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## 6.23 Development of high speed full digital processing phase detector for interferometry

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A fully digital type phase detector for plasma interferometry is developing. It can operate even in the situation where the phase changes rapidly or where the input signal is too small to drive the correct phase change from the IF signal. It directly converts the IF signal waveform of the interferometer to the phase signal by a data processing in a logic circuit, thereby the phase is derived from the full waveform of the IF signal. The IF signal of the interferometer is converted to I/Q signals by Hilbert transform, processed with a digital low-pass filter, and polar coordinates are converted by a CORDIC algorithm to obtain the phase signal. A simulation of the high speed full digital processing phase detector shows that the fringe jump does not occur until a phase change rate of  $0.85 \times 10^{\circ}6$  rad/s. This value is sufficiently large as compared with the predicted phase velocity in density rise due to the pellet injection. The phase conversion has been simulated using the real IF signal of the interferometer measured with Heliotron J. The results show that the phase signal is successfully calculated by the full digital processing method from the IF signal in which the phase derivation is impossible by the conventional analog phase detector.

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