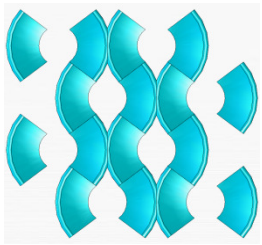
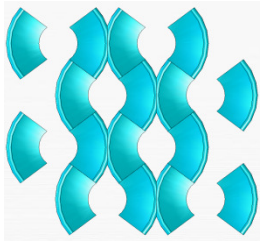
Imagine Designs, Inc.

Next Generation of TVs

June 2009



Introduction



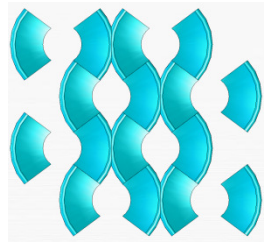
- Imagine Designs has invented and is developing two new optics technologies:

  Flat Panel Reflector, FPR optics

  Total Internal Reflection, TIR light valve

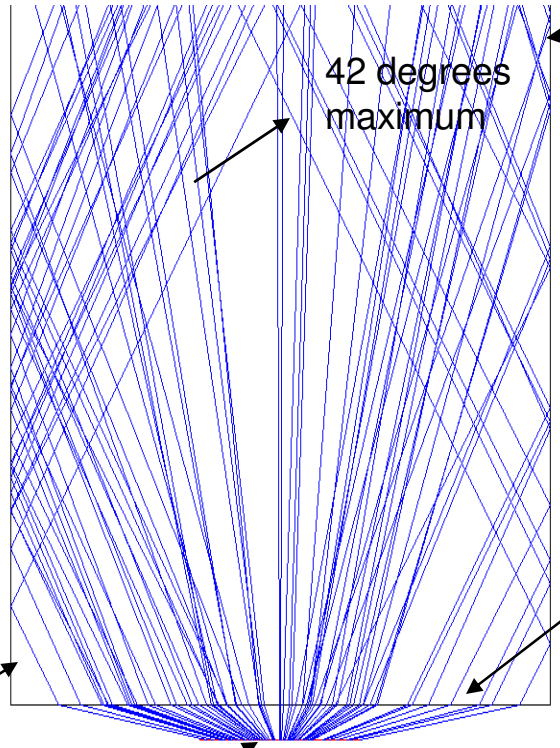
- The combination of these in a display, IDD

Current Light Guide Optics for LCD, reference



Zemax software ray trace

Small section of the bottom end of a LCD Light guide



Light TIRs up the light guide at an angle of + or - 42 degrees from vertical.

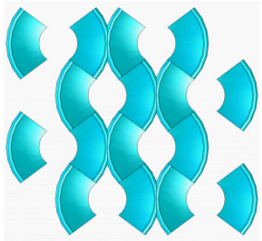
Air

Light refracts when it enters the light guide

Light guide plastic or glass

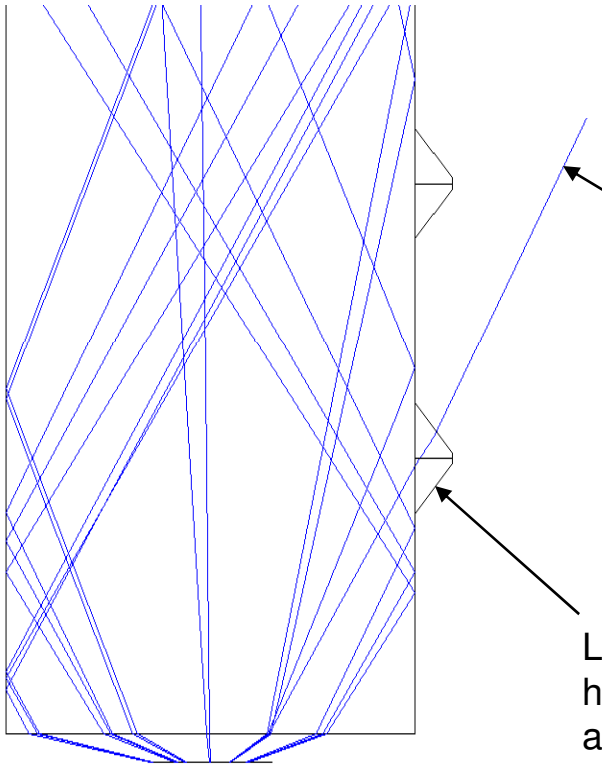
LED

Current Light Guide Optics for LCD, reference



Zemax software ray trace

Bottom end of LCD Light guide

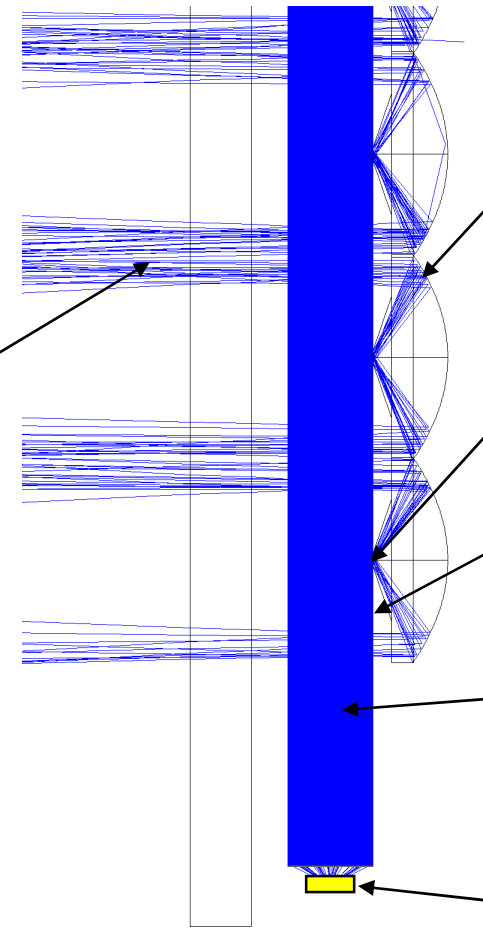


Light escapes vertically. 3M's BEF films helps redirect the light to the viewer.

LCD backlights have defects to allow the light to escape.

FPR – Imagine's new optics

Zemax software ray trace



Viewer

6. Light can be controlled accurately in direction and angle.

5. Light hits the reflector surface. Direction and distribution is controlled by the reflector contour.

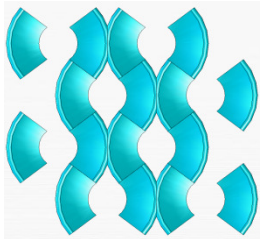
4. Light exits the light guide only at defined points

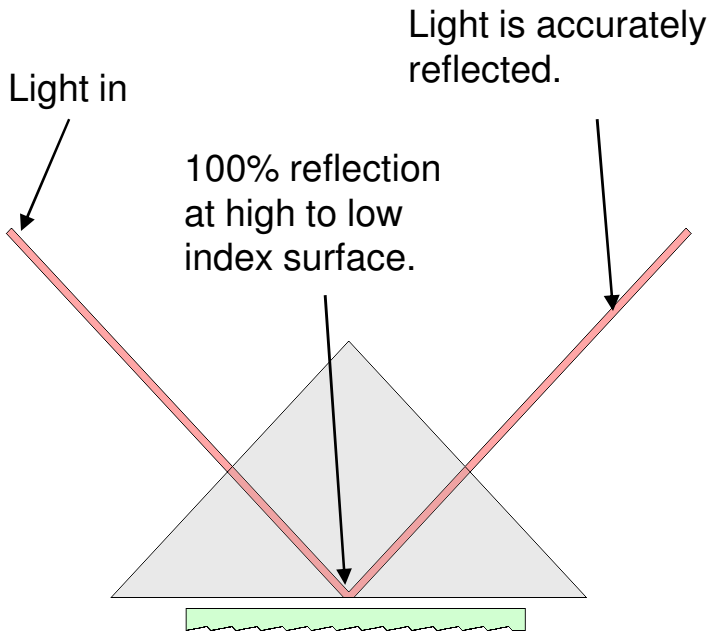
3. Light does not escape the lightguide were there is an air gap

2. Light TIRs up and down the light guide.

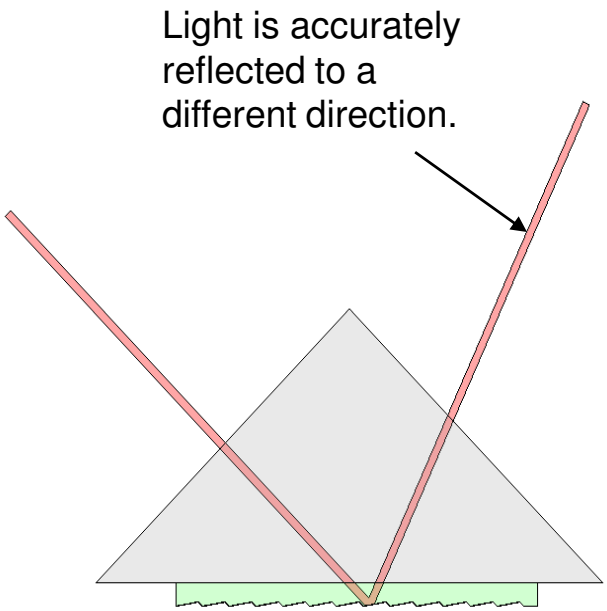
1. LEDs

TIR light valve – Imagine's new light valve



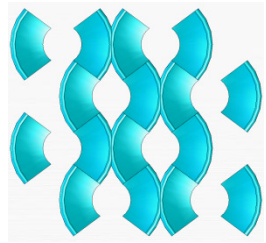


Traditional TIR, Light doesn't jump the small air gap.

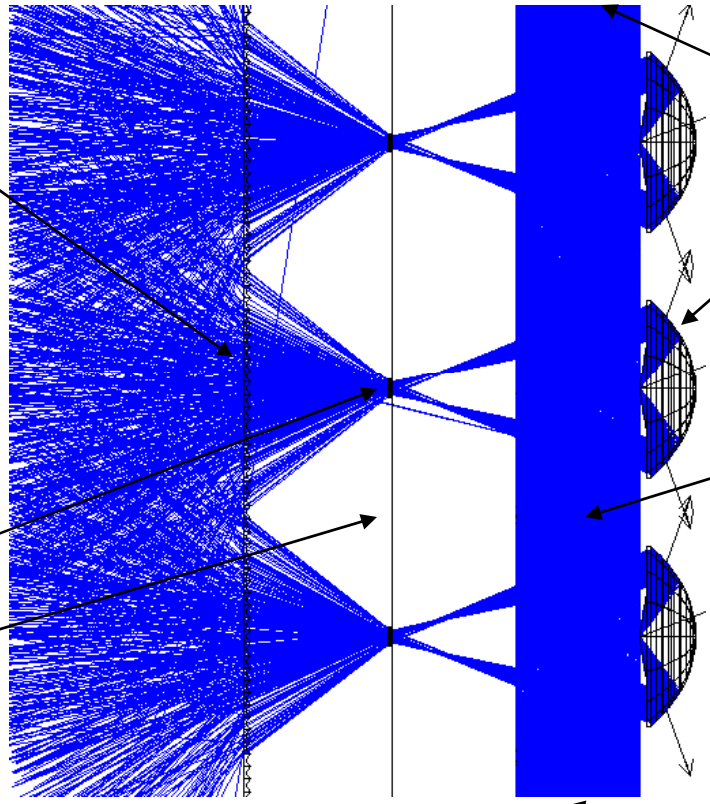


Air gap is removed. Light reflects off second surface.

IDD- Imagine's new display



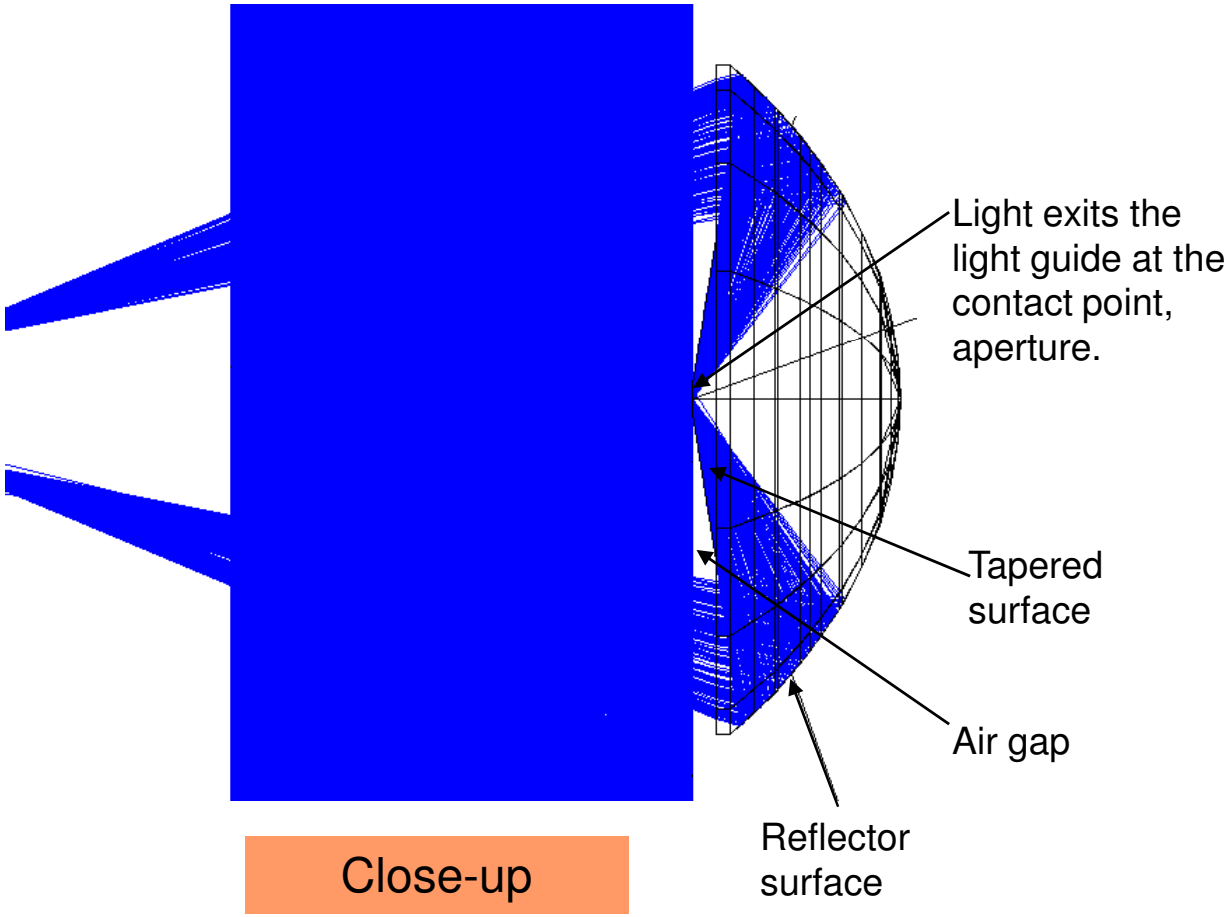
The combination of FPR and the TIR light valve into a display.



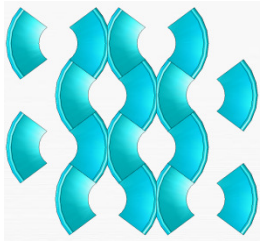
Side View of IDD optics

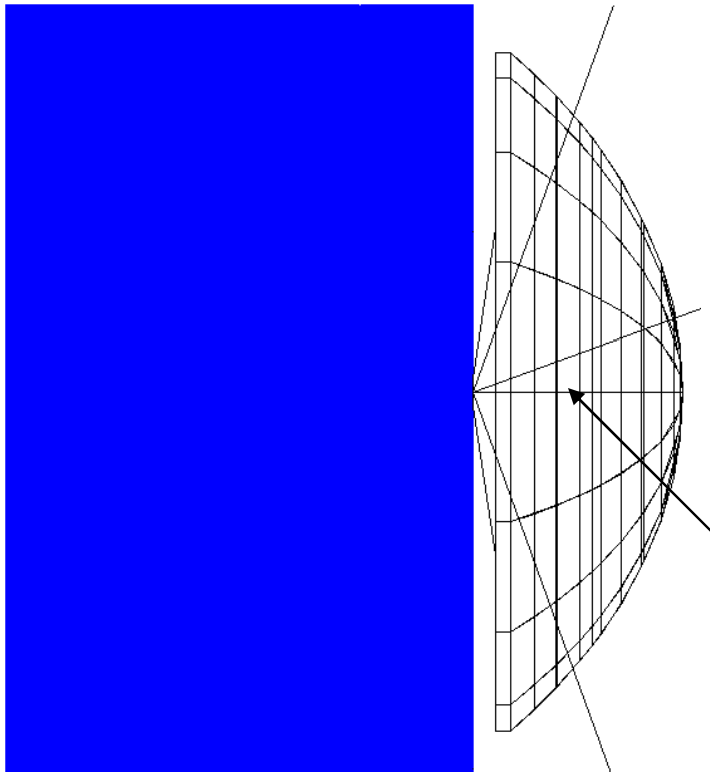
Zemax software ray trace

IDD- Imagine's new display



IDD – Imagine's new display



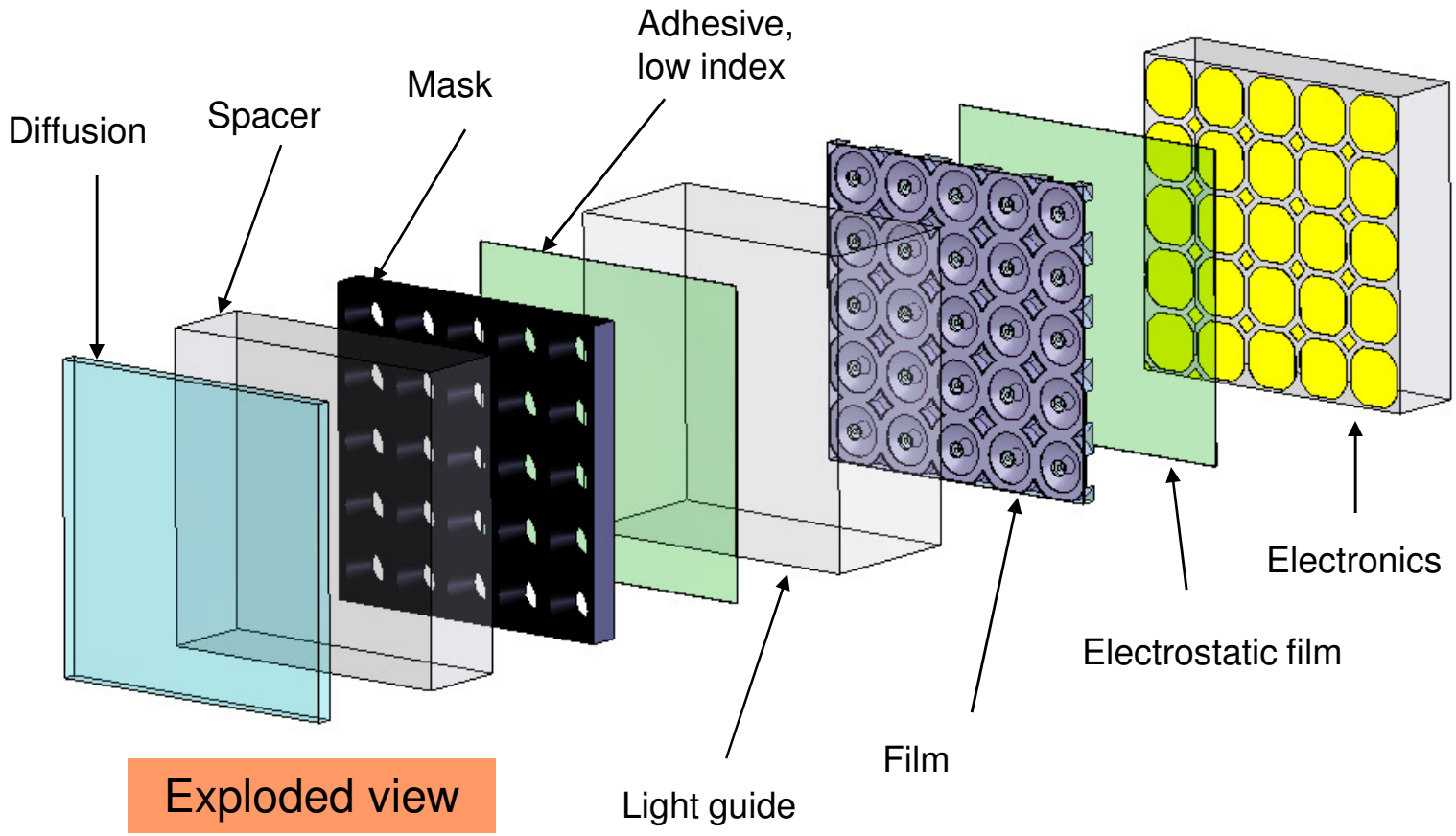


Electrostatic force used to drive the reflector.

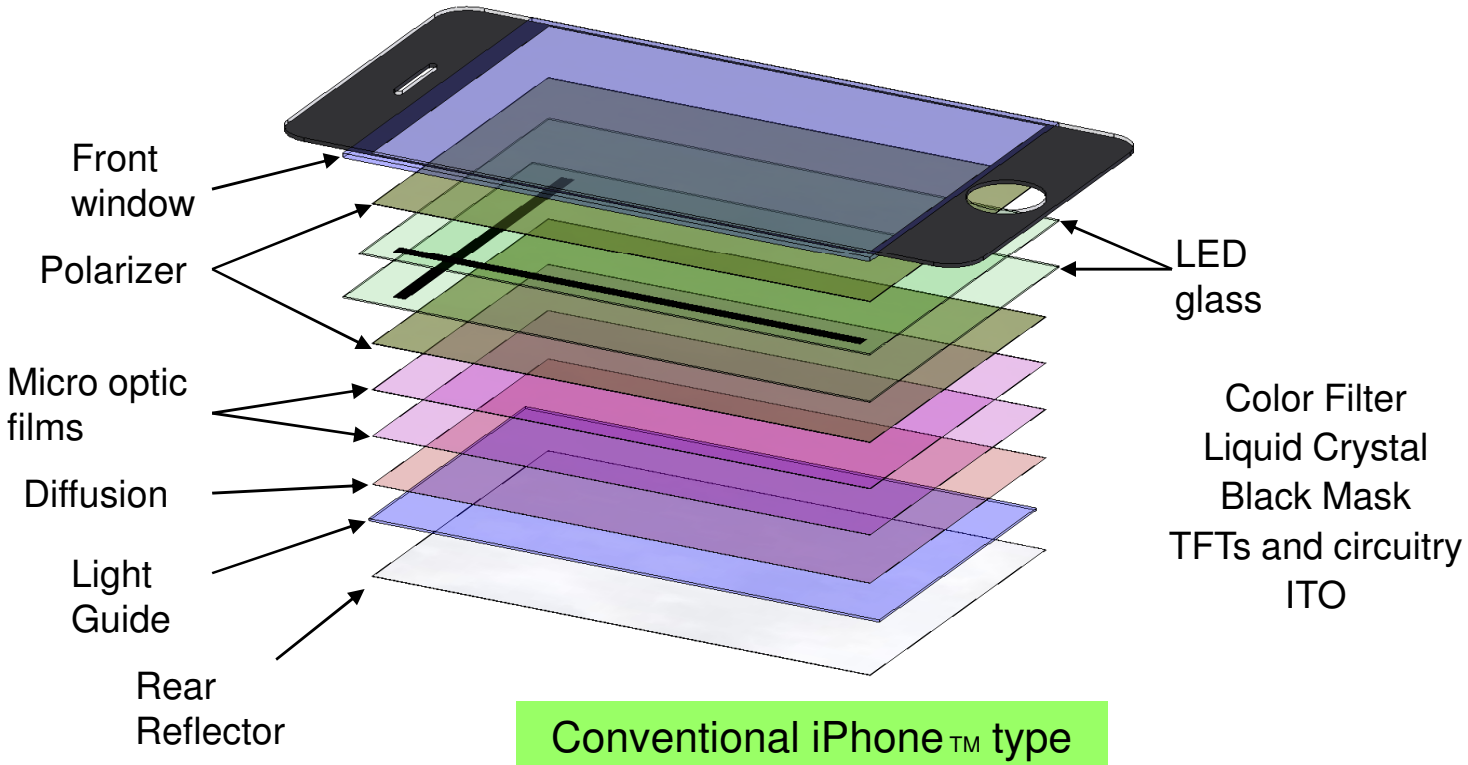
By mechanically moving the contact point 1 micron from the light guide, the pixel is turned off. Extremely high contrast ratio.

Pixel off

IDD - Small section of the display

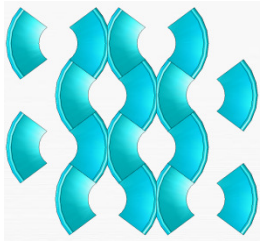


Example - iPhone™ - Current Technology

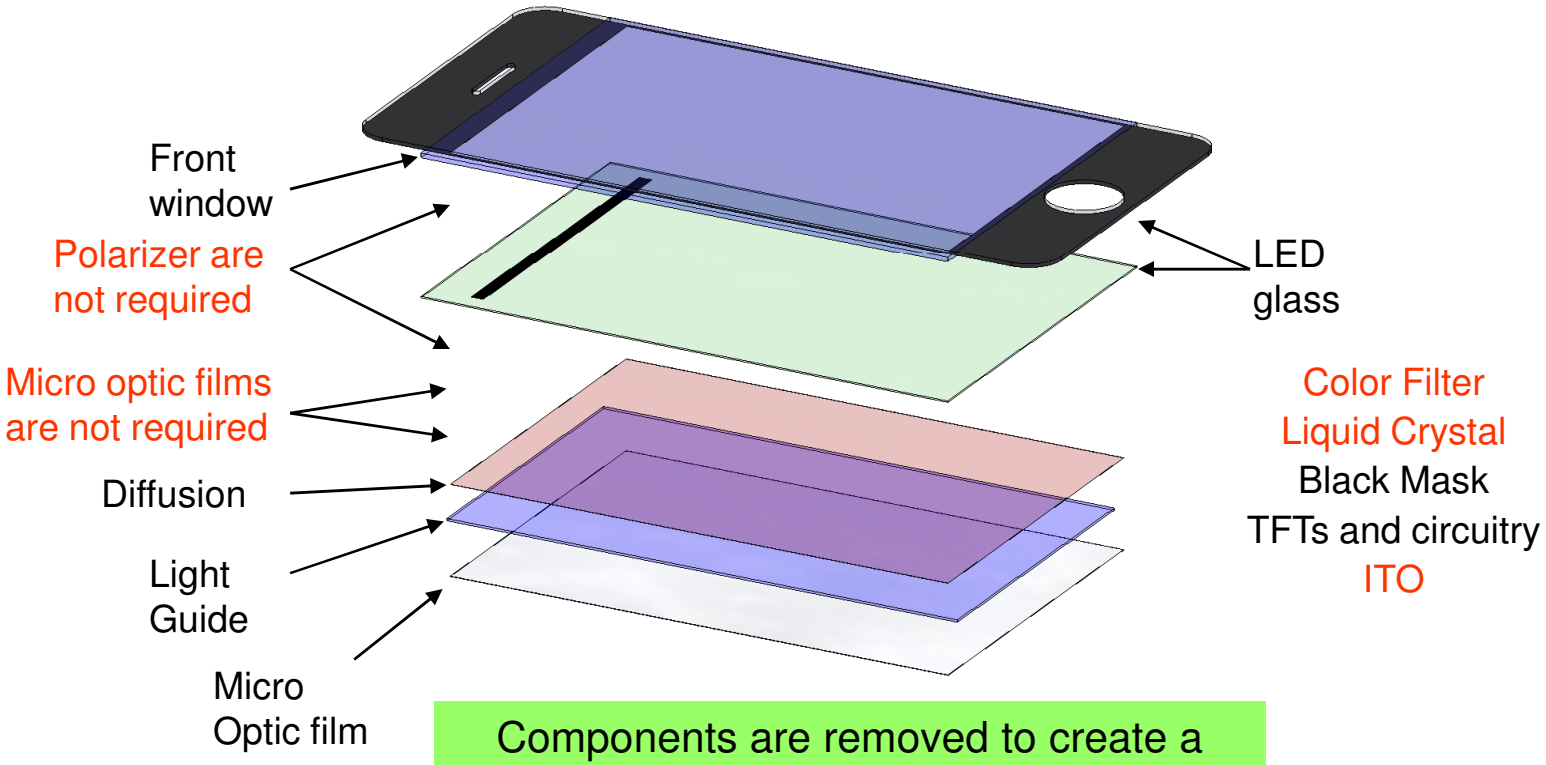


Conventional iPhone™ type display, base line.

Example - iPhone™ - With IDD

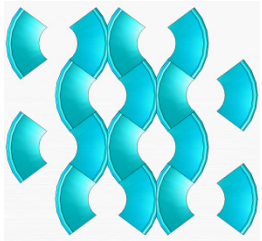


Components that are removed are in Red

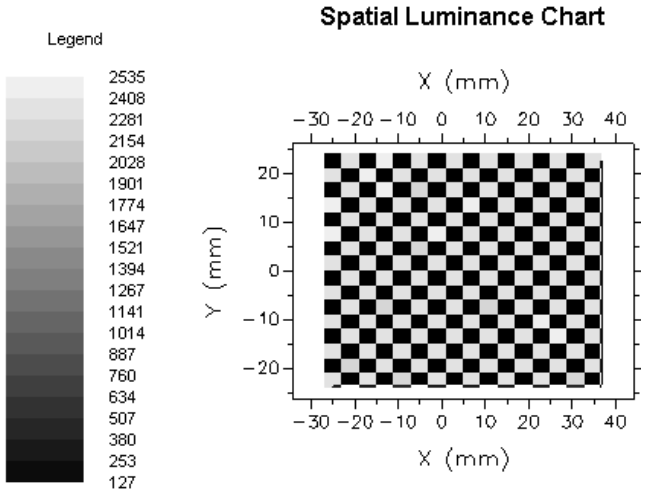


Components are removed to create a display with IDD. The components are assembled is a different positions.

Results from ORA analysis

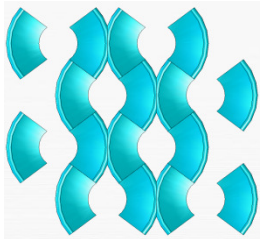


- Optical Research Associates, ORA, evaluated a cell phone sized (48 mm x 64 mm) display for Imagine Designs. A summary of their results are:
- Contrast ratio: greater than 7000:1 (iPhone 300:1)
- Brightness: greater than 1600 NIT (iPhone 300 NIT)
- Off-axis contrast ratio (30 degrees from normal): greater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



On-axis Luminance across the display surface.

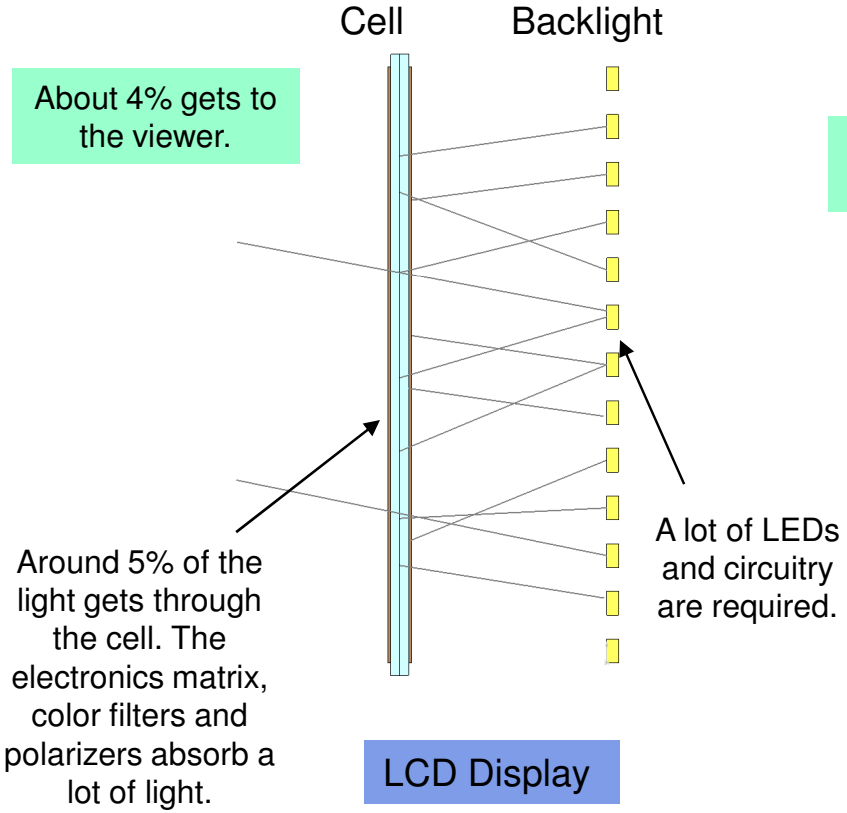
Results from ORA applied to TV

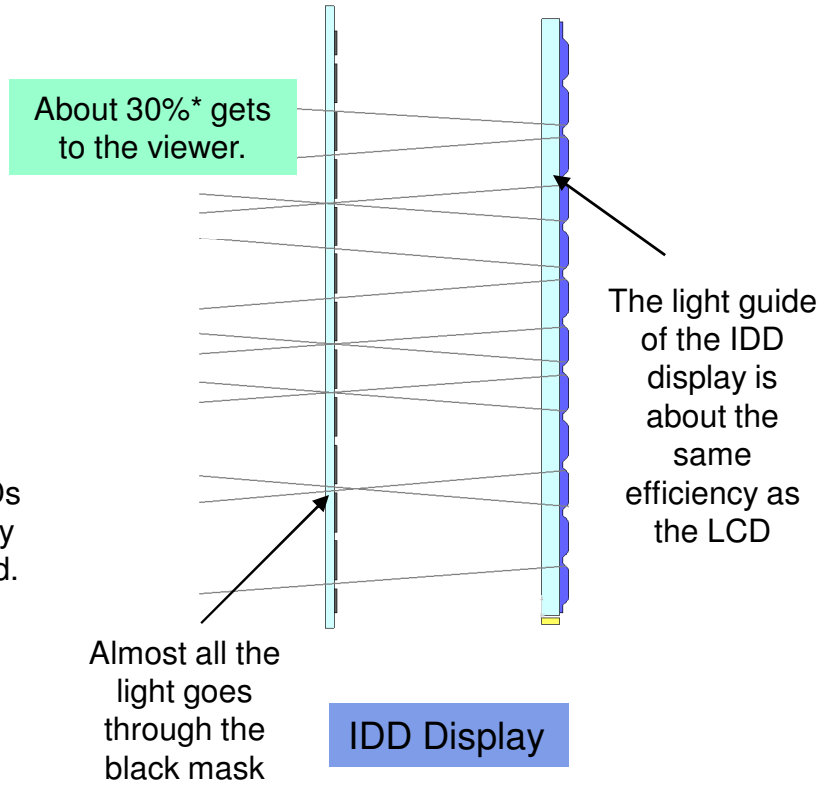


- Applying the Optical Research Associates, ORA, analysis to a 46 inch TV. A summary of the results are:
- Brightness: greater than 600 NIT
- Contrast ratio: greater than 14,000:1, native all white / all black
- Contrast ratio with 50% of the pixels black: 18,000 (slightly dimmed BL to maintain white 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

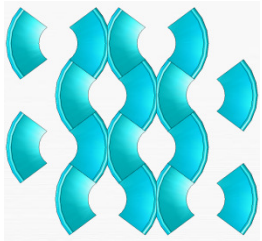
IDD displays are much more efficient than LCD. This lets them be brighter and use less power.



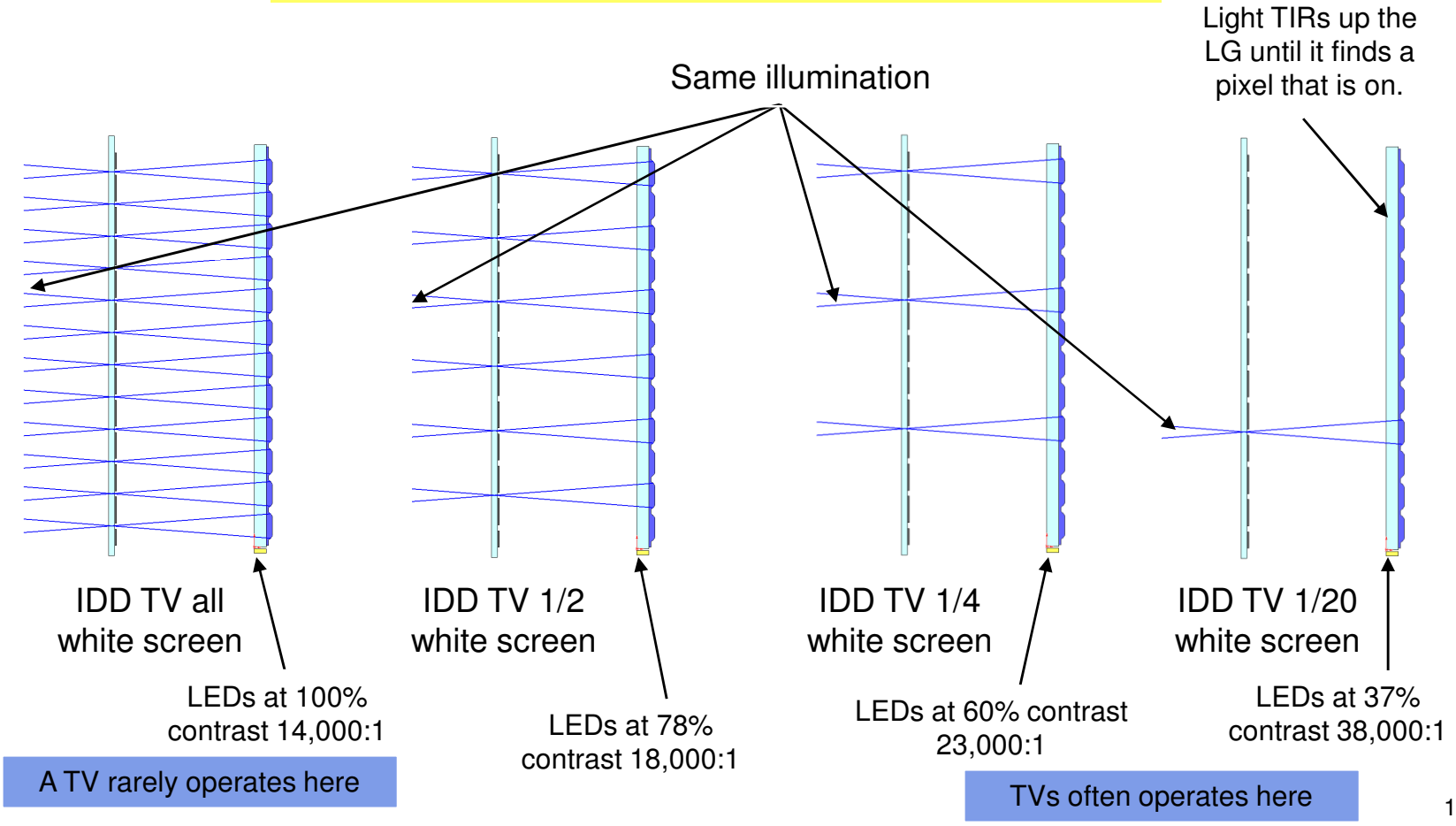


* results of ORA, light tools analysis

IDD TVs with a screen that has not all white

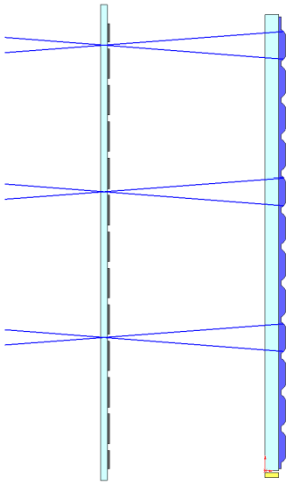


When an IDD TV has a screen that is not all white the contrast ratios goes up and they use even less power



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

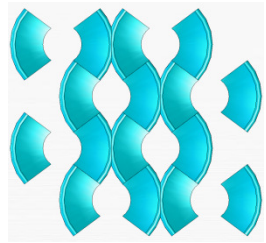


IDD TV 1/4
white screen

LEDs at 60% contrast
23,000:1

A 46” TV would, on average consume 18 watts

IDD TVs California power savings



Current Annual Consumption for TVs = 11.5 Terawatt-hrs @ $0.14Kw-hr = $1.6 B
Yearly Target Savings 33 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

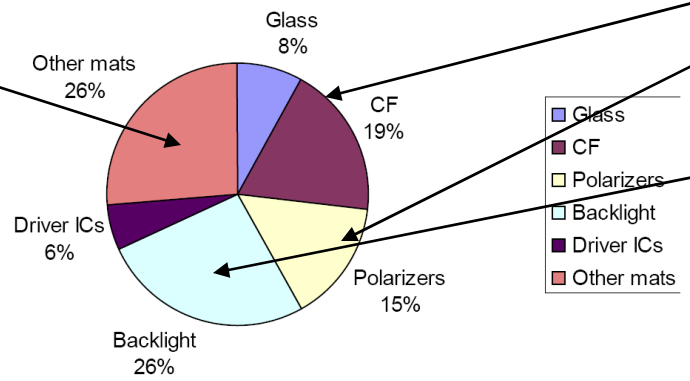
Potential Savings for United States = $12 Billion

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.

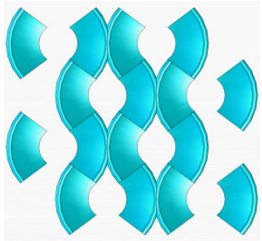
Not required for IDD technology.

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.