

## 3M Optical Systems



Vikuiti™ Dual Brightness Enhancement Film (DBEF) is a thin film reflective polarizer that increases brightness over the entire LCD viewing range. It can increase on-axis illuminance up to 60% in slab light guide displays and up to 97% in wedge light guide displays.

Featuring a multi-layer, polymeric optical film that manages the polarization of light, Vikuiti DBEF captures and utilizes light normally lost to absorption in the bottom LCD polarizer. It is able to provide an on-axis brightness increase of 165% in slab light guides, and 277% in wedge light guide displays, when combined with other Vikuiti™ Brightness Enhancement Films. This increased brightness can be converted into power savings. It also provides linear light – no need for 1/4 wave film.

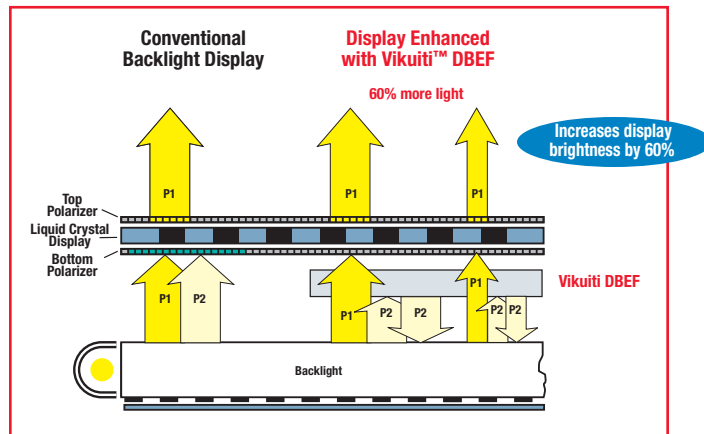




# Vikuiti™ Dual Brightness Enhancement Film (DBEF)

## How it works

Vikuiti™ DBEF works through polarization recycling. The diagram shows a conventional backlight system emitting P1 and P2 light. A typical polarizer absorbs P2, but Vikuiti DBEF reflects P2 into the backlight, where it is recycled into P1 and P2 light. With Vikuiti DBEF, more P1 light is available to be transmitted through the LCD, increasing on-axis illuminance by up to 60% for a slab backlight and up to 97% for a wedge light guide. Vikuiti DBEF achieves additional on-axis illumination performance in a wedge backlight display by redirecting available light to the viewer.



## Nominal film properties

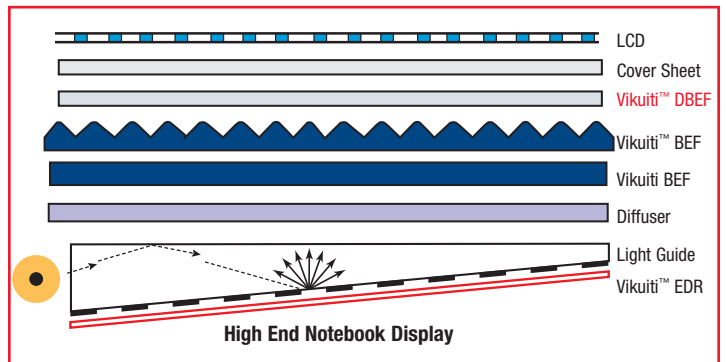
| Film properties                         | Vikuiti™ DBEF                 | Vikuiti™ DBEF+ BEF II 90/50 | Vikuiti™ DBEF+ X-BEF II 90/50 |
|---|-------------------------------|-----------------------------|-------------------------------|
| On-axis Illumination:*                  |                               |                             |                               |
| • Slab, increase                        | 63%                           | 125%                        | 165%                          |
| • Wedge, increase                       | 97%                           | 218%                        | 277%                          |
| Half Brightness for Full Viewing Angle* |                               |                             |                               |
| • Slab, Horz./Vert.                     | 120°/122°                     | 100°/68°                    | 50°/52°                       |
| • Wedge, Horz./Vert.                    | 55°/47°                       | 48°/33°                     | 28°/26°                       |
| Physical Characteristics                |                               |                             |                               |
| • Nominal Thickness                     | 132µm (5.2 mils) (ASTM D2103) |                             |                               |
| • Thermal Shrinkage, MD/TD:             | 0.3/0.3% (85°C, 15 minutes)   |                             |                               |
| • Thermal Expansion, MD/TD:             | 0.6/0.2% (85°C, 15 minutes)   |                             |                               |
| Polarization Properties**               |                               |                             |                               |
| • Parallel Transmission                 | 88%                           |                             |                               |
| • Transmission Single Film              | 47%                           |                             |                               |

The technical data for the products described are typical, based on information accumulated during their life, and are not to be used in the generation of purchase specifications which define property limits rather than typical performance.

\*Vikuiti DBEF brightness gain depends on the backlight material composition, design and overall lighting efficiency.

\*\*All in CIE 1931 space.

## Vikuiti™ DBEF in a typical LCD



### Product Size Offering

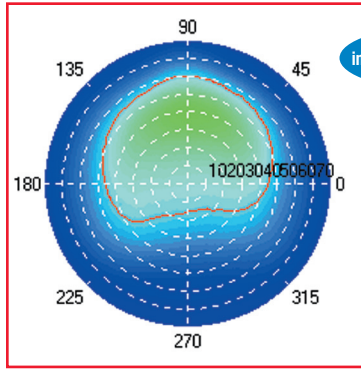
- Custom Sizes—Converted to Customer Sizes
- Product Kits—30 Sheets 11" x 11", 10 Sheets 17" x 17"

# Brighter

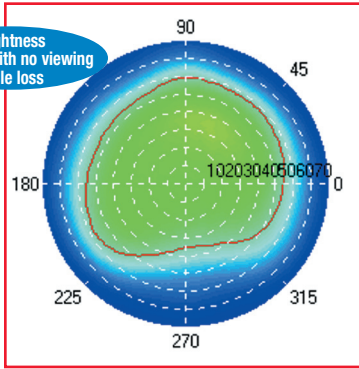
brighter

# Polar plots on standard 35.8 cm notebook computer wedge light guide

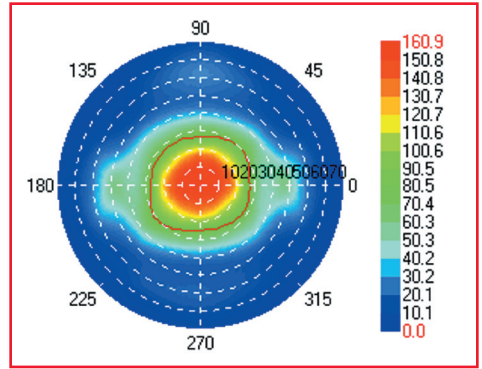
Display



Vikuiti™ DBEF

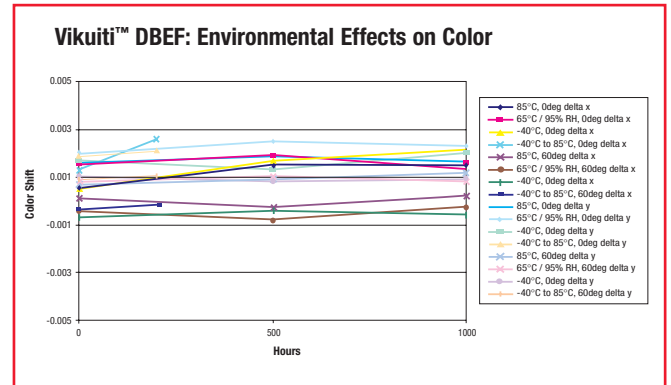
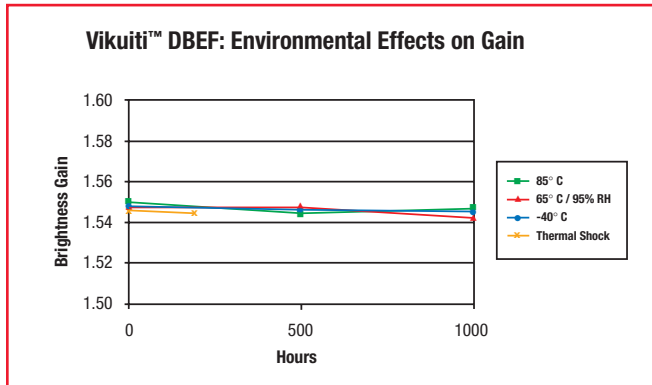
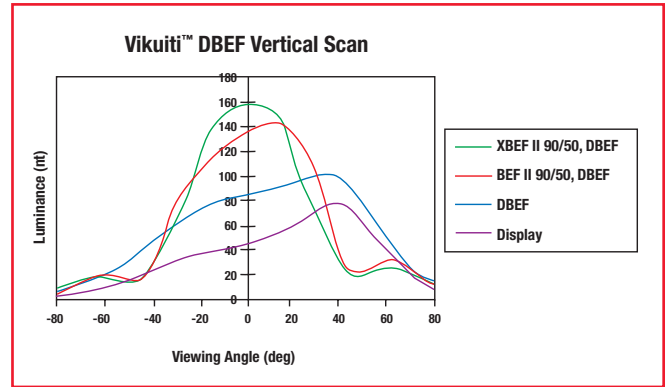
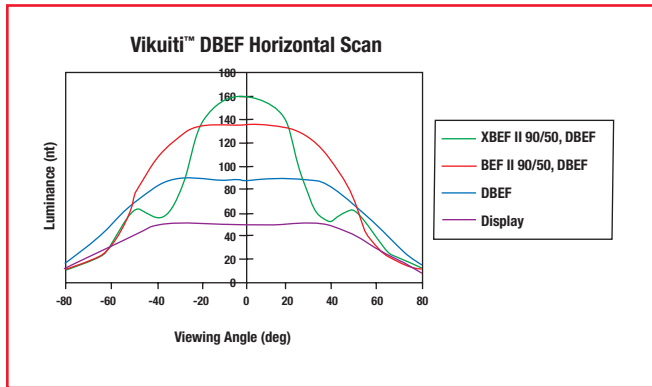


Vikuiti™ DBEF & Two BEF II 90/50



| Bottom BEF   | Top BEF      | Reflective Polarizer | Axial Luminance (nt) | Maximum Luminance (nt) | Integrated Intensity (lm/m <sup>2</sup> ) | Horizontal 1/2 Viewing Angle (°) | Vertical 1/2 Viewing Angle (°) |
|--------------|--------------|----------------------|----------------------|------------------------|---|----------------------------------|--------------------------------|
| none         | none         | none                 | 42.1                 | 74.0                   | 102.6                                     | 43.7                             | 36.5                           |
| none         | none         | DBEF                 | 82.7                 | 105.0                  | 184.2                                     | 54.9                             | 46.9                           |
| BEF II 90/50 | none         | DBEF                 | 133.8                | 143.4                  | 182.5                                     | 47.8                             | 32.8                           |
| BEF II 90/50 | BEF II 90/50 | DBEF                 | 158.4                | 160.9                  | 152.6                                     | 27.6                             | 26.3                           |

Eldim optical data taken on standard production 35.8 cm (14.1) notebook PC, TFT display, with wedge light guide with single CCFL and standard industry back reflector.





## Important Notice to Purchaser

**The following is made in lieu of all warranties, express or implied, including any implied warranties of merchantability or fitness for a particular purpose.** 3M warrants that, at the time of shipment, product will meet 3M's published specification or that specification agreed in writing between 3M and purchaser. Should product not meet specifications at time of shipment, 3M will replace or refund the purchase price of such quantity of the product found not to meet specifications. Purchaser shall determine the suitability of the 3M product for purchaser's application. 3M shall not be liable under any legal theory, including in contract or in tort, for any injury, loss, or damage, whether direct, indirect, incidental, special or consequential, arising out of the use of or the inability to use the product. **The warranties and remedies set forth herein are purchaser's sole and exclusive warranties and remedies.**

**3M**

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