

## A New Method for Off-Axis Image Color Shift Evaluation

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### Abstract

The new evaluation method of viewing angle image quality for large screen TFT LCD-TV was proposed. The improvement of the viewing angle dependence of color shift has become more noticeable especially for the vertical alignment TFT-LCD TV. Due to the off-axis color shift level is highly related to the oblique gamma shift. We develop oblique gamma distortion (OGD) method to qualify the off-axis color shift of the TFT-LCD. This evaluation method can provide reliable result for the off-axis color shift analysis.

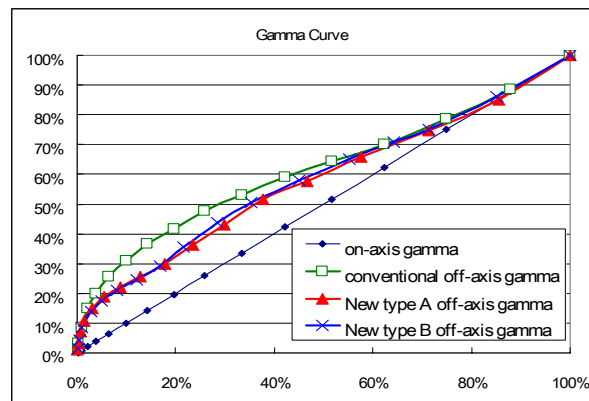
As we know off-axis color shift is highly correlated to the oblique gamma distortion. Therefore, we propose the oblique gamma distortion (OGD) method to quantify off-axis color shift of all gray level.

$$OGD = \left( \left( \frac{(L_m)_{off-axis}}{(L_{255})_{off-axis}} - \frac{(L_m)_{on-axis}}{(L_{255})_{on-axis}} \right) \right)_{m=0-255}$$

$L_m$  = brightness of level m

Figure 1 shows the conventional type and two new type (off-axis color shift improvement) LCD gamma curve distribution, and table 1 shows the OGD analysis result. The OGD value can truly represent the diagonal gamma distortion even a little difference compared to the new type A and the new type B.

The conventional single image color difference evaluation method is insufficient to quantify the color shift of all gray level. We have developed the OGD evaluation method which can clearly quantify the off-axis color shift level, and also this OGD evaluation method has good correlation to the human perception result.



**Figure. 1** The on-axis and off-axis gamma curve distribution

**Table 1:** OGD value

	OGD value
Conventional Technology	0.146
New Type A	0.086
New Type B	0.091