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# Reconstruction of the depth of shower maximum using radio signal of extensive air showers

**G Rastegarzadeh and M Mostafavi alhosseini***
Physcs faculty, Semnan University, Semnan, Iran

E-mail: grastegar@semnan.ac.ir

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**Abstract**
In the present work, we proposed an approach to estimate the depth of shower maximum of extensive air showers detected with radio arrays using the least squares method based on comparing the detected signal intensity of the east-west component of the electric field vector from secondary particles with the intensity of the simulated signals in the data bank. The simulations are specifically performed for Semnan University Radio Array (SURA). Using the described method, we evaluated the error dependence of this approach on the primary characteristics of cosmic rays. The presented method can estimate the depth of shower maximum of vertical proton-initiated cosmic rays in the energy range of 100 to 500 PeV with a resolution better than 20.42 $\frac{g}{cm^2}$.
The error can be decreased by knowing the energy of the primary particle. We evaluated the impact of the accuracy of determining the zenith angle, the core location, and the mass of the primary particle on the depth of shower maximum estimation.

**Keywords:** cosmic ray, extensive air showers, the depth of shower maximum of extensive air shower, radio detection, SURA

For full article, refer to the Persian section