X-RAY ASTRONOMY 2019
Current Challenges and New Frontiers in the Next Decade
8-13 September 2019
CNR/INAF Research Area, Bologna, Italy

Contribution ID: **149** Type: **Contributed**

Multiple Image X-ray Interferometer Modules (MIXIM) and their Scalable Mission Plans from Sub-arcsecond to Subsub-arcsecond Resolution X-ray Images

Thursday, 12 September 2019 18:05 (15 minutes)

We have invented a new type of X-ray interferometers, MIXIM, which simply consists of a grating (multiple slits) and a pixel detector. This configuration provides X-ray images as multiple slit camera can do. If we employ a grating of a pitch d of 5micrometer, and opening fraction f of 0.2 separated from the detector by the distance z of 50cm, we expect the image width of 0.4". It suggests that Chandra resolution is possible with very small satellites. In reality, diffraction blurrs the image significantly. Nevertheless, by selecting X-ray events of which X-ray energy satisfies the Talbot interference condition, we expect a sharp image of the X-ray light source convolved with the multiple slits(Hayashida+2016).
We irradiated parallel X-ray beam to our MIXIM system and succeeded in obtaining the image of the source of which image width corresponding to sub-arcsecond(Hayashida+2018). We show the latest experimental results, including the best image width of 0.26"for z of 184 cm and 0.55"with z of 46 cm, and the reasonable band width of the MIXIM of 10%. Our first motivation of the MIXIM is for very small satellites. We, however, show the MIXIM is scalable in terms of z and d. MIXIM with z of 10 m (parasites to typical X-ray observatory) can go 0.1". MIXIM with z of 100 m (formation flights) can go 0.01"resolution, comparable to ALMA. MIXIM can be a realistic approach to obtain high spatial resolution X-ray images of bright almost-point-like sources, such as nearby AGNs, alternative to ultra high precision and expensive X-ray mirrors developed by authors.

Topic

Future missions

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Session Classification: FUTURE MISSIONS