SUPPLEMENTARY INFORMATION

The generation of the DKS combs

Stable pumping of a high-Q micro-resonator with narrow linewidth needs to overcome environmental perturbations. And the existence of the sizable cavity thermal nonlinearity when accessing the DKS parameter space makes it easier to be out of resonance. The heat flow of the main pump can be largely balanced out with the approppriate power and frequency of the auxiliary pump, keeping the cavity temperature and all cavity resonances approximately unchanged. This allows the pump laser to be stably tuned across the entire micro-resonance with minimized thermal behavior. Based on the dual-driven system , the overall stability of the DKS combs generation system has been improved even stay in the single soliton state, which is shown in the Fig. 1. With a frequency detuning accuracy of about 0.5 MHz minimum step size, we can slowly access the soliton regions on the red detuned side of two resonators simultaneously and maintain a stable time of more than 8 hours (see Fig. 2).

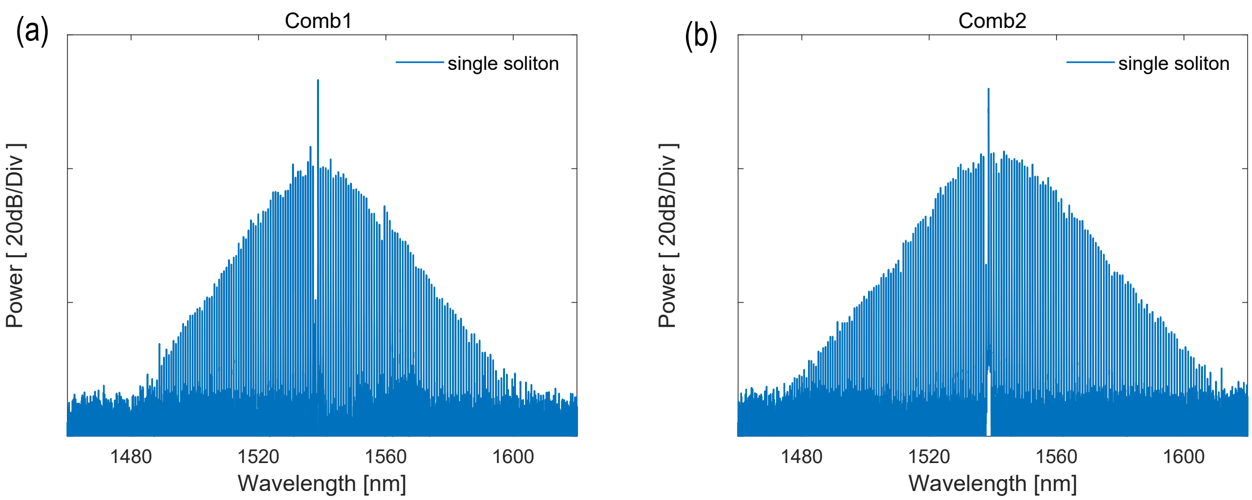

FIG. 1. From **(a)** to **(b)** are the measurement single soliton frequency sprctrums of two independent DKS combs.

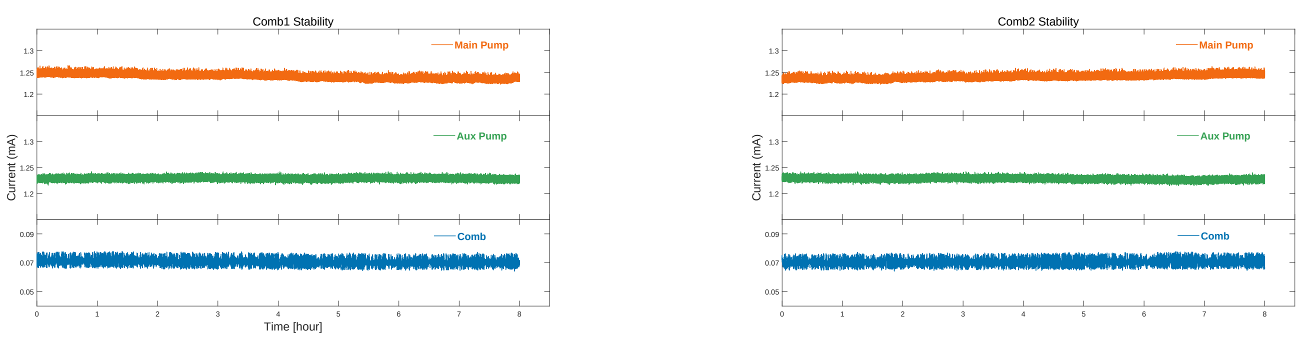

FIG. 2. The above figure shows the power stability of the aux pump, main pump and the comb power of Comb1 and Comb2 over an eight-hour period, respectively.

The results of 32 channel arrayed waveguide grating (AWG) filter

In our system, the high signal-to-noise ratio (SNR) signal light is mainly accomplished by post-filtering with 32-channel waveguide fiber arrays. In the 'Monitor' part of the experimental setup , the high-power pump light is first separated from the generated DKS comb lines by a 200 GHz bandwidth fiber WDM, and then most of the power passes though the AWG by a 1:9 fiber beam splitter. The selected CH38 to CH47 comb lines are transported to another laboratory via a long fiber. Due to the low power of a single comb line, an auxiliary light (central wavelength in the CH21 channel) with a power of about 10 dbm is needed to lock the IM working point, so cascade of AWGs are used to get a pure signal light. We characterized the signal crosstalk of adjacent channels of a single AWG as shown in the Fig. 3: the signal light is punched in from the input channel, and the output power is scanned with an optical power meter from CH38 to CH47. The obtained isolation of each adjacent channel of a single AWG can be kept above 28 dB, and the next nearest neighbor can be kept above 35 dB. The signal isolation of the adjacent channels of the cascaded AWGs is characterized to be above 50 dB by a optical spectrometer analyzer.

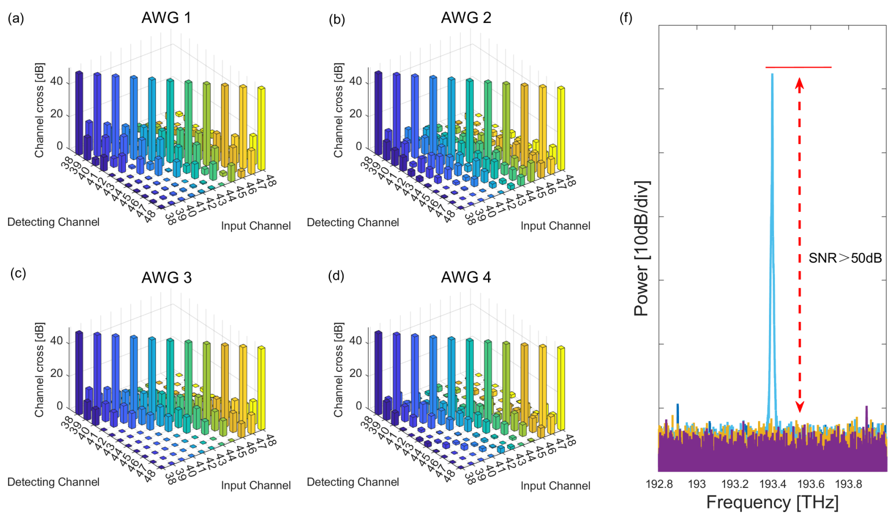

FIG. 3. The measurement signal-to-noise ratio(SNR) of casecaded 32 channel arrayed waveguide grating filters with 100 GHz spacing. From **(a)** to **(d)** is the specific channel crosstalk from AWG number 1 to 4. **(f)**. The cascaded filtering effect can reach a signal-to-noise ratio of more than 50dB.

The results of 10 HOM interference visibilities

As shown in HOM interference part, the polarization has been controlled by the combination of PBS and PM-BS. The average photon number from different DKS comb lines is set to about 400,000 per second and the measurement interference results are shown in Fig. 4.

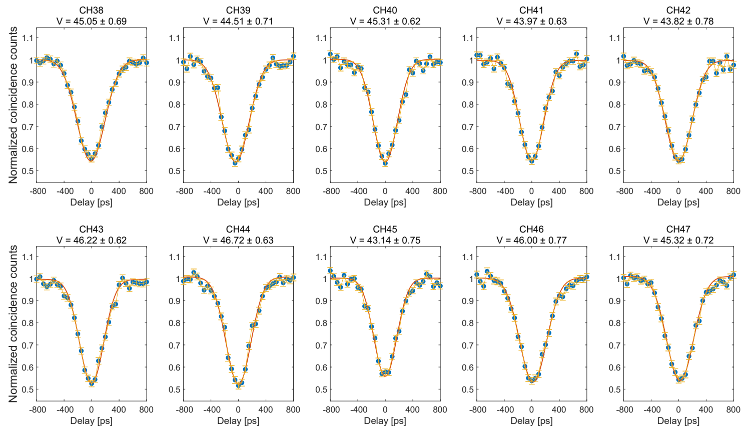

FIG. 4. HOM interference visibility details of 10 comb-line pairs. The visibility distributes in the range of 43.14% to 46.72% which is measured for five times.