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Algorithms for resolving overlapping signals in cathode-strip detectors based on wavelet transform and KAN neural network

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The second phase of the Large Hadron Collider's operation continues, characterized by higher luminosity and a multiplicity of overlapping signals.

In the cathode-strip chambers, when particles pass through, electron avalanches are formed, which are registered as clusters (groups of signals from adjacent strips) with charges whose distribution in space can be approximately described by Gauss functions. Often there is an overlap of clusters from closely passing particles, which can lead to significant losses in accuracy in determining their coordinates.

The currently used simple center of gravity algorithm does not provide the required accuracy for overlapped signals (the error is up to 40% of the strip width with the required accuracy of up to 3%).

To solve this problem, a first approximation algorithm, wavelet analysis and the use of Kolmogorov-Arnold neural networks are considered. Preliminary results of parameter estimations of overlapping signals for all algorithms are presented and discussed.

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