

Analyzing the Physical Behavior of Phosphor Pixels Used in Plasma TVs

Using the U3606A Multimeter | DC Power Supply

Application Note

Introduction

The last decade has been marked by rapid developments in television technology aimed at improving both audio and visual quality. As a result, today we see larger screen sizes paired with reduced overall set dimensions and weight, lower power consumption, and integrated and enhanced audio effects.

These advancements have been made possible largely through the efforts of researchers, and new breakthroughs will emerge as research efforts continue. One group to carry on these activities is a team of researchers at a well-known university in Great China. This team is working to better characterize and understand the behavior of phosphor pixels used to construct plasma televisions.

This application note provides a brief look at how a plasma screen operates and explains how the university's research into the physical behavior of phosphor pixels has been facilitated using the Agilent U3606A multimeter | DC power supply.



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How Plasma TV Works

A plasma TV screen is constructed of millions of tiny pixels sandwiched between two glass panes. These pixels are filled with inert gas. Within each pixel there are three sub-cells. Each of the three sub-cells is dedicated to a single color phosphor: red, blue or green. When an electrical charge is applied to the sub-cell, the phosphor glows and causes the plasma cell to excite a color (Figure 1). The collective effect of the charged phosphor from each sub-cell creates a better and more accurate color reproduction than LCDs. Plasma pixels also produce deep true blacks, which characterize the superior contrast provided by plasma TVs.



Figure 1. Green color is shown when electrical charge is applied to green sub-cell of a pixel.

For plasma TVs, like all other phosphor based display systems, such as CRT direct and rear view monitor, resistance in the plasma pixels play a significant role in image retention. This is due to the physical properties of phosphor and how it reacts to light and electric impulse. Part of the research being carried out at the university in China focuses on analyzing the performance of the plasma at various resistance levels.

Test Configuration

For this research- the university is using a tungsten coil with various resistor values in a switch box to simulate the resistance in the pixel. The tungsten coil is connected in series with these resistors to understand the behavior of the pixels (Figure 2). Once a desired performance is achieved, the resistance across the switch box and tungsten coil is recorded. This resistance value often falls below 100 milli-ohm. Hence, to measure the resistance accurately, a low range ohm meter is essential.



Figure 2. The test configuration includes a switch box with various resistor values and a U3606A to perform resistance measurement.

After comparing the instrument options available in the market place, the researchers chose to use the U3606A multimeter for two simple reasons. First, the low-ohm range multimeter meets the resolution and accuracy they desired, and secondly, because of the hybrid multimeter capabilities.

The U3606A is a two-in-one multimeter | DC power supply instrument. This affords the researches the ability to use the multimeter and DC power supply simultaneously, use it as a standalone 5½-digits DMM, or use only the 30-W dual range DC power supply. In addition to this hybrid instrument providing efficient, affordable testing, it has the added bonus of saving space on the bench or in a rack.

Obtaining Reliable Data

The performance and features of the U3606A play a key role in capturing accurate data. The multimeter has a low-resistance measurement capability down to the 100 milli ohm range and, coupled with four-wire measurement, it provides 0.25% base accuracy. The four-wire measurement is extremely important for ensuring the accuracy of measurement at the milli-ohm range.

The unit's auto ramp function generates ramp signal with length based on input parameters (Figure 3). To setup a ramp signal sweep, only two parameters need to be inserted: the amplitude end position and the number of steps required to reach the amplitude end position.

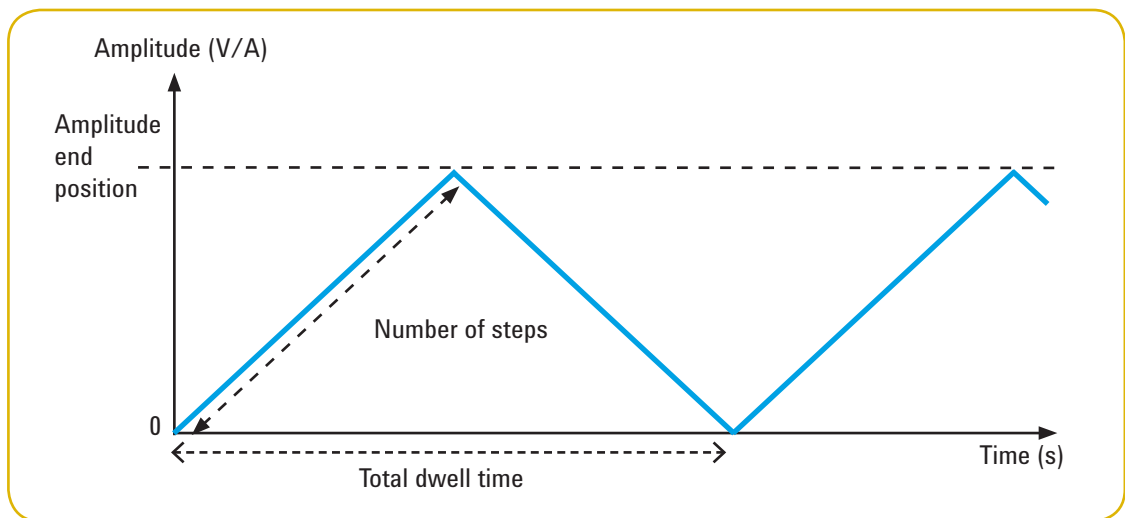


Figure 3. Ramp function

A scan function allows researchers to sweep voltage or current. Traditionally, to execute a voltage or current sweep on any programmable power supply, the user needed to understand the power supply's commands and be familiar with a programming language. However, with U3606A, users can setup a scan signal sweep just by entering three parameters on the front panel of the U3606A: the amplitude end position, the number of steps required to reach the amplitude end position, and the dwell time for each step. This simplicity allows researchers' to stay focused on their studies rather than having to learn the instrument's commands and programming language.

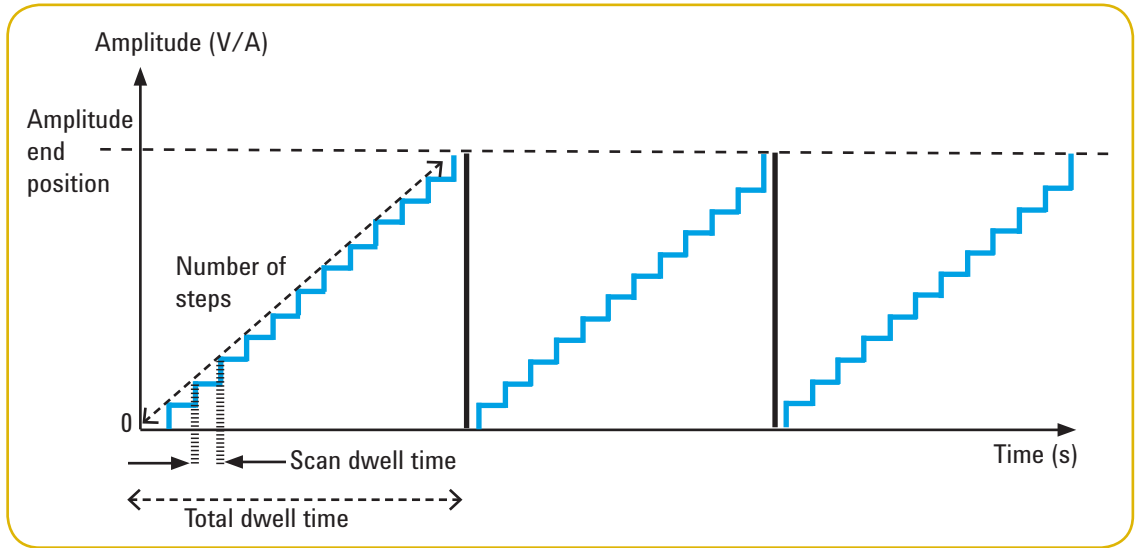


Figure 4. Scan function

Both the ramp and scan functions are conveniently configurable from the front panel to sweep up to 10,000 steps for ramp and 100 steps for scan, programmable to 105% of full scale. (For additional information on auto ramp and scan functions please refer to application note 5990-4579EN.)

Conclusion

Whether it's to enhanced TVs or investigate other devices using phosphor pixels, researchers rely on lab equipment to provide the data needed to continue to improve upon technology. Using a hybrid U3606A with its multimeter and DC power supply capabilities helps labs minimize equipment investments, maximize space on test benches, and have assurance in the reliability and accuracy of data. Easy-to-use features such as ramp and scan functions also allows researchers to quickly obtain results. In addition to its proven performance, it is an affordably priced solution for educators and industry.

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