

# Study of AC-PDP's Discharge Characteristics with Variation time and Temperature in High Xe contents

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## Abstract

*In this paper, high Xe(Ne+Xe 10%, 20%, 30%) AC-PDP's discharge characteristics according to aging time were studied. The static margin, Vt close curve, discharge time lag was measured for experiments. According to increase of Xe partial pressure, the static margin and luminance was increased. As the result of analysis for misfiring probability, the misfiring is frequently occurred in accordance with increasing of aging time. To improve misfiring, we proposed 3Reset waveform and achieved misfiring probability which was improved.*

## 1. Introduction

The luminous efficiency is important issues in order to develop AC-PDP. The relative low luminous efficiency of AC-PDP is a drawback in terms of competition with other FPDs [1]. Many approaches have been considered, the use of high Xe contents is one of the method considering many people for improvements of luminous efficiency. The higher Xe contents go, the better luminous efficiency becomes in a general way. But it has some problems. (Increase of firing voltage, extended discharge time lag). Accordingly, driving characteristic of AC-PDP in high Xe contents need to know. Not only wide driving margin or good discharge stability is required, but also reducing the misfiring is required for yield improvement. The misfiring can be defined as a flicker phenomenon caused by unwanted ON cell which should be in the OFF state. A flicker means the perceptible temporal luminance variation of a long driving panel, which can be generated by the misfiring. The luminance variations caused by unwanted cells deteriorate a picture quality of AC-PDP [2-3]. Also the mechanisms of misfiring have not been revealed, it

may be due to that the firing voltage, wall charge, priming condition and properties of material such as MgO and phosphor are changed during driving [4]. For this reason, when the misfiring in AC-PDP is occurred, we proposed the improving waveform and made an analysis of probability.

## 2. Experimental

For this experiment, it is used three 7 inch AC-PDP which has the same cell size with of 50 inch PDP HDTV resolution. And each panel has 10%, 20%, 30% partial pressure ratio of Xe. Table 1 is the detailed specification of the panel.

**Table 1. The specification of AC-PDP structure using in experiment.**

Working Gas : Xe (10, 20, 30%) + Ne Base, 400Torr		
Front glass	ITO Gap	100µm
	ITO width	255µm
	Dielectric Thickness	38µm
	ITO Gap	100µm
	Bus Electrode Width	80µm
	Black Matrix width	60µm
Rear glass	Address Electrode Width	120µm
	White-Back Thickness	17µm
	Barrier Rib Width	55µm
	Barrier Rib Height	125µm
	Rib Pitch	270µm

Figure.1. shows the schematic diagram of experiment. The used experiment equipment consisted of two kinds that aging system for acceleration of

panel and measuring system for analysis of discharge characteristic. The experiment results such as static margin, luminance,  $V_t$  closed curve, and discharge time lag is measured. (Equipment: Signal generator (time9850), Arbitrary waveform generator (FTLab, AWG1000), Amplifier Photo -diode (C6386-01, Hamamatsu))

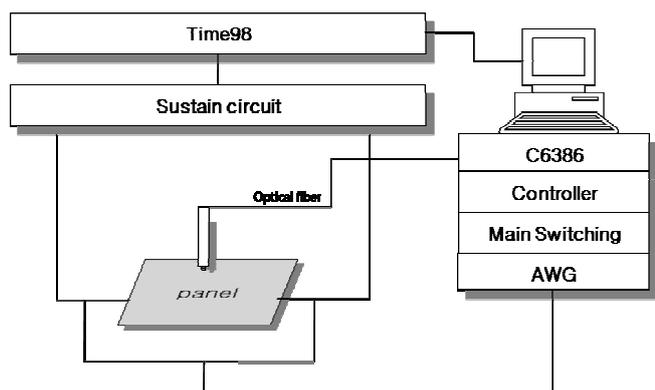


Figure.1. Schematic diagram of experiment

### 3. Results and discussion

A measurement such as static margin, luminance,  $V_t$  closed curve, discharge time lag, misfiring probability of the panel dependant on the aging time could be obtained. And improved misfiring probability was achieved by applying 3 reset waveform.

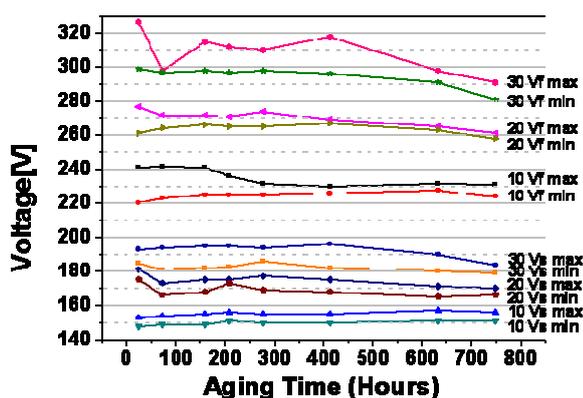


Figure.2. static margin of Xe partial pressure 10, 20, 30% in AC-PDP

Figure.2. shows phase of static margin by variation of aging time from 24hr to 749hr. As aging time goes

on,  $V_{fmax}$  falls and  $V_{fmin}$  is flat. It is verified that uniformity of panel was improved by H, O transport and redistribution in MgO surface.

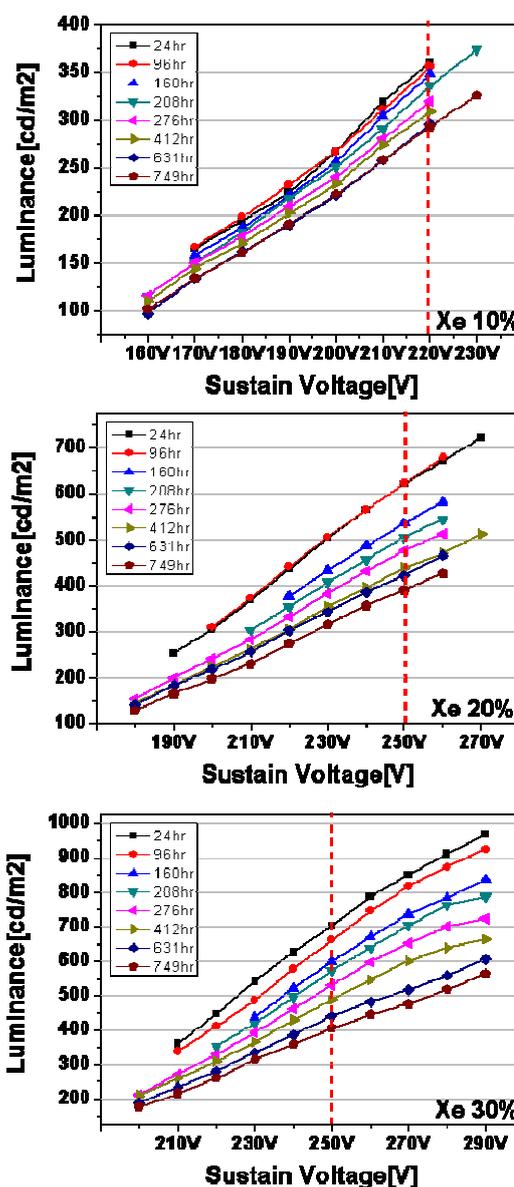


Figure.3. AC-PDP's Luminance variation with Xe partial pressure 10, 20, 30%

Figure.3. shows the change of the luminance according to aging time. The luminance decreases continually as aging time goes on. It is caused that phosphor was damaged by VUV (Vacuum ultra violet).

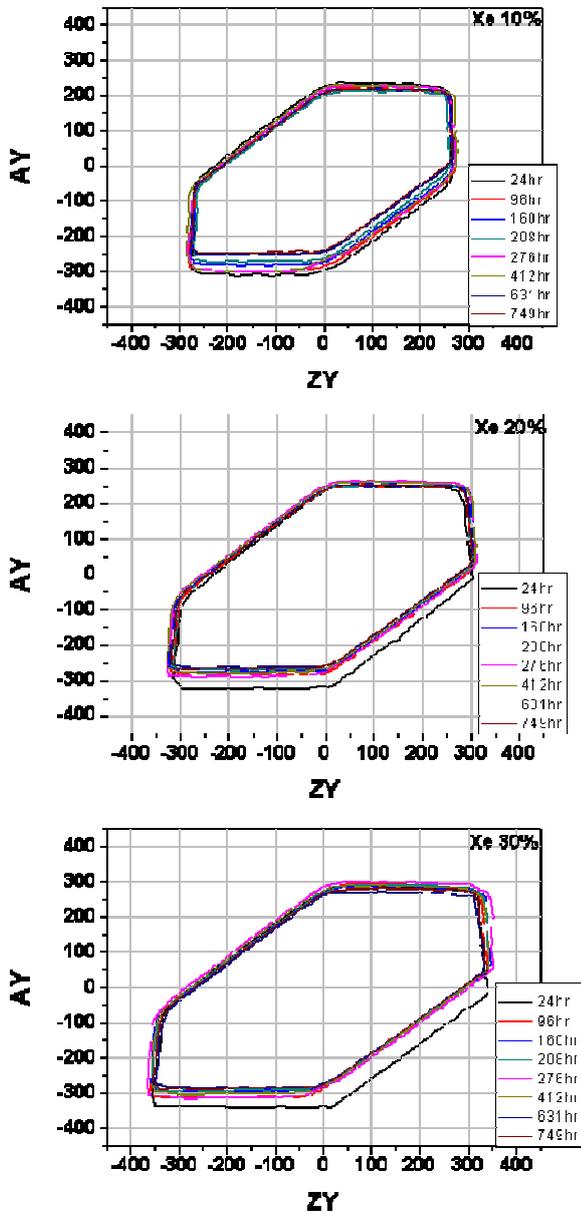


Figure.4. Vt closed curve of Xe partial pressure 10, 20, 30% in AC-PDP

Figure.4. shows the Vt close curve of panels on the room temperature (25°C). As Xe partial pressure is increased, firing voltage is also increased in all electrode. Firing voltage is changeable as aging time goes on. When the phosphor is cathode, firing voltage is quite decreased because the sputtered MgO was piled up the phosphor.[5]

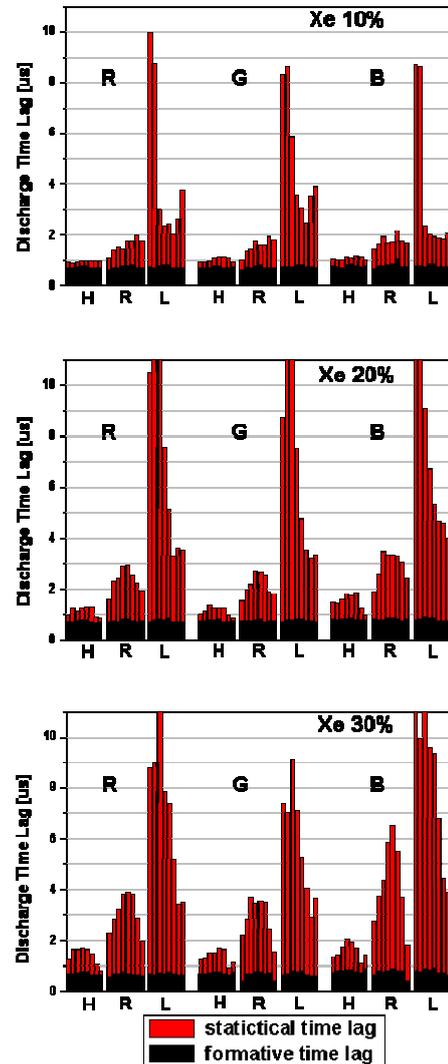


Figure.5. The variation of luminance with respect to aging time and temperature in AC-PDP

Figure.5. shows the variation of luminance with respect to aging time and temperature. The temperature was controlled of whole panels by using a heating chamber (70°C) and a freezer (-20°C). As aging time increased, the discharge time lag increased due to impurities of MgO surface and variation of electrode surface in panel. In case of high temperature, the discharge time lag showed short. But in case of low temperature, the discharge time lag rapidly increased. As the aging time increased, the increase of statistical time lag appears more obvious than that of formative time lag at room temperature. This result is dominant of the priming particles that have a long life time, such an exo-emission[6] Because it was

eliminated the wall charge by self-erasing after created a 250  $\mu$ s delay time to minimize the priming effect.

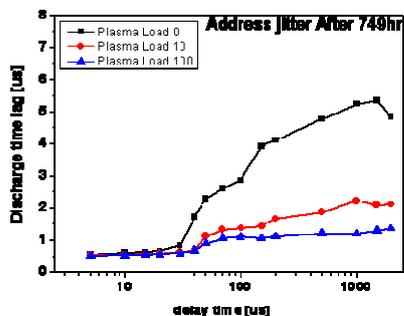


Figure .6. Discharge time lag for sustain pulses

For known discharge characteristics, we measured the change of address discharge time lag in accordance with aging time. In addition this experiment is purposed to indirectly measure the exo-electron emission in accordance with the number of sustain pulses which give VUV energy to a MgO surface. (The sustain pulse: 0, 10, and 100). Figure.6. shows discharge time lag according to adjust sustain pulses. The less sustain pulse is, the discharge time lag is increased because of increase of exo-electron emission.



Figure.7. 3 Reset waveform for improving misfiring discharge

The new 3 reset waveform to improve misfiring was proposed. Figure 7 is show the 3 reset waveform. The reduction of the misfiring probability obtained by applying 3 reset waveform. Figure.8. shows the misfiring probability between 2 reset and 3 reset. The 3 reset waveform was seriously improved rather than 2 reset.

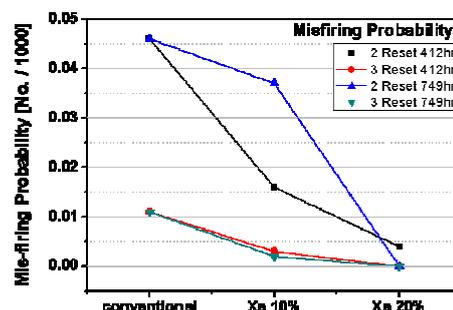


Figure.8. Misfiring Probability comparison

#### 4. Summary

In this paper, we measured for the characteristics of each Xe partial pressure such a 10, 20, 30%. And phenomena of the misfiring are analyzed experimentally. The result shows that discharge time lag increases as time goes on and decreases according to sustain pulses because of insufficient priming particles.

When the address electrode is cathode, the variation of the firing voltage is wide. Because of decreasing the firing voltage, the applied voltage caused the strong discharge at the reset period. So we proposed 3 reset waveform. And we obtained the result that improved misfiring probability.

#### Acknowledgement

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#### 5. References

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