Electronics and ICT

R&D Endorsement

Title

Photonic Microwave Generation Apparatus and Method

Abstract	Using the optical frequency comb signal to inject external light into the semiconductor laser to generate periodic Non-linear dynamics for the generation of microwave signals. This period-nonlinear dynamic can generate a microwave signal with adjustable frequency and fixed power. However, since the generated microwave signal is unstable (its microwave linewidth is on the order of MHz), this invention adopts any order of harmonic sidebands in the optical frequency comb to phase-lock the cycle-nonlinear dynamic low-frequency oscillation sidebands because of the high coherence of the signal, which can greatly narrow the linewidth (3- dB linewidth) of the generated microwave signal to 1 Hz. This system only needs a low-frequency reference microwave signal, which is used to generate an optical frequency comb. After it is injected into a semiconductor laser to generate a period-nonlinear dynamic, it can generate at least five times and at most ten times the frequency of the reference microwave signal frequency.
Benefits	Microwave generation by electronic technology is the most mature technology at present time, but due to the physical limitations of electrons, the generation of extremely high-frequency microwave signals will eventually face a bottleneck. Different from microwaves generated electronically, microwaves generated by optical beat frequency provide advantages such as extreme high-frequency bandwidth, small size, and no electromagnetic interference.
Industry Categories	Optical fiber communication, wireless communication (including microwave communication, satellite communication, satellite navigation), optoelectronic semiconductor, biomedicine, etc.
Keywords	radio-over-fiber communication nonlinear laser dynamics semiconductor laser optical signal processing microwave signal processing photonic microwave generation
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