



The tentative application of optical generation of microwave on the fountain clock in NIM

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The optical generation of microwave (OGM) based on ultra-stable laser (USL) and fiber optical frequency comb (OFC) is built at the National Institute of Metrology (NIM), China. As shown in Fig1, the OFC is stabilized with USL by controlling the pumping current and piezoelectric transducer (PZT)[1]. The second stability is better than E-15. Meanwhile, the error signal is send to the temperature control of the optical resonant cavity for the long term locking which enable a more than 30 days continuously running. By controlling the driving frequency of the AOM according to the phase detecting between the OGM and the H master (VCH1003), the long term stability of H master is transmitted to the OGM. This OGM has be tentatively applied as the local oscillator of Cs fountain clock to improve its short term stability. Compared with the native local oscillator which is H master, the short term stability has been improved obviously. However, more improvement of the fountain clock and OGM shown be made for ultimately application.

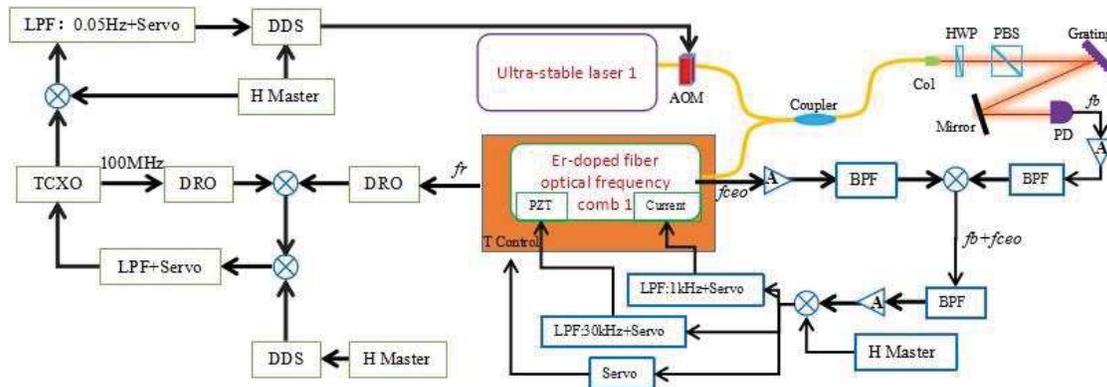


Fig.1 The system chart the ultra-stable microwave. PBS, polarized beam splitter. Col, Collimator. PD, photon detector. HWP, half wavelength polarization. PZT, piezoelectric transducer. BPF, bandpass filter. A, amplifier. LPF, lowpass filter. DDS, direct digital synthesizer. DRO, dielectric resonator oscillator. TCXO, temperature compensated crystal oscillator.

1. Millo, R. Boudot, M. Lours, P. Y. Bourgeois, A. N. Luiten, Y. Le Coq, Y. Kersalé, and G. Santarelli, "Ultra-low-noise microwave extraction from fiber-based optical frequency comb," *Optics Letters* 34, 3707-3709 (2009), arXiv:0906.4608.