LFFC - Large frequency spacing fiber laser frequency comb

Application

- Optical clocks
- Frequency/time transfer
- Low-phase-noise microwaves
- Astronomical spectrograph calibration
- Molecular spectroscopy
- Comb-calibrated tuned lasers
- Ranging
- Coherent LIDAR
- Arbitrary optical/RF waveforms

Innovative key points:

- A new theory and new technology of high repetition frequency laser were advanced. The development of ultrashort pulse fiber laser cavity by Dispersion managed soliton theory, and physical reasons of directly outputting the shortest pulse and minimal noise were discovered. This is a new contribution to the mode-locked fiber laser theory.

- Break the conventional optical fiber mode locking device constraints. A new integrated optical fiber coupling device and dispersion compensators, isolation device were developed, in purpose to obtain a very high repetition frequency in ring cavity fiber laser (750MHz) and the direct output of the short pulse (sub-50fs) which is the world's first innovation.

- The unique design of the tapered photonic crystal fiber could broaden spectrum of low power pulse optical fiber. (OElabs offers the fiber tapering working station. Click here.)This technology simplified fiber laser system, removed fiber amplifier, enhanced system stability, and reduced system cost, which could greatly promote the current market application.
Features and Advantages

- High repetition frequency, ultrashort cavity.
- More like a solid laser, the direct output could achieve <50 fs pulse.
- The pump light source is more competitive compared to solid state laser such as Ti:sapphire laser which have stability problems by its pump light source pointing issues.
- Less susceptible to external disturbance by its short fiber.
- The octave bandwidth and high contrast is obtained directly in photonic crystal fiber, so the amplified F_{ceo} with high signal-to-noise ratio is unnecessary.
- High power per comb, high power signal during frequency measurement.
- The frequency interval is large; do not need N measurement by high precision wavemeter.

Description

The large frequency spacing comb represents a real-world fiber laser frequency comb. This extraordinary comb system delivers a frequency spacing of 500 MHz (Maximum 750MHz) based on an ultra-compact Yb:fiber oscillator. An innovative optical design increases the frequency spacing by a factor of 3 over the standard Yb:fiber systems while maintaining a high stability and accuracy. Analogue to a compact femtosecond Ti:sapphire laser oscillator whose spectrum can be directly broadened by a photonic crystal fiber, the ultra-compact fiber laser does give the ultra-broadband spectrum via directly coupling into a photonic crystal fiber without amplifications, so that the system is more compact than traditional fiber laser combs.

This comb is ideal for emerging applications in the field of frequency comb metrology and spectroscopy. The laser is turn-key self-starting in a single compact enclosure giving unprecedented stability.
## Specifications of FLY-comb and FLE-comb

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Specification(s) FLY-comb</th>
<th>Specification(s) FLE-comb</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency spacing Central wavelength of the seed laser</td>
<td>500MHz (typical) 1030 nm</td>
<td>300MHz (typical) 1550 nm</td>
<td>(Maximum 750 MHz for Yb:fiber comb and 350 MHz for Er:fiber comb)</td>
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<tr>
<td>Spectral width</td>
<td>30 nm</td>
<td>30 nm</td>
<td></td>
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<tr>
<td>Pulse width</td>
<td>&lt;50 fs</td>
<td>&lt;60 fs</td>
<td></td>
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<tr>
<td>Available output power for comb</td>
<td>10 mW</td>
<td>10 mW</td>
<td>Higher comb power available on request</td>
</tr>
<tr>
<td>Wavelength covers</td>
<td>550 nm–1300 nm</td>
<td>1100 nm–2100 nm</td>
<td>Other wavelength range available on request</td>
</tr>
<tr>
<td>Instability of the frequency spacing</td>
<td>5 x 10^{-13} in 1 s</td>
<td>5 x 10^{-13} in 1 s</td>
<td>Or as same as customer supplied frequency reference</td>
</tr>
<tr>
<td>Instability of the frequency offset</td>
<td>25 MHz in 1 s</td>
<td>25 MHz in 1 s</td>
<td>Or as same as the customer supplied frequency reference</td>
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