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Radio pulses from electromagnetic, hadronic and neutrino-induced showers up to EeV energies

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We present ZHAireS a Monte Carlo code that allows the calculation of the Cherenkov radio pulse emitted by electromagnetic, hadronic and neutrino-induced showers in ice up to the EeV energies. ZHAIRES combines the high energy hadronic interaction capabilities of AIRES, and the dense media propagation capabilities of TIERRAS, with the precise low energy tracking and specific algorithms developed to calculate the radio emission in ZHS. The characteristics of hadronic showers and the corresponding Cherenkov radio pulses are compared with those from purely electromagnetic showers in both the time and frequency domains.
The code and algorithms developed also serve to predict radio emission in extensive air showers, automatically accounting for both the synchrotron and Cherenkov radiation mechanisms.

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