# Preliminary results of FXT performance

Xiaofan Zhao, on behalf of FXT team of IHEP

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# Outline

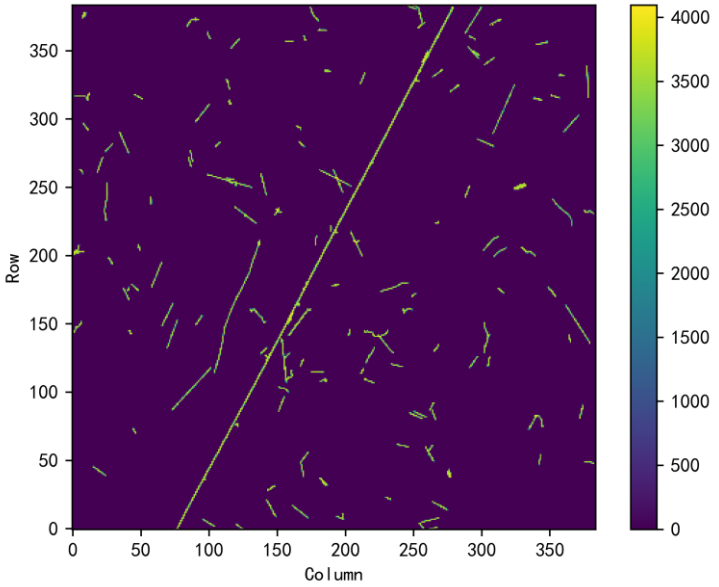
1. Introduction
2. Preliminary results of PNCCD
3. Preliminary results of mirror assembly

# Introduction

- FXT includes 2 units of completely independent optical system and detector system (FXT-A and FXT-B).
- mirror assembly is Wolter-I type imaging system with a focal length of 1.6m.
- focal plane camera is composed of imaging PNCCD, readout electronics and filter wheel.
- The work modes of PNCCD include full frame mode (FF, 50ms), patial window mode (PW, 2.2ms) and timing mode (TM).

# Preliminary results of PNCCD

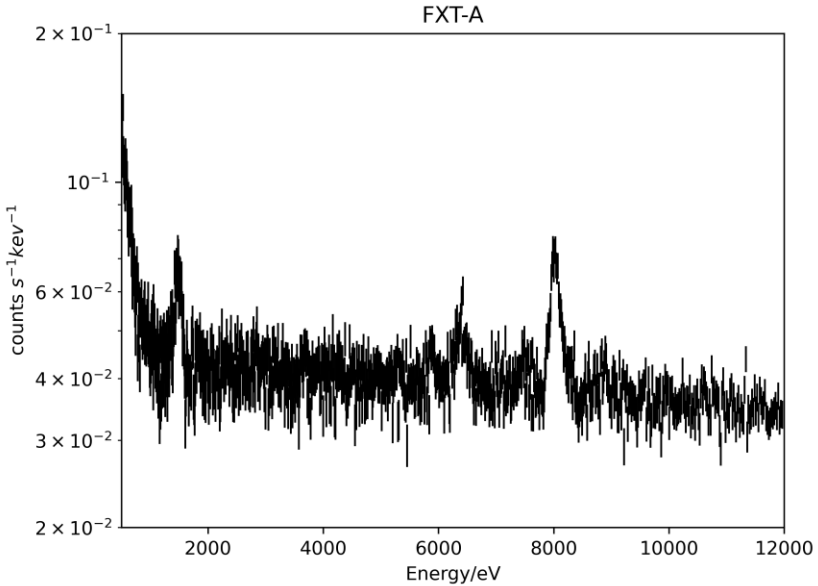
- FXT-A and FXT-B start up at the end of January and early February respectively. At this point, the turning cover is still closed.
- During several days of background observations, variety of cosmic radiation particles hit the cameras, which in orbit amount to about 6 per second.
- By using energy and pattern infomation, these particles can be identified and removed.

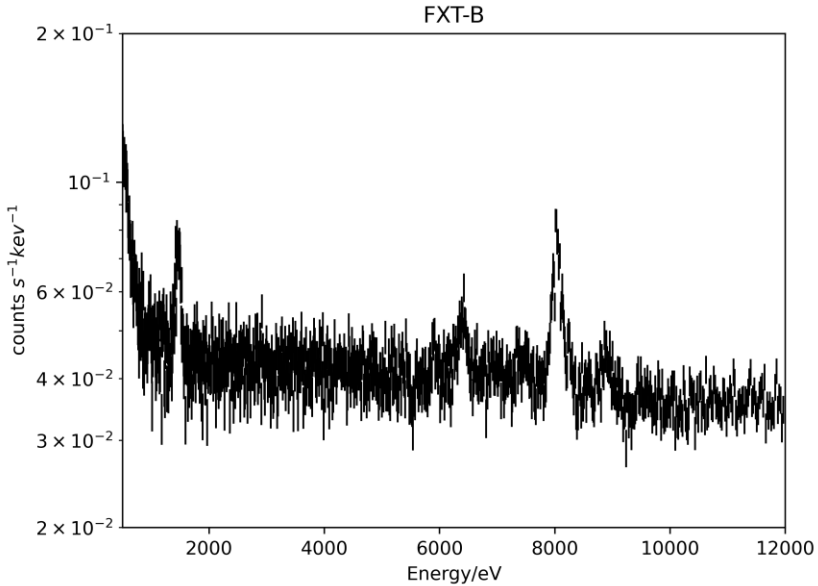



stack of numerous CCD raw frames

# Preliminary results of PNCCD

- The background flux in orbit of FXT-A and FXT-B are quite low.
- Net count rate of FXT-A background in the energy range of 0.5-10keV is 0.41, and that of FXT-B is 0.42. The main lines in background spectrum below are Al linw, Fe line and Cu line.



# Preliminary results of PNCCD

- subsequently, FXT-A and FXT-B were calibrated using the radioation source Fe55.
- the following figures are spectral and image of radioation source.

spectrum of radioation source

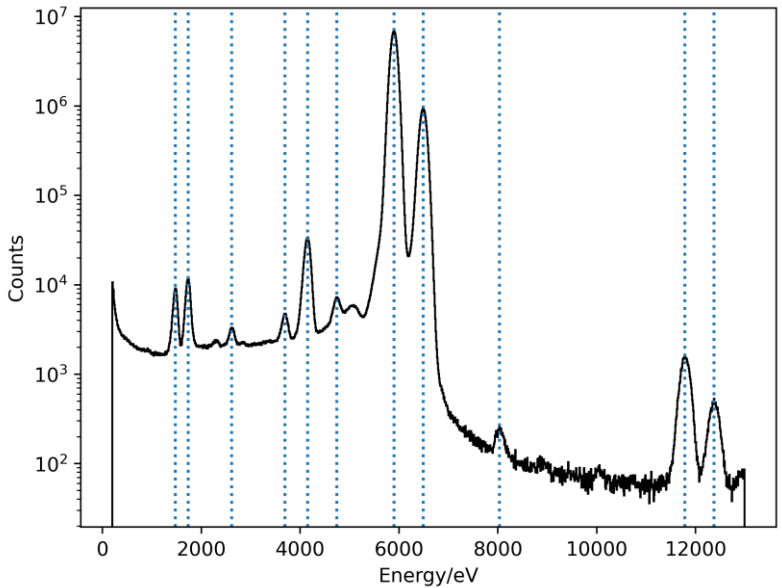
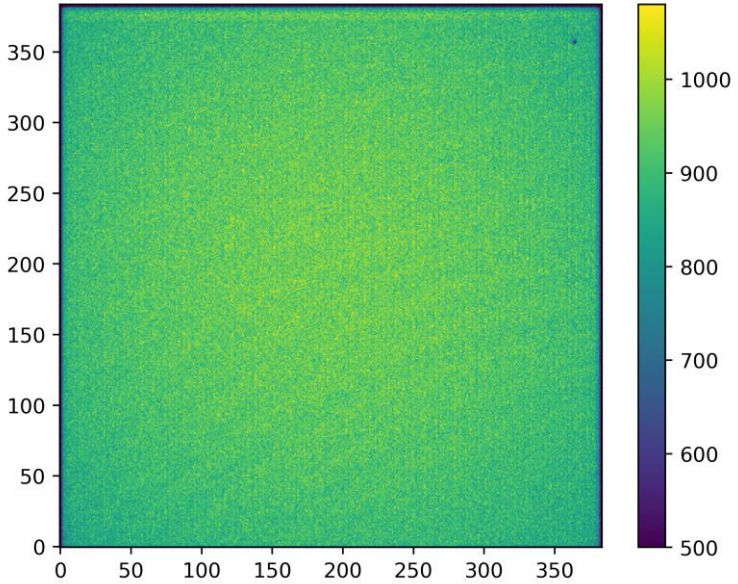
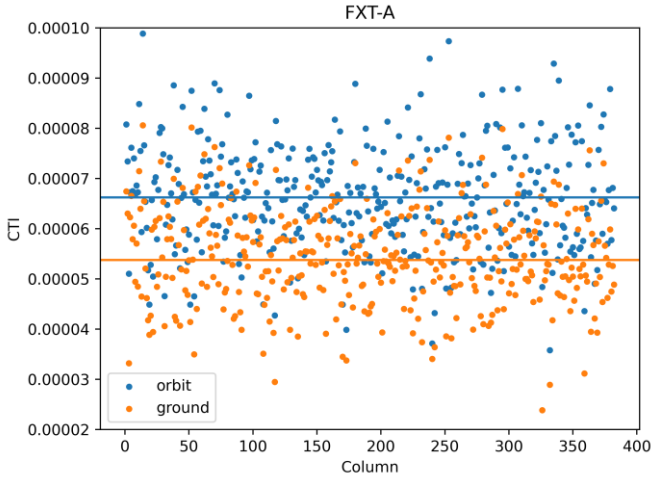


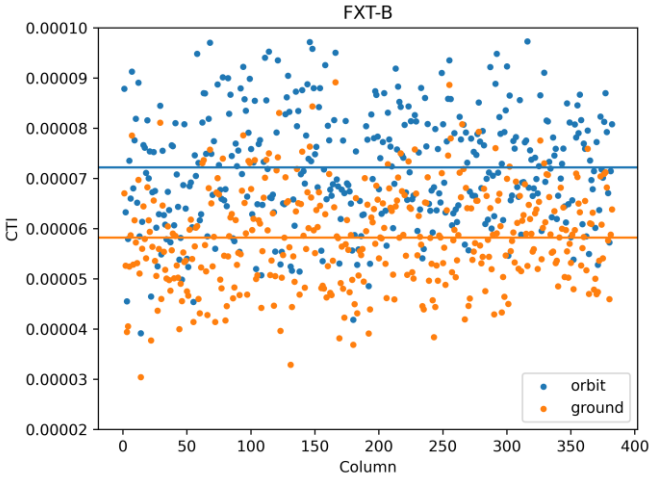

image of radioation source



# Preliminary results of PNCCD

- compared to ground, the readout noise of FXT-A and FXT-B are almost the same, which is about 3 $e^-$.
- the charge transfer inefficiency (CTI) is slightly higher.
- FXT-A is from 5.3e-5 to 6.6e-5
- FXT-B is from 5.8e-5 to 7.2e-5

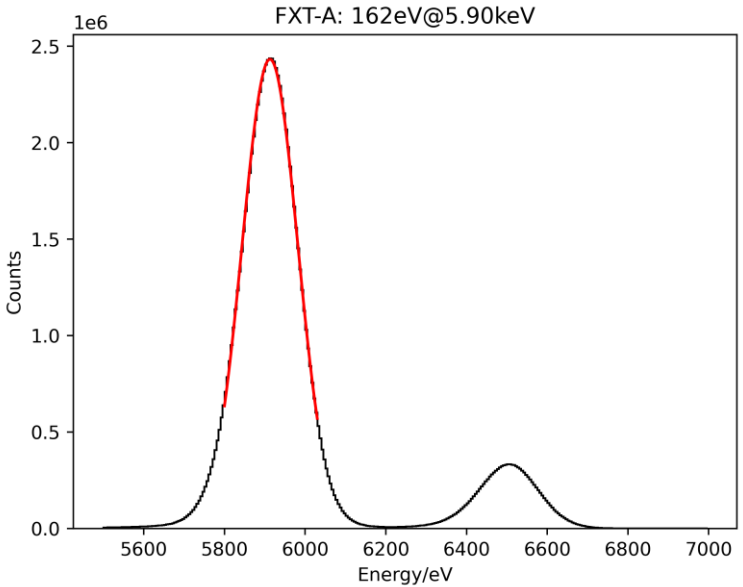


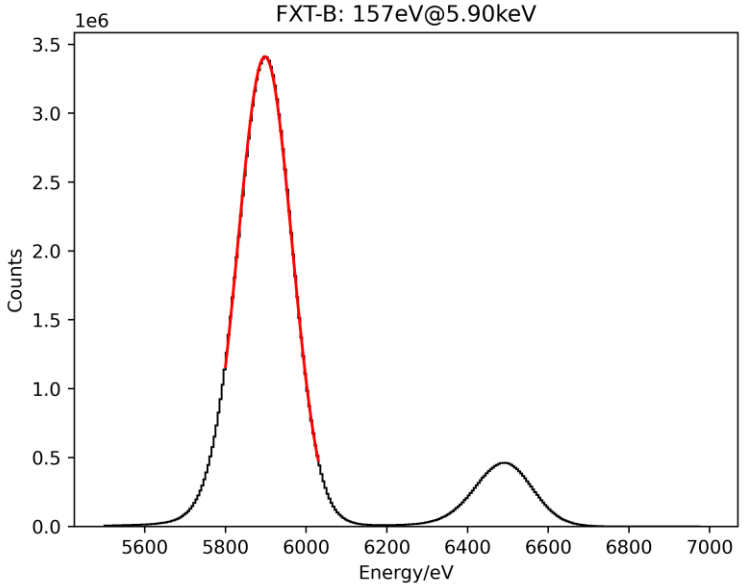



# Preliminary results of PNCCD

- Due to a slight increase in CTI, the energy resolution has also decreased slightly.

| | FXT-A (ground) | FXT-A (orbit) | FXT-B (ground) | FXT-B (orbit) |
|---|---|---|---|---|
| Al-K(1.49keV) | 96eV | 98eV | 94eV | 95eV |
| Fe-K(5.90keV) | 157eV | 162eV | 154eV | 157eV |

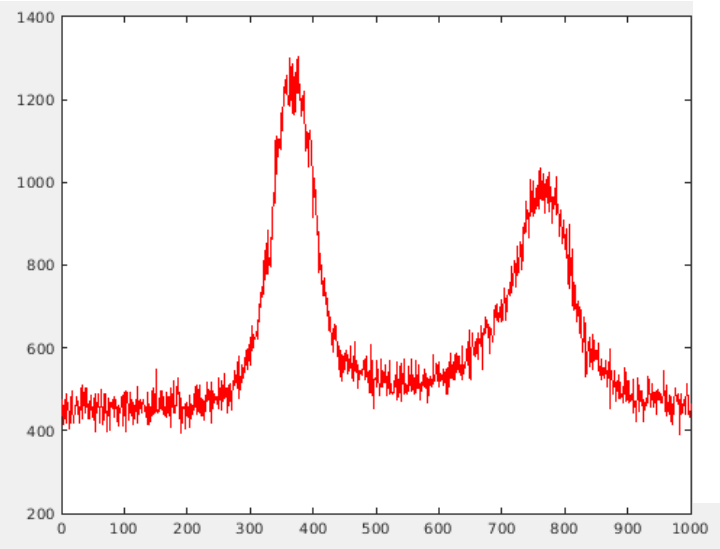


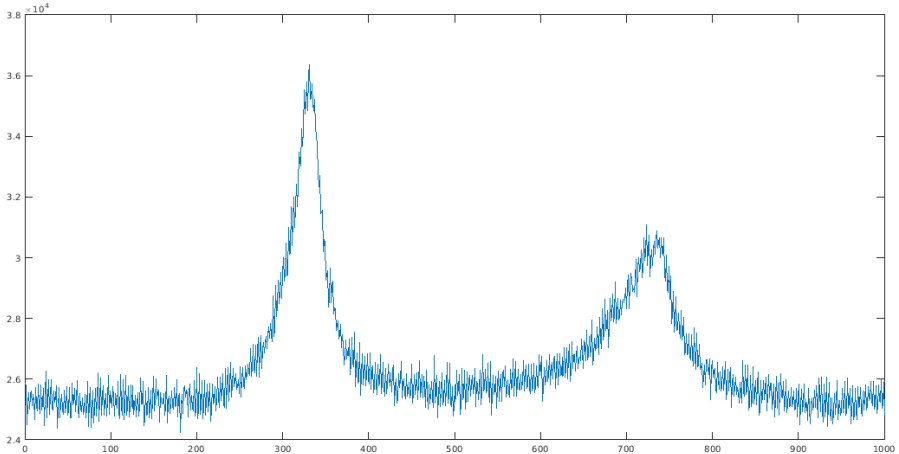
# Preliminary results of PNCCD

- The accuracy of time system was verified through Crab observations.
- The profile of Crab was observed in both patial window mode and timing mode, the absolute timing is less than 30us with timing mode.

profile of Crab in patial window mode

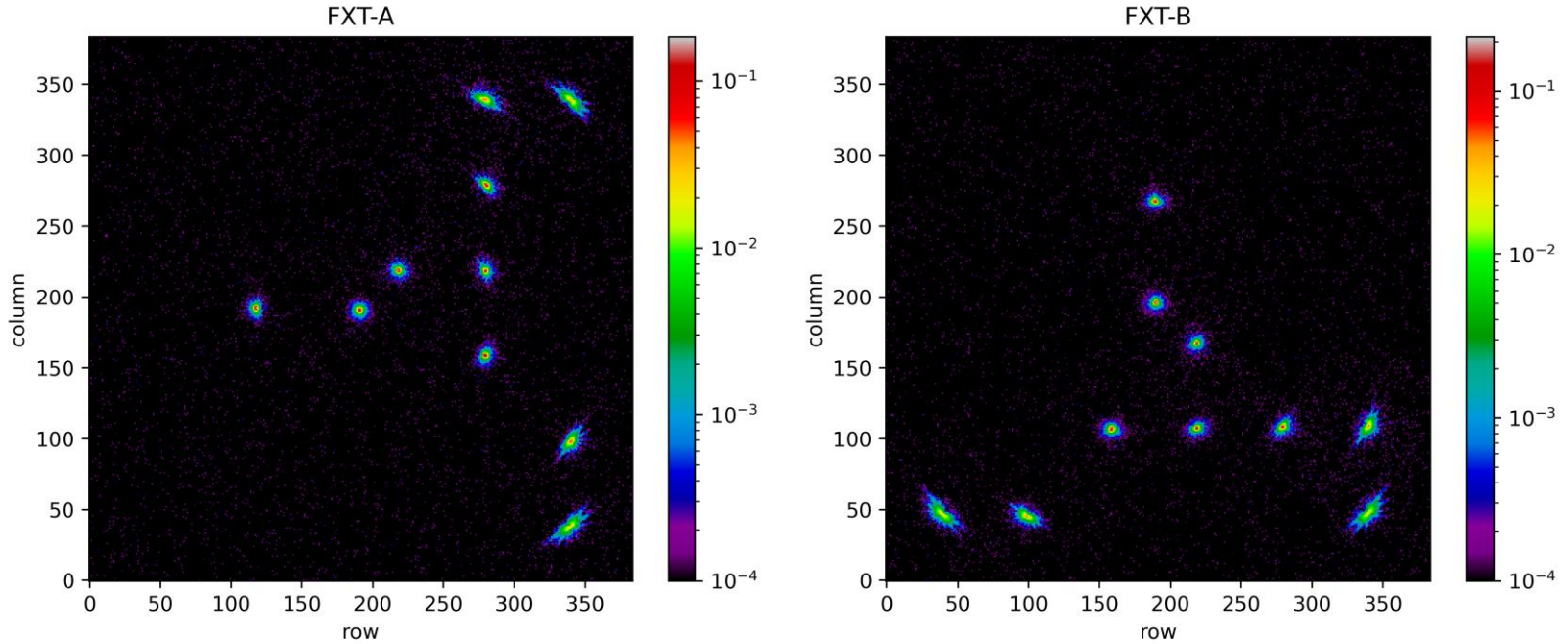



profile of Crab in timing mode



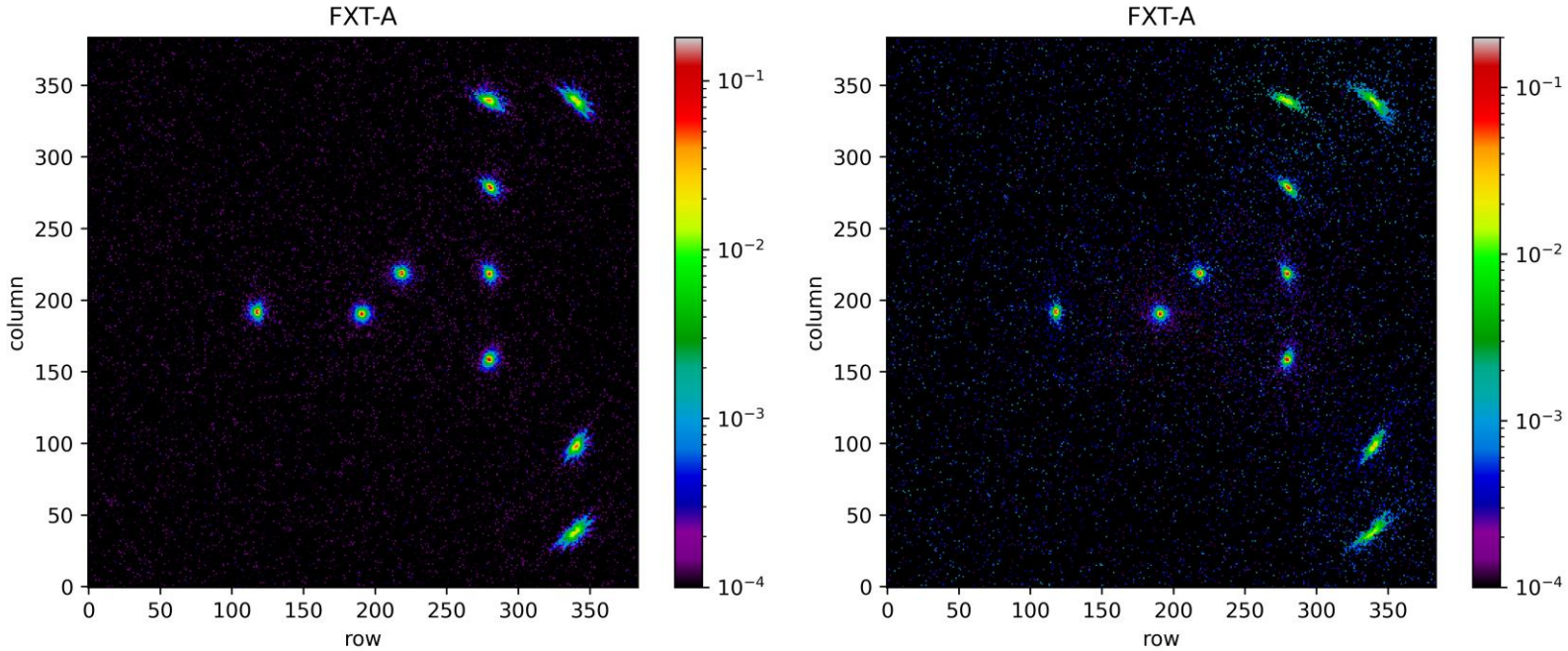
# Preliminary results of mirror assembly

- we are testing the PSF of FXT-A and FXT-B. So far, we have tested several off-axis angle.
- HPD of FXT-A is 23.7 arcsec, and that of FXT-B is 20.1 arcsec.



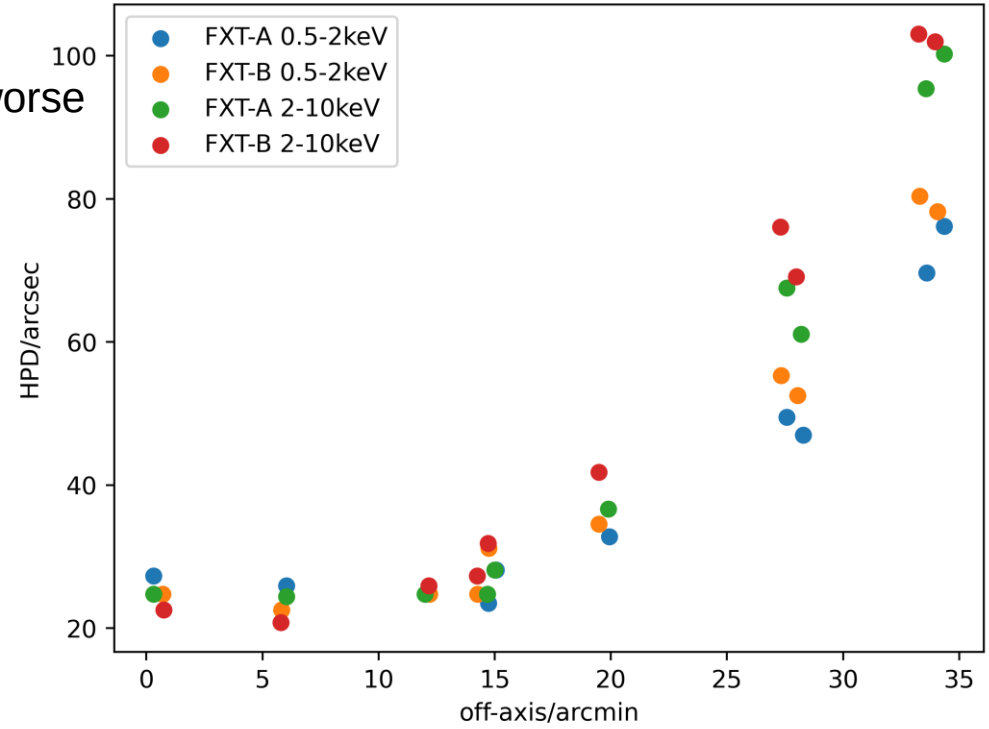
# Preliminary results of mirror assembly

- HPD of low energy is higher than that of high energy, especially when off axis.
- left image below shows the PSF of 0.5-2keV, right image shows 2-10keV.
- Due to X-ray scattering, the PSF broadening in high energy is greater.



# Preliminary results of mirror assembly

- The trend of HPD (FXT-A and FXT-B) in FOV is inconsistent.
- The HPD of FXT-A on axis is slightly worse than FXT-B.
- However the HPD of FXT-A off axis is slightly better than FXT-B.



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Thanks