The Optimum Driving Voltage of Liquid Crystal Display

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Abstract

By adjusting driving voltage, the image quality and optical characteristics have been improved. Based on the experiment results. Optical properties including viewing angle and color shifts at bias voltage 2.4 V are better than those of bias voltage 1 V. Many new and sophisticated technologies have been developed to widen the viewing angles, to increase the luminosity or improve the color rendering but they still come up short in terms of response time and image quality. [1] The purpose of this paper is to adjust the first gray level voltage. Here the bias is used to describe the difference between V9 and V10. [3~6] The gamma curve changed with various bias voltages is showed in Fig. 1a. In other words, the color shift performance is improved with increasing bias voltage. The D value was used to evaluated the color shift performance which was proposed by Kim et al. [7] As can be seen in Fig. 1a, the D value for bias = 1 , 2 . 4 and 2.7 V are 0.79, 0.77 and 0.71 respectively. According to the calculation result of D value, the better color shift performance for bias 2.7 V can be realized.

The visual evaluation results are showed in Fig. 1b and c respectively. By comparing the Fig. 1b and c, the bias 2.4 V is more reddish than bias = 1 V. With bias voltage increasing, the picture wash out would be reduced. This is also agreed with the evaluation result of D value. There will be a better oblique visual performance and image quality at bias voltage 2.4 V and 2.7 V. The optimum driving voltage for the TFT LCD can be acquired through these measurement and evaluation results. Fig. 2 shows microscopic images of the switching process from black to white state in the MVA mode. When bias voltage rising, the electric field between CF and TFT substrate would be increased in the black state. As can be seen Fig. 2a and b, the light leakage became more serious at higher bias voltage. With bias voltage rising, there is no difference in the white state Fig. 2c. So the CR and RT would decrease significantly.

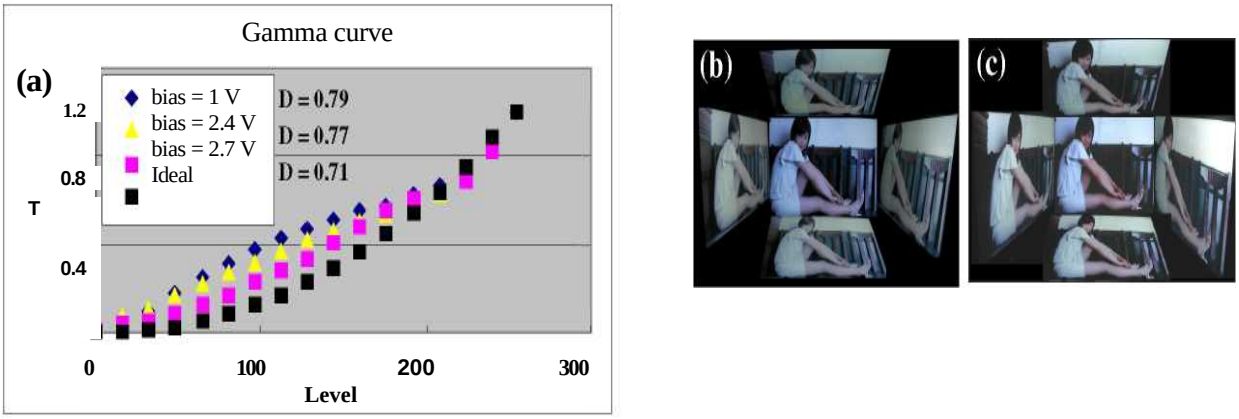

Figure 1. (a) gamma curve at Phi = 0 vs. Theta =60, (b) the visual evaluation result as bias= 1V (c) bias= 2.4 V.

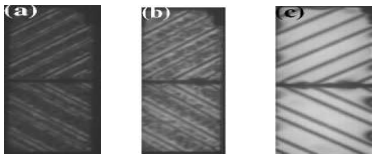

Figure 2. Microscopic images of the switching process from black to white state in the MVA mode.
(a) bias= 1 V (b) bias= 2.7 V of black state (c) white state.

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