

DESCRIPTION

Pscope is a data collection program for use with Linear Technology ADCs. Compatible with DC718B/C, DC890B and DC1371A controllers this software is capable of evaluating such AC specs as SNR, THD, S/(N+D) and SFDR. Additionally Pscope can evaluate spread spectrum tests such

as ACPR and two-tone tests like IMD third order intercept. Data rates as fast as 250Msps (135Msps with DC718B) are possible using Pscope. DC1371A is used for very high frequency serial interfaces. Many display, data capture size and windowing options are available.



Figure 1. Pscope Icon

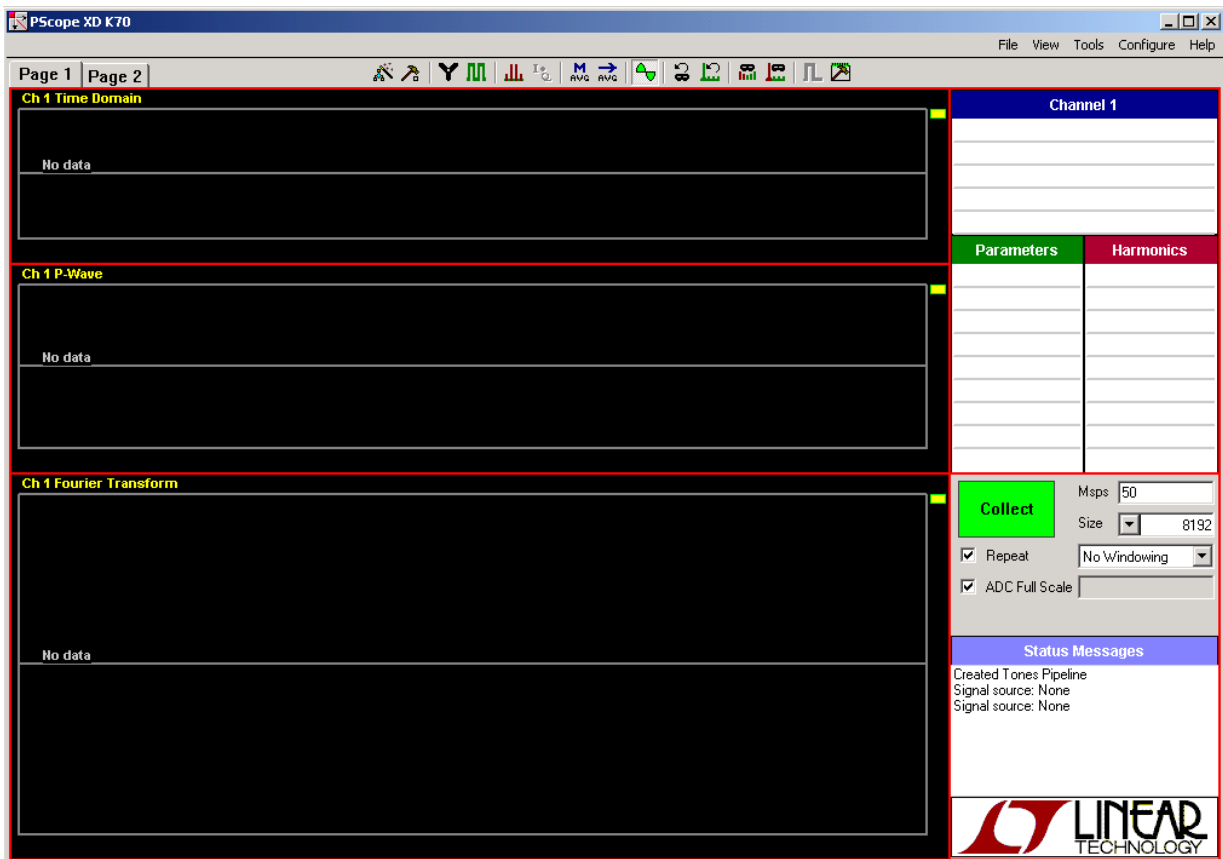


Figure 2. Pscope Startup Screen

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QUICK START PROCEDURE

Download Pscope from

www.linear.com/designtools/software.

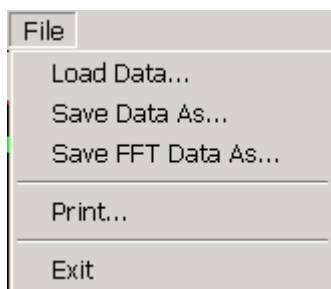
Install the software according to the directions provided in Appendix A. After installing the software, attach the controller board to the computer with a USB cable. Connect the ADC demo board to the controller board and apply necessary power (see demo board manual for connection details) to the ADC demo board. Double-click the Pscope icon (Figure 1) to start the program. You should see something similar to Figure 2 on the screen.

The Pscope software should recognize the ADC demo board and configure itself automatically. The status message in the lower right portion of the window should indicate the controller board and demo board detected by Pscope. Click the Collect button to begin acquiring data. The Collect button then changes to a Pause button which is used to stop data collection.

MENU BAR OPTIONS

Menu bar options can only be accessed when data acquisition is paused.

FILE



Load Data...

Load saved data (.adc format) to display.

Save Data as...

Save raw captured data (.adc format) for later display or for use in Excel. Data is saved in a comma delimited format which can easily be read by a variety of programs.

Save FFT Data as...

Save data from fft window for use in Excel or other programs.

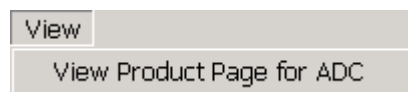
Print...

Prints current Pscope window along with comments.

Exit

Terminates the Pscope program.

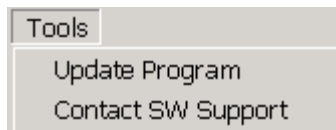
VIEW



View Product Page for ADC

Displays product page for ADC contained on the ADC demo board from the Linear Technology web site. Data sheet, reliability data and applications information are available.

TOOLS



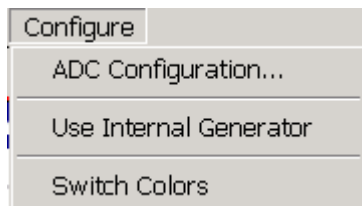
Update Program

Checks LTC web site and automatically updates Pscope if a newer version is available.

Contact Software Support

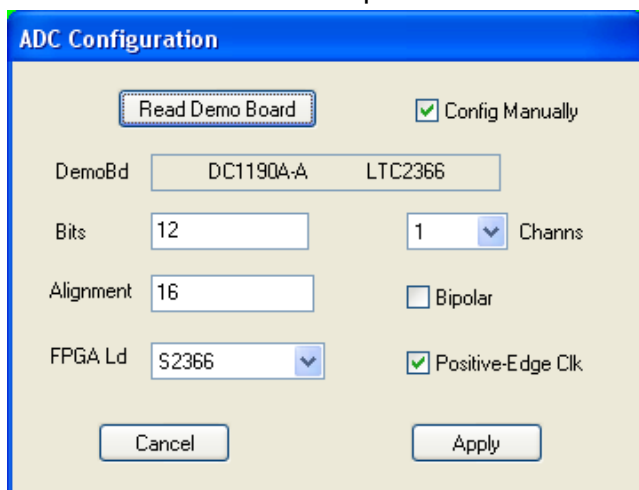
Provides email contact information for Pscope questions or suggestions.

CONFIGURE



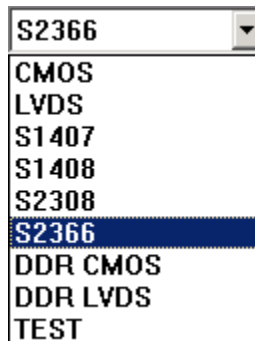
ADC Configuration...

Allows the ADC parameters to be manually configured. Options include number of bits, number of channels, alignment of the data in the 16-bit space (16 indicates the MSB is in the left most bit, 15 is shifted 1 to the right etc.), bipolar or unipolar, and whether the data is latched on the positive or negative edge of the clock. If you are using the DC890B or DC1371A controller you will also have an option for FPGA Ld which tells the controller to load a specific module for the

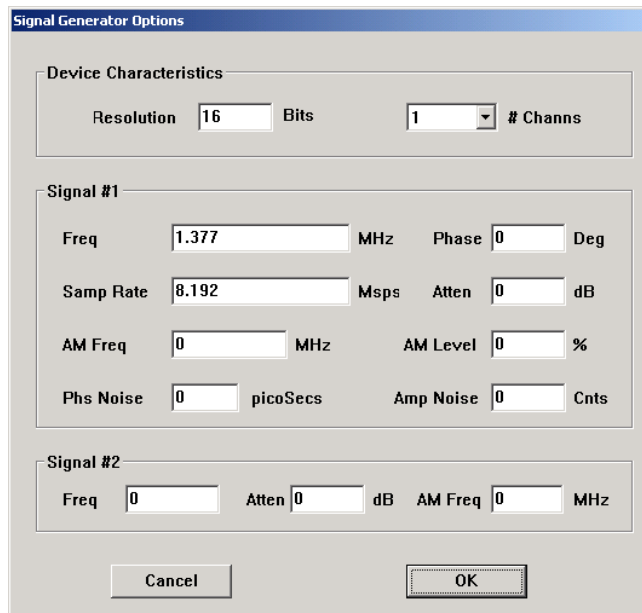


board being tested.

The modules are specific to those part number families. CMOS is used for parallel CMOS parts and LVDS is used for parallel LVDS devices. TEST is a debug mode for internal LTC use only.



Additionally, if you are using the internal signal generator simulation, this is where you will adjust such things as resolution, number of channels, frequency (MHz), sample rate (MSPs), Amplitude Noise, Phase Noise, AM Frequency, AM level, Fundamental Attenuation, and Harmonic Attenuation.



Use Internal Generator

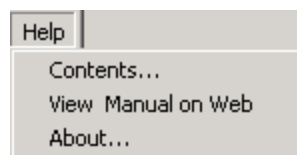
Select this option to use the internal, one or two channel, signal generator simulator. Configure the signal generator using the ADC Configura-

tion selection. This is intended primarily for LTC internal usage.

Switch Colors

Switch between black background and white background.

HELP



Contents...

An abbreviated version of this manual

View Manual on Web

A PDF version of the complete PScope manual.

About...

Contains version information on Pscope.

WINDOWS

The PScope main screen is designed to be configurable by the user. The main area of the screen is organized into 2 to 7 tabbed pages. The number of pages is usually equal to the number of ADC input channels plus one. Data displayed on each page can include input data, primitive wave and frequency domain data for each channel. The "plus-one-page" is "free" for the user to configure as desired. However, any of the pages can be configured at will.

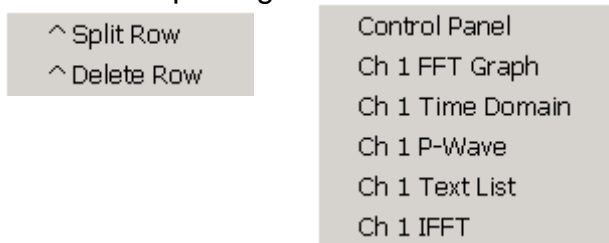
Each page is divided into several windows separated by red lines. The size and contents of each window can be set by the user as follows:

To change the size of a window, move the cursor to point at one of the red lines bound-

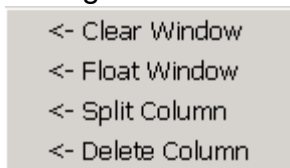
ing the window. The cursor will change to a horizontal or vertical double-ended arrow, depending on where it is positioned. Click on the left mouse button and drag the line to wherever you want it. When you release the button the windows will change size appropriately.

To change the contents of a window, place the mouse over the vertical red line to the right of the window and click the right button.

A menu will be displayed that allows you to clear the window, to float the contents of the window, to split the column containing the window or to delete the column containing the window. Also placing the mouse over the red

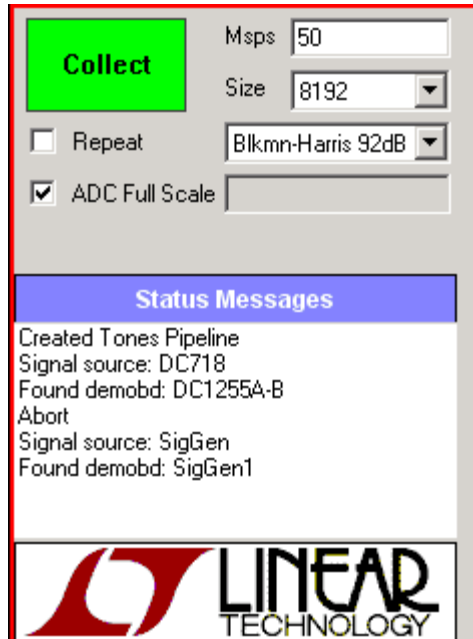


horizontal line below the window and right clicking the mouse will give you the option to



split or delete the window. Right-click inside a cleared window. This will bring up a menu of all the data types available to be displayed. To create a new window, choose Split Column or Split Row from the menus. This will open a blank window which you can then fill with data by right-clicking inside the window, as above. Whatever configuration is created will be saved on exit and restored next time the program executes.

CONTROL PANEL



COLLECT starts data collection. After Collect is selected the button changes to Pause which is used to stop data collection.

MSPS tells Pscope what the sample rate is. This does not set the sample rate. It is informational, so that the correct frequency will be displayed if frequency is selected for X-axis of FFT plots. It is important to set this box correctly as this determines how long Pscope will timeout.

Size is the sample size of each data collection.

Repeat if checked, tells Pscope to continuously take data samples of the indicated size when Collect is pressed. If not checked pressing Collect takes one sample of the indicated size, displays the data and stops.

ADC Full Scale when checked displays time-domain input data and p-wave with the Y-axis set to its maximum value. If not checked the Y-axis is auto scaled.

Windowing This selection box determines which windowing algorithm if any is used to calculate FFTs. The types of windows available are

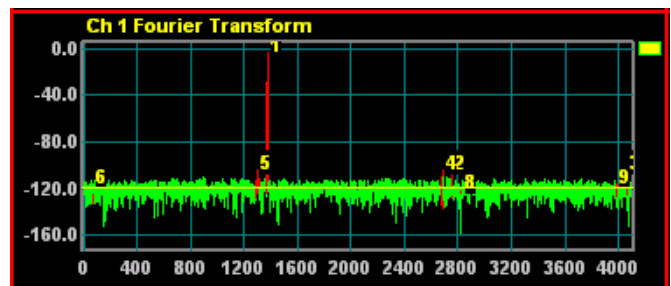
Hamming, Hann, Blackman, Exact Blackman, Blackman-Harris 72dB, Blackman-Harris 92dB and Flat Top.

Status Messages Pscope communicates miscellaneous messages to the user in this window. Some messages, such as the type of controller or type of demo board are purely informational and require no action on the part of the user. Others such as Data collection timeout suggest that no clock signal is being applied to the demo board.

FFT Graph

The FFT graph displays a Fourier transform of the input data using the specified window. Windowing is not necessary if the input data is coherently sampled. Coherent sampling is defined as $f_{in} = f_s \cdot N_{cycles} / N_{samples}$

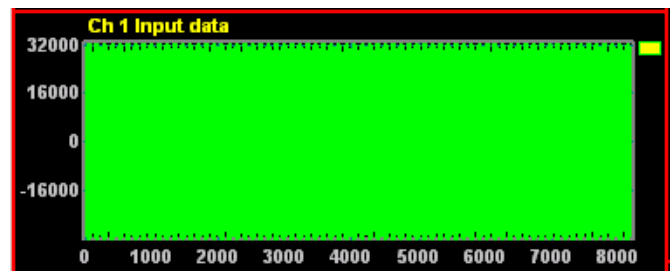
Where f_{in} is the input frequency, f_s is the sampling frequency, N_{cycles} is an integer number of cycles of the input frequency and $N_{samples}$ is the number of data points taken. $N_{samples}$ must be a power of 2. For best results use an odd prime



number for N_{cycles} . A coherent input frequency calculator can be found in the Processing Options toolbar.

Input Data

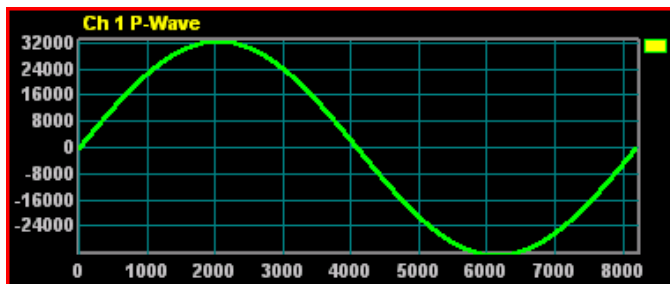
The input data graph displays the raw input data



in the time domain.

P-Wave

The P-wave is a primitive wave reconstruction of one cycle of the input data waveform based on the input frequency and data sample rate.



Text List

The text list provides a summary of the entered, measured and calculated data for each channel.

fs (sampling frequency) is entered by the user in the Msp/s window.

F1 (input frequency) is the frequency of largest amplitude measured and is calculated based on the sampling rate. If F1 is greater than $fs/2$, F1 will be aliased to a frequency between DC and $fs/2$.

BinW (Bin Width) is calculated by dividing the sampling frequency by the number of samples.

F1Bin (The bin in which the input frequency falls) is calculated by dividing the input frequency by the bin width.

F1amp (Input frequency amplitude) is calculated by $20\text{LOG}_{10}(\text{input amplitude}/\text{full scale amplitude})$. F1amp is expressed in dBFS.

SNR (signal to noise ratio) is calculated from the FFT data. It is the ratio of the rms amplitude of the fundamental frequency to the rms summation of all other frequency components except for harmonics of the fundamental frequency and DC. SNR is expressed in dB.

SINAD (signal to (noise + distortion) ratio) is calculated from the FFT data. It is similar to SNR except that it does not exclude harmonics of the fundamental frequency from the noise calculation. SINAD is expressed in dB.

Channel 1	
fs	8.192000 Msp/s
F1	1.377000000 MHz
BinW	1000.000 Hz
F1Bin	1377
F1amp	-0.000 dBFS
Parameters	Harmonics
SNR 82.38 dB	F2 -100.45 dBc
SINAD 82.11 dB	F3 -100.57 dBc
THD -94.35 dB	F4 -100.84 dBc
SFDR 99.70 dB	F5 -99.70 dBc
ENOB 13.35 bits	F6 -113.11 dBc
Mincode -32768	F7 Absent
Maxcode 32767	F8 Absent
DCLev 0.0	F9 -122.66 dBc
Flor -118.51 dBFS	Nyq -127.21 dBc

THD (total harmonic distortion) is calculated from the FFT data. THD is the ratio of the rms sum of the first five harmonics to the RMS full scale amplitude. THD is expressed in dB.

SFDR (spurious free dynamic range) is calculated from the FFT data. SFDR is the ratio of the fundamental amplitude to the amplitude of the next highest amplitude frequency component. SFDR is expressed in dB.

ENOB (effective number of bits) is calculated from SINAD. The formula is $(\text{SINAD}-1.76)/6.02$. A theoretically perfect ADC of N bits would have an ENOB of approximately N bits. ENOB is expressed in bits.

Mincode (minimum code) is measured. It is the lowest code recorded. Mincode is expressed in counts.

Maxcode (maximum code) is measured. It is the highest code recorded. Maxcode is expressed in counts.

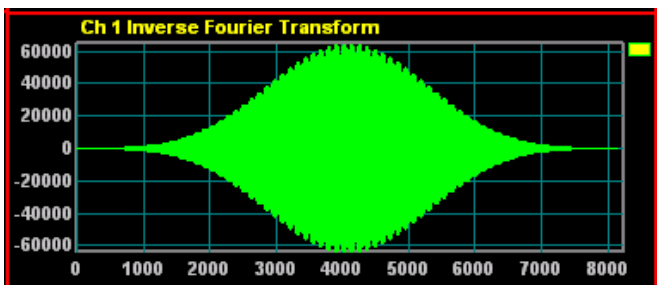
DCLev (DC level) is calculated from the input signal. It is the average level of the input signal expressed in counts.

Flor (Noise Floor) is the average level of the FFT after subtracting out DC, the fundamental and its harmonics. The Flor level can be fine tuned by editing the user defined noise mask.

and then turning on the apply user defined noise mask function. Fl_{or} is expressed in dBFS or dBc.

F2-F9 (2nd through 9th harmonics) are the levels of the harmonics of the fundamental F1. F_x is expressed in dBc.

Nyq (Nyquist signal level) is the level of the signal at Nyquist ($F_s/2$). Nyq is expressed in dBc.



IFFT

You can display the Inverse Fourier Transform of the desired Fourier Transform channel by creating an IFFT window for that channel and then clicking on the Toolbar button labeled Display IFT results. The Fourier Transform on which the Inverse Fourier Transform is performed can be modified by using the IFT Mask Edit button to the left of the Display IFT results button on the Toolbar.

The IFT "mask" is really an array of attenuation factors, one per bin of the original frequency domain data, which will be applied before the IFT is calculated. This allows arbitrary filtering of the signal, including the removal of single-bin spurs or other artifacts, before calculating the Inverse Fourier Transform.

The mask starts out with 0 attenuation for all bins. To change the value, click on the IFT mask edit button on the toolbar. The dialog that is displayed lets you specify an attenuation and apply it to selected bins by clicking the left mouse button and dragging the resulting white line over the bins that you want to attenuate. Note that a negative attenuation factor boosts the corresponding bin.

Whatever configuration is created will be saved on exit and restored next time the program executes.

X-CHANNEL

The X-Channel is available on page 3 of a two-channel part. It displays the relative magnitude and phase of the two channels. Magnitude and phase are measured with respect to channel two. X-channel is displayed but no data provided with other numbers of channels or in spread spectrum mode.

X-Channel	
Relative Phase	-118.77119°
Relative Mag	-3.83 dBc

EDITING DISPLAY FORMAT OF A WINDOW

The windows in Pscope have panning and zooming capability, and can be set to display as a series of connected points (the default setting) or discrete points.

Panning can be accomplished by moving the crosshair cursor to the right of the data (for Y-axis) or below the data (X-axis) edges of the graph. The cursor will change to a double arrow. Then left-click and hold down the mouse button and move the cursor up-down or right-left to shift the plot to the desired position.

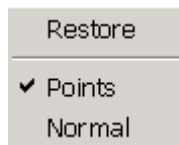
Zooming is done by moving the crosshair cursor to the left of the data (Y-axis) or above the data (X-axis) edges of the graph. The cursor changes to a <-+> to indicate zoom mode. Then click and hold down the left mouse button and move the cursor to zoom in or out on the graph to the desired scale.

A quick zoom/pan move which centers a given point on the graph can be accomplished by placing the crosshair cursor on the point you want to center and double-clicking the left mouse button. Centering a point on the screen will keep that point from moving when

the scale is increased or decreased, facilitating additional zooming in on the point.

Clicking the left mouse button on a data point causes Pscope to display the X and Y coordinates of that point.

Clicking the right mouse button while the cursor is inside one of the graphs (when the cursor appears as a cross) displays a "pop-up" menu with the following entries:



Restore: displays all the data in an autoscaled Normal format. This can also be accomplished by left-clicking on the rectangle in the upper right corner of each data window. This is useful if the data goes off the screen while scaling.

Points: displays only the data points with no lines connecting them.

Normal: displays the data points with a line between them. This is the default format.

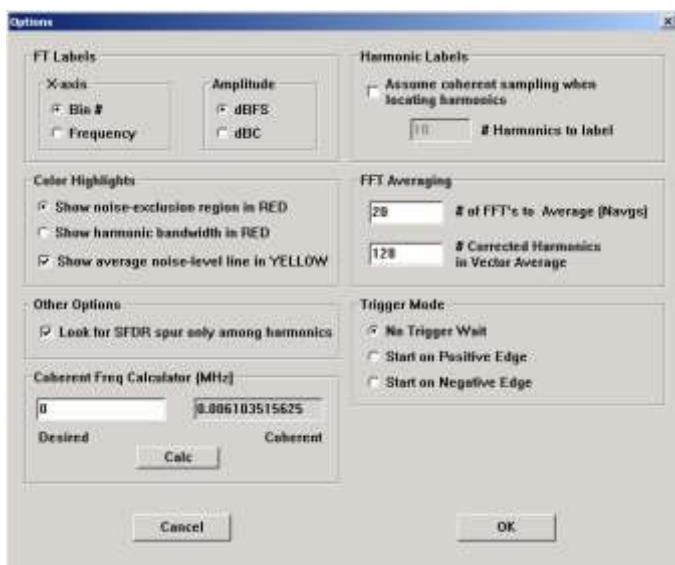
TOOLBAR



RESERVED This button is not used in this version of Pscope.



PROCESSING OPTIONS



FT Labels format the x and y axis of the Fourier transform. The x-axis can be displayed in counts or frequency. The frequency displayed will only be correct if the proper sampling frequency has been entered in the control window. The y-axis can be displayed in dBFS or dBc. dBFS normalizes everything to full scale amplitude while dBc normalizes everything to the level of the fundamental.

Harmonic Labels determines where the labels for harmonics occur and optionally how many labels to display. Normally, the box labeled “Assume coherent sampling when locating harmonics” is not checked. This means that Pscope looks for the peak value near where the harmonic should be located. If this box is checked the harmonic indicator will be placed at exact multiples of the fundamental frequency. Checking this box also gives you the ability to set the number of harmonics to be labelled. The program displays N-1 harmonics.

Color Highlights gives you a choice between showing the noise exclusion region in red or showing the harmonic bandwidth in red. Additionally you can turn on or off, a line that indicates the average noise level

FFT Averaging allows you to enter the number of FFTs to average for both power and vector averaging and the number of corrected harmonics in vector average. For vector averaging increasing the number of samples reduces the noise floor by the square root of the number of samples. When performing vector averaging, the number of corrected harmonics should exceed the number of harmonics of interest.

Other Options allows you to determine whether Pscope searches for SFDR spurs only among harmonics or if the entire FFT content is searched.

Trigger Mode tells Pscope to free run or wait for a positive or negative edge on the trigger input before acquiring data. See the Quick Start guide for the particular controller board you are using for the location and voltage requirements of the trigger signal.

Coherent Freq Calculator is used to calculate a coherent input frequency based on the sample rate and sample size selected.



RESERVED This button is not used in this version of Pscope.

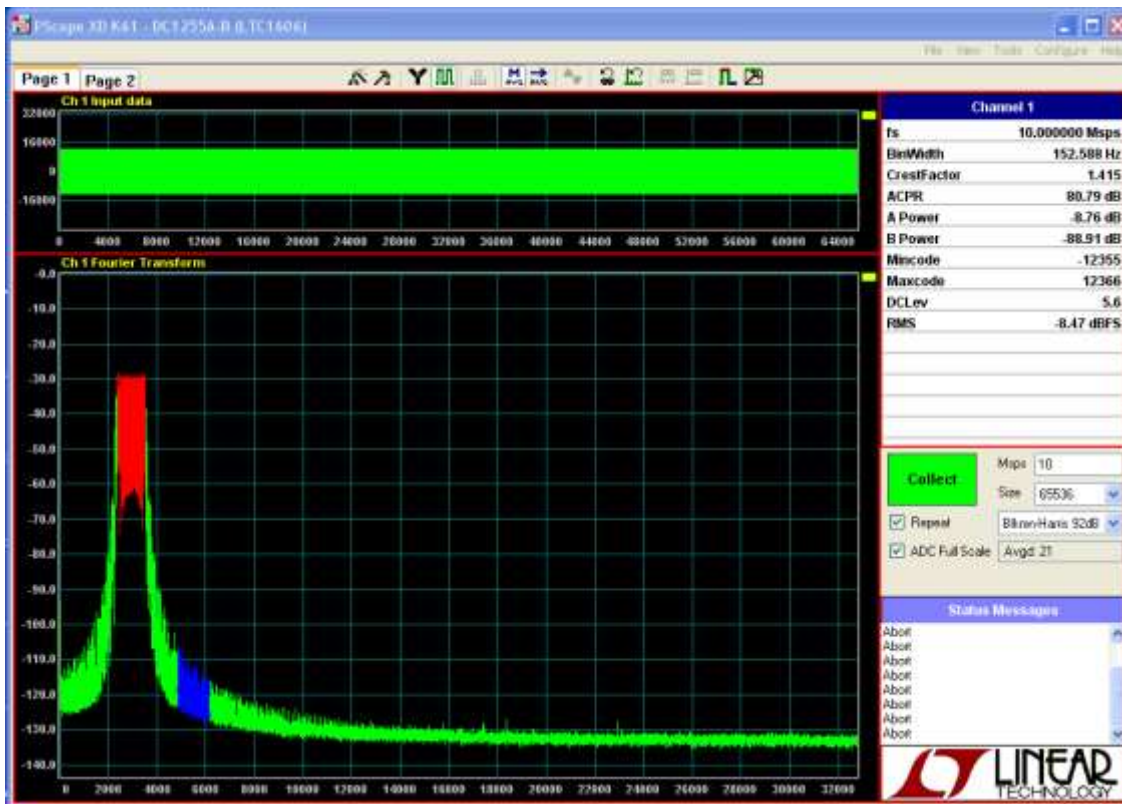


Figure 3 Spread Spectrum Mode

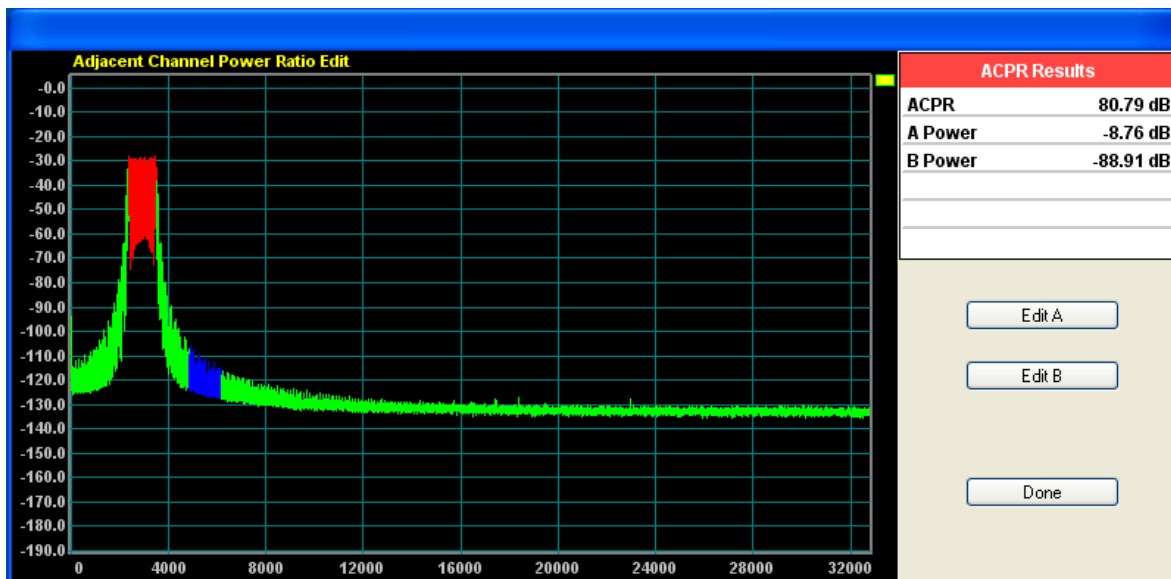


Figure 4. Define ACPR Frequency Bands



SET SPREAD-SPECTRUM MODE is used to

evaluate spread-spectrum signals. One of the first things you will notice upon entering this mode is that two-tone, display p-wave, edit user defined noise mask and use user defined noise mask are not available. This is because the input signal is assumed not to be a single tone.

Channel 1	
fs	0.250000 Msps
BinWidth	7.629 Hz
CrestFactor	1.410
ACPR	0.00 dB
A Power	0.00 dB
B Power	0.00 dB
Mincode	-26605
Maxcode	27726
DCLev	370.8
RMS	-1.60 dBFS

The text list is also modified from the standard list. New functions added are:

CrestFactor is the ratio of the peak signal amplitude to the RMS signal amplitude.

ACPR is the adjacent channel power ratio. This is the ratio of the power in the A frequency band to the power in the B frequency band. The frequency bands are set using the define ACPR regions button in the toolbar.

A Power is the average power in the frequency band specified with the define ACPR regions button.

B Power is the average power in the frequency band specified with the define ACPR regions button.

RMS is the rms amplitude of the input signal. This is the equivalent of F1 amp in the normal text list except that the input signal is not assumed to be a single tone in spread spectrum mode.

IQ MODE is a subset of Spread-Spectrum mode. It can only be activated if spread spectrum mode is used with a two-channel device. It is used to separate upper and lower phase related side-band information in CDMA signals that would otherwise overlap each other in a normal FFT display.



SET TWO-TONE MODE is used to evaluate two-tone signals as shown in Figure 5. This mode assumes that you are providing two pure tones and Pscope then calculates and displays the tones, the harmonics of the tones and the sum and difference frequencies of the tones. F1, 2F1, 3F1, F2, 2F2 and 3F2 are the input frequencies and the 2nd and 3rd harmonics of the input frequencies. S is the sum of the input frequencies. D is the difference of the input frequencies. 3U, 3L, 5U, 5L, 7U and 7L are 3rd, 5th and 7th order difference frequencies. The text list is modified from the standard list. New items added are:

F2 is the frequency of the second fundamental.
F2Bin is the frequency bin where the second fundamental exists.

F2 AMP is the amplitude of the second fundamental.

IM 3L is a third order distortion product, calculated by 2*F1-F2.

IM 3U is a third order distortion product, calculated by 2*F2-F1.

Spur is the difference in amplitude between the smallest amplitude fundamental and the largest amplitude third order distortion product.

RIP3 is an approximation of the third order intercept point. The formula is

$$RIP3 = (3 * (\text{MIN}(F1\text{Amp}, F2\text{Amp})) - \text{MAX}(\text{IM3L}, \text{IM3U})) / 2$$



ENABLE POWER AVERAGING averages a number of samples of the fft window. The number of samples is specified using the options button.





ENABLE VECTOR AVERAGING also averages the fft window but it uses the phase information in the fft to attenuate non phase related frequency content.



DISPLAY PRIMITIVE WAVE tells Pscope to calculate the primitive wave. Even if a primitive wave window is open, no data will be placed in this window if this button is not pushed.



EDIT IFT MASK The IFT "mask" is really an array of attenuation factors, one per bin of the original frequency domain data, which will be applied before the IFT is calculated. This allows arbitrary filtering of the signal, including the removal of single-bin spurs or other artifacts, before calculating the inverse Fourier transform. The mask starts out with zero attenuation for all bins. To change the value, click on the IFT mask edit button on the toolbar. The dialog that is displayed lets you specify an attenuation factor and apply it to selected bins by clicking the left mouse button and dragging the resulting white line over the bins that you want to attenuate. Note that a negative attenuation factor boosts the corresponding bin. See Appendix B for an example.



DISPLAY IFT RESULTS You can display the Inverse Fourier Transform of the current Fourier Transform by clicking on the Toolbar button labeled Display IFT Results. In addition, you will need to create a window and have it display CHX IFFT. The Fourier Transform on which the IFT is performed can be modified by using the Edit IFT Mask capability which can be invoked with the button to the left of the Display IFT button on the Toolbar.



EDIT USER-DEFINED NOISE MASK allows you to subtract out frequency bands in the calculation of SNR and SINAD. This can be useful if you are not doing coherent sampling and the fundamental and harmonics spread into more bins than Pscope allows for. Also you may find this function useful if some external interference needs to be removed. See Appendix C for an example.



APPLY USER-DEFINED NOISE MASK determines whether the user defined noise mask or the automatically generated mask is used.



DEFINE ACPR REGIONS is used in the spread spectrum mode to determine the two frequency bands whose relative levels are compared to calculate ACPR.



SET DEMO BD OPTIONS can be used by certain demo boards that have configuration options. If there are no demo-board options for the particular board you are using, Pscope will tell you. See the Quick Start Guide for your particular demo-board for details.

QUICK START GUIDE FOR PSCOPE AC DATA COLLECTION AND ANALYSIS SOFTWARE

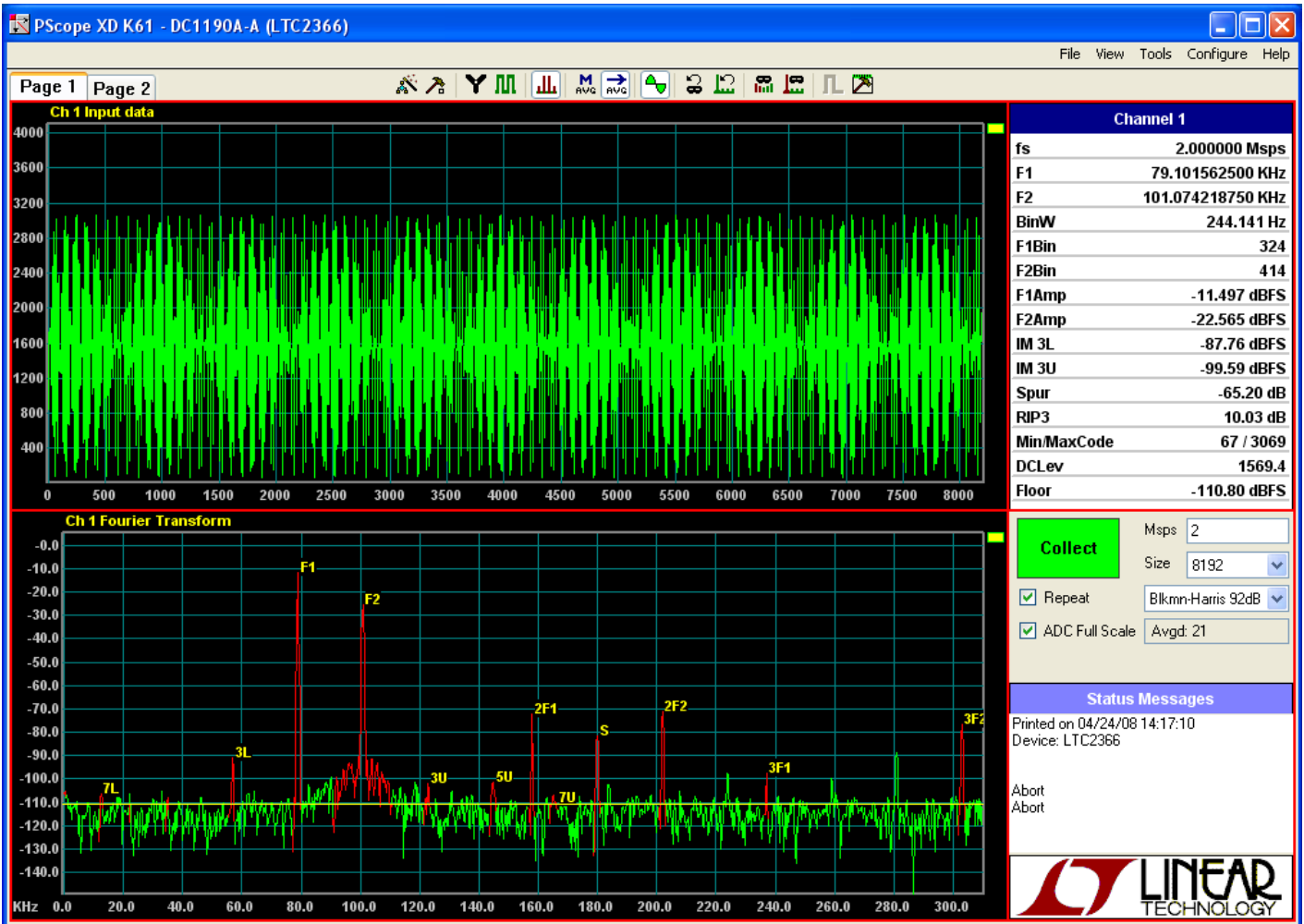


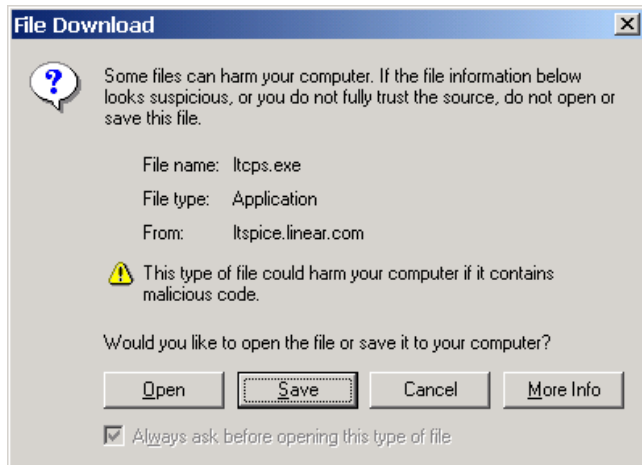
Figure 5. Two-Tone Mode

APPENDIX A - INSTALLING PSCOPE

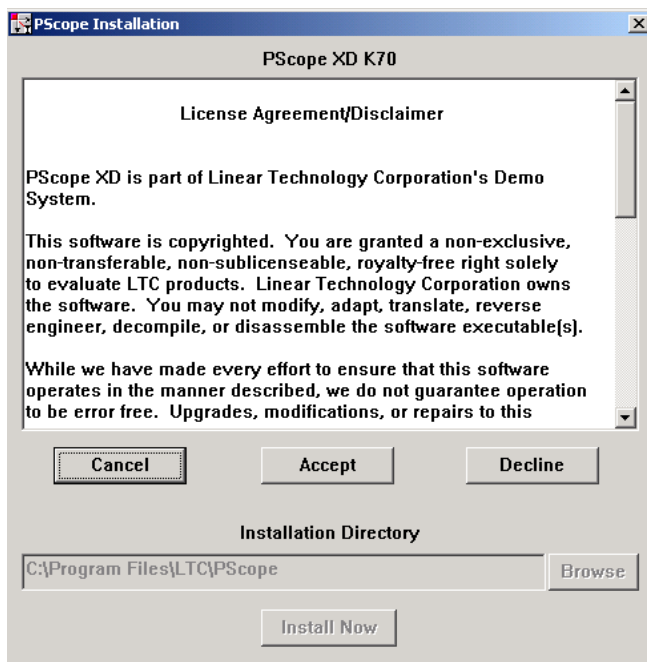
Download Pscope from

www.linear.com/designtools/software.

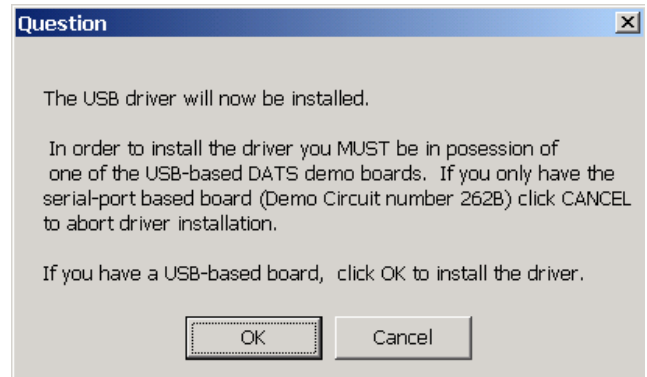
When asked whether to save or open the file select Open



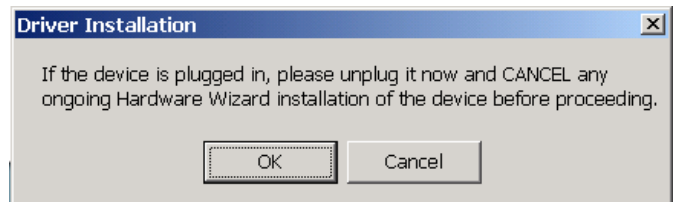
The following screen should appear. Accept the license agreement and modify the default Installation directory if desired. Then hit Install Now.



The installer then will load the USB driver. The following screen should appear.



All the current controller boards are USB based, so press OK. The following warning will be displayed.



Unplug any LTC data collection boards that might be plugged in and press OK

A driver successfully installed window should then be displayed.



Pressing OK will start Pscope. Plug in a controller board and a demo board and you are ready to begin collecting data.

APPENDIX B –EDIT IFT MASK EXAMPLE

Using the Edit IFT Mask tool you can analyze your data in the time domain by editing the FFT and doing an inverse Fourier transform on the edited data. Let's start with the following example. Figure B-1 is generated with coherent sampling and 1280 vector averages and windowing turned off. The primitive wave in Figure B-1 is created from the inverse Fourier transform. The Fourier transform has not been edited in Figure B-1. Select Edit IFT Mask and as shown in Figure B-2, Pscope will display the Fourier transform and editing tools. Set the attenuation to 100dB. Do not hit Enter. Attenuate

F1 in the Fourier transform by dragging the cursor horizontally across the frequency spectrum occupied by F1 using the Attenuate operation. (Restore returns FFT attenuation levels back to normal. Extend increases the frequency range of an attenuated or normal level. Start in the level you want to extend and move the cursor horizontally.) The IFFT edit window will look similar to Figure B-3. Press Done. Turn on the Display IFT Results button and you can clearly see the distortion products in the P-Wave with F1 subtracted as shown in Figure B-4. Compare this with Figure B-5 where magnitude averaging was

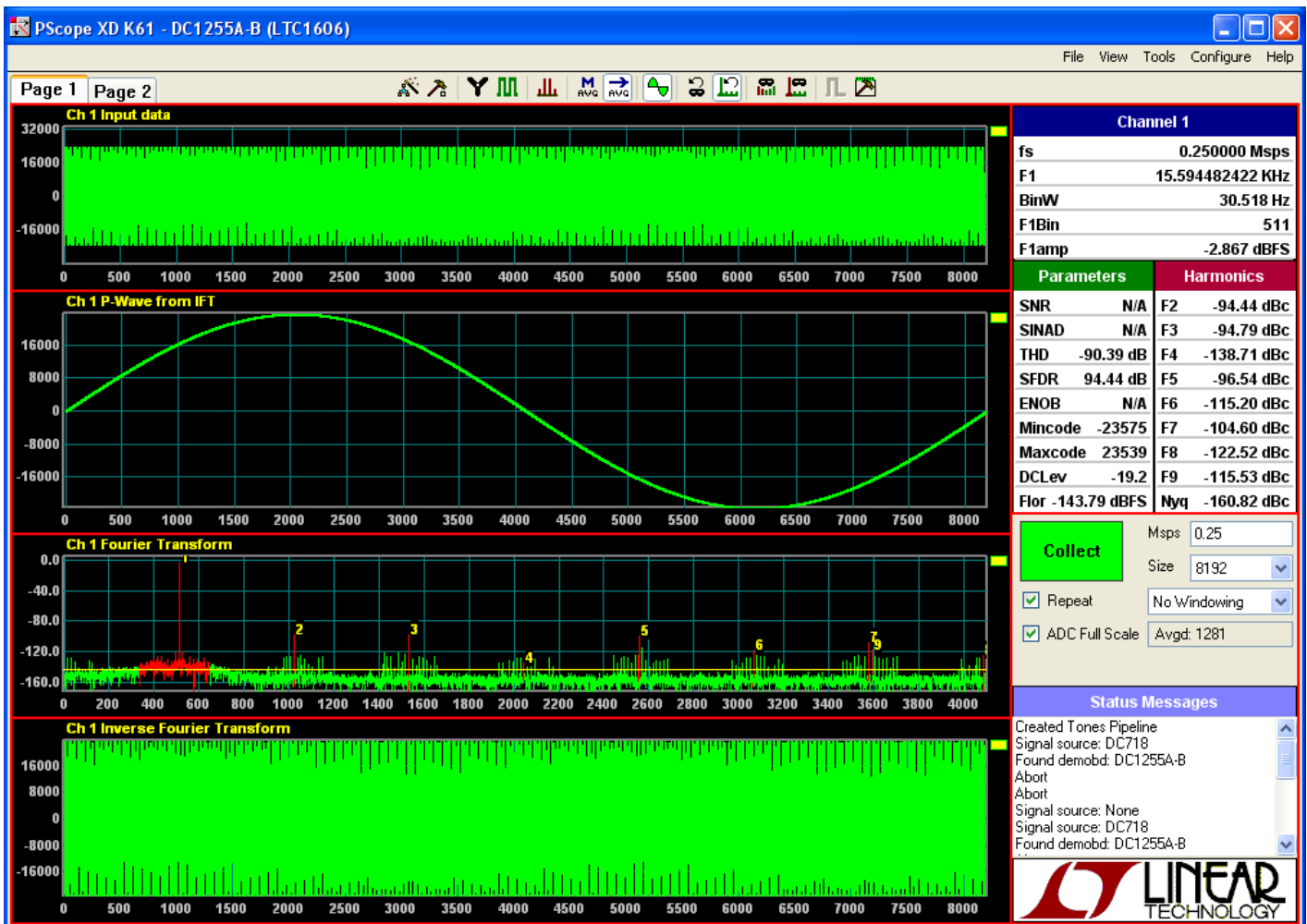


Figure B-1. P-Wave generated from IFT

performed. Because vector averaging maintains phase information, signals that are not phase

correlated with F1 are attenuated allowing the distortion products to be more clearly seen.

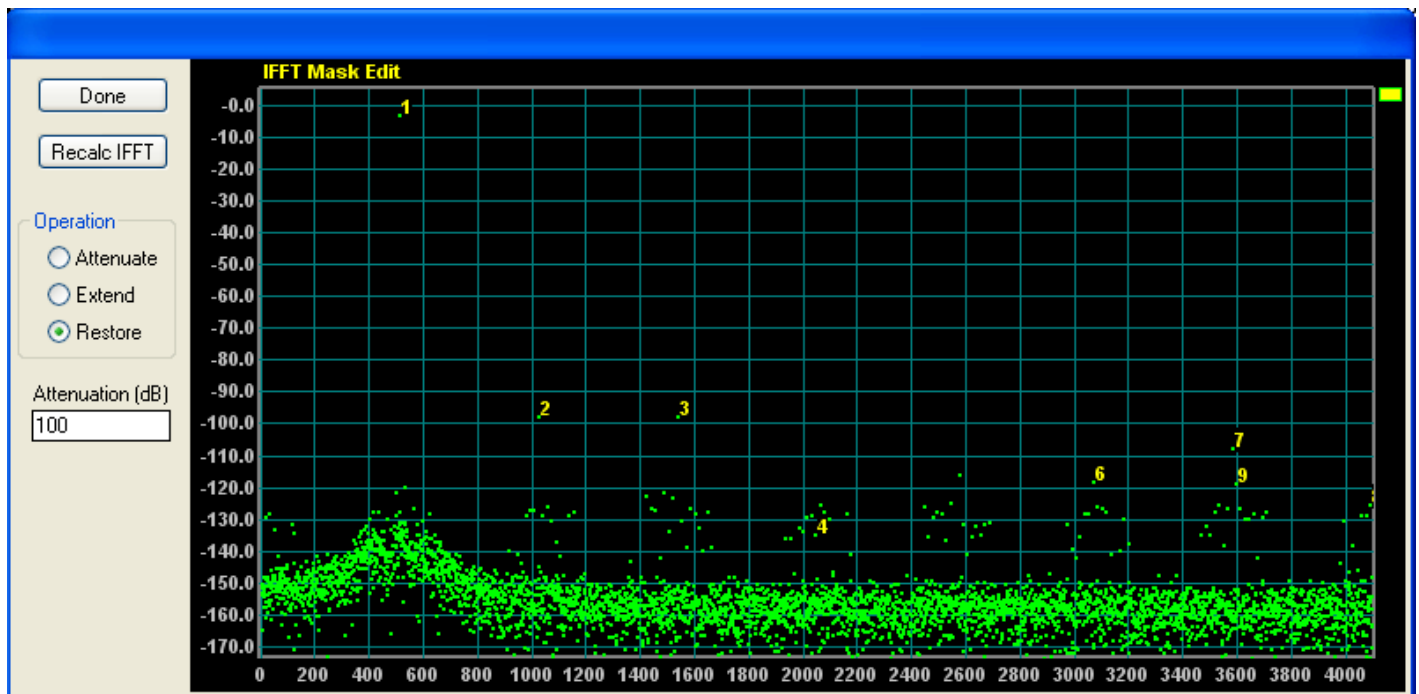


Figure B-2. Unmasked FFT

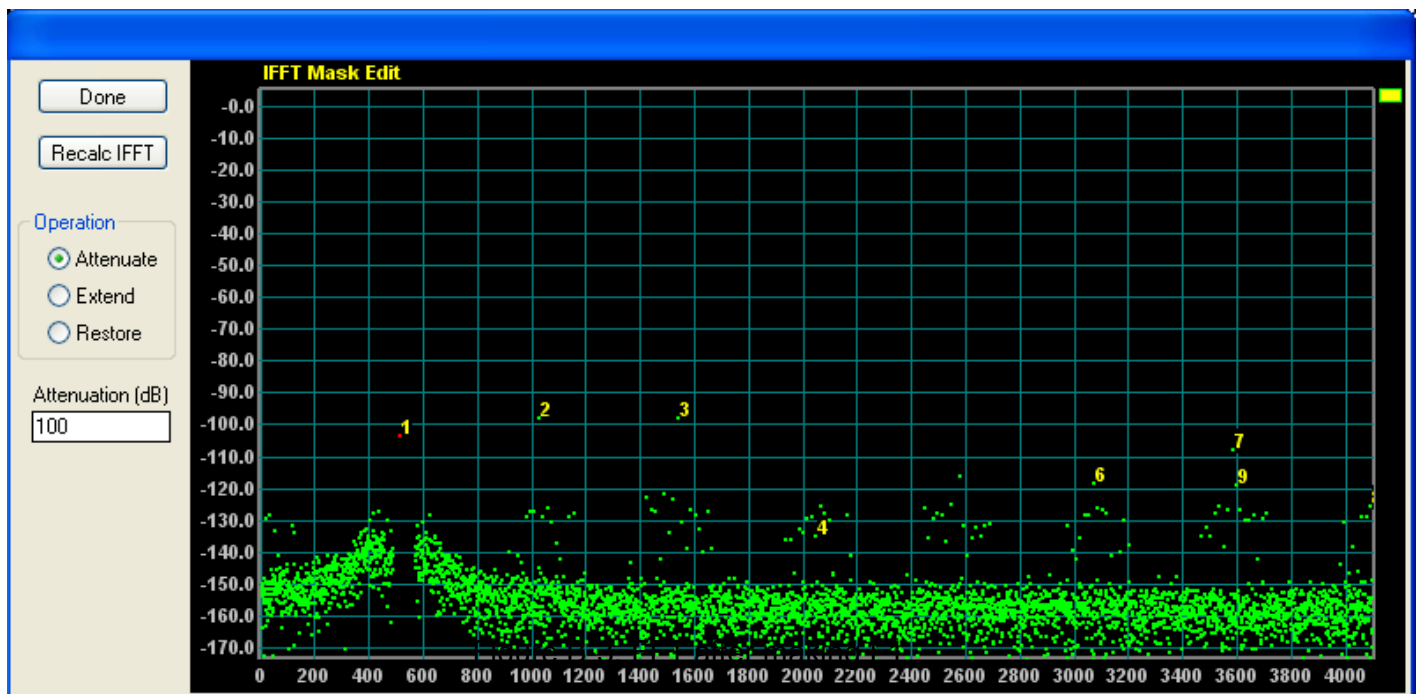


Figure B-3. Masked FFT

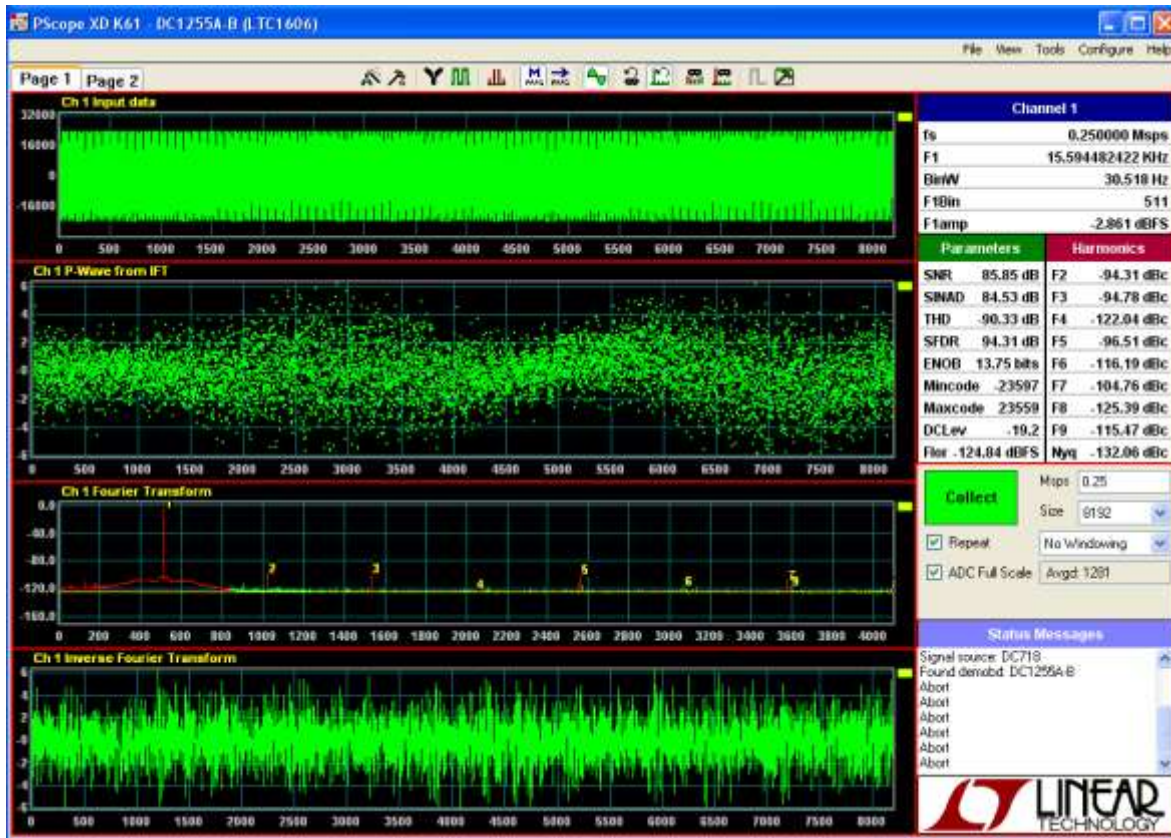


Figure B-4. P-wave from IFT with vector averaging

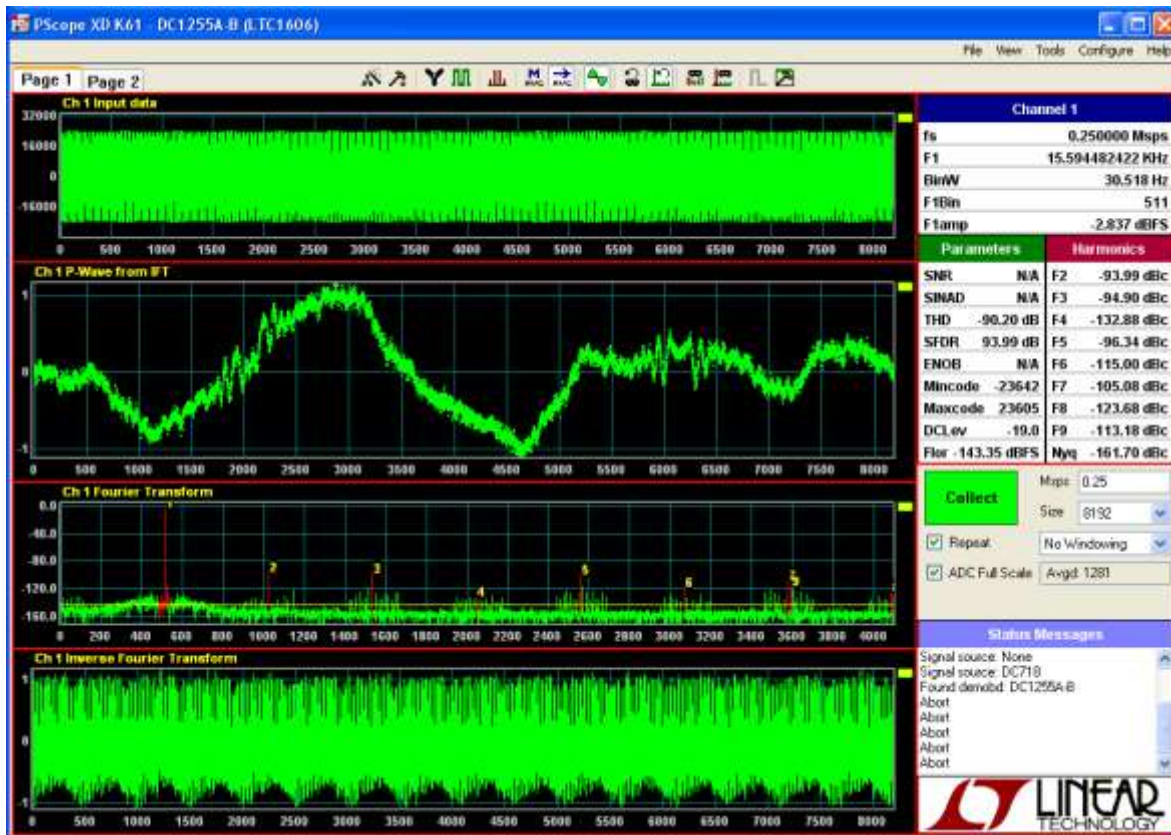


Figure B-5. P-wave from IFT with magnitude averaging

APPENDIX-C EDIT USER-DEFINED NOISE MASK

The user-defined noise mask can be used to mask out spreading of the fundamental and harmonics or signals caused by interference, which can cause errors in the calculation of SNR. In the Pscope window of Figure C-1, you can see that the SNR level is 65.61dB. Notice the pedestal from 5kHz to 20kHz beneath F1 and the spur at 31.5kHz. The pedestal is caused by jitter in the ADC clock signal. The spur at 31.5kHz is an intentional interference signal injected for this experiment. These items cause Pscope to report an inaccurate SNR for this part. Let's fix this problem by editing the user-defined

noise mask. Turn on the edit user-defined noise mask. Move the cursor to the 5kHz point. Press and hold the left mouse button and drag horizontally to the 20kHz point. Release the left mouse button. Move the cursor to the left of the 31.3kHz spur and press and hold the left mouse button. Drag horizontally just past the spur and release the mouse button. The mask should now look similar to Figure C-2. Press Done. Next, turn on the apply user-defined noise mask. Figure C-3 shows that the SNR is now calculated as 86.23db an improvement of more than 20dB.

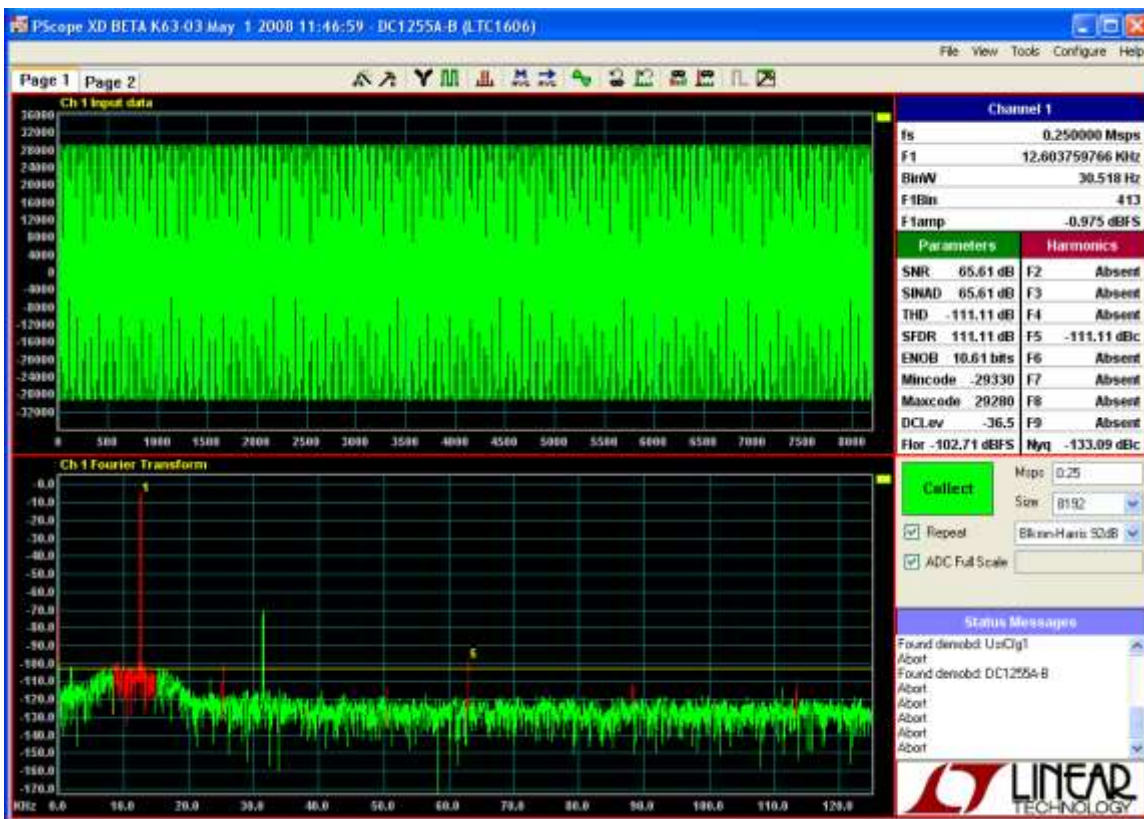


Figure C-1. No User-Defined Noise Mask Applied

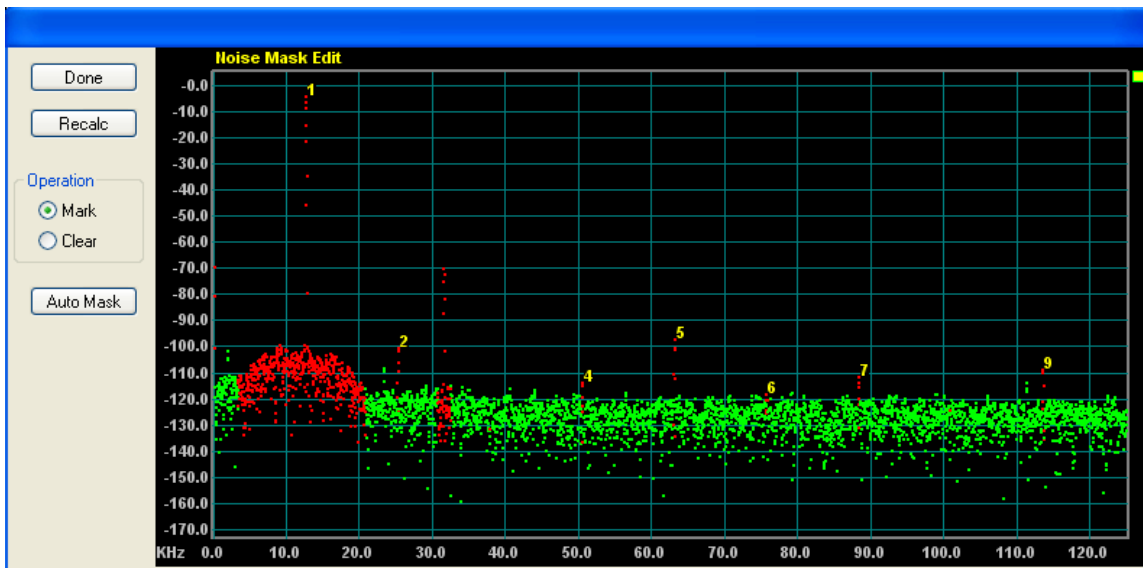


Figure C-2. User-Defined Noise Mask after edit.

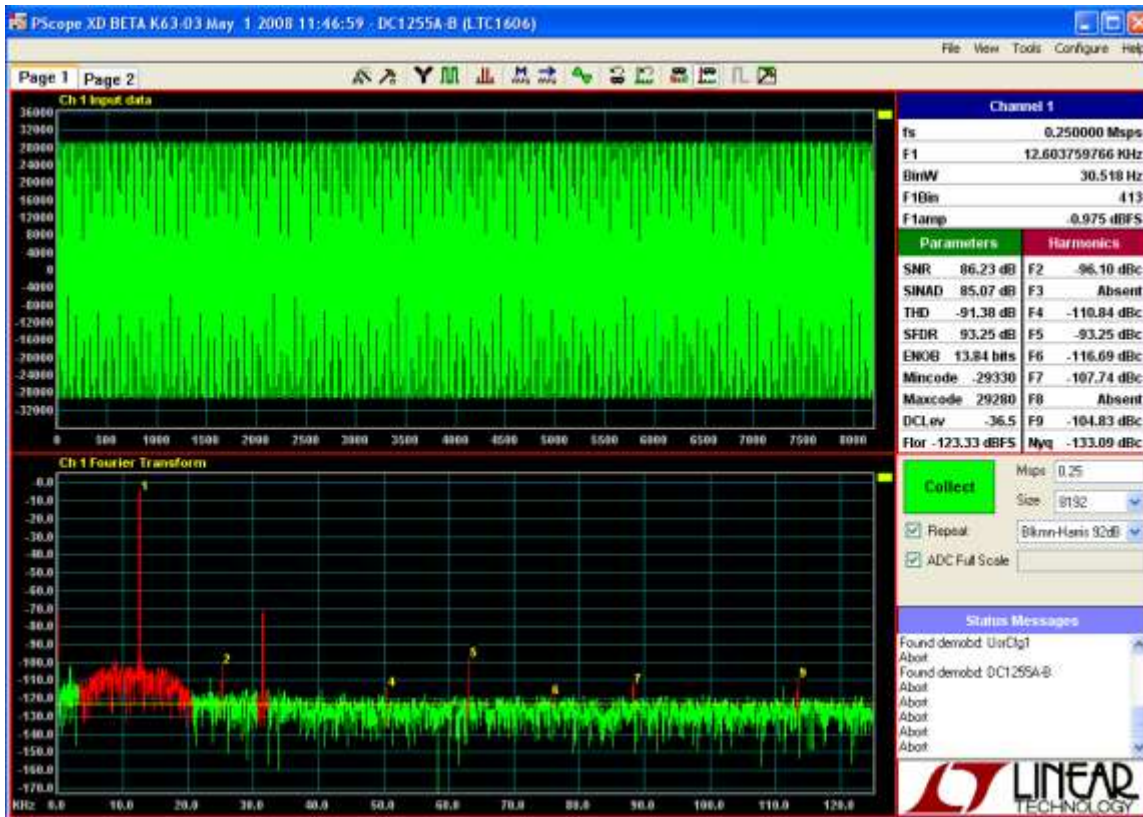


Figure C-3. User-Defined Noise Mask Applied

APPENDIX D PSCOPE STATUS MESSAGES

The following is a list of status messages that Pscope produces. These are broken into two categories, information and action required. For those messages that require action some hints are provided to solve the problem before contacting customer support.

INFORMATION

Created tones pipeline

Pscope configured to work with pure tones

Created spread-spectrum pipeline

Pscope configured to work with spread spectrum signals.

Data collection aborted

Data collection has been paused.

FPGA load OK

The FPGA has been loaded with the data required for the current demo board.

Found demobd *Demo Board Name*

Pscope has detected a demo board.

Load not in flash, using Pscope's library

The data for this demo board was not found in the controller's flash memory. The data was transferred from the PC to the on-board flash. This is only for DC890B

Loading bank y w/type x

Data of the type specified is loaded from PC into one of the four flash banks. This is only for DC890B.

Loading FPGA for type x

Data of type specified is loaded from flash into FPGA. This is only for DC890B

Signal source *Controller name*

Pscope has detected a controller

ACTION REQUIRED

Bad or No Clk

Clk source is not turned on or levels are wrong. For LVDS boards only.

*** Can't ID device

Flash on demo board can't be read. Try unplugging and plugging back in.

Can't start FPGA

No power, no clock, clock out of range for demo board or unstable clock on demo board. If you don't think any of these apply try resetting the controller board.

Controller error

Cannot communicate with the controller. Check the USB cable. Try unplugging and plugging it back in.

Controller needs external power

The controller needs more power than the USB can provide. Connect AC adapter.

Data collection timeout

This indicates a slow, bad or missing clock. Pscope sets a timeout based on the sample rate entered. Make sure the clock source is turned on and the amplitude is compatible with the demo board you are using.

Data transfer error or Data collection error

Error reading data from the controller. This is possibly due to the controller being disconnected while data collection was in progress.

Error loading FPGA

FPGA load operation failed.

Error reading FPGA status register

Check cables. Controller may be damaged.

No Ack, loading FPGA

There was an error loading FPGA data from the EEPROM. The flash ID on the demo board may be damaged or the controller may be damaged. Try another demo board if you have one.

No demo board

No demo board detected. Remove demo board and reattach.

PC file I/O error

Couldn't find FPGA file. Try updating PScope. Try reinstalling Pscope.