

## Introduction

WAVECREST Corporation has contributed significantly to the timing analysis market through our *Virtual Instruments™* line of software products. These software products have revolutionized the way the industry looks at Jitter. As our understanding of timing anomalies expands, new horizons are taking shape in the area of timing-based Signal Integrity. On this queue, WAVECREST Corporation announces the latest advancement in timing analysis software: *Virtual Instruments Signal Integrity™*, v5.0 (VISI™ 5.0). WAVECREST Corporation has developed several tools that can be used to understand/characterize such timing phenomena as: signal cross-talk, Deterministic Jitter (DJ), Random Jitter (RJ), Periodic Jitter (PJ), Edge placement predictability, and much, much more.

VISI 5.0 comes in two different configurations: Advanced dataCOM Analysis Tools and Advanced Clock/PLL Analysis Tools. Both packages take advantage of our new TailFit™ technology for reliability modeling and timing misplacement probability modeling. Advanced dataCOM software adds the capability of analyzing data patterns, in addition to clock patterns, for ANSI compliance testing of Fibre Channel, Gigabit Ethernet and IEEE1394b (Firewire®) devices.

## Introducing: TailFit™ Technology

TailFit technology was developed to improve our understanding of the many components of jitter. What we have learned from our experience in timing analysis, not all timing measurements are Gaussian. In fact most digital circuit timing measurements are not pure Gaussian. Figure 1.1 is a display of a typical Histogram of timing measurements. The horizontal axis is the time measurement and the vertical axis is the number of occurrences for that particular measurement. In this display, the dotted lines indicate the representative Gaussian distribution that best approximates the extremities, or tails, of the distribution. Using our patent pending TailFit algorithm, we can determine the standard deviation, or 1s, for the left side as well as for the right side of this distribution. Knowledge of the tails enables VISI to accurately estimate the probability timing misplacement in both the positive and negative direction. VISI then simplifies the analysis process by taking this information and plotting the Probability Density Function, or Bathtub Curve.

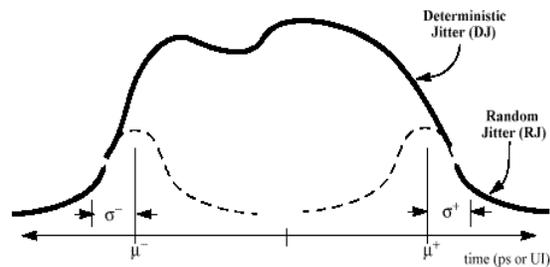


Figure 1.1 – Typical Histogram of a timing measurement.

Figure 1.2 is an example of a bathtub curve.

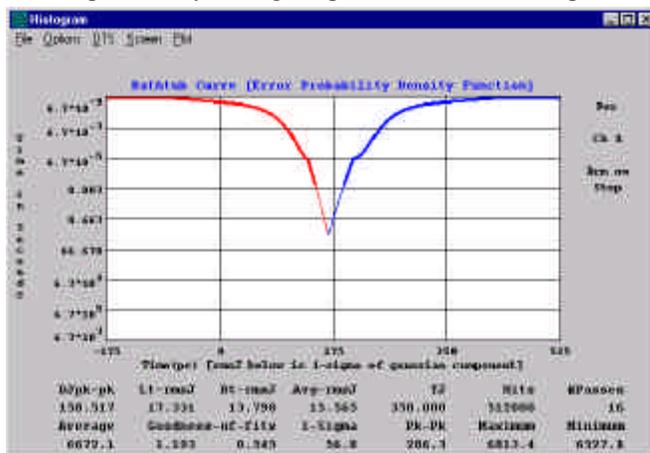
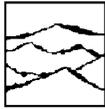


Figure 1.2 – Bathtub Curve Example



## New Functionality

Spectrum Tool has now become Histogram Tool. The biggest change for this tool is the inclusion of TailFit™ for reliability modeling. Figure 2.1 shows a typical Histogram Plot with the TailFit™ modeling overlaid on the distribution. Notice the Red and Blue high lighting on the extremes of the distribution. These are the sections of the distribution plot that are fitted for Random Jitter (RJ) estimation. This is the basis for the overall reliability modeling. Figure 1.2 is the bathtub curve that is generated based on the histogram in Figure 2.1

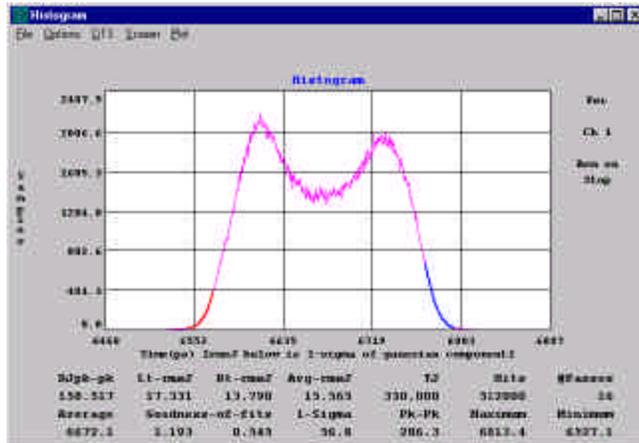


Figure 2.1 – Histogram Tool with tails highlighted.

## dataCOM

In addition to adding TailFit to the clock analysis software, TailFit has been added to the suite of dataCOM tools to improve the accuracy of Random Jitter estimates. This has been a critical step in providing an accurate estimate of Total Jitter (TJ) under all jitter circumstances.

New to the data COM software package are the Eye Histogram Tool and DDJ vs. Unit Interval plot. These new tools enhance the coverage of the current tool set.

**Eye Histogram Tool** – This tool is used for advanced clock to data analysis. The user can independently analyze rising edge and falling edge histograms, use patent pending TailFit algorithm to calculate Random Jitter (RJ) component and Deterministic Jitter (DJ) of data and clock signal independently. And, the same

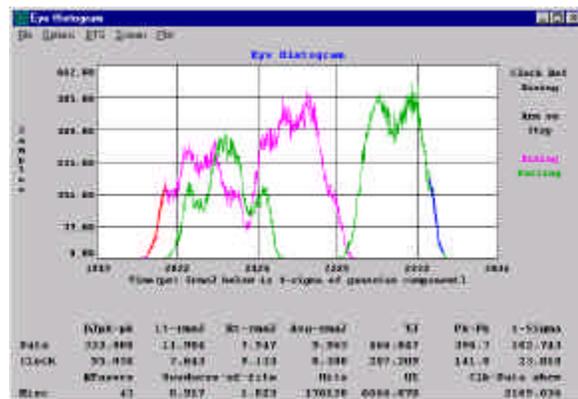


Figure 3.1 – Eye Histogram Tool.

clock to data jitter values that an oscilloscope would show are displayed for easy correlation. As an added feature, the RJ and DJ information can be displayed in a Bathtub curve for error probability testing. Again, the bathtub curve can also be generated from the histogram data. Figure 3.1 is the Eye Histogram tool and Figure 3.2 is the resultant Bathtub curve.

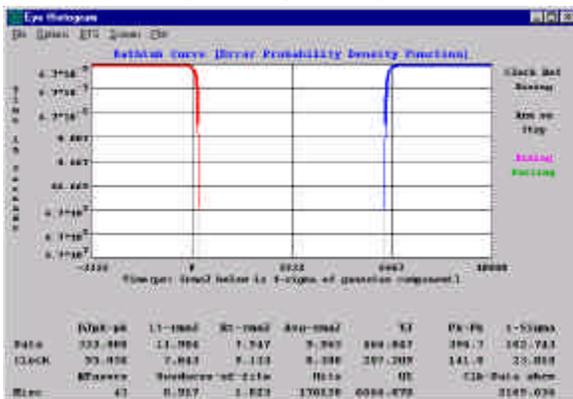
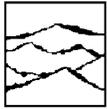


Figure 3.2 – Eye Histogram Bathtub Curve



DDJ vs. Unit Interval – This plot allows the user to analyze pattern dependencies on relative to a given pattern marker. This tool also incorporates DSP filters that can be used to analyze the effects of various bandwidth limiting media. Figure 3.3 is a plot of DDJ vs. Unit Interval.

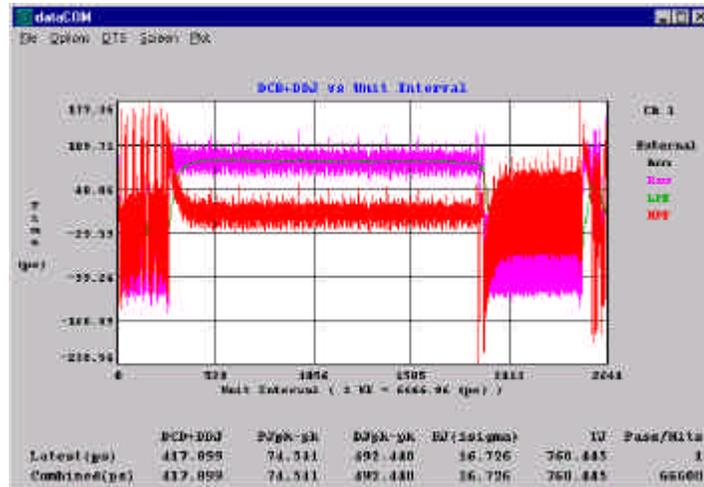
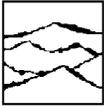


Figure 3.3 – DDJ vs. Unit Interval Plot with Filter functions enabled.

### Existing Tool Improvements:

The following is a list of bug fixes incorporated into VISI™ 5.0 with respect to Virtual Instruments™ 3.24. Many of the features listed below enhance the functionality of our existing tool set. For more information, please review the VISI 5 User’s Manual.

- Add first order DCD+ISI calibration to dataCOM learn mode, external arm only.
- Add header offset to dataCOM, allows user to skip past header in data stream - ext. arm only.
- Increase Periodic Jitter frequency range for dataCOM when using Auto-arming.
- Change default for UI pattern repeat to twice that of ISI+DCD measurement and warn if it is not.
- Use Bit Rate instead of Unit Interval for dataCOM Window.
- Add cycle STOP button to dataCOM Acquire Status.
- Use actual PDF to generate bathtub curves.
- Calculate Total Jitter directly from bathtub curves.
- Indicate current Bit Error Probability and Sample Population by line weight and color in bathtub plots.
- Gray unused dialog box selections.
- Disable filter menu for windows wherever it would not be used.
- Restore front panel setting after calibration is performed.
- Obtain oscilloscope Pulse Find dialog values based on channel selection.
- Add user defined oscilloscope trigger level.
- Improve acquisition robustness, validate and automatically re-acquire if corrupt packet is detected.
- Disable auto-serial polling on startup to eliminate intermittent GPIB errors.
- Add support for DSM16.

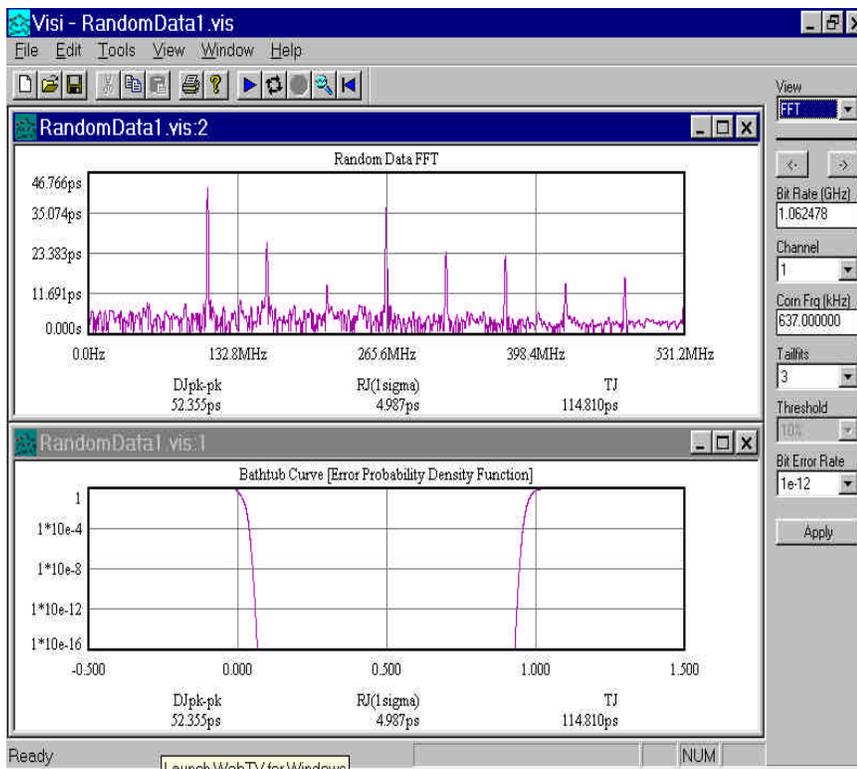


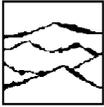
**Addendum to 5.0 Release Notes  
Virtual Instruments Signal Integrity, v5.1, Enhancements**

**Markerless/Clockless Measurements:**

Run Total Jitter (TJ), Random Jitter (RJ) and Deterministic Jitter (DJ) for ANSI specification compliance analysis, with or without clocks or markers. The VISI Random Data Tool can analyze data signals without a clock or marker. The look and feel of this window is in a new format compared to the core VISI™ 5.1 software.

*Note: Currently, the Random-Data execution speed is rather slow. Future refinements in this routine will increase its speed significantly.*





**Effective Jitter Calculation:**

The OPTION window for the dataCOM and Eye Histogram tools provides for the selection of an “Effective DJ and RJ” calculation. This is the DOUBLE DELTA calculation as discussed in the MJS Annex A. Selecting the “Effective DJ and RJ” option approximates the same DJ and RJ values received from reversed decomposed BERT results.

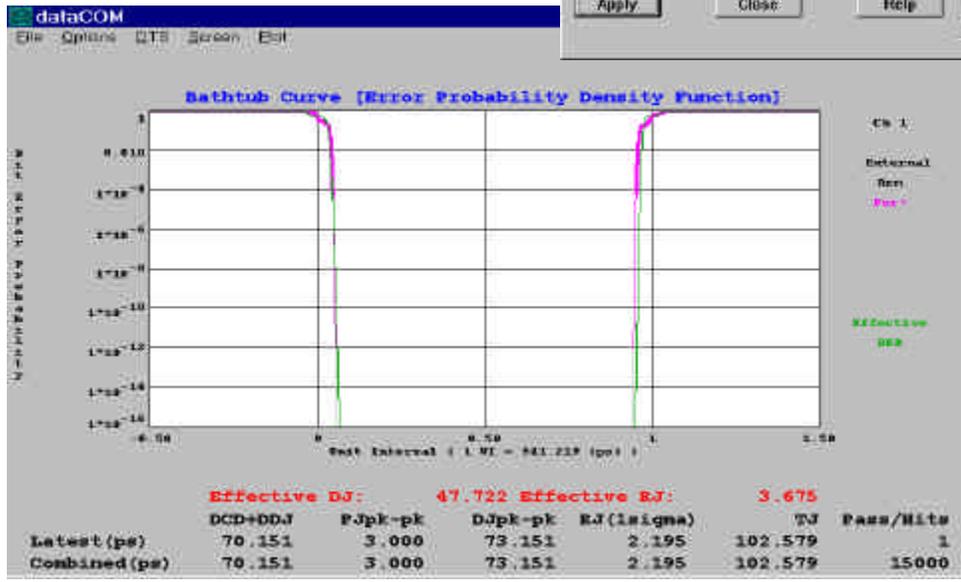


Figure A.2 – Effective Jitter Options Selection

**VISI™ 5.1 dataCOM Tool Enhancements:**

VISI 5.1 boasts a significant improvement in calculation speed from VISI™ 5.0. For example, in version 5.0, running “cjtpat” took about 30 seconds. In version 5.1, it takes 5 seconds. A K28.5 pattern runs almost instantly in 5.1 compared to about one second in version 5.0.

In addition to speed improvements, the dataCOM tool in version 5.1 can now handle a repeating pattern who’s payload is followed by a varying number of idles, as in the case of linking multiple re-timers with slightly different clocks speeds.

**Additional Tool Improvements:**

The following is a list of bug fixes included with VISI 5.1 with respect to VISI 5.0. Many of the features listed below enhance the functionality of our existing tool set.

- Re-label the Digital Switching Matrix (DSM) channels.
- Make DSM selections update all windows.
- Make all bathtub curve orientations the same.
- Fix wrong RJ saved to data file when TailFit™ is enabled.
- Improve total jitter (TJ) calculation.