The Three-Dimensional Temporal Behavior Measurement of Light Emitted From Plasma Display Panel

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Abstract

To improve the luminance and efficiency of AC PDP, the effects of a square pulse applied to the address electrode during a sustain-period is investigated. Through this experiment, we confirmed the improvement of luminance and efficiency. We performed the temporal behavior measurement for the light emitted from AC PDP at floating state of the address electrode and at various auxiliary voltages (including ground state) applied to the address electrode using the scanned point detecting system. In the case of using an auxiliary voltage pulse, emission starts at the inner edges of the anode and cathode simultaneously. Also, we obtained the larger two discharge volumes compared with the normal sustain discharge where address electrode is floated.

1. Introduction

Many approaches have been tried to understand discharge physics using the 2-dimensional simulation, 2-dimensional emission measurement, and 3-dimensional simulation [1-4]. Until now, a lot of temporal behavior measurements of the light emitted from PDP cell have been done under the normal surface discharge condition where address electrode is floated. However, in the actual PDP driving, the address electrode is ground state or has a half value of sustain voltage during a sustain-period. We investigated the effect of address electrode in order to understand more precisely the discharge phenomena in PDP cell. We measured the 3-dimensional temporal behavior of the emitted light from PDP when the voltage pulse (including ground state) is applied to the address electrode during sustain discharge using the SPDM. Also, we compared the results with the normal sustain discharge where address electrode is floated.

2. Experiments

Fig.1 shows the schematic diagram of the scanned point detecting system (SPDS) for temporal behavior measurement. The detected light signal through the PM tube is sent on the oscilloscope and oscilloscope is connected to computer with GPIB. A computer controls the whole system [5]. We insert optical-filter between the pinhole and the PM tube. Maximum transmission factor of filter is 61% at 598㎚ wavelength. Thus , we detected the temporal behavior for the visible light emitted from Ne. We set Y-axis parallel with electrode and X-axis perpendicular with electrode. Z-axis was set from front glass plate to rear glass plate because of white dielectric layer of rear glass.

Fig.2. shows the voltage waveforms applied to the three electrodes to drive the PDP test panel. Vs1 and Vs2 are the sustain voltage pulses applied to the sustain electrodes and the sustain driving frequency is 10㎑ and on-duty ratio is 25%. The Va is the auxiliary voltage pulse applied to the address electrode and

pulse width is 2μs. During a sustain period, the various auxiliary voltage pulses are applied to the address. Also, we observed the emission when address electrode is floated. We perform experiment with condition that Va is ground state, 50V, 80V, 120V, and 150V.

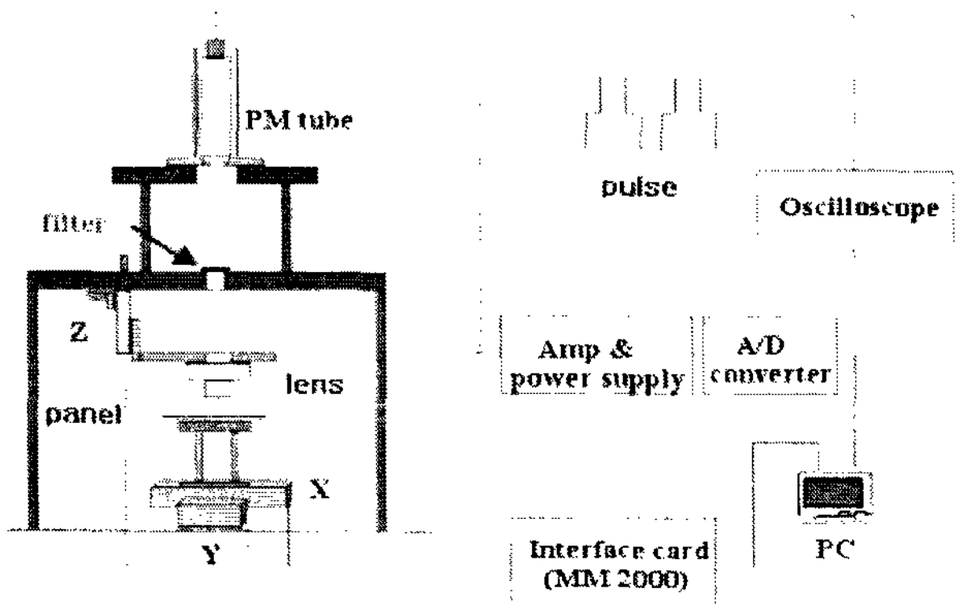


Fig. 1. SPDS for the temporal behavior measurement

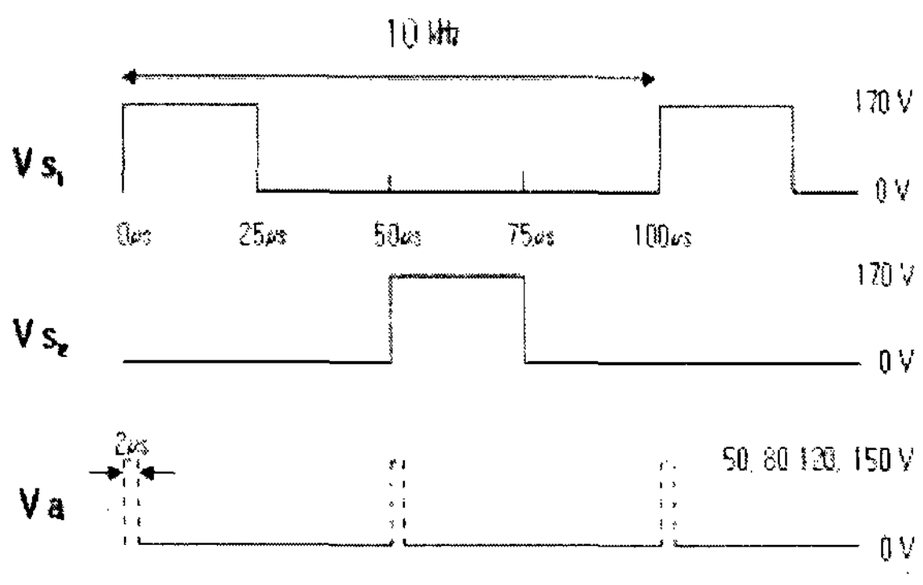


Fig.2. Driving pulse waveforms of sustain electrodes, Vs1,Vs2, and auxiliary pulse of address electrode, Va

The panel consists of a front glass plate with ITO electrode, bus electrodes, dielectric layer, and MgO layer and a rear glass plate with barrier rib, address electrode, dielectric layer. The ITO electrode was prepared with width of 300μm , gap distance of 70μm and the width of bus electrode was 80μm, the height of barrier rib was 180μm. Also, the distance between barrier ribs was 300μm.

3. Result and Discussion

Fig. 3 shows the temporal side view images of emission when an auxiliary voltage is 0V(ground state), 50V, 80V, 120V and 150V. The previous results for the Ne emission show that emission starts at the center of the anode and cathode, and spreads to the outer edge of the cathode [6]. But, when the voltage pulse (including ground state) is applied to the address electrode during sustain discharge, emission starts at the inner edges of the anode and cathode simultaneously and spreads to the outer edge of the cathode.

When the various auxiliary voltage pulse are supplied to the address, the region of discharge volume becomes wider than normal sustain discharge volume. Also, we obtained the larger two discharge volume compared with the normal sustain discharge.

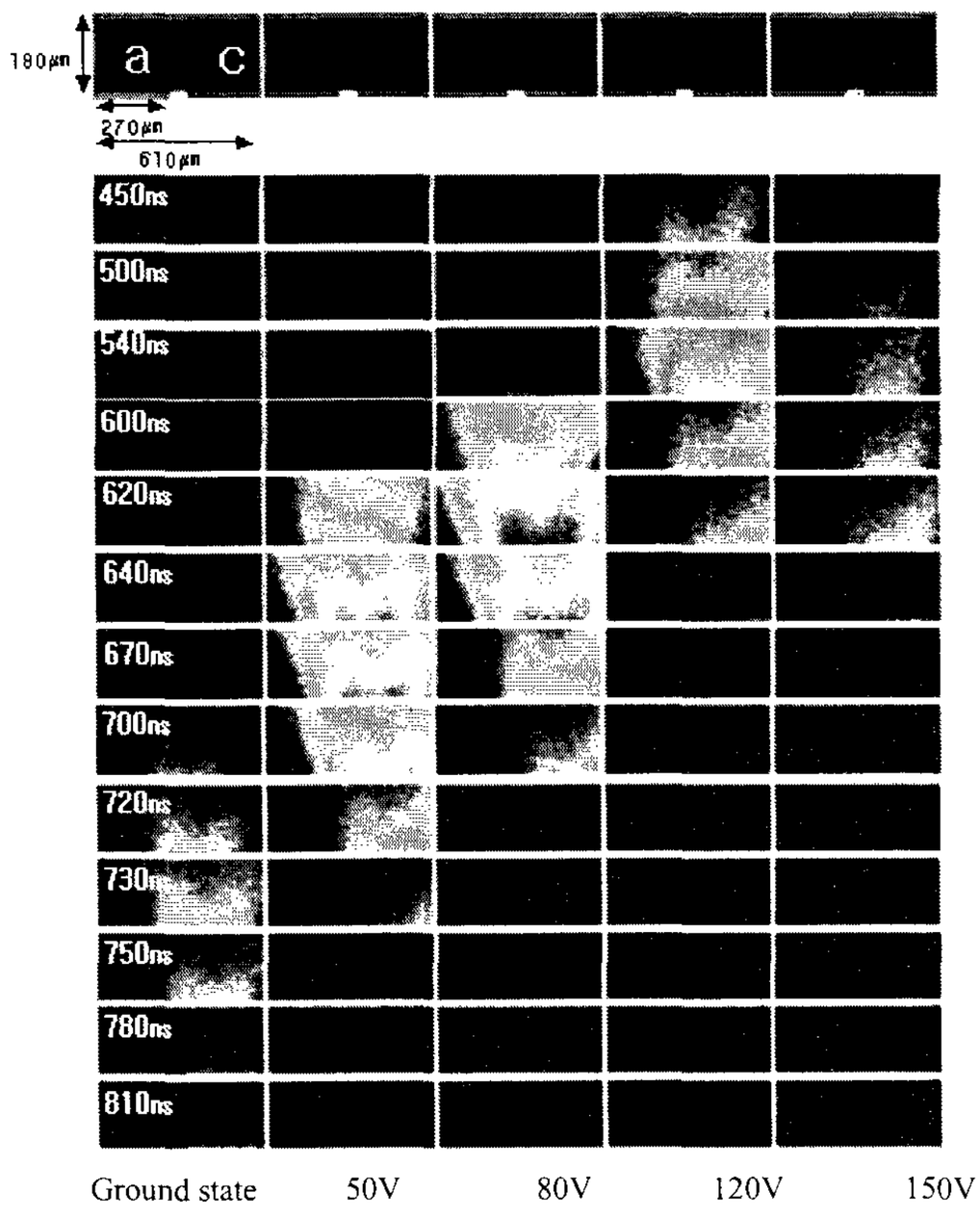


Fig.3. The temporal images of emission vs. auxiliary voltage pulses applied to the address electrode (a : anode, c: cathode)

Fig.4 shows the luminance intensity and emission time as a function of the auxiliary voltage pulse. Maximum luminance intensity appears at the voltage of 80V. If the voltage increases over the 120 volts, that is, if the voltage is higher than the half of the sustain voltage 170V, then the intensity decreases.

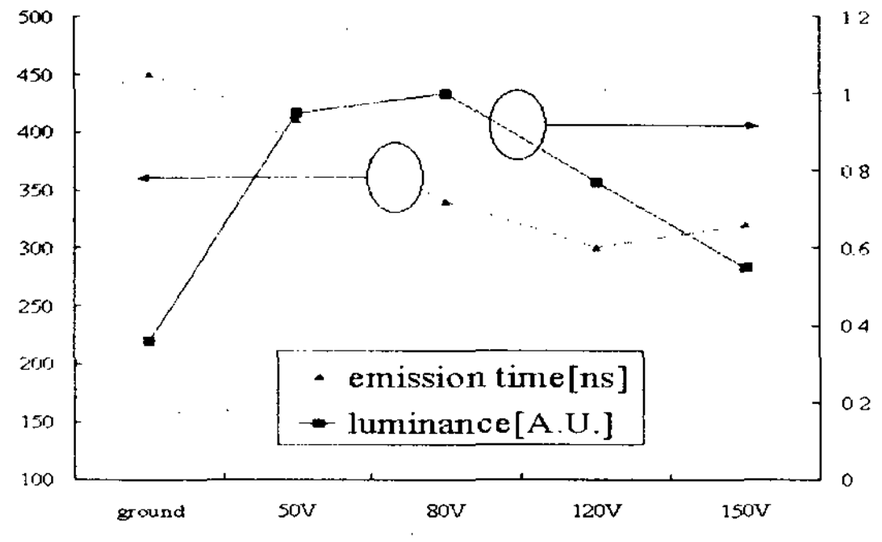
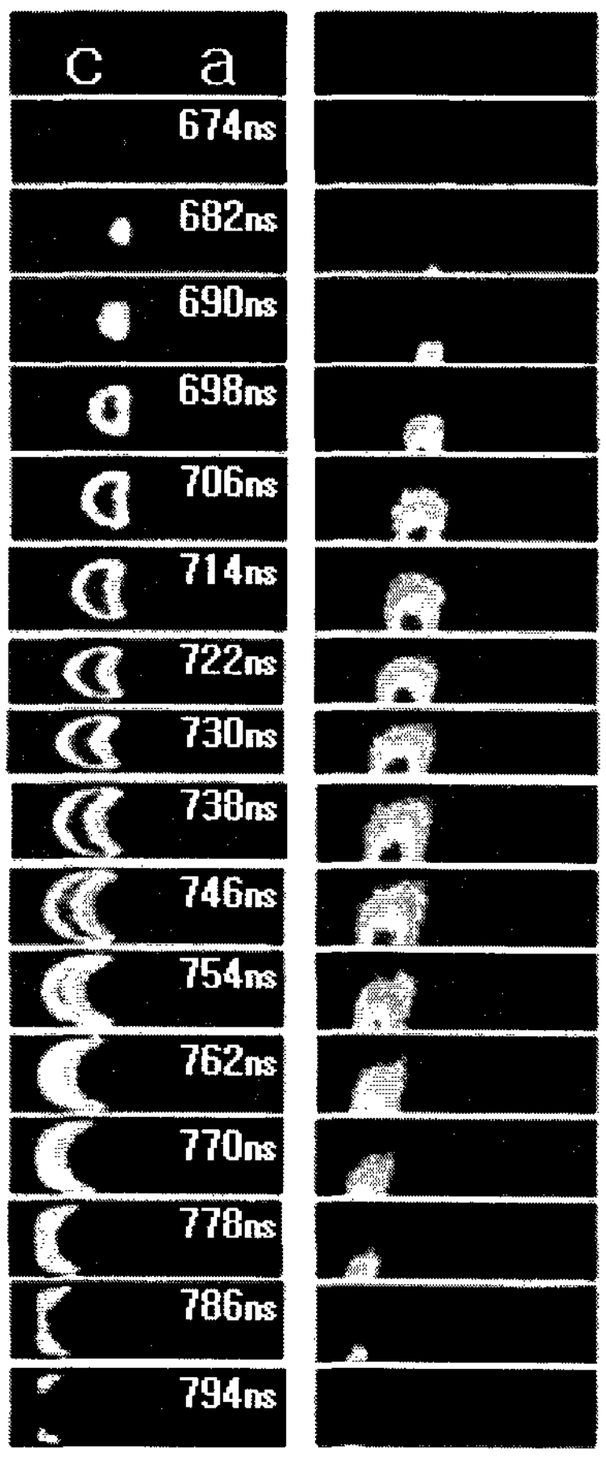


Fig. 4. Luminance vs. emission time at various address voltages

Fig.5 shows the temporal top view and side view images of emission at the normal surface discharge. The images for the Ne emission show that emission starts at the inner edge of the cathode, and spreads to the outer edge of the cathode.



top view images side view images

Fig. 5. The temporal images of emission at the normal surface discharge(a : anode, c: cathode)

4. Conclusion

In the case of applying an auxiliary voltage pulse on the address electrode, the region of discharge volume becomes wider than normal sustain discharge volume and the discharge volume can be spread to the address electrode on the rear glass plate. Also, we obtained the larger two discharge volume compared with the normal sustain discharge. From the luminance and emission duration time measurement results, it is thought to be that the most effective discharge can be obtained when the auxiliary voltage is the half of the sustain voltage.

5. References

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