The group of scientists from the National Centre for Nuclear Research are participating in the international satellite experiment JEM-EUSO (Japanese Experimental Module – Extreme Universe Space Observatory). The main JEM-EUSO objective are measurements of the ultra high energy cosmic rays (UHECR). UHECR are extremely energetic particles which come from the Universe. Their arrival direction distribution is nearly isotropic, as measured so far. The JEM-EUSO detector is very fast camera (400 000 frames/sec) which would be placed at the International Space Station (ISS), and observe the Earth atmosphere from about 400 km. It will measure Extensive Air Showers (EAS) which are huge cascades of particles (and anti-particles) generated by the primary cosmic ray particle of very high energy in collisions with atmosphere nuclei. The cascade is moving in the atmosphere with the speed nearly to the speed of light in vacuum. The high speed camera is required to measure step by step time development of the cascade. The single measurement will allow to determine primary particle energy and direction. Many measurements (we expect to measure about 1000 particles with energies above $3 \cdot 10^{19}$ eV) shall allow for search for astronomical sources of these particles, since their trajectories (if they are protons) shall be only slightly bended in cosmic magnetic fields. We expect to be able to confirm GZK cut-off, as well as measure events with still higher energies (like from „local" sources within GZK radius). JEM-EUSO has also large scientific program for atmospheric phenomena measurements.
In the JEM-EUSO project there are a few test projects. One of them is EUSO-TA experiment with objectives to calibrate the detector module and ground measurements of UHECR from the Telescope Array (TA) detector side (in Utah, USA), and with coincidence with TA.

Telescope Array is the largest cosmic ray experiment in the Northern Hemisphere. In the Utah desert it is far from any human made light sources, and it measures huge EAS during Moon-less nights.

The main tasks of this project are calibration of EUSO-TA detector by set-up of many parameters of the camera to enable measurements of EAS, and measurement of EAS with EUSO-TA working in coincidence with the Telescope Array experiment. The EUSO-TA detector is a single photo detection module (PDM) made of 36 photomultipliers (each with 64 anodes/pixels), similar to used or plan to use in another test experiments EUSO-Balloon, SPB-EUSO and Mini-EUSO.

Calibration can be made in a way to enable measurement and identification of stars which are in the field of view during the night measurements. With know brightness these stars are the reference objects for EAS measurements.

During earlier measurements I have participated we had observed stars, air planes, lightnings, and several events which were probably EAS detections (it was the first test run of the EUSO-TA).

Elaboration of the automatic method for search for "cosmic ray" events in the hundreds of millions registered frames is part of this project, as well.

Within this project I have a plan to participate in measurements (shifts) in Utah. During these shifts I expect to observe EAS events with primary particle energies above 10^{18} eV. Events found and recognised as EAS would be compared with results of EAS simulations performed by other JEM-EUSO Collaboration members, and results will be published in the Experimental Astronomy (most likely). I am going to publish a paper with would describe performance of the high voltage power supply unit (HVPS) design and made in the Łódź Cosmic Ray Laboratory of the Astrophysics Department of NCBJ, where I am a PhD student.

The EUSO-TA detector has better angular resolution and faster camera than fluorescence detectors of the Telescope Array experiment. In this sense the EUSO-TA results are interesting complement of TA data base.

Realisation of this project would be important step towards the bigger projects like participation in experiments and data analysis from Mini-EUSO, SPB-EUSO and finaly in JEM-EUSO. All these experiments are directed to measure and study of still poorly know nature of cosmic ray origin.