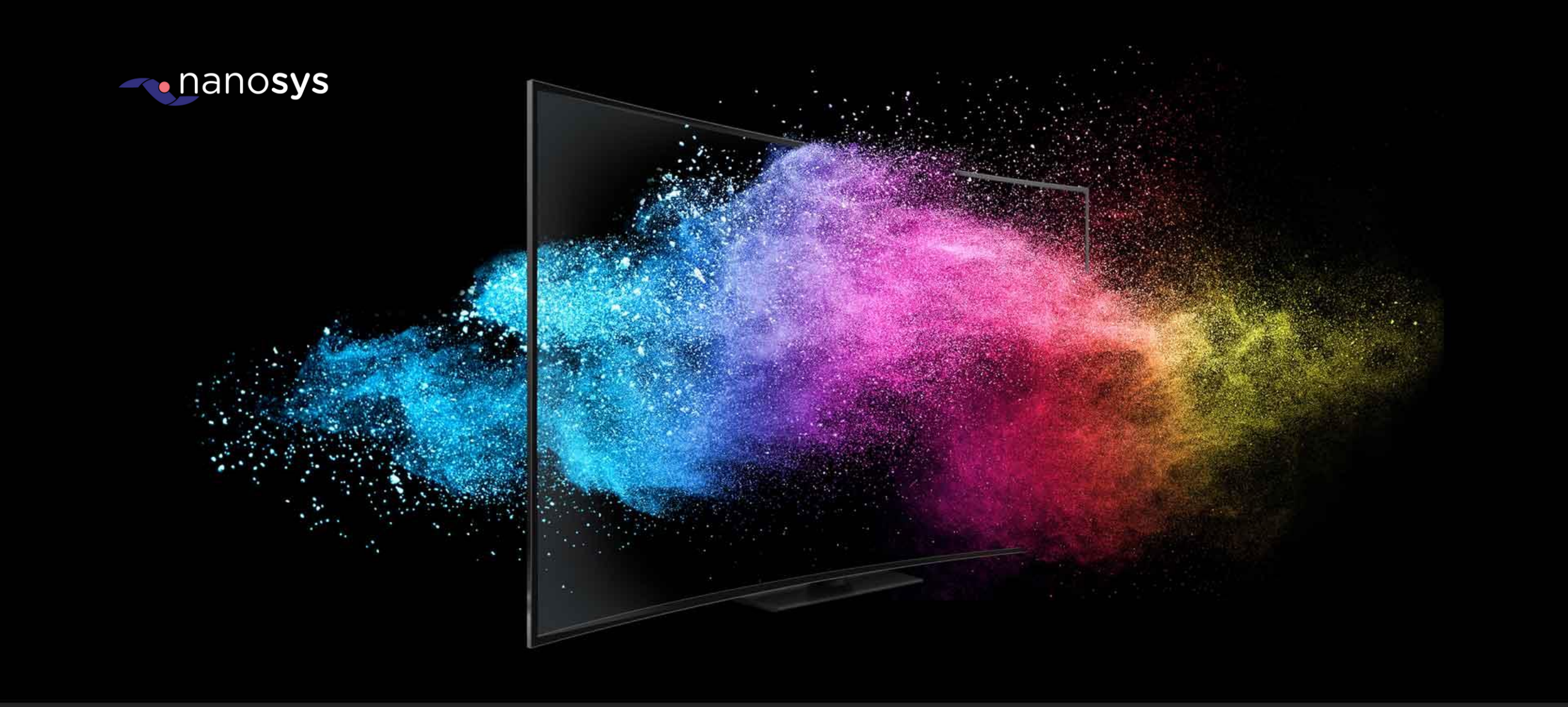


QDs For Diffuse Lighting Panels

Homer Antoniadis

Nanosys: The Quantum Dot & MicroLED Company

World's Leading Quantum Dot Supplier

Make best QD materials on all metrics

Innovation Leader

Patent portfolio with over 900 worldwide patents granted or pending

Make QDs in the Largest Volumes at the Lowest Cost

>50 tons of annual capacity

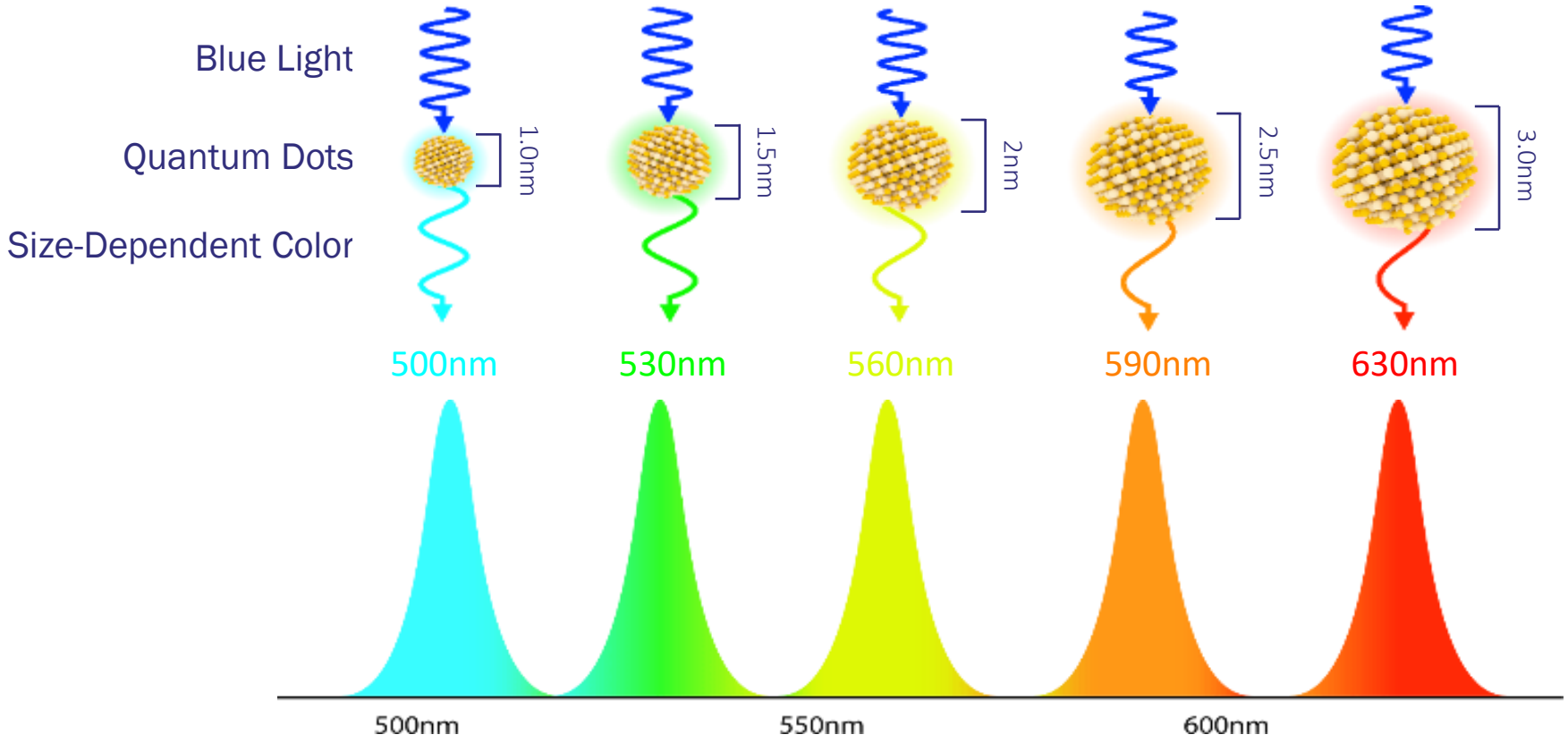
Tier 1 Customer Base

Products in the market from 5 of the top 5 global television makers

Nanosys Quantum Dot Light Emitting Technologies

- **QDs Best for Color Spectrum Engineering**
  - Best for color engineering in high efficiency display and lighting applications
- **QD Enhancement Films (QDEF™)**
  - Enabling a new generation of brighter, more power efficient displays with lifelike colors
- **QD Color Conversion (QDCC) Films**
  - Ink jet printed or photolithography-patterned QDCC technology improves OLED and microLED displays
- **QDs for Solid State Lighting**
  - QDs improve power efficiency of LED lighting
- **Electroluminescent QDs (NanoLED)**
  - Promising QD materials for efficient, low-cost, ultra-thin, flexible, displays and diffused lighting panels

Quantum Dot Advantage: Spectrum Engineering



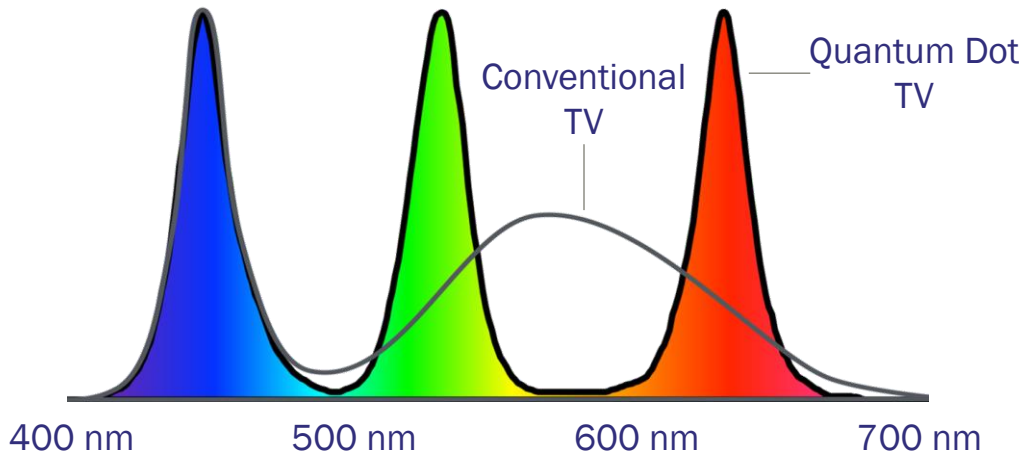
- Precisely producing the desired spectrum also leads to higher efficiency (without “waste”)
- QDs are excellent candidates for high efficiency display and lighting applications

QDEF™ Technology First To Reach Scale

The Problem with Conventional Display Technology

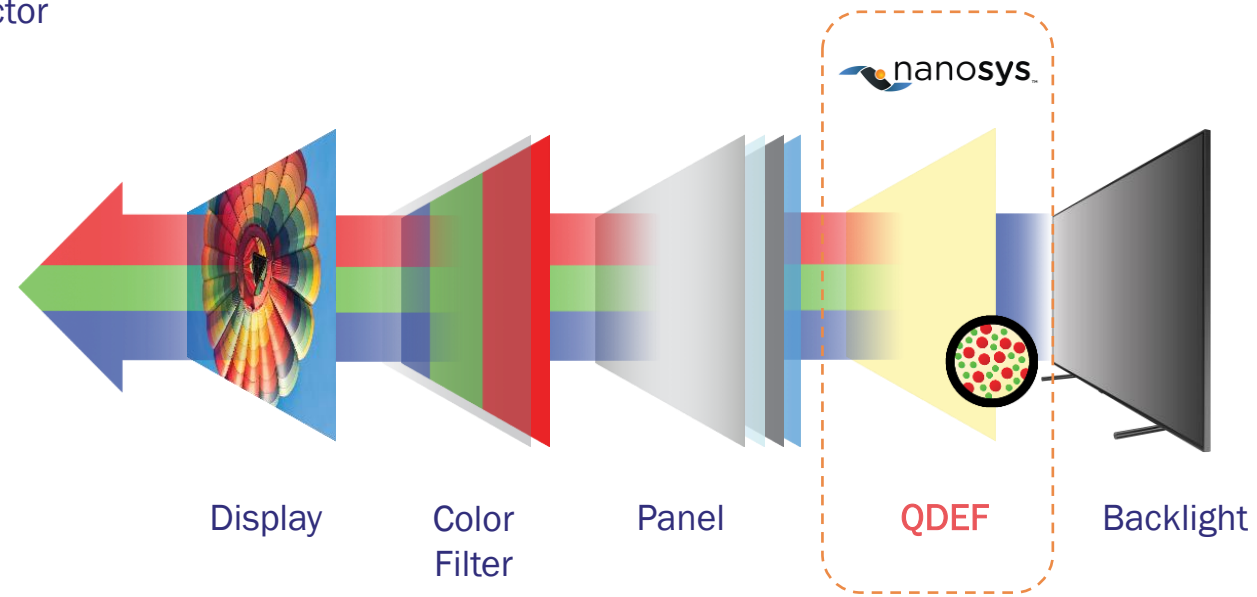
- Imprecise color
- Incomplete color spectrum
- Low brightness
- Poor dimming resolution
- Energy inefficient
- Heavy, large and rigid form factor
- Limited viewing angles

Color Spectrum



Quantum Dot Enhancement Film (QDEF) For LCDs

Enhances LCD Technology to Outperform OLED With Low-Cost Package and Zero CapEx Investment



Dominant technology for display color enhancement

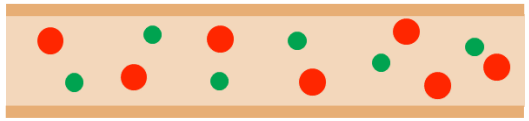
Over 35M units shipped to date

Eco-friendly, highly-efficient materials

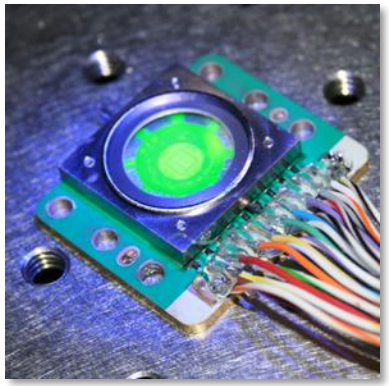
Nanosys' R&D and Production Breakthroughs Have Single-Handedly Created the QDEF Industry

Decades of Difficult Engineering to Bring QDEF to Market…

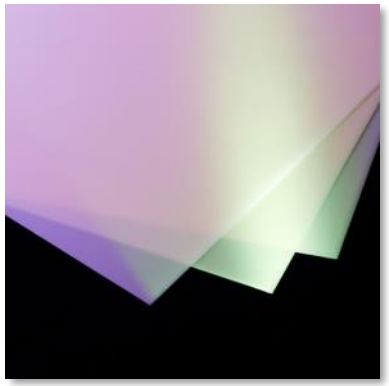
QDEF with Barrier



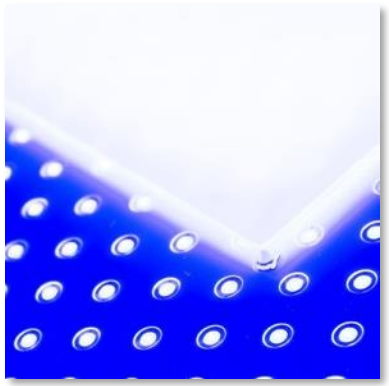
QDEF with no Barrier



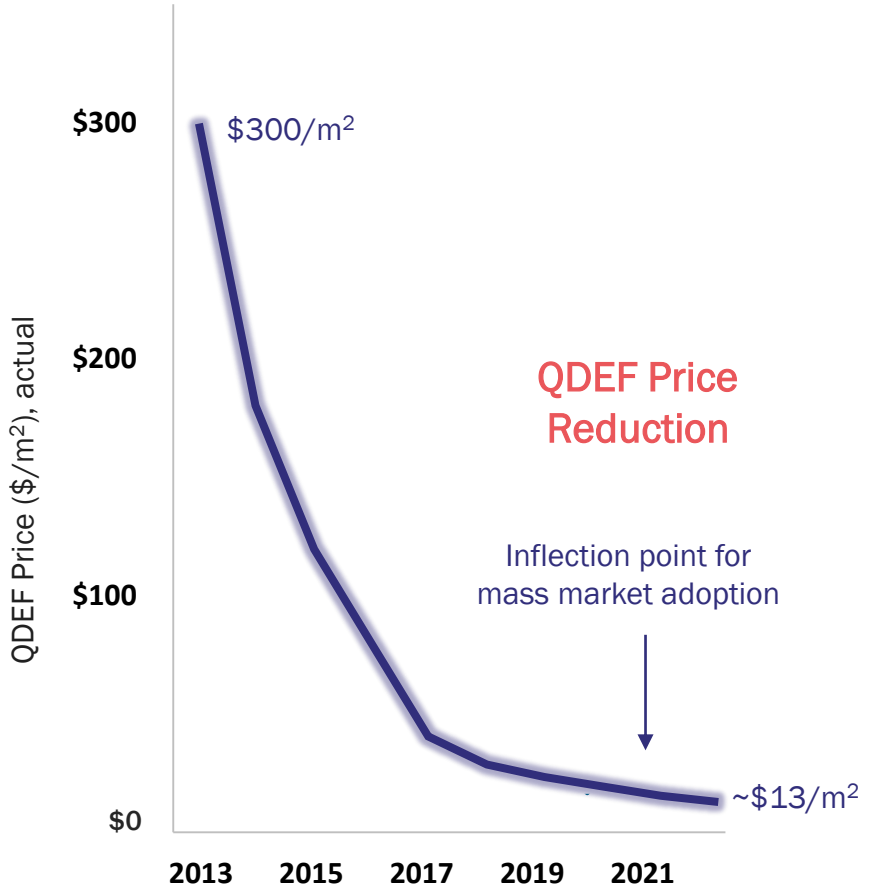
First Gen
Aerobically Unstable, Required Hermetic Packaging



Second Gen
Improved Stability Uses Cost Effective Barrier Film

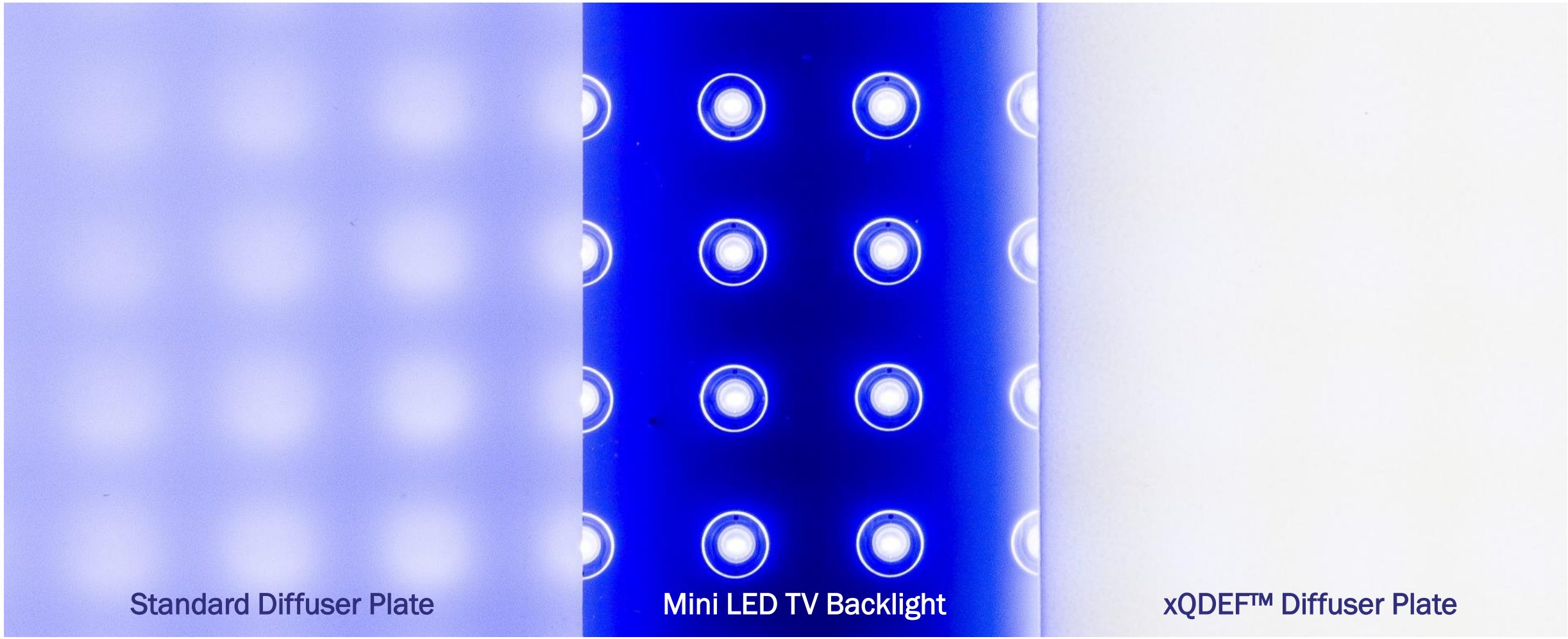


Third Gen (Today)
Aerobically Stable, No Barrier Required



xQDEF™ Diffuser Plate

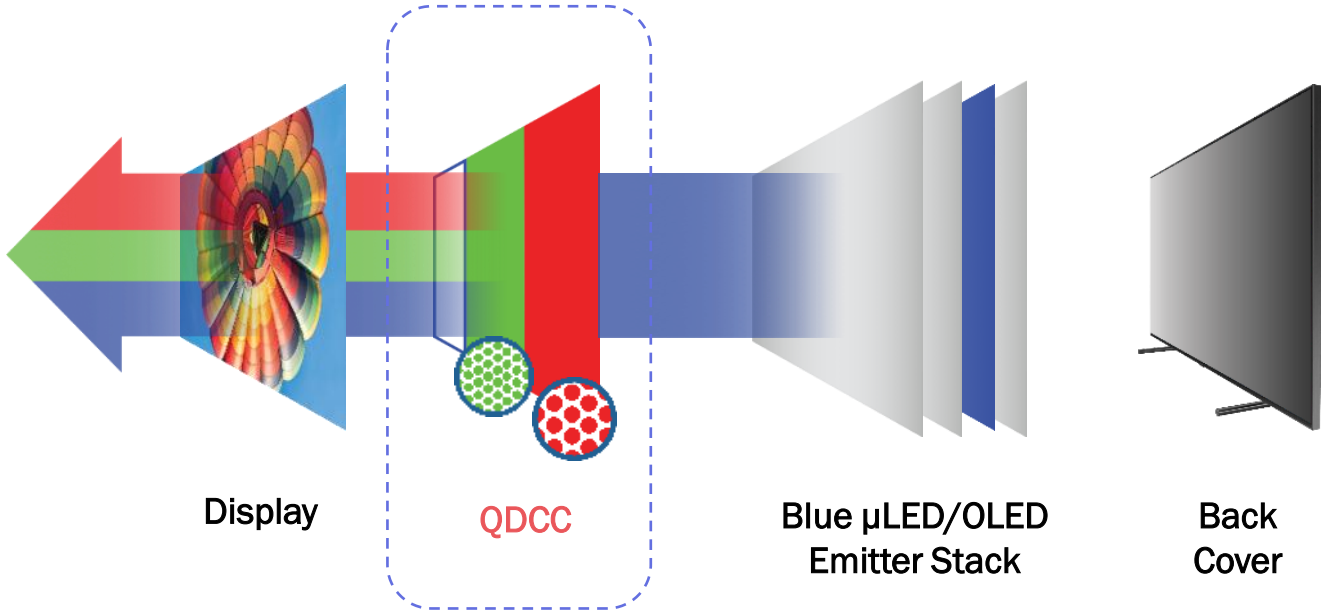
Isotropic Quantum Dot emitters are better diffusers, doubling LED illumination radius compared to standard diffuser plates



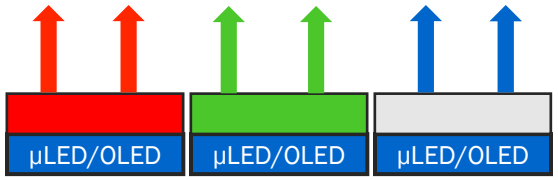
Quantum Dot Color Conversion (QDCC) Films for OLEDs and MicroLEDs

Quantum Dots Deposited Directly Over Blue Subpixels, Providing Unrivaled Color and Efficiency

- Work with OLEDs and MicroLEDs
- Provide perfect viewing angles (Lambertian)
- Replace inefficient and wasteful color filters
- Simplify the manufacturing process
- Increase yield for high res RGB MicroLED displays

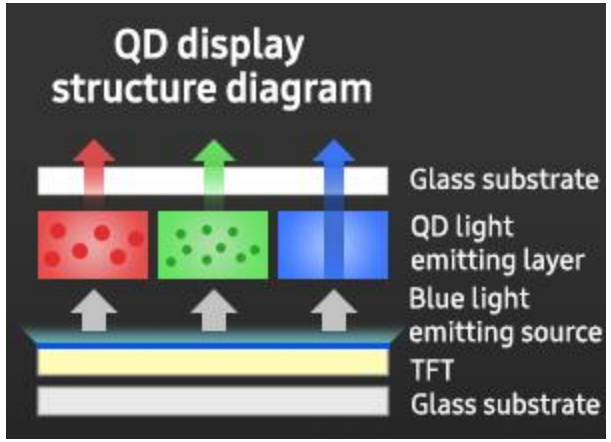


nanosys™



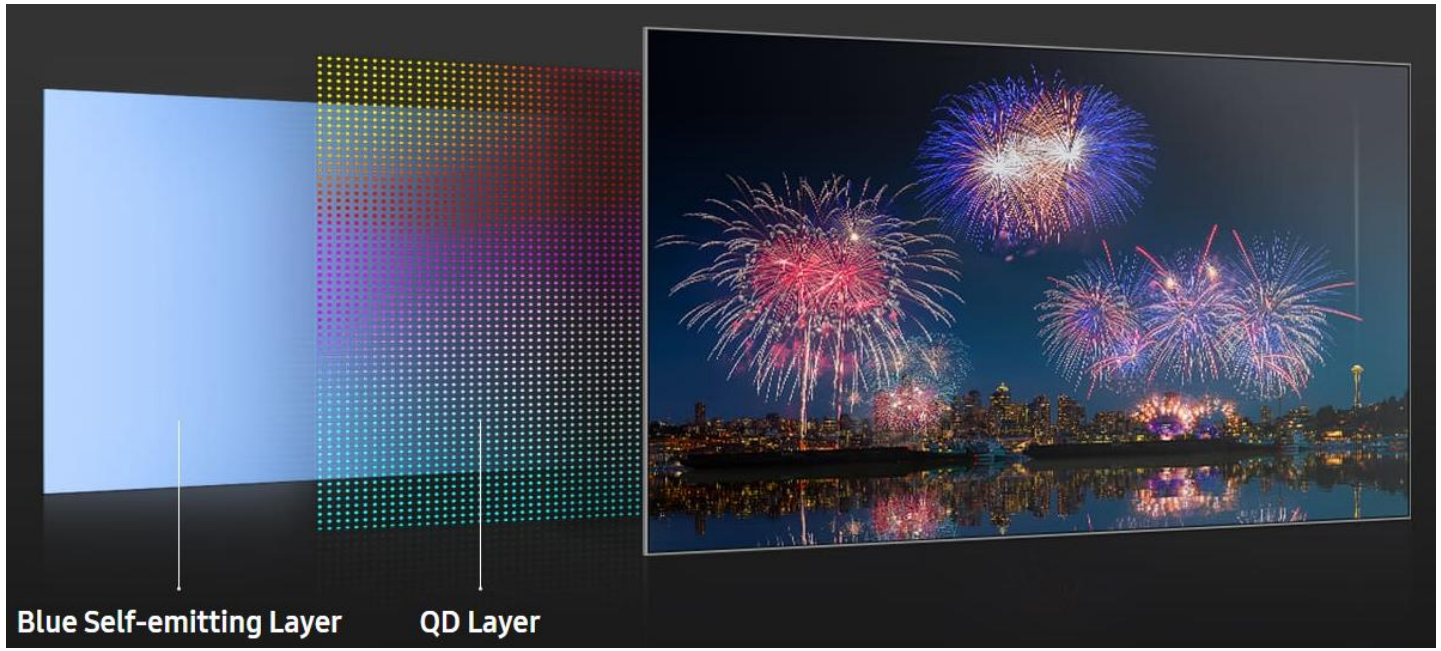
Introduction of the QD-OLED Display at CES'22

QDs are being used in next-generation displays due to their efficient use of light and simple structure



Color	QD-OLED (nits)	W-OLED (nits)
R	335	103
G	1088	350
B	136	45

Courtesy of DSCC



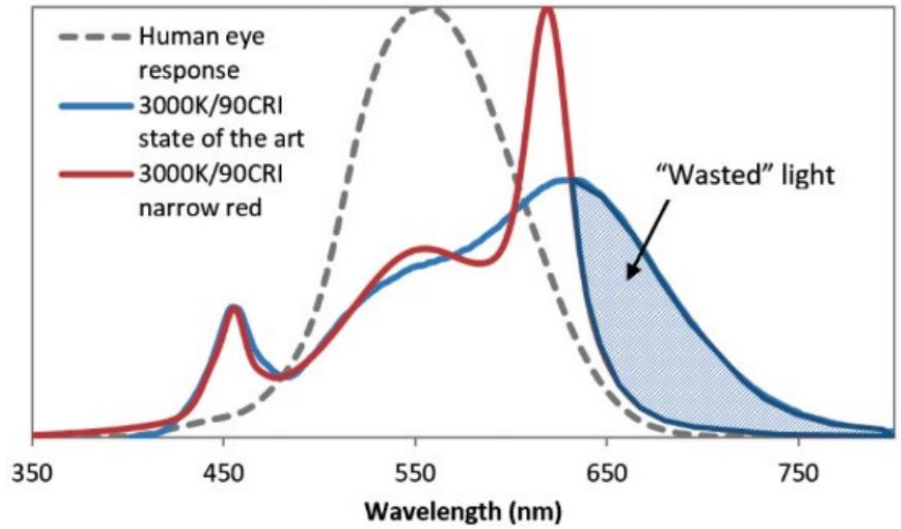
QD-OLED: 90% of BT2020
WOLED: 77% of BT2020

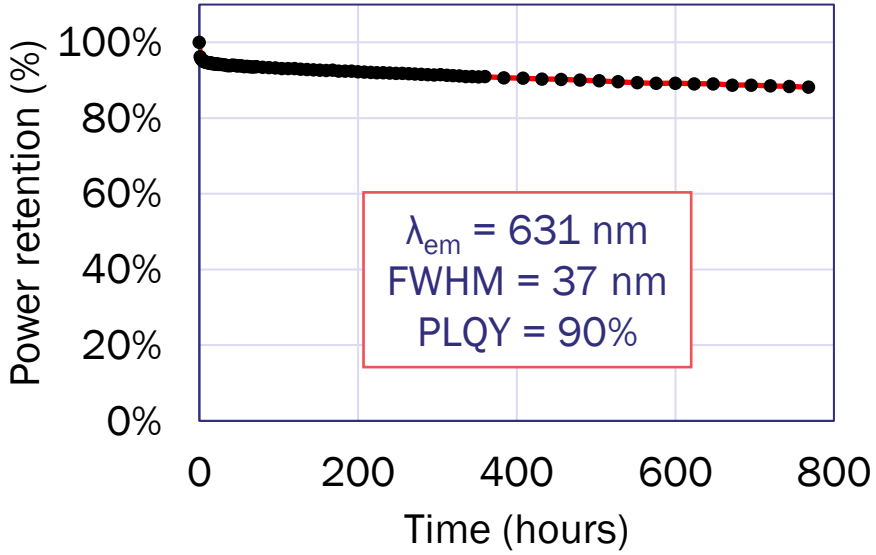
World premiere of QD-OLED the biggest display technology story of CES'22

- Sony launched world's first QD-OLED TV in 65" and 55" sizes
- Dell launched world's first QD-OLED 34" monitor aimed at the gaming segment
- Samsung Electronics confirmed plans for a QD-OLED TV in 2022

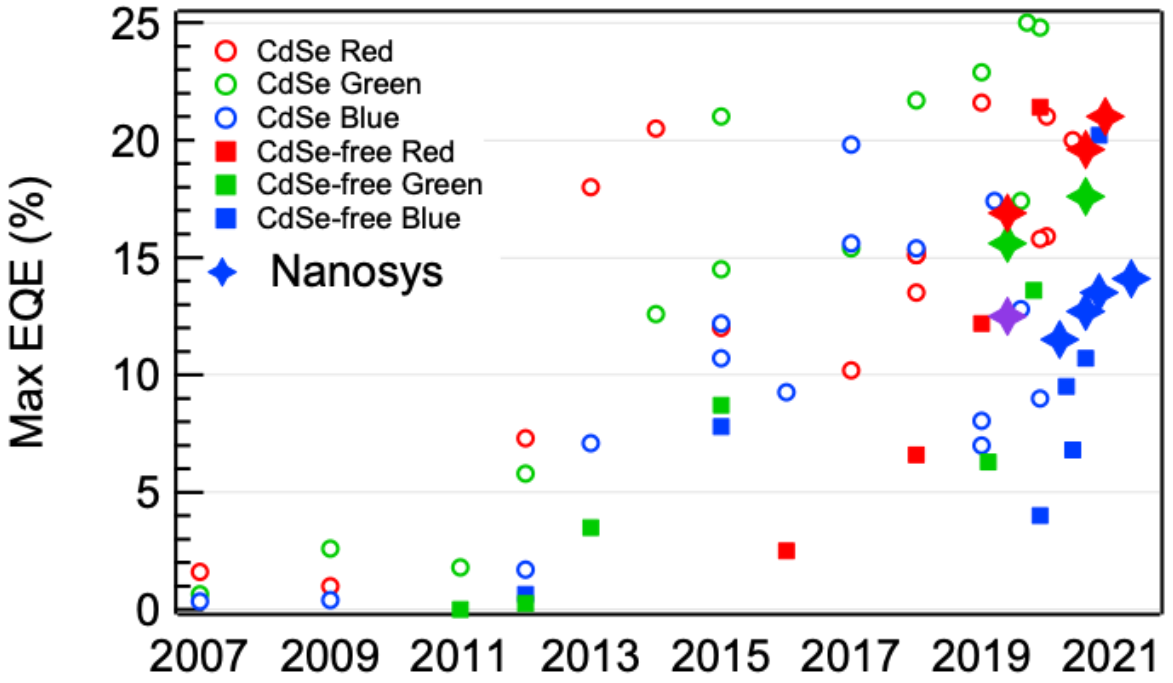
Flux-stable QDs for LED Lighting (Ongoing DOE Program)

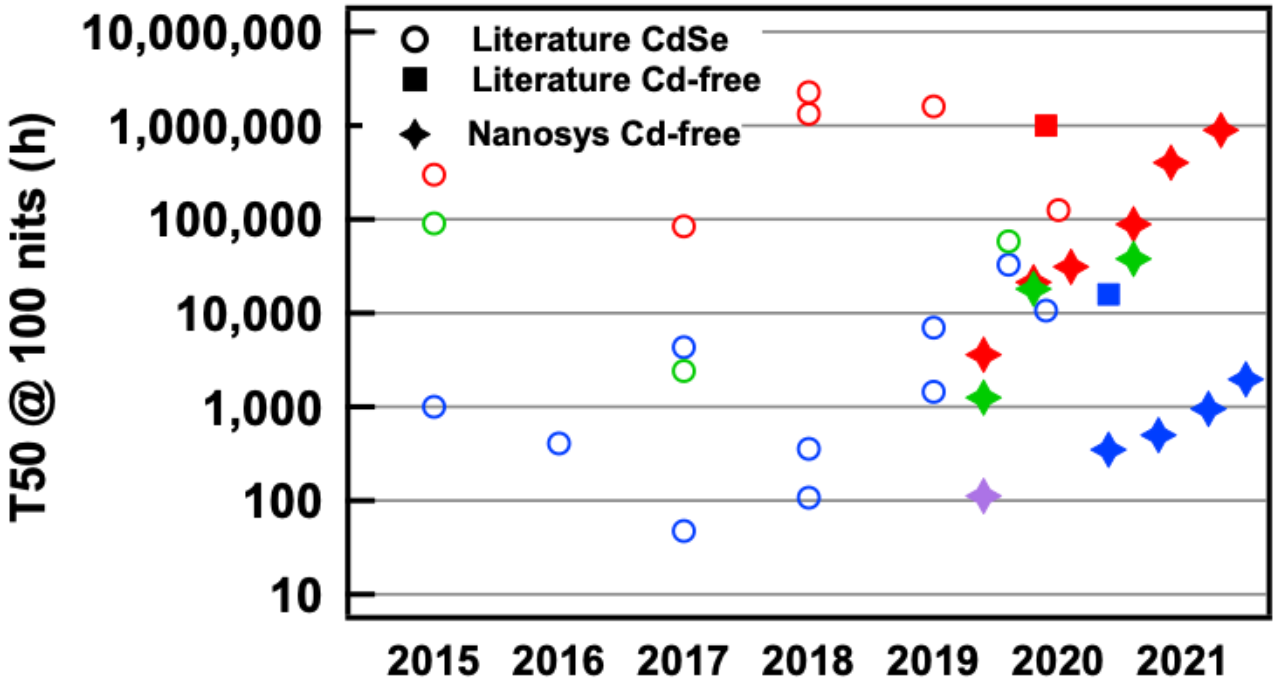
- **QDs improve LED power efficiency by reducing "wasted" light emission (>650 nm)**
- **Goal: Develop stable, cadmium-free QD downconverters for high-CRI LED lighting**
  - ≥88% quantum yield (QY) at ≥100 W/cm^2 at 150°C
- **Achievements: QD composition was controlled leading to a >50X lifetime improvement since project start**
  - LT_{70} = 4,000 hours at 5 W/cm^2 at 50°C





NanoLED EQE and Lifetime Milestones

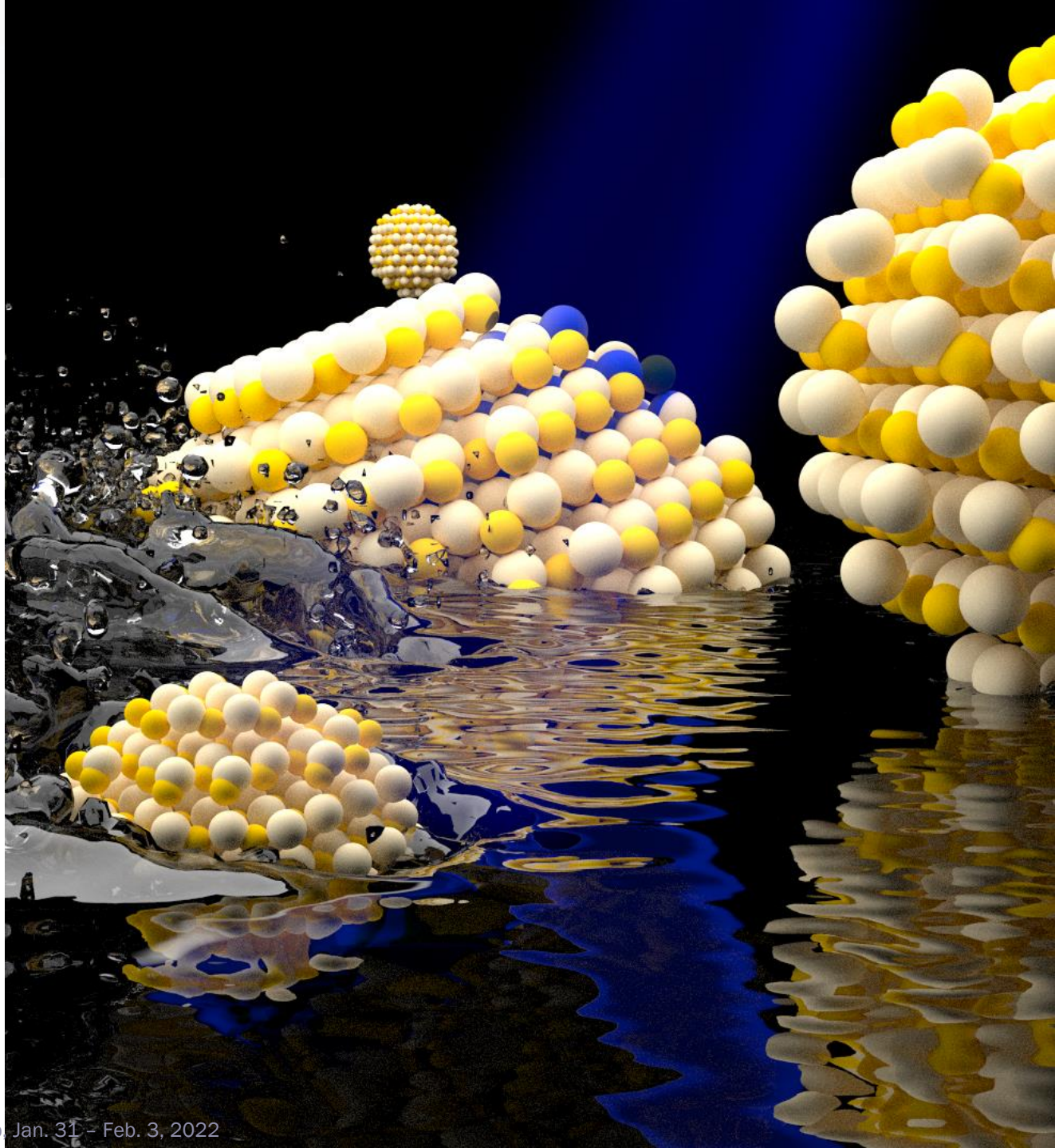




	EQE (%)	PWL (nm)	FWHM (nm)	T50 (hrs @ 100nits)
Red	>21	633	40	900,000
Green	>17	530	40	30,000
Blue	>14	454	30	2,000

Conclusion

1. QDs offer excellent spectrum engineering for color management and high efficiency display and lighting applications
2. QDEF is enabling a new generation of brighter, more power efficient LCD displays with vivid, lifelike colors
3. QDCC technology improves OLED and microLED displays and delivers new levels of power efficiency and color volume performance
4. QDs improve power efficiency of LED lighting
5. NanoLEDs has a great promise for high efficiency, low-cost, flexible, displays and diffused light sources




THANK YOU
For more info, visit: www.nanosys.com