

19 March 2020

**COMMUNICATION No. 3****Reducing the coronavirus risk by using ultraviolet radiation**

According to the scientific reports and a statement of the National Health Commission of the People's Republic of China, the SARS-CoV-2 coronavirus is sensitive to ultraviolet radiation, especially in the UVC range (200 - 280 nm). Therefore, like other bacteria and viruses, it can be effectively eliminated by using germicidal lamps.

However, it is important to remember that when a biological tissue (human skin and eyes) is exposed to the radiation from germicidal lamps (UVC), it can lead to harmful health consequences. That is why the exposure limits are established - the so-called Maximum Permissible Exposure (MPE) to UV radiation (included in the Directive 2006/25/EC of the European Parliament and of the Council of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation). During a work shift (regardless of its duration), actinic radiant exposure (dose) must not exceed 30 J/m<sup>2</sup>.

According to the currently available resources provided by the National Health Commission of the People's Republic of China, rooms should be disinfected with direct ultraviolet radiation at an irradiance of more than 1.5 W/m<sup>2</sup> for at least 30 minutes. This means that the necessary dose to eliminate these pathogens should be at least 2700 J/m<sup>2</sup>. However, it is equivalent to 90 times the MPE (Maximum Permissible Exposure) value of 30 J/m<sup>2</sup>. As a consequence, humans are not allowed to stay in the room that is disinfected with direct UVC radiation.

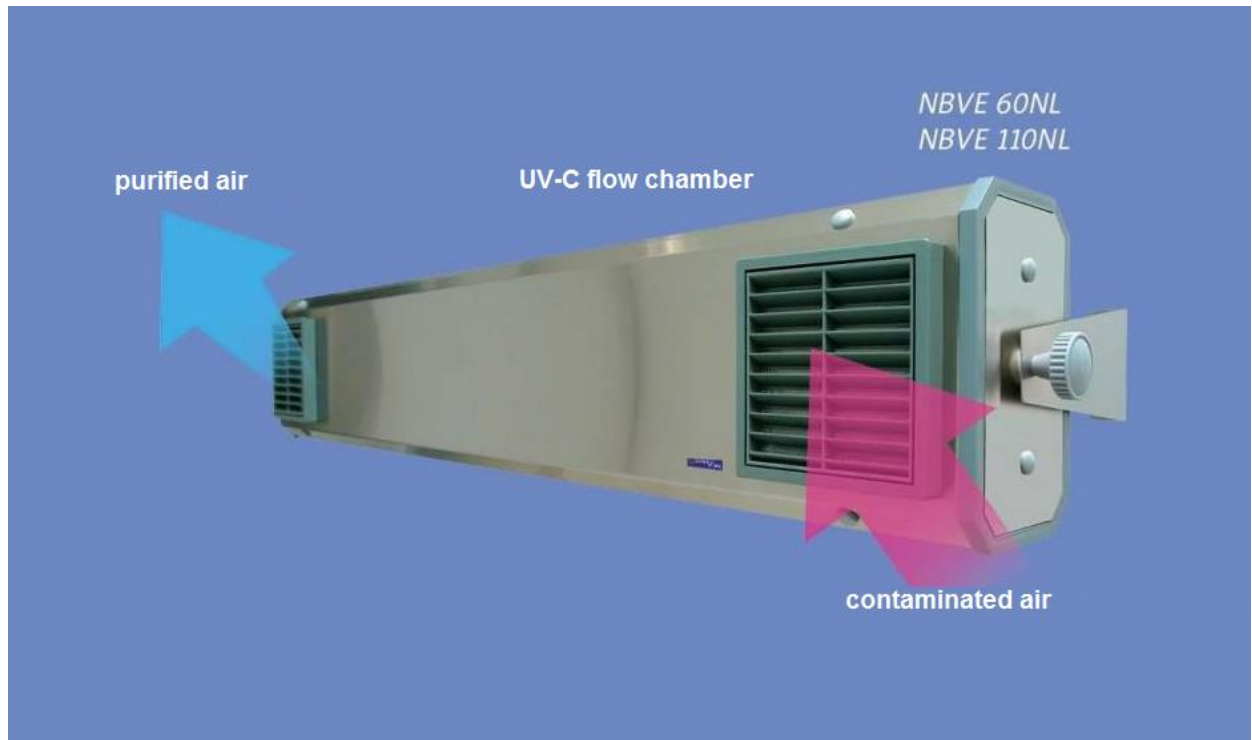
Instead of directly irradiating the surface, a safer solution is possible, namely application of germicidal luminaires with a forced airflow function. In these luminaires, air disinfection takes place in a closed chamber that prevents the transmission of UVC radiation outside the luminaire.

As a result, during the disinfection process people who stay in the room are not exposed to the UVC radiation emitted by the luminaire.

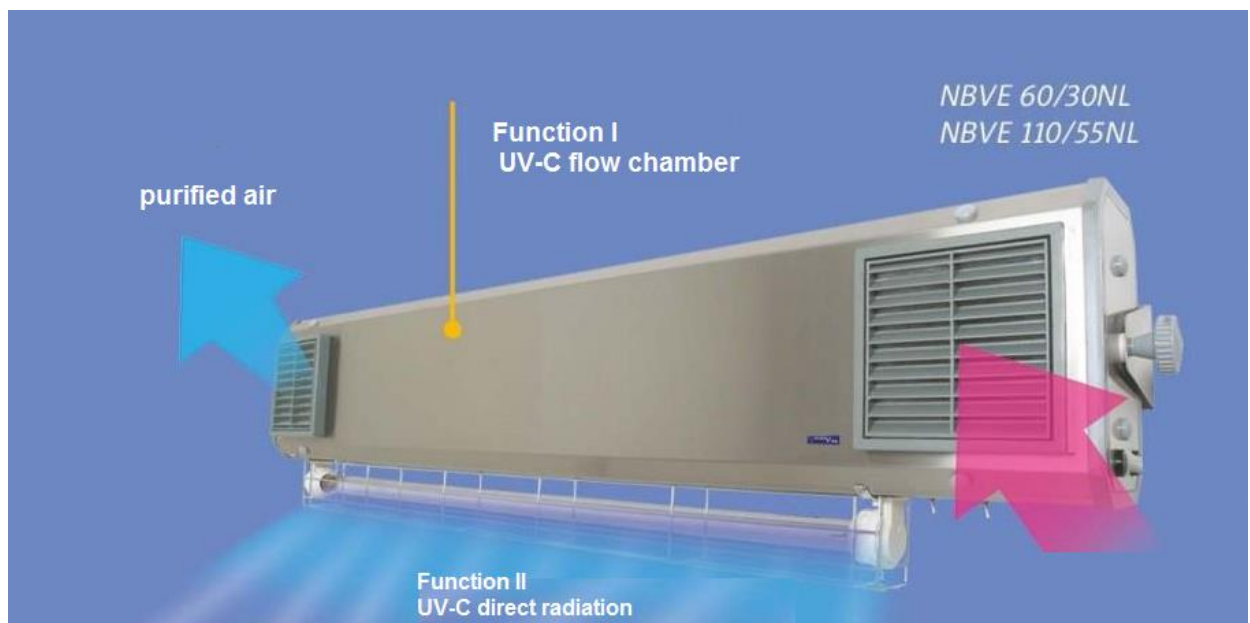
These luminaires are available in two basic types: single-functional (solely flow air disinfection {Fig. 1a}) or double-functional with additional option of direct disinfection, i.e. with additional UVC lamps installed outside the luminaire (Fig. 1b).

Fig.1 Germicidal luminaire

a) single function luminaire, b) double function luminaire



a)



b)

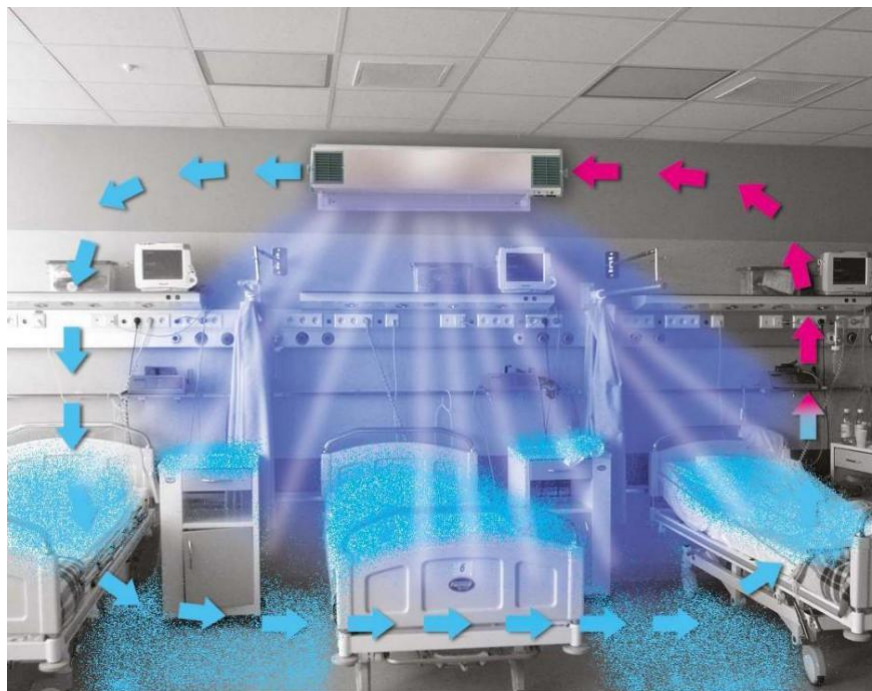
Process of the treatment is shown in Fig. 2a and 2b

Fig. 2. Process of the treatment with the use of:

- a) single function luminaire
- b) double function luminaire



a)



b)

Given the current situation of coronavirus threat, the best solution seems to be the use of single function type of germicidal luminaires (i.e. with forced airflow). Such luminaires can be mounted on the ceiling, wall or installed on a mobile stand (Fig. 3). Therefore, it is possible to use them both in working rooms, waiting rooms and corridors, etc. However, it is necessary to remember that the efficiency of one such luminaire (depending on its power) ranges from about 100 to 200 m<sup>3</sup>/h.



Fig. 3: Example of a mobile germicidal luminaire

Author:

Prof. Agnieszka Wolska – Head of the Laboratory of Optical Radiation

e-mail: [agwol@ciop.pl](mailto:agwol@ciop.pl)

Andrzej Pawlak

e-mail: [anpaw@ciop.pl](mailto:anpaw@ciop.pl)