X-ray telescope to detect dark energy in space

March 16 2010

It will be on board in 2012, when a Soyus-2 rocket carries an X-ray telescope into space to decode the nature of the universe's dark energy: an X-ray detector developed by the Max Planck Institute for Extraterrestrial Physics. Its challenging task is to detect the weak X-rays from celestial bodies, without being disturbed by the visible and UV light from billions of stars.

The detector has to be very sensitive in the wavelength range from under one to about 50 nm, while at the same time being practically blind up to several hundreds of nanometers in the adjacent range. Scientists of the Physikalisch-Technische Bundesanstalt (PTB) have now succeeded in precisely characterising the spectral sensitivity in this very broad range for the first time in the world. This was only possible, because two electron storage rings are available to PTB, which together ensure that all the required spectral ranges are available in a high quality.

So-called Dark Energy is responsible for the fact that the Universe is expanding continually and presumably with increasing speed. Astronomers and physicists want to find out what type of "energy" this is in the scope of the eRosita Project, by investigating the distribution of about 100 000 galaxy clusters and of millions of Black Holes in space with a group of seven X-ray telescopes. By using two electron storage rings, PTB scientists have proved that the X-ray detector meets its specifications:

With PTB's own Metrology Light Source, the shielding of perturbing UV and visible light was primarily investigated, while in the PTB lab at

BESSY II in Berlin-Adlershof, the sensitivity of the detector in the soft X-ray range was detected.

The detector is a 450 micrometer thick pn-CCD chip illuminated from the rear, characterised by long-term stability and a high sensitivity to light. The detector has an ultra-thin pn-junction as an X-ray entrance window, to be able to provide evidence of - above all - radiation at low X-ray energies. A filter applied directly to the chip suppresses the perturbing radiation in the visible and in the UV ranges.

Several research institutes and companies are participating in eRosita under the auspices of the Max Planck Institute for Extraterrestrial Physics. The project is financed by the German Aerospace Center (DLR).

Provided by Physikalisch-Technische Bundesanstalt (PTB)