

**DOCKET**

**09-AAER-1C**

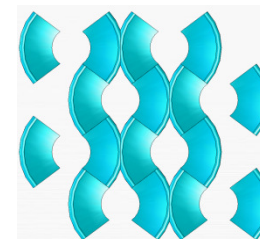
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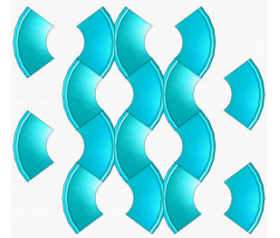
Imagine Designs, Inc.

Next Generation of TVs

June 2009



# Introduction



- Imagine Designs has invented and is developing two new optics technologies:

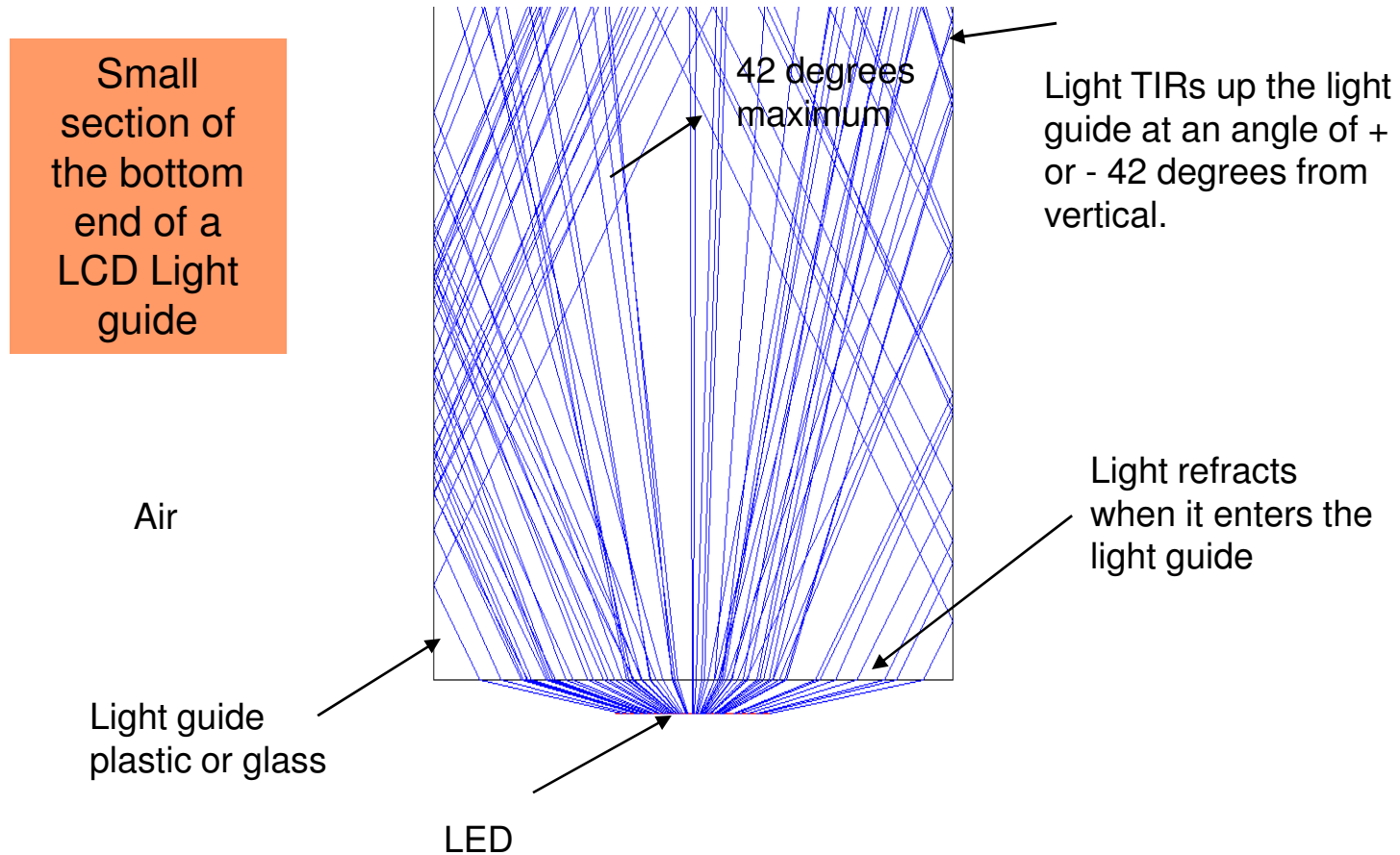
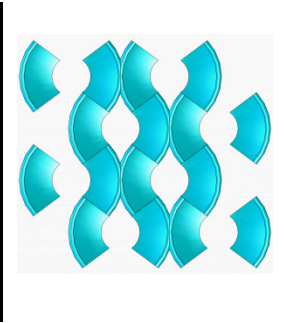
Flat Panel Reflector, FPR optics

Total Internal Reflection, TIR light valve

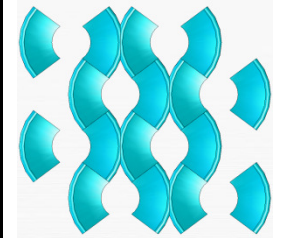
- The combination of these in a display, IDD

# Current Light Guide Optics for LCD, reference

## Zemax software ray trace

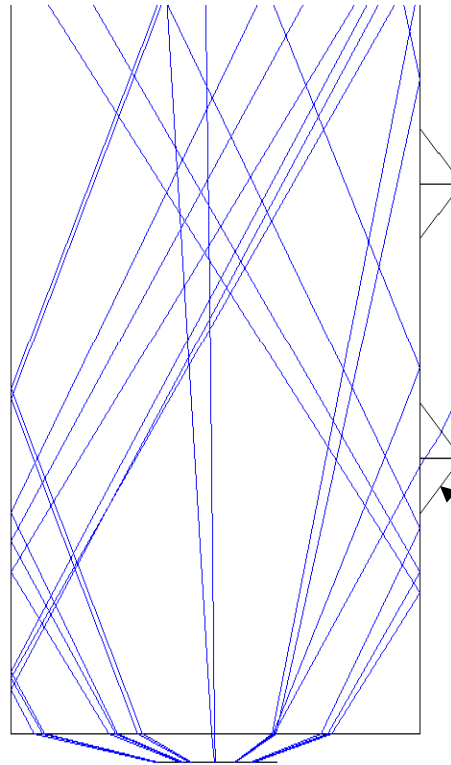


# Current Light Guide Optics for LCD, reference



## Zemax software ray trace

Bottom end  
of LCD Light  
guide

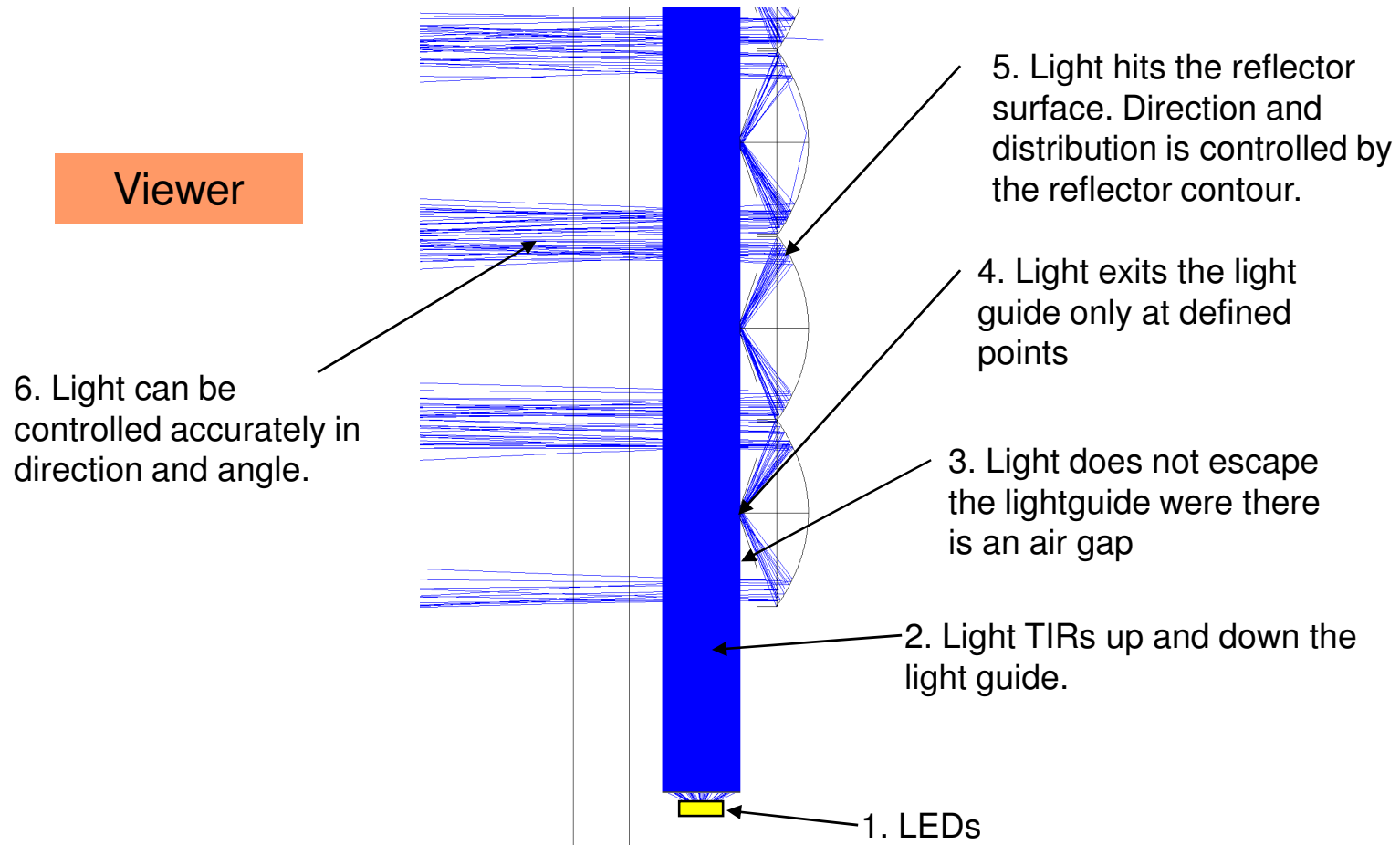


Light escapes  
vertically. 3M's BEF  
films helps redirect  
the light to the viewer.

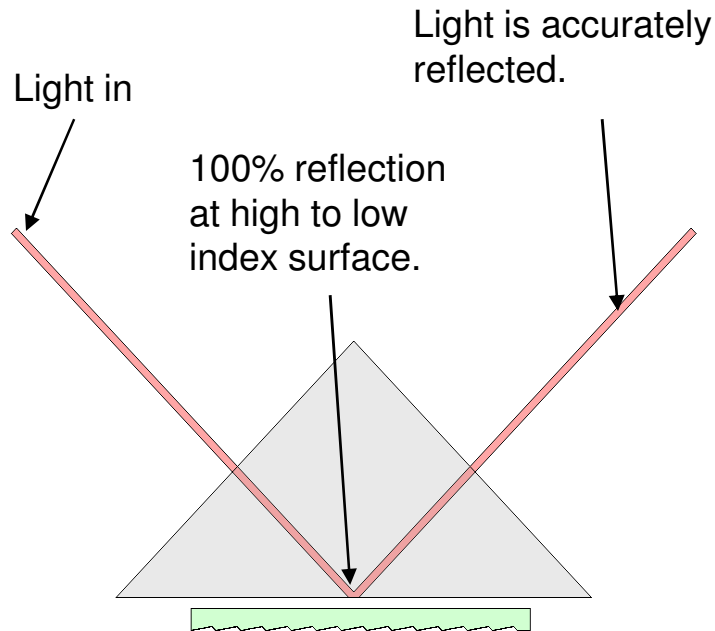
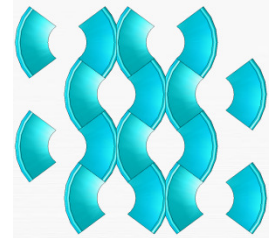
LCD backlights  
have defects to  
allow the light to  
escape.

# FPR – Imagine's new optics

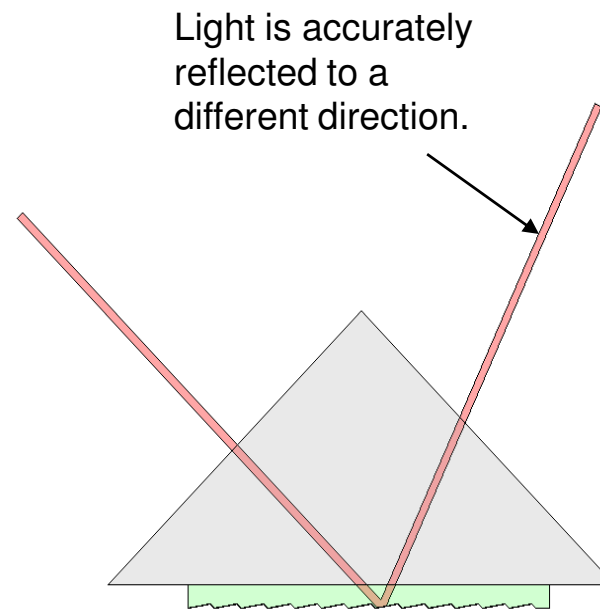
## Zemax software ray trace



# TIR light valve – Imagine's new light valve



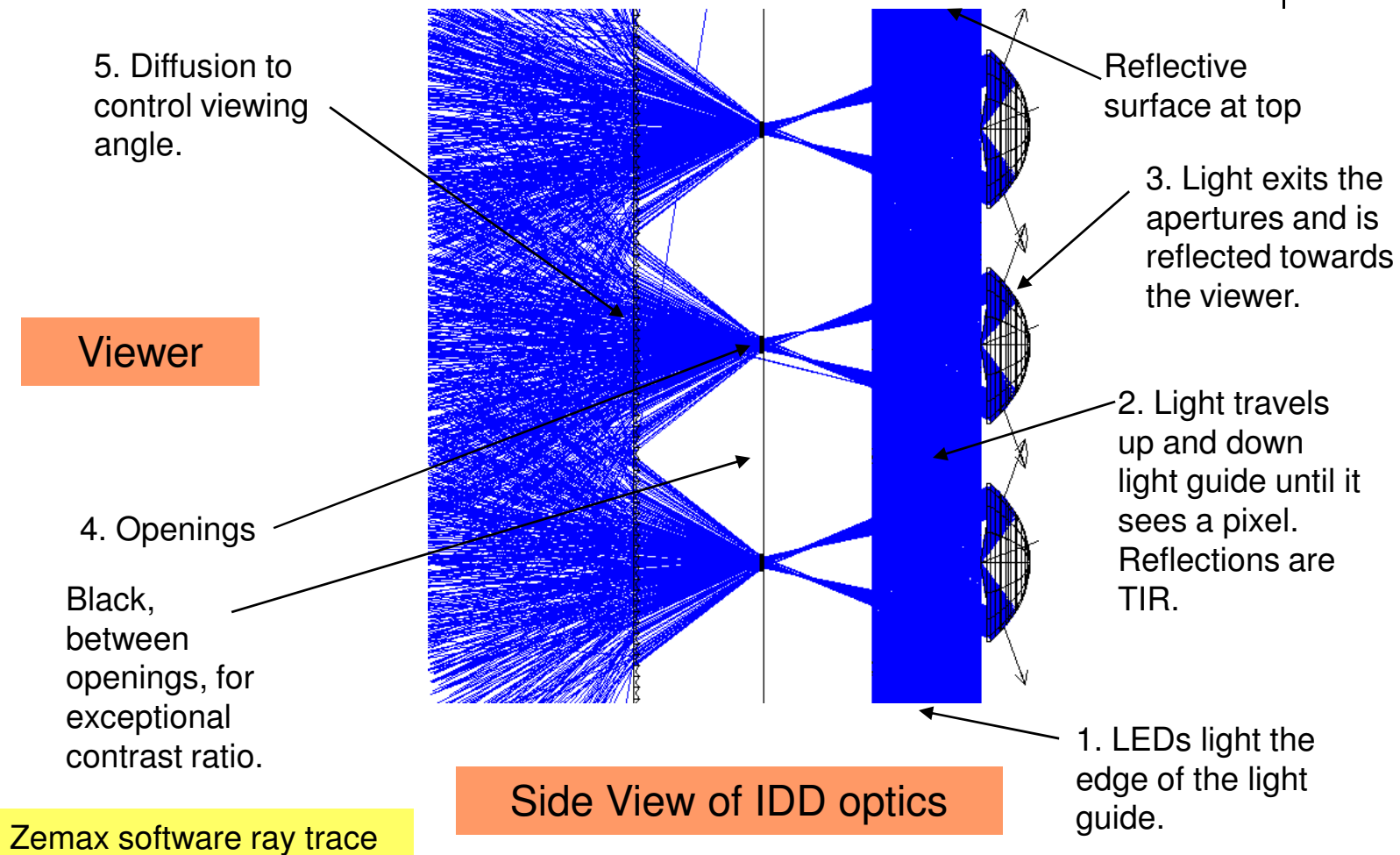
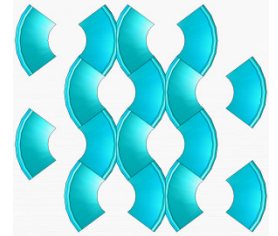
Traditional TIR,  
Light doesn't jump  
the small air gap.



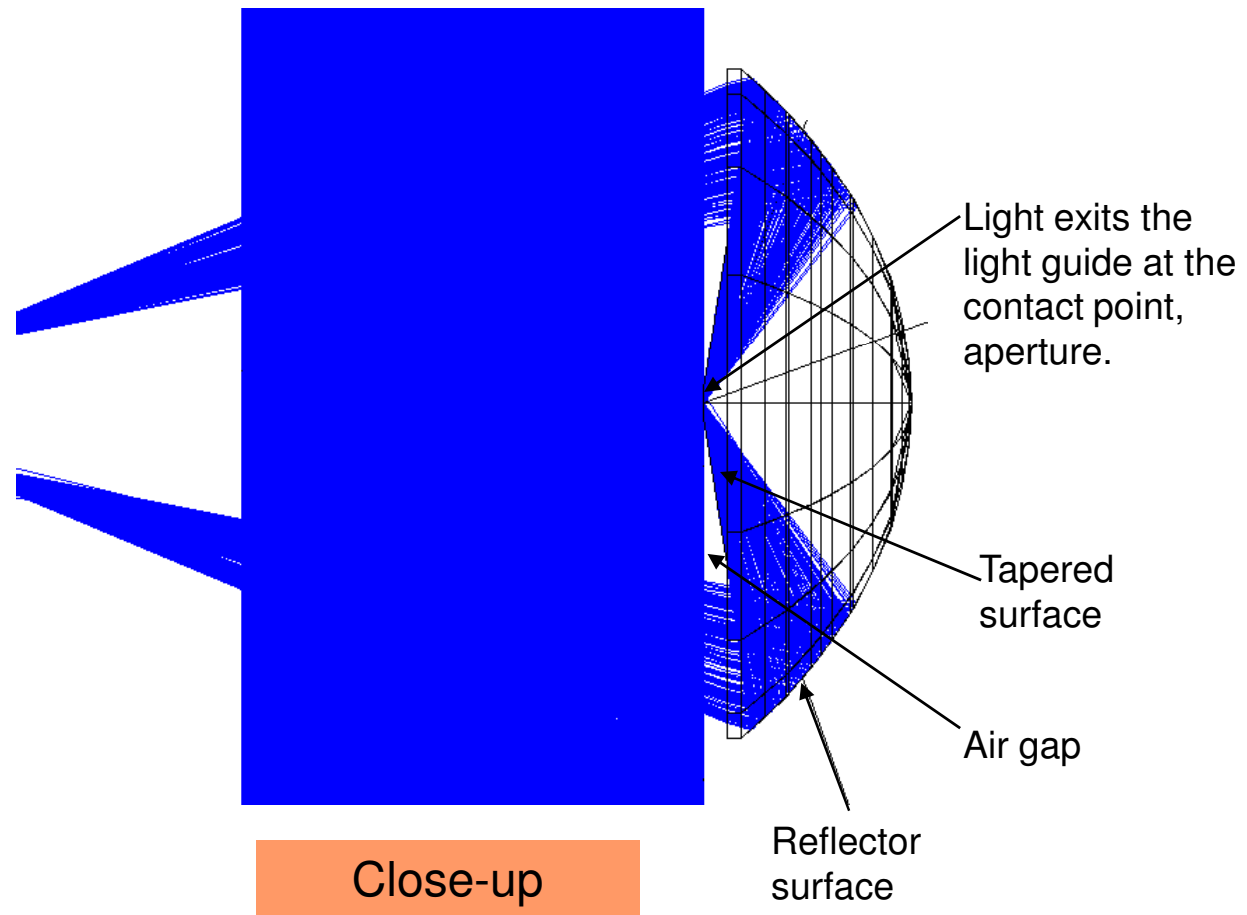
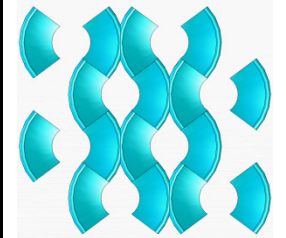
Air gap is removed.  
Light reflects off second  
surface.

# IDD- Imagine's new display

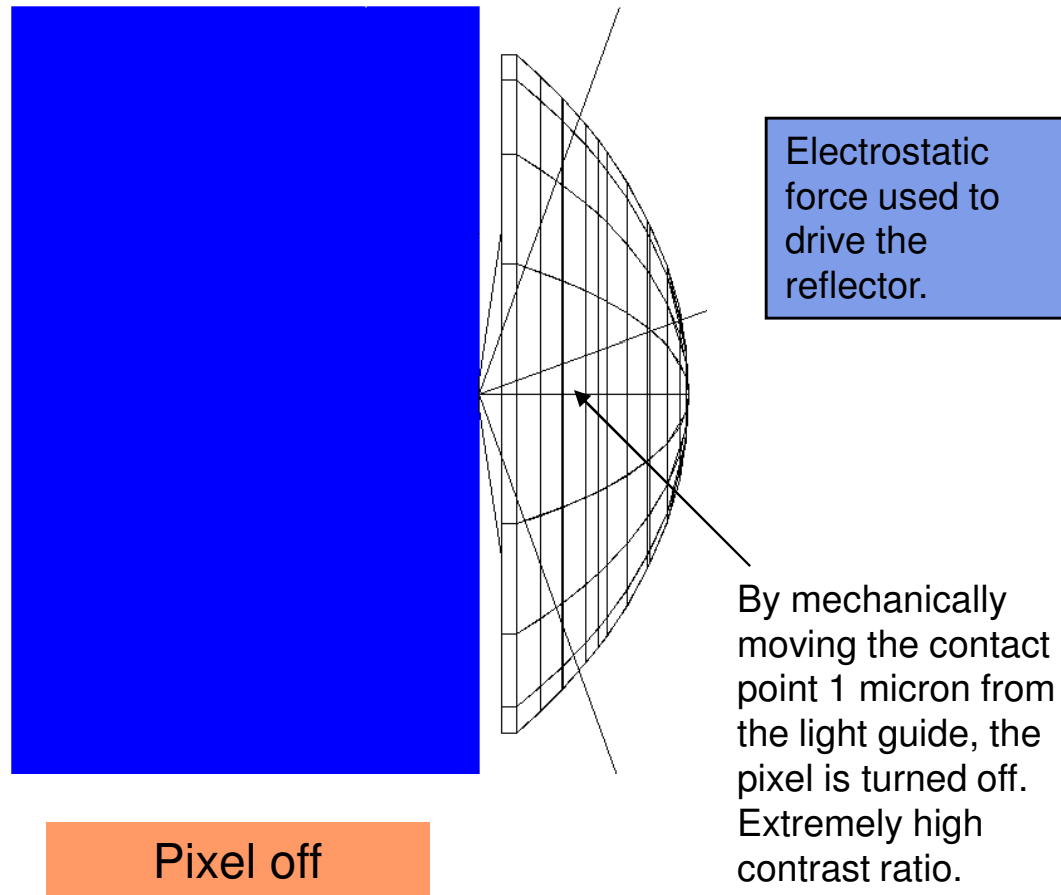
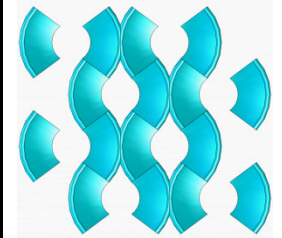
The combination of FPR and the TIR light valve into a display.



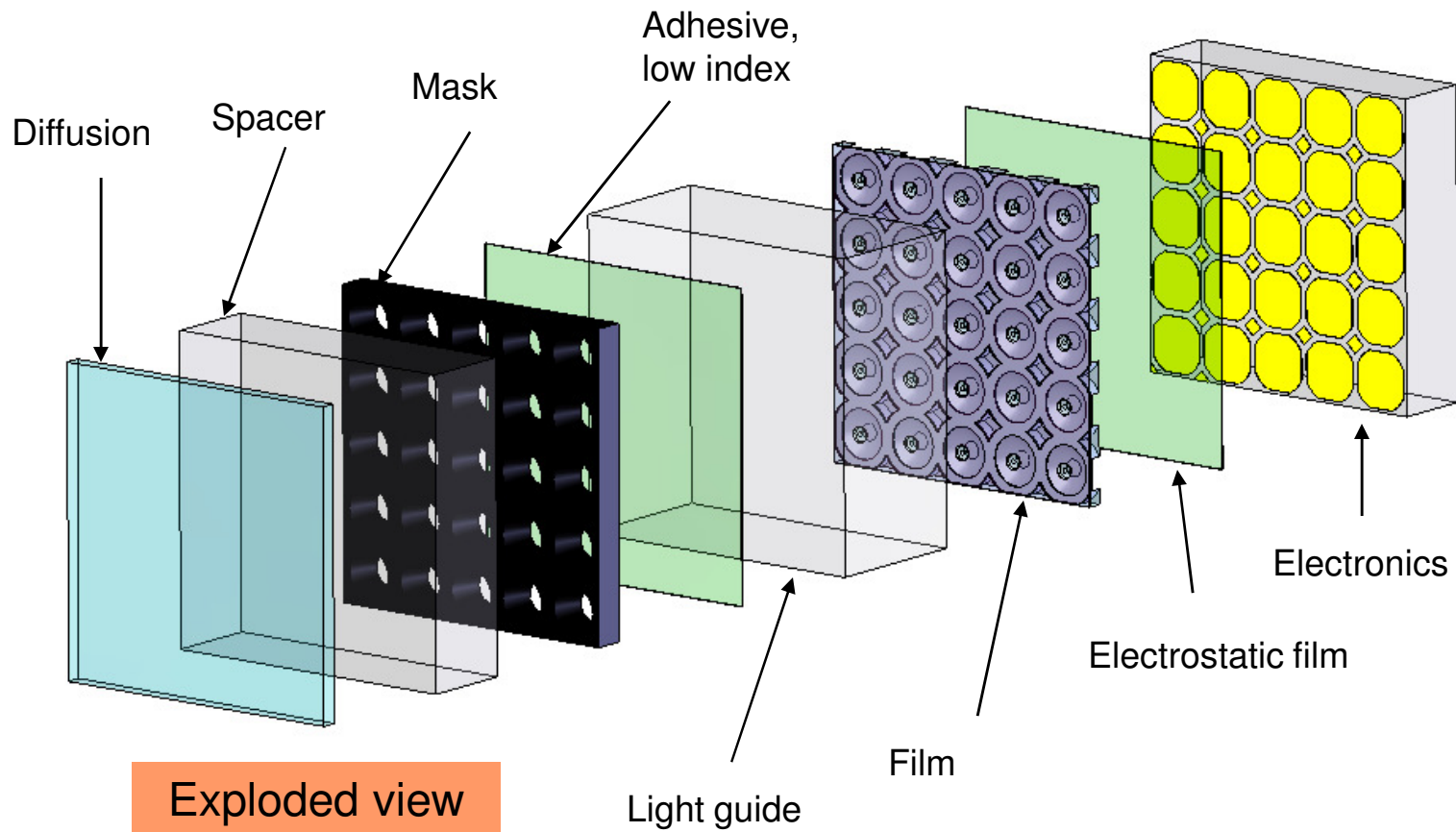
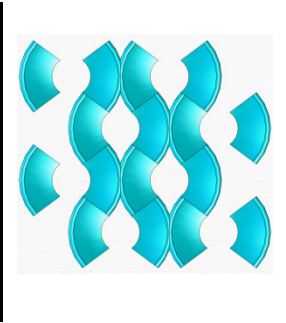
# IDD- Imagine's new display



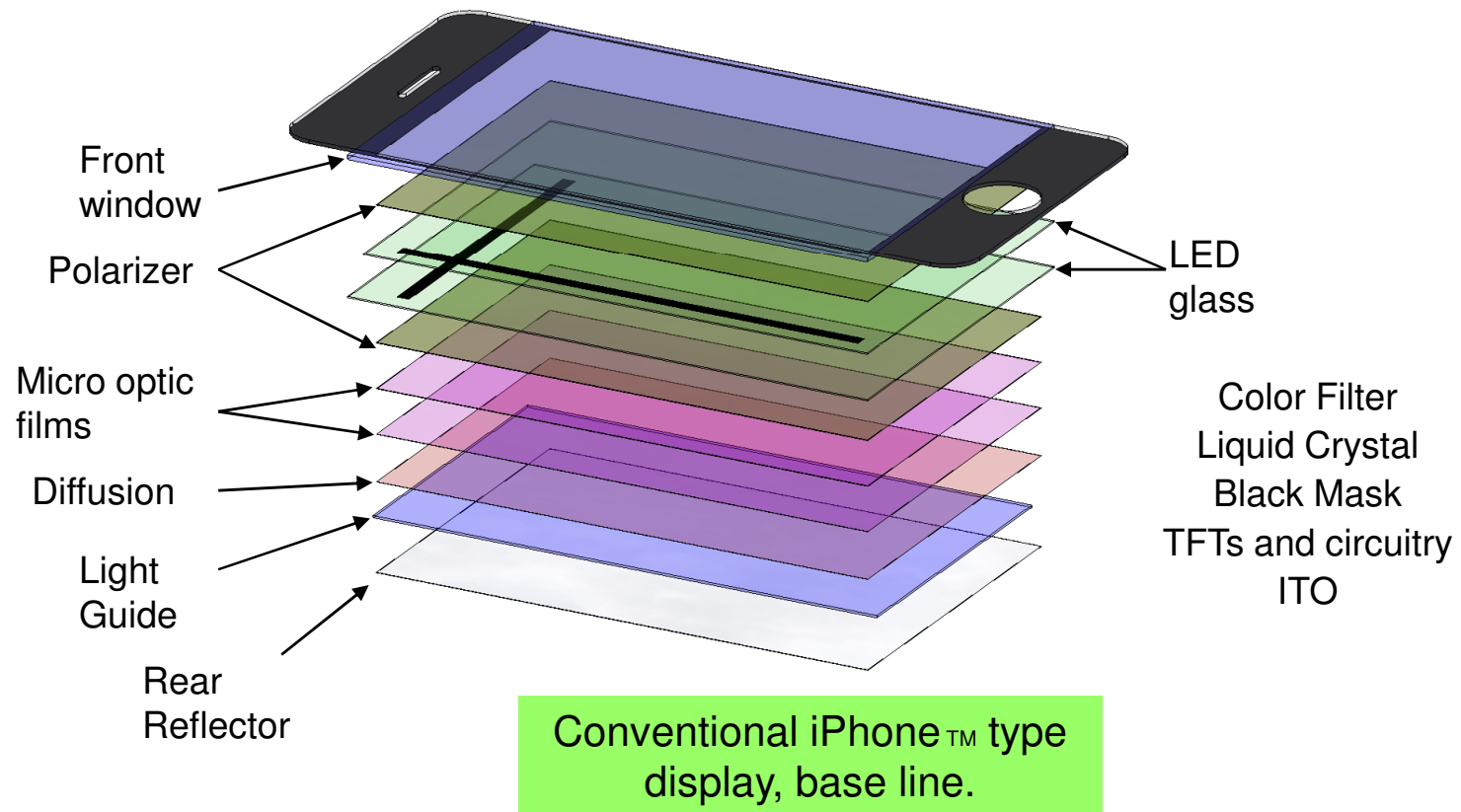
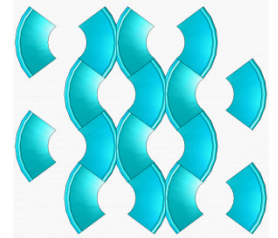
# IDD – Imagine's new display



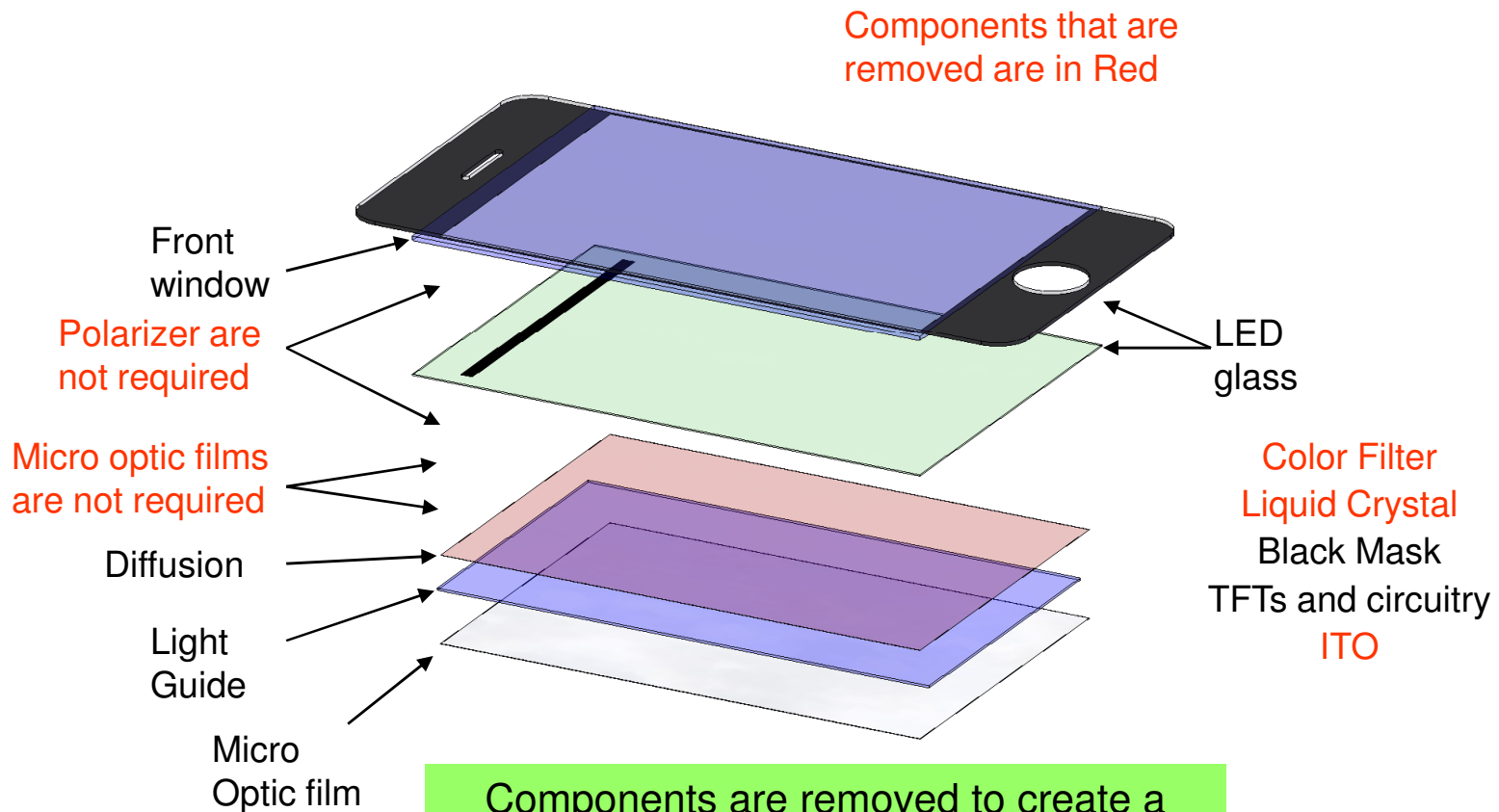
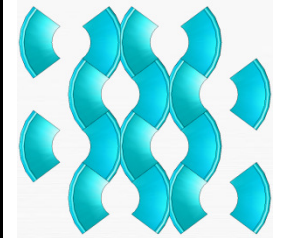
# IDD - Small section of the display



# Example - iPhone™ - Current Technology

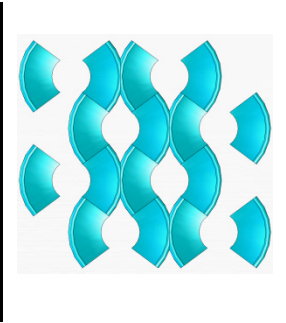


# Example - iPhone™ - With IDD

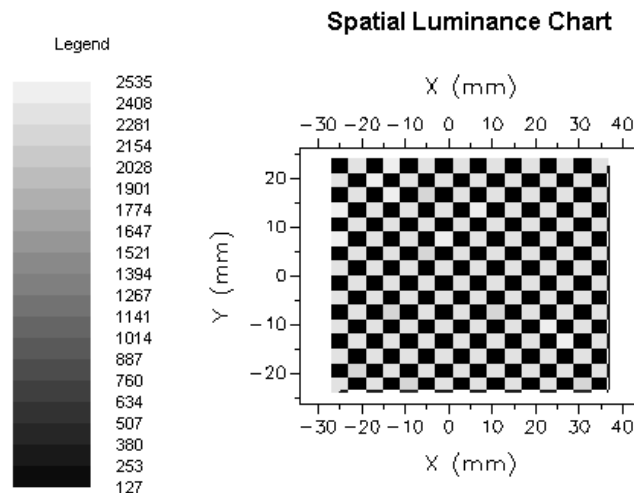


Components are removed to create a display with IDD. The components are assembled in a different position.

# Results from ORA analysis

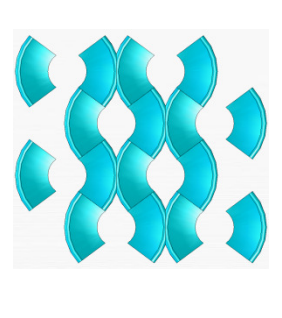


- Optical Research Associates, ORA, evaluated a cell phone sized ( 48 mm x 64 mm ) display for Imagine Designs. A summary of their results are:
- Contrast ratio: greater than 7000:1 (iPhone 300:1)
- Brightness: greater than 1600 NIT (iPhone 300 NIT)
- Off-axis contrast ratio (30 degrees from normal): greater than 600:1
- Checkerboard contrast ratio: greater than 500:1
- Field Quality:



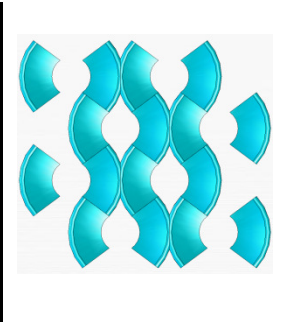
**On-axis Luminance across the display surface.**

# Results from ORA applied to TV

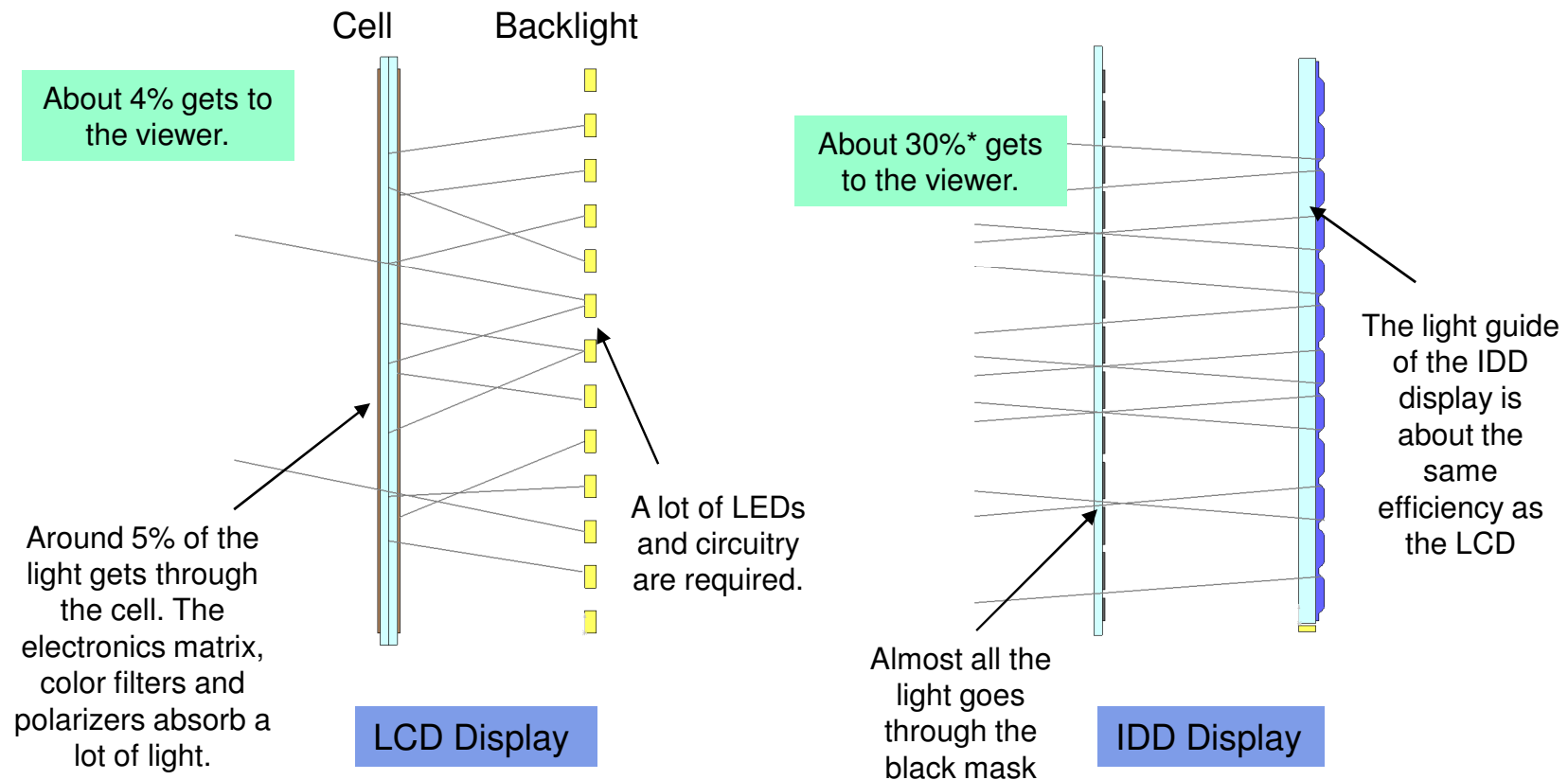


- Applying the Optical Research Associates, ORA, analysis to a 46 inch TV. A summary of the results are:
- Brightness: greater than 600 NIT
- Contrast ratio: greater than 14,000:1, native all white / all black
- Contrast ratio with 50% of the pixels black: 18,000 (slightly dimmed BL to maintain white pixels at same brightness as all full on screen above)
- Contrast ratio with 75% of the pixels black: 23,000 (dimmed BL to maintain white pixels at same brightness as all full on screen above)
- Contrast ratio with 95% of the pixels black: 30,000 (dimmed BL to maintain white pixels at same brightness as all full on screen above)
- Off-axis contrast ratio (30 degrees from normal): greater than 1200:1
- Power: 30 watts (with a full white screen).

# Why IDD TVs consumes much less power than LCD TVs

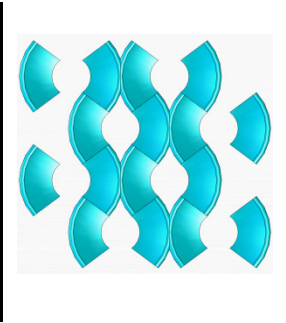


IDD displays are much more efficient than LCD.  
This lets them be brighter and use less power.

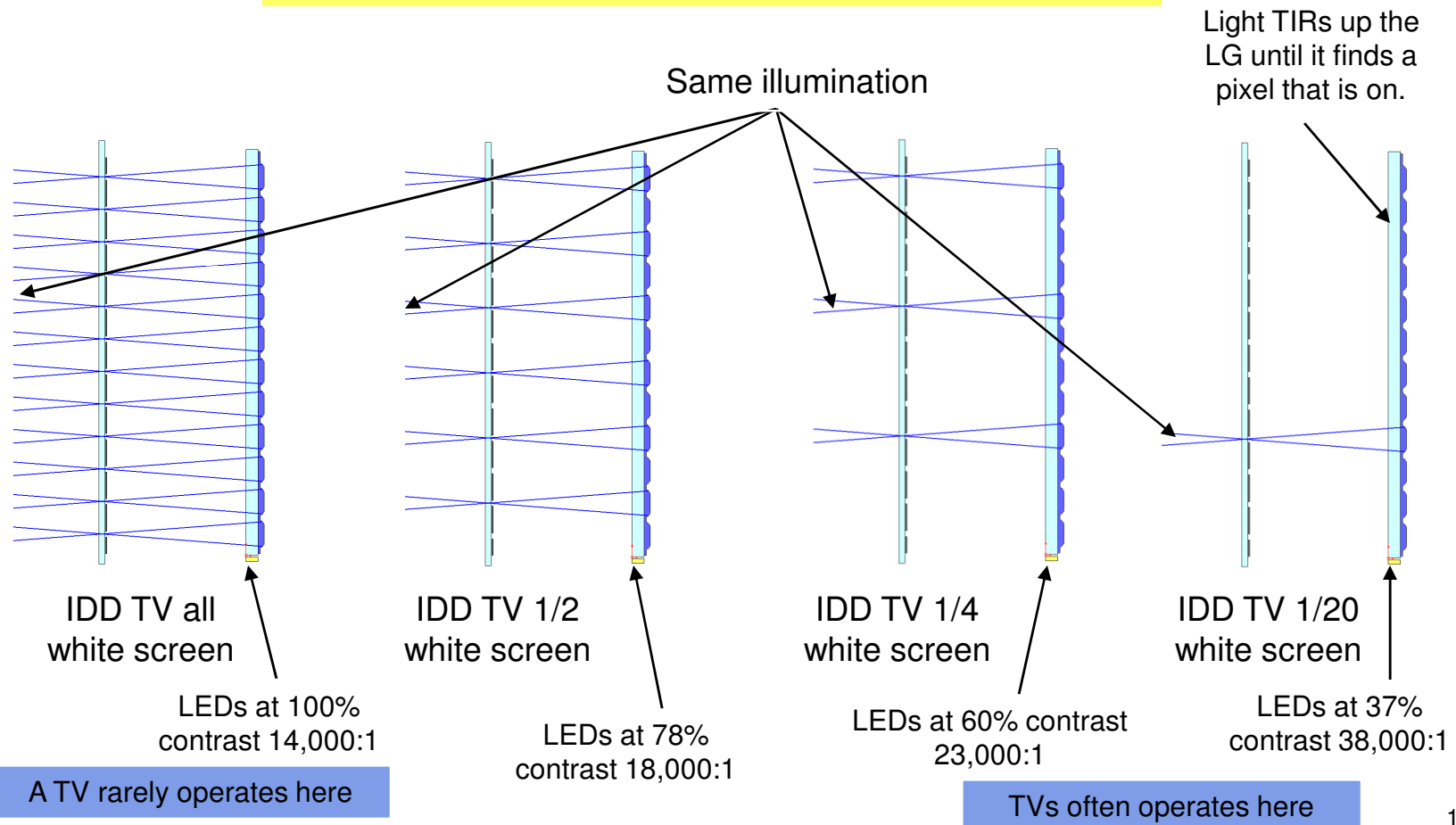


\* results of ORA, light tools analysis

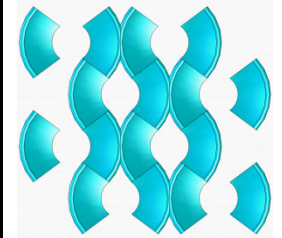
# IDD TVs with a screen that has not all white



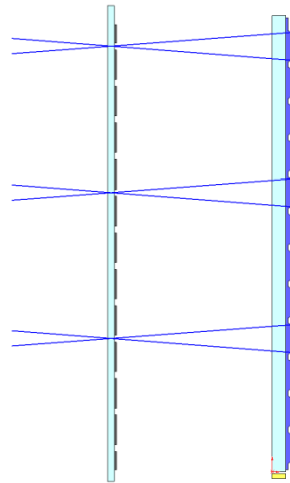
When an IDD TV has a screen that is not all white the contrast ratios goes up and they use even less power



# IDD TVs average power



When an IDD TV has a screen that is not all white the contrast ratios goes up and they use even less power

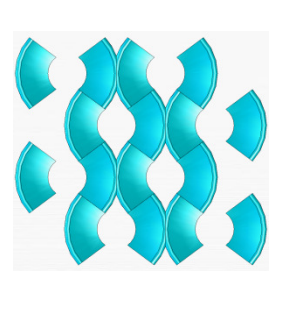


LEDs at 60% contrast  
23,000:1

A 46" TV would, on average  
consume 18 watts

IDD TV 1/4  
white screen

# IDD TVs California power savings



Current Annual Consumption for TVs = 11.5 Terawatt-hrs @ \$0.14Kw-hr = \$1.6 B  
Yearly Target Savings 33 $\frac{1}{3}$  % = 3.83 Terawatt-hrs.

## CEC New Standard

- January 1, 2011 0.156 watts x Screen area /sq. inch + 32
- January 1, 2013 0.120 watts x Screen area /sq. inch + 25

Average 46" TV has 904 sq. in. therefore the standards by year will be:

- January 1, 2011 = 173 watts
- January 1, 2013 = 133.5 watts

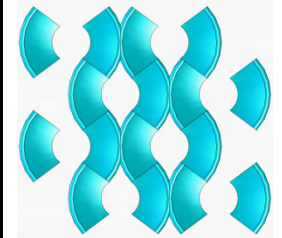
Imagine Designs power consumption will be:

- Display power = 25 watts
- Power supply = 17 watts
- Total = 42 watts
- ~ 75% reduction for 2011 & ~69% reduction for 2013

Conclusion: Savings with IDI Technology = \$1.2 Billion for State of California

Potential Savings for United States = \$12 Billion

# IDD - Cost of LCD and IDD



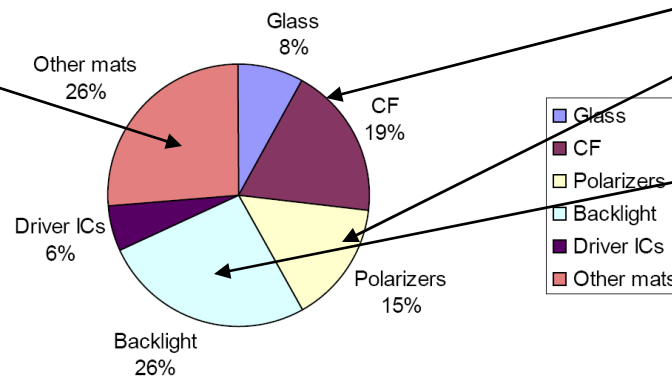
Not only do IDD TVs perform better they are lower in cost

## 32" LCD TV Component Costs



### Breakdown of Material/Component Costs 32" WXGA

Some  
reduction  
in cost.



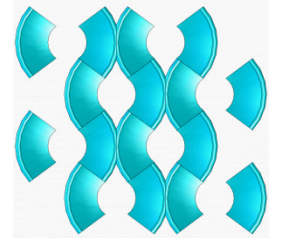
Not required  
for IDD  
technology.

Significant  
reduction  
in cost.

**Better backlight technology is critical to LCD-TV development**

IDD TVs are less than 1/2 the cost to  
manufacture than LCD TVs.

# Summary



- TVs manufactured with IDD technology will:
  1. Exceed performance of current LCD TVs in contrast ratio, brightness, viewing angle, color gamut, thickness, and refresh rate.
  2. They will consume significantly less power than LCD TVs, at least 75% less.
  3. They will be significantly less expensive to manufacture than LCD TVs.