

硬 X 射线调制望远镜“慧眼”发射成功并取得初步科学成果

2017年6月15日，硬 X 射线调制望远镜卫星“慧眼”成功发射，成为我国首个能实现宽波段、高灵敏度、高分辨率观测的空间 X 射线天文台，已按计划顺利完成了各项在轨测试工作，并且和国内外多个空间和地面天文望远镜开展了多次协同观测。目前，卫星在轨测试覆盖了所有既定科学目标，获得了伽马射线暴、银道面多次扫描监测、黑洞和中子星 X 射线双星、脉冲星、超新星遗迹、太阳耀发等观测数据，公开发布了超过 40 个伽马射线暴观测结果，显著地直接测量到了宇宙中最强的磁场回旋吸收线，完成了国内最高精度并且和国外最好水平相当的脉冲星导航实验，通过对引力波 GW170817 对应体的高能电磁辐射给出的严格限制，为深入理解首个确认的双中子星并合事件做出了重要贡献。在轨测试结果表明，“慧眼”卫星不但能够满足原定科学目标的要求，而且能够取得预期以外的重要科学成果。

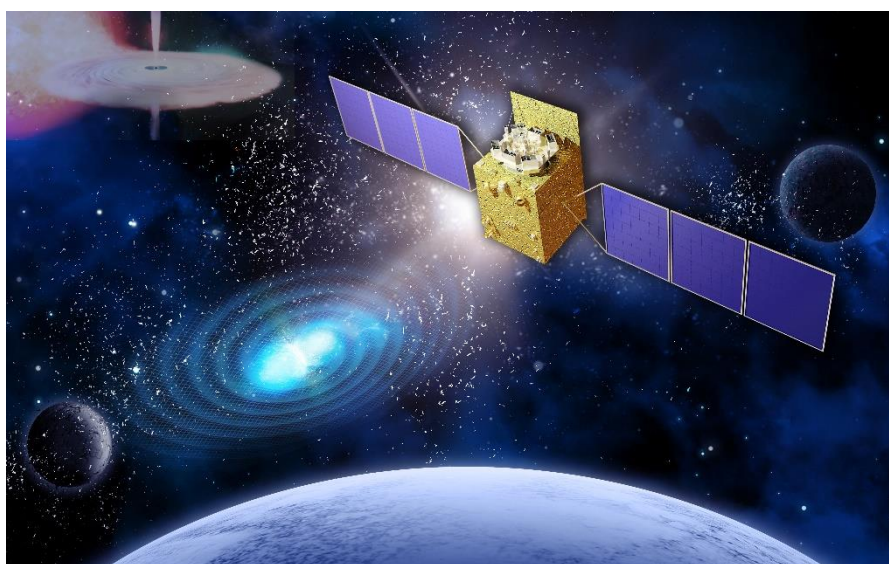


图 1. “慧眼”卫星遨游太空效果图

“慧眼”于 2017 年 12 月正式进入科学观测阶段，将继续开展银河系巡天与监测，参加国际空间和地面的多波段和多信使天文联测，对国内外一百多位科学家建议的大量天体目标开展高精度的观测，对伽马射线暴进行高灵敏度全天监测，开展更高精度的脉冲星导航研究，预期将会在黑洞、中子星、引力波和脉冲星导航等前沿科学和前瞻性战略技术的研究方面继续取得重大成果并且产生重大国际影响。



Multi-messenger Observations of a Binary Neutron Star Merger*

LIGO Scientific Collaboration and Virgo Collaboration, *Fermi* GBM, INTEGRAL, IceCube Collaboration, AstroSat Cadmium Zinc Telluride Imager Team, IPN Collaboration, *The Insight-HXMT* Collaboration, ANTARES Collaboration, The Swift Collaboration, AGILE Team, The IM2H Team, The Dark Energy Camera GW-EM Collaboration and the DES Collaboration, The DLT40 Collaboration, GRAWITA: GRAVitational Wave Inaf TeAm, The Fermi Large Area Telescope Collaboration, ATCA: Australia Telescope Compact Array, ASKAP: Australian SKA Pathfinder, Las Cumbres Observatory Group, OzGrav, DWF (Deeper, Wider, Faster Program), AST3, and CAASTRO Collaborations, The VINROUGE Collaboration, MASTER Collaboration, J-GEM, GROWTH, JAGWAR, Caltech-NRAO, TTU-NRAO, and NuSTAR Collaborations, Pan-STARRS, The MAXI Team, TZAC Consortium, KU Collaboration, Nordic Optical Telescope, ePESSTO, GROND, Texas Tech University, SALT Group, TOROS: Transient Robotic Observatory of the South Collaboration, The BOOTES Collaboration, MWA: Murchison Widefield Array, The CALET Collaboration, IKI-GW Follow-up Collaboration, H.E.S.S. Collaboration, LOFAR Collaboration, LWA: Long Wavelength Array, HAWC Collaboration, The Pierre Auger Collaboration, ALMA Collaboration, Euro VLBI Team, Pi of the Sky Collaboration, The Chandra Team at McGill University, DFN: Desert Fireball Network, ATLAS, High Time Resolution Universe Survey, RIMAS and RATIR, and SKA South Africa/MeerKAT (See the end matter for the full list of authors.)

Received 2017 October 3; revised 2017 October 6; accepted 2017 October 6; published 2017 October 16

Abstract

On 2017 August 17 a binary neutron star coalescence candidate (later designated GW170817) with merger time 12:41:04 UTC was observed through gravitational waves by the Advanced LIGO and Advanced Virgo detectors. The *Fermi* Gamma-ray Burst Monitor independently detected a gamma-ray burst (GRB 170817A) with a time delay of ~ 1.7 s with respect to the merger time. From the gravitational-wave signal, the source was initially localized to a sky region of 31 deg^2 at a luminosity distance of 40^{+8}_{-8} Mpc and with component masses consistent with neutron stars. The component masses were later measured to be in the range 0.86 to $2.26 M_{\odot}$. An extensive observing campaign was launched across the electromagnetic spectrum leading to the discovery of a bright optical transient (SSS17a, now with the IAU identification of AT 2017gfo) in NGC 4993 (at ~ 40 Mpc) less than 11 hours after the merger by the One-Meter, Two Hemisphere (1M2H) team using the 1 m Swope Telescope. The optical transient was independently

图 2. “慧眼”卫星为首个双中子星并合引力波事件电磁辐射性质的研究做出重要贡献