ABSTRACT

Supercontinuum (SC) generations have been well studied and developed in recent years. By carefully managing the dispersion, these spectrums could give us ultra-short pulses, with their pulse duration scaling down to femto-second (1 fs = 10^{-15} s) or even atto-second (1 as = 10^{-18} s) regime. There are many methods to compress a pulse such as using chirp mirrors, grating pairs, and prism pairs. As long as we have these ultra-short pulses, we can see things much clearer and observe events with more details through pump-probe experiments, generate higher order harmonics (HHG), make atto-second pulse synthesis and have many other important applications in the field of ultra-fast optics. In this thesis, we demonstrate the experiment of compressing a light source with multiple plate continuum (MPContinuum) spectrum, which was recently developed in our lab, covering almost the whole visible light range from 420 nm to 980 nm. For its programmability, we choose a spatial light modulator (SLM) as the tool to compress this pulse. With the help of two pairs of chirp mirrors, a 4-f system, and a Polarization Gating Cross-correlation Frequency Resolved Optical Gating (PG XFROG) setup, we have successfully compressed the pulse duration down to sub 3 fs.

摘要

超連續頻譜近年來已被多數實驗室所研究, 藉由相位調變我們能得到在時間上脈衝寬度為飛秒等級甚至是埃秒等級的短脈衝. 調變相為的方式有很多種, 例如啁啾鏡、光柵對以及棱鏡對. 當我們有了這樣的極短脈衝, 我們便能利用它來做 pump-probe 實驗或是製造單發高階諧波脈衝以及其他很多于超快光學領域之應用. 在這篇論文裡, 我們利用多片熔融矽石產生從420奈米至980奈米的超連續頻譜. 接著我們利用空間光調變器、兩對啁啾鏡、四焦距系統以及一個偏振態閘之交錯頻譜解析光閘系統, 成功地將此光源壓縮至脈衝寬度3飛秒以下.