

DT5810

Fast Digital Detector Emulator



Features



- 2 channels
- 1 ns Rise Time
- Pulser/Emulator/Function Generator operating modes
- Energy spectrum emulation
- Time distribution emulation
- Custom signal shape emulation
- Pile-up emulation
- Noise emulation
- Baseline drift
- 1 ns/step programmable delay generator
- Correlated signals generation on the two output channels
- Multiple shapes on the same channel for testing the pulse shape discrimination
- Continuous and pulsed reset pre-amplifier emulation
- Nuclide Database
- Analog input for recording signals from real detectors
- USB interface
- Windows software for full system management

Description

The CAEN **Mod.DT5810B** is the model of the **Detector Emulator** family with the fastest signal output. Thanks to an updated and faster DAC it is now possible to emulate the behaviour of some of the fastest detectors on the market with **1 ns rise time**. The Digital Detector Emulator is the only synthesizer of random pulses that is also an emulator of radiation detector signals with the possibility to configure energy and time distribution.

The stream of emulated signals becomes a statistical sequence of pulses, reflecting the programmed input features. When the emulation process is resetted, the kernels of generators can be either re-initialized with new random data making the sequence always different, or they can be stored to reproduce the same sequence many times.

Each Digital Detector Emulator channel is able to emulate a radiation source and to provide it either with fully independent parameters (energy spectra, signal shapes, temporal distributions of the events, noise characteristics, etc.) or with some of them correlated with those of the other channel. For example the events can be time-correlated (steps of 1 ns), or a subset of events can share the same energy spectrum. It is also possible to set the channels in a master/slave configuration, where the first channel works as a trigger for the second one.

The output amplitude is selectable at ± 2 V with 50 Ω or ± 8 V at high impedance. The unit can operate in the same three modes as the 5800 Family (Pulser Mode, Emulation Mode and Waveform Generator Mode). In addition the minimum programmable delay is 1 ns/step. The Waveform Generator supports only standard waveforms: e.g. sinusoidal, squared, ramp shape, etc. but also arbitrary waveforms customized by the user.

The **DT5810B** is equipped with an analog channel input through which it is possible to sample a real signal and add it to the signal generated by the emulator: in this way it is possible to emulate a source not actually present or hardly available. Moreover, the analog input allows to characterize a detector, acquiring shape and spectrum of its output signal.

Technical Specifications

Energy emulation features

- Single line (65535 selectable levels)
- Spectrum emulation (16384 bins with 14-bit resolution)
- ± 4 V output range, high impedance; ± 2 V, 50 Ω termination (high speed mode) - FAST OUTPUT
- ± 8 V output range, high impedance; (high dynamic range) - HDR OUTPUT
- 16-bit D/A converter

Time emulation features

- Constant rate emulation
- Poisson distribution
- Up to 30 MCPS, both in constant and statistical emulation
- Integrator circuit emulation without pile-up limitation
- Up to 16 pile-up events in the memory based algorithm
- Programmable dead-time and emulation of parallelizable and non-parallelizable machines
- 5 ns to 10 ms exponential decay time

Signal shape

- 4096 points to store waveforms
- Arbitrarily programmable shapes
- Shape length from 3 ns to 4 μ s (w/o interpolation) / 4 ms (interp.)
- Separated rising and falling edge interpolation
- Up to four separate shapes mixed on the same channel with independent statistic

Noise emulation

- White noise emulation (BW 500 MHz)
- Random Walk (baseline drift)
- 1/f noise emulation
- Random noise
- Shot noise

Baseline

- Baseline drift programmable with arbitrary shape

Correlated events emulation

- Three operation modes:
 1. Channel 1 (CH1) is the time shifted copy of Channel 2 (CH2) (1 ns step);
 2. CH2 has its own statistics generator (i.e. different spectrum, different noise, etc.) but is triggered by CH1 (delayed by 1 ns step);
 3. A third emulator channel (with separate statistic properties) generates correlated pulses for both CH1 and CH2. In this way, only some events of the two channels are correlated.
- 1 ns step programmable delay (from 0 ps to 32 us)

Digital I/O

- 2-input and 2-output programmable
- Trigger out, analog saturation warning, machine overload sensing
- Trigger in, random number generator control (reset / play / pause), gating, baseline reset

RNG (random number generator)

- 8 independent LFSRs with 64 bits generate the base for the statistical emulation
- Possibility to randomize the seeds of each RNG independently
- Possibility to initialize the RNG with fixed seeds to get repeatable sequences to test different processing architectures
- Generation of finite length streams of pulses to debug step-by-step the DUT

Programmable sequence

- 4 k points of memory/CH to store a sequence of pairs (energy, time of occurrence) to generate long predictable and defined sequences of pulses.

Arbitrary waveform generator

- Function generation: sin, square, ramp, saw, pulse, sync up to 10 MHz

Software and Interfaces

- Windows based user interface managing more than one emulator
- USB 2.0 interface

Analog Input

- 1 ADC input, 125 MSPS 14 bit
- DC coupled input (dynamic 1/2/4/8 V)
- AC coupled (gain from 2 to 110)
- Realtime emulation signal mixing with analog source
- Full MCA functionality to calculate the spectrum of the source
- Fast shape averaging to extract a model of the input signal

Ordering Options

Code	Description
WDT5810BXAAA	DT5810B - Dual Channel Desktop FAST Digital Detector Emulator with channel correlation RoHS

Related Products

NDT6800



NIM/Desktop Digital Detector Emulator

DT4800



Micro Digital Detector Emulator

DT5800



Desktop Digital Detector Emulator

DT4810

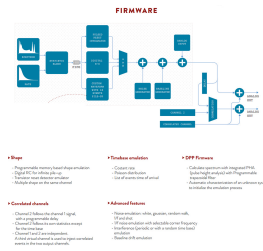
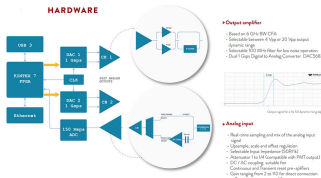


One-channel Micro Digital Detector Emulator

DT5810



Fast Digital Detector Emulator



Screenshot of the pulse generation in the graphical user interface provided with the Digital Detector Emulators

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