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Radio Morphing: Towards a fast computation of air-shower radio signals

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Incoming large-scale radio experiments for cosmic-ray detection require to run massive air-shower simulations to evaluate the radio-signal at any antenna position. The modeling of the radio-emission can be performed either based on microscopic or macroscopic approaches. The former is fast but relies on many free parameters that limits accuracy, the latter consists of Monte-Carlo simulations that are usually accurate but computationally demanding.

We present here Radio Morphing, a semi-analytical tool designed for a fast and accurate computation by any air-shower at any location from the simulation data of a few template ZHAireS showers at given positions. The method provides mean relative differences $< 20\%$ on the peak amplitude and mean differences < 5 ns on the peak time compared to usual Monte Carlo simulations while the time computation is reduced by several orders of magnitude. We will discuss here the methodology and performances of this innovant tool.

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