

Wander Analysis PC Software

Simple TIE/TE, MTIE & TDEV Post-Analysis – Quick Guide



Long-term TIE/TE Capture, Export, and MTIE/TDEV Analysis

VeEX's TX-series test sets support a wander and/or phase (timing) data logging feature, intended for further post-processing of long-term TIE (Time Interval Error) or TE (Time Error) data. Depending on specific product capabilities and options, Wander Measurements may be supported in the following test modes: SDH, SONET, PDH, DS_n, SyncE, CPRI, IEEE C37.94, IEEE 1588v2 PTP and physical Clock Wander Analysis (1PPS, 10MHz, 1.544MHz, 2.048MHz, etc.).



The optional **MTIE/TDEV Wander Analysis** (Save TIE to USB) feature allow the TX-series to store large amounts of TIE or TE data, at standard sampling rates of up to 30 samples per second, directly to a USB memory stick. Although most of VeEX's modern test sets have built-in features that can perform the analysis on-the-fly, the **VeEX Wander Analysis** PC software for Windows® provides a better and larger user interface, with much more details. It can read the stored TIE/TE data, remove offset, quickly calculate MTIE and TDEV, and compare them to industry-standard and user defined Pass/Fail masks. This PC application comes very handy when analyzing multi-day clock stability analysis (>72 hours), since the test set's capacity is only limited by the available memory in the FAT32 USB memory stick.

To obtain a copy of **VeEX Wander Analysis** PC software (499-04-139), please login to www.veexinc.com (registration not required) and search for "Wander Analysis" or contact us at customercare@veexinc.com



Figure 1: TIE/TE view with basic offset calculations

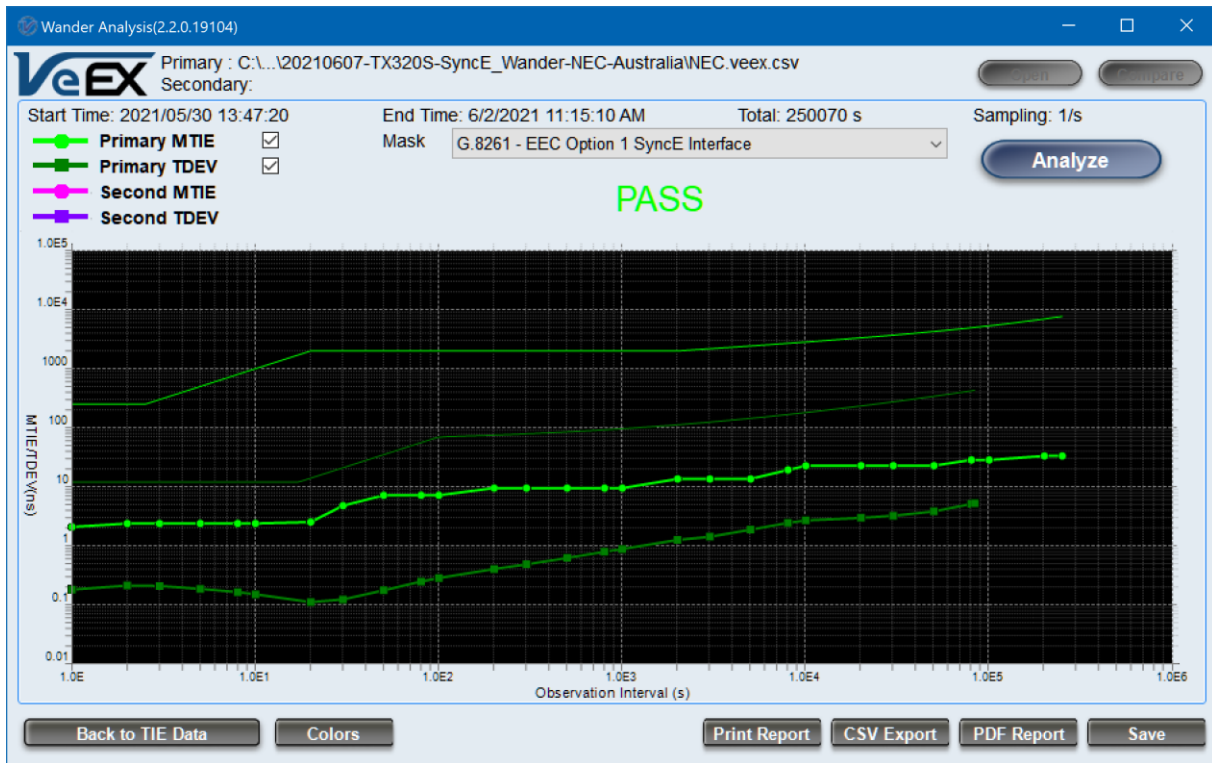
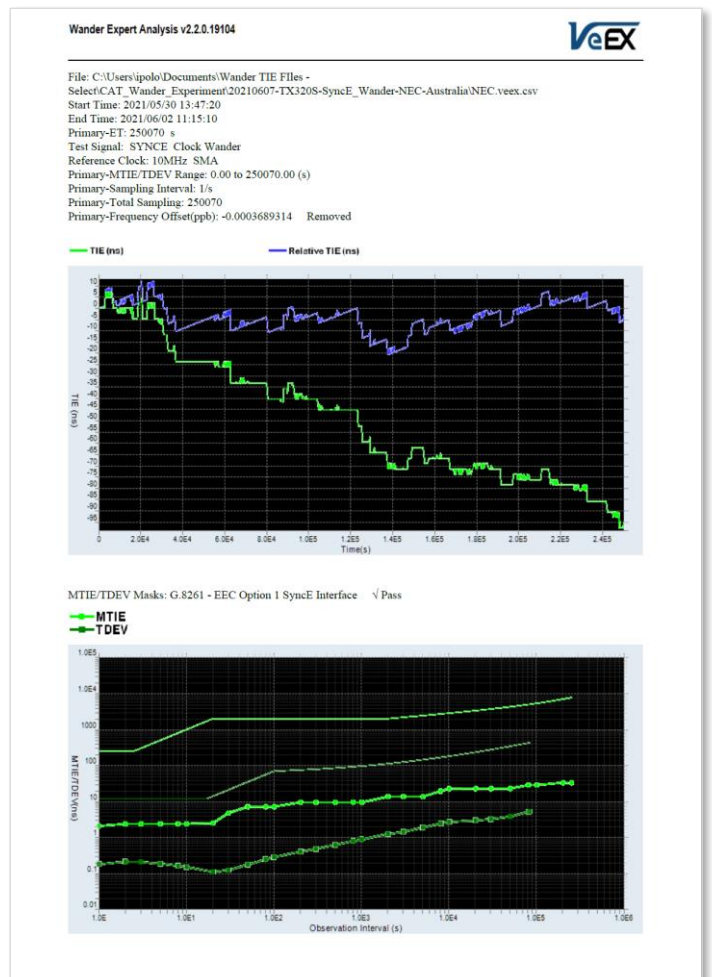


Figure 2: MTIE/TEDEV post-analysis view, with PASS/FAIL indication

MTIE and TDEV Wander Analysis PC Software

- Simple and intuitive easy-to-use GUI.
- Fast processing of TIE/TE data into MTIE and TDEV analysis. Results can be saved for immediate access, so subsequent analyses are not necessary.
- Includes all major recommended Masks, applicable to field testing, as well as easy-to-program user-defined masks.
- Frequency offset calculation (in ppb) and removal.
- Frequency drift calculation.
- Zoom in/out and sectional (partial) analysis.
- TIE/TE trace comparison (up to two traces).
- PDF report generation.
- Export to simple CSV file formats, for users who want to perform their own post-analysis or translate to other vendors' post-analysis application format (e.g., via scripts).
- Fully resizable window, to accommodate any screen size, offering the best detail level possible.
- Compact stand-alone software (no installation required). It can even be carried around and run directly from the USB memory stick used for TIE and TE files.
- Marker with vTEI/TE value, relative sampling time and ToD timestamping (no manual event time calculations required).
- Customizable colors.
- Windows 7, Vista, XP, 8.1, and 10 compatible.



Installing the VeEX Wander Analysis PC Software

The MTIE and TDEV post-processing software does not require installation.

- Download a copy of the [VeEX_Wander_Analysis.zip](#) package to a PC or USB drive.
- Unzip the folder and move the content to the desired destination (HDD or USB Flash Memory).
- Create a more accessible shortcut for the [WanderAnalysis.exe](#) on the desktop or desired destination.
- Create a folder to store the TIE files generated by VeEX's test sets (e.g., 'VeEX Wander Results', 'VeEX_Phase_Results').

Generating TIE (wander) data log files

- VeEX's TX-series test sets must have the [Wander Measurement](#) option (related to the desired link technology) and/or the [Clock Wander & Phase Analysis](#) to measure TIE or TE, and the associated [Wander TIE/TE Logging and Export](#) licenses activated in order to export real-time TIE or TE data to a USB flash drive. The advantage of exporting to a physical flash drive is that in the event of prolonged loss of power, the long-term results won't be lost, even if the test get interrupted.
- Make sure there is a supported reference clock source available (PRC or PRTC) or the test set has a locked built-in GNSS Receiver and/or Atomic Clock hardware options. The supported reference clock types depend on the type of test set, options, test interface, and protocol selected.
- Configure the test set to match the link or clock signal under test (Test Signal)
- Plug any standard USB memory stick with FAT32 formatting and no partitioning to the test set, to store TIE or TE data.
- This feature does not require a lot of memory, by today's standards. In VeEX native format, it uses up to 270 bytes/s (<1 MByte/hr, <24 MByte/day) when set to 30 samples per second, so make sure the USB memory has enough capacity to store the whole test. Users can also choose to record in more open CSV formats.
- In the Wander Measurement feature select "Save to USB", then press Start the test and assign a meaningful name to the file. It is recommended to use descriptive file names, including the date, so they can be fully identified later on.
- Once finished. Move the USB Flash Drive to the PC and launch the VeEX Wander Analysis PC software.

Using the Application

- Launch the [WanderAnalysis.exe](#) application, from the HDD or USB memory stick. If the application is stored in the memory stick where the TE and TIE data is saved, then users would have the convenience of launching it from any Windows PC.
- Use the [Open](#) button and the Windows file browser to find the TIE or TE file you want to analyze. For faster search, the application remembers the last folder used.
- The file containing the TE or TIE data may be labeled with a generic [mtie](#) or [phase](#) name. There are other supporting files in the folder, but the one to open is the mtie file.
- Use the [Compare](#) button if you want to load a second TIE or TE file for comparison purposes.
- Once the trace loads, the graphs is displayed on the screen and basic calculations are displayed (e.g., frequency offset).
- Use the cursor to click on different datapoints to get their time and TIE or TE values. Then use the left and right cursor keys (or < and > buttons on touch screens) to fine-tune the position.
- Use the ZOOM + and – buttons to zoom in and out, focusing on the current cursor position.
- Click, hold and drag the cursor to select (isolate) a data range to be analyzed, or you can enter the start and end points and set them with the [Start](#) and [End](#) buttons. The frequency Offset, Drift, MTIE and TDEV are calculated based on the selected sub-range of data. Use the [Reset](#) button to go back to the full trace range.
- Use the [MTIE/ TDEV Analysis](#) button to move to the post-analysis page. Select the applicable Mask from the pull-down menu, and press the [Analyze](#) button.
- Use the check-boxes to decide whether you want MTIE and/or TDEV analysis. In certain cases, users would be interested in MTIE only, so uncheck the TDEV evaluation.
- Use the [Save](#) button to update the file with the analysis data, so no recalculation is required next time the file is opened, unless a different mask is applied.
- Use the [CSV Export](#) button to convert proprietary VeEX file format into more open VEEEX.CSV file format. The resulting CSV files can also be opened with this application. This feature may include best-effort export functions to other vendors' formats or users can use the VEEEX.CSV to create their own converter scripts.
Note: Version 2.2.0 (July 2021) includes an exploratory/beta (as-is) version of the simple CLNX.CSV export format, wich may require manual editing for basic compatibility with the CAT post-analysis software. Refer to the Release Notes for further details.
- The [PDF Report](#) button generates a simple PDF file, based on the current view, range and settings.



Creating User-defined Masks

If a required mask is not yet listed on the pull-down menu, users can easily convert formulas from specific standards to a simple text file. Save any new or customized mask in the **\Mask** folder. Masks can be opened and edited with any basic text editor, like Notepad. Use a different file name if you make any modifications to the ones provided in the library. Do not add the .txt extension.

For example, to define the MTIE and TDEV masks listed in ITU-T G.823 tables 10 and 11:

Table 10/G.823 – Network limit for wander at SEC interfaces expressed in MTIE

Observation Interval τ (sec)	MTIE requirement (ns)
$0.1 < \tau \leq 2.5$	250
$2.5 < \tau \leq 20$	100τ
$20 < \tau \leq 2\,000$	2 000
$\tau > 2\,000$	$433 \tau^{0.2} + 0.01 \tau$

Table 11/G.823 – Network limit for wander at SEC interfaces expressed in TDEV

Observation Interval τ (sec)	TDEV requirement (ns)
$0.1 < \tau \leq 17.14$	12
$17.14 < \tau \leq 100$	0.7τ
$100 < \tau \leq 1\,000\,000$	$58 + 1.2 \tau^{0.5} + 0.0003 \tau$

You would write:

Mask Definition File Content	Description
G.823 - SDH Equipment Clock (SEC)	← Mask Label, as it will be displayed in the pull-down menu
MTIE	← Defines the start of the MTIE definition section
$0.1 < x \leq 2.5, 250$	Write formulas, replacing τ with x , and use space to separate formula elements
$2.5 < x \leq 20, 100 * x$	Use * for multiplication
$20 < x \leq 2000, 2000$	Use ^ for exponentials
$x > 2000, 433 * x ^ 0.2 + 0.01 * x$	Use <, <=, and > to define the ranges
TDEV	← Begins TDEV definition section
$0.1 < x \leq 17.14, 12$	Use comma to separate range from values and formulas
$17.14 < x \leq 100, 0.7 * x$	Use spaces between all formula elements
$100 < x, 58 + 1.2 * x ^ 0.5 + 0.0003 * x$	Write negative exponentials in parenthesis, e.g. for $\tau^{-0.5}$ use $x ^ (-0.5)$
END	← End of file

About VeEX

VeEX Inc., a customer-oriented communications Test and Measurement company, develops innovative test and monitoring solutions for next generation telecommunication networks and services. With a blend of advanced technologies and vast technical expertise, VeEX products address all stages of network deployment, maintenance, field service turn-up, and integrate service verification features across Copper, Fiber Optics, CATV/DOCSIS, Mobile 4G/5G backhaul and fronthaul, next generation Transport Network, Fibre Channel, Carrier & Metro Ethernet technologies, WLAN and Synchronization.

