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LAB Briefs

Eye Diagram Analysis Tool

Persistence Histograms Measure Eye Diagram Statistics

LAB in PDF format

Persistence histogram functions, a feature in the jitter and timing analysis package, offer an easy way to analyze eye diagrams. While persistence displays, such as eye diagrams, offer fast qualitative views of signals, they are often hard to quantify. Persistence histogram functions allow the user to specify a narrow vertical or horizontal cross-section, or "cut", and show the distribution of data points in that range. The functions are derived from the pixel maps of existing persistence displays and do not require re-acquisition of the data.

An example of horizontal persistence histogram display is shown in Figure 1. The top trace (Channel 2) is the acquired eye diagram. Multiple signals have been acquired and stored using color-graded analog persistence. This display is typical of most eye diagrams, and shows horizontal closure of the eye due to timing variations and vertical closure due to noise contamination.

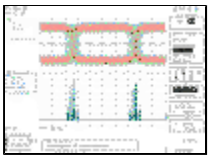

Figure 1 - The horizontal persistence histogram shows distribution of transitions in an eye diagram

Trace A is a horizontal persistence histogram function showing the distribution of the edge transitions in time. The associated menu shows the set up, including the location and width of the horizontal cut used to specify the area to be analyzed. Note that the region be analyzed is shown on the waveform between the horizontal dashed lines on the eye diagram.

The analysis function uses the location and number of pixels within the selected region to calculate the histogram. The function is automatically

scaled to match the horizontal time scale of the eye diagram. After the data is extracted from the persistence display, it can be analyzed using cursors or the existing statistical parameters available in the jitter and timing analysis option.

While the same measurements can be made with conventional, parameter based, histograms the persistence histogram is much easier to set up. Persistence histograms, derived directly from the eye diagram, are more easily interpreted.

The second type of persistence histogram is shown in Figure 2. This figure shows a vertical persistence histogram used to study a PDC (Japanese cellular phone standard) communications signal.

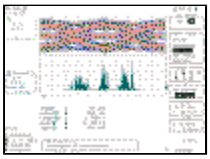

Figure 2 - A vertical persistence histogram and associated statistical parameters

A vertical analysis region is controlled using the setup menu to specify the width and location (center) of the analysis region. The area being analyzed is outlined by two vertical bars on the eye diagram. The resulting histogram is displayed horizontally below the eye diagram.

This histogram function is further analyzed using statistical analysis parameters. The average, standard deviation, range, maximum population, and peak location are shown in the example.

Persistence histograms are an easy to use and intuitive, intermediate analysis tool for evaluating eye diagrams and related persistence displays.