Interactive comment on "Experimental study of source of background noise in muon radiography using emulsion film detectors" *by* R. Nishiyama et al.

Anonymous Referee #4

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General comments

The paper by Nishiyama et al. presents some interesting results on how background noise from false muon tracks may affect muon radiographies, when using emulsion film detectors. The authors claim that the particles responsible for false events are low-energy (momenta less than $2 GeVc{-}1$), implying that background noise can be eliminated if the employed detector features a suitable energy threshold. Besides performing numerical simulations aimed at defining (a) how muons are scattered in the target material and (2) what are the energy thresholds of two emulsion film detectors

with different geometries, the authors perform a field experiment using those two detectors. They are both placed in front of a geological target (Mt. Showa-Shinzan) during a period of 168 days. Results show that the detector featuring an higher energy threshold records a less important muon flux, implying that the excessive flux observed by the other detector is due to false muon tracks. Indeed, the rock densities resulting when the data from the detector with higher energy threshold are inverted are in agreement with the expected values, while the densities that are obtained by inverting data from the other detector are as much as 2-2.6 times lower than expected.

Overall, I think that the paper by Nishiyama et al. presents interesting results that could be of great interest, especially to research groups that plan to perform experiments of muon radiography to explore the density distribution inside geological targets. The paper is well structured and gives sufficient information about the topic. Hence, it surely deserves publication. However, I feel that English language should be improved throughout the manuscript. In the following, I give some advices on how to improve some sentences. Anyway, I am not a mother tongue and I urge the author to have the manuscript checked by one of them for linguistic correctness.

Furthermore, the authors should provide more detailed discussion on the comparison between the performances of emulsion film detectors and other types of detectors like, for example, those employing plastic scintillators. In section 6, the authors give some pieces of information about the possible advantages of using emulsion film detectors. Indeed, from what the authors say, it seems that emulsion film detectors offer critical advantages with respect to detectors based on different principles and the reader is left with the question of why different detectors were employed in the past to accomplish similar tasks (Tanaka et al., 2011; Lesparre et al., 2012). To address this point, a more detailed discussion should be provided about advantages and limits of emulsion film detectors, compared with detectors based on different principles.

Corrections and suggestions

. . .they have to passed. . . change to . . .they must pass. . .

. . .the following are sources of background particles. . . change to . . .the following is-sues cause background noise. . .

. . .since they lose their. . . change to . . . since they loose their. . .

We constructed a wall that had a thickness of 100m and was composed of quartz. . . change to We assumed a quartz-made (density = 2200kgmˆ-3), 100m thick wall. . .

As discussed in Sect. 5.3.2, the momentum thresholds of these two detectors are. . . Why do the authors reveal in advance this information, that is discussed later in the paper?

. . .detectors were faced toward Mt. Showa-Shinzan. . . change to . . .detectors were installed in front of Mt. Showa-Shinzan. . .

. . . to the film normal projected on the xz and yz planes. . . change to . . . to the film normal projections on the xz and yz planes. . .

After the fllms were developed. . . change to After the films were developed...

and tan_theta_y = 0 horizontal particles. . . Are the authors sure that they mean hori-zontal, rather than vertical, particles?