

## Effective Scanning Condition of Laser CFRP Processing with High Power Pulsed Fiber Laser

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### 1. Introduction

Carbon fiber reinforced plastic (CFRP) composite has been expected to the next generation material. Laser CFRP processing has attracted attention. Fiber laser has recently appeared rapid development [1]. The fiber laser is superior to such as simplicity, stability of operation, large output and high beam quality under the hard environment compared to the conventional CO<sub>2</sub> laser and YAG laser. Then, the CFRP processing with the fiber laser had been performed in this study. We had implemented the experimental study with the pulsed laser because of adoption of cutting by the ablation process and avoidance of the thermal cutting by the continuous wave laser [2]. The experimental study of CFRP processing with the fiber laser which was pulsed and high power was performed.

### 2. Experimental

The CFRP plate was cut by laser light of pulsed fiber laser which was the average power of 125 W, the repetition rate of 167 kHz and 10 ns pulse width with the Yb-doped PCF rod fibers [3]. The wavelength was 1064 nm that was the fundamental laser light. The processing rates were measured as parameters of the hatching distance and the scanning speed.

Figure 1 indicates processing rates of the CFRP plates under the varying of the hatching distances and the scan speeds. The circular points show the processing rates at the scanning speed of 2.75 m/sec, and the square points mark one at the scanning speed of 11.0 m/sec. These results suggest that the laser light become to approach more easily into the groove inside with the hatching distance and cut the CFRP plate. The images of the wall at the groove irradiated by the laser light were observed with the SEM. The profiles of the cross section were measured with the CLSM. The experimental results indicate that good cutting quality depends on the rate of the ablative processing to be small thermal effect.

### 3. Conclusions

An importance of the hatching distance for the high speed and high quality processing of CFRP has been investigated. Influences of the hatching distance and the scanning speed for the cutting speed were appeared. There were large effects of the adjustments of the hatching distance and the scanning speed on the cutting quality and processing rate.

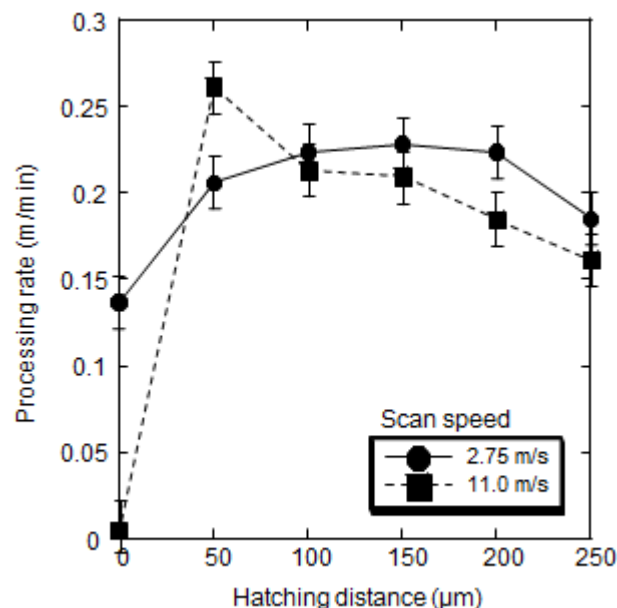


Fig. 1 Graph comparing the processing rate to the hatching distance

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