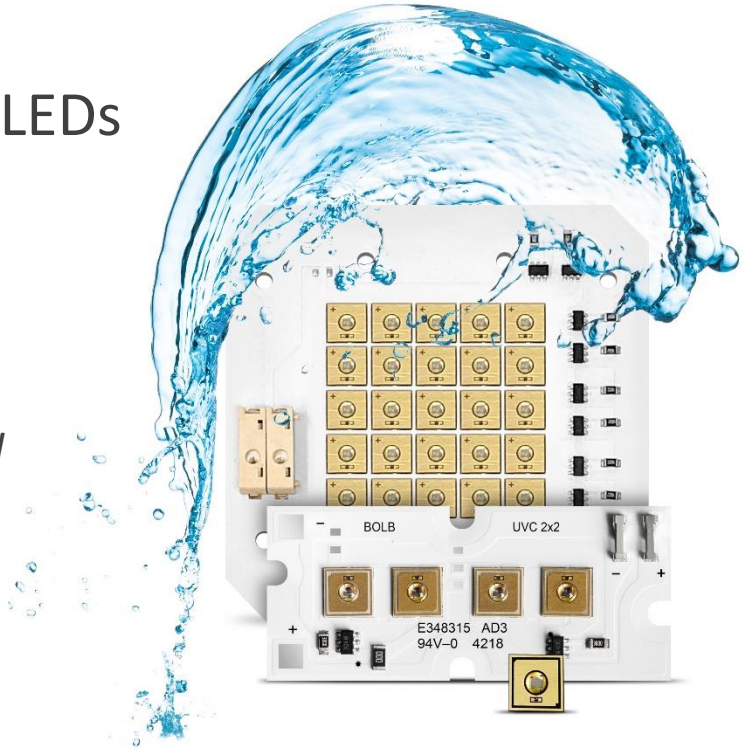
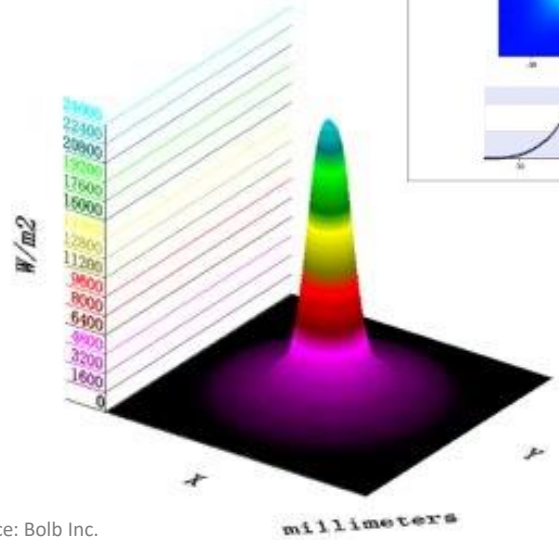
High Power, Robust UVC LEDs for Water Purification

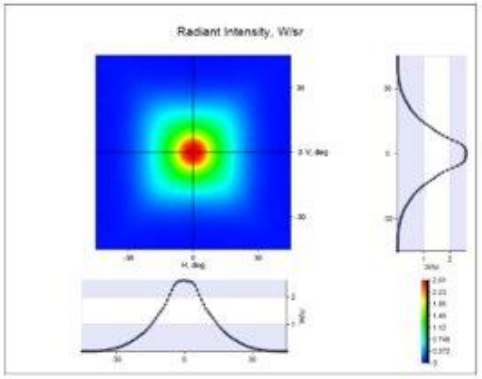
EPIC Online Technology Meeting on Water Quality Monitoring and Purification (in cooperation with IUVA)



Source: Bolb Inc. / © istock.com/pavlinec

Demonstration:
Single UVC LED Point-of-Discharge / Faucet Hospital Water Treatment Reactor





Source: Bolb Inc.

Validation Test Results

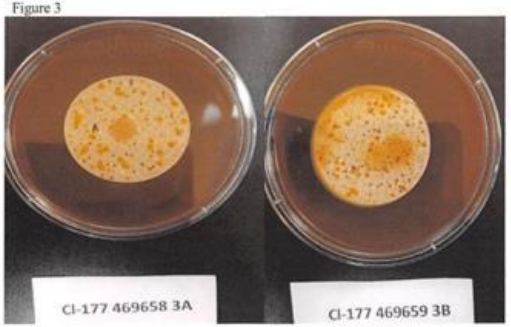
Bolb‘s Demo Water Treatment Reactor Tests

Flow	Rate	E. Coli Reduction Rate
LPM	GPM	
1.5	0.40	> 99.999%
5	1.32	99.999%
15	3.96	99.75%
20	5.28	97.52%

Before

After

Figure 3



Rev. 1 Added counts CFU/mL to sample 469654-469657

Figure 4

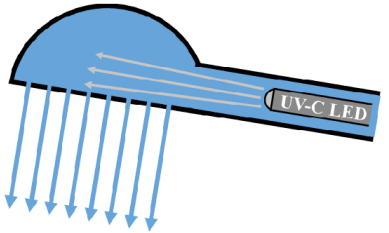
Figure 5

Rev 1 – Update summary and added Figures 4 and 5.

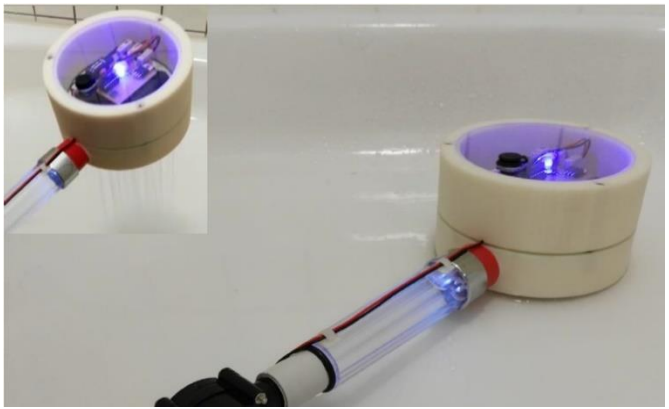
Source: Bolb Inc.

Single 100 mW LED in a Shower Head

- Schmid et al.: 254 nm UVC hg lamp source – Legionella rubrilucens 90% reduction with 1.1 mJ/cm²
- Hessling et al.: using single 100 mW LED dependent an angle of emission distribution - only 0.01 s required for 90% reduction; or 0.03 sec for 99.9% reduction
- Driven by a water flow turbine



Scheme of a UV-C LED within a Shower Head



Source: Martin Hessling, Ph.D., Professor,
Institute of Medical Engineering and Mechatronics, Ulm University of Applied Sciences

Single Emitter Ongoing Technology Advancement

June 2020

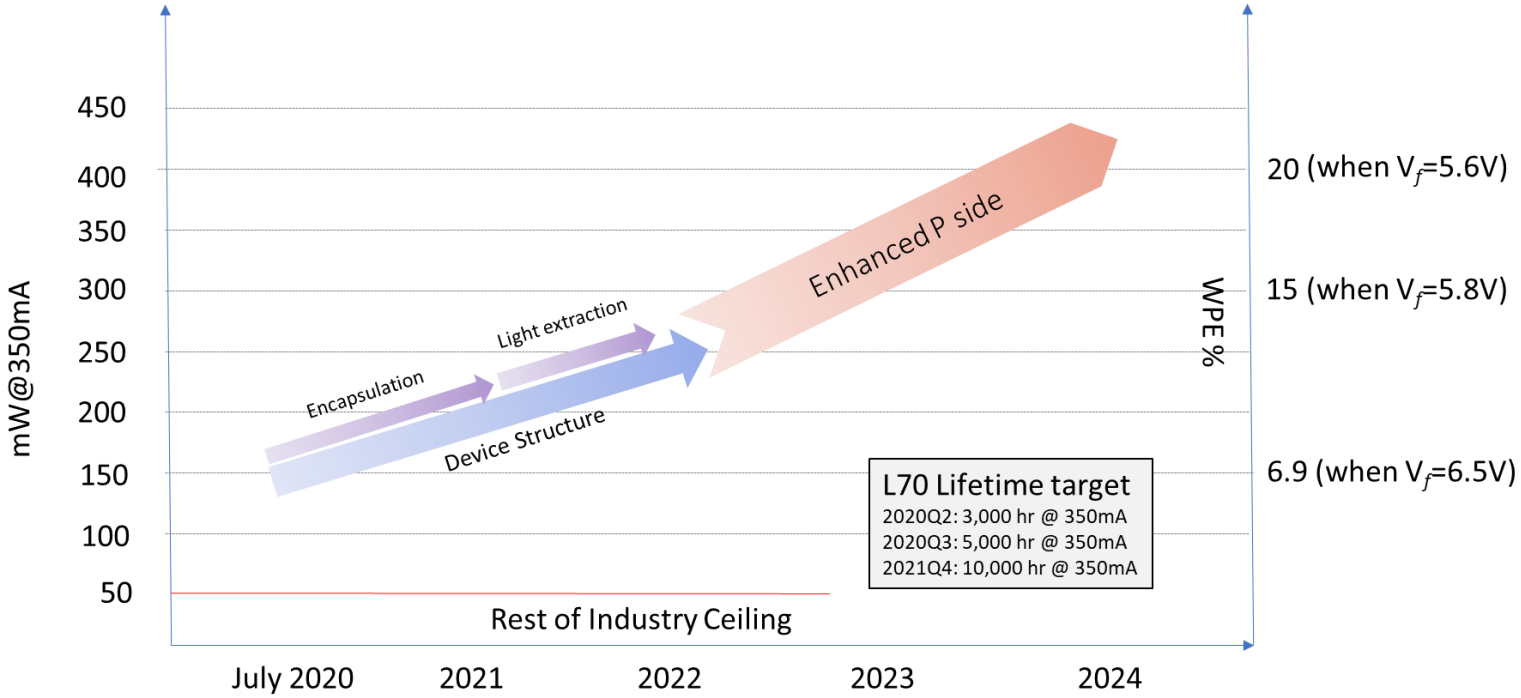
Typical single emitter
140 mW @ 350mA 6V
6060 SMD
L70 5000 hours from Time 0
at case temp of 38 °C

June 2021

Typical single emitter
200 mW @ 350mA 6V
6060 SMD
L70 7000 hours from Time 0
at case temp of 38 °C

Source: Bolb Inc.

Development Progress



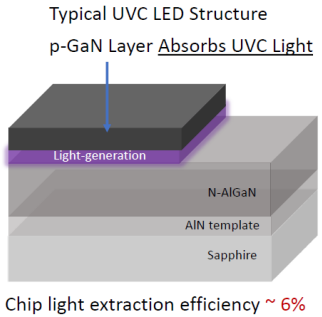
Source: Bolb Inc.

The Game Changer in Solid-State UVC Technology

Conventional Design:

non-transparent P layer Very Poor η_{ext} <6%)

- Low power
- High heat
- Hard to pack densely in array



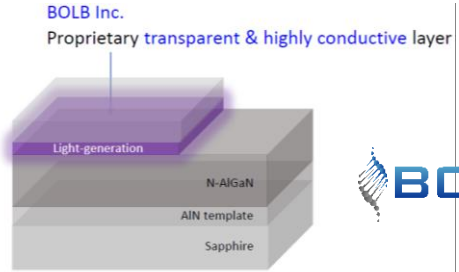
Chip light extraction efficiency ~ 6%

Breakthrough Design:

transparent P layer and efficient hole injector

Excellent η_{ext} (pathway to 60%)

+ Low power
+ High heat
+ Hard to pack densely in array



Enables extraction efficiency ~ 60%

Source: Bolb Inc.

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