

# Green light for Lazio–Sirad

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## *The experiment on the International Space Station that will chase earthquakes*

Lazio-Sirad is ready to gather data. The experiment is installed on the International Space Station and its aim is to trace the slight variations of the so-called Van Allen belts that seem to occur before earthquakes.

At the same time the experiment will gather data that will make possible the development of techniques of protection from radiation for astronauts. The astronaut Roberto Vittori will carry out measures. He will leave for the International Space Station tomorrow April 15th and he will reach it after about 2 days. Lazio-Sirad was developed by the Infn sections and by the Universities of Perugia, Rome "Tor Vergata" and Rome Tre, in collaboration with the Infn National Laboratories of Frascati, the Serms University Laboratory of Terni, the MePhi Institute of Moscow, the Ferrari Bsn, Nergal and Airtec with the participation of Filas (Lazio Region).

Our planet is incessantly bombarded with a rain of cosmic rays, charged stable particles, such as protons and electrons. This flux is partly prevented by the Earth magnetic field, that traps a part of it out of atmosphere, to a height of hundred up to thousand kilometres. The distribution of these particles is not though homogeneous: they place themselves in areas called Van Allen belts, after the name of the American physicist that discovered their existence in 1958. In whole, the Van Allen belts behave like a huge antenna, sensitive to the slightest variation of the Earth magnetic field. The surprising aspect is that

preliminary measures gathered by Russian and American researchers in more than 15 years and analyzed in details by Russian and Italian researchers, indicate that this natural antenna is able to reveal precursory phenomena of intense earthquakes four or five hours in advance. The Lazio-Sirad experiment is the first sensor planned with the aim of verifying such a hypothesis in the Space, and it is clear the interest of such researches in a country exposed to seismic risk like Italy.

In which way can the Earth's crust tensions reflect on the cosmic particles trapped out of atmosphere? It was observed, through measures realized at earth, that from the area of a future earthquake, electromagnetic waves of different frequency are generated in the underground: among these, low-frequency waves can reach atmosphere, cross it and interact with the particles trapped in the Van Allen belts. In this way, it is possible to produce rapid variations of the charged particles flux: measuring these variations it would be possible to state the area in which the emission of low-frequency waves occurred and so state where an earthquake is taking place.

"In order to study the interaction between the Van Allen belts and geophysics phenomena as the seismic events, Lazio-Sirad uses sophisticated and innovative particles detectors based on the use of silica and scintillating plastics. The measure of the particles trapped in the Van Allen belts will be related to the magnetic field measurements made through a precision magnetometer, called Egle, part itself of Lazio-Sirad programme. Once the physics principal of the instrumentation and its functioning in orbit will be verified, it will possible to open way to new Earth monitoring methods using not expensive micro-satellites", explains Roberto Battiston, director of the Infn section in Perugia, who coordinated the realization of Lazio-Sirad project, in close collaboration with Piergiorgio Picozza, director of the Infn section of Roma Tor Vergata, and with Vittorio Sgrigna, physics professor at the University of Roma Tre and spokesman of the Egle magnetometer.

In this circumstance the experiment Sileye3/Alteino, brought on board of the International Space Station just by Roberto Vittori during his previous mission "Marco Polo", will be put back into service. "The experiment Sileye3/Alteino is particularly important to develop new materials and new technologies to protect man from bombing of cosmic particles during future lunar and interplanetary missions", explains Piergiorgio Picozza, who participated in Lazio-Sirad coordination and is also spokesman of the Sileye3/Alteino experiment.

"The Lazio-Sirad experiment has another important goal: to improve the study on the phenomenon of the light flashes, observed by the astronauts on board of the Mir and of the International Space Station, by analysing, in particular, the interaction between the different kinds of cosmic rays and the astronauts' visual apparatus", explains Marco Casolino of the Infn section of Roma Tor Vergata, spokesman for the Lazio-Sirad part dedicated to the study of the light flashes.

Lazio-Sirad will work at least for six months since the beginning of the operations of data acquisition. The first results of the data analysis are foreseen by the end of 2005. Lazio-Sirad has involved about 30 persons, among these: physicists, geophysicists, engineers and technicians from the different institutes that have participated. The instrument has been realized in a very short time (less than 6 months since the beginning of the project to the delivery to the Russian Space Agency on January the 25th) respecting all the complex security procedures, verification and space qualification required by the European Space Agency (Esa) and by the Russian Space Agency (Energia).

The project takes place in the context of the European mission Eneide, born from the collaboration between the Italian region Lazio, the Military Aeronautics, Alenia Spazio, the Chamber of Commerce of Rome, Esa, and Asi. The Eneide mission will start tomorrow April the 15th from the space polygon in Baikonur, in Kazakhstan, and it will

travel on board of the Russian capsule Soyuz Tma, directed to the International Space Station. All the scientific experiments of Eneide mission will be managed from the control centre "Lazio user Centre", already working and settled in the Infn section of Roma Tor Vergata.

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