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Development of the time domain simulation of impulsive radio signals for ARAcalTA

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The Askaryan effect is the coherent radio emission of an electron excess in a particle cascade.
ARA (Askaryan Radio Array) is being built to observe the Askaryan radiation
from ultra high energy neutrino (E > 10PeV) induced showers in ice around the South Pole.
In order to study further the characteristics of the coherent emission,
and also validate ARA detection system response, we set up a replica of the ARA experiment, the ARAcalTA.
We used the electron linear accelerator on Telescope Array site to shoot 40MeV electron bunch in an ice target,
the electron excess in ice provokes the coherent radiation that is detected by the ARA sensors.
Because of the impulsive nature of the expected signal,
we developed a simulation chain entirely in the time domain (instead of frequency).
We present the simulation combining a Geant4 particle tracking
and a particle per particle radio emission calculation.
These results are in turn linked to the detector calibration and simulation to obtain the final expected waveform.
We demonstrate that in absence of other background,
the coherent radiation can be observed and characterized with ARAcalTA.

Collaboration

– not specified –

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