# Visualizing Signal Variations
Persistence Trace Function Shows Statistical Limits

Persistence trace functions, a new feature in the jitter and timing analysis option, offer an easy to use method for analyzing signal variations such as timing jitter and noise. While persistence displays, such as eye diagrams, offer fast qualitative views on signal jitter they are often hard to quantify. Persistence trace functions extend the usefulness of persistence displays by clearly showing the average, standard deviation, and range of waveform variations. The functions are derived from existing persistence displays and do not require re-acquisition of the data.

An example of persistence trace displays is shown in figure 1. The top trace (Channel 2) is the acquired persistence display. The pulse shows a variation in the amplitude and the color variations of the color graded analog persistence display indicate the probability distribution of amplitude values.

 Trace A is the persistence trace average function showing the mean amplitude.

Trace B is the persistence trace sigma function. It shows the limits of signal variation corresponding to ± 1 standard deviation (± 1 σ). The user can set the limits using the "scale to" entry
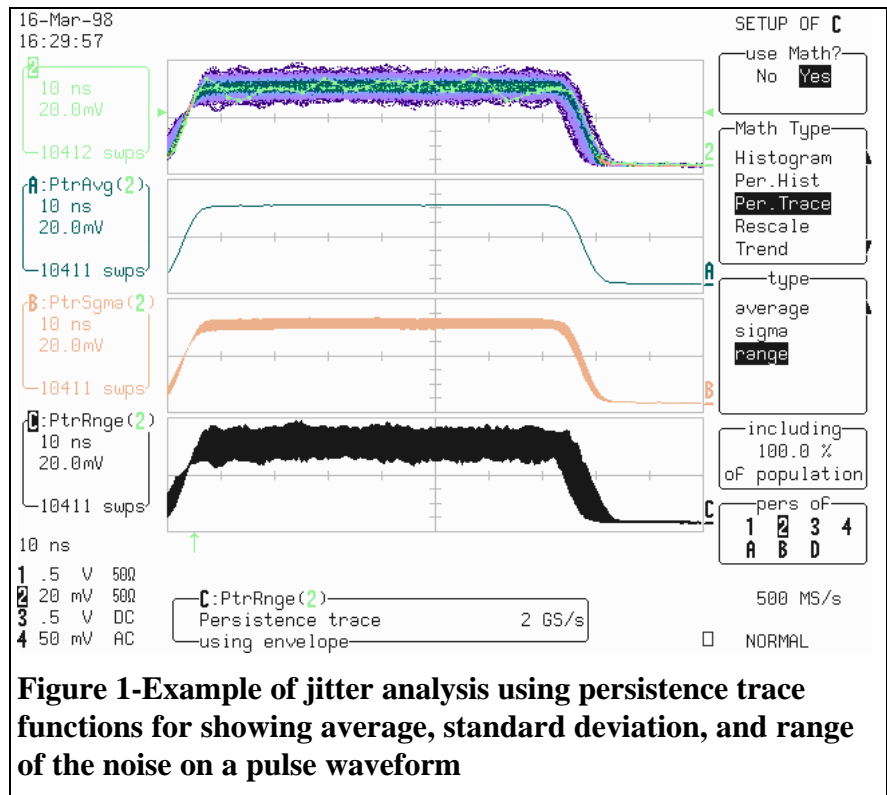
Figure 1-Example of jitter analysis using persistence trace functions for showing average, standard deviation, and range of the noise on a pulse waveform

field. Limits can be set in the range of 0.5 to 10 σ.

The bottom trace, trace C, is the persistence trace range function. It shows the maximum limits of signal variation equivalent to the peak to peak value. In the persistence trace range setup the user can limit the percentage of the total population used to generate the function from 0.5 % to 100.0 %.

The persistence trace functions are based on multiple waveforms acquired and stored in a persistence map. The sample locations on each acquired trace are de-

termined with 10 ps resolution. This results in a displayed trace with a maximum effective sampling rate of 100 GS/s

Using the persistence trace functions the user has an intermediate analysis tool between the basic persistence display and the more rigorous histogram functions. It is a graphic, easy to use technique for quantifying signal variations.