Exvi Technologies
MEASURED BY TIME, DEFINED BY PRECISION

TDC-A

USB Time-to-Digital Converter · 4-Channel Time Tagger

TDC-A — four SMA inputs · USB · clock I/O

TDC-A is a low-cost, sub-nanosecond USB time tagger for practical timing work, with **22 ps typ. (40 ps max.) RMS jitter** and **4 ps bin width**. It is built for small labs, research setups, prototypes, and measurement-heavy projects that need real timestamp data without jumping to a much higher price tier. Operate it through the **exvi.timing** desktop GUI, or script the same measurements from **Python** or **C++**.

22 ps	4	4 ps	100 MCPS	14 MTags/s
RMS JITTER (TYP.)	CHANNELS	MIN. BIN	COUNT RATE / CH	STREAMING RATE

OPERATIONAL CONCEPT

1

Threshold discrimination

Events on each input channel are first compared against a user-settable voltage threshold.

Tip: optimizing the threshold based on the input signal can greatly improve timing resolution.

→

2

Timestamp generation

Valid pulses are converted into precise timestamps, or reduced on-device to count rates.

Tip: fixed timing offsets between channels are on the order of a few ns and can be compensated in software.

→

3

Host measurement & analysis

Timestamps are streamed over USB to the exvi.timing GUI or the Python/C++ API on Windows and Linux for correlation, histogramming, and application-specific analysis.

Tip: streaming raw timestamps can be computationally intense — on-device counts are far lighter when you only need rates.

KEY FEATURES

- **Four timing channels** — SMA, 50 Ω, AC-coupled, ~50 mV to 5 V input range.
- **High count rate** — up to 100 MCPS per channel for on-device counting, and up to ~14 M time-tags/s when streaming timestamps to the host.
- **USB interface and power** — all data and device power over a single USB connection.
- **Picosecond resolution** — 22 ps typ. (40 ps max.) RMS jitter with software-configurable bins down to 4 ps.
- **User-settable dead time** — tune the per-channel dead time to match your source and suppress re-triggering or after-pulses.
- **10 MHz reference-clock input (LVTTL)** — lock the tagger to an external 10 MHz standard (GPS-disciplined, rubidium, or lab reference) for low long-term drift and a shared, traceable timebase. 10 MHz is the de-facto reference across lab and RF equipment, and the 3.3 V LVTTL input accepts standard clock sources directly.

PLANNED multi-unit synchronization — operate up to four units as one, for up to 16 synchronized channels on a shared timebase · macOS and Android software support.

SPECIFICATIONS

TIMING PERFORMANCE

Timing jitter (RMS)	**22 ps typ. · 40 ps max.**
Timing jitter (FWHM)	**52 ps typ. · 94 ps max.**
Bin width	**Configurable, min. 4 ps****
Dead time	**User-settable, min. 4 ns***

CHANNELS AND RATES

Input channels	**4**
Maximum count rate	**100 MCPS / channel**
Maximum time-tag rate	**14 MTags/s**
Measurement modes	**Counts, streaming, correlation**

INPUTS AND INTERFACE

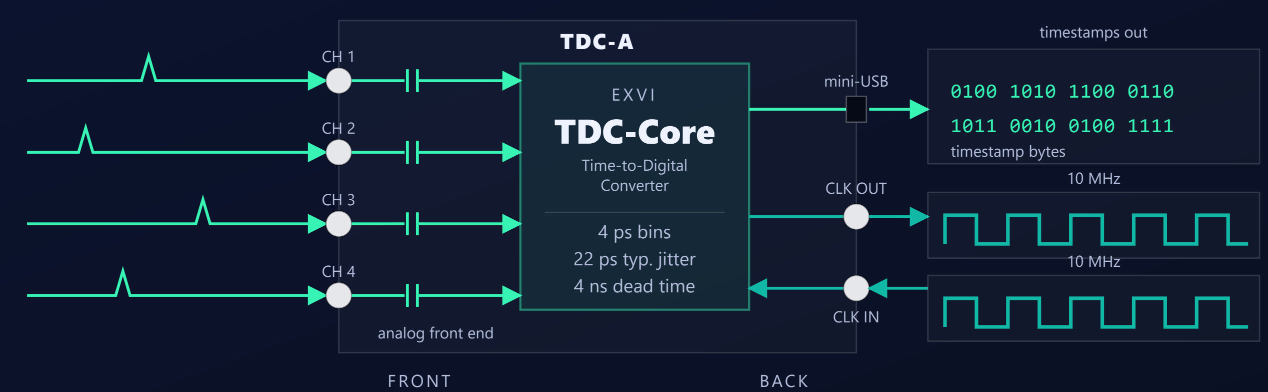
Data interface	**USB 2.0**
Input coupling	**AC coupled**
Input impedance	**50 Ohm**
Min. input amplitude	**~50 mV**
Max. input amplitude	**5 V**
Minimum pulse width	**4 ns**
Clock I/O (CLKIO)	**Internal; ext. 10 MHz; ext. 1 PPS**
Clock logic level	**3.3 V LVTTL (3 V TTL)**

**Jitter may be added for dead times below 20 ns.*
***Bin width is set in software, down to a minimum of 4 ps.*

SOFTWARE AND SYSTEM

Software	**exvi.timing (GUI)**
API	**Python and C++**
Operating systems	**Linux, Windows; macOS & Android planned**
Operating temperature	**10 to 35 °C**
Storage temperature	**5 to 45 °C**
Power draw	**~750 mW**

BLOCK DIAGRAM



Schematic overview — not to scale. The clock port can carry a 10 MHz reference or a dedicated synchronization signal for multi-unit setups.

KNOWN ISSUES

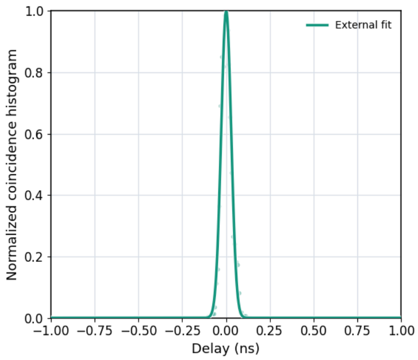
- **No LabVIEW or MATLAB drivers** — Exvi provides Python and C++ APIs only; native LabVIEW and MATLAB libraries are not supplied (both environments can call the C/C++ or Python API where integration is required).
- **Channel-to-channel jitter varies** — per-channel jitter is not identical across the four inputs. This is negligible for many experiments; for the tightest timing, select the best-matched channels.

CHARACTERIZATION

Measured cross-correlation and per-channel jitter, together with decoded streaming throughput versus input rate.

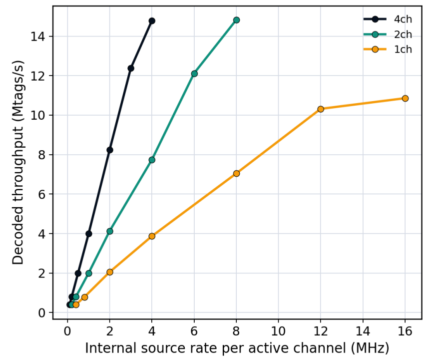
Cross-correlation

TWO-CHANNEL DELAY HISTOGRAM FROM STREAMED TAGS



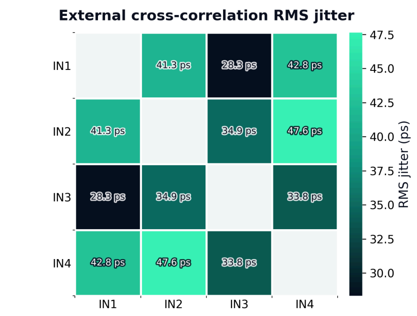
Streaming throughput

DECODED TAG RATE VS INPUT RATE — 1 / 2 / 4 CHANNELS



Per-channel jitter matrix (4×4)

PAIRWISE RMS JITTER, IN1–IN4



Matrix values are pairwise (two-channel) RMS jitter measured from the cross-correlation. For equal, independent channels the single-channel RMS jitter is the pairwise value divided by √2 ($\sigma_{channel} = \sigma_{pair} / \sqrt{2}$).

ORDERING & SUPPORT

COMMERCIAL

Base price	**$2,370 / unit**
Academic pricing	**15% (universities / research)**
Quantity discounts	**5% / 10% / 15% at 3+ / 5+ / 10+**
Warranty	**12-month limited**

APPLICATIONS & CONTACT

Applications	**Quantum optics, QKD, lidar, test & measurement**
Software	**exvi.timing · Python / C++**
Order & enquiries	**info@exvi.io**

Notes. Specifications are preliminary and subject to change without notice; characterization data is pending. TDC-A is a general-purpose instrument — the buyer is responsible for determining suitability for a given application, and no warranty of fitness for a particular purpose is implied. Sale is subject to Exvi Technologies' standard Terms & Conditions and 12-month limited warranty (exvi.io); exvi.timing software and device firmware are licensed, not sold. Country of origin: United States; the buyer is responsible for compliance with applicable export-control and sanctions laws. © 2026 Exvi Technologies, LLC. All rights reserved. “exvi” and the exvi mark are trademarks of Exvi Technologies, LLC.