China's Future Space High Energy Astrophysical Missions

Shu Zhang

on behalf of Shuang-Nan Zhang &

Center for Particle Astrophysics Institute of High Energy Physics Chinese Academy of Sciences

Outline

- Overview of China's future missions
- Missions led by our lab
- The conceptual mission EP
- > Other Missions (GRB, Dark Matter)

China's High Energy Astrophysical Missions



Missions led by our lab

(HXMT, XTP)

China's 1st Astronomy Satellite HXMT

(Hard X-ray Modulation Telescope)

Hard X-ray Modulation Telescope (HXMT)

- ➤Main scientific objectives (1-250 keV energy band)
 ✓Scan monitoring of the Galactic plane → transients watch dog: need ground follow-up observations.
 - ✓Pointed observations → Black hole and neutron star x-ray binaries: need coordinated ground observations

Satellite Facts:

- ✓ Mass: ~2800 kg
- ✓ Orbit: 550 km, 43°
- ✓ Lifetime: 4 yrs



Officially approved in March 2011 Entered Phase-B (Engineering model phase) in 12/2011 Now finishing the construction of the qualification models Planned launch time: 2015

HXMT Payloads



HXMT Sensitivity



The sensitivities of NuSTAR, INTEGRAL/IBIS and RXTE/HEXTE were reprinted from Koglin et al. (2005)

Current status of HXMT



The Conceptual Mission XTP

(X-ray Timing and Polarization Mission)

XTP satellite



XTP payload layout



Effective Areas Comparison



X-ray Timing and Polarization (XTP) mission

- Science: 1-singularity (BH); 2-stars (NS and QS); 3-extremes (gravity, density, magnetism) (s¹s²e³;1奇2星3极端)
 - Precise light curve + energy spectrum: Matter under extreme conditions, NS state equation, BH parameters
 - Polarization of X-ray: BH spin, nature of magnetars, pulsar radiation mechanism...
- Instrument Design Goal
 - The most sensitive light curve with good energy resolution and polarization at 1-30 keV → from faint Xray binaries to bright AGNs
- CAS-MPG WG: explore possible China-Europe collaboration on an intermediate X-ray mission around 2020.

The Conceptual mission EP (The Einstein Probe)

> An all-sky monitor led by NAOC



Einstein Probe (EP)

Lobster-eye optics







EM counterparts of GW explosions



Other Missions

GRB:

POLAR (Gamma-ray burst polarimeter) SVOM (Space-based multi-band astronomical Variable Object Monitor)

Dark matter:

DAMPE (Dark Matter Particle Explore) HERD (The High Energy cosmic-Radiation Detection)



Gamma-ray burst polarization : POLAR

- China- Switzerland collaboration
 - Energy range: 50-350 keV;
 FOV of POLAR: ~½ sky
- Onboard China's spacelab TG-2: launch time ~2015
- Main science: GRB jet & central engine; tests of quantum gravity theories







Instrument concept proposed by N. Produit, et al., NIM (2005)^{20/23}

DAMPE: launch in late 2015



China-Switzerland-Italy collaborations

The conceptual HERD: Baseline design



Summary: Collaborations Wanted!

