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Nitrogen fluorescence in air for observing extensive air showers

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Extensive air showers initiate the fluorescence emissions from nitrogen molecules in air. The UV-light is emitted isotropically and can be used for observing the longitudinal development of extensive air showers in the atmosphere over many kilometers. This measurement technique is well established since it has been used since many decades by several cosmic ray experiments. However, a fundamental aspect of the air shower analyses is the description of the fluorescence emission in dependence on varying atmospheric conditions. Different fluorescence yields affect directly the
energy scaling of air shower reconstruction. In order to explore the various details of the nitrogen fluorescence emission in air, few experimental groups were performing dedicated measurements
over the last decade. Most of the measurements are now finished. These experimental groups have been discussing their techniques and results in a series of Air Fluorescence Workshops commenced
in 2002.
At the 8th Air Fluorescence Workshop 2011, it was suggested to develop a common way of describing the nitrogen fluorescence for application to air shower observations. Here, first analyses
for a common treatment of the major dependences of the emission procedure are presented. Aspects like the contributions at different wavelengths, the dependence on pressure, the temperature
dependence of the collisional cross sections between molecules involved, and the collisional de-excitation by water vapor are discussed.

Primary author: Dr KEILHAUER, Bianca (KIT)

Co-authors: Dr ULRICH, Andreas (Technische Universität München); Prof. MATTHEWS, John (University of Utah); Prof. FRAGA, Margarida (LIP-Coimbra and Departamento de Fisica, Universidade de Coimbra); BOHACOVA, Martina (Institute of Physics); SAKAKI, Naoto (A); Dr TSUNESADA, Yoshiki (Tokyo Institute of Technology); TAMEDA, Yuichiro (Institute for Cosmic Ray Research, University of Tokyo)

Presenter: Dr KEILHAUER, Bianca (KIT)

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