Karlsruhe Institute of Technology

Light, ECG and Plasma Technologies
Light Technology Institute
Karlsruhe Institute of Technology

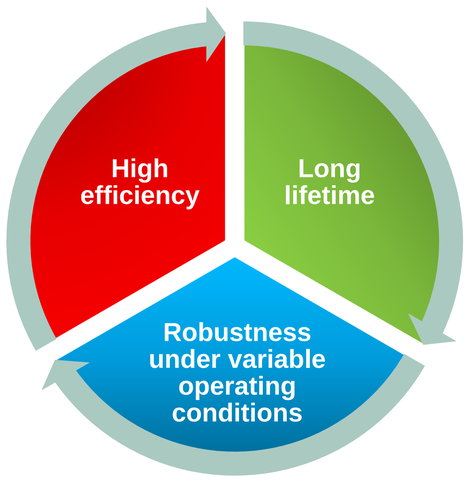
# Inductively-Driven Highly-Efficient Low-Pressure UVC Lamp System For Water Treatment

An Industry-Level Demonstrator for Long-Lifetime and Contactless-Sterilization Application

Qihao Jin, Tim Gehring and Rainer Kling

*Light Technology Institute, Karlsruhe Institute of Technology, Engesserstr. 13, 76131, Karlsruhe, Germany*

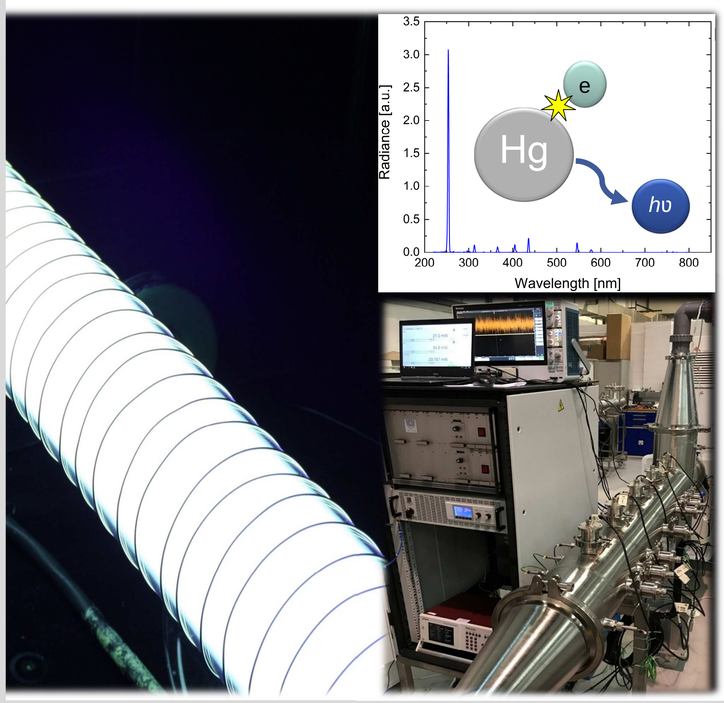
## Motivation

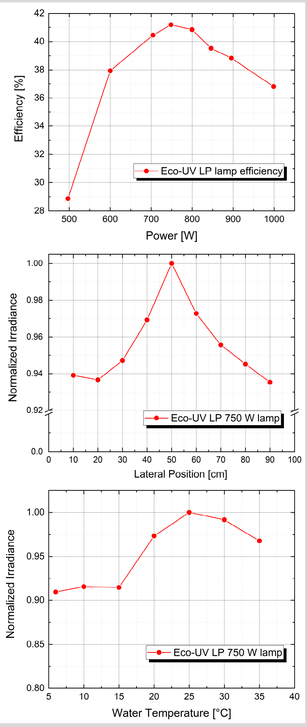



UV discharge radiation technology provides a non-contact, clean and cost-effective approach, which has been applied in many global water treatment infrastructures due to its relatively high energy efficiency [1]. Due to the existence of electrodes in the conventional UVC lamps, the lifetime of the light source is typically limited around ten thousand hours. However, the inductively driven lamp, also widely known as one of the electrodeless lamps, offers the possibility to operate the radiation source up to one hundred thousand hours without the electrodes-corrosion problem [2].

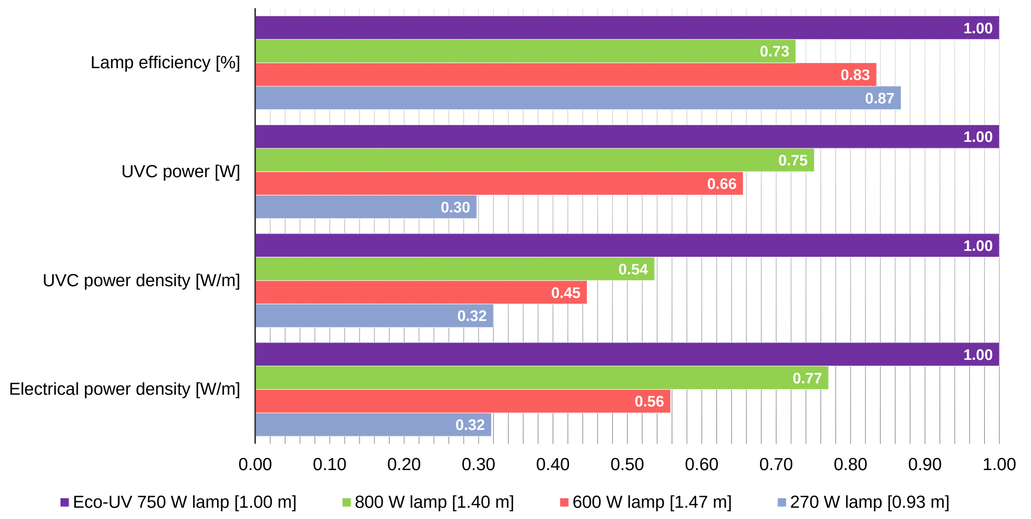
As a demonstration for an industry-level water treatment system, meeting the basic requirement of a practical working station, which means high efficiency, long lifetime and high robustness under variable ambient conditions is therefore highly desirable.

## R & D




## Industry Horizon




The developed lamp was compared with three commercial lamps in terms of efficiency, UVC output power level, UVC output power density and input electrical power density. The figure shows the normalized values for the comparison.

## Summary

1. Over 40% UVC efficiency has been achieved around 750 W.
2. UVC radiation over the lamp lateral axis is homogenous over 80% of the total length.
3. Stable UVC radiation output from 6°C to 35°C.

## Outlook

1. Higher power level investigation is desirable.
2. Further efficiency improvement is possible.
3. Application in multi-lamp system is scheduled.
4. Industry test on the existing demonstrator is recommended.

Reference:
[1] Ultraviolet Light in Water and Wastewater Sanitation, CRC Press, (2002)
[2] Handbook of Advanced Lighting Technology, Springer International Publishing Switzerland, (2017)

Project funding:
Eco-UV is a major new programme supported by the European Union's Horizon 2020 research and innovation fund. The project aims to develop a new generation of super-efficient, low energy, long life UV lamps and systems. Grant agreement number 641702.

Contact: qihao.jin@kit.edu