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**Parametric generation of high frequency coherent light in negative index materials and materials with strong anomalous dispersion**[1]
JIZHOU WANG, Texas AM University — We demonstrate the possibility of generation of coherent radiation with tunable frequencies higher than the frequency of the driving field $\nu_d$ in a nonlinear medium utilizing the difference combination resonance that occurs when $\nu_d$ matches the difference of the frequencies of the two generated fields $\omega_1$ and $\omega_2$. We find that such a resonance can appear in materials which have opposite signs of refractive index at $\omega_1$ and $\omega_2$. It can also occur in positive refractive index materials with strong anomalous dispersion if at one of the generated frequencies the group and phase velocities are opposite to each other. We show that the light amplification mechanism is equivalent to a combination resonance in a system of two coupled parametric oscillators with the opposite sign of masses. Such a mechanism holds promise for a new kind of light source that emits coherent radiation of tunable wavelengths by an optical parametric amplification process with the frequency higher than $\nu_d$.

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