NEW RADIOGRAPHY METHOD FOR SMALL SCALE STRUCTURE USING SOFT COMPONENT OF AIR SHOWER

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Introduction

We will report this newly developed radiography method using soft component for small scale structure in detail and the result of measurement. Further improvement and possible application are also discussed.

General Instruction

Air shower consists of hard component and soft component. Hard component is mainly consists of muon, and soft components is consists of electron, positron and photon. Hard component has strong penetration power, so radiography using hard component has been performed in several volcanoes and seismic faults. However, because of its penetration power, hard component is not suitable for small scale structure thinner than 1 kg/cm^2 equivalent to 10m thick water, like buildings, bridges and small hills.

Soft component is suitable for small scale structure, but it requires particle identification. Here, particles identification means distinguishing hard component and soft component. Particle identification can be done very easily by using strong magnet and dense detectors, but it is very hard to use that kind of detector for radiography because of their weight and cost.

There are two kinds of detector for muon radiography, one is comprised of plastic scintillators and the other is comprised of emulsion films. If we can use one of them, we will be able to do radiography thinner structure than 1 kg/cm^2 using same detector.

Recently, we found we can measure the lateral distribution of air shower by using current detector for muon radiography comprised of plastic scintillators, and lateral distribution can be used for radiography. Here, lateral distribution means the distance of two particles passed through detector simultaneously. The lateral distribution of soft component is steeper than that of hard component, and the lateral distribution of random component is flat. Also, lateral distribution of hard component will not change after thin structure because hard component has strong penetration power and muons including multi-particle event has much more energy than individual muons. By using this information, distinguishing the soft component, hard component and random component became possible statistically.