Characterization of Metrological Grade Analog-to-Digital Converters using a Programmable Josephson Voltage Standard

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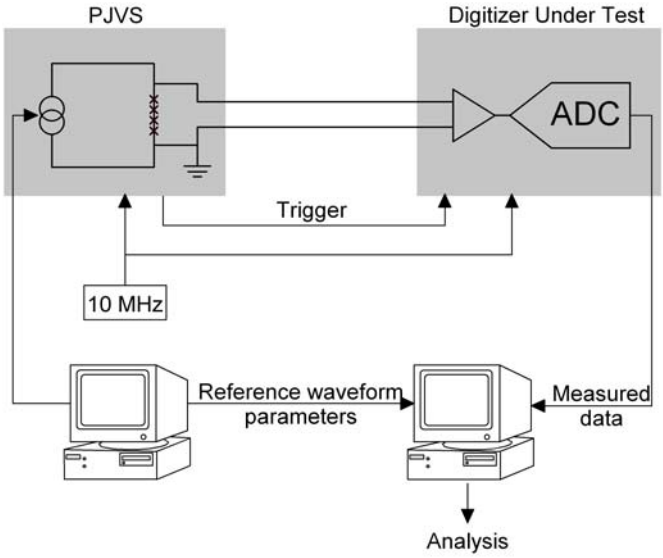
A test bench has been developed for systematic characterizations of high resolution analog-to-digital converters. The reference signal is accurately generated using a programable Josephson voltage standard.

Three different 24-bit digitizers have been characterized. Their noise performances have been measured in dc using the Allan deviation while the integral non-linearity has been measured quasi-dynamically using stepwise triangular waveforms at frequencies from 0.5 Hz to 1 kHz. None of the digitizers outperforms the others on every tested characteristics. Therefore, such a systematic characterization provides the overview needed to find out the most suitable digitizer for a particular application.

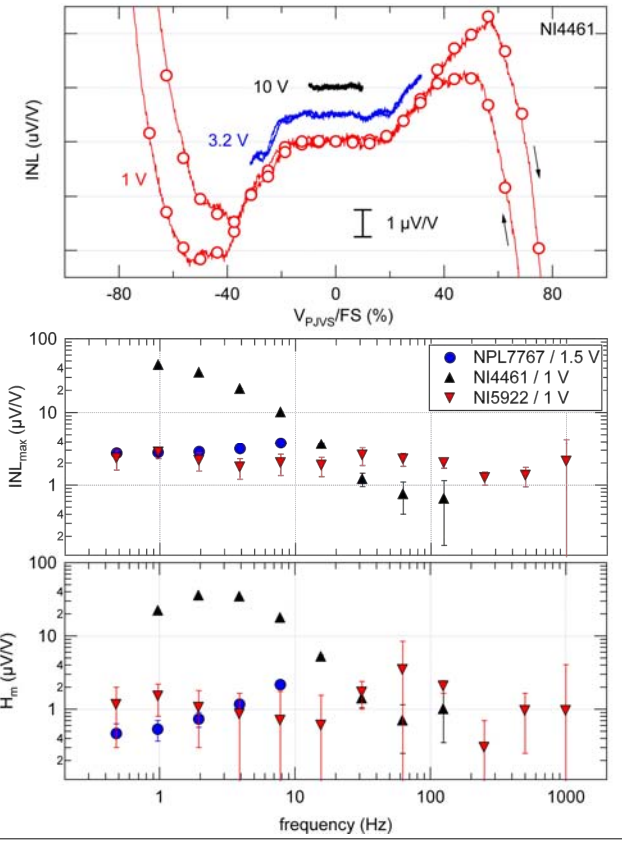
Test Bench



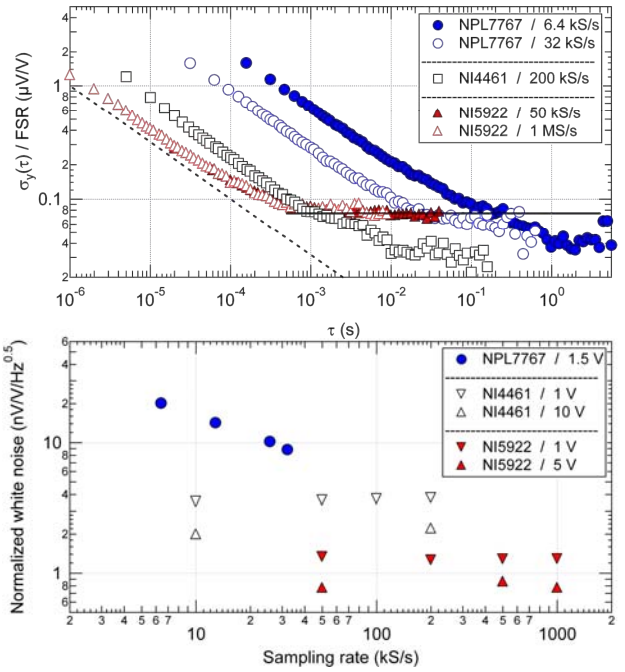
Devices Under Test

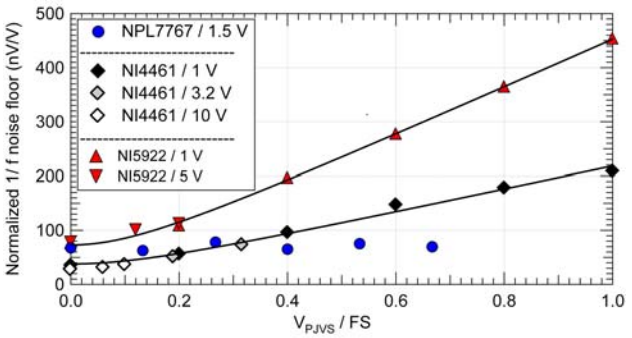
Name	Sampling rate kS/s	Resolution bit	FS V
NI5922	500	24	1 or 5
	1000	22	
	5000	20	
NI4461	204.8	24	1, 3.16 or 10
NPL7767	32	24	1.5

Integral Nonlinearity



Noise Characterization





$$\text{Noise} = \sqrt{N_O^2 + N_G^2 \cdot V_{\text{PJVS}}^2}$$

Name	N_O/FSR nV/V	N_G/FSR nV/V/V
NI5922	73±4	447±3
NI4461	38±7	215±6
NPL7767	68±4	35±34