



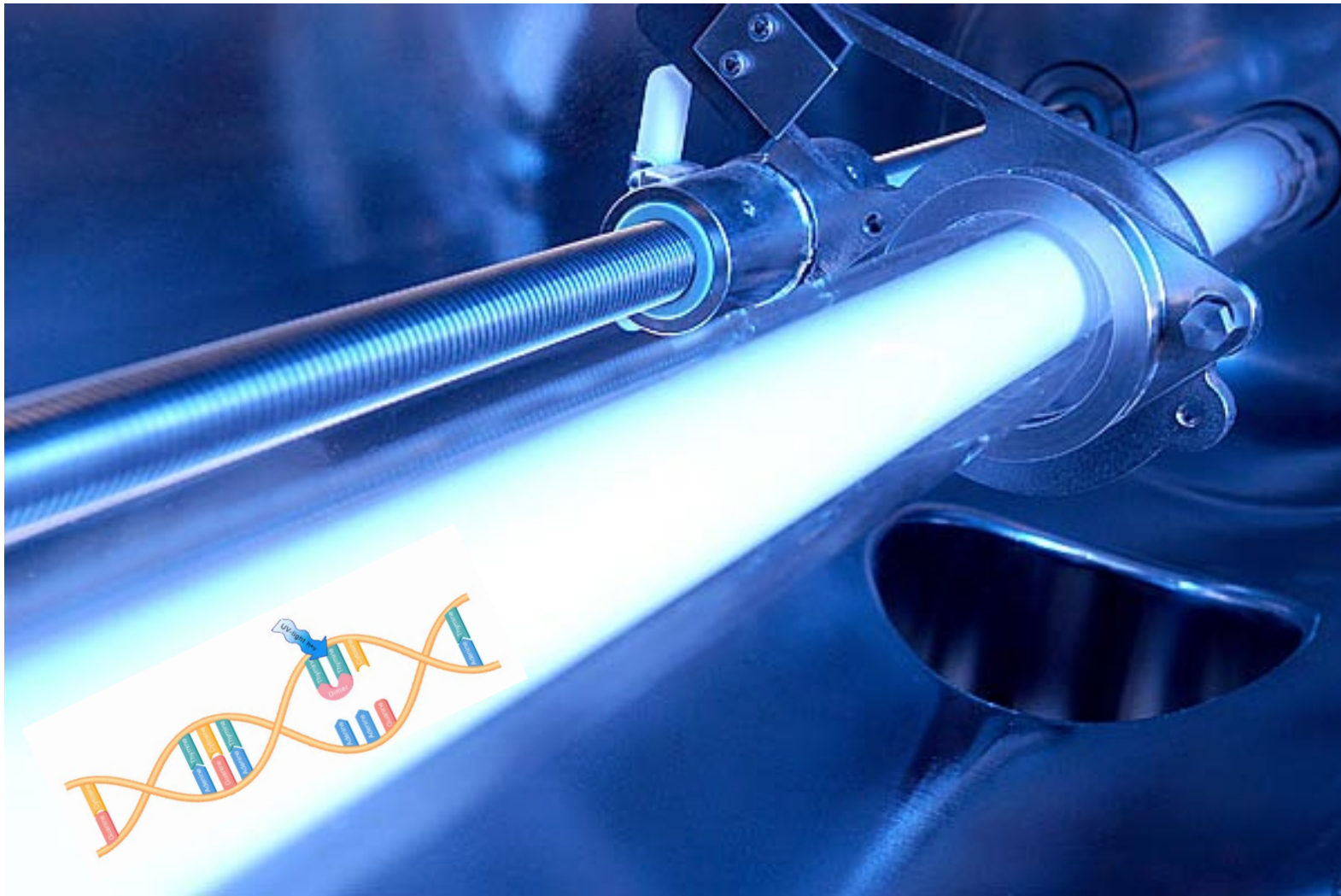
Large-Scale UV-LED Reactor for Water Treatment

Fariborz Taghipour

The University of British Columbia
Vancouver Canada

UV reactor

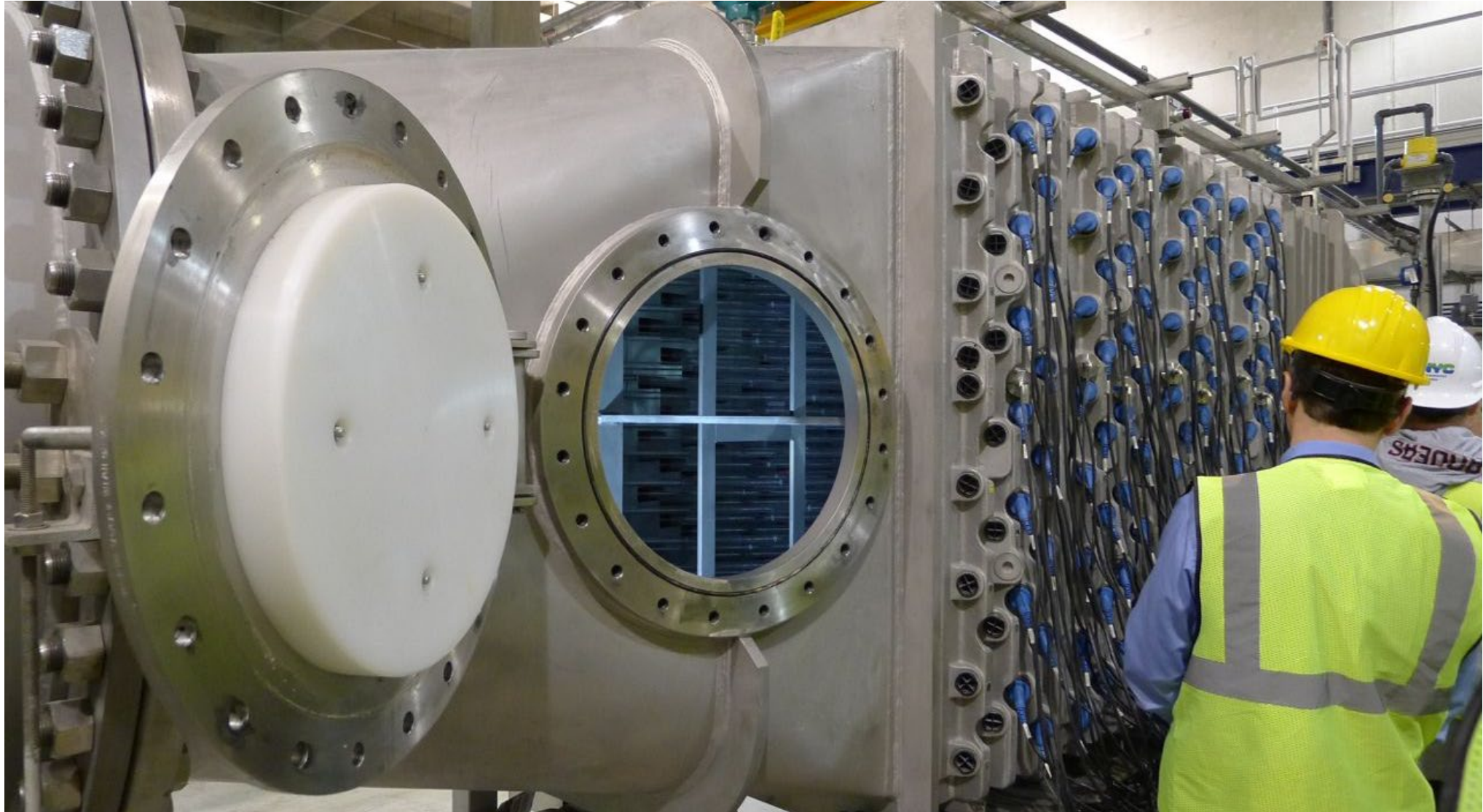
(one of) the fastest growing water disinfection technology



UV Reactor Vancouver



UV Reactor New York



















Water Treatment Paris



UV-Led Advantages

UV Lamp vs. UV LED

Conventional UV Lamp

Bulky		Structure		Compact
High		Power Consumption		Low
Long		Start time		Instant
High		Heat Production		Minimal
Hazardous		Environmental (Mercury used)		Friendly
Broad		Wavelength		Single
1,000 hours		Lamp Life		50,000 hours
Dangerous		Hazards Eye, Skin, Breakage, Voltage		Safe

UV LED

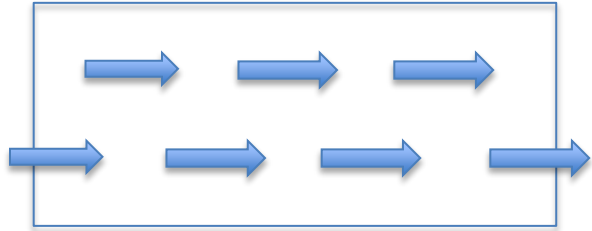


UV Lamp

UV-LED Reactor



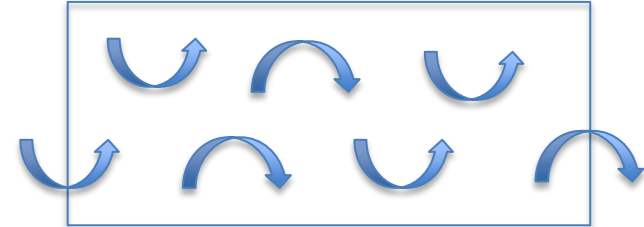
UV LED



less control



Hydrodynamics



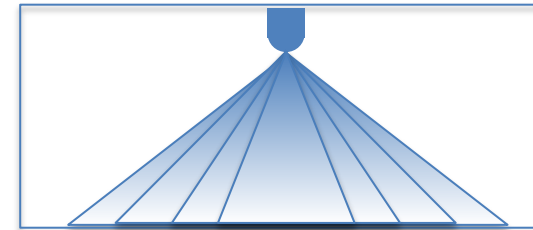
more control



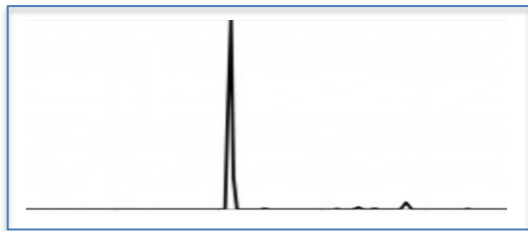
fixed pattern



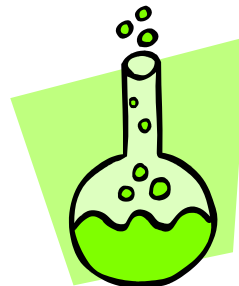
Optics



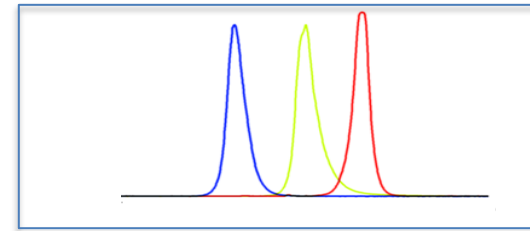
adjustable pattern



set photoreaction

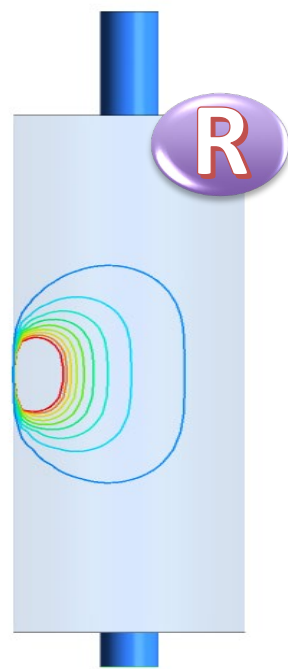
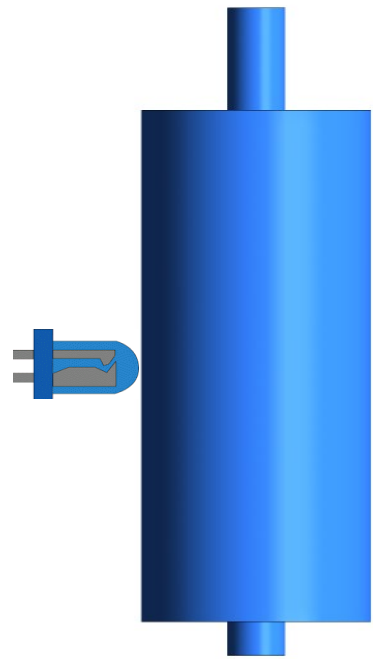


Kinetics



targeted photoreaction

Complex Phenomena



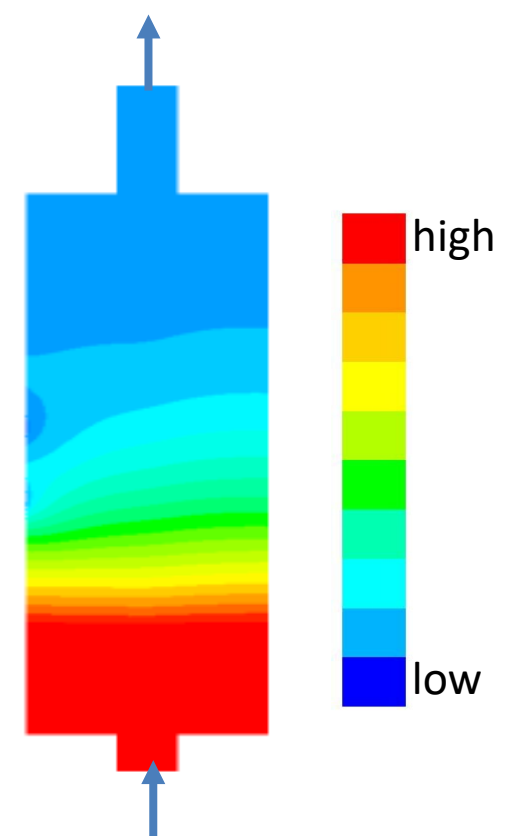
Radiation



Velocity

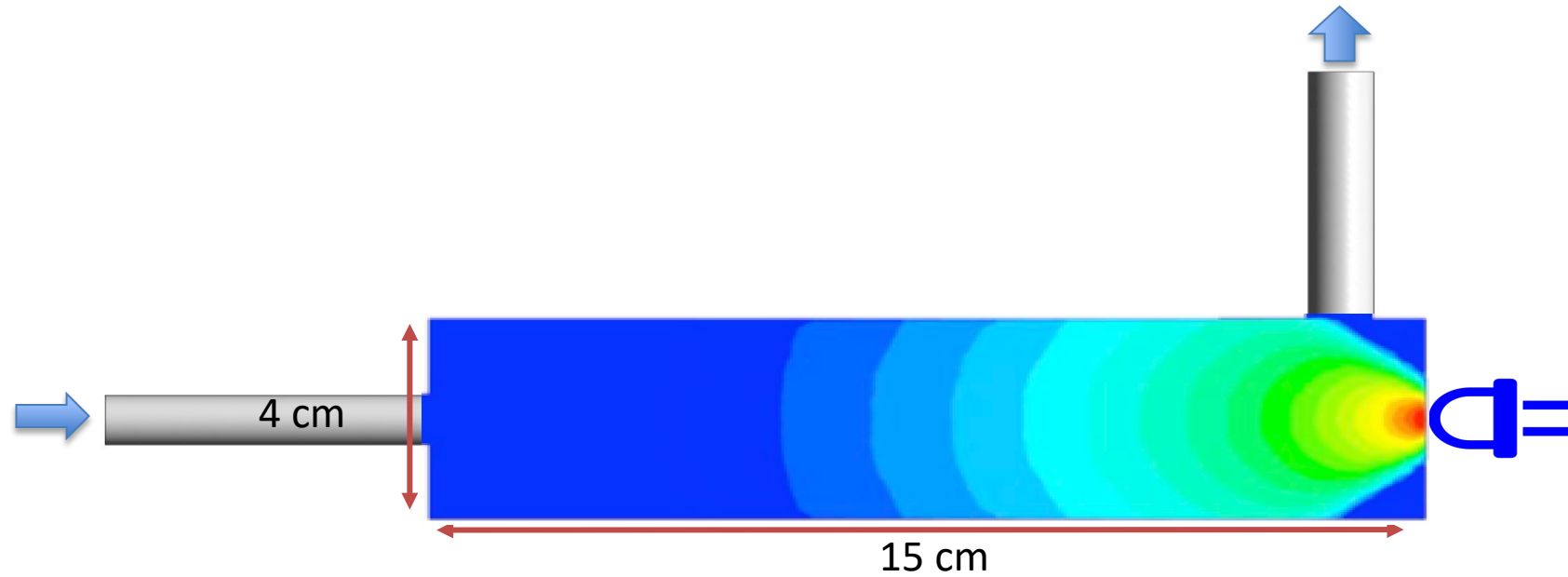


Kinetics



Concentration

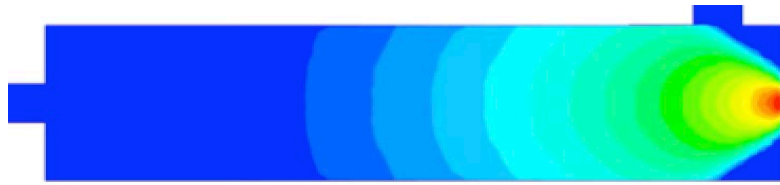
Virtual Prototyping



270 nm UV-LED (30mW)
Flow rate= 2 LPM (95% UVT)
Ecoli inactivation

Virtual Prototyping Results

Fluence rate

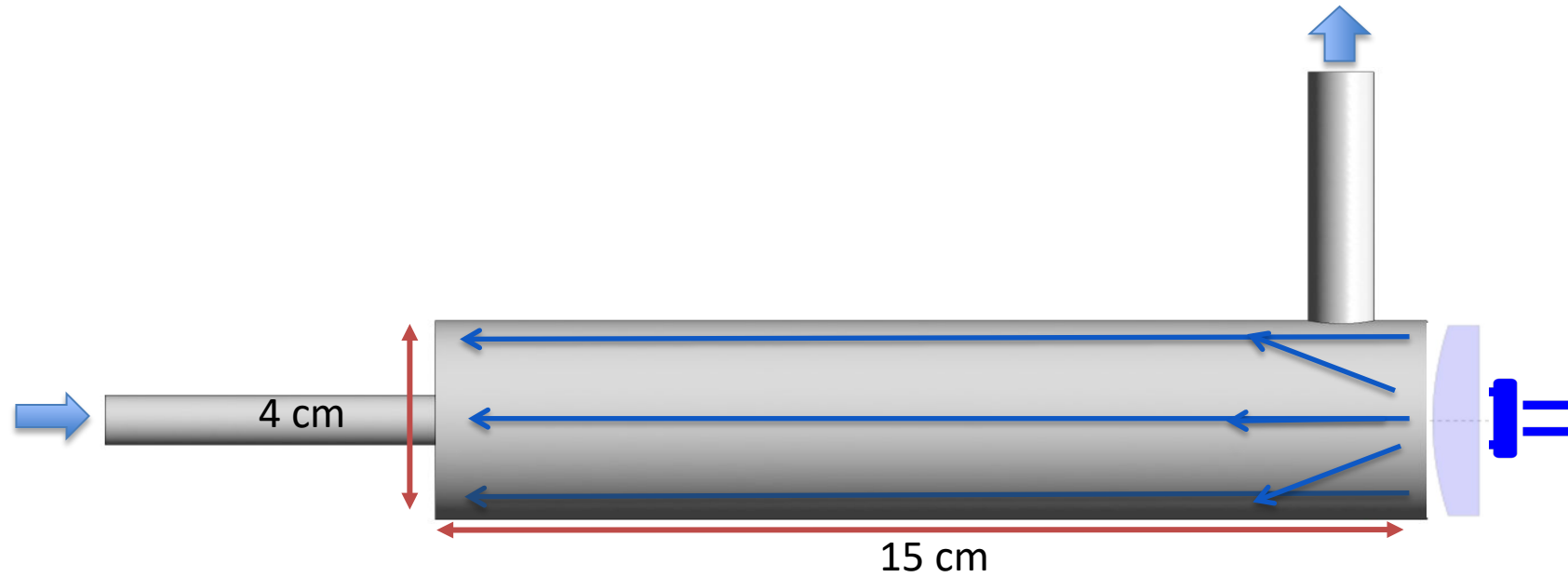


Concentration

$\text{LOG}(N/N_0)$



Virtual Prototyping



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Ecoli inactivation

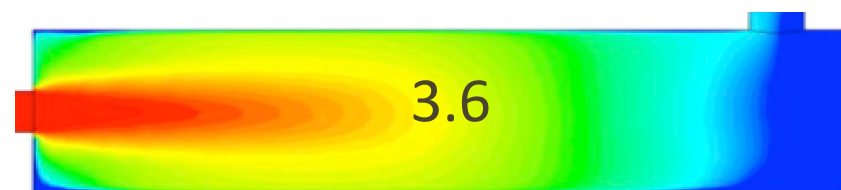
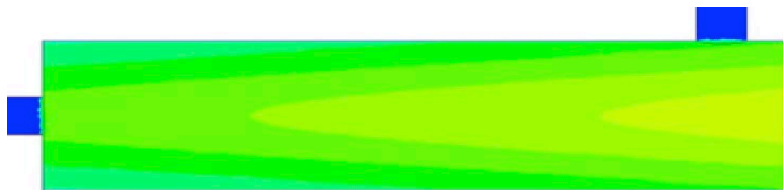
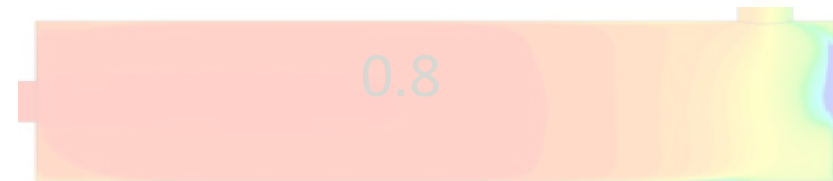
Virtual Prototyping Results

Fluence rate

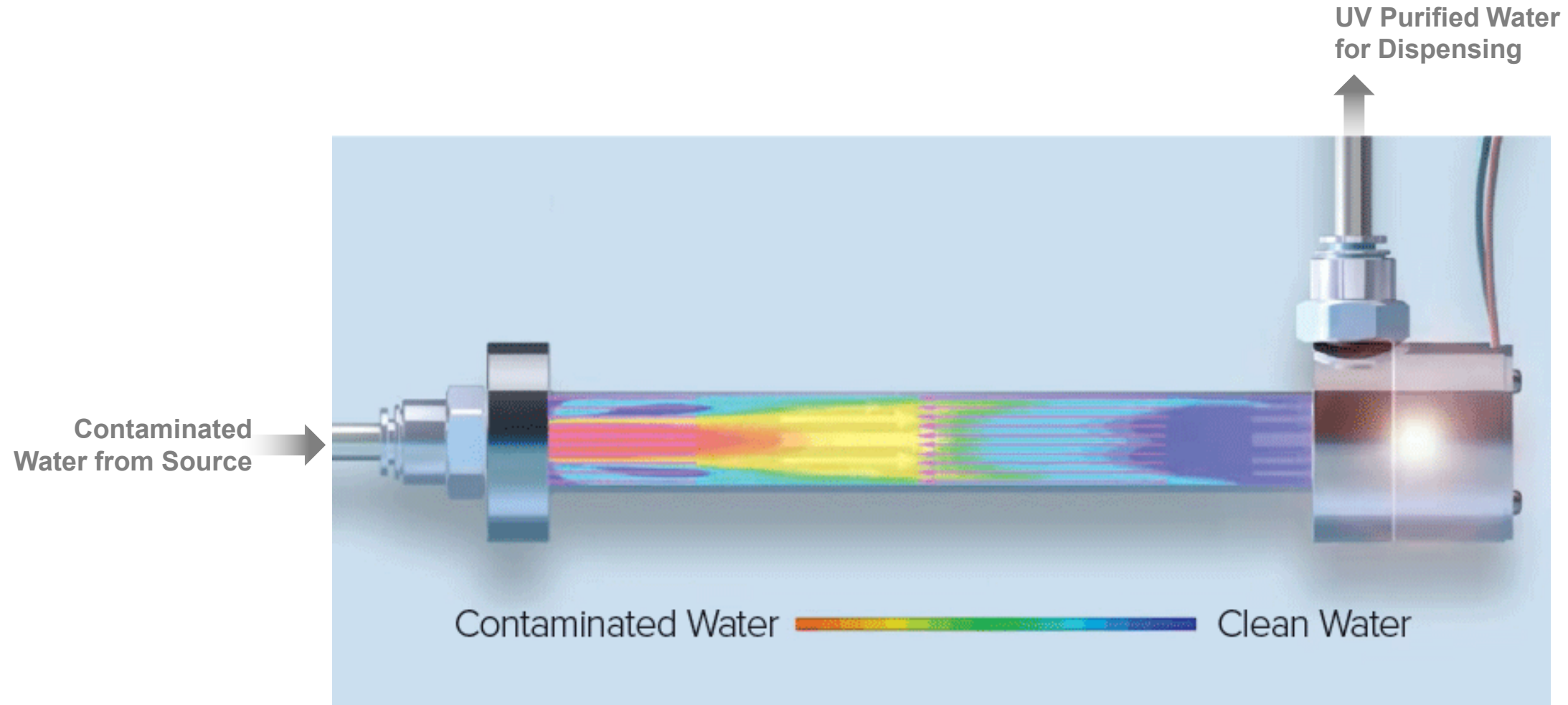


Concentration

$\text{LOG} (N/N_0)$

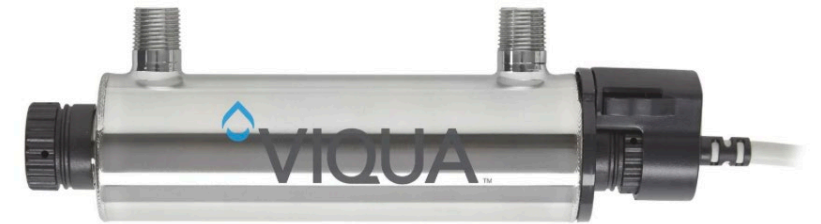


Point-Of-Use UV-LED Reactor



Point-Of-Use UV-LED Reactor

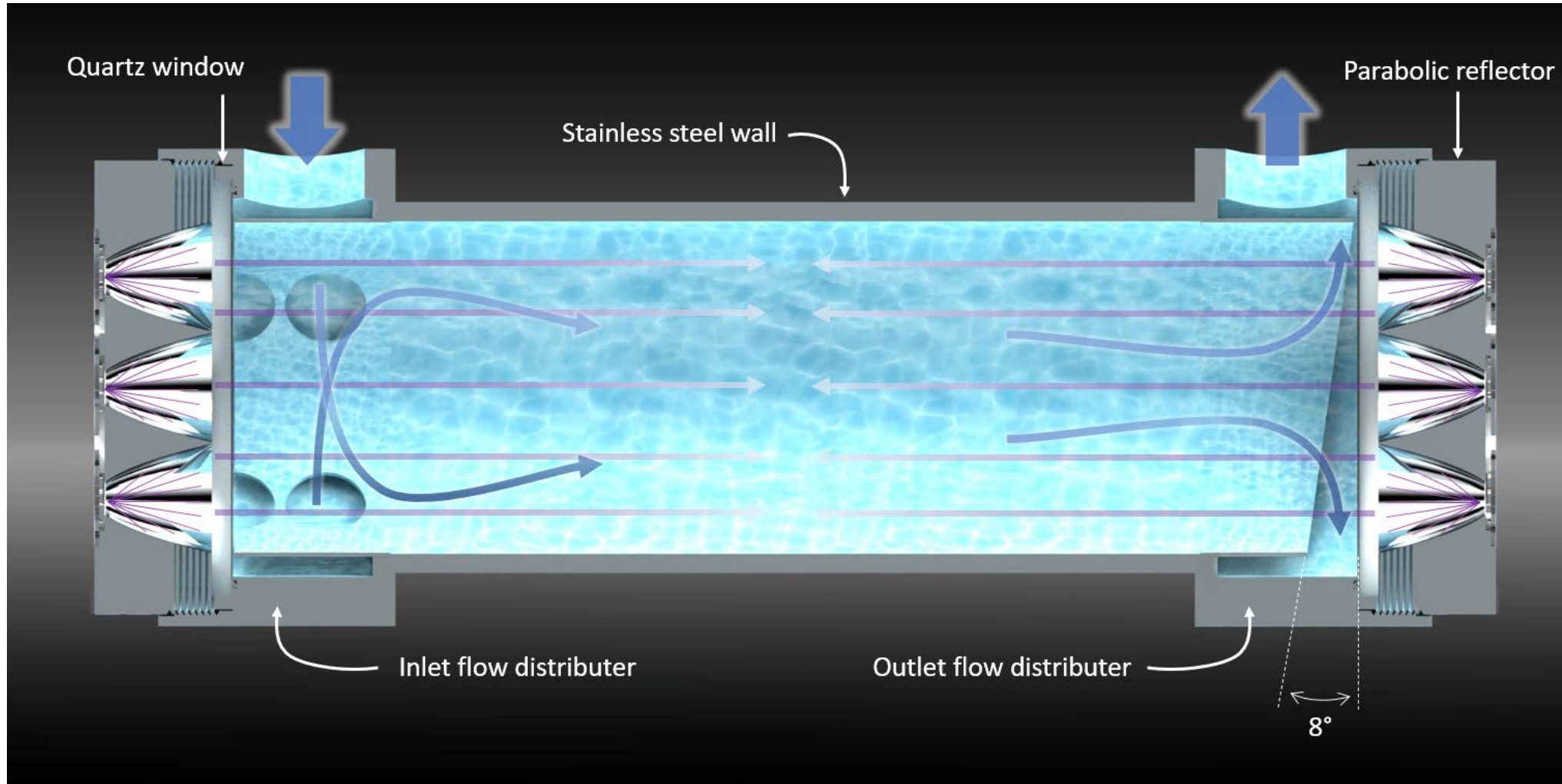
Device	Power consumption	UV-C power (app.)	flow rate
Conventional UV lamps	13 W	4000 mW	4 LPM
UV-LED Reactor	8 W	300 mW	4 LPM



Viqua VT1



Virtual prototyping



Prototyping



Field Testing



Point-Of-Entry UV-LED Reactor

Device	Power consumption	UV-C power (app.)	flow rate
Conventional UV lamps	50 W	15000 mW	8.9 GPM
UV-LED Reactor	33 W	2000 mW	8.5 GPM

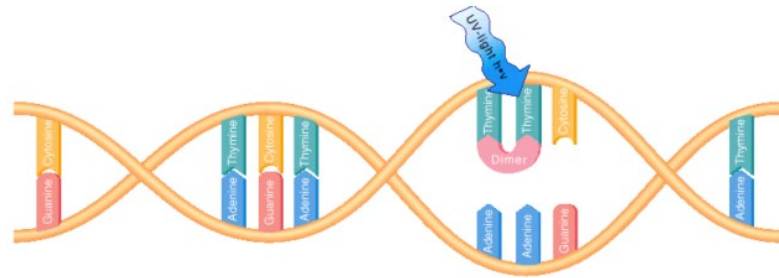


Viqua D4-V

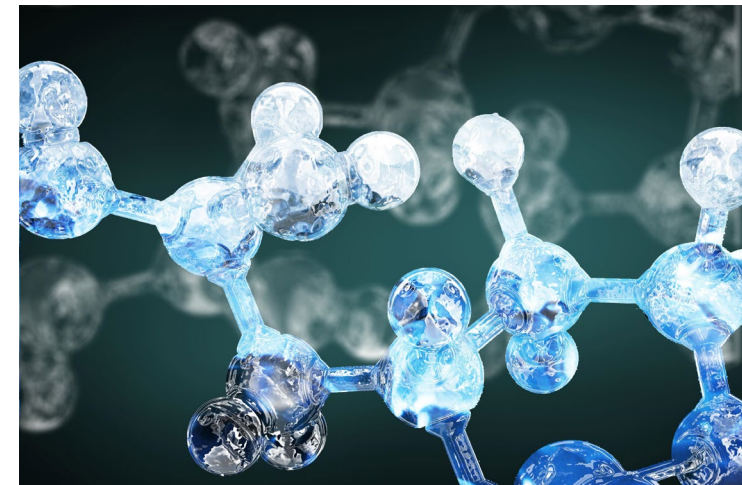
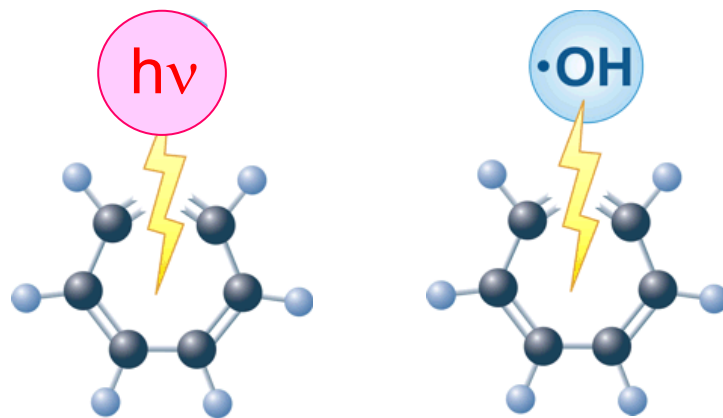


UV for Microbial & Chemical

- Inactivation of microorganisms



- Degradation of contaminants

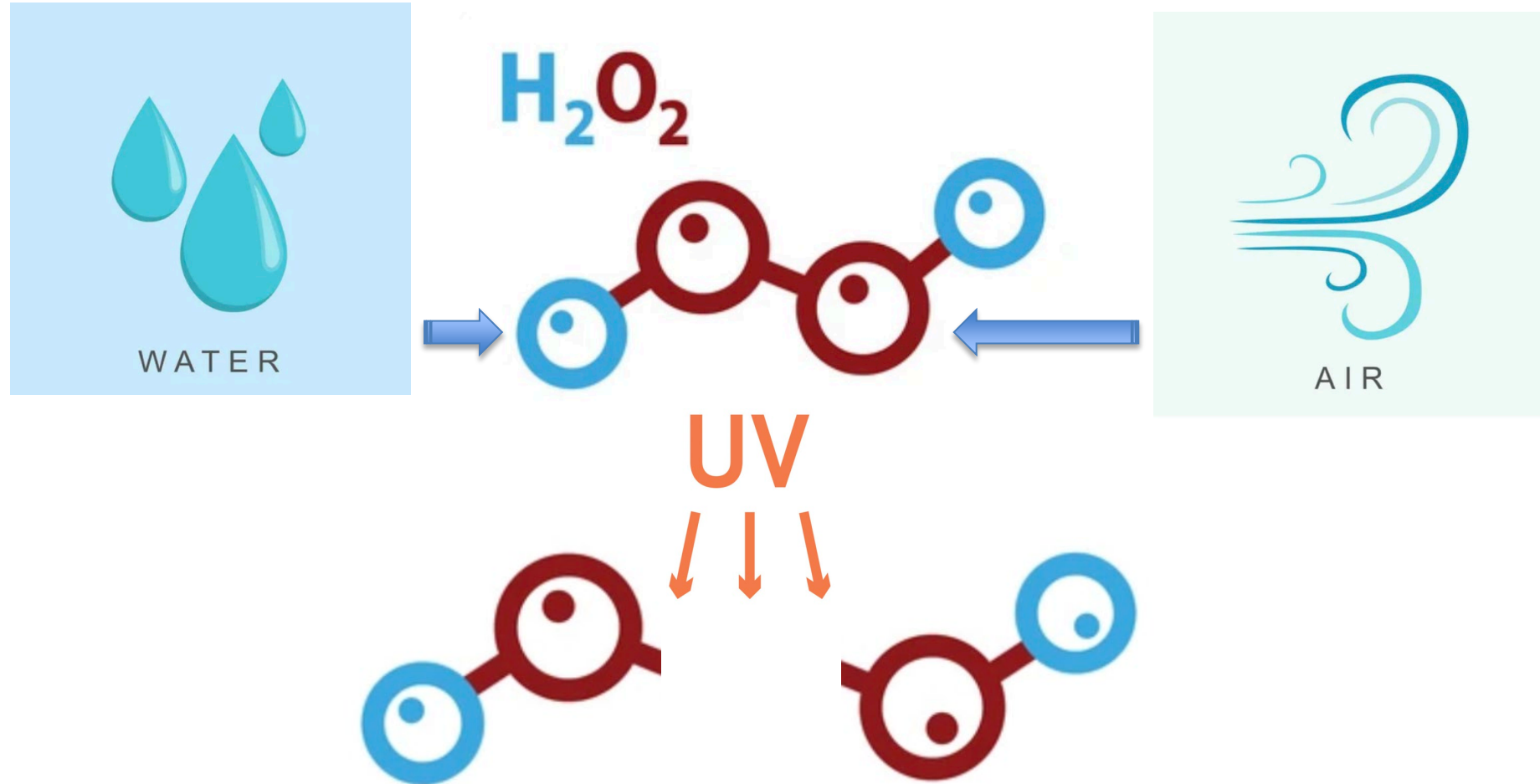


UV-H₂O₂ Reactor

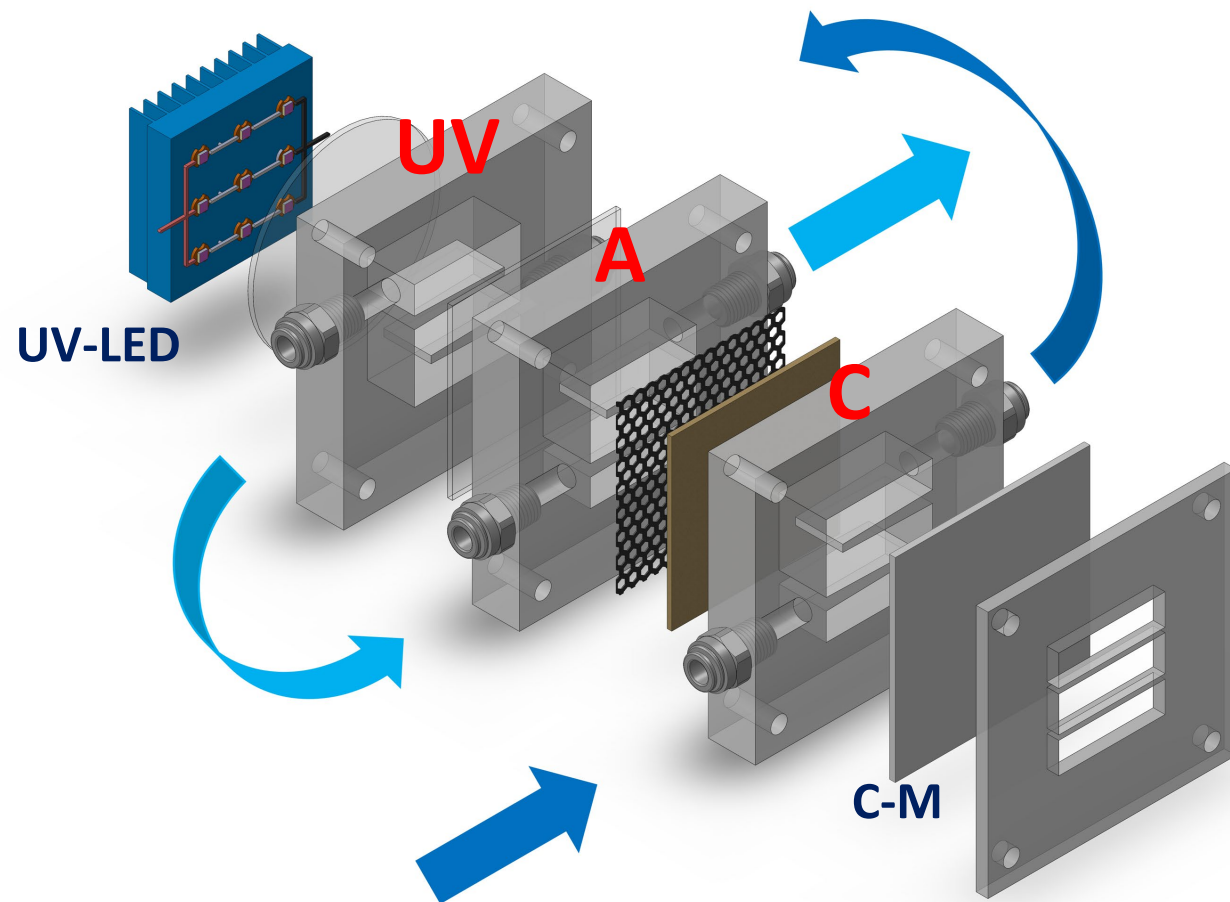
Costs and hazards related to the transportation, storage, and handling of H₂O₂



In Situ H₂O₂ Generation



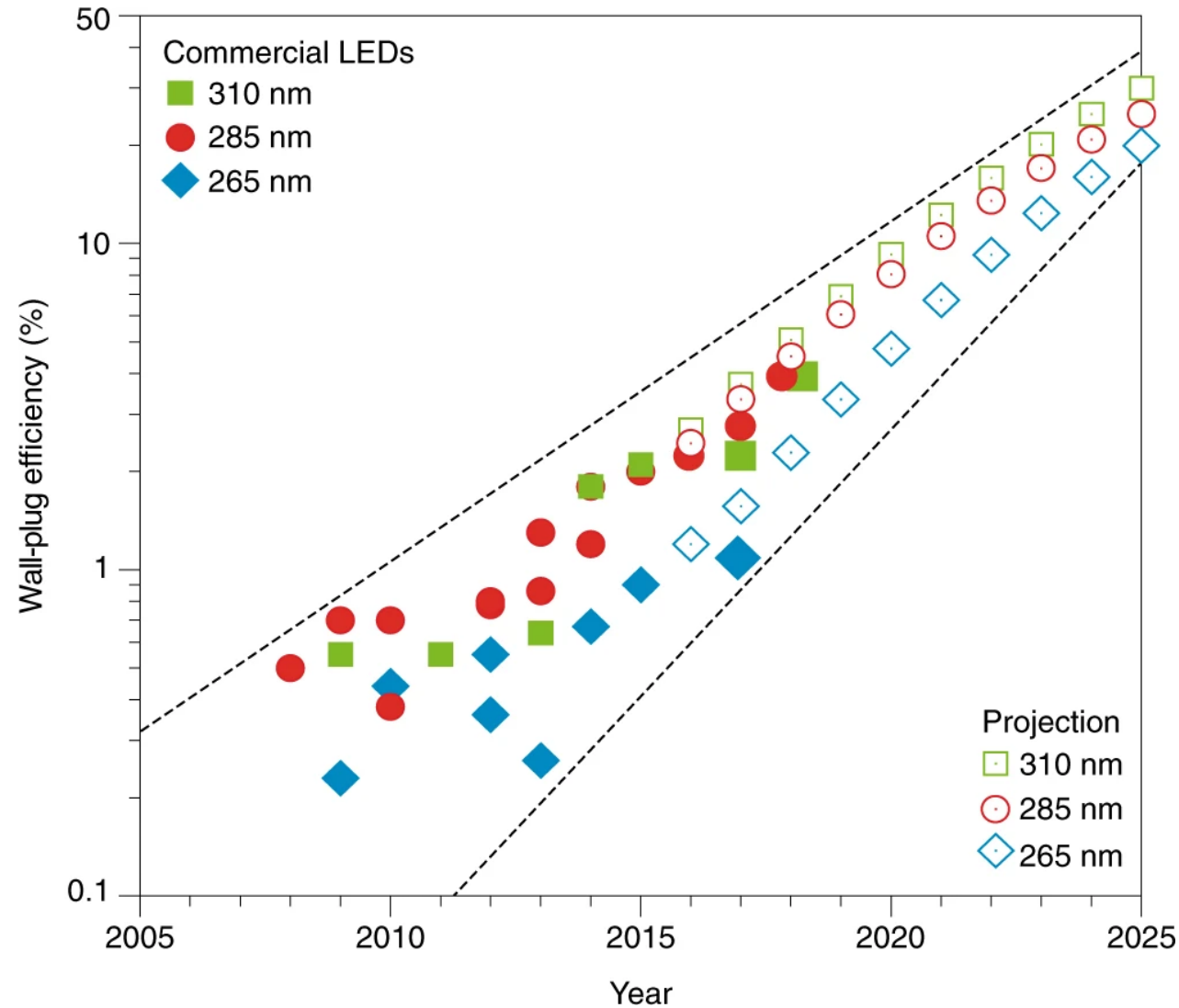
UV-LED Electrochemical Photoreactor



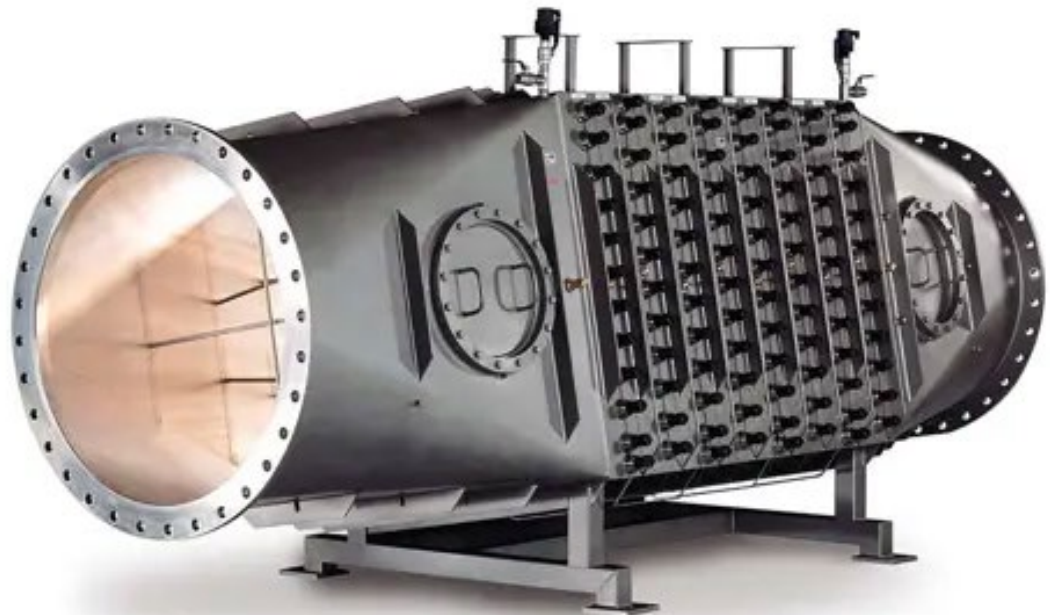
UV-LED Photo-Electrochem Reactor Prototype



What is the Prediction for UV-LED Future



Municipal UV-LED Treatment System



Wedeco UV disinfection system



UV-LED disinfection system

Anything worth remembering?

□ UV-LED is enabling creation of new technologies



□ At UBC: UV-LED Technology Development & Transfer



□ Next step: Large UV-LED....**Welcome collaborators**



University of British Columbia (Vancouver, Canada)

