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Update on the Offline Analysis Framework for AugerPrime and integration of the AugerPrime Radio Detector reconstruction

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The Offline Framework serves as a comprehensive tool for the reconstruction of measured data and simulated air showers for the Pierre Auger Observatory. Originally developed for the Surface and Fluorescence Detectors, new detectors such as the Auger Engineering Radio Array have been successfully integrated already. The development and installation of the AugerPrime upgrade required incorporating new detector types and updating existing detector descriptions. This integration was facilitated by the modular structure of Offline, which strictly separates detector descriptions, data structures, and processing modules. We will discuss the general structure of the Offline Framework and explain the design decisions that provided its flexibility. Specifically, we will describe the reconstruction of data from the AugerPrime Radio Detector within Offline. This includes the signal reconstruction for each station, the directional reconstruction based on a spherical model of the signal arrival time at all stations, and the energy and distance to Xmax reconstruction from a fit of the lateral signal distribution. Additionally, we will outline anticipated improvements in the reconstruction process, such as an absolute calibration based on the galactic radio emission and an advanced suppression technique for narrow-band RFI pulses.

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