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Title: Relaxing the requirements for accurate spectral test of data converters

Abstract:

Analog-to-digital converters (ADCs) are becoming increasing more common to be involved in most systems in integrated circuits. One of the difficulties being faced is to be able to accurately and cost-effectively test the continually higher performance ADCs. Part of this test is being able to assess the dynamic linearity of the ADC through dynamic spectral testing. The standard test method for ADCs can be difficult to implement accurately and cost effectively due to the stringent requirements. Three different algorithms are proposed that can be used to relax the test requirements in order to reduce the cost of the test equipment while still being able to maintain the test accuracy. The accuracy and robustness of these methods will be shown through simulation and measurement results.

The first algorithm developed is relaxing the requirements on the linearity of the test signal and of the need to achieve coherent sampling. The standard test requires that the input signal linearity be about 20dB more pure than the ADC under test along with always maintaining coherent sampling. This algorithm will reduce the purity requirement by allowing the test signal to be less pure than the ADC under test while also completely removing the need for coherent sampling.

The second algorithm is focusing on adding the allowance of the signal to be clipped in addition to the claims of the first algorithm. The standard test requires the input signal to be near full range of the ADC under test without clipping. This algorithm allows for the signal to be clipped up to 1% while still ensuring accurate results.

The last algorithm is performing spectral testing of the ADC using a DAC of lower linear performance. If accurate estimates of the INL/DNL of the ADC using a lower performance DAC can be obtained using other algorithms under development, then pre-distortion codes can be added to the DAC to accurately test the dynamic spectral testing performance of the ADC.