



Quantum Dot Powders and Quantum Dot Enhancement Films (QDEF) Quantum Dot Inks

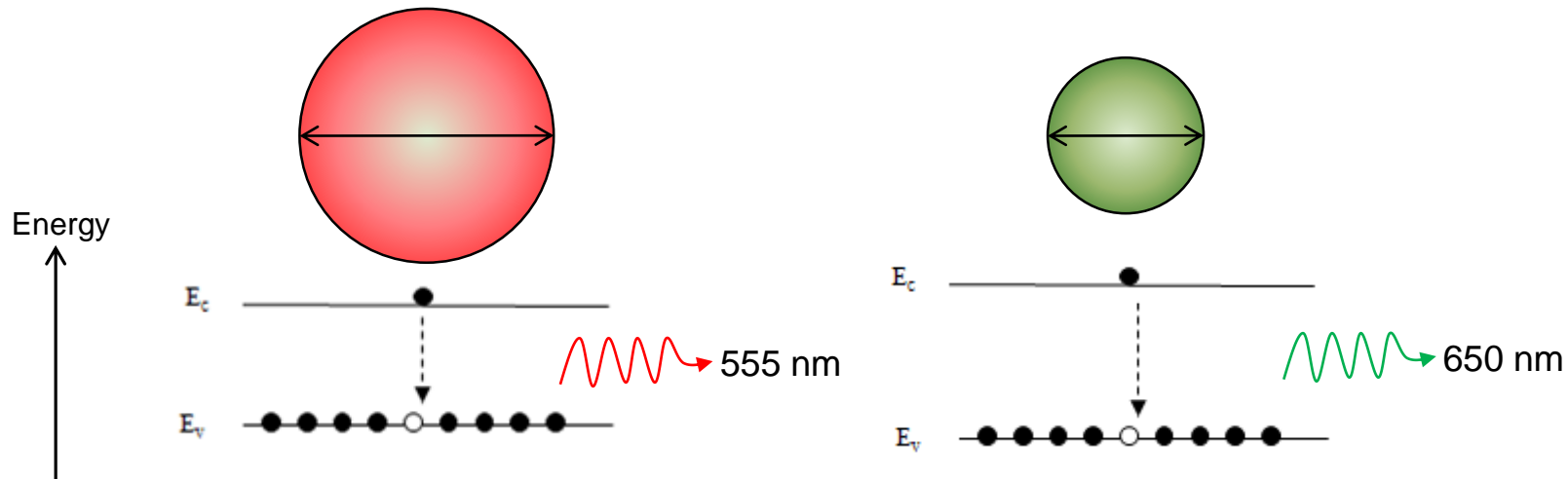
量子点粉末和量子点增强膜 (QDEF) 量
子点油墨



bricpoint What is a Quantum Dot? 什么是量子点?

- Particles of fluorescent semiconductor material
- 荧光半导体材料的颗粒
- 1 to 10 nanometers diameter in size
- 直径1至10纳米
- Size determines colour of light emitted
- 尺寸决定了发光的颜色
- Smaller = blue; larger = red
- 较小=蓝色;更大=红色

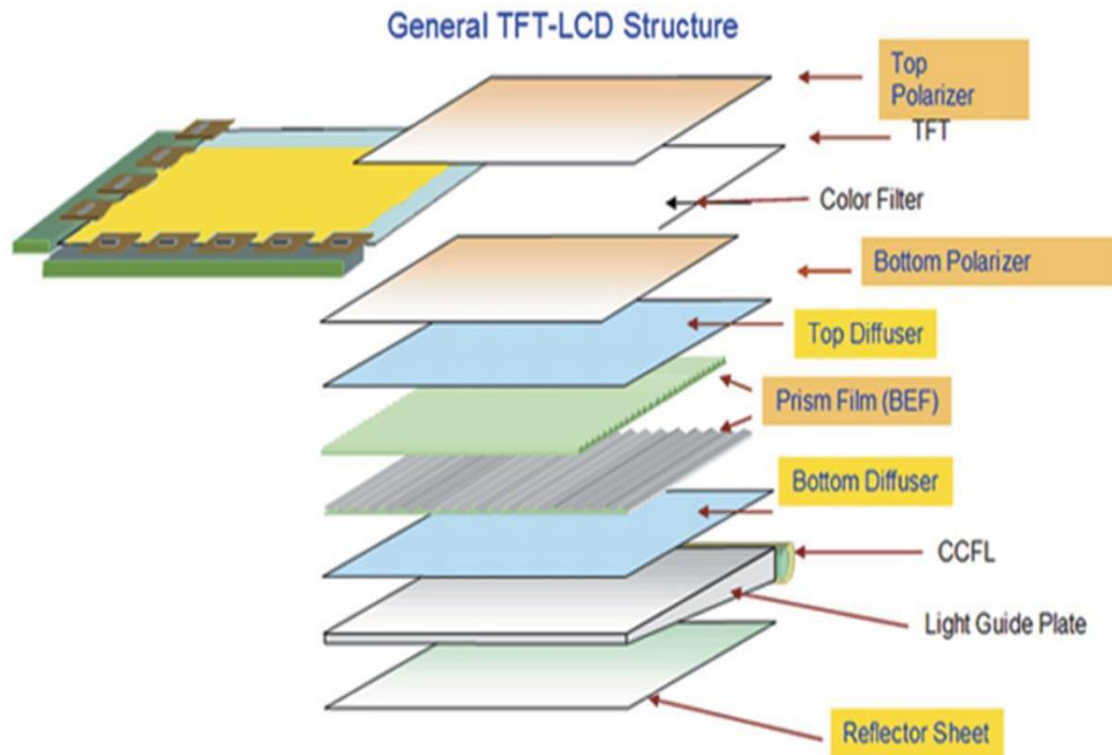
- QDs are **bandgap tunable** by size;
- 通过粒度调节实现QD带隙所需尺寸
- Smaller QDs have large bandgap / higher energy
- 较小的QD具有较大的带隙和较高的能量
- Blue shift with decreasing particle size; 随着粒径减小 蓝移
- Examples: CdSe, PbSe, PbTe, InPS; 示例：CdSe, PbSe, PbTe, InPS



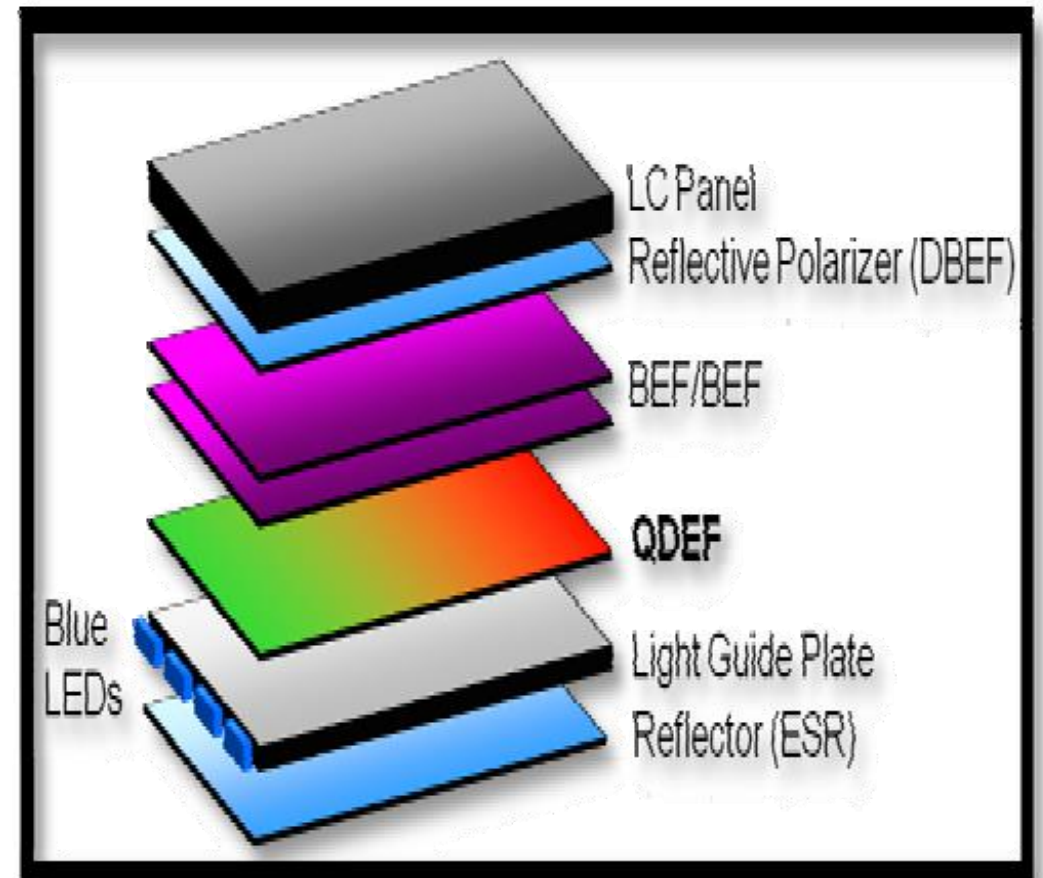
QDEF in LCD Backlight

量子点薄膜在液晶显示器背光

Normal LCD Stack

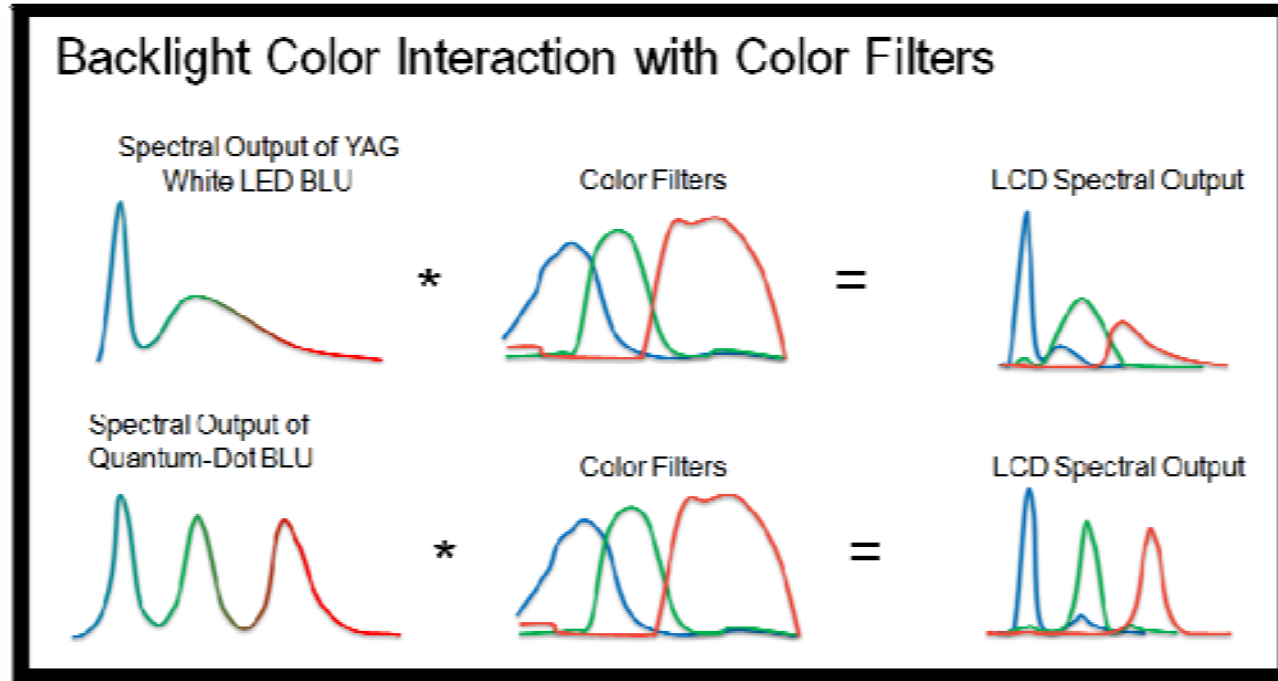


QDEF LCD Stack



Backlight Unit Colour Interaction in Displays

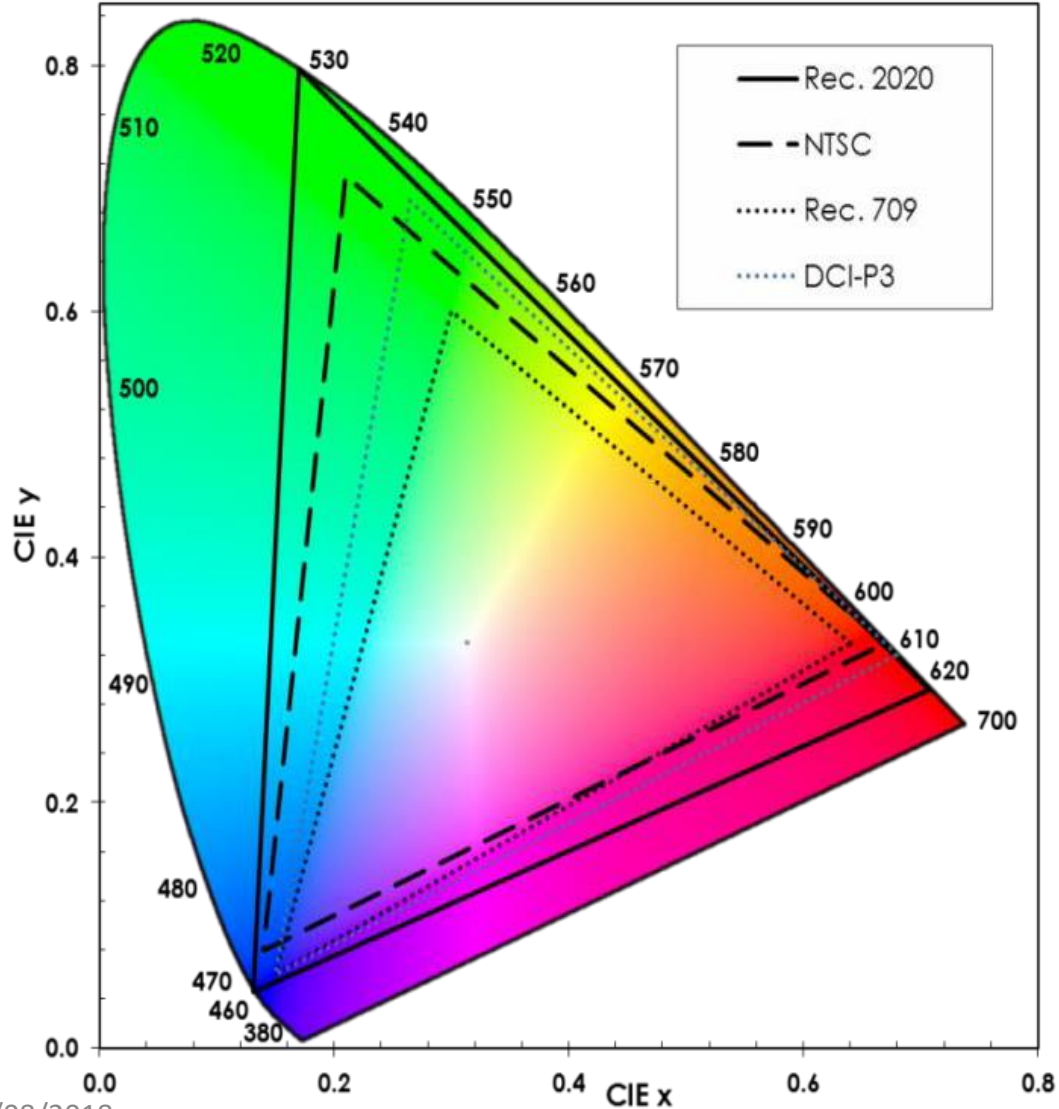
显示器中的LCD背光颜色交互



QDEF LCD spectral output superior to current white LED backlight units
QDEF LCD光谱输出优于目前的白光LED背光单元



bricpoint Rec.2020 Colour Gamut Target UHD



Today's color gamut standards:

- Television: NTSC
- Digital Cinema: DCI-P3
- Computers: Adobe RGB

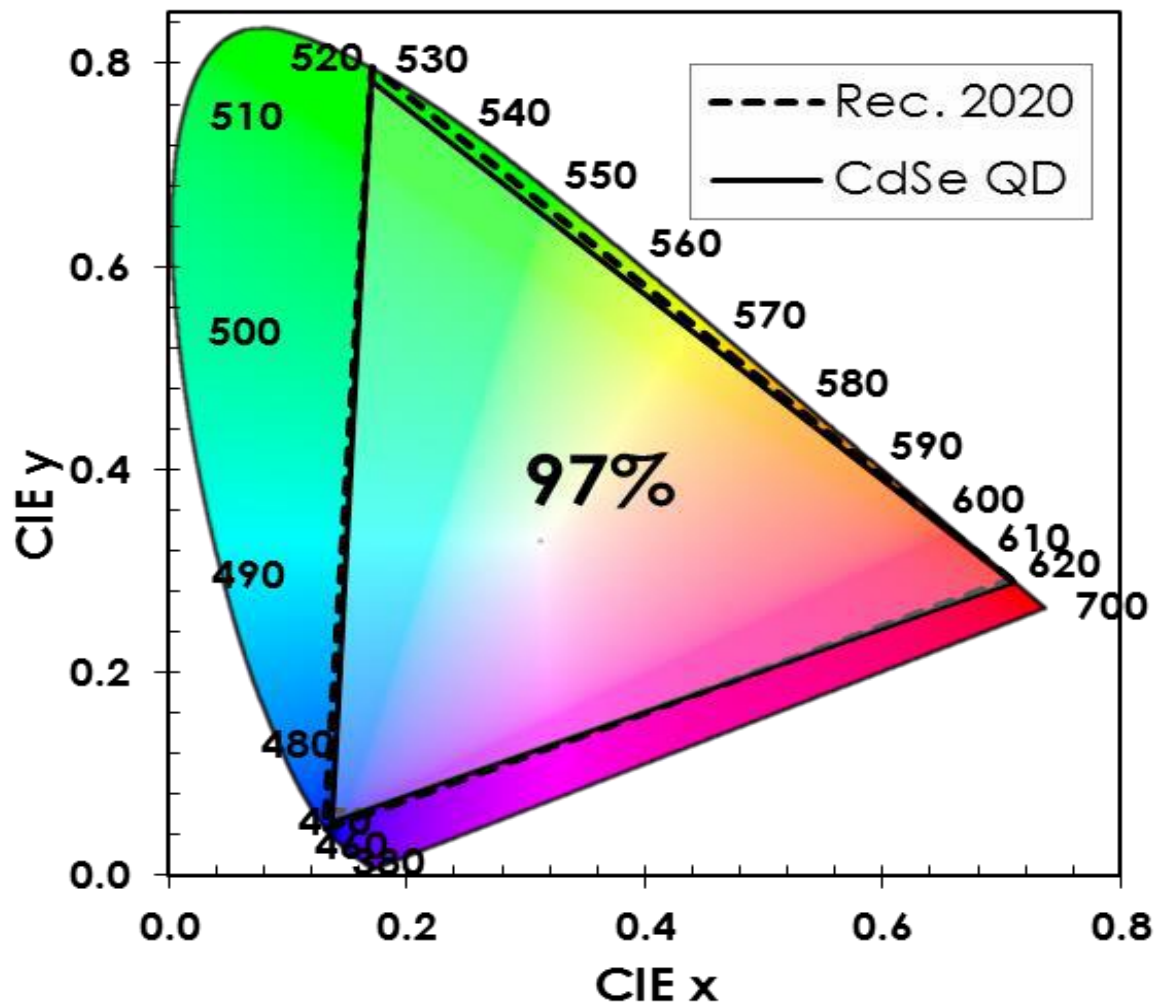
Tomorrow: Rec. 2020

- Published in 2012 by ITU
- Sets UHD broadcast standards
- Represents future standard for all displays

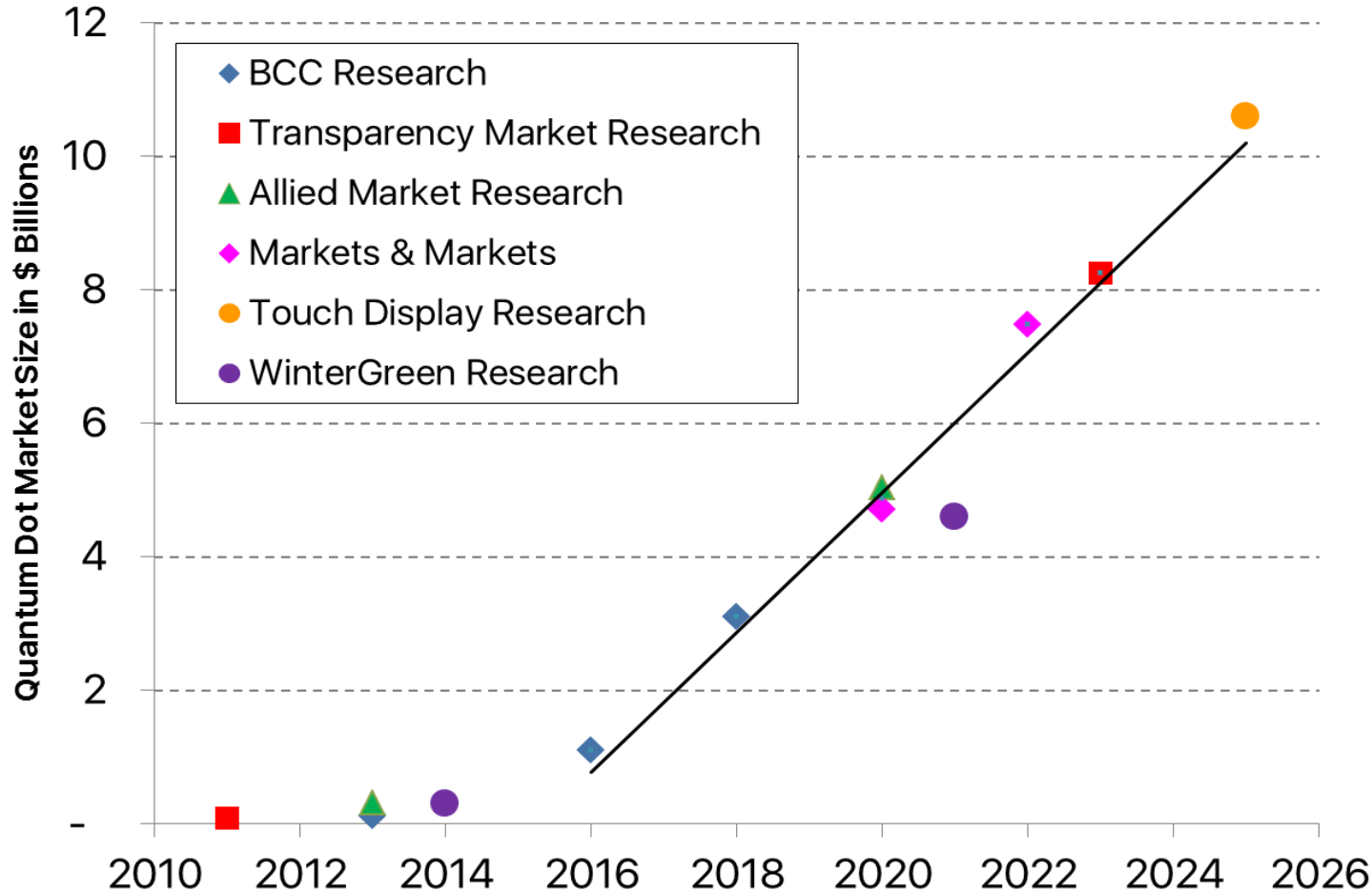
Gamut Standard	% of CIE 1931
Rec. 2020	75.8%
Adobe RGB	52.1%
DCI-P3	53.6%
Rec. 709/sRGB	35.9%

QDEF Achieves Recommendation 2020

QDEF实现了2020年对超高密度电视的推荐



 **bricpoint** QD market Size: displays and lighting applications
QD市场规模：显示器和照明应用

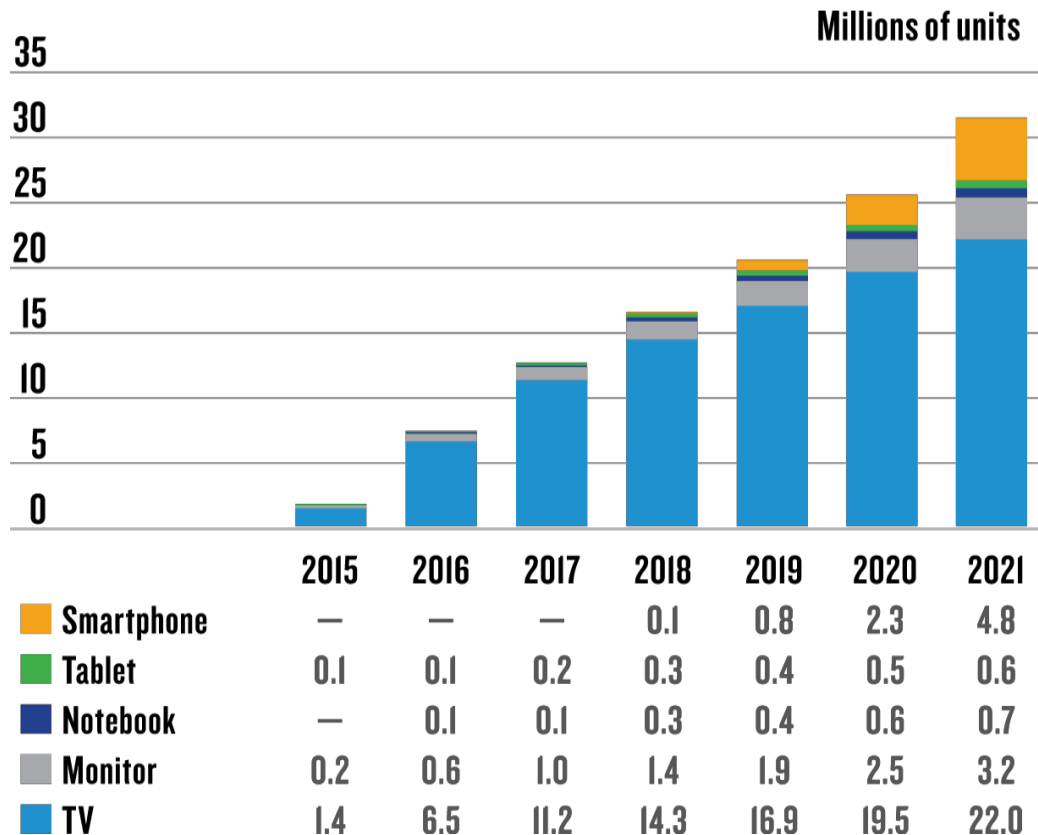


A compilation of six major research reports shows that the global QD market is expected to grow by about \$1 billion/year

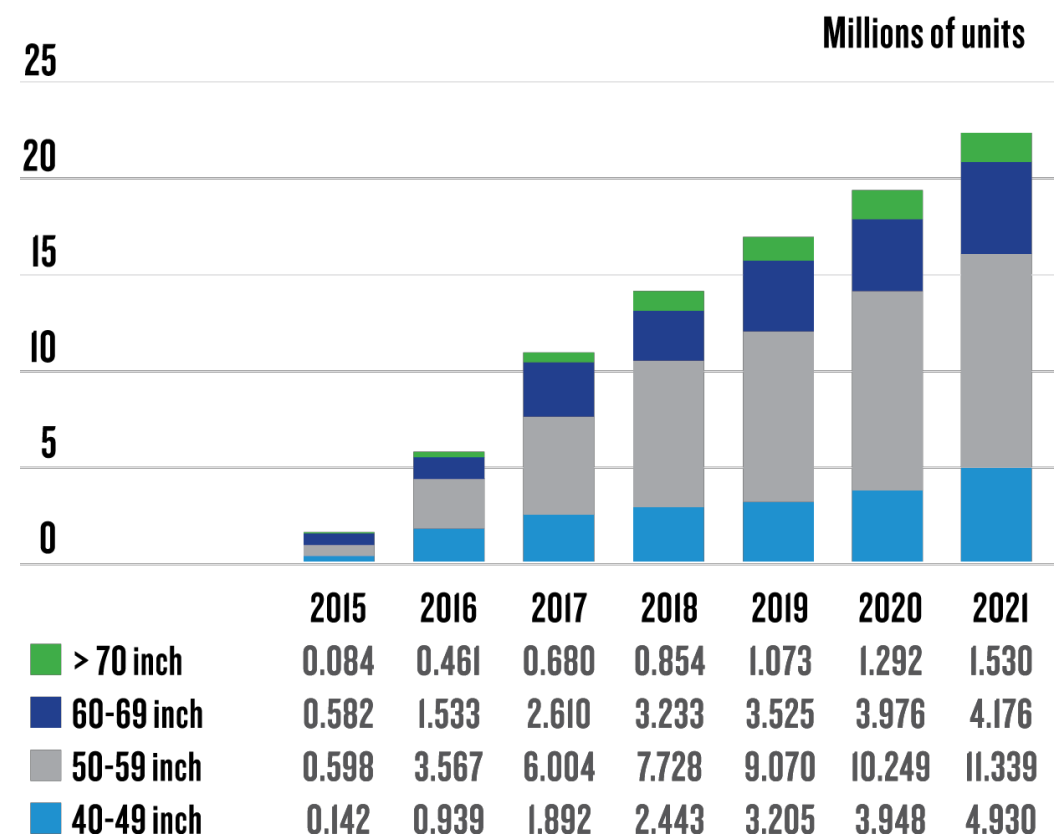
QD Display market by application and panel size

QD按应用和面板尺寸显示市场

QD display market forecast by application (volume)

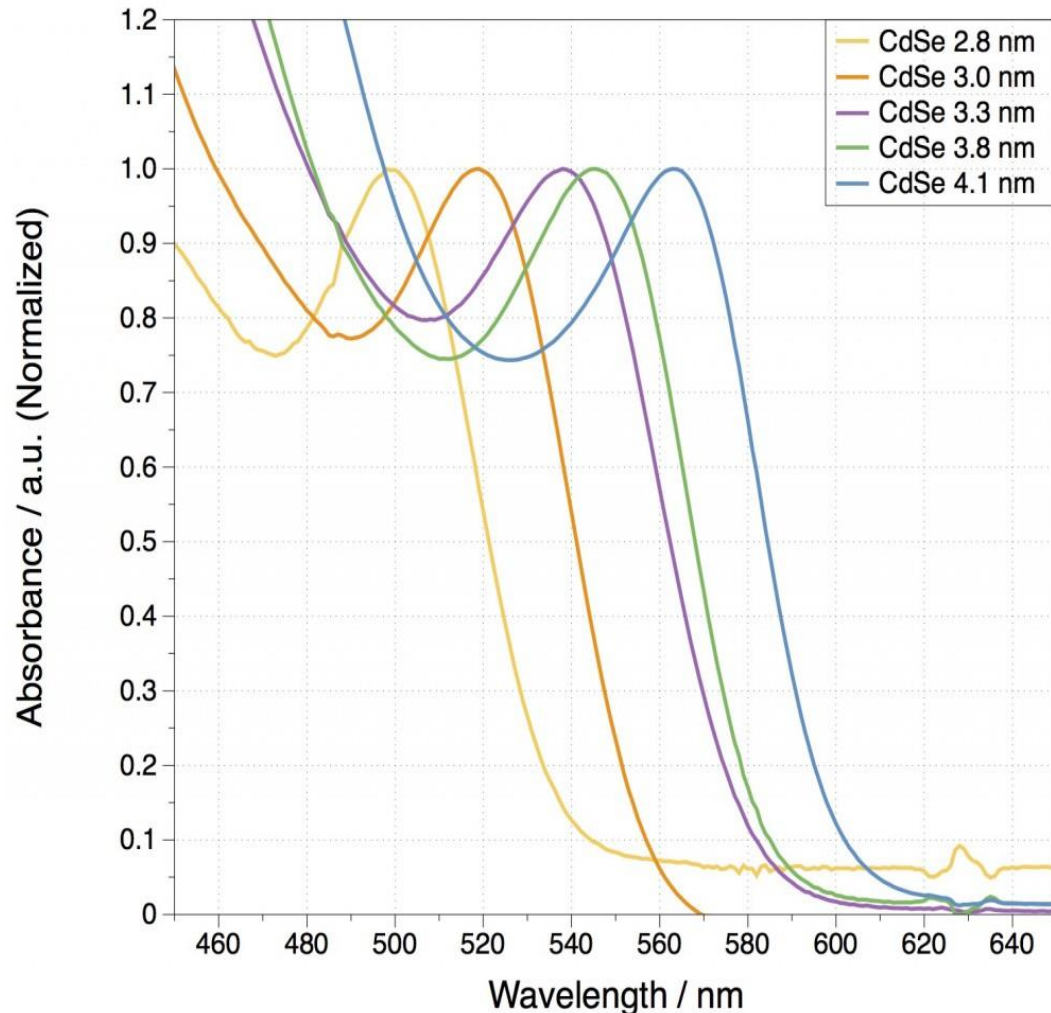


QD TV display market forecast by size (volume)



Example - QD Precision Fabrication

示例 - QD精密制造



- **CdSe Quantum Dots – 540 nm**
- 150 particles measured (see spread sheet)
- Representative coefficient of variance (CV): 1.33%
- Peak Fluorescence (λ_{em}): 540nm
- Typical Emission FWHM: <40nm
- Solvent: Toluene
- Concentration: 10mg/ml
- Standard Quantities: 5 ml, 20 ml
- Appearance: Orange solution
- Storage temperature: 2-8 oC
- With or without functional coatings
- Core shell materials with higher quantum yields



Examples of Our QD Materials

我们的QD材料的例子

- QD powders manufacture and roll-to-roll QDEF manufacture
- QD coating formulation for R2R coating on PET, examples:
 - CsPbCl₃; CsPbBr₃; CsPbI₃ (in various compositions of the halide)
 - CdSe type materials
 - Perovskites
 - Cd and Pb free materials (subject to R&D)
- First layer of a QD coating <10nm thickness
- Second layer of a protective polymer coating
- Turnkey production capacity: range 1 to 10 million sqm per year



Available QD Products and Coatings

可用的QD产品和涂料

Product Names	CdSe/ZnS Core/Shell 540, 570, 620 nm	M/N Core/Shell 535, 560, 620 nm	X/Y Core/Shell 535, 570, 620 nm
Solvent	Bespoke	Bespoke	Bespoke
Typical Emission FWHM	<40nm	<40nm	<40nm
Quantum Yield (Quantum Efficiency)	>40%	>40%	>55%
LCD Efficiency (depends on device design)	>40%	>40%	>40%
LCD Application Mode	QDEF or LC/CF QD	QDEF or LC/CF QD	QDEF or LC/CF QD
Reactive Group	Bespoke	Bespoke	Bespoke
Storage (in solvent/no protective barrier)	4-10 °C	4-10 °C	4-10 °C
pH Stability	pH 5-10	pH 5-10	pH 5-10
Shelf-Life (in solvent/no protective barrier)	>6 Months	>6 Months	>6 Months
Dispersion Concentration	Bespoke 1-100%	Bespoke 1-100%	Bespoke 1-100%
Coating Medium (Rheology Suitability: gravure, spray and ink)	UV Photopolymer coating with light transparency >90%, customised rheology	UV Photopolymer coating with light transparency >90%, customised rheology	UV Photopolymer coating with light transparency >90%, customised rheology
Excitation Source	UV or Blue LED light	UV or Blue LED light	UV or Blue LED light
Display Cost Comparison	LCD < QLED < OLED	LCD < QLED < OLED	LCD < QLED < OLED
Manufacturing Line QD Material ²	Alpha.QD.1X (1 Tonne/Year)	Alpha.QD.1X (1 Tonne/Year)	Alpha.QD.1X (1 Tonne/Year)
Manufacturing Line QDEF Photopolymer Coating ²	CO.Alpha.QD.1X (15 Tonnes/Year)	CO.Alpha.QD.1X (15 Tonnes/Year)	CO.Alpha.QD.1X (15 Tonnes/Year)
Manufacturing Line R2R QDEF PET Sheet ²	MC.R2R.1M 2 million M ² /Year	MC.R2R.1M 2 million M ² /Year	MC.R2R.1M 2 million M ² /Year
Quality Assurance Equipment Suite ²	Full Suite	Full Suite	Full Suite
Available for Technology Transfer	Yes	Yes	Yes

- Bricpoint offers opportunity for technology acquisition
- **Bricpoint为技术获取提供了机会**
- Precision manufacture of red and green emitting QDs, photopolymer coatings , encapsulating layer – for coating onto PET sheets
- **精密制造红色和绿色发光QD，光聚合物涂层，封装 - 用于PET面板上的涂层**
- Production line, quality control and testing of PET sheets, field support, training, expert placements in your factory
- **生产线，质量控制和PET产品测试，现场支持，培训，工厂专家安置**



Quantum dot technology is set to deliver next generation displays fit for the 21st century, make Bricpoint your partner for QDEF production!

量子点技术旨在为21世纪提供下一代显示器。与Bricpoint合作将使您能够制造量子点材料！