Two-dimensional confocal imaging system based on laser frequency-shifted feedback

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KEY WORD: Laser measurement; confocal imaging system; optical feedback

To image the object immerged in high-absorption, high-scattering solution, such as medial imaging of biology tissues and undersea visibility, laser frequency-shifted feedback confocal imaging system is used because of self-alignment and extra sensitivity to feedback light owing to resonant optical amplification in the laser. To image the object, step motor can be used to scan the measured target point by point. Only the light scattered on the focus could travel through the confocal system and return the cavity of laser. And then, the feedback light modulates the gain of laser, which dominates the amplitude of laser intensity. Theoretically, when the shifted frequency of feedback light approximately reaches the relaxation frequency of laser, the fluctuation of amplitude will reach maximum. Shifted frequency is controlled by two AOM (acousto-optical modulation), one added 100MHz, and the other reduced 99.5MHz. Passing through these AOM twice, the shifted frequency is 1MHz. Fixing the shifted frequency, the amplitude of laser intensity is decided by feedback coefficient; so measuring the amplitude of laser intensity, one can get the surface image of the target. In this experiment, a coin, as a measured target, is immersed in milk on the focus of the confocal system. Measuring the fluctuation of laser intensity point by point, we can restore the image of the coin with the software LABVIEW8.20.

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