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4.14 Fringe jump compensation techniques for the time-averaging zero-crossing phase measurement in the KSTAR millimeter-wave interferometer

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A new fringe jump compensation technique has been developed for a zero-crossing phase measurement that provides the phase detection within a single fringe. The algorithm is extremely useful in the case of the time-averaging zero-crossing technique on noisy environments. When the noise level over the measurements is not sufficiently suppressed, a backward slope appears near the fringe jump on the measured phase signal and this slope brings an ambiguity over the compensation process. The algorithm requires a simple circuit that provides additional channel to measure a half fringe shifted phase along with the original channel. At least one of these two channels will be placed at the outside of the backward slope on the fringe jump. Comparing the phases from two channels, the algorithm decides a more reliable channel. This system applied to the millimeter-wave interferometer on Korea Superconducting Tokamak Advanced Research (KSTAR) device, and successfully removed the ambiguity in the cases with severely deteriorated signals. The algorithm can provide a robust and cost-effective solution for the phase measurement system in many fields.

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