KSETA-Doktoranden-Workshop 2014, Freudenstadt 21.7.-23.7.

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The KSETA Doctoral Workshop allows interested KSETA fellows to learn more about methods and tools that might support their research. Doctoral students of all KSETA research fields, from theoretical or experimental particle and astroparticle physics to software or cryogenic engineering, are invited to spend three interesting and inspiring days together and to benefit from the other participants' experience.
One key aspect of the workshop are the tutorials given by all participating doctoral students. In groups, the participants prepare their tutorial "from doctoral fellows for doctoral fellows" on a topic that could be useful to others concentrating on other fields of research. This tutorial may cover introductions to useful tools, basic technologies for non-engineers, basics in physics for non-physicists, or applicable methods for research. Every tutorial lasts one hour and the presenter is free to use any didactic method like PowerPoint, whiteboard, or interactive methods such as exercises on programs installed on the students' laptops.
The workshop program is complemented by invited talks and discussions.

The spectrum of cosmic rays (CR) extends over many orders of magnitude in energy. It can be described by a power law $\mathrm{d}N/\mathrm{d}E = E^{-\gamma}$, with γ roughly 2.7. Depending on the energy regime, different detection techniques are applicable. Below 1 PeV, primary CR are measured directly using balloon- or satellite-borne particle detectors. Because of the low CR flux at the highest energies, large surface detector arrays have been used for detection of secondary particles, and radiation originating from particle interactions in the atmosphere.

The Alpha Magnetic Spectrometer (AMS-02) is a state-of-the-art particle physics detector designed to operate as an external module on the International Space Station (ISS). Started in May 2011, it has continuously collected 50,000 million events with energies up to TeV. Due to the direct detection of cosmic particles, it is possible to produce cosmic flux measurements with high accuracy.

Regarding the highest energies, the future might see another CR observatory orbiting the Earth. The Extreme Universe Space Observatory on board the Japanese Experiment Module (JEM-EUSO) is meant to observe the faint UV light emitted from extensive air showers, that originate from primary CR particles of macroscopic energy inducing particle cascades in the atmosphere.

This tutorial shall give a brief comparison between AMS-02 and JEM-EUSO regarding their physics objectives, flux and exposure calculations, as well as the general measurement techniques.