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AIRFLY: Precise measurement of the absolute yield of fluorescence photons in atmospheric gases

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We present preliminary results from the most recent data on the absolute yield of fluorescence photons in atmospheric gases by the AIRFLY collaboration. Currently, the uncertainty in the yield forms the dominant contribution to the systematic uncertainty in the Pierre Auger Observatory's energy spectrum, and are at the level of 10%. Data were taken in 2009 and 2010 at the test beam facility, M-Test, at Fermilab using protons, electrons and pions, in nitrogen, air, and in non fluorescing gases like argon, and helium. The instrument is operated in two main modes. In the first, fluorescence photons are observed, whereas in the second, both Cherenkov as well as fluorescence are observed. Comparisons of the ratio of these measurements, combined with the known Cherenkov spectrum allows for the absolute yield to be determined with reduced systematic uncertainties. In addition, the absolute yield is found by comparing the fluorescence yield to the observed photon yield of a NIST calibrated laser source directed into the apparatus. The consistency of these independent calibrations indicates that a systematic uncertainty of 5% or better is within reach.

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