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Instrumentation for the Northern Site of the Pierre Auger Observatory

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The Pierre Auger Observatory is a multi-national project for research on ultra-high energy cosmic rays. The Southern Auger Observatory (Auger South) in Mendoza province, Argentina, was completed in 2008 with an instrumented area of 3,000 km**2. Science results form Auger South motivate the completion and extension of the investigations begun there by constructing the Northern Auger Observatory (Auger North), with a much larger acceptance for the extremely rare cosmic ray events above a few times 10**19 eV. The Northern Auger Observatory (Auger North) will have an instrumented area of 20,000 km**2 in Southeast Colorado, USA.
This presentation will describe the layout and technical implementation of Auger North, highlighting advances with respect to the Auger South instrumentation that have been made to improve performance, reduce costs, and accommodate differences between the Southern and Northern sites. Improvements to the Fluorescence Detector calibration systems and the Surface Detector station dynamic range will be discussed, and the design the new Communications System, based on a peer-to-peer network topology will be presented.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

D. Nitz is the Scientific Spokesperson for the Northern Site of the Pierre Auger Observatory (Auger North). Planning for Auger North has been going on for several years, a design report has been produced, and construction proposals have been submitted in several countries. The project appears on both US and European roadmaps.

D. Nitz also leads the design effort for the Auger North Communications System. Differences in the topography of the Southern and Northern sites require replacing the Auger South approach in which detector stations communicate directly to base stations at communications towers , with a peer-to-peer network based on the sensor-net paradigm. We have developed the Wireless Architecture for Hard Real-Time Embedded Networks (WAHREN) paradigm for Auger North. The presentation will describe this paradigm along with the associated communications hardware that is being developed.

Other advances are being made. The Surface Detector water Cherenkov station design has been modified to increase the dynamic range of the PMTs, and to add insulation to withstand the colder Colorado winters. Advances in Fluorescence Detector calibration and atmospheric monitoring are being pursued to allow the Fluorescence Detector stations to be situated farther apart. The electronics systems and enclosures for the Fluorescence Detector stations have been updated. These advances will also be described.

Many of the aspects of the updated instrumentation will be tested in a Research and Development Array (RDA) that is being constructed at the Southeast Colorado site. The plans and progress for the RDA will be presented.

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