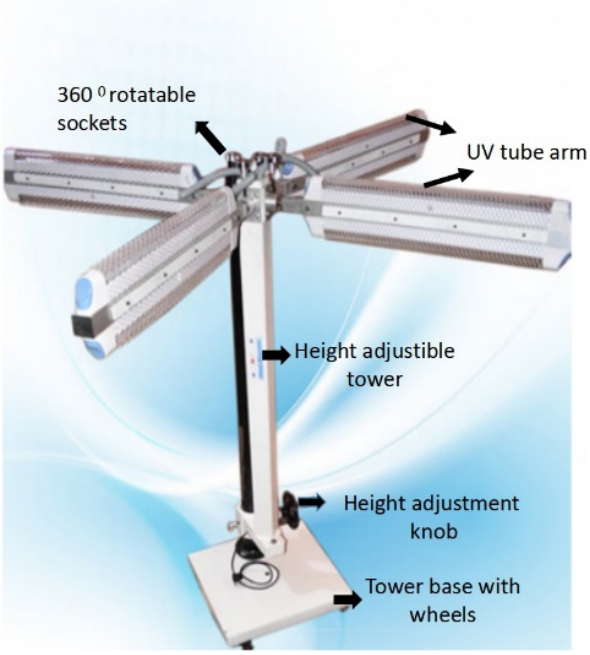
L.7: "नीलभस्मी" (NeelBhasmi) - UV based area sanitization device to inactivate various micro-organisms including corona viruses

The onset of the COVID-19 pandemic caused by the virus SARS-CoV-2, has invoked widespread interest in using Ultraviolet-C (UV-C) radiation based disinfection. This is because of its well-established efficacy against various coronaviruses including the virus SARS-CoV-1, which is a close genomic relative and a viable proxy for SARS-CoV-2 in the context of UV-C inactivation. A UV-C light based mobile sanitization device, which uses 253.7 nm UV-C light generated by low-pressure mercury lamps and is termed "NeelBhasmi", has been designed and developed at RRCAT. The device is intended for remotely sanitizing the air as well as the surfaces of various objects inside a room at research centres, hospitals, offices, or any other places of work. It offers multiple degrees of freedom of the UV-C sources and thus provides very efficient utilization of the UV-C radiation for sanitization.

NeelBhasmi has a height-adjustable vertical tower whose top end is attached with four moveable arms, each fitted with two UV-C lamps. The UV-C power of each of the lamps is around 13 W. Each of the arms can be rotated through 360° with respect to its own axis and also along the horizontal plane. The arms can also be moved at any angle between zero and 145° with respect to the vertical tower. These multiple degrees of freedom of arm movement allow the user to maximally illuminate surfaces of any orientation, horizontal, vertical or inclined, for efficient sanitization. The height adjustability of around 3 feet of this vertical tower from 5 feet to 8 feet is achieved through a rack and pinion assembly. This height adjustability allows the user to place the lamps from the target surface as close a distance as possible so as to be able to sanitize it in a minimum time. The bottom end of the vertical tower is mounted on a solid metallic base having four sturdy nylon wheels that provide the device the convenience of easy mobility to move across the room. The UV-C lamps of the system can be remotely switched on and off from outside room so as to cause no exposure of UV-C radiation to the operator. The adjustable timer provided with the device allows one to set the time duration over which the lamps are required to remain switched on for the purpose of disinfection. The motion sensor attached with the device will switch off the lamps in case of any inadvertent movement by any person inside the room, when it is in use. The UV-C lamps have special design that minimizes creation of ozone.

The efficacy of NeelBhasmi for disinfection against SARS-CoV-2 was evaluated at the BSL-3 Laboratory of Virus Research and Diagnostic Laboratory (VRDL) in Employees' State Insurance Corporation (ESIC) Medical College, Hyderabad, which is an Indian Council of Medical Research (ICMR) approved laboratory for COVID-19 test. Different materials like glass, plastic, paper, cloth, etc. impregnated with SARS-CoV-2 were kept at different heights as well as at different distances from NeelBhasmi over an area of 13 m^2 in the laboratory. It was found that UV-C radiation from NeelBhasmi could inactivate SARS-CoV-2 viruses from the surfaces of all these materials as confirmed by the gold standard RT-PCR. Figure L.7.1(a) and L.7.1(b) show the photographs of 'नीलभस्मी' (NeelBhasmi). The technology of the device has been transferred to several Indian industries.

Presently, NeelBhasmi is being extensively used at several places including Indore airport, government offices in Delhi including PMO etc. for large area disinfection.



(a)

(b)

Fig. L.7.1:Photographs of 'नीलभस्मी' (NeelBhasmi) showing different parts. (b) 'नीलभस्मी' (NeelBhasmi) being used at RRCAT Medical Centre.

Reported by:
S. K. Majumder (shkm@rrcat.gov.in)