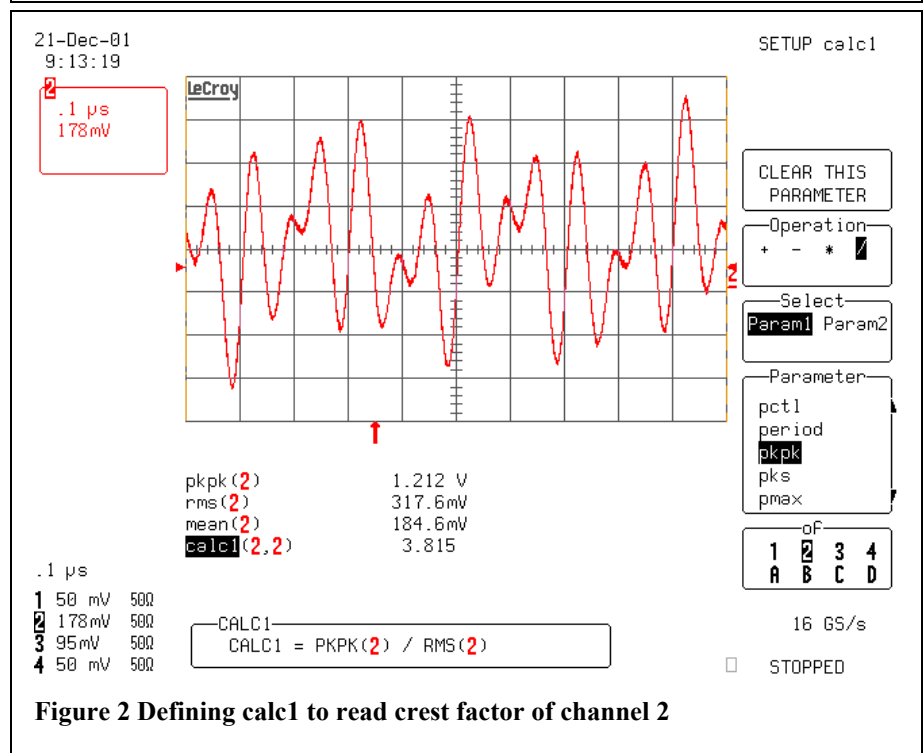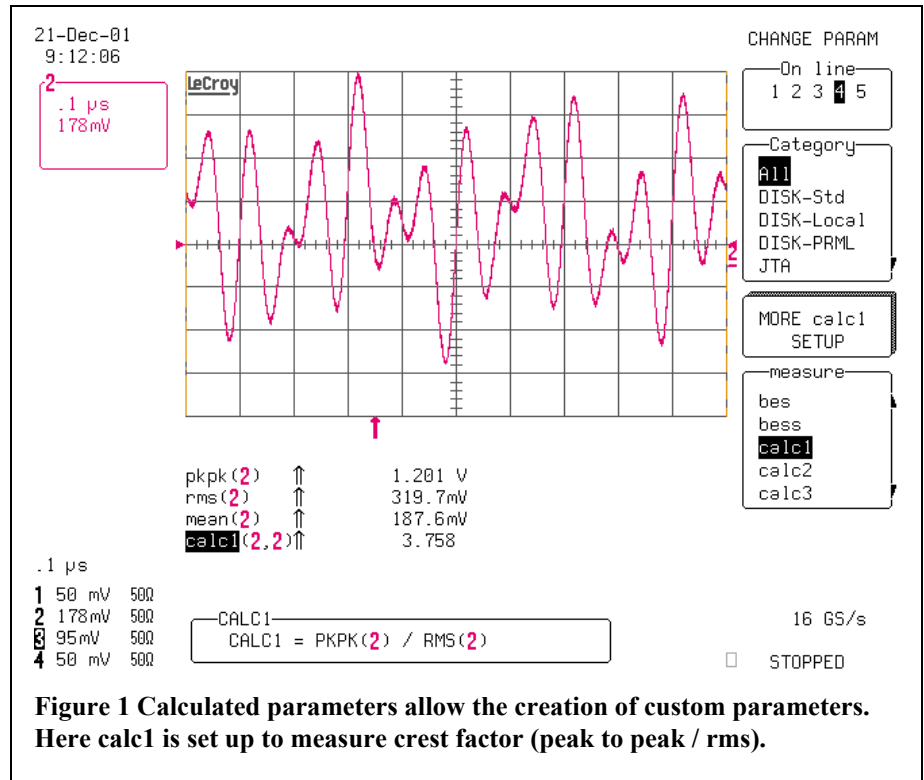# Parameter Mathematics
Custom Measurement Parameters Using Parameter Math

Parameter math allows scope users to create custom parameters based on simple arithmetic relationships of existing parameters. This feature allows users to extend the original complement of measurement parameters based on measurement needs.

As an example, suppose you need to measure crest factor of a waveform. Traditionally, you would select the peak to peak and rms parameters and manually compute the ratio of peak to peak to rms. Figure 1 shows the use of parameter math to configure crest factor as a calculated parameter. The list of custom parameters includes 5 calculated parameters called calc1 – calc5.

Selecting the calculated parameter, calc1, from the change parameter menu allows us to set it up as shown in figure 2. Here, the parameters, source waveform(s), and math operation can be selected. The calc1 parameter has been set up to display the ratio of peak to peak to rms of channel 2. This is summarized in the calc1 dialog box under the waveforms display grid.

The five calculated parameters compute new parameters based on any two parameters operating on any combination of the acqui

Figure 1 Calculated parameters allow the creation of custom parameters. Here calc1 is set up to measure crest factor (peak to peak / rms).

Figure 2 Defining calc1 to read crest factor of channel 2

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sition channels or math/zoom traces. The source parameters do not have to be displayed.

In figure 3 we provide an example of setting up a direct measurement of the modulation index of an FM signal. We have performed phase demodulation using the JitterTrack™ of time interval error (TIE) of the input signal from channel 2. Differentiation and rescaling convert the TIE function into the demodulated FM signal. In figure 3 the TIE function is multiplied by the carrier frequency of 400MHz. This results in a display of frequency deviation versus time. Since for FM modulation index we need to take the ratio of ½ the peak to peak frequency deviation we also must divide TIE by 2. All this is done in trace D using the rescale function to multiply by 2 E^8 (400 MHz/2). In general, all additive or multiplicative constant operations in the calculated parameters require the use of the rescale function. In instances such as this one, the rescale operation is required anyway.

In figure 4 we illustrate the setup of the calculated parameter, calc5, used to read FM modulation index by taking ½ the peak to peak frequency deviation divided by the modulation frequency. Both parameters are derived from trace D.

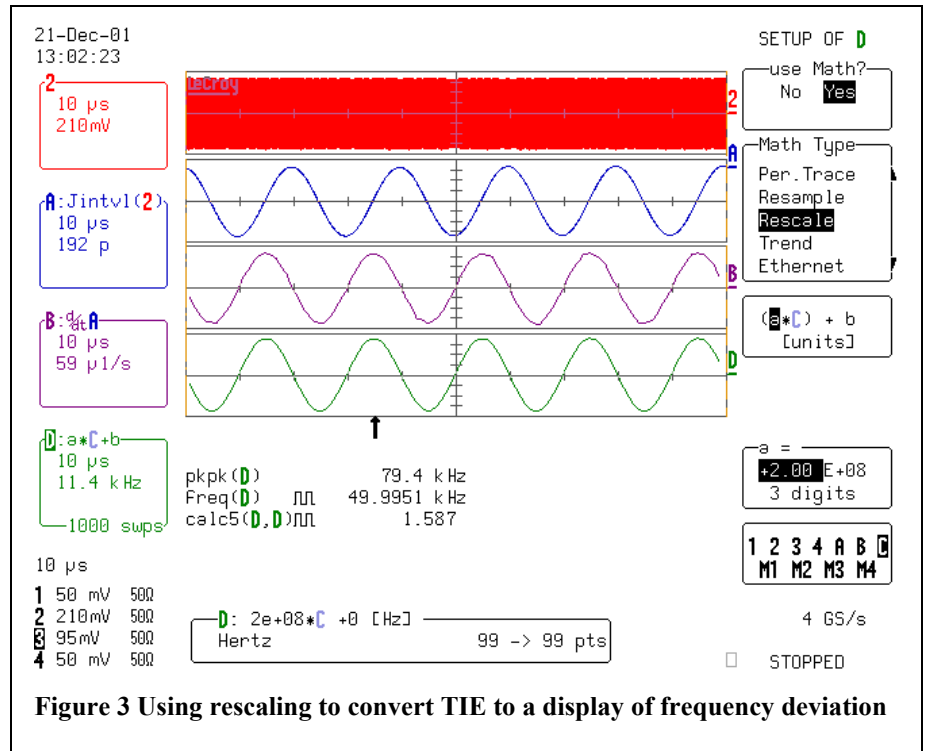Parameter math is available with firmware version 9.1.0 in the

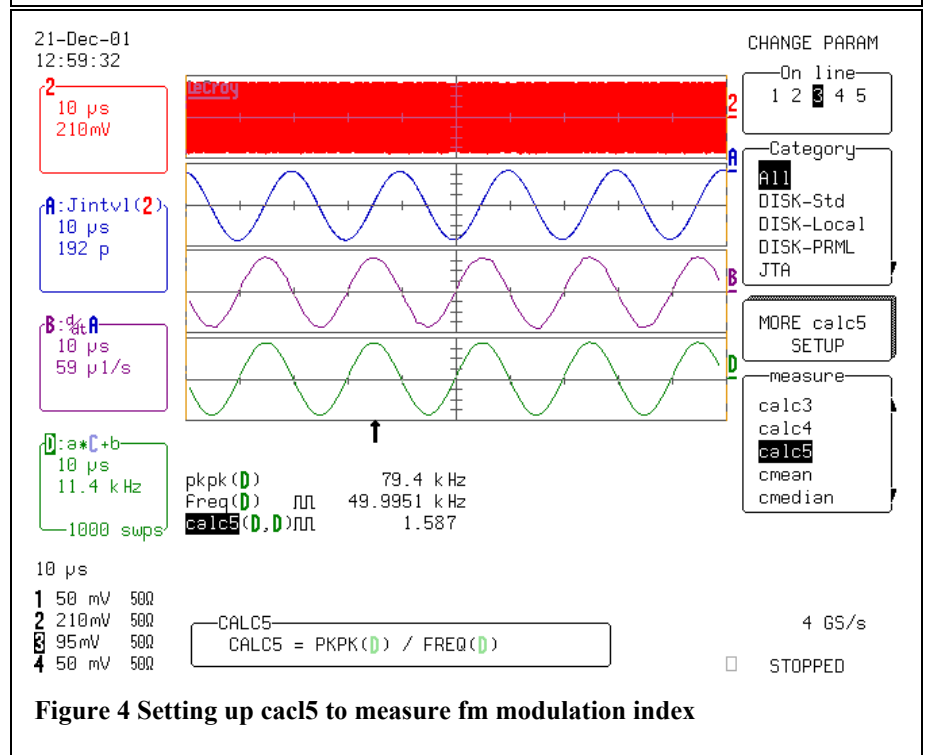**Figure 3 Using rescaling to convert TIE to a display of frequency deviation**

Figure 4 Setting up cacl5 to measure fm modulation index

LeCroy Waverunner scopes with the WAVA option and WavePro scopes with the WAVAPRO option.