PACS: 42.72.Bj, 07.05.Tp

# Optimization of the design of open-type ultraviolet irradiators

*D. E. Naumenko*[1], *V. A. Levchenko*[2] *and A. I. Vasiliev*[2]

[1] Moscow Institute of Physics and Technologies
9 Institutskiy per., Dolgoprudny, Moscow Region, 141701, Russia
E-mail: i@ddannaum.ru

[2] NPO "LIT"
25 Likhachevsky proezd, Dolgoprudny, Moscow Region, 141701, Russia

*Received 18.03.2024; revised 3.04.2024; accepted 10.04.2024*

***The distribution and flux of ultraviolet radiation in the space around outdoor open-type irradiators with a different number and arrangement of lamps has been studied. A design model of an irradiator consisting of low-pressure gas-discharge amalgam lamps and power opaque structural elements of circular cross-section has been developed, taking into account the location and dimensions of all absorbing structural elements. As a result of experiments and computer simulations, it was shown how gas discharge lamps should be positioned to achieve the best utilization rate of the bactericidal flow. The results of the calculated model coincide with the experimental results.***

*Keywords*: ultraviolet radiation, open irradiators, bactericidal flux utilization factor, gas discharge lamps, amalgam lamps, shading, computer modeling.

**REFERENCES**

1. Kostyuchenko S. V., Vasiliev A. I., Tkachev A. A., Zagainova A. V., Kurbatov I. V., Abramova I. A., Yudin S. M. and Gritsyuk O. V., Hygiene & sanitation **100** (11), 1229–1235 (2021).
2. Ultraviolet technologies in the modern world / ed. Karmazinov F. V., Kostyuchenko S. V., Kudryavtsev N. N., Khramenkov S. V., Dolgoprudny, Intellect Publishing House, 2012 [in Russian].
3. Shandala M. G., Abramova E. M., Sokolova I. F., Yuzbashev V. G., Fingers Yu. P., Ivantsova T. V., Tsirulin A. V., Wasserman A. L. and Lavrova R. G., P 3.5.1904-04, The use of ultraviolet bactericidal radiation for indoor air disinfection; Moscow, Ministry of Health, 2004.
4. Perminov S., Mikhailovskiy N., Sedunin A., Okunevich I., Kalinov I., Kurenkov M. and Tsetserukou D., 17th International Conference on Automation Science and Engineering (17). Lyon, 2021, pp. 2147–2152.
5. Haag C. W., Holliday G., Archulet K. and Tang W., Infection Control & Hospital Epidemiology **44** (9), 1505–1507 (2023).
6. Jin S., Linden K. G., Ducoste J. and Liu D., Water Research **39** (12), 2711–2721 (2005).
7. Vigstrand O., Development of an absorption model for gas discharge lamp simulation: master's thesis. Malmo, Malmo University, 2021.
8. Lawai O., Dussert B., Howarth C., Platzer K., Sasges M., Muller J., Whitby E., Stowe R., Volker A., Witham D., Engel S., Posy P. and van der Pol A., IUVA News **19** (1), 9–16 (2017).