

# 龙虾眼型X射线聚焦光学

赵冬华

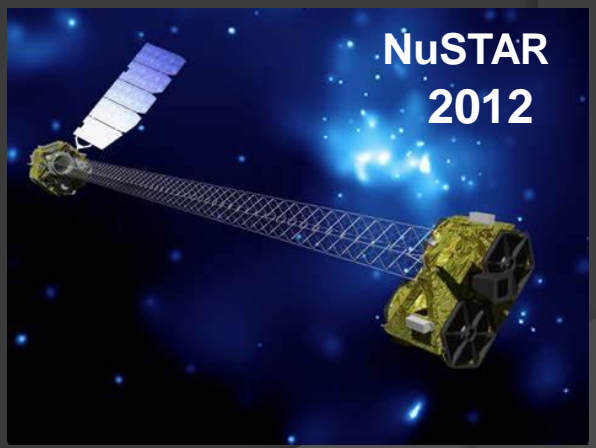
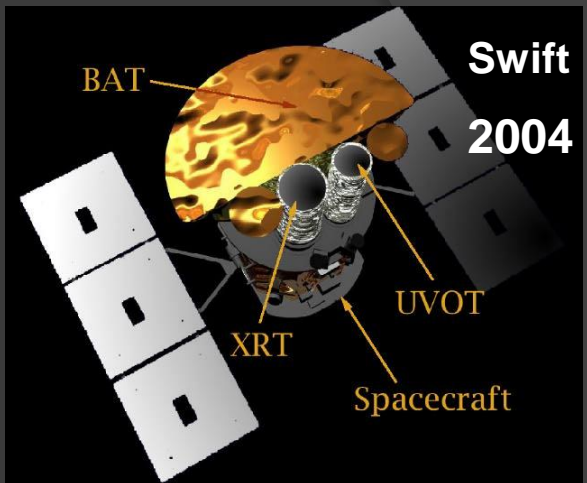
空间科学研究部——X射线成像技术研究团组



伦琴(W. C. Röntgen)  
1895年,发现X射线.



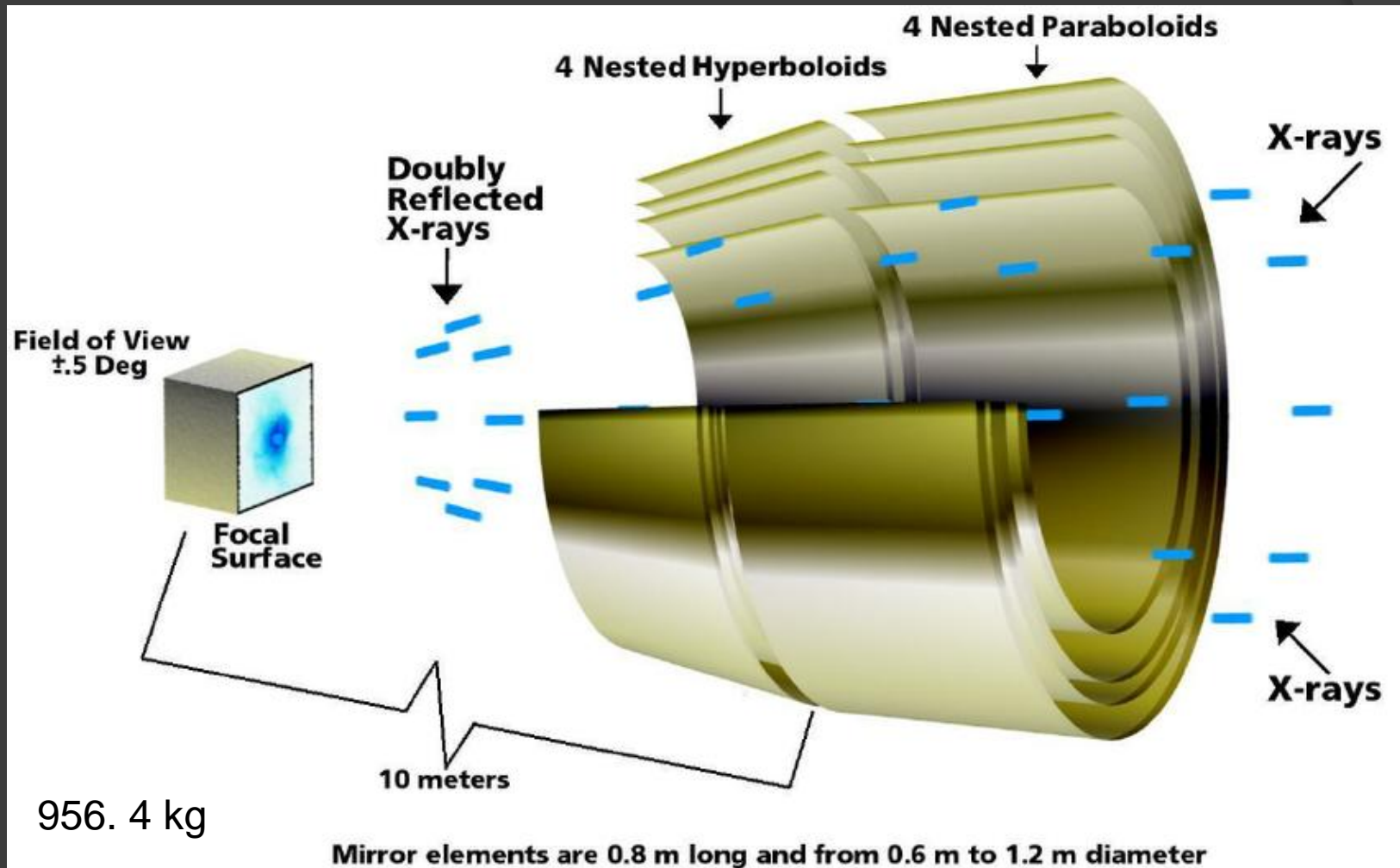
Riccardo Giacconi  
1962,第一次观测到宇宙X  
射线源, ScoX-1, 建立了  
第一个X射线源表.



# X射线天文学 蓬勃发展

# Wolter I 型

Wolter, H. 1952

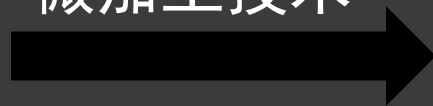


优点：可成像，角分辨率好

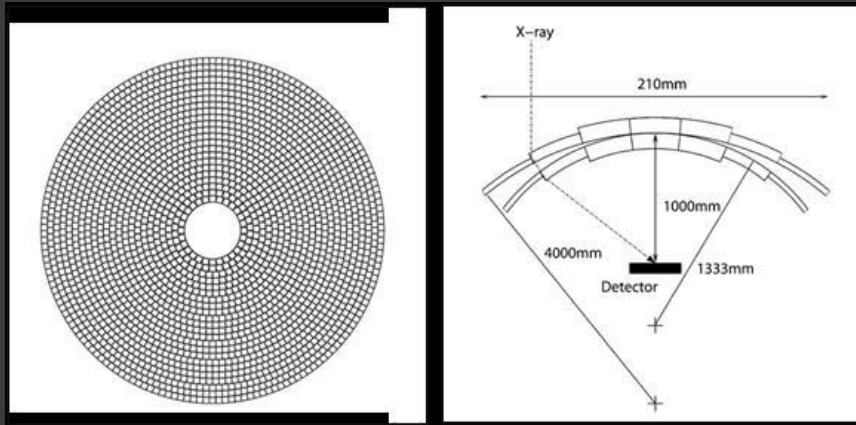
缺点：重，体积大，成本高，视场小

重  
大  
高

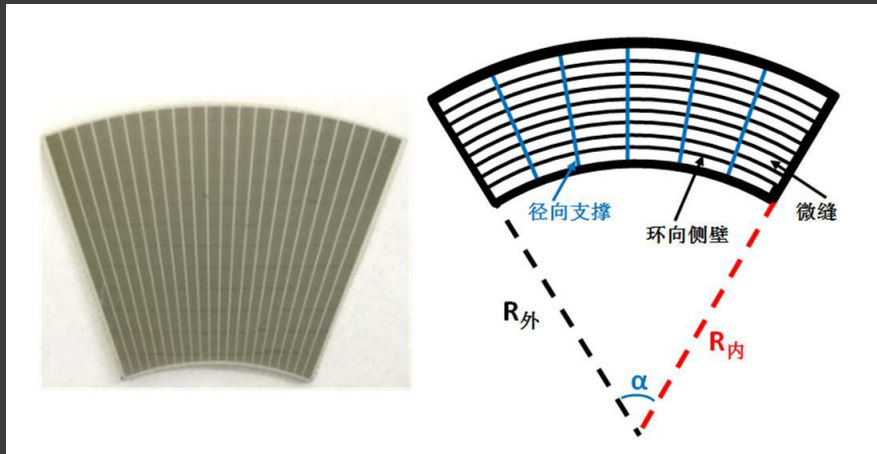
微加工技术



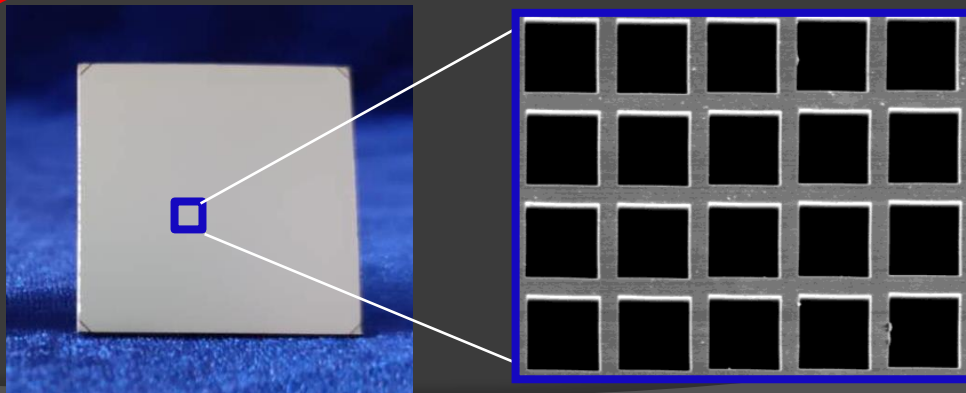
轻  
小  
低



Wolter I 型微孔光学

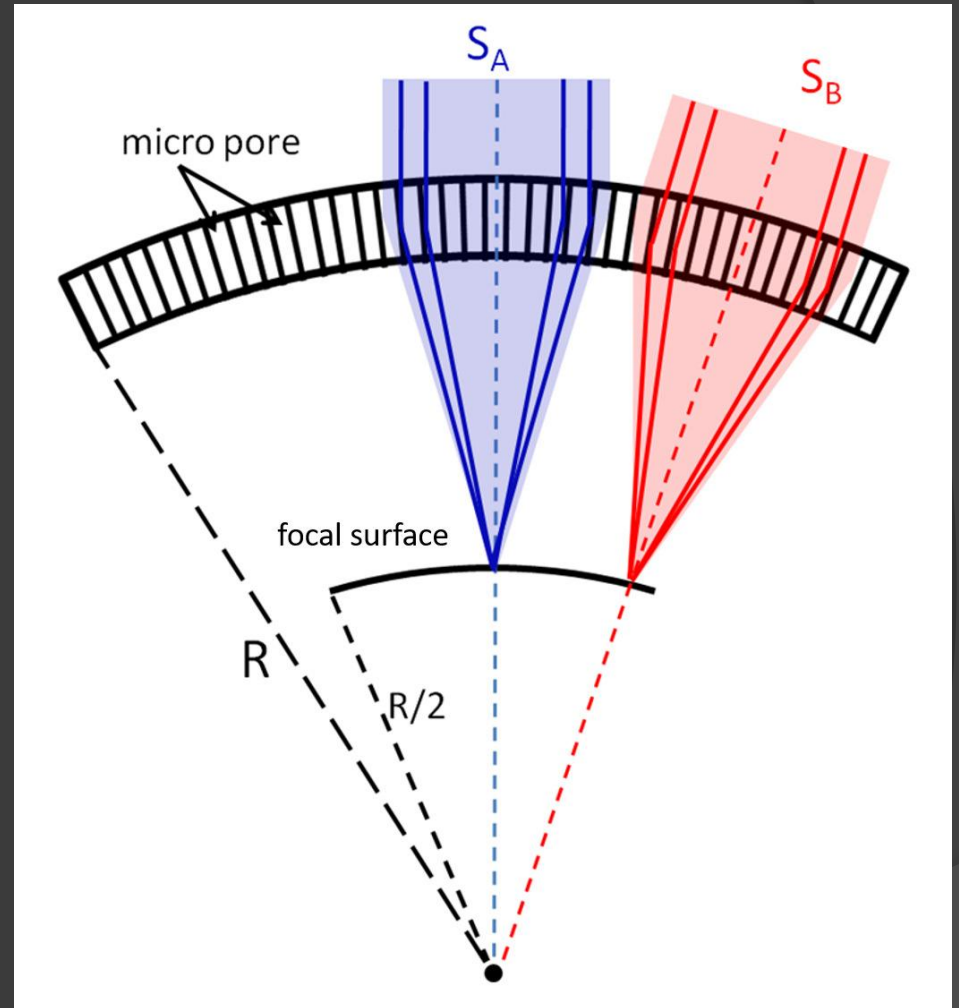
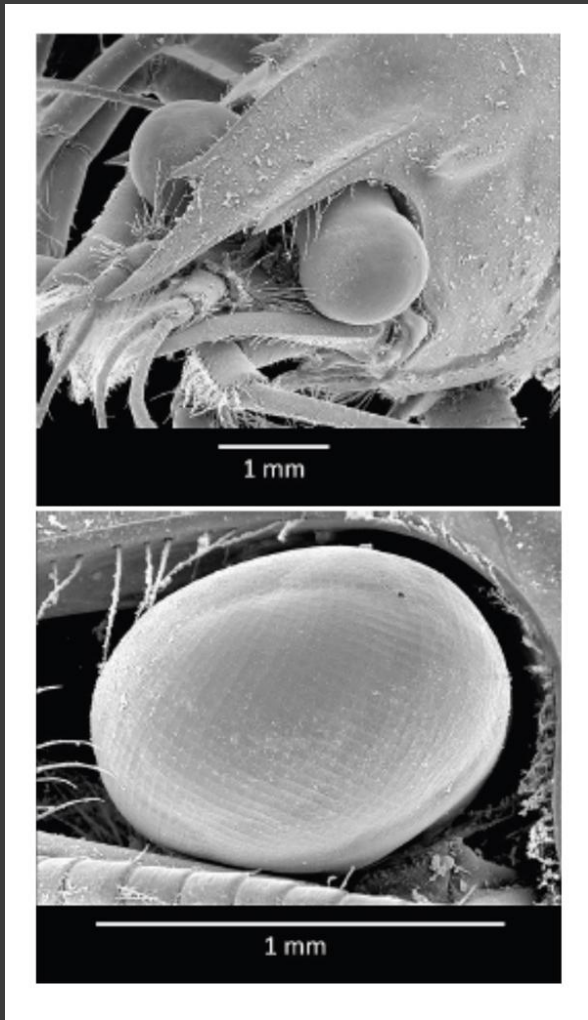


LMSO 微缝光学



Lobster-eye 型微孔光学

Vogt, K. 1975; J. R. P. Angel, 1979



优点：可成像，体积小，轻，**视场无限制**；

EP-WXT——龙虾眼型光学, 3600 deg<sup>2</sup>

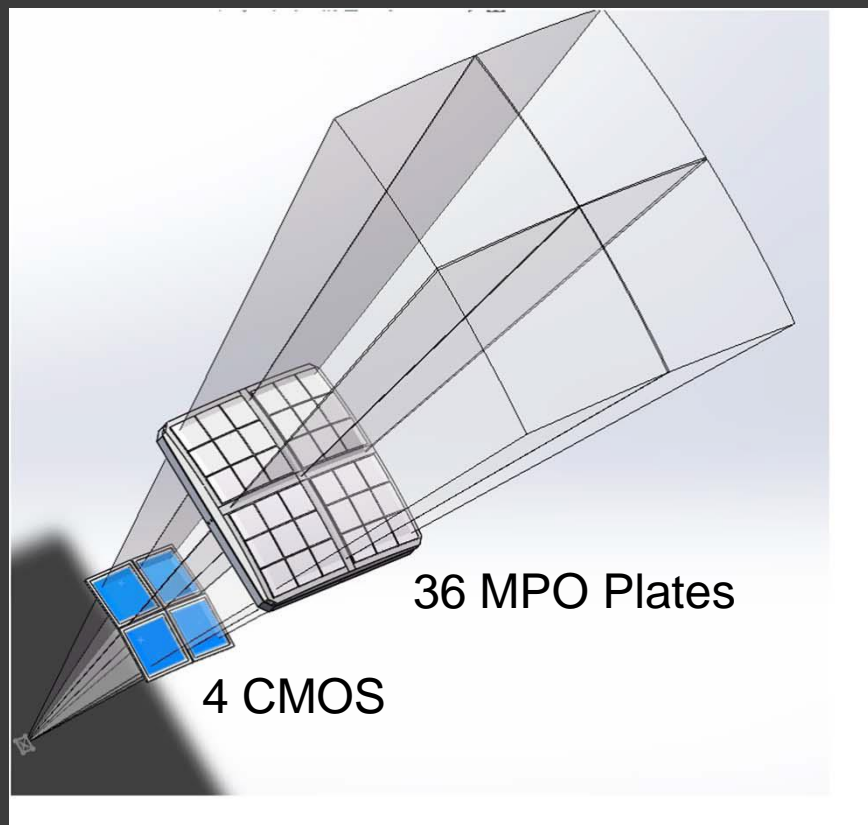
**EP (Einstein Probe)**



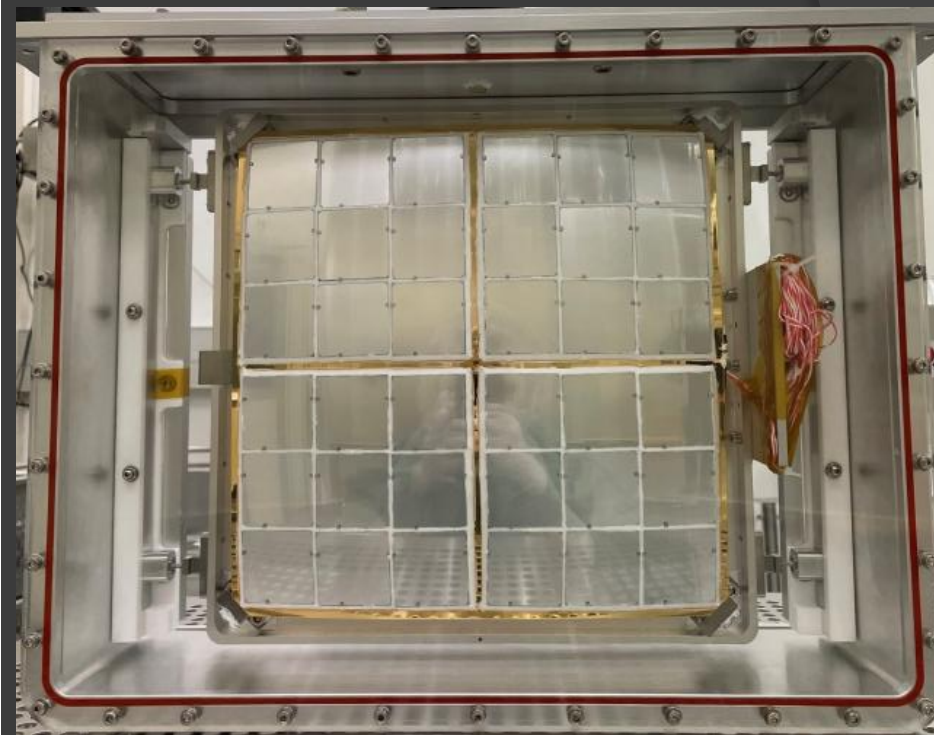
2023年年底发射



# EP-WXT

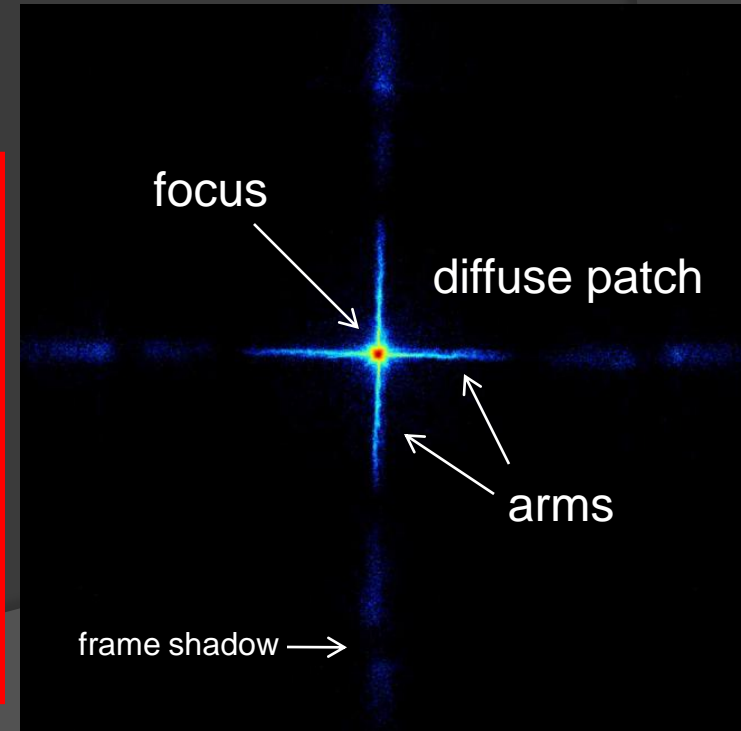
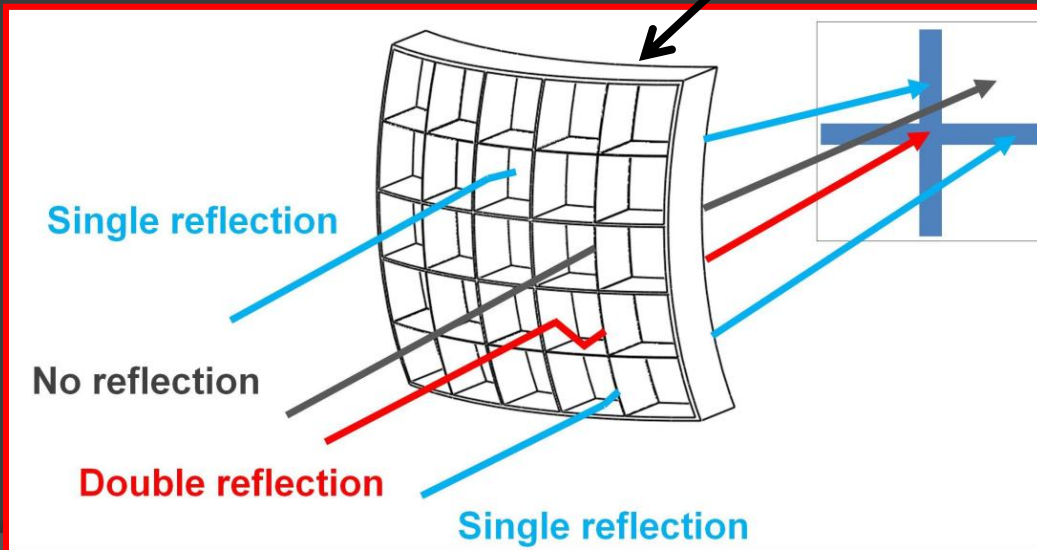
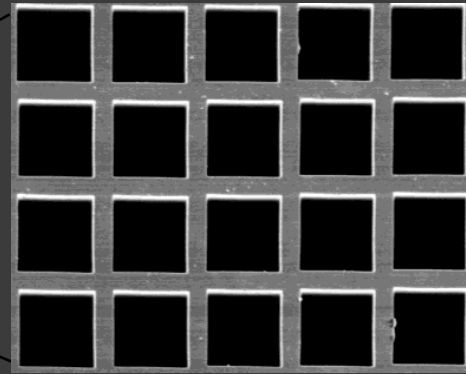
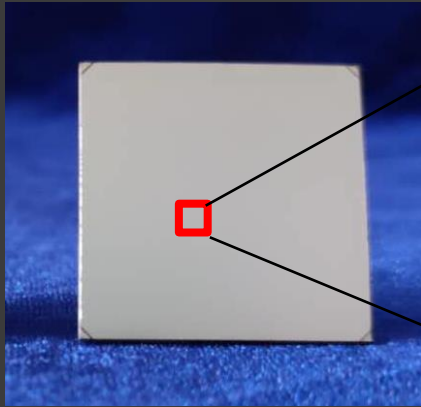


WXT 的核心构成

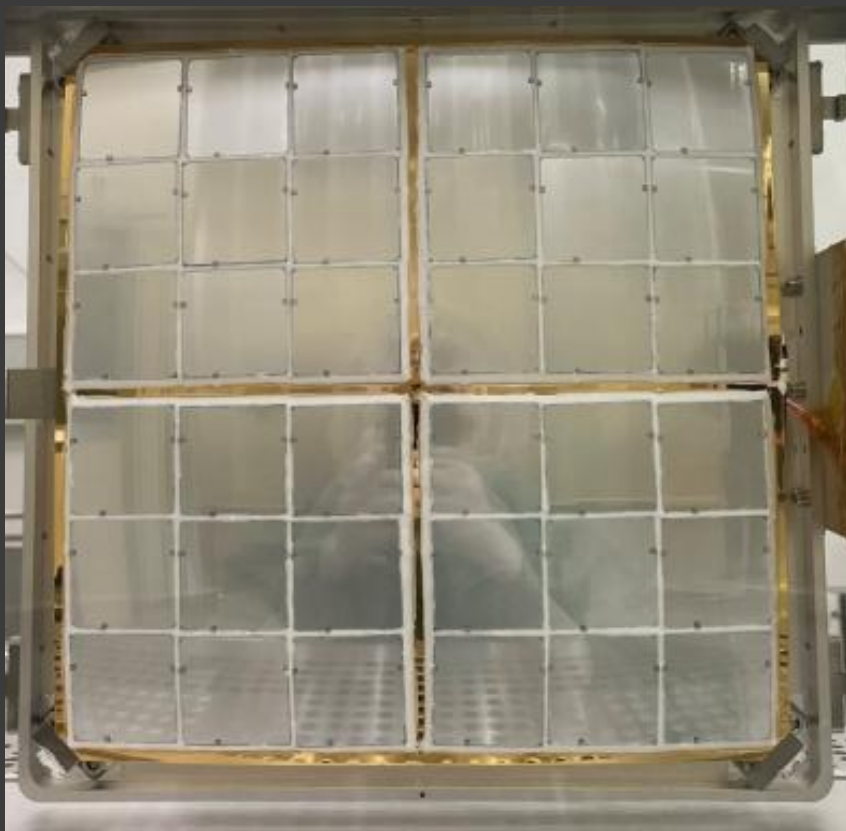


WXT 龙虾眼型光学组件

# 龙虾眼光学的成像原理

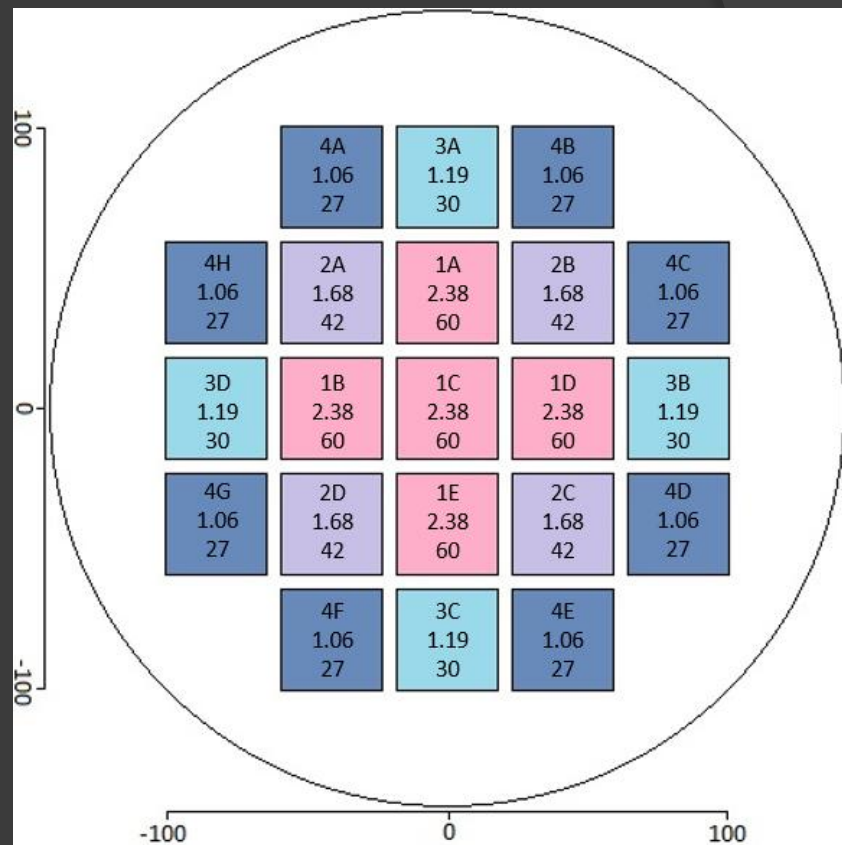


大视场，短焦距(EP-WXT)



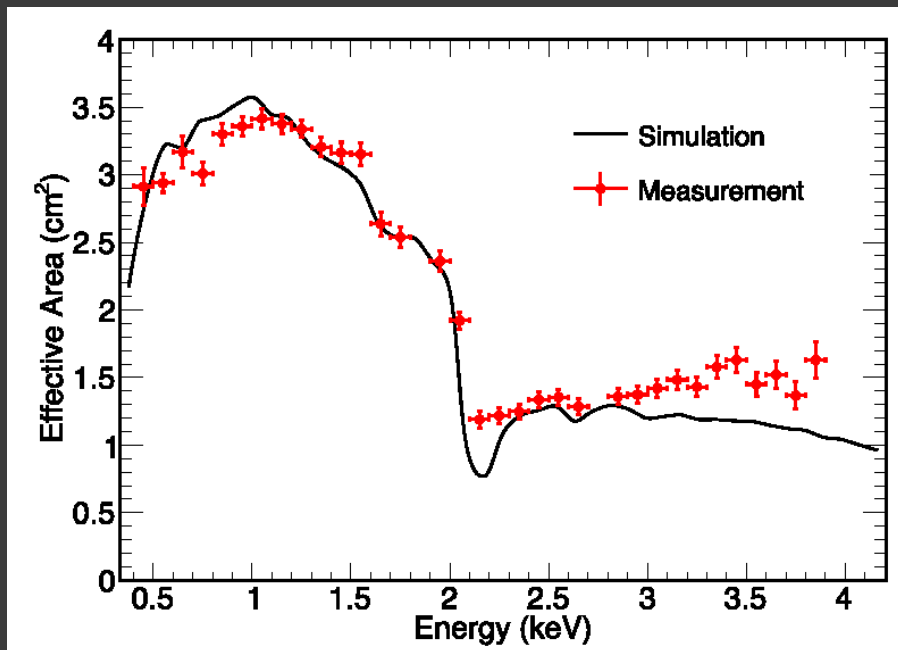
镜片参数一样

小视场，长焦距(SVOM-MXT)



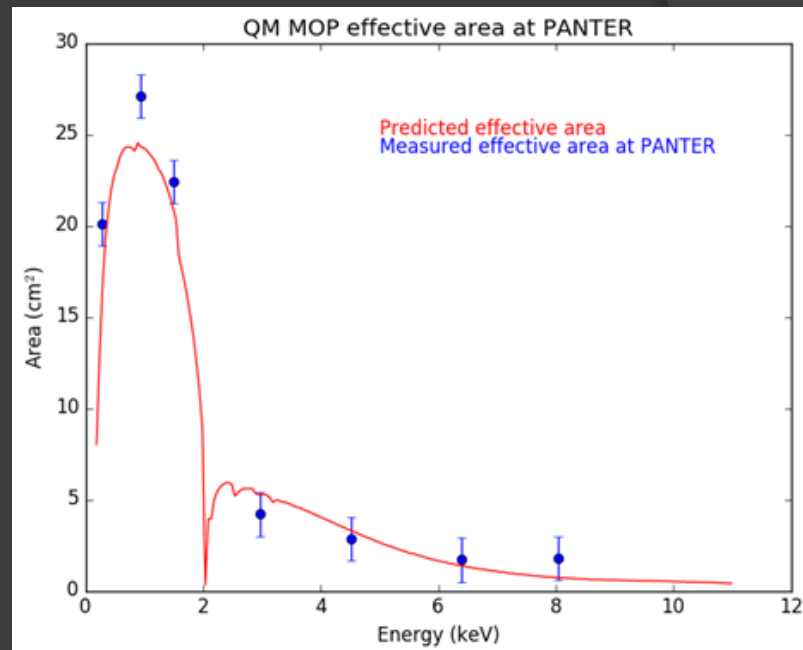
镜片参数不同

## EP-WXT

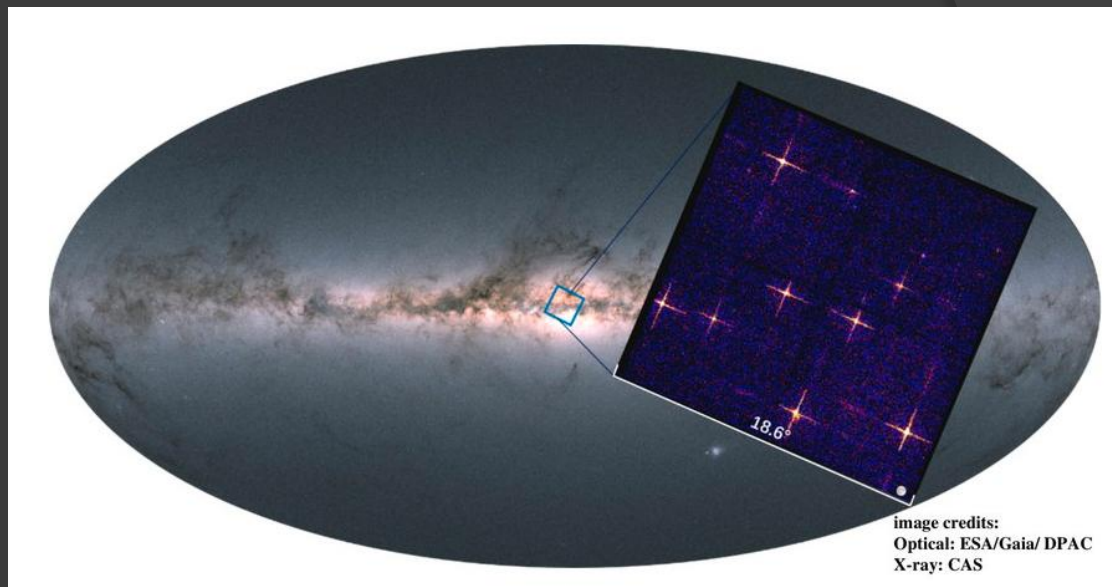
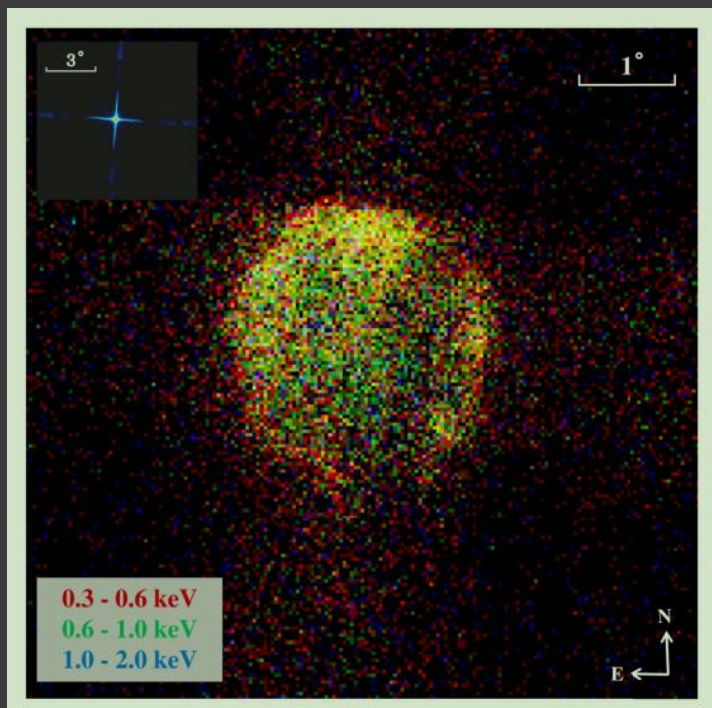


大视场，短焦距

## SVOM-MXT

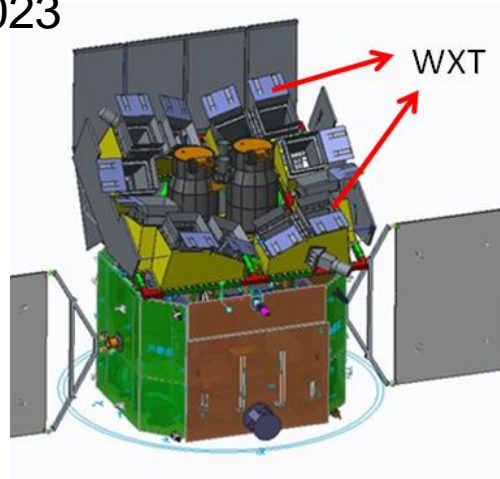


小视场，长焦距

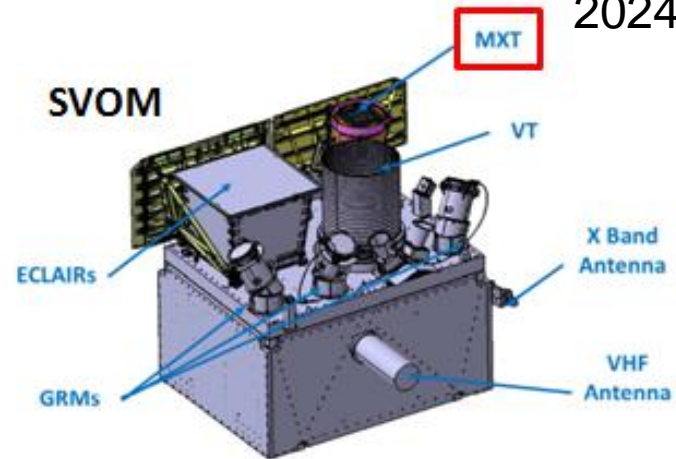


LEIA 的实测图像(左) Cygnus Loop nebula, (右) 银河系中心

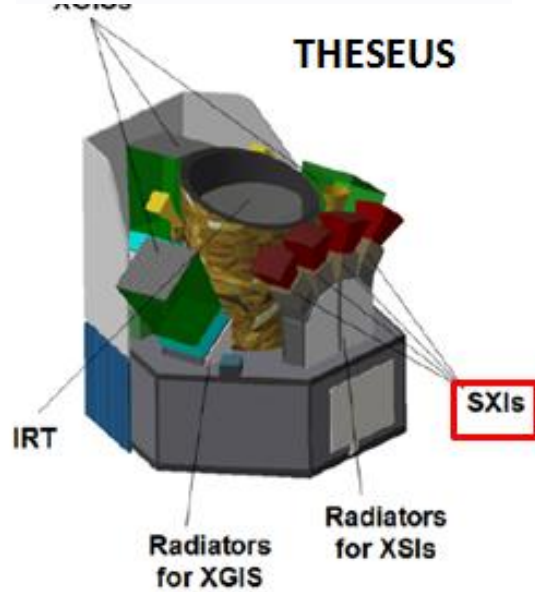
2023



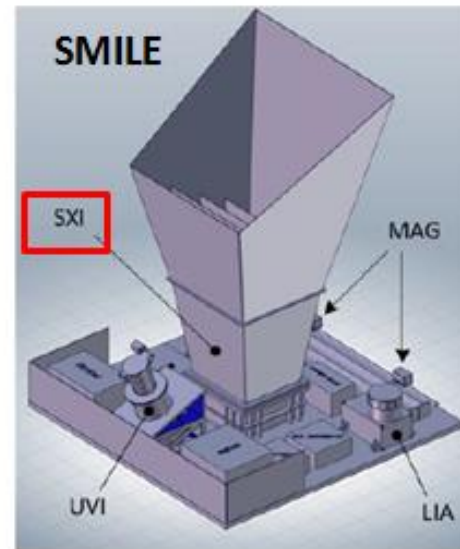
2024



THESEUS



SMILE



2032

2025

谢谢!