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(54) **CALIBRATION OF A TIME-TO-DIGITAL CONVERTER USING A VIRTUAL PHASE-LOCKED LOOP**

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(57) **ABSTRACT**

A clock product includes a time-to-digital converter responsive to an input clock signal, a reference clock signal, and a time-to-digital converter calibration signal. The time-to-digital converter includes a coarse time-to-digital converter and a fine time-to-digital converter. The clock product includes a calibration circuit including a phase-locked loop. The calibration circuit is configured to generate the time-to-digital converter calibration signal. The clock product includes a controller configured to execute instructions that cause the phase-locked loop to generate an error signal for each possible value of a fine time code of a digital time code generated by the time-to-digital converter and to average the error signal over multiple clock cycles to generate an average error signal.

