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Time-domain Cherenkov radio pulses from showers in dense media

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We have developed an algorithm to obtain the electric field of the Cherenkov radio pulse in the time domain as produced by a single charged particle track in a dielectric medium. The algorithm is implemented in a Monte Carlo simulation of electromagnetic showers in dense media, and the coherent Cherenkov radio emission can be obtained simultaneously in the time and frequency domains allowing a direct comparison of the two approaches. The shape of the bipolar pulse in the time domain is shown to be directly related to the depth development of the excess charge in the shower, and its spread in time to the observation angle with respect to the Cherenkov direction. This information can be of great importance for interpreting actual data.

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