Space Shuttle Launch to Put Giant Ray Detector in Space

Massive device will detect antimatter in space from International Space Station.

NASA's Alpha Magnetic Spectrometer (file picture) will be launched into space in the shuttle *Endeavour*.
Photograph courtesy NASA

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If you can't make antimatter, just make it come to you.

That's the logic behind NASA's Alpha Magnetic Spectrometer, a U.S. $1.5-billion, seven-ton cosmic ray detector that will soon blast off to the International Space Station with the space shuttle launch of *Endeavour*.

Though originally slated to launch Friday, the space shuttle encountered a problem with its power unit that will keep it grounded until Monday.

Designed by particle physicists at the European Center for Nuclear Reserch (CERN), the AMS studies the same types of particles that atom smashers such as the Large Hadron Collider are meant to produce.

But instead of producing antimatter particles, the AMS seeks out the particles in their natural environment—in space. (Explore an interactive of the Higgs-Boson, or the God particle.)

The AMS, to be installed on the space station's starboard truss, will study high-energy particles that fly through space at nearly the speed of light—collecting seven gigabits of data per second.

The device could be operational within a few days of the space shuttle launch, according to NASA AMS project manager Trent Martin.

After Space Shuttle Launch, New Discoveries?

The spectrometer is designed to look for evidence of antimatter and dark matter. But if AMS turns up something completely unexpected, scientists will still be happy. (Read more about dark matter in *National Geographic* magazine's "Einstein and Beyond.")

"The hope is to find out something new. Something really unexpected, because it calls for a redefinition of your ideas and the basics of physics," said Roberto Battiston, a physicist at Italy's University of Perugia and deputy spokesperson for the AMS.

"This is the same story since Galileo, when he looked at the sky and was not expecting Jupiter's satellites." (See "Galileo's Telescope at 400: Facts, Myths, More.")

Even if AMS fails to detect antimatter or evidence of dark matter, the detector will serve one important function: measuring the strength of space's cosmic rays.

Most cosmic ray measurements have been done with short experiments. Having a long-term yardstick will be crucial for planning future manned missions to Mars or beyond, experts say.

(Learn about early manned spaceflight.)

Spectrometer to Run Indefinitely

AMS was originally scheduled to launch in 2005, but after the 2003 Columbia space shuttle disaster, NASA drastically cut nonessential space shuttle missions like the one that would have carried the AMS.

Then, after finally earning a spot for the AMS on a July 2010 space shuttle launch, principal investigator Sam Ting decided to replace the device's electromagnet.

The cryogenic superconducting magnet had enough coolant to last for three years, said Ting, AMS spokesperson and physicist at MIT and CERN.

"After three years, we could have refueled the helium, but then they decided not to fly the shuttle anymore," he said.

The space station itself is expected to run until 2020 or even 2028. With its new, weaker magnet, which doesn't require coolant, the AMS is expected to run indefinitely—or until the space station itself comes down.

It took just a few months to replace the magnet, but the decision was "agonizing," since it would mean postponing the AMS's launch, according to the University of Perugia's Battiston.

In retrospect, he said, "it was a very wise choice."

(Also see "Space Shuttle *Discovery*: Final Flight in Pictures.")

Superconducting Magnet Drawback

The one drawback to removing the supermagnet? NASA had thought that superconducting magnets, in addition to helping measure space radiation, could help shield astronauts from it.

"There is potential in the future that you could use superconducting magnets to block high-energy radiation that would hurt astronauts," NASA's Martin said.

(See "'Star Trek' Shield May Protect Astronauts.")

"As the NASA project manager, I was a little disappointed in the fact that we wouldn't be able to operate a working superconducting magnet in space," he said.

But, Martin added, the team did gather ground-based data that would be helpful for future missions—and the intact magnet sits at CERN.

While data will be beamed down from AMS the minute it's turned on, principal investigator Ting expects data analysis will take a long time.

"We're going to publish very slowly, very carefully," he said.

He's not afraid of being scooped: AMS took 17 years of planning and $1.5 billion.

"For the next 30 years, I doubt anybody will put a magnetic spectrometer into space. I don't think anybody else will be foolish enough to repeat it."