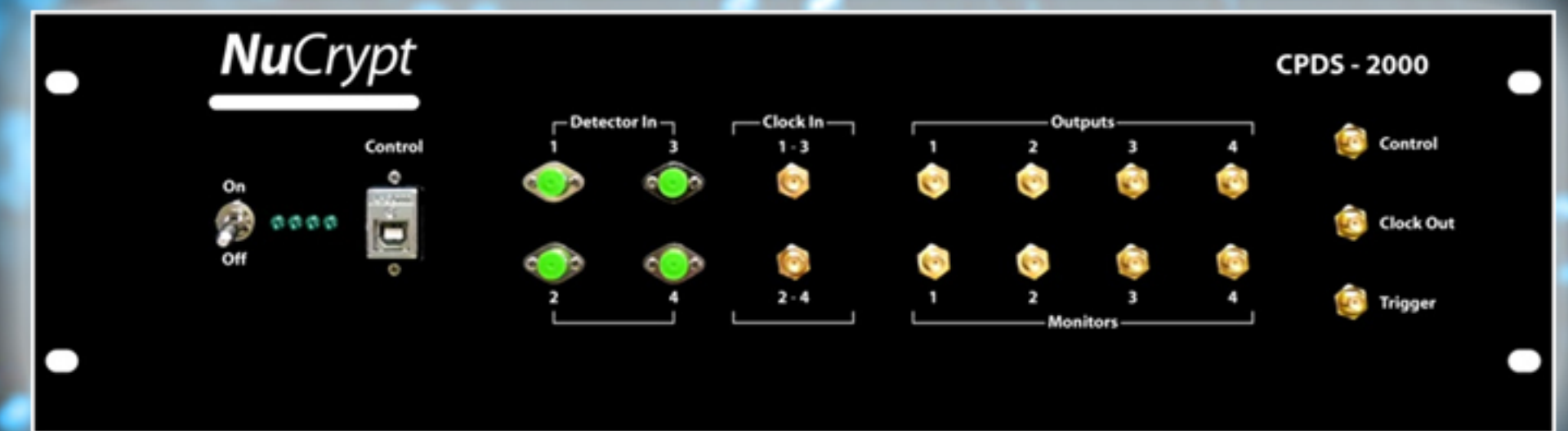


# NuCrypt

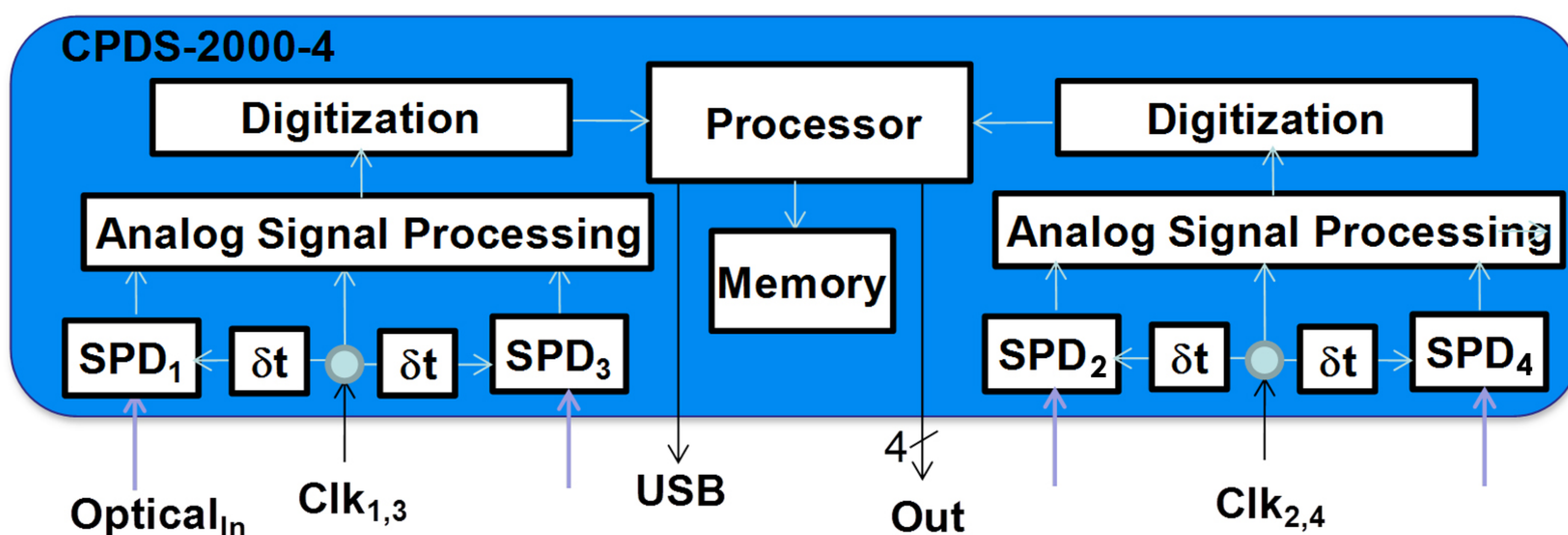
Correlated Photon Detection  
System with GHz Gate-Rate



## Product Overview

## CPDS-2000

The correlated photon detection system (CPDS) consists of multiple GHz gated single-photon detectors (SPDs) sensitive to telecom wavelengths followed by electronic processing. The system counts the detection events from each detector individually and the correlations between the various detectors. The detector outputs can be delayed before correlation to account for different fiber lengths between the detectors. The system can also store raw data from the detectors and generate up to 4 output signals in response to detecting a particular programmable (Boolean function) correlation between the detectors, allowing for feed-forward conditional quantum state manipulations. The gate repetition rate is 1.25 GHz.



## Basic Features

- Count detection events on up to four detectors at 1.25 GHz gate rates
- Count correlated detection events with programmable delays
- Four programmable outputs that are Boolean functions (AND, OR, XOR, NOT) of the detector outputs (1.25 GHz update); e.g. the raw detector binary output on the individual detectors or an indication of any particular correlation being detected.
- Store detector raw data; storage can be synchronized to a trigger signal
- Generate N-bin histograms for optical pulses arriving at rate of  $(1.25/N)$  GHz
- Command line interface is easily automated
- Analog monitors of avalanche photodiode outputs

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## \*Product Specifications

CPDS-2000

Attribute	Value	Units	Comments
Number of Detectors	1 - 4		-x suffix on model number where x {1,2,3,4}
Detector sensitivity range	1200-1600	nm	
Photon detection efficiency	15	%	at $4 \times 10^{-5}$ dark count rate, 1550 nm
After-pulse probability	5	%	10 ns after detection event with a $1 \times 10^{-3}$ photon arrival rate
Dark-count probability	$4 \times 10^{-5}$		Per gate at 15% efficiency
Noise equivalent power (NEP)	0.2 (3)	$fW/\sqrt{Hz}$	Achievable NEP for 1.25 GHz short pulses (CW light)
Gate temporal-location resolution	< 25	ps	Control gate location
Detection temporal window	150	ps	
Input clock	1	V	Per detector
Correlation delay	0-2 <sup>19</sup>	Clock cycles	Delay of detector clocks used to match long (to 100 km) external fiber delays
Clock rate	1.25	GHz	Standard; inquire about other rates
Form factor			5U 19" rack mountable box; 19x5 1/4 x24 inches
Data storage memory	512	Mbit	Aggregate memory for all detectors, actual number of storable output bits varies; $10^{-4}$ detection rate yields 1000 compression factor
Masking length	0,4,7,15,23, 31, 47, 55,63	Gates	number of gates after a detection event ignored by the processor to mitigate after-pulsing

<sup>®</sup> Specifications are estimates, subject to change without notice

## Typical Applications

- Measure quantum correlated light (Entangled photons, Bell measurements, quantum key distribution, HOM interference, etc.)
- Conditional quantum state manipulation
- Lidar and reflectometry
- Correlated photon imaging (Ghost imaging)