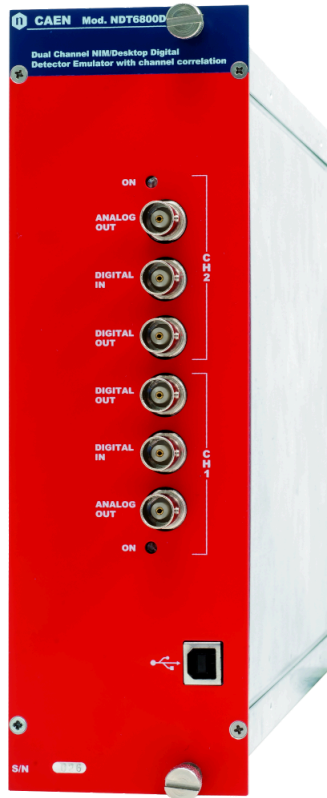


# NDT6800

## NIM/Desktop Digital Detector Emulator



## Features



- 2 channels
- 2 units, NIM standard
- Either backplane or AC-DC power supply
- Pulser/Emulator/Function Generator operating modes
- Energy spectrum emulation
- Time distribution emulation
- Custom signal shape emulation
- Pile-up emulation
- Noise and periodic interference emulation
- Baseline drift
- 12 ps/step programmable delay generator
- Correlated signals generation on the two output channels
- Multiple shape on the same channel for testing of pulse shape discrimination
- Continuous and pulsed reset pre-amplifier emulation
- Nuclide Database
- USB 2.0 interface
- Windows Software

## Description

The CAEN **Mod.NDT6800** is a **Dual Channel Detector Emulator**, an instrument for emulating in real time signals from generic setups for radiation detection, which can be operated as Desktop units. It shares the same functionalities as the **DT5800** and can operate in three modes: Pulser Mode, Emulation Mode and Waveform Generator Mode.

The output generated by the device can go up to 2 V (4 V in case of high Z) and the maximum pulse rate is 10 Mcps (5 Mcps in Poisson statistics mode). In the detector emulator operating mode, the system is able to emulate with high accuracy a radiation detection system from the detector output to its related front-end electronics. The user can program different emulation parameters like signal shape distributions, energy spectra, time distribution, as well as noise characterization and baseline drift.

Thanks to the 12 ps/step delay generator they are particularly suited for timing application. Moreover, the multiple shapes capability can be used for pulse shape discrimination applications. The two channels can be correlated either with the same or different statistical distributions.

### Operating modes:

- **PULSER**

Classic pulser operation. The system allows to set the signal amplitude, the signal rate, and to choose between constant and Poisson distributed rate.

- **DETECTOR EMULATOR**

In the detector emulator operating mode, the system is able to emulate with high accuracy a radiation detection system from the detector output to its related front-end electronics. The user must provide: the signal shape distribution, the required energy spectrum, the time distribution, the noise characterization, and the baseline drift.

The signal shape can be generated either by using the system internal database, or using recorded shapes from the experimental setup. The same is true for the energy spectrum. It is possible to create several emission lines through the tool itself, or to import a file in the format of **CVS/ANSI N42.42**, or to use the internal database electronics. The user can choose a Poisson or any arbitrary time distributions. It is also possible to emulate white noise, 1/f noise, random walk, as well as interferences. The characterization of the baseline drift can be also added.

- **CORRELATED EVENT GENERATOR**

The instrument allows to generate correlated events with fixed time shift (time steps of 12 ps). The two signals can have either the same or different statistical distributions. Furthermore, it is possible to generate a subset of events according to a fixed energy spectrum, being statistical uncorrelated from the background events.

- **ARBITRARY WAVEFORM GENERATOR**

The instrument comes with 1M points of RAM memory per channel to store and then reproduce the events from pre-defined functions.

The Desktop Digital Detector Emulator is available in single (**NDT6800S**) or dual channel (**NDT6800D**) version. **The dual channel model allows the event correlation.**

USB 2.0 communication interface, Front panel USB connector.

Either NIM backplane or AC-DC power supply. The latter allows to use the crate stand-alone, without the NIM crate.

Active cooling system for non-cooled NIM crates.

The delay line for the time correlation is thermalized through a Peltier cell to minimize the thermal drift (temperature stability of about 0.03°C).

Software tool compliant with Windows OS. Shape and spectrum files import from any Digital Pulse Processors, Digitizers, and oscilloscopes. Model shape generation (with no noise) from input waveforms.

Programmable digital outputs: Trigger in, Trigger out, and Gate.

## Technical Specifications

### Energy emulation features

- Single line (65535 selectable levels)
- Spectrum emulation (16384 bins with 14 bit resolution)
- $\pm 4$  V output range
- 16 bit D/A converter

### Time emulation features

- Constant rate emulation
- Poisson distribution
- Programmable statistical generation of events (256 bins, 8 bit resolution)
- Up to 11 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
- 20 ns to 10 ms exponential decay time

### Signal shape

- 4096 points to store waveforms
- Arbitrarily programmable shapes
- Shape duration from 64 ns to 26  $\mu$ s (w/o interpolation) / 26 ms (interp.)
- Separated rising and falling edge interpolation
- Up to two separate shapes mixed on the same channel with independent statistic

### Noise emulation

- White noise emulation (BW 62.5 MHz)
- 1/f noise emulation
- Random Walk (baseline drift)
- Interference generation (e.g. possibility to record spikes from switching power supplies and inject in the output signal)
- Interference generated with fixed amplitude and frequency or randomly modulated in amplitude and injection time

### 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) (12 ps step);
  2. CH2 has its own statistics generator (i.e. different spectrum, different noise, etc.) but is triggered by CH1 (delayed by 12 ps 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.
- 12 ps step programmable delay (from 0 ps to 32  $\mu$ s), 18 FWHM, 60 ppm linearity
- Temperature stabilization of the delay line

## 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

- 500 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

- 1 M points/CH to store any arbitrary waveform
- Function generation: sin, square, ramp, saw, pulse, sinc up to 10 MHz

## Software and interfaces

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

## Ordering Options

Code	Description	
WNDT6800DXAA	NDT6800D - Dual Channel NIM/Desktop Digital Detector Emulator with channel correlation	RoHS

## Related Products

### DT4800



Micro Digital Detector Emulator

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### DT5800



Desktop Digital Detector Emulator

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### DT5810



Fast Digital Detector Emulator

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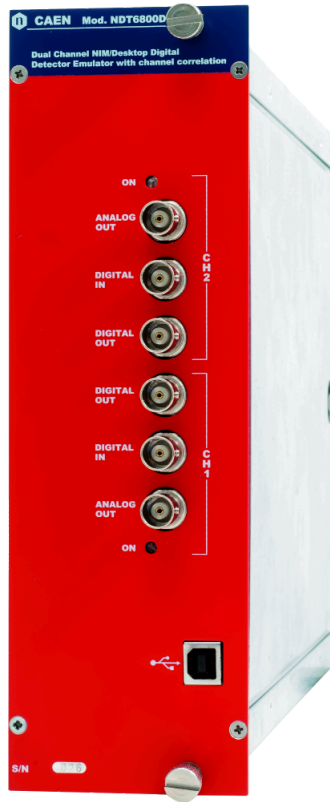
### DT4810



One-channel Micro Digital Detector Emulator

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# Gallery



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