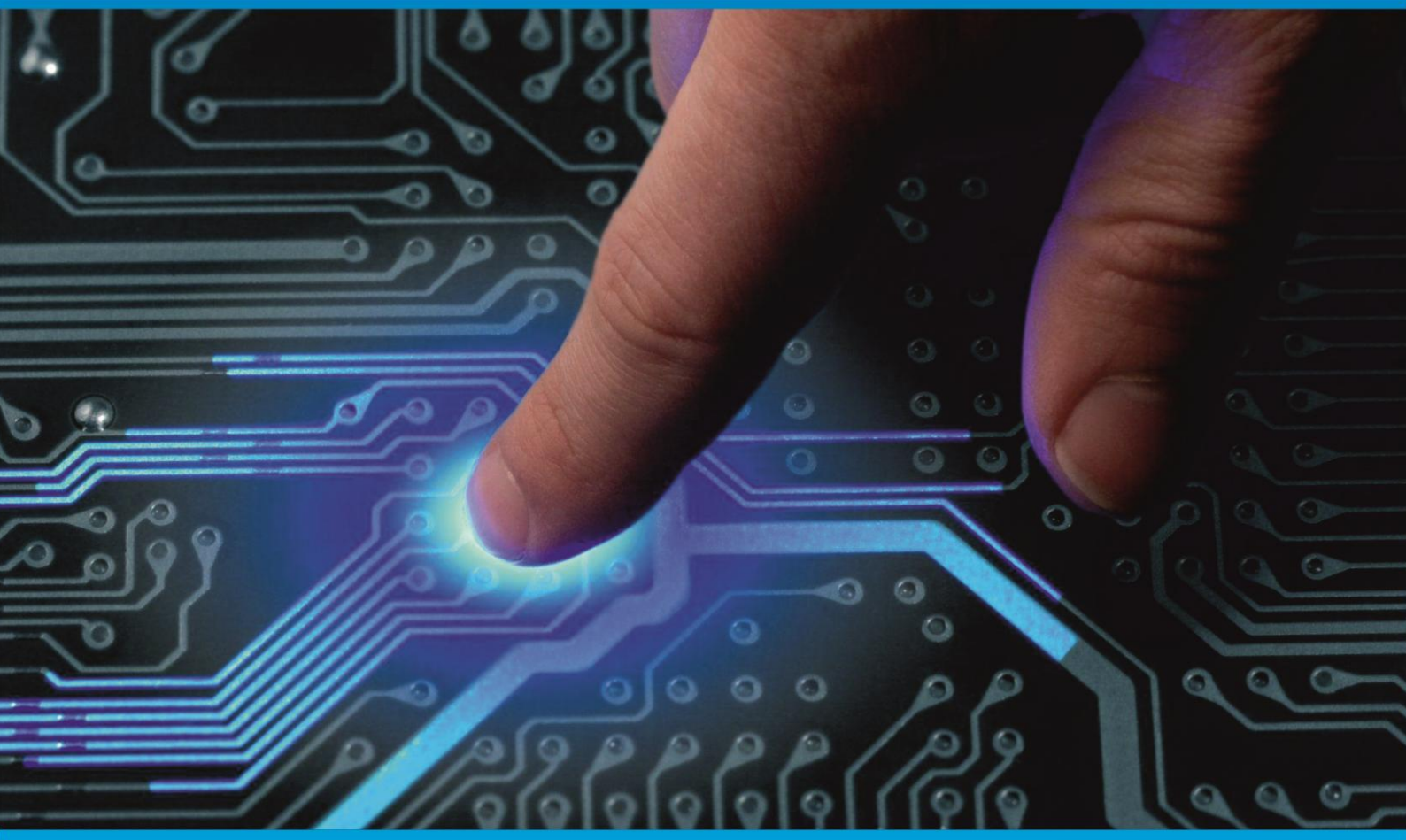

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# Ultra Violet Type C Disinfection System

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**ABSTRACT:** The quality of the air we breathe, the water we drink, and the cleanness of surfaces have a profound effect on our health and well-being. Moreover, if we are careful, the chances of getting infected via these mediums get reduced. However, the chances of getting infected due to the minute organisms that are present on the daily usable things shouldn't be neglected. During the pandemic time as of now, where the virus is causing so many fatalities, it becomes important to disinfect the daily usable items such as packaged food and groceries, wallets, stationery stuff, and many more. In one of the laboratory testing, it was found out the UV-C light sources inactivated 99% of the SARS-CoV-2 virus on a surface with an exposure time of 6 seconds. A clear indication that UV-C can play a valuable part in your protection strategy.

**KEYWORDS:** Disinfect, Frequency, SARS-CoV-2, Bacteria.

## I. INTRODUCTION

An investigation led by Hiroshima University scientists found that utilizing Ultraviolet C light with a frequency of 222 nanometers which is more secure to use around people successfully executes SARS-CoV-2 the primary examination in the world led to demonstrate its adequacy against the infection that causes COVID-19. Different examinations including 222 nm UVC, otherwise called Far-UVC, have so far just taken a gander at its power in destroying occasional Covid's that are fundamentally like the SARS-CoV-2 yet not on the COVID-19-causing infection itself. An in vitro test by HU scientists showed that 99.7% of the SARS-CoV-2 viral culture was killed following a 30-second exposure to 222 nm UVC light at 0.1 m W/cm2 which shows that when types of Ultra Violet, that too, in the range of 222nm won't cause harmful impacts to human beings [1].

The biophysically-based unthinking premise to this far-UVC approach12 is that light in this frequency range has an extremely restricted entrance profundity. In particular, far-UVC light (207–222nm) is emphatically consumed by proteins through the peptide security, and other biomolecules19,20, so its capacity to enter organic materials is extremely restricted contrasted and, for instance, 254nm (or higher) regular germicidal UV light21,22. This restricted infiltration is still a lot bigger than the size of infections and microbes, so far-UVC light is as efficient in slaughtering these microorganisms as ordinary germicidal UV light12–14. Notwithstanding, not at all like germicidal UV light, far-UVC light can't infiltrate either the human layer carenum (the external dead-cell skin layer), or the visual tear layer, or even the cytoplasm of individual human cells. In this manner, far-UVC light can't reach or harm living cells in the human skin or the natural eye, rather than the regular germicidal UV light which can arrive at these delicate cells7–10.

The far-UVC light is expected to have about the similar enemy of microbial properties as traditional germicidal UV light, however without delivering the relating wellbeing impacts. Should this be the situation, far-UVC light can be utilized in involved public settings to forestall the airborne individual-to-individual transmission of microorganisms, for example, the Sars-CoV-2 virus and others.

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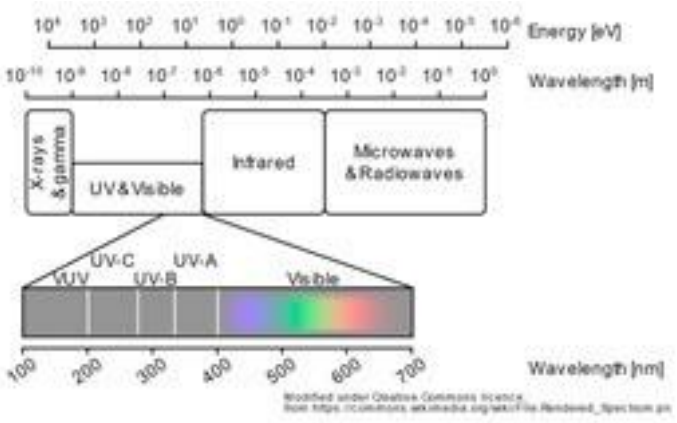


Figure 1.1: Electromagnetic spectrum position of the ultraviolet.

The Figure 1.1 shows where the ultraviolet rays lie in the electromagnetic spectrum and their types along with their wavelength.

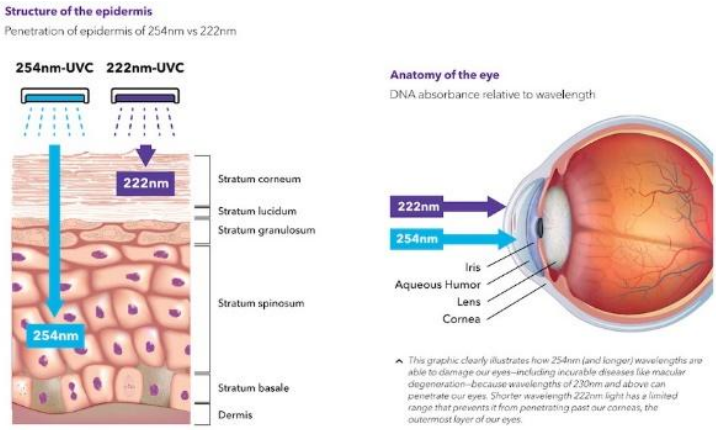


Figure 1.2: Display of the different wavelength position of human skin and eye.

The Figure 1.2 shows how the radiation of different UV rays penetrate the human eye and skin, Penetration have been shown in two ways one is of 222nm and the other is of 254nm rays.

## II. LITERATURE SURVEY

The blueprint of the UV-C disinfection system that was able to disinfect the bacteria named Bacillus cereus, a gram-positive endospore-forming bacteria and the results that came were positive in favor of the researchers [2].

Bacteria when exposed to the DUV Led treatments, researchers noticed a significant reduction in the culture of the Escherichia coli and Lister innocua on the nutrient-rich surfaces. There was a gradual decrease in the viable bacterial cells was attained in the 1 minute of the exposure and after 3 min of exposure there were no visible E. coli colonies were observed and after five min of exposure, L. innocua colonies were not found [3].

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The consideration of the inactivation and UV disinfection of murine norovirus (MNV) as a proxy for human norovirus. They examined the impacts of various surface qualities such as temperatures, and NaCl fixations on MNV endurance utilizing both a plaque test and a continuous TaqMan turn around record (RT)- PCR measure. and the results that came were astounding as the researchers found out that MNV can persist in various environmental conditions and can be efficiently controlled by UV disinfection [4].

The test was conducted to decide which wavelength of the UV light is more efficient in inactivating the bacteria strains such as Bacillus cereus, Arthrobacter nicotinovorans, Staphylococcus aureus, and Pseudomonas aeruginosa when different doses of UV radiation of 222nm krypton-chloride excimer lamp and a 254 nm mercury lamp under laboratory conditions and the results in the favor of 222nm UV light as the UV fluence mainly affects the sensitive microorganisms[5].

The most important thing about any microorganisms in the period or the duration in which the microorganisms survive on any surfaces is thoroughly explained[6].

The affectability of Escherichia coli MG1655 to three actual pressures (gentle warmth, UVA light, and daylight) that are significant in the sterilization of drinking water with sun-based radiation is controlled by the particular development pace of the way of culture[7].

The discovery pictures that sugar digestion was influenced rather the amino-acids in S. Typhimurium cells lighted at various occasions upon photograph Fenton conditions. The discoveries recommend interestingly that photograph Fenton measure at pH 5.5 could actuate practical yet nonculturable state (VBNC) on waterborne S. Typhimurium and that most likely sugar digestion harm could enact the VBNC state[8].

When the UV radiations along with the mixture of the chemicals PAA along with UV rays which were used in the sterilization treatment of enteric microorganisms accomplished critical collaboration benefits, while the medicines of coliphage MS2 didn't show huge cooperative energies. The consolidated H2O2/UV sanitization just somewhat affected the microbial decreases contrasted with UV medicines and created no cooperative energies. The outcomes unmistakably show higher obstruction of coliphage infections likewise against consolidated sterilization medicines[9].

DNA is surely one of the critical focuses for UV-actuated harm in an assortment of life forms going from microscopic organisms to people. UV radiation actuates two of the most bountiful mutagenic and cytotoxic DNA injuries, for example, cyclobutene–pyrimidine dimers (CPDs) and 6–4 photoproducts (6–4PPs) and their Dewar valence isomers. Notwithstanding, cells have fostered various fix or resilience systems to neutralize the DNA harm brought about by UV or some other stressors. Photoreactivation with the assistance of the chemical photolyase is perhaps the most significant and habitually happening fix components in an assortment of creatures[10].

## III. BENEFITS OF ULTRAVIOLET TYPE C DISINFECTION SYSTEM

**Simple in use:** UV-C disinfection frameworks are regularly more modest and simpler to use than traditional frameworks, with reasonable capital and operational expenses. UV disinfection doesn't alter the flavour of fluid or food, which can occur with synthetic or warmth medicines.

**Safety to use:** UV disinfection systems are regularly more secure for the staff utilizing them than substance devices, and killing the need to create, store and transport hazardous and conceivably poisonous synthetic compounds, and precisely they are safe to use.

**Effective against the microorganisms:** Germicidal lights are similarly powerful against microbes, moulds, spores, microscopic organisms, and infections.

**Less cost:** UV Light Disinfection is Affordable and can be afforded by anyone and can be used or implemented in any public places.

## IV. CHALLENGES FACED BY USING ULTRAVIOLET TYPE C DISINFECTION SYSTEM

The main challenge that the UVC disinfection system may pose is the chances of radiation leakage from the device during usage. Though the wavelength that we use is less impactful to humans even the small percent that stays longer in the environment may become harmful (not that severe) due to many external factors.

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The person who handles the system should be careful in ensuring that the device is properly closed and the chances of radiation leakage happening are reduced.

The other major challenge is the time and space that are required in the disinfection process. If one of the factors fails, then the disinfection doesn't go the way we want.

## V. CONCLUSION

The UV-C is strongly absorbed by RNA and DNA bases leading to molecular structural damage via a photo-dimerization process. This results in virus inactivation, such that they are no longer able to replicate which helps to kill the viruses on surfaces.

The UVC lamps that are placed either on top or bottom helps in destroying the RNA and DNA of the SARS-CoV-2 viruses thereby preventing the replication of those viruses. When there is no replication, there won't be any kind of growth in virus and thus killing the virus and hence stopping the prevention. This device that's not only applicable for the SARS-CoV-2 virus but also helps in killing otherviruses.

## VI. FUTURE SCOPE

At present time, the disinfectant is found only in hospitals for sterilization of the surgical instruments. In future the UVC disinfectant can be used in any public places or crowded areas like public institutions and private institutions (schools, colleges, offices, government offices).

The device can also be used to disinfect the entire rooms by removing the magnetic switches, but it should be done with high measures when the disinfectionhappens.

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