

# Chinese Engineering Contribution and Scientific Utilization of the Herschel Space Observatory

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Infrared  
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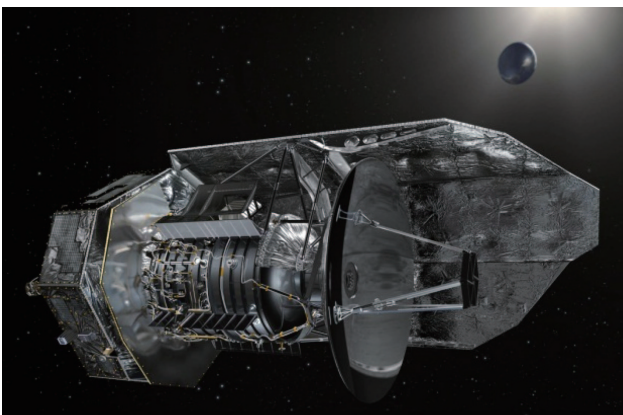
## Abstract

The National Astronomical Observatories of the Chinese Academy of Sciences is a Consortium member of the SPIRE instrument on-board the Herschel Space Observatory, and has made important engineering contribution. The collaboration has allowed Chinese astronomers to use Herschel more effectively to conduct astronomical research and make scientific discoveries.

Starting from 2005, National Astronomical Observatories of the Chinese Academy of Sciences (NAOC) has officially taken part in the development of SPIRE instrument of the 3.5-meter diameter Herschel Space Observatory of European Space Agency (ESA). Lead by Professor Maohai Huang, Chinese engineers made important contributions in the area of software engineering not only to the SPIRE Instrument Control Center (ICC) but also the fundamental infrastructure of Herschel mission and data processing system.

In return, Chinese scientists were approved to join the SPIRE Science Team as Associate Scientists during

the collaboration period. They become members of two Herschel Guaranteed Time proposals “Probing the origin of the stellar initial mass function: A wide-field Herschel photometric survey of nearby star-forming cloud complexes and HOBYS: the Herschel imaging survey of OB Young Stellar objects”, and of one Open Time proposal “Hi-GAL: the Herschel infrared Galactic Plane Survey”. The “NAOC-SPIRE Collaboration Evaluation Report (SPIRE-RAL-REP-003180)” concluded that, “The



**Figure 1** Herschel Space Observatory (credit: ESA)



**Figure 2** NAOC engineer Jingjing Li explains aspects of Herschel software he was responsible for to a full room of Herschel scientists in Oxford, UK



**Figure 3** Young Herschel scientists and engineers on top of the Great Wall

collaboration between the SPIRE ICC and NAOC, as outlined in Ref. [1], has been a highly successful one, fully meeting or exceeding all the original aims, and thereby making an important contribution to the SPIRE ICC and its readiness for Herschel operations.”

NAOC became a Co-I institute of the SPIRE Consortium in 2009 with Prof. M. Huang as a Co-Investigator. Since then NAOC engineers have worked on the software packages to assure smooth data access and high quality and easy data visualization. Their results were published in the Astronomical Data Analysis and Systems conference in Paris in November 2011. Chinese engineers are planning to re-use software they have created for Herschel in other astronomical missions.

Chinese scientists have used Herschel data to author and co-author more than 30 scientific papers since 2009 in the field of star formation, interstellar medium, the Milky Way Galaxy, and extra-galaxies.

Prof. M. Huang led an international team to propose the use of Herschel Observatory to observe Gamma Ray

Bursts (GRB) in 2010. The proposal was accepted, and carried out in April 2011 to observe a bright GRB at the edge of the Universe. To obtain a full-spectrum picture of the GRB, an array of telescopes were mobilized to join the observing campaign — from the largest 10-meter single aperture optical telescope (GTC) on Canary Islands to the largest radio telescope array (EVLA) in the US desert, from sub-millimeter telescope on the ground to Chandra X-ray space observatory. Now the scientists are analyzing data and publishing their findings.

NAOC hosted SPIRE Instrument Control Center meeting in October, 2011. Nearly 30 scientists from 10 countries, regions, and organizations attended the meeting, where current status was reported and future plans were made. Possibility of extending Chinese support to Herschel in post-operational phase was also discussed.

China’s participation in Herschel has been an example of international space science collaboration that benefits all participants in both engineering development and scientific research.

## References

[1] Contribution to the Herschel-SPIRE Project by the National Astronomy Observatories of the Chinese Academy of

Sciences, SPIRE-UCF-PRJ-002511, Issue 1.0, 19th September 2005. SPIRE-UCF-PRJ-002511