vice performs several orders of magnitude better in size, decision of a Mach–Zehnder interferometer (MZI). The proposed de-
latency, energy efficiency, and stability compared to fiber-based methods of optical thresholding. It is best suited to platforms and resonator types, but for concreteness (Si), we limit the focus of this paper to MRRs in SOI.

Integrated optics, interferometry, microresonators, silicon on insulator technology, threshold logic devices.

I. INTRODUCTION

THRESHOLDERS are the simplest kind of binary decision maker, outputting "one" if a signal is above a certain threshold value and "zero" if below. Much more than dig-

TABLE I
COMPARISON OF THRESHOLDING PERFORMANCE CRITERIA FOR THREE DEVICES. PARAMETERS FOR THE REMZ AND DREAM CORRESPOND TO 4 μm RADIUS MICRORINGS IN SOI

	NOLM [7]	REMZ	DREAM	
	Si	4×10^{-5}	7.5×10^{-5}	2
GHz	100 GHz	Throughput	400 GHz	100 G
%	40%	Energy efficiency	1%	90%
Bm	-5dBm	π-power	40dBm	-6dB
sing	flat	One-level stability	ripple	increa

linear transmission function, which has the ratio of output to input as the dependent variable, and a nonlinear transfer function, which instead plots the output as a function of the input

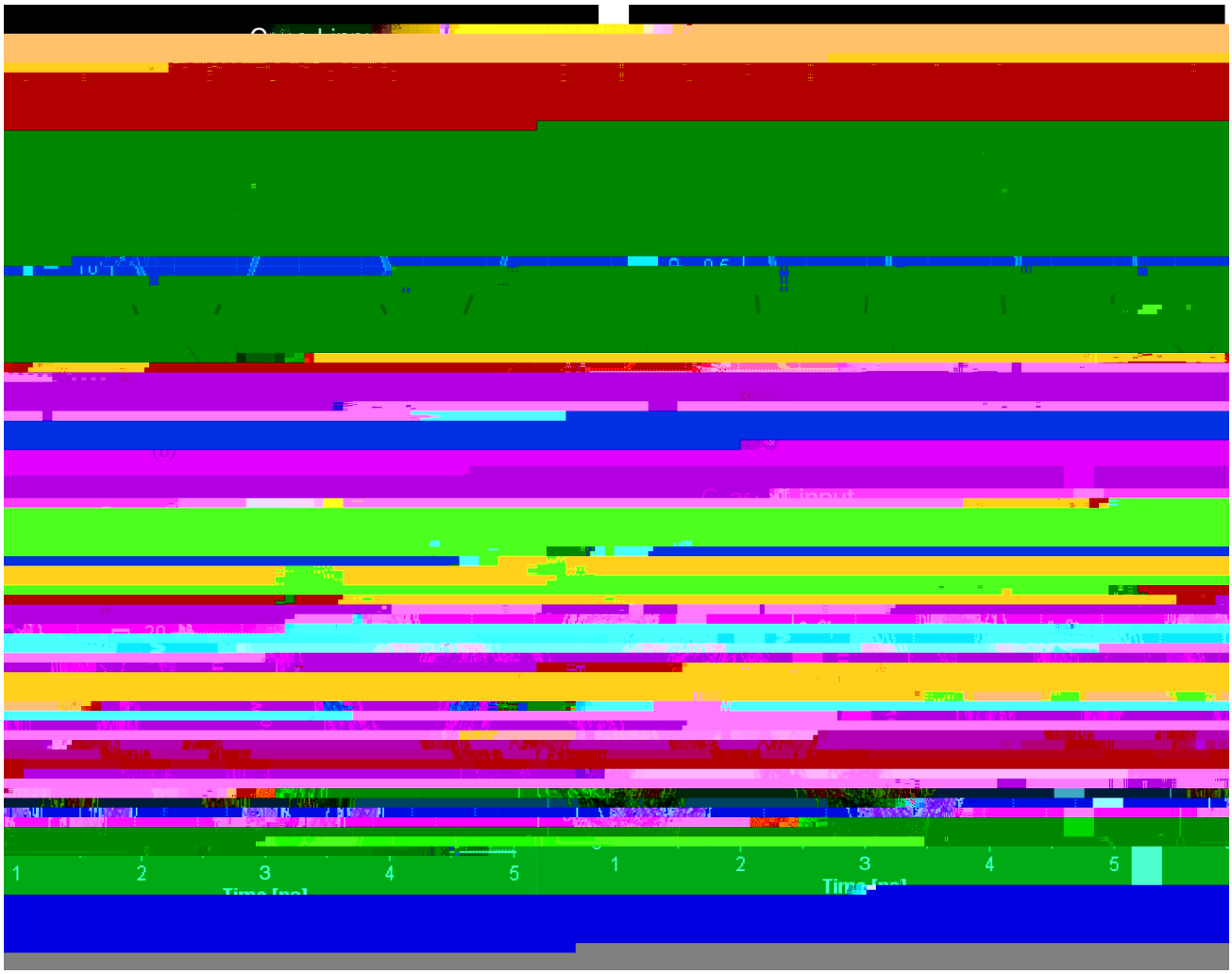

Fig. 5. Eye diagrams of time-domain simulations showing DREAM thresholding of continuous-time analog signals. Inputs are 0.5 GHz sinusoids with small (Case I) and large (Case II) noise corruption. (Color online). (a) Case I input; (b) Case I output; (c) Case II input; (d) Case II output.

Nonideal transient effects are best observed in Fig. 5(b). We observe a small transient overshoot at the rising edge, not encompassed by the steady-state model. The durations of rising and falling switching edges differ due to dynamical differences

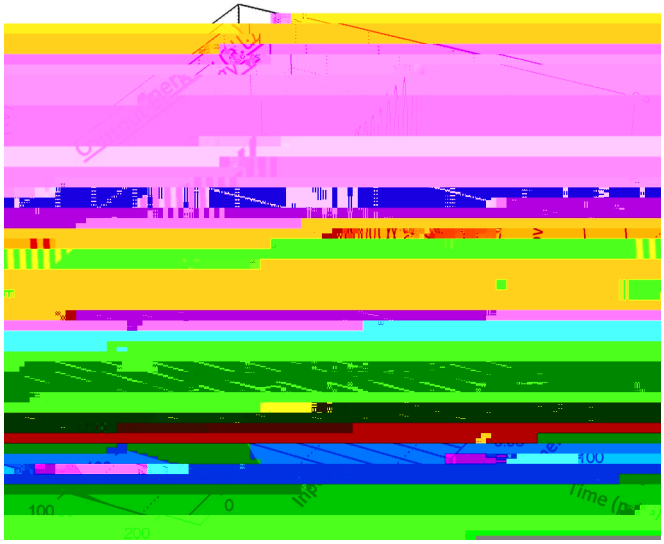

Fig. 8. 113 ps pulse shape distortion over the range of input energies. The input pulse shape is shown in blue on the same time axis, but with amplitude that depends on the trace. The time average of each trace (proportional to output energy) is displayed in red on the left y

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