

## Characterization of supercontinuum in photonic crystal fiber pumped by Yb fiber laser with time-stretch spectroscopy

Tomoki Kiyohara\*, Kouhei Mikami, Hiroyuki Toda, and Masayuki Suzuki  
 Graduate School of Science and Engineering, Doshisha University,  
 1-3 Tataramiyakodani, Kyoutanabe-shi, Kyoto 610-0394, Japan.  
 e-mail: ctwf0325@mail4.doshisha.ac.jp

### 1. Introduction

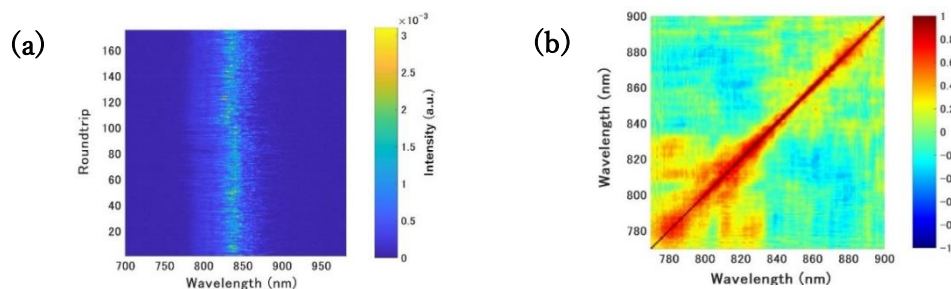
Supercontinuum (SC) from a photonic crystal fiber (PCF) pumped by a high-power laser pulse is an attractive coherent light source for ultrafast spectroscopy and biomedical imaging [1]. Although the time-integrated spectral structure of SC is smooth, the individual fine structure of SC, however, is washed out due to pulse-to-pulse fluctuation in the pump laser. Thanks to progress on a time-stretch data acquisition, the single-shot spectrum can be measured in real-time [2]. In this presentation, we report the measurement of the shot-to-shot spectrum of SC at the wavelength of 740 nm-940nm with time-stretch spectroscopy and the reconstruction of a wavelength cross-correlation map [3].

### 2. Experiment

For the pump source, we used a homemade Yb fiber chirped-pulse amplification laser system. Output average power was 0.35 W, with a pulse duration of 300 fs at the repetition rate of 40 MHz. This laser pulse was focused onto the 40 cm length of PCF with a zero-dispersion of ~980 nm using an aspheric lens. The single-shot spectrum of SC at the wavelength of 700 to 1000 nm which was selected by using a combination of bandpass filters, was measured by using a 600 m length of SMF with an ultrafast photodetector and high-speed oscilloscope.

### 3. Result

Figure 1(a) shows a 2D color plot image of single-shot spectrum of SC at the wavelengths of 700 nm-1000 nm. Figure 1(b) indicates the intensity correlation-map of the spectrum of SC. The spectral structure by each frame is completely different as shown in Fig. 1 (a). As can be seen in Fig. 1 (b), the correlation map of SC light shows negative correlation and positive correlation depending on the wavelength. The detail will be discussed at the conference.



**Figure 1.** (a) Single-shot spectra of 176 consecutive pulses at the wavelength of 700 - 1000nm. The horizontal and the vertical is the wavelength and the number of shots, respectively. (b) Correlation map of SC. The correlation coefficient (-1~1) plotted in the spectral range of SC.

### 4. Conclusion

We have demonstrated the single-shot spectrum measurement of SC with time stretch spectroscopy and retributed wavelength correlation map from the single-shot spectra. Our obtained results provide help in understanding highly stable SC generation.

### References

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- [3] B. Wetzal, A. Stefani, L. Larger, P. A. Lacourt, J. M. Merolla, T. Sylvestre, A. Kudlinski, A. Mussot, G. Genty, F. Dias, and J. M. Dudley: Sci Rep **2**, 882 (2012).