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Studying the chemical composition of the highest energy cosmic rays with the Pierre Auger Observatory

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The Pierre Auger Observatory detects the most energetic cosmic rays using two complementary detection techniques, fluorescence telescopes and a ground array of particle detectors. The fluorescence telescopes operate during night time and they are able to map the longitudinal profile of the air shower. The atmospheric depth at which an air shower reaches its maximum size (Xmax) is correlated with the chemical composition of the cosmic ray that originated the air shower. The Pierre Auger fluorescence detectors can measure Xmax with an average resolution of 20 g/cmˆ2. In this talk I will briefly explain the technique used by the Auger collaboration to measure the unbias Xmax distribution as a function of energy. I will present our latest estimates of the average cosmic ray composition (<lnA>) and its dispersion as a function of energy using post-LHC hadronic interaction models. The interpretation of the Xmax distributions in terms of the cosmic ray composition relies heavily on the interaction models. So, I will discuss whether the interaction models are consistently interpreting the different measurements obtained by the fluorescence and ground array detectors.

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