21AD140 Novel Time-Interleaved Variable Center-Frequency, Single-Bit A/D and D/A Sigma-Delta Modulator Topologies

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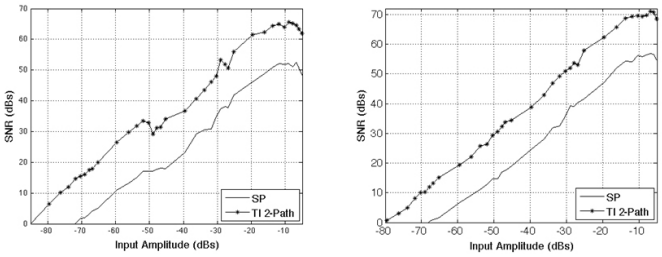
A step-by-step technique, which offers the flexibility to design generalized multi-path A/D and D/A time-interleaved sigma-delta modulator topologies that can operate at any arbitrary centre-frequency from DC to Nyquist, is developed and presented in this paper. Using this proposed methodology, dual-path 4th-order single-bit A/D and D/A sigma-delta modulator topologies are constructed and evaluated. Detailed simulations are performed at the behavioural-level using Butterworth, Chebyshev, Inverse-Chebyshev and Elliptical based noise transfer functions to verify the proposed approach and establish crucial performance metrics such as signal-to-noise ratios, dynamic ranges and stability thresholds.



SNR Plots, OSR=64 a) Butterworth-A/D, b) Elliptical-D/A

21AD141 The Matlab Toolbox for Simulation Analysis and Design Support of New Adaptive Sub-ranging A/D Converters

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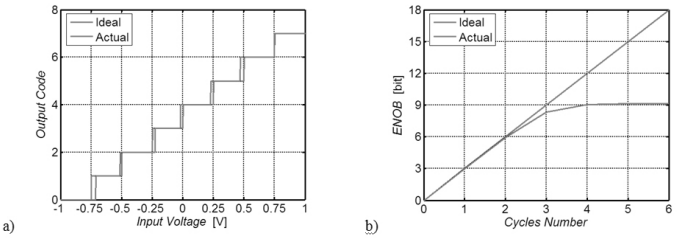
The paper presents a specialized Matlab toolbox for simulation analysis and support of the high-level design process of new adaptive sub-ranging analog-to-digital (A/D) converters whose digital parts permit to calculate iteratively output codes in a form of binary words using adaptive estimation algorithms. The developed appropriate methods and simulation tools enable the assessment of the converters characteristics taking into consideration many different non-idealities (e.g. offsets, noises, non-linearities) of their internal components. The simulation analysis can support the appropriate choice of the suitable converter configuration and tuning of conversion algorithm parameters, which allows achievement of the best characteristics of the converters under assumed level of errors of the components. The toolbox can be used at initial stages of design of the adaptive sub-ranging A/D converters to preliminary evaluation of their expected performance and their comparison with existing comparable sub-ranging A/D converters.



Exemplary transfer function of sub-ADC (a) and ENOB vs. cycles number for adaptive recursive sub-ranging ADC employing this sub-ADC.