

Taiwan helps search space for origins of the universe



Jinchi Hao (center) and his team are in charge of monitoring the AMS-02 from the POCC at the Chung Shan Institute of Science and Technology in northern Taiwan's Taoyuan County. (CNA)

- Publication Date : 08/12/2012
- Source : [Taiwan Today](#)
- By Meg Chang

The Alpha Magnetic Spectrometer-02, a particle physics detector on the International Space Station, searches outer space for antimatter and dark matter as part of an investigation into the origin of the universe. Taiwan, a founding member of the project, took on a greater role July 3 with the opening of the program's Asia Payload Operations Control Center at the Chung Shan Institute of Science and Technology in Taoyuan County.

Initiated in 1994 and led by Nobel laureate in physics Samuel Chao-chung Ting, the AMS project also performs precision measurements of cosmic rays to provide information on their origin and help plan protective measures for manned space flights, according to Jinchi Hao, general director of the CSIST's International Cooperation Program, in charge of overseeing the center's daily operations.

The control center is the second such facility in the world, supporting the one at program headquarters at the European Organization for Nuclear Research (CERN) in Geneva. "While South Korea and mainland China were both highly interested in hosting the POCC, the selection of the CSIST was unanimous, and it had nothing to do with the fact that Ting is an Taiwan expatriate," Jinchi explained.

ROC President Ma Ying-jeou said at the opening ceremony, "Taiwan is widely recognized as a major participant in terms of the scale of its contributions to this international collaborative effort.

"Involvement in the project will provide a foundation for progress in applied sciences over the next two to three decades, helping to spawn the next generation of R&D talent in the country."

William H. Gerstenmaier, associate administrator of the U.S. National Aeronautics and Space Administration's Human Explorations and Operations Directorate, said, "Taiwan should be very proud of its contribution to the AMS project and the team that will be working in parallel with the team in Geneva.

“This project wouldn’t have existed without the support of Taiwan, and definitely NASA wants to thank Taiwan for the work and for helping us understand more about the universe.”



Comprising a main computer, data extraction units, power controls and communication interfaces, the CSIST system passes system assembly tests May 2009 at CERN. (Photos courtesy of CSIST)

The AMS investigation, involving around 600 researchers from 60 institutes in 16 countries, is considered the most important international research undertaking on fundamental science in recent years.

Taiwan is represented by Academia Sinica, Aerospace Industrial Development Corp., CSIST, National Central University, National Cheng Kung University, National Chiao Tung University, the National Science Council and National Space Organization (NSPO), Jinchi said.

Given its engineering expertise, the CSIST was charged with developing an electronics system for data transmission, at the same time as a competing European organization. “We were actually the backup option because of our lack of experience in participating in such international endeavors,” he pointed out.

But the CSIST built a greatly superior and far more reliable system. After passing NASA testing in 1998, it was installed on an AMS prototype designated AMS-01. As a component of the particle physics detector, which was flown into space aboard the space shuttle Discovery in June that year for a 10-day orbit around Earth, the system performed well and helped the CSIST establish itself as a worthy partner in this grand project.

During R&D for the advanced version of the system, carried out in collaboration with the Massachusetts Institute of Technology, representatives from the other participating countries visited the CSIST every three months for technical interchange meetings with local experts and engineers.

“As the second stage of the program, the AMS-02, will last for 20 years, our system had to be equipped with stronger functions and meet much higher reliability standards,” Jinchi said. The AMS-02 was installed on the International Space Station May 19, 2011, and has been transmitting data back to Earth since then.

According to Jinchi, the function of the CSIST system is analogous to that of the human body’s nervous system. “All signals received by the AMS-02 will be transmitted back to the Earth by the

CSIST system, while all commands from the ground will be uploaded through the same route to the space station.”



The Asia POCC takes over operations from 6:00 a.m. to 2:00 p.m. Taipei time when its CERN counterpart is off duty in Geneva.

As a support facility for CERN, the POCC is responsible for monitoring AMS-02 operations and data transmission when European staffers are off duty. “While the POCC is responsible for an eight-hour shift from 6:00 a.m. to 2:00 p.m. local time, the center is fully capable of 24-hour operations if necessary,” he said.

In the initial stage, the center is manned by six researchers and equipped with information security equipment, computer and network systems and software provided by NASA. Representatives from CERN will make inspection visits every three months, while CSIST members will attend CERN-organized seminars and workshops in Geneva on a biannual basis. Six more staffers are scheduled to report for duty in November and then receive relevant training at CERN in January next year.

A complete space project, Jinchi explained, includes the development of launch vehicles, ground control systems and satellite technology. The CSIST is already working with the NSPO on the Formosat-5 program, the first self-reliant remote sensing satellite to be developed by the ROC government.

“Through managing the POCC, Taiwan can gain in-depth knowledge and hands-on experience in ground control and remote sensor technology, making a giant step forward in space research.”

Jinchi also believes the POCC could be a partial solution to Taiwan’s talent shortage. “Research on space can be a demanding and lonely job, as most of the time you’re working at your console at odd hours and stay secluded from people. The monetary rewards cannot be compared to those offered by the high-tech sector, either.”

But because the POCC will be in operation for two decades, he expects more college graduates to join his team for the rare chance to interact with top scientists and researchers from around the world.

When NASA representatives inspected the center in June, they expressed interest in working with the institute to develop other computer systems for spaceships, Jinchi said. France, Switzerland and Italy have also proposed discussions on the development of similar systems.

“These offers are votes of confidence in our engineering capabilities. We believe the experience of running the POCC will bring Taiwan more opportunities to take part in groundbreaking international research.” (THN)

Write to Meg Chang at sfchang@mail.mofa.gov.tw

<http://www.taiwantoday.tw/ct.asp?xItem=194639&ctNode=1767>