

# Photosensor 를 이용한 재할 치료형을 위한 CO<sub>2</sub> laser 의 출력변동을 안정을 위한 실시간 제어특성 연구

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## Real time control special quality research for CO<sub>2</sub> laser's output change rate stability for accumulation style surgical operation rehabilitation of ventriculus that use Photosensor

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### Abstract

The important parameters deciding the fluctuation of Accumulation style surgical operation of ventriculus laser beam are smoothing capacitor, frequency and the characteristics of laser resonator. In this thesis, we control the fluctuation of medical CO<sub>2</sub> laser in realtime by changing Duty-Ratio of IGBT and switching frequency with fixed the smoothing capacitor to improve the fluctuation of laser beam. We detect the light on laser resonator using a CdS photo sensor to improve ripple factor of laser beam and feedback fluctuated signals refined by a band pass filter into the control circuit to stabilize fluctuation actively. There is much to be desired in the realtime controlling technique of the light on Accumulation style surgical operation of ventriculus laser discharge tube in electrical signal. We propose switching control technique with microprocessor and photo sensing technique by controlling switch devices optimum operation and feedback signals detected by a photo sensor into the laser power supply in order to improve ripple factor of the CO<sub>2</sub> laser beam.

### 1. Introduction

CO<sub>2</sub> light amplification by stimulated emission of radiation is utilized in several fields such as medical, minuteness measure, material processing because continue and pulse mode action are possible and stability is superior as being high output. Specially these practical use light amplification by stimulated emission of radiation the most important special quality that must equip along with minimization of output floating rates stabilization of output be [1 - 4] . Light amplification by stimulated emission of radiation beam's output ripple ingredient is very important item in medical surgical operation that output that give protective

care is required. Also, detailed processing is available and leave out minuteness such as etching of semi-conductor process using light amplification by stimulated emission of radiation beam that output change is low in material processing of industry light amplification by stimulated emission of radiation can apply in processing field. Important parameter that decide such light amplification by stimulated emission of radiation beam's output fluctuation is archery practice bow capacitor capacity and all frequencies, and laser cavity's load characteristic of power supply.[11]

### 2. Main discourse

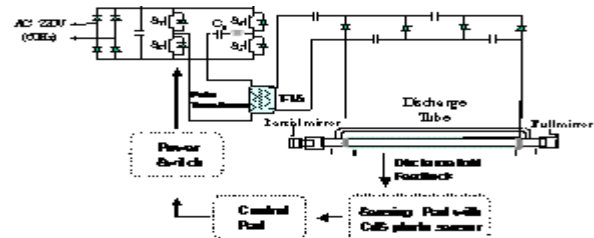


Fig 1. Main diagram

Figure 1 displays whole schematic diagram of design manufactured system for this research. Used Up pulse transformer of 1:15 turn ratio that current resonance style Full-bridge DC-DC converter uses Peraitte core manufactured design considering output improvement of laser power supply, use 4 loop' Cockcroft-Walton circuit to Hudan of transformer the second and composed so that DC may be approved to laser resonator that is last load off

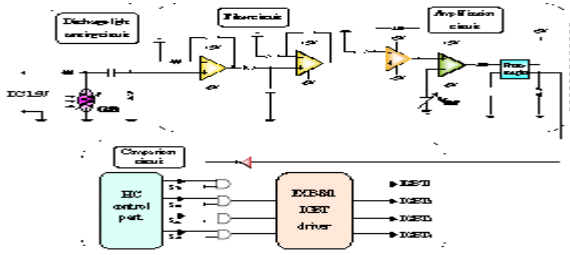


Fig 2. Sensor interface processing

Figure 2 composed to approve driving signal to power department's switch element using PIC16C57 that is 8 bit one-chip microprocessor as controlling element to control switch element. Switching frequency of controlling element to peel maximum 25kHz from 1 kHz signal occurrence setting is available driving signal being inputed to IGBT drive Driver (EXB-841) to switch element signal be approved make . By drive sensing circuit and control inning between on occurred insulation as problem and storehouse noise ingredient delete countermeasure by sensing inning in religious order Photo-coupler install . Designed to control compensation during time between detection storehouse signal and output square wave signal to make comparator output square wave that correspond in reflect sign that noise ingredient is removed and display change square wave. [5-10]

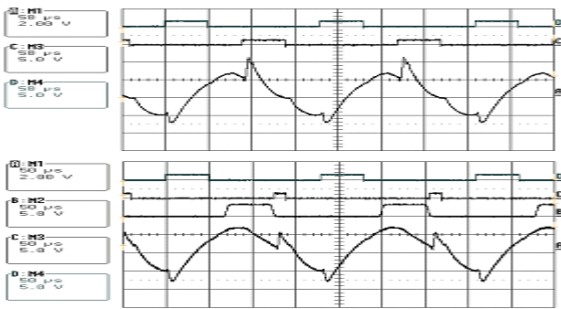


Fig 3. Discharge light waveform of the Co2 laser by realtime control

If Duty Ratio of CO2 laser power control signal grows, pulse width of microprocessor signal that submit compulsion control relatively decreases and reduces load current. Also, station peak ingredient of laser output storehouse according to width change of real time controlled pulse signal approved lastly to IGBT to signal occurrence section gradually Swipe effect that reduce ripple ingredient of output storehouse being done appear .

Figure 5 displays improvement of output change being output at On-time's maximum control point as waveform that display storehouse output change by change characteristic of storehouse ripple ingredient of laser discharge tube and switching Duty Ratio's real time compulsion TC that is broken out by switching frequency change. Therefore, decreased on the whole do peak of laser output storehouse ripple ingredient. with switching frequency & dutio ratio

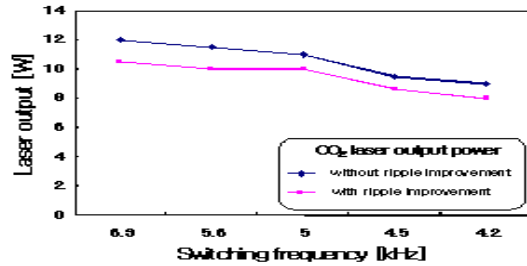


Fig 4. Discharge light waveform of the Co2 laser

### 3. Conclusion

This research got conclusion such as that study real time power control that utilize CdS optical sensor to secure ripple ingredient mend of laser output beam and stability of output. According as reduce Duty ratio of switching frequency electively, power supply input decreased and storehouse ripple ingredient improved as that reduce peak part of output storehouse. Also, output decline caused about 5% than case that do not behave output storehouse control is in CO2 laser output change, but whole change of output change confirmed that stability of laser output is defined because is slow.

### [ Reffrences ]

- [1] 김휘영의 2 인 두펄스 중첩에 따른 펄스형상과 레이저 출력과의 상관관계 제 54 집, pp 63-69, 1998 년 6 월 부산대학교 생산기술연구소 논문집
- [2] Yasutomo Fujimori, laser Material Processing in Electric Industries , Proceeding of Lamp '92, Nagaoka, pp. 981-986, (1992).