Overview

Liquid Crystal Display (LCD), is one of the amazing inventions of the modern age. With its dominating characteristics, thinness, light and low power consumption, LCD is now being within all kinds of electrical products e.g. Cell phone, palm, computer monitors, TV and so on. The demand for LCD has greatly increased in recent years. LCD supersedes the Cathode Ray Tube display (CRT in short), and become the new generation of displays.

LCD TV has come into the spotlight in recent years, as the trend is to have things of a small. In 1973 Hughes demonstrated silicon on sapphire LCD that solved the iron law of multiplexing and, soon afterwards, Brody of Westinghouse demonstrated a large area CdSe TFT. Only then did a flat panel TV seem possible.

There are many factors that affect the LCD TV’s performance, including: Viewing ability, power, contrast, speed, backlight lifetime and uniformity, and etc. However people keep asking for a faster response operation for high quality display. Although some of the LC switching times are comparable with the CRT-TV’s 5ms, for applications like 3D movie and LCD-TV with sequential color driving scheme, which needs more then partial image to display one frame, requires 1.5-2 ms switching time to meet the quality need. As a result, our project’s objective was targeting to improve the response time .

![Fig. 1-1 working principle of LC cell [12]](image-url)
Optimization of different parameters in different modes

A LCD optimization and modeling were done to ensure better display quality of the LC cells. The major categories were:

- Brightness
- Colors
- Contrast ratio
- Viewing angles
- Grey-scale
- Response time
- Controlling voltage

Of all the categories above, the target in this project was the Response Time. Simulations and optimizations corresponding to the response time were done in seven popular operation modes of LC cells:

- Super Twist Nematic (STN)
- Twist Nematic (TN)
- Electronically Control Birefringence (ECB)
- Hybrid Aligned nematic (HAN)
- $\pi$-Cell (Pi)
- Vertically Aligned Nematic (VAN)

Fig. 4-1 Device Configuration windows in Mouse-LCD