利用軸稜錐透鏡及正透鏡組合產生超連續光譜光瓶

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摘　　要

　　我們於此篇論文報導了成功利用超連續光譜光源通過軸稜錐透鏡及正透鏡組合產生之超連續光譜光瓶。其中超連續光譜光源是利用柯爾鎖模飛秒鈦藍寶石雷射光偶合至微結構光纖所得到。藉由彩色濾光片所截選出特定波長之光瓶間具有著光瓶間距及直徑的微小差異，而此差異主要是由於軸稜錐透鏡及正透鏡組合之色散現象所造成。其中產生光瓶之順序截面光場圖形可由光束攝像機所記錄下來。藉由考慮入射高斯光場於夫累涅爾－克希荷夫繞射積分公式中所得到之理論結果與實驗結果相當符合。而在利用高數值孔徑物鏡聚焦光束的微米粒子侷限應用中，縱向電場的考慮是必要的。在向量瑞利繞射積分模擬，我們觀察到了在考慮線性偏振光入射及短焦距透鏡的情況下，顯著的縱向電場能應用於操縱長型粒子。而其中的內容及公式將會在此篇論文中作詳細的介紹。
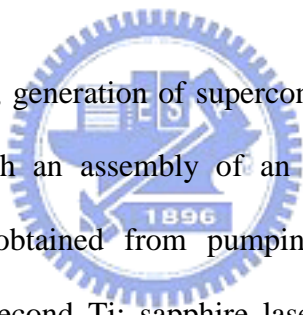
Generation of Supercontinuum Bottle Beam using Assembly of an Axicon with a Positive Lens

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ABSTRACT

We will report in this thesis, generation of supercontinuum bottle beam by passing the supercontinuum source through an assembly of an axicon and a positive lens. The supercontinuum source was obtained from pumping the microstrictured fiber by a Kerr-lens mode-locked femtosecond Ti: sapphire laser. Using the line color filters to select different central wavelengths, the bottle beams of specific central wavelengths show slightly different bottle ranges and diameters due to the dispersion of the axicon and the lens. The results consist with the theoretical calculation using the Fresnel-Kirchhoff's formula in considering incident Gaussian beam. When using high NA microscope objective for the application of microsized particle trapping, the longitudinal field is significant and has to be considered. Based on the vectorial Rayleigh diffraction integrals, we found the longitudinal field would significantly introduce anisotropic trapping force along the polarization direction of linearly polarized incident beam. With this scheme, it may benefit for laser manipulating or rotating elongated particles.