

Abstract: This thesis is dedicated to study of interactions of ultra-high energy cosmic rays using measured data from the Pierre Auger Observatory, automatic alarm system called Shift Guard and analysis of correlation of temperature and detector response.

The Pierre Auger Observatory is the largest experiment to study ultra-high energy cosmic rays. The assumed relation between temperature and fluorescence detector response is studied together with descriptive temperature analysis, which shows that the air-conditioning system is not able to stabilize temperature enough. The temperature influence on camera response is investigated in order to measure the calibration correction factor.

Shift Guard - the alarm system dedicated to protect fluorescence detectors and data taking is introduced and its functionality is described. The alarm system informs shifters about some events and situations that can endanger detector or deteriorate data quality. The basic parameters and alarm system logic are described together with light and sound signals.

The discrepancy between measured and predicted number of muons at ground level calculated by EAS generators is showed and possible sources of this disagreement are studied. The result of massive dark photons decay in EAS as one of exotic muon source is presented. The analysis of increased heavy flavour particles production shows the influence on muon numbers and missing energy.