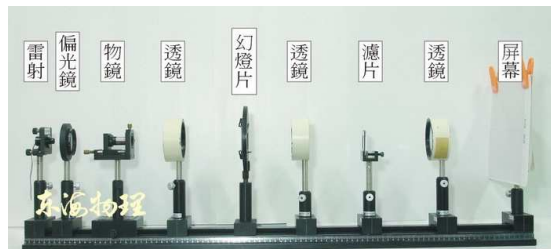
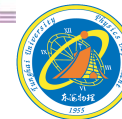


實驗3： 傅氏光學

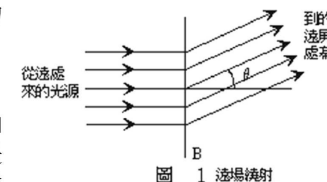


1

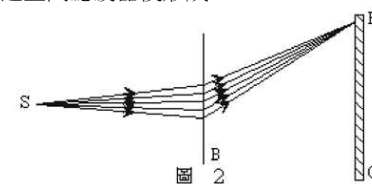


繞射 (Diffraction)

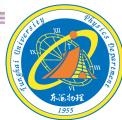
1、**遠場繞射** (Far-Field Diffraction) 又稱 Fraunhofer Diffraction, 此種繞射是光源到狹縫的距離, 與狹縫到屏幕的距離皆非常遠 (如圖1)。在實驗室內, 我們可以利用前面介紹的平行光束來模擬遠距離外的光源到狹縫的情形。



2、**近場繞射** (Near-Field Diffraction) 又稱為 Fresnel Diffraction, 此種繞射是指光源到狹縫的距離, 或是狹縫到屏幕的距離皆很近 (如圖2)。時, 由光源發出的光波是以**球面波**入射於狹縫內。此種球面波的產生, 可利用雷射光束, 通過空間濾波器後形成。

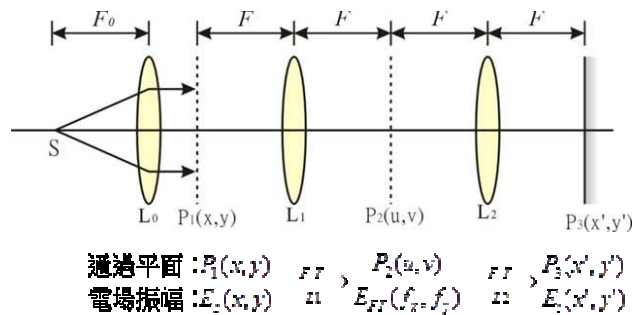


2

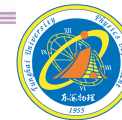


4F實驗

考慮圖5的光學系統, 單色光源S發射的光經平行擴束透鏡L0後形成平行光, 垂直入射物平面P1(x,y), 透鏡L1和L2的焦距均為F且相距為2F, P1和像平面P3個別在透鏡L1前和L2後F處, 故P1和P3之間的距離為4F。



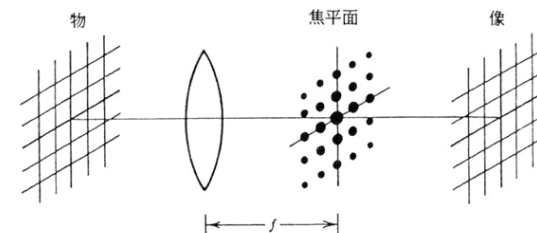
3



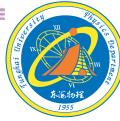
Abbe-Porter實驗

Abbe於1893年, 然後Porter於1906年分別做了一系列關於**改變像頻譜**的實驗, 我們稱這一系列實驗為Abbe-Porter實驗, 這些實驗的一般作法如圖4。

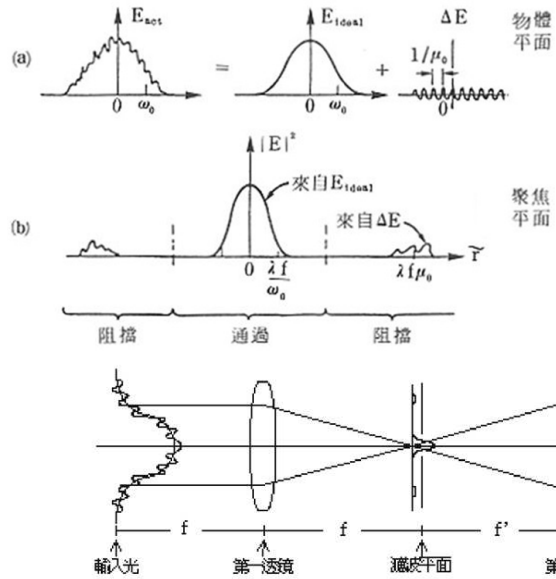
用相干光源照射到一張網狀格子的物體上, 在成像透鏡後方的焦平面上會出現週期性網狀格子的傅立葉頻譜, 最後通過透鏡的各個傅立葉分量在像平面上重新組合, 呈現網狀格子的成像。再把遮斷物放到焦平面上, 就能夠以各種方式改變像的頻譜。



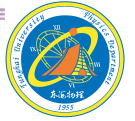
4



空間濾波



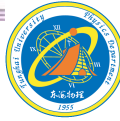
5



建立平行擴束光

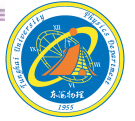
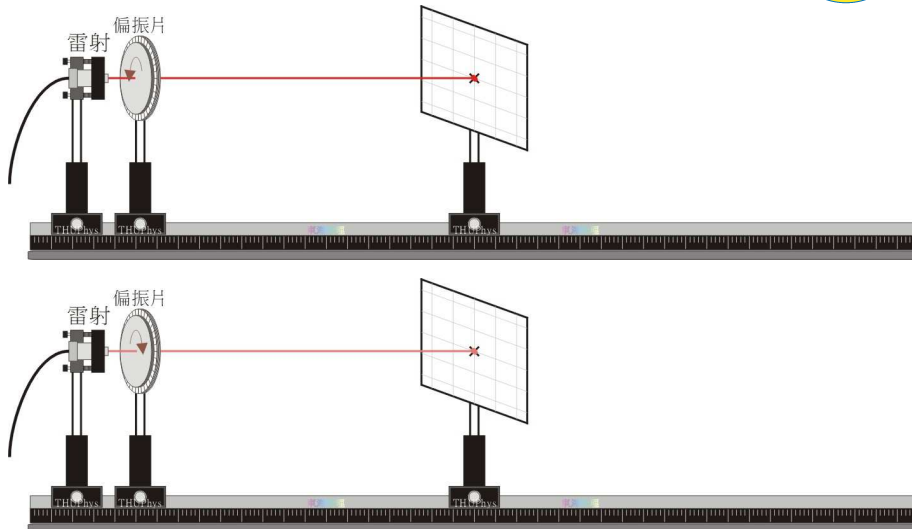
- 1-調亮度
- 2-對光
- 3-擴束
- 4-建立平行擴束光

6



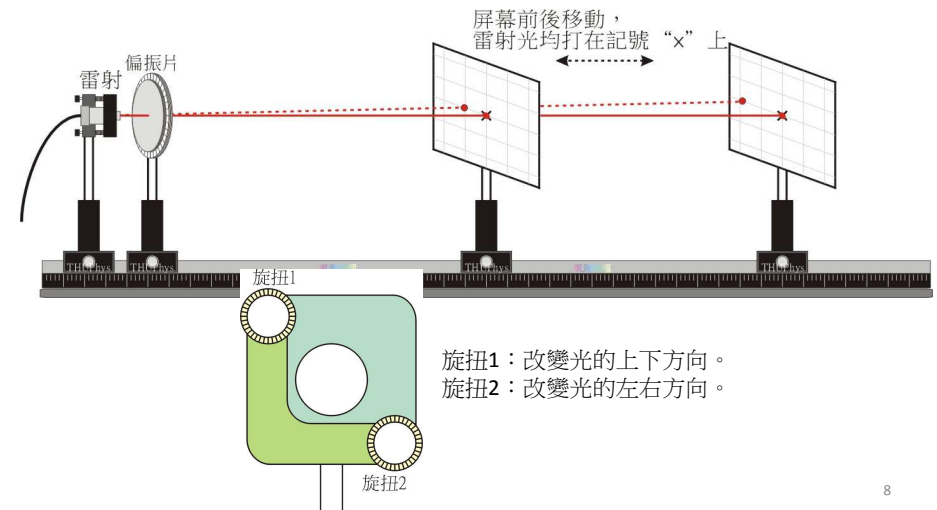
1) 調整亮度

利用偏振片調整雷射光亮度，建議對光時調暗些，避免眼睛負擔太大。

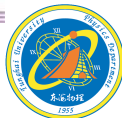


2) 對光—調整雷射高度、角度

使得光前進方向與滑軌平行—屏幕前後移動時，雷射光均打在屏幕的同一位置上。

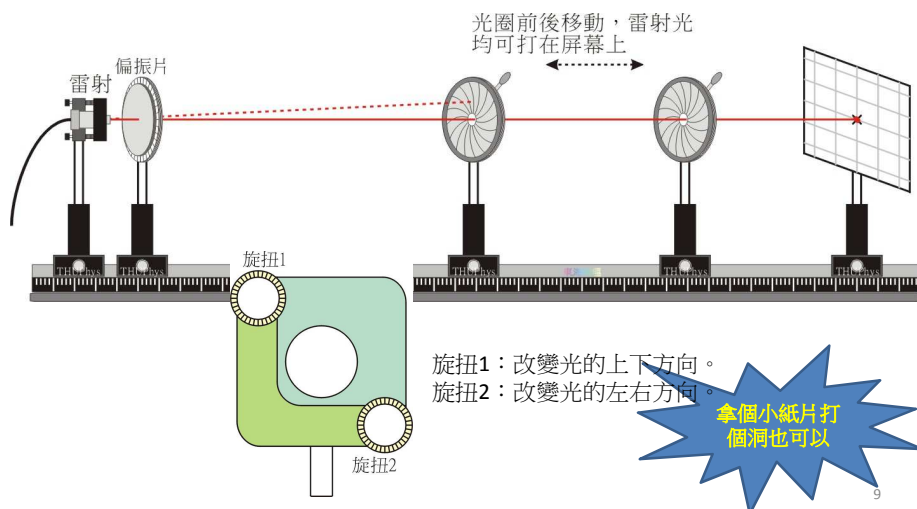


8

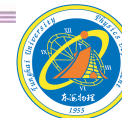


2) 對光—調整雷射高度、角度

使得光前進方向與滑軌平行—光前後移動時，雷射光均可以打到屏幕上。

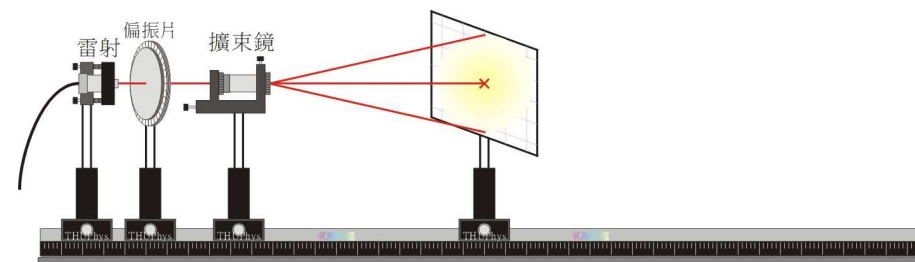


9

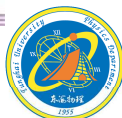


3) 擴束

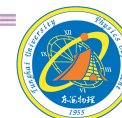
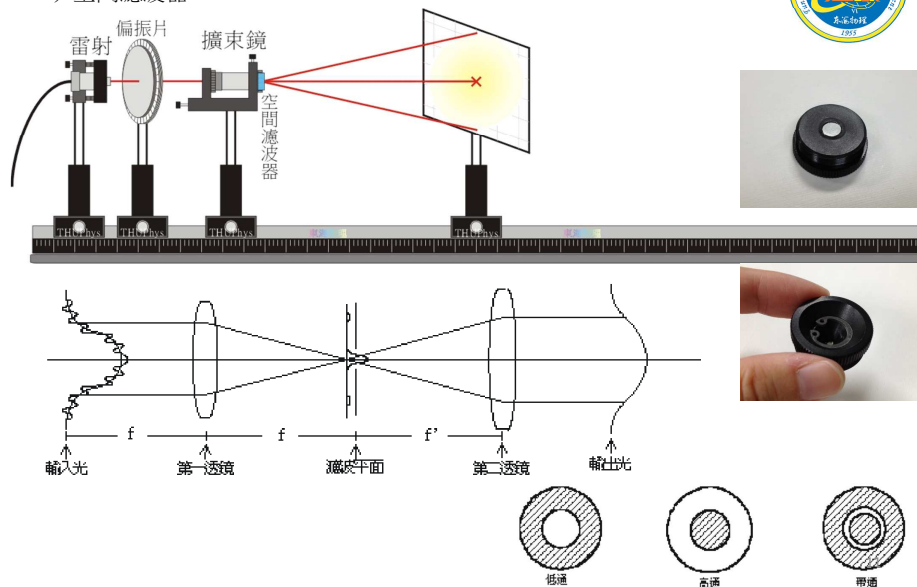
放入擴束鏡，調整擴束鏡高度、角度，
使得剛剛“x”記號在哪，現在擴束後的圓心就在哪～



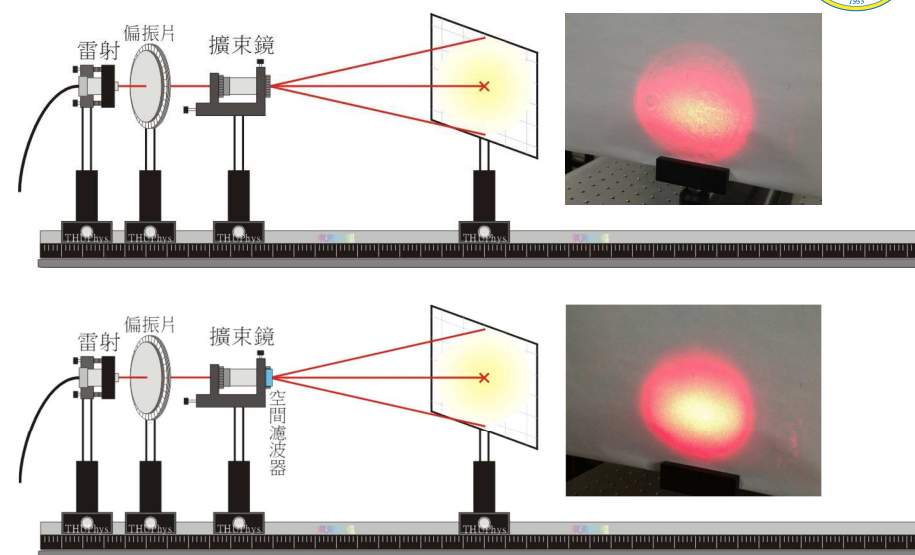
10

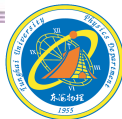


4) 空間濾波器



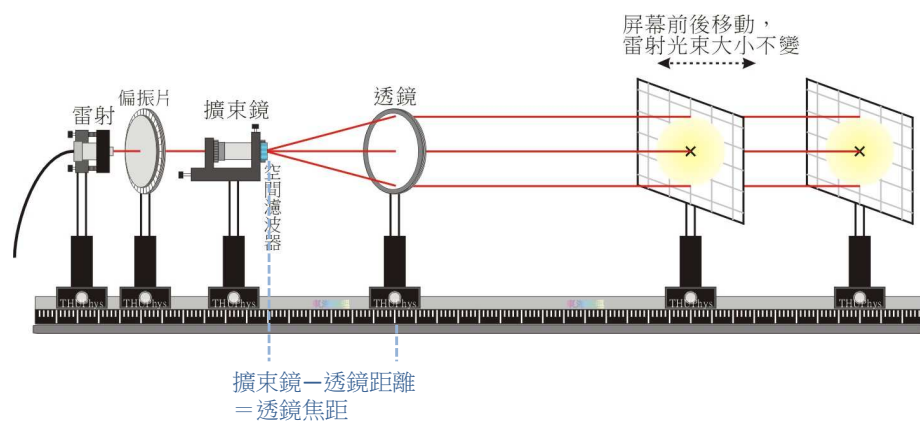
※空間濾波器



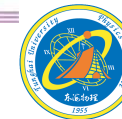


5) 平行擴束光

放入透鏡，調整透鏡高度與前後位置。
使得屏幕前後移動時，雷射光束大小不變。



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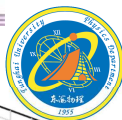
傅氏光學

一次傅氏轉換

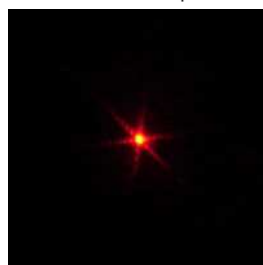
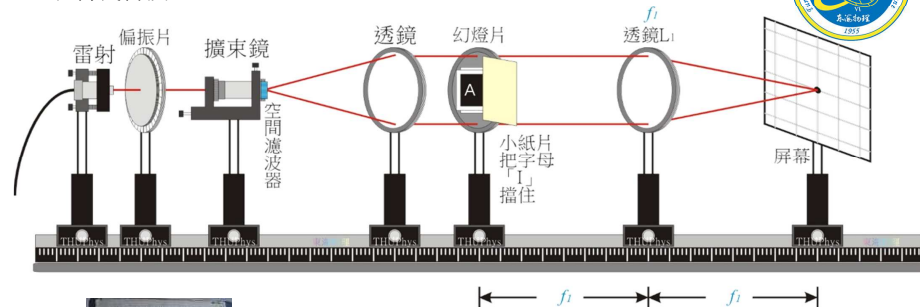
二次傅氏轉換



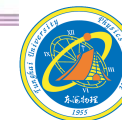
14



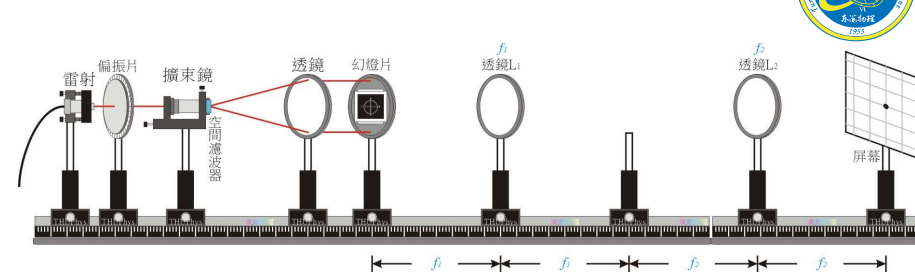
1) 傅氏轉換



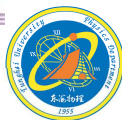
15



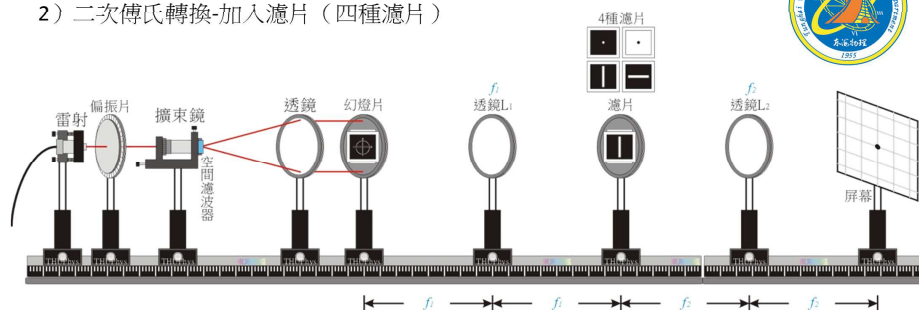
2) 二次傅氏轉換-不放濾片



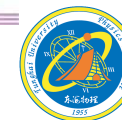
16



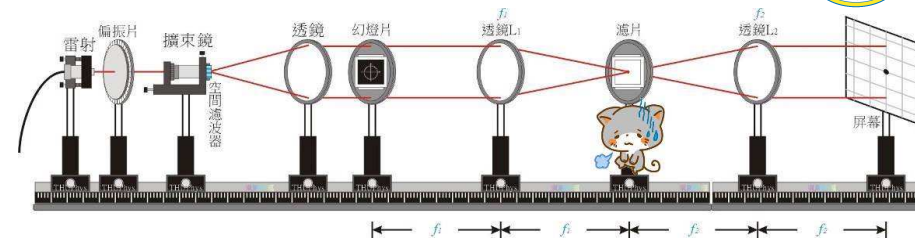
2) 二次傅氏轉換-加入濾片 (四種濾片)



17



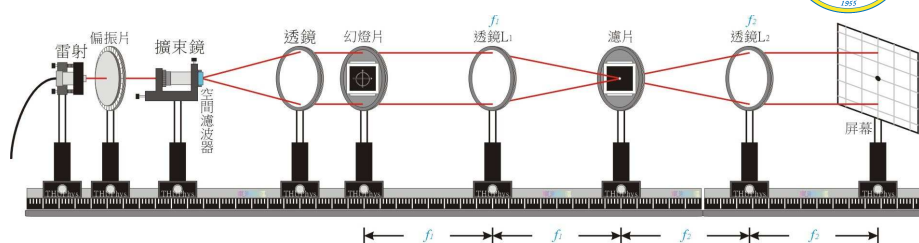
2) 二次傅氏轉換-濾片1



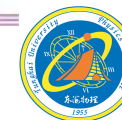
18



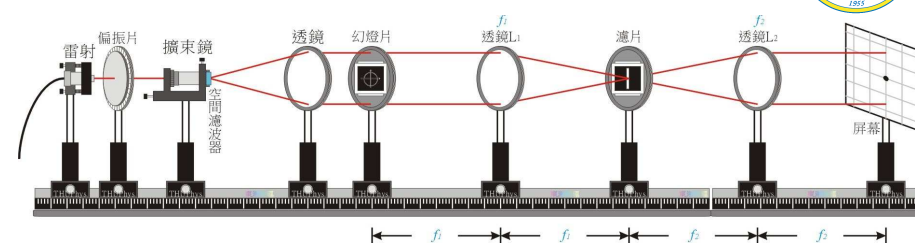
2) 二次傅氏轉換-濾片2



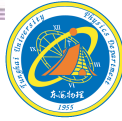
19



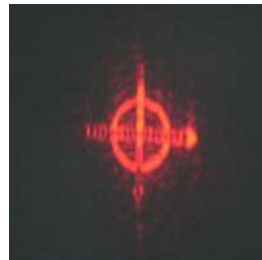
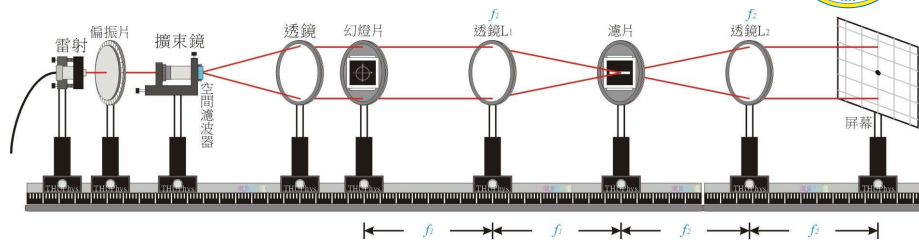
2) 二次傅氏轉換-濾片3



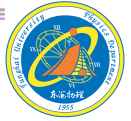
20



2) 二次傅氏轉換-濾片4



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我們沒有最好
只有追求更好

有空繼續補~~



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