

## 3M Optical Systems



### Brightness Enhancement Film (BEF) III



Vikuiti™ Brightness Enhancement Film (BEF) III is a second-generation micro-replicated enhancement film that utilizes a unique random prismatic structure to provide up to a 59% brightness gain. Vikuiti BEF III recycles diffuse light into the backlight and directs the light through the LCD, thereby providing increased brightness toward the on-axis viewer. A single sheet provides up to a 59% increase in brightness and two sheets crossed at 90° can provide up to 111% brightness increase. This increased brightness can be translated into power savings.

Single sheets of Vikuiti BEF III are ideal for use with LCD panels in monitors and televisions. Crossed sheets of Vikuiti BEF III are ideal for use with LCD panels in notebook PCs. Even greater increases in brightness can be achieved when Vikuiti BEF III is used with a Vikuiti™ Reflective Polarizer film such as Vikuiti™ Dual Brightness Enhancement Film (DBEF).

Vikuiti BEF III is available with a matte (BEF III-M) or a transparent (BEF III-T) finish.

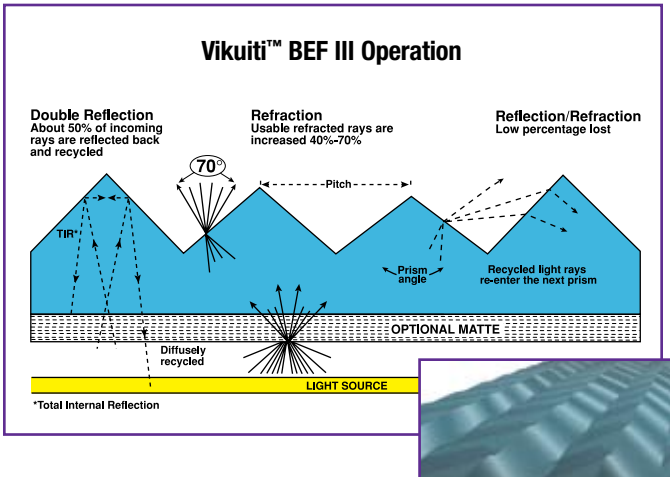




## Vikuiti™ Brightness Enhancement Film (BEF) III

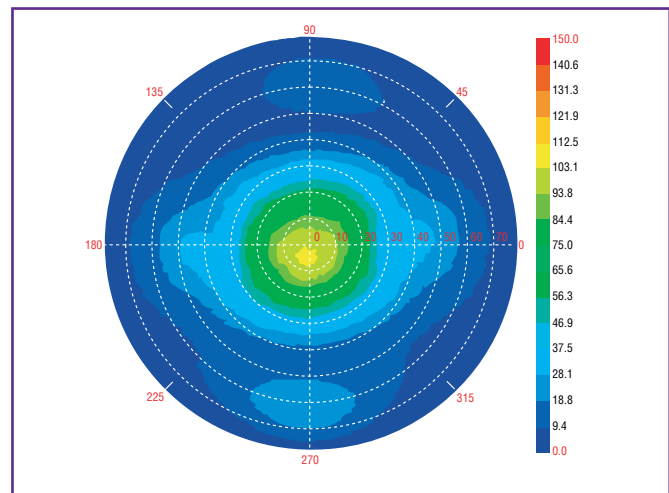
### How it works

Vikuiti BEF III utilizes refraction and reflection to increase the efficiency of your backlight. Vikuiti BEF III refracts light within the viewing cone toward the viewer. Light outside this angle is reflected back and recycled until it exits at the proper angle. The random prism pattern on Vikuiti BEF III also minimizes coupling to adjacent surfaces.

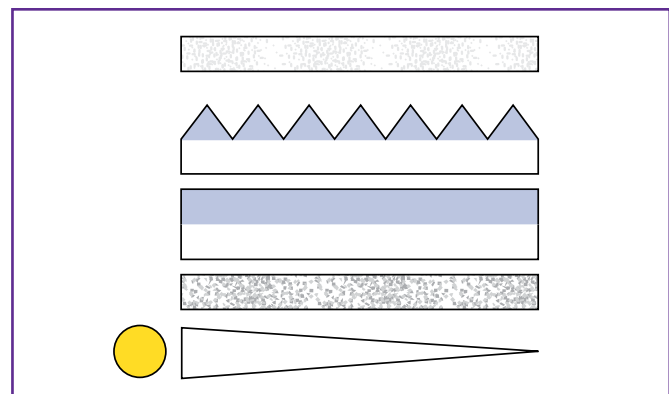


Random Prism Pattern (artist's rendering)

### Vikuiti™ BEF III high resolution notebook application



### TN type LCD-14.1" wedge type backlight



Axial Luminance Nits/Watt: 23.3  
 Integrated Intensity (Lum/m<sup>2</sup>) Watt: 19.1  
 Number of Films: 4  
 Film Stack Thickness (µm): 562

Weight (g): 45.64  
 Input Power to Inverter (W): 4.3  
 LCD Transmission (%): 7.9

# Brighter

brighter

## Testing

The polar plot measurement values indicated on the left were obtained through testing crossed Vikuiti BEF III with a cover sheet and a bottom diffuser with a TN type LCD.

We performed the test using our standard backlight and production films.

We measured the power to the backlight and measured the axial luminance and expressed the result as Axial Luminance Nits/Watt. Similarly, we measured the integrated intensity and expressed the result as Integrated Intensity (Lumens/m<sup>2</sup>)/Watt.

We believe these measurements and reporting techniques clearly and concisely represent the benefits of the Vikuiti BEF III while providing results that are readily comparable to other filmstack combinations.

## Nominal film properties

Film properties	Vikuiti™ BEF III-T	Vikuiti™ BEF III-M
On-axis Illuminations Increase* <ul style="list-style-type: none"> <li>One film, slab back light</li> <li>One film, wedge light guide</li> <li>Two films, slab back light</li> <li>Two films, wedge light guide</li> </ul>	59% 88% 108% 111%	56% 77% 96% 110%
Half Brightness for Full Viewing Angle* <ul style="list-style-type: none"> <li>One film, slab, Horz./Vert.</li> <li>One film, wedge, Horz./Vert.</li> <li>Two films, slab, Horz./Vert.</li> <li>Two films, wedge, Horz./Vert.</li> </ul>	47°/32° 45°/29° 24°/24° 26°/25°	46°/32° 45°/29° 25°/25° 26°/25°
Physical Characteristics <ul style="list-style-type: none"> <li>Thickness (ASTM D2103)</li> <li>Prism Angle</li> <li>Prism Patch</li> <li>Thermal Shrinkage, MD/TD:</li> <li>Thermal Expansion, MD/TD:</li> </ul>	155µm (6.1 mils) 90° 50µm (2.0 mils) 0.2/0.1% 0.2/0.1%	160µm (6.3 mils) 90° 50µm (2.0 mils) 0.2/0.1% 0.2/0.1%
• Thermal Shrinkage and Expansion data taken at 85°C, 15 minutes		
<ul style="list-style-type: none"> <li>Prism Material</li> <li>Substrate Material</li> </ul>	Modified Acrylic Polyester	Modified Acrylic Matte Polyester

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.

Percentage increase is defined as increase over displays without film.

\*Vikuiti BEF III brightness increase depends on the backlight material composition, design and overall lighting efficiency.

## Optical performance

Bottom BEF	Top BEF	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	42.1	74.0	102.6	43.7	36.5
Vikuiti™ BEF III-T	none	87.9	96.9	108.8	45.4	29.1
Vikuiti™ BEF III-T	BEF III-T	111.2	112.6	95.3	26.0	25.4
Vikuiti™ BEF III-M	none	76.8	84.6	95.3	44.6	28.7
Vikuiti™ BEF III-M	BEF III-M	110.4	112.0	93.9	25.5	25.1
Vikuiti™ BEF III-M	BEF III-T	110.8	112.2	95.0	25.8	24.8

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

## Environmental test results

Environments	Delta, Δx	Delta, Δy	Delta Gain
Cold Temperature, (-35°C) for 1,000 hours	0.003	0.003	0.002
High Temperature/High Humidity, (65°C at 95% RH) for 1,000 hours	0.003	0.002	0.012
High Temperature, (85°C) for 1,000 hours	0.003	0.002	0.005
Thermal Shock, (-35°C to 85°C) for 100 cycles	0.003	0.002	0.007



## 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.**

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