PS and Array Topology Effect on L0 grey Mura

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Nowadays, much attention had been paid into the investigation of L0 grey Mura on TFT-LCD Products. The object of this series of experiments was to determine the effect of the PS design and array topology on L0 grey Mura [1]. In other words, external force (like hand touching) makes array/CF substrates slide to max shift distance, and then these substrates recover to their initial position depending on their geometric topology. The dislocation, in final step out of external force, is called shift distance in this paper. Lager distance value would result in the issue as touch Mura on TN panel or L0 Mura on ADS/IPS panel. Here, the shift distance was measured to investigate the effect of geometric topology on Mura issue. The detailed parameters and image of the PS structure and array substrate topology can be found in Table 1 and Fig. 1. In normal panel with reasonable LC amounts, the main-PS was contacted to array structure in the compressed condition, but sub-PS was not contacted with array substrate. Using the same method introduced by the reference [2], the shift distance was measured after left or right touching on the 17 inch panel with different LC amounts by inspection of microscope. At each LC amount, 6 samples were examined. The average value of data and raw data were plotted line and symbol in Fig. 2. It is found that the larger LC amounts have smaller shift distance value. We can understand this trendy would be come from reducing of contact friction force between PS of CF glass and array topology. However, the decreasing slope and symmetric properties of left and right shift are obviously different among case 1, case2 and case3.

Table 1. PS design parameters

PS Type (17inch)		Case 1	Case 2	Case 3
main-PS	Density	1/12 (13.5μm)	1/12 (13.5μm)	1/27 (13.5μm)
	Position	On TFT	←	←
sub -PS	Density	11/12 (13.5um)	←	26/27 (10um)
	Position	On Gate(Zigzag)	On Gate (Center)	←
		5.5μm distance from SD line	18.4μm distance from SD line	←

Fig. 1. PS and Array topology

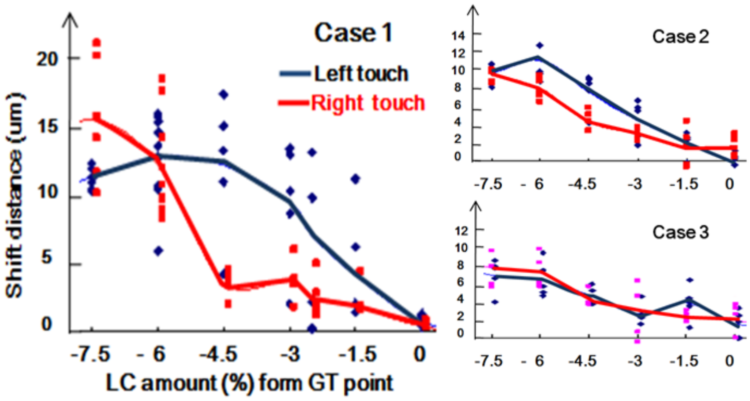

Fig. 2. Results of shift distance for different LC amount

For Case 1, the left touch shift distance is relatively large; the average distance is 12 μm when LC amount is -4.5% (normal MP condition). Combined with Fig.1 and Table 1, it could be imaged that the main-PS would be locked by the raised data line cross after left touching, and the sub-PS2 would be locked by the neighbor TFT at the same time. Whereas, the right touch shift distance is small because the main-PS and sub-PS1 wouldn't be locked at the -4.5% LC amount. While at less LC amount case as -7.5%, the left and right touch shift also are not so good. To remove the sub-PS locking issue, the position of the sub-PS was changed to the center between the raised data line cross and TFT in Case 2. As a result, the average shift distance reduced to 8 μm. To decrease more shift distance, main-PS density was cut down from 1/12 to 1/27, which reducing the entire friction and locking issue. The shift distance was 5 μm at -4.5% LC amount under both left and right touching similarly. Finally, L0 grey Mura was improved by means of reducing the shift distance in our observation. The design of geometric topology including the PS and corresponding array structure was suggested to be checked according to no locking interaction and less sliding friction viewpoints.

References

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2. Z. Zhang, J. G. You, Y. B. Hou. *Chinese Journal of Liquid Crystals and Displays*, 23(5), 525(2008).