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Muographic study of the Palazzone necropolis (Perugia-Italy)

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The muon radiography technique provides non-invasive imaging of the interior of large structures (targets) by exploiting the absorption properties of atmospheric muons in the materials. The absorption of muons depends not only on the thickness of the material but also on its density. Using this technique it's possible, thanks to the comparison with simulations that take into account the known geometry of the target, to derive images of the average density of the structure under study. In this presentation we will show the preliminary results of a muon radiography measurement campaign, carried out at the archaeological site under study is the necropolis of Palazzone (Perugia-Italy), with the goal of searching for low-density anomalies attributable to unknown or unmapped tombs. The necropolis of Palazzone (Perugia-Italy), is an archaeological site dating back to the Etruscan period. This site, which has about 200 known tombs, is of enormous interest both from an archaeological point of view and from a geological and sedimentological point of view, thanks to the sedimentary sequence outcropping on the walls of the tombs that are directly visible. Thanks to this feature, this site can be classified as an "archaeo-geosite". The area identified for exploration by means of muon radiography is a portion of the necropolis not yet fully mapped, located just outside the tourist route. This area consists of two lithofacies with a general fining upward attitude: prevailing gravel conglomerates below and sand with conglomerate above. The measurement campaign carried out in 2022 had as its objectives, the identification and localization of a known tomb, with the possible discovery of new tombs, and the determination of the boundaries between the stratifications that are characterized by different average density values. The measurements were carried out with the MIMA (Muon Imaging for Mining and Archeology) detector, a cubic-shaped muon tracker with an approximate size of (50x50x50) cm3 designed by our team. This work was supported by the INFN (Istituto Nazionale di Fisica Nucleare), the University of Florence, the University of Perugia and the necropolis of Palazzone.

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